THE FOUNDING OF THE BRITISH ASSOCIATION.

The British Association for the Advancement of Science is fifty years of age at the present time, and begins its "jubilee" meeting next Wednesday at York, the city in which it was born. Special pains have, therefore, been taken to make the meeting a good one. Men of considerable scientific eminence will make a point of attending to take part in the proceedings, the Archbishop of York will be among those who will welcome the guests; moreover, the central position of York, and its being on the high road between London and Scotland, are circumstances which tell in favour of a good meeting.

The English scientific world is in a state of glee at this its approaching "jubilee," a word suggestive of Sunday-schools, tea and cake, flags and banners, a word which falls strangely on the ear when it is uttered by lips accustomed chiefly to the deliverance of technical phrases. The etymology of "jubilee" is greatly disputed, but the most general belief is that it is derived from the horn of a ram, and that the year of jubilee is "the year of the blowing of the horn." The jubilee was a Jewish festival, held every fiftieth year, and it embraced three main enactments, namely:—(1) That the soil should rest untilled during the year, and man live upon its natural produce; (2) that all landed property should go back to those former proprietors who had been compelled by poverty to sell it; (3) that all slaves should be set free. The day was ushered in by the blast of a trumpet, a straight ram's horn instrument, with a gold mouthpiece. According to the *Mishna Rosh Ha Shana*, on this day every Israelite blew nine blasts, so as to make "the trumpet sound throughout the land," nor is there any reason to suppose that the members of the British Association will be behindhand in the performance of this duty; a few of them have always displayed an aptitude for blowing their own trumpets, especially the small minority who have had wares to advertise in papers read in the sections.

In 1849 a "Handbook of the British Association," written by Mrs. Margaret Fison, was published by Messrs. Longmans, and dedicated by permission to Sir Roderick Murchison. It is a closely printed book of 219 pages. She sets forth that, practically speaking, the Association was started by Sir David Brewster, and that Sir Humphrey Davy, Sir John Herschel, and Professor Playfair had been about that time promulgating ideas showing the necessity for some such step. Sir David Brewster conceived the idea of holding annual meetings of scientific men like those which had proved of so much value in Germany. The German annual congress of scientific men was founded in 1822 by Dr. Oken, of Munich. The first meeting was held at Leipsic for the purpose of making students of natural science and medical men acquainted with each other, and it was attended by but twenty residents in Leipsic and twelve visitors. During the next six years the meetings increased in importance, that of 1827 being held in Munich, and patronised by the King of Bavaria. On the 18th September, 1828, the congress assembled in Berlin under the patronage of the King, and the presidency of Baron Von Humboldt; Mr. Babbage was the only Englishman present, and he recorded his opinion of it in an article in the "Edinburgh Journal of Science." At a *soirée* given by the president on the same date, 1200 persons were present, among whom was the King of Prussia. In 1830, the year before the founding of the British Association, the German Congress met in Hamburgh, and among the 285 visitors from a distance in attendance were Professor Johnstone, Dr. Traill, Mr. Babbage, and Professor Pillans, Professor Johnstone wrote a full account of it to the "Edinburgh Journal of Science."

Incited by the success of the German Association, and by some ideas put forth in a work by Mr. Babbage, entitled "Reflections on the Decline of Science, and Some of its Causes," Sir David Brewster determined to start the British Association for the Advancement of Science. He selected York for the first meeting, because it was a central place, and had a philosophical society which had been in existence for eight or nine years, and he wrote the following letter to Mr. Phillips, the secretary of that society:—

"Allerby, by Melrose, Feb. 23rd, 1831.

"Dear Sir,—I have taken the liberty of writing to you on a subject of considerable importance. It is proposed to establish a British Association of Men of Science, similar to that which has existed for eight years in Germany, and which is now patronised by the most powerful sovereigns in that part of Europe. The arrangements for the first meeting are in progress, and it is contemplated that it shall be held in York, as the most central city of the three kingdoms. My object in writing to you at present is to beg that you would ascertain if York will furnish the accommodation necessary for so large a meeting, which might perhaps consist of 100 individuals; if the Philosophical Society would enter zealously into the plan, and if the mayor and influential persons in the town and in the vicinity would be likely to promote its objects. The principal objects of the society would be to make the cultivators of science acquainted with each other; to stimulate one another to new exertions; to bring the objects of science before the public eye, and to take measures for advancing its interests and accelerating its progress. The society would possess no fund, make no collections, hold no property, the expense of each anniversary meeting being defrayed by the members who are present.

"As these few observations will enable you to form a general opinion of the object in view, I shall only add that the time of meeting which is likely to be most convenient would be about the 18th or 25th of July.—I am, dear Sir, ever most truly yours,

"J. Phillips, Esq. "D. Brewster."

The Philosophical Society and the Mayor and magistrates of York received the proposition favourably; so also did the Archbishop of York, who offered hospitality to the leading members of the Association at his palace. Among the scientific men who warmly supported Sir David Brewster in the undertaking from the first were Sir Roderick Murchison, Mr. Robison, Mr. Forbes, Professor Johnstone, and Professor Phillips. The month of September was finally fixed upon as the best for the holding of the opening meetings.

At Oxford, shortly before his death, Professor Phillips described to us his anxieties about this first meeting. In the morning he took a walk in the Museum Gardens in the hope of meeting illustrious strangers and scientific visitors, but found none. A little later he met four or five scientific men, personal friends of his own. But the meeting after all proved not so bad for a first start.

The following were the first officers of the British Association:—President: Charles William, Viscount Milton, F.R.S., President of the Yorkshire Philosophical Society. President elect: The Rev. William Buckland, D.D., F.R.S., Professor of Geology and Mineralogy, Oxford. Vice-president: The Rev. William Vernon Harcourt, F.R.S., Vice-president of the Yorkshire Philosophical Society. Vice-presidents elect: Sir David Brewster, LL.D., and the Rev. William Whewell, F.R.S., Professor of Mineralogy, Cambridge. Treasurer: Mr. Jonathan Gray, of York. Secretaries: York—Mr. William Gray, jun., and Mr. John Phillips, F.G.S., secretaries to the Yorkshire Philosophical Society; London—The Rev. J. Yates, F.L.S.; Edinburgh—Mr. J. Robison, secretary to the Royal Society of Edinburgh; Oxford—Mr. Charles Danberry, M.D., and the Rev. Baden Powell, F.R.S. The Association started with about 250 members, among whom were Dr. Abercrombie, Mr. Babbage, Sir D. Brewster, Dr. Christison, Mr. John Dalton, Mr. Charles Danberry, Sir Philip Egerton, Sir John Forbes, the Rev. W. Vernon Harcourt, Mr. Charles Lyell, Mr. R. J. Murchison, Mr. John Phillips, Sir Thos. Phillips, the Rev. W. Scoresby, Sir John Sinclair, the Rev. W. Whewell, and Sir Alexander Wood.

The first official report of the first meeting of the British Association was published in February, 1832, by Messrs. Thomas Wilson and Sons, High Ousegate, York. This was reprinted in 1833 by Mr. John Murray, of Albemarle-street, London, and bound in the same volume with the report of the second meeting of the Association, which was held at Oxford in 1832. The third meeting, 1833, was in Cambridge.

The opening meeting of the Association was held in the theatre of the Yorkshire Museum, on Tuesday, the 27th September, 1831; rather more than 300 persons were present; the total number of tickets which had been issued was 353. The meeting began at twelve o'clock at noon. On the motion of Dr. Brewster, Viscount Milton was voted into the chair, from which he gave a presidential address of five minutes' duration. He expressed a hope that the Association would be a useful body, and that from a small beginning it might rise into importance. He hoped it would remove obstacles to the progress of science. For instance, the fiscal laws of the country offered obstacles to scientific improvements; the regulations relating to the manufacture of glass greatly hampered the progress of the science of optics. The Rev. Wm. Vernon Harcourt, chairman of the committee of management, then said a few words to the effect that the Association was formed upon the model of one which had existed in Germany for several years. After Mr. Phillips had made a statement about the number and nature of the invitations to attend the meeting which had been sent out, Mr. Vernon Harcourt read extracts from the letters of those who could not attend, including one from Mr. Faraday, who put forth the plea of pressing engagements elsewhere. Mr. Harcourt next explained the plan of action which had been laid down for the Association, and its proposed constitution; he also incidentally described the founding of the Royal Society, which originally was a kind of college. Dr. Brewster, Mr. Roderick Murchison, Dr. Pearson, and Mr. Robison also spoke to various resolutions proposed at the meeting. It was resolved unanimously:—"That an Association be formed to be called the British Association for the Advancement of Science, the objects of which shall be to give a stronger impulse and more systematic direction to scientific inquiry, to promote the intercourse of those who cultivate science in different parts of the British Empire with one another, and with foreign philosophers, and to obtain a greater degree of national attention to the objects of science, and a removal of any disadvantages of a public nature which impede its progress."

The sectional work began before the Association was actually formed. The opening meeting just described was held on a Tuesday, yet the preceding day—Monday—Professor Phillips had given an account of the most remarkable phenomena in the geology of Yorkshire. On the Tuesday nearly all the time was occupied in the formation of the Association, but a part of a letter from Mr. George Harvey, F.R.S., was read, on "The Geometrical Analysis of the Ancients." On Tuesday evening, Mr. Abraham delivered a lecture on magnetism, and exhibited his magnetical apparatus for protecting the eyes and lungs of the Sheffield grinders from particles of steel. On Wednesday, Dr. Brewster communicated a paper on mineralogy, and an essay by Dr. Henry on "The Philosophical Character of Dr. Priestley," was read. On Wednesday evening Mr. R. Potter, jun., read a description of his new construction of a reflecting microscope; we know several opticians now who would not object to give an evening lecture to the British Association on their improvements in microscopes; they would make it in verity "an evening of the blowing of the horn." On Thursday morning, Mr.

FIG 1

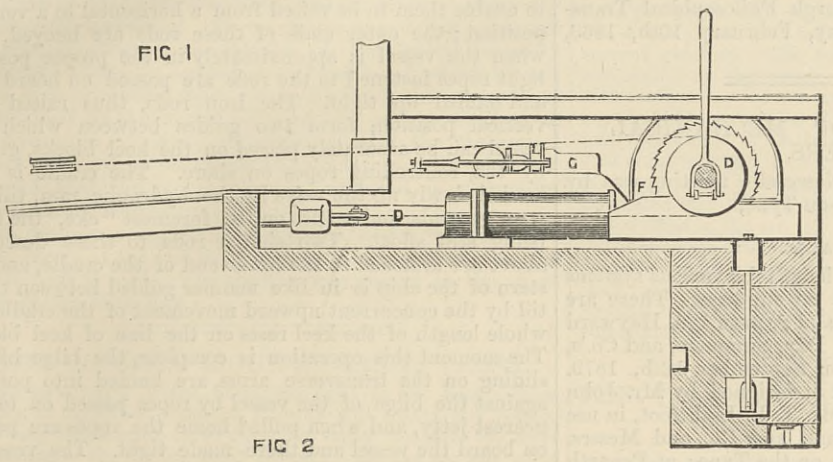


FIG 2

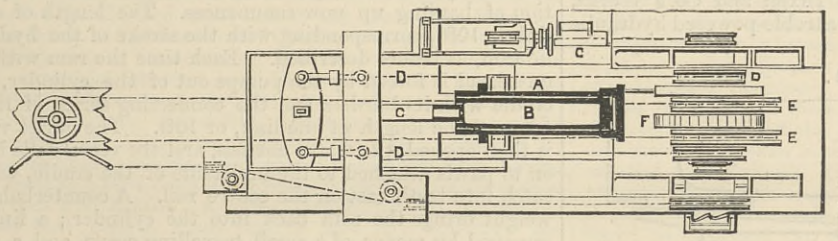


FIG 3

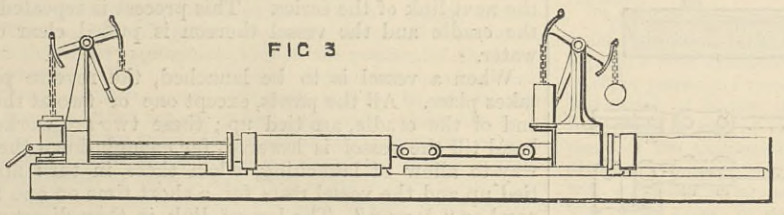


FIG.4.

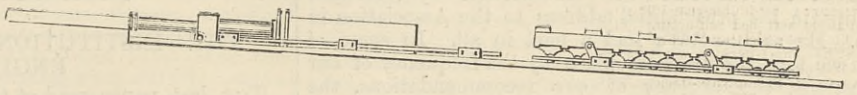


FIG.5.

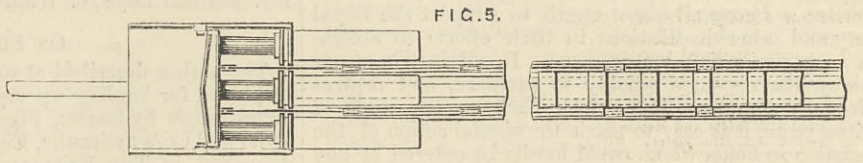


FIG.6.

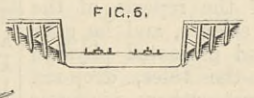


FIG.7.

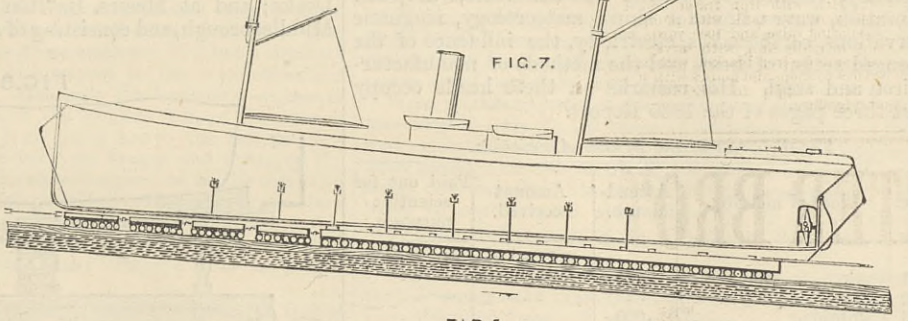
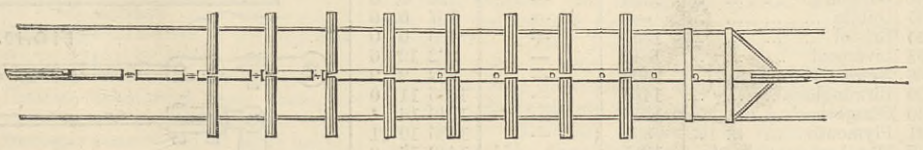


FIG.8.



*SLIPWAYS.—(*For description see next page.*)

Dalton read a paper "On Food and its Influence on Secretions," after which Mr. R. Potter, jun., came to the front again with some remarks on one of Fresnel's theories about light. The place of abode of the active Mr. Potter was Smedley Hall, Manchester. On the same day Mr. William Hutton read a geological memoir, and Mr. Roderick Murchison criticised the same. Mr. Johnston described vanadium and its ores, Mr. Witham read a botanical paper, followed by a note by Dr. Henry on the yellow copper pyrites of Anglesea. On Thursday evening Mr. Scoresby gave an experimental lecture on magnetism, and finished it on Friday morning. On Friday, also, Dr. Brewster read a paper on the crystalline lens in the eyes of various animals, and Mr. Murchison spoke on the geology of Preston. Dr. Daubeny spoke of hot springs and volcanos. On Friday the indefatigable Mr. Potter, jun., described some experiments on electrical discharges in vacuo, and Dr. Warwick, Dr. Daubeny, and Mr. Osborn communicated items of interest. On Saturday Mr. Dalton described some physiological observations, Mr. Allan described a beryl belonging to Don Pedro, Mr. Robison described his linseed oil barometer, and Mr. Forbes read an essay on the barometer. Sir James South sent in a communication on the satellites of Jupiter. On Saturday evening Dr. Daubeny called attention to experiments with coal gas, and the Rev. W. Vernon Harcourt exhibited a lamp constructed upon a new principle. Dr. Brewster contributed an essay on spectrum analysis, and Professor Gazzari another on detecting traces of writing which have been fraudulently erased. Thus three or four scientific papers per day sufficed for the first members of the British Association.

The share of the British Association in various discoveries and inventions made during the first thirty-three years of its existence was summarised by Professor Phillips, in his presidential address to the Association in 1865. He said:—"We had a part in all. In some of them we took the foremost place by the frequency of our discussions, the urgency of our recommendations, the employment of our influence, and the grant of our funds. For others we gave all our strength to support the Royal Society and other institutions in their efforts to accomplish purposes which we approve. In all instances our elastic system responds quickly to pressure, and returns the friendly impulse. If we look back on the work of previous years, it is easy to mark the special action of the Association in fields which could hardly be entered by any other adventurers." He added that many valuable labours were undertaken in consequence of the reports of the Association on special branches of science, and he gave illustrations how the Association had promoted physical astronomy, researches relating to the tides, deep-sea exploration, waves, lines for ships, meteorology, magnetic observations, earthquakes, electricity, the influence of the prolonged action of heat, and the methods of manufacturing iron and steel. His remarks on these heads occupy about three pages of the 1865 Report.

The Progress of the British Association.

Year.	Place of meeting.	Attendance.	Amount received. £ s. d.	Paid out for scientific purposes. £ s. d.
1831	York	353	—	—
1832	Oxford	—	—	—
1833	Cambridge	900	—	—
1834	Edinburgh	1298	—	20 0 0
1835	Dublin	—	—	167 0 0
1836	Bristol	1350	—	435 0 0
1837	Liverpool	1840	—	922 12 6
1838	Newcastle-on-Tyne	2400	—	932 2 2
1839	Birmingham	1438	—	1595 11 0
1840	Glasgow	1353	—	1546 16 4
1841	Plymouth	891	—	1235 10 11
1842	Manchester	1315	—	1449 17 8
1843	Cork	—	—	1565 10 2
1844	York	—	—	981 12 8
1845	Cambridge	1079	—	831 9 9
1846	Southampton	857	—	685 16 0
1847	Oxford	1320	—	208 5 4
1848	Swansea	819	707 0 0	275 1 8
1849	Birmingham	1071	963 0 0	159 19 6
1850	Edinburgh	1241	1085 0 0	345 18 0
1851	Ipswich	710	620 0 0	391 9 7
1852	Belfast	1108	1085 0 0	304 6 7
1853	Hull	876	903 0 0	205 0 0
1854	Liverpool	1802	1882 0 0	380 19 7
1855	Glasgow	2133	2311 0 0	480 16 4
1856	Cheltenham	1115	1098 0 0	734 13 9
1857	Dublin	2022	2015 0 0	507 15 4
1858	Leeds	1698	1931 0 0	618 18 2
1859	Aberdeen	2564	2782 0 0	684 11 1
1860	Oxford	1689	1604 0 0	766 19 6
1861	Manchester	3138	3944 0 0	1111 5 10
1862	Cambridge	1161	1089 0 0	1293 16 6
1863	Newcastle-on-Tyne	3335	3640 0 0	1608 3 10
1864	Bath	2802	2965 0 0	1289 15 8
1865	Birmingham	1997	2227 0 0	1591 7 10
1866	Nottingham	2303	2469 0 0	1750 13 4
1867	Dundee	2444	2613 0 0	1739 4 0
1868	Norwich	2004	2042 0 0	1940 0 0
1869	Exeter	1856	1931 0 0	1622 0 0
1870	Liverpool	2878	3096 0 0	1572 0 0
1871	Edinburgh	2463	2575 0 0	1472 2 6
1872	Brighton	2533	2649 0 0	1285 0 0
1873	Bradford	1983	2120 0 0	1685 0 0
1874	Belfast	1951	1979 0 0	1151 16 0
1875	Bristol	2248	2397 0 0	960 0 0
1876	Glasgow	2774	3023 0 0	1092 4 2
1877	Plymouth	1229	1268 0 0	1128 9 7
1878	Dublin	2578	2615 0 0	725 16 6
1879	Sheffield	1404	1425 0 0	1080 11 11
1880	Swansea	915	899 0 0	731 7 7

On the 14th of February, 1868, a biographical notice, a column long, of Sir David Brewster, was published in The Engineer. "Chambers's Encyclopædia" also contains a biographical sketch, and from these two sources the following items in relation to his career are gathered.

Sir David Brewster was born at Jedburgh, December 11th, 1781, and was educated for the Church of Scotland at the University of Edinburgh. He, however, had a taste for science, more especially optics, and in 1808 became editor of the "Edinburgh Encyclopædia." The kaleidoscope was invented by him in 1816. In 1819 he and Professor Jamieson established the "Edinburgh Philosophical Journal," and in 1831 he was the chief founder of the British Association for the Advancement of Science. In 1815 he obtained the Copley medal of the Royal Society for an optical discovery, and soon afterwards was elected a Fellow; in 1816 he received half the physical prize from the French Institute offered for two of the most important discoveries made in Europe during the preceding two years; in 1819 the Royal Society awarded him the Rumford gold medal; in 1832 he was knighted, and had a pension conferred on him; in 1838 he was chosen Principal of the United Colleges of St. Leonard, St. Salvador, and St. Andrew's; in 1849 he was elected one of the eight Foreign Associates of the French Institute—a mark of very high scientific distinction. He presided over the British Association at Edinburgh in 1850, and in 1851 over the Peace Congress held in London. In 1859, on the death of Dr. John Lee, he was chosen principal of Edinburgh University. He was also a magistrate of the county of Roxburgh. He was a voluminous writer, and his principal works consist of "The Edinburgh Encylopædia" (eighteen 4to. vols), in which the optical articles are principally by him; the "Treatise on New Philosophical Instruments," 1813; the "Treatise on Optics" in "Lardner's Encyclopædia;" the "Letters on Natural Magic," 1832; a "Treatise on the Microscope," 1837; the "Life of Sir Isaac Newton," 1828, re-published in an enlarged form in 1855; "More Worlds than One," 1854; "The Martyrs of Science," 1856; "The Stereoscope, its History, Theory, and Construction," 1857; and "The Kaleidoscope, its History, Theory, and Construction," 1857. His numerous scientific papers were contributed chiefly to the "Edinburgh Philosophical Transactions." He died on Monday, February 10th, 1868, aged 87.

THE INSTITUTION OF MECHANICAL ENGINEERS.

The last paper read at the Newcastle meeting was by Mr. William Boyd, of Wallsend-on-Tyne,

On Slipways.

The author described at some length the various systems employed for hauling up vessels on slipways. There are Armstrong's hydraulic, Figs. 1 and 2, page 145, Hayward Tyler and Co.'s hydraulic, Fig. 3, Day, Summers, and Co.'s, described in The Engineer for September 12th, 1879. Thompson's system, Figs. 4 and 5, designed by Mr. John Thompson, of Newcastle, and Mr. T. B. Lightfoot, in use at the slipways of Messrs. Cleland and Co., and Messrs. Palmer's Shipbuilding Company, on the Tyne; at Penarth Docks; and at Messrs. Raylton Dixon and Co.'s Works, Middlesbrough, and consisting of a treble-powered hydraulic

FIG. 9.

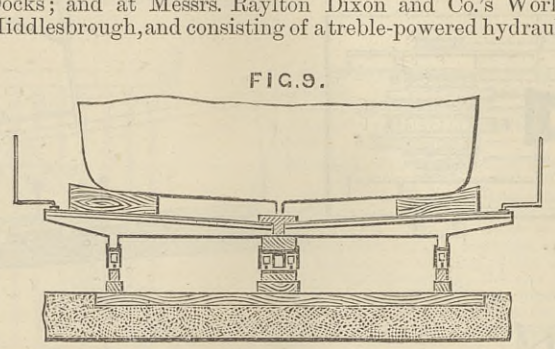
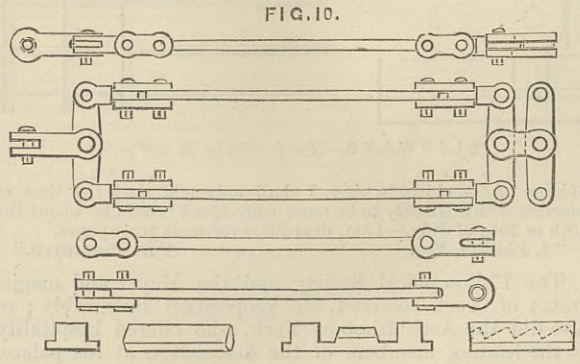


FIG. 10.



hauling apparatus placed at the top of the ways, and connected by means of suitable crosshead and rods to a double set of main hauling links, which extend nearly to the bottom of the ways. The three powers are obtained by allowing the pressure—which may be taken either direct from a pump or from an accumulator—to act respectively on the centre ram alone, on the two outer rams, or on all three together, and lastly, the Wallsend system, Figs. 7, 8, 9, and 10, used at the Wallsend Slipway. Its chief peculiarity lies in the length of the slips, which measure 1000ft. from the end of the rails to the end of the hydraulic cylinder. The machinery was constructed by Messrs. S. and H. Morton and Co., of Leith, in the year 1873; but the system was first designed by the late Mr. Morton in the year 1819, and was carried into comparatively general use in succeeding years. The cradle consists of a main body of timber framing, 173ft. long, and extended by "ekes" in the centre to 284ft. long. These "ekes" are balks of timber surrounding a wrought iron bar, and running on wheels on the centre rail. On the top of the longitudinal timbers, which are supported by transverse balks resting on a slag foundation, are fixed cast iron rails, weighing 3 cwt. per running foot for the centre rails, and 1 cwt. per running foot for the outer rails; on the latter there run two extensions or continuations of the main cradle framing, and upon these rest the transverse arms which support the sliding bilge blocks. The weight of the whole structure is about 160 tons. When a vessel is "relieved," as described hereafter, these arms swing on strong centre pins into a longitudinal position, and allow the cradle to be removed entirely from under the vessel. The motive power for each slipway consists of a hydraulic cylinder, the ram or plunger of which is 15in. diameter and 10ft. stroke, corresponding with the length of the links. Water is forced into the cylinder by three pumps, each 3½ diameter and 12in. stroke, making in quick gear fifty strokes per minute, and in slow gear twenty-five strokes per minute. Attached to the outer end of the ram is a strong crosshead, and connected to it are two wrought iron rods, passing backwards outside the cylinder; these are again joined together by a second crosshead, to which a series of links leading down the slipway to the cradle are successively attached. These links are of wrought iron, each 10ft. long from centre to centre of the eyes, and 3¾in. diameter, giving a sectional area of 11·04 square inches. The pins are of steel of same diameter. In connection with the gearing of the pumps is a chain-wheel working an ordinary short-link chain, called the "back chain," which is used for pulling up the empty cradle after a vessel is launched, and also for pulling it down into its final position to receive a vessel coming on for repairs. The mode of operation is as follows:—The cradle is run down into the water by its own weight, assisted occasionally by the back chain, which is sometimes rendered necessary by the accumulation of mud lying at the lower ends of the slipways, into which the cradle has to force its way; again, in the case of large and long vessels, the lower end of the cradle is often pulled 40ft. or 50ft. over the rails, and rests on the hard mud-bank existing outside. The vessel to be taken on the cradle is then guided into an approximate position by ropes carried to capstans on the jetties. Attached to each end of the cradle are two long iron rods, each hinged at the lower ends, and fixed a few inches on each side of the centre line of the cradle, so as to enable them to be raised from a horizontal to a vertical position; the outer ends of these rods are buoyed, and when the vessel is approximately in the proper position light ropes fastened to the rods are passed on board ship and hauled up tight. The iron rods, thus raised to a vertical position, form two guides between which the vessel can be accurately placed on the keel blocks, guided by the controlling ropes on shore. The cradle is then hauled slowly up the ways by the hydraulic ram, till the stem grounds and settles on the foremost "eke," the stern being still afloat. Two similar rods to those described above are attached to the lower end of the cradle, and the stern of the ship is in like manner guided between them, till by the concurrent upward movement of the cradle the whole length of the keel rests on the line of keel blocks. The moment this operation is complete, the bilge blocks, sliding on the transverse arms, are hauled into position against the bilge of the vessel by ropes passed on to the nearest jetty, and when pulled home the ropes are passed on board the vessel and there made tight. The vessel is then safely and securely seated on the cradle. The operation of hauling up now commences. The length of each link is 10ft., corresponding with the stroke of the hydraulic ram, as before described. Each time the ram with its crosshead is forced by the pumps out of the cylinder, the cradle with its burden, and the connecting series of links, advance the length of one link, or 10ft. The outlet valve is then opened, the water escapes, and the vessel falls back on to pawls attached to the underside of the cradle, which catch into teeth cast on the centre rail. A counterbalance weight brings the ram back into the cylinder; a link is removed by means of a small travelling crane, and a new attachment is made between the crosshead of the ram and the next link of the series. This process is repeated until the cradle and the vessel thereon is pulled clear of the water.

When a vessel is to be launched, the reverse process takes place. All the pawls, except one or two at the fore end of the cradle, are tied up; these two are worked by hand till the vessel is lowered far enough down the slipway to allow of launching, when these in turn are also tied up and the vessel rests for a short time on one single pawl or "dagger." The lowest link is then disconnected from the fore end of the cradle, and the dagger being knocked away, the cradle with its burden runs down the ways, and, as deeper water is reached, the vessel floats away from it. The back chain before alluded to is then connected to the toothed wheel at the head of the slipway, and by its means the empty cradle is pulled up the slipway till it is again required.

The actual rate of progress up the slipway is about as follows:—With single rods, for light vessels in quick gear, 2½ to 3 min. per rod; with single rods, for heavier vessels in slow gear, 4½ to 5 min. per rod. When the size and weight of the vessel exceeds a certain limit, a double tier of rods is laid, connecting the crosshead of the hydraulic ram with a similar crosshead attached to the foremost eke. Hence, although when the vessel is actually moving the rate of progress remains as stated above, yet owing to the longer time occupied in the removal of the successive rods the total time is about as follows:—Double rods, comparatively light vessels, quick gear, 5 min. per rod; double rods, very heavy vessels, slow gear, 6 to 7 min. per rod. The total distance traversed by the cradle from the point where it first receives its burden is about 240ft.; and the time occupied may be taken as about two hours with single rods, and three and a-half hours with double rods, exclusive of course of the time required to place the vessel on the cradle, which is usually about three-quarters of an hour.

The author then compared the slipway with dry docks, and stated that 714 vessels have been taken on these slipways since their opening in January, 1874, to June 30th, 1881, a period of 6½ years, and not a single accident of any kind has happened to any one vessel by reason of defect or insufficiency in the system employed

He then described the mode by which the upper portions of the slipways are made available, which enables two vessels, each say 300ft. long, to be "slipped" one behind the other on each slipway clear of the water. It has been already stated that the slipways measure 1000ft. long from end to end. When it is required to use the upper portion of the slipways, *e.g.*, when extensive repairs or alterations are in question, or when a vessel is to be lengthened, the cradle carrying the vessel is hauled, as before described, right up to the top of the ways, leaving space for another vessel between it and high

water. When in this position the operation of "relieving" is undertaken. This is commenced by placing between each pair of arms strong blocks of timber as bilge blocks, capable eventually of carrying the whole weight of the vessel. Commencing just forward of the foremost arm, and simultaneously on the port and starboard, these new bilge blocks are very tightly wedged against the bilge or underside of the vessel; the weight of the vessel is then removed from the bilge blocks sliding on the arm, and taken by the new bilge blocks resting on the ground. The bilge block on the arm is then slid out from under the vessel, and the arm is free to be moved from a transverse to a longitudinal position. This process is continued till all the arms on each side of the vessel are free of it; and the ship now rests solely on the new bilge blocks, and on the keel blocks upon the cradle. These latter are disconnected in their turn in the following way. On the centre line of the cradle are short hydraulic presses, which are connected by pipes laid beneath the surface of the ground with the pumps used for the hydraulic cylinder. These being set going, water is forced into all these presses simultaneously, and the whole vessel is raised very slightly but sufficiently to allow of the removal of the centre keel blocks. When the pressure is relieved, the vessel sinks gradually back on to the new bilge blocks just described. The whole cradle is now clear and free of the superincumbent vessel. The cradle is then allowed to move down the slipway, and is ready to be used for the reception of other vessels for painting or slight repairs, till the heavier work upon the "relieved" vessel is completed. She is then placed again on the cradle by a process exactly the converse of that just described, and is lowered down the slipway for launching. In conclusion the writer appended a table showing a comparison of the power actually required to haul up a number of vessels—of which he had been able to obtain the exact displacement weight—as ascertained by the registration of the gauge attached to the hydraulic cylinder, and compared with the theoretical power required, as obtained by calculation. From this it appears that the power actually required is always in excess of that found by calculation.

No discussion ensued on this paper, which was read in a great hurry at the last moment, very few members remaining to hear it read. The slipway was visited in the afternoon of the same day.

THE ELECTRIC LIGHT AT KING'S CROSS.

The installation of the Crompton light at the King's Cross Station of the Great Northern Railway will enable any person, who may be desirous of so doing, to easily compare the more prominent of the electric light systems. He can see the effect of the Jablochkoff system on the Embankment, of Siemens's in the streets of the City and at the British and Kensington Museums, of the Brush at Paddington and Charing-cross and in the City, of the Brockie at Cannon-street and the Post-office, and so on. The superficial observer can, however, gain no idea of the economy of the systems—he gains a knowledge of externals only. This light to him has violent fluctuations, that has periodic fluctuations, the other is less brilliant. To such an observer we think the Crompton light would specially commend itself. During our visits to King's Cross it has been very steady, and the station has been well lighted. A closer investigation of the subject shows that such a result was to have been expected. Mr. Crompton seems to have made a deliberate study of not only the salient requirements of electric lighting, but also of those minute details the perfection of which go far to make a system successful. The reader will gather, from the sectional view of the station shown, an approximate idea of the position of the lamps when at work. The station proper is divided into two bays, each 105ft. wide, 880ft. long, and 72ft. high, but to the arrival platform must be added the cab stand, 40ft. wide, which has to be lighted. There are twelve lamps within the station, six to each bay, and two larger lamps at the corners of the station in front. The area lighted by each of the inside lamps is over 18,000 square feet, or nearly half an acre, the total area lighted being 220,000 square feet.

The lamps, which were illustrated and described in The Engineer, 30th April, 1880, are suspended at a height of about 28ft. from the platform on the departure side, and 32ft. on the arrival side. The twelve lamps are arranged in four circuits of three lamps each, two circuits in each bay, the alternate lamps being in different circuits, so that if any accident happens to one of the circuits, only the lamps in that particular circuit are affected, the light of that part of the station being diminished one-half. The light from the lamps in one circuit is found practically sufficient for all necessary purposes. Each lamp is hung with a counterpoise, as shown in figure, which represents a double lamp—or a lamp with two sets of carbons—so that it can be hauled down, examined, and replaced in a few seconds. By a very simple and ingenious cut-out arrangement, should any lamp fail to work, it is at once automatically cut out of its circuit, without in any way affecting the other lamps in the circuit. The drawing shows the arrangement. The current from line enters the apparatus by the binding screw as shown, passing through the wires of the electro-magnet, causing an attraction of the armature, which presses down a spring. The first binding screw is directly connected to another fixed at the end of the armature, which under certain circumstances makes contact with a binding screw connected to the second lamp. Ordinarily the current passes from line through the magnet coils to lamp B. If, however, this lamp fails, the magnet no longer attracts the armature, the spring exerts its influence, and contact is made direct to lamp A. The roads of the current are shown by the dotted lines. It is not, however, sufficient to be able to cut out any lamp, but it is necessary for steadiness that the electrical resistance of the circuit should be as constant as possible. Mr. Crompton therefore arranges that on cutting out a lamp, a coil equal in resistance to the lamp cut out is introduced into the circuit. This arrangement is better shown in the diagram of the wire connections in the interior of the station. A and B represent the flexible leading wires of two circuits from the machines coming through the station roof, C representing the return wire common to both circuits. The wire x leads from line to cut-out apparatus, y from the cut-out to the lamps, and as previously explained these are the wires ordinarily conducting the current—but should the cut-out action come into play the current passes from the apparatus through the coil and wire shown by z. We may here state that the two outside lamps are on a separate circuit, and are placed at a height of about 70ft. These lights have an intensity of about 6000-candle power each, as against 4000-candle power each of the inside lights.

The electric current is supplied by five Bürgin dynamo machines, built by Messrs. Crompton and Co. These machines are specially constructed to run at a high speed. Two small dynamo machines are used to excite the field magnets of these machines. The construction of the machine will be better understood from the sections herewith given, and special notice should be directed to the armature. A number of separate sections are wound upon a core formed of iron tape. The number of sections is variable. The core in the diagram is shown as hexagonal. The armature is composed of any number of such elements. In the three-light Bürgin machine the armature has forty-eight coils, each 48ft. long of ·065in. copper covered wire, the weight of wire being 25 lb. The field electro-magnets of four coils, each 760ft. long, with a total weight of 140 lb. The resistance of the armature between the brushes is said to be 1·6 ohms; that of the magnets, 1·2 ohms, giving a total resistance between the terminals of 2·8 ohms. The E.M.F., at 1500 revolutions per minute, is given as 195 volts; at 1600 revolutions as 206·5 volts, through 13·16 ohms resistance. The weight of one of these machines is a little over 6 cwt. The core or ring of each element is supported by arms radiated from a hub. It will be noticed that the method adopted in winding the coils of the armature is calculated to bring the wire more under the influence of the field magnets than if wound regularly. The coils are connected successively with each other, the end of the last coil joined to the beginning of the first coil, so that all the coils form a single closed circuit. Each of the joints is connected with the corresponding plate of the commutator, which is composed of the same number of plates as the cylinder has coils. The current is taken from the commutator by brushes in the ordinary way. The following were figures obtained at King's Cross with three lights in circuit. On July 12th the mean of twelve experiments gave a sixteen Weber current with 1480 revolutions, the horse-power per light absorbed being 1·49. On August 6th, with three lights in circuit, a sixteen Weber current was obtained with 1460 revolutions, the horse-power absorbed being per light 1·48; and on the same day with 1340 revolutions, 1·37-horse power per light was absorbed, and a 14·8 Weber current obtained. The resistance of three lamp carbons and arcs found as the result of numerous experiments is about 9·36 ohms, using Carré's carbons 13 mm. diameter, and adjusting the lamp arc to give the greatest light and steadiness. The total resistance of each circuit is about 13·26 ohms, thus 9·36 ohms in lamps, 1·10 in conducting wires, and 2·80 resistance of dynamo from terminal to terminal. From these figures it is calculated that 63 per cent. of the gross power is obtained as useful effect in the arc.

The dynamo machines at King's Cross are driven by a semi-portable engine constructed to special design by Messrs. Marshall, of Gainsborough. The engine is of 12-horse power nominal, but will work up to 35-horse power, about 29-horse power indicated being required when all the lamps are in action.

THE ITALIAN NATIONAL EXHIBITION AT MILAN.

II.

In my previous communication I summarily noticed the various horizontal and vertical engines exhibited at this show, without in any way attempting a detailed criticism, or a close technical comparison between those engines. It is but a similarly short notice that I propose with respect to the locomotives and other classes of machinery. Generally the horizontal engines of Italian make partake more of the English than of the French character or style, and this is no doubt due to the fact that few such motors have been imported from France, and many, on the contrary, from England. The reverse appears to be the case with respect to locomotive engines, notwithstanding most of the best English constructors, such as Messrs. Beyer, Peacock, and Co., Sharp, Stewart, and Co., Stephenson, and some other of your engineering firms have supplied many locomotives for the Italian railways.

