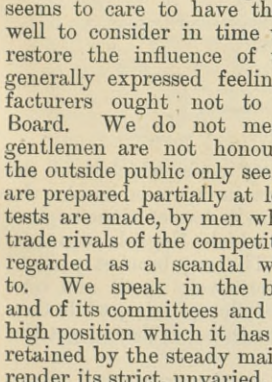
THE ROYAL AGRICULTURAL SOCIETY'S SHOW AT READING.

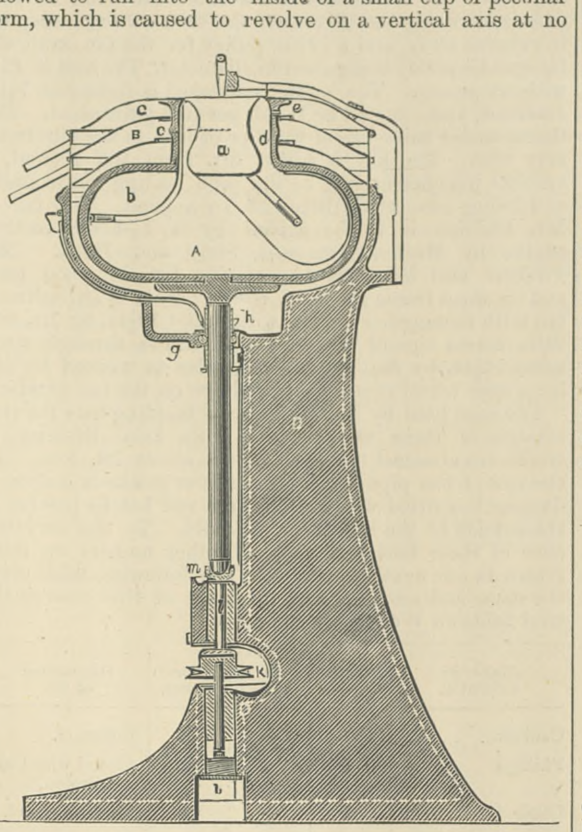
In our last impression we gave our readers such particulars of the show of the Royal Agricultural Society as will enable them to form a fair idea of its magnitude. We this week publish a key plan of the implement section, arranged on a system which has been found to answer very well. The whole of the implement ground is on our map cut up into squares, and in the margins will be found the names of the exhibitors, the numbers of their stands, and letters which indicate in which square of the plan the number sought for may be found. The ground on which the show is held stands high, and a great deal of rain will be needed to reduce it to mud. Warned, we suppose, by the results of the experience of past years, which goes to show that while the last week of June and the first week of July are dry, the second and third weeks of July are always wet. Exhibitors have this year taken care to avail themselves of the opportunity afforded them by the clerk of the weather, and even on Monday last most of the heavy machinery was in place, and the whole implement yard was wonderfully complete. There is no reason, however, to think that this will be in any sense or way a specially interesting show. On the contrary, although the number of stands, the length of shedding, and the number of exhibits compare favourably with those of past shows, there is more than the usual absence of novelties, and several of the great firms are inadequately represented, and manifest, indeed, a very lukewarm feeling concerning the Royal Agricultural Society. If the programme of trials proposed by the Committee could have been carried out, there would have been much done to attract attention and excite interest. But the world apparently begins to care very little indeed for the prizes of the Royal Agricultural Society. A smart competition was expected in trials of steam drainage ploughs. There were, however, only two entries, both of which have been withdrawn. It was anticipated that the farmers of England would take a great deal of interest in machinery for harvesting corn, but the competition in this class of machinery almost fell through altogether, and there are but six competitors for a prize of £105 offered not by the Royal Agricultural Society, but by Mr. Sutton. Again, the Society went to a great deal of expense in getting up appliances for testing centrifugal creaming machinery. Ten competitors entered, and they have all withdrawn save two, namely, Messrs. D. Hald and Co., Great Winchester-street, London, and the Centrifugenbau-Actien Gesellschaft, of Hamburg. At one time the prizes of the Society were eagerly contended for. Now no one seems to care to have them; and the Committee will do well to consider in time what steps should be taken to restore the influence of the Society. We but echo a generally expressed feeling when we assert that manufacturers ought not to have seats at the Council Board. We do not mean even to imply that these gentlemen are not honourable, high-minded men. But the outside public only see that the programmes of trials are prepared partially at least, and the arrangements for tests are made, by men who may be at any moment the trade rivals of the competitors, and this is, in plain terms, regarded as a scandal which ought to be put an end to. We speak in the best interest of the Society, and of its committees and Council, when we say that the high position which it has held can only be regained and retained by the steady maintenance of a policy which will render its strict, unvaried, and absolute impartiality a fact which no one, not even a disappointed competitor, will dare to question.

The relative values of centrifugal cream separators may not appear to be a subject likely to interest engineers; but the machines are so ingenious and even elegant in their mode of working; and the results obtained are so curious, that we cannot pass over the trials which took place this week in silence. The object of the centrifugal creaming machine is to separate all the cream from the milk at once, instead of permitting it to separate at its leisure. Cream contains the more oily portions of the milk, and being of less specific gravity, it rises to the top in an ordinary vessel, but it only does so very slowly, because the difference in specific gravities is very small. If, now, by any means, this difference could be augmented, the separation would take place more rapidly. Let us suppose, for example, that the force of gravity were increased, while the internal resistance of the liquid which tends to prevent separation remained unchanged, then the difference would be intensified. Let us assume, for example, that given similar quantities of milk and cream weigh respectively 10 lb. and 9 lb, the definite tendency to cause separation is 1 lb. If, now, the action of gravity were multiplied ten-fold, the figures would become 100 lb. and 90 lb., and the separating tendency would be 10 lb. instead of 1 lb. Now this is practically what the separator does. The milk is put into rapid rotation within a cylindrical vessel. The "skim milk" being the heaviest is carried with more force to the outside than the lighter cream, and if means could be provided for scraping the cream off, it could be obtained distinct from the more watery portions of the milk in a less number of minutes than that of the hours now required. The annexed sketch illustrates the principle of the Hamburg separator, and will serve to make our meaning clear. A is an iron vessel or ring shown in cross section, and mounted on the shaft; A is about 3ft. in diameter, and makes 1200 revolutions per minute. The milk, heated to 95 deg. Fah., is poured into B, from which it is delivered in a small stream to the inside of the cap A. It is immediately impelled against



the curved lip by centrifugal force and assumes somewhat the position shown at H H, the milk outside, the cream inside or next the centre. D shows a peculiarly-formed scoop or scraper, which goes just far enough into the curved lip of A, and nearly on a level with the axle to scrape off the cream and deliver into a suitable vessel. The machine costs £250, and will skim, it is stated, 300 gallons of milk per hour.

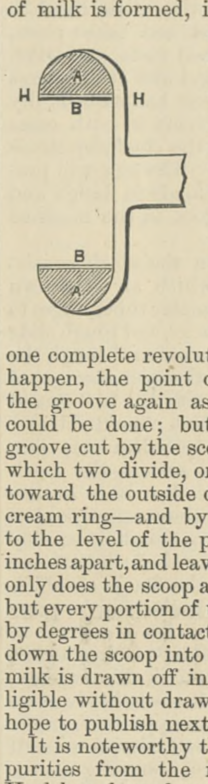
The separator shown by Messrs. Hald and Co. is somewhat different. In its case the milk heated to 95 deg. is allowed to run into the inside of a small cup of peculiar form, which is caused to revolve on a vertical axis at no



fewer than 8000 revolutions per minute. The milk and cream climb up the sides of the cup, the cream being lightest on the top, from whence it flows away through a small slot, while the heavier milk is delivered at a somewhat lower level through a round hole. The accompanying engraving illustrates the machine. The milk is delivered through a tap nto the funnel a, and passes through a small tube connected with the funnel into the rotating vessel A, which runs at a velocity of 7000 or 8000 revolutions per minute. To the bottom of the funnel is soldered a thin wing, which forces the milk to follow the rotation of the vessel. As soon as the fresh milk enters the rotating vessel an instantaneous separation takes place. The heavier portion, or the skim-milk, is thrown towards the circumference of the vessel, and forced up the bent tube b, whence it is delivered through the aperture c into the lower of two tin trays or covers B, which is provided with an outlet pipe. The cream remains nearer the centre, rises around the outside of the funnel a, and through a small slit in the cylindrical upper part of the rotating bowl it delivers itself at e into the upper cover C, whence it is discharged through an outlet pipe. At k is the driving pulley.

The arrangements made for testing the machines were very complete and extensive. Mr. Anderson, of Erith, lent the Society two large sugar clarifiers, with double copper steam-heated bottoms, each clarifier holding 370 gallons; steam was supplied by a double cylinder Clayton and Shuttleworth engine, which also drove the apparatus. The clarifiers stood on a high stage at one end of the dairy shed, and the milk was heated in them and delivered thence to a long tin cistern, from which both competitors drew their supplies of milk through suitable pipes. A somewhat complex system of shafting was fitted up overhead to convey the power to the machines. In front of the dairy shed was laid a line of rails, on which travelled a truck carrying a beautifully made 4-horse semi-portable engine, by the Reading Ironworks Company. This engine could be put on to drive any of the machines, through the differential dynamometer which has done admirable service at many shows. At one end of the dairy shed was a small testing room for Dr. Voelcker, and opposite to it was an office for the judges. A Stroudley's speed indicator was fitted against the wall, to give the velocity of the line shafting. A series of raised steps at the back of the shed afforded privileged visitors an opportunity of seeing what was going on.

The first trial of the cream apparatus, which we have described, took place on Tuesday, after a great deal of time had been wasted in endeavouring to get the driving gear right. This was not the fault of the competitors, but arose entirely from the absence of the various facilities which have on other occasions been supplied by Messrs. Easton and Anderson. Thus, for example, all the driving bands were new; consequently they stretched when put to work. Then the engine had to be stopped and the bands cut and relaced; as there were a good many bands, and plenty of stretching took place, the interruptions were numerous. At last, about half-past two o'clock, Mr. Carey, the Society's engineer, got things right, and a start was made, but a rigger worked loose on the shaft, and further delay was incurred. From three p.m., however, the trials went on without interruption till nearly five, under the superintendence of Mr. Anderson, Dr. Voelcker, and Mr. Neville. The results of Dr. Voelcker's analysis have yet to be made public. This is, in one sense, the crucial test, but regarded from other points of view it appears to us that the Lamm machines, exhibited by Messrs. Hald and Co., were better than those of their competitors. They are much lighter and smaller, and will cost less for driving gear than their competitors. Again, while the cost of the Hamburg machine is £250, and the quantity dealt with per hour 300 gallons, the cost of the Lamm machine is but £37, and the quantity dealt with from 60 to 80 gallons per hour. Taking the smaller quantity, we find that five Lamm machines, costing £185, will do as much as the single Hamburg machine, costing £250, which is a very important consideration. It is true that the Lamm machine runs at 8000 revolutions per minute, but neither of those at Reading gave the slightest indication of heating in the bearings, and they are so well made that we see no reason why they should not give quite as little trouble as the bearings of the Hamburg rotating vessels, which make 1200 or 1300 revolutions per minute. In both machines, so far as could be seen, the action is perfect, the cream being separated very completely from the milk. Some very interesting facts in the motion of fluids are supplied by both machines. For example, in the Lamm machine the milk falls through a height of about 6in. in a stream about ⅛in. diameter on to the flat base of the separator cup, which is revolving, as we have said, about 8000 times in a minute. The base imparts some of its motion to the liquid column, which is accordingly set in rotation, and revolves from the cup to the supply spout at a slower and slower speed, so that it resembles to the eye a screw with a rapidly increasing twist. This rotation is quite different in character from that frequently acquired by liquids in flowing through orifices. Again, in the Hamburg machine a complete ring of milk is formed, in section as in the sketch, where the



shaded portions A A are the milk, the space between the two lines at B B indicating the position of the cream. This forms a thin ring resting on the milk, which, being the heavier, keeps, as we have explained, to the outside. This skin of cream has, so to speak, to be bored out of the milk ring, and this is done by the pointed end of the scoop, which dips about the twentieth of an inch below the rotating surface. The point of the scoop cuts a groove in the cream, which does not fill up until more than one complete revolution is made, and if something did not happen, the point of the scoop or skimmer would enter the groove again as it came round, and so no skimming could be done; but something does happen; the single groove cut by the scoop parts into two almost immediately, which two divide, one going toward the inside, the other toward the outside of the breadth—from H to H—of the cream ring—and by the time they have come round again to the level of the point of the scoop they are a couple of inches apart, and leave it between them. For this reason not only does the scoop always find a fresh surface to deal with, but every portion of the surface of the cream ring is brought by degrees in contact with the scoop and peeled off, flowing down the scoop into a can placed to receive it, while the milk is drawn off in a way which we cannot make intelligible without drawings of the actual machine, which we hope to publish next week.

It is noteworthy that the Lamm machine removes impurities from the milk in a remarkable fashion. Dr. Voelcker showed us a tin containing some ounces of thick matter consisting principally of epithelial cells, blood corpuscles, serum, and dirt, the whole presenting an appearance sufficiently disgusting to make those who saw it vow they would never touch plain milk again; but after all the quantity was very small considering that it had been obtained from about 60 gallons of milk. This machinery will be shown in action throughout the show week.

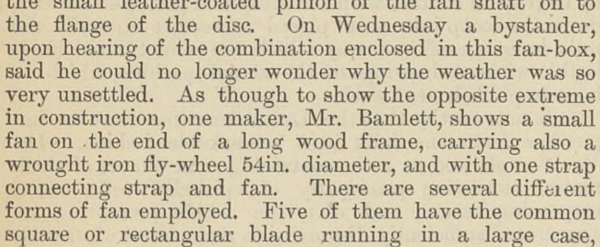
TRIALS OF HAY AND CORN DRYING MACHINES AT READING.

Great have been the disappointments at Reading this week. Many people have travelled long distances to witness the trials of hay and corn drying apparatus and machines, which were, according to the programme, to have fairly commenced on Tuesday. Many visitors, anxious to come to some decision as to the best of the machines of this class, as they are now wanted in all directions, sought the trial grounds on Tuesday, only to find a number of Samuelson's mowing machines cutting the grass as the preparatory step to further experiments, and to see a Gibbs hay-drier worked cold. Others, who had perhaps some idea that delays would be very probable in trials which depended much on weather and the Society's staff arrangements, concluded that it would be certainly safe to give one day's grace, in order that competitors might get fairly to work. They might, however, have given several days more, for nothing but grass cutting and some tossing took place on Tuesday, and grass cutting on Wednesday, except that on the latter day a few more of the competing rick-drying machines made an appearance in the meadows, and several of them were placed for working. The crop to be treated by the machines is very heavy, and in one meadow it is exceedingly coarse grass and of great length. This was a very heavy test for the mowers, for not only is it, as one man working Nicholson's haymakers said, "as long as ropes," but it is rank, tough, and in some places rotten at the bottom. It frequently clogged the mowers and the haymakers also when going with the wind. The meadows are very near to or are part of the sewage farm, and are often a long way under water. No actual operations with the new apparatus took place on Wednesday, and if any do take place to-day it will probably be only with one of them, though the Gibbs hay and corn drier by means of heated air, exhibited by Mr. W. W. Champion, the manager of the Reading Urban Sanitary Authority's sewage farm, known as Manor Farm, may be at work. On Saturday more may be at work, but we believe that those who wish simply to see them in operation, and to gain some idea of their relative merits, but do not wish to see the trials all through, will be quite in time to learn all that can be learned on Monday.

Here we may not unprofitably mention that visitors will do well not to ask for Manor Farm, on lands belonging to which some of the trials take place, but to ask for The Butts, for it is near these, and a long way from Manor Farm, that the trials take place, while the distance to the Butts is far less than to the farm, the nearest way being by Castle-street and Coley-street.

Of the machines entered for trial, eight at the time of writing were in the meadows, and a ninth had made its appearance, though it was put down near the entrance to the meadows, as though uncertain to enter the fight or not. If Gibbs' machine is excepted, all those yet in appearance are for treating the crop when stacked. Gibbs' machine, as our readers are aware, is a large affair with an attached furnace and a great fan driven by steam, by means of which heated air from the furnace is delivered on to the grass or corn to be dried, while the latter is kept in agitation by shaker forks, the onward motion of the material being effected partly by the forks or tines and partly by the reciprocating motion of the long double-inclined platform on which it rests, and over which it is passed. The machine exhibited has been considerably used by Mr. Champion. He cut 50 acres of rye from the sewage farm, and after it had been half made in the ordinary way, bad weather set in, and he finished by this machine with the satisfactory result that whereas he had not been able to use the sewage rye but for litter before, that dried by the machine was cut up and used for fodder, and the cattle liked it. Owing to the partial fermentation that had taken place, Mr. Champion says, it had a sweetened taste, and when being cut up had a malty smell. He had also cut 9½ acres of grass, and the weather being very wet had successfully treated it in the machine, its employment in both cases being economically satisfactory; but the chief objections to the machine are its size and cost. The cost will probable be reduced, and improvements made in design and workmanship, neither of which are good in the machine shown.

The machines for treating the crop in the stack consist in all cases of an exhaust fan by which air is drawn through the stack, some piping, thermometer tubes, cages to be used as cores to leave holes in the stacks, and rough slide boxes for controlling the quantity of air drawn through the stack or stacks. In each case the fan is the main element of the set of apparatus, and in some ingenuity has been taxed to produce either a good fan or one which should run at a high speed by hand, and the latter problem was not, perhaps, to be solved readily; but one maker, the Agricultural and Horticultural Association, has been so impressed with the desirability of doing without straps, and as much as possible with high-speed gearing, that they employ a sun-and-planet motion, by which a speed of three to one is given to a large flanged disc, within the flange of which runs a pair of idle or friction wheels which press the small leather-coated pinion of the fan shaft on to the flange of the disc. On Wednesday a bystander, upon hearing of the combination enclosed in this fan-box, said he could no longer wonder why the weather was so very unsettled. As though to show the opposite extreme in construction, one maker, Mr. Bamlett, shows a small fan on the end of a long wood frame, carrying also a wrought iron fly-wheel 54in. diameter, and with one strap connecting strap and fan. There are several different forms of fan employed. Five of them have the common square or rectangular blade running in a large case, with the tips nearly touching the case near the delivery part of the casing, while in others a Schiele or turbine wheel form is employed. The first met with on entering the trial meadows is that exhibited by Mr. James Coultas, of Grantham. This is a large fan of the common type, mounted on a pair of strong wheels for removal from stack to stack, and provided with three suction inlets for three sets of pipes from or to as many ricks or places in a large rick. This seems to be quite unnecessary, as one inlet pipe attached to a main pipe with branches to any number of ricks would do equally well, except that in this case the slides employed have in some cases to be under the rick. This, however, is not necessary, as the exhausting main might run by the side of the ricks and have branches into the ricks. Mr. Coultas' fan is 35in. in diameter over the tips, and has four flat blades 12in. square. It is driven by a portable engine of about 8-horse power, by Messrs. Brown and May, and will, in the first trial at least, be tried on a rick 30ft. in length and 10ft. in width, built over the mouths of five 9in. diameter pipes. The latter are imbedded in the ground, and except the short lengths nearest the fan, are of glazed earthenware. In building the ricks over the mouths of the pipes a light wood cage, 8ft. in height and about 12in. square, consisting of eight splines nailed to about four small wood frames, is employed so as to leave the space shown at G—see diagram—into



which the air and moisture from all directions are drawn through the pipe F by the fan A. In the diagram B shows the trunk inlet for the inlet pipes and bends E E; dampers or controlling slides are placed at C C, D is the fan outlet, H thermometer tube, S the horse shafts for moving fan. The price of a set of this apparatus is £18, without any pipes or bends. The fan was set running on Wednesday, but the rick will not be ready for it to work for a day or two.

The next fan met with is exhibited by Mr. C. Phillips, of Newport, Mon. This is a 15in. fan of the centrifugal pump or closed air wheel type, drawing in air from both sides. The inlet pipe is 7in. and the outlet 7½in., galvanised iron sliding sleeve pipe connections being employed. It is mounted on a cast iron stand on four wheels, carrying a small countershaft with a 5in. pulley for the engine strap, and a 17¾in. pulley for the fan strap, the fan spindle pulley being also 5in. diameter. The cost is £13, without piping. The piping employed is light iron 7¼in. diameter, and costs 1s. or 1s. 2d. per foot galvanised. The thermometer tubes are of wood or of iron as the purchaser may wish. The fan is about 3ft. from the ground, a vertical pipe descending to the pipe leading to the stack, and being connected therewith by a bend. This fan of Mr. Phillips is to be driven by a 1½-horse vertical engine by Messrs. Ransomes, Sims, and Head. Mr. Phillips also has sent for trial a fan in wood case, and on wood frame for hand power. This is an ordinary fan with rectangular blades, with outlet 10½in. by 7in. and 24in. across tips of blades, and it draws through wood tubes 10½in. by 8in. inside. This fan is worked by one large spur wheel gearing into a pinion on the fan spindle.

The cage used by Mr. Phillips for building into the rick consists of three wrought iron rings 24in. diameter, to which are attached ten wood splines about 7ft. long. At the end of the pipe under the stack or stacks is a slide or damper box fitted with a slide and a rod handle passing to the outside of the rick through a tube. To the performance of these fans and those of other makers we must return in our next impression. The following table gives the name and numbers and machines of this class in the trial fields on Wednesday night:—

Maker or exhibitor.	Number entered.	For hand.	For power.	Description of fan.
Coultas...	1	—	1	Common.
Phillips	2	1	1	Closed wheel and common.
Lister	1	—	1	Turbine wheel.
Bamlett	1	1	—	Turbine wheel.
E. Pratt	1	1	—	Common.
Agricultural and Horticultural Association ...	2	1	1	Common.

VISITS IN THE PROVINCES.

THE ENGINEERING WORKS OF LEEDS.

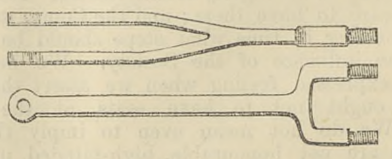
No. I.

LEEDS, very long celebrated as a home of the woollen manufacture, may now be said to be equally celebrated for its engineering and ironworks; for the value of its products in iron and steel is now at least as great as that of its textile manufactures. For this reason it is an appropriate place for the visit of an engineering institution. From a technical point of view the Institution of Mechanical Engineers could hardly visit a town which has so much to show and from which so much may be learned. Machine tool and engine building are perhaps the chief features in the mechanical manufactures of Leeds, but in these manufactures the Leeds engineers use tools, and in the extent to which they appreciate the value of good machines and tools of all kinds as the means of saving time and labour lies one of the points of interest to the technical visitor.

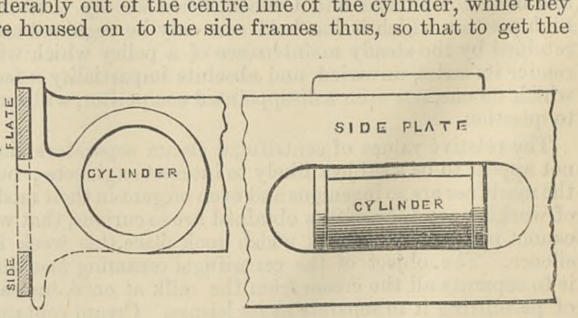
Leeds is a very old town, or perhaps it might be more correctly said that a town has existed for a very long period on part of the site of what is now Leeds with its numerous parishes. The first positive mention of Leeds seems to be by Bede, who wrote about 690-731, and called it Loidis-en-Elmeti; but it was a mere village. Subsequently, in common with most Yorkshire towns and villages, it had very bad times under the Normans. The castle or castles built by them have all gone; though in excavating for buildings in 1828, and again in 1868-70 foundations of a castle and the course of a moat round it were discovered. Leeds had a charter granted it under Charles I., but it suffered severely during the civil wars—1639-1649—but under the Commonwealth it flourished, though of the buildings then erected few remain. In the Leeds Museum may be found many interesting relics of the past history of the town; but the great modern manufacturing growth of the place seems to have obliterated almost all the evidences of middle age, for Leeds is singularly barren of the external evidences of a history, such as are yet to be found in many towns with which it was contemporary. Leeds is now a big manufactory, and for a southerner there is something not altogether inviting in the ever-encircling atmosphere of the "shop" aspect of life. In such a place even the intervals of leisure seem so much like mere rests to gain breath and strength for the renewed struggle of the morrow. The forest of chimneys, which can be seen for miles round, and which make it a second Sheffield, sending forth during the evening a light smoke, seem continually to say "fires banked down, but steam up ready for the morning." To those accustomed to the place the hours away from the works are of course as free from any depressing sense of ever present workshop as are those of the London man of business who gets away at evening to his home at Sydenham, Hampstead, or elsewhere far from the scene of his toil, and perhaps even more so than with some London men. To most visitors, however, it does not seem it can be so, although at no great distance from Leeds the hills afford the sites for many very pleasantly situated dwellings. The interest which will attach to the visit which will be made by the members of the Institution of Mechanical Engineers next month will therefore be almost wholly of a technical character, for one of the only early remains, the Kirkstall Abbey, is associated with the Kirkstall Ironworks. During the week of the visit a large number of the ironworks and engineering works will be thrown open by the proprietors for the inspection of the members and their friends, and as no one can hope to visit all—and indeed if they attend the reading and discussion of the papers which have been prepared chiefly by local engineers, but a few of them will be visited by any one individual—we propose to give a brief description of the leading features of the works, or the things now being made in the works to be visited, so that a selection may be made by each visitor, of those engaged in the particular branch of engineering in which he is most interested. We may commence then with

KITSON'S LOCOMOTIVE WORKS.

These works are situated in Hunslet-road. The visitor first enters a fine suite of offices, the general character of which bespeaks the prosperity and good management, of which ample evidences are to be found in the works themselves, which cover over four acres and employ between eleven and twelve hundred men, and are occupied almost wholly on locomotive, stationary, and tramway engines, though a number of Parson's high-speed engines, designed for driving dynamo-electric, and similar high-speed machines, are to be seen in various stages of construction. Of the locomotives to be seen, a considerable number are being built for the Western of France Railway, some being 6-wheel and others 4-wheel coupled engines for goods and mixed traffic, with 16 by 22in. cylinders, all being fitted with the Westinghouse brake. Some very notable differences between French and English locomotive practice are here to be seen, and these are perhaps in no point more remarkable than in what we should consider unnecessary work, formation of details, and in the large quantity of brass work and polish. The safety valve cases, for instance, are heavy castings in brass, and the seat for these on the boiler is also a ring of brass, while on the other hand both these details are made in cast iron for engines in course of construction for Ceylon railways. The French people seem to think that because they buy the engines by the kilogramme they may put in as much brass as they like. The brass glands, which in English engines are of a form which admits of machine finish, are so designed that they involve a lot of hand work; and the regulator casting, which in the English engine is of a well-known simple form, is, in the French engine, one which taxes the founder's ingenuity. The connecting rods are made with a very long fork for the crosshead end, and with a fork for the big end somewhat thus, so that they are expensive forgings and expensive



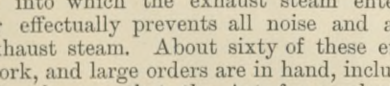
fittings, while if one of the screw ends, which take the place of bolts or keys and cotters in our rods, breaks, the whole forging is a waster. The cylinders of these engines are also fastened in a manner which English engineers would deem very bad practice. The cast bracket plate at the side of the cylinder is comparatively small and considerably out of the centre line of the cylinder, while they are housed on to the side frames thus, so that to get the



cylinder off the frames have to be separated; but if the casting were made as indicated by dotted lines, it would have a good hold on the side frames and good support, and could be fitted in and taken out without separating the side frames; and all this seems to be done for no better reason by the French engineers than to reduce the weight of the cheap material of the side frames by cutting the piece out as shown. The French engineers will not, however, listen to the English constructors, and as an example of the way in which unreasoning persistent adherence to the specification is demanded by French inspectors, it may be mentioned that a locomotive firm, not in Leeds, had recently the whole of a lot of the polished brass sheets, with which a number of locomotives were to be lagged and made pretty, rejected because on analysis it was found the metal contained about 2 per cent. more copper and 2 per cent. less spelter than the specification stipulated.

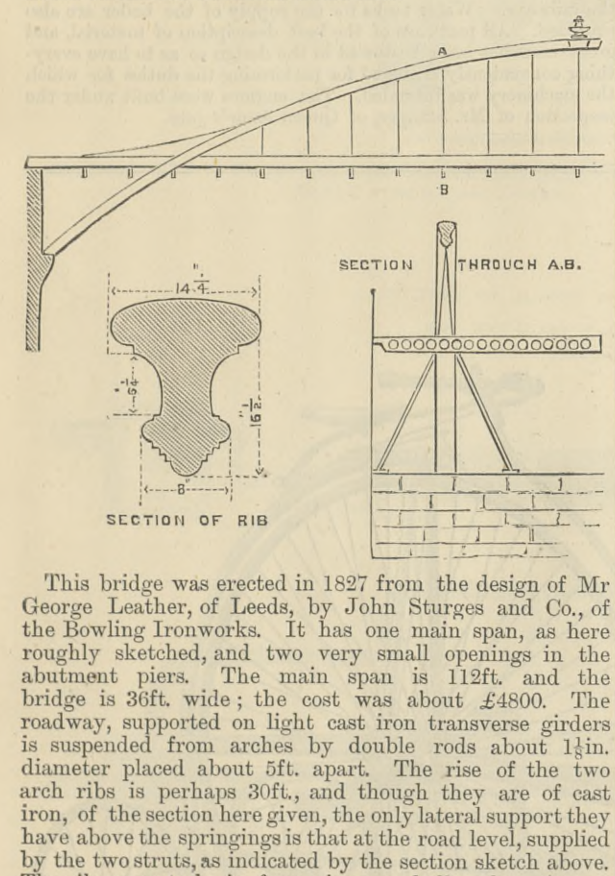
The works are undergoing alteration, and amongst the machine tools in course of erection is the largest rivetting machine, Tweddel's system, that has yet been made for rivetting up boiler shells vertically. This machine is 12ft. between the rivet dies and the bottom of the jaws, and will give a squeeze of 40 tons with water at a pressure of 1500 lb. per square inch.

In another shop for fixed engine work a lathe to take in a 20ft. wheel is being erected, and close by is a new shop specially devoted to the erection of the tramway engines, of which Messrs. Kitson have now a large number in successful work and a large number in course of construction. These engines have now been in extensive work for two years, and amongst other places they are in use in Blackburn, where steam traction alone is employed, and are working in the streets of Leeds, Glasgow, Edinburgh, Bradford, Dublin, and elsewhere. They are of the locomotive type, but the valves are worked from the coupling rods. The exhaust steam is condensed in an air condenser, consisting of a grid of thin copper pipes covering the engine cab, the pipes having a large number of radiating plates soldered to them thus—



These tubes are about an inch in diameter, and are placed transverse to the cab, and connected to larger pipes running longitudinally along the outer edge of the cab roof, and into which the exhaust steam enters. This condenser effectually prevents all noise and appearance of the exhaust steam. About sixty of these engines are now at work, and large orders are in hand, including more for Edinburgh, now that the Act for employing steam power has been obtained. We are informed that these engines work for 4½d. per mile, including every charge, and that of this 0·9d. is the cost of fuel, and as only 90 gallons of water are required per day, the quick services, like the seven and a-half minutes' run in Glasgow, are not affected by the stoppage for water, which had been required with water condensers. In the machine and fitting shops the visitor will be struck with the very large quantity of machine tools employed, and especially with the number of revolving cutter tools, including disc wheels with inlet cutters forming circular saws used for cutting out the blocks from crank forgings, for shaping fork joints, and many other purposes. In the foundry full appreciation of the value of plenty of lifting power is exhibited, there being besides two large travellers a pair of powerful steam jib cranes. The electric light is largely used throughout the works, and is considered to be of especial value in the foundry, though of course it costs more than a similar quantity of light would cost where gas can be had, as in Leeds, for 1s. 10d. per thousand. The Leeds Corporation sells the gas to the consumers at cost price instead of using the profit, as in Manchester, to lower other rates, thus allowing the consumers of gas to reap the benefit instead of extending it to all, including those who do not use gas. In speaking of the tramway engines we should mention as one of the details which show how the makers have studied each detail, that the rocking shafts with their levers are all forged in one piece instead of keying the levers on a plain shaft. These levers cannot get loose.

There are very few old machines in the works, but amongst the few is a punching and shearing machine made in 1848 by Joshua Buckton, and this is apparently as good as new, and in design and workmanship is an evidence of the high quality of the tools turned out by that well-known maker, to whose works we shall refer hereafter. A great many more things than we have touched upon will demand the attention of the visitor, though our space will not permit us to dwell further on these works, but as belonging to the same firm we may next refer to the Monkbridge Ironworks, which are situated in the Whitehall-road, near Wortley, Leeds, and the entrances are just at the foot of the Monk Bridge. This bridge is over the Aire, and deserves a passing remark, not because of any features which would now be considered worthy of imitation, but as an illustration of what was done in 1827 and which we should be afraid to do now.



This bridge was erected in 1827 from the design of Mr George Leather, of Leeds, by John Sturges and Co., of the Bowling Ironworks. It has one main span, as here roughly sketched, and two very small openings in the abutment piers. The main span is 112ft. and the bridge is 36ft. wide; the cost was about £4800. The roadway, supported on light cast iron transverse girders is suspended from arches by double rods about 1½in. diameter placed about 5ft. apart. The rise of the two arch ribs is perhaps 30ft., and though they are of cast iron, of the section here given, the only lateral support they have above the springings is that at the road level, supplied by the two struts, as indicated by the section sketch above. The ribs seem to be in four pieces, a hollow key-piece at the centre, carrying a cast iron vase, connecting the two halves, as indicated by the sketch. There seems to be no reason why there should not be a transverse connecting girder at the top of the ribs, and if we may judge by the sinuous lateral vibration which accompanies the passage of a two-horse omnibus across this bridge, we should say that this bridge certainly ought to receive such support and other strengthening additions. The bridge is known as "the suspension bridge," and there is another similar to it crossing the river Aire between Hunslet-lane and Knostrop-road. We must defer our notice of the Monk Bridge Ironworks to another impression.

TUBE WELLS FOR EGYPT.—Messrs. Le Grand and Sutcliffe, Bunhill-row, E.C., have just received an order from the War Office for 6000ft. of Abyssinian tube wells and pumps, and fifty sets of diving apparatus for Egypt. This is a heavy order, capable of supplying a large number of troops with water.

LETTERS TO THE EDITOR.

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

HYDRAULIC SHIP LIFTING DOCKS.

SIR,—My letter to you on this subject, which appeared in your journal of the 9th June, was not an unjust attempt to divide the honours of this invention, which is now an old one, and has long ago become public property. It was, however, intended to give correct information on the subject of your article and illustrations of the 19th May, as they certainly conveyed the idea that all the credit of the design and construction of the hydraulic ship-lifting docks at the Victoria Docks, at Bombay, and at Malta, were due to the firm of Messrs. Clark and Standfield.

Mr. Standfield admits an inaccuracy with regard to the Bombay Dock. He should have cleared up all mystery on the subject by admitting that he had nothing to do with the Victoria Dock, which is quite an old affair, or with the Malta Dock, which was almost, if not entirely, constructed during his absence at Bombay, and a considerable time before the firm of Clark and Standfield was in existence. It is true that three only of your nine illustrations refer to the Bombay Dock, though this is made the title of your article, and is therefore very prominent; and I must remark that five of the others are intended, as far as novelty is concerned, to explain improvements in which I purchased a share since Mr. Standfield returned from Bombay. Mr. Standfield wrote me a few weeks ago that he had no share in them. How, then, can Messrs. Clark and Standfield be sole engineers to them without my authority?

As far as I know the air-bag illustrated in Fig. 9 is the only apparatus which can be claimed as exclusively belonging to your correspondent's firm. It is quite true the transverse girders and the pontoon of the Bombay Dock were made, and very well made, by the firms mentioned in Mr. Standfield's letter, but permission was first obtained for these firms to act as sub-contractors to Messrs. Emmerson and Murgatroyd; Mr. Standfield may have inspected these parts of the work before going to Bombay, but Mr. Duer regularly inspected them and all other parts of the work during their construction. Mr. Standfield is wrong in insinuating that a large portion of the work was done before Mr. Duer commenced his labours, as the contract was not settled at that time. It is due, however, to Mr. Henry Wyndham to say that he and many others worked hard at it.

As Mr. Standfield now talks of canal lifts, I may say that I was asked a short time ago by a member of his firm to lend them drawings of the Anderton Canal Lift. It was said they had lost their copies, but the truth is that the working drawings were not made in the office of any member of the firm of Clark and Standfield, and never have been in their possession. J. T. EMMERSON.

Peover, Knutsford, July 3rd.

