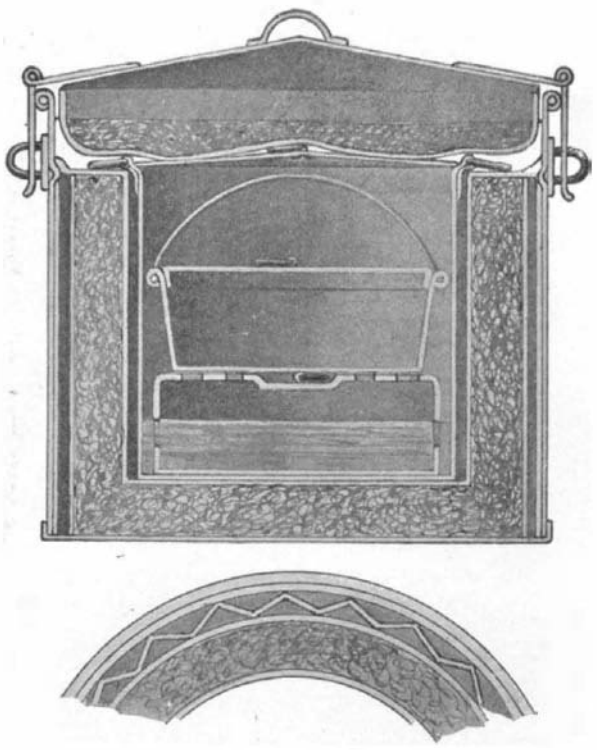
A FIRELESS COOKER.

A new method for cooking by retained heat has been invented by Mr. Felix Kahn, of New York city, who has assigned the patents covering his invention to Mr. James S. MacCoy, of 1122 Broadway, New York city. In the cooking of foods as ordinarily practised there is a great waste of heat, care, and attention, an unnecessary amount of wear and tear on the cooking utensils, a large loss of food material, and too frequently an inferior quality of food, due to the drying and burning and the loss of the juices which give wholesome, nutritious, and palatable qualities to the food. This is due to the fact that the cooking is usually done by continuous application of the heat, which wastes 70 to 80 per cent of the heat, occupies the stove with utensils for a needless length of time, and subjects the utensils to just that much more wear and destructive influence of the heat, as well as consuming an unnecessarily large amount of fuel.

The invention is an improvement over a former one, wherein the food which had been previously stewed or boiled was kept in a hot condition. By subsequent experiment it was found that after having first permeated food with heat at a cooking temperature, it was possible to stew or boil the same to perfection by the heat as conserved against loss by radiation, but that it was physically impossible to steam or dry-cook in that device by heat without the addition of a body of water. In the improved form of the device this is accomplished by placing a body of water in the bottom of the cooking receptacle, and providing a perforated rest which is placed over the water and which supports the pan or secondary cooking receptacle containing food. Substantially, the apparatus consists of an outer casing of metal and an inner casing of heavy tin. Between these are the non-conductors—paper, cylinders of dead air, and a body of fibrous material. The tight-fitting lid is similarly constructed. This effects a perfect retention of heat. As said above, in the bottom of the cooking receptacle is placed a quantity of water and a perforated support for the vessel containing the food. The manner of using the apparatus is very simple. An article of food prepared in the usual manner, and placed in the granite-ware cooking receptacle, is put on the fire until the contents are thoroughly permeated with the heat at a cooking temperature. The receptacle is then set into the heat-retaining part of the fireless cooker. This is closed and set aside for a period of time depending on the character of the food, and the same will then be found to be cooked to perfection. The fireless cooker has been exhaustively tested, about one hundred recipes having been put through this method by the Greater New York Cooking School with highly satisfactory results. For two summers it has been used practically with great success by Mrs. Lemcke, proprietress of said school, at her summer hotel.

