PROFESSOR EDISON'S NEW CARBON RHEOSTAT.

In quadruplex telegraphy it is vital to the working of the system to perfectly balance the electrical current.

The common method of doing this is to employ a rheostat containing a great length of resistance wire, more or less of which may be thrown into or cut out of the electrical circuit by inserting or withdrawing plugs or keys. This operation often requires thirty minutes or more of time that is or might be very valuable.

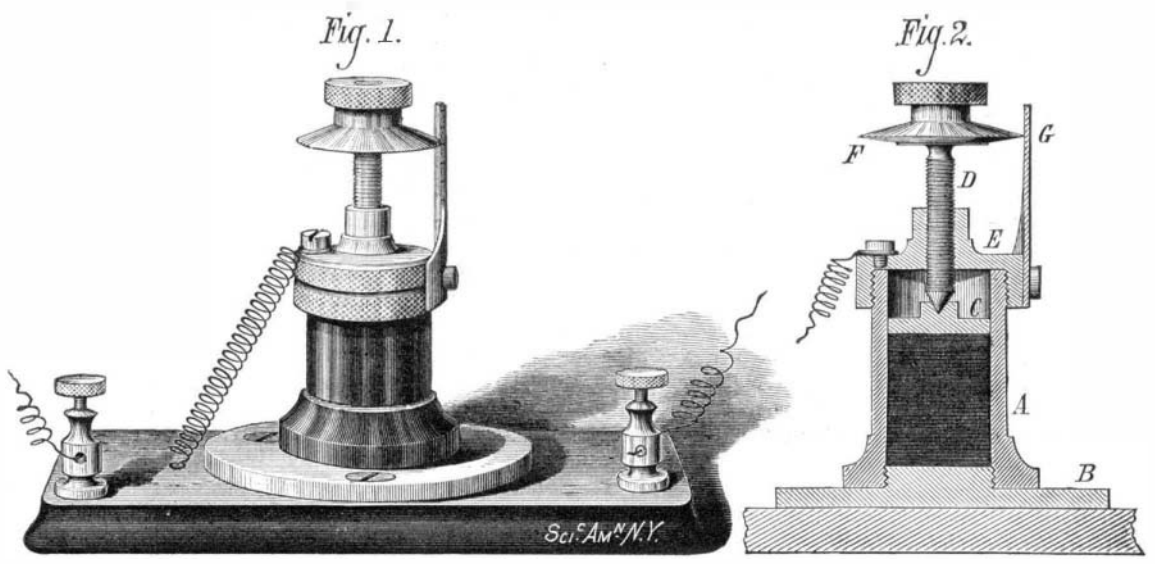
To remedy this difficulty Mr. Edison has devised the instrument represented in the engraving, Fig. 1 being a perspective view and Fig. 2 a vertical section.

A hollow vulcanite cylinder, A, is screwed on a boss on the brass plate, B. Fifty disks—cut from a piece of silk that has been saturated with sizing and well filled with fine plumbago and dried—are placed upon the boss of the plate, B, and are surmounted by a plate, C, having a central conical cavity in its upper surface. A pointed screw, D, passes through the cap, E, at the top of the cylinder, A, and projects into the conical cavity in the plate, C. The screw is provided with a disk, F, having a knife edge periphery which extends to the scale, G, and serves as an index to show the degree of compression to which the silk disks are subjected.

The instrument is placed in the circuit by connecting the cap, E, with one end of the battery wire and the plate, B, with the other end.

The principle of the instrument is identical with that of Mr. Edison's carbon telephone. The compression of the series of disks increases conductivity; a diminution of pressure increases the resistance. Any degree of resistance within the scope of the instrument may be had by turning the screw one way or the other.

In this instrument the resistance may be varied from 400 to 6,000 ohms, and any amount of resistance may be had by increasing the number of silk disks.

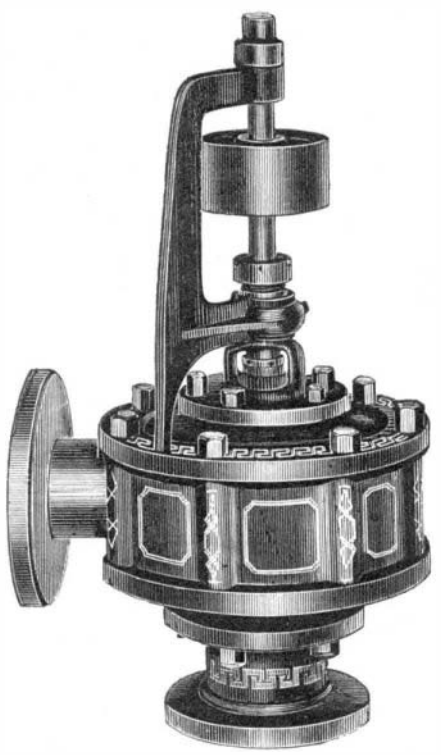


PROFESSOR EDISON'S NEW CARBON RHEOSTAT.

THE CHASE ELEMENTAL GOVERNOR.

