JULY 4, 1884.

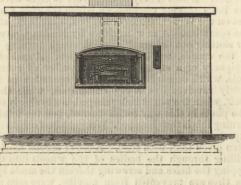


# MACHINERY AND MECHANICAL APPLIANCES AT THE INTERNATIONAL HEALTH EXHI-BITION. No. VII.

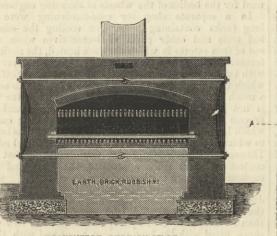
Messrs. A. M. Perkins and Sons, Seaford-street, Gray'sinn-road, W.C., occupy a large space in the bakery department, where they show a number of heating appliances for domestic and other purposes. One of the most interesting of the former is an ordinary register grate in which the bars are made of iron pipes, forming, in con-nection with a coil at the back, part of a system by which the waste heat is utilised for warming a second or third room or an entrance hall, as well as for giving a supply of hot water. The pipes exposed to the pressure are  $\frac{7}{3}$  in. thick, the joints being made with a right and

		left-hand thread,
of here placed and a	installer for blog	as shown in an- nexed sketch, this
	·····	being the plan generally adopted
		by Messrs. Per-

Perkins. The working pressure is about 60 lb. per square



FRONT ELEVATION



TRANSVERSE SECTION AT C.D.

inch, an expansion pipe or safety valve being provided in order to prevent this being exceeded. The heated water circulates through a coil in a 50-gallon tank at a suitable elevation, and through other coils placed in the apartments it is desired to warm, the arrangement being such that each coil can be brought into action independently of the each cont can be brought into action independently of the other. The combination, so far as we know, is new, and it certainly seems to be good both as regards its conveni-ence and economy. It is stated that the cost of fuel for such a fire is 1s, per day for coal and 2s. 6d. for gas. The latter is used at the Exhibition, as the authorities would not sanction the use of coal. Above we illustrate an ordinary 10-bushel baker's oven on Perkins' system, which is shown in operation in connection with a mechanical bakery worked by Messrs. Harris and Co., Edgware-road. The baking plate is 10ft. long and 8ft. wide, and we understand that ninety sacks of flour can be baked per week at a cost of only 15s, for fuel. The oven can be lighted and brought up to 500 deg. Fah. in about one and a balf hours and the heat is accily regulated by means of a-half hours, and the heat is easily regulated by means of dampers, the temperature being indicated by pyrometers. By referring to the sections it will be seen that the heating arrangement consists of two rows of steam pipes, one above the baking plate and one below. Each pipe is independent, being sealed at both ends, and contains somewhere about a pint of water. About Sin. of the ends project through the brickwork into the fireplace, the lower tier forming the fire-bars, and the tubes are placed on a slope inclining towards the furnace, so as to keep the water at the fire end. The pipes are of the same dimensions as those previously mentioned, and are tested to 3000 lb. per square inch, the working pressure being about 700 lb. Besides extreme economy in fuel consumption, many advantages are claimed for this system of heating. It is stated that the cost for repairs is much less than usual, and that as there is an repairs is much less than usual, and that as there is an entire absence of all fumes in the baking chamber, the bread, which readily absorbs gases, is purer and more wholesome. Messrs. Perkins and Sons also exhibit a patent ship oven capable of baking for 2000 persons, at a cost, it is stated, of 6d. per day for fuel. The same heating system is employed as in the brick oven, there being two tiers of twenty-two pipes each, one above and one below the baking plate, the whole being enclosed in an iron case carefully lagged with silicate cotton and supported on cast iron standards. A somewhat similar arrangement is adopted in the portable steam oven, only in this case it is

## SECTIONAL PLAN AT E F PERKINS' STEAM OVEN.

there is a large collection of heating coils of various forms, and many samples of pipes, showing the method of jointing, and how they can be twisted

and bent into all sorts of forms without affecting their strength. As we have previously stated, Messrs. Perkins test all the pipes to a very high pressure, and they exhibit an ingenious testing apparatus, by which an electric bell is set ringing as soon as the desired pressure is reached. A small force-pump, worked by hand, supplies the pressure. Accuracy of finish and first-rate workmanship are noticeable in all these exhibits, and if, as we are told, the pipes are practically indestructible, we have no doubt the system will receive very extended application. At the present time it is used very largely by the War Department, numerous dock and public companies, as well as by

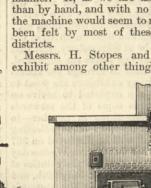
many private firms. Messrs. C. Isler and Co., artesian well engineers, Southwark-street, S.E., show a large variety of their tube wells, and appliances used in connection therewith. engraving represents an improved apparatus for driving the tubes, which is simple and effective. The tripod and ropes and pulleys are entirely dispensed with, the monkey being raised direct by hand and guided on a steel spindle. There are also a great number of tube well points for dealing with different soils, sandy or otherwise, or with chalybeate waters, which are apt to cause corrosion and stop up the perforations in the points. It often occurs that layers of stone or rock, or other hard strata which cannot be penetrated by the ordinary point, are met with at considerable depths from the surface; and in order to meet this emergency a set of small boring tools has been specially designed for military or private expeditionary forces, to be worked with the 12 in. or 2in. tube wells, so reducing the chance of failure. These are exhibited, and a great variety of hand lift and force pumps, all connected

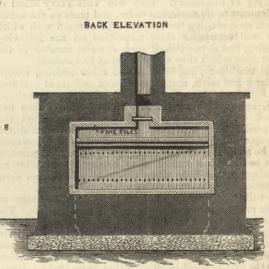
with tube well work. Messrs. Isler have driven at their

a supply of over 12,000 gallons per hour being obtained. The water is extremely clear. This well was fixed in less than two hours.

An improved machine for beating carpets is shown by Messrs. Simmons and Tullidge, King's Cross. It consists of a roller revolving at a high speed within a wood casing, and having attached to it a number of leather ropes. The and having attacted to it supported on a horse, and the ropes carpet to be beaten is supported on a horse, and the ropes as they come round strike the carpet, and beat out the dust. The horse consists of a wooden frame, open at the parts on which the ropes strike, and the carpet is here supported only by leather straps stretched across the frame, so that the dust can fall freely away. The action of the so that the dust can fall freely away. The action of the beaters suffices to draw the carpet forward into the ma-The casing is connected with a fan, which carries off the dust and discharges it into a chamber, when it can be precipitated by water, or dealt with in some other manner. If, as we are assured, the work is done better than by hand, and with no more damage to the material, the machine would seem to meet a want which has certainly been felt by most of these dwelling in highly populated districts.

Messrs. H. Stopes and Co., Southwark-street, S.E., exhibit among other things the Echangeur air apparatus





TRANSVERSE SECTION THROUGH FIREBOX

for cooling large volumes of air by the evaporation of a liquid such as water. The liquid is placed in a trough, in which is revolved, a cylinder having a diameter slightly less than the trough, and made of perforated sheet iron in several layers, the lower portion of the periphery being immersed. Air is driven or drawn by a fan through the water mechanism of the available and by its available. the wet meshes of the cylinder, and by its capacity for holding moisture in solution induces evaporation, so causing a reduction of temperature, additional cooling power being obtained when the water is at a lower sensible temperature than the air. The apparatus is also useful for imparting moisture to dry air. It is stated that about one rollon of proton will each cheat 100 000 while for the proton gallon of water will cool about 100,000 cubic feet of water, the reduction being usually about 8 deg. or 10 deg. Fah. Messrs. Stopes also exhibit some special thermometers for brewers' use, and a magnetic screen for extracting nails, broken wire, and other metallic substances from grain.

#### THE ROYAL AGRICULTURAL SHOW AT SHREWSBURY.

THE last meeting of the Council of the Royal Agricultural Society, previous to the now rapidly approaching Show, was held on Wednesday, under the presidency of Sir Brandreth Gibbs. Reports of various committees were received and adopted; and one governor and 134 new members were elected, including many Shropshire residents. The stewards of implements at Shrewsbury are Lord Moreton, M.P., Sir John Thorold, Bart., and the Hon. Cecil T. Parker, while Mr. Robt. Neville again acts as steward of engineering, and Mr. Jacob Wilson fulfils his accustomed post of steward of general arrangements.

Only a few matters of detail now remain to be dealt with before the entire preparations for the gathering on the Shrewsbury Racecourse will be completed. So far, everything has been carried out in the most harmonious spirit, the local committee vieing with the Royal Agricultural Society and all concerned to promote the success which now seems well assured, if only we may for once place confidence in that most untrustworthy of all elements -the weather. So far as human endeavours can avail, no effort has been spared, and it would be pitiful indeed if heavy rain should now mar what is otherwise certain to be a gathering distinguished by unequalled prosperity. Up to the present time singularly few difficulties have presented themselves; those that have cropped stand a 2in. well to a distance of 21ft. from the surface, up have been of no serious moment, but have

## THE ENGINEER.

mounted on wheels for facility in transport. To provide hot water, for baking and other puposes on the march, a small boiler is fixed at the base of the chimney so as to receive some of the heat that would otherwise be wasted. The fore carriage is fitted with a patent compensating arrangement, for keeping the oven horizontal when travelling over uneven ground. The wheels

-STEAM ESCAPE

SECTION AT A B

are of special construction, the rim consisting of a U-iron filled up with teak, the spokes being rivetted into the iron, and held by check nuts screwed up against the wood. The nave is of cast steel. These wheels have been subjected to very stringent trials at Aldershot in competition, and were adopted on account of their durability, and the ease with which they could be repaired in case of accident. The portable oven—which will bake for 1000 men—is very largely used by the War Department, and has been employed in all the recent campaigns. It can be heated with group word on our other port of with green wood, or any other sort of fuel, and can be used on the march as well as in camp. In addition to these exhibits,

STEAM PIPES

LONGITUDINAL

been quickly and pleasantly overcome. On the other hand, many circumstances have combined to eminently satisfactory result. Since the produce an ast show of the Royal, held at York twelve months ago, the railway concessions to exhibitors have been materially enlarged, the terms for the conveyance of unsold live stock and implements being extended to all the exhibits that remain unsold. All exhibits sent to Shrewsbury will be subject to the usual full charges for carriage both going to and returning from the Show in the event of their having been sold; but the whole of the unsold exhibits will only be charged half rates on the return journey upon produc a certificate from the secretary of the Show that tion of the exhibits are really unsold. Moreover, by a compara-tively recent concession which the Royal Agricultural Society has been successful in obtaining from the railway companies, persons *bonâ fide* in charge of live stock will be allowed to travel free by the same train with the animals, one man for each consignment or for each vehicle if necessary on the prescribed forms being duly filled up.

Next week many of the officials and some hundreds of exhibitors or their assistants will be at Shrewsbury, and that week will be an exceedingly busy one inside the showyard, as it is a work involving much time to arrange the stands in the attractive manner that many exhibitors are wont to do. The secretary and his staff are expected to arrive on Monday; a day or two afterwards some of the stewards will arrive; and the gentlemen-three in number-to whom is assigned the important function of adjudicating upon the 3242 implements, which will be displayed on 367 stands, will reach Shrewsbury not later than Wednesday These judges are expected to begin their duties at night. nine o'clock on the morning of Thursday, July 10th, and they have been instructed to deliver to the stewards their final and complete awards of prizes and medals immediately after their decisions are completed. will decide on the merits of the work done by any implements to which steam or other power is applied, and it is an instruction to them that in every case where practicable in the trial of implements, steam power should be adopted instead of horses, as the most accurate test of the relative working of machinery. They will visit every stand of implements in its numerical order, and place on the notice boards each evening the number of the stand with which they will commence their inspection on the following morning, and at one o'clock each day the number of the stand from which they will proceed at two o'clock.

All machinery, implements, and other articles, except carriages and seeds, roots, models, and samples of manures and feeding stuffs, are required not only to be in the showyard, but to be arranged in complete order before five o'clock in the afternoon of Wednesday next, but the excepted articles need not be in their places until the corresponding hour on Saturday. No painting, however, will be allowed after Wednesday evening, and all painting must be of such a nature as to be dry by the following morning, at the hour when the judges commence their inspection.

It will be convenient here to give a brief statement as to the premiums offered in the various departments. The trials specially assigned to this year are of sheaf-binding machinery, and ensilage elevators and cutters; and it will be to the thirty-six competing inventors that the judges and agriculturists in general will chiefly direct their attention. In the first, or sheaf-binding section, there are two classes,

In the first, or sheaf-binding section, there are two classes, one for sheaf-binding reapers—first prize, £100, and second prize, £50—and the other for separate sheaf-binders prize £25—but in both cases it is stipulated that the binding material is to be other than wire. In Class 1 there are twenty-two entries by eight competitors, and in Class 2 there are three entries by two competitors. These trials will, as have been previously announced, not take place until harvesting time. We understand that suitable crops, on which to test the merits of the competing machines, have been secured in the neighbourhood of Shrewsbury.

The second, or ensilage section, will certainly not be of secondary interest in the eyes of many visitors. In competition for the £25 offered for an efficient machine for cutting and elevating materials to be preserved in silos, nine different makers have entered eleven machines. The exact arrangements for the trials of these inventions are in the hands of the judges and stewards; but it is extremely probable that they will take place in the course of next week.

In addition to the foregoing, there are ten silver medals, the award of which the judges have the power of recommending in cases of sufficient merit in new implements exhibited at the Shrewsbury Show. These medals cannot in any case be awarded to any instrument unless the principle of the instrument, or the improvement of it, be entirely new. No medal will be awarded by the judges are prohibited from giving commendation to miscellaneous articles. The judges are also empowered to make special awards of medals for efficient modes of guarding or shielding machinery, especially when worked by steam, from contact with persons immediately engaged in attending to such machinery while at work. No medal will be awarded to any implement or miscellaneous article capable of trial until it has been subjected to such trial as the stewards may direct.

The live stock prizes reach a total of  $\pm 4746$ , of which horses are apportioned  $\pm 1510$ ; cattle are entitled to receive  $\pm 1985$ ; sheep are allotted  $\pm 891$ , and the remaining  $\pm 360$  going to pigs.

# VISIT TO THE MIDLAND RAILWAY WORKS,

THE members of the Society of Engineers commenced their summer excursions to engineering works of interest by a visit on the 26th ult. to the great locomotive and carriage building works of the Midland Railway Company at Derby. Leaving St. Pancras at about ten o'clock, they arrived at Derby about 1 p.m., and were met by Mr. S. W. Johnson, M.I.C.E., locomotive superintendent, and Mr. T.

Clayton, superintendent of the carriage department, by whom they were at once conducted to the works, first entering the locomotive department offices, where, amongst other things, they were shown a collection of photographs of the various kinds of engines which have been and which are made for or by the company for use on its lines. The growth in the size and power of the engines, especially those for the express passenger service, was one of the points most noticed, this growth having been necessarily accompanied by the adoption of the four-wheel leading bogie instead of the single pair of wheels, the load on which became too great. From the office they were conducted to the laboratory, a large and well-appointed department in which all metals, oils, paints, and other materials used in the works are analysed and tested. It was here mentioned that by the substitution of the redbrown oxide of iron paint for the green paint hitherto used for the locomotives a clear saving of  $\pounds 3000$  per year had been made. Hence the green colour by which these engines have long been known will soon be entirely superseded by the red-brown, which costs less, is more durable, and retains its colour better and does not show the oily dirt so quickly.

From this department the visitors passed to the coppersmithy, lamp shop, and stores, passing on the way a fine weighing machine with platform in short lengths, connected to separate steel yards, so that the weight on each pair of wheels of a locomotive can be separately ascerained and the springs adjusted to the required tension. Now entering the works, some idea was obtained of the extent of the operations conducted under the guidance of the locomotive superintendent. When it is known that the Midland Company employs about 46,000 servants of all grades, and that about 10,000 of these are under the control of Mr. Johnson, it will be understood that the duties of his office not only render it a heavy responsibility, considering that, unlike a similar number of soldiers, all these men are continually employed, but that the works at Derby must be of great extent. The company possesses no less than 1700 locomotives, a fact which further helps to a comprehension of the necessary area of the Derby central works, where also other work is carried on. These locomotives may be taken as representing about a million horse-power, but of course they really represent more than this, inasmuch as a million or any other number of horses could not do the work at the speeds.

Passing into the foundry, the moulding of chairs was seen, and to the surprise of some visitors this work is done by hand. With boxes or flasks about 2in. wider and longer than the exterior dimension of the chairs, the quantity of sand used is not large. The iron pattern is laid on a board, the flask placed round it, a little facing sand put in covered with body sand with a shovel, the handle of which is formed into a rather large pegging rammer. little more sand is thrown in, flat rammed with the shovel, and scraped off with it. The operation is thus wholly of the ordinary kind, but it is performed so quickly, the top part of the mould being only a struck top, that the cost of the moulding is but 2s. per ton of chairs. The pattern easily leaves the sand, and the loose pieces by which the jaw is formed leave without any trouble. This cost of moulding does not leave much room for economy by machine mould ing, and it is argued that when the foundry is small and the cost of keeping machines in order taken into account, the possible saving is not material. A new foundry is, however, being erected, chiefly for chair and fire-bar making, but whether the extra room so obtained will afford any inducement to adopt machine moulding is not yet known. At present from 230 to 250 tons of chairs are made in the existing foundry per week.

While passing through another part of the foundry, the unusual appearance in this department of a locomotive crank shaft in a moulding box was observed. Inspection showed that it had had the four excentric sheaves cast upon it in their proper positions. The excentric sheaves are moulded in a box provided with guides for moulding them with the pattern in the right position, so that when the real crank shaft is afterwards put into the box, it is held with the cranks at the proper angle with respect to the longer excentric diameter of the sheave to be cast on. The shaft is placed in a vertical position, the part which is to receive the sheave having been only rough turned. This gives the sheave sufficient hold when it has shrunk on. This method has been adopted about a year, and so far with success, although some fear of blown castings, chill next the shaft, and of bursting after the sheaves were turned up, might reasonably have been entertained, especially as, we were informed, the shaft is not heated at all when put into the mould.

Passing into the boiler shops, some excellent work was seen, steam rivetters being used, and suspended machines employed for tapping and screwing in the fire-box stays. These machines, or some of a similar kind, were illustrated in THE ENGINEER of July 6th, 1883. The screwed copper stays are reduced in diameter at that part which is between the plates when screwed in, so that the time occupied in screwing them in is lessened, and the stave are not so liable to break. At another part of the shop a simple machine was seen fixed to a wall, for facing those parts of the boiler upon which the gauge glass and other fittings have to be fastened. The joint is thus quickly and easily well made. Copper fire-boxes and brass tubes are used. The water used on the greater part of the line makes it impossible to use iron tubes. Amongst the engines in course of construction in the erecting shops were seen some of the new type for heavy express passenger traffic. These have cylinders 19in. by 26in. The two cylinders are made in one casting, by which a good deal of weight and work are saved, but this has only become possible by the adoption of the Joy valve gear. These engines have 7ft. driving wheels coupled, and with 9ft. centres. They are very fine engines, and have some very heavy work to do at a high speed. Some fine new mineral engines were also seen; engines weighing about 46 tons without the tender, and capable of hauling a train of 600 tons, including engine, at a high speed along the health.

heavy road to London. These erecting shops, like the adjoining turnery and machine shops, are 450ft. in length, and are provided with 25-ton travelling cranes worked by constantly running endless cotton ropes. The shafting in these shops is driven by fine wall engines supplied with steam from locomotive boilers at a pressure of 140 lb, per square inch. They are excellent engines coupled, direct to the shafting, but steam is exhausted at rather a higher pressure than would agree with the notions of most constructors of economical engines. In the turnery are groups of lathes of different sizes, four and six in a group, contained in one standard with overhead secondary shafts. In this one turnery are 450 hands.

In the machine shops were seen several emery-wheel shaping machines, shaping and finishing the surfaces of the guides for the axle-boxes of the locomotives, guide bars, and other parts. The use of these machines permits the use of chilled cast iron where so very durable and cheap a material could not otherwise be used, and the extent to which this class of machine is now used is worthy of remark. The holes in the boiler tube plates are drilled with large twist drills guided by large thick templates, but twist drills are not in general use yet. The fire-box roof bridges are of wrought iron, and are drilled from the under side about 2.5in. deep, and are tapped by the same machine. The stays are screwed into them from within About ninety of these roof bridges were seen in the box. one large planing machine, on which the ends where they rest on the vertical plates of the box, were being shaped at one operation. A new machine by Messrs. Craven Bros., for slotting out the crank dip and rough turning the pin of the cranks, was seen in operation. Attached to the periphery of a strong disc is a number of round-nosed tools, which successively come into operation as the disc slowly revolves like a big cutterhead, while the crank itself, when the pin is being shaped, is also slowly revolved. The pin is in this way rough turned, and the total cost of turning this is thus lessened. Wrought iron cranks are used, experience being that warning of their failure is more often given than with steel. A lot of special machines for drilling through the bodies of the wheels into the tires, tapping the holes and screwing therein the stude by which the tires are prevented from moving, were seen at work, and amongst other things it was observed that cast iron is used for the bodies of the wheels of shunting engines.

In a separate shop for case-hardening were seen long tanks containing water for cooling the coupling rod ends and other parts of locomotives when taken out of iron retorts in which they are heated, the noticeable feature in this shop being that the tanks are provided with two screws, one at either end on vertical shafts, by which the liquid is kept in rapid circulation. This secures a much better result than can be obtained when the water is not properly kept in motion. Tilghman's sand blast process is used for sharpening files, and cleaning castings which have to be turned, such as the inside of axle brasses, to which it is necessary to make the bearing metal adhere. Throughout the whole works it was observable that those controlling them fully appreciate the best and most economical modern methods of doing work.

From the locomotive department the visitors were conducted to and over the carriage and wagon department by the superintendent, Mr. T. E. Clayton. Here an area of more than 14 acres is covered by a splendid series of new workshops, fitted with the best modern plant and with timber stores, and outside the shops is one of the largest stocks of timber to be seen in the country. An account of the greater part of these works was given in THE ENGINEER, vol. xlv.,1878, with illustrations and description of most of the machinery. Very large quantities of American oak are used, and in the drying stores were seen what would seem to be enough frame pieces, buffer beams, sole pieces, planks, and so on, for wagons and carriages to stock the whole of the railways of the kingdom, but a little further progress through the carriage and wagon shops, where are hundreds of these in course of construction, soon dispelled this idea. It was noticed that the ends of these pieces of converted timber were coated with white lead paint, as a means of preventing the ends from drying more quickly than the other parts, and thus causing splitting. The different ideas and methods of those who have the control of timber yards are, on this subject, almost as numerous as the controllers, some of the older men having, on this subject at least, some curious "fads." The visitors were shown some of one lot of a hundred new carriages of most recent form and type, elegantly finished and designed with every attention to strength and comfort, and fitted with the Pintsch system of oil gas lighting apparatus. The Midland Company has already five trains thus fitted now running on its metropolitan service, and the excellence of the light is remarked by everyone, while not only is the cost per light much less than with lamps, but the cost for attention is exceedingly small. Some idea of the necessary area of the wagon repairing shops may be gathered from the fact that, added to the wagon stock already in its possession, the Midland Company recently purchased about 60,000 of the wagons belonging to private owners, but running on its lines. The visitors dined at the Station Hotel in the latter part of the afternoon, and returned to London in the saloon carriages specially provided for their use.

#### TORPEDO BOATS FOR THE RUSSIAN GOVERNMENT.

ON page 6 will be found engravings of the boiler and condenser of the Russian torpedo boats, engravings of the engines, &c., of which have already appeared in our pages. The engravings explain themselves. The small detail cut at the end of the box shows the joint at the end of the condenser, and the strengthening ring with which the thin copper cylinder is supported, in section.

DEATH OF GENERAL TODLEBEN.—General Count Todleben died on Wednesday at Soden, a watering-place near Wiesbaden. The General had for a long time been in a very weak state of health.

#### THE MECHANICAL ASPECTS OF A STEAM TRAWLING CRUISE.

DURING the summer season trawling in the North Sea is carried on chiefly over the extensive shoal ground known as the Dogger Bank; but in winter, when fish is not so liable to deteriorate by being preserved in ice, the trawlers go farther away to the coasts of Norway and Denmark. The more seaworthy qualities and elaborate fishing tackle of a modern steam worthy quanties and elaborate finning tackie of a modern steam trawler enable her to make longer and more hazardous voyages than those undertaken by the old type of trawling smack. Fig. 1, which is a combined sketch taken by the writer from some old superannuated vessels rotting away their existences in the Grimsby Docks, will give a very fair idea of the deck arrange-ment adopted in trawlers of the transition period when ketch-rigging first began to be introduced. The mechanical appliances carried by the old-fashioned trawler for handling her net gear were very primitive. The towing warp was wound in and paid were very primitive. The towing warp was wound in and paid out through a port-hole\* over a bollard B, by the aid of a capstan C, and the dandy bridles fastened to the trawling beam were manipulated over a double-purchase winch D standing to star-board of the poop. The modern steam trawler carries much more elaborate gear, a good example of which I had every opportunity of seeing in operation during a trawling expedition made in the autumn of last year, and in this article I shall endeavour to describe the more interesting mechanical aspects

of my cruise. Favoured by an early tide, and following the wake of the autumn gale, at eight o'clock on the morning of September 4th autumn gale, at eight o clock on the morning of September 4th I stepped from off the Grimsby Pier-head on board the steam trawler Cecily, a vessel built, engined, and owned by Messrs. T. Charlton, of Great Grimsby. The Cecily is a shapely boat, 80ft. in length, 19ft. in breadth, and 10ft. in depth to top of floors. Unlike the older sort of fishing smack, she is not bluff-bowed and full-waisted, but spare and finely drawn, after the style which fishermen denominate "yachty." Her accommoda-tion, however, is not such as would tempt any but those ready to welcome a taste of seafaring life. Forward she has a small to welcome a taste of seafaring life. Forward she has a small cabin, along the sides of which are arranged eight or ten bunks, spacious enough to admit of a full stretch or a "turn-over," and provided with sliding doors, enabling the sleeper to secure his retreat against the turnultuous undulation of a "yarn," or his retreat against the tumultuous undulation of a "yarn, or the stifling fumes of tobacco smoke which envelope the cabin like a morning mist. When the hour of "turn-in" arrives, the trawler casts himself in full rig upon the hard boards of his bunk, and shrouding himself in a homely rug, sinks uncoaxed into profound slumber. Callously indifferent to rules of venti-lation, sanitation, or hygiene, he closes his sliding door and, so to speak each shimself is a homely in sheap

to speak, seals himself hermetically in sleep. The general deck arrangement of a modern steam trawler differs from that of the old smack, not in having a different, but a better class of fishing furniture. Aft of the fore cabin of the Cecily, just described, comes the first cargo hold, partitioned into a number of compartments called "pounds," into which the fish, after it has been gutted and cleaned, is lowered and distributed according to its kind. Intervening layers of ground ice are mixed with the fish in the proportions of one layer of ice to every fifteen baskets of haddock and every ten baskets of plaice. Soles and other prime fish require greater quantities

At the back of the front cargo hold is the ice room, where ice is kept in blocks, and when required, ground down smaller between the teeth of a revolving cylinder and the sides of a

Next to the ice room lies the aft cargo hold, considerably more roomy than the fore compartment. This space is too close to the engine room to be of much use in hot weather, but in winter, or when the vessel is being utilised as a steam carrier to a fleet, this additional storage is found very useful. Over this hold and central on deck stands a steam winch, which serves to wind in and pay out the warp over the periphery of a drum. This winch is also fitted with a pair of double-coned heads, upon which can be wound or unwound any ropes or bridles connected with the shin's rigging or pat gray. Aft of the second approx with the ship's rigging or net gear. Aft of the second cargo hold comes the engine room, containing a compound surface con-densing engine of the inverted vertical type directly actuating

the propeller shaft. The crew of the Cecily consisted of skipper Nichols, a second hand, a third hand, a "deck chap," a cook, and two mechanics to attend to the working of the machinery on board. On the evening of the first day, after steaming about fifty knots, we let go the net in about ten fathoms of water on shoal ground north-east of Grimsby port; but finding for fish in ground north-east of Grimsby port; but finding few fish in these waters we at once steamed 120 miles farther out, following the same point of the compass. Here we trawled to and fro for the better part of a fortnight, shooting the net, as a rule, thrice every twenty-four hours.

every twenty-four hours. It may be interesting to give here a short description of a trawling net, an inverted plan of which, looking upwards from the sea bottom, is roughly represented in Fig. 2. The upper part or "back" of the net is attached to a long beam about 9in. in diameter and 56ft, in length, at the ends of which are two closed iron frames called "heads," which, when the net is down, rest upon the ground and carry the beam. In some instances these heads are made in the form of wheels. The net floats behind the beam like a long distended and continu-ously narrowing bag. Its "mouth" is formed by the heads lying at the sides, the beam taking the place of the upper, and the ground rope that of the lower, lip. The beam is held by the heads about 3ft. 6in. above the bottom. The fish pass in through the mouth between the beam and the ground ropes, and gliding over the false bellies of the net, find it almost impossible to effect over the false bellies of the net, find it almost impossible to effect their escape. In consequence of constant friction upon the sandy bottom of the sea the under surfaces of the iron heads wear to faces as bright as silver. For this reason loose running wheels would seem better adapted for the work than the closed iron frames which are so extensively and generally used. On the other hand, loose wheels could not be so easily managed on deck, and would be liable to slip round and get away from the hold when being hauled over the bulwarks. The dimensions of hold when being hauled over the bulwarks. an ordinary net are—length from line of beam to line of ground rope, 45ft.; from line of ground rope to beginning of cod end, 32ft.; and from beginning of cod end to tail of net, 12ft.; its width along the beam is about 55ft., embracing 220 meshes on the "back" and 200 across the "belly." The meshes vary in size from 3in. on the back to  $1\frac{1}{2}$  in. on the belly. The belly meshes are made smaller, as the fish is more apt to wriggle through that part of the net.

For the sake of easy trawling, and in order not to expose the net to the continual danger of breakage, the ground worked upon must be of a soft or sandy nature. Therefore, prior to shooting the net occasional soundings are taken to ascertain the kind of bottom and the number of fathoms of underlying water. If the ground be found good, the men take up their allotted

\* The port-hole in a modern trawler would be placed abaft of, not under the ladder, where it tends to weaken the bulwarks.

posts along the beam, the skipper standing at the aft and the mate at the front head. The forward bridle is first let go, whilst the aft head is held fast by the hind bridle till the beam floats square to the length of the vessel, when at a given signal from the skipper the whole gear is set free and the heads in the act of sinking carry down the entire apparatus to the bottom of the sea. At the same time a steel wire warp, to which the main and dandy bridles are shackled, is paid out to the extent of two and a-half time the fathere of mire events of the set of the back times the fathoms of water sounded. The vessel then begins to tow. During the time that the net is down, which varies from five to ten hours, according to the scarcity or abundance from five to ten hours, according to the scarcity or abundance of fish, the men are employed in gutting, washing, gathering into baskets, and lowering into the hold, the fish of the previous take. When the vessel is making short hauls thrice every twenty-four hours, the men get very little rest, but when fish is scarce or the weather too rough for trawling, they secure their full allowance of sleep. There is no idle time; the opera-tions of hauling-in, gutting, cleaning, net repairing, and swabbing the deck, made as slippery as ice by the accumulation of fish scales, consume all the hours of the day not set apart for meals or sleep. This unbroken continuity of work constitutes a hard if a construct of the form of the table of tab perspiration-a loss repaired only by imbibing large quantities

afloat that this magnificent allowance is to be reduced to a shilling rate.

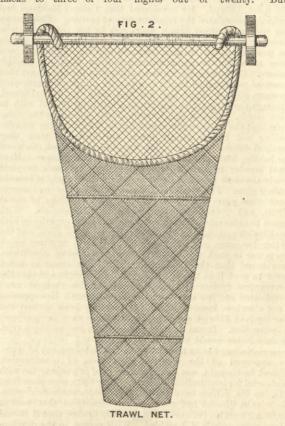
A fleeting smack remains out eight weeks, after which time its crew acquires the right of returning home to spend a week on shore. Thus, a fleeter passes six weeks out of twelve months in civilised society and the companionship of his family and friends, the remainder he drags out in a kind of transportation on board a fishing galley! In season and out of season, in fair weather and foul, away from all that is dear to him, fed on hard biscuit and salt junk, snatching sleep when he can, paid at a rate incommensurate with the risk and suffering he undergoes, and removed from all chance of satisfying his most innocent and legitimate passions, the poor fleeter leads a life which for severity can only be compared to that of a man undergoing servitude for crime. If fleeting were pursued only for a part of the year, say during the summer months when the weather is fine and gales of wind infrequent, the fleeter's lot might be tolerable; but it seems simply inconceivable that the Board of Trade should allow fleeting to go on the whole year through, exposing the smacks, which trawl all together in one line, to the constant danger of collision, and continually en-dangering the lives of the fishermen for the sake of satisfying the rapacity of certain smack owners. I am glad to state that the rapacity of certain shack owners. I am giad to state that all the Grimsby owners have finally renounced this barbarous system during the stormy months of the year. But other owners have not as yet followed their good example, if we except the fact that a strike among the fleeters of the Great Northern or Hull fleet obliged that company to yield with a bed great group areas

bad grace for one season. "Single boating" ought to be

"Single boating" ought to be enforced from the end of Sep-tember to the beginning of April, and fleeting confined to the other months of the year. Any-one who has seen a fleet of smacks numbering, as in the case of Barking fleet, some 110 ves-sels, huddled together in a narrow span of water, and lit up at night like the fires of a compact city, will realise the compact city, will realise the imminent danger there is, when the waves soar high and hailstorms shorten the vision, of the smacks colliding one against the other. Skilful seamanship is of little avail in these emergencies. The skipper must trust more or less to chance to save his vessel

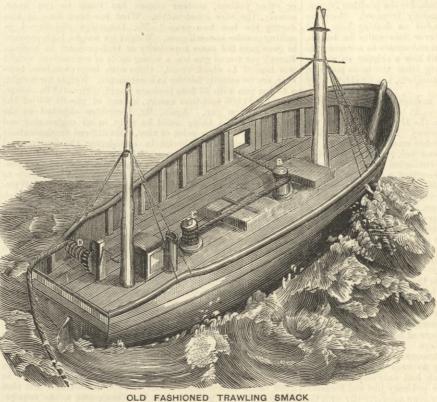
and the lives of his crew I was fortunate enough to pass through two of these large fleets-the Great Northern and Barking contingents. Moreover, I received an invitation to tea on board one of the smacks of the latter fleet, so that I had the latter neet, so that I had every opportunity of judging their life from a very near standpoint. The Barking fleet, as most of the others, is attended by a "Bethel ship," where every Sunday divine service is read and the neer are arburted to lead

of brackish, unwholesome water. In the intervals of rest many of these men, like our brave skipper, were too worn out to climb into their bunks, and so cast themselves down on the lockers or bare boards of the cabin; only a few are in the regular habit of a privilege in their class. They enjoy the blessing of sleeping on shore two, and sometimes three and four, nights out of twelve. This is reduced for fishermen on board sailing smacks to three or four nights out of twenty. But



the most unhappy fate befalls the poor, unfortunate "fleeter." A fleet consists of from one to two hundred smacks, which trawl together under the command of an "admiral." All these vessels shoot and haul simultaneously "admiral." All these vessels shoot and haul simultaneously, at times corresponding to signals given from the admiral's smack, which, for a distinguishing mark, flies a flag from the jib. The admiral of a fleet holds a very responsible post, but it can scarcely be said that his remuneration is on a par either with his dignity or responsibility. Formerly, in addition to his ordinary earnings as a skipper, he received half-a-crown each time he shot his net. At the present moment rumours are

Sunday divine service is read and the men are exhorted to lead good moral lives. I was struck by the number of fishermen who responded to this call. Out of the ten guests present at the hospitable board of our skipper nine were what the fishermen characteristically term "religious," that is, they read tracts and sing hymns over their work, avoid intoxicating liquors, and resist the prevalent habit of swearing when things go wrong. I do not mean to imply that the tenth man was the black sheep of the fold. On the contrary, he was a rare good sort of fellow. of the fold. On the contrary, he was a rare good sort of fellow, none the worse because his peculiar constitution prohibited him from partaking of the same spiritual food as his neighbours. I from partaking of the same spiritual food as his neighbours. I do not know, but I dare say he believed in the idea that on certain occasions a skipper is bound to swear. It is the only weapon, he might argue, fit to make an impression on men who live hard lives and sleep little, and who therefore need a strong stimulant to rouse them from lethargy into action. I should mention that a "Bethel ship" is not the only escort vessel of a fleet. Not far from the Bethel you are sure to find a small smack with a flag on her mizzen, the sign-board of the "pub" of the fleet. A fleeter, therefore, can make his choice between Bethel and Coper. On board the former he can re-plenish himself with spiritual wisdom; on board the latter he can supply himself with shag at a shilling a pound, or if he has can supply himself with shag at a shilling a pound, or if he has a mind to soar higher, he can purchase cigars at the rate of five shillings the hundred. These Copers generally hail from Dutch ports. The skipper of a fishing smack is not paid by the day or week. shillings the hundred. These Copers generally hall from Dutch ports. The skipper of afishing smack is not paid by the day or week. Much the same as in other walks of life, everything depends upon success; and one of the first conditions of success is good fishing ground. If the first haul contains few fish and many "sluthers," the skipper must away to ply his trade in more pro-pitious waters. His earnings depend upon his hauls, of the proceeds of which he receives an agreed share. The tearing of the net in the act of landing a good catch may mean the loss of  $\pounds 20$  or  $\pounds 30$  worth of fish. It was my fortune to witness an enormous loss of this kind. The net had been trawling all night for ten hours in waters teeming with fish. Under night for ten hours in waters teeming with fish. Under ordinary circumstances the skipper would have hauled in about midnight, but the accidental drawing of a ferule of one of the condensing tubes decided him not to haul till daylight. Thus the net was full of fish, containing on an estimate about sixty baskets of all descriptions, including prime fish such as turbot, will and appendix of the second sec brill, and sole, as well as offal fish, such as cod, haddock, and plaice. A basket weighs on an average about 6 stone, so that the catch exceeded 2 tons in weight. All went well till the bag was hoisted in the air almost high enough to be canted over on the deck, when the net began to show signs of yielding just under the hauling rope attachment. In a trice the small tear had widened to a mighty gap, and away, like a living torrent, went the fish back into their native bed. A few only, lying at the bottom of the net, were saved. The loss of a haul is the grand crux of a fisherman's life, and it had a saddening effect upon me to witness the poor man's earnings slipping from his honest grasp, when in another moment he had counted them his own. But our skipper bore up bravely, and tried every pos-sible means of saving the bag. As soon as the first mesh broke he at once lowered the net to water so as to relieve the weight. Then he passed supporting ropes underneath and called upon the hands to haul, but in spite of all these precautions the fish the hands to haul, but in spite of all these precautions the fish continued to escape. Thus, seeing the uselessness of his efforts, his zeal to save turned to comic desperation, which found vent in various exclamations, and the remark, "Never mind, my lads, let them go—they don't belong to us !" Judging by my



own feelings, the expressive language of the skipper, and the looks of the crew, the sense of loss on board must have been very keen.