There are six railway and three tramway engines of Italian build, besides a tank engine by the Esslingen Works, and an Agudio's rope locomotive for steep inclines. As many as seven or eight years ago I recollect noticing locomotives by the Impressa Industriale of Naples at work on several railways; now not one from these works is visible at the Exhibition, but I notice the name of the Comendator Cottran, director of those works, as designer of one of the locomotives, and prominently connected with some of the cars and carriages constructed at other works. The first place is undoubtedly held by the Turin Locomotive Works of the North Italian Railways, under the able direction of Signor Kossuth. In 1878 these works were unable to turn out anything worthy of being sent to the Paris Exhibition, but now, three years later, we have proofs of a very different state of things, and these works have contributed a very fine, substantially built, and well finished passenger engine, embracing several of the most recent improvements, to the Exhibition. The engine is named Torino, and is designed to run on lines having sharp curves and considerable inclines, such as, for example, the Mediterranean coast line. It is carried on four coupled wheels and a bogie truck, and is fitted with the Smith-Hardy vacuum brake, and with Chiazzari's patent injecting pump, as well as with Mazza's patent injector. All the working parts being carried externally are easily accessible. Without detracting from the general merits of the engine, I may notice occasional roughness in the finish of several parts, and led to believe that this is due not so much to the shortness of time allowed for contruction—less than six months—as to the want of high-class machine tools, such as Messrs. Smith and Coventry, Whitworth and Co., Sharp, Stewart, and Co., supply from their establishments. The following are some of the main data of this engine :—

		Metres.
Diameter of cylinders		0·430
Stroke of cylinders		0·560
Valve gear, Gooch's system		
Length of connecting rod		1·500
Total wheel-base		6·000
Diameter of driving wheels		1·820
Diameter of leading or bogie wheels		0·960
Length of fire-box (copper)		2·100
Width of fire-box		1·950
Height of fire-box in front		1·550
Height of fire-box at back		1·060
Number of tubes (brass with copper ends)	177	
Length of tubes (between tube plates)		3·500
Extreme diameter of tubes		0·050
Area of fire-grate	square	2·200
Heating surface :—		
Fire-box, square metres,	9·100	
Tubes, square metres,	87·600	
		96·700
Total length over buffers		8·700
Weight (empty)	kilos.	36,800
Adhesion or traction weight	kilos.	25,400
Tender :—		
Weight (empty)	kilos.	12,200
Capacity—water	cubic metres	8·200
fuel	cubic metres	3·000
Length over buffers		6·060

The same railway administration exhibit two other locomotives—one, constructed by Gio. Ansaldo and Co., of Sampierdarena, named Genova; the other, named Napoli, by the Pietrarsa and Granili Ironworks, near Naples. These two engines are of exactly similar design and dimensions, and are eminently substantial, well-built goods engines of fifty-eight tons weight, in working order, including tender. They are carried on three pairs of coupled wheels, occupying a total base equal to 3·370 metres. The total heating surface is 125 square metres, there being 195 tubes and 1·500 square metres fire-grate area. These engines carry seven tons of water and three of fuel, and together with tender measure 14·637 metres over buffers. With respect to finish there is little choice. The Napoli is perhaps more carefully fitted. A good rough finish is observable in both these locomotives, which, though calculated to travel on steep gradients, present no particular features.

I understand Messrs. Miani, Venturi, and Co., of Milan, are completing for the Alta Italia Mountain lines, an eight-coupled locomotive, having a wheel base of 4·100 metres, and a total weight of about 78,000 kilos. in service, together with tender. This engine was designed by the locomotive department of the Alta Italia Railways, which had several similar ones made by the Sigl Ironworks, of Wiener Neustadt, some years ago.

The Meridional Railways Company show a fine six-wheeled tank locomotive designed for sharp inclines, and the wheels of which are consequently coupled. I notice the ordinary screw brake, and nothing novel in any respect. The exhibitors have omitted to say where the engine was constructed, but it may be remarked that its workmanship is very creditable.

A fine engine is that constructed by the Pietrarsa and Granili Works, on the designs of Signor Alfredo Cottran. It has been built for the Palermo Marsa la Trapani Railway, and is adapted to goods as well as passenger service. The Mazzara—such is the name it bears—is a six-wheeled engine carried on inverted springs on the inside of the wheels, which are all connected by coupling rods. The cylinders, situated under the smoke-box, are inclined, and work upon the axle cranks of the centre pair of wheels. The springs and some parts of the mechanism appear to me too low—indeed, inconveniently and dangerously close to the ground. The crank axle is of foreign forging, and would lead one into the erroneous belief that it is not possible to forge a piece of such importance in Italy. The Roman Railways Company also contributes a locomotive, which has two coupled wheels and a leading bogie, like the Torino. The working parts are externally situated, the cylinders are horizontal, and generally the engine is well made and of good appearance, but without remarkable innovations. I am not informed where it was built, but presume in the company's own workshops.

Locomotives are generally looked upon as among the most difficult of mechanical constructions, and consequently the partial success attained in this class by Italian ironworks is an indication of very considerable advancement generally. The Italians are the first to admit they have room for great progress, and this warrants the belief they will make it. It is true that many of our railroads are excessively tortuous and unlevel, and require especial characteristics in their engines by which speed and graceful appearance are necessarily excluded. Still there are many tracts of road on which the English express type of engine could run advantageously, and I shall be glad to see Italian works turn out engines of this nature, uniting as they do all the elements of mechanical skill, and the sight of which suggests power, speed, and durability.

Were visitors to judge of the number and importance of steam tramways in Italy by the show of tramway engines at the present exhibition, they would be greatly deceived. Perhaps in no other country has this means of locomotion developed so extensively or so rapidly. The causes of this development, which is likely to continue, are easily discerned by all who have any knowledge of the country, its inhabitants, its customs, its agriculture, and industries.

It is not, therefore, without some degree of disappointment that I notice only three tramway locomotives—constructed by two Milanese firms—at our exhibition. It might reasonably have been expected that, seeing the speedier growth of tramways, and the relative facility in constructing these engines as compared to railway locomotives, there would have been an important show of tram engines, such as would have placed Italian makers to the front, and obtained for them a lead in this branch of construction in which they had a good chance of high achievements. Two out of the three engines are built by Cerimedo and Co., the third is by E. Saffert and Co. In principle and general design these engines resemble each other, though there is a marked difference in the appearance of Saffert's engine as compared to those of Cerimedo. These latter are alike, save in size and power, one being a 60-horse power, capable of hauling 15 tons up an incline of 5 per cent., and the other a 40-horse power, calculated to haul 15 tons on an incline of only 3½ per cent. The model of these engines appears to be that of the Henschel tram locomotive, which was illustrated in The Engineer of December 5th, 1879, as an accompaniment to Notes on North Italian Tramways, by my esteemed friend Mr. R. G. Elwes, M. Inst. C.E. In the present instance the cylinders are placed externally and horizontally, an arrangement which is good as placing them within easy reach, but is not to be recommended where such small wheels are adopted, as they are much exposed to mud and dust, nuisances, by the way, of no small importance on most of our roads, formed as they are with lime or other soft stones. The boiler is of the ordinary tubular type, horizontal, and is placed in the centre of the truck, reaching from end to end of same. Firing is done from the right side of boiler, and looks a cramped-up arrangement. The driver's position is at left side of boiler, where he has the ready command of steam valves, pumps, gearing, and brake. Under foot plates, the tank and condenser, between the four wheels, which are coupled, form, together with engines, a good steadying base. As to steam dome and other parts, they are very much as in Henschel's engine. It may be added that the cylinders and all the gearing are covered by iron flaps, which serve, I believe, not only to hide them from view, but also to keep dust out of these working parts. The make of these engines is good and substantial.

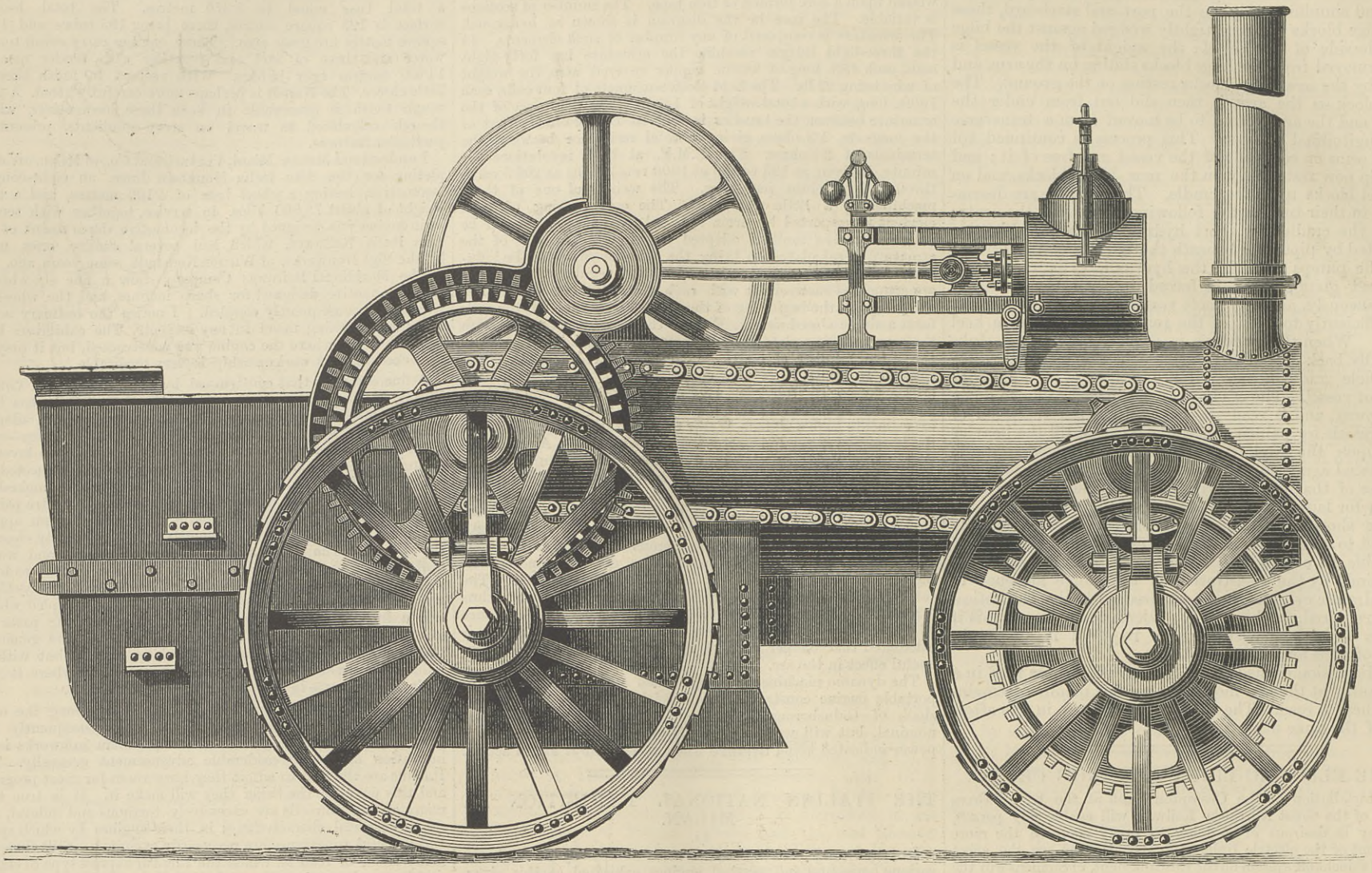
The foregoing description serves also for Saffert and Co.'s tram engines which would appear to be of from 30 to 35-horse power. It is not so carefully made or finished, and has an awkward, uncouth look about it, nor does it seem as though it would resist the jolting and jarring of tramway travelling for long. This is a hazarded opinion which may possibly prove wrong.

Excepting Hughes', Beaumont's compressed air, Francq's fireless, and Mékarski's compressed air engines, I think we have seen pretty well every known tramway locomotive on our provincial tramways. One point seems pretty well settled by general opinion here, viz., the preference for the horizontal rather than the vertical boiler. With respect to compressed air or other systems in lieu of steam, they have but a remote chance of being adopted here, because, as I stated in my former notes, Italians usually prefer less economical working to heavy first outlay for the sake of ultimate economy. Let us admit, however, that steam *versus* air or water is still an open question.

Milan, August 20th. Arturo Gallico, M.I.S.H., Ing

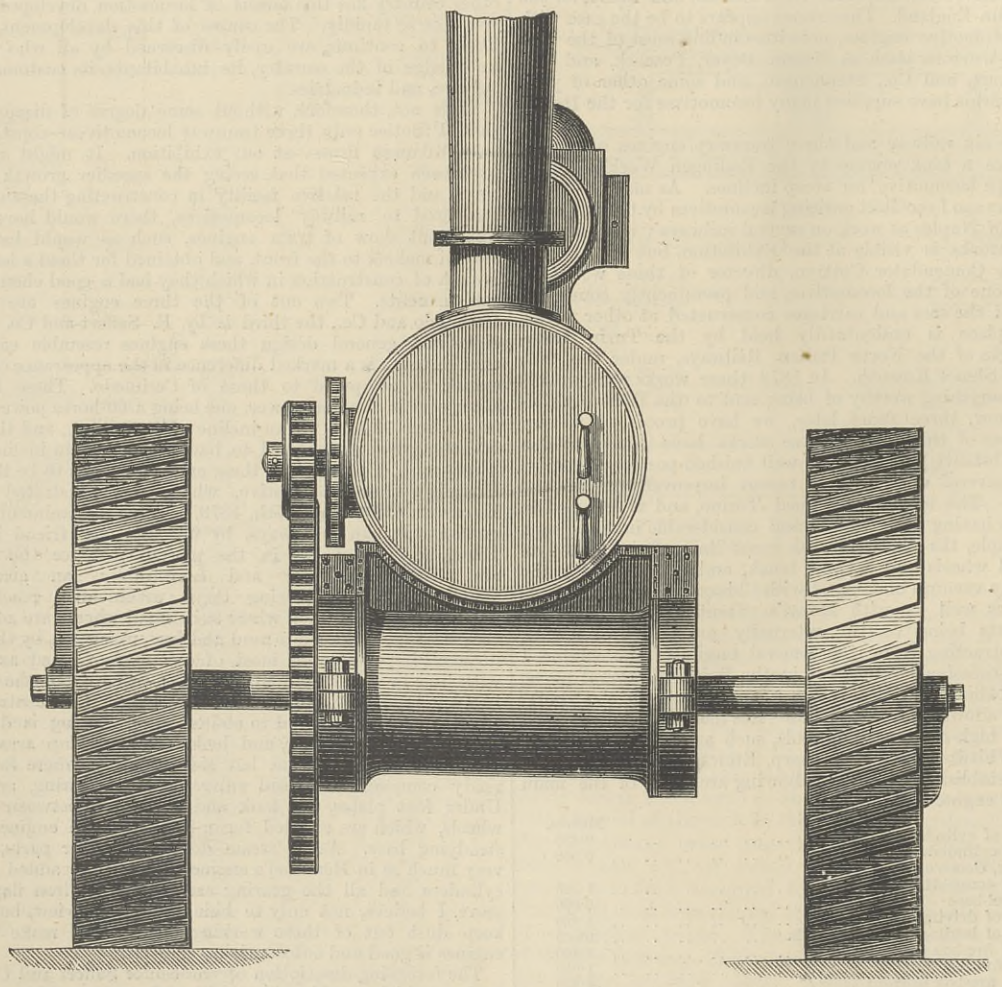
TRACTION ENGINE WITH COUPLED ROAD WHEELS.

THE DURHAM STEAM CULTIVATOR COMPANY, RIPON, ENGINEERS.



Several attempts have been made to connect the leading wheels of a traction engine with the driving wheels, so as to make drivers of all of them, and thus increase the tractive power of the engine, and to afford greater facilities for getting along soft ground or out of holes. The wheel with continuous railway and the india-rubber tires have been employed to gain the required adhesion, but these wheels have been too costly, and the attempts to couple driving and leading wheels have failed. The arrangement for making the leading wheels into drivers, illustrated on this page, has been recently brought out by the Durham and North Yorkshire Steam Cultivation Company, North Bridge Engine Works, Ripon, the design being by Messrs. Johnson and Phillips. The invention consists in mounting the leading axle in a ball and long socket, the socket being rotated in fixed bearings. The ball having but limited range of motion in the socket, is driven round with it, but is free to move in azimuth for steering.

This engine has now been in use more than twelve months in traction and thrashing work, and, we are informed, with complete success. The illustrations represent a 7-horse power, with a cylinder 8in. diameter by 12in. stroke, and steam jacketted. The shafts and axles are of Bowling iron. The boiler contains 140ft. of heating surface, and is made entirely of Bowling iron, with the longitudinal seams welded. The gearing is fitted with two speeds arranged to travel at 1½ and 3 miles per hour, and the front or hind road wheels can be put out of gear when not required. The hind driving wheels are 5ft. 6in. diameter, and the front wheels 5ft.; weight of engine 8 tons.

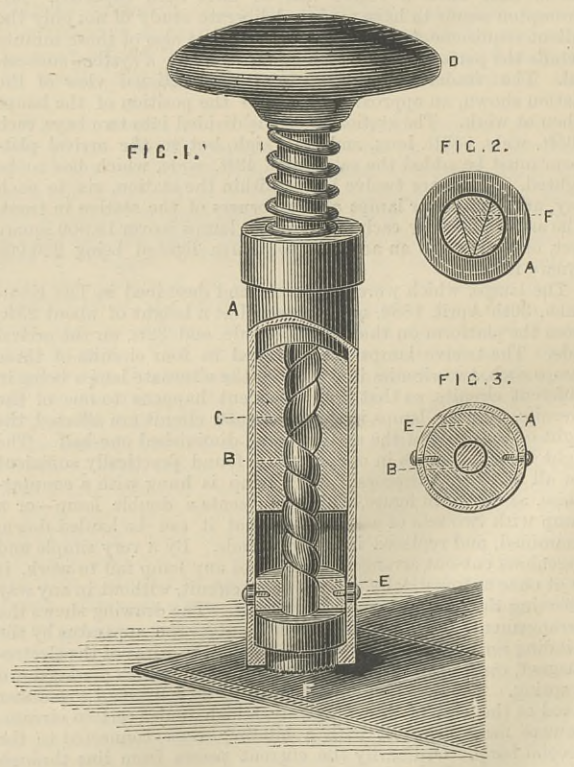


IMPROVED STAMP CANCELLING TOOL.

Offers were several times made a few years ago by the American Government for an effective stamp cancelling apparatus by which the amount lost yearly from the re-use of cancelled postage stamps should be reduced. At present, the *Scientific American* says, no adequate means of cancelling stamps, so that they cannot by any possibility be used again, has been adopted by the Government.

A device which will effectually cancel a stamp by abrading its surface is shown in the annexed engraving, which we take from that journal. The handle or body A of the canceller contains a sliding nut C, which is attached to the handle D, and receives the screw B, attached to the revolving cutter head E, which is retained in place by an internal flange at the bottom of the handle and by an inserted collar E.

Between the handle D, and the top of the case A, there is a spiral spring which returns the parts to their normal position. The cutting head, which is shown in detail in Fig. 2, is cut like a file in different directions, so that when the head is revolved by the engagement of the nut C, with the screw B, the surface of the stamp is abraded, and if the cancelling stamp is previously

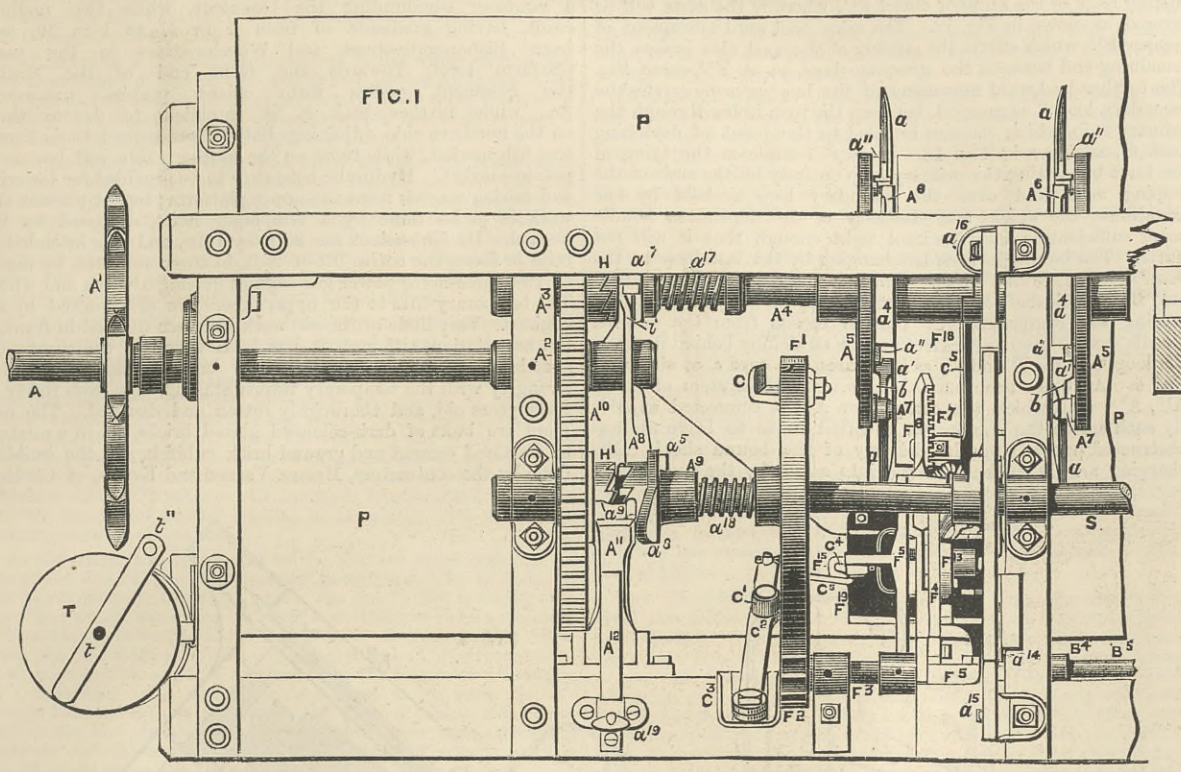


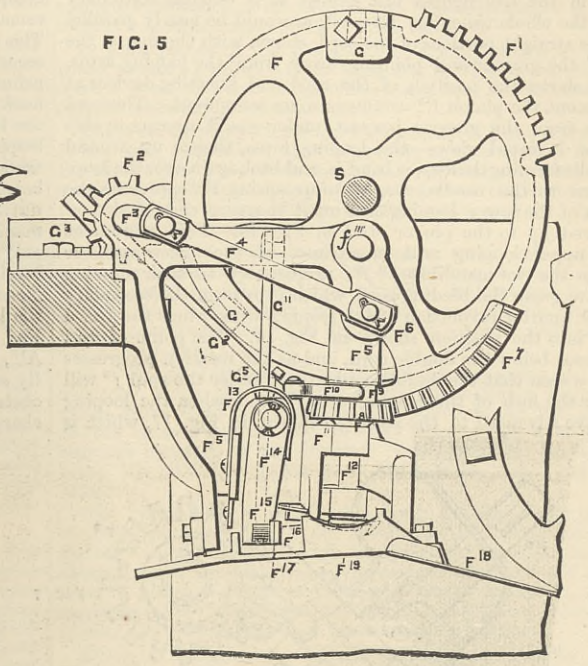
supplied with ink, the ink will be absorbed by the abraded surface, and the effects of cancellation are complete. The stamp cannot afterward be restored. This invention was recently patented by Mr. Frederick E. Grothaus, of Borem, Texas.

WOOD'S SHEAF BINDING MACHINE.

In our impression of the 13th inst. we briefly described the operation of the binding mechanism of Mr. W. A. Wood's machine. The construction and operation of this machine may be ascertained by reference to the accompanying complete drawings we give in this impression, wherein Fig. 1 exhibits a plan view of the improved grain binder detached from the harvester or reapers; Fig. 2, elevation of lower part of same; Fig. 3 is a vertical sectional view, showing the appliances for collecting and compacting the straw into the bundle, and the means for stopping the gathering wheels and starting the binding mechanism; Fig. 4 is an end elevation of the machine, showing the appliances for controlling the tension device, actuating the needle arm, compressor and discharging arm; Fig. 5 shows in transverse elevation the apparatus for transmitting motion to and governing the action of the knotting mechanism; Fig. 6 exhibits the con-

WOOD'S SHEAF-BINDING REAPING MACHINE.





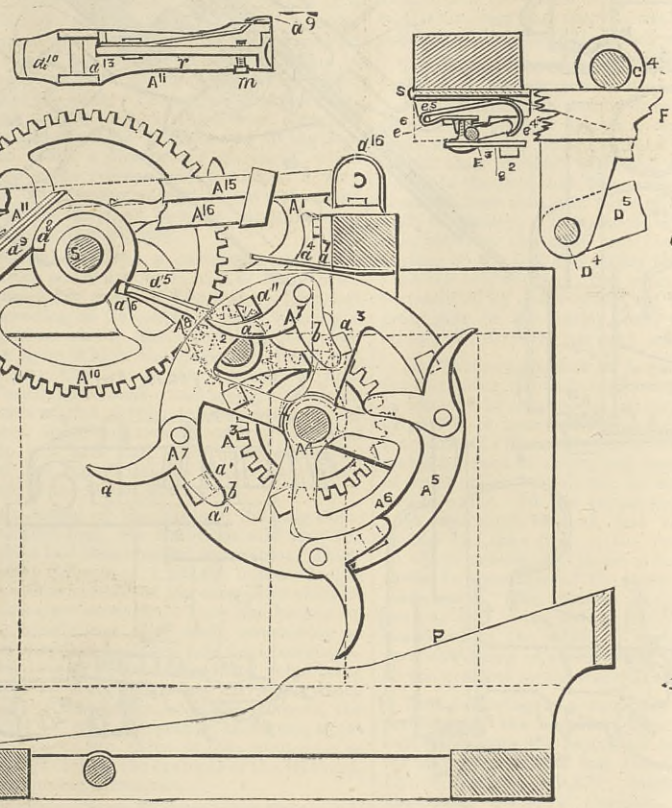
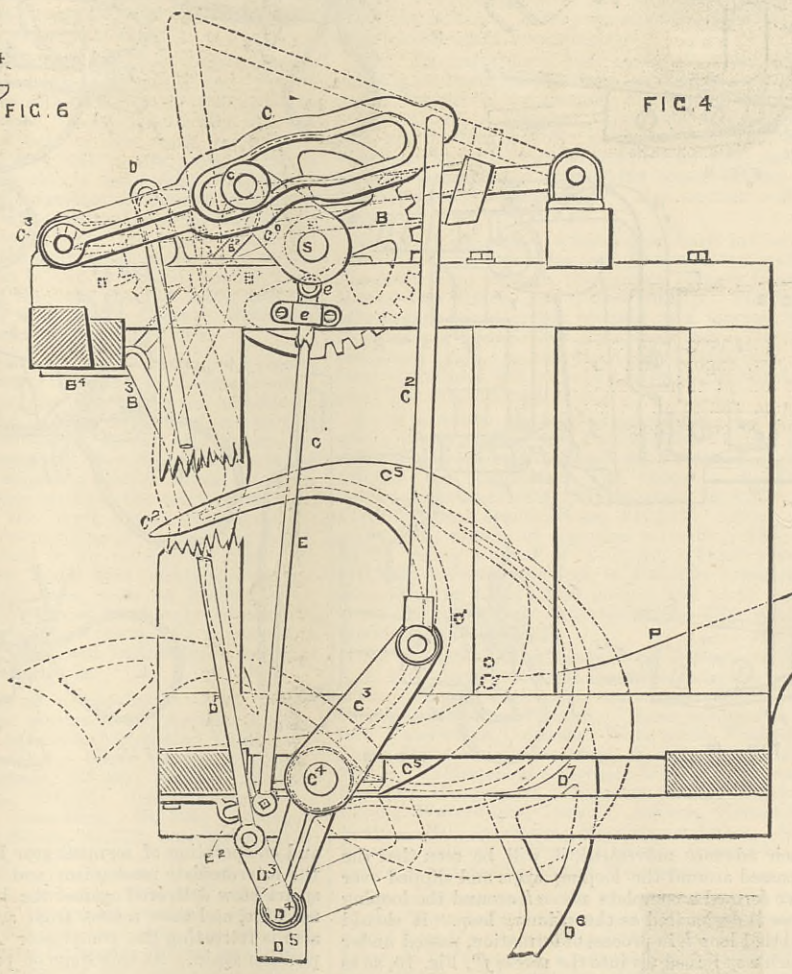
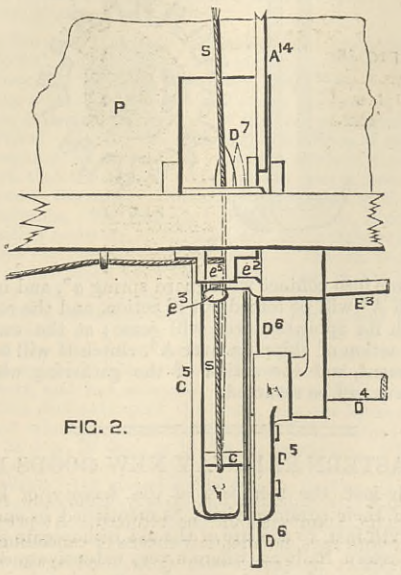


FIG. 3

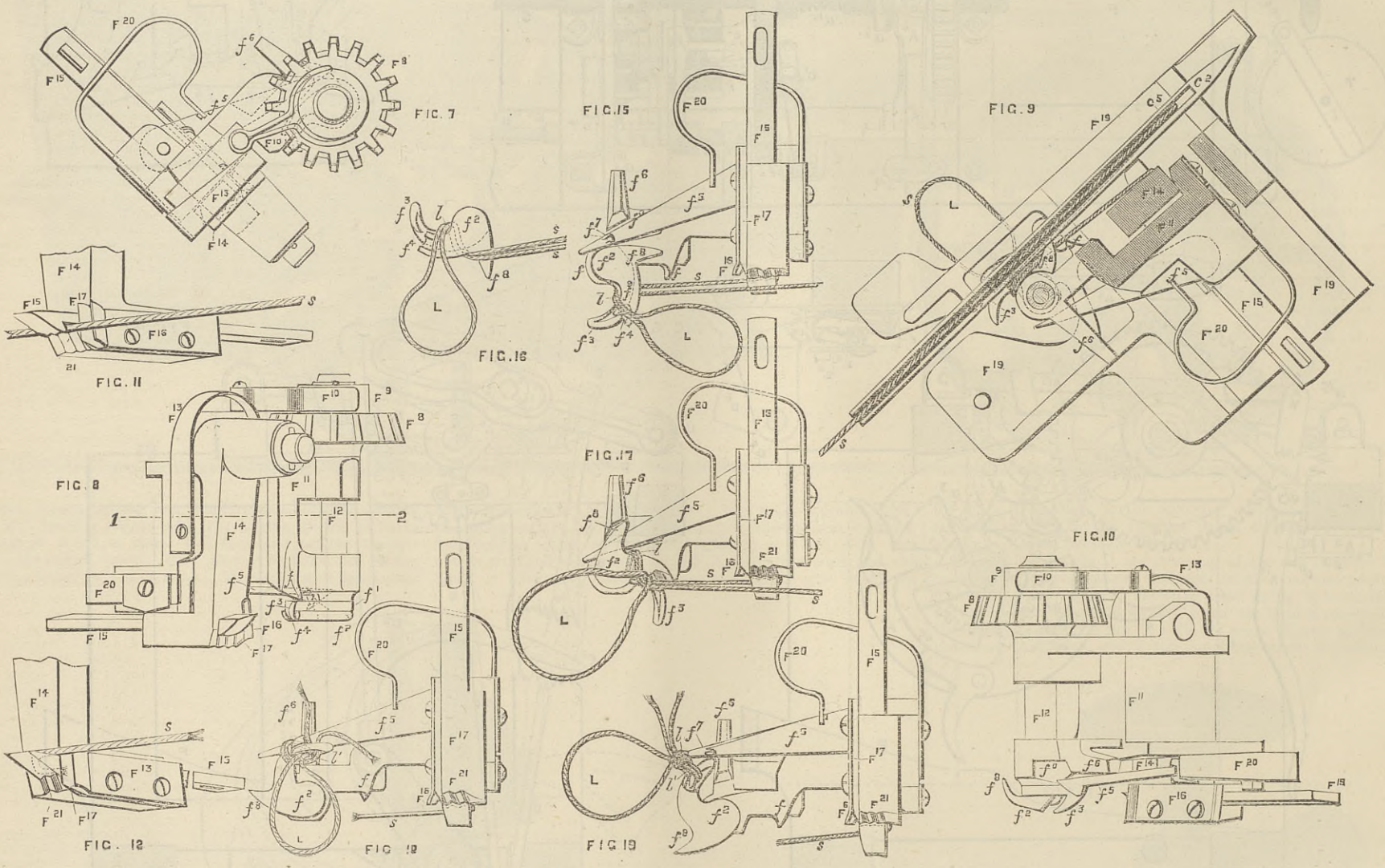




struction of part of the tension device, as connected with the compressor arm ; Fig. 7 is a top view of the knotting mechanism detached from the machine ; Fig. 8 is a view of the same in elevation projected from Fig. 7 ; Fig. 9 is a plan view of the base plate which supports the knotting mechanism, showing also such parts of the knotting mechanism as fall below the plane of the horizontal transverse section shown, which section is taken on the line 1-2, of Fig. 8 ; Fig. 10 is a view in elevation projected from Fig. 7 of the side of the knotting mechanism opposite to that shown in Fig. 8 ; Fig. 11 is a perspective view of the device for grasping and severing the binding cord, and shows the grasper in the act of seizing the binding cord ; Fig. 12 shows in perspective the position of the cord as held by the grasper after the severance of the sheaf band and the retreat of the needle arm ; Fig. 13 is a longitudinal vertical section through the shafts, which carry the looping arms ; Fig. 14 is a transverse horizontal section taken through the friction head shown in Fig. 13 ; Figs. 15, 16, 17, 18, and 19, exhibit in inverted plan views the several positions successively assumed by the knotting devices, and the binding cord during the operation of tying the knot in the band.

To thread the machine preparatory to setting it in operation the end of the binding cord is carried from the twine barrel T through the guides t, t^{11}, and through guides provided therefor on the underside of the machine to the tension device, through which it is passed, and thence behind stud c, around web c^1, through the needle eye c^2. The end of the cord being held securely, shaft S is given a single revolution, the result of which is that the needle arm C^5 carries the thread up into position as in the act of binding a sheaf. Here the cord is seized by the grasper, and is drawn back, and held between the grasping jaws, the surplus end being cut off. As the needle arm retreats it leaves one end of the cord held by the grasper while it lays the cord itself across the upper side of the looping arms of the knotting devices, and leaves it stretched from this point across the interval to the eye of the needle c^2. The machine is now ready to commence operations. The cut grain, as it is delivered on to platform P from the harvester, is seized by the fingers a a of the gathering wheels, and deposited against the binding cord in the space beneath the base plate F^{19} and the platform, and this operation of packing the bundle continues until the sheaf has attained such proportions that further addition to its bulk by the gathering wheels forces the compressor arm A^{14} against the projection a^{12} of latch tripper A^{13}, the opposite end of which, impinging against latch arm a^{10}, causes the shipping latch A^{11} to be elevated, thus permitting coil spring a^{18} to force cam clutch A^9 into engagement. The moment this is accomplished, the shaft S commences its revolution, lug a^5 of shipping lever A^8 is depressed, and consequently clutch H is thrown out of engagement, and the action of the gathering wheels ceases, simultaneously the inner concentric part of cam E moves around so as to permit the tension spring e^5, which checks the free transit of the binding cord through the tension device, to act, thus impeding the passage of the cord through the spring socket, and creating such a degree of tension on the cord as will be necessary to accomplish the tying of a second knot. In the meantime the needle arm C^5 has been moving up on the back side of the bundle, while gear B has rotated, so that friction bowl B^1 has come in contact with arm B^2 of rockshaft B^5. The further progress of bowl B^1 elevates arm B^2, and consequently swings arm B^3, which is cranked at its lower extremity against the compressor arm A^{14}, compelling it to advance toward the approaching needle arm, the bundle being then clasped between the two arms immediately under the knot tying apparatus. While the movements just described have been transpiring, flange cam a^8 has rotated to a point in advance of the end of guard spring a^9, thus permitting shipping latch A^{11} to drop into the interval between the hub and cam flanges of clutch H^1. At this stage the needle arm has moved forward, and come to a rest in the position indicated in the elevation in Fig. 4, and in plan in Fig. 9 ; the position of the binding cord being substantially as shown in Fig. 9, except that the looping arms of the knotting device have made no advancement. Crank pin C has now entered the concentric portion of the slot of lever C^1, hence the needle arm will remain stationary until the crank pin has traversed such concentric portion. Next in order the toothed faced F^1 of gear F engages with the segment pinion F^4, and tooth sector F^6 F^7, initiates the reciprocatory movement of knotting pinion F^8 and its appurtenances. It will be seen from Fig. 5 that the first half revolution of pinion F^2 will impart motion to knotting pinion F^8 in one direction, and that the remainder of the revolution will impart a retrograde movement, and return the several parts to the posi-

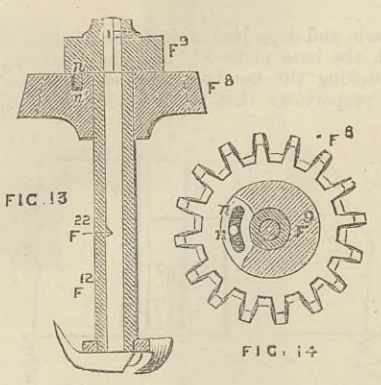
tion occupied at the outset of the movement. The operation of the knotting devices and the manipulation of the binding cord from this point forward will be more readily traced in Figs. 9, 15, 16, 17, 18, and 19, of sheet 5. In Fig. 9 the parts are shown in right plan view, but in Figs. 15, 16, 17, 18, and 19 they are shown in inverted plan. The point of the needle arm is not shown in the five figures last named, as it remains stationary during the whole time, but its position would be nearly parallel with the straight portions of the cord, shown with the eye on the right of the grasper and pointing away from the looping arms. Fig. 15 shows the position of the cord and knotting devices at the moment the pinion F^8 commences its movement. The cord s passes from the grasper jaw out under—as it appears in this series of inverted views—the looping arms, thence up around the bundle forming the loop or band L, and back again over the looping arms to the needle eye. Clamp spring F^{10} prevents the rotation of the lower looping arm until the rear end of slot n^1 has moved up to the pin or stud n, Fig. 14. This movement of the upper looping arm in advance of the lower opens or separates the two mandibles f^3 f^4, preparatory to their moving around to grasp the binding cord which is to form the secondary loop. A quarter revolution of the looping arms brings the guard spur f^8 into the position shown in Fig. 16. The point of said spur passes below the double cord, and as the rotation progresses it will be seen that the double cord so cast under the spur f^8 will slip over the hub of the looping arm f^2, and when the looping arms have advanced to the position shown in Fig. 17, which is



under the hook jaw of the grasper, as seen in Fig. 11. The withdrawal of the grasper within its socket will effect the severance of the connection between the sheaf band and the stock end of the binding cord by drawing the binding cord up against the cutting edge of the knife or chisel F^{17}, whereby the same will be severed, as shown in Fig. 12. The same backward movement of grasper F^{15} which effects the cutting of the cord also grasps the remaining end between the grasping jaws, as at F^{21}, same Fig. The further backward movement of the looping arms carries the secondary loop l^1 as grasped between the mandibles through the primary loop, which remains impaled on the point of detaching hook f^7, as shown in Fig. 18. Hook f^7 completes the tying of the knot by casting the primary loop entirely off the ends of the looping arms and over the secondary loop as held by the mandibles, the weight and elasticity of the dependent bundle being sufficient to draw the knot tight enough that it will not untie. The bundle is then left hanging by the last loop to the mandibles, as see in Fig. 19. Pending this, bowl B^1 has run off arm B^2 of rock shaft B^3, which permits arm B^3 to fall back, thus leaving the compressor A^{14} free to recede from the bundle. Needle arm C^5 now retires from action stretching behind it across the looping arms f^1 and f^2, as it recedes, the cord s, as shown in Fig. 6. At same time cam A^{17} acts upon the system of levers A^{16}, A^{15}, with which the compressor A^{14} is connected at a^{14}. By such action the compressor is lifted so as to leave an unobstructed pathway for the delivery of the bound sheaf. Discharging arm D^6 is then brought into action by the engagement

the limit of their advance movement, it will be seen that the double cord so passed around the looping arms and slipped over the hub will have formed a complete noose l around the looping arms, which noose is designated as the primary loop. It should here be observed that loop l, in process of formation, passed under the hook f^7, which was forced up into the recess f^0, Fig. 10, so as to permit said loops to pass under it. That part of the cord where it leaves the looping arms and passes around the bundle below the base-plate will be carried around the notch n^{11} in the base-plate, as seen in Fig. 9, which prevents the same from slipping or getting misplaced during the subsequent processes of tying the knot. In executing the last part of the movement just described, the mandible f^3 will have passed over that part of the double cord connecting the grasper and needle eye with the looping arms, as seen in Fig. 17. At this point the retrograde movement of the pinion F^8 commences. Looping arm f^2 will remain stationary for a moment, while the mandible f^3 having in its retreat caught the double cord within its grasp rotates backwardly until said double cord is firmly grasped between two mandibles. The further retrograde movement of the looping arms carries loop l around so that it is caught by the detaching hook f^7, which retains a secure hold upon it. During the retreat movement of the looping arms, the point of the detaching hook f^7 is, by means of the guard f^6, prevented from lifting, so that the loops might escape thereunder, and at the same time sides or bears against the convex or outside edge of the looping arm f^1, consequently as arm f^1 retreats, the point of detaching arm f^7 is carried further and further away from the hub of the hook, still being controlled in its action by hook guard f^6 and spring F^{20}. After the mandibles have grasped the double cord and commenced their retreat movement, such cord assumes the form of another loop l^1, which is designated the secondary loop, as seen in Fig. 18. In process of forming the secondary loop and carrying it around in position preparatory to drawing it through the primary loop, a certain amount of binding cord is used up, and inasmuch as neither end of the band has been released, such take-up is compensated for by the oscillation of grasper socket F^{14} on its pivot, which oscillation or yielding permits the grasper socket to be drawn by the binding cord towards the knotting devices. At this stage of the proceedings, while the grasper socket is drawn on one side, as stated, cam G encounters the bowl G^1 of lever G^2, and in passing it brings the grasper F^{15} into action. As it is thrust out of its socket the end of the band, shown in Fig. 17 as grasped at F^{21}, is released and the bevelled end of the grasper traverses the other or parallel cord, bringing the same

and co-operation of segment gear B with segment pinion D, and the intermediate mechanism and coming up in the rear by a smart blow delivered against the bundle discharges it from the machine, and then retires from action. While the discharging arm is retreating the compressor A^{14} descends into its normal position again. At this stage of proceedings the flange cam a^8



will have come into contact with guard spring a^9, and in passing it cam clutch A^9 will be forced out of action, and the rotation of shaft S, with its appurtenances, will cease; at the same time, through the action of shipping lever A^8, clutch H will be thrown into engagement, and the action of the gathering wheels and packing fingers will be resumed.

