which were provided for those who wished to enjoy them. Sometimes a second bath was taken to prepare for the evening meal. It will readily be seen that as three or four thousand people visited the great baths every day, a very large number of servants and slaves were necessary to care for them.

The arrangements which were adopted to run the establishment are so interesting that we reproduce several engravings from the work of the late J. Henry Middleton, "The Remains of Ancient Rome." These illustrations show the methods of heating and fireproofing the baths. We also give an illustration of the present condition of the "*frigidarium*" or swimming bath of the Baths of Caracalla. The portion of the baths which we shall consider is entirely separate from the constructions which were devoted especially to the entertainment of the bathers. The chief rooms in the largest establishments appear to have been put to distinct uses, but in the smaller baths, one chamber was made to do duty for more than one purpose. The chief departments in the large baths were:

1. The *apodyterium* or *spoliatorium*, where the bathers undressed.

2. The *alipterium* or *unctuarium*, where the oils and ointments were kept (although the bathers often brought their own pomades), and where the "*aliptae*" anointed the bathers.

3. The *frigidarium*, or cool room (*cella frigida*), in which usually was the cold bath, the *piscina* or *baptisterium*.

4. The *tepidarium*, a room moderately heated, in which the bathers rested for a time, but which was not meant for bathing.

5. The *calidarium*, or heating room, over the *hypocaustum* or furnace; this in its commonest arrangement had at one end a warm bath, the *alveus* or *calida lavatio*; at the other end in a sort of alcove was:

6. The *sudatorium* or *laconicum*, which usually had a labrum or large vessel containing water, with which bathers sprinkled themselves to help in rubbing off the perspiration.

The rooms which were devoted to bathing proper were often of enormous size. The walls were usually constructed of brick or concrete and the roof was also of concrete. It was necessary to have the walls and ceilings fireproof, as a certain amount of wood was used in the construction.

We present an engraving giving a perspective sketch and section to illustrate the Vitruvian system for protecting the wooden ceiling joists over the hot rooms of the baths by an inner ceiling of tiles. The air space helped to keep the room at an even temperature. The whole under surface of the woodwork had a series of iron bars at intervals of two feet. These bars were supported by iron hooks nailed to the ceiling joists. Tiles two feet square were laid on the rows of iron bars, thus covering the whole areaof the ceiling. The under side of the tiles was covered with a very hard cement called the "*opus signinum.*" Entirely over this was laid an ornamental coating of fine white stucco made of pounded white marble, the so-called "opus albarium." This was so constructed as to prevent the condensed steam from the hot baths striking through the plaster ceiling and the tiles, and causing the wooden joists to rot.

The floors of the baths were carried upon what are called crypto-porticoes, which allowed the servants to appear suddenly in all places, enabling them to attend to the requirements of the bathers without crossing the halls or interfering in any way with the noble Romans. The description by Vitruvius of the hypocausts or hollow floors used for heating the calidaria or hot rooms agrees closely with the existing ruins. We present an engraving, Fig. 2, from Prof. Middleton's work showing sections of the floors and walls of the baths of Caracalla, illustrating the different methods of heating. The *tepidarium* being heated by the hypocaust only, and the *calidarium* both by the hypocaust and the flue tiles up the walls. The following reference to the engraving shows the method of the construction in detail:

AA, concrete wall faced with brick; B, lower part of wall with no brick facing; CC, *suspensura* or upper floor of hypocaust supported by pillars; DD, another floor with support only at the edges; EE, marble flooring; FF, marble plinth and wall lining; GG, underfloor of hypocaust paved with large tiles; HH, horizontal and vertical sections of the flue tiles which line the walls of the *calidarium*; *aa*, iron holdfasts; JJ, socket jointed flue pipe of *tepidarium*; K, rectangular rain water pipe, used where there was a copious downflow of water; LL, vaults of crypt, or basement, made of pumice stone concrete.

The lower floors were laid with 2 foot tiles over a bed of concrete; and on this all over the room rows of pillars were built to support the upper or hanging floor (*suspensura*). These pillars were 2 feet high and were constructed of tiles 8 inches square, set not in mortar but with clay in the joints. In the existing examples these clay joints have been baked into brick by the action of the fire which played among the short pillars all over the space below what is called the *suspensura* (C C). The example of the hypocaust on the left side of Fig. 2 agrees exactly with the description of Vitruvius. Thaton the right is a later variety. It was from these hollow or hanging floors that Roman baths were sometimes called "*balnea pensilia*" or "*balneæ pensiles.*" In later times the architects became bolder in their use of cements and concrete, so that the tiled pillars were frequently omitted and the whole upper floor was supported only at the edges as if it were one immense slab of stone. The *suspensura* or floor was about 18 inches in thickness and was formed of four distinct layers. This main mass was of rough concrete, then came a layer of pounded brick and potsherds. Over this was laid a thin bed of hard white marble cement, and upon it was embedded the marble tesserae or slabs, which formed the upper surface of the floor. The furnace was at one side or below the hypocausts, and the heated air or smoke from it, after circulating between the two floors, escaped up the flue which was formed in the thickness of the concrete walls. This flue was usually formed of a jointed pipe about 10 to 12 inches in diameter. The fluid concrete was poured around these flues. It is probable that the flues were continued above the roof, terminating in a chimney pot for the exit of the smoke, so that there was little risk of any rain water leaking in around the chimney pot.

