THE INSTITUTION OF MECHANICAL ENGINEERS.

The Institution of Mechanical Engineers met in the Memorial Hall, Albert-square, Manchester, at 3 p.m. on Friday, Mr. P. Westmacott, president, in the chair. There was a very small attendance of members and visitors. After the minutes of the last meeting had been read, the names of new members were announced, and the secretary then read a paper by Mr. John Hayes, of London,

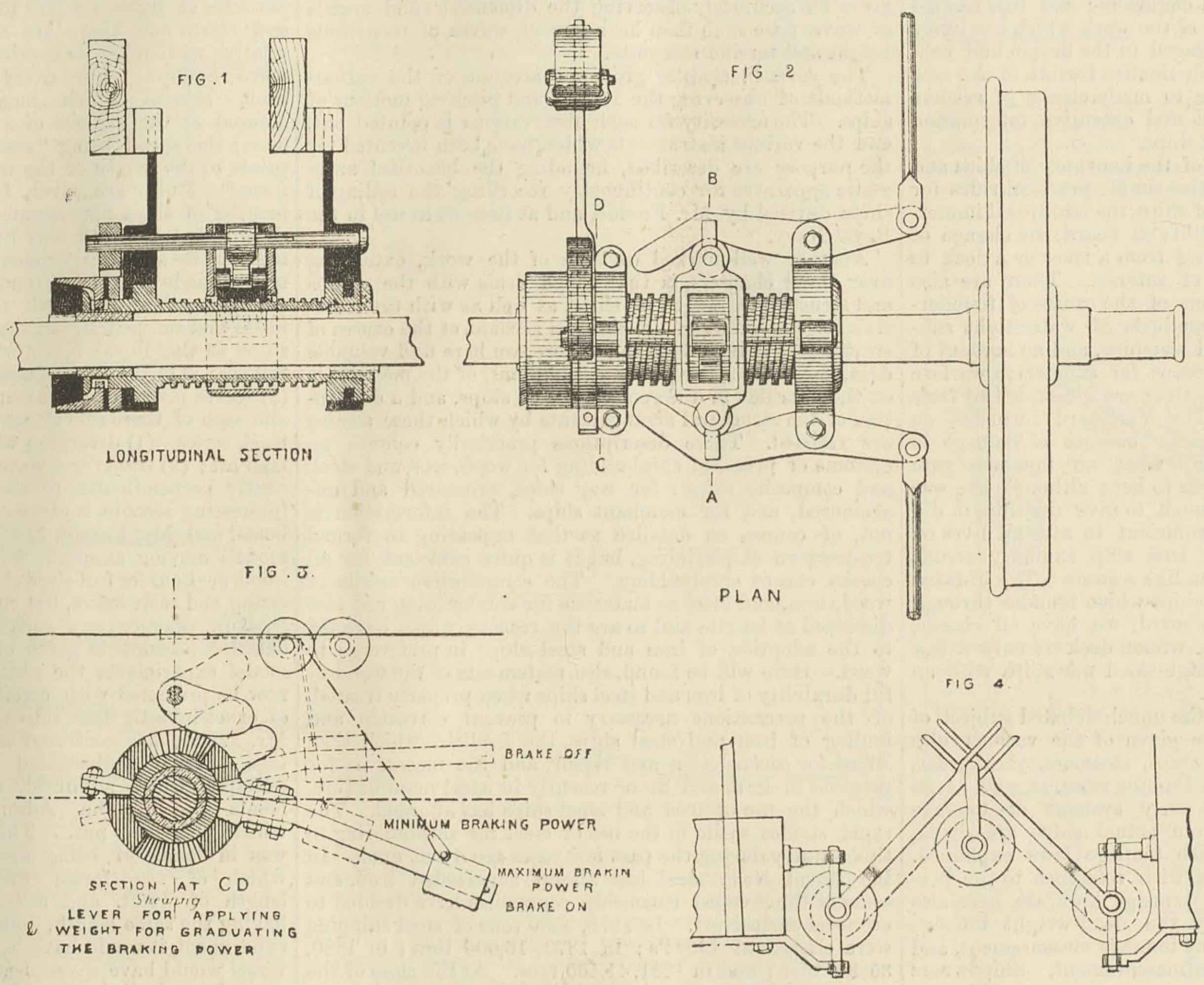
On the Fromentin Automatic Boiler Feeder.

This apparatus has been fully described and illustrated in our impression for July 21st. The paper was very short and fully illustrated by excellent wall diagrams. It will be remembered that the Fromentin apparatus consists of two copper vessels at opposite ends of a kind of balance beam, which vessels are filled alternately with steam and water. As the water rushes into one it overbalances the other, and in its descent it moves a central disc valve, which lets the vessel empty itself into the boiler, and at the same time places the other bottle in a condition to be refilled. The author stated that one of these feeders has now been in constant work at the Chaillot pumping station of the Paris Waterworks since February, 1880, without undergoing any cleaning or repairs; it delivers about 440 gallons per hour, the reversals occurring about every 75 seconds. At Messrs. Bourgin and Co.'s bleachworks at Courbevoie, near Paris, the feed is about 660 gallons per hour, with rockings every 45 to 50 seconds. In London the feeder has now been working under the author's supervision since December last, on the 20-horse boiler; in which the rate of evaporation is so much slower that the reversals generally occur only once every three or four minutes. In the inventor's early trials, the bottles were made of cast iron and consequently much thicker than the copper or wrought iron bottles now used; the condensation of the steam in the bottles was thus rendered very slow, and practically the apparatus would not work until the thinner material now adopted was resorted to.

The discussion which ensued was brief, and of small importance. Mr. Hawthorn Kitson, of Leeds, stated that he had fitted one of these feeders to a boiler, and that it worked perfectly for the fortnight he had it in use. He took it off because he fed his boilers in groups or batteries, and the boilers driven by heating furnaces were liable to have great variations of pressure in them, and the Fromentin apparatus would not work well under these conditions, as the boilers with the lowest pressure got all the feed. Mr. Kitson startled his hearers by stating that in the case of one battery of four boilers, each about 14ft. long and with a 2ft. 6in. flue through it, although all four boilers were connected by a 5in. steam pipe, yet he found the pressure to vary as much as 6 lb., the highest being 52 lb. and the lowest 46 lb. He had tested the pressure with a standard gauge, so that he could vouch for the truth of his statement. Mr. W. Anderson, of Erith, stated that he had had an experience of two months with the apparatus, which was perfectly satisfactory in its action. It kept the water level accurately right, and would even work a stroke or two now and then at night in ghostly sort of fashion; but he had some doubt as to whether an automatic feeder was the proper thing. Mr. J. Head, of Middlesbrough, spoke at some little length on the whole question of boiler feeding, pointing out that the working of the donkey was a good indication of the condition of the boiler, as when that was clean more fuel was used than when it was dirty. Mr. Paget, of Loughborough, did not think it was right to depreciate pumps and injectors, as they worked very well. He was afraid that there would be a good deal of leakage about the disc valve, and it was worth notice that thin vessels must be used, which meant loss of heat and want of economy. Mr. Cochrane objected to all automatic gear, as liable to lull a stoker into a condition of insecurity, and cited the case of a balloon boiler fitted with a float automatic feed of the James Watt type, the pressure being only 8 lb. on the inch. This float worked well for thirty years, but it stuck at last, and there was a narrow escape. We think Mr. Cochrane really bore unconscious tribute of the highest kind to self-acting arrangements, or at all events, to one; for a single failure in thirty years comes under the class of exceptions which prove a rule. Mr. Hayes replied generally and effectively on the whole discussion, and the secretary then read a paper by Mr. W. Parker Smith, of London,

On the Automatic Screw Brake.

This very ingenious brake was described by the author. The apparatus consists essentially (1) of a screwed metal sleeve—Figs. 1 and 2—loosely encircling an axle of the coach, from which, by means of a coned friction clutch, it may be rotated when desired; (2) of a part-nut contained in a cast iron box, which, by means of a cam—Fig. 3—may be raised and lowered, so as to engage with and be disengaged from the screwed sleeve. A lever performs by its descent and ascent the double duty of engaging and disengaging the part-nut, and also, when in its lowest position, acts as a lever for wedging together the surfaces of the coned friction clutch. The action of the apparatus is as follows: If the lever is held up in its highest position, as shown in dotted lines on the section—Fig. 3—the part-nut is held up clear of the screwed sleeve, and the surfaces of the coned clutch are not in contact. If the lever is permitted to descend, in obedience to its weight, to its lowest position, shown in full lines on the diagram, the part-nut becomes engaged with the screwed sleeve, and the surfaces of the cone clutch are taken into contact by the wedging action of the lever. Any downward pressure applied to the lever in this position results in the screwed sleeve revolving, and the part-nut being carried to the right or to the left of its central position—according to the direction in which the axle is revolving. It will be seen by the plan, Fig. 2, that a movement in either direction will cause the ends A B of the two brake rods to move inwards, and so bring the blocks against the wheels. For the purpose of obtaining downward pressure on the lever, and for graduating the friction between the surfaces of the friction cones, there is mounted loosely on the lever a sliding weight of about 10 lb., Fig. 3. The lower the weight is permitted to slide down the lever the greater will be the friction produced between the surfaces of the cones; and as the power which the screwed sleeve is capable of exerting on the part-nut is governed by the amount of grip in the cones, it follows that by varying the position of the weight on the lever, more or less braking power may be obtained. As soon as the desired braking power is attained, the pressure is relieved from the friction cones by lifting the weight on the lever; the screwed sleeve then ceases to revolve, but the nut still retains its position, and the brakes remain on. To take the brakes off, the lever must be lifted to its highest or dotted position—Fig. 3—thus lifting the part-nut altogether away from the thread. By levers and weights throughout a train may be controlled by a series of spindles with universal joints between coaches; or by having longitudinal rods under the coaches, joined together between them by chain, as shown in Fig. 4. Pulleys are swivelled in brackets fixed to the buffer beams as shown. One pulley hangs in a stirrup which interlaces with forks formed at the ends of links. The chain is fastened together by two open links. It will be seen that this arrangement permits of the vehicles being turned end to end; and any alteration in their distance apart, due to compression of buffers or extension of draw-bars, does not practically produce any movement in the continuous connection.



SMITH'S SCREW BRAKE

No adequate discussion followed. Mr. Ramsbottom held that the brake would not answer because it would get out of condition when the carriages were put by, and the dust under long trains would act prejudicially. Mr. Tomlinson, of the Metropolitan Railway, said that after a battle of ten years they had not got *the* brake yet. His trains stopped twenty-two times an hour, and he feared that such incessant work would tell on Mr. Smith's brake. The great objection to it seemed to be that all the brakes would not go on equally hard at the same time, and this would cause jerking in the train. Mr. Davey, of Leeds, explained that on the Liskeard and Caradon Railway, where the brake was tried, there were few trains and the speed was slow, so that the test was not sufficiently severe. Captain Fairholm explained that he had got rid of all trouble with the Heberlein brake by making the friction wheels of cast steel, which would not wear out, and acquired a surface as bright as silver. After a few words from Mr. Crampton, Mr. Smith replied, giving such explanations as were asked for.

A paper by Mr. Waldemer Bergh, of London, was then read on

A Centrifugal Separator for Liquids of Different Specific Gravity.

This was a description of the Laval cream separator, already illustrated and described in our impression for July 7th. The author sketched the history of the machine, saying that the first attempt in this direction was made about twenty years ago in Germany. A disc about 4ft. diameter was made to rotate horizontally at a high speed. Round the rim of this disc were fixed strong iron hooks, on which buckets filled with milk were hung. After, say, twenty minutes' rotation, the heavier portion of the milk—or the skim milk—was forced to the bottom of the buckets, leaving the cream on the top. The disc was then stopped very gradually so as not to disturb the cream which was floating on the milk. When the disc was brought to a standstill, the cream was skimmed off by a spoon in the ordinary way. The next machine constructed was a great improvement on the first. This was a cylinder, the top of which was partially covered, leaving only a hole in the centre. After the milk had been passed into the cylinder, the latter was made to rotate at a high speed; the milk was thus thrown to the sides, leaving a cylinder of cream in the centre. When the separation was considered complete, the machine was again stopped very carefully, and the cream which was left floating on the milk was skimmed off. It will be seen from this description that the separation of cream from milk could easily be effected, but no arrangement for drawing off the cream mechanically was used until some six years ago. A cylinder very nearly of the same construction as the last described was then employed, having on the top a rim extending inwards 4in. or 5in. By the rotation of the cylinder the separation was produced as before. When the cream was formed, skimmed milk was passed into the machine, which, taking its place behind the cream, pressed the latter up and over the edge of the cylinder, where it was collected in a cylindrical receptacle round the machine. When the cream was drawn off the feed was stopped, and the cylinder emptied by means of a cock in the bottom. Subsequently Mr. De Laval brought out his invention of a tube fixed to the neck of the cylinder, and leading to the outside, so as to draw off the skim milk as shown on the diagram. It will readily be understood that this machine, with some slight alterations, can be made to separate a great variety of fluids, as, for instance, in the purifying of oils, &c. An experiment was made some time ago at the Birmingham Gasworks with coal tar. The tar was taken direct from the converters, strained—so as to take away the grains of coal left in it—and then passed through a machine only constructed for separating milk. In an instant the clear ammonia liquor was flowing out of the one spout and the purest tar out of the other spout. Again, in one factory in Norway the machine is already in practical use for the purifying of fish oil.

The action of the separator was shown by a model, which worked very well. The desultory conversation which ensued is not worth reproducing, save so far as regards a suggestion thrown out by Mr. Davey, of Leeds, to the effect that the machine might possibly be used as an ore separator for dealing with slimes in tin mining. This terminated the business of the meeting.

LITERATURE.

A Manual of Naval Architecture. By W. H. White, Chief Constructor Royal Navy, &c. London: John Murray. 1882.

Treatises on the theory of naval architecture have usually been written in a style which has rendered them almost unreadable by persons who have not received a thorough mathematical education, and as a consequence they have been of service only to those who have desired to qualify themselves as naval architects. There are, however, numerous classes besides these who are interested in shipping and ship construction, and desirous of obtaining a general acquaintance with the principles of naval architecture, including the deductions from modern theory, and the results of recent experimental investigation. The naval officer, for example, who spends a large part of his life afloat, and has not usually received a high mathematical training, ought certainly to know something of the structural arrangements, the buoyancy, stability, and other qualities of his ship. This is true both of the Mercantile Marine and of the Royal Navy, but especially true of the latter; and only well-instructed officers can be expected to make the fullest use of the costly and complicated engine of war which the modern war vessel has now become. The shipowner should understand the principles upon which the construction and proportion of his ships depend, for this knowledge well applied by a keen man of business will go far to secure enhanced efficiency and greater profits. The shipbuilder too often possesses but scant knowledge of the theory of naval architecture, or the principles which should govern ship construction, and has to content himself with perfecting the details of the ship he builds, and fails to note possible improvement of a more general character which the theory indicates. To all of these classes, and to many others in like case, Mr. White's book on naval architecture, the second edition of which is now before us, has come most opportunely, for it contains a comprehensive outline of the accepted theory of naval architecture, written in popular language, with ample illustrations drawn from all classes of ships, and is free from the details of abstruse mathematical investigations.

This work is well deserving of the great success attained by the first edition, and the new edition, in which the various subjects discussed are brought up to date, and much additional matter added, is even more deserving of success. The title page describes it as prepared for the use of officers of the Royal Navy, officers of the Mercantile Marine, shipbuilders, shipowners, and yachtsmen. Mr. White's most sanguine anticipations have been exceeded in the welcome which the first edition received from shipbuilders, naval architects, and engineers; and this has led him to amplify those portions of the work which are likely to be of service to readers engaged in the design and construction of ships. Another distinctive feature of the new edition which will be welcome to many classes of readers consists in the giving of exact and extensive information for various types of merchant ships.

The opening chapter treats of the buoyancy of ships and of cognate subjects. It contains simple practical rules for estimating the displacement of ships, the additional immersion produced by putting weights on board, the change of draught consequent on passing from a river or a dock to the sea, and other matters of interest. There are also rules for freeboard, descriptions of the causes of foundering, details of the various methods of water-tight subdivision used in merchant and warships, and an account of the principles upon which vessels for submarine warfare are constructed. All these sections are illustrated by facts taken from actual ships. The Vanguard furnishes an example of ships which founder because of damage to their skin, and it is shown what an immense gain her water-tight subdivision was to her; although she was not kept afloat by it long enough to save the ship, it did suffice to give an interval sufficient to save all lives on board, whereas an ordinary iron ship similarly struck would have gone to the bottom like a stone. The ill-fated London is an illustration of ships which founder through being swamped. As to freeboard, we have all classes, from the American monitor, whose deck is only a few inches above water, to the high-sided war ships with an upper deck 20ft. above water.

Next follows a chapter on the much-debated subject of tonnage. Full particulars are given of the various rules at present in use for sailing ships, steamers, yachts, &c., including the Suez Canal and Danube rules, as well as an interesting account of the early systems of tonnage measurements. Examples from actual ships are given, and foreign as well as British tonnage laws explained. The several recommendations with reference to the proposed revision of the British tonnage laws are here also discussed. These are chiefly the dead-weight tonnage measurement, the displacement tonnage measurement, and the parallelopipedon tonnage measurement. Shipowners and yachtsmen will have the greatest interest in this part of the book.

The third chapter deals with the statical stability of ships. Statical stability is defined as the effort which a ship makes when held steadily in an inclined position to return towards her natural position of equilibrium—the upright—in which she rests when floating freely. The usual methods of obtaining the metacentre and the metacentre height, as measuring the statical stability for small angles of heel, are clearly explained, and so also are the terms stiffness, crankness, and steadiness, as applied to ships. The mode of constructing metacentric diagrams and the uses of such diagrams, and the construction and uses of curves of stability, are discussed in detail, with numerous illustrations from various classes of merchant ships and war-ships. The stability of cigar ships and submarine vessels, the effect upon stability of vertical movements of weights and the heeling produced by transverse shift of weights, the effects upon stability of water in the hold and of additions of and removals of weights, the stability of ships partially water-borne, and many other matters are all simply explained so that all may comprehend them.

A further section of the book, made up of three chapters, contains full accounts of the modern theories of the oscillations of ships in still water and among waves, and of the closely allied subject, deep-sea waves. This section is of great importance, and it exhausts the subjects discussed, so far as these subjects can be said at present to be exhausted. Exact knowledge on these branches has been rapidly extended during recent years, mainly by means of the experiments and observation made by the late Mr. Froude, who has done more to advance the modern theories of naval architecture than any other man. The results of Mr. Froude's investigations, which for many years enriched the "Transactions" of the Institution of Naval Architects, are not available to the general public, and even if they were, they are often necessarily so couched in abstruse mathematical language as to be beyond the ken of the general reader; but here in this work these researches are placed before the reader, with the practical deduction to be made from them, in a form in which they can be at once readily understood and made use of. Without producing any of the mathematics involved, the general character of the investigations of the modern theory of the rolling of ships are clearly described and simply illustrated by reference to the phenomena of pendulum oscillations. Then follows a valuable summary of the practical rules which naval architects now have for their guidance in attempting to design ships that shall be steady and well-behaved, and examples drawn from the performance of actual ships of the verifications which experience has given to deductions from theory. These examples include ships of the most various types—the ironclad frigates and monitors of the Royal Navy, the various classes of unarmoured ships, American low freeboard monitors, Russian circular ironclads, and French war-ships, all find a place, and in the aggregate there is brought together a mass of information respecting the observed behaviour of ships at sea, such as can scarcely be paralleled in any work yet published. The chapter upon deep-sea waves is one of the most interesting parts of the book, appealing as it does to the widest circle of readers, for wave motion has a charm and attraction quite independent of its effect upon the behaviour of ships. The fundamental theory of trochoidal wave motion is fully explained, and the relation between the length of the wave and its speed of advance established. The summary of observations made of the speeds and dimensions of waves is based upon results collected by English and foreign observers in all parts of the world, and is well worthy of attention. The connection between the speed of the wind and the speed of the waves is expressed by a tentative empirical law, and also deserves attention, as does the account of the endeavour made to utilise ocean wave power. Naval officers will do well to study and act upon the rules given for accurately observing the dimensions and speeds of waves; we shall then hear less of waves of monstrous height and terrific steepness.

The seventh chapter gives an account of the various methods of observing the rolling and pitching motions of ships. The necessity for such observations is pointed out, and the various instruments which have been invented for the purpose are described, including the beautiful automatic apparatus for continuously recording the rolling of ships devised by Mr. Froude, and at present in use in the Royal Navy.

Another well-marked division of the work, extending over three chapters, is that which deals with the strains and structural strength of ships, as well as with the materials for shipbuilding. Besides an account of the causes of straining in ships afloat and ashore, we here find valuable data, based upon elaborate calculations, of the magnitude of these strains in different classes of ships, and a description of the structural arrangements by which these strains are resisted. These descriptions practically contain an epitome of practical shipbuilding for wood, iron and steel, and composite ships; for war ships, armoured and unarmoured, and for merchant ships. The information is not, of course, as detailed as that appearing in formal treatises on shipbuilding, but it is quite sufficient for all classes except shipbuilders. The comparative merits of wood, iron, and steel as materials for shipbuilding are also discussed at length, and so are the reasons which have led to the adoption of iron and steel ships in preference to wood. Here will be found, also, statements of the wonderful durability of iron and steel ships when properly treated, of the precautions necessary to prevent corrosion and fouling of iron and steel ships, the facilities which they afford for construction and repair, and the incentives for progress in iron, and more recently in steel manufacture, which the use of iron and steel ships has afforded. The rapid strides made in the use of steel for shipbuilding in this country during the past few years are dwelt upon. In the Royal Navy steel has almost superseded iron, and some of the greatest steamship companies have decided to use steel exclusively. In 1878, 4500 tons of steel shipping were classed at Lloyd's; in 1879, 16,000 tons; in 1880, 35,400 tons; and in 1881, 41,400 tons. At the close of the year 1881, 188,600 tons of steel shipbuilding were under construction in the United Kingdom. In the chapter upon the structural strength of ships, the various systems of framing in use in the Mercantile Marine and in the Royal Navy are described, and the reasons which have led to these are given. The advantages of the longitudinal system of framing over other systems is drawn attention to. Although the transverse system has been so generally adopted in the Mercantile Marine, there are not a few ships in which longitudinal framing occupies the chief place. The Great Eastern is the most notable example, and her structural arrangements—due to the joint labours of the late Mr. I. K. Brunel and Mr. Scott Russell—furnish good evidence of the superiority of the longitudinal system. It is pointed out in a foot-note that from the details given concerning the construction of the Great Western, the Great Britain, and the Great Eastern, in the life of Mr. Brunel, published by his son, at a very early period after the introduction of iron ships Mr. Brunel perceived the great advantages attaching to longitudinal framing.

The treatment of the difficult subjects of resistance and propulsion in this book is of a very special character. The chapter on the resistance of ships is especially worthy of notice, and it will be welcomed as a great boon by the profession, for hitherto there has been no such account on record. Mr. White first glances at the earlier theories, shows what their fallacies were; then passes to the modern or "stream-line" theory, explains its principal features, and finally gives a complete description of the present condition of the question. New light has been thrown on the whole subject during the past few years by the investigations which the late Mr. Froude made under the auspices of the Admiralty. Since his lamented death these investigations are being continued by his son, Mr. R. E. Froude, who was always associated with his father in connection with these investigations, and who has made numerous contributions towards elucidating the difficult problems involved. Mr. White gives an excellent summary of these investigations up to the present date. The laws of surface friction as derived from the experiments are clearly enunciated, and the results of the experiments tabulated in a concise form, convenient for use. As a rule worth remembering, Mr. White deduces that the clean bottom of an iron ship moving at a speed of 12·8 knots per hour experiences a resistance of 1 lb. per square foot. According to modern theory, the total resistance experienced by a ship is made up of three principal parts:—(1) Frictional resistance due to the gliding of the particles over the rough bottom of the ship; (2) "eddy-making" resistance at the stern; (3) surface disturbance or wave-making resistance. The first and third of these are the main causes of resistance in well-formed ships, the eddy-making resistance being only about 8 per cent. of the total resistance, while the surface friction is from 80 to 90 per cent. in such ships at low speeds, such as from 6 to 8 knots, and even at the very highest speeds it is as much as from 50 to 60 per cent. of the total resistance. When the bottoms become foul, the coefficients of friction are doubled or trebled in consequence. In order to reduce eddy-making resistance as much as possible, outlying pieces, such as stern-posts, rudders, struts to shaft tubes in twin-screw ships, supports to sponsons in paddle steamers, &c., should be properly shaped. "It is blunt tails rather than blunt noses that cause eddies." The after terminations of outlying parts should be made as fine as possible consistently with other requirements. The general character of the causes which create waves at the bow and stern of ships, and the way in which waves operate in producing resistance, are clearly described. A body moving at a uniform velocity at a great depth below the surface would experience no resistance from this cause, and if it were moving in a frictionless fluid it would experience no resistance whatever. In the case of a ship moving at the surface, the motion of the particles of water relative to the ship is least at the bow and stern, and there are wave crests. Amidships the relative motion has its maximum speed, and there may be wave hollows. For every vessel there is a certain limit beyond which increased speed can only be secured at the expense of a very rapid growth in resistance; this speed being "somewhat less than that appropriate to the length of the wave which the ship tends to form." Rules are given for fixing approximately the lengths of ships appropriate for certain speeds, but it is shown that this can only be arrived at in a satisfactory manner by actual experiment, such as the model experiments made by Mr. Froude. The experiments on the character of waves which accompany a ship have been made first on models, but they have been verified in actual ships of the Royal Navy. These waves are classified as follows:—(1) Waves produced by the advance of the bow; (2) waves produced by stream-line motion near the stern, and each of these sets of waves may be divided into distinct series—(1) diverging waves, the crest lines of which trail aft; (2) transverse waves, of which the crest lines are nearly perpendicular to the keel line of the ship. An interesting account is given of the performance of torpedo boats, and Mr. Froude has determined the resistance of models moving at speeds corresponding to from 50 to 130 knots per hour for full-sized ships. The results are most interesting and instructive, but they do not encourage the hope that in practice any such speed will be realised. A detailed account is given of the process by which from model experiments the resistance of full-sized ships can now be predicted with certainty. In putting this power of exact investigation into the hands of naval architects, Mr. Froude has conferred a valuable and lasting advantage. This is illustrated by Mr. White by a single example, which admirably shows how well the experiments recoup the Admiralty for the expense to which they are put. The Medina class of gunboats was in course of being designed, and a question arose which of two forms was preferable—one having a length of 110ft. and a beam of 26ft.; and a second having the same length, but a beam of 34ft. Apart from experiment, it would have been expected that the narrower vessel would have given least resistance, but experiment showed conclusively that the broader form was the better, for it required only two thirds of the engine power of the narrower type to attain equal speed. The boats were built, and experiments on the measured mile fully justified the prediction based on the model experiments. The importance of this single case will be appreciated when it is remembered that the first cost of the machinery of these vessels, as well as the subsequent cost of maintenance and repair, were largely decreased. It is impossible here even to indicate the variety and value of the information given in these chapters; no previous work has been equally furnished with facts and useful rules for practice based upon experience and theory. Steam navigation is of recent date, and has been rapidly developed; but Mr. White gives the results obtained in vessels of every variety of type in both war fleets and Mercantile Marine, Russian circular ironclads, English ironclads with single and twin screws, merchant steamers capable of crossing the Atlantic or steaming to Australia at high speeds, and others, all have their performances analysed; and so have those swiftest of swift vessels, the torpedo launches, which can make their 18 or 20 knots in smooth water.

The book concludes with an admirable chapter on steering, including a description of the principles which govern the action of the rudder, the relative advantages of ordinary, balanced, and special rudders; steering by the use of propellers, such as twin screws, water jets, &c.; steering by means of auxiliary appliances, and rules for the forms and areas of rudders. The practical deductions made from the steering trials of ships of the Royal Navy form a valuable feature in this chapter.

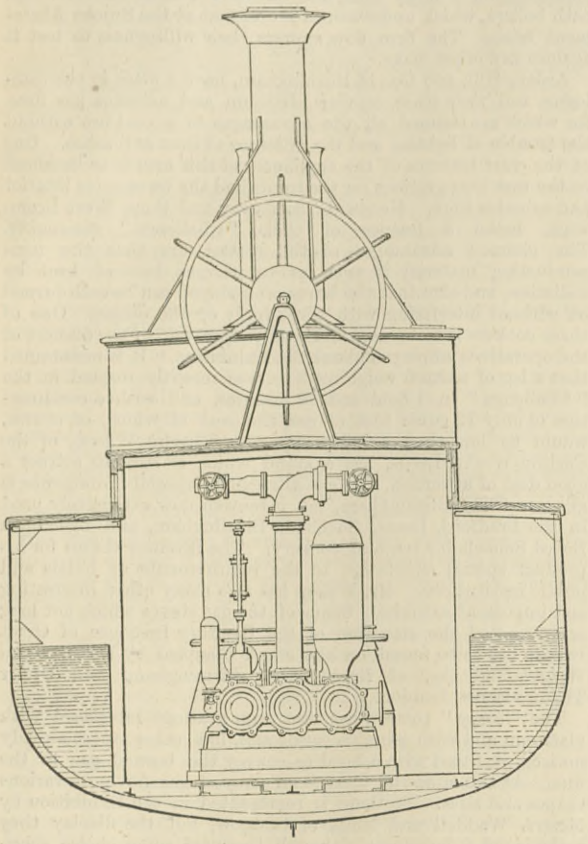
Mr. White states in his preface to the first edition that he undertook the work mainly in consequence of numerous requests made to him by naval officers studying at the Royal Naval College for information of the kind. Such a request so urged is good evidence of the awakening interest felt by naval men in these subjects, and Mr. White has not merely met their wants and the wants of other classes similarly situated, but he has furnished a book which, as we have pointed out, will be most useful to naval architects and engineers. The present position and probable future of the science of ship construction cannot be better studied in any other work with which we are acquainted.

GAS AS FUEL.—St. Louis is to be supplied with water gas for fuel purposes. The *Scientific American* says the laying of pipes is progressing rapidly.

STEAM FIRE FLOAT FOR BRAZIL.

MESSRS. SHAND, MASON, AND CO., BLACKFRIARS, ENGINEERS.

FIG. 3.



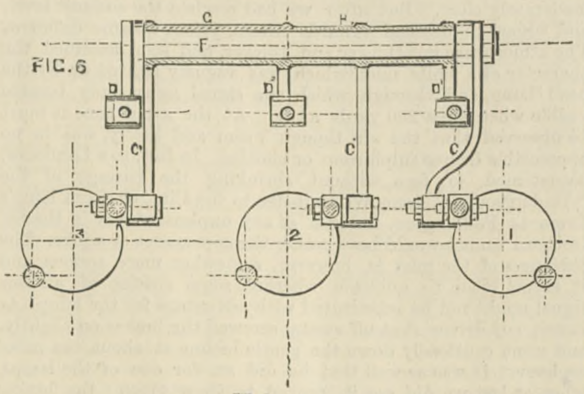
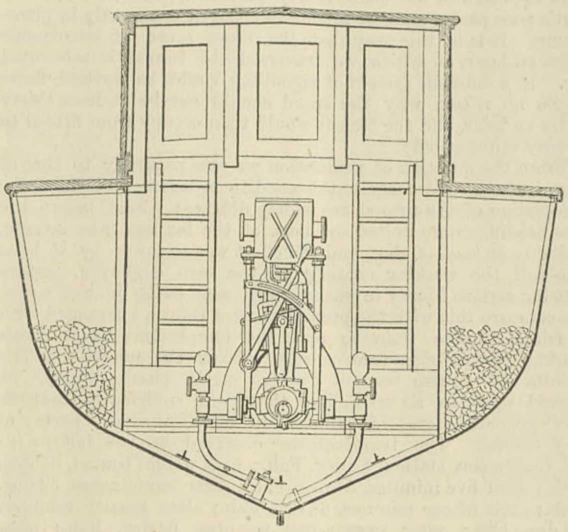
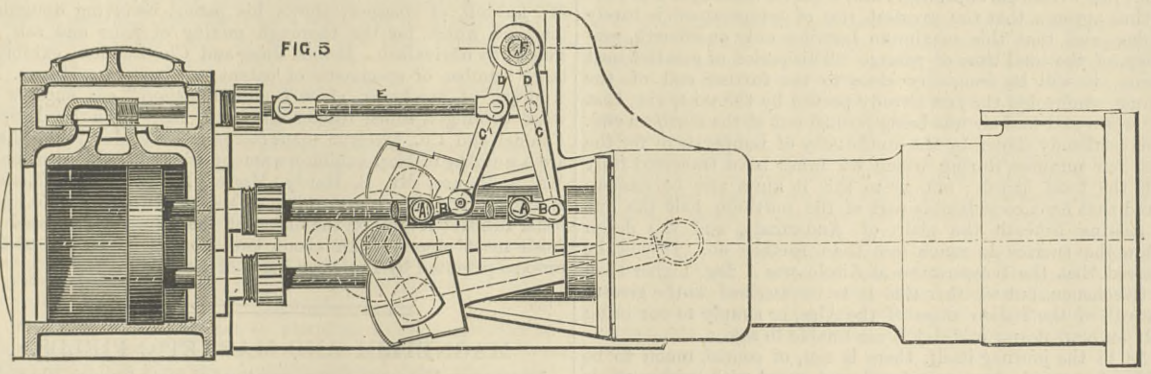


FIG. 4.





WE this week illustrate above and and on page 350, a floating steam fire engine, constructed by Messrs. Shand, Mason, and Co., for the Brazilian Government. A highly satisfactory trial of the same, at which we were present, has been described in our issue of the 29th September last. The boiler is on the makers' patent inclined water tube system, specially designed for raising steam rapidly and evaporating a large quantity of water in a small space. The fire engine can be used with steam of 160 lb. per square inch, although 120 lb. is sufficient for ordinary purposes, and also for the propelling engine.

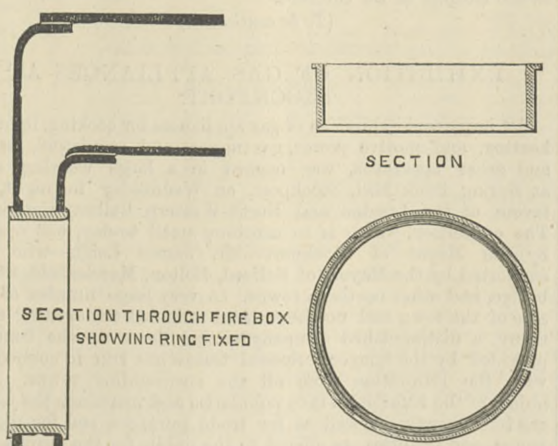
The fire engine is Shand, Mason, and Co.'s well-known "Patent Equilibrium," having three steam cylinders, the piston rods of which are connected directly to the rams of three double-acting bucket-and-plunger pumps; from a jaw on the bottom of each ram a connecting rod extends to the pin of a three-throw crank; the slide valves are worked by a simple arrangement of levers shown in the accompanying engraving—one engine working the slide valve of another. By this arrangement of triple engine a very easy motion is obtained, all parts being perfectly balanced, and with the advantage of being able to start in any position. The fire engine draws its supply either through a sea-box in the side of the vessel or by means of a flexible suction hose, the latter arrangement being used for pumping out water-logged ships and barges. There are four outlet valves to connect four lines of delivery hose, these being governed by a patent relief valve to prevent over pressure. Self-acting lubricators are fitted to all working parts. All the forgings are of steel; the pump, suction chamber, pump-head, and frames are in one gun-metal casting. Great strength and solidity have been obtained, and smooth working is obtained at 300 revolutions per minute. The engine is capable of delivering 1000 gallons of water per minute, and works up to a pressure of 220 lb. per square inch, and in one of the trials with 1⅞in. jet a horizontal distance of 225ft. was obtained, measured to where the body of the water fell, a strong wind at the time blowing across the course.

The propelling engines are twin-cylinder inverted high pressure engines, especially designed for high speed, and work at 260 revolutions per minute, at which rate a speed of 9·34 knots per hour was obtained at the measured mile. The length of boat is 51ft., beam 11ft., depth 6ft. The hull is built entirely of mild steel, the deck and fittings being of teak. Coal bunkers are provided for 2½ tons of coal. There is a cabin in the fore part of the boat with accommodation for three men. Two hose reels are fitted on deck, capable of holding 3000ft. of hose, and shelves below for 3000ft. more. The boat is arranged to be used as a tug, in which way she will be very useful in towing ships or barges on fire into open water and then extinguishing them. We have added to the illustrations two sections showing the construction of the special slide valve motion referred to above, an improvement upon working the slide valves by the ordinary excentric, introduced by Mr. J. C. Hudson, a member of the firm, and which is now applied to the whole of Messrs. Shand, Mason, and Co.'s equilibrium steam fire engines.

Fig. 5 is a side elevation, and Fig. 6 a longitudinal section of valve levers. In Fig. 5 a pin A on one of the piston rods gives motion through a link B to the lever C, which is connected to a lever D actuating the slide valve rod E. It will be seen in Fig. 6 that the lever C connected to the piston rod of No. 1 engine is keyed on the shaft F, on which is forged the lever D, which works the valve of No. 3 engine; also that the lever C^1, connected to No. 2 engine, and the lever D^1 working the valve of No. 1 engine, are attached by a hollow sleeve H, through which shaft F passes. In a like manner the lever C^2 connected to No. 3 engine is attached to lever D^2 working the valve of No. 2 engine. The proportion of lever C to D is such as to reduce the travel of the piston to that of the valve.

BOULTON'S FIRE DOOR RING.

MR. J. W. BOULTON, of Ashton-under-Lyne, proposes to dispense with the ordinary thick closely rivetted in fire door ring as used in portable and locomotive fire-boxes, by means of a thinner ring rolled to the section shown in the annexed woodcut. The iron for this ring is rolled with a small rectangular fillet on one side, and a thinned or bevelled edge on the other. The ring is placed in circular holes bored in the inner and outer fire-box, and the thin edge is then rivetted over all round on to the inner fire-box plate, the edge, as well as that of the outer

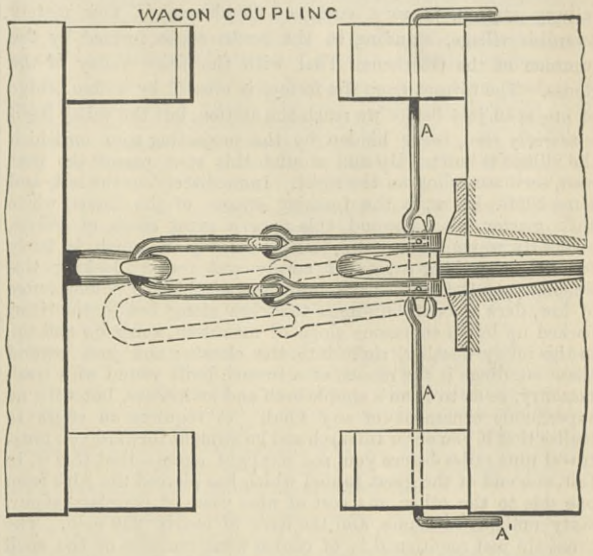


fillet, being caulked to make it steam-tight. This ring undoubtedly offers some economical structural advantages, as it avoids the usual ring of rivet holes and rivets used to hold the ring in, and it seems to promise to overcome the constantly recurring leakage which cannot be permanently stopped where the very heavy solid ring is rivetted into thin plates. Mr. Boulton has tested it with a ring 17in. in diameter, and with satisfactory results as far as manufacture is concerned, but has not, we believe, given it extended trial in a fire-box in use.

RAILWAY WAGON COUPLINGS.

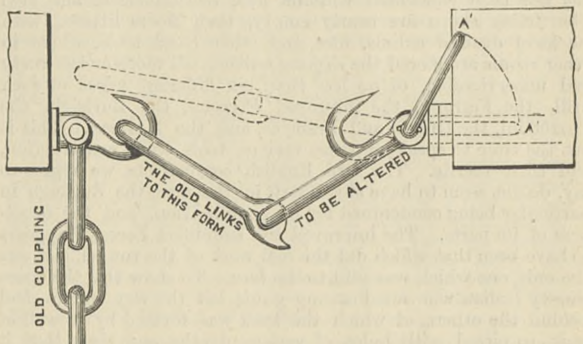
ONE of the wagon couplings exhibited at the recent Exhibition of Railway Wagon Couplings at Darlington we illustrate herewith. The invention consists in the application of two rods A A to each coupling hook pin, so as to move the hook on its pin.

Fig. 1.



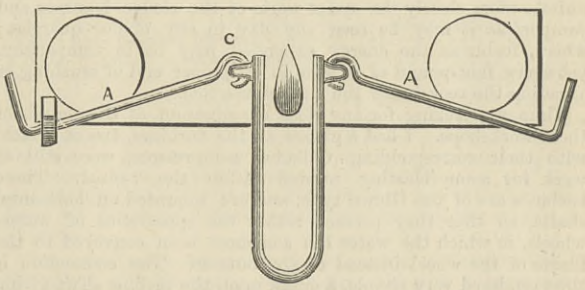
The rods extend to the outside of the wagon, one on either side, the ends being bent to form a lever handle. The links are hinged in the centre, as shown at Figs. 1 and 2, one end being fastened to the pin and revolving with it, lifting the opposite end off or on the hook of the next wagon by means of the lug, Fig. 2,

Fig. 2.



welded on the eye of the outer link. To insure introduction a coupling must not only be efficient, but must be so made that it will work with those in use, as no railway company could be persuaded to fit all its wagons now in use with a new form of coupling. The coupling we illustrate avoids these

Fig. 3.



difficulties; it has few parts, and is not liable to get out of order. It is inexpensive, costing but little more than the ordinary link coupling. Fig. 3 shows that the coupling can be applied to wagons having spring buffers. This coupling is the invention of Mr. Thos. Burall, of Thetford, Norfolk.