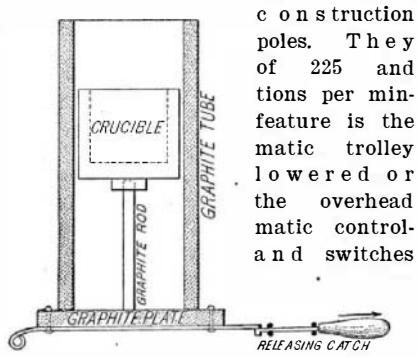
The War Department made recently at the Army Building in this city an exhaustive test of the merits of the apparatus for army use. There were present Commissary-General Weston, Capt. Murray, the cooking expert of the army from Fort Riley, Kan., Capt. Franklin, commissary at West Point, Col. Brainard and Capt. Cole, commissaries at New York, and others. The test was so satisfactory that initial orders have already been placed for its use at West Point and Fort Riley. Capt. Murray designed a case to contain six cookers of special shape, adequate to feed a troop. This case is to be carried in the transport wagon.

The cooker is adapted for general domestic use, also for use in buffet and dining cars, steamships, yachts, automobiles, etc. One of its most interesting forms is the workman's dinner pail. It cooks while he works; he can have a hot meal wherever required.

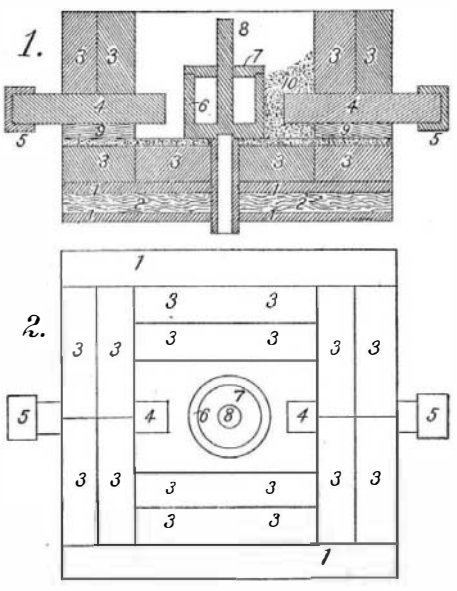


A FIRELESS COOKER.

The new electric locomotives which Ganz & Company recently built for the Valtelline system of electric railroads in the north of Italy, show a number of novel points. They employ high-tension three-phase current at 3,000 volts directly upon the motors. The main feature to be remarked is the disposition of the motors. The locomotive carries three driving wheels, and the two motors are placed in the spaces between the wheels and somewhat above the centers. The two motors are coupled across by a crank-bar which is connected to a crank on each of the motors, so that the bar takes a to-and-fro movement. The crank-bar is coupled to the middle driving wheel and thus operates it. From the middle wheel there is a horizontal driving bar which runs to each of the other driving wheels on the sides. Counterweights on the motor shafts balance the system. The inclosed motors are of a special double construction and have eight poles. They run at speeds of 225 and 112.5 revolutions per minute. A new feature is the use of a pneumatic trolley which can be lowered or raised against the overhead line. Pneumatic control-apparatus and switches are among the points to be noticed, and the motorman operates all the devices on the car by working a few valve handles which are placed together in the end cabin. The new locomotives are able to take a 250-ton load up a twenty per cent grade. They can draw a 400-ton load on a one-per cent grade and bring the speed in 55 seconds from zero up to twenty miles an hour.



Trap for Dropping Crucible.



Section and Top Elevation of Electric Furnace.

ARTIFICIAL PRODUCTION OF REAL DIAMONDS.

BY A. FREDERICK COLLINS.

Diamonds as beautiful as those found in the celebrated Kimberly Mines, in South Africa, are now made in the electric furnace; and the only difference between those taken from the extinct craters of volcanoes abroad and those formed by applying heat and pressure at home is the consequential one of size.