GREAT EASTERN RAILWAY NEW GOODS DEPOT.

On the 17th inst. the members of the Society of Engineers made one of their summer visits, as mentioned in our impression of the 12th inst. to the site of the old Bishopsgate Station of the Great Eastern Railway, where a very extensive goods depôt, occupying an area of eleven acres, is now being built by the company. Amongst the visitors were Mr. Arthur Rigg, vice-president; Mr. W. MacGeorge and Mr. Joseph Bernays, past presidents; Mr. Robert Berridge, Mr. Charles Gandon, and Mr. W. Schonheyder, members of council; and Mr. B. Reed, secretary. The visitors were received by Mr. Horace Wilmer, the acting engineer, and by him conducted over the works. The general plan of the ground occupied is roughly triangular, extending from Bishopsgate eastward to Brick-lane, and there is a roadway surrounding the basement, while two inclined roads, having gradients of from 1 in 27 to 1 in 30, lead from Bishopsgate-street and Wheeler-street to the main platform level. Towards the front end of the station the basement arches form offices, porters' messroom, &c., while further back it is intended to devote those on the northern side adjoining Bethnal-green-road to an extensive fish market, while those on the southern side will become a potato market. Hydraulic hoists are to be provided for lowering and raising wagons from the upper platform; but at present this work is to be done by a temporary hoist, designed by Mr. Fennel. Its dimensions are 25ft. by 14ft., and it is intended to raise or lower the entire lift of 25ft. in three minutes, by means of two three-horse power gas engines driving a worm and wheel. The temporary lifts to the upper floors are also worked by gas engines. Very little of the old work has been utilised in forming the new station, although it has been found of the most substantial character, built in Roman cement, and contrasting strangely with the temporary timber staging, now from thirty to forty years old, and thoroughly rotten and decayed. The new piers are built of dark-coloured glazed bricks, set in a mixture of Portland cement and ground brick rubbish, and the building done by the contractors, Messrs. Vernon and Ewens, of Cheltenham, is of a most substantial character. The warehouses and arches contain upwards of 50,000,000 bricks and about 12,000 tons of iron girders and columns, and the station buildings might be contained in a square of 425ft. A very extensive warehouse floor, calculated to carry 5 cwt. per square foot, covers the whole area of the main platform, and the largest wrought iron girder supporting this floor has a span of 55ft., and weighs 22 tons. To give some idea of the trade carried on at this terminus, it may be mentioned that the temporary fruit-shed on the south platform receives regularly 300 tons of fruit per day in the season, and this enormous quantity is often exceeded. Thanks to the courtesy of the railway company in giving facilities, and to the kindness of their engineer, Mr. Willmer, and Mr. Vernon, the members of the Society enjoyed an interesting and instructive visit.

The Whitworth Scholarships, Session 1880-81.—Science and Art Department South Kensington.—The following is a list of the successful candidates in the competition for the Whitworth Scholarships, 1881:—Ernest Lousley, age 26, engine fitter, Wallingford, scholarship £200; Alfred Sutton, 21, engine fitter, Brighton, £150; Robert W. Grace, 20, engineer apprentice, Liverpool, £150; Archibald Sharp, 18, engineer apprentice, Glasgow, £150; Arthur E. Wild, 20, engineer apprentice, and Henry G. Jordan, 23, engineer, Manchester, £125 each; Edward Murphy, 21, engineer apprentice, Liverpool, £100; Richard Parry-Jones, 23, engineer apprentice, Carnarvon, £100; Samuel Richardson, 22, draughtsman, Greenwich, £100; Arthur H. Barendt, 21, engineer apprentice, Liverpool, £100; Charles Herbert, 19, mechanic, Oldham, £100; Edmund J. M. Davies, 20, engineer student, Bristol, £100; Travis Platt, 21, millwright, Manchester, £100; William Savage, 22, engineer, Crewe, £100; John Tyson, 25, engineer, Liverpool, £100; Albert G. Hadcock, 20, fitter, Woolwich, £100; William Martin, 20, engine fitter, Brighton, £100. The following gives the results of the examination for Whitworth Scholarship Prizes, 1881, the marks obtained, and the Scholars appointed in 1878:—William Groves: Theory, 1700 marks; practice, 1185—first prize, £100. Thomas Mather: Theory, 1940 marks; practice, 873—second prize, £60. William H. Tozer: Theory, 1365 marks; practice, 1066—third prize, £50. Joseph E. Needham: Theory, 1943 marks; practice, 444—fourth prize, £40. Thomas Duckworth: Theory, 1186 marks; practice, 419—fifth prize, £30. Zachary H. Kingdon: Specially excused from the examination in theory; practice, 897 marks—sixth prize, £20. In the final competition, William Groves obtained in the three years a total of 7606 marks, and received the first prize, £200; Joseph E. Needham obtained 6910 marks, and the second prize, £100.

RAILWAY MATTERS.

The construction of a new tramway line has just been begun for connecting Wolverhampton and Dudley, which will prove of great benefit to the district. The line is to be five miles long, and it was commenced a few days back by the contractors, Messrs. Burleigh and Green, London.

The last ring of the treble granite arch in the windy stretch, the treacherous part of the St. Gothard Tunnel, under Andermatt, has been completed, and as the rings previously made show no signs of yielding, it is hoped that the difficulty which has been so sore a trouble to the engineers is at length overcome.

On the 18th inst. a train was fitted up like the Manchester express, which came into collision at Blackburn, and the jury were conveyed with the chief official of the railway company to Rimmington, on the Hellifield line. By means of the Westinghouse brake the train was stopped in 25 sec., in a distance of 231 yards while descending a gradient of 1 in 82 at the rate of forty miles per hour; with the hand brake on a level it took two minutes and 18 sec. to bring the train to a standstill.

A scheme for the extension of railway communication in and about Liverpool is said to have been devised by one of the leading railway companies having connections with that city. Its main features, the *Standard* says, is the construction of a network of underground lines, for both passengers and goods, by means of which residents in the suburbs can reach the business part of the city, while travellers arriving in Liverpool by any of the existing lines can, by availing themselves of the underground railway, proceed to any part of the city or suburbs, or under the Mersey to the Cheshire side. The scheme will doubtless be submitted to all the railway companies having termini in Liverpool, with a view to securing their co-operation.

At the conclusion of a report on the collision which occurred on the 4th of June at the London-road goods yard, near Carlisle, on the North-Eastern Railway, which was due to the breaking of a coupling, which connected no less than eight vehicles absolutely without brake power, to the ordinary train of nine vehicles fitted with the Westinghouse brake, Major-General C. S. Hutchinson, R.E., says:—This accident resulted from the failure of a coupling of a passenger train, and as such failures is by some railway officers held to be most uncommon, he gives a table which shows that in the last six and a-half years there have been altogether forty-six such failures reported to the Board of Trade, or an average of about seven per annum.

The ten a.m. train from Oban to Dalmally, when running at a considerable speed near the Falls of Cruachan on the 17th inst., and on going round a sharp curve about 100 yards to the west of the railway bridge which crosses the Falls of Cruachan, came in collision with a large stone, about half a ton in weight, which rolled down the mountain side on to the rails. The engine kept the rails, but the tender and several empty wagons which were attached behind, between the engine and carriages, were thrown off the line, the engine dragging them about a distance of 60 yards, when it came to a standstill, close to the railway bridge, and at a very dangerous part of the line. The tender, as well as several of the empty wagons, were very much damaged, but the carriages containing the passengers escaped without injury.

On the afternoon of Monday, the 22nd, a passenger train near Burn Hill, on the Benfieldside and Saltburn branch of the North-Eastern Railway, had a remarkable escape. The train, which left Burn Hill at 1.50, was proceeding on its journey, when, nearing a bridge which is only one span across the line, the bridge fell, completely blocking the rails upon which the passenger train was travelling. The engineman, Charles Baxter, seeing it fall, immediately applied his Westinghouse brake, and brought the train to a stand within a few yards of the *debris*, thus averting a bad accident. A delay of about three-quarters of an hour occurred through the train having to put back and come along the down line. The undermining of the foundation by the recent heavy rains is considered the cause of the fall of the bridge.

At the usual half-yearly meeting of the Midland Railway Company, held at Derby on the 16th inst., the chairman said that the renewals of thirty-five engines had been charged to revenue. There had been an additional train mileage of 1,280,498 miles. In the coaching department there was a decrease of ten composite vehicles and a decrease of thirty third-class carriages. They had broken up twenty small composites, which cost £340 each, amounting to £6800, and instead of these they had built ten new bogie carriages, which cost £548 each, amounting to £5480, the reduced value being £1320; and they had broken up sixty third-class carriages, which cost £182 each, and built thirty new bogies, costing £446 each, the whole amounting to £13,380; so that, altogether, there was a net increased value of £1140. There are three or four companies in the South of England who might follow the example of the Midland, and so save the cost of constructing a museum.

The Hundred of Hoo Railway, from Higham, near Gravesend, to the Isle of Grain, constructed in connection with the South-Eastern Railway, is rapidly approaching completion. The opening of this line will perhaps possess more than local significance, inasmuch as it is intended to make the Grain terminus the centre of a competing Continental traffic with Belgium and other countries. Grain is situated on the left bank of the Medway, opposite the naval and dockyard town of Sheerness, and exceptionally good facilties are, the *Times* says, offered for the anchorage of vessels in Sheerness harbour. A pier, 400ft. in length, is being erected at Grain in connection with the railway, and, as there will be a depth of 20ft. of water at low tide, as soon as the line is in working operation, it is proposed to apply for power to construct extensive docks and wharves. The railway will be in direct communication between Woolwich Arsenal and Sheerness.

At the meeting of the Midland Railway Company, on the 16th inst., the chairman said, with reference to continuous brakes, that they had 57 engines and 209 vehicles fitted with the Westinghouse automatic air-pressure brake appliances; 202 engines and 2074 vehicles fitted with the Saunders and Bolitho automatic vacuum brake, with which 80 engines and 809 carriages were fitted during the last half-year. They had 29 engines and 116 vehicles fitted with Smith's vacuum brake, of which 6 were fitted last half-year; and 2 engines and 11 carriages fitted with the Barker brake. These brakes were calculated to make up continuous brake trains. The Saunders and Bolitho and the Westinghouse fulfilled all the requirements of the Board of Trade. When reporting on the accident at Manchester, Major Marindin said, that the results of the collision were no worse was doubtless due to the fact that the driver had at his command an efficient brake. He alluded to it because it commended the course the directors were adopting of fitting the engines and vehicles as fast as possible with the Saunders and Bolitho brake.

Major Marindin's report on the accident which occurred on the 19th ult. at Matlock Bath Station, on the Midland Railway, when a young man who, it is stated, was looking out of the open carriage window, was struck on the head by a piece of timber at a timber loading siding, and received such injuries that he died within a few hours, seems to indicate that there was little blame attachable to any one except the foreman loader, who by regulation should not have been loading such trees when a train was due. It appears, however, that the tree had accidentally got fastened in such a way that the men could not move it and the crane could not be applied. "Judging from the amount of damage to the train, and from the marks upon the tree, it would seem that the statement of the foreman loader, 'that an inch would have saved it,' is accurate enough; and if the young man who was killed had not been looking out, perhaps upon feeling the brake sharply applied, it is difficult to see how he could have been seriously hurt. The fact of only two vehicles besides the vans with projecting sides being touched shows also how small was the amount of timber foul of the line."

NOTES AND MEMORANDA.

One of the readiest and simplest tests for ascertaining if water is free from organic pollution, is to cork up a small bottle nearly full of it, in which a piece of lump sugar has been put. If by thus excluding the air, and letting it stand in the light for two or three days, there is not a milky cloud seen, but the water remains clear, it may be considered free from the phosphates with which sewage water is impregnated.

To ascertain if water contains iron, take a glass of water, and add to it a few drops of the infusion of nutgalls, or suspend a nutgall in it by means of a thread for twenty-four hours. If iron be present, the water will become of a dark brown or black colour. Prussiate of potash is a still more delicate test for detecting iron. If a crystal, or a drop of it, when dissolved, be added to a glass of water containing iron, it will immediately become of a blue colour.

To ascertain if water contains magnesia, take a quantity of the water, and boil down to a twentieth part of its bulk, then drop a few grains of carbonate of ammonia into a small glass of water. No magnesia will yet be precipitated; but on adding a small quantity of phosphate of soda, if any magnesia be present, it will then make its appearance and fall to the bottom of the glass. In this experiment it is necessary that the carbonate of ammonia be in a neutral state.

The population of Canada in the last decade has increased from 3,686,596 to 4,352,596, or 18·05 per cent. Each of the older provinces—Prince Edward Island, Nova Scotia, New Brunswick, Quebec, and Ontario—shows an increase ranging from 12·4 to 18 per cent., but it is in the new districts that the more rapid strides are apparent. Manitoba heads the list with 289 per cent., British Columbia follows with 78·64 per cent., while the north-west territory has received an addition of 65·28 per cent. to its population of 1871.

The *Electrician* quotes from a French contemporary, which gives the following as a "curious instance of the spontaneous galvanisation of an engine piston, which took place at Cette, Hérault. The boiler having become much incrusted, some scraps of zinc were introduced to loosen the coating. Several days afterwards the piston began to work with difficulty; when it was taken out it was found to be covered with a thick coating of copper. This is supposed to have occurred from the particles of zinc carried with the steam into the copper steam pipes forming a number of minute galvanic elements in combination with the copper; the vibration of the piston then attracted the copper molecules to itself, whilst the heat and the electric properties of the steam are considered to have facilitated their attachment to it."

The importance of covering the face of pulleys with leather is realised by but few persons having charge of machinery. Full 50 per cent. more work can be done without the belts slipping if the face of the pulleys are so covered. Leather belts used with the grain side to the pulley will not only do more work, but will last longer than if used with the flesh side to the pulley. This is owing to the fact that the grain side is more compact and fixed than the flesh side, and more of its surface is brought in contact with the pulley. The smoother the two surfaces, the less air will pass between the belts and the pulleys. The more uneven the surface of the belt and pulley the more strain is necessary to prevent the belt slipping; for what is lost by want of contact must be made up by extra strain on the belt. Leather belts, with the grain side to the pulley, can, according to *Calvert's Mechanics' Almanack*, drive 34 per cent. more than the flesh side.

Le Charbon says that M. Leguin, of Paris, has patented a process for increasing the resisting power of iron goods to tension, bending, or torsion, by immersing them wholly or partly in hot diluted sulphuric or hydrochloric acids, or in a mixture of one part of turpentine in five or six parts of water. In the acid process, the metal is raised to cherry red heat, and then dipped in a solution of equal parts, by volume, of sulphuric acid of 66 deg. strength, and of water. In the turpentine method, the mixture must be kept constantly stirred, lest the spirit should float upon the surface and take fire, on the introduction of the glowing metal. In either process, the metal is held in the solution till it has sunk to the temperature of the latter, and is then quickly thrown into cold water. The various implements, such as hooks, levers, beams, &c., subjected to this process, need only be partially immersed in the solution, the portions selected for treatment in each case being of course those which will necessarily be subjected to the greatest strain when in actual use.

The following is a summary of the population of the several provinces of the non-Hungarian portion of the Austrian Empire, extracted from the report of the Central Statistical Commission for taking the census last December:—Lower Austria, 2,329,021; Upper Austria, 760,879; Salzburg, 163,566; Styria, 1,212,367; Carinthia, 348,670; Carniola, 481,176; Trieste, Istria, &c., 650,532; Tyrol, 805,326; Vorarlberg, 107,364; Bohemia, 5,557,134; Moravia, 2,151,619; Silesia, 565,772; Galicia, 5,653,170; Bukovina, 560,599; Dalmatia, 474,489; total for the Austrian Crown Lands, 22,130,684. This gives a total increase for the eleven years of 1,734,054, or 8·5 per cent. This is a satisfactory result, as compared with the Hungarian provinces, where the increase for the ten years—1870-1880—was only 1·24 per cent. The total population of the Austro-Hungarian Empire last December was 37,739,407, being an increase for the decade of 1,925,450, to which the Hungarian provinces had contributed only 191,396. It is worth observing that while the annual rate of increase in the provinces of the Austrian portion of the monarchy averaged only ·772 per cent., in Prussia it averaged during the last five years 1·179 per cent., being more than one-third higher. The population of the chief towns in the Austrian provinces last December stood thus:—Vienna, 726,105; Prague, 162,318; Trieste, 144,437; Lemberg, 110,250; Grätz, 97,726; Brünn, 82,655; Zara, 60,226; Czernowitz, 45,600; Linz, 41,687.

On the 5th and 15th July respectively the temperature in Paris rose to 35·6 C. and 37·8 C. The highest previously recorded in this century was 36·75 on 31st July, 1803. M. de Parville, who has written a paper on the subject which appears in the *Journal des Debats*, says that the dryness of the present summer could have been foreseen. Having referred to the influence of solar action on the atmosphere, he says:—"A very long series of observations has also shown that the moon, which passes every month from one hemisphere to the other, influences the direction of the great atmospheric currents. The changes in those currents, in consequence of the prevailing moisture or dryness, are intimately connected with the relative position for the time being of the sun and moon. The distance of the moon from the equator—that is, the inclination of the moon's path to the plane of the equator—varies every year, passing from a maximum to a minimum limit; and the meteorological character of a series of years appears to be mainly dependent upon the change of inclination when those extreme limits have been touched. Observations prove that the rainy years, the cold winters, and hot summers return periodically, and coincide with certain declinations of the moon. In our latitudes the rainy years occur when the moon's declination has touched its extreme limits of 28 deg., 26 deg., or 18 deg. respectively. They are separated from each other usually by periods of about three years and then six years. He gives a table tracing backwards this connection between the rainy years and the moon's greatest declination. The severe winters as a rule coincide, at least, within a year, with the same declination. The dry summers come naturally in the middle of the period which divides two wet years. Applying the rule which this experience suggests to the summer of 1881 we find that the next wet year ought to coincide with the declination of 18 deg. therefore, with the year 1884, as the last was 1879 with the declination of 26 deg. Consequently the dry summers should come about the middle of the intervening period between those two years—that is, they should be 1881 and 1882.

MISCELLANEA.

On Saturday 2000 persons were carried to the top of the Righi by the rack railway—the greatest number that ever ascended the mountain in one day.

A *Daily News* telegram of the 21st says that the project of a second Suez Canal under English auspices is the subject of animated discussion in the local press. The advantages proposed include a quicker transit and a reduced tariff.

In consequence of the probability of a local famine, it is proposed to make a railway from Bangalore to Tunkur and Siptur as a relief work, and the district officers have been instructed to prepare all necessary relief measures.

The weakest part of most screw steamers is still the screw-shaft. It has been determined that temporary repairs shall be made on the shaft of the Cunard steamer Catalonia, which recently had to complete, by putting a heavy iron band around the fractured portion to make it strong enough for the return voyage. She sails for Liverpool to-morrow.

The necessity for occasionally annealing crane chains was again shown by a fatal occurrence a few days since. A bag of rice was being hoisted by a steam crane attached to Simmonds's Wharf, Tooley-street, and when it had attained a considerable height the chain snapped asunder. The bag fell upon a man named Donovan, and killed him on the spot.

The Mining Institute of Scotland held a meeting at Ayr on Saturday, under the presidency of Mr. Ralph Moore, inspector of mines, when forty new members were added to the list, bringing up the membership to 400. Several papers which were read at previous meetings of the Institute were discussed, among them being Mr. M'Bett's paper on "Stirlingshire Coal and other Minerals."

The Polytechnic is closed. Its death affords another proof of the objection which people feel to being amused with educational matter. A good many people continued to use the place as a cheap place of amusement, but the entertainment did not suit the mass of pleasure-seekers or those who sought relaxation, and the instruction was not sufficiently thorough in any branch to be deemed worthy of regular attendance for educational purposes.

A disastrous boiler explosion occurred on Monday at the Dividy-lane Colliery, near Longton, North Staffordshire. The engine-house was entirely demolished, and the engineman was buried under the ruins, and had a narrow escape with his life. Nearly the whole of the surface plant has been destroyed. The engine was lifting water, and fortunately there were few men about the colliery. Three men who were in the pit were extricated after several hours' imprisonment.

The Admiralty have just approved of an estimate for the building, at Portsmouth, of the Imperieuse, an armour-plated steel cruiser, which will not resemble any vessel afloat. The cost of her hull alone will be £325,000. Her load displacement will be 7400 tons, and her length 315ft., with a beam of 61ft. She will be built with four barbette turrets, and have an outer casing of wood, the barbette being armed with 18-ton breech-loading guns, having a "disappearance arrangement." Her engines will be 8000-horse power.

The week before last a waterspout burst in Clear Creek Canyon, Colorado, thirty-five miles from Denver, a rich gold-mining region. The flood swept through the mining villages Central City, Black Hawk, Dry Gulch, and Idaho Springs. The inundation lasted only twenty minutes, but resulted in a torrent 5ft. deep rushing 15 miles per hour. Two lives were lost. The damage, a contemporary says, is estimated at 120,000 dols. The Colorado Central Railroad was buried for miles under the *débris*, which was piled 20ft. high in some places.

From a return recently issued showing a classification of the whole receipts from the Patent-office for the year 1880-81, it appears that the amounts paid on petitions for letters patent was £28,060; on applications with complete specifications, £1105; notices to proceed, £20,230; warrants, £18,300; letters patent, £18,275; final specifications, £16,625; notices of objection to grant, £82; notices of objection to sealing, £20; on oppositions, £122; giving a total of £102,819. Third year fees came to £50,300; seventh year fees to £26,100; other fees, certificates, sales, &c., to £3544; and designs and trade marks, £4982 and and £3784 respectively, or in all £8766. The total receipts have, therefore, been £191,529.

We understand that Messrs. John Warner and Sons, of Cripplegate, E.C., have purchased the large collection of valuable waterworks pumping engine and machinery patterns of the late Mr. Frederick Mason, of Ipswich. These comprise those of the Thetford Waterworks, Colchester Waterworks, Bradfield and Bramford Steam Mills, Bishop Stortford Waterworks, Wimbledon Sewage Works, Kidderminster Sewage Works, Sheerness Waterworks, Hertford Waterworks, Abingdon Sewage Works, Harlow and Epping Waterworks, Ipswich Asylum, Kettering Waterworks, Notting Hill Infirmary, Marylebone Union, Shepherd's Bush Brewery, Edmonton Union, Kettering Sewage Works, Hampstead Brewery, and Kidderminster Waterworks.

A special meeting of the Shoreham Harbour Trustees was held at the Town-hall, Brighton, on Monday afternoon, to receive a report from the finance committee on the proposal of Mr. J. Orrell Lever, M.P., regarding a scheme for the further development of the harbour. The committee reported that they had considered the letter submitted to them, and also a second letter from Mr. Lever, stating that he and his friends intended to give the necessary notice for an Act next session, subject to certain conditions and the approval of the trustees, for the purpose of acquiring Shoreham Harbour by lease. After some discussion it was agreed that the trustees should favourably entertain Mr. Lever's proposal, and that negotiations should be proceeded with on the basis of such proposal, but with such necessary modification as might appear to the trustees to be essential to the protection of the trustees and others interested in the harbour.

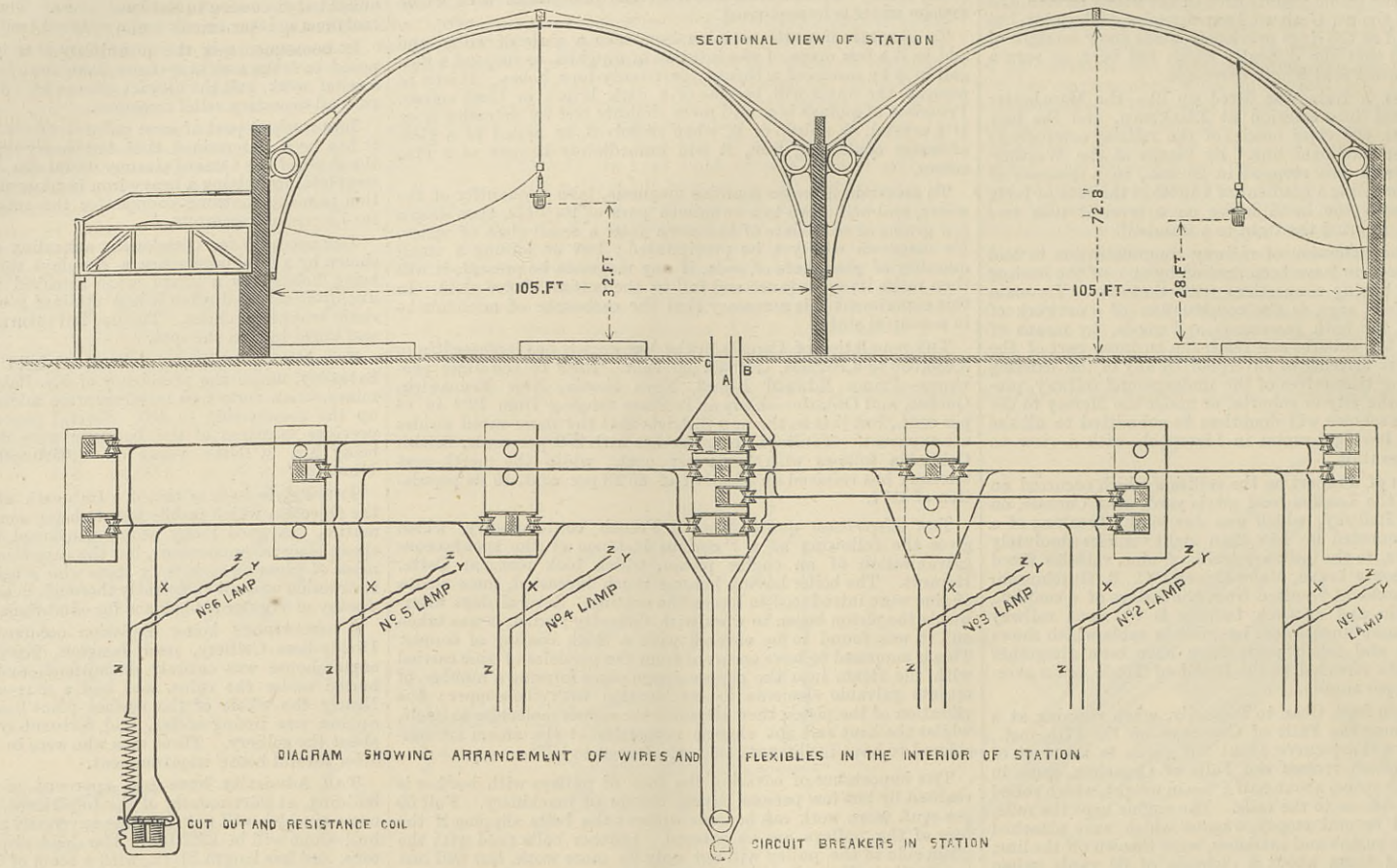
The engineer in charge of the boring operations being carried out for the Panama Canal reports that the borings had proceeded to a depth of about 100ft. from points, the altitude of which varied from 200ft. to 260ft. above the level of the sea, without encountering the rock *in situ*. The material was apparently a more or less dense brecchia or conglomerate of rounded fragments of rock embedded in argillaceous matter. The fragments of rock are in a state of decomposition, and, after exposure to the atmosphere, a slight touch will cause them to separate into concentric layers, leaving a compact central nodule. The existence of these globular blocks on all sides, and distributed over the surface through the defile, leads to the inference that the geological structure of the *col* to be cut through will prove to be similar throughout, more especially as the rocks met with most abundantly on the Isthmus are conglomerates and tufa.

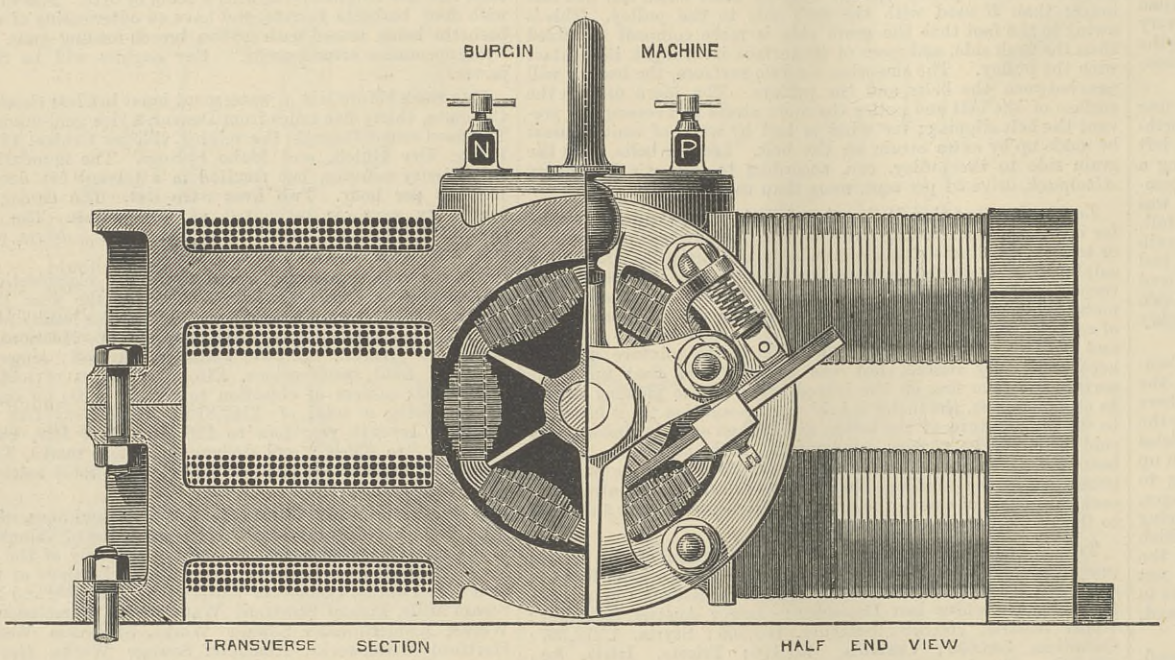
The rocks which constitute the southern island of New Zealand consist principally of gneiss, granite, mica schist, phyllite, quartzite, and felsitio rocks. They are partly covered by palæozoic strata, which are folded up into innumerable troughs and saddle-backs throughout the province of Canterbury, and which partly belong to the carboniferous period, so that there are prospects for a future discovery of coal beds. By far the greatest interest, however, is offered by the extensive volcanic phenomena of the island, and among them the extinct volcanoes upon the Banks peninsula, east of the town of Christchurch, are prominent. The special construction of such an extinct volcano has been made visible by a tunnel of 2620 meters length upon the railway between Christchurch and Littleton, which has pierced through the walls of a volcanic cone, and thus has laid bare its structure of successive streams of lava and beds of scoriæ, ashes, and tufæ, which are again intersected by dikes of younger volcanic rocks. This is, perhaps, the first volcano through which a railway has been constructed.

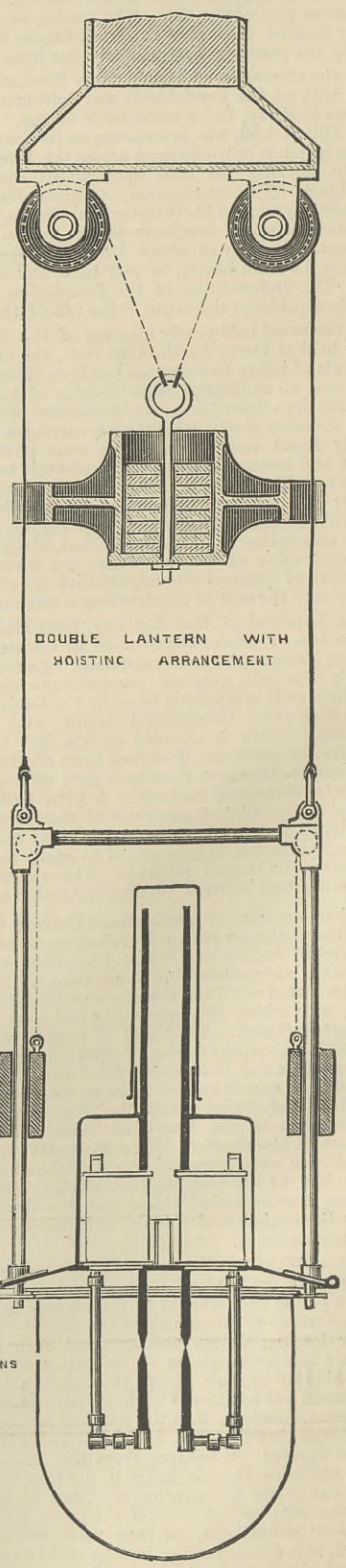
THE ELECTRIC LIGHT, GREAT NORTHERN RAILWAY STATION, KING'S CROSS.

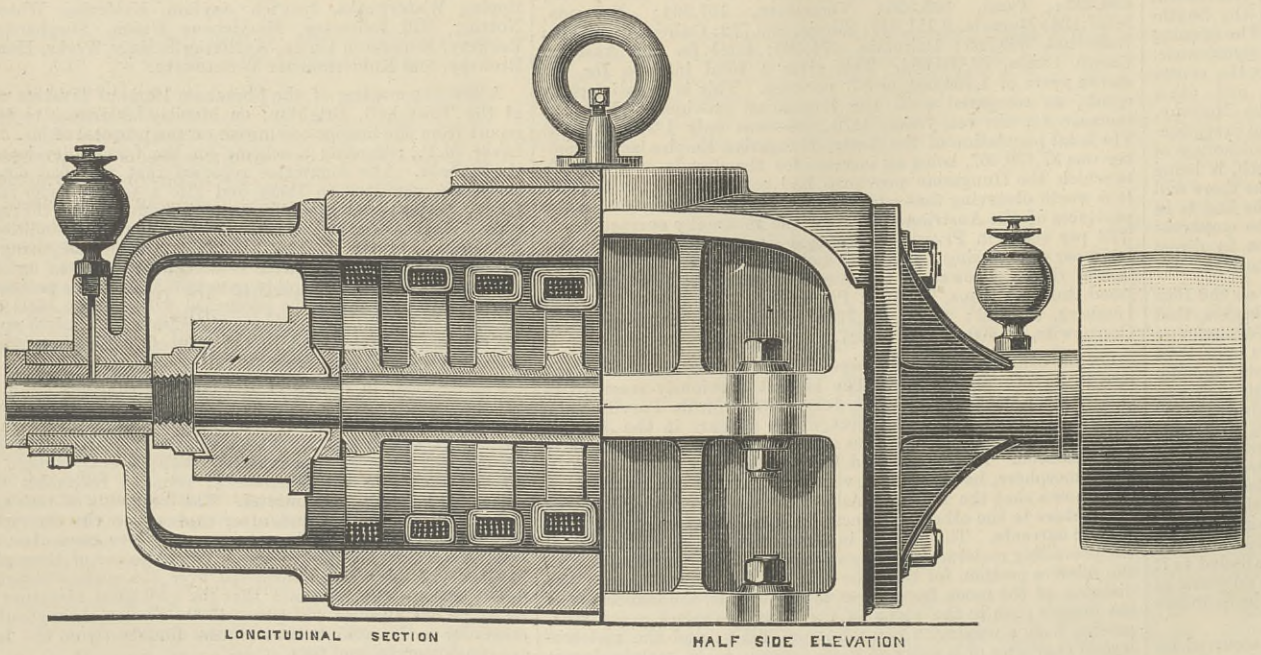
MESSRS. R. E. CROMPTON AND CO., LONDON, ENGINEERS.