Another method of heating is given by Prof. Middleton, and is shown at H H, Fig. 2. This was done by lining the hollow wall surface of the bath room with upright lines of flue pipes rectangular in section. These flues communicated at the bottom with the space under the *suspensura* and they were carried up to the top of the building, where the hot air and smoke escaped. Thus the whole wall surface, as well as the hollow floor, was strongly heated. It is believed that the exits of a large row of flue tiles were converged at one point before issuing to the roof.

The methods of heating which have been described were used not only under and around the hot air baths in the great "Thermae," but in the baths of private houses, as the "*atrium vestae*," or house of the vestal virgins.

Fig. 3 gives a section of the small bath room in the upper floor of the *atrium vestae*, showing methods of heating with the hypocaust furnace and the lining of the flue tiles up the walls. The hollow hypocaust passes under the floor of the room and also under the hot water bath, which is made of concrete faced with thin slabs of white marble. The mouth of the furnace is immediately under this bath, which is 6 feet long, 3¼ feet wide and 2 feet 4 inches deep. The pillars made of tiles, which support the *suspensura*, rest on the barrel vault of the room below. The space between the arches was filled in level with concrete and then paved with tiles, and upon these tiles the pillars rest. Three of the four walls of each of these rooms are covered with a hot air jacket in the form of a rectangular flue tile, which are bedded and covered with a thick mass of cement, against which the marble slabs rest, lining the whole surface of the walls.

This is shown in the horizontal section in Fig. 3. It also shows the nails which are driven into the joints of the brick work to form a "key" for the cement into which the flue tiles are bedded, also the **T** shaped clamps which are used at a few places to hold the flue tiles, and also the long iron or bronze clamps to hold the marble slabs. One end of these clamps is driven deep in the concrete wall, the other end is turned down in the upper edge of the marble slab. This interesting portion of the *atrium vestae* appears to date from the time of Severus, about 200 A. D., when important alterations and repairs were carried out. As the house decreases in importance, of course, the size of the bath rooms also decreases, but the general principle which governs the structure is the same, and therefore it affords an interesting study for the architect and archæologist. It is a curious fact that many of our modern systems of fireproofing structures depend largely upon the methods which the Roman architects used in constructing their baths.

The ruins of the Baths of Caracalla seem very confusing, but as soon as the orientation is understood, the plan of the enormous construction begins to unfold itself to the visitor, and he begins to understand how it was that the Romans were able to build masses of buildings easily and economically. When we consider the vaulting, which will probably always remain the crux of the architect who attempts to build in the Roman style, we must remember that it is not arched construction, but is monolithic. With his semiliquid cement the Roman architect was enabled to really cast his vaults. "Grandeur was the dominant trait of antique Rome," and even the coarse splendor of the empire could not efface the racial feeling for mass.

DR. KANDT, a German explorer, has started out to find the ultimate sources of the Nile. Having the promise of assistance from the Congo authorities when he reaches their territory, he has set out from German East Africa, intending to make his way to Urundu, Uhha, and Ruanda. There he will ascertain the size of Lake Akenjaru and measure the volume of water in the rivers Kagera, Ruvuru, Nyakirongo, and Akenjaru in the dry and wet seasons. He will trace that having the greatest volume to its source.

INTERESTING RECENT INVENTIONS.

We give herewith a group of recent inventions for which patents have been issued by the United States Patent Office within the last few weeks. They show the versatility of inventors, and seem to indicate that subjects for invention are not wanting. These examples are taken because of their novelty and originality.

ALMOND'S ROTARY ENGINE.—We have shown an improvement in that class of rotary engines in which tangential cylinders provided with outwardly movable pistons are contained within concentric casings. This invention has some features of interest which we do not remember to have seen in previous forms of rotary engines.

The housing, A, is stationary. The shaft, B, is arranged eccentrically in the housing and carries the head of the engine, consisting of four tangentially arranged cylinders, C, D, E, and F, provided with pistons, C^2, D^2, E^2, F^2. The outer end of each cylinder is open so as to allow the piston to protrude. The inner end of each cylinder has a port, j, for the admission and exhaust of steam. Steam is admitted by a pipe, G, to an inlet pipe, k, formed in the head, d, of the housing, and it is exhausted through the pipe, H, from an outlet port, l, which is also formed in the head, d. The inlet port, k, is of such length as to allow the cylinder, F, as soon as it moves from the position shown, to receive steam, which it continues to receive until it reaches the position of the cylinder, D. The outlet port, l, is of such size and length as to allow a cylinder to exhaust when it reaches a position a little in advance of the position of the cylinder, D, as here shown, and it continues to exhaust until it reaches the position occupied by the cylinder, F.

Each of the pistons carries on a tubular central stem a pivoted shoe, having a steam passage in its pivotal portion communicating with a steam space formed in the shoe, and between the shoe and the cylindrical wall of the housing, A. When steam is admitted to a cylinder, it passes through the tubular stem into the steam space in the shoe, forming a cushion which opposes the outward pressure of the piston, thus avoiding friction, the steam space in the shoe having approximately the same area as the piston itself.

Rotary motion in this engine is the resultant of the outward pressure of the pistons and their angular advance.