The Chase governor is constructed on the following principles: First, to inclose the centrifugal mechanism in the same chamber with the governor valve; and, second, to locate the centrifugal force in the valve or valves themselves. The first is claimed to obviate friction of steam packing, and unbalanced pressure; for, since the centrifugal mechanism is itself immersed in the steam, there is no need of a steam-tight connection between it and the valve, and for the same reason there can be no unbalanced pressure. The avoidance of lost motion is accomplished in a manner claimed to be equally effectual. The governor valves, two in number, are themselves made to revolve about an axis in such a manner that the centrifugal force acts on them directly without the intervention of any supplementary parts whatever; they are, in fact, centrifugal valves. A spiral spring is employed as the complement of the centrifugal force, to open the valves when the speed slackens, and this spring is attached directly to the valves, stretching from one to the other across the axis of revolution.

In the annexed engravings, Fig. 1 is a vertical longitudinal section, and Fig. 2 is an end view of the interior parts, the cover of the case being removed to show the same. The governing mechanism consists of the hollow revolving flier, B, with its two pairs of flat hollow arms, C C C C, the two valves, D D, and the spring, E. The hollow arms, C, have ports, O O O O, near their outer ends, opening inward toward each other, and the two valves, D D, are flat blocks of metal, one being fitted between each pair of arms, so that by moving out and in they cover and uncover the ports. The steam, as shown by the arrows, enters the flier, B, through a pipe screwed into the case, thence passing through the hollow arms, C, and ports, O, into the interior of the case, A; from thence it passes out through the base flange to the engine. A ring on the open end of the flier, B, bears against a shoulder in the case, forming a metallic packing, which prevents steam passing to the engine, except through the governing mechanism.



THE CHASE ELEMENTAL GOVERNOR.

The valves, D D, as seen in Fig. 2, are pivoted and supported at F F, so as to move in arcs of circles. The spiral spring, E, Fig. 2, is attached to the valves, D D. The flier and valves are driven by the shaft, S. When the speed is too fast the valves, D D, fly out by centrifugal force and cover the ports, O, and when it is too slow, the spring draws the valves together so as to uncover the ports.

The upper valve, Fig. 2, has a slotted arm projecting downward from the pivot, F, and the lower valve has a similar arm projecting upward with a fork at right angles with the former, and furnished with a square swiveled block which plays in the slot of the upper valve, the object being to cause the two valves to move together. An equalizer of this kind is necessary to counteract the alternating action of gravity on the valves in their upper and lower positions.

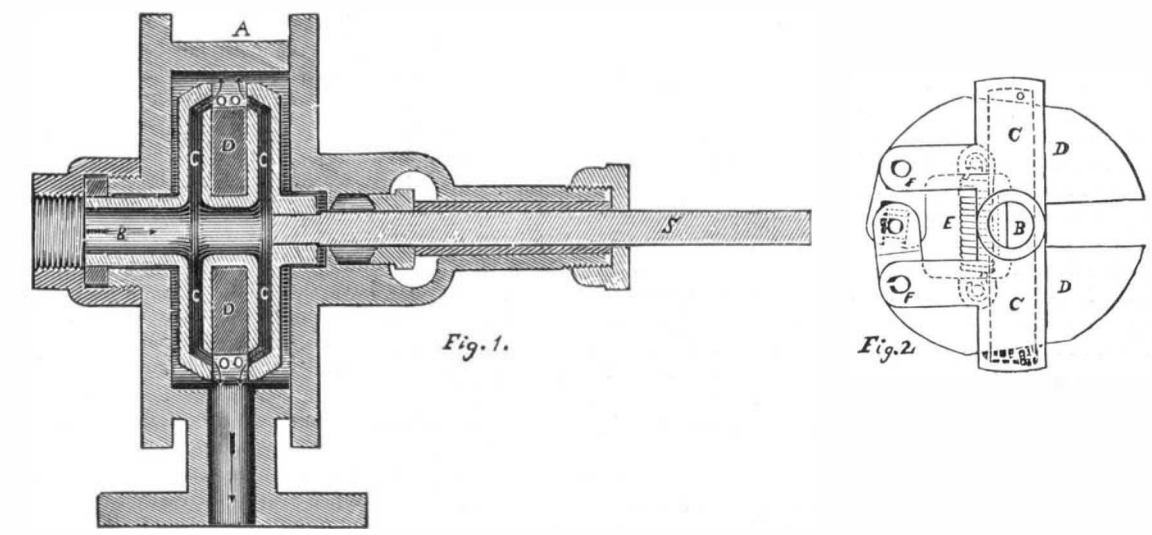
It is claimed that the two valves, being entirely guided and supported by the pivots, and suspended between two vertical valve seats, so that their weight does not bear upon the same, and with no attachments whatever, are as nearly frictionless as possible; and that as the spring is attached to the valves themselves, there can be no lost motion, whether the governor is new or old. The valves will act through minute distances with accuracy, which is the chief requisite of a good governor. The flier, with its hollow arms, lugs for pivots, etc., is cast in one piece, with nothing to unscrew or get loose. The interior parts are readily accessible by removing the cover of the case.