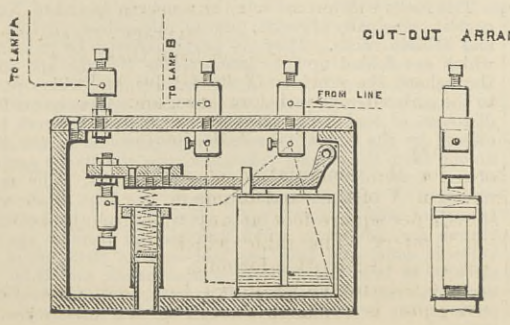
(*For description see page* 147.)

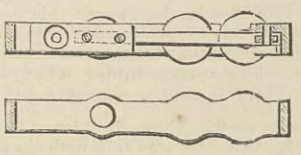


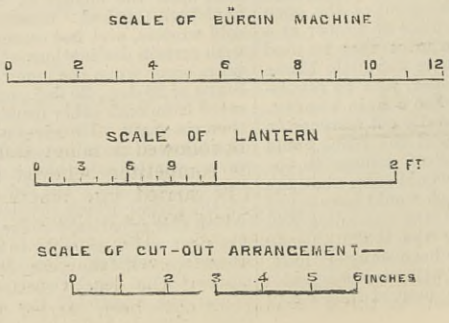












FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

PARIS.—Madame Boyveau, *Rue de la Banque.*
BERLIN.—Asher and Co., 5, *Unter den Linden.*
VIENNA.—Messrs. Gerold and Co., *Booksellers.*
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NEW YORK.—The Willmer and Rogers News Company, 31, *Beekman-Street.*

TO CORRESPONDENTS.

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

**** *We cannot undertake to return drawings or manuscripts; we must therefore request correspondents to keep copies.*

An Old Subscriber.—*There is no reason why you should not use brass tubes.*

A Duffer.—*Spretson's treatise "On Casting and Founding." London: E. and F. N. Spon.*

Subscriber.—*Please repeat question. We do not quite understand "barrel for winding gib," or "barrel winding load."*

A. B. (Victoria-grove).—*We presume you allude to the Science Classes, South Kensington. You cannot do better than apply there for information, which will be readily given you.*

W. N.—*You do not say whether your friend wishes to enter the Royal Navy or the Merchant Navy. In either case, if over fifteen years of age, he must pass three years in some form of apprenticeship in a marine engineering works. At the end of that time he could enter the Royal Navy by examination in London or one of the several sea-port towns appointed for examination. Respecting all this you will find all necessary information in the "Engineer's Guide to the Navy," a small book obtainable from any bookseller. Examinations have to be passed for the Merchant Service, but appointments are obtained by recommendation upon merit.*

SLAB GLASS TO STAND SUDDEN CHANGES OF TEMPERATURE.

(*To the Editor of The Engineer.*)

Sir,—Is there any glass manufactured in the block or slab capable of standing the sudden changes of temperature from zero to 400 deg. of heat?

Bristol, August 24th. E. B. E.

SMOKE-CONSUMING APPARATUS.

(*To the Editor of The Engineer.*)

Sir,—I shall be much obliged if any of your readers will give me the names of persons who manufacture smoke-preventing apparatus for furnaces. J. A.

Salford, August 24th.

OVAL CHUCKS.

(*To the Editor of The Engineer.*)

Sir,—Can any of your correspondents give information about oval chucks? The chuck is wanted for turning oval dies in steel, and must be strong, and without too delicate parts. J. B. F.

Birmingham, August 24th.

UNDERSHOT WHEELS.

(*To the Editor of The Engineer.*)

Sir,—We should be very thankful to any reader who will kindly say what would be the power of a paddle-wheel in an open current. Size of wheel 14ft. diameter over floats, by 5ft. wide, by 2ft. depth of float. Speed of current 7ft. per second. T. and Son.

August 18th.

THE PRUSSIATE OF POTASH PROCESS.

(*To the Editor of The Engineer.*)

Sir,—Having been much annoyed by the short duration of various motion pins which we have hardened by prussiate of potash, would any of your readers kindly give a hint, either through The Engineer or otherwise, to one who is desirous of learning the means of making this process more effectual, as I feel certain it is to be done, but at present am unable to experiment or solve the difficulty. Is it in a certain heat to cool the articles dressed, or is there any special means of application, or is it possible to test for defective chemicals? My own opinion is that the iron appears less able to resist the wear after a short time than if it had been left in its natural state from the lathe. Any information would be accepted with gratitude by Inquirer.

King's Lynn, August 20th.

[The prussiate of potash process only gives the iron an extremely thin, hard skin. If this skin be cut through, the soft iron is reached. Motion pins should be properly case-hardened. We publish our correspondent's query, however, because we believe with him, that the prussiate of potash process is capable of more than it has yet accomplished.—Ed. E.]

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

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

DEATHS.

On the 17th inst., at 66, Rue François Premier, Paris, Matthew Boulton Rennie, son of the late John Rennie, C.E., F.R.S., in the 77th year of his age.

On the 16th inst., at Margate, John Slate, C.E., late of Trinidad.

THE ENGINEER.

AUGUST 26, 1881.

THE SHEAF-BINDING TRIALS AT DERBY.

The trials of sheaf-binding reaping machines at Derby have not given satisfaction. Of this there can no longer be any doubt. The dissatisfaction is not confined to the competitors; on the contrary, there is reason to think that it is widespread, and includes all the agriculturists of the country who have taken an interest in the proceedings of the Royal Agricultural Society and of its judges. No one asserts that the trials were unfair as between the competitors, or that they were not carried out with every possible care by the judges and engineers. The prominent defect is to be found in the fact that the conditions under which the trials of the competing machines were made were adverse. In other words, the trials were not calculated to supply the information which the judges ought to have possessed before they pronounced their verdict. It is fully understood that the sheaf-binding reaping machine is the most complex and expensive implement ever put into a harvest field. Durability, in the sense of power to work through a harvest season without requiring much if any repair, is an essential qualification in such machines as those tried at Derby. Capacity on the pact of the sheaf-binder for working without the aid of skilled attendants is hardly less necessary. On neither point did the Derby trials elicit any information whatever. The machines during the experiments made with them were in the hands of their inventors or the skilled representatives of the inventors, and the test conditions were therefore very unlike those under which the reaper would be actually worked in English corn fields. Again, the duration of the trials was ridiculously short; the aggregate duty done by any of them did not much exceed about half a day's work. A good sheaf binder will do ten acres a day in a heavy crop, and as much as twelve acres may be got through. The total quantity cut by each machine at Derby consisted of half an acre of oats, half an acre of barley, half an acre of wheat, two acres of light wheat, two more acres of oats, and two acres of heavy wheat, or in all seven and a-half acres of corn. Several days were spent in doing this, and we do not hesitate to say that such a test could not supply adequate information to the judges as to the durability of the machines tried. But this was not all—the corn was for the most part cut while wringing wet; that is to say, under conditions which could not possibly exist in regular farm work. We have heard it urged in favour of the trials that the more adverse the conditions the more severe the test; but such an argument possesses no force whatever. It might as well be advanced that by running a locomotive on a hard paved road a good idea could be gained of its powers of working on a railway. It is, no doubt, proper that machinery should, when tried at all, be tried with due severity; but unless the trial takes place under working conditions its results can possess little or no value. Thus it would have been quite fair to test the machines tried at Derby in fields of very heavy corn, full of grass at the roots; but it was not legitimate to test them in corn saturated with rain, and during a heavy downpour of rain. There are thousands of sheaf-binding reaping machines in use in the United States which could not work in heavy, tall English crops; and the weight of the crops cut may, with strict propriety be used as a factor in appraising the value of a sheaf-binder; but to cut wet corn, and to use in any way the power of a machine to deal with corn in a shower, is simply absurd because no farmer in his senses would think of working a machine in wet corn and a torrent of rain. Furthermore, it is by no means certain, or even approximately certain, that it is more difficult to bind wet corn than dry. Indeed the chances are that the straw, lying closer and heavier when wet than dry, may be more readily bundled and tied than it would be if fit for cutting. When thatch is being made or "pulled," the straw is always wetted, to make it lie close and take the spring out of it, and, reasoning by analogy, it seems not improbable that wet corn may be more easily dealt with than dry by a sheaf-binding machine.

We regret to say that in carrying out the sheaf-binding trials at Derby, the Royal Agricultural Society appears to have forgotten how important a position it holds. It is a fact that a great many farmers attach a very high value indeed to the verdict pronounced by its judges, and the award of a prize to any machine or implement does a great deal to ensure the sale of the prize implement to the public. It is, therefore, not enough that the policy of the Society in dealing with inventions should be rigorously honourable. The judges have a far more numerous class to think of than the inventors. All the exhibitors have, no doubt, more or less to complain about in the conduct of the late trials, because they all wanted to have their machines fully and fairly tested. That in a sense the tests were fair, and that no man was placed under better or worse conditions than his neighbour, will not, we hope, be disputed; but there was nothing like the full trial which it was not only desirable, but imperative should have taken place. As matters stand, the prize awarded to the McCormick Harvesting Machine Company, of Chicago, will prove of little service to the recipients.

It may, of course, be urged that the Royal Agricultural Society was not responsible for the weather, and that it did all that could be done under the circumstances. To plead this is at once to deprive the trial of all value. It is to admit at once that a gold medal and other awards have been made without any good or sufficient reason for making them. It is to assert that the conditions of trial were known to be unsuitable, and, therefore, radically bad. We may be asked, "What was the Society to do?" The answer is supplied by the Society's own programme. We understand that competitors were notified that each machine might be called upon to cut and bind 100 acres of corn. This would have been an adequate test, for any machine which could successfully deal with this acreage might reasonably be depended upon to work steadily through a whole season without much derangement. Why this plan was not followed it is not difficult to explain. Probably not one competitor believed for a moment that the idea would be carried into practice. The system under which the Society works is inimical to any extended test of field implements. The judges are all busy men, who can be got together, even for a few days at a time, with difficulty. No doubt if the Derby trials had been postponed, they would not have been carried out at all. But the fact that difficulties are encountered in testing machinery is no excuse for making inadequate and delusive experiments. Either no trials should be made, or they should be made properly. The thing wanted is a reorganisation of the whole system of testing machines and implements, and we have no doubt that it is quite practicable to effect this reorganisation. For example, certain agriculturists, practical men of high standing and large experience, might be affiliated to the Society and employed to report on the work done by implements handed over to them for trial. Thus, for example, the half dozen machines tested at Derby might each have been handed over—selections being made by lot—to as many independent farmers, by them to be used during the harvest. Each machine should have to attend it and work it one man supplied by the inventor. The trial might extend over one month, and the machine would be used just as the farmer thought proper. A committee of three judges or inspectors should be appointed who would from time to time visit each farm, say once in each week for a few hours at a time, to see how things went on, and to supply independent testimony as to the character of the crops cut, their condition, and so forth. At the end of the month the machines would be returned to the inventors, a report could be prepared by each of the farmers who had used a competing machine, and from these independent reports, and that of Messrs. Eastons and Anderson, who would examine each machine after its month's work, a final report could be drawn up which would possess real value and on which the award of a prize could be, with propriety, based. Of course we know that a hundred objections may be raised to this scheme, but the only objection which would hold water cannot be urged; namely, that such trials as those of Derby are better. If the Royal Agricultural Society cannot carry out tests of machinery and implements, the results of which will guide agriculturists in making their purchases, then it is much better that they should not be made at all. This conviction is gaining strength day by day, and the time is not far distant, we fear, when firms of eminence and reputation will refuse to compete. No doubt such a result of bad management on the part of the Society would be deplorable, but it is none the less, we fear, imminent. There is yet time for change, but one or two more fiascos like the Derby trials will greatly diminish the waning influence of the Society, and render its awards things to be eschewed rather than coveted.

WIND PRESSURE ON RAILWAY STRUCTURES.

Towards the conclusion of the inquiry into the causes of the Tay Bridge disaster it was announced that a proposal had been made for the Board of Trade to undertake an investigation into the question of wind-pressures on railway structures, with a view to the determination of a minimum which should be assumed in the determination of the strength of these. Objection was very properly made to the idea that the Board of Trade should be sole arbiter in such a matter, and a committee was subsequently appointed to consider and report on the question, in which Colonel Yolland was the only officer representing the Board, the other members of the committee being Sir John Hawkshaw, Sir W. G. Armstrong, Mr. W. H. Barlow, and Professor G. G. Stokes. The report of this committee has just been made public. It contains, firstly, the report and recommendations of the committee; secondly, an appendix comprising a summary of strong winds registered at stations in England, Scotland, Ireland, and from a few places on the Continent and in India; together with a table of wind-pressure and explanation of the method of deducing it from the maximum run of wind in any one hour during a storm; letters relating to the direction of heavy gusts of wind, and list of accidents to trains caused by the force of the wind. Thirdly, it contains copies of wind-pressure diagrams taken at Bidston, near Liverpool, Glasgow, and Greenwich.

The report is not a lengthy one, and the recommendations are not numerous. Most engineers will look upon the recommendations as satisfactory, though the reasonings upon which some of them are based are not given, and are not to be inferred from anything the report contains. The method of procedure by the committee seems to have been to obtain from a large number of stations or observatories the records of wind velocities and pressures, as obtained by Robinson's cup anemometers, and Osler's self-registering anemometers. At most stations the observations are only of the velocity of the wind; but at a few both velocity and pressure are recorded. It was therefore necessary, in order to utilise all the velocity observations, to determine the general relation between velocity and pressure as shown by the records made at the stations where both velocity and pressure are simultaneously registered. For this purpose the Bidston records were employed, as most suitably representing that relation for high winds with which alone the committee had to deal. The Bidston observatory is on the top of a range of hills on the south side of the Mersey, the hills rising abruptly from the sea level on both sides, and especially on the west side. The anemometers are placed 56ft. above ground, and 251ft. above mean sea level. In dealing with these records, three sets of subsidiary tables were first formed. These included, for the period 1st January, 1870, to 31st December, 1878, the maximum hourly runs of the wind lying between 35 and 45 miles an hour, 45 and 55 miles, and 55 and 65 miles, with the maximum corresponding pressures. Three sets of average velocities and pressures were thus obtained, and from these it was found that the pressures were very nearly proportional to the squares of the velocities in each case, and that the simple formula $\frac{V^2}{100} = P$ served, with tolerable accuracy, as the basis for the computation of a table connecting the maximum run V of the wind in one hour with the pressure P in pounds per square foot at any time during the storm to which V refers. The table which we give in another place was computed by this formula.

From the information acquired the committee recommend five rules as sufficiently meeting the cases referred

to it for consideration, and although we give the report elsewhere, they may be briefly repeated here. They are—1) that for railway bridges and viaducts a maximum wind pressure of 56 lb. per square foot should be assumed for the purposes of calculation; (2) that for girders with closed sides and as high or higher than the top of railway vehicles the full pressure of 56 lb. should be employed for the whole vertical surface of one girder, and that when the girder is not as high as the vehicles, the surface should be taken as that of the length of the girder by the height from the bottom thereof to the top of the vehicles; (3) that for lattice or open girders the pressure of 56 lb. should be applied to one girder, as though the girders had closed sides from the level of the rails to the top of the train, and the same pressure to be applied to the actual ironwork area below the level of the rails and above the top of the train. The pressures to be applied to the inner or leeward girder, one only, in addition to the above, relate only to the actual vertical area of ironwork below the rails and above the train, and are, *a*, 28 lb. per square foot when the open spaces are not more than two-thirds of the area included within the outline of the girder; *b*, 42 lb. when the open spaces are between two-thirds and three-fourths the whole outline area; and *c*, 56 lb. when the open spaces are greater than three-fourths of the whole area; (4) the pressure on arches and piers should be ascertained in conformity with these rules; and (5) a factor of 4 should be employed in all these cases in calculating the necessary strength, except when wind pressure is counteracted by gravity only, then a factor of 2 is considered sufficient.

Now a good many engineers will ask—Upon what data have these pressures which are to be applied to the actual area of the ironwork of lattice structures been determined? There is nothing in the report to indicate in what way they have been derived. Yet this is an important question, for lattice girders of large spans are more likely to be used in the future than they have been hitherto, and the application of the maximum pressure of 56 lb. to the whole area of the inner or leeward girder as well as to the windward girder must have an important effect on the total weight of such girders. It would appear that the committee possessed information which led to the conclusion that the effectiveness of wind-pressure is greater on the inner one of a pair of lattice girders, roughly speaking, as the actual area is less—though this relation has hitherto been a matter of question—and that the effective pressure on a leeward girder is not at all reduced by the intervention of a girder the open spaces of which are at all greater than three-fourths the whole outline area. Again, it must be urged that the jump from 28 lb. per square foot to 42 lb. respectively for girders the open spaces of which are two-thirds the outline area and for girders having open spaces anything over two-thirds that area, seems excessive, and that some formula should be given which would assign more satisfactorily a relation between pressure and area. The jumps from 28 lb. to 42 lb. and 56 lb., and from two-thirds to three-fourths, or greater than three-fourths, looks, without information to the contrary, very like guesswork. The relation between the effectiveness of wind-pressure on large and small-mesh lattices does not seem to have received the attention which it must get before the question can be settled. Two girders, for instance, of the same span and depth might be designed so as to have an equal amount of open space area, and yet the mesh or the area of each opening might be very different. Yet the rules laid down by the committee would require the application of the same assumed wind pressure in each case, though it is generally believed that the smaller the mesh, the greater the effectiveness of wind pressure. Thus more definite rules are certainly required on this point. The report is one of undoubtedly high value, but there are several points on which experiments need to be made, in order that rules more generally and consistently applicable may be made.

LANCASHIRE AND YORKSHIRE RAILWAY—COMPETITION FOR PROPOSED NEW STATION, LIVERPOOL.

The award in connection with this competition has been made; the directors—acting, presumedly, under the advice of Sir John Hawkshaw, who was called in to assist them in their deliberations—having given the premiums to three local architects of by no means world-wide fame. The competition—differing somewhat from an ordinary architectural competition, inasmuch as considerable engineering skill as well as artistic taste had to be brought to bear on the problem—has ended most unsatisfactorily to the competitors and not creditably to the promoters. The instructions, issued for the guidance of the competitors, clearly invited designs for a "New Station," and the spirit, if not the letter, of these instructions implied a wish on the part of the directors to secure a comprehensive and liberal scheme which would suffice for the requirements of the public for very many years to come. In spite of this, however, we find the first and second premiated designs consisting of plans for crude additions to the existing buildings, utterly wanting in anything like architectural dignity, badly designed as regards the approaches and exits, and quite devoid of any originality, and unworthy of so important a city as Liverpool, and of so wealthy a company as the Lancashire and Yorkshire Railway Company. The third premiated design is, perhaps, the best of the lucky ones, but it bears a family resemblance to the others, and certainly the strange coincidence that all the three premiums go to Manchester—the head-quarters of the Lancashire and Yorkshire system—taken with the fact of all the successful competitors using in the old buildings with as little alteration as possible, points only to one conclusion, and that is, that valuable information as to the wishes and intentions of the directors has been conveyed to part of the competitors and not to the whole. If this has been so, it is certainly a most unfair and unjustifiable proceeding. The two best designs in the competition are that signed "Rectus," by Mr. James Barlow Fraser, of Leeds, and "Invitum Sequitor Honor," by Messrs. J. H. Lynde and Chas. Heathcote. The former is shown in great detail by drawings well considered and beautifully executed. The general effect of the elevation is commanding and well balanced; the booking hall centrally placed and of ample size; and all the offices and conveniences planned on a liberal scale and easy of access. The gradient from Tithebarn-street is carefully worked out and easy, although it would perhaps have been better to have made the approach and exit road somewhat wider, and to have divided it by a dwarf wall so as to keep the ingoing and outgoing traffic separate, and also to have kept the entrance and exit gates on the Tithebarn-street level apart, especially as this could have been easily effected without altering the general arrangement. The other design mentioned above is most certainly entitled to one of the premiums if for nothing else than its admirable solution of the approach difficulty. Nothing could be simpler, and therefore nothing more satisfactory for the working of the traffic than the parallel slopes, one outgoing and the other incoming placed in front of the main building. The fact of the main buildings being placed so far back from Tithebarn-street might be prejudicial to the elevation, but on the whole the scheme is a good one, and the general arrangements liberal in scale and well thought out. Among the best of the other designs are those marked "Direct," "Lancashire," "Vulcan," "Span"—who puts all his platforms under one roof after the manner of St. Pancras; "L. and Y."—with an attractive elevation and an ingenious arrangement of approaches; and "Centaur." In many of the designs considerable engineering skill and ingenuity has been shown in the construction of the roofs and in utilising the space under the platforms, and altogether the competition has produced some remarkably good work. At the same time, considering the importance of the building and the liberal amount of the premiums, it is surprising that more first-class designs have not been sent in. The competition, however, is most remarkable on account of the extraordinary disposal of the premiums, and many if not all of the forty unsuccessful competitors who have been left out in the cold will doubtless hesitate before they again submit the fruits of their talent and energy to the tender mercies of the Lancashire and Yorkshire directors.

LITERATURE.

A Handbook of Electrical Testing. By H. R. Kempe, M.S.T.E., &c. New Edition. Revised and enlarged. E. and F. N. Spon. 1881.

It is almost impossible to give a correct idea of the value of this work. There is none other with which it can be compared. Rivals it has not any. True we have books that treat of testing. We have indeed small works, such as that of Hoskier, devoted entirely to testing, but in most cases testing is discussed in one or two chapters in books which deal with electrical matters generally. Mr. Kempe, however, has made testing *the* subject of his book, and any other subject that is discussed is discussed solely because of its connection with the principal subject. Now a fair knowledge of testing is as necessary to the electrical engineer as a knowledge of certain branches of applied mathematics is to the engineer who undertakes the designing of bridges or similar constructions. Testing is a system of measurement, and implies a knowledge of the tools used as well as a knowledge of the properties of the materials employed. The tools used by electricians in their measurements are instruments of great delicacy and precision, and have a scientific as well as a practical value. The work before us describes these instruments, clearly showing the principle upon which the instrument is based, and the best methods of using it. It is with a certain amount of hesitation that we venture to hint at a seeming deficiency. The recent astonishing development of electric light apparatus opens a new field for testing operations, and we should have liked to have seen a chapter devoted to this special branch of the subject. Of course, it may be answered that the expert in testing can without the slightest difficulty apply his knowledge, inasmuch as no new principles are involved, and only care to be taken that his instruments are suited to large currents.

This work deals with testing from the standpoint of a telegraphist and has in view a thorough description of the tests requisite during the manufacture, laying, and repairing of a submarine cable. The value of the work arises not only from its comprehensiveness, but more from the excellent method pursued by the author. He not only supplies tests as devised for special purposes, and duly gives credit to the originator, but he discusses fully and freely the best conditions for making the test. The author is fully imbued with the idea that no effort should be spared to make the reader understand the "Why and the wherefore," and therefore he almost always illustrates his description by a numerical example. Thus to enable our readers to judge more easily our meaning, we indicate the method pursued in the discussion of Poggendorf's method of obtaining the E. M. F. of batteries. The method is in the first place described with the aid of a diagram, then a numerical example of the method is given, followed by remarks on the best conditions for making the test, and concluding the special subject by considering the possible degree of accuracy attainable. The method adopted by an author may be admirable, while his matter may be involved and difficult to understand. In this case the matter and method are equal, the former being clear, concise, and to the point.

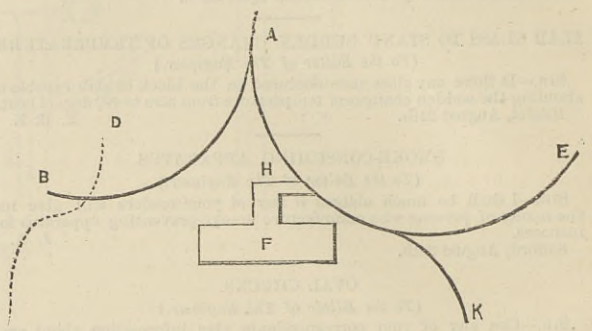
It would be difficult to indicate exactly the contents of the work. Starting, however, with one of the simplest experiments, in order, we should imagine, to indicate the principal instruments used, we then have these instruments described, this portion of the work concluding with certain tests of these instruments, such as those applicable to galvanometrical resistance, the internal resistance of batteries, and the electro-motive force of batteries. The theory of the Wheatstone bridge comes next, followed by a chapter on testing for faults. Special pieces of apparatus, such as keys and condensers, are described before chapters on the measurement of potentials and of electrostatic capacities. Thomson's quadrant electrometor and its uses is explained, the latter part of the book treating cable work carefully and exhaustively. A unique feature is a contract specification for the manufacture of a cable, with specimen sheets of the tests taken during manufacture. Various useful tables are given at the end.

This work purports to be a new edition, but in reality it is a new work, there being little connection between the previous edition and the one before us. This volume is much more extensive, and that portion which reminds us of the previous work has been remodelled and largely rewritten. An effort has been made to arrive at a system of fixing the symbolic nomenclature of the subject, for we notice that as far as possible the letters used are the first letters of the words naming the objects they represent; and in cases where it is required to indicate, *e.g.*, current received or current sent, a subscript is used, thus C_r, C_s, so that the reader has no trouble in understanding what the symbols mean. We have attempted to give a somewhat emphatic opinion as regards this work, without entering into a detailed criticism, which the nature of the work precludes.

THE BRITISH ASSOCIATION AT YORK.

All the beds at the following chief hotels in York have already been engaged for the British Association meeting, namely:—The Station Hotel, Harker's, the North-Eastern Hotel, Scawin's, the Black Swan, the Great Northern, and the Queen. A heavy sale of tickets for the "jubilee" meeting has already been made, and the North-Eastern Railway Company has most liberally arranged to issue very cheap British Association tickets to and from nearly all the chief towns in Yorkshire, available during fourteen days for as many journeys as each holder chooses to make. Altogether then, those who arrive in York early and allow themselves plenty of time to obtain lodgings will be on the safe side.

Those who have not visited York by the Great Northern Railway within the last four years will find the old system of entering a small terminus down a short branch, and then being drawn back over the same branch to go on to Scotland, abolished. In the accompanying diagram, B shows the position of the old terminus, and H that of the new station, which is built over



part of a sharp curve in the line. A E is part of the line from London to Edinburgh, K is the branch to Scarborough, and F is the great new hotel of the North-Eastern Railway Company. The dotted line D represents the old town wall, which was in the way of any extensive enlargement of the old station. The new hotel, managed for the railway company by Mr. John Kaye, has 150 bedrooms, five out of six of which will hold two beds. The Great Northern Railway ends near Doncaster, but has running powers over the North-Eastern Railway into York.

In addition to the liberal steps already mentioned, the North-Eastern Railway Company will lend a steamer for nothing, to take an excursion party of geologists and others close alongside the coast from Middlesbrough to Scarborough, a distance of about sixty miles. Most of the chief officials of this company reside in York, and in every way they have been working to promote the objects of the meeting. The Corporation, the clergy, and the railway people are all working in harmony to make the meeting a good one, and it is not always the case that all the "parties" in a town so combine for the benefit of the British Association.

The local secretaries have long had substantial offices in York, in the shape of a house—No. 3, Blake-street—lent them by the Corporation. The hard work and responsibility of a reception of the British Association always falls chiefly on the local secretaries, who in this instance are the Rev. Thomas Adams, M.A. (Cantab), and Mr. Tempest Anderson, M.D., B.Sc. (London). Mr. Adams was formerly on the Geological Survey; he is now Senior Mathematical and Science Master at St. Peter's School, York; he is a nephew of Professor Adams, the astronomer. His colleague, Dr. Anderson, passed with high honours at London University; he is surgeon to the North-Eastern Railway Company, and to the Eye Institution. He is the inventor of a new opthalmometer for measuring the refraction of the lens of the eye, and whether it is at the proper focal distance from the retina, thereby revealing at once what kind of spectacles are required to perfect the vision. This instrument obtained a first-class award at the recent International Medical Congress.

The programme of the local arrangements for the Jubilee Meeting forms a small volume, which will be presented gratis to every member of the Association; it is practically a guide, and a very good guide to York and its vicinity. It is edited by the local secretaries; Mr. W. Denison Roebuck contributes an article to it on zoology; Mr. Thomas Gough, B.Sc., an article on botany; and Archdeacon Hey an article on the founders of the British Association. It contains information about the post, telegraphs, trains, and excursions, the meetings, the officers, the geology and geography of the district, and, in short, about everything which the visitor would find it useful to know; a map is also bound up with its pages.

The excursions will be to Scarborough, Castle Howard, Helmsley and Rievaulx, Brimham Rock and Harrogate, Bolton Abbey, Cleveland, along the coast from Middlesbrough to Scarborough, Gristhorpe, Speeton, and Scarborough, Whitby, Wensleydale, and Aldborough. The tickets are at exceptionally low rates. Those who have offered hospitality to certain of the excursionists on Saturday, September 3rd, are Mr. George Howard, M.P., of Castle Howard, the Earl of Carlisle's residence, twelve miles from York, and the Local Board of Commissioners, who, at Harrogate, will entertain two hundred guests. On September 8th, Mr. Lowthian Bell, F.R.S., will entertain some excursionists at the Cleveland Ironworks. Admiral Chaloner, C.B., and Mr. J. W. Pease, M.P., will be among those who entertain. The local Philosophical Society and friends will welcome the excursionists to Whitby, and hospitalities will be extended to visitors to Scarborough.

The reception room will be at the Guildhall, a venerable old edifice erected in 1446. The hall, which has windows of stained glass, is divided into a nave and aisles by two rows of octagonal oak pillars; the remarkable thing about the pillars is, that each of them is the stem of an oak tree, all in one piece The great Council of the North held its sittings in the magistrate's room of the Guildhall, and the £200,000 paid to the Scots for assisting the Parliament against Charles I. was given to them in this chamber. The stained glass windows of the hall are modern, and presented chiefly by aldermen. The Guildhall is used for legal and municipal purposes, but the local authorities will give up the use of it during the visit of the British Association.

The presidential address will be delivered in the Yorkshire Fine Art and Industrial Institution, the hall of which is a long and narrowish wooden structure, the strength of the supports of

the galleries of which it is to be hoped have been well tested, bearing in mind the warning and precedent furnished at the Welsh National Eisteddfod once held in a wooden structure at Swansea. In adjoining rooms are some valuable paintings, and doors at one side of the hall open directly upon grounds belonging to the Institution. Sir John Lubbock, the president for this year, is the right man in the right place, a good and entertaining speaker, and a cultured and pleasing representative of the scientific world.

Section G, Mechanical Science, will meet under the presidency of Sir William Armstrong, in the Corn Exchange, a large building, with small attempts at architectural beauty inside and none at all outside. It was built recently. It will accommodate an audience of at least a thousand with ease; and as the average attendance at Section G after the first day may probably not exceed fifty, Section G will be in the position of a very small hermit crab in a very large shell.

The Lord Mayor of York and Mr. Joseph Wilkinson, the Town Clerk, will do their part in promoting the objects of the meeting. Among the clergy, the Dean and Canon Fleming are likely to take leading parts in welcoming the Association. The Archbishop of York will probably not be present. He is said to be not very well just now, and he has been spending the winter in the South of France. For some time past he has been living in retirement.

The first general meeting will be held on Wednesday next at 8 p.m., when Prof. A. C. Ramsay will resign the chair, and Sir John Lubbock will assume the presidency and deliver an address. On Thursday evening, September 1st, at 8 p.m., a *soirée*; on Friday evening September 2nd, at 8.30 p.m., a discourse on the "Rise and Progress of Palæontology," by Prof. Huxley; on Monday evening, September 5th, at 8.30 p.m., a discourse on the "Electric Discharge, its Forms and Functions," by Mr. W. Spottiswoode, President of the Royal Society; on Tuesday evening, September 6, at 8 p.m., a *soirée*; on Wednesday, September 7th, the concluding general meeting will be held at 2.30 p.m.

The following are the chief officers of the York meeting :— President Elect : Sir John Lubbock, Bart, M.P. Vice-presidents Elect : The Archbishop of York, F.R.S.; the Lord Mayor of York; Lord Houghton, M.A.; Archdeacon Creyke, M.A.; Sir W. R. Grove, F.R.S.; Professor G. G. Stokes, M.A., D.C.L.; Sir John Hawkshaw, C.E.; Mr. Allen Thomson, LL.D; and Professor Allman, LL.D. General Treasurer : Professor A. W. Williamson, Ph.D. General Secretaries : Capt. Douglas Galton, C.B.; and Mr. Philip Lutley Sclater, M.A. Acting Secretary, Mr. George Griffith, M.A. Local Secretaries : The Rev. Thomas Adams, M.A.; and Mr. Tempest Anderson, M.D., B.Sc. Local Treasurer: Mr. W. W. Wilberforce.

The officers of the sections are as follows :—

A. Mathematical and Physical Science.—President : Professor Sir William Thompson. Vice-presidents : Professor J. G. Adams, M.A.; T. Archer Hirst, Ph.D. Secretaries : Professor W. E. Ayrton, F.R.S.; Professor Oliver J. Lodge, D.Sc.; Donald McAlister, M.A.; Rev. W. Routh, M.A.

B. Chemical Science.—President : Professor A. W. Williamson, Ph.D. Vice-presidents : F. A. Abel, C.B.; Professor Odling, M.B.; Professor Thorpe, Ph.D. Secretaries : Harold B. Dixon, M.A.; P. Philips-Bedson, D.Sc.; T. Gouch, B.Sc.

C. Geology.—President : Professor Andrew Crombie Ramsay, LL.D. Vice-presidents : Professor Prestwich, M.A.; Professor W. C. Williamson, F.R.S. Secretaries : J. E. Clark, B.A.; W. Keeping, M.A.; W. Topley, F.G.S.; W. Whitaker, B.A.

D. Biology.—Professor Richard Owen, C.B. Vice-presidents : Professor W. H. Flower, LL.D., President Z.S.; Professor J. S. Burdon Sanderson, M.D. Department of Zoology and Botany.—Professor Owen will preside. Secretaries : Rev. W. C. Hey, M.A.; Professor M'Nab, M.D.; Howard Saunders, F.L.S. Department of Anthropology.—Professor W. H. Flower, LL.D., F.R.S., will preside. Secretaries : G. W. Bloxam, M.A.; W. L. Distant; H. E. Spencer. Department of Anatomy and Physiology.—Professor J. S. Burdon Sanderson, M.D., will preside. Secretaries : W. A. Forbes, F.Z.S.; W. North, B.A.; John Priestley.

E. Geography.—President : Sir J. D. Hooker. Vice-presidents : Francis Galton, M.A.; Professor Sir C. Wyville Thomson, LL.D. Secretaries : J. W. Barry; H. W. Bates, F.R.S.; E. C. Rye, Librarian R.G.S.

F. Economic Science and Statistics.—President : The Right Hon. M. E. Grant Duff. Vice-presidents : Sir George Campbell, D.C.L.; James Heywood, F.R.S. Secretaries : Constantine Molloy, W. W. Morrell, J. F. Moss.

G. Mechanical Science.—President : Sir W. G. Armstrong. Vice-presidents : W. H. Barlow, F.R.S.; C. W. Siemens, D.C.L. Secretaries : A. T. Achison, M.A.; J. F. Stephenson, H. Trueman Wood, B.A.

This list of sectional officers will be completed and will be submitted to the General Committee on Wednesday, August 31.

SILICATE COTTON OR SLAG WOOL.

In The Engineer of the 12th March, 1880, we gave the results of some experiments made with a view to test the relative value of this material, which is entirely made from blast furnace slag and other materials as non-conductors of heat and sound. We understand, however, that its application in the raw or loose state has been found to be, in some cases, attended with some difficulties and disadvantages which have somewhat operated against the application which the material might otherwise have had. To overcome some of these difficulties, Mr. Dade, of New Church-street, Bermondsey, has combined a vegetable material with the slag wool in such a way as to produce silicate cotton composition or boards, flat and curved, and rings for covering steam boilers, pipes, and cylinders, to prevent loss of heat by radiation.

The principal objection to the silicate cotton in the loose state is the costly manner in which it has to be applied, viz., by stuffing it under sheet iron or wooden lagging or other materials to keep it in its place, and Messrs. Dade and Co. claim that they have entirely overcome this objection. The silicate cotton composition is very easy of application, and is applied as though it were mortar, but the curious fact is that the composition is not hard throughout, for when set and dry the interior is soft and porous, whilst the composition forms a hard and smooth surface of its own, which can be made easily waterproof by tarring or painting it. It is also extremely light, and is so far tenacious that it will not crack or crumble away through the alternate expansion and contraction of the iron. Owing to the fact that the interior of the boards or layers of the composition when applied wet, dry perfectly porous, the non-conducting properties of the silicate cotton itself are not in the least degree impaired, it is stated, as is the case when silicate cotton is mixed with clay or any other solidifying matter.

The silicate cotton boards are made of the silicate cotton composition rolled out into various sizes and thicknesses. They are supplied either flat or curved to suit the shape or circumference of any boiler. These boards have, of course, the advantage of being easily applied, and as easily removed, and they can be applied to cold surfaces, so that it is not necessary first to get up steam, as is the case with many compositions. The non-conducting rings or tubes are ingenious applications of the material, and we should think that they will gain a good deal of favour, inasmuch as they reduce the labour of application of a non-conductor to steam or water pipes to the minimum. They constitute a complete covering in themselves; they open on one side—lengthwise—and are simply clasped round the pipes and fixed end to end. They are made to overlap each other at one end. We notice that the boiler which drives the machinery and the electric appliances exhibited at the Fine Art and Industrial Exhibition at Cardiff has been covered by Messrs. Dade and Co. with their Silicate Cotton Composition, and that the surface of the covering is cool, though but 1½in. thick.

The silicate cotton is now used in various forms for building and domestic purposes. As "sheeting" it is used as fire and sound proof, and for lining walls, partitions, fire-proof rooms, cooking stoves, and refrigerators.

WIND PRESSURE ON RAILWAY STRUCTURES.

The following is the report of the committee appointed to consider the question of wind pressure on railway structures :—

To the Right Honourable the President of the Board of Trade.

London, May 20th, 1881.

Sir,—In compliance with the instructions from the Board of Trade—a copy of which is given in the appendix—to consider the question of wind pressure on railway structures, and to report to them on the subject, we have made such inquiries and procured such information on the subject referred to us as we deemed necessary, and have now the honour to report the conclusions at which we have arrived.

It was necessary in the first instance to ascertain as accurately as possible from the sources which were accessible to us what the highest pressures of the wind in this country amount to. With this object we obtained from those observatories and stations where the pressure or velocity of the wind is measured, the statements which we give in the appendix. In order to exhibit the action of the wind during heavy storms, we have also appended lithographed copies of wind diagrams taken by means of self-registering apparatus at Bidston, Glasgow, and Greenwich.

