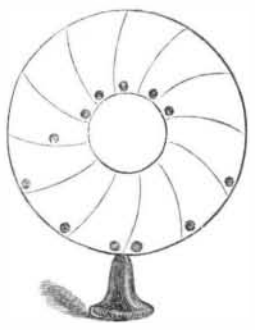
that the principle of motion which is certainly within the wheel, is really a principle of perpetual motion; but at the same time it cannot be denied that I have received very good reasons to think so, which is a strong presumption in favor of the inventor. The landgrave hath made Orfyreus a very handsome present, to be let into the secret of the machine, under an engagement, nevertheless, not to discover, or to make any use of it, before the inventor may procure a sufficient reward for making his discovery public.

I am very sensible, Sir, that it is in England only the arts and sciences are so generally cultivated as to afford any prospect of the inventor's acquiring a reward adequate to this discovery. He requires nothing more than the assurance of having it paid him in case his machine is found to be really a perpetual motion; and as he desires nothing more than this assurance till the construction of the machine be displayed and fairly examined, it cannot be expected he should submit to such examination before such assurance be given him. Now, Sir, as it would conduce to public utility, as well as to the advancement of science, to discover the reality or the fraud of this invention, I conceive the relation of the above circumstances could not fail of being acceptable.

Partington, in his "Manual of Natural Philosophy," endeavors to interpret the somewhat enigmatical specification of the Marquis of Worcester by the following diagram, which it is self-evident almost at a glance can have no movement except that derived from external forces.

Fig. 5.



Making a long jump from the remote to the near, we shall next present an illustration of a perpetual motion machine, invented by Horace Wickham, Jr., of Chicago, Ill., and on which a patent was obtained July 26, 1870. Mr. Wickham will thank us for placing him in such honorable company as the Marquis of Worcester, and our readers will perhaps be glad to see the form and essence of a machine, which Western journals have greatly lauded as most wonderfully ingenious, etc., though if they can see how it generates any motive power, their mental vision will be superior to ours.

A is the bed or table upon which the standards for supporting different parts of the machine are secured. B B are the standards for supporting rocking beam, C. This rocking beam is pivoted at the center to the standards by the ring, D, and set screws. These centers have points like lathe centers. The other parts of the machine consist of a governor, fly wheel, etc.

C is the rocking beam, constructed in two parts and secured together by the bands, E. The rocking beam consists of two tubes; the upper one is made straight, and the lower one in the form of a W. These tubes are connected together at their ends in such a manner as to allow the ball used to pass from the lower tube to the upper one, by means of hinged inclined run-ways, F, and valve, G, and from the upper one to the lower, inside of the band, E", by the opening therein. The inclined run-way, C, is hinged at one end to the upper tube, F', at the bottom of its opening or exit, inside of the band, E', while the other end rests on the valve, C'.

This valve has attached on its under side, a pin which projects down through a hole in the band, E, a sufficient distance, so that, when the pin strikes the standard, H, secured to the bed or table, as the rocking beam oscillates it will raise the valve a short distance above the upper tube. The valve is made to incline toward the opening in the upper tube, so that the ball, when raised on the valve, will roll into the same, by means of the hinged inclined run-way, F. I is a ball, which runs in the upper and lower tubes; this ball is charged with a necessary amount of quicksilver, for giving more weight to the same, and also for giving a much quicker momentum to the ball. This ball is to be used in the rocking beam for the purpose of unbalancing, and also to exert the pressure of its specific gravity on the same at whatever point or position it may be in, and in so doing it assists in oscillating it.

The pitman, J, connects the crank shaft with the oscillating beam. The rocking beam is provided, on the opposite end to which the pitman is attached, with a rod, on which is placed an adjustable weight, which is secured at any desired point by means of a set screw. This weight is for the purpose of counterbalancing the adjustable band provided with a rod to which the pitman is attached, and also the pitman. The governor is for the purpose of regulating the motion of the machine, and is operated through the medium of a gear wheel on the crank shaft, and other suitable gearing. The governor is constructed in the usual manner, excepting in using the cut-off valve, as in steam engines, which is dispensed with, and an automatic break is used and operated by means of the rise and fall of the governor balls. The automatic break consists of an elastic band, one end of which passes up through a hole in the guide rod projecting from the standard that supports the governor, and is connected to an arm projecting toward and partly around the upright shaft of the governor.