The great attraction in a trawling expedition is of course the haul, which I saw under all its varying aspects and at all hours of the day and night. It is a magnificent privilege to witness a full-blown bag of fish floating high above deck, like a huge balloon, suddenly open its vast jaws and belch forth a moving mass of live fish, scattering it all around in glistening heaps. To look upon this scene by day is enrapturing, but to gaze at midnight upon the quivering sheen of a trembling mass of fish, dashed on deck and lit up by the rays of the harvest moon, is nothing short of sublime. Myriads of fish, surpassing all adequate description, are cast at our feet; the kingly turbot; the monster cod; the winged ray, with his saw-toothed tail; the plaice, gifted with nine lives; the shark-like dog fish; the cat fish, with his rhinoceros hide; the jelly fish, *vulgo* sluther; the haddock, the codling, the whiting, the hake, and the rest whose name is legion, which never reach our shores, but are at once recommitted to the deep. The excitement of the haul compensates somewhat for the monotonous routine of life on board a trawler. Another source of distraction is the coming alongside of a friendly smack. It is surprising to learn how quickly fishermen descry and recognise the smacks of their friends. To an ordinary, unpractised eye North Sea trawlers are all much of the same build and rig. Their outfit is identical, and their form so nearly the same that it becomes a perfect enigma to explain how one vessel is so readily distinguish a "herringer," Dutch or English, for she is either luggerrigged or, if ketch-rigged, very clumsily trimmed. Moreover if her endless straight net, suspended on floating kegs, and stretching sometimes in one line over two miles in length, happen to be out, she keeps her foremast struck as a warning to trawlexs not to cross her path. But how a skipper so readily distinguishes between trawlers hailing from the same port and too far away for him to read their numbers, is a mystery to my unin

A fairly-sized outshore trawler averages 80 tons carrying capacity, and inshore boats from 18 to 20 tons. Outshore boats go as far as 300 to 500 miles from the Humber mouth, to the Faroe islands and the coast of Norway Dried codders make longer voyages, and stay out four or five months at a time.

longer voyages, and stay out four or five months at a time. As a rule a trawler works only one net, keeping a second in reserve lest the first should become entangled in *d&bris* or rocks and be swept away. As might be surmised a trawl net engulfs stranger things than fish. Sometimes it vomits upon deck shell-crusted spars, the wreckage of vessels that have gone down, boxes and portmanteaus, packing cases, jewellery, suits of clothes and apparel, and occasionally the gnawed and maculated corpses of drowned men, victims of a recent gale. I have stated that, as a rule, a trawler carries only one net. Recently, however, a double set of gear has been introduced on board the steam trawler Leo, owned by the Great Grimsby Company, and built and engined by Messrs. T. Charlton. This vessel uses her two nets alternately, and thus economises the time formerly wasted in making good faults after the net had been hauled in. High speed is a useful adjunct, and we might say almost a

High speed is a useful adjunct, and we might say almost a necessary quality, of a steam trawler, as it often enables her to save the good Thursday and Friday markets when a slower vessel would run the risk of having to dispose of her fish in the declining markets of Mondays and Saturdays.

would run the risk of having to dispose of her han in the declining markets of Mondays and Saturdays. All trawling vessels, both screw steamers and sailing smacks, are ketch-rigged. It is interesting to note the origin of this form of rigging. Formerly a smack had only one mast for a mainsail, forward of which were the ordinary jibs and foresails. But as the dimensions of the trawler grew concurrently with the requirements of a developing trade, the boom of the mainsail had to be lengthened till it became on account of its great length a source of trouble, danger, and inconvenience. It was therefore cut in two, and the parts apportioned to separate masts called main and mizzen.

Before a fair wind a fully ketch-rigged steam trawler can disconnect her screw, bank up her fires, and make way under sail alone. This contributes to the economical working of the vessel on the principle that wind is cheaper than steam. Sail is also a useful auxiliary to a steam vessel when towing, as it helps her to lie-to close under the wind for that purpose, and, if need be, to change her tack so as to take the fish in another line. Changing tack when towing is a very delicate operation, which must be performed gradually for fear of upsetting the trawl. The tiller must be manipulated as little as possible in order to allow the vessel gently to head her net. The rate for towing is about two or three miles an hour.

As I have before mentioned, the fish, after it has been hauled up and thrown upon deck, is gutted, washed, and classified, then gathered into baskets and lowered into the hold, where it is distributed into large partitioned receptacles called "pounds." Here it remains packed in ice till the return to port, where it is again put into baskets, landed, and transferred to boxes, in which shape it is sold by Dutch auction on the pontoon. At Grimsby these sales are held between the hours of nine and ten in the morning, when it is interesting to watch the commotion among the buyers hurrying from one salesman to another at the traditional call of "turbot buyers, cod buyers, haddock buyers, lemon sole buyers !" It is not less interesting, if somewhat painful, to hear the din and clatter made by the auctioneers and feel your tympanum vibrate under the stentorian tones of such a salesman as James Allward, as he rattles down the descending scale of pounds, shillings, and pence. The suddenness in which he halts at the faintest whisper of a bid is truly wonderful, and can only be compared to the pause of swift shot before the impenetrable surface of steel-armoured plate.

Travlers go to sea in all seasons, but they cannot work in heavy weather owing to the pitching of the vessel, which lifts the net off the bottom above the level of the fish. I have mentioned that jelly fish form another source of trouble. In fine weather these fish can be seen floating on the surface of the water, but in stormy or cloudy weather they precipitate themselves to the bottom, enter the net, and by buoying it up prevent the capture of more marketable sort. As a rule few edible species are found in the vicinity of "sluthers;" hence, a haul in which jelly fish abound gives the sign for a change of ground.

Before ending this article it affords me much pleasure to acknowledge that I am indebted for means of obtaining the information it contains to Mr. John Charlton, of the firm of Messrs. T. Charlton, iron shipbuilders, Great Grimsby, and for much concerning the mechanical operations of steam trawling to Skipper Nichols, of the Cecily. I have throughout avoided all mention of the habits, customs, or kind of life led by the fishermen, for this is a part of the subject which can scarcely be said to share in its engineering aspect. But, as I find that the writer of a series of articles published by a contemporary holds that the Sotch and Cornish fishermen are "simple-minded and kindly, and as different as can be from the North Sea trawlermen," I feel it incumbent to state that the experience of a fortnight's hospitality on board a North Sea trawler does not at all confirm

this low estimate of the character of its crew. The fishermen of our North-east coast are a hospitable and obliging race. Being an entire stranger to them, I have no reason to think that they made any change in their rules on my account, and I had no sooner got on board than one man came forward to offer me a waterproof suit of blue serge, another to put his best Sou'wester at my disposal, whilst a third volunteered to fit me out in high boots. Every morning the cook brought me a bucket of salt water for a bath, after which the worthy skipper condescended to fry—as he only knew how—a fresh-caught sole for my breakfast. And in stormy weather, when crossing the deck presents a problem of some difficulty to a landsman, two of the hands would graciously form themselves into pillars, one on either side. Therefore I have every reason to vindicate the noble traits in the character of our North-east coast fishermen. R. H. G.

#### COLONEL MAITLAND ON HEAVY GUNS.

THE discussion on Colonel Maitland's paper—published in our last impression--on guns was continued on Thursday afternoon, June 26th last.

Mr. Longridge said that he had listened to the paper with alarm and disappointment. Once we used to be told our guns were the best in the world, but now Colonel Maitland took credit for lagging behind other Powers, and our future is to depend on our watching other nations. May we not be caught napping in the next eight or ten years! One big gun takes fifteen months to make. While we apparently follow Elswick or other nations, another system has come to the front, namely, the wire construction. What has been done in this during the last two years? Mr. Longridge disbelieved in suiting powder to weak guns. Weight for weight, high-pressure in guns gave the same superiority as high-pressure in engines. Energy per ton of gun was a wrong mode of estimation; weight was needed to check recoil. Guns with large chambers, however, are necessarily heavier in consequence. Weight for weight, a 43-ton gun with 33 tons pressure would, with a 413 lb. charge, develope 33,000 foot-tons energy, instead of the 24,000 of the present 43-ton gun. Again, Mr. Longridge objected to the expression that a thing could be right in an engineering and wrong in an artillery point of view. He differed fundamentally from Woolwich and Elswick in considering the longitudinal strain together with the tangential—that is, he dealt with each separately. The idea of two strings to a bow was only confusion of ideas. He observed that no allusion had been made to mode or pitch of rifting. He believed that Sir Joseph Whitworth was correct in employing a long projectile and a high velocity of rotation. He desired to see no more haphazard work, and guns made systematically to meet 30 to 35 tons per inch strain.

Mr. Edmonds, of the Royal Gun Factories, said that we were not lagging behind other nations, at all events in the question of wire, for none had adopted it. As concerns the use of formulæ to calculate the strength of a gun, he would point out that much discrimination was necessary. Those of Rankine and others, for example, were intended for the case of a cylinder subject to uniform pressure, and in other respects differing from the case of a gun. Formulæ especially failed when calculations made for elementary portions were applied to structures where each part received support from those adjacent to it. Some results illustrating this had been obtained with two 9in. guns tried in the Gun Factory. In wire guns little mutual support can be given by one section to another. He pointed out that the different books on the subject, from Mallet's, written in 1860, onwards, had been studied in the Gun Factories, and that the construction given to guns had been suited to the requirements of the day. The short guns, for example, of earlier days were suited to the quick powder employed with them. Should wire now come into service, it will not be on the ground on which Mr. Longridge advocates it, namely, to meet high pressures, but rather in the form of pieces with long chambers and low pressures, with low deflectional strain. We have now wire bearing 80 tons resistance per square inch before any permanent set is produced.

manent set is produced. Captain Andrew Noble said that he agreed with so much of the paper, that it seemed ungracious to criticise the parts from which he differed. He considered that Colonel Maitland had correctly formulated the requirements of powder. This matter was well understood fifteen years ago by the committee who investigated the subject; they were not able, however, to obtain the powder desired. In fact, Germany and Italy have both been more successful in manufacturing powder than our English makers. Captain Noble, while concurring in the statement that increased proportional length in a powder charge gives increased pressure, did not admit that the fact could not be explained, although the explanation was not of a character to deal with in Neither did Captain Noble concur in the statea few words. ment that the same results might not be obtained from muzzle-loading and breech-loading guns. He admitted that they required different treatment. He had, with Sir F. Abel, discussed the holding back of shot in their Royal Society paper. More rapid powder in muzzle-loading guns may be made to yield rapid powder in muzzle-loaning guns may be made to yield nearly the same result as slower powder with the grip of breech-loading guns. The two 8in. Elswick guns lent to the Govern-ment some years ago gave to 180 lb. shot velocities of about 2092ft. and 2096ft. and were equal in all essentials. With regard to obturation, there has been much more experience with the Elswick system than the De Bange in large guns, and the former has some advantages, especially that it requires much less power to work the breech; it has, under some conditions, been found that the De Bange required five times as much power to work it as the Elswick system. He might add that the Government system of ignition, Captain Noble thought more complicated and less safe than the Elswick one. Re-coppering is not a serious inconvenience. It has only been carried out four times at Elswick on guns—two of these were for purposes of instruction. It was no more trouble than re-bushing a vent. Captain Noble would have employed different language from Colonel Maitland as to the history of the development of guns. He approved of the Government system of construction. Riband, he thought, was more valuable used in conjunction with solid metal for longitudinal strength. Over forty wire guns from 10in. to 6in. calibre have been issued, besides some field guns. The wire at Elswick had not so high a tenacity as that used in the Gun Factories, because it was specially desired that it should extend permanently if it yielded. With regard to the development of ballistic powers, this country had taken a leading part in 1877, at Elswick, were designed two guns of about 78 cwt., which were completed early in 1878; velocities were then obtained of 2056ft. and 2182ft., while 1600ft. was still an achievement on the Continent. Captain Noble would not measure chamber capacity by calibres, but rather by expansions. In real length estimated in this way, it will be found that the length in

One 12in. gun with a long chamber had exhibited wave pressure, but chambers of the same proportions have exhibited nothing of the kind in the 100-ton guns with Fossano and cocoa powder. French and German chambers are apt to be very long. He desired also to make a correction in the figures furnished by Elswick to Colonel Maitland for his table. The 17in. gun, instead of 46,600 foot-tons energy, developes 51,900 foot-tons with 15 tons pressure, and the 16°25in. gun, instead of 50,924, developes 61,200 foot-tons energy.

Mr. W. H. Smith, in vacating the chair at this point in the developes 61,200 foot-tons energy. Mr. W. H. Smith, in vacating the chair at this point in the discussion, observed that he trusted all would feel it to be their duty to further the end of securing the best weapons by every means. The chair was occupied by Admiral Boys. Lieutenant-Colonel Morris could not see the force of Sir F.

Lieutenant-Colonel Morris could not see the force of Sir F. Bramwell's remarks, and thought that they furnished no answer to what Colonel Hope had said, which he thought called for investigation experimentally. He asked for results obtained with powder in a closed cylinder. The inability of the committee to understand the question was to be specially regretted when an answer containing a flaw is offered in discussion. Before we are to be limited to  $3\frac{1}{2}$  calibres length in one chamber, we ought to show how Colonel Hope is wrong in his chamber 15 calibres long. Mr. Barlow asserted that Colonel Hope had furnished no

Mr. Barlow asserted that Colonel Hope had furnished no explanation of the particular point raised, as noticed by Sir F. Bramwell. Before concluding, he would direct attention specially to the table which Colonel Maitland had put before them from which he thought it was clearly shown by the standard of energy per ton of gun that the wire system called for further development.

Admiral Selwyn observed that it was hard that Captain Engstrom, of the Swedish Navy, should not get the credit of the breech-closing arrangement now adopted under the name of the French system. He had exhibited that system in 1861. He sympathised also with Mr. Longridge as to impropriety of distinguishing between artillery and engineering principles. As he understood, Colonel Maitland argued that the longer a gun was and the weaker was the powder the better was the condition of things. He maintained that with stronger guns higher pressure was better. Under some circumstances, such as Moncrieff gun pits and broadsides of guns, length might be a great evil. We have inconvenient guns in order to burn bad powder. Wire ought to have come in long ago. We appear to take credit to ourselves for feeling our way awkwardly to results even after we have come round to the ideas put forward by inventors, instead of asking them for their own advice with regard to their own proposals. He would say it was only due to Mr. Longridge to try a wire gun made just as he would design it.

Mr. Longridge to try a wire gun made just as he would design it. Colonel Moncrieff observed that though his pits were designed for short guns and best suited to them, his hydro-pneumatic carriages were better adapted for new type guns, and he specially called attention to the recommendations of the latter system for naval guns.

Captain Noble, on being called upon to reply to points raised on the ballistic aspect of the question, said that Colonel Hope was right in viewing the action of powder surrounded by fluid at a high pressure as abnormal, but he agreed with Sir F. Bramwell that the question he raised had not been explained. The highest pressure obtained in a closed cylinder by Captain Noble and Sir F. Abel was 70 tons per square inch. He had seen powder ignited at many different places with very variable results. Colonel Maitland, being called upon to reply, said that he hardly thought the word "life" of a gun applicable, because the gun could be relined when it suffered from wear, and in the meantime the question was one of accuracy, not of safety. He could not say how often relining might be found necessary; probably when a ship was paid off her guns should be relined. He spoke of some 6in. guns which had fired 1800 rounds and were still perfectly good; also of an Sin. 12-ton gun that had had some rapid firing—sixty-seven rounds one day between breakfast and lunch. With regard to what Mr. Rendel had said on chambering, he admitted that it was undesirable to carry it further than necessary. He gave an example of the irregular results obtained in the case of a 10'4in. breech-loading gun with charges of 260 lb., 240 lb., and 220 lb. of cocoa powder respectively ; two gauges were used in each round, and a 462 lb. projectile. The pressures registered by the gauges, and the velocities were as follows:—With 260 lb. charge, 22:5 and 22:2 tons pressure and 2213ft. velocity ; with 240 lb. charge, 24:0 and 24:0 tons pressure and 2149ft. velocity. This irregularity argued wave action. He would ask Colonel Hope if he lit his charge at a great number of places in the recent French trials. On Colonel Hope assenting, Colonel Maitland remarked that he had received records of pressures which argued irregularity and wave action in a high degree. Colonel Hope objected to Colonel Maitland's figures as not authentic and incorrect. With regard to the

#### TO CHICAGO IN EIGHTEEN HOURS.\* By Robert Grimshaw, M.E.

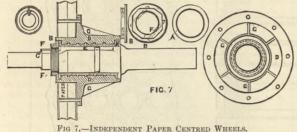
(Concluded from page 465.)

THE connection between engine and tender should not be rigid, as on curves this causes the flanges of the forward engine truck and of the rear tender truck to crowd the outside rail, and the drivers and the forward tender truck to crowd the inner rail, unless the tendertruck axles are radial, which they ought to be in any case. For the heavier curves and grades, the regular hauling engine is to be supplemented by a six-coupled "bank engine," which will lie with full steam up, on a siding a few miles in advance of the tough place. The instant the train passes the siding, the bank engine starts out to catch it, and gradually increasing its speed until slightly greater than that of the train, it catches the rear of the last car, which is supplied with extra strong buffer springs, and the bank is taken with the aid of the extra engine. Main headlight to be electrical—receiving current from a dynamo direct driven by a pony engine—and supplemented by a side lighting oil headlight above it; both lamps swivelling sidewise by a lever from the cab. Weight of engine ready for service 96,000 lb., of which from 48,000 lb. up to 64,000 lb. may be equally divided between axles by a slifting fulerum, and the rest, 48,000 lb. down to 32,600 lb., equally divided between the leading and trailing ponies. The piston area of each cylinder is 254'5 square inches; displacement, 6108 cubic inches; the driver circumference 18'85ft., or 226in. Putting on the drivers two-thirds of the total weight of 48 net tons, we have, as the cylinder capacity to move the engine 1in.,  $32 \times 5 = 160$  cubic inches, or  $160 \times 226 = 36,160$  cubic inches per revolution; giving 36,160  $\div 4 = 9040$  cubic inches piston displacement required per revolution. This calls for  $9040 \div 24 \pm 35^{4}5^{-}35^{5}5in.$ 

\* Read at the Stated Meeting of the Franklin Institute, April, 1884,

piston area for 24in. stroke. This requires / 376.67 = 21.89in. 0.7854

cylinder diameter, with 24in. stroke, with the 32 tons on drivers. If only half the total weight, or 24 net tons, were put on drivers, there would be required 6780 cubic inches piston displacement in each cylinder, and this we might put either  $18in. \times 26^{\circ}6in.$  or  $18^{\circ}25in. \times 24in.$  We may, then, assume that cylinders  $18 \times 24$  re-quire only 48,000 lb. on drivers. Tender frame and body of steel, carried on light 33in. steel-tired wheels. Capacity of tank, 3000 gallons; of coal box, 15,000 lb. Weight of tender, empty, 20,000 lb.;\* loaded, 59,000 lb. Fitted with water scoop. Tender wheels "independent," or else axles capable of assuming radial positions on curves—Fig 7. Connections between tender and for-



ward car should be by a coupling similar to that between cars; thus making a continuous pull, without the usual jerk when the slack back of the tender is tautened. The maximum tractive power of the  $18 \times 24$  engine with 72in. driver is  $\frac{18^2 \times 24}{22} = 108$  lb.

power of the 18  $\times$  24 engine with 72h, driver is  $\frac{72}{72}$  =108 lb. for each lb. of mean effective pressure upon the pistons. 912 miles in eighteen hours is 50 67 miles per hour including stoppages, allowing two hours for delays and stoppages, it is just 57 miles per hour while running; and counting loss from five slow-ups and startings, it makes it necessary to make 60 miles an hour right along when at full speed on levels. While this can-not be held on up grades, dashes can be made down grades, to keep up the average of 60 miles. The line of the Pennsylvania Railroad proper, between Philadelphia and Pittsburg, runs—as per official figures by the courtesy of Mr. Charles E. Pugh, general manager— as follows : Starting at Philadelphia, and assuming as the datum line the ordinary high tide in the Schuylkill river, the gradients in feet per mile, the distances in miles, and the heights above the datum line, are respectively :— 72 datum line, are respectively :-

Stations. Going West.		Distances.		Heights.			Grades.		
				Betw.	Sta.		Av. ft.	Worst up over 25ft.	
Going West.		Bet.	Total.	+		Total.	per mile.	Length.	Ft. per mile.
Broad-street			0		-	54		-	-
Rosemont		10	10	334	-	388	33.4	5.	49
Malvern		10	20	151		539	15.1	2.75	30
Downington		12	32	-	280	259	23.3	-	-
Parkesburg		13	45	271	-	530	20.9	6.	30
Gap	••	7 18	52 70	22		552	3.14	7.9	43
Lancaster Mt. Joy	•••	10	80	-7	200	352 359	11·11 0·70	2.1	33
Classical		10	90	63	=	422	6.3	1.8 0.6	39 42
Harrisburg		15	105	05	109	313	7.27	0.0	42
Petersburg		105	210	356	105	671	3.41	0.5	29
Barre		2	212	46	_	717	23'	0.4	29
Bell's Mills		18	230	336		1053	18.66	_	
Altoona		8	238	118	-	1171	14.75	-	-
Gallitzin		12	250	983	-	2154	81.92	0.3	100
Bolivar		45	295	-	1128	1026	29.06	0.4	40
St. Clare		15	310	59		1085	3.93	-	-
Radebaugh		15	325	58	-	1143	3.90	1.	53
Turtle Creek		15	340	-	400	743	26.67	-	
Homewood		8	348	173		916	21.63	0.25	58
Pittsburg		6	354	-	178	738	29.67		-
		354	-	2979	2295	-	_	-	
	tts-				-				
burg		354	-	684	-	-	1.93		100

It will be seen that in the total distance between Philadelphia and It will be seen that in the total distance between Philadelphia and Pittsburg there is a rise of 684ft., the highest point on the line— Gallitzin—being 2100ft. above Philadelphia. The average gradient is only 1.93ft. per mile, but the worst grade is 100ft., for 0.3 mile of the distance between Altoona and Gallitzin. The following table gives the distances taken up by rising grades—going West— from 20ft. to 30ft. per mile, from 30ft. to 40ft., &c. These distances are measured from an official profile, to a scale of 10 miles per inch : per inch :-

Up-grades, going West.									Miles.	
Over	20ft. and	under	30ft.	per mile						 49.
	30ft.	"	40ft.	,,						 20.1
	40ft.	"	50ft.							 11.4
	50ft.	,,	60ft.	,,						 5.5
	60ft.	23	70ft.	"						 0.
	70ft.	33	Soft.	11						 0.
	Soft.	33	90ft.							 1.2
	90ft.	37	10.0ft.	,,						 5*6
00ft.	per mile									 0.3

93.1

"At first I was met with more sneers than encouragement, when I <sup>10</sup> At first I was met with more sneers than encouragement, when I broached the subject of engines to make the transit of 900 to 900 to 900 miles in eighteen hours, including stoppages. Then master mechanics and locomotive builders, looking at the thing soberly, and acknowledging the defects of existing types of engines, announced their entire ability to produce engines which would be able to do the work month in and month out, on some ideal road and acknowledging the defects of existing types of engines, announced their entire ability to produce engines which would be able to do the work month in and month out, on some ideal road, on which the grades, curves, optices, and ballast were adapted to the somewhat severe requirements. But it was gravely announced that no such track existed, and that the chances were that no such track could be laid down at any price. Next, the concession was made that such a track could be put down, but that it wouldn't pay. It having been brought to the mind of objectors to the pro-ject that such a track was already down in England and did pay, the ball was tossed over again to the engine; and it was gravely, though anonymously, asserted, in a semi-practical journal, that existing engines had all they could do to knock out thirty-five miles an hour. Up steps an English engineer with figures to prove that in the London and North-Western freight trains, sandwiched in between fast through passenger trains, knock out forty-two miles an hour between London and Liver-pool; and at present the discouragement seems to be principally knock out forty-two miles an hour between London and Liver-pool; and at present the discouragement seems to be principally aimed at the permanent way, with a slight digression in reference to the insane Ohio laws about stopping at all grade crossings. The question of permanent way should be discussed from first alignment to ballast-tamping, to find out if it is not perfectly feasible and profitable to lay and maintain a track which will stand all the racket to be imposed upon it by any respectable fast train. The matter of curves and grades requires special attention. Exist-ing practice, particularly in the direction of curves, is particularly unpractical. Next comes the question of material length unpractical. Next comes the question of curves, is particularly weight and section of rail, mode of splicing, ties, ballast, and tamp-ing; frogs and switches, and, lastly, bridges. As regards rail material, I suppose that it is about settled that all iron rails are to be things of the past; and that whatever metals are put down, from

\* This weight is about 8000 lb. less than most estimates, but is buyon a peculiar proposed construction.

this point on, for any road of importance, will be of steel of some kind or another. If the advocates of iron rails have anything to say in their favour, or to the detriment of steel rails as at present say in their favour, or to the detriment of steel rails as at present used, on the ground of economy, durability, and safety, I am willing to hear them; but, so far as I am concerned, we are at present in favour of steel. Whether it be Bessemer or Siemens-Martin, or some other present. When it comes to lengths it seems as though the mechanical difficulties of making and handling longer rails, even of the heaviest sections, were rapidly disappear-ing; and if the majority of the rails laid were in lengths of 60ft. and upwards, we would obviate the expense and risk attendant upon the use of a great many splices. Even the most rabid advo-cate of patent rail joints must admit, when you get him down to it, that the best joint is no joint at all, and that the fewer joints there are, even of the most improved type attainable at any price, the less will be the wear and tear of rails, flanges, and treads, and discomfort to passengers. I am aware that the question of expansion will be raised, but anticipate this by saying that the present allowance on a 30ft rail is not so much to cover the expanpresent allowance on a 30ft, rail is not so much to cover the expan-sion as to allow for bad spring of fish-plate holes. Whatever joint is used, however, must be strongly trussed against vertical present allowance on a sore, ran is not so inter to over the expan-sion as to allow for bad spring of fish-plate holes. Whatever joint is used, however, must be strongly trussed against vertical strains, and this can only be properly accomplished by a stiffening member under the flange. As regards sections, consideration of that ought to include both head and flange. There are those who are in favour of perfectly flat trends, and others who call for a gentle curve all the way across. Still others wish right and left-hand rails. What the rail head shall be, depends, of course, upon whether the wheel treads are cylindrical or coned, and that is an oft mooted and still undecided subject—not altogether discon-nected, by the-bye, from that of rigid versus loose wheels. The admirable reports of my friend, Professor P. H. Dudley, point to the great desirability of increasing the flange width, with a view to lengthening the life and usefulness of wooden cross-ties; and this is well worth looking into, because it means not only cheaper ties in the end, but decreased liability to spreading of track. It is very certain that whatever rail section be adopted, it should be such as to comport best, and by this wish it is very distinctly to be understood, not correspond with but work well with. I have serious doubts whether a rail and a wheel which have equal curva-tures or correspond like templates, would curve well together. In this I am heretical; but it is not my fault, nor yet a criminal offence. Rail weight, of course, depends upon rail material, and upon the weight, frequency, speed, and character of the trains passing over the line. The question of material I will assume to be settled ; and will also assume that the train will consist of a well-balanced and well-equalised locomotive, having no greater weight than 33,000 lb. per driving axle, rigid wheel base of 7ft. 6in. maximum, and no greater speed than 350 strokes per minute; hauling a train consisting of tender and five cars, each car weigh-ing, with its load, I propose as a starter a rail section with 6in. flange, and giving a weight of 75 lb. per yard. There is no doubt among master mechanics, road masters, superintendents of rolling stock, and master car builders that there is an undue amount of friction between rail heads and wheel flanges at all times, and at all points along the track, but particularly when at high speed and on curves. Neither is there any doubt among passengers that the noise and motion are from this cause greatly increased, and the discomforts of travel thus varied and multiplied. It is generally admitted that the principal cause of this roughness of riding and wear and tear of rails and wheel flanges, is the primitive custom of having both wheels pressed fast upon the axle, so that whether or not the wheels upon the opposite ends of an axle are of the same diameter, or of the same taper on the treads, or are round, or are concentric with the axle, or no matter whether the outer wheel on a curve has further to go than the inner, the two wheels are compelled to revolve together. It is needless to the outer wheel on a curve has further to go than the inner, the two wheels are compelled to revolve together. It is needless to rehearse in detail the evil effects of this pernicious custom; but it may be useful and interesting to my hearers to present one of the more recent forms of loose or independent wheels, designed to allow the outer wheel when on a curve to revolve more rapidly than the inner, while at the same time preserving a higher degree of safety and not introducing undue cost and complication of parts. In the type herewith illustrated, the wheel itself is of the well-known Allen construction, with steel tires and cast iron hub, or the wheels and axles may rotate as a unit, and of course at the same wheels and axles may rotate as a unit, and of course at the same rate, in the regular outer boxes; or one wheel may revolve with and the other on the axle. Lubrication of the large inner bush and journal is insured by oil passages F F, leading from the oil box to an oil chamber E, cut in the journalled wheel seat. The Babbitted bush of the bore is held against end motion by circum-ferential ribs, and is flanged up at the ends; the inner flange of each wheel being protected by a wrought iron collar A, butting against the shoulder of the wheel seat, and the outer end having also a wrought iron collar B, one and one-half inches long, threaded upon the axle between the outer journal C, and the wheel seat journal. These threaded collars B are held from turning by pins F F, rivetted at each end. The hubs D are each strengthened by six ribs G G, &c." wheels and axles may rotate as a unit, and of course at the same six ribs GG, &c.

#### DISCUSSION.

six ribs G.G. &c." DISCUSSION. Mr. W. Barnet LeVan: Mr. Grimshaw has stated that he pro-poses to dispense entirely with the link motion. Now, if dis-pensing with links entirely, what will be his position in the event of having to run on a siding or have a break-down? How does he expect to back his engine? Mr. Grimshaw : I don't know what is meant by this question. I simply cannot answer it. It assumes that the Joy is not a reversible gear, or is more easily crippled than the link. As a matter of fact the Joy is a reversible gear, and I have no know-ledge that it is more easily crippled than the link, owing to the fact that I do not know of any of them having been crippled. Mr. LeVan: Where will you find the Joy link motion in use in this country? To my knowledge there are only one or two in use on locomotives, and they are very unsatisfactory. Mr. Grimshaw: I have seen letters from master mechanics of several American roads commending the Joy gear, and stating that they purpose adopting it. I have elsewhere answered the question as to its success on the Reading Railroad, and will only add that Mr. Joy says: "When Mr. Paxson sent me his blue print I saw it would only injure the gear. I told him the centre fixing and over-hang would never do. If they will make bad designs failure is a matter of course." matter of course.

Mr. George S. Strong criticised one point on the locomotive. Mr. Grimshaw proposes for fast trains, *i.e.*, the pony, or two-wheel truck as a leading truck, stating that he feared it would not be capable of keeping the rail if detached from the rest of the locomotive, as is a four-wheeled truck, which will keep the rail and forms a truck within itself, at the same time it presents two wheels to take the blow of striking a curve, while the other only presents one. He was afraid that a pony truck for very high speeds would be more liable to break loose from the locomotive and swivel across the track and wreek the whole engine. He also described a locomotive engine with extended smoke-box and other special features, now being built for the Lehigh Valley Railroad

special features, now being built for the Lehigh Valley Railroad Company. Mr. Grimshaw: Engineers on the Lehigh Valley Railroad, quoted by Mr. Strong as one on which a two-wheeled truck would not take curves at high speeds, say that they do take them, and safely. The Denver and Rio Grande Railroad runs pony truck engines at forty-five miles an hour perfectly safely on their curves. It only requires that the pony wheels be equalised with the front drivers, as now done with perfect success on the Denver and Rio Grande Railroad. Mr. J. W. Nystrom: I fully appreciate the importance of Mr.

