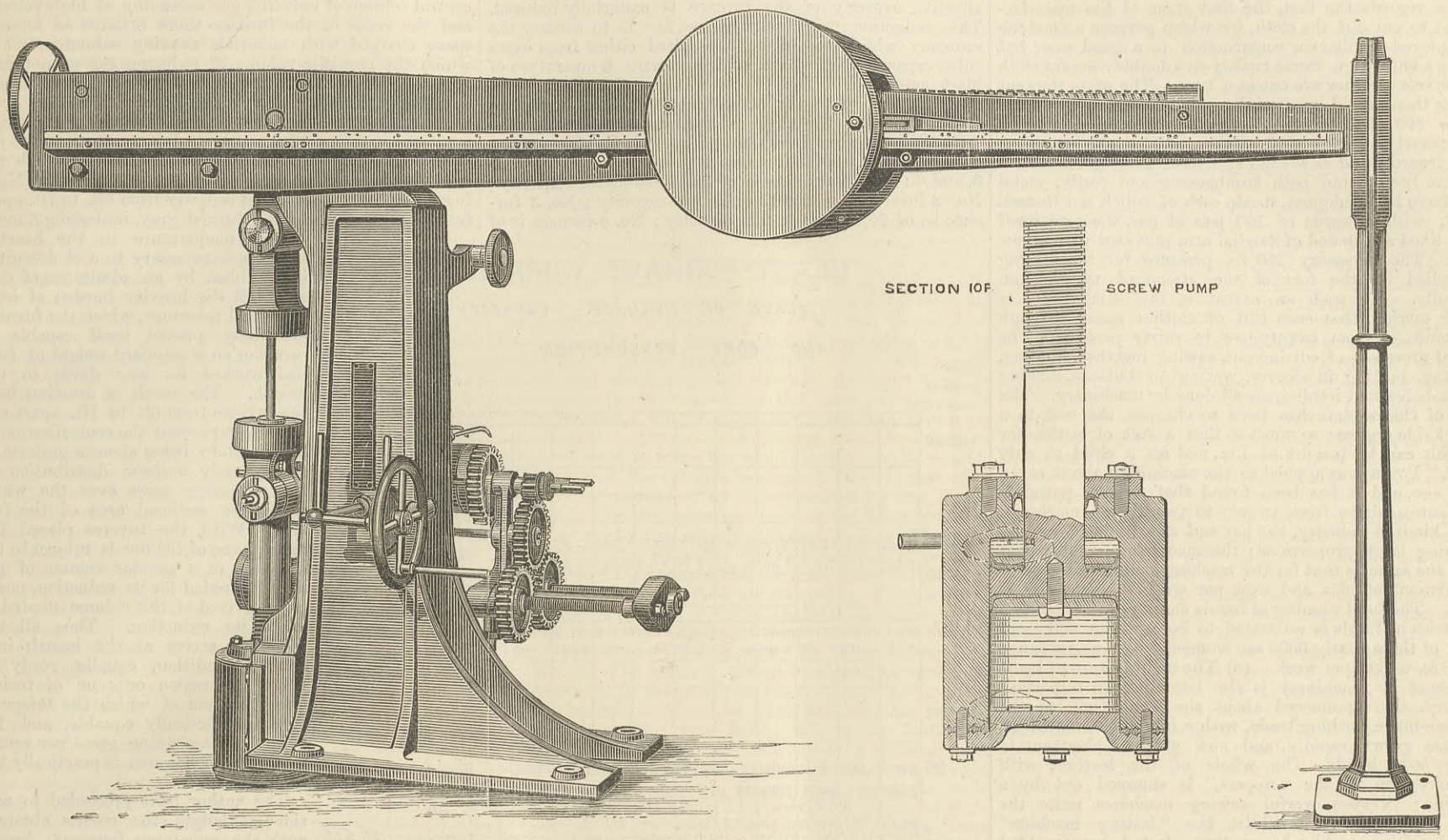
THF INSTITUTION OF MECHANICAL ENGINEERS AT LEEDS.

In accordance with the programme which we published last week, the summer meeting of the Institution of Mechanical Engineers commenced on Tuesday, with a reception by the Mayor—Mr. George Tatham—of Leeds in the Civil Court of the Town Hall. After an appropriate address by Mr. Tatham,

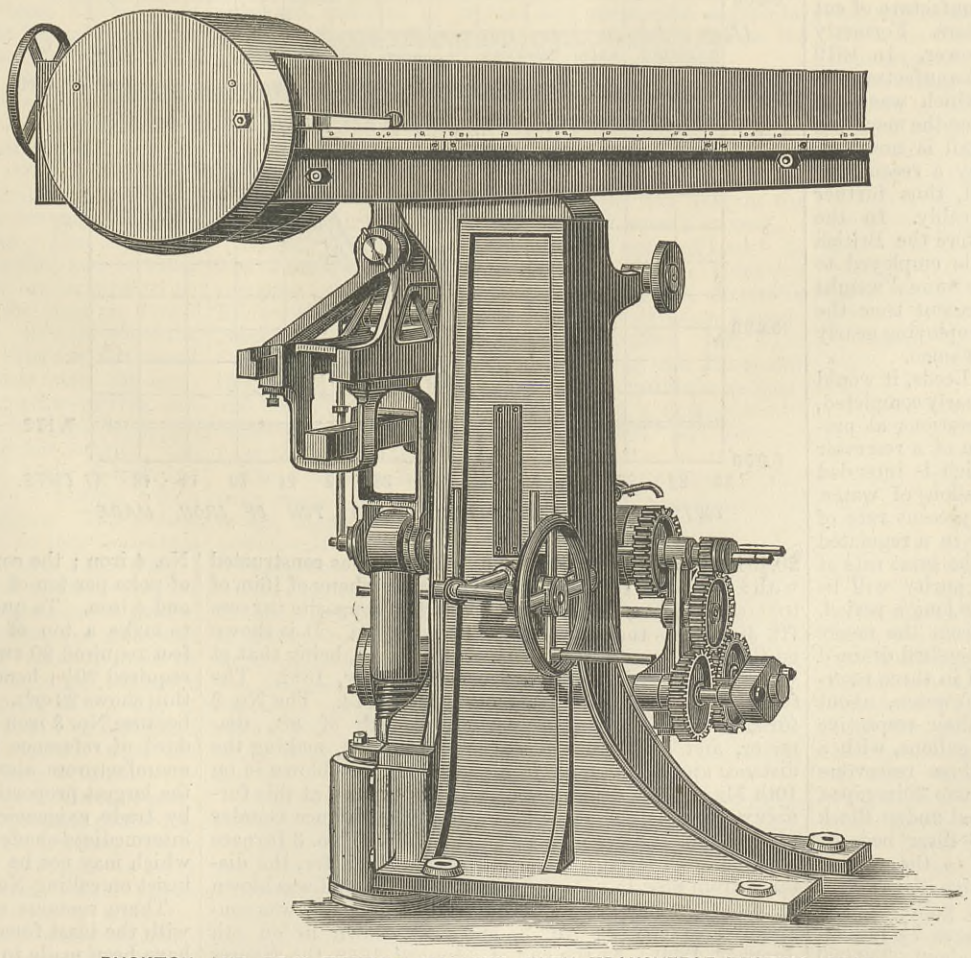
The President, Mr. Percy G. B. Westmacott, of the firm of Sir William Armstrong and Co., of Elswick, Northumberland, acknowledged the hearty welcome given to the Institution by the chief magistrate. He then spoke of the eminent engineers of past days in Leeds, among the successors of whom they now met. He paid a tribute of respect to the memory of the late Mr. W. Menelaus and Mr. C. P. Stewart, after which he spoke of the importance of a nation or a community applying its inventive faculties to the moving of materials for useful purposes with the least amount of manual labour and waste. To extend and cheapen transport by land and by water was, in fact, to be in the van of all real work of substantial progress, wealth, and civilisation. In the marvellous and gigantic structures of the East there was an enormous waste of manual power. They served no good or useful purpose for mankind, and stood only as monuments of man's pride and self-glorification. We might feel pride in the vast strides which science, art, and engineering had made in our own time, but posterity would assuredly lay its finger upon the great blot of waste and stigmatise our age as the black age, which had spoilt by careless, unnecessary, and selfish, inexcusable emissions of smoke and noxious gases many a noble town and many a lovely spot on earth. He said no really good invention was ever completely thrown aside, even though it might be superseded by some other invention. For instance, candles had not interfered with the use and progress of the oil lamp; gas had not snuffed out candles; and he did not agree with those who believed that electricity would totally supersede gas. As to the means of transport across land, it might at first sight seem singular that railways, lessening as they had done to an enormous extent the cost of land carriage in comparison with other traffic, had neither done away with horses and carts nor drained canals of their freights. He told how on the Aire and Calder Navigation, which terminates at Goole, a boat containing 30 tons of coal is by a hydraulic hoist lifted bodily out of the water and its contents are directly upset into the larger river craft; and, as this system is being further developed for boats of 150 tons, the President proceeded to ask, might there not be in this the precursor of the time when ocean-going steamers would without loss of time, on arriving in port, be lifted bodily out of the water and then scuttled of their contents right and left into warehouses at a rate and with a saving of labour which would far exceed unything hitherto attempted? The extraordinary results from a concentration of work to the fullest extent upon a limited area had not always been properly recognised by dock companies. It had frequently happened, but more so abroad than on our own coast, that where a pressure due to an increase of trade had come upon a dock, it had been met by enlarging the dock area and lengthening the quay space at a great cost, instead of first making the best use of mechanical arrangements. In conclusion, the President pointed out the importance of sufficient and constantly increasing precautions to protect this country's trade, and of providing every means for moving war materials in times of difficulty with the least amount of manual labour.

A vote of thanks to the President for his address was passed on the motion of Mr. Windsor Richarde, srconded by Mr. Williams, of Middlesbrough.

A paper was then read by Mr. A. H. Meysey Thompson



SINGLE LEVER TESTING MACHINE, BY MESSRS. J. BUCKTON AND CO., LEEDS.—(*For description see page* 117.



BUCKTON AND CO.'S TESTING MACHINE, WITH TRANSVERSE TESTING GEAR.

On the History of Engineering in Leeds.

Mr. Meysey-Thompson began by pointing out that the connection of Leeds with engineering dates from a very early period. As early as the commencement of the sixteenth century we find Bishop Tonstall asserting, at the time of Henry VIII.'s visit to Yorkshire, that this district was the richest he found in all his travels through Europe; there being within ten miles of Hazlewood, *inter alia*, "120 rivers and brooks, whereof 5 be navigable; 76 water mills; 25 coal mines which yield abundance of fuel for the whole country; 3 forges for the making of iron, &c." Leeds, however, must have given employment to the civil engineer long previous to this date, and of this fact the author gave several examples. Mechanical engineering, however, appears to have made but little progress prior to the commencement of the present century. The necessary machinery for the various mills in the district, whether driven by wind or water power, was of a very simple character, and the appliances for colliery working, or for the smelting and working of iron, were of a very primitive description. It was about a hundred years ago that improvements in the steam engine gave an impetus to mechanical engineering throughout the country, and the genius of Matthew Murray soon enabled the Leeds district to take a prominent place in this industry. The author gave many interesting particulars concerning Murray's work which we regret we have not space to refer to here. Murray commenced his career in Leeds at the flax mill of John Marshall, about the year 1789, at a time when the manufacture of flax by machinery was just commencing, and by the improvements which he introduced into the machinery, he gave to the flax trade of the district a start which it has never lost. Perhaps his most important inventions in this class of machinery were the hackling machine—which procured him the prize of the gold medal of the Society of Arts—and his machine for wet flax spinning by means of sponge weights, which proved of the greatest practical value. Murray continued in Messrs. Marshall's service up to the year 1795, when, realising the great want there existed for trained mechanics and organised works for the better manufacture of improved flax machinery, he secured the co-operation of Fenton and Wood, and started—in the works known as the Round Foundry, and now in the occupation of Messrs. Smith, Beacock, and Tannett—the well known firm of Fenton, Murray, and Wood, afterwards Fenton, Murray, and Jackson. Two engines of his make, one of 50 the other of 16-horse power, are still driving machinery at Messrs. Titley Tatham and Walkers, Water Hall Mills, Holbeck. For one of his engines, sent to Russia, he received a gold medal from the Emperor. Whether this medal was the only payment received for the engine, history does not state. Mr. Thompson explained at some length Murray's connection with Blenkinsop, and his part in introducing locomotives. Coming down to more recent times, Mr. Thompson gave facts which may be thus summarised:—In the year 1826 mechanical engineering in Leeds comprised: (1) Textile machinery; (2) locomotives; (3) fixed engines; all of which were then made solely by the firm of Fenton, Murray, and Wood. By the year 1866 the tool trade of Leeds had grown to very large proportions, employing about 8000 men. About the year 1854 a new branch of machine making was introduced, owing to the outbreak of the Crimean War. Leeds has also sent out a great number of very powerful tools for turning, boring, and

rifling heavy ordnance. Locomotive engine building in Leeds has for the last fifty years held a prominent position, and of late it has received a further development by the introduction of tramway engines. Another branch of this manufacture, that of agricultural machinery, was commenced in 1860 with the introduction of the steam plough, and is now one of the most important industries of the town. There are certain industries of comparatively recent date, and to a certain extent peculiar to Leeds, and the author thought a short notice of them might be of interest to the members. The trades are as follows:—(1) Machine-made clothing; (2) machine-made hats and caps; (3) machine-made boots and shoes; (4) machine-made nails. (1) As regards the first, the first stage of the manufacture is to cut out the cloth, for which purpose a machine is employed similar in construction to a band saw, but having a knife edge. Some twenty-five double pieces of cloth laid on one another are cut at a time. The parts thus cut out are then united by sewing machines, running at from 700 to 800 stitches per minute, normal speed; though some travel as fast as 2000 stitches. The seams have next to be ironed; and as the old system of heating irons in a fire has been found both troublesome and costly, metal cases have been adopted, inside each of which is a Bunsen burner with upwards of 100 jets of gas, the case itself being fixed at the end of a radial arm provided with elbow joints. The necessary 250 lb. pressure for the ironing is applied by the foot of the attendant pressing on a treadle. To such an extent is the subdivision of labour carried, that each suit of clothes passes through the hands of from twenty-five to thirty persons. The several processes of cutting-out, sewing together, binding, braiding, putting in sleeves, sewing on buttons, making button-holes, and ironing, are all done by machinery. The effect of this system has been to cheapen the cost to a remarkable degree; so much so that a suit of clothes for an adult can be bought at 13s., and for a child at only 2s. 9d. Power was applied to the machinery about seven years ago, and it has been found that 1-horse power is sufficient to drive from twenty to twenty-five machines. (2) A kindred industry, the hat and cap trade, is rapidly assuming large proportions; the machinery employed is much the same as that for the machine-made clothing, and the turn-out of hats and caps per week is about 70,000 dozen. The total number of hands employed in these two industries in Leeds is estimated to be between 6000 and 7000; of these nearly 5000 are women, whose wages range from 12s. to 30s. per week. (3) The manufacture of boots and shoes by machinery is also becoming an important industry. It commenced about the same time as the machine-made clothing trade, with a few simple machines, but has grown rapidly, and now gives employment to nearly 5000 hands. The whole of the leather, with the exception of the "uppers," is stamped out by a machine. Very powerful sewing machines unite the parts thus cut out; whilst the "lasting machine" and "finishing machine," recently perfected, have enabled manual labour to be still further dispensed with. Each boot passes through the hands of from six to twelve persons, and so rapid can the different processes be performed that a boot can now be turned out complete in about half-an-hour. From one two million pairs of boots are annually produced by the above processes in Leeds, and so cheap have they become that a pair of strong workman's boots can be bought retail for 6s. The manufacture of cut nails has made most rapid strides of late years. Formerly nails were made in presses by manual power. In 1819 steam was first applied in Leeds to this manufacture by Messrs. Roberts, who cut a ton a week, which was then regarded as a large quantity. Since that time the machines have been wonderfully improved. A nail is now cut, headed, and pointed at one stroke; and by a recent improvement a self-acting feed is provided, thus further diminishing manual labour very considerably. In the year 1858 Mr. Kitson, in a paper read before the British Association, estimated the number of hands employed to be 188, of whom 100 were women; and the annual weight of nails made to be 3452 tons. At the present time the annual make of nails is about 15,000 tons, employing nearly 600 hands, of whom about two-thirds are women.

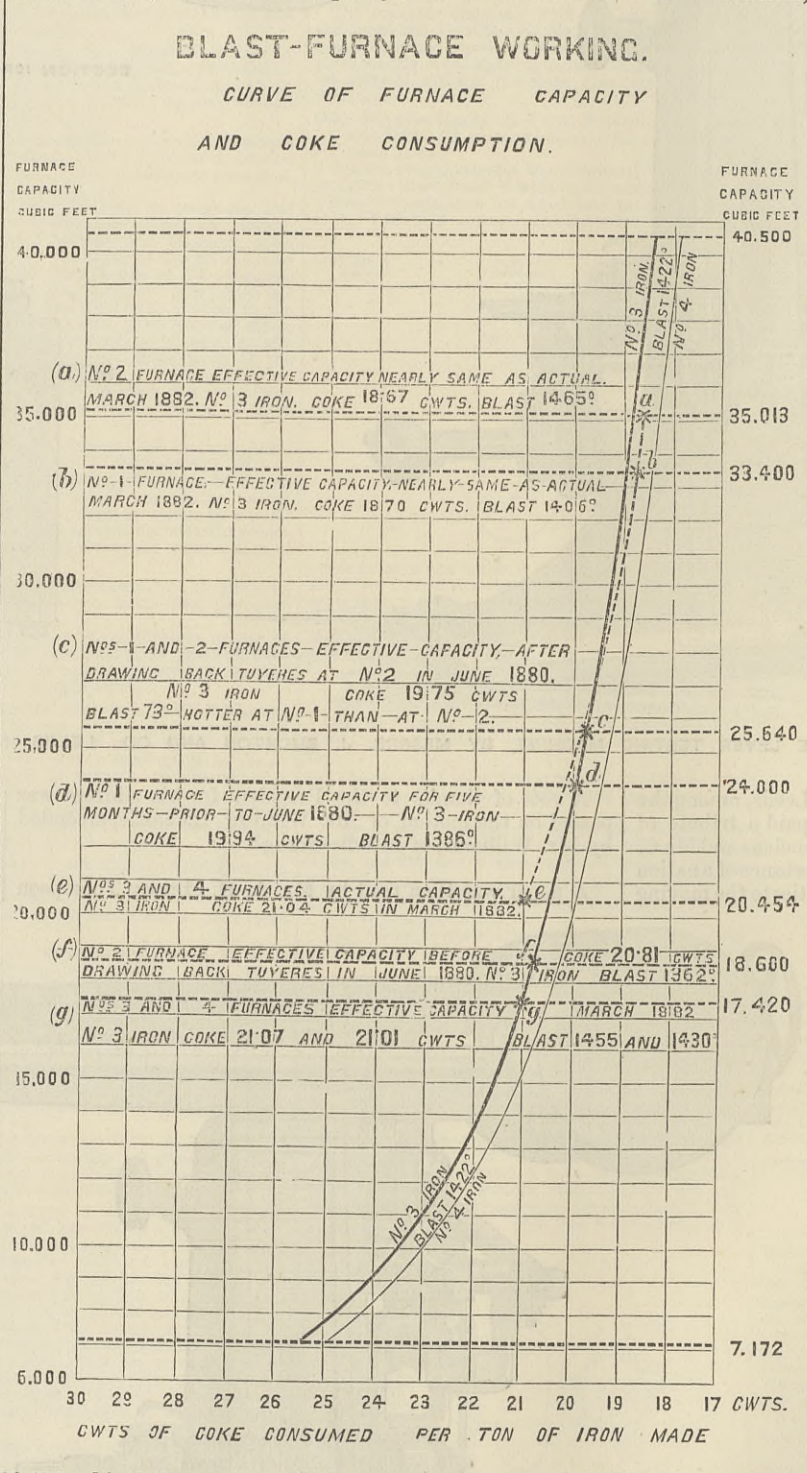
In connection with the engineering of Leeds, it would be interesting to mention the works, now nearly completed, for supplying Leeds with water. The operations at present in progress consist of the construction of a reservoir at Eccup, about five miles from Leeds, which is intended to contain when completed 1400 million gallons of water. This is about six months' storage at the present rate of consumption; and as the water will enter in a regulated quantity at one end, and be drawn out at the same rate at the other end, it is anticipated that the purity will be much increased by slow deposition during so long a period. The water is in the first place obtained from the moors about 20 miles from Leeds, the area of watershed drained being 25,000 acres. This water is collected in three reservoirs, at Lindley Wood, Swinsty, and Fewston, about 13 miles from Leeds as the crow flies; their respective capacities being 750, 960, and 870 million gallons, with a total water acreage of 426 acres. From these reservoirs the water will gravitate to Eccup, through two 30in. pipes, and from Eccup it will flow through a tunnel under Black Moor, and thence by a 40in. pipe to the filter beds at Weetwood, whence it will be distributed to the several parts of the town. The grand total capacity of the four reservoirs mentioned will be 3980 million gallons. The present daily consumption of water averages 7½ million gallons, the population supplied being about 300,000 persons. It may be stated that the present charge for water, collected, stored, transmitted, filtered, and delivered to the consumers in Leeds, is 1½d. per ton.

No discussion took place on Mr. Thompson's paper, because, as was explained by the President, it was historical. A very long paper was then read by Mr. Chas. Cochrane,

On the Working of Blast Furnaces of Large Size at High Temperatures, with Special Reference to the Position of the Tuyeres.

This paper mainly deait with the effects produced by altering the position of the tuyeres. The author held that in all the discussions which have taken place, it would appear that two important elements in the successful working of a blast furnace have been overlooked or altogether ignored, namely, the size of the hearth, and the overhang of the tuyeres, or, as it may be put by preference, the distance of the tuyeres apart across the hearth. The experience gained by the author during the past eight years, and his special observations during the last two of these, point to the fact that in the employment of high temperatures of blast the distance of the tuyeres apart from nose to nose is of great consequence; and that, *cæteris paribus*, if they approach too close together, the effective capacity of the furnace is materially reduced. This reduction may easily go so far as to destroy the economy which should have resulted either from extra cubic capacity of furnace, or from extra temperature of blast employed. The effective capacity, spoken of in contradistinction to the actual capacity, is estimated in accordance with the curve of furnace capacity and coke consumption given herewith. The writer's observations have extended to four furnaces numbered respectively 1, 2, 3, and 4:—No. 1 furnace is of 33,400 cubic feet capacity; No. 2 furnace is of 35,013 cubic feet capacity; No. 3 furnace is of 20,454 cubic feet capacity; No. 4 furnace is of 20,454 cubic feet capacity. No. 1 furnace was constructed with a hearth of 10ft. diameter, and an overhang of 16in. of tuyeres; making the distance apart of opposite tuyeres 7ft. 4in. across the hearth from nose to nose. It is shown on the sketch with this distance 8ft. apart, being that at which the tuyeres were placed in February, 1882. The furnace was blown in on 18th March, 1874. The No. 2 furnace was constructed with a hearth of 8ft. diameter, and an overhang of 12in. of tuyeres, making the distance apart from nose to nose 6ft. It was blown in on 10th May, 1876. In June, 1880, the tuyeres at this furnace were each drawn back 8in., making the distance asunder of the tuyeres, from nose to nose, 7ft. 4in. No. 3 furnace was constructed with a hearth of 8ft. diameter, the distance from nose to nose of tuyeres being 6ft., and was blown in on 27th November, 1876. No. 4 furnace was constructed exactly as No. 3, and was blown in on 8th January, 1880. At the end of January, 1882, the tuyeres were drawn back to a distance of 7ft. apart.; with what excellent results we shall presently see.

Commencing with No. 4 furnace—the tuyeres of which, till the end of January, 1882, had been only 6ft. apart, and during the months of February and March, 1882, were separated to a distance of 7ft. apart—the following were the remarkable results obtained:—The make, which had been limited to an average of 483 tons per week, over the preceding months of November, December, and January, rose in March to 599 tons per week; whilst the gross consumption of coke was only increased by 27 tons, or from 603 up to 630 tons per week. The tuyere area was unaltered, being 141 square inch total. The temperature of escaping gases at the tunnel head in March was 100 deg. Fah. less than before the withdrawal of the tuyeres, viz., 617 deg., whereas previously it had been 717 deg.; whilst the temperature of blast was increased by 109 deg., being 1321 deg. in January and 1430 deg. in March. The author then proceeded to consider why this gain was obtained. He held that the result of the tuyeres protruding too far into the furnace is that a larger volume of heated and expanded gases per square foot of transverse sectional area must necessarily be delivered up the centre of the hearth than at its circumference. Between the central column of reducing gas ascending at high velocity and the walls of the furnace there remains an annular space charged with materials needing reduction, but to which the requisite volume of reducing gas cannot gain access. Thus we have the explanation of a large furnace doing only the duty of a smaller one. This arises from the circumstance that the hearth, or rather the arrangement of the tuyeres, has not been duly proportioned to the cubical capacity of the furnace. The day on which the work commenced of drawing back the tuyeres at No. 4 furnace of 20,454 cubic feet capacity from 6ft. to 7ft. apart from nose to nose, the slag turned gray, indicating a much higher temperature in the hearth; and it was necessary to cool down the heated blast by an admixture of cold air, until the heavier burden of ironstone and limestone, which the furnace ultimately proved itself capable of carrying on a standard weight of fuel, had worked its way down to the hearth. The result of drawing back the tuyeres from 6ft. to 7ft. apart was in fact to prevent the centralisation of heat, and to bring about a uniform or more nearly uniform distribution of the ascending gases over the whole transverse sectional area of the furnace. With the tuyeres placed 7ft. apart, none of the ore is subject to the influence of a greater volume of gas than is needed for its reduction, nor is any deprived of the volume needed to effect its reduction. Thus all the materials arrive at the hearth in a similar condition, equally ready to enter the region or zone of fusion, over the area of which the temperature is practically equable, and the volume of ascending gases per square foot of sectional area is practically the same.



The author next proceeded to consider at length the results obtained with the remaining furnaces. Seeing that reference has just been made again to the capacity-curve given, it will be well to explain what is the precise meaning of this curve. In 1870—"Proceedings," page 75, and plate 12—a curve was constructed by the author, giving the results of experience obtained at that date at the Ormesby Ironworks, with furnaces up to what was then the largest actual capacity in use at those works, namely, 20,624 cubic feet. This curve was extended to show what might probably be the further economy to be obtained by increased capacity up to 40,500 cubic feet. It is indicated by the thin line, which was adjusted to No. 4 quality of iron, being the standard quality to which at that time it was thought proper to refer the working of blast furnaces. The horizontal lines in the diagram are divided into units of cwts. of coke consumed per ton of iron, whilst the vertical lines are divided into units of 1000 cubic feet of furnace capacity, commencing with 6000 cubic feet. The thick line represents the curve of manufacture under identically similar circumstances to those described in 1870, but adjusted to the production of No. 3 iron instead of No. 4 iron; the correction being made at the rate of ½ cwt. of coke per ton of iron for the difference between Nos. 3 and 4 iron. To quote a single example: Whereas in 1870 to make a ton of No. 4 iron in a furnace of 20,624 cubic feet required 20 cwt. of coke, to make No. 3 would have required 20½; hence the thick line shows 20½, whilst the thin shows 20 cwt. This change has been rendered necessary because No. 3 iron has gradually become the current standard of reference in the district, as the quality at which manufacturers aim, and of which they desire to produce the largest proportion; with the further condition, imposed by trade exigencies, that the No. 3 shall include every intermediate shade of grayer grade, from No. 3 up to No. 1, which may not be gray enough for the manufacturers to insist on calling No. 1.

There remains one point to be dealt with in connection with the blast furnace, in order to clear up allusions which have been made to the distribution of temperature in the hearth. It might be thought that, in the plane of the tuyeres, the heat is greater, or not less, in the centre of the hearth than at a short distance from the nose of the tuyere; but this is not so. The author believes the observations he has made on this point will be worthy of record. On thrusting a round bar of 1in. diameter into the hearth of a furnace, it will be found that if the temperature of the blast be nearly red hot—say, 1200 deg. to 1250 deg.—the bar will become actually red hot, as seen by daylight, at a distance of 2in. from the nose of the tuyere; and that the temperature will rapidly rise until it

attains the highest degree at 14in. from the nose of the tuyere. This temperature is so intense that in the Cleveland district 30 seconds exposure will nearly suffice to sever the bar at this point of maximum temperature, from which there is a steady fall through diminishing degrees of temperature till dull red is reached at a variable distance of 8in. or 10in. from the centre of the hearth. The curve is as shown in the engraving, page 116.

This paper evoked a long discussion, which was adjourned to Wednesday morning, and which we shall give in another impression. In the afternoon several works which we have described in previous impressions were visited.

On Wednesday morning the proceedings commenced with a renewed discussion on Mr. Cochrane's paper, and then a paper was read by Mr. Henry Davey "On Mining Machinery." This we shall give in another impression. The last paper read on Wednesday was by Mr. J. Hartley Wicksteed, of Leeds,

On a Single-lever Testing Machine.

The writer did not propose to contribute a critical paper upon various makes of testing machines, but merely to give an accurate description of an individual machine; for which purpose, however, it would be useful to sketch beforehand some of the general considerations which have influenced the design. Every dead-weight testing machine is in some form or other a weighing apparatus, and that which it weighs is the amount of resistance offered by the test sample to an attempt to distort it. The lines upon which a testing machine may be constructed are as various as the different well-known types of weighing machines; yet there are one or two essential differences between the conditions under which a dead load may be accurately weighed, and those under which the strains upon a test sample can be ascertained. In the first place, a ponderable article counteracts the weights simply by its own gravity, leaving the weigh beam free to oscillate until the balance is found; whereas a test sample, while having one end attached to the weigh beam, must have the other end firmly held by an independent support. Hence care must be taken that no unrecorded strain passes through the sample, such as might be due to shocks which with a free load would expend themselves in oscillations. Also, since the weigh-beam in the case of a testing machine is not, as in a weighing machine, free to be adjusted into the horizontal line regardless of time, it is important that the balance be "just" in all positions of the beam throughout its range of deviation from the horizontal line. The limits of deviation should be small; and as the sample is subject to extension during the testing process, provision must be made for moving the position of the independent support. For testing moderate strains the writer prefers the steel-yard in the form of a single lever to any other form of weighing apparatus; and this is the type adopted in the 50-ton testing machine about to be described, and of which we give illustrations on page 115. The lower figure shows the machine with the deflecting or transverse strength testing apparatus attached, and the sliding weight in the position of equilibrium with the index at zero. The upper figure shows the machine with this apparatus removed and with a sample for tensile strength in the holders. This shows the same weight travelled out into a position where it balances the pull of 28 tons. The novelties introduced into this steel-yard are the travelling of the weight beyond the fulcrum, on to the short end of the lever, till a point is reached where the long end is balanced; the arrangement of a non-pendulous travelling weight, of which the centre of gravity moves along a centre line drawn through the point of support and the point of attachment of the sample; and the indifferent equilibrium of the whole, which is attained by arranging the weight of the lever and all its attachments symmetrically above and below this centre line. The clips that hold a sample for tensile testing are parallel and serrated on their inner faces, and at the back are tapered to an incline of 1 in 6. At this angle the clips are found to give the necessary bite, but loosen the hold when the strain is removed. At the back of the clips are half-round pieces, made free to revolve in the cast steel clip-box; by this arrangement the clips are enabled to swivel, and so can adjust themselves to bite fairly across a sample even should it not be of truly rectangular section. The sample is similarly held by clips at its lower extremity; and the lower clip-box is attached to a bonnet, which screws on to the rod of a hydraulic piston. The section shows in detail the pulling cylinder. The long horizontal cylinder, shown at the back of the machine, with central piston-rod and pair of parallel horizontal screws connected to it by a crosshead, has the same arrangements in section as the pulling cylinder, but it is one-fifth the area, and five times the length of stroke. The annular space at the right-hand end of the horizontal cylinder communicates by a hydraulic pipe with the annular space at the top of the pulling cylinder, and the piston area at the left-hand end of the horizontal cylinder communicates with the piston area at the bottom of the pulling cylinder. By this arrangement the mechanical parts, as screws and gearing, are only called upon to act under a pressure of 10 tons, and no further friction, except water friction, comes into play in transmitting this into a 50-ton pressure upon the slower moving pulling piston. This piston has a vertical motion of 6in. in its cylinder to allow for extension in the sample. Besides this, the bonnet attached to the shackle can be screwed upon the piston rod over a range of 6in. to accommodate different lengths of samples. Water is forced into this cylinder either above or below the piston, by means of a smaller piston in a horizontal cylinder. This small piston is forced along its cylinder by means of twin screws, acting through a crosshead upon the piston rod, and driven through gearing actuated either by hand or by power. Thus a perfectly steady motion is obtained. The annular area in front of the small piston bears the same ratio to the annular area on the top of the large one as exists between the whole areas of the two pistons. There is, therefore, solid water from piston to piston on both sides, and the large piston responds at one-fifth the speed to every motion made by the small one. It will be understood that the hydraulic piston through its attachments puts the required pull upon the test sample, and takes up the necessary extension; the other end of the sample is carried by attachments from the steel yard, and, as the pull at each end of the sample is necessarily equal and opposite, it follows that the weighing apparatus balances and indicates the precise force with which the hydraulic apparatus is pulling. The lever for thus weighing the pull has a 1-ton weight upon it; this weight lies over the lever like a saddle, and will travel from end to end of it. When the weight is at the short end of the lever it balances the long end; and the adjustable index finger, carried on the weight, is made to coincide with zero on the fixed scale when the weight has reached a position which puts the lever and all its attachments into equipoise. The knife-edged centres being 3in. apart, it follows that, after zero has been established at the balancing point, every 3in. that the 1-ton weight is traversed along the lever, as indicated on the scale, throws one ton of unbalanced load upon the test sample. The weight travels 150in., or fifty times the distance between the centres, so that at the end of its travel it will balance a pull of 50 tons. Every 3in. on the fixed scale is divided into tenths and hundredths, so that with the index finger on the travelling weight the load can be read off in tons to two decimal places. There is moreover upon the index finger a small vernier scale, which again subdivides the hundredths on the fixed scale into ten; and by means of this vernier the third decimal place of tons, equal to $2\frac{1}{4}$ lb., can be read with the greatest facility. Thus, without the use of any small auxiliary weights, the most accurate results can be ascertained by the mere position of the heavy travelling weight upon the lever, and errors are reduced to a minimum; for there need be no more margin of error in a one-ton weight than in a 56 lb. weight; and here, with the extreme leverage of 50 to 1, that error can only be multiplied by 50, instead of by any higher multiplier. As the moving weight is not hanging freely, but is carried by four wheels, it is kept rigidly in line with the lever; and as its centre of gravity coincides with the centre line of the lever, it follows that, however fast it is propelled, or however suddenly its motion is arrested, the momentum can have no effect whatever upon the oscillations of the lever. Motion is imparted to the travelling weight by a screw passing along the lever between the side plates. The screw is driven by a small countershaft, bracketed out from the side of the lever, and the countershaft in its turn is driven by a belt from a pulley running in supports on the main body; but as the centre line through both spans of this belt lies in a vertical plane passing through the fulcrum of the lever, the pull upon the belt in no way affects the equilibrium of the lever. The belt is driven either by a hand wheel or from a lay shaft, as most convenient. The outer end of the lever oscillates in an opening through a vertical standard, in which it has a range of about 1 deg. above and 1 deg. below the horizontal line. In the bottom of the opening there is a thick block of wood, upon which the end of the lever falls, without undue jar, when the sample breaks. Throughout the whole of a test it is easy to keep the lever floating; for, owing to the low multiple of its power, its movement is slow. The aim is to avoid all vertical movement of the steelyard, and thus to prevent any unrecorded augmentation of pull upon the sample, such as would be due to the momentum of a moving steel-yard.

Of the discussion on this paper, which was adjourned until yesterday, we must speak in another impression.

Conversazione.

On Wednesday evening a *conversazione* was held in the Philosophical Hall, which was in every sense a success.

At 8.30 the chair was taken in the Lecture Theatre by Mr. James Kitson. Mr. Davey made some explanatory remarks on the machinery and models, and Professor Rücker then delivered a lecture "On the Dynamo-Electric Machine," which we shall publish hereafter Mr. T. R. Crampton then lectured "On Removing the Excavated Chalk from the Channel Tunnel" by his hydraulic method; and Mr. Fletcher, of Warrington, gave a demonstration of his discovery of "Flameless Combustion" and discourse "On Fuel Utilisation."

The Yorkshire Brush Electric Light and Power Company erected at the entrance porch and in several of the rooms, eight arc lamps of their ordinary 2000-candle power, and in the room known as the Industrial Museum, 18 Lane-Fox incandescent 20-candle power lamps. The whole electricity was supplied from a 16-light dynamo, installed 100 yards down Russell-street, and driven by one of Messrs. Fowler and Co.'s 8-horse power patent "Yorkshire engines," with compound cylinders; first cylinder 5in. diameter, with 125 lb. steam; second cylinder 9in. diameter, using the steam down to 7 lb. above atmosphere; stroke 12in., making 180 revolutions per minute. The lamps, dynamo, and engine were lent by Messrs. Fowler and Co.