This interesting machine is the invention of Mr. Thomas R. Almond, of Dunwoodie Heights, New York.

TURNER'S FIELD MAGNET.—This improvement in field magnets of dynamo electric machines and electric motors was invented by Mr. Charles P. Turner, of this city.

The magnetic permeability of iron used in the field magnet cores of dynamos and motors is much affected by the presence in the iron of carbon, phosphorus and other impurities, which decrease the power of the field magnets for creating lines of force. Alloying iron with other metals also causes losses which are considerable.

This invention is designed to partly or wholly prevent these losses and thus increase the efficiency of the dynamo or motor. The invention is extremely simple. It consists in the combination with the polar extremities of the cast or wrought iron field magnet of a facing of pure iron on the surface adjacent to the armature. The pure iron is deposited electrolytically, and being homogeneous throughout, insures greater permeability than can be realized in the best forgings or castings.

LIVINGSTON'S SOUNDING BOARD.—The engraving only half conveys the idea of the important invention it is designed to illustrate. This is a new sounding board for pianos and other musical instruments, which is designed to give the instrument a greatly improved quality of tone in both the treble and bass, the resonant qualities of the sounding board being proportioned to the requirements by using soft grained wood in the board in the regions vibrated by the lower strings, and fine hard grained wood in the portions vibrated by the higher strings.

In the construction of this sounding board the inventor not only improves the quality of the board, but he is enabled to use short pieces of hard grained lumber which have heretofore been wasted.

The inventor, Mr. James C. Livingston, of Little Falls, N. Y., has succeeded in securing broad claims for his simple but important invention.

LOTHERINGTON'S SAIL ATTACHMENT FOR BICYCLES.—The illustration shows an attachment to bicycles, which will be appreciated by wheelmen, who, after having ridden against head winds, are able to set sail and go without exertion in the opposite direction.

The invention is a simple and compact attachment by means of which sails, carried by spring rollers, are spread and held in the position of use by gaffs hinged by a ball and socket joint to the upper end of the roller casings. The gaffs, when the sails are furled, lie over the sails in the casings or tubes, closing them. The rider may readily set the sails by pulling chains or cords attached to the gaffs.

The inventor of this device is Mr. Thomas Lotherington, of Ardmore, Indian Territory.

BERG'S FEED WATER REGULATOR.—This is a differential feed water regulator, used for regulating the

supply of feed water to a steam boiler or a battery of boilers, and is to be used in connection with boiler feeders of various kinds, and, when it is desirable, it is furnished with a high and low water alarm.

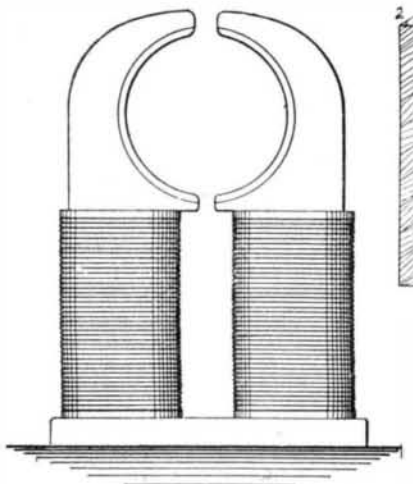
The shell or casing, A, is divided into four chambers; the main chamber, a, the interior chambers, a′ and a^2, in the lower part of the casing, and a sediment chamber, a^3. This chamber is connected by a pipe, a^4, with the water space of the boiler. As the difference between high and low water in a boiler is comparatively small, the motion of the water from a steam boiler to the bottom of the chamber, a^3, and back into the boiler is slow and steady, so that the sediment contained in the feed water can be readily collected at the bottom of the chamber, a^3. There is a screw plug in the bottom of the casing for removing the sediment.

The casing is provided with the usual accessories, such as a water gage, pressure gage, etc. On the exterior of the casing is formed a lip which is located on a level with the main water level of the steam boiler. A valve cylinder, B, is supported in the horizontal top and bottom walls of the interior chamber. It has three groups of ports, the groups—upper groups—being arranged near the upper end of the valve cylinder, while the lower group is located in the chamber, a′. The valve cylinder, B, is provided with inwardly projecting annular ribs, to which is fitted a connecting tube, B′, forming in the interior of the valve cylinder two spaces, a cylindrical space and an annular space. The middle and lower groups of the ports communicate with this annular space, while the upper groups of ports communicate with the interior space of the tube, B′. The intermediate group of ports is located in a groove or depression, which is larger than the ports. This group is opened or closed by the float valve, C.

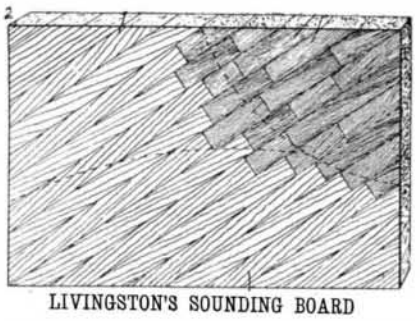
The chamber, a^1, is connected by a pipe, d^4, with the water space of the boiler, while the discharge pipe of the feed pump is connected with the bottom chamber, a^2, by a pipe, d^5. In the chamber, a^2, is arranged a small perforated brass plug, e, which conducts to the main casing the air that is liberated by the heating of the feed water. The air rises and is collected in the chamber formed in the inverted float, C, so that the air space therein is constantly supplied with air. The upper part of the casing, A, is connected with the steam room of the boiler by pipes, a^5, a^1. With the rise of the water in the steam boiler, the float valve is moved upwardly, so that the middle group of ports is gradually closed, and the pressure in the discharge pipe of the feed pump gradually increased and the motion of the feed pump retarded. The steam cylinder of the feed pump is provided with a pressure regulator which causes the opening or closing of the steam valve of the pump according as the pressure in the discharge pipe is increased or decreased.