CONTINUOUS BRAKES IN SWITZERLAND.—The Paris journal, *Les Travaux Publics*, of October 29th, contains a reference to the late calamity in Alsace, by which nearly sixty persons were killed and about 200 injured, sixteen carriages out of the twenty-five composing an excursion train having been completely wrecked. It says:—"The recent terrible railway accident at Hugstetten, the recollection of which is still far from being effaced, and in which so many persons found their death, in consequence of a train leaving the rails, gives a special interest to a communication which we extract from one of the leading Swiss newspapers, describing a similar occurrence with a direct train from Berne to Lucerne, but which was, however, unattended by any serious consequences, owing to the train being fitted with automatic and continuous brakes which saved the travellers from almost certain death." The *Intelligenzblatt* of Berne, the Swiss newspaper referred to, says:—"The 7.20 a.m. through train from Berne te Lucerne left the rails near Werthenstein, between Wohlhausen and Malters, in consequence of a landslip which partially blocked the line immediately before the passing of the train, which was then going at a speed of 65 kilos. an hour. The train was fitted with the Heberlein automatic brake, and owing to its instantaneous action the train was stopped in a distance less than twice its own length, and thus it avoided what would certainly have been a frightful accident, for without the continuous automatic brakes, the train, thus turned off the line, would have been precipitated from the top of the embankment into the river Emme, over which the line passes just at that spot. Only the stoker received any injuries." This account affords another illustration of the value of automatic brakes, and shows that the terrible accident at Hugstetten would have been avoided if all, or at least a large portion, of the vehicles forming the excursion train had been fitted with brakes like those above referred to. The Heberlein automatic brake has been fitted to all the lines of the Jura-Berne Railway, and the value of the brake as shown by the Berne-Lucerne incident is pointed to as an illustration of the great loss of life which might have been saved by it if fitted to the Hugstetten train, instead of the few brake vans with which that train was provided, and which were valueless in assisting the driver to check the speed of his train in descending the gradient off which his train is, by some of the German writers, thought to have been pushed. The Heberlein brake has received important improvements since its more extended use in Germany, and to these we may refer more particularly at an early date.

THROUGH THE ALPS BY LOCOMOTIVE.

AN ENGINEER'S TRIP OVER THE ST. GOTHARD.

(*Continued from page* 332.)

My last communication ended at Göschenen, where I took advantage of a halt to visit for a moment the works of the great tunnel. The view of these, as you stand on the low platform of the railway station, is very curious. Göschenen is now merely a largish village, standing in the acute angle formed by the junction of the Göschenen Thal with the main valley of the Reuss. The torrent from the former is crossed by a fine bridge of one span just before we reach the station, but the valley itself is scarcely seen, being hidden by the projecting spur on which the village is built. Up and around this spur passes the post road, seen ascending on the right. Immediately on the left, and some 100ft. below, is the foaming stream of the Reuss, white with glacier silt. Beyond this rises a great slope of *débris*, evidently an enormous "tip," the level top of which is fairly covered with long trains of empty and forlorn looking tip-wagons. At the further and lower end of this tip a long range of low, dark wooden buildings stretches along beside the river, backed up by an enormous slope of mountain, going up and up, in this misty weather, right into the clouds; and just beyond these buildings is the mouth of a tunnel, built round with fresh masonry, so as to form a simple arch and architrave, but with no superfluous ornament of any kind. It requires an effort to realise that if you enter this arch and go straight forward you must travel nine miles before you see daylight again—that this is, in fact, one end of the great tunnel which has pierced the Alps from one side to the other, at a cost of nine years of ceaseless labour, sixty millions of francs, and the lives of nearly 200 men. The great tip just mentioned is of course what remains of the spoil excavated during construction, the wagons are those used in conveying it from the interior to the mouth, and the buildings contain the turbines and air-compressors, together with the other tools, stores, &c., needed for the various works of construction.

On entering these buildings we find the interior forlorn and dreary enough, as may well be expected in the domain of a concluded contract, and especially a contract which unfortunately has not been concluded without loss, recrimination, and law. The fitting shops are nearly empty, their floors littered with stacks of disused chisels, files, and other hand tools, whilst in other rooms are stored the *disjecta membra*, all more or less rusty and unserviceable, of no less than six different types of rock drill—the Ferroux, the improved Ferroux, the Burleigh, the Turrettini, the Dubois and François, and the McKean. This is not the time to speak of these various tools, their construction, and their merits. The two English competitors, we regret to say, do not seem to have stood well in the race, the Burleigh in particular being condemned for its complication, and the smallness of its parts. The improved and simplified Ferroux appears to have been that which did the real work of the tunnel, and was the only one which was still to the fore. To show this the spare sinewy Italian who acted as my guide led the way into a shed behind the others, of which the back was formed by a wall of rock, so pitted with holes of various depths and sizes that it might have been the target for a whole battery of mitrailleuses. It was really the practice ground of the rock drills, and one Ferroux drill was still in its place, mounted on a strong frame, with the end of its long chisel buried in the rock before it. The guide opened a valve and the tool at once started into life, the double rack arrangement, above and below, drawing back and releasing the chisel alternately, and with lightning-like rapidity. The advance into the rock was rapid, but the shock and clatter were excessive. Would it not be possible in these machines to imitate more closely the quiet work of the sledge hammer and jumper, as it may be seen any day in any of our quarries; where, feeble as the energy expended may be in comparison, yet every foot-pound of it goes to its proper end of crushing or abrading the rock below the face of the tool.

Time was lacking for any close examination of the details of these workshops. I had a glance at the turbines, two of which, with their corresponding Colladon compressors, were still at work for some blasting needed within the tunnel. These turbines are of the Girard type, and are mounted on horizontal shafts, so that they present rather the appearance of water-wheels, in which the water has somehow been conveyed to the inside of the wheel instead of the outside. The connection is thus rendered very simple, a crank upon the turbine shaft giving at once the reciprocating motion needed for the air compressors. Of the latter of course no interior details could be seen, and it was now time to get back to the station and resume my place on the locomotive.

At 10 a.m. we steamed out of the station at Göschenen; at 10 hrs. 2 min. we passed under the arch of the tunnel, and at 10 hrs. 28 min. we emerged from the corresponding arch into the daylight at Airolo. We were thus 26 min. in traversing the tunnel, and as the length is about nine and a-quarter miles, this gives an average speed of about twenty-one miles an hour. As a matter of fact, however, the first part of our journey was performed at a considerably higher and the latter at a considerably lower speed, and that for a somewhat curious reason. It was due to the particular state of ventilation of the tunnel at that particular time. My readers will probably remember the immense difficulties which were encountered in maintaining proper ventilation in the tunnel during its construction, and the many prophecies of equal difficulty to be experienced whenever it became the channel of any considerable traffic. So much did these fears weigh even on the managers of the undertaking, that schemes were mooted for carrying bags of oxygen to supply the drivers with the means of respiration, and designs for working by electric locomotives were seriously entertained. When, however, the matter was put to the test, the difficulty vanished. If was found that at all times there is a difference in the height of the barometer at one side and the other of the great chain of the Alps; the corresponding difference in pressure forms a head of air always acting on one end or other of the great tunnel, and there is therefore a continual current of air through it in one direction or the other, exactly as there would always be a current of water through a pipe connecting two reservoirs with unequal head. This natural ventilation is found more than sufficient for the present traffic of between twenty and thirty trains per day, and there seems no fear that it will ever need to be supplemented. On the particular occasion of my visit the barometer apparently stood higher at the north, or Swiss, portal by which we entered. Consequently we were bringing, as it were, the fresh air with us; and certainly for the first half of our journey it was to us on the engine not perceptibly fouler, though somewhat warmer, than the damp and chilly atmosphere of a wet morning at Göschenen. Those in the train had of course the benefit of the smoke and gases from our engine, but this was not so bad but that windows could be kept open without special annoyance. The tunnel is guarded by means of brilliant lamps placed at each kilometre, and signalling white for safety and green for danger; and during this first half of the journey I was able, after passing each of them, not only to see the next, but also the next but one, shining like a star of the sixth magnitude just above one of the first. It is obvious that if a light can be seen at 2200 yards distance the atmosphere must be more than moderately clear. But after we had reached the summit level, and began to descend towards Airolo, things became different. The atmosphere got thicker and thicker, and soon assumed the character of a white mist, which was vaguely lighted up by the head lamp, and through which the signal lights only became visible when some 200 yards away. At the same time it must be observed that the air, though warm and heavy, was in no appreciable degree sulphurous or choking. In fact, to a Londoner, accustomed to face without shrinking the passage of the "Underground" from Westminster to the City, or from King's Cross to Paddington, the idea of any unpleasantness in the St. Gothard tunnel would have rather the appearance of a joke. The thickness of the mist is, however, somewhat more serious, and it seems open to question whether some species of audible signal might not be substituted with advantage for the lamp. As it was, our driver shut off steam, screwed the brakes on slightly, and went cautiously down the gentle incline at about ten miles an hour. It was as well that he did so, for one of the lamps, when at last we did see it, proved to show green; the brakes were applied and the train nearly pulled up, and we crept at a foot's pace past a gang of labourers engaged apparently in plate-laying. It is in this way that the mean speed of twenty-one miles an hour, at which we traversed the tunnel, is accounted for. If a different system of signalling could be devised, there seems no reason why the speed should not be at least thirty miles an hour, and the transit would then occupy from fifteen to twenty minutes only.

From the question of ventilation we pass naturally to that of temperature. Here again the conditions before and since the completion of the tunnel are widely different. Just before the two headings were united the heat at the far end was intense, rising to at least 90 deg., and the effect was to lower by at least one-half the working capacity of the men employed, besides causing serious illness in many cases, and death in not a few. To compare this with the present state of things, I arranged with a friend in the train to read the temperature at intervals during our passage, from a small pocket thermometer. The results of course cannot, under such circumstances, be looked upon as accurate, but they will sufficiently indicate the general state of things in the various parts of the tunnel. The temperatures observed are as follows:—At Göschenen station, 54 deg. Fah.; just within tunnel, 54 deg. Fah.; after five minutes, 54 deg. Fah.; after ten minutes, 59 deg. Fah.; after fifteen minutes, 64 deg. Fah.; after twenty minutes, 64 deg. Fah.; after twenty-two minutes, 64 deg. Fah.; after twenty-four minutes, 62 deg. Fah.; after twenty-six, 59 deg. Fah.; just within portal, 57 deg. Fah.; at Airolo station, 55 deg. Fah. It thus appears that the greatest rise of temperature is barely 10 deg., and that this maximum lasts for only one-fourth, probably, of the total time of passage. This period of greatest heat occurs, it will be seen, very close to the further end of the tunnel, confirming the fact already proved by the mist, viz., that the warm and foul air was being pushed out at the southern end. This is already shown by the uniformity of temperature for the first ten minutes, during which we must have traversed fully half the total length; but as to this it must also be remembered that for a considerable part of the northern half the line is passing beneath the plain of Andermatt, and the depth below the surface is much less than further on. It will be noticed that the temperature at Airolo was 1 deg. higher than at Göschenen, but whether this is to be ascribed to the greater warmth of the Italian slope of the Alps, or simply to our being half an hour nearer mid-day, I am unable to say.

As to the journey itself, there is not, of course, much to be said. A tunnel, once completed and cased with brickwork, is about as uninteresting a piece of engineering as it is possible to visit. In this case, indeed, the casing is not complete; for only one line having been laid, the rock on the opposite side of the tunnel has only been got away sufficiently to allow of the turning of the arch holding up the roof. There was therefore on one hand a mass of irregular rock, which looked picturesque enough whenever the fire-door was opened, and the ruddy glare of the furnace lighted up the surrounding gloom. So, indeed, did the courses of brickwork in the roof, with the volumes of dark smoke sweeping along them, till both together disappeared in the darkness behind. I had hoped to have seen something of interest in watching the appearance of the far end of the tunnel, which should become visible as soon as our heads were above the summit level. The white mist already mentioned of course prevented this, but I certainly was not prepared for its great effect in stopping external light. I had not been counting the kilometres, and was unaware that we were nearing the end, when suddenly there seemed a lightening in the mist ahead of us; it broadened into a confused whitish cloud, and almost in an instant we passed quietly from under the portal of the tunnel, and found ourselves in the wild upland dale of the Ticino, with its little village and station of Airolo on our left, and on our right the white line of the post road, climbing up with many zigzags beside the headlong waters of the Tremola, on its way northward to the Hospice of St. Gothard.

(*To be continued.*)

EXHIBITION OF GAS APPLIANCES AT STOCKPORT.

An important exhibition of gas appliances for cooking, lighting, heating, and motive power, gas meters and regulators, testing and other apparatus, was opened in a large weaving shed at Spring Bank Mill, Stockport, on Wednesday fortnight, by favour of the London and North-Western Railway Company. The exhibition, which is to continue until to-day, was opened by the Mayor of Stockport—Mr. James Leigh—who was supported by the Mayors of Salford, Bolton, Macclesfield, Stalybridge, and other northern towns. A very large number of the *elite* of the town and neighbourhood attended the opening ceremony, a distinguished company sitting down to the banquet provided by the mayor. Special trains are run in connection with the Exhibition from all the surrounding towns. The object of the Exhibition is to popularise and introduce the use of gas for domestic as well as for trade purposes and for motive power, and facilities are offered to the public for the purchase or hire of suitable gas cooking apparatus. While willing to admit the comfortable and cheering prospect of the good old-fashioned English fireside, the committee insist that there are a variety of cases in which the more commonly used fuel is most efficiently superseded by gas. The committee further point out that the principal recommendation of gas is the economy it offers in both space and expenditure. The undertaking has called forth a large amount of interest, and it bids fair to be a great success. Alderman Hardon is the hon. sec. of the committee, and, so far as we have seen, the arrangements have been admirably carried out. The floor of the spacious building is laid out in six bays, and although the area at the disposal of the committee was considerably larger than that at the recent Bristol Exhibition, the space was all allotted some weeks ago, with the result of an annexe being formed, where are exhibited lights of greater illuminating power than it would be convenient to burn in other parts of the building. A considerable portion of the space is allotted to Messrs. S. Leoni and Co., of London, whose cookers and grillers have already secured a foremost reputation. The exhibits of this firm are very numerous, and the food for the banquet was cooked on one of their "kitcheners." Messrs. Leoni show disinfecting apparatus on a large scale, and also one of their instantaneous bath boilers, which underwent a severe test at the Smoke Abatement trials. The firm now express their willingness to test it against any other make.

Arden, Hill, and Co., of Birmingham, have a place in the catalogue, and they place on view platinum and asbestos gas fires, for which are claimed all the advantages of a coal fire without the trouble of lighting and the nuisance of dust and ashes. One of the chief features of the appliances of this firm is to be found in the cast iron gratings for the fronts and the terra-cotta interior and asbestos fibre. Messrs. E. Siddaway and Sons, West Bromwich, make a feature of their "Challenge" gas-cooker. The claimed advantages of the roaster are that the non-conducting material is such as to prevent loss of heat by radiation, and also that the burners employed can be each turned off without interfering with the supply of the others. One of these cookers is to be used for the preparation of the dinners of the operatives employed about the Exhibition. It is maintained that a leg of mutton weighing 8 lb. was recently roasted in the "Challenge" in 1 hour and 30 minutes, and with a consumption of only 12 cubic feet of gas, the cost of which, of course, would be less than a halfpenny. Mr. Charles Wilson, of the Carlton Works, Leeds, has a stand which is sure to attract a good deal of attention. In gas kitcheners, special prominence is given to "The Birmingham," an invention now extensively used in the Bradford, Leeds, Sheffield, Birmingham, and Blackburn Board Schools for teaching cookery. The inventor claims for his product special adaptation to the requirements of hotels and public institutions. Mr. Wilson has also many other interesting and important exhibits. Some of the gas stoves which not long ago attracted the attention of the Sanitary Institute of Great Britain are to be found on the stand occupied by Messrs. John Wright and Co., of Broad-street, Birmingham, and Upper Thames-street, London.

The "cosey" pattern has cast iron gratings interlaced with platinum and with asbestos backs, and, like other stoves already noticed, is fitted with a hood to convey the burned gas to the flue. At the same end there is an array of gas stoves of various shapes and sizes. Scotland is represented in the Exhibition by Messrs. Waddell and Main, of Glasgow, but the display they make is not a large one, although there are some choice specimens of the apparatus for which this firm is justly renowned. Mr. Liddell, of Glasgow, shows his patent revolving doughing machine, which, for the thorough mixing of flour and salt, is said to be unrivalled. Messrs. Sugg and Co., London, exhibit a large number of specimens of patent gas burners; Messrs. H. Andrew, of Stockport, show their "Bisschop" gas engines at work driving a coffee roaster and mill, laid down by Messrs. Faulder and Co., preserve manufacturers. Besides these there are a number of local exhibitors, among whom may be mentioned Mr. A. Parkes, Mr. B. Hardy, Messrs. Kay Brothers, Messrs. Hargrove and Bardsley, Oldham, Messrs. Orme and Co., and other firms. Several of the dishes at the banquet consisted of fresh meat preserved for about two months by means of the process patented by Professor Barff, of London.

MAGNETISM AND MAGNETIC FIELDS.

Professor Viriamu Jones, principal of Firth College, Sheffield, delivered a very interesting lecture to a large audience in the lecture room of the College on Saturday night. The lecture was the first of a series of four which the learned professor has consented to deliver on electricity. The subject of Saturday night's discourse was "Magnetism and Magnetic Fields," and was illustrated by experiments. The lecturer commenced by remarking that there were two chief forms of light, the light of the electric arc and that due to the incandescence of the carbon fibre. These he was able to show through the kindness of the Yorkshire Brush Electric Light Company which had lent him lamps, and of the Hammond Company, which had kindly lent him a dynamo machine which supplied the current of electricity. Light, he said, was a form of energy, and energy, like matter, could not be destroyed or created. The greatest scientific achievement of the last century was the demonstration towards its close that matter was indestructible, and the most general summing up of the physical work of the nineteenth century was the principle of the conservation of energy. It followed then that light, being a form of energy, could not be obtained, except by a transformation, or a series of transformations from some other form of energy. The ultimate source of almost all the energy of our planet was the sun. Light was a form of energy we could not make; we could only transform it, and the great source of energy was coal. The problem of lighting was this—to convert as much as possible of the energy stored up in a given quantity of coal into light. Lighting by gas might be said to be of considerable efficiency and great economy. We might use coal in a steam engine to produce visible energy of motion, and then convert this energy of motion into energy of moving electricity in a dynamo machine, and the energy of moving electricity into light in the electric lamp. As a lighting process this was much more efficient than the manufacture of gas—that was, out of a given quantity of coal more light was produced. But then this did not decide the question of economy, for there were more valuable bye-products produced by this series of transformations. The distinction he had drawn between efficiency and economy would explain to some extent the somewhat contradictory statements made by the advocates of the electric light with reference to the cost of its production. He proceeded to show the successive steps by which the energy of the coal became light in the electric lamp, showing that the first step was the burning of coal in an engine which heated the water in the boiler producing steam, and that the second was the conversion of this energy into energy of moving electricity by the dynamo machine; the third step was the conversion of the energy of the current of electricity into light in the electric lamp. He stated that in the electric machine electric currents were produced by the motion of copper wires with magnets. In order to understand the production of currents by electro magnetism, it was necessary, he said, to have clear ideas as to what magnets were and how they acted. He accordingly devoted the remainder of the lecture to the properties of magnets and the space surrounding them, namely, magnetic fields. A hearty vote of thanks was accorded to the lecturer.

South Kensington Museum.—Visitors during the week ending Nov. 4th, 1882:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 9151; mercantile marine, Indian section, and other collections, 3379. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. till 4 p.m., Museum, 1408; mercantile marine, Indian section, and other collections, 610. Total, 14,548. Average of corresponding week in former years, 14,083. Total from the opening of the Museum, 21,449,855.

RAILWAY MATTERS.

The Birmingham Trades' Council have recently passed resolutions urging that in future when the Government grant powers to railway companies they shall make compulsory the running of cheap trains for workmen.

The London, Chatham, and Dover Railway Company is surveying for a new line to Croydon. The projected new line, says the *City Press*, starts from the high-level station at the Crystal Palace, and, running to Thornton Heath, passes through the district of Pitlake to the Old Town, Croydon, skirting which the line will go on to High-street, Croydon.

Arrangements are being made for the construction of a new railway from Kidderminster to Hatton Junction, to be called "The Kidderminster, Stourbridge, and Hatton Junction Railway." It is proposed to start from near to the centre of the town. There will also be a branch line to Stourbridge and other localities. An endeavour will be made to obtain running powers over both the Midland and Great Western lines.

The *Nieuwe Rotterdamsche Courant* of November 2nd, 1882, says:—"On the Rhenish Railway the No. 14 express train from Arnheim ran off the rails between Veenendaal and Ede this morning. All the carriages and the tender got off the rails, but neither passengers, officials, or rolling stock were damaged. The train was fitted with the Westinghouse brake, and by that means was brought to an immediate stand. The cause of the running off was the breaking of the locomotive crank shaft."

A new service of improved coaches similar to that now used on the Midland route from Birmingham to London has been put on the Midland Railway between Wolverhampton, Walsall, Water Orton and Birmingham. The coaches are all fitted with continuous footboards, and also with the automatic brake which enables the engine driver to pull up within a very short space. There are spring buffers placed at one end only, and couplings are superseded by bolts. Internally the third class carriages of the new service are much more comfortable than the old style of coach.

The Midland Railway Company have this week opened a new canal basin on their Wolverhampton and Walsall line to supplement the goods station erected some time ago close to the Wolverhampton Station. The basin is 300ft. long, and deck plates and other ironwork have been built into it. The contract for the ironwork was carried out by Messrs. Thomas Bridges and Sons, engineers and ironfounders, Wolverhampton. Messrs. Bridges are now fairly active in their engineering department in the supplying of local and other needs, and upon export account to the order of merchants.

Some time since we noticed the fact that the Pennsylvania Railway Company was creating some surprise and gaining praise by the intended introduction of Hansoms and cabs at Philadelphia. The fares are now fixed as follows:—For a Hansom cab holding two persons, 25 cents for a mile and a-half or less, and 15 cents for any additional mile or fraction thereof. The charge per hour will be 65 cents. The price for the "four-wheelers" will be 35 cents for a mile and a-half or less, and 20 cents for each additional mile or fraction thereof. The charge for a trunk will be 10 cents, and for each valise 5 cents. All the charges are thus higher than in London.

Last week the New South Wales Treasurer introduced his financial statement in the Legislative Assembly. In it he called attention to the rapid extension of the railways in New South Wales. Last year 274 miles of new lines were opened, and 442 miles are under construction. It is proposed to construct lines of a less substantial character to act as feeders to the main lines at a cost not exceeding £3000 per mile. These works will embrace five branches for the Great Southern Railway, three for the Great Western, and two for the Great Northern. It is also proposed to further extend the steam tramway system—which has so far been a great success—to some of the more distant suburbs of Sydney, as well as to some towns in the interior.

On Saturday morning last an alarming accident occurred to a sleeping car in the night train from Perth to Inverness. The train, which was a long one, had a sleeping car and closed wagon, and a brake-van in the rear. When 150 yards from Dalnaspidal Station the sleeping car left the rails, apparently at the points, dragging with it the two vehicles behind. The wheels came off the bogies of the sleeping car—or the bogies themselves came off—and the accident being unobserved by the engine-driver, the vehicle was thus dragged along the track until the train stopped at the platform. The alarm of the passengers was very great. All were severely shaken, but none were injured. The line was blocked for several hours, and the travelling crane, with workmen, had to be sent on from Inverness to clear it.

Railway companies at home and abroad are adopting the highly decorative material, "Lincrusta-Walton," for their carriages in place of expensive veneers and oilcloths. Panels representing engraved wood, monograms, and various designs, are reproduced on the material, which has the advantage of being imperishable and of an uninflammable nature, and lending itself to any style of artistic decoration. Amongst the latest introductions has been the outfitting of the saloons on the London and North-Western Railway Company's express trains between Euston and Liverpool; also for the mural decorations of their station hotel, lately opened at Preston. The fast Channel steamer, Invicta, has had her cabins decorated throughout with this material, and Messrs. Frederick Walton and Co., Limited, the manufacturers, are at present engaged upon a large contract for the Midland Railway.

Our Birmingham correspondent writes:—"The manufacturing district which lies between Birmingham and Dudley is likely to benefit by a scheme now being carried out for the construction of steam tramways by the South Staffordshire and Birmingham District Steam Tramway Company, Limited. The line, commencing at the present terminus of the Birmingham tramways at New Inn, will run through West Bromwich to the rapidly increasing district of Great Bridge. From Wednesbury it will extend through Tipton to the railway station at Dudley, with running powers over the authorised tramways into the market-place, Dudley. Another tram line, beginning at Wednesbury, will proceed to Moxley, there meeting the Wolverhampton tramway system, and yet another will run from Moxley to Darlaston, and thence to Wednesbury. The construction of these lines, which are 24½ miles in length, is making good progress. Already about seven miles have been completed, and large quantities of materials are on the ground ready for the completion."

The *Railroad Gazette* record of American train accidents for August shows for that month a total of 139 accidents, by which 46 persons were killed and 218 injured. There were 65 collisions, in which 27 persons were killed and 117 injured; 70 derailments, with 18 persons killed and 100 injured, and four other accidents, in which one person was killed and one injured. Twenty-six accidents caused the death of one or more persons each; 28 caused injury, but not death; while in 85, or 61·2 per cent. of the whole number, no serious injury to persons is recorded. These accidents may be classed as to their nature and causes as follows:—Collisions: Rear collisions, 41; butting collisions, 20; crossing collisions, 4; total, 65. Derailments: Broken rail, 2; broken switch road, 1; broken bridge, 4; spreading of rails, 7; broken axle, 4; broken wheel, 2; broken truck, 1; wash-out, 5; accidental obstruction, 4; cattle on track, 8; misplaced switch, 7; neglect to use signals, 1; purposely misplaced switch, 2; malicious obstruction, 1; unexplained, 21; total, 70; boiler explosion, 1; broken connecting rod, 1; broken crank pin, 1; broken axle, not causing derailment, 1; total, 139. Derailments of the long American cars are thus the most frequent form of accident, and unexplained derailments, though less than in some months, are sufficient to point to the correctness of the explanation previously given in The Engineer.

NOTES AND MEMORANDA.

Excluding collisions, 495 steamships and 2367 sailing vessels, were lost or damaged on our coasts last year.

Of the 2569 British ships which met with disaster, 1341 did not exceed 100 tons burthen, 791 were from 100 to 300 tons, 170 were from 300 to 500 tons, and 267 were above 500 tons burthen. Of the 540 British vessels totally lost irrespective of collisions, forty-four are known to have been built of iron; and of this number thirty-four were steamships and ten were sailing vessels.

A recently published patent specification, relating to copper alloys, describes an invention by Mr. G. A. Dick, well known in connection with phosphor bronze. The invention consists in alloying copper, or alloys of copper, with iron, by adding phosphide of iron to the said alloys in just sufficient quantity to deoxidise all oxides dissolved in the alloy, and secondly in adding to such alloys of copper, iron, &c., from 2 to 10 per cent. of lead.

The manufacture of bricks from granulated blast furnace slags will, according to the *Journal* of the Society of Chemical Industry, soon be started by the "Schalker Gruben und Hüttenverein." The slags are run into water, and the grit thus obtained is mixed up with lime, concrete, or plaster of Paris, and formed into bricks which are dried for a month. They possess greater solidity than common bricks, and resist a pressure of 100 kilos. to 150 kilos. per square centimetre.

Excluding collisions, out of 2862 casualties on the coasts of the United Kingdom during 1880-81, 2569 occurred to vessels belonging to this country and its dependencies, and that 293 happened to ships which belonged to foreign nations. Of these 2569 British vessels, 1732 were employed in our own coasting trade, 667 in the —oversea—foreign and home trade, and 170 as fishing vessels. There were fifteen casualties to ships belonging to foreign countries and States employed in the British coasting trade, and 220 to foreign vessels bound to or from British ports, although not actually engaged in our coasting trade; while there were fifty-eight casualties to foreign ships which were not trading to or from the United Kingdom.

The total quantity of letters and parcels of all kinds passed through the French Post-office from 1877 to 1881 rose from 865,000,000 in 1877 to 1,350,000,000 in 1881, the proportion being for stamped letters from 374,000,000 to 563,000,000; newspapers, from 219,000,000 to 354,000,000; printed matter in hand, 161,000,000 to 297,000,000; in envelopes from 14,000,000 to 50,000,000. Postcards, on the other hand, have undergone a diminution from 32,800,000 to 32,234,000. The department may well be satisfied with the increase of 56 per cent. in four years. The telegraphic service has been even more successful, showing an increase of 138 per cent. In 1877 the number of telegrams despatched was 8,174,000—of which 994,000 were international—against 19,466,000 in 1882—of which 1,952,000 were international. The parcel post was only commenced in the month of May last year, but since then its progress has been most rapid, increasing from 349,676 parcels in May, to 808,732 in December. The total despatched during the eight months was 4,186,867.

In the paper read at Southampton by Lord Rayleigh on "The Effect of Wind on the Draught of Chimneys," the author stated that a horizontal wind would usually promote a draught except in cases where the chimney opened out upon a large expanse of wall and so was indirectly affected, in which case there was only one cure, namely, to carry the chimney higher. When the wind was inclined downward to the chimney at an angle of 30 deg. and more there was a down draught, and the maximum up draught was produced by wind inclined upward at about the same angle. The simplest thing to prevent wind blowing down a chimney was to erect a T piece on the top. In that case a vertical or inclined wind favoured the draught, and the effect of a wind blowing through the T tube was practically nothing. In the discussion which followed, a speaker contended that chimneys should be turned upside down, the opening at the fireplace being narrow and the outlet widened. If all the chimneys in a house could be made to open into a common cloaca, a down draught would hardly ever occur.

Texas has been called a prolific State because recent statistics show that during the year ending on the 31st of August last it produced no less than 878,854 bales of cotton, valued at £10,000,000. It also produced 22,299,000lb. of wool, worth £1,025,000; and 13,572,000 lb. of hides, worth £325,600; besides having cattle of the estimated value of £3,200,000, and over £200,000 worth of horses and mules. The total product of the State, including lumber, grain, cotton seed, sugar, molasses, and other articles, was nearly £20,000,000. Within the year also there were completed 1641 miles of railroad, at an estimated cost for construction and equipment of £8,905,000. The State of Texas, which is by far the largest in the world, now possesses nearly 6000 miles of completed railroads, the cost of building and equipment of the whole being estimated at upwards of £33,000,000. These are tall figures no doubt, but it must be remembered that the State of Texas is the largest in the world; it is considerably more than twice the area of Great Britain and Ireland, and is more than one fourth larger than Germany. The areas are respectively 274,356 square miles, 120,879 square miles, and 212,091 square miles.

The following table by John Taylor, M. Inst. C.E., showing the volume of water flowing down the river Thames opposite the Lambeth Waterworks, Seething Wells, Thames Ditton, for the years 1876 to 1880, inclusive, is given in continuation of a similar return for the years 1853 to 1875, inclusive, which was printed in the "Minutes of Proceedings" of the Institution of Civil Engineers, vol. xlv., p. 102. The quantities are given in thousands of gallons:—

Month.	1876. Leap year.	1877.	1878.	1879.	1880. Leap year.
Jan.	30,392,588	172,240,720	35,064,356	68,261,956	21,102,884
Feb.	36,727,720	48,306,510	27,915,278	67,828,960	43,625,473
March ..	52,001,590	31,971,150	24,121,394	30,370,822	25,727,970
April ..	36,729,500	40,490,070	25,513,982	29,588,612	22,405,212
May	21,326,258	24,619,490	28,026,876	27,030,888	16,838,079
June	16,705,452	18,379,281	21,358,530	41,454,200	16,373,986
July	16,220,605	19,231,014	17,861,436	34,180,708	19,305,276
August ..	16,154,098	19,723,722	18,598,032	50,732,994	16,956,063
Sept... ..	16,720,665	21,284,406	17,147,279	35,042,378	23,421,802
Oct.	19,731,522	18,202,488	19,649,888	27,809,726	48,739,988
Nov.	24,480,078	35,027,009	30,358,020	19,344,936	46,172,206
Dec.	95,495,610	35,880,678	26,689,064	18,773,699	46,062,062
Totals ..	382,685,686	485,356,538	292,304,135	450,419,879	346,731,001

The Mississippi has no fewer than 55 tributary streams, with a total length of navigation of 16,571 miles, or about two-thirds of the distance around the world. Even this, however, represents but a small amount of the navigation which will follow when the Federal Government has made the contemplated improvements in the Upper Mississippi, in the Minnesota, Wisconsin, and other rivers, in which it is now engaged. But while the Mississippi has 16,571 miles navigable to steamboats, it has 20,221 miles navigable to barges. This navigation is divided between 22 States and territories in the following proportions:—Louisiana, 2500 miles; Arkansas, 2100; Mississippi, 1380; Montana, 1310; Dakota, 1280; Illinois, 1270; Tennessee, 1260; Kentucky, 1260; Indiana, 840; Iowa, 830; Indian Territory, 720; Minnesota, 660; Wisconsin, 560; Ohio, 550; Texas, 440; Nebraska, 400; West Virginia, 390; Pennsylvania, 380; Kansas, 240; Alabama, 200; and New York, 70. Nearly all sections of these States and territories can be reached with ease. Louisiana, Arkansas, Mississippi, Montana, Dakota, and the Indian Territory possess more miles of navigable stream than miles of railroad, all of which are open to everybody who wishes to engage in commerce. The Missouri—2980 miles in length from mouth to the Madison branch source—is the chief tributary of the Mississippi. It rises in the Rocky Mountains, near the dividing line between Montana and Idaho.

MISCELLANEA.

West Bromwich, Smethwick, and Willenhall have followed the course taken by Birmingham, Wolverhampton, and Walsall, in the matter of the electric light. They have refrained from asking for powers to light their districts themselves, intending to support certain of the companies who have served notices upon them.

The award in the suit brought by Countess Ossalinsky, the proprietor of land at Thirlmere, against the Corporation of Manchester has been announced. The arbitrator finds the countess entitled to £64,445, and a sum of either £6000 or £4000 additional, contingent on the view that may be taken of a special point in the case.

The Vestry of St. Mary's, Newington, have, by a vote of 33 against 9, adopted a report from the Works and Sanitary Committee in favour of an application being made to the Board of Trade for a licence under Section 3 of the Electric Lighting Act, 1882, for the supply of electricity for lighting purposes, both public and private, within the area of the parish.

At a meeting of the South Staffordshire and East Worcestershire Institute of Mining Engineers, on Monday, a paper was read by Mr. Treglown—of Messrs. Tangye's—on "Wilson's Gas Producer," showing the most economical way of converting fine slack into gas for heating boilers, furnaces, &c. By the producer gas for heating purposes alone could be made, he said, at a cost of about ½d. per 1000ft.

The German newspapers record the fact that four officers of the Imperial Chinese Navy recently arrived at Kiel in order to attend the torpedo exercises at that station. The Government of the Celestial Empire is said to have given Messrs. Schwarzkopff some important orders for torpedoes. The officers have been making themselves thoroughly acquainted with all details of the torpedo service, and have had every facility for that purpose placed at their disposal by the German naval authorities.

Early on Tuesday morning the water in the upper section of the Exeter Canal rose to such a height as to overflow its banks, and the soil being loosened by the recent heavy rains a breach was made about 40ft. wide, through which the water poured with terrific force until the canal had nearly drained itself dry. The flood passed into the river by way of the intervening marshes, which for an hour or two were 2ft. or 3ft. under water; but, apart from the injury to the canal bank, little damage to property resulted.

A new illustrated journal, the *Decorator and Furnisher*, is now being published in London by Messrs. Griffiths and Farran. The first part, October, contains a large number of well executed engravings, chiefly illustrative of modern furniture, showing the modern American rendering of Queen Anne, and other furniture of somewhat more recent date. Some of the designs have good features, and some of the text is interesting and instructive. It is noticeable that the publishing price in America is 35 cents; in England it is half-a-crown.

There was launched from the yard of her builders, Messrs. Raylton, Dixon, and Co., Middlesbrough, on Saturday afternoon, a steamer which was named the Sculptor, for Messrs. T. and J. Harrison, of Liverpool. The vessel is built to class 100 A1 at Lloyd's, and also to have Board of Trade passenger certificate. Her dimensions are: Length, 260ft.; breadth, 33ft.; depth, moulded, 21ft. 7in.; dead weight carrying capacity, over 1900 tons. Her engines, of 120-horse power nominal, will be fitted by Messrs. Blair and Co., Limited, of Stockton.

About three months have elapsed since the ship joiners of the Glasgow district came out on strike for an advance of ½d. per hour on their wages. The arrival of a large number of workmen, brought from England at the instance of the employers to supply the places of the men on strike, was the occasion a few days ago of a series of riots, in the course of which numbers of the Englishmen were hurt, three or four of them very severely, and their tools broken and destroyed. Large bodies of police have been employed at the several yards to guard against a renewal of these disgraceful scenes, and efforts are again being made to reconcile the claims of masters and workmen.

The Building Act Committee of the Metropolitan Board of Works have decided that the Criterion Theatre is entirely unfit for a place of public entertainment, as no sufficient means of egress in case of a panic are or can be provided. The report says the building was not originally intended as a theatre. The proprietors of the theatre have yet to be heard in the matter, and urge that the theatre is largely fire-proof, that all doors open outwards, and that the fire-proof corridors contain space enough to hold the whole audience. In a report by the same committee on the Royal Italian Opera or Covent Garden Theatre, some very extensive alterations are demanded to make egress from the building easy in case of panic.

The new French Australian packet service, to be opened by the Compagnie des Messageries Maritimes, will now soon be ready. The six new steamers, the Natal, Melbourne, Caledonian, Sydney, Saghalien, and Salazie, are 390ft. long, 36ft. wide, and 30ft. deep, and draw 18ft. of water. Their engines are of 2400-horse power, and their average speed will be 12 knots an hour. They are fitted up to accommodate 200 passengers, besides a crew of 180 hands. The starting points are to be Marseilles and Noumea, and the intermediate ports touched will be Port Said, Suez, Aden, the Seychelles Islands, Réunion, Mauritius, King George's Sound, Adelaide, Melbourne, and Sydney. The voyage, the Paris correspondent of the *Times* says, will take fifty days. The subsidy paid to the company by the State for the support of the new service is 32f. per marine league traversed, so that the total annual subsidy will amount to 3,300,000f.

A pamphlet, entitled "English and Foreign Patents and the Impending Legislation on the Patent Question," by a barrister of the Inner Temple, has been sent us. One of the chief aims of the pamphlet is to show the advantage of the French system of divisibility, under which a patent cannot be made void simply because it includes something that is not new. This part under the French law may be struck out, and the part referring to that which is new remains good. On the other hand, if an English inventor has not gone to the expense of a disclaimer for any little inaccuracy or claim of something found not to be new, his patent may be declared void, though the remaining part and the real subject matter of his patent may be absolutely and radically new and of great public advantage. Other points of great importance are dealt with in this pamphlet, which is printed by Messrs. Bemrose and Son, of 23, Old Bailey.

At a recent meeting held at Rouen of directors of societies which undertake the inspection of boilers, the question of the treatment of boilers when not in use was fully discussed. M. Boland expressed his opinion that previous to a cessation of employment a boiler should always be emptied, and completely dried, even with the aid of a small fire, and should then be stopped up air-tight. The external metal of the boiler should, he remarked, be well rubbed, so as to remove all soot, &c., which might be on it. M. Meunier, technical director of the Alsatian Society, confirmed the previous speaker's recommendations as to cleaning the external surface, particularly if the fuel used contained any quantity of sulphur. Various compositions were referred to by the speakers who took part in the discussion for the painting of the internal walls of boilers; M. Jourdan, of Paris, advocating the use for that purpose of lime-milk and oil. Finally a resolution was unanimously adopted to the following effect:—"A steam boiler which is about to be unused for a time should be thoroughly cleaned, and, after being completely dried, should be painted, in order to keep the boiler metal in good condition." This system was adopted by our Admiralty for some time, but the results were far from encouraging, the consequence being that the boilers are now filled quite full of water instead of drying them.

STEAM FIRE FLOAT FOR THE BRAZILIAN GOVERNMENT.

MESSRS. SHAND, MASON, AND CO., BLACKFRIARS, ENGINEERS.

(For description see page 347.)

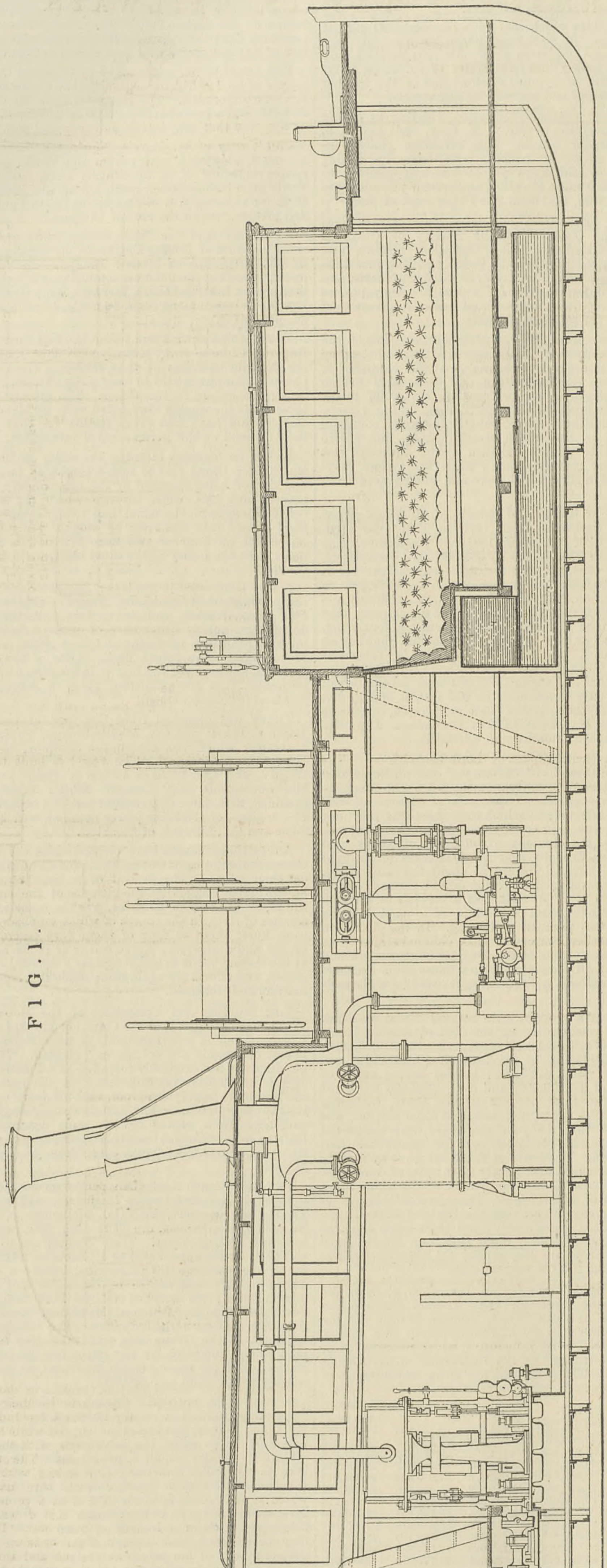


FIG. 1.