In the Industrial Museum, among the more interesting exhibits were a pumping engine recorder and well gauge, contributed by Messrs. Hathorn, Davey, and Co. This recorder gives a chart of the working of the engine, so that variations in working, stoppages, and the quantity of water pumped for all times, are graphically recorded on a sheet of paper, which forms a check on the engine-driver. A self-registering ships' compass, contributed by Mr. Pickwell. By this invention the ordinary steering compass produces a diagram showing the exact steered course of the ship. The diagram is produced by a ray of either daylight or lamp-light passing through the compass card on to a prepared paper. A model of Parson's variable expansion gear. This gear is for obtaining a high degree of expansion by working the ordinary slide valve by the compound motion derived from two excentrics, one on the engine shaft and the other on a separate shaft driven at three times the speed by spur gearing. The range of expansion can be varied from one-eleventh to eleven-sixteenths of the stroke while running, automatically or otherwise.

In the Inner Vestibule was shown M. de Laval's centrifugal cream separator, contributed by Messrs. D. Auld and Co., which we have already fully described in our notice of the Reading Show. The original model of Blenkinsop's locomotive was contributed by Mr. Embleton; also a piece of the original cog rail, which has been presented to the Institution of Mechanical Engineers by Mr. Alexander Allen. This, it is claimed in Leeds, was the first commercially successful engine used on any railway. Four of these engines were made by Fenton, Murray, and Co., of Leeds. The Salamanca and Prince Regent were set to work August, 1812; the Lord Wellington and Marquis Wellington, 1813. These engines worked for about twenty years on the railway extending from Middleton Collieries to the town of Leeds, about $3\frac{1}{2}$ miles, with trains of 30 coal wagons. The well-known model locomotive, made by Murdoch in 1784, was contributed by his grandson, Mr. Murdoch.

In the Library was a microscopical exhibition of slides of micro-organisms of disease, by Mr. Crookes; the germs that have been identified with certain acute specific diseases. Bacilli found in swine fever; and in man, typhoid and tubercle (phthisis) diphtheria. The Bacilli of anthrax or Woolsorters' disease; also "fire-fly" electric gas lighter and Swan's 5-candle electric lamps, contributed by Mr. Reynolds. A model of Sir W. Armstrong's unarmoured cruiser was contributed by the President of the Institution of Mechanical Engineers, Mr. Westmacott. This is an unarmoured ship of war, carrying bow and stern guns of 10 in. calibre, 25 tons weight; six broadside 6in. guns; two 9-pounder guns; and four machine guns. The dimensions are, length over all, 290ft.; beam, 42ft.; draught, 18ft. 6in.; displacement, 2000 tons; indicated horse-power, 5500; speed, 17 knots an hour. The coal storage will enable the vessel to steam at full speed a distance of 1280 knots, or at half speed a distance of 8000 knots. The 25-ton guns are loaded and worked by hydraulic power, under cover of screens. The vessel has an underwater deck of steel from stem to stern, covering engines, magazines, &c. An example of high-speed multiple drilling, with a hole of small diameter through a long bore, was shown by Mr. T. R. Harding. A beautiful model of Messrs. Fowler and Baker's bridge to be erected across the Firth of Forth was also shown; 2 spans, each 1700ft.; 2 spans, each 675ft.; depth of main girders at piers, 330ft.; depth of main girders at centre, 50ft.; width of bridge at piers, 120ft.; width of bridge at centre, 27ft.; clear headway for navigation at high-water, 150ft.; deepest foundation below high-water, 90ft.; highest part of bridge above high-water, 354ft.; depth of water in centre of channel, 210ft.; weight of steel used in construction, 42,000 tons. This is a "continuous" girder to be distinguished from an "independent" girder, and the points of contrary flexure are about 600ft. from the piers. Close by were comparative diagrams of large span railway bridges and a diagram of ancient bridge, contributed by Mr. Davey, to illustrate the principle of the continuous girder, which is virtually composed of a suspended girder in the middle, supported by cantilevers from the piers. Models of hydraulic coal hoist and train boats as used upon the Aire and Calder navigation were contributed by Mr. Bartholomew. The hoist has a gross lifting power of 120 tons—load lifted, 42 tons; height of lift, 30ft.; shipping capacity, 150 tons per hour; working pressure, 850 lb. on the square inch. Train boats, capacity of each compartment, from 35 to 40 tons. These compartments can be either propelled or towed. When propelled, a train consists of ten compartments; they are steered by means of wire ropes and steam power; when towed they reach thirty in number. Dimensions of compartments, length, 19ft. 8in.; breadth, 15ft. $1\frac{1}{2}$in.; depth, 7ft. 7in. A model of a governing and reversing motion for marine and steam steering engines, was contributed by Mr. Davey. In this gear an independent motion is given to the valves, so as to cause the engine to respond to the independent motion. When applied to steam steering engines, the independent motion is that of the steering wheel, and when applied to marine engines the motion is that of a small subsidiary engine. A calculating machine was contributed by Dr. Thorpe.

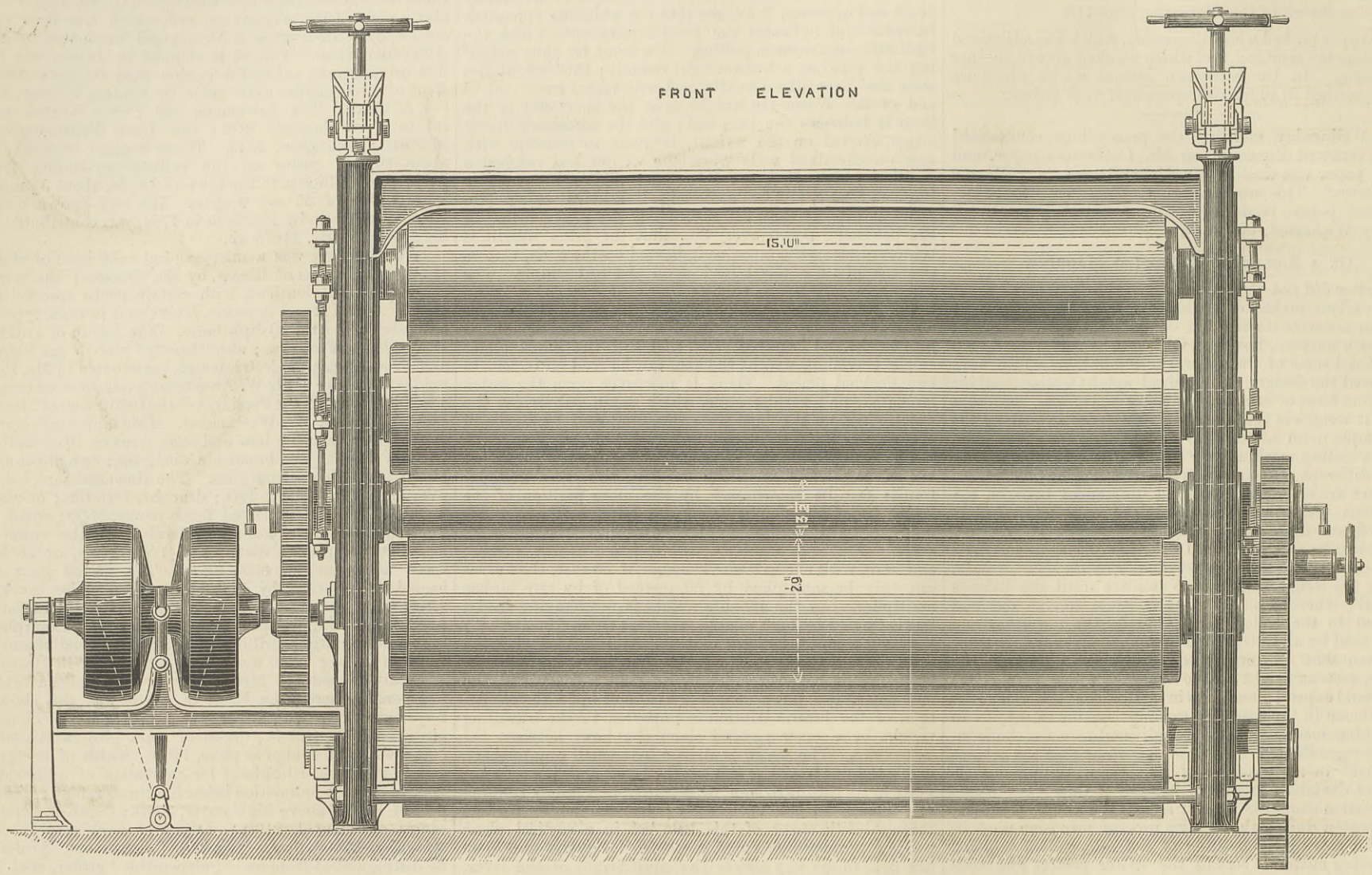
In the other rooms were to be seen illustrations of compound vibration and geometric tracery, by Mr. Teasdale; also photographs printed by the platinotype process; photographs of the compound locomotive engine "Experiment," by Mr. Webb, already illustrated in our columns; an observatory hive, with bees working under the influence of the electric light; also some other beehives, contributed by Mr. Daniel. A diagram of Joule's apparatus was contributed by Mr. Davey; a model of Cowper's regenerative fire-brick hot-blast stoves. These stoves are employed to utilise the gases from the top of a blast furnace, to heat the blast for the furnace; they give a temperature of 1500 deg. Fah.—equal to a full red heat. The stove is first heated by passing a large flame up the flame flue, and down through the numerous passages of the regenerator, which thereby becomes heated to a good red heat; then the gas is shut off, and the cold blast is introduced through the bottom of the regenerator, and in ascending becomes of a thorough red heat, and so passes to the blast furnace. Two stoves, each alternatively receiving and imparting heat, complete the system. A pyrometer was also contributed by Mr. Cowper. A copper ball is heated in the hot blast until it is of the same heat. It is then dropped into a pint of water, the temperature of which is thereby raised 1 deg. for every 50 deg. of heat in the ball. A model of coal wagon, with hopper bottom and patent catch, was contributed by Mr. Briggs. The catch is pendulous, held to its place by a weighted excentric; when the excentric is lifted the catch is set free. It is designed to supersede the use of cotter pins for securing bottom doors of wagons.

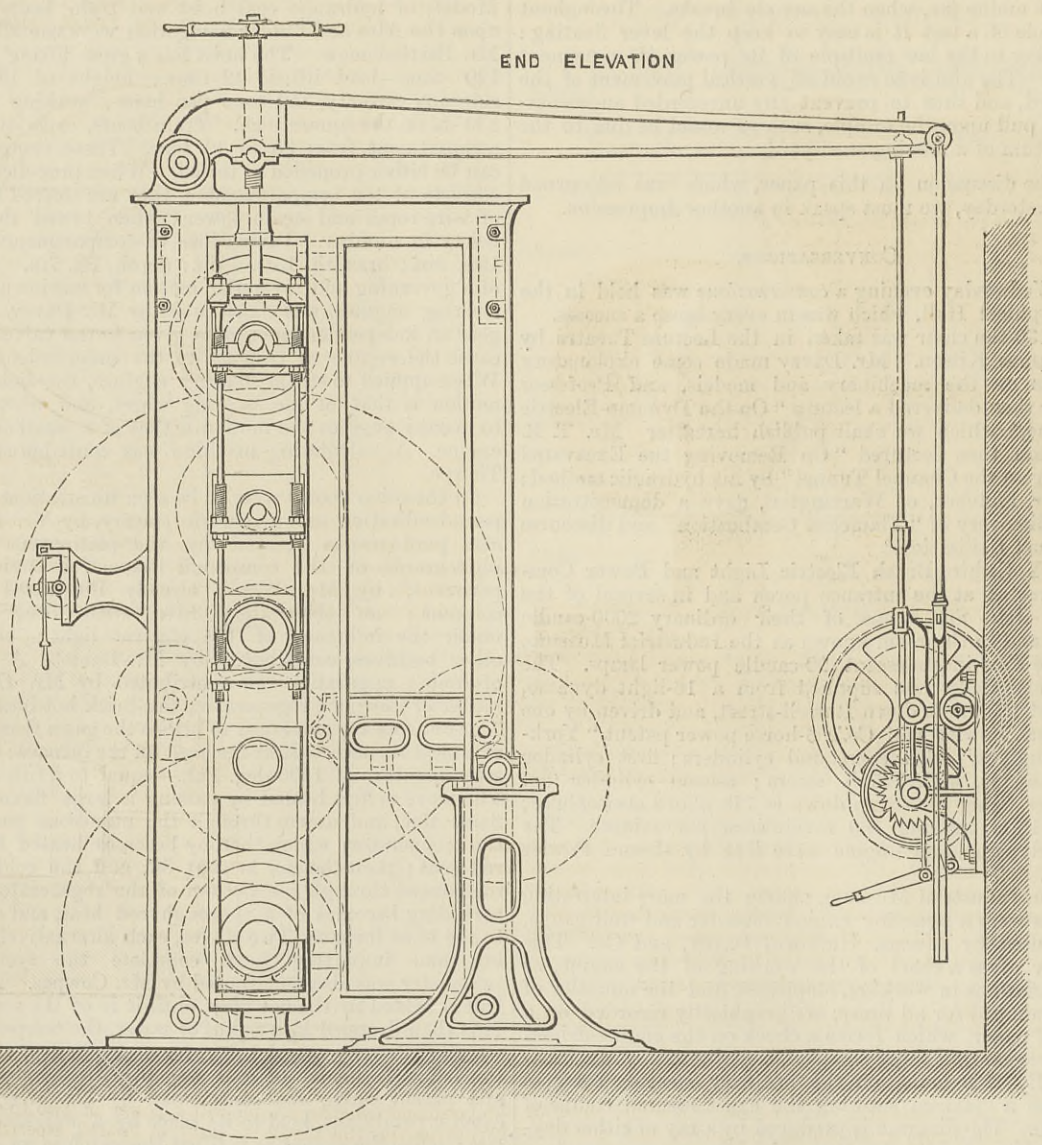
A working model of 250-horse power differential pumping engine, scale 1in. equal 1ft., was contributed by Mr. Davey.

The proceedings of Thursday and to-day we shall give in another impression.

FIVE-ROLLER CALENDER.

MESSRS. THOMSON AND SONS, DOUGLAS FOUNDRY, DUNDEE, ENGINEERS.





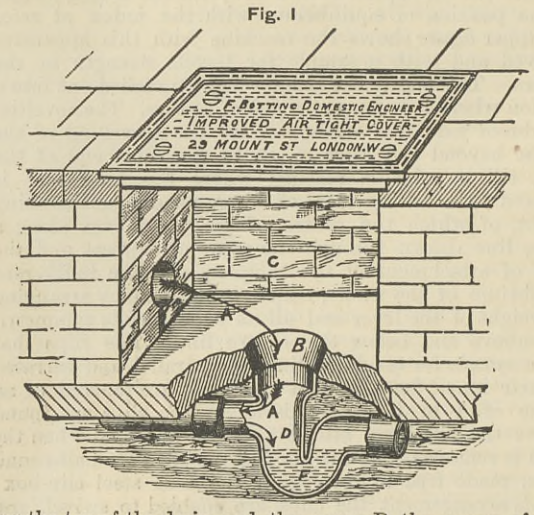
We illustrate this week an example of a five roller calender, having two paper and three iron rollers, the width of the paper on the rollers being 180in. This, we believe, is the widest calender that has yet been constructed. It is made for calendering, chesting, or glazing finish. The centre roller is steam heated, and a hoist motion is applied for raising the levers and the three upper rollers by belt motion. It is driven by two pulleys having an open and cross belt. The double friction clutch betwixt these pulleys allows the calender to be stopped or reversed at pleasure.

The gross weight of the machine is about 56 tons, and the total pressure on the lower journals is about 70 tons. The calender was designed and constructed by Messrs. Thomson, Son, and Co., Douglas Foundry, Dundee, for the well-known firm of Messrs. J. Pullar and Sons, proprietors of Pullar's Dye Works, Perth.

BOTTING'S AIR-TIGHT DRAIN AND MANHOLE COVERS.

The accompanying illustrations show an air-tight cover for drainage and other purposes, made by Mr. F. Botting, 29, Mount-street, Grosvenor-square. Air-tight covers are now very generally specified by sanitary engineers, and for this one the inventor claims the following advantages :—That it is perfectly air-tight; it can be removed and replaced without the aid of skilled labour; no key to get lost; no lock to get rusted or out of order, and having no hinges it can be taken away while any repairs are going on; no cement is needed to re-make joint; and that the joint will not set as the metal is not in contact. The hole at the side is a cold air inlet, the arrows A A show the course of the current

Fig. 1



along the top of the drain, and the arrow D the course of the sewage into the trap. B is a hole in the base of the pit for access to the trap. F is the intercepting trap. The overflow discharges into sewer—or in the case of isolated houses into the cesspool.

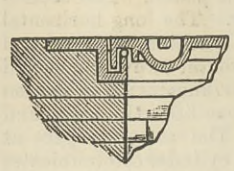


Fig. 2

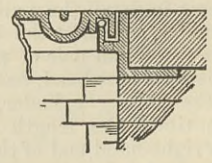


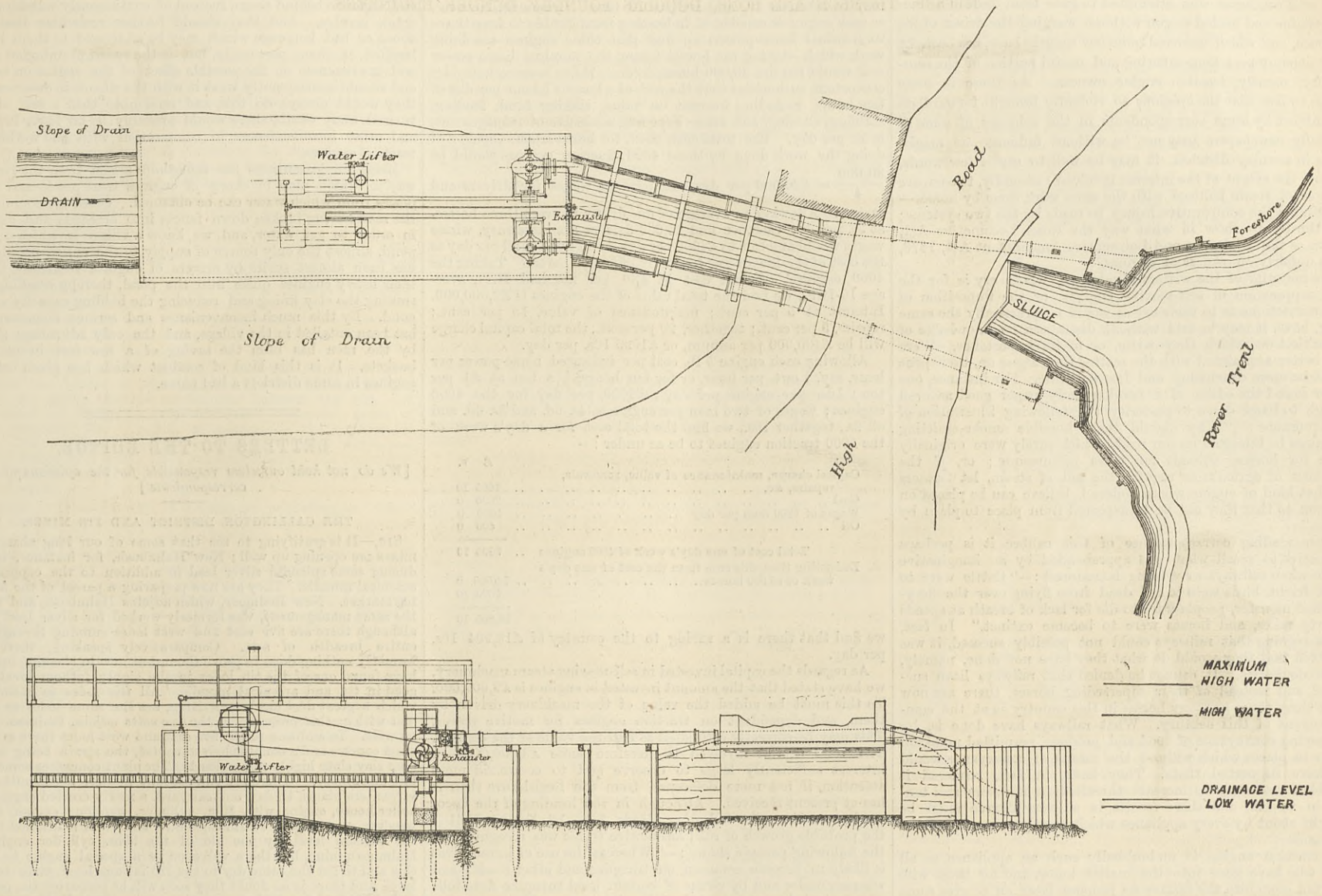
Fig. 3

Figs. 2 and 3 show different sections of the air-tight cover and its frame. Fig. 1 shows the cover as fitted over an intercepting manhole, of the form usually recommended by the engineers of the London Sanitary Protection Association.

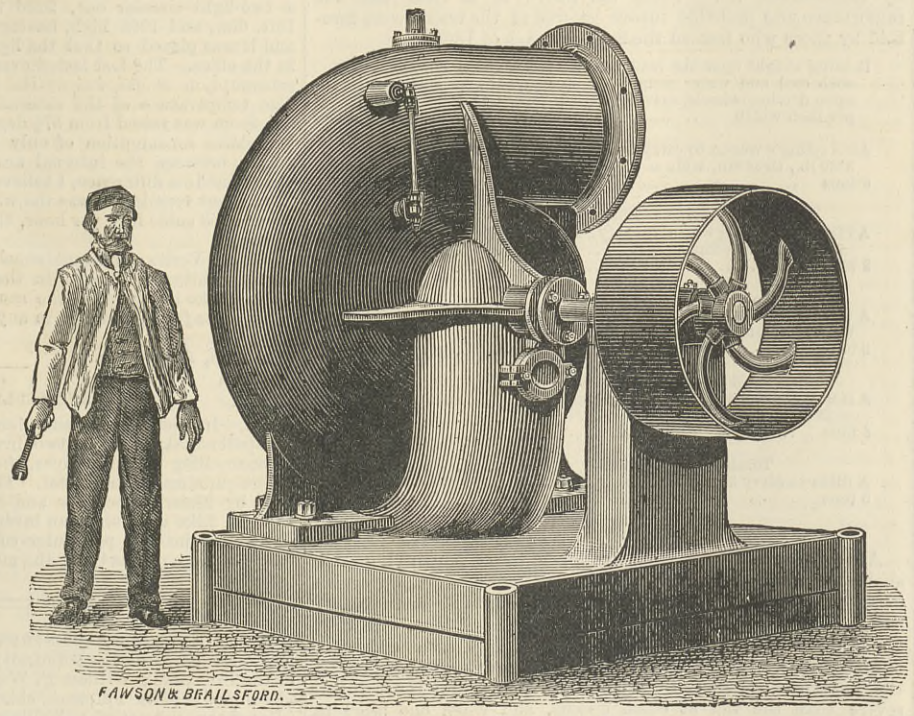
Docks on the Thames.—Under the title, "Particulars of Dry Docks, &c., on the Thames," Messrs. E. and F. N. Spon are publishing a table either in a sheet form or folded and in covers, compiled by Chas. H. Jordan, M.I.N.A., of Lloyd's Registry. Of the dry docks it gives dimensions, constant for height of high water, material of which constructed, by what closed, locality, side of river, proprietors, and how reached. Similar imformation is given with respect to floating docks, pontoons, and slips, and a map of the shipping part of the Thames shows the positions at a glance. It is a most useful table to all interested in shipping.

Midland Institute of Mining Engineers.—On Friday last a meeting of the members of the Midland Institute of Mining Engineers was held at the Bull Hotel, Wakefield. Mr. T. W. Embleton, of Methley, in the absence of the president, occupied the chair. Mr. Jefferson, of Leeds, submitted a paper "On the Coincidents of the Barogram," whilst the chairman submitted a paper entitled "The Connections between Explosions and the state of the Barometer and the Direction of the Wind." The latter paper was considered and adjourned for further discussion at a subsequent meeting. The preliminary report on accidents in mines was further considered and again adjourned to the next meeting.

MESSINGHAM DISTRICT DRAINAGE WORKS.



These works, which we illustrate herewith, have recently been erected at Butterwick for her Majesty's Commissioners of Sewers for the Wapentokes of Manley, Coningham, and Aslacoe, for the drainage of part of the levels under their jurisdiction in the county of Lincoln. The district drained includes 3250 acres adjoining the tidal portion of the river Trent, and comprises some very low-lying land. Hitherto the drainage has been by gravitation, through outfall sluices, the sills of which are placed at about the level of ordinary low-water in the river. But this system was found to be most inefficient in wet seasons, when good drainage was of the greatest importance. For when there is much rain falling in the upper districts drained by the Trent it causes what is locally known as a "fresh" in the river—that is, the water does not ebb out to normal low-water level by several feet. The consequence is that the sluice doors are kept closed sometimes for days together, during which the rainfall on the district accumulates in the drains and ultimately overflows the low grounds. The result during the recent wet seasons has been most disastrous to the agricultural population of the district, and as the only means of relieving them, the Court of Sewers has determined to erect pumping machinery. The cost of the works was defrayed by a tax on the land and as many of the contributors had become greatly impoverished by several successive bad harvests, the greatest economy had to be exercised throughout. The works were arranged and carried out under the superintendence of Mr. Alfred Atkinson, the surveyor to the Commissioners. Owing to difficulties in the way of obtaining a suitable site for the engine-house, it was built over the main drain near the outfall sluice. The engine and pump-house is constructed of timber and is carried on piles. At present only one engine and pump have been erected, but it is intended to fix the duplicate set as soon as it is practicable.



HETT'S 21in. CENTRIFUGAL PUMP.

The engine is made by Messrs. Marshall, Sons and Co., and is of their double-cylinder semi-portable type, fitted with Hartwell's patent automatic expansion valve gear. It drives, by means of a belt, one of Hett's improved "accessible" centrifugal pumps, with suction and delivery pipes 21in. in diameter. This pump is so arranged that the side of the case can be removed, and the interior inspected or the disc removed without breaking any pipe joints or connections. The pump is charged by means of a steam jet exhauster not shown, which acts most efficiently. The delivery pipe has a submerged bell-mouth, and is fitted with a sluice valve near the pump. The feed-water is lifted to a tank under the smoke-box of the engine by one of Hett's jet pumps, and every provision is made for working with a minimum of attendance. The centrifugal pump possesses the important advantage of being able to work continuously throughout a whole tide. The pump is shown below.

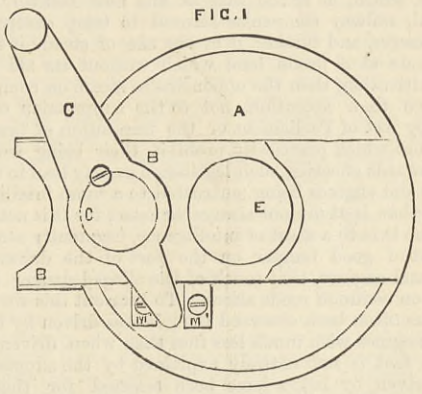
The extreme range of a spring tide in the Trent at this place is about 18ft., and the consequence is that the scoop-wheels, which have hitherto been almost exclusively used for drainage purposes in that part of the country, can only work for four or five hours each tide, or in some cases for even less. The pumping machinery was formally started on the 11th March last, and has since been working very satisfactorily. The engine house and engine were constructed by Messrs. Marshall, Sons, and Co., Limited, of Gainsborough, and the pumping machinery by Mr. C. G. Hett, of the Ancholme Ironworks, Brigg.

QUICK'S BREECH-LOADING MECHANISM.

Mr. George Quick, chief engineer, R.N., has proposed a breech-loading mechanism, which is to be tried by the United States Ordnance Committee shortly it is hoped. It is shown in Figs. 1 and 2 herewith. It consists of a wedge entering the breech like Krupp's, but sliding on grooves, and moved not by the direct action of a screw, but by a lever and ring with a counter lever moving in a slot. Until the wedge is home, the lever, which is worked like the lever and tappet ring of the old Armstrong system, forces the wedge along, the counter lever stud pin in Fig. 2, working in the slot, being the fulcrum, the moving wedge the resistance, and the handle G the point of application of the power with a lever of two to one. When the wedge is home, the same continued movement of the lever handle G, whose counter lever is now clear of the slot, forces a gas check R R in Fig. 2 home.

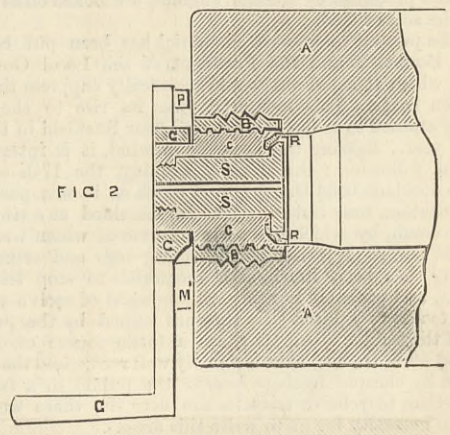
Mr. Quick claims the following advantages :—Simplicity, facility, and safety in working. The French system, he pleads, needs three motions to open it for loading and three to close the gun ready for firing. In the Krupp's he observes two are necessary for opening and two for closing, while he only asks for one in each of these operations. In the French system the breech

FIG. 1



screw is exposed and swings round on a hinged bearer ; in Mr. Quick's system there is nothing of this kind, and the screw threads are protected throughout. He pleads that on service such speed, simplicity, and safety will greatly increase the power of each gun, and that great durability and strength are obtained in his system. Like Vavasseur, he does not throw the longitudinal strain on the inside tube of the gun. The system is ingenious, and speed and protection of parts appear to be attained in the

FIG 2



model. It is clearly necessary, however, to try on full sized ordnance whether a lever with a power of two to one is capable of moving the breech as easily as desired, especially when it is fixed in prolongation of it, so as to work it when moving in and out from one side altogether. This may be shortly tried by the Americans, and we may then have much better data on which to speak than at present.

Porthcurno Lisbon Cable.—The Eastern Telegraph Cable Company have, August 11th, successfully repaired a fault in this cable in 2700 fathoms of water. Since January last two ships have been watching and waiting their opportunity to effect this repair, but the weather has prevented it.

ROAD LOCOMOTIVE LEGISLATION.

The carriage accident near Sheffield, which arose from the folly of a coachman who attempted to pass from behind a traction engine and loaded wagon without warning the driver of his presence, and which occurred some few months back, has brought some obloquy on a long-suffering and useful portion of the community, namely, traction engine owners. As there is some reason to fear that the opinions so violently brought forward on the subject by some correspondents in the columns of some of the daily newspapers may not be without influence on magistrates in country districts, it may be well to say a few words, first, on the extent of the interest involved ; secondly, to compare the cost of steam haulage with the same work done by horses—to estimate the comparative injury to roads by the two systems; and, thirdly, to show in what way the Road Locomotive Act, known as the Highways and Locomotive Amendment Act, 1878, bears unfairly on owners of engines.

The majority of the writers alluded to, whose cry is for the total suppression of self-moving engines, or the imposition of such restrictions as to their use as would be practically the same thing, have, it may be said without disrespect, no knowledge of the subject on which they write, or of its importance. Were they better acquainted with the matter they argue on, their pens might be more convincing and less romantic. For instance, one writer found the editor of a London daily paper good-natured enough to hand down to posterity the following illustration of his ignorance :—"Why should these horrible smoke-emitting nuisances be tolerated on our roads, which surely were originally made for horses, animals far more picturesque ; or, if the exigences of agriculture require the aid of steam, let farmers use that kind of engine whose boilers I believe can be placed on a wagon so that they can be transported from place to place by horses."

After reading correspondence of this calibre it is perhaps instructive to recall what was apprehended by an imaginative public when railways were being introduced :—"Cattle were to die of fright, birds were to fall dead from flying over the fiery-breathed monster, people were to die for lack of breath at speeds of forty miles, and horses were to become extinct." In fact, whilst arguing that railways could not possibly succeed, it was admitted that they would do what they have not done, namely, supersede horses. It cannot be denied that railways have succeeded, and instead of their superseding horses, there are now about three times as many horses in this country as at the commencement of this century. What railways have done is, by cheapening conveyance of food and produce, permitted mankind to live in places which without the means of conveyance would not have supported them. They have, in fact, rendered it possible for a nation to increase threefold in numbers and tenfold in wealth, and these results in a lesser degree must be brought about by every appliance which greatly reduces the cost of transit.

A traction engine is undoubtedly such an appliance, as all those who have gone into the matter know, and for those who have not gone into the matter we propose later on to give some figures. The question, then, as to whether traction engines are to be permitted to travel on public roads, under conditions remunerative to their owners, can neither stand or fall by arguments such as those alluded to as having appeared in certain daily papers. If it can be shown that traction engines can draw heavy loads more economically than horses, and also that they can draw easily, loads which cannot be drawn by horses, loads moreover, which, as in the case of the new bell for St Paul's Cathedral, railway companies refused to take, except at exorbitant charges, and further, if by the use of steam it is possible to cultivate at a profit land which without its aid would go out of cultivation, then the opponents to steam on common roads must turn their attention, not to the suppression of traction engines by Act of Parliament or the imposition of laws relating to their use which practically prohibit their being worked, but rather towards effecting such legislation as may lead to the charge of horses and engines being entrusted to a more intelligent class of driver than is at present always the case ; for it is not too much to say that it is to a want of intelligence, frequently accompanied by a want of good temper on the part of the drivers of both animals and engines, that much of the alleged danger in the use of steam on common roads arises. To bear out this we may state that it has often been observed that horses driven by ladies pass traction engines with much less fuss than when driven by men ; and this fact is not entirely explained by the supposition that horses driven by ladies have been selected for their docilty, but rather is it due to the fact that ladies do not, as a rule, bully their horses by tugging and flogging them, which add to the fright of a nervous horse.

Whenever an outcry against traction engines arises, every accident which can, however remotely, be traced to a traction engine, is raked up ; whilst the accidents produced by barrel organs, street cries, German bands, gipsey fires and railway whistles, which causes produce about one hundred accidents to every one produced by traction engines, are looked on as evitable, or as the acts of God.

At the present moment a memorial has been put before the Home Secretary and the President of the Local Government Board, which if acted on would practically suppress the use of them on roads. This memorial owes its rise to the accident already alluded to as having occurred near Sheffield in the spring of this year. Bearing this accident in mind, it is interesting to note the following : On Monday evening, the 17th of July, a serious accident befel the Brighton coach as it was passing Belmont Station, near Sutton. The horses shied at a tricycle, upset the coach, by which five persons, some of whom were ladies, received severe injuries, some having legs and arms broken. Nothing has been heard of a memorial to stop tricycles or bicycles, and probably nothing will be heard of such a memorial, as the fact is recognised that they are owned by the public and benefit the public, albeit they are a futile source of danger to foot and horse traffic ; were it equally well recognised that traction engines by cheaper haulage benefit the public to a far greater extent than bicycles or tricycles can ever do, there would have been no necessity for us to write this article.

The principal outcry against traction engines comes from those who possess carriages and horses for pleasure purposes, who seem to forget, judging by the line of argument they take up, that roads were not made expressly for them, that roads are not merely recreation grounds, but means of communication and conveyance of produce from one district to another. Roads are for the benefit of the community, not merely for the minority who ride or drive, but for the majority who walk. All are alike interested in the good condition of roads. A good road was recognised by the Romans as the first essential in civilisation. To show the importance of the traction engine question, we may state that it is estimated that there are at present employed in this country about 4000 road locomotives, self-moving thrashing engines, and ploughing engines, all of which are road locomotives within the meaning of the Act. These engines, for the most part, range in size from 6-H.P. nominal to 14-H.P. nominal, and in weight from 6 to 14 tons. Their average nominal H.P. may be taken as 10, and weight 10 tons. Inasmuch, however, as each engine is capable of indicating from double to four times its nominal horse-power, we find that these engines are doing work which—taking the lowest figure, the nominal horse-power—it would require 80,000 horses to do. It has been reckoned by competent authorities that the cost of a horse's labour per day of ten hours, including interest on value, sinking fund, feeding, stabling, shoeing, and other expenses, exclusive of management, is 5s. per day. The total cost, then, for horse labour capable of doing the work done by these 4000 traction engines would be $\frac{80,000}{4}$ = £20,000 per day, exclusive of wages for drivers and carters. Allowing an average of one driver to every three horses, at 3s. per day each, we find 26,666 drivers are necessary, whose wages would amount to £4000 per day, or £24,000 in all per day as the cost of the labour per ten hours of 80,000 horses. Taking the 4000 engines' original cost at £50 per nominal H.P., average 10-H.P., we find the total value of the engines is £2,000,000. Interest at 5 per cent.; maintenance of value, 10 per cent.; repairs, 5 per cent.; together, 20 per cent., the total capital charge will be £400,000 per annum, or £1095 10s. per day.

Allowing each engine 5 lb. coal per indicated horse-power per hour, say, 1 cwt. per hour, or for ten hours, ½ a ton at £1 per ton ; 10s. per engine per day ; £2000 per day for the 4000 engines ; wages of two men per engine at 4s. 6d. and 3s. 6d. and oil 2s., together 10s., we find the total cost for a day's work of the 4000 traction engines to be as under :—

	£	s.
Capital charge, maintenance of value, renewals, repairs, &c.	1095	10
Coal	2000	0
Wages of 8000 men per day	1600	0
Oil	400	0
Total cost of one day's work of 4000 engines	5095	10
Deducting then this sum from the cost of one day's work of 80,000 horses	24,000	0
	5095	10
	18,905	10

we find that there is a saving to the country of £18,904 10s. per day.