The working edges of the ports and valves are faced with composition to resist steam cut. The pivots have long bearings and very slight motion, and all parts are amply strong and heavy. The shaft is steel, and is supported by a long bearing on each side of the pulley.

We are informed that these machines have been in use for the past three years, having been applied to reversing elevator engines and in other situations, the most difficult that could be found, and have proved themselves capable of enduring the severest tests. The manufacturers believe them particularly adapted for marine engines, on account of their compact form, sensitiveness, and the fact that they cannot be affected by the motion of the vessel. They are also suitable for all portable and traction engines, as the position of the engine does not at all impair the efficiency of the governor.

Small sizes, down to three eighths inch, are made, as it is further claimed that the peculiar construction permits the very smallest size to work with the same accuracy as those of the larger sizes.

For further information address Chase Machine Company, 36 Charlestown street, Boston, Mass.



THE CHASE ELEMENTAL GOVERNOR.

Chinese Wine Powder.

A recent number of the *Journal Officiel* describes an extremely curious method of wine manufacture employed by those odd people, the Chinese, who make a powder or cake of what might be called the concentrated extract of wine. A little of this powder, or a pellet of the cake, dissolved in a glass of water, makes a beverage that is consumed in large quantities in China; and a beverage which, it is said, resembles more or less, as to flavor, the different sorts of wines or spirits. This drink is rather an alcohol than a wine, properly so called; and the powder of which it is composed is obtained by the pulverization either of oats or of barley or rye, or, indeed, of the three grains united (with or without the addition of aromatic or medicinal herbs), after having undergone a certain degree of fermentation.

The flour, or powder, thus obtained, is known in China under the name of *kin-tsee*, and when properly prepared it may be preserved for two or three years. Certain manufacturers in the Celestial Empire have a great reputation for the excellent quality of the *kin-tsee* that they produce, and many different processes are in use for the preparation of the powder, and for improving its flavor. Rice, very carefully cleaned, is also used for making different varieties of wines, and has this particular property, that although in certain methods of manufacture much water is used, its evaporation in this case becomes perfect, and the powder is sold in a state of complete dryness.

Amber Varnish.

Mr. S. Meredith says that the varnish he produces is capable of giving a very superior polish or surface, and is especially valuable for coach and other high-class work. In carrying out his process he first bleaches the amber by placing a quantity—about, say, 7 lbs.—of yellow amber in a suitable receptacle, such as an earthen crucible, of sufficient strength, adding 14 lbs. of sal gemmæ (rock or fossil salt), and then pouring in as much spring water as will dissolve the sal gemmæ. When the latter is dissolved more water is added, and the crucible is stood over a fire until the color of the amber is changed to a perfect white. The bleached amber is then placed in an iron pot and heated over a common fire until it is completely dissolved, after which the melting pot is removed from the fire, and when sufficiently cool the amber is removed from the pot and immersed in spring water to eliminate the sal gemmæ, after which the amber is put back into the pot, and is again heated over the fire until the amber is dissolved. When the operation is finished, the amber is removed from the pot and spread out upon a clean marble slab to dry, until all the water has evaporated, and is afterward exposed to a gentle heat to entirely deprive it of humidity.

To make a varnish, white amber prepared as above described is reduced to powder in a mortar, or otherwise, and

is melted over a fire in a clean iron pot, and as much fine nut oil as will make it into a varnish is then added, after which the whole is well stirred until thoroughly mixed. The pot is then removed from the fire, and when the heat has sufficiently moderated, essence of turpentine is added to form a composition of the proper consistence for use. The following proportions answer well: White amber, 1 lb.; fine nut oil, 1 lb.; essence of turpentine, 2 lbs.

The Alkaloids of Opium.

Dr. Isaac Ott, who has been engaged in studying the effects of the various alkaloids of opium, which now number sixteen, publishes the results of his labors in the *Journal of Nervous and Mental Diseases*. Adding what was formerly known as to the action of these alkaloids to the information derived from a large number of experiments made by him, the author has been enabled to deduce the following conclusions:

1. *Cryptopia* is narcotic. It first excites, then depresses reflex action by its effect on the spinal cord; reduces the power of the motor nerves; abolishes sensation by its action on the spinal sensory ganglia, and lowers the heart beat by action on its muscular structure.

2. *Thebaina* is a spinal convulsivant, having no action on motor or sensory nerves or striated muscle. It reduces the heart beat by an action on that organ, and increases the pressure of blood by stimulating the cerebral vaso-motor centers.

3. *Codeia* is a spinal convulsivant and narcotic, producing a veratroid contraction of striated muscle, and depressing the heart beat by action on the cardiac muscle.

4. *Chlorocodeia* is a tetanic agent.

5. *Apocodeia* produces vomiting, coma, and death.

6. *Narceina* to cold-blooded animals acts as a soporific; to man it is a spinal convulsivant. It does not destroy the motor nerves; it produces veratroid contraction of the muscles and reduces the heart beat by stimulating the peripheral end of the pneumo-gastric.

7. *Papaverina* is narcotic and convulsivant; it diminishes the heart's contractions by peripheral action on the cardio-inhibitory apparatus; it also causes veratroid contraction of the muscles.

