other end, and there also pass a stand pipe in order to be watered if necessary. Interlocking switches will be provided at one or both ends of the yard.

While the work is incomplete, such parts of it as are available are being used ; thus the well water is already in use for constructional purposes, and the round house itself will very soon be occupied by engines. When completed, the buildings will all be lighted by electricity, the Pullman car service and the ordinary car service will each have large store rooms, a special electrical plant will be installed, and eventually a very complete system for passenger car service will be in operation.

Fire Hydrants.

The need of having plenty of street hydrants was illustrated by Chief Scannell, of the San Francisco fire department. With the aid of his most powerful engine he recently gave the grand jury and the mayor and supervisors of that city an ocular demonstration of the crying need for proper protection against fire of additional fire hydrants. Of course the gentlemen knew perfectly well that in many parts of the city the distance between the hydrants was from 1,500 to 2,000 feet, but it is probable that they never before realized so thoroughly how great was the loss in power of a stream caused by the friction in the long line of hose thus made necessary. It is safe to say that they were somewhat surprised when, after seeing water thrown 206 feet through 100 feet of hose, the pressure at the nozzle standing at 90 pounds, 900 feet more of hose were coupled on and the enfeebled stream fell to the ground just fifty-four feet from the nozzle, where the pressure mark was but six pounds.

THE "AMERICAN SYSTEM" OF ELECTRIC ARC LIGHTING.

It is almost needless to say at the present day, when dynamos are used in nearly every city and village and in many isolated places for the purposes of illumination, that the dynamos and machinery employed for such use should be of the simplest character, as it cannot be expected that an accomplished electrician or engineer will accompany every electric lighting plant, large and small.

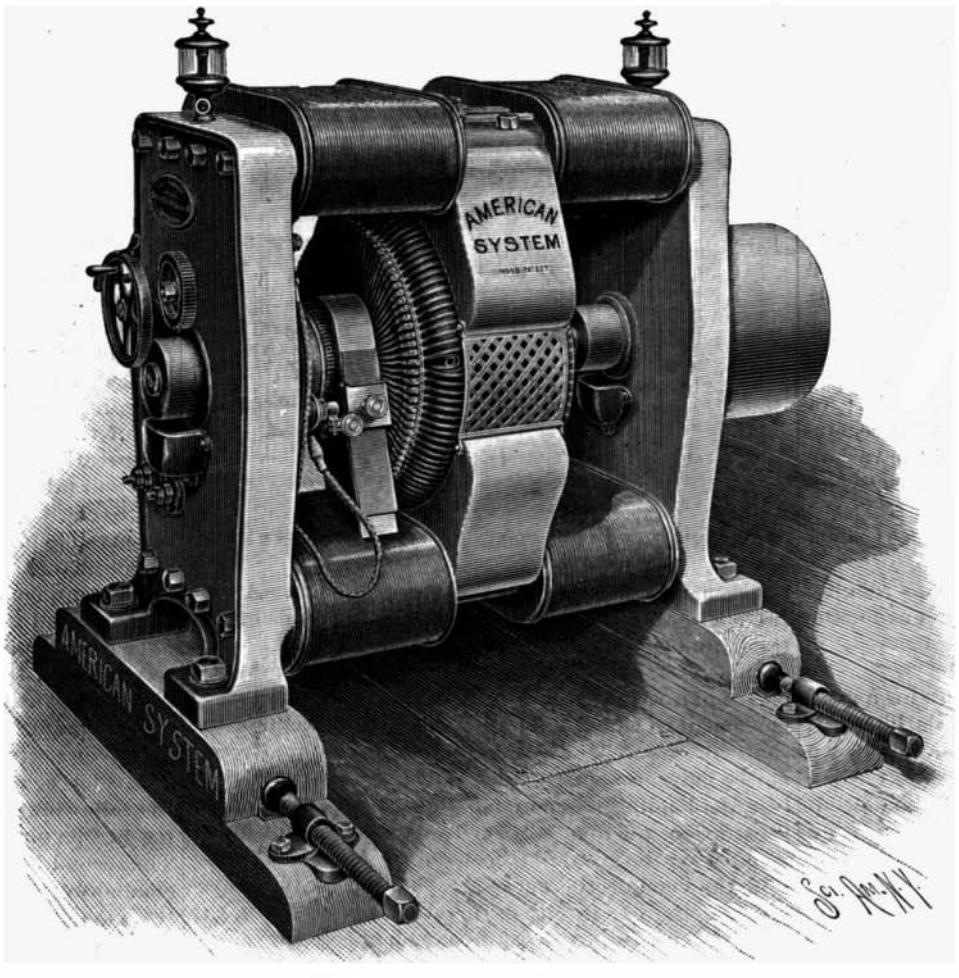
The dynamo shown in the annexed engraving is based upon the principle of the well known Gramme machine, the pioneer of efficient dynamos. The machine, as developed by the New American Electrical Arc Light Co., is a great improvement over the original Gramme. It has been simplified, its parts have been rendered accessible, the armature is provided with means for free ventilation, the commutator is so constructed as to avoid short-circuiting, and the commutator bars are made removable, so that one or more may be taken out of the commutator without disturbing the rest.