At some of the stations from which we have obtained returns the wind pressures are measured directly by Osler's self-registering pressure anemometers, at others the velocity only of the wind is measured by Robinson's rotating anemometers, the velocity of the wind being taken at three times the velocity of the revolving cups.

For some stations the only published information is the run in miles of the wind during each hour. There can obviously be no more than a general accordance between this and the greatest pressure experienced during the hour. To utilise for our purpose observations taken at stations where the velocity only of the wind is recorded, the records of the Bidston Observatory, where both elements are recorded, have been employed as furnishing a means of connection between the two. In the case of high winds, with which alone we have to deal, it was found that the greatest pressure recorded in an hour was tolerably well proportional to the square of the mean velocity during the hour, and that the empirical formula $\frac{V^2}{100} = P$, where V = maximum run in miles of the wind in any one hour and P = maximum pressure in pounds on the square foot at any time during the storm to which V refers, represented very fairly the greatest pressure as deduced from the mean velocity for an hour. We have accordingly given in the appendix a table calculated from the above formula for deducing maximum pressures from observed velocities.

In addition to the tables obtained from English, Irish, and Scottish stations, which are those only that are strictly applicable to our inquiry, we give as matter of information a summary of strong winds registered at stations on the Continent and in India.

It will be seen on reference to the tables that the wind pressures vary greatly at different stations. This, no doubt, mainly arises from difference of exposure of the stations to the action of the wind in consequence of the geographical and local circumstances of their position, but may in some cases be partly caused by differences in the instruments used for measurement. Thus at Glasgow the highest recorded pressure per square foot is 47 lb., while at Bidston, near Liverpool, the indicated pressure on one occasion amounted to 90 lb., and on another occasion to 80 lb. But the pressures at Bidston seem very abnormal, being much beyond what have been noticed at any of the other stations. The conformation of the ground on which the Bidston Observatory stands is such that the velocity of the wind there might be greatly intensified.

It will be noticed in the lithographs that the records of exceptionally high pressures indicate a very brief duration. From inquiries we have made, we are satisfied that these records are not referable to instrumental error, depending on the recording instrument being carried by its momentum beyond the position of equilibrium under the wind pressure acting at the moment, but represent a real phenomenon. But whether the exceptionally high velocities to which such pressures are due extend over a considerable space in a lateral direction, or on the other hand are extremely local, is a point on which we have not been able to find experimental evidence.

The differences of the wind pressures observed at different stations led us to consider whether there were any other modes of approximately ascertaining the force of the wind for our purpose. There are many buildings, tall chimneys, shipbuilding sheds, &c., which probably would not withstand pressures so extreme as those we refer to; but in most cases the contour of the adjoining ground, and the obstruction to wind by adjoining buildings, trees, and other surrounding objects, would render conclusions drawn from such cases unreliable. It occurred, however, to us that some useful information might be drawn from another source, viz., from railways themselves.

It is obvious that on existing railways that have been long in use, a series of experiments, if we may apply such an expression to them, have for many years been carried on, for over them trains have been running at all times of the day and night on high and unsheltered embankments and along other spaces exposed in many cases to very strong winds. Now, a wind pressure varying from 30 lb. to 40 lb. per square foot, is sufficient to overturn the ordinary railway carriages that have been in use during the last twenty-five or thirty years, and we thought it useful to inquire from the different railway companies for cases where railway carriages have been overturned by the force of the wind. The only cases of this kind that have been brought to our knowledge are appended to this report. From the information thus acquired, from the inquiries we have made, and from the consideration we have given to the subject, we are of opinion that the following rules will sufficiently meet the cases referred to us :—

(1) That for railway bridges and viaducts a maximum wind pressure of 56 lb. per square foot should be assumed for the purpose of calculation.

(2) That where the bridge or viaduct is formed of close girders, and the tops of such girders are as high or higher than the top of a train passing over the bridge, the total wind pressure upon such bridge or viaduct should be ascertained by applying the full pressure of 56 lb. per square foot to the entire vertical surface of one main girder only. But if the top of a train passing over the bridge is higher than the tops of the main girders, the total wind pressure upon such bridge or viaduct should be ascertained by applying the full pressure of 56 lb. per square foot to the entire vertical surface from the bottom of the main girders to the top of the train passing over the bridge.

(3) That where the bridge or viaduct is of the lattice form or of open construction, the wind pressure upon the outer or windward girder should be ascertained by applying the full pressure of 56 lb. per square foot, as if the girder were a close girder, from the level of the rails to the top of a train passing over such bridge or viaduct, and by applying in addition the full pressure of 56 lb. per square foot to the ascertained vertical area of surface of the ironwork of the same girder situated below the level of the rails or above the top of a train passing over such bridge or viaduct. The wind pressure upon the inner or leeward girder or girders should be ascertained by applying a pressure per square foot to the ascertained vertical area of surface of the ironwork of one girder only situated below the level of the rails or above the top of a train passing over the said bridge or viaduct, according to the following scale, viz. :—
   (*a*) If the surface area of the open spaces does not exceed two-thirds of the whole area included within the outline of the girder, the pressure should be taken at 28 lb. per square foot.
   (*b*) If the surface area of the open spaces lie between two-thirds and three-fourths of the whole area included within the outline of the girder, the pressure should be taken at 42 lb. per square foot.
   (*c*) If the surface area of the open spaces be greater than three-fourths of the whole area included within the outline of the girder, the pressure should be taken at the full pressure of 56 lb. per square foot.

(4) That the pressure upon arches and the piers of bridges and viaducts should be ascertained as nearly as possible in conformity with the rules above stated.

(5) That in order to ensure a proper margin of safety for bridges and viaducts in respect of the strains caused by wind pressure, they should be made of sufficient strength to withstand a strain of four times the amount due to the pressure calculated by the foregoing rules. And that, for cases where the tendency of the wind to overturn structures is counteracted by gravity alone, a factor of safety of 2 will be sufficient.

With regard to the eighth paragraph of the report of the Select Committee on the North British Railway (Tay Bridge) Bill, to which you have drawn our attention, we beg to observe that where trains run between girders they will generally be sufficiently protected from the wind, the degree of protection afforded by the girders depending upon the extent to which the girders are open or close; where the girders are so open as to afford insufficient protection, or where trains run, as in some cases they may do, on the tops of girders, we assume that the engineer will provide a sufficient parapet, but we are indisposed to go further into detail on this subject, as it might tend to stereotype modes of construction which we think is undesirable.

In conclusion we beg to point out that the velocity of wind, like that of every other moving body, is more or less retarded by friction, and will be affected therefore by the character of the surfaces over which it has to pass, which may be rough, smooth, or irregular. It will follow, therefore, that other things being the same, greater velocities will be attained at higher altitudes than at low ones, the wind at higher altitudes being further removed from retardation by friction.

Though we are of opinion that no bridge or viaduct is likely to be built in such a situation as to expose it to wind pressures equal to those which have been occasionally indicated by the disc on the Bidston Observatory, yet even if that were possible, a bridge or viaduct constructed according to the rules we have given would not be subjected to strains nearly equal to its theoretical strength.

On the other hand, there will be many structures of small altitude or in sheltered situations which never can be exposed to the wind pressure we have assumed, and where the application of the rules we have given would require modification.

Some modification of the rules may also be required in the case of suspension or other bridges of very large span, but such cases will be of rare occurrence, and we recommend that they should be specially considered when they arise.

We have the honour to be,

Sir,

Your most obedient servants,

John Hawkshaw,
W. G. Armstrong,
W. H. Barlow,
G. G. Stokes,
W. Yolland.

We, the undersigned, concur in the above report so far as it goes, but we think the following clause should be added, viz. :—

The evidence before us does not enable us to judge as to the lateral extent of the extremely high pressures occasionally recorded by anemometers, and we think it desirable that experiments should be made to determine this question. If the lateral extent of exceptionally heavy gusts should prove to be very small, it would become a question whether some relaxation might not be permitted in the requirements of this report.

W. G. Armstrong,
G. G. Stokes.

The following is the table above referred to as given in the appendix.

Wind Velocities and Pressures.

Maximum hourly run of the wind in miles.	Maximum pressure in lb. on the sq. foot.	Maximum hourly run of the wind in miles.	Maximum pressure in lb. on the sq. foot.
40	16·0	71	50·4
41	16·8	72	51·8
42	17·6	73	53·3
43	18·5	74	54·8
44	19·4	75	56·2
45	20·2	76	57·8
46	21·2	77	59·3
47	22·1	78	60·8
48	23·0	79	62·4
49	24·0	80	64·0
50	25·0	81	65·6
51	26·0	82	67·2
52	27·0	83	68·9
53	28·1	84	70·6
54	29·2	85	72·2
55	30·2	86	74·0
56	31·4	87	75·7
57	32·5	88	77·4
58	33·6	89	79·2
59	34·8	90	81·0
60	36·0	91	82·8
61	37·2	92	84·6
62	38·4	93	86·5
63	39·7	94	88·4
64	41·0	95	90·3
65	42·2	96	92·2
66	43·6	97	94·1
67	44·9	98	96·0
68	46·2	99	98·0
69	47·6	100	100·0
70	49·0		

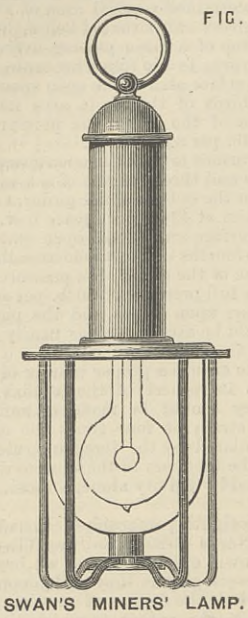
Naval Engineer Appointments.—The following appointments have been made at the Admiralty :—Edward Price, engineer, to the Malabar, vice Parsons; James Armstrong, assistant engineer, to the Malabar, Vice Barnes; W. J. Anstey, E. J. Taylor, G. W. Hudson, C. A. Harding, G. W. Fowler, P. Marrack, W. T. Hocken, W. H. Pippett, J. H. Beattie, F. J. Flood, J. A. Murray, and J. W. Fleming, acting assistant engineers, to the Asia, additional, for torpedo instruction.

THE PARIS ELECTRICAL EXHIBITION.

No. II.

Forty years ago M. Moleyns designed an electric lamp which contained the germ of the present race of incandescent lamps. It was the first incandescent lamp, and consisted of a spiral of platinum enclosed in a globe, the spiral being rendered incandescent by the passage of the electric current. In 1845 Mr. Starr improved upon the design of M. Moleyns, and designed an incandescent lamp, the heated material of which was in a vacuum. For thirty odd years the lamps on this system were looked

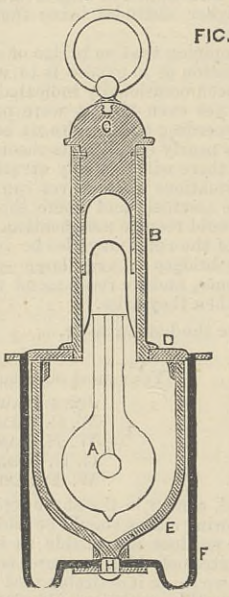
FIG. ?.



SWAN'S MINERS' LAMP.

upon as incapable of producing light economically; indeed, it has not been till within the last two or three years that improvement has been sufficiently pronounced to bring the incandescent light within the domain of practical requirements. Mr. Swan, Mr. Edison, Mr. Maxim, Mr. Lane-Fox, and others have, however, given us lamps which not only rival gas in cheapness, but possess many advantages which commercially give them a good start in a competition. The lamps of these various inventors are very similar to each other. They all use a carbonised vegetable

FIG. 2



SWAN'S MINERS' LAMP.

fibre placed in an exhausted globe. The carbon may in one case be prepared cotton, in another prepared bamboo, and so on, the principle being the same. The differences are differences of detail, such as the exact form of globe, the method of introducing the carbon, the contacts, &c. The later lamps differ from the forms of the earlier experimenters in the size of the material to be rendered incandescent; formerly it was comparatively large, now it is as fine as possible. The latest modification of these incandescent lamps is in the form of miners' lamps shown by Mr. Swan, Mr. Crompton, and Mr. Edison. We recently alluded to experiments made under the auspices of the Mines' Accidents Commissioners at Pleasley; and still more recently to the installation of the electric light in the Earnoch Colliery, near Glasgow. It seems that when Mr. Swan described his lamp last winter before the Society of Telegraph Engineers, Prof. Tyndall remarked that it might possibly be adapted to mining purposes. This remark led Mr. Swan to design a lamp for such work, which, with a few modifications introduced by Mr. R. E. Crompton, was tried with success at Pleasley. This lamp is shown in Figs. 1 and 2. A is the Swan lamp enclosed in a thick protecting glass globe E. This globe is supported by a brass collar D, which is connected to the brass tube B, into which is fitted the wooden cap C. The part of the lamp liable to be broken is surrounded by guard wires F. The modifications introduced by Mr. Jamieson will be seen by comparing Fig. 3 with the above. Here the—S L—Swan lamp is covered with wire gauze, enclosed in a strong glass globe G G, with guard wires W W. An insulating handle I H made of wood contains the stalk of the lamp, and has side contact pieces S C, S C, which are soldered to the conductors of the leading wires L L. In connection with the lamp, Mr. Jamieson has devised several forms of contact to prevent dangerous sparks when the circuit is completed. These contacts will easily be understood from the Figures. Thus Fig. 4 shows one form of gravity contact, the conductor C in the covered cable L L being electrically connected when required by the mercury drop, or metal ball, B. Fig. 5 shows a double screw action, the platinum tipped screw making contact at C in the cable L L. Mr. Edison's miner's lamp consists of his incandescent lamp placed wholly in a containing vessel of water. It is too early to express an opinion upon the merits of these lamps, but the direction in which these gentlemen are working is one that is intensely interesting to nations like England whose wealth so largely consists of minerals, and success will meet with a hearty welcome.

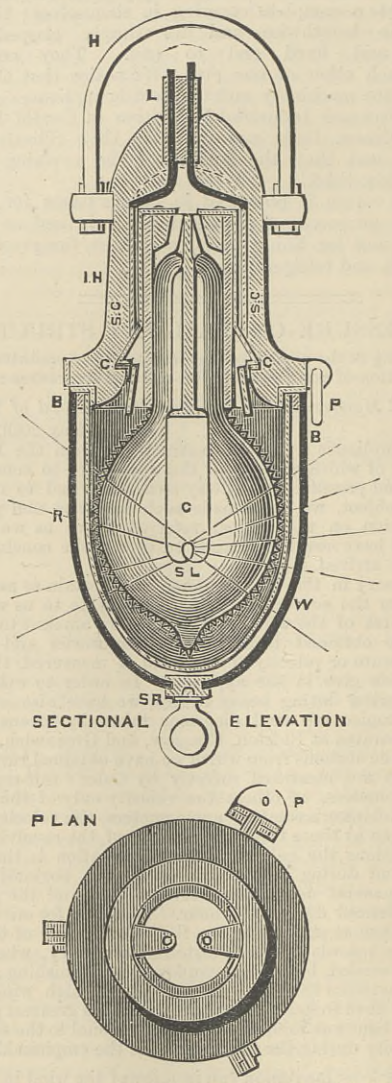
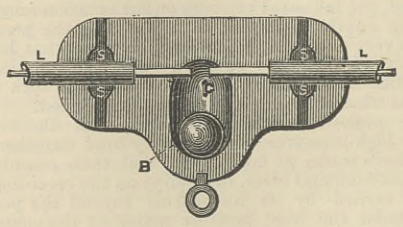


FIG. 3.—JAMIESON'S MINERS' LAMP.

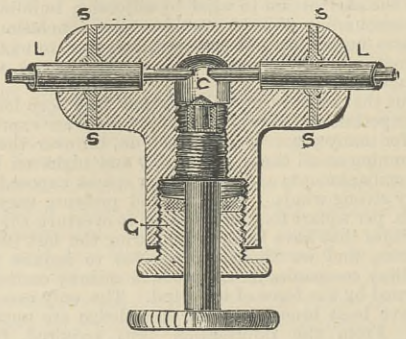
Messrs. L. Clark, Muirhead, and Co. show an instrument designed by Mr. E. H. T. Liveing for the detection and measurement of inflammable gas in the atmosphere of mines. The instruments hitherto designed for this purpose are either such as (1) depend for action on the physical properties of the gaseous mixture, or (2) upon its chemical properties. Under the former are the instruments of Mr. Ansell and Professor Forbes, under the latter those of M. Coquillion, Dr. Angus Smith, and Mr. Liveing. The principle of the apparatus under considera-

FIG. 4.

GRAVITY CONTACT



tion is based upon the following facts: A mixture of marsh-gas—fire-damp—and air in which marsh-gas forms less than 5 per cent. by volume, is not ordinarily explosive, or capable of continuing its own combustion at ordinary temperatures and pressures, because the heating value of marsh gas is insufficient to raise the large excess of atmospheric air to the necessary ignition temperature. If, however, such a mixture is exposed to some sufficiently



SECTION

FIG. 5.—SCREW CONTACT.

heated object, especially if that object be platinum, it will burn in its immediate contact and neighbourhood, and in so doing add materially to the temperature of the object, and the more so the larger the percentage of gas present. The apparatus consists of a narrow wooden box A B, Fig. 6, about 8in. in length, the lid of which is provided with a narrow glass window C, and also with two short entrance tubes D and E. At each end of this box is arranged a fine spiral of platinum wire F and G; through these a current from a small magneto-electric machine is made to circulate, both wires being in the same circuit, and offering equal resistances to the current, and having equal radiating surfaces, become equally heated on turning the handle of the machine. One of these spirals is enclosed in a small tube, having a glass end and containing pure air; the other is exposed in a small cylinder of wire gauze with glass end, to whatever gaseous mixture enters the instrument for examination. So long as the atmosphere examined is free from combustible gas, both spirals glow alike, but if the air entering the gauze cylinder contains above $\frac{1}{400}$ of its volume of marsh gas, the exposed spiral increases in brilliancy, the brilliancy increasing as the amount of marsh gas increases. This difference of brilliancy is the test used. To measure

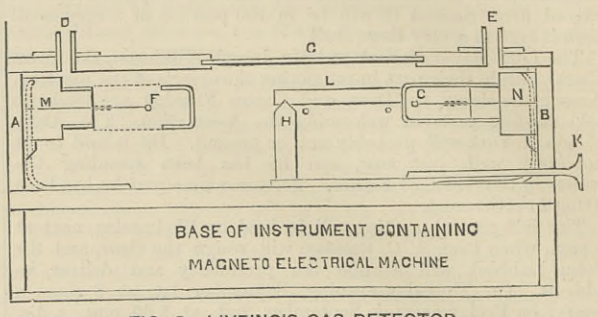


FIG. 6.—LIVEING'S GAS DETECTOR.

it, a simple photometer is provided, consisting of a wedge-shaped screen H, the two opposite surfaces of which are illumined by the glowing platinum spirals. The observer looks through the window C. The screen is movable by means of the rod K, and the amount of motion is shown on the scale L. The screen is moved towards the spiral acting as the unit that is surrounded by air, till the illumination on each side is equal. According to a table prepared by the inventor, with a percentage of marsh gas —C H_4—of 3 and 4, the relative illuminating power of the spirals is respectively 1 : 22 and 1 : 64, that is, before the explosive point is reached the testing spiral renders the screen from 60 to 70 times as brilliant as the unit spiral.

TENDERS.

WAVERTREE TRAMWAYS.

Tenders for supplying and laying with steel rails and cast iron sleepers, on Mackison's patent, about $1\frac{3}{4}$ mile of single line of tramway, and paving the entire width of the road in which the tramways are to be laid. Mr. C. H. Beloe, M.I.C.E., engineer.

	£	s.	d.
Messrs. Holme and King, Liverpool—accepted ..	10,606	12	10
Messrs. Fawkes Bros., Great Crosby	11,378	10	8
Mr. Joseph Speight, Southport	11,450	0	0
Messrs. Jones and Fitzmaurice, Birmingham.. ..	11,500	0	0
Messrs. G. Smith and Co., Southport	11,620	0	0
Messrs. W. B. Dick and Co., London	11,636	0	0
Mr. Peter Smith, Manchester	11,791	19	$3\frac{1}{2}$
Mr. J. Rendell, London	11,942	0	0
Mr. James Nuttall, Manchester	12,552	11	2
Mr. W. H. Worthington, Manchester	13,000	0	0
Mr. J. Heaps, Birkenhead	13,037	3	5
Messrs. Maccabe and Cornish, Liverpool	13,680	0	0
Messrs. Ridley and Co., Newcastle-upon-Tyne ..	14,108	16	9
Mr. B. Barker, Manchester	14,400	0	0
Mr. D. Speight, Leeds	16,500	0	0

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

(*From our own Correspondent.*)

The demand for Staffordshire finished iron is maintained. Numerous good foreign and colonial orders are about, and they are steadily being placed. Marked bars keep in request, and they are realising full rates. The Round Oak brand secures £7 12s. 6d., the New British Iron Company's bars, and those also of Messrs. John Bradley and Co., fetch £7 10s.; but there is a larger proportionate sale of the B.B.H. brand at £7. Some other makers of acknowledged repute taper down to £6 10s., but £6 will secure a less valuable bar only than could have been bought at that figure a month ago. The makers of bars who quoted down to £5 12s. 6d. at the earlier date mentioned now require £5 15s. and £5 17s. 6d.

Hoops and strips of the sort which will bear stamping, and that are used by the coopers and the hardware manufacturers respectively, were not to be bought to-day—Thursday—in Birmingham or yesterday in Wolverhampton at under £6 10s. to £6 12s. 6d., and there were makers who asked £6 15s.; while the "marked" houses quoted £8. The makers reported themselves full of work at prices up to £6 10s.; but the demand is for the moment only quiet. Yet more was done to-day than yesterday.

The heavy rain of Tuesday, following upon the showers of the previous fortnight, checked business very appreciably on 'Change in Wolverhampton. Disinclined to give way yesterday, the sheet makers were to-day even firmer in their demands for full terms. Nearly every sheet mill in the district is running full time, and the iron is mostly fetched away by the galvanised corrugated roofing firms, who continue in the receipt of new orders from the Cape, the Australias, India, the West Indies, and South America; and though prices at the Antipodes are down upon the recent maximum from 7s. 6d. to 12s. 6d., the sales there keep large. A perceptible increase is noticeable in the Cape and the Indian consumption.

The wire mills of Shropshire report themselves busy upon fencing sorts, but competition has brought down prices in Sydney some 12s. 6d. per ton. Home prices remain without change.

Girder plates, with T and angle iron, are going off at unaltered prices; and good boiler plates are less neglected at from £9 10s. down to £8 10s.

Pigs uphold last week's rates. Cinder qualities may be got down to as low as £1 17s. 6d.; part mine were yesterday quoted £2 5s., and for all-mine £3 up to £3 5s. was required for hot-blast sorts. Cold blast was plentiful at £4. The number of furnaces alight is now forty-one, and the make is going into consumption.

Coal is fairly strong in price, and steady in sale.

There is much room to fear that the sinkings at the Cannock and Huntington Colliery, which were being carried on by the Chaudron process, will have to be abandoned. All the £100,000 capital has been expended, and it is found that the tubbing originally arranged for is insufficient to keep out the water. The directors have issued a report, in which they express fear that it will be difficult to raise the required additional capital, and they state that it will be for the shareholders, at a meeting which has been convened, to determine upon the course now to be pursued.

Since my last letter there has been a dissolution of the Darlaston Miners' Association. But as wages have for some time past been stationary, and seem likely to remain so for some time to come, there has lately been no need for its existence. The district lodges still remain, but they are poorly supported, and are likely soon to die out. In any case of emergency, however, there would be no difficulty in re-constructing the association.

The negotiations reported last week as going on between employers and employed in the nut and bolt trade have now ceased; a fresh scale of wages for the ensuing year has been framed; and men in the Darlaston and Smethwick districts have given notice that on and after the 1st of September they will expect to be paid in accordance with its provisions.

NOTES FROM LANCASHIRE

(From our own Correspondent.)

Manchester.—In the iron trade of this district the market continues steady, so far as prices are concerned, but there has been rather a quieter tone in business. There is still almost a complete suspension of any important buying in pig iron, and although the few small transactions, to which the business now doing is confined are on the basis of old prices, the market can scarcely be said to be quite as firm as it has been. Buyers who would come into the market for anything like quantities appear to be holding back in anticipation of some downward movement in values; here and there offers are coming forward at under current rates, and although I do not hear as yet of makers accepting lower offers to any extent, there is apparently a disposition on the part of sellers, at any rate, to negotiate for good orders.

Lancashire makers of pig are still quoting, for delivery into the Manchester district, 44s. for No. 4 forge, and 45s. for No. 3 foundry, less 2½ per cent.; but at these figures they are only selling a few very small lots, and I hear that in some cases they are now being undersold by outside brands.

There is also extremely little doing in other district brands. Lincolnshire iron, which is still about the only outside brand which at present meets this market, is quoted at 44s. to 45s. per ton, less 2½ for delivery equal to Manchester, but I believe there are now sellers at slightly below these figures.

A good business is reported in hematites, and foundry qualities delivered equal to Manchester are quoted at from 65s. to 67s. 6d. per ton.

There has been rather a slackening off in the inquiries for finished iron. Many of the large buyers appear to have pretty well covered themselves for the present, and the shipping season, so far as the Russian ports, with which a large business in sheets has been done, are concerned, is now well advanced. There is, however, still a good business being done, and as most of the makers have already quite as much work in hand as they can get through at present, they are very firm in their prices, which in some cases are fully 5s. per ton above what would have been taken a few weeks back. For delivery into the Manchester district quotations remain at £6 to £6 2s. 6d. for bars, about £6 12s. 6d. for hoops, and £7 15s. up to £8 per ton for ordinary merchant sheets, with doubles ranging from £8 17s. 6d. to £9 per ton.

Although the new orders which are coming into the hands of engineers have still to be competed for at very low figures, which employers, as a rule, complain leave little or no margin for profit, there would certainly appear, judging from the last reports sent in to the Amalgamated Society of Engineers from the principal manufacturing centres of Lancashire, to be rather more work stirring throughout the district. Although it is exceptional where trade is reported "good," the general tenour of the reports is more satisfactory. In the Manchester and Salford districts trade is reported as improving, and there is again a small reduction in the number of men out of employment. In Liverpool and Barrow-in-Furness trade is reported as good; in Bury, Patricroft, and Rochdale as improving; in Bolton, Blackburn, Accrington, Oldham, Birkenhead, Chorley, and Preston as moderate; in Ashton-under-Lyme as bad; and at Wigan as bad and working short time.

The agitation for an advance of wages, or rather for a restoration of the 2s. per week taken off in 1878, amongst the engineers and steam engine makers in the Manchester and Salford district, to which I referred last week, was under consideration at a special meeting of the Iron Trades Employers' Association, held at the Manchester offices on Tuesday. As I anticipated the employers most decidedly held the view that there has been no sufficient improvement in trade to warrant any present advance in prices, and it was unanimously decided that the request of the men could not be complied with. It is not anticipated that this decision on the part of the employers will lead to any further action in the matter on the part of the men.

The Ince Hall Rolling Mills, Wigan, were, pursuant to an order made by the Master of the Rolls, in connection with the winding up of the company by whom they were owned, offered for sale by auction, at the Mitre Hotel, Manchester, on Tuesday. The Ince Rolling Mills have been erected since 1871, and at the present time are capable of producing 300 tons of puddled bars and 270 tons of finished bars and hoops per week, and are in full working order. They were offered as a going concern, but although there was a fair attendance at the sale, the only bid was a nominal offer of £9000, and the property was withdrawn.

Although it is not a matter which directly concerns this district, I may mention that a well-known Leeds firm have just commenced working upon a large order for the complete equipment of a small-arms arsenal for the Italian Government, and which will be supplied with all the latest improvements for this special branch of manufacture.

The proposal for completely bridging over a portion of the river Irwell, near the new Salford station of the London and North-Western Railway, to which I referred the other week, is for the present in abeyance.

The coal trade remains in much the same position as last week, with what little change there is to notice tending in the direction of a slight improvement. House pit coals are beginning to move off rather better, and other classes of fuel for iron-making and manufacturing purposes are also meeting with a somewhat increased demand. The consumption, however, is still a long way short of overtaking the present means of production, and as a consequence prices continue very low, with colliery proprietors in some cases willing to sell forward at present rates. There is, however, a strong determination generally not to give way further in prices, and except where stocks have to be forced on the market, quotations are generally being maintained at late rates. The average prices at the pit mouth are about as under:—Best coals, 8s. to 8s. 6d.; seconds, 6s. to 7s.; common coal, 4s. 9d. to 5s. 3d.; good burgy, 4s. 3d. to 4s. 6d.; and good slack, 3s. 6d. to 4s. per ton.

Shipping is only moderate, with steam coal delivered at Liverpool and Garston averaging about 6s. 6d. to 7s. per ton.

Although the colliers in the Manchester district have submitted quietly to the recent reduction in wages, there is a very uneasy feeling as to the course of action the miners generally throughout Lancashire may take during the ensuing winter. In view of any possible renewal of the struggle between the masters and the men, it may be interesting to call attention to the serious loss which the last strike entailed upon the railway companies, and which, of course, is only one item of the enormous cost of that struggle. Two meetings of railway companies have been held during the week at which the matter has been referred to, Mr. Moon, the chairman of the London and North-Western, estimating the loss to the company as the result of the strike at no less than £100,000, whilst Mr. Baines, the chairman of the Lancashire and Yorkshire, puts down the loss to that company from the same cause as something like £4000, whilst, in addition, they had incurred an increased cost in carrying coals during the strike from a greater distance than that from which they had usually been supplied.

Barrow.—I am glad to be able to report that there is a better tone noticeable in the hematite pig iron trade, and that a fair business is being transacted in all qualities of metal. With a good inquiry from all quarters, users are purchasing with greater freedom at the improved rate of prices than they showed when iron could be bought at 2s. or 3s. per ton cheaper, as I reported was the case a month or two ago. Pig iron I note is now selling at about 60s. per ton for Nos. 1, 2, and 3 Bessemer, and 57s. for No. 3 forge at works. Some makers are declining to sell the former quality of metal at less than 60s. per ton, but this position is more especially noticeable where makers are well sold forward, and where they have already made themselves responsible for the delivery of heavy parcels of iron and steel. I am authoritatively told that the inquiry from America is fairly maintained; and on continental account the business doing is on the whole satisfactory. The Colonies are also buying, but not in such large quantities. Stocks of iron large, but I expect before the end of October there will be a large decrease. There are evidences now of increased activity in the exportation of metal from local ports. The mills in connection with the steel trade are running night and day. Makers, I hear, are heavily sold forward, and the exports to foreign users are already considerable. This, it is expected, will continue during the whole of the year. Blooms are to be shipped in large quantities to America. The iron ore trade still continues steady, though quiet; and in the coal trade there is no change, the demand all round being steady. The shipbuilding trade is exceedingly brisk. Shipping fairly employed.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

In the iron trade there is more firmness manifested, full standard prices having lately been demanded, and makers refusing to book forward orders of any consequence at present prices. These signs of revival in the iron trade tell favourably on the demand for steam fuel, which has been depressed for a very long time. Now there is more doing in steam fuel than in household sorts, though, if the present damp and unfavourable weather should continue, the coalowners will soon impose winter rates.

Engineering houses are fairly well employed, though the limited companies in that line do not report very favourably as to the profitable nature of the work in hand. In rails there is a cessation in the American demand, no heavy orders having been booked from the States since those reported a few weeks ago. Other sorts of railway material, such as tires, axles, and springs, are in request, the wagon builders having been well employed all the season.

In the armour-plate mills there is full time worked, and every prospect of abundant employment for this year at least. The Sheffield firms appear to have made a success of their new departure in armour-plates. Up to this time, compound armour has been made, or is being manufactured for, in addition to our own Government, the Argentine Republic, Brazil, Peru, France, and China.

In the rolling mills rods are being largely turned out. Crucible steel is briskly called for on foreign account, and Bessemer, in spite of the recent advance of 5s. to 8s. a ton, is ordered very freely. Very little is doing in the saw and file trades generally, though even in that department there is much more doing than during June. The best class of goods seem mainly to be called for. The edge tool trade is in a rather better state, but there is still much room for improvement.

Sheep shear makers report a prosperous state of things. Very rarely have the South American, Australian, and other distant markets yielded such large orders. Heavy consignments are continuously being forwarded. In spite of the termination of the war at the Cape, there is no great business in that quarter, such as was expected to follow the advent of peace.

The leading cutlery houses are well employed on orders for the best qualities of goods. America is a very large customer for the finest makes of table cutlery, and the standard houses who maintain quality as well as price, have that trade very much in their own hands. Medium qualities are not so freely ordered, and there is positive languor in the markets where inferior goods are mainly sold.

A change for the worse has come over the scissor branches. Complaints are common of the keen competition of German firms, who produce scissors at prices with which our local manufacturers cannot contend. A few of the local factors keep the German scissors in stock to be supplied when cheap scissors are inquired after. Though there is not a little of second-rate manufacture put upon the market, the German made scissors are not all inferior. In tailors' and similar sorts they produce a very fair article at a marvellously low price.

After eight years' fighting against the water, the proprietors of the Magpie Lead Mine in Derbyshire have at last "unwatered" their mine to a depth of 95 fathoms. A tunnel has been carried at great expense and time through 2000 yards of solid rock, and profitable working is now anticipated.

The Swinton Ironworks (Messrs. John Brown and Co., Atlas works, Sheffield) were re-opened on Wednesday, after having been closed for several years. Their recommencement is a proof that the firm experience a distinct improvement in the iron trade.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

There was a much better attendance at the Middlesbrough iron market on Tuesday, and, compared with last week, more business was done. Prices, however, showed no improvement, so far as pig iron was concerned. Makers still endeavoured to obtain 37s. for No. 3, but buyers would not give this price, and consequently, whatever business was done, was done by merchants at about 36s. 9d. It is evident that makers have formed themselves into something like a ring or combination to resist the fall which would otherwise take place. Unless they alter their policy a stiff battle may be expected between them and the merchants to determine which party can do the longest without the other. In all probability the announcement of the state of stocks for the end of August, which will be made in about ten days' time, will settle the matter. The accumulation is expected to be very great, as both the shipments and local consumption have fallen off considerably, whilst the production has remained practically the same. Warrants are now freely offered at 37s. 9d. f.o.b., and forge iron at 35s. 9d. The stock in Connal's Middlesbrough store is 186,268 tons, being an increase of 568 tons during the week. At Glasgow they hold 566,416 tons, and the quantity is increasing at the rate of about 1800 tons per week. Ironfounders continue to complain of slack work, low prices, and no profit. In the finished iron trade there is a slight change for the better. That is due to the rather increased demand from America, and to the diminished local consumption, owing to the closing of several works on account of Stockton races. Plates of shipbuilding quality now command £6 per ton; bars and angles are £5 12s. 6d.—all subject to 2½ per cent. discount for cash. Mr. C. E. Müller's Erimus Works are still incomplete. Active preparations are, however, going on, and it is expected they will be in full operation shortly.

The directors of Palmer's Shipbuilding and Iron Company, Limited, have decided to declare a dividend of 3½ per cent. for the half-year, making, with the 2½ per cent. already divided, 6 per cent. for the year. This is considered very satisfactory in the present state of trade.

It must be a source of satisfaction to all connected with the northern iron trade that so well known and efficient a captain of industry as Mr. James Laing, of Sunderland, is likely to be returned for the northern division of the county of Durham, in the place of the late Mr. Joicey. Mr. Laing was brought up as a wood shipbuilder and glass manufacturer, and was the first to commence a yard for iron ships on the Wear. This occurred about twenty-five years since. He is now the largest shipbuilder and one of the largest shipowners in Sunderland. He is chairman of the River Wear Commissioners, also of the Wear Rolling Mills Company, recently started, and fills several other important public offices. The more the House of Commons is composed of such men, the more likely are the interests of trade and commerce to receive the attention which ought to be given to them.

Arrangements are being made for those members of the British Association who so desire to visit Middlesbrough on the 8th prox. An excursion train will leave York early in the day, and the visitors will be shown the Eston Steel Works, the new boring for salt at Port Clarence, and various other places and objects of interest.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

The Scotch iron trade is in a good position so far as the manufactured departments are concerned. At the malleable works steady employment is being obtained, although new orders do not come forward so well as could be desired. Owing to the continued activity in the shipbuilding trade, the marine engineering and ironfounding trades are busy; and general engineers and makers of machinery are also fairly well supplied with work. Good contracts are likewise held by the steel manufacturers, and by locomotive engineers. The pig iron trade, however, continues to lack life and vigour, on account of the large production and heavy stocks. The latter still increase day by day, although they will probably not do so to the same extent during the next few weeks, as the number of furnaces in blast has been reduced from 120 to 111. This reduction is not the result of any arrangement to limit production, but has arisen by the damping out of eight furnaces at Gartsherrie, and one at Eglinton by Messrs. William Baird and Co., who are said to be about to introduce an improvement in the manufacture of pig iron which will very materially reduce the cost of the operations. The demand for makers' shipping iron is limited, and in the course of the past week makers are reported to have shown rather more anxiety to sell. Cleveland pig iron is in steady request for use in our ironworks. The demand for Scotch pig iron from abroad is quiet, and as the season is now getting well advanced, it is doubtful whether any considerable improvement will now be experienced. For hematite the demand is very good, there being a fair business at home and also in shipments to America, so that quotations are firmer.

Business was done in the warrant market on Friday forenoon at from 46s. 1d. to 46s. 2d. cash, and 46s. 3d. one month, the afternoon quotations being 46s. 2½d. to 46s. 2d. cash and 46s. 3½d. to 46s. 3d. one month. On Monday the market was firm at 46s. 1½d. to 46s. 3d. cash and 46s. 4½d. one month. On Tuesday the market was quiet at 46s. 2½d. to 46s. 3½d. On Wednesday the pig iron market was inactive; limited business at 46s. 2½d. and 46s. 3d. cash. The close was nominal. To-day—Thursday—there was no market owing to the Royal Volunteer Review at Edinburgh. The market will be closed until Monday.

Although makers' prices have been rather easier there is not much change in the actual quotations. They are as follows:—Gartsherrie, f.o.b. at Glasgow, No. 1, 54s. 6d.; No. 3, 48s. 6d.; Coltness, No. 1, 56s.; No. 3, 48s. 6d.; Langloan, No. 1, 56s.; No. 3, 49s.; Summerlee, No. 1, 54s. 6d.; No. 3, 46s. 6d.; Calder, No. 1, 54s. 6d.; No. 3, 48s. 6d.; Carnbroe, No. 1, 51s.; No. 3, 46s. 6d.; Clyde, No. 1, 50s.; No. 3, 46s.; Monkland, No. 1, 47s.; No. 3, 44s. 6d.; Quarter, No. 1, 47s.; No. 3, 44s. 6d.; Govan, at Broomielaw, No. 1, 47s.; No. 3, 44s. 6d.; Shotts, at Leith, No. 1, 56s.; No. 3, 49s.; Carron, at Grangemouth, No. 1, 52s. 6d.; ditto, specially selected, 56s.; No. 3, 51s. 6d.; Kinneil, at Bo'ness, No. 1, 47s. 6d.; No. 3, 45s. 6d.; Glengarnock, at Ardrossan, No. 1, 51s.; No. 3, 47s. Eglinton, No. 1, 47s.; No. 3, 44s.; Dalmellington, No. 1, 47s. 6d.; No. 3, 44s. 6d.