Many have been the attempts to produce artificial diamonds that could not be detected from those of genuine origin, but there is not an instance on record where such imitations approximated anywhere nearly the hardness, the specific gravity, and refractive powers of the real gems and which gives to them their extraordinary brilliancy.

It has been a matter of common knowledge for a very long time that diamonds were nothing more nor less than a form of carbon, and that Nature in her workshop produced these precious stones by a subtle process from another form of carbon called graphite, but while the latter is a widely-distributed element there are very few places indeed where the crystallized forms are found, and the output from all the mines in the world is effectually controlled by what the broker in gems calls the "Diamond Trust."

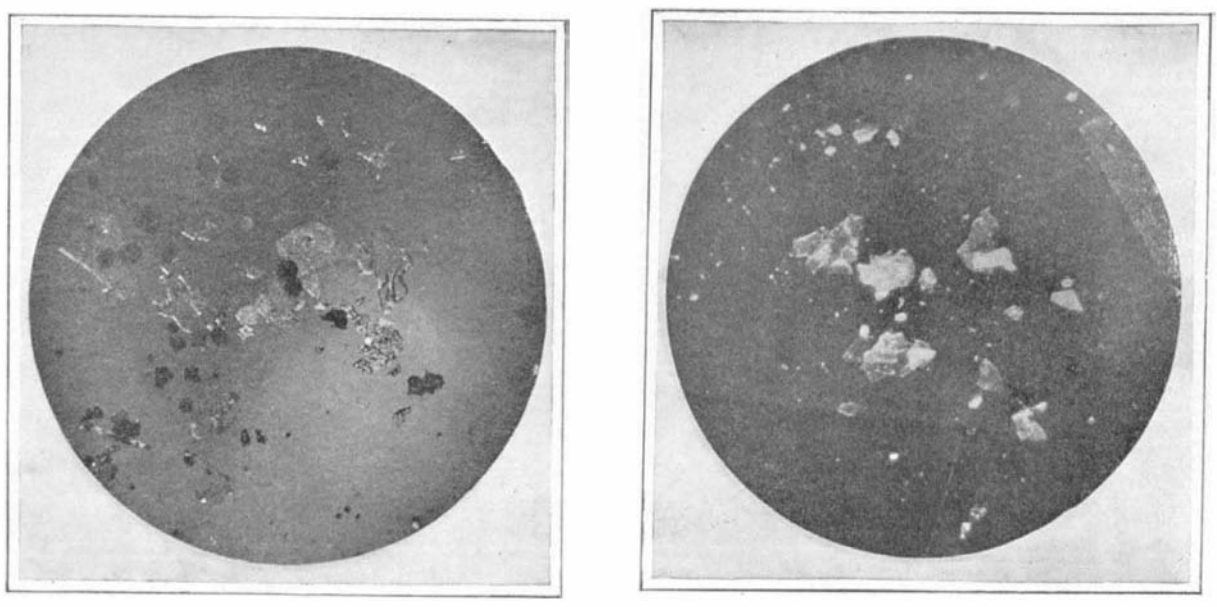
To produce real diamonds by artificial means seemed theoretically possible to those who had studied the subject profoundly, for the chief requirements were first, an intense heat, and second, an exceeding pressure directed on the material to be converted into crystals. To work out these conditions so that they might adequately prevail in practice was a vastly different phase of the problem, and for this reason, if none other, the results obtained are highly interesting and even encouraging.

The deductions relating to the formation of diamonds under natural circumstances have been based largely upon observation; of course analysis shows what the stone consists of, but of its manufacture nothing. When a gem is recovered from the "blue-stuff" or diamond-bearing clay it is found incased in an opaque layer or matrix and isolated from others of its kind.

This being the case, mineralogists concluded that ordinary carbon had been treated to a degree where it was fused and then suddenly cooled, when it crystallized, for when the matrix is removed the diamond in its rough state is found inside. In order to bring out its beautiful iridescent properties that make it so well beloved, the rough gem must be carefully cut and polished.