The lamps used in connection with this dynamo are practical and efficient. It is claimed that 2,000 candle power lamps are run in connection with this machine with an expenditure of seven-tenths of a horse power each. The machines range in capacity from 1 to 50 arc lights, each of 2,000 candle power, and they will supply a proportionately increased number of lamps of 1,200 candle power.

It may be of interest to state that this company has lighted the statue of Liberty in New York Harbor since its completion. Owing to the haste with which this plant was installed, the apparatus was not arranged in duplicate; however, its operation has been continuous, and the machinery is said to have performed satisfactorily in all respects without any interruption.

The American system of electric lighting is in extensive use in all parts of the United States and Canada as well as in England, France, Germany, Sweden, Australia and China.

The offices of The New American Electrical Arc Light Company are at 173 Broadway and 2 Cortlandt St. Factory at 165 West 18th St., New York.



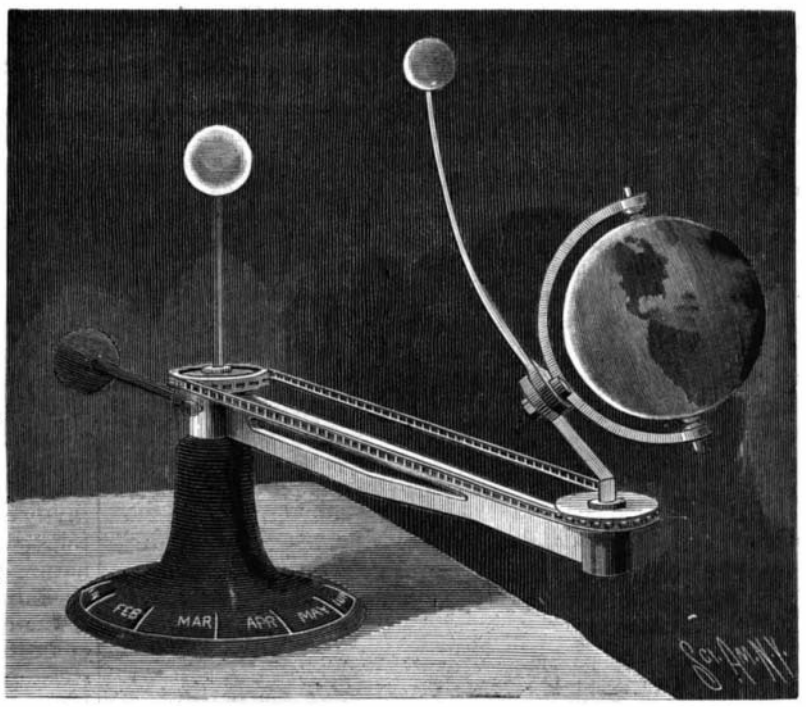
THE "AMERICAN" DYNAMO.

CAUSTIC soda or kerosene oil may be used to clean the hands from printer's ink. The former must be dilute or it will affect the skin unpleasantly. Other inks yield to oxalic acid, javelle water, etc.

Soapstone and Its Uses.