As regards the coal trade, it is alleged by some of those who profess to be well-informed, that in Fifeshire the inquiry has very much settled down, but the shipments from the Fife ports during the past few weeks, and particularly from Burntisland, have been very large. In the west the trade continues good, but the comparison with last year at first sight brings out rather too satisfactory a result, the reason being that at this time last year business was much interrupted by a strike of miners. The inland trade is also good, and the output continues fully equal to all requirements, so that there is no material change in prices.

WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

There is now a fair prospect that the whole of the works of Messrs. Booker, so-called, of late years carried on by the liquidators of the West of England Bank, will pass into other hands, and in all likelihood be energetically carried on. Mr. Spence, who was connected with Mr. Shaw in the Cwmavon property, has made an offer for them; and if the Court accept, the bargain will soon be closed. The works include those of Melingriffith and Pentyrch, with limestone and hematite quarries, collieries, &c. It is not known publicly whether Mr. Spence intends to carry the works on himself, or simply float them. Their closeness to Cardiff, and the excellence of the collieries—which have been ably managed by Mr. Edmund Howells for some years—make the speculation a good one.

Tin-plate manufacture, it is true, is not in the most prosperous state where exclusively made, for there it is hampered by old arrangements; but at Dowlais the trade is successfully carried on, and already 1400 boxes per week are turned out, and the management is preparing for increased make.

The United States are in the market for steel and iron rails, and some fair quantities have been placed. Prices, too, keep up well, and managers say that a tolerable warranty for future trade is held. Old rails are again coming into the market, and better prices have been secured. In one case 90s. per ton has been refused. This movement in old rails is due, I imagine, to the reduction of the import duties in France on old iron. Present figure, 7·50 francs per ton. Various good orders are coming in—one of them, a Belgian order, for 4000 tons.

A great deal might be made in old iron by our Welsh ironmasters. Most of them hold great quantities of tram plates, put aside since the discontinuance of Welsh iron ore mining. I have seen large stocks of these at Cyfarthfa.

Foreign ore has now completely superseded Welsh. Last week the total received in Wales from Bilbao and other sources was little short of 35,000 tons.

Judging from indications at Treforest Iron and Steel Works, Swansea, Cyfarthfa, Ebbw Vale, and other places, not excluding Tredegar, the Welsh ironmasters are making vigorous efforts to take the lead in the make of steel rails, and having cheap labour at command, good coke, and lessened cost of foreign ore, they seem likely to take a prominent position.

The exhibition of local works, at Cardiff, of the iron made and machinery turned out is satisfactory, and commends itself. Good judges are beginning to wonder why Wales has lagged so long behind, and persistently sent its scrap steel away. Siemens furnace added to the Bessemer would enable all scrap to be worked up effectually. This, and the addition of tin-plate make to the old-established ironworks, is only a question of time.

I am glad to note a healthy condition of the Welsh coal trade. At Swansea business is decidedly looking up, and the local export has materially increased; trade, too, is good at Newport, and at Cardiff it remains very much the same; prices are firm and contracts are only entered upon at improved prices. 11s. f.o.b. is now an ordinary quotation for best, and obtained.

Steel rails are quoted at Swansea £6 to £6 2s. 6d. Efforts in that quarter are being made to push up prices of tin-plates, but not successfully. France continues but a moderate customer. The total exports of coal from Wales last week came up to the old average which existed a month ago, namely, 140,000 tons, and out of this Cardiff alone sent away 112,000 tons. This was good work, considering that excursions are now the order of the day, and that the collieries are giving frequent holidays to enable their men to visit the Cardiff Exhibition. I have been much pleased of late to see large bodies of men accompanied by their managers, and the outing thus conducted is orderly and with practical benefit.

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.

16*th August*, 1881.

3542. Colourless Oil, W. P. Thompson.—(*I. Gottlieb, Vienne.*)
3543. Steam Engines, E. A. Brydges.—(*H. de Grousilliers, Germany.*)
3544. Disposal of Slag, E. F. Jones, Middlesbrough.
3545. Artificial Bait, G. W. von Nawrocki.—(*C. Schondelmier, Germany.*)
3546. Producing Spray, G. W. von Nawrocki.—(*H. Mestern, Germany.*)
3547. Sewing Machines, A. Francois, France.
3548. Collecting Letters, F. C. Winby, London.
3549. Rolls, T. Brown, Walsall.
3550. Lubricating Bearings, H. Reisert, Germany.
3551. Weighing Machines, C. Reuther, Germany.
3552. Steam Boilers, J. R. Oldham, Sunderland.
2553. Dyeing Cotton, G. Jakenburg, Sweden.
3554. Tobacco Pipe, H. Woodward, London.
3555. Conveying Messages, H. Redknap, Twickenham.
3556. Breakwaters, E. C. G. Thomas, Madras.
3557. Sounding Boards, J. Brinsmead, London.
3558. Folding Chairs, H. Austin, London.
3559. Electric Lighting, C. W. Harrison, London.
3560. Utilising Residues, W. Weldon, Burstow.
3561. Propulsion of Land, &c., Motors, A. de Kerkhove and T. Snyers, Belgium.
3562. Tennis Balls, A. J. Altman, London.
3563. Utilising Waves, W. Clark.—(*I. Roberts, U.S.*)
3564. Lamps, T. F. Shailis and T. C. Thomas, London.
3565. Fasteners for Gloves, W. Lake.—(*A. Hopfen, U.S.*)
3566. Pulverising Clay, J. C. Anderson, Chicago.
3567. Tunnelling, A. L. Blackman, Nashville, U.S.

17*th August*, 1881.

3568. Concertinas, B. Berry, Newcastle-on-Tyne.
3569. Checking Fares, A. J. T. Wild, Nunhead.
3570. Tracing Paper, D. Bogue & B. Le Moussu, London.
3571. Dredging, T. Burroughs, Liverpool.
3572. Velocipedes, G. Richards, Manchester, and B. C. Filghman, London.
3573. Smoke-consuming Grate, A. Ball, Spalding.
3574. Notes for Organs, J. Hamilton, Greenwich.
3575. Bleaching Linen, C. Abel.—(*A. Delabove, Paris.*)
3576. Velocipedes, M. A. Weir, London.
3577. Sifting Cement, G. Butler, G. Skudder, and H. Fabian, London.
3578. Boat Disengaging Gear, M. Robinson, London.
3579. Protecting Ships, B. Thomson, London.
3580. Weighing Machines, T. H. Ward, Tipton.
3581. Indicating Weight, T. H. Ward, Tipton.
3582. Water Waste Preventers, C. Winn, Birmingham.
3583. Sugar-cane Mills, D. Stewart, Glasgow.
3584. Sulphur, W. Clark.—(*C. Girard & J. A. Pabst, Paris.*)
3585. Working-up Butter, R. W. Whinnerah, Redlynch, near Salisbury.—(*R. Whinnerah, U.S.*)
3586. Soldering Tools, C. Toope.—(*W. Braidwood, U.S.*)
3587. Velocipedes, A. W. Robinson, Birmingham.
3588. Damping Lithographic Stones, J. Meinschock, New-cross, London.
3589. Mounting Shafts, J. Tangye, Birmingham.
3590. Embroidery, C. Barlow.—(*J. Halter, Switzerland.*)

18*th August*, 1881.

3591. Glass-holders, H. W. Sambridge, Birmingham.
3592. Barrels, W. Smedley, Burton-on-Trent.
3593. Pottery, H. J. Haddan.—(*G. Ligowsky, U.S.*)
3594. Targets, H. J. Haddan.—(*G. Ligowsky, U.S.*)
3595. Pianofortes, C. Collard, Camden Town, London.
3596. Traction Engines, H. Tasker, Andover.
3597. Printing Machinery, R. C. Annand, Peterhead.
3598. Looms, E. Smith, Houley, near Huddersfield.
3599. Electric Lamps, C. Lever, Bowden.
3600. Taking-off Apparatus, H. Wilkinson, London.
3601. Supporting Looking-glasses, C. Martin, London.
3602. Treatment of Fruits, A. Bolanachi, London.
3603. Preparing Colouring Matters, J. H. Johnson.—(*The Badische Anilin and Soda Fabrik, Germany.*)

19*th August*, 1881.

3604. Brushes, S. Abraham, Manchester.
3605. Black Ink, H. S. L. Gurney, Warrington.
3606. Barracks, &c., C. D. Abel —(*La Société Nouvelle de Constructions (Système Tollet), Paris.*)
3607. Marking Length of Yarn on Weavers' Beams, A. Hitchon, Accrington.
3608. Perambulators, J. T. Shaw and H. Meredith, Manchester.
3609. Stretchers, J. Furley, Sevenoaks.
3610. Ribbed Fabrics, H. M. Mellor, Nottingham.
3611. Loading Coal, T. Hancock, Rugeley.
3612. Weaving, P. Dunkerley, Manchester.
3613. Machines for Soap, J. A. Graham, Putney.
3614. Lifts, H. J. Haddan.—(*C. Lievens, Brussels.*)
3615. Self-acting Bottle-stopping Machines, C. M. Sombart.—(*O. Assman, Zwolle, Switzerland.*)
3616. Agricultural Forks, G. Postlethwaite, Aston.
3617. Advertising, C. B. S. Webb, Colchester.
3618. Cricket Bats, G. W. Frowd, London.
3619. Purification of Coal-gas, C. C. Walker, Salop, and W. T. Walker, Highgate, London.
3620. Dressing Enamelled Bricks, J. Craig, Ayr.
3621. Automatic Air-compression Machines, V. C. Haurie.—(*F. Windhausen, Berlin.*)
3622. Combined Hot-air, &c., Machines, V. C. Haurie. —(*F. Windhausen, Berlin.*)
3623. Bicycles and Tricycles, C. Toope, London.
3624. Arresting the Incursions of Insects, W. Clark. —(*A. Durand and C. Hauvel, Paris.*)

20*th August*, 1881.

3625. Pickers, I. & A. Wallwork, Ashton-under-Lyne.
3626. Wheels, J. Mansell, Birmingham.
3627. Lubricants, W. R. Goodfellow, Roche.
3628. Photographic Apparatus, H. J. Haddan.—(*J. Lefeuvrier, Merdrignac, France.*)
3629. Baths, C. Drake, Battersea, London.
3630. Facing Bricks, C. Drake, Battersea, London.
3631. Dressing Yarns, T. Goldie, Airdrie, N.B.
3632. Treating Maize, J. Muir, Edinburgh.
3633. Adjusting Action for Toilet Glasses, &c., S. Mead and J. W. Tiptaft, Birmingham.
3634. Elevating Apparatus, H. Garland, Liverpool.
3635. Electric Light, T. Tubini, London.
3636. Silk Reels, C. W. Maconchy, Ireland.
3637. Sewing Machines, W. Webster, San Francisco.
3638. Core Bars, H. S. Stewart, London.
3639. Street Tramways, C. A. Edge, Birmingham.
3640. Clips, H. C. Noble, New Britain, U.S.
3641. Puddling Furnaces, J. Lones, C. Vernon, E. Holden, and R. Bennett, Smethwick.

22*nd August*, 1881.

3642. Fire-bars, T. Nash, Sheffield.
3643. Gas-burners, C. W. Morley, London.
3644. Capsuling Jar, G. J. Hutchings, London.
3645. Shoeing Horses, G. Scrope-Ferrers, Martlesham.
3646. Wet Extraction of Lead, H. J. Haddan.—(*A. Drouin, Paris.*)
3647. Steering Apparatus, J. Walker and W. and T. Thompson, Durham.
3648. Heating Apparatus, W. Stephenson, Blackburn.
3649. Apparatus for Jigging, &c., S. Bruce, Dublin.
3650. Electric Lamps, G. Pfannkuche, London.
3651. Dephosphorisation of Iron, C. D. Abel.—(*H. J. B. Pellet and J. Cahen, Paris.*)
3652. Coiling Machine, C. L. Clarke and J. Leigh, Manchester.
3653. Ore Grinding, T. A. Readwin, London.
3654. Breech-loading Fire-arms, P. Mauser, Germany.
3655. Division of Electric Currents, R. E. Dunston, Donhead, and G. Pfannkuche, London.
3656. Glass Reflectors, F. H. F. Engel.—(*G. Franke, Hamburg.*)
3657. Production of Casts, &c., J. J. Sachs, Sunbury.
3658. Harvesting Machines, W. R. Lake.—(*M. Denizot, Paris.*)

Inventions Protected for Six Months on deposit of Complete Specifications.

3565. Fasteners for Gloves, W. R. Lake, Southampton-buildings, London.—A communication from A. Hopfen, New York, U.S.—16*th August*, 1881.
3593. Manufacture of Pottery, H. J. Haddan, Kensington, London.—A communication from G. Ligowsky, Cincinnati, U.S.—18*th August*, 1881.
3594. Targets, H. J. Haddan, Kensington, London.—A communication from G. Ligowsky, Cincinnati, U.S.—18*th August*, 1881.

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

3139. Projectiles, A. C. McLeod, Salop.—8*th August*, 1878.
3261. Preserving Timber, D. R. Gardner, Glasgow.—19*th August*, 1878.
3237. Zinc Oxide, E. A. Parnell, Swansea.—16*th August*, 1878.
3268. Hydraulic Apparatus, B. Walker and J. F. A. Pflaum, Leeds.—16*th August*, 1878.
3615. Shackles, F. Ramsay, Forest-hill, London.—12*th September*, 1878.
3678. Battery Guns, T. Nordenfelt, St. Swithin's-lane, London.—17*th September*, 1878.
3246. Sulphide of Zinc, C. F. Claus, Charlotte-street, London.—16*th August*, 1878.
3250. Regulating Electric Light, H. Wilde, Manchester.—17*th August*, 1878.
3282. Sulphate of Alumina, A. A. Croll, Coleman-street, London.—20*th August*, 1878.
3274. Purifying and Burning Gases, W. S. Sutherland, Birmingham.—20*th August*, 1878.
3287. Harrows, W. N. Nicholson and W. Mather, Newark-upon-Trent.—20*th August*, 1878.
3399. Making Moulds, J. and S. Roberts and B. Fenton, West Bromwich.—28*th August*, 1878.
3406. Getting Water from Wells, C. Chapman, Salford.—29*th August*, 1878.
3276. Buildings, &c., A. W. Lake, Gloucester-gardens, London.—20*th August*, 1878.
3311. Railway Carriage Lamps, G. Seagrave, Dublin. —22*nd August*, 1878.
3458. Apparatus for Preserving Wines, &c., G. Desvignes, Libourne, France.—31*st August*, 1878.

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

1056. Types, &c., J. Greene, Pall Mall, London.—10*th April*, 1872.
2872. Moulding Concrete Pipes, J. W. Butler, Willesden.—20*th August*, 1874.
2991. Cooling Worts, &c., H. Bycroft, Burton-on-Trent.—1*st September*, 1874.
2899. Mules for Spinning Cotton, J. Dodd, Oldham. —24*th August*, 1874.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 9th September, 1881.

1635. Boxes for Threads, J. Darling, Glasgow.—14*th April*, 1881.
1648. Packages for Carrying Paint, R. R. Gray, Liverpool.—14*th April*, 1881.
1658. Manufacturing Sugar, H. E. Newton.—A communication from A. L. Thibault.—14*th April*, 1881.
1663. Sewing Machines, L. Silverman, London, and J. R. Cumming, Ilford. —14*th April*, 1881.
1664. Tricycles, &c., W. H. Bliss, Forest-hill, Kent.—14*th April*, 1881.
1669. Type Setting Apparatus, H. Springman, Berlin. —A com. from E. W. Brackelsberg.—16*th April*, 1881.
1671. Regulating the Flow of Liquids, G. H. Flood and D. Young, London.—16*th April*, 1881.
1679. Telephonic Exchange System, J. Culbertson, Antwerp, & J. W. Brown, London.—16*th April*, 1881.
1387. Ventilating Apparatus, H. H. Lake, London.— A com. from T. Utley & J. Fawcett.—18*th April*, 1881.
1722. Ring Frames for Spinning Cotton, W. Lumb and J. Smith, Rochdale.—25*th April*, 1881.
1798. Steam Generators, B. Brazelle, St. Louis, U.S. —26*th April*, 1881.
1809. Telegraph Cables, W. R. Lake, London.—A com. from P. B. Delaney.—26*th April*, 1881.
1864. Velocipede, J. E. Hatch, Camberwell.—29*th April*, 1881.
1870. Separating Grain, &c., S. Handscombe and C. Dellar, Melbourne.—30*th April*, 1881.
1895. Surgical Instruments, E. A. Brydges, Upton.— A com. from M. Schiltz.—2*nd May*, 1881.
1982. Smoothing Irons, T. McCracken, Ardmore.—7*th May*, 1881.
2025. Elliptic Spring for Cars, A. M. Clark, London. —A com. from B. Clark & E. Righter.—9*th May*, 1881.
2055. Looms for Weaving, E. Wilson, Preston.—11*th May*, 1881.
2269. Spinning Apparatus, E. Smith, I. Cutler, and W. Shaw.—24*th May*, 1881.
2325. Pulverising Ores, A. M. Clark, London.—A com. from W. H. Howland.—26*th May*, 1881.
2326. Ash-pans for Locomotives, A. M. Clark, London. —A com. from M. B. O'Neil.—26*th May*, 1881.
2414. Manufacturing Milanaise, J. A. Sparling, Highgate.—1*st June*, 1881.
2463. Pulverising Machines, C. E. Hall, Sheffield.— 4*th June*, 1881.
2502. Steam Grain Driers, A. M. Clark, London.—A communication from H. Cutler.—8*th June*, 1881.
2540. Crushing Machinery, C. E. Hall, Sheffield.— —10*th June*, 1881.
2749. Steam and Hand Steering Gear, A. Higginson, Liverpool.—23*rd June*, 1881.
2874. Centrifugal Extracting Machines, F. Wolff, Copenhagen.—A communication from Burmeister and Wains Maskin and Skibsbyggeri.—1*st July*, 1881.
2896. Wheels, W. H. Carmont, Manchester.—2*nd July*, 1881.
3000. Self-closing Taps, G. Crawford, Port Glasgow. —8*th July*, 1881.
3021. Engine Regulator, R. M. Marchant, Clerkenwell, London.—9*th July*, 1881.
3022. Carriage Wheel, W. F. Lotz, Barbican, London. —A communication from A. Wilké.—9*th July*, 1881.
3102. Internal Stoppers for Bottles, A. T. King, Nottingham.—6*th July*, 1881.
3127. Silk-dressing Machinery, A. Greenwood, Leeds. —Communication from A. Schüle.—18*th July*, 1881.
3208. Preparing Cotton, J. Higgins and T. S. Whitworth, Salford.—22*nd July*, 1881.
3282. Caoutchouc Shoes, S. Pitt, Sutton.—A com. from A. Hutchinson and Co.—26*th July*, 1881.
3291. Retorts, T. Haldane, Glasgow.—27*th July*, 1881.
3311. Preparing Vegetable Substances, J. Johnson, London.—Com. from A. I. Mahu.—29*th July*, 1881.
3320. Fitting of the Holds of Colliers, C. H. Mowll, Dover.—30*th July*, 1881.

Last day for filing opposition, 14th September, 1881.

1367. Construction of Ceilings. T. Wrigley, London. —A com. from S. Müeller.—28*th March*, 1881.
1689. Spinning Frames, J. Erskine, Strabane, Ireland. —19*th April*, 1881.
1690. Heating Turkish Baths, W. G. and J. Sloane, Dublin.—19*th April*, 1881.
1692. Registering Distance Travelled, W. Thompson and A. Morten, London.—19*th April*, 1881.
1700. Compartments in Ships for Preventing the Displacement of Cargo, W. R. Lake, London.—A com. from F. Rainey & T. Rogers.—19*th April*, 1881.
1703. Nailing Boxes, B. J. B. Mills, London.—A communication from J. H. Swift..—19*th April*, 1881.
1728. Bases for Artificial Teeth, A. Clark, London. —A com. from J. Duchesne.—20*th April*, 1881.
1744. Preventing Explosions in Mines, C. D. Abel, London.—A com. from O. Bustin.—22*nd April*, 1881.
1745. Electrical Batteries, C. D. Abel, London.—A com. from P. Jablochoff.—22*nd April*, 1881.
1771. Valve Motions for Double Cylinder Engines, D. Greig and M. Eyth, Leeds.—23*rd April*, 1881.
1772. Bobbins used in Spinning Machinery, J. H. and L. Wilson, Cornholme.—25*th April*, 1881.
1794. Bottle Stoppers, H. A. Bonneville, London.— A communication from J. Wills.—26*th April*, 1881.
1804. Cultivating Plants without Soil, J. Imray, London.—A com. from A. F. Poullain-Dumesnil.— 26*th April*, 1881.
1812. Concrete, A. E. Carey, Newhaven, and E. Latham, Birkenhead.—27*th April*, 1881.
1854. Lifts and Hoists, J. M. Day, W. R. Green, and H. C. Walker, London.—29*th April*, 1881.
1893. Absorbing Sulphuric Acid, C. D. Abel, London. —A com. from Dr. K. Schnabel.—2*nd May*, 1881.
1972. Acoustic Instruments, F. Wirth, Germany.—A communication from A. Rettig.—6*th May*, 1881.
1989. Fastenings for Albums, &c., S. Posen, Basinghall-street, London.—7*th May*, 1881.
2009. Machinery for Combing Wool, J. F. Harrison, Bradford.—9*th May*, 1881.
2068. Steam Engines, J. H. McFerran and W. Rennie, Newry, Ireland.—12*th May*, 1881.
2167. Valves, W. Askew and A. Aird, Manchester.— 18*th May*, 1881.
2218. Padlocks, T. Harby, Liverpool.—20*th May*, 1881.
2327. Apparatus to Facilitate Swimming, J. Overton. Coventry.—27*th May*, 1881.
2344. Electrical Lighting Apparatus, P. L. M. Gadot, Paris.—27*th May*, 1881.
2521. Machinery for Boots and Shoes, J. Keats, Bagnal.—9*th June*, 1881.
2637. Cigarettes, H. Black, Blackfriars-road, London. —16*th June*, 1881.
2653. Stoves, W. Barton, Boston.—17*th June*, 1881.
2733. Rails, A. Brown, London.—A communication from H. Rimbach.—22*nd June*, 1881.
3020. Sash-bars, W. Howitt, Ilford.—9*th July*, 1881.
3050. Furnaces, J. A. King and J. Little, Dublin.— 12*th July*, 1881.
3224. Galvanic Batteries, J. Higgin and A. J. Higgin, Manchester.—23*rd July*, 1881.
3229. Railway Brake Apparatus, T. H. Ramsden, Snilesworth, near Northallerton.—23*rd July*, 1881.
3287. Governors for Steam Engines, F. W. Durham, New Barnet.—27*th July*, 1881.
3308. Bronze, H. Vivian, Swansea.—28*th July*, 1881.
3323. Mounting Spindles, C. H. Openshaw, Bury.— 30*th July*, 1881.
3333. Ice, W. P. Thompson, London.—A communication from F. M. McMillan.—2*nd August*, 1881.
3367. Engines, M. P. W. Boulton, Tew Park.—3*rd August*, 1881.
3381. Holding Forgings, A. Mure, Glasgow.—4*th August*, 1881.
3593. Pottery, H. J. Haddan, London.—A communication from G. Ligowsky.—18*th August*, 1881.
3594. Targets, H. J. Haddan, London.—A communication from G. Ligowsky.—18*th August*, 1881.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 19th August*, 1881.)

2923. Ordnance and Fire-arms, W. Hope and R. S. Ripley, London.—15*th July*, 1880.
475. Cleaning Carpets, P. Jensen, London.—4*th February*, 1881.
496. Valves for Pumps, A. Beldam, London.—5*th February*, 1881.
733. Steam Gauges, W. R. Oswald, London.—21*st February*, 1881.
746. Barometers, F. H. F. Engel, Germany.—21*st February*, 1881.
753. Bicycles, G. W. Ash, Southsea.—22*nd February*, 1881.
754. Bicycles, G. Singer, Coventry, and A. W. Metcalfe, Clifton.—22*nd February*, 1881.
763. Pressing Garments, J. Buckley and J. C. Buckley, Leeds.—23*rd February*, 1881.
767. Steam Boilers, T. Joicey, Gateshead-on-Tyne.— 23*rd February*, 1881.
783. Electrical Conductors, J. Perry and W. E. Ayrton, London.—24*th February*, 1881.
785. Covering Wire, W. E. Ayrton, Cowper-street, London.—24*th February*, 1881.
836. Joining Leather Belting, B. J. Gibney, Nottingham.—28*th February*, 1881.
915. Boxes or Cases, A. W. Rooke, Eastcheap, London. —3*rd March*, 1881.
1530. Cement, J. C. J. Smith, Northfleet.—7*th April*, 1881.
2263. Effecting Electrical Measurements, J. C. Cuff, Old Broad-street, London.—24*th May*, 1881.
2341. White and Coloured Yarns, H. Empis, Belfast. —27*th May*, 1881.

(*List of Letters Patent which passed the Great Seal on the 23rd August*, 1881.)

778. Valves for Preventing Waste of Water, E. O. Mundy, Stratford.—24*th February*, 1881.
787. Vulcanising Articles, T. Rowley, Manchester.— 24*th February*, 1881.
804. Food for forming Decoctions, E. and J. Williams, Swansea.—25*th February*, 1881.
805. Crayons, &c., W. C. Horne, Bexley.—25*th February*, 1881.
807. Aerial, &c., Navigation, F. Wirth, Germany.— —25*th February*, 1881.
808. Bushes for Wooden Block Sheaves, J. Gordon, Dundee.—25*th February*, 1881.
811. Gas Engines, W. B. Haigh and J. Nuttal, Oldham. —25*th February*, 1881.
822. Socket Pipes for Sewers, B. C. Cross, Dewsbury. —26*th February*, 1881.
824. Drying Wool, &c., D. Dawson, Huddersfield. — —26*th February*, 1881.
840. Internal Parts of Cupolas, &c., B G. D. Cooke, Colomendy.—28*th February*, 1881.
841. Dyeing Hanks, J. Conlong, Blackburn, and J. Robertshaw, Manchester.—28*th February*, 1881.
846. Lock and Door Fastenings, W. H. Crispin, Stratford.—28*th February*, 1881.
859. Erecting Telegraph Wires, J. W. Fletcher, Stockport.—1*st March*, 1881.
860. Cleaning Knives, L. Appleton, London.—1*st March*, 1881.
867. Combined Gas Engines, F. H. Wenham, London. —1*st March*, 1881.
868. Vegetable Products, H. Guiliani, London.—1*st March*, 1881.
871. Rowlocks for Ships, S. S. Hazeland, Cornwall.— —1*st March*, 1881.
911. Velocipedes, J. and C. E. Challis, Homerton.— —3*rd March*, 1881.
913. Twisting Wire, W. T. Glover and G. F. James, Manchester.—3*rd March*, 1881.
923. Heating Fluids, G. C. Gibbs, London.—3*rd March*, 1881.
926. Decorating Bricks, &c., G. and A. Maw, Salop. —4*th March*, 1881.
940. Reed Organs, W. R. Lake, London.—4*th March*, 1881.
997. Roller Mills, H. J. Haddan, London.—9*th March*, 1881.
1037. Packing Material, W. R. Lake, London.—10*th March*, 1881.
1117. Safety Fittings for Saddles, H. S. Wilton and B. S. Weston, London.—15*th March*, 1881.
1120. Lamps, S. Pitt, Sutton.—15*th March*, 1881.
1123. Driving Rollers of Rolling Mills, P. Van Gelder, Liverpool.—15*th March*, 1881.
1136. Combing Wool, W. R. Lake, London.—16*th March*, 1881.
1154. Packing Bottles, J. Packham and J. Pelton, Croydon.—16*th March*, 1881.
1156. Postal Wrappers, J. A Elstob and C. M. Elstob, Camberwell-road, London.—16*th March*, 1881.
1324. Boiling Paper Stock, A. M. Clark, London.— 24*th March*, 1881.
1362. Automatic Regulation of Heat in Kilns, A. S. Tomkins, F. M. Courage, and F. A. Cracknall, Mark-lane, London.—28*th March*, 1881.
1364. Ships, J. H. Johnson, London.—28*th March*, 1881.
1383. Thermometers, W. B. Fowle, Newton, U.S.— 29*th March*, 1881.
1419. Reservoir Penholders, T. A. Hearson, Greenwich.—31*st March*, 1881.
1629. Sharpening Drills, E. E. Bentall, Maldon.— 13*th April*, 1881.
1659. Mast Winches and Capstans, E. E. and F. A. Bentall, Maldon.—14*th April*, 1881.
1750. Steel Castings, I. Beardmore. Parkhead, N.B. —23*rd April*, 1881.
1991. Umbrellas, H. A. Davis, Finsbury Park London.—7*th May*, 1881.
2031. "Pressing" of Horn and Hoofs, D. Stewart, Aberdeen.—10*th May*, 1881.
2211. Buffer Gearing, I. A. Timmis, London.—20*th May*, 1881.
2348. India-rubber Valves, A. Pegler and T. J. Watson, Retford.—28*th May*, 1881.
2356. Washing Coal, T. Bell, jun , Saltburn-by-the-sea, and W. Ramsay, Durham.—28*th May*, 1881.
2370. Slide Valves, H. E. Newton, Chancery-lane, London.—30*th May*, 1881.
2462. Treatment of Soap Leys, C. Thomas, Bristol, and A. Domeier, London.—4*th June*, 1881.
2675. Mill Gearing, N. Macbeth, Bolton.—18*th June*, 1881.
2804. Attachments to Lifts, F. W. Haddan, London. —27*th June*, 1881.

List of Specifications published during the week ending August 20th, 1881.

5261, 2d.; 5270, 2d.; 5355, 2d.; 5375, 2d.; 97, 6d.; 135, 6d.; 139, 6d.; 151, 6d.; 159, 6d.; 161, 6d.; 199, 6d.; 205, 6d.; 207, 6d.; 208, 8d.; 209, 6d.; 210, 6d.; 216, 4d.; 218, 6d.; 220, 6d.; 224, 6d.; 225, 6d.; 226, 6d.; 227, 2d.; 228, 6d.; 230, 6d.; 231, 2d.; 232, 6d.; 233, 2d.; 234, 6d.; 236, 6d.; 237, 2d.; 238, 2d.; 240, 2d.; 241, 6d.; 243, 2d.; 244, 2d.; 245, 4d.; 246, 2d.; 248, 6d.; 249, 6d.; 251, 2d.; 252, 2d.; 253, 10d.; 254, 8d.; 255, 2d.; 257, 6d.; 258, 2d.; 259, 2d.; 261, 2d.; 262, 2d.; 263, 2d.; 264, 6d.; 265, 2d.; 268, 2d.; 269, 2d.; 270, 6d.; 271, 6d.; 273, 2d.; 276, 6d.; 278, 6d.; 279, 2d.; 280, 2d.; 283, 6d.; 285, 6d.; 286, 4d.; 287, 2d.; 288, 8d.; 291, 6d.; 292, 6d.; 293, 6d.; 294, 6d.; 296, 2d.; 297, 6d.; 298, 4d.; 299, 10d.; 301, 2d.; 303, 8d.; 304, 6d.; 305, 6d.; 306, 2d.; 307, 6d.; 308, 4d.; 310, 2d.; 311, 4d.; 312, 8d.; 314, 6d.; 315, 2d.; 316, 8d.; 317, 6d.; 324, 6d.; 325, 6d.; 326, 10d.; 329, 2d.; 330, 6d.; 341, 8d.; 354, 8d.; 355, 4d.; 373, 6d.; 374, 6d.; 375, 4d.; 390, 6d.; 437, 2d.; 449, 6d.; 459, 6d.; 489, 6d.; 509, 6d.; 618, 6d.; 796, 6d.; 982, 6d.; 1173, 6d.; 1275, 4d.; 1295, 6d.; 1726, 8d.; 1862, 8d.; 1912, 6d.; 2134, 6d.; 2217, 6d.; 2303, 6d.; 2384, 4d.

*** 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.

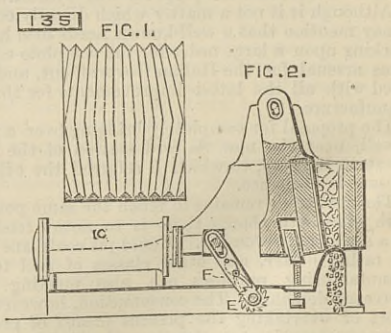
Prepared by ourselves expressly for The Engineer *at the office of Her Majesty's Commissioners of Patents.*

97. Knitting Machinery, *I. Stubley.*—8*th January*, 1881. 6*d.*

This consists in the splicing of knitted fabrics in the plain jack and sinker rotary knitting machine, by means of one or more extra thread carriers, working mainly the row of needles in conjunction with a main thread carrier working mainly above the row of needles, all the carriers being pipe carriers.

135. Stone-breaking Machines, *W. Taylor.*—12*th January*, 1881. 6*d.*

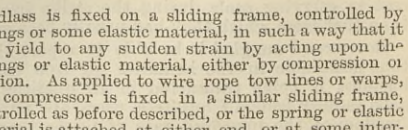
This relates more particularly to the arrangement of the grooves or furrows in the face of what is known as the cracker jaw. Fig. 1 is an elevation of the face of the cracker jaw. The grooves or furrows are caused to converge from the middle of the jaw face towards the upper and lower edges of that face respectively, so that they present somewhat the appearance of two jaws, having their pivots in the middle of the upper and lower edges of the jaw face, and with their circum-



ferences touching and overlapping at the centre of the said face. Fig. 2 is a side elevation of the whole machine, showing one arrangement of the direct-acting cylinders C, and also the method preferred for giving motion to the cylindrical riddle. The motion to the riddle, which is of the ordinary construction, is imparted by a ratchet wheel E worked by a pawl F from the piston-rod crosshead, or in some equivalent manner.

139. Apparatus for Relieving Strains on Ropes or Chains in Towing, Mooring, or Anchoring Vessels, &c., *C. Mace.*—12*th January*, 1881. 6*d.*

At some part of the rope or chain (preferably at one of the extremities) is introduced a spiral, volute, or other form of spring, or some elastic material, such as india-rubber, through which the tension upon the rope or chain will be transmitted without sudden strain. As applied to anchoring ropes or chains, the



windlass is fixed on a sliding frame, controlled by springs or some elastic material, in such a way that it will yield to any sudden strain by acting upon the springs or elastic material, either by compression or tension. As applied to wire rope tow lines or warps, the compressor is fixed in a similar sliding frame, controlled as before described, or the spring or elastic material is attached at either end, or at some intermediate point in the rope. The drawing is an elevation, partly in section, of a sliding compressor controlled by springs, which is firmly bolted down to the deck of the vessel, preferably near the bow, and is principally used for towing purposes.

151. MICROSCOPES, *F. H. Wenham.*—12*th January*, 1881. 6*d*.
The First improvement relates to the stand for carrying the limb body of the microscope. The Second improvement is for an application of anti-friction rollers for the fine focussing movement of microscopes.

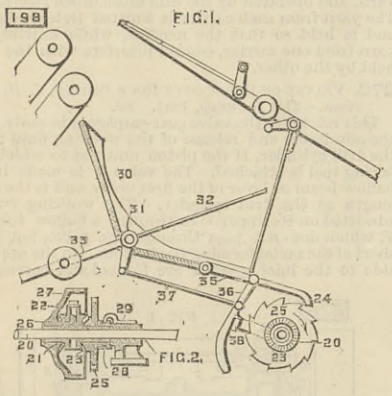
159. CHECKING AND REGISTERING THE AMOUNT OF MONEY DROPPED INTO MONEY TILLS AT HOTELS, &c., *S. Fynn.*—13*th January*, 1881. 6*d*.
The registering apparatus is so arranged that when a coin is dropped into the till it pushes a lever to one side in its descent. This lever actuates a ratchet on the first of a suitable train of toothed wheels and registers one upon the corresponding dial, and the lever is then forced back to its original position by means of a spring, weight, or other well known and suitable means. The coin on its way to the compartment assigned to it strikes a bell fixed inside the till.

162. VENTILATING BUILDINGS, &c., *T. Rowan.*—13*th January*, 1881. 6*d*.
This relates to improvements in the method of and apparatus for ventilating buildings, water-closets, ships or vessels, &c., whereby a constant and regular supply of fresh, dry, and purified or disinfected (or otherwise treated) air, is insured, with means for ejecting the vitiated or impure air.

191. LOOMS, &c., *J. Northrop.*—14*th January*, 1881. 6*d*.
This relates, First, to improved shedding motions or means of operating the heddles for changes of shedding in looms for weaving, so as to give less pressure on the warps, and for making the shed without touching the going part of the loom; also allowing of reversing the shedding motion when the loom is working, making it easy to find the pick when the weft is broken, and allowing of weaving with two shafts, up and down, without altering the speed for either plain or fancy fabrics, by which means the tappets and treadles heretofore in use are done away with; Secondly, to means by which rotary motion may be given to rotary circular shuttle boxes containing series of shuttle chambers in the order desired, allowing the missing or "skipping" of one or more of the shuttle chambers in selection of the shuttles brought into use; Thirdly, to stopping looms having shuttle boxes at each end when the weft breaks or is run off.

198. SHEAF-BINDING APPARATUS, &c., OF REAPING MACHINES, *E. G. C. Bomford and H. J. H. King.*—15*th January*, 1881. 8*d*.
Fig. 1 is a sectional elevation showing one modification of apparatus for regulating the operations of sheaf-binding mechanism, and Fig. 2 is a vertical section (at right angles to Fig. 1) of a portion of the gearing. The binding mechanism is driven by means of a horizontal shaft 20, which receives its motion through a combination of three bevel wheels 21, 22, 23, known as jack-in-the-box motion, or it might be through the equivalent combination of internally toothed spur wheels and differential planetary pinions, in either of which combinations one wheel 23 runs loosely when the motion is not being transmitted, and causes the transmission on being arrested by a catch 24, which engages with teeth on a wheel 25 made in the same piece with the wheel 23. The middle one 22 of the three bevel wheels is on a stud formed or fixed on an elongated boss 26, which is on the shaft 20, and made to turn it by means of a key and groove. A pulley 27 to receive a driving belt runs loose on the boss 26, and is in the same piece with the first 21 of the three bevel wheels. The third bevel wheel 23 and catch wheel 25 are also loose on the boss 26, and after being put on are held in position by a collar 28 fixed on the boss, which collar is grooved for a claw guide 29 fixed to the bearing, and arranged

198 FIG.1.



to keep the boss 26 and parts on it up to the bearing, notwithstanding any end-on movement on the shaft 20. Within the hopper 30, into which the crop is delivered in order to be bound, there are fixed on a transverse horizontal spindle 31 a number of rods 32, upon which the crop falls. The spindle 31 has also fixed on it, so as to project oppositely to the rods 32, a lever 33, on which a weight is adjustably fixed. The weight is adjusted to correspond to the weight of sheaf desired to be made, and when the quantity of crop received in the hopper 30 and upon the rods 32 attains the desired weight, it causes the rods 32 to descend a short distance, and then a short lever, fixed on the spindle 31, acts on the catch 24 and causes the binding mechanism to commence working. The catch 24 is on the end of a lever 35, which has a second catch or strut 36 jointed to it, and this last is connected by a rod 37 to the lever on the spindle 31 of the weighing rods. The strut 36 is shown as resting on a supporting arm 38, and holding up the catch 24, and on the rods 32 being weighted down by the portion of crop, the strut 36 is drawn off the support 38, and then allows the catch 24 to descend and engage with the wheel 25. The shaft 20 makes one turn for each complete binding operation, and in so doing carries round the support 38, which is an arm or wiper fixed to the collar 28 of the boss 26 (or it may be carried round by the shaft 20 in any other convenient way), and the arm 38 at the end of its turn acts as a wiper or cam to lift up the strut 36, and make it raise the catch 24 out of gear from the wheel 25.