Mr. J. W. Nystrom : I fully appreciate the importance of Mr. Grimshaw's paper, and believe it feasible to run a train with the high

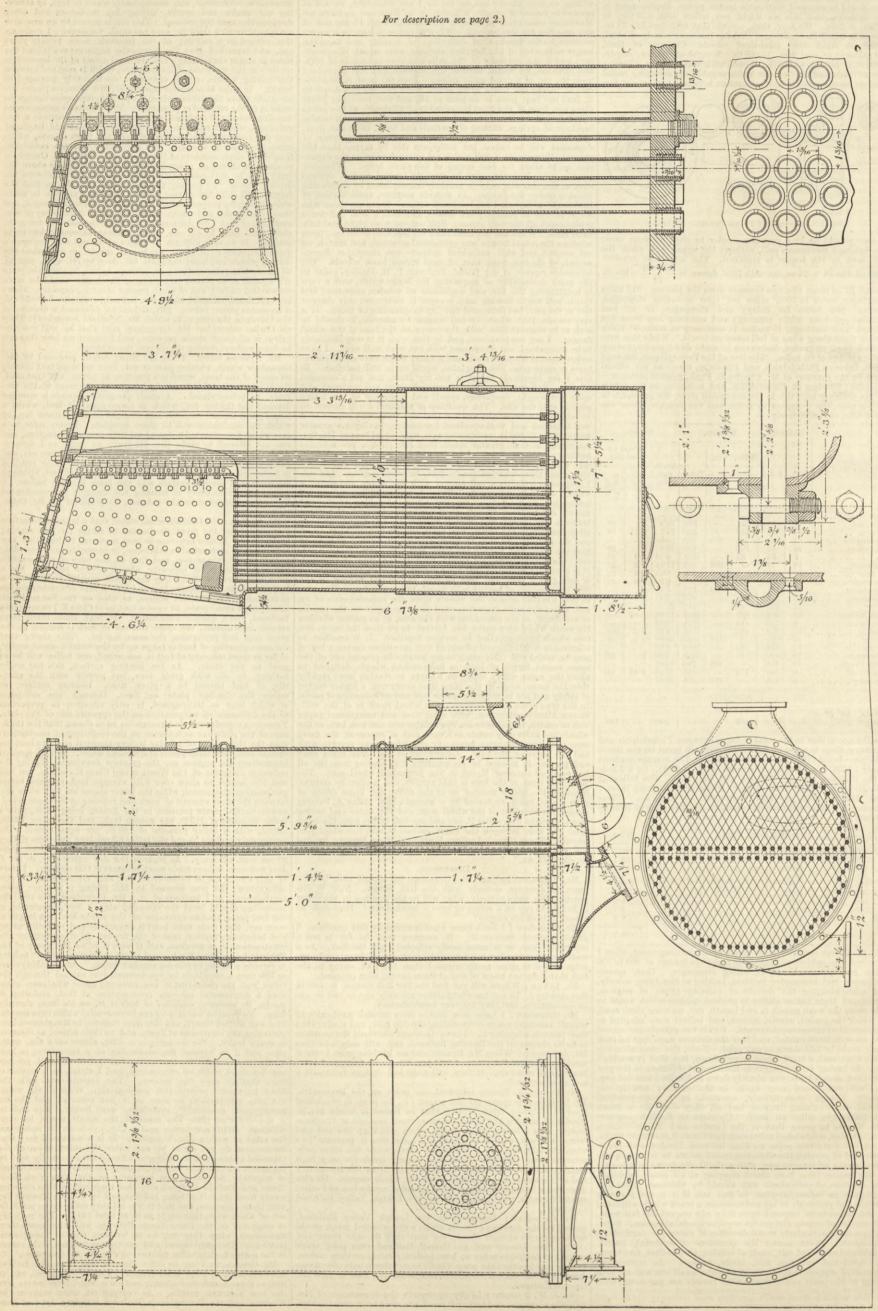
speed he proposes. I would ask that the diagram of the proposed loco speed he proposes. I would ask that the diagram of the proposed loco-motive be reproduced on the screen for further remarks on the same. [The diagram was reproduced, and Mr. Nystrom continued.] The greatest difficulty with the locomotive has always been its incomplete combustion, and consequently waste of fuel, by throw-ing out smoke and sparks, setting fire to houses and other combustibles near the railroad. This evil is caused by an excessive draught through a thick fire on a too small fire-grate. I spoke on this subject at a meeting of the Institute some twenty years ago, and remarked that the locomotive engineers are behind the times in steam engineering. The principal defect of the locomotive consists in the smallness of its fire-grate, which is confined between the driving wheels, and it cannot be conveniently increased in length. In order to overcome this defect, Mr. Wootten placed the fire-grate above the driving wheels, where there is space enough to make it of the required or proper size. Mr. Wootten's arrangement was illustrated and explained at a meeting of the Institute a few length. In order to overcome this defect, Mr. Wootten placed he fire-grate above the driving wheels, where there is space enough to make it of the required or proper size. Mr. Wootten's arrangement was illustrated and explained at a meeting of the Institute a few years ago, when I remarked that the fire-grate should be placed over the trailing truck, instead of over the large drivers, which raises the boiler up too high. My suggestion was not considered feasible by some members of the Institute. Now, Mr. Grimshaw produces a sketch of a locomotive with the fire-grate above the truck, but he still confines the width of the grate between the driving wheels. By moving the boiler back a little, so that the furnace will clear the driving wheels, the fire-grate can be made wide enough for proper combustion without excessive draught, and thus avoid smoke and sparks, which will result in economy of con-sumption of fuel. Mr. Grimshaw proposes to make the fire-grate about 10ft. deep by 4ft. 4in. wide, making 43 square feet grate surface. It is very difficult to keep a clean and even fire upon a grate 10ft. deep ; but if the fire-box is cut off so as to clear the driving wheels and make the grate 9ft. deep by 7ft. wide, making 63 square feet grate surface; or, perhaps better, to make the grate 8ft, square, of 64 square feet surface, the boiler would be more economical on fuel, and of much greater steaming capacity. About the cylindrical valves of which Mr. Grimshaw speaks, I would ask if he means piston valves. [Mr. Grimshaw speaks, I would ask if he means piston valves. [Mr. Grimshaw speats, I would ask if he means piston valves. [Mr. Grimshaw speats the will run the valves in oil under steam pressure, and I cannot see how that can be done without driving the oil into the cylinder. Mr. Nystrom added : There are many details proposed by Mr. Grimshaw which, whether good or not, have no important bearing on speed of the train, which is a function of power, and that addi-tional power can be obtained by proper arrangement of

case where I constructed a steamboat with compound engines, and was not allowed to make the fire-grate as large as I desired. After the boat had run about a year, the boiler was taken out, and another one with larger fire-grate was substituted, which resulted in better steaming capacity, with greater economy of fuel, although the amount of heating surface was the same in both boilers. I cannot see the economy in creating the draught by superheated live steam, instead of by the exhaust, as proposed by Mr. Grim-shaw. shaw

live steam, instead of by the exhaust, as proposed by Mr. Grim-shaw. Mr. Le Van: Mr. Grimshaw has stated that a large grate surface is essential for the rapid production of steam for fast running locomotives. It does not seem to have occurred to him that any boiler may be economical or otherwise, in respect to fuel, according to the rate of evaporation, and that in the case of a locomotive boiler, this rate is, of necessity, almost always varying. For a given rate of evaporation I may have with equally good reason a large fire-grate of 58 square feet and a slow rate of combustion, as in the case of the Wootten boilers, as used on the Bound Brook route; or, a small grate, 35 square feet, as in Class K Pennsylvania Railroad, and a quicker combustion. In both these cases, from reliable information, the same amount of fuel is burned in the same time and performing the same service. This shows that the same quantity of heat is taken up by the water; consequently, so far as mere economy of fuel is concerned, one boiler will be as good as the other. As for heating surface, this has really nothing to do with grate area, but merely with the quan-tity of fuel burned in a given time. Heating surface, or rather the fire-box plate or flues, through the substance of which heat is transmitted, is only effective in proportion to the difference of temperature on the opposite side of the plate. Numerous experiments and researches have shown that the thick-ness of the plate has no influence on the coefficient of conduction; thus the thin tubes of tubles beilers transmit to more heat net to be the substance of which heat has no influence on the coefficient of conduction; to the difference of temperature on the opposite side of the plate. Numerous experiments and researches have shown that the thick-ness of the plate has no influence on the coefficient of conduction; thus the thin tubes of tubular boilers transmit no more heat per surface unit than thick plates of a fire-box boiler. In high-speeded locomotives the engines are the greatest drawback. Taking the indicator diagrams of the Wootten and Class K engines, you will find the former to show over 8 lb. average back pressure before compression commences, while the latter shows but 6 lb. when per-forming the same amount of work and running at the same speed; and the initial steam pressure in the former being 84 lb., with a boiler pressure of 123 lb. per square inch, and the latter 120 lb. initial, with a boiler pressure of 140 lb. per square inch. The former only realises 55 and the latter 63 per cent., whereas if they were up to the best stationary practice they should at least show 90 per cent. efficiency. As regards the Joy valve gear, so far it does not seem to have made much progress in this country. I know of only two in use on locomotives, and they do not seem to give satisfaction; the plan adopted by Mr. Strong is a much better arrangement, as I understand it. Mr. Grimshaw also says the smoke-box should be of the extended class. Now, I maintain, in the first place, that an extension of the smoke-box to a length of over, say, 42in, from tube head is essentially and radically wrong and injurious; further, that if the fire-box is of proper size and construction it is needless, and if not, it is, as Mr. Parry of the Baldwin Locomotive Works, said about the swing trucks "helping to remedy a wrong by making another wrong." It is nothing more or less than a receptacle for unconsumed fuel carried through the tubes, and the claim that it can have any effect whatever—other to relast than a receptacle for unconsumed fuel carried through the tubes, and the claim that it can have any effect whatever—other than a detrimental one—on consumption of fuel, evolution of smoke, or steaming qualities of boilers is, on its face, absurdly false. No practice was or ever can be successful which runs counter to a well settled theory, and this does violence to the plainest laws governing the movement of fluids, and to their action, as observed in every boiler. We do not put a 12in. elbow on a 6in. water pipe, and if we expand the smoke-box of a locomotive to hold sparks, it is impossible, to say the least, that it shall produce any beneficial result on combustion, and I claim, as a matter of fact, that it does the reverse. The experiments with the Shaw locomotive proved this conclusively. With it she would not give satisfaction; as soon as it was removed and the old arrangement substituted, everything went lovely. The fact is, if the deflector plate was removed the result would be quite different. With a deflector and a 42in. extension the results are the same as with a 72in. extension. It is a notorious fact that different. With a deflector and a 42in. extension the results are the same as with a 72in. extension. It is a notorious fact that locomotives do not steam as well after the substitution of the extended smoke stack as before, as I have been repeatedly told by engineers, who thought they could speak the truth without danger of removal. Several of the engineers of the New York West Shore and Buffalo Railroad said that their boilers were steaming poorly from the fact of being handicapped by the late Howard Fry with these abortions, and that it was all they could do to get 90 lb. out of them when they ought to be at least 130 lb. The majority of engineers on the Pennsylvania Railroad will corroborate these

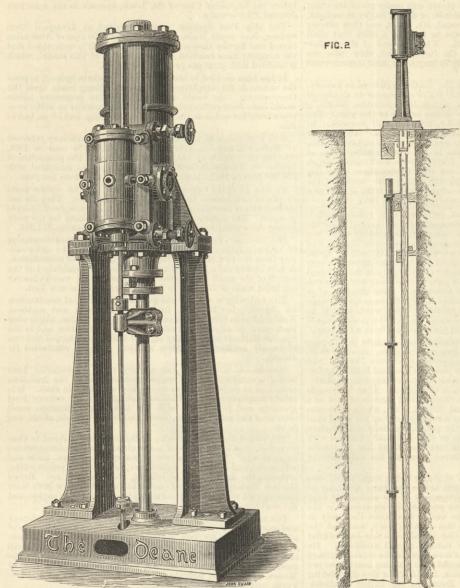
out of them when they ought to be at least 1301b. The majority of engineers on the Pennsylvania Railroad will corroborate these statements, when they can do so without risk of losing their positions. The only logical and common sense plan is the return of the sparks back into the fre-box, as done by Pike's system. Mr. Grimshaw: I beg to differ diametrically from Mr. Le Van as to the value of large grate surface. Properly managed, and so long as there is sufficient heating surface in flues, large grates give the best economic results. As competitive tests between the Wootten and the Pennsylvania Railroad standard type of loco-

# RUSSIAN TORPEDO BOATS .- BOILER AND CONDENSER.



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# THE VERTICAL DEANE PUMP.



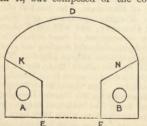
motives are now—May 12—being conducted, the public will soon have interesting figures in this connection. Grate area of necessity gives larger fire-box heating surface. Thin tubes give quickness of steaming power in starting, and quick recuperative power after hard pulls on curves and grades. Private advices from England show the Joy gear to be giving the highest satisfaction on the best roads. The modification thereof, adopted on the Philadelphia and Reading Railroad, was, I understand, protested against by Mr. Joy and its failure predicted. I took careful advice as to the extended smoke-box. It may be "remedying an evil at the wrong end," but sometimes we do not have choice of ends. It is better to remedy an evil at the worst end than to refuse to remedy it because that is not the end we would prefer. The figures on nearly every road where it has been adopted show saving by its use. The statement that "no practice was ever or could be successful which ran counter to a well settled theory" is too much at variance with the history of progress to need any detailed refutation. motives are now-May 12-being conducted, the public will soon

#### THE DEANE PUMP.

WE illustrate by the accompanying engravings the vertical form of the Deane pump, made by the Pulsometer Engineer-ing Company, and as employed for deep wells. The steam cylinders of the engines illustrated are 10in. diameter by 30in. stroke; both the up and the down stroke are adjustable specially by means of suitable throttles. The plunger is 5in. diameter by 30in. stroke, and the rising main 3in. diameter. In many situations this form of numuring mechine afform gravet advan situations this form of pumping machine offers great advan-tages over deep well pumps driven by an engine in the ordinary way, because there are far fewer moving parts in both engine way, because there are far fewer moving parts in both engine and pumps. No roller guides are required, and it takes very little room in the shaft. The wooden spear rods are very easy to fix or repair, and for driving artesian well pumps this form of engine seems specially suited, as it can be made to swing aside so as to withdraw the rod without disturbing the pipes. The pump is made so that it will run very slowly if desired, so that it can be regulated to just the feed of the well. The engravings, Fig. 2, illustrate the arrangement usually adopted for ordinary well work of this kind. well work of this kind.

## A RECENT IMPROVEMENT IN PHOTOGRAPHY.

A RECENT THIT ROVEMENT In the transformer of the formation of the several years past photographers have been injuring their eyesight by the low red light in which they habitually develope highly sensitive gelatino-bromide plates. For some months past, however, much attention has been given by photographic journals and societies to some practical methods introduced by Mr. W. E. Debenham, of Haverstock Hill, of obtaining safe lights of a higher degree of refrangibility. He uses light of low intensity, produced by means of a translucent screen or otherwise; he also passes it through an orange-coloured film and a sheet of pale green glass. At the last meeting of the Photographic Society of London he exhibited a white light with no blue in it, but composed of the complementary colours, red and D green. The lantern which Mr. Debenham then exhibited

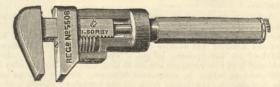


contained two lamps A B, with glass faces at K and N. The glass at K was of a deep and somewhat yellowish - green colour; whilst that at N was red, with a superimposed sheet of a very pale yellowgreen. The light from these lamps fell upon E F the surface D, which was of a deep yellow colour, and by this surface was reflected through the opening E F. When this

opening was covered with white tissue paper the light appeared nearly white, but had so little photographic effect that a very sensitive place placed at a reading distance before it for a quarter of an hour showed scarcely a trace of an image. When a yellow fabric was substituted at E F, an hour's exposure failed to produce more than the slightest mark on the plate, whilst giving sufficient light with which to work.

#### IMPROVED SHIFTING SPANNER.

THE accompanying engraving represents a spanner manu-factured by Messrs. Turner, Naylor, and Marples, Northern Tool Works, Sheffield. For this design it is claimed that being fitted with the Clyburn spanner motion, but otherwise having rigid parts, it can be adjusted to its work easily, and when set will remain so. It is also pointed out that in the ordinary wrongh the screw on the lag and the cutting in the body to wrench the screw on the leg and the cutting in the body to admit the ring, weaken the tool where strength is most required, while in this wrench these defects are removed, and the whole



strength of the tool is made available. Another defect of the ordinary wrench is avoided in that illustrated, namely, the handle is made fast to the body, which gives the user a more certain grip of the tool and a more confident command of it. The firmness of the wrench in work makes it unnecessary to cut the jaws, so that it can be applied to bright work without injury.

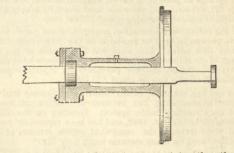
#### AN INDIAN MOUNTAIN RAILWAY.

AN INDIAN MOUNTAIN RAILWAY. A CORRESPONDENT of the American Journal of Railway Appli-ances thus describes the Darjeeling Railway:—"Since my last I have indulged in an excursion to Darjeeling, a town in the Hima-laya mountains, some 300 miles to the north of Calcutta. Leaving Calcutta, a railway ride of fifteen hours brings us to a town called Silliguri, at the foot of the mountains. Here we take the Darjee-ling-Himalayan Railway. The road is, to my mind, one of the most wonderful pieces of railroad building that it has been my fortune to inspect. Although almost a toy in appearance, the gauge being only 24in., and the cars not much bigger than an ordi-nary two-seated carriage, yet it steadily climbs the mountain with any two-seated carriage, yet it steadily climbs the mountain with grades of 260ft. to the mile, and round curves of 90ft. radius, until it reaches Darjeeling, 7200ft. above the sea, and distant from Silliguri, forty-eight miles, though less than twenty miles in a direct line.

direct line. "As our Mt. Washington is only 6000ft. high, you can see how much higher we are; but then consider that Darjeeling is in a valley, for close by the snowy peak of Kinchinganga, 29,000ft. high, rises far above the surrounding mountains, and Mount Everest, 30,000ft. high, the highest in the world, is distant about eighty miles, and on clear days can easily be seen. We were un-fortunate enough in having a cloudy day, which, of course, marred our pleasure, although for a few minutes we had a sight of the

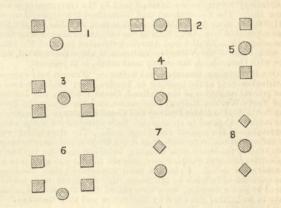
our pleasure, attributed for a tew minutes no nate a spin of the huge peaks. "The Darjeeling-Himalayan Railway was laid at first as an experi-ment on the Government cart road, but, like many other experi-ments, has passed that stage, and is an established and paying fact. The curious part of it is that it is the only road in the world on which loose or independent wheels are used exclusively. The patient rolling stock is equipped with a loose wheel on axles, entire rolling stock is equipped with a loose wheel on axles, identical with the Harrison patent of the United States. I made a thorough inspection of the axles and wheels, and made inquiries

concerning their working, and was informed that without these axles it would be next to impossible to operate the road. I annex a sketch to show the construction of the axles, and how much they resemble the Harrison. In principle of action they are identical. Is it not strange that while the Americans, with their boasted mechanical ingenuity, have been disputing the utility and advantage of such things, we find a small obscure road in the Himalayas using—and as I said, the only road in the world—inde-pendent wheels. When I say that in the whole forty miles in the mountains there is not a single length of straight track longer than



200ft., and if all the straight parts were put together they would not aggregate half a mile, you can form some idea of the crooked-ness of this little line. If a road was made on purpose to test loose wheels, it could not improve on the Darjeeling and Hima-leron Pailway." layan Railway.

#### CROSSHEADS AND GUIDES.



come between or below the central line of the guides? Here are some prevailing arrangements—which is right?" In this country, Fig. 3 is the favourite arrangement for inside and outside cylinders. Fig. 5 is used for outside cylinders, and so is Fig. 1 to a limited extent.

A CHINESE line of telegraph has been constructed and is now working between Canton and Lungchou—ninety miles south of Nanning—on the Tonquinese frontier.

CRADOCK WATERWORKS, SOUTH AFRICA.—The Municipality of Cradock have approved of the scheme submitted by Messrs. G. B. Nicholls and Sons, civil engineers, of Albert-buildings, Queen Victoria-street, London, E.C., and Colmore-row, Birmingham, for the water supply of that town. The supply is to be derived from permanent springs at Drie Fontein, about five miles from Cradock, on land belonging to Herr Janse Van Rensburg, M.L.A. The water is diverted from the stream into filtering chambers con-structed in connection with a service reservoir, and conducted into structed in connection with a service reservoir, and conducted into the town by gravitation on the constant service system, distributed by means of cast iron pipes with standpost hydrants. In the Market-square it is proposed to erect a handsome stone fountain for drinking purposes and for the use of cattle.

for drinking purposes and for the use of cattle.
NAVAL ENGINEER APPOINTMENTS.—The following have been appointed acting assistant-engineers in the Royal Navy:—Messrs.
Samuel W. F. Morrish, Alfred R. Pattison, Walter W. H. Rawlingson, John H. Dalrymple, Samuel Godbear, Benjamin J. Watkins, Frank D. Thomsett, Ernest M. Thomson, Henry Humphreys, Albert E. Tompkins, William J. Hender, Alfred Hills, Edward Swinney, Robert K. Herbert, John W. Ham, Ernest S. F. Sparks, John S. Gibson, Richard W. Torman, William Onyon, Harold Gaisford, Edward A. Short, Frederick G. Jacobs, John T. H. Ward, James D. Elliott, William B. Ransome, Frederick Hore, Alexander Baker, David Peacock, William W. Lawrence, Percy F. Faulkner, Tom E. B. Brown, James T. Willoughby, John Richardson, Thomas R. Reynolds, Charles J. Hay, Leonard Buckler, Edward J. Murphy, Ernest A. W. Heads, Alfred E. Cox, Jasper W. A. Parrott, Henry C. Peel, William W. Hardwicke, Arthur F. Kingsnorth, Lemuel C. Saywell, Henry Abbott, Frank A. Allden, Lawrence Bell, Joseph M. Crowle, Hamilton J. Coad, and William Ryan. Ryan.

Ryan. YORKSHIRE COLLEGE COAL MINING CLASS.—The work of the session concluded on Saturday last, when the students accompanied by Mr. Lupton, the instructor, visited the Aldwarke Main Colliery, Rotherham, by the kind invitation of Mr. C. E. Rhodes, the manager. This gentleman explained his apparatus for testing safety lamps, the principle of which is directing upon them a current of gas and air mixed in explosive proportions; most of the safety lamps which are known and in ordinary use become red hot when subjected to this current for a few seconds and then ignited, the explosive mixture causing a miniature colliery explosion. Mr. Rhodes tested a number of lamps in the presence of his visitors; the common Davy lamp exploded in three seconds, other lamps took a longer time, and some resisted the trial for forty-five seconds, which was the longest period for which the test could be seconds, which was the longest period for which the test could be applied. These interesting and instructive experiments were watched with great interest, and a hearty vote of thanks was accorded to Mr. Rhodes at the conclusion. At an earlier period in the session, the students visited the Newstead Colliery, near Newstead Abbey, in Nottinghamshire, where the party was received and hospitably entertained after their journey by Mr. Robert Stevenson, the engineer and manager, who subsequently took his visitors down the mine and explained the machinery and mode of working. It would be difficult to find any colliery where all the arrangements for safety and economy of working are more effectively and ingeniously executed. The fan, which produces a current of 230,000 cubic feet of air a minute, is perhaps, one of the most efficient ventilating machines now in use. Thefollowing day the party visited the well-known Clifton Colliery, on the banks of the Trent, near Nottingham; through the courtesy of Mr. Henry Fisher, the manager, the students had the opportunity of seeing the system of underground haulage, designed by Mr. Fisher; by means of endless ropes, the coal is hauled up long-inclines from the working places to the pit. The cages are un-loaded at the surface by an ingenious arrangement of machinery worked by compressed air. mode of working. It would be difficult to find any colliery where

NOTES AND MEMORANDA.

#### RAILWAY MATTERS.

THE Taff Vale directors have passed a resolution taking over the Treferig Valley Railway, and will pay the shareholders 4 per cent. THE proposals of the Porte to the Société d'Exploitation with respect to the Eastern railways junction, will in a few days be officially communicated to the company. The concession is to be given for thirty-eight years.

According to the estimate of Mr. Hansell, the quantity of laminated springs at present in use on English, Scotch, and Welsh railways is 231,920 tons, and there are used annually nearly 12,000 tons. Sheffield makers producing about 10,000 tons.

IN 1882 the colony of Victoria was required by the courts to pay IN 1882 the colony of victoria was required by the control for  $\mu_{ey}$ £120,000 to persons injured by accidents on the States railroads, of which it had 1355 miles. This sum was 17 per cent. of the total net earnings of its railroads. Most of these accidents were on one comparatively short line, and the payments for injuries exceeded the net earnings of this line by about £25,000.

THE last rail has been laid of the Ontario and Quebec Railway, THE last rail has been laid of the Ontario and Quebec Kallway, which forms the connecting link between the eastern and western sections of the Canadian Pacific system. Grading on the railway was commenced in August, 1882, and has been vigorously pushed from that time through the somewhat severe winters of 1882 and 1883, the work on many sections being very heavy.

THE announcement that the Dudley, Sedgley, and Wolver-hampton Steam Tramways Bill is to be opposed in the Upper House, seeing that it has already passed the Lower House, is not received with satisfaction by the inhabitants along the route. These have determined to promote a monster petition to the House of Lords, urging that the district is more suitable for steam than for animal traffic.

New SOUTH WALES has an area of 308,000 square miles, and, in 1882, had 817,468 inhabitants and 1815 miles of railway, whose average cost was £12,161 per mile. Their gross earnings in 1882 were £1,658,864; their net earnings  $\pounds$ 764,229, which is equivalent to £1477'6 gross and £812 16s, net per mile, £235 more net than the earnings of railroads in the United States. The net earnings were 5<sup>‡</sup><sub>4</sub> per cent. on the capital expended—an eminently satisfactory result, as the interest paid by the Government is less than that. The Government had authorised the expenditure of £11,000,000 more for railroad construction, of which £3,000,000 was negotiated last year. This is the only Australian colony that has adopted the English and American standard gauge of 4ft. 8<sup>½</sup><sub>1</sub>. A connection of the Victorian railroads is almost completed, and one with Queensland, the colony next north, is in progress. NEW SOUTH WALES has an area of 308,000 square miles, and, in

A connection of the victorian raincads is almost completed, and one with Queensland, the colony next north, is in progress. OUR Birmingham correspondent writes :—"Traders here express satisfaction that at the meeting in London, last Friday, between the general managers of the Midland, Great Western, and London and North-Western Railway Companies, and the deputation from the South Staffordshire Railway and Canal Freighters' Association, the managers agreed to recommend their directors to make sociation. the South Staffordshire Railway and Canal Freighters' Association, the managers agreed to recommend their directors to make some concessions in the present freightage scale. The deputation was an influential one, representing as it did the raw and manufactured iron trades, the heavy pipe-founding industry, and the hardware industries of South Staffordshire, and the matter was gone into at considerable detail. Upon the most important point, however, the question of freights to the ports, the managers were unpre-pared to give a decision, since they stated that this matter would have to be further discussed by themselves and their directors."

A STRIKING illustration of the importance of the railway rates

have to be further discussed by themselves and their directors." A STRIKING illustration of the importance of the railway rates question is afforded in the removal which has been determined upon, because of excessive freights and low selling prices of the patent wrought nail trade from the Wolverhampton district to Newport, Mon. The entire industry in this country will be con-centrated in the hands of a single joint stock company under the title of J. J. Cordes and Co. There are at present five distinct firms engaged in this manufacture, with an aggregate productive power of about 300 tons weekly. The amalgamation applies only to the patent nail manufacture, and such of the five firms as are engaged in other manufacturing branches will carry them on separately as heretofore. Quotations of Messrs. Cordes' brands of nails will be unchanged, but on all the other brands a 5 per cent. advance will take place. We learn from Stockholm, in reference to the railway from Lulea to Ofoten and the iron mines of Lapland, that great pro-gress has been made in carrying out this scheme. The Northern of Europe Railway Company has been formed in London for the purpose of constructing the line from Luba, in the Gulf of Bothnia, to Goten Fjord, in the North Atlantic Ocean, and of opening up the rich stores of mineral wealth in that part of Lapland, and especially in the mines of Kirunavaard, Luosavaara, and Gelli-vaard. In accordance with the terms of the Royal Concession, the company has deposited the sums of money required by the Government, as a guarantee for the construction of the railway. The works will be commenced at Lulea at once, and there is every probability that one-third of the line on the first section—Lulea-Gelivaard, will be completed before the end of the year, as the country is flat and easily traversed.

THE Victorian Government makes its railways pay for the Westinghouse brake. The Colonies and India says:—"There has been a dispute between the Customs department and Messrs. Imray, Hirsch, and Kaeppel, relative to the value of the Westing-house brake fittings, imported for use on the Victorian railways. In the original entries made by the consignees at the Custom Hunse the fittings for engines ware valued at £20 and those for House, the fittings for engines were valued at £20, and those for carriages and vans at £10, or a total of £2510 for the shipment, an assessment which the department challenged. After some delay the department valued the articles at £55 and £20 respectively, or a total of £5443, and demanded a total duty of £1496 16s. 6d., instead of an amount of £690 5s., which had already been paid by the agents. The department arrived at this estimate from the scheduled prices of the Westinghouse Company, which in England were £55 and £20 respectively. After further delibera-England were  $\pm 55$  and  $\pm 20$  respectively. After further delibera-tion, the department modified its demands. The value of the brake fittings for engines has been fixed at  $\pm 44$  ls., and those for carriages and vans at  $\pm 14$  lls. The total value of the goods on this basis is  $\pm 4055$ , which, with the usual 10 per cent. added, brings the total amount upon which duty is charged up to  $\pm 4461$  5s. 5d, The total amount of duty, which the agents have paid under pro-test, is  $\pm 1115$  6s. 4d., or  $\pm 425$  1s. 4d. more than they considered the department justified in charging."

the department justified in charging." The railway in course of construction in Guatemala from the port of San José to the capital is progressing rapidly. Numberless difficulties have been encountered by the engineers, amongst which may be mentioned many bridges over "barrancos"—deep and wide fissures of volcanic origin—the enormous quantity of water accu-mulating suddenly in the rainy season, the unhealthiness of the lower parts of the line near the coast, the building of an embank-ment across the lake of Amatitlan, and a rise of 5000ft. from the sea to the capital, a distance of about eighty miles. 4000ft. of which have to be surmounted in the last fifty miles. The line is practically finished for three-quarters of the distance, and by September next at the latest, unless some unforeseen accident occurs, the trains will reach the capital—Guatemala—enabling passengers and merchandise to reach the port in three or four hours, instead of, as at present, by diligence or ox-cart, in any time from twelve hours to ten days. There are no other railways in the Republic either open or in course of construction, but a project for a railway from Santé Thomas to Guatemala is being actively prosecuted by the Government. It is proposed to build this railway entirely by a national forced and voluntary subscrip-tion. Everybody is at liberty to buy shares, and natives who do not do so voluntarily become shareholders by compulsion under an income tax law which came into force on January 1st, 1884. The cost of the line is estimated at 12,000,000 dols., which are to be railway. Preliminary works have already been commenced. THE railway in course of construction in Guatemala from the raised during the ten years required for the construction of the railway. Preliminary works have already been commenced.

Woods and Forests gives the following, which is known to most but not all, our readers:—"Any person may easily get at the exact height of a tree when the sun shines, or during bright moonlight, by marking two lines on the ground, 3ft. apart, and then placing by marking two lines on the ground, 3ft. apart, and then placing in the ground on the line nearest to the sun a stick that shall stand exactly 3ft. out of the soil. When the end of the shadow of the stick exactly touches the furthest line, then also the shadow of the tree will be exactly in length the same measurement as its height."

In the week ending June 21st the deaths registered in twenty-eight great towns of England and Wales correspond to an annual rate of 18'7 per 1000 of their aggregate population, which is estimated at 8,762,354 persons in the middle of this year. The three healthist naces were Derby Brighton and Norwich. In three healthiest places were Derby, Brighton, and Norwich. In London 2615 births and 1371 deaths were registered. Allowing for increase of population, the births were twenty-two and the deaths eighty below the average numbers in the corresponding weeks of the last ten years. The annual death-rate from all causes, which had been 19'2, 18'9, and 18'8 per 1000 in the three preceding weeks, declined to 17'8. During the first twelve weeks of the current quarter the death-rate averaged 20'0 per 1000, against 19'6 and 20'6 in the corresponding periods of 1882 and 1883.

IN a lecture on the fixed stars, Dr. David Gill, F.R.S., said: "Light takes almost exactly 500 seconds of time to come from the sun; this is a figure easy to remember, and is probably exact to a single unit. The sun is ninety-three millions of miles distant, and this figure I believe to be exact within 200,000 miles. Quite recently the accuracy of these figures has been confirmed in a very remarkable way by different kinds of investigations by different remarkable way by unrepert kinds of investigations by unrefer to observers, otherwise I should not have quoted them with so much confidence. The parallax of  $\alpha$  Centauri is three-quarters of a second of arc; therefore its distance is 275,000 times the distance of the earth from the sun, and therefore light, which travels to the earth from the sun in 500 seconds—*i.e.*, in 8<sup>th</sup> minutes—would take 4.36, or a little more than 41 years to come from a Centauri. RUBENNICK'S process for metallising wood consists in steeping the wood in a caustic alkali for two or three days, according to its degree of permeability, at a temperature between 164 deg. and 197 deg. Fah. The wood is then placed in a second bath of hydro-sulphate of calcium, to which is added, after twenty-four or thirty-eight hours, a concentrated solution of sulphur. After forty-eight hours the wood is immersed in a third bath of acetate of lead at a hours the wood is immersed in a tintra batt of actuate of read at a temperature between 95 deg, and 122 deg. Fah., where it remains from thirty to fifty hours. After a complete drying the wood thus treated is susceptible of a very fine polish, especially if its surface is rubbed with a piece of lead, tim or zinc, and finally finished with a burnisher of glass or porcelain. It then looks like a metallic mirror, and is completely sheltered from all the deteriorating effects of moisture.

effects of moisture. A PAPER on "The Formation of Sugar in the Sugar-cane," was recently read by M. Aimé Girard before the Paris Academy of Sciences. By comparative investigations of the amount of cane sugar and grape sugar in different parts of the sugar-cane in the afternoon and before sunrise, the author has found that only in the substance of the leaves does this quantity vary, and that the quantity of cane sugar sinks during the night to one-half, whilst the quantity of reducing sugar remains almost unaltered. He finds further that the quantity of cane sugar in the leaves increases with the illumination, on very bright days reaching nearly one per cent, considerably less on dull ones, and in either case diminishing during the night by one half. From this the author concludes that the formation of saccharose from glucose takes place entirely in the leaves under the influence of sunlight, and that the effects of moisture. in the leaves under the influence of sunlight, and that the saccharose thereupon ascends the cane through the petioles, &c., and collects there.

At a recent meeting of the Berlin Physical Society, Professor Vogel gave the results of his years of work and renewed attempts Vogel gave the results of his years of work and renewed attempts to obtain coloured photographs. Sensitised plates are only affected by the more refragible rays, hence blue comes out white and yellow and red, black. He has, however, at last succeeded in obtaining in cosine, and more especially its various derivatives, colouring substances which scarcely possess more than a broad absorption band in the yellow, and which led to the desired result. When these bodies were mixed in due proportion with the dry gelatine plates, the yellow of the coloured objects already appeared quite clear on the photograph; but the blue was still always brighter. Herr Vogel inserted between the object and the camera a yellow glass, which partly absorbs the blue rays while leaving the a yellow glass, which partly absorbs the blue rays while leaving the yellow unimpaired, and obtained photographs in which the blue, as well as the green and yellow, and partly even the red parts of the coloured objects, presented to the observer's eye the same vivid effects as the original. A series of photographs exhibited by Herr Vogel side by side with the original pictures attest, *Nature* says, the good results with which this method may be carried out in practice.

A PAPER was read on the 19th June, before the Chemical Society, "On the effect of High Temperatures on Petroleum Hydrocarbons," by Drs. Armstrong and Miller. In this paper the authors describe the results of their examination of the liquid obtained on compressing oil-gas. They point out that their material is in every respect similar to that examined by Faraday in 1825, and in which he discovered benzene. Besides benzene and its homologues, the liquid from oil-gas contains hydrocarbons of the thylene and ascetylene series. From the fractions boiling below benzene, two hydrocarbons of the acetylene series have been isolated—methylallene, C  $\mathbf{H}_3$ , C  $\mathbf{H}$ . C, C  $\mathbf{H}_2$ , identical with the crotonylene separated by Caventon from the mixture of hydrocarbons condensed by compression of coal-gas and hexoylene,  $C_6 H_{10}$ , identical with that described by Schorlemmer. The crystalline tetrabromides of these hydrocarbons have both been obtained in large quantity, in a pure condition. As yet it has not been found possible to isolate the intermediate hydrocarbon  $C_5 H_8$ . The A study of their oxidation products shows that both of these are the normal hydrocarbons, the amelene furnishing on oxidation with permanganate normal butyric acid, the hexylene being converted into normal valeric acid; in other words, the amylene is normal propyl-ethylene, the hexylene, normal butylethylene.

FROM a report by the British Secretary of Legation, at Berne, it appears that the business of watchmaking dates back from the year 1557, taking its rise in Geneva, and gradually spreading north and east to the neighbouring cantons of Neuchâtel, Berne and Vaud. There appears to be an absence of reliable statistical information on the subject of watchmaking in Switzerland, but from schulations which ware made in 1866 as to the number of workmatch of the subject of watchinking in Switzerland, but from calculations which were made in 1866, as to the number of workmen employed and the watches turned out, it appeared that in the canton of Neuchâtel there were 13,706 workmen, turning out yearly nearly 1,000,000 watches, valued at 50,000,000 frames; in the Jura Vaudais 2700 watches, valued at 50,000,000 frames; in the Jura Vaudois, 2700 workmen; in the rest of this canton there were 5000 workmen engaged in this manufacture and in that of musical-boxes; in Berne, about 1300 artificers, producing watches valued at 30,000,000 fances. At the present day, it is estimated that the total annual production of watches in Switzerland exceeds 1,600,000, with an aggregate value of 88,000,000 francs, the total number of workmen employed averaging 40,000. The total exportation of watches in 1882 was 154,500 kilogrammes or 25,300 more than in 1881, while 46,400 kilogrammes wer The total exportation of watches in 1852 was 194,500 kilogrammes, or 25,300 more than in 1881, while 46,400 kilogrammes were imported; the latter, however, were chiefly articles in the rough, intended to be finished and re-exported. Mr. Thornton, in conclusion, says that a novel kind of watch has been recently invented by Mr. Paul Kramer, at Neuchâtel, but owing to the defective state of the law in Switzerland, the inventor has been obliged to rate in the neuconstance. believe state of the faw in Switzerand, the inventor has been obliged to patent it in France. This watch is called a *aiguilles universelles*, and indicates simulutaneously the times of different countries; one, for example, shows the different times for Paris, Suez, Bombay and Hué, another for New York and San Francisco.