8. *Narcotina* is non-narcotic and a spinal convulsivant, producing veratroid contraction of striated muscle, and being an active agent in decreasing the heart beats by its action on the cardiac muscle.

9. *Cotarnina* is soporific, and, like curare, paralyzes the motor nerves.

10. *Hydrocotarnina* is a narcotic and convulsivant.

11. *Hydrochlorate of Cotarninic Acid* is a convulsivant and paralyzes the pneumo-gastric.

12. *Laudanosina* and *laudanina* are tetanic agents.

13. *Morphia* is a narcotic and spinal convulsivant; it produces veratroid contraction of muscle and reduces heart beat.

14. *Oxymorphia* acts like morphia, but is weaker.

15. *Apomorphia* is an emetic; it excites and reduces spinal reflex excitability, and diminishes the frequency of cardiac contractions.

16. *Meconin* to cold-blooded animals is a narcotic, but not to man in doses of two grains; it produces hyperæsthesia and paralysis of voluntary motion with general relaxation, and also a veratroid contraction.

The effect of any one of the opium alkaloids differs from the rest, or from that of opium itself; they all possess a dominant action on the nervous system, causing first increased exaggerated functions, and finally paralysis of them, if the dose be sufficiently large. This action, on warm-blooded animals, takes place both on the spinal cord and cerebrum.

Microscopy.

A New Improvement in the Microscope is reported from Germany. Herr I. Von Lenhossek has constructed an apparatus which permits no less than sixty microscopical preparations being observed in immediate succession, without the trouble of changing slides and readjustment of the object glass. Its construction is similar in principle to that of the well known revolving stereoscopes, and the inventor has given the new apparatus the name of "polymicroscope."

Remarkable Section Cutting.—At a conversazione following a regular meeting of the Quekett Microscopical Club, of London, in April, Mr. E. T. Newton exhibited thirty-three sections of the head of one cockroach (*Blatta Americana*)!

Modes of Reproduction in the Diatomaceæ.—In an instructive article in *Science Gossip*, entitled "What a Diatom is," by M. Deby, the author says: "We believe that other modes of reproduction exist in the *diatomaceæ* besides that of conjugation, but the biology of these little beings is much too imperfect to enable us to hazard any profound hypothesis on this subject. It is evident that all the frustules do not finish by conjugating; this is highly improbable when we consider the rarity of that phenomenon. Some other explanation is necessary to account for the variations in the dimensions we meet with in the different individuals of the same series other than that of reduplication, as without it those frustules that escape conjugation would go on diminishing in size indefinitely, and we know from observation that every species of diatom possesses a maximum and minimum of dimension which it never passes. The rapid appearance of species where they did not previously exist, their periodic succession at determined seasons, and which we have never been able to find in the intervals in the same locality—this presents the possibility of a mode of generation which is only yet suspected, by germs, by micro- or macro-zoospores, possibly even in the first case with the formation of zygozoospores, as it takes place among many of the inferior algæ which live under the same conditions as the diatoms.

"Here we enter a field of study of the greatest interest and novelty to every naturalist furnished with a good microscope, and possessing time and patience for such researches; and we dare affirm that any member of a microscopical society who shall follow with care the entire life cycle of a single species of diatom (even the commonest) will *probably render a greater service to science than if he had described and figured hundreds of frustules from the four quarters of the globe.*"

We have italicized the last sentence because we like its good, practical common sense. The statement applies not only to diatoms, but to every branch of natural history.

How to view Rotifers.—A correspondent of *Nature* gives the following advice, as the result of his practical experience, in regard to the study of those lively little animalcules—the rotifers. With ordinary *compressoria* and "live boxes," these quick-moving animals are troublesome to see. The following is therefore recommended:

Take a plane glass slide; on it drop one or more of the rotifers in a drop of water about half an inch in diameter, and draw off the surplus water, if any, carefully with the empty pipette. Then fray out a very, very small portion of cotton wool until it is much extended, and spread out and lay this on the drop. Upon that lay the thin microscopic glass (the thinner the better), and then set up the capillary attraction by gently touching it with a needle. Draw off any superfluous water from the edges with the pocket handkerchief, and you will have a little wilderness of wool in which the rotifer is restrained in its movements, protected from pressure, and within reach of very high powers. The amount of wool depends on the size of the rotifer. *Hydatina* requires more depth than *rhinops*. The same plan answers equally well for all roving animals. The *poduridæ* in particular when placed in deep glass cells are easily seen by this apparatus, and it saves many a weary and vexatious five minutes with the *compressorium*, which even at the best requires with living animals extraordinary patience. The rotifers are easily found and secured with the pipette after a very little practice.

Wet Method of Preparing Objects for Mounting.—Mr. Stokes, in an article on this subject in *Science Gossip*, proposes a method by which the ever-recurring air bubble may be gotten rid of. The only piece of apparatus required is a single test tube. Into this the sections or parts of animals and plants are placed, and the tube half filled with distilled water made acid with a few drops of nitric acid. The use of the latter is not a necessity, but quickens the process.

