INSTITUTION OF CIVIL ENGINEERS.

4th March, 1862.

John Hawkshaw, Esq., President, in the Chair.

The first paper read was "Description of the Loch Ken Viaduct, Portpatrick Railway," by Mr. E. L. J. Blyth, M. Inst. C.E.

This viaduct was situated on a curve of half a mile radius, and carried a single line of railway over the loch at an oblique angle, so that the width of the waterway was increased from 265ft. to 360ft., the depth of the water at the point of crossing being 29ft. in summer. It consisted of seven openings—three of 130ft. each in the centre, spanned by wrought iron girders of the bow and string form; two semicircular arches of masonry, of 20ft. span, in the abutments; and two openings of 20ft. each at the ends, provided with flat cast iron girders. Owing to there being scarcely any current it was not deemed necessary to set the piers in the line of the loch, but they were placed at right angles to the viaduct, and each pair of girders was at a slight angle to the adjacent ones.

The foundations consisted of strong gravel, except in the case of the east abutment of the main openings, where a running sand was met with, and in this instance the lower courses of the masonry were laid on a bed of hydraulic lime concrete 2ft. in thickness. The two deep-water piers were each formed of two towers, 8ft. in diameter, placed 8ft. apart, and connected above the water-level by semicircular arches of masonry. For each tower of the piers a cast iron tube 8ft. in diameter, in six pieces, was sunk, the tubes being 36ft. and 42ft. in length for the east and west piers respectively. When the masonry was brought up to the surface the upper castings of the tubes were removed. Around the piers 4,000 cubic yards of loose rubble stones were deposited, so as to produce an artificially deeper foundation. The tubes, when placed in position, sank from 1ft. to 2ft., by their own weight, until they reached the gravel and sand, where they remained quite firm. This formed a good test of the sufficiency of the foundation, as the weight of the tubes on their narrow edges was equal to from 8 tons to $9\frac{1}{2}$ tons per square foot, while the total weight on the foundations of the finished structure, including the moving load, was only about $6\frac{1}{4}$ tons per square foot.

The method adopted in sinking the tubes was that of ordinary well sinking. Two plate iron screw pans, of an inverted cone shape, were employed; one 2ft. in diameter at the top and 1ft. deep, and the other, which was only used for the harder portions of the excavation, 1ft. in diameter at the top and 1ft. deep. There were openings in the sides, covered with leather flaps, to prevent the material from escaping when the pans were filled. Three arms of round iron projected through the sides of the pans, and being connected to a long rod with a cross handle at the upper end, the screw pans were worked by four men, and when full were raised by tackle. The larger pan raised about one cubic foot of material each time, and the smaller one about one-fourth of that quantity. By these means the tubes were sunk in some instances as much as 18in. in one day, the minimum being 2in. per day in the case of the north tube of the west pier, where large boulder stones were encountered, rendering necessary the use of a screw pick. When the tubes had been lowered the desired depth concrete was deposited within them, varying from 12ft. to 18ft. in depth in each tube. On this concrete ashlar masonry was laid, the cordon course being of granite, in large blocks, for receiving the ends of the girders, which rested on wrought iron plates, laid on thick sheets of vulcanised india-rubber, to lessen the effect of vibration.

The bow and string girders were each 136ft. 8in. in length, and were segmental in form, the rise being 17ft. 6in., so that the segment was almost identical with a catenary curve, or the true curve of equal pressure. The sections of the upper and the under booms were identical. They consisted of a main plate, 24in. broad and $\frac{3}{4}$in. thick, and of two channel irons, each 8in. by 4in. in section and $\frac{1}{2}$in. thick, placed at a distance of 8in. apart, between and to which the struts and ties, of the same section of channel iron, were rivetted. The transverse girders for carrying the roadway were 6in. in depth at the ends, where they rested on the channel irons of the under booms, and 15in. deep in the centre. The middle web of these girders was $\frac{1}{4}$in. in thickness, and there were angle irons, 3in. by 3in. by $\frac{1}{2}$in. in section, at the top and the bottom of the web on each side. Every alternate girder projected 2ft., from which T-iron struts were carried up to the crossings of the diagonal bracing. The weight of the girders and roadway between the points of support was 88 tons, and of the ballast (2in. in depth) 14 tons, making a total dead load of 102 tons; and taking the rolling load at 1 ton per lineal foot the total load on one span would be 232 tons. The area of the upper boom was 33in., and of the under boom, exclusive of rivets, 27·4in. The distance between the centres of gravity of the upper and the under booms was 17·04in. The tensile strain on the under boom amounted to 4·04 tons per inch, and the compressive strain on the upper boom to 3·35 tons per inch. When the whole of the load was upon the girders there was no compressive strain on any of the diagonals, but there were tensile strains varying from 3·4 tons to 7·5 tons, or equal respectively to 9 cwt. and 1 ton per square inch of section.

The author considered that the bow-and-string girder possessed advantages over the Warren or other lattice girders, with parallel top and bottom members; as in the latter class it was not possible to make the top and bottom members theoretically correct, without great labour and waste of material, and as, owing to the great variation in the strains on the diagonals, it was necessary that they should be of varying dimensions, involving in some cases even different sections of iron.

The girders were built in position on staging, and the greatest amount of deflection of any one girder from its own weight was $\frac{3}{8}$in. Subsequently, when a locomotive engine, weighing 34 tons, was placed in the centre of each span, and afterwards was run over, first at 10 miles an hour, and then at 25 miles an hour, the deflection amounted to from $\frac{3}{16}$in. to $\frac{1}{4}$in. in each girder, there being no perceptible difference in either case. Finally, when four engines were coupled together, so as to give a load equal to 1 ton per lineal foot, the deflection only amounted to from $\frac{1}{2}$in. to $\frac{5}{8}$in.

It was stated that the total cost of this viaduct had amounted to about £13,000.

The second paper read was "Description of the Centre Pier of the Bridge across the river Tamar, at Saltash, on the Cornwall Railway, and of the means employed for its Construction," by Mr. R. P. Brereton, M. Inst. C.E.

This communication embraced, in a narrative form, a detailed account of the preliminaries connected with the Albert Bridge, which crossed the river Tamar where it was only 1,100ft. wide, with precipitous banks and a depth of water to the surface of the mud of 70ft. A dyke of green stone trap intersected the clay slate formation at this point, and cropped out to the surface above the water on the western bank of the river. It was ascertained, by borings made in the bed of the river, that rock extended from the eastern side to beyond the middle of the stream, covered with mud or silt to a depth of from 3ft. to 16ft. Subsequently a thorough examination of the bed of the river where a centre pier would probably be built, by means of one hundred and seventy-five borings made within a cylinder at thirty-five different places, over an area of 50ft. square, enabled an exact model of the surface of the rock to be prepared, showing the irregularities and fissures that might be expected. Eventually it was decided, from the information thus obtained, to erect one pier only in the deep water, instead of three, as would have been necessary for the spans required by the Admiralty; and when it was determined to proceed with the construction of the bridge, in 1852, it was decided that there should be two spans of 455ft., two of 93ft., two of 83ft. 6in., two of 78ft., two of 72ft. 6in., and nine of 69ft. 6in.; the total length, including the adjoining land openings, being 2,200ft.

The centre or deep water pier, intended to carry the weight of one-half of each of the two main spans, consisted of a column, or circular pillar, of solid masonry, 35ft. diameter and 96ft. high, carried up from the rock foundation to above high water mark. Upon this were placed four octagonal columns of cast iron, 10ft. diameter, carried up to the level of the roadway, which was 100ft. above high water mark. Upon the tops of the columns cast iron standards were fixed, to receive the ends of the tubes and chains which constituted the trusses of the bridge. The weight at the bottom of the masonry foundation was about $9\frac{1}{2}$ tons per square foot, increased, when the bridge was loaded by passing trains, to about 10 tons per square foot.

In the construction of the masonry pier a wrought iron cylinder of boiler plates, 37ft. diameter and 90ft. in length, and open at the top and the bottom, was sunk through the mud of the bed of the river to the rock. The water was then pumped out, and the mud excavated; the masonry being built up inside, and the cylinder above the ground afterwards removed. It was expected that, by forming a bank round the cylinder after being sunk to the rock, sufficient water-tightness would be ensured for getting in the masonry. To provide, however, for the contingency of excessive leakage, the cylinder was so constructed as to admit of the application of air pressure. As the surface of the rock, although very irregular and ragged, had a general dip to the south-west, the bottom of the cylinder was formed with a corresponding bevel, one side being 6ft. longer than the other. A dome, or lower deck, was constructed inside, at the level of the mud, and an internal cylinder, 10ft. in diameter, open at the top and the bottom, connected the lower with the upper deck of the cylinder. The 6-ft. cylinder, previously used for the borings, was fixed eccentrically inside the other, and an air jacket or gallery, making an inner skin round the bottom edge below the dome, was formed, about 4ft. in width, divided into eleven compartments, and connected with the bottom of the 6-ft. cylinder by an air passage below the dome.

Details were then given of the construction of the larger cylinder, and of the mode of launching and floating it to its position. When accurately adjusted over the intended site water was gradually let in, until the cylinder penetrated through the mud about 13ft., and rested on some irregularities upon the rock, which caused it to heel over towards the east about 7ft. 6in. By letting water in upon the dome or lower deck, and loading the higher side with iron ballast, the cylinder forced its way through the obstructions at the bottom edge, and took a nearly vertical position. The air and water pumps were then set to work, and the greater part of the mud and oyster shells, which filled the compartments of the air-jacket at the bottom, was cleared out, and the irregular surface of the rock excavated; the bottom of the cylinder being now 82ft. below high water. Subsequently a leak having broken out through a fissure in the rock on the north-east, or higher edge, considerable difficulty was experienced in maintaining sufficient pressure with the air-pumps to keep the water down and the bottom dry. The leak was at length reduced by driving close sheet piling into the fissure. When at its full depth the cylinder was 87ft. 6in. below high water at the lowest place, and then a hemp gasket was worked under the edge of the cylinder, all round the outside, to assist its water-tightness. A ring of granite ashlar, 4ft. in width and about 7ft. in height, was then built in the air jacket; and a bank of clay and sand was deposited round the outside of the cylinder to compress the mud. When the water was pumped out of the body of the cylinder below the dome, and the excavation of the mud was being proceeded with, a leak broke out, and the water overpowered the pumps. Additional engines and pumps were provided, and efforts were made to diminish the leakage, with varying success; but as it required four pumps to keep the water down to 54ft., recourse to air pressure in the body of the cylinder below the dome became imminent, and preparations for its application were made. To provide against the buoyancy, or upward pressure against the dome and cover, the 37-ft. cylinder was loaded with 750 tons of ballast, in addition to its own weight of 290 tons. The pumps were then got into good order, and, by continued pumping, succeeded in keeping the water down. The mud was excavated, the cylinder below the dome securely shored across, and the rock levelled, when the masonry, in thin courses of granite ashlar in cement, in the body of the cylinder was commenced. As soon as the masonry reached the level of the air jacket ring it was thoroughly bonded, the plates of the air jacket being cut out as it proceeded. Upon the top of the bonding course, two courses of hard brickwork in cement were laid, making a perfectly water-tight floor over the whole diameter of the column. Meanwhile the masonry of the air-jacket, where the leak occurred, was taken down, and the leak was diminished by additional sheet piling. The leak was discovered to have broken out at the same fissure as before, and had torn away the rock underneath the masonry of the air-jacket and bottom edge of the cylinder, but the masonry itself was undisturbed.

The next operation was to draw off the water above the dome, and remove the ballast, to allow the masonry to be proceeded with, which it eventually did at the rate of from 5ft. to 7ft. in height per week. When it was 46ft. in height the influx of water was entirely stopped. After the masonry had been completed to the level of the plinth the upper part of the cylinder was unbolted at the separate joints, and floated to the shore.

March 11, 1862.

John Hawkshaw, Esq., President, in the Chair.

The paper read was "Description of the Delta of the Danube, and of the Works, recently executed, at the Sulina Mouth," by Mr. C. A. Hartley, Assoc. Inst. C.E.

In the autumn of 1856, by virtue of the Treaty of Paris, the European Commission of the Danube, consisting of representatives from each of the seven contracting powers, was charged to execute the works necessary below Isakcha, to clear the mouths of the river, as well as the adjacent parts of the sea, of the impediments which obstructed navigation. This commission, to which the author had acted as chief engineer, was authorised to levy rates, to cover the expense of such works, on the express condition that the flags of all nations should be on a footing of perfect equality.

In the preliminary studies of the three principal branches and mouths of the Danube, advantage was taken of the charts made by Captain Spratt, R.N., C.B.; and aided by these, and by the author's own surveys and personal investigations, a brief description was given of the chief characteristics of the progress of the river through its delta. The Danube, after a course of 1,700 miles, during which it received more than 400 tributaries, and drained upwards of 300,000 square miles, passed in a single channel, 1,700ft. wide and 50ft. deep, the Bulgarian town of Isakcha, situated on the right bank, at 30 and 40 English miles respectively below the large corn exporting ports of Galatz and Ibralia. Isakcha was 76, 78, and 90 miles from the sea, following the courses of the Kilia, the Sulina, and the St. George branches, and 58 miles in a straight line. The head of the delta was reached, at Ismail Chatal, or Fork, 15 miles lower down, and here the fresh waters divided, never to re-unite; $\frac{17}{27}$ths of their volume passing in an easterly direction by the Kilia branch, and the remaining $\frac{10}{27}$ths in a south easterly direction by the Toultcha branch. At 11 miles below Ismail Chatal this latter branch separated into two channels, the St. George and the Sulina discharging respectively $\frac{8}{27}$ths and $\frac{2}{27}$ths of the whole volume of the river.

A short account was then given of the three channels, from which it appeared that the waters of the Kilia were delivered to the sea by twelve distinct mouths, only navigable for fishing vessels; that the river portion of the St. George offered no real obstacles, having an average width of 1,200ft., and a minimum depth of navigable channel of 16ft., at seasons of extreme low water; and that in the upper reaches of the Sulina disaster of every kind was imminent, from the many intricate windings and numerous shoals—the navigable width being rarely more than 300ft., and the depth over the shallows, during seasons of low water, varying from 10ft. to 14ft.

The delta proper was described as being bounded on the north by the Kilia branch, on the south by the Toultcha and St. George branches, and on the east by the Black Sea; the enclosed space comprising an area of 1,000 squares miles, and forming a triangle of which the Ismail Chatal was the western apex, and the sea coast, from the mouths of the St. George to those of the Kilia, the base. During extraordinary high floods the delta, being unprovided with artificial banks to contain the swollen waters, was almost entirely submerged; whilst at seasons of drought its banks were elevated from 10ft. to 12ft. above the level of the river at the Upper Chatal, and from 8ft. to 10ft. at the Chatal of St. George. In the lower reaches of the three branches the level of the river was but little affected by variations in the upland waters. Adjacent to the mouths it never varied more than 1ft., except when influenced by the wind. During high floods the inclination of the surface water of the Sulina branch was 3in. per mile, while during extreme low water it did not exceed 1in. per mile. At times of ordinary high water, when the current had attained a velocity of from two and a half to three miles an hour, the Danube, before it divided at Ismail Chatal, delivered a volume of water equal to nineteen and a-half millions cubic feet per minute; while in the dry season, when the current was reduced to one mile per hour, the flow did not exceed seven and a-half millions cubic feet per minute. At times of extraordinary floods, such as that which occurred in March, 1861, the velocity was increased to five miles per hour, and the volume of water then delivered amounted to sixty millions cubic feet per minute, or eight times the quantity discharged at ordinary low water. It was stated, as the result of careful observations, that when the waters were most surcharged they carried to sea at the rate of one cubic inch of sedimentary matter, supposing it to be solidified into coherent earth, per cubic foot of water, and that not more than one-fortieth part of this proportion was transported when the floods had subsided. Thus, at the former period, upwards of 600,000 cubic yards of diluvial detritus passed into the sea by the several mouths of the river in twenty-four hours, and at the latter not more than 15,000 cubic yards. The results of these investigations accounted, in a great degree, for the changes which took place from time to time in the position and extent of the sand banks forming the bars across the several mouths. At times of high floods these bars were further from the shore, their magnitude was considerably increased, and the depth over them was diminished; their distance from the shore and their height being much influenced by the direction of the prevailing winds. The depth of the sea opposite the delta decreased to the north; thus, at three miles from the land, the depth was sixteen fathoms opposite the St. George's mouth, and only ten fathoms opposite the Sulina and Kilia mouths.

During the interval from 1830 to 1857 the shallows of the Kilia advanced fully one mile in the direction of the Sulina mouth. This, combined with the uncertain and changeable nature of the many branches issuing from the Wilkov basin to the sea, and the distance of the bars from the shore, were the chief considerations which induced the author to form an unfavourable opinion of the Kilia—in spite of its possessing the best river channel—and to recommend, in preference, the improvement either of the St. George or of the Sulina, where the sea depths were greater, and the advance of the sand-banks was less remarkable. In comparing the merits of the two latter branches the author arrived at the conclusion that, in nearly every respect, the St. George offered decided advantages over the Sulina. It was true that, in order to reach the Kedrilles bar of the St. George, double the length of works would be necessary; but when once the sand-banks were passed the greater sea depths opposite the St. George would insure, for a longer period, a constant good navigable depth at the sea entrance. The St. George's mouth was situated at the most salient angle of the delta, was nearer to the Bosphorus, by eighteen nautical miles, than the Sulina, and was more favourably placed with regard to the safe manœuvring of vessels during N.N.E. winds.

Although there was a great difference of opinion as to the merits of each of the three principal branches, or mouths, all the technical authorities, who had studied the question on the ground, agreed in recommending that, whichever mouth was chosen, the system of improvement should be that of guiding the river water across the bar, by means of piers projected from the most advanced dry angles of the mouth; so as to concentrate the strength of the river current on the bottom of the proposed improved channel, by an artificial prolongation of the river banks into deep water. After considerable discussion the commission resolved to improve the bar channel of the Sulina, by guiding piers of a temporary character, in order to give the speediest relief to the navigation in the cheapest manner; but it was distinctly guaranteed that this should not prejudice the choice of the mouth to be selected for permanent treatment. The author then received instructions to provide works which, for the expenditure of a sum limited to £80,000, should have the effect of the giving an increased depth of at least two feet, over a period of from six to eight years. This duration of time was based on the assumption that, during such an interval, either the St. George would be opened, or it might be considered expedient to limit the improvement of the Danube to rendering permanent the provisional works.

The designs for the provisional works were then matured; and as it was found, in practice, that the cost of strong timber cribs, to be loaded with stone and sunk at intervals of 20ft. along the line of works, would exceed the original estimate, choice was finally made of a structure composed of timber piling and *pierre perdue*, surmounted by a timber platform 14ft. wide, strengthened occasionally by solidly constructed cribs of the same width. The works were commenced on the 21st of April, 1858, a temporary staging, fixed on piles, being always run out from 200ft. to 300ft. in advance of the permanent piling. This staging supported nine crab engines, by which three rows of three piles, each 13in. square and 7ft. apart, were frequently driven, in one day, to a depth of 16ft. into the hard fine sand of which the bottom was composed. The piles were then immediately secured by double longitudinal walings and double cross-ties, the whole being surmounted by two thick trampieces and planking, at 4ft. above the level of the sea. From this permanent platform the close piling on the side next to the sea was driven. The daily rate of progress, during fine weather, was 20 lineal feet; and as soon as this length of sheet piles was completed stones were thrown down to protect the footing in the sand, which was liable to be washed away by the action of the sea. This scouring action of the sea was so serious, when the skirt of the bar was reached, that it threatened at one time to demand for the completion of the works double the quantity of stone originally estimated. Several plans were tried to reduce its pernicious effects. That eventually adopted, and which was perfectly successful, was to advance the open pile work with all possible expedition, and then to pave the proposed seat of the pier with stones, delivered from barges. This pavement withstood the attacks of the sea, and offered no great obstruction to the penetration of the sheet piles, which, without being shod, had frequently been driven 10ft. into the ground, after having been forced through 8ft. of rubble stone. The section of the finished stone work was described as being a solid mass of closely-packed third-class rubble, resting on a broad base, and narrowing upwards at slopes varying from 2 to 1, near the pier heads to 1 to 1, and $1\frac{1}{2}$ to 1 near the shore, until slightly below the level of the water, it became a mere ridge against the close piling. The time occupied in the actual construction of the piers was thirty-one months, exclusive of three winter months each year, during which the Danube was frozen over, and all work was suspended, but inclusive of 207 days when it was impossible to work, on account of stormy weather. The length of the north pier was 4,631ft., that of the south pier was 3,000ft., and the depth of water in which they were built varied from 6ft. to 20ft. In their construction 200,000 tons of stone and 12,500 piles had been employed, and the cost had not exceeded ten guineas per lineal foot. The stone was brought from a distance of sixty miles, and its price delivered in place varied from 4s. to 5s. per ton; the oak, used for the longitudinal and transverse timbers and for the planking and fender piles, cost 2s. 3d. per cubic foot, while the fir timber piles were delivered ready for driving for 4d. per cubic foot. The workmen, of whom there were generally 300, were composed of men belonging to more than ten different nations. Labourers were paid 2s. 6d. and carpenters 4s. 6d. per day.

The chances which had taken place at the Sulina mouth, consequent on the projection of the piers, were then noticed. The depth on the bar, since the year 1829, had varied between the extremes of 7ft. and 12ft., the least depth occurring during the subsidence of high water floods, and the greatest when the deposits lodged by those floods had been dispersed by autumnal and winter gales. In April, 1858, when the works were commenced, there was a navigable channel only 9ft. deep over the centre of the long shoal forming the Sulina bar. In November, 1859, when the works had been brought to a close for the winter, the north pier had advanced 3,000ft. and the south pier 500ft., and then the depth on the bar was 10ft., which was increased to 14ft. by the following April, although the works had remained stationary. Hopes were consequently entertained that the action of the north pier would, in itself, be sufficient to maintain an improvement; but these expectations were disappointed, as in August, when the north pier had reached a length of 4,600ft., the depth on the bar had diminished to 9½ft. Every exertion was then made to bring the opposite pier into play. Accordingly, during the next three months, the south pier was advanced 1,500ft., and as it was now within 600ft. of the north pier the good effect of concentrating the whole force of the river current directly on the bar became at once apparent. Thus, on the 30th of November, 1860, there was a navigable channel of 12ft., and on the 28th of February, 1861, of 16ft. Then came the breaking up of the ice in the river, and the furious descent of the extraordinary high floods, which caused so much damage at Galatz, and submerged the whole delta; but this time, instead of the depth on the bar being diminished, the swollen waters confined between the two piers and directed in a proper line fairly swept away the remains of the bar on to the south bank and into deep water. From that time to the present the depth had never been less than 16½ft., and frequently it was as much as 17¾ft., over a navigable width of 500ft. This result had been accomplished by works the cost of which had not exceeded the sum that had been paid in one year only for lightening vessels over the bar, and without taking into account the excellent shelter which had been afforded, and the great risks which vessels formerly ran of being wrecked off the entrance.

In conclusion the author expressed his gratitude to the members of the European Commission of the Danube for the generous support he had always received, and especially to Major Stokes, R.E., the representative of Great Britain, whose enlightened policy, if allowed to prevail, could not fail eventually to insure to the commerce of all nations the best possible means of water communication with the rich corn-growing countries bordering the shores of the Lower Danube.

OCEAN MAIL SUBSIDIES.

THE return just issued of the estimated expense of the Post-office packet service for the current year shows a diminution of £79,059 from the total of last year, and £153,881 from that of the year 1860-1. The reduction on the present occasion is entirely due to the disappearance of the charge for the Galway contract. Annexed are the several items, which make up the total of £915,897:—

ESTIMATE FOR THE POST-OFFICE PACKET SERVICE FOR THE YEAR 1862-3.

Contracts.	1862-3		1861-2
Holyhead and Kingstown, for conveyance of mails	£85,900	..	£85,900
Aberdeen and Lerwick, for hire of steam vessels to convey mails	1,200	..	1,200
Thurso and Stromness, for conveyance of mails	1,300	..	1,300
Southampton and the Channel Islands, ditto	4,000	..	4,000
Liverpool and the Isle of Man, for hire, &c.	850	..	850
Liverpool and Ramsay, Isle of Man, for conveyance of mails	100	..	100
Penzance and Scilly, ditto	300	..	300
Southampton and Cowes, ditto	750	..	750
Ryde and Gosport, ditto	50	..	50
Dunvegan and Lochmaddy, ditto	233	..	233
Greenock, Portree, and Stornoway, ditto	200	..	200
Stornoway and Aultbea, ditto	156	..	156
Ardrossan and Arran, ditto	80	..	80
Greenock, Rothesay, and Ardrishaig	1,260	..	1,260
Dover and Calais and Dover and Ostend, including £3,100 for extra charges	18,600	..	18,600
Southampton, Vigo, Oporto, Lisbon, Cadiz, Gibraltar (Of the £2,500 nominally paid for this service, 15,500 is virtually on account of the India, China, Australia, and Mauritius services.)	20,500	..	20,500
Liverpool and Halifax and Boston, and to and from Liverpool and New York and Nassau .. £176,340 Deduct proportion to be paid by the Government of Nassau .. 1,500	174,840	..	171,840
Galway and ports in America	—	..	78,000
Halifax, Bermuda, and St. Thomas, and Halifax, and St. John's, Newfoundland	14,700	..	14,700
West Indies	238,500	..	238,500
Brazils and Buenos Ayres, extension of the West Indies contract	30,000	..	30,000
Greytown and Blewfields (This service was accidentally omitted from the Estimate for last year.)	744	..	—
Turk's Island and St. Thomas	300	..	300
West Coast of America, between Panama, Callao, and Valparaiso	25,000	..	25,000
West Coast of Africa and England	30,000	..	30,000
Cape of Good Hope and England, £32,400, less £6,000 paid by the colony	26,400	..	32,400
Point de Galle and Sydney, £134,672, less moiety to be paid by the colonies	67,336	..	67,336
Australia and New Zealand	14,000	..	14,000
Alexandria, Ceylon, Calcutta, Hong Kong, and England, including a branch from Marseilles to Malta, £162,125; less 55,314 to be paid by the Indian Government, and £15,058 to be paid by the Australian colonies, and also £15,000 for abandonment of reduced fares for Government passengers on the vessels of the Peninsular and Oriental Steampacket Company	76,753	..	94,375
Aden and Bombay	22,000	..	22,000
India, by alternate weekly communication to Bombay and Calcutta, for the conveyance of additional mails	21,000	..	21,000
Southampton and Alexandria	5,000	..	5,000
China (three months only included in Estimate for 1861-2)	24,000	..	6,000
For allowance to Government agents on board the contract packets	5,940	..	5,165
Total for contracts	£911,992		£991,095
Packet Establishments. (That proportion only of the expenses of the packet Establishments which is borne by the Post-office Department is included in the Packet Estimate; one-half of the salaries and allowances being provided for by the Admiralty.)			
Dover	300	..	300
Holyhead	256	..	256
Liverpool	415	..	415
Southampton	787	..	724
Pensions	547	..	566
Contingencies	1,600	..	1,600
Total charge for the Post-office Department packet service	*£915,897	..	†£994,956

* Of this sum, taking as a basis the cost of the service when that service does not exceed the amount of the Ocean postage, and in all other cases the amount of ocean postage received, about £470,000 may be considered as expenditure for purely postal services.

† Only £919,956 was voted, £75,000 having been withdrawn in respect of the service between Galway and America.

THE PATENT LAWS.—Mr Beecroft, M.P., of Leeds, has presented a petition from residents in that town, praying for an amendment of the patent laws.

THE MAILS.—A memorial from the most eminent firms in the American trade has been addressed to the Postmaster-General, praying that, on the arrival of the American mails at Queenstown, and if too late for the regular trains, special trains may be run to bring them on to Dublin, and special steamers employed, if required, to bring them to Holyhead.

MANCHESTER LITERARY AND PHILOSOPHICAL SOCIETY.

March 4th, 1862.

J. P. JOULE, LL.D., F.R.S., President, in the Chair.

A PAPER by Professor W. Thomson, LL.D., F.R.S., Honorary Member, was read, entitled "Observations on Atmospheric Electricity."

I find that atmospheric electricity is generally negative within doors, and almost always sensible to my divided ring reflecting electrometer. I use a spirit lamp, on an insulated stand a few feet from walls, floor, or ceiling of my lecture room, and connect it by a fine wire with the insulated half ring of the electrometer. A decided negative effect is generally found, which shows a potential to be produced in the conductors connected with the flame, negative relatively to the earth by a difference amounting to several times the difference of potentials (or electro motive force) between two wires of one metal connected with the two plates of a single element of Daniell's. I have tested that the spirit lamp gives no idio-electric effect amounting to so much as the effect of a single cell. The electric effect observed is therefore not due to thermal or chemical action in the flame. It cannot be due to contact electrifications of metallic or other bodies in conductive communication with the walls, floor, or ceiling, because the potentials of such must always fall short of the difference of potentials produced by a single cell. I have taken care to distinguish the observed natural effect from anything that can be produced by electrical operations for lecture or laboratory purposes. Thus I observe generally in the morning before any electrical operations have been performed, and find ordinarily results quite similar to those observed on the Monday mornings when the electrical machine has not been turned since the previous Friday. The effect, when there has been no artificial disturbance, has always been found negative, except two or three times, since the middle of November; but trustworthy observations have not been made on more than a quarter of the number of days.

A few turns of the electrical machine, with a spirit lamp on its prime conductor, or a slightly charged Leyden phial, with its inside coating positive put in connection with an insulated spirit lamp, is enough to reverse the common negative indication. Another very striking way in which this may be done is to put a negatively charged Leyden phial below an insulated flame (a common gas burner, for instance). The flame, becoming positively electrified by induction, keeps throwing off, by the dynamic power of its burning, portions of its own gaseous matter, and does not allow them to be electrically attracted down to the Leyden phial, but forces them to rise. These, on cooling, become, like common air, excellent non-conductors,* and, mixing with the air of the room, give a preponderance of positive influence to the testing insulated flame (that is to say, render the air potential positive at the place occupied by this flame).

Half an hour, or often much more, elapses after such an operation, before the natural negatively electrified air becomes again paramount in its influence on the testing flame.

That either positive or negative electricity may be carried, even through narrow passages, by air, I have tested by turning an electric machine, with a spirit lamp on its prime conductor, for a short time in a room separated from the lecture room by an oblique passage about two yards long, and then stopping the machine and extinguishing the lamp, so as to send a limited quantity of positive electricity into the air of that room. When the lecture room window was kept open, and the door leading to the adjoining room shut, the testing spirit lamp showed the natural negative. When the window was closed, and a small chink (an inch or less wide) opened of the door, the indication quickly became positive. If the door was then shut, and the window again opened, the natural effect was slowly recovered. A current of air, to feed the lecture room fire, was found entering by either door or window when the other was shut. This alternate positive and negative electric ventilation may be repeated many times without renewing the positive electricity of the adjoining room by turning the machine afresh.

The out of doors air potential, as tested by a portable electrometer in an open place, or even by a water dropping nozzle outside, two or three feet from the walls of the lecture room, was generally on these occasions positive, and the earth's surface itself, therefore, of course, negative;—the common fair weather condition, which I am forced to conclude is due to a paramount influence of positive electricity in higher regions of the air, notwithstanding the negative electricity of the air in the lower stratum near the earth's surface.

On the two or three occasions when the in-door atmospheric electricity was found positive, and, therefore, the surface of the floor, walls, and ceiling negative, the potential outside was certainly positive, and the earth's surface out of doors negative, as usual in fair weather.

* I find that steam from a kettle boiling briskly on a common fire is an excellent insulator. I allow it to blow for a quarter of an hour or more against an insulated electrified conductor, without discovering that it has any effect on the retention of the charge. The electricity of the steam itself, in such circumstances, as is to be expected from Faraday's investigation, is not considerable. Common air loses nearly all its resisting power at some temperature between that of boiling water and red hot iron, and conducts continuously (not, as I believe, is generally supposed to be the case, by disruption) as glass does, at some temperature below the boiling point, with so great ease as to discharge any common insulated conductor almost completely in a few seconds.

THE PRINCE CONSORT MEMORIAL.—One of the letters addressed to the Memorial Committee, and read at their last meeting, was from the Ross of Mull Granite Company, who state that they can supply a monolith of red granite larger than any known column in existence. The obelisk in front of the Winter Palace at St. Petersburg, they say, is the largest one in Europe, measuring 93ft. They state that they can exceed that by at least 7ft. in length, and with a corresponding excess in diameter. This stone, said to have been hitherto unnoticed, is reported by their manager, Mr. Marshall, to have been discovered in the Tormore locality, and, what is still more remarkable, to be already quarried on three sides. It is described, moreover, as lying just at the surface of the ground, with a fine open field in front on which it could be rolled out and "scabbled." It has an even surface, is quite detached at top and bottom, is perfectly sound, and of a good red colour. It is upwards of 100ft. in length, and will average about 12ft. in diameter. The column at St. Petersburg, they state, measures 12ft. at the base, and only 4ft. at the top; its height being 93ft. Besides this letter, there is also one to the effect that in the granitic formation between Penryn and Helston monoliths can be shown at this moment of several thousand cubic feet, perfectly sound and without a single defect. These are but two examples, among many others, of the information which has been elicited on the subject. The committee have been occupied in the consideration of the enormous difficulties with which the operations, first of quarrying a monolith of the desired dimensions, then of transporting it to its ultimate destination, and finally of rearing it, would be attended. Assuming, for which there is reason, such a stone, at a rough calculation, to weigh some 600 tons, a ton being a horse load, a faint idea may be formed of the prodigious labour and risk of conveying it to the metropolis by sea, and still greater by land. Again, suppose it to have been brought up the Thames as far as Chelsea, the question of moving it through, in some cases, narrow and tortuous streets would require a practical solution. These, of course, are considerations for the exercise of engineering skill, and are only now alluded to as confronting the proposed undertaking from the commencement. Among others, Sir Roderick Murchison is rendering the committee valuable assistance as to the various quarters where a monolith of the requisite proportions might possibly be found. The Duke of Argyll, who has granite quarries on his estates unleased, is understood to have made a generous proposal in the event of their capacity being proved to yield a stone suitable for the proposed national monument.

ORDNANCE v. ARMOUR PLATES.

(From the *Times*.)

SOME interesting and important experiments were made at Shoeburyness on Tuesday, the 4th inst., in the presence of the Lords of the Admiralty and a large number of scientific officers and gentlemen, with a view of testing the resistance offered by an iron target built up to resemble a section of an iron frigate's side, and specially designed by Mr. Fairbairn, sen., to show how the teak backing to the armour plates might be dispensed with, and increased strength obtained by a combination of ironwork alone. It is necessary, in order to fully understand the object and result of this experiment, to state that when our first iron frigates were designed of the Warrior class nearly all artillerists and scientific men were agreed in the opinion that the armour plates would require a wooden backing to deaden and distribute over a larger surface the tremendous concussion with which the shot would strike. It was accordingly determined that the first frigates should be plated with 4½-in. armour, backed up with a double layer of teak beams laid transversely, in all 18in. thick, and on this plan the Warrior, Black Prince, &c., have been constructed. A target representing a section of the Warrior thus built was fired at last October at Shoeburyness during nearly two days, and, though every description of solid shot from Armstrong guns and 68-pounders were hurled at it singly and in salvoes of six at a time, this method of construction was shown to be practically invulnerable. No such satisfactory results in the way of resisting the tremendous impact of the shot have been obtained from any other target tried at Shoeburyness before or since. But the Iron-plate Committee had been led by many experiments, some previous and some subsequent to that at the Warrior target, to believe that greater advantages would be gained by increasing the thickness of the armour plates and reducing that of the teak backing. Accordingly, in the three iron frigates now building by the Thames Ironworks, Mr. Laird, and Mr. Mare it was decided to increase the thickness of the armour plates from 4½in. to 5½in., and to diminish that of the teak from 18in. to 19in. The Admiralty, however, reserved to themselves the right of still further altering the contract up to a certain date, and having the plates of 6½in. without any teak backing at all, in case there should be found in the interim such a combination of ironwork as would offer equal resistance, and thus do away with the necessity of putting a destructible material like wood between indestructible armour plates, which, when once fixed, ought never to be removed. This object was so desirable that many attempts have been made to overcome the difficulties which this method of construction presented, the greatest of all being that of fastening the plates to the target in such a way as would enable the bolts to withstand the tremendous jar the whole of the rigid and unyielding fabric receives when struck by a 200-pounder in full flight. During last summer Mr. Fairbairn, sen., constructed an entirely iron target of small size; but the experiments at this proved the difficulties that would have to be overcome in securing the plate, as with the jar caused by every shot the bolts gave way, till most of the plates were brought to the ground, and the target virtually destroyed. On Tuesday another much larger target of Mr. Fairbairn's, constructed on a different plan, was again tried to determine whether the 18in. of wood between the armour and iron skin is necessary to prevent the bolts and rivets being destroyed by the vibration. This target, which was constructed by Messrs. Fairbairn and Co., of Manchester, was 20ft. long by 10ft. high, with a porthole in the centre. The two large plates going the length of the target above and below the port were each 20ft. long, 3ft. 4in. wide, and 4½in. thick. The plates on each side of the narrow port were only 9ft. long, but of the same width and thickness. The two large upper and lower plates were each secured by fifteen 2-in. bolts, fastened with powerful screw nuts at the back, and the two centre plates by eight bolts of a similar description. These plates were fastened to 1-in. wrought iron plates, representing the skin of the ship, and behind each line of bolts were straps of wrought iron 10ft. long by 9in. wide and ¾in. thick. The entire mass was supported by ribs representing the sides of a ship, 18in. deep and 18in. apart made of ⅝in. plates secured by angle irons 4in. by 4in., and ⅝in. thick; while the back of the ribs was still further strengthened by four horizontal strips of wrought-iron, 12in. wide by ⅝in. thick. The armour plates were not wrought, but rolled by Messrs. Brown and Co., of Sheffield, and the tonguing and grooving by which the Warrior's plates are dovetailed together was not resorted to in this instance, the plates being planed flat at their edges, and entirely dependent on the bolts for keeping their places. The whole target was an admirable piece of workmanship, and outwardly seemed strong enough to resist anything.

The experiment seemed to excite great interest, and the principal iron manufacturers and iron ship-builders were present from all parts of the kingdom. Among others were the Duke of Somerset, Lord Mountcharles, Lord De Grey, Lord Clarence Paget, Sir William Armstrong, Sir John Hay, Admiral Grey, Mr. Rolt, Captain Ford, Mr. Scott Russell, Mr. Laird, Mr Mare, Mr. Samuda, Mr. Fairbairn and Mr. Thomas Fairbairn, Mr. Langdon, &c. The target was placed close on the right of the Warrior target, which, all rusty and dinted here and there in rough deep holes, showed signs of the punishment it took so bravely last October. The guns, six in number, were placed at a distance of 200 yards from the target, and consisted of one 120 and three 100-pounder Armstrong guns with two 68-pounder guns for solid shot.

The first experiment made was with three 100-pounder Armstrongs with 12 lb. charges, and shells filled with sand, weighing 104 lb. each, and with two 68-pounder guns, with 16 lb. charge, and shells filled with sand weighing 50 lb. each. These five guns were fired at minute intervals, striking the target on the left-hand of the port, and sending the fragments of the broken missiles flying off with a terrific hum through the air. Not much interest was felt in this first attempt, as, judging by all previous experiments, it was thought almost certain that no damage could have been done. Yet it is not too much to say that, to those accustomed to witness the effect of sand shell on targets of such strength and magnitude, this first result was considered conclusive as to its weakness. An examination after these five shots were fired showed that no less than eight of the main boltheads which secured the plates had given way. This was such a series defection that it could only be accounted for by supposing that the screw nuts fastening the plates at the back of the target had been drawn up too tight. The nuts were accordingly slackened down, and a packing of laynard put between the armour plates and screw nuts of many of the chief bolts, to deaden the concussion, and the trial was proceeded with. The same guns were again fired with the same charges, but this time with live shell, the Armstrongs having a bursting charge of 8 lb., and the 68's a charge of 2 lb., with pillar and concussion fuses. Each shell exploded with a tremendous crash, and four more of the armour-plate bolts were broken at the back of the target, snapping off as short as if they were cast steel. The indent made by the shells was not very much, though apparently more than was made by the same missiles on the hammered plates of the Warrior target, and on both the blows of the 68-pounders had told with a severity in proportion to the increased initial velocity of the smooth-bore over the Armstrong guns. The latter have a slow velocity of 1,100ft. per second, and maintain this rate for a long time, while the former start at once at the rate of 1,650ft. per second, but, after the first 300 yards, lose their velocity with every 100 yards traversed beyond the point blank range. Under this experiment one of the plates, which had been previously struck by the sand-shell on the left of the port, had buckled out about an 1¼in., and the whole appearance of the target showed that it could not stand long. The firing was then continued with one 120-pounder Armstrong, with a 20 lb. charge and 140 lb. solid shot, three 100-pounders, with 14 lb. charge and 110 lb. solid shot, and one solid 68-pounder. The result of this trial was almost conclusive. The 140-pounder struck with a terrific blow between the edges of the top and middle plates, making a deep dint. The second struck on precisely the same spot, deepening still further the dint, breaking the fibre of the iron, and cracking the top and middle plates up to the nearest bolt-heads. The third shot struck in the middle plate, but the fourth hit again exactly in the same spot where the first and second had gone before, and with a crushing noise went right through the target, leaving a rugged, large, irregular hole, which, if made in a vessel at or near the water line, would have caused a formidable leak. The shot penetrated not only the plate, but the strap of wrought-iron behind the bolts, 9in. wide and ¾in. thick, and beyond this again bent one of the main ribs outwards. The fracture of the iron showed that the iron itself was of excellent quality, but there was evidently not the same compactness that is produced by hammered plates, and the rust was distinctly visible between the layers of the iron. Eight more bolts, too, went at this trial, breaking as short as the former had done, but only one of the rivet heads started. It was an extraordinary piece of ill-luck for this target to get three shots in succession in its weakest part, but so it did actually happen, and the last went through. The next trial was made with three 100-pounders throwing solid cast iron shot of 200 lb., with 10 lb. of powder. These all hit in the left-hand side of the target, buckling out the plate they struck till the ends projected nearly a foot, and destroying all, or nearly all, of the remaining bolt-heads in the other plates. This ended the first portion of the experiments, which, when against targets, are always made at Shoeburyness with shots of increasing weight fired singly, and then the same charges fired in salvoes together. But it was seen, after the last trial, that it was useless to proceed with the salvoes; for, as nearly all the bolt-heads retaining the plates had been broken off, it was evident that the first salvo would bring the whole mass to the ground. The firing was, therefore, discontinued, and the target thus practically struck its flag at the conclusion of the first half of the experiments. The trial, on the whole, was considered unsatisfactory. It was admitted on all hands that the target as constructed had most undoubtedly failed. But the chief "iron men" attributed this failure partly to defects in the mode of fastening, and partly to the plates used being rolled instead of hammered. The supporters of the teak backing, on the other hand, attributed the failure wholly to the absence of timber between the armour and the skin, to distribute the force and deaden the jar upon the plates and their fastenings. These gentlemen seemed to have much reason on their side when they pointed to the Warrior target, which had gone through every ordeal during nearly two days' pounding, and was still, beyond all comparison, more perfect than the iron one, which had broken down in little more than an hour's firing. There is no doubt but that Mr. Fairbairn's target was disproportioned in the strength of its fastening. It was suggested that a "washer" between the screw heads of the bolts and the armour plating of a softer metal, such as lead or copper, might have saved the bolts themselves from breaking, and that a packing of tarred felt between the plates and the ribs would have deadened the concussion as much as timber. These may be worth trying, though we think, with all deference, that nothing cheaper and more effectual will be found than the timber backing. The chief value of these experiments, however, is not so much to ascertain the amount of iron required to resist the shot as to find out what description of fastenings will keep the plate in its position when repeatedly struck. The fastenings are, in fact, the only great difficulty in the way of making perfectly invulnerable iron frigates. We venture to think that bolts of iron wire rope might do the work. We don't say they would, but as every other description of bolt has been tried, and failed, it would be worth while experimenting to see what these could effect. They might be fastened at the back by driving an iron nail-shaped wedge into the centre of the rope, and then fusing and welding the wires into a rivet head over this again. During these experiments, as during every other at Shoeburyness, the much greater force of the blow inflicted by the old smooth-bore 68-pounder over the Armstrong shot of double its weight was strikingly evident. This is partly due to the much greater initial velocity of the smooth-bore guns, and partly to the fact that the conical point of the Armstrong shot in nearly all cases breaks off short on striking the target. Against iron targets or ships conical shot are about the worst that can be used, and, both to realise the full effect of the Armstrong gun and to test to the utmost the resistance of the target, it would be better if flat-headed shot were used on these occasions. It would also be as well if the Government were to test a target lined with only nine inches of teak, according to the plan on which the new iron frigates have been ordered. It would be rather a pity to find at the last moment that a mistake had been committed by reducing the teak at all, and nothing but actual practice at a target can ascertain this satisfactorily.