199. STEERING GEAR, *J. K. Kilbourn and G. Fossick.*—15*th January*, 1881. 6*d*.
The drawing is a sectional elevation illustrating a mode of carrying out the invention as applied to that class of steering gear in which the power is transmitted to the rudder stem by the use of a thick

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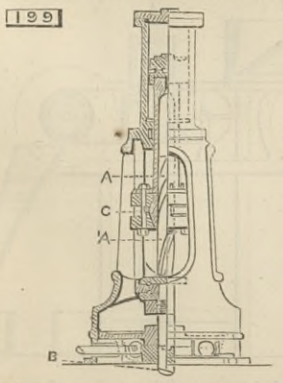

threaded screw or spiral bolt. A is the screw or spiral bolt for transmitting motion to the rudder stem, B the screw or spiral bolt receiving its rotary motion by the longitudinal to-and-fro movement of a non-rotary nut adapted to the screw. This nut is made in segments, the number of which correspond to the number of threads A1 in the screw or sides to the spiral bolt.

203. STOP VALVES, *J. Dewrance and G. H. Wall.*—15*th January*, 1881. 8*d*.
A is the valve shell provided with diaphragm to separate the inlet and outlet sides; B is the valve operated by screw C working through a stuffing-box. The valve seating is renewable, and consists of a cage

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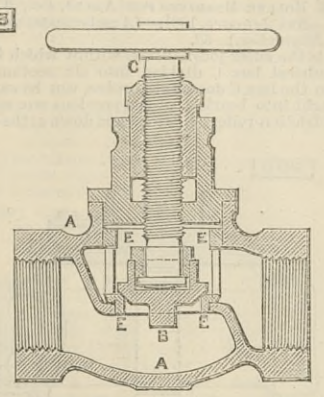
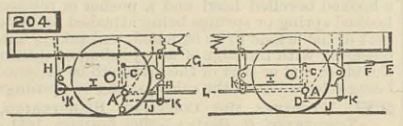


composed of two rings E connected by bars, the lower ring fitting accurately the opening in the diaphragm, the bearing surface for the valve being truly formed within it, while the upper ring screws into the socket formed in the shell to receive the stuffing-box.

204. BRAKE GEAR FOR LOCOMOTIVES, *B. Lefebure.*—15*th January*, 1881. 6*d*.
This relates to an arrangement of brake gear whereby all the rods are in tension, and the pull is the same on all the brake blocks, so that an equal wear and tear is secured and no strain put on the axle guards and boxes. A shaft A is used to each pair of wheels, and is suspended by brackets from the frame at any point between the brake blocks. On it are fixed levers C and D, the former communicating the power trans-

204



mitted to them by rods E either directly or through the balancing lever F and connecting rods G to A; or these levers C may be dispensed with when the power acts directly on levers D, the arms of which are of equal or unequal lengths, according to the lengths of the brake block hangers H, and are connected by rods I J to cross-bars K, the ends of which are connected to the brake blocks. L are rods connecting the shafts A to keep them the proper distance apart.

205. CONDENSING AND DISTILLING APPARATUS, &c., *T. J. Rayner.*—15*th January*, 1881. 6*d*.
This consists in the construction of a condenser or cooler by winding two thicknesses of sheet metal in volute form so as to present a continuous inner volute space for steam or vapour to be condensed or liquid to be cooled, and a continuous volute outer space between the successive convolutions for the passage of the cooling liquid.

207. STEAM ENGINES AND CONDENSERS FOR TRAMWAY VEHICLES, &c., *T. Robertson, jun.*—15*th January*, 1881. 6*d*.
A is a high-pressure cylinder, and B is a low-pressure or expansion cylinder, into which the exhaust steam from the cylinder A is led by the pipe A1. Into this pipe a jet of live steam from the boiler is led by the pipe C1 and injected, preferably at or before the orifice of the said exhaust pipe or passage A1, when it opens

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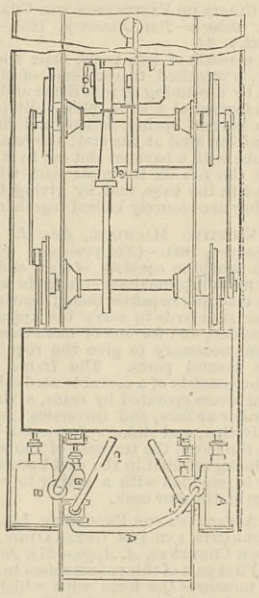

into the valve casing B1 of the low-pressure or expansion cylinder B, so as by the force of its injection to produce a vacuum, or a partial vacuum, in the said exhaust pipe. Fig. 1 is a plan of an arrangement of

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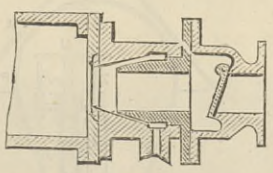

the engine of a tram-car, showing the improvements combined therewith. Fig. 2 is a longitudinal section of a part of the valve casing and exhaust pipe.

208. APPARATUS FOR PREPARING, &c., TEXTILE FABRICS, *R. W. Morrell and J. Shaw.*—15*th January*, 1881. 8*d*.
This relates to the employment of a peculiarly constructed machine or apparatus by which textile fabrics can be prepared, scoured, crabbed, boiled, steamed, tentered, dried, and calendered by any one or portion of these processes singly, or in combination according to the result desired to be produced on the fabrics.

209. CANDLES AND TAPERS, *E. G. Brewer.*—15*th January*, 1881.—(*A communication from F. M. Joly.*) 6*d*
This consists in the employment of twisted, plaited, woven, or flat wicks made in such manner as to produce at the moment of combustion the necessary curvature for the supply of the wick in contact with the air, composed of any desired number of equal or unequal wicks, and provided with cores or supply wicks of the same or of different thicknesses.

210. BEDS OR COUCHES FOR INVALIDS, &c., *G. Lowry.*—15*th January*, 1881. 6*d*.
This relates partly to the application of an endless sheet for the purpose of enabling invalids or others to lie in or be raised to any required position.

211. SIZING, DRYING, AND WARPING OR BEAMING OF WORSTED, WOOL, &c., *C. Anderson.*—15*th January*, 1881. 6*d*.
The warp roller is placed on a shaft provided with a brake drum, chain, lever, and weight. The thread of warp B passes between rollers C covered with india-rubber, and the lower one revolving in a size trough, pressure being applied by levers E. From these rollers the threads of warp pass to a revolving drying frame F and thence round rollers mounted in a hot room

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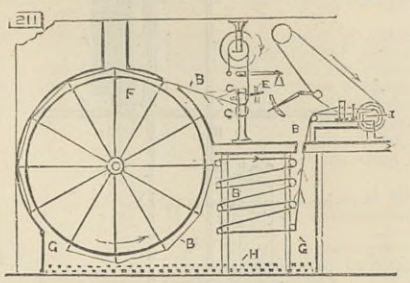

G, both being heated by steam-pipes H. The threads are then wound on to the warp beam I.

212. REVOLVING FLATS FOR CARDING ENGINES, *J. Waterhouse.*—17*th January*, 1881.—(*Not proceeded with.*) 2*d*.
This relates to means for adjusting each flat separately while in position on the carding engine, and consists of a semicircular slide with two excentric studs attached to the end of the flat. On the excentric of this stud is placed a sleeve with notches in one end which are driven into a plate screwed to the end of the flat. On the first tube is placed a second tube acting as an antifriction roller.

216. TRACTION OR ROAD ENGINES, *J. F. Dyson.*—17*th January*, 1881. 4*d*.
The object is to obtain more grip on the hind wheels B of the engine, and it consists in forming the part A of the frame hollow so as to constitute a wagon,

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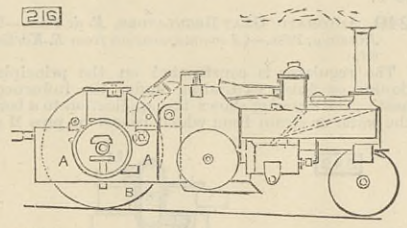

in which the stone or other material to be removed is placed, and the weight of which bears on the wheels B so as to prevent them slipping.

217. COLLECTING AND SEPARATING THE CINDERS AND ASHES FROM FIREGRATES, *T. H. Williams.*—17*th January*, 1881. 6*d*.
A metal vessel fits the space beneath the grate, and within it fits a second vessel, the bottom of which is a grating, through which the ashes can fall, the cinders being retained on the bars of the grating.

219. MACHINERY FOR DIGGING LAND, *W. E. Crossby.*—17*th January*, 1881.—(*Not proceeded with.*) 4*d*.
This consists of a portable or traction engine combined with dig g ng tools, which move up and down in guides, and are easily replaceable.

220. PRODUCTION OF COLD FOR MAKING ICE, &c., *J. H. Johnson.*—18*th January*, 1881.—(*A communication from A. J. Rossi and L. F. Beckwith.*) 6*d*.
The particular and distinct features of this invention are that the absorbent is non-volatile, and not capable of vaporising under a limited vacuum produced mechanically by an aspiration and compression pump, and the absorbed material volatilises alone under the

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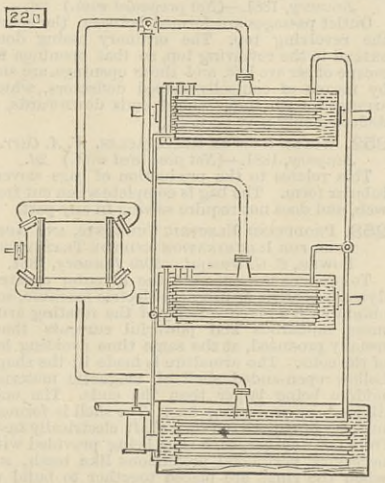

vacuum, producing a lowering of temperature, and is again liquefied by being re-absorbed in the non-volatile material, and that a special mechanical contrivance, such as a double refrigerator, is used to effect the absorption of the vapours of the volatile absorbed material, so as to re-constitute the saturated liquid. Excessive pressure in liquefying the gaseous agent is avoided. The drawing represents a sectional elevation of an apparatus for carrying out the process.

221. APPARATUS FOR THE MANUFACTURE OF VINEGAR, *H. H. Lake.*—18*th January*, 1881.—(*A communication from O. F. Boomer and H. R. Randal.*) 6*d*.
This consists in an apparatus for the manufacture of vinegar, of one or more series of shelves covered with cloth or other fibrous material, and arranged one above another in such a manner that the liquid will fall from one shelf, after traversing it and its covering, upon the shelf next below, and traverse it and its covering in a like manner.

222. PURIFYING HYDROCHLORIC ACID, &c., *W. Weldon and W. G. Strype.*—18*th January*, 1881. 4*d*.
The main object is to economise limestone, acid and manganese in the manufacture of chlorine, but a part of the invention is applicable also to the purification of hydrochloric acid, to whatever purpose the hydrochloric acid may be afterwards applied, and it consists in removing sulphuric acid from commercial hydrochloric acid by means of chloride of calcium; and Secondly, combining with the employment in the manufacture of chlorine of hydrochloric acid, from which sulphuric acid has been so removed, the neutralisation of such hydrochloric acid by an excess of what is known as Weldon mud.

226. APPLIANCES TO BE ATTACHED TO THE SHOES OR PLATES OF ANIMALS, &c., *H. Bland.*—18*th January*, 1881. 6*d*.
This consists in the employment of any convenient number of removable steel spikes, commonly known as "frost roughs" or "cogs," of peculiar construction, which roughs are inserted into smooth round holes in the shoe or plate.

224. POWER HAMMERS, &c., *J. F. M. Pollock and T. Beeley.*—18*th January*, 1881. 6*d*.
This refers, First, to an improved power hammer, which may be actuated by suitable fluid, such, for example, as steam or compressed air; Secondly, the application and use, in combination with a power hammer of an elastic anvil for carrying a set or chisel in such manner that the blow can be transmitted through the said anvil as the blow of a hand hammer is transmitted through the chisel or caulking tool in the hand of a workman; Thirdly, the combination of

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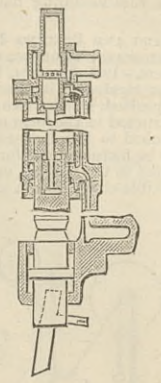

a power hammer and anvil with a suitable frame (fixed or portable) to render it available for general workshop purposes. The drawing is a longitudinal section of the improved power hammer with elastic anvil, in which, by a set screw or otherwise, can be fixed a set or chisel.

225. IMPROVEMENTS IN ELECTRIC LAMPS, AND IN THE MEANS OF TURNING ON OR OFF THE ELECTRIC CURRENTS, &c., *St. G. L. Fox.*—18*th January*, 1881. 6*d*.
The latest form of lamp is seen in the first figure. The contacts between the carbon filament and the platinum holder are made with Indian or Chinese ink, and this is the first claim. The method of carbonising the thread, string, or vegetable fibre used, is claimed. A

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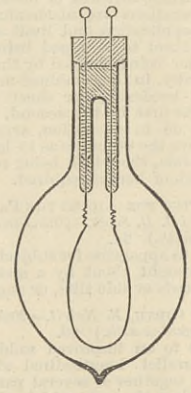
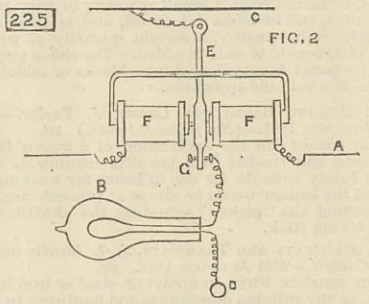


grooved graphite cylinder, into which a strip of serrated steel has been placed, so that the serrations are just above the normal level, is taken, the thread wound on it, and intensely heated in an hermetically closed crucible. The thread contracts, and is cut by

225 FIG. 2



the steel into equal lengths. The threads thus obtained are rendered incandescent by means of an electric current, and their resistance lowered to the point required. A thickening of the ends of the wire is obtained by electro-deposition of carbon, thick ends being required for good contacts. One form of the apparatus for current operations is shown in Fig. 2. It consists of a permanent magnet E and an electro-magnet F. The coils of F form part of the circuit of the line wire A. On sending a current through the line wire the movement of the magnet at every lamp in the series is caused, by coming in contact with peg G or moving from it, to turn on or off the current.

227. CHESTS, TRAVELLING BOXES, &c., *J. H. Johnson.*—18*th January*, 1881.—(*A communication from J. B. Geneste.*)—(*Not proceeded with.*) 2*d*.
This consists in constructing the chests, &c., of a number of separate parts, which are capable of being connected together or taken apart with great facility and celerity.

228. CLEANSING WINE AND OTHER CASKS, &c., *M. W. Proudlock and R. Weatherburn.*—18*th January*, 1881. 6*d*.
This consists in the employment of a sand blast or a blast of a chemical or other material, or a combination or combinations of the above materials, which is directed into the interior of the casks or other vessels to be cleaned.

230. APPLIANCES FOR PROTECTING FOOT COVERINGS AND CLOGS, *P. Martin and T. H. Sneyd.*—19*th January*, 1881. 6*d*.
This consists in forming the "iron" with one or more projections or wearing plates on each of the inside edges thereof at that part or the parts where the greatest wear takes place, viz., at the "tread" of the sole and heel, the projections or plates and the rim of the iron (forming the improved "iron") being in one piece, and being made of malleable cast iron, steel, or any other suitable material, the improved "iron" being secured to the sole in any ordinary manner.

231. PERAMBULATORS, &c., *J. Watterworth.*—19*th January*, 1881.—(*Not proceeded with.*) 2*d*.
This consists partly in making the vehicle in the general form of a hansom cab body.

232. WHEELS FOR VEHICLES, *A. M. Clark.*—19*th January*, 1881.—(*A communication from A. Blasco y Fabregas.*) 6*d*.
The felly is composed of laminæ of wood tied together by screws, and on the metal tire or iron band that confines such felly are placed strips of leather which constitute a layer of elastic material. These several strips or pieces of leather are separated at the ends, and on them are laid segmental steel plates which form the outer peripheral portion of the wheel, and take the wear incident to use.

233. CLOSING OR STOPPERING BOTTLES, &c., *R. Lanham.*—19*th January*, 1881.—(*Not proceeded with.*) 2*d*.
The stoppering consists of a vertical piece of metal or

other material, having at its lower end a loop through which passes a wire or other ligature fastening or tying it beneath the collar. To the upper end of this piece, which is level with the top or mouth of the bottle, is hinged or otherwise attached a plate, to the underside of which is secured the piece of cork, wood, or any elastic, semi-elastic or other material. Attached to or forming part of this plate is a spring catch, which, when the stopper is fully inserted, will catch under the collar, and keep the stopper plate tight down upon the mouth of the bottle, or in lieu of using a spring catch, this fastening may be hinged to the locking plate.

234. Preparing and Feeding Fibrous Substances on to Scribbling, Carding, or other Machines, *F. C. Fawcett.*—19*th January*, 1881. 6*d.*

A rectangular receiver A is provided, into which the material is deposited, having two of its vertical sides B and C constructed in the form of a lattice or flexible sheet and attached to the bottom thereof. The other two sides may be fixtures, and formed of solid pieces and not attached to the bottom, or they may also be of a lattice or flexible construction and attached thereto.

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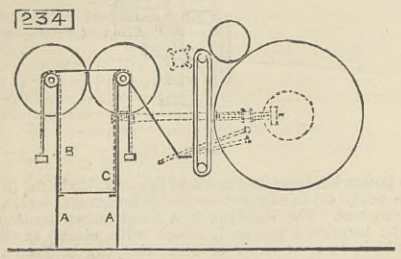

The lattice or flexible sides of the receiver are caused to rise with the bottom, this being effected by means of gearing, whereby they, after rising a suitable distance, fall away from the material, leaving it projecting, so that it may be taken off by rakes or carding to complete the preparing and feeding operations.

236. Blacking or Colouring the Borders of Paper and Envelopes, &c., *A. C. Henderson.*—20*th January*, 1881.—(*A communication from A. Duret.*) 6*d.*

The characteristic features of novelty are, First, all the several operations are mechanically performed; Secondly, the application and limit of colour on the border of the sheet to be edged being regulated, the width of border being limited by the sheet which is above it; Thirdly, in the combined mechanism for distributing and bordering the sheets one by one by superposing the first by the second, the latter by the third, and so on in succession, arranging them in stages one above the other, so as to leave two sides of each sheet visible, the width being regulated according to the depth of border required.

237. Apparatus for Aiding the Packing of Sugar, &c., *A. and J. D. Scott.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to apparatus for subjecting the packages to shaking, brought about by a series of falls, horizontal movements or side tilts, or angular drops.

238. Saddle Girth, *E. Noirit.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to an improved saddle girth formed chiefly of parallel longitudinal strips of textile material, held together at several parts by transverse pieces of leather through which the textile strips pass.

239. Compressing and Preserving Ground Coffee, *C. Pieper.*—20*th January*, 1881.—(*A communication from Captain A. von Hofmann.*) 6*d.*

The coffee after having been roasted, and while yet warm, is mixed with a small quantity of very pure, inodorous, and tasteless fat or oil, and is thereupon ground. Subsequently, a certain quantity of potash or of bicarbonate of soda is added. The coffee powder thus prepared is compressed into blocks or tablets by means of a suitable apparatus.

240. Picking Bands for Looms, *J. Taylor.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in the application of a woven fabric prepared and treated in a peculiar manner so as to form bands suitable for use in looms for weaving, in lieu of the leather bands or straps at present used for connecting the "picker" actuating the shuttle with the picking stick.

241. Railways and Tramways, *J. G. Hardie and T. Kendall.*—20*th January*, 1881. 6*d.*

This consists, First, in applying steel or iron insertions, of any suitable description and hardness, in both point and crossing plates, so as to be easily removed when worn out without disturbing the foundations; Secondly, in fixing the steel rail of the form described in patent No. 1455, dated 12th April, 1879, to timber sleepers, fixing such sleeper and timber on to a metal chair of suitable form and length; also jointing and fixing them on this chair.

243. Discharging Apparatus for Water-closets and similar Cisterns, &c., *J. Shanks.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This comprises an improved construction of float and other cocks for supplying water.

244. Heating Water, &c., *J. McAllister.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

A number of tubes are employed, through which the water or other fluid is passed, whilst the heating agent acts on the outside of them.

245. Improvements in Apparatus for Lighting Gas, *C. L. Clarke and J. Leigh.*—22*nd January*, 1881. 4*d.*

This invention refers to improvements on the electric lamp for gas lighting, patented on the 1st June, 1880, No. 2229. The improvement consists in the construction of the battery and the method of preparing the wire of the induction coil. The battery is formed of thin silver foil, coated with dry powdered chloride of silver, kept in place by being wrapped in blotting paper. Zinc plates are then laid on the sides of the plate thus formed. The whole is then wrapped in blotting paper and strapped by two or three elastic bands. After being pressed it is placed in a cell containing a solution of chloride of zinc. To give greater conductivity to the iron wire of the induction coils, it is taken in the tank and wound on to a tubular iron bobbin. Two or three layers of coarser wire are then wound above it for protection. It is then placed in a furnace, raised to nearly welding heat, then withdrawn and immediately plunged into a vessel containing powdered charcoal, and covered over so as to entirely exclude the atmosphere, being afterwards allowed to gradually cool. After this it is saturated with paraffine, wound off the bobbin, and formed into a coil.

246. Cask Stopper, *L. A. Groth.*—20*th January*, 1881.—(*A communication from E. O. C. Atarkgraf.*)—(*Not proceeded with.*) 2*d.*

A conical ring with a six-cornered flange is placed in the bung-hole, and secured therein by screws. This ring is furnished on its inner side with a rim, which is notched in two or more places. The plug or stopper is fastened to the ring, and is furnished with an eye for the reception of a small chain. The face of the rim, which is turned towards the inside of the cask, is shaped into inclined planes rising slightly upwards. The flange of the said plug or stopper is contained in the conical ring, and between the flange and the rim is placed an india-rubber ring. The cylindrical part of the plug or stopper is furnished with two projections, which have on their sides next the flange inclined planes corresponding to those on the rim.

248. Apparatus for Heating by Hot Water and Steam, *E. de Pass.*—(*A communication from E. Korting.*) 6*d.*

The drawing shows the method or system applied, by way of example, to an apartment to be heated. A is the boiler, which may be of any construction; B the steam pipe; C the surface heater or primary heating machine, in which the water surrounding the steam conductor C gets heated by the steam passing

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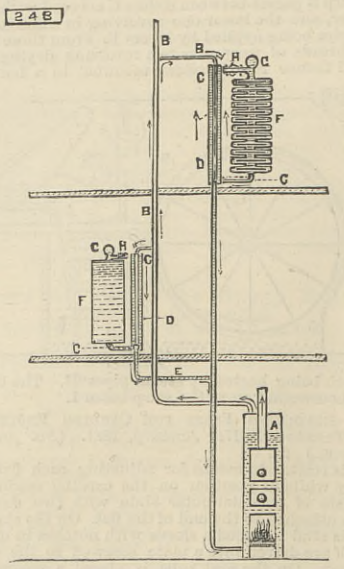

through the conductor; F the hot water stove or secondary heater, in which the water thus heated acts upon the surrounding air; E the return pipe for the condensed water to the water space in the boiler; G an expansion vessel for the heated water; and H a contrivance for regulating the flow of water from C to F.

249. Automatic Heat Regulators, *E. de Pass.*—20*th January*, 1881.—(*A communication from E. Körting.*) 6*d.*

The regulator is constructed on the principle of liquids or fluids expanding under the influence of heat. The drawing shows the application to a boiler, the water or steam from which passes by pipe M and

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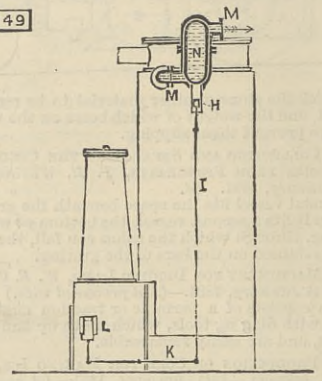

heats the vessel N containing a gas or liquid, the expansion of which acts on piston H, and through levers I and K moves the slide valve L so as to open or close the supply of air to the fire-grate of the furnace.

251. Archimedian Ventilators, *G. Whitehead.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

Outlet passages are formed between the screw and the revolving top. The ordinary casing does not extend to the revolving top, so that openings for the escape of air are left, and these openings are shielded by means of conically-shaped deflectors, which are arranged with their widest ends downwards, or one deflector only may be used.

252. Woven Bags or Receptacles, *W. A. Carr.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to the production of bags woven in a tubular form. The bag is complete when cut from the web, and does not require sewing in any part.

253. Producing Electric Currents, and Applying them for Illumination and for Transmission of Power, *C. G. Gumpel.*—20*th January*, 1881. 10*d.*

To produce the currents the inventor constructs a dynamo-electric or magneto-electric machine, so as to obtain with a given velocity of the rotating armature more numerous and powerful currents than are usually produced, at the same time avoiding heating of the coils. The armature is made in the shape of a hollow open-ended shell of magnetic material, the middle being larger than the ends. The ends are divided by projecting fins. The shell is formed of a number of rings fixed on a shaft electrically insulated from one another, each ring being provided with the necessary peripheral projections like teeth, so that when the rings are placed together to build up the shell, these projections corresponding to each other form the ribs or magnetic extension pieces. These ribs divide the surface of the armature into sections for the reception of the insulated conducting wires, the method of winding which is then described. The inventor also describes his mode of applying the current generated by his machines to the steering of ships.

254. Self-feeding and Smoke-consuming Furnaces, &c., *L. W. Sutcliffe.*—20*th January*, 1881. 6*d.*

The furnace consists of an iron stand for holding two inclined sets of fire-bars, two dead plates, a

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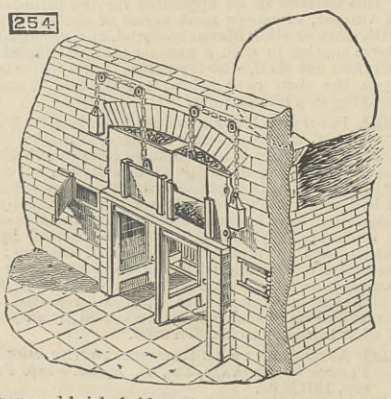

hopper, and brick bridges, two or more ventilators or heaters for supplying through each either hot or cold air, said hot air being raised by the arrangement of heated air passages or pipes, through which the air is caused to pass a sufficient distance until it meets the flames at a high temperature when the combustion takes place, and the hydrocarbons being decomposed, thus the smoke is destroyed, and increased heat given in place thereof.

255. Apparatus for Driving Potters' Wheels, &c., *T. Willett.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This consists of a small rotary steam engine acting directly upon the spindle of the potters' wheel, lathe, jigger, or other machine requiring to be driven.

256. Roller Bearings for Axles, &c., *W. R. Lake.*—20*th January*, 1881.—(*A communication from J. E. Maynadier.*) 6*d.*

A is the outer journal-box, within which is fitted a cylindrical box C divided into six sections, which, when the box C does not revolve, can be successively brought into bearing as the previous one wears. The anti-friction rollers E are turned down at the middle of

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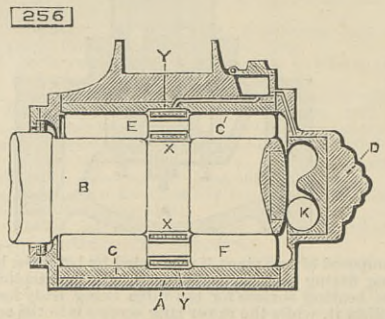

their length, and between them in the reduced parts are placed separate rollers of a smaller diameter enclosed by two rings X and Y. The cap D fastened to the end of the journal-box is formed with a circular groove in which the ball K is placed, and serves to prevent endwise motion of the axle B.

257. Fastenings for Bracelets, Necklets, &c., *O. Vaughton.*—20*th January*, 1881. 6*d.*

This relates to a fastening, consisting essentially of one or more single springs, or of a double spring, each single spring or the arms of each double spring having a hooked bevelled head and a pusher or releaser, the hooked spring or springs being attached to one end or part of the article to be fastened, and taking into and engaging with the edge of an opening, or openings, in the other end or part of the article to be fastened, and being released from the said opening or openings.

258. Machines for Counting, Registering, and Numbering, *G. Heaton.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

A series of discs are employed equal in number to the "places" of figures which the machine is intended to count and register. Each of these discs carries on its periphery the series of numerals one to nine both inclusive, each series being preceded by the cypher symbol 0. Each disc has a single notch in its edge between the cypher and the numeral 1. The discs are placed and turn freely upon a common axis. By means of arms or levers and toothed gearing these discs are caused to revolve, each in its turn.

259. Tricycles, &c., *G. Illston.*—20*th January*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in improvements in those parts by which the motion of the crank shaft is transmitted to one or both of the travelling wheels.

261. Chimney Tops and Exit Ventilators, *W. Jones.*—21*st January*, 1881.—(*Not proceeded with.*) 2*d.*

This consists in protecting the mouth of an inner shaft with an outer shaft of nearly the same length—say 3ft. to 5ft.—and say 5in. greater in diameter fixed, say, two-thirds of its length below the level of the mouth of the inner shaft about one-third above it. A double cone is also added about 1in. in diameter greater than the mouth of the inner shaft, and accurately fixed in the centre of the outer shaft, with the lower point placed at the centre of the inner shaft.

262. Clasps or Fastenings for Chains, &c., *T. and A. Osborn*—21*st January*, 1881.—(*Not proceeded with.*) 2*d.*

This consists of two parts, male and female, one of which is attached to each end of the article to be joined by a running or free dome and loop; the male part is formed of a solid plug split longitudinally to give a certain spring action, and furnished with a small nib or stud at the end; the female part consists of a tube with a bayonet slot cut in it, which slot also admits the nib on the male part when the plug is inserted in the tube, and by giving the parts a half turn they are securely locked together.

263. Knitting Machines, &c., *J. H. Smith.*—21*st January*, 1881.—(*Not proceeded with.*) 2*d.*

Each machine consists of two end standards and one or more intermediate standards when the length of the machine requires them; bearings are secured to these standards to carry the apparatus applied to the machine, and for one or more cam shafts carrying the cams necessary to give the required movements to the several parts. The frame portion of the machine consists of a movable needle bar connected to rocking levers operated by cams, a rising and falling presser bar or bars, and traversing thread carriers to each division, and sinkers depressed by slur cocks to divide the loops, the traverse of the carriers and slur cocks being effected in the well-known manner. Each sinker is provided with a spring to raise it after the passage of the slur cock.

264. Apparatus for Producing Light by Electric Currents and for Generating and Measuring such Currents, *A. Apps.*—21*st January*, 1881. 6*d.*

The First part of this patent refers to a dynamometer, which measures the force with which two platinum studs are brought into contact (the manner of contact being effected according to a former patent No. 177, 1867).

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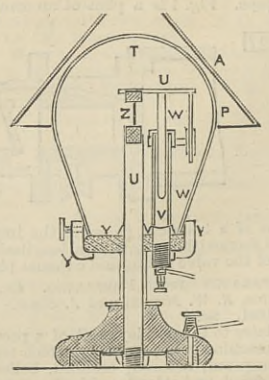

The dynamometer is constructed on the spring-balance principle, and is furnished with a gauge indicating in customary measurements of force the maximum power or variations of the currents. The Second portion refers to the multitubular form of magnet and of conductor contained within the inductor, which secures better insulation than heretofore. The Third part refers to apparatus for the production of light, which the inventor constructs as follows:—T is a closed vessel, U U^1 are two holders, the first being stationary, and the other movable. Rod W has a platinum stud screwed into the ends, by which contact is made with the mercury in tube V. A light guide rod moving in a suitable guide maintains the proper axis of the parts during the descent of the holder U^1 in relation to U; glass plate Y sustains the rods and fittings, and forms a convenient base. A ring holder Y^1, with lugs and suitable screws, fixes down the vessel to the glass base plate. Oxygen is consumed quickly on passing a current through Z, which may be of carbon or other conducting matter. A is a glass reflector.

265. Turning on Gas Jets and Igniting the Same, *J. Darling and R. Murdoch.*—21*st January*, 1881.—(*Not proceeded with.*) 2*d.*

The plug carries near to the gas jet a holder for holding the pellets or pieces of composition of phosphorus, by which the igniting flame is produced, there being two receptacles or recesses in the said holder for these pellets, the said receptacles being opposite each other in a diametrical line, which is transverse to the gas supply pipe when the gas is turned off, and which is brought coincident with the line of the gas pipe when the gas is turned on by rotating the tap through one-fourth of a rotation.

268. Velvets, &c., *H. Lister.*—21*st January*, 1881. 2*d.*

This consists, First, in the combination of mohair and silk when used in the raw state; Secondly, the combination of alpaca and silk when used in the raw state; Thirdly, the combination of camel hair and silk when used in the raw state.

269. Looms for Weaving Velvet, &c., *H. Lister.*—21*st January*, 1881.—(*Not proceeded with.*) 2*d.*

This relates to introducing the wires by self-acting mechanism.

270. Portable Heating Apparatus, *C. D. Abel.*—21*st January*, 1881.—(*A communication from A. Morel.*) 6*d.*

As a foot-warmer for a vehicle, the apparatus consists of a close rectangular water vessel rounded at the top, having an elliptical fire tube extending through it from end to end. The fuel burns in this tube, being supplied with air by a transverse tube at the middle of its length.

271. Automatic Syphon Tap, *H. J. Allison.*—21*st January*, 1881.—(*A communication from Messieurs Clairac, Millot, et Berger.*) 6*d.*

The interior of the key, which may be fixed or removable, or a safety key is perforated at its top with a vertical hole descending into the stem and turning off at right angles in a line parallel with and above the hole in the tap through which the liquid runs out. When the key is turned this hole is brought to coincide with a similar hole made in the thickness of the top of the tap, and continued horizontally as an air conduit to the extremity of the screw thread which penetrates to the interior of the barrel, at which point the conduit turns slightly upwards and opens outwards. The opening for the passage of liquid is below the air conduit, and runs from one extremity to the other of the tap, its outer end being either forked or preferably continued horizontally beyond the part bent downwards and through which the liquid escapes, the prolonged part being fitted with a screw plug, and serving to refill the barrel when empty without having either to remove the tap or use other means than a suitable funnel.

273. Knitting Machines, *J. Wetter.*—21*st January*, 1881.—(*A communication from J. Bufield.*)—(*Not proceeded with.*) 2*d.*

The mechanism consists essentially of an adjustable pattern plate operated by the motion of the machine, and connected by suitable mechanism to a series of cams arranged to operate sliding yarn carriers, each carrier directing to the needles a different coloured yarn, and operated by the cam mechanism referred to. The yarn from each carrier is knitted independently, and is held so that the needles, while knitting the yarn from one carrier, cannot interfere with the yarn held by the other.

276. Valves of Percussive Rock Drills, *J. H. Harrison.*—21*st January*, 1881. 6*d.*

This relates to the valve gear employed in controlling the admission and release of the working fluid; G is the drill cylinder, H the piston and rod to which the boring tool is attached. The valve V is made like a hollow beam or lever of the first order, and is the same length as the drill cylinder. The working fluid is admitted on its upper side through a hollow fulcrum T, which does not pass through the valve, but stops short of the metal forming the bottom. On the opposite side to the inlet, ports P are formed and correspond

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FIG. 1.

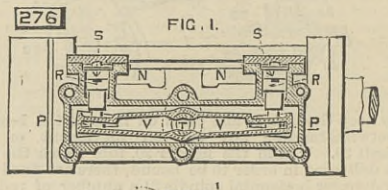
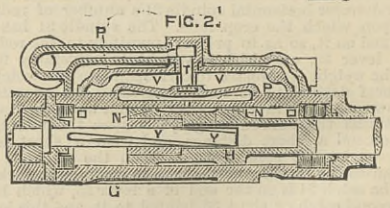


FIG. 2.



with ports in the cylinder. The vibration of the valve is effected by small pistons R on opposite ends of the valve, but at the same side and at right angles to its longitudinal axis, and moving freely in cylinders S. The admission and release of the working fluid to and from these valve pistons is controlled by the movement of the drill piston, which at suitable points Y in its stroke uncovers small passages N leading from the drill cylinder to the valve cylinder. The exhaust from the cylinders S passes through port N into the annular space between the double piston in the drill cylinder, thence through opening Q into the atmosphere.

277. Ore Separators, *R. H. Brandon.*—21*st January*, 1881.—(*A communication from E. B. Hastings, J. F. Holbrook, and E. L. Goddard.*) 6*d.*

This separating rocky or earthy substances from ores susceptible of being influenced by magnetic attractions, consists in spreading said ores and

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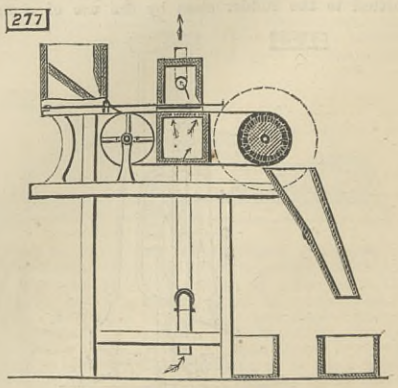


earthy substances over the surface of a moving wire cloth or other suitable porous apron, and while so moving lifting out the light particles by an upward air blast and carrying off said particles by an exhaust-

ing air current, and then subjecting the materials remaining upon the apron to the attraction of an electro-magnet.

278. MATCH FILLING MACHINES, *C. R. E. Bell.*—*22nd January*, 1881. 6*d*.

To the machine are adapted two counterweighted treadles, such treadles being connected respectively to the lower feeding roller and to the knife in such a manner that when one of the treadles is depressed the levers connecting it with the feed roller will be operated so as to pull forward the desired length of wax tapers to be cut off; the other treadle being now depressed, the knife, by means of a suitable arrangement of levers, is brought down so as to cut off the length of wax tapers brought forward, and the lengths cut off rest on the board in the usual manner. The frame is then lowered and a fresh board placed in position. The treadles being relieved from pressure are raised to their normal position by their counterweights ready for the next operation.

279. LOOMS, *J. Holding.*—*22nd January*, 1881.—(*Not proceeded with.*) 2*d*.

The shuttle guard is attached to the "cap bar" by means of steel springs, or other yielding attachments are employed which give way and permit the guard to easily approach the cap bar whenever the guard and the said bar are both inclined in the grasp of the operative, or at times when the guard comes into contact with any obstacle.