#### MISCELLANEA.

AN interesting paper on "Engineering Photography," read fore the Engineers' Club of St. Louis, appears in the American before the Engineers' ( Journal Photography.

THE ship Port Jackson recently arrived at Liverpool from Sydney, New South Wales, with a cargo of 3100 tons of Australian cannel coal for the Liverpool Gas Company. It is understood that the company have received previous cargoes of this cannel, which is credited with great gas producing qualities.

It has been decided to commence relief works in Sydney, to meet the demands for employment which are being made upon the Government. One would have thought that gregarious habits would have been sufficiently overcome in Australia to make men move from the towns to the country when things looked so bad as this.

THE production of coal in France last year is officially returned at 20,887,092 tons, as compared with 20,046,796 tons in 1882, showing an increase of 820,296 tons last year. The production of lignites in France in 1883 was 559,107 tons as compared with 556,908 tons in 1882, showing an increase of 2199 tons last year.

PEOPLE go to the Crystal Palace and find that for various parts of the entertainment they have to pay extra fees. They do not manage things like this at the Healtheries, and consequently people go again. The number of visitors to this Exhibition for the week ending June 28th, was 159,132; total since the opening, 871,213.

MR. STANLEY, the explorer, has transferred the site of his station f Vivi to a table-land some 1500 metres to the north; and a railway from the new station to the Congo is in course of construction. A new station called Sette-Cana, has also been established at the mouth of the small river Sette. Numerous small wooden houses are being made in Belgium to be transported to the new Vivi.

THE following is a list of the guns now in course of construction for Spain:-In England, fourteen Armstrongs and eighteen Nordenfelts; in Germany, sixteen Krupps; in France, thirty-nine steel guns, principally of twelve and ten centimetres, and in the Spanish national manufactory eight of sixteen centimetres and two of twenty centimetres. More artillery is being contracted for abroad abroad.

MESSRS. J. A. YOUNG AND COMPANY, of Westminster, have issued a catalogue which reminds one of some of the American price lists of railway bridges up to any span kept in stock. chiefly descriptive of simultaneous acting gates for railway level crossings and interlocked with the signalling apparatus, small cross-over and other bridges, roofs and roof principals, sheds, and so on.

THE recent change of Ministry in Belgium, from Liberal to Conthe recent change of similarly in Delignin, if Non Liberat changes in the administrative departments. There is a new Ministry of railways, posts and telegraphs, and another of agriculture, industry and public works, including the departments of bridges, roads, and mines. Before the late Ministry went out of power, however, two new laws were promulgated containing revised regulations as to steam engines and the working of mines. the working of mines.

THE necessity for a pocket edition of a catalogue of machinery and machine tools, except for the use of the few representatives of any firm, is not at first obvious. Several firms have, how-ever, published these, illustrated with numerous very small engravings, so it may be concluded that they are wanted. The most neatly got-up, comprehensive, and nicely finished is that of Messrs. Tangye, just published. It is a little larger than a Moles-worth, and contains about 300 pages.

THE Times Berlin correspondent hears that the German Govern-THE Traces Berin correspondent hears that the German Govern-ment has just concluded a contract with Messrs. Yarrow and Co., of Poplar, for the supply of a large sea-going torpedo boat, to be fitted with double torpedo launching apparatus. This will be one of the largest torpedo boats ever built, and will have unusually large coal-carrying capacity. It will thus be seen that, in spite of much late boasting to the contrary, the German Navy has not yet been rendered independent of British industry.

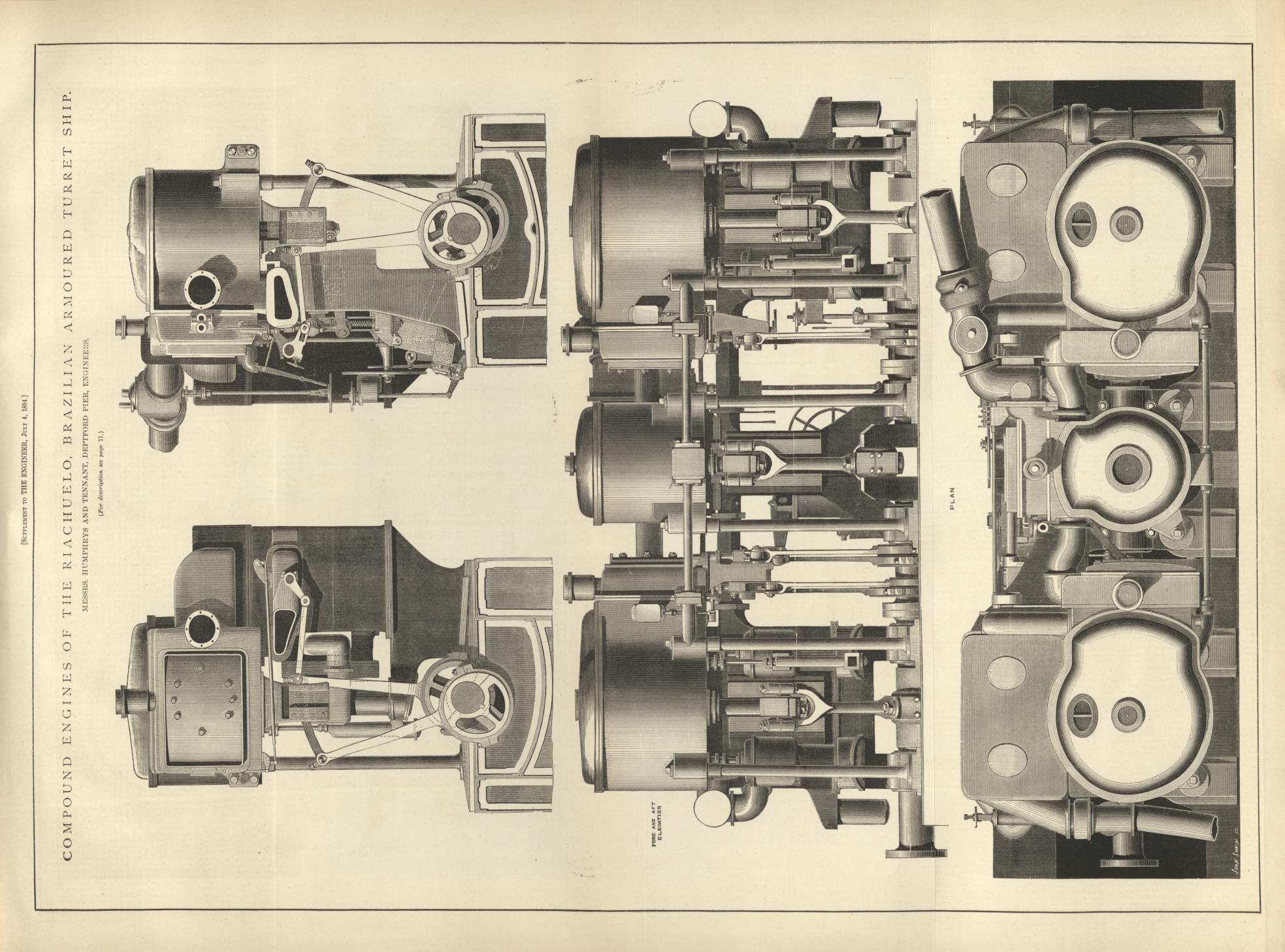
THE P. and O. steamer, Tasmania, the latest addition to the P. and O. Company's fleet, has just made her trial trip at Greenock, an average speed of 15<sup>1</sup>/<sub>2</sub> knots, or 17'8 miles, being obtained. This vessel is 400ft. long, has 45ft. beam, and is 31<sup>1</sup>/<sub>2</sub>ft. deep, the gross tonnage being 4500 tons, and the horse-power, 4000 effective. The Tasmania, which has been built and engined by Messrs. Caird and Co., of Greenock, is of steel, and has been fitted with the electric light by Messrs. Siemens Brothers. She will carry about 200 pas-sengers and 3800 tons of cargo, and will leave London on the 16th of July next in connection with the India, China, and Australian mail services.

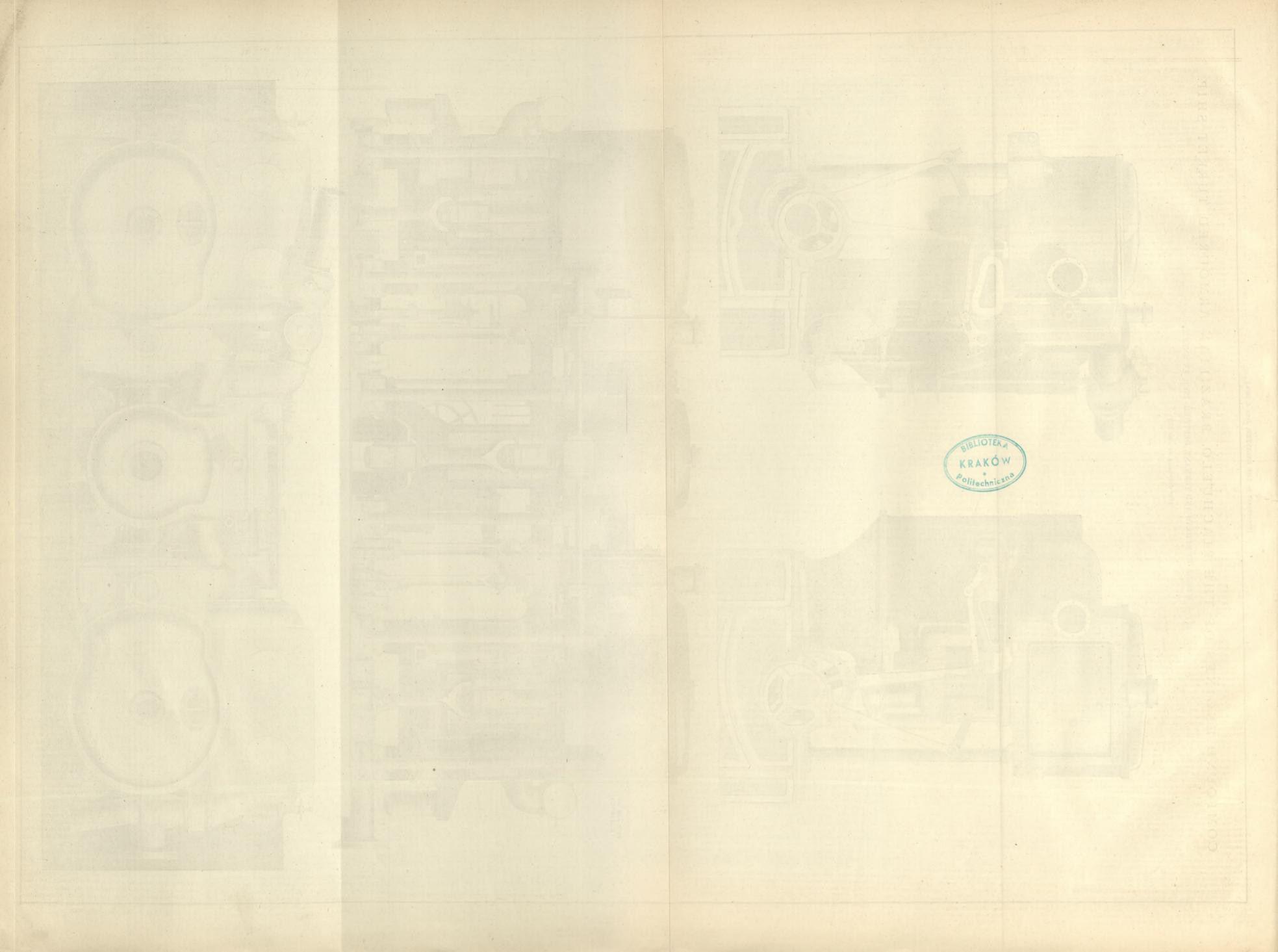
THE principal business at a meeting in Wolverhampton, on THE principal business at a meeting in Wolverhampton, on Tuesday, of the Mines Drainage Commissioners was a proposal to borrow £60,000 to pay off loans amounting to £30,000, and to com-plete the requisite works for the underground drainage. The chairman—Mr. Walter Williams—stated that the increased expen-diture was due to the putting up of two new big engines. One would be ready in three months and the other at Christmas. Then the Commission would be able to work at less cost since when the the Commission would be able to work at less cost, since when the new engine was at blast they would be able to dispense with about six of the sixteen engines at present working only at half-blast. The proposal was carried.

IT is estimated there are more than 400,000 tons of shipping laid up in this country; yet Messrs. Bolling and Lowe say in their Iron Trade Report :-- "Increased plant to produce steel for shipbuilding Trade Report :— "Increased plant to produce steel for shipbuilding purposes is being put down. The advocates of steel vessels will in future be able to have ships promptly constructed, and with full benefit of increased competition. Several of our largest and leading steamship companies have recently held their meetings, and in some instances no dividends were declared, in others, the finan-cial year has closed with a loss. Foreign Governments, anxious to develope their maritime power, are beginning to subsidise their mercantile navy; France has done so already, and at this moment, Germany, Italy, and the United States are following in her wake."

THE Dover Standard states that the London, Chatham, and Dover Railway Company has under consideration a very im-portant project for the construction of a new harbour at Sandwich, portant project for the construction of a new harbour at Sandwich, by a cut from Old Haven to a point about equi-distant between Sandwich and Deal, and the making of a line of railway from the main system of the London, Chatham, and Dover Railway. It is calculated that the harbour, which can be very quickly and cheaply made, owing to the favourable nature and situation of the land, will have an important effect upon the district. In addition land, will have an important effect upon the district. In addition to this, the passage to Flushing from this point would be very much less than the present route from Queenboro'. Its proximity to the Downs would also make the harbour exceedingly valuable for vessels passing in the Channel.

THE first two of four hopper barges-one of which was built by Messrs. J. and W. B. Harvey, of Littlehampton, and the other by -one of which was built by Messrs. J. and W. B. Harvey, of Littlehampton, and the other by Messrs. Austin and Parkins, of Swansca—have recently been launched from their yards. These crafts, which were designed by Captain Swales, harbour master of Shoreham, who has had con-siderable practical experience in dredging operations, are being built for the Dundee Dredging Company, and will carry about 330 tons dead weight. They are constructed of most substantial material, consisting chiefly of pitchpine and solid English oak, and are also fastened equal to the highest-class ship at Lloyd's. The remaining two, now being built by the above firms, are in an advanced state and will be pushed forward in order to be launched in the course of a couple of months. The essential difference between these hoppers designed especially for the Dundee Dredging Company, is that, instead of their being flat-bottomed barges—at all times dangerous at sea, and particularly so when they have to navigate bar harbours—they are designed as sea-going hoppers, and on lines not dissimilar from ordinary ships eugaged in mercantile pursuits. pursuits.





## JULY 4, 1884.

## FOREIGN AGENTS FOR THE SALE OF THE ENGINEER.

PARIS.—Madame Boyveau, Rue de la Banque. BERLIN.—Asher and Co., 5, Unter den Linden. VIENNA.—Messrs. GEROLD and Co., Booksellers. LEIPSIC.—A. TWIETMEYER, Bookseller. NEW YORK.—THE WILLMER and ROGERS NEWS COMPANY, 31, Beekman-street.

#### PUBLISHER'S NOTICE.

\*\*\* With this week's number is issued as a Supplement a two-page Engraving of Compound Twin-Screw Engines for the Riachuelo, Brazilian Armoured Turret Ship. Every copy as issued by the Publisher contains this Supplement, and subscribers are requested to notify the fact should they not receive it.

#### TO CORRESPONDENTS.

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

with these instructions. \* All letters intended for insertion in THE ENGINEER, or con-taining 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

good faith. No notice whatever will be taken of anonymous communications.
THE INVENTOR.—Yes. The sale must be registered at the Patent-office.
W. J. S. — The address of Messre. Simplin and Marshall is Stationers' hall-court, Ladgate-hill, London, F.C.
ONE WHO WANTS TO HELP HIMSELF.—Apply at the City and Guilds of London Technical College, Finsbury.
J. A.—Wilson's work on chinneys will probably answer your purpose. It is published by Messre. Spon, Charing-cross.
E. R. B.—On a small scale the joint you show would work well. We doubt its success on a large scale, and it would be expensive to make.
ERRARA.—In a letter on elevators in our last impression, in the tenth paragraph, eleventh line, the word "descends" should be "ascends," and the word "rises" should be "descends."

#### BUCKLEY'S PATENT PISTON SPRINGS.

(To the Editor of The Engineer.) SIR,—Will any reader kindly give me the address of the maker of Buckley's patent piston springs? P. B. W. G.

#### THE STRENGTH OF GEARING.

(To the Editor of The Engineer.) (To the Editor of The Engineer.) SIE,—Permit me to ask through the medium of your columns what is the strength of cast steel gearing compared to that of cast iron, the wheels being cast from the same pattern. H. P. R. Porto Rico, June 10th.

THE BRIDGE OVER THE THEISS AT SZEGEDIN.

(To the Editor of The Engineer.) MONSIEUR LE REDACTEUR,—A la suite de l'article paru dans votre journal THE ENGINEER, en date du 29 Férrier, 1884, page 169, sur les établissements de la Société Autr. Hongr. Priv. des Chemins de fer de l'Etat à Resicza (Hongrie), M. G. Eiffel constructeur, nous a addressé une réclamation relativement au passage concernant le pont sur la Theiss à Szegedin.

I État à Resicza (Hongrie), M. G. Enfei constructeur, nous à addresse due réclamation relativement au passage concernant le pont sur la Theiss à Szegedin.
Cette réclamation étant de tous points justifiée, nous vous prions de vouloir inséres dans votre prochain numéro l'observations suivante: à savoir, que M. Eiffel, constructeur à Paris, était chargé de la descente des caissons et des montage des travées du pont de Szegedin, tandis que notre Société n'a fait que livrer la construction métallique d'après les dessins qui lui ont été transmis et dressés par M. Eiffel.
Agréez, je vous prie, Monsieur le Rédacteur, l'assurance de notre par-faite estime.
Wien, am 27 Juin.

#### SUBSCRIPTIONS.

- DUBCINITIONS
  The Exciting of the fact of the case of the

Mauritus, Sandwich Isles, £2 5s. **ADVERTISEMENTS.** \*.\* The charge for Advertisements of four lines and under is three shillings; for every two lines afterwards one shilling and sixpence; old lines are charged one shilling. The line averages seven words. When an advertise-ment measures an inch or more the charge is ten shillings per inch. All single advertisements from the country must be accompanied by a Post-office order in payment. Alternate advertisements will be inserted with all practical regularity, but regularity cannot be guaranteed in any such case. All except veekly advertisements were taken subject to this condition. Advertisements cannot be inserted unless Delivered hefore Six

All except weekly advertisements are taken subject to this conducton. Advertisements cannot be inserted unless Delivered before Six o'clock on Thursday Evening in each Week. Letters relating to Advertisements and the Publishing Department of the paper are to be addressed to the Publisher, Mr. George Leopold Riche; all other letters to be addressed to the Editor of THE ENGINEER, 163, Strand.

#### MEETING NEXT WEEK.

**DETINGENENT OF** ASSOCIATION OF MUNICIPAL AND SANITARY ENGINEERS AND SUF-strongs.—Annual meeting at Newcastle-on-Tyne on Thursday, Friday, and Saturday, the loth, 11th, and 12th, July. Business : Thursday, at 1625 Jam., Council meeting at engineer's office, Town Hall ; 11 and the toth, 11th, and 12th July. Business : Thursday, at 1626 Jam., Council meeting at engineer's office, Town Hall ; 11 and iteration of officers, general business; the President's address. A paper will be read, should time permit, "On Inspecting and Testing the Sanitary Arrangements of Houses," by Mr. J. P. Spencer, A M.I.C.E., FAS, of Newcastle-on-Tyne. At 3:30 p.m., visit to places of interest in the town; at 6:30 p.m., the annual dinner. Friday, 11th, at 10 a.m., reading and discussion of papers on "Steam on Tranways," by Mr. Jas, Hall, Borough Surreyor, Stockton-on-Tese. "Sewage Disposal," by Lieut. Colonel Jones, V.C. Wrexham, "Esc. O'stor of Local Government and the Distribution of the Funds," by Mr. F.S. Brunton, Assoc. M. Inst. C.E., Richmond. At 2 p.m., visit to the Elswick Ordnance and Engine Works, the Swam and Edison Electric Light Company's factory at Ben-Works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Swam and Edison Electric Light Company's factory at ben-works, the Corporation Cattle Lairs, St. Laurence, Messax, Walter Scot way at the Corporation Cattle Lairs, St. Laurence, Messax, Walter Scot way at the Corporation Cattle Lairs, St. Laurence, Messax, Walter Scot whitehill Point Coal Statithes,

#### DEATH.

On the 26th June, in the 76th year of his age, JAMES EASTON, Mining Engineer, of Nest House, Gateshead,

# THE ENGINEER.

# THE ENGINEER.

# JULY 4, 1884.

#### THE HEALTH EXHIBITION.

THE outbreak of cholera at Toulon accentuates the

THE outbreak or choiera at foulion accentuates the position and promise of the Health Exhibition. Attention will very properly be directed to the carrying out of such measures as may best enable us to avert a considerable danger, and the Health Exhibition is supposed to be competent; to supply the practical instruction which we all in theory, at least, need. The sanitarians have for some time had their own way, and we should be the last to dispute that they have done a great deal of good; but it may perhaps be worth while to ask whether it has been effected quite in the fashion they suppose. The assumption is that man is beset by insidious foes, who assail him in the air he breathes, the earth he walks on, the food he eats, and the drink—no matter what it may be—that he imbibes. It is furthermore taken for granted that man possesses little or no natural power of contending with these foes, and he is warned that the only way to retain even a modicum of safety is to wage unceasing war on bacteria, vibrios, and that awful mystery, the disease germ. It is pointed out that by doing this, even in a perfunctory and inadequate way, longevity has been greatly promoted, and the national death-rate reduced; and it is carefully explained to us that our safety is due altogether to the exclusion of this or that form of foe, according to the school to which our teacher belongs. No doubt there is a vast amount of truth in all this, but there is also, we regret to add, much that is not true, or rather we should say, much, the truth of which is not proved. Thus, for example, we are told on the one hand that water once contaminated with sewage never can become pure again ; while equally great authorities assure us that sewage contamination is eliminated from a running stream in a few hours. The fact seems to be that if people lead clean, wholesome lives, they will live longer than is possible when they have bad air and but little of it to breathe, and bad food and but little of it to eat. It is not essential that we should go to bacteria for an explanation of the cause of divers diseases. No one has ever yet proved that bacteria, or germs of any kind, caused typhoid fever, let us say. At a time when the reign of the bacteria theory was all-powerful, and people were warned to shun them as they would the plague—of which, indeed, they were the proximate cause—one enterprising authority pushed his researches very far. It was argued by some persons that the bacterium was not omnipresent. He set this fond notion at rest by proving that we draw in bacteria in myriads every time we inhale even a so-called pure mountain air. He overdid the thing. When men heard him, they saw that it was useless to fight the foe any longer. Indeed, he lost nearly all his terrors. We inhale the enemy from the cradle to the grave, and

seem to be none the worse. We have said that if men and women and children lead when have said that it men and women and confident team what are called healthy lives, the chances are that they will escape disease. If a thinly clad girl leaves a hot ball-room and gets a chill, we need not go in search of bacteria to account for her death by inflammation of the lungs. If a whole family live in one wretched room, without clothes or fine on your little food some of the members will include or fire, on very little food, some of the members will in all probability die young, and we need not seek for any special cause of death. It is well known that every plant and animal depends for its existence on the conditions which surround it, and that each and all possess powers of accommodating themselves, more or less, to these conditions. A well-fed, well-nourished man, for example, can bear up against con-ditions which would prove fatal to one not so well prepared to contend against malign influences. The conditions most favourable to life are pure air, pure food, pure drink, and a proper temperature. The want of this last kills more people than the sanitarians take count of. The supply of these things is the beginning and end of sanitation. It may amuse, in-terest, or instruct, to hunt the bacterium to his lair, or drag the disease germ from its lurking hole; but the practical house-holder need take no care for these things. If he provides pure air and plenty of it, pure food, pure drink, and a proper temperature, he may let bacteria, vibrios, and germs urge their wild career where they please, they will not harm him. The natural power of recuperation, which enables a broken bone to knit, or a cut finger to heal, will come in and aid him. Man can stand a great many assaults, as everyday experience tells us, and maugre the sanitarians, be none the worse for them.

In so far as the Health Exhibition shows us how these things can be best provided, it will fulfil the object for which it was ostensibly called into existence; but it is very difficult to walk through it and inspect its contents without arriving at the conclusion that it does not teach quite so much as we were led to expect it would. Food is pro-vided, of course, in all forms; but the average visitor is certainly not placed in a position to know whether what he sees is good, bad, or only indifferent. Piles upon piles of tins, for example, are to be seen; but who can say what the nature of their contents may be? We do not doubt the nature of their contents may be? We do not doubt that it is excellent, but we would rather not be asked to give a reason for our belief. It is possible to see butter made, bread baked, chocolate and cocoa, and soda water and sweetmeats prepared. Is the visitor really any better off because he has seen these things? We fear not. As regards the supply of pure air, &c., we were told that the Exhibition was to contain two houses, one fitted up with every desirable appliance, the other to be a truthful example of jerry building. The houses are there, but they have not been opened yet. Some difficulty has, we believe, been met with in the attempt to make the bad house bad enough. Certain fittings and appliances, for example, which the sanatarians thought miserable, have been held to be much too good by those who are prac-tically acquainted with the habits and mode of life of the jerry builder. Meanwhile, the houses being shut up, the Health Exhibition teaches nothing.

extremely interesting and attractive, and the management of it is admirable; but as an Exhibition it teaches very little sanitation indeed. We do not find fault with it for this, simply because we do not think that sanitation can be taught by Exhibitions, or, indeed, can be taught at all. It is either too simple or too complicated. An Exhibition is not needed to tall us that we ought to put on years is not needed to tell us that we ought to put on warm clothes in winter, and it cannot teach any one what is the best way to dispose of the sewage of our towns. One is not needed to prove that we should not pollute our air with carbonic oxide and carbonic acid; but no Exhibition can teach us how to burn coals or fuel of any available kind without producing both. A display of pipes, however huge, will not enable the average householder to decide whether his habitation is or is not properly drained. In a word, we fear that to expect that health can be promoted by Exhitions is to expect too much. On the other hand, however, there is a great deal about this one to amuse, interest, and instruct the visitor. A day might be spent in "old London," and something would be left unseen which ought to have been seen. It is impossible for any intelligent person to live even a few hours in the various buildings, which nearly cover the whilome gardens, without coming away better informed, for the time at all events, than he ever was before on various matters. The Exhibition is deservedly popular; but too much must not be expected, and the last things perhaps to be learned are those lessons in sanitation, which it was supposed that it would teach in a very pro-minent way. We are not sure, indeed, that we have found anything sanitary put forward on a comprehensive scale. Of course it goes without saying that the manufacturers and inventors of all kinds of foods, drinks, baths, furniture, ventilators, et hoc genus omne, are present in multitudes; but the average Englishman will find it very difficult to decide among the rival claimants who is to be preferred. We fear that in one sense the Exhibition must be regarded as a failure; that is to say, it is not didactic in the proper way, but it is very instructive, nevertheless, and that in a host of ways which have little or nothing to do with health; and it is very amusing, which cannot be said of all Exhibitions.

We might pursue this line of argument if it were neces-sary, but we think it is not. The Health Exhibition is

#### GAS SUPPLY.

AMALGAMATION continues to reduce the number of the Metropolitan Gas Companies, while sanguine electricians may anticipate the period when, by a process more power-ful than amalgamation, the companies will be made to disappear altogether. But the day when gas will depart is probably too remote to influence present arrangements, while, on the other hand, amalgamation is still an active force. The London Gas Companies are now reduced to the curt category of three—the Chartered, the Commer-cial, and the South Metropolitan. The effort to absorb the last-mentioned into the first having failed, an attempt is now being made by the South Metropolitan to take in the two Woolwich companies. Thus the suburbs are the two Woolwich companies. Thus the suburbs are being invaded, and there is the chance that some important parts of the "outer ring" of gas companies may be ultimately attached to the centre. Mr. John Field, in drawing up his valuable yearly "Analysis," is placed under the necessity of extending his sphere of observation in order to produce a really presentable record. After 1879 he found it expedient to go into the suburbs, and the present issue of his handbook makes reference to the provinces. The gas sold in the metropolis continues to increase the The gas sold in the metropolis continues to increase, the quantity in 1883 being more than 20,000 millions of cubic feet. The quantity is vast, and the consumption of coal is proportionate, the weight carbonised being more than 2,000,000 tons. But the quantity of cannel coal is diminished by more than one-third, as compared with the fourteen in number, and the provincial ten, beside eight Municipal Corporations. The eighteen provincial under-takings employ less capital than the three London companies, the latter requiring nearly £14,000,000, while the eighteen take less than £12,000,000. The Chartered Company has a capital of £10,733,000, while in the provinces the Birmingham Corporation stands at the head, with a capital of £2,282,000, being a little in excess of the South Metronolitan. The suburban companies have an with a capital of  $\pm 2,282,000$ , being a fittle in excess of the South Metropolitan. The suburban companies have an employed capital of  $\pm 2,173,000$ , or less than that of Bir-mingham alone. Adding this to the capital of the eighteen provincial undertakings, we get a total slightly exceeding that of the metropolitan companies.

Amalgamation having been carried so far, it seems Amalgamation having been carried so far, it seems strange that a company like the Commercial, with a capital of only £746,000, should continue to exist as a separate undertaking in the metropolis. But it would be possible to lay hold of the figures adduced by Mr. Field, and make it appear that large undertakings are not always the most satisfactory. For every thousand feet of gas sold, the Commercial Company employs only 9s. 4d. of capital, while the South Metropolitan requires 11s. 1d., and the Chartered 14s. 6d. Accordingly it might be argued that Chartered 14s. 6d. Accordingly it might be argued that the larger the company the worse the economy. However, if we go back to 1869, before any amalgamation had began to operate, we find that the Chartered Company, then less than one-seventh of its present size, had a capital amounting to as much as 20s. 3d. per thousand feet of gas sold, and the average of all the London companies was 15s. 10d., this last ratio being now 13s. 5d. That amalgamation has been really beneficial to the gas consumer may be further proved, if we compare the capital employed with the quantity of coal carbonised. Taking all London, this was £6 13s. 8d. per ton in 1869, whereas now-that is to say, in 1883—we see a falling off to £6 7s. 11d. difference is not great, but it is in the right direction. The South Metropolitan shows an increase in the ratio, as between 1869 and 1883, to the extent of 7s. 6d. per ton. As there was a marked rise in 1880, immediately following the amalgamation with the Phoenix, we may presume that the heavy capital of the latter company ffected the financial aspect of the South Metropolitan. But London at large was not injured, the burden being merely shifted from one company to another.

As a matter of fact, the Commercial Company has preeminence over its two metropolitan colleagues in economy of results. The South Metropolitan comes next, and the Chartered last. That amalgamation has been for the benefit of the metropolis thus far, is perfectly consistent with this state of the case. Yet it may be true that amalgamation has gone far enough. The presence of the Commercial Company shows how much can be got out of a certain amount of capital, and the South Metropolitan is also a good example of economy. If all were blended together, London might be none the worse for the change; but the stimulus of competition would be wanting. It is worthy of remark that the gas supplied by the Commercial Company last year was of higher lighting power than any other, excepting, of course, the cannel gas of the Chartered Company. Compared with the South Metropolitan, the Commercial gas was four-tenths of a candle higher in the scale—a result accounted for by the larger proportion of cannel coal used by the Commercial. The disadvantage attendant on small undertakings is shown by the operations of the suburban companies. Not one of these is equal in size to the Commercial, and the capital employed exceeds, on an average,  $\pounds 7$  per ton, or 15s, per 1000ft, of gas sold. At Barnet the capital actually amounts very nearly to  $\pounds 2$  per 1000ft. The Woolwich Consumers' Com-pany does well, showing results about equal to those of the Commercial in London.

In the provinces we find the companies comparing favourably, in some respects, with the corporations. former are nearly nineteen shillings below the latter in the amount of capital per ton of coal, and very nearly half-a-crown below them in the ratio per 1000ft. of gas. The companies also get more gas out of a ton of coal than the corporations, and make a slightly better proportion of coke. For their residuals they get less. In management charges the corporations have the advantage, their ratio per ton of coal being less than half that of the companies. In manufactory charges the latter show a moderate excess The corporations have a charge of  $\pounds 299$  for auditors only, while the companies expend £11,364 for auditors and directors. The corporations get a larger profit on the sale of gas than the companies, but when we come to the net profit-that is to say, after allowing for insurance, depre-ciation, annuities, and interest on borrowed moneys-the companies have the advantage, the latter clearing tenpence per 1000ft., and the corporations less than sevenpence. In their charge for gas, the corporations sightly exceed the companies. The average is about  $4\frac{1}{2}d$ , below that of the metropolis, and that, again, is 11d. below the suburban average. Perhaps it is right we should specify that the corporations in question, in addition to Birmingham, almost metropole are these of Boston Halifer Lacks already mentioned, are those of Boston, Halifax, Leeds, Leicester, Manchester, Oldham, and Salford. The provincial companies are those of Bath, Brighton, Bristol, Derby, Liverpool, Newcastle-on-Tyne, Plymouth, Portsea, Preston, and Sheffield. The statistics thus furnished are valuable, and will help to settle some of the tangled controversies which occasionally arise on the question of the gas supply.

#### ELECTRIC LIGHTING.

ALTHOUGH no more is heard of the formation of companies and huge undertakings for lighting whole cities, electric lighting continues to make steady progress. It is impossible to see the magnificent display at the Health Exhibition without feeling that a system of artificial illumination which can do so much, must be independent to a large extent of the success or failure of mere speculators. It is beyond all question, we think, that the electric light has a great future before it; and the fears which have been expressed that it must fail to meet with popular approval may be dismissed as of little or no moment. The course of events during the last few months in connection with electric lighting may be very easily stated. In incan-descent lighting no important improvement of any kind has been introduced-we do not now refer to means of generating or distributing current, but to the lamps. It would seem, indeed, as though finality in this direction had been reached ; lamps of very high resistance are in the market, and the durability of lamps all round seems to be fairly satisfactory. Whether it is or not, however, there is no evidence to show that better lamps can be produced than those now made. It is possible, of course, that improvements may be effected, but it is at least very doubtful. It is a noteworthy fact, moreover, that arc lighting is coming daily into more efficient rivalry with the incandescent system, and justly so. Let our readers who visit the Health Exhibition contrast the lighting of the great hall by star lamps along the roof, with the lighting of courts where arc lamps of really good quality are employed, and we think that it will be impossible to avoid the conclusion that the arc has the best of it. Nothing, for example, can excel the tempered glory of the sun lamps in and about the water comoanies' pavilion, but there are other arc lights to be seen which are quite equal to them. For domestic lighting nothing exists at present equal in quality to the incandescent lamp, but it is open to question whether it may not meet with a rival of importance even in its own special province. Long since we have pointed out that it might be found quite possible to produce arc lamps of small size which would answer admirably for domestic lighting. Those who re-member the first Werderman lamp, in which a small pencil of carbon was pressed against a disc of the same material, know that a step was made in the right direction. Messrs, Siemens are now, we understand, pushing further on this road, and producing a little arc lamp which works with a current of about two ampères. For large, or comparatively large buildings, arc lighting is matchless, and arc lamps are now made by Crompton, Brockie, Bowman, and others, which leave nothing in this respect to be desired. Much of the success which has been achieved in arc lighting is due to the improvement which has been effected in the manufacture of carbons, an art still kept a secret, and by no means yet brought to the perfection of which it is capable. A few words on this point will not be out of place here.

flickering and noise. Variations in the amount of light are of secondary importance. If a lamp flickers, the defect is simply fatal. As a rule flickering is not caused by a defect in the lamp, but by the imperfection of the carbons, or the improper manner of using them. It seems to be proved that on the whole the best results are got by using carbons about 10 or 11 millimetres in diameter below and 12 millimetres above, the upper carbon being, of course, the positive, with a current of 8 to 12 ampères, and an electro-motive force of 35 to 40 volts. The horse-power in the first case will be  $\frac{8 \times 35}{212}$ , or 37 of a horse-power. In the latter case we have

 $\frac{12 \times 40}{746}$ , or say, 64 of a horse-power. This is rather too much for carbons of the stated size, and it will be found almost impossible to make the lamp burn steadily and without noise. The large current tears the carbon points to pieces. If it is still further augmented flaming sets in, and the light is positively reduced instead of being aug-Now every carbon requires a special current and mented. electro-motive force, which will give a better result than any other; and when the current is kept small, and the electro-motive force moderately high, absolute steadiness may be secured, as illustrated by Clark and Bowman's lamp at Brixton, or the Brockie lamps shown last year at the Crystal Palace. In neither case has any attempt been of light out of the lamp. The struggle to do this of light out of the lamp. has, indeed, ruined the reputation of many good lamps No matter what the current may be, some carbons will never burn quietly, the reason being either that gases are occluded in the carbon, or that substances are left in it which will produce them. In estimating the good qualities of a carbon, the first thing to be cousidered is its con-ductivity; if this does not exist in a high degree, it must be rejected without ceremony, no matter how good it may be in other respects. It will become very hot when the current passes through it, and will rapidly waste, tapering away to a point from its proper thickness for a length of 2in, or 3in. The carbon holder of the lamp may be burned, and much mischief done. We have seen carbons quite silent, and giving out a magnificent light, which were worthless because of their high resistance. Attempts are made to get over the difficulty by coppering the carbons by the electrotype process, but the result is not satisfactory. No adequate explanation of the causes of want for order of the same process, at the same time, and from the same materials, may be found, one of which will prove excellent, while the other will not conduct at all. So far as can be gathered, the conducting power depends more on the molecular structure of the carbon than on anything else.

