INCANDESCENT LAMPS AT THE VIENNA EXHIBITION.

THE last few years—even the last few months—have produced many new developments in the manufacture of incandescent lamps. These have been chiefly in the direction of producing lamps of greater candle power, but some entirely novel designs are exhibited at the Vienna Exhibition. The newest and most remarkable of these is that of Bernstein, to which we will refer at some length at the end of this article.

The chief exhibitors of incandescent lamps are Ganz and Co., who exhibit Swan lamps; the Paris Edison Company; Siemens and Halske; Siemens Bros., of Charlottenburg; the International Electric Company (Anglo-Austrian Brush) who use the Lane-Fox lamp; the Société Anonyme d'Electricité de Paris, whose lamp is that of Gérard; Müller, of Hamburg; Bernstein, of Boston; and the United States Electric Lighting Company, who work the Maxim lamps.

Swan has for some years past made very small lamps of different sizes, besides the standard size of twenty candles. These small lamps have been called "button-hole" lamps. They have been used chiefly in theatrical decoration, and no doubt also for attachment to fancy ball dresses. At this exhibition the new larger sizes of lamps are more interesting. In both the small and the large sizes the double turn given to the filament has been abandoned, and the simple bow, like that of Edison's lamp, is adopted. The largest size is designed for about 200 candle power. This is enclosed in an oval glass globe 3½in. diameter by 6in. long. The carbon strip forms a simple bow 3½in. high, the legs of the arc being ⅞in. apart, and the width of the strip ⅛in. approximately. The difference between the largest and smaller lamps lies simply in the dimensions of the carbon filament. The small size, rated at 16 candles, has a simple bow ¾in. high, contained in a 2in. round glass globe. In the 20-candle lamp the carbon strip takes a double turn about 1in. high, the glass globe being 2½in. In both these the strip is about 1 mm. wide. These are made longer, slightly thicker, and considerably wider in the large sizes. The length and width are increased in order to give greater light-radiating surface. The section, however, is increased in greater proportion than the length, so that the electrical resistance of the filament diminishes in inverse proportion to the light-giving power required. All the lamps are designed to require the same electro-motive force when lighting to their full power. It follows that they are designed to have a lighting power proportioned to the current sent through them. The following are the proportions :—

Lighting power in normal candles.	Electro-motive force in volts.	Resistance in ohms when hot.	Current in ampères.	Energy per second in volt-ampères.
200	104	8	13	1356
100	104	16	6½	678
50	104	32	3¼	339

Volt-ampères per candle power, 6·78.

These must be regarded as only approximate figures. In practice, of course, the electro-motive force is not quite steady, and from 100 to 110 volts are used. Also it is only a rough approximation to the truth to say that the light-giving power is strictly proportional to the current for the same electro-motive force. The heat generated in the filament in the lamp is so, but the light radiated per second is not strictly proportional to the heat generated. On the supposition that this is an exactly true proportion instead of only a roughly approximate one, it may be interesting to show how the above mode of proportioning the resistance gives the required result.

Let L represent the candle-power of the lamp, C the current, and R the resistance of the filament. We notice that according to the proportions adopted in the design $R = \frac{16 \times 6\frac{1}{2}}{C}$. Now the heat generated is proportional to $C^2 R$, and if H represent the heat generated in one second, in Gramme-cent. degrees, $H = 0{\cdot}24\ C^2 R$. Therefore, $H = 0{\cdot}24 \times 16 \times 6\frac{1}{2} C$, or this heat is proportional to the current. According to the above figures the proportion between the current and the candle-power is $C = \frac{6\frac{1}{2}}{100} L$. Inserting this value of C we get the proportion between the heat generated per second and the candle-power of the lamp—

$$H = 0{\cdot}24 \times 16 \times \frac{6\frac{1}{2} \times 6\frac{1}{2}}{100} L = 1{\cdot}62\ L.$$

We have called this "heat," but it must be understood that it includes the energy given off as light. The whole of it is not given off from the surface of the wire in the form of heat. Part is converted into light, that is, into visible radiating energy. What is not so converted is thrown off from the surface of the filament as non-visible radiating energy. If it were all given off as heat, and utilised to heat water by plunging the lamp in water, the number of grammes of water that would be heated in one second through one degree Cent. would be 1·62 times the candle-power of the lamp. This is the meaning of the above equation. Otherwise stated, the number of pounds of water heated one degree Cent. in three quarters of an hour, would equal the candle-power of the lamp.

It must be understood, of course, that these figures apply only to the Swan lamp as above designed, namely, on the principle of using the same electro-motive force for all sizes of lamps, and making the resistance vary by inverse proportion to the desired candle-power, so that the current varies in direct proportion to the same. A similar, but not the same, proportion will hold for all other incandescent lamps designed on the same principle; but such lamps do not need to be worked all with the same electro-motive force, nor to have their full lighting power proportional—for different sizes of lamps—to the current sent through them. To make this clear, suppose that the above 100-candle Swan lamp were worked with 78 volts, or three-fourths the electro-motive force it is intended for. The current will now be less, and the temperature less; therefore the resistance will now be greater, and the current will be reduced in a greater proportion than three-fourths. The amount of heat generated may, as above, be represented by $0{\cdot}24\ C^2 R$, but for our present purpose is more conveniently stated by the formula $0{\cdot}24 \frac{E^2}{R}$, where E is the electro-motive force in volts. R having increased, this heat generated per second is reduced in a greater proportion than the square of the electro-motive force—that is than $(\frac{3}{4})^2$. It is, in fact, considerably less than one-half of what it was before. Furthermore, the lower the temperature the less is the proportion of the light radiated to the whole radiant energy. Thus the light obtained increases in a very rapid ratio, something like that of the cube, with the electro-motive force. It is also to be noticed that the higher the temperature the greater is the proportion of pure white light to the whole light radiated, as has been shown by Dr. Wm. Siemens' spectroscopic measurements. The object to be aimed at, therefore, is to attain as high a temperature as possible, both for the sake of economy in the expenditure of mechanical power in the production of the light, and for the sake of purity of light. The "full power" of a given lamp is the light it will give when fed by the strongest current it will bear without injury for a long time, say for several months.

The mode of connection of the terminals of the Swan lamp to the conductors in the holder remains the same as it has been for some time past, and indeed could not be much improved in simplicity and efficiency. It is effected by two pairs of small hooks forming the ends of platinum terminal wires and those of the copper conductors respectively, which slip over each other, and are made to bear against each other by the expansive elasticity of the brass spiral spring which forms the upper part of the holder.

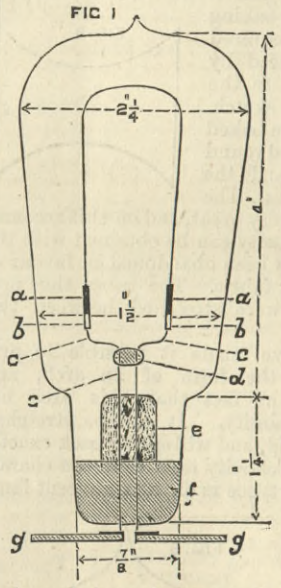
The form of the Edison lamp remains quite unmodified, and has been so often described that we need say nothing of it here. There are four sizes of lamps exhibited at Vienna, of 8, 16, 33, and 100-candle power. This last has been produced for the Exhibition specially, merely as a set-off against the big lamps shown by other makers. The company do not recommend the use of lamps of large candle-power. The following are the dimensions of the different sizes :—

Candle-power.	Electro-motive force required. Volts.	Resistance when cold. Ohms.	Resistance when hot. Ohms.	Current. Ampères.	Length of carbon filament. mm.
8	50 to 55	125	70	¾ about	80
16	100 to 110	250	140	¾ ,,	80
33	100 to 110	125	70	1½ ,,	150
100	100 to 110	—	25	4 to 4½	200

Volt-ampères per candle-power, about 4·7.

There is no essential difference between the incandescent lamps manufactured by Siemens and Halske, of Vienna, and those by Siemens Bros., of Charlottenburg. They differ only in external form. The filament is made from cotton thread, and is bent in a single bow of the Edison form, as shown in the accompanying Fig. 1. The lower ends are thickened at *a a*; the outer small rectangular envelopes *b b* being of sheet copper. From these issue the platinum wires *c c*, which lead down to the brass terminal plates *g g*; *d* is a small bead of glass enamel, which serves to keep the wires at the proper distance apart; *e* is a glass tube packed with an insulating mixture of water-glass and asbestos. At the base the whole is sealed by a thick layer of gypsum. The air is exhausted from the upper end of the globe after these parts have been fixed in place, the glass being drawn and sealed when the required vacuum has been attained. The plates *g g* are stout rectangular strips of brass, which slip under similar strips in the holder, the interior of which is composed of a small cylindrical block of vulcanised fibre. In two holes in this block lie two brass knobs pressed upwards by spiral springs against the plates *g g*. The dimensions shown on the sketch are those for a 16-candle lamp. There are three sizes exhibited, whose electric dimensions are as follows :—

FIG 1



Candles.	Resistance when hot. Ohms.	Current. Ampères.	Electro-motive force.	$\frac{E^2}{R}$ Volt-ampères.	Volt-ampères per candle power.
12	200	·52	105 volts	54·6	4·5
16	140	·75	for all	78·7	4·9
25	85	1·25	sizes.	131·2	5·2

The Lane-Fox lamps, used by the International Electric Company, are all—*i.e.*, all in use in this Exhibition—of approximately 18-candle power. The illumination which has been undertaken by this company, stretching, as it does, down the Elizabeth Allée, one of the avenues through the Prater to the Rotunda, extends probably over a greater length of conductor than any other installation in the present Exhibition. In another article we will give a plan map showing to scale the routes by which the mains are taken and the positions of the two accumulator batteries used as relays. The central station is in the north machine gallery. To the east currents have to be supplied to six of the "interiors" lighted by Lane-Fox lamps. Current is also supplied to arc lamps in the gallery of the Rotunda. To the east the mains stretch along the Elizabeth Allée to a distance of 650 metres, or $\frac{4}{10}$ths of a mile from the central station.

As each lamp forms a bridge from the out to the return main, it is evident that the electro-motive force which feeds each lamp, that is, the difference of potential between the terminals of the connections of the lamp with the out and return mains, decreases with the distance of the situation of the lamp from the central station. The decrease is so considerable on a long line that, in order to keep the distant lamps up to full power, their filament resistance has to be correspondingly decreased. This is done by sorting out the lamps as received from the factory in accordance with their tested resistance. For 18-candle power the resistance aimed at is 88 ohms when the lamp is cold, but variations always arise in the manufacture, which are taken advantage of in the above manner, The electro-motive force available for the lamps in the present case varies from 63 to 51 volts, and the corresponding resistance required in the lamp varies from 50 to 40 ohms when hot. This gives a uniform current of 1¼ ampères to all lamps. The normal, or average, electrical dimensions of the lamps are as follows :—

Candle-power.	Electro-motive force. Volts.	Resistance hot. Ohms.	Resistance cold. Ohms.	Current. Ampères.	Volt-ampères.	Volt-ampères per candle-power.
18	60	48	88	1·25	75	4·16

Since 746 volt ampères are usually reckoned as one electrical horse-power, the above is at the approximate rate of 180 candles per electrical horse-power. The company's engineers calculate the luminous or light-radiating surface of the filament at the rate of one square inch per 180-candle power. These filaments for the Lane-Fox lamps are peculiar in being made of specially small and circular section. They have a diameter of between $\frac{1}{200}$in. and $\frac{1}{100}$in., and are about 4in. long. For a 4in. length the above proportion would give the diameter ·008in. Considerable changes and improvements have been lately made in the manufacture of these lamps. The filament is made of cotton thead, which is steeped in a solution of sulphuric acid for five hours to destroy the fibre and obtain greater homogeneity of substance, the strength of the solution being changed about once an hour. The fibres are first dipped in the vessel containing the strongest solution, and enter the weakest last. When thus prepared the thread is coiled round a sort of frame or bobbin formed of a flat plate of hard gas coke carbon about ½in. thick and 3in. square. In one edge over which the thread is coiled is cut a narrow groove into which is slipped a piece of millboard, over the projecting edge of which the thread is wound. The opposite edge of the carbon disc is rounded off to give the desired bow form. These frames are then placed in a crucible and packed round with finely powdered plumbago; and the whole is then baked at a white heat. The heat makes the millboard become friable and easily crushed, so that it gives way and allows for the shrinkage of the thread in being carbonised without breakage of the latter. The accompanying Fig. 2 shows this frame with the thread wound on it. Figs. 3 and 4 show the lately modified forms of lamp

FIG. 3

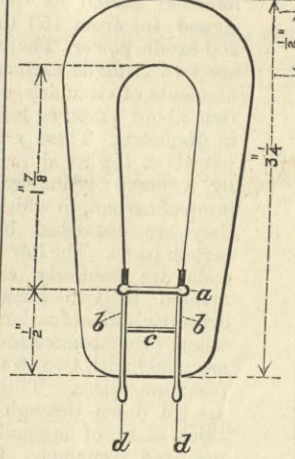


FIG. 2

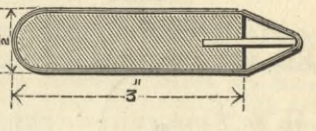
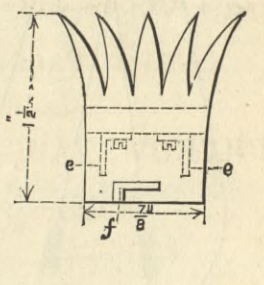


FIG. 4



and holder. In Fig. 3 *a* is a stout bridge of enamel, connecting the two small glass rods *b b*, which are again bound together lower down by the glass bridge *c*, and terminate at their lower ends in two stout bulbs of enamel. These glass stems *b b* are wrapped round two platinum wires *d d*, to which, just above the points at which they issue from the bulbs of *a*, are fastened the ends of the carbonised filament by carbon paste. The holder B, Fig. 4, is a short length of brass tube split and opened out in trumpet shape at top, and having inserted at about the middle of its length a stout diaphragm of vulcanised fibre. To the latter are screwed two angle strips of brass *e e*. The terminal wires *d d*, Fig. 3, are brought underneath these screws, and form the only binding connection between the lamp globe and the holder. We should say that the lower ends of *d d* are frequently made of copper for the sake of greater cheapness. The slit *f* and a corresponding opposite slit enable this holder to be easily fastened to a lower wooden holder. In this two internal brass screws make contact by pressing against the slightly springy plates *e e*. This contact is not made until the lamp has been properly attached by turning it round, the slits *f* sliding over the brass pegs on which they catch. The design of the lamp has thus been reduced to a form eminently suitable for cheap manufacture and for simplicity and safety of attachment.

The Maxim lamp, used by the United States Electric Lighting Company, has undergone no essential change in design, the company having devoted its attention to the perfecting of the manufacturing processes, so that it now gets carbon filaments of much greater uniformity and reliability than formerly. The carbon is denser and more homogeneous in character and in thickness, and the company is thus enabled now to guarantee its lamps a life of 2000 hours. It adheres to the M form of filament, but has made its glass globes somewhat smaller. It has only one size in use at the Vienna Exhibition, which has the following electrical dimensions, there being a slight variation made for the lamps used at the end of the circuit, where the electro-motive force has fallen off to some extent.

	Near end of circuit.	Far end of circuit.
Candle-power	45 to 50	45 to 50
Resistance, cold	75 ohms	65 ohms
,, hot	40 ,,	35 ,,
Electro-motive force	70 volts	—
Current	1·75 amp.	—
Volt-ampères	122	—
Volt-ampères per candle-power	2·5 to 2·7	—

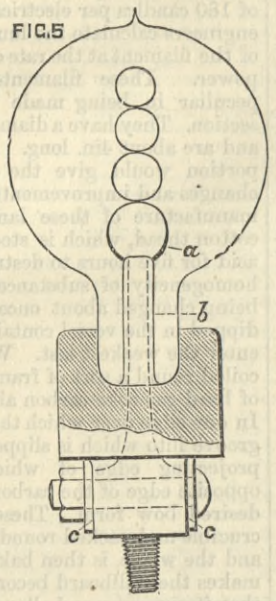
The above figures are given on the authority of Mr. Farquahar, the representative of the company at Vienna. It is to be noticed that the volt-ampères per candle-power is extremely low, and it is possible that the candle power has been somewhat over-estimated.

The lamp of Mr. Müller, of Hamburg, has been in the market for some time. It is made in various sizes, from 2 up to 100-candle power. We give the measurements of what is termed the 20-candle lamp, made by Mr. F. Uppenborn, of Mr. S. Schuckert's establishment, whose accuracy may be relied on—

Candle-power.	Electro-motive force.	Current.	Resistance hot (deduced from electro-motive force and C.)	Volt-ampères.	Volt-ampères per candle-power.
	Volts.	Ampères			
18·5	105	·75	140	78·8	4·47

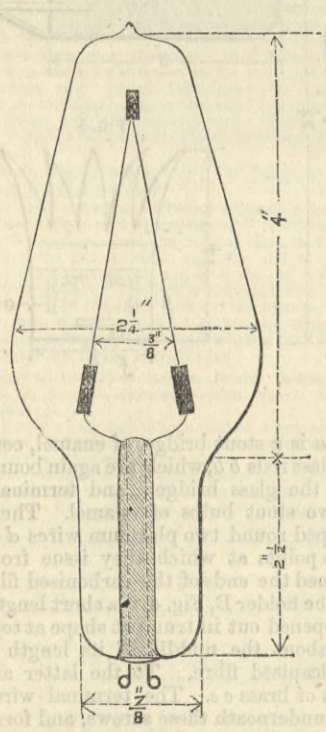
The carbon filament is in this lamp twisted to the form of a double spiral, its ends being cemented to two tapering horns of enamel *a* wrapped round the upper ends of the platinum wires, and fused to the top of a stout stem of glass *b*, in which the platinum wires are embedded. The whole is inserted in an ebony holder, which has at its base a tapered screwed portion. The platinum wires are led down through the ebony to two small flat brass plates *c c*, which are held to the sides of the ebony block by a bolt and nut also made of ebony. The larger sizes have two turns of the double spiral, giving the appearance of three loops, as in the figure, while the smaller have one and a-half or only one turn. For all sizes up to the ordinarily used one, namely, 20-candle power, the filament is evidently made as thin as possible, and apparently of about the same diameter for all sizes up to this limit, the lengths being less for smaller candle-power. For the large powers the carbon is made much thicker but very little longer.

FIG.5



The Gérard lamp is quite new. It is shown in the annexed sketch as designed for from 150 to 200-candle power. There are two straight carbon filaments of circular section, about ½ mm. or less in diameter. These are joined at top as shown by a small cylindrical lump of carbon, in which they are cemented by carbon paste. The lower ends are similarly cemented to two larger cylindric lumps of carbon, where the connections are made with two stout platinum wires. These are led down through a thick stem of specially prepared enamel, in which they are embedded. They end in a couple of eyes formed by bending them round, and the coupling to the holder is made in a very similar manner to that of Swan's lamp. In the larger sized lamp, which is said to give from 400 to 500-candle light, there are four exactly similar carbons coupled in the above manner in two pairs, and through which the current runs in series, the junction between the pairs being made by a short cross piece of some carbon stick, and this junction hanging free in the vacuum, so as to allow free expansion of the whole—see Fig. 7. The electrical dimensions given are—

FIG.6.



Candle-power.	Electro-motive force. Volts.	Resistance hot. Ohms.	Resistance cold. Ohms.	Current. Ampères.	Volt-ampères.	Volt-ampères per candle-power.
150-200	56	8	20	7	392	2 to 2·6
				Higher limit		
400-500	56-75	6¼ to 7½	19	7·5 to 12	900	1·8

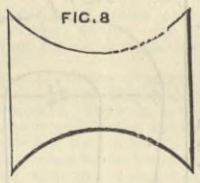
One of this latter large power has been tried with a 7 to 8 ampères current for 600 hours, and found to hold out without signs of injury. The experiments are at present being continued. Another was tried with an 18 ampères current, when the platinum wires melted, but the carbons remained intact. The long narrow base of the glass globe has for object the diminution of temperature of the glass where it joins the socket. The carbon sticks are Carré carbons, made by squirting a paste of powdered coke through a tube, and baking the rod thus obtained. To make these suitable for incandescent lighting the sticks so prepared are further carbonised by depositing carbon on their surfaces from a hydrocarbon gas, in which the sticks are held while a current is passed through them to bring them to a white heat. This process is continued until the desired resistance for the lamp is obtained, the resistance being measured from time to time as the deposition proceeds. It was found very difficult to find a paste with which to cement together the upper and lower ends of the straight sticks, which would endure the high temperature sufficiently long. A very large number of substances was tried before the one now used was decided upon. This and the next lamp we describe are among those that cannot be said as yet to have been officially tested. The above numbers are given on the authority of the makers. We will await with interest the results of the exact experiments that the Scientific Commission will presumably make, in order to see whether the high claims put forward for the latest improved Maxim, the Gérard, and the Bernstein or "Boston" lamp are entirely well founded.

FIG.7

The Bernstein lamp is creating more sensation than any other at the Exhibition. Mr. Bernstein considers that, other things being equal, the greater the surface of the light-radiating solid, the pleasanter and more efficient will be the lamp. There can be no doubt about the greater pleasantness to the eye due to the less concentration of the light source. There is much debate, however, as to the unmitigated advantage of a large surface. The greater the surface, it is argued, the quicker is the cooling effect; and, as the temperature to which the filament is raised depends on the ratio of the rate of generation of energy to the rate of cooling, it is inferred that a lamp with a comparatively large filament surface cannot attain a high temperature, and therefore cannot be economical as a light producer. We cannot say that we think this argument a safe one. The rate of cooling by conduction or by connection would certainly be proportionately greater with greater surface; but it has to be remembered that the cooling here takes place wholly by radiation, and when the radiating surface is a completely closed one, and not merely a portion of a larger surface, we expect that the total amount of radiation at a given temperature does not increase so rapidly as in direction proportion to the extent of that surface. If Mr. Bernstein's measurements of his own lamp are correct, which is very doubtful, it shows it to be extraordinarily economical as a light producer from mechanical energy.

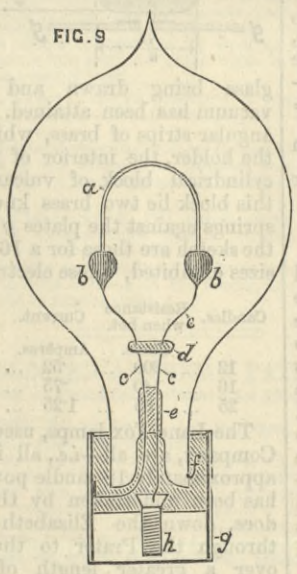
The mode in which the inventor sought to attain the above object was to make the carbon hollow while not increasing its cross-section, an idea that has probably occurred to many, but which no one has heretofore carried out with practical success. He made many experiments with straw, and with carbon cylinders produced by depositing carbon on a metal mandril and then dissolving the metal out. At the time of his American patent he considered paper to be the best material he could use. This he rolled round a mandril, making the different layers adhere by a weak solution of gum or starch, which readily carbonise in the subsequent baking process. The thickened ends required for the carbons were produced by cutting the sheet of paper to the shape shown in the annexed sketch. The tubes thus produced were baked in a plumbago crucible packed round with powdered plumbago, and the baking took place at a white heat. The contraction was found to be very great, and on this account, and because greater homogeneity can be obtained with the now-used material, paper has been abandoned in favour of a finely woven cotton or silk fabric. The tubes thus produced were straight, and were stretched between two platinum wire terminals.

FIG.8



Later improvements have made it possible to produce these fine tubes in the form of an arch, and more remarkable still is the fact that this arch has a very large range of pliability. It can be stretched almost straight out when cold, and will spring back exactly to its original form. This elasticity is, of course, a characteristic of the highest importance in an incandescent lamp carbon. The glass globe is spherical in form, drawn and sealed at the top when the vacuum is made. It has a long cylindrical base to prevent the temperature rising too high at its junction with the gypsum; *a* is the hollow carbon tube, cemented with a special carbon paste, the composition of which is kept secret, to very large pear-shaped terminals *b b*. To these are attached stout copper wires *c c* leading down through the enamel bridge *d* and the enamel stem *e*, the one wire to the brass screw *h* and the other to the outer brass tube *g*. The glass globe is cemented in this brass tube *g* by the means of gypsum *f*. The holder is a round block of wood, in the centre of which a brass tube, screwed internally, screws on to *h*. Small strips of brass, with a tendency to spring outwards from the cylindrical surface of the wood block, come in contact with the interior surface of the tube *g*. To the outside of the wood block connections are made by stout copper wires to these external and internal contact pieces. The contact is not directly made, but by means of a small wedge-shaped plug which fits between two flat obliquely set spring plates, but which is pressed outwards out of contact by a small spiral spring.

FIG.9



On pressing it inwards a shoulder on the wedge spindle is caught by a transverse peg, which is also pressed home by a spiral spring. When disconnection is to be made, this latter transverse peg is pushed downwards, and the wedge immediately flies outwards. Thus imperfect connection or imperfect disconnection is made impossible by a very ingenious device occupying very small space, the two operations being completed by merely pressing two small buttons. The electric dimensions of this lamp are:—

Candle-power.	Electro-motive force.	Current.	Resistance hot.	Volt-ampères.	Volt-ampères per candle-power.
65	23	7	3·3	161	2·5

A larger size is also exhibited, giving about 150-candle power with 46 volts. The resistance has not yet been very accurately measured. Mr. Bernstein has designed his lamp for a small E.M.F. on two grounds; firstly, because it has been practically proved that the carbon disintegrates with a rapidity greater in proportion to the E.M.F.; and, secondly, because the small E.M.F. permits a large number of lamps to be arranged in series. He claims that it is especially suited for separate installations, such as that of a theatre, a large workshop, or a large shop, and also for street lighting, but it must not be forgotten that Mr. Bernstein is working in direct opposition to the direction taken by other makers, who all favour high resistances, and high electromotive force, because with these alone can the cost of long leads be kept down. To put this in another form, we may point out that the greater the pressure at which water is delivered, the smaller is the pipe that will suffice to transmit a given power. In the same way the higher the E.M.F. the less in diameter may be the leading mains from the dynamo. These lamps are at present only made in Boston, but it is intended to establish a manufactory of them in Europe shortly.

THE BRITISH ASSOCIATION.

The fifty-third meeting of the British Association began at Southport, Lancashire, on the 19th inst. The attendance promises to be fairly large, and some good papers will be read. Among the papers expected or announced or read are the following:—In Geography: Mr. H. H. Johnson, on the Congo; Mr. Colborne Baker, on his Chinese experiences and the discovery inland of a buried forest; on the Shan States, by Mr. Holt Hallett; on New Guinea, by Mr. Coutts Trotter; on Madagascar, by the Rev. M. Sibree; on the floral development of the Jordan geographically considered, by Mr. Cope Whitehouse; on Athabasca and the Canadian lakes, by Father Petitot—just awarded the Back premium of the Royal Geographical Society; on the topography and ethnology of the district to the west of the Hudson's Bay Territory by the Chevalier Ernst von Hesse Warttegg, and on the holy Tunisian city, Kirawan, by Mr. E. Ray, of Birkenhead. In Mechanics: On Alpine railways and the Euphrates Valley Railway, by Mr. J. B. Fell; on the Mersey Tunnel, by Mr. C. D. Fox; on the Portrush Electrical Tramway, by Mr. A. Siemens and Dr. E. Hopkinson; on the first electric launch, by Mr. E. Reckenzaum; and on the Manchester Ship Canal, by Mr. Leader. In Economy: On Canada, by Mr. H. Moody, Sir J. Rose and Sir C. Tupper probably being present; on the depreciation of gold, by Mr. Shadwell: on the distribution of wealth, by Professor Levi; on the uniformity of statistical records, by Mr. Baden Powell; on the cotton trade, by Mr. E. Guthrie; on the teaching of science, by Mr. Lant Carpenter; and on the anomalies and effects of port charges, by Mr. R. Capper. In Biology communications are expected upon the structure of plants in reference to the very recent discovery of a continuity of the protoplasm of plant cells through the cell walls; so that a plant is, as Mr. Darwin suggested, a continuous mass of protoplasm. Papers are also expected on bacteria in relation to disease, on new wheel animalcules and new worms, and on the exploration of Timor-laut.

On Wednesday evening the first general meeting of members was held in the pavilion of the Winter Gardens, which had been suitably decorated, and presented an imposing spectacle. On the platform were the presidents of the sections and Principal Dawson—Montreal—Professor J. C. Adams, Professor Stokes, Professor Hull, Sir Erasmus Ommanney, Professor Dewer, Principal Greenwood, Professor Roscoe, Dr. W. B. Carpenter, Captain D. Galton, Mr. Vernon Harcourt, Canon Tristram, Professor Schuster, Mr. A. M. Marshall, and others.

The chair was taken by Sir William Siemens, the retiring president. In introducing the president-elect, Professor Cayley, he said:—"The duty of the President of the British Association was an anxious one in several respects, and during his term of office two questions had arisen which had occupied much attention, and by the vote of the general committee at Southampton Southport was selected as the next place of meeting, and Montreal, in Canada, for the year succeeding. It was thought by many of the older members that as Southport was not a great industrial centre, the chances of the success of the meeting were problematical, and that the visit to Canada was a most adventurous undertaking. He was glad to find, at any rate, that the meeting at Southport promised to be a success, and he trusted that their next gathering in Canada would be a success likewise. It must either be a great failure or a great success; but considering that 500 members had already expressed their intention of availing themselves of the opportunity of visiting Canada, and that an influential deputation had come over from that country to welcome them, there was every probability of a most distinct success, and that, through it, the range and influence of the Association would be very much extended."

Professor Cayley then delivered his inaugural address. Contrary to our usual custom, we reproduce this address neither in whole nor in part. It dealt from first to last with transcendental mathematics, and as it is well that the truth should sometimes be spoken, we may say that it was as dry and uninteresting as it was possible for a man whose type of beauty is the fifth book of Euclid to make it. It is as certain as anything can be that not fifty people who heard the address understood it, and that not one half of these enjoyed it. To transcendental mathematics Professor Cayley added interminable disquisitions on metaphysical questions, and he unfortunately entirely lacks that *soupçon* of the poetical element which enables some men, and notably enabled Clerk-Maxwell, to invest the driest matter with a charm. Our readers will feel that we have acted for the best in declining to fill our columns with page after page of disquisitions on such matters as space of one and four dimensions. No doubt a few of our readers find a charm in such speculations, and it would be quite possible, as Professor Clifford has proved, to make them intensely attractive to the general reader or hearer; but Professor Cayley is a profound mathematician first, and a suitable man to address a British Association audience a long way afterwards. It is not the custom to condemn addresses such as that of Professor Cayley; but we think it well to depart from the custom. We may add that, of its kind, the address was perfect—deep, accurate, far-seeing; but, on the other hand, carefully divested of all charm of composition. In one sense, there are not more highly imaginative subjects to be found than those with which Professor Cayley dealt; but he lacked the means of convincing his audience that this was the case. Concerning the subjects dealt with, however, we may have more to say at another time.

THE MARIEMONT AND BASCOUP COLLIERIES.

[*Concluded from page* 202.]

(2) *Mariemont Colliery.*—This colliery has a royalty of 1480 hectares, partly within the Forest of Mariemont. There are eighteen seams of coal. They lie with a tolerably regular dip towards the south, and are worked by various methods according to circumstances. The output is about 500,000 tons per annum, from six pits—the amount varying between 522 tons per day at the St. Arthur pit, and 100 tons per day at Le Placard pit. The situation of the pits is shown on the map. The endless-chain haulage system, which connects all these six pits with the Triage Central, has a total length of more than 5300 metres; it is likewise shown on the map. The district is much cut up by roads and railways, which presented considerable obstacles in the laying out of the haulage system; on the other hand, the whole of the surface is the property of the society. Amongst the principal works of the system may be mentioned a tunnel 107 m. long, by which the haulage road passes under the railway from Baume to Marchienne, and another tunnel of 72 m. passing under Montaign-road. These tunnels are circular in section, of 2·75 m. diameter. There is also a suspension bridge in iron, by which the Placard system is carried across the boilers, sidings, &c., at the Triage workshops, and over a road. It consists of two suspension spans of 36·20 m. and 37·30 m., and of two fixed spans of 12 m. and 20·50 m. The Triage workshops just mentioned have been described in the first section. The coal washing apparatus is on the system of Lührig and Coppée—the same as at No. 5 pit described below. The patent fuel works, which are adjacent, are arranged to yield 250 tons of fuel bricks per day; the system is that of M. Bouriez with some modifications. The coal comes to them still wet from the washers, and comprises nothing but dust below 5 mm. diameter. It is raised by a Jacob's ladder, and deposited on a band of sheet iron plates inclined at 20 deg., which carry it slowly to a wooden tower divided into six compartments and capable of containing 200 tons. From the tower it is delivered by screw distributors to six hydro-extractors on the system of M. Briart. This hydro-extractor has its axis horizontal and the usual screw for the delivery of the coal; but the water escapes through a narrow slit extending the whole way round the hydro-extractor. The coal falls into a conical drum with steep sides, and slips down into a second cone containing the regulating screw; a second drum, revolving at a different speed, receives it from the screw, and delivers it at the circumference, while the water escapes by the opening between the two drums. The difference in speed always keeps this opening clear. The machine can be so regulated as to dry dust of any size at will. From the hydro-extractors the coal passes to a dryer consisting of a sheet-iron cylinder, having fixed blades rivetted on the insides and occupying a quarter of its section. The coal falls from one blade to the other, being swept off each by rakes revolving on a central axis at 50 revolutions per minute. The coal is thus mixed up and falls as dust into the smoke coming from a furnace placed below the dryer. This smoke dries the coal whilst gradually getting moistened itself. From the dryer the coal passes to the hydraulic presses, which have an improvement due to M. Guinotte. Between the compressing pistons and the cranks which work them are placed two hydraulic cylinders communicating with each other; in these the pressure is maintained constant by means of a loaded plunger. The result is that the cranks are double-acting, instead of single-acting as in the ordinary presses. The steam engines working the washers and pressers have a variable expansion on the Guinotte system. The governor acts on the expansion valve through a simple mechanism called the *Servomoteur cinématique.* This system solves the problem of applying the governor to any required mode of expansion with as great regularity as in a Corliss engine. Close to the Triage works is the store for bricks, mortar, &c., together with brick making machines and mortar mixers. The St. Arthur pit is the most important of those in the Mariemont Colliery. Its daily output is rrom 500 to 600 tons. There is a winding engine of 200-horse power, a pumping engine of 600-horse power, a man engine of 110-horse power, and a Guibal fan of 9 m. diameter. It comprises three shafts, all in brickwork. Of these, the first is a winding shaft in two compartments 510 m. deep; the second is a similar shaft which is used both for winding and for the ascent and descent of the workmen; the third is an upcast shaft 386 m. deep, and 2·40 m. in diameter. As explained in the first section, the whole of the coal is wound from the lowest level, 476 m., although two higher levels are worked; from these the coal runs on inclined planes to the lowest level. At the mouth of the pit are a number of large rooms warmed by stoves, and containing chests in which the workmen can keep their tools and clothes. The other pits belonging to the colliery are the St. Henriette pit—of which the arrangements much resemble those of the St. Arthur pit—the Réunion pit, the Abel pit, the L'Étoile pit, and the Placard pit. The last is the only pit belonging to the socicty where the workmen are raised and lowered by cages.

Bascoup Colliery.—This colliery has a royalty of 2410 hectares, lying to the west of the Mariemont Colliery. The output is 500,000 tons per annum, of which about one-half comes from pit No. 5, which lies apart from the others. This pit delivers 800 to 1000 tons per day. It comprises a winding engine of 150-horse power, shown in elevation and view and plan by engravings on page 185, showing also steam starting and reversing gear, two pumping engines of 400-horse power, described below and shown by pages 184 and 204, a man engine of 40-horse power, described below and shown on page 181, and two Guibal fans, of 9 m. diameter. There are also twelve boilers, heated rooms for the men, haulage workshop and coal-washing apparatus. There are three circular shafts, of which the first is 4·25 m. diameter, and is used for pumping and for the workmen; the second, of the same diameter, is used for winding; and the third, of 3 m. diameter, is used for ventilation. The third pit can, however, be utilised for winding if required by the application of the Clapets d'Aérage, described in Section 1. In all these pits it was necessary to sink close to the surface through a layer of sand filled with water. This was done by the pressure process, a column of cast iron tubbing being driven right through the sand by means of screw presses until it penetrated about 1 metre into the coal measures. This column was formed of whole rings, turned and bolted to each other, as in the Chaudron system; and at the bottom where cutting edges, which excavated to a diameter 0·25 m. greater than that of the finished pit. There were eight screw presses bearing against a solid scaffold erected above the shaft, and supporting the different tools required for the sinking. It was also loaded by pig iron to a weight amounting, towards the end of the operation, to 450 tons. The tubbing was sunk direct into a seam of coal of great thickness; and as this was very unfavourable for closing the tubbing by the vacuum process, the pressure process was employed, and succeeded perfectly. From thence the shafts were sunk to the depth of 95 m., all below the tubbing being bricked. The great quantity of water which was expected induced the society to provide two pumping engines which, with other motors, are placed in the engine house. The two engines together deliver half a cube metre per stroke, or at the ordinary speed of ten strokes per minute, a total of 6000 metres in ten hours. They are rotary engines with a high grade of expansion, but have only one cylinder, as M. Guinotte considers, contrary to the common opinion that the compound system is not the most advantageous for such engines. The pumps are so arranged that the main rod always works in tension, the piston being fixed while the pump cylinder moves. This rod consists of a single round bar of iron, going the whole depth of the pit, and not requiring any guides. There are three lifts of pumps, the height of each being 80 to 85 m. The rod is attached at the other end to a beam, the other end of which is worked by the steam cylinder. From the piston rod is hung, through links, a counter-weight, which allows the pumps to be single-acting while the cylinder is double-acting. The foundations consist of an immense bed plate of cast iron, 5 m. in height, and are much more solid than if built either of brickwork or of masonry. The advantages of the arrangement are the following. First, the beam is always subjected to the same stress, namely, that due to the main rod itself, and the column of water raised. The stress is always in the same direction, whether on the ascending or descending stroke, so that the beam is protected from that reversal of strains which so often produces the deterioration and final rupture of such structures. Secondly, the cranks connecting the piston to the beam are under the same conditions as the beam itself. Thirdly, the pressure exercised by the steam on the piston is divided into three parts. One is passed on to the beam by one set of cranks, another to the fly-wheel by a second set of cranks, and a third to the counterweight by links. Each of these parts have only a moderate strain to support, whilst the whole of the stress is taken by the piston-rod. The valves are worked by means of slides, and the expansion is on the system of M. Guinotte. The man-engine is on the system of M. Warocqué, but with special improvements by M. Guinotte. The objections to the former system were as follows:—(1) The stroke is necessarily small, and the number of strokes per minute was limited by the necessity of preventing any shock at the beginning or end, hence the speed of ascent or descent is slow. (2) The steam is always acting at full pressure, and the waste of fuel was therefore large. (3) The valves are worked by the engine man; hence the stop at the end of each stroke is not always exactly the same, and any inattention on his part may produce too rapid starting and stopping; this is another reason why the speed must be slow. These objections are all remedied in the present man engine—see page 181. The rods with their platforms are, as before, suspended from two plungers always in hydraulic balance, equilibrium is obtained, not by a direct communication between the two cylinders, but by an intermediate crank-shaft, to which the plungers of two pumps are connected. Each of these pumps communicates with one of the cylinders of the balancing apparatus, but the cranks are so disposed that one pump is delivering into this apparatus at the time that the other is drawing from it. Since the stroke of the pump pistons and balancing cylinders are inversely proportional to their areas, a crank of ordinary dimensions suffices to give a long stroke to the rods. Here the effective stroke of the rods is 5 m., while the cranks have a radius of only ¾ m. The pumps are worked by an ordinary inverted cylinder engine—shown on page 205—at ten revolutions per minute; the pump shaft makes only one revolution per minute, being connected by gearing. This engine has the Guinotte system of variable expansion worked by the governor. The speed of ascent and descent has by this means been doubled, while at the same time the workman has full time for stepping from one platform to the other. No unpleasantness results to the workman because the rods move as they are actuated by the cranks, and, therefore, the speed becomes considerably slower at the dead points—that is at the starting and stopping. Moreover, the platforms always come exactly opposite each other, so that the workman passes easily from one to the other. The steam consumed is much reduced by the employment of expansion; the saving is estimated at 75 per cent. A similar man engine is in course of erection at the Réunion pit. There is a steam capstan, which calls for no special remark beyond the dead-weight brake which it carries, and an arrangement which allows the pulleys to be shifted so as to serve one or other of the three compartments in the pit. The winding engine is a vertical two-cylinder engine, with automatic variation of expansion and with a steam brake. It works a round steel rope wound upon cylindrical drums; the guides in the shaft are of iron. The underground haulage deserves special mention; the principle is the same as in the other pits, but the arrangements are much simplified. On each side of the shaft at the level of 240 metres a chamber is excavated the same height as the cages. From each of these chambers start two inclined galleries, each with a single track, one towards the north and the other towards the south. The two northern galleries meet at a point situated at the level of 150 metres, and the two southern galleries also meet at the level. At these two points of meeting are placed the motor pulleys of the automatic haulage. These points are on the line of the main roads which serve as the principal hauling ways and which start towards the east and west from each of the motor pulleys. These two systems of inclined planes are worked by two endless chains passing over the semi-circumference of the motor pulleys; the full trams descending on the one side and the empty trams ascend on the other. The chains pass over return pulleys placed at the two extremities of the chambers above mentioned, and cross the shaft without interfering with the cages or with any of the operations within it. The length of the northern system is 1300 m. and the southern system 490 m. The screening shop at No. 5 shaft comprises three sets of apparatus—one is a revolving circular screen, the two others are on the same plan as those at Bascoup, and separate the coal into five classes. They have a special arrangement which allows the distance between the bars to be altered, and are so placed that the similar products coming from the two apparatus can be brought together. The finest coal goes to the washing machine; the other classes are taken direct to the wagons on moving bands, the cleaning being done by hand as they go. Each apparatus is able to screen 120 tons per hour. In moments of pressure this single pit has furnished in one day as much as 2100 tons. The coal washing apparatus is on the system of Lührig and Coppée. The small coal is raised in a Jacob's Ladder, and thrown on a perforated iron table, which is shaken violently, and so subdivides the coal into four classes of different size. The first two of these are washed in ordinary tanks, the others on the Felspar screens of the Lührig system. After washing, they are brought together again and delivered as one lot. The finest dust is sometimes delivered separately. The yield of the washing apparatus is 40 tons per hour. The other pits of the Bascoup Colliery are the St. Catherine, No. 3 and No. 4. The number of seams worked is sixteen. There is an automatic haulage system leading from each pit to the Atelier Central de Triage at Bascoup, and comprising a tunnel 272 metres long, which passes under the workmen's village at St. Catherine. The water from above the 210 metres level is collected and carried in a tunnel driven for the purpose to No. 5 pit, where it is pumped. The water from the lower levels is pumped from No. 4 pit. The Atelier Central de Triage has six sets of screening apparatus, and is lighted by Gramme arc lights outside, and by Edison incandescent lights inside. If this lighting is successful it will be extended to the other establishments.