Occasionally diamonds have been discovered in meteorites formed of masses of iron that have fallen from space to the earth and in which the heat generated by the aerial passage and pressure due to the change of temperature were sufficient to crystallize the graphite and thus form the diamond. It is from these limits that men came to believe in the possibility of imitating the process and so to legitimately produce real diamonds.

The electric furnace offers the means for obtaining heat at an exceedingly high temperature, and several different methods have been evolved for procuring the requisite pressure. In the earlier experiments of Prof. Henri Moissan in the art of diamond making he employed the following methods: His electric furnace comprised an iron casing having a lower block of carbonate of lime for the body. A cavity was formed in the lower block for a crucible made of molded carbon. The carbon electrodes between which the electric arc was formed, were placed horizontally through the furnace over the mouth of the crucible. Into the crucible a fourth of a pound of Swedish iron was placed together with the graphite which was to be converted into diamonds, and the mixture was then covered carefully with powdered charcoal. The arc was produced by a current of 1,000 amperes at 500 volts, and when the heat became intense enough the graphite was practically fused with the iron. The next step was to subject the fluid mass to great pressure, and this was done by grasp-



Artificial Diamonds Viewed by Reflected and Transmitted Light.

MAKING DIAMONDS BY ELECTRICITY.

ing the crucible with a pair of tongs and plunging it into cold water, a process not without danger to the operator.

The effect of this sudden change in temperature was to cause the iron, which was heated to incandescence, to instantly contract and with such force that the particles of carbon held in suspension in the liquid mass were greatly increased in density, and having the brilliancy and other attributes of real diamonds.

Mr. Henry W. Fisher, chief engineer of the Standard Underground Cable Company, of New York city, has improved upon Moissan's method in many respects but especially in the manner in which the contents of the crucible are immersed in the cooling bath. Other improvements relate to the construction of the furnace and the means employed for obtaining a more intense and uniform heat, the details of which will be made clear by referring to the diagrams.

The furnace was made by attaching sheets of asbestos, 1, 1, above and below the table, 2; on top of the asbestos, fire brick, 3, 3, 3, 3, were placed and a lining of magnesite, 4, 4, formed the inner surface of the furnace. The crucible, 5, was made of Acheson graphite and so designed that a portion of it extended through the hood of the furnace and on through the table; 6 is a valve stem arranged so that it can be lifted and the incandescent mass in the crucible permitted to fall into a cooling bath immediately below. Graphite electrodes, 7, 7, are capped with brass conductors over the ends to facilitate the flow of the current; crushed coke is packed around the crucible and electrodes, this serving to retain a large percentage of heat that would otherwise be wasted.

In the diagram showing a top elevation of the furnace, where like figures are used to designate similar points, extending to either side of the powdered coke, 8, is the lining of finely-divided magnesite, 9, 9, which in this form does not conduct and dissipate much of the current when the furnace becomes excessively heated. This furnace is the outcome of several prior ones that Mr. Fisher had designed and built. The first one was of lime and similar to the one used by Moissan, and then furnaces of asbestos board were constructed and these were lined with blocks of magnesia, but not until he set up the one described above was a really satisfactory furnace obtained.

Since there were large heat losses due to the reduction of temperature from the instant the crucible was removed from the furnace until the contents were thrown into the cooling bath, the experimentalist devised several methods in which the matrix could be instantly dropped from the furnace into the cooling vessel below.

His first plan was to employ a cylinder of hollow graphite for a crucible and have the lower end of this rest on a graphite slab large enough to project beyond the furnace; when it was desired to discharge the mass in the crucible into the cooling bath the flat slab was pulled away and gravity did the rest.

The danger due to explosion by the sudden change of temperature when the matrix was cooled in water led the investigator to test the efficiency of other mediums as cooling agencies; in one a large lead casting having a hole of appropriate size drilled in the center formed the receptacle for the fluid mass; then a bath of solder was tried, but finally it was found that water gave the best results.