SIR,—In your number of the 23rd of June Mr. Standfield begins a letter to you on this subject by saying, "It is within the knowledge of most engineers that Mr. Edwin Clark was the inventor, patentee, and engineer of all the hydraulic docks and canal lifts that have yet been constructed." I have not previously taken any notice of this letter, as I wished to give Mr. Edwin Clark the opportunity of correcting the extraordinary statement which I have quoted from it. He has not corrected it, and I will therefore not let it pass any longer unchallenged.

Your correspondent knows little about the history of hydraulic docks, or he would have hesitated before making so general an assertion with regard to them, and a little more inquiry will show him that his remark is incorrect. I wish, however, more especially to call your attention to the latter part of my quotation, which refers to canal lifts.

It would, perhaps, be too absurd to suppose that your correspondent seriously means, which he however says, that Mr. Edwin Clark was the inventor, patentee, and engineer of all the canal lifts of every kind that have been constructed; and I will therefore, without further remark, confine my observations to the hydraulic canal lift at Anderton, and even with this limitation a few words will suffice to show that your correspondent is in error. The idea of raising and lowering floating barges vertically at Anderton by hydraulic power was originated by Mr. E. Leader Williams, M. Inst. C.E., who at the time was engineer to the Weaver Trustees. I do not remember that any of the ideas involved in its construction were originated by a member of the firm of Messrs. Clark and Standfield; in fact, I assert that they are mainly due to myself.

The English patent which describes and claims the invention of the Anderton lift was granted to Mr. Edwin Clark on the 18th of February, 1873; but the contract for this work was dated the 16th of September, 1872—that is to say, the construction of the lift had proceeded for five months before it was patented. The reason that this invention was left unpatented for so long would come better from Mr. Standfield than from me; but whatever it may have been, it follows, from the delay, that there is no patentee for it.

I wrote a paper on the subject of the Anderton lift, which was read at the Institution of Civil Engineers on March 21st, 1876, and your readers will find in it more information than I can give in a letter like the present. I could say more about the engineering and design of this lift, and could probably give a different appearance to what your correspondent says about the docks, but I think that I have exposed his inaccuracy sufficiently to render it unnecessary for me to occupy more of your valuable space. SIDENGHAM DUER.

6, Westminster-chambers, Victoria-street,
London, S.W., July 3rd

ELECTRICAL ACCUMULATORS.

SIR,—I should feel obliged if you would grant me space to call attention to an inaccuracy in the otherwise very interesting and important articles upon "Electrical Accumulators and Secondary Batteries," by Professor Oliver Lodge. It is in reference to the very high electromotive force that he assigns to the Faure accumulator, namely, 2·5 volts. I have had lately upon several occasions the opportunity of measuring and testing several lead secondary batteries of various forms, and amongst others the Faure accumulator. Now not once have I been able to obtain such a high electromotive force as 2·5 volts; in fact it was in all cases rather under than over 2 volts. As this is a most important factor in calculating the amount of work obtainable from secondary batteries, as well as in comparing their respective values, it would be interesting to know whether Professor Lodge has himself obtained an electromotive force of 2·5 volts from a Faure accumulator, or only assumed it from hearsay. I believe M. Faure gives the electromotive force of his accumulator as 2·2 volts.

July 4th. F. G. HOWARD.

MR. SCOTT RUSSELL.

SIR,—In the excellent article under the above title contained in your issue for 16th June, 1882, you make no mention of the steam coaches designed by Mr. Scott Russell, and which ran regularly and well for some time between Glasgow and Paisley. These carriages have been referred to by numerous authors, but, so far as I am aware, they have not been illustrated and fully described in any of the numerous works dealing with the history of the steam engine.

The Earl of Caithness, in a paper "On Road Locomotives" read before the British Association in 1859, says:—"Mr. Scott Russell made a successful steam carriage, and if it had not been for a most unfortunate misunderstanding between the promoters of the carriage and the road trustees, whereby a fatal accident took place, I believe it would then have made a great stride in the right direction. It performed its journey very well for some time."

In "Young's Steam Power on Common Roads," page 219, we read:—"In April, 1834, Mr. Scott Russell established a line of steam coaches between Glasgow and Paisley as a regular mode of conveyance. These ran for many months with the greatest regularity and success, and the trip, a distance of seven miles and a-half, was run in from forty to forty-five minutes. An accident, caused by the breaking of a wheel, which happened to one of these carriages, being unfortunately attended with fatal results, caused the Court of Session to interdict the whole set of carriages from running."

Among some introductory remarks in the report of the traction engine trials at the Wolverhampton show in 1871, contained in the R. A. S. E. *Journal*, vol. vii., mention is made of these carriages designed by Mr. Scott Russell, and it is here stated that the boiler exploded.

The fullest report of these carriages is given in Mr. John Head's paper on "Steam Locomotion on Common Roads," read before the members of the Institution of Civil Engineers in 1873, and from this source we learn that these carriages were among the most successful ever designed. "In 1834 six of them ran for hire between Glasgow and Paisley. They were abandoned chiefly on account of the opposition of the road trustees, who placed every conceivable impediment in their way, at last causing a serious accident, which resulted in the death of several persons."

I should be very pleased if some of your numerous readers could give us more particulars of these interesting carriages; and if you, Mr. Editor, could furnish us with an engraving of one of them in a subsequent number, you would gain the thanks of all, who like the writer, take a great interest in everything pertaining to steam on common roads. EBONY SETSQUARE.

29th June.

THE FOUNDATION OF MECHANICS.

SIR,—I shall not require much of your space—and this shall be the last time I ask for it—to reply to the letters of "C." and "Φ. Π." in your last issue. It is surprising that the latter did not see that the sentence he quoted from Rankine was his own condemnation. I need only recall the first words—"In a heat engine moving with a uniform periodical motion." Of course in such an engine the resistance measures the pressure, because the fact that the motion is uniform shows in itself that the two are equivalent. But a locomotive starting a train is not a heat engine moving with a uniform periodical motion, because every successive stroke is made quicker than the last, and therefore the statement does not apply. Why is the qualification put in, but that Rankine knew, as every student should know, that without it the statement would not be true? I must repeat, for the last time, that the cases of uniform motion and accelerated motion are totally different and must not be confounded together.

Again, it is surprising that both "C." and "Φ. Π." should actually take the term "cylinder pressure" to mean the average pressure, and not, as is always customary, the initial pressure. It is obvious that by manipulating the point of cut-off we can make the average pressure vary as we like, from the initial pressure down to a small quantity, quite independently of the resistance. To impart this idea into the discussion would therefore be absurd. As for "C.," I would advise him to try a simple experiment. Let him take any engine of which he has the charge, disconnect the governor, turn on full steam with a full load, and then suddenly throw off the main driving belt. If the steam pressure in the cylinder falls to next to nothing—as it should do on his theory—I shall be astonished. But I think that it is "C." who will be astonished.

As to the other point, I am sorry I cannot "take 'Φ. Π's.' word for it" that "the act of melting is nothing more than the moving of the water molecules," or that "the internal motion of a liquid is greater than that of a solid"—so that a pound of cold water has more internal motion than a pound of red-hot iron—or that "the difference between a solid and a liquid is exactly this"—for the true difference, as generally supposed, see Maxwell's "Theory of Heat," p. 306. On the contrary, I affirm, once more, that the internal motion is exactly that which is measured by temperature —see Balfour Stewart on "Heat," pp. 367, 368—that the temperature of a pound of water or ice, each at 32 deg., being the same, their internal motion is the same; and therefore the heat expended, or the work done, in turning the ice into the water is not represented by the motion existing in the water.—N.B. I do not therefore assert that it is not represented in some way.

I do not suppose it can be for the interest of your readers that this discussion should be continued further. I wrote the papers on the "Foundations of Mechanics," which you were kind enough to insert, because I felt it to be desirable that many engineers should think more clearly, and write less confidently, on these matters than they have done; and that conviction has certainly been deepened by the present correspondence. Perhaps I ought formally to disclaim all connection with any such monstrous equations as $F M = R$, or $F = M R$, which have been fathered upon me. My views on the relations between force, motion, and resistance—which are simply the views of all authorities on mechanics—have been fully set forth in the papers referred to.

10, Victoria-chambers, Westminster. WALTER R. BROWNE.

SIR,—In my letter, which you did me the favour to publish in your impression of yesterday's date, I meant to have continued the sentence after the words "to be 63 lb. upon the square inch," by adding "the initial pressure, say, 60 lb. per square inch," but I suppose I must inadvertently have omitted those words in the MS. C.

July 1st.

THE NORTH-EAST COAST EXHIBITION.

SIR,—The Committee of the above Exhibition regret to find that there is an impression abroad, that the undertaking is merely a local affair, and that there is no wish or desire to include exhibits from a distance. Such is not the wish of the Committee; on the contrary, they hope that exhibitors from all parts will send exhibits. If they do so, I am sure they will be heartily welcomed and appreciated. GEO. RENWICK, Hon. Sec.

Newcastle-upon-Tyne,
July 5th.

THE ROYAL AGRICULTURAL SHOW.

SIR,—I find there is a new rule this year that all machinery must be in its place, fixed, and painted, by July 1st, or a clear week before the show. On discovering this yesterday I immediately wired to the secretary asking whether my machinery would be admitted. It was all loaded up and would have been in position to-day; the reply was in the negative. I hear that goods have since been admitted into the yard. The ordinary rules are well known to annual exhibitors, and such a change as the one mentioned, I maintain, should be specially pointed out, and if the hard-and-fast line is drawn in one case it should be in another. I trust you will find room for this to explain the non-appearance of my exhibits.

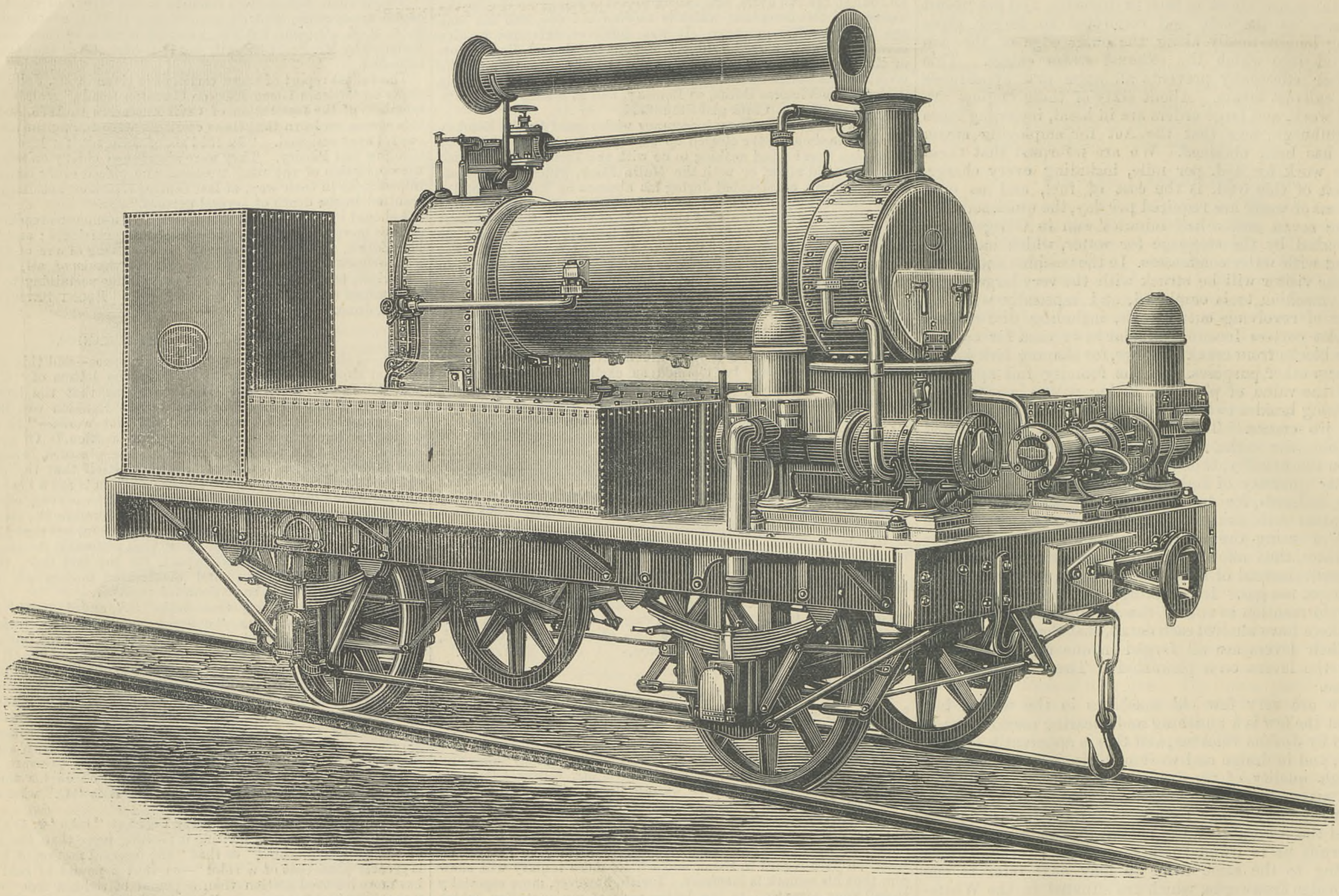
Castle Engine Works, Stafford, July 5th. W. G. BAGNALL.

A LARGE BORING AND TURNING MACHINE.—What is described as the largest boring and turning machine in the United States has just been set up in the establishment of McIntosh, Hemphill, and Co., of Pittsburg, Pa. It weighs 235,000 lb., or 110 tons, is 25ft. high, and occupies a space 30ft. square. It will turn, bore, and cut a key-way in wheels of any size up to 16ft. in diameter by 11ft. wide on the face.

A REMARKABLE BLOCK OF AMBER.—Some fishermen of the Isle of Zuigst have fished up, opposite Stralsund, a piece of amber weighing more than 8 lb. It is 9½in. long and 5½in. in circumference. It is a most remarkable piece of amber, having all the qualities which distinguish the rarest pieces—colour, dark yellow, shining like glass, and not transparent. It is rare that a piece of amber weighs 1 lb. The piece which is preserved in the Museum of Natural History at Berlin weighs about 14 lb.

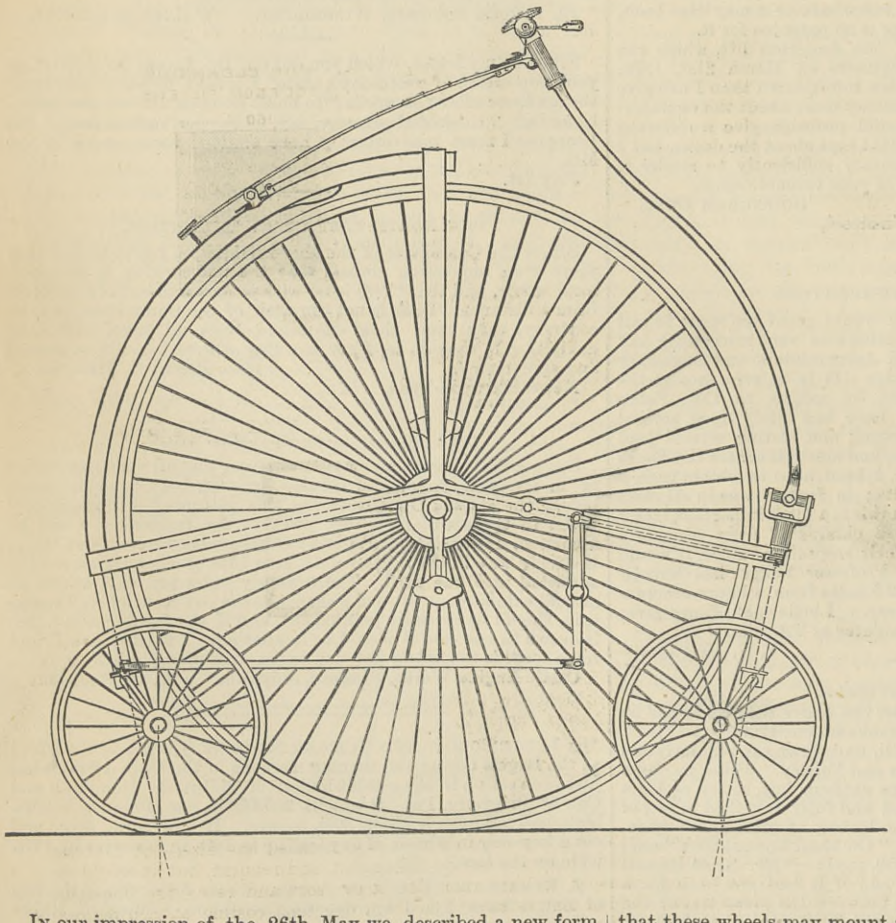
WATER-TANK ENGINES FOR THE CAPE COLONIES' RAILWAYS.

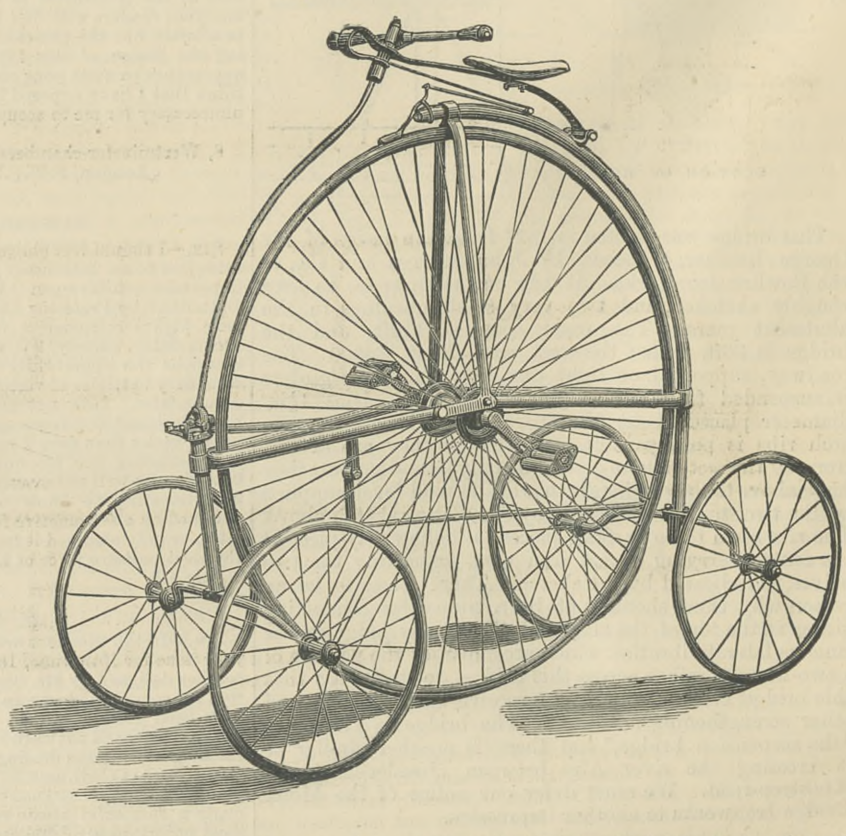
MESSRS. HAYWARD TYLER AND CO., LONDON, ENGINEERS.



MESSRS. HAYWARD TYLER AND CO., of London, have lately supplied to the Cape Colonies Railways a rather novel description or combination of engine for the combined office of washing out locomotive fire-boxes and carrying water up the line to outlying stations. The engines, six in number, were made for the above-named railways to the order of Mr. Thornton, locomotive engineer to the railways, Mr. Hutton Gregory, past president of the Institution of Civil Engineers, being consulting engineer to the Crown Agents of the Colonies. In some of the outlying stations on the Western system water is scarce and of exceedingly bad quality, necessitating frequent washing out of the fire-box casing of the locomotives—hence the use of one of the pumps shown in our engraving. It is one of the well-known "Universal" steam pumps of Messrs. Hayward Tyler and Co. It has a 7in. steam cylinder and a 4in. double-acting pump, and is fitted with ball valves of india-rubber. The pump is capable of throwing from two to three thousand gallons of water per hour against a pressure of some 80 lb. per square inch. The second use to which the engines are applied is that of filling a train of water trucks, of which we are told the railways have provided themselves with some thirty. The second, or auxiliary, pump has a steam cylinder of 5in. and pump 5in. diameter. By means of hose, water can thus be picked up on the roads and carried into the interior. The boiler is of the locomotive type, made of steel; all flanges formed by hydraulic pressure. It is of 6-horse power, and capable of supplying steam of 150 lb. should it be desired. Both pumps are provided with ample hose in lengths fitted with unions, and the washing-out engine is fitted with nozzles suitable for going into the mud-holes of the fire-boxes. Coal bunkers are provided on the truck, which is of the standard type used by the railways. Water tanks for the supply of the boiler are also provided. All parts are of the best description of material, and great care has been bestowed in the design so as to have everything conveniently arranged for performing the duties for which the machinery was intended. The engines were built under the inspection of Mr. Stanger, of Queen Anne's-gate.

THE CENTRE-CYCLE.

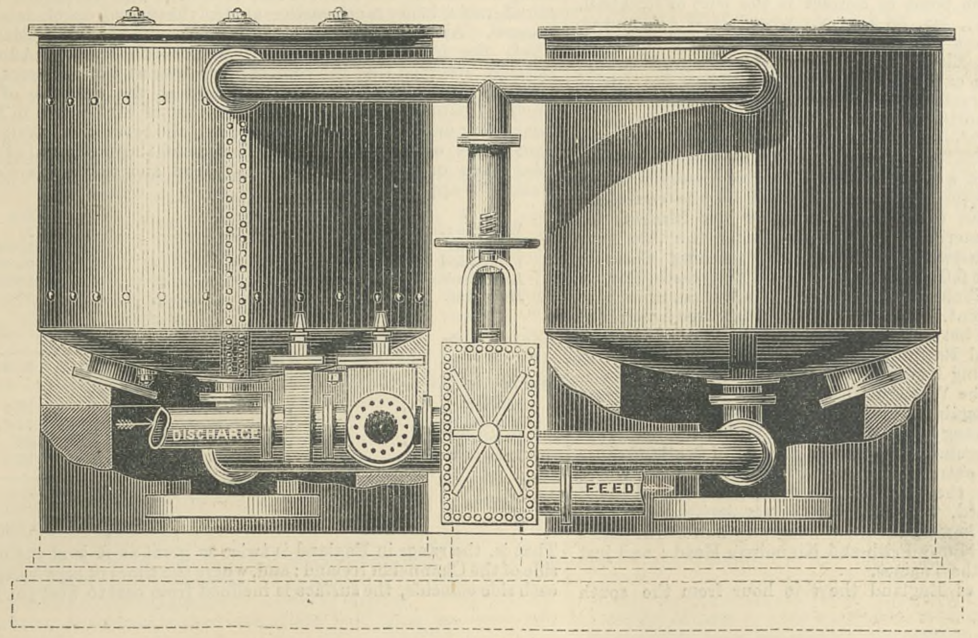




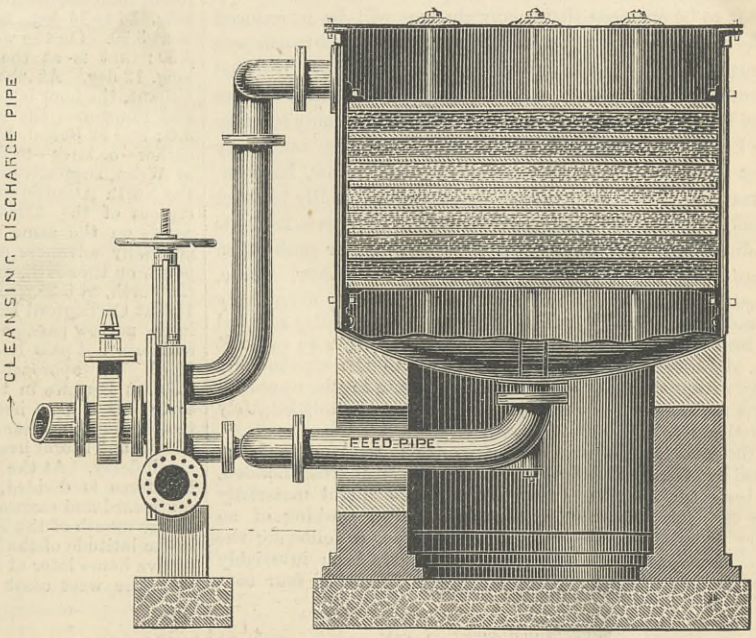
IN our impression of the 26th May we described a new form of velocipede invented by Mr. Ed. Burston, architect, Horsham. This machine we now illustrate. It presents several features which make it of special interest, amongst which are the arrangement by which the frame carrying the small wheels is jointed so that these wheels may mount any obstruction, or the large wheel may rise between them without inconveniencing the rider. The machine is light, can be mounted at any time, the weight of the rider is immediately over the main wheel, yet he cannot be thrown over the machine. The riding movement is like that of skating, the bicycle crank being retained, the best and most controllable form is used. The four small wheels may be so set that they but seldom touch the ground, and generally the machine may be said to combine the advantages of the bicycle with those of the tricycle.

HIGH-PRESSURE FILTERS.

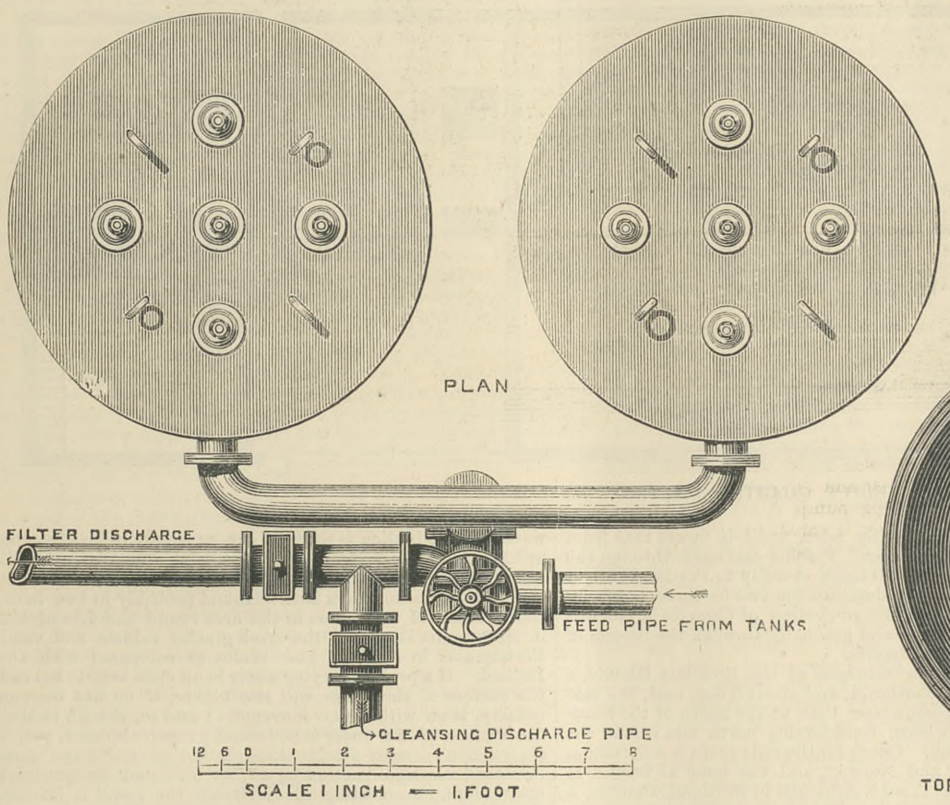
MESSRS. J. HALLIDAY AND CO., NEWTON, MANCHESTER, ENGINEERS.

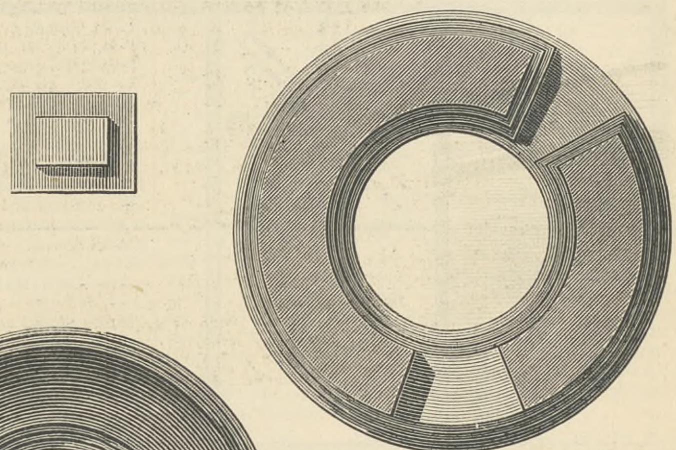


ELEVATION

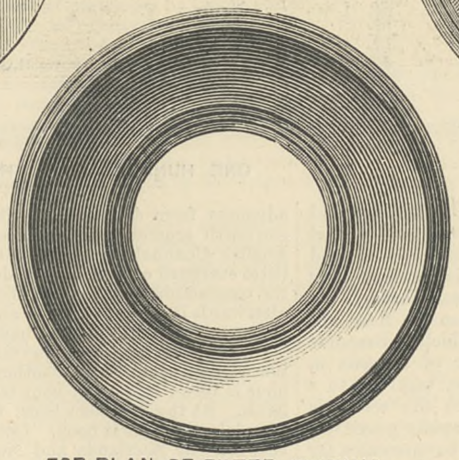


SECTION



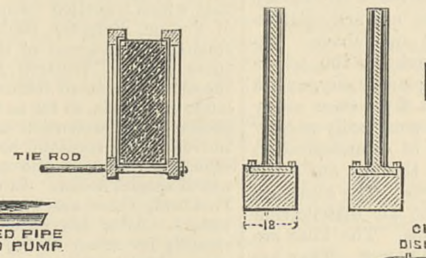


FOUNDATION PLAN OF FILTER SEATING

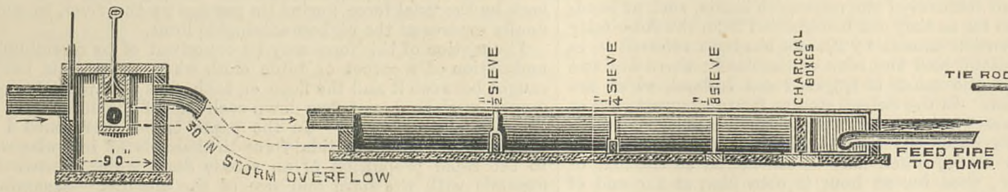


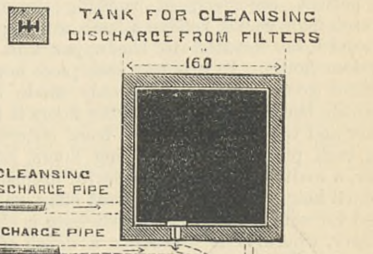
TOP PLAN OF FILTER SEATING

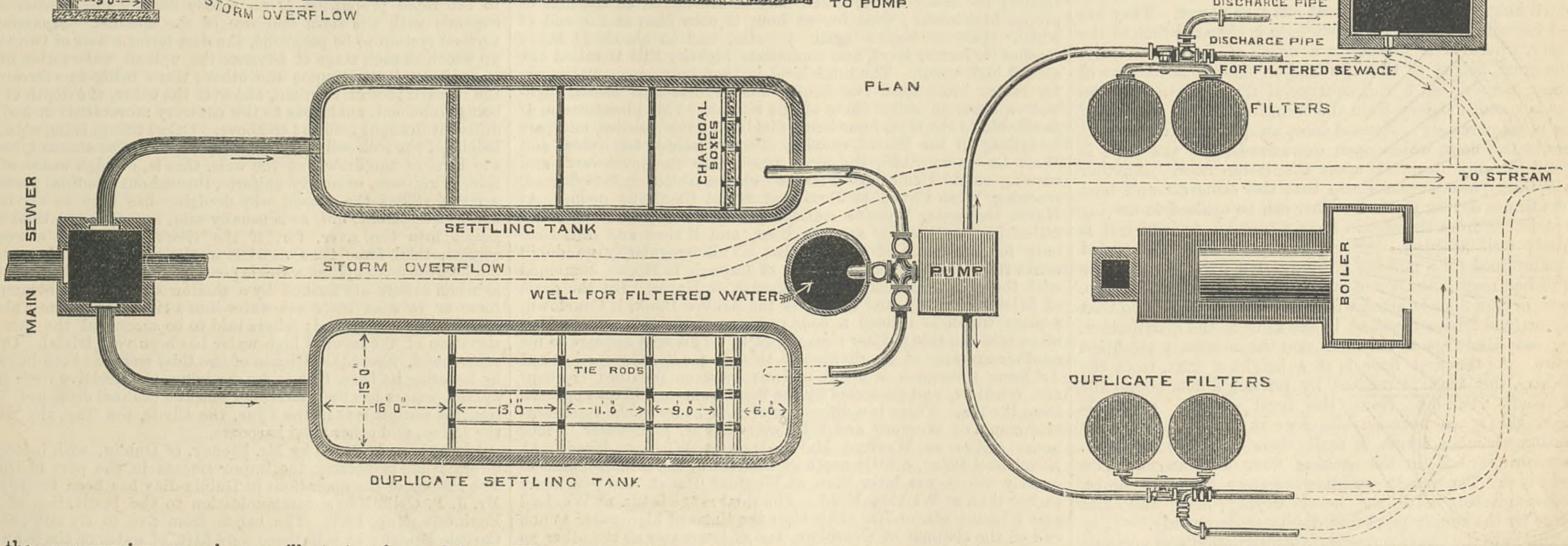
CAST IRON SIEVE STANDARDS AND CHARCOAL BOX



SECTION OF SLUICE WELL AND SETTLING TANK







By the accompanying engravings we illustrate a form of charcoal filter made by Messrs. Joseph Halliday and Co., Portland Works, Newton, Manchester. The filter is specially made for purifying large quantities of water for drinking and manufacturing purposes, but it is also made for filtering sewage water. The filters we show in elevation and section above, and also an arrangement of the filters for sewage water treatment is shown. In the latter the water is received into settling tanks, and pumped from them into the filters, which may be duplicated and placed in one line, or set apart as shown. The filter is charged with charcoal made for this purpose, and is constructed as shown in section, the fluid entering at the bottom and passing upwards through the filtering medium. In this way all the solid matter is kept at the bottom side of the filter. When it is necessary to clean the filter the stream is reversed, the fluid enters in at the top and washes out the solid matter into a tank for cleansing discharge, and is there dealt with; the water for cleansing purposes is taken from a well of clean water, so that the top side of filter is kept clean during the cleansing process.

The filter case is made of boiler-plate, the pipes of cast iron, and all valves are of brass with brass seatings, the outer casing being of cast iron. The interior of the filter cylinders are fitted with perforated plates held in position with bolts and angle iron rings. Charcoal for the purpose of sewage filtration differs from the charcoal used for domestic or manufacturing purposes, and can be made where the filters are used at a cost of £3 per ton. The cylinders are 8ft. diameter, and will take a charge of charcoal to fill two cylinders—which is called one filter—of 11 tons. This charcoal may be taken out and reburnt, but it would be cheaper to only wash the larger sort and renew the fine beds, which may be said to be about five tons, costing at each renewal £15 without labour, and would require renewing every three months. The two filters shown, the maker states, would filter 80,000 gallons per hour of sewage water taken from the settling tanks; and adding the cost of pumping, he says the cost of this mode of treating sewage would not be more than 18s. per 1,000,000 gallons.

The filters are being extensively made for boiler purposes, and are now used to cleanse the water from the hot well, and are said to pass it into the boiler at a cost of one halfpenny per 1000 gallons.

BREWING IN ENGLAND.

No. IV.

IMPROVED MALTINGS.

Now that the malt tax is repealed and malting is absolutely free, it is to be expected that many changes will be introduced into the system of making malt. Formerly malt had to compete with sugar alone, and although the past ten years have revealed retrogression in the actual quantities of malt made, the immense increase in the use of sugar has been sufficient not only to make up the increased quantity of beer produced, but also materially to assist in keeping down the prices of malt. Now, however, malt has a third rival, and one which threatens speedily to affect materially the normal conditions of the trade, both as to its mode of production and the value of its products. Other grain than malt can be used entirely at the discretion of the brewer. Hence, rice, maize, or similar cheap starchy grain is already extensively used, and threatens very quickly to become universally adopted by all brewers. As a consequence, for a long time to come it will be idle to expect any material addition to the number and capacity of our malt-houses, but improvements in the re-modelling or a replacement of existing maltings may not only be safely predicted, but is an absolute necessity.