OBELISKS.

A CORRESPONDENT of the *Times* gives, with reference to the Prince Consort Memorial, the following particulars of large monoliths, including obelisks:—

"This idea of an obelisk naturally suggests three questions, viz., the material, the size, and the mode of transportation. As to material, the British Islands give us abundant specimens of the finest granite, a stone with which we are all familiar. London Bridge is a specimen of the blue-gray granite of Aberdeenshire. All the granite of the Royal Exchange is the granite of Devonshire, differing but little in quality and not at all in colour. Waterloo Bridge (at least all the upper part) is Cornish granite of a less compact texture and a somewhat lighter colour. The red granite of Peterhead, in Aberdeenshire, was, I believe, first introduced into London by the late John Rennie, the engineer, who directed that a slab of it should cover his grave. We are now very familiar with it, in the polished shafts of the Carlton Club, in all our cemeteries, and it is generally the material which we see polished in the drinking fountains. It is very compact and beautiful.

"The granite spoken of as the Ross of Mull is much coarser and of a brighter red. I have a polished specimen I brought from that neighbourhood, which is very beautiful in colour, but very coarse; but Nicol, in his *Geology of Scotland*, seems to suggest two sorts—viz., 'pale and high red.' He also says, 'It is the only granite to be found in the Western Islands.' It appears limited to the South-western extremity of the Island of Mull, and the formation is surrounded by the sea on three sides. I never visited the quarries at Peterhead, in Aberdeenshire; but the same writer says the granite of that locality is occasionally sienitic or porphyritic, which latter characteristic is often seen in the polished specimens. I am not aware whether these quarries can be approached from the sea, but I believe the stones at present are brought by land to Aberdeen, and then shipped. I recollect, some years since, when there was a desire to use polished granite shafts 40ft. or 50ft. long for the columns of a large public building in London, it was suggested that the road bridges in Aberdeenshire might prove unequal to the weight of such large stones though there was no difficulty whatever in obtaining them in the quarry itself. Leaving for the moment this part of the question, I now come to monolithic obelisks. They had their origin, as all your readers know, in Egypt, and notwithstanding all the learning of Zoega in his great work, *De Origine et Usu Obeliscorum*, their origin appears to be unknown, and no good reason has ever been given, in my judgment, for their introduction. Their use is well-known. They were set up in pairs before the great temples, and they were used to record the dedication of the temples and obelisks to various Deities, the names and titles of the Kings, with the fulsome additions that usually accompanied such dedication. Champollion gives a translation of the inscriptions on the four faces of the Paris obelisk, which shows they were erected by Ramses II. and his son, Ramses III., with their objects.

"The name given by the Greeks and Romans to these monuments is rather ignoble,—ὀβελος, as your readers know, is the Greek for a spit, and *obeliscus* is of course the diminutive. How many were set up in Egypt in the days of its greatness I have no means of knowing, but 48 of different sizes were removed to Rome. Augustus set the example, and it was followed by his successors down to Constantine. During that period of 340 years these 48 obelisks were set up in Rome, and were standing in the time of Valentinian and Valens, A.D. 364, for in the 'Regionary,' or catalogue, of the public buildings made at that time by Publius Victor, we read as follows:—'Obelisks (great), six, viz., two in the Circus Maximus, the greater of which is 132ft. high, the lesser 88ft.; one in the Vatican 82ft.; one in the Campus Martius 72ft.; two at the Mausoleum of Augustus, 42½ft. Obelisks (small) 42.'

"All these six great obelisks have survived the ravages of the Goth, the Christian, time, war, and flood, showing the enduring monumental power of a monolith. The largest of these stones—that before the church of St. John Lateran—was originally set up at Thebes, it is supposed 1,700 or 1,800 years before Christ. After remaining 2,000 years in its native city, it was floated down the Nile to Alexandria by Constantine; that emperor having intended it to decorate his newly-founded city on the Bosphorus; but, having died before this was accomplished, his son Constantine brought it to Rome. It was conveyed from Alexandria to Ostia, and up the Tiber, in a vessel of 300 oars; it was then removed by land and set up as the *spina* of the Circus Maximus. The land journey extended to three miles, which was performed on low-wheeled wagons. The date of its being raised was A.D. 357. It is not known when it was thrown down, but it was found by Sixtus V. broken in three pieces and buried twenty-four Roman palms in the ground. Its height is stated to be 148 palms. It was set up in its present place, as was also the obelisk, in front of St. Peter's, by the celebrated architect Fontana, who also removed and erected the great obelisk in front of St. Peter's. It is impossible to follow out this subject, but those who desire to do so may find all the circumstances of the Roman obelisks fully discussed in a very learned paper read by the Rev. Richard Burgess before the Institute of British Architects, May 31, 1858, and in the report of the discussion of June 14, which followed, by Sir Gardner Wilkinson and others. At this meeting Mr. Bell, the sculptor, also explained his ideas of the proper lines or forms of an obelisk, in which I agree. I am indebted to this paper by Mr. Burgess for many of the foregoing particulars. The Lateran Obelisk is red granite or sienite, and covered with hieroglyphics most beautifully cut. I believe all the Egyptian obelisks are red sienite, from the quarries of Syene (whence its name), and many travellers have noticed the fact that two unfinished obelisks of enormous size still remain in those quarries.

"This reference to the colour and material of the obelisks of antiquity leads me back to the first point of my remarks, and I have only to express a hope that the English monolith may be of red granite, and, if possible, of the granite of Peterhead, so similar in colour and quality to the Roman obelisks."

"The third point, to which I will shortly advert, is the means and cost of removing, working, and setting up large stones. In ancient times Herodotus speaks of a monolith temple of Latona removed 600 miles—of course principally down the Nile—and, if his dimensions are to be relied upon, its weight must have been 5,000 tons. The mode adopted by the Egyptians is shown, like everything else belonging to that remarkable people, in the paintings on the walls of the tombs. It was effected by mere brute force, and by thousands of men."

"In modern times we have exact details of the method pursued by three architects, viz., that of Fontana, in his book *Della Transportazione dell' Obelisco Vaticano*, published in 1590; next, the removal of the great stone on which the statue of Peter the Great stands, by Le Comte Caabary, or Lascary, Paris, 1777; and, lastly, the curious book of M. Lebas, the French architect, employed to bring the obelisk of Luxor to Paris and to set it up in the Place de la Concorde, Paris, 1839.

"The St. Petersburg monolith was found in the marshes of Finland, is of dark gray granite, and it weighed 1,450 tons, was moved four miles by land, and floated across the Gulf of Finland on a great raft towed by two ships. The expense, as far as I can make out, was 70,000 roubles.

"In the French instance the obelisk was lowered into a canal cut to the Nile, and received into a vessel (the Luxor) built on purpose, having an opening in the stern. This vessel crossed from Alexandria to Toulon, then to Havre, and finally ascended the Seine, where it was moored at the foot of the incline leading up to the Quai, and rolled on a platform to the middle of the Place de la Concorde, where it was set up. The cost of this work is stated variously at from £25,000 to £30,000.

"I will not intrude upon your space to refer further to monolithic shafts of columns than to state that the columns of the Pantheon are in one stone (the front row gray granite, the second row red granite), from the island of Sardinia; and also that at St. Petersburg there is an isolated column, "the Alexander column," 80ft. high, in one stone. This column was designed and executed by M. Montferrand, a French architect, who also built the Izaak Church; the shafts of the columns of the portico of that church are 60ft. high, in gray granite, each in one stone, and the masses of steps up to the portico are also in single stones and of enormous dimensions. I believe there is an account published of the mode adopted for moving these stones, but I have not been able to see it.

"In conclusion, I may add that a monolithic obelisk, of the exact proportions of the Luxor obelisk, and 100ft. high, would be 10ft. 6in. diameter at the base, and 6ft. 6in. under the pyramidion; and its weight, wrought and polished, of Peterhead granite, would be about 600 tons. To procure and raise such a stone in Hyde Park ought not to offer any particular difficulties to the architects of our own country."

Mr. Latimer Clark, writing from Cairo, also gives the following particulars of the obelisk at Alexandria.

"As the Alexandrian obelisk, which is the property of the British nation, has lately formed the subject of several letters in your columns, I have, through the assistance of the English Consul at Alexandria, obtained permission to excavate round it, and examine it, and the following account of its present condition may probably be interesting to your readers:—

"It lies on its side, imbedded in sand and shingle in the Western Harbour. Its under side is from 6ft. to 18ft. beneath the surface of the soil, and about 10ft. above the sea. Its base is about 12ft. and its apex 50ft. distant from the inner side of a rough rubble sea wall, which is 19ft. thick, and 24ft. high. The sea just washes the base of the wall, and the gravelly bottom deepens so gradually that a vessel drawing 20ft. of water could only approach within 400 yards. The obelisk is of granite, and is perfectly sound and unbroken, with the exception of its apex, 20in. of which have been broken away, but could be readily restored. Its present length is 66ft. 10in.; its breadth at the base is 7ft. 6in. by 7ft. 1in., and at the top where the apex commences 5ft. 1in. by 4ft. 10in.; the apex when complete is 7ft. 11in. high. The base is not flat, but roughly rounded as the stone left the quarry, and as 18in. of this would be necessarily built in its foundation, its height when erected as an obelisk would be 67ft. I believe the one at Paris is nearly 3ft. higher. Its weight is about 170 tons. Before describing its condition I will speak of that of the fellow monolith, so well known as "Cleopatra's needle," which stands erect a few yards to the eastward. This measures 7ft. 8in. by 7ft. 7in. at the base, and appears both in size and in its hieroglyphics to be almost a fac-simile of the fallen one. On the north side, facing the sea, the hieroglyphics appear nearly as perfect as when they left the sculptor's hand, and on the west side they are equally so, except near the bottom and at the extreme top. On the east side they are also perfect for one-third of the breadth throughout the whole height, but on the remaining two-thirds and on the south side they are nearly obliterated, and the granite is much decomposed, a few only of the deeper markings (originally 2in. or 3in. deep) being faintly discernible. It is evident that it has at some period lain on its side, partially imbedded in a soil which exerted a decomposing action upon it.

"The fallen obelisk is in this respect in a better condition, every hieroglyphic upon it being perfectly legible. On the two lateral faces they are very bold and perfect, and by mining under it in places I was able to ascertain that those on the under side are in the same condition. The upper face is the most imperfect, the surface being worn and injured, and the figures partially obliterated, though still very legible. The worse feature is, however, the state of its edges, all four of which have been broken away from top to bottom, usually to the extent of three or four inches, and near the base one of them has suffered a still more extensive injury. This greatly deteriorates from the beauty of the obelisk, and constitutes, I think, the only real ground for those who think it not worth the expense of its removal to England. It will be again covered with earth after the visit of His Royal Highness the Prince of Wales, to prevent the sale of fragments by the Arabs; but a model of it in its present state will be forwarded in a week or two to 1, Victoria-street, Westminster, to the care of Sir Charles Bright, who will, doubtless, have pleasure in showing it to any who are interested in the subject. There is no ground for the supposition that either obelisk is undergoing any decay or deterioration in its present position."

WOOD'S FERMENTING TUNS.

THIS invention, by Alfred Wood, of Lewes, Sussex, has reference more particularly to the fermenting tuns employed in brewing beer in which "covers" or "barm separators" are employed for separating the yeast from the beer as it is formed during the process of fermentation. Such covers have been variously constructed to act as attemperators or coolers to the fermenting mass in the tun by being formed of a hollow metal vessel through which cold water was made to flow, or they were formed of wood with a coil of metal pipes fixed to the under side, which was consequently immersed just under the surface of the fermenting worts, and through which cold water was made to flow; the yeast rising through small apertures in the cover was deposited upon the upper surface of the same. All these contrivances have, however, failed more or less to accomplish the object for which they were intended, because, in the first place, they were wrongfully made to act as attemperators or coolers to the surface of the fermenting mass where the yeast is forming, which carries with it particles of unconverted starch and gluten, and these particles on being thus cooled were precipitated into the warmer and consequently less dense mass of fermenting worts, instead of rising to the top of the cover, and being there brought into contact with the atmosphere.

Secondly, the attemperating action of the upper surface of the cover upon the yeast deposited upon it was not sufficient to act upon and separate liquid particles carried up with the yeast.

Thirdly, the openings through which the yeast rises on to the cover were too small, and consequently the liquid particles and gases were in a great measure squeezed out of the yeast before it arrived on the cover.

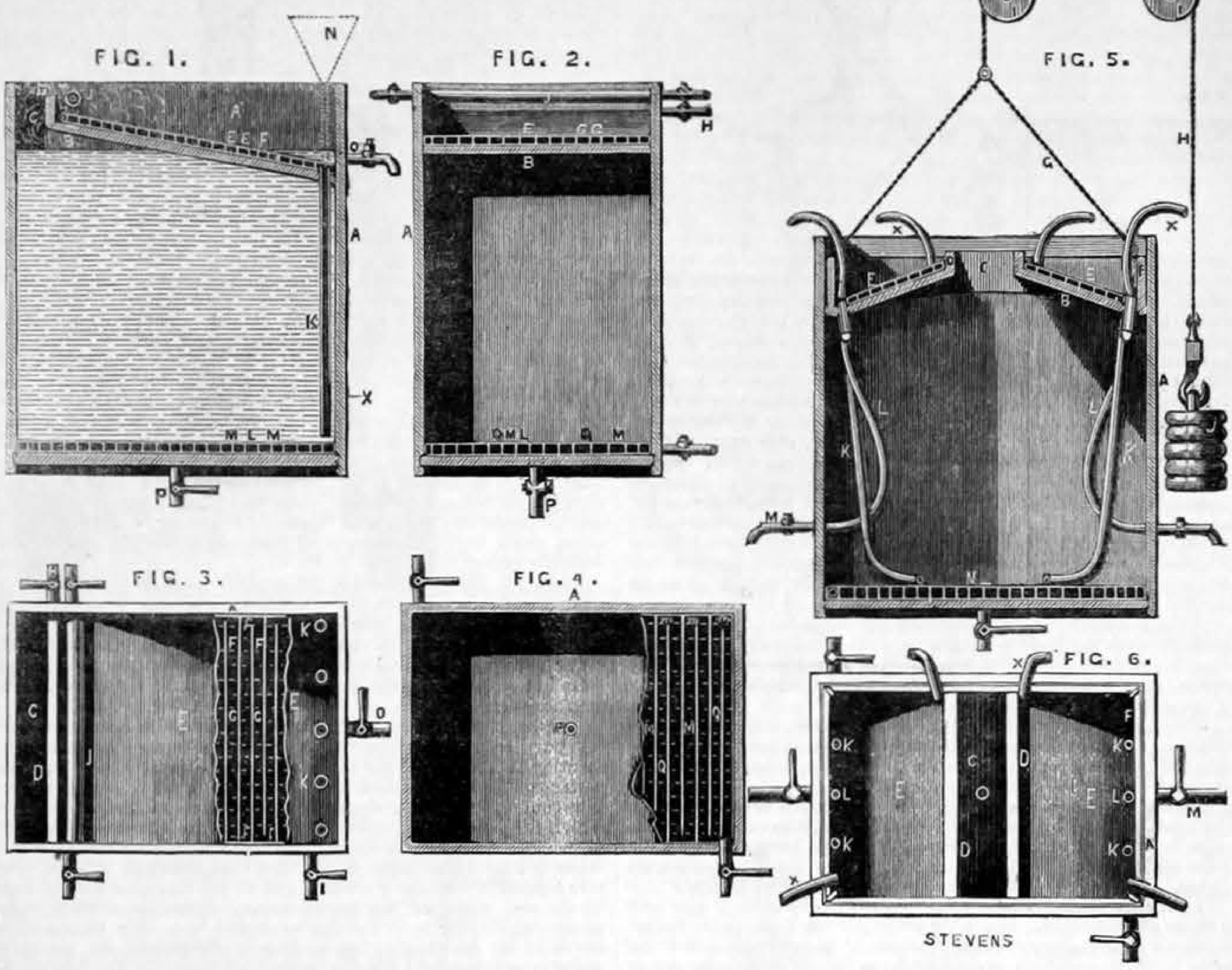
The object of this invention is to remedy these defects, and for this purpose a "cover" or "barm separator" is applied to the fermenting tun, of which the under side, which is in contact with the surface of the fermenting liquor, is formed of wood or other good non-conductor of heat, while the upper surface of the same, upon which the yeast is deposited as it rises from the fermenting liquor, is formed of a flat hollow metal vessel through which cold water is made to flow. The yeast, which rises freely through a large aperture formed in the cover at one end of the tun, is thus acted upon by the cold upper surface of the cover, whilst the surface of the fermenting liquor is effectually protected from any such cooling action by the intervening non-conductor of heat, and the precipitation of yeasty particles into the fermenting liquor is by this means prevented. It is preferred to fix this cover in an inclined position, and at the lowest side of the same are provided pipes for conducting the beer which is separated from the yeast on the cover back again to the bottom of the tun. On the bottom surface of the tun is formed another hollow metal casing through which, when the fermentation of the liquor is nearly completed, cold water is allowed to pass, by which the beer is cooled and acid fermentation prevented from setting in. In some cases where the fermentation of the liquor is sluggish it is accelerated at the commencement by passing hot water through the double bottom of the tun; or if the fermentation should proceed in too violent a manner it is checked to any required extent by passing more or less cold water through the double bottom during the process of fermentation.

Fig. 1 shows a longitudinal section through the fermenting tun; Fig. 2 shows a transverse section; Fig. 3 shows a plan; and Fig. 4 a sectional plan on line X, X.

Near the top of the fermenting tun A, which may be of any ordinary construction, is a cover B, formed of wood or other material which is a bad conductor of heat; this cover is fixed in a slanting position in the tun, as shown, and fits close to three of the sides of the tun, thus forming a yeast chamber A¹. At the fourth side where the cover is highest a space C is left between it and the tun. At this edge of the cover is fixed a vertical rim D, and upon the upper surface of the cover B is placed a shallow metal vessel or casing E, the top surface of which may either be plain or corrugated, and inside which a series of transverse partitions, F F, are fixed in such a manner that every following one has an aperture at the reverse end to that in the preceding one, as seen more clearly at *f f*, in Fig. 3, where a portion of the top plate of the casing is removed. Cold water is made to flow into this casing at H, and is caused by partitions F and G to flow backwards and forward over the entire area of the same, and eventually escapes through the pipe I. A short distance in front of the vertical rim D is a metal pipe J, through which also cold water is made to flow. By this arrangement, if the tun is filled with the fermenting liquor up to the under side of the cover B, the yeast as it is formed will rise up freely through the wide opening C, will fall over the edge of the rim D on to the cold surface of the metal casing E, coming in contact at the same time with the cooling surface of the metal pipe J, and then gradually descending upon the inclined surface of the attemperating metal casing in a thin layer, will thereby be thoroughly acted upon both by the cold surface of the casing and by the atmosphere. The yeast becomes by this means perfectly separated from the beer that is carried up along with it, and the latter, passing down to the lowest point of the cover, finds its exit through the small pipes K K, which conduct it back down to the bottom of the tun. On the bottom surface of the tun is another hollow metal casing L, constructed with partitions M M, having openings *m m*, similarly to the before-described yeast attemperator E, and through which, at a certain period of the process of fermentation, cold water is made to flow, the partitions M M serving both to cause the water to circulate over the whole surface of the casing, as also to strengthen the same so that it can bear the weight of a man when the tun is emptied for cleansing purposes.

The mode of operation in the fermenting tun is as follows:—The wort is pitched with yeast in the usual manner, and the tun is filled up to the under side of the cover to the height indicated by the dotted line in Fig. 1, so that a certain quantity of the worts lies upon the top of the cover, owing to the communication formed by the pipes K K. On the fermentation setting in the yeast as it is formed, accompanied by unconverted particles of starch and gluten, and containing at the commencement a large amount of essential oils of the hops, rises through the opening C and falls over the rim D on to the attemperator E, as already described; it passes down the surface of the same, and the liquid, becoming separated from it, finds its way in a cooled state through the pipes K K to the bottom of the tun. During the earlier stages of the fermentation it is best to rouse the thin yeast into the liquor upon the cover, and to pass the same down into the tun through the funnel N inserted in the openings of the pipes K. This is an important feature in this invention, as by this means the essential oil of the hops which passes up with the yeast becomes fixed in the liquor instead of being volatilised and lost as was heretofore the case, thus effecting a great saving in hops and improving the flavour of the beer. Should the fermentation proceed too sluggishly at first it may be accelerated by passing warm water through the bottom attemperator L. The circulation of the worts continues until the yeast which is formed becomes thick, when the openings in the cover leading to the pipes K K are closed, so as to prevent the yeasty beer from passing back into the tun; a funnel N is inserted into these apertures, through which clean beer from a previous brewing is poured in from time to time to make good the loss of the liquor resulting from the formation of the yeast. The beer as it settles from the yeast in the yeast chamber A¹ is drawn off through the cock O provided for that purpose, and is also poured back through the funnel N. When the beer has become sufficiently attenuated and the vinous fermentation

WOOD'S FERMENTING TUNS.



nearly ceases cold water is made to circulate through the bottom attemperator L, so as to cool the mass and check further fermentation, when the process will be completed and the beer fit for use.

In some cases the fermenting tun is employed for storing the beer after the fermentation is completed, by which a great economy in space, in waste, and in apparatus is effected. For this purpose the aperture C in the cover, as also the small holes leading to the pipes K K, are effectually closed up and the yeast chamber A^1 is filled with cold water, thus forming a perfectly air-tight vessel, which is effectually shielded from the heat of the atmosphere, and in which the ripeness of the beer may be hastened or retarded, by means of the attemperator L at the bottom of the tun, at the pleasure of the operator. The beer is drawn off from the tun when required through the cock P fixed in the bottom of the same. The "cover" or "yeast separator" to the tuns may be arranged in such a manner as to rise and fall in the tun according to the level of the worts in the same. For this purpose they may be constructed as shown in Figs. 5 and 6. Fig. 5 shows a longitudinal section, and Fig. 6 shows a plan of the apparatus. A is a fermenting tun of ordinary construction, provided with an attemperating vessel N at the bottom; B B is the wooden bottom to the cover, which is not fixed to the sides of the tun; and E E the attemperating vessels fixed on the top of the same, into and out of which the water is caused to flow through the flexible pipes *x x*. The aperture C which extends across the cover is in this case situated in the middle of the same, and the cover slopes up to it from either side. A rim, D D, is fixed at the edges of this opening, and round all four sides of the cover is fixed a rim F, forming the yeast chamber; to this rim are attached the chains G G, fixed to a central chain H, which passes over pulleys I I, and is also fixed to a balance weight J, by which the cover is kept suspended in the tun. As the level of the worts in the tun rises or falls, so this cover, floating on the surface of the same, is caused to rise and fall with it. The pipes K K for conducting the liquor back to the bottom of the tun are made flexible to allow of the motion of the cover, and other flexible pipes, L L, are provided, leading from the top of the cover to the cocks M M fixed in the sides of the tun for drawing off the beer from the yeast chamber when the pipes K K are closed. Mr. Wood sometimes forms such floating cover with an aperture at each end of the same, and then forms the cover so as to slope down toward the centre, and in some cases he provides only one aperture at one end of such floating covers, and makes them to slope down towards the other end, similar to the fixed cover shown in Figs. 1, 2, 3, or the cover is made flat instead of sloping.

VAVASSEUR'S MACHINE FOR RIFLING CANNON.

FIG I.

FIG 2.

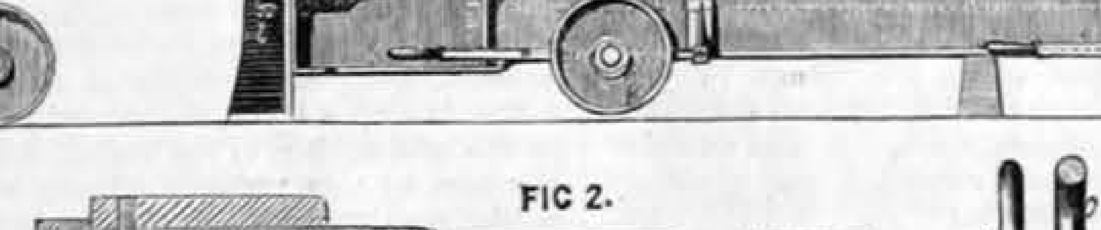
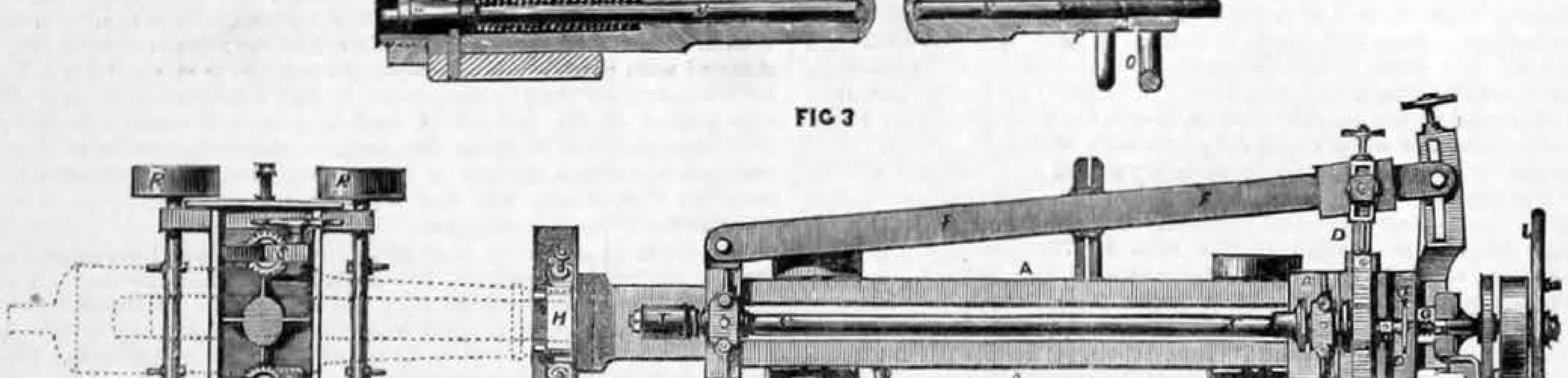


FIG 3



THIS invention for a "New or Improved Transportable Machine or Apparatus for Rifling Cannon," by Josiah Vavasseur, of 28, Gravel-lane, Southwark, consists in so constructing and arranging to be driven by manual power the machinery used for rifling cannon in combination with new or additional parts so as to produce a machine capable of being readily moved or transported from gun to gun, and place to place, in order that the operation of rifling may be carried on in the place where the guns are used, as, for example, in fortresses or ships, thereby avoiding the expense and inconvenience of removing the guns any distance from their position to the arsenal or other place where the rifling is usually done.

Fig. 1 is a longitudinal elevation of the improved transportable machine or apparatus, with the carriage for holding the gun in position for the purpose of rifling the same; Fig. 3 is a plan of the same machine and carriage; and Fig. 2 is a view, drawn to an enlarged scale, of the arrangement for rifling or cutting the grooves.

The machine for rifling consists of a bed A, similar to a lathe bed, fitted with a saddle B, travelling along the bed carrying the end of the rifling bar C, cross slide D, rack E, radius bar F, and screw G, for travelling saddle similar to an ordinary rifling machine. At one end of the machine is fitted a bracket and chuck H, with a hole large enough to receive the muzzle of the largest cannon the machine is designed to rifle. Four or more set screws *i, i, i, i*, are tapped through this chuck for the purpose of setting the gun or other piece of ordnance concentrically with the rifling bar, and securing it in its position when so set. At the other end of the machine may be mounted a fly-wheel J, so that the machine may be driven by manual power where, from position or other circumstances, other motive power is not available.

The bed of the machine is carried on four wheels, on the axles of which are fitted eccentrics K, K, by means of which the wheels may be raised or lowered so that the bed of the machine can rest upon suitable standards fixed to the machine, or can be lifted on to the wheels and transported from gun to gun as may be required.

The bar C used for rifling is hollow; on the end to which the cutters are attached a block L is fitted, which fits the bore of the gun, so as to slide up and down the barrel freely; the hole at this end of the bar is enlarged to admit of a cone M. On the surface of this cone, at right angles to the axis of the same, the cutters rest. The cone is fastened to the end of a small rod N, Fig. 3, which is continued right through the end of the bar carried by the travelling saddle B. This end of the rod is screwed, and a small hand-wheel O is tapped to fit the screwed end of the rod. Between the boss of the wheel and the end of the bar a cam P is placed; the object of this cam is that, previously to the bar being run back up to the breech of the gun or other piece of ordnance to be rifled, the cam P is to be so placed as to allow the cone M to recede back towards the breech of the gun, a spiral spring pressing against the cone for this purpose; this allows the cutters to fall in towards the centre of the bar, a small spring being used to press on them for that purpose. When the bar has arrived at the breech end of the cannon the cam P is turned so as to bring the cutters back to the same place exactly in which they were at the finish of the last cut: the necessary feed is then given by the small hand-wheel O. The block L at the end of the bar, through which the cams project, is made so as to be changed to suit the different sizes of guns or other pieces of ordnance it may be required to rifle.

The carriage on which the gun or other pieces of ordnance is to be placed during the operation of rifling is mounted on four wheels R, R, so as readily to be moved alongside the gun it is proposed to operate upon. The gun is lifted into the carriage, the trunnions resting on V-shaped carriers S, S, with a screwed piece T, T, beneath each, and a nut worked by a worm and whee similar to a screw jack. This arrangement allows the gun to be readily raised, if necessary, for the purpose of adjusting it for rifling. The carriages which carry the V-shaped carriers and screws can also be moved transversely by means of a screw; this, with the screws *i, i, i, i*, for the muzzle, allows the gun to be adjusted readily and accurately. With this machine the cannon may, in some instances, be rifled without even moving it from its carriage.

The machine may be also fitted with a bar for reboring the cannon previous to rifling, when necessary, through the cannon being old or badly bored.

MEYER'S SLIDE VALVES.

THESE improvements, by H. C. Meyer, of Hoxton, consist, firstly, of certain appliances to the ordinary slide valves now in use, and by means of which the friction on the face of the valve is reduced to a minimum, and consist of eccentric axles provided with wheels placed on the sliding part of the valve, and revolving in bearings placed on each side of the wheels, the bearing bracket or plummer block being fixed on the pressure side of the slide bearing, being close to the wheels in correspondence with rails fixed on the face side of the stationary frame of the valve.

Secondly, in this arrangements the axles are not eccentric as in the first plan, but will be fixed on to the body of the sliding valve, and the wheels will revolve in one and the same position on the rails of the stationary frame of the valve.

FIG. 6.

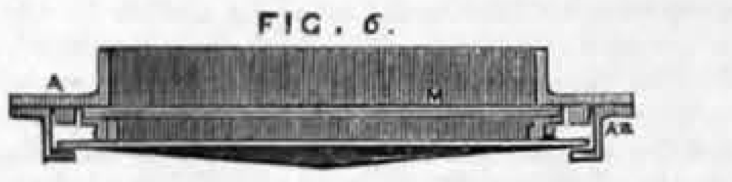


FIG. 5.

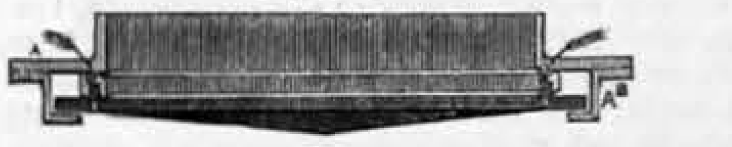


FIG. 4.

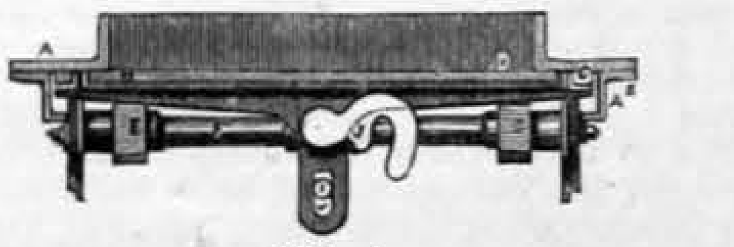


FIG. 1. FIG. 2. FIG. 3.

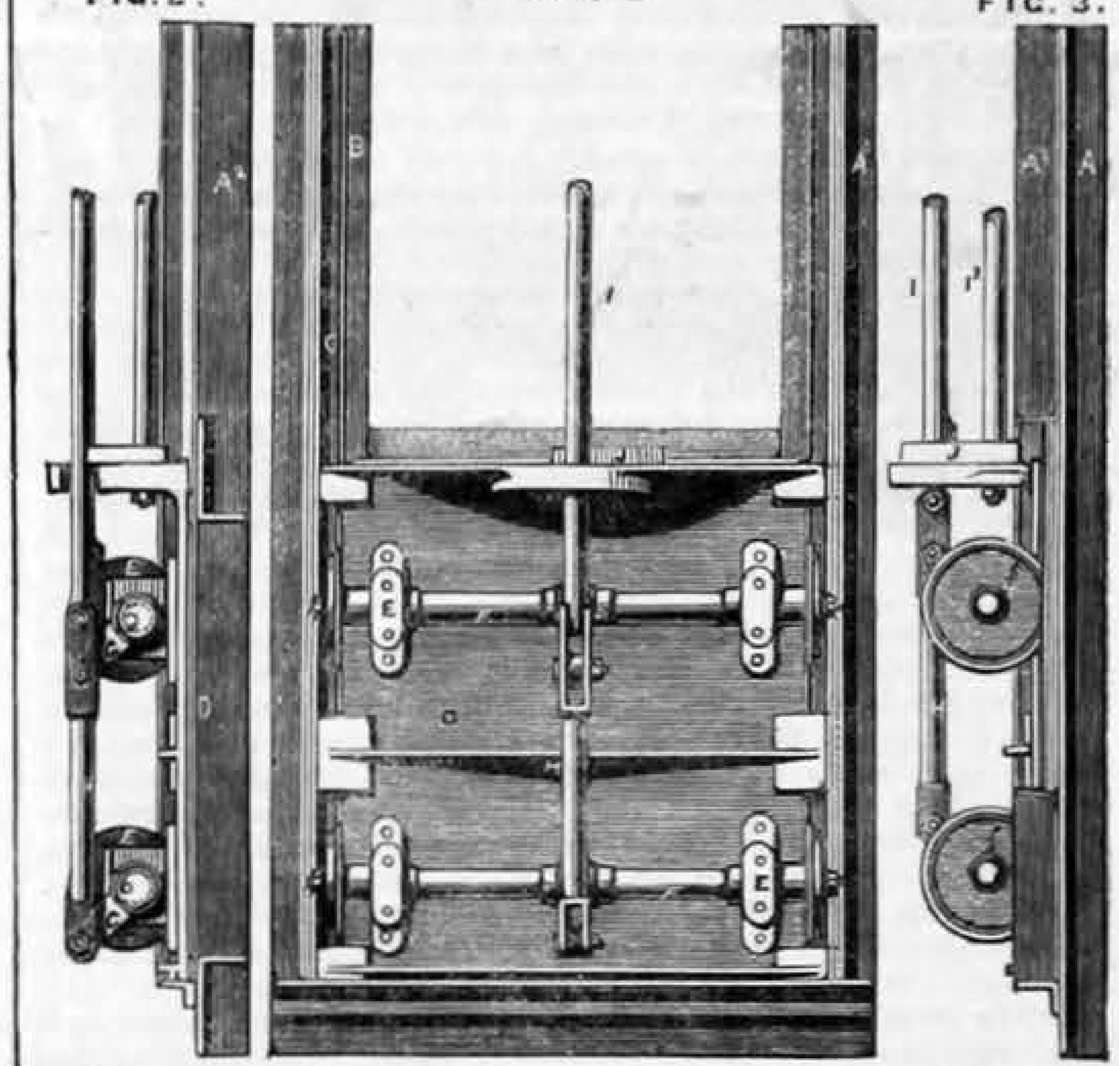


Fig. 1 is a front elevation; Fig. 2, vertical section, taken at A, B, of Fig. 1, showing slide pressed close to the face forming the water-tight joint; Fig. 3 is a side elevation with the slide not closed or raised from the face; Fig. 4, a transverse section showing the application of the metallic double-joint face; Fig. 5, a plan or transverse section showing position of india-rubber packing, to assist in forming the joint. A denotes the stationary frame; B, the face which abuts against the face on the slide; C, the rail on which the flanged wheels attached to the slide travel when the slide is put in motion; A^2, upright guide for the slide, bolted or screwed to the stationary frame; D, the slide to which the plummer blocks E are secured, such plummer blocks forming the bearings for the axles F of the wheels: these axles are at the ends constructed so as to form axles of smaller diameter (see *f*, Figs. 2 and 3) for the wheels to turn upon, this smaller reduced axle being eccentric to the circle of the main portion F of the said axles, that is, close to its circumference and not at its centre. The axle F is at the middle provided with a lever arm G, keyed on to the axle, secured to another lever H, connecting the same to the other lever arm G of the other axle F, and to the connecting or working rod I. K is a square rod secured (free to turn) to the slide.

Supposing the valve to be shut, as shown in Figs. 1 and 2, and it is desired to open the same, the connecting or working rod I is moved, which, through the levers G and H, communicates motion to the axle F, *f*, giving the axle F, *f*, a quarter turn, thus forcing the wheels on the rails, and raising the slide from contact with the faces; then, by continuing to move the working rod I, the slide is moved from the valve opening, and when the valve is to be shut again the rod I^2 is turned a quarter turn, causing the hook J to embrace the working rod I, to insure the wheels being kept in contact with the rails while the slide is in progress of being shut, and when the slide is fairly over the valve opening the hook is to be reversed, and then, by continuing the motion, the axles will make a quarter of a revolution and bring the face to close contact.