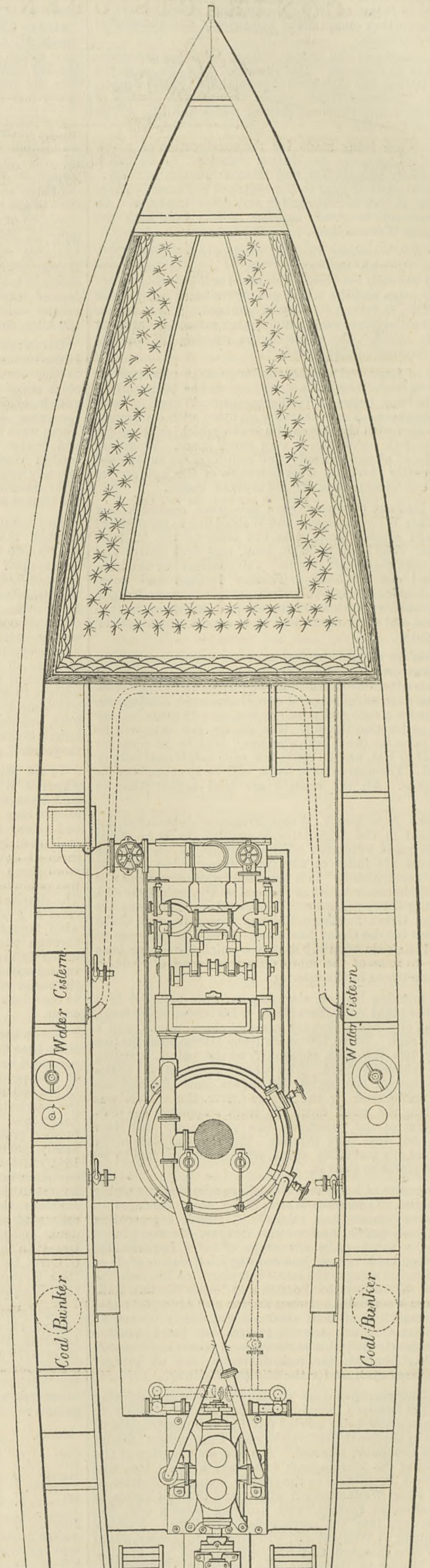
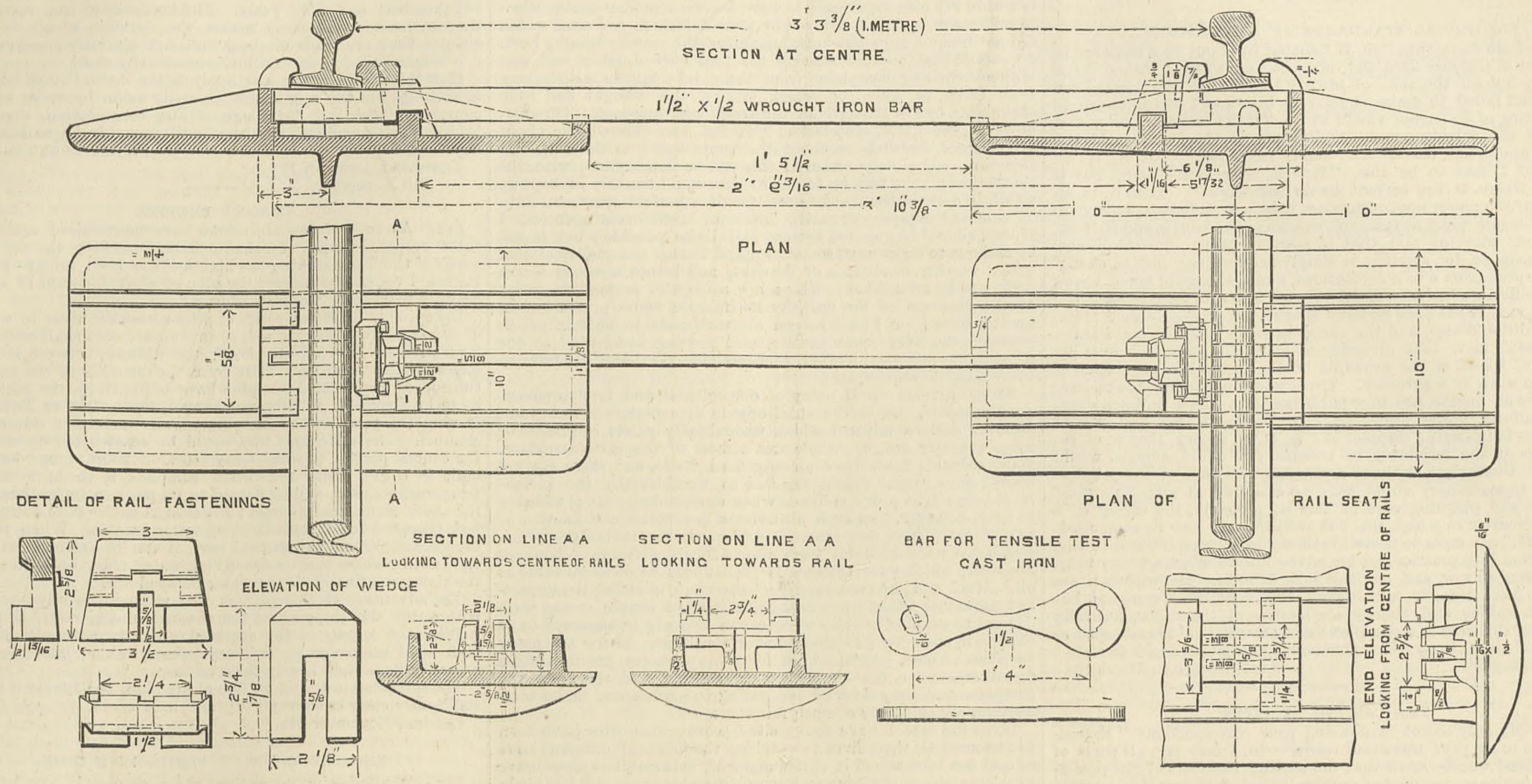
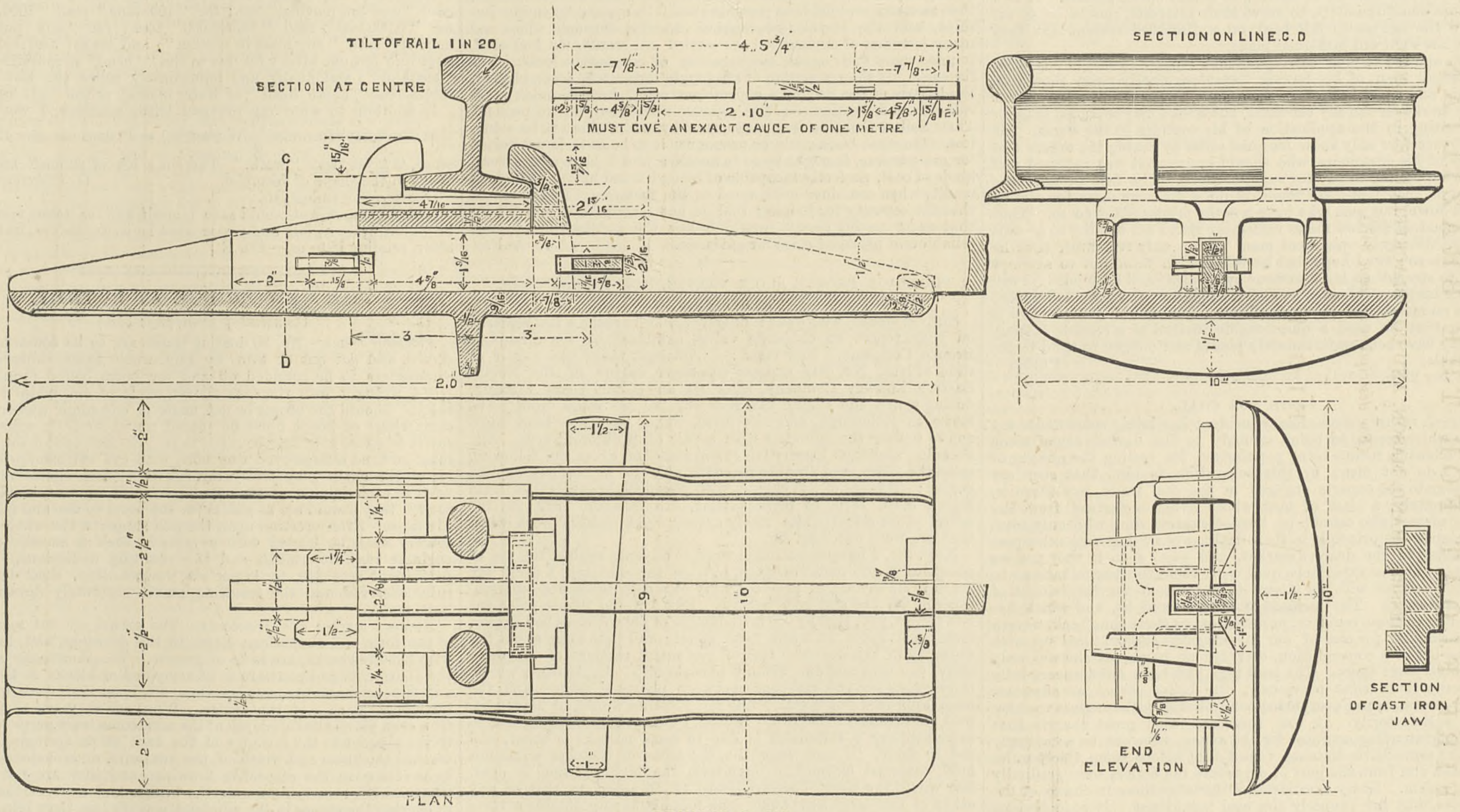


FIG. 2.

CONTRACTS OPEN—PERMANENT WAY, I.S. RAILWAYS.



DRAWING D 204



DRAWING D 213

CONTRACTS OPEN.

INDIAN STATE RAILWAYS.

THE following is an abstract of the contract specification for permanent way materials, consisting of cast iron plate sleepers for 41¼ lb. steel rails, for the Northern Bengal and Rewari-Ferozepore Railways—metre gauge :—

The work required consists of 218,875 pairs of cast iron plate sleepers with wrought iron tie-bars, and all fastenings complete as under, viz.:—8875 pairs of sleepers, &c., to drawing, Figs. 213, for Northern Bengal Railway ; 10,000 pairs of sleepers, &c., to drawing, Figs. 204, for Northern Bengal Railway ; 200,000 pairs of sleepers, &c., to drawing, Figs. 213, for Rewari-Ferozepore Railway. Each pair of sleepers to Figs. 213 is to consist of two cast iron plate sleepers and one wrought iron tie-bar, four cottars, and two cast iron inside rail jaws. Each pair of sleepers to drawing No. D 204 is to consist of two cast iron plate sleepers, two cast iron inside rail jaws, two cast iron wedges, and one wrought iron tie bar. The various parts of the sleepers are estimated to weigh as follows : —Two plate castings, to drawing No. D 213, 89½ lb.; two cast iron jaws, ditto, 5¼ lb.; one wrought iron tie-bar, ditto, 11¼ lb.; four wrought iron cottars, ditto, 2¾ lb.; two plate castings, to drawing No. D 204, 93 lb.; two cast iron jaws, ditto, 4 lb.; two cast iron wedges, ditto, 2¼ lb.; one wrought iron tie-bar, 10 lb. No work weighing less than the above weights by more than 2 per cent. will be accepted. Payment will not be made for any weight above that which is estimated, and the actual weight only will be paid for if the work is under the above estimated weights. The cast iron used for the sleepers is to be a mixture of soft grey, all mine iron, of such a quality that a bar of the same 1in. broad and 2in. deep, placed on bearings 3ft. apart, shall not break with a less load than 30 cwt. suspended in the centre. The wrought iron used is to be of some best best brand, and is to be equal to a tensional strain of 24 tons to the square inch, with a contraction at the point of fracture of not less than 20 per cent. Before the work is commenced accurate gauges for testing the several parts of the sleeper are to be prepared by the contractor, and after being approved by the inspector-general they must be carefully worked to. The tilt of the rail is to be 1 in 20, from a perpendicular drawn at right angles to the line of the cross tie, and if on applying a set gauge of that angle it shall be found that the rail is tilted more or less than 1 in 20 by more than $\frac{1}{32}$in. in its depth, the sleeper will be rejected. The name of the maker, the date of casting, and the letters "I. S. R., 41¼ lb.," are to be cast on each sleeper. Every piece of cast and wrought ironwork must be permanently marked with the letters "I. S. R." The contractor must cast twice in each day from the same metal as that used in the sleepers two duplicate bars 2in. by 1in. and 3ft. 6in. long for test by transverse strain, and two duplicate castings of the form shown on the drawings and exactly 1in. square for a length of 1½in. in the middle for test by tensile strain. One of the two bars for test by transverse strain must be tested on edge on bearings 3ft. apart, and it must bear 30 cwt. in the centre without breaking, and must show a deflection of at least 0·29in., and one of the other two castings must be tested in a suitable machine to ascertain the tensile strength of the iron, which must be equal to 11 tons per square inch. The second test casting of each kind is to be marked with the date of casting and put away for subsequent inspection. All sleepers cast on any day when either of the two bars tested fail to stand the specified tests will be rejected. One sleeper in every lot of 200 will be tested daily by blows. The sleepers so tested are to be placed on a bed of sand ballast. A piece of rail 18in. long is then to be keyed into the sleeper as if for the road. The rail is then to be struck by a monkey weighing 3 cwt., falling from heights commencing at 2ft. and rising by increments of 1ft. up to 8ft., and whenever any sleeper so tested does not bear these blows without cracking or showing other signs of failure the day's work will be rejected. The sleepers tested will not be taken as part of the contract, but must be broken up immediately after testing. The sand foundations on which the sleepers are tested is to be 2ft. thick and is to be laid on a cast iron bed plate 8in. thick. All sleepers must be moulded by machine. No hand moulding will be allowed. Immediately after each sleeper is cast it must be so protected that the process of cooling will proceed so slowly that its strength will not in any way be diminished by too rapid or unequal cooling. All the holes and notches in the tie-bars must be punched in one operation. The contractor is to replace, at his own cost and charge, all sleepers, &c., which may be broken or damaged in carriage or delivery, or otherwise previously to their coming into actual possession of the Secretary of State for India. All the wrought ironwork must be heated and dipped while hot into boiled linseed oil. When dry, all the small parts, with the exception of the tie-bars, must be packed in strong cases. The cases are to be made of 1¼in. thick well-seasoned deal boarding, with 1¼in. thick elm ends, the whole nailed together with wire nails; they are to be strengthened by battens pitched at a proper distance along the sides, tops, and bottoms, each set of which is to be entirely surrounded with one strap of hoop iron. The cases are to have outside end corner posts, and the ends are to be tied with hoop irons, each stretching across the end and along the sides to meet the first side battens. The hoop iron is to be 1½in. wide, No. 18 B.W.G. thick. The joints of all cases are to be tongued and grooved. The tie-bars are to be delivered in bundles of sixteen, firmly bound together with strong rod iron. The sleepers may go out unpacked. All packages must have such shipping marks as may be directed by the Inspector-General; the marks on all wooden cases being cut or branded into them, not merely painted. The weight of each case when packed is not to exceed 5 cwt. The contractor is to furnish, with his second delivery, the usual seven complete sets of tracings on cloth. The cost of all cases or other materials required for packing, as well as of all such tracings, oiling, packing, marking, testing, &c., must be included in the contract sum. Tenders are to be delivered at the Store Department in the India Office, Westminster, S.W., on Tuesday, 14th November, 1882, before two p.m., after which hour no tender will be received. They are to be addressed to the Secretary of State for India in Council, with the words, "Tender for Cast Iron Plate Sleepers for 41¼ lb. Steel Rails" on the left-hand corner of the envelope, and are to be placed in a box provided for that purpose in the Store Department.

KING'S COLLEGE ENGINEERING SOCIETY.—At a general meeting of this Society, held on the 2nd inst., Mr. E. H. Horne read a paper on "The Construction of Naval Guns." The meeting was very well attended. There will be no meeting next week.

LETTERS TO THE EDITOR.

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

ELECTRICAL STANDARDS OF MEASUREMENT.

SIR,—I am sorry that "Φ. Π." should have put on a sentence in my letter of October 23rd the very meaning which I wished it not to bear; but for the sake of brevity I shortened the passage too much, and failed to make it clear to him that I was referring to the starting of an engine when I wrote, "if the resistance to motion equalled the driving power, equilibrium would result, and the engine would not move," *i.e.*, start, from rest. "J. B. W.'s" argument I take to be this, "E = R, therefore C = 0, but if C = 0, where is the current to do the work?" That is, in an engine, if the power applied to start it be not sufficient to disturb its equilibrium when at rest, and overcome the inertia and friction, it will not start at all; that is, starting power must be greater than resistance, for starting is simply accelerating, that is, changing the speed from *o* to *n* revolutions, and a change of speed shows that equilibrium has been disturbed, and is in process of restoration; the sign that it has been restored is that the change, acceleration, or diminution ceases, and the speed becomes uniform and steady. This useful fact, that disturbance of equilibrium is shown by change of speed, is the principle of the automatic regulation of power to work by a governor. There would be no limit to acceleration were an engine not in equilibrium at a given uniform speed with uniform power and load. The necessity for and use of governors is in itself a disproof of "Φ. Π.'s" theory, that the force decreases if the resistance be lessened; if it did, engines would regulate themselves without assistance, and one of the greatest dangers to machinery would have no existence at all. The most familiar and plaguing case of this is, probably, the racing of a steamer's screw in a high sea, but even this can now be controlled. If "Φ. Π." attempts to prove his theory by putting his boat-towing illustration into practice, let me advise him to select a heavy boat, get a friend to tow, and cut the rope himself. He will then see that the force does not vanish when the resistance is removed, but causes a sudden and violent acceleration of the motor, generally ending in this case in a sharp collision between the tower's nose or knees and the path by which this moving body is brought to rest.

November 6th. AN ELECTRICAL STUDENT.

THE CASTING OF PIPES.

SIR,—My only object in noticing your correspondent "Experience" is to let your numerous readers—in, I may say, all parts of the civilised world—know that the leading members of the profession of engineers are men of progress; that as they saw frequently the upcast socket fail and gave them trouble, they insisted on a change in the system of casting to obtain better results. It is a pity that small founders, to serve their interests, should be so far behind the age as to fall back on a discarded system that they might use their old-fashioned plant.

I am amused at your correspondent's repeated boast of his being a practical man, of his having "cast personally many thousands of tons and varnished other thousands." No doubt many of his fellow-workmen can say the same, but a man may be a good founder yet wanting in the application of his castings to the works. He would therefore only show his good sense by taking the orders and advice of his customers, who should know what was required and who were willing to pay for superior work. The fact in reference to cost is that first-class founders do not charge extra for casting socket down, but men who have not the proper plant do so. Your correspondent advises me to remember that I am talking to a—this time a thoroughly—practical man. I can only remember that he says he is so; but I hope that he will bear in mind not to attempt again to strengthen his assertions by a vulgar and silly joke. I will not ask him to name even one civil engineer who specified socket up, as no member of the profession doing so would like to have it known that he used a questionable instead of a reliable casting. He may have been unfortunately placed and obliged to bend to the inevitable. PRIOR.

October 28th.

TESTS FOR COAL.

SIR,—A rather extraordinary incident has lately come under my notice which seems to point strongly to the desirability of some ready scientific means being popularised for testing the quality of coal. I do not mean by this suggestion to hint that such are necessary to the experts engaged in the coal trade, but there is, unfortunately, a class of men whose living is derived from the supply of coal who cannot be termed experts, and who only seem to recognise the principle in their dealings of buying in the cheapest and selling in the dearest market, and who, even if they possess the knowledge or experience qualifying them to discriminate as to quality, neither will nor desire to exercise it for the benefit of their customers. The incident above referred to, and which has given rise to these remarks, occurred only a short time back, when a steamer bound for one of our eastern ports started filled up with coal for her own consumption, carrying no cargo, as she was only for delivery out there. The trial trip had been most successfully run some little time previously, the boiler giving an adequate supply of steam, and everything connected with the engines working most satisfactorily. It was therefore with great chagrin that the superintending engineer for the owner, who was to accompany the ship some little distance, found that before some thirty miles had been run from the port of departure the boilers were gradually losing steam. Every exertion was made by those in charge of the furnaces, but fire properly the coal would not. It soon became evident that the coal, although not bad looking stuff, and purchased by the agents as the best Welsh steam coal, flew into dust, and the tubes were rapidly becoming choked, and this to such an extent that before proceeding much further the vessel came to a dead stand for want of steam to move her engines. There was no alternative but to wait until a little could be raised, turn the vessel's head round, and, with occasional stoppages to get a few pounds of steam, creep slowly back to port. Arriving there late in the evening, the next morning a few tons of West Hartley and Northern steam coal were obtained from a coal hulk, and a run of 45 miles taken to test the question as to whether the fault was wholly attributable to the quality of the coal, when the result was fully equal to that obtained on the trial trip. There was nothing for it, therefore, but to discharge the whole of the coal on board, and fill up with more reliable fuel.

Now, there are several questions connected with this rather ignominous proceeding that deserve consideration. In the first place, the highly respectable firm who supplied the coal must have, presumably, been ignorant of its quality, or must have been culpably negligent in supplying such material as the *quid pro quo* of the price paid, a price for which the very best Welsh coal should have been supplied as contracted for. The question was attempted to be raised as to whether the furnaces were of adequate size; but this was set at rest very speedily, for they had been constructed of extra dimensions to admit of wood being occasionally used as fuel. Then, further, it certainly appears strange that the engineers of the ship, well experienced men as they are, should have allowed such coals to have been placed on board without protest. In fact, the only man who seems to have protested before the fact of inferior quality became manifest, after the ship was a good many miles on her journey, was the ship's cook, who complained that it took him an hour to light the galley fire with it. Now here we have men of long use in the coal trade, and with a high character for honourable dealing—the captain of the vessel, an officer of long experience with steamers; the first and second engineers of the ship, with equally long experience; and lastly, the superintending engineer himself—all unable to pronounce upon the quality of the coal by any test of sight or handling. I believe that such incapability of forming a judgment in this respect is by no means uncommon, and it is therefore that I desire to suggest that some ready means of practically testing the quality of coal should be devised for the use of those who are outside the actual working of the trade. For it must be borne in mind that too late discovery is but too often made, and serious results are not unlikely to attend the fact. It is within my own experience to have known a mail steamer, when in mid-ocean, seriously delayed by some defects in her coal, which did not become apparent until long after the vessel's leaving port. I recollect that on this occasion the coal burned fairly well, and without eliciting complaint from the chief engineer, all the way from India to Aden, on which journey the draught had been stimulated by the strength of the south-west monsoon. Directly, however, the quiet, land-locked Red Sea was entered, the slight after-breeze, blowing at about the same speed as the ship was steaming, completely removed this aid to combustion, with the result that all the way up to Suez steam could scarcely be kept up at all, in spite of the frantic exertions of a perfect army—on duty in constant relays—of native firemen. Such contingencies, I repeat, should be guarded against as fully as possible; but it will be difficult to do so until some means of testing the quality of coal under varying conditions of draught, and before a vessel leaves dock, can be established. There are some who pretend to judge by the cleavage of the coal, by its fracture under pressure or a forcible blow; but I have known all such tests to be falsified in practice, the very finest looking coal proving ill-adapted to the required purpose, while other, condemned as worthless, has fulfilled every possible requirement.

As the opening up of many of our colonial and foreign possessions proceeds, one of the chief objects of explorers is to try and discover coal—a mineral which undoubtedly exists in greater or lesser quantity over the whole area almost of the earth's surface. Many valuable finds have already been made, and there are yet many more finds, which, rejected as worthless by the surface specimen, might prove valuable when worked deep. It is amusing to hear, however, how such discoverers contradict one another as to quality. Thus, very recently, coal specimens, said to be of high standard, were brought from the African districts inland of Zanzibar, which were afterwards pronounced to have no value at all. Much would be accomplished, therefore, in aiding the important researches after fresh coal-fields if some simple means were devised to enable discoverers—who can scarcely be supposed to be experts in coal—to test the value of the finds. There are many varieties of coal, which, useless for some purposes, are invaluable for others, and a few simple rules laid down, and some not too complex machinery devised for testing the specimens under combustion, are evidently a much felt want.

If, as the case I have above cited proves, men who have been accustomed all their lives to watching the firing of different sorts of coal can be deceived in their judgment, it is manifest those brave explorers who push their way into unknown lands are still less likely to be able to form a correct opinion. It is of the utmost importance to England, with her world-distributed interests and commerce, that as many coal-fields as possible should be opened to supply her ships, and the Royal Geographical Society, through whose aid many journeys of exploration are carried on, would, we feel sure, impress upon their agents the necessity of constantly looking out for such. If the realisation of my suggestions can be accomplished, the leaders of the Society's expeditions could furnish much more valuable information on this subject than they do at present. Their find at Zanzibar was pronounced by one of them to be valueless. On what basis could he pronounce it to be so? If not suited for one purpose, it might be so to another, and I have seen several kinds of coal, perfectly incapable of being burned alone, yield good results when combined with wood in the furnaces. It is evident that the capacity for judging coal is not widespread, and I hold that many useful results would follow the publication of some reliable and practical rules for guidance. A. F.

PHOSPHOR BRONZE SLIDE VALVES, NORTH-EAST COAST EXHIBITION.

SIR,—I would, with your indulgence, like to make a few remarks on your report on old slide valves exhibited by the Phosphor Bronze Company. You state:—"Amongst them was a pair of slide valves, No. 845 express passenger engine of the North-Eastern Railway Company, after six and a-half years' working, during which the engine has now run 261,282 miles from Newcastle to Edinburgh, and *vice versâ*. They have now been taken out to replace the cylinders with a pair of a different type. Mr. Fletcher, assistant locomotive superintendent, gives the following upon the slides, and another pair still at work in No. 844 express engine:—Mileage of 845 engine, with phosphor bronze slides, from March 30th, 1876, to present time, 4th October, 1882, 261,282 miles. Gun-metal slides rarely exceed eight months' work when they are worn out," &c. &c.

Now, Sir, I have not a single word to advance against the use of phosphor in gun-metal castings, but, on the contrary, I could say much in its favour, as proved by my own experience and observations of its use and good results. But, I would like to point out two things, viz., that by the introduction of phosphorous bad or poor metal can never be made good metal; and that there is not the disparity in the wear and tear of gun-metal castings of the same alloy, one with and one without phosphorous. Or, in other words, there exists not the difference between phosphor bronze and the most approved gun-metal, while Mr. Fletcher would, by his report, lead your readers to believe. Indeed, I cannot help thinking that so extraordinary a statement is due to some mistake or other, and not to facts. If such were true, the name of Fletcher would not hold, amongst locomotive engineers, the high position it does. Nor would the North-Eastern Board of Directors, or that of any other of our large companies, long tolerate so unprofitable a state of affairs in its locomotive department.

Perhaps it may not be uninteresting to Mr. Fletcher, jun., and others of your readers, for me here to say that during an experience now verging upon twenty years, I have made slide valves for a good number of passenger engines, four wheel-coupled class, diam. of wheels 6ft., diam. of cylinders 16in., and 20in. stroke. With constant care and attention to the noting of results during the whole of the afore-mentioned period, I have found the average wear of slide valves to be $\frac{3}{32}$in. per annum, and the average life to be five and a-half years. If there be no mistake in the report supplied to you, or in your report itself, I am, with all due respect to officials and artisans in the service of the North-Eastern Railway Company, forced to the conclusion that to something radically wrong in the brassfoundry—which I can scarcely believe—or to the injudicious interference of some official placed in authority over it, is due these unfortunate results in the wear and tear of slide valves belonging to their express passenger engines, as per Mr. Fletcher's report. FOUNDRYMAN.

Oswestry, November 4th.

THE DECAY OF IRON STRUCTURES.

SIR,—The circumstance of the controversy regarding the plans of the high level bridge over the Firth of Forth, now going on, and a letter from a friend telling me that he was at present engaged renewing railway bridges in the North of Scotland, meeting together as two streams of thought in my mind, have produced a reflection on the importance of giving a very minute study to the matter of the duration and last of iron structures exposed to the weather, and I fancy that I am doing no more than right in inviting attention to this matter.

I suppose that it is a historical fact that no iron bridge or iron part of a bridge has yet attained to the age of one hundred years, but that, on the contrary, the greater part of them are aged at twenty-five, and at thirty-five or forty years standing are worn out, useless, or at best, unsafe.

The point of the question as to the last and durability of such structures rests, I imagine, on an inquiry into the deep dimension of the iron, that is to say its comparative thickness. Those structures whose pieces are built or partially built even of iron web from $\frac{1}{4}$in. to $\frac{5}{8}$in. in thickness, will probably not last much longer than a quarter of a century, or at best will not be safe at that age; while structures that are made of bar iron, or iron of not less than 1in. thick, and with thicknesses proportionate to other dimensions, may be expected to last from one hundred to one hundred and fifty years. The tendency of iron exposed to the weather to rapid decay makes the duration of all classes of articles that are made of sheet iron, not specially preserved—for it is wonderful what care will do—necessarily short.

How this consideration may apply to the Forth Bridge scheme I cannot say, but the application is easily made by those who are conversant with it. Although of airy construction, suspension bridges—being made of bar iron—will probably be as lasting as any. WILL. YOUNG BLACK.

Townhead, Leith, N.B.,
6th November.

THAMES BRIDGES.

SIR,—As such strong objections have been raised against the three proposed forms of communication between the north and south of the Thames, viz., the high and low level bridges and the tunnel, I venture to suggest the plan of what, for want of a better name, I will call a "submerged way."

I propose to drive two series of piles across the river to a depth of 40ft. or 50ft. below its bed, so that their heads shall come about level with the bed of the river; the distance between these two series of piles would be a little over the breadth of the intended submerged way. After the piles have been driven, the earth, &c., is to be removed, to form a channel about 20ft. or 25ft. deep, leaving the piles as the temporary walls on either side of such channel. The submerged way would be constructed of cast iron, the central portion of which—say 200ft. or 250ft. long—would be built in a dry dock, and when complete is to have its ends temporarily closed, and be floated to its position immediately over the above-mentioned channel; it would then be sunk down to the bed prepared for it by admitting water into it. When this has been accomplished, this central portion can be extended at either end, until its base reaches above high-water mark on both sides of the river, and finally all the water pumped out.

The advantage of this plan is that while in no way interfering with either the shipping or the channel of the river, it greatly reduces the length of the approaches as compared with either a high level bridge or an ordinary tunnel, which latter would of necessity have to be nearly twice as deep.

The foregoing is a brief outline of my plan, but I trust it will be sufficiently clear to convey the principle involved. A. L. G.

London, November 8th.

THE PRESSURES OF FLUIDS IN MOTION.

SIR,—The following corrections are necessary in my letter on above subject, published in your last. For "Huysens" read "Huygens"; for "they were to be moving with a velocity," &c., read "one ton moving," &c.; for "100 tons" read "1000," and for "1,000,000" read "10,000,000" tons; for "any pump in motion" read "any mass in motion"; and erase "and help" in next line but one after; for due to the "'head' it contains" read "sustains"; and finally and immediately below the last of the tables read "$\frac{1}{827}$th head" of water instead of the "$\frac{1}{827}$ lb."

In addition to what my previous letter contains, I would say that Hawksley's formula, $\frac{v^2}{g}$ W (weight) = P, does not give P in any sense, it gives twice "work." There is a lot of rubbish knocking about in the shape of formulæ. G. PINNINGTON.

Chester, November 7th.

[Our correspondent would save himself and us some trouble if he would write legibly and revise what he writes before, instead of after, sending it to us.—ED. E.]

THE NEW BRIDGE AT PUTNEY.

(*Concluded from page* 315.)

Floating booms.—No. 20 floating booms are to be constructed as shown, and cut out of 14in. by 14in. whole baulk timbers; the arrisses are to be rounded off and the boom bound round with No. 4 wrought iron rings, as shown, made of 4in. metal by 1in. thick. Should the booms be not made of one single timber, sufficient rings or hoops must be placed round to fully secure any scarfe or splice that may be made in it. At each end of the booms must be fixed a large-eyed ring bolt, with eye sufficiently large to let a $\frac{3}{4}$in. chain play freely through it. These chains must be fixed to each dolphin as shown, and screwed up taut, as it is intended they should act as guides for the boom to rise and fall with the tides. After erection upon the pile supports, the whole of the centres shall be loaded with weights in such a manner as the engineer may determine, and the resulting deflections, or any permanent sets due to imperfect workmanship, shall be carefully observed and the resulting curves accurately drawn to a large scale.

Arches: Arches and skewbacks.—The arches are flat segments, of the form and dimensions shown in the drawings, and, together with the skewbacks, are to be of granite. The skewbacks both of the abutments and piers are to be composed of blocks of the form and dimensions shown, not less than 4ft. upon their beds measuring across the axis of the bridge. When set they are to form a true even plane the full depth of the archstones truly perpendicular to the tangent to the intrados of the arch at its springing. The vertical thickness and width of the voussoirs, or archstones, is to be as shown in the respective drawings, and they are not to be less than 4ft. measuring across the bridge, and none of them are to overlap the stones in the adjoining courses less than 18in. The archstones are all to be fine axed on the face, perfectly smooth and true according to their respective positions, the soffit being truly formed to the curvature of the intrados, and the sides fine picked worked, so that a parallel joint shall be left between each course of archstones $\frac{3}{16}$ths of an inch in thickness, and truly perpendicular to the tangent to the intrados of the arch at that point. In setting the stones, vertical strips of lead $\frac{3}{16}$ths of an inch in thickness, 2in. in width, and the whole depth of the stones in length, are to be introduced at a distance of 6in. from each end of each stone, and as soon as each course has been completed the joints shall be grouted with Portland cement and sharp Thames sand—1 and 1—being put in of such a consistency as perfectly to fill solid the whole depth of the joints. The extrados of the arches are to be hammer dressed. The whole of the joints of the arch stones are to be fine picked over their whole surface without any deficiency whatever. The extrados of the arch stones shall be fine picked for a sufficient depth to receive the face stones of the outer spandril walls. The whole of the five arches are to be carried over together in such a manner that no arch shall at any time be more than one course in advance of another.

Spandril Walls and Platform for Roadway.—Upon the completion of the bridge arches the whole surface of the extrados and skewbacks shall be covered with a coat of Claridge's asphalte of the best quality, to be laid in one perfect and continuous sheet $\frac{1}{2}$in. in thickness over the entire surface of the bridge, and turned up 6in. in height against the internal surfaces of the outer spandril walls. Upon the completion of the asphalte covering, the seven inner spandril walls shall be built of the dimensions and in the positions shown on the drawings, with sound, hard and well burnt square stock bricks set in mortar composed of 2 of sharp Thames sand to 1 of Portland cement. The bricks are to be thoroughly soaked and to be properly bonded, so as to form the most perfect and strong work. Each spandril wall is to be capped with a course of Bradford landings 9in. thick, and bedded in mortar as last described, and so as to project equally over each side of the spandril walls. The whole width under the carriage and footways is then to be covered with a floor of Bradford landings, 9in. in thickness, bedded in mortar as above, and so laid that the longitudinal joints shall coincide with the centres of the spandril walls. The outer margins of this floor are to overlap the inner sides of the external spandril walls. Under the carriage way the space between the granite paving setts and this platform of Bradford landings shall be filled in with lias lime concrete, as shall also the space between the granite setts and the arch stones in the centre of the arches over which the spandril walls do not extend. In the space between the platform and the 3in. York stone paving of each of the two footways the contractor shall lay two water pipes as hereinafter specified, the space not occupied by the pipes being filled in compactly with sand, upon which the paving stones shall be bedded. Each of the spandril walls over the piers shall be pierced with an arch opening to give access across the bridge, and a shaft shall be carried up in the recesses of the bridge to the underside of the paving stones, to afford means of entrance by the removal of one of the stones.

River Wall.—The contractor shall construct on both sides of the bridge on the Surrey side, between points which are given on general plan, a river wall of Portland cement concrete mixed in the proportion of one measure of cement to six of Thames ballast, faced with granite and protected at the toe with sheet piling of American rock elm. The length which cannot be completed before the removal of the old bridge and the temporary aqueduct, is to be brought up to and returned round the flank and river end of the stairs, and to be continued to and bonded in with the abutment. The other length is to be bonded in with the abutment on its up-river side, and is to be carried into the existing towing path so as to make a water-tight joint. The granite facing is to be built with a batter as shown, and to correspond in every respect with that described for the abutment, and where the ground on the land side of the wall is below the level of the coping of the wall, the space is to be filled in and brought up to that level with such of the excavated or other material as the engineer shall approve. The top of the wall to be 14ft. above ordnance datum.

Watermains of Chelsea Waterworks Company.—The contractor shall provide and lay from Albert-row, Putney, along the High-street approach, across the new bridge and along the new bridge approach, on the Fulham side, to its termination in High-street, Fulham, at Church-row, two lines of water pipes each of 24in. internal diameter, and two lines, each of 12in. internal diameter. Of these, one line of 24in., and one line of 12in. pipe shall be laid under the western footway of the Putney High-street approach and across the bridge; and one line, of 24in., and one line of 12in. pipe under the eastern footway of the Putney High-street approach and across the bridge; and on the Fulham side of the bridge the pipes shall be continued in the same manner under the respective footways of the Fulham approach road, or under the carriage way of the same as may be directed. Connection is to be made with the existing mains at Albert-row, Putney, and at Church-row, Fulham, respectively, in such a manner as not to impede or interfere with the supply of water by the existing mains. The 24in. mains are to be of cast iron, to weigh 7 cwt. to the yard linear, and the 12in. also of cast iron, to weigh 3 cwt. to the yard, all to be socket pipes laid in 9ft. lengths, and the joints made entirely with lead run solid and properly caulked to make a perfectly water-tight joint. To make room under the footways over the bridge for the 24in. pipes, the arch stones of the bridge near the crown of the arch will have to be sunk to receive the body of the pipe, and further recessed to receive the sockets, as shown on page 292. The arch stones will have also to be sunk in a similar manner to receive the body, but not the sockets of a second 24in. pipe under each footway, as is also shown on Drawing No. 5—see page 292. On this and on Drawing No. 4 two 24in. pipes are shown under each footway, but only one of these under each footway is to be supplied and laid by the contractor, but those that are to be supplied by the contractor are to be laid in such a manner as to leave room under each footway for a second 24in. main which will hereafter be laid by the Chelsea Waterworks Company. All the pipes to be laid by the contractor shall be new and of the best description and pattern, and both the pipes and the method of laying and jointing, are to be subject to the approval of the engineer of the Chelsea Waterworks Company, and the contractor is to provide and fix such stop cocks, drain cocks, as the engineer to the company may require, and to his satisfaction. All the old mains, cocks, &c., which may be rendered useless and unnecessary in consequence of the laying of the new pipes, are to become the property of the contractor, and are to be removed by him. Any damage or loss sustained by the Chelsea Waterworks Company, in consequence of any interruption to their supply of water, or otherwise, arising from the works to be executed by the contractor, or through his default, shall be made good by him.

Bricks.—The bricks to be used under this contract, except where otherwise specially provided, are to be picked stock bricks, of the best and hardest quality, or such other bricks as the engineer may approve, and subject to such conditions as he may impose. No broken bricks or bats are to be brought upon the works. All bricks which may be rejected by the engineer are to be immediately removed from the works. All the bricks are to be thoroughly soaked with water before being used, and for this and other purposes the contractor shall lay on water without any extra charge.

Brickwork.—The works in brickwork are to be executed in the most workmanlike manner, each course flushed in, grouted, and finished solid, the courses laid truly parallel, or, where curved, then evenly and uniformly to the curvature of the works and centres in neat, close, and regular joints, kept straight, or regularly curved, as the case may be, and the joints struck neatly and flush with the face of the work. To be in rings or otherwise, old English or other bond, or herringbone courses, where and as may be directed, to break joint correctly with the bricks underneath, and, except where otherwise specified, to be set in Portland cement. In the sewers, the courses, and blocks, as the case may be, are to be evenly and uniformly to the curvature of the moulds and centres, in neat, close, and regular joints, which are not to exceed $\frac{1}{4}$in. in thickness on the face; the courses are to be kept straight or regularly curved, as the case may be, with the direction of the sewers, and parallel with the rise of the same; the joints are to be struck and cut neatly and flush with the face of the work, and the arches cleaned off and carefully stepped as the centre is moved forward for each length.

Inverts.—The inverts of the brick sewers with the exception of the inner ring, shall be built either in blocks of approved dimensions or otherwise, as the engineer may direct, and be composed of stock bricks, as before described, and Portland cement, to be used one of cement to one of sand, and neat when required by the engineer.

Centreing.—The contractor shall provide a sufficient length of centreing to admit of the centres remaining in till the work has set and the ground has been filled in over the arch. The centres, laggings, moulds, and leading frames shall be made as shall be directed, and renewed as often as the engineer may consider necessary. The laggings to be planed and kept smooth and true as long as they are used.

Stoneware Pipes.—The pipes, bends, junctions, and drain mouths shall be of the best stoneware, to be approved by the engineer, well burnt, glazed, circular, perfectly true in bore, and straight, with whole or half socket joints, as may be ordered, free from flaws, blisters, cracks, and other defects. All junction pipes shall be moulded with a proper curve. All the stoneware pipes shall be jointed with neat Portland cement.

