wardly at 6, and adjacent chambers are connected by means of external rings 8 and internal apertured sleeves 4 which abut against ribs 9 formed on the internal surfaces of the rings 8. Tubular cross-braces 3 may connect the tubes 1,

FIG. 1.

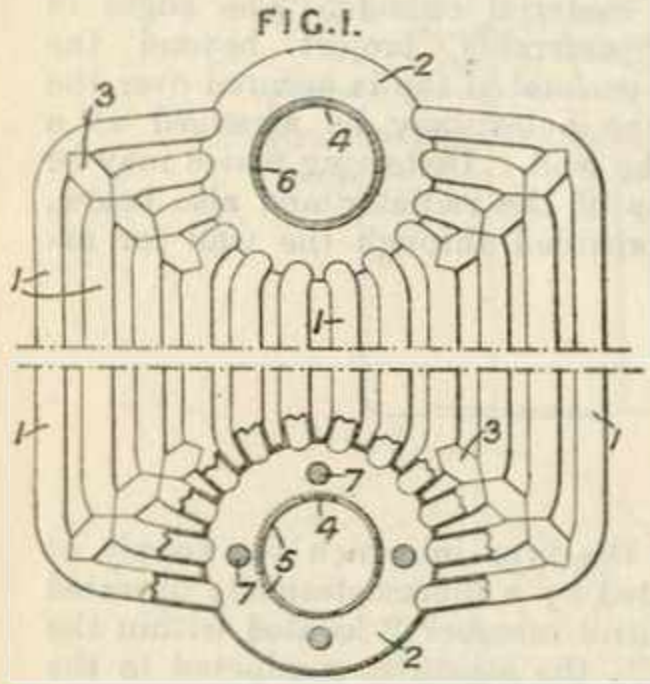
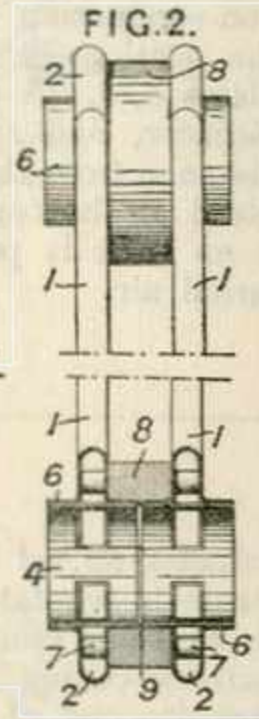


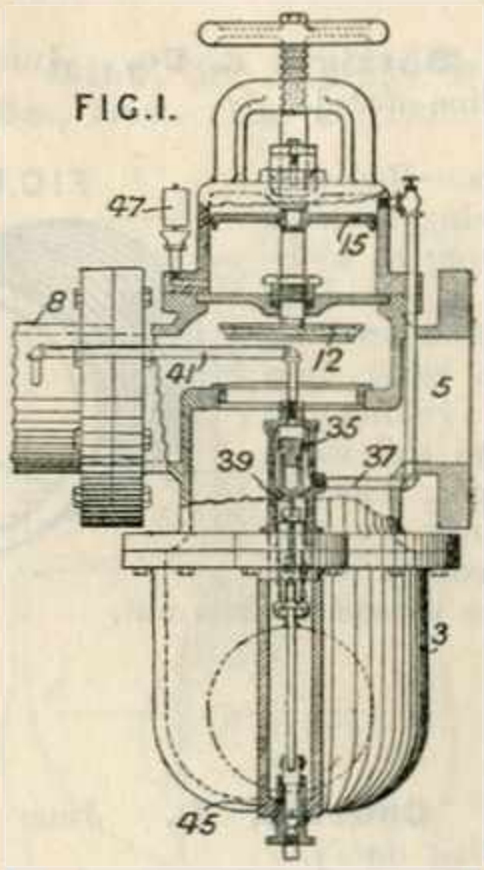
FIG. 2.



while the chambers 2 may be further strengthened and supported by a number of internal rods 7 which, when the sections are formed electrolytically, may be inserted in position toegther with the sleeves 4 during the casting of the fusible core.

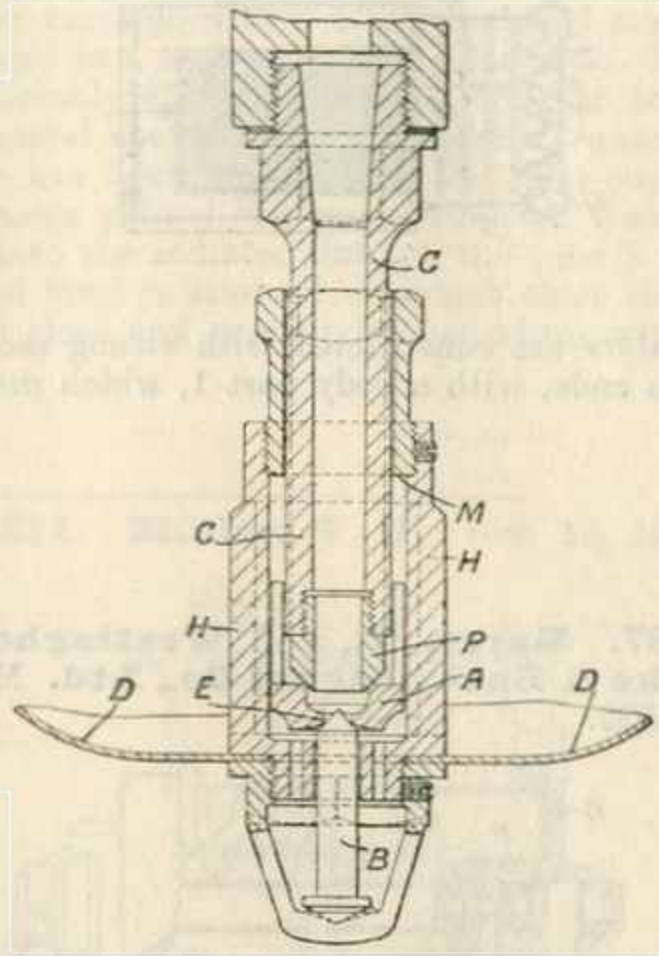
199,892. Kelly, J. F. May 10, 1922.

FIG. 1.



Steam traps.—An emergency control valve for cutting off the supply of steam to the engine when the pressure in the supply pipe falls also cuts off the steam supply when water carried over by the steam collects in the valve chamber. A signal is automatically operated when the valve is closed. Water collecting in the valve chamber 3 is discharged through a valve 45 connected to a float.

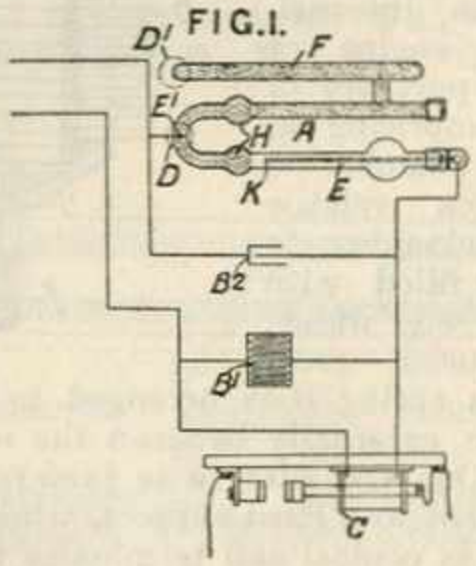
199,936. Brown, R. L., Hopkinson, R. A., and **Hopkinson & Co., Ltd., J.** June 14, 1922.



Steam traps.—The main valve A is of cage-like form sliding upon the depending discharge pipe C, and is hollowed out to form a ring which seats upon the end P of the pipe C. A pilot valve B adapted to be opened on the falling of the bucket D controls a central passage E through the main valve A. At the end of its downward travel the shoulder M on the sleeve H forces the main valve from its seat.

200,124. Maclaren, R. June 20, 1922.

FIG. 1.



Thermostats.—Relates to thermostatic apparatus for controlling the temperature of electric or hot-water radiators or heating and cooling apparatus of the type, such as is described in Specification 191,515, comprising a **U**-tube A containing an expansible fluid and mercury H and provided with electrodes connected to a solenoid controlling an electric switch. In order to avoid sparking

when the apparatus is used in a town supply up to 250 volts, a condenser B^1 is connected across the terminals of the solenoid C and a second condenser B^2 across the electrodes in the **U**-tube. A single **U**-tube with an enlargement F is employed and carries, in addition to the fixed electrode E^1 always in contact with the mercury, only one other electrode E to regulate the maximum temperature, such electrode being ground with a flat face K. Plungers inserted at D or D^1 regulate the temperature at which the apparatus responds.

200,150. Wade, H., (*Nash Engineering Co.*). March 10, 1922.

FIG. 1.

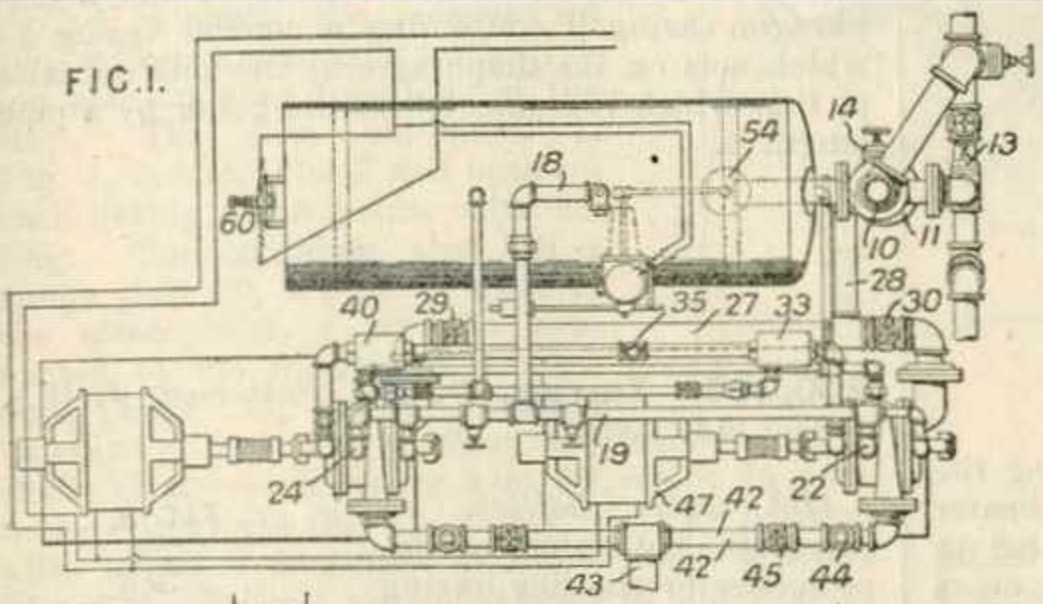


FIG. 8.

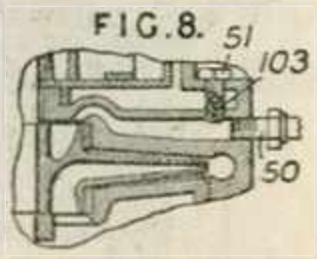


FIG. 3.

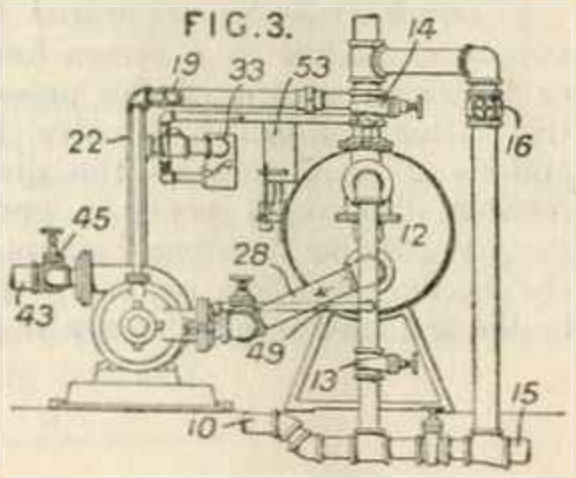


FIG. 5.

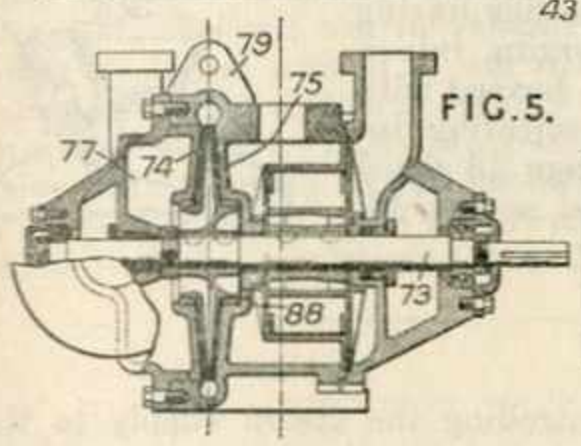
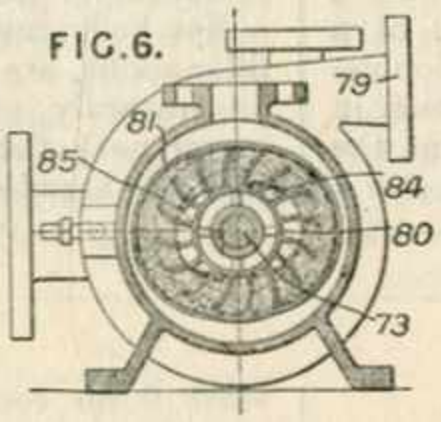


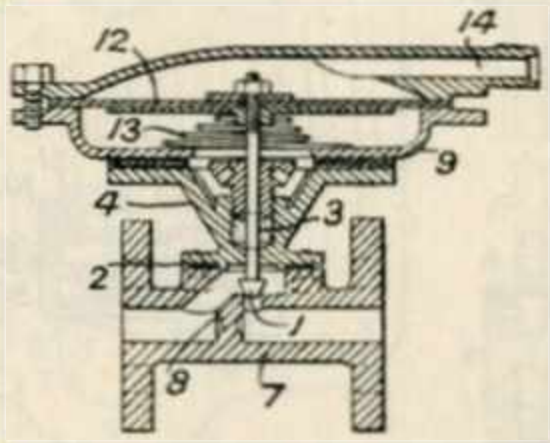
FIG. 6.



Heating buildings.—A water and air pumping system has a receiving tank for air and water, a pump for withdrawing air from the receiver and a second pump for withdrawing water; the operation of the pumps may be controlled by means governed by the pressure and amount of water in the receiver. The return pipes 10 from the heating system &c. discharge through a strainer 11 into the upper part of the receiver 12, the flow being controlled by valves 13, 14. In the form shown, two pumping sets are employed each driven by an electric motor 47. The inlet of each of the air pumps is connected by pipes 22, 24 to the header 19 and then by the pipe 18 to the top of the tank. The inlet of each water pump is connected to a header 27 and then by a pipe 28 to one end of the receiver at a slight distance above the bottom and valves 29, 30 in the header control the flow to the pumps. The air from the pumps is discharged from the pipe 35 into the atmosphere after passing through separators 33, 40 for collecting any water from the air discharge. The water from the pumps is discharged through the header 42 and pipe 43 into the boiler. Check valves 44 prevent the return of water to the pumps, and stop valves 45 are also provided. A pipe 49 supplies water to keep constant the supply in the air pumps; the quantity supplied is controlled by the orifice 103 of the plug 51, Fig. 8, at the end of the connection 50 of the pipe 49. The motors 47 are controlled by switches 53, 60 the latter of which is operated by a diaphragm under the influence of the air pressure in the receiver, while the former is operated by a float 54 in accordance with the quantity of water in the receiver. One of the pumping units is shown in Figs. 5 and 6. The shaft 73 carries the impeller for each pump, the water impeller 74 rotating in the casing 75 with an inlet chamber 77 and discharge 79; the air rotor 80 is arranged with a water seal in an elliptical casing 81 having inlet openings 84 on one side and discharge openings 85 on the other side, the two sets of openings being arranged at right angles. Air passes into the spaces between the rotor blades from the inlets 84, and as the impeller rotates these spaces become smaller since water surface approaches the hub, thereby forcing the air through the openings 85. The water that escapes with the air is replaced through the pipe 49 or through the port 88 at the side of the water pump. In operation the returns from the pipes 10 flow into the tank 12 and the water flows through the pipe 49. Later the water flows through the pipe 28 to the centrifugal pump. The float 54 then closes the switch 53 and starts the motors 47. The water pumps discharge water to supply the boiler and the air pumps exhaust air from the receiver. If the water reaches the required level while the air pump is still operating, the water pump be-

comes air-bound and requires practically no power. When the air pressure falls to a predetermined value, the diaphragm switch 60 is operated to stop the pumps. In a modification the diaphragm for operating the switch is arranged near the bottom of the tank so that it is controlled by both air and water pressure.

200,359. Still & Sons, Ltd., W. M., and **Still, E. H.** July 10, 1922.

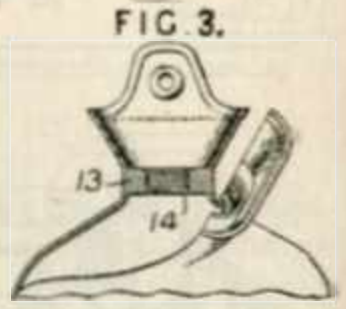


Thermostats.—An apparatus for regulating the supply of steam to a steam-heated water-heater or boiler by means of the pressure generated in the latter comprises a valve 1 mounted on a spindle 2 connected to the diaphragm 12 of a flexible diaphragm pressure governor, a double-flanged tubular member 7 adapted for location in the steam pipe-line at some distance from the boiler and having a valve seating 8, a connector 4 fitted with a stuffing-box 3 through which the spindle 2 passes and arranged for ready connection to the member 7, and when disconnected giving access to the valve seating 8, and a diaphragm casing 9 containing a conical spring 13 which acts on the diaphragm at the side opposite to that which is connected to the boiler by a pipe-length 4.

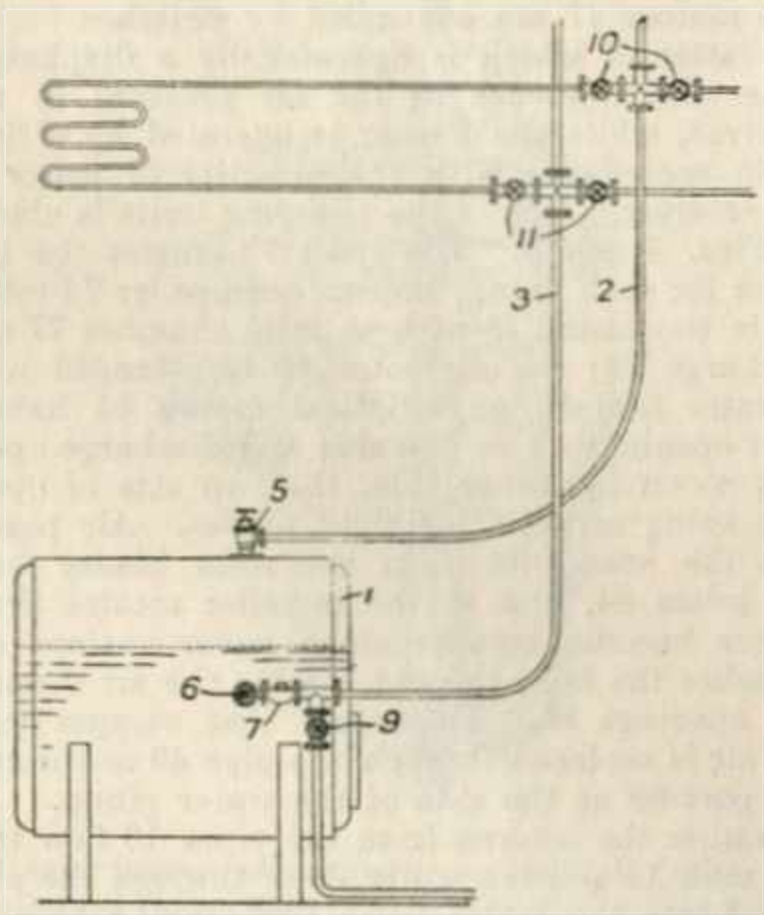
200,393. Imray, O. Y., (*Patterson, J. W.*). Aug. 15, 1922.

Hot-water bottles. — Seamless hot-water bottles of rubber or the like having a flat body merging into a filler spout, are formed with an inwardly projecting integral neck flange 13 fitted with a threaded socket 14.

FIG. 3.



200,697. Dickie, C. July 12, 1922.



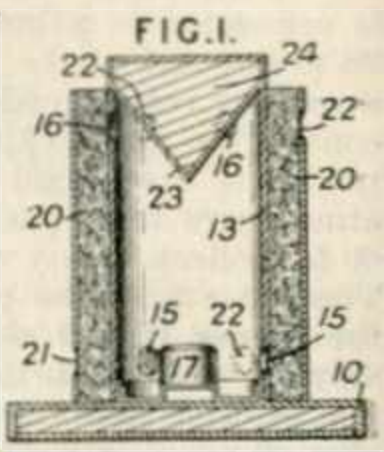
Heating buildings &c.—In a steam heating-system for buildings &c. of the kind in which the steam circulation is aided by the downward flow of condensed water from the radiators on the return side of the system, there are provided a valve 5 for controlling the steam supply to the pipe 2, a stop valve 6 and non-return valve 7 controlling the return of steam and condensed water from the pipe 3 to the boiler 1, inlet and outlet valves 10, 11 in connection with each radiator, and a valve 9 for initially draining off the condenser water.

Reference has been directed by the Comptroller to Specification 14181/14.

200,909. Welch, W. H., and **Frost & Co., Ltd., H.** April 20, 1922.

Heat-storing apparatus.—In vulcanizing-apparatus comprising a base 10 heated by conduction from a flue 13 surrounding a fuel-container 17, the top of the flue is closed by a plug 23 preferably cone-shaped and made of metal of high specific heat, or as a shell filled with an alloy 24 fusible at a temperature not less than that required for vulcanizing to act as a heat-storage element.

FIG. 1.



200,950. Monahan, T. W., and **Wilson, T. C.** May 1, 1922.

Steam traps.—In steam traps having a float or bucket and tumbler mechanism for automatically operating two valves, the float and a rocker arm are mounted on a shaft, the arm operating a loosely mounted weight member which in turn moves a two-armed lever on a second shaft from which a disc valve is controlled, whereby the pressure on the casing is altered for the filling and draining functions of the trap. The float container 1, Fig. 1, has an inlet 7 and outlet 6 each having a non-return valve fitting. The container also has a gauge glass 10, a pipe 16 open to the atmosphere, a pipe 15 connected to the condenser, a pressure gauge 14, and a pressure equalizing pipe 5^1. A float 20, Fig. 3, on a shaft 17 moves a rocker arm 19 which in turn moves a weight 21 up to its vertical position after which it continues to move under gravity. Stops 22, 23 limit the movement of the weight. Arms 25, 26 on a shaft 27 are moved by contact with the weight and thus operate a valve disc 28 on the shaft 27. This disc controls ports in a valve body whereby in one position the container is coupled to the pipe 15 for keeping the pressure below that of the condenser and allowing the container to fill or in the other position is coupled to the pipe 16 for allowing the container to drain. The valve disc is kept on its seat by a spring 38, the compression of which can be adjusted. The valve and shafting are carried by a casting 51 bolted to the casing 1. In a modification, a bucket is used in place of a float, and the valve disc has rollers for reducing friction.

FIG. 1.

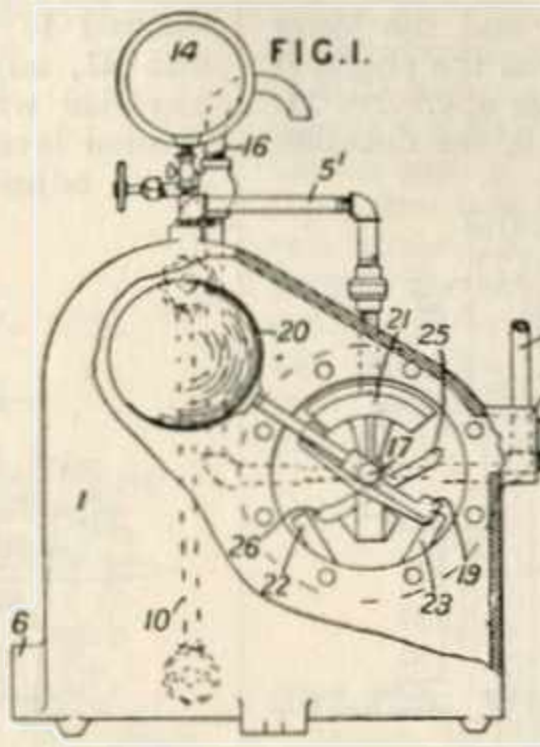
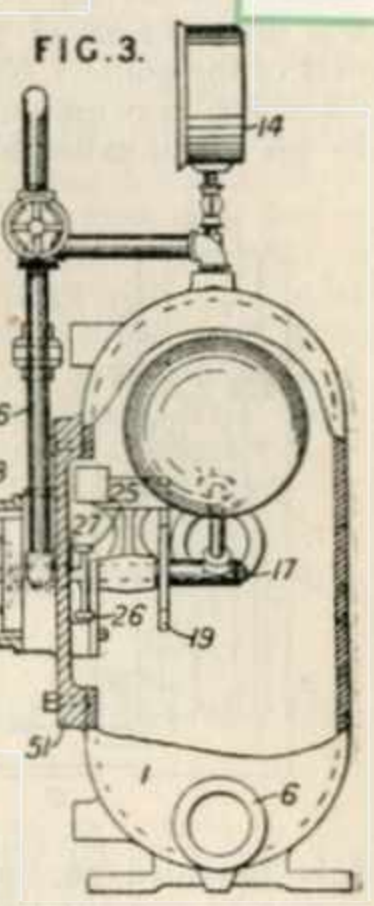


FIG. 3.



201,180. Basenau, J. F. July 21, 1922, [*Convention date*].

FIG. 2.

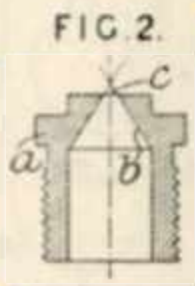
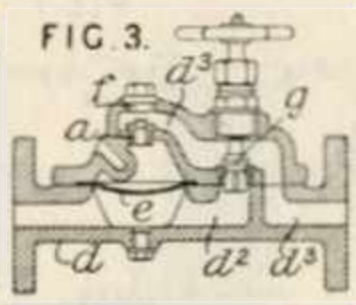


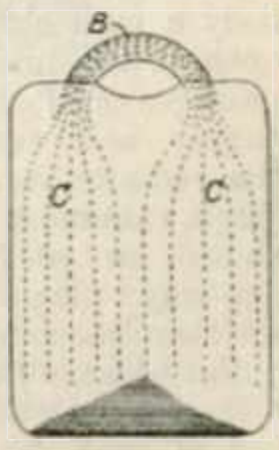
FIG. 3.



Steam traps.—In an apparatus for discharging water of condensation from steam piping or the like, a nozzle *a* is employed for the outlet of water having a conical passage *b* tapering towards the outlet end *c* with the object of allowing a maximum of water to escape with a minimum amount of steam. In the construction shown in Fig. 3, the nozzle *a* is mounted in a casing *d* having a duct d^2 which is branched on to the steam piping and a discharge duct d^3. A strainer *e* prevents access of impurities to the nozzle and a removable plug *f* facilitates cleaning of the nozzle, while a hand-valve *g* may be opened to allow the steam to blow out impurities from the strainer *e* and duct d^2. Preferably the sides of the conical passage *b* make an angle of $32\frac{1}{2}°$ with the longitudinal axis.

201,452. Jones, T. Oct. 4, 1922.

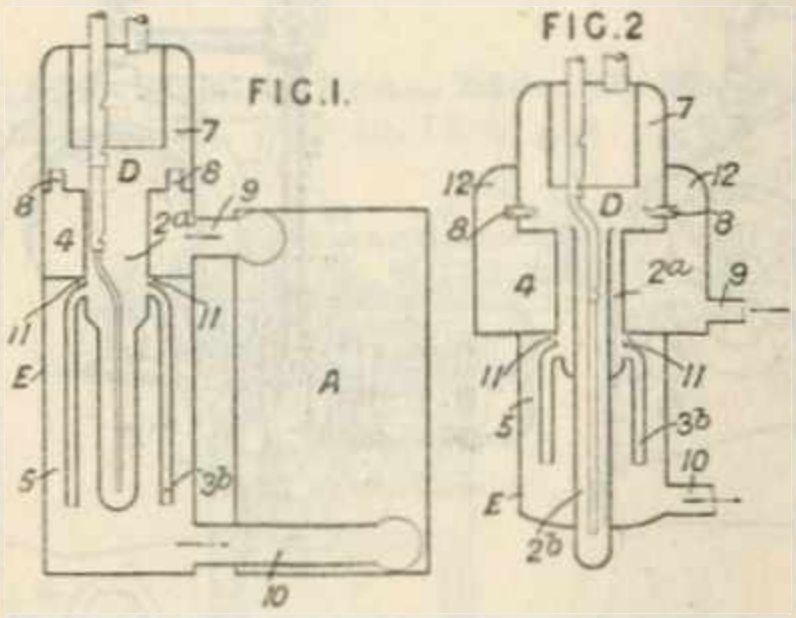
Footwarmers.—Solid footwarmers for use in beds or in vehicles are made from reinforced cement material and provided with a metal handle B fixed by means of the embedded wires C.



201,553. Lemaistre, M. J. G. A. July 25, 1922, [*Convention date*]. *Addition to* 186,348.

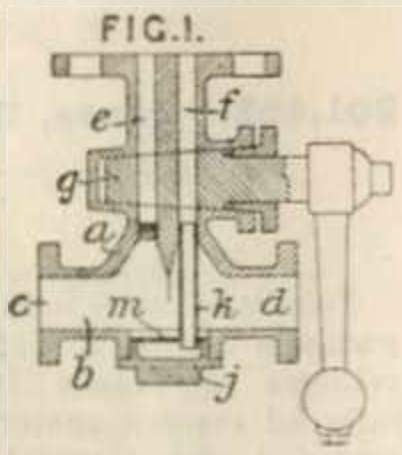
Heating buildings.—In a hot-water heating system, according to the parent Specification, the circulating device D, Fig. 1, is arranged in a casing E external to the boiler A and divided into two chambers 4, 5, the chamber 4 having connections 8, 9 to the upper chamber 7 of the device

D and the upper part of the boiler, and the chamber 5 having connections 3, 10 to the central chamber 2^a of the device D and the lower part of the boiler. The device D and the chamber 5 are also in communication through apertures 11. In the modification shown in Fig. 2, the chamber



4 is provided at its upper part with a steam pocket 12 and the lower chamber 2^b of the device D extends up to the top of the central chamber 2^a. The boiler A may be provided with Perkins tubes, and several circulating devices D may be provided in connection with one boiler.

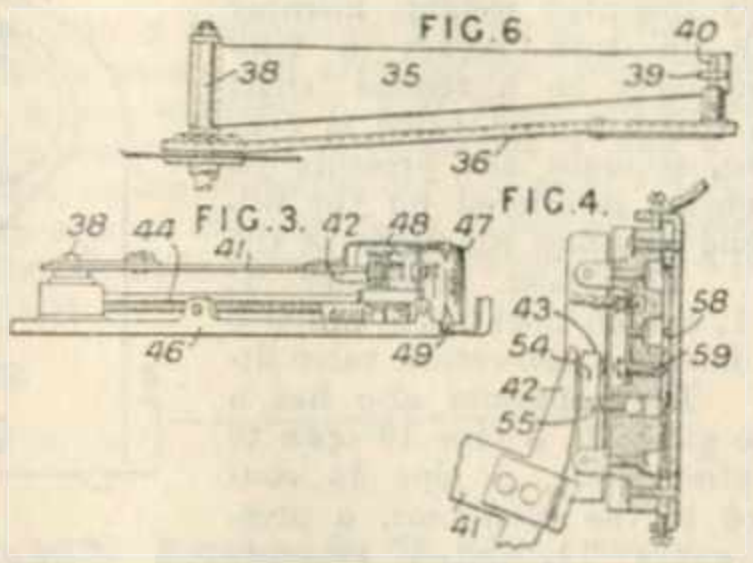
201,582. Pickersgill, A. E., and **Harris, V. R.** Feb. 24, 1922.



Heating by circulation of fluids.—A distributor fitting for steam or hot-water installations comprises a body *a* with chamber *b* open to the main *c*, *d*, passages *e*, *f*, for the supply and return to the radiator &c. and a single-member valve shown as a full-bore two-way plug valve *g* for simultaneously controlling both passages. The outlet passage *f* delivers to the bottom of the main either as shown by a tube *k* leading below a grating *m* in a detachable sump *j* or by a passage integral with the body. In the example shown, if the direction of flow is reversed, the distributor will work in the reverse direction by screwing the pipe *k* into the port *e*. Specification 110,230 is referred to.

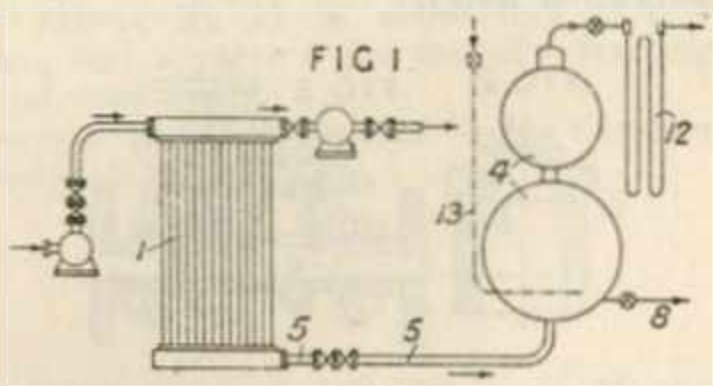
201,733. British Thomson-Houston Co., Ltd., (*International General Electric Co., Inc.*). July 8, 1922.

Thermostats.—A thermostat for controlling the heating circuit of an electric oven or the like comprises a bimetallic strip 35 fixed at one end to a shaft 38 and provided at the other end with a slotted member 39 engaging a pin 40 adjustably secured to the support 36. A switch-operating arm 41, adjustably mounted on the shaft 38, is provided with a sector 42 adapted to engage a pivoted lever 43 for operating a switch mounted on an adjustable arm 44. A quadrant 46 serves



as a support for the shaft 38 and arms 41, 44 the latter being provided with pointers 48, 49 which co-operate with a scale 47 on the quadrant. When the sector 42 engages the roller 54 on the arm 43, the screw 55 forces the spring 58 away from the contact screw 59, and opens the circuit of the operating coil of the switch 10, the circuit being re-established as soon as the sector 42 and roller 43 become disengaged.

201,888. Erste Brünner Maschinen-Fabriks-Ges. Aug. 5, 1922, [*Convention date*].



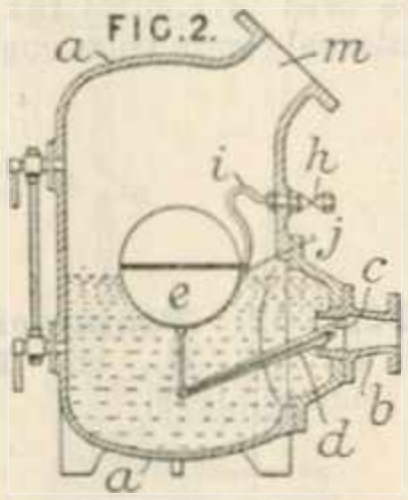
Heating systems and apparatus.—The whole or part of the hot water from a boiler economizer is collected in a storage chamber under a pressure lower than the boiler pressure. The chamber serves as a low-pressure steam regenerative accumulator and receives excess hot water and steam from the boilers, engines and other steam consumers in the plant. Excess water from an economizer 1 passes into a storage chamber 4 consisting of two interconnected drums through a pipe 5. Hot water or steam from the other parts of the plant enters the chamber through a pipe 13. Low pressure steam taken from the chamber is passed through a dryer 12. Hot water withdrawn from the chamber through a pipe 8 is supplied either directly or through the economizer to the boilers or other hot water con-

sumers. In a modification, two economizers working at different pressures and connected together through a pump are each connected to a low-pressure storage chamber.

201,951. Millington, W. E. W. Feb. 16, 1922.

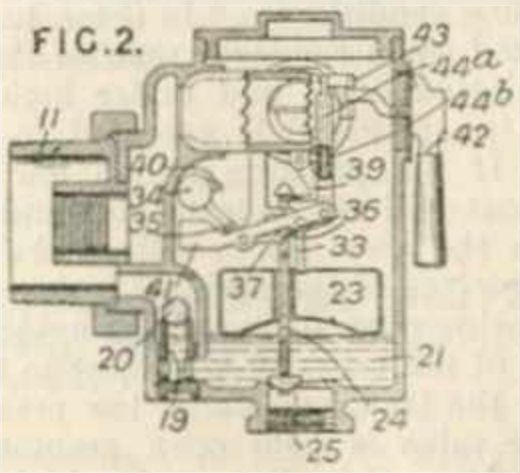
Steam traps. — In constant-level float-type steam traps with separate discharge of condensate and air, the liquid outlet is controlled by a butterfly or wing type valve. The chamber *a* has an inlet *m* from a water heater, evaporator, or the like, and an outlet *b* for condensate which is controlled by a butterfly valve *c*. The valve is connected by a lever *d* to a float *e*, which thereby maintains the level automatically and allows continuous discharge to take place. The air is discharged at the valve *h*, which may have an inlet pipe *i* the free end *j* of which is attached to the float. In an alternative construction, the float moves between vertical guide-rods, and the lever *d*, instead of being pivotally attached, has its free end moving over a roller on a stem on the float. A baffle-plate may be fitted at the top of the chamber to prevent direct flow on to the float, and the opening *m* is shaped so that it cannot be sealed by water which would prevent air passing down into the chamber.

FIG. 2.



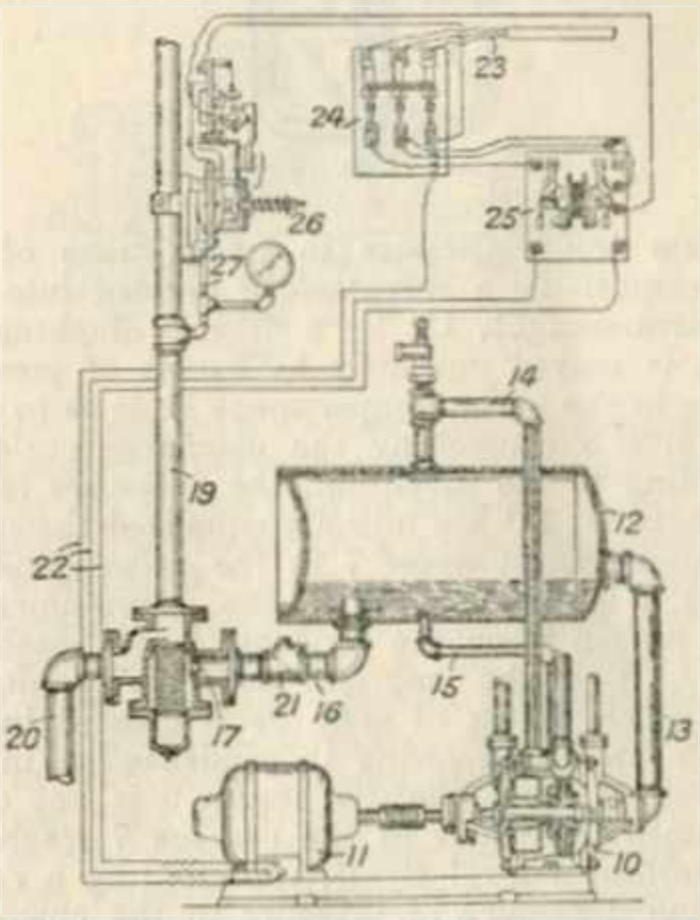
202,055. Hutchinson, F. Le C. May 15, 1922.

FIG. 2.



Steam traps.—A float-actuated steam trap, particularly adapted for use with steam radiators, has the float indirectly connected with the water exit valve and directly connected by means of levers with the steam inlet valve. Condensation from the radiator enters the trap through a connection 11, raises a floating ball 20 from a [illegible] 19, and passes into a chamber 21, where it raises a float 23. This float is guided by the spindle 24 of the discharge valve 25, and is connected by a link 33 to a counterweighted lever 41 adapted to engage a collar 35 on a tumbler 34. The tumbler has an arm 37 arranged to engage a collar 36 on the valve spindle to open the valve, and has a cam surface 40 adapted to release a catch 39 to permit the valve to close. The lever 41 is also connected by means of a lost-motion connection 44a, 44b with a lever 43 on the spindle of a butterfly valve on the steam inlet pipe. This valve may also be actuated by means of a handle 42.