Fig. 6 shows another arrangement with loose faces; L are loose angle irons brass-faced (cast) bolted to the valve (M), with vertical slots, to allow the angle irons brass-faced (L) being by the pressure of the water kept close to the brass faces, keeping the same water-tight. For the eccentric motion wooden faces would be preferable to those of other materials. The loose metal faces may be used with advantage for steam engines

W. AND P. A. SAVORY'S WINDING APPARATUS.

FIG. 1

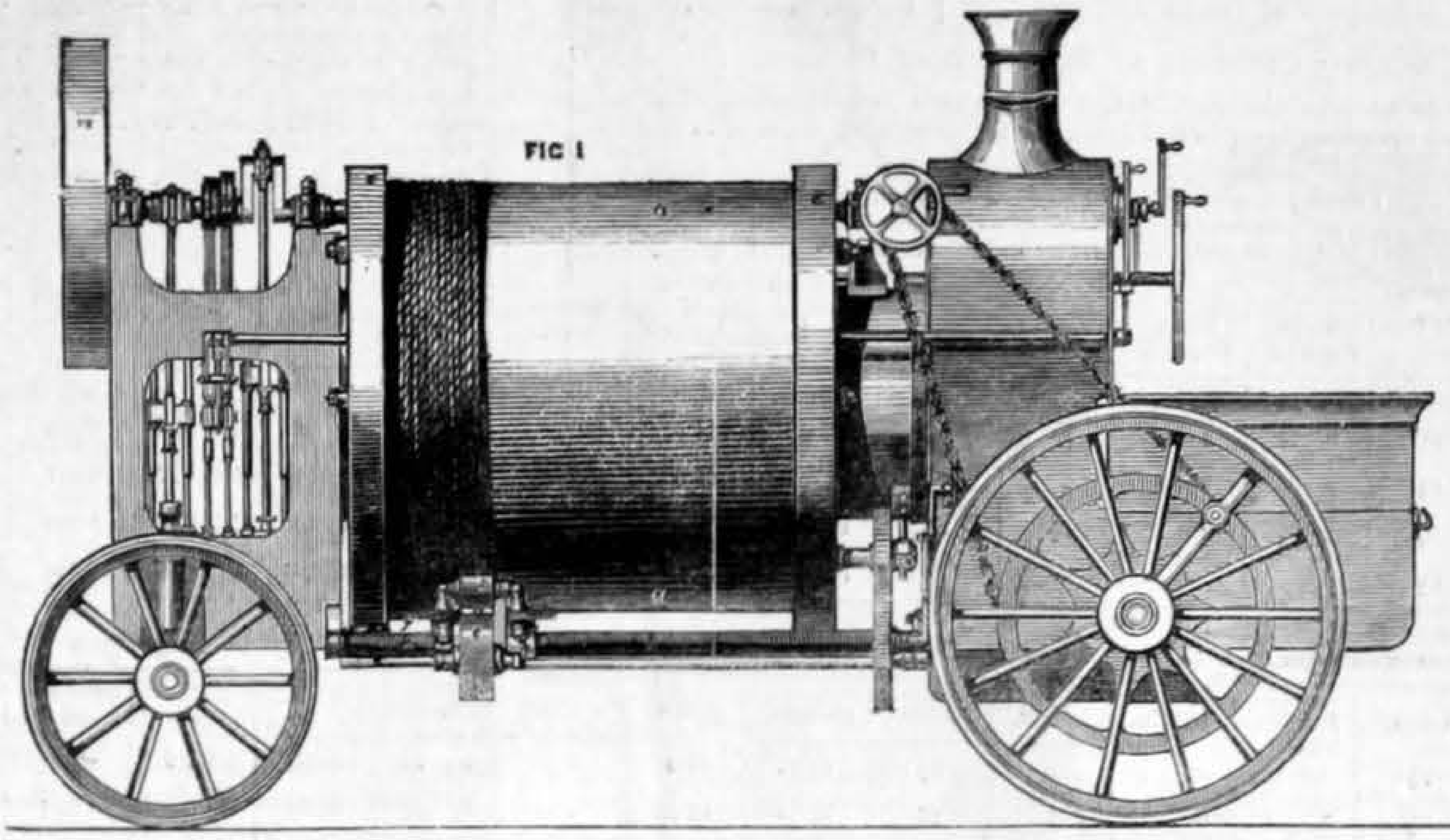
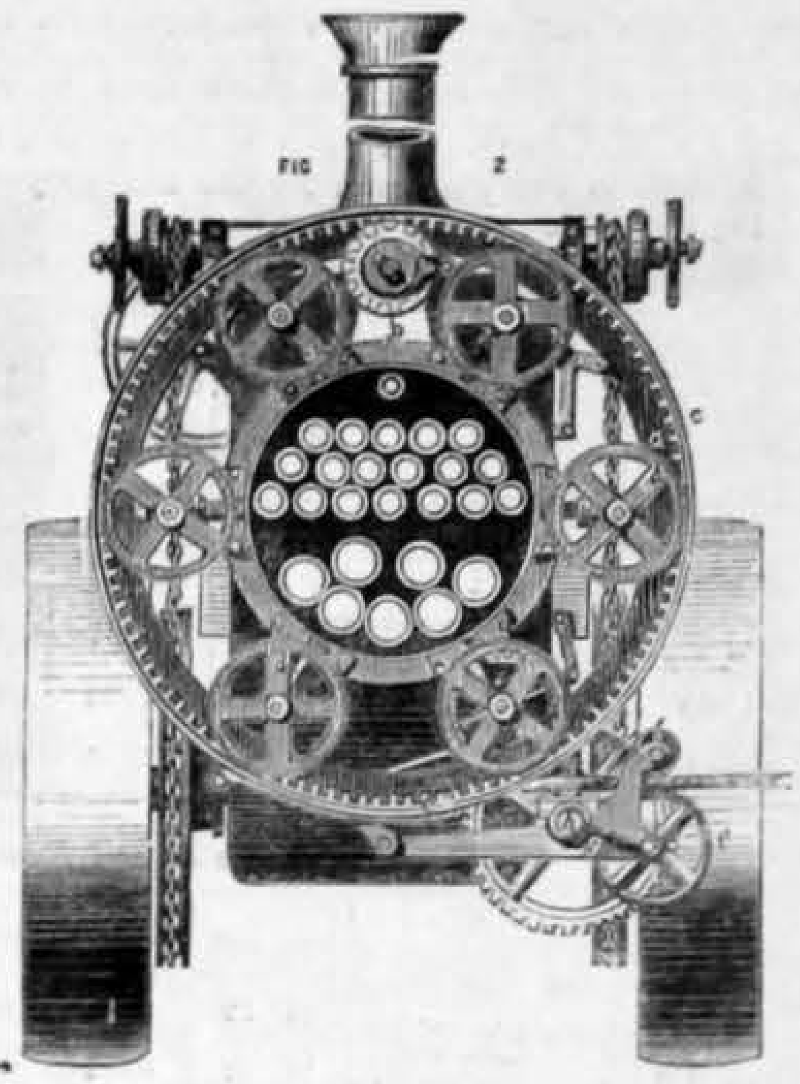


FIG. 2



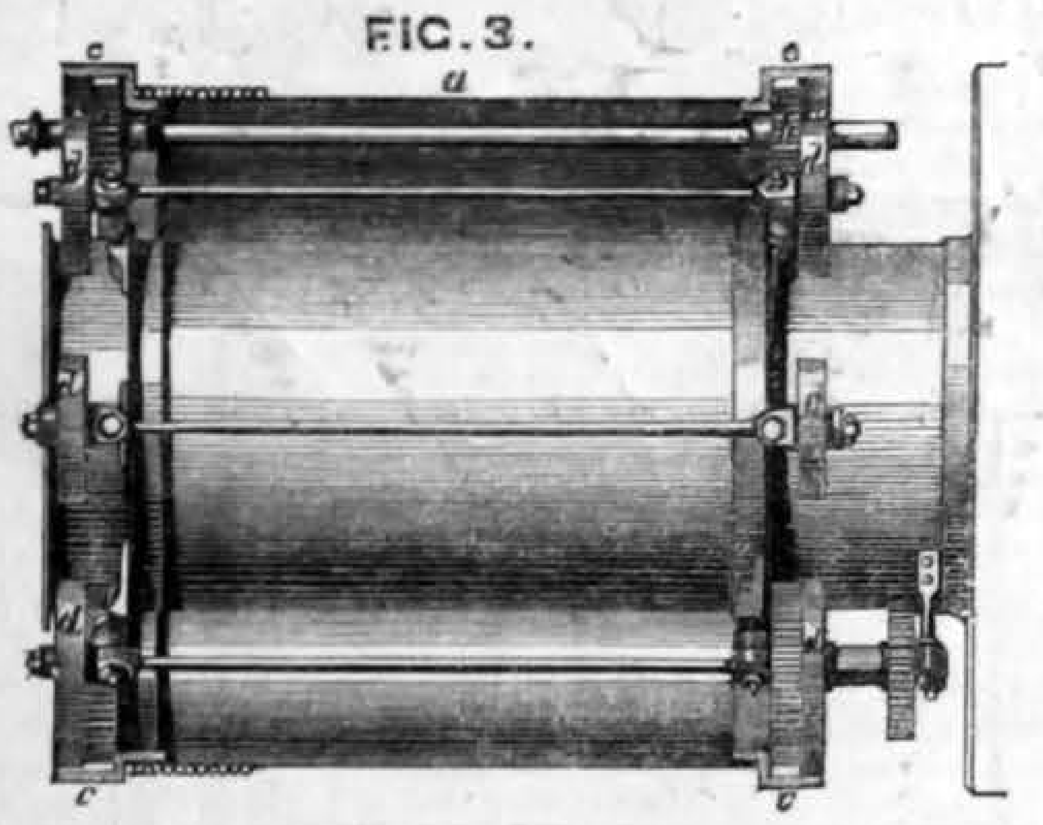
THIS invention, by Messrs. Savory, of Gloucester, consists in applying certain mechanism to the barrel or cylindrical part of the horizontal boiler of a stationary or portable engine, for the purpose of winding ropes or chains at pit's mouths, or for ploughing or other purposes.

It is proposed to place a drum round the horizontal boiler, which drum is caused to revolve by suitable wheels or gearing connected to the engine. The drum is to be made of wrought iron with a suitable cast iron head or ring at one or both ends; this ring is to have teeth cast inside, to gear into a pinion or pinions on the engine or other shaft; a part of the breadth of this ring is turned out true, to run on a number of friction rollers on the barrel of the boiler. When two drums are used they may be constructed with a cast iron head at one end and a wrought at the other with friction rollers, as before. The rope is to be guided on the drum in the following manner:—A pulley is fixed on a horizontal spindle in a suitable frame, to receive or bear the rope from the plough or other thing to be drawn; two other pulleys are fixed on the same frame on vertical studs or spindles, with grooves turned in each to fit the rope, and placed one on each side of the rope, so that the grooves of the guide wheel are opposite the periphery of the drum where the rope runs, and connected with suitable wheels to the internal gearing of the drum ring. The pitch of the screw is proportioned so as to move the frame during one revolution of the drum a distance corresponding with a little more than the thickness of the rope.

Fig. 1 is a side elevation of the apparatus; Fig. 2 is a transverse vertical section; and Fig. 3 a longitudinal vertical section.

a is a drum of metal placed around the horizontal boiler of the engine, and caused to revolve by pinions *b*, *b*, working within heads or rings *c*, *c*, placed or fixed on each end of the drum *a*, and having also teeth within them which correspond with those of the pinions *b*, *b*, these pinions being firmly secured to the engine shaft, as shown at Figs. 2 and 3. A series of friction wheels or rollers *d*, *d*, are secured by suitable bearings to the barrel of the boiler, for the purpose of supporting the drum *a* and maintaining it in position, or the friction wheels *d*, *d*, may in some cases be attached to the rim of the drum *a*, and revolve round the periphery of the boiler ends.

FIG. 3.



At Figs. 1 and 2 will be seen the method of guiding the rope round the drum *a*, to prevent its overlapping. A pulley *e* is fixed on a horizontal spindle in a suitably constructed frame, to receive or bear the rope from the plough or other thing being drawn; this pulley has another small pulley or roller e^1 immediately above it, to steady the rope in its passage through two horizontal grooved wheels *f*, *f*, fixed on studs or spindles attached to the before-mentioned frame; the edges of these grooved wheels touch each other, thus forming a circular opening for the rope to pass through; the frame is provided with suitable bosses *g*, *g*, having an internal screw thread cut therein to fit on a horizontal screw shaft *h*, secured by brackets or otherwise to the frame of engine or boiler. This screw shaft is so placed that the grooves of the guide wheels are opposite the lower periphery of the drum *a*, where the rope runs, and is connected with suitable wheels to the gearing inside the drum ring, as shown at Fig. 3. The pitch of the screw upon the shaft *a*, as also the number of teeth upon the wheels driving such shaft, are proportioned so as to move the frame during one revolution of the drum *a*, a distance corresponding with a little more than the thickness of the rope.

TRAFFIC RECEIPTS.—The traffic receipts of railways in the United Kingdom, amounted for the week ending the 1st of March, on 10,109½ miles, to £466,290, and for the corresponding week of last year, on 9,871¾ miles, to £483,920, showing an increase of 237½ miles and a decrease of £17,630. The gross receipts on the following fourteen railways amounted in the aggregate, on 6,601¼ miles, to £354,060; and for the corresponding week of 1861, on 6,445 miles, to £370,485, showing an increase of 156¼ miles and a decrease of £16,425. The decrease on the Great Northern Railway amounted to £1,803; on the Great Southern and Western to £377; on the Lancashire and Yorkshire to £4,461; on the London and North-Western to £4,203; on the Manchester, Sheffield, and Lincolnshire to £1,658; on the Midland to £2,734; on the North-Eastern to £2,925; and on the South-Eastern to £1,159—total, £19,320. But from this must be deducted £975, the increase on the Caledonian; £180 on the Eastern Counties; £877 on the Great Western; £65 on the London, Brighton, and South Coast; £518 on the London and South-Western; and £280 on the North British—together, £2,895, leaving the decrease, as above, £16,425. The goods and mineral traffic on those lines amounted to £201,813, and for the corresponding week of 1861 to £218,376, showing a decrease of £16,563. The receipts for passengers, parcels, &c., amounted to £152,247, against £152,109, showing an increase of £138. The receipts on sixty-six other lines amounted, on 3,507¾ miles, to £112,230, and for the corresponding week of last year, on 3,426¾ miles, to £113,435, showing an increase of 81 miles and a decrease of £1,205. The falling off in the traffic of the past week as compared with the corresponding period of 1861 is principally in the goods and mineral traffic of the great lines, and indicates the depression of trade in the manufacturing districts. The traffic receipts of the past week show an increase of £3,431, as compared with those of the preceding week ending the 22nd of February.

RICHMOND, CHANDLER, AND RITCHIE'S SACK HOLDER.

THE object of this invention, by Messrs. Richmond and Chandler, of Salford, and W. B. Ritchie, of Belfast, is to retain the orifice of sacks distended while they are being filled. The improved sack holder consists of a pillar or other fixing, to which is connected, by a set screw or other adjustable means, a bracket, in which are fixed the studs for two levers or arms furnished at their lower extremities with holders to which the sack is suspended. The levers are coupled by toothed segments, or other equivalent means, so that both are expanded or contracted simultaneously. One of the levers is provided with a ratchet segment, into which a pall gears to hold the levers apart. By means of this improved holder sacks of any size may be held open.

FIG. 1. FIG. 2.

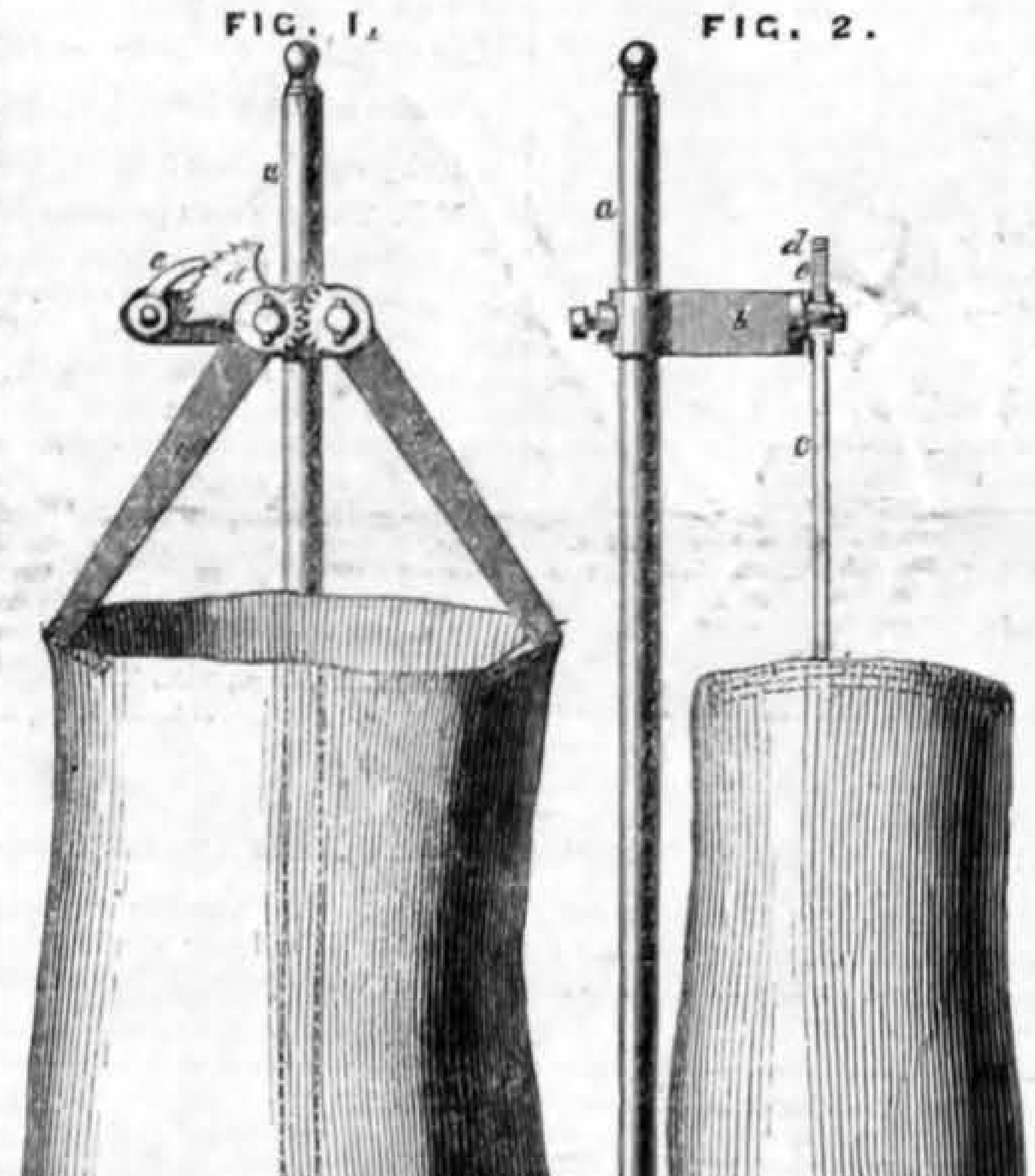


Fig. 1 is a front elevation of the sack holder; and Fig. 2 is a side elevation; *a* is the pillar or other fixture, to which is connected the adjustable bracket *b*, which can be set to any height from the floor, according to the length of the sack to be filled. To the bracket *b* are fixed two studs for the levers or arms *c*, *c*, the bosses of which are furnished with toothed segments gearing into each other. To one of the levers *c* is cast or forged a ratchet segment *d*, into which takes the pall *e*, which is hinged to a stud fixed in the bracket *b*. The extremities of the levers or arms *c*, *c*, are provided with spiked segments, on to which the mouth of the sack to be filled is suspended; the segments hold the orifice open. When the sack is full, or when it is required to remove it from the holder, the pall *e* is taken out of gear with the ratchet segment *d* to liberate the selvage of the sack. This pall and ratchet segment also render the holder suitable for sacks of various sizes.

THE MERSEY DOCKS.

THE Mersey Docks and Harbour Board have shown some prudence by withdrawing their application to Parliament—as will be seen on reference to the proceedings in the House of Commons on Monday—for an act authorising them to expend an additional £1,000,000 in dock accommodation. We have repeatedly expressed an opinion under this head that, in the present state of affairs, taking into account, also, the yet unfinished works on the Birkenhead side of the river, the course proposed to be adopted was rash and uncalled-for; and the members of the board seem at last to have come to a similar conclusion, although, in doing so, they have sorely offended the steam trade of the port, who threaten to take all kinds of steps on the subject. At the last meeting of the board the engineer submitted an interesting report on the condition of the dock works at the time of his entering on the duties of his office. The new works on the Liverpool side and adjoining the Canada Dock are nearly completed, and the foundation for the shed to be erected over the eastern extremity of the South Carrier Dock, for the use of the Bridgewater Trustees, is in a forward state. Nine cranes are fixed around the quays, and six more are in hand to complete that arrangement. The dock gates to the several entrances may be considered finished, and the bridges across the passages to the Carrier Docks are in hand, but nothing has as yet been done towards the construction of the ironwork of the bridge over the 80-ft. entrance into the Canada Dock, at which point a considerable amount of work will also have to be done before a "thorough" communication can be effected. The Woodside Landing-stage is in position. The kelsons have been continuously connected and the deck beams laid, so that now little remains to be done but the surface finishing. The report recommends that immediate provision be made for laying down some moorings extra to those originally proposed, for, with such a tide as this enormous floating mass is subject to, no precaution will be too great to guard against accident. Of the Morpeth Dock nearly two-thirds, or 420,165 cubic yards, of the excavations are complete, leaving 226,835 yards yet to be done. The outer sill of the lock, which will connect the Morpeth basin with the river, is completed, and 120ft. of the north wall carried up to the level of the old dock sill, leaving a gap between it and the river wall of about forty lineal yards. The low water basin, the most important point of the progressing works, is described in the report in the following terms:—"The foundations around its site are of the most treacherous character, being clay overlaying a wet and flowing sand, which, when bored into, 'spouts up' in a perfectly fluid state, the rock being at such a depth as to preclude the possibility of reaching it with solid foundations; and, were it possible to have done so, the danger of tapping the quicksand would appear to be so formidable as to have rendered such a course highly dangerous. The foundations, therefore, must have been a source of grave anxiety, and every precaution necessary to secure the safety of the work seems to have been adopted. The 50ft. entrances, the sluices, and large feeding tunnels which lead from the great float are built upon a forest of piles, and a similar course has been adopted wherever an indication of weakness has appeared in the substratum; yet, with all these costly but necessary precautions, slight settlements have here and there occurred in the walls, due to such enormous weights being laid on a bed of compressible material." Little doubt is entertained but that these sinkings (which are all vertical) will cease after the weight has fairly taken its bearings; but, in order to provide against the possibility of any disarrangements in the wall, a solid "toe" of masonry, in conjunction with piling of a most substantial character, has been laid. The masonry of the lock, main tunnels, and sluices may be considered in general terms as finished. The sluice gates and the inner gates of the lock are fixed in position, and the side walls are ready for coping. The engine-house is rapidly rising, and Messrs. Armstrong's people are fixing the hydraulic machinery. The return walls on each side of the lock, being the walls through which the sluices are carried, are completed and coped. The north wall, for its entire length of 1,461ft., with the exception of a gap of 129ft., which still severs it from the river wall, is complete and ready for coping. The report again points out the unreliable nature of the foundation, and alludes in pointed terms to the frequent interruptions occasioned by the breaking out of fresh water-springs from the substratum of quicksand before described, which seems to overlie the entire surface of the rock. To deal with these springs, as well as the enormous amount of leakage involved by the wetness of the bottom generally along this site, it has been found necessary to sink another well for pumping purposes: this is now in a forward state, and when the engine is fairly at work it is considered that it will effectually keep down the water. The completion of the coffer-dam for excluding the tide, for the purpose of enabling the contractor to complete his excavations, is mainly dependent on the masonry adjoining the river-wall, against which it will abut, so that, until this is done, a large portion of the excavations must remain untouched. The time prescribed for having this portion of the works completed is the 31st of March, 1862; but, owing to the many unavoidable adverse circumstances above stated, it must necessarily be extended for six or eight months beyond that period. In reference to the graving docks, it appears that there remains about 90,000 cubic yards yet to excavate, a quantity which will be required to make up the ground behind the masonry. They will not be ready for use in less than from fifteen to eighteen months, and this if no unforeseen contingencies occur. In regard to the execution of the masonry, the engineer says it is so good that he does not mean in any way to depart from the plans laid down by his predecessor. A summary of the report shows that in round numbers there are 500,000 cubic yards masonry, 1,212,630 cubic yards excavation, and 272,574 superficial yards paving remaining to be done; a heavy lot of hydraulic machinery; no less than 38 shuttles for sluices, 24 pairs of gates, and two caissons to be built, besides an infinite variety of work which such appliances involve.

THE COAL TRADE.—The coal supply to the metropolis, both by rail and water, still continues depressed, and for the two months, January and February, the tonnage entered by railway was 240,081 tons 8 cwts., against 285,509 tons for the corresponding period, showing a decrease of 45,427 tons 12 cwt. Sea-borne coal shows a diminution of 1,786 tons, as also to the canals. The following quantities were brought up by the respective railways named during February:—London and North-Western, 49,542 tons 3 cwt.; Great Northern, 33,972 tons 17 cwt.; Eastern Counties, 12,582 tons 19 cwt.; Great Western, 6,964 tons; Midland, 5,912 tons; London, Tilbury, and Southend, 54 tons: total, 109,027 tons 17 cwt.; corresponding month last year, 148,608 tons 16 cwt.; decrease on the month, 39,580 tons 17 cwt. The sea-borne coal has been entered as follows:—From Newcastle, 119,728 tons; from Sunderland, 98,897 tons; from Hartlepool, 74,046 tons; from Wales, 10,995 tons; from Yorkshire, 3,176 tons; from Seaham, 12,966 tons; from other sources, 13,864 tons; total, 336,664 tons. The quantity entered from Hartlepool, as contrasted with last February's tonnage, shows an increase of 100 per cent.; but for this the sea-borne tonnage would have declined considerably more. The quantity of cannel, coal, coke, and patent fuel shipped at Liverpool in February was 49,794 tons, and in the corresponding month of last year 49,841 tons, showing a decrease last month of 47 tons.

EXPERIMENTS ON LOCOMOTIVE POWER AND RAILWAY RESISTANCE.

MR. JOHN DIXON, Chief Engineer of the Stockton and Darlington Railway, has completed a further series of experiments upon the resistance of trains and power of locomotives on that line, some of the results of which will be found in the subjoined tables. The performances on gradients of 1 in 44 are of especial interest:—

[COPY.] EXPERIMENTS TRIED WITH NO. 141 ENGINE "EXCELSIOR" ON ORMESBY BANK (GRADIENT 1 IN 44), GUISBRO' RAILWAY, ON THE 4TH FEBRUARY, 1862.

Weight of engine, 29 tons 17 cwt.; tender, 16 tons 4 cwt.; cylinder, 18in. diameter, 24in. stroke; wheels, 5ft. diameter. The weather was mild, there was no wind, and the rails dry. The engine when starting, in every trip, ran for the first 30 yards with the reversing lever in full gear; for the remaining distance in 2nd notch from centre. Started in each trip at the 17½ mile post, and stopped at the 19¾ mile post.

The First Experiments were with running twelve Stockton and Darlington Railway trucks, laden with coke, three times up Ormesby Bank.

No. of trips.	Weight of train.	Weight of engine and tender.	Total gross weight moved.	Distance run.	Height of water in tank. When starting.	Height of water in tank. When stopped.	Water in boiler or fire-box. When starting.	Water in boiler or fire-box. When stopped.	Water used out of tank.	Water used out of boiler.	Total No. of gallons used.	Time in running trips.	Gallons of water used. Per mile.	Per hour.	Per ton per mile.	Per ton per mile per hour.	Coke used.	Speed per hour.
	tons. cwt.	tons. cwt.	tons. cwt.	miles.	ft. in.	ft. in.	inches.	inches.	gallons.	gallons.	gallons.	min. sec.					lb.	miles.
First trip	115 19	47 5	163 4	2¼	3 10	3 6	6	1¾	121·8	114·5	236·3	10 10	105·02	1,393·20	0·644	3·797		13·27
Second trip	115 19	46 3	162 2	2¼	3 3½	2 10	6	3½	167·53	65·0	232·53	10 59	103·34	1,270·27	0·637	3·483		12·29
Third trip	115 19	44 14	160 13	2¼	2 6¼	2 1	5½	3½	159·91	52·0	211·91	11 1	94·18	1,154·12	0·588	3·203		12·25
Average for three trips	115 19	46 1	162 0	2¼					149·74	77·16	226·90	10 43·3	100·16	1,272·53	0·623	3·494	1,528	12·60

The Second Experiments were with running six Stockton and Darlington Railway trucks, laden with coke, three times up Ormesby Bank.

	tons. cwt.	tons. cwt.	tons. cwt.	miles.	ft. in.	ft. in.	inches.	inches.	gallons.	gallons.	gallons.	min. sec.						
First trip	56 12	47 8	104 0	2¼	3 11	3 9	6	3½	60·92	65·0	125·92	5 52	55·96	1,287·8	0·538	5·503		23·01
Second trip	56 12	46 11	103 3	2¼	3 7	3 4½	5	2¾	76·15	61·25	137·40	5 27	61·06	1,512·6	0·592	6·517		24·77
Third trip	56 12	45 12	102 4	2¼	3 1	2 11	5	2¾	60·92	61·25	122·17	5 7	54·29	1,432·6	0·531	6·230		26·38
Average for three trips	56 12	46 10	.103 2	2¼					65·99	62·50	128·49	5 28·7	57·10	1,411·0	0·553	6·083	928	24·72

NOTE.—The quantity of coke consumed includes the return journeys down the incline, which, of course, would be very little.

(Signed) WM. BOUCH, Locomotive Superintendent, Stockton and Darlington Railway.

EXPERIMENTS TRIED WITH NO. 141 ENGINE "EXCELSIOR," ON ORMESBY BANK (GRADIENT 1 IN 44), GUISBRO' RAILWAY, ON THE 4TH FEBRUARY, 1862.

Tons. cwt.
Weight of engine ... ... 29 17 } 18in. cylinder, 24in. stroke, 5ft. wheels.
Ditto tender ... ... 16 4 }

46 1

Tons. cwt.
Load, 12 trucks, 4 tons 16 cwt. ... = 57 12 Cylinder 18in. diameter = 254·46 sq. inches area.
Coke 12 × 4 tons 17·25 cwt. = 58 7 Stroke 24in.

Gross load, exclusive of engine and tender 115 19 Diameter of wheel 5ft. = 15·7ft. circumference.

Gradient, 2¼ miles, 1 in 44 $\left(\frac{2,240}{44}\right)$ ... 50·9 lb. per ton gravitation.

Speed 12·6 miles per hour ... ... = 1,108·8ft. per minute.

Engine ... ... 9·85 × 50·9 = 1,519·36 Gravitation of engine.
29·85 × 18·0 = 537·30 Friction of engine.
Tender ... ... 16·2 × 50·6 = 824·5 Gravitation of tender.
16·2 × 10·0 = 162·00 Friction of tender.

Tons. 3,043·24 Resistance of engine and tender.
Load, say ... ... 116 × 50·9 = 5,904·40 Gravitation of load and wagons.
116 × 9·0 = 1,044·00 Friction of load and wagons.

9,991·64

lb. ft.
And 9,991 × 1,108·8 = 11,078,020 foot pounds.
which ÷ 33,000 = 335-horse power.

254·46 × 2 = 508·92 area of two cylinders $\frac{9,991\cdot64}{508\cdot92}$ = 19·6lb. of equal velocity, but 19·6 × 3·92 ratio = 76·8 pressure per inch on the piston.

Water used per hour 1,272 gallons = 3·8 gallons per horse power per hour.

Same day and same engine, but load only 6 trucks = 56·6 tons, exclusive of engine and tender. Speed with this load 24·72 miles an hour, or 2,175·36ft. per minute.

Gravitation of engine and tender same as before ... ... 3,043·24lb.
Load 56·6 × 50·9 = ... 2,880·94lb. gravitation of load.
56·6 × 10·0 = ... 566·00lb. friction of load.

6,490·18lb.

And 6,490lb. × 2,175·36ft. = 14,118,086 ÷ 33,000 = 427-horse power.

Water used per hour, 1,411 gallons = 3·3 gallons per horse power per hour $\frac{6490}{508\cdot92}$ = 12·75lb. if velocity equal. But 3·92 increased velocity = 49·98lb. on the piston.

N.B. The *pro rata* pressure inversely as the speed would only be 39lb.

Observation on the above experiment:—
Load 162, including engine and tender, at 12·6 miles = 2,041 tons over one mile in an hour.
116, exclusive of ditto ditto 12·6 „ = 1,461 ditto ditto
58·7 paying or net load ... ... 12·6 „ = 739 ditto ditto

Next experiment at 24·72 miles an hour:—
103, including engine and tender × 24·72 „ = 2,546 ditto ditto
56·6, exclusive of ditto ditto × 24·72 „ = 1,399 ditto ditto
28·8 net or paying load ... × 24·72 „ = 711 ditto ditto

The above shows that, as a mechanical result, the most work is done at the highest speed, viz., 2,546, as compared with 2,041. But the result, commercially, shows that the paying loads are 739 tons, as compared with 711 tons.

The difference, viz., 28 tons, is important in the earnings:—
viz., 28 tons, at ·22 of a penny for haulage = 6·16 pence for every mile the train runs.

[COPY.] EXPERIMENTS TRIED WITH NO. 141 ENGINE "EXCELSIOR" BETWEEN BARNARD CASTLE AND THE SUMMIT, ON THE 6TH FEBRUARY, 1862.

Cylinder, 18in. diameter; stroke, 24in.; wheels, 5ft.; weight, 29 tons 17 cwt.; tender, 17 tons 12 cwt., at starting. The weather was good, there was no wind, and the rails were dry. The engine ran the whole distance with the reversing lever in the 2nd notch from the centre, except when running the second trip the lever was in 1st notch from centre for three miles after passing Bowes Station. The engine ran two trips, started at Barnard Castle Water Column, and stopped at the Summit Water Column when passing Bowes Station; the speed was reduced to ten miles an hour in each trip; when starting from Barnard Castle the water in the tender was heated to 130 deg.

No. of trips.	S. & D. trucks laden with coke.	Guard's van.	Weight of train.	Weight of engine and tender.	Total gross weight moved.	Distance run.	Height of water in tank. When starting.	Height of water in tank. When stopped.	Water in boiler on fire-box. When starting.	Water in boiler on fire-box. When stopped.	Water used out of tank.	Water in boiler.	Total quantity of water used.	Time in running trips.	Gallons of water used. Per mile.	Per hour.	Per ton per mile.	Per ton per mile per hour.	Coke consumed.	Speed per hour.
			tons. cwt.	tons. cwt.	tons. cwt.	miles.	ft. in.	ft. in.	inches.	inches.	gallons.	gallons.	gallons.	min. sec.					lbs.	miles.
First trip..	18	1	181 3	47 9	228 12	13·75	4 1½	1 1⅞	3	1¾	1,026	35 less	1,061	61 0	77·16	1,043·61	0·337	0·332	1,232	13·52
Second do.	9	1	95 2	47 5	142 7	13·75	4 1½	2 2	3	3¼	716	7 more	709	31 30	51·56	1,350·47	0·362	0·689	784	26·19

(Signed) WM. BOUCH, Locomotive Superintendent, Stockton and Darlington Railway.

EXPERIMENTS TRIED WITH NO. 141 ENGINE "EXCELSIOR" BETWEEN BARNARD CASTLE AND THE SUMMIT, ON THE 6TH FEBRUARY, 1862.

Tons. cwt.
Cylinder 18in. diameter = 254·46 square inch area ... ... Weight 29 17 = 29·85 tons.
Stroke 24in. ... ... Tender 17 12 = 17·60 „
Wheels 5ft. diameter = 15·7ft. circumference, 3·925 ratio ... Load 181 3 = 181·15 „

Total ... ... 228 12 = 228·60 „

Distance run, Barnard Castle to the summit, 13·75 miles in 61 minutes. Speed per mile on the whole, 13·52 miles per hour = 1,189·76ft. per minute.

Elevation of summit 1,378
Ditto of Barnard Castle station 583

795ft. rise.

Being 57·82ft. per mile, or 1 in 91·33, average gradient.

$\frac{2240}{91\cdot33}$ = 24·52 lbs. per ton gravitation.

Engine 29·85 tons × 24·52 lb. = 731·92 lb. gravitation of engine.
29·85 „ × 18·00 „ = 537·30 „ friction of engine.
Tender 17·60 „ × 24·52 „ = 431·55 „ gravitation of tender
17·60 „ × 10·00 „ = 176·00 „ friction of tender.

1,876·77 „ resistance of engine and tender.
Load 181·15 „ × 24·52 „ = 4,441·79 „ gravitation of load.
181·15 „ × 10·00 „ = 1,811·50 „ friction of load.

8,130·06 „ total resistance.

Feet per min.
Then 8,130 lb. × 1,189·76 = 9,672,748 foot pounds, which ÷ 33,000 = 293-horse power nearly.
Water consumed per hour 1,043 gallons = 3·55 gallons per horse power per hour.

N.B. Pressure per inch on the piston = $\frac{8,130 \times 392}{508\cdot92}$ = 62·6 lb. per inch.

Second experiment:—Load 95·1 tons over same ground at 26·19 miles per hour with the same engine.
Resistance of engine and tender as above ... ... 1,876·77
Load 95·1 tons × 34·52 lb. F + G ... ... 3,282·85

5,159·62 total resistance.

(26·19 miles an hour = 2,304·72ft. per minute.)
Then 5,159·62 × 2,304·72 = 11,891,479 foot pounds.
÷ 33,000 = 363-horse power. Water, 1,350 gallons = 3·72 gallons per horse power per hour.

$\frac{5,159\cdot62 \times 3\cdot92}{508\cdot92}$ = 39·7 lb. upon the piston.

N.B. Steam pressure *pro rata* inversely as the speed would only be 32·3 lb. per inch.

First experiment:—Load, including engine and tender, 228·6 tons × 13·52 miles per hour = 3,090 tons over one mile in an hour.

Second experiment:—Load, including engine and tender, 142·35 × 26·19 miles per hour = 3,754 tons over one mile per hour.

Showing that mechanically the engine is doing 21 per cent. more work at 26 miles an hour than at 13 miles, notwithstanding the popular notion about the "loss of power" at high speed.

But as the net or paying load is the important commercial question it will stand thus:—
First experiment ... ... 89·9 × 13·52 miles an hour = 1,215 tons 1 mile.
Second ditto ... ... 47·1 × 26·19 ditto = 1,232 ditto
Still showing 1·4 per cent. in favour of the higher speed, or, say, about the same.

THE MACHINERY DEPARTMENT AT THE EXHIBITION.—The annexe for machinery in motion is fast advancing. The steam and exhaust pipes are conveyed under ground at the bottom of a square brick trough, along the top of the side walls of which is laid a tramway, by which all the heaviest machinery will be brought up the annexe to their stations. The engine-house and lofty chimney are nearly built. In the former will be six very large boilers, capable of supplying the machinery with from 60 lb. to 70 lb. of steam. The steam pipes are fitted at every length of 45ft. with hollow discs or drums of wrought iron, to allow of contraction and expansion, and the whole length of piping is laid, in gradually diminishing diameters, at an incline of 1 in 100. A simple but very ingenious self-acting drain provides for the escape of the water condensed at the lowest end of the pipes. The shafting for working all the machines is to be conveyed along each side of the annexe in handsome fluted cast iron columns 10ft. high and 10ft. apart. These rest on bed-plates bolted through slabs of stone to similar bed-plates placed beneath masses of concrete about four feet below the earth, so that each individual column will be as rigid and immovable as the building itself. Some of the groups of machinery in this annexe will be very large and powerful; two in particular, for which foundations are being excavated, are steam pumps of 40-horse power. One is for draining waste lands, and will be worked to show the body of water it can pump out, raising it to a low elevation; the other will be to show the mass of water it can discharge after raising it high. There are to be some powerful steam hamme here, and here also must be put the "stamper," or quartz-crushing machine, which has been sent from Australia with a cargo of gold quartz for its supply. Here, also, we believe, will be the steam hoists designed by Mr. Ashton, first used in this building, and which have lifted and lowered every ton of the materials used in its erection. It proves how nearly the building is done when, for the first time since the beginning of June, these hoists ceased work on Saturday last, and were removed from their old stations. It was intended to use them in lowering the dome scaffolds, but it was found that this could be accomplished more quickly by making slanting timber shoots from the summit to the ground, and sliding the beams down this on to a wadding of old sacks and rope yarn. In this way they are now thundering down at a great rate.

LETTERS TO THE EDITOR.

(We do not hold ourselves responsible for the opinions of our Correspondents.)

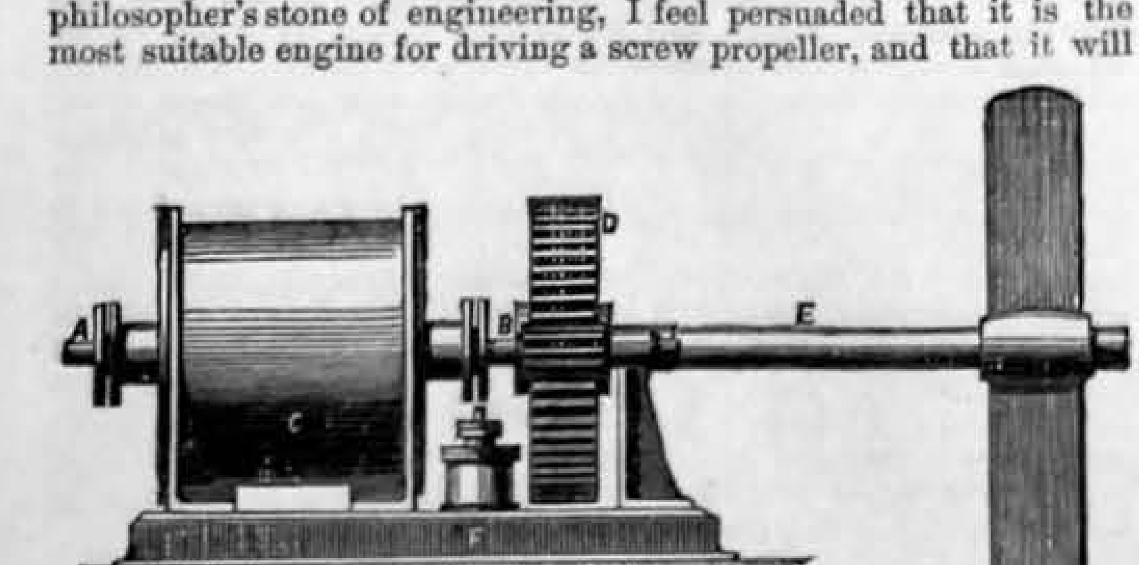
EXPANSIVE STEAM ENGINES.

SIR,—I have read with pleasure the able letter of your correspondent, "V. P.," in your impression of the 14th inst., on the practical use of steam expansively in marine engines; and, as he invites a discussion of the subject, I beg, with your permission, to say a few words about it and the marine engine generally.

From the general tone of "V. P."'s remarks I fancy that he holds a poor opinion of the steam engine as at present turned out by our manufacturers. I consider it at best as still in a state of barbarism, as any one must confess it is who reflects for a moment that, in order to utilise the force of a few cubic feet of steam in a cylinder, for the propulsion of a ship, it is necessary to carry about the world many tons of dead weight, besides the cylinder, and, in large engines, many tons of metal in constant motion. Without citing the ponderous old-fashioned side lever engines, with their infinity of moving parts, and whose use is still persisted in by some first-class companies, take as an example of modern practice for paddle-wheel steamers the Siamese twin engines. Here we have, in constant reciprocating motion, two pistons with their rods, a huge T cross-head, and an immensely heavy connecting rod, together with a lot of other gear. These engines work well, though when running before a heavy sea they sometimes perform the down stroke in a way calculated to frighten one. A cursory glance at these engines must convince any one that a considerable portion of the force of the steam is uselessly expended in tumbling these ponderous pieces about, though the object sought—a long connecting rod—is undoubtedly obtained. Expansion in the down stroke might be carried to any extent in this class of engine with success, but scarcely any use would it be in the up stroke. As an example of an engine for screw propulsion take the "crack engine," double trunks. Here we have a short stroke, almost as large an amount of cooling surface as can be obtained with a working cylinder, and a short slide, wasting at every revolution the amount of steam contained in the passages, in fact, just the necessary conditions for consuming fuel on a large scale. On the other hand, it offers great compactness, and it must be confessed that it is a first-rate working engine provided that its appetite for lubricating material be satisfied. Anything in the shape of economy is not to be looked for here; the short quick stroke and the loss of steam in the passages and clearance room in the cylinder ends effectually prevents anything of the sort being obtained. *Apropos* of this clearance "V. P." observes that in ordinary engines it is of so little importance as to be practically disregarded. He is, perhaps, not aware to what extent this disregard is sometimes carried. An instance lately came under my notice, where, in an engine of 13-in. cylinder and 12-in. stroke, a plate of 1¼in. thick was fixed in one end of its cylinder, and one of ⅞in. in the other, leaving them the orthodox clearance, and this in an engine by a maker who would doubtless consider himself injured were he classed as less than first-rate. Nor is this by any means a solitary instance. "V. P." is fully alive to the necessity of reducing this clearance, and knows, doubtless, that it cannot be kept under ⅜in. without risk of knocking the cylinder ends out. It is not consolatory to reflect that from this cause alone one-fifth of the steam supplied to the engine he cites is lost. It proves, though, the correctness of his argument in favour of a comparatively long stroke. In the principles he puts forth for a good engine, viz., high speed of piston, long stroke, and great expansion, together with the means by which he proposes to attain them, there is, in my opinion, some good engineering sense. The novelty of running the engines quicker than the screw, and reducing the speed, as proposed by you some time ago, is, I consider, a good innovation. With a pinion driving a wheel on the screw shaft the engine must necessarily have more command over the screw than when the reverse is the case. To obtain the all-important object of preventing condensation in the cylinder he gives four methods, and considers that of having a jacket round it, filled with heated air from the furnaces, as the best one. My opinion is that there is quite heat enough in the engine-room at present without taking any more, and that a better remedy has been applied, for whose invention there are several claimants amongst your correspondents—I mean that of placing the cylinder in the boiler or steam dome. This arrangement effectually prevents any radiation of heat from the cylinders at least, and renders felt and lagging unnecessary there. With regard to the details of his engine I have no comment to make, except that I think his pumps should all be rotatory ones, discharging their contents in a continuous stream.