The tension of the band is regulated by nuts and screw-thread on the end of the band. The other end of the band passes under a wheel on the shaft, K, and is secured to a projecting arm on the standard that supports the governor. The crank shaft is counterbalanced.

I do not wish to confine myself to the precise construction of the rocking beam, as shown and described, as I intend using, in lieu thereof, wires, or rods, arranged in the form and shape of the rocking beam described, with mounted weights arranged to roll on them, which, in connection with the other parts of the machine, will accomplish the same result.

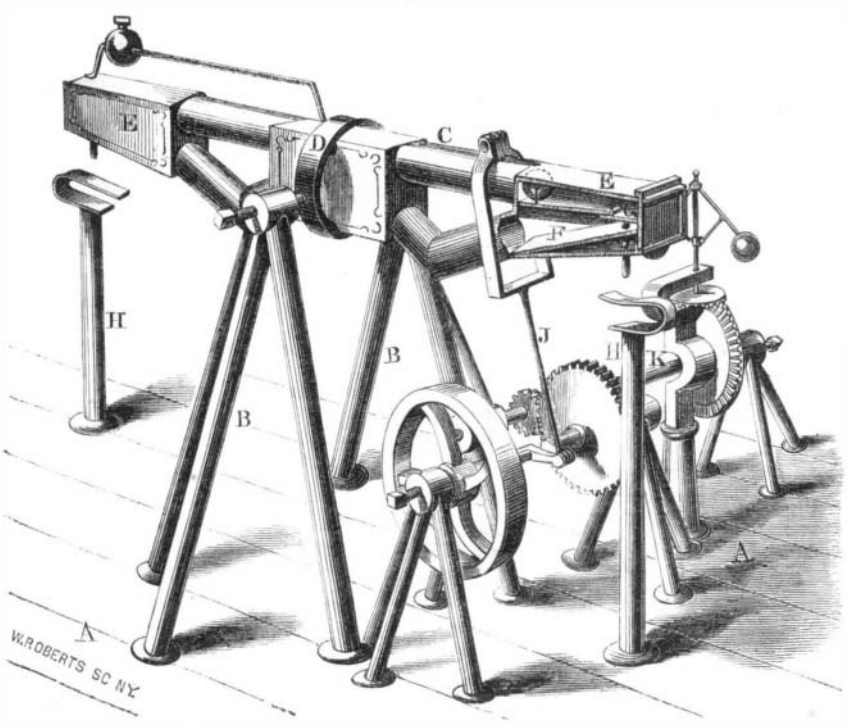
The lower tube can be made semicircular in form and shape instead of the form and shape of a W. Any number of rocking beams may be used, and more than one ball can be used in the rocking beam, by having inclined run-ways and valves on each end of said beam; the rocking beam so arranged that the balls drop from one tube to the other at the center of the of the beam, and rolling alternately from the center to the ends of the beam.

The rocking beam is oscillated by any power operating alternately on each end of the same, and which transmits motion to the other parts of the machine through the medium of the pitman and crank shaft, and for applying power to any other machine a pitman is secured on the opposite side of the rocking beam to which the pitman, J, is attached, or, instead thereof, pulleys, and endless belts on the shaft, K, or the crank shaft.

The spokes of the fly wheel are charged with quicksilver, for the purpose of giving weight to the same at any desired point, as it passes from the center to the circumference of the wheel.

It is claimed that this machine has run seven months without stopping, independent of any external force, which we do not believe, and we think our readers, after reading the above description of it, abstracted from the specification on file in the Patent Office, will concur with us in our belief.

Fig. 6.