In the maltings illustrated by us this week, page 8, as designed by Messrs. H. Stopes and Co., Southwark-street, London, a number of novel features are introduced which add materially to the effective power, safety, and economical working of an ordinary malting based upon the English type, or following the system of working which, until recently, has been invariably adopted in Great Britain. It is planned as a series of four contiguous buildings of unequal height, each perfectly distinct and fireproof, so that should a fire occur it will be confined to that particular portion of the building in which it arises. At one end is placed the barley store. Directly the barley is received it is hoisted to the top floor; then, as wanted, it passes through the screen and half corn separator, and is placed upon the floor immediately above the upper set of cisterns, into which it descends as needed by opening a slide. The number of cisterns is twelve; they are made of iron, and are square, tapering to a point below. When the steeping is complete the water is drained away, and by opening a valve the corn rapidly gravitates to the floor upon which it is intended to be grown. By these arrangements no manual labour of any description is required in the barley store or cisterns, excepting the small amount needed to direct the running of the corn or occasionally shifting it. The next building to the barley stores is devoted exclusively to the growing floors, three in number. These are arranged so that two are below the ground line and one above. To ensure perfect regularity of working throughout the whole house, each floor would receive a fresh wetting every day, and a piece would be elevated to the upper kiln floor once every twenty-four hours. In this way each piece is necessarily narrow and under good control. The only mode of communication between the barley store and growing floors is through one small iron door and the discharge pipes from cisterns. The kilns are double, each possessing two drying floors, an air distributing chamber, a malt store, and a powerful fireplace. The kilns are of unusual height, so as to gain great effective power. They are designed for wire floors. The grown corn is elevated first to the upper floor, where it is loaded to a depth of 4in. or 5in. only. With the great height of the kiln and an enormous volume of air passing through as a consequence of its construction, the moisture is speedily driven from the corn, little or no turning of the floor being necessary. Several doors are placed at convenient distances in this floor, which open downwards, and the corn is easily and quickly dropped upon the lower floor. Another charge is then placed upon it, so that the same air and heat which continues drying the lower floor can be utilised in driving off the moisture from the second floor, a purpose for which it is particularly well adapted. After being sufficiently kiln dried —*i.e.*, maintained for a number of hours at a high temperature —the finished malt is thrown down to the adjacent malt store. The lower drying floor is fitted with a mechanical turner, so that the only manual labour required in the kilns is the distribution, levelling, and discharge of the floors and the necessary attention to the fire. As the first floor is at a height of 22ft. from the furnace bars, this space is utilised by putting a floor round the central shaft 7ft. 6in. from the level of the stokehole floor, and the space between the floor at the bottom of the distributing chamber forms a malt store of large capacity. Ample room is left in the stoking floor for an adequate supply of fuel. The fourth building is a store for malt combs, &c., communicating with the lower drying floor and kiln malt store by the supply pipes and discharge doors only.

In addition to the many novelties of construction and arrangement of this malting, it is especially designed to have the whole of the hoisting, turning of floors and screens, and pumping of water to cisterns performed by an electrical motor in connection with a dynamo machine driven by the main engine of the brewery, which may be at a considerable distance, or by a fall of water or running stream, should one exist within practicable distance. By this method sufficient power can be gained in an economical form, which would require no skilled labour at the malting to tend, and which would be attended with little or no risk of any kind. Our engravings so fully illustrate the malting above-described, and show the main dimensions, that further explanation is unnecessary.

ON TIDES AND TIDAL SCOUR.*

By MR. JOSEPH BOULT, C.E.

[*Continued from page* 470.]

On referring to the tidal hours of the British Isles, it will be found that the earliest point of contact is the islet of Rockhall, long. 13 to 14 deg. W., lat. 58 deg. N., where H.W. F. and C. is at 3.30. On the west coast of Ireland the earliest time is also 3.30; that is at the Blaskets, off the extreme point of Kerry, long. 12 deg. At the extreme west point of France, the Isle of Ushant, the hour is practically the same, or 3.32; at Cape Ortegal and Finisterre, the north-west extremity of Spain, the time is 3.0; and at Belem, Lisbon, 2.30, and the hour gradually becomes earlier—or later—to the Straits of Gibraltar, and the West Coast of Africa, suggestive of a meeting in the Bay of Biscay between the North Atlantic return and an offshoot from the equatorial regions of the African coast. Rockhall and the Blaskets are nearly on the same meridian. From the latter the tide hour gradually advances eastward, not westward, reaching Carnsore point, on the south, at 6.0, Tuskar at 5.45, and Ballycastle Bay, on the north, at 6.25. From Carnsore the hour advances rapidly to 11.0 at Carlingford Point. On the north the tidal force is detained in the narrow passage between Fairhead and the Mull of Cantire, and does not pass Red Bay until 10.31, reaching Donaghadee at 11.13. On approaching Scotland the tide hour at St. Kilda is 5.30, at Bernera in the Western Isles 6.11; its further progress eastwards is very irregular and slow until it passes the Mull of Cantire at 10.45, reaching Morecambe Bay at 11.26; the numerous islands and litoral irregularities of the west coast of Scotland cause much delay. At the extreme north of the Shetland Isles, where the force is divided, the tide hour is 9.45, thence it advances southward and eastward, with considerable regularity of increase, to the mouth of the Thames, the hour being very uniform at places in the latitude of the Moray Frith and Kinnaird's Head; and just twelve hours later at the Thames.

On the west coast of England the tide hour from the south advances from 4.30 at the Scilly Isles, until it meets that from the north around the Isle of Man. Passing eastward through the English Channel, the hour advances steadily to Portland Bill, a little eastward of which it is detained for two or three hours by the contraction arising from the projection of Cape de la Hogue; afterwards it advances slowly and gradually through the Straits of Dover to the mouth of the Thames.

On the coast of Norway the tide hour at the Romdals Islands, a few degrees north of the Shetlands, and about 6 deg. east, the tide hour is 10.45, or just an hour later than at the north of the Shetlands. At the Loffoden Isles, considerably north and east of the Romdals, the hour is noon. Going southwards there is a detention between the Shetlands and Norway, and the hour at Bergen is 1.30, about the same as it is at Arbroath in Scotland, showing a drag, caused doubtless by the rugged coast of Norway and the in-draught to the Baltic. At the Skawt, south of the entrance to the Baltic, the hour is 5.56; here the hour from the north meets that which travelled through the English Channel along the coasts of France, Belgium, Holland, Germany, and Denmark. In thus tracing the progress of the several divisions of the tidal force in these parts of Western Europe observation has been confined to the most prominent features of the respective coasts, such as headlands or islands, so far as they can be obtained from the Admiralty tables. The detention caused by islands has been referred to in the case of Greenland and the isles of Scotland; there are two other instances, on the coasts of England and Ireland, which are worth special notice. In the Solent, and as far to the westward as Portland, there are what are termed the first and second high waters. After low-water the tide at Southampton rises pretty steadily for seven hours, which may be considered as the first or proper high-water; then for an hour it ebbs 9in., at the end of which time it begins again to rise, and in about 1¼ hours reaches its former level, and sometimes higher; this is called the second high water. The tidal level is therefore nearly stationary for rather more than two hours; similar first and second high-waters occur on either shore of the Solent. This phenomenon is ascribable to the tidal force being divided at the Needles, one part travelling up the Solent, passing Hurst Castle at ten o'clock and West Cowes at 10.45, the other passing to the southward, and turning round Bembridge Point at eleven o'clock into Spithead, reaching West Cowes at 11.45 and Hurst Castle at noon. At Havre the water remains stationary for an hour, with a rise and fall of 3in. or 4in. for another hour, and it rises and falls 13in. only for the space of three hours. This irregularity no doubt arises from the sudden projection of Cape de la Hogue, combined with the peculiar formation of the coast of Havre. On the coast of Wicklow county, and abreast of the Arklow Bank, is Courtown, a place which is termed a node or hinge of the tide, where it is often said the tide neither rises nor falls. This spot appears to me another example of the division of tidal forces here by the bank of Arklow. Courtown is about midway between Wexford Harbour and Wicklow, and protected by the bank from any direct approach from the sea. There is a difference of four hours in the tidal establishments of Wexford and Wicklow; that is, high-water is four hours earlier at Wexford Haven than at Wicklow Head. At Kilmichael Point, a little north of Courtown, the establishment is exactly two hours later than at Wexford Haven and two hours earlier than at Wicklow Head. The tidal range is 2ft. at Wexford and Wicklow 6ft. or 7ft. It is clear the times of high-water at one end of the channel of Courtown and of low-water at the other so nearly coincide, the tides become complementary, and nearly balance each other at Courtown, producing a state of almost no-tide. To a limited extent the phenomenon of two tides is found in the Mersey, the flood through the Horse, or Hoose, and Rock channels, being twenty minutes to half an hour in advance of that through the main channels, which is detained by Great Burbo and other banks. On the ebb the tide, I think, usually turns earlier on the Cheshire than on the Lancashire shore, but not always; in making observations it is necessary to be very careful, as light bodies on the surface may drift down the river while heavier bodies are still carried upwards.

From observations reported by Mr. Shoolbred, C.E., it appears that the time of high-water of an equinoctial spring tide, April 8th, 1875, is nearly uniform at Whitehaven, Fleetwood, Liverpool, Belfast, Dundalk, Dublin and Kingstown, the greatest difference between any two places not exceeding forty-five minutes, whilst it is the same in four places out of seven, two of the other three being identical. At Barrow and Holyhead the variations were considerable, being much earlier at Holyhead and much later at Barrow. All these places border the area round the Isle of Man, in which the forces from the north and south unite. Admiral Beechey observed that the time of low-water at the northern and southern entrances of the Irish Sea, and at the entrance of the English Channel, were identical with that of high-water in Morecambe Bay and the Straits of Dover, and the reverse. Taking Mr. Shoolbred's observations, for the convenient comparison of the tidal range on the west coast of England and the east coast of Ireland, it appears that at—

		Feet.
Whitehaven	the extreme range is	27
Barrow	,, ,, ,, ...	30·66
Fleetwood	,, ,, ,, ...	28·93
Liverpool	,, ,, ,, ...	29·75
Holyhead	,, ,, ,, ...	18·5
	5)	134·83
	Mean	26·96
and at		
Belfast	,, ,, ,, ...	10·0
Dundalk	,, ,, ,, ...	14·33
Dublin	,, ,, ,, ...	13
Kingstown	,, ,, ,, ...	12·5
	4)	49·83
		12·46

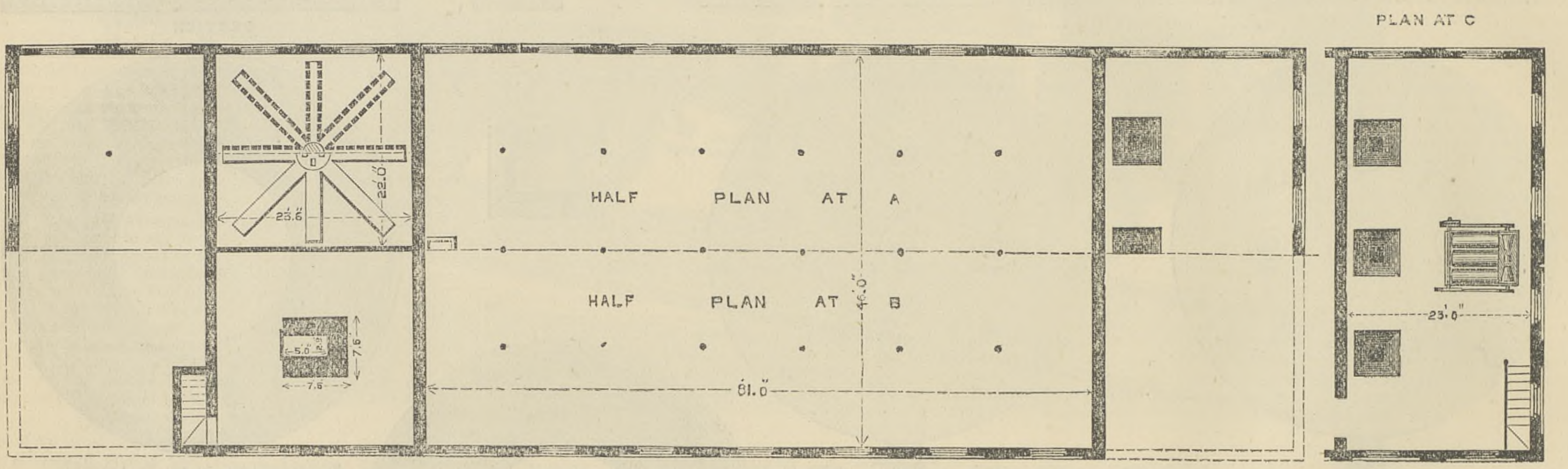
That is, the range in England is twice as great as it is at the other side of the Channel in Ireland; and, where the times of high-water on each side coincide, the surface is inclined from east to west; at low-water the inclination is reversed, or, as it may be briefly expressed, at high-water the current is from England and Wales to Ireland; at low-water from Ireland to England and Wales. The explanation of this phenomenon is to be found probably in two facts, viz., the re-union of tidal force in the area round the Isle of Man and in Morecambe Bay, and the much greater volume and velocity of the streams in England and Wales as compared with those in Ireland. If a person carrying water in an open vessel stop suddenly the surface of the water will rise higher, if he has been moving quickly, than with a slow movement; and so, though in the ocean the surface of the water is not usually much elevated, yet, if any obstruction present itself, the rebound of the force causes an increased elevation according to the size and abruptness of the obstruction. In meeting a land stream the result is similar, with this additional feature, that the surface of that stream is also raised, action and re-action being equal; and when the obstruction is removed by the advance of the tidal force a re-action follows which carries the surface of the water about as much below its mean level as it had been raised above, unless the basin is too shallow. The ebb, then, is not caused by any continued tidal influence, but is the return of the water which had been dammed back by the tidal force during its passage up the river, in which it finally expires at the highest attainable limit.

The motion of this force may be conceived of as resembling the undulation of a carpet or table cloth when a little air has been caught between it and the floor or table, but the particles of the carpet or cloth do not flow down each side of the undulation as do the particles of water. In the paper before mentioned I have compared the action of tidal force in channels of irregular section to the rapid propulsion of an elastic dam, which contracts and expands with the form and size of the channel. Assuming the vertical section to be parabolic, the dam forms a weir of two slopes, up which at each stage of advance the upland waters rise on the one side to descend upon the other; there being two streams on the upward face of the dam, one over the other, the depth of each being undefined, analogous to the contrary movements in bodies of different draught referred to above. Other things being equal, the height of the weir will vary with the depth of the channel, because the level of the crown of the weir, that is, of high water of any tide, is uniform, or nearly uniform, throughout the tidal portion of a river. Thus the reason why dredging has been so serviceable becomes apparent, not, as is usually said, because more tidal water passes into the river, for, if the views enunciated above are correct, tidal force is as viewless as the wind and as immaterial, but because more upland water is pent up and afterwards discharged, as when sewers are flushed by a shallow stream. All attempts to force or to coax more sea-water into a river have almost always, if not uniformly, failed; where said to be successful the increased elevation of the level of high water has been very trivial. On the other hand, where the altitude of the tidal weir has been increased by lowering its base, that is by dredging, the effective force of the upland waters has been increased and the channel deepened. This result is conspicuous in the Tyne, the Clyde, the Tay, the Ribble, the Liffey, and other tidal harbours.

I have been favoured by Mr. Stoney, of Dublin, with interesting information respecting the improvements in the port of Dublin. The history of the operations in Dublin Bay has been recorded by Mr. J. P. Griffith in a communication to the Institution of Civil Engineers, May, 1879. The bar is from five to six miles east of Carlisle Bridge; in 1819 there were 6½ft. of water on the bar at low water; in 1822, 8¾ft.; in 1838, 10½ft.; in 1856, 13ft.; in 1868, 15ft.; and in 1873, the date of the last Admiralty survey, 16ft. There does not appear to have been any subsequent survey.

(*To be continued.*)

*A Paper read before the Liverpool Engineering Society.



ONE HUNDRED AND THIRTY QUARTER MALTING.

SMELTING COPPER IN AMERICA.—It is not perhaps generally known that very low-grade copper ores are now smelted successfully in the United States, and that there is a market for such ores. We understand that the Orford Nickel and Copper Company, at its works at Bergen Point, is smelting imported ores as low as 3 per cent. in copper, and for a lot recently offered, running 2·87 per cent. in copper, 4 dols. 88c. per ton was paid.

RAILWAY MATTERS.

The London, Chatham, and Dover Railway Company announces that the new Kearsney loop line, affording direct communication between London and the Deal and Walmer branch line, has been opened.

On the Ceylon railways the drivers and guards are mostly Europeans, and are said to get salaries ranging from two to three hundred pounds a year. The station masters are usually Burghers; that is descendants of the Dutch and Singalese races, and the remainder of the *employés* are natives.

In concluding his report on an accident that occurred on the 29th May—Whitsun Monday—near Whittington Station, on the Cambrian Railway, Col. Rich says:—"The accident was caused by attaching the shunting engine to the tail of the 8 a.m. passenger train from Aberystwith. This engine is of a description which is quite unfit to run safely with any train."

A Great Northern train, with an 8ft. single driver outside cylinder engine, which recently took the Duke of Edinburgh from Leeds to London on the Great Northern Railway, did the journey, 186¾ miles, in exactly three hours. One stop was made at Grantham. The actual speed, therefore, was over 62 miles per hour. This is, we fancy, the quickest run of the stated length on record.

A collision occurred on the 29th May, at Farringdon-street Station, on the Metropolitan Railway, and in reporting on this Major Marindin says:—"If the evidence of the driver of the Great Northern train could be accepted as correct, the cause of this collision would appear to have been the accidental failure of part of the mechanism for applying the continuous brake with which the train was fitted."

Traffic by steam tramcars has recently been opened between Hanley and Burslem, the engines being supplied by Messrs. Manning and Wardle, of Leeds. By the opening of this section the last link has been added to a chain of steam tramways, seven miles in length, by which connection is made between all the chief towns of the Staffordshire potteries. The system is served by as many as ten steam-condensing smoke-consuming engines. From Hanley to Burslem is said to be the track of the first tram line ever laid in England.

In a report on the double collision which occurred on the 18th of April on the Cockermouth, Keswick, and Penrith Railway, Major-General Hutchinson says:—"This double collision, which was nearly being attended by most serious results, though contributed to by other causes, was mainly brought about by a direct violation of the train staff and block telegraph regulations under which the Cockermouth, Keswick, and Penrith single line is worked." He further says: "But for the promptitude which was afterwards displayed by porter Robinson at Bassenthwaite Lake Station in first despatching the message about the runaway engine, and then by clerk Patterson at Cockermouth in receiving and acting on it, the loss of life would probably have been great."

It will be remembered that some months ago a terrible accident happened at Spuyten Duyvil, which was attributedto the Westinghouse brake, which, it was said stopped a train by its failure, and this train was then run into by a following train. The Spuyten Duyvil Investigating Committee, has however, reported to the New York Senate attributing the responsibility for the disaster to the negligence of the rear brakeman, and deprecating the idea that the automatic brake-cord was used to stop the train. The committee recommend "the Government to exercise such supervision as will more completely insure an observance of those precautions which the public have a right to demand for their security and comfort from the companies." This verdict effectually settles the dispute in favour of the Westinghouse brake.

At the date of recent news the surveyors were busily engaged on the route of the railway from the Semaphore to Largo Bay, South Australia. The Government contemplate making considerable reductions in railway fares throughout the Colony. The details of the change have not yet been thoroughly completed. On May 17th the Governor performed the ceremony of opening the second and last sections of the Great Northern Railway. The former section is from Orroroo to Quorn, a distance of 58½ miles; the cost of this was £116,000. The latter section is from Beltana to Government Gums, and completes the line from Port Augusta to Government Gums, as well as from Adelaide. The total length of railway from Adelaide to Government Gums is 406 miles. The total cost, *The Colonies and India* says, has been about a million of money.

The collision which occurred on the 13th May on the Midland Railway, at Midland junction, King's-cross—Metropolitan—when, as the 6.8 p.m. Midland passenger train from South Tottenham to Moorgate was standing at the up home-signal at Midland junction, King's-cross—Metropolitan—at about 6.40 p.m., it was run into by a Midland pilot engine—No. 691—which had left Kentish Town for Farringdon-street at 6.30, and which had by a mistake been allowed to pass Paul's-road junction, the next block post to Midland junction, King's-cross, while the preceding train was still in the same block section, was due to a failure in the block working between Paul's-road junction and Midland junction, King's-cross, and considering that it took place in a tunnel, and with the atmosphere too thick for the driver of the pilot engine to see the tail lamp of the passenger train more than 20 yards off, it is fortunate that it had no worse consequence.

In a paper recently read before the Institution of Civil Engineers in Ireland, entitled "Engineering Notes in Ceylon," by H. F. A. Robinson, the author says:—"The centre of Ceylon is mountainous, and it is only of late years that a trace was discovered by which a railway could be brought up to Kandy from the low country. At it is, the line runs for about fifty miles nearly level, and then ascends for twelve miles at a uniform gradient of one in forty, with curves as sharp as five and a-half chains. Two engines are necessary to take the train up this pass, and the time for the distance is over an hour. Coming down, brakes are applied to every car separately, which, as may be imagined, has the effect of greatly shortening the life of the rolling stock. The gauge of this line is 5ft. 6in., or the ordinary Indian gauge. The sleepers, which are all imported, are creosoted, which, besides improving the sleeper, renders it impervious to the ravages of white ants. The carriages are very similar to those in ordinary use at home, although they are better ventilated; but they are very stuffy and uncomfortable, and, in fact, not fit for the climate. American cars would be much more suitable for the European passenger traffic, as they have through ventilation, which is so necessary in the East."

In a recent impression reference was made in this column to the condition of the horses on the Reading tramways, and a correspondent says that there seems little reason to wonder that the horses soon grow thin. The horses on the Reading tramways are overworked; they are driven a good part of the journey too fast; they are driven by very young men, or mere boys, without experience and with the thoughtlessness of boys; they have quite enough of whip, and they have a great deal too much of the brake. Some of the thoughtless drivers employed by the Reading Tramway Company seem to imagine that there is something fine in bringing up the horse or horses and car as rapidly as possible, directly a passenger signifies the desire to alight or enter. Without any warning to horses, who have perhaps just felt the whip, the brake is put full on as fast as hands can get it on, and the horses are pulled up. The horses are worried, and in their work they are not treated with the care of an experienced driver. Then the road is bad, for there are many steep little climbs. Some of the cars are one-horse and some two-horse, and all are worked two-horse over part of the road. The company possesses about thirty-seven horses, and only about six cars are worked, so that this should be enough horses if they were fed as well, for instance, as the railway companies' horses in Reading and worked by careful men. Some of the cars are in bad order, and on Wednesday one car ran into another because of the failure of the brake to act, and a horse was much injured.

NOTES AND MEMORANDA.

At a temperature of 773 deg. Fah. steam cannot be condensed into water, no matter how much it may be compressed.

The following test for fusel oil has been recommended by Jorrisow:—Ten drops of colourless aniline and two or three drops of sulphuric acid are added to ten cc. of the spirit; a red coloration will be produced if one-tenth per cent. of fusel oil be present. If less than 0·1 per cent. is present then a greater quantity of the spirit must be shaken up with chloroform, and the test applied to the residue after evaporation of the chloroform.

The number of miles of streets which contain mains constantly charged and upon which hydrants for fire purposes could at once be fixed, in each district of the metropolis, is as follows:—Kent, 85 miles; New River, 213; East London, 85; Southwark and Vauxhall, 117; West Middlesex, 83½; Grand Junction, 37; Lambeth, 70; Chelsea, 65; making a total length of 755½ miles. The companies are ready to affix hydrants thereon whenever required to do so.

The first screw boats ever built in America, and, as far as we know, the first iron hulls, were the Anthracite and the Black Diamond, built on the plans of Captain Ericsson, and employed in carrying coal through the Delaware and Raritan Canal. The first sea-going propeller built in America was the frigate Princeton, built on Captain Ericsson's designs, under the direction of Captain Stockton. It was a full rigged sailing ship, the intention being to use steam only as auxiliary.

For the conservation of yeast the following has been recommended in the *Chemical Review*:—"The thick portion of the yeast is filled into a champagne bottle, and on top of it is poured about 2½ cm. of olive oil. The bottle is then closed by tying a bladder over its top, and in order to protect it from explosion a pin is put through the bladder. So the yeast will keep well for a long time if kept in a cold place. Yeast, if mixed with about one-eighth of pure glycerine, also keeps well for some time if kept in a cool place."

M. Alexandre St. Ives is reported by the Journal of the Society of Arts to have succeeded, after numerous experiments, in extracting from sea-weed a composition like that of starch and sugar, which is well adapted for the economical manufacture of certain articles of commerce, such as imitation leather, and transparent substances. The sea-weed, previously washed in pure water or water impregnated with a little lime or potash, is dried, and then pounded or ground, according to its variety, and introduced into a conical boiler. A soluble substance is extracted by a bath of hot water or steam, when the residue on cooling assumes a gelatinous consistency.

The following experiment, called "Unburning of Water-gas by Iron and by Magnesium," is given by *Nature*. 3-4 grams very finely divided iron (*ferrum alcoholisatum*) are placed in a small piece of hard glass tubing about 12cm. long and 14mm. diameter. One end of this tube is connected with a flask containing hot water, the other with an ordinary gas exit-tube and small pneumatic trough. The iron is heated, the water brought to, and just maintained at the boiling-point, and the end of the delivery-tube is plunged under the water in the trough. Hydrogen is obtained in a rapid stream. As thus arranged the decomposition of water-gas by iron is readily shown without the use of a furnace or porcelain tube. A similar apparatus serves to show the decomposition of water-gas by magnesium; a piece of magnesium-ribbon about 60cm. long is folded on itself so as to form a bundle about 1cm. in length, which is placed in the glass tube; the water is kept nearly boiling; the magnesium is heated until it begins to melt and burn at the edges, at this moment the water is rapidly boiled (and the exit-tube is plunged under the water in the trough), when the magnesium is found to burn vividly in the steam, and hydrogen to be evolved in quantity.

A remarkable instance of the development of electricity by friction, the *Brewer's Guardian* says, has been brought to light in a Berlin brewery. The building is constructed of stone and iron, with the floors laid in asphaltum. Located in the upper story of the malt-house is a malt-cleaning machine, from which the cleaned malt is conducted down, through an iron shoot, to wagons in the lower stories, for distribution through the works. If the malt-cleaning machine remains a long time in operation—which freqently does occur without intermission for three weeks at a time—electricity is developed by friction of the malt in the iron shoot; and in the most isolated portions of it, such is the tension of the electricity that sparks continuously flash here and there, the malt crackles throughout, and sparks fly from it to the hands of the *employés*. The men at first thought this was a demoniacal exhibition, until an expert calmed their fears. This gentleman, Herr Nehrlich, brought the subject before the Electro-technical Union, and the discussion thereupon caused statements from several members that would have noticed similar appearances in other breweries, &c. Dr. Werner Siemens showed how, through the existence of the asphalt floors, the malt room is so isolated from other portions of the building that it electrically resembles a Leyden jar.

The American Signal Service Bureau has in press a monograph, by Sergeant Finley, containing a review of the observations of 600 tornadoes, which have occurred in America during the past eighty-seven years, with generalisations from the recorded facts and suggestions as to the methods which ought to be followed in the investigation of such storms. It appears that tornadoes occur most frequently in summer, and in the month of June; though they have occurred, however, more frequently in April than in July, and in May and September than in August. The average width of the path of destruction is 1085ft., and the storm cloud runs with a velocity of from twelve to sixty miles. The wind within the vortex sometimes attains a velocity of 800 miles an hour, the average velocity being 392 miles. Among the suggestions made in the paper are some having reference to the peculiarity of the movements of tornado clouds, containing rules for arriving at their violence. A tornado cloud always has a centre, and it always moves forward from west to east. It may, however, sway from side to side in its progressive movement. Changes in motion are sometimes very sudden. In the event of a sudden change the observer, who is east or south of east of the storm, should move quickly to the south. If he is north-east he should move to the north. If within a very short distance of the cloud the observer should run east, bearing to the south.

Mr. W. T. Thiselton Dyer communicated to the Linnean Society, on June 15th, an important paper "On the Caoutchouc-yielding Apocynaceæ of Malaya and Tropical Africa." After giving a general sketch of the structural and physiological conditions of the occurrence of caoutchouc in plants, the author pointed out that the plants which appeared to yield it in commercial quantity in three widely-separated regions all belonged to one tribe of *Apocynaceæ*, the *Carrisseæ*. In the East Indies the *Gutta singgarib* of the Malay Peninsula, the *Gutta soosoo* of Borneo, was the produce of a new species of *Willughbeia* (*W. Burbidgei*). Many other species of this and allied genera also seemed to produce caoutchouc in quantity worth collection. In Central Africa, *Landolphia*, which was closely allied to *Willughbeia*, but differed in possessing terminal instead of axillary flowers, was the most important source. On the east coast caoutchouc was yielded by *L. Owariensis* and *L. florida*, the latter a very ornamental plant. As the rubber exuded from the cut stems, it was plastered on the breast and arms, and the thick layer, when peeled off and cut up into squares, was called "thimble rubber." On the west coast the most important species was *L. Kirkii*, the rubber of which could be wound off into balls or small rolls from the cut stems, like silk from a cocoon; this species was called "matere." *L. florida* also occurred, and was called "m'bungu;" its rubber was worked up into balls, but was inferior in value. The rubber of *L. Petersiana* was of little importance. In South America *Hancornia speciosa* yielded what was called Mangabeira rubber.

MISCELLANEA.

A gold medal has been awarded to Gandy's patent cotton belting at the New Zealand Exhibition.

The Anchor Tube Company, of Gas-street, Birmingham, has appointed Mr. John Frankish, 24, Corporation-street, Manchester, its agent for Manchester and district.

Messrs. Priestman Brothers have been awarded first order o merit, carrying a silver medal, and a special certificate with a gold medal, for their patent dredger, excavator, &c., at the International Exhibition at Christchurch, New Zealand.

The General Steam Navigation Company has just added to its fleet, now numbering fifty vessels, a new steamer, the Mallard. This, and another now on the stocks, are of a larger class than th e rest; and it is intended to gradually supersede all the smaller craft by ocean steamers.

The French Government are projecting a canal to unite the Meuse with the Scheldt, for putting the collieries and blast furnaces of the North into communication with the mines and ironworks of the East, and thus restoring to Dunkirk the importance of which she has been deprived by Antwerp.

According to the *Liverpool Journal of Commerce* an exhibition has been held at Oelnitz, Saxony, and it was a noteworthy fact that the whole of the machinery exhibited was of English manufacture. In the embroidery trade the number of machines in use in 1881 was 70 per cent. greater than that of the previous year.

The Local Government Board have given their sanction to the purchase by the Corporation of Bridgnorth, Salop, of the Gas Company's Works for £14,000, and the expenditure of £2000 in improving the approach road to the works. The Corporation is now advertising for a loan of £16,000, and when that has been obtained the works will be formally transferred.

According to Möller's steamship circular, "the mere possibility of a stoppage in the Suez Canal, has already diverted many steamers from the India and China trade, and accumulated tonnage elsewhere. The natural consequence of this has been a severe depression in freights in general, and charters from Indian ports can only be effected with difficulty."

The Parkes Museum, which was first instituted in 1876 as a memorial to the late Dr. Edmund Parkes, and in order to promote the health of the community, was incorporated on the 28th ult. The museum has been temporarily located in University College, Gower-street, since its establishment, and a proposal for permanently keeping it in connection with the college has been under consideration for some time, but negotiations are now being made for acquiring an independent building in a more central position than University College. The first Council of the incorporated institution commence their work with a fund of £1630, and a collection of apparatus and appliances valued at upwards of £1000.

The Association of Belgian Gasworks Managers has arranged for an international exhibition of gas-heating appliances, to be held at Brussels from 1st August to 1st October. The object is to popularise the use of gas for industrial, domestic, and culinary purposes. Prizes to a value not exceeding £160, in gold and silver medals, are offered for appliances of sufficient merit. Gas engines are admissible for exhibition, but not to compete for prizes. No charge is made for space, for reception, installation, or re-expedition, and gas will be supplied gratis. Nor will any charge be made to the public for admission. No goods will be received after the 15th inst., and applications must be made to the president, M. H. Aerts, director of the Brussels Gasworks.

The s.s. Essex, which has recently been built by Messrs. Raylton, Dixon, and Co., to the order of Messrs. Money, Wigram, and Sons, Limited, of London, for their famous Australian line of steamers, has made her trial trip to London. She is a handsome iron screw steamer of the following dimensions:—Length over all, 310ft.; breadth, 40ft.; depth of hold, 25ft. 3in., and has a carrying capacity of 3700 tons. She is built on the three-deck rule, having iron main deck and upper deck covered, with teak poop, long bridge and forecastle, steam steering gear, extra steam winches, and is altogether a very superior vessel of her class, intended principally for cargo carrying, but having some handsomely fitted accommodation in the poop for a few passengers. Her engines, of 250-H.P. nominal, by Messrs. T. Richardson and Sons, of West Hartlepool, indicating up to 1550-H.P., worked remarkably well, giving a speed of 12¾ knots.

M. Clamond has made a gas burner in which the gas is burnt with air heated to a very high temperature, the combustion taking place within a cone or basket of platinum wire, which, raised to incandescence, forms a light-centre of remarkable softness, steadiness, and brilliancy. The air, which must be provided under pressure, has a pipe system distinct from that of the gas, and reaching the burner, the air traverses a tube of refractory matter kept at a temperature of 800 deg. to 1000 deg. C., it is said, by a number of small gas flames about it, and thence it passes into a chamber, where the gas joins it. M. Clamond has succeeded in so grouping the heating and the mixing chambers that the whole burner may be enclosed in a cylinder about 2½in. diameter and 4½in. in height. One-horse power, it is stated, suffices for an illumination of 150 to 200 Carcels. One Carcel requires, with various burners, 27 to 45 litres of gas. The platinum has to be replaced every forty or fifty hours, and this is rendered easy. A modification of this arrangement has long been used for illuminating magic lanterns, a lime disc being employed instead of a platinum wire cage.

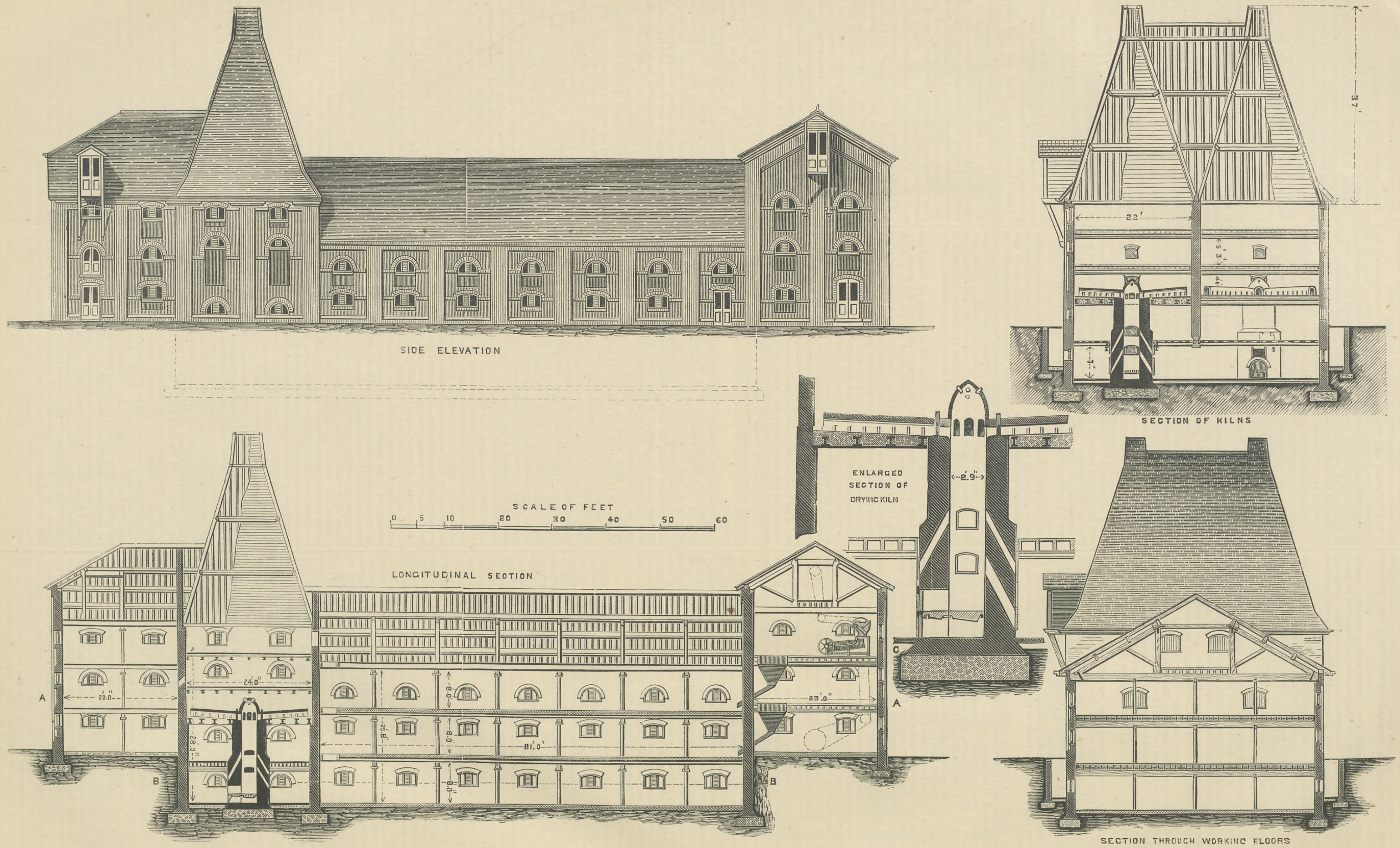
This week the town of Tipton, near Birmingham, has, for the first time, been lighted with gas made by its own Corporation, instead of being dependent upon Birmingham for its supply. The new works have been erected in consequence of the price charged by the Birmingham Corporation being considered as excessive. The ironwork and engines have been supplied by the Horsley Engineering Company, at a cost of £11,000. The meters, pipes, and gas mains will be purchased from the Birmingham Corporation for £34,000. In the retort house there are at present eighty-four retorts; but there is provision for about thirty more, should they be needed. The condenser, which receives the gas from the retorts, consists of ten cast iron tubular columns, 3ft. in diameter; and from them it passes into the exhauster, which has been manufactured by Messrs. Walker and Co. The exhauster is worked by a 6-horse power engine, and can force upwards of 400,000ft. of gas per day through the pipes. The two gasometers are capable of containing about 154,000 cubic feet of gas each, and the total capacity of the new works is estimated at 60,000,000 cubic feet of gas per annum. The work of erection has been carried out under the supervision and from the plans of Mr. Thomas Proud, C.E., Birmingham.