Conductivity secured, the next thing to be sought for is silence and absence of flickering; and these can be had in only one way, namely, by purifying the coke in the first instance from which the carbons are made. The best material seems to be the linings of gas retorts; but this ought to be treated with caustic potash, and carefully washed. This is not the place to go into the details of manufacture. We must content ourselves with general principles. The best carbons and the best lamps will give bad results if, as we have said before, the current is not just right; and one point, frequently neglected, ought to be insisted on-namely, that the speed of the dynamo shall be kept constant. The resistance of the arc varies continually. It is instructive to put a single arc lamp in circuit, and then watch the hand of an ampère-meter. This will seldom or never be quite at rest. If the carbon is a bad one, the hand will jump through comparatively large ranges; each sputter of the carbon being attended by When there are a good many lamps in series, a a jump. little over-feeding or a little under-feeding may considerably alter the resistance; and unless there is plenty of power and a good governor, the result will be unsatisfac tory. Thus, for example, let us suppose that a little overfeeding takes place. The resistance is diminished, the quantity of current augmented, and more load is thrown on the engine. If it is properly governed, it will keep its speed constant, and the lamps have a chance of recovering themselves. If, on the contrary, the speed falls off, the lamps will get worse and worse. It is only too often assumed that arc lights do not need regular speeds; but this is quite a fallacy. They want it quite as much as the incandescent system.

#### THE RAILWAY HALF-YEAR.

THE termination of the half-year of the chief English railways—for several of the Scottish railways close their accounts a month later—enables an approximate estimate to be formed a month later—enables an approximate estimate to be formed of the results of their working. It can only be an approximate estimate, for there are several days yet to be reported on. But assuming that these days showed no great change, it may be said that there are increased traffic receipts on the Great Eastern, the Midland, the Great Western, Lancashire and York-shire, London and Brighton, Metropolitan, and one or two other lines but these increases or but large average in the area of the lines, but these increases are not large, except in the case of the first-named line. On the other hand, there are decreased receipts in the cases of several lines, culminating in comparatively heavy falls in those of the London and North-Western and the North-Eastern. To set against the decreases there will be, probably, lessened expenditure, and to set against the inworking charges must be expected to be higher. s the But in both cases there are higher capital charges owing to the enlargements of the capital; and when the legislation that is threatened is borne in mind—and in some extent that legislation will in all probability be carried out in an early session—it must be acknowledged that so far as the improvements of lines and works that are open for traffic is concerned, the capital expenditure is called for, and must for some time go on. Thus the fair deduction is that on the whole the dividends of the railways for the half-year now completed must be slightly less than those for the corresponding half of the past year. But the prospects of the railways are still good. The great lines pay dividends that are fairly remunerative to the capital, when other investment returns are remembered; and the most profitable branch of traffic—the passenger traffic—is likely to The two greatest defects which arc lighting can have are increase still further, whilst some railways, such as the Metro-

politan, will derive great benefit from lines that approach completion. The public claims greater facilities—the law will sanction these, and the railways must either voluntarily or com-pulsorily give them—but on the whole the returns will be favourable, and increased safety will lessen one and the worst of of the dwarges compared to of the charges-compensation.

#### TRACTION ENGINES IN SHEFFIELD.

THE Sheffield Corporation appear determined to wage uncompromising warfare with the owners of traction engines. The Highway Committee recommend the Council to rescind the byelaw made by them on the 11th October, 1882, as to the byelaw made by them on the 11th October, 1882, as to the hours during which locomotives are not to pass over certain specified highways within the borough, and to make a new bye-law in lieu thereof, prohibiting such locomotives from passing over any highway within the borough between the hours of 9 a.m. and 5 p.m. in every day. This resolution came before the last Council, which referred it back to the Highway Com-mittee for consideration as to whether some provision could not be made for rural districts. The Highway Committee has again met and confirmed the resolution originally passed, to have no traction engines on the borough thoroughfares between the hours of nine o'clock in the morning and five in the evening, the hours of nine o'clock in the morning and five in the evening, the only exception to be the Corporation steam roller,

#### LITERATURE.

Across the Pampas and the Andes. By ROBERT CRAWFORD, M.A., M.I.C.E. London: Longmans, Green, and Co., 1884. 344pp.

ENGINEERS may be accounted travellers; not a few have made more voyages, crossed more virgin soil, opened up more wild country, and bared to daylight more ancient remains than many of the so-called travellers. Yet few engineers have written of what they have seen, and fewer have written a book that those not engineers can read for the pleasure of the thing. Mr. Crawford—or, as our author occupies the Civil Engineering Chair in the Dublin University, we must perhaps say, Professor Crawford— has written such a book. His work is an account of a journey across South America commenced in 1871, for the purpose of exploring and surveying a route for the then proposed Transandine Railway. Accepting the position of engineer-in-chief of the expedition, Professor Crawford proceeded to the River Plate in March, 1871, and the difficulties which beset the survey began upon his arrival at Monte Video, at a time when yellow fever was raging, the Government gone from Buenos Ayres, just as did what in England was called the Government when it left London for Oxford in 1665, and no business of any kind was done. After great loss of time, however, the expedition made a start, and was continued under great difficulties; owing to the state of the country, the difficulty of obtaining the necessary military escort, rendered necessary chiefly through the depredations of the marauding Indians; trouble in obtaining and transporting supplies and water, the heavy rains, burning sun, and freezing nights when on the mountains. When, however, a start had been made from the almost depopulated city of Buenos Ayres at the end of October, these difficulties were lightly considered, and are lightly touched upon in the book. The expedition consisted of seven engineers, a doctor, captain in charge of the transport service, a Government commissioner and his assistant, an interpreter, a storekeeper, besides thirty-three Europeans, and two North Americans for surveying purand eighteen Gauchos, or natives, for driving the bullock-carts and horses. The means of transport were thirteen bullock-carts, six horse-carts, and a troop of 230 horses and bullocks, some of the latter being for food, a butcher being obtained by appointing one of the Gauchos who developed a very sanguinary character soon after the start, and Professor Crawford appointed him to this work means of satisfying his evident rage for knifework. Of the actual surveying we are told but little, but of the country, the climate, vegetable and animal life, and inci-dents of the journeys, the author gives a most entertaining account. Were we to begin to refer in detail to these, or to quote any, we should find our notice of the book running into space which cannot be spared. The naturalist, as well as engineer and the physicist, will see that the author is an observer of more than usual scientific exactness, and all interested in well-told accounts of travels will feel themselves carried from page to page with sustained interest. Although from time to time provided with a few soldiers, such as they were, the actual conflict with Indians was insignificant; but the adventure element is sufficient to please even those who look most for this in travels. The wildness that even now characterises the heart of South America is well pictured in the course of this account of journeyings from station to station, or fort to fort, over sandy plains, up mountain sides ten thousand feet above the sea level, from earthquake-destroyed cities to virgin soils, from the infernal fires of the Andes to the eternal snows, from parched lands to floods that washed the camps almost away, and frosts that sometimes froze their drenched beds to the ground after the day sun which runs the thermometer up to 107 deg. in the shade.

Nearly ninety pages of the book is occupied with appendices which give valuable information of the geodetic, geographic, and engineering features of the country surveyed. An account, with ample statistic detail, of the railways save those most recently completed, is also given. Since the publication of the volume, it may be mentioned that recent advices from Buenos Ayres report the completion. of the Andine Railway to the town of Mendoza—the capital of the province of that name—situated at the foot of the Andes. The line now extends from the Parana to the Cordilleras, and opens up a zone of immense natural wealth. Mendoza is one of the richest provinces of the Republic; it covers an area of about five thousand square leagues of land at the foot of the Andes, with a population estimated at 150,000. With this short notice of Mr. Crawford's book, we must close it, but must mention that it has a good index, and is well got up.

A STEAM boiler in use at a village near Drayton, Ohio, in a flour mill exploded on Friday last. Of forty persons who were working there, seven were killed and others injured—three of them fatally.

## LETTERS TO THE EDITOR.

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

#### HYDRAULIC LIFTS.

SIR,—Messrs. Waygood and Co. have now had ample time to respond to my inquiry for practical results, had they considered it desirable to publish them. As they have not done so, perhaps you will allow me to state in detail the objections shadowed forth in my former letter. my former letters.

will allow me to state in detail the objections shadowed forth in my former letters. In the old type of direct-acting ram lift with overhead balance chains and wheels, and suspended balance weights, it was always recognised that the gradual protrusion of the ram as the lift ascended caused the former to be continually robbed of hydraulic support, by reason of the continually decreasing head of water, as measured from the point of the ram to the driving tank. In the case of some low-pressure lifts this loss of support would be the equivalent of twice the net load lifted. The defect was met by making the chains carrying the balance weight much heavier than considerations of strength alone would have required. These heavy chains were so proportioned that as they were paid over from the ram side of the wheel to the weight side, their weight being gradually deducted from the ram and added to the balance weight, the difference of balancing effect so obtained compensated for the protrusion of the ram. Within a very recent period it occurred to three or four inventors that it would be desirable to dispense with the overhead balance chains, weights, and wheels, with their extreme tensional strains, and arrange the balance in some different way. The several systems of what is now known as

To the protrusion of the rain. Whithin a very recent period it decerned to three or four inventors that it would be desirable to dispense with the overhead balance chains, weights, and wheels, with their extreme tensional strains, and arrange the balance in some different way. The several systems of what is now known as hydraulic balancing were the result of the movement. The arlier introducers of the new type of balance, either from the date of the first conception of their ideas, or very shortly afterwards, saw the necessity for providing for the loss of effect due to protrusion of rams, and coupled with their balancing cylinders a compensating arrangement to do duty for the heavy overhead chains which had been removed. The compensating systems may be classified as (1) heavy weights moving into positions of varying effectiveness; (2) so arranging and proportioning cylinders, strokes and pressures, that the various rams should have reverse protrusions, and should ultimately mutually compensate each other. In the old direct-acting lift with weights and chains, in multiplying cylinder lifts, and in the newer hydraulic balance lifts with compensating arrangements, the net efficiency has in all cases approximated with singular closeness to 60 per cent. the variation among good lifts not exceeding 1 or 2 per cent. But in Messrs. Waygood's hydraulic balance with the "Economiser" there is apparently no compensation for emergence provided by either of the above named system or in any other way. Let us estimate the amount of the loss of suprovide in a lift to raise 10 evt. 70ft. high, the stroke of the balance or driving ram being 9ft. Hydrostatic pressure due to rotrusion 594 h. But the driving cylinders, instead of counteracting some of this, will in the case of the "Economiser" add a farther loss of 624 h. or 56 per cent. of the gross load lifte.
If they result of the use of a close so to effect equivalent to 30 b. on the lift ram, making a gross loss of 624 h. or 56 per cent. of the gross load lifted.

arrangement is the subject of a patent owned by one of Messrs. Waygood's competitors. It does not therefore appear that the name of "Economiser" and the implied claim can be justified by the facts. If any state-ment of mine in this letter can be shown to be unwarranted, I shall be pleased to have it corrected. I have just received details of the test of a hydraulic balanced lift with compensating apparatus, in which an efficiency of 71 per cent. has been obtained. A letter from Mr. Gibson, of the American Elevator Company, appearing in your paper of yesterday's date, appears to require a reply on my part, which I will make as brief as possible. In only one case are complete figures given to enable your readers to check

reply on my part, which I will make as brief as possible. In only one case are complete figures given to enable your readers to check the efficiency; the result there obtained is 71 per cent., and this is equalled by other types. That result was found after twelve months' wear, probably the most efficient period in the life of a lift. Mr. Gibson gives the repairs for two years, but this does not include new ropes, which must be getting rather insecure and near their date of renewal. Some considerable sum should have been added on that account. I note that the packing is internal, and somewhat difficult of access. Will Mr. Gibson tell us something of the cost of repacking one of his pistons? Having repacked, what means exist for ascertaining that the piston is tight and does not pass water into the exhaust, thus using more water than the calculated quantity? The probable time for such leakage would be during the ascent of the car, and as at that time exhaust water should be running full bore, an examination of the exhaust pipe would yield no information.

running full bore, an examination no information. Mr. Gibson passes lightly over the method of suspension, viz., wire rope, the life of which is generally considered shorter than that of any other suspending medium in use, though it conduces to smooth working; and he appears to need reminding that safety ECONOMISER. gears do fail. London, June 28th.

Tondon, June 28th. S18,—A lengthy letter upon the above subject appearing in your fast issue, and signed by the American Elevator Company, should not, we think, be passed unnoticed by the lift manufacturers of this stose lavished upon the "Standard Hydraulic Elevator" should speedily find its way into all our new public buildings; and yet those lavished upon the "Standard Hydraulic Elevator" should speedily find its way into all our new public buildings; and yet the American lift does not make such headway as your readers might be led to expect. An unprejudiced public will naturally set Mr. Gibson's interested opinions against our interested ditto, and we therefore think it better to quote the opinions of others. Our system of hydraulic balance lifts has on several occasions been to comparison with the American lift, and invariably with the special object. The cases of at least nine lifts, the purchasers were led by their professional advisers to decline the Standard elevator, and adopt the cases of at least nine lifts, the purchasers were led by their professional advisers to decline the Standard elevator, and adopt the cases of at least nine lifts, the purchasers were led by their the cases of at least nine lifts, the purchasers were led by their the cases of at least nine lifts, the purchasers were led by their the cases of at least nine lifts, the purchasers were led by their the cases of at least nine lifts, the purchaser were led by their the cases of at least nine lifts, the purchaser were led by their the cases of at least nine lifts, the purchaser were led by their the cases of at least nine lifts, the purchaser were led by their the due of the building they express their unqualified approbation of our the submitted approbation of our the building, they are quite satisfied that in adopting ours they are a proper selection. The considerable contracts for lifts are now pending in London,

and in each, under the advice of engineers, the American and all other suspended lifts are excluded from competition after having had their claims submitted, and the question is now only between one hydraulic balance lift or another. There are in the North of England at least four contracts in precisely the same condition at the time of writing

had then each of the end of the end of the end of the order of the end of th

Also. At the same rate 220 worth of water win and wo infreen journeys only per day. Some of our lifts make from 180 to 200 journeys per day. As to the quantity of water used. There are two ways of getting at this. First, calculating how much the lift ought to use, having regard to its capacity; and Secondly, measuring the actual quantity passed, say, in a day. Our experience with internally packed lifts, with the packing and the leakage both hidden from view, tells us that a large difference may be expected between the two results. The first method is a very seductive one for advertising purposes. We never use internal packing; when a leakage occurs it then makes itself so apparent that it is at once stopped. Respecting cost of repairs, Mr. Gibson quotes some very short bills. We can show him lifts of ours which have run for five and six years, in which the only repairs have been the re-scraping of a valve, in one case once and in the other twice. But Mr. Gibson's accounts obviously omit all allowance for replacing ropes. Colliery ropes are renewed every three years; their conditions of working are infinitely superior to those of any lift rope, owing to the larger diameter of the wheels. How much will it cause, to re-rig one of the Standard elevators? Does Mr. Gibson consider repacking the piston a repair? In one of our externally necked lifts where the dend is withdrawn by the

the larger dialiteter of the wheels. How much will it couse, to many men will be required, and how great delay will it cause, to re-rig one of the Standard elevators?
Does Mr. Gibson consider repacking the piston a repair? In one of our externally packed lifts where the gland is withdrawn by the ordinary attendant, and re-packed in two hours at the outside, the operation is obviously not a repair; but in the case of the Standard elevator, can the attendant, and does he, do corresponding work? Is it not, on the other hand, necessary to call in the engineer, and does not the process of repacking sometimes occupy three or four men a period only measured by days? The experience of users would be valuable upon the point.
Your correspondent gives prominence to the uniformity of pressure obtained throughout the stroke of piston, and informs us that the superior economy is in that way accounted for. As there is no superior economy, the statement is gratuitous. Having, for reasons which are not apparent, adopted the objectionable device of a very long bored cylinder for the Standard elevator, its designer was compelled to introduce some arrangement to give uniformity of pressure, or the lift would have exhibited great inferiority to other systems, whereas now it is simply reinstated in a level position. The arrangement of "solid water on both sides of the piston" is only another type of compensation for emergence, which principle takes in other lifts the form of heavy compensating chains; of special relationship among strokes and diameters of rams and pressures of water, or of variable balance weights.
Other points might be enlarged upon would your space allow, such as reliance upon refractory wire ropes; that a rope may have every wire severed, and yet not part as a whole, if another rope relieved it of strain ; and therefore the first rope to break may be the last rope which had a sound wire in it ; and the ultimate dependence upon that broken reed, a safety gear.
In conclu

plying a lift which is as economical, works as smoothly, is as noiseless, and is fully as safe as the American lift, and costs about half the money. We offer the additional advantages of external packing, with opportunity of observing leakage, and what we claim to be a more reliable controlling valve.

ARCHD. SMITH AND STEVENS. Janus Works, Queen's-road, Battersea. London, June 30th.

SIR,—I have read with considerable interest the letter inserted in your last issue from the "American Elevator Company," and desire with this to say that as far back as 1871 I designed an hydraulic lift on precisely the same principle as that now intro-duced by your correspondents. I had at that time been written to by a Bristol engineer—a Mr. Whitehouse, since dead—who requested me to tender for a lift worked from the water in a tank about 62ft. above ground, and on condition that the hydraulic cylinder was not to reach to a greater depth than 20ft. below ground. It was required for an hotel then in course of erection, and my design sent in at the time, together with a tender, bears con-siderable general likeness to that submitted now by the Elevator Company, though my design was not carried out. I used, more-over, an arrangement of differential pulleys fitted to the top of the piston-rod, which enabled me to regulate the travel of the cage and of the piston to any ratio desired—in our case 3 to 1. This seems to me still in advance of the American design, which, except by complicating matters, can only work with the fixed ratio of 2 to 1. My design was not patented. I shall feel obliged for the insertion of this note in your next issue, for which I render thanks in advance. 96, Newgate-street, London, Jos. BERNAYS, M.I.C.E. June 28th 96, Newgate-street, London, JOS. BERNAYS, M.I.C.E.

June 28th.

SIR,—Having noticed the somewhat lengthy but none the less interesting letter on this subject in your last issue by the American Elevator Company, I propose with your permission to supplement the same by a few remarks, and to point out what I consider are rather serious defects in American practice generally in connection with the working of hydraulic elevators. I do not refer to any particular make or firm, but state this as the result of my own observations in various parts of the United States, New York, Washington, New Orleans, and other important centres, the defect being that the speed is excessive, and that in many cases the starting gear operates too quickly; these two points combined, I should imagine, being conducive to a much greater number of casualties and accidents than is common with us, and in the case of eldel 1 persons must cause a severe strain on the nervous system, for after all in going up a lift one does not care to think that he is having to pay the penalty by either leaving his coat-tails behind him, or that for the moment he is to be converted into a kind of involuntary projectile. Involuntary projectile. In America elevators are considerably more in vogue than in this

country, and with the two important exceptions above referred to their lifts are very carefully fitted up and luxuriously furnished. On the score of economy in working, the New York elevators would also doubtless compare favourably with anything we are doing here in London, but in the matter of lifts safety takes precedence of the question of either first cost or working expenses. 27, Leadenhall-street, London, JOHN HAYES. E.C., July 2nd.

engineers

should like to inform him that although he seems to have been I should like to inform nim that although he scenes to have a unable to hear of Mr. Audain at 42, Devonshire-chambers, anyone in possession of their wits, on going to that address will not fail to hear of Mr. Audain or his office. I shall, Sir, look upon it as a very great favour if you will insert this. CYLINDER. very great favour if you will insert this. July 1st.

#### THE CRYSTAL PALACE EXHIBITION.

THE CRYSTAL PALACE EXHIBITION. Str.—Referring to the concluding remarks in your notice of the manner in which this is being misconducted has at last been venti-lated. It might almost as well have been held in the backwoods of America as at the Crystal Palace, for there are comparatively of America as at the Crystal Palace, for there are comparatively in the commercial value to the exhibitors. What is the reason of this? Simply the fact that but very few have any knowledge of a few posters sparsely distributed at the railway stations in and around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you around the metropolis, and a very few on hoardings; while you provide these were signed by a person styling himself "Execu-tive Commissioner for the Crystal Palace," thus conveying to my mind he idea that the Exhibition was being promoted by the Crystal palace Company, instead of which I learn it is simply a private around the name to appear in a matter in which, up to the provide their name to appear in a matter in which, up to the provide the rame to appear in a matter in which, up to the secent, a confiding public are victinise

#### HEAVY GUNS.

SIR,—It is conceded that the superior materials suitable for the heavy guns and the admirable workmanship have accomplished some part of a success. But having recently seen the difficulty of extracting the breech piece after the gun has been fired, I am in a position to applied and the sector of the sector. extracting the breech piece after the gun has been fired, I am in a position to certify very grave objections to the continuance of the so-called system of the Woolwich gun, and protest against the method of igniting the charge as defective. Very important improvements can also be introduced with practical advantage in the system of breech-loading and obturation. I brought forward the subject of large grained gunpowder adapted for long guns before the Royal United Service Institution over twenty-one years, at an evening meeting, and have frequently submitted my inventions to the War-office, with the usual results. My experience of the Ordnance Department extends over many years, and consequently Ordnance Department extends over many years, and consequently I have some idea of official obstruction. The general public may I have some idea of official obstruction. The general public may be congratulated upon the few experimental guns now on trial and found defective, and with some good reason keep back the money till matured plans are entertained. ARTHUR GEARING. Red House, Camden Hill-road,

Upper Norwood, June 30th.

#### THE AMALGAMATED SOCIETY OF ENGINEERS.

SIR,-On Wednesday last an action in which our Society was defendant was tried in the Salford Court of Record, before Mr. defendant was tried in the Salford Court of Record, before Mr. Thomas Jordan, sitting in place of the Recorder, Mr. West, Q.C., M.P., who was unfortunately absent. In the course of the case Mr. Jordan thought fit to pass some very severe strictures upon our Society and some of its rules. All his most pungent remarks were published by the general press of the country, and by your paper in common with others. Of this we do not complain. Originality or eccentricity in a judge, even of Mr. Jordan's stand-ing, are sure to excite attention and remark. To some of this judge's expressed opinions we trust you will give us through your columns the same publicity of reply as you accorded

to his remarks. We should have claimed this right of reply at an carlier date, but were advised by our solicitor to wait, as by public reply we might prejudice further proceedings to be taken in the

case. The case of Collinge v. Amalgamated Society of Engineers, &c., as your readers will remember, was not decided on the merits, but a verdict was given in our favour on a point of law raised by us. Why we put forward this technical defence I will briefly explain. When Robert Collinge, the plaintiff in this action, entered our Society, he did what is done by every person admitted to member-ship. He signed a declaration that he would abide by all its rules, and would, in matters of trade interest, give up his personal opinion to the united wishes of his fellow members, as expressed through the constitutional channels of the Society. He undertook certain obligations, and in return the Society agreed to pay certain benefits, and to extend to him protection in trade matters. In

through the constitutional channels of the Society. He thus entered into a written contract with the Society agreed to pay certain benefits, and to extend to him protection in trade matters. In doing this Collinge had perfect "freedom of contract," which he used by becoming a member of our Society. For fourteen or fifteen years all went smoothly. Collinge faith-fully discharged all the duties required of him, and in at least one case was an active collector for a strike fund. In April, 1882, a movement for an advance of wages took place all over the country, which was generally obtained. The movement naturally extended to Radcliffe Bridge, where we have a branch, and where Collinge was employed as foreman or manager for Mr. Stead, an employer in our trade. Mr. Stead refused to give an advance of wages, and our Radcliffe Committee decided that the men must strike if the advance was not obtained. The advance was refused, and the members of our Society came out on strike. Collinge being a fore-man was allowed to remain in the shop on the distinct under-standing that, if he himself did any work with the tools of the trade, or taught non-society men introduced in place of our members how to work, he would be liable to withdrawal from his situation by the Society, or would be excluded from membership. After the strike had gone on some time, the Radcliffe Bridge Committee charged him with violating these conditions, and summoned him to appear and answer the charge. This he failed to do, but returned his sum-mons unopened. It was clear to the committee that he had induced non-society men to start in the shop, and as his own brother went in and started at the advance vas evident to the com-mittee that Collinge was using undue influence against the Society. A resolution of exclusion was, therefore, passed upon him by the committee. Now, as Collinge was not present when the com-mittee thus excluded him, the local council of the Society ordered another committee meeting to be held to again go over the case, and have

tion from Rule 35, as follows :— 1. Any member of this Society, or persons claiming on account of a member, finding himself or themselves aggrieved, or having any complaint against the officers or members, or who may be excluded for arrears or benefits improperly received, may appeal to the committee of his branch for redress, within four weeks from the date of such dispute, or from the date of his exclusion; all such appeals must be made in writing. If not satisfied he or they may appeal to the next summoned meeting of their branch, and if he or they do not receive satisfaction, an appeal may be made to the local executive council, if notice of appeal be given to the secretary, and such appeal be made within fourteen weeks from the date of the local executive council than that heard before the branch, and shall submit the same to his branch before sending it to the local executive council. The local executive council's decision to be final, unless reversed by the general executive council or delegate meeting. If Collinge had been loyal to his obligations as a member, he

by the general executive council or delegate meeting. If Collinge had been loyal to his obligations as a member, he had here the fullest freedom of appeal, and if he could have shown to the local council that he had been excluded on false or insufficient evidence, he would certainly have been reinstated in his membership. But he did nothing of this: to all ap-pearance he accepted his exclusion. He made no further payment into the Society, and was duly published as an excluded member in the Society's reports. From the rule above quoted it will be seen that appeal, if any, should have been made to the local council within fourteen days from the date of exclusion. We never heard a word from Collinge until the 5th of September, 1883, fifteen months after his exclusion, and nine months after he had fifteen months after his exclusion, and nine months after he had lost his situation, owing to the death of Mr. Stead—but for which we should never again have heard of his case. He then called in person at our office, and left a long written statement on the facts of the case.

of the case. It was pointed out to him that he had allowed his right of appeal to the local council to lapse by not being in time, but he was assured that his statement should be laid before the general council, the next court of appeal above the local council. He appeared to assent to this proposal, but shortly after, and before the general council met, astounded us by placing his case in the hands of a solicitor, who entered an action against us for £20 4s. of donation benefit, due to Collinge, as he alleged, for fifty-three weeks he had been out of employment. Now, if Collinge had been in every respect still a full member of the Society, and not in arrears, he had absolutely no claim under our rules to this benefit; because the donation rule requires—first, that a member must inform his secretary that he has been thrown out of work ; second, that he must each day sign the vacant-book, not one of second, that he must claim donation at branch meeting; and third, that he must each day sign the vacant-book, not one of which conditions had been observed by Collinge. Nor did he ask to be allowed to comply with these rules. Knowing all this, and knowing that he had never offered to pay us a farthing from before the time of his exclusion, this man has the impudence to sue us in a Court of Law, over the head of all our tribunals, for £20. 4s. With such a plaintiff as this, Sir, who treated all our rules with contempt, we put in as one of our defences the 4th section of the Trades' Union Act, which distinctly provides, and was intended to provide, for all such cases as this. The clause is as follows:— Nothing in this Act shall enable any Court to entertain any legal pro-

Of this clause in a well-known Act of Parliament Judge Jordan was in utter ignorance until it was pointed out to him by the barristers engaged in the case.

From the above statement it will be seen that all violation of rule and contract has been on the side of the plaintiff in the case and not on ours. Judge Jordan made an onslaught on one of our rules for the regulation of piece-work. He misconstrued this rule, and I am sorry to say the twelve jurymen in the box accepted his misinterpretation as correct. He said, under this rule, if a man working by the piece on any job is able to earn £5 per week, the Society's rules require that he shall give up £3 10s. of that sum to be divided among other men working by the day, and earning only £1 10s. per week. A moment's consideration might have shown the judge that men, even trade unionists, are not absolute fools, as they would be if they subjected themselves to such conditions as these. as these

tain portions of work are taken for execution at a given price by a set or number of men. One man acts as intermediary between the men on the job and the firm, and is charge-man. Each week the men are paid only time wages for the hours they have worked. If, when the contract is finished a surplus of money remains over what has been paid in time wages by the firm, it ought in justice to be shared among all the men engaged on the work in proportion to their wages and time, and not be pocketted by the charge-man. This is the simple principle of equity between man and man which our rule lays down. That it is absolutely fair and just is shown by the fact that in most of the large firms of Lancashire the sur-plus earnings of the men are duly apportioned by the employers themselves and paid to each man through the office.

themselves and paid to each man through the office. I trust to your high sense of impartiality for an insertion of our defence to remarks made where we had no chance of reply. JOHN BURNETT, Gen. Sec. General Office: 90, Blackfriars-road, London, S.E., July 2.

#### WATER TUBE BOILERS.

WATER TUBE BOILERS. SIR,—I am glad to see that Mr. Babcock has been able to send you so good an account of the Babcock water-tube boiler, as it confirms all I have hitherto said in favour of water-tube boilers for high pressed steam. My experience, however, has been with the Root boiler, many of which I have passed through my hands, and from which better results as regards economy have been obtained than with other types; but it is absolutely necessary that the tubes should be kept free from incrustation, otherwise the boiler will not maintain its superiority. The Stollwerck's apparatus, as mentioned by Mr. Knap in his recent letter to you, should be of great advantage to boilers in general, but more particularly to water-tube boilers, to enable them to compete successfully with the ordinary types, under the con-ditions that are generally met with as regards quality of water. G. ALLAN, M. Inst. C.E. 10, Austin Friars, London, July 2nd.

## 10, Austin Friars, London, July 2nd.

#### WORKING REFRACTORY TITANIC ORES.

WORKING REFRACTORY TITANIC ORES. SIR,—Under this heading, in yours of the 20th inst., your correspondent, Mr. Jas. Davis, for some reason makes startling statements as to working titanic sands in a Siemens' rotary furnace, and that he has "found nothing so well adapted to treat direct as these sands." He also states that "although so much has been expended in these countries—referring to New Zealand and Canada —in experiments to work up these sands, he has not yet read of any proving successful." Nor has any one else, for even Stenson's process was not practical or profitable, and to the present, save the Hindoo and the Catalan forge systems, no method of smelting these ores direct has succeeded. Knowing something about these titanic sands and ores, I must confess my scepticism as to the result of the little improvements in

confess my scepticism as to the result of the little improvements in the Siemens' furnace which Mr. Davis so confidently heralds, and relegate the further consideration of his chimera to the time when he shall have favoured your readers—myself amongst the number —with the name of the talented gentleman who furnished the analysis at the end of his letter. JNO. LEWTHWAITE.

Union Works, Mount-street, Halifax, June 30th.

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

#### (From our own Correspondent.)

(From our own Correspondent.) THE most important feature of trade this week is the strike or lock-out—for the dispute virtually assumes both phases—in the coal trade. Undeterred by the resolution of the masters, declaring a lock-out if the men should still persist in refusing to accept the drop of 4d. per day or "stint" in the thick coal seams, and 2d in the thin coal seams, awarded by the arbitrator. The colliers refused on Monday to begin work at those pits where the managers declined to concede the old terms. A partial strike has, therefore, taken place. The number of men out is variously estimated, but it is probably about 10,000, out of the total of 14,000 or 16,000 who ti is probably about 10,000, out of the total of 14,000 or 16,000 who would come under the declaration of the award. The principal masters are determined to enforce the drop. The pits where the men remain in are in the hands of small owners and butties. The action of this small minority will not, however, it is anticipated, much influence the ultimate upshot of the struggle. At mass meetings of the men which have been held during the week it has been determined "to contest the legality of the notices; and further to allow all men who can obtain the old rate of wages to continue at work." The effect of the strike upon the iron trade is not marked, for the ironmasters are able to keep their works going by the aid of accumulated stocks of fuel and of the large supplies which are available at cheap prices. On 'Change this—Thursday—afternoon in Birmingham and yesterday in Wolverhampton ironmasters reported that sheets, hoops, and bars were in most demand. But the inquiries this week are not large either on local or foreign account, for buyers continue the action to which I referred in my last report, viz., withholding the placing of further orders until after the quarterly

withholding the placing of further orders until after the quarterly meetings which come off next week. It is unlikely that crucial prices will be changed at these gatherings, but buyers prefer to await the course of events. The

gatherings, but buyers prefer to await the course of events. The selling prices of common iron will probably be rather stronger than otherwise, in face of the colliers' strike. Prompt deliveries are difficult, owing to the incapacity of the puddlers, with the present hot weather prevailing, to remain as long as usual before the furnaces. This the masters do not mind, since it necessarily limits output. The thin sheet and tin-plate makers are best employed, certain of these not being able to execute orders fast enough. Best bars are £8 2s, 6d, to £7, and common, £6 5s. to £5 15s. Sheets—singles—are £7 to £7 5s., and hoops, £6 to £6 10s. at works. Boiler plates are £8 10s. to £9, and superior sorts, £9 10s. to £10.

perior sorts, £9 10s. to £10. Galvanised sheet makers did not to-day report much increase Galvanised sheet makers did not to-day report much increase of business. The export markets are particularly slow in buying at date. Prices are in buyers' favour, and are irregular. The Red Star brand of galvanised sheets was quoted £11 15s. for 18 and 20 b.g., £12 15s. for 24 b.g., £14 15s. for 26 b.g., and £16 15s. for 28 b.g. The Red Diamond brand was £12 for 18 and 20 b.g., £13 for 24 b.g., £15 for 26 b.g., and £17 for 28 b.g. The Lion brand, double best, close annealed, flat sheets were £20, £21, £23, and £24 her ton according to the respective gauges. The Anchor brand per ton according to the respective gauges. The Anchor brand, of single best sheets, £17, £18, £20, and £21; while the Woodford Crown brand, of flat sheets, were £15, £16, £18, and £19 respec-tively, all delivered at out ports.

Pig iron was tame at, for Staffordshire part mines, 45s., and orider pigs 37s. 6d. Derbyshires were 42s. 6d., and Northamptons about 6d. less per ton. The continued depression in the pig trade has now induced the Barbor's Field Iron Company, Bilston, to blow out its remaining furnace Considering the limited current demand for all kinds of metal,

Considering the limited current demand for all kinds of metal, steel more than holds its own. It is in request as blooms to be rolled down for tin-plate and other uses; while in the more advanced stage of bars it is likewise sought, not only by the tin-plate firms, but also by the edge tool and other manufacturers for plating purposes. For drawing down into strips to be worked up at the tube works, it is in heavier request than at any earlier date. The consumers of drawn tubes are stimulating the inquiry in this last-mentioned department, since many of those who were at one time satisfied with a good drawn tube of iron, now ask for steel tubes. Of steel tubes so admirably welded that it is next to at one time satisfied with a good drawn tube of 170n, how as 101 steel tubes. Of steel tubes so admirably welded that it is next to impossible to distinguish between a welded and a solid-drawn specimen there is an excellent and diversified supply in Birming-ham and in portions of South Staffordshire, but solid cold-drawn tubes of steel are in most call. Indeed, it is impossible to supply with the needed rapidity the demand which, for such tubing needed Let me explain what this much abused rule amounts to. In some with the needed rapidity the demand which, for such tubing needed districts piecework is the prevailing system. In many shops cer- by the bicycle manufacturers, is now and has been for some time

past expressed. The article realises high prices, as much as 1s. 3d. a foot; indeed, 2s. 6d. per lb. is not seldom secured. Steadily the out-turn of steel plates, also, in Staffordshire is growing. These are needed in larger quantities in other districts than in this. Steel plates are being now rolled in the mills of the Staffordshire Steel and Ingot Iron Company, for use in the building of torpedo boats. They are of varied dimensions and thicknesses. Some are a ton in weight and 1½in. thick. This, the newest concern in this district, reports a steadily augmenting inquiry for both partially manufactured and also completed steel, and the conductors of the business express confidence that the numerous requests for samples will be followed by orders, which must every week become more sensibly felt in the aggregate output. Economies, resulting from a more intelligent adoption of mecha-nical contrivances, are in vogue at the steel works, at Spring Vale, of the Staffordshire Company, Wolverhampton, which it is reason-able to assume will soon be reflected in the management of other steel and ironworks. The most widely applicable is an arrage-ment of three-cylinder steam engine and worm gear, by which the top roll in cogging and plate mills can be raised and lowered with a nicety, a facility, and a rapidity impossible with the clumsy hand gear very generally adopted. In the preparing and the manipula-ting of the converters there are bottom stove and hydraulic ram devices in application, which are not to be found in other steel works, but which ought not long to remain peculiar to the Stafford-shire concern since it is not desired, as to the devices which have been patented by Messrs. Gilchrist and Fitzmaurice, upon whom the practical conduct of the works devolves, that other converter-using firms should be deharred from adopting them. Tipe founders note with satisfaction the inquiry of the Bombay

using firms should be debarred from adopting them. Pipe founders note with satisfaction the inquiry of the Bombay Municipality for 5800 tons of cast iron pipes, varying in diameter from 24in. downwards, as also for other ironwork. Business should also come to this district from the valuable miscellaneous inquiry now on the market from the Oude and Rohilkund Railway

inquiry now on the market from the Oude and Rohilkund Railway Company. Railway fastening firms in Wolverhampton report the demand restricted and their machinery only partially employed. This—Thursday—afternoon a meeting of railway freighters, convened by the Council of the Birmingham Chamber of Com-merce, was held to consider Mr. Chamberlain's Railway Bill. Mr. Elliott, of the Elliott Metal Company, presided. By resolution the meeting pledged itself to heartily support the Bill, providing that the terminal charges clause was withdrawn, and that clause 25 was so modified as to allow of one appeal only in each case on questions of law.