As regards the capital invested in self-moving steam machinery, we have stated that the amount invested in engines is £2,000,000. To this must be added the value of the machinery driven by them, and dependent on traction engines for motive power. This may be correctly estimated as half the value of the engines. The total capital involved is therefore some £3,000,000—an interest sufficiently large to deserve and to command more attention, if not more deference, from the Legislature than it has at present received. Although in the heading of the Locomotives on Turnpike and other Roads Act—1st August, 1861—the probable growth of road locomotive traffic was recognised as the following passage shows :—"Whereas the use of locomotives is likely to become common on turnpike and other roads; and whereas under and by virtue of certain local turnpike Acts tolls may be levied upon locomotives drawing or propelling wagons or carriages, or upon the wagons or carriages so drawn or propelled, which are or may be prohibitory of the use of locomotives on the roads to which the said Acts respectively apply; and whereas the weighing clauses of the General Turnpike Acts have not been framed in anticipation of traffic by locomotives, and are in many respects ill adapted to the profitable carrying of goods or to the just and adequate tolls upon wagons or carriages drawn by locomotives, &c." From the above it is clear that the importance and probable future growth of the traffic were foretold by those who framed the amended Act of 1865.

	lb.
Bearing weight upon the road of an 8-ton traction engine, with coal and water weighing 9 tons, two-thirds weight upon driving wheels, driving wheels 16in. wide—bearing per inch width	420
An Ayeling's wagon to carry 6 tons—weight 1 ton 10 cwt. = 3360 lb., tires 8in. wide =	105
6 tons	420
Total bearing per inch	525
A Pickford's spring wagon to carry 2 tons—weight 1 ton 1 cwt. = 2352 lb., tires 2in wide =	294
2 tons	560
Total bearing per inch	854
A ditto to carry 3 tons—weight 1 ton 7 cwt. 2 qr. = 3080 lb., tires 2½in. wide =	308
3 tons	672
Total bearing per inch	980
A Hayes and Son's wagon to carry 4 tons—weight 1 ton 5 cwt. = 2800 lb., tires 4in. wide =	175
4 tons	560
Total bearing per inch	735
A ditto to carry 3 tons—weight 18 cwt., tires 3in. wide =	168
3 tons	560
Total bearing per inch	728

As regards the alleged injury to roads, the accompanying table shows conclusively that with the wide wheels of the traction engine, the pressure on each inch in width of road is considerably less than half that of a Pickford's van, to carry 2 tons, with tires 2in. wide, whilst with a 3 ton van, tires 2½in. wide, the difference is even greater. It follows then that in mere crushing force on the individual stones in a road, the traction engine is much less severe than the van at equal speeds, and when one bears in mind that the van frequently goes at eight miles an hour, thus producing a violent hammering motion between the tires and the road, and that the engine never exceeds four miles an hour, the superior destructive action of the van is still more apparent. In the recent case of transporting Great Paul it is worthy of note that the engines met with no trouble on the road, but the great weight of the bell and its truck—20 tons approximately—have been too much for the bearing surface afforded by four wheels ; the truck consequently crushed some parts of the road completely in over which the engines had passed without making any impression. Although a great deal may be said on the cost of steam traction on roads, and on the necessary reforms of the Highway Acts as respects road locomotives, at present it must suffice to call attention to the following suggestions sent by a correspondent for those interested in traction engines and horses :—

"If your horse be nervous, do not tug, flog, or shout at him. Hold your hand up for the driver to stop his engine, and then either lead your horse past yourself, or get the man on foot to do so. After meeting engines two or three times, and finding that no ill effects of whip or spur ensue, the horse will become quite bold.

"Never attempt, when overtaking a traction engine—either with wagon attached or not—to pass it until you have made the driver aware of the fact of your being there, otherwise he may turn into a cross road and nip you between the wheels and the bank.

"Drivers of engines should remember that albeit their engines make a good deal of noise, their speed is slow, and that consequently vehicles wishing to pass from behind are nearly as frequent as those meeting them. They should therefore frequently cast a glance behind them, instead of continuously watching the crank revolve. And they should further remember that any abuse or bad language which may be addressed to them is not levelled at them personally, but is the result of mingled anger and nervousness at the possible effect of the engine on horses, and should consequently treat it with the silence it deserves. If they would always do this, and remember that a soft answer turneth away wrath, there would probably be far fewer lawsuits and other inconveniences in connnection with the working of traction engines."

Much unpleasantness has sometimes arisen from the reckless way in which men in charge of engines treat ponds and other places from which water can be obtained. Cases are common of the men having broken down fences into orchards and gardens in order to get water, and we know a village in which a large pond, almost the only source of supply to the entire population, has been almost spoilt by drivers of engines recklessly taking their heavy engines quite into the pond, thereby cracking and ruining the clay lining and reducing the holding capacity of the pond. By this much inconvenience and serious monetary loss has been entailed in the village, and the only advantage gained by the men has been the saving of a few feet in carrying buckets. It is this kind of conduct which has given traction engines in some districts a bad name.

LETTERS TO THE EDITOR.

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

THE CALLINGTON DISTRICT AND ITS MINES.

Sir,—It is gratifying to see that some of our long abandoned mines are opening up well ; New Halmbush, for instance, is producing some splendid silver lead in addition to the copper and arsenical mundic. They are now preparing a parcel of the former for market. New Redmoor, which adjoins Halmbush, and under the same management, was formerly worked for silver lead only, although there are five east and west lodes running through the entire breadth of sett. Comparatively speaking, there was formerly nothing done to prove them, but now in cleaning up they have found one of the tin lodes in the eighty fathom level very good in tin and arsenical mundic. All the lodes in Kithill, of which a great deal has been written, are the same lodes as those met with in this property, as the two setts adjoin, Redmoor being on west. In addition to the five east and west lodes there are four cross courses and a counter helven course, the strata being chiefly blue clay slate highly mineralised. The plant comprises some very fine machinery. There are two account houses, blacksmiths' and carpenters' shops, timber and sawyard, a newly-erected engine and boiler house, engine with 80in. cylinder, pumping engine, and a winding engine, with steam capstan. The water is drained to the 100 fathom level by the aid of the 90in. cylinder engine at Halmbush mine, but there will soon be a special engine to work this and to get the mine dry to the 125 fathom level, their bottom level, and there is no doubt they soon will be preparing tin, copper, and silver lead for market. Jno. Buckingham.

Callington, August 16th.

THE SANITARY STOVE.

Sir,—I have to thank you for the notice of my stove in your issue of last week, and for the lucid description given of it. Will you allow me to supplement this with a few abstracts of the report of Messrs. Verity and Hunt, briefly referred to at the end of the description ? The stove tested by these gentlemen was, as stated, a two-light circular one, fixed in an office, measuring 17ft. by 15ft. 6in., and 10ft. high, having a capacity of 2635 cubic feet., and it was placed so that the lights were available for general use in the office. The test lasted over a period of eight hours, and the consumption of gas was at the rate of 17½ cubic feet per hour. The temperature of the external air was 43½ deg., and the air in the room was raised from 57½ deg. to 71½ deg., showing that, with the above consumption of only 17½ft. per hour, a difference of 28 deg. between the internal and external temperatures could be maintained—a difference, I believe, quite sufficient for this country. A constant ventilation was the whole time going on, at the rate of about 1750 cubic feet per hour, the air entering the room at about 152 deg.

Messrs. Verity and Hunt conclude their report by stating that the circulation of the air in the room was very satisfactory, the temperature being nearly the same in all parts, and the air at all times quite fresh, and not in any way vitiated by passing through the stove. W. Schonheyder.

London, August 9th.

ENAMELLED PIPES.

Sir,—In your "Notes and Memoranda" for last week, you refer to a patent taken out by two inventors in Bohemia for a method of enamelling cast iron pipes, the glaze being laid on to the core before running in the metal. This very process was patented in 1850 by Messrs. Cochrane and Slate, of Dudley—see patent No. 12,918. Like the Bohemian inventors, Messrs. Cochrane and Slate did not claim any particular composition of glaze, the essential feature of the patent being the mode in which it was applied.

Z.

Naval Engineer Appointments.—The following appointments have been made at the Admiralty :—Henry Jones, chief engineer, to the Inflexible ; William P. Ward, chief engineer, to the Jumna, vice Jones ; Felix Foreman, chief engineer, to the Bittern, reappointed on promotion ; William Nicklin, chief engineer, to the Beacon, reappointed on promotion ; Richard J. Tench, engineer, to the Penelope, vice Feak ; James C. Oare, to the Alexandra, vice Craddock, and Robert J. Barker, engineer, to the Vernon, additional.

The Miners' National Association and the New Method of Working Coal.—In the programme issued by the Miners' National Association for the forthcoming conference to be held at Manchester, notice has been given by the representatives of the Yorkshire miners with respect to the new method of getting coal by the use of lime cartridges. The notice is as under :—"That we urge upon the Home-office the necessity of finding means to test the principle of bringing into use the new system of getting coal with lime." The question is an important one, and is likely to give rise to an important discussion, inasmuch as Mr. Burt, M.P., president ; Mr. Pickard, vice-president ; Mr. Nixon, treasurer ; Mr. Crawford, secretary ; and other members of the Union, have recently visited the Shipley Collieries, Derbyshire, and seen the system at work, and were very favourably impressed by what they saw. The system will, it is understood, be recommended, owing to its enabling miners to wedge or remove coal without having resort to blasting or drilling, thus making it valuable in the fiery seams, which are wrought in Yorkshire and other coal-fields. It is also said to be even quite as economical as blasting, whilst the coal is brought down in much larger and more saleable blocks. A trial of the system has been made at one of the largest collieries in South Yorkshire, where the measures worked are subject to those sudden outbursts of gas from the roof and floor, necessitating the strict use of the very best safety lamps, accompanied with strict discipline.

RAILWAY MATTERS.

THE French Government have declared to be a measure of public utility the establishment of a tramway to be worked by locomotives, between Fourmies and Wignehies, in the department of Le Nord.

THE Taff Vale Railway report is to hand, and shows a most satisfactory state of things. On the 31st August 10 per cent. and 8 bonus will be paid. Mr. Nicholson has been appointed secretary, vice Mr. Geo. Robertson, who retires after thirty-one years' service. The Rhymney Railway report is also a hopeful one. They declare a dividend of 12 per cent.

ACCORDING to the *Gazette de Lausanne*, the report of M. Marteau, French Commissioner, appointed by the Government to report on the effect of the St. Gothard Railway on French trade, advises in the interest of France the construction of another Alpine railway between the St. Gothard and Mont Cenis, and recommends the adoption of the Simplon scheme.

ON Saturday week the new Calais Station, 100 metres long, situated alongside the landing quay, was opened in the presence of of M. Sartiaux, *chef de l'exploitation* of the Northern Railway of France; M. Muet, chief inspector; and M. Bourrat, assistant locomotive superintendent. During the first seven months of the present year there have been 117,041 passengers between Dover and Calais, against 104,243 for the corresponding period of 1881, thus showing an increase of 12,798.

THE directors of the Bristol Tramways Company have accepted the tender of Mr. August Krauss, contractor, &c., Bristol, for laying the new double line between the city and the suburb of Redland, about three and a-quarter miles of single tramway. Mr. Kincaid, of London, is the engineer for same. The work will have to be commenced in six weeks and finished within nine weeks from commencement. The contractor has constructed several tramways, and has now before him a smart piece of work.

MESSRS. FUESSLI AND CO., of Zurich, are publishing an "Illustrated Europe" series of hand-books, chiefly illustrations of those parts and sceneries which are reached by well-known railways. They are of a handy size, 7¾in. by 4¾in., and are exceedingly well illustrated. A part has just been published descriptive of the St. Gothard Railway. It contains a great deal of interesting descriptive matter; the engravings, forty-three in number, by J. Weber, are good. It is published in English, French, and in German. The English edition is published at 63, Charing-cross, by C. Smith and Son.

THOSE who may have thoughts of residing south of the Thames near London will do well to remember the fact that they cannot select those places which are most easily reached by the London and South-Western Railway by its trains running into Ludgate-hill without subjecting their visitors to the enormous extortions of the company for first and second-class fares. For instance, the fare for some of the short distances is more than three times more for first-class than for the ordinary third-class, and 233 per cent. more for the second-class. The season tickets may not be much higher than on the Chatham and Dover line, over which the South-Western runs, and so the holders of these may not be much affected, but those who have occasionally to take day tickets will not care to travel much on a line that charges to this extent.

A LOCOMOTIVE gas engine is described in *Herapath's Railway Journal* as having been tried in the United States. The report describes an Erie-road locomotive, fired entirely by hydrogen gas, produced by the decomposition of water under the action of ignited naphtha, and says it was successfully run from Paterson to the station in Jersey City, making the trip one minute and ten seconds ahead of time, and coming into the depôt with a pressure of 140 lb. of steam, being nearly three times as much as the ordinary locomotives carry at the end of such a trip. The engine had been constructed under the supervision of the inventor. During the above trip so much steam was generated, that the safety valve had to be opened nearly all the way. The amount of naphtha used for 19¾ miles was 84 gallons, costing 2·08 dols., or about one-third of the cost of coal usually consumed for the distance.

AN express train from Derby to London, on the Midland Railway, has had a very narrow escape, the *Times* of Tuesday said, of being wrecked through the extraordinary conduct of a man in charge of a wagon and a team of horses. The driver of the express when nearing Leicester at full speed saw a man deliberately take a large farmer's wagon and horses on to the line by a level crossing at a road between two fields. The engine-driver blew his whistle, and at once applied the vacuum brake with which the train was fitted throughout. The wagoner made no attempt to get out of the way, and the express was only brought to a stop within ten yards of the obstruction. After waiting till the wagon had been moved out of the way, the guard and driver of the express remonstrated with the man as to the extreme danger which his conduct had caused, but he only laughed at them, and treated the matter as a joke. It is expected that the company will take some action in the matter, and certainly such a wagoner deserves severe punishment.

A SYSTEM for enabling a railway train in motion to send and receive telegrams was recently tried, but it is not said with what success, on the Altanta to Charlotte aërial railway in America. It is the invention of Captain C. W. Williams, of the United States Army, and is described as consisting of a telegraph wire running along the track, but insulated from it, and interrupted at intervals of 40ft. The ends at each break are connected to copper rollers which normally are in contact, so that the electric circuit is completed through them. One car of the train is fitted up as a telegraph office, and two long metal strips or rails projecting from below the car rub against the metal rollers as the car passes. In doing so they depress the rollers, thus causing them to break contact with one another. The strips are connected together through the instruments in the car, and the electric current passes from one roller through the instruments to the other roller, and thence pursues its way along the rest of the wire. The circuit through the apparatus thus established is never absolutely interrupted, for as the car moves from one pair of rollers to the next, the strips make contact with the latter just before contact with the former is broken. The system enables a passenger to send or receive an important telegram while travelling, or the position and state of the train to be communicated to a distant station.

BELGIAN railways are under the control of the Administration des Ponts et Chaussées, and consist of four different classes, according to the conditions under which they are constructed. The first class consists of railways constructed by the State to plans and sections prepared by the Ponts et Chaussées, and let by public contract, the State generally purchasing the land. The second class comprises lines constructed for the State by companies or by individual contractors to plans and sections prepared by them and sanctioned by the Government, subject to the necessary modifications. The contractors have to purchase the lands and carry out the works in accordance with the plans approved. In the third class, the project is prepared by the State, and the works are let by contract; but the contractor has to submit the final plan and section, and also to purchase the land. Railways of the fourth class are conceded to, and constructed by, companies, who are authorised to charge fares. Generally the companies also work the lines; but sometimes the State works them and pays the concessionaires a percentage on the receipts. Experience has shown that the second and third systems lead to many difficulties, the chief of which is the antagonism of interests between those who construct and those who work the line. The former have every inducement to make the line as cheaply as possible; while the State has every interest in its being the most favourable for working. The best system is found to be that in which the State construct as it thinks fit the line it has to work, and pays in proportion to its requirements.

NOTES AND MEMORANDA.

THE census of India gives the total population for the North-West Provinces and Oude as 44,107,889 against 43,028,389 on previous returns, 22,912,556 being males, 21,195,333 females. Villages, 105,124; towns, 297. The number of persons per square mile, 415.

AT a recent meeting of the Academy of Sciences, Paris, a paper was read on the vaporisation of metals in vacuo, by M. Demarçay. This was effected at comparatively low temperatures; the volatility of cadmium was proved at 160 deg., zinc at 184 deg., antimony and bismuth at 292 deg., lead and tin at 360 deg. The deposits in twenty-four to fourty-eight hours were weighable—5 to 15 mgr.

THE call for an electrical sheep-shearer made by a New Zealand correspondent in *The Scientific American* some months ago, has apparently brought forth fruit in an unexpected quarter. It is now announced that the head of the Hudson Bay Fur Company, Sir Curtis Lampson, has applied electricity to the trimming of sealskins. The skin is "fed" over a knife-edge bar, above which is stretched a fine platinum wire, which, raised to a white heat by an electric current, meets the longer hairs which rise above the under fur, and mows or burns them down.

SCRAPS of mackintosh and other india-rubber coated fabrics have hitherto been useless because the india-rubber could not be profitably extracted from them. An American inventor, however, finds that strong hot sulphuric or muriatic acid has no effect on the rubber, but a strong corrosive action on the textile fabrics, and he has taken out patents for a process of recovery in which he eats away the textile fabrics with these acids, preferring hydrochloric, as it forms more soluble salts with the zinc and whiting than sulphuric. If the original stuff be in lumps, it is first softened with benzol.

AS an artificial marble the following has been patented:—Equal weights of Portland cement, blue lias cement, cinder dust, and marble dust are mixed with water containing 1 per cent. of borax and run into moulds to set. Next day the casts are smoothed down with sand paper and enamelled with a succession of coats in the following order, baking for twenty-four hours at from 150 deg. to 200 deg. Fah. and smoothing down after each coating: (1) Best tar varnish; (2) Pontypool varnish; (3) pale mixing varnish; (4) copal varnish and extra fine polishing varnish. The ground colours are applied after coating No. 1, the marbling after coating 2 or 3.

THE following are given in the *Railroad Gazette* as the freezing points of drying oils, some of which are in common use:—"Lin — flax — seed oil freezes at 16 deg. below zero; poppy seed oil freezes at 4 deg. below zero; walnut seed oil freezes at 16 deg. below zero; prunella—a Japanese oil—hempseed oil freezes at 16 deg. below zero; castor oil freezes at 1 deg. above zero; sunflower seed oil freezes at 1 deg. above zero; grape seed oil freezes at 1 deg. above zero; cotton seed oil freezes at 28 deg. above zero; fish oils freeze at 32 deg. above zero. Some of the above are more properly half-drying oils. Linseed oil stands first in every good quality, except for its tendency to change colour."

AT a recent meeting of the Paris Academie a paper was read on a use of electrolysis in dyeing and printing, by M. Goppelsrœder. For example, he impregnates tissues or paper with an aqueous solution of chlorhydrate of aniline, puts it on a non-attackable metal plate, which he connects with one pole of a battery or small dynamo. On the tissue or paper is placed a second metal plate having a design in relief and joined to the other pole; on pressure and passage of the current the design is reproduced. A modification of the method gives chemical discharge of colour. The current, again, is used to prepare vats of indigo, aniline black, &c.; the hydrogen which arises at the negative pole being utilised. It is also used to prevent oxidation of colours in printing.

IN the course of a discussion in the *Morning Post*, on the subject of creaming machines, a correspondent points out that the scientific principle upon which they are based has long been known. Dr. Desaguliers, in his "Natural Philosophy," vol. i., p. 313—third edition, London, 1763—describes a very simple experiment showing how centrifugal force tends to promote the separation of substances of different specific gravity. If a glass tube, hermetically sealed, containing non-miscible liquids, or foreign matter mechanically suspended in a liquid, such as muddy water, be whirled round by a string fastened to a loop at one end, the various substances will rapidly arrange themselves in the order of their density, the heaviest being at the end of the tube farthest from the point of attachment to the string. This is just what happens in the centrifugal creaming machine.

A STRONG and durable article of belting is made at Oakland, California, out of the entrails of sheep. The entrails, which will average about 55ft. in length, are first thoroughly cleansed and then placed in vats of brine, where they remain some days. When thus prepared they are not much thicker than a piece of common cotton twine, and will sustain a weight of about 10 lb. The next stage in process of manufacture is to wind the prepared material on bobbins, after which the process is the same as in making common rope. This method is used to produce a round belt; but where a wide flat belt is to be made, a loom is employed, and the fine strands are woven together, as in ribbon manufacture. The flat belts are made of any size, and the round of sizes varies from $\frac{1}{16}$in. up to 1½in. diameter. The round belts are made either in the form of a smooth cord, or as ropes with from three to five large strands. The ⅜in. rope is said to stand a strain of seven tons.

A PAPER was recently read before the Academie des Sciéncés on the properties of antiseptics, and volatile products of putrefaction, by M. Le Bon. The disinfectant power of any antiseptic is weaker the older the putrefaction. The strongest disinfectants are permanganate of potash, chloride of lime, sulphate of iron acidified with acetic acid, carbolic acid, and the glyceroborates of sodium and potassium. There is no parallelism between disinfectant action of an antiseptic and its action on microbes; nor between the power of preventing putrefaction and that of stopping it when it has begun. Except a very few substances, strongly poisonous—such as bichloride of mercury—most antiseptics, and notably carbolic acid, have very little action on bacteria. There is no parallelism between the virulent power of a substance in putrefaction and the toxical power of volatile compounds liberated from it. The volatile alkaloids from advanced putrefaction are very poisonous. According to M. Le Bon the air of cemeteries may be very dangerous.

REFERRING to some recent articles by Dr. J. H. Gladstone and Mr. Tribe in *Nature*, on "The Chemistry of the Planté and Faure Batteries," Dr. Oliver Lodge asked a question about the lead sulphate into which they stated the spongy lead was converted during the discharge of a Planté or Faure battery. In reply Mr. Gladstone says, "In an early stage of our investigation we satisfied ourselves that lead sulphate was capable of both oxidation and reduction by the voltaic current under the circumstances found in these batteries. Our best experiment is described in *Nature* of March 16th. It was made by spreading lead sulphate on platinum plates, but I have just had it repeated with lead plates, so as to imitate more closely the conditions of actual practice. The sulphate was reduced by the electrolytic hydrogen as before. As, however, the reduction takes place first in close proximity to the lead plate, it is not easily recognised till the chemical change has advanced some distance, and a good deal of the white salt always escaped decomposition. But the circumstances of the actual practice are much more favourable for the reduction of the sulphate than were those of our experiment; for the sulphate is formed in perfect contact with the metallic lead of the plate or its spongy covering, and the reduction is doubtless facilitated by its intimate mixture with the excess of spongy lead. When we stated that sulphate of lead is finally the 'only product of the discharge,' we were referring to the disappearance of any peroxide, and did not mean to imply that in actual practice the whole of the spongy metal is usually converted into sulphate."

MISCELLANEA.

IT seems probable that the electric light will be largely employed in dyeing works, where also electricity may be employed for other purposes. At night the light permits the matching of colours as in daylight, and in the daytime the current may be employed for electro-chemical purposes.

TWO new courses of lectures, on the applications of machines and of electricity, have been added to the *curriculum* of the Civil Engineering College attached to the Ghent University. There will be one lecture of an hour and a-half a week on both subjects, and the fees for each course are fixed at 30f.—24s.

THROUGH an excess of current accidentally brought about, the wires for conducting the electricity for illuminating the stage of the Paris Opera lately became red-hot, burnt their covering of gutta-percha, and caused a fire, which, however, was speedily extinguished with a few buckets of water. Such events as these are of the class that result from what must be culpable carelessness.

THE Association des Gaziers Belges, acting for the Brussels Municipality, have organised a competitive exhibition of gas stoves for industrial, domestic, and culinary purposes. It is to be held in the Rue Grétry, Brussels, near the Halles Centralles, from 1st August to 1st October. The jury will award gold and silver medals and diplomas, not exceeding, altogether, the value of 4000f. The President of the committee is M. H. Aerts, manager of the Brussels gas-works.

A CONTACT key, which it is said will work with $\frac{1}{1000}$in. play, is made by Messrs. Cumming and Brinkerhoff, of 219, East Eighteenth-street, New York. The contacts, or electrodes, consist of a pair of round-edged discs, the periphery of one of which rests on that of the other at an angle of 90 deg. The smallest possible surface of contact is thus obtained in such a way as to be ever renewable, and the invention consists in the discovery that the smallest surface of contact is the best for telegraph work.

THE prospectus is issued of the Bahia Central Sugar Factor es Company, Limited, and subscriptions are invited for a part, £270,000, in shares of £20 each. It is guaranteed by a Brazilian Government decree to the extent of over £37,000 per annum, and is formed for the purpose of establishing eight central sugar factories, including all other accessory works, such as roads, tramways, &c., in Bahia, Brazil. Mr. James Cleminson, Westminster, is the engineer, and the offices of the company are at 9, New Broad-street, E.C.

ON the 14th inst. the Noord Braband was launched from the shipbuilding yard of Messrs. Raylton, Dixon, and Co., Middlesbrough, a handsome screw steamer destined for the mail service between Rotterdam and Java. Her dimensions are:—Length over all, 310ft.; breadth, 40ft.; depth of hold, 23ft. 9in., and she will carry a dead weight of about 3650 tons. She is built with water ballast throughout on the cellular principle; has iron decks—the upper laid with teak—full poop aft for the accommodation of twenty first-class passengers, and the second-class in forecastle, and having accommodation for her officers, &c., under long bridge amidships. This is the seventh vessel built by Messrs. Raylton, Dixon, and Co. for the same service.

A STEAM-WHEEL has been recently patented in Austria by Professor Wellner, of Brünn. The wheel—according to the *Polytechnischer Journal*—consists of a simple water-wheel, mostly immersed in hot water in a closed vessel. Steam is admitted at the lower part, and forces the cells of the wheel upward, producing rotation. The steam fills more and more of the cells on the rising side, and at length begins to escape into the steam-space above the water. Steam may either be produced directly at the lower part, or conducted to the vessel from elsewhere. The upper tube for outlet of steam may lead either into the open air or into a condenser. The mechanical work is effected by the ascent of the specifically lighter steam in the heavier liquid.

THE completed portion of the Hudson river tunnel, in which several men were killed some time ago, at the north end now measures more than 1200ft., although little advance has been made on the New York side, owing to the difficult character of the ground, which is a mixture of sand, gravel, and boulders. The air pressure, to keep out the water, has been increased on the New Jersey side, and two bulkheads have been erected in the tunnel, which is being driven through in somewhat tough silt. The severest test has yet to be passed, namely, that spot where the water being deepest, the tunnel has to be made closest to the bed bottom of the river. The air pressure is already 30 lb. on the square inch, but as little inconvenience is said to be experienced by the workmen, it is thought probable that it can be increased sufficiently to enable the engineers to complete the work without serious accident.

AUSTRALIANS are vieing with English publishers in the publication of works of considerable merit. Mr. W. Crellin, Victoria Government surveyor, has compiled a work of great importance to surveyors—namely, a "complete traverse table," which is spoken of in the highest terms by all the leading engineers of the Government of Australia, and especially by Mr. R. L. J. Ellery, F.R.S., Government astronomer of Victoria, who says it enables computors to double the work with half the fatigue resulting from the ordinary mode. Mr. Crellin has also made an instrument for laying on the tables in the volume in which they are bound, which greatly facilitates the reading and addition of the numbers. The book is published in Australia by Mr. G. Robertson, of Melbourne and the other capitals, and in this at 17, Warwick-square, Paternoster-row. A copy of it and the instrument referred to is to be seen at the Institution of Civil Engineers.

THE syllabus of the course of lectures at King's College on metallurgy, by Professor A. K. Huntington, has been issued, and contains particulars relating to the Siemens gold medal and prize, which has been founded by Dr. C. W. Siemens, with the object of stimulating the students of King's College, London, to a high standard of proficiency in metallurgical science. It is open to those who have, as matriculated students, studied in the Applied Science Department for two years, and who, either in their third year, or, if they remain in the department for three years, in the succeeding year, make metallurgy a special study. The first award will be made at the end of June, 1883, and will depend partly on an essay on some particular subject, partly on a written examination on the Metallurgical lectures, and partly on actual work done in the laboratory. The subject for the essay for 1883 will be, the "Manufacture of Steel suitable for Ship and Boiler Plates."

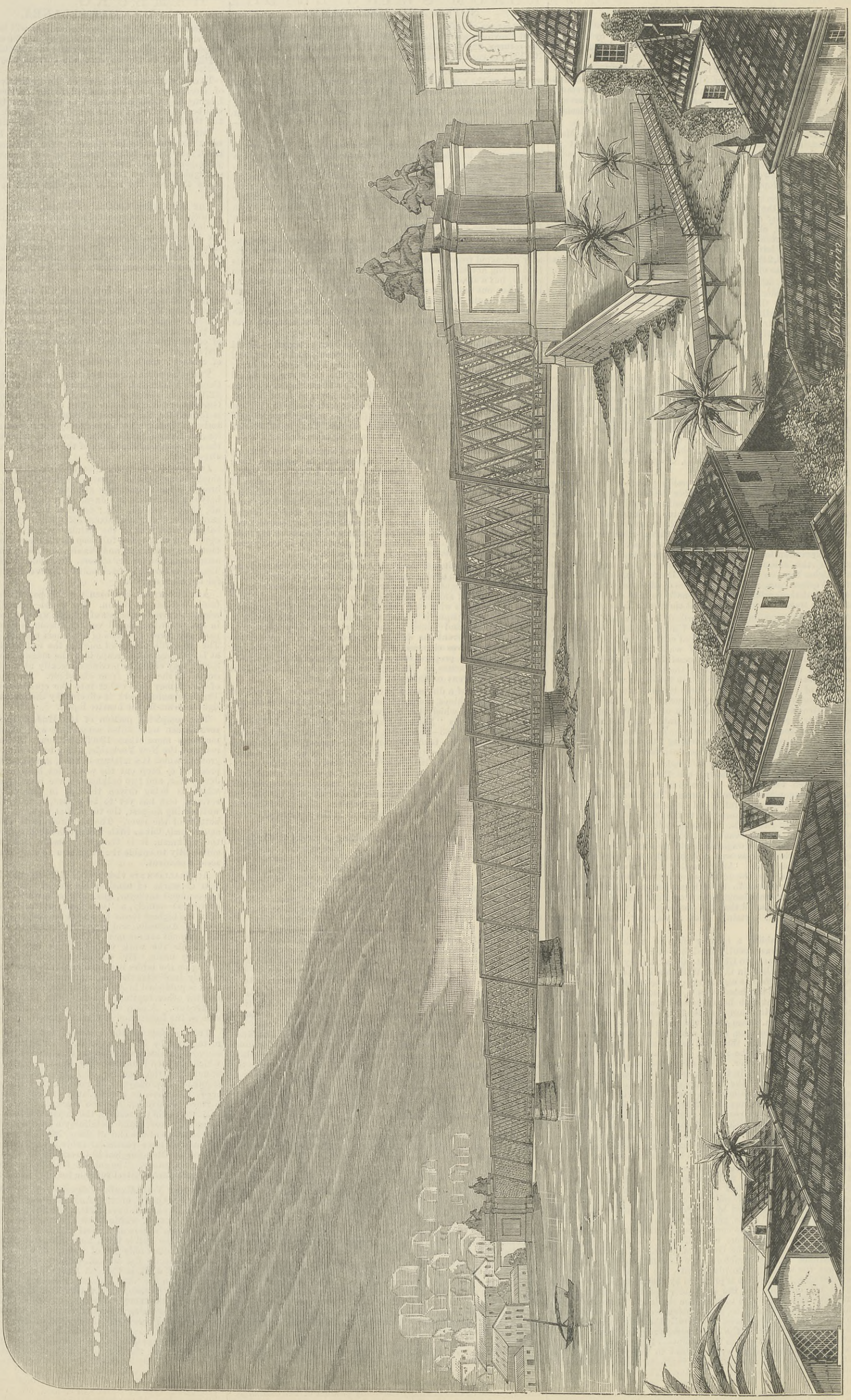
THE New York *Evening Telegram* says:—"Natives of the Isle of Cuba—'Queen of the Antilles'—were never noted for progressive ideas, but, nevertheless, the residents of the old shipping port, Cienfuegos, within a few weeks will be edified by the appearance in their waters of a novel steam craft intended for lighterage service. The hull is 100ft. long, 32ft. wide, and, with 100 tons of cargo, will draw only 3ft. of water. She will be decked over, and has a perfectly flat bottom with vertical sides, and is the first example of what is thought by many experts will prove to be a revolution in the 'dark science' of screw propulsion. A high rate of speed, of course, is not expected, but her performance will exemplify, it is thought, the economy which Mr. J. B. Root, of the Root Manufacturing Company, claims for his novel system of the application of screw-propelling wheels. These wheels will be set on the ends of an athwartship shaft, the plane of their faces being fore and aft, and not as the common type of screw propeller is, at right angles to the line of motion of the vessel. They will be driven by a single vertical direct-acting engine 10 by 12. The boiler will be vertical tubular, 10 by 6, and with 80 lb. pressure will drive the wheels from 150 to 200 revolutions per minute. The 'true screw' type of wheel will be used, 6ft. in diameter, and they will be only half submerged when the vessel is loaded. When finished, which will be about the last of August, she will steam across the Gulf down to Cuba. She will cost about 15,000 dols."

IMPERIAL CENTRAL BAHIA RAILWAY.

IMPERIAL DOM PEDRO II. BRIDGE, BRAZILIAN I

DESIGNED BY MR. JAMES CLEMINSON, M. INST. C.E., WESTMINSTER.

(*For description see page* 126.)



THE NIEDERBAUM SWING BRIDGE, HAMBURG.

Section THROUGH PIVOT PIER

SUPPLEMENT TO THE ENGINEER. AUGUST. 18. 1882

Fig. 8.

Fig. 7.

John Swain. Photo. Litho.

FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

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

PUBLISHER'S NOTICE.

*** *With this week's number is issued as a Supplement, the Niederbaum Swing Bridge, Hamburg. Every copy as issued by the Publisher contains this Supplement, and subscribers are requested to notify the fact should they not receive it.*

TO CORRESPONDENTS.

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

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

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

N. and S.—*Tramways of Montevideo, Buenos Ayres, Salto and Bahia, and Palermo.*

C. Welsteed (Montreal).—"*Warlike Woolwich*" *is to be obtained of Mr. Jackson, Thomas-street, Woolwich.*

S. B.—*See* The Engineer, *8th October*, 1881. *For* 230 *revolutions per minute read* 2300 *revolutions per minute, and for* 2500*ft. per minute read* 25,000*ft.*

H. G.—*There is no book specially dealing with the subject as treated in the article to which you refer. You may, however, be able to deal with it as you wish by the aid of Cottrell's book "On Steam and the Steam Engine," and Box's "Practical Treatise on Heat."*

CONVERTING FISH INTO MANURE.

(*To the Editor of The Engineer.*)

Sir,—I shall be obliged if any of your correspondents can give me any information as to the best process for converting freshly caught fish into artificial manure, with particulars of the requisite machinery, which I shall probably wish to purchase.

W. L. D.

East India-avenue, E.C., August 12th.

SUBSCRIPTIONS.

The Engineer *can be had, by order, from any newsagent in town or country at the various railway stations; or it can, if preferred, be supplied direct from the office on the following terms (paid in advance):—*

Half-yearly (including double numbers) .. .. .. £0 14s. 6d.
Yearly (including two double numbers) .. .. .. £1 9s. 0d.

If credit occur, an extra charge of two shillings and sixpence per annum will be made. The Engineer *is registered for transmission abroad.*

Cloth cases for binding The Engineer *Volume, price* 2s. 6d. *each.*

Many Volumes of The Engineer *can be had price* 18s. *each.*

Foreign Subscriptions for Thin Paper Copies will, until further notice, be received at the rates given below:—Foreign Subscribers paying in advance at the published rates will receive The Engineer *weekly and post-free. Subscriptions sent by Post-office order must be accompanied by letter of advice to the Publisher. Thick Paper Copies may be had, if preferred, at increased rates.*

Remittance by Post-office Order. — Australia, Belgium, Brazil, British Columbia, British Guiana, Canada, Cape of Good Hope, Denmark, Egypt, France, Germany, Gibraltar, Italy, Malta, Natal, Netherlands, New Brunswick, Newfoundland, New South Wales, New Zealand, Portugal, Roumania, Switzerland, Tasmania, Turkey, United States, West Coast of Africa, West Indies, Cyprus, £1 16s. China, Japan, India, £2 0s. 6d.

Remittance by Bill in London. — Austria, Buenos Ayres, and Algeria, Greece, Ionian Islands, Norway, Panama, Peru, Russia, Spain, Sweden, Chili, £1 16s. Borneo, Ceylon, Java, and Singapore, £2 0s. 6d. Manilla, Mauritius, Sandwich Isles, £2 5s.

ADVERTISEMENTS.

*** *The charge for Advertisements of four lines and under is three shillings; for every two lines afterwards one shilling and sixpence; odd lines are charged one shilling. The line averages seven words. When an advertisement measures an inch or more the charge is ten shillings per inch. All single advertisements rom the country must be accompanied by stamps in payment. Alternate advertisements will be inserted with all practical regularity, but regularity cannot be guaranteed in any such case. All except weekly advertisements are taken subject to this condition.*

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

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

DEATHS.

On the 12th inst., at 5, Cedars-road, Clapham-common, Charles Edwards Amos, C.E., in his 77th year. Friends will kindly accept this intimation.

On the 13th inst., at his residence, at Fairfield, near Manchester, Mr. Thomas Dixon Hill, C.E., Ashton-under-Lyne, aged 50.