Having thus taken a glance at "V. P."'s letter, and feeling convinced that a discussion in the columns of THE ENGINEER, on marine engine economy, cannot fail to be highly useful to the world at large, I venture to propound, "also for discussion," my own views as to what an economical and tidy marine engine for screw propulsion should be, without entering into the subject of boilers. The arrangement I advocate is the following:—The boiler is placed athwart ships, with the furnaces forward, and through a stuffing box, fixed in the shell at the back, the engine shaft passes to the cylinder inside the boiler. This shaft may either drive the screw direct or by means of a pinion and wheel as proposed. The pumps—air, feed, and bilge—being fixed on the condenser, and driven by the screw shaft. Suppose for a moment that this arrangement can be carried out, let us see what benefits are to be derived from it.

First, perfect freedom from condensation of steam and radiation of heat from the cylinder. Secondly, by properly felting and covering the boiler, and from the entire absence of steam pipes in the engine room, "excepting a short exhaust pipe to the condenser," the radiation of heat may be considerably diminished as compared with present practice, and a ship might thus have an engine room in which engineers and firemen would have some prospect of living when out on a tropical station. Under the existing order of things a temperature of 120 Fah. is a common thing in the engine rooms of steamers in the tropics, as many naval engineers can testify. Thirdly, as the radiation of heat and condensation of steam would be diminished, so also would the consumption of fuel, while the comfort of the attendants would be wonderfully increased. The most suitable engine for occupying a position inside a boiler is undoubtedly a rotatory one, and though I shall pass for one more of the many "locos." who have knocked their heads against this philosopher's stone of engineering, I feel persuaded that it is the most suitable engine for driving a screw propeller, and that it will



ultimately drive the present reciprocating engine from the field. In making these remarks I have no crotchet of my own regarding this engine to obtrude upon your readers, my object is simply to call their attention to it, in order to elicit a discussion of its merits and some practical information respecting it. My own opinion is, that many of the rotatory engines already invented are capable of being improved by an addition of the equilibrium principle, so as to compete successfully with the ordinary engine in use, and even excel it.

I enclose a sketch of the arrangement that some of the known rotatory engines would give for driving a screw propeller. On the shaft *a*, which passes through the cylinder *c*, a pinion B is fixed, which drives the large wheel D on the screw shaft *e*. The sole plate F being also the condenser, on which the pumps are fixed, and are driven by the screw shaft. If the cylinder be placed inside the boiler it would be supported on suitable brackets. The details for starting and stopping, &c., have already been invented and published, and the combination for simplicity, "the great merit in engineering," would contrast favourably with the best example extant of the common engine.

The problem to be solved in order to produce a good rotatory engine is simply that of fixing on a shaft passing through a plain cylinder a piston that shall utilise the power of the steam in turning round the shaft about its axis, at least as well as it is utilised in the common engine. When we read that, even under favourable circumstances, in an engine constructed expressly for the purpose, "of the dimensions cited by 'V. P.,'" expansion cannot be carried to $\frac{1}{15}$ of the stroke without losing $\frac{1}{5}$ of the steam, that is, wasting 20 per cent. of the fuel, from clearance alone, surely we may reasonably expect to get as good a result from a rotatory engine in which no clearance is required, and in which expansion can be carried to any extent. In addition to this clearance, in the common engine the passages from the slide case to the cylinder, be they long or short, have to be filled at every revolution with steam that gives no useful effect, another increase of waste in the fuel. If the coal represented by these two items could be saved in the engine, even were it pitched overboard at the commencement of a voyage, shipowners would gain by the loss. In the rotatory engine the steam enters by one port and goes out through another; therefore, the waste from filling passages is entirely avoided. In the common engine a mass of metal is being constantly driven about in opposite and ever-changing directions, which any engineer must know cannot be done without some expenditure of power. In the rotatory this loss of power must necessarily be considerably reduced; for, as all its parts may move in a continuous rotating motion round an axis, they partake of the nature of a fly-wheel, and give out again a considerable portion of the useful power administered to them, while their motion is uniform and steady. Any one who wishes to test the truth of this, let him take in his hand a weight of a few pounds, "a book, for instance," move it rapidly to and fro in a straight line for a few seconds, then change the motion to a circular sweeping one at the same speed, after which he can form his own conclusions as to the respective merits of reciprocating and rotating motions. In the common engine a considerable amount of power is expended in working the valves, and the engine's efficiency depends entirely upon their proper regulation and good order. If my memory does not deceive me, it was stated in THE ENGINEER some time ago that the valves of the Marlborough required 100-horse power to work them. All valve connections are a source of trouble and expense. In the rotatory engine no such valves are required, the piston admitting the steam to the cylinder, and providing for its egress without any other apparatus "excepting for expansion," thus obviating another loss of power, and favouring economy.

Take the rotatory engine in comparison with the common reciprocating one in a commercial point of view. Instead of having to transport constantly with the vessel, a large amount of metal in the shape of framing, plummer blocks, rods, &c. &c., occupying a considerable portion of the vessel, not only unproductive, but at a considerable expense for wear and tear, lubrication, &c., as is at present the case, we may with the rotatory reduce this space almost to boiler room and a screw alley, and the weight of engines considerably; for, as what little framing would be required would have no reciprocating motion to withstand, it might be considerably lightened as compared with present practice. The space thus left for productive cargo would make a respectable figure in the year's accounts. With regard to repairs, in the engine I have sketched, a duplicate cylinder with its shaft, piston, and pinion being kept on hand, the vessel might be run under a crane, have her cylinder out, and the duplicate in and ready for work in at most a couple of hours. I may remark here that, until the portable system has been introduced into the marine engine, nothing like perfection will have been reached. With proper arrangements on this system nearly the whole of a vessel's machinery, boilers and all, might be taken out and replaced by duplicates "new or repaired" during the time she is discharging and re-loading, without detaining her a single hour. The marine engine of the present day bears about the same proportion of excellence to one in the state of efficiency to which I allude as does one of the old stationary engines, with its bearings built in the engine-house walls, to one of our best portables. The time now occupied in marine engine repairs necessarily keeps a large capital idle, a fact not at all creditable to the engineering skill of our country, since the remedy is simple and easy of application, for screw propulsion at least, nor is the introduction of the rotatory an indispensable requisite for this.

There is nothing, however, in mechanics, of which I am aware, that impedes the production of a good rotatory engine. Steam, the principal agent concerned in the matter, submits to be conducted through all sorts of intricate passages at the caprice of constructors, therefore there is no tenable argument to adduce in favour of its being compelled to perform its work at last moving exclusively in straight lines. The other agent concerned is the metal, which from experience we know works best and lasts longest, with the least amount of repairs, in machines where rotating motion is used. The only valid objection that can be urged against the rotatory is that up to the present time no inventor has been able to produce a proper piston for it. This, however, is no argument in proof of the impossibility of a good one being yet discovered, else what is the use of invention at all? Some time ago a correspondent of THE ENGINEER, "J. D.," in a discussion on portable engines, stated that in his opinion a good rotatory would after all be the best engine for the purpose. On this letter "V.P." in your number of January 10th, tells him that, if he desires it, he will send him a sketch of a rotary engine superior, in his opinion, to any yet invented; and adds that he thinks he knows them all, stating that, in his opinion, the rotatory is the very worst class of engine in existence. I cannot, of course, know whether this "V.P." and he whose excellent letter has called forth my present communication are one and the same person; but, be that as it may, I beg to disagree with "V.P." on this head *in toto*; and, *en passant*, I may mention that "J.D.'s" question in the same number, "Can a body, having a reciprocating motion, be balanced by another body having a rotatory motion?" appears to have staggered his opponents, as I have seen no answer to it. But to return. If "V.P." has a sketch of a rotatory engine superior to any yet invented, there must be something of considerable merit about it, and I would respectfully solicit him to make it known. J. S.

Ferrol, February 25th, 1862.

AGRICULTURAL LOCOMOTIVES.

SIR,—In Mr. Romaine's letter, of the 28th ult., he states that he considers "it very dangerous for locomotives to travel about on town or country roads without first having some mechanical means of adjusting the boiler." He also speaks of having "suffered great annoyance by the melting of fusible plugs out of the crown plates of fire-boxes."

I have had several years' experience with road locomotives, and out of the forty engines fitted with my patent locomotive gear, now in constant work (many having travelled more than 3,000 miles each in the most hilly parts of this and other counties, frequently up and down inclines of one in six), in no one instance has a fusible plug melted out, or a crown plate been injured; a practical proof that the mechanical arrangement advocated by Mr. Romaine is an unnecessary complication. THOMAS AVELING.

Rochester, March 12th, 1862.

STEAM PLOUGHING.

SIR,—Will you kindly allow me space in your valuable columns to correct some errors Mr. Howard stated in his paper on "Steam Cultivation," recently read before the Farmer's Club, regarding my digging machine travelling over the land. Mr. Howard states it takes fourfold the power to move an engine over the land to that taken by a stationary engine to transmit its power to the implement traversing the field. I think Mr. Howard has overlooked the important element of time, or the speed at which my machine travels when digging. This mistake has arisen, I presume, in calculating the speed to be the same as that of Boydell's traction engines when ploughing, viz., four miles per hour; whereas the digging machine exhibited at Leeds travelled at one-fifth that speed, viz., three-quarters of a mile per hour. I have often proved that it takes but 10 lb. of steam to propel my machines on a moderately level road and 15 lb. on the land, while to dig 7in. to 8in. deep, and 8ft. broad, 80 lb. to 90 lb. is required, showing, conclusively, that eighty per cent., at least, of the power is directly employed in the digging.

Mr. Howard is mistaken in supposing that I have abandoned the idea of a self-contained digging machine being practicable, but feel myself in the position of those inventors who were, as he says, in advance of the people, for I am still convinced that in countries with dry autumns, or in dry seasons here, it is the most economical mode of applying steam to the cultivation of the soil.

Devizes, Wilts, March 12th, 1862. ROBERT ROMAINE.

MISCELLANEA.

IT is understood that a medium-sized paddle yacht, intermediate between the Victoria and Albert and the Fairy, is about to be built for the use of the Queen.

SIR WILLIAM ARMSTRONG has presented to the officers of the Royal Artillery stationed at Shoeburyness for the time being a very useful library, valued at £500.

THE Scotia, which has just made so successful a trial trip, has the largest engines ever made on the Clyde, being 100in. cylinders, and 12ft. stroke, the Arabia's and La Plata's having 103in. cylinders and 9ft. stroke.

A LARGE quantity of metal fuzes, termed "pillar fuzes," which have been issued in vast numbers for the use of the Armstrong guns, have been proved in Woolwich marsh, and found defective. This, it is stated, will entail a serious loss on the War Department.

A PROSPECTUS has been issued of the South Essex Waterworks Company, with a capital of £80,000, in shares of £10. The object is to supply the district round Gray's, Essex, with water from extensive and pure supplies to be obtained from the chalk beds at that place.

THE wooden posts which support the roof of the eastern annex of the Exhibition building have got so far out of perpendicular that it has already been found necessary to restore them to their proper position. The posts under the roof of the western or machinery annex will, doubtless, require to be similarly treated.

ORDERS have been received at Chatham, from the Admiralty, directing Mr. Bernays, civil engineer, now employed at Pembroke Dockyard, to superintend the works in connection with the extension of the dockyard at Chatham. Mr. Bernays will be succeeded at Pembroke by Mr. M'Donnell, acting superintending civil engineer at Chatham.

PLUMBAGO, closely resembling the English, has been discovered in large quantities at Sonah, India, by Dr. Thompson, Civil Assistant Surgeon, Goorgaon. Its analysis gave:—In grains, 1,000; water, 43·54; salts soluble in water, 0·80; sulphates, 0·45; chlorides, 0·34; sesquioxide of iron, 32·94; carbonate of lime, 8·37; silica and alumina, 129·89; carbon, 784·52.

A WHARFINGER on the Surrey side publishes a formal notice in the papers that he shall oppose the construction of the Temple Bridge by all lawful means. He leases a wharf belonging to the Duchy of Cornwall; and he intimates that, if his own opposition fails, the bridge promoters will most likely be compelled to purchase the whole of the wharf.

THE advantage to be derived from the concession obtained by the South of Ireland Direct Telegraph Company for a telegraph station at Roche Point, at the entrance to Cork Harbour, where the pilots reside, and whence they board the steamers, was exemplified this week by the receipt of the news brought from New York by the Cunard steamer Asia some time before it could have been transmitted from Queenstown.

AMONG the number of Armstrong guns subjected to proof one day this week at the Royal Arsenal butt, Woolwich, three 100-pounder naval guns, to be denominated henceforth 110-pounders, were considerably damaged, and were returned to the forge. The defects were similar in each gun, namely, a separation of the coils forming the breech part, which yielded so as to disable the guns from further use in the present state.

IT is stated that Mr. Wilson has entered into an engagement with a company about to be brought out for laying down light rails, to be worked by locomotive power, on the road from Nulhatee to Moorshedabad, which has been conceded to him by the Government of India for that purpose. Mr. Wilson proceeds to India immediately to commence this work, and to complete negociations for other similar concessions from the Government.

THE pressure upon the departments of the Royal Arsenal at Woolwich has now subsided, and arrangements are being made for the reduction of the establishment by the discharge of a large number of mechanics and labourers, probably to the number of 3,000 men. Some of the men about to be dismissed have been employed as continuous hands on the establishment for seven, eight, and nine years, and are now entering into engagements to emigrate to British Columbia.

ON Saturday the officers and workmen of the London and North Western Company's locomotive department at Wolverton presented to Mr. J. E. M'Connell, C.E., a testimonial of their regard and esteem, and an address signed by 1,966 contributors, upon his retirement from office as locomotive superintendent of the southern division of the London and North-Western Railway. The presentation took place in the company's new pattern shop at Wolverton, about 1,500 officers and workmen being present. The testimonial consisted of three beautiful pieces of plate, of the value of £210.

IN addition to the fusible metal (cadmium, 1 or 2 parts; tin, 2 parts; lead, 4 parts; bismuth, 7 or 8 parts) already described by Dr. B. Wood, of Indianapolis, U.S., and which melts at 150 deg. to 160 deg. Fah., he has since discovered another alloy (cadmium, 1 part; lead, 6 parts; bismuth, 7 parts) which melts at about 180 deg. Fah., or about midway between the melting points of the old fusible metal and that first described by Dr. Wood. The principal feature to be noticed in Dr. Wood's alloys is the proof given of the fluidifying properties of cadmium.

THE railways of the United Kingdom are to receive from the Post Office £558,891 for carrying the letters this year; mail coaches only £13,509. Carts, stage coaches, and omnibuses, however, will get no less than £124,910. It will cost £700 to provide clothes for the mail guards, £16,150 to pay their wages and the wages of mail porters, £10,960 for the supply and repair of mail bags, £2,080 for apparatus for exchanging them on railroads. The whole cost of the conveyance of mails in the United Kingdom this year is taken at £755,980. But for the conveyance of mails abroad—the packet service—the country is to pay above £900,000.

THE following appointments of naval engineers have been made since our last:—Henry W. Blake, chief engineer, to the Indus, for the Buzzard; John Langlands, engineer, to the Indus, for the Shearwater; James Barlow, second-class assistant-engineer, confirmed in the Asia; William Jones, second-class assistant-engineer, confirmed in the Warrior; J. G. Sampson and W. F. Cole, acting second-class assistant-engineers, to the Indus, as supernumeraries; W. B. Stephens, engineer, to the Dart; Thomas Jeans, first-class assistant-engineer, to the Asia, for the Swinger; Robert H. Dobney, first-class assistant-engineer, to the Asia, for the Savage; W. H. Bambury, first-class assistant-engineer, to the Dart; Henry T. Smeddle, acting second-class assistant-engineer, to the Dart; Binch, first-class assistant-engineer, to the Hawke, for the Lark; H. William M'Lourin, acting first-class assistant-engineer, to the Euryalus.

W. AND J. GALLOWAY AND WILSON'S STEAM BOILERS.

FIG. 3.

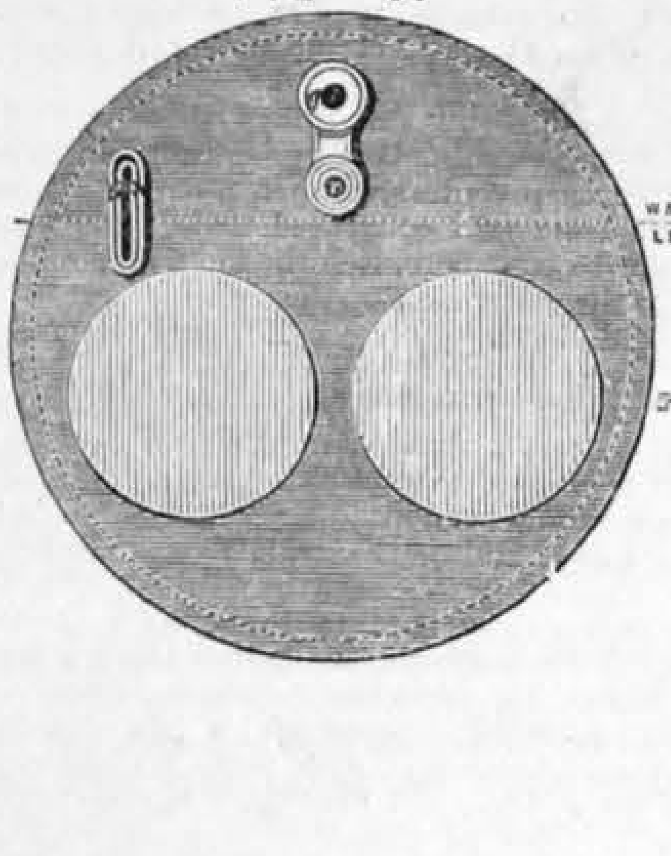


FIG. 1.

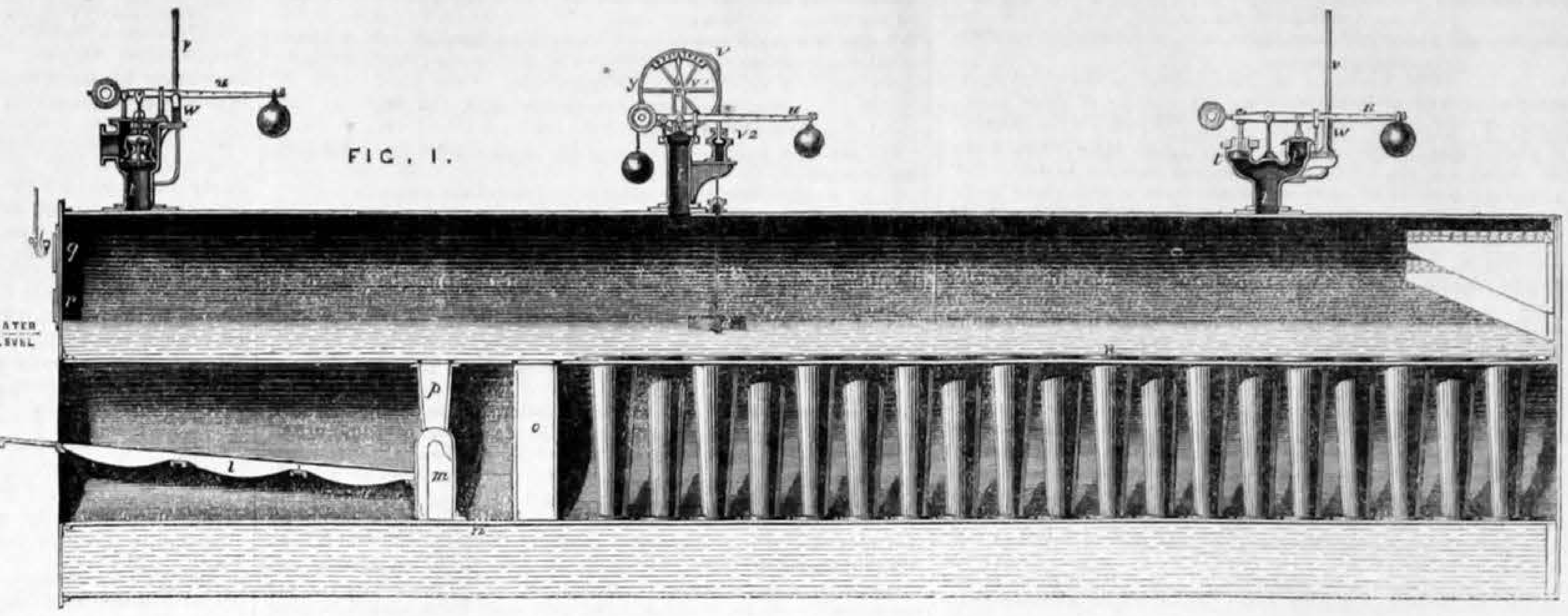


FIG. 5.

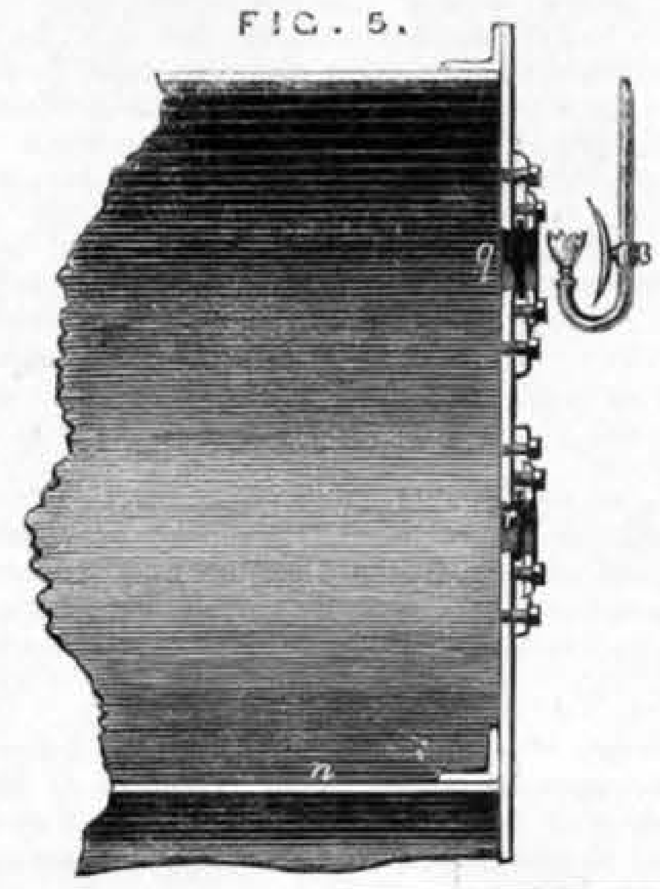


FIG. 6.

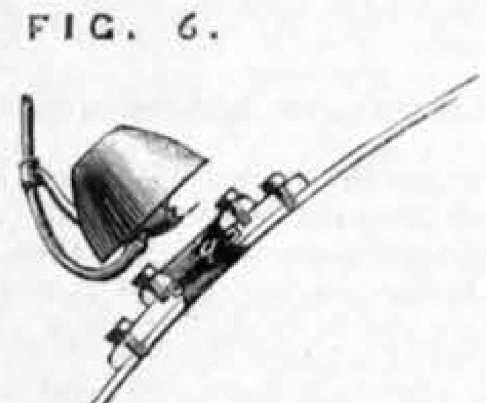


FIG. 8.

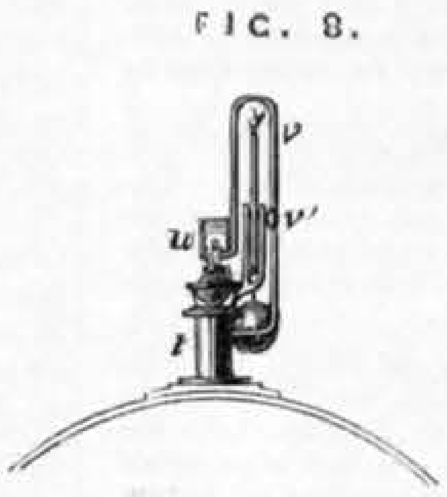


FIG. 7

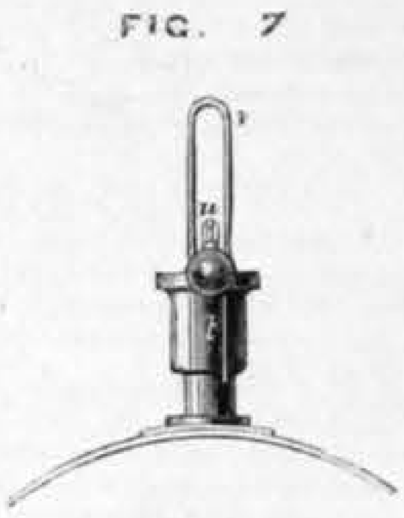


FIG. 4.

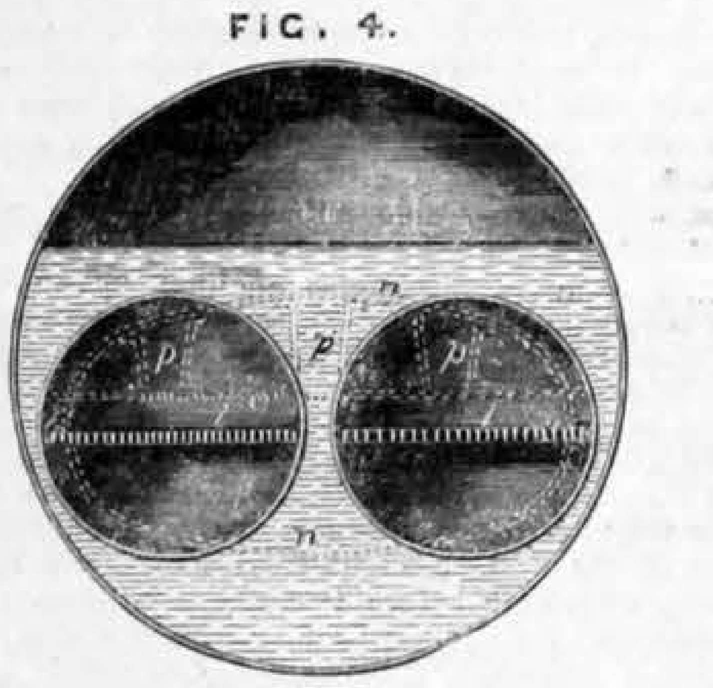
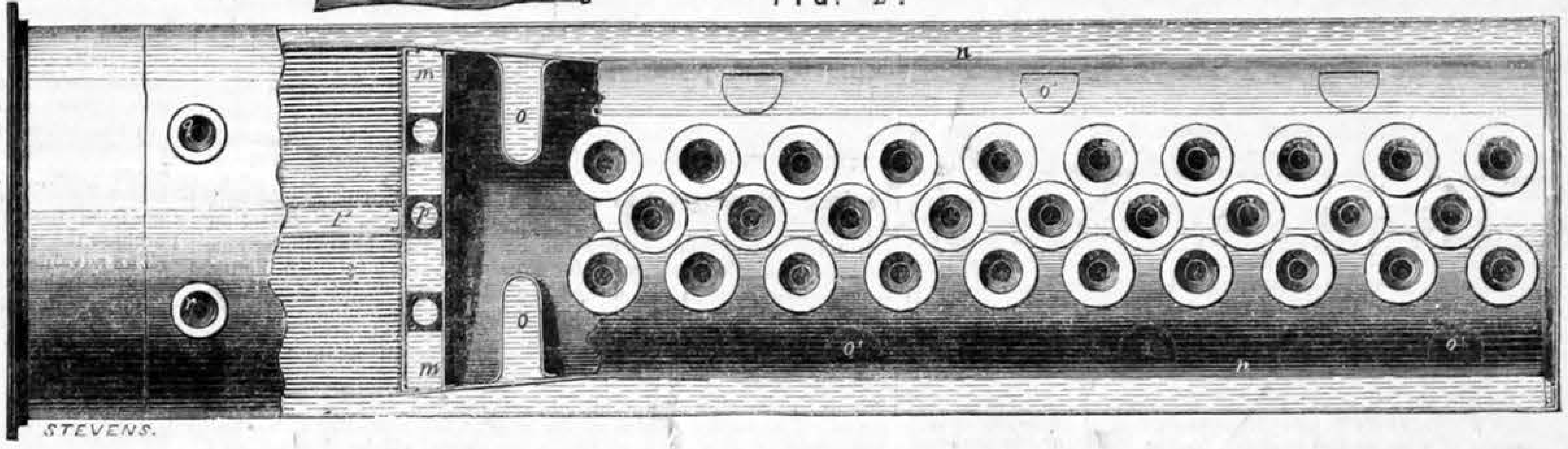


FIG. 2.



STEVENS.

Fig. 1 is a section of a boiler to which improvements, by W. and J. Galloway, of Manchester, and J. W. Wilson of Barnsley, are applied. Fig. 2 is a plan partly in section, Fig. 3 is an end elevation, and Fig. 4 a transverse section of the same boiler. Figs. 5 and 6 are detached views of parts of the improvements, and Figs. 7 and 8 are detached views of the safety valves.

In Figs. 1 and 2 l, l, are two furnaces of the ordinary construction, separated by a mid-feather or water space l^1; m, the bridge, which may either be made of fire-brick as usual, or a water-chamber as shown; and n is the flue furnished with conical vertical tubes. Beyond and near the bridge are the two water chambers o, o, projecting from the sides of the flue; the object of which is to divert the currents of the products of combustion, and thus to increase the consumption of the smoke. To the upper part of the water bridge m are connected the lower ends of the vertical pipes p, shown also by dotted lines in Fig. 4. The upper parts of these pipes, which are tapered by preference, are connected to the flue n, thus insuring a circulation of water through the bridge.

The improvements in applying glasses to boilers are shown in Figs. 1, 2, 3, 5, and 6. On referring to these views the glass marked q is the one through which light is to be reflected by a jet of gas or otherwise, and the glass r is the one through which the interior of the boiler can be examined; both these glasses may be magnifying or plain, but they must be of considerable strength to resist the pressure of the steam in the boiler. By means of these two glasses the interior of the boiler can be seen while the boiler is at work. The glasses may either be placed in the end of the boiler as shown in Figs. 1, 3, and 5, or in the shell of the boiler as shown in Figs. 2 and 6.

The improvement in applying a glass plate to the end of the boiler through which the level of the water can be seen is shown in Fig. 3. On referring to which view it will be seen that a narrow strip of glass s of about the length of the usual glass water tube is applied to the end of the boiler. This narrow plate of glass is secured to the boiler in the manner shown in Fig. 5, or by any other convenient means, and it will indicate the level of the water in the same manner as the ordinary glass tube; while the fixings, taps, and detached glass tubes or plates are entirely dispensed with.

The improvements in safety valves are shown in reference to Figs. 1, 7, and 8. The safety valve shown in section at the left-hand side of Fig. 1 and in elevation in Fig. 7 is arranged in the following manner:—t is the valve box containing a duplex vavle of the usual construction. This valve is weighted by the lever u. The bent tube v is secured to the valve box t, or to the shell of the boiler, and the steam from the boiler has free access to the tube, the other end of which is connected to the under side of a ram, piston, or disc contained in the box w, the upper end of the ram, piston, or disc being in connection with the under side of the weighted lever u. When the pressure of steam in the boiler is sufficiently great to raise the ram, piston, or disc in the box w, the lever u raises the safety valve any required distance off its seatings, and holds it open until the pressure of steam is reduced to lower the ram, piston, or disc in the box w; thus allowing a free escape of steam from the valve. The safety valve shown near the right-hand end of the boiler is provided with two flat valves of the usual construction marked t^1 and t^2, the former opening inwards and latter outwards; both these valves are connected to the weighted lever u, which is acted upon by a ram, piston, or disc in the box w, to which the bent tube v is connected as before described; by this means when the lever u is raised the valve t^1 is lowered, and the valve t^2 raised off their seatings to allow the steam to escape.

The safety valve shown in section on the centre of the boiler Fig. 1 and in side elevation in Fig 8 is of the usual construction, and is combined with the water float to let off steam in case of deficiency of water. x is the water float, the rod of which, after passing through the shell of the boiler, is connected to a chain passing over the wheel y; the axle of this wheel forms the plug of a tap v^1 in the bent tube v. This bent tube conveys the steam to the under side of the disc or flexible diaphragm v^2, the upper side of which is in connection with the lever u; by this arrangement the safety valve is opened in the ordinary manner when the pressure of steam exceeds the desired limits, and it is held open by the descent of the float x, which opens the tap v^1 in the bent tube v, and admits the steam to the under side of the disc v^2, when the water descends below its proper working level.

The Scotia.—The new steamship Scotia, built under special survey expressly for the British and North American Royal Mail service, arrived in Liverpool from the Clyde on Thursday week, having made the run from the Cloch Lighthouse on the Clyde to the Bell Buoy at the mouth of the Mersey in 12 hours 4 minutes. The machinery worked admirably, and, in proof that the vessel is perfectly manageable, she was easily moved round in the Mersey within her own length. The trial trip on Wednesday before the Scotia left the Clyde for Liverpool was highly satisfactory, notwithstanding the unpropitious state of the weather. The distances were performed under the following conditions:—Against a strong flood tide, and also against a double-reefed topsail breeze of wind, from the Cloch to the Cumbræ Light in 59 minutes; after passing the little Cumbræ, the Scotia was brought round with great ease, and performed the upward run between the Cumbræ and Cloch Lights, but on this occasion with wind and tide in her favour, in 49 minutes; mean time, 54 minutes. The rate of speed will be understood by the following:—

59 minutes =	13·898 knots, or	16·010 miles per hour.
49 minutes =	16·734 knots, or	19·277 miles per hour.
	30·632	35·287

Mean speed 15·316 knots, or 17·643 miles.

It is anticipated that under ordinary circumstances the maximum speed of the Scotia will be about 19 miles an hour. The trial referred to was made to test the efficiency and speed of the vessel for the mail service, which was done under the superintendence of Mr. John Dinnen, inspector of machinery, and Mr. James Luke, master shipwright of the Admiralty, Whitehall; the Board of Trade being locally represented by Mr. George Barber, shipwright surveyor, and Mr. H. R. Robson, inspector of machinery for the Clyde. The Scotia is to be under the command of Captain Judkins, the commodore of the Cunard fleet, who will now move his flag from the Persia, in which he has so long and so ably distinguished himself.

Foreign and Colonial Jottings.—As our readers will, no doubt, have inferred from the rise in the shares and bonds, there is hope in store for the hitherto luckless Grand Trunk of Canada. The receipts for the week ending February 15th were £17,674. Compared with those for the corresponding week of last year the increase is £8,997. On the first seven weeks of the half-year the increase in the receipts is £37,836.—A statement appeared in most of the London journals on Saturday, to the effect that the Indian Tramway Company had received an intimation that the Government of India had sanctioned the construction, by Mr. Wilson, an engineer recently returned to England, of the first tramway of 27 miles between Moorshedabad, the old capita of Bengal, and Nulhatee, a station on the East India Railway. As there are several gentlemen in the north of England interested in the concession referred to it is important to mention that it is not for a tramway at all, but for a railway, and that it has no connection whatever with the India Tramway Company.—A circular from the French Minister of the Interior cautions French shipowners against frauds practised in the ports of Cardiff and Swansea with respect to the loading of coal.—During the recent bombardment of Fort Donaldson by American gun-boats, in which the latter had to haul off greatly damaged, 1½in. iron plates backed with 15in. oak were found ineffectual to resist 32lb. shot.—The British screw steamer Stella has been chartered at New York to carry American contributions to the Great Exhibition.—A project has been set on foot to connect Singapore with the system of telegraphs in India at Rangoon. This line was promised to be executed by our Government when the Dutch Government laid a cable in 1859 between Singapore and Batavia; it being obvious that the utility of the latter line depends in great measure upon its extension to India, our Government accordingly shipped the cable that is now laid down between Malta and Alexandria in the autumn of 1860 for Rangoon and Singapore, and the line now proposed would have been then completed but for the wreck of the Indian steamer Victoria, with a portion of the cable on board. This caused a delay, which involved the loss of the season, and the destination of the cable was changed to Malta and Alexandria. The India and Singapore telegraph will save eight days between India and China, and the same time between England and China. Indeed, by a slight alteration in the dates of departure of the China mails an additional gain of two days, or ten days in all, would be secured—still leaving two days for telegraphing between Bombay and Singapore, for accidental delays on the voyage.

A numerously signed memorial and protest of owners and occupiers of wharves and other property on the Surrey side of the Thames has been presented to the commissioners, setting forth that between Lambeth Palace and Southwark bridge there are eighty wharves in separate occupations, carrying out a variety of extensive trades, besides factories, mills, granaries, and buildings rising directly from the waterside, with drawing docks and free landing-places, and for all of which the free use of the river shore is essential. While expressing their unwillingness to offer any opposition to public improvements, or to relieving the evils arising from the floodings of the river, the memorialists consider that their entire trades would be seriously damaged if any material impediment should be created in the river traffic by the interruption of the landing and loading of goods. They consider that any of the plans for an embanked roadway that have been laid before the public would materially impede such traffic, and that the present flooding of the river periodically may be prevented by causing the banks of the river to be raised and the wharf walls to be altered.

A contract has been entered into by the French Government with the Compagnie Générale Maritime for the establishment of a postal steam service monthly between France, the Island of Martinique, Santiago de Cuba, and Mexico. The speed at which this service is to be performed is nine knots per hour, and the subsidy granted is at the rate of 21s. 11d. per mile. This contrasts strikingly with the rates paid by the British Government to the contract packet companies generally. For example, the Royal Mail Steam Packet Company, which conveys the mails between this country and Mexico, although required to perform the service at a much higher rate of speed, is paid less than 10s. per mile.

TO CORRESPONDENTS.

ERRATUM.—*In the article on "The Paddle and the Screw," in our last number, first column and 15th line of the fifth paragraph, for "in proportion as the radius is to the cosine," read "in proportion as the cosecant to the radius." The words "assumed in this case to be 45 deg.," four lines above, or in the 10th line of the same paragraph, should have been omitted.*

L. O.—*In type, but crowded out this week.*

C. S.—*Bourne's quarto treatise on the steam engine, published by Messrs. Longmans, is undoubtedly the best extant.*

P. M.—*Leather and vulcanised rubber are destroyed by contact with steam. Even at low pressures they will soon become rotten.*

R. H. S. (Carr Bridge)—*We are unable to give you the address of the Association. Perhaps the Editor of the* Mining Journal *could inform you.*

J. B. M.—*The substance to which you allude is, we suppose,* papier maché. *We cannot say where you could most conveniently procure it.*

AN OLD SUBSCRIBER.—*We are not certain that the law which governs the action of steam in the curved tube of a Bourdon steam gauge has been demonstrated.*

E. B. M.—*The Taranaki Steel Iron Company's offices are at 3, Delahay-street, Westminster, where you can address the Secretary for the required information.*

W. T. (Thorney).—*Mr. Hall Dare, 12, Hanover-square, is the Secretary of the Royal Agricultural Society. You will probably find the card of a maker of pitch chains in our advertising columns.*

F. (Ferrol).—*It would not do to publish your invention in England previous to applying for provisional protection. There must be many such manufacturers as you ask for, but we are unable to refer you to one.*

J. S. L.—*It is generally held that the application of an old invention to a new purpose is not patentable. By sending, say 1s., in stamps to the Patent-office, and asking for Schiele's patent of November, 1848, it will be sent to you.*

MECHANICAL ENGINEER.—You *will find Mr. Weale's rudimentary treatises most useful. If, however, you are about entering upon a more extended course, you will probably require a teacher, and he could best advise you as to text books.*

T. B.—*Any steam gauge maker can doubtless furnish you with a gauge to indicate the pressure of water in mains, adding the graduations for the heads corresponding to the pressures per square inch. This is supposing that you have an air vessel.*

T. P.—*We really wish we could tell you what would prevent the formation of scale in boilers where bad water is used. So much quackery has been practised in treating scale disease, that we do not like to prescribe. Some of the remedies have been sal-ammoniac (once used on some of the railways) oak sawdust, gum catechu, or "cutch," &c. &c. In any case frequent blowing off must be practised.*

AN ENGINEER'S PUPIL.—*If you are what you describe yourself you ought not to come to us a second time with such a question. The problem is very simple, but we cannot undertake to work it out for you. Again we say, make the diagram, with any length of connecting rod you like, and find the thrust, at various parts of the stroke on the principle of the resolution of forces acting through jointed levers.*

A. Z. (C. M). *Steamers are very commonly tried in the way you describe. The Peninsular and Oriental Company's steamer Mooltan had her engines tried last spring, alongside the quay at the Victoria Docks. With engines working up even to 4,000 horse power, the actual pressure exerted upon the hull, tending to drive it forward, would be but about 40 tons, and it would be a poor ship indeed which would be strained by such a pressure applied in the direction of her keel.*

J. D. (Uddingston).—*Like nine-tenths of our correspondents who ask us for dimensions of parts of engines, you neglect to give the pressure at which you intend to work. Supposing your 10-in. double-cylinders, with 16in. stroke, and making 90 revolutions per minute, to be worked by steam of 60 lb. pressure, we should employ a wrought iron crank shaft 3½ in. in diameter. This is supposing that the fly wheel is between the two cylinders. If both connect on one side of the fly-wheel, let the shaft be 4¼in. diameter. The crank pins, if of the ordinary kind, may be 2¼in. in diameter, and 2¼in. long. If you employ your fly-wheel as a belt pulley, which we should advise you to do, its diameter will be governed by the speed at which you intend to drive your machinery. If it be 5ft. in diameter, let it weigh 3,000 lb. Although much less than this will answer, if great regularity of motion is not required.*

FANS.

(*To the Editor of The Engineer*).

SIR,—Will you kindly furnish me with a "practical rule" to calculate what air a fan of the following dimensions will discharge per minute, viz.:—6 blades, 30in. diameter outside of blades, each blade being 8¾in. long, 10in. wide at the butt, and 4½in. at the tips, and making 180 revolutions per minute? The fan has an outer casement, revolving with the blades.

Todmorden, March 8th, 1862. W. T.

ROLLING STEEL TYRES.

(*To the Editor of The Engineer.*)

SIR,—In THE ENGINEER of the 1st instant you say you believe that Messrs. Brown, of this place, are the only parties who have machinery to enable them to roll cast steel tyres, and of course this statement will apply to all other tyres in the circle. I have been engaged for the last eight years or more in rolling that and other tyres in the circle, on a principle patented by me, and have, during that period, rolled upwards of sixty thousand tyres. I am sure you only require this information to cause you to insert the statement. W. OWEN.