Trade in North Staffordshire is slightly better. The home buyers are a little more buyant, and the export merchants are fuller time is being made, most of the mills averaging four or five qualities, but common sorts are £6 5s. In boiler plates the Lanca-shire demand is pretty good. Still the mills are only running irregularly. Hoops appear to be almost at a standstill as regards irregularly. Hoops large foreign buyers.

# NOTES FROM LANCASHIRE

#### (From our own Correspondent.)

(From our own Correspondent.) Manchester.—The continued depression in the iron trade of this district and the apparent impossibility of getting orders at any-thing like remunerative prices is compelling makers to face the problem whether they will not lose less by blowing out furnaces than by attempting to keep works going in the present condition of the market. The really weak point in the market is the con-tinued stagnation of the finished iron trade, which has so seriously affected the demand for the raw material that not only is there very little buying going on, but even where pig iron makers are tolerably well sold and have orders on their books which under ordinary circumstances would be sufficient to keep them fairly tolerably well sold and have orders on their books which under ordinary circumstances would be sufficient to keep them fairly well employed, they are unable to get their customers to take deliveries, and the output which ought to be going away against contracts, is either being thrown into stock or has to be forced for sale in a falling market. In this district the production of pig iron is already practically reduced to a minimum, not only by furnaces being out of blast, but by others having been put on to subject and in the Lincolnshire district, which is one of the chief spiegel, and in the Lincolnshire district, which is one of the chief

spiegel, and in the Lincolnshire district, which is one of the chief competitors here, the blowing out of furnaces is under considera-tion. As regards the finished iron trade, with one or two exceptions, the forges in this district are on short time, and the same applies to North Staffordshire, from which a large quantity of the manufactured iron comes into this district. There was a very dull iron market at Manchester on Tuesday, with the tendency of prices downwards, although nominally the quoted rates were without material change. The average price for both local and district brands of pig iron is about 42s. 6d. to 43s., less 24 for forge and foundry qualities delivered equal to Man-chester, but at these figures comparatively little or no business is being done. At about 1s. per ton less, fairly large offers for

chester, but at these figures comparatively little or no business is being done. At about 1s. per ton less, fairly large offers for delivery up to the end of the year are reported, but at present makers hesitate about accepting business on so low a basis as this. Hematites still meet with little or no inquiry except at prices which makers apparently do not care to accept. In the finished iron trade £515s. remains the basis of the quoted prices of good Lancashire and North Staffordshire bars delivered here, and there are a few makers who decline to entertain offers at anything under this figure, but for good specifications there are sellers at as low as £5 12s. 6d., and in common bars prices have a tendency to touch about £5 10s. per ton. There is not much to add to my last week's report of the con-dition of the engineering trades generally; there is still a very fair

There is not much to add to my has week's report of the end dition of the engineering trades generally; there is still a very fair amount of work on hand, and in the ordinary run of work tool-makers are still kept tolerably well employed. There is, however, no new work of any weight going out, and the tendency of trade continues in the direction of decreasing activity, some of the large

continues in the direction of decreasing activity, some of the large firms which have been kept busy up to the present reporting a marked slackening off in the new orders coming in. The success which has attended the experiments that have been made with ensilage is necessitating the attention of agricultural machinists to the adaptation of implements to meet the require-ments of this special class of work, and one of the local firms, Messrs. Richmond and Chandler, have just completed for exhi-bition at the ensuing Borgal Show a new chaff-culture special bition, at the ensuing Royal Show, a new chaff-cutter, specially designed for dealing with ensilage. This is fitted with elevators and a new form of rising cover; as chaff-cutters are usually con-structed, the space between the mouth and the front of the frame is too narrow to admit of long lengths being cut, particularly in green stuff, without clogging. To overcome this difficulty, the green stuff, without clogging. To overcome this difficulty, the frame has been constructed with an opening of 16in.; it is also fitted with an endless creeper to carry away the stuff after it has been cut, and it will be shown with a short length of elevator, which, however, can be made of any size to meet requirements. The Exhaust Injector Company, of Manchester, has brought out a new "live" steam injector, somewhat similar in principle to

out a new "live" steam injector, somewhat similar in principle to the exhaust steam injector, which has already been described in the columns of THE ENGINEER. The new injector is constructed to restart automatically, and its principal feature is the "split" nozzle, the action of which is as follows: When not working the "flap" hangs open, leaving a large area for the egress of steam, which, when turned on, rushes through this area and out of the injector by way of the overflow, carrying with it a portion of the air, and thus forming a vacuum into which the water rises. This water, mingling with the steam, a stronger vacuum is formed, and this sucks the flap on to its seat, the nozzle being then practically solid. On the jet being broken in any way, the flap opens and the above process is repeated. The automatic restarting thus secured is an important feature in the application of injectors to marine engines, where ordinary injectors have hitherto made but little headway, owing to the rolling of the vessel frequently causing a stoppage of the operation of the injector, which has then to

#### JULY 4, 1884.

undergo manipulation for restarting. A novel application of this injector has also recently been made by adapting it for fire extin-guishing, with the result that with steam at atmospheric pressure the injector forced the water to a height of 55ft. through a gin. nozzle.

nigeter has also recently been made by adapting it for fire extin-rule. In the result that with steam at atmospherio pressure the injector forced the water to a height of 55ft, through a jin. Messrs. Goodbrand and Holland have just completed for Messrs. Smith and Hutton, of Bradford, one of the Excelsior pumps similar in construction, but not so large in size as the one sent away to Calcutta which I described a few weeks back, and the result of the test made will be of interest. The mill is a building 55 yards in length, 42 yards wide, and 45ft. high, with a chimney about 120ft. high. The pump supplied is a 5in., with Sin. stroke; with three fin. jets attached, water was throw as high as the chimney top, and the same result was obtained with two lin. jets; with a lin. jet horizontal against the wind, the water was discharged a distance of 120ft, and with the wind a distance of 150ft.; the water pressure was 70 lb. through the single lin. jet and 75 lb. through the three jin. jets, and the quantity of water disclarged was 194 gallons per minute from the lin. jet at 701b, pressure, and 266 gallons per minute from the lin. jet at 701b, pressure, and 266 gallons per minute down and movement in prices. In the coal trade continues very quiet all round, all classes of round coal, especially, being bad to move, and stocks accumulating with what prices are practically unchanged. In other districts, pit was classed district, the delivered rates for house fire coal have be ner reduced 10d., and for engine fuel 5d. per ton; but pit and what frices are practically unchanged. In other districts, pit rates are in most cases made to secure orders. At the jit mouth what prices are practically unchanged. In other districts, pit proprietors had decided to 9x, is econda, 6s. 6d. to 7s; common round coal, 5s. to 5s. 6d.; burgy, is. 6d. to 4s. 9d. per ton. - In the shipping trade there is a moderate weight of business figure for ordinary qualities, 3s. 6d. to 5s. 9d. per ton. - The that Mr. C. Jackson, the owner of the coal, is res very low state, and no business of importance is coming to many. Rails are quiet at last week's rates. Merchant qualities and wire are also asked for. Engineers and boiler-makers quiet. Ship-building very quiet. Iron ore in demand at about 9s. per ton net at mines. Stocks are heavy.

#### THE SHEFFIELD DISTRICT. (From our own Correspondent.)

(From our own Correspondent.) A PLEASING event, which has been most favourably commented upon, deserves notice as evidence of the marked improvement which has taken place in the relations of master and workmen at the Birley Collicries—Sheffield Coal Company. On Saturday the workmen, numbering 2200 persons, with their wives and sweet-hearts, had an excursion to Liverpool. The men were conveyed in three trains, starting from the collieries at five a.m. The managing director, Mr. J. R. Gainsford, remained at the colliery all night. The manager, Mr. Hargreaves Walters, was on the spot at three o'clock in the morning, and with the other officials worked most assiduously in seeing that all had a good breakfast before they started. From the closely packed trains, before they left the collieries, came hearty cheers for Mr. Gainsford and Mr. Walters for their efforts on behalf of the workmen. These col-lieries, which now yield 1700 tons of coal per day, have been the scene of several severe strikes, and the incident of Saturday is a hopeful indication of a better feeling prevailing. The Nunnery Colliery Company is now quoting at its Soap-house Depót, Blast-lane, as follows :- Hand-picked Silkstone brand, 13s.; best Silkstone screened, 9s. 2d.; screened Silkstone that, 5e, ise cond Silkstone screened, 9s. 2d.; screened Silkstone thave been placed since my last letter, and they all appear to have made last year's prices at least. At Unstone, in Derbyshire, the unstone Coal and Coke Company's Collieries have been asked to make several concessions to the men ; but Mr. Hewitt, the manager, ould not see his way to do so, and the men have resolved to con-tine the strike, which has now lasted sixteen weeks. Generally in Yorkshire the coalfield is free from any disturbance or agitation. Mr. R. Schott, consul at Sheffield for Belgium, has received a circular from his Excellency the Belgian Minister of Foreign Affairs, be adde in the Antwerp Exhibition has been extended to the lst of August. Th A PLEASING event, which has been most favourably commented

of August. The Dore and Chinley Railway Bill has at length been passed, and while it affords an independent line betwixt Manchester and London for the Midland, it will open up a most beautiful country to tourists as well as to trade. At present the coal is mainly carted, though traction engines are largely employed; and the grindstones, which form a large portion of Derbyshire industry that way, have to be similarly conveyed to the nearest railway station. There have been rejoicings at Hathersage, Castleton, and other villages which the new line will bring into touch with the rest of the world.

other villages which the new line will bring into touch with the rest of the world. Mr. W. Watson, the acting official on behalf of the Miners' Per-manent Relief Fund, reports that the institution has already been the means of providing allowances in 12,000 cases of disablement to 103 widows and 237 children, besides paying funeral claims in 171 instances, to married men £5, unmarried £23, and boys £12 each. At the Drift Pit, the other day, a miner named Fielding received fatal injuries. He had been a member of the Thorneliffe Branch of the Miners' Permanent Relief Fund about twelve months, and his widow and children, five in number, are now entitled to a weekly allowance of 15s. until the eldest, aged nine, is thirteen years of age. This allowance is equal to the current interest on £1000 invested capital; and it may be added that when the eldest child is thirteen, four years hence, there will still be 13s. a week paid to the family until the made of 2s., leaving 11s. weekly. The support of the miners' children from the Society is, to each child, 2s. per week up to thir-teen years of age, and every widow receives 5s. weekly in addition during the whole time of widowhood. The experience of similar funds shows the duration of widowhood to average twelve years. Earl Fitzwilliam and the Earl of Wharneliffe, who are largely interested in collieries, warmly support the Miners' Permanent

Relief Fund, which is doing excellent work in the South Yorkshire colliery district.

colliery district. A trade mark case of great interest to Sheffield was decided on Tuesday, in the Chancery Division of the High Court of Justice. It was an application made on behalf of Messrs. Heaton and Adkins, of Brades Steel and Iron Works, near Oldbury, for the registration of the "Hoop L" trade mark. The application was opposed by the Baron de Gier, of Leufsta, Sweden, who claims the exclusive right to the mark under a registration in 1878, when, he states, he supplied iron so marked to Messrs. Thomas Firth and Sons, Norfolk Works, Sheffield. The application was dismissed with costs.

The Manchester, Sheffield, and Lincolnshire, and Great Northern The Manchester, Sheffeld, and Linconshire, and Great Northern Railways have been running two trains per day each way between London and Sheffield, timed to accomplish the distance—157 miles —in three hours and twenty-five minutes. It has now been decided that one of them each way shall perform the journey in three hours and twelve minutes, and the new fast trains started on the 1st July. The engines make only one stop—at Grantham—and run 106½ miles without a stop.

and twelve minutes, and the what has diministration of the 1065 miles The engines make only one stop—at Grantham—and run 1065 miles without a stop. A singular feature of Sheffield trade is in the production of razors. Grosses of what are known as blanks go to Germany from Sheffield and back again—after being ground out there—for two reasons: (1) The labour is cheaper; (2) the grinding is undoubtedly very regular, but it is said that the finish of the whole razor suffers. Messrs. George Butler and Co., of Trinity Works, have just brought out a speciality in this line which they have called Butler's keen razor. It is claimed for this razor, which is made of the finest silver steel, that it does not require setting or whetting, and never gets out of order. For upwards of a hundred years Messrs. Butler and Co. have produced table and pocket cutlery, razors and scissors, of a quality which has been a credit to the town. The grinding and finish of the keen razor is said to be superior to anything done in Germany, If an earlier effort had been made in the improvement of grinding, Sheffield might have enjoyed an entire monopoly of the manufacture, and the term "German ground" never been heard of. Messrs. Butler and Co.'s selection of razors and cutlery sent to the Calcutta Exhibition got a first-class award. The Chesterfield and Derbyshire Institute of Engineers have abandoned their intention of removing their head-quarters to

The Chesterfield and Derbyshire Institute of Engineers have abandoned their intention of removing their head-quarters to Sheffield, and will remain in the City of the Crooked Steeple as heretofore.

#### THE NORTH OF ENGLAND.

### (From our own Correspondent.)

THE demand for Cleveland pig iron has been somewhat quieter during the past week, but as most of the makers are well sold for the present, they have been able to steadily maintain their prices. Merchants are doing all that lies in their power to force down values, but their action has little effect, as they hold but small quantities

At the market held at Middlesbrough on Tuesday last, No. 3 g.m.b. could not be had from makers for less than 37s. per ton, and even 37s. 6d. per ton was asked by some, and obtained for special brands. Gray forge iron is only in moderate request, but

special brands. Gray forge iron is only in moderate request, but quotations continue firm at 35s. 6d. per ton. Messrs. Connal and Co.'s stock of Cleveland pig iron at Middles-brough decreased 281 tons during the week ending Monday last. The quantity then held was 57,926 tons. At Glasgow their stock of pig iron declined 265 tons. The exports from the Tees of pig and manufactured iron and steel were fairly satisfactory last month, but not equal to those in May. The total quantity of pig iron shipped was 80,116 tons, being a falling off of about 12,600 tons. The principal export items were as follows:—Scotland took 23,060 tons; Wales, 5843 tons; Germany, 14,309 tons; Russia, 12,150 tons; and France, 7055 tons. Of manufactured iron and steel 36,880 tons were sent away. The condition of the finished iron trade is still very gloomy. It

were as follows:—Scotland took 23,060 tons; Wales, 5843 tons; Germany, 14,309 tons; Russia, 12,150 tons; and France, 7055 tons. Of manufactured iron and steel 36,880 tons were sent away. The condition of the finished iron trade is still very gloomy. It is scarcely likely that prices will be lower, but, nevertheless, orders are exceedingly scarce, and there is great difficulty in keeping in operation the few mills and forges that have not been laid off. Quotations are as follows:—Ship plates, £5 to £5 2s. 6d.; angle iron, £4 15s. to £4 17s. 6d.; and common bars, £5 2s. 6d. to £5 5s. per ton; all free on trucks at makers' works, cash 10th of month following delivery, less 2½ per cent. Puddled bars are £3 5s. to £3 7s. 6d. net on trucks. Steel rails remain at £4 12s. 6d. per ton, but orders are not forthcoming. A new firm, to be styled the Darlington Wagon and Engineering Company, is being formed at Darlington. The company will acquire and amalgamate the businesses of the Albert Hill Wagon Works and Messrs. Wilson Brothers and Co., engineers, and will build railway wagons, bridges, &c. Both works are at Neetfield, Darlington. The company was registered on the 21st ult., with a capital of £50,000 in £10 shares. The men in the Hartlepool and Tees-side shipyards received notice of a 10 per cent. reduction, which was to come into force on July 1st. They intimated that they would not submit to so great a reduction, and considered 5 per cent. ought to satisfy the masters. Representatives of the men have had interviews with the em-ployers, and after considerable discussion the following compromise has been effected, viz.:—7½ per cent. reduction on all work except rivetting, which is only to be reduced 5 per cent. The smaller matters which the notice includes are left to be separately dealt with. Time wages are to be reduced 1s. per week all round. These arrangements are to be subject to a month's notice on either side, terminating with the New Year's holidays of January, 1885. The plate makers of the North of England a The legal point in question, after fruitless discussion by the Stand-ing Committee, was finally referred for decision to Mr. Dale, the referee. After hearing what could be said on both sides and taking time to consider, he gave his decision on Monday last in favour of the employers. Action will therefore be at once taken by the latter, and their cases will be brought before the Standing Committee without further delay.

#### NOTES FROM SCOTLAND. (From our own Correspondent.)

(From our own Correspondent.) SINCE last report the Glasgow pig iron market has been very quiet. The fluctuations in prices have not been very large, but they steadily tended downward. This was so in respect to warrants. The quotations of makers' pigs, on the other hand, have been pretty well maintained; indeed, in some cases they have been quite firm. The week's shipments were, however, dis-appointing, aggregating only \$133 tons, as compared with 13,324 in the corresponding week of 1883. The foreign demand has been drooping in a marked degree, but a revival in a few weeks would not occasion much surprise. It is a good feature of the business that stocks are not increasing to any great extent. Those in Messrs. Connal and Co.'s Glasgow stores show a decrease for the week of about 200 tons. There are 95 furnaces in blast, against 113'at this date last year.

113'at this date last year. Business was done in the warrant market on Friday at 41s. 2½d. cash, and on Monday at 41s. 1½d. to 41s. 2d. Tuesday's market was quiet at the same rates, with scarcely any business doing.

Business was done on Wednesday at 41s. 5d. cash, and 41s. 7d. one month. To-day—Thursday—the quotations were 41s. 5d. to 41s. 6d., closing at 41s. 4d. cash. The values of makers' iron are comparatively firm as follow :— Gartsherrie, f.o.b. at Glasgow, per ton, No. 1, 51s. 9d.; No. 3, 50s.; Coltness, 57s. 6d. and 51s.; Langloan, 53s. 6d. and 51s.; Summerlee, 51s. and 47s.; Calder, 52s. and 46s. 6d.; Carnbroe, 50s. 6d. and 47s.; Clyde, 48s. and 45s.; Monkland, 43s. 6d. and 40s. 3d.; Quarter, 42s. 6d. and 40s. 3d.; Govan, at Broomielaw, 42s. 6d. and 40s. 3d.; Shotts, at Leith, 51s. 6d. and 51s.; Carron, at Grangemouth, 48s. (specially selected, 54s.) and 47s. 6d.; Kinneil, at Bo'ness, 44s. and 43s.; Glengarnock, at Ardrossan, 50s. and 43s. 6d.; Eglinton, 44s. 6d. and 41s.; Dalmellington, 46s. 6d. and 42s. 6d.

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first half of 1883.

# WALES AND ADJOINING COUNTIES.

#### (From our own Correspondent.)

THE coal output is well maintained, and I see that high pressure,

THE coal output is well maintained, and I see that high pressure, long shown at the Rhondda Valley, is extending into the Mon-mouthshire district. At the Sir George Elliott pit, New Tredegar, over 1000 tons were raised one day last week. From Cardiff the weekly total shipped is now bordering on 170,000 tons, and a fair average is maintained at all the ports. Of late the Taff Vale Railway has managed its enormous traffic with ease, and to show its capacity for more, arrangements have been made with the Powell Duffryn and other collieries to run their coal to Cardiff. This coal hitherto has been worked by the Great Western and Rhymney Companies, and the loss to them is a serious one.

a serious one. I hear that the opening of the Newport, Caerphilly, and Tre forest line, known locally as the Sir George Elliott line, is post-poned for a little while. Still, whenever ready the Taff is prepared

to undertake its working. I have to report the settlement of the long dispute on the Taff between the trainmen and directors with regard to time. Hence-forth one hour's work less daily has been allowed without affecting

In iron a little more has been done of late in merchant and steel In iron a little more has been done of late in merchant and steel bar, but serious delays have taken place on account of the scarcity of water, and a good many small, but important, orders have had to be postponed. Dowlais in particular has felt this, and the works are nearly at a standstill. It is now ten years since we had such extreme heat in this district, and then the works were also stopped for a short time. Cyfarthfa, which is well placed as regards water, is unaffected so far, and the make of pig iron and merchant hars continues briskly. bars continues briskly.

I note that the Barry Dock Bill has been read a third time I note that the Barry Dock Bill has been read a third time. In the meantime there is no faltering in the endeavour to grapple with the increasing coal traffic, and the progress of the new docks is rapid. The contractors under Mr. Nelson for supplying stones are Messrs. Mitchell and Scott, and this week a large blast took place at their Caerphilly quarries. The charge was 15 cwt. of gunpowder placed in a hole 50ft. deep, and the stone displaced amounted to 10,000 tons. It was noticed that the force was altogether lateral, and not even a fragment of stone was thrown into the air. even a fragment of stone was thrown into the air.

It is gratifying to remark the peaceful attitude of the Welsh colliers at present. The sliding scale has effectually quieted the turbulent spirits who used to seize upon every occasion for a strike. The only difficulty now existing is a small one at Bwllfa, in the Dare Valley; but this is not expected to last. The Rhondda colliers last week drew out a programme for the Bradlaugh and Burt demonstration, which is to come off this summer. Many subjects were sketched out, some political, others social; but the chief were those affecting the immediate interests of the colliers-time of working, length and "pay," improvements in the Liability and Regulation (Mines) Acts, &c. &c. One grievance of the colliers is that they are not sufficiently well represented in the House, and this is to be brought under the notice of the visitors. But colliers have themselves to blame. Mr. W. T. Lewis offered himself for election some time ago, and was rejected. Up to the present time colliers have held the belief that dissenting ministers were the bests guides, even in politics. They are rapidly altering their views now. In the Swansea district trade is quiet, but satisfactory on the It is gratifying to remark the peaceful attitude of the Welsh

In the Swansea district trade is quiet, but satisfactory on the whole. The coal business with France is progressing, 10,000 tons having been sent thence during the week. The patent fuel trade is brisk. Tin-plate remains much about the same, and the only difference about prices is that the market tone is slightly weaker.

I mentioned lately that notice of a reduction had been given to the puddlers of Llanelly. Last week the notice expired, and a reduction was offered to the men, but they refused to accept it, and to the number of 90 they are now on strike. The ironworkers of Tondu are also on strike; they were offered a reduction of 6 per cent., but refused.

An important company has been started at Neath, called the Neath Abbey and Duffryn Estates Colliery Company, with a capital of £120,000 in £10 shares. Most of the subscribers are

capital of £120,000 m £10 shares. Most of the subscribers are London capitalists. The Landore works are to supply 12,000 tons of the steel required for the new bridge that is to span the Firth of Forth. In the late colliery accident at Abercarn one man was killed and several injured. At the inquest held this week a verdict of accidental death was returned, and it transpired that deceased—a single man—was a member of the Miners' Provident Fund, and that £20 would be given to big relations.

would be given to his relations. Vernon Works have been acquired by Mr. Edgar E. Morgan, and will be started forthwith.

# SOUTH KENSINGTON MUSEUM.—Visitors during the week ending June 28th, 1884:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 9215; mercantile marine, Indian section, and other collections, 3483. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. to 6 p.m., Museum, 1876: mercantile marine, Indian section, and other collections, 187. Total, 14,761. Average of corresponding week in former years, 19,316. Total from the opening of the Museum, 21,157,147.

## 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 more 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.

#### 24th June, 1884.

24th June, 1884.
(2027. FORGING NAILS, B. P. Walker, Moseley, and C. B. Ketley, Birmingham.
9238. MELTING FURNACES, F. Monks, T. Hall, and T. Burton, Warnington, and W. Burton, Aspul.
9329. DRAWING ROLLERS of SPINNING MACHINES, A. Hollings, Fairfield.
9380. JOINT for SEWAGE PIPES, J. PARSONS, Carlton.
9381. SUSPENDING VENETIAN BLINDS, C. Catlow, Burnley.
9332. COOKING RANGES, J. Napier, Kirkintilloch.
9333. BUCKLES, A. E. Hancock, Aston-juxta-Birmingham.

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9334. 9335.

n. LATHE, J. T. Nelson, Leeds. FIRE-ESCAPES, A. B. Fisher, Liverpool. ENVELOPERS, D. T. Lee, London. LUERICATORS, A. M. Clark.-(W. A. Boyden, 9336. 9337.

Jersey, U.S.) 9338. SAFETY SASH FASTENING, F. R. Wildegose, London. 339. CIRCULAR KNITTING MACHINES, T. Coltman,

 don.
 9339. CIRCULAR KNITTING MAURING,
 Leicester.
 9340. ELECTRICAL MOTORS, J. H. Johnson.—(A. W.
 9340. ELECTRICAL MOTORS, J. H. Johnson.—(A. W. 9340. ELECTRICAL MOTORS, J. H. Johnson.—(A. W. Adams, St. Louis, U.S.)
9341. ELECTRIC MOTORS, J. H. Johnson.—(A. W. Adams, St. Louis, U.S.)
9342. STRUG-CUTTER, J. Darling, Glasgow.
9343. STRETCHERS, J. Furley, Ashford.
9344. REGULATING ELECTRIC CURRENTS, L. A. V. Pellegrin, London.—(G. Carette, Paris.)—3rd April, 1884.
9345. WARP, R. H. Hewitt, Gomersall.
9346. BALING PRESES, H. J. Allison.—(A. S. Robinson and A. Schell, Albany, U.S.)
9347. CASH CARRYING SYSTEM, J. W. Flagg, Worcester, U.S.

U.S.
9348. DYNAMOMETERS, A. Wilson, New York.
9349. CLIP or GRIP, W. W. Lunt, Wolverhampton.
9850. BOTTLE-PACKING, H. J. Haddan.-(C. Schlüter, C. Forster, and O. Long, New York.) 2551. JOURNAL BOXES, H. J. Haddan.-(E. K. Wilcox, Cleveland, U.S.) 2552. POCKET KNIVES, H. J. Haddan.-(C. Helsner, Saxony.)

9353. ELECTRIC BRUSH, W. Tapp, Bristol. 9354. MOUNTING SWING FRAMES, W. Trobridge, Bir-

4854. MOUNTING SWING FRAMES, W. HODFIGGE, Diffinitional.
4855. LUBRICATING STEAM and WATER COCKS, &c., J. E. Walsh.—(M. Schneider, Doos.)
4856. CORD TWISTING MACHINES, &c., W. E. Gedge.—(Schreiber and Co., Vienna.)
4857. KLINS for BURNING LIMESTONE, &c., S. de la G. Williams, Malvern, and J. A. B. Bennett, Llyndale.
4858. SMITHS' HEARTHS and FORGES, W. Allday, jun., Birmingham.
4859. PORTABLE STANDS for PHOTOGRAPHIC CAMERAS, G. Smith, London. 035

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9560

G. Smith, London. 500. FURNACE FIRE-DOOR LINERS, T. Dugard.-(J. Mailer, San Francisco.) 361. PRODUCING ORNAMENTAL DEVICES, E. and F. Smith, London. 362. CONSERVENT 9361.

9361. PRODUCING ORNAMENTAL DEVICES, E. and F. Smith, London.
9362. CONCENTRATING SULPHURIC ACID, A. J. Boult.-(M. Willett, Newport.)
9363. BICYCLES, W. F. Healy, Bridgeport, U.S.
9364. COMPRESSING ENSILAGE, E. T. Blunt, London.
9365. MACNETO-DYNAMO. ELECTRIC GENERATORS, A. Shippey and J. E. Wyder, London..
9366. BRACE-ENDS, P. W. Martin, Birmingham.
9367. VESSELS for HoLDING OLLS, G. A. J. Schott, Bradford.
9368. FLUE TURES of STEAM BOILERS, W. Clark, Plumstead.-3lst March, 1884.
9369. ELECTRIC BELTS, C. B. Harness, London.
9370. CURING OR SALTING MEAT, &C., W. P. Savage, King's Lynn.
9371. PRESERVING MILK, G. A. Maples, London.
9372. LATCHES and LOCKS, W. Rockliffe, Sunderland.
9373. DERBOYING VECETABLE SUBSTANCES in Wool, G. S. Jarmain, Huddersfield.
9374. INDICATING the SPEED OF ROTATING SHAFTS, B. Tower, London.
9376. SOAP, A. Domeier and B. Nickels, London.
9376. SOAP, A. DOMEIER and B. Nickels, London.
9374. ERFIGERATING MACHINES, H. Walker and F. J. Garnish, London.

Garnish, London.

#### 25th June, 1884.

25th June, 1884.
9377. ROTARY HAIR BRUSHES, W. Tapp, Bristol.
9378. STOPPERS for TUBES of STEAM BOILERS, W. Latham, Liverpool.
9379. PIFES OF CONDUTTS, H. Shelmerdine, Liverpool.
9381. PRINTING DADOS ON PAINTED WALLS, W. Glassey, Liverpool.
9382. TURBINERS, J. Ritchie, Edinburgh.
9384. PREVENTING SHUTTLES FLYING from LOOMS, W. E. Hoys. (J. Mayer and H. Audierheide, Bavarda, Dublin.
9385. TRICYCLES, B. W. Stevens, Birmingham.
9385. CLOCKS and WATCHES, E. E. Pickard, London.
9385. CLOCKS and WATCHES, E. E. Pickard, London.
9386. CLOCKS and WATCHES, E. E. Pickard, London.
9388. OKNOSING WARGHES, E. M. Stevens, Birmingham.
9389. CLENCH GROOVING TOOL for SHOEING HORSES, R. S. B. CLENCH GROVING TOOL for SHOEING HORSES, R. S. B. M. STEVENSTING HORSES, P. S. BUS, BAROSING MUSIC, M. PARIS, RAMSSIA.

S. Bird, Brandon.
9390. Gas Governor and Regulator, &c., W. Potter, Silvertown, and E. L. White, Ilford.
9391. HAR BRUSHES, S. J. Hill, Bristol.
9392. KILNS for BURNING BRICKS, &c., H. Knowles, Woodville.

Woodville, 9393. THERMOMETER for MEASURING HIGH TEMPERA-TURES, J. Murrie, Glasgow. 9394. PROPELLING ROAD VEHICLES, &C., W. Paddock, Dispirate-

9394. PROPER. Birmingham. FEED-WAT

Birmingham. 9395. FEED-WATER HEATERS, J. S. Taylor and J. Withinshaw, Birmingham. 9396. VELOCIPEDES, T. Rigg, Rochdale. 9397. DISTILLING ALCOHOLS, J. C. Mewburn.-(B. A. Barbet, France.)

(2397). DISTILLING ALCOHOLS, J. C. BEWERLIN, C. M. Barbel, France.)
(2398). APPLIANCE for GRIPPING WIRE ROPES, T. COPE, jun., Essington.
(2399, LOWERING WEIGHTS, S. MCANDRW, Bromley.
(2400, COMENEED HAND and STEAM STEERING GEAR, G. DAVISION, GALESchead, and R. Turnbull, Durham.
(3401, ACORN BEER, & C., G. P. Pond, London.
(3402, ROOFING TILES, F. I. Nibb', London.
(3402, ROOFING TILES, F. I. Nibb', London.
(3403, COMPOSITION for PREVENTING MILDEW, A. Myall. -(H. D'Espatungue, Paris.)
(3404, HOLDING FLEXIBLE MATERIAL in SUSPENSION, A. T. Finch, London.

9404. HOLDING FLEATERS
9405. SASH BARS, W. H. Luther, Glasgow.
9406. SPRINGS for WEARING APPAREL, H. M. Knight,

FEED APPARATUS for FIRE-ARMS, H. S. Maxim. 9407. London. 9408. WEAVERS' SHUTTLES, W. R. Lake.-(J. H. Nolan. Boston, U.S.)

Boston, U.S.) 9109. ELECTRIC GENERATORS, A. SPÖREl, Broslau. 9410. SALOON WEAVING APPARATUS, M. Fabian and G. Walther, Brandenburg. 9411. MAINTAINING UNIFORM ARC in ELECTRIC LAMPS, W. Rowbotham, Woolwich.

 9412. REFRESHING GALVANIC BATTERIES, A. M. Clark. -(A. Dun, Frankfort.)
 9513. FLYERS for SPINNING, &c., WOOL, T. Broughton, Keighley.
 5062. PERSPECTOGRAPHS, G. Macaulay-Cruikshank, Glasgow.-24th. October, 1883.-(A communication from A. Ritter, Frankfort.)

 9412. ARING OVER LEAVES of MUSIC, E. Negroni, London.
 9513. FLYERS for SPINNING, &c., WOOL, T. Broughton, Stid June, 1884.
 5062. PERSPECTOGRAPHS, G. Macaulay-Cruikshank, Glasgow.-24th. October, 1883.-(A communication from A. Ritter, Frankfort.)

 9414. MAKING SLABS, &c., J. C. Bromfield, London.
 28th June, 1884.

 9515. ROVING, &c., COTTON, &c., P. Wallace, Armitage Bridge.
 9515. ROVING, &c., COTTON, &c., P. Wallace, Armitage Bridge.

 26th June, 1854.
 9514. H. Bland, London.
 9515. ROVING, &c., COTTON, &c., P. Wallace, Armitage Bridge.

26th June, 1884.

PASSENGER INDICATOR, &c., J. Bisset, jun., 9416. 9416, PASSENGER INDICATOR, &c., J. Bisset, jun., Aberdeen.
9417, PHOTOGRAPHIC LENS MOUNT, S. D. McKellen, Manchester.
9418, STEAM PRESSURE, &c., GAUGES, R. Marsden, Sheffield.
9419, OLOTH WEAVERS' BOBBINS, H. W. Vick, Uley.
9429, RAILWAY CHAIRS, J. POYSER, MABSfield.
9421. HORSESHOES, E. Burke, Brighton.
9422. FURNACES, T. Shuttleworth, Stockport.
9423. LAWN-TENNIS NETS, E. J. Hatton, Hereford.
9424. TRUNK, C. A. FARWIG, LONDO.
9425. MULE SPINNIS MACHINERY, C. Redfern and E. WIlliams, Rochdale.
9426. DEFECTING INEQUALITIES, &c., in YARN, J. Smith, Shipley.

9426. DETECTING INEQUALITIES, &c., in YARN, J. Smith, Shipley.
9427. WASHING LIQUOR, J. J. Fanning, Manchester.
9428. LAPPET MUBLINS, &c., D. Ligat, jun., and R. Ligat, Glasgow.
9429. AUTOMATIC MOTOR, J. Wilson, Belfast.
9430. CASE, &c., C. W. Barnard, Belfast.
9431. SHEARING, &c., METALS, E. Fletcher, Salford.
9432. MACHINE TOOL, E. M. Eckardt, Dresden.
9433. FURNACES, H. C. Bull, London.
9434. TOBACCO-PIPE MOUTHPIECES, J. D. Carter, London.

9434. TOBACCO-PIPE MOUTHPIECES, J. D. Carter, London.
9435. FLAT DRILLS, J. D. Carter, London.
9436. COLLAR-STUD, R. R. S. Waraker, Cambridge.
9437. FASTENING for TRUNKS, &C., J. Perry, Wolver-hampton.
9438. REGISTERING DISTANCE TRAVELLED, G. C. Wild-man, Wolverhampton.
9439. BANJOES, S. W. Kemp, London.
9440. DRYING PHOTOGRAPHIC PLATES, L. A. Groth.-(L. Micciullo, Bassano.)
9441. UNION JOINTS, G. POllard, London.
9442. REFRODUCING DRAWINGS Upon GLASS, G. McCarthy, Glasgow.
9443. TAPS, &c., D. Hancock, Stratford.
9444. TAPS, &c., D. Hancock, Stratford.
9445. RUDDER ATTACHMENT for BOATS, W. Johnson, East Molesey.