280. METALLIC ALLOY, *W. Koppel.*—*22nd January*, 1881.—(*Not proceeded with.*) 2*d*.

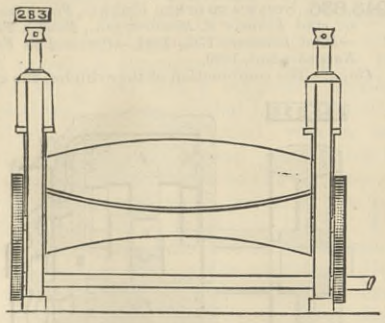
This relates to an alloy to be used for axles or shafts, and consists of spelter 18 to 20 parts, iron 10 parts, and copper 10 parts.

282. VELOCIPEDES, *E. R. Settle.*—*22nd January*, 1881. 6*d*.

This relates to an adjustable step for mounting the velocipede; Secondly, to a novel form of twin pedal rubber (one on each side of the crank pin), consisting of two rubber cylinders joined together, and through which two rods pass to prevent them turning round on the pins; and Thirdly, to an improved spring tail slide.

283. APPARATUS FOR SHAPING PLATES AND SHEETS OF METAL, *T. Turton and R. Roberts.*—*22nd January*, 1881. 6*d*.

Two concave shaped rolls are carried in bearings in the frames, placed in the same or nearly the same hori-



zontal plane, and a convex roller is placed over and above the centre line between the two concave rollers. The drawing shows a side elevation of the apparatus.

285. SIZING MACHINES, *H. Livesey, jun.*—*22nd January*, 1881. 6*d*.

This consists of machinery to regulate the drying of yarn upon cylinders with more regularity; positive driving to drag roller, and friction motion to drive the beam fitted with a clutch or catch-box with levers and fork for uncoupling (to avoid having to uncouple the friction plates when doffing the beam).

286. IMPROVEMENTS IN TELEPHONES, *F. H. F. Engel.*—*22nd January*, 1881.—(*A communication from J. H. Konigslieb.*) 4*d*.

The object of this invention is to increase the power of transmitting and receiving sounds by the telephone. Instead of making that part of the casing of a telephone which is below the diaphragm massive, a thin walled wooden box is placed beneath the diaphragm, and a second casing of wood is placed beneath, and some distance apart from this box, this casing forming a sounding-board. The magnet may be passed from below through the bottoms of both box and casing into the free space beneath the diaphragm, or it may be introduced into the sounding-board through the upright circumference sideways, and the ends of the magnet, which must in this case be bent at right angles, will be introduced through the bottom of the box into the free space between box and diaphragm. The sounding-board may have sound-holes in it.

287. STOVES, &c., *J. W. and B. E. Midgley.*—*22nd January*, 1881.—(*Not proceeded with.*) 2*d*.

The back of the stove is constructed of any suitable material, so as to be adjustable and pivotted at the bottom, close to the ribs preferably, and can be regulated to any nicety, so that the fire presents a large heating surface to the interior of the room with a much less quantity of fuel than ordinarily.

289. PRODUCTION OF BENZALDIACETATE, &c., *J. A. Dixon.*—*22nd January*, 1881.—(*A communication from Dr. K. Koenig and Meister, Lucius and Brüning.*) 4*d*.

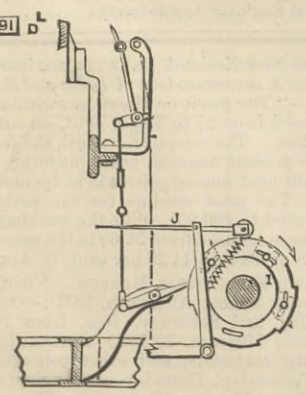
This consists of a process for producing cinnamic acid from benzal-chloride or benzal-diacetate, and for producing the chlor, brom, or nitro substitution compounds respectively, of cinnamic acid from the chlor, brom, or nitro substitution compounds respectively of benzal-chloride or of benzal-diacetate, and extracting the said acids in the form of their sodium salts.

290. SMELTING ZINC, *J. Binon and A. Grandfils.*—*22nd January*, 1881. 2*d*.

Zinc and the carbonaceous matter required for its reduction are mixed with sufficient lime or other cheap binding material to make the mixture cohere, and is then moulded into bricks of suitable size to feed the retort or muffle, in which the reduction is effected by heat in the usual way.

291. LOOMS FOR WEAVING CARPETS, &c., *W. Adam.*—*22nd January*, 1881. 6*d*.

This consists in slackening the weft thread on the



passage inwards of the weft inserting needle D by means of cam I and lever J, and allowing the means heretofore in use to tighten it at the proper times

292. BRUSHES, *J. Worrall, J. Lawrence, and J. Lea.*—*22nd January*, 1881. 6*d*.

A thin metal cylinder is provided to receive the tufts of bristle, wire, or fibres. This cylinder is mounted upon two, three, or more hubs of cast iron, which are keyed to the brush axle, and around the cylinder are arranged helically groups of open tubes of copper or other metal, into which have been inserted the tufts of bristle, wire, or fibre.

293. CREAMING MILK FOR PRESERVING THE SAME, &c., *F. W. Unterilp.*—*22nd January*, 1881.—(*A communication from C. Becker.*) 6*d*.

This consists in subjecting milk in a closed vessel to a temperature ranging between 120 deg. and 185 deg. Fah., and maintaining it at such heat for two hours, or thereabouts, the gases developed during such heating being allowed to escape, and access of air to the interior of the vessel being prevented.

294. TRANSMITTING MOTION, *A. M. Clark.*—*22nd January*, 1881.—(*A communication from S. Denis and A. Samper.*)—(*Not proceeded with.*) 6*d*.

This relates to the transmission of motion by means of bands, ropes, or chains, wound spirally on drums or surfaces receiving rotary motion.

296. GRASS-BOX FOR LAWN MOWERS, *C. D. Barrett.*—*22nd January*, 1881.—(*A communication from Messrs. Lloyd, Supplee, and Walton.*)—(*Not proceeded with.*) 2*d*.

The box is constructed of a rectangular-shaped frame of metal wire or the like, the top of the front of the frame projecting beyond the bottom; the bottom rods of this frame extend forward and are adapted to fit the back of the mower and to rest thereon, so as to keep the box from the ground, and the ends of the said rods are formed into eyes to fit over the projecting ends of the axle of the mower. Over the frame is stretched a covering of canvas or like fabric which forms the box properly so called, a hole being left at the top to allow of the cleaning out.

297. STAIR ROD EYES, *M. and M. M. Lenzberg.*—*22nd January*, 1881. 6*d*.

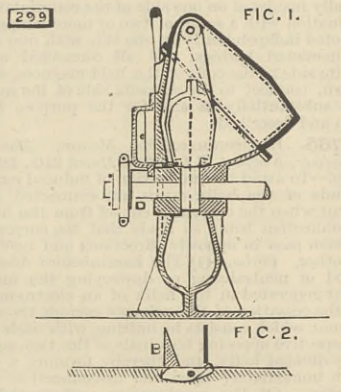
This relates to the manufacture and use of adjustable stair rod eyes to suit carpets of different thicknesses.

298. MAGNESIA, *C. Scheibler.*—*22nd January*, 1881. 4*d*.

This consists in the manufacture of magnesia or hydrate of magnesia from magnesiferous limestone, from magnesian limestone, or from calciferous magnesite, using a water solution of sugar or molasses.

299. ROTARY ENGINES, &c., *J. Matthews.*—*22nd January*, 1881. 10*d*.

This consists in the general combination of parts forming the improved rotary, steam, air, or gas engine, in which a piston, such as B, works in an annular chamber, the central part of the cylinder being filled by the boss, such as D, the abutment being formed by a hinged flap or shutter swinging in a plane transversely to the direction of motion of the



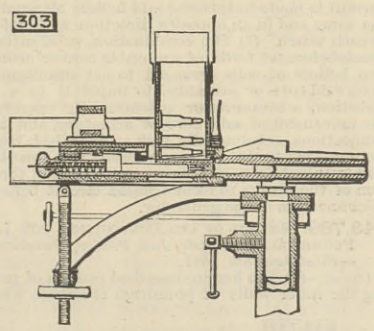
piston, and operated partly or wholly by the piston itself or from the engine shaft. Fig. 1 is a vertical longitudinal section; Fig. 2 shows a cam lever arranged to be acted on at one end by the piston B, so as to depress that end within a recess, thereby causing the other end to be pushed in the opposite direction, and thereby to impel the abutment flap so as to start its movement back into its chamber, and out of the way of the piston B.

301. PRODUCTION OF OIL FOR ILLUMINATING PURPOSES, &c., *J. H. Johnson.*—*22nd January*, 1881.—(*A communication from F. F. Rohart.*)—(*Not proceeded with.*) 2*d*.

This consists in submitting bitumen or other natural hydrocarbons, being either a natural product or obtained in any process of manufacture, to the combined action of an alkali or alkaline earth (by preference lime), and of heat in an alembic for distilling, the heat being maintained for several hours near the boiling point of the hydrocarbon under treatment before proceeding with the distillation.

303. MACHINE GUNS, *W. Tranter.*—*22nd January*, 1881. 8*d*.

The barrels and their breech chambers are mounted, together with the closing, loading, and discharging mechanism, upon a horizontal frame. This frame is capable of a side or horizontal motion upon an under support, the latter turning in and being supported by a pedestal on a base-plate or foundation. This under support permits the rough horizontal adjustment of



the barrels, and the upper frame by means of a worm and tangent wheel, permits of a fine or exact horizontal adjustment of the barrels. By means of a screw worked by a hand wheel at the rear of the upper frame, the pivotted barrels may be adjusted vertically. The drawing shows a longitudinal vertical section of the gun.

304. CARBON AND GRAPHITE, &c., *R. Werdermann.*—*22nd January*, 1881. 6*d*.

This relates to the manufacture of carbon by carbonising a mixture of sugar, wood pulp, cotton, hemp, flax, or the like, with oil, resin, tar, or other hydrocarbon.

305. GAS STOVES, *A. C. Henderson.*—*24th January*, 1881.—(*A communication from Messrs. André and Legrand.*) 6*d*.

This consists in adapting to the lower part of the stove an undulated or smooth cone in form of a parabola, permitting of the reflection of the light and heat given by the burning gas.

306. ELEVATORS FOR FLOUR MILLS, &c., *J. D. Gauldie and T. A. Marshall.*—*24th January*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to improvements in elevators in which an endless belt, fitted with buckets, is carried and worked by suitable apparatus.

307. APPARATUS FOR PREVENTING THE FREEZING OF WATER IN WATER PIPES, *J. Rule.*—*24th January*, 1881. 6*d*.

This consists in the application to ball-cock cistern supply appliances of an air supply valve to the ball-cock or adjacent part of the supply pipe, and of a stop cock and a draw-off outlet in connection with the supply pipe, so that the water standing in the supply pipe is drawn off therefrom by the closing of the supply of the opening of the draw-off outlet, the air valve or ballcock being thereby automatically opened, and air admitted to the interior of the pipe.

308. CORDS FOR BINDING FODDER, &c., *J. Wetter.*—*24th January*, 1881.—(*A communication from M. L. Rollier.*) 4*d*.

Each end of the wire or string is provided with a loop, one of which is permanently attached to a metallic connecting plate, while the other can be attached to or detached from a hook forming part of said plate, and situated at the side of the latter.

310. WIRE BRUSHES, *S. Abraham.*—*24th January*, 1881.—(*Provisional protection not allowed.*) 2*d*.

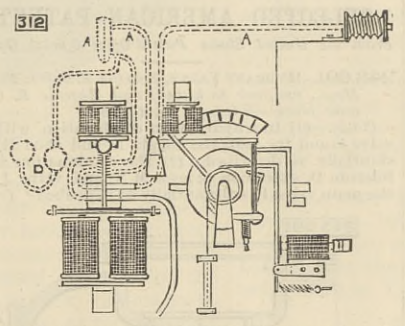
This consists in employing steel wire that will not corrode.

311. ORNAMENTING VARIOUS SURFACES, *H. E. Newton.* *24th January*, 1881.—(*A communication from E. A. Batonnier.*) 4*d*.

This consists in the use in combination of a veining paste and colouring matters applied by hand to the surfaces to be ornamented.

312. APPARATUS FOR TESTING AND INDICATING PRESENCE AND PERCENTAGE OF COMBUSTIBLE GASES IN AIR—ESPECIALLY APPLICABLE IN COAL MINES, *A. W. L. Reddie.*—*24th January*, 1881.—(*A communication from D. Monnier.*) 8*d*.

The apparatus consists of an exploding chamber A traversed by a platinum wire, with the exploding gases acting on a manometer D holding mercury. A has also two outlets, as shown, one connected to a pair of bellows worked by clockwork, the other receiving the air to be tested. The action is based on the decompo-



sition of marsh gas at high temperatures, such as that of a red or white hot platinum wire. The tubes connected to A are sealed and unsealed by means of electro-magnetic action, the various contacts being made by clockwork arrangement. The bellows periodically take in air. The platinum is twice heated for a known period. The resulting decomposition causes changes in the height of the mercury, which, by means of a number of contacts, are registered.

314. GYMNASTIC APPARATUS WORKED BY THE MUSCULAR STRENGTH OF THE PATIENT, *G. Zander.*—*24th January*, 1881. 6*d*.

This consists in the use, for exercising the muscles and producing mechanical effects on the human frame, of apparatus to be worked or operated by the muscles of the person using it, constructed in such way that the resistance opposed by the apparatus to the muscular force in the various stages of movement is modified according to the mechanical principles of the lever.

315. ROOFING TILES, *R. C. Robinson.*—*24th January*, 1881.—(*Not proceeded with.*) 2*d*.

The clay is expressed through a die in the ordinary manner, the formation of the nib and head of the tile being effected by placing opposite the mouth of the die a hollow stop, which also answers as a mould into which the clay as it exudes from the die is pressed. The mould or stop is provided with a suitably shaped recess corresponding with the form of the nib to be produced.

316. GYMNASTIC APPARATUS WORKED BY MACHINE POWER, *G. Zander.*—*24th January*, 1881. 8*d*.

This relates to gymnastic apparatus which have for object to produce various mechanical effects on the human body, such as extensions, shakings, choppings, rubbings, kneadings, rolling, &c.

317. BRAKES FOR RAILWAY CARRIAGES, &c., *J. A. Steward.*—*24th January*, 1881. 6*d*.

The brakes are connected with weighted or spring levers, which, when at liberty to act, withdraw the brake blocks from the carriage wheels. When the said levers are raised they cause the brake blocks to press upon the wheels, and thereby bring the carriage to rest. The raising of the said levers is effected by a chain or cord wound upon a drum.

324. CARDS, *C. M. Sombart.*—*25th January*, 1881.—(*A communication from P. Leclerc.*) 6*d*.

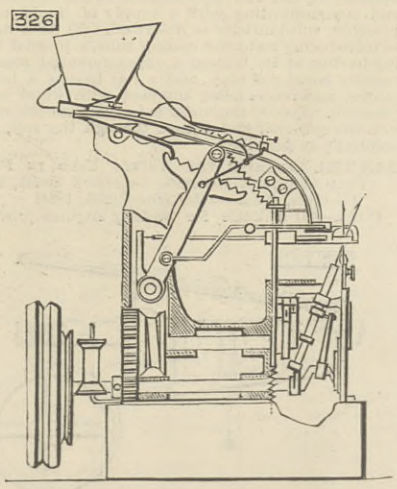
This consists in cards, the lateral faces of which run out in a concave line from the large back into the edge, and terminating in a very long point.

325. BRASS HINGES, *C. H. and F. W. Brampton.*—*25th January*, 1881. 6*d*.

This consists in the manufacture of hinges from plate metal in two or more thicknesses, the various thicknesses being fastened together by sheets of fusible metal, or by soldering, or by brazing.

326. SEWING MACHINES, &c., *R. H. Brandon.*—*25th January*, 1881.—(*A communication from J. H. Morley.*)—(*Complete.*) 10*d*.

This consists in mechanism for automatically sewing shank buttons on to fabrics, and in means for carrying



out said operation in sewing buttons on to shoes and other articles, and the further object of the invention is to form a double-threaded transverse stitch on the top side of the material being sewed upon transversely to the direction of feed, and on the reverse side of the material to parallel lines of stitches at right angles to the first-named ones, to make alternately long and short stitches, and to so feed buttons to be sewed by the said machines as to present them at the proper time and in the proper place to be operated upon. The drawing shows a front elevation of the machine with the take-up and the tension removed.

329. PREPARATION OF CARBONIC ACID AND AERATED WATERS, *J. Williamson.*—*25th January*, 1881. 2*d*.

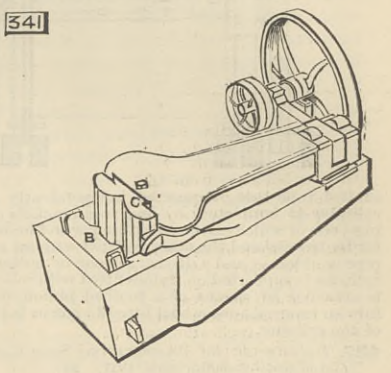
This consists in the use for the production of carbonic acid gas and in the manufacture of aërated water of bisulphate or supersulphate of soda and bicarbonate of soda.

330. ROUGHING APPLIANCE FOR HORSESHOES, *W. Bishop.*—*25th January*, 1881. 6*d*.

This consists of a strip of metal, which extends across the front arch of the shoe, and has near its ends projecting sharp studs, which operate as ordinary roughing studs.

341. ROCK AND ORE CRUSHERS AND PULVERISERS.—*26th January*, 1881.—*J. T. King.*—(*A communication from C. Forster.*) 8*d*.

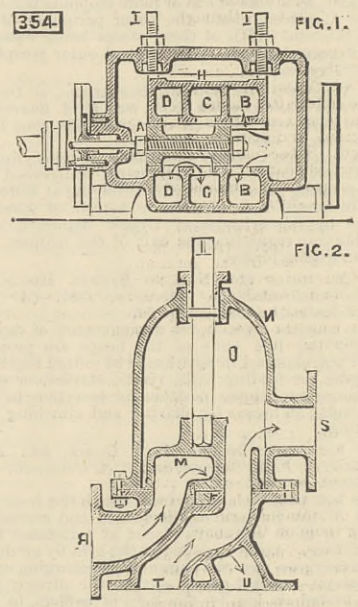
This relates to machines with a jaw which has a lateral vibration or crushing and grinding motion across the face of the fixed jaw or die, and it consists in the combination of a fixed corrugated die B and a laterally movable corrugated die C, both



being formed with a series of lips extending out from the surface, the lips of one die fitting between those of the other, and both dies having a series of angles extending longitudinally across their faces. The fixed die has its base concave, and the movable die has its base convex.

354. PUMPING ENGINES, *M. Silvester.*—*26th January*, 1881. 8*d*.

A double-faced valve A, Fig. 1, works between two valve faces, in each of which are three ports B, C, and D, C communicating with outlet B, with one end of the cylinder, and D with the other end. The top valve face H is adjustable to take up any wear by means of screws I, and is secured by other screws. The valve is exposed to pressure on its upper and lower and on both end surfaces. The lower valve face



may also be made removable. Fig. 2 shows an arrangement for reversing the delivery and suction ports of a pump by means of a single valve. The case N has four apertures R, S, T, U, the first connected to the suction pipes, the second to the delivery pipes, the third to the pump suction inlet, and the last to the pump delivery outlet. M is the reversible valve operated by the spindle P and situated within air vesse O.

355. TREATING RAGS AND WASTE FABRICS, &c., *C. W. Smith.*—*26th January*, 1881. 4*d*.

This consists in subjecting the waste fabrics to the action of steam of a pressure of not less than about 75 lb. on the square inch, either alone or in conjunction with sulphide of sodium.

373. SHIPS' SLEEPING BERTHS, *W. R. Lake.*—*27th January*, 1881.—(*A communication from the Brunswick Berth Company, Incorporated.*) 6*d*.

This relates to improvements in ships' berths of that class commonly called self-levelling berths, in which the berth is supported at each end on a trunnion, each of which is suspended, the object being to prevent the berth from being raised at the head or foot or tipped by the motion of the vessel.

374. APPARATUS FOR HATCHING, RULING, AND DRAWING ON STONE, &c., *W. L. Wise.*—*27th January*, 1881.—(*A communication from Messrs. F. Martini and Co.*) 6*d*.

This relates, First, to means for effecting the feed or intermittent sideways motion of the marking instrument; Secondly, to means whereby the amount of the feed may be automatically increased or diminished, so that lines may be drawn at gradually increasing or diminishing distances apart; Thirdly, to means for effecting the ruling or drawing of undulating lines; Fourthly, to the construction and operation of the slide and holder that carries the marking instrument.

375. PREPARATION OF BANKERS' CHEQUES, &c., *A. Dupré and O. Helmer.*—*27th January*, 1881. 4*d*.

This consists in the manufacture of bankers' cheques, &c., of the use of sulphide of zinc or other metallic sulphide or sulphides insoluble in water, but soluble in or acted upon by dilute or weak acid in admixture with carbonate of lead or other salt or salts of a heavy metal or metals, in such manner that if weak acid, or alkali, or cyanide of an alkali, be applied to alter such a cheque or other document, the said mixture being acted upon by such weak acid, alkali, or cyanide of an alkali, will form in or on the said cheque or other document a dark stain or stains.

390. RESPIRATORS, *E. Rizzi and A. A. Berthier.*—*28th January*, 1881. 6*d*.

The respirator is composed of two flat, or nearly flat, sides, with a rim at one end and with a perforated or gauze plate, either in piece with the sides or attached to them, at the other. The rim is at the

open end, and is shaped to fit the inner portions of the lips of the wearer, the flat portions being held between the lips with the perforated or gauze end slightly projecting therefrom.

409. MACHINE FOR DRYING COFFEE, CORN, &c., *J. Gordon.*—31*st January*, 1881.—(*A communication from J. Stewart.*) 6*d.*

This consists of a rotating cylinder containing a number of radial divisions, in which are placed a series of galvanised wove wire shelves, in such a manner as to leave a uniform opening between the shelves and the radial partitions. The said cylinder is provided with a central movable half tube or pipe fitted with a feeding and discharging screw, this

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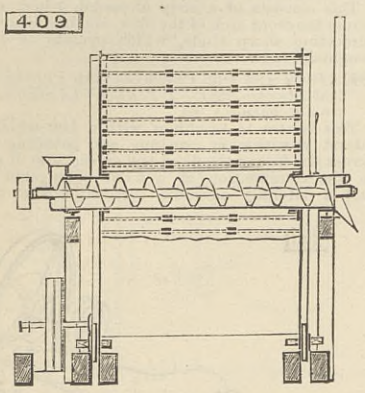

central tube being supported independently of the cylinder at both ends by cast iron brackets or bearings, one of which carries a feed hopper and branch pipe for heated air, and the other is fitted with an exhaust pipe or chimney and a discharge door or outlet. The cylinder is supported on frames fitted with rollers, and is actuated by means of a toothed pinion working into an internal spur wheel fitted to one or both ends of the cylinder.

437. DECORATING OR ILLUSTRATING SOAP CAKES, *P. Chapelain.*—2*nd February*, 1881. 2*d.*

This consists in ornamenting soap cakes by decorating them with either drawings, prints, engravings, or photographs.

449. VALVES, *R. Schram.*—2*nd February*, 1881.—(*A communication from E. Schenson.*) 6*d.*

This relates to means for overcoming the suction in valves, and it consists in making the aperture for the escaping fluid equal to the inner periphery of the

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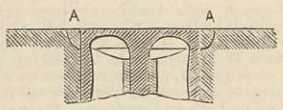

valve seat, by means of one or more stopping pieces or guides A, placed round the outer periphery of the valve, the total width of these pieces being equal to the difference between the inner and outer periphery of the valve seat.

459. MACHINES FOR SOWING, DEPOSITING, OR DISTRIBUTING MANURE OVER LAND, &c., *H. A. Bonneville.* 3*rd February*, 1881.—(*A communication from L. A. Conteau.*) 6*d.*

This machine consists essentially of two cylinders of different diameters provided with transversal and corresponding grooves and ribs revolving at different rates of speed, of a hopper, the bottom of which is formed by the cylinder of largest diameter, of a movable trap regulating the exit of the manure, and of disengaging blades.

489. MACHINES FOR NAILING BARREL HOOPS, *W. Morgan-Brown.*—5*th February*, 1881.—(*A communication from E. Cole.*) 6*d.*

This consists in a novel arrangement of devices whereby the free ends of the hoops are properly lapped and clamped in position to be united together; in means for feeding nails, rivets, staples, or other fastenings into proper position for insertion in said hoop ends; in means for driving and clinching said fastenings.

509. KILNS FOR DRYING MALT, GRAIN, &c., *A. S. Tomkins, F. M. Courage, and F. A. Cracknall.*—7*th February*, 1881. 6*d.*

The hot plate is a case into which the heat and fumes of the furnace are discharged and carried off by one or more chimneys placed at a distance from the furnace. Air is supplied to the kiln by air ducts, which may pass near the chimneys, discharging under the ash-pit and hot-plate, so that the already partially heated air has, by the help of bafflers, to pass under, over, and through hot plates before reaching the kiln.

618. OBTAINING AND APPLYING MOTIVE POWER TO VELOCIPEDES, &c., *W. H. J. Grout.*—14*th February*, 1881. 6*d.*

This relates to the method of obtaining and applying motive power to velocipedes by the use of differential bevel wheels, connected or geared together with movable bevel pinions, so that the speed may be decreased and proportionately greater propelling power obtained, or *vice versâ*, and without stoppage of the machine.

717. SELF-ACTING FASTENER FOR DOORS, WINDOW SASHES AND FRAMES, *J. Woodward.*—19*th February*, 1881. 6*d.*

This relates to the construction of spherical ball latches. For mortice locks on one end of the bolt is fixed a brass cup corresponding in its interior with a section of the circumference of the sphere or ball which seats itself in the cup. In the fore-end is made a seat corresponding with the sectional circumference of the sphere, so as to prevent its escape from the cup, thereby securing the sphere in its true position for action and re-action when the sash, door, or frame is opened or closed, either by the turning of the knob or handle or by pressure upon the sash, door, or frame when required to be opened or closed. The drawing is a plan of a two-lever mortice lock with followers.

728. MANUFACTURING MAGNESIA, &c., *C. Pieper.*—19*th February*, 1881.—(*A communication from M. Sprenger.*) 4*d.*

This consists in the method of producing magnesia and sulphate of potassium or of sodium from sulphate of magnesium, kiserite, schoenite, or kainite for one part, and from chloride of potassium, chloride of sodium, or carnallite for the other part, by mixing one or more of the substances of the first part with one or more of the substances of the second part, in such proportion that one chemical equivalent of sulphate of magnesia will be brought together with two equivalents of chloride of potassium or of sodium (or of both chlorides combined) by heating such mixture in a pulverised state to a dark red heat, and by exposing it at the same time to the action of steam.

760. IMPROVEMENTS IN TELEPHONES, *E. W. Anderson.*—23*rd February*, 1881.—(*A communication from J. Goodman.*) 6*d.*

The inventor connects the diaphragm to the magnet by flexible connections and elastic devices, and also by inflexible connections without the latter. The figure refers to the former. D represents the magnets, which are fastened at intervals by one end to the post H, located near the end of the helices C. In this construction two flattened helices are employed, their long sides parallel with each other, one being a left and the other a right-hand helix. These are designed to affect the magnets between them in the same manner that a single coil would. The ends of the magnets opposite H are free to move. B is the diaphragm, A ear-piece, and E a cord in connection extending from B to spring F. E is connected in its

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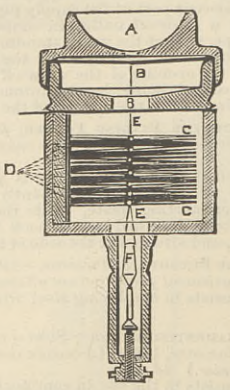

course to the middle portions of the magnets, which are therefore held in tension between B and F, thus holding them parallel to the wires of coils C. This tension may be regulated by screw G. If the instrument is applied to the ear and the circuit suddenly closed by metallic connection, the current in the coil will overcome the tension of the spring, and the points of the magnets will be deflected, and this movement being propagated by the cord E, the diaphragm will be effected and give out a sharp click sound. Another arrangement is to make the magnets themselves elastic or flexible, and so dispense with the spring.

SELECTED AMERICAN PATENTS.

From the United States Patent Office Official Gazette.

243,691. HYDRANT VALVE, *Zebulon E. Coffin, Newton, Mass., assignor to himself and Eugenie E. Coffin, same place.*—*Filed April* 19*th*, 1881.

Claim.—(1) In a hydrant, in combination with the valve E and its seat, the toggle A and shoe H, substantially as described. (2) The combination of the fulcrum D, extension or lever M N, and valve J with the main valve E, substantially as described. (3) The

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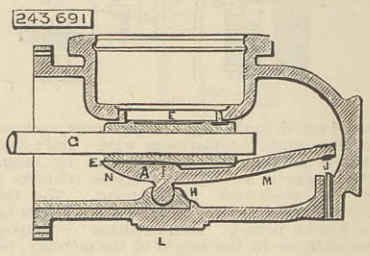

sliding shoe or fulcrum plate H, in combination with the toggle I L and valve E, substantially as described. (4) The combination of rod G, valve E, toggle I L, lever M N, and valve J, substantially as described.

243,697. MANUFACTURE OF NAILS, *David J. Farmer, Penn Yan, N.Y., assignor to himself, John P. Farmer, and Samuel Farmer, same place.*—*Filed August* 29*th*, 1879.

Claim.—As an improvement in the art of making cut nails and tacks, the process of rolling plates with transverse ridges and depressions, cutting these up into transversely-tapered nail-plates with the fibre

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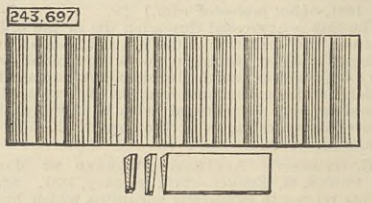

produced by previous rolling crosswise to said nail-plates, feeding such nail-plates to the nail machine without the usual oscillation or alternate inversion, and heading in customary cut nail or tack machinery, all substantially as set forth.

243,708. COOLING ROLLS, JOURNALS, AND SHAFTS, *Wm. R. Jones, Braddock, Pa.*—*Filed February* 5*th*, 1881.

Claim.—(1) The combination, with a horizontal journal or shaft, of a journal box or bearing therefor having at its bottom only a recess or trough exposed directly to said journal and containing a liquid under pressure, substantially as specified. (2) The combination of a stationary journal bearing having a circumferential recess in its lower face, a horizontal journal or shaft having a central opening communicating through radial openings with said recess, and a pipe

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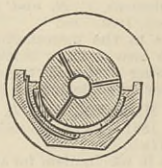

opening at one end into said recess and at the other end communicating with a supply of liquid under pressure, substantially as described. (3) As a means of introducing water for cooling rolls, a journal bearing having at its bottom a circumferential recess, a radially bored roll neck, and a roll having a hollow centre, said recess being supplied with water under pressure, whereby the water is forced from the recess into the roll neck and thence through the roll, substantially as described.

243,733. SECURING THE KNIVES USED IN PAPER PULP GRINDING ENGINES, *Guildford Smith, South Windham, Conn.*—*Filed March* 28*th*, 1881.

Claim.—(1) A knife for beating engines provided

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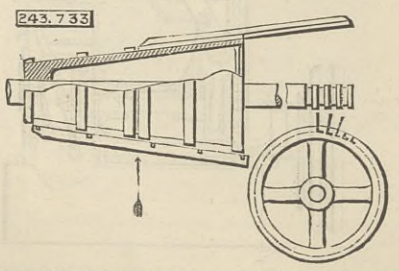

with a series of lips upon its side, the said lips being formed by being pressed or forced outwardly, and which adapt the knife to be held in a cone or shell from any radial movement outwardly. (2) A cone for beating engines provided with a series of ribs which are recessed radially and laterally, as and for the purpose set forth. (3) A knife for beating engines having lips formed upon it, and provided with bevelled or rounded ends, as and for the purpose set forth. (4) A cone or shell for beating engines provided with a series of ribs which are recessed radially and laterally, and combined with a knife provided with a series of lips upon its side, as and for the purpose set forth. (5) In a beating engine, a cone or shell having a series of ribs formed upon it, in combination with a knife having an offset formed upon it, and in contact with and between two or more of the ribs, whereby said knife is prevented from moving toward either end.

243,746. DYNAMO-ELECTRIC MACHINE, *James J. Wood, Brooklyn, assignor to the Fuller Electrical Company, New York, N.Y.*—*Filed April* 7*th*, 1881.

Brief.—The circuits from the armature sections are taken separately to the lights or other working devices, then, by a common return conductor, back through the field magnets to the opposite ends of the armature sections. *Claim.*—(1) An electric lighting apparatus consisting of a magneto-electric machine having an armature formed with a series of two or more distinct coils or groups of coils, and a commutator having corresponding sections, with collecting and transmitting springs bearing thereon, in combination with a series of two or more lamps each connected on one side with one of the springs on one side of the commutator, and all connected on the opposite side to one common or main conductor

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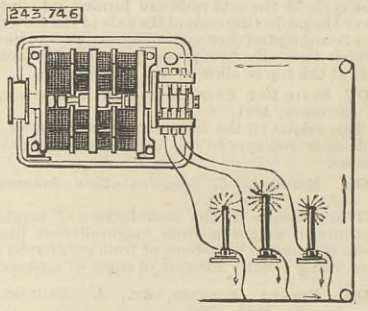

connected with the several springs at the opposite side of the commutator, substantially as and for the purpose herein set forth. (2) An electric lighting apparatus consisting of a dynamo-electric generator having an armature formed with two or more distinct coils or sections, and a commutator with corresponding sections connected therewith, with collecting and transmitting springs bearing thereon and mutually insulated on one side of the commutator, in combination with a series of two or more lamps, each connected independently on one side with one of the said insulated springs, and all connected at the opposite side to the coils of the field magnets, which, in turn, connect to the opposite side of the commutator, substantially as and for the purpose herein shown and described.

243,765. ELECTRO-MAGNETIC MOTOR, *Moses G. Farmer, Newport, R.I.*—*Filed March* 25*th*, 1881.

Brief.—To avoid the production of induced currents the ends of the helix wires are connected at the moment when the current is cut off from the helices, the connection being so made that the currents of induction pass in opposite directions and neutralise each other. *Claim.*—(1) The hereinbefore described method of neutralising or destroying the induced current generated in the helix of an electro-magnet upon the cessation of the primary current traversing the same, which consists in uniting with each other the respective opposing terminals of the two sections of the divided helix, and thereby forming a closed circuit immediately upon the disconnection of the generator. (2) The combination, substantially as hereinbefore set forth, of two helices included in the same current and acting in unison upon the same

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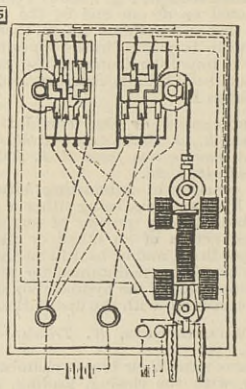

core or armature, a commutator automatically operated by the movement of said core or armature, and circuit connections, substantially such as described, whereby the connections of the terminals of the respective helices are reversed, so that a current is made to traverse said helices alternately in the same and in an opposite direction with reference to each other. (3) The combination, substantially as hereinbefore set forth, of a movable core or armature, two helices or coils arranged to act simultaneously upon said core or armature to impel it in a given direction, a commutator automatically operated by the movement of said core or armature, and circuit connections, substantially such as described, from the commutator to the helices, whereby the opposing or like terminals of said coils are united at the termination of the stroke to form a closed circuit before the disconnection of the generator.

243,789. METHOD OF AND COMPOSITION FOR LINING PLUMBAGO CRUCIBLES, *Jno. Pedder, Pittsburg, Pa.*—*Filed June* 8*th*, 1881.

Claim.—(1) The herein-described process of protecting the inner walls of plumbago crucibles, whether

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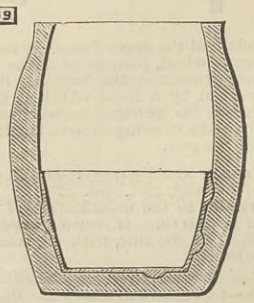

perfect or imperfect, consisting in forming within the crucible, before use in the melting furnace, a case or lining composed of plumbago, silica, salt, and clay water or similar materials, and thoroughly drying out the moisture contained in the lining, substantially as and for the purposes set forth. (2) A composition for lining the interior of plumbago crucibles, containing plumbago, silica, salt, and clay water, substantially as and for the purposes set forth.

243,822. COMPOUND HOSE COUPLING, *George Westinghouse, jr., Pittsburg, Pa.*—*Filed April* 25*th*, 1881.

Claim.—(1) In combination with a pair of lap joint couplings, a pair of auxiliary or added coupling sockets or shells B B, integral therewith, for coupling together or uniting the meeting ends of an independent line of pipe, substantially as set forth. (2) In

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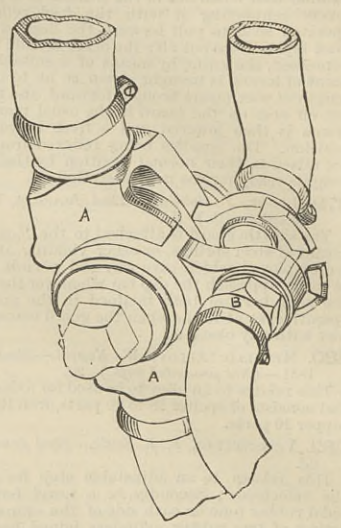

combination with the clutch couplings A A, a pair of added or auxiliary couplings for an independent or separate line, consisting of tubular sockets or shells, thimbles and packing rings, and with or without interlocking or engaging lugs, substantially as set forth (3) A half coupling A, having a coupling socket or shell A, integral therewith, provided with packing ring E and holding lug S, substantially as set forth.

243,836. STEAM AND OTHER ENGINES, *Pierre Besnard, sr., and Francis E. Besnard, jun., Nantes, France.*—*Filed February* 17*th*, 1881.—*Patented in France, November* 2*nd*, 1880.

Claim.—The combination of the cylinder, the crank-

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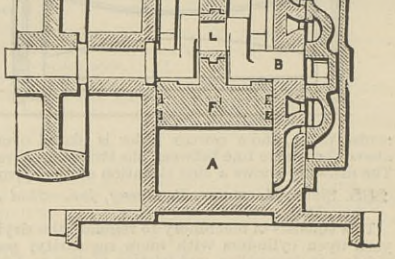

shaft B, the wrist L, the sliding box K, having ribs or flanges on its upper and lower surfaces, and the piston composed of the two separable pieces F F, forming the slideway J, in which are grooves receiving the ribs or flanges on said box K, the said members being constructed and arranged substantially as specified.

CONTENTS.

THE ENGINEER, August 26th, 1881.

THE New Zealand Railways are increasing in value. A correspondent of *India and the Colonies* says:—"The profit on them has within the year increased from 2¼ to 3½ per cent. on cost of construction. The returns for April, the first month of the present financial year, encourage the hope that our next annual gains will be far more favourable. The total receipts for the period stated amounted to £90,051, while the working expenses have been reduced from 55·69 in the corresponding month of 1880 to 44·29 per cent. in April, 1881."

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending Aug. 20th, 1881:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 13,786; mercantile marine, building materials, and other collections, 8021. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 6 p.m., Museum, 2089; mercantile marine, building materials, and other collections, 741. Total, 24,637. Average of corresponding week in former years, 18,761. Total from the opening of the Museum, 20,270,298.