The liquid is now heated almost to the boiling point for some 5 to 15 minutes. The acidulated water is then poured off, and the tube filled with hot distilled water and gently shaken once or twice. The water is now carefully poured off and replaced by methylated spirit; this is heated almost to the boiling point for about 5 minutes. It is then poured off, the tube about a quarter filled with ether, and the contents heated gently by immersing the end of the tube in a cup of hot water for half a minute. Ether, being inflammable, should not be heated by nor brought near a light. Now pour off the ether and quickly drop in a quantity of turpentine that will a little more than cover the objects. The whole operation is now finished, and every particle of air and water originally in the object has been replaced by turpentine. The objects are now ready for mounting in Canada balsam or dammar. Objects, such as some parts of insects, which are not transparent, need, as usual, previous maceration in potash solution. The author very correctly remarks, we think, that benzole would doubtless do equally as well as ether. If it be desired to stain the specimens, this is best done by adding the dye to the methylated spirit.

Is the Moon Inhabited?

The writer of these remarks has repeatedly had the above question put to him: in return he would put the following: What evidence have we of the habitability of the moon? Some writers have indulged in the speculation that, with the large telescopes now in existence, armies of soldiers, troops of elephants and such like may be detected on the march, and others have surmised that buildings might be seen and the styles of architecture ascertained. The ideas such extraordinary statements may induce in the minds of the uneducated render it desirable to examine a little into the probability of obtaining such results. The diameter of the moon is 2,163 miles; but, as it never remains at the same distance from the earth, being sometimes nearer and sometimes further, it never presents the same apparent diameter as seen in the sky. When nearest the earth it is seen under the largest angle, or 33′ 33·20″; but when furthest from the earth it is seen under the smallest angle, or 29′ 23·65″. Now it follows from the relation between the real and apparent diameters of the moon, at its mean distance from the earth, that a second of arc, written thus (1″), is the angle under which a mile and a little more than the tenth of a mile, written thus, 1·139, is seen at the center of the moon's disk; again, as a second is pretty well the smallest distance that can be clearly discerned, it follows that a building on the moon to be clearly seen—we may say to be seen at all—must be about a square mile in extent, and then it would be seen only as a spot, light or dark according as the materials of which it was built reflected a larger or smaller quantity of light.

There are some very level plains on the surface of the moon, surrounded by mountains. One such plain has been very carefully examined; it is about 60 miles in diameter. The mountain wall rises to a height of 3,000 feet on the south, 3,200 on the west and north, and 3,800 on the east. On the wall are four lofty pinnacles of rock, three on the west and one on the east. The highest, which is on the east, rises to the height of 7,418 feet above the level interior; the next highest is on the west; its altitude is 7,258 feet; the two lower rocks are respectively 6,396 and 5,128 feet above the interior.

Let us place ourselves, in imagination, within the confines of this mountain cinctured plain and view from its center its girdling rocks at a distance of 30 miles; they would appear from this point under a vertical angle of very little more than one degree, and the highest rock on the east would subtend an angle of less than three. It is believed that no other portion of the moon has undergone so close a scrutiny as this. For three years has its surface or floor been examined, during sunshine upon it, with telescopes able to bring small objects into view, and the results carefully discussed, from which it appears that nowhere on this plain has anything at all approaching the nature of a building or a collection of buildings been detected. At various intervals, as many as 36 small white spots have been seen during the three years, but never the whole together. Ten of these spots have been ascertained to consist of volcanic cones, the bases having an average diameter of about one mile; the base of the largest, near the center of the plain, certainly does not exceed two miles. With the exception of these natural productions nothing sufficiently elevated above the surface to cast a shadow at sunrise or sunset exists on this plain; there are, indeed, some remarkable variations of brightness upon it: for example, about the middle of the day, when the sun is highest, it appears very dark, almost black, but there is nothing to induce the opinion that a patch of a different tint exists anywhere on this plain, such as might be supposed to arise from a collection of buildings covering a space of four or five miles in extent. From such facts as these, the results of close and unremitting observation, into which conjecture is not permitted to enter, we are forced to the conclusion that the evidence we possess of the habitability of the moon is very scanty. Indeed, it does not even furnish a clew by which we might institute a series of observations likely to lead to a positive result.

It must, however, be remembered that the walled plain, Plato, to which the foregoing remarks refer, is but a very small part of the moon's surface, and it would be manifestly unsafe to draw any conclusions on the above question from the examination of so small a part, carefully as that part has been examined. While there may be great difficulty in detecting any evidence of artificial construction, it is beginning to be ascertained that there is not so much difficulty as formerly in detecting instances of physical change. The discovery in May, 1877, by Dr. Klein, of a dark spot northwest of Hyginus, where nothing of the kind had been seen before, combined with the celebrated case of Linné, will go far to show that changes of a physical character and of sufficient magnitude to be seen from the earth are now in operation, and will doubtless open up a line of research by which we may learn something of the nature of the forces at work within the moon, and form more accurate notions of our satellite than those to which we have been treated of late years, such as a "burnt up cinder," "a dead world," or one reduced to its last stage of existence. So far as we are able to judge of the mundane processes going on around us, there is a perpetual cycle of recurring physical events by which decay is replaced by renovation. We have, on our own globe, instances of very ancient formations, and others of a most recent date: the same alternation of ancient and recent tracts is found on the moon, and it would not be difficult from careful observation to assign the epochs of some of the most striking series of changes. Indeed, a chronological arrangement of the large gray plains, of the craters in their neighborhoods previously existing, and of those opened upon their surfaces, has been attempted upon a large scale, but it is evident that the study of the more minute objects is likely to be attended with results upon which a more correct system of lunar topography can be raised, which, in its turn, will conduct the student to a satisfactory system of selenology.—*English Mechanic.*

New Mechanical Inventions.