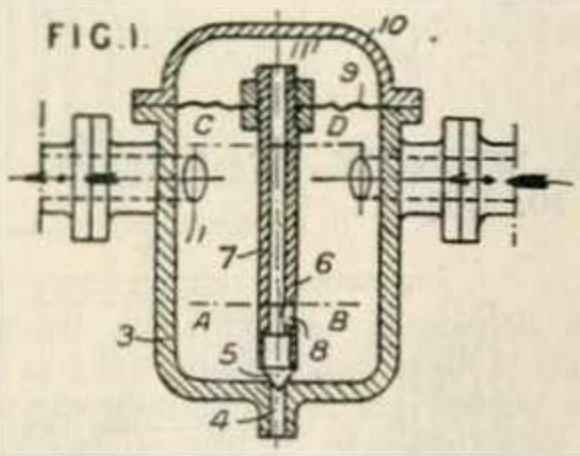
202,250. Wade, H., (*Nash Engineering Co.*). March 10, 1922.



Heating buildings.—Pumping-apparatus 10, particularly adapted for use with vacuum steam-heating systems as described in Specification 200,150, comprises air and water exhausting pumps, each connected with a receiver 12 having in its inlet pipe 16 a restricted portion 17 of such size that the quantity of water passing therethrough cannot exceed the capacity of the liquid pump to exhaust the same. By this means flooding of the receiver 12, and consequent passage of water through the air pump, are avoided. A gravity-operated non-return valve 21 in the pipe 16 prevents the back-flow of air and water from the receiver to the return pipes 19, 20 of the heating system. The inlet pipe 14 of the air pump is connected to the top of the receiver, while the inlet end of the priming pipe 15 for the liquid pump is situated below the inlet end of the inlet pipe 13 for the liquid pump. Further, the outlet end of the pipe 16 is well above the inlet of the pipe 15, so that sufficient priming liquid remains in the receiver in the event of the valve-

The leads 22 of the electric motor 11 driving the pumps are connected to the mains 23 through a hand-operated knife-switch 24 and a pressure-controlled switch comprising a magnetically-operated switch 25 and a diaphragm pressure relay switch 26 connected by a pipe 27 with the return pipe 19, the pressure in which opens or closes the motor circuit.

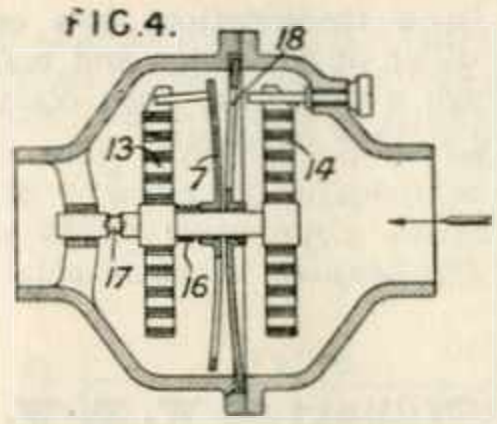
202,380. Thivolle, J. L. May 15, 1922.



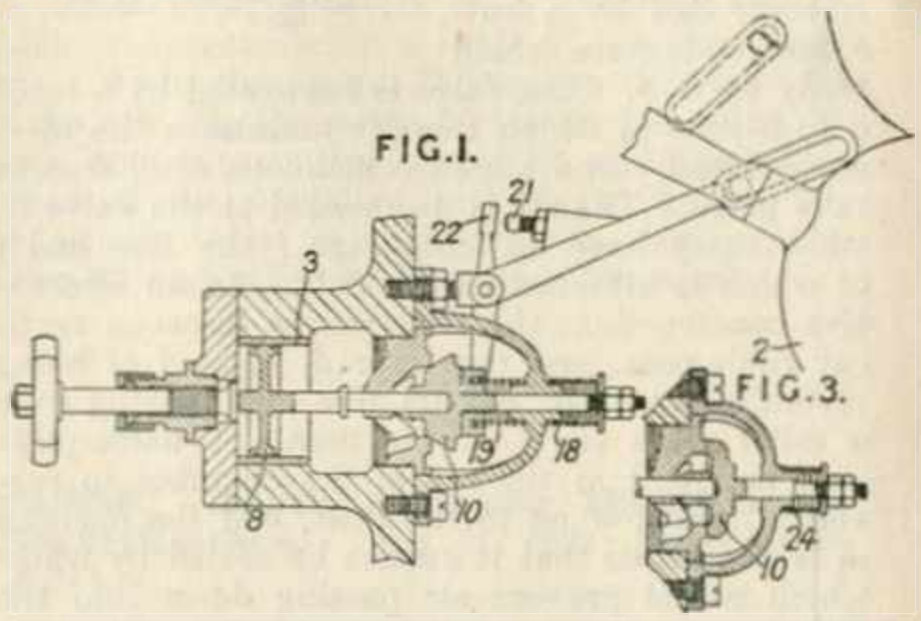
Steam traps.—Relates to steam traps of the kind comprising a receptacle 3 divided into two compartments 11, 11^1 by a flexible diaphragm 9 which is moved upwardly by excess of pressure arising in the lower compartment 11 so as to open the valve 5 controlling the discharge outlet 4. According to the invention, the pressures in the chambers 11, 11^1 are initially equalized through a communicating passage 7 in the valve spindle 6 having a lateral opening 8, the communication being broken when the condense water reaches a level A—B in the trap and seals the opening 8, after which excess of pressure is created in the lower chamber 11 owing to condensation in the chamber 11^1, but the diaphragm 9 is not operated until the water in the passage 7 reaches a predetermined level C—D, representing a corresponding difference of pressure in the chambers 11, 11^1. Modified constructions are described in which the cover 10 of the chamber 11^1 is located inside the receptacle 3, in which the valve spindle is solid and the passage 7 is formed in the wall of the receptacle 3, and in which the communicating passage lies outside the receptacle 3.

202,640. Ernst, W. E. Aug. 15, 1922, [*Convention date*].

Thermostats.—In thermostats comprising a rotary disc valve 7 controlled by bi-metallic strips 13, 14 the valves are prevented from sticking to their seats 18 by making the face of one or both convex. They may be rigid or flexible so as to be further bent by the pressure of the working fluid which is supported by a spring 16 and adjustable thrust bearing 17. The thermostats may be used to control the flow of cooling water in internal-combustion engines.



202,763. Plummer, W. E., Kermode, W. M. B., and **Plummer, C. St. C.** June 6, 1922.



Steam traps.—Relates to steam traps wherein a float 2 operates a pilot valve controlling the admission of steam to a cylinder 3 fitted with a diaphragm or piston 8 for displacing the relief valve 10 and consists in the provision of two separate control means, one operating the valve 10 under low pressure conditions, whilst the other operates the valves 10 periodically under high pressure conditions. In Fig. 1, the pilot valve is lifted when the lever reaches the position shown in dotted lines, and under high pressure conditions the piston 8 is operated to open the valve 10. If the pressure is too low to effect this, the float will continue to rise and the stud 21 operates the lever 22 to relieve the valve 10 from the pressure of the spring 19, the valve consequently being opened by the spring 18. In Fig. 3, the back of the valve 10 is subject to the steam pressure in the trap, and under low pressure conditions the valve is held open permanently by the spring 24. Operation under high pressure conditions is effected in the usual manner. The valve 10 may have a conical or flat seating.

202,817. Reid, R. W., and **Westinghouse Brake & Saxby Signal Co., Ltd.** July 24, 1922.

FIG.1.

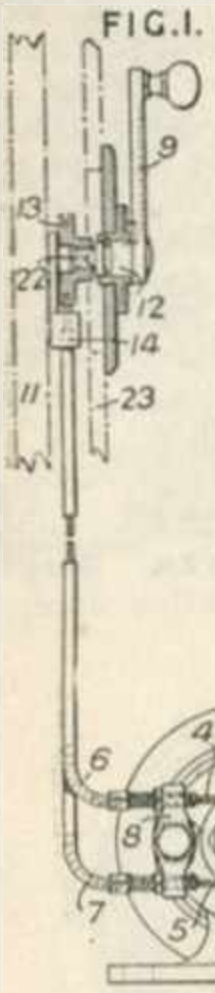
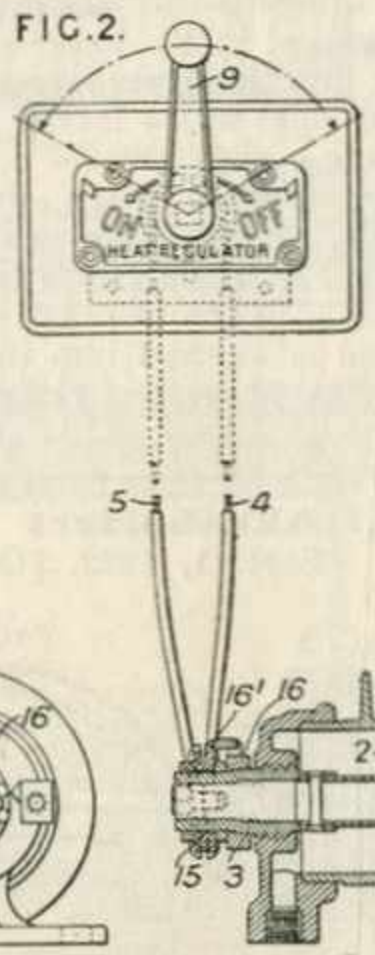


FIG.2.



Radiators.—In a steam-heated radiator for use in railway vehicles and the like of kind in which the thermostatic steam admission valve is capable of initial manual adjustment, this adjustment is effected from a handle 9 located within the carriage through the medium of Bowden wire mechanism. In the construction shown, two movable wires 4, 5 are connected to diametrically opposite points of a pulley 15 having a finger 15¹ projecting into engagement with a notch in a collar 16, which is clamped by means of a locknut 16¹ on the adjustable screw-threaded element 3 to which the thermostatic tube 2 and valve are connected. The opposite ends of the wires 4, 5 are connected to a second pulley 13 concealed between the inner and outer walls 23, 11 of the vehicle and engaging the squared end 22 of a pivot 12 to which the handle 9 is attached. The outer sheaths 6, 7 of the Bowden wire transmission are connected to fixed brackets 8, 14. Specification 26754/06 is referred to.

202,843. Leeds Forge Co., Ltd., and **Redpath, W.** Aug. 24, 1922. *Drawings to Specification.*

Non-conducting coverings for heat and sound.—The structure of a railway or other vehicle is insulated for heat and sound by means of cellular rubber. Rubber sheets are attached to the exterior wall and similar sheets are attached to the interior wall. Preferably the material of the rubber sheets is so blown as to comprise small individually sealed air cells, each cell being completely bounded by a thin skin of rubber and the whole covered on one or each side by a thin skin of rubber vulcanized or otherwise secured thereto. The material may be sheets of ordinary sponge rubber with or without an external skin or skins of rubber.

202,848. Coathupe, B. Aug. 31, 1922.

FIG.4.

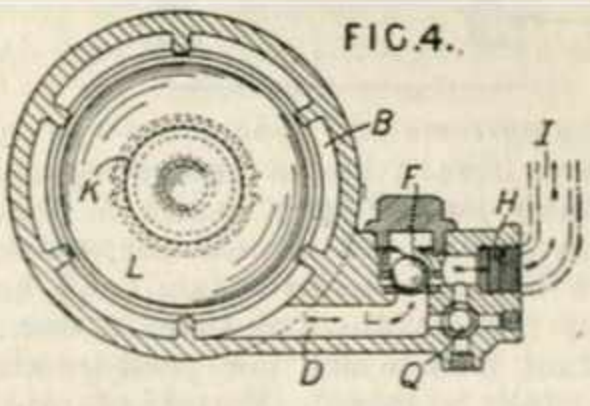
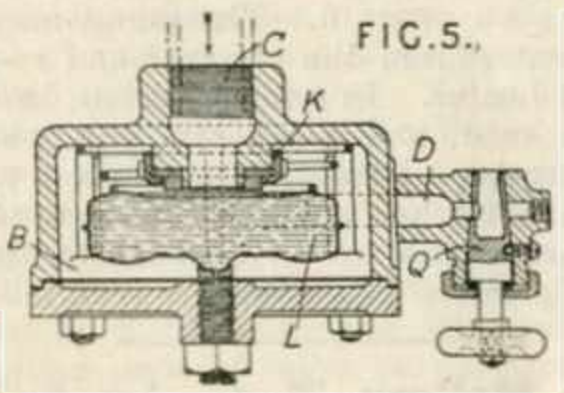


FIG.5.



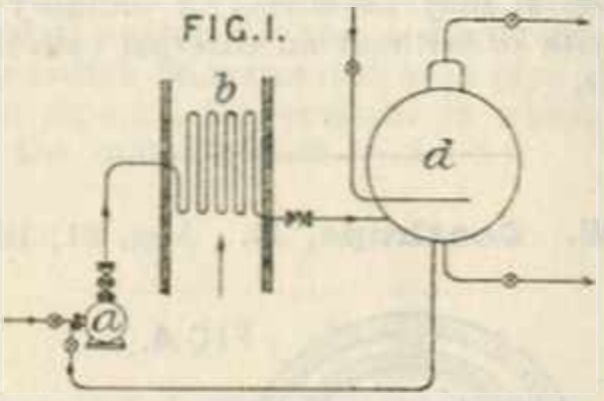
Steam traps.—In a steam trap for draining the steam supply pipes of heating-systems for railway vehicles &c. of the kind in which a thermostatic diaphragm L located in a casing B co-operates with a seating K to control the flow of water of condensation through a pipe C, the outlet D from the casing is fitted with a ball or other check valve F so that the water of condensation, instead of being discharged on to the track, can pass by way of an opening H and pipe I to an overhead tank on the vehicle, and also with a plug or cock Q by which the casing can be freed of water when the heating-system is cut out of operation. The valve F is preferably constituted by a ball past which the water of condensation is forced by the steam pressure, but which prevents any return flow into the casing B. The water supplied to the overhead tank may be used for lavatory or other purposes.

202,880. Long, J. de. Oct. 24, 1922.

Non-conducting coverings for heat.—A heat-insulating material for use in buildings, railroad-cars &c. is composed of a central sheet of burlap 1, having cattle hair or other fibre 2 felted to both sides of it, and the whole covered on both sides with asbestos 3 secured by adhesive. The adhesive may be of such character and used in such quantities as to stiffen the product.

203,091. Erste Brünner Maschinen-Fabriks-Ges. Aug. 22, 1922, [*Convention date*].

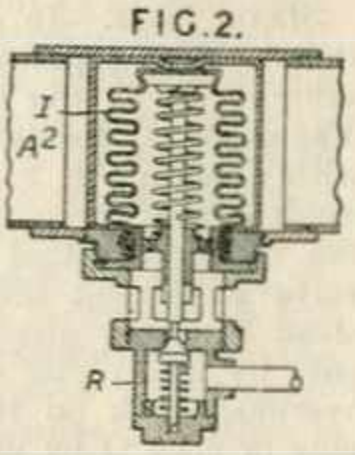
FIG.1.



Heating systems and apparatus.—To utilize the waste heat from a steam generating and power plant, water heated in a heater *b* placed on a boiler flue behind the economizer, excess steam from the boiler, exhaust steam, and hot waste water are passed into a receiver *d* serving as a storage unit from which low pressure steam and hot water may be taken. Water is forced through the heater by a pump *a*. The pump may withdraw hot water from the receiver and re-pass it through the heater. In a modification, two water heaters are used, and a separate pump is fitted in the return pipe between the receiver and the heaters. In a further modification, a number of receivers are connected in parallel to the hot-water supply and return pipes.

203,152. Mallory, H. C. Aug. 8, 1922.

FIG.2.



Thermostats for use with the cooling systems of internal-combustion engines are provided with volatile fluid in a container having bellows-like walls I, which contract when the temperature exceeds a predetermined amount, thereby opening a valve R for the release of air.

203,250. Clorius, O. T. Dec. 11, 1922.

FIG.1.

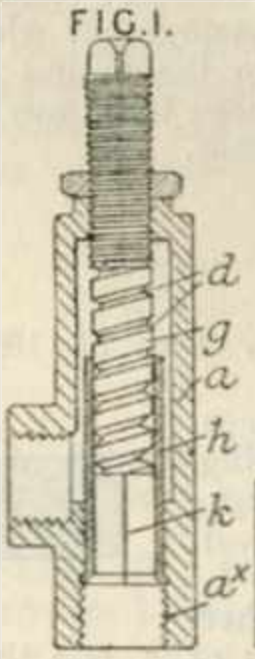
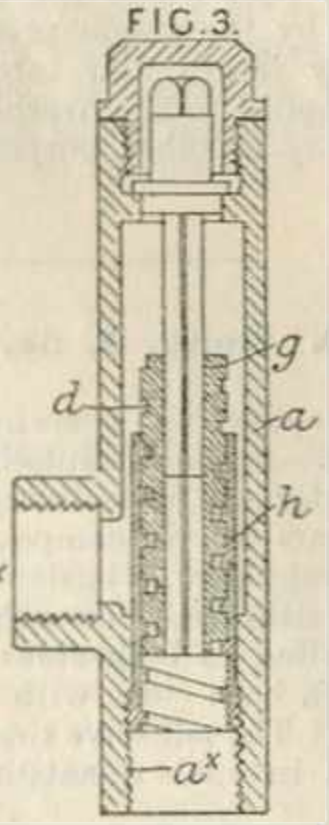


FIG.3.



Steam traps.—Relates to steam traps comprising a tubular casing *a* having an internal sleeve *h* fitted with a movable plug *g*, the condensing surface being formed by zig-zag or crossing grooves *d* or the like, and consists in forming the casing with two different internal diameters, the sleeve *h* being secured in the lower smaller bore a^x and projecting into the upper larger bore so as to form an annular inlet space in the casing and providing the plug *g* with grooves of gradually increasing width and depth in the outlet direction. The pitch of the grooves may increase from inlet to outlet. In Fig. 1 the sleeve is slit longitudinally at *k*. In Fig. 3 the sleeve is also provided with grooves and is screwed into the casing so that it may be adjusted relatively thereto.

203,292. Aktiebolaget Birka Regulator. Sept. 1, 1922, [*Convention date*].

FIG.3.

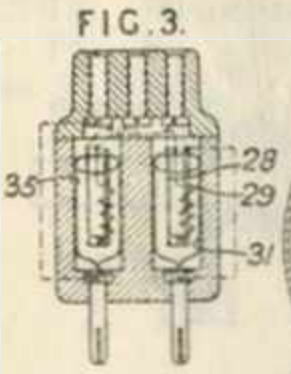
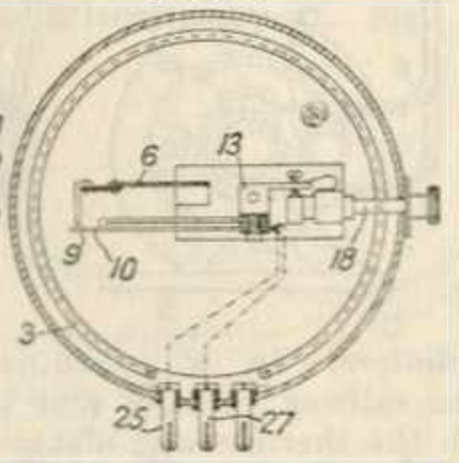
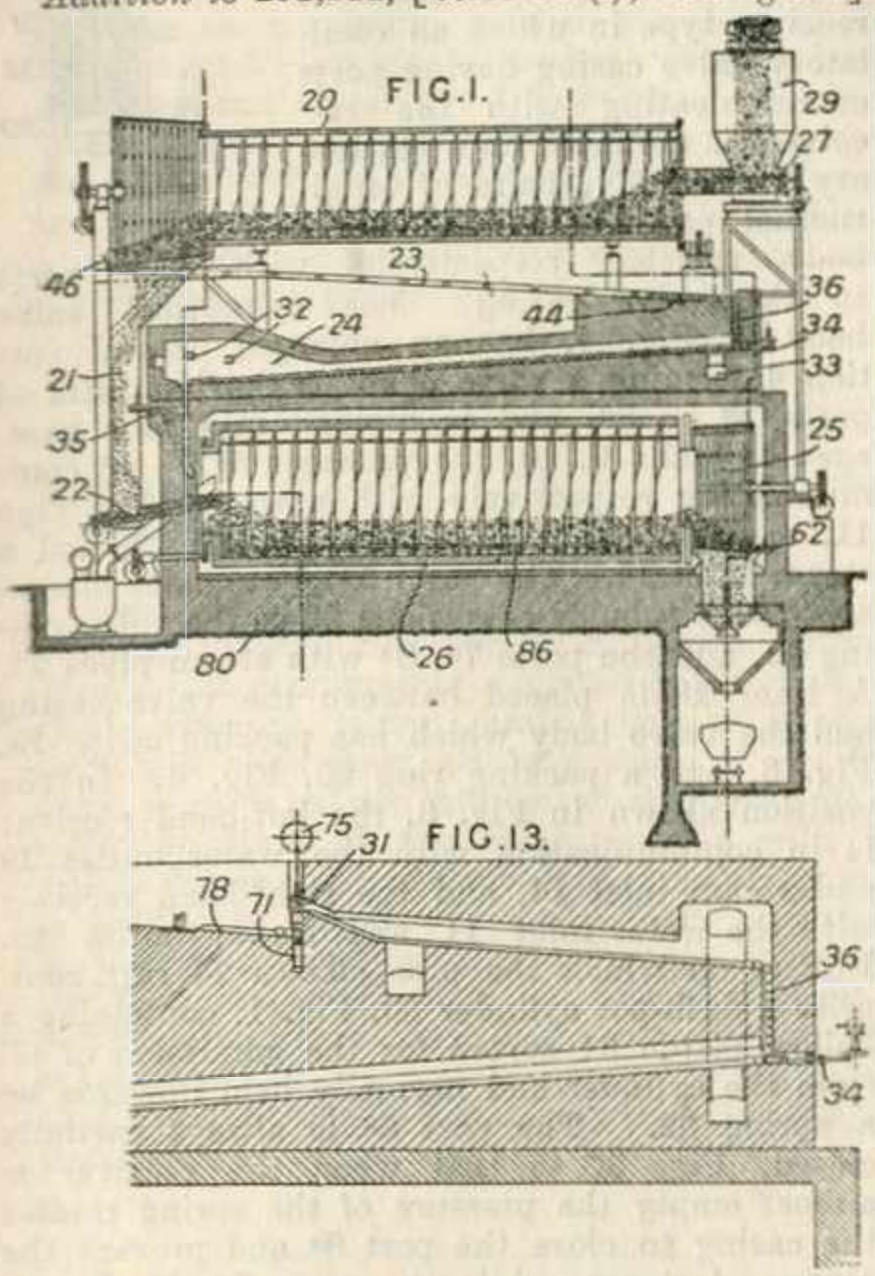


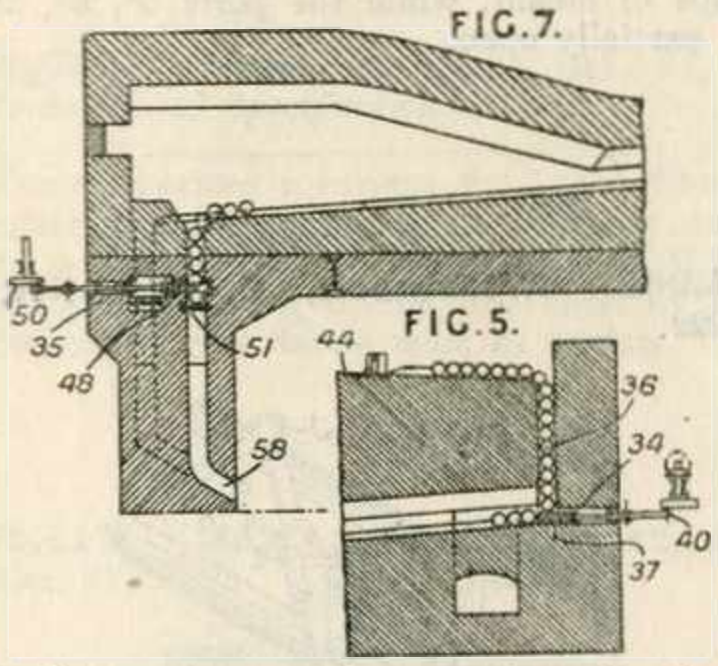
FIG.2.



Thermostats—Relates to electrically operated apparatus such as cooking apparatus or an electrically driven pump in which the supply of current is regulated by one or more thermal switches, the circuit to which is closed by a switch automatically operated by changes in temperature, water-level, &c. According to the invention the thermal switches are inserted in the wall plug or like member by which the apparatus is coupled to the source of current. Fig. 3 shows a plug member which may either be inserted directly into a wall socket and connected by a plug cord with the cooking vessel shown in Fig. 2 or vice versa. When the temperature reaches a predetermined point a thermal switch 6 arranged between two bottoms of the cooking vessel bridges springs 9, 10, thus connecting contacts 25, 27 and closing a circuit through the heating coils of thermal switches 35, 31. The switch 31 then opens its contacts 28, 29 thus breaking the circuit to the heating coil 3 of the cooking vessel. The switch 35 opens and closes intermittently, allowing enough current to pass to the heating coil of the switch 31 to keep that switch open. When the temperature of the cooking vessel falls, the switch 6 opens, breaking the circuit to the heating coils of switches 35, 31, which close and re-establish the circuit to the heating coil 3. The device may be adjusted to act at any temperature by rotating a member 18 which carries at its end a cam determining the position of the pivoted member 13 which carries the springs 9, 10. The switches 31, 35 are enclosed in receptacles which are either evacuated or filled with an inert gas.

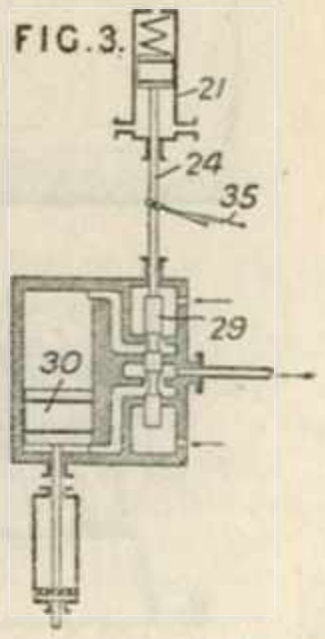
203,444. Koppers, H. June 28, 1922.
Addition to 184,144, [*Class* 55 (i), Coking &c.].





Heating systems and apparatus.—In the apparatus described in the parent Specification the closed revolving tubular retort is replaced by an open-ended drum 26 adapted to revolve in a closed chamber 80, the chamber 80 being surmounted by and preferably combined in one compact structural unit with the ball-heating furnace 24 and a pre-heating drum 20. The drum 20 is charged with green fuel and with balls which have already passed through the distilling drum 26, the drum 26 being fed with the pre-heated fuel from the drum 20 and with the heated balls direct from the furnace. The drums are each provided internally with a screw thread which compels the fuel to travel from the inlet to outlet end of the drums, the outlet ends having a grid extension 25, and bars 86 which assist in mixing the balls with the charge and in breaking down any incrustation. The balls from the furnace 24 pass through a regulating device 35 to the drum 26 and meet the pre-heated fuel fed to the drum by a screw conveyer 22, the whole travelling through the drum to the grid 25 where the coke falls through into a hopper and the balls continue to run forward into a channel 62. From this channel the balls are conveyed in an elevator to the fuel-charging hopper 29, passing through a regulating screw conveyer 27, where they mix with fresh fuel and pass through the pre-heating drum 20 to the outlet grid which allows the coal to fall down a shoot 21 to the screw conveyer 22, the balls continuing to a shoot 46, channel 23, vertical slot 36 and a regulating device 34 to the heating furnace. The regulating device 34 comprises a slide 37, situated at the bottom of the slot 36, reciprocated by a crank 40 and so arranged that when the slide moves to the right the balls in the slot will descend a distance equal to about the diameter of one ball, and upon reversal of motion the bottom row of balls will be pushed into the furnace. To ensure that the regulating device is charged uniformly with balls, a second distributing device comprising a flat bar 44 reciprocated by crank gear is provided. The regulating device 35 comprises a reciprocating slide 48 provided with fork-like projections operated by a crank 50 and arranged to deliver the bottom row of balls on to a reciprocating cross slide 51 provided with an opening which allows the balls to fall down an inclined plane and through an opening 58 to the drum 26. The furnace is provided with openings 32, 33 for the heating gases and products of combustion respectively, and, if desired, the furnace may embrace a part of the channel 23 in which case a further regulating device comprising a slide 71, Fig. 13, raised and lowered by a crank 75, is provided which transfers the balls from the regulator 44 and inclined plane 78 to the inlet opening 31 of the furnace. Additional heating of the drum 26, either external or internal, may be resorted to for the prevention of radiation losses &c.

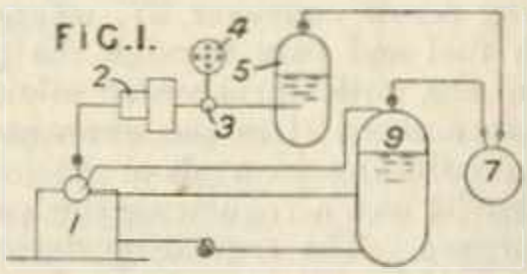
203,606. Babcock & Wilcox, Ltd., (*Deutsche Babcock & Wilcox, Dampfkessel-Werke Akt.-Ges.*). Dec. 28, 1922.



Heating by circulation of fluids. — In a steam-generating plant supplying steam for power and for cooking or other purposes, the cooker or the like is heated by the steam from several thermal-storage units, one of which receives low pressure exhaust steam from an engine, and the others receive higher pressure steam either from engines or directly from

...r. The cooker 7, Fig. 1, is heated by low pressure steam from a storage unit 5 receiving the exhaust of an engine 2, and by high pressure steam from a storage unit 9 connected to the boiler 1, the high pressure steam being used only for a short period at the completion of the cooking process. A two-way valve 3 may be operated automatically to direct the exhaust from the engine 2 into a condenser 4 when the pressure in the unit 5 rises above a certain point.

FIG. 1.



The valve may be actuated by fluid pressure admitted above or below a piston 30, Fig. 3, under the control of a slide valve 29, which is connected to a piston in a cylinder 21 in communication with the units. A tumbler spring 35 connected to the valve rod 24 moves the slide valve past its middle position to its end positions. In a modification, the boiler is provided with a separate boiler-water storage unit, the unit supplying high pressure steam being then connected only to the boiler steam space.

204,182. Rakestraw, T. G. Aug. 1, 1922.

FIG. 3.

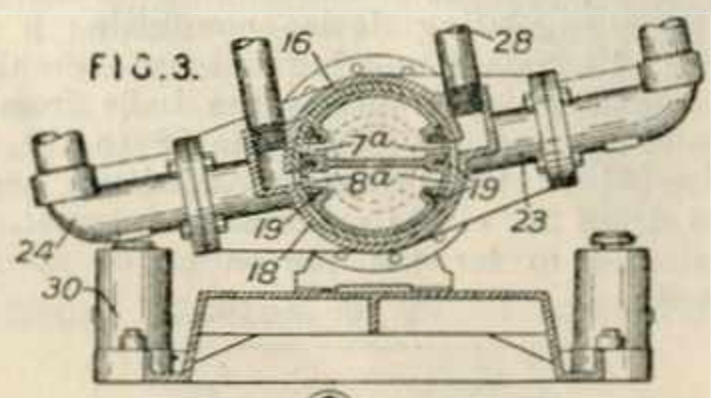
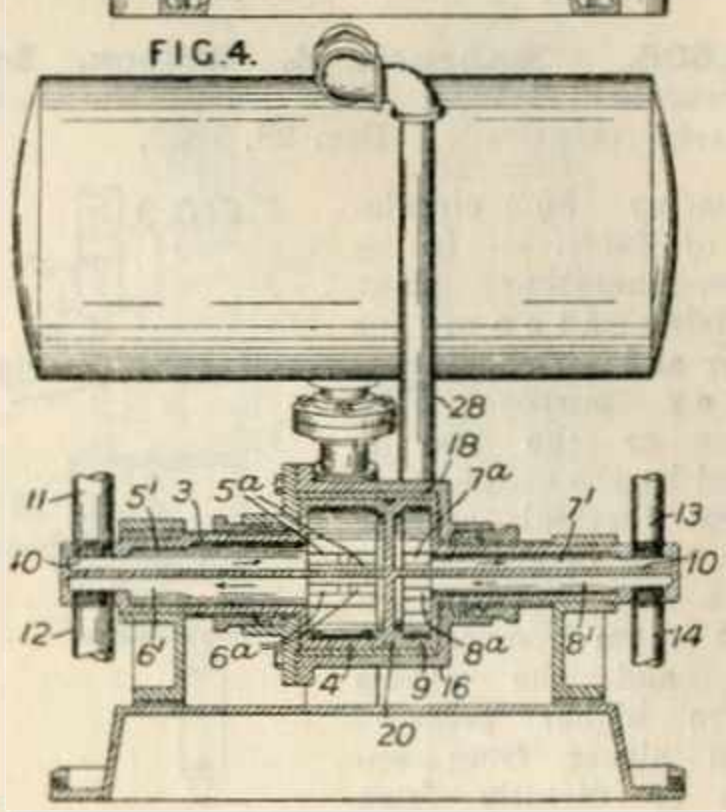
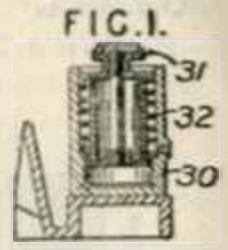


FIG. 4.



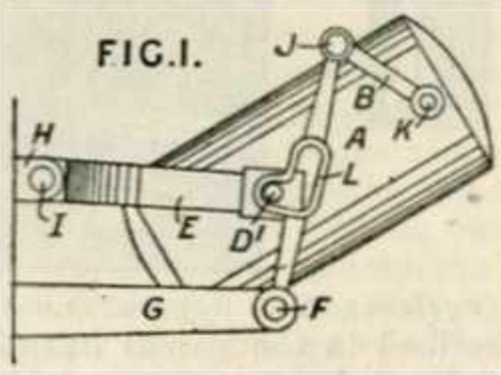
Steam-traps. — In a steam-trap of the counter-balanced receiver type in which an oscillatory valve casing having ports communicating with the receivers is mounted on a stationary valve body, pairs of longitudinal passages in the valve body register respectively with the ports in the valve casing. The cylindrical valve body 3, Fig. 4, has an enlarged central portion 4 forming a valve chamber having pairs of ports 5^a - - 8^a, and is divided into four passages by walls 9, 10, the passages 5^1 - - 8^1 communicating respectively with a water inlet pipe 11, a water outlet 12 a steam outlet 13, and a steam inlet 14. The ports 5^a, 6^a register alternately with tubular extensions 23 of the valve casing 16, and the ports 7^a, 8^a with steam pipes 28. A liner 18 is placed between the valve casing and the valve body which has packing strips 19, Fig. 3, and a packing ring 20, Fig. 4. In the position shown in Fig. 3, the left-hand receiver is in communication with the water outlet 12 and steam inlet 14, and the right-hand receiver with the water inlet 11 and steam outlet 13. Buffers on which the pipe elbows 24 rest comprise a dash-pot cylinder 30, Fig. 1, containing a hollow piston 31 ported for the admission of oil from the cylinder and normally held upwards by a spring 32. The port 8^a is always partially closed, Fig. 3, so that when the receiver is almost empty the pressure of the spring rotates the casing to close the port 8^a and prevent the escape of steam, while the ports 5^a, 6^a, 7^a are still partially open.

FIG. 1.



204,962. Wilkinson, C. H. Nov. 23, 1922.

FIG. 1.



Steam-traps.—A float actuating device particularly applicable for operating the discharge valves of steam traps is provided with release catch mechanism to give a quick opening and closing of the valve. The float A is cylindrical in shape and has trunnions D^1 mounted towards one end of the float and adapted to turn in the ends of a forked float lever E pivoted to a fixed bracket H at I. The trunnion D^1 is also surrounded by a guide frame L formed on a lever pivoted at F to a fixed bracket G and connected at J to a pin K on the float by a link B. While the water level is rising the float first tends to turn in a clockwise direction, causing the horizontal part

of the frame L to engage the trunnion D^1 and prevent the float rising. As the water level approaches its maximum position the float rotates in a counter-clockwise direction, which releases the catch and allows the float to rise. The lever E has a projection adapted to engage a second lever connected to the discharge valve for opening and has a projection on the frame L to release a pawl arranged to hold the valve in the open position and so permit the valve to close.

205,347. Long, J. de. Oct. 24, 1922.
Drawings to Specification.

Non-conducting coverings for heat.—A heat-insulating material for use in buildings, railroad cars, &c. is composed of a central sheet of woven fabric such as burlap, having bats of asbestos fibre and cattle hair, on both sides of it. The fibres of each bat are interlocked with each other, with the fibres of the other bat and with the woven fabric. An asbestos paper covering may be secured by adhesive to both sides of the fabric. In a preferred method of manufacture, the asbestos fibre and cattle hair are passed through a picker, and formed into bats by a carding machine; the bats are attached to the woven fabric by a punching needle loom. Specification 205,348 is referred to.

205,348. Long, J. de. Oct. 24, 1922.
Drawings to Specification.

Non-conducting coverings for heat.—The heat-insulating material for use in buildings, railroad cars &c. described in Specification 205,347 is modified by making the central sheet of a non-inflamable woven fabric such as burlap.

205,413. Hall, I., and **Howlett, J. H.** Jan. 17, 1923.

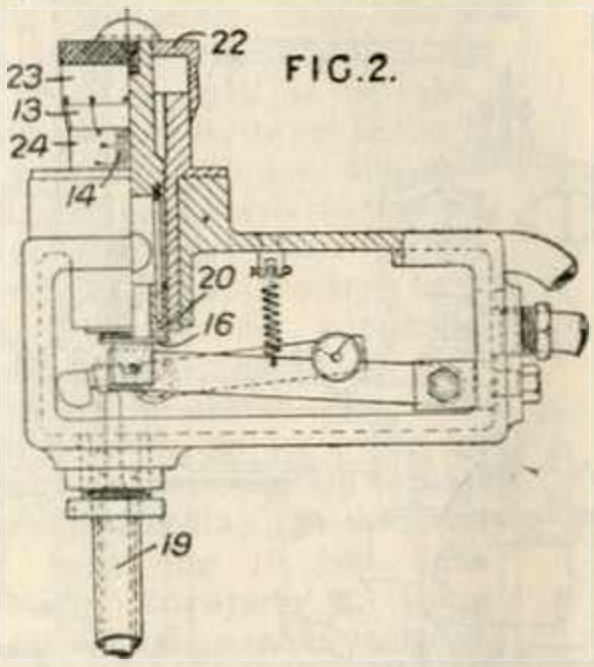


FIG.2.

Thermostats.—In an automatically controlled valve of the type shown in Specification [illegible] wherein the valve member 16 is operated by a thermostat 19, the valve seat 20 is adjusted by a sleeve 23 surrounding a tubular portion 24, the sleeve being graduated circumferentially and the tubular portion being graduated longitudinally to indicate the adjustment of the valve seat.

205,504. Romagnoli, T. Oct. 12, 1922, [*Convention date*].

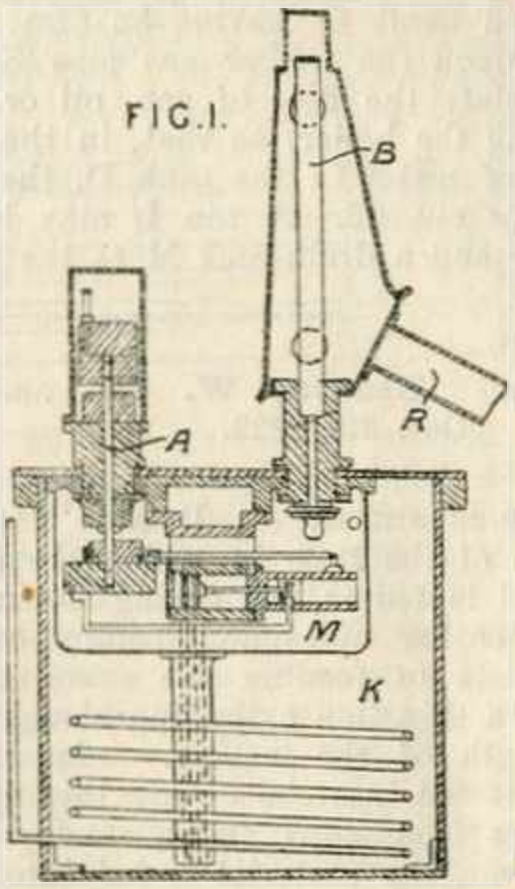


FIG.1.

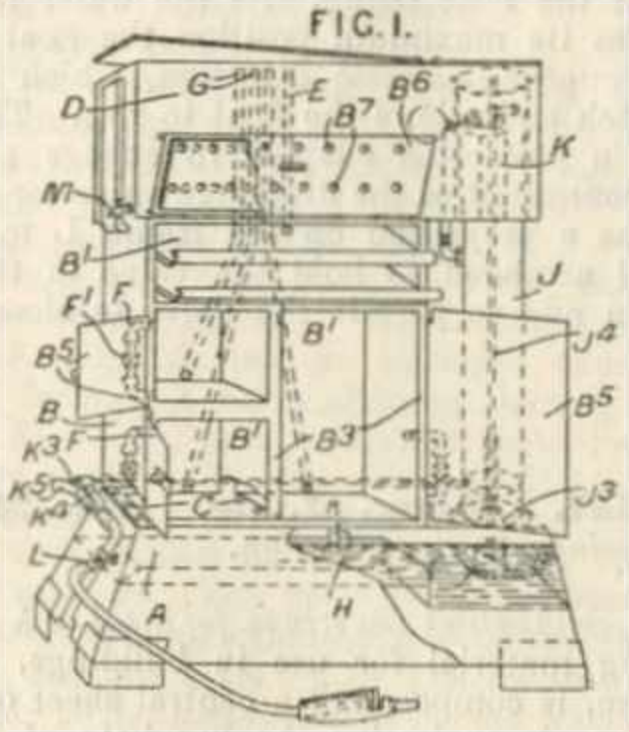
Solar heat, utilizing.— An engine using sulphurous anhydride and used for raising water comprises a heat absorber R made in the form of a flat-sided, iron box, which contains water to take up solar heat which evaporates the power fluid in a heater B in connection therewith. The fluid expands in a pair of inclined cylinders M mounted in a condenser K, the pistons of which are connected by **U**-shaped, return connecting-rods to a crankshaft which passes out through a stuffing box. Cold water raised by the pump is circulated inside a condensing-coil and on issuing therefrom is brought into contact with the outer surface of the condenser casing. The condensed liquid is pumped back to the heater.