In one of the early trials at making diamonds when the pivoted drop door of asbestos was used to plunge the molten mass into the bath, the crucible holding it did not fall in a straight line, as had been intended, but precipitated the seething matrix into the bath in such a manner that it came in contact with the iron vessel containing it; instantly a bluish-white flame shot up like a heavy disruptive discharge, due, it is thought, to the rapid decomposition of the water, and the matrix then passed through the bottom of the iron pot, melting a large hole in it.

This accident led to further improvements so that the crucible could not depart from its predetermined course. It was subsequently found that the more rapidly the contents of the crucible were cooled, the greater the diamond-making qualities of the matrix, and when the cooling process took place very quickly little pieces that were broken off in the water from the principal mass contained diamonds, which was not the case with the large lump remaining in the crucible and which was partly insulated by it.

In one of the accompanying photographs is shown a reproduction of a microphotograph of the first diamonds produced by Mr. Fisher; as the illustrations indicate, the photograph was taken by reflected light from the top and shows well the transparency of the miniature crystals. Our cut shows a specimen containing several perfectly transparent crystals which were evidently chips split from a larger crystal and the largest of these measured one-half millimeter in diameter; this was burned on platinum foil and when consumed left only a trace of ash. The long, sharp crystal was exceedingly brilliant and its sharp edges showed very clearly that it was fractured. This photograph was likewise made by a direct light from the top.

Attempts were made to obtain photographs by transmitted light, but where this was tried the reflected light thrown off by the diamonds cast a kind of a halo and this fogged the plate.

To create these beautiful little gems Mr. Fisher employed a current that reached as high as 1,200 amperes and the maximum power required was about 50 kilowatts. The arc produced by this great expenditure of energy caused the temperature of the furnace to speedily reach the limits of the pyrometer used to determine its value, which was 1,950 deg. C. The work of the arc had, however, only begun, and before the matrix was ready for the water bath it was estimated that its temperature had risen to a point near 2,500 deg. C., and it is quite probable that in some places within the crucible this reached as high a value as 3,500 to 4,000 deg. C.

While the stones thus formed are not large enough to be of commercial importance, it is of more than passing interest, for it points out a way for the manufacture of diamond powder for polishing and grinding purposes, and Mr. Fisher is confident that his future investigations will result in a process by which he will be enabled to produce diamonds of fairly good proportions.

It is stated that the Austrian administration put in service not long ago in the central telephone office of Vienna an automatic section constructed according to the American Strowger system. This section supplies 200 subscribers at present, but it can be extended to take in as many as 10,000 subscribers. The expense of the outfit, as regards the special devices for automatic connection, reach $6,000 for the 200 subscribers above mentioned, not counting the mounting of the apparatus, the wires, etc. This apparatus has been purchased from the German concessionaires of the Strowger patents. Should the trial prove satisfactory, there is no doubt that arrangements will be made to manufacture the apparatus in Austria in order to apply it in Vienna on a large scale.

RECENTLY PATENTED INVENTIONS.

Of Interest to Farmers.

CULTIVATOR.—C. E. A. STICKEL and H. C. ROGERS, Battlecreek, Iowa. The invention relates particularly to the construction of disk-cultivator. One purpose is to provide a cultivator constructed in two sections, so connected that they have independent action and when in action a rocking movement, so that when one section moves upward the other generally moves downward, whereby the cultivator is not liable to clog or choke in damp and trashy soil. The implement will leave the soil in an even condition, well turned over, and with the grain or trash thoroughly covered.

COTTON CHOPPER AND CULTIVATOR.—W. G. SUGG and J. V. SUGG, Searcy, Ark. While this machine is designated as a "cotton chopper" it may be used for chopping out corn or similar crops. The object of the invention is to provide a machine by means of which scraping, dirting, and chopping may be done practically in one operation, thus causing a great saving of time and labor in the cultivation of cotton.