Mr. Robert H. Ramsey, of Philadelphia, Pa., has patented a new Car Transfer Apparatus. The invention is an improvement upon the patent of May 30, 1876, to the same inventor. While preserving the same general principle of shifting the trucks shown in said patent, the present invention consists in arranging the side trucks and the general level of the depressed portion of the main track upon an incline with the steepest grade in the side tracks just where the ascending incline of the main track commences, by which arrangement the shifting of the truck is effected by the gravity of the car and without the aid of a locomotive.

Mr. Royal Gurley, of Meadville, Pa., has patented a new Railway Switch Bar, which is used independently of ties or sleepers, for connecting switch rails so as to hold them parallel and thus preserve the gauge of the track. The rails are connected by tie rods and nuts which slide on the latter. The nuts are provided with claws that embrace the base of the rails, and the latter are held apart by slotted tubes which inclose the tie rods and whose ends enter recesses in said nuts.

A new Cotton Press has been invented by Mr. Sampson Pope, of Williamsburg, Miss., in which the follower receives greater speed when the power required is light, but is moved slower when the resistance increases and a greater power is needed.

Mr. Lafayette A. Hays, of Greenville, N. H., has patented a new Saw Filing Machine, which consists of an adjustable saw clamp, file holder, and file guide for holding the saw blades and uniformly filing the teeth of the same at any angle desired, horizontal or vertical.

A new Steamer for Feed has been patented by Messrs. F. E. Mills and C. Clager, of Ann Arbor, Mich., which may be used also for laundry purposes, and which is so constructed as to be easily portable.

In an improved Valve Gear for Steam Engines, patented by Mr. Charles A. Smith, of Columbus, Ohio, there is a new construction of the link and of an angle bar employed in connection therewith, in lieu of a link block, the whole forming a simple and accurately working reversing mechanism.

A new Wrench has been patented by Mr. John S. Birch, of Orange, N. J., which will adjust itself to various sized objects and may be securely locked in position.

The new feature in an improved Earth Auger, devised by Mr. B. F. Mull, of Merced, Cal., is the bit, made V-shaped, having a screw point formed upon its angle, and having the forward edges of its arms or wings made sharp and extended beyond the circumference of the tube to which the shanks of said bit are attached.

A new Car Coupling, patented by Mr. Geo. E. Weber, of Opelika, Ala., is arranged to couple cars of different heights on any curve, without the brakeman going between the cars, and is also so constructed as to connect cars having the common pin and link coupling.

Mr. Lewis T. Cornell, of Chicago, Ill., has devised an ingenious implement for extracting, uncapping, loading, cutting, creasing, and closing breech-loading cartridge shells. It embodies many new and useful contrivances, and will doubtless be found valuable by sportsmen.

Mr. Edward Henderson, of New York city, has invented a Clamp, to be used by gold leaf manufacturers for holding the mould while the leaves are removed to be cut into sizes and placed in books.

Mr. William Davies, of Henderson, Ky., has improved the construction of the Tobacco Stripping and Drying Machine which he patented August 14, 1877, so that the leaves are stripped from the stems and flattened and dried in a very effective and ingenious manner.

Mr. William G. Raoul, of Macon, Ga., has patented a device for adapting air brakes, as now used under the several existing patents, to mixed trains, or to render it possible for freight or other cars not supplied with air-brake attachments to intervene between the engine and such cars as may be supplied with air brakes, without rendering the latter inoperative.

Mr. Lorenzo D. Hurd, of Wellsville, N. Y., has patented a new Car Truck, the object of which is to reduce friction in passing around a curve. There is no slipping of the wheels on either side, as they are fixed on independent axles.

Messrs. Robert L. Vernon and George W. Vernon, of Greensboro, N. C., have patented a new Railway Switch Signal, in which a rotating lantern is employed to give different colored lights and thereby indicate whether the switch is open or closed. The red or "danger" signal is given by causing red glasses to appear in front of the lantern lamp whenever the switch rails are not properly adjusted and the switch lever is not locked to the switch stand.

Joseph Saunders, of Brooklyn, New York, has invented a Steam Valve, which is applicable to steam pipes of all kinds, and by which the water of condensation may be collected and discharged, and thereby steam of greater dryness furnished than customary with the common steam valve. The steam valve has an enlarged portion or pocket below the valve seat, a discharge opening in the pocket, and a discharge valve or cock below the pocket for letting out the water of condensation collected in the pocket of the main valve.