The largest whistle in the world may be seen at the store of the Eaton, Cole, and Burnham Company, 58, John-street, New Brunswick. It was made at their factory in Bridgeport, Conn., and ordered from them by Manning, Maxwell, and Moore, of Liberty-street, for a Montreal firm. It will be used by the largest sawmill in Canada. Experts in brass work and steam whistles have pronounced it one of the best-proportioned and the largest of all the steam whistles they ever have seen. It is about the size of a flour barrel, being 27in. long and 20in. in diameter. The average diameter of sawmill whistles is 4in. Its extreme length, from the bowl to the ornament on top, is 4ft. 9in. Its spindle is 3½in. in diameter, or as large as an ordinary steam whistle. It is made of cast brass, and cost 500 dols. It will be blown by means of a spring valve connected with a steam pipe 4in. in diameter. A long blast upon it would almost empty a 100-horse power boiler. The Canadian mill that will use it has a boiler of 150-horse power. The mill has been totally destroyed by fire several times. The proprietors, in order to guard against future destruction of property, ordered the whistle. In case a fire breaks out all *employés* of the mill and the various fire departments in neighbouring towns will be summoned by the big whistle. It is also to be used, by a system of signals, to give orders to wood-choppers and *employés* at a distance.

ONE HUNDRED AND THIRTY QUARTER MALTING.

DESIGNED BY MESSRS. F. STOPES AND CO., LONDON.

(*For description see page 6.*)



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TO CORRESPONDENTS.

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

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J. H.—13A, *Great George-street, Westminster.*

CORNUBIA.—*Yes, you can do so in the absence of agreement to the contrary.*

GILLAIRD.—*We do not think the idea is new. We do not make Patent-office searches, but you can readily make one for yourself among the specifications in your public library.*

J. G. (Hartlepool).—*The invention is not new. The same idea has been patented by Dunlop and others.*

W. G.—*We see no reason why the idea involved in your sketch should not be successfully worked out, but so much depends on details, that it is impossible for us to pronounce ang definite opinion concerning the merits of the scheme.*

A SUBSCRIBER.—*Thirty-two is the velocity in feet ver minute acquired by a falling body in one second. For the reason why it should be doubled we must refer you to any work on mechanics, as, for example, the papers "On the Foundation of Mechanics," recently published in our own pages.*

CAINNIE.—*A wheel will drive a worm, and has been used for that purpose. For example, it is so employed in many forms of mechanism in which a fan acts as a speed controller. The worm is on the fan axis. The arrangement wastes much power in friction. The screw should have the quickest pitch possible to diminish friction.*

HORIZONTAL SCREW PRESSES.

(*To the Editor of The Engineer.*)

SIR,—May I ask your readers who are the makers of the horizontal screw presses for hay, cotton, tallow, &c.? B.

Liverpool, July 3rd.

BRIQUETTES.

(*To the Editor of The Engineer.*)

SIR,—Will some of your readers kindly say which is the best process for making briquette fuel from Cannel without the addition of tar?

July 4th. J. B.

WOOD SCREWS.

(*To the Editor of The Engineer.*)

SIR,—I shall be glad if some of your readers will kindly give me the names and addresses of the best makers of machinery for manufacturing iron and steel wire into wood screws. BETA.

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THE ENGINEER.

JULY 7, 1882.

OUR FLEET AT ALEXANDRIA.

THE modern Turk, if not an enterprising and original being, has, at all events, a good memory. The present alarm about the entrance of Alexandria Harbour reminds us of what doubtless is present to many a Mussulman's mind, our disaster in 1807, when our fleet, under Sir John Duckworth, sailed up the Dardanelles with ease on February 19th, but returned with heavy loss on March 2nd, the Turks in the meantime having mounted a number of heavy guns. We do not contemplate the flower of our fleet being destroyed in Alexandria Harbour. At the same time submarine mines are far too serious and treacherous to tamper with. Vigilance is, therefore, most necessary. Again, we do not rate the power of the batteries at Alexandria highly. Our information on them, however, is meagre. The *Standard*, June 28th last, said:—"Bearing on the entrance one battery has five 9in. muzzle-loading Armstrongs. At the harbour point three of the same, one bearing on the Monarch are in readiness. Fort Ada has one heavy 10in. gun. Some heavy guns are at Kafarillia. Two rifled guns are bearing on the Invincible (query Inflexible). Inside the harbour there is a host of smooth bore batteries. All the guns, however, are miserably mounted, and would be silenced by our fleet in half an hour." On Wednesday the same paper informed us that "the Egyptian troops have been busy with the fortifications. This morning it was discovered by the officers of the fleet that two big guns had been placed in position between forts Pharos and Ada, pointing seawards. They bear so as to threaten the ships of war."

The question naturally arises as to the powers of our fleet against forts. We should be surprised if the Alexandria batteries are at all formidable, but it is well to consider how we stand against them as well as more serious foes. Egypt bought a number of Woolwich muzzle-loading guns about the year 1867 and subsequently. These are probably the guns in question, as they are said to be muzzle-loaders. They were obtained, with their projectiles, through Efflatoun Pasha from Elswick, and corresponded exactly to our then service muzzle-loading armament, and we know their powers well. The 9in. 12-ton guns can perforate a little over 12in. of unbacked iron at the muzzle, and the 9in. 18-ton gun a little over 14½in. The vessels which we have to the front appear to be the Inflexible, Alexandra, Temeraire, Superb, and Monarch. Now without saying exactly what could be done against these ships by different guns—for this hardly seems to be the moment to parade such information—we may say that while the weaker and less important parts of the weakest of them are, no doubt, not impervious to the fire of the guns we have named, we should, considering the probabilities of range and of oblique impact, face such fire with great confidence, considering that the injury likely to be caused was a matter of cost only, rather than detriment to fighting power.

From a defensive point of view then, the position of our ships in Alexandria is satisfactory. As regards their offensive powers, there can be no doubt that the power and accuracy of the guns would be more than sufficient for all that is needed at Alexandria. Still we cannot help wondering how we should stand suppose Alexandria to be stronger and more fully representative of a modern defended harbour. We may suppose that there would be, as in this case, a limited number of fairly powerful rifled guns and a great many smooth bores. Is our fleet well adapted for the attack of such a place? Unquestionably it is so, both from the fact that we have heavy side armour and heavily plated decks, and that our guns and men, as well as the vital parts of our ships, are well-covered. Our armament is, however, not calculated to produce the greatest possible effect against ordinary harbour works. We have but few heavy guns, and a supply of ammunition for heavy guns is necessarily very limited. At Alexandria the first work would be to silence the more formidable rifled guns, and then the numerous smooth bores. Nothing could be more unsuitable for such work than the armament of the Inflexible. The Alexandra, Temeraire, Invincible, and Superb have good batteries of 25-ton and 18-ton guns; but the Monarch only carries six guns, and the Inflexible only four. The last surely would hardly be allowed to waste the ammunition of her 80-ton guns in killing the scattered flies of Alexandria. As we have said, we could no doubt do very well without her in this case; but surely we may well take this as an illustration of the need of a second armament of medium new-type guns. Supposing them even not to be protected by armour, they would be available in all less serious cases of exposure. They would enable fire to be directed on a number of objects; they would save the expenditure of heavy ammunition; and so they would greatly expedite the work. As to the Inflexible, the best use we could suggest her being put to, supposing the Admiral's instructions admitted of it, would be to point her guns at the largest and most imposing object within safe hitting distance, and after fair warning, on the first call to display force, bring down the object with one or two of her enormous common shell, as a specimen of what might be expected to follow.

THE CHANNEL TUNNEL IN CHANCERY.

IN the year 1874 the South-Eastern Railway Company obtained from Parliament an Act which, among a number of provisions relating to extension of powers and other matters connected with its undertakings, contained a clause authorising the company to expend a sum of £20,000 towards the cost of experimental borings. The whole intent and effect of this clause was to avoid to that extent the operation of what is technically called the *ultra vires* doctrine. Railway companies are incorporated for certain specified purposes, and every single person who subscribes for shares in such a company is by law entitled to require that the funds which he himself subscribes, and all the other funds of the company, shall be applied for no other than those purposes. It is only by the bestowal of express statutory powers that railway companies have been enabled to work steamboats or keep hotels—things which, however common now, and however beneficial to the shareholders, are not within the objects of a railway company. They are *ultra vires*. The effect, then, of this clause in the Act of 1874 was only to prevent a single dissentient, or even a minority, or the Attorney-General, from objecting to this manner of expending £20,000 of the company's money. It did not even authorise the company itself to make the borings. Accordingly certain clauses were inserted in an Act obtained by the company in 1881—which, as dealing with many other matters, was styled by Sir H. James an "Omnibus Act"—empowering the company to acquire for the purpose of experimental borings certain lands bounded on the south by and including the beach and foreshore. So far there is clearly nothing to empower the company to do anything below low-water mark. If there is anything in the Act to authorise workings beyond low-water mark it must be found in a subsequent clause, which authorises the Woods and Forests, with the consent of the Treasury, to execute all necessary conveyances and agreements relating to any land, soil, or rights belonging to the Crown and under the management of the Woods and Forests; and these clauses are followed by numerous provisions, excepting and reserving almost every conceivable right of the Crown and its prerogative.

To see what, upon these somewhat limited powers, has been done, let us turn to the accounts of the proceedings on the 1st July. The guests on that occasion appear to have descended the shaft at the western side of Shakspeare's Cliff to the mouth of the tunnel, at which point, according to the report, "one seemed to be looking along a great tube, and as the glowing electric lamps, placed alternately on either side of the way, showed fainter and fainter in the far distance, the tunnel, from anything one could tell from appearances, might have had its outlet in France. A journey of some seventeen minutes, however, not counting a stoppage for refreshments when 1000 yards had been traversed, the workmen drawing the cars on the down grade at a fast walk, brought the party to the end of the boring, 1900 yards from the shaft." Sir H. James stated in Court on Wednesday last, and it was not denied, that in April last the attention of the Board of Trade, as representing the Crown, was brought to the fact that low water mark was reached, or nearly so; that from that time to the present many applications had been made by the President of the Board of Trade for inspection; but that while the representatives of the South-Eastern Railway Company were profuse in their hospitality to the Board of Trade, they raised objections to minute inquiries. The practical object of the suit was to ascertain how far these works had been carried, so as to determine whether the tunnelling had actually gone on under the bed of the sea or not.

We regret very much the impression which is produced in our mind by the story of these proceedings on the part of the Company. If Sir E. Watkin wishes to overcome the existing repugnance felt to the scheme of a Channel tunnel, he will do well to avoid exciting repugnance to the means adopted for pressing it on. If he desires to reason the public out of groundless fears, he had better strive to produce confidence in his own straighforwardness. If, on the other hand, he or his friends are so silly as to believe that the Company was justified in point of law, upon the enactments we have stated, in working beyond low-water mark without the consent of the Crown, the Treasury, the Board of Trade, the Woods and Forests, the Admiralty, or the War Department, people will hesitate to accept them as instructors on the delicate and complicated question of the possibility of a continental invasion. How do they receive the intelligence of the intended application to the Court? Sir Edward sneers at the President of the Board of Trade and his caucuses. M. de Lesseps drinks the Queen's health, and remarks that the completion of the work is required in the interests of mankind. Sir Edward ironically recommends his friends to console themselves with reflecting that they live under a Liberal Government. But what on earth else could the Government do, when they found, as they believed, that the limits set by Parliament were being transgressed, unless they were prepared to liberally disregard Parliament in the interests of Sir E. Watkin and his Company? Could he really be vain enough to expect such a thing? If, he exclaims to his friends, they lost any of their property, if they found any portion of their rights sequestrated, or if any aspirations they might entertain of contributing something to the great interests of mankind were put an end to, they might always fall back on the glorious idea that they were governed on Liberal principles. Aspirations after the interests of mankind can only produce in the countenance of a Gladstonian Minister the twinkle with which the Roman augur met his colleague; while the insinuation that it is the South-Eastern Railway Company whose property and rights are being encroached upon must be ludicrous to everybody. There is, however, a sense in which it may prove to have been actually true; as the directors of the South-Eastern Railway may possibly find out, if they should ever be sued by shareholders whose money had been used for purposes not authorised by Acts of Parliament.

THE DEMAND FOR GAS.

THE extent to which the electric light will probably affect the demand for gas is a matter of direct concern to a large number of persons, and is not without interest to the public at large. On this subject we have obtained some trustworthy statistics, partly from the returns of the Registrar-General and partly from Mr. John Field's "Analysis," to which we made reference a few weeks ago. Mr. Field has not yet included in his valuable annual publication those results which we are now going to work out, and we would suggest to that gentleman that he might advantageously comprehend in the scope of his excellent tables the kind of inquiry which we are thus entering upon. The question to be considered is sufficiently simple, and consists in combining the statistics of the gas supply with those of the population. Mr. Field may carry this to any extent he pleases, but we shall limit ourselves on this occasion to a few leading considerations.

Beginning in 1869, we find that the population of Registration London—which is practically the same as that of the Metropolitan Board—comprehended 3,176,308 souls. The quantity of gas actually sold was 9,885,857 thousands of cubic feet, amounting therefore to 3112 cubic feet per head. If we perform a similar calculation for all the years down to the present time, we shall gain an idea concerning the popularity of gas as an illuminant and as a source of heat. Taking the series of thirteen years down to the close of 1881, we find not only that the demand for gas in the metropolis increases in the aggregate year by year, but also that the demand per head of the population shows an annual augmentation. The rate of advance varies, but it averages 150 cubic feet per head. We may reckon that this quantity of gas, if properly consumed, would give the light of 480 candles for the space of an hour. This may seem a small matter when distributed over the entire year; but it has to be remembered that this is the additional quantity per head, and that there are several persons in the average household. The statistics of the London water companies show more than seven persons per house; and if we apply this to the gas supply we find that the yearly increase per head, if distributed over the entire year, amounts to nearly ten candles per household for the space of an hour per day. It may still be said that the additional light is not much. Yet it represents the light of three candles for three hours each day in the year; and this is simply the increase which goes on year after year, amounting to 1804 cubic feet more in 1881 than in 1869. This quantity is equivalent to the light of sixteen candles for one hour each day in each household of seven persons at the latest date.

The yearly increase per head in the consumption of gas is by no means regular. The greatest increase was in the year 1879, and the least in the year following, the additional cubic feet per head being respectively 291 and 47. Last year was better than 1880, the increase over the preceding year being 116. Comparing 1869 with 1881, we see an extraordinary advance, the actual consumption of gas for the year being equal to 4916 cubic feet per head at the latter date, as against 3112 at the former, the increase per head being 58 per cent. No doubt this is partly occasioned by the increased use of gas for cooking purposes, and for the raising of steam. Still the fact is remarkable. Concerning the progressive use of gas, for whatever purpose, we observe that the rate of the annual advance per head showed a decline in 1876, and again in 1877. In 1878 there was a rise in the ratio, and again in 1879, the leap in the latter year being especially marked. Why 1880 should have been so sluggish is difficult to explain, except that the advance in 1879 was so great as to leave little room for immediate progress. The years 1872 and 1873 also showed a comparatively small rate of increase per head, and these were preceded by a leap in 1871, when the advance was 251 cubic feet per head. But the fact that what we may term the individual use of gas shows an increase every year—though the rate of increase varies—is a fact which proves the craving of the people of London for "more light." The increase is too great to be fully accounted for by the growing practice of using gas as fuel, though this has some share in producing the phenomenon. The gas companies themselves reckon that the brilliancy of the electric light operates in their favour, by stimulating the public to a more liberal use of the older illuminant. Some of the statistics, we apprehend, are affected by the state of the weather. A foggy winter has a decided influence on the consumers' gas bills, and this may have been the reason why, in one particular season, there was a great outcry in London that something was wrong with the meters. But the regular growth of the demand is shown by the fact that while the yearly increase per head averaged 118 cubic feet in the four years 1870-73, it became 160ft. in the next Olympiad and 173ft. in the last.

The use of gas is of course stimulated or checked according as the price is either low or high. At least we might expect as much, though the effect is not likely to be instantaneous. So far as price can influence consumption, we should expect to see the London gas companies doing a large trade in the present year. Last year the net rental for gas per 1000ft. sold was 37·08 pence, being the lowest ever known in London. The effect of cheapness in promoting consumption seems to show itself when we compare 1869 with 1875, and these again with 1880. In 1869, when the net rental of gas was 48·41 pence per 1000ft., the year's rental per head of the population was 12·5 shillings. In 1875 the net rental per 1000ft. was 45·19 pence, and per head 14·7 shillings for the year, or more than two shillings in advance of 1869. The effect on revenue, where the population consists of millions, is, of course, a very appreciable sum. In 1880 the net rental per 1000ft. had fallen to 39·38 pence, and the rental per head had risen another shilling, being 15·7s. per annum, as compared with 12·5s. in 1869. Last year the rental per 1000ft. was more than 2d. below that of 1880, and the net rental per head showed a slight decrease, being down to 15·2s. There is, indeed, some difficulty in accounting for all the fluctuations, if we take them year by year. The largest revenue per head was in 1872, when the price of gas was abnormally high, being as much as 54·62d. per 1000ft. The net rental per head was then 16·8d., the highest point reached in the series of thirteen years. But this point was nearly reached in 1879, when the average rental was down to 41·10d. per 1000ft. Since 1879 the rental per head has fallen rather more than 1s., although the price of gas has been reduced. We may say that the drop in the price of gas has scarcely yielded its due results in 1880 and 1881.

Thus far the effect of the electric light on the London gas supply can have been nothing more than that of stimulating the gas companies to lower their prices. As soon as the new illuminating agent enters into commercial competition with gas, we may expect to see the result showing itself by a reduction in the consumption of gas per head of the population. It is here that the effect will first make itself evident. Not until the electric light has really mastered the situation may we expect to see a falling off in the gross manufacture of gas. The perpetually increasing population of the metropolis creates a growing demand for artificial light, and a powerful check must be imposed on the consumption of gas ere we shall see its total manufacture declining. In the thirteen years, 1869-81, the population of London has risen from 3,176,308 to 3,831,719. Had the consumption of gas per head remained unaltered after 1869, the total demand would have increased, but in 1881 it would have been under 12,000,000 thousands of cubic feet instead of exceeding 18,800,000 thousands. The difference of nearly 7,000,000 thousands of cubic feet is due to the fact that while the population has increased, the demand for gas has grown still faster. The population has increased by 20 per cent.; but—as already mentioned—the demand for gas per head has increased by 58 per cent. The circumstance that the net rental for gas has been declining during the last three years is probably a token of apprehension; but a reduced charge for gas is also induced by the operation of the sliding scale, whereby the metropolitan gas companies, with one exception, have been offered the privilege of paying a higher dividend on condition of going below the initial price specified in the statute. These two causes operate in favour of the public, and will continue to do so. How severe the contest may become between the gas supply and the electric light it is impossible to foresee; but more or less of competition seems to be impending.

The destructive qualities of gas form an element in the calculation which the public will increasingly appreciate according to the experience which they gain in the use of electricity. It will soon be found that the services of the painter, the decorator, and the upholsterer will be less frequently required under the dominion of the electric light than where gas continues to hold sway. The value of the difference will have to be estimated, and as the balance on this part of the account must needs be struck in favour of the electric light, the latter will be often welcomed even where the mere cost of the light may seem to be enhanced. At present the new light has done nothing to affect the metropolitan gas supply, except so far as it has influenced the gas companies in the direction of improvement and reduced charges. Future years may tell a different tale, but the metropolitan gas companies have a wide margin in which to prepare their defences against their brilliant antagonist. The figures we have thus presented prove how well the gas supply is adapted to the requirements of the public. The fact is significant that in the space of twelve years the consumption of gas in London has so increased that—speaking in round numbers—each person now burns 5000ft. of gas where formerly he burned 3000ft. For this enlarged supply the individual pays 15s., instead of the former amount of 12s. 6d. The increased consumption per head is, of course, partly occasioned by the fact that gas is now burned in houses where formerly it was unknown. But this process may still go on, and the domestic use of gas may be extended where it has to overcome the opposition of the cheap mineral oils. These oils are very popular with the poor, but are apt to prove dangerous as well as troublesome. In agricultural districts, where gasworks are impracticable, such oils have their proper place. But in large towns gas ought to bear sway in all respectable working-class dwellings, as well as among the middle classes. The electric light is probably destined soon to become the luxury of the higher classes; but that it will work its way downwards is a result which comes within the range of probability, despite many remaining difficulties.

FRANCQ AND LAMM'S FIRELESS LOCOMOTIVES IN LILLE.

THE tramway between Lille and Roubaix, 12 kilos.—seven and a-half miles—long, has been open about a year and a-half, and has always been worked by steam, the difficulties of the line being too great for horses. Brown's and Hughes' tramway engines have both been used, but for the last year the line has been worked exclusively by five of Carel's locomotives and fifteen fireless locomotives on Francq and Lamm's system, built by Cail et Cie., of Paris. The first "*locomotive sans foyer*" that was ever made on a working scale is still in the shed, and after having already done good service, will be again available after thorough overhauling. Steam at a pressure of 17 kilogs. per square centimetre—244 lb. per square inch—is supplied by two out of three Belleville boilers, which evaporate over 8 kilogs. of water per kilog. of coal, superseding boilers of the locomotive type made by Cail et Cie. The steam passes into a steam trap in the form of a vertical column, where it parts with the water held in suspension, and then ascends to a horizontal steam pipe of 11½ centimetres—4½in. diameter—carefully cleaded, where it has a pressure of about 15 kilogs. per square centimetre, or 215 lb. per square inch. This runs across four lines of way in the running shed, and as each engine is brought to the yard it is run up to this common steam pipe. Opposite each line of way is a copper pipe of 45 millimetres—1¾in.—internal diameter, taking a large turn to give elasticity, and provided at the end with an *écrou à volant*, or nut and hand wheel combined. By these means the connection is readily made with the engine, stop valves being also provided both on the engine and in the steam pipe. When the engines come in from Roubaix, after the run there and back, they generally have a pressure left of 2 to 3 kilogs. per square centimetre—30 lb. to 45 lb. per square inch—which is sufficient to shunt with and get into the running shed; and it only rarely happens that an engine has become so far spent as to require towing in. When the communication is opened with the steam pipe the water in the reservoir of the engine is heated by the steam at full steam-pipe pressure in nine minutes. This gives the locomotive a power of twenty-five horses; and it can work for nearly an hour with a pressure of 14 kilogs. per square centimetre, or 200 lb. per square inch. The quantity of water contained in the reservoir when fully charged is 2500 litres = 550 gallons; and there must always be at least 2000 litres = 440 gallons. This is ascertained by a series of gauge-cocks set at the levels of 2000, 2220, 2400, and 2500 litres. The exhaust steam is condensed in a surface condenser, and at the same time that live steam is admitted from the stationary boiler, the condensed water is blown out into the pit. All the valves are then closed, and the engine is ready for its run to Roubaix and back. On the road, the disengagement of the steam from the hot water under pressure is regulated by an appliance called "*détendeur*," or expander; and this is opened more or less in proportion to the resistance encountered. Drawing an ordinary tram-car, and with the steep gradients of the Roubaix line, the total cost of working—traction at least—with the fireless locomotives is found to be about 65 centimes per kilometre—that is to say, under 10d. a mile—which is estimated to be one-third the cost of working with horses, if that were possible. The Francq and Lamm engines run quite into the centre of Lille, and stop and start again at least as easily as horses, while no difficulty appears to attend their passage along the streets. The fares charged between Lille and Roubaix are :—Single, 75c.—first-class—and 65c.—second-class; and return, 1f. 10c., and 90c. We have to thank M. Marsillon, Ingénieur, *Chef de Traction* of the Lille Tramways Company, and M. Grijffon, *Chef de Depôt*, for the particulars which we have given.

SHIPBUILDING IN THE HALF-YEAR.

THERE appears to have been good ground for the belief that has been entertained that during the present year the number and tonnage of the vessels built will be the largest that have been known. On the Clyde in the six months now ended the tonnage of vessels launched is larger than in any previous corresponding six months, 168,674 tons having been reached this year, a large increase on the very high figures for the past year for the same period. Similar statistics have not yet been compiled for the Tyne; but on that river, on the Wear, and at West Hartlepool, and on the Tees, it is expected that the tonnage launched has also been in excess of that of any previous corresponding half-year; and at some others of the centres of the shipbuilding industry it is anticipated that there will also have been an enlarged output. At most of these places it is acknowledged that there is a slackness in the demand for new vessels at the present time, but it is felt that the orders that are already placed are sufficient to give briskness for the present year. This being the case, it may be readily believed that unless there should arise some unexpected difficulty, the total tonnage built for the present year will exceed that of any of its predecessors. The details of the average tonnage of the vessels launched are not as yet procurable, but the inclusion of some of very heavy tonnage gives some ground for the belief that the increase that has for the last few years been known in the average is being still continued.

LITERATURE.

The Modern Applications of Electricity. By E. HOSPITALIER. Translated and enlarged by JULIUS MAIER, Ph. D. Illustrated Kegan Paul, Trench, and Co. 1882. *Magnetism and Electricity: An Elementary Text-Book for Students.* By R. WORMELL, D. Sc., M.A. T. Murby. 1882.

THESE two books on electrical subjects treat the matter from two different standpoints, and hence are widely different so far as the treatment of the subject is concerned. M. Hospitalier is a young Frenchman—well-known, however, to many electricians in England—who, possessing natural talent, has used it during the past four or five years in particularly studying the electrical problems which have during that time been brought into prominence. Electric lighting and telephony then form the principal features of his work. Dr. Wormell, on the other hand, is one of the leading teachers of this country. The head master of the City Middle-class Schools has done much to put scientific teaching upon a proper footing. His works on mechanics, dynamics, hydrostatics, and geometry are well known, and although extensively used, might, with advantage, be still more used. This new work of Dr. Wormell's is one of the "High School Science Series," written thus with a view to the wants of schoolboys. From this point of view it must be judged. Dr. Wormell thoroughly understands that something besides mere telling is required in education, hence he lays great stress upon experiment. The first ten chapters of the book deal with magnetism, and then we have a series of experiments for laboratory practice in magnetism. In the later portion of the work, the making of the apparatus and the performing of laboratory experiments is insisted on at the end of most chapters. A boy will learn more by making and pulling to pieces a coil or a telephone than from a number of lectures on the apparatus. The laws and phenomena of the subject, so far as they can be treated in a work of this kind, are described in simple language, and require but a very moderate amount of mathematical knowledge to be fully understood. The introduction of new symbols is a mistake. The ordinary thick and thin lines to indicate a battery, thus | | |, are to be found in every printing establishment, but the new symbol for a condenser, for example, as introduced into this work, will not be so found, and must be specially made. There is no comparison between the illustrations in the two works we have named at the head of this article. Those in Dr. Wormell's book are such as we generally find in English books—they serve their purpose, and that is all. They do not give a character to the book like those in M. Hospitalier's work. Although we placed the latter first, we have left it till the last to notice. The translation is founded upon the Second Edition of the French, but contains extensions and additions. The whole work is descriptive, and being well illustrated, the reader is able to obtain a good idea of the difference of the various apparatus described. The work commences with a short historical disquisition upon electricity, followed by a chapter on batteries, in which the more important forms are described and illustrated. This is followed by a short chapter on thermo batteries, and then we come to that part of the book treating on electro-dynamic machines. It seems to us a pity that so little of M. Hospitalier's own experimental work is given, especially when we call to mind a remark made by one of our best electrical engineers, to the effect that no person whom he had ever met seemed to so thoroughly understand these machines as M. Hospitalier. We are glad to see that some machines are mentioned, more to intimate that they are faithful copies of others than as possessing any feature worthy of distinction. Secondary batteries are described as "electric transformers." The work of Planté, Faure, Sutton, Houston, Thomson, and D'Arconval is amply recognised. This concludes Part I. of the work; Part II. deals with electric lighting. The various arc lamps, semi-incandescent and incandescent lamps most generally used are described, and it is here that the principal additions have been made by the translator. Part III. is devoted to telephony, and Part IV. to various applications of electricity not previously treated.

As might be expected when a science has no recognised nomenclature, some of the terms used by writers on the Continent differ from those in use here. We have given up the word "tension" as used in this work, we also generally talk of electro-motive force, not electro-motive power; both terms, however, are used. Clerk-Maxwell, than whom could no better be followed, uses C not I to indicate current, and has Ohm's law, $C = \frac{E}{R}$ not $I = \frac{E}{R}$. On the whole the work is rendered into very good English, and reflects credit on the translator. It would have been better in several cases if the complete descriptions of apparatus had been given instead of referring the reader to the pages of periodical publications. The latter are necessarily fragmentary, while the aim of a book is rather to gather up the disjointed facts and give them completeness.

ELECTRICAL ACCUMULATORS OR SECONDARY BATTERIES.

By PROFESSOR OLIVER J. LODGE, D.Sc.

No. V.

I NOW proceed to the complete investigation of the most advantageous conditions when charging a set of similar secondary batteries with a shunt dynamo driven at a constant speed :—

Let P be the horse-power actually applied to the driving of the dynamo when it is in full action, at the given speed, as determined by a dynamometer.

Let P^1 be the power required to drive the dynamo at the same speed when it is not allowed to produce any current whatever ; that is, the power necessary to overcome the friction and the resistance of the air. So that $P - P^1$ is the whole horse-power available for electrical purposes, and of this some will be expended in heating the armature and field magnet wires.

Let A be the resistance of the armature wire in ohms.
B the resistance of the wire on the field magnets.
R the resistance of the leading wires conveying the current to the cells.
r the resistance of each of the cells.

Let $N (= n\,m)$ be the number of cells being charged—arranged n tandem and m abreast.
e the maximum electromotive force in each cell opposing the charging current in volts.
c the current flowing through each cell in Ampères.
b the current flowing through the field magnets of the dynamo.
E the difference of potential between the terminals of the dynamo when it is in action charging the cells.

Of these quantities it is essential that E shall be greater than $n\,e$ if the cells are to be charged at all. If $n\,e$ is the greater they are slowly discharging themselves through the dynamo and are helping to turn it. The nearer $n\,e$ comes up to E the easier will it be for the engine to drive the dynamo, and as soon as $n\,e$ exceeds E it will begin to drive the engine instead of the engine driving it. If the engine strap is slipped the dynamo will go on turning at the expense of the now discharging battery in the same direction as when it was charging it.

The following relations hold among the above quantities :—

$$E = n\,e + n\,r\,c + m\,R\,c \quad \ldots\ldots \quad (1)$$
$$E = B\,b \quad \ldots\ldots \quad (2)$$
$$746\,(P - P^1) = E\,(m\,c + b) + A\,(m\,c + b)^2 \quad \ldots \quad (3)$$
$$E + A\,(m\,c + b) = \Phi\,(b) \quad \ldots\ldots \quad (4)$$

The last being a statement that the whole electromotive force generated by the revolving armature is a function of the current flowing round the field magnet; but what that function is depends upon the construction of the machine, and especially upon how near the iron of the magnets is to being saturated. If it is saturated the function is a constant; if it is nowhere near saturation, the function is simple proportion. It can be determined by experiment and plotted.

Of all the above quantities,

P^1 has a fixed value determined by the speed employed, and ascertainable by direct measurement.

e and r may also be taken as fixed and known quantities, for the size of the cell is a matter of convenience, and this determines r ; while e is a function of the materials used in the cells, and for Planté or Faure it is about $2\frac{1}{2}$ volts.

R is easily measured, and can be made as small as convenient.

A and B are also easily measurable, and though not uncontrollable, must yet be considered fixed for a particular dynamo.

n and m are of course completely under control, and we have to determine what is the most economical ratio $n : m$. But at present they can be regarded as given quantities.

The remaining four of the above quantities, viz., c b, P, and E, are dependent variables, and are given in terms of the others by the preceding four equations.

The number of thermal units (water—gramme—degree —centigrade) produced every second is :—

At the bearings and in the air churned by the machine, $178\,P^1$;

in the armature $\frac{A}{4{\cdot}2}\,(m\,c + b)^2$;

in the field magnet $\frac{E^2}{4{\cdot}2\,B}$;

in the cells $\frac{1}{4{\cdot}2}\,N\,r\,c^2$;

in the leading wire $\frac{1}{4{\cdot}2}\,R\,m^2\,c^2$;

The energy utilised as chemical work is $N\,e\,c$.

What we want of course is to make this last term as great as possible in comparison with the preceding five terms. Now it goes without saying that the smaller P^1 and R can be got the better. It also appears from the second and third of the above terms that it is good to have A small and B large. But what about N? N appears as loss only in the fourth term, and as gain in the sixth; hence it must be advantageous to make N large. But then N contains two factors n and m ; and the second of them appears squared in two of the above loss terms; hence, though it is good to have n as large as possible, it is quite a question how big m should be. We find, however, by a little calculation, that to make $N\,e\,c$ as large as possible, compared with the other terms, that is to make the ratio of useful work to the waste a maximum, we must have—

$$\frac{m}{n} = \left(r + \frac{e}{c}\right)\left(\frac{A + B}{B^2\,(A + R) + 2\,A\,B\,R + R^2\,(A + B)}\right)^{\frac{1}{2}} \quad . \quad (5)$$

or since R and A are, in practice, small, compared with B, we may say that the best possible value of the ratio $m : n$ is very approximately

$$\frac{m}{n} = \frac{e + r\,c}{B\,c}\sqrt{\left(\frac{A + B}{A + R}\right)} \quad \ldots \quad (5^1)$$

We perceive, therefore, that the best value of m depends upon c. If the current flowing through each cell is very weak, a large number may be arranged abreast; but if c is pretty strong m must not be great. Now, the permissible value of c depends entirely upon the size of the cell, for it is the "intensity," or as some call it the "density," of current—that is the current per unit area of electrode—which is to be kept small. But though a very small current is economical, not only because it reduces the waste heat, but, more important still, because it allows the chemical changes to go on slowly and steadily without evolution of gas or secondary disturbances ; yet in practice a charging current of only one Ampère through large cells would be felt to be somewhat tedious, and an allowance of five Ampères would still be very moderate.

I will therefore suppose that the actual value of c is determined by practical convenience, and is measured by a galvanometer. Equation (5^1) fixes the best value of m in terms of n—but what is the best value of n? The equations indicate that the nearer $n\,e$ is to its maximum permissible value the better. This maximum value is

$$E_0 = \Phi\,(b_0) - A\,b_0 \quad \ldots\ldots \quad (6)$$

But if it is too near this value, not only will the charging be very slow, but, unless the engine is absolutely steady, there will be a risk of the cells sometimes helping to drive it. It need not be so very far short of this upper limit, however, for the current tapped off through the outer circuit ($m\,c$) will not be usually great enough to reduce b much below its maximum value b_0, nor E much below E_0 ; and so we may put pretty nearly

$$n\,e < E_0 - A\,m\,c$$
$$= B\,b - A\,m\,c \quad \ldots\ldots \quad (7)$$

Or putting in the best value of m from (5^1) we get

$$n = \frac{b\,B^2\,\sqrt{(A + R)}}{e\,B\,\sqrt{(A + R)} + (e + r\,c)\,A\,\sqrt{(A + B)}} \quad . \quad . \quad (8)$$

The current through the field magnet which enters into this expression is not an absolute constant, even at a given speed, since it depends somewhat upon how much current is tapped off through the outer circuit—that is, upon $m\,c$. Nevertheless, if the wire on the magnet has a properly high resistance, it will be found that b is very nearly independent of $m\,c$, unless the latter is enormous. And as we have expressly said that $m\,c$ is not to be very great, we may regard the value of b at the given speed as nearly constant, and may measure it with a galvanometer.

Practically, the value of n would be determined by adding to the series of cells until the current is brought down to the desired small value, taking care that the limit E is not too nearly approached, for fear that a diminution in the speed of the engine might cause it to fall below $n\,e$.