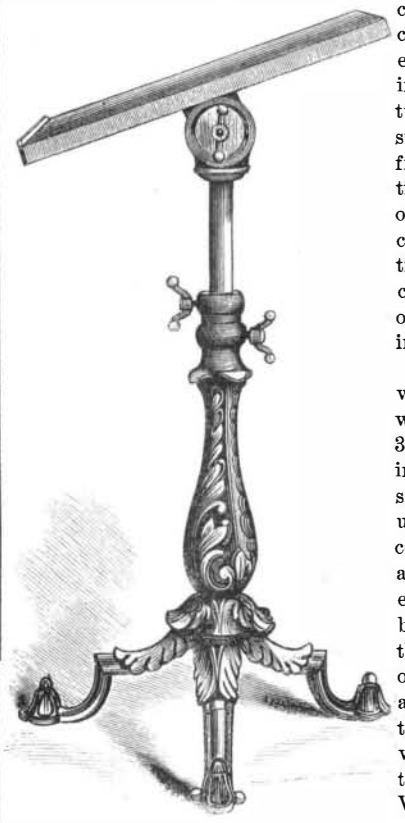


Wire Rope Bridges.

At a recent meeting of the Institution of Mechanical Engineers, held at Birmingham, a paper was read entitled "Description of a Wire-Rope Bridge, at Landore Steel Works, for conveying Materials across a Navigable Stream," by Mr. William Hackney, of Swansea, England. This bridge has been erected as an inexpensive means of removing the spoil from excavations made in carrying out an extension of the Landore Siemens Steel Works, near Swansea, and depositing it on the low marshy ground at the other side of a navigable stream, which runs by the side of the works; and it was a necessary condition that any structure thrown across the stream should be arranged so as not to interfere with the passage of vessels. The bridge is constructed of a pair of steel wire ropes, stretched alongside each other across the stream, and sloping downwards from the higher bank on which the works are situated, to the lower ground on the opposite side, where the spoil is deposited. On each rope travels a runner, or small carriage mounted on a pair of grooved wheels, from which the trucks are suspended by chains; and the two runners are connected together by an endless wire cord passing round a pulley on each bank, so that the loaded truck running down from the higher bank on one of the ropes draws up an empty truck from the lower bank on the other rope, the inclination of the ropes being sufficient for this purpose; the speed is regulated, if necessary, by a brake upon the cord pulley. The ropes are strained over abutments on either bank, and attached by chains to anchorages in the ground; and in order to admit of the passage of vessels in the stream, the abutment on the upper bank is constructed of a timber framing mounted on wheels, which can be run forwards through a sufficient distance to allow of the wire ropes being lowered to the bottom of the bed of the stream, so that the whole bridge is then completely out of the way of passing vessels. For raising the bridge again, the movable abutment is drawn backwards by a hand-winch, until the ropes are hauled up nearly tight; the hauling chains are then hooked to the anchorages by screw couplings, by which the ropes are finally tightened up, and the hand-winch is thus relieved from all strain during the working of the bridge. In this way the bridge is raised into its working position in the course of a few minutes by a couple of men at the upper end. Owing to the curve in which the wire ropes hang, their inclination is steepest close to the upper bank, thus retarding the speed of both trucks as they approach the landings on either bank, and serving generally to stop them without the use of the brake. This bridge has now been in constant use for several months, and has proved very satisfactory for the special purpose for which it was designed.

Adjustable Stand for Draftsmen.

We herewith illustrate a stand which meets a want long felt by draftsmen and artisans. It consists of a table which can be readily and conveniently adjusted to any hight and inclination, easily turned to bring either side of the work in front, and, at the same time, be substantial, ornamental, and cheap: It is made entirely of iron, except the top, which is of wood, 20 by 22 inches.



The stand complete weighs 55 lbs., and will support a board 3 by 4 feet without inconvenience. The spindle which slides up and down in the column can be raised and lowered with ease, and held firmly by the set-screw on the right. The screw on the left immediately above passes through the collar which turns on the top of the column. When this screw is set up, and the others turned back, the top of the stand can be easily turned as the convenience of the workman requires. By means of the hand nut immediately under the board, the work is set at any inclination. It is but a minute's work to adjust it for standing or sitting, which is very desirable for the comfort of artists. It is mounted on casters, and its tasteful appearance makes it equally desirable in the office, counting-room, library, or sitting room.