Rotherham, 10th March, 1862.

THE HARTLEY ENGINE BEAM.

(*To the Editor of The Engineer.*)

SIR,—In answer to "A. C. H." I am not aware that any experiments have ever been made on "open sand castings." I should imagine, for this simple reason, that it was never supposed that such a material would ever be used where any particular strain was required. In the absence of any great authority perhaps the next best thing to do is to take the opinion of several experienced ironfounders, and I find that I have placed a high value upon "S." I agree with your correspondent "V.," who says they possess only two-thirds the strength of ordinary castings.

With regard to "Founder's" letter, it was stated at the inquest that it was "an open sand casting," and a representative of the makers was present at the time, and did not contradict it. It has also been discussed in these columns during the last six weeks unmistakeably as an open "sand casting." If it is not so why did not the makers say so long ago? I for one should like to see the original calculation of this beam. S.

Bermondsey, March 12th.

RAILWAY COLLISIONS.

(*To the Editor of The Engineer*).

SIR,—I shall feel obliged if you will give me a formula for the following:—A railway train 100 tons weight is running at a velocity of 8 miles an hour, and is run into by a following train of 200 tons weight, running at the rate of 16 miles an hour, what is the amount of force with which they come into contact? J. W. WILLIS.

[*The force of a blow cannot be rightly estimated as a steady pressure, although both may produce substantially the same result. The force of collision would be due to a difference of speed of 8 miles an hour, or 12ft. nearly per second. A body moving at this velocity would, if projected upwards, rise to a height of 9ft., and therefore in striking another object at rest the force would be that acquired by falling from a height of 9ft. The carriages which first came in contact would strike their buffers together with the same force as if one had fallen 9ft. upon the other, but the remaining carriages would receive a diminished shock owing to the elasticity of the buffers.*

SCREW SHAFT PACKING GLANDS.

(*To the Editor of The Engineer.*)

SIR,—Seeing by the newspapers that a screw steamer has had to put back owing to the packing coming out of the screw shaft stuffing box, the following plan has suggested itself to me as an easy means of getting over that difficulty in future.

Supposing the packing to be worn away, or to have come out in some manner, if a piece of rope or gasket was put outside of the gland, and the gland screwed tightly up, that would effectually prevent any water leaking through between the gland and tube.

To prevent the leakage between the shaft and gland I should take a few fathoms of rope of a suitable size, and having laid one end on the shaft, about 2ft. from the gland, commence winding it tightly round the shaft; this could be best done by starting the engine slowly, and by holding the rope tightly until it pressed against the gland, when, if there was room for it, a second coil might be run back over the first. The end of the rope must then be lashed to prevent its coming loose. This plan would, I think, be sufficiently secure to enable the vessel to proceed on her voyage.

N. C.

[*How long would the surface of the rope last where it rubbed against the stuffing box, and what would there be to keep it tight against the box?—Ed. E.*]

MEETINGS NEXT WEEK.

INSTITUTION OF CIVIL ENGINEERS.—Tuesday, March 18th, at Eight p.m., Discussion upon Mr. Hartley's paper "On the Lower Danube," and, if time permits, "Description of Works at the Ports of Swansea, Silloth, and Blyth." By Mr. J. Abernethy, M. Inst. C.E.

SOCIETY OF ARTS.—Wednesday, at 8 p.m. "On the Sewerage of Towns." By Robt. Rawlinson, C.E., Engineering Sanitary Commissioner in the Crimea. On this evening the Right Hon. Lord Stanley, M.P., will preside. *** Plans, details, estimates, and cost of public sewers in Carlisle, Buxton, Worksop, and West Ham, will be given.

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THE ENGINEER.

FRIDAY, MARCH 14, 1862.

DURABILITY OF IRON STRUCTURES.

No engineer pretends to assign a precise period for the duration of his structures. They will last for a very long time, for many centuries, perhaps,—at all events he professes to believe as much. In the case of masonry, we are able to refer to many works of the ancients—to a few of those of the Phœnicians, indeed, and to a long list of Roman structures, both cisalpine and transalpine, all of which prove the endurance of stone and mortar. Tiles, also, moulded by the ancient Romans, are still found in a sound state, and we have examples, in Hampton Court Palace and in the Lollard's tower of Lambeth Palace, of the endurance of exposed brick work for three or four centuries at least. Wood, too, when sheltered, as in the roof of Westminster Hall, or when immersed, as in the old piles of London bridge, or in the caissons of Westminster bridge, will last for centuries. But how is it with iron? The first iron bridge is believed to have been erected only ninety years ago, at Coalbrookdale, and we are not sure whether it is still standing. It was only about forty years ago that iron came into extensive use for engineering purposes, and but about thirty years since it was first used under the trying circumstances of railway traffic. And it is hardly fifteen years since wrought-iron bridges began to be used for railways. Now are they really to remain permanently? We are going on, apparently in the utmost confidence, as if these works were to last for ages,—and it may be that we cannot bring up anything to show that they will not last as long as their builders have anticipated. Yet we are forced to own that all our faith in the durability of iron structures is based upon *data* which are more inferential than absolute. Some wharfs and piers have been built, which appear to stand very well in sea and river water, and Mr. Mallet has come to some most encouraging conclusions from the results of some experiments which he has made upon the corrosion of cast-iron in the Liffey, and elsewhere. Mr. E. B. Webb has lately published considerable information upon the durability of cast iron piers and lock-gates, some of which information has been lately transcribed into our own columns. As far as it goes, this experience is calculated to inspire the engineer with renewed confidence in the applicability of iron to works of construction. But, at the same time, abundant instances can be adduced of the rapid corrosion of cast iron tubbing in coal pit shafts, even where no sulphur was to be detected. Cast iron pipes do not last for ever, either, in the ground, and iron troughs, and other castings, have been found to decay in a comparatively short time. As for wrought iron, there are abundant examples of its decay after some years' exposure. The lightning rods of old steeples are sometimes found to be eaten away by rust, and the iron dowels or clamps which have served to bind stones together in old masonry, are now and then found to be swollen to twice or thrice their orginal bulk with rust. Iron roofs on buildings are found to go rapidly, and galvanising has been found to be but a partial protection. Iron ships become eaten through in the plates, and boilers working with both "fresh" and distilled water become occasionally corroded in an unaccountable manner and after a few years' service. Wrought iron bridges, we must remember, are so recent in their use, that we cannot pretend to say with any certainty how far their durability is determinable from other experience. It has been said that wrought iron, after resting for many years in one position, becomes crystalline, and the case has been instanced of an anchor at Woolwich, which, having lain for nearly a century in one position, broke short off when finally removed. Iron becomes brittle, too, after long use. The old axles on the Liverpool and Manchester Railway lasted for from fifteen to twenty years, and at last began to break, promiscuously. The load which they carried had not been greatly increased, nor had they been run at a much higher speed, as they were under goods wagons, the speed of which had remained nearly the same from 1830 to 1850. Why, then, did they not hold out indefinitely? Their case appears to illustrate what Mr. Braithwaite calls the "fatigue of metals." They bore up for so many years and then broke down, just as a horse might have done. Now, as to this matter of fatigue of metals we know next to nothing. At the last meeting of the British Association Mr. Fairbairn related some experiments which he had made, and which showed, clearly enough, that a given load, repeated sufficiently often, at last broke the camel's, or rather the girder's back. He made a model of one of the girders of the Spey viaduct (about "passing" which Captain Tyler made such weighty objections), and loaded it with one-fourth of its calculated breaking load. By a simple contrivance this load was changed, or alternately applied and removed, one million times without apparent injury to the girder. The beam was then loaded to nearly one-half of its calculated breaking weight, and after the load had been changed 5,175 times, the beam broke down. It was then repaired, and a load equal to two-fifths of the calculated breaking strain was alternately applied and removed, 25,900 times, when, we believe, a second failure took place. Afterwards, with a load equal to one-third of the calculated breaking strain, nearly three million changes were made without perceptible injury. We are not to suppose, however, that the changes of load took place, in Mr. Fairbairn's experiment, in the manner in which 100 or 200 railway wheels deal out their blows upon a bridge at from 10 to 50 or 60 miles an hour. Indeed, it is impossible to say what is really going on in large iron girders, over which heavy trains are constantly flying. They were, most of them, built, too, for a live load of 1½ tons per lineal foot, some of them, indeed, for but one ton per foot. The present maximum load for moderate spans is nearer 2 tons per foot. So, too, different engineers have provided a strength varying from two to six times the maximum load, and no longer ago than last September Mr. Fairbairn was engaged in explaining to the British Association that, in calculating the strength of a bridge, its own weight was *first* to be deducted from its calculated breaking strength, and one-sixth of the *remainder* taken as the limit of safe load. Now, with tubular bridges a span would soon be reached where the work would break down under its own weight, yet Mr. Fairbairn would have engineers believe that, in all cases, a bridge will safely carry a live load equal to one-sixth of the difference between its own weight and its calculated breaking strain applied as a distributed load!

Is it generally known that, in the case of steel, a highly carbonised bar, too harsh for working, becomes, after long exposure out of doors, workable, showing a loss of carbon? If carbon in its solid form will escape invisibly from steel, as any experienced steel-maker can testify it does, what gradual changes may not be going on in iron? We do not suggest this question with any desire to excite alarm, but it may lead to more searching inquiries, of which, we think, it must be admitted, there is still some need.

STEAM ENGINE CONSTRUCTION.

GIVEN, a steam cylinder, a reciprocating piston, and a crank, and a constructing engineer will combine them in almost a hundred different ways. In the earlier steam engines the cylinder was always vertical, with the piston-rod working through the top cover, the vibrating beam being employed in the transmission of the power to the crank. In single-acting pumping engines, having no crank, Mr. Bull afterwards took the piston-rod out through the bottom of the cylinder, an arrangement which contained the idea of the steam hammer, and that, also, of Messrs. Thomson's inverted cylinder engine, as originally introduced by them in the Frankfort steamship, and since extensively adopted by other builders. Messrs. Boulton and Watt introduced the side lever engine for steam vessels—Mr. Fairbairn soon taking it up for factories. Another variety of beam engine is the "grasshopper." The greatest variety of arrangement, however, is among the direct-acting engines. With the upright cylinder the shaft is variously placed, according to the point at which it is required to take off the power. In the more usual plans, the connecting rod grasps a pin placed close to the end of the piston rod, the crank being above. With the shaft at a lower level, the cross head is sometimes bent down so as to work in guides on opposite sides of the cylinder, an arrangement at one time adopted by Mr. Bury for marine engines, and by Messrs. Robinson for sugar mill engines. With the shaft just over the cylinder cover the "steeple" plan is sometimes adopted, and at others, the piston rod is taken out through the bottom cylinder cover, and the connecting rod reversed so as to work upwards, the whole being an inversion of Maudslay's "table engine." The same attachment of parts is sometimes employed with horizontal cylinders, and Messrs. Maudslay's double piston rod engine is no more than the steeple engine laid horizontally. Then we have diagonal engines, sometimes with two cylinders placed at right angles to each other, both piston rods being connected to the same crank pin, according to the plan patented by Sir Marc Brunel in 1822, or having the cylinders separated at a less angle and having the drag-link interposed as in the Galway steamship Adriatic. Then there are oscillating engines and trunk engines, "Siamese" engines and pendulum engines, and there is an arrangement in which the cylinder turns completely around upon trunnions like those of an oscillating cylinder. In these diversities of position and connection there is seldom any thing which can be dignified as a mechanical principle. The variety may be interesting enough to ingenious draughtsmen, and may arouse the competitive spirit of a builder, here and there, just entering into business, but with the practical engineer simplicity and accessibility will generally determine his choice, although it is a fact that engines which are neither simple nor conveniently accessible appear best to meet certain exigencies of space and place on shipboard. It is only in this way that we can account for the favour still shown to trunk engines, for example, which work with much friction and considerable loss of steam by condensation. One important mechanical distinction, it is true, may be made with respect to the varieties of engines which we have enumerated. Some are self contained, while others are not. The beam and side lever engines require firm foundations to which they must be well tied down, the strain at the main centre of the beam being double the total pressure on the piston. Most of the direct acting engines, on the contrary, require no foundations beyond a surface sufficient to carry their weight. In the inverted cylinder engine, however, the lateral pressure on the guides is applied so far above the floor, and in the case of marine engines, the top weight of the cylinder is so great, and it has such a leverage when the ship is rolling, that the standards require to be of corresponding strength, and to be securely fastened down.

As with the position of the cylinder and the transmission of the pressure of the steam from the piston to the crank, so are all the other arrangements of the engine susceptible of a great variety of changes, all attaining much the same result with different degrees of simplicity. It is thus that we have a host of engines dissimilar in appearance and yet identical or nearly so in principle. The eminently practical man finds in these differences abundant scope for comparison and eclecticism, but is apt to look with distrust over those broader grounds of inquiry beyond which may arise fundamental changes in practice. The philosophical engineer, on the other hand, is impatient of details of engine-craft, and enters, instinctively, upon the pursuit of ideal perfection—an ounce or so of coal per horse-power per hour. The former will revel in the merits of a new piston or an improved valve gear, while the latter, disdaining such material littleness, poises the pinions of his imagination for a flight to the practice which shall dispense with nine-tenths of the present weight, bulk, and complication of steam engines. In regarding, therefore, the mere structure of engines, we may as well dismiss at once the consideration of maximum pressures, prolonged expansion, and, possibly, surface condensation. Mechanically, then, we may say, that modern practice is tending, visibly, towards smaller pistons running at higher speeds for a given power; to a unification instead of a multiplication of parts, and to the greatest possible directness of transmission of strains and pressure. With higher pressures and quicker speeds the most accurate workmanship is found indispensable; wearing surfaces of greater amplitude are necessary, and means for reducing the friction of valves and for counterweighting the disturbing weights of the engine acquire increased importance. On land, it is sought, as far as possible, to dispense with gearing and to work steam engines more nearly up to the speed of the machinery which they are employed to drive; in steam vessels, the increasing adoption of the screw has, except where gearing is still employed, led to the adoption of short-stroke engines running at high speed, a 3½-ft. stroke being repeated, in some cases, 200 times a minute. Wrought iron has been fighting its way for years into the place of cast iron, for framing, and even for beams where beams are still used. It was once thought a great step to substitute cast iron for wood in beams and connecting rods for land engines, but cast iron rods are hardly made now, and the case of the Hartley engine and that of the levers of the Scotia steamship are likely to decide the question of cast iron *v.* wrought iron engine beams. The cast iron main and end centres are, at last, going out of use too. For large engines, steam jackets are beginning to be considered as indispensable, both around the sides and upon the ends of the cylinders. With steam of higher pressure, pistons of greater simplicity and longer stuffing boxes are preferred, and care is being taken to relieve the back of the slide valve from a portion of the enormous pressure now resting upon it. We might thus pursue the details of steam engine construction, only to find that all are undergoing gradual change, and, as we hope, corresponding improvement.

RAILWAY ENGINEERING.

The late Mr. Stephenson once remarked that the construction of machine tools, although a subject of great importance, hardly afforded any field for discussion. This is now the case with railways. At the time when every thing connected with railway location, gauge, permanent way, locomotive power and working was undetermined, the field for inquiry and discrimination was almost boundless. There are many who can remember, and all have heard, with what energy the question of the substitution of locomotives for stationary engines and horses on railways was debated, thirty odd years ago. When the multitubular boiler and blast pipe had carried the day, wide differences of opinion arose as to the gradients and curves. Improvements in locomotive valve gear, and, almost at the same time, the relative merits of outside and inside cylinder engines, soon after occupied the attention of mechanical engineers. Then came the question of gauge, respecting which a deal of nonsense was emitted on both sides. Almost immediately followed the far more consequential discussion of the substitution of wrought for cast iron in bridges. More recently there has been a division on the question of iron permanent way, and, at the same time, much inquiry has been directed to the use of coal in locomotives. All, or nearly all, these questions have been argued, and the conclusions acted upon in a manner which would seem to leave little but to slowly accumulating experience in the future. Whatever of freshness may have attached to these subjects has certainly been exhausted. Railway engineers are *blasé* with all of them. Railway engineering has become a matter of *routine*, which almost any attentive young gentleman, with fair powers of apprehension, can readily master. (Not, by any means, that every knight of the level and drawing board can secure an appointment as chief engineer.) There is the survey, in which the Ordnance maps are of wonderful assistance, leaving, it is true, however, full scope for the study of the topographical and commercial features of the route. It is here indeed that the judgment and ability of the engineer are generally exerted to the best purpose. At all events, few engineering errors are more costly than errors of original location, as the practice of even our best masters has now and then testified. The nice determination of the line which shall best combine the more important requisites of directness, easy gradients and curves, facility of construction and general adaptation to the wants of the district, is a problem often worthy of the highest engineering talent, requiring, especially, the soundest professional judgment. The temptation to make a direct line, especially across country, is generally strong, and often, with works of considerable magnitude in the way, such a railway will prove actually cheaper in cost than a longer one entering upon the more valuable property along the watercourses. The question of gradients arises, however, involving much consideration of the working of the line, which also requires attention to the nature, probable extent, and prevailing direction of the traffic. Good judgment might sanction an incline of 1 in 50 in one case and refuse one so steep as 1 in 100 in another. An engineer might not be justified in one case in incurring more than a moderate expense to obtain curves no easier than of 10 or 12 chains radius, while, in another, a 20 chain curve would be the least admissible, and a large sum might, perhaps, be rightly expended in order to obtain a *minimum* of 30 or 40 chains. The value of property and the convenience of the inhabitants of the district traversed will also determine greatly the question of deviations. In respect of bridges, cuttings, and embankments, too, it is very often the case that much more favourable ground can be had by going a little out of the way. Indeed, the whole question of the selection of route requires, in many cases, the most comprehensive and careful consideration of a vast number of details, upon which the best professional experience, and the ripest judgment, may well be exercised. These once settled upon, however, and standing orders complied with, nearly all opportunity for the exercise of original qualities on the part of the engineer is past. To draw up the specifications is very much like drawing up a lease or an agreement, at least in so far as the introduction of the conventional clauses of both are concerned. The price of executing nearly all kinds of work is so well-known, too, that an engineer, with even a moderate circle of acquaintance, can hardly get far wrong in his own estimates of what his undertakings are to cost. When it comes to bridges there is not much chance of going astray. The omnipresent wrought iron girder—a capital superstructure, too, for a bridge—has but to be repeated, and the conditions which govern the choice of foundations and the width of spans are generally capable of such ready determination that but little room is left for doubt. As for the different kinds of bridge superstructure, almost all that can be said has become familiar to the engineer. For moderate spans the plate girder will generally be preferred, and when the span becomes so great that an economical arrangement of plates cannot be conveniently made in the sides of the girder, the lattice offers obvious advantages. As for cost, the leading contractors quote the same price per ton for both plate and lattice girders, so that there is very little room for choice in that respect. In many bridges, perhaps, indeed, the larger number, the cost of the superstructure is, after all, considerably less than that of the foundations, abutments, and piers, so that the question of superstructure, presuming that it is abundantly strong, is not of paramount consequence.

As for permanent way—such permanent way as is now put down on railways—its selection requires much the same kind of knowledge and care as would that of an ironmonger's stock of goods. Dilate as we may about form, weight, and quality of rails, weight and fastening of chairs, bearings of sleepers, &c., all these matters were practically settled years ago in the practice of the earlier railway engineers. We may modify a little here, and enlarge a little there, but we are, after all, following so nearly in the old track, that no "outside" observer could tell the difference. A rail is a rail, after all, and the best article in that line is, we fear, no better than, if as good as, the thoroughly worked and soundly welded bars turned out thirty years ago. We may own to more or less professional interest as to steel rails, improved rail-joints, &c. &c., but no one of us thinks of laying down a long line with steel rails, or of revolutionising rail joints. We leave those matters to patentees and the Permanent Way Company, an organisation perhaps less frequently heard of since the expiration of the fish-joint patent and the final decision *in re* Harwood *v* the Great Northern, but which, we believe, is still in existence.

And as for rolling stock, what has the engineer to do but to digest the quotations of the leading builders, for no engineer would think of specifying locomotives and carriages differing substantially from the recognised patterns. There is no engineer so isolated but that he can command the most complete plans and specifications of locomotives any day he requires them. He has only to take care that they are not much too large nor much too small, much as he would in buying a hat or a pair of gloves. Locomotives are manufactured now-a-days, and well it is that they are. Their value to the world is almost directly as the readiness and facility with which they can be procured. Some builders will turn out a better job than others, but few builders, even without the interposition of an inspector, would knowingly send out engines of conspicuous inferiority. So close, too, has competition been in locomotives these many years, that an engineer would be very safe who, having sent out his specifications, accepted the tender which represented a mean between the highest and the lowest. Some engineers cannot feel that they have discharged their proper functions until they have dictated something out of the common course with respect to a boiler, a safety valve, a piston, an axle, or a tyre, but, in the end, their pet preferences are resolved into the orthodox modes. In our own case we have had occasion to pay especial attention to locomotive practice, but we cannot point to any substantial improvement which has been made, within the last ten years, in that noble machine. A sheet iron shield has been intruded within the fire-box, and a hollow stay-bolt tapped in here and there, and the result is that coal is burnt with a moderate but indictable production of smoke. We have begun to use steel tyres, and, here and there, steel axles, and so we have begun to wear ventilating hats and to carry rotatory umbrellas, but in neither case is there a novelty in the essential construction.

We might go through every detail of railway construction and equipment and we should merely find that each was of much importance, but that with the conclusive arrangements which have already been made, no field was left open for extensive selection. It is well that this is so. The great principles of our practice being determined, our services to society are all the more comprehensible, and more likely, therefore, to be in request.

At a late meeting of the Archæological Institute Captain Windus, R.I.N., read an account of a great carrack, or man-of-war, built by the Knights of St. John, at Nice, in 1530. It was one of the fleet sent by the Emperor Charles V., in 1535, against Tunis. She was named the Santa Anna, and attracted much attention from her size, armament, and fittings. She had six decks; her crew was 300 men; she had a chapel, hall of reception, &c., and they served the crew with fresh bread daily. One remarkable fact of her construction was that she was sheathed in lead up to her bulwarks, and was impenetrable to the artillery of that day. The lead was attached with brass bolts. She was the La Gloire or the Warrior of her day. The account of her was to be seen in Bosio, and the huge carrack figures in the frescoes of the Palace of the Knights Hospitallers at Rome.

LITERATURE.

A Course of Elementary Mathematics. By John Radford Young, formerly Professor of Mathematics in Belfast College. London: W. H. Allen and Co., Leadenhall-street. 1861.

Those of our readers who have enjoyed the benefit of a comprehensive mathematical training—and there are but few branches of our profession in which such a training can be wisely dispensed with—will remember through how many difficult and often ponderous volumes he had to plod his weary way. Reverting for a moment to our own early years our memory recals a goodly library. "Euclid's Elements," Wood's "Algebra," Hymer's "Trigonometry," O'Brien's "Co-ordinate Geometry," Hymer's "Analytical Geometry of Three Dimensions," Woolley's "Descriptive Geometry," Snowball's "Mechanics," Whewell's "Dynamics," Webster's "Hydrostatics," Miller's "Hydrodynamics," Hall's "Differential and Integral Calculus," Moseley's "Engineering and Architecture," and Willis's "Principles of Mechanism," to say nothing of works on the steam engine, optics, and so forth, treated mathematically, or of others which we have probably forgotten in this hasty retrospect. Doubtless very many of our readers could at once recite a parallel list of treatises which formed part of their "first course" as students, and a few may be able to add largely to the number.

Now there are several evils associated with this distribution of one's study over so many different works. The first, and probably the least, of them is the unnecessary expense which has to be incurred. Another is the confusion produced in the student's mind by differences in the style, and often in the notation also, of the various authors. Then, again, it often happens that the various treatises overlap each other, so that time is wasted in extricating the thoughts from the books sufficiently to enable the mind to pursue a clear course of study steadily and progressively, and without loss of time. Finally, your studies are embarrassed throughout by the absence of that frequent reference to particular theorems and problems already studied, which is so servicable to the student in a mathematical work whenever an author is wise enough to provide it. This last is a very important consideration. The mathematical sciences are so essentially progressive in themselves, and so intimately blended together, that it is impossible to pursue the study of them without keeping up a constant reference to doctrines or principles which have been previously established. The necessity of this is so obvious that we need not dwell upon it a single moment. It is manifest, however, that where you are driven from author to author every time you take up a new branch of study it is absolutely impossible to have the natural connection of subjects and parts of subjects kept up in the mind. We are quite aware, of course, that familiarity with the modes and views of different thinkers gives breadth to our knowledge. But this advantage should be sought after an elementary course of study has been completed; the young student is in no position to profit by discursiveness. His first business is to advance steadily along the highway of science; the time for exploring its byways will come afterwards.

In the work before us we have a course of mathematics, written by a single author, costing less than some of the treatises on single subjects mentioned above, preserving a consistent notation from one end to the other, avoiding repetition, and keeping up a continuous connection between subject and subject as they are successively developed. These, it will be acknowledged, are admirable characteristics to begin with. They create a strong *primâ facie* claim in favour of the work; but in this respect it is not, perhaps, altogether unexampled. It possesses other qualities, however, which fairly demand for it, in our judgment, a pre-eminent place among mathematical courses.

But before mentioning these it will be well to explain what the volume does and does not contain. It does not, of course, treat of many of the subjects named in the list of books given in our first paragraph. It is a purely mathematical treatise, and the author does not travel out of a strictly mathematical sphere. Common arithmetic and "Euclid's Elements of Geometry" are likewise excluded from it—the former, because it may be studied with all needful advantage from the ordinary manuals in popular use; the latter, because it is a distinct work of itself, "universally known and esteemed, and everywhere to be easily procured." The author has rightly judged that to insert either Euclid's treatise or one upon common arithmetic in the present volume could be of no possible benefit to the learner. It begins, therefore, with Algebra, which is followed by Plane and Spherical Trigonometry, Mensuration and Analytical Geometry; then come Statics, Dynamics, and Hydrostatics; then the Differential and Integral Calculus; and, finally, a series of applications of the Calculus to Mechanics.

Professor Young has long been known, and celebrated too, as a mathematical reformer, basing his reforms upon a fundamental belief with which we entirely and most heartily concur. He believes that the study of mathematical analysis should be prosecuted in the same spirit as the study of Euclid—that the reasonings of analysis equally with those of geometry should produce irresistible conviction, and that assent to every result of such reasoning should be compelled rather than yielded—"wrung from the reader, and not coaxed from him." He contends that every mathematical inquiry should be entered upon by the student in a sceptical spirit: "he should admit just so much as he is obliged to admit, and no more; and due watchfulness should always be exercised over the symbols he employs, lest, from his relaxation of the necessary constraint, they conduct him beyond the regions of common sense." The author anxiously—almost unnecessarily so, as it seems to us—asserts and re-asserts this view, and insists upon the necessity of bearing it in mind. If the reader should suppose that all our elementary works of repute provide against such errors (which but few readers who have been attentive students of mathematics are likely to do, we think), the author would refer him to many instances of them. Even in so common-place a subject as the Binomial Theorem it is marvellously easy to go wrong. How many students of ordinary mathematical works are there, he asks, who would not unhesitatingly affirm that the following equation holds universally, for all values of x and a?—

$$(a + x)^{-2} = \frac{1}{a^2}\left(1 - \frac{2}{a}x + \frac{3}{a^2}x^2 - \frac{4}{a^3}x^3 + \frac{5}{a^4}x^4 - \frac{6}{a^5}x^5 + \ldots\right)$$

Yet whoever affirms this must necessarily affirm also that—

$$(1 + 1)^{-2} = \tfrac{1}{4} = 1 - 2 + 3 - 4 + 5 - 6 + \ldots$$

which is a palpable absurdity!

Again, says the author: Take the subject of the Reversion of Series, which is sometimes applied to develope a root of an algebraic equation; how many are there—guided by their books—who, if required thus to develope x in terms of y from the equation $y = x + x^2 + 2$, or $y - 2 = x + x^2$, would hesitate to affirm that

$$x = (y - 2) - (y - 2)^2 + 2(y - 2)^3 - 5(y - 2)^4 + \ldots ?$$

But let $y = 1$: the statement then becomes

$$x = -1 - 1 - 2 - 5 - \ldots .$$

and yet x is known to be imaginary! "All such apparent discrepancies and contradictions may easily be reconciled. Algebra is not in the slightest degree chargeable with them, yet—there they are."

Nor is it by any means in algebraical works only that the due watchfulness over symbols, of which the author urges the necessity, is requisite. Every one who has studied Mechanics will have found himself stumbling at some time or other—pretty often, many of us—over the mysterious meanings which they sometimes assume in that department of study. No better illustration of this can be given than that which Professor Young adduces. Let a person tolerably familiar with algebra take up at random a modern treatise on dynamics. He may chance to light on one in which he will find such terms as Mass, and Weight, and Velocity, and Acceleration clearly and well defined. He is told that gravity produces an acceleration of velocity of 32ft. and a fraction per second in the latitude of London; that g is the recognised symbol for this quantity, that M stands for mass, and W for weight. Keeping all this in mind, he reads on a few pages, perhaps, smoothly enough, till he is suddenly arrested by the staggering statement that "W = Mg." If, as is no doubt often the case, the reader has been intent exclusively upon his symbols, this conclusion may come out naturally enough; but if he has connected them in his mind with the things signified, he must find it a serious perplexity.

The impediments which this slovenliness on the part of mathematical writers often throws into the path of the student are fearful. Professor de Morgan, in a sentence quoted by the author, speaks of the confusion created in his mind when a student by the definition of accelerating force which has become generally received. "Accelerating force, which any one would suppose to be the force which accelerates, is no such thing; it is the effect produced—the very acceleration itself." Well do we ourselves remember the trouble which this phrase at first occasioned us. So serious are the evils which this kind of thing produces that it is doubtful whether the great body of students ever altogether escape them. At any rate, many authors of works on science do not. We could name several treatises in which the most manifest incongruities are not only introduced, but paraded from one end of them to the other. A very common blunder indeed is to connect quantities of different dimensions, and not unfrequently of different natures, by plus or minus signs.

It is, therefore, in our judgment, a very gratifying circumstance to have put into our hands this comprehensive volume, by a most competent author, in which special care has been taken not to play fast and loose with the student, and not to stagger him with solecisms. There is, moreover, another feature in the present work which adds greatly to its value. The author has laboured throughout to relieve the student from the monotony of merely moving symbols about, and to show him, to some extent, the practical uses to which those symbols may be put from time to time as he advances. Where ordinary verbal matter can be made available in the elucidation of a subject, he does not scruple to employ it. He says many modern writers have a great aversion to put what is called "talk" into their mathematical books; but he has no such prejudice. The reason is plain and conclusive: "An ardent and intelligent student, who naturally expects, by devoting himself earnestly to the work, to gain something more from the study of analysis than a mere expertness in manipulating symbols, is apt to get weary of this unprofitable exercise; and knowing, as he must do, that *this is not mathematics*, becomes disheartened, from misgivings that his own mind is inadequate to the undertaking, that he has no talent for mathematics, nor sufficient acumen to penetrate its mysteries; whereas, in truth, there are no mysteries to penetrate."

This concluding phrase of Professor Young's—"*there are no mysteries to penetrate*"—if employed by a superficial writer would stamp him as unfit to instruct others; but employed by him, it is the best possible guarantee of his serviceableness as a teacher. It is because he has fathomed every part of his subject so thoroughly that he makes this declaration; and the man who has seen so-called mysteries through and through is the very best person to clear them up for us. It may be desirable to state, in this connection, that the author is not by any means a mere reviser of the labours of other men. Interspersed throughout this volume there are numerous new mathematical developments of a very high order which we owe entirely to him, and which it would be difficult to parallel, either for number or excellence, from the works of any other modern mathematician. This is saying a great deal, we know; but it is not more than we honestly believe to be due. We might illustrate the truth of it had we the necessary space at our disposal; but the extensions and improvements introduced are far too numerous to admit of that.

We must, however, direct the attention of such of our readers as may possess themselves of this admirable work to the highly satisfactory manner in which the Differential Calculus is here commenced and developed. Under the hands of the author this profound and all-important study is entirely stripped of its difficulties. All that (which may be properly called) "talk" about the ratios of nothing to nothing, and of infinitesimals to infinitesimals, with which so many writers have clouded the subject, he sweeps utterly away. It is to be regretted, he truly says, that in one of the most interesting and important branches of analysis, and one, too, the elements of which are far from difficult, the learner should be embarrassed at the very threshold by metaphysical subtleties repugnant to all his previously-acquired notions of mathematical accuracy and logical consistency. He asks for nothing more, therefore, when he comes to deal with differentials than the student has already become familiar with in vanishing fractions. The theory of vanishing fractions has, it is true, to be extended here, but it has not to be modified, still less has it to be overthrown. We cannot refrain from quoting the substance of the author's arguments upon this point, for they will be found full of interest to every one who has studied the Calculus, and will at the same time serve to justify the warmth of our admiration of the author's style:—

It is sometimes said, in reference to such equations as those marked [2]*, that if $d\,y$, $d\,x$, are each zero, we have divided 0 by 0, and have, therefore, no more right to put any one thing for the quotient than any other, for $\frac{0}{0}$ means anything. But the results [2] have not been obtained by any such division of 0 by 0: they have been arrived at, in each case, by dividing $F(x + \Delta x) - F(x)$ by Δx, and by this operation only. The result is a general expression, over the form of which—implying a law that all the particular cases of it must conform to—we have no control; but over the particular cases themselves, so far as their values depend on Δx, we have complete control, inasmuch as Δx is not fixed by any condition, but is free to take any value we may please to give it. Our aim has then been to select from the innumerable series of possible or admissible values—all conforming to one and the same law—that which would be the last or ultimate value in this series, if it were formed by first giving to Δx some finite value k, as small as we please, and then continuously diminishing k down to $k = 0$; the value of the ratio thus obtained terminates the entire series of values, and continuously unites with the individuals of that series in as strict obedience to the law of the general expression. It has been objected, however, that this is to change the original hypothesis: to make that (namely, Δx) 0 at the end of an operation, which at the beginning was a finite quantity. But there was no "original hypothesis" as to the value of Δx: this quantity Δx (or h) was designedly left free from *all* restriction as to value at the outset, *in order* that at any subsequent stage we might, without violating any previous restriction, give to it any value we chose, and with a view, of course, to its *ultimate* value, 0. It must not be overlooked that the fundamental operations of algebra—though called by arithmetical names—are quite free from arithmetical restrictions: $(x^2 + a\,x) \div x$ is $x + a$, and would still be $x + a$, though there were no such thing as arithmetic in existence; as it is thus universally true, it is true when the symbols stand for numbers—any whatever; so that when $x = 0$, $(x^2 + a\,x) \div x = a$, whatever number is put for a. We thus see that the differential coefficient $\frac{d\,y}{d\,x}$, derived from any function y of x, is not so derived by dividing 0 by 0; it is derived by dividing the algebraic quantity Δy by the algebraic quantity Δx, and then giving to Δx the arithmetical interpretation $\Delta x = 0$. Having thus found the true value (say $f(x)$) of the vanishing fraction $\frac{d\,y}{d\,x}$, we are justified *then* in writing $\frac{d\,y}{d\,x} = f(x)$, and consequently in writing $d\,y = f(x)\,d\,x$. This is more than stating the truism $0 = 0$—it is conveying the information that the zero $d\,y$ comes to be zero by multiplying the zero $d\,x$ by the factor $f(x)$, and in no other way. Those who object to regard $d\,y$, $d\,x$ as *zeros*, call them *infinitesimals*; which in reality is only using a long word for a short one: an infinitesimal has no finite value; and this is all that can be said of zero, which, however, is the preferable term, because it is more precise.

It remains for us to express our surprise that the author, whose avowed, and, for the most part, well-sustained design is to wring assent to his propositions from the reader, should have claimed for the three laws of motion all the force of self-evident truths. We know very well that D'Alembert put forward what he considered an *à priori* demonstration of the first law, and that Professor Playfair endeavoured to do the same thing in a more mathematical manner. But we know, also, on the other hand, that Poissin, who has seldom been surpassed as a mathematician, declared that "we cannot affirm *à priori* that the velocity communicated to a body will not become slower and slower of itself, and end by being entirely extinguished: it is only by experience and induction that this question can be decided." And this view of Poissin's is the accepted view of most modern philosophers. We should be sorry to go to the length to which Mr. John Stuart Mill proceeds, and assert that all science is of necessity inductively obtained in the first instance; but when we remember that from the time of Aristotle down to that of Galileo it was believed that all bodies in motion had, by their own nature, a constant tendency to move more and more slowly, so as to stop at last, from some inherent cause of fatigue—we say, remembering this, we find it impossible to go farther than Dr. Whewell when he says, "though the discovery of the first law of motion was made, historically speaking, by means of experiment, we have now attained a point of view in which we see that it might have been certainly known to be true, independently of experience." "This law," he adds, "in its ultimate form, when completely simplified, and steadily contemplated, assumes the character of a self-evident truth." It seems to us rather unlikely that a doctrine which it took men ages of existence and numerous refined experiments to find out, and which even now philosophers themselves cannot see to be evidently true without its being completely simplified and steadily contemplated, should wring a ready assent from every student of this elementary course of mathematics. We may be taking a harsh view of the matter, but this certainly seems to us a serious blemish in Professor Young's excellent, aye unrivalled, work.

* These equations need not be given. They merely express values of $\frac{d\,y}{d\,x}$ derived from certain equations, from which the reasoning of the author starts in expounding the nature of the differentialing process. The careful reader will have no difficulty in following the author's meaning through the passage quoted.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

Grants of Provisional Protection for Six Months.

2702. JOHN WATT, Lorrimore-street, Walworth, Surrey, and THOMAS SNAITH HAVISIDE, Cornhill, London, "Improvements in the manufacture of soap."—*Petition recorded 29th October*, 1861.

126. BARROW MOSS, Liverpool, "The application of steatite, either alone or in combination with other substances, to the manufacture of bricks, fire-bricks, the lining of furnaces, and other similar purposes."—*Petition recorded 17th January*, 1862.

356. WILLIAM WOOD, Monkhill, Pontefract, Yorkshire, "Improvements in the process of manufacturing pomfret or liquorice cakes."—*Petition recorded 11th February*, 1862.

384. THOMAS DAVISON, Belfast, Antrim, Ireland, "Improved means for preventing the corroding of steam boilers."—*Petition recorded 13th February*, 1862.

403. THOMAS RENISON, Glasgow, Lanarkshire, N.B., "Improvements in water closets."

404. JOHN HENRY JOHNSON, Lincoln's-inn-fields, London, "Improvements in electro-magnetic time-keepers."—A communication from John Henry Koosen, Dresden, Saxony.

407. JOSEPH WALL and THOMAS DODD, Liverpool, "Improvements in the construction and arrangement of apparatus for regulating the flow or passage of fluids."

409. THOMAS HORSLEY, Coney-street, York, "Improvements in apparatus for turning and closing the cartridges of breech-loading fire-arms."

410. JOHN COOKE, Willington, Durham, "Improvements in the method of propelling ships and other vessels."

411. DAVID DUNNE KYLE, Victoria-street, Westminster, "An improved method of communicating or signalling in and with railway trains."

413. JOHN CHATTERTON, Highbury, and WILLOUGHBY SMITH, Dalston, London, "Improvements in telegraph cables."

417. JONATHAN RUSSELL, Westbury Villa, Camberwell, Surrey, "Improvements in the method of raising sunken, submerged, or stranded vessels."—*Petition recorded 15th February*, 1862.

419. HUGH CRAWFORD, JAMES CRAWFORD, ROBERT CRAWFORD, and ROBERT TEMPLETON, Beith, Ayrshire, N.B., "Improvements in looms for weaving."

421. JOHN WHITAKER, Leigh, Lancashire, "Improvements in machinery or apparatus for pulping roots."

422. JAMES JOHN VAN DEN BERG, Hague, Netherlands, "A new fire lighter."

425. JAMES COMBE, Belfast, "Improvements in machinery for winding cops, and in the treatment of cops for warps and other purposes."—*Petitions recorded 17th February*, 1862.

427. JOHN HENRY HASTINGS and JAMES FREEZER, Holkham, and JOHN WOODS, jun., Wells, Norfolk, "Improvements in ploughs."

428. RICHARD WATKINS, Lower Belgrave-place, Pimlico, London, "Improvements in oil and spirit lamps, and in the means of producing light therein, parts of which improvements are applicable to lamps generally."

431. WILLIAM CLARK, Chancery-lane, London, "Improvements in gas apparatus used for lighting cigars and other tobacco."—A communication from Pierre Duchamp, Boulevart St. Martin, Paris.

432. MICHAEL HENRY, Fleet-street, London, "Improvements in cartridges."—A communication from Jules Lemoine, Rue Saint Paul, Paris.

433. WILLIAM BUSH, Tower Hill, London, "Improvements in omnibuses and other carriages."—*Petitions recorded 18th February*, 1862.

460. RICHARD HUME SKELLERN, South-terrace, Hatcham Park, Surrey, "An improved self-inking hand stamp or press."

462. JOHN STANDISH and JOHN GOODEN, Egerton, near Bolton, Lancashire, "Improvements in machinery or apparatus for stripping or cleaning the flats of carding engines."—*Petitions recorded 21st February*, 1862.

470. WILLIAM ASHTON, Manchester, "Certain improvements in machinery or apparatus employed in the manufacture of braids, and similar articles."

472. JAMES KIRKWOOD, Paisley, Renfrewshire, N.B., "Improvements in looms for weaving."

474 JOHN MILLINGTON, Oaken Gates, Shropshire, "A new or improved hearse or bier."

476. CHARLES HENRY JULIUS WILLIAM MAXIMILIAN LIEBMANN, Huddersfield, Yorkshire, "Improvements in felted fabrics suitable for carpets and other similar purposes, and in the apparatus employed therein."

480. GEORGE BLAKEY, SAMUEL BLAKEY, and JOHN BLAKEY, Liverpool, and BENJAMIN WHITE, Birkenhead, Cheshire, "Improvements in leggings or gaiters."

484. MARC ANTOINE FRANCOIS MENNONS, Rue de l'Echiquier, Paris, "Improvements in burners for heating by gas."—A communication from Carsten Richard Meyn, Carlshütte, Rendsburg, Holstein.—*Petitions recorded 22nd February*, 1862.

486. GEORGE WEST, Chapel-place, Long-lane, Borough, Surrey, "Improvements in the construction of washing machines."

490. THOMAS BLAIR, Carlisle, "Improvements in machinery or apparatus for cutting, chopping, and breaking refined lump sugar and other substances."

492. THOMAS NESHAM KIRKHAM, West Brompton, and VERNON FRANCIS ENSOM, Highgate, Middlesex, "Improvements in bleaching and dyeing yarn and thread when in the form of cops or otherwise wound."