When the pressure regulator is not used, the piston valve, D, is made to control the steam passing out of the pipe at the top and supplying the pump with steam.

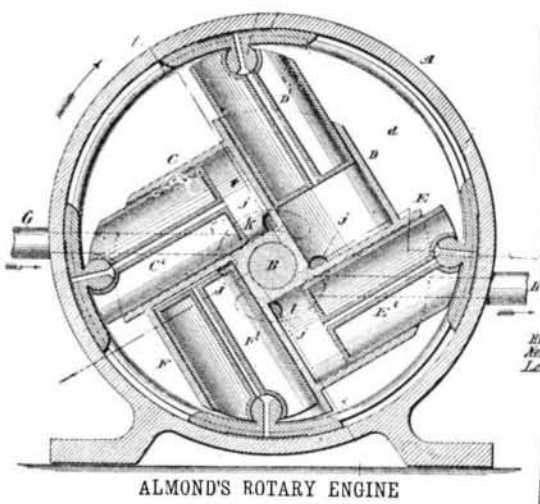
When the water level in the steam boiler falls, the float valve is lowered by its own weight, and the middle group of ports is gradually opened, when the pressure in the discharge pipe of the feed pump is de-



TURNER'S DYNAMO ELECTRIC MACHINE AND ELECTRIC MOTOR

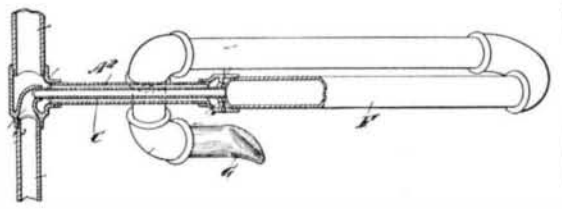


LIVINGSTON'S SOUNDING BOARD

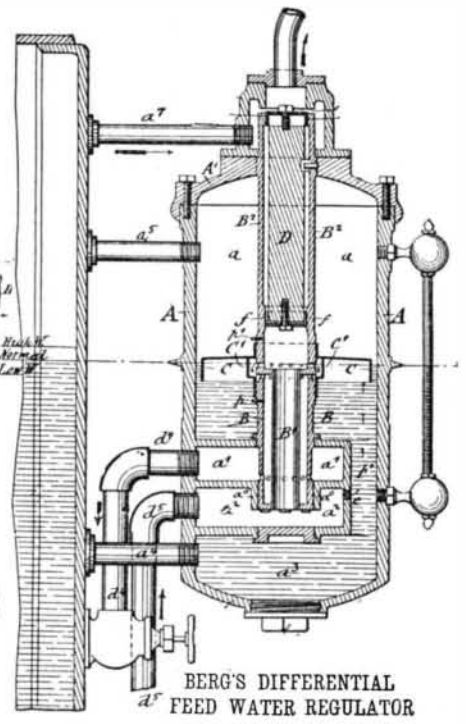


ALMOND'S ROTARY ENGINE

LOTHERINGTON'S SAIL ATTACHMENT FOR BICYCLES

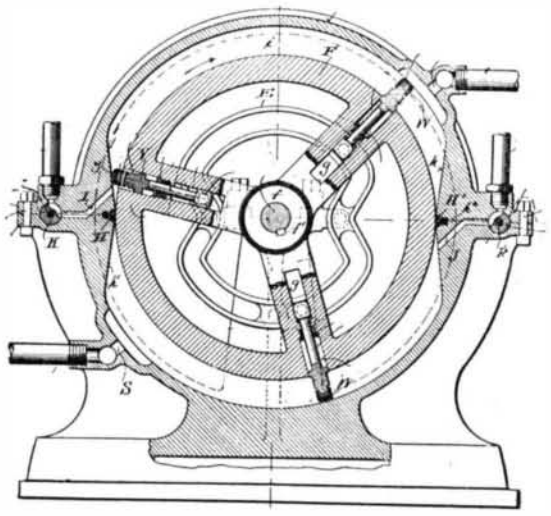