Manufactured only at the Washburn Machine Shop connected with the Free Institute of Industrial Science, Worcester, Mass. Address, for further information, M. P. Higgins, superintendent.

Repairing the French Atlantic Cable.

The steamship *Robert Lowe*, belonging to the Anglo-American and French-Atlantic Telegraph Companies, returned to the Thames a short time since, after repairing the American section of the French-Atlantic cable. This work was not done by Captain Blacklock without experiencing several difficulties. The exact position of the cable was not accurately marked on the chart, because the faulty portion had been laid in a thick fog. After dragging for it for some time, it was however hooked, and found to be in good electrical condition to St. Pierre; the fault was shown by the electrical tests to be twenty-five miles off, in the direction of Duxbury Beach. The St. Pierre end was buoyed, and then Captain Blacklock proceeded to wind in the cable with the picking-up machinery. After about twenty miles had been brought on board, a ship's anchor came up attached to the cable, and to free it from the anchor the cable had to be cut.

The picking-up was then proceeded with, and at last the fault was reached. At the faulty part the cable had been wilfully damaged and hacked, probably by some captain who had hooked it with his anchor, and had damaged it in freeing his ship. At the time the fault was reached, the barometer fell, and it was plain that a storm was at hand. The end of the cable was therefore buoyed, and soon the storm was felt in all its force. One of the boats was swept away, and the men on the deck were frequently up to their waists in water. It was some days before the weather moderated sufficiently to permit the cable repairing operations to be resumed. The buoy could not be seen, but the cable was grappled once more, the splice made, the cable on board paid out, and the St. Pierre section reached. Then another splice was made, and the loop of the repaired cable dropped overboard.

Capt. Rowett, at the late meeting of the British Association, read a paper on Ocean Telegraph Cables, the object of which was to show the superiority of hemp over metallic cables. He contended that hemp cables were much lighter, and extremely enduring when submerged, and iron cables were quickly corroded by the action of the sea water. Various specimens of submerged cable were exhibited by the author, in support of his views.

Improvement in Bridle Bits.

This invention consists in making the cheek pieces by which the bit is hung to the cheek straps, independent of the bit, to a certain extent, so that the latter may be rotated in the horse's mouth to bring the curb chain to bear upon the jaw without moving the cheek pieces. Also in placing small metal rollers on the bit, to prevent the horse from seizing the bit in his teeth.

A in the engraving represents the bit, and B the small metal rollers. The side pieces, C, have square holes in them by which they are fastened upon the ends of the bit. The extremities of the bit outside the square shoulders, are cylindrical, and upon these cylindrical portions are loosely placed the lower ends of the cheek pieces, D, where they are retained by nuts, spaces wider than the cheek pieces being left between the nuts and side pieces by means of which the bit and side pieces are allowed to freely rotate.

The spaces are partially closed by flanges projecting from the side pieces and inclosing the lower ends of the cheek pieces, with the exception of a recess in which the side pieces rotate. This arrangement enables the rider to tighten the curb, without interfering with the cheek pieces

The bit is more particularly designed for cavalry use, and is the invention of Col. Thomas B. Hunt, Quartermasters' Department, Austin, Texas.

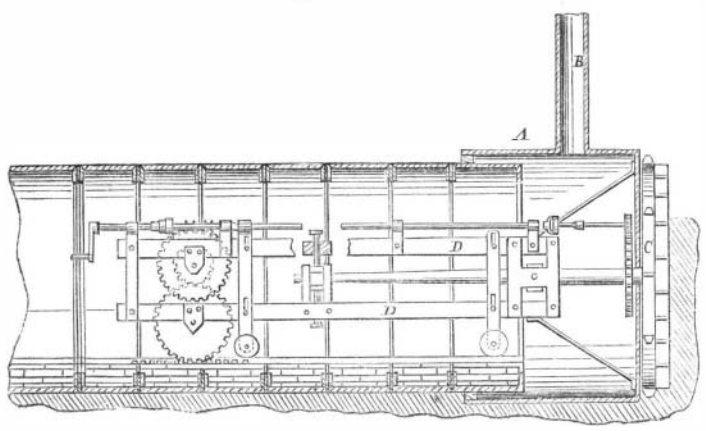
Patented in France through the Office of the Scientific American.