498. WILLIAM EDWARD NEWTON, Chancery-lane, London, "Improvements in the joints or chairs of the permanent way of railways."—A communication from Raymond French, Seymour, Connecticut, and William Goddard, Boston, Massachusetts, U.S.—*Petitions recorded 24th February*, 1862.

500. JEREMIAH WOODROW, Oldham, Lancashire, "A certain improvement in the manufacture of hats or coverings for the head."

502. JOHN PIDDINGTON, Gracechurch-street, London, "An improved machine for shelling or husking all kinds of grain.—A communication from Melchior Nolden, Frankfort on the Maine.

504. EDWIN BLISS, Percival-street, Clerkenwell, and HENRY LAMPLOUGH, Holborn-hill, London, "Improved means for viewing microscopic photographs and other minute objects."—*Petitions recorded 25th February*, 1862.

518. GEORGE DAVIES, Serle-street, Lincoln's-inn, London, "Improvements in emptying or draining the water from careening docks in maritime ports."—A communication from Pierre Lucien Fontaine, Paris.

520. AGATHE DESIREE DUPARET, Paris, "Improvements in the ornamentation of tissues."

522. JAMES HENRY BENNETT, Blackburn, Lancashire, "Improvements in steam generators, and in engines to be worked by atmospheric pressure or steam and air combined."

524. JOHN CLIFF, Imperial Potteries, Lambeth, Surrey, "Improvements in glazing stoneware, red clayware, porcelain, and other kinds of earthenware."

526. CHARLES LOUIS KNOLL, Tottenham-court-road, London, "Improvements in pianofortes."

528. EDWIN GEORGE BRUZAUD, Pembroke-road, Kensington, Middlesex, "Improvements in pianofortes."

530. JOHN MEDHURST, Lower Queen-street, Rotherhithe, Surrey, "Improvements in apparatus for reefing and furling the top sails, courses, and other square sails of vessels."—*Petitions recorded 26th February*, 1862.

532. GEORGE TORR, Bucks-row, Whitechapel, London, "Improvements in, and an improved apparatus for, manufacturing and reburning animal charcoal."

534. CHARLES CLARK, City-road, London, "Improvements in tea and other trays for the table."

538. SIR CHARLES TILSTON BRIGHT, Victoria-street, Westminster, "Improvements in electric telegraphs, and in apparatus connected therewith, and employed in the manufacture thereof."

542. WILLIAM STUART WOOD, Larchfield Foundry, Leeds, Yorkshire, "Improvements in valves for regulating the flow of steam, water, or other fluids, and in means or apparatus for working or actuating them direct from the governor, or when worked by expansion cams in connection therewith."—*Petitions recorded 27th February*, 1862.

Invention Protected for Six Months by the Deposit of a Complete Specification.

573. PIERRE REMOND, Rue de l'Echiquier, Paris, "Improvements in double rein bridle bits."—*Deposited and recorded 3rd March*, 1862.

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

580. JOHN LEIGH, Manchester.—Dated 5th March, 1859.

584. WILLIAM PEACOCK SAVAGE, Roxham, Downham Market, Norfolk.—Dated 5th March, 1859.

601. ADAM BOOTH, sen., and ADAM BOOTH, jun., Manchester.—Dated 8th March, 1859.

642. ALFRED TYLOR, Warwick-lane, Newgate-street, London.—Dated 14th March, 1859.

598. JOHN PRETTY CLARKE, King's-street Mills, Leicester.—Dated 7th March, 1859.

647. THOMAS PATSTONE, Birmingham.—Dated 14th March, 1859.

610. JOHN ALLIN WILLIAMS, Baydon, Wiltshire.—Dated 9th March, 1859.

643. THOMAS LIGHTFOOT, Accrington, Lancashire.—Dated 14th March, 1859.

670. HENRY BESSEMER, Queen-street-place, New Cannon-street, London.—Dated 16th March, 1859.

655. JOHN DIXON and ROBERT CLAYTON, Bradford, Yorkshire.—Dated 16th March, 1859.

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

505. WILLIAM WEILD, Manchester.—Dated 7th March, 1855.

504. JOSEPH COOPER, Birmingham.—Dated 7th March, 1855.

538. SAMUEL CUNLIFFE LISTER, Manningham, near Bradford, Yorkshire.—Dated 9th March, 1855.

618. William Smith, Little Woolstone, Fenny Stratford, Buckinghamshire. —Dated 19th March, 1855.

Notices to Proceed.

2691. William Taylor, Newport Pagnell, Buckinghamshire, "Improvements in joints or connections for metal and other pipes and tubes."—*Petition recorded 26th October*, 1861.

2702. John Watt, Lorrimore-street, Walworth, Surrey, and Thomas Snaith Haviside, Cornhill, London, "Improvements in the manufacture of soap."

2708. William Holland Furlonge, Mark-lane, London, "Improvements in the condensation of steam by surface contact."—*Petitions recorded 29th October*, 1861.

2726. Eugene De Bassano and Adolphe Brudenne, Brussels, Belgium, "Improvements in the manufacture of stearine."—*Petition recorded 30th October*, 1861.

2733. George Norman, St. Matthias-place, Stoke Newington-green, Middlesex, "Improvements in the mounting of 'cots or cradles.'"—*Petition recorded 31st October*, 1861.

2742. James Higgins and Thomas Schofield Whitworth, Salford, Lancashire, "Improvements in machinery or apparatus for preparing cotton and other fibrous materials for spinning."

2744. Robert Mushet, Coleford, Gloucestershire, "An improvement or improvements in the manufacture of cast steel, or homogeneous iron."—*Petitions recorded 1st November*, 1861.

2755. Thomas Walker, Robert-terrace, King's-road, Chelsea, London, "Certain improvements in the construction of cables or chains for telegraphic and other purposes, and for machinery connected therewith."

2757. John French, Manchester-road, Bradford, Yorkshire, "Improvements in machinery or apparatus for doubling or twisting yarns of worsted or other fibrous substances."

2759. Samuel Osborne, Bayswater, London, "Improvements in hooped skirts."

2763. Thomas Spencer, Prescot, and Thomas Robinson, St. Helen's, Lancashire, "Improvements in machinery or apparatus for making pipes and other articles of earthenware, and in the form of pipes for gas, sewage, and other purposes."—Partly a communication from Alfred Delafol, Paris. —*Petitions recorded 2nd November*, 1861.

2771. John Ashley, Grosvenor-place, Bath, "Improvements in apparatus for attaching horses to carriages."—*Petition recorded 4th November*, 1861.

2772. Robert Wilson, Patricroft, Manchester, "Certain improvements in steam hammers, and in valves applicable to the same, and to other steam engines."

2775. William Hall, Calais, France, "Improvements in the production of curved and other forms in articles of lace."

2777. Richard Fethney, Manchester, "Improvements in machinery or apparatus for preparing, spinning, or doubling cotton, silk, and other fibrous materials, parts of which improvements are applicable for winding and other purposes."—*Petitions recorded 5th November*, 1861.

2790. Frederick George Stuber, St. James'-road, Brixton, Surrey, "An improved hygrometer for measuring the humidity of the atmosphere, dampness of beds, garments, and for other similar purposes."—*Petition recorded 6th November*, 1861.

2801. John Barrow, Dalton Chemical Works, West Gorten, near Manchester, "Improvements in the manufacture of benzole, naphtha, naphthaline, aniline, and carbolic acid."—*Petition recorded 7th November*, 1861.

2804. Henry Montucci, Rue du Sentier, Paris, "Improvements in apparatus for goffering or embossing stuffs in high relief."—*Petition recorded 8th November*, 1861.

2814. Robert McNair, Glasgow, Lanarkshire, N.B., "Improvements in casings for stitching machines, and in adapting the same for writing."

2821. Edward Loysel, Cannon-street, London, "Improvements in match boxes or cases."—*Petitions recorded 9th November*, 1861.

2835. William John Hay, Southsea, Hampshire, "Improvements in protecting iron and wooden ships, caissons, dams, and other wooden or iron structures from decay, and from fouling by vegetable and animal matters, and in preparing the materials employed therein."

2837. George Davies, Serle-street, Lincoln's-inn, London, "Improvements in bleaching cotton and other textile fabrics or materials, and in the apparatus employed in such process."—A communication from Edouard Turpault, Paris.—*Petitions recorded 12th November*, 1861.

2862. Joseph Booth, Thomas William Chambers, and James Chambers, Bury, Lancashire, "Improvements in looms for weaving."—*Petition recorded 16th November*, 1861.

2996. Samuel Amphlet, Birmingham, "An improvement or improvements in ornamenting surfaces."—*Petition recorded 27th November*, 1861.

3015. Edward Tyer, Old Jewry Chambers, London, "Improvements in electric telegraphs."—*Petition recorded 29th November*, 1861.

3028. John Henry Glew, Howland-street, Fitzroy-square, London, "Improvements in machinery or apparatus for sewing or stitching."

3033. Watson Duchemin, Charlottetown, Prince Edward's Island, "Improvements in blocks for hoisting."—*Petitions recorded 3rd December*, 1861.

3220. John Francis Harvey, Strand, London, "Improvements in umbrellas and parasols."—*Petition recorded 24th December*, 1861.

3270. William Edward Newton, Chancery-lane, London, "Improved apparatus for obtaining motive power from explosive compounds."—A communication from Eugène Barsonti and Felix Matteucci, Florence, Italy.—*Petition recorded 31st December*, 1861.

90. James Garth Marshall, Leeds, Yorkshire, "Improvements in the preparation of flax, hemp, and other fibres, previous to being spun."—*Petition recorded 13th January*, 1862.

111. James Garth Marshall, Leeds, Yorkshire, "Improvements in the machinery and process for producing fibre from woven and other textile fabrics."—*Petition recorded 14th January*, 1862.

116. Henry Duncan Preston Cunningham, Bury, Gosport, Hampshire, "Improvements in means or apparatus for protecting screw propellers from entanglement, or being fouled by ropes or other bodies, also improvements in means or apparatus for closing up the screw aperture."—*Petition recorded 15th January*, 1862.

162. William Tozer, Gracechurch-street, London, and Archibald Read, Walworth, Surrey, "Improvements in boots and shoes."—*Petition recorded 21st January*, 1862.

226. William Edward Newton, Chancery-lane, London, "Improvements in engines to be employed for pumping or forcing air or water, or for other purposes where a rectilinear motion is required."—A communication from Wellington Lee, New York, U.S.—*Petition recorded 28th January*, 1862.

231. Francois Delamare De Boutteville, jun., Fontaine-le-Bourg, Seine Inférieure, France, "Improvements in machinery applicable to the spinning of fibrous substances."

233. John McKean and James Gabbott, Walmer Bridge Mills, near Preston, Lancashire, "Improvements in sizeing or dressing yarns or textile materials."—*Petitions recorded 29th January*, 1862.

275. Friedrich Wilhelm Daehne, Swansea, Glamorganshire, "Improvements in furnaces used in the manufacture of zinc."—*Petition recorded 1st February*, 1862.

327. Alexander McKenzie and Francis Panthel, Glasgow, Lanarkshire, N.B., "Improvements in sewing machines."—*Petition recorded 7th February*, 1862.

355. William Lyall, Amiens, France, "Improvements in machinery for preparing flax, hemp, and other fibrous substances."—*Petition recorded 11th February*, 1862.

396. Samuel Benjamin Whitfield, Birmingham, "Improvements in the manufacture of iron bedsteads, and in the manufacture of ornamental iron tubes or columns for the construction and ornamentation of iron bedsteads."—*Petition recorded 14th February*, 1862.

427. John Henry Hastings and James Freezer, Holkham, and John Woods, Wells, Norfolk, "Improvements in ploughs."—*Petition recorded 18th February*, 1862.

460. Richard Hume Skellern, South-terrace, Hatcham Park, Surrey, "An improved self-inking hand stamp or press."—*Petition recorded 21st February*, 1862.

509. John Imray, Westminster Bridge-road, Lambeth, Surrey, "Improvements in hinges."—*Petition recorded 25th February*, 1862.

5'8. Sir Charles Tilston Bright, Victoria-street, Westminster, "Improvements in electric telegraphs, and in apparatus connected therewith, and employed in the manufacture thereof."—*Petition recorded 27th February*, 1862.

And notice is hereby given, that all persons having an interest in opposing any one of such applications are at liberty to leave particulars in writing of their objections to such application, at the said Office of the Commissioners, within twenty-one days after the date of the *Gazette* (and of the Journal) in which this notice is issued.

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ABSTRACTS OF SPECIFICATIONS.

The following descriptions are made from Abstracts prepared expressly for The Engineer, *at the office of her Majesty's Commissioners of Patents.*

Class 1.—PRIME MOVERS.

Including Fixed Steam and other Engines, Horse, Wind, and Water Mills, Gearing, Boilers, Fittings, &c.

2091. T. Green, *Leeds, and* R. Mathers, *Stoke Newington-green,* "*Transmitting motion to machinery.*"—*Dated* 21*st August*, 1861.

This invention has for its object improvements in apparatus for transmitting motion to machinery. For this purpose, when transmitting motion from one grooved or plain pulley to another grooved or plain pulley, by an endless band or strap, an intermediate pulley on which is interposed in such manner that the opposite parts of its periphery are in contact with part of the periphery of the driving pulley, and part of the periphery of the pulley which is driven. When the driving and driven pulleys are grooved to receive the endless band the periphery of the intermediate pulley or wheel may be plain or grooved, and be in contact with corresponding plain or grooved parts of the peripheries of the driving and driven pulleys; but when the parts of the peripheries of the driving and driven pulleys, where the endless band acts, are plain, then those parts of the peripheries which are in contact with the opposite sides of the interposed pulley or wheel are to be grooved or suitably formed to work in a groove or grooves formed in the periphery of the interposed wheel or pulley.—*Not proceeded with.*

2108. S. Elson, *Oldham,* "*Apparatus for heating the feed-water of steam boilers, superheating steam, and surface condensation.*"—*Dated* 23*rd August*, 1861.

According to this invention the patentee proposes that the water to be supplied to the boiler shall first be heated by means of the exhaust steam of the engine, whence it is to be forced by pumps into suitable cylinders placed in the flues leading to the chimney, the water becoming further heated by the waste heat from the furnace of the boiler. A tube or pipe of small diameter, open at the lower end, conveys the water to the bottom of each cylinder, and is so arranged as to pass through their interior, whence the water continues its passage within the cylinders to the feed pipe which conveys it to the boiler. The cylinders are kept free from the accumulation of soot or dirt by means of chains or bands passing partly, entirely, or more than one turn round them from end to end, where their extremities are attached to wheels rotating at either or both ends of the cylinders by means of a shaft and cog wheels. These chains or bands thus scrape or rub off the soot or dirt as it lodges on the exterior of the cylinders, rendering them more capable of absorbing heat and conveying it to the water within. These cylinders, in like manner, serve for the purpose of superheating steam, in which case a syphon box is placed at their lower extremity, and an iron casing combining a lever, float, balance weight, and equilibrium valve is suitably arranged in order to carry off any water that might lodge in the cylinders, and also to retain the steam. The cylinders may also be made useful for surface condensation by arranging them in conjunction with an iron vessel or suitable receptacle, and exhausting steam inside or outside the cylinders, according as they are placed either in the interior or outside the said vessel.

2113. G. T. Bousfield, *Loughborough Park, Brixton,* "*Apparatus for feeding boilers.*"—*A communication.*—*Dated* 23*rd August*, 1861.

This invention consists, First, in combining a Giffard injector, and the suction pipe thereof, with a valve located in the said suction pipe in such a position that it prevents the reflux of the water from the suction pipe when the steam is shut off from the apparatus. The object of the Second part of this invention is to permit the suction pipe to be filled with water, or "primed," as the patentee terms it, up the end of the steam nozzle, so that, when the steam jet is put in operation, it shall begin to act immediately upon dense water. This part of the invention consists in combining the Giffard injector, the suction pipe thereof, and the reflux valve before mentioned, with a priming nozzle fitted with a cock or valve, the combination being such that the suction pipe can be primed through the priming nozzle, and that the latter can then be closed. The object of the Third part of this invention is to procure a supply of water for priming the suction pipe by the occupation of the injector, and it consists in combining the second part of this invention with a tank by means of a branch pipe leading from the discharge pipe of the injector, which branch pipe is fitted with a cock or valve, so that the tank may be replenished with water by the injector itself.

2130. H. Attwood, *Wapping-wall, London,* "*Improvements in cleansing and in feeding boilers.*"—*Dated* 26*th August*, 1861.

These improvements in cleansing boilers consist in placing one, two, or more conduits at about the water level; the conduits are dished on their upper surfaces, and are perforated at intervals, while curved flanges are adapted to the sides. Similar conduits are placed at the bottom of the boiler. The improvements in feeding boilers consist in supplying them from below through perforated pipes extending along the length, or nearly so, of the boilers. This arrangement is for keeping the sediment in a state of agitation, thereby causing the impurities contained in the water to rise to the surface, when it may be drawn off by the scum plate and cock. For some waters chemical agents are also used.

2131. Z. Colburn, *Tavistock-street, Bedford-square, London,* "*Arrangement and combination of high and low pressure steam engines.*"—*Dated* 17*th August*, 1861.

By the present invention a certain portion only, and not the whole, of the steam employed in working or driving a steam engine is to be previously worked at a higher average pressure per square inch above the atmosphere, either in another steam engine or in another separate and independent addition cylinder or cylinders of the same engine. Two facts are well known in connection with steam, to wit, that equal weights of fuel will generate nearly equal weights of either high or low pressure steam, and that steam on its discharge from the steam engine retains nearly the whole of the total heat or combined sensible and latent heat which it had on its admission to such engine. In cases, therefore, where steam engines are being worked at pressures ranging from 5 lb. to 60 lb. or 70 lb. per square inch above the atmosphere, and where more power is required with little or no sensible increase in the expenditure of fuel, or where it is desired to have the same power with a less expenditure of fuel, a part of the fuel may be applied under suitable boilers to raise steam of a pressure considerably higher than that already worked, and the high pressure steam so raised, and which may have a pressure of from 70 lb. to 250 lb. or more per square inch, is then to be worked either with or without expansion, or in a separate engine, or else in a separate cylinder or cylinders to be added to the existing engine; and this high pressure steam on its discharge from such separate engine, or such separate cylinder or cylinders, is to be allowed to mix with additional steam, by preference of a lower pressure, and the mixture is then to be admitted to and worked in the original or low pressure engine or engines in like manner as the steam ordinarily supplied to such engines. The steam may be exhausted from the high pressure engine either into the low pressure boiler, or into any vessel intermediate, between and in direct communication with the low pressure boiler and low pressure engine, or it may be exhausted into either the slide valve box, or the cylinder of the low pressure engine. The portion of steam to be worked twice over may bear any ratio desired to the whole of the steam worked in the low pressure engine, that is to say, an eighth, a half, or three-fourths, more or less, of all the steam worked in the low pressure engine may be previously made to pass at a higher pressure through the high pressure engine, or the high pressure cylinder or cylinders of the combined engine. The high pressure steam may be superheated if desired, either before its admission to the high pressure cylinder or after its escape therefrom, and while on its way to mix with the steam of lower pressure. If desired a portion only of the steam from the high pressure engine or high pressure cylinder may be permitted to mix with the low pressure steam, the rest of the high pressure steam being taken up in a small quantity of cold water, so as to heat it to a temperature equal to or greater than that at which the water is maintained in the low pressure boilers when at work. The water so heated is then to be admitted as feed water to the low pressure boilers. In this case the portion of high pressure steam to be condensed into water is to be made to pass through a condensing vessel, into which vessel is forced, by a pump or any other means, a regulated quantity of water of ordinary temperature, this quantity being sufficient only to take up as much of the steam as it is desired to condense into water, and so that the final temperature of the condensing water shall be equal to or above the temperature of the water in the low pressure boilers.—*Not proceeded with.*

Class 2.—TRANSPORT.

Including Railways and Plant, Road-making, Steam Vessels, Machinery and Fittings, Sailing Vessels, Boats, Carriages, Carts, Harness, &c.

2092. T. Grahame, *Worthing,* "*The construction of boats, rafts, &c.*"—*Dated* 21*st August*, 1861.

The floating or under portion of these boats or rafts is to be formed in two, three, or more longitudinal sections, say ribbed troughs of iron, or any suitable material placed alongside, and apart from each other, and are to be so fitted as to receive and be firmly attached to and support a deck or floor projecting beyond the outside lines of these troughs, and this deck or floor is to be of a strength sufficient to support the cabins or coverings necessary for the protection of the passengers and cargo, and to protect these floating troughs from the effect of concussions at wharves, or in passing other floating bodies. The troughs are to be formed at stem and stern on the angle of exit and entry best fitted for progression through the water on which they are to navigate, and of a sufficient strength fully to resist the pressure to which they must be subjected, when submerged, by the weight of a full cargo placed on the deck or carrying platform of which they form the support; and, for further security, these troughs are to be divided from stem to stern, crossways or longitudinally, into such a number of water-tight divisions as to make submersion, without an almost total destruction of the troughs themselves, almost impossible.

2095. A. J. Mahon, *Dublin,* "*Screw or spiral propellers.*"—*Dated* 22*nd August*, 1861.

This invention consists in having the blade, of whatever form it may be (screw or otherwise), so constructed or arranged that it shall strike water while working at any angle that may be desired throughout its extent, and irrespective of its pitch, and also that, spaces being left next the parts of the blade placed angularly, water may pass freely through all parts of the said blade, and will be held within the perimeter of disc formed by the revolution of the blades.—*Not proceeded with.*

Class 3.—FABRICS.

Including Machinery and Mechanical Operations connected with Preparing, Manufacturing, Printing, Dyeing, and Dressing Fabrics, &c.

2094. J. Kane, *Templemoyle, near Londonderry,* "*Treating flax, hemp, and other analogous substances which yield fibres, for the purpose of manufacturing from them fibres adapted to be spun into yarn and thread.*"—*Dated* 21*st August*, 1861.

For the purposes of this invention the flax-straw, hemp-straw, or other substances that yield fibre are, when being steeped in water, to be subjected to the action of certain ingredients which have for their object to induce or hasten the putrefaction of the nitrogenous and gummy matters which surround the fibres in their natural state. These ingredients, which may be used in a solid or liquid state, consists, essentially, of a nitrogenous substance or substances containing phosphoric acid or phosphates, or to which these latter are added, and which will produce ammonia by putrefaction, such as ground bones and guano, a solution of glue to which phosphates of soda or any soluble phosphate is added, or yeast. In some cases the patentee prefers using a solution of a soluble phosphate and carbonate, nitrate, or caustic ammonia, or other salt of ammonia only.

2110. R. A. Brooman, *Fleet-street, London,* "*Treating the hop plant to obtain a material resembling wool.*"—*A communication.*—*Dated* 23*rd August*, 1861.

The object of this invention is to produce from the hop plant a vegetable wool, or a material resembling wool. To accomplish this the plants are dried, put in trusses, and laid in sheds or barns, which must be dry and well ventilated. The plants are then sorted (for the branches and different parts produce different qualities of wool) and are passed through a crushing machine to break them up, and to crush the knots which are somewhat harder than the stalks, and contain a resinous gum more tenacious than that in the intermediate parts. The crushed plants are next submitted to the action of stamps or hammers, which beats out the resinous or gummy matter. The vegetable wool, with the waste still adhering to it, is submitted to the action of beaters, which free it from all foreign matters, and prepare it to be combed and carded previous to being spun or otherwise used in the arts or manufactures; or it may be used without being combed or corded. Among other uses it forms a valuable material for the manufacture of pulp and other purposes.—*Not proceeded with.*

2116. W. Clissold, *Dudbridge Works, near Stroud,* "*Apparatus for oiling wool.*"—*Dated* 24*th August*, 1861.

This invention relates to the operation of supplying oil or oleaginous mixtures to wool preparatory to its being submitted to the carding engine for the purpose of being worked into silver, the object of this invention being to effect a uniform distribution of the liquid through the mass of the fibres under operation, and prevent the waste that is consequent on the ordinary mode of oiling wool. To this end the patentee employs a travelling brush or brushes, which, after receiving oil from a dipping plate, will transfer the same to a roller mounted above the feed apron of the carding engine, and pressing upon the wool supplied thereto. The contact, therefore, of this oiled roller with the wool that is passing under it will ensure the equal distribution of the oil over the whole surface of the wool.

2122. H. Nelson, *Manchester,* J. Carr, *Blackburn, and* G. Harrison, *Burnley,* "*Self acting mules.*"—*Dated* 26*th August*, 1861.

The documents relating to this invention are with the law officers under objection, and cannot at present be seen.

2126. F. Tolhausen, *Paris,* "*A new kind of artificial fur, to be made by means of the jacquard or other looms with silk or other textile material.*"—*A communication.*—*Dated* 26*th August*, 1861.

This invention relates to the manufacture of a kind of imitation fur resembling to all intents and purposes that called astrakan. The patentee produces this imitation fur either on the jacquard or on the common loom in the following manner:—The textile material intended for the weft, which is composed of several ends, is first sized or dressed in a gelatinous solution, then wound on tubular cops or spools which are exposed to a heat of about 150 deg. Fah., by which the fibres are curled. By using this weft, with the proper jacquard combinations, a piled or terry fabric is obtained, the weft forming the raised pile, which is then cut in the usual way. The pile or terry may also be obtained by means of the weft with what is termed a satin or satinade shed. The process is similar to that used for making velvet, and in order to cause the weft to curl the wires or knives are heated to a suitable degree, and they are also provided with a groove for guiding the knife while cutting the pile. The pile may also be cut on the under face of the fabric.

2133. L. M. J. Patureau, *Paris,* "*An improved thread protecting clew-box.*" *Dated* 27*th August*, 1861.

This invention relates to an improved mode of protecting sewing thread or other yarn when made up into a clew form becoming contaminated or soiled by continuous handling, dust, or other similar causes, whilst the invention at the same time prevents the thread or yarn of the clew from becoming entangled on being wound off, as often happens when unwinding the thread from a skein. For this purpose the patentee encloses each clew in a small capsule, box, or protecting case, by preference made of cardboard, fitting round the clew, and provided with a hole through which is left protruding that end of the yarn that is situated in the interior of the clew, thus allowing to wind off any suitable quantity of thread from the clew without fear of the thread becoming entangled. The box or protector he prefers making in two halves, hollow semi-spheres or shells, the rims or borders of which, being applied against each other exactly, fit together, so as fully to cover the clew inserted between them, the said rims being further glued or in any other suitable manner fixed together, but by preference by glueing all round the line of junction of the two semi-capsules or shells a small strip of paper bearing the manufacturer's trade mark, or any other suitable indication or ornament, whilst in order to allow of examining the yarn or thread of the clew whilst in the interior of the capsule or protector this latter is provided with one or more holes suitably situated for that purpose. He prefers making the clew boxes or thread protectors of cardboard, but stout paper, thin wood, sheet metal, gutta percha, leather, or other similar suitable materials, might be likewise made use of for that purpose.

2134. J. *and* W. Smith, *Keighley,* "*Spindles and flyers used in machinery for spinning and twisting fibrous substances.*"—*Dated* 27*th August*, 1861.

This improved method of attaching the flyer to the spindle consists in dispensing with screws, and forming in the top or upper part of the spindle a groove or bayonet slot, and in fixing or attaching a small pin or projection to the inside of the boss at the upper part of the flyer, which locks into the said groove or slot, and thus fixes the flyer at once without screwing.—*Not proceeded with.*

2138. R. A. Brooman, *Fleet-street, London,* "*Temples or stretching rollers for looms.*"—*A communication.*—*Dated* 27*th August*, 1861.

The main feature of this invention consists in effecting by one and the same temple or roller, carrying points or needles at or near each end, and extending across the loom, the regular and equal tension on the two selvages of the fabric under manufacture. The rotation of the temple roller is produced by the onward movement of the fabric, the selvages of which are seized by the points or needles, which are arranged spirally, and inclined outwards from the centre of the roller. A box for holding the temple or roller extends across the loom, and is furnished with bearings for it to revolve in. The box is held to the loom by springs secured to a cross bar, and the springs are slotted to enable the position of the temple to be adjusted. The outer ends of the temple are composed of segments made by preference of copper, tin, or other soft metal, and held on the roller by rings; the needles or points pass through the segments.—*Not proceeded with.*

Class 4.—AGRICULTURE.

Including Agricultural Engines, Windlasses, Implements, Flour Mills, &c.

2097. B. Samuelson, *Banbury,* "*Harvesting machines.*"—*A communication.* —*Dated* 22*nd August*, 1861.

This invention relates to those harvesting machines in which the grain or grass, after having been severed by cutters which breast the crop, is intended to be removed out of the track by mechanical means, and is carried into effect as follows:—First, in those cases in which the cut grain or grass is allowed to fall on the ground, or on a fixed platform, the inventor places an upright shaft so that the step that carries it shall be in a line or thereabouts with the cutters on one side of them. This shaft he causes to revolve by means of any ordinary mechanical arrangements, deriving its first motion from a propelling wheel in contact with the ground; attached to this upright shaft, and revolving with it, he places arms furnished with rakes or sweepers. Around or partially around this upright shaft, but not revolving with it, he places one or more guides, so shaped that, by the contact therewith of the arms carrying the rakes or sweepers, these latter may be made to rise and fall as well as to revolve, thus enabling them to enter the uncut crop at the proper inclination, to lay it upon the platform or the ground behind the cutters, to sweep the cut crop to one side, and to release themselves from it at the proper time. In many cases it is desirable that the rakes or sweepers should not all travel in the same path, for instance, one or more may simply bring the crop towards the cutters, but not remove it after it has fallen on the ground or platform. He effects this by so shaping the arms which carry some of the rakes or sleepers, or by attaching certain projections to them, that some may be guided into one path and others in another, in contact with one or more of the guides. Secondly, in those cases in which the cut grain or grass is allowed to fall on a travelling platform consisting of endless belts or similar contrivances which carry the cut crop to one side and deposit it; when this mode of delivery is adopted he places any convenient seat, saddle, or stand in advance, and on one side of the cutters, and at right angles, or at a less angle, with them, so that a person occupying it may be well placed for guiding or forcing the uncut crop by a rake, fork, or paddle towards the cutters and on to the travelling platforms leaving the removal of the crop, after it is cut, to be effected by such platform.—*Not proceeded with.*

2106. J. DUNN, *Alnwick, "Reaping machines."—Dated 23rd August*, 1861.

This invention is carried out in practice as follows:—From a basket fixed on the side frame of the carriage is suspended a bent oscillating lever, the lower end of which is connected with the cutters; the said lever carries two pulleys placed at equal distances, one above and the other below the centre pin on which the lever moves and is suspended. To the spokes of the carriage wheels, on its inner side, is fixed a circular rack, into which the said pulleys gear. As the wheel revolves these pulleys traverse the teeth or projections on the said rack, and thus communicate to the said lever and the said teeth a reciprocating motion. By means of an ordinary slide-lever the said pulleys may be put out of gear when the knives are not required to be in use.—*Not proceeded with.*

2107. A. B. CHILDS, *New Oxford-street, London, "Dressing or cracking of millstones."—A communication.—Dated 23rd August*, 1861.

This invention cannot be described without reference to the drawings.

CLASS 5.—BUILDING.

Including Brick and Tile Machines, Bricks, Tiles, Drain Pipes, and House Fittings, Warming, Ventilating, &c.

2120. R. W. JONES, *Cork, "Heating and ventilating, especially applicable to Turkish baths."—Dated 26th August*, 1861.

By this invention the patentee proposes by flues, passages, or air chambers, peculiarly constructed and arranged between the heated floor immediately over the heating flues and under the upper floor of the sudatorium and tepidarium, to prevent accidents by burning, to which people are very liable in the hot air bath with horizontal flues constructed and covered in the ordinary way. The heating flues are connected with an ordinary furnace, over which are placed two boilers, one a circulating boiler for heating water, the other a steam boiler for generating steam or vapour, which is admitted into the hot rooms of the Turkish baths by a pipe which branches off into each room, and is regulated or controlled by separate cocks, to which again are attached perforated pipes which can be arranged in such a manner that the general and equal distribution of vapour is so completely under control that the vapour can never become disagreeable or oppressive, nor condense on the body of the bather. The hot air flues, passages, or chambers constructed between the two floors are also used to obtain an equal and even distribution of heat in every part of the hot room or sudatorium, and also in the tepidarium, and maintaining the required difference in the temperature of the two rooms, and, further, for lowering or increasing the temperature for the admission of pure oxygenised hot air for the purpose of ventilation, driving out impure air, so that the same air is not left in the room a minute, but is constantly changed, and which obviates the necessity of chilling the bather by the introduction of cold air; and this pure oxygenised hot air is also used for disposing of the vapour which is only allowed to pass over the surface of the body of the bather, to soften it, and to assist perspiration, which (the perspiration), to the great danger of the bather, is forced in the dry hot air bath. By the use of tiles of a peculiar make, which fit into each other where they join over the heating flues, the admission of gas, smoke, or any other injurious or deleterious matter is impossible, and the air is thereby preserved pure. For retaining heat fine sand is used.

2117. J. CRANSTON, *Birmingham, "Conservatories, orchard houses, and other horticultural erections."—Dated 24th August*, 1861.

This invention applies to horticultural buildings to be constructed of wood and glass, and also to erections for any other purposes in which the same principle of construction is carried out, but with the use of iron, zinc, copper, tin, lead, or other suitable material in the place of glass, all the buildings being pinned and screwed together, and made to rest upon blocks of wood or butts of trees sunk in the ground, so that they can be erected with great ease, and are portable. For horticultural buildings the space to be covered is to be divided crossways by "principals" formed to the shape required, and of any ordinary kind. Upon the backs or outer surfaces of the "principals" pieces of timber are fixed edgeways to run horizontally from end to end of the buildings, and at any distances apart that may suit the lengths of the glass to be used in the roof. These timbers have been called "radical pieces," and to them grooved rafters are secured, the top end of each rafter to the bottom edge of the "radical piece," and the other end of each rafter to the top edge of the radical piece, and so on throughout the roof, dividing it into planes, the one plane rising above the other as much as the radical pieces are deep. Sheets of glass are fitted into the rafters, sliding into the grooves, where they are held by turn buttons screwed to the ends of the rafters, the turn buttons being long enough, when in horizontal positions, to catch and bear up the glass on each side of the rafters, and when turned to vertical positions they are sufficiently narrow in width to allow of the panes of glass being pulled out. The radical pieces have circles, trefoils, quarterfoils, or small openings of any shape pierced through them at equal or unequal distances, either all along or partly along their lengths, for the ventilation of the buildings, the insides of the radical pieces so pierced having valvular slides with friction rollers at the edges made to run in grooves, so that the ingress and egress of air is always under control, insuring perfect ventilation by numberless small openings in horizontal rows throughout the whole roof surface. The outlines of buildings so constructed can be varied to any extent by making the "principals" upon which the radical pieces rest either straight, canted, arched, or curved.

CLASS 6.—FIRE-ARMS.

Including Guns, Swords, Cannons, Shots, Shells, Gunpowder, Implements of War or for Defences, Gun Carriages, &c.

2093. W. RICHARDS, *Birmingham, "Rifles and projectiles."—Dated 21st August*, 1861.

In constructing breech-loading rifles (more especially, although not exclusively, double rifles), according to this invention, the patentee forms the stock in two parts, and hinges or joints the parts at a point a few inches in advance of the breech ends of the barrels, as is common in some breech-loading fowling-pieces. The front portion of the stock carries the barrels (if two are used), which, although connected, are not fixed to it, being capable of sliding freely a short distance. The butt portion of the stock has a plate fixed to it with projections or plungers upon it, which, when the piece is ready for firing, enter and close the breech ends of the barrels; this portion of the stock also carries, immediately behind the joint before mentioned, a vertical axis, which at its upper end terminates in a cam immediately under the barrels, and on the lower end of the axis is a lever by which it can be turned. On the under side of the barrels is a projection, which, when the barrels are brought up into a position for firing, comes just behind the cam, and then by turning the handle on the axis of the cam the barrels are forced back, the plungers on the breech-plate entering the barrels, and carrying forward the cartridges (which in loading the piece have previously been placed in the ends of the barrels) into their proper positions in the barrels. In constructing projectiles made in one piece of soft metal, and suitable for breech-loading fire-arms, he forms the body of the projectile cylindrical, and of such a diameter that it will just enter the bore of the piece, allowance being made for the thickness of the paper with which the projectile is enveloped when making it up into a cartridge. The projectile is by preference made without a hollow at its base, though it may, if desired, be hollow at that end. A short length of the projectile at the rear end is made of somewhat larger diameter than the bore of the piece, so that it will not enter the same. This enlargement, in loading a breech-loading fire-arm, stops the cartridge when it comes to the end of the chamber made to receive it at the breech-end of the barrel, thus preventing its being pushed too far forward. This enlarged portion, when forced forward by the explosion, takes the rifling of the barrel so completely as not to allow any escape or windage, and at the same time it ensures the rotation of the projectile as it leaves the barrel.

2104. J. WHITWORTH and W. HULSE, *Manchester, "Sights for small arms and ordnance."—Dated 23rd August*, 1861.

This invention cannot be described without reference to the drawings.

2125. J. L. FIELD, *Colton Haverthwaite, "Improvements in the construction of armour-plates, and in their application to ships and batteries."—Dated 26th August*, 1861.

In constructing armour-plates according to this invention the patentee rolls or forms them with ribs or projections at the back surfaces, in such manner that the ribs or projections may be the means, when used with suitable bolts or fastenings, of fixing the armour-plates to ships or batteries, thus avoiding the use of holes through the armour-plates for the passage of bolts through them and through the sides of the ships or batteries. In fixing the armour-plates to a ship or battery it is preferred to employ bolts the inner ends of which are tapped with screw threads to receive screw nuts, the outer ends of such bolts being made forked, so that the ribs or projections formed or fixed at the back surfaces of the armour-plates may be received between the forks and fixed thereto by rivets or other fastenings passed through the ribs or projections and the forks of the bolts; or the bolts or instruments used for fixing the armour-plates, when having ribs or projections at their back surfaces, may be otherwise formed.

2128. J. C. HADDEN, *Bessborough-gardens, Pimlico*, and C. MINASI, *Camden Town, "Projectiles and cartridges."—Dated 26th August*, 1861.

Among the important features of this invention are the following:—Constructing projectiles with a hard metal body, and the soft metal belt so formed and so disposed with regard to each other as to present or leave a recess or channel around the projectile, and rearwards of the belt, that the direct force of the explosion may cause the belt the more readily to expand into and follow the rifling of the cannon from which such projectiles may be discharged. Also, manufacturing projectiles intended to centre themselves in the bore of the gun (as in several patents granted to the present inventors for inventions for forming them), with the swells or projections for receiving the twist situate at the rear of the projectile, and not at the front or forward portions. Also, with reference to shells intended to burst and break up into fragments, the following special mode of manufacturing the cast iron pieces intended for filling cases previously cast, as in the Armstrong shells, or for having cases cast on to or round them, as in the Britten shells, that is to say, the casting such pieces with thick parts and with thin or weak parts so shaped as that they may be fitted together in pairs or sets of pieces, the thick parts of the one fitting against the thin or weak parts of the other, and the thickness and form of such weak parts being such that fracture may readily and easily occur. And, further, the manufacturing elongated projectiles by so building within a case, or so casting a case on to such pieces, or other pieces intended to break up and separate, as to leave a chamber for the bursting powder to be used, principally situated at the rear end only of the projectile, and not extending throughout its length, except for purposes of ignition. And, as to the cartridges, the invention consists in so partially cutting, stamping, perforating, or acting upon thin cases, covers, or wrappers, that they will readily open, tear, separate, or part at a certain place or position, or places or positions, as required, either before being placed in the gun, or when pressed down to or near the breech. And in manufacturing cartridges as lastly described, or otherwise, with a stopple-cock or other equivalent contrivance for holding in the powder and keeping it dry, and which is removed when the twisted end is broken off or removed.—*Not proceeded with.*

CLASS 7.—FURNITURE AND CLOTHING.

Including Cooking Utensils, Upholstery, Ornaments, Musical Instruments, Lamps, Manufactured Articles of Dress, &c.

2099. R. TELFORD, *Birmingham*, and J. SANDERS, *Clifton, "A substitute for castors for furniture."—Dated 22nd August*, 1861.

This invention consists of a kind of shoe with a smooth rounded bottom or bearing surface in substitution for ordinary castors with rollers or balls, such shoe being applied to furniture in a manner similar to that in which castors have ordinarily been applied thereto. The shoe consists of a socket, similar to the upper part of an ordinary castor, in which the leg of the piece of furniture is fixed, or a plate screwed thereto, and a solid piece of metal, earthenware, glass, or other material with a rounded smooth surface at the bottom, is inserted in the lower part thereof. The leg or portion of the furniture is thus made to rest on a solid, smooth, and rounded surface, instead of on the axis of a roller, or on a loose ball of an ordinary castor.

2124. A. LECHENE, *Stanhope-street, Hampstead-road*, and C. NATHAN, *Westmoreland-street, Pimlico, "Ladies' collars, cuffs, &c."—Dated 26th August*, 1861.

This invention consists in the application to the above-mentioned purposes of embossed and perforated paper, woven fabric, or other suitable material, stamped or cut out in varied designs by means of suitable dies or tools, such ornamental, embossed, and perforated designs being cemented or attached by some suitable adhesive material to a groundwork of net, tulle, tarlatan, muslin, cambric, or other suitable fabric, by which the otherwise fragile ornamental design so applied is protected from being torn or injured when made up or applied to the several purposes of the invention.

2135. J. C. C. AZEMAR, *Mark-lane, London, "An instrument to facilitate the practice of the drum."—Dated 27th August*, 1861.

This invention cannot be described without reference to the drawings.

CLASS 8.—CHEMICAL.

Including Special Chemical and Pharmaceutical Preparations, Fuel and Lighting Materials, Preparation and Preservation of Food, Brewing, Tanning, Bleaching, Dyeing, Calico-Printing, Smelting, Glass, Pottery, Cements, Paint, Paper, Manures, &c.

2096. J. H. JOHNSON, *Lincoln's-inn-fields, London, "The preparation of pulp for paper."—A communication.—Dated 22nd August*, 1861.

This invention relates to improvements in the preparation of pulp for paper, and consists in making subservient for this purpose and suitably treating hay (preferring, for the sake of economy, hay damaged by rain or damp, and which, consequently, may be obtained at a low price), the residuum or pulp of beet-root from sugar manufactories after the sugar has been extracted therefrom, and the wrack grass, either of which substances are first immersed for about two to twenty-four hours, more or less, in a lime bath, the strength of which must vary according to the nature of the above-mentioned substances to be treated, each of which will, by the present process, give rise to pulp which may be used separately or combined together, or with any other description of pulp hitherto made use of for the manufacture of paper. After this the substances are left to soak in an alkaline lye or liquid composed of lime, soda, potash, or ammonia, common sea salt, and nitric or hydrochloric acid and water. The proportions of the components of this liquid vary likewise according to the nature of the substance to be treated; the following composition may, however, be given as an example:—Lime, 20 per cent.; soda salt, 5 per cent.; nitric acid, 150 to 230 grains troy for every 200 lb. of the substance; sea salt, 5 per cent. The lye being once more made to act during eight to twelve hours, more or less, the thus lixiviated substances are boiled either in an open or a closed boiler, by preference, however, in a closed boiler under a pressure of about three to four atmospheres for about twelve hours. The substances are then washed either with phenic, or tri-nitrophenic, or carbuzotic acid, and finally well washed in water, after which they may be bleached by any of the known bleaching processes, by preference by means of chlorine or sulphurous acid. The pulp thus obtained from either of the above mentioned substances may then be used either of them alone or mixed together, or with any other pulp suitable for the manufacture of paper, and in any suitable proportions.