(4) *Workmen's Institutions.*—These collieries have for a long time made a special study of the material, intellectual, and moral good of the numerous workmen whom they employ. In 1872 was founded, by the late M. Warocqué, the Industrial School at Morlanwelz. This school has now more than 350 scholars, who receive free education, comprising mathematics, drawing, mechanism, physics, mining, &c. The courses of lectures are given by the engineers of the collieries, and the certificates conferred by the school are highly appreciated by the workmen. The societies have also organised a sanitary service, and have done their utmost to encourage the formation of school clubs and of co-operative stores. The sanitary service is under the direction of a committee composed of delegates from the management, from the medical men, and from the workmen. There is a special benevolent fund belonging to these collieries, which in 1882 distributed to sick or injured workmen a total sum of 40,710 francs. The co-operative stores and the workmen's benefit clubs are not confined to these collieries alone, but are absolutely free, each being managed by a committee appointed by the shareholders. In addition, a large number of saving clubs exist in the collieries, and are worked entirely by the men themselves. There is a pension fund established on the same basis as the State pension funds, and managed by a committee composed of members of the colliery staff. With regard to workmen's dwellings, the societies have given all possible encouragement to the purchase of land and building of houses by the workmen themselves; giving them for this purpose advances of money without interest, and repayable on easy terms. They have also built numerous houses, large and convenient, which they let at very reduced prices. The success of these endeavours is shown by the fact that 22 per cent. of the adult workmen are now proprietors of the houses they occupy. The Society of Mariemont owns 280 houses for workmen, and the Society of Bascoup 270, containing together a population of 3000 souls. Each house consists of a large living room, a kitchen, and a bedroom on the ground-floor, two bedrooms on the first floor, and some out-buildings. They are scattered in groups of two, four, or six, and do not take the form of a town, for which the workmen often evince a certain repugnance. Each house has its own garden, which the tenant keeps with the greatest possible care. They are all lighted by gas, the cost of fittings being borne by the society. The employment of women underground was some years ago put an end to by the society, without waiting for a law on the subject. The General Manager is M. Lucien Guinotte, the Engineer of Mines M. Briànt, the Mechanical Engineer M. Weiler, and the Engineer for Transport, &c., M. Peny.

Coal screen.—The inclination that the fixed screen above described makes with the horizon is 10 deg., that of the hopper for large coal 22 deg., that of the jolting table 20 deg., that of the fixed spout for loading 26 deg., and that of the movable hopper from 27 to 37 deg. The useful length of the screens is 2 m. (6ft. 6¾in.); their width is 1 m. 68 (5ft. 6in.) maximum, and 1 m. 32 (4ft. 4in.) minimum; while their maximum and minimum areas are respectively 3 m.² 36 and 2 m.² 64. The thickness of the bars is 30 mm. (1⅛in.); the distance from centre to centre of bars is 160 mm. (6⅓in.) maximum, and 120 mm. (4¾in.) minimum, and their travel 65 mm. (2½in.). In this screen both sets of bars travel. The speed of the screens is 50 double strokes a minute, that of the tipler 9·6 a minute, and that of the revolving table about two turns a minute. The external diameter of the horizontally revolving table is 4 m. 9 (16ft.), and the internal diameter 3 m. 3 (10ft. 9in.), with an available width of 80 centimetres (2ft. 7in.). All shafts and parts liable to friction are of steel. Working joints are provided with gun-metal collars and oil-holes, and all rivets inside the hoppers have countersunk heads.

Man engine.—Our engravings illustrate the Warocquère or man engine improved by M. L. Guinotte. The diameter of the steam cylinder is 60 centimetres (23⅓in.), and the piston's stroke 50 centimetres (19⅓in.). The diameters of the pumps are 0 m. 816 (32in.) and 0 m. 826 (32½in.), with a stroke of 1 m. 2 (47⅓in.). The diameter of the balance plungers is 40 centimetres (15⅝in.), and their stroke, which is consequently that of the ascending and descending planes by which the men are raised and lowered, 5 m. 2 (17ft.). There are ten revolutions of the engine shaft to that of the pumps, and the weight of the fly-wheel, including boss and arms, is 19,403 kilogs. (19 tons 2 cwt.). The following are some of the chief dimensions of the engine, page 205 :—

Diameter of cylinder			0 m. 65 = 25⅝in.
Stroke			0 m. 65 = 25⅝in.
Diameter of piston rod			92 mm. = 3⅝in.
Sectional area of steam port			46×360 mm. = 1·8×14in.
Sectional area of exhaust port			70×360 mm. = 2¾×14in.
Steam slide valve—	Outside lap	top	20 mm. = 0·787in.
		bottom	20 mm. = 0·787in.
	Inside lap	top	4 mm. = 0·157in.
		bottom	14 mm. = 0·55in.
Expansion slide valve, value of y		top	34 mm. = 1·34in.
		bottom	46 mm. = 1·8in.

TECHNICAL EDUCATION AT NOTTINGHAM.

THAT in some towns at any rate working men exhibit considerable interest in the question of technical education is sufficiently evident from the crowded and enthusiastic assembly which met in Nottingham on Thursday evening, the 13th inst. The meeting was convened by the invitation of the Nottingham "Trades Council of Learning," which is an association of representatives from the several trades' unions of the town, constituted for the purpose of improving the education of the artizans, and of the Trades' Unions' Congress, and nearly 8000 working-men assembled. The chair was occupied by Mr. Samuel Morley, the member for Bristol, who expressed his conviction that the question of technical education was one of vital importance to the industries of this country.

The first resolution was in favour of technical education generally, and was proposed by Mr. Summers, M.P., seconded by Mr. Wordell, M.P., one of the members of the Royal Commission on Technical Education, and supported, in the unavoidable absence of Mr. Magnus, the director of the City and Guilds Institute, by Mr. Alderman Gripper. The second resolution was in favour of technical eduction in Nottingham, and referred specially to the scheme now being carried out by the Corporation in the University College. This resolution was proposed by Colonel Sealy, one of the members for the borough, seconded by Mr. Alderman Cropper, and supported by Professor Garnett. It appears that a complete set of engineer's workshops has been recently added to the college, and that a museum of mechanism and of local machinery of historic interest is to be formed in connection with the workshops. On the one hand it is intended to give a tolerably complete course of instruction in mechanical and electrical engineering to students, who can spend the whole day in the schools; while, on the other hand, special classes will be held in the evenings for artisans. In these classes instruction will be given not only in the several branches of mechanical engineering, but also in the technology of the lace and hosiery manufacture. In fact, such an education will be offered to workmen as will qualify them to become foremen in their shops.

The workshops are provided with a 20 H.P. Robey engine, which will drive the machinery and dynamos. The plant will comprise a cupola, brass furnace, smiths' hearth, large and small lathes, planing, shaping, milling, shearing, drilling, and other machines, in addition to which there will be a carpenter's and patternmaker's shop, and a special shop for the construction of delicate scientific instruments. Opportunities will therefore be afforded of learning all the ordinary operations of a large engineering establishment.

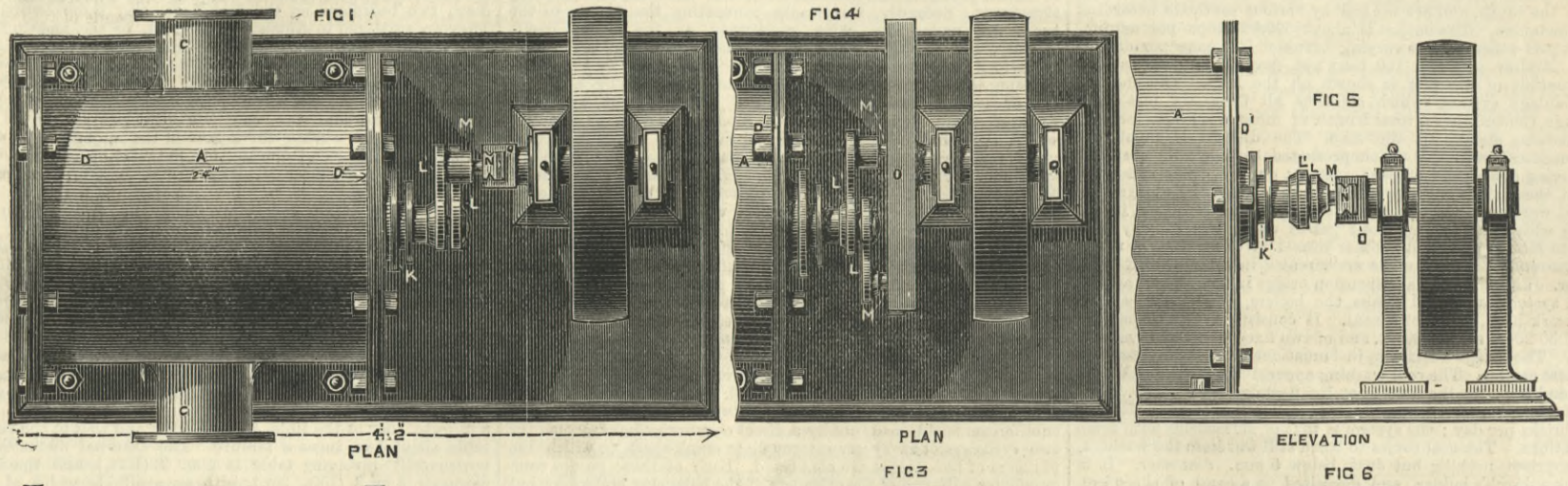
The school is under the supervision of Professor Garnett, assisted by Dr. John Ryan, who are both graduates of Cambridge and former Whitworth scholars. Dr. Ryan is a D.Sc. of London University, and Professor Garnett has for the last four years been Examiner in Natural Philosophy in the same university, so that mathematics, physics, and mechanics ought to be well represented on the staff of the school.

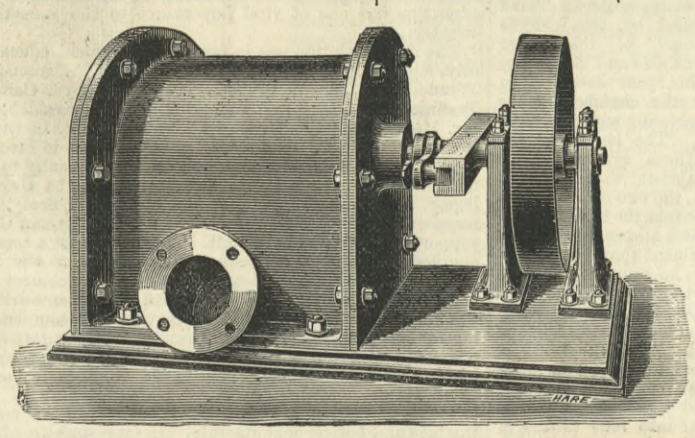
Arrangements have been made for students who are not residents in Nottingham to attend the classes and workshops of the college.

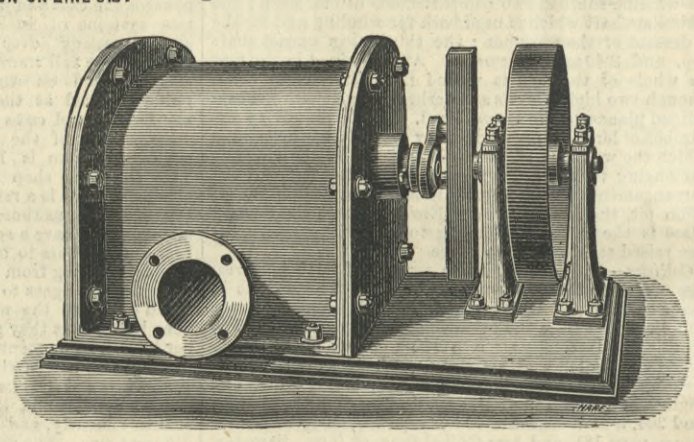
LOCOMOTIVE BUILDING IN THE UNITED STATES.—The superintendent of one of the leading manufactories of locomotives in Paterson, New Jersey, said to a *New York Tribune* reporter the other day: "I should say that there is about 12,000,000 dols. of capital invested in the manufacture of locomotives in this country, distributed among a dozen or fifteen companies. Five of these manufactories are in New England, four in New York state, two or three in Pennsylvania, and there are three here in Paterson. Perhaps there are 4000 operatives in the business here, the best workmen earning from 15 dols. to 20 dols. a week. One company turns out five locomotives a week, the others three each. The weight of a locomotive is nearly 48 tons. There have been steady improvements in late years. Just after the panic the question of economy was a pressing one, and one study was to increase the traction power of engines. The result has been that the traction power of 12,000 lb. or 13,000 lb. of ten years ago has been increased to 20,000 lb. now. That is, three of the present style of engines will do the work of five engines of the style of ten years ago. The change is in the size of the cylinder and the driving wheels, the latter being eight in number, against six wheels of the former kind of engines. Our trade is mostly domestic, of course, though we occasionally export to South America and have exported to Spain."

STEWART'S DIFFERENTIAL BLOWER AND EXHAUSTER.

THE YORK ENGINEERING COMPANY, YORK, ENGINEERS.







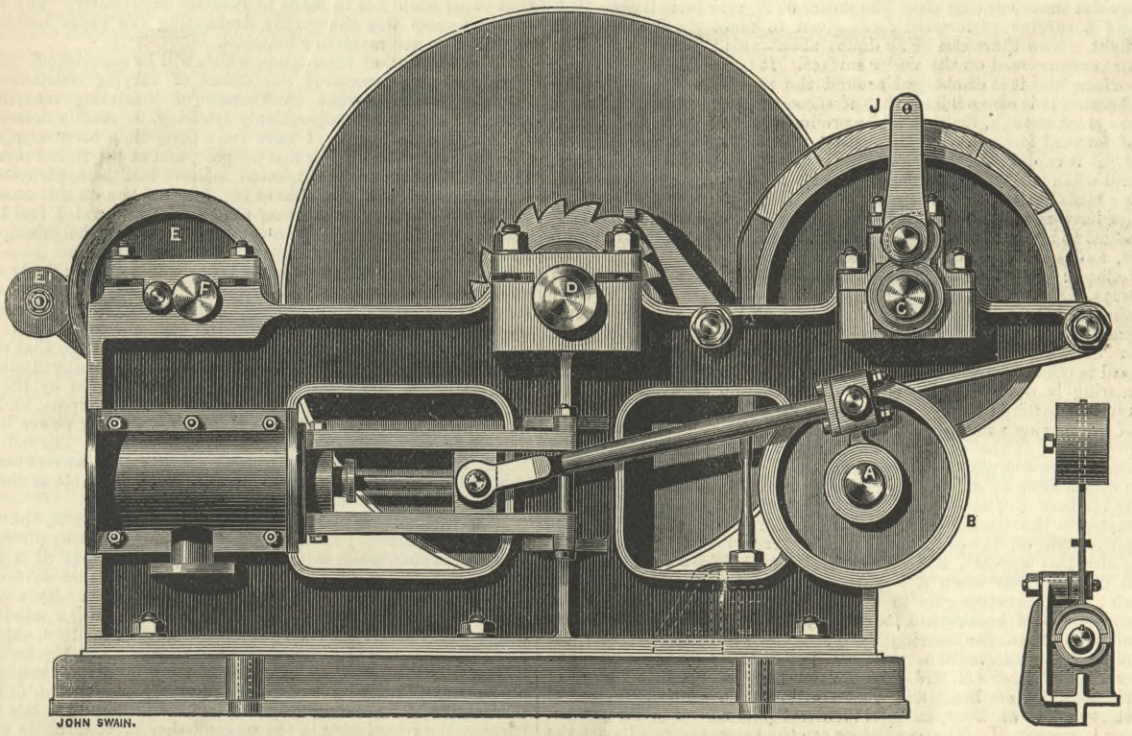
In our account of the machinery exhibited at the York show of the Royal Agricultural Society we referred to Stewart's differential blower and exhauster. This we now illustrate by the engravings above. The York Engineering Company exhibited a 4-horse power caloric engine working one of these blowers. This machine is a silent blower, capable of delivering or exhausting air or gases under widely varying conditions of pressure. Its action may be briefly described as follows:—Two blades or vanes are free to revolve within a horizontal cylinder and upon a common axis, concentric with the axis of the cylinder. The form and arrangement of these vanes may be compared to the flaps of a large hinge, either flap being able to perform nearly a complete revolution upon the hinge pin, while the other remains at rest. Figs. 1, 2, and 3, are respectively plan, elevation, and section of the machine, at the moment when the vanes are in the position of closest proximity to one another, and when their velocity is alike. Figs. 4, 5, and 6 are similar views at the moment when the vanes are at their greatest distance apart, and when the difference in their velocity is greatest. Fig. 7, 8, 9, and 9 are details of the vanes and the crank arms by which they are actuated. Figs. 11 and 12 are perspective when the vanes are in the same respective positions. In these figures the same letters of reference indicate corresponding parts throughout. A is the cylinder, B B^1 are the inlet and outlet ports, C C^1 are the inlet and outlet pipes, D D^1 are the cylinder ends or covers, E E^1 are the blades or vanes, F F^1 are the barrels of the vanes, G G^1 are adjustable shoes of iron, gun-metal, or other suitable metal or alloy, H H^1 are spaces for the insertion of springs of india-rubber or other adjustment, I I^1 are packings of any suitable metal or alloy, J is a spindle passing through the axis of the cylinder—this spindle may be either solid or hollow, and in the latter case may be used as a channel of lubrication—K K^1 are stuffing-boxes, L L^1 are crank arms, M M^1 are crank pins, N N^1 are slide blocks, O is a cross-head attached to the shaft, from which the motion is to be imparted, and in which the slide blocks N N^1 are free to slide. The spindle J passes through the barrel of each of the vanes. The barrel F is securely fixed to the spindle, while the barrel F^1 is free to revolve upon it. The barrel F^1 is extended, and passes through the stuffing-box K^1. The crank arms L L^1 being fixed respectively to the spindle J and to the barrel F^1, it will be seen that motion may be imparted to one of the blades by means of the crank arm L, and to the other by means of the crank arm L^1. The axis of the shaft from which motion is to be imparted is excentric to the axis of the cylinder, and the crank arms L L^1 are propelled at constantly changing velocities, according as the slide blocks N N^1 are brought nearer to, or further from the axis of the shaft and crosshead. The differential movements thus produced may be varied according to the excentricity of the crosshead, the position of the ports being correspondingly varied. Thus the excentricity of the belt pulley spindle, as shown on the drawings, is four-fifths of the radius of the crank arms. If this proportion be increased, the vanes will be brought nearer together at the moment when their velocity is equal, and the machine will thus deliver a larger volume per revolution, but with a resulting decrease of pressure. And conversely if a high pressure is required the proportion of excentricity to crank radius may be reduced, and the necessary differential power obtained. The shoes G G^1, as well as the packings I I^1, may with advantage be dispensed with where the conditions of pressure permit. In this case the radius of the blades E E^1 is increased, so as to produce contact or a near approach to contact with the shell of the cylinder. By means of the crosshead, driven direct from the belt pulley spindle, the velocity of these crank arms, and consequently of the vanes within the cylinder, is constantly being varied, the maximum velocity of one being simultaneous with the minimum velocity of the other. Thus, referring to Fig. 4 it will be seen that the sliding block M^1 of the arm L^1 is near the axis of the crosshead O, while the other arm L is near the extremity of the crosshead. The arm L will then have a very high velocity as compared with L^1, and while the blade E^1, Fig. 3, moves a distance B^1 to B, the blade E only moves from B to B^1. Outlet and inlet ports are provided near the bottom of the cylinder, from 60 deg. to 100 deg. apart, and the movements of the vanes are, it will be seen, such that one or other of them is always between the ports, and acting as an abutment. Thus, the variation of their velocities of the blades is such that during half a revolution of the belt pulley one of the vanes travels from the outlet to the inlet port—or say one-fifth of a revolution in the same space of time as is occupied by the other vane in travelling from the inlet to the outlet port or say four-fifths of a revolution. It will thus be seen that a volume of air or gas equal to the difference between these two is delivered alternately by each vane, and as each performs a complete revolution, for every revolution of the belt pulley this volume is delivered twice. By varying the excentricity of the slide which actuates the crank arms the differential movement of the vanes can be regulated to suit the conditions of volume or pressure which may be required in any particular machine. In cases where pressure is less important than volume, a very high degree of excentricity can be adopted, reducing each vane alternately almost to a state of rest between the outlet and inlet ports, while the other vane is at its maximum velocity. On the other hand, pressure can be obtained in the exact ratio in which volume is sacrificed, by adopting a low degree of excentricity in the slide. The difference in the velocity of the vanes at different parts of their revolution can thus be reduced to any required extent at a proportionate gain of differential power. The motion obtained by this arrangement is a curious and ingenious one, and when at work has a peculiar appearance. The blower runs with great steadiness and ease, and we were much pleased with its performance at York.

The Mason Science College, Birmingham.—During the ensuing session a series of special lectures upon the "Chemistry and Geology of Coal Mining," "Mechanical Engineering as Applied to Coal Mining," and the "Theory and Practice of Coal Mining and Colliery Management," will be delivered by the professors in chemistry, geology, and engineering, and Mr. John Brown, M. Inst. C.E., F.G.S., the lecturer on the "Theory and Practice of Coal Mining and Colliery Management." The course will extend over two years, and will embrace about seventy lectures in all. These will be delivered upon the evenings of Monday in each week, from four to six p.m., or at such other hours as shall be eventually found to be most convenient, during the first term—October to December—and from four to five p.m. during the second and third terms—January to June. The opening lectures on the "Chemistry and Geology of Coal Mining" will be delivered by Professor Tilden and Professor Lapworth on Monday, the 22nd of October next, from four to five and five to six p.m.

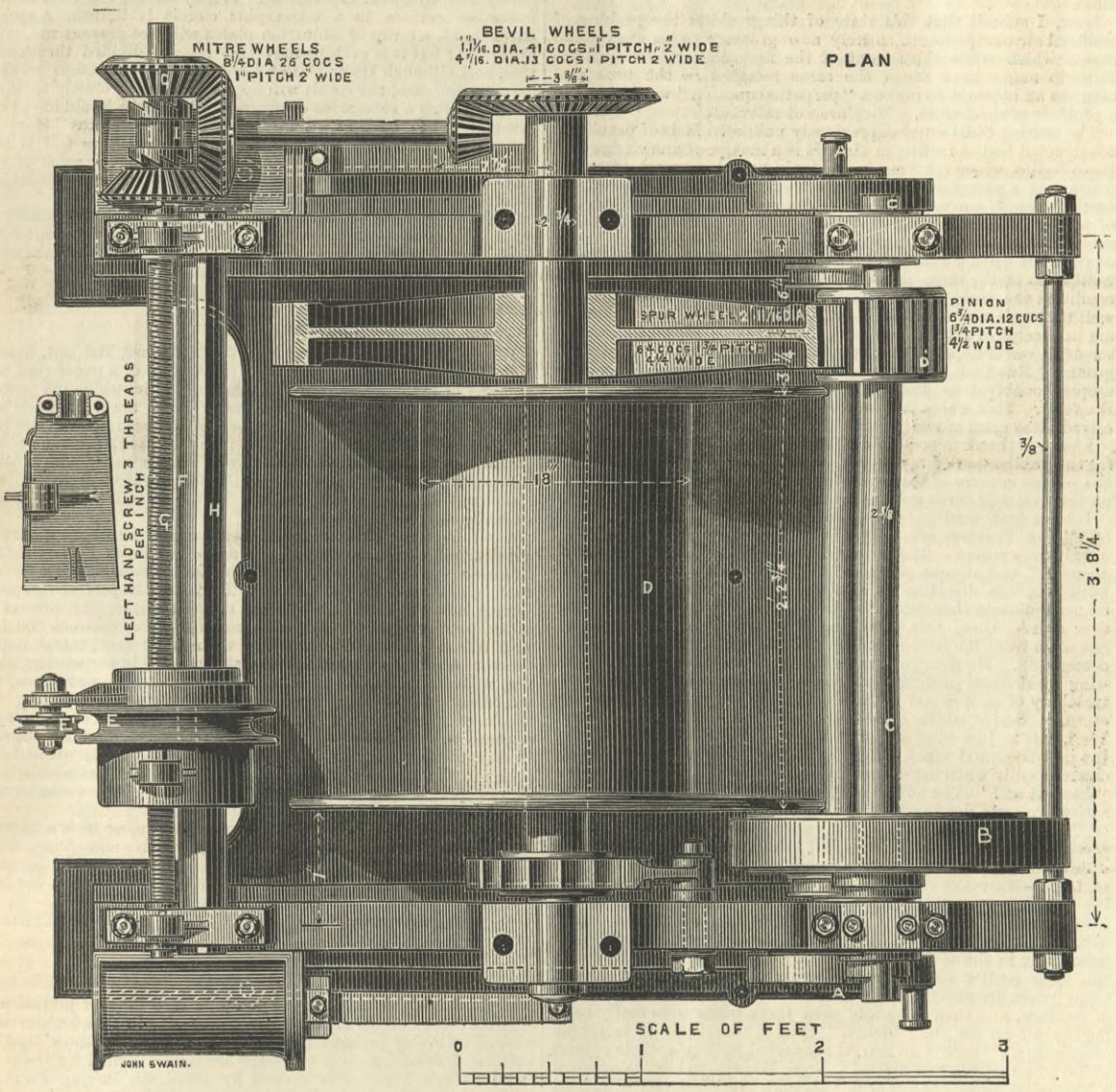
THE KINGSTON TRAWL WINCH.

MESSRS. ROSE, DOWNS, AND THOMPSON, HULL, ENGINEERS.

ELEVATION



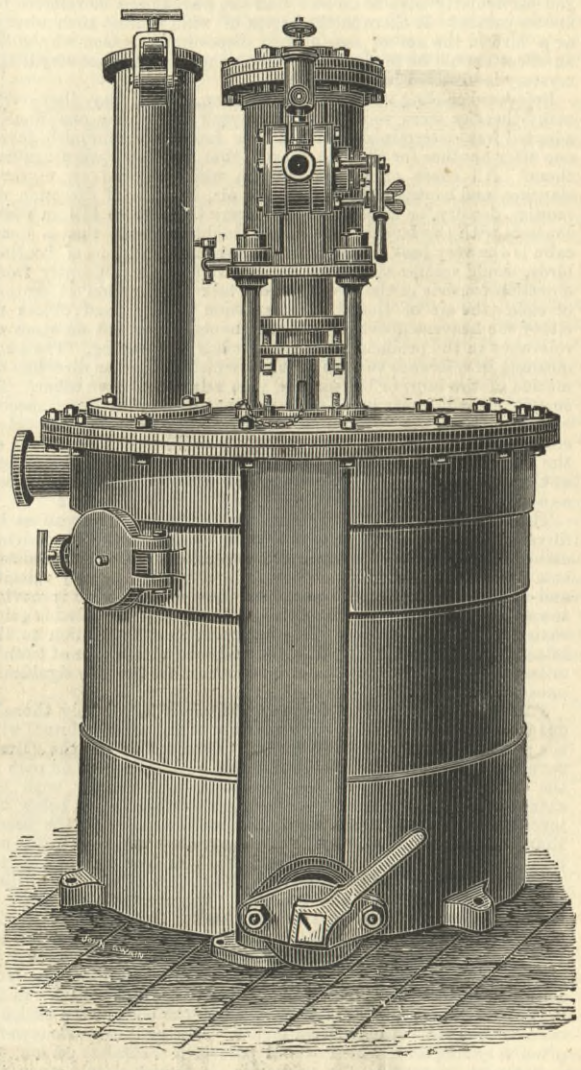
PLAN



THE Kingston trawl winch exhibited at the Fisheries Exhibition is for wire trawl warp, and in the form shown above is intended to be placed below the deck. The winch is supplied with steam from an upright boiler, 6ft. 3in. high, 2ft. 8in. diameter, with two cross tubes 6in. diameter. It has two 5in. cylinders 10in. stroke, these drive a first motion shaft A A, which carries a friction sheave B driving a countershaft C, which carries a spur pinion D gearing into the winding drum D, which has provision for some 200 fathoms of 3in. steel wire trawl rope. The rope is led from the gangway roller over a drum on the hatchway combing and under the sheave E to the drum; the sheave E travels from side to side, the bar F being driven from the drum shaft by the screws and gear G G. When a layer of warp is laid on the drum D the sheave and block E catch a stop on the bar H, which reverses the revolutions of the screw G by means of the clutch and gear I when the leading sheave moves in the reverse direction, and winds the warp evenly upon the drum until its motion is reversed by a stop on the bar H. The winch is worked by one lever J on the excentric of the countershaft brasses, by which it lowers, hoists, or brakes at pleasure. The makers claim that only by an arrangement of this kind is it possible to work wire trawl ropes without danger of kinking—as with the common steam winch used in the paddle-wheel trawlers of the north-east coast—or of life and limb to men, as such warp is worked by the common upright deck capstan. The Kingston trawl winch is made in larger sizes and can with a few unimportant alterations be fixed on a vessel's deck. In the case of steam cutters and steam-driven trawlers it can be driven from the main boilers. An arrangement is fitted by which the warp is prevented from being slack between the leading sheave and the drum in cases where the roll of the ship might disengage it from the sheave E.

THE "THAMES" STEAM-CLEANED FILTER.

THE filter shown by the accompanying engraving is constructed more especially for such purposes as filtering boiler feed-water, and is a modification recently made by the Pulsometer Engineering Company of the "Thames" filter which was illustrated in our impression for the 16th of June, 1882. The filter then described was fitted with hand apparatus by which the cleansing was effected. In the larger filters for supplying feed water to boilers in large mills, and more especially in those used in steam barges and tugs which often have to use the muddy water of tidal reaches, this hand apparatus is replaced by a reciprocating lever and connecting rod driven from shafting, or where steam is available, as in steamboats and tugs, the arrangement we now illustrate is preferred. From the description of the filter given in the above-mentioned issue it will have been learned that the filtering medium is sponge, a material which when pressed is probably better adapted for filtering purposes than any other substance, at the same time washable without removal from the filter casing. When closely compressed it affords not only an effectual, but a rapid filtering medium. To clean it effectually, however, an active alternate compression and relaxation analogous to that when a sponge is squeezed and released in the hand under water, is necessary in order to get that violent movement of water through the pores of the sponge which is required to move impurities mechanically attached. The lower part of the cage holding the sponge is for this purpose attached to a piston-rod, upon which is a piston in the steam cylinder placed on the top of the filter. Steam is admitted alternately to the top and the bottom of this piston by a hand lever and quadrant valve seen in the front of the cylinder. A few minutes' action of the piston, and thereby of the sponge carrier, is sufficient to cleanse the filter of the mud which has collected during the time the filter was in action. The frequency with which this operation must be carried out depends of course upon the state of the water filtered; about once a day is sufficient when the water is drawn from the Thames in the neighbourhood of London Bridge. By means of the arrangement of water passages in the flat pipe on the front of the casing, and the two-way cock connected therewith, the filter may be kept full of water, and the water may be drawn away from the bottom of the sponge as required. While the process of cleaning is going on the whole of the sponge is covered by water, the water having to pass up one part of the flat pipe, which is divided by a vertical diaphragm from the other part, down which it returns, and so away through the cock; when the cleaning is nearly completed, the cock is turned the other way, so that the water can run straight out from the lowest portion of the filter and flush it out. The vertical pipe is merely to prevent splashing on to the cover and gland of filter, when the air valve at the top of the pipe is open. The inlet for dirty water is behind the filter when in the position shown in the engraving, but the outlet for clean water and the hand hole for putting in sponge are shown. In washing out, the two-way cock alternately takes two positions: (1) The cock is so turned that the opening is direct from the



bottom of filter to outlet pipe, and thus any dirt which has collected in the bottom is sluiced out; (2) then the cock is so turned that the water has to pass out over the diaphragm, thus ensuring the sponge being covered; (3) the cock is turned back to its original position, so that it allows the flushing out direct into outlet, and leaves all clean at the finish.

DOCK EXTENSION.—At a special meeting of the Wisbeach Town Council, Mr. Abernethy, C.E., attended and explained the details of the proposed docks, which the Council resolved to promote in the ensuing session of Parliament. The estimate for a six-acre dock is £143,000, and for ten acres £188,000. The lock is proposed to be 250ft. long between gates, and 50ft. wide; depth of water over sill, 24ft. at spring tides, and 15ft. 6in. at neap tides.

EXPERIMENT WITH BOILER EVAPORATION.—Mr. W. T. Peoples, general master mechanic of the Manhattan Elevated Railway, has been engaged in a series of interesting experiments to test the evaporative service of boilers under varied conditions. The methods of investigation which he followed were in some instances quite unique. A locomotive boiler employed to supply steam for driving part of the machinery at the repair shops was not evaporating so much water for the coal consumed as was considered desirable. J. D. Campbell, foreman of the works, who directed the experiments, believed that the flues were too numerous for efficient evaporation. He kept a record of the fuel used and the water evaporated in the ordinary working of the boiler, and ascertained that 6½ lb. of water was evaporated for each pound of coal. While the boiler was doing this work, a vessel containing one gallon of water was placed in the fire-box, and the water evaporated in 7 minutes and 2 seconds. The vessel was again filled and put into the smoke-box, where the water evaporated in 38 minutes. This experiment was repeatedly tried, and the mean of the periods taken to evaporate the water did not vary materially from the time given. Forty flues were then plugged throughout the centre part of the boiler, and the experiments repeated. It was now found that the gallon of water placed in the fire-box evaporated in 5 minutes and 45 seconds, while it took 60 minutes for it to evaporate in the smoke-box. This showed a remarkable increase of fire-box temperature and decrease in the heat of the smoke-box. Under the last conditions the evaporation of water rose to 8 1/16 lb. of water to the pound of coal. These figures are curious and startling. We would feel disposed to doubt their accuracy were they not made by thoroughly reliable engineers, who know perfectly what they are about. Several experiments were made where tin, lead, and antimony, with their compounds, were used to find the fire-box and smoke-box temperatures, but they did not act so reliably as the water vessel.—*American Machinist*.

LETTERS TO THE EDITOR.

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

THE PROBLEM OF FLIGHT.

SIR,—The trouble in the way of accepting the facts exhibited by the soaring birds arises from the presumed difficulty, not to say impossibility, that a body floating in moving air, entirely unsupported from without, would experience in resisting the friction of the wind. With the single exception of the birds, or some identical mechanism, no object is enabled to accomplish this result. That a quiescent body resting in and upon a medium which is itself moving must have motion communicated to it, seems a necessity. No peculiarity of shape would be likely to offer an exception; no relation of quantity of matter to form or nature of material or any imaginable thing whatever would be likely to overcome the tendency to be driven with the enveloping medium. Imagine whatever device you will, and if it be quiescent its movement with that which contains it seems imperative. Above all, it seems impossible that it should move directly against its support. So emphatic is this, and so completely obscured are the facts of the case, that were it not that nature has utilised the means which make such a movement possible in the mechanism of soaring birds, it would be hard to see how the process would be discovered during the lifetime of the human race. The birds at once dissipate all doubt that the thing can be done by directly doing it. By doing it so completely, so easily, and so conspicuously that the only pertinent question remaining is, how is it done? One may solve the question after the manner of an Oriental, and say Bishmilla, it is the will of God! Or it may be referred to a diabolic cause, after the manner of Lapland witches, or the whole thing may be denied on general principles. But there is no use in settling the matter thus without you particularly wish to do so. Can the phenomena be referred to known causes? Is there in the action of wind against such a body as a bird in the act of soaring any discoverable reason why such an effect should be produced? I think there is, and that very little mystery is involved in the solution.

Before proceeding with the explanation, I will say that very many theories were considered by myself before the one finally adopted was determined upon. I was forced to relinquish them one after another for the sole reason that the facts were against them. All those efforts at solution which depend on upward slanting, and contrasting currents of air, whether of direction of motion, density, or velocity of flow, were the first to fail in their contests with the facts. The one undoubted truth, that a dead calm is the very best condition of air for the operations of floating birds, would scatter all such theories. But the significantly fatal objection consists in the fact that all talk of direction of motion of either the air or the bird, in relation to any fixed object in either the heavens above or the earth beneath, has not an atom of relevancy in the problem of flight. It has no meaning. The only meaning in reference to that problem which either the direction of motion of the bird, or the air has, is in relation to each other. To sustain flight in every case, with no exception, with every species of soaring bird, the wind must be blowing against the advancing creature. If the wind were blowing upwards from the surface of the earth the bird might be floated with it, 'tis true, by the action of the air, but such movement would resemble soaring, as exhibited as a matter of fact, in nothing.

The velocity of the wind in relation to the earth, as well as its direction, may be anything or nothing. So far as the bird is concerned it is a matter of utter indifference. Its velocity and direction in relation to the bird is determined wholly by the velocity and direction of motion of the latter. Suppose the wind is moving towards the west at twenty miles an hour, and the bird is going with it at the rate of forty miles an hour, then in relation to the latter that wind is blowing directly eastward at the rate of twenty miles an hour. The relations of bird and air are the only significant ones in this question.

There were also half a dozen explanations laboriously thought out which rested on the angular position of the wings habitual with the most frequently observed birds. Observations on the gannet gave the quietus to all of those, for this bird sails with no part of the wing elevated above the backbone, and usually with the extremities of the pinions depressed two or three inches below the level. They can maintain themselves more steadily in the breeze than any bird which ever came under my observation with the one exception of the sandhill crane, and this bird closely resembles the gannet in the position of its wings. No theory of flight is worth a rush which leaves out the gannet. The man-of-war hawk is weighty evidence also in this question. Usually it sails with wings shaped like a flattened M, the outer ends a little above the back. On the approach of a south-western gale, however, it resembles a bent bow, being a circular segment seemingly or true, as if struck with compasses. At times the wings will be so far deflected beneath a level as to meet under the body of the bird, and even to pass each other several inches. During those furious puffs, often very frequent, which would prostrate a careless person, the entire wing, excepting the primaries, is flexed closely upon the body of the bird. The primaries are expanded at an angle of 45 deg. beneath, the head drawn in, and the tail closely folded upon itself. Should one meet with this creature in this position he would not take it for a bird at all. Its vibrations while thus poised are through a space of 10ft. or more vertically, horizontally, or obliquely. It resembles in a striking manner a ball suspended in air from a pressure blower, when the blast is interfered with by interposing the hand or in any other way.

Any theory of flight to be secure must account for a man-of-war hawk in a gale. Returning to the main question, two things must be taken for granted in the outset. One is the bird poised on fixed wings in a horizontal breeze; the other is the results obtained by the Æronautical Society of Great Britain; passing over any experiment tried by myself as not being required in this explanation. Briefly, the pertinent results of the above Society were, the equal force against gravity, and to the rear, exerted by wind moving on an inclined plane of 45 deg.; also that the lifting force was to the rear force of the different inclinations, directly as the base was to the height, to undetermined limits. To make the explanation as concrete as possible, we will suppose the surface to be 35ft. long and 7ft. wide, containing 245 square feet, such as would presumably support 350 lb., the weight of a practical device for sustaining a man in a flow of air of thirty miles an hour, or 44ft. per second, with an inclination of surface of 12in. from horizontal. The air current, then, in passing the 7ft. width of surface in about the one-sixth part of a second gives a lifting force of 350 lb., thus balancing the weight of the device. The rear force of 1 in 7 would be 50 lb. In short, then, the device would be lifted with a force equal to its weight, and driven to the rear with a force of 50 lb.