Observe that the greater n is the greater m may be too, so as to maintain the most economical ratio (5).

Liverpool. O. J. L.

IMPORTS OF RAW AND MANUFACTURED IRON.

EVERY one interested in the iron and steel industries of our country is familiar with the difficulties wherewith the manufacturers have to battle by reason of foreign competition. But it is not generally known that the struggle is not solely confined to sustain a position abroad. During recent years it has been extended to our home markets. Not only have the raw and half manufactured materials been freely imported from various quarters of the globe, but foreign manufactured iron and steel work, comprising building materials, rails and plates, have now a place of some importance in our dealings. Belgian, German, and other foreign foundries, have supplied the United Kingdom with their produce to an aggregate value of £7,278,654 during the short space of five years, 1876 to 1880. This is very nearly double the amount paid to foreign manufacturers during the previous five years, 1871-75, when the imports summed up to £3,902,079. Prior thereto, imports into the United Kingdom of manufactured iron were things almost unknown, saving in the shape of a few articles of steel of comparatively little importance. As for the raw materials, there were for several generations imports of very microscopic dimensions ; they consisted of charcoal ores from Russia and the Scandinavian States. During the ten years 1861-70 the total value of foreign ore imported was but £618,658. In the following decade, 1871-80, the value was equal to £9,446,500. The bulk of these imports came from Spain.

Pig iron had likewise but a small demand, so far as it concerned foreign products. But a change has intervened, as will be seen from the subjoined figures, giving the value of imports of pig iron for the past two decades :—

1861-70, total imports, value	...	...	£672,972
1871-80, do. do.	...	...	3,262,521

A five-fold increase during ten years. Not fully two-thirds of this supply came from Sweden, the remainder from Westphalia, shipped *in transitu* through Holland. The item therefore appears in the Board of Trade Returns as imports from the Netherlands. Unwrought bar iron has been imported from time immemorial from Russia and Sweden. The aggregate supply of this commodity has doubled within the last twenty-five years.

A carefully compiled table, subjoined hereto, tends to show that the total imports of all descriptions of iron and iron or steel work has risen, so far as the supply from European countries is concerned, from £3,097,288 in 1856-61, to £19,910,984 in 1876-80. Independent thereof, there are imports of iron manufactured from the United States, as well as ore from Algiers, Asia, and other countries out of Europe. The second table is designed to illustrate the value of each special commodity, distinguishing the raw material from manufactured iron and steel. The aggregate amount furnished by German establishments occurs under the head of imports from the Netherlands. The Dutch foundries are mainly calculated to supply domestic wants. They export little or nothing. It is clear, therefore, that these imports comprise the product of the districts of Essen and Bochum. The Belgian manufacturers have managed to introduce the thin end of the wedge, and, to the activity of Belgian and German agents, a certain amount of credit is due for the pressure brought on railway companies with the view of securing special rates of freight. By reason thereof, English manufacturers have often been beaten at their own door. These foreign manufacturers began in an exceedingly small way Nothing daunted, they have travelled the uphill road, and manufactured iron, of which the United Kingdom imported, during the quinquennial period of 1856-60 to an extent only of £18,556 ; it has been swelled to £7,278,654 during the five years 1876 to 1880. Unfortunately, the record of our exports during the same period tends to shows a movement in the opposite direction.

THE IMPORT OF IRON AND STEEL.

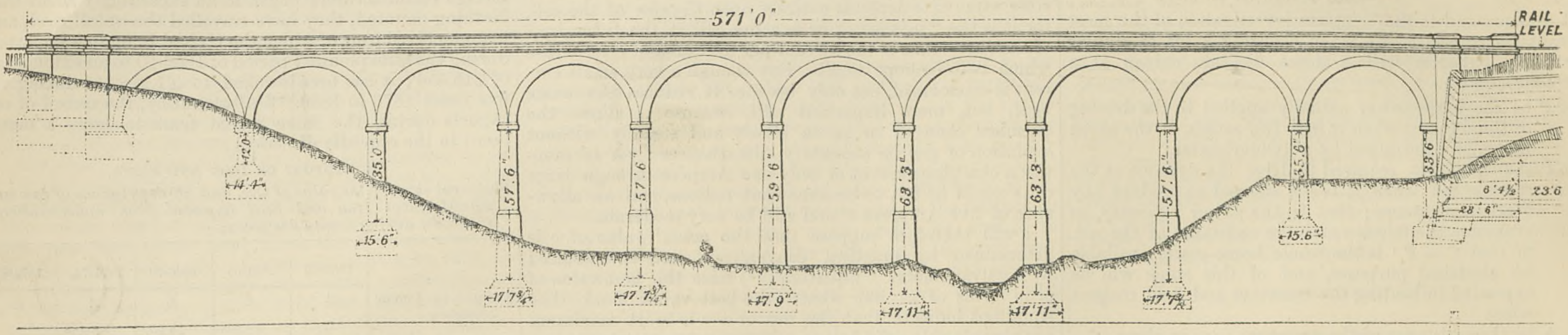
Statement showing the value of Ore, and all descriptions of raw and manufactured Iron and Steel imported from undermentioned Countries during twenty-five years :—

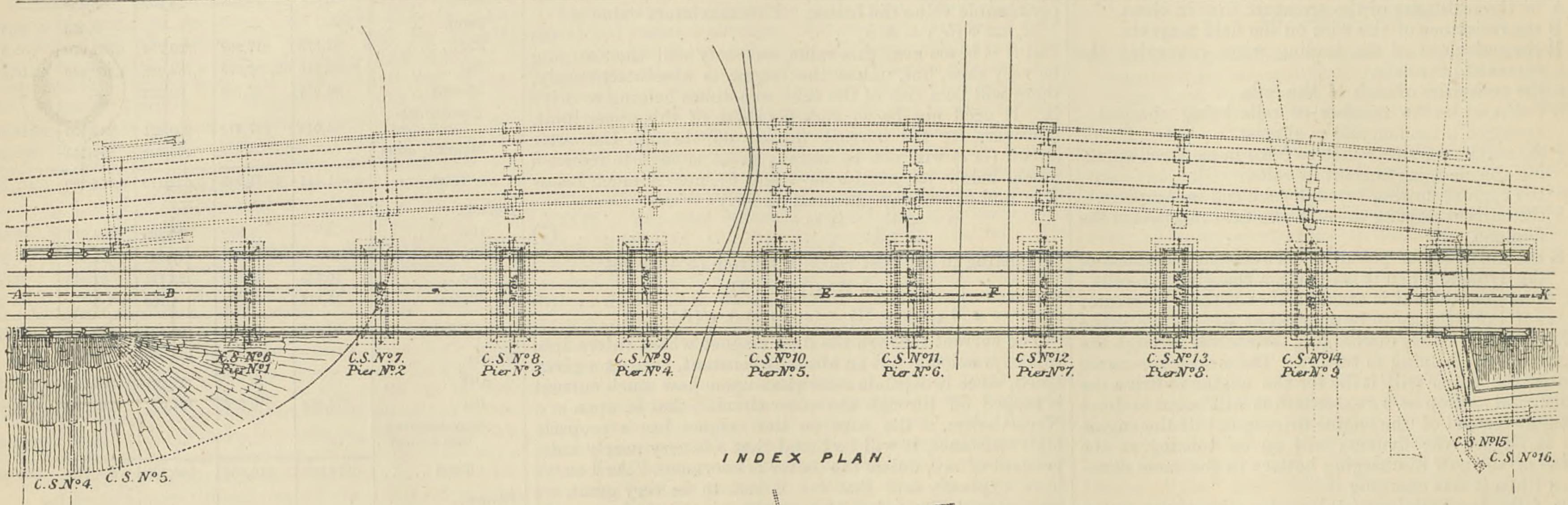
	1856-60	1861-65	1866-70	1871-75.	1876-80
Imports from Sweden—	£	£	£	£	£
Ore	—	12,894	10,767	6,450	—
Scrap	—	—	—	9,468	42,446
Pig	93,373	217,902	320,778	1,351,079	643,356
Bar	2,430,815	2,292,026	2,754,085	4,463,349	4,516,418
Blooms	64,251	96,708	89,323	—	—
Unmanufactured steel	64,012	247,412	350,921	244,105	144,372
Manufd. steel	—	—	106,301	277,754	971,195
Total	2,651,441	2,871,942	3,632,175	6,302,200	6,317,787
Norway—					
Ore	—	8,372	46,665	104,657	16,958
Pig	—	2,874	17,981	22,615	5,271
Bar	10,548	23,908	23,141	21,848	8,661
Bloom	15,875	7,867	4,706	—	—
Total	26,423	43,021	92,493	149,120	30,390
Russia—					
Ore	—	—	22,297	278,583	246,609
Bar	376,686	210,956	124,093	115,590	20,066
Manufactured iron & steel	—	—	—	—	123,341
Total	376,686	210,956	146,390	394,173	390,016
France—					
Manufactured steel & iron	—	249,618	459,152	534,415	497,808
Belgium—					
Pig	3,143	—	—	—	—
Bar	8,913	22,786	102,363	205,204	514,760
Manufactured iron	5,578	285,228	558,417	2,097,527	2,800,344
Total	17,634	308,814	660,780	2,302,731	3,315,104
Netherlands—					
Pig	—	4,242	109,195	878,825	361,315
Bars	—	13,604	232,010	116,971	92,674
Unwrought steel	1,600	137,327	189,976	286,800	191,795
Manufactured steel & iron	9,641	352,511	726,131	1,042,333	2,885,966
Total	11,241	507,684	1,257,312	2,324,909	3,531,750
Spain—					
Ore	13,865	130,680	375,983	2,909,787	5,750,515
Portugal—					
Ore	—	—	—	55,851	77,575
Total Europe ..	3,097,288	4,321,952	6,624,285	14,973,380	19,910,984

Statement showing the values of Iron Ore and all descriptions of unwrought and manufactured Iron and Steel imported into the United Kingdom during twenty-five years from undermentioned Countries :—

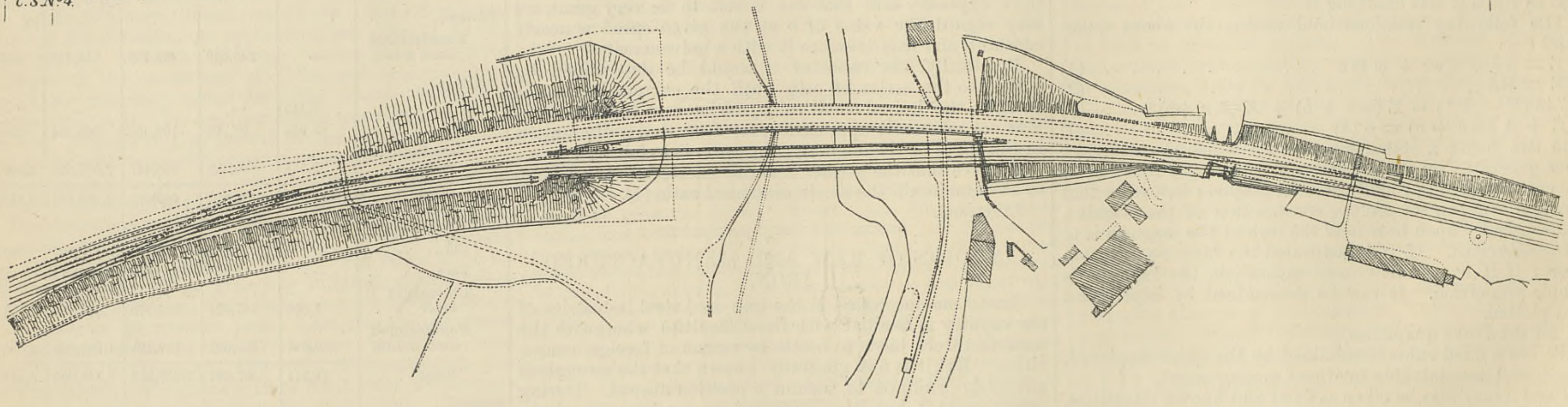
	1856-60.	1861-65.	1866-70.	1871-75.	1876-80.
Iron Ore from—	£	£	£	£	£
Sweden	—	12,894	10,767	6,540	—
Norway	—	8,372	46,665	104,657	16,458
Russia	—	—	22,297	278,583	246,609
Spain	13,865	130,680	375,983	2,909,757	5,750,515
Portugal ..	—	—	—	55,851	77,575
Total	13,865	161,946	455,712	3,355,388	6,091,157
Pig Iron—					
Sweden	92,373	217,902	320,778	1,351,079	643,356
Norway	—	2,874	17,981	22,615	5,271
Netherlands..	—	4,242	109,195	878,885	361,315
Total	92,373	225,018	447,954	2,252,579	1,009,942
Bars, unwrought					
Sweden	2,430,815	2,297,036	2,754,085	4,463,344	4,516,418
Norway	10,548	23,908	23,141	21,848	8,661
Russia	376,686	210,956	124,093	115,590	20,066
Belgium.. ..	5,578	22,786	102,363	205,204	514,760
Netherlands ..	—	13,604	232,010	116,971	92,674
Total	2,823,627	2,568,280	3,235,692	4,922,957	5,152,579
Steel, unwrought					
Sweden	64,012	247,412	350,921	244,105	144,372
Netherlands..	1,600	137,327	189,976	286,800	191,795
Total	65,612	384,739	540,897	530,905	336,167
Steel and Iron, manufactured—					
Sweden	—	—	106,301	227,754	971,195
Russia	—	—	—	—	123,341
France	—	249,618	459,152	534,415	497,808
Belgium ..	8,913	285,228	558,417	2,097,527	2,800,344
Netherlands..	9,641	352,511	726,131	1,042,383	2,885,966
Total	18,554	887,347	1,850,001	3,902,079	7,278,654
Blooms, scrap and broken iron and steel— Sweden, Belgium, &c. ..	83,269	94,573	94,028	9,468	42,446
Total all Europe..	3,097,288	4,321,953	6,624,285	14,973,280	19,910,954

VIADUCT AT STOURBRIDGE, GREAT WESTERN RAILWAY.





INDEX PLAN.



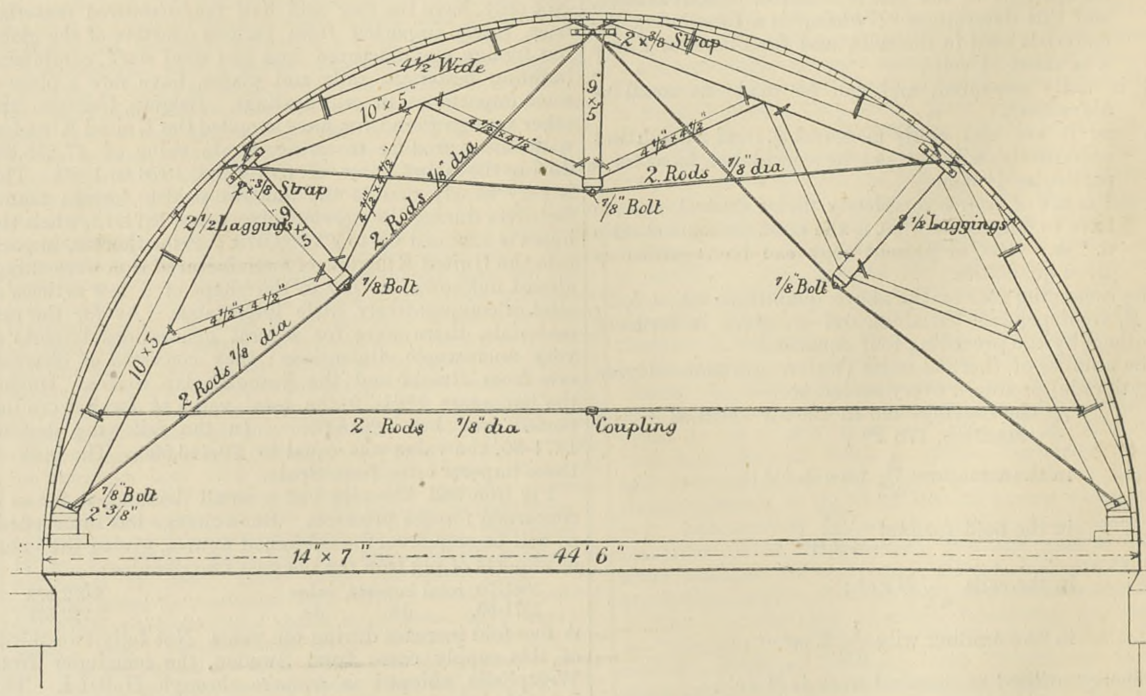
VIADUCT RECONSTRUCTION ON THE GREAT WESTERN RAILWAY.

THE Great Western Railway Company is carrying out some extensive works of this description in Worcestershire, on the Oxford, Worcester, and Wolverhampton section of their line. On Sunday, the 14th ult., was opened for traffic a new viaduct of brick and stone at Stourbridge, to replace the old timber structure, which has stood about thirty years. The new viaduct is built on the west side of the old one, and the rails diverted on to it. It is 571ft. long, and 98ft. high at the highest point. Built of very high-class Staffordshire brindled bricks, it has a handsome and pleasing effect when seen from the valley below. There are ten semicircular arches of 44ft. 6in. clear span, faced with blue pressed bricks, and these arches spring from Derbyshire stone springers 2ft. 9in. high and 7ft. across. The piers are 6ft. thick under the springers, and batter outwards 1 in 40. The plinth is 31ft. below springers, and is of blue brick splayed 6in. projection, 9in. high. The parapets are relieved with string course and coping of Derbyshire stone.

The deepest foundation is that of the north abutment, the end nearest Wolverhampton, which is carried down to a depth of 46ft. below ground, and was a difficult piece of work owing to its contiguity to the abutment of the old viaduct and the main line. Over 1000 tons of concrete were put into this foundation. The other foundations vary in depth from 36ft. to 18ft., and are either on sandstone rock or hard fireclay. The centres were of very light construction, as shown in the accompanying figure. The combination of timber and iron resulted in elasticity which allowed the arches to take their form while the centres were yet under them, and no settlement took place after their removal. On September 20th, 1880, the first excavation was commenced; on October 13th of the same year the first brick was laid, and the last coping stone was bedded January 11th, 1882, the viaduct having been under sixteen months in progress. Messrs. Kellet and Bentley carried out the work in a very efficient manner. The cost of the viaduct was £13,835. Mr. W. D. Robotham, of Wolverhampton, was the engineer, represented on the works by Mr. C. R. Williams.

The same firm of contractors are building a similar viaduct at Blakedown, near Kidderminster, for the same company, which will be completed towards the end of the current year. This viaduct is shorter by one opening than Stourbridge viaduct, and of less height, but otherwise is a *fac simile*. It is likewise being built alongside the old viaduct.

The third viaduct in this district—the contract for which is now open—is that at Hoo Brook, near Kidderminster. This will be a more extensive work, as there are twenty arches, and its average height is about 70ft. A description of this will be given on its completion.



STEEL SHIPS STERN FRAMES, STEMS, AND RUDDERS.

SOME very large castings have been made during this century, and complex castings too, so it may not be altogether beyond the range of possibility that some day a founder or metallurgist will arise who shall show the world how to cast steel ships all of a piece. It would truly be a big piece of founders' art, and graving docks to be plastered and sanded up to the outer form of a big ship might not be common, and monster cores might be difficult to hold up and to vent; but if it were shown that the shells of ships could be cast it would not be impossible to range cupolas along a monster mould and do it within the present decade. Messrs. Cooke and Mylchreest, of Liverpool, have begun with the thin end of the wedge, and are only casting steel stern frames, rudders, stems, keels, keelsons and stringers. It will be seen from the series of engravings which we give on page 13, that the rudders are made with the head in one solid piece, with the object of avoiding a bad weld, this being a source of considerable danger in built-up rudders, and also to avoid the use of a hollow plate structure in which corrosion proceeds quietly and harmfully. By making the rudders of cast steel, the stops for preventing the rudder from going too far over may be more in number, and in the drawings it will be seen that there is one to each joint, thereby steadying the rudder better and safer than by relying on one on each side, as at present, and that they are solid instead of being rivetted on. The stern frames are made with attachments for transom plates to connect them with the frames of the vessel as well as the shell, and this is done on the inner or outer post or both. It will be also seen that a portion of the keel, keelson, and garboard strake are made with the frame, so that there will be a much better connection than at present with the keelson.

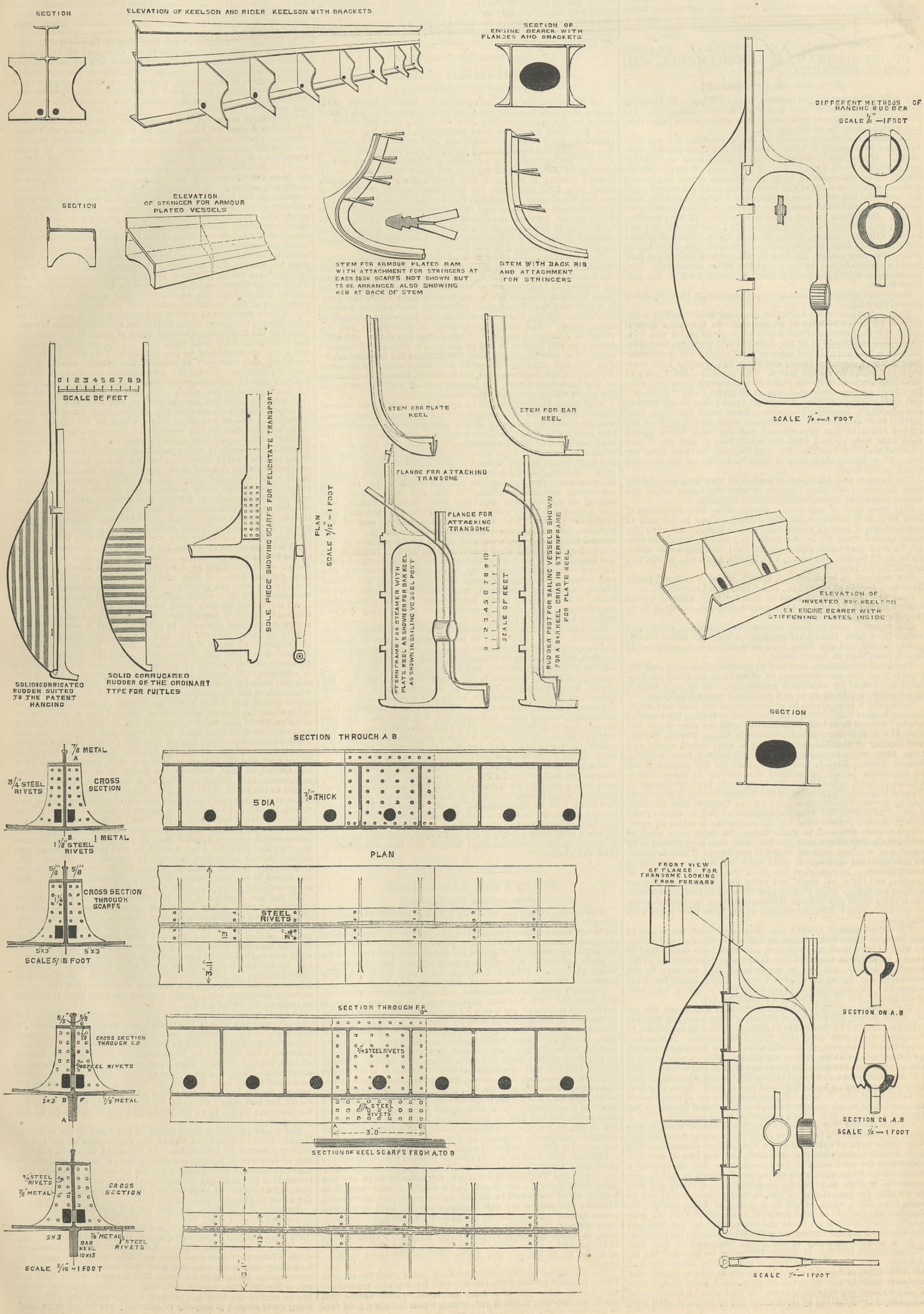
Some of these keels and keelsons are now being made for testing purposes, and it is expected that from the fact of their being solid, that is the keel—either a plate or bar keel—keelson, rider keelson, and brackets to attach the floors, that they will be found to be considerably stronger, while they have the advantage of requiring very few rivets for connection. As angle iron or steel is dispensed with, the limber holes may be made very near the skin, and as they do not require to be above the angle frames as at present, a much smaller quantity of cement than now used will be required; this will probably, the inventors think, reduce the weight of cement in a 2000-ton vessel by 50 tons. Stringers made under the invention in solid sections, and in forms that cannot be rolled—as, for instance, with large brackets—offer very considerable constructive advantages; advantages which will perhaps have the greater importance in vessels of war.

The engravings show also some forms of stems for war vessels. These again are cast with connections which cannot be got in the manner or in the desirable form shown, by forging.

Another feature of the invention is that it is intended to connect the plating of the hull, not in the ordinary way by drilling and rivetting through the stem and stern frame, but by having a portion of all the strakes of the vessel solid on each frame and

COOKE AND MYLCHREEST'S STEEL CASTINGS.

(*For description see page 12.*)



stem respectively, thus giving a diagonal fastening of the plating to the stem and stern, instead of the short nip the rivetting has in the present method. Several stern frames and runners made in crucible steel have already been completed, and some large ones are being made by the Steel Company of Scotland, on the Siemens-Martin process. Messrs. Jessop and Sons, of Sheffield, made that lately exhibited at the Naval and Submarine Exhibition.

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

(*From our own Correspondent.*)

FIRMNESS characterised the business done on 'Change in Birmingham to-day—Thursday—and yesterday in Wolverhampton. Indeed there were finished iron makers who sought better prices than last week by from 5s. to 10s. per ton.

The makers of sheets needed by the galvanisers led the way. Instances were quoted in which sheet mills had three months' work ahead. Quotations by the chief medium sheet firms were to-day and yesterday based upon £7 15s., £8, and even £8 5s. per ton for singles. The difference of only 10s. between either singles and doubles, or between doubles and trebles, was no longer quoted; and the firms who last week were maintaining a difference of 20s. now required 25s., and there were others who required the full difference of 30s. Quotations ranged severally at singles, £7 15s.; doubles, £9 5s.; and trebles, £10 15s.; singles, £8; doubles, £9 5s.; and trebles, £10 10s.; singles, £8 5s.; doubles, £9 10s.; and trebles from £10 10s. to £10 15s. Buyers mostly declined to give these higher prices, nor were makers all firm at the revised rates; but they would not meet buyers to the extent the latter demanded. New transactions were consequently fewer in sheets than in the past three weeks.

Hoops and strips were steady at all the money that regulated sales a week ago.

Plate orders were sought after at, for good boiler-making sorts, £9, and for bridge building at £8 per ton. In the latter department the competition of the North of England plates was felt. These were obtainable at £7 10s. delivered into South Staffordshire. High-class bars are in better request for Canada, the Australias, New Zealand, and the Cape; and there has recently been some buying of such iron for the States. The purchases are known to have been augmented by the strike of ironworkers upon that side. Earl Dudley's bars are quoted firm at £8 2s. 6d.; and "B. B. H." and similar brands £7 10s. From that figure prices to-day tapered down to £6 10s. according to quality. More small bar firms have notified their adhesion to the compact arrangement to keep the rate of extras in that department; and the rates before agreed upon have been revised with the result that $\frac{3}{16}$ and No. 6 now stand at 45s., No. 7 at 65s., No. 8 at 95s., and No. 9 at 135s. per ton. These figures are a drop of from 5s. to 10s. per ton upon the terms earlier fixed.

The London and Liverpool exporters of tin-plates are making freer inquiries; but they hesitate to give the terms which the Staffordshire and Worcestershire makers stipulate.

Pigs were slow of sale to-day, though there were consumers of both forge and foundry sorts who desired to buy in advance of requirements if makers would accept their terms. All-mine pigs were quoted from £3 7s. 6d. to £3 10s.; Barrow hematites were £3 7s. 6d.; part-mine pigs were £2 10s.; Willingsworth sorts, £2 5s. to £2 7s. 6d.; and Spring Vale brands, £2 2s. 6d., £2 12s. 6d., and £3 2s. 6d. respectively.

Ore was not in brisk request, though native "gubbin" might have been bought at about 14s., and "blue flats" at within 15s.

Coal was procurable at from 6s. 3d. for forge sorts of a poor quality up to 6s. 9d. and 7s. for a good description, and from 8s. to 9s. for excellent furnace kinds.

The furnaces now in blast number 48; but there are several which have been thoroughly repaired—certain of them, indeed, nearly rebuilt, and are being kept in readiness to be relighted at hardly more than an hour's notice.

The steel experiments continue to be much discussed; and the reports from the manufacturers by whom slabs are being manipulated are looked for with much expectation. So far as is known, these reports are likely to be of a somewhat varied description.

Enterprise is being shown by at least two of the cable and chain-making firms of this district, with the object of making steel-welded goods. Several firms had experimented with the same object, but they had come to the conclusion that only Messrs. Brown, Bayley, and Dixon, of Sheffield, were making a steel linked chain, and that they were employing a method distinct from welding. Messrs. Brown, Bayley, and Dixon have for the present, I am in a position to say, abandoned the making of these chains. Chains of steel welded links are being made here by Messrs. J. Vernon Hope and Co., Limited, of the Atlantic Works, Wednesbury, and by Messrs. Forrest, Bros., and Co., of Cradley, near Birmingham. The first-named firm make cables as well as chains; and though Messrs. Forrest have not at present made cables of steel, they are quite prepared to make them. In these cases steel of acknowledged quality which has for some time been proved to be capable of welding without injury is employed. There is reason to conclude that unsuccess in other cases was mostly a question of manipulation. Nevertheless the fault was laid at the door of quality, and there are chain and cable firms hereabouts who are looking for success when they employ the steel of local production. Such firms are as yet without information upon the issue thus far of the trials that I have mentioned which have been made with that steel.

The colliers around Dudley are dissatisfied with the ruling of the Superior Court in the action of Griffiths *v.* the Earl of Dudley, to which I have previously referred, and they have determined to start a subscription to enable Mrs. Griffiths to take her case to the Court of Appeal. It will be remembered that contrary to the opinion of Sir Rupert Kettle, the County Court Judge for Worcestershire, the Superior Court has ruled that a collier may contract himself out of the Employers' Liability Act.

The Birmingham Town Council on Tuesday sanctioned the use of steam power, for a term not exceeding three years, by the Birmingham and Aston Tramways Company, subject to conditions to be agreed upon with the Public Works Committee. It is understood that the engines, which will travel from Corporation-street to Aston, will go at the rate of six miles an hour—a pace which is the same as that at which the horse cars are allowed to travel; and the company have volunteered to give the Council a guarantee that they will put down a much improved line of rail. Some members of the Council were in favour of permitting the use of steam on all the tram lines which chose to use it, but the general opinion of the Council was averse to so wide a permission being granted.

On Monday the Walsall Town Council had before them a proposal for purchasing a locomotive engine for drawing from the railway siding the coal used at the new Corporation Gasworks. The cost of such haulage last year was £280, and the Gas Committee think that the work could be done much better and cheaper by a locomotive. The cost of such an engine of from 6 to 8-H.P. was estimated at £500, and allowing for percentage on outlay and cost of working, the annual expenditure, it was believed, would not be more than £109, which would be a saving of £170 yearly. No decision was come to in consequence of a suggestion that the railway company might agree to do the haulage for 1d. per ton, and the General Purposes Committee will further consider the proposal.

At a monthly meeting of the South Staffordshire and East Worcestershire Institute of Mining Engineers, on Monday, Mr. H. Johnson, jun., vice-president, read a paper "On Electricity and the Utilisation of Small Coal." He said it had been stated over and over again by electricians that they could carry stored electricity without any appreciable loss. If that were so, he saw great advantages to be derived by electricians and coalmasters alike from bringing the motors to the coal instead of taking the coal to the motors. One of the chief advantages to the company supplying the electricity would be the reduced price of fuel at the pit's mouth, and the non-necessity for expensive sites as in boroughs. The advantage to the coalowners would be a constant demand for the smallest coal or slack which could not now be sold at a profit. Mr. J. Davies wondered what sort of plant would be required at a colliery to supply a large town with electricity. From what he had seen it required heavy machinery to produce the electric light. The paper was considered a suggestive one, and the best thanks of the meeting were accorded to the author.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

DR. WEBSTER, the Consular agent for the Sheffield district, in his return of exports from the town and neighbourhood to the United States for the quarter ending 30th June last, does not afford us such gratifying results as were anticipated. Steel has been exported to the value of £105,929, and cutlery £53,673, the respective totals for the corresponding period of 1881 being, £82,925 and £55,577, the latter showing a decrease of £1904, and the former an increase of £23,004. But it is in the gross values that the decreased trading is apparent, the total exports for last quarter being only £326,440, while for the June quarter of 1881 they reached the amount of £360,587; the decrease being thus £34,147. The falling-off must be in steel rails, Bessemer blooms, and similar heavy goods. Of these the Consul gives no specific return, as the trade being in so few hands, it would practically be revealing each other's business. A diminution in value of over £34,000 in a single quarter is undoubtedly a serious matter.

The exodus from Dronfield to Workington is quietly proceeding. Messrs. Charles Cammell and Co. have not removed the works, but the Dronfield people are taking time by the fore-lock, and finding for themselves new quarters at Workington. Dwelling-houses for three hundred workmen are to be erected close to the new yard. It is said that the Workington authorities are likely to get into trouble through the Derwent and Moss Bay Ironworks requiring so much water. The neighbouring town of Harrington and the village of Distington are short of water from this cause. An additional pipe will have to be laid to the lake, a distance of fourteen miles. The present supply cost £20,000, and the proposed extension will add £15,000. Dronfield was about eaten up by rates. Workington is not quite so bad, but with this extra expense looming in the immediate future, the present rate of some 6s. or 7s. in the pound will be materially increased.

A pleasant incident has to be noted this week. Mr. Samuel Osborn, head of the old-established Clyde Steel and Iron Works, was presented on Saturday with a splendid silver candelabrum, two pretty side dishes, and an enamelled silver salver. On the candelabrum was this inscription:—"To Mr. and Mrs. Samuel Osborn, in honour of their silver wedding day, from the partners and employés of Messrs. Samuel Osborn and Co., June the 11th, 1882." Messrs. James Dixon and Sons, of Cornish-place, supplied the presents. The occasion was really a double event, for while celebrating the silver wedding of Mr. and Mrs. Osborn, the coming of age of their son, Mr. Wm. Fawcett Osborn, was also honoured. There were over 650 members of the staff and employés present. Mr. George Jackson Smith, one of the partners, in making the presentation, said that the firm of Samuel Osborn and Co. were now in the proud position of the second largest private steel manufacturing firm in Sheffield. It was mentioned by the head of the railway department—Mr. George Tilfourd—that in addition to the home representatives the firm had others in Belgium, France, Germany, Russia, the United States, Canada, and Australia, while business was also done in India, China, Japan, South America and South Africa—their manufactures, indeed, being carried over nearly every sea and found in nearly every land.

The new line of railway between Lincoln and Spalding is now completed. It is forty miles in length, and has cost £1,000,000. For the purposes of construction, it was divided into two sections—the first, from Spalding to Ruskington, being carried out by Messrs. Kirk and Parry, contractors, under the supervision of Mr. A. A. Langley, M.I.C.E., engineer to the Great Eastern Company; the second, from Ruskington to Lincoln, was constructed by Messrs. Baker and Firbank, contractors, under the supervision of Mr. R. Johnson, M.I.C.E., engineer to the Great Northern Company. The latter part, twenty miles in length, has cost £300,000. The permanent way is laid throughout with steel rails 30ft. long. By this new line the Great Eastern, in addition to other advantages, has running power to Black Bar Junction, at Doncaster, so that the whole of the Yorkshire coalfield is thus opened up to them.

In reference to the statement mentioned last week that "Messrs. Burgon and Ball, of the La Plata Works, Malin Bridge, Sheffield, have been informed by telegram that they have gained a gold medal for their sheep-shears, exhibited at the New Zealand Exhibition, now being held at Christchurch," Messrs. Ward and Payne write to say:—"We beg to observe from the official catalogue which has just been received we find the facts are as follows:—'First order of merit and silver medal, Ward and Payne, Sheffield, tools and shears of excellent workmanship; Burgon and Ball, sheep-shears, price and quality.'"

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—There has been only a limited amount of business doing in the iron market here during the past week, and the recent spurt now seems to have expended itself. No doubt the considerable purchases made during the last few weeks have pretty well covered the actual requirements of buyers for the present, and the advance in prices has tended to check the placing out of orders of a speculative character. Makers, however, hold very firmly for their prices, and there has been no real pressure to sell.