2103. T. RICHARDSON, *Newcastle-upon-Tyne*, and R. IRVINE, *Harlet, Renfrewshire, N.B., "The manufacture of paper."—Dated 22nd August*, 1861.

This invention consists in applying in the manufacture of paper aluminous cakes obtained by acting on pit or alum shale or blues, either in a natural or roasted state, or on those ashes of bituminous minerals which consist chiefly of silicate of alumina with sulphuric acid, in substitution of the alum or aluminous cake heretofore employed, and which is extracted and manufactured from the compound of shale blues or ashes and acid above stated, at considerable cost.

CLASS 9.—ELECTRICITY.

Including Electric, Magnetic, and Electro-Magnetic Apparatus, Electrical Apparatus, Galvanic Batteries, &c.

2127. F. TOLHAUSEN, *Paris, "A new and economical method of producing dynamical electricity, thereby obtaining useful chemical compounds."—A communication.—Dated 26th August*, 1861.

This invention relates to a new arrangement of piles or batteries having constant and energetic currents, and yielding useful products at the poles of each element. The principle of this method is based on this theory, that the electro-motive power of a battery is proportional to the chemical action that takes place by the contact of a metal and an acid, which chemical action, on the other hand, is directly proportional to the caloric evolved, First, by the oxidation or decomposition of the metal by the acid; and, Secondly, by the combination of the metal or metallic oxide with the acid used, the said chemical action being inversely to the absorption of caloric produced by depolarisation. In order to form a battery by this method the inventor uses a metal or an alloy, and either a free acid or an acid that is combined with an electro-negative metal, so as to procure a very pure salt, which may be used in the arts directly or indirectly. In order to produce an energetic current he uses such metal and acid as will give rise to a rather powerful chemical action, and evolve much heat, *e.g.*, iron, zinc, lead, copper, and silver, nitric and hydrochloric acids, and clorhydrate, sulphuric, acetic, and chronic acids. Nitric acid being used as a depolariser at the positive pole, yields the best results, because it depolarises by absorbing the hydrogen with the least absorption of caloric. In order to absorb the nitrous vapours, which are given off as in Bunsen's pile, he uses the oleine or oleic acid from fatty bodies, or non-siccative oils, which are thus converted into concreto, elaïdine, or elaïdic acid, and may be used for making stearine candles.—*Not proceeded with.*

CLASS 10.—MISCELLANEOUS.

Including all Patents not found under the preceding heads.

1974. R. DE CLERCQ, and E. CHAZELLS, *Brussels, "Apparatus for raising water and other fluids."—Dated 8th August*, 1861.

This invention consists in employing in a horizontal position a wheel having its boss or nave traversed by and fixed upon a vertical hollow shaft, terminating at the bottom in a solid spindle maintained between cross bars or webs to allow a passage, and working in a suitable bearing. The lower part of the shaft and spindle is placed in the water to be raised. The rim or circumference of the wheel is composed of a number of cylinders, closed at their ends, and placed near each other in the same directions as the arms. Above the boss or nave of the wheel there is a hollow truncated cone, traversed by the hollow shaft. In the interior of the cone there are partitions, so arranged as to leave spaces between them. Each of the hollow cylinders carries two pipes extending upwards. One of these pipes communicates with the truncated cone, and the other pipe is placed vertically at the other end of the cylinder; the length of this pipe is varied to correspond with the length of the hollow shaft between the nave and bottom spindle. Each of these vertical pipes has an elbow at the top directed to the exterior part of the machine. The shaft is hollow from the bottom spindle to the top of the truncated cone. The other part of the shaft is to be solid, or if not there must be means provided to prevent any communication with the lower part. The interior of the hollow part of the shaft communicates with the interior of the cone by apertures near the top. At the top of the shaft there is a spindle working in a suitable bearing, and having a pulley or other contrivance for giving rapid motion to the shaft and parts connected with it. The machine has to be filled with water, and rapid motion given to it, and the water contained in the truncated cone and horizontal cylinders is powerfully forced towards the circumference, and rises in the vertical pipes, from whence it is spirted out, but this water cannot flow to the circumference, nor rise in the pipes without leaving a vacuum in the truncated cone and in the horizontal cylinders. The water from the supply reservoir is then drawn through the hollow shaft and passes through the apertures near the top of the cone and fills the space from which the water has been forced. The water last supplied is in its turn forced outward, which causes another vacuum and aspiration, and so on. A continuous flow of water is thus obtained, the rapidity of which depends upon the speed given to the machine.—*Not proceeded with.*

1981. A. J. MOTT, *Liverpool, "Drawing beer and other liquids from casks, &c."—Dated 9th August*, 1861.

The object of this invention is to prevent the air from coming in contact with fermented liquids when contained in vessels in limited quantities for domestic use, and consists in allowing the atmosphere to exercise a pressure on one side of a travelling medium interposed between such liquids and the air, which travelling medium will give or transmit the said atmospheric pressure to the liquids.

1982. C. P. MOODY, *Corton, Denham, Somerset, "Gates."—Dated 9th August*, 1861.

This invention is for improvements upon a former invention for which letters patent were granted to the present patentee 12th December, 1860, (No. 3050), and consists in the means of securing and fastening the horizontal bars and uprights by hoops or straps of iron or steel which are carried outside the uprights on both sides of the gate, and tightened up by wedges or screws. He carries screws, bolts, or rivets through the straps or hoops, and into or through as many of the horizontal bars and uprights as may be found necessary to give solidity to the gate.

1983. J. HEMINGWAY, *Robert Town, York, "Apparatus for working coal, ironstone, &c."—Dated 9th August*, 1861.

This invention consists in a series of revolving drills or augers, arranged in a suitable frame, and driven simultaneously by steam or other power, or by manual labour. These drills are to be furnished with cutters of various dimensions, and different shapes, to suit the particular material or mineral to be operated on, and are to be employed for the purpose of making either horizontal, oblique, or perpendicular cuttings, called "barings," or under cuttings, vertical or end cuttings, or any other cuttings required to facilitate the working of the material or mineral under operation. The drills may be applied and worked in any number which may be found expedient, and most convenient, and their action may be regulated at the pleasure of the person working the machine. The machine may be applied to the driving of headings or straight work, as well as to the working of coal or other material or minerals, by making suitable slight variations in the mode of application.

1985. J. and C. GRIFFIN, *Walsall, "Machinery for the manufacture or cutting of corks and bungs."—Dated 9th August*, 1861.

According to this invention a knife supported horizontally has a rapid reciprocating motion given to it by the means hereinafter explained:—The piece of cork to be made into a cork or bung is supported between two centres, and is made to rotate slowly. The centres supporting the piece of cork are in a line parallel or nearly parallel to the edge of the knife, and at a distance from the said edge equal to one half the diameter of the cork or bung to be cut, and, while the said piece of cork slowly rotates, the rapidly revolving knife cuts the cork into a cylindrical or slightly conical figure. The knife and the centres carrying the piece of cork work independently of each other. The said knife is moved rapidly backwards and forwards by means of a connecting rod actuated by a crank made in or fixed on an axis situated at right angles to the line of the knife's motion. A rapid rotatory motion is communicated to the said cranked axis by hand or other power.—*Not proceeded with.*

1986. H. CHATWIN, *Birmingham, "Certain improvements in the manufacture of card, needle, pin, and other cases, and in the application to such articles of a new branch of ornamental art."—Dated 9th August*, 1861.

The way in which the patentee proceeds to give effect to this invention is to prepare from pure deal lime tree, or other suitable wood or material, the sides of such cases, and on the one side he secures the edges and top and bottom parts with glue, the same being of a regular width for allowing the internal capacity to be uniform and regular, and over this he secures the other side, again using strong glue, as being the best and most convenient for uniting articles so composed. The case thus made is shaped on the outside either round square, or otherwise, as desired, by means of a rasp, file, or other suitable means and appliances well known to the workers or makers of such small goods. In this condition such cases are cut open, and around the division he places a lip or facing of thin bone, ivory, metal, or other suitable material, finishing this mounting around the same shape as the internal and external form of the case, with the exception that he allows the mounting, of whatever material it may be composed, to project according to the thickness of the material he purposes covering or applying to the outside of such cases. The parts thus prepared he unites when required with a suitable hinge-joint at the back, and with a spring snap in the front, in the ordinary way. In this condition he next applies (if so desired and arranged) the glass panel or panels containing the photographic picture and thus treated the case is fit for receiving the leather or other covering.

1987. A. V. NEWTON, *Chancery-lane, London, "Machinery for sewing."—A communication.—Dated 9th August*, 1861.

This invention relates, Firstly, to the use of an adjustable needle bar guide box, by means of which the vertical needle of the sewing machine, whether it be coarse or fine, can be brought to any required proximity to the shuttle and shuttle race. Secondly, to the use of a needle guard by means of which the needle will be protected from being struck by the shuttle in its forward movement. Thirdly, to the throwing out of action of the presser foot. The invention cannot be described without reference to the drawings.

1990. R. A. GODWIN, *Newport-street, Lambeth, "Pumps."—Dated 9th August* 1861.

For the purposes of this invention the patentee employs a cylinder mounted in a horizontal position, and having a piston fitted into it. Near each end of the cylinder a suction pipe enters in, passing through the side of the cylinder; each of these suction pipes is fitted with a valve opening into the cylinder, and the ends of the cylinder are closed, the piston rod working through a stuffing box in one of the ends; through the ends of the cylinders the exit passages are formed, and these are fitted with valves opening outward. These valves are kept as low down as possible to allow the whole of the water the cylinder contains to run out. In some cases he makes the whole of the ends or covers of the cylinder open as exit valves, in order to give free passage to the water; and in order that the piston rod may not interfere with the action of the end or valve through which it passes he causes the said rod to work through a stuffing box carried by a bar passing from side to side of the cylinder, and the end or valve has a circular hole cut in it large enough to pass the piston rod freely, and when the end closes the edges of the hole in the centre come against a ring around the stuffing box, and so make a tight joint.

1991. A. F. B. FALGAS, *Paris, "Construction of trusses and bandages for hernia, and of hypo-gastric girdles or belts."—Dated 9th August*, 1861.

The object of this invention is to afford means whereby the wearer may place or adjust the pad or cushion of the truss, bandage, girdle, or belt, at any suitable inclination or position at which he or she finds the most comfort, ease, or relief, and after having adjusted it to such desired position may there retain it. For this purpose the patentee employs an arrangement or apparatus constituting a ball and socket adjustment or arrangement, in which a ball or a spherical or rounded knob or head fits in a socket cup or rounded recess (rotula or ball and socket fashion), and which is so combined with the pad or cushion of the truss, bandage, girdle, or belt, that the wearer can readily place or adjust such pad or cushion at the desired inclination or position, and retain it there by a screw.

1992. C. H. BIRKBECK, *Southampton-buildings, Chancery-lane, "Tents."—A communication.—Dated 10th August*, 1861.

This invention has for its object improvements in the construction of military and other tents, whereby greater protection is afforded to the occupiers from the effects of bad weather on damp ground, together with additional ease and comfort whilst being occupied. For this purpose, when constructing a tent capable of accommodating four persons, three uprights are driven into the ground about two feet apart. These uprights may be in two parts formed with sockets or joints to connect them together, and are furnished with hooks near the centre for supporting the metal rods to which one end of the cloths or hammocks are attached. The upper ends of the uprights are connected by the rods, which also serve to support the outer covering of the tent. The other end of each cloth or hammock is attached to a metal rod formed with eyes or other connections at each end; this rod when the hammock is to be used, is firmly screwed to the upper edge of the knapsack by straps or other fastenings, which thus forms a bearing or support for the foot or lower end of the cloth or hammock, so as to raise it above the ground. Ropes are attached to each end of the rod which fixes to the knapsack, the ends being tightly stretched up to a peg which is firmly driven into the ground. Two or more such cloths or hammocks may thus be stretched and supported side by side (according to the number of uprights employed), corresponding ones being stretched and supported from the central uprights in the opposite direction. Each cloth or hammock thus supported forms a dry and flexible bed or surface on which the soldier or other occupant of the tent can repose with ease and comfort, without being exposed to the weather, or the injurious effects of lying upon damp ground, while the space underneath the hammock forms a shelter for the arms, ammunition, provisions, or clothes of the occupants. The cloth or covering of the tent is cut in a rectangular form, so as to shut in the tent at the side by falling almost close to the side to protect the men against the heat of the sun, rain, or wind, and the parts thus forming the cover are furnished with buttons, hooks, eyelet holes, or other fastenings to connect them together; and the various parts can in case of need be employed as sacks or receptacles for the use of the commissariat or for luggage. The whole of the parts are capable of being rolled together to form a package of limited size, which may be carried on the knapsack. For the use of cavalry or travellers a light portable metal or other support may be substituted for the knapsack suitably constructed to fold up or attach to the hammock.

1996. T. SCHNEIDER, *Horseferry-road, Westminster, and* C. E. CRAWLEY, *Gracechurch-street, London, "Inlaying wood, ivory, &c."—Dated* 10*th August*, 1861.

For the purposes of this invention the inventors take a veneer (which, to facilitate the description, they assume to be black) of the wood or other material, and they place it on a sheet of metal, from which portions have been cut, corresponding in form with the parts which are required to be removed from the veneer; the said sheet of metal being fixed on a suitable base to retain in their places any parts which may have been separated in producing the pattern. Over the veneer they place another sheet of metal, on the surface of which punches are fixed exactly corresponding in form and position with the parts to be removed from the veneer; this plate is put correctly in its position, so that the punches come correctly over the corresponding recesses in the first plate by means of guide pins. The plates are then pressed together until the veneer is cut, when they are again separated; the hollows in the first plate will be filled with portions of the veneer which have been forced with them by the punches, whilst on the upper plate, and clinging around the punches, will be the veneer to be inlayed, perforated in the manner required.—*Not proceeded with.*

1997. A. BARCLAY, *Kilmarnock, "Apparatus for raising, lowering, or moving heavy bodies."—Dated* 10*th August*, 1861.

Under one modification or arrangement of parts the improved crane consists of a main pillar or column, fitted in a footstep bearing, and movable or not about its axis. This pillar has jointed to it a jib extending upwards in an angular direction, and having jointed to its free extremity a secondary jib or beam, which sustains the load to be raised or otherwise moved. This secondary jib or beam is jointed to the main jib at about one third of its length from the upper extremity, which is connected to the main pillar by a connecting rod or radius bar. A pulley is fitted to the lower end of the secondary beam; over this the chain to which the load is attached is carried, and this chain is carried up over a pulley at the junction of the secondary beam and the radius bar, and down to an ordinary winding barrel, which is fitted to the main pillar, and may be actuated either by hand or steam power. The hoisting chain is wound round the front of the barrel, and there is a second chain for drawing in the main jib, which is wound on a duplex barrel in a direction contrary to that of the hoisting chain. The free end of this second chain is attached to the upper end of the jib where it is jointed to the secondry beam. The winding barrel on which the hoisting chain is wound is made with a second barrel, which runs loosely upon it, but is caused to rotate with the primary barrel by means of a clutch which is actuated by a hand lever. To raise the load the primary barrel is put in motion, then, if the second barrel is put into gear, the main jib is quickly drawn in, and the load moves inwards in a horizontal line, in readiness to be at once deposited on the truck, wagon, or other receptacle placed in readiness to receive it. The clutch which throws the secondary barrel into or out of gear with the primary barrel is arranged with an annular ratchet wheel and spring pall, as well as the ordinary external wheel and pall, so that, if the barrel should be inadvertently put in motion the wrong way, the pall slips over the ratchet teeth without doing any injury or causing breakage of the parts.

1998. M. WIGZELL, *Friars Green, Exeter, "Apparatus for twisting ordinary nails, and all other similar driving articles of a parallel or tapered form, and of a plain, fluted, grooved, or indented section throughout or in part."—Dated* 10*th August*, 1861.

This invention consists of a machine or apparatus, or arrangement of spur or other toothed wheels, and friction rollers of a parallel, conical, or other suitable form, for twisting screws with or without nuts or mandrils, or other shaped pieces, worked by a rack or racks or other gearing moving on suitable guides, and working in the necessary bearings, and arranged on suitable stands or beds, and driven by requisite driving wheels and pulleys, to which motion may be given by any known motive power. The machine may be made to twist the nails and other similar driving articles when in a horizontal, vertical, or oblique position. It may have any number of head pieces with rollers, segments, or other shaped pieces (of steel, iron, metal, or metallic alloy) that may be thought desirable to follow up or suit the thickness, shape, or length of the nails or other similar driving articles to be twisted. The nails and other similar driving articles can be fed into the machine and removed therefrom when twisted by hand or machinery, and the machine may be made to twist any number of nails or other similar driving articles at any number of revolutions or parts of a revolution of its driving gear. The nails and other similar driving articles already made and required to be twisted are fed into the machine so as to rest in holes or slots, or between grippers or rollers, then twisted by traversing and revolving mandrils by means of screws, racks, toothed-wheels, segments or friction roller, having at one end, or both of their ends, rollers or other shaped pieces of steel, iron, metal, or metallic alloy of a form suited to the thickness, length, and shape of the nails.

1999. M. WIGZELL, *Friars' Green, Exeter, "Improvements in machinery or apparatus for making plain twisted nails, spiral fluted nails, and other similar driving articles of a twisted or spiral fluted form throughout or in part."—Dated* 19*th August*, 1861.

This machine or apparatus is capable of making one or more nails at any number of revolutions or parts of a revolution of its driving gear, and when the bars, rods, strips, or wire of iron, steel, brass, copper, or other metal or metallic alloy, are placed in the machine, they are drawn into their required position between the grippers at intervals by machinery or by hand, then gripped and cut off into the required lengths, and held by jaws which are placed on the ends of traversing and rotating mandrils, then headed by hammers or press rods, and twisted by the traversing and revolving mandrils which draw the pieces of iron, when cut as herein described, through rollers in front of the grippers, so as to give them the required number of twists. The nails when thus made drop out of the jaws, which open when the mandrils have travelled their full distance. The machine is constructed as follows:—A driving shaft is arranged on a suitable framework or bed, and is driven by driving gear, to which motion can be given by any known motive power; from the said driving shaft, by means of cams or cranks, the mandrils are made to travel to and from the grippers, and upon the ends of the mandrils are self-acting jaws which hold the nails, and form dies for the heads of the nails, and in the centre of the mandrils are press rods, around which the mandrils are made to rotate by means of friction rollers, revolving cams, or conical clutches upon a shaft to which motion is given by the driving shaft. The grippers are worked by a cam fixed on the shaft, which rotates the friction rollers, and the feeding apparatus, composed of revoling cams and rollers, is geared by wheels and worked by the said shaft. The whole is arranged on requisite bearings and a frame or bed.

2001. A. GARZEND, *Paris, "Apparatus for cutting up and reducing dye and other wood."—Dated* 12*th August*, 1861.

For the purpose of this invention the inventor employs a tool carrier or kind of cylinder having the form of an Archimedian screw, on the projections of which cutters are fixed in any suitable manner. By imparting a rapid rotary motion to the cutter cylinder the wood, as it is fed into the apparatus, will be instantly cut up.

2005. V. JANKOWSKI, *Fitzroy-square, London, "Apparatus for sawing wood, &c."—Dated* 12*th August*, 1861.

In carrying out this invention one end of the saw is fixed in a holder passing through a guide connected to a spring, which the inventor prefers to be of vulcanised india-rubber. The saw thence passes through a suitable hole in a table adapted to support the material to be cut, and it is then at its other end retained in another holder passing through another guide, and connected by a link to a crank pin having a pulley upon its axis, with band operated by another pulley, by preference of larger diameter, upon the axis of which is placed another pulley still larger, and this pulley is caused to revolve by a band from another large pulley, the axis of which is formed with a crank operated by a treddle.—*Not proceeded with.*

2006. J. H. ELVANS, *Lower Kennington-lane, "Steel busk or stay fastener."—Dated* 13*th August*, 1861.

This invention consists in constructing a steel busk or stay fastening, opening down the centre, and so arranged as to readily fasten and unfasten by means of three catches locking on to a spring slide.—*Not proceeded with.*

2009. J. JACOB BRUNNER, *Austria, "Producing on porcelain and other ceramic products, on glass, venetian enamels, and on metallic surfaces, designs in colours, and in gold, silver, and other metals."—A communication.—Dated* 13*th August*, 1861.

According to this invention such designs are first printed on paper in the thographic press, and thereupon drawn off or transferred upon the article or object to be ornamented. As usual in chromolithographic or colour printing the various colours and metals are printed on to the paper in succession, each from a separate stone, the paper used for this purpose being prepared to prevent shrinking during the operation of printing and transferring the design upon the object to be ornamented. The prepared metals and prepared colours as well as the vitreous mass or flux are in all cases reduced to the finest powder or dust before being used. On ceramic products and on enamels the ornamentation can be produced either upon the glaze or under the glaze.

2010. J. LANCASTER, *Princes-street, Bedford-row, London, "Producing sand."—Dated* 13*th August*, 1861.

In carrying out this invention the inventor places the stone, ballast, or gravel in a suitable machine for crushing, pulverising, and washing the same, after which it is to be sifted through sieves of various sized meshes, according to the purpose for which sand thus produced may be required.—*Not proceeded with*

2012. J. G. RENNY, *Brussels, "Improvements in the manufacture of articles of furniture by utilising certain parts of the cedar tree."—Dated* 13*th August*, 1861.

The Havannah cedar tree usually employed in the manufacture of cigar boxes has a portion of its trunk (called forks) knotty and rugged; these parts are rejected as unfit for any other use than fire-wood, for which purpose they are usually sold. Now the object and intention of this invention is to render these refuse parts useful in and for the manufacture of articles of furniture by preparing the said refuse parts in the following way, that is to say:—The patentee first saws the forks into veneers, and then glues them together for the purpose of giving to them consistency and hardness, which the said parts are naturally deficient in. The wood thus treated, when polished, presents a more brilliant appearance than the most costly mahogany, and has the advantage of neither degenerating in appearance, cracking, nor requiring to be repolished occasionally, which is the case with the finest specimens of knotted mahogany.

2013. C. BINKS, *Gray's-inn, London, "Treating linseed and other oils and fats."—Dated* 13*th August*, 1861.

The specification of this invention is too voluminous to be quoted here in detail. The objects of the invention are as follows:—Firstly, to improve the drying properties of linseed oil, and other drying oils, but more especially of linseed oil. Secondly, to obtain such drying oils in certain cases free, or comparatively free, from colour, and especially from the deep or dark colour usually pertaining to linseed oil, which has been boiled or treated by the methods hitherto commonly resorted to in order to quicken its drying properties. Thirdly, to provide improved methods of obtaining dark coloured drying oils or drying oils similar in appearance and uses to those known as boiled oils. Fourthly, to impart to such drying oils at pleasure, and by improved methods of operating, different degrees of thickness or of "body." Fifthly, to provide improved methods of operating, and improved kinds of apparatus by which to carry on certain operations requisite for obtaining these or like effects or products, or for bleaching and refining linseeds and other oils and fats.—*Not proceeded with.*

2014. W. COMMON, *Brighton, "Apparatus applicable to water-closets and urinals."—Dated* 13*th August*, 1861.

In carrying out this invention the inventor uses an air-tight vessel in which water sufficient for one discharge is collected. As the water accumulates air contained in the vessel is compressed, so that, when the discharge takes place, the water will rush out with a force due to the degree of compression of the confined air. The air vessel is brought into communication by means of a pipe, with the reservoir or other water-supply apparatus, the vent of which pipe is capable of being closed by the rise of the spindle of the closet-supply valve. The spindle works through a stuffing-box in an elbow discharge pipe, and carries at its upper end a disc valve, which has its seat on the upper face of the elbow. In the head of the spindle a deep cross cut is made to form a passage for the water from the supply-pipe to the air vessel. The head of the spindle is capable of sliding in an elbow or lip of the supply-pipe, and when in its lowest position (which will be when the valve is on its seat) the small vent formed by the cross cut in the head of the spindle will allow of water flowing in a small stream into the air vessel. When, however, the valve is raised to discharge water into the closet pan this supply will be cut off. The spindle is jointed at its lower end to the ordinary lever of the closet, so that, when that lever is raised in the usual way, the valve will rise and discharge the water. To guide this discharge over the surface of the pan, and effectually to cleanse it, he proposes to form the pan with a hollow rim projecting inwards, which will guide round the water and allow it to escape close to the surface of the pan. When the lever is allowed to fall the spindle will also fall, this tendency being increased by the pressure of the supply water on the head of the vessel. The valve being now again brought to its seat the discharge of water will be effectually cut off, and the supply of the air chamber will recommence.—*Not proceeded with.*

2020. F. DURAND, *Paris, "Metallic tubes."—Dated* 14*th August*, 1861.

This invention relates to a new mode of manufacturing any description of metallic tubes without brazing or soldering, and consists in casting the tube in a mould provided in the inside with a core arranged in such manner that, in running the molten metal in the mould, free escape is allowed to the air contained in this latter.—*Not proceeded with.*

2021. A. A. R. DAMOISEAU, *Paris, "Kilns."—Dated* 14*th August*, 1861.

This invention consists, principally, in arranging the kiln in such manner that all or a part of the feed air is properly heated on reaching the fuel, so as to obtain a better combustion of this latter, and whilst at the same time the construction of the kiln allows of the articles being more equally heated or fired than was the case in the kilns hitherto made use of.—*Not proceeded with.*

2023. R. A. BROOMAN, *Fleet-street, London, "Coating wire with copper, silver, gold, &c."—A communication.—Dated* 14*th August*, 1861.

The object of this invention is to prevent rust or oxidation of wire, and the invention consists in coating the wire with copper, silver, gold, brass, tin, or other suitable metal or alloy in manner hereafter described. The wire to be coated is first passed over a roller or pulley, which is in connection with the positive pole of a galvanic battery, then under one or more rollers or pulleys immersed in a suitable bath or solution, and in which a piece of copper or other metal which is to form the coat is suspended by a platinum wire; this piece of copper being connected with the negative pole of the battery the wire in passing through the bath or solution receives a deposit or coating of copper; it then passes over a wooden roller or pulley outside the bath and through a vessel containing water, on emerging from which it is cleaned and dried by a cloth or otherwise, and then wound on a roller to be used as required. The bath or solution before mentioned is prepared according to the metal or alloy with which the wire is to be coated.

2024. E. EDWARDS, *Beaufort-buildings, Strand, London, "Separating mineral ores, coal, and other substances from impurities."—Dated* 14*th August*, 1861.

The patentee claims, First, the novel combination of the several parts of the machines described, for the purpose of washing mineral and other substances or materials, as set forth; Secondly, the novel application of flexible discs, worked by revolving cams in the manner described, for the purpose of producing sudden elevations and gradual depressions of water used for washing or purifying substances or materials, as aforesaid; Thirdly, the combination with such flexible discs and movable cams, when employed for the purposes before mentioned, of wheels or rollers carrying scrapers, in such a manner that the said scrapers can be turned up out of the way for the purpose of cleansing the screens without stopping the machine; Fourthly, the arrangement of such flexible discs, cams, and scrapers, so that the same water can be employed for a considerable time in performing the duty for which it is required, instead of permitting it to escape continuously.

2025. T. SILVESTER, *West Bromwich, Staffordshire, "Spring balances or weighing apparatus."—Dated* 14*th August*, 1861.

This invention consists in attaching the spring (in the description of balances known as "Salter's balances") to the bottom instead of the top or the middle piece or slide, by which the patentee saves about a-third of the material with the same size or weight of spring, and instead of employing varnish, as heretofore, to preserve the barrels from rust, he galvanises the barrels and also the middle pieces. In the ordinary balances the spring is always concealed, whether in use or not; but in this improved balance a short length of the spring is always to be seen protruding from the bottom of the barrel; and, when the whole weight is on, about half the length of the spring is in sight, so that the existence of rust or damage to the spring is very readily ascertained, and lubricating matter is easily applied.

2027. J. BILLING, *Abingdon-street, Westminster, "Stoves."—Dated* 14*th August*, 1861.

The patentee claims, First, the construction of stoves wherein the smoke from the fire-box is caused to pass horizontally through an opening in the back of the stove into a central back flue, in which it descends, and then passes into two side flues, whence it ascends into the chimney, as described. Secondly, the construction of stoves having descending and ascending back flues, or simply one ascending back flue and a sliding valve to regulate the opening into the same, in combination with a throat valve or throat valves, and wherein the opening and closing of the throat valve or valves, and of the sliding valve regulating the opening into the back flue or flues, is effected by means of one and the same screw spindles and levers, as described. Thirdly, the application of a rising and falling "blower" to stoves actuated by an escutcheon or a rose, in conjunction with the knob that regulates the opening and closing of the valve or valves, as described. Fourthly, the construction of stoves, wherein a second movable grating is placed beneath, and is fitted in between the bars of the ordinary grating, for regulating the draught and clearing the bottom of the fire, as described. Fifthly, the construction of stoves provided with a back draught, wherein a fire-brick or metal back is employed, having a number of vertical or nearly vertical channels, through which air is made to pass, as described.

2029. S. CAREY *and* W. M. PIERCE, *East Ham, "Apparatus for re-burning animal charcoal."—Dated* 15*th August*, 1861.

This invention consists in making a revolving cylinder or retort for receiving the charcoal required to be re-burnt of an octagon or other many sided form, and casting or forming on each of the several longitudinal angles a bevelled fillet or rib, whereby the contents of the cylinder or retort, when in motion, may be readily agitated or spread, and more uniformly burnt than in the ordinary circular cylinder. The patentees also fit or hang the front end of the said cylinder or retort; or they sometimes hang or fit a door in or upon the front plate of the said cylinder or retort, so as to facilitate the charging or discharging the contents.

2031. J. BETHELL, *King William-street, London, "Improvements in the manufacture from steatite of journals, axle-boxes, and bearings for machinery, axles, and spindles to work in smoking pipes, buttons, crucibles, and pots for chemical and smelting purposes, and also of a lubricating compound for railway and other carriages."—Dated* 15*th August*, 1861.

The patentee manufactures from steatite, journals, axle-boxes, and bearings for machinery axles and spindles to work in, by making bearings or linings to the bearings of blocks, sheets, or powder of steatite in its natural condition, or purified, as described, and on which the axle will rotate. He manufactures from steatite smoking pipes, buttons, crucibles, and pots for chemical and smelting purposes, by simply cutting them out of the steatite blocks to the forms desired, and either calcining them or not as is thought best, as for all these purposes, except buttons, they will answer equally well either burnt or not. He makes lubricating compounds for railway and other carriages by first grinding and reducing the steatite to a very fine powder, and then washing it to separate it from all gritty particles, and, if it is found to contain iron, he steeps the powder for some time in muriatic acid, stirring it often, and he keeps it there until all the iron is dissolved. He then takes out the powder, washes it again in clean pure water, and dries it, and after this is done it is what he calls purified steatite powder, and then it is only necessary to mix the powder with any of the oils, or fats, or soapy compounds now used for lubricating in any proportion that may be thought best.

2035. J. T. HUTCHINGS, *Charlton, "Tennis and rackett bats."—Dated* 15*th August*, 1861.

This invention consists, principally, in the combination for such purposes of india-rubber, either by itself or in any of its various plastic compounds, or any other similar and suitable material. The inventor makes the india-rubber or compound material pulpy in the usual manner, and in such pulpy state places it in a mould of the required shape or form, where it remains until it has undergone the usual process of hardening, so as to give it the consistency and strength of what is known as ebonite, or otherwise known as vulcanite, and usually called hard rubber. He then removes them from the mould, and finishes off by burnishing. In some cases, such as when unusual lightness is desirable, he uses paper, and forms it in moulds, as before stated; and, when sufficiently dry and hard, he removes it from the mould, and finishes off in the ordinary way. The advantages of this invention is that, unlike the bats at present in use, they will retain their uniform shape for any length of time, are not liable to be effected by climate or temperature, and, consequently, the use of the presses, as heretofore, will not be required to force them into shape.—*Not proceeded with.*

2036. S. DESBOROUGH, *Noble-street, St. Martin's-le-Grand, London, "Umbrellas and parasols."—Dated* 15*th August*, 1861.

This invention relates to the form and construction of the metal ribs, stretchers, and joints of umbrella and parasol frames, and consists in forming the ribs and stretchers of metallic wire, the section of which is of T, triangular, bayonet, or other similar shape, in place of solid, tubular, or trough shape, as heretofore employed. Ribs and stretchers constructed according to this invention possess great strength and lightness, and, owing to their peculiar form, are very suitable for having the joints formed thereto which connect the stretchers to the ribs and runner, and the ribs to the top notch. Another part of the invention consists in forming the metal ribs and stretchers of umbrellas and parasols of a double trough or similar shape (m), or having two or more longitudinal channels.

2040. G. FANCHERRE, *Green-terrace, Middlesex, "Manufacturing gold dials."—Dated* 15*th August*, 1861.

In carrying out this invention the inventor first produces an engraved plate of the dial intended to be reproduced, and from this, by means of the electrotype process, he prepares a matrix of copper. In this matrix he deposits any desired thickness of gold by the electrotype process, and the gold copy so obtained he mounts upon a backing plate of brass, fitted at its back with pins suitable for fixing the dial to the watch or clock frame. The gold electrotype copy he secures to the backing plate by means of solder; and in order to facilitate the process of soldering the dial to the brass backing plate he first submits the gold dial face to ebullition in water, taking care to change the water frequently; and in order to remove any cyanide of potassium which may still remain in excess, and thoroughly to clear out the pores of the gold, he immerses the dial in fluoric acid, and afterwards washes it in boiling water. It is then ready to receive at its back a deposit of copper, which will facilitate the soldering of the brass plate thereto. When the soldering has been effected he covers the backing plate with a protecting coat of wax, and then immerses the whole in a bath of dilute nitric acid, by the action of which the copper matrix will be removed from the face of the gold dial plate. The dial may now be cleaned, cut, and finished in the ordinary way.—*Not proceeded with.*

2049. P. WALTERS, *Wolverhampton, "Machinery for cutting, sawing, and slicing or planing wood and other substances."—Dated* 17*th August*, 1861.

This invention is carried into effect as follows:—On a strong framework of wood or iron, fixed or mounted on standards, a bed-plate is arranged, on which a slide, having suitable grooves to correspond with the bed-plate, is caused to move with a reciprocating motion by means of a connecting-rod attached to the crank of a driving axle. The wood or other material to be operated upon is attached to the upper surface of the slide, above which a suitable plane, saw, or other cutting or sliding apparatus is secured by means of standards bolted to the framework. By these arrangements at each revolution of the crank a slice of wood or other substance is taken off of the desired thickness, and the cutter may be so regulated as to sheave or slice the wood of such thickness that it will curl or roll up, and form spills for the ordinary purposes of lighting, or a thicker slice may be obtained useful for many purposes.—*Not proceeded with.*

2057. E. S. CATHELS, *Shrewsbury, "Compensating gas meters."—Dated* 19*th August*, 1861.

This invention relates to an improved mode of maintaining a constantly uniform water line or level in gas meters, by compensating for the loss of water in the meter by evaporation or otherwise, which is effected in the following manner:—The upper part of the front chamber of the meter is partitioned off by a horizontal partition, and is thereby converted into a space water supply tank or fountain. In the partition plate which forms the bottom of this supply tank or fountain there is a valve seat fixed perpendicularly under the gas inlet valve, the spindle of which passes through this valve seat, and on which spindle there is fixed a plug or valve that fits water-tight into the valve seat. The position of this water valve is so arranged that, when the water in the meter is at the correct line, and, consequently, the gas inlet valve is open, the buoyancy of the float (the float being common to both valves) keeps the valve in the bottom of the tank closed, and prevents any water descending therefrom. But when the water in the meter falls belows the proper level the float descends, and slightly opens the water valve, and allows the water to flow gently into the meter until it has regained its proper height, when the float shuts the valve, and prevents any further descent of water. The gas inlet valve box has a horizontal partition, in which the valve seat is fixed, the valve spindle passing through a small hole in the bottom of the box, and the gas on entering through the valve is conveyed by a pipe down to the waste water box, from which it passes through the syphon pipe into the measuring wheel or drum. The top of this pipe (which is inside the front cover of the drum in the usual way) is at the correct water line, or, if made above the water line, a separate overflow pipe is employed, the top of which is at the correct water line or level.

2059. W. GOSSAGE, *Widnes, Lancashire, "Soap."—Dated* 19*th August*, 1861.

The patenteee claims, First, the use of steam generated by the concentration of caustic alkaline liquors or soap lyes in close boilers for the manufacture of those kinds of soap in which the boiling is effected by the employment of steam. Secondly, the construction of apparatus to be used in the manufacture of those kinds of soap which are made by injection of steam amongst the materials employed, which apparatus provides for the steam employed being passed through a bed of filtering materials, and thereby causing the separation of particles of water therefrom previously to its being used for such manufacture.

2064. A. S. ROSTAING, *Dresden, "Spectacles."—Dated* 20*th August*, 1861.

The patentee claims an arched spring lever or hinged bridge piece (when applied to spectacles of any shape or form), having for its purpose the raising of spectacles from before the eyes up to and before, but not on to, the forehead or hair.

2065. W. FITKIN, *Fleet-street, London, "Instruments for extracting teeth."—Dated* 20*th August*, 1861.

This apparatus consists of two separate portions, instruments, or appliances, which, when put to use, are employed in conjunction or combination. Each part has a handle or end conveniently formed for holding and using it, and one of these instruments or appliances, which the patentee calls the "fulcrum instrument," is constructed with a part or surface, hereinafter called the "rest piece" (intended to bear or rest against the gum or jaw of the patient), and also with a curved or bent arm, or what he calls a "bridge piece" or "arch," which is so shaped that, when the rest piece is applied against the gum, this bridge piece or arch passes over the tooth, and affords a fulcrum or bearing point for the second instrument or elevator to rest and work upon at the opposite side of the gum to that against which the rest piece is applied. The stem or body, the rest piece, and the bridge piece or arch of the first appliance, are in one piece, or in rigid connection, or so contrived as to afford a firm and steady bearing, rest, or fulcrum for the second appliance. The second instrument, or "elevator," is serrated, or otherwise conveniently formed at one end for acting directly upon the tooth in the operation of extraction, and is also conveniently contrived for resting on the bridge piece or arch, for which he prefers to shape it with an orifice near the end, by which it is passed over the end of the bridge piece. The compound instrument is generally applied by so placing the first or fulcrum instrument that the rest piece may bear, rest, or press against the gum on one side or surface thereof, and the elevator is rested on the bridge piece or arch at the opposite side, and works thereon as a lever on its fulcrum, and thus acts upon the tooth; in fact both appliances or instruments may be worked as levers, in some cases the handles being moved in antagonistic or opposite directions. The first or fulcrum instrument may be said to be formed with two fulcra, one being the rest piece, and the other the place of contact with the elevator or second appliance.

2066. H. EMES, *Adelaide-road, Haverstock-hill, "Dress fastenings."—Dated 20th August*, 1861.

This invention cannot be described without reference to the drawings.

2071. J. SOMERVILLE, *Maidstone, "Improvements in apparatus for drilling and tapping gas and water mains and pipes, and in preventing leakage therefrom."—Dated 20th August*, 1861.

According to this invention the patentee proposes to employ a peculiar apparatus, consisting of a bow or breech piece or bracket, secured to the main or pipe to be drilled by clips or straps, and having fitted to it at its centre, or in any other convenient position, a set screw, for the purpose of applying pressure to a combined drill and tap of a peculiar construction, which is actuated by an ordinary ratchet or other suitable contrivance. Immediately above, and attached to or forming part of, the drill or boring bit there is a cylindrical piece of metal, of the same diameter as the hole made by the drill, its object being to keep the drill steady after it has entered the main, and prevent it from breaking through too soon, or until the whole is ready to receive the tap; it is also serves to plug the hole whilst the drill is breaking through, and so prevents the escape of gas or water at that time. The tap is formed on the upper part of the stem of the drill, immediately above the cylindrical part hereinbefore referred to, and has two or more annular grooves or recesses made round it at proper intervals, into each of which is fitted a circular washer or collar of india-rubber, leather, or other suitable material. These washers or collars should be made of slightly larger diameter than the hole to be tapped, so that, as the tap penetrates into the main, and the washers or collars successively enter the hole, they will effectually plug the same, and prevent any escape of gas or water through the longitudinal grooves or slots made in the tap. The intervals or spaces between the washers or collars should not be less than the thickness of the metal being tapped, so that there may always at least one of such washers or collars in the hole. When the screw thread is sufficiently cut the tap is removed, and the service pipe is inserted in the usual manner.

2073. T. SUTTON, *King's-College, London, "An improved camera for taking photographic portraits and instantaneous pictures."—Dated 20th August*, 1861.

This invention cannot be described without reference to the drawings.

2074. R. S. LAMBERT, *White-hall, Clevedon, "An improved skipping dipper or vessel for removing sugar and other liquids from boiling pans."—Dated 20th August*, 1861.

The nature of this invention consists in the construction of a dipper provided, First, with external ribs or guards, so applied as to prevent the contact of the exterior surfaces of the vessel with the interior surfaces of the pans from which it is intended to dip up the contents, whereby the heated surfaces of these latter, even whilst the improved dipper is actually within them charged with a portion of their contents ready for removal, remain covered with liquid matter in quantity always sufficient to prevent injury from charring or scorching. Secondly, with a cover (by preference a dome or elevated cover) which enables the operator to "change over" or take into the pans in action, and before the improved dipper is in any degree lifted out or removed therefrom sufficient liquid to replace that taken into the improved dipper for removal, so that, when this vessel and its charge are actually lifted away, the pan is formed to be already replenished. By these means all possibility of injury from the destructive effects of large over heated surfaces acting on small quantities of highly inspissated substances is wholly avoided.

2075. F. GYE, *Royal Italian Opera, Covent-garden, London, "Gasometers and gasometer tanks."—Dated 20th August*, 1861.

For the purposes of this invention the patentee constructs a gasometer tank in such manner as to render available much of the central space of land now covered or occupied by the tank of a gasometer. The tank for a gasometer according to this invention is made double at the outer circumference to receive the water or fluid employed, the interior space being left free for use when roofed or closed in air and gas-tight. He prefers to use the compartments in the centre of a tank to act as a second or interior tank to receive another but a smaller gasometer, though such space may be otherwise advantageously employed, and the central portion of the smaller tank may be similarly arranged to the outer one in order to admit of such space being used. The inner or smaller gasometer is arranged to act in the interior tank independently of the larger or outer gasometer, which works in the ring formed or outer tank. When thus employing the enclosed and roofed space interior of the tank of a gasometer to receive a smaller or inner gasometer the space between the roof of the enclosed compartment is in communication with the open atmosphere by suitable pipes or passages, so that the space may be at all times occupied by air; or such space may be so arranged as to receive gas when the inner gasometer is discharging its contents, and the gas received into the central compartment may be discharged into the mains when the inner gasometer is being charged with gas.