A writer in a London journal calls attention to the unappreciated uses and preservative qualities of soapstone, a material, he says, which possesses what may be regarded as extraordinary qualities in withstanding atmospheric influences, those, especially, which have so much to do with the corrosion of iron and steel; and from experiments made, it is said that no other material is capable of taking hold of the fiber of iron and steel so readily and firmly as this. In China, soapstone is largely used in preserving structures built of sandstone and other stones liable to crumble from the effect of the atmosphere; and the covering with powdered soapstone in the form of paint, on some of the obelisks in that country, composed of stone liable to atmospheric deterioration, has been the means of preserving them intact for hundreds of years.

AN arrangement for the prevention of accidents by the electric current has been adopted at the works of the Morgan Engineering Company, of Alliance, Ohio. A board is fixed on the wall facing the dynamo in the engine room. On this board are six hooks on the checks of the six men who are employed in looking after the circuits. When a man is called on duty he removes his check from the hook and takes it with him. The engineer sees by a glance at the board that one hook is absent, and that, therefore, one man is engaged about the lines around the shop, and the dynamo is not started until the check is replaced on the hook. The engineer then understands that the coast is clear, and turns on his current without fear of accident to any of the linemen.



HOSKING'S INSTRUMENT FOR ILLUSTRATING THE CHANGES OF THE SEASONS.

AN IMPROVED TELLURIAN.

The illustration represents an instrument designed to show, in a simple and effective manner, the motion of the earth around the sun and that of the moon around the earth. It has been patented by Mr. Alfred Hosking, of the Mount Eden School, Auckland, New Zealand, the instrument being the result of the inventor's efforts to perfect a "seasons demonstrator" for use in his own school—one which would not readily get out of order, and which would enable the teacher, instantly and without noise, to change the relative positions of the sun, earth, and moon. On a circular base, provided with a graduation indicating the different seasons of the year, is a post on which is mounted to turn a counterbalanced horizontally extending arm, on the outer end of which turns a vertical shaft integral with which is an inclined arm. At the outer end of this arm is a stud provided with a segmental arm, in which is mounted to turn a globe representing the earth, the axis of this globe being inclined to the vertical post extending upward from the base, on the upper end of which is a fixed globe representing the sun. On the stud carrying the segmental arm in which is held the globe representing the earth is also held to turn a curved arm carrying at its outer end a globe representing the moon. On the main post, above the horizontal arm, is a sprocket wheel, over which passes a sprocket chain, which also passes over a sprocket wheel on the vertical shaft of the horizontal arm. The sprocket wheels are both of the same diameter, so that when the operator turns the horizontal arm once around the post, the globe representing the earth makes a movement similar to that of our earth around the sun, and the moon globe, when its arm is turned, travels around the earth in a similar manner to the natural movement of the moon around the earth. The horizontal arm and the arm carrying the moon can be turned at pleasure, and the four seasons of the year can be easily demonstrated on the globe representing the earth.

Warping of Wood.

As lumber is now sawn, every board but one will warp and curl up in the process of seasoning. The reason for this is plain. If the board be sawn from the side of a log, the grain rings of the wood lie in circles, which have a greater length on one than upon the other side of the board. A board cut from the very center of the log has grain circles of equal length upon each side, and will lie perfectly flat when seasoned.

When selecting the lumber for a tool chest or some other fine job, pick out boards which show that they came, as near as possible, from the center of the log. A method is in use which compensates for this tendency to curl in seasoning. This is known as quarter sawing, and quartered oak, of which so much is said at present, is sawn by this process.

It consists in cutting out boards radially from the center to the outside of the log. Suppose a log to be split into four pieces, each of these pieces is sawn diagonally so that the grain rings run through, instead of the circles running into, part way through and out upon the same side of the board.

Quarter sawn lumber will not warp in drying, neither will it yield so readily to changes of weather. It has the disadvantage of being more expensive, as in sawing each quarter a narrow board is first taken off, then one a little wider. The boards increase in width until the middle of the quarter is reached, making the widest board equal to half the diameter of the tree. The narrow boards may be glued up into wide strips, but that shows considerable sap, and they cannot be used in some kinds of work.

To prove that the circles or sap rings cause curling during the seasoning process, it is only necessary to take such curled boards and wet the concave side, or apply heat to the convex side. If each or both be done, the boards will straighten out forthwith. This method is often taken advantage of by carpenters, in working twisted or warped boards. The seasoning process is also controlled by frequently turning boards over so that each side may receive just enough heat and air to keep the boards flat.—*Woodworker.*

Chocolate and Cocoa.