Granite.—The granite to be used throughout this contract to be Aberdeen, Guernsey, Dalbeattie, or the best quality of Cornish; but the contractor may, upon permission of the engineer in writing, and subject to any conditions he may impose, and not otherwise, substitute such other granite as he may approve. All granite to be used in exposed faces to be of uniform colour, and free from stains, flaws, or other imperfections, and all to be sound and fully equal as to workmanship, labour, and finish, to the samples referred to or deposited at the office of the Board. The stones, except where otherwise specified, to be bedded and jointed in neat cement, and the joints struck with the same. In all parts of the works where not otherwise specified, the stones of all descriptions are to be worked to smooth surfaces on their exposed faces, and scabbled or squared to a surface in all other parts, and bedded and jointed as above described.

Stone, mode of working.—All the stone, other than granite, to be worked or tooled to smooth surface where exposed, and to square beds and joints, bedded and jointed as described.

Sand and ballast.—The sand for the various works and the ballast for the whole of the concrete are to be perfectly clean and sharp.

Lime.—The lime that may be required to be used in any part of the works shall be obtained from the lower or hardest beds of the blue lias formation, of quality equal to the best Aberthaw or Lyme Regis, brought in lumps fresh from the kiln.

Mortar.—The lime to be turned over and wetted from the rose of a watering-can, covered up with sand, and allowed to remain till cold; then sifted through a fine sieve; except where otherwise specified, about two and a-half of sand is then to be added to one of lime and made into mortar, which is to remain for at least twenty-four hours before being used.

Portland Cement.—The whole of the cement for these works, and herein referred to, is to be of Portland cement of the best quality, ground so fine that the residue on a sieve of 5800 meshes to the square inch—equal to about 76 per lineal inch—shall not exceed 15 per cent. by weight. When tested, should the proportion which will not pass through this sieve be greater, a quantity of cement proportionate to such excess must be added. When brought upon the works it is to be put into a dry shed or store, which the contractor is to provide for the purpose, having a wooden floor and all necessary sub-divisions.

Testing.—The cement is to be emptied out upon this floor, every ten tons being kept separate, and is not to be used until it has been tested by samples taken from different sacks. The cement is to be gauged with three times its weight of dry sand which has been passed through a sieve of 400, and been retained upon one of 900 meshes to the square inch. The cement and sand having been well mixed dry, about 10 per cent. their weight of water is to be added, and briquettes formed in moulds of 1in. sectional area at the weakest part. The briquettes, having in the meantime been kept in a damp atmosphere, are to be put into water twenty-four hours after they have been made, and remain in water until their tensile strength is tested by means of apparatus belonging to the Board, and by their officers. The cement, neat, must not at any season of the year set in less than one hour, and must bear without breaking a weight of 170 lb. per square inch twenty-eight days after the briquettes have been made. If it does not it will be rejected, and must be forthwith removed from the works. All cement mortar, except otherwise specified, shall be composed of one measure of cement to two of sand.

Concrete of Portland cement.—All cement concrete to be used throughout the works, except where otherwise specified, to be formed of one measure of Portland cement to eight measures of ballast. All lime concrete to be formed of one measure of lime to six measures of ballast.

Of lime.—The whole to be thoroughly mixed and put into the works as may be directed. The whole of the concrete filling shall be brought up in layers not exceeding 12in. in depth, and an additional layer is not to be filled in until the layer previously filled has been in three days at least, and, should the engineer deem it necessary, the surface of the lower layer shall be thoroughly cleansed and also picked or otherwise roughened and grouted over with thin grouting before the next layer is placed upon it.

Excavation.—The ground shall be opened to the necessary width and depth for constructing the works, in such lengths at one time as the engineer may direct, and the sides of the excavation shall be supported by suitable timber, and shall be close-timbered wherever the engineer may consider necessary, until the whole of the work is completed in each length.

Pumping, &c.—The whole of the works, other than the necessary tide work, shall be thoroughly drained and kept drained as long as may be required, by pumps, steam or other engines, pipes, sumps, and every other appliance necessary for the purpose. All offensive matters shall be removed as soon as they are taken out of the works, and with such precautions as may be directed. All irregular and vacant spaces shall without extra charge be filled in with clay or gravel, or firmly rammed in with concrete, or with cement run in, as the necessities of the case may require, or the authorised officers may direct. The filling-in materials are to be carefully placed in and around the various works, in thin layers, well punned with iron punners. At the back of the works forming the river and retaining walls, and at the backs, sides, fronts, and ends of all like works and of all chambers, erections, and works whatsoever, the ground is to be very carefully filled in, and well punned in thin layers, as above, for widths, respectively, of 20ft. at the base, and 5ft. at the highest part thereof, before any other works of filling and punning are executed.

Ironwork.—The castings to be of the best quality of soft grey iron, clean and sound, free from porous places, sand, and air holes. All iron sent with plugging or stopping in any part will be rejected, and at once taken away. All wrought iron shall be tough, fibrous, and possess an elastic limit of not less than 26,000 lb. per square inch, and an ultimate strength of not less than 50,000 lb. per square inch. All rivet holes must be so accurately punched or drilled that when the several parts are put together a rivet $\frac{1}{16}$in. diameter less than the hole can be entered hot into any hole without reaming or straining the iron with drifts. The rivets when driven shall completely fill the holes. Abutting joints in all compression members shall be in exact contact throughout. All workmanship shall be first-class in every particular. All ironwork shall at the shop be payed over with a thorough coating of pure boiled linseed oil applied hot, and after its delivery upon the works, inspection and approval by the engineer, it shall receive three coats of the best quality of iron oxide paint. Any ironwork painted before its inspection by the engineer shall be rejected.

Provisions, £20,000.—The contractor to include in tender—in addition to all other things specified therein—and to provide the sum of £20,000 to be expended or used, either wholly or in part, or not to be used, at the discretion of the engineer, and entirely as he may decide and direct; but if no part, or only parts thereof are used, then the whole, or the parts not used, shall be deducted from the amount of the contract; and in like manner any increase thereof shall be added to the said amount, and such works shall be deducted from or added to the amount of the contract, in accordance with the terms specified in Clause 5° for regulating such diminished or extra works, or otherwise, as herein provided.

TWELVE-WHEELED LOCOMOTIVE FOR THE CENTRAL PACIFIC RAILROAD.

The engraving which we publish this week on page 354 illustrates the largest and heaviest locomotive in use in the United States. It was built in the shops of the Central Pacific Railroad at Sacramento, Cal., from the designs of Mr. A. J. Stevens, locomotive superintendent. This engine is at work on a grade of 116ft. per mile with 10-deg. curves, one right after the other, as closely as they can be laid. The engine has hauled up this grade, twenty-five miles in length, a train of fourteen freight cars loaded with 20 tons—of 2000 lb.—to the car. This would be a total load of about 210 tons, not including the weight of engine and tender. This, according to Mr. Stevens, would be a heavy load for two of his largest ten-wheeled engines with 18in. by 24in. cylinders, and weighing 40 tons.

The engine has a reversing gear operated by water taken from the boiler. This gear can be used or not, at the option of the engineer. The engine also has a brake on the driving wheels, which is operated by steam.

The following are the principal dimensions of the engine and tender—kind of fuel used, bituminous coal:—

Weight and General Dimensions.

Gauge of road ... 4ft. $8\frac{1}{2}$in.
Total weight of locomotive in working order, including two men ... 123,000 lb.
Total weight on driving wheels ... 106,050 lb.
Total wheel base ... 24ft. $11\frac{1}{2}$in.
Distance between centre of front and back driving wheels ... 15ft. 9in.
Distance from centre of main driving wheels to centre of cylinders ... 16ft. $9\frac{1}{4}$in.
Length of main connecting-rod from centre to centre of journals ... 11ft. 9in.
Transverse distance from the centre of one cylinder to the centre of the other ... 6ft. $11\frac{1}{2}$in.

Cylinders, valves, &c.

Diameter of cylinders and stroke of piston ... 19in. × 30in.
Horizontal thickness of piston over piston head and follower plate ... 6in.
Kind of piston packing ... Cast iron snap ring.
Diameter of piston-rod ... 3in.
Size of steam ports ... $1\frac{1}{8}$in × 14in.
Size of exhaust ports ... $2\frac{7}{8}$in. × 14in.
Greatest travel of main slide-valves ... 4in.
Greatest travel of cut-off valve ... $3\frac{11}{16}$in.
Outside lap of slide-valves ... $\frac{7}{8}$in.
Inside lap of slide-valves ... $\frac{3}{16}$in.
Lead of slide-valves in full stroke ... $\frac{3}{32}$in.
Throw of upper end of reverse lever from full gear forward to full gear backward, measured on the chord of the arc of its throw ... 4ft. $6\frac{1}{2}$in.
Sectional area of opening in each steam pipe connected with cylinders ... $23\frac{3}{4}$ sq. in.

Wheels, &c.

Diameter of driving wheels, outside of tires ... 54in.
Diameter of truck wheels ... 26in.
Distance between centres of truck wheels ... $68\frac{1}{2}$in.
Size of driving axle journal, diameter and length (steel axles) ... 8in. × $7\frac{1}{4}$in.
Size of truck axle journals, diameter and length ... $4\frac{1}{2}$in. × 8in.
Size of main crank-pin journals, diameter and length ... $4\frac{1}{2}$in. × 4in.
Size of coupling-rod journals, diameter and length ... $3\frac{1}{4}$in. × 3in.
Size of coupling-rod journals on main pin ... $5\frac{1}{2}$in. × $3\frac{1}{8}$in.
Length of driving springs, measured from centre to centre of hangers ... 2ft. 9in.

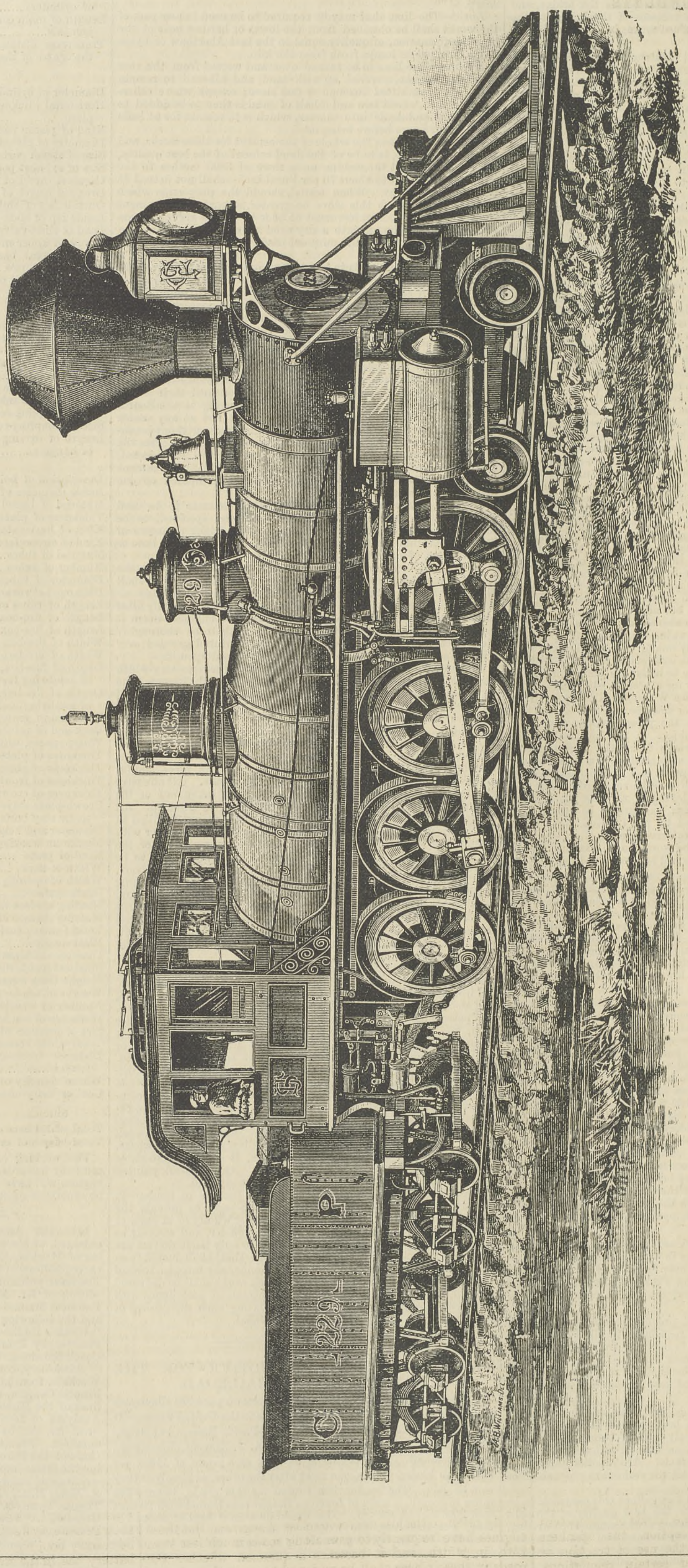
Boiler.

Description of boiler ... Wagon-top.
Inside diameter of smallest boiler ring ... 54in.
Material of barrel of boiler ... Otis steel throughout.
Thickness of plates in barrel of boiler ... $\frac{7}{16}$in.
Kind of horizontal seams, lap seams, inside welt, triple rivetted.
Kind of circumferential seams ... Lap seam, double rivetted
Material of tubes ... Iron No. 10 wire gauge.
Number of tubes ... 166
Diameter of tubes outside ... $2\frac{1}{4}$in.
Distance between centres of tubes ... $2\frac{15}{16}$in.
Length of tubes over tube-plates ... 12ft.
Length of fire-box at grate ... 9ft.
Length of fire-box at tube sheet ... 13ft. $4\frac{3}{4}$in.
Width of fire-box at top ... 4ft. $2\frac{3}{8}$in.
Width of fire-box at grate ... 2ft. 10in.
Depth of fire-box, under side of crown sheet to bottom of mud-ring forward end ... 4ft. $10\frac{1}{2}$in.
Depth of fire-box, under side of crown sheet to bottom of mud-ring back end ... 3ft. $3\frac{1}{2}$in.
Back end of crown sheet drops ... 9in.
Back end of mud-ring rises ... 10in.
Water spaces, sides, back and front of fire-box ... $3\frac{1}{4}$in., $3\frac{1}{4}$in., $3\frac{1}{4}$in.
Thickness of plates of outside shell of fire-box ... $\frac{7}{16}$in.
Thickness of plates in sides, back end ... $\frac{5}{16}$in. $\frac{5}{16}$in
Thickness of front and back tube plates ... $\frac{1}{2}$in. $\frac{1}{2}$in.
Thickness of crown sheet ... $\frac{3}{8}$in.
Crown-plate stayed with suspended girders in front and screw stay bolts at the back end.
Diameter and height of dome ... 26in. by 39in.
Maximum working steam pressure per square inch ... 135 lb.
Kind of grate ... Rocking finger grate.
Width of bars ... $\frac{15}{16}$in.
Width of opening between bars ... $\frac{19}{32}$in.
Grate surface ... 25·74 sq. ft.
Heating surface in fire-box ... 181·86 sq. ft.
Heating surface of the inside of tubes ... 1076·33 sq. ft.
Total heating surface ... 1258·19 sq. ft.
Blast nozzle ... double
Diameter of blast nozzle ... 4in.
Smallest inside diameter of chimney ... 20in.
Height from top of rails to top of chimney ... 15ft. $6\frac{1}{2}$in.
Weight of tender in working order ... 63,000 lb.
Number of wheels under tender ... 8
Diameter of tender wheels ... 30in.
Size of journals of tender axles, diameter and length ... $3\frac{3}{4}$in. by 7in.
Total wheel-base of tender ... 15ft. $\frac{3}{4}$in.
Distance from centre to centre of truck wheels of tender ... 3ft. $8\frac{3}{4}$in.
Water capacity of tank (in gallons of 231 cubic inches) ... 3000 galls.
Coal capacity of tender or fuel bin ... 12,000 lb.

Engine and Tender.

Total wheel base of engine and tender ... 53ft. $1\frac{3}{4}$in.
Total length of engine and tender over all ... 64ft.

The working of this engine has been so satisfactory that the company has ordered twenty-five more of the same kind. The new engines will have 20in. by 30in. cylinders, we understand, but will be otherwise substantially the same as the one here described.



TWELVE-WHEELED LOCOMOTIVE—CENTRAL PACIFIC RAILWAY.

CONSTRUCTED AT THE WORKS OF THE CENTRAL PACIFIC RAILWAY, SACRAMENTO, FROM THE DESIGNS OF MR. A. J. STEVENS.

(*For description see page 353.*)

FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

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

Enquirer.—*At the works of Messrs. Bolckow, Vaughan, and Co., Middlesbrough, amongst others.*

J. A. J.—*The velocity of the current is to be added to the steam speed of the ship. Therefore the answer to your question is "Yes."*

G. W. W. (Nottingham).—*There is no special treatise on syphons. You will find all that can be said about them in every elementary treatise on hydraulics.*

H.—*To calculate the tensile strength of steel from its transverse strength is a difficult operation, giving anything but trustworthy results. Practically, such calculations are useless.*

Trudder.—*A coating* 1in. *thick, of Portland cement and clean, sharp, fine sand, one-half of each by measure, will render your house perfectly waterproof. The cement should not be put on at this time of year, as a hard frost before it is quite dry will peel it off. May is the best month in the year to put it on. It is best applied in wet weather. Care should be taken to rake out the joints in the brickwork before applying the cement, and the wall should be kept thoroughly wet while the cement is being put on. In England the price of such work, including the use of scaffolding, ranges between* 2s. 6d. *and* 3s. *per square yard, according to the amount of ornament put round windows. Oil or paint is entirely unnecessary, unless the coating of cement is less than* ½in. *thick, which it should not be. Cement surfaces will absorb oil or paint.*

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MEETING NEXT WEEK.

Chemical Society.—Thursday, Nov. 16th, at 8 p.m.: Ballot for the election of Fellows. Papers to be read: (1) "Contributions to the Chemistry of Tartaric and Citric Acids," by the late Mr. B. J. Grosjean. (2) Contributions from the Jodrell Laboratory, Kew: "Constitution of Lignin and Bastose," by Messrs. C. F. Cross and E. J. Bevan. "Contributions to the Chemistry of Plant Fibre," by Messrs. C. F. Cross, E. J. Bevan, and S. S. Webster. "Action of Nitric Acid on Cellulose," by Messrs. C. F. Cross and E. J. Bevan. (3) "On the Constitution of some Bromine Derivatives of Naphthalene," by Mr. R. Meldola.

THE ENGINEER.

NOVEMBER 10, 1882.

TRACTION ENGINES.

On Friday last the President of the Local Government Board, the Right Hon. J. G. Dodson, received a very large and influential deputation on the use of steam on common roads. The deputation was introduced by the Duke of Buckingham, who, with Mr. C. Stuart Wortley, M.P., were the chief speakers. A great deal that was not favourable to the employment of traction engines was said; but it must be admitted that few deputations on such a subject have been so temperate both in objection and demand as was that of Friday, judging by the speeches of those who were its chief leaders. The deputation represented large manufacturing towns, small towns, and country districts, and whatever there may be in the memorial presented, there was certainly very little in the speeches of the narrow-spirited wholesale denunciation of traction engines which in previous years has marked the discussion of this subject. The facts chiefly urged were these—namely, that common roads cost a great deal more to maintain where steam traction is employed than where horse traction is used; that traction engine traffic is a source of very considerable danger to the public, and that traction engines are not placed in the hands of competent certified drivers. With one exception the speakers expressed themselves in favour of the use of traction or agricultural traction engines under certain regulations, and remarked that they would not wish for a measure that would place undue restrictions on their use, while the Duke of Buckingham said he believed the use of steam might be beneficially extended both on roads and for agricultural purposes.

The complaints of those who object to traction engines having now become temperate, it behoves those who are distinctly partial to the use of this mode of haulage to consider their objections. It need hardly be said that we have always supported the use of steam on common roads, and shall continue to do so while its possible advantages are as great as they are now. At the same time we must not shut our eyes to the fact that steam is not at present employed on common roads under the best circumstances or on the best possible conditions. Let us then examine the objections of the memorialists to the Local Government Board. Firstly, is the allegation of the increased cost of maintenance of ordinary roads. It is without doubt a fact that many roads which have been satisfactory, and have not cost a great deal for repairs, have become very costly after the appearance of the traction engine. In some cases this may be chiefly because the engine has come on to the scene with the introduction of a trade new to the locality; but increased cost in the maintenance of roads has been observed in many cases where the steam engine has been simply substituted for horses. This being the case, it is certainly not sufficient to say that the roads must be better made; the traction engine must rather be made to suit the roads, for in these cases it is not the general public that gains by the employment of steam, but only perhaps a single firm of brewers or manure manufacturers. It may reasonably be demanded that the road bridges in any district should be made of sufficient strength to carry a heavy traction or steam ploughing engine, for a pair of these engines may serve a number of farms in a district, and not necessarily affect roads by continually traversing the same one. In this case the damage to roads is not noticeable, as, though the load is heavy, it moves very slowly, and the wheels are of great width. On behalf of the traction engine, it is urged that though the weight is great, the width of wheel decreases the load per unit of width of wheel, and thereby the damage done to the roads. Experience does not, however, wholly support this conclusion, for it does seem that a given quantity of material may be moved between two places with less damage to a common road—not the best that can be made—by a number of vans, such as those used by Pickford and Co., than by traction engines; and even on roads that would for ordinary traffic be considered well made it seems that the much greater weight of the traction engine is often sufficient, especially after bad weather, to break, not only the surface of the road, but to shatter the whole road structure. The increase in the width of the wheels is thus not sufficient to overcome the difficulty, and the question comes, What is the reason that narrow-wheeled vans will do a given amount of goods transport with less damage even to the road surface than the wide-wheeled traction engine? and we believe that the answer is that the van is usually fitted with springs, while the heavy traction engine is springless. Engines have been made with springs, and they have been found to do much less damage to the roads than those without, and the only reason why springed traction engines are not built is that they cost considerably more than the ordinary engines, and buyers look at this cost. If, however, it can be shown that traction engines are necessary to the economical conduct of trades, then the cost of fitting engines with springs is one that must be incurred, for it certainly can be shown that if all these engines were fitted with effectively elastic wheels, or good long springs, the damage done by them to common roads would be enormously reduced, and might not be more than that done by ordinary traffic. The permanent way of our great railways is generally strong, well laid, and well maintained, but there is not a mile of line in this country that would stand a week's traffic with springless locomotives. While referring to this part of the question, it is noticeable that the Duke of Buckingham urged that the use of diagonal cross bars on the engine wheels did great damage to the roads and caused heavy and needless expense. The Highways and Locomotives Amendment Act, 1878, Part II., paragraph 28, has the following:—"The driving wheels of a locomotive shall be cylindrical and smooth-soled, or shod with diagonal cross bars of not less than three inches in width nor more than three-quarters of an inch in thickness, extending the full breadth of the tire, and the space intervening between each such cross bar shall not exceed three inches." Traction engine makers are thus acting under compulsion in fitting these diagonal cross bars, and if they really do the harm alleged, then this part of the law should be modified, for builders would as readily affix bars transversely as diagonally.

One of the points urged against traction engines with respect to the danger to ordinary traffic was the width of the engines, which under the Act of 1865 is limited to 9ft. instead of 7ft., as required by the Act of 1861. The law only requires that roads leading to market towns shall have a width of 20ft.; and even on these it is alleged that the 9ft. width of engine is the cause of much danger that would not exist if the 7ft. width had been retained. The extra 2ft., no doubt, makes a good deal of difference, and except for steam ploughing engines 9ft. width is not necessary. With the system of steam ploughing as originally devised and successfully worked, with a portable engine and disc anchor and windlass, by Fowler and Worby, and as still employed in a modified form by two or three makers, these heavy, wide engines were not necessary; but as steam ploughing is chiefly done by those who make it a special business, and not by farmers themselves, the double special engine set offers some advantages over the light general-purpose engine system. The ordinary and more numerous agricultural locomotive and traction engine is not however, made of this width, and so the objection chiefly refers to the less numerous class of engines. But these engines have frequently to pass along roads much less than 20ft. in width, and it becomes a question whether the roads in these places shall be widened to meet the requirements of steam ploughing engine, or the passage of the engines restricted even more than now as to the hours during which they shall pass along the roads. Working these engines at night only is dangerous work for all employed with them, while at daytime it is often equally dangerous for ordinary traffic; and to avoid making it necessary for the driver of a horse to retrace a considerable distance, it would in these districts with very narrow roads often be necessary to make the man bearing the red flag precede the engine by perhaps a mile instead of a hundred yards or so; but if steam plough engines are necessary this matter could be settled by regulations suiting the immediate district. With respect to the third allegation of the memorialists, it is almost unnecessary to add our previously expressed views on the culpable heedlessness with which traction engine owners employ men not in the least competent to assume the charge of an engine which requires almost as much care in its working—and in some cases more—than a railway locomotive. The Maidstone accident, among others, showed what incompetency and recklessness is exhibited by the ignorant men often placed in charge of these engines for the sake of a shilling or two saving per day; and nothing short of compulsory qualification, and the grant of certificates to competent men, can overcome this great objection to steam on common roads.

SECONDARY BATTERIES AND THE PUBLIC.

A considerable period has elapsed since Sir William Thomson startled the scientific world with the announcement that he had carried a small box with him from Paris to Scotland, in which were stored up more than a million foot-pounds of energy. What Sir William said was quickly snatched up by a section of the public, and it was stated, on the large scale of statement, that it was possible to store up great quantities of electricity in deal boxes. We believe that this was the first journal in which it was explained that no electricity at all is stored up in a secondary battery; and that the lesson was taken to heart in certain quarters there seems to be no doubt. The whole theory of the secondary, or storage battery, is being so fully set forth in our pages, by one of the greatest authorities on the subject, Professor Oliver Lodge, that we need say nothing about it here; but it is, we think, highly desirable, for reasons which will no doubt be understood by our readers if they follow us a little further, that we should set forth here what the Faure battery is. It was discovered long ago that if two plates of any metal, say copper, are immersed in acidulated water, and if a current of electricity be passed through the cell, a change takes place in the relations of the parts to each other, and a galvanometer placed in a circuit connecting the two plates will be powerfully deflected, the plates acting for a short period much as though they were of different metals, such as copper and zinc, instead of both being copper or both being zinc. This action seems to be due to the formation of a coat of bubbles of hydrogen on one plate and of oxygen on the other. These gases act toward each other like two metals, a current of electricity passing from the hydrogen to the oxygen. We have here in a small way a storage battery. In 1859 M. Planté, of Paris, made a storage battery with lead plates on this principle. The oxygen formed attacks the lead and converts it into peroxide. When the battery comes to be "let down," that is to say to give out work, the peroxide becomes effectually deoxidised, and a powerful current of electricity is set up. But the only storage which takes place, if any storage at all occurs, is one of chemical energy, for there is no more electricity in the peroxide than there was in the metal. M. Faure improved upon Planté by coating his plates with red lead to begin with; but FitzGerald had suggested the use of red lead for secondary batteries, and published the suggestion in the *Electrician* as far back as the 20th of March, 1863, as shown by the following extract from its pages:—"The great power of the secondary combinations we have referred to is due to the presence of peroxide of lead in contact with the negative element in these combinations. This substance, as was pointed out by M. De la Rive, surpasses even nitric acid in its affinity for hydrogen, and for this reason a couple constructed with a negative element of platinum surrounded by a mixture of dilute sulphuric acid and the peroxide of lead, and with a positive element of amalgamated zinc in dilute sulphuric acid, is more powerful even than the couple of Grove; and when lead instead of platinum is used for the negative element, the power of the couple is but little diminished." A further elucidation of this statement will be found in The Engineer for March 10th, 1882, page 171. Thus, so far as the principle is concerned, M. Faure did not give the world a new thing, nor had he made any discovery. It so happens that it is by no means easy to ascertain precisely what process of manufacture is now adopted by the company holding the Faure patents, but it appears that two sheets of very thin lead, one 16in. and the other 20in. long, both being 6in. wide, are employed in the formation of a cell. These plates are first thickly painted with red lead mixed up to a thin paste with water; a sheet of parchmentised paper is then laid on the red lead. The next step is to cover each prepared plate with felt. The short sheet is now put on the long one, and the two are rolled up together, small slips of india-rubber being used to keep the surfaces fairly apart. The roll is then put into a leaden vessel or cell, and wires are attached to the cell and the roll. The former is then filled with water containing 10 per cent. of sulphuric acid, and the whole is ready for charging. Such, then, is the Faure battery; nothing can apparently be more simple or easy to make.

We need hardly remind our readers that companies were floated to construct and sell accumulator batteries within a short time after the publication of Sir W. Thomson's letter. Furthermore several accumulators have been made. In the early part of the present year the Sellon-Volkmar battery was employed to light the Alhambra Court at the Crystal Palace. They have been used also in the City, and the public at large believe that they are articles of commerce which can be readily bought. The truth is, however, that the Faure battery has, in the strictest sense of the word, no commercial existence. It is true that uncharged Faure batteries can be bought, the buyer taking the risk of charging on himself, but this is not quite what is wanted. It is as though a gas company sold coals and retorts, and let the consumer make his own gas. A great many experiments have, however, been made with it, because it is very easy for any-one who is at all used to laboratory work to make a cell, or half a dozen cells, in the way we have just described; and these cells can then be charged either with a dynamo or by the aid of an ordinary galvanic battery of reasonable electro-motive force. All these experiments have taught so far the same lesson, namely, that the battery is not trustworthy, save in the most experienced hands, and that even when used with great care it is liable to go to pieces and to prove worthless just when most wanted. If the company has really got a trustworthy battery which it can sell, and which may be depended upon to last a long time, its experience must be entirely different from that of all the scientific men who have tried to reduce the scheme to a commercial basis, and we have no hesitation in expressing our belief that there are not half a dozen Faure batteries in existence which could be sent out to do a couple of nights lighting with certainty. A battery might do the work or it might not. It is proper to add that many demands have been made on the company for charged batteries. To all such applications a deaf ear is turned. But in the money article of the *Times* of Tuesday appears a paragraph to the following effect:—"Elsewhere will be found the report of a meeting of the Faure Electric Accumulator Company, at which a resolution was adopted forcing on the directors the policy of forming sub-companies with rights to use the parent company's patents. The advocates of this mode of working are M. Philippart and his friends, and its wisdom entirely depends on the extent to which the Faure apparatus is not merely the best of its kind, but the best that is likely to be invented for some time to come. Considering the extraordinary rapid progress that has lately been made in the practical application of electricity, it appears to us to be unsafe to assume that no improvements on the Faure battery are possible. That battery has undoubtedly proved itself capable of doing a good deal that its inventors alleged it could do, but he would be a bold man who would affirm that science has said its last word on the subject of secondary batteries."

Our contemporary's warning is well timed, and those who propose to invest money in shares of the sub-companies will do well to ascertain very clearly what it is they are purchasing. Ostensibly the thing sold is the sole right to manufacture, for a given district, a very valuable apparatus, which may be used with success to furnish light and power to the public. There can be no question that Faure batteries have been made which could be employed to light buildings and drive small machinery; but those who undertake to make a profit out of the sale or hire of such batteries will very soon learn that laboratory experiments are very different things indeed from manufacturing for the public. A battery which will satisfy the necessary conditions must be moderate in price, and must be tolerably durable. Any company proposing to deal in Faure batteries must be prepared to sell them for use at a distance, and also to supply them charged, on hire, to consumers of electricity. If the purchaser buys £100 worth of batteries, and finds that in less than one month they have become entirely useless, he will be likely to express his opinion of the sellers in a very decided fashion. If a company invest five or six thousand pounds in the construction of batteries which go to pieces in use, the company will have lost a good deal of money; and, finally, if charged batteries are supplied to customers who find themselves left in darkness when they most want light, the result will again be extremely unsatisfactory to the company. Now, our contention is that there is not at this moment any secondary battery in existence the success of which is so assured that the inventor would be justified in asking the public at large to invest in it. There are, however, several batteries which are so far full of promise that men who understand perfectly the nature of the risks they run are justified in finding funds to be expended in further research. The time has not yet come for the general public to touch secondary batteries. That such batteries have successfully accomplished comparatively great things is admitted on all hands; but it is simply impossible to form the least idea at what cost. For example, the expense incurred in lighting up the Alhambra Court at the Crystal Palace last year was no doubt enormously out of proportion to the result obtained. As a scientific experiment, the thing was of world-wide importance; but to fancy that it went to prove that the manufacture of secondary batteries must be a successful speculation is utterly absurd. There are weak points in all secondary batteries yet made, and in this country, France, Germany, and America dozens of able men are struggling to overcome what now appear to be fatal objections to their extended use. That their efforts will be successful it is, perhaps, safe to predict; but just now cells crack, and sometimes from causes entirely obscure, after a battery has been a short time in use; excessive leakage takes place, and in certain cases has proved uncontrollable; the anode plates disintegrate and fall to pieces; the insulation cannot be preserved, and so on. Indeed, it will be readily understood that inasmuch as lead oxide is alternately being converted into a species of metallic sponge, and re-converted into an oxide. which is the reverse of coherent, while violent chemical and electrical action is constantly going on, as well while the battery is being charged as while it is being let down, little can be more difficult to ensure than the permanence of the structure. Of these matters, however, the public is, of course, in total ignorance; and we only discharge our duty when we warn would-be speculators in any form of secondary battery to think twice before they invest. It is beyond our province to deal with the motives of promoters of companies; but it is not beyond our province to explain to our readers what is the nature of an invention which one company proposes to sell to others; and we repeat here that neither the Faure battery nor any other storage battery has as yet passed out of the earliest experimental stage—nothing at all like complete success has yet been achieved. The anticipations of Sir William Thomson have not been as yet fulfilled. As we have explained, the red lead and metallic lead storage battery is at least nineteen years old, and it is doubtful if, at this moment, more has really been accomplished, save in degree, than was effected years ago. Bigger batteries and more of them have been made than Mr. FitzGerald experimented with; but the modern secondary battery is not the more fit to be put into the market. When we have said that the idea of the storage battery is full of promise, and that numerous able and enthusiastic men are hard at work to reduce the idea to a practical form, we have said all that can be said in favour of it. That success will ultimately attend their labours we have little doubt, but repeating, in other words, the judicious warning of the *Times*, we ask what possible chance can a comparatively crude invention like that of M. Faure have of holding its own in such a competition of storage batteries as that which is likely enough to take place? M. Philippart and his friends are in any case bound to demonstrate the success of the Faure battery before they take another step. They must not be surprised if they find their own sanguine estimates of the value of the invention largely discounted by competent scientific authorities, and the wisest policy they could pursue is to adduce proof, if they can, that they have really got something to sell which is worth a good deal now, and will continue to retain its value even in the face of keen competition.

AMERICAN LOCOMOTIVES.

American locomotive practice differs very widely from that of Great Britain. It has been contended that because the railway system of the United States is immensely larger in extent than that of Great Britain, that American engineers must know best what a locomotive ought to be. The argument is specious, and not entirely unjustifiable; and it is worth while to say a little concerning it. The subject admits of being discussed at great length, because it can be divided into several distinct or comparatively distinct branches. Thus, for example, the American boiler is different from ours, so are the frames, the wheels—indeed, almost every part of a locomotive; but it is not to matters of detail that we would direct attention so much as to the larger question of system. As regards passenger traffic, we find that all the first-class lines are by degrees assimilating their practice more or less to that of Great Britain. In other words, long distances are now travelled without a stop and at high velocities; but this has only become possible because the roads have been improved, so that very little difference exists between most of the lines near New York, at all events, and the best type of English permanent way. It used to be boasted that the flexible American locomotive could travel at high velocities on roads which an English engine dare not attempt. It does not appear that any facts exist to prove the proposition; whether they do or do not, it is at least certain that until permanent way was made as good as that usually found now on main lines in England, no such average velocity as forty-five miles an hour was attained on any American railway.

If, leaving passenger traffic, we turn to that in minerals and goods, we find that the difference which has always existed between English and American locomotive practice is widening and extending rather than contracting. In this country the standard goods engine is carried entirely on six-coupled driving wheels, usually about 4ft. 6in. diameter, seldom, if ever, less than 4ft. or more than 5ft. The cylinders are 17in. or 18in. diameter, inside, inclined, and the piston stroke is 24in. The weight of such engines in working order varies between 30 and 35 tons; the heating surface between 900 and 1100 square feet, according to design. Locomotives of this type have no existence in the United States, and the recent tendency shown is to make machines much larger and more powerful than the English engine. As an example, we may cite the twelve-wheeled locomotive for the Central Pacific Railroad which we illustrate this week. It is, according to our contemporary the *Railroad Gazette*, the largest and heaviest engine in the United States. It weighs in working order very nearly 55 tons, of which over 47 tons are carried on eight driving wheels, all coupled, and 4ft. 6in. diameter. The cylinders are outside, 19in. diameter and 30in. stroke. By Pambour's formula, the tractive power of this locomotive is 200 lb. nearly for each 1 lb. average cylinder pressure, and taking this last at 90 lb., which it may well be at slow speed, we have a tractive effort of 18,000 lb., or over 8 tons. The engine works on an incline of about 1 in 45, twenty-five miles long, and on this it hauls a load of 210 tons. The tender weighs 38 tons, so that the total load moved is, when the tender is not quite full, 300 tons in round numbers. The resistance due to gravity is $\frac{1}{45}$th of this, or in round numbers 15,000 lb., leaving 3000 lb. of tractive effort to overcome the resistance of friction, &c., or 30 lb. per ton, which is probably nearly twice as much as is needed. Such an engine would be entirely out of place in this country, because we have no incline twenty-five miles long rising 1 in 45 over which to work coal trains; but it is open to question whether, if we had, we should follow the American system. It is almost certain that the English locomotive superintendent would work his traffic with a six-coupled engine of the normal type, but with cylinders 18in. by 24in. and 4ft. wheels. The tractive effort of such a machine would be 162 lb. per 1 lb. average cylinder pressure, and taking this as 90 lb., as before, we have 14,580 lb., which would be competent to move a gross load of about 230 tons up an incline of 1 in 45. Thus two English engines would do much more work than the American engine, their total being 460 tons moved against 300 tons for the American engine. As to the working expenses we can pronounce no opinion, as we know nothing concerning those of the twelve-wheel engine, save that it is stated to be more satisfactory in its performance than two American ten-wheeled engines, each weighing 40 tons and fitted with cylinders 18in. by 24in. The dead weight of the two English engines and tenders would be about 120 tons, against 93 tons for the American engine, but the proportion borne by his engines and tenders to the loads hauled is in favour of the English engines, being as 120 is to 340 for these last, and as 93 is to 207 for the American engine. The net loads are as 2·83 to 1, and 2·22 to 1, and so far the advantage seems to lie with the English system, besides which the traffic could no doubt be worked more safely with two engines, one pushing and the other hauling, than with a single engine pulling. The big engine has, however, given so much satisfaction that twenty-five more of them have been ordered, with cylinders 1in. larger in diameter, from which we gather that the boiler of the existing engine supplies more steam than it can use up to advantage. The American engine is fitted with special cut-off slides on the backs of the main slides, and worked each by a separate excentric, so that the engine has six excentrics instead of four. We cannot regard this as a step in the right direction, although Mr. Stevens, the locomotive superintendent of the line, maintains that he is "satisfied that it is the gearing for a freight engine." He gives no reason for the faith that is in him, and considering how great is the wear and tear on the valve gear of locomotives, and how admirable a diagram can be got either with the Allan straight link or Joy's gear, we have no doubt that all English engineers will condemn this innovation.

There are two causes which operate powerfully in the United States to settle the type of goods engine which shall be employed. One is the fuel used; the other the practice of moving very large trains at slow speeds. The coal used in by far the larger number of goods engines in the United States is either anthracite or a bituminous coal of comparatively inferior quality; in either case large grates are necessary. The tubes employed are commonly larger and wider spaced than with us, and so they must be longer to avoid waste of fuel. These things modify considerably the form of the boiler and its dimensions, especially as regards length. The practice of hauling huge trains at slow speeds is found to be extremely economical. Indeed, if it were not it would be impossible to carry grain and other produce at the extremely low rates charged. In this country the slow speed could not be tolerated on our crowded lines. Thus it will be seen that both the English and the American locomotive superintendent have their designs to some extent dictated to them, and neither has a right to say, so far, that his fellow is wrong.

IRON CURTAINS IN THEATRES.

An exhaustive article which has appeared in the *Kölnische Zeitung* gives expression to the views on the general question of theatrical mechanism and public safety held by Herr Fritz Brandt, mechanical director of Wagner's Bayreuth Theatre. He attacks the arrangements of the "Asphaleia" Theatre at Vienna as being the work of an engineer with a special knowledge of hydraulic machinery, but devoid of much acquaintance with theatrical requirements. He argues that the most simple mechanism is *per se* the most suited for use in a theatre, and considers the hydraulic apparatus quite as objectionable as steam appliances were found to be when an attempt was made to move stage machinery by that means. He states that it is quite feasible to construct both the fixed and movable machinery for the most part of iron, thus possibly lessening danger, but he maintains that the system now in favour of iron curtains and other costly appliances for affording protection from fire is radically inefficient. Taking into account the difficulty of arriving at an effective impregnation of scenery, property, and decorations with fire-resisting substances, and also considering the fact that buildings supposed by their mode of construction to be fireproof, have failed to stand the test, he takes up the position that the danger of fire is inherent to theatrical representations, and that the safety of the public is best consulted by the staff of the theatre being properly drilled in the necessary measures to be observed in the event of fire breaking out, adducing various facts in support of this theory. Herr Brandt condemns all self-acting fire-alarms and valve-openers—which often fail to work at the critical moment—and particularly attacks iron curtains, which he says involve an expenditure varying from £1500 to £2000, or more, in each case. He remarks that the object of these appliances is to prevent the draught in case of fire, and to hide a conflagration on the stage from the eyes of the public. He suggests that an asbestos curtain, or a linen one properly impregnated, would answer as well if guided from the side. He adds that if half the money which is being spent on iron curtains were devoted to securing an intelligent and specially-trained staff, there would be a distinct gain so far as the public safety is concerned. Although published some days after the fall of the iron curtain at the Berlin Opera-house, Herr Brandt's article was no doubt written before it occurred, and he is therefore entitled to claim it as to some extent confirming the general sense of his remarks, as well as illustrating the losses which such accidents cause theatrical managers to suffer from the enforced suspension of dramatic representations during the period of repair. According to an official report the curtain was not ready at the contract time, and the opening of the Opera-house for the current season had to be delayed a fortnight in consequence. Thus the curtain would only have been in actual use for about five weeks, and during that time it seems to have required constant putting to rights. On the 5th October, when the daily police inspection of the working of the curtain took place it could not be freely let down nor drawn up, and when the workmen of the firm who erected it proceeded to examine into the cause of the circumstance, the curtain glided down and could not be raised at all. According to a statement in the *Post* the damage done was not confined to the fracture of the lines which supported the curtain, but lumps of plaster and pieces of broken iron were scattered around. The fall of the heavy driving wheel seems to have caused the damage and to have torn the wire ropes. It is remarked that had the accident happened when the curtain was being drawn up for the performance to begin, the actors on the stage would have been in serious danger, and on account of the grouping which takes place in the opening scene of the opera which was to have taken place on the evening in question, some of them must have received fatal injuries. There are some discrepancies between the various reports published as to the details of the accident, but they do not affect the main facts as illustrative of Herr Brandt's remarks.