205,614. Brims, J. A. Aug. 8, 1922.

Heating-apparatus.—In apparatus for vulcanizing, sterilizing and other heating purposes of the type comprising a boiler and a heating-chamber connected therewith in which either dry or wet heating may be carried out, the heating-chamber B has a number of compartments B^1 closed by doors B^5, B^6 and surrounded by steam pasages B^3 leading by a pipe E to a tank D, which supplies the boiler A and in which the steam is condensed. The steam enters the

passages B^3 through perforations C in the roof of the boiler and is admitted to the chambers B^1 when required through valves F^1 in pipes F. Air is allowed to circulate through the chambers by pipes G open to the atmosphere and leading to the bottom of the chambers, being discharged through perforations B^7 in the door B^6. Condensed water in the chambers B^1 passes to the boiler through a pipe H, and the level of the water in the boiler is maintained constant by a valve J^3, which is located at the base of a tube J connecting the boiler and tank D and is mounted on a rod J^4 carrying a float K at its upper end. The float K is also connected by levers to a shaft K^2 having an arm K^4 adapted to press upon the rubber gas pipe K^5 or otherwise regulate the flow of gas, oil or electricity for heating the boiler, so that, in the event of a shortage of water in the tank D, the heating is reduced or cut off. A tap L may be fitted to the boiler and a drain-cock M to the tank D.

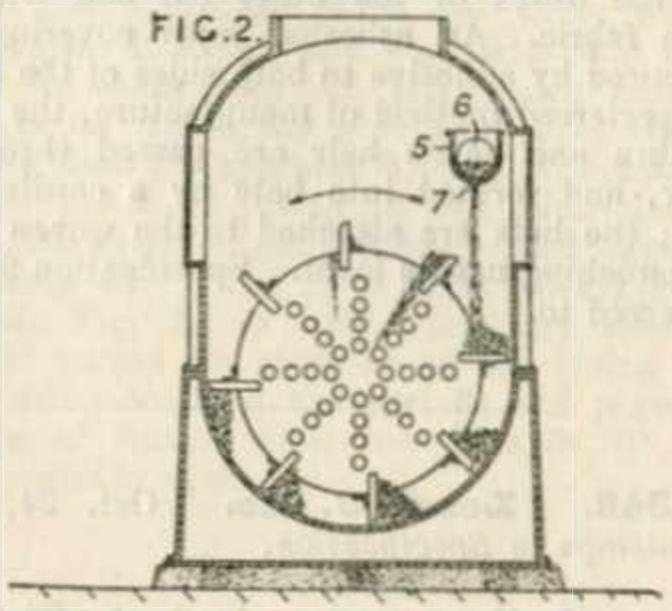
FIG. 1.



205,674. Simon, W. G., and **Simon, F. R.** Oct. 13, 1922.

Heating-apparatus. — Relates to heating apparatus of the type in which the material to be treated is fed into a casing having a rotary nest of heating tubes and beaters or agitators, and consists in feeding the material into the casing in a thin line extending along a considerable length of the casing. As shown, the material is fed into the casing through a trough 5 having a feed-slot 7 and a conveyor 6. In a modification, the material is fed into the casing through the space between two adjacent rollers.

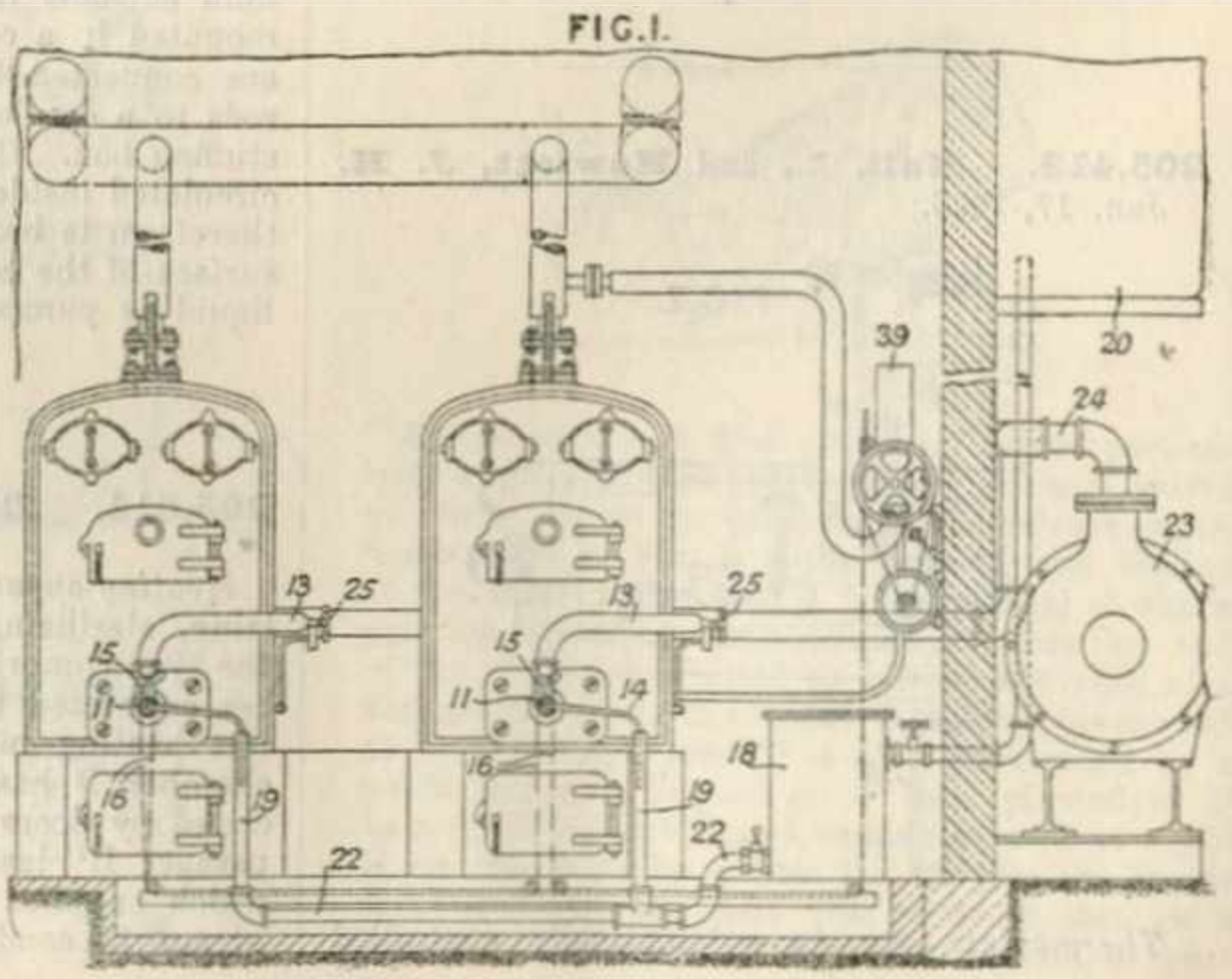
FIG. 2.



205,814. Ateliers H. Cuénod Soc. Anon. Oct. 19, 1922, [*Convention date*].

Thermostats.—In a heating installation comprising one or more boilers heated by liquid-fuel burners from which fuel is delivered by compressed air, the burners are regulated by controlling the supply of compressed air to them in accordance with variations in the temperature of the water from the boiler or boilers. In the event of a burner being extinguished the fall of temperature in the vicinity of the burner acts through an air thermometer and pressure gauge to shut off the compressed air supply to the burner. The burners may be of the kind described in Specification 201,167. Liquid fuel is supplied by a tank 20, Fig. 1, to a receptacle 18, where it is main-

FIG. 1.



tained at constant level, the receptacle being connected by a pipe 22 to reservoirs 19 from which burners 11 draw their supply through tubes 14. Compressed air is supplied by a fan or the like 23 to the burners through the main 24 and branch pipes 13 in each of which is located a valve 25, which is operated to shut off the air supply should the burner flame be extinguished and a main air supply valve operated by the variation of temperature of the water supplied by the boiler to a chamber containing an air thermometer 39, Fig. 2. The valves regulating the air supply to the burners are operated simultaneously by a sprocket chain 16 engaging with sprocket wheels 15 on the valve spindles and also a sprocket wheel on a shaft 52 on which is also mounted a toothed wheel 28 adapted to be rotated by one or the other of two pawls 30 pivoted on a rocking member 29 driven from a motor through a shaft 41, crank 42 and connecting-rod 43. Variations of pressure in the air thermometer 39 due to changes of temperature of the water from the boiler or boilers is communicated through a pipe 38 to an accordian type expansible chamber 35 which acts through a lever 37 upon a lever 31 provided at one end 32 with an abutting member adapted to disengage one or other of the pawls 30 and allow it to engage with the notches of the wheel 28 and cause its rotation. The lever 31 is maintained in contact with the lever 37 by a spring 36 the tension of which may be adjusted.

FIG.2.

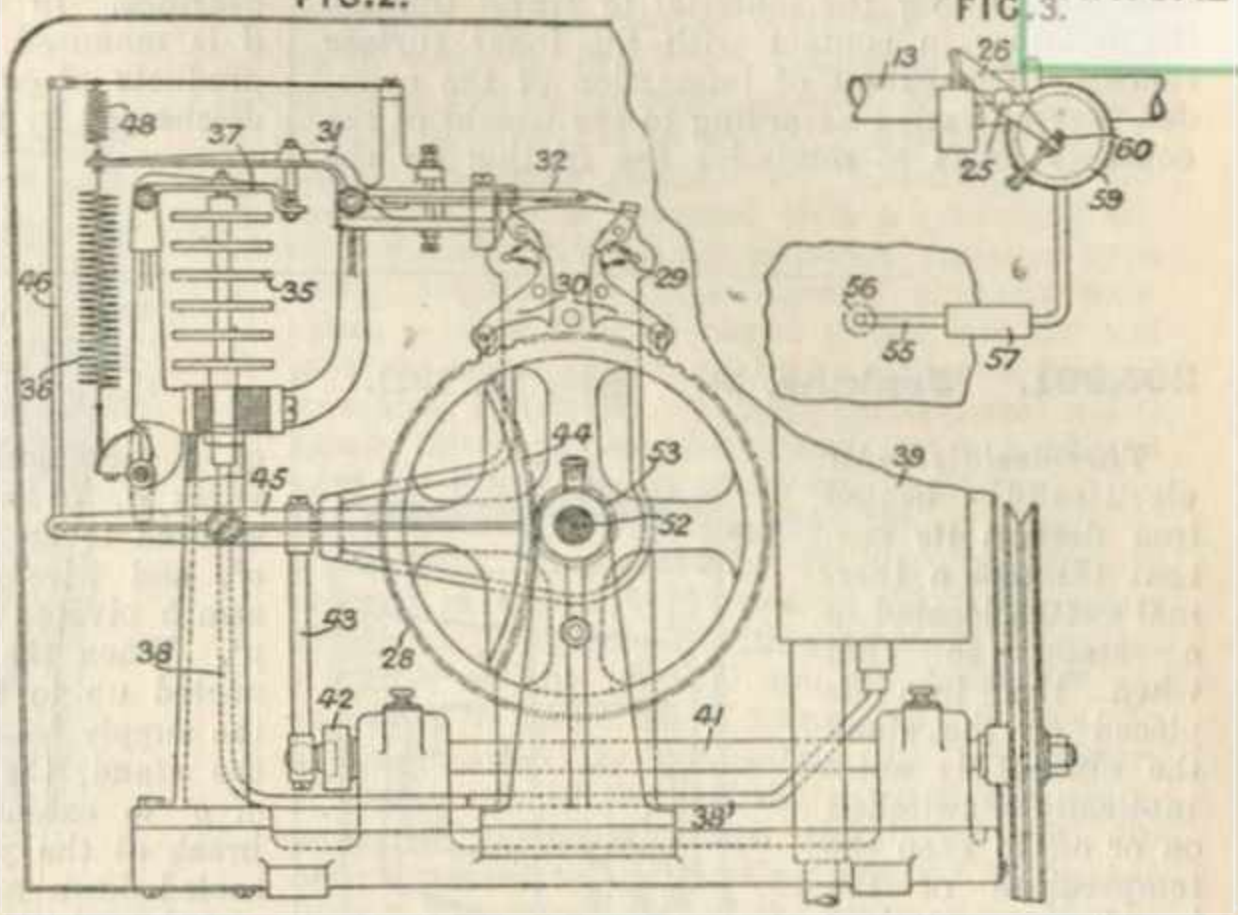


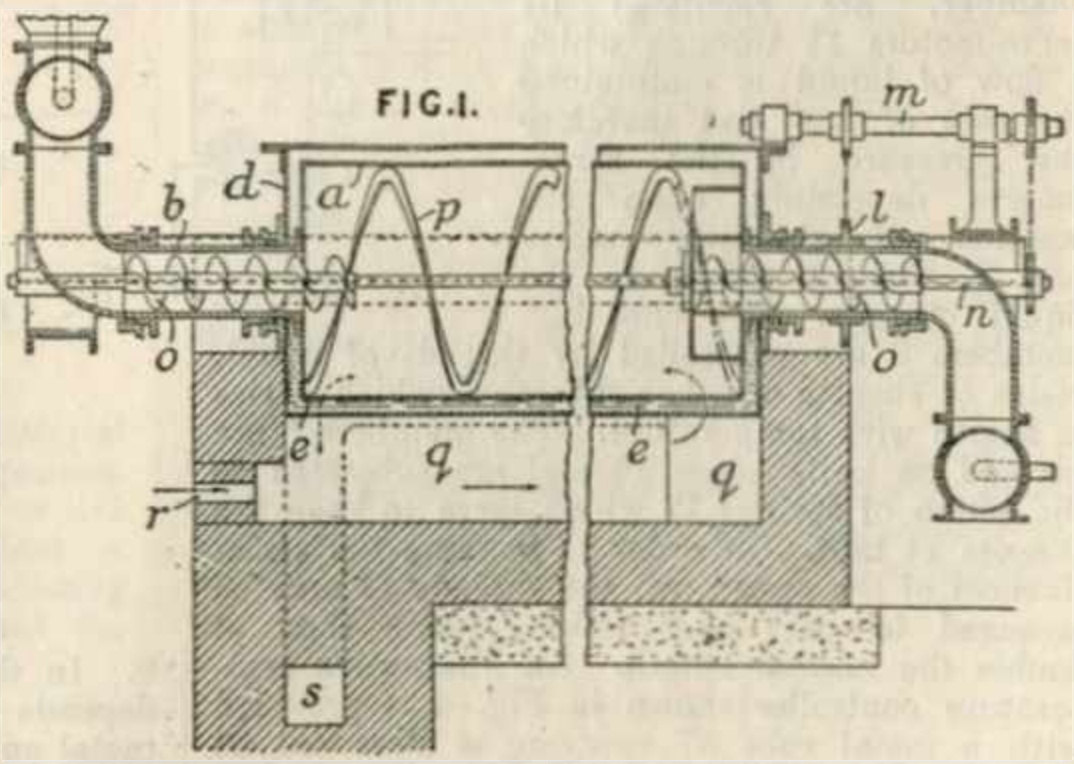
FIG.3.

The shaft 52 also carries a toothed wheel 53 adapted to engage a toothed sector 44 mounted on a lever 45 connected by a rod 46 and spring 48 to the arm 31. An air thermometer comprising a chamber 56 arranged near the burner and communicating by a pipe 55 and chamber 57 with a pressure gauge 59 causes, in the event of the burner being extinguished, a catch 60 to release a counter-weighted arm 26 on the valve spindle 25 and close the valve controlling the compressed air supplied through the pipe 13 to the burner. The air thermometer 56 may be arranged to control the fan motor or to control the supply of fuel to each burner in any convenient manner. Where heavy fuel is employed it may be heated by steam or electricity.

205,906. Woodall, Duckham, & Jones (1920), Ltd., and **Duckham, Sir A. M.** July 28, 1922.

Heating granular materials.—In heating-apparatus of the kind in which the materials, e.g. those employed in the manufacture of chemical products such as permanganates, are caused to travel through a heated rotating cylinder, the cylinder *a* is wholly or partly immersed in molten lead or other metal *e* contained in a stationary bath *d*. The cylinder is supported at its ends by means of hollow trunnions *b* which are rotated from a shaft *m* by chain or like gearing *l* and contain spiral conveyers *o* for feeding the material into and delivering it from the cylinder the conveyers *o* being mounted on a shaft *n* also operated from the shaft *m*. In the interior of the cylinder a helical blade *p* is

FIG.1.

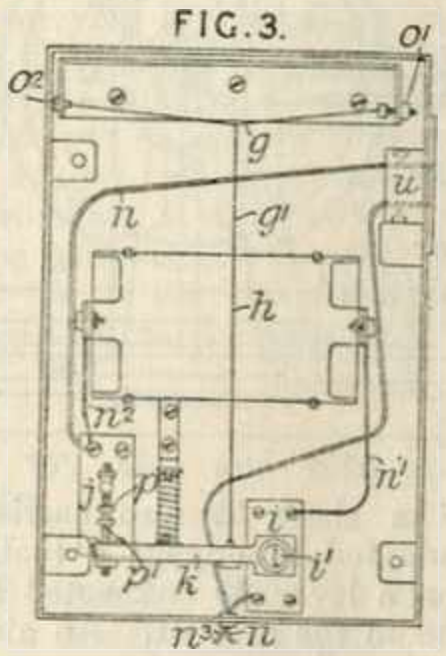


causing the material to travel through the cylinder in contact with the inner surface thereof. The extent of immersion of the cylinder may be varied according to the weight of the contents so as to minimize the friction on the bearings. In the arrangement shown, the bath *d* is mounted in the flues *q* of a furnace, the products of combustion entering at *r* and being discharged by the outlet flue *s*.

205,961. Jenkins, R. Sept. 23, 1922.

Thermostats.—An electrically - heated iron derives its current through a thermal switch located in a stand so that when the iron is placed on the stand the current is automatically switched on or off to keep the temperature of the iron between desired limits. As shown in plan in Fig. 3 with the perforated top plate removed, the stand is in the form of a rectangular box supporting two soft iron wires *g*, g^1 arranged **T**-fashion, wire *g* being secured to an adjustable screw o^1 and fixed pin o^2, and wire g^1 to a spring-controlled contact arm *k* pivoted at i^1 and carrying a platinum pin p^1. When the leads to the iron have been connected up to the plug points *u* in circuit with the supply leads *n*, n^3 and the iron is placed on the stand, the heat generated causes the wires *g*, g^1 to extend and the circuit consequently to break at the points *p*, p^1. When the iron has cooled down sufficiently the circuit is again completed and the heating-up of the iron re-commences. A condenser *h* is shunted across the points *p*, p^1, by connection through wires n^1, n^2 with the conducting plates *i*, *j*.

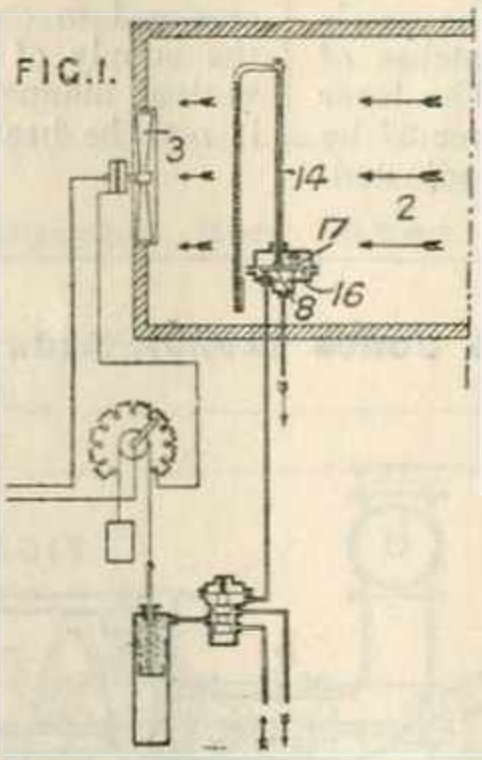
FIG. 3.



206,154. British Arca Regulators, Ltd., (Assignees of *Aktiebolaget Arca Regulatorer*). Oct. 25, 1922, [*Convention date*].

Thermostats. — Comprises a method and apparatus for automatically controlling the temperature prevailing, for example, in a chamber for drying tobacco. Controllers such as a fan 3, Fig. 1, for controlling the flow of air through the drying-chamber 2, or a valve 32 for controlling the action of a heating device 6 in the chamber, are regulated by servo-motors 11 through which a flow of liquid is maintained the rate of flow and therefore the pressure in the servo-motors depending upon the position of checking - members 8, Figs. 1 and 2, in the liquid circuits. The checking-members 8 are controlled by threads of metal, strips of ebonite or other substance which varies in length with temperature. The members 8 are pivoted on knife edges 16 and are subjected to the action of springs 17 which serve to keep the threads 14 taut. In order to increase the sensitiveness of the apparatus, the threads 14 may be arranged to pass over rollers, being then of double the normal length. An alternative temperature controller shown in Fig. 4 is provided with a metal tube 37 carrying a glass rod 36 upon the top of which rests the checking-member 8. In this case the position of the member 8 depends upon the differential expansion of the metal and glass. Specification 116,074 is referred to.

FIG. 1.



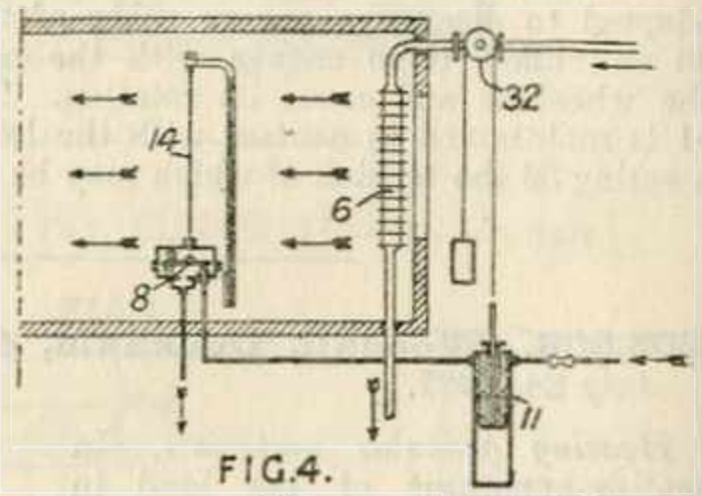


FIG. 4.

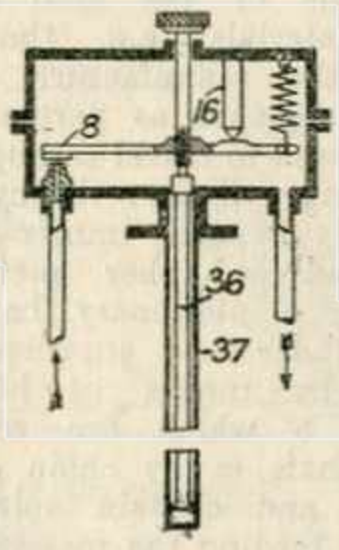
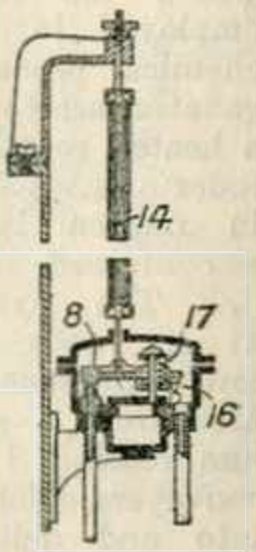
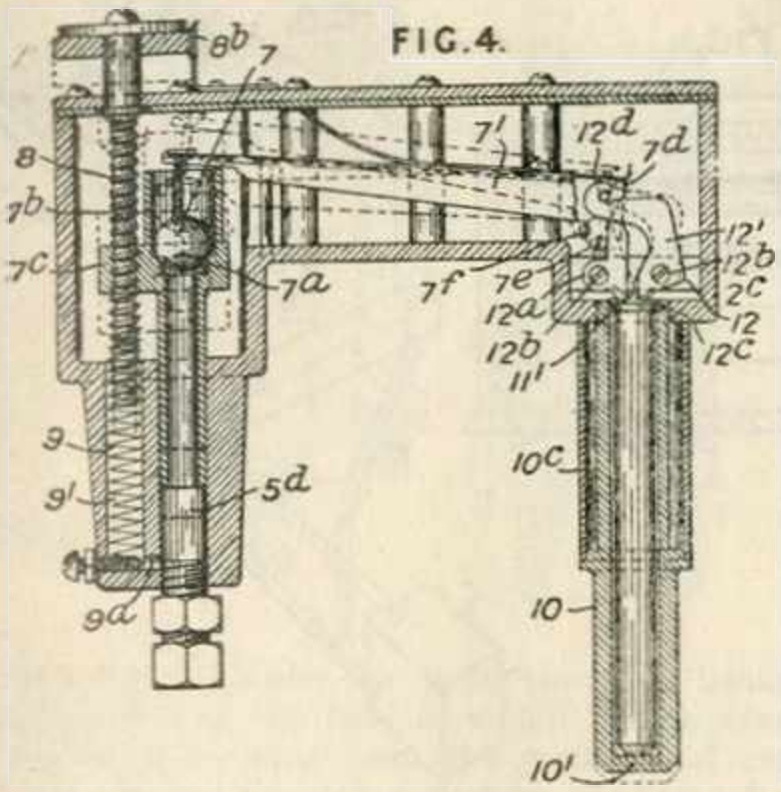


FIG. 2.



206,220. Partlow, H. W. July 31, 1922.

FIG. 4.



Thermostats. — A thermostat particularly applicable for use in connection with the melting pots of type-bar making machines has a spherical valve member suspended from the end of a floating lever mounted on a pair of oppositely moving cranks actuated by the thermal element. The valve member 7 works in conjunction with a seat 7^a formed in a member 7^b slidably mounted in the gas outlet passage 5^d and adjusted to vary the controlled temperature by a screwed rod 8 engaging a threaded lug 7^c on the member 7^b. The screwed rod is pressed upward by a spring 9 housed in a well 9^x in which is arranged the adjustable bye-pass passage 9^a. Externally of the casing the rod is provided with a graduated adjusting knob held in its adjusted position by a spring finger 8^b. The thermal element comprises a brass tube 10 closed at the end 10^1 and protected at its upper end by an air jacket formed by a steel sleeve 10^c. A high carbon steel rod is loosely fitted in the sleeve and has a hardened head 11^1 formed at its upper end to fit the sleeve and engage the rounded ends 12^c of a pair of levers 12^1, 12^a pivoted at 12^b to a support 12 secured in a well 2^c formed in the main casing The lever 12^1 is formed with a hook 12^d to engage a pin 7^d on the lever 7^1 and the lever 12^a engages pin 7^e on an ear 7^f formed on the lever. In a modification for controlling the temperature of the mouth of the pot the thermal element is arranged horizontally and the levers 12^1, 12^a are connected to the floating lever 7^1 by hooked links. The upper part of the brass sleeve 10 may be formed as a separate member screwed into it. The Specification describes the application to melting pots in which the pouring spout is heated by two vertical and one horizontal burners in addition to the main burner under the body of the pot.

206,526. British Thomson-Houston Co., Ltd., (Assignees of *Heisler, C. L.*). Nov. 6, 1922, [*Convention date*].

FIG. 1.

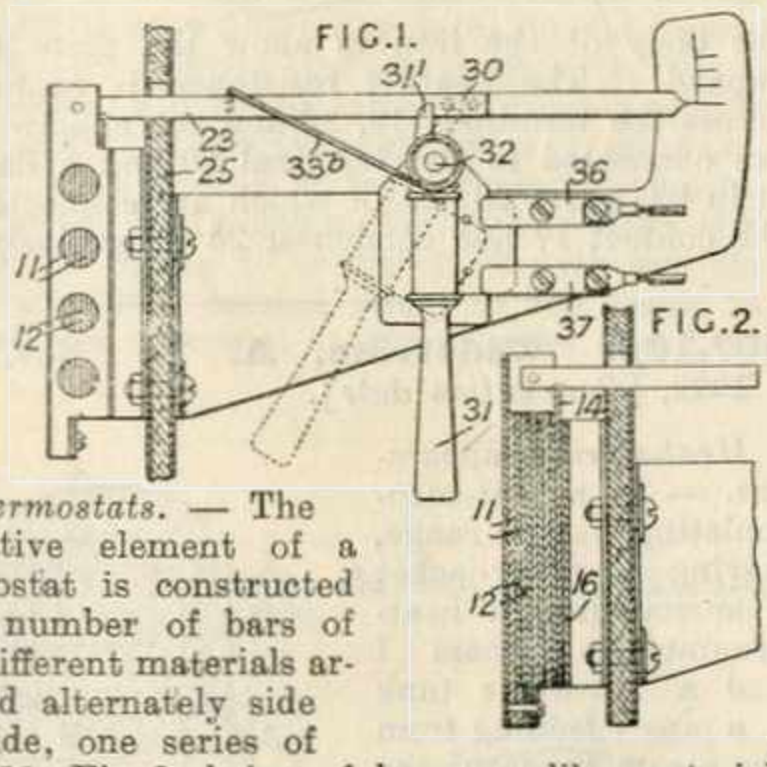


FIG. 2.

Thermostats. — The operative element of a themostat is constructed of a number of bars of two different materials arranged alternately side by side, one series of bars 11, Fig 2, being of brass or like material having a relatively high coefficient of expansion and the other sides being of steel, invar, or like material having a relatively low coefficient of expansion, the adjacent ends of the bars being connected by welding or brazing so that the movement of the end 14 of the final rod is the sum of difference in expansion of the pairs of bars. Lateral distortion or bending of the bars is prevented by the provision of a casing 16 which surrounds the bars and guides their movements. Modifications are described in which the bars 11 are of I or like section and completely enclose the bars 12, and in which the bars are replaced by series of concentric tubes. In the construction shown in Fig. 1, the thermostatic element is mounted on the wall 25 of an electrically-heated oven and adapted to cut off the current when a predetermined maximum temperature is attained. The switch comprises air arm 31 normally held in closed relation to the contacts 36, 37 by the engagement of a latching lug 31^1 with a projection 30 on a pivoted arm 23, between which and the pivot 32 of the arm 31 a spring 33^b is arranged tending normally to depress the right-hand end of the arm 23 and to move the switch arm 31 to the open position. When the predetermined maximum temperature is attained the end 14 of the thermostatic element raises the right-hand end of the arm 23, frees the lug 31^1 and allows the spring 33^b to open the switch, resetting being effected by hand when the temperature has fallen sufficiently to allow the lug 31^1 and projection 30 to re-engage.

206,592. **Slade, M. W.** Aug. 9, 1922.

Heating by circulation of fluids.— The tank or radiator of an incubator is constructed as a self-contained water-circulating system to which water from a boiler is admitted by a thermostatically-controlled valve. The flow and return pipes *d*, *e* of the tank *a* are connected by a cross-pipe *h*, and baffles *l* having graduated apertures l^1 are fitted to equalize the flow through the tank. A valve *f* controlled by a thermostat *g*, Fig. 1, regulates the amount of water passing from the boiler *c* into the circulating system. The transverse pipe *h* allows circulation to continue when the valve *f* is closed, the pipe *e* being exposed to the atmosphere for instance in a flue a^1. A pipe *i* allows circulation in the boiler to continue when the valve is closed. According to the Provisional Specification the tank may be connected directly to a boiler that is regulated by any known method.

FIG. 1.

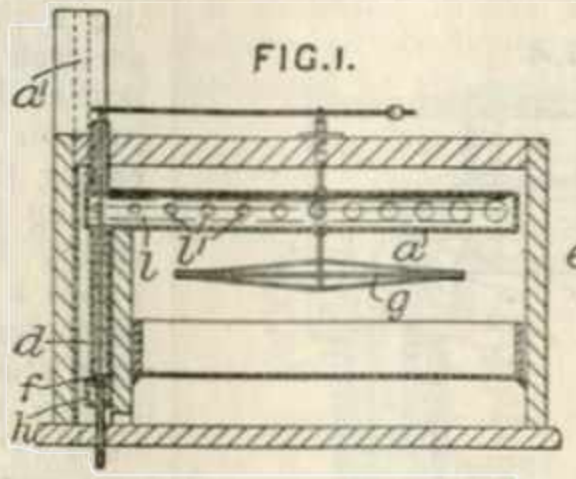
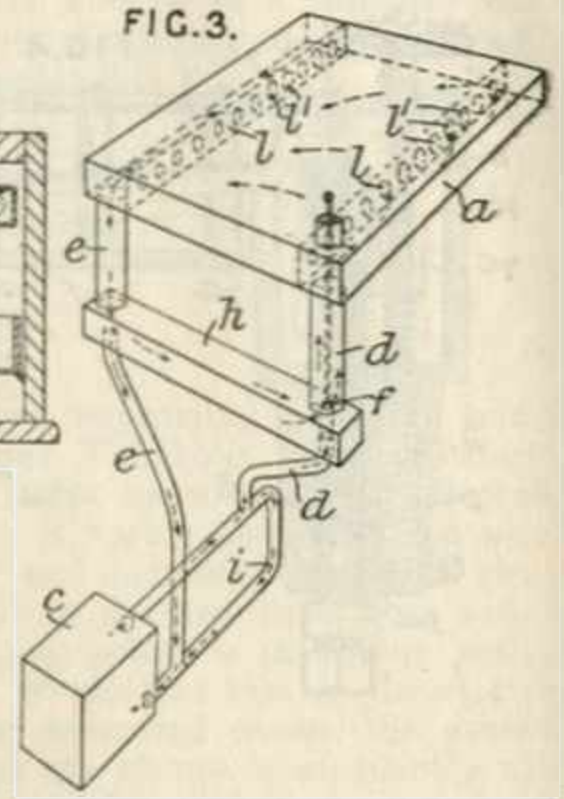


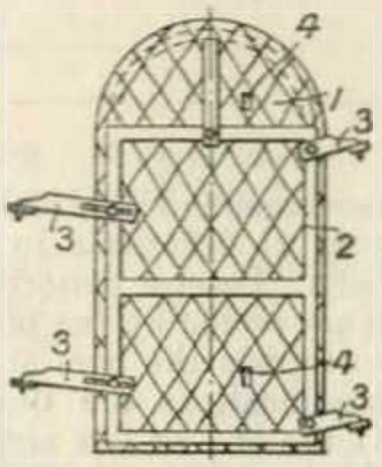
FIG. 3.



206,613. Unwin, D. J. Aug. 23, 1922.
No Patent granted (Sealing fee not paid).

Non-conducting coverings for heat. — A device for preventing loss of heat through the doors of enamel kilns or ovens &c. consists of a heat-insulating asbestos mattress 1 held in shape by a metal frame 2 or a sheet metal blank, which is adapted to be suspended in front of the door and independently thereof, e.g. by hinge or hook elements 3 engaging eyes on the kiln-wall. The mattress consists of an asbestos casing stuffed with asbestos wool, and it may either be laced to the frame, or may be gripped between a pair of frames. Inspection openings 4 registering with those in the door are fixed in the mattress.

FIG. 1.



207,030. British Thomson-Houston Co., Ltd., (*International General Electric Co., Inc.*). Nov. 17, 1922.

Thermostats. — An electric flat-iron &c. is provided with a bimetallic flat plate 11, fixed at one end in direct heat-conducting relationship with the heated body portion 10, and carrying at its free end an insulated c ntact 17 flexibly connected in circuit and normally held in engagement with a stationary contact 18, to close the circuit through the heating resistance 28, and a condenser 25 mounted upon the iron and connected across the contacts. A recess 12 is provided in the body of the iron to allow the plate 11 to expand. The heating resistance is connected across the terminals 19, 20 and the supply leads are connected to the terminal 20 and a flexible strip 22, parts 23, 24 of which are connected to the contact 17 and condenser 25 respectively.

FIG. 2.

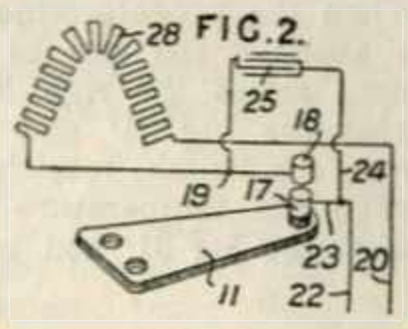
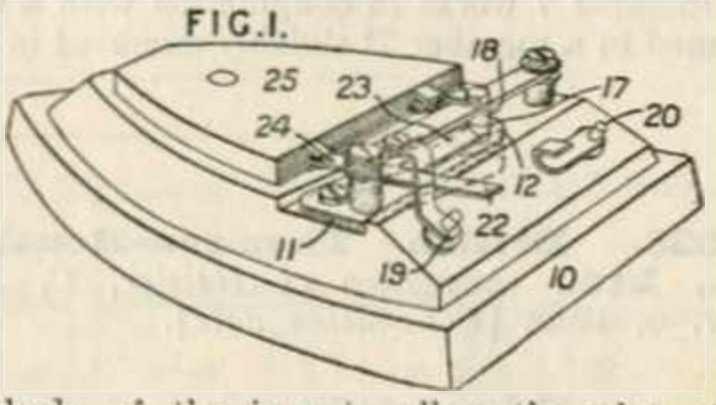
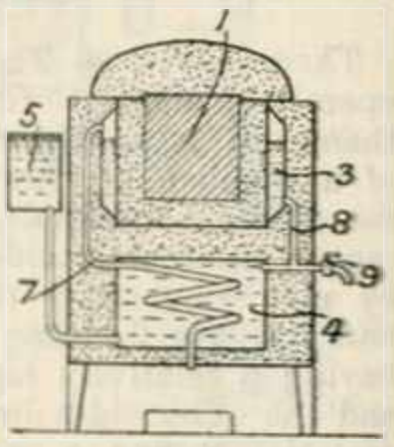


FIG. 1.

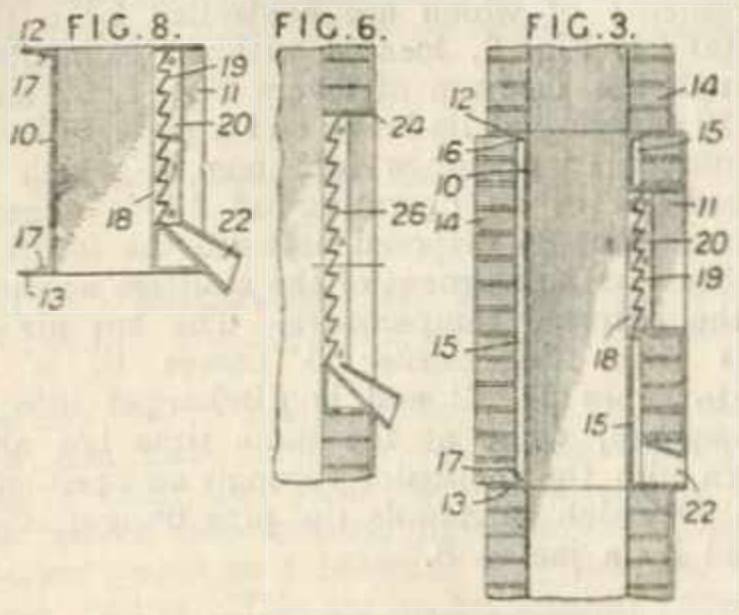


207,168. Widström, A. D. Nov. 17, 1922, [*Convention date*].

Heat-storing apparatus. — In a heat-accumulating electric range, having a water-jacket 3 surrounding a heat-accumulating mass 1 and a hot-water tank 4, a pipe 7 leading from the steam space of the water-jacket arranged so that the steam heats the water in the hot-water tank without coming into direct contact therewith. The bottom part of the water-jacket and the upper part of the hot-water tank are connected by a pipe 8 fitted with a draw-off cock 9. A tank 5 supplies water to the hot-water tank.



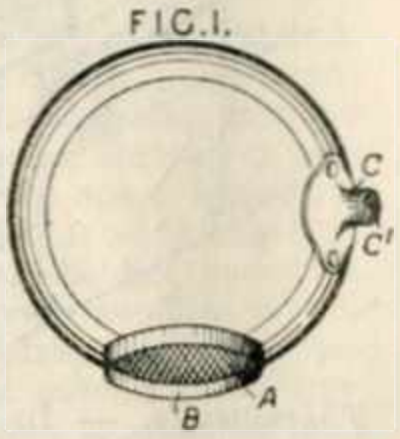
207,295. Dodge, H. Sept. 12, 1922.