BY A. N. BELL, A.M., M.D.

The introduction and common use of the terms "coca" and "cocoa," applicable to medicinal substances, have had the effect of confusing people's minds with regard to the source and preparation, and, in some cases, creating a prejudice against the use, of the wholly different substances—chocolate and cocoa.

The medicinal wine of coca and the powerful alkaloids and nerve stimulants cocaine and hygrine are prepared from the leaves of *Erythroxylon coca*, a shrub indigenous to Peru and Bolivia, wholly different to *Theobroma cacao*, a small but beautiful tree, which grows luxuriantly both wild and cultivated in the northern parts of South America, Central America, Mexico, and the West Indies, from the *seeds* of which chocolate and cocoa, and (from the oil) cocoa ointment or "butter," are prepared.

When the Spaniards first visited Mexico, four centuries ago, they found the natives using *chocolatl*.

It was introduced into Europe as early as 1520, and has since been more or less extensively used in every civilized country. Linnæus was so fond of it that he gave to the tree from which it was obtained the name of *Theobroma*—food for the gods.

Chocolate and cocoa are only two forms of the same substance. The tree twice in the year yields a crop of reddish spongy fruit, shaped somewhat like a cucumber; the ripe fruit being collected at the decline of the moon, the tree continues its yield for twenty or thirty years. Each fruit or pod contains from six to fifty beans—usually about twenty—and there are from ten to twenty pounds of such beans from each tree at each crop. The beans are usually about the size of large almonds; they are frequently (from a confusion of language) called indifferently "beans," "seeds," "nuts," "berries," and "fruits," but their character will be better understood by regarding them as beans contained within a pod. They are generally picked out and dried for exportation.

Besides the beans, the pulp contains a creamy and cordial juice; and, by steaming and pressing, the beans will yield one-third of their weight of a kind of butter, to which the richness of cocoa is due.

For preparing the beverage material, the beans are exported in their original state, to be converted into cocoa or chocolate by a manufacturing process. They are first roasted in slowly rotating ovens, then broken by machine into such a state that the husks may be separated from the kernels by a blast of air, and they are afterward treated and beaten and converted into a pulp by means of their own oil. The pulp, when ground between millstones till it assumes a consistency something like that of treacle, is in a state to receive any of the modifications that will fit it for the market.

It may be "plain cocoa," or "homeopathic cocoa," or "vanilla chocolate;" it may have arrowroot, or sago, or sugar mixed with it; or, if the manufacturers be tinctured with roguery, there may, perchance, be bean meal or other adulterants mixed with the pulp. The pulp, when fully prepared in any of these diverse ways, is cast into large moulds; the cakes thus produced are cut into minute shreds by machine, and the shreds are rubbed, sifted, and packed for sale.

The preparations of cocoa and chocolate made in France are more numerous than those usually made in England or the United States: they comprise vanilla chocolate, milk chocolate, chocolate bonbons, chocolate papillotes, chocolate crackers, chocolate pastilles, chocolate with taraxacum or with sarsaparilla, chocolate with tar—in short, there is no end to the list; for once admit the principle of mixing cocoa with vegetable infusions, or decoctions, or essences, and the variety becomes interminable. The French limit themselves to the use of the word "chocolate," derived from the Mexican name of the plant (*chocolatl*); they seldom speak of "cocoa."