THE PULLMAN CAR FIRE.

On Wednesday, at Leeds, the coroner's jury returned a verdict concerning the burning to death in a Pullman railway sleeping car on the 29th of October of Dr. J. Findlay Arthur, who was returning home from Ceylon to Aberdeen. The verdict was:—"(1) That Dr. Arthur died from suffocation and burning, and we are of opinion he would have been able to effect his escape as other inmates of the car did had he not been affected by narcotic stupor. (2) The fire, we believe, originated over No. 8 berth, and was accidentally caused by Mr. Cranston's reading lamp.

(3) We think Dr. Arthur might have been saved before the train was taken to the water crane had his position in the car been definitely known, and we think, under the trying circumstances, the officials did their duty. (4) We strongly condemn as dangerous to the safety of the travelling public the clause in the railway company's rules which prevents the engine-driver from stopping his train at the earliest possible moment after the communication cord whistle has sounded. Also we think the use of reading lamps in Pullman cars should be strictly prohibited." With all the details of the event the public have been made familiar by the daily papers, and it is quite unnecessary to recapitulate them here. To us the verdict is unsatisfactory, and it is to be regretted that the solicitors employed did not direct their inquiries more fully to ascertaining whether the fire did not arise outside, the car roof being ignited by a spark from the engine, or to discovering whether the heating apparatus was implicated. The apparatus consists of a hot-water boiler, from which flow and return pipes are led throughout the car in the usual way. The boiler is of the vertical type, and stands in a little closet lined with sheet iron. The chimney passes through the roof, and the fuel used is coke. No inquiries of any importance seem to have been made in the directions we have indicated. Concerning the impropriety of the Midland Company's rule that drivers shall not stop their train when the signal cord is pulled until they have put themselves under the protection of signals, there cannot be two opinions. It is evident that the company has no faith in the security provided by its own block system. In theory, trains are always under the protection of signals, no matter on what part of the line they may be; and if practice complies with theory, a signal 500 yards behind a train really gives less security from a rear collision than one five miles further back. It appears strange, too, that the conductor did not himself stop the train, which he could have done at once by simply lifting up the hose pipe of the air brake between the two cars, when the coupling would fall asunder and the brakes would have put themselves on. As a measure of precaution it would be well to provide air brake valves in accessible places on all Pullman cars. Fortunately, the accident is unique, and it is very improbable that it will ever be repeated—on an English railway at all events.

THE SYNTHESIS OF TYROSINE AND URIC ACID.

When directing attention last week, in an obituary notice of the illustrious Prof. Wöhler, to the very important synthesis which he effected long years ago, that of urea, we little thought we were about to hear of that of two other complicated compounds at which chemists had worked in vain for a long time. In the interval several highly important syntheses have been effected, for instance, those of alizarine, conine and indigo. The synthesis of uric acid had been for years attempted in vain by Wöhler and Liebig. Uric acid, $C_5H_4N_4O_3$, is a product of the incomplete oxidation of animal tissue, and in combination with ammonia is the chief constituent voided by insects, land reptiles, and birds. Normally it occurs in the urine of man, but in small proportions, as well as in the liver, lung, and brain. In certain cases of gout all the fluids of the human body are more or less saturated with it, and what are called "chalk stones" are urate of soda. According to a telegram from Vienna in the *Standard* of the 6th instant, Dr. Horbatschevsky, the second assistant in the Vienna Chemical Institute, has succeeded in forming uric acid synthetically. Their correspondent adds that the scientific world of Austria is just now immensely interested in the discovery; and that it is hoped that albumen itself, the chief organic compound in the animal organism, may ultimately be produced by artificial processes from inorganic elements. No details are given, nor is one word about the successful method to be found as yet. The other compound which has just been prepared synthetically is tyrosine, also a quaternary compound, $C_9H_{11}NO_3$. It was first obtained by Liebig, in 1846, and is a crystalline nitrogenous body produced by the decomposition of albuminoidal bodies under the influence of acids, alkalies, and putrefaction. Liebig formed it by decomposing cheese with melting potash. It has also been obtained by acting on feathers, hairs, prickles and horn with sulphuric acid. It occurs ready formed, accompanied by leucine, in the animal organism in the pancreas, spleen, blood, &c. Erlenmeyer, who has part honour in the discovery of the method of preparing it synthetically, appears to have worked on it since 1858. According to the preliminary announcement in the *Naturforscher* of the 4th instant, this synthesis, of the greatest chemical and physiological interest, which for years past has baffled the endeavours of many chemists, has now been accomplished by Messrs. Erlenmeyer and Lipp. They have prepared tyrosine, the very important product of the decomposition of albuminoidal substances, which up to the present has only been found in animal organism, and has been obtained only by the putrefaction of protein substances, or by heating them with acids or alkalies—they have prepared it artificially by synthesis. The way by which they arrived at it is somewhat complicated. They started from phenyl-ethyl-aldehyde, which they converted into phenylalanine; this is changed into para-nitro-phenylalanine, which is reduced with nascent hydrogen. The product is then treated with nitrous acid, and this yields tyrosine. The artificial tyrosine agrees in all its characters with the natural body, and its chemical position seems established: it is a parahydroxy-phenyl *a* alanine. Again, then, by this discovery of Messrs. Erlenmeyer and Lipp, a complex body, belonging to the region of animal chemistry, has been assigned its proper chemical place, and numbered among those which can be built up synthetically. A few months ago an announcement appeared in the *Comptes Rendus* to the effect that quinine had been formed synthetically, and a sealed packet giving details was deposited with the secretary. M. Maumené appears, however, to have so far failed, as the time is now passed, much to the comfort of a Ceylon planter, whose peace of mind suffered much when we communicated this statement to him.

AGRICULTURAL MACHINERY FOR TASMANIA.

Agricultural machinery is in increased demand in Tasmania The Government statistics of the colony, which have just come to hand, show that at last year's harvest the acreage of wheat reaped by machine was 29,081, and by hand 22,671, the machine-reaped being greater by 6410 than the hand-reaped. Ten years ago only 2389 acres were reaped by machinery, as against 60,001 reaped by hand. Lift and force pumps have increased to a very great extent, viz., from 15 in 1874 to 175 in 1881; and on all other agricultural machines and appliances, with the single exception of clod-crushers. Thus chaff-cutters, which in 1872 were 77, last year were 494, the number worked by steam being 4 and 28 respectively; cultivators were 48 in 1872 and 168 in 1881. Of corn-crushers only one was reported as being in the colony in 1872, but there were 127 last year. The use of hay elevators has fluctuated very considerably, but on the whole it has been in favour of the later years; while hay-rakes—horse—increased from 104 to 229. Horse-hoes, grubbers, and scarifiers were 631 in 1881, compared with 358 in 1872; subsoil ploughs 236 last year, against 28 in 1872—an increase of 743 per cent. Double-furrow ploughs, of which there were none in 1872, and only 4 in 1873, increased to 450 in 1881, and in the latter year 11 treble-furrow ploughs were also returned. Reaping machines increased in the ten years from 66 to 140; reapers and mowers combined, from 35 to 257; strippers, from 3 to 9. The combined reaper and binder was introduced into the colony in 1879-80. The number then returned was 47, whereas in 1881-2 as many as 130 were found to be in use. Dividing the greater number of these machines into three groups, as under, the progress is clearly and remarkably shown, thus:—For preparation for and putting in crop, there were in 1872-3, 556; and in 1881-2, 1717, being an increase of 209 per cent.; for gathering crops in the same years, the numbers are 455 and 1180, being an increase of 159 per cent.; while for converting crops, the figures are 79 and 621, or 686 per cent.; or in all we have 1090 and 3518, or a gross increase of 223 per cent. It appears that the difficulty of obtaining labour is also increasing, so that agricultural machinery is likely to be in greater demand in the future. Turning to the figures relating to imports, we find that in 1881 the colony received from the United Kingdom 1701½ tons of iron and tin, valued at £11,257, in addition to 6668 packages ditto, of the value of £5945. Of ironmongery, hardware, hollow-ware, &c., during the same year the imports from the United Kingdom were valued at £39,154. The machinery is put down at £3835. There is some difficulty in ascertaining how the trade with the United Kingdom and Victoria really stands, seeing that a large, if not a larger portion of the goods from the United Kingdom and other countries is introduced by way of Victoria; the result being that that colony is credited with more imports or exports than really belong to it.

COAL, IRON, AND WAGES.

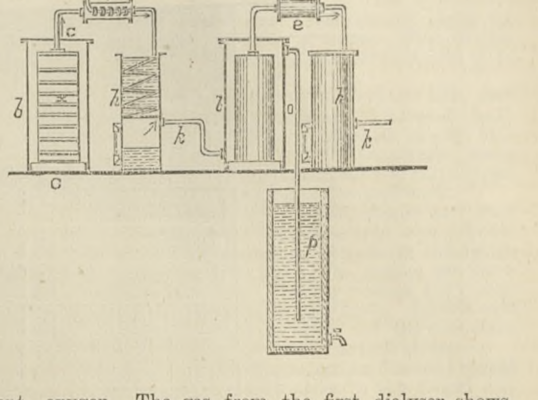
The agitation as to the wages of the coal miners is now for a time at an end, advances varying from five to eleven per cent. having been received in some of the counties where sliding scales were not in existence, whilst in the largest of the latter it is interesting to notice that the price up to the end of September has risen sufficiently to allow of an increase in the wages of the miners; and as it is believed that since that time there has been a greater increase, it is evident that the counties where sliding scales prevail will reap the effects also of the increase in the price of coal that has been concurrent in the agitation for higher wages. This may be said to be the first general increase in the rate of wages in the coal trade that has taken place for three years, and it is interesting to turn to wages in an allied industry where sliding scales have ruled for the whole of the time. The resolution of the Manchester Conference included miners of all classes in the kingdom, and we notice that the Cleveland miners at once remarked that as their wages were regulated by such an arrangement as that hinted at they could take no part in the agitation. There was another reason—and that was that they were enjoying the bulk of the advance of 15 per cent. that was to be claimed. In these three years, during the course of the two sliding scales that have prevailed in the Cleveland iron mining trade, the miners have received advances of over 14 per cent. in the total, and there has also been a slight improvement of the position of part of the miners through their sectional advances being made as large as those of the other classes. It is clear, then, that tested by the results to the miner, the sliding scale system has been by far the most beneficial. The broad result of these advances must be to cause the prices of iron and coal to move upwards. Already this has been seen in advances in price that have been made in several of the chief markets, and though there is only a part of the coal on which these advances take place, yet in that that is contracted for it is certain that the advance, if deferred, is only deferred till new contracts are entered upon. The increase in wages will be over the whole of the coal produced, and the increase of price will be slowly and steadily spread over the whole of the output also, so that it may be looked upon as tolerably certain that the "era of cheap coal," that Dr. Siemens a few years ago spoke of, is likely to be at an end for a time at least.

THE DRAINAGE OF MINES.

The extent to which the recent very heavy rainfall has prejudiced mining operations has been considerable. It seems timely, therefore, that the Mines' Drainage Commissioners in Staffordshire should have adopted a system of management which is a radical and somewhat startling change upon that hitherto practised in the management of its affairs. It has been customary to conduct the surface drainage business, the business connected with the drainage of the mines in the great and chief Tipton district, and the finance business by three several committees. At a special meeting of the Commissioners at their offices in Wolverhampton, on Wednesday, it was determined to entrust all this to a committee of three Commissioners. Government by one is often advocated by men who have no great belief in the virtues of popular representation, and there is famous historical precedent for government by a Triumvirate. The Staffordshire coal and ironmasters seem by their eight years' experience in the working of their Commission to have determined to fall back upon ancient Rome for a pattern of speedy, efficient, and economical dispatch of business. While this triumvirate cannot, by reason of the terms of the Act of Parliament, legally discharge all the functions of the Commissioners, any two of them are, nevertheless, empowered to sign on behalf of the Commissioners any contracts which may have been approved by the general body. Such a committee will henceforth remove any complaint that local interests may be considered at the cost of the district; it will enable the surface works to be completed with the much-needed rapidity, and it is the testimony of the chairman that he will now be able to negotiate the loan which some few months since was authorised. The three Commissioners selected are Mr. Walter Williams—chairman of the Commission—Mr. Walter Bassano, and Mr. Edmund Howl. Grave trade issues depend upon their joint prudence and wisdom.

APPARATUS FOR THE PRODUCTION OF OXYGEN BY DIALYSIS OF ATMOSPHERIC AIR.

The following is a description of a method of producing oxygen invented by M. P. Margis, of Paris, as given in the *Journal* of the Society of Chemical Industry:—The air is drawn through membranes, through which the oxygen passes in larger quantity than the nitrogen. They consist of bags of taffeta which have been soaked in a solution of 50 parts by weight of caoutchouc, dissolved in 400 parts of carbon disulphide, 20 parts alcohol, and 10 parts ether. The bag *a*, which is stiffened by iron rods, is placed in an iron cylinder *b*, the air entering through its perforated bottom. The exhausting action is produced by the injector *c* working with steam. The gas passes from *a* to *e* mixed with steam, then through the cooling apparatus *h*, where the steam is condensed whilst the gas rich in oxygen goes through the pipe *k* into the second dialyser, which is arranged like the first one, excepting that the outer cylinder *l* is closed. The non-dialysed nitrogenous air leaves the apparatus through the pipe *o*, which dips in the water tank *p*. The height of the column of water in *p* regulates the pressure in the cylinder *l*. After dialysing four times, the gas collected in a gasholder contains



95 per cent. oxygen. The gas from the first dialyser shows 40 per cent. oxygen, and is suitable for some illuminating and metallurgical purposes. The second dialyser yields gas with 60, the third gives gas with 80 per cent. oxygen.

RAILWAY SAFETY APPLIANCES IN SWITZERLAND.

The *Eisenbahn* of the 21st ult. published the following important circular, addressed to all the Swiss railway directions, by the Railway Department of the Federal Government:—

The dangers to the public safety which have frequently resulted of late from points being wrongly set, or other errors committed, have led the undersigned Railway Department, whilst drawing attention to the necessity of a strict observance of all existing regulations as to traffic, and especially with regard to the working hours of the railway servants, to call upon the Swiss railway directions to defer no longer the introduction of such technical appliances for increasing the safety of the traffic as are well known at the present time as being extensively adopted upon the most important railways in other countries, and as having produced good results. Amongst these improvements we especially point out—

1. *Bell signals.*—These give notice to the watchmen, pointsmen, and gatekeepers along the line of the approach of a train, whilst admitting at the same time of their making in return certain danger signals, as, for instance, in the case of the line being blocked, such bell signals afford a greater safeguard for the line being clear and duly maintained so, and the primitive horn signals, which often cannot be heard, are replaced with advantage by them.

2. *An absolute block system.*—Block stations for regulating the distance between following trains are to be erected on all lines upon which at certain hours trains running in the same direction succeed each other, on the time-tables, at intervals of less than ten minutes. Ordinary stations are to be considered as block stations in all such cases where it is provided for that not more than one train is to be upon the same line of rails between any two such stations at the same time.

3. *Complete interlocking of the points with the home signals.*—This is to be introduced at all stations and branches where passenger trains run through without stopping or cross each other. The object to be thus attained is to render it impossible for trains to be allowed to enter such stations until the points have been properly set. The interlocking is to be extended to all points which could in any way affect the safe passage of the train.

4. *Continuous and automatic brakes* which are thoroughly trustworthy, and which can, in case of necessity, be applied by every train servant, are to be fitted in sufficient numbers to every train carrying passengers, in order to facilitate the prompt and certain stoppage of the train at any required moment.

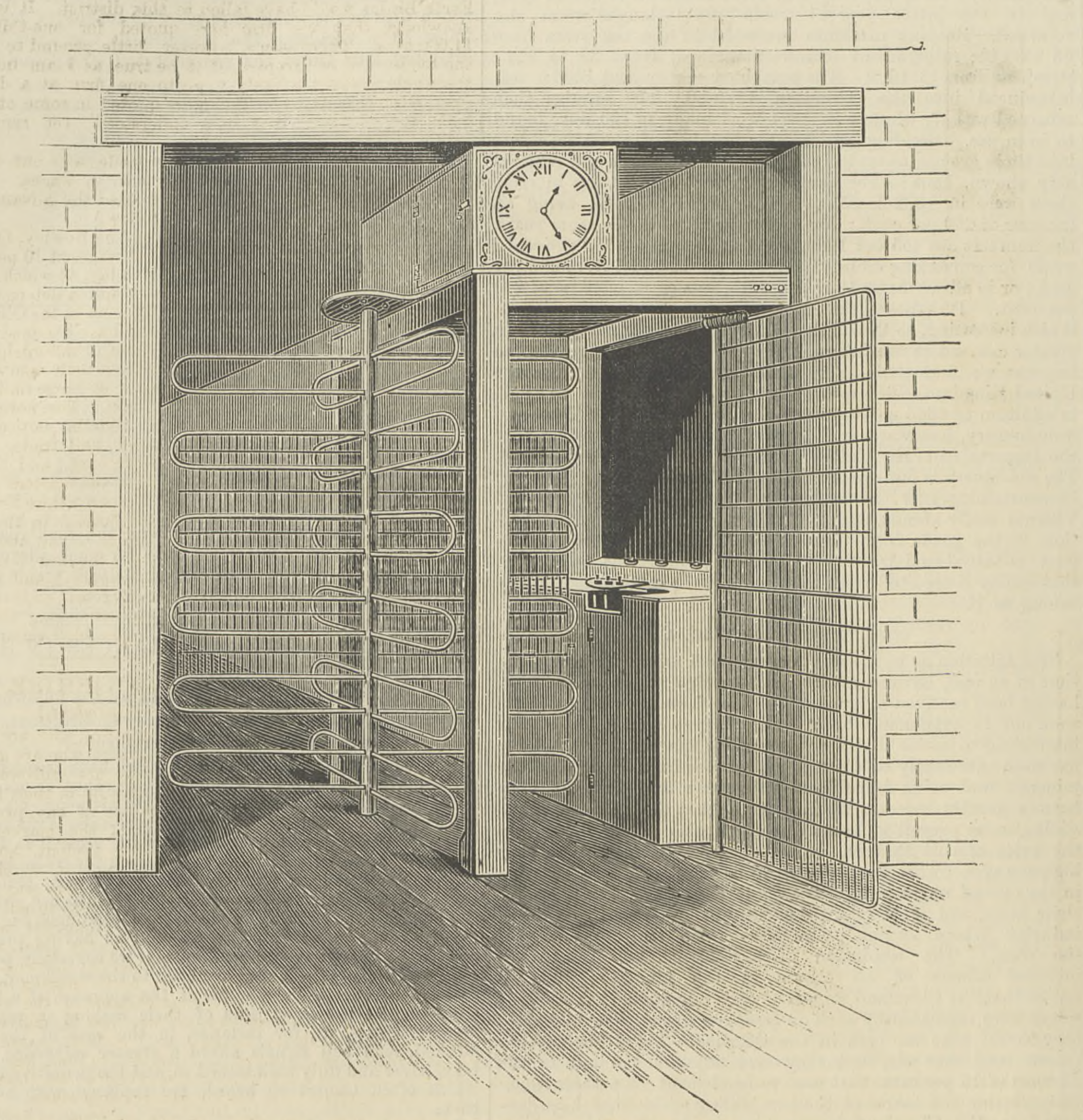
The various above-mentioned appliances are to be at once introduced on all main lines on which express trains are run. Their adoption is to be completed by the end of the year 1884 on all Swiss railways, with the exception of such lines as shall, in consideration of the secondary character of their traffic or other special circumstances, have received by special request a dispensing order from this department. Reports are called for from the several railway directions as to the measures adopted for carrying out the above instructions.

For the Swiss Postal and Railway Department—Railway Division.
(Signed) Welti.
Berne, October 14th, 1882.

Colliery Explosion.—The most serious explosion which has ever occurred in the Derbyshire coal-field took place on Tuesday morning at the Parkhouse Pit, near Clay-cross, and belonging to the Clay-cross Coal and Iron Co. 250 men and boys are ordinarily employed in the pit; but it being an off-day only ninety men went down. Of these forty came up at ten o'clock, and fifteen minutes later the pit "exploded" with a tremendous report. Several men were rescued during the day, but at the time I write there is every fear that thirty-nine lives will be lost. The cause of the explosion will be difficult to discover; but as the workings are exceptionally free from gas, and the calamity occurred without almost any warning, experts incline to the opinion that there had been a fall of roof, liberating gas which had come in contact with light. Naked lights, with Green's patent safety lamps, are used in the pit. The last explosion at Clay-cross was in 1865, when eight lives were lost. The Derbyshire coal-field is ranked as the safest in the country, and presenting a marked contrast to the fiery Barnsley seam.

Danger from Exposed Electric Light Wire.—*Apropos* of the recent death of a workman through the current from the wire of a Brush arc lamp, the *Times* says that Mr. Edison is said to have confided to the reporter of a New York paper his opinion that such accidents would continue to increase with the multiplication of wires carrying powerful currents, till some dreadful accident occurred to arouse public indignation and compel the placing of all such wires underground. In case of fire particularly, the breaking of a great number of wires which would be thrown down in inextricable confusion by the fall of a roof, might have serious results. This is a dreadful picture. Forked lightning flashing about among wires seemingly alive under the influence of attraction and repulsion would be calculated to weaken the nerves of the stoutest-hearted fireman. We wish the reporter had kept Mr. Edison's confidences to himself. Mr. Park Benjamin, a well-known scientific man, has called attention in New York to the fact that a stream of water from a hose-nozzle, striking a broken arc-light wire, might easily serve to conduct the current through the body of the fireman who held the hose, with fatal consequences; while the cutting of such a wire with an axe, particularly if the handle of the axe were wet, might have a like effect. We may add that if one fireman were to hit another hard over the head with an axe, whether the handle was wet or dry, the man hit would receive a violent shock. Mr. Park Benjamin has curiously enough omitted to call attention to this fact. It would, perhaps, be better under the circumstances either to give up the use of electricity, or else to have no more conflagrations. By either expedient comparative safety would be secured for fire brigades.

WORKMAN'S TIME RECORDER.

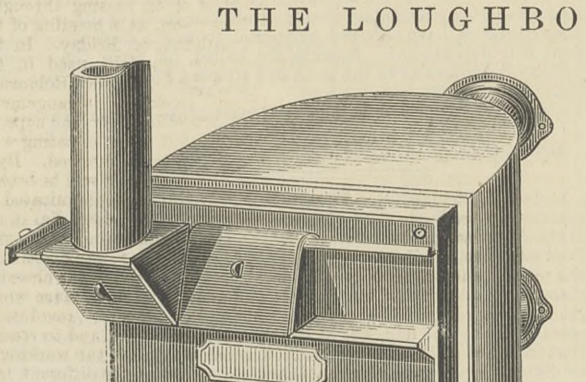


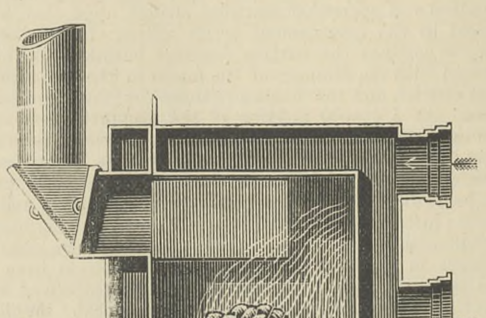
THE object of this invention—Levy and Lane's patent—is to register the time at which each workman or person enters and leaves a factory or other place, thus dispensing with the services of a timekeeper. The apparatus consists of an entrance gate, revolving gates or turnstile, fixed at the entrance of the factory or other building, to which is applied a tell-tale instrument, an eight-day clock, and a continuous roll of ruled paper. As each *employé* passes through the outer gate, which closes behind him, he drops his domino or metal disc, with his number thereon, in a recess or aperture in a table and pushes a lever which, having a multiple action, opens a cylinder which receives the domino, and at the same time locks the gate to prevent him passing out, and unlocks the turnstile, leaving him no alternative but to pass on, when, by a mechanical contrivance, the gate becomes again unlocked and the turnstile locked, only to be re-opened by the above process being repeated by each workman passing through, and which is done with great rapidity.

The self-registering apparatus consists of a powerful eight-day clock, to which are connected two cams with horizontal motions, one traversing its course in twelve hours, the other every hour. These cams are in connection with puncturing pins, facing which is the time-sheet, held in position by a suitable framework contrivance, and which is automatically and simultaneously moved onwards through rollers and forward to the puncturing pins by the action of the turnstile as every operative passes through. When all hands have arrived, the dominoes will be found in the cylinder in rotation, agreeing with the indications recorded on the paper, and which can be figured in by an office-boy in a few minutes. Thus, by a most simple process, an infallible and automatic record is made of the exact time each workman has arrived or left his factory, and which is absolutely proof against any deception or collusion between the operative and the timekeeper.

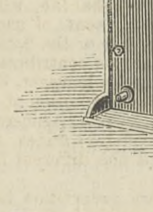
We understand that Messrs. John Davis and Son, All Saints' Works, Derby, and Newgate-street, London, E.C., have been appointed sole manufacturers, and no doubt will be glad to supply further particulars.

THE LOUGHBOROUGH BOILER.





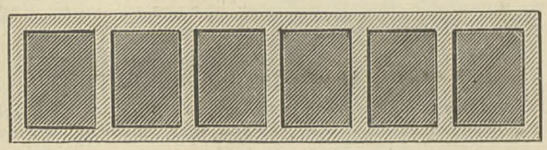
THE accompanying engraving illustrates a new hot-water boiler for greenhouses, &c., brought out by Messrs. Messenger and Co., Loughborough. It will be understood that the front containing water is connected to the boiler by bolts and nuts, provision being made for the circulation of the water by a hole in each corner, a rubber ring being used to make a water-tight joint. The ring fits into a recess in each part, as in sketch. The flue is made either in the front or through the top of the boiler, or at the back, as may be most convenient. In the smaller sizes the fronts are made solid. The great advantage claimed for these boilers is that the whole of the heat given off by the boiler is utilised in the house, which is a very great consideration for amateurs. The boiler illustrated—No. 3—will heat 200ft. of 4in. pipe, and will contain enough fuel to keep up the heat for twelve hours without attention.



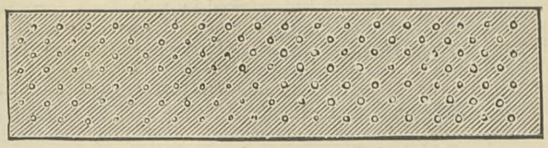
A FUEL THAT PRODUCES ELECTRICITY.

THE object which M. Brard, of La Rochelle, has in view in his researches is to produce an apparatus capable of transforming heat into electricity without having recourse to the complications presented by dynamo-electric machines which have been hitherto inapplicable for domestic illumination. M. Brard wishes to produce a veritable electro-generative stove, furnishing at the same time heat, light, and electricity. After having demonstrated by his experiments that thermo-electric batteries have on the one hand only a feeble production, and on the other hand are soon rendered useless under the action of heat, M. Brard thinks he has found, according to the *Electrical Review*, the solution of the difficulty in a thermo-chemical battery, in which the current is produced by chemical action, the combustion of carbon, under the influence of an elevated temperature produced by a special method, by the oxidising action of nitrate of potash or soda. It forms thus a veritable thermo-chemical battery, analogous to the ordinary batteries, in which the oxidising of the carbon takes the place of the oxidising of the zinc, and the nitrate of potash of the oxidising body. The carbon is, therefore, the negative pole, and the nitrate the positive pole of the element. M. Brard alluded, in reference to his labours, to the experiments of Antoine-César Becquerel in 1855, and those more recently made by M. Paul Jablochkoff in 1877; he has, however, gone further than his antecedents in this way, for he has presented to the association the principal features of an apparatus actually in construction, and showed some electro-generative slabs which we are about to describe, reserving the description of the complete generator until it has been tried, and until it has undergone certain modifications which the experiments will suggest.

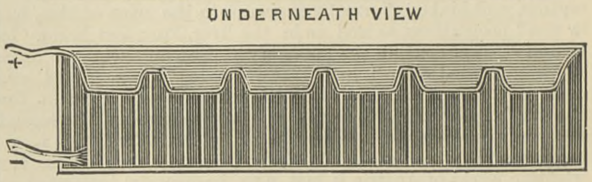
What is termed the electro-generative slab may be defined as a piece of prepared carbon, which, when thrown into the fire, produces electricity by its combustion. The subjoined figures, which represent the exterior view of it, the longitudinal section, and the transverse section, will demonstrate clearly the principle of it. The slab presents the external appearance of a parallelopiped, about 15 centimetres—6in.—long, 3½ centimetres, —2¼in.—wide, and 25 millimetres—1in.—thick; the materials which compose it are enveloped in a sheet of asbestos paper, only two thin sheets of brass being exposed to view, which serve as conductors of the current. The interior consists theoretically of a prism of carbon and a prism of nitrate of potash, separated by a plate of asbestos, which plays very nearly the same part as the porous cell in ordinary batteries. In practice the sheet of carbon is formed of about 100 grammes of coal-dust, formed into a paste with molasses or tar. The paste thus obtained is strongly compressed, cold or preferably with heat, in a mould of suitable form, at the bottom of which has been placed previously a sheet of copper, of brass, or any other metal which is a good conductor, cut into several strips, which are found embedded in the agglomeration of the carbon and project from one of its extremities to constitute the negative pole. The mould is disposed in such a manner that the slab is perforated throughout its thickness with numerous holes intended to facilitate combustion and to multiply the points of contact of the carbon with the nitrate, as we shall presently see. It bears besides upon the upper surface rectangular depressions, 15 millimetres deep, divided by transversal partitions more or less numerous, obtained by the moulding. The angles thus formed are intended to prevent the flowing of the melted nitrate into the fire during the working of the apparatus. The whole surface of these compartments is covered by a thin sheet of asbestos paper. The



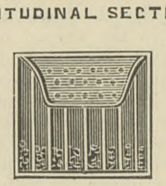
TOP VIEW



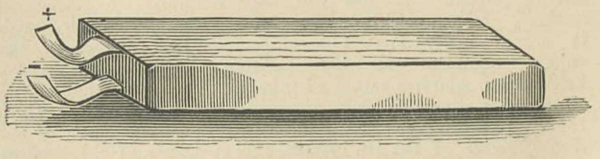
UNDERNEATH VIEW



LONGITUDINAL SECTION



TRANSVERSE SECTION



GENERAL VIEW OF SLAB

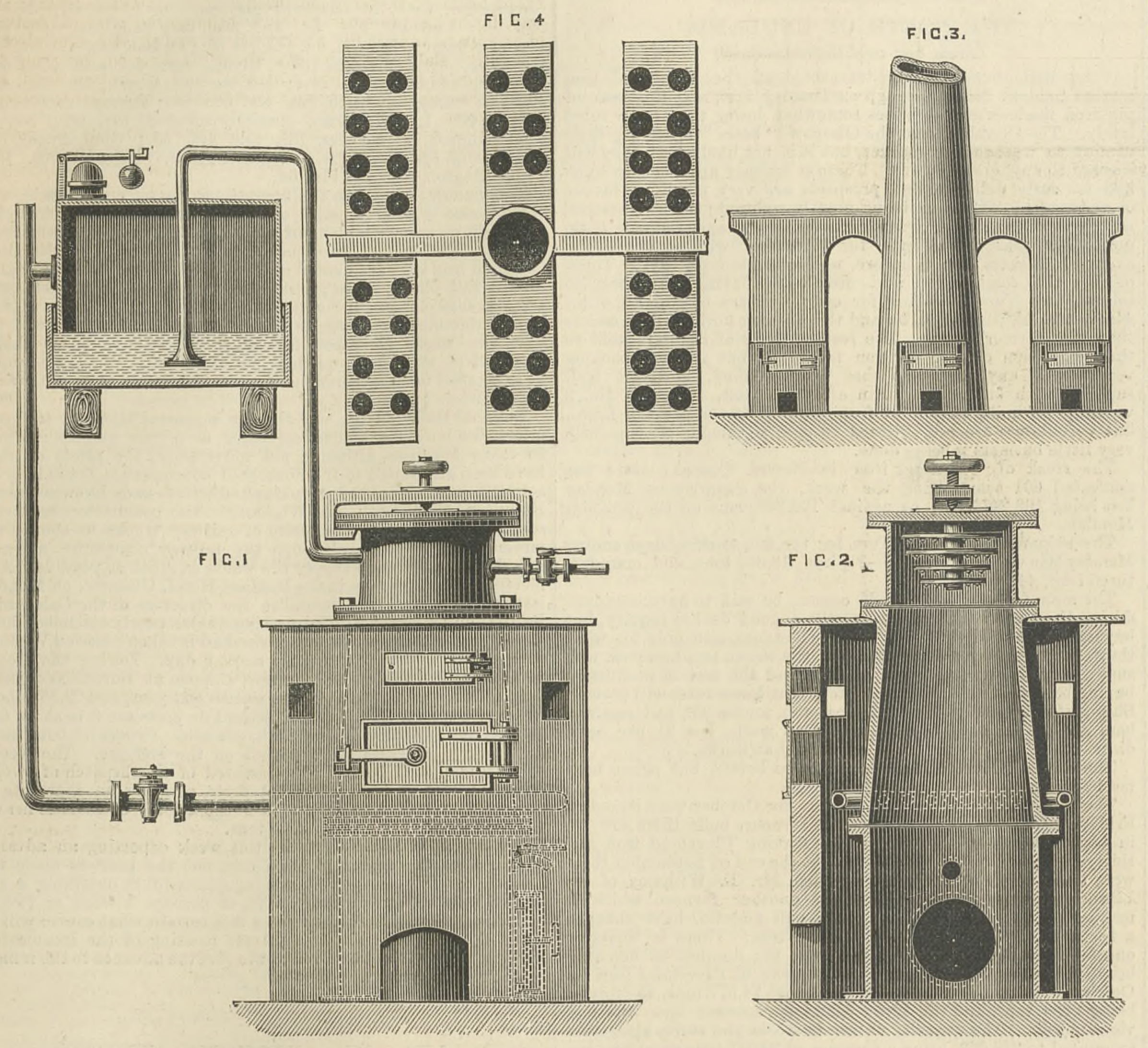
upper part of the brick is formed of a mixture of three parts of ashes and one part of nitrate of soda or potash. The ashes are intended to prevent a too rapid combustion, and to prevent the slab from melting. This mixture is melted and poured upon the brick very hot and in a syrupy state. About 100 grammes per slab are required, equal to about 25 grammes of nitrate and 75 grammes of ashes. A second sheet of copper or brass analogous to the first is embedded in the nitrate before cooling, and forms the second pole of the slab. The whole is enveloped in a sheet of asbestos paper.

It is sufficient to place in a fierce fire the extremity of the slab opposite to the conductors, in order to obtain in a few minutes a continuous current—and a constant one if the slab is homogeneous—during its combustion, lasting an hour and a-half to two hours. M. Brard has not yet taken the constants of this new thermo-chemical battery, but in an experiment which we owe to the chemical department of the laboratory of the Lycée of La Rochelle, a single slab was sufficient to actuate an electric bell of the ordinary commercial form. One can, moreover, burn several briquettes at once, and group them in tension or in quantity to increase the effect. Three or four slabs in tension produce the decomposition of water. Such are the results at present obtained by M. Brard. Without expressing an opinion as to the future and the results which will be obtained from this apparatus, which is at present confined to the laboratory, we may observe that these researches are very interesting, and that to M. Brard must be ascribed the honour of having been the first to construct a veritable electro-generative combustible.

SANITARY INSTITUTE OF GREAT BRITAIN.—At an examination held November 2nd and 3rd, eight candidates presented themselves. The Institute's certificate of competency to discharge the duties of local surveyor was awarded to C. H. Cooper, and the Institute's certificate of competency to discharge the duties of inspectors of nuisances was awarded to J. Brown, S. C. Legg, D. Richards, A. Taylor, and J. Watson.

NAVAL ENGINEER APPOINTMENTS.—The following appointments have been made at the Admiralty:—Walter Collman, engineer, to the Tenedos; William J. Hancock, chief engineer, to the Pembroke, additional; William R. MacAvoy, chief engineer, to the Tyne, vice Hancock; John T. Price, engineer, to the Superb, vice Coope; Alfred M. Trivers, engineer, to the Asia, additional, for the Devastation, vice Price; Andrew Lloyd, chief engineer, to the Sultan, vice Hunt; and William J. Pettit, chief engineer, to the Pembroke, additional, for the Opal.

BROMFIELD'S PROCESS OF IRON MAKING.



A PROCESS for making iron direct from the ore has been patented by Mr. J. C. Bromfield, Hove, Brighton, and described as follows :—The iron ore and fuel coal are reduced to a powder by a machine such as Blake's crusher, after having been calcined in ovens above a tank filled with water, into which the roasted ore passes direct from the ovens. The ore then becomes disintegrated and friable, and the cost of reduction afterwards very small. The crushed iron ore and coal dust are then mixed, and to them is added carbonate of lime, which is also powdered ready for mixing, as well as alumina or sand. The proportions of each depend on the quality of the material used, and vary according to the nature of the iron in the different districts. The lime, however, will probably vary from one-tenth to one-eighth. The materials are then passed through a mixing machine and brought into a plastic state by the admixture of mucilage, obtained from steaming seaweed in a close jacketted boiler, the seaweed being afterwards submitted to hydraulic pressure. The mucilage thus obtained has the effect of cementing the pulverised materials which are discharged at the end of the cylinder into the hopper of a brick or tile-making machine. The compressed materials issue from the machine, either as bricks or continuous solid cylinders, into trucks or barrows, and are removed at once to the retort, there to be consolidated into coke by a process of distillation in a furnace, which is illustrated in the annexed engravings. In these, Fig. 1 is a front elevation, and Fig. 2 a longitudinal vertical section of a furnace and retort. Figs. 3 and 4 show respectively an outline elevation and a ground plan of a series of furnaces and retorts, from which the gases are led and disposed of, either for lighting purposes or for being burnt as a fuel under the furnaces. The bye-products are in this manner to be saved. The retorts are made in two parts; the lower, which is used as a cold coke chamber, is made of wrought iron; and the upper, which is conical in shape, is of fireclay, in combination with either carbonate of lime or calcium oxide. The object is to absorb the sulphur given off from the material being coked during the process of gas distillation. The lime, which should be in a caustic state and thoroughly blended with the particles of the fuel, should arrest and combine with any sulphur which may exist in the incorporated materials, whilst acting still more efficiently and quickly than it ordinarily does in forming a flux with the intermixed silica. Each block or brick of the compound will thus be subjected to cementation in a carbonaceous matrix, which is firmly held together by those ingredients, which are intended to flux the whole mass when the melting zone of the furnace is reached. The saving in fuel and the increase in the output of each furnace are due to the same cause, the greater quickness with which the smelting re-actions take place, and the much lower temperature required.

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

(*From our own Correspondent.*)

UPON Birmingham Exchange to-day—Thursday—as also upon Wolverhampton Exchange yesterday, there was a fairly animated, though not a brisk tone. Inquirers were seeking to know upon what terms makers were disposed to take orders in nearly all the departments. Nor was this all froth.

Inquiries which meant business were conducted on behalf of United States consumers, and home users who are tendering for constructive and other engineering work in the market were seeking makers' terms for forward delivery; while smaller and present needs were expressed to a limited extent by local users. Makers displayed a reluctance to quote beyond the present year, and the terms which they were prepared to take, when immediate execution was stipulated, were generally without alteration upon the week. There was a conviction that though current business may not be unmarked by much of the quietude usual in November, yet that the early spring will bring a demand from all leading export and home markets which will prove conspicuous.

By mill and forge proprietors the wish to-day and yesterday was mostly to restrict operations to a tolerably hand-to-mouth character.

Quotations were nearly all based upon the crucial £8 per ton for marked bars. It cannot, however, be said that that price has induced consumers to infer that still higher rates are impending: for the firms who are quoting the figure are not this week reporting much new business, and it is a fact that one at least of the concerns at which the old price of £7 10s. has been maintained is busier than before.

Less difficult to buy than a week ago were perhaps good serviceable bars at £7 and upwards of the general merchant class. From this figure rates went down to £6 15s. Common bars were procurable at £6 12s. 6d.

Hoops were not much sought after, but as most makers were well off for work on earlier orders, quotations were not consequently weakened, and remained at £7 to £7 2s. 6d. and £7 5s.

The exception to the general quietude in hoops related to that form of them in which, as strips, they can be stamped out into buckles for baling purposes. In this form hoops were sought after to-day in satisfaction of the necessities of the firms who make these fastenings for the United States, and who are now receiving season instructions from Transatlantic customers.

Sheets likewise were demanded for America, but few makers could be found who in the present state of their order-books were sweet upon the business. For home work, as galvanising sheets, or for general braziery and for shaping sheets, the inquiries were steady. Prices were scarcely so strong upon the week for doubles and trebles, but there were no indications of weakness in singles. These were £8 10s. strong, but a little less respectively than £9 10s. for doubles and £10 15s. for trebles was being taken from old customers.

Plate mills where boiler no less than girder and bridge and tank qualities are rolled are doing more than the average of work. Excepting where terms unmodified by modern usages are still demanded, £9 10s. remains the quotation for good boiler plates. Bridge and girder or boat plates range from £8 10s. down to £7 15s., according to quality and size.