East Molesey. 9446. FILLING, &C., BOTTLES with LIQUIDS, F. G. Riley,

London. 9447. SPINNING and TWISTING FRAMES, P. Speak,

Queensbury. 9448. PORTABLE ORCHESTRAS, H. Marsden, Bradford. 9449. MAKING UMBRELLA RIBS, &c., H. Young London.

London. 9450. VENTLATING BUILDINGS, M. Tobin, Uxbridge. 9451. CONSTRUCTION, &C., of SHIPS' DAVITS, W. S. Winans, London. 9452. LAWN WEEDER, A. C. Sterry, Redhill. 9453. SAFETY LAMPS, &C., W. E. Gedge.—(A. S. Fama, Vica).

Nice.) 9454. MAGAZINES for FIRE-ARMS, W. R. Lake.-(G. V.

HAUALINE (1997)
Fosbery, Liege.)
9455. QUOITS, C. B. Hayes, London.
9456. SCREW-FORGING APPARATUS, C. Fairbairn, Man-

9456. SCREW-FORGING APPARATUS, C. Fairbairn, Manchester.
9457. GRINDING PHOSPHATES, I. Brown, Edinburgh.
9458. SULPHITE of SODA, E. Carey and H. Gaskell, jun. —(Partly a communication from F. Hurter, Paris.)
9459. WORKING DYNAMO MACHINES, F. Thornton and F. V. Andersen, London.
9460. CHROMIUM ALLOYS, T. Slater, London.
9461. PANORAMIC PEOTOGRAFH CAMERA, A. M. Clark. —(P. MOESSAR', PARIS.)
9462. AUTOMATICALLY COMPLETING, &c., CIRCUITS, F. Thornton and F. V. Andersen, London.
9463. PREPARING SURGICAL DRESSINGS, W. R. Lake.— (P. Hartmann, Wurtemberg.)
9464. REFLECTING STAND, E. Tomlinson, London.
9465. LOCKS, &c., J. H. King, Liverpool.
270h June. 1884.

27th June, 1884.

9466. LENO OF CROSS WEAVING, J. Eccles, Preston. 9467. BRACES, J. Lawrence, Birmingham. 9468. DOOR KNOBS and ATTACHMENTS, J. Brooks, West Bromwich. 9469. UMBRELLAS and PARASOLS, W. Crow, Birming-

ham. 9470. Cooling, &c., Rifle Barrels, T. B. Burns, Camelford. 9471. MEMBR MEMBRANE TELEPHONES, S. P. Thompson and P.

Camelford.
9471. MEMBRANE TELEPHONES, S. P. Thompson and P. Jolin, Bristol.
9472. PRODUCING LIGHT and HEAT, &c., G. Rydill, Highgate.
9473. INCRUSTATION COMPOSITION, G. Jaques, Armley.
9474. MULES for SPINNING FIBRES, W. Houghton and E. Knowles, Gomersal.
9475. HARVESTING MACHINERY, J. Hornsby and J. Innocent, Grantham.
9476. CALCULATING MACHINERY, J. Hornsby and T. Shaw, Crewe.
9477. POTTERY KILN, J. Broadhurst, Fenton.
9478. DIVING MECHANISM for BICYCLES, F. G. Myers, Wellingborough.
9479. DWARF WINDOW BLINDS and SCREENS, A. Shepherd, Birmingham.
9480. PREPARING STRECTYPES for PRINTING MACHINES, A. G. Jeans, Liverpol.
9481. TRICYCLE, B. Fowell, Poynton.
9482. DYENG FARENCE, A. J. Butler and W. Jennings, Nottingham.

Nottingham.

Nottingham. 9483. FLOWER-POT SAUCER, J. Knight, near Epsom. 9484. DAMPING and STAMPING ENVELOPES, H. S. Edwards, London. 9485. SECURING BROOM HANDLES, &c., J. W. Kenyon, Manchester. 9486. HANDLES for SPADES, &c., D. Yardley, Stour-bridge.

9486. HANDLES for SPADES, &C., D. Fardley, Stourbridge,
9487. BRACES, &C., D. Power, Walsall.
9488. SECONDARY BATTERIES, A. Tribe and A. P. Price,
London.
9489. SECONDARY BATTERIES, A. Tribe, London.
9440. BOOTS and SHOES, D. Hollin and Z. Anderson,
Stafford.
9491. DRIVING GEAR for TRICYCLES, &C., W. E. Parry,
Redland.
9492. BOULUS WILLS H. Holdon, (H. Sach Sacana) Redland. 9492. ROLLING MILLS, H. Haddan.—(H. Sack, Saxony.) 9493. BRILLIANT WHITE POWDER, H. J. Haddan.— (—, Najark and …, Prätorius, Saxony.) 9494. Cop and PIRN WINDING MACHINE, I. Vermandel,

Belgium. 95. WASHING and SCOURING WOOL, E. Tremsal, Brussels Brussels, 9496. VENTIATING MARINE VESSELS, A. M. Clark.— (J. M. J. Barton, Australia.) 9497. UNSTOPPERING of BOTTLES, J. Johnson and J. P. West, London. 9498. FURNACE, A. M. Clark.—(J. Garnier, Paris.) 9409. Decompt H. Australia, M. Clark.—(J. Schemer, J. Sc

9498. FURNACE, A. M. Clark.—(J. Garnier, Paris.) 9499. Power HAMMERS, A. M. Clark.—(G. N. Schan-

9499. FOWER HAMMERS, A. M. CIARK.-(G. N. Schamberg, France.)
9500. CONVERTERS, G. Hatton, Hagley.
9501. MAKING CIGARETTES, S. Lamb, London.
9502. REGULATING the PRESSURE of FLUIDS, J. L. Milne and C. S. E. Crakanthorp, Edinburgh.
9503. BOOTS and SHOES, P. Purdie and G. Purdie, Glascow.

503. BOOTS ALL Glasgow. 504. GAS STOVES, C. H. Robinson, Glasgow. 505. COMBINED ALBUM and PROGRAMME, C. Linz, Jordon.

9504. GAS STOVES, C. H. RODINSUR, VIASGOV.
9505. COMBINED ALBUM and PROGRAMME, C. Linz, London.
9506. TAMPING of BLAST HOLES, W. Walker, Saltburn-by-the-Sea.
9507. FIRE-ARMS, W. S. Riley, Birmingham.—Sth April, 1883.
9508. SHEAF-BINDING REAPING MACHINES, G. Kearsley and G. T. Rutter, Ripon.
9509. PULP, S. Pitt.—(R. P. Pictet, Geneva, and G. L. Brélaz, Switzerland.)
9510. TREATMENT of OLLS, C. E. Bell, Durham.
9511. NUTMEG GRATER, S. Grafton, Birmingham.
9512. SLIDING SCALES, E. G. Colton.—(R. C. Smith and H. Fox, New York.)

THE ENGINEER.

JULY 4, 1884.

pictures, drawings, plans, and the like.
5160. BLEACHING OF PAPER PULP, &c., J. H. John son, London. - 30th October, 1833. --(A communication from E. H. Hermite, Rouen.) 6d.
The process consists in electrolytically decomposing chloride of sodium or potassium in the presence of a metal, preferably lead or zinc, so as to obtain an alkali-caustic soda or potash-and a chloride of lead or other metal, which is used for bleaching purposes by being subjected to electrolysis in the presence of the material to be bleached.

The indernal to be bleached. 5175. STEAM AND HOT-AIR GENERATOR, W. Turnbull New Hompton.—31st October, 1883. 8d. Consists, First, in utilising the waste gases from the furnace of a steam boiler for heating and storing com-pressed air in a hot-air receiver; Secondly, in using a portion of the heat of the furnace of a steam boiler which has not been utilised in conjunction with the waste heat escaping from such furnace for the purpose of increasing the temperature of the waste gases transmitting heat to the compressed air in the hot-air receiver.

ceiver.

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receiver. 5199. BICYCLES, R. C. Thomson, London, and W. Spence, Surbiton.—1st November, 1883. 6d. Consists in the combination with the steering fork of a bicycle, of extensions or arms attached rigidly to the lower extremities of the said fork, or make in one therewith, passing beyond and clear of the path described by the cranks and pedals, and rising at either side of the steering fork at such a distance therefrom as to admit the rider's legs between them and the fork, said arms or extensions having handles attached to their upper ends.

5202. ELECTRIC METERS, R. Belfleld, London.-1st

5202. ELECTRIC METERS, R. Belfield, London.—lat Nonember, 1883. 6d. The instrument used for releasing alternating cur-rents is somewhat similar to a Thomson electrometer, and has four double quadrants mounted upon an insulated base and connected together in pairs, the opposite quadrants forming a pair. A needle is sus-pended by a wire between the upper and lower sur-faces of the double quadrants. One terminal of the generator is connected with one pair of quadrants and the other terminal with the other pair, the needle is also connected with one terminal through the sus-pending wire. In a modification two plates are mutually attracted. Several other modifications are described.

5207. PRODUCTION OF DESIGNS UPON WATERPROOF FABRICS, C. Moseley, Manchester. - 2nd November, 1883. 2d.

1883. 2*d*. Relates to textile and other fabrics rendered water-proof by a coating of india-rubber, and subsequently coated or covered with farina or other substance capable of creating a like effect, and consists in pro-ducing an ornamental or other design upon the coated surface either before or during the process of vulcani-stion

Surface either before of during the process of vulcanisation.
5222. GRINDING THE TREADS OF RALLWAY AND TRAMWAY WIEELS, &C., E. P. Alexander, London.-26th November, 1883.-(A communication from A. W. McInityre, Chicago.)-(Complete.) 10d.
Relates, First, to mechanism whereby the work can be placed accurately in position and be securely sustained during the grinding operation; Secondly, to means for imparting a uniform steady revolution to the object to be ground; Thirdly, to mechanism for sustaining and operating the grinding or cutting wheels; Fourthly, to mechanism for automatically compensating for the wearing away of the grinding or cutting wheels with improved hoods and exhaust apparatus, whereby the dust from the work and the wheels may be collected and withdrawn, and the liability of accident from the bursting of carelessly placed wheels shale be avoided; Sixthly, to for entreing and securing thesame on their mandrils.
5238. ELECTRIC GENERATORS, H. J. Haddan, London.

centreing and securing the same on their mandrils.
5238. ELECTRIC GENERATORS, H. J. Haddan, London. —5th November, 1883.—(d. communication from the Bain Electric Company, Chicago, U.S.) 10d.
This relates to a generator having two or more field magnets with the cores, pole pieces, and yoke pieces all turned from a common centre, and secured to a base plate by a clamping ring. The armature consists of a spider frame having blades, upon which the iron wire sere wound to form the core, the coils of copper wire being wound outside these. Various modifica-tions and methods of connecting the coils are described and illustrated.
5244. APPARATUS FOR PRODUCING INTENSE WHITE

described and indistrated.
5244. APPARATUS FOR PRODUCING INTENSE WHITE LIGHT, C. D. Abel, London.—5th November, 1883.— (A communication from C. Clamond, Paris.) 6d. Relates to the arrangement of the various passages and chambers for heating the air supply to the gas jets.

5249. STEAM ENGINES, T. Hunt, Manchester. - 5th November, 1883. 6d.

5249. STEAM ENGINES, T. Hunt, Manchester. — 5th November, 1883. 6d. Relates, First, in locomotive steam engines to placing the uptake of the engine boiler at the side farthest from or opposite to the fire-door, and providing the intervening space with pendent tubes or water spaces; Secondly, to constructing the chimney in two parts or tubes one within the other, with a space between them, in which is contained a substance capable of vibrations; Thirdly, the combination with the blast pipe of a valve for automatically varying the area of escape for the exhaust steam in accordance with the pressure thereof; Fourthly, to the arrangement of the water tanks; Fifthly, to the arrangement of the reversing gear. 5267. HATCHING AND REARING VIPAROUS ANIMALS,

5267. HATCHING AND REARING VIPAROUS ANIMALS, &c., C. E. Hearson, London. -6th November, 1883. 1s. Relates to improvements in the general construction of incubators.

5301. MULTIPLE DRILLING, BORING, TURNING, AND TAPPING MACHINES, T. Carver, Nottingham.—9th November, 1883. 6d.
 Relates to improvements in the general arrangement of the parts of the machines.

5306. MANUFACTURE OF PULP, &c., G. B. Walker, Lon-don.-9th November, 1883. 6d. Refers to the treatment of a species of cactus known as the Yuong drawning.

as the Yucca draconis, or Yucca puberula, or Yucca crevifolia, or Sotal tree, for the manufacture of pulp or stock for paper manufacture.

5309. MANUFACTURING ELASTIC WEBBING, &c., L. Turner, Leicester.-9th November, 1883. 6d. Consists in the weaving of elastic webbing and other narrow fabrics with transverse stripes or bars of colour, and with a speckled or plain ground, by the aid of a single shuttle.

5318. APPARATUS FOR SIGNALLING AT SEA, W. Balch, London.—10th November, 1883. 6d. Relates to the construction of rockets, and to appa-ratus for discharging the same.

5327. CLEANING KNIVES AND FORKS, E. Greenfield, Bromley.—10th November, 1883. 6d. Relates to the arrangement of apparatus for clean-ing knives and forks, consisting of a polishing sur-face either horizontal or inclined, in combination with a cylinder or cylinders.

a cylinder or cylinders.
5333. RETAINING AND RELEASING WINDOW-BLIND CORDS, &c., W. P. Kelly, Mount Brandon, Ireland. -12th November, 1883. 6d.
Relates to an apparatus for retaining and releasing window-blind cords and the like, consisting of a box of suitable material adapted to be fixed to a window frame, the said cords passing through holes or slots in the said box, and through or against a friction block

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of incubators.

Bridge. 9516. RAILWAY SIGNALLING, T. Abbott and M. Haw-thornthwaite, Lancaster. 9517. DRESSING WARPS, J. W. Blakeley, Birstal, near Loade 2017. DERSENT CONTERNS, J. Erskine. — (Farben-jabriken vormals Friedrich Bayer and Co., Elberfeld,

fabriken vormals Friedrich Bayer and Co., Elberfeld, Germany.)
9519. UMBRELLAS and PARASOLS, C. J. Lee, Croydon.
9520. WILLOW PEELER, R. Walpole, Leicester.
9521. LANPS, F. R. Baker, Birmingham.
9522. COMBINED BEDSTEAD, WARDROBE, &C., S. Hirschberg, Berlin, and T. Bath, Pomerania.
9523. LIFTING, &c., LIQUIDS, &c., C. T. Powell, Handsworth, and J. Csete, Edgbaston.
9524. BOTTLE-STOPFERS, C. Wingfield, Sheffield.
9525. CIGARETTE-MAKING APPARATUS, F. Bloor, Sheffield.

19524. BOTTLE-STOPFERS, C. WINGREIG, SNEIHEIG.
19525. CIGARETTE-MAKING APFARATUS, F. Bloor, Sheffield.
19526. WATER-HEATER, A. H. Hearington, London.
19528. GAS-BURNERS, A. H. Hearington, London.
19529. FINGER PLATERS, J. A. Lawley, Birmingham.
19530. METALLIO BROOCHES, J. H. Jahncke, J. Ginzler, and H. W. Herbst, London.
19531. PHOTOGRAPHY, A. G. BrOOKES.—(T. S. Nowell, Boston, U.S.)
19532. OBTAINING GAS from HYDROCARBONS, J. F. Schnell, J. Read, J. Warwick, and W. Darbyshire, Manchester.
19533. STARTING VEHICLES, H. M. Martin, London.
19534. GUDES for the NOFE of ROPE TRACTION RAIL-wAYS, H. M. Martin, London.
19535. BRAKES, H. M. Martin, London.
19536. RING ARMATURES, R. E. DUBSTON, LOIRON.
19538. DISINFECTING COMPUNES, G. R. TWEEDE, C. D. Abel.—(L. Arbel, Loire, France.)
19538. WINDING APPARATUS for SEWING MACHINES, A. J. BOIK.—(C. Hosch, Bohemia.)
19540. RAISING and LOWERING, J. W. PORTIH, LONDON.
19541. COMBS, W. Spence.—(L. M. Chorier, Paris.)
19542. FIXING the EXDS UPON BOBENNS, E. Edwards.— (L. A. BOURDWIG, FORCE.)
19543. LOCKING ON BOLTING MECHANISM, J. M. Hart, LONDON.
19544. LOCKING ON BOLTING MECHANISM, J. M. Hart, LONDON.

Solution.
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-(L. Koppel, Germany.) 9547. Mode of DRIVING BICYCLES, &c., J. E. Hollo-

way, London.

9341. MODE of DRIVING BICYCLES, &C., J. E. Hollo-way, London.
9548. AUTOMATICALLY WORKING FOG HORNS, W. FOX and H. P. Fenby, Leeds.
9549. ATTACHING BUTTONS to LEATHER, W. L. Wise.-(G. Kloiz, Germany.)
9550. REPRODUCTION at a DISTANCE of CHARACTERS, &C., T. Tubini, London.
9551. REPRODUCTION at a DISTANCE of CHARACTERS, &C., T. Tubini, London.
9552. CONTROLLING SUPPLY of WATER, G. H. and S. Jennings, and J. Morley, London.
9554. COFFINS, G. F. Redfern.-(Messrs. Wirth and Co., Germany.)

Germany.) 9555. Apparatus for Spinning, &c., Wool, J. H. Clapham, Shipley.
9556. PLANING PISTONS of PUMPS, &C., T. H. Thwaites, Bradford.

30th June, 1884.

30th June, 1884.
9557. COOLING OIL in order to CONGEAL PARAFFIN, N. McF. Henderson, Broxburn.
9558. DISINFECTING VAN, &c., FIBRES, J. Illingworth, Batley.
9559. BURNERS for the COMBUSTION of GAS, T. McCracken, Londonderry.
9560. DRAWING TURES or BARS, J. Short, Birmingham.
9561. CHAIN LINKS, T. Bedington, Small Heath.
9562. CONTRIVANCE for BLINDFOLDING HORSES, J. Lytle, Belfast.
9564. COVERING CORD with COTTON, &c., J. and W. Peacock, Paisley.
9565. OFEN HEARTH STEEL FURNACES, &c., J. Riley, Glasgow.

9565. OFEN HEARTH SIEEL CONTINUES AFRATED LIQUIDS, J. M. Glasgow. 9566. BOTTLES FOR CONTAINING AFRATED LIQUIDS, J. M. Day, Dublin. 9567. COMBINED MEASURING and FILLING APPARATUS for LIQUID, W. R. Maud, PONTEFRACE. 9568. SUSPENDING, &C., VENETIAN BLINDS, C. Catlow, Burnley.

JOOS. SUSPENDING, &C., VENETAN BLINDS, C. CALLOW, Burnley. 9569, SEWING MACHINES, E. Kohler, U.S. 9570, MANUFACTURING EXTRACTS of FUSTIC, &c., H. Rimmer, Liverpool. 9571, APPARATUS for DRIVING TRICYCLES, &c., W. P. Pinder, Westgate. 9579. SEWINGTURING VENES for BOALDER J. E.

Pinder, Westgate.
 9572. SELF-REGULATING FEEDS for ROLLERS, J. E. Walsh, London.
 9673. DRAWING AIR out of SHIPS, &c., J. C. Baker, Linemeter Statemeter Statemet

Walsh, London.
9673. DRAWING AIR out of SHIPS, &c., J. C. Baker, Liverpool.
9574. WOOD-CUTTING MACHINE, A. McDonald and T. W. Kendall, Liverpool.
9975. FIRE ALARM, W. S. Richmond and W. A. Balcon, London

9975. FIRE ALARM, W. S. Richmond and W. A. Balcon, London.
9576. CAREDERTING GAS, J. Kidd.—(W. J. Kidd, U.S.)
9577. COMPOUND PROJECTILES, C. D. Abel.—(W. Lorenz, Germany.)
9578. APPLYING MAGNETIC to produce ELECTRO-CHEMICAL ACTION, F. J. Bolton and R. H. Woodley, London.
9579. SPRAY PRODUCERS, H. J. Haddan.—(P. Lochman, Sazony.)
9580. FEEDING APPARATUS for CARDING MACHINES, H. J. Haddan.—(C. Schreiter, Sazonu.)

Sazony.) 9580. FEEDING APPARATUS for CARDING MACHINES, H. J. Haddam.—(C. Schreiter, Sazony.) 9581. DISCHARGING DROP-STOPPERED BOTTLES, W. J. T. Higgitt, London. 9582. BLEACHING PIECE GOODS, J. WORTAIL, Ordsall. 9583. SHOEMAKER'S AWL, A. V. Newton.—(J. Keats, Germany.)

Germany.) 9584. Connecting Large Welded Tubes, H. H. Lake.

-(Schulz, Knaudt, and Co.) 9585. SAFETY RUDDERS, J. H. Fock, Germany. 9586. WASHING CLOTHES, R. Norton, Gateshead, and S.

MASHING CLOTHES, K. Norton, Gateshead, and S. W. Snowden, London.
 TREATING SEWAGE for the purpose of DEODORIS-ING, J. HANSON, Wakefield.
 CULTIVATION Of LAND, J. Coulson and W. A. Todd, Stamford.
 TREATING LEATHER to render it WATERPROOF, J. Cove and W. P. Sherwood, Northampton.
 OPERA GLASS, A. M. Clark.—(C. Rothacker, jun., Germanu.)

9591. STORM-RESISTING ESPALIERS, A. J. Boult.- (C.

Schwend, Germany.) 9592. MAKING-UP of CIGARS, O. Barnsdale, Nottingham. 9598. UTLISING EXPANSIVE GASES as a MOTIVE POWER, F. J. Harrison, London.

ABSTRACTS OF SPECIFICATIONS.

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

5088. ARRANGEMENTS OF CIRCUITS AND APPARATUS FOR THE DISTRIBUTION OF ELECTRICITY, J. S. Beeman, London. - 26th October, 1883. 6d. This relates to distributing and translating electri-city by means of suitable generators placed in series, the circuits between which are closed by interposing between the positive and negative poles of adjacent generators, suitable resistances and translating devices. The invention is illustrated by eleven dia-grams,

9586. W.

contained in the said box, and kept pressed against the said cords by a suitable spring. **5348.** BRIDDES, &C., W. R. Kinipple, Greenock.-13th November, 1883. 18. **5397.** DRILLS, &C., J. Harrington, Coventry.-15th November, 1883. - (Not proceeded with.) 2d.
A movable roadway consisting of overhead or high level girders whereon the carriages on rollers are norther and form which carriages the meeting ends of the girders of the two movable parts of the roadway are suspended, the shore ends of the said graves are suspended, the shore ends of the games or on the solid masonry pier or quay, constituting the shore or land ends of the bridge. Other improvements are described. **5349.** CONNECTION OF PIERS FOR COMMUNICATING

improvements are described.
5349. CONNECTION OF PIPES FOR COMMUNICATING FULID PRESSURE TO WORK BRAKES ON RAILWAY TRAINS, C. D. Abel, London.—13th November, 1853. —(A communication from G. Westinghouse, jun., Pitts-burgh, U.S.) 6d. Consists partly in combination with two sets of flexible hose or jointed pipes connecting carriage to carriage with a single intermediate separable coupling, the use of two pairs of valve boxes, each of the one pair communicating with one part of the coupling, and each provided with a duplex valve. 5351. LOWERING, RAISING, AND RELEASING SHIPS' BOATS, C. J. Fox, Birkenhead.—13th November, 1883.

The apparatus consists essentially of a rocking arm, supporting bar, and a crutch, which bears the boat y a boat hook, all in duplicate.

by a bost nook, all in duplicate. 5357. HVDROARBON FURNACES, A. J. Boult, London.— 18th November, 1883.—(A communication from 0. D. Orvis, Chicago.) 8d. Relates partly to the method of utilising hydro-carbon liquids for heating purposes, the same con-sisting in forcing said liquid by means of steam into a retort, heated directly by the furnace, in which retort the hydrocarbons rise and escape only in a vaporous form to the fire chamber.

5361. MANUFACTURE OF AMMONIA AND HYDROCARBON GASES, W. R. Lake, London.—13th November, 1883. —(A communication from T. B. Fogarty, Brooklyn.) Sol.

8d, Mainly consists in converting the atmospheric nitrogen discharged with the hydrocarbon gases and other products of furnace combustion into ammoniaad gas, removing the ammonia from the said gases, and then passing the remaining nitrogenous gas, deprived of carbonic oxide and carbonic acid, into retorts con-taining bituminous coal, mixed with an alkali or alkaline earths, while undergoing the process of des-tructive distillation for the generation of illuminating and heating gas, or either of them if desired.

and heating gas, or either of them if desired.
5373. CONTROLLING AN ENGRAVING, CUTTING, OR IM-PRESSION TOOL, ACCORDING TO PATTERS, &c., H. J. Haddan, London.—14th November, 1883.—(A com-munication from the Bain Electric Company, Chicago, U.S.) 6d.
This relates to the means for controlling an engraving tool by light or heat rays, so that the operations of the tool correspond to the varying conditions of a pattern through which the rays are passed. The rays are received upon a selenium cell forming part of the cir-cuit of an electro-magnet, whose armature actuates the engraving tool.
5381. HYDRAULC LIFTS. J. H. Johnson, London.—14th

the engraving tool.
5381. HYDRAULIC LIFTS, J. H. Johnson, London. --14th. November, 1883. --(A communication from H. M. L. Crouan, Paris.) 10d.
Relates partly to the employment of distributing apparatus operated by excentric studs causing either of two main valves to open and at the same time maintaining the other main valve closed, according as the controlling wheel is turned in one direction or the other; the said main valves being provided with auxiliary or relieving valves and trunks working in cylinders and with pendant cylindrical or other pro-ections on the lower side, whereby the flow of water s graduated.

s graduated.
5383. TEMPERING THE BOBBINS ON SPINNING AND TWISTING FRAMES, H. S. Boase, Dundec.—15th November, 1883.—(Not proceeded with.) 2d.
This relates to means for tempering or dragging the bobbins on spinning and twisting frames, and it con-sists in attaching the rail which carries the temper cords at the back of the bobbin boards to the said board by links, so that it is parallel to the board, and can be moved to or from it laterally and endwise simultaneously.
5394. STEERING AND PROPERTIES FOR E. F. B.

simultaneously.
5384. STEERING AND PROPELLING BOATS, &c., F. B. Heathorn, London.—15th November, 1883. 6d.
The rudder has one part pivotted so that it can be set at any angle, and by causing the rudder to move to and fro it can be used to propel the vessel.
5385. EXHAUST VENTLATORS, W. Walker, Birkenhead. —15th November, 1883. 6d.
The object is to form a ventilator or chimney top which will cause an upward current in the shaft in whatever direction the wind blows, and it consists in providing the top with corrugated surfaces, directing the wind in an oblique direction into or past the orifice.

5387. PREPARATION OF RAGS FOR THE MANUFACTURE or MUNGO, &c., R. Buckle, Shipley.-15th November, 1883.-(Not proceeded with.) 2d. The rags are cut into strips by being pressed against a revolving knife, in order to cut out the linings and revolving knife, in order to cut out the linings.

Seams. 5388. BLINDS FOR WINDOWS, &C., H. A. Goodall, Lon-don.-15th November, 1883. 6d. Relates to the combination of parts consisting of an expanding wood blind or screen and longitudinal grooved or channelled protective guiding and strength-ening rails attached to side supports, and receiving within suitable grooves or channels the ends of the crossed strips forming the expanding portion of the blind.

5390. SEWING MACHINE, T. J. Denne, Selhurst.-15th November, 1883. 6d. The object is to enable sewing machines to sew both heavy and light materials, and it consists in the general construction of the mechanism.

general construction of the mechanism.
5391. Excluding the ENTRANCE of DRAUGHTS, RAIN, &c., to ROOMS, J. Warhurst, London.—15th Novem-ber, 1883. 6d.
Relates to the novel adaptation to hinged doors, casements, and the like of a base board or shutter for excluding draughts, rain or dust, which is actuated as the door is opened or closed to rise and fall in a direct perpendicular line.

5394. SEWING MACHINES, J. Imray, London.—15th November, 1883.—(A communication from S. Y. Love, Pittsburg, U.S.) 6d. This relates to mechanism for imparting a vertical reci-procal movement and also a horizontal reciprocation transversely to the line of feed of the fabric to the needle

transversely to the line of feed of the fabric to the needle of the sewing machine, so as to cause it to descend alternately in opposite sides of the line of feed when required to produce a button-hole stitch or other orna-mental stitch, the mechanism which effects the trans-verse movement being capable of being thrown out of action when the machine is used for straight stitching stitching.

satching.
5395. PUMPS, J. Imray, London.-15th November, 1883.-(A communication from G. Hanarte, Bel-gium.)-(Not proceeded with.) 2d.
This relates to the arrangement of the passages in pumps employed for forcing liquids to a great height or with a great velocity, so that a gradual increase in speed is imparted to the liquid, retarding it as it passes through the valves, so that it acts on them mostly by pressure. passes through the mostly by pressure. 5396. HEELS FOR BOOTS AND SHOES, W. H. Stevens, Leicester. -15th November, 1883.-(Not proceeded with 2 and 18 a

with.) 2d. The heels are made by compressing vegetable fibre

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THE ENGINEER.

which a hot blast is caused to pass.
5399. STEAM ENGINES, A. M. Clark, London.—15th November, 1883.—(A communication from A. Eber-hart, Philadelphia, U.S.) 6d.
This consists in a steam engine having two cylinders curved to the arc of a circle, and two pistons in each cylinder, the pistons being coupled in pairs (one in each cylinder) by curved rods completing the circle.
These rods are connected to radius arms with sliding crossheads connected by rods to crank pins. Four valves control the inlet and outlet ports of the two cylinders, and are connected in pairs by rods, which are geared together.
5400. TELEPHONE APPARATUS. M. Kature, Condition

5400. TELEPHONE APPARATUS, M. Kotyra, Cardiff.-15th November, 1883.-(Not proceeded with.) 2d. A permanent, or electro-magnet of C-shape has fixed on to the ends of its poles other smaller perma-nent or electro-magnets.

nent or electro-magnets. 5402. SEPARATING AND COLLECTING DUST FROM AIR, A. Lund and T. F. Hind, Preston.—15th November, 1883.—(Not proceeded with.) 2d. A revolving cylindrical drum is covered with cloth and enclosed in a case, which the dust-laden air is caused to enter by suction or fan pressure, and, pass-ing through the cloth, deposits the dust thereon, such dust being removed as deposited by a revolving brush. brush

5403. PROFELLING SHIPS, &c., W. Lockwood, Sheffield, -15th November, 1883.—(Not proceeded with.) 2d. The blades, vanes, or arms of the propellers are made hollow, and have one or more openings formed therein, through which water, supplied by suitable means to a hollow shaft, on which the blades are mounted, is caused to issue, and cause the propeller to revolve.

caused to issue, and cause the propeller to revolve. 5404. COMMUNICATING MOTION TO ANY SHAFT FOR THE TRANSMISSION OF POWER, W. Ross, Surrey.-16th November, 1883.-(Not proceeded with.) 2d. This relates to the employment of a reciprocating piston, provided with means for actuating a shaft both on its up and down strokes, so as to cause said shaft to rotate always in the same direction. 5405. STEERING GEAR, J. Hastie, Greenock.-16th No-vember, 1883. 8d.

5405. STERENES GEAR, J. Hastie, Greenock.—16th November, 1883. 8d. This relates to combined hand and steam or hydraulic steering gear, the main object being to disconnect the hand steering wheel is on a shaft, with right and left. The steering wheel is on a shaft, with right and left stock. Fins which carry two blocks, guided on rods, connected by links to a crosshead on the rudder stock. Pins which connect the links to the blocks are removed when power is used, and a light frame is fixed on the guide rods, and guides the free ends of the links. A brake block to prevent violent movements of the rudder is described, and also a special connection for the chains for transmitting motion from the power gear to the rudder stock.

Form the power gear to the rudder stock.
5408. GAS MOTOR ENGINES, G. G. Picking and W. Hopkins, London.—Ioth Norember, 1883. 6d.
The pressure in the cylinder resulting from the explosion of the charge is caused to act upon the piston, and move it about one-fifth of its stroke before the piston commences to compress the charge, for which purpose the exhaust or a discharge port is kept open, or a partial vacuum is formed in the cylinder to utilise the further expansion of the gases therein.
5407. OBTAINING COPPER FROM CUPREOUS SOLUTIONS, A. P. Price, London.—16th November, 1833. 2d. This consists in effecting the precipitation of copper from solutions of the same, by the employment of metallic zinc when in a fine state of division.

metallic zinc when in a fine state of division. 5409. MANUFACTURE OF WIRE NETTINO, H. J. Haddan. London. -16th November, 1883.-(A communication from E. Kretschmann, Leipzig.) 6d. This relates to machines for manufacturing wire netting with hexagonal cells or meshes; and it con-sists in a system of spindles formed of semi-cylindrical parts, which cover each other in pairs, and are adapted to rotate together, in order to perform the meshing process, the upper spindles of each pair carrying bobbins, from which the wire to form one part is wound off, while the lower spindles are perforated at their rear, and receive the wire to form the other part from bobbins.

5410. UMBRELLAS, H. J. Haddan, London.-8th Nove

ber, 1853.—(A communication, Double, --Sta Novem-ber, 1853.—(A communication from Knauth and Co., R. Geisler, and W. Jaedicke, Germany.)—(Not pro-ceeded with.) 24. This relates to an umbrella capable of closing auto-matically, and which requires no special mechanism to remain closed, while the frame is adapted to turn freely on the stick.

5411. PETROLEUM HEATING APPARATUS, R. Schulz, Dresden.—16th November, 1883. 6d. Relates partly to the method of converting petro-leum or other hydrocarbon into spray through an ejector, by means of compressed air or steam, for the purpose of attaining a rational perfect combustion in heating arrangements. 5441. Stropperperson the purpose of the stropperperson.

From their seats, and discharging the contents thereof. 5412. MOUNTS OR HOLDERS FOR GLASSES, JUCS, &C., J. Davson and T. F. D. Heap, London.—16th No-vember, 1883.—(Void.) 2d. This relates to a frame for holding glasses or jucs, the frame having a spring clip to grasp the rim of the vessel, and being provided with a handles for lifting or holding the same.

9710. RETAINING STUD FOR SCARFS, J. Dalziel, Glas-gov.-16th November, 1883. 4d. This relates to a stud or clip to be applied to the collar stud, and which is formed so as to prevent the scarf or necktie rising or riding up the collar at the threat.

5414. BEDS, J. G. Davison, Sunderland.—16th November, 1883.—(Not proceeded with.) 2d.
 This relates to a folding bed, the head of which is fixed to the floor or wall of the room in which it is

placed.
5415. LAWN MOWERS, G. W. Carr, New York.-16th November, 1883.-(A communication from Messrs. Carr and Holson, Limited, New York.) 6d.
Relates, First, to the method of mounting and fixing the handle; Secondly, to the construction of the rotary cutter or wiper; Thirdly, to fixing the cross bar and the back regulating roller by a single bolt at each end; Fourthly, to the driving gear; Fifthly, to means for regulating the position of the fixed blade or cutter in relation to the rotary cutter or wiper.
5416. Productron of Zinc A. P. Price, London.-16th

5416. PRODUCTION OF ZING, A. P. Price, London.—16th November, 1883. 2d. The inventor claims the manufacture or production of zine by first volatilising the zine contained in ores, compounds, or products, and then condensing the same, and subsequently converting the zine so ob-tained into a solid condition.

5452. SMELTING ORES, &C., S. R. Smyth, London.-19th November, 1883.-(Not proceeded with.) 2d. Consists in the application of liquid hydrocarbon and liquid oxyhydro-compounds; also liquid alkali

compounds to the smelting of iron and other ores and metals, by first accumulating and afterwards atomising and distributing the same either by hot or cold air blast; or by atomised water or vapour, or superheated steam, or by carburetted hydrogen or carbonic oxide gas, or by oxygen or hydrogen, or any or either them alone or combined acting as carriers.

them alone or combined acting as carriers. 5418. UNTEASELING WOOLLEN FIBRES, W. A. Barlow, London.-16th November, 1883.-(A communication from F. Overend, Puris.)-(Not proceeded with.) 2d. The teaseled wool is passed between rollers held slightly apart, so that the teasel in its whole state cannot pass between them without being subjected to pressure, but the wool on account of its elasticity will pass through the space without being retarded in its course.