BARRETT'S HYDROCARBON BURNER

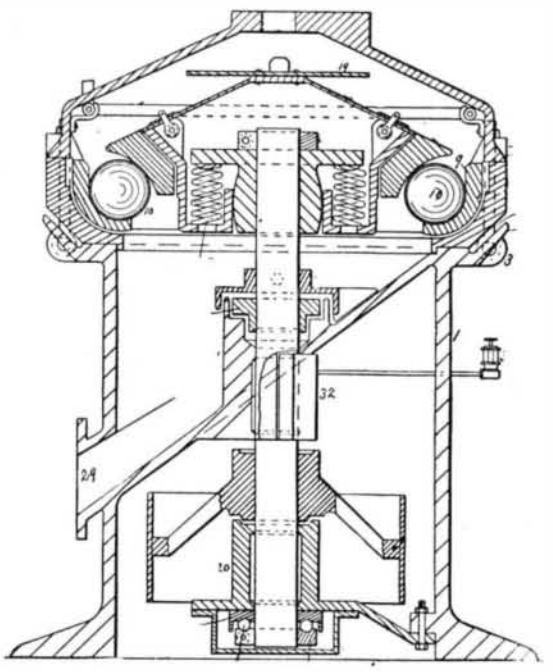


BERG'S DIFFERENTIAL FEED WATER REGULATOR

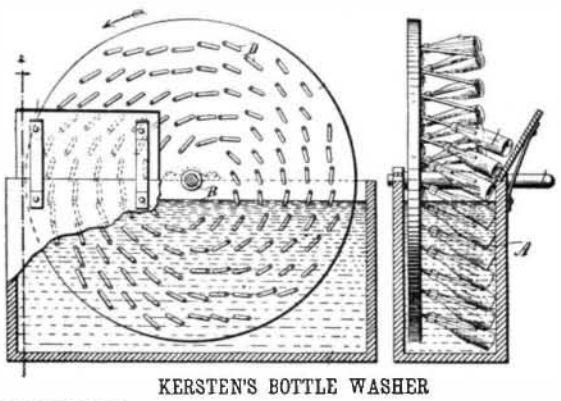
BROOKE'S CIGAR LIGHTER



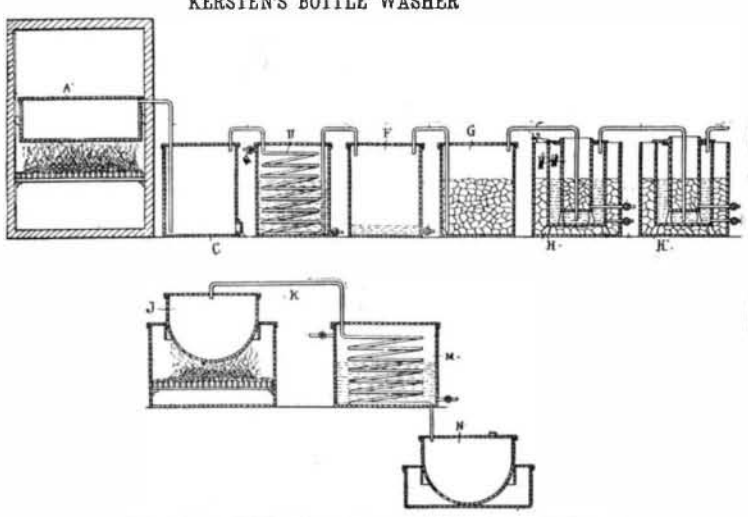
FLEISCHER'S ROTARY ENGINE



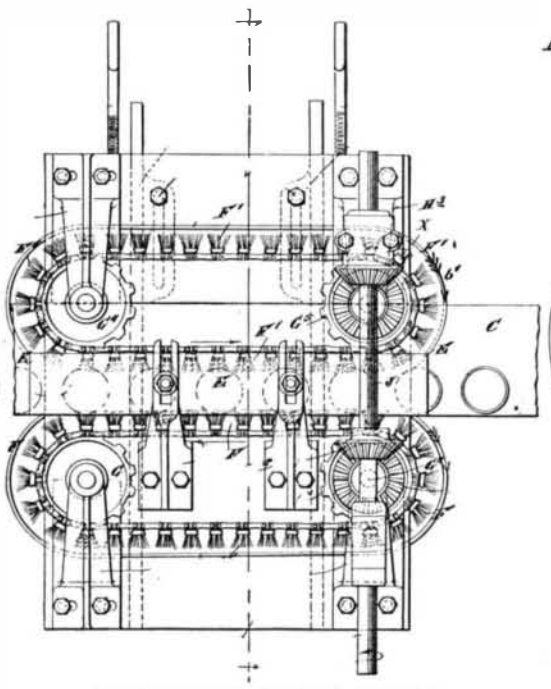
MORRIS'S BALL PULVERIZER



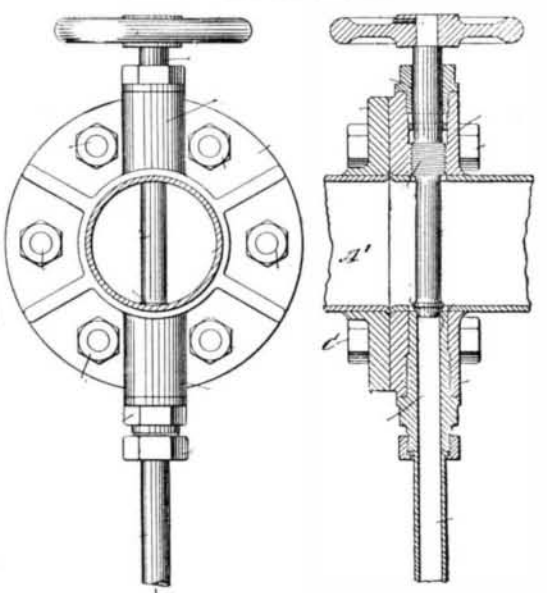
KERSTEN'S BOTTLE WASHER



NAGEL'S PROCESS OF MAKING ARTIFICIAL CAMPHOR



SEUFERT'S CAN WASHING MACHINE



MARCHAUT & DORMOY'S VALVE

SOME RECENT AMERICAN PATENTS.

creased, so that the motion of the pump is accelerated and the steam boiler is supplied with water according to the quantity of steam used.