So far flight would be impossible. Note the character of this action, and omit all notice of molecular impact, if there be any, and confine the attention to the density of the air alone. The other elements would only confuse the case, without assisting the explanation. The upward force of 350 lb. would measure the compression of air below the surface, provided there was a normal condition of atmosphere above. Work is done vertically upward by compressing the air below, so that there is a greater tension of air after it has done its work than there was before, and doing the work makes the tension. Could the compressed air be put to labour after it had escaped from the surface it could accomplish 350 lb. additional work in falling to the tension of the surrounding air. The air above is rarefied. Bear in mind that it is passing at the rate of 44ft. per second, and the lifting power of this partial vacuum cannot be other than important.

The significant fact of this matter now comes. The device is supported but also carried with the air current with a force of 50 lb., and this force must be neutralised to constitute flight. Along the entire 35ft. of rear edge of surface precisely where the compression of the air is greatest, it is suddenly discharged into a partial vacuum at the precise point where that vacuum is greatest, around and against that rear edge. The result is self-evident. There will be a thrust upward and forward along the entire rear edge made by the escaping air. There exists a miniature whirlwind, 35ft. in length, against which the rear edge of the surface rests along the line of its greatest intensity. This vertical tempest is placed precisely where it would actuate the surface with the greatest effect. Beneath is a push, above is a pull, while the wedge-like whirl is driven against the edge in equilibrio to force it against the advancing air. The entire 50 lb. rear force is cancelled, and a surplus of forward force given to meet the conditions of flight. Now there can be no doubt about this triple action. The air is compressed on the under surface. It is rarefied on the upper surface, and it is discharged around the rear edge with a forward thrust. It is also evident that if these three co-existing activities are great enough, flight must be produced. If there be any surplus of forward force in the differential result of this triple alliance, flight is explained. I submit that it is a very good working theory, and when it is further found to explain all the movements of sailing birds, its claims to respect are not lessened.

I have now presented this subject with sufficient detail—so it seems to me—to enable those interested to pretty well understand it, and will conclude the matter by summing up the whole as follows:—(1) Birds maintain themselves in air in two contrasted ways. One method is by beating the atmosphere with their pinions as a means of employing muscular power to overcome gravity and the friction of the air. The other is by the fixed wing, or "soaring" process, where the force to actuate the quiescent bird is obtained from the air. (2) Expressed in a mechanical form, soaring is a differential result of the action of wind upon flat surfaces inclined to the direction of its motion, where the friction of the moving atmosphere is neutralised by the escape of the compressed air at the rear edge of the surface. (3) The conditions of soaring are complied with on the part of the body, when there is a distribution of weight, an extent of surface, a shape of surface, and an inclination of surface, approaching the maximum which is approximated in the soaring birds. (4) The conditions of soaring are complied with on the part of the atmosphere when it is in motion in a direction opposed to that of the body. Flight on fixed wings is only possible when it is directed against an opposing current of air; an imperative rule to which there is no exception. (5) The conditions of soaring are found in their sum total in the relations of the air to the soaring body. The tendency to refer all phenomena of motion to fixed positions is dangerous when employed here. A bird standing on fixed wings in a breeze of thirty miles an hour, and a bird sailing in a calm at the rate of thirty miles an hour, exhibits identical phenomena so far as soaring is concerned. The conditions are the same, the results are the same.

Now, I submit that this state of things shifts the problem of artificial air navigation to entirely new ground; to an unexplored region which waits the advent of the first pioneer. The efforts hitherto made have much the same relation to the true problem as an attempt to make a "perpetual motion" would have to a problem of mechanics. They are not relevant.

The soaring birds unmask previously unknown facts of peculiarly constructed bodies resting in air. It is a matter of knowledge that these bodies when set free in still air would descend after the manner of a parachute until they rested upon the surface of the earth, when to move upon that surface would require the exertion of force to overcome friction. The birds reveal the fact that when such a body has initial movement set up in it it finds a point of equilibrium upon a cushion of moving air, upon which it rests; but, unlike the earth, there is no friction between them, and in this condition the body has no weight. Now, I understand perfectly well that this seems incredible. It is saturated with paradox. I am in receipt of letters every day from men of reputation in the scientific world objecting to my solution of flight on some *à priori* ground. But then, gentlemen, the facts as I have stated them are unquestionably true, and the theories advanced completely explain the facts. This makes it bad for the paradoxes, and the preconceived ideas seem crowded out.

I have to thank the editor of THE ENGINEER for the space given for the publication of my papers, and the readers of this journal in the remote corners of the world for their letters giving observations on the habits of birds not known in the United States.

I have just read in your issue of the 10th inst. an article on "The Problem of Flight," by Mr. Quartermain, which I hardly understand. The writer declares that we now "know all about it," and at once proceeds to reduce the value of my contributions in this direction to absolute zero, by asserting that birds do not maintain themselves in the air on fixed wings. From whatever source, then, this gratifying knowledge comes, it does not not come from the motionless wing birds, for there are none of that description. He then goes on to tell of an accident with an active wing mechanism presumably of his own construction, wherein the treachery of an iron rod or bolt left fast in the embrace of mother earth, a device which otherwise would have mounted skyward. Well, this is just what all active wing affairs have been doing for the past thousand years, either refusing to go up at all, or coming down speedily when not wanted to do so. Wherein, therefore, do we "know it all?" The quiescent process denied altogether, and the active process a dead failure, as usual, I would respectfully inquire of Mr. Quartermain where his knowledge comes from. I will proceed to explain another request I have to make of him.

After observing a frigate bird standing in a breeze at a distance of 10ft., with wings stretched through a space of 8ft.; after looking at the creature from below, from the rear, from the front, and from above without being able to detect any motion whatever, except the incidental tremors preservative of equilibrium; after proceeding in the same way with many other species of birds with the same results, and after continuing these operations through many years, frequently, at all seasons of the year and in all kinds of weather, and then to be told that these wings were really beating the air all the time though "eluding observation," is simply astonishing. There is no marvel connected with this whole subject which at all equals this marvel. From Darwin, in his "Voyage of a Naturalist around the World," through every observer of soaring birds who have been in situations suitable for such observations, there must have been present some inscrutable error.

Let anyone take a stick 4ft. long and no more than ½in. square and pivot it at one end to a post and bring it to a horizontal, then view it at right angles to its length from a distance of 10ft. while an assistant moves the free end up and down, and motion can be at once detected. I have made observations on soaring birds at a distance of 1ft. from the eye, when the creature was totally ignorant of my presence, and do most positively assert that I could detect no beating of the air whatever.

Now it is presumable that Mr. Quartermain has observed these birds in favourable locations—that he has done more than look at kestrels, crows, and blackbirds at a distance—and my request is that he make known how it is that the wing of a living bird is so different from all other objects, that while appearing perfectly still, is is in reality all the time in pretty vigorous motion?

Chicago, Ill., August 29th. L. LANCASTER.

ARTIFICIAL SUBMARINE LINES.

SIR,—In the obituary notice of my brother, the late Mr. C. F. Varley, which has appeared in your journal, among the inventions mentioned as identified with his name is that of the "artificial line," which represents in every respect a submarine circuit. The suggestion of constructing such lines originated with myself, and a description is given in a paper read by me before the Society of Arts on March 30th, 1859. You did me the honour of reproducing this paper, and you made it the subject of your leading article in THE ENGINEER of April 8th, 1859.

The artificial line which my late brother turned to such good account was made some years afterwards, the resistance coils forming part of it, and which were, I may say, the largest and most complete which had been made up to that period, were constructed by a firm of which I was the active partner, and were made a present to Mr. Cromwell Varley. I furnished him with instructions how to make the induction plates, and these were constructed under his instructions by a workman named Green.

By way of parenthesis, perhaps you will allow me to state I believe I was the first to make paper induction plates which would retain a statical charge for any length of time, and as a matter of fact, my brother tried to dissuade me from doing so on the ground that paper could not be made to insulate sufficiently. The secret of my success was thoroughly desiccating the paper before immersing it in the insulating material.

"The amount of retardation which will be experienced in submarine circuits possessing conductors of varying resistance, and insulated with different thicknesses of insulating material, it appears to me, can, comparatively speaking, be readily determined by actual experiment. I have for a long time been engaged in designing an apparatus for this purpose, and at the time I arranged to give this paper I fully expected to have had the apparatus completed, and to have been able to lay it before you on this occasion; and though I regret not being able to do this, yet I feel I have sufficiently advanced to warrant my explaining the principles of its construction.

"The principles upon which it is based are, that a body which offers the same resistance as another, without reference to its substance or length, may, as far as conducting power is concerned, be considered electrically the same. If we make use of a substance or metal of any inferior specific conductive capacity to that of the metal employed in submarine circuits, and also of greatly diminished sectional area, the same resistance as that offered by the very longest circuits can be obtained in a very small compass, and such an arrangement will, as far as simple conducting power is concerned, fairly represent a long submarine circuit. The induction which manifests itself in submarine circuits can also be obtained, if the conditions for its development are as favourable as they are in submarine conductors.

"The apparatus consists, first, of a series of resistances, the values of which are known; secondly, of a series of induction plates, the values of which, when compared with a given surface of a gutta-percha coated wire, are also known; thirdly, a mechanical arrangement to accurately measure minute periods of time. By a combination of the resistances and the induction plates, a conductor, which will fairly represent a submarine circuit, will be obtained. The resistance can be diminished or increased, and the inductive surface can be doubled or halved at pleasure, and thus circuits with conductors of varying length and sectional area, and different thicknesses of insulating material, be imitated, and the law which governs the retardation in the transmission of telegraphic signals determined by direct experiment. It may be argued that as the inductive surface in a telegraphic circuit is uniformly spread throughout, a series of induction plates will not present the same condition; but it is evident that they may be divided throughout also, and although they will not then precisely represent what is actually the case, the result will approximate very closely to those obtained from a submarine conductor. Perhaps it would have been prudent not to have called attention to an apparatus before its completion. I have done so, however, because I have felt it was due from me to endeavour at least to point out how some of the important problems involved in submarine telegraphic communication between the distant stations may be resolved."

I give above an extract from the paper read before the Society of Arts, giving the description of the construction of the artificial line. S. ALFRED VARLEY.

2, Hamilton-road, Highbury, N.,
September 18th.

BEECHWOOD SLEEPERS.

SIR,—Your article in your issue dated August 31st last, headed "Beechwood Sleepers," contains a translation of a paper read at a meeting of the German Railway Association, in which my process of thermo carbolisation is incorrectly if not absurdly described. Permit me to correct it in your paper, as has been done in the case of the papers which have published it in Germany. In the process employed on the Northern Railway of France, as well as on other French and Austrian railways for the treatment of beech and oak sleepers, there is a great difference in the operation as the paper describes it.

First, instead of "a current of steam mixed with the vapours of creosote oil, to which the sleepers are exposed during five or ten minutes"—which in truth would be absurd even to suppose—the fact is as stated in the patent: That the sleepers are exposed during thirty to forty-five minutes, or even longer, to a current of superheated steam of a temperature that varies between 600 deg. and 900 deg. Fah., which carries with it by mechanical action creosote or tarry spray which the steam holds in suspension, as in fog, water is held in suspension. This current is continuous, the condensed matter being again converted into spray during the whole of the operation, and is very penetrating, so that a sleeper exposed to its action during the thirty or forty-five minutes attains in its centre a temperature of 120 deg. to 140 deg. Fah. without any injury to the surface of the wood. The fact is incontestable, and can be proved at any time by a visit to any of the works on the Northern of France lines.

Secondly, the penetration is not incomplete, as it is a natural consequence of the first operation, and the after absorption, when such is considered necessary, may be made to take up any quantity of creosote oil, and what is more, hold it and not run it out into the ground afterwards as is now very often the case.

Cauterets, Hautes Pyrenées, JOHN B. BLYTHE.
September 11th.

CONTINENTAL RAILWAY SPEED.

SIR,—Some few months ago you published in your journal particulars of the relative speed of express trains in this country and abroad. It may perhaps interest your readers to know that in point of fast running our expresses are now equalled by those on some French lines, as is proved by the train leaving Paris at 8.45 a.m., and arriving at Bordeaux at 5.52 p.m., making ten stoppages, aggregating 48 minutes. The distance is 363 miles.

It is also possible to travel from one end of France to the other, viz., Calais to Portbon, in 27 hours and 10 minutes, the route traversed measuring 872 miles, and the stops lasting over five hours. COMMERCIAL.

Birmingham, September 17th.

THE GRAPHIC TREATMENT OF STRESSES.

SIR,—Owing to absence from town I have only just seen a letter published in your issue of September 7th, in which the writer takes objection to my assumption of 45 lb. per square foot as the weight distributed over a particular roof treated for stress in a former number of your journal. In reply I have only to mention that I adopted these conditions after consultation with those who know best what are the actual weights of material and accessory pressures brought to bear upon these special roofs. The same writer also objects to the uniform distribution of wind pressure, for the reason that the wind only strikes one side of the roof, and might therefore vary not only the amounts, but also the nature of the stresses. Now, it is perfectly true that the wind blows from but one quarter at the same time, but we must also remember that at different times it blows from different quarters. I would, therefore, ask from which quarter will your correspondent force his wind to blow? In order to meet all contingencies it is evidently necessary to design the roof for uniform wind pressure. Thirdly, your correspondent finds fault because I do not design the great tie rods of short cylindrical lengths of different diameters. But it is a golden rule to avoid all sudden changes of form, and on this account a truncated cone is, *cæteris paribus*, stronger than a rod made up of short cylindrical lengths of different diameters.

5, Ashburnham Villas, Greenwich, S.E., R. H. GRAHAM.
September 18th.

RAILWAY MATTERS.

MOOSELUCMAGUNTIC and Jocknahmakantajus are to be stations on a projected railroad in Maine. These are evidently the names which prophetic porters have been shouting in the carriage doors all over the country, but which weary travellers have never been able to distinguish by ear.

MR. ALFRED A. LANGLEY, who has been for ten years engineer-in-chief to the Great Eastern Railway Company, has recently been appointed chief engineer to the Midland Railway Company. Mr. Langley leaves the Great Eastern at the end of this month and enters office at Derby on the 1st of October.

THE contract for the Aliwal North Extension Railway, South Africa, has been let to Messrs. Reid and Mackay, of 13A, Great George-street, Westminster. This firm is now engaged in constructing the Jamaica Government Railways, and Mr. Mackay also constructed the waterworks for Port Elizabeth, South Africa.

THE "Railway Companies' Directory," edited by Mr. Percy Lindley, giving a list of directors, officers, and agents of the railways of the United Kingdom, with capital, working expenses, and revenue, prices of stock, dividends, mileage, and weekly traffic receipts, for the last five years, will be published in December.

THE general traffic agreement which has subsisted between the North British and Caledonian Railway Companies during the past ten years has been renewed for another similar term. The agreement covers the working of the Edinburgh and Glasgow and northern traffic, but in respect of the latter it will allow certain stipulated changes to be made on the completion of the Tay Bridge.

AT the Staines Junction of the South-Western Railway a new curve is being made to the west of the station in order to connect the London line with the Reading branch. The works, under the direction of Mr. W. Jacomb, the company's resident engineer, are being rapidly pushed forward, and will, it is hoped, be available in a few months. When the communication is finished a new service of trains will, it is understood, be provided, enabling passengers to travel between Windsor and Aldershot without entering the old station at the junction.

WE learn from *Poor's Railway Manual* the number of passengers moved one mile in the New England group of the United States in 1882, was 1,107,045,086, at a charge of 2·1 c. per mile; in the middle States group, 2,356,226,676, at a charge of 2·3 c. per mile; in the Southern group, 559,577,836, at a charge of 2·6 c. per mile; in the western group, 2,708,268,037, at a charge of 3·2 c. per mile; in the Pacific group, 351,942,279, at a charge of 3·1 c. per mile. The total movement on all the roads equalled 6,834,048,765 persons moved one mile, at a charge of 2·86 c. per passenger mile.

THE German Railroad Union held its annual meeting in August, and a report of its officers showed that in the middle of July there were ninety-eight different railroad managements which belonged to the Union, working in the aggregate 59,679 kilometres—37,068 miles—of road; 21,922 miles of which were in Germany, 12,271 in Austria-Hungary, 91 in Luxemburg, 420 in Belgium, 1325 in Holland, 724 in Roumania, and 315 in Russian Poland. The increase in mileage during one year was 1007 miles. No less than 10,951 miles of the roads in the Union were Prussian State railroads, substantially worked by a single authority, but represented by eleven different "directions," each of which is a member of the Union.

THE number of tons of freight transported on the part of the railroads of the New England group of the United States in 1882 was 28,605,416 tons, being seven tons per head of its population. The number of tons transported on the middle group was 166,272,589, the number of tons moved per head of population being 13·6. The number of tons moved on the railroads of Pennsylvania, per head, was 23·4. The number of tons transported on the southern group was 19,199,096, the number of tons per head being 1·56. The number of tons transported in the western group was 140,791,848, being seven tons per head. The number of tons transported on the Pacific group was 5,526,426, being four tons per head. The number transported on all the railroads of the United States the past year was 360,490,375 tons, the average moved per head of population being very little over seven tons.

THE contract for the construction of the railway across Vancouver Island in British Columbia in connection with the Canadian Pacific Railway has, it is said, been signed. Surveys will be commenced immediately, and the centre line placed in running order by the autumn of 1886. A project is before the people of St Paul and Minneapolis for the construction of a line of railway from these commercial centres of the American North-West to Sault St. Marie, between Lakes Huron and Superior, and thence over the Canadian Pacific Railway from Algoura direct to Montreal, with a view to obtaining the shortest possible outlet to the seaboard for the products of the country north and west of St. Paul. By this route these places would be brought 400 miles nearer the seaboard than by the Chicago and New York route, and as 125 miles of the 455 between Minneapolis and Sault St. Marie are already made or under contract, and the section of the Canadian Railway east from Algoura is now nearly completed, there remain but 330 miles to be constructed to carry out the scheme.

ACCORDING to *Poor's Manual* the number of passengers transported in 1882 on the railroads of the New England group of the United States, having a population of 3,990,529, was 65,220,934—a number 16·3 times greater than its own population. The number transported in Massachusetts was 48,063,639, a number greater than for any other State. The number transported in the middle group of States, having a population of 12,196,876, was 205,844,626; or deducting 86,161,029 carried on the New York city elevated railroads, 119,683,597—a number very nearly equalling ten times its population. The number transported in the southern group of States, having a population of 12,255,910, was 10,875,511; a number of 1,379,399 less than the population of this group. The number transported on the railroads of the western and south-western group, having a population of 20,132,325, was 82,940,331—a number 4·1 times greater than its population; the lower average for this group arising from embracing in it the south-western States. The number transported on the Pacific group, having a population of 1,393,817, was 10,510,410—a number 7·5 times greater than its population. The total number transported on all the railroads of the United States the past year, not including the New York elevated roads, was 289,190,783—a number equalling very nearly six times the total population—50,442,066 of the United States in 1880.

AT the commencement of last year Germany possessed 33,707 kilos.—1 kilo. = § mile—of railways of ordinary gauge, 192 of narrow gauge, and 1477 of mountain lines. Of this number 22,325 were owned and worked by the State, 3737 were owned by private companies, but worked by the State, while 7644 were owned and worked by private companies. The State possessed in Prussia 11,505 kilos., 4267 in Bavaria, 1942 in Saxony, 1535 in Wurtemburg, 1185 in Baden, 270 in Hesse, 278 in Oldenburg, and 89 in Saxe-Coburg-Gotha. But if we include all the private lines administered by the State, then we find that Prussia possessed about 15,000 kilos., almost half of the whole German system. The most important private company lines are those of Altona-Kiel, Berlin-Hamburg, Brunswick, and the Palatinate. The cost of establishing the German railway system was 8400 millions of marks—£420,000,000—varying from 45,333 marks to 759,654 per kilo. The proportion of first-class travelling to second-class is 104 first in every 10,000 travellers, to 1355 second. The railway adminstration employs altogether about 300,000 persons, thus distributed:—In the general management 7977, and 3457 temporary employés, with 840 artisans; on the lines themselves, 30,060 permanent and 2663 temporary employés, with a staff of 58,021 workmen; or, in round numbers, 90,143 persons, while the traffic necessitates a body of 72,555 employés and 55,852 workmen.

NOTES AND MEMORANDA.

ONE of the oldest Clyde shipbuilding firms, Robert Steele and Co., of Greenock, closed their yard on Thursday, after launching their last vessel, the Inveruglas, of 2000 tons net register. The firm was established in 1796.

THE *Wochenblatt für Architeckten und Ingenieure* states that the Russian Government is causing surveys to be made, under the direction of General Tschernageff, with the ultimate view of establishing a connection between the river Amu-Darja—the Oxus of the ancients—and the Caspian Sea. The execution of the scheme would be carried out by making canals between the intervening small lakes, and thus the long projected direct communication by water between the Caspian Sea and the Sea of Aral would be accomplished, as the Amu-Darja runs into the latter.

THE *Neueste Erfinderung* describes an anti-corrosion paint for iron. It states that if 10 per cent. of burnt magnesia, or even baryta or strontia, is mixed cold with ordinary linseed oil paint, and then enough mineral oil to envelope the alkaline earth, the free acid of the paint will be neutralised, while the iron will be protected by the permanent alkaline action of the paint. Iron to be buried in damp earth may be painted with a mixture of 100 parts of resin (colophony), 25 parts of gutta-percha, and 50 parts of paraffine, to which 20 parts of magnesia and some mineral oil have been added.

PROFESSOR BELL, the electrician, is reported as saying in a recent conversation that there are more than 500,000 telephones in use in the United States, and the manufacturers are unable to supply the demand so as to keep abreast of orders. He said that the progress of the telephone would have been greater but for the opposition of the telegraph companies, who regarded it as, in part, a competitor instead of an ally. In other countries the telegraph companies had very generally adopted the telephone as an auxiliary, especially at city branch offices and at small offices in the country. Professor Bell said that the science of electricity was still in its infancy. He was constantly engaged in further investigations. Incidentally he was preparing a catalogue of books, pamphlets, and even short articles on the subject, with a view to facilitate his own investigation and that of others. He has the titles of 40,000 such productions already.

THE system of irrigation now in use in the Madras Presidency is on a vast scale; a record, though imperfect, of the tanks in fourteen cultivated districts showing them to amount to 43,000 in repair and 10,000 out of repair, or 53,000 in all. The length of embankment required for each may be estimated on a moderate calculation at half a mile, and the number of masonry works in irrigation sluices, waste weirs, and the like, may be taken to be at least six. The embankments alone for all these tanks would extend over 30,000 miles, while the total number of separate masonry works are at least 300,000. The most remarkable feature about this gigantic system is that it is entirely of native origin, not one new tank having been made by Europeans; and, according to all accounts, there must be a good many equally fine works which have been allowed to fall into decay. According to the *Tropical Agriculturalist*, the revenue dependent on existing works is roughly estimated at 150 lakhs.

IN 1771 the population of the city of New York was a little over 21,000; and in 1786, three years after the close of the revolutionary war, it had 23,614 inhabitants. The several censuses taken during the past 100 years exhibit the marvellously rapid strides which New York has made toward her present imperial position. In 1790, however, the population was little more than it was in 1771; but by 1800 it had risen to 60,515. The remaining censuses are thus given:—1810, 96,373; 1814, 95,518; 1820, 123,706; 1825, 166,086; 1830, 202,589; 1835, 270,089; 1840, 312,710; 1845, 371,223; 1850, 515,547; 1855, 629,906; 1860, 813,669; 1865, 726,384; 1870, 942,292; 1875, 1,041,886; and 1880, 1,206,299. On only two occasions has the enumeration shown a decrease from the figures of the preceding census. The first time was after the war of 1812, and the second after the civil war. The population of New York city has doubled six times within a century—doubling, on an average, once in every seventeen years. In other words, the New York of to-day is sixty-four times as large as the New York of 100 years ago. The rate of increase in the country at large is insignificant beside that of the metropolis. In 100 years the population of the United States has multiplied itself by sixteen; but the population of New York has increased at four times that rate. At the rate of increase shown by the last twenty-five years alone—a rate diminished by the decline of American commerce and the influence of the civil war—there are children who will behold a New York city containing no less than 10,000,000 inhabitants.

THE exceedingly delicate coloured photographs on glass which have come into fashion somewhat of late, are produced by fixing a paper photograph upon a cushion-shaped glass with transparent cement, and when it is dry rubbing away two-thirds of the thickness of the photograph with sandpaper. The thin film left is then rendered transparent by soaking in melted paraffine wax, after which transparent colours are applied, which appear softened down when looked at from the front. The background and heavier portions of the picture are then painted in body-colour upon the face of another cushion-shaped piece of glass, which is afterwards fixed behind the first one. An improvement in this process has just been made by Mrs. Nelson Decker, daughter of the late Mr. C. F. Varley, F.R.S., and the first of the young members of his family to have produced a scientific novelty. She has just discovered that the second sheet of glass may be abolished, a better artistic effect produced, and the picture rendered more permanent by being protected from the action of the air and deleterious gases by being wholly embedded in paraffine. She does this by quickly dipping the photograph in paraffine a second time after the transparent colours have been applied, and painting the heavier colours upon the back of this second coat. A third layer of paraffine is then applied, and the background painted upon that; this third coat may be finally protected by yet another layer of paraffine. Some practice is necessary to acquire the "knack" of doing this efficiently. It must be done quickly enough not to re-melt previous layers, and the plate must after each dipping be quickly tilted on end in such a manner that the paraffine does not run into ridges and thickened lines, but forms an even coating.

IT is now some sixteen years since Mr. Crookes introduced in metallurgy the sodium-amalgam by which the gold miners' difficulty of "sickened" and "floured" mercury was to a great extent overcome. The addition of a small quantity of this amalgam to the mercury used for the extraction of gold from its ores produces a cleansing and deoxidising effect, which however lasts but for a short time, *i.e.*, until the sodium has become converted into the hydrate of the metal. Within the last twelve months attempts have been made by Mr. Barker, and also by Professor Huntington, to render this cleansing and deoxidising effect permanent and continuous by the employment of a current of electricity, in the circuit of which the mercury is made a cathode. Mr. Barker's plan has already been described in these columns, and the main result aimed at by Professor Huntington is to secure a prolonged and perfect contact between the ore and the mercury, which is done by forcing the finely divided ore into the fluid metal. Quite recently a very scientifically devised application of the electrical agency to the required purpose has been effected by Mr. Bernard C. Molloy, M.P., of the Inner Temple. We have had the opportunity of seeing this system experimentally worked, and it appears to combine all the requisites for the effective and economical treatment of those ores of gold which are adapted for the amalgamation process. On a future occasion we may be able to describe Mr. Molloy's system in full; for the present we can only state that the apparatus employed is small and light, so as to admit of ready transport, that the "sickening and flouring" of the mercury are effectually prevented, and that the ore is brought into very perfect contact with the mercury—improvements which signify increased facilities in working and a better yield of gold in the case of a large class of auriferous ores.

MISCELLANEA.

IT is proposed to establish a permanent industrial exhibition on the banks of the Hudson, within easy distance of Central Park, New York city. For this purpose a company has been formed with a capital fixed at 1,000,000 dols. The company was organised in March, and its plans will doubtless be laid in detail before the public ere long.

IN recent experiments which have been made at Grenoble for the transmission of electric force from a distance of 14 kilometres, the wire was of silicated bronze 2 mm. diameter, instead of iron as on former occasions. According to *L'Electricité* the results have been very poor, a motive power of 45-horses having been required to convey 7½-horse power.

IN France in 1830 there were only 115 umbrella makers, and their business did not amount to more than £180,000 per annum. In 1847 the number of umbrella makers in France had increased to 303, and their business to £400,000 per annum, while last year the umbrella and sunshade makers in Paris were 408, employing 1508 workmen, and making £520,000 worth of umbrellas.

THE French gun factory at Fives Lille, has just finished a cannon which presents some peculiarities of proportion and shape, but whose chief novelty is a compact wrapping of fine wire wound around it as tightly as possible by a machine constructed for the purpose. This is of course the Longridge gun. Preliminary tests have shown that the resisting strength of the gun-metal is more largely increased by this device than it could be from an equal weight of similar metal cast with the tube itself.

THE First Commissioner of Works has purchased the Edison electric plant, which has been used in the House of Commons during the 103 nights of the past session. The success attending this experiment has induced Mr. Lefevre to adopt the light on a permanent footing, and a considerable extension of machinery is now being made by the Edison Company. Next session, therefore, not only the libraries and the dining rooms of the House of Commons, but also the division lobbies, Minister's rooms, and precincts of the House will be lighted by the Edison light.

THE Sheffield armour-plate manufacturers—Messrs. John Brown and Co. and Messrs. Charles Cammell and Co.—have received very gratifying news as to the behaviour of their test plates at Spezzia. This is all the more satisfactory on account of the outcry which was raised when the Italian Minister of Marine decided on Sheffield compound armour in preference to the all-steel plates of Schneider. The successful tests at Spezzia will now pass the entire order for the Italia, amounting to 1800 tons, equally divided between the two companies. The plates are 17¾in. and 18¾in. thick.

ON the 14th inst. Rear-Admiral, T. Y. Ito; Chief Engineer, Ziro Mirjabara; asssistant constructor, Sason Sachin; and Lieutenant G. Ijuin, belonging to the Imperial Japanese Navy, visited the Cyclops and Atlas Works, to witness the manufacture of armour plates. The Japanese Government, probably warned by the powerful navy China is getting together, have decided to begin the building of armour-clads in their own dominion at any early date; and these officials are travelling through Europe to see the latest improvements in shipbuilding and armour-plating, as well as in arming the vessels.

THE Local Government Board sanction the borrowing of £46,834 by the Hendon Local Board for sewerage and sewage disposal works, under a modification of the scheme as originally prepared by Mr. J. Pollard, the engineer to the Hendon Local Board. The Local Government Board recommended that the Brent Valley Main Sewer, from Mill-hill to the outfall, and the Silk Stream Valley sewer, from Sunny Fields to the outfall, should be carried out at once. In conclusion, the Board offer in the first instance to lend £10,000, plus the costs connected with the purchase of the land, and recommend that the work should not be let in a lump sum, but on a schedule of prices.

TWO ironclads are, according to the *Neue Freie Presse*, being built for the Russian Government at Sebastopol by the Steam Navigation Company, and, according to the terms of the contract, the first of these two vessels is to be launched not later than November, 1886, and the second six months later, while both are to be ready to take the sea by May, 1888. They will be 314ft. long by 69ft. broad and 42ft. deep, and the plates are to be 5in. thick above the floating line, and 3in. thick below it. The turrets will be covered with plates 14in. thick in front and 12in. behind, and will carry six 12in. and six 6in. guns. The engines, which will be double, with three cylinders, fourteen boilers, and two screws, are to be of 9000-horse power.

MR. FLOYD DELAFIELD, of Noroton, Conn., has brought out a new dynamo, the novel feature being that the armature is a tube of copper. One of the field magnets is terminated at either end by a tubular pole piece; within this pole piece rotates a tubular armature. On either side of the central magnet runs an auxiliary magnet, which is attached to the axle of the armature. Thus the tubular armature has one pole as its axle, whilst the other pole completely surrounds it. The current is drawn off at either end of the cylinder by brushes. The machine is so arranged that one armature can be used to excite the magnets, whilst the other is used for the main circuit, which gives a good current for plating purposes, or, when required for incandescent lighting, the magnets may be excited by a small high tension dynamo, and then the two armatures may be used for main circuit purposes.

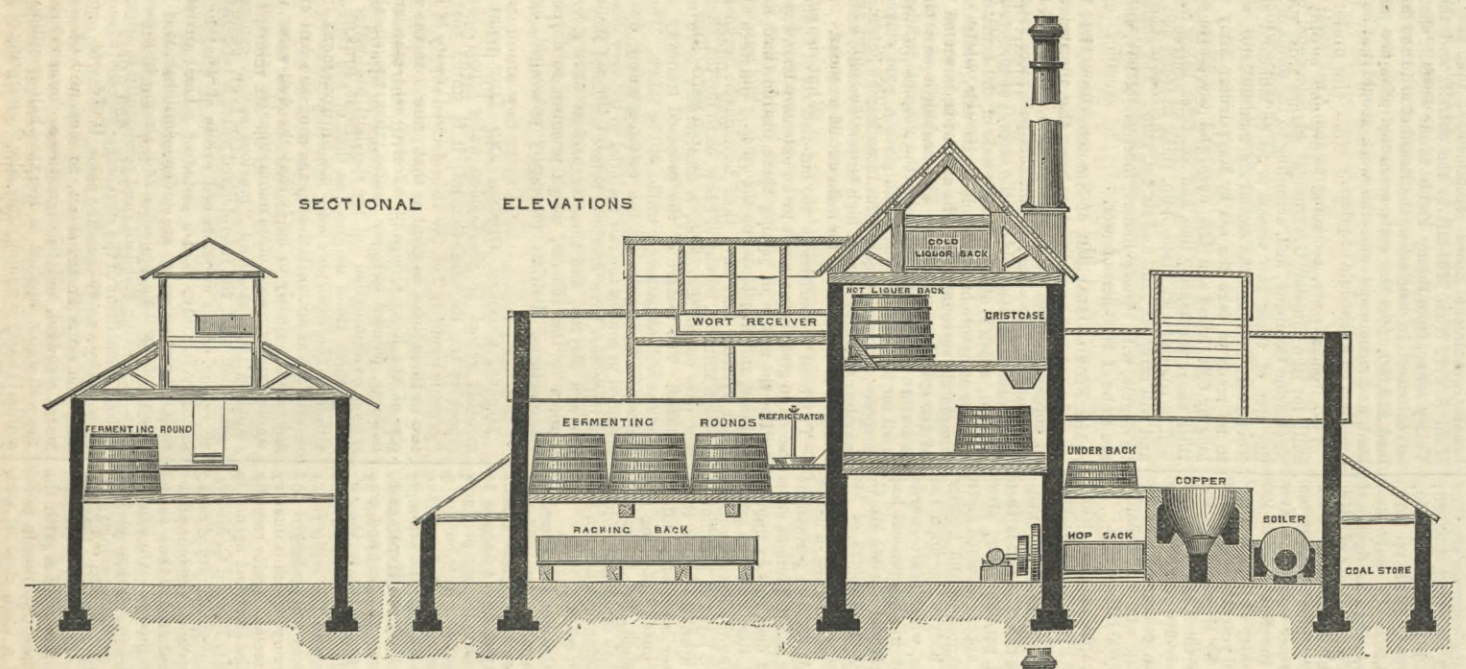
THE local authorities in the out-districts of Oldham have been asked to give their consent to an extensive tramway scheme which will be the means of joining those districts with Rochdale on the one side, and Manchester on the other. The tramway will connect other systems that have their terminus in Rochdale, and will go through Milnrow, by way of Shaw, on to Royton, thence to Oldham, and pass on to Middleton, a considerable town now altogether isolated. The feature of the proposed tramway system is that goods as well as passenger traffic will be taken. The route will lie almost in the centre of the cotton-spinning district, and it is intended to convey the raw material to the very doors of the mills. The promoters have appeared before the Local Boards of Chadderton and Royton, and these authorities have given their hearty support to the scheme, which promises to develope important manufacturing districts practically untouched by any railway system.

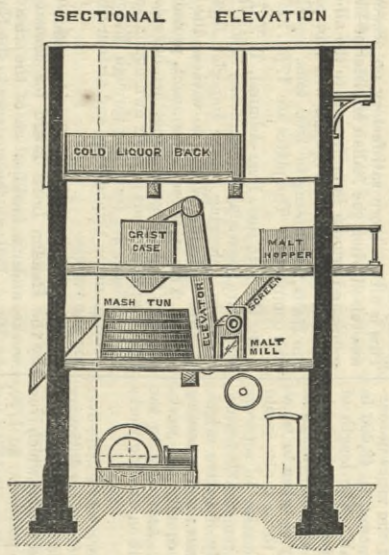
MESSRS. CROOKES, ODLING, AND TIDY point out, in their monthly report on the London water supply, that in the July report to the Registrar-General, it is stated that the so-called "organic impurity" of the river-derived supply of London is from two to three times as great as that present in the well-water supply of the Kent Company, selected as a standard. It is not, however, pointed out, *per contra*, that the so-called "previous sewage contamination" of the standard well-water is from two to nearly three times as great as that of the river-derived water; although the reporter's own figures, establishing alike the two results, are as authoritative in the one case as in the other. It is not meant seriously to imply that the well-water is rendered unwholesome by reason of its unquestionable excess of what has been called by Dr. Frankland "previous sewage contamination," any more than that the river-derived water is rendered unwholesome by reason of its unquestioned excess of what he calls "organic impurity." Only, if at a period of general anxiety with respect to the threatenings of an epidemic outbreak, it is justifiable, as a means of exciting prejudice and alarm, to measure river-water by a well-water standard, and persistently to stigmatise a characteristic constituent of the river-water supplied to some four millions of people by a nasty-sounding name, it must be equally justifiable, with the same worthy object, to measure well-water by a river-water standard, and to stigmatise a characteristic constituent of the well water supplied to less than half a million of people, by a similarly nasty-sounding name, also the offspring of Dr. Frankland's happy invention.

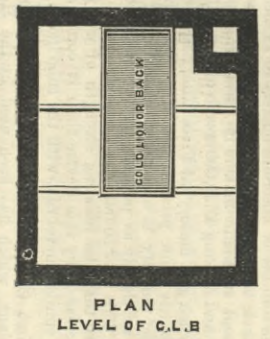
THE WELL PARK BREWERY, EXETER.

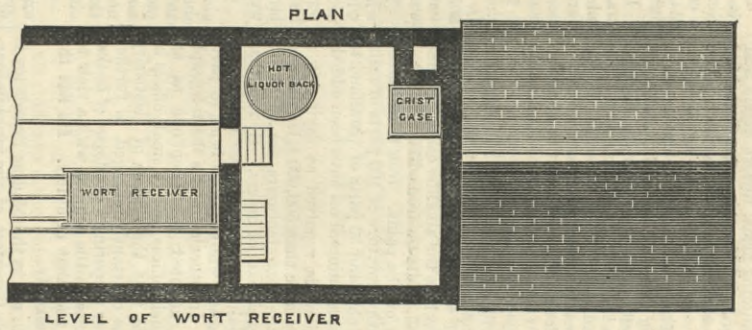
MESSRS. WILSON AND CO., FROME, ENGINEERS.

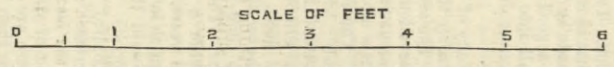
(*For description see page* 231.)