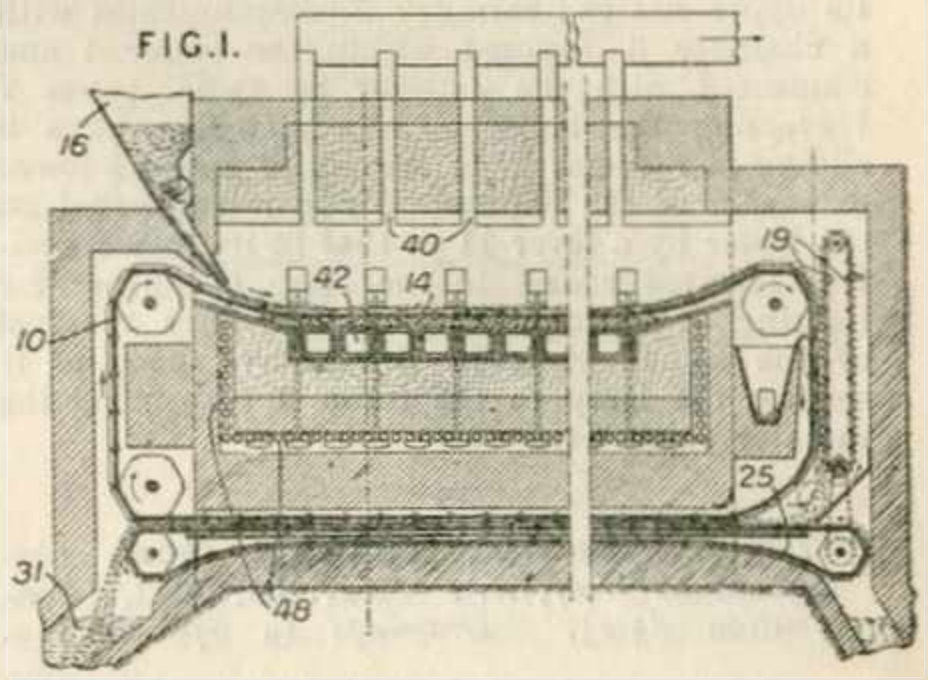
Radiators.—Relates to apparatus for heating buildings &c. of the kind in which heat is transmitted to the rooms from the products of combustion passing through a flue by radiation from a metal plate or diaphragm inserted in an aperture in the flue. The inner wall of the entire apparatus comprising the diaphragm and its support is flushed with the inner wall of the flue so as to leave the entire area of the flue unobstructed. In the construction shown in Fig. 3, the diaphragm 19, which is preferably corrugated, is mounted between clamping strips 18, 20 in a frame 11 forming part of a casing 10 inserted into the flue aperture. At its ends the casing is formed with flanges 12, 13 adapted to be embedded in the brick-work of the flue and shouldered at the points 16, 17 so that the bricks 14, may be spaced away from the casing to leave an air space 15 around the latter. By means of an inlet passage 22 communicating with the air space 15 at the lower front portion of the casing air is drawn into the space 15 and passes upwardly in front of the diaphragm 19. In a modification, Fig. 8, the casing 10 extends only to the height of the diaphragm 19, and the passage 22 opens directly in front of the diaphragm. In a further modification, Fig. 6, the main portion of the casing 10 is dispensed with and the diaphragm 26 is carried solely by the frame 24 inserted into a frontal aperture in the flue.

207,362. Wilson, A. H., and **Wilson, F. C.** Nov. 7, 1922.

Steam - traps. — A float for actuating ball and float valves and analogous purposes is formed with an air aperture A at the base surrounded by an outstanding flange B. The float is secured to the ball arm by means of a socket C having an internal thread C^1.

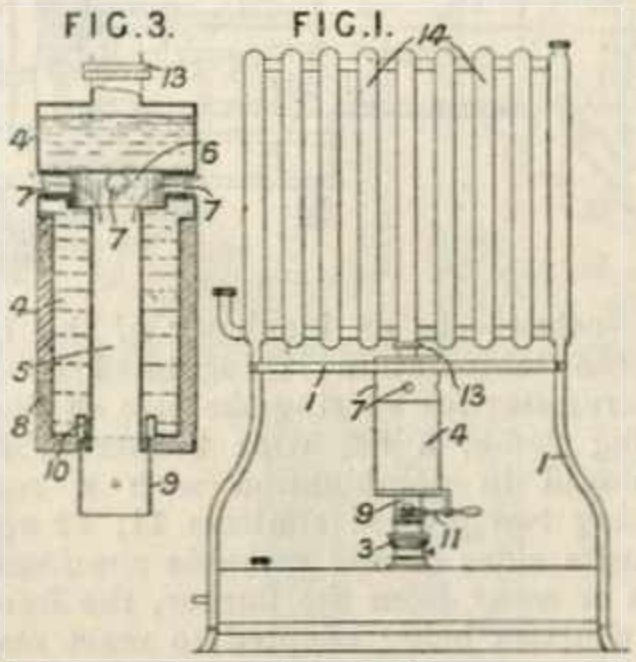


207,460. Piron, E., and **Caracristi, V. Z.** March 20, 1923.



Heating systems and apparatus.—In a distillation apparatus for solid materials the material is heated by a bath of molten material without direct contact therewith by passage over the bath on a conveyer floating on its surface. The material is delivered from a hopper 16 on to an endless conveyer 10 which passes over and in contact with a bath of molten material 14 heated by flues 42, the distillates escaping through outlets 40. The residue is conveyed to disintegrating means comprising endless chains or belts 19 having projections and moving at a speed different to that of the conveyer whereby the material is broken up any gases contained therein being released and falls on to a conveyer 25 moving in proximity to the inverted conveyer 10 by which it is kept hot during its passage to the sealed outlet 31. A row of cooling tubes 48 prevent the heat of the bath spreading unduly to other parts of the apparatus.

207,534. Brégeaut, L. Nov. 24, 1922, [*Convention date*].



Radiators. — A combined heater and radiator for warming buildings &c. comprises a boiler or water reservoir 4, preferably having an insulating covering 8, traversed by a central vertical chimney 5 below which is disposed a lamp or gas burner 3, the reservoir being connected at

number of vertical heat-radiating tubes 14 in which the steam generated circulates before condensing and returning to the boiler 4. At its upper end the chimney 5 communicates with a chamber 6 disposed within the boiler 4 and connected with the exterior by radial tubes 7 traversing the boiler. An adjustable sleeve 9 sliding in recesses 10 in the boiler forms a lower extension of the chimney 5 and is supported on the boiler by a lever 11 so that in its raised position it gives access to the lamp or burner for lighting or extinguishing or facilitates removal of the same, while in its lowered position it secures the lamp to the frame 1 supporting the radiator tubes 14.

207,809. Kohlenveredlung Ges., (Assignees of *Wolf, A.*). Nov. 30, 1922, [*Convention date*]. *Drawings to Specification.*

Heating systems and apparatus.—In a plant for the distillation of coal or other carbonaceous substances, in which solid, liquid or gaseous fuel produced in the distillation is utilized in a subsidiary apparatus, where it is burnt and gives up the greater part of its heat, the cooled waste combustion gases from the subsidiary apparatus are passed to a drying apparatus where they serve for the drying of the coal &c. before it is charged into the retorts.

In the Specification as open to inspection under Sect. 91 (3) (a), any hot gases, the temperature of which exceeds that desired for processes in which they are to be used, are reduced in temperature to the desired degree by utilization in any useful apparatus. This subject-matter does not appear in the Specification as accepted.

207,854. Charters, E. D. Sept. 2, 1922.

FIG.4.

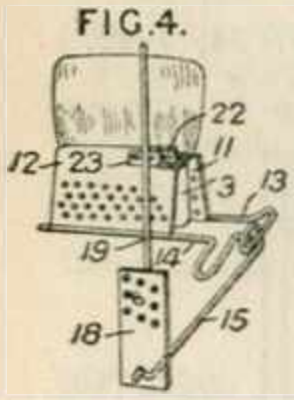
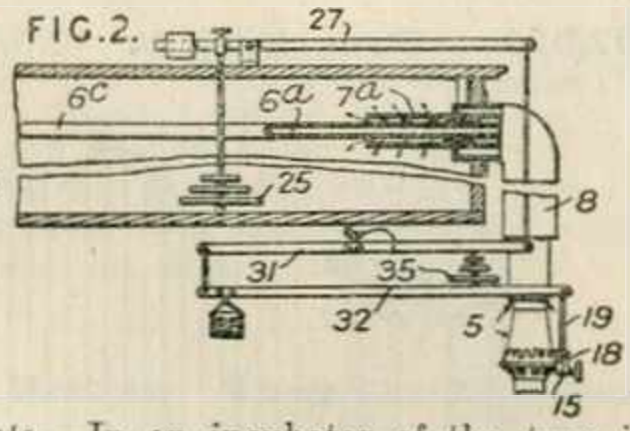


FIG.2.

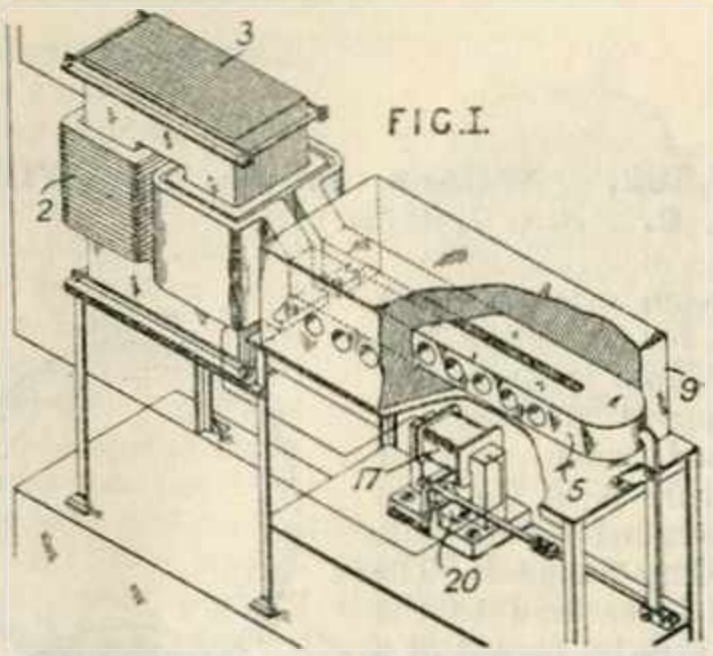


Thermostats.—In an incubator of the type in which the temperature is regulated by means of a thermostat for varying the size of the heat-producing flame, a flat wick burner 3, Fig. 4, is employed in combination with a regulator comprising two pivoted shutters 11, 12 arranged on opposite sides of and movable simultaneously towards or away from the burner, the free edges of the shutters being adapted to meet over and extinguish a portion of the flame. Each shutter is provided with a notch 22 at one of its upper corners so that a pilot light is left when the shutters are in the closed position, the size of the pilot light being adjustable by means of a sliding slotted plate 23 mounted on one of the shutters adjacent to the notch 22. The shutters 11, 12 are mounted on shafts 13, 14, the rotary movements of which are controlled by a thermostat 25, Fig. 2, located within the incubator through the medium of levers 27, 31, 32 and a rod 19 carrying at its lower end a plate 18 having a number of openings into one of which the hooked-end of an operating-rod 15 is engaged. A thermostat 35 disposed between the levers 31, 32 effects an adjustment of the shutters according to the external temperature. The hot air and gases from the burner 3 passes by a flue 5 into pipes 6^a, 6^c and is discharged into the atmosphere, while at the same time hot air is drawn into the incubator through an open-ended pipe 7^a which surrounds the pipe 6^a and is protected by a jacket 8.

207,958. Hydroloid, Ltd., (*Exportingenieure für Papier-und Zellstofftechnik Ges.*). Oct. 25, 1922. *No Patent granted* (*Sealing fee not paid*).

Non-conducting coverings for heat and sound.—Asbestos materials such as cord, fabric, paper, and board for non-conducting coverings and other purposes, are impregnated with a sizing agent such as animal size, gelatine, or casein, and also with a hardening agent such as alum, chrome salts or formalin. The material is either allowed to remain in the sizing bath at a temperature of 35—40° C. until completely impregnated or it is passed between pressure rolls either while in the sizing bath or subsequently. Acids, such as lactic acid, or alkalis, such as caustic soda, may be added to the sizing bath to accelerate impregnation. After the hardening treatment the material may be impregnated with glycerine to render it flexible and varnished to retain the glycerine. Instead of glycerine, an addition of emulsifiable material such as soap or castor oil may be made to the sizing bath.

208,109. Imray, O. Y., (*Central Mining & Investment Corporation, Ltd., Dew, W. Elsdon-, Pryce, L., and Woodworth, L. B.*). May 29, 1923.

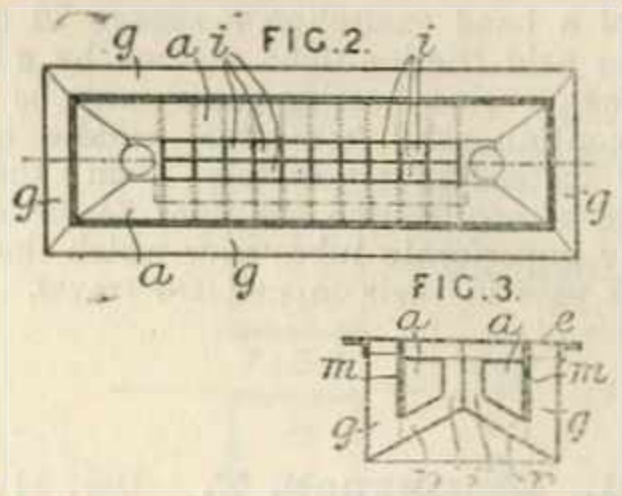


Thermostats. — In an induction furnace the

temperature of the secondary 5 is regulated by utilizing the expansion thereof to operate a primary current controller 17 as described in Specification 209,707.

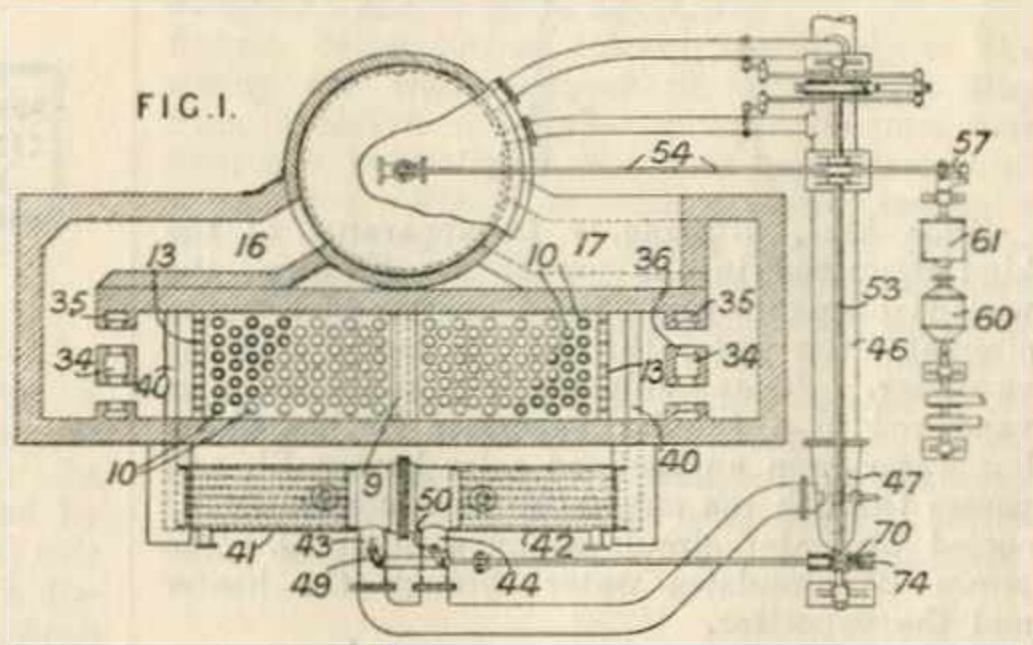
208,116. Sadovich, E. Z., (Assignee of *Koch, G.*). Dec. 5, 1922, [*Convention date*].

Radiators. — A radiator for heating motor vehicles, comprises an outer casing separated by passages *g* from the inner branched casing *a* through which the heating medium circulates, and central passages *i* between the branches of the inner casing. The air to be treated passes downwards through the outer parts of the perforated cover-plate *e*, and escapes through the central portions of the plate after traversing the passages *g*, *p*, *i*. The passages *p* are inclined outwardly by inclining the bases of the outer and inner casings as shown The outer walls of the inner casing are continued upwards to meet the cover-plate and are lined with heat-insulating material *m*.



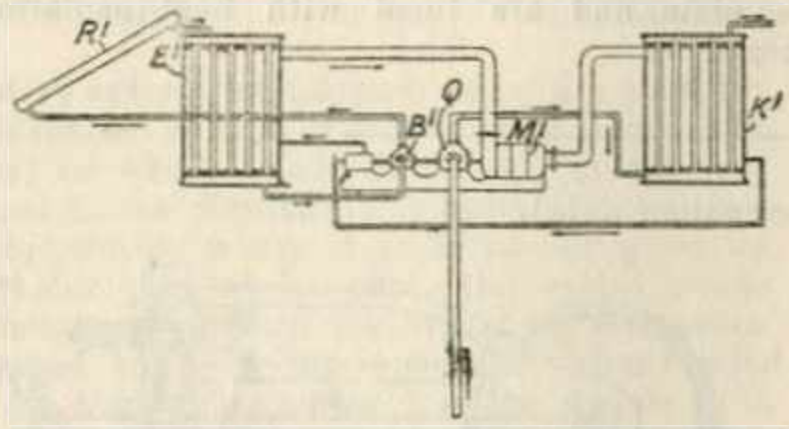
208,170. Puening, F. Dec. 11, 1922, [*Convention date*].

Heating-apparatus. — Transfer of heat to materials or articles is effected by passing a body of heating-gases alternately in opposite directions through a heating chamber. In the apparatus shown, in which the heat-absorbing element is a tubular heater 10 for gas, oil or water, the two ends of the chamber 9 are connected by flues 16, 17 to the upper and lower ends of a large vertical cylinder 15 above and below a piston 18 operating therein. At each end of the chamber is a perforated wall 13, and beyond these walls are perforated vertical flues 34, 35, by which heating gases are supplied to the system from combustion chambers 28 beneath, even distribution of the gases over the height of the chamber being effected by graduated damper blocks 39 in the ports 36. Between the walls 13 and the corresponding flues 34, 35 are outlet ports 40 leading through regenerators 41, 42 and valve-controlled flues 43, 44 to a common stack flue 46, in which may be an exhaust fan 47. The valves 49, 50 in the flues 43, 44 are inter-connected and are so arranged and operated at each reversal of flow that the port 40 at the end of the heating-chamber from which the gases are flowing towards the cylinder is in communication with the stack. The piston is protected by a covering 26 of refractory material and is cooled by water supplied through a pipe 22 within the piston rod to the space beneath a partition 20 in the head. As an additional protection against the action of the hot gases, relatively cool waste gases may be supplied alternately above and below the piston through pipes 81, 82 under the control of automatically-operated valves 85, 86. The piston is actuated from



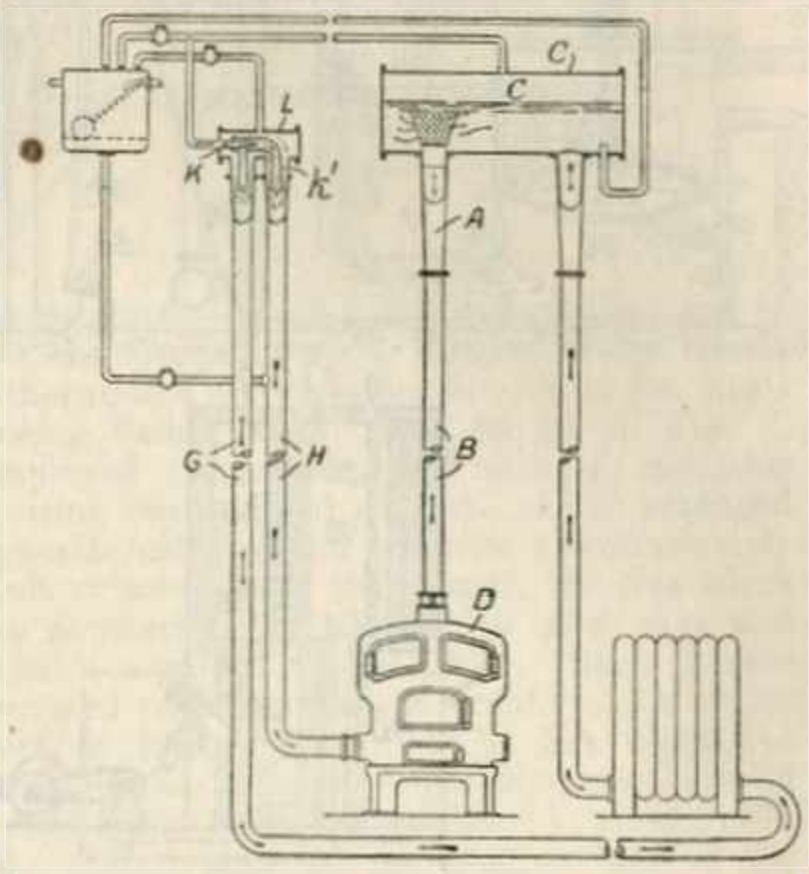
a motor 60 through reducing gear 61, the crank 58, link 57 and the rocker 54, while the valves 49, 50, and 85, 86 are operated from the rock-shaft 53 through links and a slipping device consisting of a band encircling a sheave 70 on the shaft and held friction-tight thereon by a spring 74. The surplus heating-gases may be withdrawn continuously from the middle of the chamber instead of alternately from the two ends. In a modification the flues 34, 35 are replaced by imperforate tubes over which the heating-gases pass in their to and fro travel.

208,171. Romagnoli, T. Dec. 11, 1922, [*Convention date*]. *Addition to* 205,504.



Solar heat, utilizing.— In apparatus of the kind described in the parent Specification, the various elements are spaced apart and a pump circulates the water through the heater and the vaporizer. The sulphurous anhydride is vaporized in a tubular vaporizer E^1 heated by hot water from an inclined solar heater R^1, and passes through the engine M^1 to a condenser K^1 cooled by water circulated by a pump Q. The pump B^1 circulates water through the heater and the vaporizer.

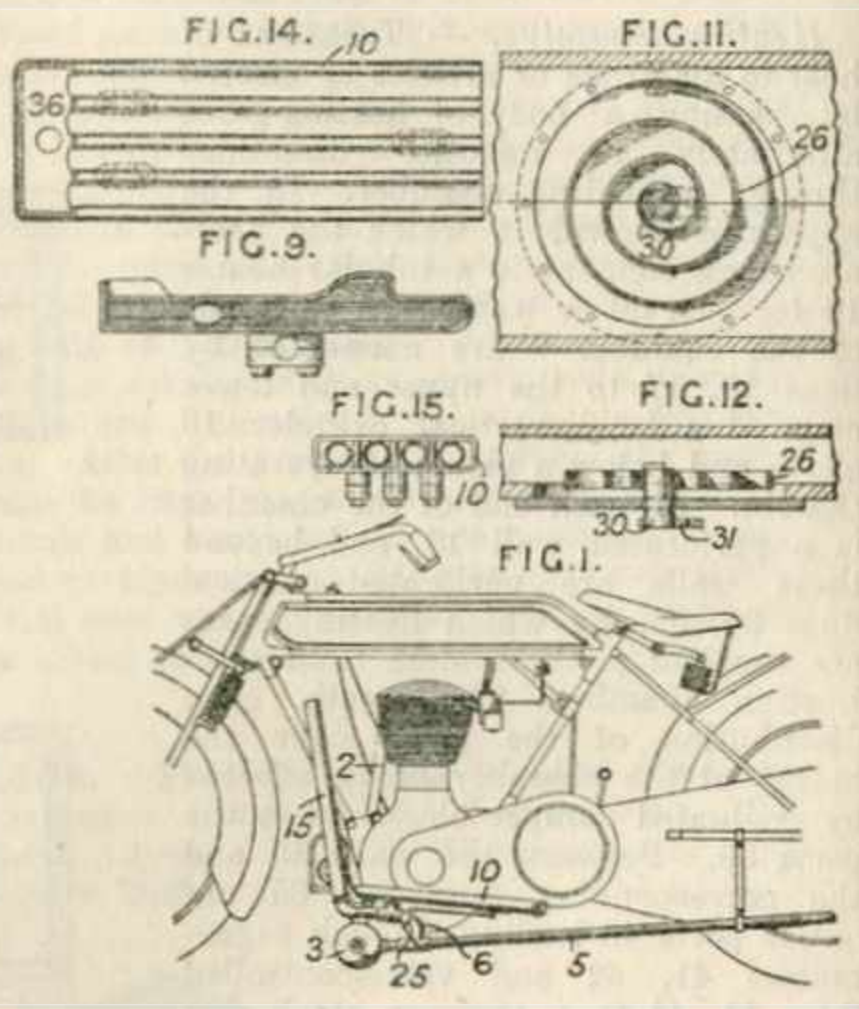
208,203. Craig, F. B. Sept. 8, 1922.



Heating buildings.— In a hot-water heating-system the circulation is accelerated by the formation of steam globules in the rising pipe B thereby lightening the column and by passing the collected steam through an injector K in the **U**-pipe G, H on the return side of the system, whereby the steam is condensed and pre-heats the water returning to the boiler D. In the arrangement shown the generation of the steam globules is facilitated by enlarging the upper end A of the rising pipe B, the steam collects in the zone *c* above the water in the expansion tank C, and the injector K is located in a condensing chamber L and preferably terminates in an expanding tube k^1 which assists in the condensation.

Reference has been directed by the Comptroller to Specifications 14474/99, 6852/03, 2445/04, 3797/04, *and* 22525/13.

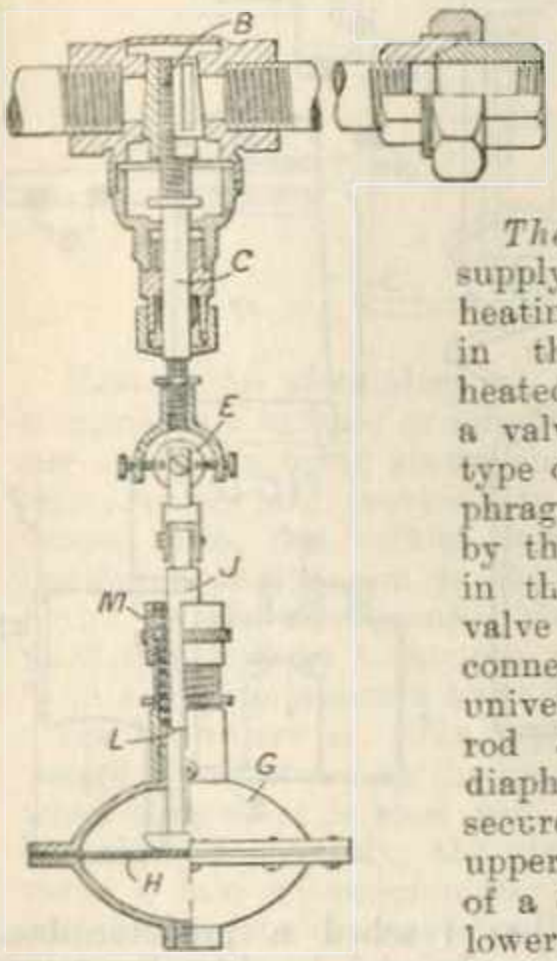
208,245. Ashton, P. E. Sept. 20, 1922.



Footwarmers; thermostats. — In motor-cycles the exhaust is led from the exhaust silencer through foot boards, foot rests or leg guards, being directed to the warmers or to the atmosphere by pairs of interconnected valves controlled by hand or by a thermostatic regulator. In the construction shown in Fig. 1, the engine exhaust pipe 2 discharges into the transverse silencer 3 having two outlet pipes 5 one on each side. From each outlet pipe a branch 6 leads through a **T**-piece, to the footboard 10 and to the leg guard 15 each of which is in the form of a hollow casting with or without internal baffles. The exhaust is diverted to the heaters when required by means of two valves arranged one in the outlet pipe 5 and the other in the elbow piece 6, these valves being interconnected by a link 25

so that when one is closed the other is open. The leg shield 15 may be made with a central passage through the lower end of which the exhaust is admitted and with side passages open at their lower ends. The footboards may be made with a header 36, Figs. 14 and 15, to which exhaust is admitted and with tubes enclosed in the casing 10 and discharging at the rear. Hollow foot rests, Fig. 9, may be provided instead of or in addition to the foot rests. A thermostatic regulator arranged in one of the heaters, consists of a bimetallic strip 26, Figs. 11 and 12, coiled spirally, the outer end being fixed to the heater while the inner end is secured to a spindle 30 having an arm 31 connected to the valves. According to the Provisional Specification the heating medium may be the engine cooling water or water heated by the exhaust.

208,358. Bond, E., and **Sumerling & Co., Ltd.** Nov. 29, 1922.



Thermostats.— The supply steam to a heating coil immersed in the water to be heated is regulated by a valve B of the gate type operated by a diaphragm H acted upon by the steam pressure in the heater. The valve spindle C is connected through a universal joint E to a rod J resting in the diaphragm, which is secured between the upper and lower parts of a chamber G. The lower part of the chamber is placed in communication with the steam space of the heater. The rod J is pressed against the diaphagm by a spring placed between a shoulder I. on the rod and an adjustable cap M screwed on an extension of the upper part of the diaphragm chamber. When the pressure of the steam generated in the heater is sufficient to overcome the thrust of the spring, the rod J is lifted and the valve is closed.

208,566. Fabrique d'Appareils Electriques F. Sauter Soc. Anon., (Assignees of *Bronner, E. Egli-*). Dec. 18, 1922, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].

FIG.1.

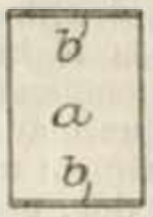


FIG.4.

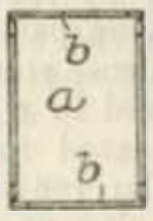


FIG.7.

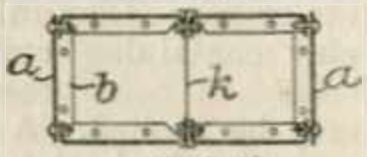


FIG.13.

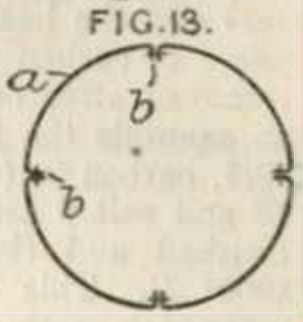
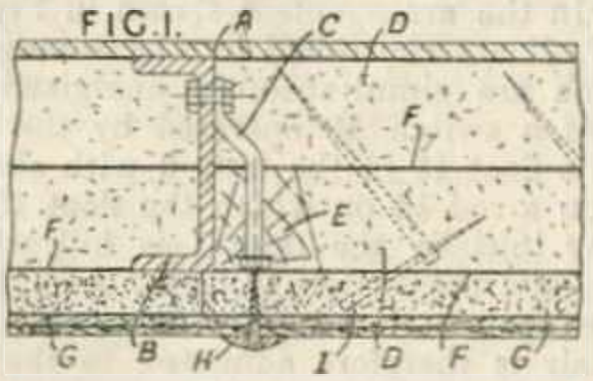


FIG.11.

Heat-storing apparatus.—Metal tiles used in the construction of stove casings, especially casings for electric heat-storage stoves, are provided with perpendicular flanges at one or more edges, the flanges being turned toward the inside of the casing and there secured to an adjacent tile. Figs. 1 and 4 show tiles *a* with two and four flanges *b* respectively, the tiles being assembled as shown in Fig. 7 to form a casing having a central stay *k*. Fig. 1, shows another form of tile which may be used to form a casing as shown or may be used in conjunction with the type shown in Fig. 4 to construct an elongated casing. Fig. 13 shows a further modification. The size of the tiles may be 40 cm. x 60 cm. The casings are especially adapted for enclosing a loose mass of pebbles or soapstone in which tubes containing electric heaters are embedded.

208,743. Bean, A. July 26, 1922.

FIG.1.



Non-conducting coverings for heat.—In insulation for ships or buildings, the first sheet D of cork is fitted closely between the beams B secured to the deck or floor A. The next sheet D is placed against the first sheet, the wood guards E fitted and the parts drawn together by the bolts C, a layer of thin sheet cork is then fitted against the bevel surface and secured by skewers I and finished off by double cement sheathing, and butt straps H. A layer F of pliable solution is used to fix the sheets D and G.

209,057. **Kraus, C. E.** Dec. 28, 1922, [*Convention date*]. *Void* [*Published under Sect. 91 of the Act*].

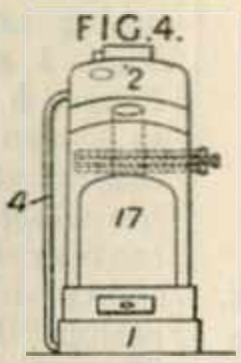
Non-conducting coverings for heat and sound.—An ingredient of heat and sound insulating material is formed with sealed cells containing air or gas. Clay mixed with carbon or a natural clay containing carbon is heated to a viscous state and below the temperature at which glass may be formed. A flux may be added if necessary and the heat treatment may be in an atmosphere of carbon monoxide, unburnt carbon being removed after cooling by reheating in air. As an example the following parts by weight of clay 79.5, carbon 2, (or glucose solution 20), bentonite 18 and salt 5 are mixed in a pug-mill dried and crushed and then heated in a rotary kiln to 1800° F. This cellular material is mixed with infusorial earth and clay or a colloidal clay to which may be added cork, sawdust, sponge, corncob, bark, quebracho wood, stalks &c. As an example these parts by weight are used; clay 10, cellular material 20, sawdust 16 infusioral earth 54. Bricks may be formed and fired.

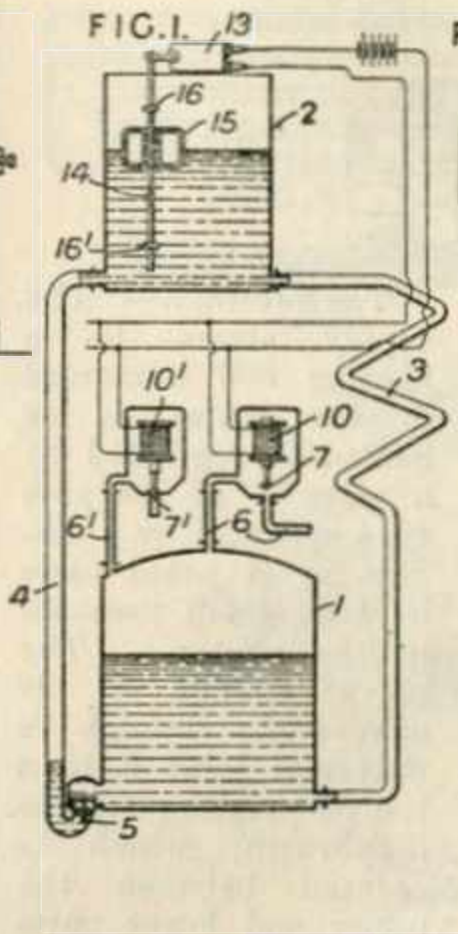
209,106. **Maier, J.** Dec. 29, 1922, [*Convention date*].

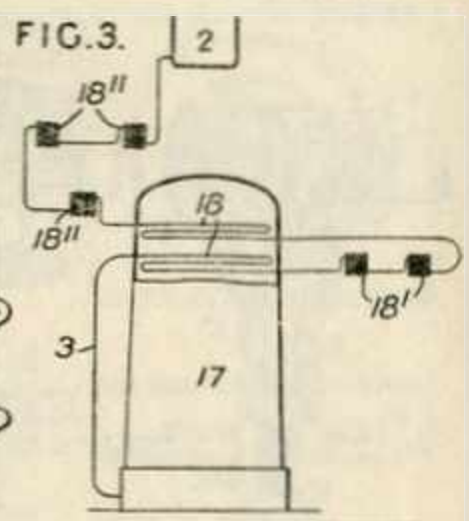
Non-conducting coverings for heat.—An insulating coating for protecting parts of articles subjected to heat treatment, e.g. portions of tools which are being hardened, comprises a mixture containing hygroscopic substances in which water of crystallization is also present. A suitable coating may be obtained by replacing the water in the usual paste composed of water glass, water and a refractory substance such as pipeclay by a watery solution of calcium and magnesium chlorides in the respective proportions of 8 : 10, the percentage of water added varying with the material under treatment.

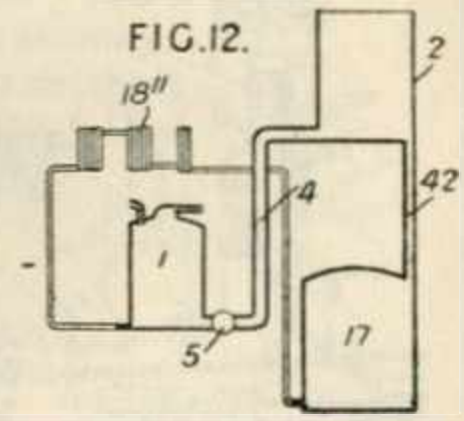
209,251. **Moreau, H.** Nov. 17, 1922.

Heating buildings.— In a central heating-system for buildings of the kind in which the circulation is effected by means of compressed air the air pressure is arranged to act intermittently on the surface of heated water in a single fluid-tight pulsating-tank 1, Fig. 1, so as to expel the water through the service pipe 3, in which the heater and radiators are connected, to a second or load tank 2, which is located above the tank 1 and the heater, and from which water returns under gravity to the tank 1 when the air pressure in the latter is relieved. Connected to the pulsating tank are a conduit 6 connected to a source of compressed air and controlled by a valve 7 and a second conduit 6^1 controlled by a valve 7^1 and opening to the atmosphere. In the arrangement shown in Fig. 1, the valves 7, 7^1 are controlled by electromagnets 10, 10^1 which are simultaneously energized by the closing of a switch 13 operated by the engagement of a float 15 in the tank 2 with abutments 16, 16^1 on a rod 14 on which the float 15 slides. Assuming initially the tank 1 is full, the tank 2 empty, and the switch 13 open, then the valve 7 will be open and the valve 7^1 closed. Compressed air is therefore admitted to the tank 1 and expels the water through the system 3 to the load tank 2, until the float 15 causes the switch 13 to be closed and the electromagnets 10, 10^1 to be energized. The valve 7 is thereupon closed cutting off the supply of compressed air, while the valve 7^1 is opened, allowing air to escape by the conduit 6^1 and a new supply of water to be admitted to the tank 1 through the conduit 4 fitted with a non-return valve 5. The cycle of operations is then repeated. A thermostatically-controlled valve may be arranged in the conduit 6 so that compressed air is only admitted to the pulsating tank 1 after the water in the heater or boiler has reached a predetermined temperature. The water circulated in the system 3 may, after passing through one series of radiators 18^1 as shown in Fig. 3, be reheated in tubes 18 in the heater 17 before entering a second series of radiators 18^{11}, and the tanks 1, 2 and heater 17 may be combined in a single structure as shown in Fig. 4. In the case of a small heating installation the valve 7 may be dispensed with and the pulsating tank 1 be in permanent communication with the source of compressed air through a small orifice, the valve 7^1 being operated directly by the float 15 in the tank 2. Further modifications are described in which the exhaust and compressed air valves, instead of being electrically operated, are connected directly to a rod fitted with abutments and controlled



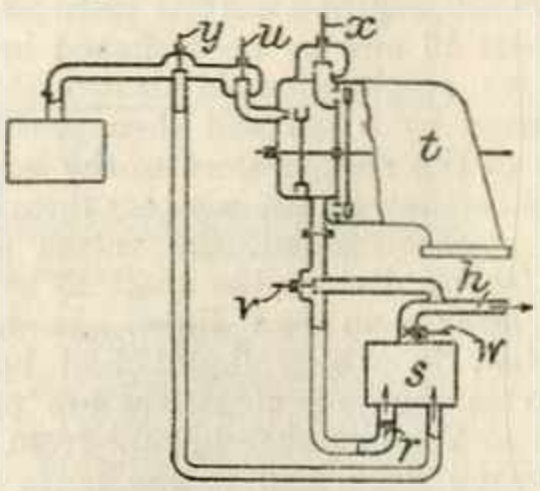






by a float disposed either in the pulsating tank 1 or in the load tank 2. A feed valve may also be provided for replenishing the system with water, which is admitted to the pulsating-tank 1 when the pressure at the base thereof falls below a certain limit. In applying the invention to a system comprising an ordinary boiler 17. Fig. 12, the water is driven from the pulsating-tank 1 through the radiators 18^{11} to the boiler 17 and thence by a conduit 42 to the load tank 2, returning to the tank 1 by the conduit 4; or alternatively, the water may pass from the radiators to the tank 2 and return through the boiler to the tank 1. In order to prevent undue evaporation from the load tank 2 or the loss of vapour carried away with the exhaust air, a condensing coil, through which the cooled water from the radiators passes, may be located in the upper part of the tank 2.