The inventor of this feed water regulator is Rudolph Berg, of Pittsburg, Pa.

NAGEL'S PROCESS FOR THE MANUFACTURE OF CAMPHOR.—Early in the present century it was known that a product sometimes called "artificial camphor" could be produced in the laboratory, by passing hydrochloric acid through turpentine until the latter was saturated. The product, however, was not camphor, nor artificial camphor, but a hydrochlorinated terpene. It has lately been discovered that camphor can be made from hydrochlorinated terpene, and it is possible to produce camphor artificially on a commercial scale.

Oskar Nagel, of Vienna, Austria-Hungary, has invented a patented process in which hydrochlorinated terpene is converted into true camphor. In carrying out this invention, the inventor employs anhydrous hydrochloric acid and anhydrous turpentine; but a slight departure from the absolutely anhydrous state in either of the materials named does not cause a failure in the process. Hydrochloric acid gas is first produced and dried, and the turpentine, which may be any pure commercial article, is made by adding calcium chloride, which absorbs the water, and which is settled by filtration.

The anhydrous hydrochloric acid gas is passed through the turpentine until the saturation point is reached. During the passage of the gas through the turpentine both are cooled by a refrigerating agent, such as ice and salt. When the point of saturation is reached there is found in the vessel in which the operation has been carried on a crystalline substance and a heavy liquid. The latter is pumped off and filtered to obtain the crystals held in solution. These crystals with the crystalline precipitate are the hydrochlorinated terpene. These crystals are recrystallized with benzine or washed with alcohol; then the inventor mixes the same with lime, using about three parts by weight of crystals to one of lime; then distilling and producing camphene, and first a by-product, calcium chloride. The camphene is then treated with nitric acid under moderate heat, thus freeing the oxygen, which is taken up by the camphene, the product being camphor.

The apparatus by means of which the camphor is made is illustrated by the cut which shows the tank, A, in which is formed the hydrochloric acid gas, the heavy products being deposited in the tank, C. The gas then passes through the worm, D', which is cooled by water. It is then discharged into the closed tank, F. In this tank the moisture is condensed and separated from the gas and the dried gas passes off through the tank, G, containing calcium chloride. The gas is then passed into the tank, H, which is provided with an inner tank containing the turpentine. In this tank the combination of the hydrochloric acid gas with the turpentine is effected. The tank in which the combination is effected is kept at a low temperature by ice. The gas escaping from the turpentine in this tank is introduced in the same manner into the turpentine contained in the tank, H'. After the crystals are formed in the turpentine and precipitated, they are transferred to a vessel, J (shown in the lower figure), and the lime is added. The mixture is then distilled, the gas passing off through the pipe, K, to the worm in the vessel, M, where it is cooled.

The product at this stage of the process is camphene ($C_{10}H_{10}$). This camphene is then treated in the vessel, N, by adding thereto nitric acid. Other oxidizers may be employed in place of nitric acid. The result of this process is a body of crystals which may be compressed into a solid, and which is the same as the natural camphor found in commerce.

BROOKE'S CIGAR LIGHTER is designed to act as a shield for the end of a cigar while the match is introduced and the cigar is being lighted.

It consists of two similar halves stamped from sheet metal and fastened together with a rivet to form a chamber, into which the end of the cigar is inserted and which shields the flame of the match so as to prevent it from being extinguished.

This invention is due to Isaac Brooke, of Pottstown, Pa.

MORRIS' BALL PULVERIZER.—The machine shown in the engraving was invented by Mr. William L. Morris, of Cleveland, O., and is designed for pulverizing rock and ores carrying deposits of precious metals. In the upper part of the casing there is a circular channel or track, 9, in which are placed balls, 10, which are caused to roll around on the track by the carrier, mounted loosely on a vertical shaft so that it will not turn on the shaft, while it is capable of adapting itself to the work to be done.

The top of the carrier is provided with a disk, 19, on which the ore is delivered. When the shaft is revolved, the carrier, which rests upon the balls, causes the ball to travel around the ball track, and the material fed to the machine and thrown outwardly by centrifugal force is pulverized by the combined action of gravity and centrifugal force. The material pulverized drops into the chute, 29, and is delivered at the side of the machine. The spiral springs hold the driver down to its work.

FLEISCHER'S ROTARY ENGINE.—In this engine the piston consists of a cylindrical carrier, F, having three radial guides containing pistons, each having a rod extending inward and provided on the inner end with an arm carrying a roller which runs in the cam, E, and serves to keep the pistons in contact with the inner surface of the cylinder throughout the entire revolution of the engine, and to carry the pistons over the abutments which are on diametrically opposite sides of the cylinder. Steam is admitted through ports, I, J, and valves, K and K^1, in the abutments, and the exhaust passes out through ports, R, S. The pistons are packed and the abutments are provided with packing at H, H^1. Steam can be cut off at any desired point by means of the valves, K and K^1. Mr. Richard J. Fleischer, of Milwaukee, Wisconsin, is the inventor of this engine.