Of General Interest.

PAVEMENT.—G. W. CRICHFIELD, Jersey City, N. J., and W. T. S. CRICHFIELD, New York, N. Y. The object in this case is to provide an improved sheet or so-called "monolithic" pavement; and the invention relates to that general class in which the pavement is formed of bituminous or asphaltic mixtures. Such pavements as usually constructed are formed of a base or binder laid in a continuous sheet and having above it a wearing-surface formed of a mixture having greater elasticity than the base or binder. These pavements have disadvantages and difficulties which are overcome by the provision of an improved pavement formed of a number of separate blocks of convenient size and peculiar composition. The blocks form a continuous, unbroken, and practically monolithic or sheet pavement.

COUPLING FOR DRILL-TOOLS.—F. EDER, Thayer, Mo. This coupling is capable of use in any construction requiring a rigid connection unaffected by rotation. One of the principal advantages of the improved coupling is the absolute security against detachment by reverse rotation. To disengage the parts, access must be had to the chamber. This is an important feature in well-drilling as it is frequently necessary or desirable to reversely rotate the drill.

CONFECTIONER'S CANDY-STIRRER.—M. RAUBOLD, Hopkinsville, Ky. It is customary in making candy to make frequent tests of the liquid candy by means of cold water. These are necessarily inaccurate, because the water is often of different temperatures, and the making of each test ordinarily occasions a stoppage of the stirring operations. The invention prevents the necessity for taking these frequent tests. Mr. Raubold's object is to facilitate observations of temperature of the liquid candy as it cooks.

RECLINING-CHAIR.—C. CONN, Bremerton, Wash. This is a form of chair usable as an ordinary chair or instantly and conveniently converted into a reclining-chair simply by the movement of the body of the occupant. The occupant may assume a full or partially reclining position at will and the parts will remain in their adjusted position as long as desired and will so remain when the chair is vacated until the adjusted parts are purposely disturbed. It is flatly foldable without disconnecting any of the parts.

AIR-SHIP.—W. C. BRANCH, Minneapolis, Minn. This invention relates particularly to improvements in the balloon or body portion of air-ships, the object being to provide an air-ship body portion so constructed that it will move through the air on a practically even keel or without undue rocking or tipping sidewise and that should a leak of gas occur will descend slowly, thus making the ship practically safe for passengers.

CREASING AND FOLDING DEVICE.—E. C. NAYLOR, Gloversville, N. Y. The intention of the inventor is to provide a new and improved creasing and folding device more especially designed for conveniently and quickly creasing and folding fabrics—such, for instance, as shade-cloth—with a view to form a pocket for the reception of a stick, but the device may be used for other purposes, such as folding fabrics for the formation of neckties and the like.

ICE-CREAM CUTTER.—C. A. KULENKAMPFF, New York, N. Y. The purpose of the improvement is to provide a device for cutting at one operation a block or brick of cream in slabs or cakes of equal or varying thickness and to so construct the device that the knives can be quickly and conveniently placed and adjusted in the body-section and secured in adjusted position and wherein the knives may be as expeditiously and readily removed and each part of the device rendered accessible for cleaning.

WATCH-GUARD.—A. FISHMANN, New York, N. Y. The objects in this improvement are to provide means for preventing the removal of a watch or similar object from the wearer's pocket, at the same time permitting the watch to be removed sufficiently for the use of the wearer without the necessity of manipulating any fastening devices or disengaging any hooks or the like.

SOLAR APPARATUS FOR PRODUCING HIGH TEMPERATURES.—M. A. G. HIMALAYA, 13 Rue de Buzenval, Boulogne-sur-Seine, Seine, France. This invention refers to an apparatus for producing high temperatures, particularly in the metallurgical and chemical researches which necessitate the use of temperatures higher than those of ordinary furnaces, including the electrical furnace. It converges solar rays upon a confined focus placed in the center of a furnace, crucible, or other receiver, this furnace, etc., being, if desired, placed completely outside the reflecting system. Means adjust or set the apparatus so as to maintain convergence of rays upon the focus selected whatever the height of the sun above the horizon.