On the 13th inst., at his residence, Cork, Mr. John Ring, C.E., aged 70 years.

THE ENGINEER.

AUGUST 18, 1882.

AMALGAMATION AMONG THE LONDON GAS COMPANIES.

The immediate prospect of another amalgamation among the London gas companies calls attention to the change which has come over the conditions of the Metropolitan gas supply during the last few years. In 1869 there were thirteen gas companies in the area which had been governed by the Metropolis Gas Act of 1860. In 1870 two of the thirteen had disappeared, the Chartered absorbing the City of London Company and the Great Central. In 1871 the Equitable went the same road, followed by the Western in 1872. A broad sweep was effected in 1876, when the Imperial was absorbed by the Chartered, as also the Independent, while the Ratcliff was taken by the Commercial. In 1879 amalgamation began to show itself on the South side of the Thames, the South Metropolitan absorbing the Surrey Consumers, added to which came the Phœnix in the following year. Thus in 1880 the gas companies of the metropolis were only four, namely, the Chartered, Commercial, London, and South Metropolitan. The first two of these companies are situated solely on the north side of the Thames, the South Metropolitan is wholly on the south, and the London has a curiously disjointed district extending to both sides of the river. The latest phase consists in a project for amalgamating the London Company with the Chartered, for which purpose terms have been arranged between the two companies, as ratified by the shareholders at meetings held on Friday last. The scheme of amalgamation awaits the approval of the Board of Trade, and it is well understood that this authority will require the Chartered Company to surrender the southern portion of the London Company's district to the South Metropolitan. The result will be to place the whole of the gas supply of South London in the hands of the South Metropolitan, while the Chartered and the Commercial will have the northern shore. Only one more step is wanting, and that is the absorption of the Commercial into the Chartered, so as to give the latter company the advantage of supplying gas along the whole line of their mains from Beckton. The only present difficulty consists in the fact that the Commercial Company are supplying gas at a cheaper rate than the Chartered. But there was the same obstacle years ago with the Independent, and it may be hoped that the Chartered Company will be able to reduce their charge, especially if they have the prospect of entering the Commercial district, which at present is like a desert land to the Chartered shareholders, rendering many miles of their mains wholly unproductive.

It is not anticipated that amalgamation will be encouraged to such an extent as to place London in the hands of one enormous gas company. The official design is apparently to have two companies, divided by the Thames. The boundary is a natural one, though it divides the area very unequally, and the northern company will be very much larger than the southern. Keeping alive the South Metropolitan Company is somewhat of a trial for the Chartered, as the capital account of the latter company is heavily burdened, and comparisons will be made between the prices charged by the two companies for their gas. On the other hand, the South Metropolitan Company took a considerable load upon their shoulders when they absorbed the Phœnix, and the success of the southern company seems to depend very much on the exercise of a rigid economy. They have thus far enjoyed the advantage of having a large portion of the old Phœnix district free from the supervision of a gas examiner, inasmuch as they have by some means or other postponed the establishment of a testing station for that area. The Metropolitan Board are a little uneasy on this point, and have threatened to apply to Parliament for compulsory powers of a general nature, so as to prevent such delay in the future. The company are promising that there shall be no further loss of time, and the Board of Trade have expressed a hope that there may be no necessity for the proposed enactment. But the absence of a testing station is practically nullifying those guarantees which Parliament intended to afford to a gas consumer in respect to the quality and pressure of the supply. In the interest of the company it may be observed that if the latter are really fulfilling their obligations, they are not likely to have the credit of doing so, unless the public have positive proof to that effect. Even with the highest official evidence, the consumer is apt to be suspicious that in some way or other, beyond the discernment of ordinary mortals, he is being "victimised" by the gas company. Independently of this attitude of suspicion on the part of the public, it is only fair, if comparisons are to be instituted between the Chartered and the South Metropolitan, that the two should be placed on the same level as to the conditions of the service.

The process of amalgamation commenced under the distinct approval of Parliament. The Legislature were of opinion that amalgamation was favourable to economy, and was therefore conducive to the interests of the consumer. Another point to which reference was made about the same time consisted in the removal of the gas manufacture from the metropolis. Gas-making was deemed a nuisance, and most people had an idea that gas-holders were much the same as powder magazines. The Chartered Company obtained favour with select committees, because they proposed to erect enormous gasworks near Barking Creek, so as to enable them to abolish certain gasworks existing in the metropolis. Hence arose Beckton, big in its original design, and bigger still as the result of subsequent enlargements. But consolidation has its limits. To have all the water supply by one aqueduct seems agreeable to some minds, and so also to have all the gas made in one place is an idea which finds considerable acceptance. But we question the wisdom of such a conclusion. Any accident happening to Beckton or to its mains would be a very serious matter for the metropolis, and might lead to a considerable revulsion of feeling on this subject. It may be questioned whether Parliament has done wisely in refusing any extension of the Fulham Gasworks. It is true that no less a personage than a prelate objected to the enlargement; but even bishops may be mistaken. The result is that land which might be profitably used by the Chartered Company for an extension of its Fulham works is simply occupied by osiers. If these works were enlarged, the supply of an important district could be carried on more economically than it can be now, and any accident happening to Beckton would be less serious to London. With Battersea Bridge improved —as it will be—coals could be brought up to Fulham by steam craft on the river, in addition to the facilities afforded by railway communication on land. The West London Extension Railway connects the Fulham works with the North-Western and other railway systems; but the river communication is specially important. Coals come by the sea route to Beckton, occupying only thirty-six hours from the pits to the works. Another six hours would bring them up to Fulham. But there is little chance in these days of any permission being given for the extension of gasworks situated as those of Fulham, valuable as those works must be for the supply of the western part of the metropolis. The Chartered Company will, apparently, have to make the best of the existing area occupied on that site, together with their other works situated in the north and east. In the meantime Beckton is itself becoming the centre of a populous district. The marshes are being covered with factories and houses, extensive docks have been formed in the neighbourhood, new lines of railway are about to penetrate the district, and the region which was so lonely in 1868 is rapidly growing into an important manufacturing and mercantile quarter.

The extraordinary increase in the consumption of gas in London has lately been demonstrated in these columns by means of a statistical investigation. The electric light, it is thought, has rather stimulated the demand for gas than otherwise. Certainly the London gas companies do not seem disposed to lose heart. The Chartered Company covet a larger territory, and the London Company have only submitted to absorption after a long series of negotiations. The South Metropolitan Company have faith in the future, or they would hardly undertake the erection of what may be termed a transpontine Beckton in the marshes of East Greenwich. There is also the pressure of a statutory obligation in the case of the gas companies in common with the water companies. They are bound to provide a supply equal to the demand, and must, therefore, have works which shall be adequate to meet the growing requirements of the public. Hence new works become a necessity, and all possible improvements have to be introduced. Amalgamation is part of the same process, and is bringing about a readjustment of the gas supply which cannot fail to benefit London at large, though for a brief period there may be an apparent disadvantage befalling some localities. Had the Chartered Company been gifted with greater prescience in its early days, an enormous waste would have been avoided in regard to the supply of gas. Instead of extending their borders, as the earliest of the London gas companies might have been expected to do, the Chartered Company allowed the metropolitan field to be divided among many comers, and that in the most capricious manner. London is only just escaping from the complicated system which thus grew up. It was nothing strange for one company to have their works in another company's district. Thus the Imperial had works at Fulham in the district of the London Company, and the Great Central had works at Bow Common in the district of the Commercial. Some of the districts were flung about London in fragments, a piece being sometimes inserted—like a solitary island—in the middle of another company's district. Thus the Western Company stopped short at Knightsbridge, and reappeared, with a scrap of territory, completely isolated, at the east end of Piccadilly. The district of the London Company, pending the coming amalgamation, affords a similar example, having a perfectly outlying area extending from the Victoria Embankment, between Somerset House and the Temple, up to Theobald's-road. Properly speaking, the eastern boundary of the London Company's district is at Westminster Bridge, taking the Surrey side of the river; but even then we meet with a severance at Vauxhall. Looking back to the time when all the companies were enjoying a separate existence, we are not surprised at the story that, during this period of complication, the directors of one of the companies became a little puzzled at finding that they were selling more gas than they made. Inquiry revealed the fact that they had been laying on gas from the mains of another company instead of their own, and profiting accordingly. Things are getting into better shape now, and the costly chaos of the past is to give place to that more orderly arrangement which permits of due economy. With the electric light rising above the horizon, the London gas companies have more reason than ever to put their house in order. The question between them and the purveyors of the electric light is simply one of price, and the gas interest must study how to eliminate from their undertakings everything that partakes of extravagance or that occasions loss.

THE BRITISH ASSOCIATION AT SOUTHAMPTON.

Nearly thirty-six years will have passed away between the first meeting of the British Association in Southampton in September, 1846, and that which commences in that town next Wednesday. Names now classical in the lists of English science were the leaders at this meeting, Sir John F. W. Herschel, Bart., resigned the post of president to Sir Roderick Impey Murchison, and thus the two men in the first positions, represented the leading thought on the architecture of the heavens and of the earth. Not that Sir John Herschel was unknown in geological circles, for he contributed some most important papers to physical geology, but his strength was in astronomy. Of those who delivered evening addresses in September, 1846, Professor Owen still remains to us, but of the Council very few remain. Dr. Murchison's address, though largely occupied with geological questions, touched upon many other branches of science. In those days it was customary with the presidents to give an address in which they glanced at almost every subject which had prominently occupied thought during the past year. This custom has of late years been less followed, and the presidential address has become more of a special character, and as scientific work has been split up into branches, this has its advantages, for most of our leading men have devoted themselves especially to one or two subjects. This, perhaps, gives to the address a personal element which cannot be avoided; but although the address may suffer in popularity, it is more likely to be of solid advantage to scientific progress.

The Southampton meeting is not identified with the announcement of any remarkable discovery. A report by Professor Owen on the "Archetype and Homologies of the Vertebrate Skeleton" occupies a considerable portion of the whole volume of the reports of the Association for the year. A report on the "Iron Manufacture of Great Britain," by Mr. G. R. Porter, contained a good deal of information of statistical value, while in the communication to the sections some papers on electrical or electrochemical subjects may be turned to with interest, though they possess little special importance. Amongst the papers read on mechanical science were those of Fairbairn and of Eaton Hodgkinson on the experiments on the tubular bridge then proposed for the Menai Straits; and one still of interest by John Scott Russell on "The Law which Governs the Resistance to Motion of Railway Trains at High Velocities." Russell made a series of

experiments with trains on several lines, and reached sixty-one miles an hour. The resistances at different speeds were recorded, and a formula deduced therefrom for the resistance at any speed. The resistances obtained by this formula agreed pretty closely with the observed resistances, but were in most cases higher. Of the papers to be presented at Southampton next week little is known, but the address of the president, Dr. C. W. Siemens, may be expected to touch upon the several branches of physical science in which the president-elect is a known master; but more especially to dwell upon certain metrical questions important in the practical application of electricity. The determination of electrical units is a subject of growing importance, and one in which Dr. Siemens is known to take great interest, and in his proposals on this subject it may be hoped that he will suggest the employment of terminology and units well known and commonly employed by English mechanicians and physicists. There is no reason why, for instance, we should not continue to use feet and pounds and foot-pounds as much in electrical matters as in engineering and thermodynamics; and as these and other commonly known units are and will continue to be used by the leading electrical engineers, there will be but little chance of the general adoption of the meg erg and centimetre gramme seconds system. To some minds a gramme raised one centimetre in a second may represent a conceivable quantity of work; but a pound raised 1ft. in a minute will ever remain a more tangible and useful quantity to engineers, electrical and otherwise. Fancy measuring or talking of the power of an engine, or work done by one, in ounces raised an inch per second; yet this is a much greater combined unit that the centimetre gramme second. If very small quantities must be expressed, they may be most accurately expressed in decimals of the larger and more generally handy units. When the centimetre gramme second system was supported, it was because only very small quantities were to be measured, but now that enormous quantities of electricity for transferring power and electric lighting have to be dealt with, foot-pounds instead of centimetre grammes are as necessary to the electrician as to the engineer.

As a meeting place Southampton possesses many attractions, and offers many facilities to those who travel thence by sea, holiday bent. In the town and within easy distances are many places and remains of great historic and archæological interest. Southampton is itself a town with a history, though, like the modern representative of some other old English towns, it does not occupy the site of its ancient predecessor. It has, however, existed—it was sacked in 1339 by the French or Genoese—long enough to have many objects of great interest, including old town walls and towers, while some traces of the Roman town of Clausentum, looked upon as the predecessor of Southampton, may still be found on Bittern Manor Farm on a promontory, counterpart of the Northam promontory made by the curvature of the river Atchen. It is on the east side of the river, and is reached by the Northam Bridge. Only a short distance down Southampton Waters are the ruins of Netley Abbey. Not far off are the City of Winchester, the old town of Romsey, the City of Salisbury, Old Sarum, Stonehenge, Cherbury, and Wilton Park, the village of Beaulieu, in the New Forest, with the remains of Beaulieu Abbey. On the shores of the Solent is Hurst Castle, and a little beyond, the priory of Christchurch. Less than half an hour away is the Isle of Wight, which, like the places already mentioned, has its ancient ruins and modern attractions. There are, moreover, the Queen's residence at Osborne House, and facilities which have been granted for inspecting the Royal Victoria Hospital at Netley, the great naval arsenal, dockyard, &c., at Portsmouth, and the royal yacht Victoria and Albert. The geologist will find more than enough to occupy much more time than the meeting will afford him, round the Island, Headon Hill, and at Swanage, Lulworth Cove, along the stratified cliffs of Purbeck stone, gypsum, clay, chalk, &c., the Purbeck Hills and beds, Studlands Bay, Durlston Bay, past Tilly Whim, St. Aldhelm's Head, and Kimmeridge Bay, and also along Southampton Waters. Southampton is 74 miles by road, 78¾ miles by South-Western Railway. Of the General Local Committee Prince Leopold is president, and about two dozen local nobility and gentry are vice-presidents. Mr. W. H. Davis, Mayor of Southampton, is chairman of the Executive Committee; Mr. W. E. Darwin, vice-chairman; local treasurer, Mr. T. Blount Thomas; and the local secretaries are Mr. C. W. A. Jellicoe, Mr. J. E. le Feuvre, and Mr. Morris Miles.

The president-elect, as already mentioned, is Dr. C. W. Siemens, F.R.S. The first general meeting will be held at the skating rink on Wednesday, August 23rd, at 8 p.m.; when Sir John Lubbock, F.R.S., will resign the chair, and the president-elect will assume his office and deliver his address. On Thursday, August 24th, at 8 p.m., there will be a *soirée* in the Hartley Hall; on Friday evening, August 25th, at 8.30 p.m., in the skating rink, a discourse on the tides, by Sir William Thomson, F.R.S. On Monday evening, August 28th. at 8.30 p.m., in the skating rink, a discourse on pelagic life, by H. N. Moseley, F.R.S. On Tuesday evening, August 29th, at 8 p.m., a second *soirée* in the Hartley Hall; on Wednesday, August 30th, the concluding general meeting will be held in the skating rink at 2.30 p.m. In addition to these arrangements, there will be a lecture to the operative classes in the skating rink on Saturday evening, August 26th, by Mr. John Evans, D.C.L., on "Unwritten History, and How to Read it." Amongst other places available for the sectional meetings are, the Watts Memorial Hall, Zion Hall, the Grammar School, Portland Baptist Chapel, Kingsfield School, the Masonic Hall, the Philharmonic Hall, the County Court, the Friends' Meeting House, the Unitarian School, and Taunton's Trade School.

The Southampton Yacht Club, the Council of the Hartley Institution, the Dock Company, and the Union Steamship Company, have made arrangements by which the members of the Association are afforded great facilities. Beside the work to be done at the sectional meetings, which no doubt will be well attended, there are excursions which are generally as enjoyable as the work. The excursion arrangements are very complete, and include all-day excursions on Thursday, August 31st, to Salisbury, Stonehenge, and Wilton Park; Portsmouth Arsenal, Dockyard, the Royal Yacht, &c.; and a marine excursion to Bournemouth, or round the Isle of Wight; as well as afternoon excursions on Saturday, August 26th, to Alum Bay; Ryde, Brading, Whitecliff, Newport, and Carisbrooke; drives in the New Forest; Netley Abbey and Hospital; Romsey, Broadlands (the seat of Lord Mount-Temple), &c.; Winchester and St. Cross. The various local factories (Messrs. Day, Summers, and Co., Northern Ironworks; Oswald, Mordaunt, and Co., Woolston Shipbuilding Works, &c.), and the yard of the Royal Mail Steamship Company will also be accessible to the members and associates with their friends. Fine weather alone is required to make the meeting a successful one.

THE CITY AND GUILDS OF LONDON INSTITUTE.

A writer on the "Human Mind" defines an invention as "a device for effecting some purpose which either philosophy suggests, pleasure prompts, duty demands, or some inconvenience forces us to form." Inventions are not confined to the mechanical arts, but range over every subject that man can conceive. Arts are sciences turned to practical account by inventive genius. These bear the same relation to sciences as wisdom to knowledge, or practice to theory. Is, or can, any art be quite perfect? This question must, we imagine, be answered in the negative. It is but quite recently that it has dawned upon the minds of enthusiasts that education is a science, and if it be a science we presume there is a corresponding art. Further, the laws of the science being acknowledged to be at present but vaguely known, the art must necessarily be far from perfect. It is, therefore, with no suprise that we find constant changes in our educational system; whether such changes are good or bad, time alone can prove.

In order to turn science to practical account it is necessary that the principles of science should be known. These principles can be known in two ways:—(1) Partially and with great trouble from experience; (2) by a knowledge of the history of the science. The greater part of our information is historical. We, thanks to the advantages derived from the art of printing, to a certain extent commence where others left off. The results of their labours are tabulated; some of them may in our so-called student days be tested to verify correctness, but by far the greater part are taken without doubt. The knowledge derived from individual experience is comparatively small, that obtained from the experience of the world through half-a-dozen generations is immense. Which, then, is better—to spend a few years acquiring a knowledge of the history of a science, or to plunge into the practice without such knowledge and blindly to trust to experience? Since we have fallen into the track of quotation, let us hear what Bacon in his "Advancement of Learning" says—*v.* Kitchen's edition, Book II., p. 111. "But if my judgment be of any weight, the use of history mechanical is of all others the most radical and fundamental towards natural philosophy. Such natural philosophy as shall not vanish in the fume of subtile, sublime, or delectable speculation, but such as shall be operative to the endowment and benefit of man's life, for it will not only minister and suggest for the present many ingenious practices in all trades by a connection and transferring of the observations of one art to the use of another, but further, it will give a more true and real illumination concerning causes and axioms than is hitherto obtained. For like as a man's disposition is never well known till he is crossed, nor Proteus ever changed shape till he was straightened and held fast; so the passages and variations of nature cannot appear so fully in the liberty of nature as in the trials and vexations of art."

We all tacitly agree that this is a fair statement of the case, but till quite recently no action was taken to carry the idea into effect. The reason is simple, but natural. Those who possess the knowledge dread the competition of those who have not, but would like to have, the knowledge. Fortunately or unfortunately, as the case is viewed from different standpoints, the development of the applications of recently discovered scientific principles finds all alike ignorant; thus there are no vested interests, and everyone starts in the race under similar conditions, and all want to know what is known. The application to practical purposes of the expansive properties of steam has done much to educate the world, and if there is any reality in the utility of the application of the newer electrical science, the progress made from ignorance to knowledge will in the next fifty years be proportional to that utility. We are accustomed to consider the 1851 Exhibition the cause which led to a more generous appreciation of technical or really scientific knowledge. Till then the dictum, work to your orders, drawings, specifications, &c., held good; the wider principle, work to drawings because they accord with scientific teaching, was unknown. The previous work was good when viewed as mere work; bad because generally neither designer, draughtsman, nor workman knew why this or that was done, the result being frequently at variance with nature's laws. It is unnecessary to give specific examples. Scientific teaching became recognised in our schools. The Government granted an annual subsidy and instituted a special department to further it. The universities bestirred themselves, and for a time all seemed well. Trade became dull; other nations seemed to be ousting us from our markets, and these, added to politic considerations, have led the City Guilds to use some of their surplus income in furthering the spread of "Technical Education." The best method of doing this is unknown, owing, as we have said already, to the ignorance of the principles of the science of education. The plan adopted is to pay teachers for pupils who pass prescribed examinations. In fact, the plan of the Science Department has been slavishly followed. We protest most emphatically against the method which allows gentlemen, however able and honourable, to be both teachers and examiners. Although in such a case the teacher-examiner is generally far more careful to frame his questions so that they may not be favourable to his own pupils, it is impossible to eradicate the idea from the minds of other teachers that this is possible. The City and Guilds Institute is desirous of providing artisans and those engaged in manufacturing industries with a knowledge of the laws and principles which guide in the designing of their work. They are to know the why and the wherefore of all they do. Great care must be taken that the Institute does not degenerate into a mere examining body, looking to the number and the success of the candidates in the examinations as reasons why it should receive support. The examinations, as examinations, should be viewed with little favour; as giving a rough idea of the method and matter of the teacher, should be viewed with a considerable amount of respect. The vast majority of the men whom this instruction should reach have received no other than an ordinary elementary education. They have passed the sixth standard and have gone to work. Grammar and logic are almost negative quantities in their minds; yet the men may know thoroughly the why and wherefore of their work. In these examinations do such men shine conspicuous by their absence, or are they plucked because of bad spelling, bad grammar, or inability to give a logical answer? The report states that in November last 3467 students were attending the technical classes, and implies that this number increased; yet only 1972 candidated presented themselves for examination. Were the students led to believe that the attainment of knowledge was the sole purpose of their attending the classes, or were they led to suppose that the aim was to pass the examination at the end of the session? We fear too much stress is laid upon the examination, and that thousands of young people who would like to join the classes are thereby kept away. At present we imagine that while the cost of a scholar in an elementary school is about 10s. a year, the cost of a scholar in a technical school is more like £10 a year; yet for the same cost in all probability ten times the number of students could be taught.

That our remarks are warranted by facts may easily be seen from the examiner's report on bread-making. He says:—"In the past examination forty candidates entered; not one has passed. Those numbered 1343 to 1390 seem to be children who have been crammed by a person grossly ignorant of the subject, and whose sole idea has been to get the children to learn by rote various parts of my 'Cantor Lectures.' Parrot-like, they repeat the words, not only without knowing their meaning, but mixing them up so as in many cases to produce the most absurd nonsense." We may here remark that a good deal of information would be given to the general public if in these reports the "ages" and occupation of the candidates were given. Are the candidates really "children"—for example, children in board schools? If so, do these form the *corpus vile* the City Guilds Institute wishes to mould and shape? Then, again, a pertinent question concerns the examiner. The problems he puts may or may not be suited to the object in view. If we rightly grasp the object of the Institute, we are reluctantly compelled to say that 50 per cent. of the questions asked at these examinations are such as should not be asked, and which the students might naturally be expected to fail in answering.

For centuries the thinkers of the country have favoured technical education, and recently an attempt has been made to carry out such instruction. We have rather adversely, perhaps, criticised the system adopted, but that it is able to bear good fruit we have no doubt. The work of the City Guilds, even as now carried on, will do a good deal of good. The mere suggestion of study in a particular direction induces students—these original workers influence their friends; and more by book work and discussion amongst themselves, and a closer attention to principles when at work, than from teachers, such men gain knowledge. Masters desirous of earning a few pounds by the results of the examinations, influence pupils; and although we decry the methods of cram as much as the examiners, we must admit that there is even in such cases wheat as well as chaff. Many of the pupils begin to get a liking for the subject, and where they are interested in it, the master, *quà master*, be he good, bad, or indifferent, is ignored; but the obtaining of knowledge goes on. Assume, nay prove, that many or most of the science masters in connection with South Kensington are charlatans, crammers, and so on, it is impossible to ignore the fact that since South Kensington came into existence there has been a very considerable increase in the general scientific knowledge of the British public—and it will be so with respect to this technical education. It is wanted—it must come—and whether the method adopted to dissemminate the knowledge be the best or the worst, the ball has been set rolling, and nothing will or can stop it. Good is thus, it may be admitted, being effected by these educational establishments, but at present the cost is enormously disproportionate to work done.

ARTILLERY CASUALTIES IN THE BOMBARDMENT OF ALEXANDRIA.

Certain casualties have been reported in the papers as occurring which interfered with the efficiency of our guns, stopped their fire, or lessened its effect. There has been some mystery about the matter. We believe we can now speak with confidence as to general character and nature of these casualties. The most alarming report was with regard to the guns of the Alexandra, which were represented as unserviceable. The facts are these: In two 10in. guns of this ship slight imperfections in welds and slight movement of coils has been perceptible, but such as in no way to interfere with the efficiency of the guns, which are ready to continue their work whenever it may be necessary. An 11in. gun of the same ship has suffered from the bursting of a common shell in the bore, near the muzzle. The steel tube has, we believe, a slight crack in it; the gun was fired some rounds afterwards, however. It is proposed to drill a hole at the extremity of this crack, to prevent its extension as the gun continues to be fired. This is not, however, likely, in our judgment, to be satisfactory, because it is very difficult to trace how far a crack in steel extends. When opportunity occurs we imagine this gun will be exchanged. A shell bursting in the bore of a gun near the muzzle of course throws a shock on the weakest part of the bore, though injuries effected there are less important than those which might occur nearer the breech. We know of no other casualties to our guns, although we believe some incon-

venience and delay was caused by the jamming of some of the Inflexible tubes. This was only the matter of the few minutes necessary to remove the axial vent, and the difficulty was known beforehand, and an improved pattern has been brought in. Then again many shells failed to explode on impact. This is unsatisfactory. The fact is that such care has always been taken to ensure the Pittman fuse not exploding against a wave, that it has not unnaturally become too little sensitive. The proof in the Laboratory, we think, has always been that a percentage of fuses should be fired in shells against water from a 7in. gun with 22 lb. charge. Striking newly dug earth obliquely, there might then be a chance of their not exploding. It ought not to have occurred in a direct blow against earth, much less against masonry. Our readers have doubtless read the absurd account in the *Standard* of a shell of the 80-ton gun, which had been fired from the Inflexible, being found in the drawing-room of a house, unexploded. On the owner's request that it might be removed, it was carried carefully away rolled up in a feather bed. This brings out another question connected with our ammunition, one of detail, but one that needs attention, especially if our navy are likely to have to deal with fired and unexploded shells. Some years since—perhaps fifteen years ago—the great danger of handling shells containing percussion fuses whose internal parts had been disarranged, or put in action by firing, and consequently might be exploded by a very slight shock, led to a second hole, termed an "unloading hole," being drilled in each shell in the head, not many inches from the fuse hole. This was closed by a screw plug, which could be safely removed from a fired shell, so that the charge might be drowned with water before tampering with the fuse. Latterly these unloading holes, which it appears were practically never used, were discontinued. The 80-ton gun shells have not got them. Probably this shell might be safely carried off in a feather bed if it had failed to fire on impact, however oblique. Nevertheless we confess we should have preferred to treat it differently. We should have made a sort of little ring wall with clay or putty round some spot of the upper side of the shell as it lay, such as enabled us to have a small pond of water on it, in the bottom of which we should have carefully drilled a hole into the interior of the shell, moving the bit very gently, and keeping water on it, specially at the end of the process as it broke into the interior. The charge might then have been gradually saturated. We presume the shell was thrown into the sea in this case, which would have been on our plan unnecessary, and a big shell is worth saving. Another curious question suggests itself as to what might become eventually of a shell lying in the water. We hear that one of our old shell fired in the siege of Sebastopol exploded recently in that town on being tampered with. The iron shot brought up from the Mary Rose which had lain two hundred years under water was so finely honeycombed by the sea water, and presented metal in so fine a state of division to the action of the air, that, to the horror of the finder, the shell gradually steamed fiercely, and became intensely hot. Might this happen if our feather bed friend should be taken out of the water two hundred years hence, and if so, will the Egyptians of the period find that it finishes its performance by exploding?

THE CHANNEL TUNNEL.

Different opinions will be expressed on the decision of the Government with respect to the Channel tunnel, but the fate of the bills before Parliament is certainly that which has been anticipated by a good many. In our impression of the 10th of December last we gave expression to views held by many who, without being in the slightest degree of the alarmist disposition, could nevertheless see that the Channel could not be tunnelled without enormously adding to our military requirements. These views met with a good deal of adverse criticism, but were subsequently strongly supported by our daily contemporaries. The Government placed the scheme in the hands of a War-office Committee, assisted by engineering and other experts, and having now the assistance of their report, they have decided that it is unadvisable to allow the two Channel tunnel Bills to proceed further. This is in spite of the speeches and actions of Sir Edward Watkin, whose *couleur de rose* views, and denunciations of all opposed to his actions in the matter, have probably done as much to stop as to help the scheme to practical realisation. There are objections which may be urged against the scheme as an engineering matter, not the least of which are connected with the economical working and ventilation of the tunnel if finished, and as far as the trial heading under our shores has been carried, it has afforded no real proof that the tunnel would be carried under twenty miles of sea without great difficulties, which might render its completion a work of much greater cost and expenditure of time than any estimates put forward, to say nothing of the sanguine expectations, or, at any rate expressions, of the chairman of the South-Eastern Railway Company. So far as they have gone the trial headings have indicated that the work might be successfully accomplished, but they afford no proof, though they have added somewhat to our information on the condition of what is presumed to be a tolerably continuous formation through which the tunnel would be made. It is not, however, it seems, so much from an engineering point of view as from political consideration that the Government have arrived at a conclusion adverse to the promoters of both the tunnel Bills, and upon these consideration we have now no reason to add anything to what we have already published. It is certain, however, that as far as cross Channel traffic is concerned, there is so much possibility of improvement in the direction now being taken by the railway companies, as by the London, Chatham, and Dover in the construction of the fine fast vessel, Invicta, and what might be done in the improvement of the port accommodation, that with these fully carried out, and the Channel crossed in about an hour, there would be no arguments in favour of the tunnel on the score of economy of cost, little in time, and none as to safety or comfort.

THE CANAL DU NORD.

The Municipal Council of Paris has just adopted the conclusions of a report proposing that surveys for this great canal should be pushed forward with the utmost possible activity. The Council has further adopted a resolution expressing a wish that the canal should be extended as far as Dunkerque, which the French wish to make a rival of Antwerp. It may be interesting to recapitulate a few particulars with reference to this important new canal. A law of 1878 authorised the French Government to execute the necessary works for giving the Seine a depth of 10ft. between Rouen and Paris. English coal, which is already delivered in considerable quantities upon the Parisian markets, would, on such a depth of water being obtained between Rouen and Paris, reach the French capital more easily, and could be sold upon the Parisian markets at some reduction in price. The prospect of this state of things occasions some uneasiness among the colliery proprietors of the Nord and the Pas-de-Calais, who naturally wish to secure a large share of the coal supply of Paris. After consideration of all the facts, the parties interested came to the conclusion that, in order to increase the outlets of the coal mines of the Nord with the Pas-de-Calais, it is indispensable to unite those departments of Paris by a direct canal. Paris, in fact, now communicates with the northern frontier of France by a number of navigations which have become inadequate to meet the requirements of modern commerce. The movement of commodities is effected upon these navigations in a sluggish fashion and under relatively costly conditions. The Northern of France Railway cannot supply the deficiencies of the existing navigations, and the result is that Paris, the great industrial centre of France, is obliged to apply to England, Belgium, and Germany for half the coal which it consumes. The proposed canal would not only accommodate coal traffic, but it would be of obvious utility for the conveyance of heavy goods, which naturally seem intended to travel by water rather than by railway. Two routes for the proposed great canal came under consideration, and an inquiry having been opened as to the relative merits of these routes, the Commissioners of Inquiry pronounced almost unanimously in favour of a direct canal *viâ* Arleux, Péronne, Ham, and Noyon. The Commissioners further advocated the doubling of the sluices, and proposed that the width of the canal should be carried from 36ft. 8in. to 56ft. 8in. The Commissioners, in short, adopted the proposal for a direct canal of large dimensions. The effect of the proposed doubling of the sluices and increasing the width of the canal will be to carry the estimated cost from £3,320,000 to £4,200,000. The expense of maintaining and working the canal is estimated at £36,000 per annum. The annual charge for interest at 4 per cent. per annum upon the capital which will have to be expended will be £168,000; and, accordingly, to clear its expenses the canal will have to earn somewhere about £204,000 per annum. Should the canal of the Nord be carried out, it will abridge the distance between Dunkerque and Paris by 68¾ miles. The district to the east of France accommodated by the new canal from the Oise to the Aisne will also benefit to some extent, as it will abridge the distance between it and Paris by about 63 miles. Finally, direct navigation between the Mediterranean and the North Sea will also be reduced by the proposed new canal to 715⅝ miles, or about the length of the present railway route from the north to the south of France. A reduction of the distance over which coal will have to be conveyed will necessarily involve also a reduction of the transport dues; and it is estimated that upon coal forwarded from Anzin to Paris, for example, the average saving will be about 1s. 7d. per ton. As the consumption of the department of the Seine now exceeds 3,000,000 tons of coal per annum, of which more than half is imported from abroad, the annual saving secured by the district accommodated by the proposed canal would obviously be very considerable.

LITERATURE.

A School Course on Heat. By W. Larden, M.A. London: Sampson, Low, and Co. 1882.

In a generally clearly descriptive manner the author conducts the student through the various subjects usually grouped under the general heading, heat. In some cases he refers to Deschanel's Natural Philosophy, part Heat; but he pays Deschanel a greater compliment than this by an imitation which is at first made evident to the reader by many of the illustrations, and afterwards by the text. If Mr. Larden had exactly followed Deschanel, we should have asked why his book was published at all; but examination shows that in places where the former work is not sufficiently explanatory, he has done his best to make things plain. In some respects he has succeeded, but the good intention with which he seems to have started, namely, to help the student by means of worked-out examples in the application of the values found by the methods described, seems soon to have tired him, for there is little of this after the part dealing with the expansion of solids. Even here, however, his method is not as simple as it might be, for in giving an example of what he calls "area expansion" in one place, and "square expansion" in another, he makes the student repeat a lot of figures which would be unnecessary if he simply explained the use of the expression $A' = A + (A \times t \times 2k)$, A being the area before the rise in temperature through the range t with a co-efficient of expansion k. In dealing with the mechanical theory of heat, the author has made a few points rather clearer to the student than Deschanel has done, or rather Everett in his translated and revised edition, but it is not so complete, while his treatment of the steam engine is no better, and the illustrations are copies. The diagram used in explanation of the compound engine is the absurd misleading thing used by Everett. Mr. Larden's information on compound engines is also restricted. He says, "Engineers have sought to combine the economy of energy gained in expansive working, with an approach to the same evenness of pressure during the stroke that we get in non-expansive working. Now the total pressure with which the piston is urged is given by the pressure of the steam per square inch × the area of the piston. If, then, we can contrive to admit steam, when it has lost pressure by expansion, behind a fresh piston of larger area, this larger area will to some extent compensate for the decreased pressure of the steam." After reading the latter paragraph, it seemed necessary to go back through the book to see whether other fuzzy parts had not been overlooked, but the author, like Professor Everett in the translation to which we have already referred, and which seems to be the author's model, is safe until he gets on to the practical modern steam engine, and there he fails.

It is curious that authors of works of this kind will not turn to modern books, such as Rigg's on the "Steam Engine," for their examples, instead of placing before their students incorrect ideas both of theory and design. The steam engine diagrams and illustrations given in the book are nearly all old or incorrect. For this there is no excuse. It makes it necessary for the student's eye to unlearn what it learns here, while it might easily be prevented. In his chapter on conduction the author is moreover insufficiently explicit, and, like his model, does not show at all how the observations on conduction may be applied to questions of heating liquids, &c. In explaining the expansion of solids, the author seems to have had some idea that a well-known lecture apparatus was first used on the Thames, for he says that volumetric expansion of solids is shown by "the Gravesend Ring and Ball," the illustration showing Gravesande's ring and ball. Mr. Larden's book has probably been written for the same reason that many school books have in recent years been written, namely, because the writer found his own lecture notes more handy for his own use than other teachers' books, but there are few teachers who will take his book in preference to those with which they are acquainted.

Rules and Regulations Made Under the Adelaide Sewers Act, 1878, *with Plans and Descriptive Directions as to the Best Method of Making House Connections.* By Oswald Brown, M.I.C.E., Hydraulic Engineer. Published at the Office of the Hydraulic Engineer of Adelaide. 1882.

Those interested in the methods of forming house drains, and their connections with the main sewers, will be glad to possess a copy of these rules and regulations, which comprise not only the rules, &c., but complete descriptions of the various methods of draining and of ventilating house drains, illustrated by twenty-four well executed lithographic plates. Adelaide contains 65,000 inhabitants, and covers 1500 acres, so that its sewerage system is considerable. It has been carried out under Mr. Oswald Brown, and is now complete except in respect of the house connections, which in Adelaide, as elsewhere, will take time. Although the engineer of a town has had a great many perplexing systems of water-closets, traps, gulleys, and ventilating arrangements to sort out and choose from, the designs given in these plates show that Mr. Brown has made a selection which at the same time secures effective action and simplicity. In a "Note to the English Editor" of these rules, &c., an interesting description is given of the water supply and sewerage works of Adelaide, with the reasons for adopting the plans which have been carried out. Broad irrigation and intermittent downward filtration are adopted for the disposal of the sewage, 450 acres of land of a light loam over a sandy subsoil having been obtained for that purpose.