Nail rods are less actively sought for, and the demand on home account is not improved by the prospect of a strike by the operative nailers. Gas strip was quiet at £6 15s. easy.

Horseshoe and tip iron is in more than average request, the demand for the former on local account being especially good.

The tendency is still towards the opening of more sections of ironworks. Last week I reported the starting of a sheet mill of the Darlaston Iron and Coal Company. I may this week add that the guide mill of the same establishment at Darlaston-green is about to be again set going. It has been taken by Mr. Tolley, of Bradley, and the closing of their tinning department by the Osier Bed Company, of Wolverhampton, will afford them the desired additional sheet-making accommodation.

Pig iron of several brands may be had at less money than was demanded three weeks and a month ago. Some Lincolnshire and Derbyshire samples were to-day quoted 52s. 6d., and not as for three weeks past 55s.; but the lower quotations did not lead to business. Still there are not many smelters who are anxious to book large orders at the prices which consumers would just now alone give. There are, however, only few consumers of forge pigs now in the market; most of them have bought well forward. To-day's quotation for all-mine iron was mostly £3 10s.; a larger number of vendors probably than last week would have been induced to book at an offer of £3 7s. 6d. Transactions did not accompany the quotation either to-day or yesterday of £3 10s. for hematite pigs in other than small dealings when lots were needed to complete mixtures. Staffordshire part mines were 57s. 6d. to 55s., and cinder pigs 42s. to 45s.

The recent heavy rains have somewhat interfered with operations at a few of the collieries. While, therefore, the domestic collieries are not busier on the week, there is slightly more pressure for deliveries at some of the ironworks' pits.

Steel keeps in the enlarged output recently reported at Messrs. Tangyes, and at the works of the Patent Shaft and Axletree Company. At the latter place Bessemer, Siemens-Martin, and Thomas-Gilchrist steel are all being made. The last-named is not in large output, and the firm explain to me that their experience of it is not at present such as to induce them to materially slacken their efforts in respect of the two former systems.

There is no falling off in the inquiries on account of roofing and girder and bridge work for different export markets, and the considerable extent of business previously in hand of this class seems almost certain to be early augmented. Simultaneously the prospects on home account continue favourable. A fair proportion of the new ironwork needed by the London and North-Western Railway Company for erections in Birmingham, Manchester, and Northampton, it is being hoped will come into South Staffordshire.

It had been hoped that some portion of the work for the Forth Bridge would have fallen to this district. It is within my knowledge that one firm here quoted for one-third of it, or 14,000 tons. There seems, however, little ground to expect that the tender will be excepted, if it be true, as I am informed, that the whole contract is likely to go to one firm at a distance, at a price astonishingly under the figure quoted in some other tenders. Still the contract, it is here understood, yet remains to be ratified.

The operatives in the dollied chain trade came out on strike on Monday for an advance of 10 per cent. in wages. Nine of the fifty-six employers affected have conceded the advance, and it is anticipated that the remainder will follow.

The rivet makers now on strike in the Rowley, Old Hill, and Black Heath districts for an advance in wages of 10 per cent., held a mass meeting at Black Heath on Monday, at which an offer of 5 per cent. from the masters was refused, and a determination come to to continue the strike. Some of the men in the Old Hill district have obtained the full 10 per cent., and have resumed work.

The horse-nail manufacturers of South Staffordshire and East Worcestershire have received notices from their men asking for an advance of 3d. per 1000 on all classes of horse-nails, Brazils included—to take place on the 25th inst. The notices ask for a reply not later than the 11th inst. Similar notices have been received by the employers in the common nail trade. In this case the advance asked is equivalent to 10 per cent., and the men state that they will submit a revised list after the masters' answer.

The South Staffordshire and East Worcestershire Trades' Council have applied to about fifty of the chief masters in the forged nail trade asking whether they were favourable to the abolition of the "truck" system, and if they would assist the council in suppressing it. Only fourteen firms, however, have replied, and at a meeting of the council on Saturday last this fact was unfavourably commented upon, and a resolution was passed urging the Anti-truck League to prosecute their efforts with redoubled vigour.

NOTES FROM LANCASHIRE.

(*From our own Correspondent.*)

Manchester.—Iron makers is this district who are mostly well sold are not forcing sales, and consumers who are generally well covered for the remainder of the year, are still waiting for any development of the market which may be in their favour before giving out further orders. The absence of any pressure to sell keeps prices nominally firm, but where the market is actually tested a tendency towards weakness is evident, and there is a considerable amount of underselling amongst merchants, whilst makers, although they are not disposed to give way for anything like prompt delivery, are in some cases willing to sell over the first three or four months of next year at under current rates.

The Manchester iron market continues very quiet, and there was very little business stirring at Tuesday's meeting. Lancashire makers of pig iron report new orders to be coming in very slowly, but as they are well sold for the remainder of the year, they are firm at their quotations of 49s. to 50s., less $2\frac{1}{2}$, delivered equal to Manchester. District brands are without material change, Lincolnshire being quoted at from 49s. to 51s., less $2\frac{1}{2}$, for forge and foundry; and Derbyshire at about 51s. to 52s., less $2\frac{1}{2}$, delivered here, but very few sales are at present being made.

In the finished iron market buyers continue to fight against the recent advance in prices, but the principal makers, who have plenty of orders in hand, are very firm. In some quarters orders are reported to have been coming in rather more freely during the week, but the weight of new business altogether is only small. Prices are very irregular; for good local bars the principal makers are not taking less than £6 15s. per ton delivered into the Manchester district, but some of the local brands can be bought at £6 10s., and I have even heard of sellers as low as £6 5s. per ton; hoops can be bought at from £6 15s. to £7, although the makers generally quote £7 5s.; local made sheets average £8 12s. 6d., and Staffordshire qualities £9 per ton.

The engineering trades continue well employed, and as a rule have plenty of work in hand to keep them going for the present, but there appears to be a falling off in the quantity of new business coming in.

There seems to be a growing demand for the small class of motors, such as hot air and gas engines. The manufacture of gas engines is rapidly developing in this district, and one or two new engines are at present being brought out. Hot-air engine makers are also busy with orders both for home use and export, and this class of motor engine is coming extensively into use both for pumping purposes and for power.

An ingenious arrangement for taking measurements on the surface, at any moment, of the quantity of air passing through a mine, was described by Mr. Joseph Thompson, at a meeting of the Manchester Geological Society, held in Lynn, on Friday. In the place of the ordinary anemometers now generally used in the mines, Mr. Thompson proposes to adopt the well-known Robinson's cups, and dispensing with the present clockwork arrangement, which records the speed of the wind travelling over the cups, to connect the apparatus with an electric circuit communicating with the surface at one or any number of points, as desired. By a simple mechanical arrangement the electric circuit will be broken at every revolution of the cups, and this will be communicated by a small "dead beat" hammer on a glass or porcelain dial in the observing station on the surface. This will be contained in a small wooden box, the lid of which is furnished with a crank action to break or connect the circuit a second time as the box is closed or opened. By this arrangement the manager on the surface would be able to ascertain, at any moment, the number of revolutions which were being made by the cups in the mine, and to readily calculate the amount of ventilation passing through the workings.

The disputed point as to the relative merits of the different fans now in use for ventilating mines also came forward at the same meeting. Mr. Cockson, who had read a paper on the subject at a previous meeting, expressed the opinion that the Guibal fan, which he said had been found in Germany to give 70 per cent. of useful effect, was to be preferred to either the Waddell or the Schiele fans. Mr. C. M. Percy, who is well known for his contributions on questions connected with mine engineering, held, however, that the Schiele was the best fan, and criticised the construction of the Guibal as being wrong in principle. It was, however, generally admitted that with the varying conditions of different mines, any fair comparative test of the relative efficiency of the different fans was scarcely possible.

An illustration of the difficulty which colliery proprietors have sometimes to encounter in carrying out measures which they consider to be for the safety of their mines was also afforded at the Wigan meeting of the Manchester Geological Society. For some time past the use of "Davey" lamps in mines has been almost generally condemned as not being sufficiently safe with the present powerful system of ventilation, and at a recent meeting of the Geological Society at Hull one of the Inspectors of Mines introduced to the meeting what are known as the tin-can lamps, which he considered would be found capable of meeting the present requirements of mines. Since then these lamps have been introduced at several collieries in the district, but the men are refusing to work with them, and at one colliery have actually struck work against the introduction of the lamp. The men do not allege that the lamps are not safe, but their ground of complaint is that they do not give quite as good a light as the other lamps, a point, however, which is open to very much question. As there is a probability of this type of lamp coming into use, which is regarded by those who have already introduced it into their mines as absolutely safe, it was decided at the meeting to postpone a discussion on safety lamps, which had been intended, pending the settlement of the present dispute with the men.

The annual meeting of the West Lancashire Coalowners' Association was held at Manchester, on Tuesday, and Mr. C. G. Jackson, of the Chamber Collieries, Oldham, was elected president for the ensuing year.

A project for the construction of a new railway from Hest Bank to Ulverstone was explained to the members of the West Lancashire Coalowners' Association at the annual meeting by Mr. W. J. Walduck, of Silverdale, and in view of the rumoured acquisition by the Midland Railway Company of the Furness line, considerable importance was attached to the proposed scheme. The line is to be carried across the sands, and will lessen by fully one-half the present railway distance between Hest Bank and Ulverstone. Part of the scheme consists in the reclamation of a large area of land now covered at high tides.

In the coal trade the recent pressure for supplies has disappeared, but colliery proprietors have not yet cleared off all their old orders, and these, with a fair demand still coming in, are more than sufficient to take away all the present output, which continues limited in extent. Buyers do not show much willingness to pay the advanced prices, and in some cases there is a little giving way to secure good orders, but prices generally are without material alteration, and at the pit mouth average about 11s. for best coals; 8s. to 9s. for seconds; 6s. 6d. to 7s. 6d. for common coals; 5s. to 5s. 6d. for burgy; and 3s. 9d. to 4s. 3d. per ton for good ordinary slack.

The demand for shipment has been only moderate, and steam coal delivered at the high level, Liverpool, or at the Garston Docks, can be bought at from 8s. to 8s. 3d. per ton.

For coke there is a good demand, and with the upward movement in coal prices have generally been put up about 10d. per ton. The average quotations at the ovens now range from 10s. to 11s. for common sorts up to 14s. and 15s. per ton for the best made cokes.

The wages agitation having been settled so far as the colliers are concerned, has extended to the underground daymen, and during the past week there have been disputes at most of the collieries in the West Lancashire district, which has resulted in a number of the pits being stopped for several days. Generally advances averaging about 5 to 10 per cent. have been conceded to the daymen, and work has now in most cases been resumed. With regard to the recent advance in wages, it will be of interest to note that in the Ashton and Oldham district, where the sliding scale is in operation, the making up of the books for last quarter shows that there has been no advance realised in prices to entitle the men to an advance in the rate of pay, and in the above district wages will consequently remain without change for the next three months.

Barrow.—The tone of the hematite iron trade is somewhat quieter on the week, but no change in the actual business position. There is not quite so strong an inquiry, but there is a general disposition on the part of makers not to sell at lower values, and the business which has been transacted during the week has been at undisturbed rates. 58s. net per ton at works is the quotation of No. 1 Bessemer; No. 2, 57s.; and No. 3, 56s. Both on home and foreign account deliveries have of late been great, but on the latter no doubt there will soon be a falling off, because of the season being far advanced. Makers have a considerable amount of business on hand, and the indications are such as to warrant the assumption that, independent of new orders, good trade will continue throughout the winter. There is a brisk employment in the steel trade, especially of railway material, and the output of merchant qualities is well maintained. Iron shipbuilders are busy, and new orders are coming to hand. There is a good demand for iron ore at an average of 14s. per ton at mines. The coal trade is unchanged, but higher values are expected to be realised in a few weeks.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

I HAVE the best possible authority for stating that there is no foundation whatever for the assertion that changes are being contemplated at the Atlas Works—Messrs. John Brown and Co., Limited—"which will probably result in the discharge of a considerable number of men." It arises out of the introducing of machinery which will greatly facilitate the sawing off of armour-plate ends. These new sawing appliances will not lessen the number of hands employed. There is great activity in all the departments at the Atlas Works, and the company has not the remotest intention of discharging workmen in any part of their establishment.

Following the example so successfully set by the colliers, the ironworkers have held a meeting at Sheffield, and resolved to agitate for a 10 per cent. advance, the resolution expressing the opinion that the South Yorkshire ironworkers were entitled to this advance in virtue of the recent rise in the selling price of iron. The employers in this district are governed by the rate of wages paid in South Staffordshire. There the men are agitating for 10 per cent., and if it is given in that quarter the advance will also be conceded in South Yorkshire.

Mr. B. Pickard, the secretary of the Yorkshire Miners' Association, at Barnsley, has issued a circular in which he states that the majority of coalowners who have been appealed to have granted 10 per cent. advance, and that 114,674 men in the Midlands and Wales have voted in favour of restriction of the output. "The offer of the South Yorkshire owners of 5 per cent. and a sliding scale has not been entertained, but the offer of the West Yorkshire owners of 10 per cent. has been accepted to avoid a strike." This sentence from the circular reads as if Mr. Pickard had a rod in pickle for the South Yorkshire owners for being the last to concede the 10 per cent. Though formal acceptance of the employers' resolutions seems withheld, there is no fear of further trouble in the South Yorkshire coal-field, unless it is in the matter of restricting the output, which is exciting some uneasiness.

Coal of all kinds has promptly risen in response to the advance of wages. During October the value of house coal rose from 1s. 10d. to 2s. 1d. per ton, 1s. to 1s. 2d. of that being obtained immediately on the back of the 10 per cent. A further advance of 1s. per ton is expected during this month, there being at present a very active demand for house coal. Manufacturing fuel has also been advanced 5d. to 8d. per ton, but in face of the demand for the Baltic ports having now stopped, it is hard to see how coal for manufacturing purposes can be permanently increased in value.

Meetings are being held in this district to arrange for the restriction of the output, so as to keep up the present prices, and, if possible, secure still higher wages. The policy of restriction, if pressed, will tell more seriously against the collier than the coalowner in the long run. The coalowner will certainly lose upon running contracts, but when restriction operates closely old pits will be reopened and new hands put on to work them, and the collier will find that though he gets more money for his work, he has less work, and, practically in the end, he will have less wages to take home. The wise policy of the miners now would be to let well alone, and refrain from any attempt to force the market.

A noticeable improvement is taking place in the South American trade. There are heavy buyers from the Spanish settlements, and good orders are being placed with several Sheffield firms. From the United States there is a continued call for the best classes of cutlery, and three leading houses—Messrs. Joseph Rodgers and Sons, Limited, Messrs. Harrison, Brothers, and Howson, and Messrs. George Wostenholm and Sons, Limited—are full of work, the latter company sending largely to the Western States. The Australian orders are also very important, and the colonial demand generally is very gratifying.

The silver-plating and kindred trades are beginning to feel the order pressure at the approach of Christmas. Several very fair orders have this week been taken on metropolitan account.

The recent advances in ivory will, I hear, be followed by another 15 per cent. almost immediately. A Sheffield manufacturer told me this week, as proof of the rapid increase in value, that three years ago a complete table knife, in ivory, could be furnished at less cost than the ivory in the haft can be bought at to-day.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

VERY little business was transacted at the Cleveland iron market held at Middlesbrough on Tuesday last, and the sales of pig iron made were at prices somewhat lower than have ruled lately. The Cleveland and the Glasgow "bears" are doing their utmost to weaken the market, but it is not likely that they will succeed to any great extent. There is scarcely any pig iron to be had for early delivery, and prospects are very much in favour of producers. Stocks are being greatly reduced; the ironmasters' returns for last month are very satisfactory, and there is little doubt but that the exports for November will be above the average. Makers can, therefore, well afford to hold back. Those outside the combination and merchants having any iron to sell were on Tuesday asking for early delivery of No. 3 g.m.b., 44s. to 44s. 6d. per ton f.o.b., and there was no business done at less than the former figure. The leading firms of smelters hold to their quotation of 45s. per ton for No 3, but are now booking very few if any orders at that figure; being, however, well supplied with orders, they can afford to wait. Connal's No. 3 warrants are being offered at from 43s. 6d. to 44s. per ton f.o.b., but speculators are not inclined to give so much, consequently very little business is being done.

The stock of Cleveland iron in Messrs. Connal's store has decreased 601 tons during the week, the quantity on Monday last being 102,247 tons, as against 102,848 tons on the previous Monday.

The shipments from the Tees for the five working days ending Monday last were as follows:—Pig iron, 18,049 tons, and manufactured iron, 4449 tons.

The manufactured iron trade cannot be said to have improved during the past week. There is still a good deal of inquiry, but buyers give out their orders with reluctance, and only for what they are in urgent need of. Most of the works are, however, well supplied with orders for the present, and the cost of production having been enhanced, it is not likely that lower rates will prevail. Ship-plates are £6 12s. 6d. to £7 per ton, angles £6, and common bars £6 5s. per ton, free on trucks at works less 2½ per cent. discount. Puddle bars are £4 2s. 6d. net at works.

The demand for steel rails is somewhat better, but prices have not improved.

The Cleveland ironmasters' returns for October were issued on Friday last, and show that out of 164 furnaces built there are 121 in blast. Of these eighty-four are making Cleveland iron and thirty-seven are making hematite. At the end of September there were 120 furnaces at work. Since then, Mr. E. Williams, of the Linthorpe Ironworks, has blown in another furnace which is making hematite. Messrs. W. Whitwell and Co. have changed a furnace from hematite to Cleveland iron. There is therefore one additional furnace on native iron, the number on hematite being the same as a month ago. The make of Cleveland iron for October was 156,154 tons, and of hematite 74,077 tons, the former being 6999 tons, and the latter 3422 tons increase upon the previous month. The quantity of iron in stocks and stores altogether amounted to 239,062, being a decrease of 30,211 tons since September 30th. Stocks have fallen 195,379 tons since September 30th, 1881.

Messrs. Monkhouse, Goddard, and Co., accountants under the Durham miners' sliding scale agreement, have issued their certificate for the three months ending September 30th. They certify that the net average selling price of coal for the time named was 4s. 9·72d. per ton. The prevailing rate of wages will therefore be advanced 1¼ per cent.

The supplementary returns Mr. Waterhouse was requested to furnish to the North of England Board of Arbitration in connection with the present wages dispute have just been issued. They refer to the sales of manufactured iron made from the 1st to the 18th of October. The net average selling price is certified to have been £6 8s. 2·23d. per ton for all classes of iron, and £6 8s. 2·92d. per ton excluding rails.

The annual general meeting of the Cleveland Institute of Engineers was held on Monday evening last. A report and balance-sheet was presented, which showed that the Institute was in a flourishing condition, and had done much valuable work during the preceding year. In order, however, to provide for still further usefulness, it was announced that a proposal would be submitted to increase the subscription of members from one guinea to thirty shillings, and of graduates from half a guinea to one guinea per annum. The president-elect, Mr. E. F. Jones, of Normanby Ironworks, then read his address. The subject was the history of the Cleveland iron trade, and the author's long residence in the district enabled him to make it extremely interesting.

It is announced that there is a strong probability of the Tees-mouth being selected by the Government for a harbour of refuge for vessels engaged in the North Sea trade. There are certain advantages possessed by this locality which seem to indicate that such a harbour could be made more cheaply, more quickly, and more advantageously here than anywhere else. Thus the position of the Tees-mouth is about midway between the extreme ends of the east coast. The headlands forming the Tees Bay afford considerable shelter of themselves, and the Tees-mouth is very spacious and well adapted for deepening into a harbour. As material for the work there is a practically unlimited quantity of slag available, which may be had for almost nothing, and may be deposited wherever wanted for a cost per ton scarcely worth mentioning. It is much to be hoped that this great and useful national work will be proceeded with without delay.

The day has not yet been fixed for the arbitration upon the ironworkers' wages. The delay has arisen from the necessity for Sir J. W. Pease to remain in London until the Procedure debates have been brought to a conclusion. The masters' case for a reduction of wages has already been put in, and the representatives of the men are preparing their case for an advance. Meanwhile the old rate of wages is being paid.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

THE Glasgow iron market, which was very dull up till the close of last week, recovered a little on Monday; but there is still a want of strength in the speculative department of the trade. The shipments of pig iron turned out about 2000 tons less than was anticipated, a fact which had a bad effect, although the exports cannot be expected to continue so high at this season as they have been during the past few months. But opposite to the decrease in shipments falls to be placed the report that the ironmasters were about to increase the wages of their workmen, and it was chiefly this latter rumour which operators seized upon to give the quotations an improved turn. In the course of the week about 600 tons of pigs have been withdrawn from Messrs. Connal and Co.'s stores, and it is not now expected that the decrease of stock will be so great as of late. One furnace has been relighted at Coltness, making 114 in blast, as compared with 106 at the same date last year.

Business was done in the warrant market on Friday forenoon at 49s. 9d. to 49s. 7½d., and back to 49s. 9d. cash, and 50s. 1d. to 49s. 10½d. and 49s. 11d. one month, the afternoon quotations being 49s. 8d. to 49s. 4½d. and 49s. 6d. cash, and 49s. 8d. to 49s. 11d. one month. On Monday forenoon transactions were effected from 49s. 4½d. to 49s. 6d. cash, and 49s. 7½d. to 49s. 8½d. one month. That afternoon the market was firmer at 49s. 5d. to 49s. 8d. cash, and 49s. 8d. to 49s. 10½d. one month. On Tuesday forenoon business was done at 49s. 8½d. to 50s. cash, and 50s. to 50s. 3d. one month, business in the afternoon being at 50s. 1½d. cash, and 50s. 4½d. one month. Business was done on Wednesday from 50s. 3d. one month, and 49s. 7½d. cash. To-day—Thursday—business was done at 49s. 9d. one month, and 49s. 5½d. cash.

The quotations of makers' iron are a shade lower, as follows:—Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 64s. 6d.; No. 3, 54s. 6d.; Coltness, 69s. 6d. and 55s. 6d.; Langloan, 68s. and 56s. 6d.; Summerlee, 64s. 6d. and 54s. 3d.; Calder, 64s. and 53s. 6d.; Carnbroe, 58s. and 52s. 3d.; Clyde, 54s. 6d. and 52s. 6d.; Monkland, 51s. 9d. and 50s.; Quarter and Govan, 51s. 6d. and 49s. 9d.; Shotts, at Leith, 66s. and 56s. 6d.; Carron, at Grangemouth, No. 1, 53s.; ditto, specially selected, 57s. 6d.; No. 3, 52s.; Kinneil, at Bo'ness, 51s. and 49s. 6d.; Glengarnock, at Ardrossan, 58s. and 52s.; Eglinton, 52s. 6d. and 50s. 6d.; Dalmellington, 53s. and 51s. 6d.

The manufactured iron trade continues in an active state, and there is also a large amount of employment at the steel works, although, on account chiefly of the breakdown of the demand from America, the inquiry for steel rails is dull and the prices low. Common iron bars are quoted at £6 5s.; best bars, £6 15s.; angles, £6 5s.; ship plates, £7 5s.; and boiler plates, £11 5s. Steel angles are £9; ship plates, £10; and boiler plates, £11 5s. The exports of manufactured iron articles from Glasgow in the course of the past two weeks embraced £52,100 worth of machinery, chiefly locomotives and sugar-making plant; £3500 sewing machines; £11,000 steel manufactures, besides £1667 blooms; £78,000 various iron articles.

The coal trade is brisk, and there is a general tendency to firmer prices, the later f.o.b. advances being as a rule well maintained. In many localities, although not universally, the prices of coals have been also raised to the household consumers. There is great activity in coal in the Monkland district and likewise about Hamilton, Motherwell, and Wigham. The coalmasters have still some complaint as to a scarcity of railway trucks to convey the mineral to the ports, although the railway companies are now exerting themselves to supply the wants as much as possible. At a meeting of coalmasters in the Bedford Hotel, Glasgow, on Monday last, it was agreed to memorialise the directors of the Caledonian Railway on this subject. The meeting was but poorly attended, but it would no doubt have been otherwise had it taken place on Wednesday, which is the regular weekly market day. During the month of October 71,513 tons of coal were shipped at Burntisland, being 1000 tons more than in the same month last year, and 29,352 above those of October, 1880. Prices at the Fife ports are firm at 7s. 6d., 7s. 9d., and in some cases 8s. f.o.b. per ton. Orders for both home and foreign markets are reported on the increase. The week's shipments of coal from Leith consisted of the dispatch of twelve steamers, mostly for continental ports, carrying an aggregate of about 6000 tons. At Grangemouth the export of coals is heavy, the past week's being about 5000 tons.

The miners in Lanarkshire are this week expecting an advance of wages to the extent of 6d. a day, but the masters made the increase conditional upon their being successful in obtaining a rise in the price of coals. Some days, or perhaps a week or two in certain districts, will elapse before it is certain what course will be adopted in the matter. At a private meeting of the ironmasters on Wednesday it was resolved not to give the advance to the miners in their employment.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

OLD residents in the Welsh colliery districts well recollect the rough customs adopted with regard to injured colliers. A door was taken off its hinges, the injured man borne upon it, his head being in the lap of another workman, who, when the injury was not very severe, seemed to enjoy his ride, and showed his white teeth and eye-balls smilingly. I am glad to record civilising indications. Mr. W. T. Lewis has suggested the adoption of the St. John's Ambulance Association arrangements at every colliery, and has given an ambulance to the Lewis Merthyr Colliery as a beginning. This excellent step will, I hope, be generally followed.

There has never been seen such an accumulation of coal as was noticed the last few days in the Rhondda. Vessels could not come into port owing to stress of weather, and to take trucks down on the dock rails would have entailed demurrage. Shipping has suffered severely, and the storms have had a prejudicial effect on all departments of the coal trade. Several coal vessels from Welsh ports have been lost, and others driven into ports with damaged sails, yards, or still graver injuries. In the colliery districts some casualties have occurred from the floods. An idea of the currents flowing from old workings this week is given by one manager, who states that the current from an old level was 8ft. wide and one yard in depth, and its force tremendous.

Most out-of-door operations, bridge work, &c., have been suspended, but the iron and steel works generally have not been affected, and about 6000 tons rails and bars have been despatched during the week. The destinations were principally Aarhuus, Maceio, Baltimore, and Monte Video.

In spite of the badness of the weather 20,000 tons Spanish ore came into the ports of Cardiff and Newport last week.

Patent fuel has been the greatest sufferer by the storms. From Swansea last week instead of a total of 3000 to 5000 tons, only 110 tons were despatched. Generally the coal trade may be regarded, both house and steam, as unaltered in its prosperous state. If exports show a decline it is from the prevalence of contrary winds, and not from lack of orders, as the leading coalowners are well placed for many months to come. Prices remain about the same, but a slight advance has taken place in best coals at Swansea.

I noticed this week a fine train of Cannel coal brought into Wales for use at one of the gasworks. This is a novelty, as the Energlyn and Viponds coals are found well suited for gasworks.

The Mumbles Local Government contemplate disusing gas and obtaining electric light for their district.

The Nantyglo and Blaina Iron Company paid on Saturday a dividend—half yearly—of 4 per cent. upon their 8 per cent. preference shares.

The official announcement of "no alteration in the colliers' wages" has been made by the South Wales and Monmouthshire Sliding Scale Association.

A meeting of house coal representatives, and steam coal as well, has been held to discuss an invitation received from Leeds inviting co-operation of action in December next, restricting hours of labour and output of coal. It was finally decided to determine the question at another meeting. With regard to the restriction of hours of labour on railways, the Taff Vale Railway directors have decided not to grant the application of their *employés*. The question of proper times for the men will be left with the traffic manager, and the men can certainly depend upon thorough considerate treatment at his hands.

One of the collieries at Maesteg has been stopped, but it is not supposed to be for permanence, only for an extension of operations.

An excellent initiatory step for the good of the colliers has been taken by the Harris Deep Navigation Colliery. They propose to build houses for the colliers at a redemption price of 10s. per month. The houses are to be well-built and fitted with all accommodation, and as soon as the cost has been cleared—ten years—the house will become the collier's own property.

Pitwood is again advancing in price.

Enquiries for small coal continue unchanged.

A series of meetings have been held by the Dean Forest miners on the subject of the existing scale, and they have decided to accept the basis on which the recent advance of 5 per cent. was made.

Two men were killed on Monday at Tynebedw Colliery by the breakage of a wire rope, and work was suspended on Tuesday in consequence. It would be well to test these wire ropes periodically.

The Rhondda monthly meeting of colliers has been held, and all passed off satisfactorily.

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.

31st October, 1882.

5172. Gas, &c., Furnaces, T. Layton, Redditch.
5173. Fasteners for Wearing Apparel, J. N. Aronson, London.
5174. Arc Electric Lamps, F. L. Willard, London.
5175. Bobbins, E. Tweedale, Accrington.
5176. Constructing Bands and Joining Same, L. Binns, Bradford.
5177. Coating Surfaces of Metallic Lead, J. Mangnall, Manchester.
5178. Folding Tables, F. F. Atkinson, New York.
5179. Sewing Machines, G. Browning, Glasgow.
5180. Shaping Ends of Labels, C. Anderson and T. Cormie, Leslie, N.B.
5181. Accommodating Electrical Conductors in Streets, H. F. Joel, London.
5182. Telegraph Printing, J. Imray.—(*A. Knudson, Brooklyn, U.S.*)
5183. Secondary Voltaic Batteries, R. H. Woodley and H. F. Joel, London.
5184. Measuring Power Transmitted by Driving Belts, C. V. Boys, Wing.
5185. Securing Pendulum Clocks, J. Ganter, London.
5186. Stove-pipe Attachments, J. Wetter.—(*C. Lovell, Massachusetts, U.S.*)
5187. Umbrellas, W. E. Gedge.—(*H. Bollack and G. Mayer, Paris.*)
5188. Gas Motor Engines, T. Ashbury, H. Sumner, W. Lees, and R. W. B. Sanderson, Manchester.
5189. Cleaning, &c., Currants, &c., D. Fox and A. Wheeler, Darlington.
5190. Retaining Neckties &c., in Place, G. Schubert, London.
5191. Combined Reaping and Sheaf-binding Machine, W. McI. Cranston.—(*Walter A. Wood Mowing and Reaping Machine Company, Hoosick Falls, U.S.*)
5192. Measuring Water, &c., J. A. Muller, London.
5193. Compound for Retarding Passage of Heat, W. Whiteman.—(*R. Eberts and J. Lee, New York, U.S.*)
5194. Fastenings for Bracelets, &c., E. Jones, London.
5195. Automatic Weighing, W. T. Whiteman.—(*C. C. Clawson, Raleigh, U.S.*)
5196. Making Soap, &c., J. T. Armstrong, Newcastle-under-Lyne, and W. Bostock, Liverpool.
5197. Flushing Water-closets, W. R. Lake.—(*J. Cooper, Boston, U.S.*)
5198. Producing Bi-sulphide of Carbon Vapour, W. R. Lake.—(*W. S. Colwell, Pittsburgh, U.S.*)
5199. Combined Water and Air Pressure Motors, A. J. Boult.—(*A. Dotta, Trieste.*)
5200. Controlling Valves by Electricity, J. Formby, Formby.

1st November, 1882.

5201. Making Paper, F. Wrigley & J. Robertson, Bury.
5202. Tubes, G. Little, Oldham.
5203. Furnaces for Treating Town Refuse, B. D. Healey, Brighouse.
5204. Gas Lighting Apparatus, T. Thorp, Whitefield.
5205. Utilising Various Gums as Substitute for Gutta-percha, J. E. T. Woods, London.
5206. Retention Springs for Umbrellas, W. H. Belknap, London.
5207. Means for Raising Liquids, F. A. Bonnefin, London.
5208. Making Mould Candles, J. J. Claret, London.
5209. Sewing Machinery, F. Simmons, London.
5210. Lowering Ships' Boats, R. Duncan, Leicester.
5211. Trawl Nets, G. Read, Deal.
5212. Screw Propellers, W. Taite, Sunderland.
5213. Linings for Shirt Fronts, J. Wetter.—(*Kruse and Breying, Germany.*)
5214. Generating Petroleum Vapours, H. Swoboda, Germany.
5215. Moulding, E. Peyton & C. Burley, Birmingham.
2516. Shirt Fronts, J. W. Frost, Aldermanbury.
5217. Splitting Willow Withes, J. Y. Johnson.—(*C. Pieper, Berlin.*)
5218. Propelling Boats, J. Y. Johnson.—(*H. Martin and F. Segondy, France.*)
5219. Refrigerating Rooms, J. Y. Johnson.—(*J. B. J. Mignon and S. H. Rouart, Paris.*)
5220. Safety Valves, D. Cockburn, Glasgow.
5221. Purifying Coal Gas, C. C. Walker, Lilleshall, and W. T. Walker, London.
5222. Spinning, &c., Fibrous Substances, E. Rushworth, Idle, near Leeds.
5223. Lowering, &c., Ships' Boats, M. Bourke, U.S.
5224. Placing Fog Signals, T. Guttridge, London.

2nd November, 1882.

5225. Axle Fittings and Springs of Vehicles, H. Weatherill, Manchester.
5226. Closing Bottles, J. Airey, Darlington.
5227. Governors for Steam Engines, T. Browett and H. Lindley, Salford.
5228. Valves, &c., for Steam, &c., Fluid under Pressure, G. Furness and J. Robertshaw, Manchester.
5229. Treating Leather for Boots, &c., T. Gare, Stockport.
5230. Purifying Coal Gas, C. Estcourt, Manchester.
5231. Facilitating Formation of Words and Numbers, J. Wetter, New Wandsworth.—(*S. Ridel, France.*)
5232. Breaking, &c., Flax, &c., J. Shinn, U.S.
5233. Bathing, &c., Apparatus, W. Morgan-Brown.—(*W. W. Rosenfield, U.S.*)
5234. Bicycles, &c., G. Singer, Coventry, and W. R. Davies, Abergavenny.
5235. Increasing Draught in Chimneys, P. A. Bayle, Paris.
5236. Stopping Bottles, A. M. Davis, London.
5237. Musical Instruments, A. Banger, Worcester.
5238. Lamps, A. H. Robinson, Dublin.
5239. Furnaces, &c., A. J. Boult. (*W. Heiser, Berlin.*)
5240. Facilitating Stopping of Machinery, W. R. Lake.—(*J. A. Horton, Reading, U.S.*)
5241. Electric Time Ball, W. R. Lake.—(*Standard Time Company, Incorporated, U.S.*)
5242. Ploughs, E. Savage, Church Preen.

3rd November, 1882.

5243. Horseshoes, W. Morgan-Brown.—(*H. Gentzke, Berlin.*)
5244. Elevators for Grain, &c., H. Garland, West Kirby, and R. Bennet, Liverpool.
5245. Machinery for Spinning, &c., H. B. Barlow.—(*E. C. A. Masson, Paris.*)
5246. Metallic Wagons, R. Hudson, Gildersome.
5247. Heating Water by Gas Jets, J. H. Topham, Manchester.
5248. Digging Apparatus, F. Proctor, Stevenage.
5249. Preparing Wicks of Railway Carriage Lamps, H. Defries, London.
5250. Supplying Baths with Water, W. D. Scott-Moncrieff and W. Dodds, London.
5251. Aerial Navigation, P. Jensen.—(*G. Koch, Munich, Bavaria.*)
5252. Distilling, &c., Coal, &c., G. Hislop, Paisley.
5253. Toy Locomotive Engine, W. Hall, Beckenham.
5254. Driving Tramcars, &c., by Electricity, A. Reckenzaun, Leytonstone.
5255. Decanting Liquids and Preventing Overflow, D. G. Joy, Hull.
5256. Making Artificial Ice in Blocks, T. D. Kyle, London.
5257. Deepening the Beds of Rivers, J. N. Moerath, London.

4th November, 1882.

5258. Locks for Carriage Doors and Handles for Same, J. Edwards, London.
5259. Window Fasteners, A. E. Crisp, London.
5260. Mechanical Stopper for Bottles, C. A. Stahlin, Stockholm.
5261. Process for Making Artificial Leather, W. A. Barlow.—(*E. Pollak, Vienna.*)
5262. Making Corsets, E. W. Almond, Bristol.
5263. Apparatus for Combing Wool, &c., F. Illingworth, Bradford.
5264. Making of Coal Gas, H. E. Newton.—(*A. Klönne, Germany.*)
5265. Utilising Electricity for Medical Purposes, T. Welton, London.
5266. Closing Doors, &c., R. Chapman, Patricroft, and J. Hibbert, Manchester.
5267. Couplings for Railway Vehicles, W. Wright, and J. Pethick, Plymouth.
5268. Bearings for Screw Shafts, J. Rebecca, Liverpool.
5269. Preserving Foods, &c., W. H. Thew.—(*P. Forbes, South America.*)
5270. Rowing Boats, A. J. Boult.—(*W. Rettig, Berlin.*)
5271. Making Drawings to Scale, J. Wetter.—(*A. Wachs, Saxony.*)
5272. Leather & Flexible Hose, E. Nunan, London.
5273. Breech-loading Small-arms, A. Henry, Edinburgh.
5274. Attaching Hat Pegs, &c., on Walls, A. M. Clark.—(*Messieurs Gollot Frères, Paris.*)
5275. Millstone, W. R. Lake.—(*P. Vérat, Paris.*)
5276. Utilising Motive Force of Waves, W. R. Lake.—(*A. de Sousa, Paris.*)
5277. Constructing Water Wheels, &c., J. Knight, London.
5278. Telegraph Cables, G. E. Vaughan.—(*S. Trott and F. A. Hamilton, Canada.*)
5279. Clocks for Signalling by Electricity, W. R. Lake.—(*Standard Time Company, Incorporated, U.S.*)
5280. Signalling by Electricity, W. R. Lake.—(*Standard Time Company, Incorporated, U.S.*)

6th November, 1882.

5281. Buffing Straps for Looms, T. Brown, Manchester.
5282. Compound Marine Steam Engines, J. McFarlane, Dundee.
5283. Translucent Plates for Use as Glass, W. Kennedy, Glasgow.
5284. Tillage, S. Walter, Berlin.
5285. Artificial Dung, S. Walter, Berlin.
5286. Bobbins, J. Clayton, Bradford.
5287. Umbrella Frames, &c., S. Scherer, London.
5288. Refining Cast Iron, J. Wetter.—(*C. Lévêque, France.*)
5289. Locking Bolt, H. Scott, Liverpool.
5290. Consuming Smoke in Boilers, F. Cheesbrough.—(*C. and H. Zacharius, Vienna.*)
5291. Spinning Wool, &c., W. Turner, Bradford.
5292. Centrifugal Separating Machine, F. H. F. Engel.—(*H. Petersen, Hamburg.*)
5293. Locks for Rivers, &c., J. N. Moerath, London.
5294. Finings for Spirits, J. Blum, London.
5295. Boiler Furnaces, W. Mowatt, Slateford.
5296. Tapping Casks, G. W. von Nawrocki.—(*J. Schaefer, New York, U.S.*)
5297. Treating Fibre-bearing Leaves, H. C. Smith, Richmond.
5298. Running Metals into Several Moulds, F. Asthöwer, Germany.
5299. Finishing Interior of Hollow Ware, J. V. Hope, Wednesbury.
5300. Electro-plating with Nickel, A. J. Boult.—(*J. Vandermersch, Belgium.*)
5301. Ornamentation of Metallic Bedsteads, R. G. Hodgetts, Birmingham.
5302. Tickets for Railway Passengers, &c., A. Ellisen, London.
5303. Purifying Sewage, F. Petri, Berlin.

Inventions Protected for Six Months on Deposit of Complete Specifications.

5136. Watchman's Time Detectors, J. Wetter, New Wandsworth.—A communication from G. F. Ransom, Cleveland, Ohio, U.S.—*28th October*, 1882.
5165. Gas Cooking Stoves, &c., A. M. Clark, Chancery-lane, London.—A communicatien from W. W. Goodwin, Philadelphia, U.S.—*30th October*, 1882.
5188. Gas Motor Engines, T. Ashbury, H. Summer, W. Lees, and R. W. B. Sanderson, Manchester.—*31st October*, 1882.
5197. Flushing Water-closets, W. R. Lake, Southampton-buildings, London.—A communication from J. Cooper, Boston, U.S.—*31st October*, 1882.
5217. Splitting Willow Withes, J. Y. Johnson, Lincoln's-inn-fields, London.—A communication from C. Pieper, Berlin, Germany.—*1st November*, 1882.
5223. Lowering, &c., Ships' Boats, M. Bourke, Youngstown, U.S.—*1st November*, 1882.
5256. Making Artificial Ice in Blocks, T. D. Kyle, London.—*3rd November*, 1882.

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

4414. Gas Burners, T. Heron, Manchester—*29th October*, 1879.
4439. Heating, &c., Iron, &c., J. G. Willans, London.—*31st October*, 1879.
4470. Constructing Piers, &c., J. L. Clark and J. Stanfield, London.—*1st November*, 1879.
4520. Rick Covers, T. Jones, Rowley Regis.—*5th November*, 1879.
4534. Dynamo-electric, &c., Machines, C. W. Siemens, London.—*6th November*, 1879.
4558. Hand Combs, J. Hart, Handsworth.—*8th November*, 1879.
4574. Propeller for Ships, J. E. Liardet, Brockley.—*10th November*, 1879.
4653 Transmitting Power by Electricity, J. Hopkinson, London.—*14th November*, 1879.
4731. Measuring Cloth, &c., J. McClure, Belfast.—*20th November*, 1879.
4809. Breech-loading Snap Guns, H. F. Phillips, Rotherhithe.—*25th November*, 1879.
4903. Facilitating Conversation by Telephone, C. E. Scribner, London.—*29th November*, 1879.
4480. Turning of Three or More Sided Objects, G. W. von Nawrocki, Berlin—*3rd November*, 1879.
4516 Sawing Machinery, W. R. Lake, London.—*5th November*, 1879.
4465. Portable Wheel, R. R. Gubbins, London.—*1st November*, 1879.
4552. Washing Wool, &c., H. Illingworth, Bradford.—*8th November*, 1879.
4494. Crushing, &c., Phosphates, &c., W. R. Lake, London.—*4th November*, 1879.
4545 Combing Fibres, G. Little, Oldham, and T. C. Eastwood, Bradford.—*7th November*, 1879.
4630. Fire-grates, W. H. Warman, Bristol, and J. S. Bremner, Coalbrookdale.—*13th November*, 1879.
4666. Wire Rope Tramways, A. S. Hallidie, San Francisco, U.S.—*15th November*, 1879.
5085. Dynamo-electric Machines, &c., W. L. Wise, London.—*11th December*, 1879.
4508. Horseshoes, C. S. Tomlin, London.—*5th November*, 1879.
4513 Preventing Overwinding of Cages in Mine Shafts, J. I'anson, T. Hudson, and E. Rowe, Darlington.—*5th November*, 1879.
4536. Air-injecting Nozzles for Ventilating, A. M. Clark, London.—*6th November*, 1879.
4606. Bicycles, &c., G. Illston, Birmingham.—*12th November*, 1879.