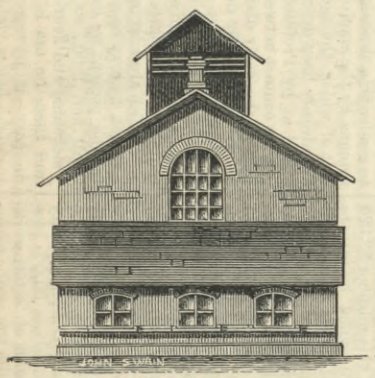




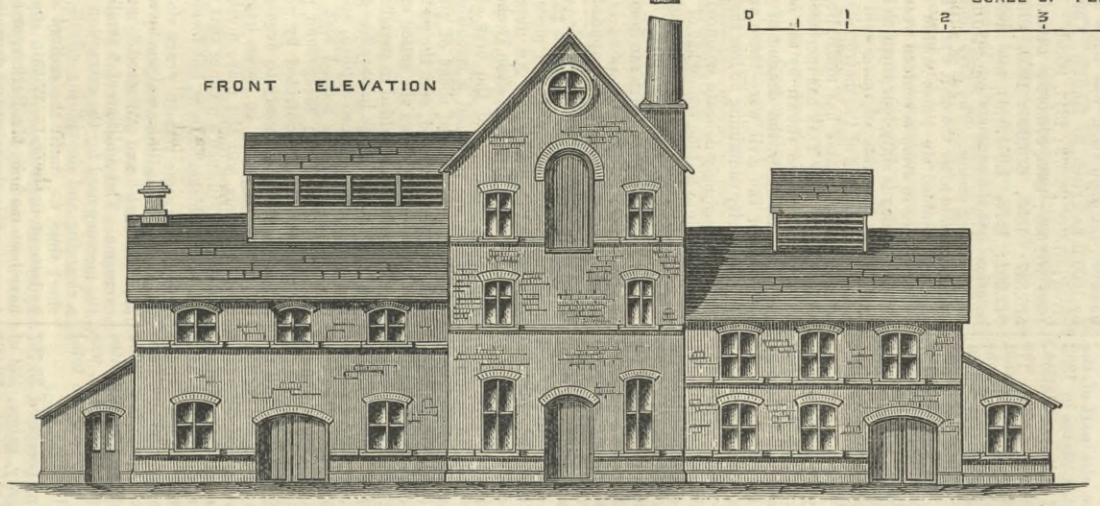


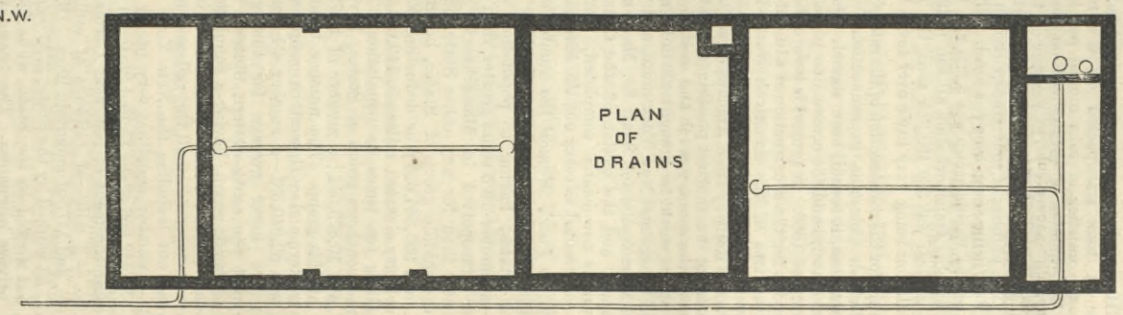


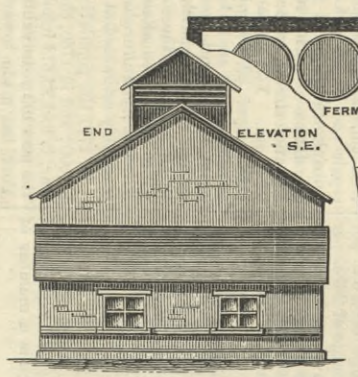


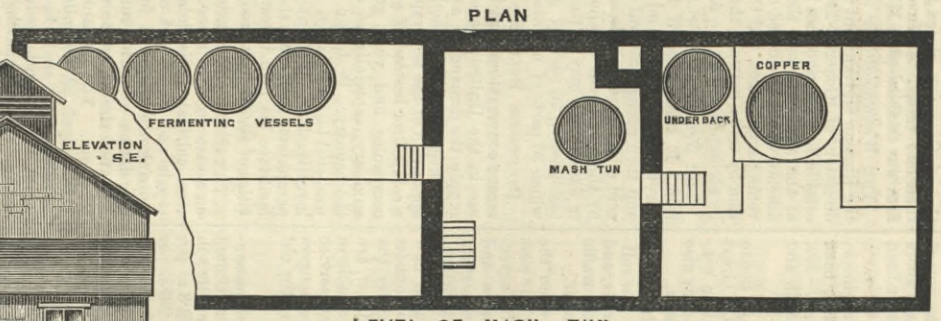


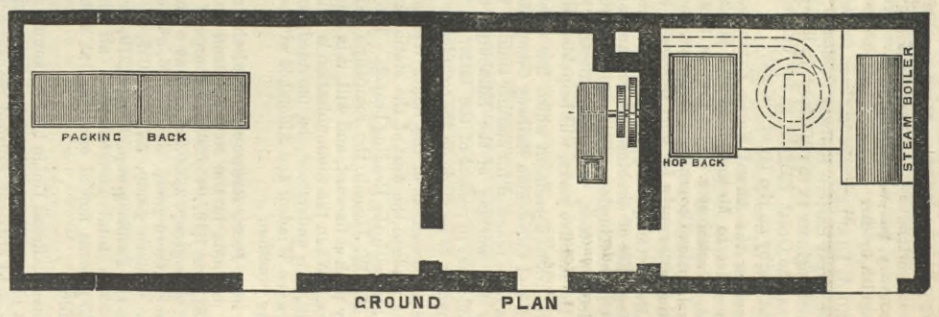
END ELEVATION. N.W.











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TO CORRESPONDENTS.

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

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

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

P. AND SONS.—*We are unable to say.*

A. S.—*We believe so; consult a solicitor.*

DELTA.—*We have received no letters for you.*

INQUIRER.—*A letter lies at our office for this correspondent.*

R. J. L.—*We do not know of any book of the kind you want.*

A SHIPOWNER.—*We have heard of Fenton's bush, but we have had no practical experience with it ourselves; nor have we met with any one who has been to sea with it. Perhaps some of our readers can supply information.*

A MECHANIC.—*Valves of the kind shown in your sketch have often been proposed and tried. In practice they do not wear equally and become leaky, and under the influence of heat the angle alters and they do not keep tight. On the whole, the disadvantages of such valves overbalance the advantages.*

ERRATUM.—*In the article in our last number on the Chicago Railway Exposition, an error was made in describing the scraper illustrated in Figs.* 32 *and* 33. *The description near the bottom of the first column, page* 200, *should read—"When filled with earth, the man in charge bears down on a lever in the rear, and raises the scraper clear of the ground, a catch maintaining it in position. The scraper can be tipped by turning it on its axis by means of a pair of short handles, another catch keeping it tipped, see Fig.* 33, *page* 201."

DEDERICK'S HAY PRESS.

(*To the Editor o The Engineer.*)

SIR,—I shall be much obliged to any reader who can give me the address of a maker of Dederick's American hay press, or will say where Mr. Dederick may be found. MILAN.

September 15th.

ROAD AND RAIL CARS.

(*To the Editor of The Engineer.*)

SIR,—May I ask some of your readers to kindly give me some information as to the most satisfactory scheme for running the same rail or tram wagon on street or road surface, or on rails, at pleasure? I understand some schemes effect the change by having a peculiar rail, others by peculiarity of wheel, &c. I would also be obliged for some particulars as to how the plans have stood the crucial test of every-day work.

VARIUM ET MUTABILE.

LOADS ON INCLINES.

(*To the Editor of The Engineer.*)

SIR,—Will any reader kindly tell me formula for ascertaining the strain on wagon draw-bars while travelling down inclined planes? For instance, counterbalance incline with a gradient of 1 in 13, and the gross descending load of 80 tons, consisting of coal and wagons—pulling up empties—what should be the sectional area of the draw-bar and the steel rope? and what, if any, allowance should be made for the strain caused by applying the brake to prevent excessive speed? INQUIRER.

Cardiff, September 19th.

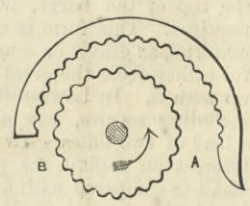
BURDEN'S ROTARY SQUEEZER.

(*To the Editor of The Engineer.*)

SIR,—I have just noticed your answer to "Subscriber," in your issue of the 14th inst., wherein you state that you have never heard of "Bergen's rotating squeezer." Your correspondent probably means Burden's squeezer. I have Burden's own drawings of this squeezer by me. The drawing is marked, "Patent Shingling Machine, invented by Henry Burden, of Troy Ironworks, U.S." There are several at work in South Staffordshire, all made from this same drawing. The patent was bought from Burden by the late Mr. James Foster, of Stourbridge Ironworks. The drawing is dated August 15th, 1841. I shall be glad to give your correspondent any information he requires respecting cost, &c., of this squeezer. W. LEWIS.

Wollaston, Stourbridge, September 19th.

SIR,—For the information of "Subscriber," I can give you the following particulars relating to "Burden's" invention, which is clearly alluded to:—It consists of a strong cast iron cylinder corrugated on its surface—parallel to its axis—with indentations similar to those on the jaws of the crocodile squeezer. It is mounted on a strong vertical axis, and is driven from below by heavy bevel gearing. It is partly surrounded by a correspondingly corrugated curb, in which it is placed excentrically as shown in annexed sketch. The puddle ball is thrown in off the trolly at A, and is waltzed round and round between the two corrugated surfaces, which approach one another, towards B, where it is ejected in the shape of a compact cylinder ready to be passed through the rolls. The advantages of this machine are great; besides accomplishing the work far better it does it with no attendance whatever; the trolly being run sharply up against it, the puddled ball is shot into it, to be discharged ready for the rollers. This machine is the invention of Mr. Burden, of Troy, New York, one of the largest ironmasters in the United States, who possibly may give your correspondent further particulars.



R. RUSSELL.

17, Park-road, New-cross, S.E., September 15th.

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DEATH.

On the 6th inst., at his residence, Belmont Villas, Leicester, JOSIAH GIMSON, aged 64.

On the 13th inst., WILLIAM STOCKWELL, aged 59 years, for 32 years foreman of shipwrights at Messrs. Samuda Brothers, Engineers and Iron Shipbuilders, of Poplar, London, much esteemed and deeply regretted by his employers and all the foremen and men on the establishment.

THE ENGINEER.

SEPTEMBER 21, 1883.

THE VALUE OF STRIKES.

A CORRESPONDENT, himself a large employer of labour, tells us that while giving a general adhesion to the views expressed recently in our pages in an article on foreign competition, he holds that we have done the working man scant justice in one respect. To make this matter clear, we must recapitulate a little. We called attention to the fact that it usually happened that months, if not years, must elapse before the working man can hope to repay himself for the money lost during a strike. Thus, if a man earning 30*s.* a week turns out for another shilling, and wins the battle after being out ten weeks, then he will have expended £15; and he cannot recover this at the increased wages, leaving interest out of the question, in less than 300 working weeks, or, say, six years. That this is quite true our correspondent admits, but he holds that this is not the right way to look at the matter. If it were not for strikes the position of the working man would be, he contends, very much worse than it is, and he points to the men engaged in the London building trade in proof of the accuracy of his views. He maintains that the position of the bricklayer, carpenter, joiner, painter, &c., has been very much improved by the union of the men, and the repeated strikes which at one time threatened to disorganise the entire building trade. The question thus raised by our correspondent is one of great interest, and it deserves to be more fully discussed than it has been as yet. However, we have not thought it necessary to publish his letter, because we have given the substance of it above.

The moment an "if" is introduced into any argument or discussion, anything becomes possible in the way of assertion on the one hand, and of admission on the other. When, therefore, we are told that *if* the men did not strike, such and such things would happen, we feel that we are more than half defeated. It is simply impossible to say with certainty whether they would or would not on the whole be worse off than they are. We believe that wages are after all adjusted by something far more powerful than strikes, namely, by the law of supply and demand, and we have on our side some of the most able political economists. But we are not sure that we could prove this in a way to satisfy a working man. It is no doubt clear that in a few instances strikes have modified wages, driving them up; but this has never been the case unless the strike was so judiciously timed that the masters could really afford to pay the rise. If we suppose that the members of any trade—say moulders, for example—had no union, and consequently no real power of striking, it may be contended that they would be ground down in the matter of wages to starvation point, whereas with a union they would be sufficiently powerful to fight the greedy capitalist. This is a very plausible, and, indeed, popular line of argument. Those who favour it, however, quite forget that when wages are low in any trade, men of the proper type avoid it. Thus, after a certain point had been reached under the assumed conditions, moulding would no longer be adopted as a trade by men likely to excel in it. The whole practice of the art would deteriorate; and even bad and incompetent workmen would become scarce, and the masters would in self defence have to pay higher wages. This is by no means a fancy picture; all that we have sketched has actually taken place in the case of pattern makers. Several years ago they had no union, or other means of asserting themselves, and they were very badly paid; first-class workmen were getting 24*s.* a week, while second-rate moulders had 30*s.* But the consequence was that no more apprentices joined the trade. The competent pattern maker threatened to become extinct. The masters then began to bid against each other for good men, and at the present moment the pattern maker is certainly not the worst paid man in an engineer's works. Such a truth as this goes some way, we think, to confirm the accuracy of the statement that continuous supply and demand do much more to regulate wages than any intermittent action on the part of men can effect. However, we do not wish to assert that strikes cannot affect wages. Indeed, it will be seen at a glance that a strike is nothing more or less than a means of reducing supply. Let us suppose, for example, that there were in Great Britain ten thousand boiler-makers, and that these men were all employed at thirty shillings a week. If, now, nine thousand of the party agreed to kill off the tenth thousand, then, other things being equal, and the demand for boilers remaining unaltered, each of the nine thousand would find his wages increased by one-ninth—for the share of every dead man would be divided into nine equal portions, and divided among the survivors. To slay is not permissible; but nine thousand might say to the tenth thousand, "Give up boiler-making, and we will pay you well;" the result would be the same. This principle is really put in practice in almost all trades; for it is evident that if even one man were always on strike in some place or another, the whole working power of a given community would be reduced by so much, and wages raised accordingly. In the same way, if we find that strikes have reduced the whole producing power of a given trade by, say, 10 per cent. in any year, then the result is just the same as if the number of those pursuing that particular calling had been reduced by 10 per cent. Strikes operate by diminishing supply, and really in no other way; and the question we wish to see discussed from all points of view is, Does it pay the strikers, as a whole, to diminish supply?

If it could be proved that wages were regulated solely by the supply of labour and not by demand, there could be only one answer to this question. It would pay very well indeed to diminish supply. Thus in some of our colonies physicians earn very large sums, not because they are efficient, but because they are scarce. We find lawyers of reputation making fortunes, because there are not lawyers enough with great reputations to satisfy the demand, and their services are reserved for the rich. But in the affairs of trades and trades unions, and producers of all kinds, there is a third party, concerning whom we have said nothing as yet, who plays, nevertheless, an extremely important part in settling wages. We allude to the consumer. If wages reach a certain point in any trade, the thing produced becomes so dear that the public reduce the extent of their purchases, and so the men suffer again. After all the power of the consumer is practically unlimited; and in nothing is this more apparent than in trades affected by caprice or fashion, such, for examples, as the silk ribbon, straw bonnet, and crinoline steel trades. In such as these strikes are invariably entirely powerless. There is, moreover, another and kindred influence to be taken into account, namely, competition. We have said that a strike operates by reducing the supply of labour. The number of workmen may be so great that a strike of feasible dimensions is quite unable to reduce supply sufficiently to have any effect in the way of raising wages. Thus, for example, when Messrs. Bull had a strike of masons at the new Law Courts to contend against, they drew upon Belgium for what they wanted, and got it. Many somewhat similar instances might be cited; and furthermore, it is worthy of note that no matter how badly any given class of working men think they are used there are hundreds of other working men who are quite willing to accept that which the strikers reject. For example, we now and then hear of a strike of locomotive engine drivers. Now, these men are in reality much envied by others; and the result is that the moment a railway strike takes place hundreds of candidates for the vacant berths present themselves. These men have all had something to do with steam engines, either stationary engines, or traction engines, or colliery locomotives. Others, again, are drivers discharged for small offences, and so on. In a very short time the service of a railway can be fully carried on with such assistance, and the strikers find themselves beaten. The attempt to limit supply fails. If we are right in the line of reasoning we have taken—and we see no reason to doubt it—then strikes, instead of being potent elements in settling wages, are really of very secondary power. They do, however, possess one peculiarity worth notice. When they operate at all, they affect wages much more quickly than any other influence, and it is to this, no doubt, that they owe most of their popularity. Thus, for example, in process of time, the under-paying of a given class of men would diminish supply and raise wages; but years might elapse before this was brought about, as in the case of the pattern makers which we have cited. Strikes, by taking all the labour out of a district, act much more promptly, but less permanently.

Under all the conditions, can it be proved that strikes pay the strikers? We think not; but of course, the answer must depend to a great extent on the cost of the strike. It is impossible to witness the effects of a great and prolonged turn-out; the ruin of homes; the sacrifice of property sold to procure food; the load of debt incurred; the ruin to the bodily health of children and the mental and bodily health of parents, without coming to the conclusion that strikes are far too dear. It does not appear that they can ever pay. If, further, we consider what they cost the country at large, and that they may drive trades entirely away from certain districts, or to other countries, it seems to us to be more and more difficult to urge anything in their favour. They may be necessary, but it can only be on the same principle that the great standing armies of the European Powers are necessary. We admit with regret that arbitration seems to have almost failed as a means of adjusting wages questions in this country. What is left we know not. He who would suggest some means of determining wages, less costly and less objectionable than strikes, and which would be accepted by men and masters alike, would deserve well of his country; so well indeed that we do not think it would be possible to award him riches and honours in excess of his deserts.

THE CONTINUOUS BRAKES RETURN.

THE continuous brakes return for the six months ending June last has just been issued, and according to our usual custom we proceed to make a few comments upon the leading features to be found therein. It would seem that the total carriage stock of the country now amounts to 47,045 vehicles. Of these 37½ per cent. are fitted with five descriptions of automatic brakes, or rather, to adopt the cautious phraseology of the Board of Trade, with "brakes which appear to comply" with the conditions of the Board; 32 per cent. are fitted with thirteen other kinds of brakes which make no pretence of doing so, and the remaining 30½ per cent. are without brakes altogether. These figures, however, show an improvement in the right direction—that is, in the extension of the automatic principle. The number of automatic brakes now amounts to 17,662, or an increase of 2597 in the six months, while for the first time since the returns have been issued the non-automatic stock shows a reduction, there being 341 less than in the previous return. The gross increase during the half-year may therefore be said to consist altogether of brakes on the automatic principle. If we omit sectional brakes, and deal with continuous brakes only, we find there are now 17,662 vehicles fitted with automatic brakes, and 6467 with non-automatic brakes, and of the former over 60 per cent. are Westinghouse. But though the general tendency of the figures in this return—in principle, as we have said—leads to what we have all along insisted on as the right direc-

tion, we cannot say that the brake question is much nearer a settlement than it was, and we doubt very much whether a satisfactory solution will ever be arrived at without compulsory legislation. We have frequently referred to the necessity for uniformity in brakes; but instead of everyone using his efforts towards this very desirable end, there are indications in the return, of fresh inventions, and consequently of further complications. For instance, the matter is by no means simplified by finding that the return from the North London Railway, the stock of which is fitted with the Clark-Webb brake, is now suddenly transferred to the automatic list, while there are still 6087 other Clark-Webb sectional brakes in the non-automatic list. The London and North-Western Company has, as is well known, always exercised a baneful influence upon this subject, its efforts having been from the first devoted to the extension of the Clark-Webb brake, and the suppression of other systems which are in every way superior. Some time since, Mr. Moon, the chairman, announced the intention of his company to discard the chain brake, upon which so much money had been lavished, and to adopt in its place a vacuum brake, which, with the assistance of a good steam brake upon the engine, they hoped to be able to make answer every purpose. What form this vacuum brake was to take was not divulged, and even now there would appear to be some doubt on the subject. In addition to 5518 chain brakes, the North-Western Company returns seventy-five carriages fitted with a brake vaguely described as "vacuum," but which it appears, on further search, can only be applied by the driver, and not by the guard; moreover, in answer to question No. 2, Whether self-acting? we find it is said to be "self-acting on a van only in case of a break-away." In the return from the North Staffordshire Railway, mention is made of a brake called "Webb's vacuum," which is also applied only by the driver, and in answer to the question as to its self-acting properties, the reply is simply "No." Whether the last-named appliance is the same as the former, we do not know. The modesty of inventors is well known; but it may be that the North Staffordshire Company has been premature in thus fathering an invention which is still in an embryo state. However, it would certainly appear that the North-Western Company finds it beneath its dignity to adopt any fully developed appliance, and is again bent upon having a system which will bear the mark of its own genius. That one company, or one man should now be answerable for introducing three or four brakes, certainly does not bring the prospect of an uniform system any nearer. Such a course serves only to check the elucidation of a problem already difficult enough.

Whatever the form of vacuum brake, however, which the North-Western Company intends introducing, it is to be hoped it will manage to avoid such risks as, according to the returns, are constantly being run by trains fitted with the chain brake, and also those which are regularly recorded against the Smith vacuum brake. A large number of cases of overrunning stations during the half year have arisen from the failure of the vacuum brake to act; and a perusal of these lists gives rise to very unpleasant sensations. For instance, the first report mentioned in this return runs as follows, from the Cheshire Lines Committee:—"7.15 p.m. passenger train from London-road station, Manchester, to Central station, Manchester, ran through Stockport—Teviotdale—station." The brake failed to act. Such incidents have occurred so often that it is extraordinary that they have not been followed by more disastrous results, which, however, can only be a question of time. Curiously enough this very place—Stockport—was on the night of the 12th inst. the scene of another illustration of the defective principle of the vacuum brake, and which resulted in serious injury to several passengers. It would seem that as a heavy train, drawn by two engines, conveying excursionists from Doncaster races, was approaching Stockport on a steep down gradient, the vacuum brake was applied with the effect that the train was broken in two. The front part proceeded and the detached portion soon followed. A Chester passenger in it says:—"We ran down the incline for a mile, I should say, amid awful sensations and screams of 'put on the brake,' when we ran smash into the first part of the train. I sat in an open third-class carriage; as the trains met my companion was shot violently over the barrier into the next compartment, and we were all huddled together, the glass was smashed, the lights extinguished, and a scene of terrible confusion ensued." It is true an automatic brake would have prevented all this, but how is the new London and North-Western brake, which is self-acting only on the van, to stop the hind part of a heavy train on a steep falling gradient? Can it seriously be considered necessary that Mr. Moon or some other magnate is to be violently shot out of a train in the fashion described above—it may be with the result of a broken neck—before the reasonable demands of the Board of Trade are complied with?

As has been shown before, frost is a fruitful source of failure with the vacuum brake, and many of the failures in this return are due to this cause, for which we doubt if there is any remedy. Others are due to the couplings coming undone without warning, and a remedy for this defect has been attempted by providing a tell-tale gauge on the engine, the pointer of which should indicate whether the couplings are separated or not. An illustration of the use of this make-shift is given in the returns of the Great Northern Company, as follows:—"Vacuum pipes became uncoupled. Driver fined for not observing tell-tale gauge. Overran station." There can clearly be no proper tell-tale without an automatic brake, by which the driver would have been unmistakeably warned by the stopping of his train. The automatic vacuum brake has again suffered many serious delays, due to the leak-hole being stopped up. In our number of May 11th we pointed out the fact, clearly demonstrated in the previous returns, that these leak-holes gave a great deal more trouble, and, in fact, led to much greater complications than the triple valves in use with the Westinghouse brake, and this feature is confirmed in the present return. The record of failures against the Westinghouse brake contains no mention of frost, and the parts peculiar to this brake are again only mentioned often enough to show that they exist. The return for this brake is mainly a list of burst hose and mistakes on the part of the companies' servants. We may never eliminate the tendency of human beings to err, but whether these burstings arise from defective material or from injury, it should surely be possible either to provide a better article or to protect them from being damaged.

DREDGING AND EMBANKING.

It is much to be wished that some competent engineer, able to obtain the requisite material, should give us a treatise on excavating. When we consider the enormous quantities of earthwork which are shifted every year in different countries of the world for the making of railways, docks, drains, &c., it is obvious how important it becomes that the best and cheapest mode of doing this should be generally known. Few will assert that our engineers and contractors are already perfect in this department, or that our practice in excavation leaves nothing to be desired. At present the shovel, pick, and grafting tool, worked by hand, are still the means by which most of our excavation is carried on, both in England and the colonies. In America the higher cost of hand labour has produced a more advanced state of things. In our number for September 14th we described the excavating machinery exhibited at Philadelphia, and largely used in the United States for the making of cuttings and the clearing of ditches by the side of new railways. Unfortunately, no details of the cost of such excavations are forthcoming, which would enable us to judge how far they are fitted to replace hand labour on this side the Atlantic. Of course, however, such machines are not a monopoly of the United States. Messrs. Ruston and Proctor, Appleby, Priestman, and others, have for some time past exerted themselves in perfecting and selling excavators of various types; but here again we are not aware that trustworthy estimates of first cost, working cost, and repairs have ever been laid before the public. We need hardly say that we should be glad to open our columns to any figures which these firms, or those who have employed their machinery, might be disposed to contribute. But the subject requires something more than isolated monographs. It should be treated systematically in all its branches, including, of course, the question of excavation under water as well as land.

It is this latter branch of the questicn on which we desire to say a few words. It is, perhaps, the more important of the two. For the excavation yearly accomplished on land is relatively diminishing, from two causes—the first being that the more important and longer lines of railway have already been constructed, and the other that in those still to be made the tendency is more and more to keep as close as may be to the surface, and diminish the amount of excavation by every possible means. It is possible, indeed, that the spread of cheap excavating machinery may gradually cause a reaction in this respect. But however this may be, the excavation required under water is not at all likely to diminish, owing to the unfortunate tendency in nature to remove earth and sand from places where they are harmless, or even useful, and deposit them in other places where they are neither the one nor the other. There are two great examples of this tendency in the action of rivers on the one hand, and of waves and ocean currents on the other. Of the first we have a striking example in the case of the Mississippi, of which we gave some account in a recent issue; while there is scarcely a harbour on the coasts of the German Ocean which does not furnish a more or less striking illustration of the latter. The *modus operandi* in each case is tolerably well known, and need not here be dwelt upon. The result in each is the same, viz., the deposit of a layer of silt at the bottom of the river or estuary, which lessens its depth, and must be artificially removed, if the depth and water-level are to be maintained the same. In the case of harbours these conditions are imperative, and consequently the problem thus resolves itself into het best form of dredger to be employed for the purpose. In the case of rivers this is not so; and as a matter of fact, in the rivers on the Continent, where this evil is most common and most serious, very little is done in the way of dredging the silt deposited. The regular method is to counteract the evil by raising the embankments along the river, thus allowing its surface level to rise, and maintaining the depth unaltered in spite of the higher level of the bottom. This method of dealing with the problem received a severe practical reprimand in the disastrous floods at Szegedin, which occurred in the spring of 1879. In April 11th of that year we dealt with the subject at some length, pointing out that the system, even if cheaper at the moment, was sure to end, sooner or later, in disaster; but that it was in fact dearer and more troublesome, provided only that proper dredging appliances could be obtained.

Since the date of that article nothing has occurred to invalidate the soundness of the conclusions then drawn; on the contrary, further experience has shown that the ratio then assumed to hold between the cost of dredging and embanking, viz., as 1 to 5, is really higher than the truth. A good deal of information on dredging has since become accessible, though it is by no means as full as it might be. The Proceedings of the Institution of Mechanical Engineers for 1879 contains a paper by Mr. Buckley on the "Fouracres Dredger," which gives some useful figures on the subject. It appears in the first place that the cost of ordinary work by bucket dredger may be taken at 3d. to 4d. per cube yard, when the circumstances are favourable and the quantities so large as, for instance, is the case on the Clyde or the Tees. Of this price, not more than 1½d. is the actual working cost of dredging; the remainder is absorbed by repairs, and by interest on first cost, reckoned at 10 per cent. In India, owing to the climate and the high cost of skilled labour, the working cost alone is about 6d. to 9d. per cube yard, and the total cost about 15d. On the other hand with the Fouracres dredger, as working in the Patna canal, the total cost was only 2d., and the working cost 1½d. This dredger was a comparatively rough apparatus, fitted up with a crane in an ordinary barge. The dredge itself consists of a single bucket made in halves, which, when closed, form a semi-cylinder with a horizontal axis. The two halves have, of course, sharp edges, and special arrangements are provided for causing them first to bury themselves in the sand, and then to close upon the mass comprised between them.

To the same class belongs the well-known dredger of Messrs. Bruce and Batho, which we believe was really earlier in the field. This dredger has never been fully described, but a model of it has been exhibited on various occasions, and its construction is well known. The dredge or bucket is here of a hemispherical form when closed, and is made up of three equal divisions, meeting at the lowest point. Each of these when open has, therefore, a sharp end, and somewhat resembles the pointed shovel of a coal-heaver. This pointed end enables each blade to penetrate deeply, even into hard or clayey soil. When buried to the required depth, they are drawn together by mechanical means, and the bucket, with the mass of earth enclosed, is lifted to the surface, and discharged into barges or otherwise as required. The apparatus may be worked, like that of Fouracres, by an ordinary crane, but in practice, and especially when of large size, it is worked by hydraulic pressure. For sea-going vessels the bucket is suspended from one end of a strong iron beam: below this is an opening in the bottom of the vessel, through which the bucket descends and rises, the shoot being so arranged that it swings out of the way of the bucket as it passes, and then drops underneath it to receive the contents. The opening can be closed when the bucket is not wanted, and the dredger used as an ordinary steamer. For canal work every action of the machine is performed by hydraulic machinery, and is so easy that the whole can be managed by native labourers. The working parts are few, and none of them, except the journals of the bucket, are exposed to the wearing effect of the material dredged. In the most recent examples the hydraulic pumps are regulated by an accumulator, which renders the pressure uniform, and governs the engine so completely as to reduce the cost of fuel by 50 per cent. Even without this improvement, the superintending engineer of the Punjaub, in a report to Government, estimated that a Bruce dredger can there lift 2000 cubic feet per hour at a working cost of about 2½d. per cubic yard. To this has to be added the expenses of repairs and depreciation; but the first cost is much less than that of a bucket dredger, and the expenses of repairs during two years' working are understood to be *nil*.

A special form of this dredger has lately been devised for the canals of China, where the dredging needed is enormous, and is at present carried on in the most primitive manner. The difficulty here is that the numerous bridges, with which, as represented on crockery, we are all familiar, have only a span of some 6ft. or 7ft., and a height of 3ft. or 4ft. above water level. Through this restricted opening the dredger must pass. The difficulty has been got over by building the dredger as a long narrow boat, with a pontoon attached on either side. In passing a bridge the pontoons fall behind, and the beam is lowered to the deck. On arriving at the scene of action the beam is raised, the dredger is anchored, and the pontoons are brought up alongside to act as platforms for working.

Lastly, Mr. A. A. Langley, now engineer to the Midland Railway, described to the Institution of Mechanical Engineers in 1882 the so-called "Bazin dredger," which has been worked with great success in the harbour at Lowestoft, and also in different districts of the Continent, by Mr. Charles Ball. This dredger consists simply of a centrifugal pump mounted on a barge, from which a pipe of india-rubber stiffened with wire passes to the bottom. This pipe is furnished with a mouthpiece, which digs into the silt, and on starting the pump this silt is driven up the pipe by the head of water, and delivered into a trough on the top of the barge, whence it may be discharged as required. This form is of course applicable only in soft material, as gravel or sand, and even with mud is of doubtful utility, from the great amount of water which is carried up with it. In Lowestoft harbour the total working cost, including repairs, was about 2½d. per cube yard, with a lead of two miles. To this may be added about ¼d. for interest on capital, the prime cost being, of course, very small as compared with any other class of dredger. Similar dredgers used in Holland have delivered the spoil through pipes to a distance of 1200 yards, thereby saving all the labour of discharging. A similar dredger, not floating, but mounted on wheels, was built for the South of France at a cost of £480, and was tested to dredge 750 tons per day.

Looking at the information thus obtained, we are disposed to accept the estimate made by an engineer of great experience with one of the dredgers we have described, viz., that in Europe, under favourable circumstances, and where the work is regular and extensive, the cost of dredging, all told, should not exceed 1d. per ton. We need hardly say that no process of land excavation, even with the most improved machinery, has ever approximated to such a figure. The result is one which cannot be too prominently put forward, or too vigorously urged upon the attention of every engineer concerned with the removal of silt or earth from below water, whether on the Mississippi, the Po, or the Theiss; being surely the cheapest, as it is the most direct means of maintaining channels at their required depth, whilst at the same time removing all fear of those terrible disasters which have so frequently attended the almost necessary failures occurring in the rival process of embanking.

COMING RAILWAY WORK.

Seven hundred and eighty-two miles of railway to be constructed within the United Kingdom represents a quantity of railway work which has not had an equal for many years. For such a length, however, powers have been granted to existing and new railway companies during last session. An expenditure of £30,682,100 has been authorised for new lines and connected works, and nearly three millions and a-half sterling have to be added to this, as the authorised expenditure on about 150 miles of tramways, which have also been authorised. Four

of the companies are each authorised to expend over two millions sterling, viz., the Great Eastern £2,250,000, for fifty miles of new railways in Essex, and other works; the London and North-Western £2,433,000, for fifteen miles of new line and widening of lines; the London and South-Western, £2,013,000, for thirty miles of new line, and works in connection; and the Lancashire and Yorkshire, £2,600,000, for various works. Among the new companies in the metropolis and the locality immediately around which have received these powers, is the London, Harrow, and Hendon Company, which is authorised to construct twelve miles of railway at an outlay of £373,300. The lines proposed to be constructed are from the authorised Beaconsfield, Uxbridge, and Harrow Railway, at Harrow, to Hendon, and the Great Northern —Edgware and Highgate branch—Railway, north of Highgate, and to the Alexandra Branch Railway; also branch lines to the Midland Railway at Hendon, to the Harrow and Rickmansworth at Harrow, and to the Metropolitan Outer Circle at Kingsbury. Fifteen tramway Bills, eight of which include the use of mechanical power, have been sanctioned for the construction of thirty-eight miles of tramway, at an outlay of £623,000, of which £347,000 are for the construction of fourteen miles of tramways within the metropolitan area—namely, eight miles in the Norwood and Croydon district, at a cost of £150,000; three miles in Brentford and Isleworth, at an outlay of £150,000; and three miles in Peckham and East Dulwich, at a cost of £47,000. Twenty-six Board of Trade applications for tramway provisional orders were granted, in sixteen of which mechanical power was sanctioned, and in nine the Hallidie cable system. There will thus be a good deal of railway and tramway making, and plenty of new stock will be required within the next year or two. Internal trade in these industries certainly has not a very gloomy outlook.

WAGES IN THE IRON TRADE.

THE series of ironworkers' meetings referred to at the late assembling of the Mill and Forge Wages Board have been inaugurated this week. At West Bromwich Mr. Capper informed the men that he was of the opinion that the present price of labour in the ironworks was too low, and that they were fairly entitled to an advance. A scheme, propounded by a workman, that the minimum should be no lower than 8s. per ton, and rise and fall 1s. with every 20s. in the selling price of iron, did not, however, meet with Mr. Capper's support. He contended that it was very difficult, when arranging a sliding scale, to secure a respectable minimum, and the present minimum of 7s. 3d. per ton was better than none at all. The result of the meeting was a resolution instructing the men's representatives to claim a revision in the wages' basis that should include all classes of iron, with a premium of 1s. in excess of equal shillings to pounds sterling. Excepting that an improved sliding scale should have as its basis 8s. per ton, a similar resolution was passed at a meeting at Brierley Hill. The anticipations of the ironworkers in this district are being upheld by similar action being taken by the ironworkers in the Sheffield district; and inquiries are reaching firms in Wolverhampton showing that great importance is attached to what is going on there in wages' matters by the iron-masters in Scotland, where wages are regulated by those fixed by the Wolverhampton Board.

AN ELECTRICAL PATENT CASE.

IN our last impression we referred to an important patent case recently tried in the United States, in which the representatives of the owners of the Gramme dynamo patents were the plaintiffs. Judge Blatchford, as Circuit Judge of the Southern District of New York, has just given his decision. The action was brought by the Gramme Electrical Company against the Arnoux and Hockhausen Electrical Company, in equity, for the infringement of letters patent granted to Zenobe Theophile Gramme and Eardley Koms Charles d'Ivernois, October 17th, 1871, for seventeen years from that day, for an improvement in magneto-electric machines. It was set up for the defence that the patentees obtained a patent in Austria on December 30th, 1871, and that an application was filed in the United States Patent-office on August 17th, 1870. The Court holds that as the Austrian patent expired at the latest on December 30th, 1880, and before this suit was brought, and the American patent lapsed with the Austrian, there was no ground for this suit in equity when it was brought. The judge added:—"The novelty of the invention patented is attacked, and it is also contended that the patent is invalid, because it was issued for a term of seventeen years and not for a shorter term. But the consideration of these questions is unnecessary, and the bill is dismissed with costs." It would appear, therefore, that any one in the United States can now make the Gramme machine.

THE TREVITHICK MEMORIAL FUND.

IN our impression for February 16th, 1883, we brought before our readers a proposal for the formation of a fund for the erection of a memorial to Richard Trevithick. A committee has been formed, and we are happy to find that success appears to attend their labours. A list of subscribers has been published, at one end of which we find Mr. R. G. Tangye, with 100 guineas, and at the other 10s. subscribed in pence by the workmen of Mr. P. Brotherhood; we imagine that this latter contribution would be more pleasing to Trevithick than the former. A fair sum has been collected, but more is wanted and more will, we have no doubt, be forthcoming. Mr. Henry Chapman, of Victoria-street, is the treasurer. A memorial edition of the "Life of Trevithick," from, we suspect, the pen of Major Davis, has just been published by Messrs. Spon, of Charing-cross. It is a pamphlet of but twenty-four pages, but it is profusely illustrated and very well written; it leaves nothing indeed to be desired, and we heartily recommend it, not only to those who are specially interested in Trevithick, but to all who care for an extremely interesting chapter in the history of the steam engine. We trust that such a generous response will be made to the request of the committee for more funds, that a memorial will be provided really worthy of the genius of a most able engineer.

THE FLORIDA SHIP CANAL.—The engineer of the Florida Ship Canal has presented a report as to the feasibility of cutting across the peninsula, and thus avoiding the long and perilous journey round through the Florida Straits. The estimated cost of making a canal sufficiently broad to enable two sea-going vessels of the largest class to pass each other is 46,000,000 dols., apportioned as follows:—Excavations, 36,000,000 dols.; harbours at each end, 4,500,000 dols.; engineering, right of way, and contingencies, 5,500,000 dols. The total length of the proposed canal is 137½ miles, and for the whole distance the highest elevation to be cut through on crossing the watershed is only 143ft., and this but for a short distance. The advantages of the canal are a great saving of distance and risk between the Mexican Gulf and the Atlantic ports, the saving between New York and New Orleans being 500 miles, and between New York and Pensacola 600 miles. The cost will be lessened also in the smaller proportion of canal dues to the insurance charged for vessels going round the Straits, which often amount to from 500 dols. to 800 dols.

THE IRON AND STEEL INSTITUTE.

MIDDLESBROUGH-ON-TEES must decidedly be regarded as the birthplace of the Iron and Steel Institute—although the idea of its formation was started at Newcastle, in a paper by the late Mr. John Jones, read before the North of England Iron Manufacturers' Association on the 29th of September, 1868—because its founders were Middlesbrough men, and the first general meeting was held at Middlesbrough, under the presidency of the Duke of Devonshire, in September, 1869.

During the fourteen years which have elapsed between the first meeting and that which began last Tuesday the importance of the Cleveland district and its centre, Middlesbrough, has greatly increased; and this is due almost entirely to the development of the iron manufacture, and more lately to the commencement of the steel manufacture. It is estimated by Mr. Edward Williams that the quantity of pig iron made in the district during 1869 did not exceed 1,500,000 tons, whereas in the year ending with June of the present year 2,730,000 tons were produced, the number of blast furnaces having increased from 93 to 117, and the weekly production per furnace from 310 to 440 tons. Although the make of finished iron was not very much greater in 1882 than in 1869—being 726,000 tons against 600,000—about 400,000 tons of steel are now produced yearly in the district, the acid process being adopted at Eston, Darlington, and Tudhoe, while the new basic process has been taken up actively by Bolckow, Vaughan, and Co. and the North-Eastern Steel Company.

Thus, the iron mines of Cleveland, which suffered a temporary check through the universal superseding of iron by steel rails, which require pure ores for their production by the old Bessemer process, are in a fair way to receive a fuller development than ever, thanks to the dephosphorising process brought into practical working by Messrs. Thomas and Gilchrist, so ably seconded by Mr. Windsor Richards. Nor could any time or place have been more *àpropos* for conferring on Mr. Thomas the Bessemer gold medal for the present year, which, on account of his regretted absence through illness, was received on his behalf from the President's hands by Sir Henry Bessemer himself.

Another interesting event in the first day's proceedings was the formal presentation to the Institute, by Mr. T. Hugh Bell, on behalf of his father, of an advance copy of Mr. I. Lowthian Bell's work, "Elements in the Manufacture of Iron and Steel," which was begun for the British Iron Trade Association, but has so grown in course of preparation that its presentation to the technical body seemed more appropriate. This circumstance also was tinged with sadness, because the state of Mr. Bell's health had prevented his finishing the work, so as to be published, as he intended, concurrently with the meeting, and also the reading of his promised paper on "The Use of Raw Coal in the Blast Furnace." The sympathy with Mr. Bell and his family, expressed by the President, found a ready echo among the members generally. The welcome of the members to their home, as it were, was appropriately given by Mr. C. F. H. Bolckow, chairman of the Local Executive Committee, who commented upon the remarkably rapid progress of the Institute, the number of members being now 1350, including the sixty elected on Tuesday.

In the course of his address the president, Mr. B. Samuelson, M.P., F.R.S., observed that fluctuation in the iron trade were best met by effecting economy in the production of that article which was of the first importance to all engaged in the trade, and it was the special mission of the Institute, to bring about that economy without sacrificing the perfection of the articles produced. He hoped that, while they were doing their best to cheapen the production of iron and steel and encourage its consumption, the railway companies would second such efforts by providing the means of obtaining the raw material and conveying the finished products at the cheapest possible rate. He also hoped that the endeavour to preserve the peace between France and China—which was the cause of Earl Granville's absence—would be crowned with success, because it was most important to the country at large, and not least to the iron manufacturers.