Did our space permit we would reprint these regulations *in extenso*, but as they can be obtained for 1s. we must commend our readers to the book itself, which is in every way a creditable piece of work. House connections made in accordance with these regulations have been found to work very satisfactorily. Since the formation of the street sewers in Adelaide some complaints have been made of smell from the street ventilators, the cause being the fact that, owing to the comparatively small number of connections at present completed, the quantity of sewage flowing is not sufficient to maintain a constant stream in the small sewers. Hence, artificial daily flushing has been resorted to until all the connections are made, then the sewers will all be self-cleansing, having good falls. In the wide streets ventilators are provided at the centre of the roadway, spaced 100ft. apart. In the narrow streets ventilating shafts 6in. in diameter are carried up above house tops in suitable situations. In addition to these precautions every house, as may be seen from the regulations, is isolated from the sewer and provided with its own special ventilation of its drains.

BOOKS RECEIVED.

A School Course on Heat. By W. Larden, M.A. London: Sampson, Low, and Co. 1882.

Elementary Chemical Arithmetic, with 1100 *Problems.* By Sydney Lupton, M.A. London: Macmillan and Co. 1882.

A Manual of Naval Architecture. For the Use of Officers of the Royal Navy, Officers of the Mercantile Marine, Shipbuilders, Shipowners, and Yachtmen. By W. H. White. London: John Murray. 1882.

Continuous Railway Brakes: A Practical Treatise on the Several Systems in use in the United Kingdom. By Michael Reynolds. London: Crosby Lockwood and Co. 1882.

Art Instruction in England. By J. Edward Hulme, F.L.S., F.S.A. London: Longmans, Green, and Co. 1882.

Transactions of the Institution of Civil Engineers of Ireland. Vol. xiii. Dublin: Printed for the Institution by John Falconer. 1882.

Treatise Relative to the Testing of Water Wheels and Machinery. Third Edition. By James Emerson. Springfield, Mass: Weaver, Shipman, and Co. 1881.

Lectures on the Science and Art of Sanitary Plumbing. By J. Stevens Hellyer. London: B. T. Batsford and Co. 1882.

The Principles of Colliery Ventilation. Second Edition. By Alan Bagot, Assoc. M.I.C.E. London: Kegan, Paul, and Co. 1882.

Treatise on the Arrangement, Application, and Use of Slide Rules. By Thos. Dixon, Engineer, Bradford, Yorkshire. 1881.

The Dredger, Excavator, and Elevator. London: Priestman Bros., 52, Queen Victoria-street. 1882.

The Liability of Employers for Personal Injuries. By W. Rowland Roberts and Gerge Henry Wallace, M.A. London: Reeves and Turner. 1882.

Proceedings of the United States Naval Institute. Vol. 8. Published quarterly by the Institute. 1882.

Notes on Continental Irrigation, with Plates. By Henry Ling Roth. London: Trübner and Co. 1882.

Society of Engineers, Transactions for 1881. London: E. and F. N. Spon. 1882.

Picture Frame Making for Amateurs. Illustrated by James Lukin, B.A. London: L. Upcott Gill. 1882.

A Popular Hand-book to the Natural History Collection in the Museum of the Yorkshire Philosophical Society. By the Keeper of the Museum, Walter Keeping, M.A., F.G.S. York: John Sampson. 1881.

The Foundations of Mechanics. By W. R. Browne, M.A., M.I.C.E., &c. Reprinted from The Engineer. London: C. Griffin and Co. 1882.

The Diamonds, Coal, and Gold of India, their Mode of Occurrence and Distribution. By V. Ball, M.A., F.G.S. London: Trübner and Co.

Minutes of Proceedings of the Institution of Civil Engineers. Vol. lxviii. London: Published by the Institution. 1882.

THE NIEDERBAUM SWING BRIDGE, HAMBURG.

With this impression we publish a supplement containing a section through the pivot pier of this bridge, and an enlarged view of part of the girder, forming Figs. 7 and 8 described in The Engineer of the 4th inst.

The Steamship Mary Beatrice.—The new Folkestone and Boulogne passenger ship made her first passenger run yesterday, when the trip was made in ninety-three minutes with a two and a-half knot current against her.

THE MECHANICAL REFRIGERATION OF AIR.

By T. B. Lightfoot, M. Inst. C.E., M. Inst. M.E.

No. III.

In the first class of refrigerators the expansion is accomplished either in a single or double-acting cylinder; the whole of the difference between the amount of moisture held in solution by the air at its entering temperature and pressure, say, 95 deg. Fah. and 75 lb. per square inch absolute, and that held at its temperature and pressure after expansion, or, say, 50 deg. below zero and at atmospheric pressure, is condensed and converted into ice, which is, or should be, discharged with the cooled air, from which it must be abstracted by a snow collector before the air can be used as a cooling agent.

The amount of ice formed in the expansion cylinder of a refrigerator working under the temperatures and pressures just mentioned, can be ascertained from Table I., corrected for the actual pressure, and will be found to be 0·68 lb. for each 100 lb. of air treated. This formation of ice necessitates the adoption of special exhaust valves, these valves being generally of the mitre type, closed by means of strong springs against a sharp edge, so as to cut through any snow or ice that may have lodged upon the seat. Besides the inconvenience which arises from the conversion of all the condensed vapour into ice, there is an actual loss of efficiency, greatest in the tropics, from the liberation of the heat of liquefaction, each pound of water on being frozen giving off 142 thermal units to the expanded air, which is accordingly heated to this amount.

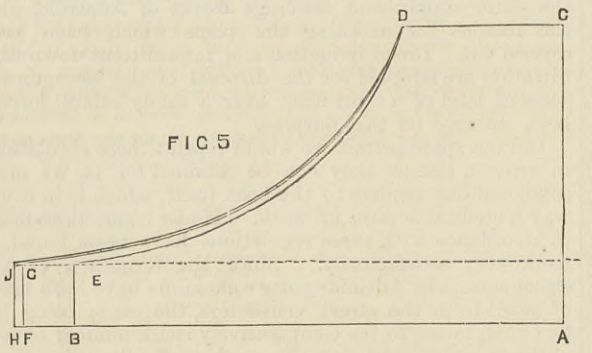


FIG 5

The following diagram Fig. 5 gives the actual expansion curve D J from a refrigerator expanding moist air, also the line of adiabatic expansion D E, and the theoretic curve D G for moist air. Taking the initial temperature at 95 deg. Fah., and the pressure at 75 lb. absolute, and assuming expansion to be carried out to atmospheric pressure, the final temperatures are 112 deg. below zero for adiabatic expansion, 77 deg. below zero for the theoretic expansion of moist air, and about 50 deg. below zero for the actual case, provided due care be taken to thoroughly clothe all parts of the cylinder and valve chests with a good non-conducting material. The final volumes are proportional to the absolute temperatures.

Refrigerators of the second class may themselves be separated into two divisions—those in which the further cooling of the compressed air is accomplished by passing it through an arrangement of tubes, or other surfaces, exposed directly to the current of intensely cold air discharged from the expansion cylinder, and those in which the cooling action is derived from the spent air passing from the cold chamber. The object in both cases is to reduce the temperature of the cooled and saturated compressed air as nearly as possible to freezing point, so that, by lessening its vapour capacity, a condensation and deposition of a portion of its contained moisture will be effected.

Taking air, as in the first case, at 75 lb. pressure and 95 deg. Fah., every 100 lb. will contain 0·71 lb. of vapour. On reducing the temperature to 40 deg. Fah., under constant pressure, it will be found from Table I., corrected for pressure, that only 0·112 lb. of water can now be held in solution. The difference, or 0·598 lb., will therefore have been condensed, and can be collected and run off. The heat given off in cooling the compressed air, and also that rendered sensible in condensing the vapour, is imparted to the cold expanded air. In the case just taken, this heat will amount to 1946 thermal units, made up as follows :—

Cooling 100 lb. air from 95 deg. Fah. to 40 deg. Fah.	1309 units.
Condensing 0·598 lb. vapour	657 ,,
Total	1966 ,,

And as this must all be taken up by 100 lb. of almost perfectly dry air, its temperature will be thereby raised 82 deg. Fah.

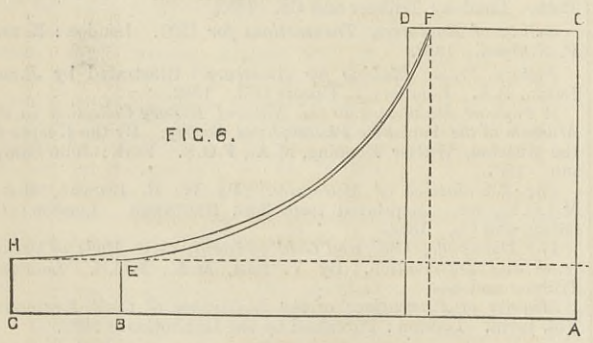


FIG. 6.

Fig. 6 shows graphically the operation of cooling and expanding air on this system. C D is a volume of compressed air just cooled by the application of water. By submitting this to the further action of colder air the temperature is reduced from 95 deg. Fah. to 40 deg. Fah., during which process the external cooling air will have been heated 82 deg. Fah. The volume is now reduced to C F, and if this is expanded to atmospheric pressure, F E will represent the adiabatic line and F H an expansion curve from an actual indicator diagram. For adiabatic expansion the final temperature would be 147 deg. below zero Fah.; but in practice probably 80 deg. below zero would be the maximum degree of cold produced under the most favourable circumstances, on account of the great losses from conduction of heat from the outside, which occur at such excessively low temperatures.

If the air delivered from the expansion cylinder at 80 deg. below zero is immediately caused to impinge against the tubes of the apparatus for cooling the compressed air, as it is in one description of refrigerator, it will at once receive the heat given off in the cooling and condensation of the vapour; and if this cooling extends through the range taken in our calculations, the cold air will be raised 82 deg. Fah., and will be delivered for use at 2 deg. above zero. This must therefore be taken as the available temperature for cooling purposes. If the air is not thus heated, then the deposition of moisture will be less, and more snow will be formed during expansion. In using this apparatus care should be taken to avoid the formation of ice in the cooling tubes, from the freezing of the condensed vapour. This is desirable, not only on account of the trouble in thawing the ice and clearing out the obstruction from the tubes, but also to prevent the further sacrifice of cold likely to arise.

In the other division of this class of refrigerators, in which the spent air leaving the cold chamber is used for cooling purposes, there is, of course, no danger from the formation of ice in the cooling tubes, and in this respect this plan is preferable to that just considered; but the spent air, which is seldom below 25 deg. Fah., is capable of but little cooling and moisture-depositing action. This is at once seen by remembering that if the initial temperature of the partially cooled compressed air is 95 deg. Fah., the final temperature of the cooling air must be actually, at least, 10 deg. less than this, or 85 deg. Fah., so that the difference between 25 deg. and 85 deg. Fah. represents the maximum range through which the cooling air can be heated, and this gives per 100 pounds of air an absorbing power of only 1428 units instead of the 1966 which would be given off in cooling the compressed air to 40 deg. Fah. It is, therefore, evident that when the spent air at 25 deg. Fah. is used for cooling and moisture depositing purposes, the compressed air can never be reduced below 58 deg. Fah. in the tropics, or in cases where the cooling water is initially at 90 deg. Fah., and will, therefore, be delivered to the expansion cylinder containing a considerable amount of moisture which will be converted into ice during expansion. Another objection to this method is the space occupied by the apparatus which is necessarily of large dimensions, and there is a difficulty in applying it in cases where there is no cold chamber, such, for instance, as in the cooling of cellars or moderating of temperatures in breweries, as well as in cases where comparatively high chamber temperatures are required.

In the third class of refrigerators the moisture is also abstracted by taking advantage of the varying vapour capacity of the air, but instead of the cooling being accomplished by contact with cold surfaces it is effected in the following manner :—The expansion cylinder is provided with a trunk piston, and the compressed air after being cooled by the action of water is introduced into the annulus and expanded to such pressure as gives a terminal temperature of about 35 deg. Fah. The result is the condensation of almost the whole of the moisture, which in the form of a thick mist is discharged with the air into a small vessel called the separator, having extended surfaces so arranged that the mist is deposited on them as water, which falls to the bottom and is drained off. The surfaces are proportioned so that the air in passing through is thoroughly relieved of the water, and dried in this manner, is passed again to the cylinder, expanded behind the full piston area to atmospheric pressure, and discharged cooled and practically free from snow ready for use.

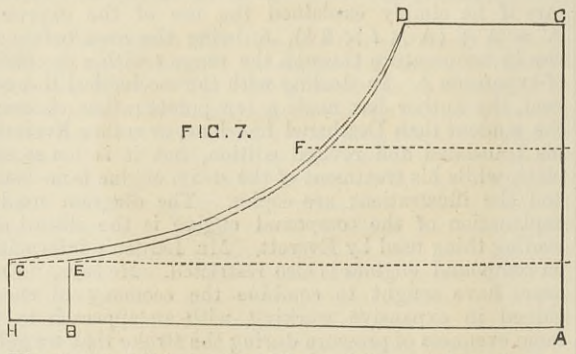


FIG. 7.

Fig. 7 shows this method of expansion. The volume of air C D at 75 lb. pressure and 95 deg. is expanded, according to the curve D F, the pressure being reduced to about 40 lb. absolute and the temperature to 35 deg. Fah. It is then exhausted and passed through the water separator, admitted behind the piston, and the expansion continued to atmospheric pressure according to the curve F G, this line being nearly a true adiabatic, the final temperature being about 55 deg. below zero. D E is the adiabatic line as before with a terminal temperature of 112 deg. below zero. According to calculation the curve for final expansion on this system should fall a little below the curve for moist air expansion given by line D G in Fig. 5, as the loss due to the setting free of the heat of liquefaction in the formation of ice is almost entirely avoided. In practice, however, from conduction of heat which always takes place, no matter how carefully it is guarded against, the final temperature is always a little higher, though the actual result comes much nearer the theoretic than in the case shown in Fig. 6, in which by reason of the very low temperature attempted the losses from conduction are unfortunately much increased.

The following calculation shows the quantity of moisture that can be abstracted from 100 lb. of saturated air at the above-named pressure and temperature expanded on this system :—

Amount entering first expansion cylinder	0·71 lb.
Amount remaining after passage through separator...	0·12 lb.
Difference	0·59 lb.

The 0·59 lb. is run out as water, and of the balance of 0·12 lb., 0·1 lb. will be condensed and converted into ice during final expansion and discharged with the air, the remainder, or 0·02 lb., continuing in the state of vapour in the cold air. The abstraction of water is therefore precisely the same as in the case treated in Fig. 6, but while there, in order to obtain the cooling of the air and consequent condensation of vapour, the cold air after expansion had to be heated by 82 deg. Fah. before it could be delivered for use, in this case the air at 55 deg. below zero can at once be utilised, and full advantage taken of all the cold produced. In order to allow for any variation in the temperature of the cooling water the cut-off valve of first expansion is made variable, so as to increase or decrease the ratio of expansion according to the increase or decrease in initial temperature, and this adjustment not only maintains an uniform abstraction of moisture in all climates, but prevents alteration in the temperature of the air after final expansion.

In these articles but little reference has been made to the details of machines for carrying out the various processes of compression, cooling, and expansion. These present nothing special beyond requiring that careful design and selection of material and workmanship, which are just as much to be desired in an ordinary steam engine or machine as in an air refrigerator. While, however, in a steam engine a slight leakage at the slides, or bad adjustment of them, may only affect the result in so far as to cause a fractional increase in coal consumption, in a refrigerator the same defects, without being what would ordinarily be called very excessive, may yet be sufficient to cause the air to be delivered some 20, or even 30, degrees higher than what would be attained with better workmanship and construction. To produce cold air, heat must be converted into mechanical work during expansion, and *cæteris paribus*, that machine in which expansion is most efficiently performed will best discharge the function of a refrigerator.

In conclusion, it should perhaps be pointed out that though the adiabatic curve for the expansion of a perfect gas has for convenience been taken as the basis for all comparisons of expansions, the curve actually to be aimed at is the adiabatic for air saturated with aqueous vapour. This moist air expansion curve, as it is called, differs slightly from the adiabatic for a gas, inasmuch as owing to the continual condensation of vapour as the temperature is lowered, heat of vaporisation is liberated, and being taken up by the partially expanded air, its temperature is thereby raised. Below 32 deg. Fah. heat of liquefaction is also set free on the conversion of the condensed vapour into ice, but the quantities of moisture existing as vapour at any temperature below this point are so small that the curve afterwards almost coincides with that for a perfect gas.

For any known temperature and pressure the volume and the quantity of contained vapour can of course be easily ascertained by the formulæ already given, but the actual construction of the moist air curve involves the use of expressions much too elaborate for reproduction here though they have been carefully worked out by that able mathematician, Mr. J. McFarlane Gray, to whom the writer is also much indebted for many valuable hints and suggestions.

IMPERIAL DOM PEDRO II. BRIDGE.

The engraving we give this week on page 104, illustrates a bridge, in the design and construction of which are features of an essentially practical and important character. This structure was designed by Mr. James Cleminson, Mem. Inst. C.E., for the threefold purpose of carrying the Brazilian Imperial Central Bahia Railway; to form a public highway, and lastly a foot-bridge across the Paraguassa River, between the cities of Cachocira and Sao Felix. The principle that has been observed by Mr. Cleminson in designing and carrying out this work is the elimination of all skilled labour, by utilising the material just in the condition that it leaves the rolling mill, and its treatment throughout by machinery only. We shall publish details in another issue, when we shall describe the methods and appliances that have been devised and employed with great success in point of economy in the cost of the work. The inception of the work is due to Mr. Hugh Wilson, C E., whose energy and judgment in guiding the Brazilian Imperial Central Bahia Railway to its present high rank in Brazil as a work of public utility have earned signal recognition at the hands of his Majesty the Emperor, who graciously permits the bridge to be named after himself. This work is being carried out under the approval of Mr. A. L. Stride, M. Inst. C.E., the consulting engineer of the Brazilian Imperial Bahia Central Railway Company.

CHARLES EDWARDS AMOS.

The death is announced, on the 12th inst., of Mr. Chas. Edwards Amos, at the age of 77, at his residence, Cedars-road, Clapham Common. Mr. Amos, like Sir William Cubitt and others, began life as a millwright, to which he served an apprenticeship under Mr. J. Wilkinson, at Elm, Isle of Ely, and early started on his own account, for in 1855 he had been in business sixteen years as a manufacturer of engines and machinery, and was well known as a very skilful millwright and ingenious mechanist.

Mr. Amos was early associated with Mr. James Easton, and became his partner in 1836. Under his directions in 1844 he was engaged in the sinking of the well and construction of the Government waterworks in Trafalgar-square for the supply of the fountains and of all the Government offices. These works were commenced in 1844. A good supply of water was obtained from the beds beneath the London clay, the boring being carried to a depth of 300ft., and a second well to a depth of 168ft., the two wells being connected by a tunnel 400ft. in length. In 1859 a paper on these waterworks was read before the Institution of Civil Engineers by Mr. Amos, and a lengthy discussion followed it. Mr. Amos became a Member of the Institution of Civil Engineers in 1855.

For thirty years he was the partner of Mr. Easton, and with him was consulting engineer to the Royal Agricultural Society. His practical ability and mechanical ingenuity was here applied in the arrangement and conduct of the important trials of steam and other machinery which used to be carried out by the Royal Agricultural Society until its council comprised members interested in the trials. When Mr. Amos retired in 1866, the firm of Easton and Amos became and remains Easton and Anderson.

A NEW FORM OF GIRDER.

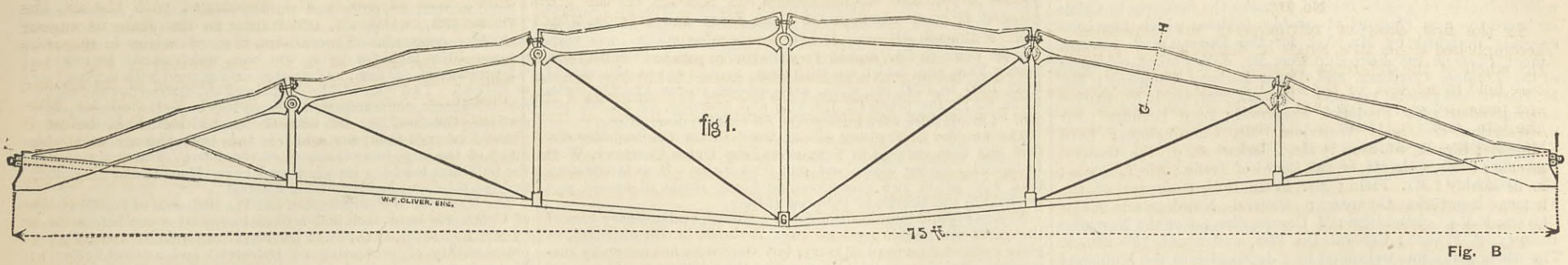


Fig. C

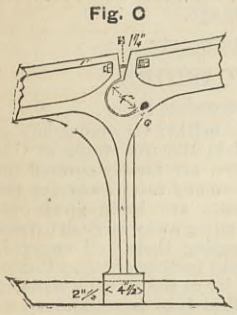


Fig. A

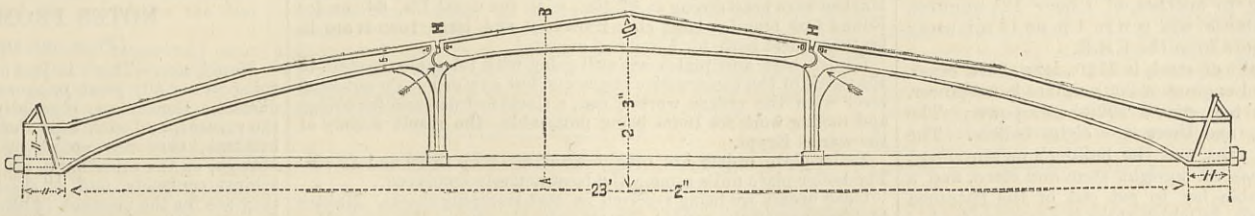
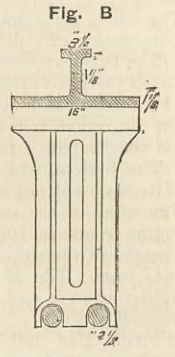
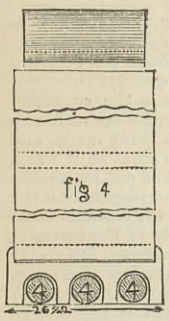


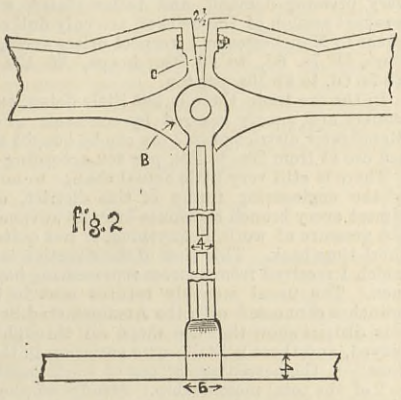
Fig. B



Some experiments were conducted some months ago at the Pacific Rolling Mills, of San Francisco, with a form of cast iron girder, the invention of P. H. Jackson, of that town, late Chief of the Bureau of Iron Construction, Department of Buildings, in New York. This girder, in various detail, we illustrate herewith. Mr. Jackson hopes a great deal from his design, and many will agree with him that cast iron has without cause fallen into bad favour amongst engineers and bridge builders. Mr. Jackson thus described his designs in the *Mining and Scientific Press* last year :—

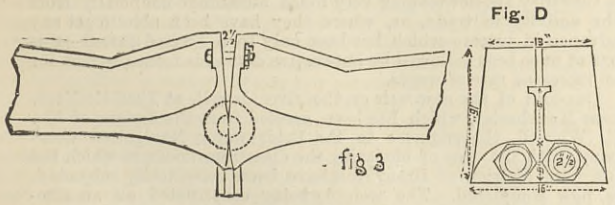
"By this formation cast iron may be made into girders for long spans, used compressively as in cast iron columns,





having a resistance of 60 per cent. in excess of wrought iron —that is comparing the compressive resistance of wrought iron at 18 tons to that of cast iron 41 tons. It is so used that its defective strength for long spans may be avoided by short sections, and the tensile strain on the rods utilised to destroy the power of the load to rupture the arch. The prime cost of the 25ft. girder was 150 dols. The girders in common use in this city to sustain 100 tons and 25ft. long, supported only at the ends, are sold at about 350 dols each. Fig. A of the engraving is an elevation of a girder experimented on.

Fig. D



Length, 25ft.; distance between supports, 23ft. 2in.; height from bottom of tie to under side of arch, 2ft. 3in. The cross section of arch—see Fig. B—was 16in. wide by 1⅛in. thick at bottom, and the greatest height 10in. Two of 2½in. diameter wrought iron tie rods sustained the tensile strain. Fig. C shows the knuckle joint, the round cast on the centre piece, and the socket cast on end pieces, and with the strut cast on same piece, this latter resting on the bottom of the tie rods as there shown. At the top of this arch will be seen a space of 1¼in. Whatever may be the deflection, no parts of the arch, excepting the knuckle joint, touch, so that compression is only exerted on the line of the bottom flange. The cross section of arch—see Fig. B—is of the Hodgkinson form for straight girder and made to sustain a 16in. brick wall ; consequently, from its broad bearing for the wall, it is largely in excess in compressive resistance to the tensile capacity of the rods. The following is the cost of this girder in San Francisco, where materials and labour are higher than in the Eastern cities and in Europe :—

	Dols.
Weight of arch casting, 3080 lb., 3½c.	100·10
Weight of tie rods and nets, 902 lb., 4½c.	40·59
Fitting four bolts and lead	5·50
Drayage and painting	3·00
	149·19

Had this been made to sustain 186 tons as a safe load, the breaking load, three times greater—the same casting to be used, but to have three of 3in. diameter rods, it would have cost :—

	Dols.
3080 lb. casting, as before	100·10
Three 3in. rods, 1848 lb. 4½c.	87·78
Other expenses	9·50
	197·38
Difference	48·19 dols.

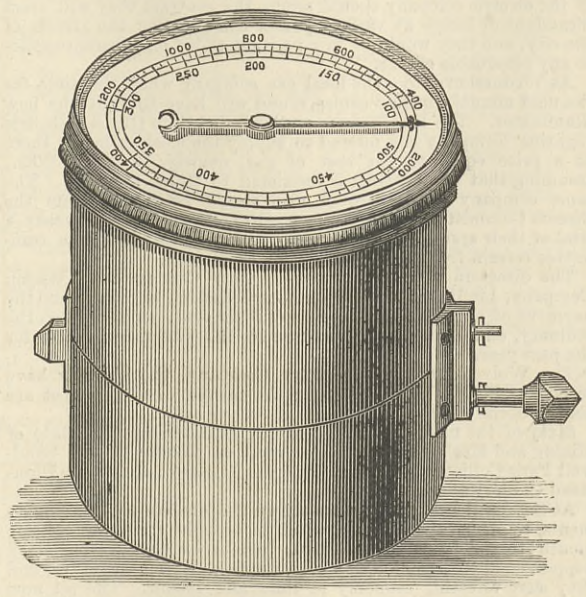
In the experiment at the Pacific Rolling Mills this girder was loaded with 117 tons and 1741 lb. of railroad iron, the length between the supports. Under the weight it deflected ¼in. The foundation on which the girder rested settled 7in., so that loading had to be stopped. I have no doubt it would have carried 225 tons, or until the rods broke. At each of the abutting ends a lamina of lead was used to fill in between the castings, which were not nicely fitted, as the strength at this place was so much in excess of requirements. This was to make up for the irregular surfaces, the draught of the pattern making it fuller in the middle in each piece. To make up for the closing up part of the lead when the compressive force was exerted, as well as to straighten the tie rods, when loaded, the arch was cambered ¾in. at the joints above the true arc. The same rule applies to each one of these three sections as that of a continuous arch in one piece of its length ; that is, they are subject to a bending moment and a thrust force, and both compression and tension are brought into play, as in a straight girder, but less of tension than compression, being of arch form, as mentioned in a previous part of this article. But it must be borne in mind that the compressive force exerted on each of these three short arches, or sections of the long arch, equivalent to three small girders, each 7ft. 9in. long, is equal to the compressive force of the whole length, 23ft. 3in."

Figs. 1, 2, 3, 4, and 5 show a railroad bridge which may be made 500ft. in length, and of a suitable number of bays. It will be seen that the top of strut is round and the ends of arch are socketted to meet the round of the strut. Provision is made to prevent the girder rising by being loaded only at one end with a tendency to raise at the other, as by a railroad train on the one end. This is effected by the bottom edges of casting pressing together. It will be seen that the ends of arch on outside enclose the strut. Provision against lateral deflection is made for long spans by widening the ends where they abut and enclose the strut. To sustain the bridge floor wrought iron rods, or suspenders, may run inside or on outside of the cast iron strut, or a wall on top and floor beams laid on it."

This construction Mr. Jackson thinks will be found to be much cheaper for equal strength than any now in use.

YOUNG'S PATENT SPEED INDICATOR.

The want of an instrument which will instantaneously and correctly indicate the speed of dynamo-electric and other machines adapted to run at high speeds, has been often experienced by engineers and others employing such machines. This want is effectually met by the instrument shown in the annexed illustration, which is a portable speed indicator, and can be applied to a rotating shaft in the same manner as the counters hitherto employed for ascertaining the speed of dynamo and other machines ; it possesses, however, the advantage over the counters, in that it indicates the number of revolutions per minute at a glance, and without the necessity for using a watch or clock



in conjunction with it. Owing to its construction, moreover, each little machine can be minutely adjusted during final testing in the manufactory, and its indications may be so correctly fixed that it will show the variations in the speed of a machine caused by the slipping of the belt, a point of great importance to those employing machines for producing the electric light. In addition to the portable form shown, these instruments are made to be permanently attached to the machines. The indications are effected by means of a small high-speed centrifugal governor, arranged within a casing as shown herewith, and acting upon an index or pointer by means, shown in Figs. 2 and 3. Two or more spindles are provided as shown, upon which to place the carrier for thrusting against the end of the shaft. These spindles are fitted with multiplying or reducing gear, so that both high and low speeds can be indicated, the dial having two or more graduated circles for this purpose. A number of these instruments have now been used by some of the leading electrical engineers with great success, and have in every case given satisfaction to those employing them. These speed indicators are manufactured in a durable and highly finished form by Messrs. Elliott Brothers, of Charing Cross.

In Figs. 2 and 3, A, A^1, are the governor balls provided with arms *a*, a^1, and connected to arms *b*, b^1, on the sleeve B. The arms *a*, a^1, are connected to the fly-wheel P, by a plate *n*, passed over a screwed tube formed on the fly-wheel P until it rests against the fly-wheel, and a nut n^* is then screwed down over it. The said plate *n* is formed with lugs n^1, n^2, for the arms *a*, a^1.

FIG. 2

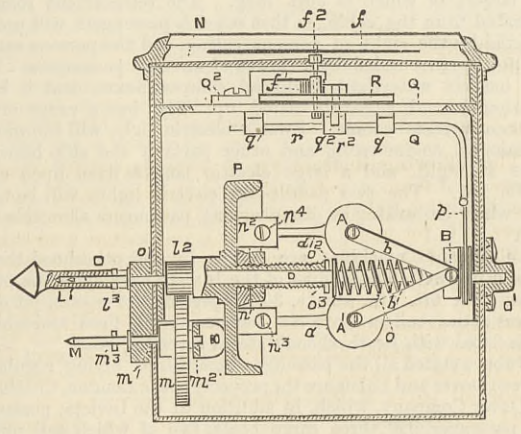
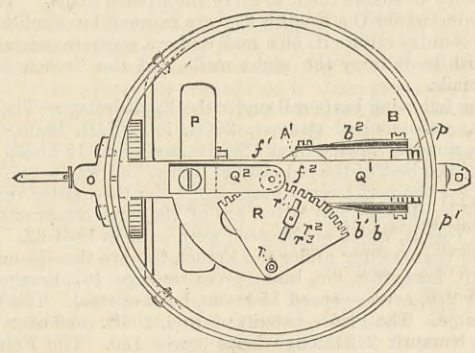


FIG. 3.



The fly-wheel P is fitted upon the spindle D, so that, when the said spindle is rotated, the fly-wheel will be carried round with it by friction as soon as the inertia of the fly-wheel is overcome. The spindle D passes through the casing to receive the carrier L^1. The pinion l^2 is fixed upon the spindle D, and gears with the spur wheel *m* fixed on the spindle M, in bearings m^1, m^2.

TENDERS.

BREWERY AT TADCASTER.

The invitations to tender for a 60-quarter brewery at Tadcaster, with cooperage, drying shed, stores and offices, boundary walls, &c., for Mr. John Smith—Messrs. Scamell and Colyer, architects, 18, Great George-street, Westminster, S.W., the quantities by Messrs. R. L. Curtis and Sons, London—resulted in the following tenders :—

Contract No. 1.—Buildings only.	£	s	d.
J. Hartley, Birmingham	28,057	0	0
W. Biscombe, York	26,563	0	0
J. and W. Beauland, Bradford	26,200	0	0
H. Lovatt, Wolverhampton	24,793	0	0
W. Nicholson and Son, Leeds	24,325	0	0
Bentley and Burn, Leeds	24,076	0	0
Illingworth Brothers, Bradford	23,844	0	0
M. Wilson, Headingley	23,215	0	0
Lowe and Sons, Burton-on-Trent	23,170	0	0
W. Holdsworth, Bradford	22,658	0	0
Armitage and Hodgson, Leeds—accepted	22,103	0	0
Kell and Chambers, Leeds	19,481	0	0
Contract No. 2.—Girders and Columns.			
Head, Wrightson, and Co., Stockton	14,032	0	0
Laidlaw and Sons, Glasgow	13,993	0	0
Thornewill and Wareham, Burton-on-Trent	13,028	0	0
Handyside and Co., Derby	12,867	0	0
Eastwood and Swingler, Derby	12,061	0	0
Bagshaw and Sons, Batley	11,160	0	0
Dawson and Nunneley, Leeds—accepted	10,699	0	0

No plant included in the above tenders.

The Phosphor Bronze Company, Limited, *v.* Billington.—On Wednesday last, before the vacation judge, Mr. Justice North, Mr. Aston, Q.C.—with whom were Mr. Webster, Q.C., and Mr. Macrory—moved for an *interim* injunction to restrain the defendant, until the hearing of the action, from advertising certain metallic alloys, known as "phosphor bronze." An order was made restraining the defendant from so advertising any such metallic alloys, and the defendant was directed to keep an account. Mr. W. Barber, Q.C., appeared for the defendant. Mr. T. H. Devonshire was the solicitor, and Messrs. Vaughan and Son were agents, for the plaintiff.

THE DOVER-CALAIS CHANNEL BOATS.—THE NEW S.S. INVICTA.

Last Saturday morning a special train left Victoria for Dover with a number of guests invited to make the first trip to Calais on board the new Channel steamship Invicta, which has been specially designed by Mr. Ash for the Dover-Calais passage. Among those on board the ship were Mr. J. S. Forbes, chairman of the London, Chatham, and Dover Railway Company; Mr. M. Harris, the general manager; Captain Morgan, R.N., marine superintendent; Sir Frederick Bramwell; Lord Bathurst; Sir S. Waterlow and Lady Waterlow; Mr. Cunningham; Lord Kilmorey; Sir E. Sullivan; Mr. Blackwood, of the General Post-office; Mr. Calcraft, of the Board of Trade; Sir T. Bruce; Mr. Maudslay; Mr. Field; Mr. Peter Rolt, chairman of the Thames Ironworks Company; General Newdegate; Major Dickson, M.P.; Colonel Rice; M. Cousin, director of the Northern Railway of France; General Du Plat, and about 150 others. The whole party was welcomed by a deputation of the Municipal Corporation of Calais, and entertained at *déjeûner*.

The Invicta passed the Dover pierhead at 11.34 a.m., and the Calais pierhead after a run, according to one authority, of 1 hour 11 minutes, and according to another, of 1 hour 12½ minutes. On the return trip the distance was run in 1 hour 14 minutes; sea very smooth; faint breeze from the E.S.E.

The Invicta, which is built of steel, is 312ft. long, 33ft. beam, 17ft. 3in. depth of hold, and engines of 600 nominal horse-power. The engines are expected to indicate 3900-horse power. The engine room is 70ft. long, and there are eight boilers. The draught of the ship is 1251 tons, and the builder's measurement 1647 tons. The Invicta has an upright stem and stern, and a rudder at each end to enable her to get out of the entrance channel of the port of Calais, in which there is not room for her to turn. Her builders are the Thames Iron Company, and she has been fitted with oscillating engines by Messrs. Maudslay and Field. When taken over she will become the property of the London, Chatham, and Dover Railway Company, which owns all the passenger steamships running regularly between Dover and Calais, although some of them which carry the French mails are obliged to sail under the French flag.

Passengers embarking on board the Invicta in wet weather have entire shelter even while on deck, under the promenade deck, which is the full width of the ship. There are two saloons, the largest of which is 96ft. long. The refreshment room is separated from the cabin, so that sea-sick passengers will not be irritated by the sight of persons eating, and the persons eating will not be surrounded by a chorus of sea-sick passengers. The ship has six watertight bulkhead compartments, and is both luxuriously and elegantly fitted up. She has a range aft of fourteen private cabins. Swan's electric light will illuminate the saloons, engine-room, and other parts of the ship between decks at night, and a large electric lamp is fixed upon each paddle box. The two paddle-box electric lights will be used only when embarking or disembarking passengers alongside the piers.

The dynamo machines are driven by a Brotherhood three-cylinder engine. The engines of the Invicta have cylinders 80in. in diameter, 6ft. 6in. stroke, 30 lb. pressure of steam, jet condensers; the boilers have six furnaces each, fired amidships. She is fitted with Brotherhood's steam reversing gear.