5420. TOOL HOLDERS FOR LATHES, &c., M. C. Despard,

5420. Tool HOLDERS FOR LATHES, &C., M. C. Despard, Ekter.-17th November, 1853.-(A communication from G. S. Jones, Cawnpore.) 6d. Relates to the construction of tool holders with a cylindrical swivel head carrying an internal plug through slots, in both of which the tool is to be passed, and with a screw bolt to screw through the stem of the swivel head and bear against the plug, so as to grip and hold the tool, and also with a separate screw nut to screw on to the exterior of the stem of the swivel head and lock the swivel head to the shank.

5421. CLOSET-PAN APPARATUS, E. Hurley, Birmingham. —17th November, 1883.—(Not proceeded with.) 2d. This relates to an apparatus in which the urine is separated from the solid excrement, and by raising a valve the urine passes from an upper pan to a pan beneath in which the solid matter collects, and thereby fluches the same flushes the same.

5422. DYNAMO-ELECTRIC MACHINES AND ELECTRO MOTORS, Sir C. T. Bright, London.-17th November 1883. 6d.

1883. 6d. This relates to improvements of patent 2280, of 1883, and consists in dividing an iron shaft into two parts by a piece of brass, and expanding the magnetic parts of the shaft at each of their central ends into discs, from the outer ends of which spaces are cut dividing the discs, for a suitable depth, into radial arms, which hus form poles N on one side of the non-magnetic division and S on the other. The armature coils are stationary. stationary.

5424. AUTOMATIC SALE AND DELIVERY OF CIGARETTES, &c., W. P. Keeson, London.-17th November, 1883.-(Not proceeded with.) 2d. The cigarettes or other articles to be delivered at an

opening in the apparatus are arranged on a band which is caused to travel upon a coin being inserted in a slit in uch apparatus.

such apparatus.
5425. AUTOMATIC FEEDING OF BOILERS, A. Mayhew, London.--17th November, 1883. 6d.
Relates to apparatus for feeding boilers with water and automatically cutting off the supply when the working level is obtained.
5426. CLOSING VESSELS, DOORS, &c., AIR-TIGHT, E. Leinert, Dreaden.--17th November, 1883.-(Not pro-ceeded with.) 2d.
This apparatus consists of an upper and a lower

ceeded with.) 2d. This apparatus consists of an upper and a lower plate, the latter being provided with means for turn-ing it, and having a spiral coil which gears with teeth on sliding arms in the top plate, so as to cause the arms to move outwards from the centre, and by press-ing on a packing ring, close the opening to which it is applied quite air-tight.

5427. DISCHARGING VESSELS CONTAINING LIQUIDS, H. L. Orr, Belfast.—17th November, 1883.—(Not proceeded with.) 2.J. Air is forced into the vessel, and acting upon the liquid, forces it out through a suitable discharge pipe.

liquid, forces it out through a suitable discharge pipe. 5428. MANUFACTURE OF SULPHURETTED HYDROGEN, &c., D. Urquhart, Westminster.-17th November, 1883. 4d. The inventor claims, First, the manufacture of sul-phuretted hydrogen and monohydrates of the alkaline earths by first roasting the sulphates of such earths to sulphides, and then treating these with superheated steam; and Secondly, in the manufacture of mono-hydrates of the alkaline earth in the manner described in first claim, the use of a cupola furnace with hearth in a bath of molten metal.

in first claim, the use of a cupola furnace with hearth in a bath of molten metal. 5431. STEAM ENGINES, W. P. Thompson, Liverpool.— 17th November, 1883.—(A communication from F. D. Cumwer, Detroit.) 8d. Relates, First, to such an arrangement of the steam and exhaust valves that the latter shall be on a level lower than the cylinder, thereby draining the cylinder; Secondly, an arrangement of the main steam and exhaust valves that the latter shall be on a level lower than the cylinder, thereby draining the cylinder; Secondly, an arrangement of the main steam and exhaust valves whereby all may be operated simulta-neously by one excentric, excentric rod, and rocker arm, and whereby all the valve motion and all the valves are located upon one side of the engine; Thirdly, to combine with the main exhaust valve secondary valves, which distribute the exhaust steam to the auxiliary heater and a condenser, the propor-tions of the said distributing valves and their ports to their seat ports, and their adjustments as to times of opening and closing in relation to each other and the main exhaust valves, is distributed to the auxiliary heater and to the condenser in such a way that the feed-water is heated to a temperature corresponding very nearly with the terminal temperature of the steam in the cylinder at the time of release, and with-out causing any increase of back pressure or variation out causing any increase of back pressure or variation in the exhaust line upon an indicator diagram taken from the engine.

From the engine. 5433. VELOCIFEDES, &c., E. C. F. Otto, London.—17th November, 1883. Sd. Relates, First, to the employment of a swinging frame; Secondly, the mode of driving and steering by means of clutches and brakes in connection with the driving wheels, which are also steering wheels; Thirdly, the employment of the undulating or helical tensional spokes of highly elastic steel or other suit-able metal. 5424. Verse.

able metal. 5434. VENTILATING AND FILTERING THE AIR OF CAR-RIAGES, BEDSTEADS, &C., W. A. Barlow, London.— 17th November, 1883.—(A communication from E. Bandow, Hamburg.) 6d. Relates to providing for the supply of filtered air or air impregnated with medical ingredients to the interior of carriages, invalid chairs, or bedsteads by means of an improved covering attached to the frame of the carriage roof or on top of the invalid chair or bedstead.

5435.

nam, Montreat.)--(Not proceeded with.) 2d. Relates to the means of forming the seams. 5459. BREECH-LOADING GUNS AND GUN LOCKS, H. J. Haddan, London..-20th November, 1883.-(A commu-nication from J. P. Burkhard and F. Novotkey, Minnesota, U.S.) 8d. The objects of the invention are, First, to provide means for automatically cocking the hammers when the barrels of breech-loading guns are tilted up at the breech to receive the cartridges; Secondly, to provide means for cocking and locking the hammers when the barrels are tilted; Thirdly, to provide means for un-locking the hammer when required to discharge the gun; Fourthly, to provide simple and compact locks, composed of few parts all secured to the side plates of the gun and adapted to be removed therefrom; Fifthly, to provide automatic indicators, so situated as to enable the gunner to ascertain instantly whether the right or left or both hammers, are locked; and lastly, to provide means for securing the barrels to the stock. edstead.
435. TRANSMITTING MOTION TO MACHINERY, P. A. Dohis, Paris.—17th November, 1883.—(Not proceeded with.) 2d.
This relates to the introduction of a regulator ccumulator in the course of the transmission of ower to the machinery to be actuated, so as to take up irregularities. For animal power the regulator and consist of a train of gearing arranged to wind by prings, and for wind or other engines an air pump ind reservoir may be employed.
5436. TREATMENT OF WASTE MATERIALS TO OBTAIN

5460. HAMMERS FOR PLANOFORTES, H. J. Haddan, London.-20th Agreember, 1883.-(A communication

and reservoir may be employed. 5436. TREATMENT OF WASTE MATERIALS TO OBTAIN USEFUL PRODUCTS AND MOTIVE POWER THEREFROM, G. Epstein, London.—17th November, 1883. 64. Waste materials containing starchy matters are treated with sulphuricacid and heated for the purpose of converting such matters into sugar. The mixture is then allowed to cool down to the temperature requi-sit hen allowed to cool down to the temperature requi-sit developed, and may be utilised for obtaining motive power, or for any other purpose to which it is applicable. The residue forms a valuable material for manure. nanure

5437. FILTER-PRESS PLATES, J. Pedder, Lancashire.— 17th November, 1883.—(Not proceeded with.) 2d. This relates to attaching filter cloths by metallic rings to the press plates, the joints of which are made with roll-packing or other flexible material laced to the outer flange of the recessed joint.

5438. APPARATUS FOR VENTILATION, T. E. Bladon and W. Matthews, Birmingham. --17th November, 1883.

17

2*d.* This consists of a fan with inclined vanes working in connection with a tube for conveying away vitilated air or vapour, the fan being driven by clockwork or other motor.

5439. BICYCLES, &c., J. and J. Bradshaw, Wigan.-17th November, 1883.-(Not proceeded with.) 2d, This relates to gearing for producing speed or power as required. as required.

as required. 5440. ROLLERS FOR GRINDING MILLS, W. R. Lake, London.-17th. November, 1883.-(A communication from F. Prokop, Bohemia.)-(Not proceeded with.) 2d. Conical rollers with straight grooves are arranged with the small end of one near the large end of the other, and with their axes slightly inclined in relation to each other, whereby the sharp edges of the grooves in the rollers, whose adjacent surfaces move in oppo-site direction, meet along the contact line of the two rollers in an inclined position and produce a shearing action.

action

action. 5442. PIANOFORTES, H. J. Haddan, London.-19th. November, 1883.-(A communication from E. Höjtng-höff, Bavaria.) 6d. Consists in a contrivance which enables the piano player to change at will the original tone of the piano into the tone of the harp or other musical instruments by treading on a pedal made for this purpose.

5443. PRESSURE GAUGES, H. J. Haddan, London.-19th November, 1883.-(A communication from L. Carton, El Kseur, Algeria.-(Not proceeded with. 2)

The gauge is provided with adjustable contact stops, so as to signal the maximum and minimum pressures.

pressures. 5444. EXAMINING THE GERMINATIVE PROPERTIES OF GRAIN, &c., H. J. Haddan, London.—19th November 1883.—(A communication from 0. Coldeve and L. Schönjaha, Brunswick.) 6d. Relates to the process of producing or promoting the germination of grains or seeds by causing the water and other substances necessary for the develop-ment of the germ to penetrate the grain or seeds in form of vapour. 5446. FACILITATING THE COUPLING AND UNCOUPLING

form of vapour.
5446. FACILITATING THE COUPLING AND UNCOUPLING OF RAILWAY VEHICLES, G. W. con Naurocki, Berlin. --19th November, 1883.--(A communication from P. Madaen, Berlin) 6d.
Rolates to appliances for facilitating the coupling and uncoupling of the draw-bars and safety chains of railway vehicles, and consists chiefly of a coupling chain, a suitable system of levers to be governed from the side of a vehicle, and screw mechanism serving for the tightening of the coupling.
5448. TELEPHONIC OF MICOPHONIC APPARATUS. H.

5448. TELEPHONIC OR MICBOPHONIC APPARATUS, H. H. Lake, London.—19th November, 1883.—(A commu-nication from J. Berliner, Hanover.) 63. This relates to a method of completing the circuit through pulverised or granulated material which is a conductor of electricity, and is used under pressure, either in a dry state, or moistened with water or other suitable liquid.

either in a dry state, or moistened with water or other suitable liquid.
5449. INSTRUMENTS FOR ASCERTAINING LEVELS, A. J. Boult, London.-19th November, 1883.-(A communication from C. C. Goetze, Germany.)-(Not proceeded with.) 2d.
Relates to the construction of an apparatus which can be folded up and placed in a case or in the pocket.
5450. FREFARATION OF ORGANIC BASES SUITABLE FOR THE MANUFACTURE OF DUE STUFFS, &c., J. H. Johnson, London.-19th November, 1883.-(A communication from A. Kern, Switzerland.) 4d.
The inventor claims, First, the preparation of tetramethyldiamidobenzhydrol and of tetraethyldiamidobenzhydrol and of tetraethyldiamidobenzhydrol for amide compounds of benzophenone) in alcohol solution with zinc dust and caustic alkalies; Secondly, the preparation of "leukobases" (or amido compounds of triphenylmethane and analogous hydrocarbons suitable for the manufacture of dye stuffs or colouring matters) by the condensation of tetraethyldiamidobenzhydrol or of tetraethyldiamidobenzhydrol or of tetraethyldiamidobenzhydrol with primary, secondary, or tetriary aromatic amines.
5382. COMPOUND MARINE ENGINES, W. B. Thompson, Durdes \_ bit November, 1883. (A tot merceded

aromatic amines. 5382. COMPOUND MARINE ENGINES, W. B. Thompson, Dundec.-15th November, 1883.-(Not proceeded with.) 2d. The object is to balance the driving power applied to the fore and aft cranks of triple compound marine engines. Over each cylinder so fordinary compound engines a high-pressure cylinder is placed, and both receive steam direct from the boiler, and alternately exhaust the same into the casing of the second cylinder, whence it passes to the largest or lowest pressure cylinder.

cylinder. 5456. WASHING MACHINES, J. Bryson, Bolton.-20th November, 1883.-(Not proceeded with.) 2d. Consists in securing a hollow metal tube in the centre of the bottom of the tube, which tube extends vertically upwards for about one-third of the depth. The "dolly" shaft or spindle, which is formed of metal, is continued beyond the legs, and the lower portion is inserted in the tube and rests upon a conical footstep at the bottom.

5457. WASHING AND DRVING GRAIN, J. G. Walker, Leith.-20th November, 1883. 6d. The inventor claims in the treatment of grain to remove the outer rind or husk, the effecting of this object as a continuous operation or as a continuous series of operations by the combined use of washing and drying apparatus. 5458. Bocra and Sugar S. J. K. Day, Glascon - 20th

5458. Boots AND SHOES, St. J. V. Day, Glasgow.—20th November, 1883.—(A communication from J. Pop-ham, Montreal.)—(Not proceeded with.) 2d. Relates to the means of forming the seams.

from M. Junger, Leipzig.)-(Not proceeded with.) 2 Relates to the general construction of the hammer

5461. UNFERMENTED DRINKS, E. Perrins, Birmingham. -20th November, 1883.—(Not proceeded with.) 2d. The object is to manufacture unfermented drinks from malt and hops.

5463. HEATING BEER, &c., E. Birch and P. J. Catterall, Manchester.-20th November, 1883.-(Not proceeded with.) 2d. The object is to enable hot or cold beer or other liquid to be drawn at will from the same barrel or vessel by the use of one and the same pump or lift.

5462. RAILWAY SIGNALLING, H. Morris, Manchester, 20th November, 1883. 6d. This relates to that class of signalling in which a shifting rail is employed to complete the circuit of

eded with.) 2d

18

electrical apparatus, carried on the locomotive itself, and is more particularly intended to replace the present system of "fogging." Reference is made to patents Nos. 1706 of 1881, and 1527 of 1882.
5464. PRODUCING COLOURED PHOTOGRAPHS, &c., A. Kepler, A. M. de Preumion, and A. Pigeau, London. 20th November, 1883.-(Not proceeded with.) 2d. Relates to the preparation of a solution or compound.
5465. METER FOR ELECTRIC CURRENTS, A. M. Clark, London.-20th November, 1883.-(A communication from L. Hours-Humbert, Besançon, France.) 6d. This relates to an instrument for measuring the image which the current passes through any or all of the translating devices in the working circuit; and consists of a combination of a rotating contact points; these, with the arm, being in sub-derivations of the primary derivations. An electro-magnet advances a registering apparatus every time the contact arm closes a circuit.
5466. INDICATING AND REGISTERING APPARATUS FOR LONGS, &c., F. M. Johnson, London.-20th November, 1883.-(A communication from Atteliers de Construction de Mulhouse, Mulhouse, Alsatia.)-(Not proceeded with.) 4d.
5467. PLASTIC CONFORMS, M. Mackay, London.-20th November at work and stopped.
5477. PLASTIC CONFORMS, M. Mackay, London.-20th November and stopped.

5467. PLASTIC COMPOUNDS, M. Mackay, London.-20th

November, 1883. 4d. The compositions are manufactured from a mixture of gum sandrac or gum kauri (singly or in combina-tion) shellac, with or without resin, carbon or asphal-tum, and asbestos, or other fibrous material or sili-cates.

tum, and asbestos, or other horous material or silicates.
5468. RIVETTED JOINTS, J. A. Rowe, North Shields.— 20th November, 1883. 6d.
Relates to the construction of rivetted joints between plates of steam boilers, receivers, or other vessels re-quired to resist internal or external pressure, so as to leave between the edges of the adjoining plates a space sufficient to allow of caulking the edges of the plates against the butt straps with a closely pitched line of rivets next edges, thereby obtaining a thoroughly tight joint with a large percentage of strength.
5469. SECONDARY BATTERIES, F. M. Lyte, London.— 20th November, 1883. 4d.
Relates to improvements on patent No. 3452 of 1883, and consists in supporting the active material, formed as studs or prisms, on plates of non-conducting material, having interposed between them a plate of lead, to which the studs are secured in suitable manner. The circuit connections are made to the lead plates.

TELEGRAPH AND TELEPHONE LINES, &c., H. H. 5471

5471. TELEGRAPH AND TELEPHONE LINES, &c., H. H. Lake, London.-20th November, 1883.-(A communi-cation from J. C. Chambers, Cincinnatti, and N. C. Gridley, Chicago, U.S.) 6d.
 Consists in combining with the working circuit one or more induction wires arranged in electrical prox-imity to the circuit and insulated from it, the sup-ports, and the earth, so as not to form a closed circuit. The induction wires are preferably bare.
 5472. Furgence Lung, H. Lake Landon, 20th

5472. ELECTRIC LAMPS, H. H. Lake, London.—20th November, 1883.—(A communication from T. J. McTighe and J. T. McConnell, Pittsburg, Penn., US) ord 6d.

U.S.) 6d. Consists in providing in an arc lamp a normally open path of low resistance around the arc having two points of closure, one of which is made by the ab-normal movement of the armature of the usual regu-lating helix, and the other by the lower carbon, the latter being broken by the pressure of the upper carbon on the lower one.

carbon on the lower one.
5473. MANUFACTURE OF OXIDE OF ZINC, A. P. Price, London.—21st November, 1883. 2d.
This relates to the manufacture and production of oxide of zinc by effecting the combustion and oxidation of metallic zinc contained in the combustible and other gaseous products arising from the treatment of ores, compounds, or products containing zinc.

5475. STEAM HAMMERS, J. Cochrane, Barrhead, N.B.-21st November, 1883. 6d. Relates to the making of the edges of the valve and of the ports by which steam enters the top of the hammer cylinder of an angular form, combined with arrangements for turning the valve independently of its longitudinal movements.

5477. TENTERING OR OTHER MACHINES FOR FINISHING FABRICS, J. Chadwick, Littleborough.—21st Novem-ber, 1883. 4d. The object is to improve the machine so that the selvedges of the fabric will be dried in about the same time as the middle portion.

5478. APPARATUS FOR CLEANING BOOTS AND SHOES, T. O. Jones, London.—21st November, 1883. 6d. Relates to the arrangement of circular brushes and polishing cylinders.

polishing cylinders.
5479. PREVENTING THE TEARING OF MATERIAL IN WHICH BUTTON-HOLES ARE FORMED, H. H. Lake, London.—21st November, 1883.—(A communication from E. Hambuger and J. Koch, Detroit, U.S.) 4d.
The inventor claims as a means for preventing the material around button-holes from tearing, a corru-gated wire secured between the lining and fronts of the article, and arranged to present one of the corru-gations in front of each button-hole of a series, the opposite portion of the wire being bent upon itself at right angles.
5480. Foop ror Young ANIMALS C. Simmer Lower

5480. FOOD FOR YOUNG ANIMALS, C. Simpson, London. —21st November, 1883.—(Not proceeded with.) 2d. Relates to the treatment of the celestial bean (Soja Hispada) to obtain a substitute for milk.

(Sola Hispada) to obtain a substitute for mink.
5481: HAND FIRE ENGINES, S. Bauer, Bonn.-22nd November, 1883. 6d.
The object is the production of a continuous or nearly continuous stream of water from the jet after a few strokes of the pump piston; also the means of readily connecting and disconnecting the said pump to a tank or other suitable reservoir.

5482. ELECTRODES USED IN THE ELECTRO-AMALGAMA-TION OF GOLD AND SILVER, &c., R. Barker, jun., London.-22nd November, 1883.-(Not proceeded with.) 2d.
 It is proposed to face the electrodes with platinum, gold, or aluminium.

5483. OBTAINING THIOCYANATES FROM THE MATERIAL USED FOR THE PURIFICATION OF GAS, H. J. Haddam, Iondon.—22nd November, 1885.—(A communication from Dr. S. Marasse, Berlin.)—(Not proceeded with.)

Relates to improvements in the general treatment of residues from gas works.

of residues from gas works. 5484. TREVELES, J. G. Parker, London.—22nd Novem-ber, 1883. 2d. Consists, First, in the combination of a pair of ad-justable treadles adapted to be operated in a standing position, with a double crank shaft, and a pair of con-necting rods; Secondly, the combination of a pair of adjustable treadles adapted to be operated in a stand-ing position, with a spring, a double crank shaft, and a pair of connecting rods.

5485. ELASTIC PAD FOR WET STAMPS, E. J. Walsh, Halifax. -22nd November, 1883.-(A communication from A. Callewaert, Brussels.)-(Not proceeded with.)

Relates principally to a pad composed of an elastic

5486. VELOCIPEDES, T. Lawson, Rochester.-22nd No-vember, 1883.-(Not proceeded with.) 2d. Relates to improvements in the steering gear.

5488. FURNACES for HEATING INGOTS, &C., E. W. Richards, Middlesbrough-on-Tees.-22nd November, 1883. 8d.

1883. 8d. Relates to the use for heating ingots and other rticles, such as slabs of steel, in an equable manner, f a furnace provided with chambers to contain

the articles to be heated in a vertical position, and so connected with one another and with the source of heat that the heating medium is caused to travel over the entire length of each ingot or article to be heated.

5489. TREATMENT OF ALKALINE SALTS AT HIGH TEM-PERATURE, &C., C. A. Faure, Paris.—22nd Novem-ber, 1883. 6d. This relates to improvements on patent 6058 of 1882.

and consists in forming the reverberatory vessel of compressed magnesia and imbedding in the bottom of the pan electric conductors, terminating at the sides in pole pieces, to which are attached the conducting mains

Manny, VELOCIPEDES, &C., N. Salamon, London, and A. G. Meeze, Redhill.—22nd November, 1883. 6d. Relates to improvements in the construction of velocipedes in which central three-throw cranks are used for driving the machine.

5491. CUTTING, GUMMING, AND PERFORATING LETTER, NOTE, AND MEMORANDUM FORMS, B. C. Scott, Lon-don.—22nd November, 1888.—(Not proceeded with.)

2d. Relates to mechanism, the construction and com-bination of which is designed for the purpose of pro-ducing out of a continuous length or roll of paper, novel designs or forms of letter, note, or memorandum forms, which are self-contained, and can be used for the purpose of correspondence through the post or otherwise, without separate enclosure or envelope. 5492 Arguing Straps, Lagels, dr. J. G.

otherwise, without separate enclosure or envelope.
5492. AFFIXING POSTAGE STAMPS, LABELS, &C., J. C. S. Wallace, London.—22nd November, 1883. 6d.
Relates to the construction of apparatus for damping and affixing the stamps.
5494. SUGAR-CANE MILLS, F. M. Rogers, London.— 23rd November, 1883.—(A communication from A. Leblanc, Cuba). 6d.
Relates, First, to the arrangement of rollers; Secondly, the position of injecting knives or chests on the underside only of the bagass, the knife having two or more chambers, and the openings being collique, so as to prevent the retention of add fluid ; Thirdly, the arrangement of brake by which both ends of the roller can be slackened or tightened up at the same time.
5495. LOOMS, T. H. Blamires, Huddersided.— 23rd Nov.

5495. LOOMS, T. H. Blamires, Huddersfield.-23rd Nov

5495. Looms, T. H. Blamires, Huddersided.—23rd Nov-ember, 1883. 6d. Relates to the combination of the warp beam and delivery roller or drum arranged in such manner that the warp beam is resting upon and in contact with the "letting-off" roller or drum, for the purpose of unwinding and delivering the warp with uniform regularity, notwithstanding the varying diameter of the warp beam.

5497. PRESERVING MILK, CREAM, &C., R. Hornby, Notting Hill.—23rd November, 1883.—(Void.) 2d. Relates partly to the mode of condensing the milk,

5501. BOOK SEWING MACHINES, R. Frank, Hamburg .-

5501. Book SEWING MACHINES, R. Frank, Hamburg.— 23rd November, 1883. 10d. Relates, First, to the employment of a number of needles operating in combination with one shuttle; Secondly, to the arrangement of such needles in sets, which alternately come into operation; Thirdly, to means for operating successively the needles belonging to the same set; Fourthly, to the employment of a reciprocating needle plate; and Fifthly, to means for facilitating the passage of the needles through the paper by puncturing or pricking the same before the needles come into action thereon.

5502. BLAST FURNACES, G. G. M. Hardingham, London -23rd November, 1883.-(A communication from

5502. BLAST FURNACES, G. G. M. Hardingham, London. -23rd November, 1883.-(A communication from L. D. York, Portsmouth, U.S.) 6d. The inventor claims in combination with the blast furnace and air-heating stove and its connections for driving heated air into the blast furnace, a gas pro-ducing source and stove and their connections, for driving the gas at a high temperature into the blast furnace.

furnace.
5503. TELEGRAPHIC AND TELEPHONIC APPARATUS, H. H. Lake, London.—23rd November, 1883.—(A com-munication from F. Van Rysselberghe, Schaerbeck, Belgium.) 8d.
This relates to combinations and arrangements of telephonic and telegraphic apparatus by which ordinary telegrams sent by the Morse, Wheatstone, or other telegraphic apparatus, and telephonic conversations may be simultaneously transmitted by the same wire or wires over long distances.
5504. Furcement, Currours, F. G. Honoard, Cuichle.

5504. ELECTRICAL CUT-OUTS, F. G. Howard, Crickle wood.—24th November, 1883.—(Not proceeded with, 2d.

The circuit is completed through mercury, and this being released by a plug when the current abnormal, flows away and breaks the circuit.

abnormal, Hows away and breaks the circuit. 5505. OBTAINING VOLATILE HYDROCARBONS FROM COAL GAS, &C., E. Drev, London.-24th Norember, 1883.-(Void.) 2d. In extracting light hydrocarbons for coal or shale gas the inventor causes the gas to bubble through, or pass in close contact with heavy oil, but the gas is caused to be in a greatly compressed state while in contact with the heavy oil.

5506. NON-ALCOHOLIC BEVERAGES, A. C. L. Weigel, Brighton.-24th November, 1883.-(Not proceeded with.) 2d, Relates to manufacturing non-alcoholic beverages

m grapes.

5508. CHECKING THE RECEIPT OF MONEY IN PUBLIC VEHICLES, &C., B. C. Scott, London.-24th November, 1883.-(Not proceeded with.) 2d. Relates to the construction of a portable box or case designed for containing rolls or continuous strips of blank paper which can be printed upon, delivered and severed intermittently, and given to passengers riding in which can be printed upon, delivered and

nt as cheques for the receipt of money.

ment as cheques for the receipt of money. 5509. MINERS' LAMPS, E. Evans, Llanrwst.-24th No-vember, 1883. 6d. Consists partly of a cylinder enclosing a large air space, and suspended by an easily-fused or easily-burned connection, placed near the wire gauze on the inside, in such manner, that if gas begins burning in the inside, the link shall be destroyed, and thus the connection shall be broken, and all intercourse be-tween the lamp and combustion chamber and the outside air shall be cut off. 5511. CIMPR-DUPERS, CIGARETTE-HOLDERS, AND PLES.

5511. CIGAR-HOLDERS, CIGARETTE-HOLDERS, AND PIPES, E. Edwards, London.—24th November, 1883.—(A communication from F. Bailac, Toulouse.)—(Not proceeded with.) 2d. Relates to providing a paper cylinder containing cotton wool saturated with astringent substances acting as antidotes to the nicotine.

acting as antidotes to the medine. 5512. SHIP RALWAYS AND CARRIAGES, J. B. Eads, London.-24th November, 1888. 1s. Relates to the use in connection with ship railways of a rigid lifting platform or dock operated by primary rams and fitted with secondary rams, in combination with a multiple track or section of the line fixed on the lifting platform, and a wheel carriage provided

with an adjustable frame or cradle, whereby the weight of the vessel when lifted on its cradle may be transferred from the secondary rams to the wheel carriage and uniformly distributed and maintained

5513. FLUES, &c., R. Evans, London.—24th November, 1883. (Void.) 2d. The flues are arranged for downward draught, all those of one building, or block of buildings, descend-ing to a channel below, which is in communication with an uncast short. with an upcast shaft.

5514. LOOMS, A. P. Dickinson and J. Conlong, Black-burn.-24th November, 1883.-(Not proceeded with.) 2d. The object is to stop the loom automatically when a float or break in the cloth occurs.

float or break in the cloth occurs. 5520. BURNERS FOR INCREASING THE LUMINOSITY OF GAS FLAMES, F. Siemens, Dresden.—26th November, 1883. 6d. Consists in gas burners wherein the gas issues in a series of small jets, in inclosing the lower part of the flame by a metal casing that serves to take up the heat radiated by such inclosed part of the flame, and to impart the same to the gas and air supply. 5520. We resource W. Without Continue 2014.

5523. VELOCIFEDES, W. Hillman, Coventry.-26th November, 1883. 6d. Relates, First, to the construction of the framework of a tricycle; Secondly, to the construction of a ball pedal.

5524. SECONDARY BATTERIES, G. F. Prescott, Dublin. 26.2.1. SECONDARY DATTERIES, G. F. Preseott, Dublin,— 26th November, 1883.—(Not proceeded with.) 2d. An oxide of lead and metallic lead are intimately mixed together while under a high temperature, the plates being formed, by compression, from the mass. 5525. SUBSTITUTE FOR BISULPHIDE OF CARBON, P. G. W. Typke, W. R. King, T. T. P. B. Warren, London.-26th November, 1883. 4d.

London.-26th November, 1883. 4d. Relates to the production from petroleum of a sub-stitute for bisulphile of carbon, and which can be used for extracting oils and anthracine for dissolving gums, resins, and analogous substances for water-proofing and for vulcanising india-rubber, in conjunc-tion with chloride of sulphur or other vulcanising accent.

agents.
 5529. ELECTRICAL RAILWAYS AND TRAMWAYS, J. Enright, London.-26th November, 1884.-(Not pro-ceeded with.) 2d.
 The circuit is completed through a number of brushes fixed to an insulated conductor laid along the line, making contact with a conductor fixed on the train, preferably its whole length.

train, preferably its whole length. 5540. SECONDARY VOLTAIC BATTERIES, A. Khotinsky, London.-27th November, 1883. 4d. The cell is made in the form of a shallow trough divided by a low aig-zag partition into two compart-ments having branches interspaced with one another, each compartment containing a sheet or shallow layer of one of the elements, and both being covered over the partition with the exciting liquid. EE45. Memoarcement B. L. Canal, Mean Palaine.

5545. MICROPHONES, F. J. Semal, Mons, Belgium.-27th November, 1853.-(Not proceeded with.) 4d. A small ball of carbon completes the circuit between a number of cylinders of carbon attached to a suitable sound-board, on the board being caused to vibrate.

5562. GENERATING ELECTRIC CURRENTS, A. B. Cunning ham, London.—28th November, 1883.—(Not proceede with.) 2d. To prevent waste the generating machinery is covered with a hood of non-conducting material.

covered with a hold of non-conducting material.
5584. ELECTRIC IGNITING APPARATUS, H. J. Haddan, London.-30th November, 1883.-(A communication from F. Witte, Vienna.) 6d..
A small electrophore is provided with a handle and tubes containing blotting paper saturated with thio-alcohol. The flame produced flashes out of a hole in the tube and ignites the wick of a small lamp.

the tube and ignites the wick of a small lamp.
5592. FILE WHEEL FOR GRINDING CARDS, E. Duf-ricke-Miroude, Paris.-1st December, 1883. 6d.
This relates to the steel blades mounted upon rollers so as to form file wheels. The blades are arranged independently and alternately upon the roller, the first set being made of steel and magnetised on both sides of the angle forming the cutting edge by electricity while working, the second set, also of steel, being shaped on one side only, and having the other side covered with emery.
5623. DETECTING BURGLARS, &c., G. L. Pearson, London.-eth December, 1883.-(Not proceeded with.) 2d.

London. -4th December, 1883.-(Not proceeded with.) 2d.
An electric circuit embracing a revolving lamp out-side the house and bells within the house is completed on any of the doors or windows being opened.
5874. ELECTRICAL CONDUCTORS, R. H. Brandon, Paris. -27th December, 1883.-(A communication from H. F. Campbell, Concord, N.H., U.S.A.) 6d.
The conductor is provided with a covering of insula-ting material, and this is melosed within an anti-inductive shield forming an envelope and composed of paramagnetic and diamagnetic substances, the shield also forms part of a complete electric circuit, independent of the inclosed conductor. The shield may be wound spirally on the cable.
5899. ARRANGEMENT OF TILES, &C., FOR EDUCATIONAL

10.85 De world spirally on the CADIe. 5899. ARRANGEMENT OF TILES, &C., FOR EDUCATIONAL PURPOSES, D. Clarke, Birminghum, and P. Shrap-net, London.—28th December, 1883.—(Complete.) 24. This consists in applying tiles to the walls of schools or other buildings, such tiles being decorated with suitable designs for educational purposes.

SELECTED AMERICAN PATENTS. From the United States' Patent Office Official Gazette.

299,098. FAN BLOWER, Frederick C. Anderton, San Francisco.-Filed March 7th, 1882. Claim.-(1) In a fan blower, the combination, with the main fan F, set in line with the blower case, of the two smaller auxiliary fans E, set one on each side of the main fan , and each having one side exposed to the atmosphere without cover, and having blades e, drawing in the air and delivering it to the centre of

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B the main fan, as set forth. (2) In a fan blower, the combination of the blower case and annular discs or plates B, having the wide flanges  $B^1$ , surrounding the circular openings, the yokes y y, shaft D, central fan F, and side fans E, revolving in the circular openings surrounded by the flanges B<sup>1</sup>, substantially as set forth.

THE 'B-

299,117. CONSTRUCTION OF ELECTRIC MACHINES, Philip Dicht, Elizabeth, N.J.—Filed April 5th, 1883. Claim.—(1) An electric machine having a driving pulley, in combination with pivottal supports for said machine, and with means for adjusting the height of one of said supports, and thus varying the tension

of the driving belt for said pulley, substantially described. (2) An electric machine having a drivin pulley, and constructed with a fixed pivottal suppo at one end and an adjustable support at the oth

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adjustable

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purpose specified.

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JULY 4, 1884.

B combined with means for changing the height of adjustable support, and thus varying the ten of the driving belt for the said pulley, substant as described.

as described. 299,467. ELECTRIC CIRCUIT CONNECTION, David E Drake, Newark, N.J.—Filed October 4th, 1883. Claima.—(1) The combination, with a socket contain ing recesses or grooves, and contact strips, formin the terminals of a circuit secured therein, of a plu and raised contact strips secured thereon, an arranged to register with the grooves in the socket, and for the purpose set forth. (2) The combinatio

with an insulating cup or socket having grooves o recesses in its walls, and contact strips contained therein of a circular plug, raised contact strips secured thereto, and conductors passing through the plug and connected to the contact strips, as and for the convergence died

Gröndahl, Portland, Oreg.—Filed November 24th, 1883. Claim.—A pulley having a hub b, with an inter-mediate ring c, fastened to b by taps or spokes  $e^{i} \partial_{i}$ , which are fastened to the ring e by keys or pins or other suitable mechanism, and allowed to swing in the

hub b, the taps or spokes  $e^{11} e^{11}$  fastened to d in a similar way as  $e^1 e^1$  to  $e_1$  and d allowed to swing on taps or spokes  $e^{11} e^{11}$ , all substantially as set forth, and for the purposes specified.

CONTENTS.

THE ENGINEER, July 4th, 1884.

(Illus.)

CIETY'S SHOW

10 10 10

12

14

THE DEANE PUMP. (Illustrated.) RECENT IMPROVEMENTS IN PHOTOGRAPHY. (Illus AN INDIAN MOUNTAIN RAILWAY. (Illustrated.) CROSSHEADS AND GUIDES. (Illustrated.). RAILWAY MATTERS... NOTES AND MEMORANDA MISCELLANEA LEADING ARTICLES— THE HEALTH EXHIBITION ... GAS SUPPLY ELECTIC LIGHTING THE RAILWAY HALF-YEAR... TRACTION ENGINES IN SHEFFIELD ... LITERATURE—

THE BRAZILIAN IRONCLAD RIACHUELO. (Illus.)

 Royal Irish Agricultural Society's Show

 TERDERS

 Letters to the Editor—

 Hydraulic Lifts

 PROSPECTS OF YOUNG Engineers

 Crystal Palace Exhibition

 HEavy GUNS

 Amalgamated Society of Engineers

 Water-Tube Boilers

 Working Titanic Ores

 The Iros, Coal, and Geveral Trades of Bir-Mingham, Wolvenhampton, and District

 Notes from Substitie

 Notes from Substitied

 Notes from Scotland

 Notes from Scotland

 Notes from Scotland

VOLTA AND MAGNETO-ELECTRIC INDUCTION ROYAL IRISH AGRICULTURAL SOCIETY'S SH

LITERATURE-ACROSS THE PAMPAS AND ANDES ACROSS THE PAMPAS AND ANDES

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SELF-ADJUSTING PULLEY, Wilhelm A. dahl, Portland, Oreg.-Filed November 24th,