The first papers taken were those on new methods of coke-making, viz., "The Manufacture of Coke on the Simon-Carvès System," by R. Dixon, Peases' West, and "The Jameson System of Coke Manufacture," by Mr. J. Jameson, of Newcastle-on-Tyne, the object of both methods being to produce a high quality of coke for ironmaking with recovery of the volatile matters that are now generally wasted. Mr. Dixon said that having the management of Messrs. Pease's extensive coking establishments in the county of Durham, was instructed to visit the Bessèges works of the Terre-noire Company, and to make himself thoroughly acquainted with all that related to the Carvès system of coking, and its applicability to the coal of the county of Durham. Having reported favourably, he was instructed to proceed with the erection of a battery of twenty-five ovens, with adjuncts for utilising the waste products, not exactly proportioned to the twenty-five ovens, but of such power and capacity as might be obviously necessary or advantageous. The paper was designed merely to give recorded results—it was a species of supplement to one read in 1880 by Mr. H. Simon. There are twenty-five ovens, each 23ft. long, 6ft. 6in. high, and 19½in. wide, with side and bottom flues, the capacity of each oven being equal to a charge of 4¼ tons of coal. The cost of the twenty-five ovens was £226 8s. 6d. per oven. The cost of an equal number, twenty-five, of 11ft. ordinary beehive ovens, built on the same site as the Simon-Carvès ovens, would be approximately £57 10s. 9d. per oven. Up to the date of this paper the battery of twenty-five ovens has been working on gas 215 days, during which time 7042 tons of coal put into the ovens produced 5424 tons 11 cwt. —or 77·03 per cent.—of good coke; and the bye-products from the above quantity of coal were 43,164 gallons of tar, and 195,076 gallons of ammoniacal liquor, or 6·12 gallons of tar and 27·70 gallons of ammoniacal liquor per ton of coal, the liquor being 6 to 7 deg. Twaddell. The cost of coke-burning, including all labour connected with obtaining the bye-products. amounts to 2s. 3·96d. per ton of coke; but this, the author expected, with a larger number of ovens would be somewhat reduced. In comparing the production and cost per ton of coke in the Simon-Carvès coke ovens with ordinary beehive ovens, the author finds that the yield is 15 per cent. more in the Simon-Carvès ovens, which is equal to 1056 additional tons of coke from the 7042 tons of coal. The extra cost of labour per ton of coke produced in the Simon-Carvès ovens over that of the ordinary beehive oven is 1s. 3·31d. per ton, which covers expenses connected with obtaining the bye-products.

The Jameson process has already been fully described and illustrated in our pages. It is for effecting recovery of volatile products in the beehive oven worked in the ordinary way, except that suction is applied to the oven bottom while the charge is being coked. The products vary greatly with the kind of coal operated upon. The results of trials of many varieties of coal were given by Mr. Jameson, ranging from 3·2 to 13·5 gallons of oil (not tar) per ton of coal, and 2·5 to 11·3 lb. of sulphate of ammonia. The yield of coke at Page Bank Colliery—Messrs. Bell Bros.—is 67·5 per cent., and at Tudhoe Grange—Weardale Iron and Coal Co.—70 per cent. At Felling the range is from 60 to 77·75 per cent. The appearance and quality of the coke are absolutely unaffected, saving that the percentage of contained sulphur is reduced. The cost of working the recovery process, including repair, is stated to be about 1¾d. per ton of coal. The cost of converting ovens is stated to be covered by £20 each, including all necessary appliances, and the converting power of each oven appears to be 11 tons per week, or 1·57 tons per oven per day. The gas in the Jameson process is available for use as fuel. The special advantage of this process appears to be that it is available with existing plant, that the coke is made in the ordinary way, and no special men are required. Moreover, the cost of conversion of ovens, and of the recovery plant, is very small, while the converting power of the oven is great, and the cost of recovery, including repairs, inconsiderable.

The discussion of these two papers, taken together occupied the remainder of Tuesday morning. It was opened by Mr. Henry Aitken, of Falkirk, whose system had been referred to in Mr. Jameson's paper. He defended the beehive oven, stating that it could be constructed so as to give within 1 or 2 per cent. of what is obtained in a retort, that it made excellent coke, and produced a very satisfactory quantity of tar and ammonia. He thought sufficient weight had not been attached to the value of a silvery appearance in coke, because this silvery skin was almost entirely composed of pure carbon, which prevented the coke from suffering in its downward passage in the blast furnace.

Mr. Stevenson observed that furnace managers preferred light, silvery, hard coke, because if the coke be too solid, the air cannot get through it, but it passes down unconsumed, and floats upon the slag. There were now twenty-five Simon-Carvès ovens, and twenty-five more were soon to be erected; he would suggest that two other firms who lead the van of progress, say Messrs. Bolckow and Vaughan and Messrs. Bell Bros., erect twenty-five more furnaces each, so that Mr. Edward Williams might keep a furnace going entirely with coke from the Simon-Carvès ovens, and then give the members the benefit of his experience.

On Wednesday morning the first paper read was "On Different Systems of Hydraulic Cranes for Steel Works," by Mr. R. M. Daelen, Düsseldorf. This was a descriptive paper, which would be unintelligible without drawings, of the cranes used in Bessemer steel works. It was followed by a paper "On a New Form of Centre Crane for Bessemer Plant," by Mr. T. Wrightson, which may be thus described:—A strong wrought iron post is carried from a socket in the foundation to a socket in the roof. This post is enlarged in diameter at its lower portion. A cylinder works up and down upon this part, the top gland of the cylinder working on the smaller diameter, and the bottom gland working on the larger diameter of the post. Thus when water is admitted into the cylinder through a hole in the post, the cylinder itself rises with a lifting power equal to the difference of the areas of the post multiplied by the effective pressure of the water. Further, by flattening one side of the post at the larger diameter, and adapting the lower gland-box to this form, a sliding-key arrangement is produced, so that for horizontal rotation the cylinder and post move round together. Two steel trunnions are mounted upon this cylinder, and the platform for supporting the ladle is poised upon these in such a way that a very slight rocking motion of the platform upon these trunnions can take place. The platform is made very rigid by trussing, and half the maximum weight of steel to be lifted in the ladle is balanced by a fixed counter-weight at the opposite end of the platform. We have still left one half the weight of the steel unbalanced, the effect of which we wish to neutralise or remove to another portion of the structure. To accomplish this, chains are led from each end of the girders forming the platform over sheaves fixed in a strong frame at the top, and forming part of the crane post immediately under the top socket, so that the sheave frame can rotate horizontally with the crane post and cylinder. The two sets of chains, after passing over their respective sheaves, descend to a heavy balance weight of annular form surrounding the upper portion of the crane post, which acts as its guide, the points of connection of both sets of chains being the same, and in a plane passing through the centre of gravity of the weight, so that it may hang indifferently on either one or the other set of chains. Let us first imagine the ladle half full of steel. It is obvious that the fixed counterweight at the opposite end of the platform balances this amount of steel, and the annular balance distributes its weight equally between the two sets of chains, neutralising so much of the dead weight of the platform, and thus saving so much water pressure in the cylinder. Secondly, let us suppose the ladle to be filled with steel. Half the total weight of steel then becomes preponderant at that end, and tends to bring down

the ladle end of the platform. This, however, cannot take place, owing to the rigidity of the platform, without the opposite end being raised to an equal extent. The depression of the ladle end therefore tightens its chains, while the elevation of the opposite end slackens its chains. By this means the whole weight of the annular balance comes on the tight chains at the ladle end, and thus automatically any preponderant weight in the ladle is balanced. As the steel is run into the ingot moulds the preponderance becomes less, until, when more than half is run out, the preponderance is transferred to the opposite end of the platform. As this takes place the opposite chains are tightened by the action of the fixed balance-weight, until, by the time the whole of the steel has run out of the ladle, the entire weight of the annular balance is hanging on the set of chains opposite to the ladle, and in fact balances the whole effect of the fixed weight on the platform. This transmission of the forces is entirely automatic. The annular balance, by means of this special mechanical arrangement, divides its weight between the two ends of the platform in the exact proportions required to maintain equilibrium, and this without effecting any of the other motions of the crane which may be going on at the same time. In the crane lately erected by Messrs. Head, Wrightson, and Co. for the North-Eastern Steel Company, on this principle, 15 tons at a rake of 26ft. is capable of being lifted and turned. The horizontal strains on the crane post are brought as close as possible to the top and bottom, and the maximum horizontal strain at the top support does not exceed 4½ tons. A few well-arranged tie-rods in the roof is all the support necessary to meet so small a strain.

The discussion was opened by Mr. E. Windsor Richards, of Bolckow, Vaughan, and Co., who, while recognising the ingenuity of Mr. Wrightson's invention, failed to see how it would prevent damage, in the event of an accident, any more than the ordinary centre cranes. He would like to see if Mr. Wrightson could find out what quantity of steel was left in the ladle, so that in turning it would be possible to save loss of steel. Mr. Walker agreed with the remarks of the previous speaker, and pointed out another difficulty in the shape of the fixture of the crane. He very strongly objected to the use of chains in working, as they were liable to breakage and disorder. He recommended the use of hydraulic power in this method, however, and great economy in the amount of labour should be practised. He always measured his estimate of the efficiency of the management by the number of men employed. Mr. Snelus, of the West Cumberland Works, stated that in the works under his control he had nearly every kind of crane at work; and he proceeded to give an account of their comparative efficacy and economy. He had introduced certain improvements of his own, which had worked satisfactorily. Sir H. Bessemer said that when the price of steel was high, economy in connection with so small a matter as the crane was not worth great attention, but the fall in prices had brought it before the notice of ironmasters. He referred to the patents which he had taken out on the subject, commenting specially upon one which provided a counterbalancing weight. Mr. Daelen and Mr. Wrightson having replied, a vote of thanks was passed.

A paper was then read "On Recent Improvements in 'Cowper Stoves,'" by Mr. Edward A. Cowper, M.I.C.E., London. This was a short history of the invention, and an account of several recent improvements. The author begged those who are not intimately acquainted with the subject to bear in mind that the regenerator is not simply a mass of brickwork, alternately heated and cooled; but it is also a mass, the top of which is always as hot as the gas flame can make it, and the bottom always cool; whilst between the two there is a zone of gradation, which is near the bottom when the stove has completed its turn on gas, and commences its duty of heating the blast, and near the top when its turn at the latter duty is completed. The smallest fire-brick stove ever made was one made for the table, and shown by Mr. Cowper, to explain the action of regenerative furnaces. The interior is only 6in. in diameter, and the regenerator, 12in. deep, is composed of a mass of clean broken tobacco pipes. On heating it for three hours with a gas flame, the top became only just milk warm, and yet when cold blast was turned in at the top, it cut lead well as it issued as hot blast at the bottom, having only traversed a regenerator 12in. deep, as just stated. This thoroughly proves how perfectly a regenerator works when heated at one end and cooled at the other by the introduction of cold blast. With a view to increase the power of the stove, he is now arranging to draw off the products of combustion from several points opposite to the circular flame flue, which is placed opposite the chimney valve, so that the distances through the various parts of the regenerator are, as nearly as may be, always the same, thus causing a more perfect distribution of the products of combustion in going out, and of the cold blast in coming in, the power of the stove being in this way somewhat increased. Another recent improvement is in the burner for the gas, which is placed in the bottom of the circular flame flue, as he finds from numerous experiments made with gas flames of various forms, that the greatest quantity of heat is produced, and the best and hottest flame obtained, when the gas is properly burnt at one place, and is kept well together as one solid flame. It then turns over under the dome, and distributes itself in the best possible manner throughout the whole area of the regenerator. The paper concluded with a statement of the advantages of the Cowper stove.

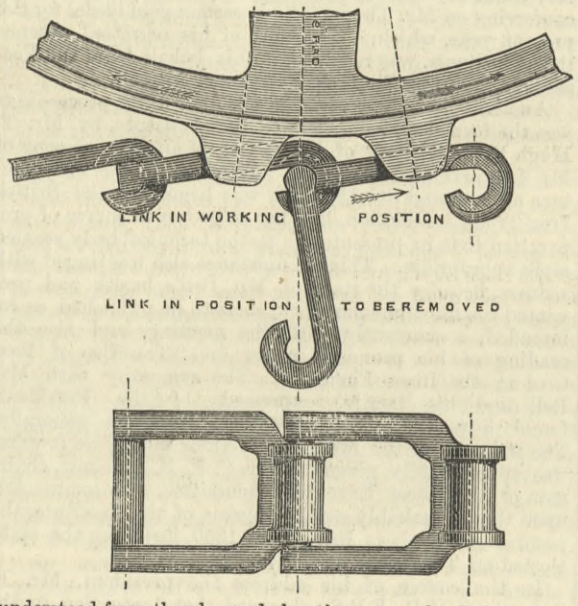
The next paper read was "On Blast Furnace Economy in Relation to Design," by Mr. R. Howson. This was a somewhat discursive paper, extremely technical, dealing with the formation of "scaffolds" in furnaces and the means to be adopted in preventing them. It cannot be abstracted with any advantage.

The discussion on this paper was begun, and was interrupted by the announcement that a deplorable accident had taken place at the North-Eastern Steel Works, and the meeting was immediately adjourned. It appears that a few of the members, instead of going to the Oddfellows' Hall to hear papers read, proceeded in the morning to the North-Eastern Steel Works to witness the manufacture of basic steel. About twelve o'clock a blow was completed in a 10-ton converter, and the metal was poured into a ladle and lifted on to a bogie drawn by a small engine. In some way, not quite satisfactorily explained, the balance of the ladle was overset, and 10 tons of molten steel was poured out on the floor below, almost among the visitors and workmen. Mr. Green, of Monmouthshire, who was close by Mr. S. Davison, manager of the Horbury Ironworks, near Wakefield, ran along the platform as fast as he could, shouting to Mr. Davison to follow. Mr. Davison did not do so, but made a spring at a lift which was at hand, and instantly involved himself in a bath of molten metal. The lift was lowered as speedily as possble, when it was found that the unfortunate gentleman's clothes had been burned from his body. His face was fearfully charred. His hair and whiskers had disappeared, and his whole body bore marks of fearful injury, from which there was no hope of his recovery. He was taken on a stretcher to the North Riding Infirmary, where he died between eleven and twelve o'clock last night. Among others who received injuries were M. Simon, inventor of the Simon-Carvés coking process; Mr. Leonard Cooper, of Leeds; Mr. James Whetham, of Leeds; and Major Stevenson, of Middlesbrough. Several workmen were also injured. One of them, named Ramsden, is not expected to survive; while the rest are all badly burned. Mr. Davison was about forty years of age.

After luncheon a trip was made to the Port Clarence Blast Furnaces and other works, concerning which we must reserve particulars until next week.

HALL'S DETACHABLE PITCH CHAIN.

We illustrate below a form of pitch chain exhibited during the York Show of the Royal Agricultural Society, by Mr. Charles Hall, Saville-street, Sheffield. Its construction will be readily



understood from the plan and elevation annexed. It is made of malleable castings. A link can at any time be removed in the way shown; but while the chain is at work a link cannot become detached. This is a very simple, efficient, and inexpensive chain.

BREECH MECHANISM FOR HEAVY B.L. GUNS.

After many experimental trials with various devices, our Army and Navy Boards have adopted the French or slotted screw fermature. Probably, the first successful application of this kind of screw to a B.L. gun was made by the late John P. Schenkl, of Boston, in 1853. F. Krupp, and the German, Russian, and Austrian Ordnance Boards, prefer the primitive wedge; while Sir William Armstrong and the French Ordnance Corps prefer the slotted screw. The wedge is the only system which has been tested in service. The slotted screw, though strongly recommended, possibly may turn out as did Sir W. Armstrong's invention in the Chinese campaign of 1860. Had the brave Egyptian gunners at Alexandria had a few of Sir W. Armstrong's latest guns, we to-day might know more of the capabilities of the slotted screw fermature.

The single Nordenfelt gun in the foretop of the Condor silenced the heavy guns opposed to it, and scored them in such a manner as to make it almost certain that any projection on the bodies of the guns would have been hit. That is to say, if the end of a Krupp wedge had projected beyond the body of the gun—as it must project during the loading of the gun—it would have been hit by the machine shot; or, if the slotted screw fermature had been opened for loading it would have been hit. When the Krupp and slotted screw fermatures are opened for loading their mechanism is specially exposed to injury. In the case of the Krupp wedge, it is necessary to slide the wedge outward in its slot, to open the bore for loading. The outer end of the wedge is then beyond the circle of the breech, and this extended end of the wedge, with its two actuating screws, are exposed to the possibility of a storm of machine shot, being without shelter, except such partial shelter as the cheek of the carriage affords. In the case of the slotted screw, when the gun is to be loaded the breech screw is drawn out from its seat in the gun until it rests upon the tray, which is then swung upon its hinge outward. It is partially sheltered behind the cheek of the carriage and behind the gun; but a considerable part of this delicate machine is unprotected, and may be hit by any missile. A projectile, or a fragment, might smash the tray, when the whole would fall to the ground. Some strong shield is greatly needed, but it is difficult to see how to attach it in a substantial manner to the gun. It may be said of the wedge, that less of its mechanism is exposed, because of the thick hoop in front of the slot. It certainly does afford some shelter, and if the hoop was increased into a mantelet, by increasing the diameter of the hoop it would also strengthen the gun. The two actuating screws are liable to be bent or broken, and except bruises which the wedge might receive, this might be the extent of the injury from machine fire. Any casualty of this kind might seriously delay firing. The slotted screw fermature permits a close visual inspection after each fire; but coupled with this advantage is the inherent exposure to being hit and disabled. It is also liable to get fouled, and needs frequent cleaning to keep it in working order. Firing might be interrupted at a critical period of an engagement from this cause.

If all of our guns were to be mounted in turrets, or in Gruson casemates, on muzzle-pivotted carriages, they would not be easily disabled. But most of them will be mounted, as heretofore, in earthworks. Many of these earthworks will be newly made, so that the enemy's projectiles will scatter dirt in liberal quantities over our guns. Many must be built on ground so low that our guns cannot see the decks of the ships they must fight. We have purposely omitted to consider the danger to breech mechanism from ordinary gun and mortar fire, because this new danger from shells, from machine guns alone should have early and special attention. The marked success of machine guns at Alexandria must tend to augment machine fire in future attacks, and render it more and more necessary to shield the mechanism of our B.L. guns as far as possible. It is a moot case whether the slotted screw fermature is best fitted for guns in earthworks, where hard and steady work may be required of them. Is it not wise to seasonably consider the weak points which are inseparably connected with the slotted screw fermature, and not wait even for a Chinese war to force them upon our attention?—*United States Army and Navy Journal.*

Experiments with Steam Whistles.—Messrs. Lloyd and Symes, of Boston, U.S., writing to the editor of the *Railroad Gazette*, describe certain interesting experiments which they have carried out. They were made on a locomotive, and with steam varying from 60 lb. to 135 lb. pressure, and most of them with a whistle having a bell 4$\frac{1}{16}$in. diameter, 3$\frac{3}{4}$in. long from lip to head—inside—and an annular steam opening of $\frac{1}{16}$in. wide. This whistle, at 60 lb. pressure, gave the sound of E natural, at 80 lb. of F sharp, at 90 lb. of G, at 110 lb. of A, and at 125 lb. to 130 lb. of C sharp in alt. The distance between the steam opening and the edge of the whistle was 1½in.; when this was raised to 2in. the power of the sound was sensibly lessened, but its pitch was altered relatively but half a tone. When, on the contrary, it was diminished to 1in. and to ¾in., the whistle would sound nothing but its supertones, or "squeal" as the boys call it. The bell in these experiments was made of cast brass of medium, not a hard character, and the lip or edge carefully chamfered down to a thin edge, set so as to stand exactly over the steam opening. The quality of its sound was very clear, penetrating, and even "reedy," owing to its thin, elastic shape. The power may be estimated by the fact that on a clear, still night, it has been heard at Mansfield from Attleboro', a distance of over six miles. They afterwards repeated the experiment with a bell of the same dimensions, but made of brass tubing, annealed, hammered, and then heated again, with somewhat the same results, the intensity of the sound and the pitch being somewhat heightened. The next experiment was made with an iron whistle of the same size, which was unsuccessful, the travelling quality of the sound being greatly reduced. The last trial was made with a whistle 6¼in. diameter, 3½in. long, and set over an annular opening 5$\frac{7}{8}$in. diameter, blown at a pressure of 150 lb. The sound given by this whistle was greatly inferior to that of the first one, lacking power and resonance of tone, which they attribute to the size of the bell, which was so much larger than the diameter of the steam opening as to make of it what Professor Henry calls a "resounding cavity." As confirmation of this, they add that they took a bell of the size first named, and cut into it three longitudinal and three perpendicular slits 3in. long, which had some effect on the character but none on the power of the sound. With regard to the penetration of the sound obtained from the whistle in distinction to other sounds or noises made at the same time, the greatest effect was obtained by "dragging" the whistle, as it is termed; that is, gradually opening and closing the valve, by which means a gradation of five semi-tones can be obtained, the ear seeming to have peculiar appreciation of this change of relation—as in an organ the effect of power is gained more from the crescendo of the swell than from the full organ itself.

A Railroad in Palestine.—The first railroad in Palestine is being laid out, and the preliminary survey has been completed as far as the Jordan. It is to run between Acre and Damascus, and it is called the Hamidié line, because it is named after his present Majesty the Sultan Abdul Hamid, and probably one reason why the firman has been granted so easily lies in the fact that it passes through a great extent of property which he has recently acquired to the east of the plain of Esdraelon. The concession is held by ten or twelve gentlemen, some of whom are Moslems and some Christians, but all are Ottoman subjects resident in Syria. Among the most influential are the Messrs. Sursock, bankers, who own the greater part of the plain of Esdraelon, and who have, therefore, a large interest in the success of the line. Starting from Acre, it will follow the curve of the bay for ten miles, in a southerly direction, at a distance of about two miles from the beach. Crossing the Kishon by a 60ft. bridge, it will turn east at the junction of a short branch line, two miles long, at Haifa. Hugging the foot of the Carmel range, so as to avoid the Kishon marshes, it will pass through the gorge which separates that mountain from the lower ranges of the Galilee hills, and debouch into the plain of Esdraelon. This plain it will traverse in its entire length. The station for Nazareth will be distant about twelve miles from that town; there may, however, be a short branch to the foot of the hills. So far, there has only been a rise from the sea-level in twenty miles of 210ft., so that the grade is imperceptible. It now crosses the water-shed and commences to descend across the plains of Jezreel to the valley of the Jordan. Here the Wady Jalud offers an easy incline as far as Beisan, the ancient Bethshan, and every mile of the country it has traversed so far is private property, and fairly cultivated. At Beisan it enters upon a region which has, partly owing to malaria and partly to its insecurity, been abandoned to the Arabs, but it is the track of all others which the passage of a railway is likely to transfigure, for the abundance of the water, which is now allowed to stagnate in marshes, and which causes its unhealthiness, is destined to attract attention to its great fertility and natural advantages, which would, with proper drainage, render it the most profitable region in Palestine. Owing to the elevation of the springs, which send their copious streams across the site of Beisan, the rich plain which descends to the Jordan, 500ft. below, can be abundantly irrigated. There is a little bit of engineering required to carry the line down to the valley of the Jordan, here 800ft. below the level of the sea, which is then followed north as far as the Djisr el Medjàmieh. Near this ancient Roman bridge of three arches, which is used to this day by the caravans of camels which bring the produce of the Hauran to the coast, the new railway bridge will cross the Jordan, probably the only one in the world which will have for its neighbour an actual bridge in use which was built by the Romans, thus, in this now semi-barbarous country, bringing into close contact an ancient and a modern civilisation. After crossing the Jordan, the line will follow the banks of that river to its junction with the Yarmuk, which it will also cross, and then traverse a fertile plain of rich alluvium, about five miles long and four wide, to the banks of the ridge which overlooks the eastern margin of the Sea of Tiberias. This is the extent to which the survey has been completed. It is not decided whether to rise from the valley by the ridge which overlooks the Yarmuk, or to follow the east shore of the Lake of Tiberias to the Wady Semakh, which offers great advantages for a grade by which to ascend nearly 3000ft. in about fifteen miles. This is the toughest bit of engineering on the line, and is in close proximity to the steep place down which the swine possessed by devils are said to have rushed into the sea. Once on the plateau, it will traverse the magnificent pasture lands of Jaulan and the grain-growing country of Hauran, with probably a short branch to Mezrib, which is the principal grain emporium, and one of the most important halting-places on the great pilgrimage road from Damascus to Mecca. It is calculated that the transport of grain alone from this region to the coast will suffice to pay a large dividend upon the capital required for the construction of the road, which will be about 130 miles in length. The grantees have also secured the right to put steam tugs upon the Lake of Tiberias, and under the influence of this new means of transportation the desolate shores will undergo transformation.—*Boston Advertiser.*

THE NEWPORT ROLLING MILLS, MIDDLESBROUGH.

AMONG the works visited by the members of the Iron and Steel Institute may be mentioned those of Messrs. Fox, Head, and Co. On entering Middlesbrough from the south or west the traveller by rail passes these works situated on the left close to the line, and about a mile from the station. This place, among others, was thrown open to the members of the Iron and Steel Institute during their recent visit to the metropolis of Cleveland. The engraving represents them as seen from the north-west or river side, and, being made from a photograph recently taken, is closely accurate. Twenty years ago the site now so largely built over and so fully utilised was still a green marsh, intersected by dykes and serving as pasture land for sheep and oxen. In 1863 Messrs. Fox, Head, and Newcomen—the latter gentleman has since retired—combined to form the firm and build the works under consideration. In 1864 the first plate was rolled. From that time to the present a gradual and continuous expansion has taken place, though occasionally interrupted by strikes and impediments of various kinds. At the present time the plant, which occupies over twelve acres, comprises twenty steam engines, two locomotives, twenty-five boilers, five steam hammers, two forge trains, two finishing mills, one blooming mill, forty-seven puddling furnaces, eighteen heating furnaces, five shearing machines, and various other machinery, tools, and appliances. The specialities produced are: boiler, bridge, and ship plates, and welded, flanged, and punched work. The output of plates of all qualities is from 600 to 700 tons per week. To effect this, about 600 men are employed; three-fourths of these are paid by the ton, and one-fourth by the hour, or the shift. The average earnings are, approximately, 30s. per man per week; but some few, notably rollers and shear men, earn from £1 to £2 per diem. The principal materials used are: pig iron, made from Cleveland or local ores; hematite pig iron, smelted locally, but made from the ores of Bilbao, in Spain; coal, from South Durham; purple ore, or spent pyrites, from Tyneside or Lancashire chemical works; refractory fire bricks from Scotland, Durham, and mid-Yorkshire; sand, from the nearest sea shore; old iron rails, brought by sea from British and foreign ports; new steel rails, from Eston, Middlesbrough, or Darlington; iron and brass castings, made by local founders to patterns sent by the firm; coke, from the Auckland district; bar iron, from Stockton; scrap iron from the shipyards and engineering works; and general stores from various parts. The consumption of pig iron is about 700 tons per week. For the cheap purchase of this important material great facilities exist, there being a private line of railway to most of the surrounding blast furnace works. The average railway carriage incurred for this purpose is only 8d. per ton. The coal used amounts to 1200 tons per week. Of this, one-third is used for heating, and costs 7s. per ton, and two-thirds is used for puddling, and costs 5s. per ton delivered. The finished iron produced is sent to all parts of the kingdom, the Continent, America, and the Colonies, in fact, wherever constructive engineering is carried on. The facilities for export are unusually good, the cost of putting f.o.b. the nearest Tees wharf being only 1s. 6d. per ton. When iron plates were first rolled in the Cleveland district, they were only of the quality required for shipbuilding purposes. It was not then believed possible to make the higher qualities. Messrs. Fox, Head, and Co., however, set themselves the task of making boiler plates of every grade in current demand, as good in quality and, if possible, cheaper in price than any procurable elsewhere. In this endeavour they have been favoured by the gradual improvement which has latterly taken place in the quality of Cleveland pig iron, and also by the introduction and growth of the hematite pig iron trade in the Cleveland district.

Finding everywhere a strong, and as they thought unfair, prejudice in favour of the productions of older districts, they determined some time since to commence the manufacture of the more difficult parts of boilers and sell them ready made, thus affording ocular demonstration of the capabilities of their boiler-plates. They established a new department with this object, and this branch of their business has now grown to considerable dimensions. Boiler-makers, especially those situated abroad and at a distance from manufacturing districts, have often found it a great convenience to be able to procure such articles, enabling them to be independent of the more highly skilled labour and the more costly appliances. In view of the possible change from iron to steel in shipbuilding, Messrs. Fox, Head, and Co. have latterly given considerable attention to the latter material, and have already rolled a quantity of plates from ingots made by modern processes. So far, these plates have given complete satisfaction to the users. In preparation for the probable increase in the demand for steel, the mills and other machinery have been gradually increased in size and strength, so as to enable them to deal with every extra strain which may in future have to be met to suit the requirements of consumers.

In welded and flanged work Messrs. Fox, Head, and Co. claim that they are able to make out of their own iron or steel anything which can be made out of any other iron or steel. At the Amsterdam Exhibition still open, and at the Engineering and Metal Trades Exhibition held in London in July last, they exhibited trophies composed of parallel and conical flanged boiler tubes, man-holes, flue rings, flanged boiler ends, crown plates, domes, uptakes, neck-pieces, and so forth. In all these articles their own treble best iron or mild steel was exclusively used. For their Amsterdam exhibit a silver medal has been awarded to them.

THE WELL PARK BREWERY, EXETER.

THIS brewery, illustrated on page 226, has been built for Messrs. Stevens, Pidsley, and Co., from the designs of Mr. G. R. Wilson, of the firm of Wilson and Co., engineers, Frome. The design is the very opposite of that known as the tower or gravitation system, in which the liquor, wort, or beer is made to flow by its own gravity from vessel to vessel in the successive stages of manufacture. Under certain accidents of position, when the site of a brewery is commanded by a supply of water—liquor—from hills in the vicinity, no doubt the tower principle has certain advantages, but when the brewer has to pump his "liquor" from a well, the very opposite prevails, for not only has he to force the water up to double the height necessary in the present design, but he has also to lift his malt a proportionate height as well as the coal for his copper. In the brewery we are describing it was necessary to pump the liquor from a well on the site, consequently it was determined to pump the "worts" from the hop back to wort receiver, placing the copper on the ground-floor next the boiler and under the same roof, with louvres for the escape of steam. The process is now as follows:—Liquor—water—pumped by well pumps to the cold liquor back. It then runs by gravity to the hot liquor back, where it is heated by steam coil for mashing. Malt is lifted by hoist to the second-floor, where it is discharged into malt hopper, screened, ground, and lifted by elevator to the grist case over the mash tun. After mashing the worts are run successively by gravity from mash tun to under back, copper, and hop back; thence pumped by archimedean pump to wort receiver, afterwards running by gravity to refrigerator, fermenting rounds, and racking back. Service pipes for hot and cold liquor are fitted for mashing, sparging, attemperating, and washing down, the latter being one of the most important processes in a brewery.

DEATH OF MR. WERDERMANN.

WE regret to announce the death of Mr. Werdermann. Richard Sigismund Karl Werdermann was born in 1828, in Silesia—Prussia—served for some time as officer in a Prussian artillery regiment, went then to Paris, and established himself there as a civil engineer. In Paris he made the acquaintance of M. Gramme, at that time a working man, and seeing the Gramme machine, he began to be interested in the electric light and transmission of power. Like many other Germans he found it advisable to leave Paris in 1870, but before leaving, he bought M. Gramme's English and American patents. He came to England in September, 1870, and exhibited here the first Gramme machine. Ever since then he has been actively engaged in the introduction of the electric light, and the development of the Gramme machine on a large scale. Only a few months before his death, a large modified Gramme has been finished at Stockport which was built to his designs. He was the first to show—in the Institution of Civil Engineers—the transmission of power by the Gramme machine, and he had also a little Gramme working for some months in the Postal Telegraph-office, taking the place of batteries. In 1875 he exhibited the electric arc light from the top of Charing-cross Hotel, and in 1878 he invented—and exhibited in a factory in the Euston-road—his well-known Werdermann semi-incandescent lamp. He invented, simultaneously with Jablochkoff, the electric candle, and sold his patent to the original Jablochkoff Company. At the Paris Exhibition of 1881, the Salle du President, one of the most attractive rooms of the Exhibition, was lit by Werdermann lamps. Like many inventors, Mr. Werdermann, although very fertile in brilliant and ingenious ideas, was not a sufficiently shrewd business man to reap material benefits by his inventions. There was a certain child-like simplicity in his character which made him look only to the successful carrying out of an invention, and not to what it might bring commercially. He left the commercial part to others, and with the usual results, viz., very little benefit to himself; law suits and interminable vexations, which at last undermined his health. It is a fact which redounds very much to Mr. Werdermann's credit, and is characteristic of his scientific dignity and honesty, that last year, when, during the electric light craze, inventors could ask and obtain their own price for inventions, good, bad, or indifferent, he would have nothing to do with limited companies. Mr. Werdermann leaves a widow, three daughters, and one son.

TENDERS.

LIVERPOOL ARTISANS' DWELLINGS.

FOR the erection of thirteen blocks of five-storey dwellings, containing 273 tenements, in accordance with plans prepared by Mr. Clement Dunscombe, M.A., M. Inst. C.E., city engineer of Liverpool. Quantities supplied by the engineer.

	£	s.	d.
Messrs. Hughes and Sterling, Liverpool—accepted ..	53,722	0	0

ROADWAY BBIDGE, BEDFORD.

Roadway Bridge across the River Ouse at Bedford, with north and south approaches. John J. Webster, Assoc. M. Inst. C.E., Stephenson-chambers, Lord-street, Liverpool, engineer.

	Contract No. 1. Masonry, brickwork, earthwork, &c. £ s. d.	Contract No. 2. Iron-work. £ s. d.	Total. £ s. d.
F. Nawill, London	4069 0 0	3571 0 0	7640 0 0
B. W. Ward, C.E., Leicester	4030 13 4	—	—
Head, Wrightson, & Co., Stockton	—	4764 8 0	—
H. Young and Co., London	5620 0 0	3400 0 0	9020 0 0
S. and M. Pattinson, Ruskington	4217 0 0	3160 0 0	7377 0 0
B. Cooke and Co., Battersea	4840 0 0	—	—
W. Richards and Sons, Leicester.	—	3564 7 0	—
Gimson and Co., Leicester	—	3446 19 6	—
Heenan & Woodhouse, Manchester	—	3900 0 0	—
Coalbrookdale Co., Shropshire	—	3499 19 0	—
Maynard and Cooke, London	5550 0 0	3200 0 0	8750 0 0
J. Butler, near Leeds	—	3832 5 0	—
Pilling and Co., Manchester	*3657 18 3	3636 2 4	7294 0 7
G. Griffiths, Gloucester	5018 9 8	3491 15 1	8510 4 9
Eastwood, Swingler, & Co., Derby	—	3956 13 1	—
Handyside and Co., Derby	—	3836 4 6	—
T. Smart, Nottingham	4999 0 0	—	—
G. Smith, Newcastle-on-Tyne	4182 15 5	3750 0 0	7932 15 5
G. Moss, Liverpool	5064 0 0	4054 0 0	9118 0 0
Russell & Robertson, Werkington	—	3529 2 5	—
Goddard & Massey, Nottingham.	—	*3150 0 0	—
W. J. Botterill, London	6993 0 0	—	—
W. Bland and Sons, Bury	—	4477 7 6	—

* Accepted.

SOUTH KENSINGTON MUSEUM.—Visitors during the week ending Sept. 15th, 1883:—On Monday, Tuesday, and Saturday, free, from 10 a.m. to 10 p.m., Museum, 11,160; mercantile marine, Indian section, and other collections, 5515. On Wednesday, Thursday, and Friday, admission 6d., from 10 a.m. to 6 p.m., Museum, 2005; mercantile marine, Indian section, and other collections, 1492. Total, 20,172. Average of corresponding week in former years, 19,344. Total from the opening of the Museum, 22,390,295.

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

(*From our own Correspondent.*)

A CONSIDERABLE aggregate demand for finished iron was expressed yesterday in Wolverhampton, and to-day—Thursday—in Birmingham. But as most mills and forges are fuller of work now than they were a week ago, there was less inclination than then to accept other than advanced rates. For most common and medium sorts a rise of from 2s. 6d. to 5s. was generally required, and in only few instances could a compromise be effected at 50 per cent. under those terms.

Bars, angles, and girder plates were most in request. The prices most quoted for the first two were £6 7s. 6d. to £6 10s., and £7 to £7 10s. for superior sorts. Tees of from ⅜in. to 2½in. sizes were to be had at from £7 10s. to £8 easy, according to quality. Crown bars are quoted £6 7s. 6d.; Crown angles, £6 17s. 6d.; Crown tees, £7 7s. 6d.; Crown plates, £7 17s. 6d.; and boiler plates, £8 5s. per ton. For best qualities an increase is asked of 10s. per ton under each of the foregoing heads.

For sheets there is less disposition than a week ago to book at offers under £8 10s. for doubles, and £9 10s. for trebles, while for all singles the prices for doubles are quoted.

Pig iron is in heavier stock at the furnaces than would have been the case but for the strike before noticed. Resumed deliveries have been permitted by customers, and the consumption is now about equal to supply. Prices remain firm at for all-mine iron, 62s. 6d. to 65s. and 67s. 6d.; hematites, 61s. to 62s. 6d.; part mines, 45s. to 56s.; and cinder qualities, 40s. to 42s. 6d.; Derbyshires, 47s. 6d. to 50s.; and Northamptons—Kettering brand—47s. 6d. firm. The prices of crude, even more than the prices of finished iron, were stiffer to-day and yesterday because of the anticipation generally entertained that coal may be advanced in price in the ensuing few weeks to the extent of 1s. per ton in furnace sorts, which at present remain at 9s.

The majority of the constructive engineers, the district through, are busily engaged, and in some cases can see two or three months ahead. A good proportion of the work is for bridges and colliery plant.

India and South America both continue to require bridges of all descriptions.

One firm have now no fewer than twelve bridges on hand.

The Wolverhampton Chamber of Commerce has determined to memorialise Government in favour of England being at once included in the International Patents and Trade Marks Convention, in the hope mainly that manufacturers, in this country, of goods secured by a patent obtained in France, may be no longer compelled to manufacture such goods in France if he desires to sell in that country.

NOTES FROM LANCASHIRE.

(*From our own Correspondents.*)

Manchester.—With both pig and finished iron makers are still fully employed as a rule; the market continues in a very unsatisfactory condition.

For delivery equal to Manchester, quotations for Lancashire pig iron remain at 45s. for forge and 45s. 6d. for foundry, less 2½ per cent., and at present makers decline to entertain orders at under these figures. For district brands delivered here 44s. 10d. to 45s. 10d., less 2½ per cent., for good forge and foundry Lincolnshire, remains the basis of quotations, but there are sellers open to book orders at less money.

In finished iron there is plenty of business doing for prompt delivery, and for quick specifications prices are fully maintained. For delivery into the Manchester district prices are steady at £6 2s. 6d. to £6 5s. for ordinary bars, £6 12s. 6d. up to £6 15s. for hoops, and £8 5s. to £8 7s. 6d. per ton for good qualities of sheets.

The reports as to the condition of the engineering trades continue in the direction of lessening activity. The only branch of industry in this district in which there is any real pressure of work is locomotive building, and in this department some of the works are kept in double shifts to get out orders.

The construction of baling presses for the Eastern cotton-growing districts comes within one of the important branches of engineering in this district, and as an illustration of the powerful class of machinery now being supplied, a brief description of a cotton press which is being erected by Mr. Wm. Turner, of Salford, for a packing firm at Alexandria will, be of interest. This press is, in fact, probably the largest of its kind ever constructed for cotton baling purposes. The total height to the top of crosshead is a little over 75ft., and in weight the machine exceeds 130 tons, separate portions of the machine weighing up to 18 tons. The press is constructed on the compound steam and hydraulic principle, with 48in. steam and 16in. hydraulic cylinders, the primary object of this system being, by the combination of steam and hydraulic power, to press the cotton rapidly. The first 10ft. of compression is given quickly by steam power only; the second, or finishing down stroke of the steam piston, brings into action the hydraulic ram pumping power, and the whole operation of pressing the bale is completed in one up-and-down stroke of the piston. The pressure is given in an upward direction, the cotton presses being filled in from the top of the press; and in order that the filling in of the boxes may keep time with the quick action of the machine, the presses are arranged with three boxes revolving round a central column, two of the boxes being filled by separate sets of men, whilst the third is under the press. By this arrangement an average of one bale of 5 cwt. can be packed and baled per minute, and I am informed that during a special trial of one of these machines as many as seventy-five Egyptian bales have been made up within the hour.

Mr. Turner has also on hand a speciality in roller mills for millers, in which he has introduced an ingenious system of applying the pressure upon the roll. This is usually accomplished by independent screws or levers, but in the Turner system it is all brought to one centre, and only one operation is necessary to set the rolls absolutely true in all parts of the grinding surfaces. The necessity for skilled labour is in large measure dispensed with by the above arrangement, and where a large number of mills are in use its simplicity of action cannot fail to be of advantage.

For the time of the year a fairly steady business is being done in the coal trade of this district. The advance in prices at the commencement of the month has tended to keep back any actual pressure of orders, and this has induced a little giving way on the part of sellers in some cases. Generally, however, both the better qualities of round coal for house fire consumption and the commoner sorts for steam and forge purposes are going off pretty freely, the demand keeping the pits going five days a week, and prices are steady at 9s. 6d. to 10s. for best coals, 7s. 6d. to 8s. for seconds, and 6s. to 6s. 6d. for common round coals. Engine classes of fuel continue bad to sell; burgy is only in poor demand, and slack is more or less of a drug in the market, with heavy stocks accumulating at some of the collieries. Burgy at the pit mouth averages 4s. 6d. to 5s.; best slack, 4s.; good ordinary qualities, 3s. 6d.; and common sorts from 2s. 9d. per ton upwards.