A patent has been issued to Alexander Marengo, Joseph Marengo, and R. Marengo, of Montreal, Quebec, Canada, for a Cheroot Machine, which is an improvement on the cigarette machine for which letters patent have been granted them heretofore, dated May 23, 1876, and numbered 177,732, so that the class of cigars known as "cheroots" or "dovetails" may be manufactured thereon with convenience and rapidity. The machine has two top rollers, and an endless belt, which is stretched over the top rollers and over a vertically adjustable bottom roller, whose supporting frame is secured on the fixed side standards of the machine by set screws. One of the top rollers is supported in fixed arms, while the other roller is mounted on pivoted arms, which are connected with a suitable treadle mechanism, so that by pressing the treadle down the rollers will be brought closer to each other and inclose the tobacco placed in the bight formed by the belt between the rollers.

Joseph Koenig, of Indianapolis, Ind., has patented an Awning which may be adjusted into different positions, so as to shut out the sun or light, either partly or entirely It is also readily arranged so as to be closed at either side, and admit a draught of air at the opposite side. The awning may be used as an exterior curtain and rolled up entirely, so as to be out of the way, being protected by the guard piece at the top of the window casing.

A machine for Pasting Together and Drying Rolls or Continuous Sheets of Paper and other Fabrics, patented by Joseph Caller, of Cambridge, Mass., consists of an arrangement of pasting rolls, a sizing roll, and drying cylinders, for simultaneously drying both sides of the paper.

Sern P. Watt, of Jamestown Neb., has patented an improved Velocipede of that class known as four-wheeled or carriage velocipedes, and which are operated by lever action, worked by hand, and guided by means of the feet. The invention consists of a front axle, with stirrups for the feet in connection with a compound lever connection with the double crank of the rear axle. The hubs of the hind wheels have inner boxes, with ratchets that engage spring pawls of the rear axle, to produce the revolving of the rear driving wheels.

Mr. John Hill, of Columbus, Ga., has patented a Copying Press, which furnishes a convenient means for securing privacy for letter copying books against meddlers, as well as security for the same against loss by abstraction. It consists in combining a locking device with the letter press which locking device holds the platen or movable follower to its tightened adjustment upon the book, so that the latter cannot be removed except by the proper person having possession of the key.

Mr. Daniel L. Holden, of Philadelphia, Pa., has devised an improved form of refrigerator for cooling a non-congealable liquid by the evaporation of a volatile fluid; an improved form of condenser for again liquefying the volatilized gas; and an improved form of congealer for freezing cans of water immersed in a tank of refrigerated non-congealable liquid; the said features being improvements upon an ice machine previously patented by Mr. Holden, and illustrated on the first page of this paper in the issue of March 16, 1878. The improvements are protected by three patents.

A new Locomotive Smoke Stack, patented by Mr. Isaac H. Congdon, of Omaha, Neb., is so constructed as not to choke the draught, to arrest sparks, and so that it may be applied to any smoke box.

Communications.

THE ELECTRICAL INDICATOR FOR SHOWING THE ROTATION OF THE EARTH.—A NOTE FROM PROF. MAYER.

To the Editor of the Scientific American:

The reading of the article by Mr. George M. Hopkins on the "Electrical Indicator for Showing the Rotation of the Earth" has suggested an addition to the apparatus which will render the experiments with it more delicate, and make manifest the rotation of the earth after the gyroscope has run for only a minute. If he will attach a plain or concave mirror to the frame of the gyroscope and reflect a beam of light from the mirror to a screen he will have an index which may be of considerable length, of no weight, and have no momentum. If the distance of the screen from the mirror is, say, ten feet, then the spaces over which the light passes on the screen will be the same as those which would be passed over by a rod 20 feet long attached to the gyroscope as an index. This is because the angle of deflection of the reflected beam is always double of that of the angular deflection of the mirror.

The apparent angular motion per hour of Foucault's pendulum and of his gyroscope for showing the earth's rotation is equal to 15° multiplied by the sine of the latitude of the place where the pendulum or gyroscope is mounted. Calling the latitude of New York 40° 43′, we have 9° 47′ as the amount of hourly motion in azimuth. But as the reflected beam moves through double the angle of the mirror attached to the gyroscope, we have 19° 34′ as the hourly angular motion of the reflected beam of light. In one minute of time the beam will move through $\frac{1}{60}$ of 19° 34′, or through 19½ minutes of arc. This angular displacement of the beam will equal ·678 of an inch on a screen ten feet distant from the mirror. In ten minutes of time we will consequently see the spot of light on the screen move through $6\frac{78}{100}$ inches. This quantity, however, gives the motion during the first ten minutes, if we suppose the beam to have started for a direction at right angles to the screen. The distance through which the spot of light travels will be greater during succeeding 10 minutes of time, for the distances will be the tangents of the angular deflections. If, however, the screen have a cylindrical surface with a radius equal to the distance of the axis of rotation of the gyroscope to the screen, then the spot of light will travel over equal distances in equal successive portions of time.