2077. G. F. MUNTZ, *French Halls, Birmingham, "Apparatus for melting metals."—Dated 20th August*, 1861.

According to this invention the inventor places the metal in a vessel of brickwork or other material, suitably lined with fire clay, and through the bottom of this vessel are formed holes or passages (one or more) which are covered with tubes, similar to inverted crucibles, without bottoms, and made in a similar manner of fire-clay or other refractory material. Under the vessel containing the metal a furnace is formed, and the heat passes up into and is transmitted through the refractory tubes to the metal, the vessel, containing which is suitably covered. The refractory tubes may be arranged to pass horizontally, or in an inclined direction, through the metal containing vessel, but the arrangement described is preferred. It will be seen that, whereas when metal is melted in a crucible or pot, the weight tends to burst the sides of the vessel outwards; when the arrangement is as is above described, exterior of the refractory vessel, it tends to press its sides inwards, or crush it in, a strain which it is very much more capable of resisting than a tensile or bursting strain.—*Not proceeded with.*

2079. J. ELLIS, *Minories, London, "Sizing corks."—Dated 20th August*, 1861.

The patentee claims the use of mechanism for gauging or separating the larger from the smaller sized corks, consisting of a worm or propelling shaft acting in conjunction with an open work or gauging cylinder or cylinders, so as to gauge or separate the larger from the smaller sized corks as required.

2083. W. CLARK, *Chancery-lane, London, "Optical and illuminating apparatus."—A communication.—Dated 21st August*, 1861.

The patentee claims, First, the application of apparatus furnished with compartments of crystal or glass, composed of one or more hollow pieces, as substitutes for like or different forms to those in present use for optical purposes, whereby to reproduce in all scales of magnitude, of scientific or other experiments, by means of liquids contained in the spaces between the glass, for the purpose of producing the necessary refracting power. Secondly, the construction of lanterns with partitions of crystal or hollow glass filled with liquids, either coloured or limpid, as described, for the purpose of increasing the dispersive power of the candle, oil, gas, or electric light, according to the nature of the illuminating agent employed. He also claims all illuminating glasses, lanterns, or globular forms suitable as substitutes for the plain or solid forms ordinarily used, having hollow partitions, as described, for the introduction of white or coloured liquids for the production of infinitely varied and novel effects, by regulating the shades of the liquids and the containing sides. Thirdly, he adds that, by the word crystal, he includes flint and all other glass, and also that material employed in optical experiments, the invention consisting of the application of all transparent matters, either coloured or uncoloured, and polished or unpolished, having hollow spaces or compartments filled with liquids, instead of the ordinary solid glass hitherto employed for general illuminating purposes, as also for the production of effects of white or coloured fire at public entertainments.

2086. N. SALAMON, *Ludgate-street, London, "Attachments or apparatus for sewing machines."—A communication.—Dated 21st August*, 1861.

This invention consists, First, in a contrivance which can be readily adapted and attached to any suitable sewing machine of the construction already well known and publicly used. By means of this contrivance two pieces of cloth (or material suitable for ruffling) are caused to be supplied to the ordinary feeding along apparatus of the sewing machine at different tensions while being sewn together. Secondly, in a contrivance for automatically creasing or marking, in regulated uniform distances in advance of the sewing, the next line of sewing to be followed, which is especially useful in folding and tucking by machine sewing, as by it the folds and tucks or plaits can be sewn at exact distances, in precisely the same repetition, without requiring the previous preparation by hand heretofore necessary, whereby it saves much labour and time. Lastly, in a modification of the last mentioned contrivance according to which the attachment is arranged so as to be applied to quilting and similar work, by marking with a piece of chalk or other suitable substance upon the material being sewn, so as to indicate precisely the next line of sewing to be followed, and thus secure more positive uniformity in the repetition of the work, and with less time and labour than heretofore.

2087. A. J. HENNART, *Tournay, Belgium, "Smoke consuming grates."—Dated 21st August*, 1861.

This invention consists in the combined form or shape and arrangement of the grate bars of furnaces. These improved bars are composed of three pieces cast together so as to form a single one leaving many open spaces between each compound bar to give free passage to the atmospheric air.—*Not proceeded with.*

2089. J. M. MURAT, *Paris, "Apparatus for shearing military hat tufts, &c."—Dated 21st August*, 1861.

The article to be sheared is, according to this invention, held in a tube at the end of a horizontal spindle caused to revolve slowly by means of cord and pulleys, so that the article to be sheared has only a rotatory motion round its horizontal axis. The tool carrier or holder is mounted on a horizontal shaft, and consists of a regular prism, having six sides or faces, on each of which is a blade or cutter. The tool carrier spindle, which is supported at two places, is caused to rotate rapidly by strap and pulley. The blades or cutters in rotating come nearly in contact with a fixed plate or counter-cam, which supports the thread or filaments of wool or other material to be cut. This plate or counter-cam is fixed on a carriage, and the tool holder is also placed on this same carriage, which is moved along by a screw; or it may be moved round the article to be cut by causing it to revolve (by a handle) in a circular path. The machine will sheave cylindrical, conical, and spherical articles.

2082. W. MASON, *Liverpool, "Soap."—A communication.—Dated 21st August*, 1861.

The object of this invention is to dispense with hand washing in the cleansing of clothes and other articles. The improved soap consists of equal parts of any ordinary soap and kaolin, with about five per cent. of ammonia and five per cent. of soda; the whole mixed together and dried.—*Not proceeded with.*

2098. E. LANDSBERG, *Aine, Paris, "Porte-robes or buttons for holding up the skirts of ladies' gowns."—Dated 22nd August*, 1861.

This invention has reference to a previous patent, dated 13th February, 1860 (No. 387). This porte-robe or button for holding up the skirts of ladies' gowns, instead of having only one end of the braid, tape, cord, string, or other tie fixed to and partly coiled round the barrel, in the inside of the button, has the same doubled, and both free ends fixed to the barrel, whilst the remainder forms a loop into which part of the skirt may be introduced and kept fixed by a runner or slide gliding along the braid, tape, or other tie, which runner or slide may serve likewise for regulating the length of tape, string, or other tie allowed to protrude beyond the button or stud.—*Not proceeded with.*

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

(From our own Correspondent.)

IRON TRADE AND THE PROSPECTS OF THE FOREIGN AND HOME TRADE: *Increased Demand from India and China: The Growth of the Trade with France*—COMPLAINTS OF THE LOW PRICES: *Commensurate Quality*—PIG IRON TRADE: *Reduced Make*—PRICE OF STONE—COAL TRADE: *Ruling Prices*—MR. S. GRIFFITHS AGAIN: *The Assumed Firm of E. B. Thorneycroft and Co.*—THE CINDERFORD IRON COMPANY: *Separation of Partnership*—GENERAL MANUFACTURING TRADES: *No Improvement: Shipments to the Southern States: The International Exhibition and the Jewellers*—BOARD OF TRADE RETURNS: *New Classification: Metals and Hardwares*—NEGLIGENT ENGINE TENTERS: *Eight Men Injured*—MR. H. L. FLETCHER CHARGED WITH FORGERY.

A SLIGHT shade of improvement characterises the reports which we receive this week from the different ironmaking firms of South Staffordshire. There is slightly more doing than there was last week at a few of the best houses, and some of the firms, who are not very careful as to the quality of the iron that they produce, are not worse off as a rule. This, however, does not say much, because, with the advance of the season, the orders were expected to increase very much faster than as yet had been perceptible, even although the American war should not assume appearances more favourable to a termination within a reasonable period than has been perceptible for some time past, and the condition of the trade, in the past six months in particular, has been almost unprecedentedly bad. Masters gather satisfaction from the slight encouragement held out by Earl Russell that the all-disturbing war may terminate within a reasonable period. But, while they give his lordship credit for better information than they themselves possess, they are not inclined, from their own reasoning, to share very warmly in his lordship's views. They are still of opinion that the Southerners are not to be subdued; and that the attempt to subdue them, if much longer persisted in by the North, will bring temporary ruin upon the Federal States. Masters are not, therefore, full of expectation of good from the recent Federal victories.

The Board of Trade returns for January, which are noticed at some length below, are adverted to with satisfaction as showing the rapid growth of our trade with France in particular at a time when we so urgently needed new markets to compensate in some measure for the loss in the American trade direct. The continent, however, whence a greatly increased trade this year as compared with last was being looked forward to, is not this week in a condition less unsatisfactory than it was deemed to be at the time of our last report. As some set-off to this unfavourable feature of the prospects of the continental trade, India and China are announced to be ordering more freely than for some time past, and the future is anticipated with some satisfaction. Home will remain pretty good for iron of large sizes and fair quality, provided the political horizon of the continent should not portend storms of more than ordinary ruthlessness. Before the revival of trade prices will be as they now are accepted, for some descriptions, at very low figures. At Wolverhampton, on Wednesday, the complaints were very loud of the rates that were being accepted by South Staffordshire houses for iron delivered in Liverpool in particular. They are almost incredibly low; but the fact of invoices showing the precise figures having been seen removes all room for doubt. Sheets are being sent hence to Liverpool on terms which would make them £6 15s. a ton in South Staffordshire. The quality, however, is proportionate with the price; and what such iron can be used for is a problem which no one here can solve.

Pig-iron continues inanimate; and the make of the district is about to be reduced by the blowing out of two more furnaces at Bilston—those of Messrs. Jones and Murcott.

The quantity of hematite iron stone is small as compared with a short time ago, and the prices of native stone are for white and gubbin from 13s. to 15s. per ton.

The coal trade is, in the Dudley district, in a somewhat better state than it was a fortnight ago. The qualities in demand are principally those used for domestic consumption, and are chiefly exported. Best thick coal is realising 11s.; common, 8s.; lumps, 7s.; and fine slack 2s. 6d. per ton. Heathen coal, 10s.; lumps, 7s.; brooch, all one way, 9s.; Kibbles, 5s.; at the wharfs west of Dudley. On the east side prices range from 6d. to 1s. per ton higher.

Mr. Samuel Griffiths has received his "letter of license" from his creditors; and his "deed of inspection" has been duly published in the *Gazette*. In the reference to this matter last week, some confusion arises from the omission of Mr. E. B. Thorneycroft's name in the statement that the deed contained a recital setting forth that he (Mr. E. Bagnall Thorneycroft) was never a partner in Mr. Griffiths' so-called firm of Messrs. E. B. Thorneycroft. Notwithstanding this recital we find that Mr. Griffiths, in this week addressing the men who were in his employ while the "Staffordshire works" were open, still referring to Mr. E. B. Thorneycroft as his past and present partner. Mr. Griffiths has been entertaining those workmen this week with a plentiful supply of good fare. His election expenses for contesting the borough of Wolverhampton at the last election are just published. They amount to £980.

The following is a copy of a circular which has been issued by Mr. William Crawshay, announcing a dissolution in the partnership which formed the Cinderford Iron Company:—

"I beg to inform you that the partnerships heretofore subsisting between my father, Mr. William Crawshay, and the late Mr. William Allaway, and subsequently between my father and Mr. Stephen Allaway, and since between Mr. Stephen Allaway and myself, are all now at an end, and that the business of the late Cinderford Iron Company will, for the future, be carried on by me alone, in the name, or under the title of 'The Cinderford Ironworks.'"

The Birmingham general trades continue without noticeable alteration. The cases in which there is scarcely any alteration are an exception.

A Birmingham paper announces that some vessels have sailed from Liverpool with heavy goods—articles regarded simply as necessaries—for the Southern States, intending to run the blockade, and we understand that some members of Lloyd's have taken the insurance at such an easy rate that, after deducting freight, risk of capture, danger of the seas, &c., there remains a margin for profit which bears favourable contrast with that under the high protective duties of the North. Several special branches of Birmingham manufacture have profited by these transactions, and some surplus stock has thus unexpectedly been got rid of. The experiment seems likely to be repeated as opportunity offers.

At one time great dissatisfaction was felt among the fine art houses in Birmingham—such, for instance, as the manufacturers of jewellery, chains, &c.—with respect to the accommodation for those branches in the New Exhibition Building, and it was indeed probable that many firms would not be represented at all. There has, however, been an entire re-arrangement of the position assigned them, and we now find that Birmingham will stand very well. The representative of a local firm writes from the International Exhibition office:—"The whole affair is re-arranged. The Birmingham jewellery department is an entire square by itself—four frontages; and we shall do very nicely."

By the Board of Trade returns just issued we find that the total value of the British manufactures and produce exported in January was small, amounting only to £8,439,055, but it is rather more than that of the exports of the corresponding month of last year; and the increase is participated in by most of the important manufacturers of the Midlands, the chief exceptions being hardwares and cutlery, machinery, railway iron, and silk manufactures. These branches of the national industry are now entered in the tables in such a manner as to show in which of the numerous sub-divisions into which modern arrangements have cast them the increase or diminution has taken place, by which separation the utility of the returns is very much enhanced. Small arms appear in these accounts for the first time in the January return, which shows that £43,356 were exported in that month, against 16,908 in the corresponding month of last year, and 10,381 in that of 1860. Earthenware and porcelain are now separated, and we learn that the value of the exports of the former was £66,221, and that of the latter £2,999, against £53,010 for both, last year, and £98,938 in 1860. The increase upon last year was general, but was most conspicuous in the exports to France, which from £249 in value in 1860, and £499 last year, rose to £3,938. Glass shows a decline from £42,738 in 1860, and £34,777 last year, to £33,310, owing to a falling off in the exports of window glass and common bottles. Hardwares and cutlery are also separated, as they ought long ago to have been, and the exports of the former are shown to have amounted in value to £24,968, as those of the latter to £17,107; but the last amount represents only a portion of the goods formerly classed under this head, being limited to manufactures of steel, or of steel and iron combined (anvils, vices, saws, files, edge tools, cranks, slide-bars, &c.), and tools or implements of industry, otherwise than agricultural, not wholly composed of iron or of steel. The value of the exports of all articles previously entered under the denomination of hardwares and cutlery was £161,773, against £230,973 last year, and £243,105 in 1860. Manufacturers of leather are now entered so as to distinguish the value of the boots and shoes exported, which amounted to £120,710, more than five-sixths of the whole being shipped to Australia. Machinery, as already mentioned, shows, on the whole, a decline, as though the value of the steam engines exported rose from £44,081 to £53,962, as compared with the corresponding period of last year, the exports of other machines declined in value from £170,436 to £144,920. The increased production of steam engines for India and Brazil was sufficient to more than compensate for the diminished shipments to Spain, but such was not the case with regard to the increased production of other machines for France, Spain, Holland, the Hanse Towns, and Russia, as against the diminished shipments to India and Australia. The improved classification of metals gives the following results:—

MONTH ENDED JANUARY 31ST.

	1860.	1861.	1862.
Iron, Pig and Puddled	£43,379	£46,517	£64,991
„ Bar, Angle, Bolt, and Rod ..	140,660	98,699	126,920
„ Railway	152,415	183,269	107,670
„ Wire	20,771	13,441	11,351
„ Cast	40,199	32,252	42,082
„ Hoop, Sheet, and Plate ..	58,752	36,038	44,957
„ Wrought	103,269	138,969	148,529
Steel, Unwrought	71,841	30,076	50,324
Copper, Unwrought	99,070	52,714	34,230
„ Bar, Rod, Bottoms, Pans, Sheets, Nails, and Plates (including Yellow Metal)	114,507	67,922	91,046
„ Wrought, Other Sorts ..	19,801	14,253	14,785
Brass	11,770	11,881	18,608
Lead	38,405	24,119	21,543
Tin, Unwrought	25,402	20,311	22,492
„ Plates	100,996	36,596	64,283
Zinc	6,063	2,802	3,069

The great increase in the exports of pig and puddled iron took place in the exports to France and Holland; while that of the second description was general, except as regards the United States. There was a diminution in the shipments of railway iron to India, Australia, and the United States; but the exports to other railway-making countries show an increase, especially to France and Spain. The increase in cast iron was general, except as regards the United States and Brazil. In hoops, sheets, and boiler plates the exceptions were the Hanse Towns, Australia, and the United States, the increase being greatest in the trade with Holland, Spain and India. The falling off in unwrought copper was general, while the increase in wrought copper and yellow metal extended to all countries except Holland, Italy, and Turkey. Australia was the only market which diminished its demand for tin plates. The value of the plate, plated wares, jewellery, and watches exported was £40,480, against £34,327 in the corresponding period of last year. In the import account clocks and watches show a falling off, the former from 9,338 to 4,514, and the latter from 6,867 to 5,030. There was a largely increased importation of copper, chiefly from Chili, and also of copper ore and regulus tin and zinc; but iron and lead show a diminution. Silver ore is an item in the metallic imports which appears for the first time, the value imported being £32,170 against £780 in the corresponding month of last year.

Two cases of gross and serious negligence by engine-tenters at collieries have come under our observation since last week. On Monday the magistrates at Willenhall sent an engine-tenter, who had been in the service of Mr. Phillip Williams, the chairman of the Ironmasters' Association, of South Staffordshire, to prison for six weeks, and ordered the wages that were due to him to be confiscated, for his having drawn a skip over the pulley, and for being drunk while he was at his work. On the same afternoon eight men received serious personal injury, seven of them by being drawn over the pulley at a pit at Tividale, two miles from Dudley. The doggy of the pit was on the bank when the men were nearing the top of the shaft. On perceiving that the engine was working faster than was compatible with safety, and being further alarmed by observing that the engine tenter was out of the engine-house, thrust the "wagon," or movable platform, over the pit's mouth. He had scarcely done so before the skip was over the pulley, and the men were out. Immediately that he had performed the timely act, which saved at least a majority of his fellow-workmen from certain death, he sustained very severe injuries himself, for some of the men, and probably portions of the skip and the massive weights which are hung above it, fell upon him. It is further to be regretted that the son-in-law of this man, who was one of the party in the skip, cannot survive. All the injured men are married and have children.

Mr. H. L. Fletcher, one of the partners in the late firm of Pitt and Fletcher, iron merchants, of Willenhall, and who is the eldest son of the notorious Bilston incumbent of that name, was, on Wednesday, charged before the magistrates at Wolverhampton with forging the acceptance to, and then uttering a bill of exchange for, £80. The bill was drawn by Fletcher upon the firm of "Pitt and Fletcher," two months after the dissolution, and he wrote the name of "Jacob Groves," of Willenhall, as the acceptor. The bill was discounted by a broker, and, when disavowed by Groves, tendered to the firm. Pitt was then a clerk, and he paid the money to the bill broker. Pitt and Fletcher having, however, through the discovery of the defalcations of the Rev. H. S. Fletcher, to go into the Birmingham Bankruptcy Court, an explanation of the payment had to be made. Hence these proceedings. Fletcher was remanded for a week, and the bench refused to accept bail. The affair gave rise to much conversation among the iron trade in Birmingham yesterday (Thursday), and on the day before in Wolverhampton.

NOTES FROM THE NORTHERN AND EASTERN COUNTIES.

(*From our own Correspondent.*)

NORTHERN MATTERS: *Depression on Tyneside: Trade of the North East Ports: The Elswick Works: The Steam Collieries: Cleveland Iron Trade: River Tyne Commission: Miner's Relief Fund* — FATAL ACCIDENT ON THE BORDER UNION RAILWAY — BIRKENHEAD FERRIES—MANCHESTER, SHEFFIELD, AND LINCOLNSHIRE RAILWAY: *New Station at Liverpool*—IRONWORK CAPABILITIES OF LIVERPOOL: *Messrs. Vernon and Son's Works*—INSTITUTION OF ENGINEERS IN SCOTLAND—FENCING OF FLY-WHEELS: *Important Judgment by Sir A. Alison*—SUGAR MILL MACHINERY FOR THE INTERNATIONAL EXHIBITION—STATE OF TRADE: *Manchester: Sheffield: Derbyshire*—EASTERN COUNTIES RAILWAY.

WE commence with the north. The state of commercial affairs on Tyneside is still gloomy. In the exports of general merchandise from north-eastern ports there was last month a considerable falling off, the decline in the shipments from Newcastle having been upwards of £18,000, from Sunderland upwards of £5,000, and from the Hartlepools upwards of £40,000. Most of the large establishments in the northern district have rather circumscribed their operations, but the great Elswick Works are an exception to the rule, and the large space of ground which the Ordnance Company purchased a short time since to the east of their existing buildings is being covered with large workshops. It is stated that several of the largest steam collieries are working only four days to the fortnight; and only those collieries which have large contracts, and are, therefore, but little affected by market fluctuations, are working eleven days to the fortnight. The Cleveland iron trade participates in the general depression, and in the Rosedale district there is some want of employment. The members of the Tynemouth Chamber of Commerce have a bone to pick with the Tyne Improvement Commission. They held a special meeting on Friday evening, at which the great source of complaint against the river conservators, who have now had a separate corporate existence of nearly twelve years, seemed to lie in their postponement of the construction of the Low-Lights Dock, for which Parliamentary powers were obtained last year; and petitions were adopted for presentation to both Houses of Parliament, and to the Admiralty and Board of Trade, with a view to amend and extend the present constitution of the commission. At the same meeting, a petition, praying Parliament to withhold its sanction from the Tyne Ferry Bill in the form in which it is proposed, was likewise agreed to. The chamber seems to ignore the fact that great commercial depression prevails, and that the commissioners with prudent caution decline to embark in works involving a large outlay in the present state of affairs. The miners of Northumberland and Durham propose to establish a permanent relief fund to include only fatal accidents and those by which miners may be permanently disabled. It is recommended that all men should contribute 1d. weekly and boys ½d. weekly towards the object in view. An interesting letter has been addressed by Mr. J. W. Pease, of Darlington, to Mr. Hugh Taylor, as president of the coal trade. The subject of which the writer treats is the relief fund proposed to be established, and he submits a plan of insurance, by which the object may be carried into effect, to the highest advantage of those whose interests are concerned. He calls attention to the single cases of accident which are of so frequent occurrence, and the miners in the comparatively new iron district in Cleveland he also intends to include in the scheme. Mr. Pease suggests that each year should provide a fund equal to the cases arising in it, and the term of insurance he would limit to five years, a longer period being easily provided for by a larger weekly payment. Care, he says, should be taken that the premium payment should be so regulated year by year, after the experience of a year or two, that the Hartley fund should not be infringed upon, save in the case of any casual circumstance which might arise; and he thinks that the surplus money might be invested in the names of seven trustees, to be selected by a majority of the coalowners, who subscribed to the insurance fund.

Yesterday week a fatal accident occurred on the Border Union Railway. Heavy rain caused an accumulation of waters at Flash Burn, in Liddesdale, where the stream passes under a high embankment of the railway, through a culvert 8ft. in diameter. The bank had slid down and stopped the end of the tunnel, and the accumulation of water, 20ft. deep, threatened to sweep away the embankment. Mr. J. F. Tone, the engineer of the company, entered the tunnel from the other end, accompanied by Mr. Thomas Ridley, the cousin of the contractor, and a labourer. Mr. Tone took a shovel, intending to pierce the mass of clay and let through a small quantity of water which might gradually enlarge the opening. In an instant the mass of clay gave way, and all the three were swept by the water through the tunnel. The labourer was washed on to dry land. Mr. Tone, though stunned and bruised, struggled to land, but Mr. Ridley was swept into the Liddell, swollen by the rain, and lost his life. The unfortunate gentleman leaves a widow and four children. But for the precautions taken by Mr. Tone a much more serious loss of life might have taken place. The workmen expressed their readiness to go up the culvert, but Mr. Tone refused to allow them in the face of such imminent danger before he had examined the state of matters in the culvert, and satisfied himself that the remedial works could be undertaken with safety.

The Birkenhead ferries continue extremely prosperous, and are yielding a gradually increasing revenue. New steamers are about to be provided in connection with the Woodside Ferry, and at the last sitting of the Birkenhead Commissioners a report was read from Mr. G. Harrison and Mr. J. Laird, M.P., as to the best description of boats which could be selected. The report stated that the passenger steamers should not be less than 150ft., or more than 160ft. long, and not less than 27ft. beam; draft of water, with 50 tons on board, not to exceed 7ft.; the power not more than 100 horses, each wheel to be worked by a pair of engines, say four engines in all, and the engines to be capable of working up to four times their nominal horse-power; the vessels to be built of iron, and steered from each end; to be provided with separate accommodation for ladies and children if practicable; to have water-tight bulkheads, to render the vessel safe in case of collision under all ordinary circumstances; and the steamer's deck to be level with the new Landing-stage at Woodside, which is 6ft. from the water's edge. The luggage-boat should not be less than 150ft., or more than 180ft. long; not less than 30ft., or more than 35ft. beam; and draft of water, with 100 tons dead weight on board, not to exceed 8ft.; the horse-power of engines not to be less than 120, or more than 180 (nominal), and to be on the same powerful principle named for the passenger steamer; the vessel to be built of iron, and steered from both ends.

The Manchester, Sheffield, and Lincolnshire Railway Company solicit powers for establishing a station in Liverpool in connection with their gradually extending system. It is proposed to construct a railway 1 mile and 53 chains in length from a junction with the authorised line of the Garston or Liverpool Railway at Egerton-street, Toxteth Park, to or near the junction of Lawton-street, and Ranelagh-street, Liverpool. The proposed new line and station are to be completed, if authorised, in five years.

The *Liverpool Albion* has not yet quite exhausted its stores of information on the ironwork capabilities of Liverpool. This week it gossips very agreeably about the works of Messrs. Vernon and Son, eminent local iron shipbuilders. Mr. Thomas Vernon, now deceased, was the founder of the firm, and, as a practical operator in plates and other descriptions of malleable iron, was one of the first to perceive the advantages to be derived from the application of iron to shipbuilding. No less than 30 years since Mr. Vernon, under the approving superintendence of Mr. C. Wye Williams, so well and so honourably known in the steam shipping world, constructed some 30 iron barges for the Shannon navigation, many of them being still in use. Between 1831 and 1844 Mr. Vernon built and launched some 37 ships almost entirely constructed of iron, several of them being steamships of considerable power and tonnage, and he also devoted his attention to many other kinds and branches of iron manufacture. At the commencement of 1844 Mr. Vernon was joined by his son Mr. John Vernon, who became a partner in the business; and since that year the firm has kept a regular record of the ships which it has built. It appears from this journal that from 1844 to the end of 1861 they built no fewer than 108 ships, with an aggregate measured burden capacity of about 46,000 tons, besides a very large extent of other important works, in the shape of girder bridges, floating wharves, and similar constructions of manipulative skill. Of the now celebrated iron-screw colliers trading between the Tyne and London, and having double iron bottoms, the first were constructed by Messrs. Vernon and Son. They fully solved the problem—"Can a vessel be made to carry a full ore-cargo on her voyage, and return in a seaworthy condition without the cost of loading ballast?" These vessels are made to a certain extent with double bottoms, and with such hydrostatic apparatus that, under perfectly regulated arrangements, water can be admitted to or excluded from the space between the two bottoms or skins of the ship. Thus, when the vessel is loaded, and she requires no ballast, the water is excluded from the vacant space; but when her cargo has been discharged, and she has to return with an empty hold, the turning of a tap admits the water between the inner and outer skins of the ship till she is sufficiently loaded with water-ballast, and is thus expeditiously and cheaply made ready for sea. Besides the important improvement above referred to it may be mentioned that Mr. Vernon, sen., along with Mr. James Kennedy, were the inventors of the bulb deck beam iron, which is now universally employed in the construction of all iron ships. Other improvements have also been made or sedulously worked out at this establishment, till now the deck and inside ceiling are nearly all the wood-work required in the formation and completion of iron-built ships. A continued increase of business led to a gradual extension of Messrs. Vernon's premises, and the building yard and its appurtenances are now of large dimensions. From south to north the yard stretches along the river margin 486ft.; and from east to west it extends 323ft. In the central portion of the east side are situated a range of writing and drawing offices; and contiguous to these is the large drafting room in which the ribs and framing of the different vessels are drawn out of the full size. The southern margin of the building yard is occupied by the smiths' shop—230ft. long by 40ft. wide, which is employed in making the general smith work of the establishment, and has twenty blast hearths. It is amply furnished with all the varied tools required in the preparation of heavy ironwork, including the making of stern and rudder-posts, and the scarfing of keels, and has a steam hammer of considerable dimensions. Just beyond the shop referred to, still more to the south, is the shop and yard for bending the ribs and other portions of the framing of first-class iron ships. This shop is furnished with the requisite amount of perforated iron floor, and there are two sets of large rollers for bending or flattening rod or plate iron, besides punching, drilling, and trimming machines. The building yard is conveniently situated, and commands a good stretch of river front, with a well-regulated launching elevation. Since the commencement of the present year Messrs. Vernon have launched, or have now on hand, eleven iron vessels, having an aggregate of 10,000 tons measurement; all these are sailing ships. Conspicuous in a complete list of Messrs. Vernon's miscellaneous works would necessarily stand the stupendous landing-stages on the shores of the Mersey. They constructed all the girders for the high-level railway at the north end of the town, and restored the screw-steamship Great Britain, after she had been stranded in Dundrum Bay. They constructed the two first of Mr. Bourne's steam-trains of barges for the navigation of the Indus, each train being 700ft. in length, and connected by joints to accommodate it to the tortuous channels of the Indian rivers. They also constructed barges for the navigation of the Ganges and of the Danube, and built the iron steamer Assam, about twenty-five years ago, for navigating the Ganges. This vessel, after having worn out one pair of engines, is being, or has been, fitted with new engines, her hull being still in perfectly good order. Last, not least, may be mentioned a caisson of very peculiar construction, recently executed for the Government Dockyard at Malta. The floating principle of this caisson is an air-chamber, so placed in the fabric as to be completely submerged, the buoyancy or sinking of the whole apparatus being effected in the simplest way, and with the utmost nicety, by a very small weight of water introduced into a chamber placed above the air-chamber first alluded to.

At last week's meeting of the Institution of Engineers in Scotland discussions took place on papers "On the Expansive Working of Steam" (read by Professor Rankine), and "On Surface Condensers" (read by Mr. Spencer). The meeting was presided over by Mr. W. Johnstone.

In the Sheriff's Court at Glasgow Sir A. Alison has disposed of the case of "Mrs. Sarah Docherty and children *v.* James Alexander, calenderer, of Glasgow." The pursuer's husband, the defender's engine-keeper, was killed by the fly-wheel of the engine. It was held by Sir A. Alison, reversing the judgment of the sheriff-substitute, that the defender was liable, as the fly-wheel was not boxed or railed in; and the sum of £50 was ordered to be paid to the pursuer in respect of "damages and solatium." Sir Archibald Alison, in the course of a long note appended to his judgment, observed:—"The necessity for boxing fly-wheels has been so strongly experienced that, in some trades where young persons are generally employed, it is declared imperative by Act of Parliament, specially made for that matter. The defender here is a calenderer, which is not one of the trades where it is by statute declared that boxing is indispensable; but the reason of the thing applies to all factories where fly-wheels are in use. The deceased had been for fourteen years about engines, in one employment for four years and a half as an engine-keeper, and no special unskilfulness can be proved against him. The sheriff does not go so far as to assert that a master is bound to guard his workmen against the consequences of any probable recklessness on their part; but he apprehends that he is bound to guard against the probable dangers of the employment at which they are engaged, if it can be done at a reasonable expense and without any extraordinary trouble. In the present case, the risk to the engine-keeper was obvious, and such as must have endangered the life of the most careful workman, for how was it possible for a person in charge of the fly-wheel, and requiring to oil it occasionally, to go round the engine in a little space of from 2ft. to 2½ft. broad, when revolving with extreme velocity, without incurring some danger? And although, in some cases, the danger might be removed by stopping the engine when the same was being oiled, yet sometimes this was not possible, and under no circumstances could it be done without stopping the engine, and thereby throwing all the persons in the works dependent on its motions for a time out of their duties."

Messrs. W. and A. M'Onie, of Scotland-street, Glasgow, have completed a powerful steam engine, with sugar-cane mill, which they will show at the International Exhibition. The steam engine is highly finished and of 30-horse power nominal, the sugar mill being of corresponding size. The weight of the whole exceeds 70 tons. More sugar mill work is stated to be shipped from the Clyde than from all the other parts of the empire; and Messrs. M'Onie have now large orders on hand for Asia, Africa, and the West Indies.

Captain Palin reports thus as to the state of employment among the machinists and foundries of Manchester:—Of forty-seven machinists, sixteen are working full time with all hands, twenty-one full time with a portion of their hands, nine are on short time, and one has stopped altogether. Of twenty-four foundries, six are working full time with all hands, fourteen are working full time with a portion of their hands, and four are on short time. At Sheffield there is not much change. Several houses in the engineers' and machinists' tool trade report that they are in receipt of good orders, while others state that they are not doing much. The coal and iron trades of Derbyshire are depressed.

The Eastern Counties Railway Company has been foiled again in an absurd attempt to obtain powers to establish lines of steamers from the minor eastern ports to various points on the continent. The project was strenuously opposed by the steam shipping interest, who contended that the funds of the company could not properly be applied to such an object. The Parliamentary Committee, before whom the matter came, took a similar view of the matter, and, in doing so, probably saved the company itself from considerable loss. The Bill for amalgamating the Eastern Counties, Norfolk, &c., companies, will pass, in all probability, so that 650 miles will be placed under one general management, and fused in one common interest.

PRICES CURRENT OF METALS.

British Metals are quoted Free on Board; Foreign in bond.—Extra sizes charged for at the rates agreed by the trade. *Brokerage is not charged for buying except on Foreign Tin.

		£ s. d.	Dis. p. ct.
IRON, English Bar and Bolt:—			
in London	pr tn	5 15 0	3
in Wales	,,	5 0 0	,,
in Liverpool	,,	5 10 0	,,
Deliv. into boats at wks — Staffordshire Bars (Nom. prices last qr. day for favourite brands)	,,	7 0 0	1½
Sheet, Sngl.	,,	8 10 0	,,
Dbl.	,,	10 0 0	,,
Hoop	,,	8 0 0	,,
Rod, round	,,	7 0 0	,,
Nail Rod, sq.	,,	7 5 0	,,
SHIPPING IRON, (Delivered in Liverpool 10s. per ton less)			
Staffordsh. Bars	,,	7 0 0	2
Sheet, Single	,,	8 15 0	,,
Double	,,	10 5 0	,,
Hoop	,,	8 5 0	,,
Rod, Round	,,	7 0 0	,,
Nail Rod, Square	,,	7 5 0	,,
IRON, Rails, in Wales, cash	,,	5 7 6	nett
,, ,, 6 months	,,	5 10 0	,,
Old, to cut up	,,	0 0 0	,,
Railway Chairs, in Wales	,,	4 0 0	,,
,, in Clyde	,,	3 15 0	,,
Pig No. 1, in Clyde	,,	2 6 0	,,
3-5ths No. 1 & 2-5ths No. 3.		2 9 0	,,
No. 1, in Wales	,,	3 10 0	,,
No. 1, in Tyne and Tees	,,	2 12 0	,,
Ditto, Forge	,,	9 0	,,
Staffordshire Forge Pig (all Mine), at the Works, L. W., nom.	,,	3 10 0	,,
Welsh Forge Pig (all Mine), at the Port	,,	3 5 0	,,
Acadian Pig, Charcoal	,,	7 10 0	,,
Scotch Pig, No. 1, in London	,,	0 0 0	,,

		£ s. d.	Dis. p. ct.
IRON, Swedish, Indian assortments	pr tn	11 5 0	2
Russian C C N D to arrive	,,	16 0 0	,,
STEEL, Swedish Keg, ham.	,,	15 10 0	2½
Ditto, rolled	,,	15 0 0	,,
Fagot		17 0 0	,,
SPELTER, on the spot	,,	17 15 0	nett
To arrive	,,	18 0 0	,,
Hard, remelted	,,	17 0 0	,,
ZINC, in sheets	,,	23 0 0	,,
COPPER, Tile, 14 to 28 lb.	,,	98 0 0	2
Tough Cake	,,	98 0 0	,,
Sheathing and Bolts	pr lb.	0 0 11	,,
Sheet	,,	0 0 11	,,
Bottoms	,,	0 0 11½	,,
Old	,,	0 0 9	,,
Yellow Metal	,,	0 0 9	,,
Burra	,,	97 0 0	,,
Russian do.	,,	0 0 0	,,
LEAD, British Pig	,,	20 15 0	,,
Spanish	,,	19 10 0	,,
W. B.	,,	21 0 0	,,
Sheet	,,	21 15 0	,,
TIN, English Block, nom.	,,	120 0 0	,,
Bar ,,	,,	121 0 0	,,
Refined ,,	,,	122 0 0	,,
Foreign Banca	,,	126 0 0	,,
Straits	,,	118 0 0	,,
TIN PLATES, Charcoal, IC	pr bx	1 9 0	*
Ditto IX	,,	1 15 0	,,
Coke, IC	,,	1 3 0	,,
Ditto IX	,,	1 9	*
Do. at Newport, 1s. pr bx less		—	,,
Do. at L'pool, 6d.	,,	—	
CANADA, Plates	pr tn	12 0 0	2
QUICKSILVER	pr bt	0	

LEAD in fair demand.

RAILS.—There has been a good many inquiries this week, and the market is somewhat firmer in consequence.

SCOTCH PIG IRON has been a little firmer this week, and a fair amount of business done. The market closed firm at 49s. 6d. cash for Mixed Nos. Warrants f.o.b. in Glasgow.

SPELTER continues unaltered, and but little doing in it at £17 15s. on the spot.

COPPER in moderate request, at the reduction reported last week.

LEAD tolerably firm.

TIN.—English in fair demand. Banca cannot be had here under £126, while the price in Holland is much higher. Not much doing in Straits which is quoted £118.

TIN PLATES in good demand.

March 13th, 1862. MOATE AND CO., 65, Old Broad-street, London.

PRICES CURRENT OF TIMBER.

Per load—	1861. £	s.	£	s.	1862. £	s.	£	s.
Teak	15	10	17	0	15	0	16	0
Quebec, red pine	3	10	4	10	3	5	4	0
yellow pine	3	0	4	0	3	0	3	15
St. John, N.B., yel.	5	0	5	10	5	0	5	10
Quebec, oak, white	5	0	5	10	5	0	5	10
birch	3	10	4	0	4	10	0	0
Memel	0	0	0	0	0	0	0	0
elm	3	10	4	15	3	10	4	15
Dantzic, oak	3	10	6	0	3	10	6	0
fir	2	15	3	10	3	0	4	0
Memel, fir	3	10	4	0	3	10	4	0
Riga	3	5	3	10	3	10	3	15
Swedish	2	15	3	0	2	15	3	0
Masts, Queb. rd pine	5	0	6	0	5	0	6	0
yl. pine	5	0	6	0	5	0	6	0
rd pine	0	0	0	0	0	0	0	0
Lathwood, Dantz, fm	6	0	6	10	6	0	7	0
St. Peters.	8	0	8	10	9	0	9	10
Deals, per C., 12 ft. by 3 by 9 in.								
Quebec, wht. spruce	13	0	18	0	15	0	19	0
St. John, wht. spruce	13	0	16	0	15	0	17	10

Per load—	1861. £	s.	£	s.	1862. £	s.	£	s.
Yel. pine, per reduced C.								
Canada, 1st quality	17	0	18	10	17	10	19	0
2nd do	12	0	12	10	12	0	13	0
Archangel, yellow	13	0	13	10	14	0	15	0
St. Petersbg. yel.	12	0	12	10	12	10	13	10
Finland	9	0	10	0	9	10	10	10
Memel	10	0	15	0	10	0	15	0
Gothenburg, yel.	10	0	11	10	10	0	12	1
white	9	10	10	0	9	10	11	0
Gefle, yellow	10	0	11	0	11	0	12	10
Soderhamn	10	0	10	10	11	0	12	10
Christiania, per C 12 ft. by 3 by 9 in. yellow	22	0	25	0	22	0	24	0
Deck plank, Dntz per 40 ft. 3 in.	0	14	1	4	0	14	1	4
Staves, per standard M								
Quebec, pipe	70	0	75	0	80	0	85	0
puncheon	16	0	18	0	16	0	15	0
Baltic, crown pipe	160	0	170	0	170	0	180	

SCOTCH PIG IRON REPORT.

		s.	d.	
No. 1	Gartsherrie	55	3	f.o.b Glasgow.
,, 1	G.M.B.	49	0	,, do.
,, 3	Do.	48	0	,, do.
M. Nos.	Do.	48	6	,, do.

WARRANTS.

		s.	d.	
3-5ths No. 1 and 2-5ths ,, 3 G.M.B.	Cash prompt	49	3	per ton.
	1 mo. open	49	6	do.
	2 mos. ,,	49	9	do.
	3 ,, ,,	50	0	do.

MANUFACTURED IRON.

	£	s.	d.	
Bars, Govan	7	0	0	
,, Common	6	17	6	
Drumpeller, Common	6	17	6	
Do. Best	7	17	6	
Plates and Sheets	9	0	0	to £10.
Rails	7	5	0	
Pipes	4	15	0	
Chairs	3	10	0	

GLASGOW, 12th March, 1862.

The market, as regards speculation, is almost lifeless. The shipping demand is good, and promises to continue so throughout the spring months. The home demand is slack both among malleable iron makers and founders. These are not quite so busy as they were at this time last year.

Exports last week were 9,042 tons, against 7,117 tons in the corresponding week last year. SHAW, THOMSON, AND MOORE, Metal Brokers.

ENAMELLED TABLETS.—The Patent Glass Enamel Company, of Birmingham, represented by Messrs. James Hunt and Co., of 36, High Holborn, are producing great numbers of enamelled tablets, chiefly lettered signs, in which the letters are burnt on in the most indestructible materials. The glaze resists a considerable concussion, and is in no danger of cracking with ordinary care. A great improvement has been lately made by the Glass Enamel Company in fixing gold upon the enamelled surfaces, so that gilt letters may be produced at will.

THE EXHIBITION.—The Great Western and Vale of Neath Railways will exhibit five or six broad gauge locomotives in the approaching Exhibition. Locomotives will soon arrive, also, from Prussia, intended for exhibition. All these engines are to be drawn through the streets to South Kensington, by Bray's traction engines. A block of Krupp's steel, weighing upwards of 30 tons, is also to be taken to South Kensington by the same means. Among the heavy weights lately moved by one of these engines was a steam cylinder weighing nearly 21 tons, being one of a pair made by Messrs. Penn and Son for a pair of 1,000-horse engines for the Spanish Government. During a la trial, with a heavy load over swampy ground, one of Bray's engines exerted a measured tractive force of 9,000 lb., the wheels sinking but two or three inches into the soft ground