Barrow.—A fine new vessel, which for some time has been in the process of building at the extensive yards of Messrs. Williamson, at Workington, was launched on Monday. The ship has been built to the order of Messrs. Leyland and Co., of Liverpool, and is the third boat built at this yard for the same firm. The lines of the vessel are the same as those of her predecessors, and the ship is considered to be a fine model and a thoroughly substantial vessel in all respects, and will add to the reputation of Messrs. Williamson as makers of steel ships. The ship, which is 267ft. long, 39ft. beam, 23ft. 7in. depth of hold, is fitted with all the latest appliances, and has a registered tonnage of 1800 tons, with a carrying capacity of 3000 tons. The vessel is built throughout of steel plates, manufactured by the West Cumberland Iron and Steel Company. The plates are of mild steel of the highest quality, and are more substantial than iron plates. The vessel, which is called the Garston, is built to the requirements of the colonial trade, and when rigged will be towed to Cardiff to take coals.

There is very little animation to note in the hematite pig iron trade this week, buyers being practically few, and altogether makers occupy a worse position than they did some few weeks ago. The furnaces are producing a heavy tonnage of pig iron, and the orders at present coming to hand are not sufficient to meet the output. It is probable that before long makers will restrict the output, as they are indisposed to accept orders at the present low values, which are far below the cost of production. They are therefore actually stocking iron in the face of the present dull market. A few of the works are barely employed, owing to the large and continuous drain upon the stocks by the steel makers. The prices quoted this week are 49s. 6d. for No. 1 Bessemer, at works; 48s. 6d., No. 2; and 47s. 6d., No. 3. The steel trade is very brisk in all departments, the demand for rails and merchant qualities being exceptionally heavy, but there are no signs of continuance of the trade through the winter months. Quotations are given at from £4 15s. to £5 per ton. Iron ore in great demand at from 9s. to 11s. per ton at works. Coal and coke is steady. Shipping has not improved in any departments, freights being not only scarce but low.

THE SHEFFIELD DISTRICT.

(*From our own Correspondent.*)

THE Sheffield ironworkers have taken definite action in regard to wages. At a very largely-attended meeting, on Monday last, they passed a resolution declaring that the present price of iron warranted an advance of 9d. per ton on puddling, and 7½ per cent. on all other kinds of work. Mr. William Ellis, the representative of the South Yorkshire district on the Staffordshire Mill and Forge Wages Board, counselled the men to make no unreasonable demand, but to apply for such an increase as trade justified and argument allowed. The meeting further resolved that their wages be governed by marked bars as formerly, with a shilling above poundage. This means a return to the old method of rising and falling by the price of iron, receiving 1s. for every £1, and 6d. for every 10s., with 1s. added. Thus, if iron were selling at £7 10s. per ton, the wages would be 8s. 6d.; viz., 7s. 6d. and 1s. added.

The coalowners are also within measurable distance of a fresh agitation among the miners. At a meeting of the council of the Yorkshire Miners' Association the most moderate members talked of 15 per cent., while others suggested advances up to 20 and 50 per cent. Very elaborate measures were adopted for taking the opinion of the men on the subject. Pit-gate meetings are to be held throughout the district, and conferences are to be held at Rotherham and Manchester. Simultaneously with the action of the counncil there comes the news of a demand at Hoyland Silkstone Colliery for a reduction of 10 per cent. The men regard this as a counterblast to the movement for an increase in wages. The leading colliery in South Yorkshire has advices from its London and provincial agents this week reporting a lull in the demand, and any idea of further advancing prices has received a check.

A survey is being made on behalf of the Great Northern Railway with a view to a line of railway from Rossington through Wadworth, Edlington, Mexbro', on to the Swinton and Knottingley line near South Kirkley. This proposed line is intended to work the extensive bed of ironstone and iron ore in the locality of Conisbro'. The bed is believed to reach from near the Holywell Brewery, Conisbro', to Bramley, beyond which it has not been followed. The ore is stated to be superior to Frodingham, and to lie within a few inches of the surface in many places. It is expected, if further investigations bear out the favourable reports already received, that the directors of the Manchester, Sheffield, and Lincolnshire Company will revive its project for a line from Shire Oaks to Warmsworth, which would cross the bed in another direction. The Rotherham and Bawtry Railway, which "hangs fire," would reach the ironstone at a third point.

Messrs. Charles Cammell and Co. are sending to the Calcutta Exhibition a selection of their productions in railway buffers, bearing springs, conical and volute springs for buffers, bends of boiler plates, and fractures of tires and rails, a large propeller blade, steel shells, crank axle, &c. An item of unusual interest is a cast steel railway wheel. Fractures are also shown of Wilson's compound steel-faced armour plates. The exhibit is of a high character, and is worthy of the reputation of the company.

On the 19th inst. the Earl and Countess of Wharncliffe, Colonel and Mrs. Arbuthnot, Lord Brooke, Lord Charles Beresford—the well-known naval officer—Mrs. Ronald, and Mr. Henry Manners visited the Atlas Works, and were shown the various processes, including the casting of a compound armour plate on the Ellis system, for the Brazilian Government.

THE NORTH OF ENGLAND.

(*From our own Correspondent.*)

THERE was a good attendance at the Cleveland iron market held at Middlesbrough on Tuesday last, a large number of the members of the Iron and Steel Institute being present. Business, however, was exceedingly quiet, prices being about the same as last week. Merchants continue to accept 39s. per ton for small parcels of No. 3 g.m.b. for prompt delivery. The stock of No. 3 in makers' hands is very low. Ordinary brands cannot be had for less than 39s. 3d. per ton, and special brands are 3d. per ton more. Grey forge iron is offered at 37s. 6d., and No. 4 foundry iron at 38s. per ton for early delivery, slightly higher prices being asked for forward delivery.

Warrants are offered at 38s. 9d. per ton, but the demand is very poor.

The stock of Cleveland iron in Messrs. Connal and Co.'s store at Middlesbrough decreased 1310 tons during the week ending Monday last, the quantity then held being 70,071 tons.

The shipments of pig iron from the Tees continue at a brisk rate and promise to be heavier than for any month this year. The quantity exported up to Monday night was 53,586 tons, as against 43,931 tons during the same number of days in August.

Finished iron manufacturers are still busy on old contracts, but are booking very few fresh orders. The prices which have ruled for some weeks are well maintained, and are as follows:—Ship plates, £6 5s. per ton; shipbuilding angles, £5 12s. 6d.; and common bars, £5 17s. 6d. to £6, all cash 10th, less 2½ per cent. free on trucks at makers' works.

Owing to the continuance of the engineers' strike at Sunderland, large numbers of shipyard operatives have been paid off, and notices have been issued at all the marine engine works stating that workmen in the boileryards will be put on half time. It is stated that new hands have been engaged to fill the places of the men on strike, and that temporary buildings are being prepared for their accommodation.

The mechanics in Leeds and the neighbourhood are asking for an advance of wages, and threaten to strike unless the masters grant their request. The minimum rate of wages is now 26s. per week, as fixed by the Amalgamated Society of Engineers, and the men ask that all the members of the society who are receiving less than 28s. per week be advanced to that rate on or before October 1st. About 1000 men will be affected by this decision. It is said that some of the firms have already agreed to pay the higher rate.

The North-Eastern Marine Engineering Company has just had a very large anvil block—weighing 36 tons—cast for its new works at Wallsend. It was made at the North-Eastern Foundry, South Shields, and is one of the heaviest castings ever made at any Tyneside foundry.

It is reported that Messrs. R. Craggs and Co. will be ready to start their new shipbuilding yard at South Stockton some time next month, and that other parties are also contemplating the commencement of a similar enterprise on the banks of the Tees.

The erection of a lighthouse on the Saltscar at Redcar seems likely to become an accomplished fact. At all events the Elder Brethren of the Trinity House have given notice that they are about to send their engineer, Mr. Douglas, to make a survey of the site and prepare an estimate of cost.

The Middlesbrough meeting of the Iron and Steel Institute seems to be one of the most successful ever held, in point of numbers present, and interest in the proceedings. Over four hundred are said to have arrived, and are pervading the district in every direction. The absence of certain prominent members, through unavoidable circumstances, has been greatly deplored. Among these may be mentioned Earl Granville, who is detained by public business, and Mr. I. L. Bell and Mr. S. G. Thomas by ill-health.

Mr. Waterhouse's report upon the average realised price of manufactured iron during July and August has been received by the joint secretaries to the Board of Arbitration, but the result has not yet been publicly made known. A meeting of the standing committee was to be held at Darlington on Thursday to consider how it would affect wages for the future. A reduction of at least 5 per cent. is anticipated.

NOTES FROM SCOTLAND.

(*From our own Correspondent.*)

ALTHOUGH there is a very extensive business doing in the Scotch pig iron trade, the profits are exceptionally small. Competition is also very keen, and the production is likely to be increased instead of diminished. In the warrant market a large business has been done since last report between members of the trade, outside orders being yet far from plentiful, although rather better than of late. Prices improved somewhat towards the close of last week, but were again down at the last and the beginning of the present week. For makers' iron the demand is fair, but the quotations are not quite so firm. There is an increase of several hundred tons on the stock in Messrs. Connal and Co.'s Glasgow stores. The shipment of Scotch pigs in the past week amounted to 10,311 tons as compared with 10,902 in the corresponding week of last year.

Business was done in the warrant market on Friday at from 46s. 4½d. to 46s. 5d. cash, and 46s. 7d. to 46s. 7½d. one month. On Monday transactions were recorded at from 46s. 4d. to 46s. 2d. cash, and 46s. 6½d. to 46s. 4½d. one month. The market was quiet on Tuesday at 46s. 1½d. to 46s. 2d. cash, and 46s. 4d. to 46s. 4½d. one month. On Wednesday business was done at 46s. 1d. cash, and 46s. 3d. to 46s. 3½d. one month. To-day—Thursday—there were transactions down to 46s. 0½d. cash, and 46s. 2½d. one month.

The values of makers' iron are slightly lower, as follows:—Gartsherrie f.o.b. at Glasgow, per ton, No. 1, 55s. 6d.; No. 3, 52s.; Coltness, 57s. 6d. and 52s.; Langloan, 58s. 6d. and 52s.; Summerlee, 56s. 6d. and 50s. 6d.; Chapelhall, 55s. 6d. and 52s.; Calder, 57s. and 49s. 6d.; Carnbroe, 54s. 6d. and 48s. 3d.; Clyde, 49s. 9d. and 47s. 9d.; Monkland, 47s. 6d. and 45s. 6d.; Quarter, 47s. and 45s.; Govan, at Broomielaw, 47s. 9d. and 45s. 6d.; Shotts, at Leith, 58s. and 53s. 6d.; Carron, at Grangemouth, 48s. 6d. (specially selected, 54s. 6d.) and 47s.; Kinneil, at Bo'ness, 48s. and 47s.; Glengarnock, at Ardrossan, 54s. 6d. and 47s. 3d.; Eglinton, 48s. and 45s.; Dalmellington, 48s. 6d. and 47s. 6d.

The malleable iron trade is very brisk, a large business being done and orders coming in more satisfactorily than in some recent weeks. The steel works are also very busy, and important extensions of premises are being made to cope with the growing demand for goods constructed of this material. Ground has been secured for new steel works at Motherwell, the promoters being Glasgow gentlemen; and it is also reported that another new steel works is about to be erected in the north quarter of Glasgow by young gentlemen whose relatives have been long and honourably connected with the Scotch iron trade. Some very good shipbuilding contracts have recently been placed, and these will help to prolong the activity that characterises the steel trade.

The engineering trades are at present also well employed, among the more successful being those engaged in the manufacture of sugar-making machinery. The complete plant of an extensive sugar refining work, to be erected in Cuba, has just been shipped at Glasgow. It was constructed by Messrs. J. Copeland and Co., of Pulteney-street Engine Works, in that city, and weighed upwards of 3000 tons.

In the coal trade there is much animation all over the country. The agitation amongst the miners for increased wages proceeds, but as yet with no real success.

WALES AND ADJOINING COUNTIES.

(*From our own Correspondent.*)

THE latest information current with reference to the Barry Dock and Railway Bill is that the promoters are steadily engaged in preparing for the second attempt. They accept all that the Taff Vale and Bute Docks gives in the matter of expediting and lessening cost as only temporary relief, and are determined to do their best to afford the district a rival dock and railway. In the meantime, before action can be taken in a prominent manner, the alleviating movements are being steadily carried on. The Taff Vale Railway at the Cathays-yard will soon be in a position to water, coal, and turn all locomotives there instead of at the terminus. New shunts are being prepared, and marked benefit is derived from coal being delivered direct to the east side of the docks. The Bute Docks' agents are equally active, and there is scarcely a week but some beneficial change is brought about.

This week there have been some experiments shown by Mr. J. V. Thomas in loading bunker coal and cargo at the same time. This was successfully done in the presence of a large number of coal-owners and others.

The graving dock, late Hill's, was opened on Wednesday.

I regret to note the continuance of depression in the iron and steel trades. Even the low market quotations now ruling fail to prompt anything like active business, and the best placed may be said to have only a hand-to-mouth trade. Prices ruling are: Rails, £4 15s.; bars, £5 2s. 6d.; and pigs as low as 45s.

Little work remains to be done to complete the railway link between the Rhondda coalfield and Newport. This new line will "tap" several rich coal valleys. One in particular I may note, Craig-an-Allt. This contains all the best seams, but is a deep pit, and would require a capital of £100,000 to develope.

A still richer coalfield I hear, that of the Navigation, the most central part of the South Wales coal basin, has been secured by Mr. Davies, of the Ocean Collieries. I recollect several years ago bringing this very coalfield under public notice in these columns as one of the most desirable of the unlet properties. This is one of the largest, and also one of the last in the immediate neighbourhood of the Taff Vale. One of the remaining coalfields, sunk by Mr. Williams, of Penygraig, still awaits that development which an energetic company and large capital can effect.

Tin-plate is steadily improving, and inspection is being made of stagnant works which may result in restarts. Prices are keeping up very well.

The coal trade maintains its vigour.

A mass meeting of colliers from Dowlais, Cyfarthfa, and the Taff Valley is to be held next month, but I should not imagine that there is any grievance to discuss. Their rate of wages is now good, and many men are able to earn £2 per week easily.

NAVAL ENGINEER APPOINTMENTS.—James Hook, chief engineer, to the Asia, for service in the Shah, vice Herrmann; and Adam Shoolbred, chief engineer, to the Enchantress, vice Nott.

THE PATENT JOURNAL.

Condensed from the Journal of the Commissioners of Patents.

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

Applications for Letters Patent.

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

11th September, 1883.

4336. PRODUCING INFLAMMABLE GAS, E. Duchamps, West Dulwich.
4337. SULPHUROUS ACID, C. A. Allison.—(*National Chemical Machine and Manufacturing Company, U.S.*)
4338. VELOCIPEDES, C. A. Allison.—(*C. F. Waldo, New York, U.S.*)
4339. FURNACES for CONSUMING SMOKE, C. Edmeston, Manchester.
4340. CLEANING the SIDES and BOTTOMS of SHIPS AFLOAT, D. Hunter, Troon, N.B.
4341. LAMPS, J. Hinks, Birmingham.
4342. DOMESTIC HEATING APPARATUS, B. J. B. Mills.—(*M. Veaux-Ducruix, Beaujeu, France.*)
4343. VENT-SPILES for CASKS, R. C. Ekworth, Carlisle.
4344. MAKING FOOD for CALVES, T. and T. G. Bowick, Bedford.
4345. GALVANIC BATTERIES, E. P. Chaimsonovitz, Leytonstone, and T. Rowan, Westminster.
4346. SELF-LEVELLING BERTHS, B. Merrill, Boston, U.S.
4347. OPERATING SAFETY SIGNALS, T. A. B. Putnam, New York, U.S.
4348. COMBINED ROLLER and WRAPPER, E. E. Merrick, Clifton.
4349. GAS GENERATORS, L. A. Groth.—(*W. Bäcker, Budweis, Austria.*)
4350. NUMBERING, &c., TICKETS, J. M. Black, London.
4351. SYRINGES, J. Thompson, London.
4352. INDIA-RUBBER TIRES, R. Kearsley, Manchester.
4353. COMBING COTTON, &c., W. Dobson, Douglas, Isle of Man.
4354. EARTHENWARE-LINED SMOKING PIPES, &c., J. E. Walsh, Halifax.—(*A. Burkard and P. Galmark, Antwerp.*)
4355. SCRIBBLER CARDING ENGINES, W. Houghton and E. Knowles, Gomersal, & T. H. Kilner, Kirkheaton.
4356. MANUFACTURE of GLUE, W. R. Lake.—(*C. V. Flodgvist, Mölndal, Sweden.*)

12th September, 1883.

4357. STEAM ENGINES, M. J. Brewer, Cardiff.
4358. SPRING, &c., TAPS, R. H. Perks and J. Morley, Birmingham.
4359. SPRING BUFFERS, E. Jackson, Birmingham.
4360. OPERATING the HARNESS FRAMES of LOOMS, H. J. Haddan.—(*L. Mercier, Louviers, France.*)
4361. PREVENTING the CORROSION of SHIPS' BOTTOMS, J. B. Hannay, Glasgow.
4362. ROTARY ENGINES, G. Gore, Balsall Heath, and W. Pearson, Stourbridge.
4363. VELVET, J. Hallworth, Manchester.
4364. LOOMS for WEAVING, R. Brownridge and P. Bond, Macclesfield.
4365. ELECTRIC METERS, P. Jolin and J. Parsons, Bristol, and M. F. Purcell, Dublin.
4366. PRESERVING GRASSES, W. Cowley and J. Makin, Liverpool.
4367. REGULATING GAS BURNER, T. Thorpe, Whitefield.
4368. CASES for CUTLERY, T. and J. Brooke, Sheffield.
4369. DECORATION by ENAMEL upon METAL ARTICLES, T. Reeves, Birmingham.
4370. SPINNING, &c, COTTON, J. Dodd, Oldham.
4371. MANUFACTURE of CELLULOSE, &c., E. A. Brydges.—(*A. Mitscherlich, Germany.*)
4372. EFFECTING CONTINUOUS FEED of GRANULAR MATERIAL, C. H. Gill, London.
4373. TESTING, &c., the LOAD of RAILWAY TRUCKS, J. Imray.—(*J. F. R. Siebelist and C. J. Steibelt, Berlin.*)
4374. CLEANING WHEAT, J. Ritchie, Liverpool.
4375. RAISING, &c., SHIPS, A. Grothe and C. J. Appleby, London.

13th September, 1883.

4376. BICYCLES, &c., F. Beauchamp, Edmonton.
4377. EXCAVATORS, C. Pieper, Berlin.—(*C. Vering and H. Vering, Hanover.*)
4378. ELASTIC SIDE SPRING BOOTS, E. Jennings and J. Butcher, Leicester.
4379. LINING FURNACES, J. Imray.—(*H. Rémaury and F. Valton, Paris.*)
4380. GAS STOVES, C. H. Robinson, Glasgow.
4381. ELECTRIC LAMPS, J. W. Swan, Bromley.
4382. CARRYING, &c., WIRE, H. J. Haddan.—(*L. P. Johnson, New York, U.S.*)
4383. ROTARY ENGINE, H. J. Haddan.—(*A. Decher, Munich, Bavaria.*)
4384. LOCKS, &c., E. J. Smith, London.
4385. VELOCIPEDES, A. Barham, Anerley.
4386. BUTTONS, H. J. Haddan.—(*F. Kammerer, Pforzheim, Germany.*)
4387. MANUFACTURE of GLUCOSE, H. J. Haddan.—(*C. Coster, Bruxelles, Belgium.*)
4388. BUTTONS, E. F. Lulham, Eastbourne.
4389. MANUFACTURING CONFECTIONERY, W. R. Lake.—(*J. Lutted, Buffalo, U.S.*)
4390. LOOMS, E. Edwards.—(*H. Gallant, Paris.*)
4391. PREPARING RAW HIDE, A. G. Brookes.—(*O. E. Wait, Providence, U.S.*)
4392. BARREL or TOWER BOLTS, W. Davison, London.
4393. TELEPHONIC APPARATUS, T. H. Meatchem, Waterford, Ireland.

14th September, 1883.

4394. STEAM ENGINES, R. Ogden and I. M. Livsey, Ashton-under-Lyne.
4395. PREVENTING the RADIATION of HEAT, W. E. Williamson and E. V. New, London.
4396. STEAM BOILERS, D. Francis, Rhymney.
4397. COMBINED BROOCH and FLOWER HOLDER, H. J. Davis, London.
4398. FILLING, &c., BOTTLES, J. Phillips, London.
4399. PENTAGRAPH ENGRAVING MACHINES, J. Mowat, Barrhead.
4400. LAWN TENNIS, &c., T. B. H. Cochrane, Ryde.
4401. RESERVOIR PEN-HOLDERS, W. Vale, Birmingham.
4402. JOINING LEAD PIPES, J. Jakens, Bury.
4403. CARPET SWEEPERS, H. J. Haddan.—(*G. W. Gates, Michigan, U.S.*)
4404. CASES for ROASTED COFFEE, E. de Pass.—(*V. A. Billette, Paris.*)
4405. CLEANSING, &c., FABRICS, D. Haworth and W. Hanson, Mottram.
4406. CARDING ENGINES, J. Constantine, Heaton.
4407. HORSE HOES, W. Smith, Kettering.
4408. TREATMENT of HOPS, G. F. Redfern.—(*Messieurs F. Slama and F. Felix, Austria.*)
4409. FACILITATING the OPENING, &c., of ENVELOPES, W. R. Lake.—(*J. R. Bissex, Philadelphia, U.S.*)
4410. MECHANICAL MUSICAL INSTRUMENT, W. R. Lake.—(*J. Morgan, Brooklyn, U.S.*)
4411. FOLDING TABLES, &c., W. R. Lake.—(*C. E. F. Couturier, Paris.*)
4412. FASTENINGS for BOOTS, &c., A. J. Boult.—(*L. Maurier, Montreuil, France.*)
4413. VAPOUR BATH, A. J. Boult.—(*G. Dyrna, Austria.*)
4414. CAUSING STRIKING CLOCKS to REPEAT, A. J. Boult.—(*J. Blot, Bourmont, France.*)
4415. CARBONIC ACID GAS, G. Jármay, Winnington.
4416. CHARGING SECONDARY BATTERIES, T. J. Jones and E. C. Rimington, London.

15th September, 1883.

4417. DELIVERING TICKETS to TRAVELLERS, &c., J. M. Black, London.
4418. PARQUET FLOORS, F. F. Brown, Chester.
4419. DYNAMO-ELECTRIC MACHINES, W. M. Mordey, Putney.
4420. STRIKING WORK for CLOCKS, A. G. Hovde, Hönefos, Norway.
4421. SIGNALLING, A. P. Price, London.
4422. PAPER, J. Dixon, Oughtybridge.
4423. CLOSING, &c, CARRIAGE DOORS, F. Pontifex, W. J. Rosser, and F. E. Pontifex, London.
4424. GAS METERS, H. Green, Preston.
4525. TRANSFERRING COAL from WAGONS, G. Taylor, Penarth.
4426. PLOUGHS, E. Edwards.—(*J. and M. Grèze, Paris.*)
4427. IGNITING CARTRIDGES by ELECTRICITY, T. P. Wood, Bristol.
4428. COLOURING MATTERS, A. P. Price.—(*H. Caro, Mannheim, Germany.*)
4429. LOADING VESSELS with COAL, G. Taylor, Penarth.

17th September, 1883.

4430. INJECTORS, R. G. Brooke and T. H. White, Manchester.
4431. PRODUCING ICE-FLOWER-LIKE FIGURES on GLASS, C. Pieper.—(*Dunkel und Compagnie, Prussia.*)
4432. PAPER PULP, H. J. Haddan.—(*C. Coster, Bruxelles.*)
4433. LOOMS, D. Whittaker, Blackburn.
4434. HYDROMETERS, &c., T. Derham, Bolton.
4435. TABLE CUTLERY, J. Ball, Sheffield.
4436. LASTING BOOTS, &c., C. F. Gardner.—(*G. McKay, Boston, U.S.*)
4437. SAILS for VESSELS, I. A. Storer, Newport.
4438. WATER CIRCULATING BOILERS, J. Heal, Southsea.
4439. ROLLER MILLS, J. A. A. Buchholz, Twickenham.
4440. ELECTRICAL SIGNALLING APPARATUS, G. Porter, London.
4441. MATS and MATTING, W. Cooper, Nantwich.
4442. ROLLER MILLS, F. C. Glaser.—(*A. Mechwart, Budapest, Hungary.*)
4443. MEASURING, &c., CALORIFIC ENERGY, W. Siemens, London.
4444. PREPARING ANTISEPTIC SURGICAL DRESSINGS, G. W. von Nawrocki.—(*P. Hartmann, Wurtemberg.*)

Inventions Protected for Six Months on Deposit of Complete Specifications.

4337. MANUFACTURE of SULPHUROUS ACID, C. A. Allison, Southampton-buildings, London.—A communication from the National Chemical Machine and Manufacturing Company, Newark, U.S.—*11th September*, 1883.
4338. VELOCIPEDES, C. A. Allison, Southampton-buildings, London.—A communication from C. F. Waldo, New York, U.S.—*11th September*, 1883.
4346. SELF-LEVELLING BERTHS, B. F. Merrill, Boston, U.S.—*11th September*, 1883.
4371. MANUFACTURING CELLULOSE, E. A. Brydges, Upton.—A communication from A. Mitscherlich, Germany.—*12th September*, 1883.
4382. CARRYING, &c., WIRE, H. J. Haddan, Kensington, London.—A communication from L. P. Johnson, New York, U.S.—*13th September*, 1883.

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

3685. ATMOSPHERIC GAS ENGINES, H. Williams and J. Malam, Southport.—*10th September*, 1880.
3716. SEWING MACHINES, T. Chadwick, T. Sugden, and C. Shaw, Oldham.—*13th September*, 1880.
3739. STEAM BOILERS, W. R. Lake, London.—*14th September*, 1880.
3793. NOZINGS for STAIR TREADS, F. W. Hembry, London.—*18th September*, 1880.
3906. WORKING GLASS out of TANK FURNACES, W. Horn and R. Bell, Sunderland—*27th September*, 1880.
3773. JOINTS for PIPES, J. Page, Glasgow.—*17th September*, 1880.
3754. COATING TIN with ZINC, W. R. Lake, London.—*15th September*, 1880.
3761. HEAVY GUNS, J. B. Howell, Sheffield.—*16th September*, 1880.
3765. ELECTRIC LAMPS, E. G. Brewer, London.—*16th September*, 1880.
3784. ELECTRIC TYPE PRINTING TELEGRAPH APPARATUS, G. J. Droste, Bremen.—*18th September*, 1880.
3792. HAY and CORN BARNS, J. Coleman and I. Henson, Derby.—*18th September*, 1880.
3803. OPERATING, &c., RAILWAY SWITCHES, W. R. Lake, London.—*18th September*, 1880.
3880. CONDUCTORS for ELECTICITY, P. Jensen, London.—*24th September*, 1880.
3934. SETTING, &c., TYPE, W. Morgan-Brown, London.—*28th September*, 1880.
3964. MAGNETO, &c., MACHINES, P. Jensen, London.—*30th September*, 1880.
3752. TURNING, &c., WOOD, L. Vallet, Liverpool.—*15th September*, 1880.
3757. RAILWAY BUFFERS, I. A. Timmis, London.—*16th September*, 1880.
3766. GOVERNING the SPEED of ENGINES, J. G. Jones, London.—*16th September*, 1880.

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

3561. HYDRAULIC PUMPING APPARATUS, J. Hastie, Greenock.—*11th September*, 1876.
3569. METAL ROLLERS for PRINTING CALICO, H. Wilde, Manchester.—*12th September*, 1876.
3580. WINDING HOSIERY YARN, H. G. Warburton, Leicester.—*12th September*, 1876.
3562. STOPPING the MOTION of SHIP'S CABLES, A. J. Alderman, London.—*11th September*, 1876.
3579. BUILDING MATERIALS, T. Hyatt, London.—*12th September*, 1876.
3594. REFRIGERATING, F. P. E. Carré, Paris, and E. Jullien, Marseilles.—*13th September*, 1876.
3647. METALLIC DRUMS or CASKS, J. Simpson, Liverpool.—*18th September*, 1876.
3602. DECANTERS, &c., J. Vernon, Newton Stewart.—*14th September*, 1876.
3714. IRON and STEEL, C. W. Siemens, London.—*22nd September*, 1876.
3648. WINDOWS for CARRIAGES, H. Brittain, Birmingham.—*18th September*, 1876.
3702. SEWING MACHINES, A. V. Newton, London.—*21st September*, 1876.

Notices of Intention to Proceed with Applications.

(*Last day for filing opposition, 5th October*, 1883.)

2362. ELEVATING and DISCHARGING GRAIN, &c., G. J. Hone, London.—*9th May*, 1883.
2365. BEARINGS, J. E. Price, near Wrexham.—*9th May*, 1883.
2375. COMBINED NET-HAULING MACHINE and BOAT'S CAPSTAN, J. D. Jack, Elgin.—*10th May*, 1883.
2378. CHECKING the RECEIPT of MONEY, J. M. Black, London.—*10th May*, 1883.
2398. CASTING WHEELS, &c., E. de Pass, London.—A communication from J. D. Delille.—*11th May*, 1883.
2399. STORE-ROOM, O. Reynolds, Rockland St. Mary.—*11th May*, 1883.
2405. STEAM BOILERS, H. Lane, London.—*11th May*, 1883.
2409. MILLING MACHINES. H. H. Lake, London.—A communication from P. P. Huré.—*11th May*, 1883.
2414. LAMPS, J. Matthews, London.—*12th May*, 1883.
2424. TEAPOTS, &c., J. Ridge, Sheffield.—*12th May*, 1883.
2428. UTILISING EXPLOSIVE COMPOUND, R. Punshon and R. R. Vizer, London.—*12th May*, 1883.
2432. CARDING ENGINES, G. and E. Ashworth, Manchester.—*15th May*, 1883.
2433. JOINTS of DRAIN PIPES, D. Edwards and J. Williams, Cardiff.—*15th May*, 1883.
2447. HYDRAULIC PUMPING APPARATUS, J. Moore, San Francisco.—*15th May*, 1883.
2448. ELECTRIC LIGHT BUOYS, E. C. Thomas, London.—*15th May*, 1883.
2526. APPARATUS USED in BLASTING ROCK, H. N. Penrice, near Norwich.—*21st May*, 1883.
2563. OPENING DOORS by ELECTRICITY, G. F. Redfern, London.—Com. from A. Gautier.—*22nd May*, 1883.
2595. WINDING ENGINES, D. and A. Greig, and R. H. Shaw, Leeds.—*24th May*, 1883.
2767. TREATING GAS, &c., H. Symons, Totnes.—*4th June*, 1883.
2824. APPARATUS for COOKING EGGS, J. Darling, Glasgow.—*7th June*, 1883.
3252. PURIFYING SEWAGE WATERS, J. Bock, Silesia, Germany.—*30th June*, 1883.
3268. RESERVOIR PENHOLDER, L. B. Bertram, London.—*2nd July*, 1883.
3313. COUNTING and REGISTERING APPARATUS for TILLS, J. Imray, London.—A communication from H. Pottin.—*4th July*, 1883.
3370. APPARATUS for GETTING COAL, &c., W. F. Hall and W. Low, Durham.—*6th July*, 1883.
3387. BAKING by STEAM, H. E. Newton, London.—A communication from E. Yäger.—*9th July*, 1883.
3557. CLOSING CANISTERS, A. W. Jaeger and C. A. Farwig, London.—*19th July*, 1883.
3838. BOATS and OARS, A. J. Boult, London.—A communication from M. F. Davis.—*7th August*, 1883.
3856. PRODUCING SODA CRYSTALS, C. D. Abel, London.—A communication from La Société Anonyme des Produits Chimiques de Sud-Ouest.—*8th August*, 1883.
3864. TUNNELS, &c., G. Edwards, Hanwood.—*9th August*, 1883.
3867. BARRING ENGINES, W. Hargreaves and W. Inglis, Bolton.—*9th August*, 1883.
3873. SEPARATING METALS, &c., H. R. Cassel, London.—*9th August*, 1883.
3875. MANUFACTURING SEWING NEEDLES, R. Brandon, Paris.—Com. from H. S. Ward.—*9th August*, 1883.
3897. REGULATING the SPEED of ENGINES, N. Macbeth, Bolton-le-Moors.—*11th August*, 1883.
3915. INCANDESCENT ELECTRIC LAMPS, G. F. Redfern, London.—A communication from A. Bernstein.—*13th August*, 1883.

(*Last day for filing opposition, 9th October*, 1883.)

2415. DISINFECTING RAGS, J. Illingworth, Batley.—*12th May*, 1883.
2422. EXAMINING SAMPLES of WINE, &c., A. J. Boult, London.—Com. from P. Contant.—*12th May*, 1883.
2437. DIFFERENTIAL GEARING, F. Wynne, London.—*15th May*, 1883.
2450. CARDING FIBROUS MATERIALS, W. Tatham, Rochdale.—*16th May*, 1883.
2452. AUTOMATIC COUPLING, G. F. Belling, Little Ilford.—*16th May*, 1883.
2454. SPRING MATTRESSES, G. A. Billington, Wallasey.—*16th May*, 1883.
2458. METALLIC PACKING of PISTONS, A. Spagl, Munich.—*16th May*, 1883.
2467. GUMMING APPARATUS, C. Pieper, Berlin.—A communication from J. E. Parmentier.—*17th May*, 1883.
2472. EXTINGUISHING FIRES, G. W. von Nawrocki, Berlin.—A com. from C. J. Mönch.—*17th May*, 1883.
2481. SUBSTITUTES for IVORY, &c., F. Greening, Southall.—*17th May*, 1883.
2487. OIL CANS, L. A. Walters, London, and J. Bradbury, Braintree.—*18th May*, 1883.
2506. SEPARATING IRON from SOLUTIONS, G. W. von Nawrocki, Berlin.—A communication from Loewig and Co.—*19th May*, 1883.
2541. KNITTING MACHINERY, H. J. Haddan, London.—A com. from W. W. Clay.—*22nd May*, 1883.
2547. SECURING CHESTS of DRAWERS, &c., R. Mander, Birmingham.—*22nd May*, 1883.
2665. SCREW STOCKS and DIES, W. J. McCormack, Paignton.—*29th May*, 1883.
2712. COCKS or TAPS, J. Ohren, Rio de Janeiro.—*31st May*, 1883.
2870. PLAYING PUZZLE, &c., GAMES, T. H. Ward, Tipton.—*8th June*, 1883.
3130. RINGS and TRAVELLERS of SPINNING MACHINES, J. Wetter, London.—A communication from H. Dodt.—*23rd June*, 1883.
3254. HORSE NAILS, J. A. Huggett and J. Swalwell, London.—*30th June*, 1883.
3349. CUTTING PAPER, T. G. and J. Dawson, Otley.—*6th July*, 1883.
3635. INDICATING WEIGHTS and FORCES, T. H. Ward, Tipton.—*24th July*, 1883.
3816. POLES for LAWN TENNIS NETS, S. C. Davidson, Belfast.—*4th August*, 1883.
3907. TIMEPIECES, O. Fleischhauer, Berlin.—*11th August*, 1883.
3916. KILNS, W. Kemp, Miller's Dale.—*13th August*, 1883.
3930. ARTIFICIAL IVORY, H. H. Lake, London.—A communication from J. B. Edson.—*14th August*, 1883.
3939. COUPLINGS, L. Anderson, Lamar, U.S.—*14th August*, 1883.
3972. TREATING VOLATILE FLUIDS, &c., S. M. Eiseman, London.—*16th August*, 1883.
3996. MOTORS for LIFTING, &c., F. W. Scott, London.—*17th August*, 1883.
4000. ORE ROASTING FURNACES, H. H. Lake, London.—A communication from T. Walker and J. F. Carter.—*17th August*, 1883.
4009. WEIGHING and MEASURING PARCELS, W. Tozer, London.—*18th August*, 1883.
4017. STOP VALVES, J. A. and J. Hopkinson, Huddersfield.—*18th August*, 1883.

Patents Sealed.

(*List of Letters Patent which passed the Great Seal on the 14th September*, 1883.)

1376. WOOD-WORKING MACHINERY, E. Cory, Barnes.—*15th March*, 1883.
1378. FIRE-ESCAPE, S. Bott, Birmingham.—*15th March*, 1883.
1382. INJECTING INSECTICIDE LIQUID into VINES, &c., E. Edwards, London.—*15th March*, 1883.
1395. TILTING, &c., RAILWAY COAL WAGONS, G. Taylor, Penarth.—*16th March*, 1883.
1396. VALVELESS ROTARY MOTOR PUMP, &c., W. Dawes, Leeds.—*16th March*, 1883.
1397. LOADING VESSELS with COAL, G. Taylor, Penarth.—*16th March*, 1883.
1398. STRAIGHTENING and BENDING METALLIC PLATES, C. Scriven, Leeds, and J. Tweedy, Walker-on-Tyne.—*16th March*, 1883.
1399. AUTOMATIC PENCIL-HOLDER, O. Bussler, London.—*16th March*, 1883.
1403. TELEPHONIC APPARATUS, W. Mosley, London.—*16th March*, 1883.
1404. CUTTING LEATHER, C. P. Carpenter, London.—*16th March*, 1883.
1408. DISINTEGRATING FIBRES, G. and J. E. Tolson, Dewsbury.—*16th March*, 1883.
1412. LATHE CHUCKS, W. R. Lake, London.—*16th March*, 1883.
1416. CLOCKS for ADVERTISING, F. W. Little, London.—*17th March*, 1883.
1435. SPINNING MACHINES, L. A. Groth, London.—*19th March*, 1883.
1436. PREPARING, &c., FIBROUS MATERIAL, L. A. Groth, London.—*19th March*, 1883.
1450. LAMPS, J. H. Johnson, London.—*19th March*, 1883.
1503. UMBRELLAS and PARASOLS, R. H. Brandon, Paris.—*22nd March*, 1883.
1508. STEREOTYPE PLATES, A. Sauvée, London.—*22nd March*, 1883.
1532. AUTOMATIC FLUSHING APPARATUS, A. C. Boothby, Kirkcaldy.—*24th March*, 1883.
1585. HEATING APPARATUS, W. P. Thompson, Liverpool.—*29th March*, 1883.
1589. SUBSTITUTE for INDIGO, W. H. Spence, London.—*29th March*, 1883.
1611. MANUFACTURING TISSUES, H. J. Haddan, London.—*30th March*, 1883.
1618. ELECTRO-MAGNETS, A. M. Clark, London.—*30th March*, 1883.
1645. TELEGRAPHIC and TELEPHONIC WIRE, L. Elmore, London.—*2nd April*, 1883.
1673. MANUFACTURE, &c., of SULPHURIC ACID, W. Garroway, Glasgow.—*3rd April*, 1883.
1678. PRODUCING STEEL BANDS, J. Sheldon, Stockbridge.—*3rd April*, 1883.
1729. REMEDYING PHYSICAL DEFECTS of the MOUTH and PALATE, R. H. Brandon, Paris.—*6th April*, 1883.
1733. ROTARY KNOTTERS, H. J. Haddan, London.—*6th April*, 1883.
1790. GAS REGULATOR, H. J. Haddan, London.—*9th April*, 1883.
1818. STEERING APPARATUS, &c., J. Philp and W. Forrester, Liverpool.—*10th April*, 1883.
1879. ELECTRIC SIGNALLING, &c., J. H. Johnson, London.—*13th April*, 1883.
1892. AERATED WATERS, F. Bennett, London.—*13th April*, 1883.
1918. HARMONISING MELODIES, &c., B. S. Maitland, London.—*16th April*, 1883.
1995. OBTAINING ALUMINIUM from its ORE, H. A. Gadsden, London.—*19th April*, 1883.
2107. FLEECE DIVIDERS, C. Pieper, London.—*26th April*, 1883.
2111. CARTRIDGES and WADS, R. Morris, Blackheath.—*26th April*, 1883.
2291. REVERSING the MOTION of ENGINES, E. Boutard, Leiston.—*5th May*, 1883.
2308. HEATING or COOLING LIQUIDS, &c., J. Price, jun., Liverpool,—*7th May*, 1883.
2368. FACILITATING the MEASUREMENT of EMBROIDERY, &c., H. H. Lake, London.—*9th May*, 1883.
2380. CRUSHING STONE, S. Mason, Leicester.—*10th May*, 1883.
2651. LAYING ELECTRICAL CONDUCTING WIRES in the GROUND, H. J. Allison, London.—*29th May*, 1883.
2659. HARNESS SHAFT-TUGS, S. E. Davies, Liverpool.—*29th May*, 1883.
2765. FIREPLACES, &c., P. Jensen, London.—*4th June*, 1883.
2780. AUTOMATIC MOMENTUM BRAKES, H. J. Allison, London.—*5th June*, 1883.
2861. LOOMS for WEAVING, M. Sowden, Bradford.—*8th June*, 1883.
3053. ANTISEPTIC FLUIDS, &c., B. Nickels, London.—*20th June*, 1883.
3079. GAS MOTOR ENGINES, F. W. Crossley, Manchester.—*21st June*, 1883.
3083. BALING PRESSES, J. Watson, London.—*21st June*, 1883.
3115. DYNAMO-ELECTRIC MACHINES, G. Forbes, London.—*22nd June*, 1883.
3127. PREPARING a COMPOUND from VEGETABLE MATERIALS, E. C. T. Blake, London.—*23rd June*, 1883.
3133. COUPLING HOSES, &c., J. C. Hudson, London.—*23rd June*, 1883.
3169. MATTING, &c., W. R. Lake, London.—*26th June*, 1883.
3173. BORING ROCK, W. L. Wise, London.—*26th June*, 1883.
3175. STEAM ENGINES, W. P. Thompson, Liverpool.—*26th June*, 1883.
3300. MANUFACTURING SPRINGS, W. R. Lake, London.—*3rd July*, 1883.
3361. COOLING the LINING TUBES for ARTILLERY, S. Pitt, Sutton.—*6th July*, 1883.
3598. CORSETS, H. H. Lake, London.—*21st July*, 1883.