209,430. Forner, G. Jan. 8, 1923, [*Convention date*].

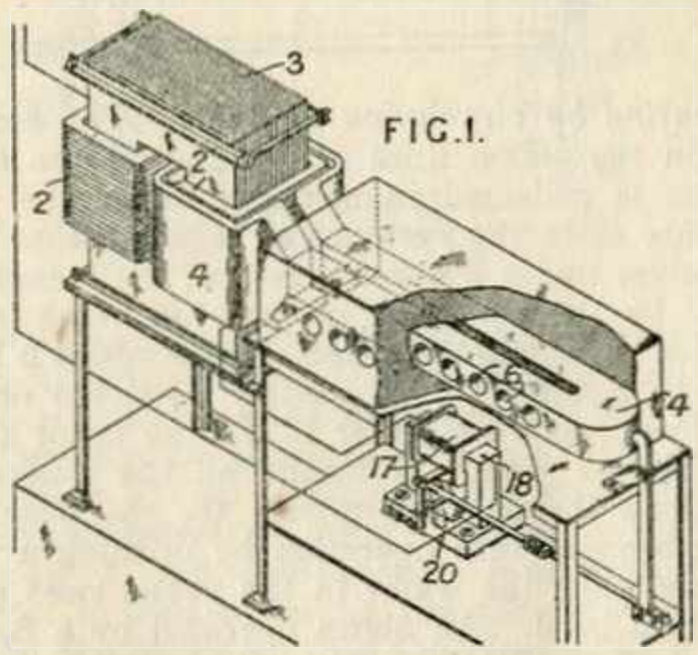


Heating by circulation of fluids. — In plant comprising a turbine or other steam-engine, heating apparatus using steam and a steam accumulator, valves are provided to permit the steam tapped from the turbine to pass direct to the heating apparatus, or to the accumulator or to both. In the arrangement shown, steam is supplied to a turbine *t* through valves *u* and passes from the high-pressure stage to the low-pressure stage by valves *x*. The tapped steam may be passed by a valve *v* to the heating pipe line *h* or, when that valve is shut and the steam pressure has risen sufficiently, the steam can pass by a valve *r* into an accumulator *s*. Steam can be admitted to the accumulator direct from the generator by means of valve *y* and from the accumulator to the pipe line *h* by the valve *w*.

209,479. Pollak, J. E., (*Hirsch, Kupfer- und Messingwerke, Akt.-Ges.*). Oct. 9, 1922. *Drawings to Specification.*

Heating by chemical action.—A heating device for use in soldering, vulcanising or the like comprises a solid heat-inducting mass having a cavity to receive an alumino-thermic-heating member or cartridge and being of such a size in relation to the heating power of the cartridge that it acts as a storer of heat so as to transmit the high temperature generated on ignition of the cartridge for some time at a lower temperature to the part to be heated. The head of a soldering iron has a cavity to receive a heating cartridge or capsule of tin containing a mixture of aluminium powder, oxide of iron and an igniting substance and provided with a storm match. After igniting the storm match the capsule is dropped into the cavity. The plate of a vulcanising outfit may similarly be provided with a cavity to receive the capsule. The cavity may be closed by a lid which may be screwed in place to render it air-tight.

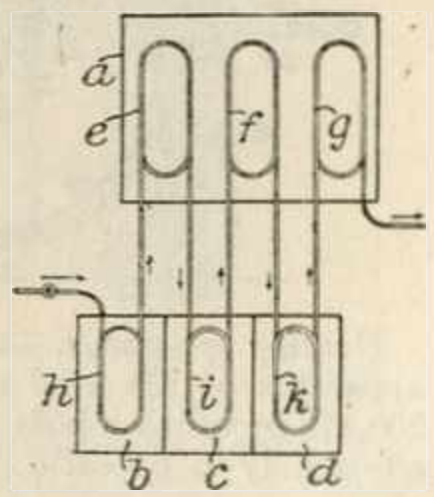
209,707. Dew, W. Elsdon-, Pryce, L., and **Woodworth, L. B.** Jan. 13, 1923, [*Convention date*].



Thermostats. —An induction furnace is provided with thermostatic means operating in accordance with the temperature of the secondary unit for controlling the primary current, the secondary unit forming a part of the thermostat. The furnace shown comprises a primary 2 inductively coupled by means of an iron core 3 to a secondary 4 provided with a number of holes 6 adapted to receive the end of rock drills which require forging or hardening. The secondary is fixed at one end, and when it expands it operates a pivoted gap piece 20 arranged in the air gap of a core 18 on which is wound a choking coil 17 in series with the primary 2.

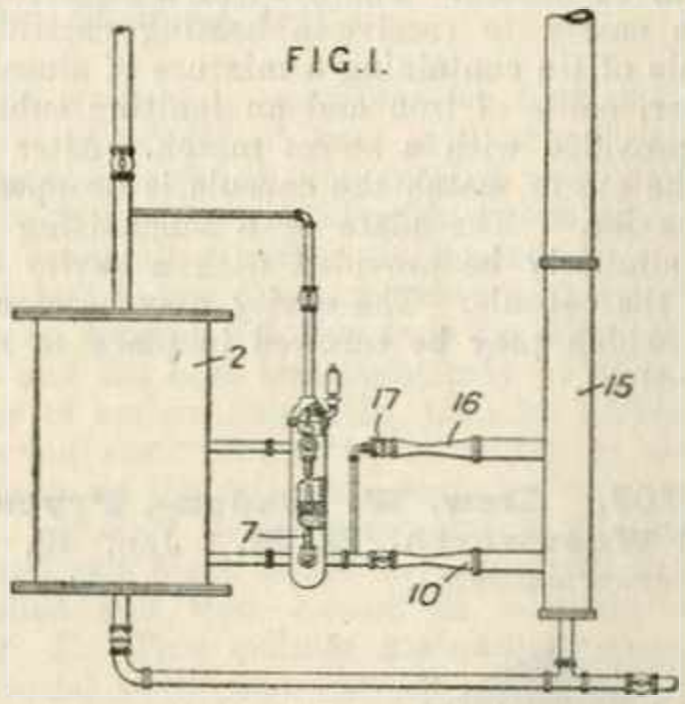
209,772. Fuchs, K. Jan. 13, 1923, [*Convention date*]. *Void* [*Published under Sect. 91 of the Act*].

Heating by circulation of fluids.—Superheated steam, particularly for use in distilling apparatus, flows alternately through elements *e*, *f*, *g* arranged in the apparatus *a* for utilizing the heat and through superheating units *h*, *i*, *k* arranged in a heating device *b*, *c*, *d*.



209,951. **Clarke, C. W. E.** Jan. 25, 1923.

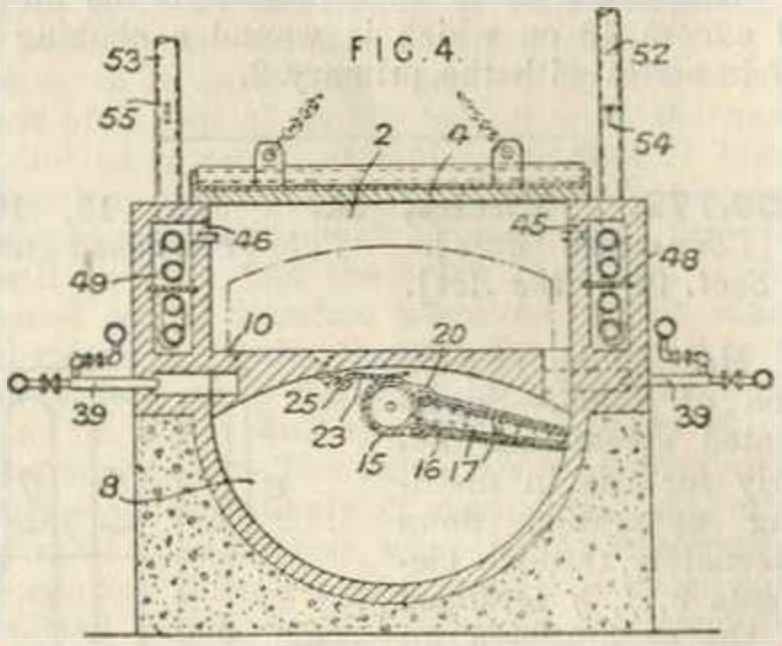
FIG.1.



Heating by circulation of fluids.—The condensate in the steam lines of a high-pressure steam system is collected in a vessel under the same pressure as in the system and is then passed into a receiver under a lower pressure, the steam produced by the reduction of pressure being led off for use. Condensate collected in a vessel 2 is led through nozzles 10, 16 having restricted orifices to a low-pressure receiver 15 leading to an auxiliary exhaust main. Normally all the condensate is passed through the nozzle 10, the nozzle 16 being brought into operation by opening a valve 17 only when the water in the vessel rises above a certain level. An alarm operated by a float in a gauge 7 is sounded when this level is reached. The valve 17 may be automatically operated by a thermostat comprising an inclined expansion tube in communication with the top or bottom of the vessel. The steam may be used for heating the boiler feed.

210,068. Puening, F. Jan. 18, 1923, [*Convention date*].

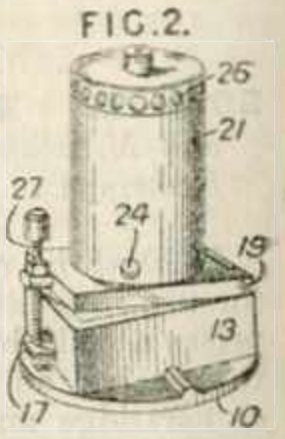
FIG.4.



Heating apparatus. — In a furnace or heating apparatus of the kind described in Specification 208,170 in which a body of heating-gases is passed alternately in opposite directions through a heating-chamber the impelling member for the hot gases consists of a piston device of the oscillating-vane type. In the apparatus shown the heating-chamber 2 having a removable cover 4 is connected by side ports 10 distributed along its length with a lower chamber 8 in which the oscillating piston 16 operates. Fresh hot gases are supplied continuously by means of burners 39 delivering into the ports 10, and at each stroke of the piston a portion of the hot gases is withdrawn through ports 45, 46 leading to recuperator chambers 48, 49, and stack flues 52, 53, in which are dampers 54, 55 interconnected for operation in such manner that when the gases are passing from left to right through the heating-chamber, the right hand ports are put into communication with the corresponding stack and vice versa. The piston is mounted on a hollow shaft 15 and consists of a box-like member provided internally with perforated strengthening partitions 17 and covered externally by a layer of heat-insulating material 20. Passage of gas from one side of the piston to the other, otherwise than through the heating-chamber, is prevented by a sealing-member consisting of a curved plate 23 supported on the shaft 15 and by hook-shaped brackets 25. The air for combustion is drawn through the hollow piston by a fan and then passed through the tubes of the recuperators to the burners. The shaft 15 is oscillated from a motor through a crank arm and connecting-rod, the valves 54, 55 are operated from a disc on the shaft 15 by a friction band, a lever arm and links. In a modified construction, in which liquid fuel burners are used, two combustion chambers are provided at each side of the chamber 8, and from these upwardly flaring flues lead to the ports 10. The heating-gases may be distributed in the chamber 2 by vertical walls having perforations, which may be controlled by damper blocks. In a further modification, in which the combustion products are not brought into contact with the materials to be heated, a body of air is passed to and fro over heating-pipes and the charge. The apparatus may be used for annealing metals and glassware, the low temperature carbonization of coal, and in the cracking of hydrocarbons.

210,149. Frost & Co., Ltd., H., and **Welch, W. H.** Oct. 24, 1922.

FIG.2.



Thermostats. — A heating apparatus comprises two parts, one of which is directly heated, and the other is heated from the first by conduction, and means are provided for automatically controlling the supply of heat from the one to the other by interposing a variable length of a poor conductor e.g. an air gap, in the conducting path. A member 13 with base-plate 10 adapted to be clamped to the article to be

heated, has hinged to it at 10 an upper member 21 of good conducting material, consisting of a double cylinder having air inlets 24, and outlets 26, the inlets of the inner cylinder being staggered with respect to those in the outer. The cylinder 21 is heated by the combustion of material in an internal cup and heat is transferred by conduction to the lower member 13. Upon a predetermined temperature being attained, the distortion of a bimetallic strip 17 bearing on an adjustable screw 27, tilts the upper member 21, and produces or increases an air gap between the members. Several modifications of details are described. The screw 27 may be replaced by a cam, and the upper member may be provided with ribs and transverse passages to increase its heat capacity. The combustible-containing cup may be fixed or adjustable, or it may be perforated and surrounded by an adjustable shield to vary the rate of combustion.

210,201. Crittall, R. G., and **Musgrave, J. L.** Nov. 10, 1922.

FIG. 1.

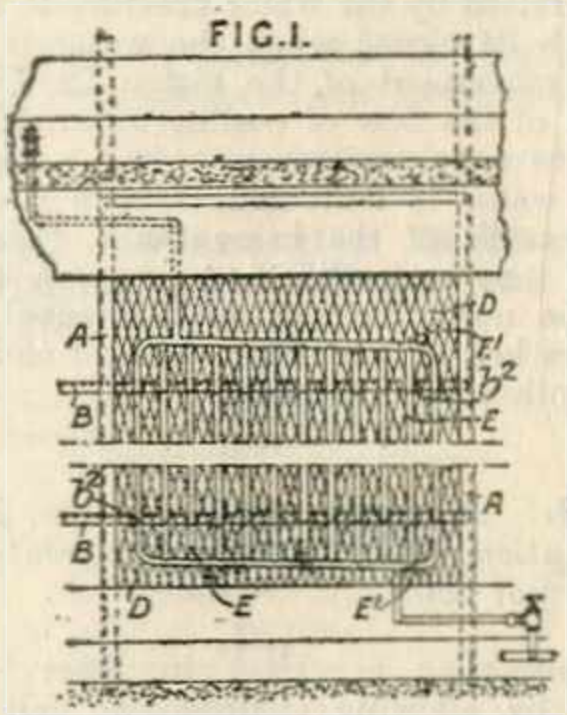
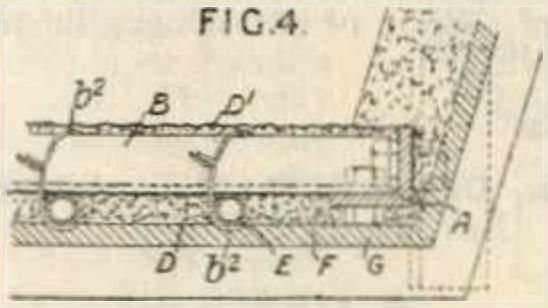


FIG. 4.



Heating buildings.—In a heating or cooling system for buildings of the kind in which the heat or cold is radiated from the surface of the walls, floors or ceilings by the circulation of a fluid therein, a structure is applied to the walls &c. comprising a number of uprights A and cross-bars B of metal or reinforced concrete forming a framework, which supports a facing D and/or a backing D^1 of expanded metal or lathing and has attached thereto by wires b^2 a grid of tubes E through which the fluid circulates, the structure being embedded in cement or concrete F so as to leave the surface of the tubes E protruding and the whole being faced with the usual plaster G. The grid preferably consists of a number of vertical tubes E connected by upper and lower horizontal tubular headers E^1, to which inlet and outlet connections are made.

210,202. Musgrave, J. L., and **Crittall, R. G.** Nov. 10, 1922.

FIG. 3.

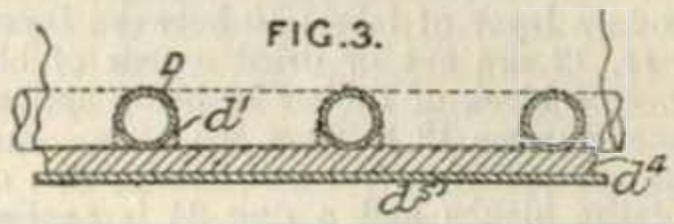
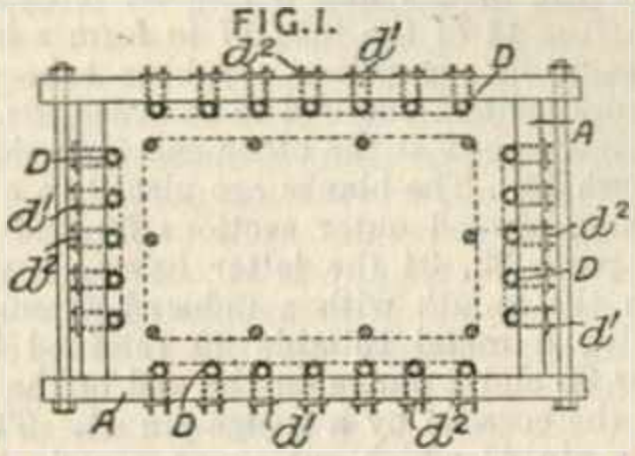


FIG. 1.



Heating buildings.—In a system for heating or cooling buildings formed of reinforced concrete by the circulation of a fluid through the walls, floors, ceilings or supporting columns, the circulating pipes D are arranged in position in the walls &c. by attaching them to the interior of the shuttering A and subsequently building up the walls &c. in situ by filling the concrete mixture into the shuttering so that the pipes remain embedded when the mixture sets. The pipes are preferably attached to the shuttering by clips d^1 held in place by wedges d^2, which, when the concrete is set, are driven out, then the shuttering is removed, the exposed ends of the clips are sawn off, and the surface is finished with a layer d^4 of heat conducting material and a layer d^5 of plaster.

210,230. Imray, O. Y., (*Seamless Rubber Co., Inc.*). Dec. 4, 1922.

FIG. 5.

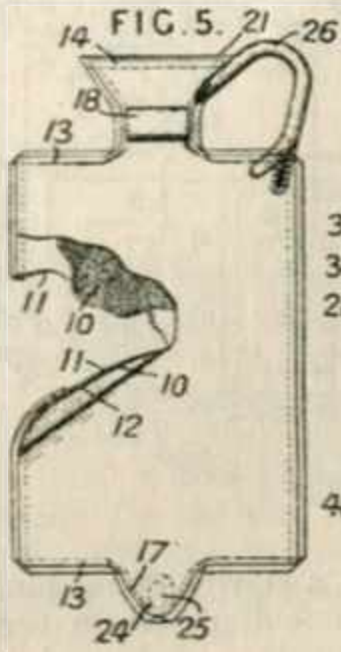
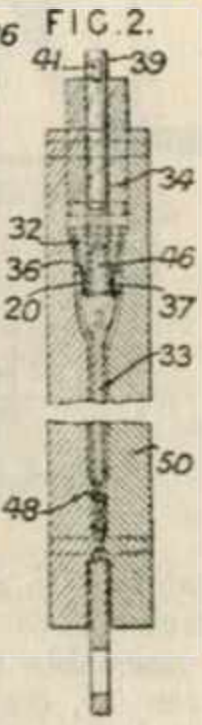


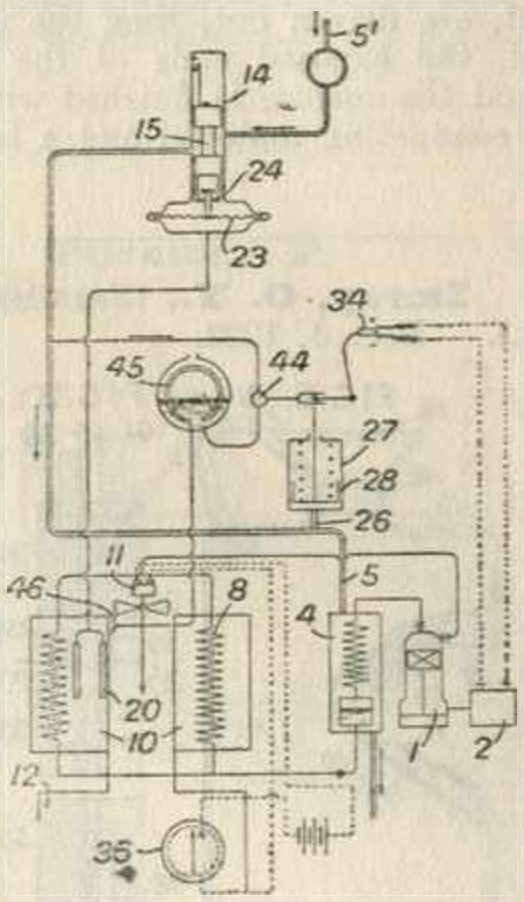
FIG. 2.



Hot-water bottles.—A vulcanized rubber hot-water bottle has walls comprising a ply of fabric

between layers of rubber, the fabric having an appreciable stretch and being perforated so that during vulcanizing and moulding the rubber penetrates the fabric to form a homogeneous structure. The fabric may be a knitted material such as stockinette and may be cut on the bias. The outer layer of rubber is preferably thicker than the inner layer. From a composite sheet comprising a layer of fabric 10 between layers of rubber 11, 12 are cut or dried a pair of blanks 13, Fig. 5, a block of rubber 18 being applied to each inner surface 12 to form the neck. Rubber strips 21 are placed round and overlap the outer edges of the blanks and a ring 24 is applied to each surface 11 of the tabs 17 to form a hole 25. The handle 26 comprises a rubber tube with a fabric core split at one end to embrace the blanks and wedge-shaped at the other end for union with the mouth 14. The blanks are placed in a mould comprising shaped outer sections 50 and a core in two parts 33, 34 the latter having a part 32 to form the mouth with a reduced extension 37 to receive a metal thimble 20 retained by the shoulder 36 and a flange on the end of the rod 39 held in the core 34 by a wedge-pin 41. The core 33 has a pin 46 which enters a recess in the rod 39, and has a tongue 48 almost as wide as the bottle to form an opening through which the core 33 may be removed. The bottle is vulcanized in the mould and the slit is filled by a piece of unvulcanized rubber and sealed and vulcanized after removal of the core. Specification 105,577 is referred to.

210,452. Jauvert, P. M. Jan. 26, 1923, [*Convention date*].

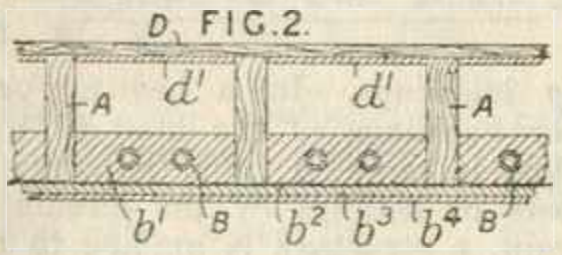


Thermostats.—In a refrigerating plant comprising evaporator coils 8 disposed in tanks 10 containing congealable brine, and an intermittently operated fan 11, controlled by a thermal device 36, for circulating the air of a cold-storage room 12 over the surfaces of the tanks, the flow of cooling-water to the compression machine of the plant is controlled according to the temperature of the brine in the tanks 10, which depends in part upon the operation of the fan and accordingly upon the temperature in the cold-storage room. The flow of cooling-water serves to control the operotion of the compressor 1 as by controlling the switch 34 of an electric driving-motor 2 and preferably also controls means for supplying water to rinse the walls of the brine tanks and thereby remove accumulated rime. The cooling-water for the condenser 4 of the plant is supplied through a pipe 5^1, and its flow is controlled by a sliding valve 15 in a casing 14. The valve is actuated by a pin 24 on a diaphragm 23 subject to movement due to the expansion and contraction of congealable brine contained in tubes 20 immersed in the brine in the tanks 10. One of the tubes 20 is placed near an evaporator coil 8 and the other near the wall of the brine tank, so that the brine in the tubes is at the mean temperature of the cooling-brine. The pin 24 has a lost motion connection with the valve 15 so that the valve moves only at limiting temperatures. A branch 26 of the cooling-water pipe leads to a cylinder 27 containing a spring-loaded piston 28, which is raised by the water pressure to maintain the switch 34 closed when the water is flowing. At each movement of the piston 28 due to resumption of the flow of cooling-water, it opens a cock 44 to supply water to prime a siphon 45, whereby water is delivered through a spray 46 over the walls of the brine tanks. The piston device 27 may be modified to give a quick breaking of the motor circuit and a gradual closing, for motors having a starting rheostat and may be used for other driving-means.

210,459. Angelis, P. de. Jan. 27, 1923, [*Convention date*]. *No Patent granted (Sealing fee not paid).*

Non-conducting coverings in sheet form are obtained by allowing slag-wool to fall from a sieve into receptacle where it is sprayed with a solution of sodium or potassium silicate and carrageen lichen.

210,550. Crittall, R. G., and **Musgrave, J. L.** Nov. 10, 1922.



Heating buildings.—In a system for heating or cooling buildings by the circulation of a fluid through pipes from which the heat is transmitted to the rooms by radiation from the surface of the floor or ceilings, the circulating pipes B are embedded in a material or composition b^1 of a more or less heat-conducting nature, which is located between the joists A and held in position by suitable means such as by expanded metal b^2, wire, or wire netting fixed across or between the joists.

The expanded metal b^2 also serves the purpose of keying the cement b^3, which is embedded on it and to which the covering of plaster b^4 is applied. In order to give a more even distribution of the heat or cold, an insulator or spreader d^1 may be fixed between the joists under the floor boards D.

210,611. Hancock, C. Jan. 16, 1923.

FIG.1.

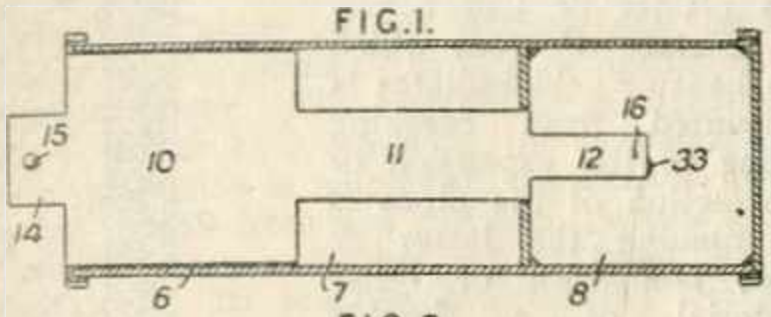
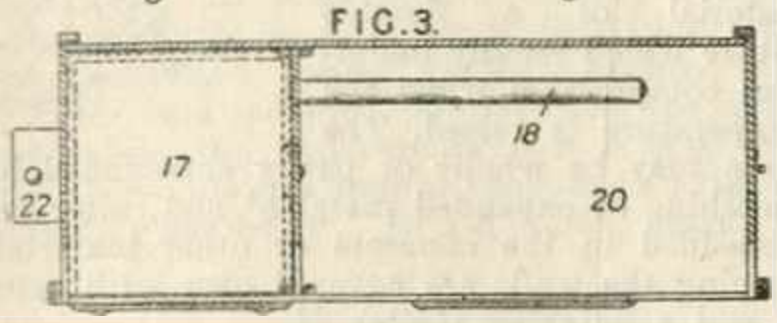


FIG.3.



Radiators.—A device for heating propagating-frames, foster-mothers, and like appliances which have a number of adjacent compartments consists of a radiator-like heating-device formed of a number of elements of differing heat-radiating capacity; one of them is in the form of a flat tank which can be slid endways into the frame &c., so that the various elements lie in the compartments they are required to heat. Fig. 1 shows a heater consisting of three rectangular compartments 10, 11, 12 of decreasing dimensions adapted to be fitted in the lower part of a propagating-frame of three compartments 6, 7, 8. It has a filling-aperture 15, a vent 16, and a drain plug 33. Fig. 3 shows a heater 17, 18 for a foster-mother, in the upper part of which it is fitted. The part heated by the flat tank 17 is for the day-old chicks; the adjacent compartment 20 heated by the pipe 18 is for the older chicks. The extensions 14, Fig. 1, and 22, Fig. 3, are heated by oil lamps, gas burners, &c. The tanks &c., are filled with water, but the heating may be effected by warming the air in them.

210,680. Plantation Rubber Manufacturing Co., Ltd., and **Dessau, M. M.** Oct. 5, 1922.

FIG.1.

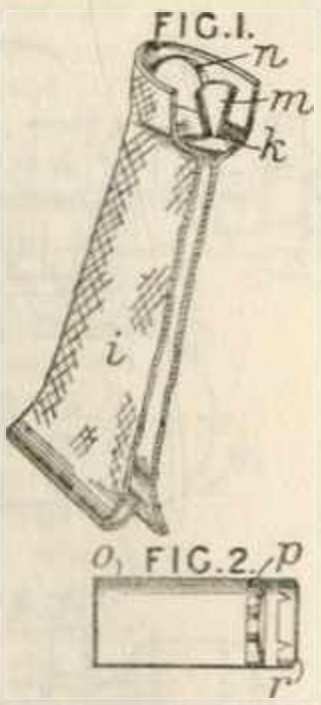


FIG.2.

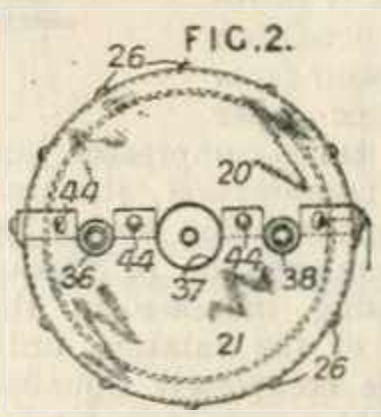
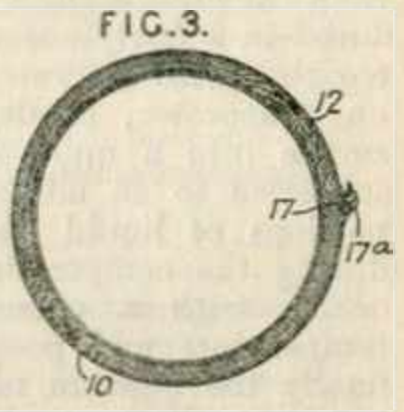


FIG.3.



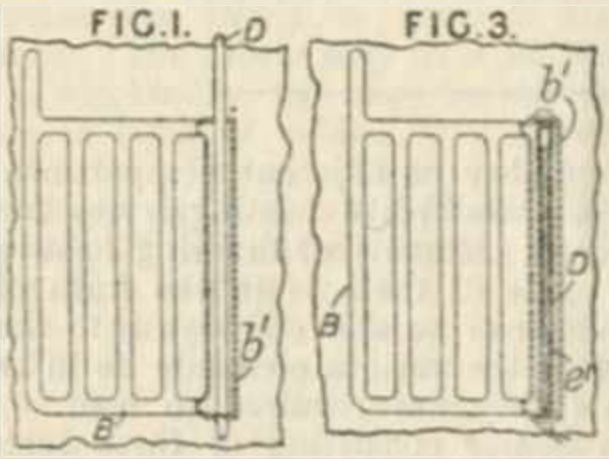
Hot-water bottles.—A flexible hot-water bottle or footwarmer has a body made from a blank of raw or plastic rubber, the walls i, o, Figs. 1 and 2 respectively, being extended beyond the top proper k, or p so as to enclose the filling mouth-piece m, and the handle n or handles if employed. The body may be made by folding the blank and uniting the edges, as shown by Fig. 1, or it may be moulded on a former, Fig. 2 showing an example of a bottle made in this way. In this arrangement a moulded closure cap r is adapted to be inserted into the extended side wall o of the bottle.

comprises a flexible band 10 of asbestos or similar material attached to a canvas backing 12 adapted to be passed round the sides of tank and its meeting edges secured together, in combination with an end cap or cover formed in one or more moulded portions 20, 21 having a canvas or like attachment by which the portions 20, 21 are secured to each other and to the edges of the sheath formed by the band 10. In the construction shown one edge of the canvas backing 12 overlaps the other edge and is secured thereto by stud and socket fastenings 17, 17^a, while the cover is formed of two portions 20, 21, which are shaped so that when brought together they provide openings for the pipe connections 36, 37, 38 to the tank, and are connected to each other and to the canvas 12 by fastenings 44 and 26 respectively.

210,682. Withers, J. S., (*Bastian-Morley Co.*). May 15, 1923.

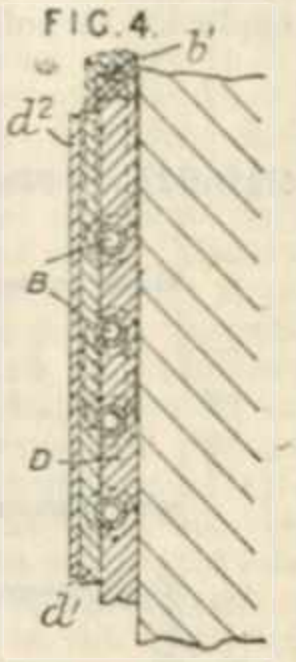
Non-conducting coverings for heat.—A non-conducting covering for a hot-water or like tank

210,880. **Crittall, R. G.**, and **Musgrave, J. L.** Nov. 10, 1922.



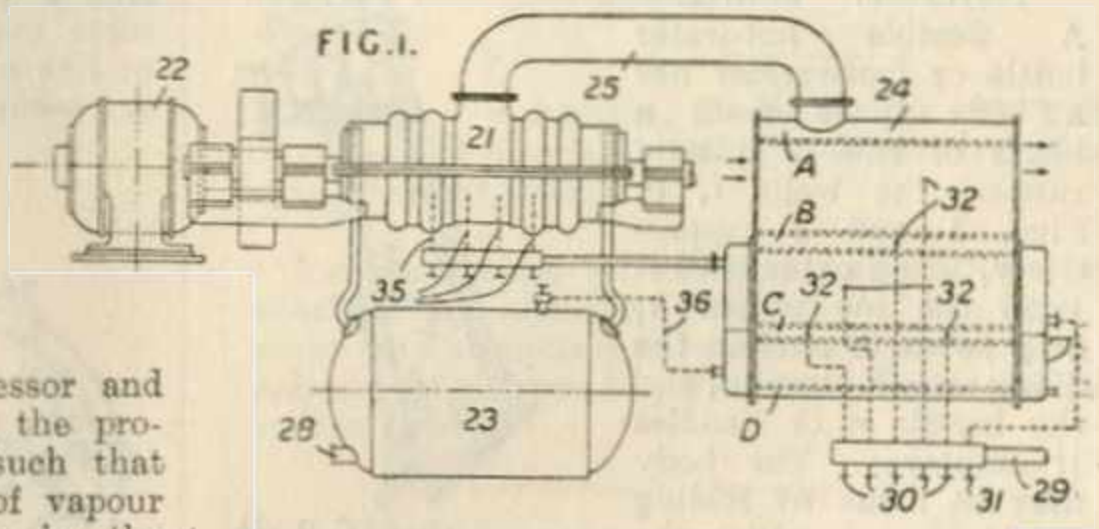
Heating buildings.—In a system for heating or cooling buildings by means of radiators located in the walls, floors or ceilings there is embedded in the plaster of the wall or ceiling or in the concrete of the floor a series of tubes B forming a grid adapted to contain water and to receive a pipe D through which is passed a fluid for heating or cooling and circulating the water in the grid or into which is inserted an electric heating element e^1, Fig. 3. Preferably, the tube b^1 receiving the pipe D has a greater cross-sectional area than that of the remaining tubes of the grid.

210,881. **Musgrave, J. L.**, and **Crittall, R. G.** Nov. 10, 1922.

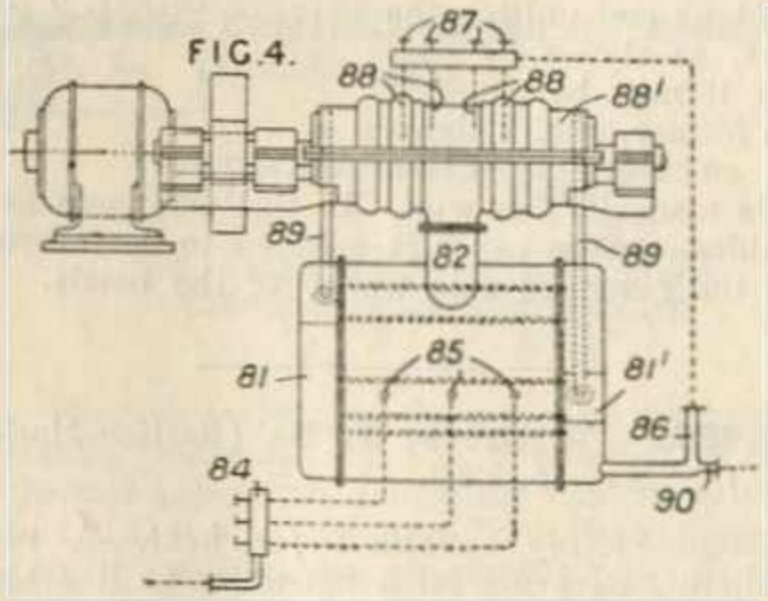


Radiators.—In a system for heating or cooling buildings by the circulation of a fluid through pipes embedded in the walls, floors or ceilings, the plaster or like covering surface d^2 from which the heat or cold radiates is prevented from cracking owing to the expansion or contraction of the pipes B by making the latter of lead, composite or other material of a flexible nature which readily undergoes compression when the temperature is raised. The pipes may be wholly or partly surrounded by a sheathing of expanded metal b^1 and, after being embedded in the concrete or other material D forming the wall, are covered over with cement d^1 and a finishing plaster d^2.

211,088. **Vianello, E.** Oct. 9, 1922.



Heating by circulation of fluids.—In a hot-liquid heating-installation for heating buildings, boiling or evaporating liquids and for similar purposes, return hot liquid from the circulating system is introduced in a finely atomized condition together with saturated vapour from an evaporator, condenser or other source into a multi-stage turbo-compressor and subjected to an adiabatic compression, the proportions of liquid and vapour being such that during the compression condensation of vapour occurs with a corresponding increase in the temperature and pressure of the mixture until finally the mixture may be completely liquefied before its discharge from the compressor for recirculation through the system. In the case of a mixture of water and steam the proportion by weight of water must be at least 60 per cent. In the heating installation for buildings shown in Fig. 1, the hot water returning from the radiators by the pipe 29 is passed through an evaporator 24, one portion of the water passing through valves 30 to atomizers 32 which spray it against the surface of the evaporator tubes, while the other portion passes by valves 31 through the set of tubes B - - C of the evaporators to the atomizers 35 disposed in the turbo-compressor 21. The evaporated portion of the water is drawn by suction into the compressor through the pipe 25, and the mixture finally discharged in a liquefied condition into a receiver

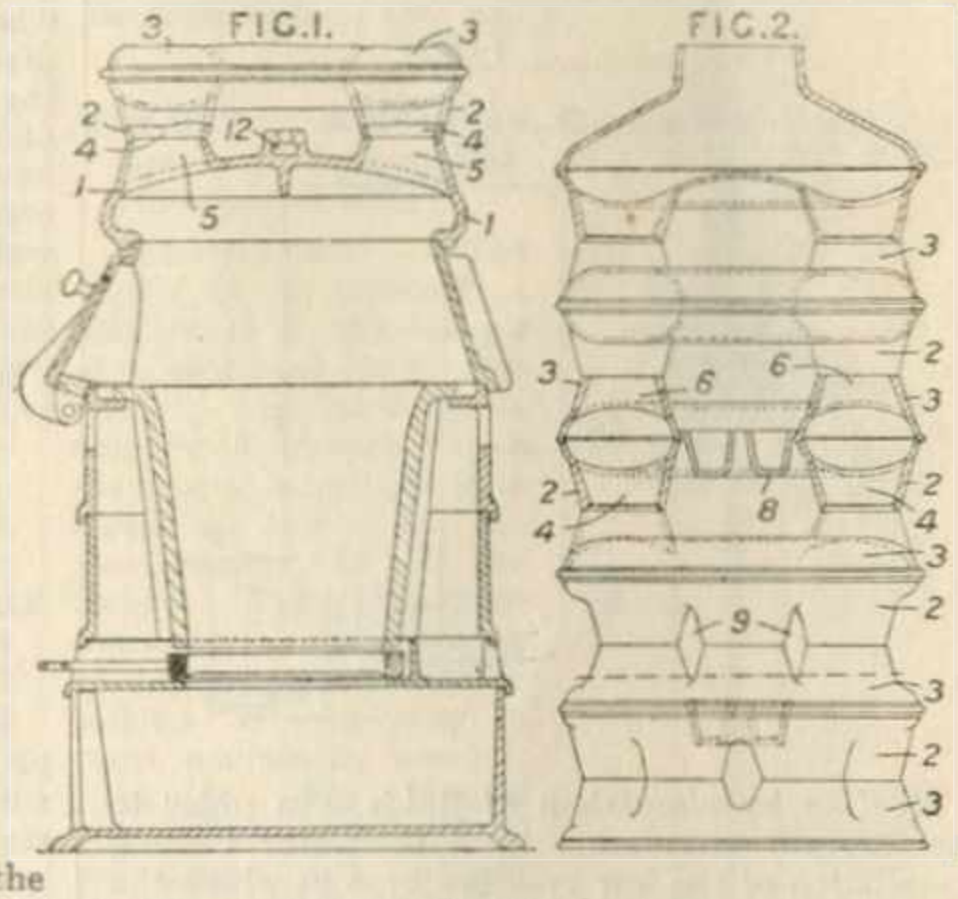


23, from which it passes by an exit 28 to the radiators. Leakage air and a certain amount of water vapour which collect in the upper portion of the receiver 23 are passed by a pipe 36 through

a set of tubes C - - D of the evaporator. Another set of evaporator tubes A - - B is provided through which air or water at or slightly above the atmospheric temeprature is passed, the cooling effect produced on the air or water being, if desired, utilized in a light cooling installation. If the water returning by the pipe 29 has a higher temperature than that corresponding to the suction end of the compressor, a portion thereof may be introduced into the compressor 21 at an intermediate stage of the compression corresponding in temperature to the temperature of the return water. The compressor in this installation is driven by a motor 22, but in a modification a gas-engine is employed, the exhaust gases and hot water from the cylinder jackets being utilized to heat a further set of tubes in the evaporator. In another modification the hot circulating liquid is used for boiling water, the steam generated being passed through the evaporator and adapted to pre-heat the feed-water, while the turbo-compressor is also employed to maintain a partial vacuum in a jacket surrounding the boiler. In a distilling apparatus as shown in Fig. 4, the hot liquid ejected from the compressor 88^1 by the pipes 89 is employed solely for evaporating purposes, passing to the tubes of the evaporator through collectors 81, 81^1. The liquid to be distilled is forced through atomizers 85 by means of a pump 84 and sprayed against the surface of the tube, the vapour formed being drawn into the compressor through a pipe 82. The vapour is mixed in the compressor with a quantity of hot liquid returned from the collectors 81, 81^1 through a pipe 86, valves 87 and atomizers 88, and is condensed in passing through the compressor. A proportion of the liquid leaving the collectors 81, 81^1 passes as distilled liquid through the pipe 90 to a receiving-tank. In a further modification, the hot liquid ejected from the compressor passes to the boiler of a steam plant which includes a condenser and a turbine for driving the turbo-compressor. The vapour introduced into the compressor is derived from the condenser, while the hot liquid to be atomized is derived partly from the hot-well and partly direct from the boiler.