APPARATUS FOR SHARPENING MOWERS.—E. C. SPRINGER, Mason City, Iowa. In the use of this apparatus, the mower to be sharpened having been secured in place and the crank member clamped upon one of its driving-wheels, some fine abrasive material such as flour of emery, is mixed with oil and applied to the ledger-blade, whereupon by rotating the working blades in the opposite direction to that in which they rotate in use, by means of the crank member, their edges will be sharpened. It is particularly applicable to "lawn-mowers."

FIRE-ESCAPE.—E. A. MEADERS, JR., Grenada, Miss. The device may be secured to a window-sill or any convenient object within the room from which the person desires to escape. The operator carried by the sling from the casing may exert any desired tension upon the line in the reel in order to assist in controlling the descent. It is intended to be made of such size that it can be easily carried in a satchel or trunk and can be immediately brought into use when needed in a hotel or elsewhere. Ordinarily the main section of the casing will be about five or six inches in diameter and about two and a half inches thick or in the direction from end to end along its axis.

Hardware.

WRENCH.—E. F. ATKINSON, Battlecreek, Mich. This wrench belongs to that class having a fixed jaw and a movable jaw. The inventor's object is to provide novel details of construction for a wrench which adapt it for convenient adjustment to engage cylindrical or angular objects between its jaws and afford means for reliably holding the movable jaw at a desired distance from the fixed jaw.

SAW.—C. DILKS, Alloway, N. J. In this instance the invention is an improvement in saws, capable of application to band or circular saws, as desired. In practice the application of the bits and keys, will not interfere in any appreciable degree with the tension of the saw at the rim thereof; nor will it detract to any material extent from the ring of the saw-blade in operation.

PIPE-WRENCH.—W. H. BROCK, Seaford, N. Y. This improvement relates to the manner of mounting the lugs. Means are provided to replace the plates when broken or worn out and to greatly cheapen the construction of the wrench. The plates may be made of fine and hard metal, whereas the handle may be constructed of comparatively cheap material. Means enable the pivot-point and channels to be formed by drop-forging. By forming the channels this way the surface is made of comparatively hard metal, whereas if channels were made by milling or by filing the metal left and constituting the bottom and sides of the channel would be comparatively soft.

Household Utilities.

THREAD-CUTTING THIMBLE.—W. H. GAY, Richmond, Va. This form of thread-cutter is a very convenient means for severing the thread from the work without use of scissors and without biting off the thread and is always on the hand when sewing and is conveniently available. It is cheaply made and is not liable to cut the work nor the fingers and presents no unsightly projection from the thimble.

Machines and Mechanical Devices.

TABLET-MOLDING PRESS.—J. F. BUCKLEY, 26 Meath road, Ilford, Essex, England. Mr. Buckley's invention relates to molding-presses, preferably of the hand-operated type, and has for its object the production of a press whereby tablets varying in thickness from the thinnest wafer to a comparatively thick lozenge may be compressed into any given uniform thickness and density at the will of the operator in a very efficient manner.

Prime Movers and Their Accessories.

ROTARY ENGINE.—W. SCOTT, Sheridan, Wyo. The invention relates to improvements in double-cylinder rotary engines using steam, air, or gas as the motive agent, the object being to provide an engine of novel and simple construction in which there will be an economical use of steam or other motive agent. Another object is to provide an engine with speed-reducing mechanism thus adapting it for use in drilling or boring.

Railways and Their Accessories.

CAR-PLATFORM.—A. MELGAREJO, Harrison, N. Y. The general purposes of this invention is to avoid accidents to passengers in getting on or off at stations and to expedite traffic. In railway operation gaps sometimes occur between the car and station-platform at the