(*List of Letters Patent which passed the Great Seal on the 18th September*, 1883.)

1318. CONDENSING WOOL, &c., J. Wilkinson, Yeadon.—*13th March*, 1883.
1444. SECTIONAL WARPING, H. Yates, Manchester.—*19th March*, 1883.
1445. PICKING MOTION for LOOMS, H. Yates, Manchester.—*19th March*, 1883.
1453. TOBACCO PIPES, C. Jackson, Nottingham.—*20th March*, 1883.
1460. HYDRAULIC MOTORS, W. P. Thompson, Liverpool.—*20th March*, 1883.
1467. FURNITURE for VESSELS, A. E. Maudslay, Littlebourne.—*20th March*, 1883.
1469. TREATING OFFAL, M. Zingler, London.—*20th March*, 1883.
1470. PUMPS, A. Russell and F. Curtis, Newburyport, U.S.—*20th March*, 1883.
1472. PROPELLING CARS, &c., by ELECTRICITY, P. R. Allen, London.—*20th March*, 1883.
1476. STOPPING GEAR for MACHINERY, W. H. Beck, London.—*21st March*, 1883.
1481. GENERATING ELECTRICITY, J. A. Kendall, Middlesbrough.—*21st March*, 1883.
1484. NUT-LOCKING DEVICE, W. J. Brewer, London.—*21st March*, 1883.
1486. "LAP" FORMING MACHINES, J. Walker and T. G. Beaumont, Dewsbury Mills.—*21st March*, 1883.
1487. ROLLING ANGULAR WIRE, J. W. and J. Hirst and J. Bottomley, Brighouse.—*21st March*, 1883.
1495. CUTTING MACHINE SCREWS, W. P. Thompson, Liverpool.—*21st March*, 1883.
1507. CLEANING the INTERIOR of TOBACCO PIPES, S. Grafton, Birmingham.—*22nd March*, 1883.
1513. PAVEMENTS, R. M. Ordish, London.—*22nd March*, 1883.
1522. TREATING SEWAGE, &c., J. H. Kidd, Wrexham, and T. J. Barnard, London.—*22nd March*, 1883.
1538. ELECTRICAL CONDUCTORS and CABLES, H. H. Lake, London.—*24th March*. 1883.
1547. MANUFACTURING PAPER BAGS, T. and J. Bibby and J. Duerden, Burnley, and J. and W. Baron, Rochdale.—*27th March*, 1883.
1552. AERIAL NAVIGATION, B. W. Maughan and S. D. Waddy, London.—*27th March*, 1883.
1559. AUTOMATICALLY OPENING the DOORS of LIFTS, &c., J. Stones, Ulverston, and T. Kirby, Barrow-in-Furness.—*27th March*, 1883.
1593. STEAM TRAPS, J. Gillies, Glasgow.—*29th March*, 1883.
1647. ELECTRICAL SAFETY PLUGS, C. V. Boys, Wing, and H. H. Cunynghame, London.—*2nd April*, 1883.
1719. FASTENING PAPER, M. Bauer, Paris.—*5th April*, 1883.
1743. UTILISING PHOSPHATIC METALLIC SCORIA, G. Pitt, Sutton.—*6th April*, 1883.
1779. REGISTERING DISTANCE TRAVELLED, &c., J. Imray, London.—*9th April*, 1883.
1786. WHEELS, J. and H. McLaren, Leeds.—*9th April*, 1883.
1822. HOSE PIPES, J. C. Merryweather, Greenwich.—*10th April*, 1883.
1968. STOPPING HOLES in SHIPS, J. B. Wilkie, North Shields.—*18th April*, 1883.
2109. COMBING SILK, &c., J. Thompson and T. Barker, Manchester.—*26th April*, 1883.
2298. INKSTANDS, H. Lake, London.—*5th May*, 1883.
2383. KNITTING MACHINERY. S. Lowe and J. W. Lamb, Nottingham.—*10th May*, 1883.
2978. CREATING a VACUUM in the BULBS of INCANDESCENT LAMPS, C. H. Stearn, London.—*15th June*, 1883.
3224. PIANOFORTE ACTIONS, J. J. Robinson, London.—*29th June*, 1883.
3302. TELEPHONIC APPARATUS, W. R. Lake, London.—*3rd July*, 1883.
3419. MANUFACTURING CARPETS, &c., T. Tempest-Radford, Kidderminster.—*11th July*, 1883.
3519. ROLLING MILLS and ROLLS, A. W. L. Reddie, London.—*17th July*, 1883.
3559. LASTING BOOTS and SHOES, W. R. Lake, London.—*19th July*, 1883.

List of Specifications published during the week ending September 15th, 1883.

2254*, 4d; 3888*, 6d.; 142, 6d.; 209, 6d.; 210, 4d.; 249, 2d.; 255, 2d.; 263, 4d.; 270, 1s.; 271, 2d.; 272, 6d.; 273, 2d.; 274, 2d.; 275, 2d.; 276, 2d.; 277, 6d.; 279, 2d.; 282, 2d.; 283, 6d.; 285, 2d.; 286, 6d.; 287, 4d.; 288, 10d.; 295, 6d.; 296, 4d.; 298, 2d.; 299, 2d.; 300, 2d.; 303, 2d.; 304, 2d.; 305, 2d.; 308, 4d.; 309, 2d.; 310, 6d.; 313, 2d.; 314, 2d.; 315, 4d.; 316, 2d.; 317, 2d.; 318, 4d.; 319, 2d.; 320, 6d.; 322, 6d.; 324, 1s. 6d.; 326, 6d.; 328, 2d.; 329, 6d.; 330, 6d.; 331, 6d.; 332, 6d.; 333, 6d.; 335, 6d.; 336, 2d.; 337, 4d.; 338, 6d.; 339, 6d.; 342, 6d.; 343, 2d.; 344, 10d.; 345, 2d.; 346, 4d.; 347, 4d.; 348, 2d.; 351, 6d.; 352, 10d.; 354, 2d.; 355, 2d.; 356, 2d.; 357, 6d.; 359, 6d.; 360, 8d.; 362, 6d.; 363, 4d.; 365, 6d.; 366, 6d.; 367, 2d.; 370, 6d.; 371, 6d.; 373, 4d.; 374, 2d.; 376, 4d.; 378, 8d. 379, 6d.; 381, 2d.; 382, 6d.; 383, 2d.; 385, 2d.; 386, 6d.; 387, 6d.;

388, 2d.; 389, 2d.; 391, 2d.; 392, 1s. 10d.; 394, 2d.; 395, 8d.; 396, 6d.; 397, 2d.; 398, 2d.; 399, 4d.; 401, 6d.; 402, 8d.; 404, 8d.; 405, 6d.; 406, 2d.; 407, 6d.; 408, 6d.; 409, 6d.; 410, 4d.; 411, 2d.; 412, 2d.; 413, 6d.; 414, 6d.; 417, 2d.; 419, 10d.; 421, 6d.; 428, 4d.; 429, 6d.; 430, 6d.; 431, 2d.; 432, 6d.; 434, 6d.; 435, 6d.; 436, 2d.; 437, 4d.; 438, 4d.; 445, 6d.; 448, 6d.; 456, 6d.; 459, 10d.; 461, 6d.; 463, 6d.; 490, 6d.; 491, 6d.; 498, 6d.; 510, 6d.; 524, 10d.; 540, 8d.; 565, 8d.; 578, 6d.; 597, 6d., 2556, 8d.; 2561, 1s.; 2606, 6d.

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

ABSTRACTS OF SPECIFICATIONS.

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

142. SEWING MACHINES, *W. Walker, Dunstable.*—10*th January*, 1883. 6*d.*

This relates to a single thread chain stitch machine producing long and short stitches, and consists in mechanical arrangement for producing the feed motion, the threading of the needle and unthreading of the same, and retaining and releasing the loop. A double cam imparts two distinct movements to the work, so as to produce one long and one short stitch. The needle is formed with a double hook.

179. TELEPHONIC TRANSMITTERS, *H. Alabaster and T. E. Gatehouse, London.*—11*th January*, 1883. 6*d.*

The transmitter has a bridge with an accurately plane and smooth under surface resting on and forming electrical contact between two electrodes having accurately plane and smooth upper surfaces. The bridge receives direct the acoustic impulses through a confined passage, such as a speaking tube.

184. DYNAMO OR MAGNETO-ELECTRIC MACHINES, &c., *H. H. Lake, London.*—11*th January*, 1883.—(*A communication from C. L. R. E. Menges, The Hague.*) 1*s*

This invention relates to the method of winding and constructing the armatures, of which many examples are described and illustrated, and to methods of cutting out of circuit portions of the electro-magnet coils. The coils are cut out by the action of a centrifugal governor driven by a motor, through the coils of which flows a portion of the main current. The magnet cores are made of a number of iron rods, the shaft being hollow to permit of a circulation of air.

187. MODES OF PRODUCING ELECTRIC LIGHT, *J. A. Briggs, London.*—12*th January*, 1883. 2*d.*

The focus of the cathodix rays formed by electric discharge in high vacuo is used to render refractory bodies incandescent. An electric discharge may be made to pass through highly condensed gases.

209. CONSTRUCTION AND WORKING OF STEAM GENERATORS, *H. Lane, London.*—13*th January*, 1883. 6*d.*

This relates to steam generators of the sectional type, and consists in the method of and means for establishing communication between the sections. The terminal boxes are made with only one orifice on the outer face, and the connecting pieces are arranged to overlap one another. To separate the steam from water, the steam on rising is conveyed to a coil arranged in a chamber, and in passing through it the water is separated by centrifugal force. To cause impurities in the water to be deposited the chamber is partly charged with scrap iron, pumicestone, or other suitable material, with which the feed-water is brought in contact on its way to the boiler.

210. KEY FOR SECURING RAILS ON THEIR CHAIRS, *H. B. Moreton, Cardiff.*—13*th January*, 1883. 4*d.*

The key is of sheet steel, bent to form a tube, divided on one side longitudinally, and formed with a tongue at each end to bend back against the sides of the chair.

217. WORKING AND REGULATING SECONDARY BATTERIES, &c., *J. S Sellon, London.*—13*th January*, 1883. 8*d.*

The gas generated in the cells causes a column of mercury to complete the circuit of a magnet and cut the cell of circuit when sufficiently charged. Two magnets are so arranged as to automatically switch more cells into the circuit when its electro-motive force falls; the same apparatus is applicable for re-charging batteries. The reversal of current is prevented by passing the charging current through an electro-magnet, which oscillates a polarised armature and completes a well circuit. In a modification the cells are cut out of the circuit and a resistance equal to the generator inserted. Each cell is connected to a switch board, and may be presented to a voltmeter to detect whether it is short circuited. In circuits for charging cells and lighting lamps alternately an electro-magnet and its armature are so arranged as to complete the charging circuit on the passage of the maximum current and the lamp circuit on the passage of the lamp circuits. A switch is so arranged as to permit of the coils of the armature being placed in parallel circuit or in series.

218. RED COLOURING MATTERS, *F. Wirth, Germany.*—13*th January*, 1883.—(*A communication from Messrs. Kalle and Co., Germany.*)—(*Not proceeded with.*) 2*d.*

This relates to the production of red colouring matters by the combination of the paradiamines with the amidated ethers of the phenols by oxidation.

219. SELF-FILLING AND SELF-DISCHARGING GRAPPLES, SKIPS, OR BUCKETS, *G. F. Fuller, Millwall.*—13*th January*, 1883. 6*d.*

The skip is of semicircular or other suitable shape in two halves hinged at the centre to open and shut freely. The leverage for closing it is obtained by cross levers connected by arms to a crosstree to which the hoisting chain is attached, and the opening is effected by a sling chain connected to the extreme edges of the skip, and attached at its centre to the opening chain, which is automatically actuated by means of a friction clutch, so that when the skip has been lowered, and the brake applied to the discharging chain barrel, the chain will be arrested and the bucket caused to open.

220. CHIMNEY COWLS AND VENTILATORS, *G. Davis and W. Jones, Cardigan, and R. Girdwood, Edinburgh.*—15*th January*, 1883. 6*d.*

According to one arrangement a cowl is caused to rotate by the action of wind, but has its vane arranged so as to keep the mouth directed towards the current. The mouth is conical, and the inner part communicates with a passage acting as an inverted syphon, the air entering the cowl passing down vertically and then through a curved part so as to issue upwards, such curved part opening in the passage or flue, through which smoke or air is discharged.

221. BEARINGS AND LUBRICATING APPARATUS FOR UPRIGHT SPINDLES OF SPINNING AND WINDING MACHINERY, *J. Nicoll, Dundee.*—15*th January*, 1883. 6*d.*

The object is to improve the bearings and lubricating apparatus described in patent No. 4840, A.D. 1877; and relates more especially to an arrangement in which the footstep and neck bearings are combined, and the lubricant is contained in a hollow rail, through the top of which are inserted a number of bearing tubes, each having the bearings for a spindle. Each bearing tube projects to near the bottom of the hollow part of the rail, which is filled with lubricant. A tube is fixed inside the bearing tube with a space between them, the neck bearing being formed at the upper part of the inner, and between it and the footstep bearing the tube is slightly larger than the spindle, which has a helical groove formed in it to convey the lubricant to the neck bearing. Holes are formed in the inner tube and in the footstep bearing.

222. MACHINERY FOR GRINDING AND TREATING CORN, *W. L. Wise, London.*—15*th January*, 1883.—(*A communication from A. and B. Mariotte and E. Boffy, Paris.*) 6*d.*

This relates to a portable grinding machine, consisting of a pair of flat metallic grinding discs of hard metal, arranged horizontally one above the other, a shaking sieve to conduct the product from the grinding apparatus, and a revolving sifter that may be connected to a fan or blower. The three parts are detachable to facilitate transport. The working face of each disc is divided into equal sectors, separated by radial grooves, and each sector is formed with a number of slightly inclined grooves, the first being nearly radial, and each succeeding one slightly widening and deepening towards the axis of the disc, by which means a fan-like effect is produced, and the grain is more efficiently ground. The shaking sieve has two meshed divisions, which retain the coarser portions of the ground grain, while the finer portions pass to the rotating sieve having meshes of different sizes.

224. MECHANISM TO BE EMPLOYED FOR DELIVERING CONSECUTIVELY NUMBERED TICKETS TO PERSONS RIDING IN PUBLIC VEHICLES, &c., *M. Bebro, Kilburn.*—15*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to improvements on patent No. 941, A.D. 1881; and consists, First, in reducing one of the delivery rollers to half the diameter of the other; Secondly, to arranging in connection with the delivery rollers a suitable dating and numbering mechanism, supplied with ink from a roller or pad; Thirdly, in actuating the rollers by a plunger formed with a rack; and Fourthly, in a special shaped bell.

226. PRODUCING HOMOGENEOUS METAL CASTINGS, &c., *G. W. von Nawrocki, Berlin.*—15*th January*, 1883.—(*A communication from W. G. Otto, Germany.*) 2*d.*

This consists in stirring the metal during casting with a block of marble, dense chalk, or other mineral capable of giving off carbonic acid, which drives out any gases present.

227. PRESERVING MILK, *H. W. L. O. von Roden, Hamburg.*—15*th January*, 1883. 2*d.*

This relates to the preservation of milk by killing the germs of fermentation by heat, and preventing the formation of new germs by saturating the milk with carbonic acid, which is forced into the vessels containing the milk.

228. KETTLES, *R. F. Farquharson, London.*—15*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The opening in the top of the kettle is made outside the handle, so that it will be much easier to remove the lid fitting the opening.

229. REPEATING MECHANISM AND CARTRIDGE MAGAZINES FOR BREECH-LOADING FIRE-ARMS, *G. E. Vaughan, London.*—15*th January*, 1883.—(*A communication from J. Werndl, Austria.*) 8*d.*

This relates to improvements on patents No. 3878, A.D. 1878, and No. 1982, A.D. 1882, and consists, First, in a cartridge case to be filled from the rear; Secondly, in the connecting arrangement of the magazine with the removable repeating mechanism, and the connecting arrangement of the latter with the gun; and Thirdly, in the arrangement of mechanism, by means of which the repeating fire can be discontinued, and the gun used as an ordinary gun even when the magazine is fastened thereto.

231. MACHINES FOR STAMPING, ENDORSING, AND EMBOSSING PURPOSES, *N. Wilson and T. Hinds, London.*—15*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The stamp is connected to a vibrating arm mounted loosely on a stud on the frame, and acted upon by a spring, at the free end of which is a stud actuated by a double tappet on the driving shaft, so that the stamp is carried down with an almost vertical movement to the letters below. The stamp is raised by a spring. When ink is used an ink roller is caused to traverse the stamp when in its raised position.

233. DISTRIBUTING AND DIFFUSING POWERFUL LIGHTS, *A. P. Trotter, London.*—15*th January*, 1883. 6*d.*

This consists in forming a lantern glass either with a number of horizontal steps or zones or a number of vertical flutings, or both combined, for the purpose of effecting a uniform distribution and diffusion of rays of light passing through such glass.

234. HOLDING AND RELEASING ROLLER BLINDS, *J. Hudson, Bolton.*—15*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The roller has a stud at one end and a double flanged cord pulley and stud at the other. The bracket supporting the cord pulley end is formed with a slot terminating in a circular hole in which the stud revolves when the blind is raised or lowered. The end of the bracket has a projecting piece slightly convexed inside, and when the actuating cord is pulled outwards the stud travels along the slot and binds the edge of the pulley against the projection. A cord is attached to the bottom of the blind to pull it down when required.

235. MANUFACTURE OF BOWLS OR ROLLERS FOR MANGLING AND CALENDERING MACHINES EMPLOYED FOR FINISHING WOVEN FABRICS AND PAPER, *C. L. Jackson, Bolton.*—15*th January*, 1883. 2*d.*

Jute fibre is opened and combed, and cleansed from all extraneous matter, and then built up into the form of a bowl or roller upon an iron or steel axis and submitted to powerful hydraulic pressure, after which it is turned true and polished.

236. GAS RETORT FURNACES FOR GENERATING HEAT, *J. Dempster, Elland, and J. A. Drake, Halifax, Yorkshire.*—15*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to utilise waste heat or gases from retort benches or settings, and it consists in making the furnace much deeper than usual so as to obtain a large body of coke, and one side series of zigzag flues are arranged and open at one end into the furnace, and at the other into the atmosphere. The gases from the furnace are made to pass through flues running by the side of the air flues, whereby the air passing to the furnace is heated.

237. SCREW TAPS, *H. H. Lake, London.*—15*th January* 1883.—(*A communication from C. R. C. French and F. Bullivant, Providence, U.S.*) 6*d.*

The object is to construct a screw tap which can be adjusted to compensate for wear, and which can be made parallel in its length or tapering in either direction as desired. The body of the tap has a longitudinal cut extending through the threaded part, and a set screw passing through the tap transversely to the cut draws the two sides together. Two taper screws fit taper holes intersecting the cut on opposite sides, and when turned inwards spread the two parts outwards.

238. WATER-CLOSETS, &c., *H. H. Lake, London.*—15*th January*, 1883.—(*A communication from J. Bennor, Philadelphia.*) 8*d.*

The object is to enable the closet to be readily cleansed, and it consists of a bowl and trap in one piece, the outlet and the inlet of the trap being connected by a removable retainer so as to gain access to the trap. Around the outlet and inlet is an elastic gasket forming a seat for a ball valve. The valve for the hopper is actuated by a shaft and lever, while the ball in the trap is operated by the water passing through the trap. A stench trap for lavatories and other places is described, and is fitted with elastic gaskets.

239. PENS, *W. Brierley, Halifax.*—15*th January*, 1883.—(*A communication from A. F. I. L. Scholz, Transylvania.*—(*Not proceeded with.*) 2*d.*

The points of the pens are made flat and solid without a slit, the hair-strokes or ground-strokes being produced by pressing the flat point more or less against the paper, so that the point must be slender and elastic. To accumulate ink near the point small tongues are formed by transverse slits in the pen close to the point.

240. ARTIFICIAL STONE, &c., *R. Stone, London.*—15*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This consists in grinding flint, marble chippings, spar, or other hard stone, and mixing it with cement, and moulding it to the required form in dies or moulds.

241. REDUCTION OF METALLIC ORES, *S. H. Emmens, Soho.*—15*th January*, 1883. 4*d.*

This relates to the electrolytical reduction of metals from their ores, and is designed to effect this by the electrolytical decomposition of solutions of the salts of sodium, or other chemically equivalent salts, in the presence of such ores. The ore is broken to a coarse powder and calcined, and then placed in one compartment of a tank divided into two compartments by a porous diaphragm. Each compartment is provided with an electrode. The tank is filled with a solution of sodic chloride, sodic nitrate, or both combined, and the electrodes connected with the poles of a battery or dynamo, so that a current flows through the tank from the one to the opposite extremity. Nascent chlorine or nitric acid, or a mixture of the two, is evolved in the ore compartment, and acts on the metals, gradually dissolving them, the action in some cases being assisted by a jet of steam. The liquors are drawn off at intervals from the two compartments and mixed, the metals being precipitated by the free alkali derived from the electrolytic decomposition of the original salt. The supernatant liquor can be again used.

242. COMBINATION AND TREATMENT OF CERTAIN MATERIALS FOR THE PRODUCTION OF SUBSTITUTES FOR GUTTA-PERCHA AND INDIA-RUBBER, *M. Zingler, London.*—15*th January*, 1883. 4*d.*

Hard gums or gum resins, but preferably equal parts of kawrie and manilla gums, are dissolved in any of the solvent spirits as described in patent No. 1153, A.D. 1882, and then heated to from 200 deg. to 250 deg. Fah. When the whole is dissolved, from 5 lb. to 10 lb. of casein, vegetable albuminous matter extracted from beans, peas, carrots, any kinds of lichens, or seaweed, or animal gelatinous matter, is added for each hundredweight of gum, and the boiling continued until it attains a proper consistency, when it is placed in a masticator with oleaginous materials, and then rolled into sheets to be used in place of gutta-percha. Instead of the gelatinous or albuminous matter from 8 to 10 per cent. of flower of sulphur may be used, and from 3 to 5 per cent. crude camphor, whereby a substitute for india-rubber is produced.

243. GALVANIC BATTERIES, *H. H. Lake, London.*—15*th January*, 1883.—(*A communication from A. Skene and F. Kühmaier, Austria.*) 6*d.*

The object is to produce a battery of continuous and uniform action, and which will supply a large amount of electricity at a small cost. This consists in causing the copper plate of a copper and zinc battery to be alternately raised from a weak solution of sulphuric acid and exposed to the action of the atmosphere, and then again plunged into the liquid. Various methods of effecting this are shown, one consisting in mounting the copper plates on an oscillating lever, and another in making these plates in the form of discs, which are caused to revolve.

244. LATCHES OR FASTENINGS FOR DOORS, GATES, OR SHUTTERS, *W. Wright, Droylsden, Lancashire.*—16*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This relates principally to doors and gates which slide upon rollers, and consists of a bar hinged to the door, and the action of which is limited by a metal strap in which works its upper end, the bar having a projection passing through a hole in the door, and capable of being pulled out therefrom when the bar is pulled back by a handle. A lock in the jamb or post of the door frame has a bolt which when shot prevents the projection of the bar being removed from the hole in the door.

245. COMBINED ANTI-FOULING AND PRESERVING COMPOSITION, APPLICABLE TO SHIPS' BOTTOMS, &c., *J. H. Barry, Clapton.*—16*th January*, 1883. 4*d.*

Waste leather is disintegrated and boiled, and to it is added a weak solution of muriatic or hydrochloric acid. The acid and moisture are then expressed, and the mass dried, reduced to powder, and mixed with paraffine wax. The surface to be protected is covered with a preliminary coating of pulverised leather mixed with naphthaline, stearine, pitch, or other mixing medium constituting an adhesive composition, to which the anti-fouling composition above described is applied in a heated state.

246. PRESERVATION OF ALIMENTARY SUBSTANCES, &c., *C. M. Pielsticker, Kilburn.*—16*th January*, 1883. 6*d.*

This consists in a gas producer with openings to admit air near the top for the purpose of oxidising the vapours of carbonic oxide produced from the combustion of coke into carbonic acid gas, and so producing a mixture of carbonic acid and carbonic oxide gas in the proportion of from 55 per cent. to 75 per cent. of carbonic acid gas, the mixture being cooled, and then passing into preserving chambers containing the alimentary substances.

248. PICKERS EMPLOYED IN WEAVING, *R. Lister, Keighley.*—16*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to constructing pickers of hard wood and with metal picker spindle slides secured in the tops of the pickers, and over which are passed and secured the picking bands or straps; also to forming in the body of the pickers conical holes, in which are secured conical pieces of india-rubber, which strike and actuate the shuttles when weaving.

249. SELF-ACTING MULES FOR SPINNING AND DOUBLING, *J. Brook, near Bradford.*—16*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to means for checking the carriage so as to prevent it running up with force against the stoppers, and it consists in a friction brake actuated by a lever and spring.

250. COOLING BEER, *H. J. Haddan, Kensington.*—16*th January*, 1883.—(*A communication from W. Nussbeck, Berlin.*) 6*d.*

The object is to cool the beer in casks, and at the same time the air which enters such cask. An ice reservoir is placed on top of the cask, and from it a cooling pipe extends through the bung-hole down to near the bottom of the cask, where it is bent round horizontally. A small tube leads up from the bottom of the outside of the reservoir to the top of the inside, and admits air, while a second tube leads the air from the top through the ice and into the cask. A third tube leads from the bottom of the cooling pipe up into the ice reservoir, and allows water to escape from the cooling pipe.

251. CRANES, WINCHES, AND OTHER HOISTING APPARATUS, *H. J. Haddan, Kensington.*—16*th January*, 1883.—(*A communication from Dujour et Bianchi, Paris.*) 6*d.*

The object is to operate cranes and similar apparatus with variable speed and with safety without requiring complicated mechanism. On the main shaft, which carries the crank and chain pulley, three discs or carriers, a spur wheel, and a friction brake are mounted, the carriers being loose, while the spur wheel is fast, and gears with a second wheel on a shaft fixed in the middle carrier and carrying at the other end a third wheel gearing with an internal toothed wheel on the third carrier, while the first carrier has an internal toothed wheel gearing into the second wheel. The first and middle carriers have friction bands to keep either one stationary. The third carrier is coupled to the chain pulley. The friction brake is in the form of a conical sleeve, fitting a socket in a bracket and forming at the other end a toothed coupling with surfaces that cause the two parts to separate when the shaft runs in one direction and to remain in contact when it runs in the opposite direction. An arrangement is described for preventing the heavy loads being raised, and consists of a piston to which the weight is secured, and which fits a cylinder filled with liquid and provided with a loaded valve. The descent of the piston causes a brake to be applied to the hoisting apparatus.

252. RAILWAY CAR BRAKES, *H. J. Haddan, Kensington.*—16*th January*, 1883.—(*A communication from J. F. Mallinckrodt, Ohio, U.S.*) 6*d.*

The object is to utilise the weight of the car in applying the brakes and compressed air, steam, or other power to take them off. One end of each car spring secured to the axle-boxes is connected to a hanger by a link. To the under side of the car other hangers are secured, and carry bell cranks, one arm of which is connected to one end of the spring by a link, while to the other arm are connected brake bars fitted with shoes at their opposite ends. Connecting rods are pivotted to the brake bars, and their other ends to a lever, the upper end of which is attached to the piston-rod of the power cylinder.

253. REGISTERING GAUGES FOR WATER, WIND, RAIN, &c., *R. J. Rudd, Croydon.*—16*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to produce diagrams on a large scale for registering water, wind, &c. A cylinder covered with paper is caused to revolve by travelling down a fixed screw by its own weight, its speed being regulated by a clock movement, whereby such cylinder may be made much larger than usual, and the diagrams formed by a pencil resting upon the paper and controlled by the water or whatever it is intended to regulate, will consequently be much clearer for gauging.

254. POROUS SILICIOUS MATERIAL AND OBJECTS APPLICABLE FOR BUILDING MATERIALS, &c., *A. Frank, Germany.*—16*th January*, 1883. 4*d.*

Artificially produced or natural finely-divided silicious earth, and especially the so-called infusorial earth, is mixed with organic materials and alkalies or alkaline earths. Water or other suitable liquid is added, and masses formed, which are then dried and burnt, whereby the organic masses are carbonised and the carbon wholly or partly burnt up, while the silicious acid, partly uniting with the added fireproof bases under the influence of the heat, will form silicate, so that they will be cemented or burnt together and form a very porous but sufficiently cohesive mass.

255. RUNNER CATCHES OR "SPRINGS" FOR STI OF UMBRELLAS, &c., *W. G. Attree, London.*—16 *January*, 1883.—(*Not proceeded with.*) 2*d.*

The catch consists of two parts, the one engaging with the runner being flat, and having a slot at on end, in which the cross rivet works. It is connected to the stick at the other end by a rivet. The second part is a curved spring, and is fastened to the piece in a notch.

256. PORTABLE RAILWAYS, *H. Woods, Lee, Kent.*—16*th January*, 1883.—(*A communication from B. G. Chapman, Peru.*)—(*Not proceeded with.*) 2*d.*

A portable railway is constructed in strong but light sections consisting of two steel rails secured to a cross bar by means of special chairs with lugs, which are bolted to the cross bar, the rails being secured in the chairs by inserting the web in a deep channel in their upper surfaces, and fastening them by bolts. The sections can easily and readily be shifted, so that a railway may be rapidly laid by the side of rows of crops in fields for the purpose of removing them as they are cut.

257. FILTERING SACCHARINE AND OTHER SOLUTIONS, &c., *E. P. Alexander, London.*—16*th January*, 1883.—(*A communication from P. Casamajor, Brooklyn, U.S.*) 4*d.*

The object is to prevent the clogging of the filtering surfaces by the solid matters held in suspension in the liquid to be filtered, and it consists in mixing such liquid with sawdust and then forcing the liquid so mixed through suitable filtering materials.

260. CENTRE-BOARD VESSELS, *P. M. Justice, London.*—16*th January*, 1883.—(*A communication from J. S. Birch, New York.*) 6*d.*

This consists in an improved contrivance for centre-board vessels, whereby the centre-board may be extended lengthwise of a vessel nearly the whole length, so that it may be correspondingly diminished in depth. The centre-board is arranged to slide in ways, placed at an angle of about 45 deg., and is raised or lowered by a chain or cord.

262. CORK JACKETS, &c., *H. H. Lake, London.*—16*th January*, 1883.—(*A communication from E. R. Cogswell, New York.*) 6*d.*

Granular cork is immersed in liquid paraffine so as to become coated with it, and is enclosed in a fabric or envelope, also coated with paraffine, and of a shape to produce a jacket, belt, buoy, or other object for supporting persons in water.

263. LOCKS AND KEYS, *H. H. Lake, London.*—16*th January*, 1883.—(*A communication from J. P. White, Savannah, Georgia, U.S.*)—(*Not proceeded with.*) 4*d.*

The object is to prevent the lock being opened by drilling or cutting away the bolts, and it consists in making the front plate of hardened steel or chilled cast iron so as to be capable of resisting a drill, and as a further protection the locking cylinder is provided with a collar of larger diameter, also hardened and placed between the plate and a handle. A special construction of lock is also described.

264. STEAM GENERATORS, *A. M. Clark, London.*—16*th January*, 1883.—(*A communication from M. W. Barse, New York.*) 6*d.*

A water chamber or boiler forms the back or bridge wall of the furnace, and is provided with circulation pipes extending into the fire-box and combustion chamber. The upper side of the fire-box is inclined and the water chamber extends into the side walls. The combustion chamber is at the back of the boiler and leads to the chimney. The steam drum extends transversely of the fire-boxes and above the boiler, being supported by the side wall, and it is connected to the boiler by a tube furnished with an inner tube extending down to near the middle of the water chamber.

266. MACHINERY FOR REDUCING AND TREATING CEREALS AND CEREAL PRODUCE FOR THE MANUFACTURE OF GRITS, SEMOLINA, OR FLOUR, *W. H. Williamson, Wakefield.*—16*th January*, 1883. 8*d.*

As applied to roller mills the invention consists in combining with the hood or cover of each pair of rolls an aspirator, from which the air is partially exhausted, and which serves to purify and assort the product preparatory to the passage of its heavy portions between the rolls, and also to exercise a cooling influence up the roller casing. The cereals are introduced into the aspirator by a feed roller with a regulating slide so as to fall through the aspirator on its way to the rolls, and as it falls it comes in contact with suitable guides or deflectors arranged so as to baffle its course, and the current of air entering the aspirator carries off the lighted portions, while the heavier particles of these lighter portions are guided by deflectors over the rolls, but not between them, the cereal itself passing through the rolls, and then mixing with the part that has passed over them and passing with it to a subsequent stage.

268. MAKING CHAINS OR OTHER INTERLINKED OR INTRICATE ARTICLES OF CAST STEEL, &c., *W. Ralston, Manchester.*—17*th January*, 1883. 6*d.*

Alternate links are cast separately and placed in proper positions in indentations in sand, and linked together by links of paraffine wax placed in intermediate indentations. The mould is then heated and the paraffine wax allowed to run out, after which molten steel is run in and forms the intermediate links.

269. CHAPLETS FOR HOLDING CORES IN POSITION IN THE OPERATION OF CASTING, *W. H. Haley, Bradford.*—17*th January*, 1883.—(*Not proceeded with*) 2*d.*

The object is to ensure regularity in the thickness of metal round a core, and it consists in suitable means for adjusting the position of the core by means of screws.

270. MACHINERY FOR STAMPING LETTERS, POSTAL CARDS, &c., *A. Hoster, London.*—17*th January*, 1883. 1*s.*

This relates to machinery for printing the date and place of reception and delivery on letters, &c., and for cancelling the stamps thereon. The letters are brought under a die by elastic fingers on endless travelling bands, and are arrested by a fork actuated by a cam, when flat springs descend and hold the letter on a wire card bed or a bed formed of wires or bristles set on end. The stamping device has a flat face and is mounted on the end of a vibrating lever actuated by a cam, and to which a spring is applied so as to exert a yielding pressure. An inking roller travels across the face of the die. Other improvements are described, including means for delivering the stamped letter and counting mechanism actuated electrically, pneumatically, hydrostatically, or by mechanical connection with the machine.

271. HOLDING IN POSITION SCARVES AND TIES, *D. Appleton, Manchester.*—17*th January*, 1883.—(*A communication from N. H. Baldwin, Laconia, U.S.*) —(*Not proceeded with.*) 2*d.*

On the back of the scarf or tie is secured a fastener, the ends of which can pass over the collar band and hold the scarf in position.

272. APPARATUS FOR THE TREATMENT OF FŒCAL MATTERS, *G. W. von Nawrocki, Berlin.*—17*th January*, 1883.—(*A communication from J. Swiecianowski, Russia.*) 6*d.*

The object is to separate the liquid from solid matters and dry the latter. A collector is employed consisting of two concentric vessels, the inner one perforated to allow the liquid to pass to the annular space between them, and from which it is led to a filtering apparatus containing powdered peat, while the solid matters are dried in a furnace.

273. STOPPERING OR CLOSING BOTTLES, *J. Sceats, Norbiton.*—17*th January*, 1883.—(*Void.*) 2*d.*

The mouth of the bottle is formed with grooves with which catches on the plate supporting the stopper engage.

274. PRESERVING ALIMENTARY AND OTHER SUBSTANCES, *T. F. Wilkins, London.*—17*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This consists in forming antiseptics suitable for preserving alimentary substances of metaboric acid, metaborate of potassium, biborate of potassium, and sodium metabodrate, with or without the addition of other chemicals.

275. APPLYING ALTERNATING ELECTRIC CURRENTS TO THE PRODUCTION OF LIGHT, *A. Muirhead, London.* —17*th January*, 1883. 2*d.*

Condensers, constructed by soaking piles composed of thin sheets of paper with alternate layers of tinfoil in paraffine, are placed in the main circuit or in a divided circuit.

276. GLASS COVERINGS FOR THE KEYS OF MUSICAL INSTRUMENTS, *B. Kohl and K. Voigtritter, Dresden.* —17*th January*, 1883.—(*Not proceeded with.*) 2*d.*

Pieces of glass are cut and ground to the required size and treated with an aqueous solution of hydrofluoric acid, and are then fixed on the keys to be covered by a special cement.

277. CARTS FOR THE RECEPTION AND DISCHARGE OF MUD, MORTAR, &c., *S. Clarkson and J. Ross, Hull.* —17*th January*, 1883. 6*d.*

This relates to "tumbler" carts, and consists in causing them to turn on the axle of the driving wheels by means of a loose chain secured to the fore and rear edges of the cart and passing beneath the same, and over a chain wheel secured to an axle at the front of the cart and actuated by a crank and suitable gearing.

279. BLUE COLOURING MATTER, *F. Wirth, Germany.*— 17*th January*, 1883.—(*A communication from Messrs. Kalle and Co., Germany.*)—(*Not proceeded with.*) 2*d.*

This relates to the production of blue colouring matter called benzlen blue, which is derived from the salts of the aromatic quaternary amines (ammonium bases), and particularly from the dimethylphenylbenzylammonium chloride, which is produced if the nitroso-compounds of these bases be treated in proper proportions with sulphuretted hydrogen, and the so-formed leuco base converted into the proper colouring matter by employing oxidising media.

280. BRICKS, TILES, PIPES, &c., *J. H. Starling, Erith, and E. A. May, Belvedere.*—17*th January*, 1883. 4*d.*

This consists in the manufacture of bricks, tiles, pipes, and earthenware articles and cement from the dredgings of rivers, docks, harbours, and such like alluvial deposits, either alone or in admixture with chalk and silicious material.

281. MECHANICAL MUSICAL INSTRUMENTS, *H. H. Lake, London.*—17*th January*, 1883.—(*A communication from the American Automatic Organ Company, Incorporated, Boston, U.S.*) 6*d.*

This relates to instruments in which the playing is effected by the passage of a perforated sheet through the instrument, and it consists in various improvements in the construction of such instruments.

282. PRIMARY ELECTRIC OR VOLTAIC BATTERIES, *M. R. Ward, London.*—17*th January*, 1883. 2*d.*

The exciting liquids are supplied from cisterns placed at an altitude. A system of pipes and valves is so arranged that fresh liquid can be turned into the batteries when required, and waste liquid drawn off.

283. APPARATUS CONNECTED WITH THE FITTING AND APPLICATION TO STEAMSHIPS OR VESSELS OF SCREW PROPELLERS, *A. Morris, London.*—17*th January*, 1883. 6*d.*

This consists in providing a tube or channel at or near the stern of the vessel, and as low down in the dead wood as possible, the forward end branching off and being open to the water on each side of the dead wood. The propeller rotates with little clearance within the tube.

284. MANUFACTURE OF SUGAR, AND MACHINERY OR APPARATUS THEREFOR, &c., *A. Fryer and J. B. Alliott, Nottingham.*—17*th January*, 1883. 1*s.* 4*d.*

The crushed cane is used for fuel, and is automatically conveyed to the furnaces by being discharged from the crushing apparatus into a gutter, along which it is conveyed by rakes attached to a travelling band, the gutter passing over the furnaces, and having a hole over each one so that the cane falls into a hopper with a door at bottom opening inwards, and combined with prongs, above which when the door opens at regular intervals the hopper is closed at top. So as to increase the yield of juice from sugar cane after it has left the mill it is treated in a supplementary extractor, where it is subjected to the action of stampers or beaters, the cane having been first treated with hot water, which is afterwards expressed by rollers. Apparatus for heating the juice is provided with a loaded valve, so that the juice is retained therein until it has attained a pressure corresponding to a temperature exceeding the boiling point at atmospheric pressure. The juice is then treated with chemicals to neutralise its acidity and cause the more thorough flocculation and separation of the coagulated solids. A filter to separate the solid matter held in suspension is arranged so that the bags can be allowed to drop from the filter head through the bottom of the filter on to a truck. Other improvements are also described.