211,105. Fonderies de la Meuse Soc. Anon. Feb. 6, 1923, [*Convention date*].

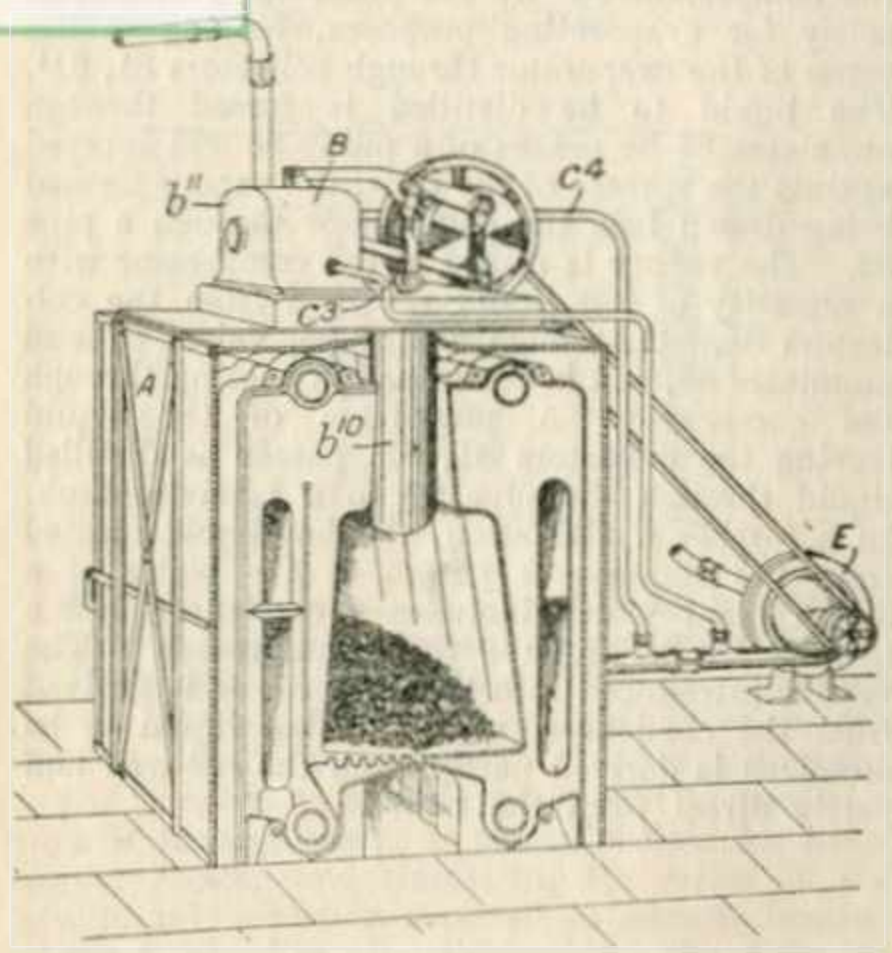
Radiators.—A heat radiator adapted to be heated by any suitable agent, such as hot gases or vapours and described in connection with a solid-fuel stove, comprises a number of elements in which the heating agent circulates, each composed of two or more superposed parts 2, 3, of annular or polygonal form, and comprising a series of hollow bosses 4, 6 which are connected to similar bosses on the adjacent element. The adjacent parts 2, 3 may be turned so that the passages formed by the hollow bosses 4, 6 are staggered relatively to one another, as shown in the two lower elements in Fig. 2. Air circulates through openings 9 between the bosses, and is baffled by means of internal members 8 which contain water for humidifying purposes. Fig. 1 shows the radiator arranged on a solid-fuel stove, the top 1 of which is formed with hollow bosses 5 for connecting to the bosses 4 of the lowermost element. The elements are held together by a central rod secured at 12.



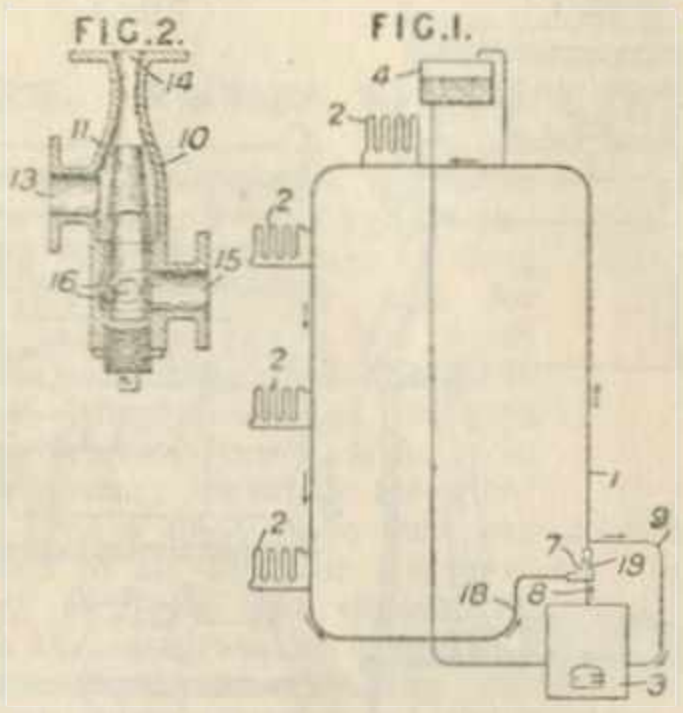
211,195. Griffiths, E. Nov. 8, 1922.

Heating by circulation of fluids.—In a hot-water system for supply or warming, the circulating pump E is driven by a hot-air engine B having its heater b^{10} arranged in the furnace or furnace flues of the hot-water boiler A. In the case of an oil-fired boiler the hot-air engine may also drive the fuel-oil pump. The working cylinder b^{11} of the engine B is provided with a water-jacket having circulating connections c^3, c^4. The pump E may be mounted on the boiler, if desired.

(*For Figure see next page.*)

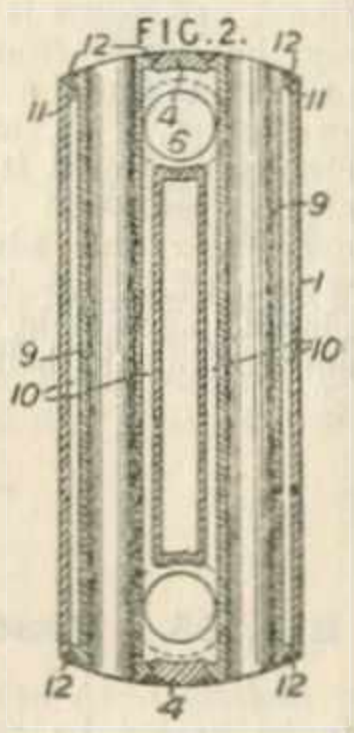


211,287. Adlam, J. H. Dec. 15, 1922.



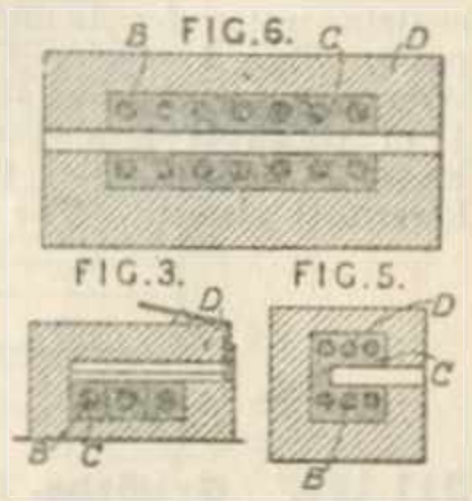
Heating by circulation of fluids.—In order to increase the circulation in a hot-water heating installation of the low pressure type in which the whole system including the service main 1, radiators 2, and boiler 3 is maintained full of water, preferably by gravity supply from a tank 4, the return pipe 18 from the system leads into the flow-pipe 1, and at the point of junction a zone of low pressure is produced by reducing the cross-section of the flow pipe so as to provide a Venturi throat 7. A pipe 8 leading from the boiler delivers a jet of hot water into the injector 7 and flow-pipe 1 through a nozzle 19, the boiler being fed by a pipe 9 branched on to the flow-pipe 1. A modified construction of injector and nozzle is shown in Fig 2 comprising a Venturi tube 10 having an inlet 13 and outlet 14 for connection to the return and flow pipes 18, 1 respectively, and an adjustable jet or nozzle 11 having a lateral opening 16 leading to a pipe 15 connected to the delivery pipe 8 from the boiler. In addition, the local circulation through the separate radiators may also be increased by arranging Venturi tubes in the mains at the points of junction therewith of the return pipes from the radiators.

211,387. Guimont, J. W. May 22, 1923.



Radiators.—Relates to radiators for heating buildings and the like of the kind in which each section comprises an outer casing 1 enclosing parallel inner air-conducting tubes 9 which are so arranged with respect to the casing as to provide annular spaces 10 for the reception of the heating fluid, connections 6 being fitted at the ends of the sections for placing the annular spaces in communication with each other when the sections are assembled. According to the invention the casing is formed with central walls 4 at each end, and each tube 9 is provided at its ends with a bevelled flange 11 adapted to co-operate with corresponding bevelled portions on the outer walls 1 and central walls 4 so as to provide a V-shaped annular groove 12 which is filled with molten metal in welding the parts together. The weld so formed is preferably flush with the ends of the inner tube and the casing.

211,462. Cornelius, C. E. Feb. 15, 1923, [*Convention date*].



Heat-storing apparatus is provided with a resistance or resistances B of carbon and fire-clay, graphite, amorphous carbon, carborundum or the like, each enclosed in a metallic casing or casings C which serve as heat accumulators and deliver the heat to the material to be heated, the radiating surface of the resistances being as large as or larger than the heat-delivering surface of the accumulators. The mass of the casing C is such that it can accumulate enough heat to operate the furnace for at least

one hour. This may be achieved by having a casing which weighs 5 kilograms for every kilowatt supplied. The casing may be of iron with low carbon content or an alloy of iron, chromium, wolfram, molybdenum and other metals with a high melting point. An addition of siliceous iron to the material of the casing prevents oxidation thereof.

211,490. Saxegaard, A. Feb. 14, 1923, [*Convention date*].

FIG. 1.

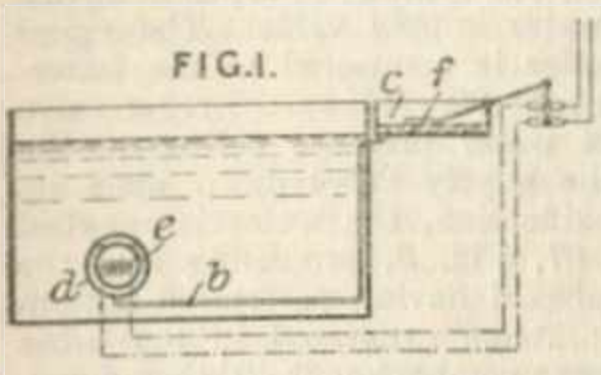
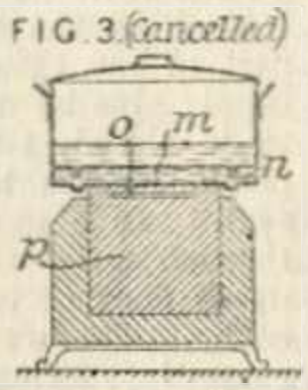


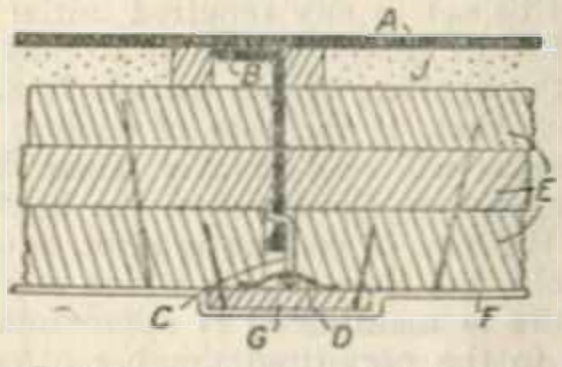
FIG. 3 (*Cancelled*)



Heat-storing apparatus; thermostats. — In a cooking apparatus having a body of water in which heat is stored, for example as a water bath, an electric heater *e* embedded in a solid heat storing body is surrounded by a water filled jacket *d* so constructed that when steam is generated in this jacket the water level is forced down, so reducing the heat-transmitting surface. The jacket communicates by a pipe *b* with a reservoir *c* in which a float *f* on rising, may cut off the supply of heating means. In a modification the heating means in a metal block is surrounded by a similar jacket open at the bottom to the main water space. A compartment heated by the water and an oven within the metal block are also provided.

The Specification as open to inspection under Sect. 91 (3) (a) comprises also the use of heating means other than electric, whether embedded in a solid body or not, and a form is shown in Fig. 3 (*Cancelled*) in which the heater *o* may be embedded in a heat storing metal block *p*. A vessel with a lower compartment *m* is placed on the heating means and heat regulation is effected by the steam generated driving the water from the part *m* through the tubes *n* to the upper part of the vessel. This subject-matter does not appear in the Specification as accepted.

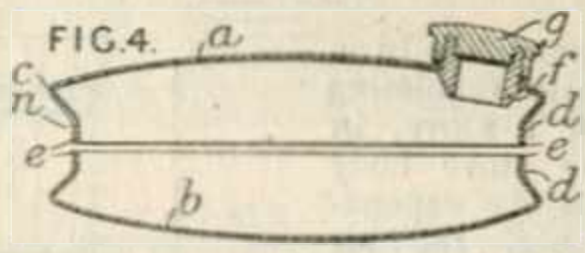
211,575. Orde, J., and **Diskett, W. H.** Nov. 22, 1922.



Non-conducting coverings for heat. — In non-conducting coverings for heat as applied to ships &c. of the type comprising slabs E of cork or other insulating material secured to the surface A by retaining strips D and bolts C held by the beams B, the strips D are arranged flush with the slabs and are covered by flat cork strips G. The slabs are covered by cement F and the space J and spaces caused by the arcuate shape of the strips D are filled with granulated cork. The slabs are further secured by means of skewers.

211,604. Joseph, B. C., and **Joseph, N. C.** Dec. 2, 1922.

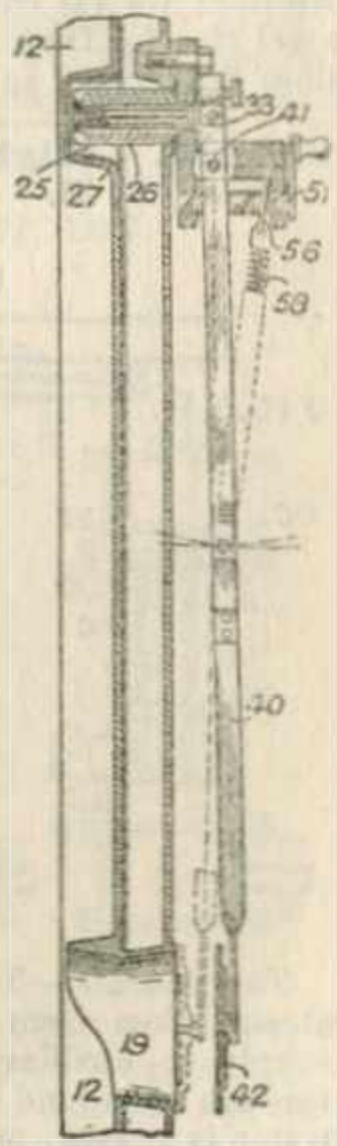
FIG. 4.



Hot-water bottles.—Hot-water bottles or like hollow containers are formed from two complementary dished discs *a*, *b* of aluminium or other easily worked metal or alloy which are pressed or spun so as to form flanges *d* bent inwardly from the edges *c* of the discs, the abutting edges *e* of the flanges being joined by welding or other means so as to provide a recess or groove *n* around the finished article for the reception of a carrying or suspending strap or cord. For filling purposes an aperture is formed near the periphery of one of the discs and fitted with a screw-threaded collar *f* and cap *g*.

212,217. American Radiator Co., (Assignees of *Eggleston, L. W.*). Feb. 27, 1923, [*Convention date*].

FIG. 2.

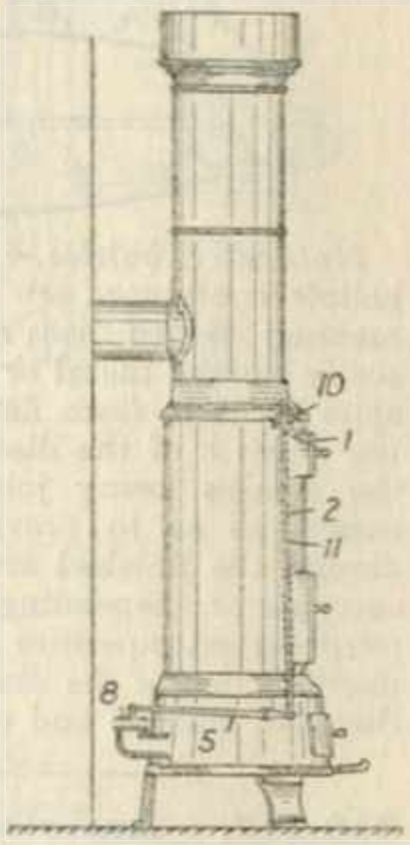


Thermostats. — The supply of air through a passage 19 to the ash-pit of a sectional boiler furnace is regulated by a damper 42 controlled by a thermostat arranged in a recess 25 formed in the rear section 12 of the boiler. The thermostat comprises an outer casing 26 and an inner metallic bellows 27 enclosing a space containing alcohol, ether or other volatile fluid. The outer ends of the casing and bellows are connected by a flange serving to seal the space between them. The inner end of the bellows is connected to a plunger 33, which is also connected to a lever 40 pivoted at 41 and carrying the damper 42. When the bellows expands due to rise in temperature in the boiler the plunger 33 operates the lever 40 to close the damper. The

damper is closed against the resistance of a spring 58 attached to the lever and to a plate 56 engaging with a helical groove in the shaft 51. By turning the shaft 51 the position of the spring and the resistance against which the damper is closed may be varied. By removing the casing 26 of the thermostat and exposing the bellows 27 the damper may be controlled by steam pressure.

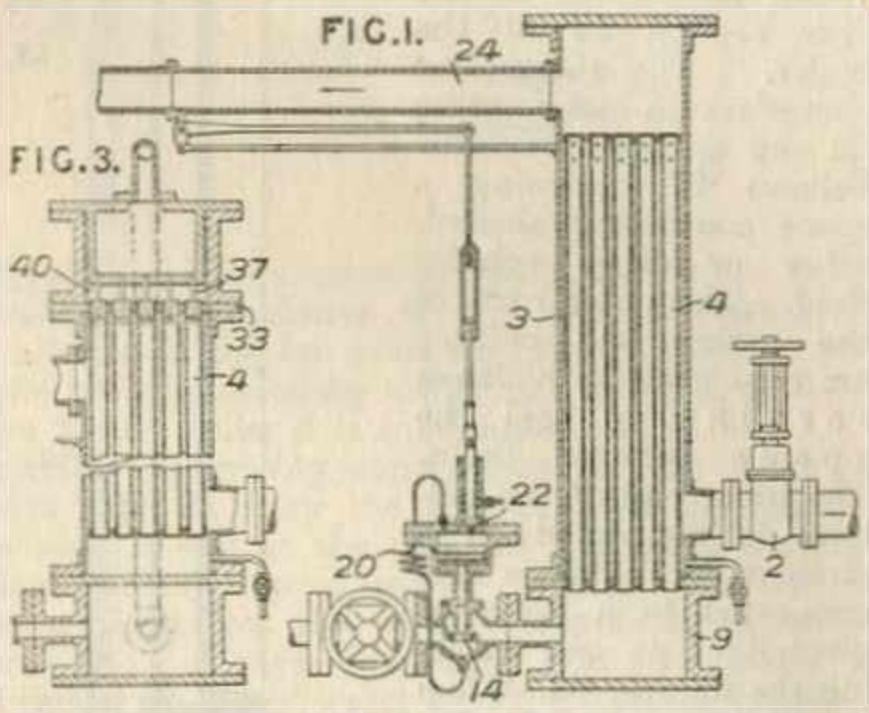
212,243. Kvaerner Ovnstöperi Aktieselskabet. Feb. 28, 1923, [*Convention date*].

Thermostats.—In a thermostatic regulating device for a stove, in which the stove body constitutes the expanding member, the air supply valve 8 is actuated by a lever 5 pivoted to the stove body and connected to a bar 2 of relatively inexpansible material, such as wood, the other end of which is connected to a lug 1 on the stove body. In the arrangement shown a pipe 11 surrounds the rod to protect it from the heat, and a nut 10 at the upper end allows the rod to be adjusted to give the correct opening of the valve.



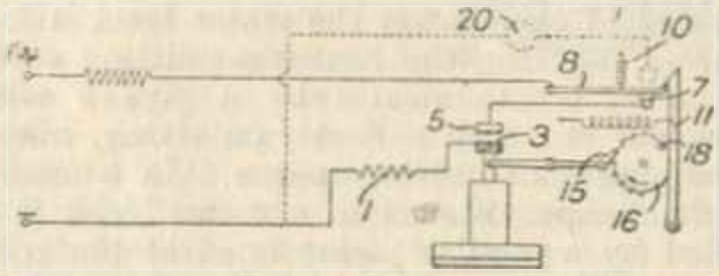
The Specification as open to inspection under Sect. 91 (3) (a) comprises also the use of a thin steel pipe for the member 2. This subject-matter does not appear in the Specification as accepted.

212,414. Highfield, J. S., and **Highfield, W. E.** March 10, 1923.



Thermostats.—To reduce the temperature of steam taken from a high temperature main for supply to auxiliary plant, the steam is passed through or around tubes around or through which water is passed, and the wet steam generated is mixed with the high temperature steam inside the chamber containing the tubes. The high temperature steam may pass through a pressure-reducing valve before entering the chamber. High temperature steam is admitted through a valve 2, Fig. 1, into a chamber 3 containing tubes 4 opening into a water-supply chamber 9. Wet steam issues through perforations in the upper ends of the tubes. The water-supply valve 14 is automatically operated in accordance with the temperature of the steam leaving the chamber. The expansion and contraction of a section of the steam-delivery pipe 24 operates through levers a relief valve 22 on the cylinder of a piston device controlling the water supply valve. The upper part of the cylinder is connected to the water-supply pipe by a tube 20. When the relief valve 22 is closed, the water pressure acting on the piston presses the supply valve down upon its seat. In a modification, the water is supplied through nozzles 37, Fig. 3, projecting into the upper ends of tubes 4 having perforated bottom ends. The wet steam generated in the tubes passes into an upper compartment 40, then downwards through perforations in the tube plate 33, and mixes with the high temperature steam passing around the tubes.

213,334. Frost, W., and **Frost & Co., Ltd., H.** Dec. 29, 1922.



Thermostats.—In thermostatically-controlled apparatus the time during which the heat is applied is regulated by the combination with the heat generator and its controlling thermostat of a supplementary controlling-device which is automatically operated to diminish or stop the supply of heat after a predetermined number of operations of the thermostatic controlling-device. In the arrangement shown the supply of electricity to the heater 1 is controlled by a switch 3, 5 operated by a capsule or other form of thermostat, while the supplementary controlling-device consists of a switch 7, 8 normally held in a closed position by a spring-controlled detent 11, but adapted to be opened after a predetermined number of operations of the switch 3, 5 by a spring 10 which comes into action when the detent 11 is swung aside through the medium of a cumulative mechanism such as a pawl and ratchet wheel 15, 16 carrying a pin 18 adapted to engage the detent 11 and to be set to any required initial position. A lamp, bell or similar indicator 20 may be actuated by the opening of the switch 7, 8. Owing to the fact that, if the rate of cooling is rapid, the apparatus will cool quickly when the heater is off and heat up slowly when the heater is on, while, if the rate of cooling is slow, reverse conditions hold, the time during which any required temperature is maintained is approximately proportional to the permitted number of operations of the thermostat. Specification 191,143, [*Class* 70, India-rubber &c.], is referred to.

213,350. Miller, C. P. Jan. 5, 1923.

Thermostats. — In apparatus for regulating the temperature of a furnace or the like of the type comprising a thermo-electric couple 4 connected with a galvanometer 3 so as to actuate means for increasing or decreasing the supply of heating medium, the galvanometer needle 11 is adapted to be depressed intermittently by means of a vertically reciprocating bar 12 to make contact with one or other of two plates 23, 24, Fig. 2, which are thereby depressed and by alternative pawl and ratchet wheel mechanisms 27, 29, or 28, 29 operate the main valve, damper or rheostat controlling the heating. The coil of the galvanometer is initially set by means of a mill-head 9 on the spindle 10 in conjunction with a pointer 7 and scale 8, and, when the temperature reaches the required value, the E.M.F. generated restores the pointer 11 to its zero position between the plates 23, 24 so that neither plate is depressed when the bar 12 is reciprocated. Any departure, however, from the required temperature, will deflect the pointer 11 from its zero position and cause one or other of the plates 23, 24 to be actuated. The reciprocation of the bar 12 is effected by means of a bellows 21, which is connected to vertical extensions 13, 14 of the bar 12 through pivoted levers 17, and is inflated or deflated by gas, air or water pressure transmitted through a valve 37 controlled by a gravity tumbler 34 having striking plates 35, 36 respectively for opening or closing the valve. The tumbler itself is operated by a plate 31 carrying two studs 32, 33 and connected by a rod 30 to the vertical extension 13 of the bar 12. Consequently, when the bar 21 moves upwardly, the striking plate 36 is brought into operation to close the valve 37; the bellows 21 is then deflated and the bar 12

FIG.2.

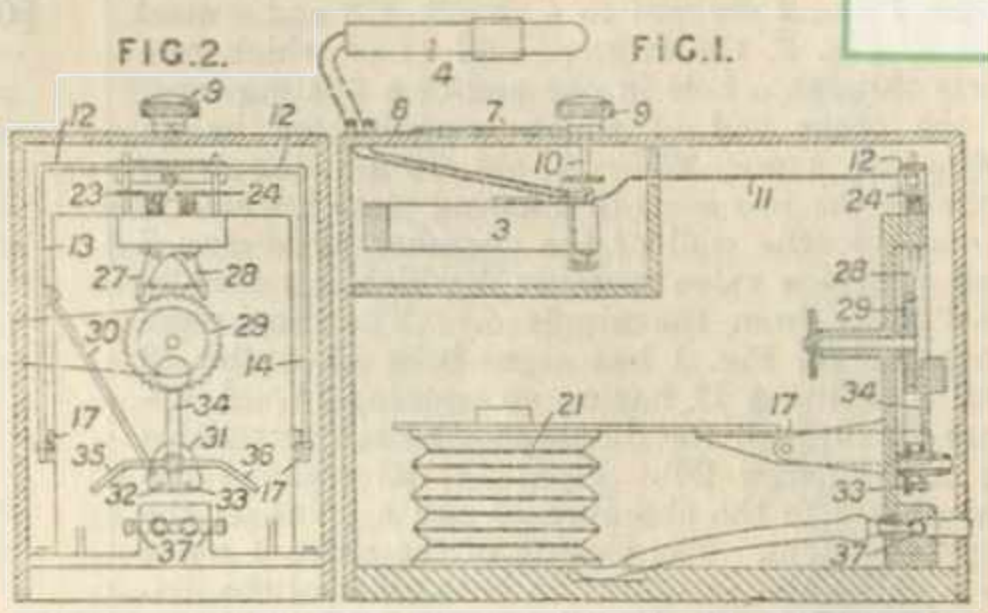
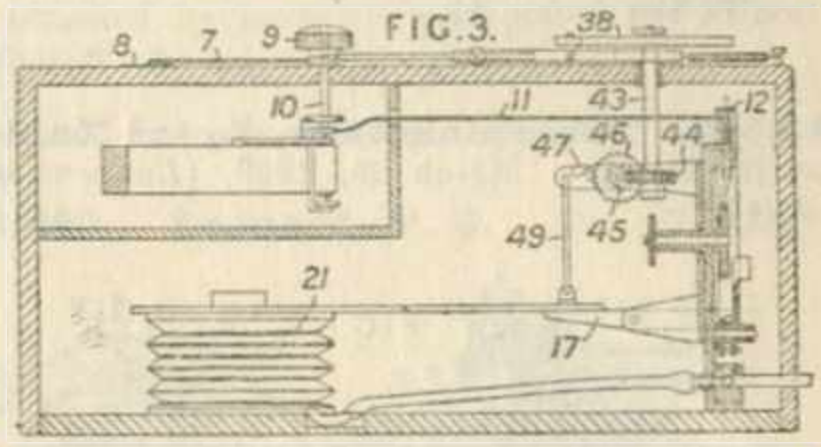


FIG.1.

FIG.3.



moves downwardly to bring the striking plate 35 into operation and again open the valve 37. In a modification shown in Fig. 3 the pointer 7 is automatically set to follow any predetermined time-temperature curve by the addition to the apparatus already described of a cam 38 which is shaped according to the curve required and is rotated so as to adjust the pointer by connection with the lever 17 through the intermediary of a link 49, pawl and ratchet mechanism 47, 46, a worm 45 and a wormwheel 44, the latter being mounted on the spindle 43 carrying the cam 38.

213,394. Keith & Blackman Co., Ltd., J., and **Keith, G.** Feb. 22, 1923.

FIG.1.

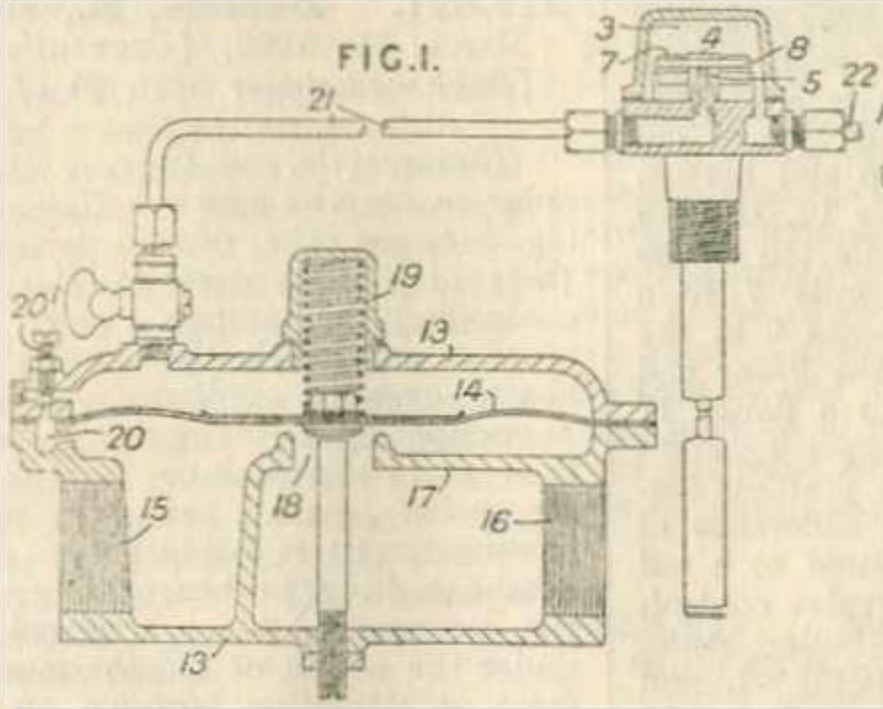
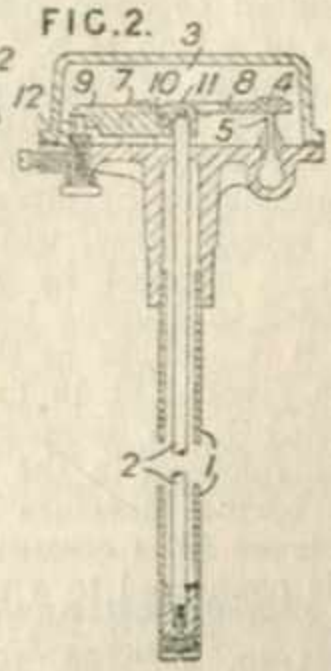


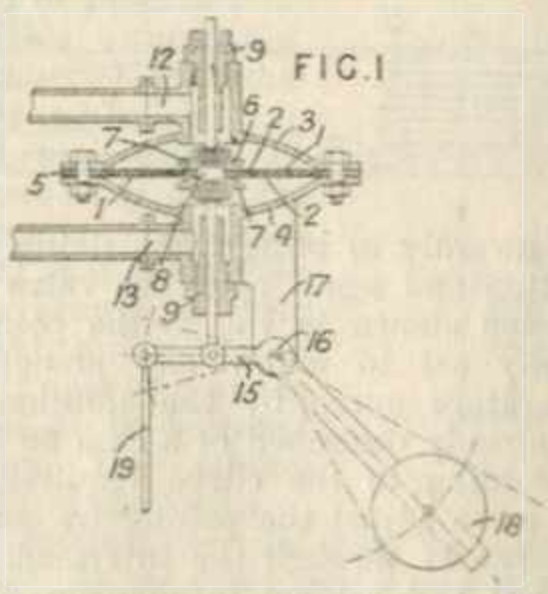
FIG.2.



Thermostats.—In a thermostat of the type in which a gas-regulating device is controlled by a valve operated by a thermostatic element including members of different coefficients of expansion through a motion-multiplying device, the latter includes a floating lever engaged by the member of less coefficient of expansion and engaging a flexible strip carrying the valve. The

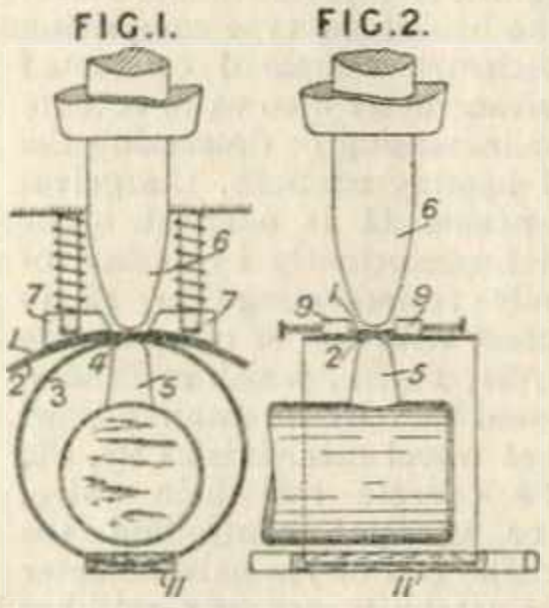
thermostatic element comprises a brass tube 1, Figs. 1 and 2 secured to a chamber 3 and a steel rod 2, Fig. 2, the reduced end 11 of which projects through a hole in one end of a floating lever 9 the other end of which is supported by an adjusting screw 12. A pin 10 on the lever engages the two arms of a spring plate 8 which is secured to the wall of the chamber by screws 7 and carries a valve member 4 which is normally held away from the nipple 5. The diaphragm chamber 13, Fig. 1 has a gas inlet 15, outlet 16 and a partition 17 having an opening 18. A by-pass 20 through the diaphragm 14 is controllable by a set screw 20^1. Pipes 21, 22 connect the chamber 3 to the chamber 13 and a point on the supply system. The closing of the valve 4 tends to equalize the pressures on both sides of the diaphragm which will close the opening 18 under the action of the spring 19.

213,572. Tcherniakofsky, I., and **Zaniroli, R. C.** March 29, 1923, [*Convention date*].



Heating by circulation of fluids.—A differential pressure gauge is connected to the hot-water and return pipes of a hot-water installation and is operatively connected to a device controlling the operation of the boiler. A suitable construction of gauge of the diaphragm type comprises steel discs 1 freely mounted between rubber sheets 2 between the edges of which is a spacing ring 5 and between the centres of which is a spacing washer 6. The edges of the diaphragm are clamped between the flanges of top and bottom casings 3, 4 communicating by pipes 12, 13 with the hot-water and return pipes, while the centre of the diaphragm is secured by nuts 7 to a screwed rod 8 guided in stuffing boxes 9 in the casings. The rod 8 is secured at the lower end to a bent lever 15 pivoted at 16 to a flange 17 secured to the casing 4. A counterpoise weight 18 maintains the diaphragm in the position corresponding to the normal pressure difference of the system. The lever 15 is connected to a rod 19 which in turn is connected to a valve controlling the admission of air to the boiler grate. Specifications 11211/85, 4320/90, 19131/02, and 14467/04 are referred to.

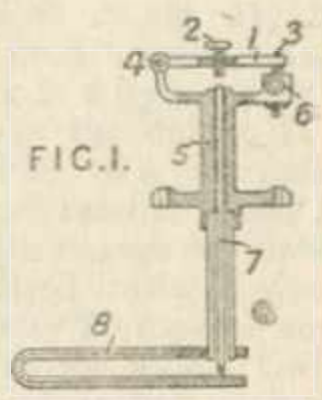
213,596. Ernst, W. E. March 28, 1923, [*Convention date*].



Thermostats. — The two strips of metal 1, 2 constituting a bimetallic thermostat, instead of being connected over their entire contacting surfaces, are connected by electric welding between electrodes 5, 6 along a number of lines or at a series of points only. In the apparatus shown the strips 1, 2 are passed over a tubular support 3 having an opening 4 through which the electrode 5 acts. The portions of the strips adjacent to the welding points are maintained at a suitably low temperature by conducting the heat away through spring-pressed copper, aluminium or like blocks 7, 9 bearing respectively upon the surface and edges of the strips, and by means of a pipe 11 through which a liquid flows to cool the support 3. By the use of only one pair of electrodes 5, 6 the strips 1, 2 may be connected along a single line or a row of points, but two or more pairs of simultaneously acting electrodes may be employed to weld along a number of lines or rows of points.

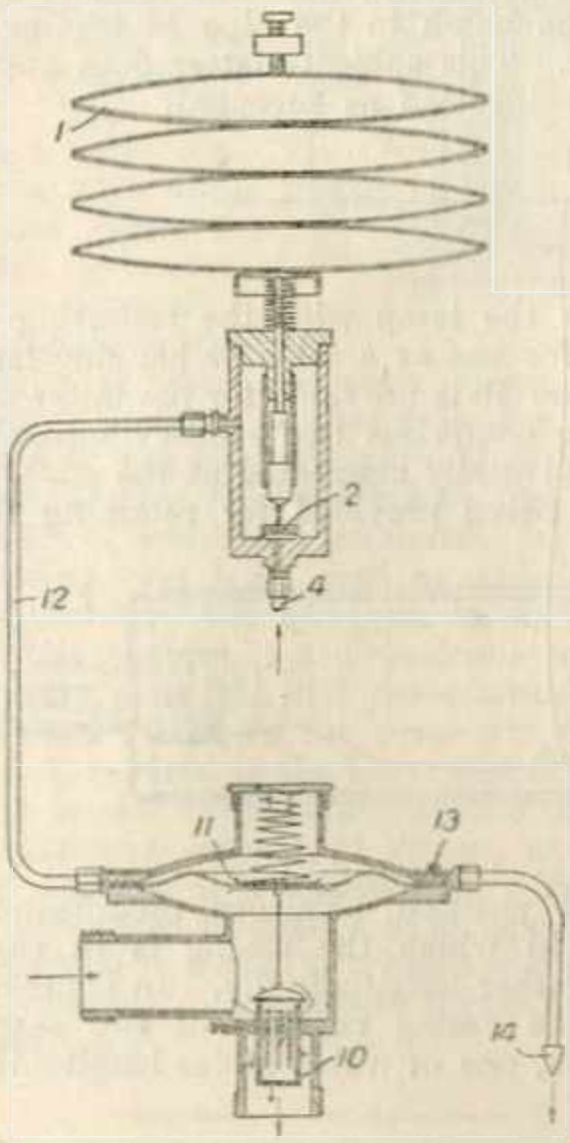
213,621. Demole, E., and **Müller, M.** March 31, 1923, [*Convention date*]. *Void* [*Published under Sect. 91 of the Act*].