As above stated all the passenger steamships plying regularly between Dover and Calais are the property of the London, Chatham, and Dover Company, which, in addition to the Invicta, possesses nine passenger and three cargo boats, five of which sail under the French flag, and are manned by French crews, an imperative necessity to enable them to carry the French mails. The boats steaming under the English flag are manned by English sailors; each country carries its own mail under a separate contract. The English boats carry the night mails, and the French boats the day mails.

The following boats sail under the English flag:—The Maid of Kent, paddle-wheel steamer, 200ft. long, 24ft. beam, 334 tons gross, nominal horse-power 160, average speed 15 knots. She is one of the best of the old class of boats, and was considered too large for the port twenty years ago. Her three sister vessels, the Samphire, Breeze, and Wave, are of the same construction. All these vessels, which are of steel, were built in 1861-62.

The boats sailing under the French flag are the Foam, paddle, 230·6ft. long, 26ft. 6in. beam, gross tonnage 497, nominal horse-power 240, average speed 15 knots, built of steel. The Petrel is the same. The Prince is built of iron, 206ft. long over all—she has a bowsprit 24ft. long—horse-power 180. The France, also iron built, is the same. They were built in 1862-64.

The well-known twin ship the Calais-Douvres, which sails daily during the summer under the French flag and a French commander, is 300ft. long each hull, gross tonnage 1924, extreme beam over all 63ft., and is driven by two wheels between the hulls, by separate engines. When the wheels are rotated in opposite directions at the same time, the ship turns upon its vertical axis. The nominal horse power is 600, and the speed 14 knots. In bad weather she compares relatively more favourably in speed with the other vessels, because her wheels are always in the water, and are not so much knocked about by the waves. She is taken off the route in the winter, when passengers are fewer, because she is such an expensive boat to run, but in the summer she works at a profit, irrespective of the circumstance that she also brings traffic to the railway. By her steadiness she reduces the amount of sea-sickness, and apparently by about 75 per cent., so far as average statistics—once carefully collected by the London, Chatham, and Dover Railway Company—can throw any light upon a problem so intimately connected with the uncertainties of organic life.

The three screw cargo boats are the Chatham, built in 1873, of iron, 378 builders' tonnage, 168ft. long, 22ft. beam, nominal horse-power 80. The Calais, built in 1874, is the same. The Paris, built of iron in 1878, is 170ft. long, 22·6ft. beam, nominal horse power 85. At present three passenger ships run each way daily.

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

(*From our own Correspondent.*)

The mills and forges remain in steady—many of them in active—operation, and during the past fortnight certain mills have been started for the week on Monday instead of Tuesday.

Prices show a tendency to strengthen for most high-class sorts of rolled and of crude iron.

The chief feature of the market this week is a rise of 1s. 3d. per ton in the forge pigs of the Barrow Iron Company. Yesterday in Wolverhampton, and to-day—Thursday—in Birmingham, the quotation for that iron was £3 8s. 0d. instead of £3 7s. 6d. The other brands of hematite iron remained unaltered upon my last quotations, namely, from £3 2s. 6d. to £3 7s. 6d., according to district. The same tendency is not seen in all-mine pigs. Nor are purchasers in the market for hematites to any considerable extent, consumers having largely satisfied their requirements to the end of October, and in a few cases to the end of the year. New brands of Northampton pigs continue to be placed upon the market. Hunsbury Hill is a new brand. It is being offered at 47s. 6d. Wellingborough remains firm at 50s., yet there were some Northampton's procurable to-day at down to 45s. Willingsworth iron, of native part-mine quality, was from 47s. 6d. down to 45s., and there were cinder pigs to be had at 40s. Spring Vale pigs, which are still being turned out at the rate of from 1000 to 1200 per week, were quoted at, for hydrate sorts, £3 2s. 6d.; mine sorts, £2 12s. 6d.; and common, £2 2s. 6d. per ton. Lincolnshire were mostly 50s. for reliable descriptions.

The number of furnaces now at work in the Staffordshire district has been reduced to forty-seven, the Union Company, West Bromwich, having blown out one for repairs. It is satisfactory that, with one or two exceptions, no heavy stocks of unsold pigs are held in the district at the present time.

Merchants and large consumers of common and ordinary bars of the most serviceable sections were desirous, in Birmingham, to place orders for forward delivery, but they were not generally successful. Makers named higher prices than buyers would consent to give, such as £6 15s. to £7 for common unmarked qualities; but for delivery to the end of October £6 10s. to £6 7s. 6d. was taken. Chain bars were most saleable at from £6 7s. 6d. up to £6 10s. Marked bars keep strong at £7 10s., with the usual 12s. 6d. on for Round Oak brand. High-class rivet iron and large rounds are in better request both for home and export.

Girder bars and plates are still going with tolerable freedom to the yards of the constructive engineers, but new orders do not keep level with the orders worked out, a slackened demand for bridge and roofing work for India being noticeable—the result mainly of the war in Egypt.

Boiler-plate orders are sought after at £8 up to £9 and £9 10s. The boiler-plate mills remain the least actively employed.

Good orders are being received for best stamping sheets. Makers to-day reported the receipt of more valuable advices this week than last, and for prompt delivery a little more money was here and there required. Medium sheets were demanded by the merchants and the galvanisers. There were few firms who roll this class of iron who were anxious to book. They sought from £10 to £10 5s. and £10 10s. for latens, £9 for doubles, and £8 5s. for singles.

Excepting at impossible prices, hoops were not asked for. The best offers which the holders of baling hoop specifications were prepared to make were 5s. under the lowest figures that most makers would quote. Buyers expressed themselves able to place orders at less than the £6 10s. mostly asked. For bedstead strip £6 15s. was again required, and £7 was named as the price for coopers' hoops.

Galvanised sheets were scarcely so strong as they were a week ago, the influence of some lower quotations in the London market having a slightly prejudicial influence.

Slightly more is being done in ironmaking fuel. The quotations remain at:—Furnace coal, east of Dudley, 10s.; west, 9s. 6d.; and slack, best, 5s.; and medium, 4s.; good mill coal is fetching 7s. 6d., and forge coal is to be had down to 5s. 9d. per ton. To-day the quotations were strengthened by a possible joint action among the colliers throughout several of the districts to restrict the output to get up wages, the question being about to be debated with more persistence than heretofore at a conference of miners in Birmingham. Colliery owners hesitated to-day to book forward.

The Sandwell Park Colliery Company is dividing 7½ per cent., and is carrying forward a larger balance than a year ago.

Beyond the slackened inquiry for constructive engineering work in India, the influence of the war in Egypt is most seen in the suspension of the demand lately so considerable in pumps and other irrigation machinery and general manufacturing appliances of a mechanical sort, and the hardware firms are complaining that the varied goods which they were accustomed to send to Alexandria for distribution over a wide area, extending even to Constantinople, are not now being bought.

Camp requisites to the order of Government have come in to make up for some of the foregoing loss.

The engineer to the South Staffordshire Waterworks Company reports that the new reservoir at Burton is finished and in full use. The contractor has also finished the pipe-laying for Sutton Coldfield, Wylde-green, and Boldmere, and the pipes are all charged under pressure, and are now giving a constant supply to those requiring it in those localities. The half year's working of the company justifies a 4 per cent. per annum dividend, and permits of about £1500 being carried forward.

The electric lighting companies are alert in this part of the kingdom. Hitherto the absence of competition has always led to the tacit acceptance by the Corporation of Lichfield of the annual tender of the local gas company. This year, however, the contract is not to resolve itself into so formal a matter, for in addition to the tender of the Lichfield Gas Company, an enterprising electric light company has offered to supply the necessary illumination. If the electric company should secure the contract they will erect incandescent lamps at various points commanding the streets of the city, and they would be in a position to lay on private supplies to any reasonable extent.

At Wednesbury, too, the local gas company when the time for the next annual contract comes round will have to fight the new illuminator. The Birmingham and Warwickshire (Brush) Electric Lighting Company has offered to supply the local authority there at a price equal to the cost of gas, namely, 3s. per 1000ft., assuming that the contract is restricted to street lighting. The same company has this week also sought permission from the Streets Committee of the Wolverhampton Corporation to make a trial of their system in the streets of that town. But the committee refrain from taking any action at present.

The directors of the Midland Railway Carriage and Wagon Company, Limited—Birmingham—have decided to recommend the payment of a dividend at the rate of 5 per cent. per annum on the ordinary, and 6 per cent. per annum on the preference shares for the past year.

The Wolverhampton Tramways Company, though they have received £481 less on this than in the previous half-year, yet are able to declare the same dividend of 3s. per share.

Sixty of the members of the South Staffordshire Institute of Mining and Mechanical Engineers went on Monday to the Sandwell Park Colliery; to Messrs. Tangye's Limited; and to the Hamstead Colliery Workings.

At Sandwell Park they were shown the endless chain arrangements, by which the coal and slack is brought from the colliery mouth to the boats on the canal, together with the fine slack hopper. These appliances were in splendid working order, and they were effecting economy in time and labour. The pit now contains 10¼ miles of gate roading, and the huge fan still continues to ventilate the whole. The new duplicate pit shaft and winding plant are now advanced to the following state:—The pair of large winding engines, eight boilers, underground hauling engines, bricks, and other materials have all been secured by contract at low prices, and considerable progress has been made in the erections. The shaft has been sunk to a depth of 75 yards, and is being rapidly proceeded with. As much of this plant as was erected was critically examined by the engineers, and the proposition to use a future hauling machine for the purpose of sinking was considered an excellent one.

At Messrs. Tangye's the party divided, but the whole works were visited. Some went through the steel works, where Siemens' process is in use; and they admired the gas producers, whereby the finest slack is converted into gas to feed the boilers. The pump shop contained specimens of the Soho engine, the Colonial boiler, and elsewhere there were all kinds of the manufactures of the firm in process of testing. Shipping hoists, pins, brasses, blocks, &c., were all shown; nor were the extensive moulding, fitting, and blacksmiths' shops overlooked.

This week a new central fire brigade station which has been erected at the Upper Priory, Birmingham, has been thrown open to public inspection. The site has the advantage of being easy of access from most parts of the town. The brigade premises comprise a residence for the superintendent, houses for the assistant superintendent, and for the firemen and their families, erected on the "flat" system, an office and waiting-room, a large engine-house 75ft. by 17ft., which will afford space for six engines, extensive stabling accommodation, workshops, store-room, recreation-room, a tower 55ft. high for drying the hose, which can be heated to a temperature of 120 deg., and a large drill ground with a glass roof at the end. Two men will be on duty at the station day and night, and telephonic communication is being laid on to the various police stations, theatres, &c., and with the central station of the Telephone Exchange Company, which in turn is in communication with many of the large manufactories of the town. The ironwork for the buildings has been supplied by Messrs. Hassall and Singleton, and the total cost has been some £20,000.

The Mayor of Wolverhampton and the chairman of the Chamber of Commerce have each had a formal suggestion put before them by Mr. A. S. Hill, Q.C., M.P. for West Staffordshire, touching the practicability of promoting an industrial and art exhibition in Wolverhampton, to be held next year, similar to that which was held in the same town some twelve years ago.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—There is just at present neither very much buying going on nor any great pressure to sell in the iron trade of this district. Consumers, especially founders, are mostly covered for the present, and with heads of firms in many cases away for the holidays, very few orders of importance are being given out. Makers, on the other hand, are still sending away large deliveries against contracts, and as these are keeping them well engaged, they are for the moment indifferent about further orders. Consequently, although the market is dull so far as the actual weight of new business coming in is concerned, a firm tone is maintained as regards prices, and where sales are made they are at fully late rates.

There was only a moderate attendance on 'Change at Manchester on Tuesday, with very little business doing. Quotations were unaltered, and for delivery equal to Manchester Lancashire pig iron remained at 46s., less 2½, for both forge and foundry qualities, with distant brands, such as Lincolnshire, ranging from 47s. 6d. to 48s. 6d. and 49s., less 2½; and Derbyshire from 48s. 6d. to 50s. per ton, less 2½.

The finished iron trade is steady, most of the forges in this district being well supplied with work, makers in some special departments being well sold over the remainder of the year. For home requirements the demand is only moderate, but there are fair shipping inquiries mainly for sheets and hoops. Bars are not in very pressing demand, and boiler plates, which seem to be the weakest section of the market, are only dull of sale. For delivery equal to Manchester or Liverpool prices average about as under:—Bars, £6 7s. 6d. to £6 10s.; hoops, £6 15s. to £7; and sheets, £8 7s. 6d. to £8 10s. per ton.

In the ore trade there is but little doing, as for the present consumers are mostly covered by contract. For delivery into the Manchester district purple ore can be bought at about 16s. 6d., and red ore at from 20s. to 22s. per ton according to quality.

There is still very little actual change to notice in the condition of the engineering trades of this district, except that although almost every branch continues busy no advance is being made, and the pressure of work, if anything, is not quite so great as it was a short time back. This view of the situation is borne out by reports which I received from sources representing both employers and the men. The usual monthly returns sent in by the various local branches connected with the Amalgamated Society of Engineers in this district show that the shops all through continue fully employed, and there is little or no variation in the number of men on donation, the percentage of out of work members remaining at 1½ to 2 of the total membership. Steady employment is reported as being afforded to the men generally, although there are not the same pressing enquiries for hands as was the case in some departments recently.

There is one point, whilst I am referring to the engineering trades, which is deserving of notice, and this is the abnormal condition of the iron shipbuilding trade. This branch of trade continues as busy as ever, and shows no sign of falling off. This exceptional activity in shipbuilding, with the comparatively high rate of wages obtained by the men, has a disturbing influence upon other allied branches of industry, including iron making and engineering, and tends to a restless feeling amongst the men. So far as employers are concerned, the general statement that I hear is that they are not reaping very much advantage financially from the activity in trade, as, where they have been able to get any advance in prices—which has been only to a limited extent—this has at once been followed by imperative demands from the men for an increased rate of wages.

One-half of the new weir on the river Irwell, at Throstle Nest, near Manchester, which has been erected from the designs of Mr. F. Wiswell, the engineer to the Bridgewater Navigation Company, with the view of obviating the disastrous floods to which the low-lying districts of Broughton have been periodically subjected, is now completed. The weir is being constructed on an altogether new principle, and consists of a number of tilting sluice gates on French Barrage principle, which are being substituted for the previously fixed weir and dam boards. The gates are designed to open automatically when there is 3ft. head of flood water, or they can be opened or closed at any time by means of multiple crabs. The width of the weir is 140ft. and it is divided into fourteen sluice gates, each held on a swivel in the centre, from which they rise 5ft. at an angle of about 45 deg. In ordinary times there is a fall from the crest of the weir of about 9ft., and it is calculated that for every foot of water passing over there is a back-pressure rise of 2ft., so that with 3ft. of water going over the weir there would be a back pressure of 6ft., which would be sufficient to tilt up the sluice gates to a dead level, and the water, with the exception of about 18in. of staging carrying the gates, would be allowed to pass away freely without obstruction. The efficiency of the new weir has been very keenly criticised, and in many quarters doubts are entertained as to whether it will secure the object of preventing a recurrence of floods in the district. Although this question has not yet been practically put thoroughly to the test, the portion of the new weir now completed has been put to a tolerably fair test by the recent heavy rains, and so far has proved very effective, whilst a weir constructed recently on the river Medlock at Knott Mill on similar principles has worked very successfully.

The provisional committee appointed in connection with the proposed construction of a tidal navigation canal to Manchester continues its weekly sittings, and the scheme, both by the addition of influential names to the list of promoters, and the strong expressions of support received from corporate and other bodies throughout the district, is certainly growing in favour. The engineers are pushing forward rapidly their investigations by borings and surveys, and although no definite report can be expected at present, so far I understand nothing like any serious obstacle has presented itself in the carrying out of the work from an engineering point of view.

The Iron Trades' Mutual Insurance Association, the object of which is to protect its members against claims under the Employers' Liability Act, will hold its first annual meeting in London during the course of next month. This association is in connection with the Iron Trades' Employers Association, whose central offices are in Manchester, and I understand that the report to be presented will show very satisfactory results for the first year's working. After very careful investigation it was decided to adopt a rate of premium more than 300 per cent. below the rates asked by ordinary insurance offices in Manchester and London for covering the same

risks, and even upon this low scale the receipts have been found considerably more than sufficient to cover the working expenses and every claim that has arisen.

An extension of Messrs. W. H. Bailey and Co.'s Albion Works, Salford, is being carried out with the view of practically doubling their present facilities for the production of the varied specialities manufactured by the firm. The addition will consist of a building four stories high, covering about an acre of land, and special machinery is being designed in connection with the boring and manufacture of valve and steam cocks.

The coal trade is without material change. The demand all through continues dull in proportion to the supplies, and pits in most cases are not working more than about four days a week. Quoted rates nominally are unaltered, but low selling continues to secure orders, and for quantities prices are very irregular. At the pit best coal is quoted at 8s. to 8s. 6d.; seconds, 6s. to 6s. 6d.; common coal, 4s. 9d. to 5s. 3d.; burgy, 4s. 3d. to 4s. 6d.; good slack, 3s. 6d. to 4s.; and common, 2s. 9d. to 3s. 3d. per ton.

Shipping has fallen off rather during the week; a moderate trade is, however, being done, but at very low figures, Lancashire steam coal delivered at the high level, Liverpool, or at Garston Docks, being obtainable at 6s. 6d. to 7s., and seconds house coal at 8s. 3d. to 8s. 6d. per ton.

For coke a tolerably good demand is kept, and prices are steady at about 9s. for common up to 11s. and 12s. per ton for the best sorts at the ovens.

The St. Helens strike continues, with the men apparently more determined than ever to hold out, and a miners' conference is to be held in Manchester next week, when propositions from various Lancashire districts for an advance in wages are to be brought forward. As the winter approaches there seems to be more than a possibility that the wages question may again become a disturbing element in the coal trade.

Barrow.—Considerable progress has been made with the business in the hematite pig iron market, and, as I foreshadowed in my last, prices have gone up 6d. per ton all round. No. 1 Bessemer is quoted at 59s. per ton; No. 2, 58s.; No. 3, 57s., net, f.o.b. west coast ports. American demands for some little time past have shown an appreciable increase, and it has been evident that American users would require a heavy tonnage of metal; but during the past week the demand from that quarter has improved very largely, and some heavy orders have been given out. Continental buyers are also showing a much better disposition to give their orders before prices get much higher. Stocks are getting low on account of the exceedingly heavy exportations. Second-hand parcels may be said to be *nil*, as very few are procurable. The pig iron market all round is very briskly employed, and the prospect of a good winter's trade is a certainty. The gradual recovery of prices has a very re-assuring effect on both buyers and sellers, and every confidence is felt in the reaction as being sound and likely to continue. Smelters in various parts are busily pushing forward arrangements for the re-lighting of extra furnaces, in order to be better able to cope with the demand which I have no doubt will continue to improve weekly. There is an advance to note in the price of steel rails this week owing to the very heavy demand, and now the prices are quotably higher, other advances may be expected, although the output is enormous. Shipbuilders have improved their position a little. Other industries unchanged. Iron ore in good request at late rates, but a few raisers are able to get prices a little beyond quotations. Shipping active.

THE SHEFFIELD DISTRICT.

(From our own Correspondent.)

The coal trade in this district, though in a very unsatisfactory state, is not quite so bad as in West Yorkshire. In the southern division of the county there are several collieries working fairly well, including the Nunnery Company, who have four collieries on full time. A slight advance has been secured on coal for the London market, varying from 6d. to 9d. per ton. At London, according to a circular issued by a leading firm of dealers, an advance of 2s. per ton has been obtained. To consumers in the Sheffield district summer prices continue to be quoted; but the slight change in the weather towards cold would soon cause coal-owners to issue fresh lists.

In West Yorkshire affairs appear about as bad as they can be, judging by the annual report of Messrs. Henry Briggs, Sons, and Co., Limited, of Normanton, Whitwood, Methley Junction, and Streethouse collieries. The directors state that the year's business has been the most unprofitable ever experienced by the company. The very mild weather prevalent during the past winter deprived the company of the profit which, under the present conditions of the coal trade, can alone be made during the winter, and reduced the sales of house coal during the season almost to a summer level. Sales show a falling off during the year of £22,000, and although the utmost economy has been exercised, the directors regret that their efforts have not sufficed to make more profit than will meet the interest on debentures, and under these circumstances cannot recommend the payment of a dividend. They have closed the Streethouse Colliery, and have given twelve months' notice to determine the lease of Stanley Main coal under the portion of Mr. Torre's estate. The Silkstone seam, instead of helping the company, has so far turned out unremunerative, owing to the large number of small faults and the divisions of coal. The sales of coals made £188,901, other items bringing up the receipts to £198,987. On the other hand £97,440 has been paid for wages, for carriage £39,003, and after various other items the balance, being profit, is £3476.

With all this dulness in the coal trade it is somewhat curious to read the returns of the business done with in steam fuel from South Yorkshire. No less than 88,256 tons more were forwarded in the past seven months than was the case in the corresponding period of last year. Last month 49,908 tons were sent by water, and 64,457 tons by rail, the total quantity forwarded in the seven months ended July last being 730,010, a much larger tonnage than has been sent in the same period for a number of years. The export season has been brisk throughout, no fewer than 385,732 tons having been forwarded during the past seven months, against 278,894 tons in the corresponding period of 1881. One firm alone, the Denaby Main Colliery, has supplied from January to July, both inclusive, 90,177 tons, against 58,168 tons in the same period of last year.

When the sliding-scale ceases to slide up, and begins to slide down, its popularity wanes. At Manvers Main, the other day, the accountant's audit resulted in an advance of wages. At Thorncliffe it ended in a reduction. Then the miners held what reads like an indignation meeting, in which one of the speakers—Mr. W. Brown, secretary of the Staffordshire Miners' Association—stated that "the present wages of miners were no more than a bone thrown to a dog, compared with what they ought to be." The meeting after that passed a resolution in favour of better organisation and increased wages.

At Dronfield, on Tuesday, Messrs. Wilson, Cammell, and Co.'s steel works were in full blast, and seemed very unlikely to be moved this side of 1883. I am assured, however, by undoubted authority that the transfer to Workington will take place in October at latest. To that Cumberland town the Dronfield people are rapidly betaking themselves. Near to the Derwent Works, which have been acquired by Messrs. Charles Cammell and Co., Limited, of Sheffield, along with the Dronfield Steel Works, whole streets have lately risen and are still rising. It is stated that with the additions to be made the total area of the site occupied by the Derwent Works and the new steel works will be about 83 acres.

Steel rails are not so freely ordered as they were, but most of the local houses are full of work on American, South American, North American, and home account. Quotations at present are about £5 5s. at Liverpool, and from £5 10s. to £5 15s. at works according to sections. Tenders are invited for 35,000 tons of steels rails for the Victorian Company, and there is considerable interest as to the placing of this large contract.

The Sheffield Forge and Rolling Mills Company, Limited, reports a gross profit on the past twelve months trading of £5738 19s. 7d., and the net profit is £2930, which added to last year's balance, makes a total available for dividend of £4658, which permits a dividend of 6s. per share, and leaves £2407 to be carried forward to next account. The whole of the balance due to the vendors on purchase account has been paid off during the year, and a special loan of £1000 has also been discharged. The directors report that a considerable portion of the melting furnaces, which had been unoccupied for several years, has now been let, and there is a fair prospect of the whole becoming tenanted at an early period.

The twelfth annual meeting of the shareholders of Samuel Fox and Co., Limited, Stocksbridge Works, Deepcar, near Sheffield, was held on Wednesday—Mr. James Halliday presiding. The meeting was held at the offices of the company, in order to give the shareholders an opportunity of seeing the additions to the premises during the past few years. The shareholders expressed themselves as highly gratified at the condition of the works, and their greatly-increased capacity. A dividend at the rate of 15 per cent. per annum was declared, and much satisfaction was expressed with the management of the concern, special praise being given to Mr. Fox, the chairman, whose devotion to the interests of the company, the trustees considered, had suggested the question as to whether he was sufficiently compensated. This suggestion was warmly approved by the shareholders, and there is no doubt that the question will soon be brought before them in a tangible form. The portrait of Mr. Fox, recently presented to him, was on view, and a desire was expressed that an engraving should be sent to each shareholder.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

The iron market held at Middlesbrough was but poorly attended. This was partly owing to Stockton races—regarded in the Cleveland district as justifying a week's holiday—and partly to the absence of many ironmasters at the Leeds meeting of the Institution of Mechanical Engineers.

The tone of the pig iron market was nevertheless firm. The price paid for No. 2 g.m.b. was from 44s. 6d. to 45s. f. o. b. Middlesbrough, and for forge quality 1s. less. Manufactured iron was also firm. The price of ship plates was from £6 15s. to £7, but makers were not anxious sellers. Bars and angles were quoted at £6 5s. to £6 7s. 6d., less 2½ discount. The whole of the manufactured ironworks, foundries, and engine works at Stockton and Middlesbrough are closed for the remainder of the week.

It now appears that the recent purchase of the Moor Ironworks, Stockton, ostensibly by Mr. A. J. Dorman, of the firm of Dorman, Long, and Co., Middlesbrough, was not, as was widely stated, on behalf of that firm, and in order to place both works under a single management. The case was this, Messrs. Backhouse and Co. held the Moor Works under a mortgage deed, with an attornment clause, in security for a loan of £40,000 and interest. They had a right to sell at any time should default be made, in order to recover the above amount. But had any greater amount been obtained by the sale, they could not have appropriated the surplus, even though they had further claims. They must have handed it over to the liquidator for the benefit of the unsecured creditors generally. They had, therefore, hardly any incentive to sell the works for a higher price than they did. They would only have got a trifling sum in the pound out of the excess in satisfaction of their further claim. They were, therefore, willing to sell the works for the amount of their secured debt, as far as their own interests were concerned; but very properly offered it first to the unsecured creditors that they might get the benefit of the excess value if they chose to buy. The policy adopted by Messrs. Backhouse and Co. was a most reasonable and liberal one towards the unsecured creditors. The latter, however, could not agree among themselves, and for this cause their chance seemed likely to be lost. Seeing this, Messrs. A. J. Dorman and W. Donaldson, of the wealthy firm of James Watson and Co., iron merchants, of Middlesbrough and Glasgow, who also were large creditors, went to the bank, and in their joint names concluded the purchase, and became owners of the property. It was then obviously in their power to do what they chose with it. Under all the circumstances, however, they decided to transfer it, without profit, to a new limited company, and to admit into the latter on equal terms with themselves any other creditor or creditors who might wish to enter. Harmony was thus restored by a masterly stroke of policy, for which the principal actors deserve great credit. The works have never stopped, notwithstanding the failure, and it is not now expected that they will.

The future of the Erimus Steelworks, lately owned by Mr. C. E. Muller, is not yet decided on. There were two mortgages, one for £34,000 and a second one for £18,000. Of course the first mortgagee retains ownership, unless, and until, he is paid off. The general opinion in the district is that, if sold, the property would not fetch more than his claim, if so much. There is, therefore, nothing to be expected from it for the second mortgagee, much less for the unsecured creditors. The Bessemer converting plant, which has been added within the last year and a-half, is well arranged, and in excellent condition. It is, however, adapted only for the acid process, which can scarcely pay at the present time, when rails are being offered at under £5 per ton at works. To adapt the plant for the basic process, and to make the mills and other appliances sufficient for rolling heavy steel rails in large quantity, would probably require a large expenditure of additional capital.

The North-Eastern Steel Works at Middlesbrough are beginning to make a considerable show. It is expected they will start about January next. They will produce nothing but basic steel. Two converters out of the four in place will at first be set to work, and one heavy cogging and one rail mill. Rails will be the only finished products, but there will probably be an excess of ingots for which a market will have to be found.

The Durham colliers' strike is over. The employers' committee met the workmen's deputation a few days since, the result being a complete surrender by the men. They desired to resume work at once, and agreed to pay the costs of 500 summonses, together with the nominal sum claimed by the owners for damages sustained, and that the scale price for working the jet seam should be settled by arbitration. Here is the case of a strong employers' and a strong operatives' union, with a negotiating committee to act between. The result contrasts favourably with those which have latterly been obtained by the North of England Manufactured Iron Trade. There both employers' and ironworkers' union have long been weak, and the Board of Arbitration, which was supposed to supply the place of both, has shown itself quite incapable of enforcing its own decisions. Clearly when the latter is remodelled, which is likely before long, it should be made to assimilate more to the system adopted in the Durham coal trade.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

The Glasgow warrant market has been comparatively quiet during the week. The fluctuations in prices have not been very great. At the same time a large quantity of iron has changed hands, chiefly amongst brokers, the outside public still manifesting little interest in the market. The quantity of pig iron shipped abroad is very satisfactory, and it is now believed that the demand will keep pretty good throughout the remainder of the summer. The stock of pig iron in Messrs. Connal and Co.'s stores has decreased about 500 tons in the course of the past week.

Business was done in the warrant market on Friday forenoon at from 51s. 3½d. to 50s. 11d. cash and 51s. 5d. to 51s. 1½d. one month; the afternoon quotations being 51s. 1d. to 51s. 11d. cash and 51s. 1d. to 50s. 11d. one month. On Monday the market was dull at 50s. 10½d. to 50s. 7½d. cash and 51s. to 50s. 10d. one month in the forenoon, and in the after part of the day 50s. 8d. to 50s. 7d. cash and 50s. 10½d. to 50s. 9d. one month. On Wednesday business was done at 50s. 10½d. to 50s. 6½d. cash, and 51s. to 51s. 8½d. one month. To-day—Thursday—transactions took place at 50s. 4d. to 50s. 2d. cash, and 50s. 6½d. to 50s. 4d. one month.

There is not much change in the quotations of makers' iron, which are as follows:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 62s.; No. 3, 54s. 6d.; Coltness, 65s. 6d. and 55s. 6d.; Langloan, 64s. and 56s.; Summerlee, 63s. and 54s.; Calder, 62s. 6d. and 53s. 6d.; Clyde, 55s. and 52s. 6d.; Carnbroe, 55s. 6d. and 52s. 6d.; Monkland, 52s. 6d. and 51s.; Quarter, 52s. 6d. and 51s.; Govan, 52s. 6d. and 51s.; Shotts, at Leith, 63s. 6d. and 56s.; Carron, at Grangemouth, 53s.—specially selected, 56s. —and 52s.; Kinneil, at Bo'ness, 51s. 6d. and 50s. 6d.; Glengarnock, at Ardrossan, 55s. 6d. and 52s. 6d.; Eglinton, 53s. and 51s. 6d.; Dalmellington, 53s. and 52s.

The past week's imports of Middlesbrough pig iron at Grangemouth were 3910 tons, as compared with 4166 in the same week of 1881. The total imports to date since Christmas are 147,246 tons, showing the large falling off of 35,914 tons as compared with the corresponding week of last year. It is believed that an extra amount of Scotch pigs fully equal to this decrease has been used here in the manufacturing works, the relative prices of the English and Scotch make admitting of this being done.

The malleable works still keep busy, as also do the foundries. There is a steady and large demand from abroad for locomotives and sugar-making machinery. Nearly all the general engineering works in Glasgow and the western districts of Scotland have good orders in hand, and marine engineers are, of course, sharing in the continued prosperity of the shipbuilding trade.

A strike has occurred of the moulders employed in the casting of cart bushes at the Carron Ironworks, the men asking an advance which the company does not feel itself warranted in conceding.

The coal trade continues very brisk in the west, there being a pressing demand for ell and main coals for shipment at prices which are about 3d. per ton better than those recently current. For splint coals the inquiry is not quite so good, but the demand for this quality usually slackens a little at this season of the year. Trade is active in Fifeshire, with the miners in full employment. At Burntisland steam coals are quoted at 6s. 3d. to 6s. 6d. per ton, while household qualities are about 7s. 6d. at the pits.

The sanction of the Court of Session has been given to the sale by the liquidators of the Benhar Coal Company, Limited, to the re-constructed company of the Benhar and Niddries Collieries, for £97,000. Of that sum £30,000 are to be paid in November, £30,000 in February, the same amount in June, and the balance in October, 1883, the company to get possession of the collieries on payment of the first instalment. The share capital of the original company was £560,000, and it has all been lost, the price now obtained not being sufficient to meet the liabilities. It was, however, the best that could be obtained.

The annual meeting of the Huntington Sulphur and Copper Company was held in Glasgow this week, when the report presented was not a favourable one. The statement of accounts showed the amount at debit of profit and loss account to be £66,206, as compared with £60,697 last year. Part of the loss, it was explained, was caused by a reduction in valuations made by the new superintendent of the works. Some proposals were made for a rearrangement of the capital among them, being an increase of it to the extent of £25,000 in preference shares of £1 each, the dividend to be cumulative and at the rate of 10 per cent. on the amount of the shares paid up.

The Uphall Oil Company, Limited, agreed, at a meeting held a few days ago in Glasgow, to empower the directors to borrow £20,000. It was explained that £11,000 had recently been expended on new plant.

WALES AND ADJOINING COUNTIES.

(From our own Correspondent.)

It was not to be expected that so important a measure as the passing of the new Bute Dock would be signalised without some amount of fractious opposition, and accordingly the tippers made this week a demand for unreasonable concessions, and this being refused struck work. There was a good deal of alarm in Cardiff in consequence. Pessimists said: "If tippers and trimmers strike no coal can be shipped, there will be no use sending coal down, and no need for the collieries to be worked—in fact, a thorough deadlock must be expected all over Wales." This view may have been an innocent one; but I am afraid that it was purposely used in some quarters to coerce Mr. W. Lewis, and thus enable the agitators to gain their ends. If so the device was ill-conceived, for Mr. Lewis has been in the thick of every strike for the last twenty years, and his indomitable resolution in withstanding anything like an unjust claim is known to every collier. Happily his resolution has not been much taxed in this episode, for as the strikers only numbered a few hundreds, sufficient men were soon got together to work the tips, and the regular men seeing this have given way.

It would be a great misfortune for anything now to obstruct business. Both in coal and iron trade is eminently satisfactory; orders are coming in well, and quotations are firm.

In iron and steel good healthy business is being done in all the works, and at the new works rapid strides are being made towards completion.

Of late Cyfarthfa has been occupied in blowing up the "old horses," and what with clearing ground and making preparations for the Rhymney line, which will be brought within the precincts of Cyfarthfa Works, the activity there is marked. The following quotations are readily obtained at present:—Common Welsh bars, £5 15s.; heavy wrought scrap, £3 5s. to £3 10s.

Steel rails, ordinary sections, £5 7s. 6d. to £6. Iron rails are still in demand, but in greatly decreased quantities, the chief demand being for steel, some of which, brought lately under my notice, is of first-rate excellence. Pig iron is fetching better prices, and large sales are effected. This is probably due to a better tone becoming visible in tin-plate.

A petition has been presented for winding up the Aberdare Rhondda Steam Coal Company. This will be heard this week. I have not heard, up to despatch of my letter, how it has fared with the announced sale of Plymouth Works and Collieries. I know of one gentleman prepared to give a moderate amount, but the hindrance in the case of most would-be buyers is the twelve years' lease. As there is a lot of virgin ground, and as new sinkings to the lower measures means three or four years, the temptation to speculate is not a great one. Anyhow, the sale may be expected to "clear the air," and it may yet be Plymouth *redivivus*.

The Taff Vale management tried the curves, &c., of the new Clydach line this week, and found all in excellent state. A large coalowner and ironmaster is in treaty for "three pairs of pits" in this new locality.

Numerous single accidents are occurring in the coal districts. During the last month or two there has been an average of one fatality a day. This in the aggregate approaches the dimensions of a great calamity, but does not receive the attention it should from the men. I believe that all is now done that can be by coal-owners to minimise accidents, but the haste of coal getting is leading to some amount of recklessness on the part of the men.

This coal get is considerable. Last week the exports, foreign and coastwise, from Wales, showed a total of 199,962 tons, and this notwithstanding a large amount of holiday making. Prices are firm for house and steam qualities, and enquiries justify their firmness. An agreement has been made with the Great Western Railway for the extension of the line to Cardigan. Appleby and Lawton are likely to be the contractors. I had the pleasure of noting a fine train of coal this week from the Harris Deep Navigation. The coal was of magnificent quality. How comes it that this wealthy company have not succeeded in getting a railway station for their new town?

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

**** *It has come to our notice that some applicants of the Patent-office Sales Department, for Patent Specifications, have caused much unnecessary trouble and annoyance, both to themselves and to the Patent-office officials, by giving the number of the page of* THE ENGINEER *at which the Specification they require is referred to, instead of giving the proper number of the Specification. The mistake has been made by looking at* THE ENGINEER *Index and giving the numbers there found, which only refer to the pages, in place of turning to those pages and finding the numbers of the Specification.*

Applications for Letters Patent.

*** When patents have been "communicated" the name and address of the communicating party are printed in italics.

8th August, 1882.