Tuesday's market at Manchester was only moderately attended, and with but little business stirring was not of long duration. Lancashire makers of pig iron were firm at their full rates of 45s. to 46s. less $2\frac{1}{2}$ for forge and foundry qualities, delivered equal to Manchester, and at these figures they have done a moderate business, chiefly in forge qualities, during the week. In outside brands, although the last advance has scarcely been realised to the full, makers have not been giving way to any material extent, and it is only in exceptional cases that iron is to be bought at prices approaching late rates. For Lincolnshire brands quotations go up to 46s. 6d. and 47s. 6d., less $2\frac{1}{2}$, and for Derbyshire up to 48s. and 49s., less $2\frac{1}{2}$, for forge and foundry numbers, delivered equal to Manchester. At a trifle under these figures sales have been made, but odd lots of Lincolnshire have been offered at as low as 45s. 6d. per ton. In Middlesbrough iron occasional sales for special requirements are made on the basis of about 52s. per ton, net cash, for g.m.b's. delivered equal to Manchester.

Finished iron makers are in a better position than they were a short time back. Most of the Lancashire forges are now fairly employed, and although there is not any actually large business being done, there is a fair inquiry in the market. Bars can still be bought at as low as £6 7s. 6d. for delivery into the Manchester district; but makers are not anxious sellers at that figure, and prices generally are stiffening up to about £6 per ton. For hoop iron, however, the inquiry is still only limited, this branch of trade being at present adversely affected by the unsettled state of affairs in Egypt, and I have heard of quotations in the market at as low as £6 5s. to £6 10s. per ton for hoops delivered equal to Manchester.

The position of the engineering trades remains much the same as I have reported for some time back. The large works throughout the district are generally fully employed. Tool-makers and machinists are well supplied with orders, which include a good deal of work in hand for machinery connected with electric lighting whilst I hear of good American orders in hand for cotton machinery. In general machine tools a good trade is being done with France, and German inquiries are again coming into this district.

The old-established engineering firm of Messrs. Nasmyth, Wilson, and Co., Patricroft, is being formed into a limited company. The shares have, however, I understand, been taken up privately, chiefly by members of the concern, and have not been thrown open to the public.

At the annual meeting of the Iron Trades Employers' Association held on Thursday last Mr. David Greig, of Leeds, was re-elected the president for the ensuing year, and a resolution was passed recommending the General Committee of Management to revise the rates of subscription, with the view to widening the basis of the Association. An abstract of the annual report, which was presented and adopted at the meeting, was given in your columns last week.

The present session of the Manchester Geological Society was brought to a close on Friday last by a meeting held at Wigan, when the programme brought before the members was one entirely confined to questions interesting to mining engineers, of whom there was a large number present. Mr. Chas. Cockson read a paper on "The Relative Efficiency and Useful Effect of Centrifugal Fans for Mine Ventilation." It had become now-a-days, he said, not so much a question as to the superiority of mechanical or furnace ventilation, but which was the best mechanical ventilator, the great majority of engineers having become convinced, on the ground of safety and efficiency, that mechanical was greatly superior to furnace ventilation. Mechanical ventilators might be divided into two classes, the first consisting of the Waddle, Guibal, and Schiele, which were centrifugal ventilators, and the second consisted of those machines which were known as varying capacity ventilators, and acted after the manner of an air pump. The latter class, however, in his opinion, were not at all suited for the enormous volumes of air which were required at the present day for the ventilation of coal mines, and perhaps the most convincing argument as to the superiority of the centrifugal ventilators was that while the varying capacity machines at work in this country might be counted on one's fingers, there were of the Guibal fan alone 250 to 300 at work, whilst on the Continent, where all types of mechanical ventilators had been more fully tried than with us, the centrifugal fan was being put up practically to the exclusion of all others. It was, therefore, only necessary to consider the relative merits of this class of ventilator. Taking the useful effects, results as shown by trials at several collieries, there was little to show that any one fan was superior to the other. The fans in these cases had not been working under the same conditions, and as it was impossible to secure these with present experiments, they must turn their attention to one or two other points which, in his opinion, were quite as important as the question of the percentage of steam utilised. They must first consider what the work of a fan was. Primarily, of course, it was to produce a ventilating current in the mine, and they could calculate what ventilating pressure could be produced by a fan running at any speed. Since the quantity of air in a mine depended upon the ventilating pressure or water gauge that a fan could produce, the question as to which type of fan was able to produce the greatest water gauge was one of great importance, because it might be said that the fan which at a certain speed could produce the greatest water gauge was the most efficient ventilator. As a basis on which to test this class of ventilator they might consider that in all centrifugal fans the air travelled the fan at the speeds at which the tips of the blades were travelling. The work which was stored up in the air when travelling at a certain speed was nearly all lost by open running fans. If they could utilise any of this stored up work by lessening the velocity of the air before discharging it into the atmosphere they would increase the useful effect of the fan. If all this stored-up work could be utilised, and the fan caused no friction to the air in passing through it, they would arrive at what a perfect fan could produce. In order to get at a fair average of results in this respect he had worked out the percentage of efficiency of some six Guibals, three Waddles, and five Schiele fans, and he found they gave the following comparison: Guibal's, 64·5; Waddle's, 44·78; and Schiele, 34·54 of efficiency with regard to water gauge produced. Taking this as a fair basis for calculation, they would find out approximately what each of the three types of fan would do at the same or different speeds, and taking 9000ft. per minute of periphery speed as being about the limit of safe working speed of fans of such dimensions as would pass large volumes of air, he found that working under similar conditions the Waddle would give 16·6 per cent. and the Schiele 26·9 per cent. less air than the Guibal, or that to produce the same amount of air the Waddle would have to run at 20 per cent. and the Schiele at 36·6 per cent. greater speed than the Guibal, so that whatever the result as to the useful effect calculation, they might say that as a matter of efficiency with regard to the speed of the fan, the Guibal was the most efficient. The test of water gauge produced was one of great importance, and would, he hoped, be of service to persons thinking of changing from furnace to fan ventilation. Mr. Wm. Bryham, although prepared to admit that the time was coming when mechanieal ventilation would be more applied than it had been, scarcely thought the time had yet come when it could be said that under some conditions it was altogether superior to furnace ventilation. Mr. Cockson said that no doubt at certain depths furnace ventilation was bound to be more economical than mechanical ventilation, but the question of safety was another point to be considered.

At the last meeting of the Manchester Geological Society the question of mine safety lamps was again discussed, and several different types of lamp were brought forward. Nothing, however, definite was arrived at, except, perhaps, the general conclusion that a perfect lamp had not yet been introduced. Mr. Wm. Bryham said that what colliery proprietors desired to know was what was a safe lamp; at present they were in a state of suspense, and he for one would like to know what conclusion the Royal Commissioners on Mines Explosions had come to. They required a lamp to meet not only the ordinary conditions, but the extraordinary conditions which might perhaps not arise more than once or twice in the life of a mine.

The coal trade continues in a depressed condition, owing to the excessive output sent into the market, and prices as a consequence are kept down extremely low. House coals are, of course, but little inquired for owing to the season of the year. There is, however, a fair demand for ironmaking and manufacturing classes of fuel, but the supplies more than meet all the requirements of consumers. There is a good deal of irregularity in prices where holders of stocks have to push for orders; but quoted rates are without material change, and at the pit mouth average about 8s. to 8s. 6d. for best coals; 6s. to 6s. 9d. for seconds; 4s. 9d. to 5s. 6d. for common; 4s. 3d. to 4s. 6d. for burgy; and 3s. 6d. to 3s. 9d. for good slack.

The wages question is being forced to the front by the action of Messrs. Richard Evans and Co., of St. Helens, one of the largest colliery concerns in Lancashire. At several of their pits a reduction of 10 per cent. is being enforced, which, if carried out, will no doubt be followed more or less generally elsewhere. The men, who realise that this is simply the preliminary to a more general reduction, have resolved to stop, not only the pits directly affected, but the whole of the pits owned by the firm.

Barrow.—The hematite pig iron market continues to be much firmer and steadier every day. Prices are practically unchanged, but the demand is much brisker, and orders are being taken with a little more freedom. From all quarters the demand is good; but that from America especially so. A number of furnaces have been relighted during the past few days, and this will be the means of increasing the production, but even that will not place makers in a position to be able to meet the demand which has set in. Stocks are rapidly declining, as the demand is in excess of the production. Heavy consignments of metal are being made abroad, principally to America; but deliveries on local account are pretty extensive. Steel makers, within the past week or two, have made heavy demands on Bessemer pig iron, owing to the increased demand for steel qualities. No. 1 Bessemer is quoted at 57s. per ton net at works; No. 2, 56s.; No. 3, 55s.; delivery at three months. On no account will makers consent to accept orders extending over three months. Steel rails are firmer in price, being now quoted at £5 15s. per ton. The inquiry is very active, and some good orders have been booked. The mills are running in regular work night and day, except Sundays. The output of steel rails is very heavy, principally to complete foreign orders. Iron ore in good request at unchanged values, 13s 6d. to 16s. per ton at the mines. Iron shipbuilders are rather quiet, other industries in steady employment. Coal and coke in steady request. Shipping active.

THE NORTH OF ENGLAND.

(From our own Correspondent.)

THE Middlesbrough ironmasters held their usual meeting before 'Change on Tuesday last and decided not to alter their prices, which, therefore, remain at 43s. 6d. for prompt f.o.b. deliveries of No. 3 foundry quality. Merchants are now asking fully as much as makers, and in some cases even 1½d. per ton more. They have considerable difficulty in supplying the needs of their customers under contracts entered into as "bear" transactions some time since, and there are many complaints against them on this score. Warrants are rather more in demand than they have been recently, and now command full makers' prices.

The quantity held by Messrs. Connal and Co. at their Middlesbrough stores is now 122,439 tons, or 2285 tons less than a week since. The demand for hematite pig has improved considerably both on the east and west coasts, and several sales have been reported at improved prices.

The demand for finished iron is well maintained. Buyers for postponed delivery have been holding back their orders in hope of lower prices, but there is very great pressure from those whose requirements need immediate attention. In some cases manufacturers have asked and obtained 5s. per ton more for prompt than for deferred delivery. Plates are quoted at from £6 15s. to £7 in trucks, Middlesbrough, and bars and angles at from £6 to £6 5s. per ton.

Materials for iron manufacture are everywhere in excess of the demand for them. This is largely due to the recent ironworkers' strike, at the end of which large stocks had everywhere accumulated. Old rails are now offered at 72s. 6d. ex-ship Tees. Purple ore commands about 18s. per ton delivered Middlesbrough, and covered sand castings £4 per ton.

Towards the close of the market the ironmasters' statistics for June were issued. They show that seventy-nine furnaces are making Cleveland, and forty hematite or basic iron, in the Cleveland district, this being the same number as last month. There is a decrease in the total output of 14,427 tons, one half of which, roughly speaking, is accounted for by the day less in the month. The stocks have, on the whole, decreased 8376 tons. If the make had been proportionate to May, they would just have remained at the last figure. Makers' stocks, as a whole, have increased; and stocks in public stores have, as a whole, decreased considerably. This bears witness to the continued struggle carried on between the makers and the "bears," and to the gradual victory of the former.

Shipments have decreased in all 23,204 tons. Exports contribute only 1540 tons of this, whilst coastwise shipments are debited with the remainder. This is mainly due to the decreased demand from Scotland, owing to the relatively higher price demanded of late by the Cleveland ironmasters. As Scotch pig is now again higher in price, we may expect to see Cleveland iron sent northward at the previous rate of delivery.

The rolling mills, and, indeed, works of all kinds along Tees-side and at Hartlepool lost two shifts at the beginning of the present week, owing to the boatrace between an Australian oarsman and a Middlesbrough publican. The working population seemed perfectly demented with excitement at this trivial event. There were the usual concomitants of gambling and drunkenness to an inordinate extent, benefitting publicans and book-makers, and leaving the working men so much the poorer. The only redeeming feature about the affair was that a considerable sum of money was realised in return for admission tickets to wharves, shipyards, &c., and which will be handed over to the North Riding Infirmary and the North Ormsby Hospital. It may be added that the impecuniosity resulting from the boatrace will have a good effect in keeping the ironworkers steadily at work for some time to come.

One of the most clear-headed, far-seeing, and courageous men in Cleveland is Mr. William Fallows, chairman of the Works Committee of the Tees Conservancy Board, and aged 85. At the last meeting of the Board, he called attention to the great need of another dredger to expedite the deepening of the river Tees, so that ships drawing a great depth of water might be able to leave the river with full cargoes. Vessels containing 3000 tons are already capable of passing over the bar, but this is not enough for Mr. Fallows. The four dredgers already at work will require six years to complete the necessary work, and this delay he cannot brook. Therefore he advocates a new one to be ordered at Glasgow, and to cost £30,000, which sum it is proposed to pay out of revenue. The motion was opposed by Mr. Richardson, who advocated a more cautious policy, and would prefer a lightening of rates to other less immediately tangible advantages. But ultimately Mr. Fallows prevailed, and the engineer was directed to make the necessary inquiries as to the cost of the new dredger.

NOTES FROM SCOTLAND.

(From our own Correspondent.)

THE iron trade is in almost every respect in a satisfactory position. Prices in the warrant market have slightly fluctuated during the week, but the tone on the whole has been firm and steady, and the value of makers' iron has been fully maintained. At the close of last week the warrant market was somewhat easy, but greater strength was imparted at the beginning of the present week by the large shipping return, which showed that the shipments of pig iron for the week had exceeded 15,000 tons, as compared with 10,000 in the preceding week, and 13,000 in the corresponding week of last year. The stock in Messrs. Connal and Company's stores has been further reduced this week to the extent of between 300 and 400 tons, and makers state that they are well sold, and in most cases making only what meets current requirements. Owing to the increase in the prices of No. 3 g.m.b. the imports from Middlesbrough are becoming larger, and it is probable that they will now slightly increase week by week should the quotations of Scotch iron be maintained.

Business was done in the warrant market on Friday morning at from 49s. 2½d. to 49s. cash, and from 49s. 4½d. to 49s. 2d. one month, the quotations in the afternoon being 48s. 11d. to 48s. 8d. cash. On Monday the market was stronger, with business from 48s. 9d. to 49s. cash. On Tuesday forenoon transactions were effected at 48s. 11d. to 49s. cash, and in the afternoon at 49s. to 49s. 4d. cash, and 49s. 5½d. one month. The market was firm on Wednesday, with business between 49s. 2d. and 49s. 5d. cash, and 49s. 4½d. to 49s. 7d. one month. To-day—Thursday—business was done at 49s. 6d. cash, and 49s. 8d. one month.

As stated above the values of makers' iron have been well maintained, and are now as follows:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 60s. 6d.; No. 3, 55s.; Coltness, 62s. and 55s. 6d.; Langloan, 60s. 6d. and 55s. 6d.; Summerlee, 58s. and 52s. 6d.; Calder, 59s. and 52s.; Carnbroe, 53s. 6d. and 50s. 6d.; Clyde, 53s. and 50s.; Monkland and Quarter, each 50s. 6d. and 49s.; Govan, at Broomielaw, 50s. 6d. and 49s.; Shotts, at Leith, 60s. 6d. and 55s. 6d.; Carron at Grangemouth, 50s.—specially selected 52s. 6d.—and 49s.; Kenneil at Bo'ness, 49s. 9d. and 48s. 6d.; Glengarnock at Ardrossan, 53s. and 50s.; Eglinton, 50s. 6d. and 49s. 6d.; Dalmellington, 50s. and 49s. 6d.

There is still a very good demand for hematite ore and hematite pig iron, and the prices are very firm.

At some of the finished ironworks there is rather less doing, but generally makers report that they have still a sufficiency of employment, and in several cases the demand for malleable iron has manifested an improvement. There is no change to report in prices.

A strike is threatened in the engineering works of Edinburgh and district in consequence of a number of employers having refused to grant an advance of ½d. per hour. The present wages are 6½d. per hour for fifty-four hours a week. In some cases, it is stated, the employers have complied with the men's request.

The coal trade is in a rather more satisfactory state than it was last week.

WALES & ADJOINING COUNTIES.

(From our own Correspondent.)

A GOOD deal of speculation is rife as regards the future of Plymouth works and collieries. In the House of Lords' Committee Mr. Simpson was understood to state that the works were likely to go on, and this is taken as indicating that a Scotch firm will very likely come into the field.

It would be possible to revive the old Plymouth bar trade, and this with a share of the steel rail business coming to the district would warrant a reconstruction. Mr. Fothergill expended a quarter of a million sterling in transferring the works from cold blast to hot blast. This would be no advantage now. Thorough clearing away and erection of new plant would be imperative, such as is intended at Cyfarthfa. A strong force of men is now busily engaged at Cyfarthfa works. At length sharp, determined business is meant, and is being conducted, Mr. Edward Williams, of Middlesbrough, the owner of, perhaps, the most pattern works in the North of England, being the general adviser.

Some important alterations will be required by Cyfarthfa with respect to railways, and the action of the Rhymney, Taff Vale, and Great Western is watched with interest.

The present time is favourable for iron and steel, and with a moderate amount of business coming in, some degree of impetus is given to the process of transformation, which in some form or other is being carried on all over the district. I hear of a French order for 20,000 tons of steel rails in the market, and other substantial ones coming. With our colonies the amount of iron trade done is satisfactory. Last week one good shipment of over 3000 tons took place to Montreal.

The Bute Docks struggle is being watched with a considerable degree of partisanship. One thing is certain, Mr. Lewis is making a good fight of it. Every week shows the necessity for more dock accommodation, and it would be far better, one would imagine, to adopt the scheme propounded than drift about to the mud-banks or out-of-the-way spots.

The common sense opinion in Cardiff is that though certain regulations are distasteful—and this is a matter of opinion—the whole scheme is admirably arranged, and in the end will be found a more reasonable one than that propounded by the shippers.

The promoters of the opposition dock scheme are sanguine of support from Lord Windsor and the Great Western Railway. It is announced as probable that Lord Windsor may give £150,000, and the Great Western £100,000; but I have not heard of any substantial reasons being afforded for this rather remote "probability."

The men are now working at the various collieries of the house coal with a great degree of regularity, and the new scale is generally approved by them. There is a dispute amongst the steam coal colliers of Fernhill, Gelly, and Tyn'ybedw collieries with reference to lowering the standard; some little cessation of work is expected until the men can be arranged with. The Dynevor Tin-plate Works are to be brought to the hammer next week. There is a whisper in the trade that some makers have been flooding the market; unless these doings are avoided I shall expect other works to succumb.

One of the leading questions under discussion this week is the action of the colliers' representatives with Lord Aberdare and Mr. Mundella *in re* reducing the educational standard to the 4th so as to allow children to go to work at the age permitted by the Mines' Regulation Act, after their twelfth year. It is generally conceded that Mr. Mundella, who refused to aid, had the better hand in the argument, and yet an influential section will be found to combat him. The mass of workmen do not require the fifth standard; the analysis of sentences and vulgar fractions are not wanted in the every-day life of a collier, and the regulation which floods the country with "clerks" or men who shun coal cuttings and labour, does not work well practically, Mr. Mundella to the contrary.

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.

27th June, 1882.

3021. DETACHING HOOKS, J. King, Pinxton.
3022. INDIA-RUBBER TIRES, A. J. Wyley and B. Collins, Manchester.
3023. VELOCIPEDES, G. Moss, London.
3024. GAS, S. Chandler, jun., & J. Chandler, London.
3025. DYNAMO-ELECTRIC MACHINES, E. Sperry, U.S.
3026. BLOW-PIPE LAMP, J. T. Garratt, London.
3027. HORSESHOES, J. Vernon, Newton Stewart.
3028. PARTITIONS, J. W. Cook, London.
3029. GLASS FURNACES, E. de Pass.—(*H. Quennec, Paris.*)
3030. FLOATING LIGHTS, C. Abel.—(*L. Brasseur, Belgium.*)
3031. STOPPING CARS, F. J. Prince, London.
3032. SAFETY LAMPS, W. Jenkins and D. Morgan, N.B.
3033. PRODUCING CARBONS, F. S. Isaac.—(*Sir J. Vogel, Australia.*)
3034. COLLECTING FOUL MATTERS, F. Bonnefin, London.
3035. PHOTOGRAPHIC CAMERAS, G. Hare, London.
3036. DYNAMO-ELECTRIC MACHINES, W. Ayrton and J. Perry, London.
3037. SYRINGING PLANTS, J. Drake and R. Muirhead, Maidstone.
3038. STABLE FITTINGS, D. McGill, London.

28th June, 1882.

3039. GALVANIC BATTERIES, C. Nezeraux, Paris.
3040. CLEANING KNIVES, R. Wallwork, Manchester.
3041. BOTTLE STOPPERS, W. Froggatt, Nottingham.
3042. INCANDESCENT ELECTRIC LAMPS, F. L. Willard, London.
3043. DRAWING CORKS, T. Wymond, London.
3044. ALPHO OXYHYDRO-CHINOLINE, J. Erskine.—(*The Farbwerke vorm. Meister Lucius, and Brüning, Germany.*)
3045. SLICING into STRIPS, J. Whytehead, Ilkley.
3046. ABSTRACTING GOLD, R. Barker, Seacombe.
3047. TELEPHONE RECEIVERS, W. Spence.—(*M. Kotyra, Paris.*)
3048. INSULATING TELEGRAPH WIRES, G. Macaulay-Cruickshank.—(*W. E. Banta, U.S.*)
3049. ARTIFICIAL STONE, R. Searle, London.
3050. BAT HANDLES, C. Meiter and R. Moth, London.
3051. GLASS MELTING, L. Mount, London.
3052. PREPARING COTTON, S. Lord & J. Kaberry, Rochdale.
3053. BREECH-LOADING SMALL-ARMS, T. Webley and T. Brain, Birmingham.
3054. REGULATING ELECTRICITY, J. Mewburn.—(*F. Rigaud, Paris.*)
3055. CARTRIDGE, H. Newton.—(*La Société Anonyme Dynamite Nobel, Switzerland.*)
3056. REMOVING INGOTS, T. Hampton, Sheffield.
3057. CHUCKS, H. H. Lake.—(*L. Frobeen, Berlin.*)
3058. ROLLERS, E. Hancock.—(*W. Grüne, Berlin.*)
3059. PREVENTING EXPLOSIONS, G. von Nawrocki.—(*R. Jacobi, Germany.*)
3060. SECURING BUTTONS, E. C. Barron, London.
3061. MAGNETIC COMPASSES, F. Betbeder.—(*E. Bourse, France.*)

29th June, 1882.

3062. GAS-LAMP JOINTS, W. Wynne, London.
3063. REFINING SACCHARINE, D. MacEachran, Greenock.
3064. PRODUCING INGOTS, A. Longsdon.—(*F. A. Krupp, Germany.*)
3065. OPENING FUR, J. Woodrow, Stockport.
3066. WORKING SIGNALS, W. Stroudley, Brighton.
3067. SCREW PROPELLERS, J. Carr, Heaton.
3068. FLUID METERS, T. R. and T. W. Harding, Leeds.
3069. LOOMS, C. Catlow, Burnley.
3070. ELECTRIC-ARC LAMPS, E. de Pass.—(*C. Roosevelt B. Abdank, Paris.*)
3071. HOOKS, W. Downs, Liverpool.
3072. HYPOSULPHITE of SODA, G. von Nawrocki.—(*The Verein chemischer Fabriken, Germany.*)
3073. ELECTRIC RAILWAYS, H. Binko, London.
3074. TREATING HOPS, W. Forster, Streatham-common.
3075. FURNACES, W. Bell, Lancaster.
3076. MILLS, W. Lake.—(*W. Hartman, Germany.*)
3077. SHARPENING SAWS, C. P. Martin.—(*E. Vallingin, Paris.*)

30th June, 1882.

3078. UTILISING TIDAL WATERS, I. Timmis, London.
3079. ELECTRIC LAMPS, J. Johnson.—(*L. Bardon, Paris.*)
3080. STOP VALVES, J. & J. Hopkinson, Huddersfield.
3081. SWIVEL, W. Skelhorn, London.
3082. BOILERS, S. Newbold & S. Thornley, Liverpool.
3083. WRITING INK, E. Detmold, Putney.
3084. SIZING ROOTS, S. Copeland, Beverley.
3085. EXCAVATING EARTH, W. Gedge.—(*C. Leach, U.S.*)
3086. PRINTING INK, F. Wirth.—(*G. Schmidt, Germany.*)
3087. LOOMS, J. Dodd, Oldham, and W. Adam, Kidderminster.
3088. COMBING WOOL, J. Bradley & J. Wood, Bradford.
3089. BREECH-LOADING FIRE-ARMS, H. Thorn, London.
3090. SELF-ACTING MULES, C. Barlow.—(*V. Lenoir, Paris.*)
3091. UTILISING DEPOSITS, J. Stanley, London.
3092. SAFETY VALVES, C. Collins, Manchester.
3093. PLOUGHS, J. Howard and E. Bousfield, Bedford,
3094. WASHING WOOL, J. Petrie & F. Petrie, Rochdale.
3095. VALVE-CLOSET OVERFLOWS, H. Conolly and A. Hubert, London.
3096. WATER WASTE PREVENTERS, H. Conolly, London.
3097. SECONDARY BATTERIES, A. Watt, Liverpool.
3098. PENCILS, J. D. Sprague, Upper Norwood.
3099. CARBON FILAMENTS, A. P. Leask and F. Smith, London.
3100. SEWING CARPETS, W. Lake.—(*A. Neustadt, U.S.*)
3101. ELECTRIC LAMP, R. H. Courtenay, London.
3102. MICA PITS, J. Lovering & R. Martin, St. Austell.

1st July, 1882.

3103. BRICKS, W. Valon, Ramsgate.
3104. PICKER ARMS, W. Alexander, Dundee.
3105. AGRICULTURAL ELEVATORS, R., J., and H. Wilder, Wallingford.
3106. PROPELLERS, R. Bell, Liverpool.
3107. SECONDARY BATTERIES, C. Cathcart, Sutton.
3108. SECONDARY BATTERIES, H. Haddan.—(*C. Brush, Cleveland, U.S.*)
3109. PREVENTING BOAT ACCIDENTS, H. O. Grünbaum, Stratford.
3110. DOOR FURNITURE, J. Brownrigg, Windermere.
3111. SCOURING HANKS, J. F. Kilburn, Meltham.
3112. COLOUR PRINTING, J. Bromley, Leeds.
3113. PEAT for LITTERS, S. D. Cox, New Charlton.
3114. GLASS IMITATIONS, C. D. Stearn, Newcastle-upon-Tyne.
3115. GENERATORS, L. P. Martin, Vienna.
3116. VENETIAN BLINDS, E. V. Emery, Canonbury.
3117. LIFTING BARRELLED BEER, W. Wood and W. Whitaker, Burnley.
3118. STEAM BOILERS, J. T. Ward, Ossett.
3119. ORGANS, &c., J. M. and J. B. Draper, Blackburn.
3120. GALVANIC BATTERIES, J. H. Davies, Ipswich.
3121. TRICYCLES, W. J. Lloyd, Harborne.
3122. COATING METAL, A. Clark.—(*C. Haegele, Germany.*)
3123. SYPHON, F. Sara, Plymouth.

3rd July, 1882.

3124. STEAM and HAND STEERING, J. Hastie, Greenock.
3125. CARBONATE of SODA, C. Wigg, Liverpool.
3126. SIDE SADDLES, G. T. Jenkins, London.
3127. ARTIFICIAL STONE, G. Hodson, Loughborough.
3128. ELECTRIC LOGS, R. M. Lowne, London.
3129. GENERATING ELECTRICITY, T. Varley, Walthamstow, and H. Greenwood, London.
3130. EXHAUST FAN, G. Capell, Northampton.
3131. PERMANENT WAY, A. Clark.—(*J. Meacham, U.S.*)
3132. VALVES, A. Clark.—(*W. Scott, U.S., and W. Horford, Canada.*)
3133. MOTIVE POWER, J. Jeffs, London.
3134. GRAIN ELEVATORS, H. Newton.—(*J. Roger, Vienna.*)
3135. MALT EXTRACT, L. Hoff, London.
3136. SHACKLES, R. Ruck, Chatham.
3137. CARTRIDGE CASES, C. D. Abel.—(*W. Lorenz, Germany.*)
3138. QUARRYING SLATE, G. Hunter, Egham.

Inventions Protected for Six Months on Deposit of Complete Specifications.

3025. DYNAMO-ELECTRIC MACHINES, E. A. Sperry, Cortland, U.S.—*27th June*, 1882.
3039. GALVANIC BATTERIES, C. P. Nézeraux, Paris.—*28th June*, 1882.
3100. SEWING CARPETS, W. R. Lake, Southampton-buildings, London.—A communication from A. Neustadt, San Francisco, California, U.S.—*30th June*, 1882.

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

2636. DIES or MOULDS, J. Hamblet, West Bromwich.—*30th June*, 1879.
2661. SEPARATING MATTERS, J. A. Stephan, Madeley.—*1st July*, 1879.
2448. LOCOMOTIVE BOILERS, J. Wavish, Leytonstone.—*19th June*, 1879.
2654. TELEGRAPHY, E. Warburton, Manchester, and L. Crossley, Halifax.—*1st July*, 1879.
2737. COLOURED TILES, G. A. Marsden, Cobridge.—*5th July*, 1879.
2635. WEIGHING, R. Simon, Nottingham.—*30th June*, 1879.
2689. LOCOMOTIVES, W. Adams and J. Cleminson, London.—*2nd July*, 1879.
2645. VOLATILISING CRESYLIC ACID, J. H. Valentine, U.S.—*30th June*, 1879.
2650. REAPING MACHINES, W. McI. Cranston, London.—*1st July*, 1879.
2662. LIDS for GAS RETORTS, W. P. Wilson, Brockley.—*1st July*, 1879.
2666. BOOTS, R. McDonnell and T. Forster, Leicester.—*1st July*, 1879.
2678. CLEANSING MESHES, W. R. Lake, London.—*2nd July*, 1879.
2680. METALLIC BEDSTEADS, J. B. Rowcliffe, Glossop.—*2nd July*, 1879.
2682. ENRICHING GAS, J. Livesey and J. Kidd, London.—*2nd July*, 1879.
2683. HARVESTING, W. R. Lake, London.—*2nd July*, 1879.
2709. SECTIONAL BOILER, J. Keith, Edinburgh.—*3rd July*, 1879.
2715. DREDGER BUCKETS, W. R. Kinipple, Greenock.—*4th July*, 1879.
2786. BOOTS and SHOES, T. Cowburn, Gloucester.—*8th July*, 1879.
2809. SULPHATE of SODA, J. Hargreaves, Widnes.—*10th July*, 1879.
2819. COCKS, E. T. Lambert, London.—*10th July*, 1879.
3047. COLOUR PRINTING, W. G. White, Paris.—*26th July*, 1879.
2648. MIXING MACHINES, J. and J. A. Baker, London.—*1st July*, 1879.
2667. PROPELLING VESSELS, S. Snowden, Kenilworth.—*1st July*, 1879.
2669. STOCKINGS, H. J. Griswold, London.—*1st July*, 1879.
2674. SIGNALLING, S. Pitt, Sutton.—*2nd July*, 1879.
2684. SCAFFOLDING, W. R. Lake, London.—*2nd July*, 1879.
2685. GAS, S. Holman, London.—*2nd July*, 1879.
2751. BRASS-HEADED NAILS, W. H. Richards, Birmingham.—*5th July*, 1879.
2855. FIRE ALARMS, W. Tranter, Birmingham.—*14th July*, 1879.

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

2363. HORSE RAKES, J. Howard and E. T. Bousfield, Bedford.—*29th June*, 1875.
2379. CUTTING FLOCKS, S. Lowe, W. Renton, J. Johnson, Leeds.—*30th June*, 1875.
2401. HOUSE TRAPS, E. G. Banner, London.—*2nd July*, 1875.

Notices of Intention to Proceed with Applications.

Last day for filing opposition 21*st July*, 1882.

906. MOTORS, W. R. Lake, London.—A communication from M. Rosenstock.—*24th February*, 1882.
921. SULPHATE of AMMONIA, J. Dempster, Elland.—*25th February*, 1882.
922. TRANSMITTING SIGNALS, A. F. St. George, London.—*25th February*, 1882.
926. OMNIBUSES, A. G. Margetson and W. S. Hek, Bristol.—*25th February*, 1882.
927. LUBRICATING ENGINES, J. J. Royle, Manchester.—*25th February*, 1882.
935. DOBBIES for WEAVING, J. Shorrock, Darwen.—*27th February*, 1882.
936. CARPETS, J. J. Delmar and W. Folliott, London.—*27th February*, 1882.
939. TROUSER PROTECTOR, L. A. Groth, London.—A com. from A. F. Milders.—*27th February*, 1882.
941. CONTROLLING SPEED of ENGINES, J. Richardson, Lincoln.—*27th February*, 1882.
946. RAILWAY SIGNALLING, P. P. Sykes, Diggle.—*27th February*, 1882.
947. THIMBLES, F. H. F. Engel, Hamburg.—A communication from I. Hirsch.—*27th February*, 1882.
949. FOLDING PAPER, F. Wolff, Copenhagen.—A com. from J. G. A. Eickhoff.—*27th February*, 1882.
951. CLEANING WOOL, C. D. Abel, London.—A communication from La Société Anonyme La Laine.—*27th February*, 1882.
961. CAPSULING BOTTLES, F. W. Boldt and P. C. Vogel, Hamburg.—*28th February*, 1882.
966. SPRING HINGES, J. T. B. Bennett, Aston-juxta-Birmingham.—*28th February*, 1882.
987. SAVING LIFE at SEA, W. Wilkins, Tunbridge Wells.—*1st March*, 1882.
997. HORSESHOE NAILS, I. Briggs and J. W. Booth, Birmingham.—*1st March*, 1882.
1017. INSULATING TELEGRAPH WIRES, J. S. Lewis, Birkenhead.—*3rd March*, 1882.

1048. Filter Presses, S. H. Johnson, Stratford.—4th March, 1882.
1075. Musical Instruments, W. R. Lake, London.—A com. from F. Sudre.—6th March, 1882.
1099. Cut-off Valve-gear, A. W. L. Reddie, London.—A communication from J. Swann and F. R. Fennessy.—7th March, 1882.
1107. Cotton Fibre, F. Wheaton, Brooklyn, U.S.—7th March, 1882.
1168. Portable Railways, J. C. Mewburn, London.—A com. from G. Fender.—10th March, 1882.
1218. Knife Cleaners, H. Beech, London.—A communication from E. Ferguson.—14th March, 1882.
1282. Breech-loading Fire-arms, L. Gye, London.—16th March, 1882.
1487. Cutting Metals, W. W. Hulse, Manchester.—28th March, 1882.
1516. Insulation, J. Imray, London.—A communication from La Société Anonyme des Cables Electriques.—29th March, 1882.
1919. Electric Arc Lamps, J. Lea, London.—22nd April, 1882.
1931. Hoes, &c., R. B. Yates, Birmingham.—22nd April, 1882.
2195. Railway Signalling, A. Smith and S. A. Taylor, Kibworth.—10th May, 1882.
2320. Water Wheels, A. Figge, London.—17th May, 1882.
2326. Driving Machinery, C. Truman, Birmingham.—17th May, 1882.
2418. Stays and Corsets, A. Ottenheimer, Stuttgart.—22nd May, 1882.
2428. Telegraph Printing, J. Imray, London.—A com. from A. A. Knudson.—23rd May, 1882.
2549. Building, T. Hyatt, Kensington, London.—30th May, 1882.
2585. Separating Soluble Matters, G. T. Beilby, Mid-Calder.—1st June, 1882.
2618. Dynamo Machines, R. E. B. Compton, London.—3rd June, 1882.
2633. Steam Boilers, A. C. Engert, Bromley-by-Bow.—5th June, 1882.
2657. Railway Brakes, A. E. Harris, London.—6th June, 1882.
2659. Primary Batteries, W. B. Brain, Cinderford.—6th June, 1882.
2700. Malleable Iron, P. J. Ogle, Swansea Valley.—8th June, 1882.
2723. Electric Lamps, C. G. Gumpel, London.—9th June, 1882.
2757. Gas Burners, J. Imray, London.—A communication from C. Clamond.—12th June, 1882.

Last day for filing opposition, 25th July, 1882.