Important Patent Decision.

In the United States Circuit Court, Judge Blatchford has granted an injunction in the important suit of Isaac P. Frank against Charles F. Jacobson and Charles E. Mabie (known as the United States Refractor Company), in which great interests are involved, restraining the defendants from infringing on the plaintiff's patent for glass-lined reflectors, such as are used for lighting stores, churches, theaters, and public buildings generally.

TUNNEL EXCAVATOR.

Our engraving illustrates an appliance for excavating tunnels, patented by Theodore A. Fisher and Anson F. Fisher, of Beardstown, Ill. It consists of a sliding coffer, A, provided with an excavating disk, C, supported by a car, D, arranged on a suitable way in a cast-iron tube. By means of suitable gear the excavating disk is kept advanced to its work. Those familiar with the excavation of the tunnels by the use of coffers, will need no further description to understand the general principle of the device, which is designed to lay submarine tunnels, the cast-iron tubing to be laid in sections as the work proceeds. Air is supplied to the coffer through the tube, B.



Manufacture of Champagne.

As the greater part of the champagne country has been overrun by the German army and the exportation of genuine wine can hardly take place for sometime to come, the artificial production of this beverage is likely to receive a new impulse. For those who prefer to manufacture their own champagne we append a number of approved recipes:

8 Parts of the best West India sugar are to be dissolved in 4 quarts of distilled water, and boiled, and while still hot, 2 quarts of rectified spirits added. This affords what is called champagne liquor to serve as stock in the manufacture.

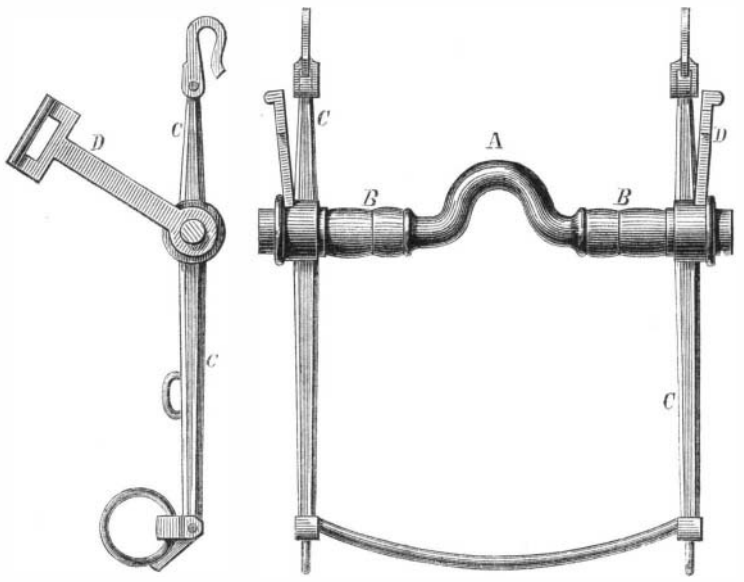
To prepare the Roedern brand with green seal and bronze cap, take one portion of the above liquor, 1 anker white wine, 1 bottle cognac, and 4 drops of the oil of wine beer dissolved in cognac.

For Heidsick, 1 portion liquor, 1 anker white wine, and ½ quart cognac.

Other varieties are prepared in a similar way, the chief difficulty being to provide the proper bottle, sealing-wax, and labels. In default of white wine, cider is found to answer every purpose, and glycerin can be substituted for sugar.

Plaster Casts of Natural History Objects.