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

3814. Rivetting, &c., H. McColl, Glasgow.—*3rd November*, 1875.
3941. Umbellas, &c., J. Hayward, Stocksbridge, and W. Hoyland, Hunshelf.—*12th November*, 1875.
4009. Singeing Woven Fabrics, A. H. Blanche, Paris.—*18th November*, 1875.

Notices of Intention to Proceed with Applications.

Last day for filing opposition, 24th November, 1882.

3042. Incandescent Electric Lamps, F. L. Willard, London.—*28th June*, 1882.
3077. Sharpening Saws, C. P. Martin, London.—A communication from E. Vallangin.—*29th June*, 1882.
3081. Making Jewellery Ornaments, &c., W. Skelhorn, London.—*30th June*, 1882.
3088. Combing Wool, &c., J. W. Bradley and J. Wood, Bradford.—*30th June*, 1882.
3095. Overflows of Valve Closets, H. Conolly and A. E. Hubert, London.—*30th June*, 1882.
3096. Water Waste Preventers, H. Conolly, London.—*30th June*, 1882.
3102. Trapping "Micas," J. Lovering and R. Martin, Cornwall.—*30th June*, 1882.
3105. Agricultural Elevators, &c., R., J., and H. Wilder, Wallingford.—*1st July*, 1882.
3107. Secondary Batteries, C. H. Cathcart, Sutton.—*1st July*, 1882.
3110. Door Furniture, J. Brownrigg, Windermere.—*1st July*, 1882.
3115. Steam Generators, L. P. Martin, Vienna.—*1st July*, 1882.
3123. Syphon for Drawing Off Liquids, F. Sara, Plymouth.—*1st July*, 1882.
3134. Grain Elevators, H. E. Newton, London.—A communication from J. F. Rojer.—*3rd July*, 1882.
3138. Tunnelling and Quarrying Slate, G. Hunter, Egham.—*3rd July*, 1882.
3254. Knife-cleaning Machines, G. Kent, London.—*8th July*, 1882.
3267. Making Heels of Boots and Shoes, J. J. Gascoine, Leicester.—*10th July*, 1882.
3295. Ink-distributing Apparatus, W. R. Lake, London.—A communication from A. S. Doane.—*11th July*, 1882
3297. Breech-loading Guns, A. N. Gavard and H. Millon, Paris.—*12th July*, 1882.
3414. Electric-telegraph Signalling Apparatus, H. E. Newton, London.—A communication from O. Zadig.—*18th July*, 1882.
3441. Regulating Electric Lamps, A. Gray and T. Gray, Glasgow.—*20th July*, 1882.
3454. Arranging Covers of Account Books, J. H. Linsey, London.—*20th July*, 1882.
3459. Checking Cords for Blinds, A. and T. H. Dix, Chester.—*20th July*, 1882.
3548. Extinguishing Fire, A. M. Clark, London.—A communication from P. C. Tabouët.—*26th July*, 1882.
3625. Making Central Fire Cartridges, C. S. Bailey, Essex.—*31st July*, 1882.
3742. Tricycles known as Convertible Sociables, I. T. Townsend, Coventry.—*5th August*, 1882.
3747. Spring Mattresses, &c., G. H. Slack, Manchester.—*5th August*, 1882.
4236. Metallic Fencing, R. J. George, Swansea—Com. from E. M. George.—*6th September*, 1882.
4302. Apparatus for Recording the Amount of Salt in the Water of Steam Boilers, &c., Hon. J. W. Plunkett, London.—*9th September*, 1882.
4390. Electric Lamp Holders, J. W. Swan, Newcastle-upon-Tyne, and C. Swan, London.—*15th September*, 1882.
4587. Regulating Transmission of Power to Bellows of Organs, J. Johnson and R. Talbot, Blackburn.—*27th September*, 1882.
4609. Raising, &c., Rivetting Machines, R. H. Tweddell, Westminster, and J. Fielding, Gloucester.—*28th September*, 1882.
4735. Secondary Batteries, C. T. Kingzett, Tottenham.—*5th October*, 1882.
4781. Watches, J. A. Knott, Balsall Heath, Worcester.—*7th October*, 1882.
4783. Opening and Closing Window Sashes, &c., G. Hurdle, Southampton.—*7th October*, 1882.
4797. Steam, &c., Engines, C. A. and R. C. Parsons, and J. H. Kitson, Leeds.—*9th October*, 1882.
4819. Dynamo or Magneto-electric Machines, W. R. Lake, London.—A communication from J. Wenström.—*10th October*, 1882.
4833. Coating Tin and Terne Plates, T. H. Johns, Hackney.—*11th October*, 1882.
4881. Lubricating Steam Engines, G. Varley and W. Gregory, Over Darwen.—*14th October*, 1882.

Last day for filing opposition, 28th November, 1882.

3109. Preventing Boat Accidents, H. O. A. E. Grunbaum, Stratford.—*1st July*, 1882.
3124. Steam, &c., Steering Apparatus, J. Hastie, Greenock.—*3rd July*, 1882.
3129. Generating Electricity, T. Varley, Walthamstow, and H. Greenwood, London.—*3rd July*, 1882.
3130. Fan for Exhaust or Blast Purposes, G. M. Capell, Northampton.—*3rd July*, 1882.
3136. Shackles, R. M. Ruck, Chatham.—*3rd July*, 1882.
3144. Barb-wire for Fences, F. C. Glaser, Berlin.—Com. from A. Schniewindt.—*4th July*, 1882.
3148. Ventilating Waterproof Rain-cloaks, &c., A. Sachs, Berlin.—*4th July*, 1882.
3150. Dynamo-electric, &c., Machines, R. Werdermann, London.—*4th July*, 1882.
3152. Making Boots and Shoes, T. Morgan, London.—Com. from F. A. Schmider.—*4th July*, 1882.
3158. Cooking Food, G. W. von Nawrocki, Berlin.—Com. from C. Becker and J. Reunert.—*4th July*, 1882.
3164. Boiler for Distilling Liquids, W. A. Barlow, London.—Com. from J. Gareis.—*4th July*, 1882.
3170. Pavement, &c., Lights, T. G. Webb, Manchester.—*5th July*, 1882.
3173. Recording Speech, J. Imray, London.—Com. from A. Gentilli and L. Alexander.—*5th July*, 1882.
3174. Horseshoes, M. Bauer, Paris.—A communication from J. R. Cancio.—*5th July*, 1882.
3197. Tension Couplings, J. T. Mitchell, Mere, Wilts.—*6th July*, 1882.
3212. Making Gas, J. Thomas, Bodmin, and C. J. Ennor, Oporto.—*7th July*, 1882.
3213. Valves, J. Thomas, Bodmin, and C. J. Ennor, Oporto.—*7th July*, 1882.
3235. Collectors, J. T. Mitchell, Mere, Wilts.—*7th July*, 1882.
3247. Axles, &c., H. J. Haddan, London.—A communication from E. Mers.—*8th July*, 1882.
3261. Spinning, &c., J. Myers and B. Berry, Bradford.—*10th July*, 1882.
3274. Driving-gear, J. H. Johnson, London.—A communication from G. S. Strong.—*11th July*, 1882.
3278. Boot Burnishing Machines, H. J. Haddan, London.—Com. from C. Blakeley.—*11th July*, 1882.
3279. Electric Lamps, J. S. Beeman, London.—*11th July*, 1882.
3349. Incandescent Electric Lamp Appliances, J. S. Beeman, London.—*14th July*, 1882.
3351. Automatically Shunting Electric Currents, J. S. Beeman, London.—*14th July*, 1882.
3409. Plates for Secondary Batteries, W. Taylor, Tottenham, and F. King, New Cross.—*18th July*, 1882.
3452. Screw Propellers, R. Duncan, Glasgow.—*20th July*, 1882.
3455. Dynamo-electric Machinery, J. S. Beeman, London.—*20th July*, 1882.
3467. Acoustic, &c., Instruments, F. Wirth, Germany.—A communication from A. Rettig.—*21st July*, 1882.
3491. Producing Photographic Images, E. G. Colton, London.—*22nd July*, 1882.
4048. Making Blue Colouring Matter, &c., F. Wirth, Germany.—Com. from E. Oehler.—*22nd August*, 1882.
4282. Ring Spinning, E. Clarke, Todmorden.—*8th September*, 1882.
4364. Producing Caustic Alkalies, &c., W. L. Wise, London.—Com. from C. Lowig.—*14th September*, 1882.
4386. Crayon-holders, J. H. Johnson, London.—Com. from J. Reckendorfer.—*14th September*, 1882.
4441. Coupling Railway Vehicles, C. C. Braithwaite, London.—*19th September*, 1882.
4452. Guard Rails for Fishing Boats, J. Gunn, Golspie, N.B.—*19th September*, 1882.
4495. Machines for Making Bricks, W. R. Lake, London.—A communication from H. R. Dickinson.—*20th September*, 1882.
4516. Fire-arms, W. W. Greener, Birmingham.—*21st September*, 1882.
4542. Pumps, J. S. Sawrey, A. Attwood, and H. Woodburne, Ulverston.—*23rd September*, 1882.
4544. Compound Atmospheric Funnels, E. Wery, London.—A communication from G. E. Wery.—*23rd September*, 1882.
4574. Hydraulic Machines for Shearing, &c., R. H. Tweddell, Westminster.—*26th September*, 1882.
4706. Making Paper Bags, W. L. Wise, London.—Com. from M. N. Stanley.—*3rd October*, 1882.
4806. Harvesting Machines, J. Hornsby, J. Innocent, and G. Rutter, Grantham.—*9th October*, 1882.
4821. Apparatus for Transporting Afloat Barges, &c., C. D. Abel, London.—A communication from C. G. Viehoff.—*10th October*, 1882.
4837. Constructing Vehicles Propelled by Human Force, C. Truman, Birmingham.—*11th October*, 1882.
4853. Compound for Making Tight Joints, A. J. Scollick, London.—A communication from H. Simons.—*12th October*, 1882.
5020. Mechanical Musical Instrument Motors, G. D. Garvie and G. Wood, New York, U.S.—*21st October*, 1882.
5037. Governors, W. P. Thompson, London.—A communication from F. Cumnver.—*23rd October*, 1882.
5165. Gas Cooking Stoves, A. M. Clark, London.—Com. from W. W. Goodwin.—*30th October*, 1882.
5217. Machines for Splitting Willow-withes, J. Y. Johnson, London.—A communication from C. Pieper.—*1st November*, 1882.
5223. Lowering Ships' Boats, M. Bourke, Youngstown, U.S.—*1st November*, 1882.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 3rd November, 1882.*)

1837. Steam Boilers, J. Imray, London.—*18th April*, 1882.
2114. Perambulator Wheels, T. Cooke, Manchester.—*5th May*, 1882.
2117. Grinding, &c., Flint, J. Goodwin, Stoke-upon-Trent.—*5th May*, 1882.
2121. Water-closet Basins, T. W. Helliwell, Brighouse.—*5th May*, 1882.
2133. Stoves for Consuming Petroleum, &c., F. J. Duggan, Bristol.—*6th May*, 1882.
2137. Revolving Harrows, &c., E. Button, Stanway.—*6th May*, 1882.
2139. Velocipedes, B. Bennett, Coventry.—*6th May*, 1882.
2146. Liquid Measuring, &c., Apparatus, E. G. Rivers, Thornton Heath.—*6th May*, 1882.
2148. Tricycles, &c., W. Dawes and J. Tankard, Leeds.—*6th May*, 1882.
2153. Penholders, W. Sinclair, East Linton.—*8th May*, 1882.
2156. Preparing Photographic Plates, F. Wirth, Germany.—*8th May*, 1882.
2159. Automatically Playing Pianofortes, A. Wilkinson, Bradford.—*8th May*, 1882.
2161. Refining Sugar, A. Scott, jun., J. D. Scott, and T. R. Ogilvie, Greenock.—*9th May*, 1882.
2202. Motor Engines Worked by Gas, &c., S. Clayton, Bradford.—*10th May*, 1882.
2209. Graining, &c., Surfaces, S. J. J. Kelly, London, and C. B. Lindsay, Blackheath.—*10th May*, 1882.
2266. Combined Letter-box and Name Plates, W. Newell, Birmingham.—*13th May*, 1882.
2288. Electric Lamps, E. L. Voice, London.—*16th May*, 1882.
2295. Compensating Dynamo-electric Machines, B. H. Chameroy, France.—*16th May*, 1882.
2299. Cabinets or Stands, W. R. Lake, London.—*16th May*, 1882.
2355. Cutting Teeth of Files, P. Ewens, Cheltenham.—*19th May*, 1882.
2368. Indicators for Steam Engines, G. Hambruch, Berlin.—*19th May*, 1882.
2380. Velocipedes, A. Phillips, South Birmingham.—*20th May*, 1882.
2437. Telephonic Apparatus, W. R. Lake, London.—*23rd May*, 1882.
2474. Fluid Meters, C. D. Abel, London.—*24th May*, 1882.
2496. Breech-loading Ordnance, T. Nordenfelt, London.—*25th May*, 1882.
2498. Door Fasteners, A. M. Clark, London.—*25th May*, 1882.
2534. Paper-makers' Drying Felts, T. Aitken, Helmshore.—*27th May*, 1882.
2556. Window Screens, G. L. Reynolds, California.—*30th May*, 1882.
2574. Decorticating Grain, J. Wetter, New Wandsworth.—*31st May*, 1882.
2576. Compressing Air, &c., W. Darling and R. Sellers, Keighley.—*31st May*, 1882.
2608. Folding Slates or Writing Tablets, C. D. Abel, London.—*2nd June*, 1882.
2660. Carbon Burners for Electric Lamps, J. Wetter, New Wandsworth.—*7th June*, 1882.
2664. Making Sulphide of Sodium, G. W. von Nawrocki, Berlin.—*7th June*, 1882.
2682. Treating Carbonaceous, &c., Substances, H. Aitken, Falkirk.—*8th June*, 1882.
2924. Pencil, &c., Holders, F. Hardtmuth, Budweis.—*20th June*, 1882.
3156. Engraving Machines, H. J. Haddan, London.—*4th July*, 1882.
3236. Arc Electric Lamps, F. M. Rogers, London.—*7th July*, 1882.
3366. Smoke-flues, &c., H. J. Haddan, London.—*15th July*, 1882.
3426. Dust-collecting Flues, &c., H. J. Haddan, Kensington.—*19th July*, 1882.
3666. Wire Conductors for Electrical Purposes, P. B. de Faucheux d'Humy, Clapham-road, London.—*2nd August*, 1882.
3710. Electric-lighting, T. Parker, Coalbrookdale, and P. B. Elwell, Wolverhampton.—*4th August*, 1882.
3718. Machines for Crushing, &c., Ore and Grain, W. R. Lake, London.—*4th August*, 1882.
3772. Thrashing Machines, W. R. Lake, London.—*8th August*, 1882.
3774. Repeating Fire-arms, J. Imray, London.—*8th August*, 1882.
3872. Folding Chairs, W. R. Lake, London.—*14th August*, 1882.
3882. Telephonic Apparatus, F. R. Welles, Antwerp.—*15th August*, 1882.
3896. Art of Brewing Malt Liquors, L. Varicas, London.—*15th August*, 1882.
3904. Process of Bleaching, C. Toppan, Salem, U.S.—*15th August*, 1882.
3920. Balances, H. J. Haddan, London.—*16th August*, 1882.
3944. Sash Fasteners, G. J. Dickson, Albany, New York, U.S.—*17th August*, 1882.
3962. Under-covering of Cylinders, &c., B. J. B. Mills, London.—*18th August*, 1882.
3982. Electric Signalling Apparatus, R. H. Brandon, Paris.—*19th August*, 1882.
4094. Making Starch, &c., W. R. Lake, London.—*26th August*, 1882.
4141. Reciprocating Pistons, H. J. Haddan, London.—*30th August*, 1882.
4155. Apparatus for Evaporating Liquids, &c., A. Podewils, Munich.—*31st August*, 1882.

(*List of Letters Patent which passed the Great Seal on the 7th November, 1882.*)

2152. Apparatus for the Combustion of Fuel, W. Beasley, Birmingham.—*8th May*, 1882.

2154. Lubricating Composition, H. Montgomerie, Cleadon.—8th May, 1882.
2158. Lamps for Bicycles, &c., H. F. D. Miller, Birmingham.—8th May, 1882.
2164. Regulating, &c., Flow of Water, T. S. Borradaile and E. J. C. Welch, London.—9th May, 1882.
2167. Rotary Engines, W. P. Thompson, London.—9th May, 1882.
2171. Cooling or Refrigerating, W. P. Thompson, London.—9th May, 1882.
2182. Clocks, A. Harder, Ransen, Prussia.—9th May, 1882.
2189. Sharpening Razors, A. Payne, East Moulsey.—10th May, 1882.
2190. Automatically Working Railway Signals, W. Goalen, London.—10th May, 1882.
2198. Preparing Hides, &c., J. S. and B. Stocks, Leeds.—10th May, 1882.
2200. Indicating a Ship's Position, A. W. Tuer and J. Cleminson, London.—10th May, 1882.
2201. Railway Signals, A. W. Tuer and J. Cleminson, London.—10th May, 1882.
2212. Wire Woven Fabric, A. Arnold, Halifax.—10th May, 1882.
2218. Elastic Couplings for Ropes, &c., J. Greenwood, Southend.—11th May, 1882.
2224. Producing Nitrous Vapours, G. Prim, Mons.—11th May, 1882.
2228. Freezing Liquids, A. Allworth, London.—11th May, 1882.
2230. Winding Engines, T. Perkins, Hitchin.—11th May, 1882.
2301. Fastenings for Gloves, &c., T. Hinks, T. Hooper, and S. G. Moore, Birmingham.—16th May, 1882.
2331. Spring Mattress and Bedstead, S. Isaacs, Birmingham.—18th May, 1882.
2362. Engines and Pumps, C. Woodward, Leeds.—19th May, 1882.
2378. Preserving Leather, W. E. Gedge, London.—20th May, 1882.
2425. Incandescent Electric Lamps, J. J. Barrier and F. T. de Lavernède, Paris.—23rd May, 1882.
2469. Shuttle-box for Looms, W. P. Thompson, London.—24th May, 1882.
2505. Axle-boxes, H. Simon, Manchester.—26th May, 1882.
2508. Cutting Screw-threads, J. H. Johnson, London.—26th May, 1882.
2575. Removing Vegetable Matter from Wool, J. Wetter, New Wandsworth.—31st May, 1882.
2654. Electric Lamps, R. J. Hatton, Stratford, and A. L. Paul, London.—6th June, 1882.
2814. Metallic Bedsteads, &c., T. Wilson, Birmingham.—14th June, 1882.
3058. Rollers for Transferring, Printing, &c., E. C. Hancock, Worcester.—28th June, 1882.
3502. Fuel Economisers, J. G. Perkin and J. Scott, Wakefield.—22nd July, 1882.
3619. Facilitating Electric Lighting, J. Verity, London.—31st July, 1882.
3740. Bleaching or Decolorising, J. C. Mewburn, London.—5th August, 1882.
3910. Coffins, S., J., and R. Turner, Rochdale.—16th August, 1882.
4091. Wind Motors, H. Lubben, Hanover.—26th August, 1882.
4185. Stoppers for Bottles, &c., N. Thompson, Brooklyn, U.S.—2nd October, 1882.

List of Specifications published during the week ending November 4th, 1882.

198,* 2d.; 759, 8d.; 1211, 6d.; 1241, 6d.; 1336, 8d.; 1449, 8d.; 1365, 6d.; 1369, 6d.; 1379, 2d.; 1380, 2d.; 1393, 8d.; 1404, 6d.; 1451, 2d.; 1455, 2d.; 1457, 2d.; 1459, 4d.; 1466, 2d.; 1474, 6d.; 1475, 2d.; 1481, 2d.; 1482, 2d.; 1483, 2d.; 1485, 2d.; 1486, 6d.; 1489, 2d.; 1490, 10d.; 1492, 6d.; 1493, 2d.; 1494, 6d.; 1495, 2d.; 1496, 6d.; 1497, 2d.; 1500, 2d.; 1501, 2d.; 1503, 6d.; 1504, 2d.; 1505, 6d.; 1507, 2d.; 1508, 2d.; 1509, 2d.; 1510, 2d.; 1513, 6d.; 1514, 2d.; 1515, 8d.; 1516, 4d.; 1517, 2d.; 1519, 6d.; 1520, 6d.; 1521, 2d.; 1522, 6d.; 1523, 4d.; 1524, 2d.; 1525, 2d.; 1526, 10d.; 1527, 6d.; 1528, 2d.; 1530, 2d.; 1531, 6d.; 1532, 6d.; 1533, 6d.; 1534, 2d.; 1535, 2d.; 1537, 2d.; 1538, 8d.; 1539, 2d.; 1540, 2d.; 1541, 2d.; 1543, 6d.; 1544, 2d.; 1546, 2d.; 1547, 6d.; 1548, 6d.; 1549, 4d.; 1550, 2d.; 1551, 6d.; 1553, 2d.; 1555, 2d.; 1556, 4d.; 1557, 2d.; 1558, 2d.; 1559, 2d.; 1560, 6d.; 1561, 4d.; 1562, 2d.; 1563, 6d.; 1564, 6d.; 1566, 4d.; 1568, 2d.; 1569, 6d.; 1570, 6d.; 1571, 6d.; 1572, 2d.; 1574, 6d.; 1575, 6d.; 1576, 6d.; 1578, 6d.; 1580, 6d.; 1581, 2d.; 1584, 6d.; 1586, 4d.; 1587, 4d.; 1588, 2d.; 1589, 2d.; 1590, 6d.; 1592, 6d.; 1593, 4d.; 1594, 6d.; 1595, 2d.; 1596, 2d.; 1598, 6d.; 1599, 2d.; 1600, 6d.; 1601, 4d.; 1603, 6d.; 1604, 4d.; 1605, 2d.; 1606, 6d.; 1607, 6d.; 1608, 8d.; 1609, 2d.; 1610, 8d.; 1611, 2d.; 1613, 2d.; 1614, 6d.; 1615, 6d.; 1616, 2d.; 1617, 8d.; 1621, 2d.; 1622, 6d.; 1623, 6d.; 1624, 6d.; 1626, 8d.; 1627, 8d.; 1628, 2d.; 1629, 2d.; 1630, 4d.; 1631, 2d.; 1632, 6d.; 1633, 8d.; 1634, 6d.; 1635, 6d.; 1637, 6d.; 1638, 6d.; 1640, 6d.; 1641, 6d.; 1643, 4d.; 1644, 6d.; 1646, 4d.; 1647, 6d.; 1648, 2d.; 1649, 6d.; 1651, 6d.; 1652, 4d.; 1654, 2d.; 1655, 4d.; 1656, 6d.; 1657, 8d.; 1658, 2d.; 1659, 8d.; 1662, 8d.; 1665, 4d.; 1666, 6d.; 1667, 2d.; 1669, 6d.; 1670, 4d.; 1671, 6d.; 1675, 6d.; 1682, 6d.; 1683, 6d.; 1687, 2d.; 1688, 4d.; 1694, 6d.; 1697, 6d.; 1702, 6d.; 1703, 6d.; 1705, 4d.; 1726, 6d.; 1742, 4d.; 1775, 4d.; 1798, 4d.; 1817, 2d.; 1851, 4d.; 1929, 6d.; 1949, 6d.; 2240, 6d.; 3445, 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.*

759. Purifying Anthrachinone and Alizarines, &c., *J. A. Dixon, Glasgow.*—16th February, 1882.—(*A communication from J. Brönner, Frankfort-on-the-Maine.*) 8d.

This consists, First, in the process and method of purifying anthrachinone and alizarines and other substances by crystallisation from volatile solvent media; and, Secondly, in the construction of the apparatus to carry out such process.

1211. Machinery for Obtaining Electric Currents, *H. E. Newton, London.*—13th March, 1882.—(*A communication from A. J. Gravier, Paris.*) 6d.

A ring carries a series of inductor coils, overlying which are the induced coils.

1241. Brooms and Brushes, *J. G. Horsey, Mile-end.*—14th March, 1882. 6d.

This relates to means whereby the bristles are knocked up and kept in position with their ends in regular order in a vibrating and shaking box or hopper and ready to be taken in small quantities by a reciprocating tuft extractor and conveyed by it to a receiver and thence to a guide in succession, and forced by a plunger in a folded state down a guide into a hole of the brush-stock, which is arranged by hand on an adjustable table and gauged in position by a finger.

1336. Covered or Insulated Wire, *A. J. Boult, London.*—18th March, 1882.—(*A communication from J. D. Thomas and L. F. Requa, New York.*) 8d.

This relates to machinery to cover wire for electrical and other purposes, first with a layer of india-rubber, then a layer of cord or tape, which may be tarred or otherwise waterproofed, and, lastly, with a second layer of india-rubber.

1349. Railway Signals, *J. Livesey, Blackburn, and S. Whitehall and R. Becconsall, Summerseat, Lancashire.*—20th March, 1882. 8d.

This relates to means for signalling to the driver of engines in foggy weather without using fog signals, and consists in the use of a lever, which, when raised, actuates a whistle on passing engines.

1363. Secondary Batteries, *F. Maxwell-Lyte, Savile-row.*—21st March, 1882. 4d.

Fuses lead salts and casts upon conducting cores, reducing the salts by electrolysis, or introduces the salts within the pores or ramifications of a network of wire.

1365. Moving the Rollers of Rolling Mills for Iron, &c., *F. Asthower and T. Bicheroux, Westphalia.*—21st March, 1882. 6d.

This consists in driving each roller of rolling mills for metals independently from the other by a belt from two driving shafts geared together, so as to rotate at the same speed in opposite directions, and one of the rolls being driven from one shaft and the other from the second shaft by belt and pulley.

1369. Metal Drums for Oil, &c., *H. D. B. Wall, Liverpool.*—21st March, 1882. 6d.

This relates to means for attaching the drum head or cover to the body, and to means for securing a handle thereto when in use, such handle being first stowed inside the drum. The top of the drum has a hoop round it, and between it and the body a piece of tin is inserted, to which the cover is soldered and can be removed by cutting through the tin. The handle is placed inside the drum, and when required to be used its ends—which are turned upwards and inwards—are forced into holes in the hoop, previously closed by pieces of tin soldered over them.

1379. Fire Buckets, *J. M. B. Baker, London.*—22nd March, 1882.—(*Not proceeded with.*) 2d.

This consists of a cylinder containing muriate of ammonia or other suitable chemical, which, by depressing a piston in the cylinder, is injected in measured quantities into the water contained in the fire buckets.

1380. Raising Water for Artificial Fountains, &c., *B. J. B. Mills, London.*—22nd March, 1882.—(*A communication from J. Fangeat, Lyons.*)—(*Not proceeded with.*) 2d.

This relates to the use of a windlass operated by a weight, and on the axis of which is a wheel gearing with a pinion, on whose axis is a second wheel gearing with a second pinion, and so on up to four or five shafts. Upon the shaft of the last pinion is a fly carrying at one part of its felly an axis of T form, the upper arm carrying two grooved pulleys embracing a pendulum with a horizontal balance at its upper part, to which it transmits movement. The rods of the pumps are attached to the balance.

1392. Incandescent Electric Lamps, *D. Graham and H. J. Smith, Glasgow.*—22nd March, 1882.—(*Not proceeded with.*) 2d.

Describes only carbons of different shape to those ordinarily used.

1393. Obtaining Sulphur, &c., *F. B. Rawes, Stratford.*—22nd March, 1882. 8d.

This consists in the combined process for converting certain sulphates into hydrogen sulphide by first reducing the sulphate into a sulphide by heat and by contact with a reducing agent or mixture in a closed vessel from which air is excluded, and treating the sulphide with carbon dioxide in a closed vessel containing an intermedium, air being excluded and means provided for agitation. Also in the construction of the apparatus to carry out the process, and in utilising the bye-products.

1400. Incandescent Electric Lamps, *T. E. Gatehouse, Camberwell.*—23rd March, 1882. 2d.

Describes a compound conductor, such as of platinum and carbon.

1404. Manure, *E. Fisher, Beverley.*—23rd March, 1882. 6d.

This consists in converting woollen rags, shoddy, and other woollen waste and animal fibre into manure by introducing it with a proper quantity of sulphuric acid or other mineral acid into an ordinary manure mixing machine with revolving knives to agitate the contents. The machine is surrounded by flues or heating chambers, so as to heat the same, while the operation is being carried on.

1405. Paper Files and Binder, *A. Ellis, Lewes.*—29th March, 1882. 6d.

Two metal plates are hinged together, and one carries a metal tube forming a quadrant of a circle, while the other carries a rod of corresponding shape. The papers are filed on the tube, and when desired to hang up the file, the plate carrying the rod is turned on the hinge, so that the rod enters the tube, and the file is then suspended by a loop formed on the inner end of the other plate.

1412. Electric Lighting, *O. E. Woodhouse and F. L. Rawson, Queen Victoria-street.*—23rd March, 1882. 6d.

Refers to the use of a partially-reflecting globe for incandescent lamps; to clips and junctions, &c., of the carbons.

1423. Apparatus for Cooking, &c., *A. J. Boult, London*—24th March, 1882.—(*A communication from J. Dudley, Liège.*)—(*Not proceeded with.*) 2d.

This consists essentially in forming movable galleries or dishes with or without perforated bottoms in the saucepan or other boiler above the bottom.

1424. Machines for Trimming the Heels of Boots or Shoes, *W. R. Lake, London.*—24th March, 1882—(*A communication from The Tyler Manufacturing Company, Portland, Main, U.S.*)—(*Not proceeded with.*) 4d.

This relates to several improvements in heel-trimming machines, in which the heel is rotated against a shaving knife, which is automatically tipped as the heel rotates to keep it at the proper angle of inclination relatively to the heel.

1425. Velocipedes, *A. Pengelly and R. Day, Highbridge.*—24th March, 1882. 8d.

This relates, First, to the general construction, arrangement, and combination of velocipedes capable of carrying one or several persons at one and the same time or separately; Secondly, to the combination of velocipedes and floating structures.

1444. Electric Incandescent Lighting Apparatus, *R. Werdermann, Princes-street, Surrey.*—25th March, 1882. 6d.

A carbon rod forming an electrode impinges against a block forming another electrode. Water, mercury, glycerine, or other pressure is employed to keep the contact. A disc of steatite, magnesia, or other suitable material is fixed to the carbon rod, to prevent a too great length incandescing.

1451. Cigarette Papers on Wrappers, *A. G. Goodes, Newgate-street.*—25th March, 1882.—(*Void.*) 2d.

The object is to render the paper waterproof and prevent it sticking to the lips, and it consists in coating the end with a mixture of albumen and a suitable yellow colouring matter, and when dry applying a coating of silicate, preferably silicate of potash.

1455. Secondary Batteries, *G. Molloy, Dublin.*—27th March, 1882.—(*Not proceeded with.*) 2d.

Each plate consists of thin sheet lead suitably folded, closely corrugated, and fitted with a frame.

1457. Looms, *L. A. Groth, London.*—27th March, 1882—(*A communication from H. Vogt, Berlin.*)—(*Not proceeded with.*) 2d.

This relates to apparatus for tightening warp, and in self-acting regulating devices connected therewith, the object being to simplify the operation of changing the warp beam.

1459. Portable Field Forge, *L. A. Groth, London.*—27th March, 1882.—(*A communication from A. F. Hammel, Copenhagen.*) 4d.

The invention consists of a hearth (connected with an inner case), and an outer case, both made of sheet iron and capable of sliding one within the other. A rotary fan is mounted at the side and worked by a screw, so as to send a stream of air under the hearth.

1462. Electric Lamps, *S. Waters, Ladbroke-square.*—27th March, 1882. 2d.

Refers to the making of one part of the globe of incandescent lamps into a mirror, the material being sufficiently thin as to be semi-transparent.

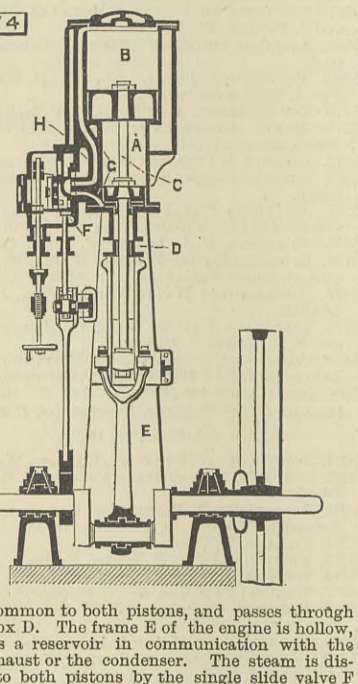
1466. Perforated Tiles, *W. L. Fison, Stowmarket.*—27th March, 1882.—(*Not proceeded with.*) 2d.

This consists in forming perforated tiles for draining cereals and other substances with strengthening ribs on their under side, all lying parallel to one another in one direction, so as to form a series of straight grooves which can be cleared out by a brush.

1474. Steam Engines, *W. R. Lake, London.*—27th March, 1882.—(*A communication from E. D. Farcot, Paris.*) 6d.

This relates to improvements in engines in which the steam is successively expanded in cylinders of different diameters, and consists mainly in placing the cylinders directly in a line with one another, and with no division or stuffing-box between them, so that each cylinder is single-acting. A is the small cylinder, and B the large cylinder placed above it. The piston

1474



rod C is common to both pistons, and passes through stuffing-box D. The frame E of the engine is hollow, and forms a reservoir in communication with the steam exhaust or the condenser. The steam is distributed to both pistons by the single slide valve F being admitted through ports G, and exhausted through the port H. The space between the two pistons is constantly in communication with the reservoir and steam exhaust.

1475. Utilising Pneumatic Pressure as a Motive Power, *W. R. Lake, London.*—27th March, 1882.—(*A communication from G. V. Sheffield, New York.*)—(*Not proceeded with.*) 2d.

The object is to maintain a vacuum in a vessel or vessels connected by pipes with a motor, so that the latter may be operated by atmospheric pressure.

1481. Heating Water, *A. J. Billing, London.*—28th March, 1882.—(*Not proceeded with.*) 2d.

A water holder is formed with a smoke or fire tube passing through it, the outer casing being then continued down and a flat shallow vessel placed therein and connected by two tubes with the lower part of the water holder. A gas tube and burners are placed beneath the shallow vessel, and heat the apparatus.

1482. Washing Clothes, *R. E. Wearden, Manchester.*—28th March, 1882.—(*Not proceeded with.*) 2d.

This relates to a substitute for the transversely corrugated washing boards now used, and consists of an open frame, in which a series of transverse rollers are mounted so as to revolve, their surfaces being in contact, or nearly so, forming together a corrugated surface, against which the clothes are to be rubbed.

1483. Coiling Machine, *C. L. Clarke and J. Leigh, Manchester.*—28th March, 1882.—(*Not proceeded with.*) 2d.

This relates to improvements on patent No. 3652, A.D. 1881, for a machine for making induction and resistance coils, the object being to simplify the same and render it more automatic, and it consists in using a short spindle with a right and a left-handed thread cut thereon, and driven in one direction. The guide rod has a swing bracket, with a half nut at each end, corresponding respectively with the two threads on the spindle, so that as the guide rod is rocked one nut will be brought in gear with the spindle, and so moved to the right or left.

1485. Increasing the Illuminating Power of Gas, *F. H. Wenham, Shepherd's Bush.*—28th March, 1882.—(*Void.*) 2d.

Gas is conveyed downwards through a vertical pipe to a burner perforated with small orifices at the under end. Air is caused to pass between the chimney and an inner cylinder, and is heated before passing to the burner.

1486. Bottles, *D. Rylands, near Barnsley.*—28th March, 1882. 6d.

This consists in forming the groove to receive the india-rubber washer of internally stoppered bottles tapering from the outside to the inside, so as to grip the washer when placed in position. In bottles with discs or similar stoppers a swelling or bulb is formed in the neck, just near enough to the mouth so that a single turn of the disc when the bottle is full will bring the disc in the position to form a tight joint against the washer.

1489. Sights for Fire-arms, *L. Loewenthal and D. de R. Willoughby, London.*—28th March, 1882.—(*Not proceeded with.*) 2d.

This consists in the employment of a piece of white or other suitable coloured substance which will readily catch the eye, and is fixed near the muzzle end of the barrel.

1492. Folding Cots or Bed Frames, *J. Rycroft, Manchester.*—28th March, 1882.—(*A communication from E. S. Griffith, Toledo, Ohio, U.S.*) 6d.

The object is to produce a bed frame which will combine strength and lightness, and also fold compactly into a small space, and it consists principally in the mode of hinging the different parts together, and securing them in position when opened out for use.

1493. Preparing and Coating the Interior of Lead Pipes, *D. Walker, Highbury, and W. S. Simpson, Battersea Park-road.*—28th March, 1882.—(*Not proceeded with.*) 2d.

In order to clean the interior of lead pipes to prepare them for a coating of varnish, paint, lacquer, or enamel, a revolving brush is inserted therein, and afterwards a sponge and drying cloths. The coating material is then forced into the pipe by means of a piston, and another revolving brush inserted to spread it evenly, a flexible brush being then drawn through the tube to finish the coating, which is then dried by any suitable means.

1494. Treatment of Gases arising from the Manufacture of Salts of Ammonia from Gas Liquor, *P. Spence, Manchester.*—28th March, 1882. 6d.

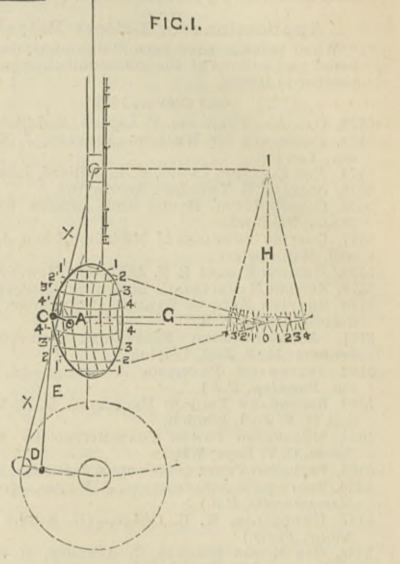
This consists is utilising the sulphuretted hydrogen arising from the manufacture of salts of ammonia from gas liquor, for the production of sulphuric acid, by bringing it into contact with the sulphuretted oxide of the gas works when being burned for the manufacture of the sulphuric acid.

1490. Steam and other Motive Power Engines, *A. Morton, Glasgow.*—28th March, 1882. 10d.

This relates to the mechanism for actuating the distribution valves of steam and other motors, so that when the piston has travelled equidistant from either end of its stroke, the valve may be relatively equidistant from the end of its stroke, whether in forward or backward gear, or in any intermediate position. The object is to equally distribute the steam to both ends of the cylinder, whether in the

1490

FIG. I.



position of full or intermediate gear, and it consists, First, in the means for actuating a movable point or centre C on the end of rod A, and shown in the diagram, Fig. 1, as actuated from an overhung crank D—on the main crank pin of the engine—through the link E, so that it is caused to radiate on or equally across the centre line of the connecting rod X, and thus describe the path of an elliptical figure whose major axis becomes a segment of a circle, and where the major and minor ordinates intersect each other at 1, 2, 3, 4 and 1^1, 2^1, 3^1, 4^1, from either end of the figure they form the elliptical path. The Second part consists in connecting one end of a simple lever G with the radiating point or centre C, so that that end may follow the point through its path, and at a radius equal to that of the major axis. The lever G is connected with link H, vibrating from fixed centre I, so that the link is always parallel to the connecting rod

1490

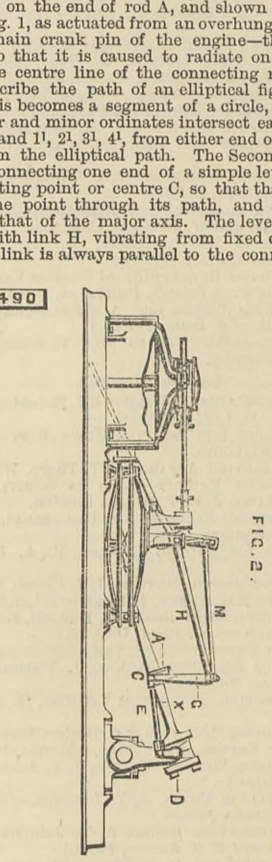


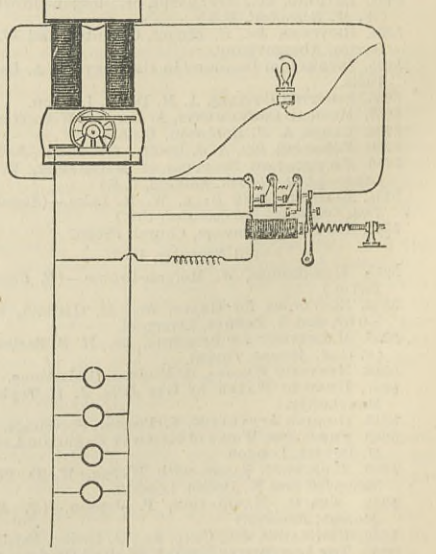
FIG. 2.

X, and consequently always in the middle of its vibration when the engine is at the termination of its stroke "on the centre." The Third part consists in the use of a link M, one end of which can be adjusted in a curved slot, whose radius is equal to the length of the link, for the purpose of actuating the distribution valves of the engine, the curved slot forming part of the slide valve rod. The other end of the link M is connected to the simple lever G near to where it joins and works link H. Fig. 2 shows an ordinary horizontal reversing engine with the improvements applied thereto.