976. Drilling Machines, W. R. Lake, London.—A com. from A. Shedlock.—25th February, 1882.
981. Treating Dynamite, W. Howitt, Ilford.—28th February, 1882.
984. Hose Couplings, J. C. Hudson, London.—1st March, 1882.
1000. Etching, E. C. Hancock, Worcester.—A communication from W. Grüne.—2nd March, 1882.
1004. Ships' Logs, F. Webster, London.—A communication from W. Webster.—2nd March, 1882.
1014. Caustic Barium, J. G. Tongue, London.—A com. from R. Ziomezynski.—2nd March, 1882.
1028. Pumping Engines, H. Davey, Headingley.—3rd March, 1882.
1034. Galvanic Chains, C. D. Abel, London.—A communication from A. Kraehmer.—3rd March, 1882.
1035. Stoppering Bottles, W. W. Macvay and R. Sykes, Castleford.—3rd March, 1882.
1072. Gun Carriages, T. Nordenfelt, London.—6th March, 1882.
1071. Electric Lamps, W. Crookes, London.—6th March, 1882.
1098. Velocipedes, J. M. Taylor, Seer Green, and G. Wethered, Maidenhead.—7th March, 1882.
1121. Separating Bodies, H. J. Smith, Glasgow.—8th March, 1882.
1147. Attaching Wheels to Axles, J. Mackay, Liverpool.—9th March, 1882.
1178. Heating, A. M. Clark, London.—A communication from P. and F. Depoully.—10th March, 1882.
1197. Decorticating Rice, A. M. Clark, London.—A com. from G. D. Dennis, jun.—11th March, 1882.
1248. Rotating Drum, T. Cope and W. Brewer, Liverpool.—15th March, 1882.
1464. Electric Piles, F. de Lalande, Paris.—Partly a com. from G. Chaperon.—27th March, 1882.
1592. Projectiles, J. Vavasseur, London.—1st April, 1882.
1705. Condensers, A. M. Clark, London.—A com. from R. E., M., and M. Williams.—8th April, 1882.
1713. Electric Arc Lamps, J. Brockie, Brixton.—11th April, 1882.
1749. Roofing Tiles, C. Major, Bridgwater.—12th April, 1882.
1853. Printing Telegraphs, W. J. Burnside, Lower Norwood.—18th April, 1882.
2254. Figured Pile Fabrics, T. Anderson, Liversedge.—13th May, 1882.
2270. Galvanic Batteries, R. H. Simons, Brixton.—15th May, 1882.
2345. Gas Motor Engines, S. and H. N. Bickerton, Ashton-under-Lyne.—18th May, 1882.
2370. Electric Arc Lamps, J. Brockie, Brixton.—19th May, 1882.
2375. Air Pumps, C. H. Gimingham, Newcastle-upon-Tyne.—19th May, 1882.
2493. Hydrochloric Acid, J. W. Leather, London.—25th May, 1882.
2533. Pontoon Docks, R. Turnbull, South Shields.—27th May, 1882.
2545. Working Coffee Berries, E. J. Humphrey, London.—30th May, 1882.
2604. Electric Lamps, F. des Voeux, Derby.—A communication from A. Bernstein.—2nd June, 1882.
2611. Distilling Coal, W. J. Cooper, London.—2nd June, 1882.
2663. Drying Blood, 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 to Tubs, A. W. Gillman and S. Spencer, London.—9th June, 1882.
2722. Secondary Batteries, A. P. Price, London.—9th June, 1882.
2748. Burning Pyrites, E. Bramwell, London.—12th June, 1882.
2759. Electric Lamps, H. H. Lake, London.—A communication from R. R. Moffatt.—12th June, 1882.
2806. Securing Sheets of Glass, S. Deards, Harlow.—14th June, 1882.
2811. Metallic Bedsteads, T. Wilson, Birmingham.—14th June, 1882.
2818. Secondary Batteries, J. S. Sellon, London.—15th June, 1882.
2890. Locomotive Engines, G. Allan and R. E. Dickinson, Sheffield.—19th June, 1882.
2904. Taps and Valves, J. Nixon, Oldham.—20th June, 1882.

Patents Sealed.

(List of Letters Patent which passed the Great Seal on the 30th June, 1882.)

5239. Hay-making Machines, W. N. Nicholson and W. Mather, Newark-upon-Trent.—30th November, 1881.
5737. Ornamental Glass, J. Hewitt, London.—31st December, 1881.
6. Nickel-plating, J. E. Chaster, Manchester.—2nd January, 1882.
7. Hot-air Engine, T. Morgan, London.—2nd January, 1882.
8. Safety Valves, J. S. Stubbs, Manchester.—2nd January, 1882.
18. Substitute for Whalebone, W. Morgan-Brown, London.—3rd January, 1882.
31. Aerial Vessels, W. R. Lake, London.—3rd January, 1882.
37. Compound Packing, P. Blair, Birkenhead.—4th January, 1882.
42. Stoves, E. G. Lakeman, Modbury.—4th January, 1882.
50. Locomotive Engines, T. Morgan, London.—4th January, 1882.
55. Distributing Electricity, J. Perry, London.—5th January, 1882.
60. Railway Signals, S. S. Allin, London.—5th January, 1882.
64. Magneto, &c., Machines, L. A. Groth, London.——5th January, 1882.
71. Electric Printing Registers, A. J. Boult, London.—6th January, 1882.
80. Converting Iron and Steel, W. F. Jackson, Bradford.—6th January, 1882.
93. Rolling Metal, F. Wirth, Frankfort-on-the-Main.—7th January, 1882.
111. Crushing Substances, J. Spencer and J. Consterdine, Hollinwood, and N. G. Kimberley, London.——9th January, 1882.
156. Treating Phosphates, D. Perry, Glasgow.—11th January, 1882.
182. Forging Horse-nails, F. W. Wallner, Cologne.—13th January, 1882.
196. Beetroot Wine, E. G. Brewer, London.—13th January, 1882.
209. Glazing Greenhouses, T. R. Shelley, Smethwick.—14th January, 1882.
218. Couplings, H. E. Newton, London.—16th January, 1882.
253. Laminated Springs, H. Woodruff and G. Barson, Sheffield.—18th January, 1882.
352. Cutting Cheese, W. Chisholm, Hawick.—24th January, 1882.
504. Railway Brakes, H. H. Lake, London.—1st February, 1882.
518. Velocipedes, A. G. Meeze, Redhill, and A. G. Salamon and R. R. Phillips, London.—22nd February, 1882.
551. Treating Fibrous Materials, F. Wirth, Frankfort-on-the-Main.—4th February, 1882.
556. Ventilating Windows, E. and J. M. Verity, and B. Banks, Leeds.—4th February, 1882.
629. Railway Signalling, J. W. Webster, Littleborough, J. Hill, Rochdale, and T. and T. Greenwood, Smithy Bridge.—9th February, 1882.
630. Lamps for Petroleum, S. Pitt, Sutton.—9th February, 1882.
632. Signalling, S. C. C. Currie, London.—9th February, 1882.
784. Mowing Machines, W. R. Lake, London.—17th February, 1882.
900. Gas Burners, G. S. Grimston, Brockley.—24th February, 1882
1029. Incandescent Electric Lamps, F. Wright and M. W. W. Mackie, London.—3rd March, 1882.
1031. Vacuum Pumps, F. Wright and M. W. W. Mackie, London.—3rd March, 1882.
1033. Shaping Glass, F. Wright and M. W. W. Mackie, London.—3rd March, 1882.
1221. Roller Bearings, T. F. Hemmich, Reading.—14th March, 1882.
1265. Chain Clips, J. Smith, Thornliebank.—15th March, 1882.
1410. Ingress to Buildings, U. Scott, London.—23rd March, 1882.
1462. Electric Lamps, S. Waters, London.—27th March, 1882.
1491. Saddle Bars, J. Oldmeadow, Cheltenham.—28th March, 1882.
1594. Reverberatory Furnaces, W. W. Hughes, London.—1st April, 1882.
1849. Printing, W. R. Lake, London.—18th April, 1882.
1881. Breech-loading Small-arms, W. Tranter, Birmingham.—19th April, 1882.
1890. Eye for Stair Carpet Rods, F. Kingston, Deptford.—20th April, 1882.
1896. Telephonic Signalling, A. C. Brown and H. A. C. Saunders, London.—20th April, 1882.
1909. Extract of Malt, T. Dence and J. J. Mason, London.—21st April, 1882.
1920. Boilers, &c., J. Keith, Edinburgh.—22nd April, 1882.
1958. Boilers, G. W. Hawksley and M. Wild, Sheffield.—25th April, 1882.
1960. Clock Mechanism, H. H. Lake, London.—25th April, 1882.
1978. Decorticating Stalks, W. R. Lake, London.—26th April, 1882.
2042. Temples for Looms, W. R. Lake, London.—29th April, 1882.
2160. Pottle Cleaner, A. M. Clark, London.—8th May, 1882.

(List of Letters Patent which passed the Great Seal on the 4th July, 1882.)

4880. Portable Forges, G. H. Pym, Nottingham.—8th November, 1881.
5524. Electric Lamps, R. Kennedy, Glasgow.—17th December, 1881.
5746. Numbering Machines, W. R. Lake, London.—31st December, 1881.
63. Rendering Fabrics Uninflammable, P. Jensen, London.—5th January, 1882.
73. Horseshoes, J. Vernon, Newton Stewart.—6th January, 1882.
78. Printing Machines, T. A. Briggs, Providence, U.S.—6th January, 1882.
81. Whitewash, J. I. Fordham, London.—6th January, 1882.
82. Recording Fixed Amounts, J. T. Parlour, London.—6th January, 1882.
88. Cutting Tobacco, C. J. Fox, London.—7th January, 1882.
91. Heddle Frames, F. W. Pim and T. Sands, Harolds Cross.—7th January, 1882.
99. Velocipedes, M. D. Rucker, jun., London.—7th January, 1882.
100. Weighing Machines, F. Wolff, Copenhagen.—7th January, 1882.
102. Teaching Reading, E. Sykes and O. G. Abbott, Huddersfield.—7th January, 1882.
116. Knife Cleaning, E. M. Knight, Manchester.—9th January, 1882.
124. Reproducing Engravings, L. H. Phillippi, Hamburg.—10th January, 1882.
130. Obtaining Electric Currents, W. T. Henley, Plaistow.—10th January, 1882.
147. Cranes, F. R. Ellis, Liverpool.—11th January, 1882.
201. Skates, J. S. de B. Yelloly and A. H. S. Elwes.—14th January, 1882.
204. Distilling Apparatus, G. E. Vaughan, London.—14th January, 1882.
214. Steel-yards, J. Spencer and J. Consterdine, Hollinwood, and J. Greenwood, Salford.—16th January, 1882.
283. Making Trenches, A. M. Clark, London.—19th January, 1882.
299. Utilising Phosphatic Slags, S. Pitt, Sutton.—20th January, 1882.
300. Fire Extinguishers, W. R. Lake, London.—20th January, 1882.
320. Recording the Moves in Chess, A. M. Clark, London.—21st January, 1882.
399. Ornamenting Glass, &c., W. H. Slater, Stoke, and E. C. Hancock, Worcester.—26th January, 1882.
400. Propeller, C. Corneby, Poplar.—26th January, 1882.
408. Cooling Paper, F. C. Glaser, London.—26th January, 1882.
509. Salt-cake, G. S. Hazlehurst, Runcorn.—2nd February, 1882.
686. Telephone Call, A. M. Clark, London.—11th February, 1882.
688. Transmitting Sounds, A. M. Clark, London.—11th February, 1882.
689. Telephone Receivers, A. M. Clark, London.—11th February, 1882.
691. Fire-bars, S. Barlow, Castleton.—13th February, 1882.
759. Purifying Anthrachinone, J. A. Dixon, Glasgow.—16th February, 1882.
940. Taps, J. E. Chambers, Smethwick.—27th February, 1882.
1400. Electric Lamps, T. E. Gatehouse, Camberwell.—23rd March, 1882.
1927. Designs on Tissues, J. Mugnier, Lyons.—22nd April, 1882.
1938. Centrifugal Separating Machines, F. H. F. Engel, Hamburg.—24th April, 1882.
1984. Refrigerating, J. Chambers, Manchester.—27th April, 1882.

List of Specifications published during the week ending July 1st, 1882.

3896, 8d.; 4002, 2d.; 4368, 2d.; 4520, 2d.; 4716, 2d.; 4768, 2d.; 4780, 6d.; 4958, 2d.; 4978, 2d.; 5046, 2d.; 5050, 6d.; 5060, 6d.; 5094, 2d.; 5139, 6d.; 5146, 2d.; 5149, 2d.; 5150, 2d.; 5159, 4d.; 5163, 6d.; 5171, 6d.; 5181, 2d.; 5183, 4d.; 5184, 6d.; 5187, 2d.; 5188, 6d.; 5189, 6d.; 5193, 2d.; 5196, 6d.; 5197, 6d.; 5198, 6d.; 5199, 2d.; 5202, 2d.; 5203, 6d.; 5206, 2d.; 5210, 2d.; 5211, 1s.; 5212, 6d.; 5213, 2d.; 5214, 2d.; 5216, 8d.; 5220, 2d.; 5224, 6d.; 5225, 8d.; 5227, 6d.; 5228, 6d.; 5229, 4d.; 5230, 4d.; 5231, 8d.; 5233, 1s.; 5235, 2d.; 5236, 6d.; 5237, 2d.; 5238, 6d.; 5240, 2d.; 5241, 8d.; 5242, 2d.; 5243, 6d.; 5244, 2d.; 5246, 6d.; 5247, 6d.; 5248, 4d.; 5249, 2d.; 5250, 4d.; 5251, 6d.; 5253, 6d.; 5254, 6d.; 5255, 2d.; 5256, 6d.; 5257, 6d.; 5258, 4d.; 5259, 2d.; 5262, 4d.; 5264, 2d.; 5266, 6d. 5267, 6d.; 5268, 2d.; 5269, 4d.; 5270, 2d.; 5272, 6d.; 5273, 6d.; 5274, 4d.; 5275, 4d.; 5276, 2d.; 5277, 2d.; 5278, 2d.; 5279, 2d.; 5281, 2d.; 5282, 6d.; 5284, 6d.; 5285, 6d.; 5287, 6d.; 5288, 2d.; 5290, 2d.; 5291, 4d.; 5292, 8d.; 5293, 6d.; 5294, 2d.; 5297, 4d.; 5298, 6d.; 5299, 2d.; 5302, 6d.; 5307, 6d.; 5312, 4d.; 5320, 6d.; 5321, 6d.; 5326, 6d.; 5348, 6d.; 5358, 6d.; 5371, 6d.: 79, 4d.; 1108, 4d.; 1479, 6d.; 1636, 6d.; 1719, 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.*

3896. Machinery for Spinning, Doubling, and Winding Yarn, *W. Lancaster, Accrington, and E. Slater, Burnley.—8th September,* 1881. 8*d.*

This relates partly to what are known as ring spinning frames or throstles, and consists in a novel arrangement of mechanism that gives motion to the lifting rail; a heart or cam working horizontally, or nearly so, by preference in contact with a slide, is connected to a chain or other flexible band, by which means a direct pull or push is given to the parts working the rail, and this without the intervention of a first lever as is now used.

4002. Manufacture of Cast Iron, &c., *H. J. Haddan, Kensington.—16th September,* 1881.—*(A communication from J. Chaine, Lyons.—(Not proceeded with.)* 2*d.*

This consists, First, in applying the ores, fluxes, and fuel in a pulverulent state; Secondly, in transforming these pulverulent materials into pieces or agglomerates of uniform size; Thirdly, in drying and heating the said agglomerates before their introduction into the blast furnace.

4368. Apparatus for Propulsion, *J. Pursell, London.—7th October,* 1881.—*(Provisional protection not allowed.)* 2*d.*

A gas engine and a reservoir are fitted to receive air from a pump, the said air under compression being passed into and through an apparatus for utilisation as a motive power in an engine employed for propulsion purposes.

4520. Exhibiting and Protecting Trade Marks, &c., *F. Mously, Birmingham.—17th October,* 1881.—*(Provisional protection not allowed.)* 2*d.*

This consists in applying the device or advertisement to the base of drinking glasses.

4716. Labelled Bottles and Jars used by Chemists, &c., *M. Hardcastle, Hoxton.—27th October,* 1881.—*(Provisional protection not allowed.)* 2*d.*

This consists in the employment of tablets of thin talc in place of glass tablets.

4768. Antiseptic Drinks, *J. Ascough, Handsworth.—1st November,* 1881.—*(Provisional protection not allowed.)* 2*d.*

This relates to the addition to non-fermented and non-alcoholic beverages of a chemical substance containing the pure antiseptic element boron.

4958. Apparatus for Receiving Traders' Orders at Railway Stations, &c., *W. M. Lindsay, Dublin.—12th November,* 1881.—*(Provisional protection not allowed,)* 2*d.*

This relates to the employment of boxes or compartments provided with slots, through which the order is dropped. The box or compartment is marked with the name and address of proprietor.

4978. Appliances for Securing Books, &c., *J. O. Spong, London.—14th November,* 1881.—*(Provisional protection not allowed.)* 2*d.*

This relates to the employment of steel or other strips of material, preferably springy, in the front, to the sides, or one of them only, or at the back of a boot, so that that part may be easily opened for the insertion and removal of the boot, and be closed to assist in retaining the boot in position without inconvenience, and without exercising any restrictive action on the motion of the foot.

5046. Production of Aerated Waters, *A. P. Price, London.—17th November,* 1881.—*(Provisional protection not allowed.)* 2*d.*

This consists in the use and employment of the carbonic acid gas together with the other gaseous and volatile products generated in and produced during what is known as the vinous or alcoholic fermentation which occurs in the manufacture of beer and of spirits.

5060. Preventing Accidents in Hoists, *S. Empsall, Halifax.—19th November,* 1881. 6*d.*

This consists in the employment of movable lattices for protecting the entrances to the wells of hoists.

5094. Brake Blocks for Railway Vehicles, *J. A. Timmis, Westminster.—22nd November,* 1881.—*(Provisional protection not allowed.)* 2*d.*

The blocks are made of any suitable shape or pattern out of rolled bars of iron and steel, and cut into suitable lengths and trimmed with a hammer, or tilt, or press, or sheared into shape.

5139. Tricycles, &c., *F. Beauchamp, Edmonton.—24th November,* 1881. 6*d.*

This relates, First, to improvements to facilitate the propulsion of tricycles, &c., up hills or over obstacles; Secondly, to improvements whereby the hands and arms are more efficiently employed to propel the vehicle; Thirdly, to improvements whereby the axle of a tricycle or other vehicle can be divided into two parts, so as to facilitate the storing, &c.

5146. Reservoir Penholder, *W. Hampton, Busby, and W. H. Gray, Partick, N.B.—25th November,* 1881.—*(Not proceeded with.)* 2*d.*

The object is to provide a penholder for containing ink, and to give an automatic flow of such ink therefrom to an ordinary pen or "nib," the rate of such flow being adjustable as required to suit the speed and thickness of writing.

5149. Velocipedes, *W. H. J. Grout, Stoke Newington.—25th November,* 1881.—*(Not proceeded with.)* 2*d.*

This relates, First, to an improved arrangement of brake power; and, Secondly, to the bevel gearing.

5150. Vessels for Containing Fluids, *J. Imray, London.—25th November,* 1881.—*(A communication from W. Kowalevsky, Moscow.—(Not proceeded with.)* 2*d.*

The vessel is made in two pieces, each being shaped as a hemispherical or hemispheroidal basin of sheet or cast metal, papier maché, celluloid, or other suitable material, lined or coated internally. The two halves are jointed together at their edges.

5163. Two-wheeled Carriages, *J. M. Stuart, London.—26th November,* 1881. 6*d.*

This relates to the arranging and combining of the parts of two-wheeled carriages.

5171. Apparatus Employed in Brewing, *A. Kinder, London.—26th November,* 1881. 6*d.*

The inventor claims, First, in apparatus for brewing the employment of a steam jacketted vessel capable of being closed tightly, and furnished with an arrangement of rakes or stirrers, in which vessel the materials are treated; Secondly, in apparatus for brewing, the combination with the vessel in which the materials are treated of a pump or air forcing apparatus for enabling the material to be treated by steam or steam and pneumatic pressure, and thereafter to be put under pneumatic pressure alone.

5181. Artificial Light Apparatus for Photography, *R. Simmonds, Glasgow.—28th November,* 1881.—*(Not proceeded with.)* 2*d.*

The object is the constructing of apparatus for applying artificial light in photographing in an improved and simple manner, and so that a sufficiently close approximation to the effects of diffused light may be obtained without the use of expensive reflectors.

5183. Purification of Water for Domestic Purposes, &c., *P. Spence, Manchester.—28th November,* 1881. 4*d.*

This consists in the use of salts of alumina or alumina and iron for the purification of water.

5184. Knobs and their Attachments to Spindles, *E. W. Buller, Birmingham.—28th November,* 1881. 6*d.*

This relates to attaching or connecting knobs with their spindles by means of a spring pawl upon a loose sleeve or its equivalent in the neck of the free knob through which the spindle passes, the pawl engaging in the teeth on the spindle, and released by a pusher or by inserting a point.

5187. Looms, *R. and R. Vickers, Burnley.—28th November,* 1881.—*(Not proceeded with.)* 2*d.*

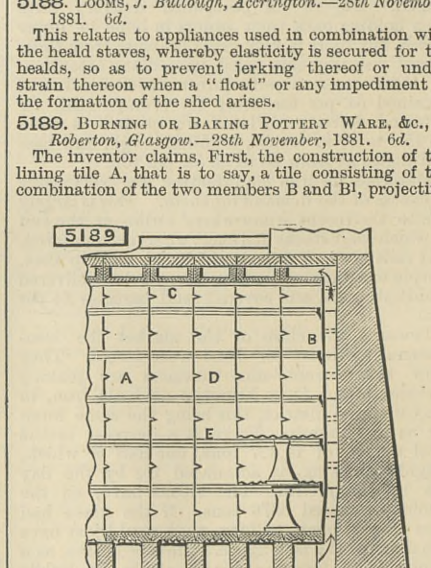
This relates to the warp beam, and is designed to impart an uniform amount of friction or drag to the beam.

5188. Looms, *J. Bullough, Accrington.—28th November,* 1881. 6*d.*

This relates to appliances used in combination with the heald staves, whereby elasticity is secured for the healds, so as to prevent jerking thereof or undue strain thereon when a "float" or any impediment to the formation of the shed arises.

5189. Burning or Baking Pottery Ware, &c., *J. Roberton, Glasgow.—28th November,* 1881. 6*d.*

The inventor claims, First, the construction of the lining tile A, that is to say, a tile consisting of the combination of the two members B and B1, projecting



at right angles from the tile A and the member C, together with the projections D and recesses E; Secondly, the construction of a shelf for supporting the ware with corrugations.

5193. Pulleys, &c., *W. H. Price, Wrexham.—28th November,* 1881.—*(Not proceeded with.)* 2*d.*

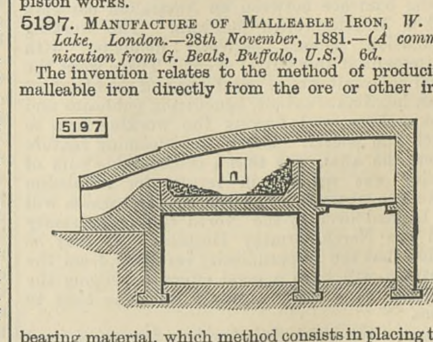
This relates to a means of fastening or keying pulleys, &c., to shafts.

5196. Cocks and Valves, *D. R. Ashton, Clapton, and J. N. Sperryn, Brixton-hill.—28th November,* 1881. 6*d.*

This consists essentially of a screw-down cock or valve in which the valve spindle is furnished with a cupped plunger or piston, and the body of the cock is formed with a barrel in which the said plunger or piston works.

5197. Manufacture of Malleable Iron, *W. R. Lake, London.—28th November,* 1881.—*(A communication from G. Beals, Buffalo, U.S.)* 6*d.*

The invention relates to the method of producing malleable iron directly from the ore or other iron



bearing material, which method consists in placing the mixture of iron-bearing material and fuel in a reverbatory or ordinary puddling furnace in a sloping mass or masses, leaving a free space on the hearth upon which the iron may be balled, and then raking down the metallic iron from the sloping surface or surfaces, when it has come to nature, and balling the same on the free space of the hearth. The drawing shows a longitudinal section of a puddling furnace.

5199. Composition for Disinfecting Sewage, &c., *A. M. Clark, London.—28th November,* 1881.—*(A communication from P. Schlosser.—(Not proceeded with.)* 2*d.*

The base of the composition is a metallic salt of any kind, but chlorides or fluorides are preferred.

5202. Boilers, Condensers, &c., *P. J. Lynam, Ballinasloe.—29th November,* 1881.—*(Not proceeded with.)* 2*d.*

The invention is based on the principle that the internal thermal resistance of metals is generally small compared with the external thermal resistance.

5203. Printing Fabrics, *J. Kerr and J. Haworth, Church, Lancaster.—29th November,* 1881. 6*d.*

In carrying out the invention the inventors attach to the machine a self-acting motion acting upon the printing rollers, so that any pattern can be impressed upon the cloth or woven fabric being printed during the progress of printing other patterns without having to stop the machine. With this is combined a measuring apparatus, by which the distance between such patterns can be varied at will.

5206. Railway Switches, *E. D. Reynolds, London.—29th November,* 1881.—*(A communication from A. W. Reynolds, Ottawa.—(Not proceeded with.)* 2*d.*

The invention consists mainly in a double-railed link to take the place of the frog now in common use on railroads, and has for its object the lessening of the cost of switches, doing away with the necessity of the frog, and greater safety to the cars or vehicles passing over it.

5210. Centrifugal Hydro-extractors, *F. Bates, Sowerby Bridge.—29th November*, 1881.—(*Not proceeded with.*) 2*d*.

To reduce the strain and friction the casing to the machine is mounted upon spiral springs or other elastic cushions.

5211. Sewing Machines for Making Button-holes, *J. Hunt and J. S. Fairfax, London.—29th November*, 1881. 1*s*.

The object is to make button-holes in a more perfect manner than heretofore, and to give the operator of the machine complete control over the character of the work done upon it, so that after adjustment for a particular class of button-hole, the movements of the machine are entirely automatic, motion only being given to the main shaft in any well-known way.

5212. Manufacture of Animal Charcoal from Bones, &c., *T. Hadfield, Liverpool.—29th November*, 1881.—(*A communication from R. Reddish, Bordeaux.*) 6*d*.

This relates to the process of manufacturing animal charcoal, which consists in filling the bones into vertical, or nearly vertical, retorts arranged in ranges on each side of a central flue, in such manner that the gases of the furnace, but not the fuel itself, shall surround the retorts and be drawn off at or near the lower part of the chamber walls into flues regulated with dampers or their equivalent.

5213. Heating Conservatories, &c., *J. Nicholl, Halifax.—29th November*, 1881. —(*Not proceeded with.*) 2*d*.

This relates to a small heating apparatus, preferably warmed by a Bunsen's burner, and consisting in its simplest form of two cones forming the walls of water spaces, through which the products of combustion pass to pipes slanting through the water to the exterior. The outer walls of the outer water space are preferably cylindrical.

5214. Manufacture of Casks, &c., *F. McC. Scott, Liverpool.—29th November*, 1881.—(*Not proceeded with.*) 2*d*.

The machine is so arranged that the stave is cut to the proper bevel according to the diameter of cask or barrel intended for, and to this end there is used a pair of knives so arranged and guided as when operated to travel in two planes, which produced, would intersect each other at a line coincident with the axis of the intended barrel.

5216. Hydraulic Motors, *J. E. Liardet, Brockley, and T. Donnithorne, London.—29th November*, 1881. 8*d*.

This relates to the construction of tidal wheels or spiral hydraulic motors.

5218. Spinning, Twisting, and Drawing Fibrous Substances, *F. W. Fox, Windhill.—29th November*, 1881. 4*d*.

A stationary ring rail is fixed below the cap, used hitherto in cap spinning only, sufficient to give clearance to the yarn, and the yarn is spun on to the bottom either in the ordinary way or from the top downwards, and as the yarn is so built on to the tube it is enclosed in the cap until the tube is quite filled.

5219. Nippers, *F. J. Cheesbrough, Liverpool.—29th November*, 1881.—(*A communication from T. G. Hall, Brooklyn, U.S.*) 6*d*.

This relates to improvements on patent No. 3792, A.D. 1878, and consists, First, of a recess and lip cut in each jaw of the nippers to receive and hold in position the reacting spring; Secondly, of a cog, pin, or roller connection between the handles of the nippers opposite their fulcrums, by which they are made to act together.

5220. Railway Sleepers, *A. G. Browning, Westminster.—29th November*, 1881.—(*A communication from B. Leslie, Calcutta.*)—(*Not proceeded with.*) 2*d*.

This relates to the construction of wrought iron or steel transverse railway sleepers, more particularly adapted for lines that are ballasted with hard stone.

5223. Ornamented Fabrics, &c., *G. Pitt, Sutton.—29th November*, 1881.—(*A communication from the Fabric Ornamenting and Manufacturing Company, New York.*) 6*d*.

This consists partly in the deposition upon a fabric having an adhesive surface of dry powdered pigments in detached heaps or masses consisting of different colours, in dispersing or intermingling, or partly intermingling, the said detached masses of dry pigments, and in subsequently applying pressure to the powdered surface.

5224. Window Sashes, *E. J. Harris, Winchester.—29th November*, 1881. 6*d*.

This relates to the arrangement, combination, and construction of window sashes in which the stiles and meeting rails are rebated together to form a close or air-tight joint, the sashes being connected to the frames by a pin joint to allow the sash to rotate and remain stationary at any desired angle, and so as to be lifted out of its bearings when required.

5225. Extinguishing Fire, &c., *W. H. Phillips, Nunhead.—29th November*, 1881. 8*d*.

This relates, First, to the arrangement and construction of apparatus for discharging and projecting powerful jets of water for extinguishing fire and other useful purposes from reservoirs by the energy or power resulting from the gravitation of a weight or weights or leverage; Secondly, to the construction of means and apparatus for producing and applying motive power for extinguishing fire, &c.

5227. Manufacture of Rings, Hooks, &c., *J. V. Hope, Wednesbury.—30th November*, 1881. 6*d*.

This relates to the manufacture of rings, hooks, and other articles from bars, wires, or other kindred shapes of malleable metal, by pressing the piece of metal by means of a die or dies forming the inner surface of the article against pivotted dies, which pressed forward with pressure applied close in upon the piece of metal and bending it against the inner dies gives it the required shape.

5228. Dams, Retaining Walls, &c., *J. Thomas, Bangor.—30th November*, 1881. 6*d*.

This relates to the method of constructing concrete brickwork or masonry blocks or structures, consisting in forming them with a thin sheathing of metal strong enough to withstand the strain of the concrete or other filling during formation, and sufficiently thick to resist being corroded through till the concrete or mortar has set sufficiently hard to be able to withstand the action of the water or other material brought against it.

5230. Manufacture of Cut Pile Fabrics, *J. H. Johnson, London.—30th November*, 1881.—(*A communication from A. O. Delétoille and H. J. B. Lechopier, Paris.*—(*Not proceeded with.*) 4*d*.

According to this invention the threads forming the pile are wound singly upon spools or bobbins, whereby it is rendered possible to obtain a greater variety of effects than when the ordinary system is adopted.

5231. Motive Power Engines, *J. Bell, Wishaw, N.B.—30th November*, 1881. 8*d*.

This relates to the details of construction of motive power engines.

5234. Fire-alarms, &c., *W. T. Braham, Manchester.—30th November*, 1881. 6*d*.

This consists of an apparatus that shall on the occurrence of a fire in its immediate vicinity do any or all of the following acts, that is to say, it may sound an alarum or alarums, transmit electric currents or telegraphic signals to any place or places desired, or turn on a supply of water through a series of perforated pipes for the purpose of extinguishing the flames.

5235. Matches, *J. L. Mapple, London.—30th November*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to boiling the match splints before dipping them in the chemical solution in a bath of inflammable material.

5236. Steam and Hand Steering Apparatus, *J. N. Holliday, Sunderland.—30th November*, 1881. 6*d*.

The inventor claims, First, the application of a combined sliding and rotary motion imparted to the chain sheaves or drums by which an increased travel of chains or wire ropes is effected; Secondly, the facility of changing from hand to any other motive power, or *vice versâ*, at any part of the stroke; Thirdly, the employment of serrated teeth on the guide frames, with

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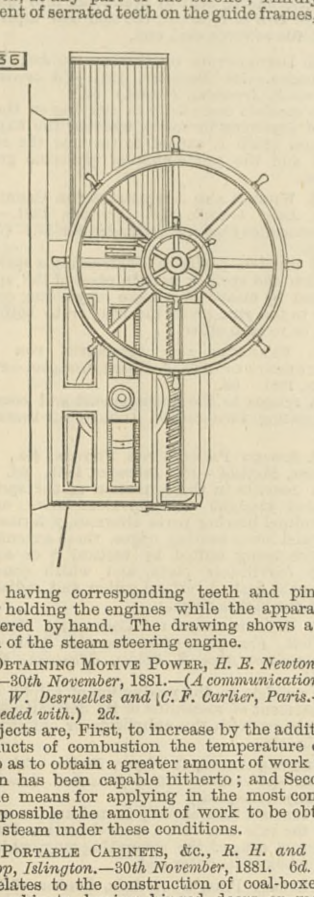

a block having corresponding teeth and pinching screw for holding the engines while the apparatus is being steered by hand. The drawing shows a front elevation of the steam steering engine.

5237. Obtaining Motive Power, *H. E. Newton, London.—30th November*, 1881.—(*A communication from L. A. W. Desruelles and C. F. Carlier, Paris.*—(*Not proceeded with.*) 2*d*.

The objects are, First, to increase by the addition of the products of combustion the temperature of the steam, so as to obtain a greater amount of work therefrom than has been capable hitherto; and Secondly, to provide means for applying in the most complete manner possible the amount of work to be obtained from the steam under these conditions.

5238. Portable Cabinets, &c., *R. H. and A. S. Bishop, Islington.—30th November*, 1881. 6*d*.

This relates to the construction of coal-boxes and portable cabinets having hinged doors or movable panels and drawers with rocking handles in connection with the said doors or panels and drawers.

5240. Biscuit Boxes, &c., *S. J. Pinder, Sheffield.—30th November*, 1881.—(*Not proceeded with.*) 2*d*.

This consists in so arranging the parts that both halves of the partially rotating lid or cover are carried on the same axis, one being fixed on each side of the body of the box, and so arranged that they cannot rotate beyond the required position.

5241. Feeding Paper to Printing Machines, &c., *J. H. R. Dinsmore and F. Hoyer, Liverpool.—30th November*, 1881. 8*d*.

This relates to improvements in and relating to feeding paper to printing and other machines by means of exhaust or suction.

5242. Belt Clasps, &c., *J. H. Cofield, Birmingham.—30th November*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to the general construction of fastenings or clasps chiefly applied to belts, waistbands, &c.

5243. Burners of Oil Lamps, *W. Foxcroft, Birmingham, and J. Titley, Wolverhampton.—30th November*, 1881. 6*d*.

The invention consists in employing an instrument or cutter for snuffing or trimming the wicks of lamps by removing the consumed or partially consumed portion, and at the same time extinguishing the flame.

5244. Cleaning Coal, *J. Bell, Wishaw, N.B.—30th November*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to the general construction of the machinery for cleaning coal.

5245. Ships' Propellers, &c., *C. D. Abel, London.—30th November*, 1831.—(*A communication from J. A. Andrée, Esens, Germany.*) 8*d*.

This refers to the construction of ships' propellers in which flat blades or vanes are pivotted to a central boss in such a manner that on rotating the propeller alternately in opposite directions the blades will be made, by the pressure of the water, to assume alternately opposite angular positions so as to propel the boat forward in whatever direction the propeller is rotated.

5246. Separating Ores, Minerals, &c., *F. C. Glaser, Berlin.—30th November*, 1881.—(*A communication from F. Büttgenbach, Düsseldorf, Germany.*) 6*d*.

This relates to the method of separating or sorting mixtures of ores, minerals, and other similar bodies by the aid of their different degrees of hardness or cohesion, such method consisting in throwing the mixed

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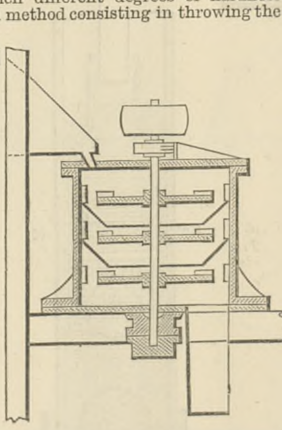

material with such centrifugal force against a hard surface as to cause the more friable particles of the mixture to be broken up while the harder particles are left intact, the mixture being then separated into different sizes by screening. The drawing shows a vertical section of the apparatus.

5247. Apparatus and Wheel Pads for Polishing Knives, Forks, &c., *J. F. Walters, Bayswater.—30th November*, 1881. 6*d*.

This consists in a special combination or arrangement of appliances forming a machine for polishing knives or forks; also a special arrangement of pad as part thereof, particularly applicable for polishing spoons.

5248. Ornamental Glass, *H. H. Lake, London.—30th November*, 1881.—(*A communication from J. Budd and J. Grant, Boston, U.S.*) 4*d*.

This relates, First, to applying to a plate of glass a liquid dye of the proper colour to represent any desired wood, and then applying photographers' varnish, and after heating the glass applying various shades of dyes to represent the different shades of the wood; Secondly, to the use of a coating of shellac, into which is rubbed dry powdered plaster of Paris with various dry colours to form a backing for the imitation of wood.

5249. Colouring Matters, &c., *O. N. Witt, Alsace, and H. Köchlin, Baden.—30th November*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to improved methods of obtaining the dyestuffs described in patent No. 1373, A.D. 1881, and called indophenols, and it consists in treating a mixture of paramido derivatives of phenols, their homologues or derivatives, and primary, secondary, or tertiary amines, with oxidising agents in solutions which may be either acid, or neutral, or basic.