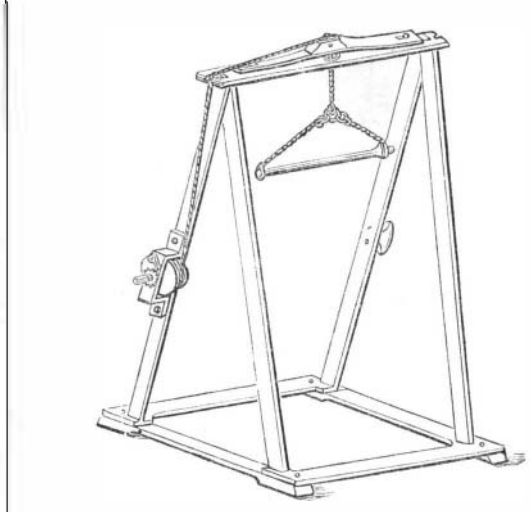
At a recent meeting of the Manchester Philosophical Society, Mr. Boyd Dawkins, F. R. S., exhibited a number of casts in plaster of Paris, of various objects of natural history, and explained the process by which any one can make them for himself. The material of the mold is artists' modeling wax, which is a composition akin to that which is used by dentists. And as it becomes soft and plastic by the application of heat, though in a cold state it is perfectly rigid, it may be applied to the most delicate object without injury. As it takes the most minute markings and striations of the original to which it is applied, the microscopic structure of the surface of the original is faithfully reproduced in the cast. The method is briefly this: 1. Cover the object to be cast with a thin powder of steatite, or French chalk, which prevents the adhesion of the wax. 2. After the wax has become soft, either from immersion in warm water or from exposure to the direct heat of the fire, apply it to the original, being careful to press it into the little cavities. Then carefully cut off the edges of the wax all round, if the under cutting of the object necessitates the mold being in two or more pieces, and let the wax cool with the object in it, until it be sufficiently hard to bear the repetition of the operation on the uncovered portion of the object. The steatite prevents the one piece of the mold sticking to the other. The original ought to be taken out of the mold before the latter becomes perfectly cold and rigid, as in that case it is very difficult to extract. 3. Then pour in plaster of Paris, after having wetted the molds to prevent bubbles of air lurking in the small interstices, and if the molds be in two pieces it is generally convenient to fill them with plaster separately before putting them together. 4. Then dry the plaster casts, either wholly or partially. 5. Paint the casts in water colors, which must be fainter than those of the original, because the next process adds to their intensity. The delicate shades of color in the original will be marked in the cast by the different quantity of the same color which is taken up by the different textures of the cast. 6. After drying the cast, steep it in hard paraffine. The ordinary paraffine candles, which can be obtained from any grocer, will serve the purpose. 7. Cool and polish the cast by hand, with steatite. The result of this process is far better than that obtained by any other. The whole operation is very simple, and promises to afford a means of comparison of natural historys pecimens in different countries, which has long been felt to be a scientific need. Casts of type specimens may be multiplied to any extent, at a small cost of time and money, and are as good as the original for purposes of comparison, and almost as hard as any fossil. Mr. Dawkins has employed it for copying flint implements, fossils, and bones and teeth, which can scarcely be distinguished from the originals.



HUNT'S BRIDLE BIT.

EXERCISING APPARATUS.

A portable apparatus for gymnasiums and private use, and which combines the horizontal bar with the swing, is shown in the accompanying engraving. It is the invention of Geo. W. S. Hall, of Baltimore, Md. On the upright of the frame is a device for taking up or letting out the rope, which latter passes over a pulley hung in the middle of a spring, and descends to support the bar, as shown in the engraving. The whole can be taken in pieces for transportation, and easily set up for use when wanted. The utility of apparatus of this kind to those leading sedentary lives, has not been hitherto properly appreciated by the American public, but we are glad to say that the disorders which our general lack of proper muscular exercise has entailed upon a large class of our population are gradually teaching us its value.



SIEMENS' PYROMETER.