For accurate measurements of the motion of the gyroscope it will be better to place a horizontal scale of equal parts facing the mirror at the distance of, say, five to ten feet, and view the reflection of this scale from the mirror by sighting through a telescope with cross threads in its focus. With such an arrangement (see Article XI. of the "Minute Measurements of Modern Science," in the SCIENTIFIC AMERICAN SUPPLEMENT, by the writer) two or three minutes' observation on the motion of the scale over the cross threads of the telescope will suffice to give the amount of angular motion, which may be compared with that which theory requires, and which is computed by any one who has a table of natural sines. He will find the sine corresponding to the angle of the latitude of the place, and multiply this by 15° (the hourly angular motion at the poles of the earth); he will then take $\frac{1}{60}$ of the product for the angular motion in one minute, and double this result to allow for the doubling of the angle of reflection.

Foucault suspended his gyroscope by a strand of untwisted silk fibers, and if Mr. Hopkins will adopt this mode of suspension in place of the steel point, he will get rid of the friction, which should be avoided. There is a good description of Foucault's gyroscope, with four engravings, in Arago's "Astronomie Populaire," volume 3, page 50, *et seq.*

I have during the past winter repeated the Foucault experiment with the pendulum, and the apparent hourly angular motion of the instrument corresponded quite well with the theoretic value. The bob of my pendulum was a thirty pound cannon ball, which I floated in a hemispherical bowl containing mercury, and thus found out the position the ball has when its center of gravity is in a vertical line with its center of figure. The ball was suspended in the same position it had when it floated in the mercury.

ALFRED M. MAYER.

South Orange, N. J., July 1, 1878.

Electrical Indicator for Showing the Rotation of the Earth.

To the Editor of the Scientific American:

In my article on an "Electrical Indicator for Showing the Rotation of the Earth," in your issue of July 6, I mention that the apparent motion of the index is 15° per hour. With this instrument this would be true only at the poles, at the equator it would be 0°, and in this latitude it would be about 9°.

I intend soon to furnish you with sketches of another form of instrument, which will indicate the full diurnal motion when placed at any point on the earth's surface.

GEO. M. HOPKINS.

To the Editor of the Scientific American:

I translate the following from Aristotle, De Mirabiliis, Ausc., page 189, tom. 16, Lipsiæ. Might it not have been gallium of which he wrote?

"They say that Celtic tin is melted quicker than lead. A sign is that it appears to be melted in water. It stains (or sticks to the vessel) quickly. But it is melted away or is liquid in the cold, when it should be congealed."

In the same vol., cap. 36, *Quæst. Mechan.*, you will find the reasons why bodies on eddies of water move to the center, that are the same in part given by some writer lately, perhaps in your journal. J. F. G. MITTAG.

Counterfeiting American Goods.

In reply to the charge that American goods sent to South American markets are not equal to the samples exhibited by agents, a correspondent of the *Evening Post* calls attention to the fact that enormous quantities of cheap imitations of American goods are made in England and Germany to be shipped to the West Indies and South America; and not only is the general appearance of American goods imitated, but the brands, labels, and trademarks of American manufacturers are placed upon the spurious products. In the single district of Elberfeld, in Rhenish Prussia, over thirty factories were at one time at work forging "American" implements, such as axes, machetes, hatchets, and the like, with exact imitations of the private marks of reputable American firms. Law suits against some of the worst of these offenders have resulted in their conviction, but the petty fines imposed by the German courts have had little effect to stop the outrage. The trade is kept up, and American manufacturers find everywhere in the West Indies and Spanish America miserable imitations of their goods, bearing their own names, brands, and trademarks.

The Steam Street Railways of New York City.

It is surmised that the purpose of the constructors of the Metropolitan Elevated Railway is partially moral and pious, at least for the present. Rendering everybody indignant and extremely uncomfortable along the line and in the vicinity of the road by running trains of the noisest and most damaging sort during week days, and intermitting them on Sundays, they hope, it is rumored, to make the Sabbath what the word implies. In this they succeed; they have made Sunday a day of rest and real enjoyment—a day of gratitude and benefaction. The most secular of the West Siders speak of it as blessed and blessing, and admit that never, until the running of the Metropolitan trains, have they fully appreciated it. They are thankful from the bottom of their hearts for Sunday, and wish most sincerely, so far as the railway is concerned, that Sunday might be perpetual. They attend church less than they have done, staying at home to enjoy comparative quiet, and to realize wholly their deliverance from the infernal trains. Many of them are compelled to employ the day in sleep, as they cannot sleep with any satisfaction during the week. We like to have the railway people credited with good intentions, but we fear that they suspend the trains on Sunday for the nonce, only to prevent the indignant howl which they know would rise from the orthodox on account of the necessary interruption of service in all the churches within any ordinary distance of Sixth avenue. A common prayer nowadays on the West Side is, "Good Lord, deliver us from the din and torture of the elevated railway."—*N. Y. Times.*

THE London *Telegraphic Journal*, in a recent article upon the admitted pre-eminence of telegraphic improvements and advances in the United States over all other nations, expresses the opinion that this superiority of the Americans is due to the excellence of our patent laws, which encourage inventors to obtain patents, and place no restrictions upon them after they are obtained.