Thermostats. — In order to prevent sparking between the contacts of a thermostat controlling the temperature of an electrically-heated oven or similar apparatus by ensuring their rapid approach or separation when the heating-circuit is being established or broken, the contacts 3, 6 are arranged to be separated under the action of the thermostat 8 against the force of attraction between an electromagnet 5 and its armature 1 which is magnetized either permanently or by means of an electromagnetic field, the magnetic force decreasing rapidly when the contacts are only slightly separated owing to



the interposition of an air gap in the magnetic circuit. In the construction shown, a bimetallic strip thermostat is employed operating in conjunction with a rod 7 and an adjustable abutting screw 2 on the armature 1, but a capsule or other form of thermostat may be employed. The contact 6 is mounted directly on the magnet 5, while the armature 1 is hinged to the magnet at the point 4.

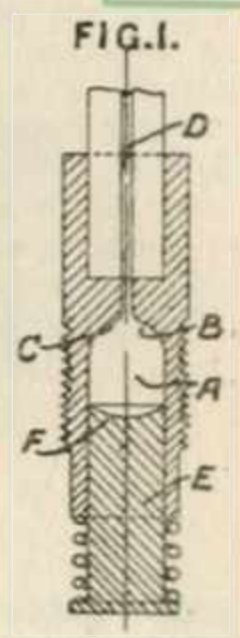
213,789. Fairweather, W. C., (*Naamloose Vennootschap Technisch Bureau Voorheen Nell & Stutterheim*). May 4, 1923.



Thermostats.—A gas supply regulating valve device for maintaining a uniform temperature in gas ovens, heaters, &c. is controlled by a thermal device 1, of the bi-metallic or other type, acting on an auxiliary regulating valve 2 which regulates the pressure of a secondary current of gas passing through the pipes 4, 12 to a diaphragm 11 carrying the main gas valve 10. The two valves comprise separate units, spaced apart conveniently and connected by the conduit 12. The diaphragm 11 is not perforated and the space above it is connected to the conduit 12 and to a discharge pipe 14 at separate points, the discharge being preferably controlled by a set-screw 13. The discharge pipe 14 leads the secondary gas to an innocuous place, e.g. near the main flame.

213,792. Maclaren, R. May 9, 1923. *Addition to* 191,515.

FIG. 1.

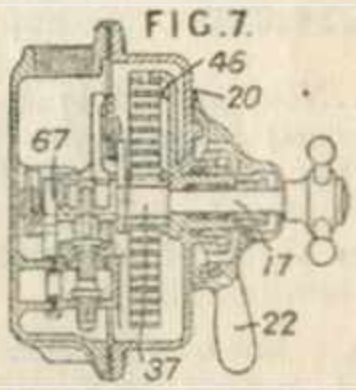


Thermostats.—A thermostatic regulator for electric, steam, or hot-water radiators applicable also to gas heating, fire alarm and refrigerating control devices of the kind described in Specification 191,515 has the adjusting plungers E for the mercury switch formed with a concave face F and arranged to work in a cylinder A having a dome-shaped end B provided with a small bore C leading to the capilliary tube D. The cylinder is made from a metal not attacked by mercury, such as aluminium.

213,860. Leonard, F. C. Nov. 27, 1923.

FIG. 6.

FIG. 7.

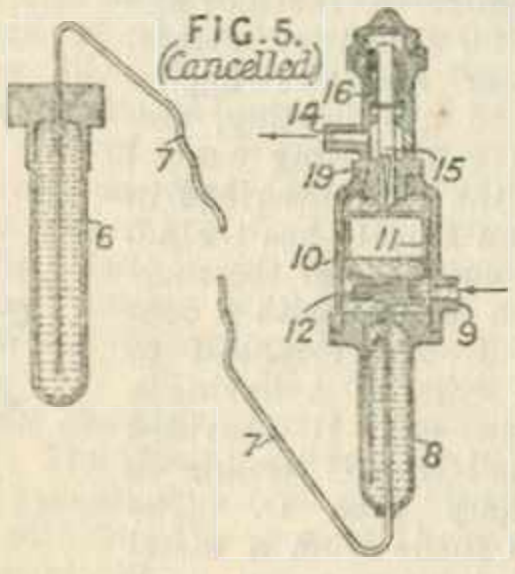


Thermostats.—A mixing-valve for hot and cold water comprises two lift valves operated by a rocking spindle, on which is mounted also a thermostat which controls the relative lift of the two valves to maintain a constant temperature. The flow of hot and cold water is controlled by two double beat valves 14 which are connected by links 75 connected to a pivoted lever 73. The valves are lifted together by the rotation of the spindle 17, which is provided with an eccentric portion 67 serving as the pivot for the lever 73. A thermostat 16 in the form of a spiral coil of sheet material, is fixed at its outer end to an arm 46 and at its inner end to a sleeve 37 which is rotatable on the spindle 17. The lever 73 is rigid with an arm 74, which is connected by link mechanism 15 with the sleeve 37, so that a rotation of the sleeve 37 due to a temperature change produces a tilting of the lever 73 and a partial closing of one valve and opening of the other. The arm 46 is rigid with an external handle 22 and indicator 20, so that the thermostat may be set to obtain any desired temperature of water.

213,877. Etablissements P. Colombier Fils, (Assignees of *Diffinger, E. A.*). April 5, 1923, [*Convention date*].

Thermostats.—The Specification as open to inspection under Section 91 (3) (a), comprises the following subject-matter:—The flow of refriger-

are into the evaporator of a refrigerating machine is regulated according to the temperature of the



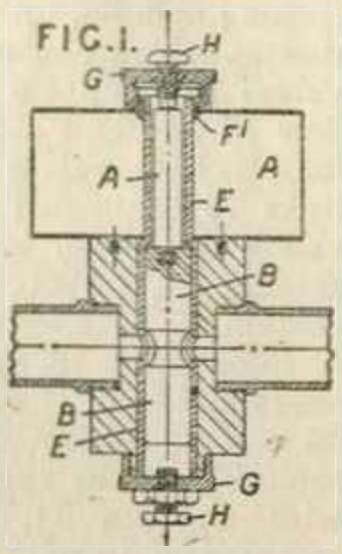
compressed refrigerant on its way to the condenser coil by means of the device shown in Fig. 5 (*Cancelled*). This comprises a closed steel bulb 6 fitted in the inlet to the condenser coil and containing a liquid whose boiling point is above the normal temperature of the compressed refrigerant. The bulb is connected by a flexible tube 7 to a cylinder 8 containing mercury. A chamber 10, to which liquefied refrigerant is supplied through a pipe 9, contains a hollow float 11 whose interior communicates with the mercury vessel through a coiled flexible tube 12 having a capillery opening at its lower end. A slidable valve 15 having a tapering notch 19 is pressed by an adjustable spring 16 into contact with the float. The action is such that when the temperature of the compressed refrigerant rises, mercury is forced up into the float and increases its weight, whereupon the valve moves down to admit the liquid refrigerant to pass in greater amount through the notch to the pipe 14 leading to the evaporator. This subject-matter does not appear in the Specification as accepted.

214,030. Loke, J. J. May 14, 1923.

Non-conducting coverings for heat. — An external covering for furnaces is formed of several thin layers of a natural volcanic sand, consisting chiefly of oxidized titanic iron, enclosed in casings or shells of refractory material such as earthenware or asbestos.

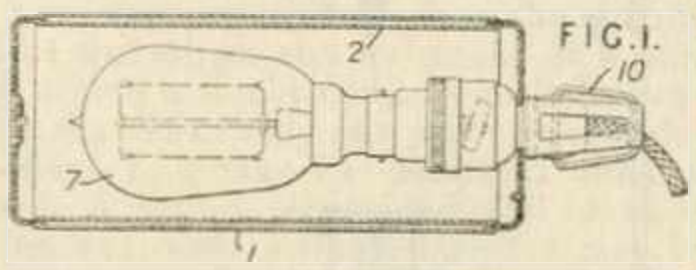
214,451. Maclaren, R. April 13, 1923.

Thermostats. — An electrically-actuated valve particularly applicable for use in connection with the control thermometer described in Specification 200,124 has a piston valve member B directly connected to the core of an iron clad solenoid A adapted to move the valve against the action of gravity. The valve member slides in a ported brass tube E provided at its upper end with an iron boss F¹ to which the walls of the solenoid are secured by folding or riveting. The ends of the tube are closed by caps G fitted with adjustable soft iron stops H. Specifications 25965/05 and 128,193, [both in *Class* 135, Valves &c.], also are referred to.



214,858. Rombach, P. May 31, 1923.

Bed-warmers. — A combined portable electric lamp and bed-warmer comprises a casing with an inner reflecting surface and totally enclosing a lamp 7 secured to one end of the casing, the casing being constructed so that it may be opened to disclose the lamp with the reflecting surface behind it for use as a table or hanging lamp. A pivoted hook 10 is provided for the latter purpose. The casing comprises two semi-cylindrical members 1, 2 pivotally connected at the ends, a locking catch being provided for retaining them in



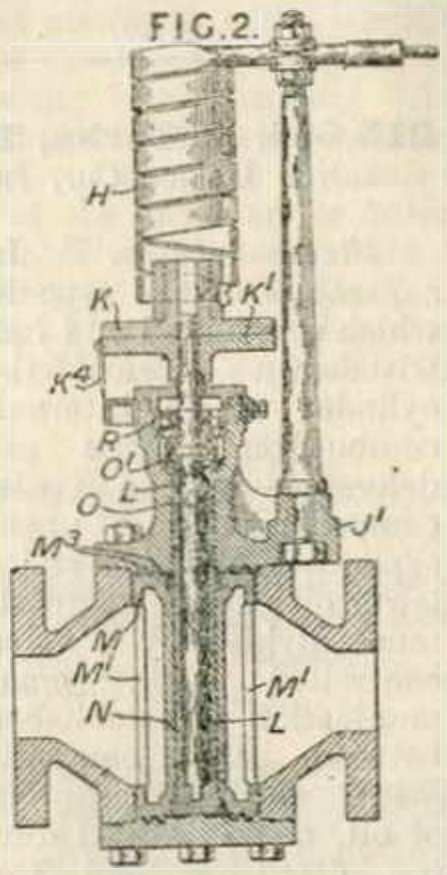
the closed position. Various modifications are described in which the casing is in two parts hinged together longitudinally. In another modification, the casing consists of two semi-cylindrical parts, one of which slides longitudinally in the other.

214,877. Haag, J. July 5, 1923.

Heating by circulation of fluids. —Perkins tubes for use in heaters, condensers, and like apparatus are of circular cross section as at 7, Fig. 1 where they are heated and at their points of contact with walls 8 9, 10, and have flat parts 5 where heat is emitted. Specification 197,769, [*Class* 64 (i), Heating liquids &c.] is referred to.

214,900. Gordon & Co., Ltd., J., and **Ferguson, C. M.** Aug. 25, 1923.

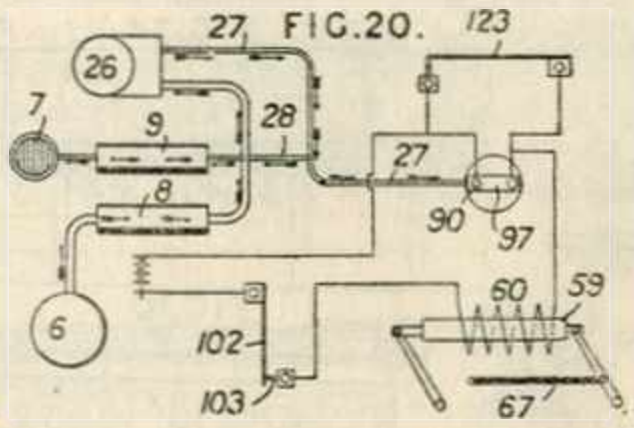
FIG. 2.



Thermostats. — A rotary cylindrical valve is actuated by a Bourdon tube thermometer, which, in an example, controls the admission of wet steam to a pipe conveying superheated steam to maintain a constant temperature in the latter. A Bourdon tube is connected to a temperature responsive device in a pipe conveying superheated steam. The tube actuates a valve controlling a pipe conveying wet steam to mix with the superheated steam and a pointer indicates the temperature at which the valve opens. The preferred form of valve is shown in Fig. 2. The lower end of the Bourdon tube H is secured to the upper member K of a coupling, the two members K, K¹ of which are adjustable by means of slots moving over bolts, and an indicator K⁴ is provided to show the temperature at which the valve is set to open. A cylindrical valve M is used, having slots M¹, the valve being rotatable on a sleeve N fixed to the cover J¹. The valve spindle L is secured to the lower end of the valve. The ends of the valve M are formed with ridges M³ to minimize leakage of steam, and a small drainage opening is also provided. The spindle may be lubricated by means of an opening O, the oil discharging to a well O¹. The valve is approximately balanced, but any end thrust is taken by a ball bearing R.

215,065. Blanchard, G. N. Jan. 30, 1923.

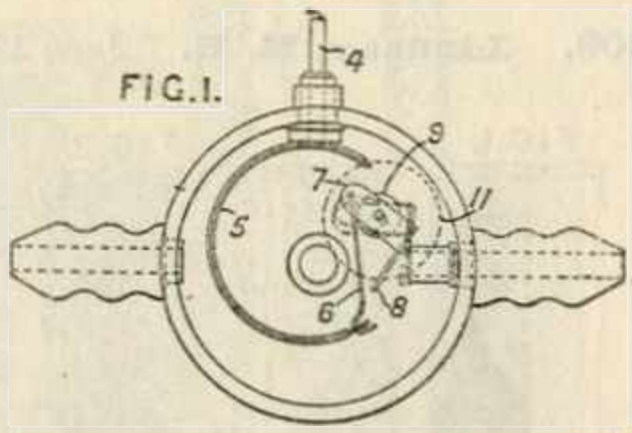
FIG. 20.



Thermostats.—Liquid fuel is supplied from a reservoir 6, Fig. 20, to a burner 7 by means of a pump 26 operated by an electric motor having arranged in parallel in its supply circuit a laminated thermostat 123 and a make-and-break device 90, 97 operated by the pressure in the fuel line 27, 28 between the pump and the burner. The motor shown comprises a core 59 movable within a solenoid 60 which is alternately energized and de-energized by making and breaking the supply circuit at contacts 103. The core is returned to its original position when the circuit is broken by means of a spring. When the room temperature is low the pump is operated even though the pressure in the fuel line separates the contacts 90, 97. When the room temperature is sufficiently high to operate the thermostat 123, the operation of the pump is controlled by the variation of pressure in the fuel line 27.

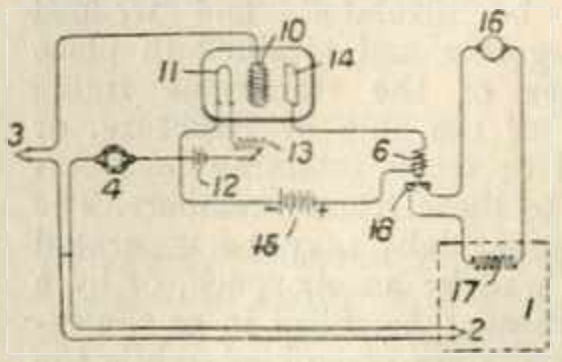
215,370. Granhult Aktiebolag, H., (Assignees of *Hult, C. J.*). May 3, 1923, [*Convention date*].

FIG. 1.



Thermostats.—A thermostatically actuated gas-regulator particularly applicable for use with cooking apparatus has a valve 8 carried by a lever 7 connected by a link 6 to the free end of a Bourdon tube 5. The Bourdon tube is connected by a pipe 4 to an air vessel adapted to be raised in temperature by the heat of the chamber whose temperature it is desired to regulate. The pivot of the lever 7 is eccentrically mounted on a member 9 adapted to be rotated by a milled head 11, whereby the temperature at which the valve closes may be regulated. In a modification the valve member is formed on the end of the Bourdon tube and a cam stop is fitted for controlling the opening of the valve.

215,483. British Thomson-Houston Co., Ltd., (*International General Electric Co.*). Feb. 26, 1923.



Thermostats. — A relay 6 for controlling the supply of electricity to an oven 1 or for similar purposes is operated through the medium of a

vacuum-tube amplifier by the E.M.F. generated in a thermo-electric couple 2, 3 subject to the temperature of the oven or the like. In the arrangement shown an alternating-current relay 6 is connected in circuit with a battery 15 to the filament 11 and plate 14 of the amplifier and is unaffected by direct current passing through it, the filament 11 is heated from a local circuit including a battery 12 and rheostat 13, while the thermo-couple 2, 3 is connected in circuit to the filament 11 and grid 10 with an interposed interrupter 4, which transmits the voltage set up by the thermo-couple to the grid in the form of pulsations of a frequency to which the relay 6 responds. At a certain maximum temperature of the oven 1 the alternating current in the relay circuit is of sufficient strength to open the switch 18 and cut off the supply of electricity from the generator 16 to the heater 17, the heating circuit being re-established as the temperature falls.

215,608. Lindsay, H. B. June 12, 1923.

FIG. 1.

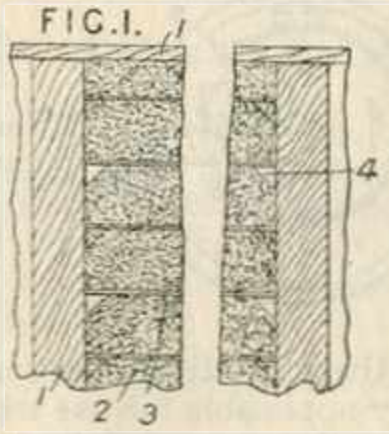
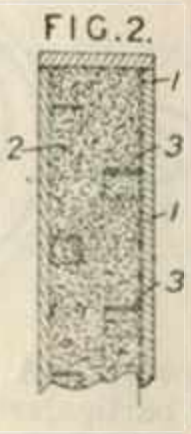


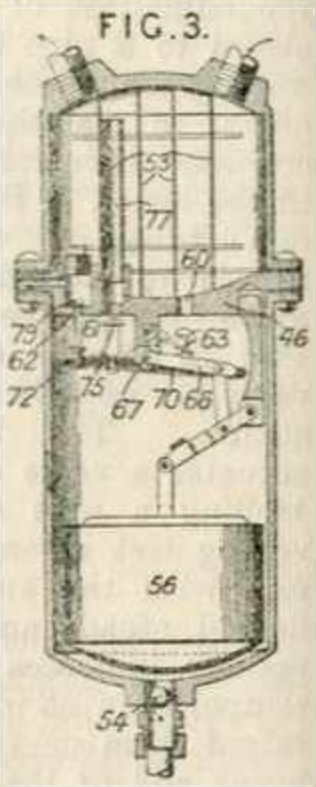
FIG. 2.



Non-conducting coverings for heat and sound. —A heat-insulating and sound-deadening wall comprises a hollow casing 1 of wood filled with an insulating material such as kapok that is supported by means of bars 3 carried at their ends on brackets 4 secured to the end walls. The bars are narrower than the width of the casing and are arranged on the opposing walls in staggered relation.

215,685. Marks, E. C. R., (*Skinner Automotive Device Co., Inc.*). Oct. 30, 1922.

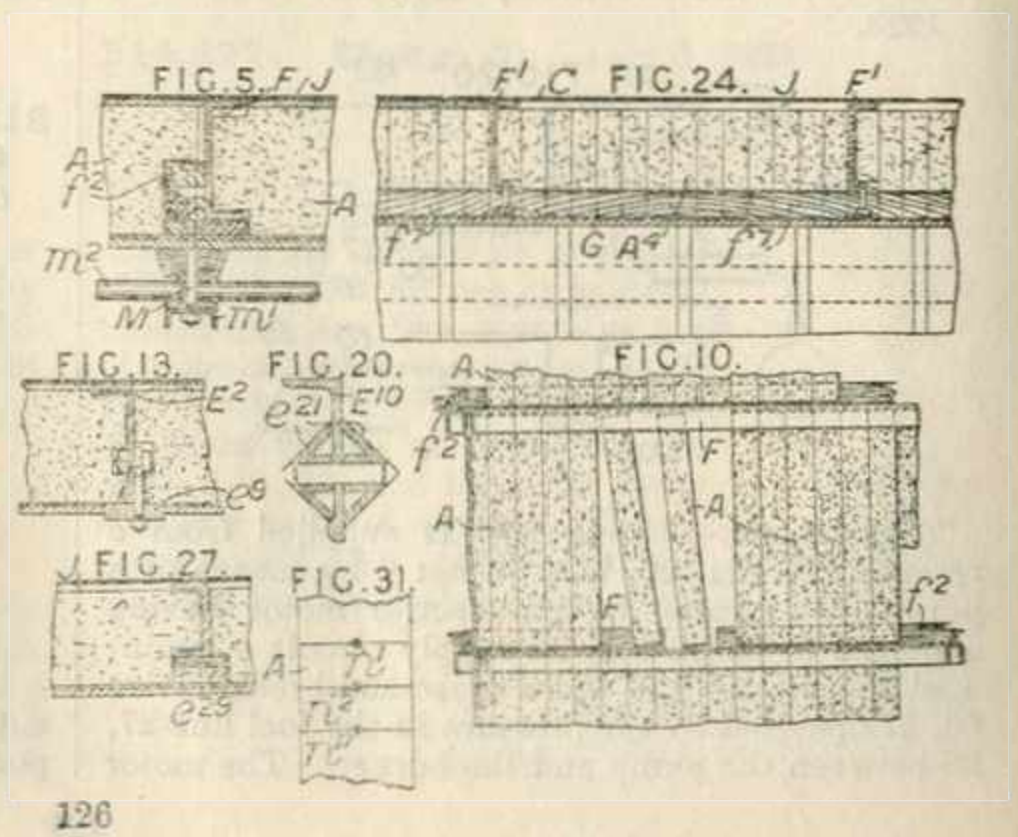
FIG. 3.



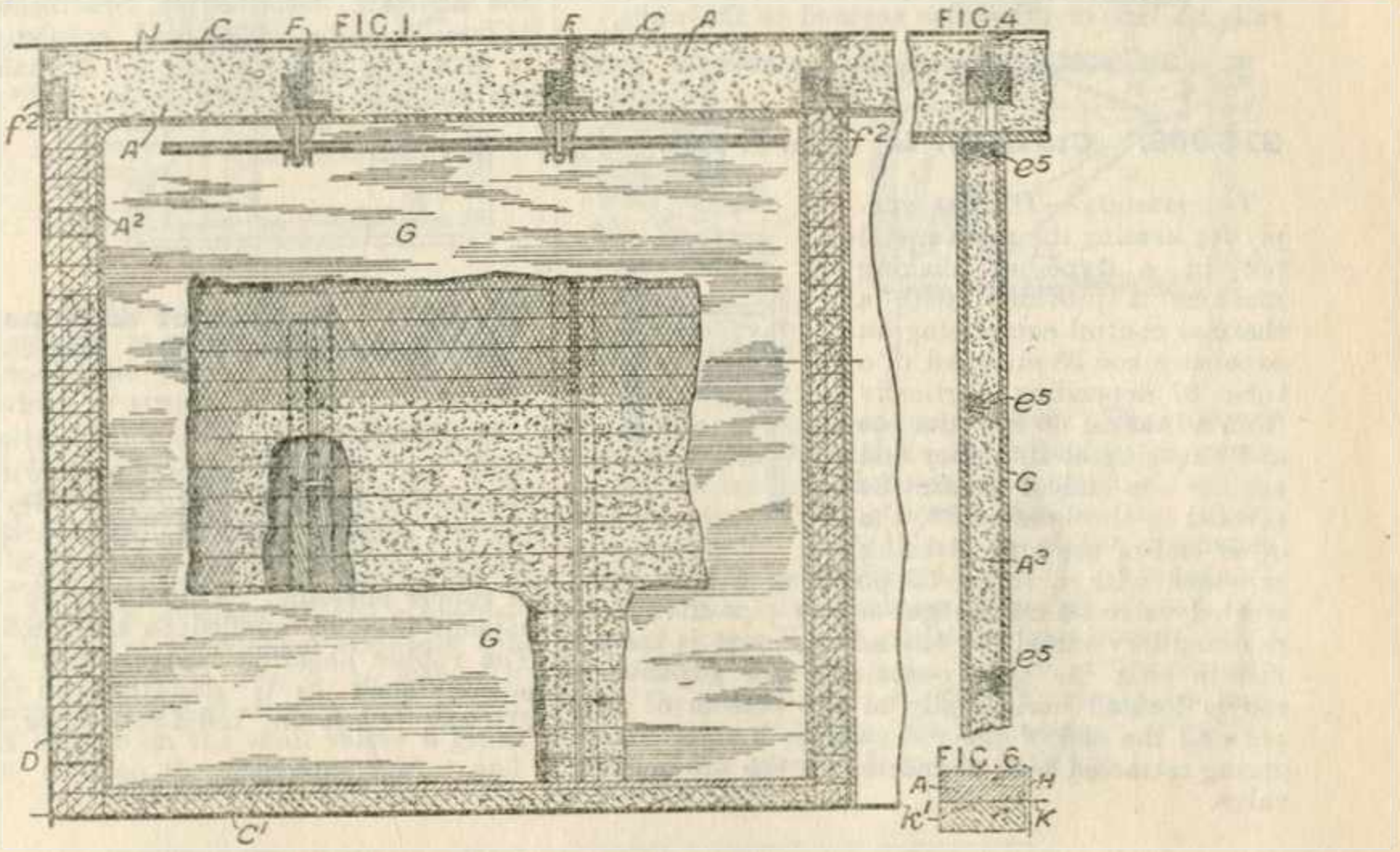
Steam - traps. — In separators of the type in which surplus oil and fuel withdrawn from the cylinder of an internal-combustion engine are delivered into a vessel comprising an upper separating chamber and a lower oil storage compartment divided by a valve controlled wall, communication is established between the compartments during collection of oil, and is closed during discharge and the storage compartment opened to the atmosphere, all by float operated means responsive to the oil level. The upper half of the separating vessel has fine-mesh screens 53, and the division wall 46 has an oil port 60, a port 61 communicating with an air tube 77, and a port 62 communicating with the atmosphere. The opposite ends of links 66, 72 having a common pivot 67 are connected by a pair of springs 70. The float 56 raises the link 66 until the springs pass the pivot 67 when they contract and seat the valves 63, 75 and open the valve 79. The ball valve 54 is closed during collection of oil by suction of the intake.

216,184. Rathmell, B., and **McIvor, W. T.** Feb. 19, 1923.

Non-conducting coverings for heat. —The walls and ceilings of cold-storage rooms, particularly those of ships, are lined with slabs of compressed cork or composition placed with their larger surfaces at right angles to the surfaces to be insulated, and wedged tightly together and retained in place by flanges of the transverse frame members of the ship or structure, or by metal or wood retaining members attached to these frame members. The edges of the slabs may be separated from the wall by an air space, or by a layer of cement &c. filled in as the insulating slabs are assembled, while the exposed surface of the slabs is covered with a layer of plaster keyed to wire mesh material anchored to the slabs by means of barbed rods. Partition



walls may be formed of similar superposed slabs fitted between and retained by grooved wood or other posts or rails. A cross-section of a chamber between a bulk-head plating D and a partition G between decks C, C¹ is shown in Fig. 1, the lining for the hull plating being similar. The slabs A, A² are of a length to fit between beams or stiffeners F, and are cut away at the ends to fit behind the flanges of the stiffeners or behind fillets f^2 bolted thereto. They are assembled by passing them singly through a gap in the flange or fillet, as shown in Fig. 10, this gap being afterwards filled in by a suitable block or plate. The space J between the slabs and the plating may be an air space or be filled in with cement, and the plaster lining is keyed to wire mesh H, Fig. 6, attached to rods K having barbs k^1, these rods being placed in position between the slabs during assembly. The partition G and a part of the hull lining are shown in plan in Fig. 4, the slabs A³ of the partition having pointed ends for engagement between grooved posts e^5. The brine pipes or suspension rails m^2, Fig. 5, are supported on channels m^1 suspended from bolts M secured to the retaining fillets f^2. The retaining members may take the form of plates e^9, Fig.

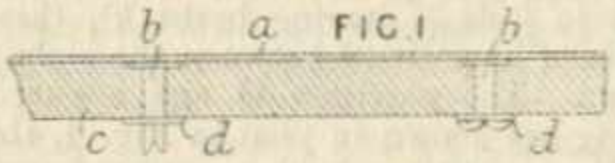


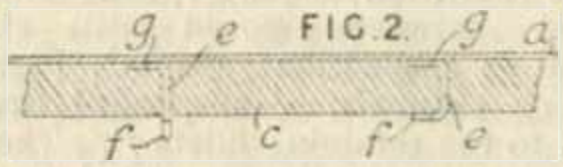
13, supported by eye-bolts attached to the frame members E², or such plates may be bolted to wood fillets attached to the frame members, and the brine pipes may be carried by bearers attached to the plates. The fillets or retaining members may be of triangular section, and may consist of hollow metal members e^{21}, Fig. 20, mounted on a pin or bolt on the frame member E¹⁰. The frame-members, before being built into the ship, may have plates e^{29}, Fig. 27, riveted to the flanges to serve as retaining members. A part of each such plate is cut away to enable the slabs to be assembled, the gap being subsequently closed by a strip bolted to the flange. The meeting faces of the slabs may be stepped, and are preferably cemented together. They may have registering V-grooves n^1, Fig. 31, to receive a compressible packing material n^2 to form an airtight joint. The slabs may be set parallel with the frame members, as shown at A⁴ in Fig. 24, in which case retaining members f^7 running transversely to the slabs are bolted to the flanges of the frames F¹.

216,638. Leeds Forge Co., Ltd., and **Ashford, E. H.** April 13, 1923.

Non-conducting coverings.—Heat-insulating or similar coverings are secured to vehicle or other walls by pressing the insulating layer or slab *c* against piercing devices previously attached to the wall, e.g. by soldering, and subsequently clinching the protruding portions of the piercing devices. In the arrangement shown in Fig. 1, the heads of bifurcated rivets *b* are secured to the wall *a*, and the split limbs of the rivets after passage through the insulating or similar layer *c* and washers *d* are bent over the latter, while in the construction shown in Fig. 2 a thin metal strip *e* is employed having at one end a bent portion *g*

s a securing-head and a sharp point *f* at the other end. In the case of non-metallic walls

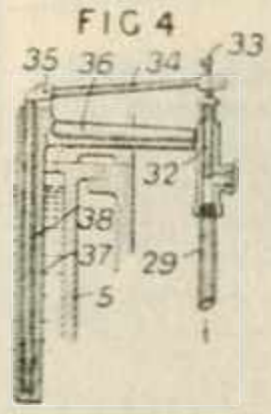




the fastening devices may be secured to metal rails let into or otherwise secured to the walls.

216,909. Curle, G. L. Jan. 8, 1923.

Thermostats.—The gas supply for heating the main metal pot in a type-bar making machine is provided with a thermal control comprising an expansion rod 38 enclosed in a tube 37 depending vertically from a bracket 36 into the pot and engaging at its upper end against one end of an arm 34 pivoted in the bracket 36, the other end of the arm 34 being provided with a screw 33 engaging a spring-retracted valve 32 on the gas-supply pipe 29. For the auxiliary metal pot the arrangement is modified in that the tube containing the expansion rod is located horizontally at the bottom of the pot and the end of the rod engages a screw on a spring-retracted arm connected to the gas-supply valve.



217,026. Broadfoot & Sons, Ltd., J., and **Robertson, J. G.** May 23, 1923.

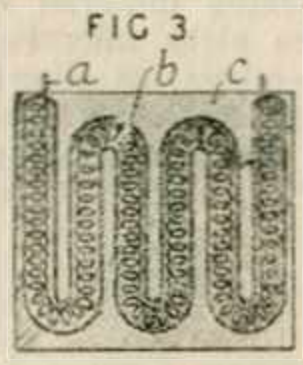
Non-conducting coverings for heat.—Heat-insulating slabs for use in refrigerating chambers are faced on either or both sides with magnesite cement to the surface of which a layer of rubber sheeting is caused to adhere, a final layer of magnesite cement being applied if desired. The rubber sheeting consists of any suitable woven fabric impregnated with rubber and vulcanized, and is preferably attached to the magnesite cement by the adhesive described in Specification 216,953, [*Class* 70, India-rubber &c.], consisting of animal or fish glue and formalin or formaldehyde with the addition of an alkaline earth or weak alkali.

217,027. Broadfoot & Sons, Ltd., J., and **Robertson, J. G.** May 23, 1923.

Non-conducting coverings for heat and sound.—Slabs &c. of cork agglomerated with a silicate cement are faced on one or both sides with a coating of a cement containing magnesite, magnesium chloride and a filler, and are covered with a layer of rubber sheeting. A final coating of magnesite cement may be applied to the rubber sheeting. The rubber sheeting is preferably attached by cement such as is described in Specification 216,953, [*Class* 70, India-rubber &c.].

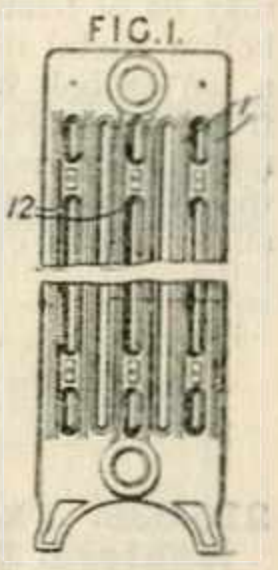
217,212. Strasser, A., and **Graber, O.** June 6, 1923, [*Convention date*].

Heat-storing apparatus.—An electric heater comprises a resistance *a* embedded in an oxide of the rare earths such as zirconium oxide, contained in a quartz casing *b* hermetically sealed in a metal body *c* serving as a heat accumulator. The sides of the metal body may be ribbed to increase the heating surface. In a modification, the quartz tube is arranged in spiral form in the wall of a hollow cylindrical metal body. The conductivity of the oxide increases as the temperature rises so that the oxide co-operates with the resistance to produce the heating effect.

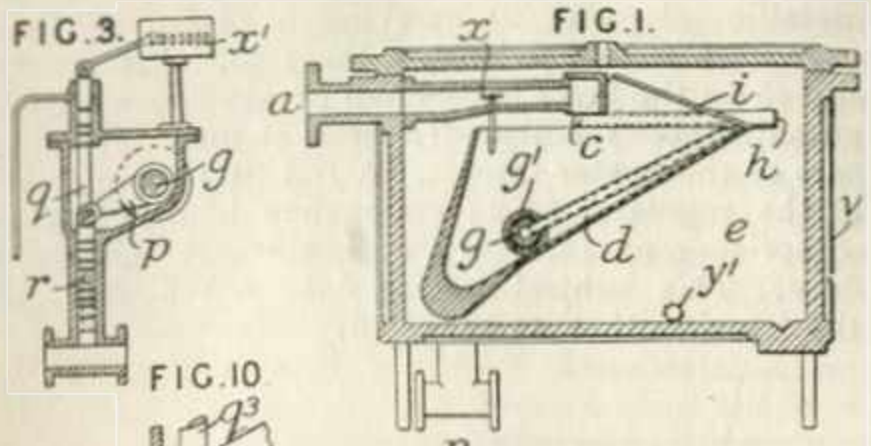


217,416. Courtot, L. June 1, 1923.

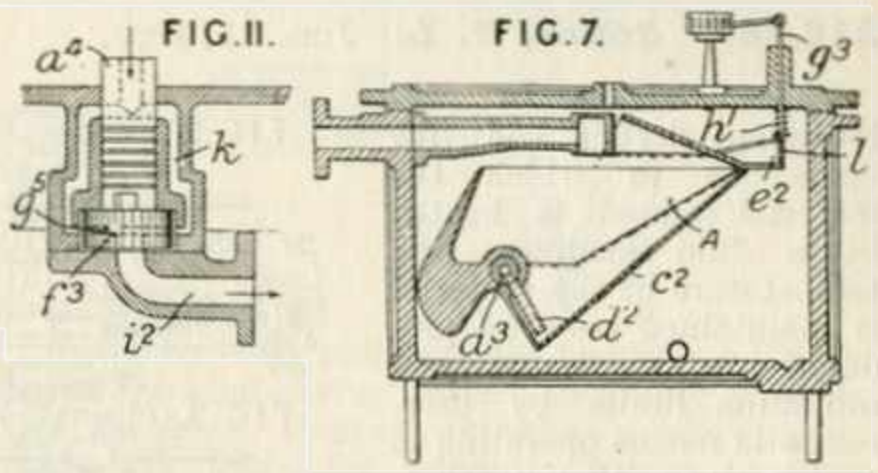
Radiators. — Cast radiator elements of the general form shown in Fig. 1 have the tubes 1 cross connected in pairs at 12.



217,427. Eisenbeiss, E. June 26, 1923.



Steam-traps.—In a steam-trap of the type in which the discharge is controlled by a tilting vessel, the condensate passes directly into an open vessel which is suspended within a closed stationary container so that a predetermined quantity will tilt it to operate the discharge valve. The condensate enters the container *e* Fig. 1 through a pipe *a* having a sieve *c* and passes into the bucket *d*, weighted at one side, partially covered by a plate *i* and secured by a sleeve g^1 to a shaft *g* journaled in the container walls. The tilting of the bucket connects the container with a chamber *o*, Fig. 2, by way of a tube *f*, a passage *k* in the shaft *g*, a port *m* and passage *n*. A lever *p* on the shaft raises a plunger *q*, Fig. 3, to open the discharge port *r* and to actuate a counting device x^1. The pipe is throttled by a valve *x* during discharge. A channel *h* on the bucket, scoops up water collecting in the container *e* and a drain y^1 is provided. Packing is provided on the shaft and plunger. Jackets *v* contain air or heat-insulating material. In a modification the bucket is spherical, is secured to the shaft at or outside its periphery and is balanced by a weight on the plunger. In a further modification, Fig. 7, a channel c^2, open at the top of the bucket A, depends below it and communicates by a tube d^2 with the passage a^3 in the shaft which communicates directly with the discharge chamber (not shown). The covered channel e^2 has holes *l* for the collection of water in the container and holds up the rod q^3, which actuates the counting device, against the action of a spring h^1. Modifications of the discharge valve are shown in Figs. 10 and 11. A sleeve z^2 extends into the discharge chamber o^1 and has opposite ports V with which register bores r^5 communicating with the axial bore r^4 of the plunger q^3. The hollow shaft a^4, Fig. 11, terminates in a rotary valve f^3 having radial passages g^5 which connect the passage *k* to the outlet i^2.

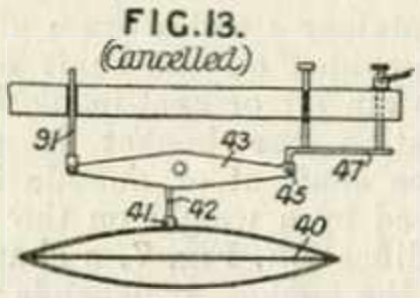


217,562. Wood, H. J., and **Eastgate, F. L.** June 14, 1923, [*Convention date*].

Thermostats.—Ventilators 3 mounted on shafts 4 in the roof 2 of a building 1 are automatically controlled, according to the temperature of the building, from a vessel 5 containing air or other gas and connected by pipes 8 to a vessel 6 containing liquid and in which is inserted an inverted member 7 attached to a rod 10 slidable in a fixed guide 11 and carrying a boss 12 linked to the ventilators 3. On change in temperature the gas in the vessel 5 expands or contracts, causing the rod 10 to open or close the ventilators 3. According to the invention, the inner pipe 8 is surrounded by an air space 9 to prevent cooling action of the liquid on the gas. To allow the member 7 to descend further after the ventilators are shut the boss 12 is made slidable on the rod 10 which is then provided with an adjustable collar 14, whilst, in order to allow for further expansion of the gas after the ventilators have been fully opened, a second inverted member 16, suitably weighted at 17, is inserted in the vessel and communicates with the vessel 5 through a branch pipe 8. In some cases, the member 7, instead of being directly connected to the ventilators 3, may be arranged to govern the operation of a secondary power device in the form of an electric or hydraulic motor.

217,915. Perrot, J. June 20, 1923, [*Convention date*].

FIG. 13. (Cancelled)



Thermostats.—According to the Specification as open to inspection under Sect. 91 (3) (a) a thermostat for an incubator comprises a bi-metallic element 40 carrying a piece 41 that engages a rod 42 to rock a lever 43. A mercury cup 45 on the lever makes and breaks contact with an adjustable member 47, these elements forming part of the heater circuit. A rod 91 is connected to the regulator of an emergency heating-device comprising an oil lamp with suitably arranged flues. This subject-matter does not appear in the Specification as accepted.

218,086. Jones, T. L. June 11, 1923.