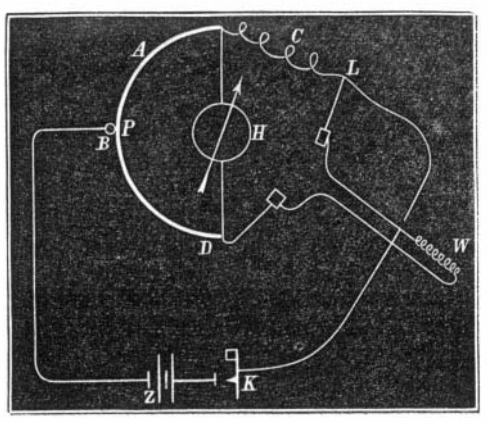
[Condensed from The Mechanics' Magazine.]

This instrument can be used to indicate high temperatures, such as those met with in blast furnaces; it can also be used to measure moderate temperatures, but its chief feature is that the indicating part of the apparatus may be several yards, or miles even, away from the place of which the temperature has to be ascertained. Hence it was used by Dr. Carpenter to learn the temperature of the deeper portions of the Atlantic, and it enables ironmasters and colliery proprietors to see in the office of the works the temperature of their pits or furnaces which are at a distance from the place of observation.

The principle of the instrument is simple. When a plati-num or iron wire rises in temperature it offers more resistance than before to the passage of a current of electricity. Hence the variations in the conductivity of the wire serve to indicate the variations in temperature, which variations may be read off by means of suitable galvanometric appliances.

The apparatus for indicating high temperatures, such as those of furnaces, consists in a coil of fine platinum wire wound round a cylindrical clay pipe, which pipe is about 3in. long by ½in. in diameter. The wire lies in a spiral groove made upon the surface of the clay cylinder; this grooving prevents the convolutions of the platinum wire from touching each other, in consequence of which the electrical current must pass along the whole length of the wire, or about three yards. The exact length through which it must pass is regulated by a small platinum adjusting clamp, the position of which may be shifted. In this way all the instruments made by Mr. Siemens are adjusted to give the same indications. The ends of the fine wire which measures the temperature are connected with two thick platinum wires, each about 18in. long; as the further ends of these thick wires are at a tolerable distance from the source of heat when the instrument is in use, they in their turn are connected with thick copper conducting wires. All these wires are protected by clay pipes. The whole of this arrangement is placed in a protecting tube of iron about 4ft. long. The platinum spiral pyrometer is then in the closed end of the tube; the other end of the tube has a wooden cap on which two brass terminal screws are fixed, and these screws are connected with the conducting wires to and from the spiral.

When temperatures above the melting point of iron have to be measured, the end of the tube which is subjected to the heat must be made of platinum. In some instances, where moderate furnace temperatures have to be measured, the end of the tube may be made of copper. The metal is very thick at a point some few inches nearer the cold end of the pipe than the platinum spiral, in order that the cooler part of the outer pipe may not draw off the heat by conduction too rapidly, and thus affect the reliability of the indications. The short clay cylinder carrying the platinum spiral has a projection at each end, which prevents any part of the spiral touching the sides of the iron pipe, and thus interfering with the accuracy of the indications by increasing the electrical conductivity of the whole arrangement.



When the end of the great metallic pipe is pushed into a furnace, the temperature of the platinum spiral rises and its electrical conductivity consequently decreases; the decrease in conductivity is measured by electrical appliances, and thus the temperature of the furnace is read off.

Conducting wires are connected with the terminal screws at the cold end of the iron pipe, and thus the hot spiral becomes a part of the electrical circuit. The change in the electrical resistance is then measured by apparatus, the principle of which may be explained by the aid of the accompanying diagram.

The current goes from the zinc pole of the battery, Z, to the movable contact wheel, B, which wheel may be moved to any part of the arc, A D, which is a very fine platinum wire fixed round the edge of a disk of ebonite. When the little wheel is in the position shown in the diagram, the current enters the platinum wire at P, and splits into two parts, one portion of the current going to A, and the other to D. Midway between A and D, the galvanometer, H, is fixed. From the two ends of the platinum wire, A D, the current passes on one side into the constant resistance, C, and at the same time into the galvanometer; on the other side it passes to the other terminal of the same galvanometer, and at the same