3761. Preserving Wood, F. C. Glaser.—(*P. J. F. Röper, Pinneberg.*)
3762. Utilising the Force of Fluids, E. E. H. Rousseau, Paris.
3763. Telephones, J. J. Barrier and F. T. de Lavernède, Paris.
3764. Permanent Way, J. Dickson, jun., Seaforth.
3765. Spools, &c., E. Hunt.—(*J. C. Davis, U.S.*)
3766. Mounting Ordnance, A. C. Kirk, Glasgow.
3767. Decorating Glass, T. Markham, Manchester.
3768. Lamps, H. Cullabine, Sheffield.
3769. Sewing Machines, H. Gardner.—(*R. M. Wanzer, Hamilton.*)
3770. Lead, L. Epstein, London.
3771. Mining, W. R. Lake.—(*G. D. Whitcomb, U.S.*)
3772. Thrashing, W. R. Lake.—(*J. Schleyder, Vienna.*)
3773. Sulphites, J. Imray.—(*F. C. Kudelski, France.*)
3774. Fire-arms, J. Imray.—(*F. Mannlicher, Vienna.*)
3775. Bricks, J. C. Bloomfield and J. M'Gurn, Ireland.
3776. Coke, J. Wood, Flockton.
3777. Gun Carriages, P Jensen.—(*M. Bussiere, Paris.*)
3778. Washing Machine, C. C. Greenway, Streatham.

9th August, 1882.

3779. Lamps, B. J. B. Mills.—(*W. M. Thomas, U.S.*)
3780. Rotary Engines, A. Kissam, London.
3781. Velocipedes, C. Crozat, London.
3782. Bicycles, J. Beale, Blackheath.
3783. Asphalte, B. D. Healey, Brighouse.
3784. Gas Generators, J. Noble, Consett.
3785. Regulating Apparatus, H. Davey, Headingly.
3786. Furnaces, J. Imray.—(*C. Russmann, Hamburg.*)
3787. Generating Apparatus, H. Davey, Headingly.
3788. Sewing Machines, J. Imray.—(*Grimme, Natalis, and Co., Germany.*)
3789. Oxidising Alcohols, E. A. Brydges.—(*D. Sandmann, Charlottenburg.*)
3790. Paint, E. P. Wells, Notting-hill.
3791. Fire Extinguisher, P. M. Justice.—(*V. Vankeerberghen, Brussels.*)
3792. Distillates, E. K. Mitting, Rye.
3793. Door Mat and Scraper, J. S. Willway, Bristol.
3794. Lids or Covers, E. Green, Wakefield.
3795. Lamps, W. R. Lake.—(*J. B. Wallace, U.S.*)
3796. Fixing Looking-glasses, W. J. Hinde, London.
3797. Locks, J. Walker and H. Worsey, Birmingham.
3798. Hop Poles, W. A. Barlow.—(*F. Börner, Cologne.*)
3799. Steering Gear, J. H. Smiles, Stockton-on-Tees.
3800. Boxes, P. Jensen.—(*D. L. Caillat, Paris.*)
3801. Cutlery, D. Hummel.—(*H. Hallström, Sweden.*)
3802. Secondary Batteries, C. Kingzett, Tottenham.
3803. Telephonic Apparatus, S. P. Thompson, Bristol.

10th August, 1882.

3804. Time-pieces, W. Morgan-Brown.—(*J. Trenor, U.S.*)
3805. Steel Wire, S., M., and A. Wood, Brighouse.
3806. Brake Apparatus, S. Carlton, Swindon.
3807. Conveying Apparatus, J. Riley, Glasgow.
3808. Steam Boilers, G. Sinclair, Leith.
3809. Chemicals, J. W. Kynaston, Liverpool.
3810. Looms, &c., J. and J. H. Shorrock, Darwen.
3811. Cleaning Windows, C. H. Southall, Leeds.
3812. Electric Batteries, J. S. Beeman, W. Taylor, and F. King, London.
3813. Electric Currents, J. S. Beeman, W. Taylor, and F. King, London.
3814. Lamp Apparatus, H. J. Haddan.—(*C. F. Brush, Cleveland, U.S.*)
3815. Type Writers, H. J. Haddan.—(*B. Schmitz, Runderoth.*)
3816. Stoves, H. J. Haddan.—(*D. M'B. Graham, U.S.*)
3817. Securing Locks, H. J. Haddan.—(*W. Kilian, Berlin.*)
3818. Type, J. C. Mewburn.—(*A. A. Low and L. K. Johnson, Brooklyn, U.S.*)
3819. Gas Engines, J. McGillivray, Glasgow.
3820. Railway Signalling, J. H. Johnson.—(*T. and J. Ducousso and the Société Anonyme Maison Breguet, Paris.*)
3821. Electric Lamps, F. Mori, Leeds.
3822. Electric Batteries, F. Mori, Leeds.
3823. Knives, T. Clark.—(*J. Kay & T. Beath, Melbourne.*)
3824. Meters, A. M. Clark.—(*L. Houqs-Humbert and J. de B. de Liman, France.*)
3825. Electric Motors, S. H. Emmens, London.
3826. Knitting Machines, A. M. Clark.—(*I. W. Lamb, Parshallville, U.S.*)
3827. Compressing Air, C. W. Harding, King's Lynn.
3828. Furnace Liking, W. H. Beck.—(*L. Wallet, Paris.*)

11th August, 1882.

3829. Ventilating Sewers, &c., T. S. Wilson and H. T. Johnson, Manchester.
3830. Drying Fabrics, &c., W. M. Riddell, London.
3831. Ores, A. K. Huntingdon & W. E. Koch, London.
3832. Steam-traps, L. Dove, Stratford.
3833. Combing Fibres, G. Little, Oldham, T. C. Eastwood, Bradford, and J. Green & J. Fletcher, Oldham.
3834. Regulating Apparatus, H. Wilde, Manchester.
3835. Alum, &c., P. and F. M. Spence, Manchester.
3836. Cutting Cloth, &c., E. Dredge, London.
3837. Brooms, &c., A. J. Boult.—(*J. Gontier, France.*)
3838. Transporting Loads, A. J. Boult.—(*F. Bouquet, France.*)
3839. Tilling, J. H. Johnson.—(*J. A. Kay, Melbourne.*)
3840. Neckties, D. T. Keymer and F. Theak, London.
3841. Shields, W. R. Lake.—(*J. A. Canfield, U.S.*)
3842. Suspending Wires, H. C. Jobson, Dudley.

12th August, 1882.

3843. Working Levers, W. Carling, Hitchin.
3844. Reed Fabrics, E. A. Brydges.—(*P. Stauss and H. Ruff, Prussia.*)
3845. Glove Fasteners, W. G. Rigden, London.
3846. Regulating Currents, W. S. Smith, Highgate.
3847. Lamps, W. H. Bulpitt, Birmingham.
3848. Steam Engines, I. Beck, Sheffield.
3849. Parallel Vices, W. M. MacBrair, Sheffield.
3850. Closing Boxes, &c., A. J. Boult.—(*C. Dauché and P. Deniant, France.*)
3851. Dressing Grain, G. W. Murray, Banff.
3852. Indicating Apparatus, T. Hughes. London.
3853. Closing, &c., Doors, F. Pontifex, London.
3854. Bottles, J. Ferguson, Ashton Keynes.
3855. Signalling Apparatus, G. Porter, London.
3856. Lamps, W. R. Lake.—(*N. E. Reynier, France.*)
3857. Preparing Paper, G. W. Simmons, London.
3858. Purifying Ores, D. Watson, Manchester.
3859. Tramway Points, H. Scott, Liverpool.
3860. Sewing Machines, J. E. Walsh.—(*J. Kayser, Germany.*)
3861. Lamps, G. Pfannkuche, London, and A. A. Dixon, Gateshead-on-Tyne.
3862. Valves, D. Hancock, Stratford.
3863. Deodorising Apparatus, R. Nicholls, Hendon.

14th August, 1882.

3864. Iron, W. S. Sutherland, Birmingham.
3865. Stays, J. Ingleby.—(*P. W. Ziegler, Germany.*)
3866. Valve Motions, J. Edge, Liverpool.
3867. Ironing Machine, H. Podger, Bromley, and W. H. Davey, Highgate.
3868. Chair, E. Smith, West Dulwich.
3869. Motor Machine, E. Desfossés, Paris.
3870. Boilers, J. Imray.—(*C. H. Russmann, Hamburg.*)
3871. Starting Engines, A. B. Brown, Edinburgh.
3872. Folding Chairs, &c., W. R. Lake.—(*F. G. Johnson and J. H. Hayward, U.S.*)
3873. Printing Indexes, W. R. Fordham, London.
3874. Bending, &c., Metal, C. Scriven, Leeds.
3875. Cotton, &c., E. de Pass.—(*H. Anthoni, Paris.*)
3876. Clearing Tramway Rails, S. Shields, Liverpool.
3877. Fire-arms, W. Rogers, London.
3878. Wheels, H. J. Barrett, Kingston-upon-Hull.
3879. Type Setting, E. W. Brackelsberg, Prussia.

Inventions Protected for Six Months on Deposit of Complete Specifications.

3762. Utilising the Force of Fluids, E. E. H. Rousseau, Paris.—*8th August*, 1882.
3795. Electric Lamps, W. R. Lake, London.—Com. from J. B. Wallace, U.S.—*9th August*, 1882.

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

3194. Sulphur, W. Weldon, Burstow.—*8th August*, 1879.
3191. Steering Apparatus, W. Clarke, Gateshead.—*8th August*, 1879.
3192. Dressing, &c., Bags, F. and L. Marx, London.—*8th August*, 1879.
3196. Phosphates, S. G. Thomas, London. — *9th August*, 1879.
3225. Dies, G. F. Champney, London.—*11th August*, 1879.
3306. Making-up Sheets of Printed Paper into Pamphlets, W. Conquest, London.—*16th August*, 1879.
3226. Overhead Sewing, C. D. Abel, London.—*11th August*, 1879.
3229. Sewing Machines, S. W. Wardwell, jun., Providence, U.S.—*11th August*, 1879.
3212. Spinning, &c., Fibres, W. Sutcliffe and J. Greenwood, Halifax.—*11th August*, 1879.
3396. Buffer, &c., Apparatus, R. H. Hepburn, Llanelly.—*23rd August*, 1879.
3251. Radiographs, C. Milton, London.—*12th August*, 1879.
3230. Treating Dextrine-Maltose, A. L. Bruce, G. Stenhouse, W. M'Cowan, and A. Haddow, Edinburgh.—*12th August*, 1879.
3234. Lead Pigment, H. J. Haddan, London.—*12th August*, 1879.
3268. Looms for Weaving, H. Lomax, Darwen.—*13th August*, 1879.

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

2806. Audible Alarm Signals, N. J. Holmes, London.—*10th August*, 1875.
2823. Clay Tobacco Pipes, R. Golding, Tooting.—*11th August*, 1875.
2843. Illuminating Gas, G. Anderson, London.—*12th August*, 1875.
2870. Ticket-holder, H. J. M. Russell, Ashiesteel.—*14th August*, 1875.

Notices of Intention to Proceed with Applications.

Last day for filing opposition 1st September, 1882.

1679. Cleaning, &c., Grain, M. Church, Washington.—Com. from D. Lukins.—*6th April*, 1882.
1684. Telephonic Instruments, A. E. Dolbear, Summerville, U.S.—*6th April*, 1882.
1695. Breakwaters, G. H. T. Beamish, Ireland.—*8th April*, 1882.
1704. Rowlocks, E. J. Robertson, Ipswich.—*8th April*, 1882.
1714. Steam or Air Whistle, J. Cran, Leith.—*11th April*, 1882.
1720. Cases for Letters, W. P. Thompson, London.—Com. from G. V. Naueth.—*11th April*, 1882.
1755. Ascertaining Gradients, P. Jensen, London.—Com. from E. F. MacGeorge.—*13th April*, 1882.
1830. Transporting Goods, F. Jenkin, Edinburgh.—*17th April*, 1882.
1852. Preserving Meat, E. G. Brewer, London.—A communication from A. Lee, J. A. Wallace, and R. W. Knox.—*18th April*, 1882.
2142. Ploughs, C. A. Snow, Washington.—A communication from H. Quin.—*6th May*, 1882.
2455. Raising, &c., Windows, R. J. Iron, Dover.—*24th May*, 1882.
2541. Architectural Work, P. Ross, London.—*30th May*, 1882.
2679. Attaching Handles, &c., T. and J. Brooke, Sheffield.—*7th June*, 1882.
3202. Combing Wool, F. Fairbank and J. Robertshaw, Allerton.—*6th July*, 1882.
3240. Preparing Plates for Electric Accumulators, T. S. Sarney and J. M. Alprovidge, London.—*8th July*, 1882.
3353. Brick-making, G. Dalton, Leeds.—*14th July*, 1882.
3461. Supply, &c., of Water, J. Shanks, Barhead.—*21st July*, 1882.
3495. Links for Attaching Chains, J. H. Shoebotham and J. F. C. James, Birmingham.—*22nd July*, 1882.
3762. Utilising the Force of Fluids, E. E. H. Rousseau.—*8th August*, 1882.

Last day for filing opposition, 5th September, 1882.

1709. Steering Gear, T. Britton, Sunderland.—*11th April*, 1882.
1712. Lamp Burners, W. Lighbody, Edinburgh.—*11th April*, 1882.
1717. Gas Burners, J. A. Drake and R. Muirhead, Maidstone.—*11th April*, 1882.
1721. Lead Peroxide, F. M. Lyte, London.—*12th April*, 1882.
1725. Soap, F. C. Glaser, Berlin.—A communication from Dr. O. Liebreich.—*12th April*, 1882.
1727. Electric Machines, W. Fisher, Birmingham.—*12th April*, 1882.
1730. Colouring Substances, J. Wetter, London.—A communication from O. Bredt.—*12th April*, 1882.
1735. Piston Packing Rings, A. A. Rickaby, Sunderland.—*12th April*, 1882.
1741. Filling, &c., Bottles, J. J. Varley, London.—*12th April*, 1882.
1743. Moulded, &c., Fuel, I. Lilley and F. Morris, Swansea.—*12th April*, 1882.
1744. Sewing Machines, A. Guillaume and A. Lambert, Belgium.—*12th April*, 1882.
1779. Crushing Seeds, H. Holt, Hull.—*14th April*, 1882.
1836. Artificial Stone, W. Walker, London.—*18th April*, 1882.
1837. Steam Boilers, J. Imray, London.—A communication from J. P. Bordone.—*18th April*, 1882.
1857. Bricks and Tiles, W. Blyth, Barton-upon-Humber.—*18th April*, 1882.
1858. Lamps, A. Leefe, London.—*18th April*, 1882.
1866. Purifying, &c., Raw Spirits, F. M. Lyte, London.—*19th April*, 1882.
1875. Secondary Batteries, D. G. FitzGerald, C. H. W. Biggs, and W. W. Beaumont, London.—*19th April*, 1882.
1956. Electric Batteries, T. J. Handford, London.—Com. from B. Jarriant.—*25th April*, 1882.
1996. Moleskin Cloth, H. W. and H. King, Hebden Bridge.—*27th April*, 1882.
2156. Preparing Photographic Plates, F. Wirth, Germany.—A communication from G. Meisenbach.—*8th May*, 1882.
2182. Clocks, A. Harder, Ransen, Prussia.—*9th May*, 1882.
2220. Ornamenting Ribbons, &c., A. H. Horsfall, Coventry.—*11th May*, 1882.
2221. Holding Globes, J. and T. L. Archer, Manchester.—*11th May*, 1882.
2224. Nitrous Vapours, G. Prim, Mons, Belgium.—*11th May*, 1882.
2239. Separating Sugar from Molasses, Prof. Dr. C. Scheibler, Berlin.—*11th May*, 1882.
2544. Colouring Matters, J. Erskine, Glasgow.—A communication from Dr. C. Kœnig.—*30th May*, 1882.
2575. Removing Vegetable Matter from Wool, J. Wetter, London.—A communication from A. Snoeck.—*31st May*, 1882.
2789. Supplying Air to Furnaces, J. Howden, Glasgow.—*14th June*, 1882.
2888. Capstans, &c., S. Baxter, London.—*19th June*, 1882.
2929. Metallic Printing, H. Panowski and K. M. Ross, London.—*20th June*, 1882.
3044. Producing Certain Derivatives of Alpho Oxyhydro-chinoline, &c., J. Erskine, Glasgow.—A communication from F. vorm. Meister, Lucius, and Brüning.—*28th June*, 1882.
3057. Chucks, H. H. Lake, London.—A communication from L. Trobeen.—*28th June*, 1882.
3160. Regulating Currents, W. R. Lake, London.—A communication from J. Carpenter.—*4th July*, 1882.
3208. Obtaining the Separation of Hair or other Covering from the Natural Skins of Animals, J. T. Tussaud, London.—*6th July*, 1882.
3216. Methyl Indigo, J. Erskine, Glasgow.—A communication from the Farbwerke vorm. Meister, Lucius, and Brüning.—*7th July*, 1882.
3218. Cinnamic Acid, J. Erskine, Glasgow.—A communication from the Farbwerke vorm. Meister, Lucius, and Bruning.—*7th July*, 1882.
3322. Electric Currents, J. M. M. Munro, Glasgow.—*13th July*, 1882.
3362. Combs, W. Spowage, Nottingham.—*15th July*, 1882.
3477. Clay, J. Gillespie, Garnkirk.—*21st July*, 1882.
3485. Telegraphing, W. B. Healey, London.—A communication from W. L. Hunt.—*22nd July*, 1882.
3547. Electric Cables, J. G. Lorrain, London.—A communication from J. André.—*26th July*, 1882.
3575. Electric Lamps, J. G. Lorrain, London.—*27th July*, 1882.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 11th August*, 1882.)

693. Roller Mills, J. Qualter, Barnsley.—*13th February*, 1882.
699. Looms, J. Hollingworth, Dobcross.—*13th February*, 1882.
703. Gas Engines, C. T. Wordsworth, Leeds, and H. Lindley, Salford.—*14th February*, 1882.
715. Venetian Blinds, R. M. Chevalier, London.—*14th February*, 1882.
732. Sulphate of Alumina, W. Gentles, Widnes.—*15th February*, 1882.
754. Hooks, M. Benson, London.—*16th February*, 1882.
777. Recovering Tin, C. D. Abel, London.—*17th February*, 1882.
782. Winding Yarns, W. T. Stubbs, Manchester.—*17th February*, 1882.
785. Textile Fabrics, J. B. Hutcheson and J. J. Dobbie, Glasgow.—*18th February*, 1882.
789. Potato-planting Machines, G. W. Murray, Banff, N.B.—*18th Febuary*, 1882.
790. Illuminating, J. R. Wigham, Dublin.—*18th February*, 1882.
792. Ploughs, E. G. Lakeman, Modbury.—*18th February*, 1882.
822. Casting Ingots of Steel, J. D. Ellis, Thurascoe Hall, near Rotherham.—*20th February*, 1882.
823. Case for Holding Paint, W. R. Lake, London.—*20th February*, 1882.
825. Fountain Pen-holders, M. Benson, London.—*21st February*, 1882.
852. Reaping, &c., Machines, J. Harrison, Ipswich.—*21st February*, 1882.
872. Electrodes, F. des Vœux, London.—*23rd February*, 1882.
908. Washing Wool, W. R. Lake, London.—*24th February*, 1882.
911. Bricks and Tiles, J. Parker, Kilmarnock.—*25th February*, 1882.
951. Cleaning Woollen Materials from Vegetable Impurities, C. D. Abel, London.—*27th February*, 1882.
957. Spinal Support, G. E. Vaughan, London.—*27th February*, 1882.
973. Compensating Apparatus, F. W. and W. W. Brierley, London.—*28th February*, 1882.
977. Staple, W. R. Lake, London.—*28th February*, 1882.
1036. Carbons, H. Leipmann and P. S. Looker, London.—*3rd March*, 1882
1048. Filter Presses, S. H. Johnson, Stratford.—*4th March*, 1882.
1062. Ball, A. M. Clark, London.—*4th March*, 1882.
1084. Wheels, R. H. Brandon, Paris.—*7th March*, 1882.
1099. Cut-off Valve Gear, A. W. L. Reddie, London.—*7th March*, 1882.
1231. Grinding Mills, L. Gathmann, Chicago.—*14th March*, 1882.
1241. Brooms and Brushes, J. G. Horsey, London.—*14th March*, 1882.
1415. Ships' Rudders, Sir J. E. Commerell, London.—*23rd March*, 1882.
1516. Electric Insulation, J. Imray, London.—*29th March*, 1882.
1615. Utilisation of Tides, F. Davies, London.—*3rd April*, 1882.
1834. Ice, W. W. Nightingale, Southport.—*18th April*, 1882.
2047. Bridges, W. W. Wynne, London.—*1st May*, 1882.
2215. Sights for Rifles, T. Gilbert, London.—*11th May*, 1882.
2428. Telegraph Printing, &c., J. Imray, London.—*23rd May*, 1882.
2565. Dynamo-electric Machines, A. J. Jarman, London.—*31st May*, 1882.
2633. Steam Boilers, &c., A. C. Engert, London.—*5th June*, 1882.
2757. Gas Burners, J. Imray, London.—*12th June*, 1882.
2921. Medicines, W. H. McLaughlin, San Francisco, U.S.—*20th June*, 1882.

(*List of Letters Patent which passed the Great Seal on the 15th August*, 1882.)

707. Rolling Pamphlet Covers, W. P. Thompson, London.—*14th February*, 1882.
746. Ventilating, T. F. Wintour, London.—*16th February*, 1882.
755. Water-closets, R. Weaver, London.—*16th February*, 1882.
763. Nuts for Screw Bolts, R. Harrington, Wolverhampton.—*16th February*, 1882.
765. Vessels, &c., W. May, London.—*16th February*, 1882.
767. Cans, &c., J. S. Gates, London.—*16th February*, 1882.
768. Rails, Sleepers, &c., H. T. Grainger, London.—*17th February*, 1882.
771. Punching Holes, J. Tushaw, London.—*17th February*, 1882.
779. Pianofortes, E. Outram, Greetland.—*17th February*, 1882.
799. Organs, &c., J. B. Hamilton, Greenwich.—*18th February*, 1882.
802. Refrigerator, W. Morton and P. Robinson, Burton-on-Trent.—*18th February*, 1882.
811. Lubricators, J. Lumb, Elland.—*20th February*, 1882.
826. Scoring, &c., Fabrics, A. C. Adam and D. Stewart, Glasgow.—*21st February*, 1882.
871. Showing the Speed of Ships, T. Davison, Glasgow.—*23rd February*, 1882.
879. Annunciator, &c., M. Volk, Brighton.—*23rd February*, 1882.
880. Signalling, C. Spratt, London.—*23rd February*, 1882.
893. Mixing Concrete, A. Jamieson, Blantyre.—*24th February*, 1882.
910. Cores, B. Johnson, jun., Pudsey, near Leeds.—*25th February*, 1882.
914. Water-closets, &c., S. S. Hellyer, London.—*25th February*, 1882.
980. Moulding Bricks, T. le Poidevin, Guernsey.—*28th February*, 1882.
997. Horseshoe Nails, I. Briggs and J. W. Booth, Birmingham.—*1st March*, 1882.
1040. Valves, W. Brierley, Rochdale, and M. Mitchell, Bacup.—*4th March*, 1882.
1074. Feeding Water to Steam Boilers, J. Ripley and T. Scholes, Bolton.—*6th March*, 1882.
1075. Musical Piston Instruments, W. R. Lake, London.—*6th March*, 1882.
1079. Incandescent Electric Lamps, W. Crookes London.—*6th March*, 1882.
1103. Carding Engines, A. Holden, Gorton.—*7th March*, 1882.
1168. Endless Travelling Railways, J. C. Mewburn, London.—*10th March*, 1882.
1348. Gas Lighting, &c., T. Thorp, Whitefield.—*20th March*, 1882.
1387. Valves, W. Teague, Illogan.—*22nd March*, 1882.
1485. Gas, F. H. Wenham, London.—*28th March*, 1882.
1560. Fasteners for Gloves, &c., E. Horsepool, London.—*31st March*, 1882.
1587. Secondary Batteries, A. Tribe, Notting-hill.—*1st April*, 1882.
1699. Motive Power, A. Wilson, Handsworth.—*8th April*, 1882.
1705. Condensers, A. M. Clark, London.—*8th April*, 1882.
2024. Exhausting Apparatus, T. Thorp, Whitefield, and T. G. Marsh, Oldham.—*28th April*, 1882.
2129. Air Pumps, D. Johnson, Chester, and S. C. Tisley, London.—*5th May*, 1882.
2195. Signalling Apparatus, A. Smith and S. A. Taylor, Kibworth.—*10th May*, 1882.
2545. Mixing Coffee Berries, Beans, &c., E. J. Humphery, London.—*30th May*, 1882.
2611. Distilling Coal, W. J. Cooper, London.—*2nd June*, 1882.
2657. Railway Brakes, A. E. Harris, London.—*6th June*, 1882.
2663. Pulverising Blood, &c., J. Farmer, Salford.—*7th June*, 1882.
2675. Telephones, H. Alabaster, South Croydon, T. E. Gatehouse, Camberwell, and H. R. Kempe, Barnet.—*7th June*, 1882.
2721. False Bottoms of Mash Tubs, A. W. Gillman and S. Spencer, London.—*9th June*, 1882.
2759. Electric Lamps, H. H. Lake, London.—*12th June*, 1882.
2813. Shirts, D. P. Belknap, San Francisco, U.S.—*14th June*, 1882.

List of Specifications published during the week ending August 12th, 1882.

578*, 4d.; 3964*, 4d.; 768*, 4d.; 5517, 4d.; 5750, 4d.; 18, 6d.; 46, 6d.; 53, 10d.; 74, 6d.; 77, 2d.; 82, 6d.; 83, 6d.; 86, 6d.; 91, 6d.; 95, 6d.; 100, 6d.; 104, 6d.; 107, 4d.; 110, 4d.; 119, 6d.; 122, 6d.; 125, 2d.; 126, 2d.; 127, 2d.; 131, 2d.; 132, 2d.; 133, 6d.; 134, 4d.; 135, 6d.; 137, 6d.; 138, 4d.; 139, 6d.; 140, 2d.; 141, 2d.; 142, 2d.; 144, 2d.; 145, 2d.; 146, 6d.; 148, 2d.; 150, 2d.; 152, 6d.; 153, 2d.; 154, 2d.; 155, 2d.; 156, 4d.; 159, 8d.; 161, 2d.; 162, 2d.; 163, 2d.; 164, 2d.; 167, 8d.; 168, 2d.; 172, 6d.; 173, 6d.; 174, 2d.; 175, 2d.; 176, 4d.; 177, 2d.; 179, 2d.; 181, 2d.; 183, 6d.; 184, 2d.; 185, 2d.; 186, 6d; 187, 2d.; 188, 2d.; 193, 2d.; 196, 4d.; 197, 2d.; 199, 2d.; 202, 4d.; 205, 4d.; 206, 6d.; 211, 2d.; 213, 4d.; 217, 2d.; 220, 4d.; 224, 6d.; 242, 6d.; 277, 1s. 4d.; 319, 2d.; 411, 6d.; 414, 4d.; 415, 6d.; 1437, 4d.; 1591, 1s. 2d.; 2223, 6d.; 2325, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

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

1591. Manufacture of Starch and other Useful Products from Maize, &c., *H. H. Lake, London.*—*1st April*, 1881.—(*A communication from E. Wilhelm, New York.*) 1*s.* 2*d.*

This relates partly to improvements in processes and apparatus described in patents No. 386 and No. 2840, both in the year 1881; and it consists, First, in treating starch water obtained by the separator with caustic alkali, after the greater part of the starch has been first obtained from such water by subsidence. The invention further relates to means for concentrating starch-milk or starch-water, so as to deprive the starch of a large quantity of its water, and consists in supplying the water to the bottom of a tank, from the top of which the water flows off, leaving the starch behind. The invention further relates to a carrier for conveying the starch from the settling tables to any desired point, and various other improvements are described.

2325. Boots and Shoes, *P. M. Justice, London.*—*17th May*, 1881.—(*A communication from S. K. Hindley, Worcester, U.S.*)—(*Complete.*) 6*d.*

This relates to improvements in what are known as "stitchdown" boots and shoes, in which the upper at the line of contact with the sole is turned outward, and fastened to the sole by seams or fastenings outside the upper.

5517. Smoking and Reading Chair, *J. Sothcott, Bayswater.*—*16th December*, 1881. 4*d.*

The inventor claims the combination of chair, flap-table, countersunk articles, such as tobacco box, match box, &c.

5750. Alloying, Uniting, and Covering Metals with other Metals, *P. de Villiers, St. Leonards-on-Sea.*—*31st December*, 1881.—(*Void.*) 4*d.*

This relates to the employment of metallic salts, from which by decomposition fine metallic alloys are obtained.

18. Substitute for Whalebone, &c., *W. Morgan-Brown, London.*—*3rd January*, 1882.—(*A communication from G. H. Phelps, Newton, U.S.*) 6*d.*

The substitute for whalebone is composed of long fibres arranged in mass with individual strands parallel, the same being coated or treated with a solution of gelatine, then with chromic acid, and then subjected to the action of light, heat, and pressure.

46. Open Fireplaces or Grates, &c., *W. Haughton, London.*—*4th January*, 1882. 6*d.*

The grate is designed to consume its own smoke, and means are provided for emitting a stream of warm air into the apartment.

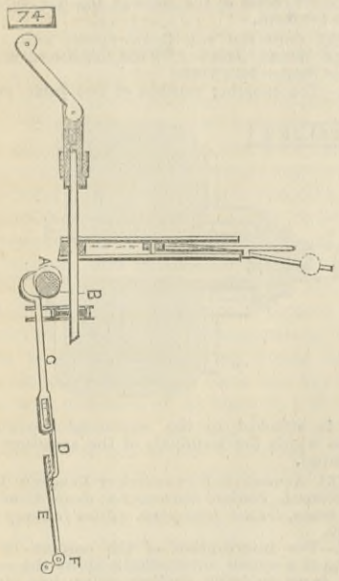
53. Mining Coal, *W. G. Thompson, Liverpool.*—*5th January*, 1882.—(*A communication from J. Du Bois, Pennsylvania.*) 10*d.*

The First part relates to the method consisting in boring a hole in the breast of the coal to the depth to which it is to be undermined, and then cutting from the hole outward by successive actions of a reciprocating chisel or cutter, a slot or channel extending beneath the coal, and also when required upward past the sides of the same, thereby loosening the body of the coal, so that it may fall or be forced down in the usual manner. The Second part consists in a channelling tool, consisting essentially of a reciprocating chisel, a guide therefor, and a ram or hammer provided with means whereby it may be moved forward and backward by hand.

74. Apparatus for Applying and Retarding Motive Power, &c., *W. B. Tibbits, Bristol.*—*6th January*, 1882. 6*d.*

The drawing is a side elevation of an apparatus as applied to the underside of a brake van for example.

A is one of the axles of the vehicle; at or near the middle of this axle is constructed or fixed an excentric or tappet B. C is a bar which is curved at one end in such manner that when the said end is raised the said curved part half encircles the said excentric or tappet B. The other end of the bar C is forked and slotted so as to slide on a bearing pin secured in a horizontal frame. D is a pawl connected by a pin to



the bar C, and arranged to run over the bearing pin. E is a bar connected by a pin joint to the arm of a lever F fixed on the axis or shaft which applies the brakes. This bar E has ratchet teeth formed on a portion of its upper side, into which the pawl D catches or drops.

77. MACHINE FOR MOULDING AND FORMING CEMENT AND OTHER CONCRETES FOR PAVING, &c., *H. Reid, London.*—*6th January*, 1882. 2*d*.

This machine is constructed so as to traverse in a horizontal or vertical direction, and on which moulds are placed.

82. APPARATUS FOR RECORDING FIXED AMOUNTS AND THE PORTION OR PORTIONS OF A JOURNEY OVER WHICH A PASSENGER MAY HAVE TRAVELLED, &c., *J. T. Parlour, London.*—*6th January*, 1882. 6*d*.

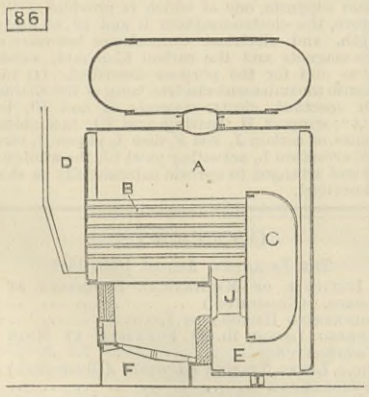
This relates mainly to a system of dividing a journey into sections, and in identifying each section by a symbol or letter which can be stamped or impressed upon the ticket at the time of issue.

83. MACHINERY FOR RECLAIMING LOW OR SWAMPY LAND ADJACENT TO TIDAL WATER, *W. R. Lake, London.*—*6th January*, 1882.—(*A communication from G. Howell, Philadelphia.*) 6*d*.

The invention consists partly in the method or process of securing and applying the necessary material (sand or mud) for filling in such lands without injury to the beach where the operation is carried on, and without the necessity of resorting to dumping or other artificial means of obtaining such material. It consists further in the peculiar construction of an excavating and distributing apparatus for carrying such method into effect.

86. STEAM GENERATORS, *J. Jones, Liverpool.* — *7th January*, 1882. 6*d*.

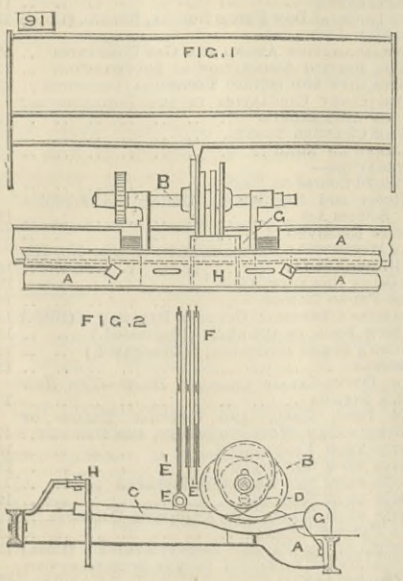
In the drawing A is the forward part of generator made cylindrical and provided with fire tubes B, which lead from the combustion chamber C near the back to the uptake D in front. E elliptical rear portion of the generator joined to the forward part A and having the combustion chamber C formed



therein. The portion E is flush with the top of A, and projects or hangs down beneath it so as to form a foot or support to the generator and a water back to the furnaces. The two furnaces are separated by a mid-feather or wall. J are openings leading from the furnaces into the combustion chamber.

91. HEDDLE FRAMES OF WEAVING LOOMS, *F. W. Pim and T. Sands, Harold's Cross, Ireland.*—*7th January*, 1882. 6*d*.

In the drawing A represents the frame of the loom,



B the shaft on which the cams or tappets are mounted, C the treadles provided with a bowl D, which latter works in the excentric grooves formed in the tappets. To these heddles are connected by means of a pivot E the vertical bars E^1, which carry the heddle frames F. The treadles act on a fulcrum at G, and their free ends move in vertical slots in the guides H. Vertical motion is imparted to the heddle frames by suitably formed guides clasping the side bars of same in any convenient manner.

98. TRICYCLES, &c., *W. Dawes, Leeds.*—*7th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the production of a tricycle or other manumotive vehicle in which, whilst both the legs and arms of the rider are employed for propelling, a means is embodied in the arrangement and construction of the whole, whereby the guiding and controlling can be as safely and efficiently effected as in those vehicles in which the legs only are employed for propelling.

99. VELOCIPEDES, &c., *M. D. Rucker, jun., Bethnal-green.*—*7th January*, 1882. 6*d*.

This relates, First, to an automatic clutch action; and Secondly, to the ball bearings.

100. WEIGHING MACHINES FOR RAILWAY VEHICLES, &c., *F. Wolff, Copenhagen.*—*7th January*, 1882.—(*A communication from F. Casse, Haarlev, Denmark.*) 6*d*.

This relates to improvements in weighing machines for railway vehicles and other heavy objects, and also for ascertaining the pressure of the wheels of locomotives, &c.

101. WRITING PADS, *W. R. Lake, London.*—*7th January*, 1882.—(*A communication from E. M. Engel, Vienna.*) 4*d*.

This relates to a writing pad consisting of a number of sheets of blotting or other paper suitably bound together, and having printed upon them consecutive portions of a calendar or diary.

102. APPARATUS FOR TEACHING READING, &c., *E. Sykes and O. G. Abbott, Huddersfield.*—*7th January*, 1882. 6*d*.

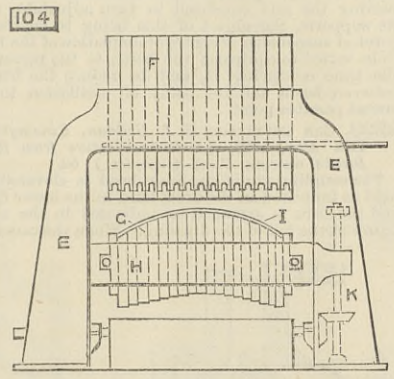
This relates to the employment of printed blocks which can slide up and down wires.

103. BOTTLES FOR CONTAINING AERATED LIQUORS, &c., *A. and J. Jacobs.*—*7th January*, 1882. 6*d*.

This relates to the employment of a screw-threaded stopper.

104. APPARATUS FOR THE MANUFACTURE OF LAMINATED STEEL SPRINGS, &c., *R. B. Hansell, Sheffield.* —*7th January*, 1882. 6*d*.

The drawing is an elevation of the machine for shaping, hardening, and tempering spring blades. E is the frame, F is a series of weights loosely held in the frame side by side, G is a bed built up of a series of separate parts, H is a holder in which the parts G can be fixed so as to give to the surface of the bed any curvature which may be desired. I is a spring blade



resting upon the bed, K is gearing by which the holder H can be made to slide with a parallel movement on the frame E. When the blade has been laid upon the bed it is raised up to the weights F, which then cause the blade to conform to the curvature of the bed.

105. OMNIBUSES, TRAM-CARS, &c., *H. W. Hart, London.* —*7th January*, 1882.—(*Not proceeded with.*) 4*d*.

This relates to improvements in omnibuses, tramcars, and other vehicles, parts of such improvements having for their object the checking of all fares paid by the passengers therein.