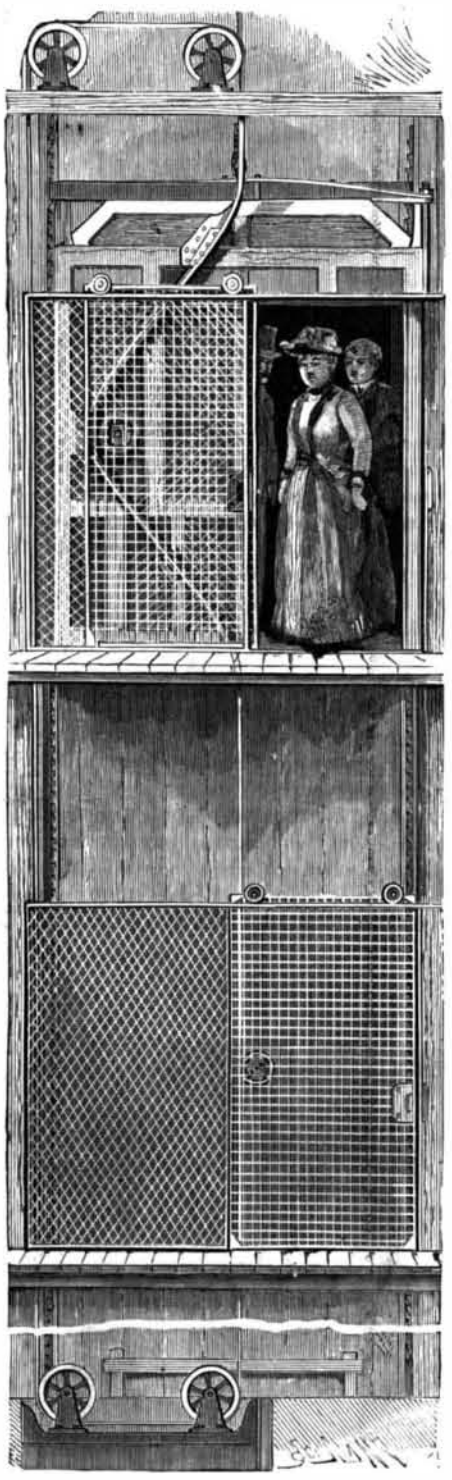
What are called "cocoa nibs" are the beans roughly crushed. "Flake cocoa," also, is another name for the beans when crushed between rollers, but before anything else has been added to them.

The husk of the seed, after roasting, contains a good deal of nutriment; indeed, so do the pods likewise; and all three are more or less used in making cheap cocoa. The plant is certainly used in more ways than coffee: drunk as a thick decoction (made to somewhat resemble gruel), made into various confections and pastries, eaten as bonbons, etc., while a poor decoction is drunk in some places by boiling the husks separated from the beans.

While chocolate and cocoa contain an essential principle, *theobromine*, comparable to *caffein* and *theine*—the alkaloids of coffee and tea—it is much less potent as a disturber of the nervous system; and chocolate and cocoa are proportionally more wholesome as a beverage, besides possessing specially nutritive qualities which render them much more sustaining; and there can be little question but that its general substitution for tea, especially of that cheap, oversteeped, second edition kind which is the too common beverage of overworked women in various avocations of life, would be promotive of health.—*The Sanitarian.*

AN IMPROVED METHOD OF AUTOMATICALLY CLOSING ELEVATOR DOORS.

The accompanying illustration represents a simple and inexpensive construction for automatically operating the sliding doors guarding the exposed landings of passenger elevators, and by means of which all the doors in the elevator shaft will be held positively closed, except the door at the particular landing where the car is stopped. This has been patented by Mr. C. H. Stilson, and Messrs. Otis Bros., of New York, have contracted to use the guard. On each landing door, near the latch side and opposite the latch, is a grooved wheel about eight inches in diameter, and on the elevator car there is a parabola-shaped track adapted to engage the groove of the wheel, this track running down and inward on the side of the car, from just above its top to a point about midway of the door, and back from the side of the car a distance equal to the width of the door. From there the track bends back to a point below the door, and in line with the commencement of the track at the top of the car. A wire cable is attached to the upper and lower ends of this track, and extends over pulleys at the top and bottom of the shaft, this cable being kept under tension by means of a weighted platform having a slight vertical movement to which the pulleys at the lower end of the shaft are secured, or for which an adjustable screw device may be substituted. When the elevator is at rest at a landing, as shown in the upper portion of the illustration, the door is opened by the attendant in the usual way, the grooved wheel on the door then fitting into the bend of the curved track; but on the movement of the car in either direction, up or down, the wheel follows the lower or upper arm of the track, forcing the door forward and firmly closing it. As the cable attached to each end of the track forms virtually a continuation of the track to the top and bottom of the shaft, all the doors in the shaft are thus held closed whether latched or not, as the car passes away from them, and cannot be opened except when the car is present. The car can thus be moved from a remote landing and brought to any other, above or below, closing the door of the landing it leaves, without requiring the services of an attendant on the car. The apparatus may be readily applied to all elevators, old or new, where the doors slide on rollers, and can be easily manufactured and put in place by any good mechanic. For further information address the inventor, Mr. C. H. Stilson, architect, 736 Chapel Street, New Haven, Conn.