BARRETT'S HYDROCARBON BURNER.—In this burner an oil feed pipe, C, is inclosed by the steam pipe, A^2, and a retort, F, extending outwardly, and is made in the form of a coil, upon the end of which is placed a burner, G, having a flaring mouth reaching under the retort, F. Steam issuing from the pipe, A^2, atomizes the hydrocarbon and passes it through the retort, the mixture being in condition to burn as it issues from the burner, G. The inventor of this burner is S. A. Barrett, of San Bernardino, Cal.

KERSTEN'S BOTTLE WASHER.—This machine consists of a disk carrying a number of pins projecting from the face thereof at an angle, the disks being mounted on a shaft and arranged to rotate in a tank filled with a cleansing solution. On the front of the tank at one side is arranged a guideboard which engages the butt ends of the bottles as they move downward into the liquid, and the tank is of such a width as to prevent the bottles from sliding off the pins during the time they are traveling through the liquid in the tank. As the bottles descend into the liquid they readily fill, and as they rise upon the opposite side they discharge the cleansing liquid back into the tank. The bottles are removed from the pins as soon as they emerge from the sterilizing liquid.

The engraving shows front and side views of this machine, which has been patented in the United States and several foreign countries by Emil Kersten, of Richmond, Va.

SEUFERT'S CAN WASHING MACHINE.—The rubber feed pipe, C, carries the filled cans forward under the cover, E, while the cans are acted upon by the brushes, F, F', mounted on endless chains and running in opposite directions. By means of this arrangement the cans are turned around several times in their passage through the machine. It is almost unnecessary to say that the cans and brushes are submerged in a cleansing liquid during the operation of washing. Guards are provided for preventing the water from splashing.

This invention was recently patented by F. A. Seufert, of The Dalles, Oregon.

MARCHAUT & DORMOY'S VALVE.—The annexed engraving represents an improved valve designed for draining the water of condensation from a steam pipe,

On the end of the steam pipe is secured a thick flange, which receives bolts passing through the flange of the adjacent section. The bottom of the thick flange is formed of an enlargement into which is screwed an outlet or discharge pipe, having at its upper end a valve seat, and in the top of the same flange is a threaded opening above which is arranged a stuffing box. The valve is screwed into the opening, and the valve stem extends across the diameter of the pipe and holds the valve formed on the end thereof in contact with the valve seat. The valve stem is turned by the hand wheel when it is desired to open or close the valve. The inventors of this valve reside in Bordeaux, France.

RECENTLY PATENTED INVENTIONS.

Engineering.

CONDENSER.—Albert Hoberecht, Ensenada, Mexico. For locomotives and other engines, distilleries, and wherever it is necessary to condense steam or vapors, this inventor has devised a condenser with cold air tube extending centrally through its body and water offtake within the flue, around which are cooling chambers having perforated portions, there being lateral air tubes and baffle plates. The condenser is designed to save the water now passing off in the exhaust and permit its use over and over again. The body of the condenser is divided into sections by the baffle plates, with an annular perforated air chamber in each section, the air chambers and baffle plates being preferably arranged in series.

SIGHT FEED LUBRICATOR.—Alexander A. De Witt, New York City. The reservoir forming a portion of this lubricator is connected at its lower end with the lower portion of the sight feed tube, there being a check valve between the feed tube and reservoir and opening toward the feed tube, and a plunger in the reservoir to regulate the height of the liquid in the feed tube. Any desired pressure may be applied upon the column of liquid in the reservoir, to make the feed of the reserve column in a measure automatic, and the liquid may be readily discharged whenever desired from both the reservoir and the sight tube.

Mechanical.

TOOL FOR STONE PLANERS.—Charles A. Thomson, Kearney, N. J. This is a tool for forming a corrugated or tooled surface at right angles to the travel of a planing machine, and is attachable to the ordinary tool head, to which the body of the device is bolted. Its lower portion has recesses to receive a cam-carrying shaft actuated by a flexible shaft connected with any convenient revolving shaft, and the body of the device has guides for the movement of a reciprocating plate to which is bolted the cutting tool, the plate having lugs embracing the cams, whereby the motion of the plate will be positive in both directions. The cutting tool may be of any width necessary to cover the surface of the stone operated upon, and the device may be attached to a tool head adapted to work on the side of the stone as well as on top.

Agricultural.

CORN HARVESTER.—James L. Hart, Grenola, Kansas. This is a machine which may be attached to a lumber wagon or similar vehicle, when its cutting and directing apparatus will be fastened to the under side of the wagon bed in front of the hind wheels, and the dropping mechanism to the lower end of the wagon body. The machine automatically cuts the stalks, which are received on a dumping platform and delivered upon the ground when a sufficient quantity has been cut, the stalks being carried out of the path of the ground wheels. The machine may be accommodated to rows of different widths.

Miscellaneous.

HARDENING RAILS.—Harry C. Clement, New York City. To secure a more thorough and uniform hardening of rails this inventor provides a hardening tank having passage for the rail and a sprinkling device, a cooling tank having an entrance for the rail, which is received by carriages traveling on the tank transversely of the track of the hardening tank. Water is sprinkled against the head only of the heated rail, the rail being inverted so that as the water heated by contact falls away its place is supplied by fresh, cool water, and the hardened rail, while still inverted, having its head immersed in water.