1496. Dynamo or Magneto-electric Machines, *T. J. Handford, London.*—28th March, 1882.—(*A communication from T. A. Edison, Menlo Park, New Jersey, U.S.*) 6d.

Refers more particularly to the combination with the dynamo of a circuit controller, as shown in draw-

1496



ing. Various other methods of using the controller are shown in the drawings and described in the patent.

1495. Fastenings for Boots, Shoes, Gloves, &c., *J. W. Saunders, Stourbridge.—28th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists, First, in the use of spring clips secured to one edge of the article, and under which the other edge is drawn, and thereby secured; and Secondly, in covering boot and other laces with wire, so as to prevent the ends slipping when tied.

1497. Hot-air or Turkish Baths, *T. Maccall, Matlock Bank, Derby.—28th March*, 1882.—(*Not proceeded with.*) 2*d*.

Two rooms are placed side by side, the larger being used as the "flue room," the "hot room," and the "warm room," and the smaller as the "douche" and shampooing room; the former being heated by suitable means, and the latter provided with hot and cold water cisterns, and the usual jets and appliances.

1500. Tobacco Pipes, *E. Lorge, St. Claude, France.—28th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in connecting the stem and the mouthpiece by causing their ends to screw into an intermediate piece of metal tubing.

1501. Sizing Hand-beamed Warps for Weaving, *A. J. Boult, London.—28th March*, 1882.—(*A communication from P. V. Latellier, Sedan, France.*—(*Not proceeded with.*) 2*d*.

The apparatus consists of a size trough into which the warp is introduced, and from which it passes between two large rollers mounted in a slide and fitted with set screws. The warp on leaving the rollers is divided into two parts, each of which is wound on a small roller placed obliquely to the pressing rollers. A bar is placed into the end of the warp, which is then introduced into the rolling-up device or reel.

1503. Opening and Cleaning Cotton, *A. M. Clark, London.—28th March*, 1882.—(*A communication from A. A. Goldsmith, Charleston, U.S.*) 6*d*.

This consists in the use of rotary and reciprocating whippers of special construction, which whip the cotton without injury to the staple.

1504. Fishing-rods, *W. H. Brookes, Birkenhead.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in letting the reel into the butt, or attaching it near the end thereof, with its centre coincident with the axis of the rod, but at right angles thereto.

1505. Electric Gas Lighting Apparatus, *J. W. Urquhart, Crouch-hill.—23rd March*, 1882.—(*Not proceeded with.*) 2*d*.

Describes the use of what is called a graphite-silver cell, to light gas.

1507. Furnaces for Annealing Metal Plates, &c., *T. Bowen and E. Jenkins, Morriston, Glamorganshire.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to effect the more equal diffusion of heat over the annealing pots, and it consists in enclosing the ashpit of the furnace with a door and employing an artificial draught instead of the natural draught.

1508. Harrows, *R., J., and H. Wilder, Wallingford, Berkshire.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to form harrows so that they may be rendered flexible at will for use on uneven or heavy ground, and which can be rendered inflexible or even folded up, and it consists in forming the harrow in sections, connected by bolts or pins, and when required to be made inflexible clamping a bar on to it so as to brace the sections together.

1509. Umbrellas, Walking Sticks, &c., *J. Hickisson, Hackney.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to transmit to the person employing the umbrella an electric shock, or a succession of electric shocks, each time the same is brought to the ground, and it consists in placing a small battery in the stick, and completing the circuit by pressing on the handle.

1510. Disintegrators, *F. Wirth, Frankfort-on-the-Main.—29th March*, 1882.—(*A communication from F. Westmeyer, St. Johann-on-the-Saar, Germany.*)—(*Not proceeded with.*) 2*d*.

This consists essentially in the employment of a special distributor or spreading device with disintegrators for grinding coal or other material.

1513. Taps and Valves, *F. Robinson, Bradley, near Huddersfield.—29th March*, 1882. 6*d*.

A flanged bush is inserted in the tap hole, and is internally screw-threaded, the valve being similarly threaded and fitting over the inner end of the bush. The tap when inserted screws out the valve, and when withdrawn screws it home to its seat.

1514. Engines for Pulping Fibrous Materials, *G. Tidcombe, jun., Watford.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in making the engine circular, and so that the fibres circulate equally and in one natural direction, without a partition or midfeather, with only one channel the width of the rolls, with the inner or centre side of peculiar shape, with an outward swell in the course of the channel to narrow the gut without impeding the average current. The rolls are driven by centre shaft and beam or toothed wheel in gear with bevel pinion on the axes of the rolls.

1515. Steam Motors for Tramways or Railways, *W. R. Rowan, Hamburg.—29th March*, 1882. 8*d*.

This relates to an arrangement of steam engine and boiler, so as to form a steam motor combining great stability with a complete protection of the working parts from mud, and to apparatus for condensing the steam and mingling with the water of condensation fresh water for feed. The boilers and engines are arranged in a box, through the sides of which the axles pass. The surface condenser is placed on the roof of the car, and consists of two corrugated plates secured together, and extending up or down to present extended surfaces to the air. A number of such sections are fixed side by side a little distance above the roof, and air circulates between them. The exhaust pipe is connected to each section, and other pipes lead the water of condensation from the condenser to the feed tank.

1517. Lamps, *B. C. Simpson, Westminster.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the construction of the lamp so that the globe or shade and the chimney may be raised to facilitate the lighting of the lamp without having to remove the same. Also to a slide or other opening in a diaphragm in the lamp, through which the oil or spirit can be supplied.

1519. Rail and Joint Chair for Fixing the Rails of Railways, *W. J. Boaler, London Bridge.—29th March*, 1882. 6*d*.

The chair has only one jaw, the other side being an inclined plane sloping up from the cavity to receive the rail towards the outside. An iron wedge, with its under surface inclined and another surface shaped to fit the side of the rail, is secured to the chair by bolts and nuts and cotters.

1520. Looms, *J. C. Rouse, Halifax.—29th March*, 1882. 6*d*.

This relates to looms for weaving tufted pile fabrics, and consists in forming the nozzles of the spool frame so that a closely woven fabric can be produced without altering the general arrangements of the loom. According to this invention 10 tufts to the inch may be woven across the fabric without altering the number of warp threads or the number of dents in the reed required for weaving fabrics with only 5 tufts to the inch. This is effected by fixing a division in each nozzle and passing a firmer tufting material through each passage thus formed.

1521. Bridle Bits, *J. C. Mewburn, London.—29th March*, 1882.—(*A communication from P. H. Goulet, Paris.*)—(*Not proceeded with.*) 2*d*.

This consists in adding to the check piece which bears on the "bars" of the lower jaw and causes the animal to move backwards, an upper lever which by bearing against the "bars" of the upper jaw causes it to move forwards. This lever is acted upon by additional upper reins.

1522. Apparatus for Flushing Sewers, &c., *J. B. Denton, Westminster, and G. Butler, Turnham Green.—29th March*, 1882. 6*d*.

The object is to collect waste or other water until sufficient is stored to effectually flush a sewer or pipe when it is automatically discharged in a continuous stream, and it consists in the use of a syphon placed in the vessel in which the water is stored, and set in operation by a tipping-box discharging through an inlet into the longer leg of the syphon in combination with a valve for closing the inlet when the tipping-box is in its normal position. The box is caused to tip by the water entering the same when the cistern is sufficiently filled.

1523. Looms, *R. Hindle and G. Greenwood, Blackburn.—29th March*, 1882. 4*d*.

This relates to the swell employed for arresting the progress of the shuttle at each end of the pick, and consists in forming and arranging a spring so that it may also answer as the swell, and at the same time afford the required pressure or resistance.

1524. Buoys for Signalling, *J. Jaques, Poplar.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to arranging signalling buoys so that they will not be materially damaged in the event of collision, and it consists in connecting the same to a frame below it, so that if the buoy is struck it will rotate about its vertical axis without turning the frame.

1525. Structures for Drying and Bleaching Grain, *J. Fisher, Manchester.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in making the floor on which the grain rests during the operation of drying and bleaching so that it can be made to turn on pivots, and thus empty the grain from the drying and bleaching chamber.

1528. Manufacturing Band Twines or Ropes, *J. G. Hey, Cleckheaton.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to apparatus for rotating the hook spindles and of guide return pulleys, whereby gearing is dispensed with, and double the length of band, twine, or rope may be spun or twisted within a given length of "walk" or shed without splicing.

1530. Fusible Plugs for Preventing Explosions in Steam Boilers, *J. Burton and R. Byrnes, Staleybridge.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

A cap or thimble of fusible metal is inserted inside the body of the plug, and forced up by means of a screwed ferule (turned by a suitable key) against the annular feathered edge which forms the inner orifice of such body, and thus such fusible cap closes the orifice and presents a large surface or area to the action of the flames.

1531. Fasteners for Gloves, &c. *J. W. Pritchett, Clapton.—29th March*, 1882. 6*d*.

This relates partly to fasteners in which there is a pivotted or hinged lever screwed to a plate on one side of the wrist opening, so arranged that it will enter an eyelet or aperture on the other side of the said opening, and may be caused to draw the edges of the glove together and hold them in a closed position.

1533. Extraction of Gases from Molten Metals, &c., *R. Aitken, Westminster.—29th March*, 1882. 6*d*.

This consists in effecting the extraction or separation of gases from molten metals or other molten materials by passing the said molten materials in a stream or streams, or spray or equivalent divided condition into or through a space, ladle, chamber or vessel in which a vacuum or partial vacuum is created.

1534. Safety Lamp for Mines, *J. Cunliffe, near Bolton-le-Moors.—29th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the employment of a glass cylinder having an opening extending down the whole length of the side.

1535. Stamp Box Charm, *J. Hirst, Clerkenwell.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to a revolving pin upon which the stamps are caused to be wound, the pin being placed inside a cylindrical chamber.

1536. Furnaces, *A. J. Boult, London.—29th March*, 1882.—(*A communication from M. Gros Desormeaux, Martinique.*) 6*d*.

The object is so to construct a steam boiler or other furnace that the waste heat from the furnace may be utilised for drying the fuel before its introduction into the furnace, that the fuel so dried may be fed into the furnace in proportion as it becomes dry and as fresh fuel is introduced into the drying chamber, and that the arrangements or devices for these purposes be so placed as to allow the furnace to be fed with coal in the usual manner if desired.

1537. Indicators for Pillar and other Letter Boxes, *J. W. and A. Lawrence, Birmingham.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to make the indicators of letter boxes automatic, so that on the locking of the door of the letter-box after the box has been cleared, the hour at which the next clearance is due will be automatically indicated.

1538. Looms, *G. H. Hodgson and J. Broadley, Bradford.—30th March*, 1882. 8*d*.

This relates, First, to the arranging or combining parts whereby the selection for the movements of the healds for changes of sheds is effected; Secondly, the arranging or combining parts for effecting changes in the order of moving the healds for changes of shed; Thirdly, the arranging or combining parts for effecting variations in the order of picking.

1539. Portable Steam Engines, *G. R. Mather, Wellingborough.—30th March*, 1882. 2*d*.

The inventor claims, First, the method of and means and arrangements for utilising the ordinary axle or shaft and fly-wheel or fly-wheels of portable steam engines, when travelling from place to place, as and for the supporting axle or shaft and travelling wheel or wheels thereof; Secondly, the adaptation of the horse shafts to the steadying of such engines when at work.

1540. Clip or Clutch for Retaining and Joining the Ends of Ropes, *F. W. T. C. Cordua, London.—30th March*, 1882.—(*A communication from C. M. E. Kortum, Berlin.*—(*Not proceeded with.*) 2*d*.

This relates to the employment of two wedge-shaped blocks provided with teeth, and which slide within a hollow case.

1542. Machinery for Preparing Fish for Cure, *J. Ross, jun., Muchalls, N.B.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

The fish after being gutted are placed upon a travelling cloth and pass under cleaning brushes. They then pass on to a scynding brush and cutters.

1543. Capsules for Bottles, Jars, &c., *C. Cheswright, Holloway.—30th March*, 1882. 6*d*.

The inventor claims the manufacture and use of ventilating capsules for bottles, jars, and similar receptacles having a perforated ventilating recess or chamber formed in the top thereof above the cork or stopper.

1544. Curtain Suspenders, *C. F. Grimmett and J. Cook, Birmingham.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

According to one arrangement the upper part is made of a round ring formed from sheet metal, the ring being cast through one part of its circumference for the purpose of allowing the bottom part to be more readily joined on to it. The bottom part is formed by bending round one piece of brass or other wire, so as to form at its upper end a bow suitable for slipping over the cornice ring, and the lower part of the wire or end is bent round into a large and small bow something like the two legs of a pair of tongs, with a natural tendency to spring open, due to the twist of the upper portion of the wire. The curtain is placed between these two lower ends, and they are drawn together by a ring.

1546. Mincing or Sausage Machine, *J. Hood, jun., Edinburgh.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to cut small pieces of meat, &c., lying on the upper surface of a block of end wood, without having a reciprocal knocking or rocking motion, vibration or noise, and the unnecessary wasting or chopping of the block or any interference, by grinding, turning, pressing, or tearing of the substance.

1547. Machinery for Excavating Trenches for Draining Land, *T. Abbott, Newark-on-Trent, and G. S. Moore, Sunderland.—30th March*, 1882. 6*d*.

The drain-cutting machine operates by means of a wheel cutter armed with teeth which are protruded from the front and under part of the wheel, and are drawn back at the upper and hinder part of the wheel to clear them from the detached soil.

1548. Secondary Batteries, *W. B. Brain, Cinderford, Gloucester.—30th March*, 1882. 6*d*.

This inventor claims the use of chambers, bags, or envelopes of lead or other suitable metal or alloy, in combination with pieces of asbestos, felt, &c., as a porous separator, with the oxide or other salt or finely divided metal placed in or between the said chambers, &c.

1549. Steelyards, *A. J. Boult, London.—30th March*, 1882.—(*A communication from P. Arnaud and L. Gayttée, La Ciotat, France.*) 4*d*.

This consists of a graduated bar or scale beam, on which slides a movable box carrying an indicator to show its position upon the scale. Knife-edges upon the box carry hooks or equivalents, one above by which the whole apparatus is hung, and one below upon which the load is hung. A supplemental scale is also provided in or upon the box, and being arranged in proximity to the main scale, gives the finer divisions A suitable balance-weight is fixed at one end of the scale beam.

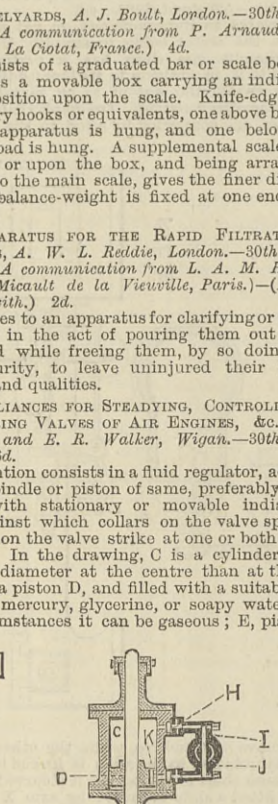
1550. Apparatus for the Rapid Filtration of Liquids, *A. W. L. Reddie, London.—30th March*, 1882.—(*A communication from L. A. M. Hélie and C. M. Micault de la Vieuville, Paris.*)—(*Not proceeded with.*) 2*d*.

This relates to an apparatus for clarifying or filtering the liquids in the act of pouring them out of their vessels, and while freeing them, by so doing, from every impurity, to leave uninjured their peculiar properties and qualities.

1551. Appliances for Steadying, Controlling, or Buffering Valves of Air Engines, &c., *J. S., T. A., and E. R. Walker, Wigan.—30th March*, 1882. 6*d*.

The invention consists in a fluid regulator, acting on the valve spindle or piston of same, preferably in conjunction with stationary or movable india-rubber buffers, against which collars on the valve spindle or projections on the valve strike at one or both ends of the stroke. In the drawing, C is a cylinder a little greater in diameter at the centre than at the ends, containing a piston D, and filled with a suitable fluid, such as oil, mercury, glycerine, or soapy water, or in some circumstances it can be gaseous; E, piston rod

1551



attached to valve spindle F, and by it to link G; H H are valves weighted with springs adjusted by set screws; I, passage for the fluid to go from end to end of the cylinder when the valves are open; J, regulating cock, allowing free passage when open, but capable of being closed to any desired extent, so as to regulate the passage; K, passage through piston; L L1 two caps carrying spring M between them, and the latter screwed upon spindle F; N, buffer of india-rubber to prevent the two surfaces of metal knocking together.

1553. Locks or Fastenings, *G. H. Wildes, London.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

The object is to provide a spring lock or fastening which can be opened by simply pressing on a stud or button, which may be placed in the knob or handle of the drawer, door, or the like on which the lock or fastening is placed.

1555. Telephones, *J. H. Johnson, London.—30th March*, 1882.—(*A communication from C. G. Roderigues-Pereire, Paris.*)—(*Not proceeded with.*) 2*d*.

Refers to the use of differential currents for transmitters and receivers.

1557. Brushes, *A. M. Marsden and F. Cross, Huddersfield.—30th March*, 1882.—(*Not proceeded with.*) 2*d*.

This consists in making brushes reversible, so that when the bristles have been worn away on one side, or in one place, that part of the brush in which the bristles are fixed can be moved, so that the bristles which are worn down may be moved to a position where the wear and tear is less, and the bristles which are not worn down would be moved to a position where the wear is greater.

1558. Governors for Steam Engines, *E. Truman, Grantham.—31st March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to apparatus for operating the throttle valve.

1559. Driving Ropes, *J. Rowbottom, Charlesworth.—31st March*, 1882.—(*Not proceeded with.*) 2*d*.

A strong rope is made of cotton or other vegetable fibre, and then it is lapped with a small rope or cord formed partly of cotton or other fibre and partly of metal.

1560. Fastenings for Gloves, &c., *E. Horsepool, Cheapside.—31st March*, 1882. 6*d*.

This consists in certain detail methods of securing the tongue or lever of the fastener described in patent No. 511, dated 7th February, 1881.

1561. Purifying Coal Gas, *J. Walker, Leeds.—31st March*, 1882. 4*d*.

The inventor claims purifying coal gas by using the waste product called breeze, retort breeze, mineralised or without being mineralised, ground and mixed with hydrate of lime or ground quick lime from the kiln.

1562. Indicator for Registering and Checking the Number of Persons and the Fares in Public Conveyances, &c., *H. Lyon, Bloomsbury.—31st March*, 1882. 6*d*.

This relates to an instrument having keys, say 1 to 6, representing various sums paid by the passengers, who press the key having the value of their fares marked thereon, which will strike a bell and register one unit.

1563. Thrashing Machines, *A. W. Mantle, Germany.—31st March*, 1882. 6*d*.

The inventor claims, First, connecting the straw shaker to the caving riddle so that they are both actuated by the same cranks; Secondly, constructing the straw shaker with a hinge joint towards its back end, combined with means of raising or lowering its front end: Thirdly, combining with the second cleaning apparatus a screen composed of sieves or riddles of different gauge arranged to reciprocate with the riddles or sieves of the second cleaning apparatus.

1564. Drinking Vessels to be used as Measures, *J. Tams, Longton.—31st March*, 1882. 6*d*.

This relates to a means for regulating the containing capacity of the vessel to the exact measure required without defacing or damaging the vessel itself.

1566. Looms, *J. Wade, near Leeds.—31st March*, 1882.—(*Void.*) 4*d*.

The First part relates to an improved wire motion whereby control is obtained over the pile wires from the point of withdrawing them out of the fabric to the re-inserting them into the open shed and wire-box; the Second part relates to an improved means of driving looms by friction gearing; the Third part relates to the construction of a roller for taking up the fabric during the process of weaving.

1567. Concentrated Milk, *E. Kunkler, London.—31st March*, 1882. 4*d*.

This relates to a means of concentrating milk without any mixture of foreign materials, such as sugar.

1568. Manufacture of Bricks, Tiles, &c., *F. Render, Manchester.—31st March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the adding of silica to the clay or other material.

1569. Stoppers for Bottles, &c., *Count W. von Schlieffen, near Güstrow, German Empire.—31st March*, 1882. 6*d*.

This consists of a shell, preferably of hardened india-rubber, closed at its outer end and having a projecting rim or collar when necessary to prevent it from slipping into the bottle, jar, cask, &c., to which it is applied. At the inner end of this shell is a flexible bag or bladder of some suitable material. To the outer or closed end of the shell a tap is attached, and, if desired, a flexible or other pipe may extend from the tap again.

1570. Electric Arc Lamps, *G. W. Jeffery, North Woolwich.—31st March*, 1882. 6*d*.

This invention aims at providing simple means of regulating the arc for the production of the electric light, and refers to the arrangements for regulating the arc. The lower or negative carbon is a fixture. The upper or positive carbon, or the wood or other rod to which it is clamped, is free to slide through a tube or guide. To this a flexible loop or ring, say of india-rubber, is connected, through which the positive carbon or positive carbon holder passes. The opposite side of this loop or ring is connected to the armature of an electro magnet by a lever, which is jointed at its other end to another piece or lever having its fulcrum on a bridge. The opposite end of this lever is provided with an armature, which is acted on by an adjacent electro-magnet or solenoid. When the armature is attracted by the magnet the elastic ring is tightened, and the carbon thereby gripped and lifted the required distance to produce the arc. The armature being released, the elastic ring contracts, and the carbon is free to slide through. The loop or ring is by preference placed in a slanting position. A series of carbons arranged in this manner may be fitted alongside one another in a ring, or as desired, in one and the same lamp.

1571. Screw Buttons, *E. A. Brydges, Berlin.—31st March*, 1882.—(*A communication from B. Fischer, Stuttgart.*) 6*d*.

The button proper acts as a nut, and is so attached to a suitable screw that the button cannot leave the screw.

1572. Boots, *J. and G. J. Taylor, London.—31st March*, 1882.—(*Not proceeded with.*) 2*d*.

The boots are made to button or fasten up the outer side of the leg, and the appearance when in wear is as when a gaiter is worn.

1574. Apparatus for Augmenting Electric Currents for Telephonic Purposes, *W. R. Lake, London.—31st March*, 1882.—(*A communication from J. Moser, Berlin.*) 6*d*.

Secondary coils are used with a number of transmitters and transmitter coils.

1575. Metallic Roofing Shingles, *W. R. Lake, London.—31st March*, 1882.—(*A communication from R. Seaman, New York.*) 6*d*.

The invention consists partly in a diamond-pointed shingle provided with a central longitudinal tapering rib having an internal and external groove formed in each side extending the full length of the said rib, and so constructed that the said rib will enter the rib of the next shingle above it. It also consists in forming a flange along the parallel edges of each shingle by turning such edges over on the body of the said shingle so as to enable the said flanges to dovetail or fit into the internal grooves of the central ribs of the course next above, and in the details of construction. It also consists in the apparatus for use in the manufacture of such shingles.

1576. Separating Tin from Tin-plate Scrap, &c., *W. A. Barlow, London.—31st March*, 1882.—(*A communication from L. Bourau, Paris.*) 6*d*.

This consists partly in the treatment of tin-plate scrap by a chloride of tin containing only a quantity of acid which corresponds to the quantity of tin to be dissolved.

1578. Administering Anæsthetics and Diffusing Perfumes and Disinfectants, *W. R. Lake, London.—31st March*, 1882.—(*A communication from S. Cooper, Westfield, and E. Dennis, New York, U.S.*) 6*d*.

This consists in enclosing material saturated with the anæsthetic in a closed vessel so as to prevent waste or the escape thereof, then opening such vessel containing the anæsthetic for the admission of air, and finally forcing the air by external mechanical means through such anæsthetic, whereby the air is laden with the said anæsthetic, and is forcibly expelled in the form of a dry gas at the point of application.

1580. Electric Lamps, *Sir D. Salomons, Tunbridge Wells.—31st March*, 1882. 6*d*.

The incandescent material is placed in a small bored space in a suitable substance.

1581. Saddles for Bicycles, *J. Jenner, Kensington.—31st March*, 1882.—(*Not proceeded with.*) 2*d*.

This relates to the application of springs.

1584. Fireplaces or Grates and Stoves, *G. L. Shorland, Manchester.—1st April*, 1882. 6*d*.

This consists partly of a fire-grate in combination with an air-warmer box or chamber, and having front and back flues fitted with dampers, so that the whole or part of the gaseous products can be drawn through the fire into the back flue.

1586. Bleaching Jute, &c., *T. G. Young, Kelly, N.B.—1st April*, 1882. 4*d*.

This consists, First, in the combined use of an alkali and soluble sulphide in the process of causticising jute and other fibrous substances; Secondly, in an intermediate treatment with acid; Thirdly, in the employment of a bleaching solution containing excess of alkali, alone or combined with either or both of the foregoing processes.

1587. SECONDARY BATTERIES, *A. Tribe, Notting Hill.—1st April*, 1882. 4d.
Uses compressed peroxide of lead.

1588. GUIDES FOR SAW BLADES, *H. J. Haddan, Kensington.—1st April, 1882.—(A communication from C. Calloch, Reolon, France.)—(Not proceeded with.)* 2d.
The guide consists essentially of a block of metal fixed at the place usually occupied by the wooden guide, and forming a casing where the blade passes.

1589. APPARATUS FOR PAINTING THE INTERIOR OF HOUSES, &c., *M. Menge and H. Krause, Berlin.—1st April, 1882.—(Not proceeded with.)* 2d.
The apparatus consists chiefly of a colour receptacle, preferably of sheet iron, attached to the lower end of a handle and carrying a brush or distributor for spreading the colour equally over the floor.

1590. GAS MOTOR ENGINES, *R. Skene, Lambeth.—1st April*, 1882. 6d.
The invention is designed to effect greater convenience and economy in working, and in the cost of construction, by dispensing with the water jacket or any cooling medium, in or about the working cylinder, so as to retain and utilise the heat generated by explosive combustion. Also by the use of explosion chambers of special form attached to, but apart from, the working cylinders, by a piston rendered non-conducting to heat, and by a simple and novel form of ignition valve, and apparatus connected therewith.

1592. PROJECTILES FOR BREECH-LOADING RIFLED ORDNANCE, *J. Vavasseur, Southwark.—1st April*, 1882. 6d.
The inventor claims the manufacture of a projectile with a projecting flange or abutment around its base, and a grooved or roughened surface in front of the abutment, and a band of copper or other suitable ductile metal drawn down over this roughened surface, so that its rear end shall bear against the abutment, whilst the forward end has no abutment to bear against.

1593. GLOVES, *H. Urwick, Wandsworth.—1st April*, 1882. 4d.
The inventor inserts on the inner side of the hand a piece passing from the base of the first and second fingers (or rather the interval between these fingers) to the base of the thumb; and the same piece also forms the inner side of the thumb, and the forefinger "quirk" or the gusset piece at the root of this finger.

1594. REVERBERATORY FURNACES, *Sir W. W. Hughes, Bayswater.—1st April*, 1882. 6d.
This consists in the combination of the melting or reducing furnace with its nearly flat and inclined bed; a downwardly inclining flue, conveying the materials as they melt, and also the products of combustion; and the collecting furnace receiving the same and retaining the metal in its deep bed.

1595. FIRE-ESCAPES, *W. P. Thompson, Liverpool.—1st April, 1882.—(A communication from J. Gabrielli, Spalato, Austria.)—(Not proceeded with.)* 2d.
This relates to the employment of a safety bag to be lowered from the windows.

1596. LATCHES OR LOCKS, *W. Johnson, Liverpool.—1st April, 1882.—(Not proceeded with.)* 2d.
This relates partly to forming the handles so that they will not work loose.

1598. MACHINERY FOR GRINDING SPINDLES, *G. Ryder and M. Fielding, Bolton.—1st April*, 1882. 6d.
The grinding wheel is mounted upon a sliding carriage, and the spindle to be ground is mounted on the upper swivelling part of a table, to the lower part of which is imparted an automatic longitudinal motion by a worm and rack or a screw and nut or otherwise. An adjustable pivot is provided, on which the upper part of the table swivels, and attached to the frame of the machine is a template or pattern for guiding the swivelling table. An antifriction roller, which turns on a bracket fastened to the swivelling table, is caused by a spring to press against the template.

1631. COOLING MILLSTONES, &c., *A. W. L. Reddie, London.—4th April, 1882.—(A communication from H. Dorrity, New York.)—(Not proceeded with.)* 2d.
The invention consists in the combination with the upper or stationary stone and the lower stone or runner, each provided with a cavity, which may be formed between two sections of the stone, or between the back of the stone and a back plate applied thereto, of inlet and outlet pipes for maintaining a circulation of water or cooling liquid through the cavity in the upper stone, a pipe extending downwards through the eye of the upper stone and communicating directly with the cavity in the runner for supplying the cooling liquid thereto, and connected with the runner so as to rotate therewith, and an outlet pipe or pipes through which the liquid may escape from the cavity in the runner.

1632. HYDRAULIC CRANES, &c., *E. Priestman, Sheffield.—4th April*, 1882. 6d.
The invention consists in the use of a drum or barrel carried by the piston-rod of hydraulic cranes, hoists, and other like machinery, and which drum or barrel is revolved on the outward and inward stroke of the piston-rod by pinions gearing into a fixed rack guide.

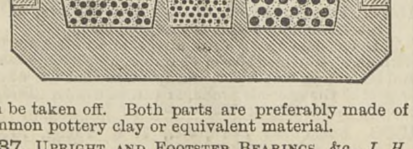
1633. DRIVING GEAR FOR WRINGING AND MANGLING MACHINES, &c., *H. Clegg, Accrington.—4th April*, 1882. 8d.
On the boss of the fly-wheel is a pinion, and on axis of lever roller shaft is a flanged disc, the flange having internal teeth to gear inside the disc and carries loose gear wheel on concentric stud. This wheel gears with the internal teeth of disc and with pinion. On back of disc are studs which gear with teeth of wheel on axle of upper roller. The face of the flanged internal gear wheel forms an inclosing guard or fence for the wheel.

1634. INDIA-RUBBER COATED FABRICS, *W. R. Lake, London.—4th April, 1882.—(A communication from H. W. Burr, Cambridgeport, U.S.)* 6d.
The improvement in the method of curing the india-rubber-coated fabrics consists in subjecting them to the action of the electric light, and preferably during the process of coating, and while the fabric is passing through the machine.

1635. MECHANICAL TOYS, *W. R. Lake, London.—4th April, 1882.—(A communication from W. A. Webber, G. B. Kelly, E. L. Rand, and J. L. Given, U.S.)* 6d.
This relates to a mechanical toy made in imitation of a living creature, and internally provided with devices capable of being operated to produce musical sounds.

1649. UNDERGROUND CONDUITS FOR ELECTRIC WIRES, *A. J. Boult, London.—(A communication from J. D. Thomas, New York.—5th April*, 1882. 6d.
The figure shows a section of the conduit. The top

1649



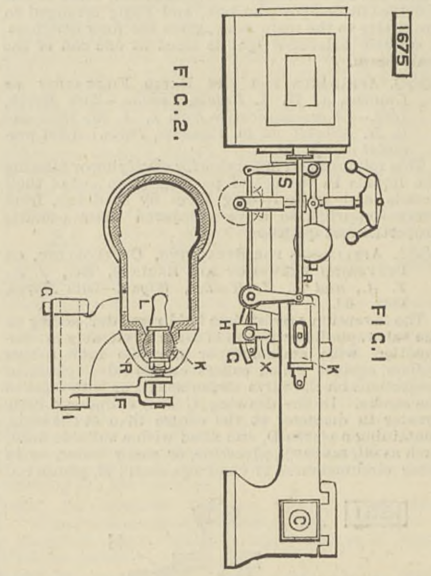
can be taken off. Both parts are preferably made of common pottery clay or equivalent material.

1687. UPRIGHT AND FOOTSTEP BEARINGS, &c., *J. H. Johnson, London.—4th April, 1882.—(A communication from A. Fesca, Berlin.)* 6d.
The object of the invention is to partially or wholly remove the direct pressure of the heel or end of the shaft upon the footstep or bearing-plate by hydraulic power, and to enable this to be performed by a suitable arrangement of apparatus, whereby in the construction of centrifugal machines, for example, it is rendered possible to provide for the rotation of very heavily loaded shafts at the desired speed.

1638. ARMOURED VESSELS, *J. H. Johnson, London.—4th April, 1882.—(A communication from N. B. Clark, Philadelphia.)* 6d.
This consists, First, of a rotary turret for guns, having the side in the rear of the guns of a semi-cylindrical form, and the front portion through which the nozzles of the gun pass sloping or curving downwards; Secondly, a rotating shield for a gun, having its front portion, through which the gun passes, of a rounded wedge-shape, its rear open end being pivotted to swing about a fixed point.

1670. INCANDESCENT ELECTRIC LAMPS, *J. Jameson, Newcastle-upon-Tyne.—6th April*, 1882. 4d.
The carbon from which the filament for incandescent electric lamps are to be formed is deposited within a tube of refractory material, from hydrocarbon gas or vapour, so as to produce a deposit of great density and uniformity of structure. When the deposit is formed of considerable thickness the envelope employed in its formation is broken, and then to give endurance to the cylinder so formed the inside is filled with a tenacious cement, such as rosin or shellac.

1675. SLIDE VALVES AND SLIDE GEAR FOR STEAM AND OTHER FLUID-PRESSURE ENGINES, *D. Halpin, Westminster.—6th April*, 1882. 6d.
This relates to improvements on patent No. 3495, A.D. 1878, the object being to simplify the arrangement whereby the slide has a partial rotation imparted to it, in addition to its longitudinal motion, so as to enable the cut-off to be varied while the exhaust remains constant. On crank shaft C are two excentrics, one connected by a rod to the slide rod R

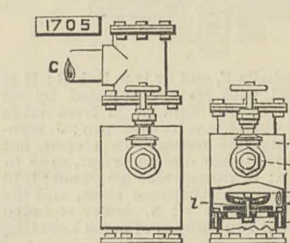


so as to move it to and fro, while the other for giving the partial rotation to the slide is linked to an arm F on a rocking shaft I, having on it a curved arm G, on which is fitted a slide H linked by arm X to an arm L projecting from an enlarged part of the slide rod R, such part having collars which engage grooves in a head working in the cylindrical guide K. The slide H is linked to lever S worked by a centrifugal governor, so as to vary the cut-off as the speed increases or diminishes.

1697. INCANDESCENT ELECTRIC LAMPS, *Hon. R. Brougham and F. A. Ormiston, Regent-street.—8th April*, 1882. 6d.
Relates to the method of sealing the conducting wires, and a means for securing the carbon filament to the wires.

1705. CONDENSERS FOR STEAM ENGINES, *A. M. Clark, London.—8th April, 1882.—(A communication from R. E., M., and M. Williams, California, U.S.)* 4d.
In the air chamber B is fixed a grid *h*, on which is secured a disc valve *i* of flexible material, and above the valve is a guard *k* that limits the movement of the valve in opening; *l* is a pipe for discharge of air from cylinder B, and *m* is a removable cover on the cylinder to allow access to the valve. When the exhaust steam

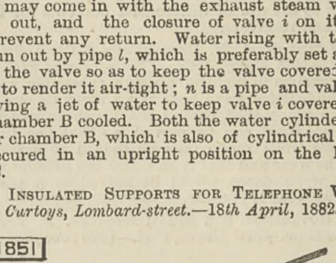
1705



enters the condenser through the pipe *c* the shock will raise the valve *i*, and the air in the condenser, or that which may come in with the exhaust steam will be forced out, and the closure of valve *i* on its seat will prevent any return. Water rising with the air will run out by pipe *l*, which is preferably set a little above the valve so as to keep the valve covered with water to render it air-tight; *n* is a pipe and valve for supplying a jet of water to keep valve *i* covered and the chamber B cooled. Both the water cylinder and the air chamber B, which is also of cylindrical form, are secured in an upright position on the hollow base C.

1851. INSULATED SUPPORTS FOR TELEPHONE WIRES, *C. Curtoys, Lombard-street.—18th April*, 1882. 4d.

1851

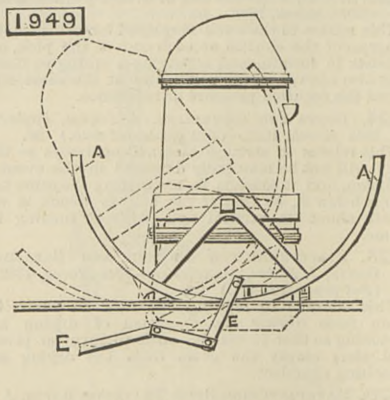


The insulator is grooved and capped as shown in the figure.

1726. ELECTRICAL APPARATUS FOR SIGNALLING ON RAILWAYS, *E. Tyer, Dalston.—12th April*, 1882. 6d.
Details certain combinations of relays, and contact pieces to make contact when the train passes over the rail. Thus an arm bearing an adjustable screw may be actuated by the train, the screw making contact through an electro-magnet, whose action on its armatures actuates the signal.

1949. BESSEMER CONVERTERS, *S. G. Thomas, Westminster.—25th April*, 1882. 6d.
This relates to improvements in Bessemer converters, whereby the advantages of both the tipping and fixed systems are united, and it consists in mounting the vessel on rockers A at each side, so that the vessel may be readily tipped to one side or the other by a very slight force. On the front side is a

1949



tapping hole and on the opposite side a row of side tuyeres of large diameter. The blast can be introduced through jointed pipe E. The tilting may be effected by hand lever, or by a hydraulic or steam ram, or a rack and pinion or other simple contrivance. A catch or wedge is arranged to hold the vessel at any required angle.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

265,934. ORDNANCE, *James L. Norris, Washington, D.C.—Filed 19th July*, 1882.
Claim.—A composite gun consisting of a cast steel outer casing C C[1], formed in two parts screwed

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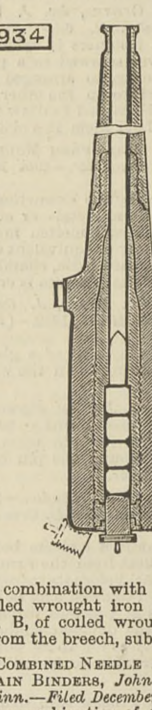

together, in combination with a front lining tube, A, of either coiled wrought iron or of steel, and a rear lining table, B, of coiled wrought iron screwed into the casing from the breech, substantially as described.

265,978. COMBINED NEEDLE ARM AND COMPRESSOR FOR GRAIN BINDERS, *John Lloyd Owens, Minneapolis, Minn.—Filed December 27th*, 1881.
Claim.—The combination of the needle arm B and compressor arm D, the said compressor arm pivotted at one end in said needle arm and at the other end to

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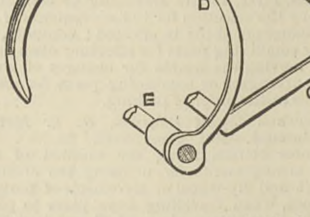

a shaft E, and said needle arm adapted to be oscillated about said shaft by a crank arm C, whereby the parts operate as and for the purpose described.

266,220. STEAM BOILER TUBE, *George S. Strong, Philadelphia, Pa.—Filed March 6th*, 1882.
Claim.—(1) The mode herein described of making tapering tubes for steam boilers, said mode consisting in forming on an ordinary cylindrical lap-welded tube corrugations prominent at the small end of the tube, but gradually decreasing in prominence until they merge into the cylindrical portion of the tube at or near the opposite end as set forth. (2) The within-described tapering tube for steam boilers, said tube

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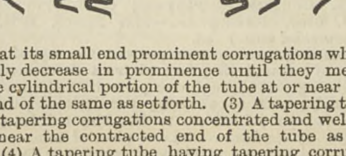
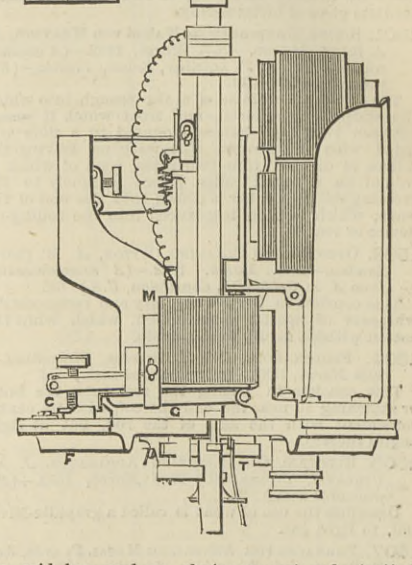


having at its small end prominent corrugations which gradually decrease in prominence until they merge into the cylindrical portion of the tube at or near the large end of the same as set forth. (3) A tapering tube having tapering corrugations concentrated and welded at and near the contracted end of the tube as set forth. (4) A tapering tube having tapering corrugations, and having at its large end a flange *d*, and at its small end a concentrated and welded portion *h*, as set forth.

266,240. ELECTRIC ARC LAMP, *Edward Weston, Newark, N.J.—Filed July 17th*, 1882.
Claim.—(1) In an electric lamp containing two sets of carbons, the combination, with the electro-magnet, of independent feed mechanisms, one for each set of carbons, a pivotted bar adapted to maintain either of said feed mechanisms out of operation, a spring for shifting the same, an electro-magnet independent of the feed magnets, and an armature therefor, arranged to lock or release the pivotted bar, substantially as and for the purpose set forth. (2) In an electric lamp containing one set of feed controlling magnets and two sets of carbons, the combination, with the movable armature, of two independently connected clutch mechanisms, one for each set of carbons, a pivotted bar adapted to raise the free end of either of the said clutch mechanisms, a spring connected with

266,240



the said bar, and an electro-magnet and pivotted armature for locking and releasing the bar, as and for the purpose set forth. (3) In an electric lamp containing one set of feed-controlling magnets and two sets of carbons, the combination, with the movable armature, of two independently connected clutch mechanisms, one for each set of carbons, a pivotted bar adapted to maintain either of said clutch mechanisms out of operation, a catch hinged to said bar and arranged for sustaining the carrier of the inactive set of carbons, a spring for shifting the pivotted bar, and an electro-magnet and pivotted armature for locking and releasing the same, substantially as set forth. (4) The combination, with the spring shifting bar C, of a magnet M, and armature G, placed above the base F, and a pin *p*, extending through the said base and arranged for raising the armature, substantially as described. (5) In an electric lamp, the combination, with the carbon carrier, of a bearing spring T, or its equivalent, and a cam for controlling the position of the same, substantially as set forth.

CONTENTS.

THE ENGINEER, Nov. 10th, 1882.