106. BARRELS MADE OF PAPER OR OTHER PULP, &c., *W. R. Lake, London.* — *7th January*, 1882.—(*A communication from G. W. Laraway, Hartford, U.S.*) 6*d*.

This relates to barrels made of paper or other pulp, and to machinery for making the heads of such barrels and other articles.

107. MACHINES FOR TENTERING, STRETCHING, AND OTHERWISE TREATING FABRICS, &c., *J. Ashworth, Rochdale.*—*9th January*, 1882.—(*Not proceeded with.*) 4*d*.

The improvements relate principally to tentering machines, and some of them to machinery and arrangements for treating fabrics before and after they pass through the tentering machine proper, and they may be used separate from, but the invention also consists in combining them with, the tentering machine.

110. TREATING FISH FOR PRESERVATION, *C. Pieper, Berlin.*—*9th January*, 1882.—(*A communication from J. H. G. Walkoff, Hamburg.*) 4*d*.

This consists in a combination of the operations of salting the fish, of removing its entrails, of drying and smoking it, and of packing the same, together with sweet oil and with or without the addition of spices or aromatic fruits, into suitable vessels, which after having been hermetically closed, are exposed to a moderate heat.

112. MAKING BRICKS, &c., *H. J. Haddan, Kensington.* —*9th January*, 1882.—(*A communication from L. Jäger, Germany.*)—(*Not proceeded with.*) 2*d*.

This consists in the application of three revolving forms, by means of which the filling of one form, the pressing of a brick in the second form, and the emptying of a third form are carried out at the same time.

113. EMBOSSED FABRICS, *H. Cryer, Ilkley.*—*9th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the employment of a stiffening composition composed of water, pelts, borax, and isinglass.

114. OVERSTITCHING MACHINES, *J. E. Richard, New York.*—*9th January*, 1882.—(*Not proceeded with.* 4*d*.

This relates to an overstitching machine, which is especially adapted to the sewing the "sweats" or "sweat-leathers" into hats.

115. APPARATUS FOR WASHING, SOAPING, DYEING, &c., *W. Birch, Salford.*—*9th January*, 1882. 6*d*.

The object is to dispense with the top roller, and at the same time to provide a self-acting means whereby the tension of the fabric under operation is kept equal.

116. KNIFE-CLEANING MACHINES, &c., *E. M. Knight, Manchester.*—*9th January*, 1882. 6*d*.

The inventor claims, First, the construction and arrangement of bearing for the axles or shafts; Secondly, the construction and use of an india-rubber roller, an emery roller, and a cleaning brush combined on one axis.

117. CONSTRUCTION OF CAMBER AS A MEANS FOR SIGNALLING ON RAILWAY ENGINES, *M. Ager, Pimlico.*—*9th January*, 1882. 6*d*.

The object is the construction of a camber in a special manner of spring steel or equivalent material, to be affixed in the path of an engine of a railway train to open the steam whistle mechanically while the train is passing, and the semaphore or signal set at danger, whether the said signal be observed by the driver or not.

118. IMPROVEMENTS IN TELEGRAPHY, *P. Jensen, Chancery-lane, London.*—*9th January*, 1882.—(*A communication from F. W. Jones, New York.*—(*Not proceeded with.*) 4*d*.

This relates to duplex cable telegraphs, and the objects are to overcome the disturbing effects of the electrical discharge from the cable upon the receiving instruments, and to avoid the difficulties arising from the use of a check for the static discharge in the shape of an electro-magnetic coil placed in the main circuit.

119. WINDOW SASH FASTENINGS, *E. R. Wethered, Woolwich.*—*9th January*, 1882. 6*d*.

The object is to provide a simple and efficient fastening for window sashes which cannot be opened from the outside, and which when fastened will hold the window sashes firmly together.

120. STORING ELECTRICAL ENERGY, *J. E. Liardet and T. Donnithorn.*—*9th January*, 1882. 8*d*.

Small particles of chalk, salt, &c., are covered with lead; then the interior removed, leaving a porous mass. Charcoal, coke, &c., are covered with porous lead by electrolysis. Cells are made by filling the interior with finely-divided lead. Various other ways of making up the electrodes with finely-divided lead are described.

121. STOVES OR FIRE-GRATES, *A. C. Engert, Bromley-by-Bow.*—*9th January*, 1882. 6*d*.

The stove or fire-grate consists of a fuel holder or receiver in the form approximately of one-half of a barrel divided longitudinally.

122. SHEARS FOR SHEARING SHEEP, &c., *W. Smith, Sheffield.*—*10th January*, 1882. 6*d*.

The invention consists in the employment of a fixed two-edged blade between the two movable blades of a pair of shears, by which two sets of cutting edges are formed.

123. STILLIONS, *R. Moreland, jun., London.*—*10th January*, 1882. 4*d*.

This relates to the construction of stillions in such a manner that they are simple.

124. REPRODUCING ON METAL ENGRAVINGS, &c., BY MEANS OF PHOTOGRAPHY, *L. H. Philippi, Hamburg.* —*10th January*, 1882. 2*d*.

The inventor claims, First, in the reproduction of drawings or pictures on metal, the application of photo-engravings or photo-reliefs as patterns for casting plates of hard metal, the depressions of which are filled with enamel, niello, or other convenient material; Secondly, the process of producing stamps of hard metal from photo-engravings or photo-reliefs for stamping sheet metal.

125. BOTTLES, &c., *H. H. Fanshaw, East Dulwich, and A. J. T. Wild; Nunhead.*—*10th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to bottles for containing aerated and other liquids or powders, and in the means for closing and opening the same.

126. MECHANICALLY MOULDING SMALL ARTICLES, *A. C. Henderson, London.*—*10th January*, 1882.—(*A communication from C. G. Picard, Paris.*)—(*Not proceeded with.*) 2*d*.

In principle the invention emanates from the rolling mill, in so far that the moulding substance in the requisite condition is distributed at the point of contact of two discs turning in contrary directions at an equal velocity. On the periphery of one of the discs is engraved or sunk the mould of the article desired.

127. HYDRAULIC MOTOR, *C. Burnett, Ladyston, N.B.* —*10th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the construction of a motor operated by means of a fall or pressure of water.

128. ARMY TRENCHING TOOL, *A. H. Storey, Wandsworth.*—*10th January*, 1882. 6*d*.

This relates to a combined pick and shovel or spade, pivotted or turning on the end of a handle shaft.

129. AN IMPROVED METHOD AND APPARATUS FOR ELECTRICALLY LIGHTING RAILWAY TRAINS, *W. H. Preece, Wimbledon, and J. James, Lambeth, Surrey.* —*10th January*, 1882. 6*d*.

This consists in the combination of air compressors and reservoirs with dynamo machines and lamps. The reservoirs are charged with compressed air by compressing pumps worked from one of the train axles. This compressed air works engines, which in turn work the dynamos, by which current is supplied to the lamps connected with them by suitable wires, and which latter are distributed as required through the train.

131. FIXING BRONZE AND BROCADES ON WOVEN OR FELTED FABRICS, *H. Dewhurst, Huddersfield.*—*10th January*, 1882.—(*Not proceeded with.*) 2*d*.

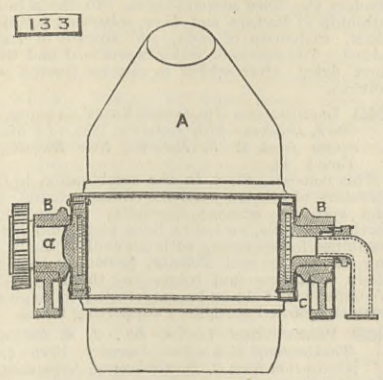
The bronze or brocade is mixed into a liquid or pasty ferm, a solution of india-rubber being added thereto, so as to make the bronze or brocade adhere to the fabric. The fabric passes over a revolving roller; and in contact therewith is hinged an inclined plate or "doctor," which forms a V-shaped trough into which the bronze is placed, so that as the fabric is travelling along over the roller it is pasted or coated with bronze or brocade.

132. MANUFACTURE OF MANURE FROM THE WASTE FROM DISTILLERIES, *E. Edwards, London.*—*10th January*, 1882.—(*A communication from Messrs. Gaillet and Huet, Lille.*—(*Not proceeded with.*) 2*d*.

This relates to novel chemical processes for the purification of the liquid product.

133. CONVERTERS, &c., FOR MAKING BESSEMER STEEL, *J. H. Johnson, London.*—*10th January*, 1882.—(*A communication from W. M. Henderson, Steelton, Dauphin County, U.S.*) 6*d*.

In the drawing A is the converter, which may be constructed in substantially the same manner as ordinary converters, but its trunnions A instead of turning in fixed bearings are provided with flanged wheels B, adapted to a track consisting of the girders C, which are supported on columns in the usual manner. The object of this arrangement is to permit the converter, when it has to be relined or otherwise



repaired, to be wheeled away on the track and on to any siding or turn-out communicating therewith, so as to make way for a converter which has been prepared for immediate use, and which can be at once wheeled to the working position previously occupied by the temporarily discarded converter.

134. TREATMENT OF ANIMAL REFUSE FOR THE MANUFACTURE OF ANIMAL FAT, &c., *J. H. Johnson, London.*—*10th January*, 1882.—(*A communication from A. J. Huet, Paris.*) 4*d*.

This consists in first preserving the crude materials from decomposition by submitting them to the action of chloride of aluminium, and afterwards extracting the fat or tallow and gelatine by the employment of heat in conjunction with pressure.

135. MANUFACTURE OF FIRE-LIGHTERS, *F. Holmes, New Cross.*—*10th January*, 1882. 6*d*.

This relates to forming composition fire-lighters with a conical or tapered hole therein.

137. TIP WAGONS, *J. W. Glover, Warwick.*—*10th January*, 1882. 6*d*.

This relates to the method of hinging the movable bodies of tip wagons or carts, and to means for throwing them into any desired position, and also to a removable sliding cover for preventing the dust and other refuse from jolting over the sides and end of the tip cart or wagon.

138. RAIL, &c., FOR RAILWAYS AND TRAMWAYS, *W. Bean, Croydon, and E. Thompson, Nunhead.*—*10th January*, 1882.—(*Not proceeded with.*) 4*d*.

The object is an improved and special section of single rail with four treads and two grooves at an angle with the tread surfaces, which rail can be turned end for end, and the under surface be brought uppermost when desired.

140. PREVENTING THE HEATING OF RAILWAY CARRIAGE AXLE-BOXES, &c., *A. M. Clark, London.* —*10th January*, 1882.—(*A communication from H. Bouchard, Saint Elmo, U.S.*)—(*Not proceeded with.*) 2*d*.

This consists partly in forcing a current of cold air into each axle box by means of a rotary gear.

141. BICYCLES, *C. W. Francis, London.*—*11th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to improvements in the steering apparatus.

142. MANUFACTURE OF IRON AND STEEL WIRE, &c., *G. and E. Woods, Warrington.*—*11th January*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to produce galvanised or metal-coated iron and steel wire of superior finish.

145. UMBRELLA FASTENERS, *A. C. Henderson, London.* —*11th January*, 1882.—(*A communication from Messrs. J. Roy and J. Beuste, Paris.*—(*Not proceeded with.*) 2*d*.

The fastener comprises two parts, one being a metal piece serving as hook for the second part to catch in.

146. LITHOGRAPHIC AND LETTERPRESS PRINTING MACHINES, *G. Newsum, Leeds.*—*11th January*, 1882. 6*d*.

This refers, First, to the inking or forme rollers used in lithographic and letterpress printing machines; Secondly, to the arrangement of damping rollers on lithographic machines.

148. APPARATUS FOR INCREASING THE ILLUMINATING POWER OF GAS, *J. H. Weston, Shepherd's Bush.*— *11th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to apparatus which can be adapted to any ordinary gasalier, wall bracket, or other gas fitting for the purpose of curburetting the gas on its passage to the burner, and thereby increasing its illuminating power.

150. APPARATUS FOR EXTINGUISHING FIRE, &c., *W. Dennis, Brixton.*—*11th January*, 1882.—(*Not proceeded with.*) 2*d*.

The invention relates to improvements in the arrangement and construction of apparatus for extinguishing fire of the character described in specification of letters patent, dated 25th January, 1873, No. 301, in which portable pneumatic apparatus was described for discharging a jet of water under pressure.

152. APPARATUS FOR DYEING OR WASHING HANKS OF YARN, &c., *E. Boden, Manchester.*—*11th January*, 1882. 6*d*.

This relates to improvements in that class of dyeing and washing apparatus consisting of a vat or cistern provided with a double series of revolving rollers over which the hanks are placed.

153. SHUTTLES FOR LOOMS, *J. R. Richards, near Preston.*—*11th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the construction of the tongue or peg of the shuttle.

154. APPARATUS FOR LUBRICATING THE SPINDLES OF MACHINES FOR PREPARING, SPINNING, DOUBLING, AND TWISTING COTTON, &c., *G. Bodden, Oldham.*— *11th January*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to cause the circulation of the oil to take place in whichever direction the spindles are driven by the employment of two scrolls or spirals, one right-handed and the other left-handed.

155. BUTTONS, *S. P. Wilding, London.*—*11th January*, 1882.—(*A communication from R. Behrendt, Magdeburg.*)—(*Not proceeded with.*) 2*d*.

This relates to means of affording a more secure attachment for, and to obviate certain disadvantages in, buttons as at present used.

156. TREATMENT OF CERTAIN MINERAL PHOSPHATES TO OBTAIN USEFUL PRODUCTS THEREFROM, *D. Perry, Glasgow.*—*11th January*, 1882. 4*d*.

This relates to the treatment of mineral phosphates containing either iron or alumina, or both, in order to obtain the phosphoric acid and the alumina therein contained as compounds of commercial value, viz., an alkaline or earthy phosphatic and alumina hydrate, or any of its compounds.

159. MACHINERY FOR MAKING BOXES OF CARDBOARD, &c., *S. Wood, Cleckheaton.*—*12th January*, 1882. 8*d*.

This relates to a method of securing and strengthening the angles or sides of boxes made of cardboard and other suitable material by wire staples, which are inserted through the sides of material of the box, bent to the angle required, and clenched on the other side.

160. FASTENINGS FOR STAY BUSKS, *J. E. Salisbury, Sheffield.*—*12th January*, 1882. 4*d*.

This relates to the manufacture and use of stay fasteners or clasps provided with covers or shields, and made out of one continuous piece of metal.

161. MACHINERY FOR SPINNING, TWISTING, AND DOUBLING COTTON, *J. Roussel, fils, Roubaix, France.*— *12th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to improvements in the arrangement of the spindles.

162. SYPHON TRAPS FOR DRAINS, *A. T. Angell, Fulham-road.*—*12th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to a means for the effectual cleansing and flushing of the traps.

163. SKATES, *H. J. Haddan, Kensington.*—*12th January*, 1882.—(*A communication from H. Wirths und Sohn, Remscheid, Germany.*)—(*Not proceeded with.*) 2*d*.

This relates to the means of attaching skates to the boots of skaters, and has for its object to fasten the skate by simply treading upon it with the foot without previously adjusting the mechanism according to the size of the boot.

164. SHUTTLE BOXES FOR POWER LOOMS, *F. W. Pim and T. Sands, Harolds Cross, Dublin.*—*12th January*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to improvements in shuttle boxes and knocking-off motion of power looms.

167. DYEING AND COLOURING FELT, JUTE, &c., *J. Allan, Barnsbury.*—*12th January*, 1882. 8*d*.

This relates to machinery and appliances used for dyeing and colouring felt, jute, or other textile or porous fabrics, in which the material to be treated is held firmly between hollow dies or blocks upon which the pattern is formed, and through which suitable liquid dye or colour is forced so as to penetrate the material, the dye or colour being then withdrawn and the hollow blocks separated, so that the material can be drawn forward for a sufficient distance, when the blocks are again brought together and the process repeated, and so on as often as may be necessary.

168. LUBRICANT FOR RAILWAY AXLES, &c., *T. G. Alcock, Manchester, and J. Johnson, Stretford.*— *12th January*, 1882. 2*d*.

This consists of tallow, water, and soda, heated together.

172. Apparatus for Mixing the Materials used in the Making of Concrete, *J. Jackson, Kensington.*—12*th January*, 1882. 6*d.*

This relates to an apparatus provided with sloping or inclined shelves on each side, upon which the materials fall when thrown into the hopper.

173. Producing (Automatically) Signals and Alarum Sounds in Dwelling Houses and other Buildings in Case of Fire, &c., *C. B. Crisp, London.*—12*th January*, 1882. 6*d.*

The object is to produce signals and sound alarums in dwelling houses and other buildings by the destruction, the severance, or the releasing of a cord of a sensitive character, so that an upper vessel may fall within a lower one and force the contained air through a whistle, and at the same time to uncover and turn on a gas or other flame, this being in proximity with a bull's eye or lens fitted in a prominent part of the wall within view of persons who may be passing or brought there through the noise of the alarum bell, the catch or hammer of which is also set free by the descent of the upper vessel, which is of sufficient weight, or may be weighted according to the degree of desired descent of it.

174. Implements for Polishing Rods, &c., *A. Watt, Old Charlton, Kent.*—12*th January*, 1882.—(*Not proceeded with.*) 2*d.*

This consists of a pair of jaws formed with recesses corresponding in size to the rods to be polished and faced with felt or leather. The jaws are forced towards each other by a spring.

175. Hoisting Machines, *T. King, Birmingham.*—12*th January*, 1882.—(*Not proceeded with.*) 2*d.*

In a strong frame, by which the machine is supported by a hook, a vertical axis carrying a drum is mounted and driven by worm and worm wheel. On one end of the horizontal shaft of the worm a sprocket wheel is fixed, and over it passes the endless rope to work the machine. The weight to be raised is suspended to a cord or chain coiled several times round the drum.

176. Bedsteads for Military Use, &c., *A. M. Clark, London.*—12*th January*, 1882.—(*A communication from A. H. L. Oudry, Paris.*)—(*Not proceeded with.*) 4*d.*

The object is to combine strength and economy with hygienic conditions, and the bedstead is specially constructed to prevent harbouring vermin. The bottom is of wire-work, and is stretched in an iron frame pivotted at one end on its legs, so that it can be raised to a vertical position in the day time.

177. Manufacture of Steel from the Residuum of Pyrite Roasting Furnaces, &c., *W. T. Whiteman, London.*—12*th January*, 1882.—(*A communication from C. Martin, Belgium.*)—(*Not proceeded with.*) 2*d.*

The residuum after being roasted in presence of oxidising or desulphuring agents is reduced to powder and placed on perforated iron sheets and then washed in a vessel, after which it is mixed with unctuous clay and lime, added to form a very fusible flux. The mixture is moistened with water and pressed into blocks, which are subjected to the elevated temperature of a calcining and reducing furnace. The blocks while red hot are plunged into a bath of melted scoria or slag produced in the calcining furnace.

179. Pattens or Attachments to Boots and Shoes, *C. Mayer, Cologne.*—12*th January*, 1882.—(*Not proceeded with.*) 2*d.*

A plate of thin steel is jointed in the middle so as to allow it to bend when walking, and its underside is fitted with leather strips to give a firm hold and prevent noise. To the heel a curved plate is connected by links, the ends of which are formed with loops secured by straps. A leather cap fits over the toe of the boot.

180. Gas Burners and Regulators, *F. Siemens, Dresden.*—12*th January*, 1882. 6*d.*

This relates to a construction of gas burners, so as to obtain very complete combustion and great brilliancy of light, and of regulators for governing the flow of gas to such burners, these regulators being applicable also to burners of other kinds.

181. Velocipedes, *G. Moss, London.*—13*th January*, 1882. 2*d.*

This consists in an improved method of steering by canting the wheels of velocipedes having a wheel on each side of the driver, either opposite to one another in a parallel line or one wheel in advance of the other. The invention further relates to constructing wheels smaller than really required, and attaching to the tire by means of springs a second tire of the required diameter.

183. Buttons, *W. Willeringhaus, London.* — 13*th January*, 1882. 6*d.*

This relates to buttons with shanks, and consists in forming the part of the shank to be connected to the head with an eye fitting a slot in the head, and through which a pin is passed, such pin being inserted in a transverse hole in the head.

184. Gas Burners, &c., *T. A. Richardson, London.*—13*th January*, 1882.—(*A communication from J. H. Smith, Buffalo, U.S.*)—(*Not proceeded with.*) 2*d.*

The object is to heat the gas by the flame of the burner before it is consumed, and it consists in dividing the lower part of the burner into two chambers by a horizontal partition, and leading the gas from the lower one through a tube passing over the gas flame, and then discharging it into the upper chamber, from whence it escapes through the orifices of the burner, and is consumed.

186. Manufacture of Coke, &c., *H. J. Haddan, Kensington.*—19*th January*, 1882.—(*A communication from G. Seibel, France.*) 6*d.*

The invention is based on the fact that hydrocarbon gases produced by the distillation of coal, and passing at a high temperature through a mass of coal being converted into coke, yield a portion of their carbon to the spongy material through which they are passing, the quantity of carbon given increasing with the thickness of the coal stratum through which the gases are filtered, and it consists in the construction of a furnace to carry out this principle.

187. Apparatus for Admixture of Liquids of Different Densities, *E. J. Whitlock and S. Smale, London.*—13*th January*, 1882.—(*Not proceeded with.*) 2*d.*

This relates principally to means for rousing and blending the lighter and the heavier worts while running into the fermenting back in the process of brewing, and consists in the use of two pipes, one within the other, and attached to the wort mains. The inner pipe has an air channel, and the outer pipe can be raised or lowered. To the bottom of the pipe a rouser is secured, and consists of a shell with hollow blades, through which the wort passes, causing it to revolve rapidly.

188. Warming and Ventilating Apparatus, *J. Parrott, Surrey.*—13*th January*, 1882.—(*Not proceeded with.*) 2*d.*

An open fireplace is provided with a chamber beneath the grate closed on all sides but the top, and communicating with a box at the side, a valve being provided to regulate such communication. The side box is fed with air from outside the building or from a ventilator in the ceiling of the room. The sides and back of grate are of fire-brick, and the upper part of the back projects backwards into the chimney. A slide is used in place of the usual damper.

192. Ochre Pigments, *J. M. Cameron, London.*—13*th January*, 1882. 2*d.*

This relates to the manufacture of ochre pigments by combining ochre with any one or more of the following substances, viz., the carbonates or bi-carbonates of the alkalies, soda ash, the oxalates of the alkalies, oxalic or carbonic acid, and the yellow salts of chromic acid.

193. Appliance to Horseshoes to Prevent Slipping, *J. C. Worthington, Lowestoft.*—13*th January*, 1882. —(*Not proceeded with.*) 2*d.*

A metal cross bar is notched at the ends so as to fit into the recess of the shoe, and its projecting ends lie against the under side of the front arch of the shoe. One end of the bar has a pin which enters a hole bored through the shoe, and the other end has a similar sliding pin forced outwards by a spring, so as to enter a hole in the other side of the shoe. Projecting studs are formed on the cross bar.

196. Manufacture of Wine from Beetroot, *E. G. Brewer, London.*—13*th January*, 1882.—(*A communication from A. and L. Q. Brin, Paris.*) 4*d.*

The beetroot is cooked by steam and reduced to pulp, which is placed in linen bags and submitted to powerful pressure to extract the juice, which is then placed in wooden vessels provided with steam coils, and in which it is caused to ferment. Sprouting barley or other suitable substance is then added to finish the fermentation, when the liquid is strained through tannin or crushed oak.

199. Stoves, Lamps, &c., *J. F. Hoyne, London and G. B. Louedec, Birmingham.*—14*th January*, 1882.—(*Not proceeded with.*) 2*d.*

The object is to increase the supply of air to stoves or lamps, and as applied to closed stoves it consists in forming grooves in the inside of the case, and in them are placed two or more plates so as to form passages inside the stove, such passages corresponding with apertures at the base of the stove. The top has also apertures corresponding with the passages, and placed so that air can pass down the passages through the apertures at the base and impinge on the fuel.

202. Treating Solutions Containing Compounds of Ammonia, *A. McDougall, Penrith.*—14*th January*, 1882. 4*d.*

This consists in the production of ammoniacal compounds from ammoniacal solutions, urine, or other analogous bye products, excretions, or liquids, by treatment with a mixture of sawdust, bark, peat or other similar organic matter in a divided state with calcium, or magnesium sulphate or chloride.

204. Construction and Working of Distilling and Sublimation Apparatus, &c., *G. E. Vaughan, London.*—14*th January*, 1882.—(*A communication from F. Lürmann, Germany.*)—(*Complete.*) 1*s.* 10*d.*

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

205. Reducing Rock Ores, &c., *J. C. Mewburn, London.*—14*th January*, 1882.—(*A communication from J. Tayler, New York.*)—(*Not proceeded with.*) 4*d.*

Between the two side plates of an iron frame two jaws of cast iron are suspended by rods, and provided with corrugated face plates. The jaws are operated by pitman rods from a crank shaft, and exert a combined pressure and grinding or rubbing action on the substance to be reduced.

206. Wire Net, *F. Wirth, Frankfort-on-the-Main.*—14*th January*, 1882.—(*A communication from C. Pickhardt, Hagen, Germany.*) 6*d.*

This consists, First, in forming a protection for the edges of wire net by bending the ends of the cross bars and spirals of which it is composed; Secondly, the manufacture of wire net with wires of semicircular, rectangular, triangular, or other transverse section; Thirdly, joining the free ends of wire net by means of one or more wire spirals; and Fourthly, the manufacture of wire net by interlacing round spirals of wire.

207. Perambulators and Bath Chairs, *J. H. Miles, Birmingham.*—14*th January*, 1882. 8*d.*

This consists, First, in the method of connecting the seat of the perambulator or Bath chair with the body, whereby the seat can be turned into any desired position with respect to the body; Secondly, to the construction and arrangement of parts for changing the position of the body with respect to the wheels according as the perambulator or Bath chair is propelled from the front or from the back.

209. Glazing Greenhouses, Conservatories, &c., *T. R. Shelley, Smethwick.*—14*th January*, 1882. 10*d.*

This consists partly in improvements for preventing the sheets or squares of glass from sliding downwards and from rising vertically when they overlap; that is to say, by means of loose stops constructed and used in conjunction with slots and other appliances.

211. Fire-proof Paint, *C. J. Mountford, Birmingham.* —16*th January*, 1882. 2*d.*

This consists essentially in using ground asbestos, silicate of soda, or potash, and water well mixed, as the ingredients of the fire-proof paint.

213. Breech-loading Fire-arms, *H. A. A. Thorn.* - 16*th January*, 1882. 4*d.*

This relates to improvements on patent No. 1242, A.D. 1881, the object being to dimininish the draw or draft on the trigger in cocking and releasing the hammer, and it consists in the employment of a split or double trigger, to which a lever is adapted, and so connected to the trigger plate or trigger guard that the act of gripping the gun will operate the lock action and withdraw the hammer bolt to its fullest extent, ready to be released by pulling the second trigger.

217. Horse Beds, *B. W. Holt, London.*—16*th January*, 1882.—(*Not proceeded with.*) 2*d.*

Two sheets of canvas are connected by stitching, so as to form a number of tubes, which are filled with sawdust and then sewn up, the cover being then coated with a waterproofing composition.

220. Artificial Ivory, *F. W. Cottrell, Gray's-inn-road.*—16*th January*, 1882. 4*d.*

Fibre is immersed in a solution of nitrous acid in sulphuric acid, and then slightly pressed and allowed to stand for from twenty minutes to an hour. The fibre is then washed to remove the greater part of the acid, some of which, however, must be allowed to remain, and the fibre is immersed in a solution of sulphide of barium containing about 25 per cent. of the salt, which neutralises the remaining acid and renders the fibre non-explosive. To the mixture of sulphide of barium and fibre, saturated solutions of alum, carbonate of soda, and silicate of soda are added. The excess of water is removed and the product dried, after which it can be treated with a solvent.

242. Loading and Unloading Ships' Cargoes, *A. M. Clark, London.*—17*th January*, 1882.—(*A communication from C. B. Messrole, New Rochelle, New York.*) 6*d.*

This consists, First, in the combination in freight elevators of jointed sections, endless chains, tables, and sprocket wheels; Secondly, in forming the sections of rails, united by joint plates and rods, and combined for operating with the endless chain carrying the tables; and Thirdly, providing the endless chain with eyes and connecting them by rods and V-shaped bars held by braces forming, in combination with the jointed sections, a supporting frame.

269. Permutation Locks, &c., *J. R. Nottingham, Washington, U.S.*—19*th January*, 1882.—(*A communication from G. M. Hathaway, Jersey City, U.S.*) 6*d.*

The objects are, First, to produce a practically safe permutation lock; Secondly, to lock the combination by a novel auxiliary lock.

277. Steam Pumping Engines, &c., *W. D. Hooker, St. Louis, U.S.*—19*th January*, 1882. 1*s.* 4*d.*

This relates to improvements in steam pumping engines; also to improvements in compound engines and their connection and combination with a condenser of novel construction, producing a pumping engine of increased working capacity. The condenser forms the bed-plate, and direct connection of the engine exhaust with the condensing space and of the pumps with the water-way of the condenser is provided, so that the water raised is drawn through the condenser, and produces a vacuum in the water-way to counteract that formed by condensation in the steam space of the condenser. The invention further relates to the valve mechanism and to an improved construction of steam pump. The pumps are mounted on one end of the condenser and driven direct by the engines mounted on the other end thereof.

411. Sewerage Gullies, *C. Pieper, Berlin.*—27*th January*, 1882.—(*Complete.*) 6*d.*

This relates to the effectual separation of solid matter from rain or surface water to be carried off by sewers; and consists in causing the water to pass off from the upper part of a vessel, perforated at top to form a strainer. When the latter is obstructed a portion of the water passes automatically through an aperture at the lower part of the vessel, to which a syphon, containing a valve, is attached.

414. Carriages for Advertising Purposes, *A. Cracknell, Peckham.*—27*th January*, 1882. 4*d.*

This consists in forming an ornamental car with grooves to receive sheets bearing advertisements. For night advertising the sheets are made transparent and lighted from within.

415. Velocipedes, &c., *W. Hillman, Coventry.*—27*th January*, 1882. 6*d.*

This consists, First, in an arrangement of double driving gear for tricycles consisting of the combination of crown pinions on the hubs, clutches carrying studs with bell cranks disconnecting either wheel as the steering rod is moved to turn the machine to either side, or for disconnecting both wheels for descending hills; Secondly, an improved carrier for the crank shaft, consisting of a globular or spherical surfaced sleeve held between adjustable screws; Thirdly, in an improved form of driving chain; and Fourthly, in an arrangement in "sociable" tricycles to enable the "off" rider to steer.

1848. Crystallised Anhydrous Grape Sugar, *W. R. Lake, London.*—18*th April*, 1882.—(*A communication from A. Behr, New Jersey.*)—(*Complete.*) 4*d.*

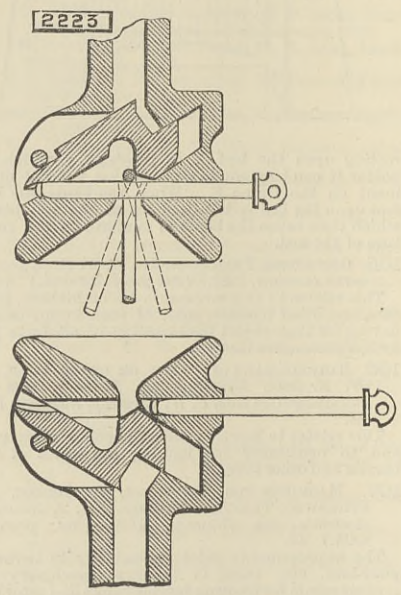
This consists in forming a highly concentrated watery solution of grape sugar, and in depositing the same in a suitable receptacle, either with or without admixture with a minute proportion of finely-divided crystallised anhydrous grape sugar previously prepared, and in maintaining the concentrated solution at a temperature of about 90 deg. Fah. until complete crystallisation has taken place, and in then disintegrating the crystallised mass and depositing it in bulk in the basket of a centrifugal machine and draining it in the usual manner.

1932. Self-levelling Ships' Berths, *A. A. Young, Boston, U.S.*—22*nd April*, 1882.—(*Complete.*) 6*d.*

This consists in supporting the main oscillating beam upon a crosshead in such manner as to be longitudinally adjustable upon the latter, and in supporting the said crosshead in turn adjustably upon its supports, the object of this being to enable the point of suspension or centre of oscillation of the berth to be varied to equipoise the berth to the person for the time occupying it, and to reduce the friction between beam and its point of oscillation to the lowest possible point.

2223. Car Couplings, *H. J. Haddan, Kensington.*—11*th May*, 1882.—(*A communication from R. M. Brooks, Georgia, U.S.*)—(*Complete.*) 6*d.*

The coupling pin of one draw head is elevated and held as indicated in the draw head in the lower figure and the link is arranged as indicated in the upper figure at the left of the drawing. When the cars come



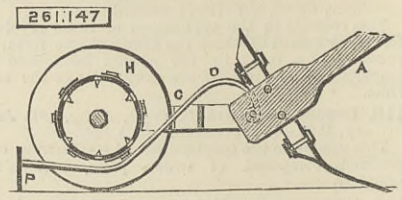
together the link secured in the draw head enters the opposite draw head and forces the pawl or dog back so as to drop the coupling pin through the link.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

261,147. Combined Garden Hoe and Seed Planter, *Jas. R. Gilbert, Leesburg, Ga.*—*Filed December 31st*, 1881.

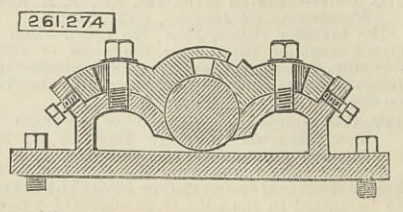
Claim.—The combination, with the frame C, having flanged rotary hopper or seeding cylinder H, and



pivotted beam A, of the rods or brackets O, pivotted upon the same bolt as beam A, extending rearward under the hopper, and carrying the covering blade P, substantially as set forth.

261,274. Journal Box, *Frederick H. Sweet, Williamsport, Pa., assignor to Rowley and Hermance, same place.*—*Filed June 5th*, 1882.

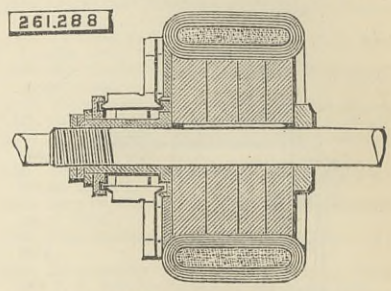
Claim.—(1) The combination, substantially as set forth, of a fixed box or bearing having a central recess for the reception of a shaft journal and a



segmental guide formed upon its top on each side of said recess, and two adjustable cap sections, each fitting upon one of the guides and adapted to bear at its inner end against the journal. (2) The combination, substantially as set forth, of a fixed box having a curved guide on each side of a central shaft recess, two cap sections fitting on said guides, and adjusting screws bearing against the ends of the cap sections. (3) The combination, substantially as set forth, of a box having curved guides on its top, two cap sections fitting on said guides, and a lip or dust-guard. (4) A journal bearing having an internal oil reservoir, covered at top by curved guides extending from a central shaft recess to the sides of the box, substantially as set forth.

261,288. Coupling for Commutators and Armature Wires, *James J. Wood, Brooklyn, N.Y.*—*Filed October 26th*, 1881.

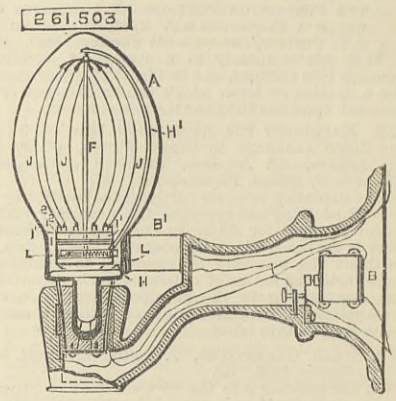
Brief.—The coupling consists of two parts, one of



which is attached to the commutator segment, between which the terminals of the armature coils are clamped.

261,503. Automatic Incandescent Electric Lamp, *William L. Voelker, Merton, Pa., assignor to John H. Irwin, trustee, same place.*—*Filed January 23rd*, 1882.

Brief.—The interruption of the current by the breaking of a carbon automatically shifts the carbon carrier, so as to bring another carbon into circuit. *Claim.*—(1) In an automatic incandescent electric lamp held firmly in position, the combination of numerous carbon filaments pivotted between supports within the vacuous chamber, one of such supports being provided with an armature and arranged and adapted to be revolved by an electro-magnet on the outside of said vacuous chamber, substantially as described. (2) In an automatic incandescent electric lamp held firmly in position, the combination of numerous carbon filaments pivotted between supports within the vacuous chamber, one of such supports having an armature and electrical connections between said carbon filaments, and the electro-



magnets B and B¹, and between said electro-magnets, substantially as described. (3) In combination with an automatic electric lamp held firmly in position, and having numerous carbon filaments, adapted and arranged to rotate within the vacuous chamber between supports, one of which is provided with an armature, the electro-magnets B and B¹, of unequal strength, and electrical connections between said electro-magnets and the carbon filaments, substantially as and for the purpose described. (4) In an automatic incandescent electric lamp of the character herein specified, electro-magnets B and B¹, lamp bulb A*, support H, bearing arm H¹, incandescent filaments of carbon J, rod F, disc I, pieces I¹, screws I², and armature L, actuating pawl L¹, the whole combined and arranged to operate substantially as shwno and described.

CONTENTS.

The Engineer, August 18th, 1882.