HEATING AND VENTILATING APPARATUS.—William L. White, Princeton, Ind. According to this invention a jacket or casing surrounds a fire box or furnace proper, and is separated from it by a space for the air to be heated and passed into living rooms, the casing being made and supported independent of the fire box, and an outer casing surrounding the inner one, being attached to its cornice and supported at the base independently. The fire box and its casing may be used alone, the outer casing constituting an independent ventilating attachment which may be easily and quickly bolted in place or removed.

RADIATOR.—Augustus Eichhorn, Orange, N. J. To make an easily adjustable hot water radiator, for varying the degree of heat thrown off, this inventor employs a series of radiating loops communicating at each end, excepting one loop which has its lower end shut off from communication with the contiguous loops and its upper end in communication with them. This loop communicates at its lower end with a water feed pipe, and each end loop communicates with a return pipe, the latter pipes being valve-controlled and having air vents. The loops on each side of the feed may be thrown in and out of action by the opening or closing of the valves to the return pipes.

PERMUTATION PADLOCK.—Theodore R. Vinzent, Salem, Oregon. This is a lock of simple and durable construction, which permits of many combinations, is inexpensive to manufacture, and is arranged to enable the owner to readily change the combinations to prevent unauthorized persons from tampering with the lock. The lock has a sleeve with longitudinal slot from which lead transverse recesses, tumblers turning on the sleeve having recesses registering with the slot, while a bolt engaging the sleeve has lugs engaging the slot. At the end of the shell is a graduation enabling the owner to bring the several tumblers into proper position for opening the lock.

SIPHON HEAD.—Emil Stahl, Hoboken, N. J. In heads to be attached to mineral water bottles or others where the waters are charged with gas, according to this invention, the head is so constructed that an excess of gas in the bottle, rendering it liable to explode, will cause the valve to open sufficiently to discharge the excess, thus rendering the bottle safe. The valve is spring-controlled and is located over and normally closes the outlet. It has a body portion sliding in the upper portion of the head, and is raised by a removable lever provided with a shoulder at the intersection of the head with the body, adapted to engage the valve body.

CABINET FOR BLANKS.—Abram M. Kinsel, George A. Hunter and Seth B. Nolley, Dallas, Texas. For use in hotels, post offices and other public places, this inventor has devised a cabinet for stationery, having a compartment with discharge opening at one end, a false bottom with spring beneath it, and a spring detainer having a pointed free end which presses upon the stationery, thus serving to prevent withdrawal of the sheet underlying the top one. The cabinet also has a similar envelope compartment, permitting the removal of envelopes singly as required.

STORM APRON CASE FOR VEHICLES.—William Fetzer, Sheldon, Iowa. This casing is preferably formed of carpet or similar material, its lower edge secured to a transverse strip upon the floor, which is adapted also to serve as a rest for the heel, while a suitable number of short straps secured to the front body of the vehicle are adapted to buckle with longer straps extending upward from the floor strip to hold the casing in place over the folded apron. The casing may serve as a boot rug when the apron is in service.

LAMP WICK RAISING OR LOWERING DEVICE.—William C. Quiggle, Pine Station, Pa. To enable a person to readily raise or lower a wick with either hand, from either side of a lamp, this inventor provides a device of which the shaft or spindle extends on both sides of the lamp, there being at each end a head for turning the shaft, and each head having teeth, the teeth of the two heads standing in the same direction. As one places the fingers on the head, the direction of the teeth indicate the way in which the head should be turned to raise or lower the wick.

FIRE KINDLER.—Nicoll MacDonald, Mount Oliver, Pa. This is a kindler designed to produce a strong flame for about fifteen minutes, and then become a glowing mass for about fifteen minutes more, or until entirely consumed. It is made in the form of a hollow brick with detachable base section and transverse partitions, of pulped paper, sawdust and pulverized coal, and, after moulding and baking in an oven, it is saturated with a combustible compound, which preferably consists of a specified mixture of coal tar, crude petroleum and resin. A surface binding solution of flour, resin and water closes the pores and gives the article a glossy surface.

HAT HOLDER.—Julia Egan, Savannah, Ga. To securely hold a hat in a trunk or box, preventing the hat from being crushed or otherwise injured, this inventor provides a holder readily adjustable for hats of different sizes. It consists of a base adapted to be fastened by screws or otherwise to a tray or other fixed part, and on the base is a short post from which extend a series of arms each carrying a slidable spring clamp adapted to engage the hat brim and hold the hat in place. When the device is not in use, the arms may be removed from the post and folded to take up but little room.

ROCKER.—Joseph S. Byrnes, Brooklyn, N. Y. This is a device for use on chairs, bicycle saddles, etc., and consists of a base made in three sections and having a curved top, while a rail curved in an opposite direction to the top of the base is adapted to ride on it. On the under side of the central fixed section of the base is a lug to be screwed on the bicycle saddle post, and each of the two side sections is connected by a hinge to the central section. The rail, connected to the saddle, as it rocks forward on the top surface of the base, draws the rear section upward, swinging on its hinge, and when the rail rocks rearwardly the front section of the base swings upward, the rail being always permanently connected with the base, and the rail and seat readily following the movement of the rider's body.

MEAT HANGER.—Joseph Beaulieu, Hot Springs, Ark. A device especially adapted for