285. ELECTRIC LAMPS, *J. Unger, Cannstadt.*—17*th January*, 1883. 2*d.*

The lower carbon is immersed in a tube of liquid and fed up against the lower end of an iron cylinder carried by a spring attached to its upper end.

286. THRASHING MACHINES, *J. H. Johnson, London.*— 17*th January*, 1883.—(*A communication from J. Montandon, Paris.*) 6*d.*

The object is to reduce the size and weight and the power required to drive thrashing machines; and it consists, First, in the employment behind the concave of a thrashing machine of a perforated plate, through which the dust passes, and is collected in compartments communicating with sacks; Secondly, in the means for supporting and adjusting the position of the drum relatively to the concave; and Thirdly, in a special arrangement of the fore carriage. The drum is supported on pivotted levers, and springs enable the drum to yield.

287. ACCUMULATORS FOR STORING ELECTRICAL ENERGY, &c., *H. H. Lake, London.*—17*th January*, 1883.—(*A communication from N. de Kabath, Paris.*) 4*d.*

The electrode is constructed of a plate of lead in which a number of V-shaped incisions are made. The projecting parts are folded or curled over on to the plate. The plate is then folded on itself. In a modification a number of projections are stamped in the plate, the upper part of each projection being perforated.

288. APPARATUS FOR REGULATING OR CONTROLLING ELECTRIC CURRENTS, *H. H. Lake, London.*—17*th January*, 1883.—(*A communication from N. de Kabath, Paris.*) 10*d.*

Relates to apparatus designed to control and maintain constant electric currents, and comprises a magnet placed in the main or a shunt circuit, having an armature withdrawn by a spring. When the current is strong enough to attract the armature it causes the current to flow in one direction in an electromotor. When the spring preponderates, it reverses the current and the direction of rotation of the motor. The movement of the motor operates a commutator, which introduces into the circuit additional sources of electricity or resistance coils, as the case may be.

290. HOLDERS OR FASTENINGS FOR BLIND, SASH, AND OTHER SIMILAR CORDS, *J. D. Sprague, Upper Norwood.*—18*th January*, 1883. 6*d.*

The cord is passed through a slit in a case fixed to the window, and in which is pivotted a pawl with teeth, and when the cord is pulled outwards the teeth are forced into it, so that when released the cord pulls the pawl round on its pivot, and is jammed tight. By pulling the cord down slightly the pawl drops, and the cord is free.

291. CORSETS, *H. C. Leprince, Paris.*—18*th January*, 1883. 4*d.*

This consists in abolishing gussets or gores, and reducing the whalebone necessary by the particular mode of forming the body of the corset of three pieces on each side, viz., a top piece and a bottom piece, joined by a middle piece or belt, rising to a point at the back and front, and hollowed out at each side.

292. MANUFACTURE OF SALTS OF STRONTIA AND OXIDE OF STRONTIUM, *W. A. Rowell, Newcastle-on-Tyne.*— 18*th January*, 1883. 4*d.*

This consists in subjecting sulphate of strontia to repeated boiling with carbonate of soda, using successively solutions more or less spent by previous boilings, and attacking with the fresh solution the nearly exhausted mineral, thereby obtaining the almost complete conversion both of the sulphate of strontia and the carbonate of soda, the one into carbonate of strontia, and the other into sulphate of soda.

293. MANUFACTURE OF SALTS OF STRONTIA AND OXIDE OF STRONTIUM, *W. A. Rowell, Newcastle-on-Tyne.*— 18*th January*, 1883. 4*d.*

This consists, First, in the decomposition by fusion of a mixture of sulphate of strontia and carbonate of soda into carbonate of strontia and sulphate of soda; and Secondly, in the manufacture of carbonate of strontia by fusing the sulphate of strontia with carbonate of soda, washing the product with water, and consolidating the residue into cakes by means of a filter press.

294. HYDRAULIC MACHINERY FOR PRODUCING POWER OR FOR PUMPING, *W. Donaldson, Ambleside.*—18*th January*, 1883. 6*d.*

One or more cylinders are each open at one end and covered with a loose lid at the other, and on the outside a balanced cylindrical valve works with an easy fit. A case surrounds the cylinder and through one side the open end projects. A piston fits easily in the cylinder, and its rod works through the lid. One or two excentrics actuate the valve and alter the length of stroke. Rods connect the pistons with the crank shaft and the valve with the excentric. The case is kept supplied with water under any required pressure. The cylinder has three sets of ports, one at the commencement to admit water, one near the end for the egress of water, and one ordinarily covered by the lid and acting as a safety valve. The lid has valves to admit air at the instant of the termination of the full stroke and allow it to escape during the return stroke, the valves closing the instant the water is admitted.

295. TREATING YARNS AND COVERING WIRES FOR TELEGRAPHIC, TELEPHONIC, OR ELECTRIC LIGHTING, &c., *W. T. Glover and G. F. James, Manchester.* —18*th January*, 1883. 6*d.*

The wires, previously covered with gutta-percha, are further covered with yarns which have been immersed in heated ozokerite. The braiding spindle has its head formed with a slot opposite the opening, in which the dropper works, and which acts as a guide for the front extremity of the dropper. This facilitates threading the yarn through the hole at the top of the drop rod, the hole being parallel with the dropper.

296. DRIVING BELTS, *G. H. Hebblethwaite, Huddersfield.*—18*th January*, 1883. 4*d.*

The belt is composed of an inner leather belt and an outer flax, hemp, or cotton woven belt, the two being secured together and forming a complete belt of great strength, and which will not stretch.

298. FLOATING BASIN OR STAGE FOR OYSTER CULTURE, *A. J. Boult, London.*—18*th January*, 1883.—*A communication from L. Auschitzky, France.*)—(*Not proceeded with.*) 2*d.*

This consists essentially in forming the floor or bottom of the basin or stage so that it can be raised and lowered.

299. VENTILATING TRAMWAY CARRIAGES, &c., AND FOR DISPLAYING MOVING ADVERTISEMENTS THEREON, *G. W. von Nawrocki, Berlin.*—18*th January*, 1883. —(*A communication from Colonel L. von Vöneky, O. Suter, and J. Lehmann, Berlin.*)—(*Not proceeded with.*) 2*d.*

A spindle is driven by a chain from one of the wheel axles, and by means of pulleys and cords actuates a ventilating fan arranged above the roof, and also drums serving to exhibit advertisements.

300. ENGINES FOR MOTIVE POWER, COMPRESSION, &c., *H. G. Williams, Greenwich.*—18*th January*, 1883.— (*Not proceeded with.*) 2*d.*

This consists in dispensing with connecting rods to transmit the power from the piston-rod by employing a pinion revolving in an annular wheel of twice its diameter. A stud on the pitch line of the pinion makes a straight line across the diameter of the annular wheel as the pinion revolves, and to this stud the piston-rod is connected. By driving the pinion the pistons can be actuated for compressing air or other purposes.

301. WAIST BANDS FOR TROWSERS, &c., *E. Dastot, Brussels.*—18*th January*, 1883.—(*Not proceeded with.*) 2*d.*

A stout elastic gusset or expanding piece is lined with a suitable material and secured by a metallic rim round its edge to the points of the trousers where the front and back brace buttons are usually attached, thus forming a waist band which will do away with the necessity for using braces.

302. BREWING, *H. E. Newton, London.*—18*th January*, 1883.—(*A communication from J. Purvez, France.*)— (*Not proceeded with.*) 2*d.*

This relates to the operation of boiling the wort, and to the preparation of the hop element to be added to the wort. Tannin is added to the boiling wort and precipitates the excess of nitrogenous matters, and after boiling for an hour or so, it is allowed to flow to the cooling vat, where its temperature is lowered to about 167 deg. Fah. It is then filtered and returned o the boiler, where it is caused to boil rapidly and the hops added, the latter having had their volatile oils extracted by distillation. The volatile oils are collected and added to the wort in the gyle tun.

303. SIGNALLING APPARATUS IN CONNECTION WITH VACUUM BRAKES FOR RAILWAYS, *W. J. Adams, London.*—18*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The objects are to indicate when leakage occurs in pneumatic brake apparatus, and also to enable passengers to signal the attendants of a train. An audible signal is provided and actuated through a flexible diaphragm or floating piston open at one side to the vacuum pipe of the train. A visible signal is also provided. The signals will be actuated if a passenger opens a valve in the vacuum pipe, or if air enters the same by leakage.

304. FURNACES FOR THE TREATMENT OF MATERIALS FOR THE PRODUCTION OF SULPHATES OF SODA OR POTASH, &c., *J. Mackenzie, Stockton-on-Tees.*—18*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to furnaces which may be worked on a continuous system for the treatment of materials for the production of sulphate of soda or potash, or for carbonating, calcining, or drying other chemical products or materials, and it consists in the use of a series of retorts placed in a furnace and each provided with blades mounted on a shaft to constantly agitate and carry the material through the retort to a passage connecting it with the next of the series.

305. APPLIANCES EMPLOYED IN THE LOADING, UNLOADING, AND CONVEYING OF MERCHANDISE, &c., *Sir H. Bessemer, Denmark Hill.*—18*th January*, 1883. —(*Not proceeded with.*) 2*d.*

This relates to improvements on patent No. 5171, A.D. 1882, in which a system is described for conveying merchandise on railways in the same wagons as it is brought to the railway, and in which railway platform trucks are used to receive the road wagons. This platform is made with grooves to receive the wheels of the wagons, and the front wheels are placed closer together than the hind wheels. Means are provided to prevent the wagons shifting on the platform.

308. ELECTRIC SIGNALLING APPARATUS FOR USE ON RAILWAYS, *W. Walker, London.*—18*th January*, 1883.—(*A communication from C. D. Tisdale, Boston, Mass., U.S.*) 4*d.*

The signal indicates "safety" only as long as an armature is attracted by its electro-magnet. The apparatus comprises a main and auxiliary circuit, the latter serving by means of suitable appliances, to complete the main circuits at the desired points. The circuit breaker is operated by the passage of the train.

309. FACTORY CHIMNEY SHAFTS, *S. Hart, Hull.*—18*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The base is constructed of iron girders bolted together and on which upright stanchions are secured and joined together at the top by an iron frame, the whole being filled in with brick or stonework. On this frame the shaft is erected, and consists of a sheet iron cylinder bolted together and lined with brick or stonework. Near the bottom of the shaft a number of tubes pass obliquely from the outside to the inside and serve to admit air and also allow some of the hot air to escape from the shaft.

310. APPARATUS FOR CRUSHING, GRINDING, OR PULVERISING CEMENT, LIME, STONE, &c., *H. H. Lake, London.*—18*th January*, 1883.—(*A communication from C. Jouffray, France.*) 6*d.*

A cast iron roller is caused to revolve, and on it a hollow cylinder rests freely, and upon the interior of the latter a grinding roller also rests freely. The hollow cylinder rests on guide rollers, and the material to be crushed is fed inside the cylinder and passes under the crushing roller. Scoops lift the crushed material, the smaller particles passing through wire gauze to a receptacle beneath, while the large particles return to the cylinder again.

313. HEARTHRUGS OR MATS, *B. Taylor, near Huddersfield.*—19*th January*, 1883.—(*Not proceeded with.*) 2*d.*

The rug is made of pieces or lists of cloth, stuffs, fents, or other suitable material woven into a canvas back.

314. UNIONS OR CONNECTIONS FOR PIPES, *R. F. C. Tonge and J. Westley, Lancaster.*—19*th January*, 1883.—(*Not proceeded with.*) 2*d.*

This relates to unions for enabling pipes to be joined in a straight line or at varying angles, and consists in forming each part of the union nearly semi-globular and with a screwed socket for connection with the pipe. A groove to receive packing is formed in one part and an annular lip on the other. A bolt is cast on one part and passes through the other, being secured by a nut coned to fit a seating.

315. CYLINDERS FOR BREAKING-UP FIBROUS MATERIALS, *T. D. Tomlinson, Rochdale.*—19*th January*, 1883. 4*d.*

The object is to form cylinders for hard waste breakers, combining lightness, rigidity, simplicity, and economy of construction. The ends are of cast iron or steel or wrought iron, and are secured to the shaft. The shell is formed of a plate of wrought iron or steel and secured to flanges on the ends. An outer case is fastened to the shell and receives the teeth. The ends are provided with sheet metal covers to keep fly or dust out of the cylinder.

316. DYNAMO-ELECTRIC MACHINES, *F. H. Relph, London.*—19*th January*, 1883.—(*A communication from J. Olmstead, New York, U.S.*) 2*d.*

To enable the armature to be readily removed, the pole pieces attached to the cases of the upper electromagnets are capable of rotation. The cylindrical armature core is wound longitudinally with five independent coils having their starting ends connected together. The commutator consists of insulated rings having segmental projections on their peripheries. A pair of collecting brushes are applied to each ring.

317. SECONDARY OR STORAGE BATTERIES, *H. J. Haddan, London.*—19*th January*, 1883.—(*A communication from E. Boettcher, Leipzig.*) 2*d.*

Zinc is electrically deposited from a solution of sulphate of zinc on a cathode of thin pure sheet zinc. The anode is formed of a thin sheet of lead covered on both sides with porous metallic lead obtained by the decomposition of an oxide of lead. The decomposition is aided by the addition of a small amount of acetic acid or acetate of zinc.

318. HURRICANE LANTERNS, &c., *H. J. Haddan, Kensington.*—19*th January*, 1883.—(*A communication from A. Schindler, Germany.*) 4*d.*

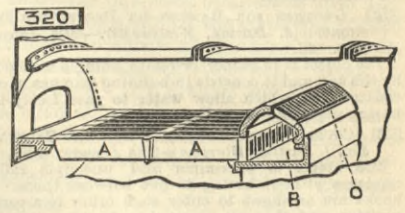
The object is to render the interior of lanterns easily accessible without the use of side doors, and it consists in forming the lantern of two parts, the lower having a flanged base-plate, with the lamp in the centre, and the upper comprising the glass sheets, frame, roof, and chimney. From the base-plate vertical bars extend upwards, and pass through a guide attached to the ring carrying the roof. To the top of the bars is hinged a hoop serving to suspend the lantern and secure the two parts together. By turning the hoop down, the top part of the lantern can be removed.

319. MACHINES FOR THE MANUFACTURE OF BUTTONS, *H. J. Haddan, Kensington.*—19*th January*, 1883.— (*A communication from H. Ulbricht and J. Hortig, Saxony.*)—(*Not proceeded with.*) 2*d.*

This consists in a machine which automatically cuts and dresses buttons by milling tools in three different operations, carried on simultaneously on three different objects, the first operation serving to remove the crust from the article, while the second produces the required shape, and the third cuts or dresses the back.

320. STEAM BOILER AND OTHER FURNACES, &c., *B. Harlow, Macclesfield.*—19*th January*, 1883. 6*d.*

The object is to more effectually consume the smoke in steam boiler and other furnaces, and it consists in forming an air chamber B with a movable bridge O at the rear of the furnace bars A, which are tubular, and through which air passes to chamber B, and issues through a grating in the bridge O facing the flue. In the top of each fire-bar a piece of wrought iron is inserted, and runs the whole length, so as to considerably strengthen the bars and provide a hard wearing surface on the face. The furnace door is formed of three or more plates with intermediate spaces, the



outer and inner plates having a number of perforations, and the centre plate a single hole in the centre, the object being to admit a current of heated air over the fire. A valve is fitted to the hole in the centre plate.

321. SWITCH FOR INCREASING OR DIMINISHING THE STRENGTH OF CURRENT IN ELECTRIC LIGHTING APPARATUS, *F. Mori, Leeds.*—19*th January*, 1883. 4*d.*

More or less resistance coils are interposed in the circuit as required.

322. ELECTRIC ARC LAMPS, *F. Mori, Leeds.*—19*th January*, 1883. 6*d.*

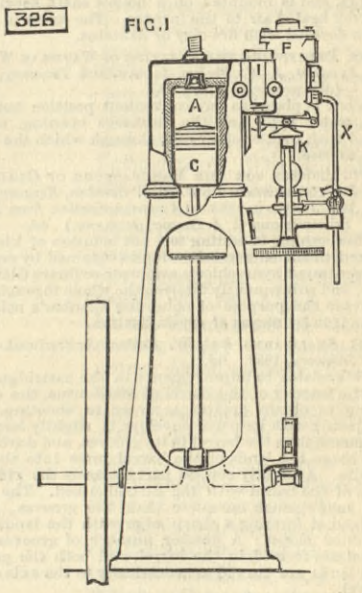
The descent of the upper carbon is controlled by a worm wheel and pinion. The cage containing the pinion is attached by a lever to the core of a solenoid placed in the main circuit, which on the passage of current lifts the cage and establishes the arc. The up stroke of the cage brings the wheel in contact with an upper brake, a lower brake acting on it when the cage descends. In a modification the cage is balanced by two solenoids, one of high the other of low resistance. The descent of the cage completes the circuit of an electro-magnet, which lifts the brake and allows the carbon to descend.

324. MACHINERY FOR SECURING CORKS OR STOPPERS IN BOTTLES, *R. L. Howard, Luton.*—19*th January*, 1883. 1*s.* 6*d.*

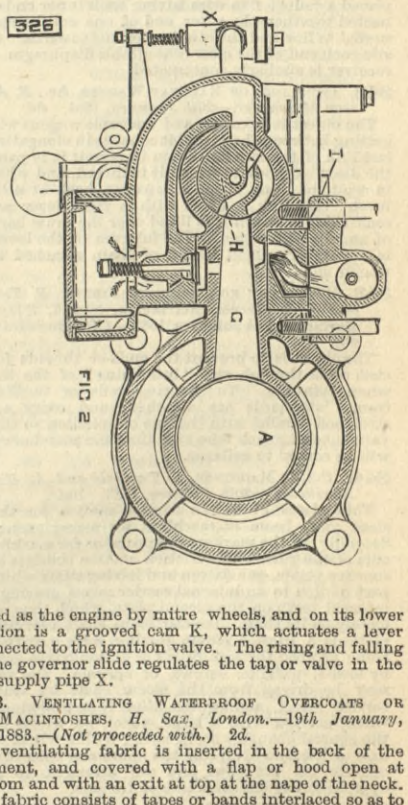
This relates to improvements on patent No. 926, A.D. 1880, and consists in twisting the wires for securing the corks before cutting the same, and so that a portion of the twisted part is ready, and is applied to the securing of the next cork. To effect the twist the wire or bottle is revolved, and the wire thus secured across the top of the cork and round the rim of the neck.

326. GAS ENGINES, *C. T. Linford and W. E. Cooke, Birmingham.*—19*th January*, 1883. 6*d.*

This relates to engines in which the motive gases are not compressed previous to ignition. The drawings show the invention as applied to a vertical engine. The cylinder A is provided with a water jacket, and its



trunk piston C is connected to the crank shaft in the usual manner; F is a circular valve casing, and G the port leading into the cylinder; I is the ignition slide; H the rotating or cylindrical valve, with suitable ports for mixing the motive gases and exhausting the residues after combustion. Valve H is driven at the same



speed as the engine by mitre wheels, and on its lower portion is a grooved cam K, which actuates a lever connected to the ignition valve. The rising and falling of the governor slide regulates the tap or valve in the gas supply pipe X.

328. VENTILATING WATERPROOF OVERCOATS OR MACINTOSHES, *H. Sax, London.*—19*th January*, 1883.—(*Not proceeded with.*) 2*d.*

A ventilating fabric is inserted in the back of the garment, and covered with a flap or hood open at bottom and with an exit at top at the nape of the neck. The fabric consists of tapes or bands interlaced so as to leave apertures, and secured together where they cross by metallic eyelets. Ventilators with a bellows-like action are also provided, and arranged to be actuated by the movement of the arms in walking.

329. STEAM BOILERS OR GENERATORS, *J. W. Boulton, Ashton-under-Lyne.*—20*th January*, 1883. 6*d.*

This relates to water tubes for steam boilers, the object being to construct and arrange them so as to present

a large heating surface, produce a free circulation of water and a rapid generation of steam, while the joints with the tube plate will be unaffected by expansion or contraction. The pipes are of U form, and one leg is extended a few inches above the water level in the boiler. The tubes can be applied to vertical or horizontal boilers.

330. GROYNES FOR RAISING OR PROTECTING FORESHORES, *A. Dowson, Westminster.*—*20th January*, 1883. 6*d.*

The object is to gather or retain shingle washed up by the sea, and it consists in building groynes of open construction, which allow water to pass freely after having deposited the shingle.

331. COUPLING AND UNCOUPLING RAILWAY CARRIAGES, &c., *J. Darling, Glasgow.*—*20th January*, 1883. 6*d.*

The object is to couple and uncouple railway carriages without having to get between them. The hooks are arranged to enter each other in a vertical position, and they are pivotted to draw-bars provided with levers for lowering the hooks, so as to disconnect them.

332. TREATMENT OF SEWAGE, &c., *J. Young, Kelly, N.B.*—*20th January*, 1883. 6*d.*

This relates to the treatment of sewage and other liquids, such as refuse from the beet sugar manufacture, in order to obtain ammonia and in the apparatus for the same; and it consists in improvements on patent No 3562, A.D. 1882, in which a partial vacuum was formed, so as to enable the sewage to be boiled at a low temperature. This vacuum is utilised, together with the pressure of the atmosphere, to force the sewage through the apparatus. The atmosphere acts upon the ingoing sewage or other liquid, pressing on one side of a piston against the vacuum, and the power thus obtained is utilised to force or draw the sewage through the apparatus. To separate the ammonia from the steam, the steam is brought in contact with sulphuric or other acid in a closed vessel.

333. FOOT MATS FOR DOORS, BATH ROOMS, &c., *E. P. Alexander, London.*—*20th January*, 1883.—(*A communication from C. Cheswright, France.*) 6*d.*

A number of strips of wood are jointed together so as to leave interstices between them to receive the dirt. The mats can be folded up when not in use, and a backing of canvas may be applied to collect the dirt. The strips may be faced with cork or india-rubber for use in bath rooms, and the backing may be of waterproof material.

335. APPARATUS USED FOR THE DISTILLATION OF COAL, SHALE, &c., *B. P. Walker. Birmingham, and J. A. B. Bennett, King's Heath, Worcester.*—*20th January*, 1883. 6*d.*

The object is to reduce the manual labour, and effect the distillation of coal, &c., more economically. A horizontal retort, with its lower part of semicircular section, has a mouthpiece at each end, and at top of the front a hopper, from which the coal is fed to the retort by a screw. To the top of the back mouthpiece a pipe is connected to convey the gas away, and from the lower part a shoot depends for the discharge of the coke or ash. In the bottom of the retort a screw works, and is mounted on a hollow shaft, serving to convey heated air to the furnace. The screw is made of or covered with fire-clay or asbestos.

336. PREVENTING THE FREEZING OF WATER IN WATER-CLOSETS, *J. W. Blakey, Leeds.*—*20th January*, 1883.—(*Not proceeded with.*) 2*d.*

A box is placed in any convenient position between the water main and the discharge opening, and is filled with rock or other salt, through which the water has to pass.

337. PROCESS FOR THE MANUFACTURE OF GLAUBER'S SALT FREE FROM IRON, *H. J. Haddan, Kensington.*—*20th January*, 1883.—(*A communication from Dr. B. Schmaltz and C. A Loewig, Germany.*) 4*d.*

This consists in adding to a hot solution of kieserit, mixed with common salt, a liquid obtained by pouring concentrated hydrochloric acid over ordinary Glauber's salt, and subsequently filtering the whole through rock salt for the purpose of obtaining Glauber's salt free from iron by means of crystallisation.

338. SMALL-ARMS, &c., *W. Hebler, Switzerland.*—*20th January*, 1883. 6*d.*

This relates to improvements in the cartridges and in the interior of the barrel of small-arms, the object being to obtain greater accuracy in shooting. The projectile with its paper envelope is slightly larger in diameter than the barrel in its grooves, and during the discharge the lands of the barrel press into the projectile. A slightly conical part connects the rifle portion of the barrel with the cartridge bed. The lands are made much narrower than the grooves, which instead of forming a sharp edge with the lands have rounded slopes. A greater number of grooves than usual are formed in the barrel, and both the grooves and lands are curved concentrically to the axis of the barrel.

339. TELEPHONIC APPARATUS, *J. Graham, London.*—*20th January*, 1883. 6*d.*

The transmitter has its iron core surrounded by an insulated winding of coarse iron wire, the ends of which are in the battery circuit. At each extremity of this coil, and around the ends of the interior core, is placed a coil of fine wire having their inner ends connected together, the outer end of one coil being connected to line and the other outer end to earth. Opposite each end of the cone is a suitable diaphragm. The receiver is similarly constructed.

342. COUPLINGS OF RAILWAY WAGONS, &c., *F. Attock, near Manchester.*—*20th January*, 1883. 6*d.*

The object is to couple and uncouple wagons without getting between them, and it consists in elongating the last link of the coupling chain to permit it to pass over the draw bar hook to which it is linked, and when not in use to be hung up on a separate hook at a higher level. This link is fitted with a rigid lever arm at each side, by which it is lifted over the draw bar hook of an adjacent wagon. The fulcrum of the lever arm is preferably a small length of chain attached to the wagon end.

343. MACHINERY FOR SPINNING FIBRES, *E. Tweedale and J. R. Barnes, Accrington, and R. Riley, near Burnley.*—*20th January*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to prevent the ends or threads fouling each other through the "ballooning" of the threads when spinning. To the ring rails or to the end frames standards are attached, and carry a wire stretched parallel with the line of spindles, so that the yarn touching such wire each time the traveller rotates will be caused to collapse.

344. SIZING MACHINES, *E. Tweedale and A. Hitchon, Accrington.*—*20th January*, 1883. 10*d.*

This relates, First, to a friction motion for the unsized yarn beam of machines for sizing yarn; and Secondly, in the markers or apparatus for marking the cuts of the yarn. The friction motion consists of two concave plates, one driven and having studs which impart motion to an internal carrier wheel gearing with internal teeth on the second plate, which thus rotates loosely on its shaft. On the main shaft carrying the plates is a friction pinion gearing with a carrier and being gripped through plates or clutch boxes actuated by levers, weights, screws, or springs. The marker may be driven from the worm shaft by stud and carrier wheel, and on the stud is a pinion change wheel gearing with a large wheel, on whose axis is the general change wheel gearing with a wheel on the axis of the cam operating the hammers, both of which operate on one bowl and are arranged to strike approximately the same line of threads.

345. COMBINATION TOOLS FOR KITCHEN USE, *W. Brierley, Halifax.*—*20th January*, 1883.—(*A communication from P. Frost, Germany.*)—(*Not proceeded with.*) 2*d.*

This relates to a combination tool which may be used for splitting wood, cutting or breaking bones or other material, for mashing or beating meat, and other like uses.

346. PREPARATION OF YARNS EXPRESSLY INTENDED TO BE USED AS WEFT IN THE OPERATION OF WEAVING FABRICS, HAVING WHEN FINISHED A CRIMPED OR CRINKLED SURFACE, *G. Eaton, Manchester.*—*20th January*, 1883. 4*d.*

This consists in applying size, and especially vegetable size made from the gum weed (gracillaria tenax), or other soluble seaweed, to hard or highly-twisted yarns employed as weft in the manufacture of China or Canton crape or other fabric which, when woven and finished, have a crimped or crinkled surface, whereby such yarns are prevented from kinking or snarling during the weaving process.

347. APPLIANCES FOR THE GAME OF CRICKET, *G. G. Bussey, Peckham.*—*20th January*, 1883. 4*d.*

The blade of cricket bats is formed of two or more layers of wood, with or without intermediate layers of leather or canvas, with which the blade may also be faced. The handle is formed by pressing pieces of cane soaked in glue into a mould by hydraulic or other pressure. The handle is glued in a dovetailed recess in the blade, and a hole is bored through the joints and enlarged at the ends, a plug of ebonite being forced into it in a plastic condition. The stumps are inserted in a plate pinned to the ground, and provided with flexible material at top, in which holes are formed to receive the stumps.

348. VOLTAIC BATTERIES, *R. H. Courtenay, London.*—*20th January*, 1883. 2*d.*

In batteries of low tension polarisation is prevented by fixing in a suitable vessel, impervious to moisture, partitions composed of a material not acted on by the battery excitant, in which partitions the elements are placed. The conductors are fixed on the partitions. Should a higher electro-motive force be required a bibulous substance is fixed to the conductors. In strong current batteries three elements are used—one negative, another partly negative, and the third positive. The solution containing the first is thoroughly insulated from that containing the other two.

351. APPARATUS FOR COUPLING AND UNCOUPLING RAILWAY WAGONS, *S. A. Croft and R. Lomax, Manchester.*—*22nd January*, 1883. 6*d.*

The object is to avoid having to get between the wagons in order to couple and uncouple them. Two draw-bars are fixed at both ends of the wagon and equidistant from the centre. The end of one forms a bracket to which the shackle and links are secured, and the end of the other is shaped like a jaw, the bars being fixed so that the bracket for one wagon comes opposite the jaw on the next wagon. The end link has a bridge on the upper side near one end, and it rests in a recess in the bracket when uncoupled, and automatically enters the jaw of the next wagon when the two are brought together, and a pin in the jaw is then caused to pass through the link, being actuated by side levers and rods.

352. FIRE-RESISTING DOORS, &c., *J. M. Hart, London.*—*22nd January*, 1883. 10*d.*

This consists, First, in forming doors with air spaces between the locking or bolting chamber and the fire-resisting portion of the doors or between the outer plates and the fire-resisting portion; Secondly, in applying additional locking bolts or stops acted upon by the operation of the key to prevent an inefficient locking of the door or cover, except when such extra bolts have been acted upon before the key is removed; Thirdly, in applying clamping plates both to the internal and external surface plates of doors near their edges, and in protecting the edges of the doors by overlapping flanges covering the openings between the door and the frame; Fourthly, in protecting the edges of doors suspended to ride on rails, by covering channels or guard plates which prevent the admission of hot air or flame at such parts, and thereby retaining the door in position; Fifthly, in applying to doors hung to rise in opening and tending to close by gravity in shutting, V-shaped or inclined planes for the hollow edge to ride in aided by rollers. The hinge pivot or pin may be formed with male and female threads of an acute pitch to cause the door to fall by its weight acting on the incline plane of the thread.

354. APPARATUS APPLICABLE TO WIRE AND SIMILAR CONNECTIONS FOR WORKING RAILWAY SIGNALS, &c., *W. Robertson and E. P. Holtham, London.*—*22nd January*, 1883.—(*Not proceeded with.*) 2*d.*

The object is to overcome the inconveniences arising from the wire slackening, and it consists in passing the wire over a grooved drum, near the periphery of which a link is pivotted, and its outer end suitably guided. The link carries a roller near the middle which travels in a slot formed in a sliding bar conveying motion to the signal.

355. APPARATUS FOR SOUNDING SIGNALS, *E. F. R. Boehm, Manchester.*—*22nd January*, 1883.—(*A communication from C. W. J. Blancke, Germany.*)—(*Not proceeded with.*) 2*d.*

This relates to an apparatus by which signals are sounded by the action of steam or compressed air, which instead of acting direct on the resonant part, creates a vacuum, and by suction draws the external atmosphere through a resonant instrument, consisting of a tongue which is caused to vibrate.

356. METAL CASES OR CANISTERS FOR HOLDING TEA, &c, *G. L. Cumberland, London.*—*22nd January*, 1883.—(*Not proceeded with.*) 2*d.*

The canisters are made smaller at bottom than at top, so that when the lids are removed they can be placed one inside another, and so occupy less space for transport.

357. DYNAMO OR MAGNETO-ELECTRIC MACHINES, *H. H. Lake, London.*—*22nd January*, 1883.—(*A communication from H. R. Boissier, New York, U.S.*) 6*d.*

This invention relates to improvements in the brushes and their holders, and also to a shunt circuit around the armature. The brush holder is fitted with a spindle having an insulated knob, the turning of which operates an excentric or clamping device, by which the brush is locked in position. The free end of the brush is covered with insulating material. The shunt circuit consists of two resilient conductors provided with means for forcing their contiguous ends apart. These are so connected to the brushes as to form a low resistance shunt to the main circuit, from which, when their ends are in contact, they divert the current.

359. FASTENINGS FOR STAY BUSKS, BOOTS, GLOVES, &c., *F. R. Baker, Birmingham.*—*22nd January*, 1883. 6*d.*

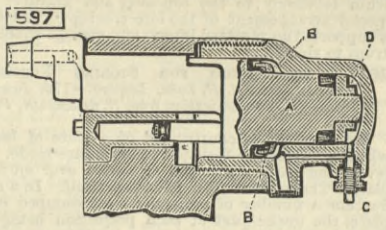
The fastening consists of two pieces of metal, one in the form of a tongue piece with a part stamped out, and raised above the surface to form a spring catch, and the other having its end turned up and the edge turned slightly back again to form a lip. In the turned-up end a slot is cut to receive the tongue piece, the catch on which takes under the lip of the turned-up end. By depressing the spring catch the fastening is undone.

367. REMOVING VEGETABLE IMPURITIES FROM WOOL, &c., *H. J. Haddan, Kensington.*—*23rd January*, 1883.—(*A communication from G. Fernau and Co., Belgium.*) 2*d.*

This consists in coating the metallic parts of card-clothing or carding sheets with magnetic oxide, when they are used to remove vegetable impurities from fibrous materials, whereby they are made harder and protected from rusting.

597. DIRECT-ACTING HYDRAULIC MACHINES FOR RIVETTING, PUNCHING, FORGING, &c., *R. H. Tweddell, Westminster, and J. Platt and J. Fielding, Gloucester.*—*3rd February*, 1883. 6*d.*

This relates to means of varying the power of direct-acting hydraulic machines for rivetting, punching, forging, &c., and consists in providing the hydraulic cylinder with a differential plunger and suitable valves to allow the fluid pressure to act on the smaller area of the plunger or on its annular area, or on both. A is the plunger, and the fluid pressure can act on the annular area B, and when valve C is opened on the circular end area D. By also providing a valve for area B the pressure can be brought to bear on either area or on both. The head of the plunger which carries the



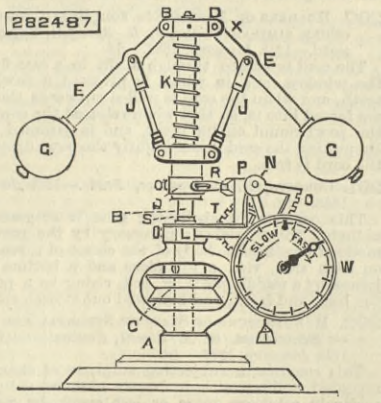
rivetting tool is made excentric and in one piece with the plunger.

SELECTED AMERICAN PATENTS.

From the United States' Patent Office Official Gazette.

282,487. SPEED INDICATOR, *Thos. Blanchard, Stoughton, Mass.*—*Filed March 29th*, 1883.

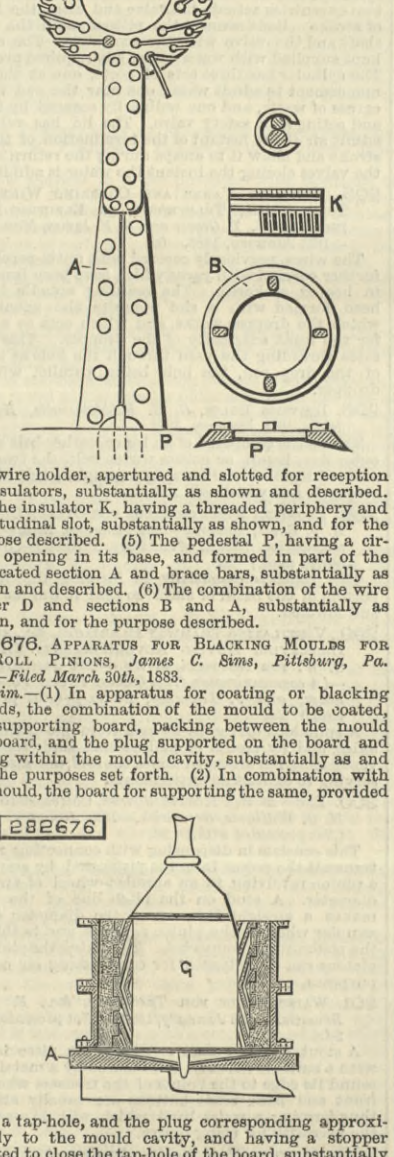
Claim.—(1) In a speed indicator, the bracket L, shaft N, segment O, shaft S, spur wheel T, pinion V, shaft Z, pinion, hand, and dial W, in combination with means for supporting the bracket, and with operative mechanism, substantially as set forth. (2) The improved speed indicator herein described, the



same consisting of the body A, shaft B, whirl C, sleeve H, collet Q, bars J, arms E, balls G, lever R, collet P, shaft N, segment O, pinion, shaft S, wheel T, pinion, shaft Z, weight, cord, dial W, hand, and brackets Y M, constructed, combined, and arranged to operate substantially as set forth.

282,489. TELEGRAPH POLE, *Thomas Breen, Knowlton, Pa.*—*Filed December 16th*, 1882.

Brief.—A pedestal and two upright perforated sections compose the pole and support an apertured and slotted wire holder. The apertures are screw-threaded for the reception of a screw-threaded tubular insulator. *Claim.*—(1) The combination of pedestal P, sections A and B, and wire holder D, substantially as shown, and for the purpose specified. (2) A telegraph pole composed of pedestal P, ribbed section A, and section B, substantially as shown and specified. (3)



The wire holder, apertured and slotted for reception of insulators, substantially as shown and described. (4) The insulator K, having a threaded periphery and longitudinal slot, substantially as shown, and for the purpose described. (5) The pedestal P, having a circular opening in its base, and formed in part of the bifurcated section A and brace bars, substantially as shown and described. (6) The combination of the wire holder D and sections B and A, substantially as shown, and for the purpose described.

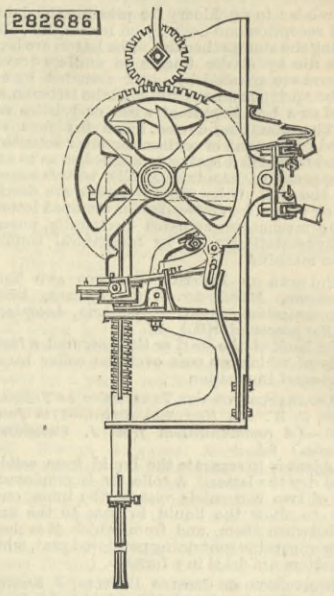
282,676. APPARATUS FOR BLACKING MOULDS FOR ROLL PINIONS, *James C. Sims, Pittsburg, Pa.*—*Filed March 30th*, 1883.

Claim.—(1) In apparatus for coating or blacking moulds, the combination of the mould to be coated, the supporting board, packing between the mould and board, and the plug supported on the board and fitting within the mould cavity, substantially as and for the purposes set forth. (2) In combination with the mould, the board for supporting the same, provided

with a tap-hole, and the plug corresponding approximately to the mould cavity, and having a stopper adapted to close the tap-hole of the board, substantially as and for the purposes set forth. (3) In apparatus for coating or blacking mould, the combination, with the plug G, having the stopper H, of the board A, having the tap-hole E and trough F, substantially as and for the purposes set forth.

282,686. ROCK DRILLING MACHINE, *Thomas Threlfall, San Francisco, Cal.*—*Filed December 7th*, 1881, *renewed June 7th*, 1883.

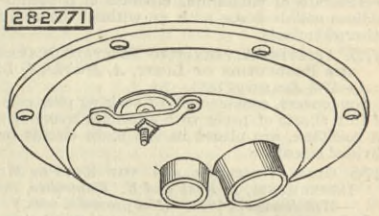
Brief.—The drill is driven by a spring hammer, and retracted and partially revolved by bell-crank levers and suitable connections, the hammer and lever being operated by wiper cams. Before the blow of the

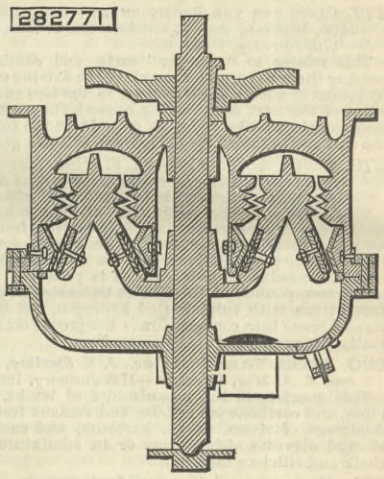


hammer, after the partial revolution, the drill is borne by a spring against the rock. The rotating lever is connected to a swinging pawl-plate, the pawl of which engages with a ratchet wheel concentric with the plate and feathered to the drill stock.

282,771. BARK MILL, *La Flavius Reed, Hornellsville, N.Y.*—*Filed June 15th*, 1883.

Claim.—As an improvement in bark mills, the combination of the receiving bowl, provided with a discharge pipe and a hand hole in the vicinity of said discharge pipe, with a lid or cover for said hand-hole,





and means for holding the same securely in place when the mill is in use, as and for the purpose shown and set forth.

CONTENTS.

THE ENGINEER, September 21st, 1883. PAGE

MESSRS. WITTY AND WYATT, Billiter House, City, have obtained a silver medal for asbestos goods at the Amsterdam Exhibition.