5250. Harrow, *J. Elkington, London.—30th November*, 1881.—(*A communication from R. Cockerell, Melbourne.*) 4*d*.

This relates to a rotary harrow, and consists of tines or teeth in the form of serrated bobbins or flanged wheels fixed on jointed rods which allow them to yield to the irregularities of the ground, such rods being placed at an angle to their draught so as to produce a tearing action, the rotating motion allowing it to pass over roots, stones, and other obstructions.

5251. Washing Machines, *W. B. Brooker, Lancaster.—30th November*, 1881. 6*d*.

A drum is caused to revolve, and is supported at each end on rollers carried by the frame. Inside the drum rods are arranged so as to form a kind of grating, which lift the clothes and cause them to fall down when they reach the top, whereby they are knocked about in the soap and water and thereby cleansed. To rinse the clothes a jet of water is admitted, and passing through the clothes on the grating is collected by boards placed under the rods, and which are inclined so as to direct the water to a hole leading to the outside of the drum.

5252. Clothes' Dryer, *H. J. Haddan, Kensington.—1st December*, 1881.—(*A communication from J. H. D. Everett, Toronto, Canada.*) 6*d*.

This consists in a clothes' dryer composed of a series of arms independently pivotted upon an adjustable standard.

5253. Tricycles, *J. F. Townsend, Coventry.—1st December*, 1881. 6*d*.

This relates to a machine to accommodate four riders, two seated on either side of the driving axle, and actuating pedals fixed to shafts, over which pass endless chains, which engage with toothed wheels on the driving shaft. The saddles for the back riders project backward so as to facilitate mounting and dismounting.

5254. Picks, Pickaxes, &c., *T. N. Robson, Durham.—1st December*, 1881. 6*d*.

This relates to means for fixing the head of picks, &c., to their handles, and consists in forming the head with an eye or socket deeper than usual, and tapered to suit the handle. A steel wedge with a head at top is inserted into the top end of the handle and secured by a pin, whereby the top is caused to spread out and tightly fit the socket of the head.

5255. Cooling or Heating Fluids, *F. Wirth, Frankfort-on-the-Maine.—1st December*, 1881.—(*A communication from A. Dietsche, Waldshut, Germany.*)—(*Not proceeded with.*) 2*d*.

This relates to the rapid and effective cooling or heating of fluids by passing them in an extremely thin film between two surfaces composed of tubes, which convey the heating or cooling medium. The tubes are formed by corrugated plates, and are arranged so that they fit one over the other without touching.

5256. Lubricators for Bearings, &c., *J. Davis, London.—1st December*, 1881. 6*d*.

The drawing shows a vertical section of the lubricator. A is a boss adapted to screw into the oil hole of a bearing. B is a bowl or cylindrical glass, C is the central standard; it screws into a socket in a part of A, and is perforated at C^1 C^1. D is the cover; it is

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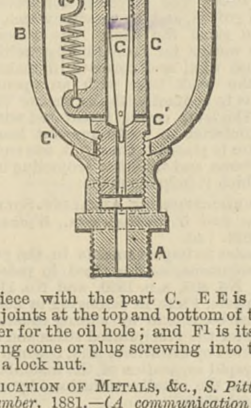


formed of a piece with the part C. E E is packing forming tight joints at the top and bottom of the glass. F is the stopper for the oil hole; and F^1 is its spring. G is a regulating cone or plug screwing into the standard C. H is a lock nut.

5257. Purification of Metals, &c., *S. Pitt, Sutton.—1st December*, 1881.—(*A communication from H. Harmet, France.*) 6*d*.

The apparatus employed consists of a vertical receiver, into the top of which are charged the metals and the reagents to be simultaneously melted, the fusion taking place at the lower part of the receiver. At the bottom of the receiver is a combustion and purifying chamber, in which heat is produced by a burner supplied with gas or oils, and the metals and reagents as they fuse run out together, the sole of the furnace being inclined. A crucible is fitted beneath the furnace and receives the liquid matters, the metal being concentrated in the bottom after traversing, drop by drop, an upper layer of purifying slag.

5258. Rings Employed in Machinery for Spinning and Twisting Wool, &c., *J. W. Merrall, York.—1st December*, 1881. 4*d*.

The object is to prevent the loose projecting fibres being caught by the ring traveller and breaking and snarling the yarn, and also to improve the drag; and it consists in forming on the rings an inner ring or annular projection between the ring traveller and the bobbin, so as to shield the ring traveller from being caught by the projecting fibres on the bobbin. As the yarn bears on this ring it serves to put drag on the yarn between the traveller and bobbin.

5259. Gas Engines, *J. Rhode, Manchester.—1st December*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to double-acting gas engines; and consists in constructing the cylinders so that both outer extremities receive the mixture of gas and air in regulated proportions to be compressed and exploded at each in and out stroke of the engine. The spaces from the inside surfaces of the pistons, when at the outer extremities of the cylinders, form chambers to produce a vacuum, so as to exhaust the products which pass into the atmosphere, whereby an engine with an explosion at both in and out strokes, and a great saving in gas, and a more powerful engine is produced in a small space.

5264. Chromate of Soda and Chromic Acid, *C. D Abel, London.—1st December*, 1881.—(*A communication from F. C. Glaser, Berlin.*)—(*Not proceeded with.*) 2*d*.

Chromate of iron is employed for the production of chromate of soda by mixing it, when ground fine, with lime and carbonate of soda, and subjecting it to a strongly oxidising flame at a bright red heat until the mass shows no more unconverted ore. By lixiviation with boiling water, with or without the addition of soluble soda compounds, such as sodic carbonate or sulphate or caustic soda, the chromate of soda is obtained as aqueous solution.

5262. Chromate of Soda, *C. D. Abel, London.—1st December*, 1881.—(*A communication from F. C. Glaser, Berlin.*)—(*Not proceeded with.*) 4*d*.

The object is to obtain chromate of soda in a solid form by subjecting the lye obtained in the manufacture of alizarine to a calcining process by application of superficial heat.

5266. Apparatus for Receiving, Disinfecting, and Separating Fœcal and other Matters, *A. M. Clark, London.—1st December*, 1881.—(*A communication from P. Schlosser, Paris.*) 6*d*.

This relates to the tub system of cesspool, the object being to mechanically and automatically effect the separation of the solid and liquid parts and to disinfect the latter, so that it may be ran away into drains. The tub is fitted at top with a movable annular filter formed with straight double outer walls and an inner wall in the form of a truncated cone, the latter, as well as the inner straight wall, being perforated, and the space between them filled with a disinfecting absorbent composition. The sewage falls centrally into the tub, and the liquid portion rises to the top and passes through the perforations and the disinfectant and out through a hole to the drain. A perforated tube is placed within the tub and contains a disinfectant to act on the solid matter.

5267. Desiccating Apparatus, *A. M. Clark, London.—1st December*, 1881.—(*A communication from F. Schlosser, Paris.*)—(*Not proceeded with.*) 6*d*.

This relates to apparatus for desiccating liquid and viscous matters, and consists of a hollow drum dipping into a trough containing the matters to be dried. The drum in revolving receives a coating of such matters, and heated air, gas, or steam being caused to circulate within the drum effects the drying of the same. A scraper removes the dried matter, which falls into a hopper, and is raised by a screw into any desired position. A casing surrounds the drum, and is connected with an exhaust to carry off the vapours.

5268. Treating Fœcal and other Matters, *A. M. Clark, London.—1st December*, 1881.—(*A communication from P. Schlosser, Paris.*)—(*Not proceeded with.*) 2*d*.

The object is to collect fœcal matters in as small a volume as possible, to avoid nuisance in any form, and produce a manure rich in fertilising properties, and it consists, First, in the use of the portable cesspool with a filter described in patent No. 5266, A.D. 1881; Secondly, in the use of the disinfecting absorbent composition described in patent No. 5199, A.D. 1881; Thirdly, in the preliminary treatment of matters containing foreign substances so as to separate the same, and consists in draining, drying, and pressing said matters; and Fourthly, the drying of the fertilising products thus obtained and separated by the drying apparatus described in patent No. 5267, A.D. 1881.

5269. Purifying Coal Gas, *J. Walker, Leeds.—2nd December*, 1881. 4*d*.

Coke from which the gas has been extracted is taken in a semi-dry state as slacked from the retorts, crushed into rough, irregular bits, and placed on the first grating at the bottom of a purifier in a layer of about 9in. in depth. Then the small and dust from the crushing operation is placed over such layer to a depth of from 1in. to 2in. The other gratings of the purifier are similarly charged, and the gas is passed through a series of such purifiers coupled to work together, whereby the sulphur and other impurities are absorbed by the coke, and the sulphur may be recovered in the usual way in making sulphuric acid.

5270. Roller Mills for Grinding Middlings, &c., *A Stevenson, Chester.—2nd December*, 1881.—(*Not proceeded with.*) 2*d*.

This relates, First, to means by which the material ceases to be supplied to the rolls in the event of their being drawn apart from their ordinary working distance; Secondly, to means by which the crushed or flattened material is broken up after passing through the rolls preparatory to further treatment; and Thirdly, to means by which the space or casing surrounding the rolls is ventilated in order to prevent the accumulation of moist vapour which is produced in the crushing process, and which rusts or tarnishes the polished surface of the rolls.

5271. Purification of Precipitated Copper, *F. Claudet, London.—2nd December*, 1881. 4*d*.

This consists in effecting the separation of arsenical compounds from precipitated copper by the employment of a caustic alkali, or of an alkaline carbonate, in conjunction with heat, in order that the copper smelted therefrom may be obtained free from arsenic.

5273. Capsules for Bottles, *J. Imray, London.—2nd December*, 1881.—(*A communication from C. Cheswright, Paris.*) 6*d*.

The object is to form capsules so that in opening the bottle the head of the capsule which covers the cork becomes separated from the body which encloses the bottle neck, whereby the capsule cannot be removed entire and again used, and yet the mark on the body of the capsule remains intact.

5274. Insect Powder for Agricultural Purposes, *A. C. Henderson, London.—2nd December*, 1881.—(*A communication from E. Koch and L. Schulner, Paris.*) 4*d*.

This consists in the mixture of silica or any silicious or aluminous matter in place of plaster, sand, or lime, with tar for the production of a powder for agricultural purposes, whether or not added to manure of some sort. A small quantity of picrate of potash may be added to make the powder more bitter and increase its properties as an insect killer.

5275. Wind Chests of Organs, &c., *O. Dinse, Berlin.—2nd December*, 1881.—(*A communication from M. Reiter, Berlin, and G. Sanden, Breslau.*)—(*Not proceeded with.*) 4*d*.

The object is to provide a prompt and certain sound action of the pipes of an organ, or other instrument worked by wind, and to improve the mode of playing, so that the movement of the keys is rendered lighter and they need not be depressed so far as hitherto; and it consists in the use of a peculiar arrangement of valves not actuated directly by the key-board, but indirectly by the compressed air in the wind chest, while the player, to produce the required note by drawing the register and depressing the key, only opens flaps which let out a small part of air from the wind chest and thereby actuates the valves.

5276. Fire Grates, *J. Teer, Salford.—2nd December*, 1881.—(*Not proceeded with.*) 2*d*.

The object is to effect a more perfect combustion and lessen the emission of smoke, and it consists of a perforated fire clay back with an air chamber formed behind it, into which air is admitted from the space below the grate so as to bebome heated as it passes to the chamber. The air issues from the chamber through the back, and passes into the burning fuel. A hinged cover or blower is fitted so as to cover over the top of the fire when required.

5277. Ladders, *G. Whalley, Hackney.—2nd December*, 1881.—(*Not proceeded with.*) 2*d*.

This relates to a ladder capable of being used as steps without support, or as a ladder to lean against a support, and it consists in forming it in two parts hinged together, so as when fully opened out to form a continuous ladder, the necessary rigidity being obtained by metallic cross-pieces pivotted near the hinge to one side, and sliding in a slot on a corresponding pivot on the other side, and capable of being tightened up by nuts.

5278. Purification of Coal Gas, *G. B. Spence and J. Desvignes, London.—2nd December*, 1881. 2*d*

The object is to remove ammonia from coal gas without the use of scrubbers, and it consists in dissolving phosphate of alumina in sulphuric acid, and treating the mass obtained with sufficient carbonate of lime to neutralise any free sulphuric acid. The mass is then dried, and the powder obtained placed in a purifier and the gas passed through it, the ammonia it contains combining with the sulphuric acid, and forming sulphate of ammonia. The gas is then passed through a second purifier containing oxide of iron or other suitable purifying agent, and parts with the sulphur and carbonic acid in the usual way.

5279. APPARATUS FOR HEATING AND COOKING BY DIRECT RADIATION FROM SURFACES OF METAL, &c., *T. Ivory, Edinburgh.—2nd December, 1881.—(Not proceeded with.)* 2d.

This relates to upright gas burners, and consists, First, in making them in the form of narrow boxes with one or more faces pierced with small holes for the passage of mixed gas and air, such pierced face being inclined downwards towards the horizontal. Secondly, in forming a projection between every two holes in the upright rows, and also a projecting portion surrounding each hole. Thirdly, in graduating size of the holes from the bottom to the top; and Fourthly, making such burners of pierced metal, and of a conical form.

5280. FUSIBLE PLUGS FOR STEAM BOILERS, &c., *H. J. Harman Manchester.—2nd December, 1881.* 2d.

This consists in the use of a packing ring or wad of metal, mineral, or other suitable material above or below the fusible alloy.

5281. CULTIVATING LAND, *G. P. Blake, Exeter.—2nd December, 1881.—(Not proceeded with.)* 2d.

The implement is formed so that the furrow slice when separated from the land in the usual way is carried up to the interior of a revolving screen with internal flanges, which break it up and allow the fine earth to pass through the meshes, while the stones and weeds are conveyed to a receiver.

5282. FANCY YARNS, *E. Horsfall, Bradford.—2nd December, 1881.* 6d.

This relates to machines for twisting or doubling plain or fancy threads of wool or other fibrous material so as to form knots therein at certain distances apart.

5284. TRICYCLES AND QUADRICYCLES, *N. K. Husberg, Stockholm.—3rd December, 1881.* 6d.

The object is to reduce the power required to propel the velocipede, and to make it compressible in length and width, and it consists in the use of pedal levers pivotted at one end to the frame and carrying the pedals at the other, in combination with spring actuated clutch pulleys, and chains and means for varying the point of attachment to the lever of the chains without dismounting, and also in the use of an elastic strap connected to the levers to effect their return movements.

5285. FURNACES, *J. Redgate, Nottingham.—3rd December, 1881.* 6d.

This relates to a new form of bearing bar and fire-bar applicable to the flues of furnaces of circular or other shape. In each furnace are two or more bearing bars lying in the direction of the length of the flue, and their ends are formed on the underside to fit the inner edge of the dead plate at one end and the bridge bearer at the other. Each bearer bar is reticulated on the side nearest the side of the flue, and on the opposite side on the lower edge a recessed bracket is cast, provided with a screw for adjustment, and in the recesses one end of a slotted cross bar rests. This arrangement prevents the expansion of the cross bar forcing outwards the side of the flue. The ends of some of the fire-bars rest on the dead plate at one end, and on one side of the slotted cross bar at the other end; the remainder resting at one end on the bridge bearer, and at the other on the opposite side of the slotted cross bar. Each fire is formed with its lower edge thin and corrugated its whole length. The bar is thicker at top, and reversely reticulated on each side, and each corrugation of the bottom edge terminates in two or reversely inclined reticulations at the top edge, so that the streams of air entering are caused to cross or impinge upon each other.

5287. VELOCIPEDES, *C. Beger, Berlin.—3rd December, 1881.* 6d.

The main axis which supports the rider is formed in two parts, each having a crank and actuated independently by hand, so as to steer in either direction. The wheels are mounted on the outer ends of the axles, the inner ends of the axles being supported upon a bent bar swinging from the axle and carrying a seat for the rider.

5288. WARDROBES, BOOKCASES, &c., *E. Peyton, Birmingham.—3rd December, 1881.—(A communication from J. H. Baxter, Sydney.)* 2d.

The object is to enable wardrobes, &c., being readily put together and taken to pieces so as to pack up into a small compass, and it consists in forming the frame of a series of metal bars connected together by dovetailed joints and sockets.

5289. STEAM GENERATORS, *W. L. Wise, London.—3rd December, 1881.—(A communication from G. H. Babcock, Plainfield, S. Wilcox and N. W. Pratt, Brooklyn, and E. H. Bennett, Bayonne, U.S.)* 8d.

This relates to improvements in that class of steam generators in which a number of inclined tubes extend through the furnace with an active circulation of water and steam through them, the water descending at the back connections established between the barrel or separating drum or chamber and said inclined tubes, and rising, mingled with steam, through the front connections into the barrel.

5290. LUBRICATORS, *H. J. Haddan, Kensington.—3rd December, 1881.—(A communication from E. Quesnot, Marseilles.—(Not proceeded with.)* 2d.

Between the grease receptacles and the part to be lubricated a valve chamber is situated and communicates at top with the receptacle and at bottom with the part to be lubricated, and opening at the side into a pump barrel in which a small ram piston is actuated by hand or mechanically. Two valves connected by a stem are placed in the valve chamber, and serve to close the top and bottom. On the valve stem are two perforated discs one fast and the other loose, the two being held apart by a spring.

5291. CHROME YELLOW AND CHROME RED, *W. Spence, London.—3rd December, 1881.—(A communication from E. Werner, Warsaw.)* 4d.

This relates, First, to a new method of preparing chrome yellow based upon the chemical action of a solution of dichromate of potassium and sulphuric acid, or phosphoric acid, or even sulphate of alumina upon white lead or litharge suspended in water and in a cold state; and Secondly, to a new method of preparing chrome red based upon the process of boiling a suspension of white lead or litharge in water, together with a solution of dichromate of potassium in water which may be acidulated with sulphuric acid.

5292. SPINNING COTTON, &c., *J. Leyland, Bolton.—3rd December, 1881.* 8d.

This relates to means for mounting, driving, and lubricating spindles used in machines for spinning, doubling, and twisting cotton, flax, and other fibrous materials. A tube contains the spindle and its bearings with their lubricant, and is attached to the top rail. This tube contains a bolster or top neck, footstep, and intermediate bearings, so as to steady the spindle and contain the lubricant.

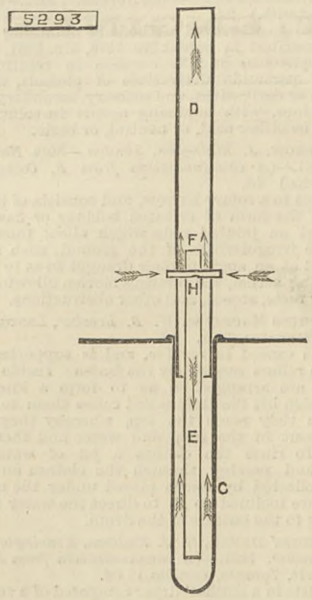
5294. FURNACES, *E. Kaulbach, London.—3rd December, 1881.—(Not proceeded with.)* 2d.

When it is requisite to supply fuel to the furnace a vertical slide door or grating is opened so as to throw the two compartments into one. The coal is then thrown into the hopper, and falling between the blade or thread of a screw is forced by the rotation of the latter into the furnace beneath the mass of ardent fuel, which is thus upheaved and remains upon the surface.

5297. COMPOSITION FOR BLACKING LEATHER, *H. H. Lake, London.—(A communication from J. Nicolet, Lyons.)* 4d.

The composition consists of linseed oil 200 parts by weight, litharge, 20; wax, 150; tallow, 15; molasses, 190; lampblack, 103; spirits of turpentine, 280; alcohol, 35; gum lac, 5; violet aniline, 2.

5293. STEAM BOILERS, &c., *E. A. Brydges, Berlin.—3rd December, 1881.—(A communication from J. Schrieber and F. N. Moldenhauer, Vienna.)* 6d.



One part of the invention consists in the employment of the boiler tubes C D, E, F, H, in order to obtain a rapid generation in the boiler.

5298. CRANES, &c., *W. D. Priestman, Kingston-upon-Hull.—3rd December, 1881.* 6d.

This relates to a duplex and self-balancing crane, more particularly applicable for working self-acting grapple buckets, grabs, skeps, and like devices, and it consists in mounting two jibs on a movable or rotating platform so that they balance each other.

5299. REMOVING OBSTRUCTIONS OCCASIONED BY FROST IN GAS, WATER, AND OTHER PIPES, &c., *H. Green, Preston.—3rd December, 1881.—(Not proceeded with.)* 2d.

This relates to the use of a chemical substance to remove obstructions caused by frost or to prevent liquids freezing in meters and other vessels. The substance is prepared by treating waste manganese liquor with carbonate or hydrate of lime, also the residue after separating ammonia from its chloride by means of hydrate of lime, or by saturating hydrochloric acid or chlorine liquor with lime. After saturating the acid liquor with lime and throwing down metallic oxides and other impurities, the liquid is filtered and evaporated to dryness, or to such a state of concentration as is known as a saturated solution.

5302. DRYING COFFEE BEANS, &c., *F. Des Vœux, London.—5th December, 1881.—(A communication from W. A. Dieseldorff, Guatemala.)* 6d.

A cylindrical casing is heated by a steam coil and provided with horizontal shelves arranged alternately with circumferential and central channels for the passage of the beans and the heated air. A central revolving shaft carries radial stirrer arms with inclined and spring-cushioned stirrer blades, and a hook-shaped rake for the final delivery of the beans to the discharge pipe.

5307. OIL, TALLOW, AND GREASE LAMPS, *J. Darling, Glasgow.—5th December, 1881.* 6d.

This relates partly to means for raising the wick of miners' and other lamps, and consists of a prong or picker lever mounted on an axis outside the wick tube, so as when turned in one direction to project into the tube. The picker is connected with a rod sliding in guides, and by moving which the picker is caused to raise the wick. The invention further relates to means for more rapidly melting the grease or paraffine wax, and consists in making the inner side of the wick tube with an opening, so that the wick is in contact with the grease throughout its length. The lamp casing is covered with a non-conducting material so as to prevent loss of heat. A copper wire is placed in the spout, one end terminating near the flame, and the other projecting into the grease or wax which it helps to melt.

5312. PURIFICATION OF ALKALINE SOLUTIONS, *H. W. Deacon and H. Gaskell, jun., Widnes.—5th December, 1881.* 4d.

This relates to improvements in the purification of alkaline solutions, as described in patents No. 2939, A.D. 1879, No. 608, A.D. 1880, and No. 1161, A.D. 1881, and it consists, First, in removing or neutralising the excess of carbonic acid by adding caustic soda to the solution after the precipitated silica and alumina have been removed by filtration; and, Secondly, in effecting the more rapid separation of the insoluble compounds of iron from the alkaline solutions by causing air to pass through them.

5315. FIXING OR SECURING WINDOW GLASS, *W. Clark, London.—5th December, 1881.—(A communication from T. Tanner, Osage, U.S.)* 4d.

This consists of a rubber strip for holding and fastening window glass in the sash.

5320. HATS, &c., *R. Wallwork, Manchester.—6th December, 1881.* 6d.

This relates to improvements on the machine for "setting" or giving the finished shape to the hat brim before it has been "bound" or "trimmed," but after being "curled," as described in patent No. 2838, A.D. 1867. The sliding bed is prepared to hold the shape or mould, and the solid india-rubber shaper which acts on the brim is attached to the head of the ram, but a space is left between them when the ram is lifted from the hat, and round the ram head are set screws, the heads of which come against the top side of the shaper near its edge, such screws serving to adjust the pressure of the india-rubber on any part of the brim.

5321. PRINTING MACHINERY, *J. Salmon, M. Smith, and J. Hamilton, Manchester.—6th December, 1881.* 6d.

This relates, First, to mechanism for "taking off" the printed sheets from the "impression cylinders" of machines with reciprocating type beds or plattens, and delivering the sheets printed side upwards on to a receiving table, and it consists in improvements on patent No. 643, A.D. 1877. A swing frame carrying grippers, as described in above-mentioned patent, is employed, but has shorter arms, and the frame oscillates on an axis above its grippers and carried on the end of one or two levers, secured to a shaft below and some distance in front of the impression cylinder, which shaft is oscillated to and fro by a crank and connecting-rod from a shaft making one revolution for each impression printed. The swing gripper frame is oscillated by a toothed rack gearing with a wheel on the axis of the frame. The invention further relates to the application of the above arrangements for taking the printed sheets from the grippers of the impression cylinder of lithographic printing machines.

5326. WASHING MACHINES, &c., *A. Mill, Glasgow.—6th December, 1881.* 6d.

The machine consists of a deep box open at top, and in which is placed a shorter box open at top and bottom, and capable of moving up and down when actuated by a connecting-rod attached to a crank shaft mounted above the outer box. The bottom of the box is covered with a coarse wire cloth, and the top is covered with a similar cloth hinged so as to enable the clothes to be inspected and withdrawn. The washing liquid is placed in the outer box.

5337. CLIP OR HOLDER FOR FACILITATING THE CARRYING OF PARCELS TIED WITH STRING, *R. Burgess, Shepherd's Bush.—6th December, 1881.* 6d.

The parcel string clip or holder consists of a strip of thin sheet metal, bent by preference into the figure of a hollow bow or crescent, the said bow tapering from its middle towards each end.

5348. DISTILLATION OF GLYCERINE, &c., *W. Clark, London.—7th December, 1881.—(A communication from F. Armandy, France.)* 6d.

This consists essentially in carrying on the distillation of glycerine in vacuo, whereby the expenditure of steam which is caused to traverse the still is reduced and the production of glycerine greatly increased.

5358. WHEELS AND AXLE-BOXES FOR CARRIAGES, *W. R. Lake, London.—7th December, 1881.—(A communication from J. Friedlander, Berlin.)—(Complete.)* 6d.

This consists partly in constructing a spring wheel in which the springs used in place of the spokes are fastened by means of a loose or yielding connection either to the rim, or to the hub, or to both of these parts, or to each other.

5371. FURNACES AND APPARATUS FOR HEATING CURRENTS OF AIR, *J. Bissett, Glasgow.—8th December, 1881.* 6d.

This relates to the arrangement and combination of a heating furnace and tubular air-heating apparatus.

5498. SPRING PACKING FOR PISTONS, &c., *W. Lockwood, Sheffield.—15th December, 1881.* 6d.

This consists in the formation of the spring with extended straight or equivalent wire extending longitudinal bearing parts alternately formed on its upper and lower bearing edges, these extended bearing parts being united by vertical S or equivalent double curvilinear parts, and which construction ensures the desired vertical action and radial distension of the piston rings.

5586. MANUFACTURE OF COLOURING MATTERS, *F. Wirth, Frankfort.—21st December, 1881.—(A communication from E. Oehler, Offenbach, Germany.)* 2d.

This consists in the production of sulpho acids by the treatment of rosaniline or its derivatives or other similar bases with the anhydride or chlorhydrine of ethionic acid.

79. VEHICLE AXLES, *C. Pieper, Berlin.—6th January, 1882.—(A communication from J. F. Schmid, Offenbach.)—(Complete.)* 4d.

This consists substantially in making the nut on the end of the axle arm with a conical portion fitting into an internal cone of the obturating ring, which closes the axle-box at its outer end.

1108. SAFETY PINS, *W. R. Lake, London.—7th March, 1882.—(A communication from J. Jenkins, New Jersey, U.S.)—(Complete.)* 4d.

This consists in a safety or toilet pin which has the coils of its spring in part either enclosed in a hood or soldered together, whereby the garment of the wearer is prevented from entering between the coils of the spring.

1479. MAKING SOAP FROM FAT AND OILS, &c., *L. Varicas, London—28th March, 1882.—(A communication from H. Heckel, Cincinnati.)—(Complete.)* 6d.

This consists in first extracting the glycerine from the fats in their neutral condition by the direct action of steam and water under a pressure of about 150 lb., so that the use of any chemical is not necessary, and then saponifying the resultant stock.

1636. MAGAZINE FIRE-ARMS, *W. R. Lake, London.—4th April, 1882.—(A communication from C. M. Spencer, Hartford, and S. H. Roper, Boston, U.S.)—(Complete.)* 6d.

The object is to provide for the re-charging of a magazine shot gun without requiring the gun to be taken down from the position in which it has been fired.

1719. WATER METERS, *A. J. Boult, London.—11th April, 1882.—(A communication from E. C. Terry, Terryville, U.S.)—(Complete.)* 6d.

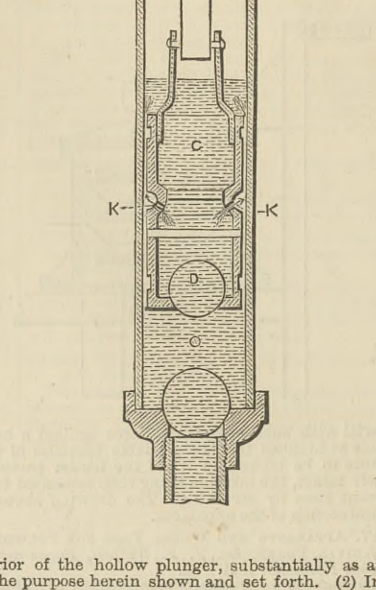
This relates to water meters in which an oval float has both a longitudinal and rotary motion within a cylindrical case.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

259,548. PUMP, *H. Jones, Sterling, Ill.—Filed April 10th, 1882.*

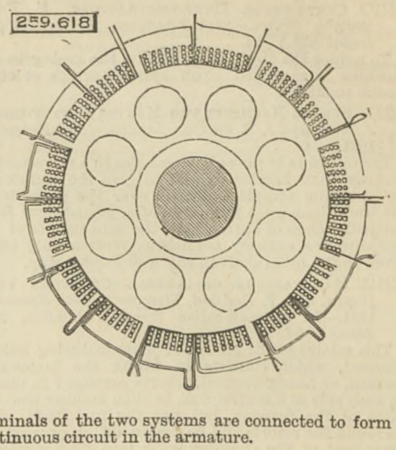
Claim.—(1) In a pump, the hollow plunger C, of cylindrical shape, having valve D, valve seat E, top and bottom channels G and I, and central annular channel H, and provided with oblique ducts K, slanting from the intermediate annular chamber or channel K, in a downward direction toward the



interior of the hollow plunger, substantially as and for the purpose herein shown and set forth. (2) In a hollow pump plunger having a valve and valve seat of suitable construction, a series of ducts K opening obliquely from the inside of the hollow valve to an annular chamber or channel H on its outside, substantially as and for the purpose herein shown and set forth.

259,618. DYNAMO-ELECTRIC MACHINES, *Edward Weston, Newark, N.J., assignor to the United States Electric Lighting Company, New York, N.Y.—Filed December 13th, 1881.*

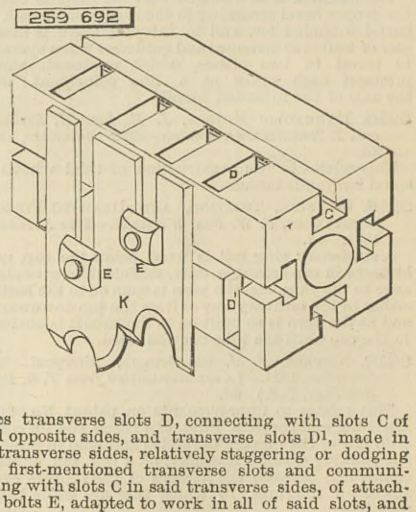
Brief.—The armature is wound with two systems of coils, each section containing four coils, those of each system being alternately above and below. The



terminals of the two systems are connected to form a continuous circuit in the armature.

259,692. CUTTER-HEAD FOR MOULDING MACHINES, *Edwd. K. Jenkins, Albany, N.Y.—Filed October 27th, 1881.*

Claim.—(1) The combination and arrangement, with a cutter-head having longitudinal slots C and transversely arranged slots D or D^1, made in opposite sides of said head, and attaching bolts E E, adapted to fit in each said slots and hold with said head, of cutting knives or bits K, each provided with slots, whereby said knives or bits will be held at two points in their lengths on the faces of said cutter-head, substantially in the manner and for the purpose set forth. (2) The combination, with a cutter-head having longitudinal slots C made in its four sides and in its two opposite



sides transverse slots D, connecting with slots C of said opposite sides, and transverse slots D^1, made in its transverse sides, relatively staggering or dodging the first-mentioned transverse slots and communicating with slots C in said transverse sides, of attaching bolts E, adapted to work in all of said slots, and also with slots made in the knives or cutting bits, whereby said knives or bits may each be attached to said head at two points in their lengths, and be adjusted on two sides longitudinally on said head in either direction, and be capable of a similar attachment and adjustment on the transverse sides of said head, with the knives and head balanced, substantially as and for the purpose set forth.

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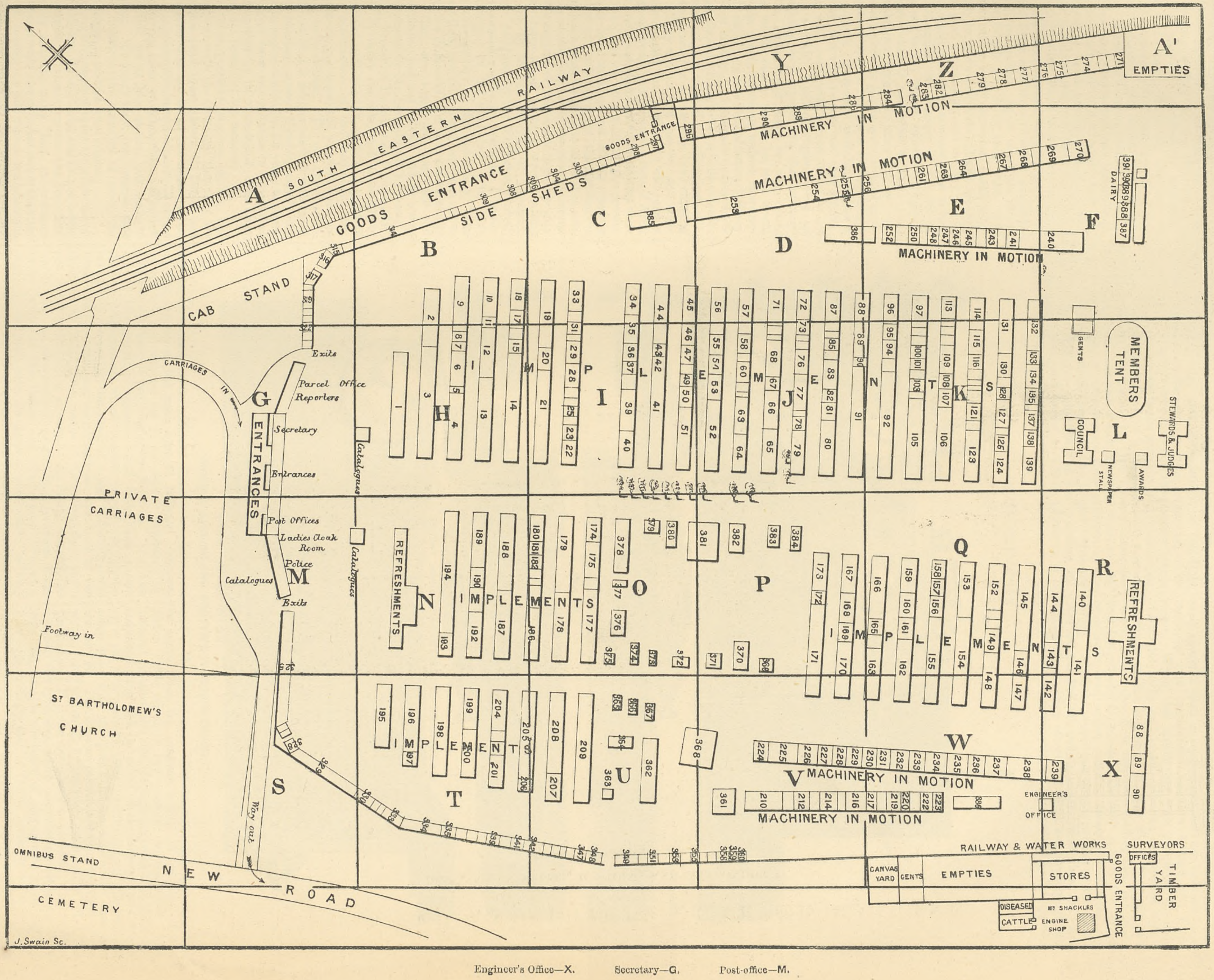
THE ENGINEER, July 7th, 1882.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending July 1st, 1882:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 9359; mercantile marine, building materials, and other collections, 4266. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 6 p.m., Museum, 2668; mercantile marine, building materials, and other collections, 644. Total, 16,937. Average of corresponding week in former years, 18,729. Total from the opening of the Museum 21,104,004.

MAP OF MACHINERY DEPARTMENT, ROYAL AGRICULTURAL SOCIETY'S SHOWYARD, READING.



Engineer's Office—X. Secretary—G. Post-office—M.

Exhibitor.	Block	No
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Cowley and Son	J	69
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