STILSON'S ELEVATOR DOOR-CLOSING ATTACHMENT.

Fusible Plugs.

Fusible plugs are very important adjuncts to a boiler, yet, like everything else about a boiler, they need a great deal of attention, and often more than they get. These plugs usually consist of a piece of tin, lead, and bismuth inserted in various manners in the crown sheet or heads of the boiler, and as will be readily understood, the design being that when the water gets too low the fusible metal will be melted by the heat, allowing the water to escape into the fire, or the pressure to be relieved from the boiler. So long as the alloy is kept at a comparatively low temperature by the water on one side, it is of course prevented from melting by the fire on the other.

Notwithstanding the great favor in which they are held, Wilson claims there is no doubt that their efficiency has been much overrated, as in his experience as a boiler inspector numerous cases of failure to work are recorded every year. This is partly due to an accumulation of soot and dirt that usually takes place in the cavity over which the plug is inserted, and partially in consequence of the alteration which takes place in the nature of the alloy during long exposure to the heat of the furnace.

There are numerous instances given by Wilson, also, of fusible metal melting out without liberating the steam pressure. This is chiefly caused by the accumulation of incrustation on the metal being sufficiently strong to withstand the pressure upon it, and prevent the liberation of the steam, and it does not take much to do this. The simple plan of screwing or riveting a piece of lead or fusible metal into a hole should never be adopted, on account of the leakage that often takes place when the plug is slack, which leads to the corrosion, patching, and destruction of the plate. Moreover, the plug will probably not melt until the crown sheet shall have actually become bare. For this reason alone there should be a provision on the furnace plate for the insertion of the plug to keep the sheet still covered with two or three inches of water after the plug itself has been left bare. This is usually done by riveting or screwing a seating of the wrought iron into the sheet into which the fusible plug is fitted, sometimes one within another, so that in the event of one failing to work, the other may be ready. Where the area is small, greater care is necessary in keeping the metal free from incrustation, a coating of hard scale less than one-sixteenth inch thick over a one-half inch hole being sufficient to hold a pressure of 70 to 80 pounds. The mouth of the seating, when that method is used, is made two or three inches in diameter, to allow the easy removal of the soot and greater exposure to the heat.

In making a selection of the description of plug, the nature of the feed water should be considered. With feed water containing much carbonate of lime or magnesia, especially where grease is present, many of the fusible plugs in use are found to be too sensitive, and cause much trouble by melting, even where there is still abundance of water over the sheet, from the same cause as brought about the bulged plates referred to recently.

It must not be supposed that the steam in an ordinary large sized boiler can always be liberated with sufficient rapidity through a small hole to prevent overpressure. Many engineers state that, on the melting of the plug, the discharge of dry steam over the fire greatly increases the heat of combustion. That this will take place under certain favorable conditions there can be no doubt, and is probably one reason why fusible plugs are sometimes ineffective; but when the discharge of water or wet steam over the fire is to any extent, combustion will be retarded, the pressure relieved, and warning of danger given.

To guard against the risk arising from the tendency to change in the nature of the alloy, it is advisable to renew the fusible metal every three or four months, and only plugs that will admit of this should be chosen. Low temperatures can be determined by the melting points of compositions of lead, tin, and bismuth, and the following alloys are given by Weisbach as suitable for fusible plugs, together with their melting points. The second is what is known as Rose's metal, and very commonly used.

1 part lead,	1 part tin,	4 parts bismuth,	201° Fah.
5 " "	3 " "	8 " "	202° Fah.
2 " "	3 " "	5 " "	202° Fah.
1 " "	4 " "	5 " "	246° Fah.
1 " "	— " "	1 " "	257° Fah.
1 " "	1 " "	— " "	466° Fah.
— " "	2 " "	1 " "	334° Fah.
1 " "	3 " "	— " "	334° Fah.
— " "	3 " "	1 " "	392° Fah.

—*Boston Jour. of Com.*

To coat tin dishes to withstand the action of chemicals used in developing and toning photos, use a quick-drying asphalt varnish, as that for bicycles.