Thermostats. — In pasteurizing, drying and like operations in which the material treated is heated by a fluid medium, the temperature of the material is maintained between predetermined maximum and minimum limits by thermostatic means operating in conjunction with two relays 5, 7, Figs. 1 and 4, one, 5, of which is associated with a solenoid 15 adapted to move in the closing direction the valve 13, Fig. 2, controlling the supply of heating-fluid and a solenoid 30 for moving in the opening direction the valve 14, Fig. 3, controlling the supply of the material, while the other relay 7 is associated with a solenoid 16 for opening the valve 13 and a solenoid 25 for closing the valve 14. The cores of the solenoids 15, 16 and 25, 30 actuates the valves 13, 14 respectively through the intermediary of levers 22, 20 and 31, 26 and pawl-and-ratchet mechanism. When any one of these solenoids is energized the corresponding core is moved outwardly to operate one of the valves 13, 14 and also to close one of four pairs of contacts 34, 40, 44, 48 and is locked in the outward position by the engagement of a detent 39 with one of four catches 34, 41, 45, 49 controlled by unlocking solenoids 37, 43, 47, 51 respectively. In the arrangement shown which is applied to a pasteurizing operation for maintaining the temperature between 195° F. and 205° F., a maximum thermometer 1 is associated with the relay 5 and a minimum thermometer 2 with the relay 7, the current being derived from a low voltage transformer 3. The switch 6 controlled by the relay 5 is normally open and is associated with the solenoids 15, 30 and with one solenoid 60 controlling a rocking-switch 64, while the switch 8 controlled by the relay 7 is normally closed and is associated with the solenoids 16, 25 and the other solenoid 61 controlling the rocking-switch 64. The pairs of contacts 34, 48 are associated with a solenoid 52 actuating a normally closed switch 4 in the thermometric circuit and a normally open switch 55 arranged in unlocking circuits with the solenoids 37, 51, while the pairs of contacts 40, 44 are associated with a solenoid 56 actuating a normally open switch 9 in the thermometric circuit and a normally open switch

FIG. 2.

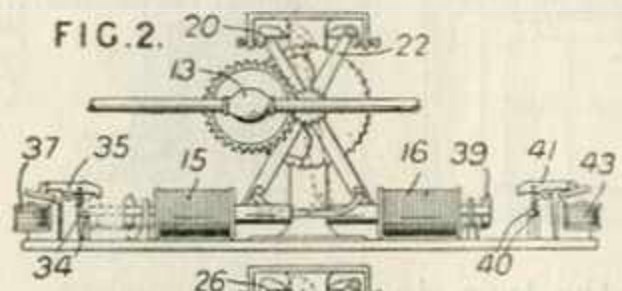


FIG. 3.

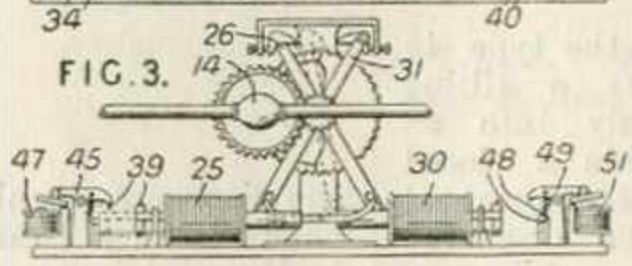


FIG. 4.

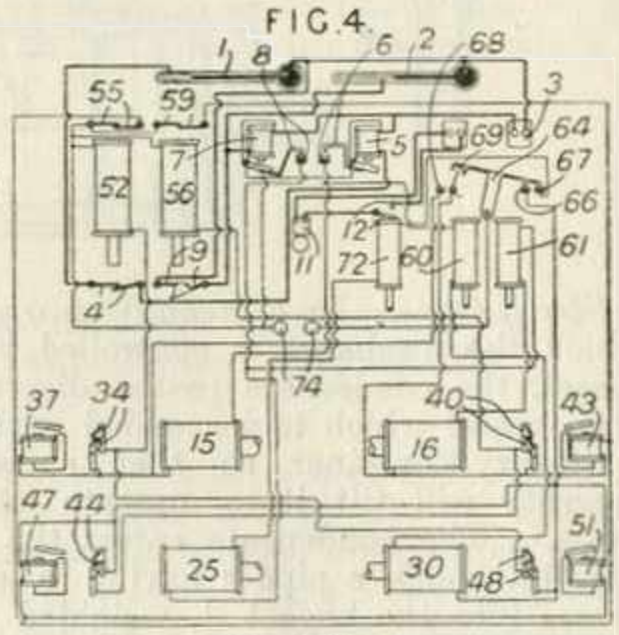
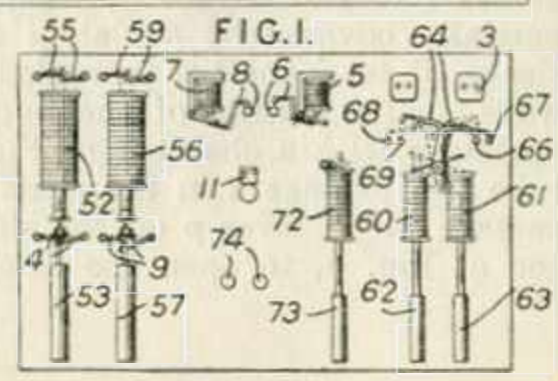


FIG. 1.



59 arranged in unlocking circuits with the solenoids 43, 47. One terminal of a relatively high voltage transformer 74 is connected to the main arm of the switch 64 which has four mercury contact-cups 66, 67, 68, 69, while the other terminal is connected to the solenoids 52, 56. An additional solenoid 72 for closing a switch 12 in a local circuit including an electric warning-bell 11 is associated with the solenoid 25. The cores of the solenoids 52, 56, 60, 61, 72 are adapted to fall by gravity to their lower or normal positions and operate in combination with adjustable dash-pots 43, 57, 62, 63, 73 which retard the movements in one direction to a required degree. The action of the apparatus is as follows. In normal circumstances when the temperature is between 195° F. and 205° F. the relay 7 is energized and the relay 5 non-energized, both switch 8, 6 therefore being open, while the rocking-switch 64 makes contact at 68, 69. Should the temperature rise to 205° F. or above the relay 5 is energized and the switch 6 closed completing the circuit 6, 15, 68, thus moving the core of the solenoid 15 to close the valve 13 by one step and simultaneously closing the pair of contacts 34. The circuit 68, 34, 52 is thus established, and the solenoid 52 opens

the switch 4 and closes the switch 55, the former operation de-energizing the relay 5 and opening the switch 6, while the latter operation establishes the unlocking circuit 37, 55, 68 and thus releases the core of the solenoid 15. If at the end of this cycle of operations the temperature is still above 205° F., the cycle will be repeated and the valve 13 is closed still further, the repetition occurring until the temperature falls below 205° F. On the other hand, should the temperature fall below 195° F., the relay 7 is de-energized and the switch 8 closes establishing the circuit 8, 61, 16, 69, and causing the core of the solenoid 16 to open the valve 13 by one step and closing the contact 40, whereby the circuit 40, 56, 69 is established. The solenoid 56 being thus energized allows the contacts 9 to close and re-energize the relay 7, and also closes the switch 59 whereby the circuit 43, 59, 69 for unlocking the core of the solenoid 16 is established. Meanwhile the solenoid 61 is also energized, but its action upon the rocking-switch 64 is delayed by the dash-pot 63 so that the cycle of operations detailed may take place the requisite number of times before the switch 64 is rocked over to make contact at 66, 67. In this latter position of the switch 64, if the temperature still continues below 195° F. the solenoid 25 is energized anl causes the supply through the valve 14 of the material treated to be reduced, or if the temperature rises above 205° F. the solenoid 30 is energized and the supply of material treated increased, the series of steps involved being simlar to those described with reference to the valve 13. Owing to the delay action of the dash-pot 73, the solenoid 72 operates the switch 12 only after the valve 14 has been closed to the limit allowed and atfer the solenoid 25 has made an abortive attempt to move its core, a warning thus being given to the attendant that the temperature has fallen permanently below the required level.

218,121. Lombardi, M. July 19, 1923.

FIG. 4.

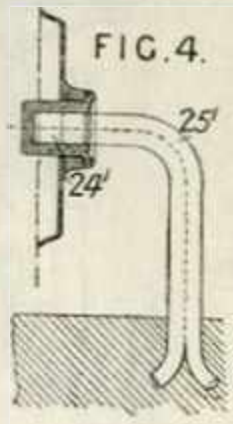
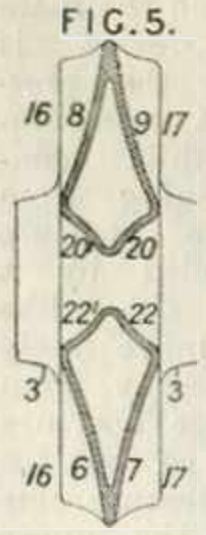


FIG. 5.

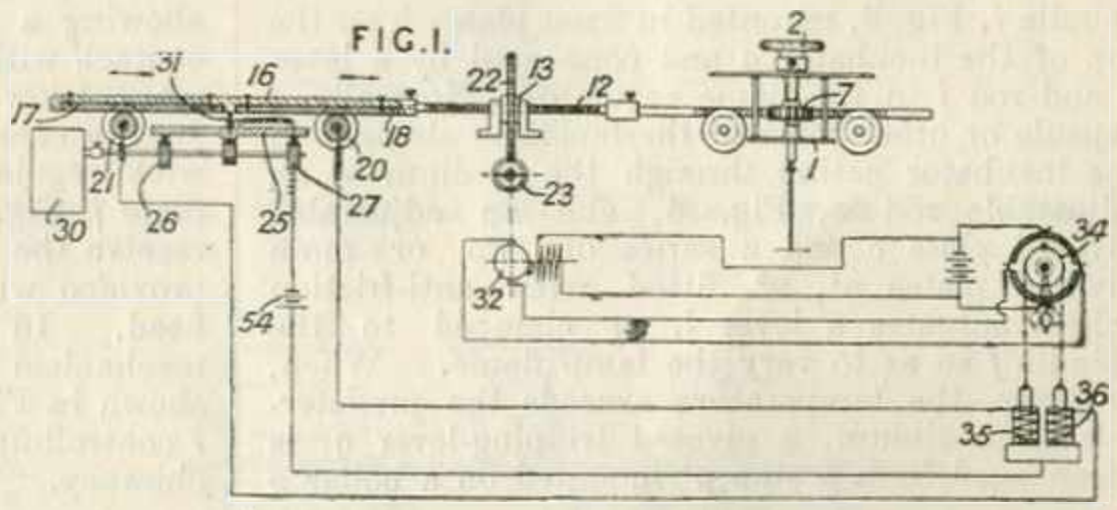


Radiators.—In radiators for heating buildings &c. of the kind having concave radiating surfaces, each section or element comprises a pair of interconnected four-sided conduits having concave surfaces of parabolic form, the outwardly directed sides 6 - - 9 being all of equal width and approximately twice the width of the inwardly directed surfaces 20, 20¹, 22, 22¹. At the top and bottom the conduits merge into plane surfaces 16, 17, while the several elements are connected by the usual threaded nipples 3. Instead of resting on the floor of a room the radiator may be supported from a wall by means of cramp irons 25¹ engaging recesses in screw-threaded stoppers 24¹ inserted in place of the connecting nipples.

218,303. Verney, J. L. L. June 28, 1923, [*Convention date*].

Thermostats.—In a furnace wherein a temperature-regulating apparatus adapted to maintain the furnace at a determined temperature is automatically controlled by controlling apparatus so that the temperature is varied according to a predetermined law, the controlling apparatus comprises a lengthwise movable control bar 16 capable of sliding on a support 25 adapted to move uniformly tranversely to the bar, the latter being operated by driving-mechanism adapted to be controlled in either one or the other direction according as a point of the bar passes to either one or the other side of a curve 31 representative of the predetermined law and materialized on the support 25. The regulating apparatus is of the type described in Specification 184,797, [*Class* 37, Electricity, Measuring &c.], and comprises a galvanometer having a torsion head 2 coupled to the bar 16 by a screwed rod 12 and rack-and-pinion gearing 7. The galvanometer coil is energized by a thermo-electric couple disposed in the furnace and is adapted to operate a switch fitted to a circuit which controls the operation of a valve, a register, a rheostat or other temperature-regulating-device according to the type of furnace used. The bar 16 is made of insulating material and is fitted with conducting plates 17, 18 engaging conducting rollers 21, 20. The support 25 carrying the metal strip 31 is moved at a uniform speed along rails 26, 27 by a clockwork mechanism 30. When a part of the metal strip 31 comes in contact with either of the faces 17, 18 the battery 54 sends a current through one of the solenoids 35, 36 with consequent operation of the reversing switch 34 to start the motor 32 which actuates the rod 12 through the worm gear 23, 22 and nut 13. The support 25 may be in the form of a revolving drum.

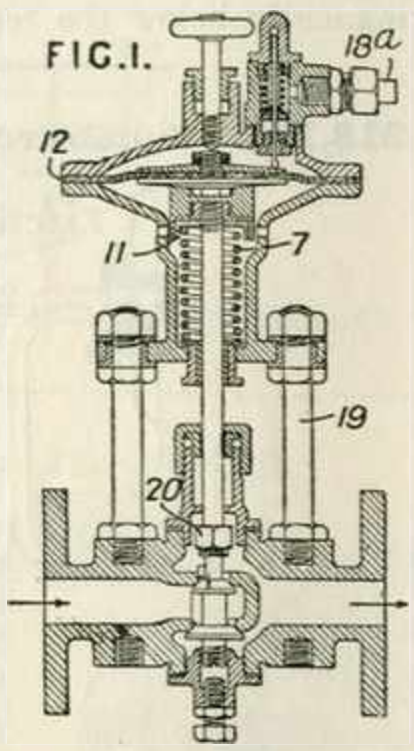
FIG. 1.



218,370. British Arca Regulators, Ltd., and **Lindsay, T.** March 29, 1923.

Thermostats. — A power device for use in connection with apparatus for regulating temperature, of the type in which the main regulating device is operated by the pressure of a non-compressible fluid continually issuing from a discharge aperture and controlled by a cup or the like adapted to move freely towards or away from the discharge aperture is arranged so that the actuating pressure acts directly on the upper surface of a flexible diaphragm directly connected to the main regulating device. The Figure shows the application of the invention to the actuation of a valve. The main valve is detachably connected by means of a nut 20 to the actuating spindle which is coupled to a diaphragm 12 loaded by a spring 7 bearing against an abutment 11. Fluid pressure is supplied to the chamber above the diaphragm through a connection 18^a provided with a cleaning pin of the kind described in Specification 199,024, [*Class* 69 (ii), Hydraulic presses &c.]. The diaphragm casing is connected to the valve casing by pillars 19 adapted to engage alternative holes in the valve casing so that the latter together with the valve member may be inverted so that the spring tends to open instead of close the valve. Insulating bushes, washers &c. of fibre are inserted between various parts of the apparatus to prevent conduction of heat. Specification 116,074, [*Class* 69 (ii), Hydraulic presses &c.], also is referred to

FIG. 1.



218,518. Hopkins, V. G. Aug. 15, 1923.

Thermostats.—In apparatus for automatically regulating the temperature of incubators &c. of the kind in which the flame of a gas or wick burner is raised or lowered in accordance with the temperature in the incubator one portion of the control mechanism is disengageable from the other portion so that the lamp flame is permanently lowered or extinguished when the temperature reaches a predetermined maximum. In the construction shown the disengageable portion of the mechanism immediately regulating the flame comprises a counterweighted rotatable spindle *f*, Fig. 3, mounted in fixed plates *b* on the top of the incubator *a* and connected by a lever *g* and rod *i* to the flame regulator. Normally a capsule or other form of thermostatic element in the incubator acting through the medium of an adjustable rod *e*, Fig. 4, and an adjustable pivoted plate *c* and a series of two or more pivoted plates n^1, n^2 fitted with anti-friction rollers actuates a lever *l*, *m* clamped to the spindle *f* so as to vary the lamp flame. When, however, the temperature exceeds the predetermined maximum, a pivoted tripping-lever *q* is disengaged from a stop p^1 mounted on a collar *p* carried at one end of a pivoted lever *o*, thus allowing a spring p^3 to rotate the lever *o* into contact with the lever *l*, *m* and effect a permanent lowering or extinction of the lamp flame. In the case of a wick burner the head of the wick regulator is connected to the rod *i* by a plate *j*, Fig. 6, slotted in two different planes to receive the head and shank of the regulator and provided with a set-screw *k* for gripping the head. In addition to the flame-regulating mechanism the incubator may be provided as shown in Fig. 4 with the usual lever and damper *r* controlling the flow of hot gases from the lamp chimney.

FIG. 3.

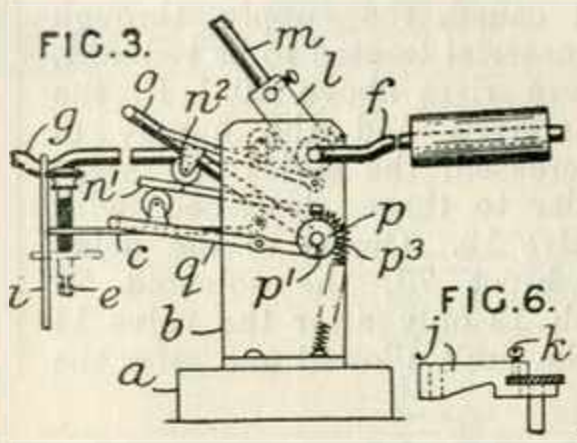
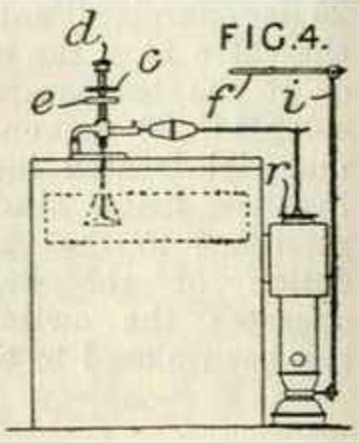


FIG. 6.

FIG. 4.

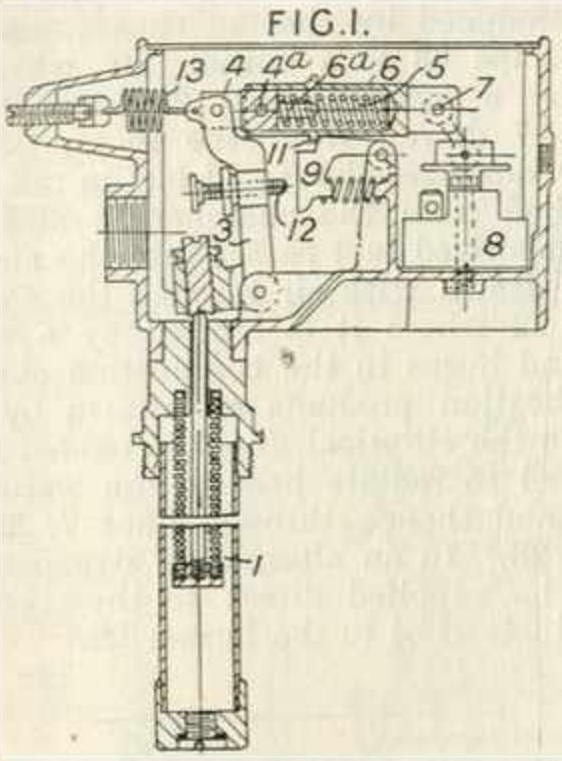


218,740. Wingfield, B. R. April 10, 1923.

Thermostats.—Thermally operated electric switches have a tube 1 filled with expansible liquid into which extends a switch operating rod terminating in a cap between which and the upper closure cap to the tube 1 extends a liquid-tight corrugated flexible tube. On expansion of the liquid the rod is forced upwards operating a quick-action switch 8 through intermediate mechanism which enables the slowly moving operating rod to move the switch to its "off" position with a quick action. This mechanism comprises a pivoted bell-crank lever 3 one arm of which is held by an adjustable spring 13 in engagement with the upper end of the operating rod. The other arm of the lever 3 is attached to a plunger 4 in a cylindrical casing 6 with a spring 5 which in turn is attached to the operating lever 7 of the switch 8, relative motion of the plunger 4 and casing 6 being limited by a pin 4^a on the former moving in slots 6^a in the wall

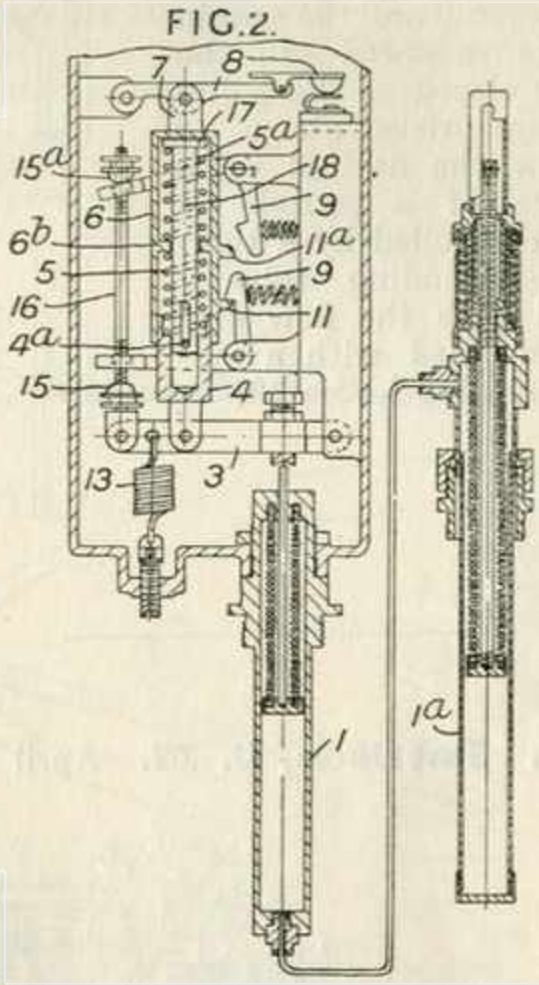
of the tube 6. As the operating rod rises with increasing temperature the spring 5 is compressed by the plunger 4, the casing 6 being held by a detent 11 on its wall being engaged by a pivoted spring-pressed latch 9, which is finally tripped by an adjustable screw 12 on the lever 9 thereby allowing the spring 5 to open the switch 7 with a quick action. The switch is reclosed positively by the action of the return spring 13 on the con-

FIG. 1.



traction of the liquid in the tube 1, until the detent 11 is re-engaged by the latch 9. The switch 8 may have an inherent quick make action to re-close its circuit rapidly. In the modified form shown in Fig. 2 two inter-connected thermostat tubes 1, 1^a are employed and the mechanism between the operating rod and switch 8 is arranged to give a snap action to the latter in both directions. This is effected by having two springs 5, 5^a in the casing 6, one bearing between the plunger 4 and a division of the one between the division and the enlarged head 17 of a rod 18 within the casing. The wall of the casing has a second detent 11^a, engaged by an additional catch 9. The opening movement on expansion of the liquid is similar to that de-

FIG. 2.



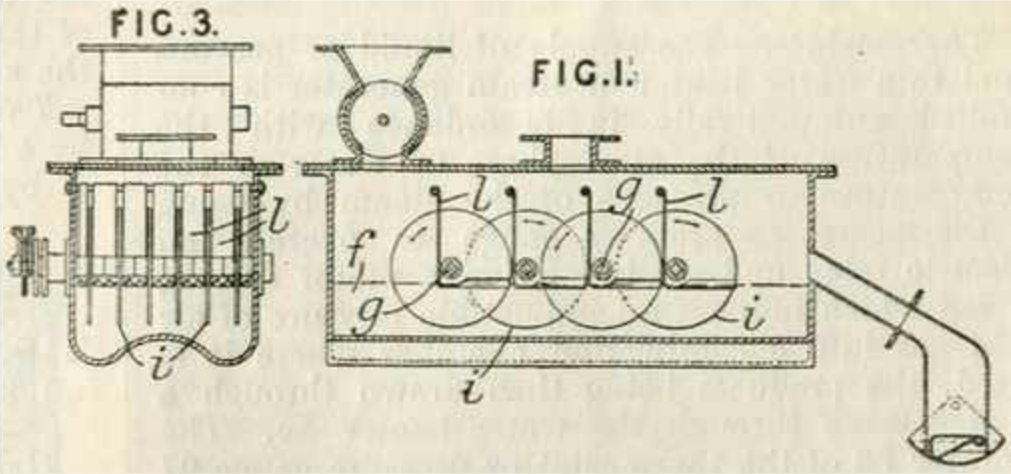
scribed above, but on subsequent contraction the upper spring 5^a is compressed by downward movement of the rod 18 until the upper latch 19 is engaged by adjustable nuts 15, 15^a on a rod 16 attached to the lever 3. Specification 6783/05, [*Class* 38, Electricity, Regulating &c.], is referred to.

218,807. Thermal, Industrial, & Chemical (T.I.C.) Research Co., Ltd., and **Rider, D.** June 4, 1923. *Addition to* 174,974.

Special heat-transmitting media.—Apparatus for use in the process according to the parent Specification is constructed with two or more parallel shafts *g* each carrying thin discs *i*, the discs on one shaft extending between the discs on the other shaft. Transverse partitions *l* between the discs on a shaft prevent material from travelling over the surface *f* of the molten metal without immersion. Scrapers, which may be carried by the partitions, are arranged more or less radially to each disc below the the surface of the molten metal to remove material adhering to a disc and to feed it on to a disc on the next shaft. The apparatus shown is adapted for destructive distillation of subdivided solid materials.

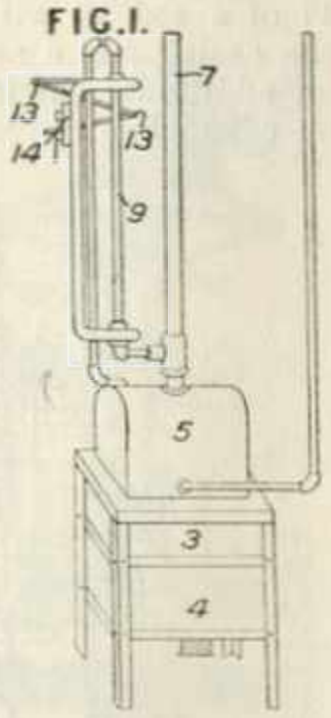
FIG. 3.

FIG. 1.



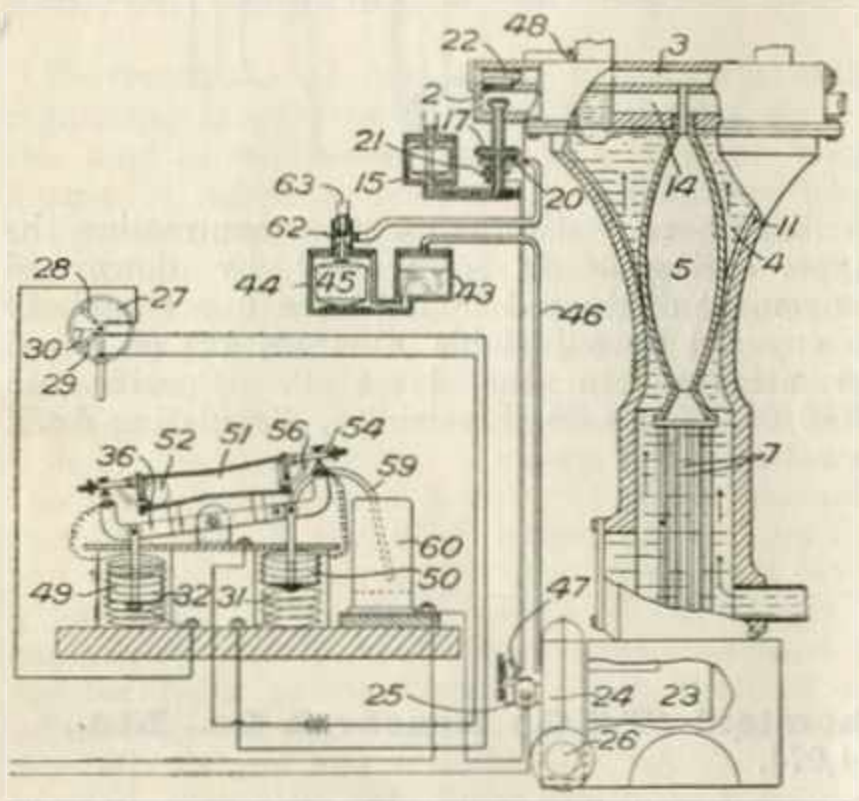
218,867. Lombardi, L. Aug. 14, 1923.

FIG. 1.



Thermostats.—In a hot-water heating installation in which the boiler 5 is heated by an electric arc the main circuit is adapted to be opened or closed as the boiler temperature rises above or falls below the desired valve by means of a switch 14 which is controlled by a thermostatic expanding tube 9 connected with the flow pipe 7 and associated with a system of operating levers 13.

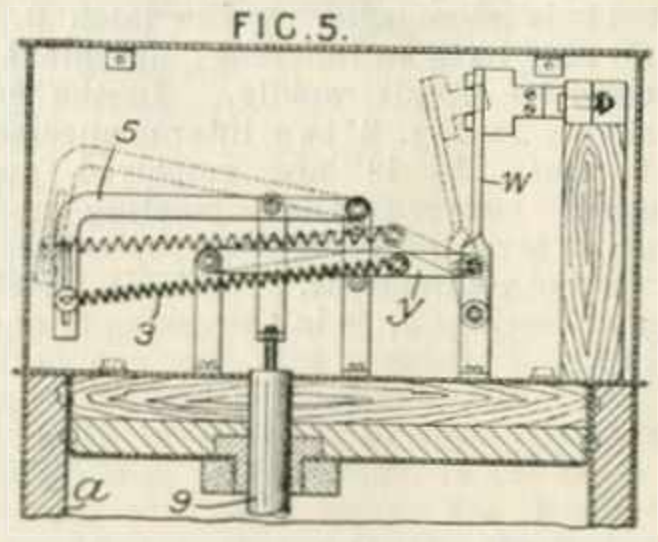
219,067. Pattison, C. M. April 12, 1923.



Thermostats.—The supply of liquid or gaseous fuel to a water heater or steam generator is controlled automatically in accordance with the temperature of the atmosphere or water or the temperature or pressure of the steam by using a thermostat or pressure gauge to operate an electric relay and set in motion a motor driving a fan which induces a combustible mixture of air and gas into a combustion chamber where it is fired, the products being then drawn through a flue passing through the water heater &c. The pointer 30 of the thermostat or pressure gauge 27 is adapted to make contact with one or other of the adjusting arms 28, 29 and complete an electric circuit including one or other of the solenoids 31, 32 having cores 49, 50 mounted on a rocker arm 36. Upon a fall of temperature or pressure the solenoid 31 is energized to operate the core 50 and rocker arm so as to cause the fork 59 to dip into mercury pots 60 and complete the main circuit of the motor 25 operating the fan 24. The movement of the rocker arm 36 also causes a ball 52 to pass to the opposite end of the tube 51 and engage with the arm 56 to break the electric contact 54 in the solenoid circuit. The suction side of the fan 24 is connected by a pipe 46 to a chamber 43 containing a liquid and connected to a chamber 44 containing a float 45 adapted to rise and fall with the liquid in the chamber and operate a gas supply valve 62. Suction produced by the fan causes gas to pass from the pipe 63 to a burner 20 where it is ignited by a sparking-plug 21 connected to a magneto 47 driven from the motor 25. The burner 20 vaporizes the liquid fuel in the chamber 17, supplied from the chamber 15 and pipe 1, and the vaporized fuel passes into the air conduit 14 and is drawn with air through the gauge 2 to a nozzle 22 where it is ignited by a sparking-plug 48 and burns in the combustion chamber 3. The combustion products are drawn by the fan 24 through the elliptical flue 5, provided with fins 11, adapted to radiate heat to the water in the boiler 4, and thence through flues 7, 23 to the fan oulet 26. In an alternative arrangement the gas may be supplied direct to the combustion chamber instead of to the burner 20.

219,496. Bohle, H. July 28, 1923.

FIG. 5.



Solar heat, utilizing.—In an electric hot water system the water supply to the storage tank is led through a grid of pipes situated in the roof of the building and painted dead black to absorb the sun's rays.

Thermostats.—The current supply is controlled by a thermostat 9 connected to the heater switch *w* by links 5, *y* and springs 3, as shown.

219,688. Tcherniakofsky, I. July 28, 1923, [*Convention date*].

Heating buildings.—The circulation of water in a hot-water heating system is accelerated by the insertion in the flow-pipe 2 connecting the boiler 1 and expansion chamber 3 of a multitubular heat-exchanger 4 which is adapted to be cooled by water returning to the boiler from the radiators 6 through the pipe 7. A portion of the return water passes direct to the boiler through a throttle-valve 11, while the remainder passes

through the heat-exchanger 4 by pipes 8, 9, the relative quantities being determined by the position of the valve 11 which is controlled by a pressure actuated regulator 13 of the type described in Specification 213,572, connected between the flow and return pipes and co-operating with a counterweighted lever 16 and a chain 17

FIG.1.

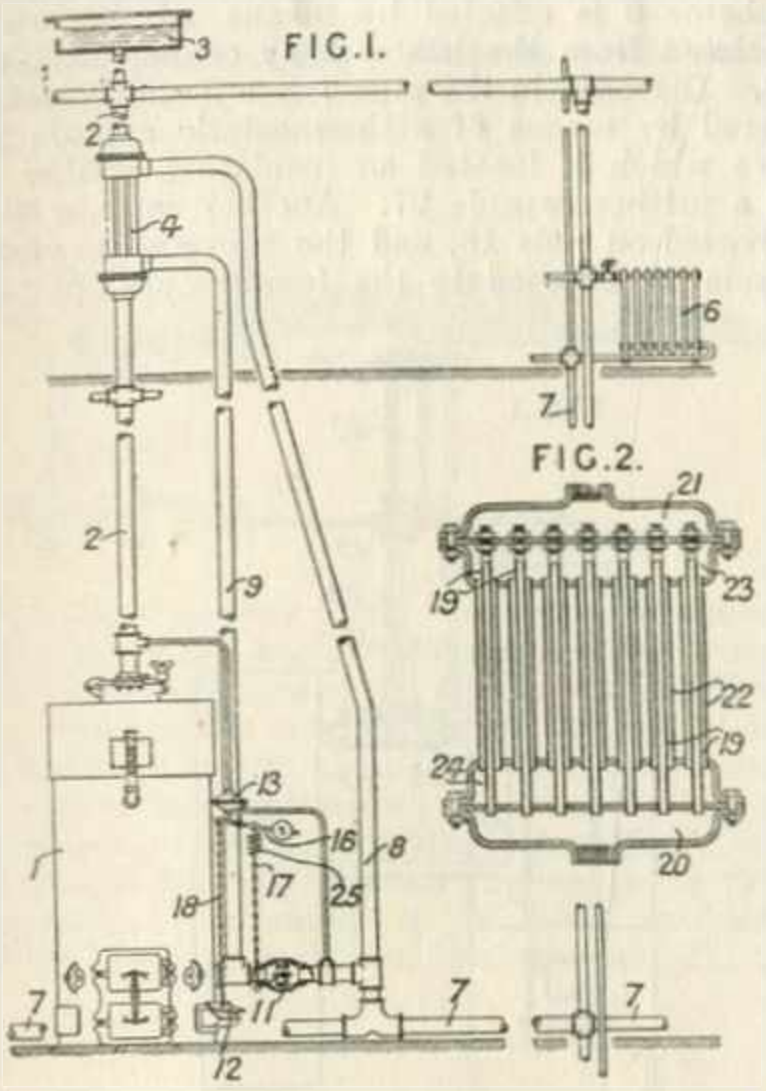


FIG.2.

having an elastic portion 25. By means of a second chain 18 the regulator 13 and lever 16 also control an air-admission valve 12 for the boiler furnace. The heat-exchanger 4 comprises an inner series of tubes 19, Fig. 2, communicating between chambers 20, 21, which are connected respectively to the boiler 1 and expansion chamber 3, and a surrounding series of tubes 22 communicating between chambers 23, 24, to which the pipes 8, 9 are connected.

219,812. Gillet, C., (*Diederich, A.*). July 18, 1923.

FIG.3.

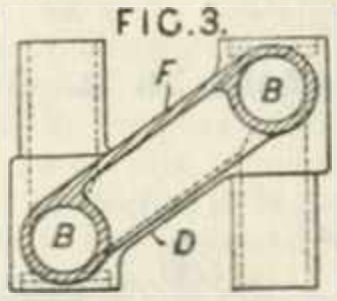
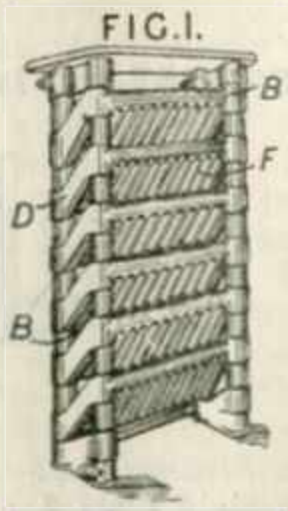


FIG.1.



Radiators.—A steam or hot-water radiator comprises a tubular structure having two or more rows of longitudinal tubes B arranged one in front of the other at different levels and connected by transverse tubes number of inclined plates F, the undersides of which are ribbed, being provided between the tubes to form a series of inclined chambers. The apparatus may be built up of a number of castings constructed as in Fig. 3 and secured together by long vertical bolts. The front tubes B may be bow-shaped and the front and back tubes may be connected by one or more inclined intermediate tubes.

219,882. Cheeseman, A. R. Jan. 24, 1924.

FIG.2.

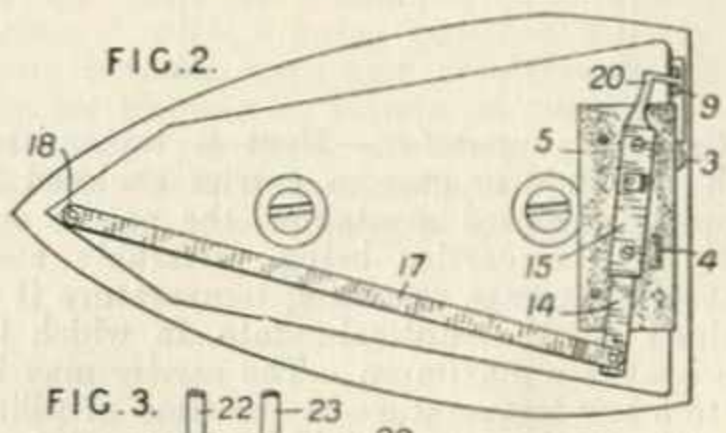


FIG.3.

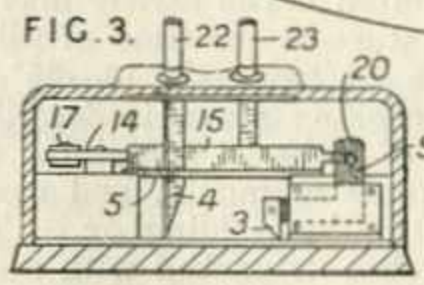
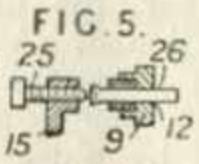
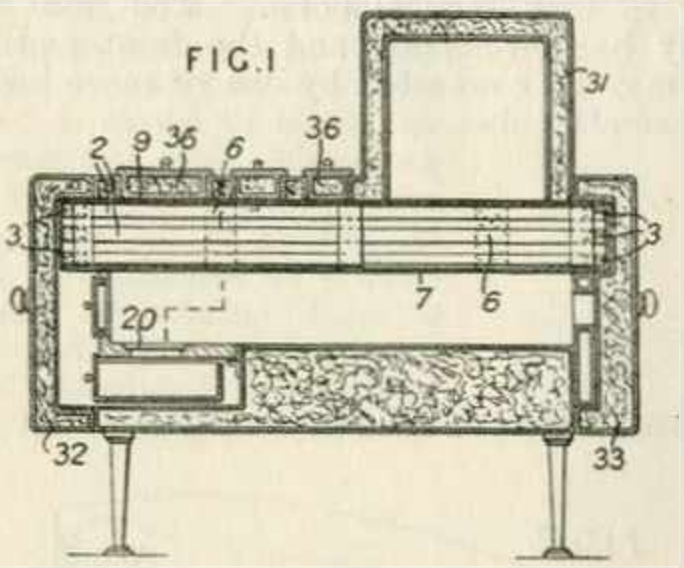


FIG.5.



Thermostats.—Relates to electric irons of the type in which the temperature is automatically regulated by a switch which makes and breaks the circuit including the heating-elements and is controlled by an element having a greater coefficient of expansion than the body of the iron. According to the invention the operating elements of the switch comprise a divided lever formed of two parts 14, 15 insulated from each other and mounted on an insulating base 5, one of the terminal pins 23 of the iron being connected to the part 15, an expansible bar 17 of brass or like material pivoted at 18 to the body of the iron and connected to the part 14 of the lever 14, 15, and terminals 3, 4 for the heating-elements, of which one, 4, is connected directly to the terminal pin 22 while the other, 3, is connected to the member 15 through the intermediary of the make and break device which consists of a finger 20 on the member 15 having a sliding contact with a plate 9 connected to the terminal 3 and mounted on but insulated from the body of the iron. A modification of the make and break device which permits a variation of the working-temperature is shown in Fig. 5, in which the member 15 carried an adjustable screw 25 having a flexible connection with a pin 26 sliding in an opening 12 in the plate 9.

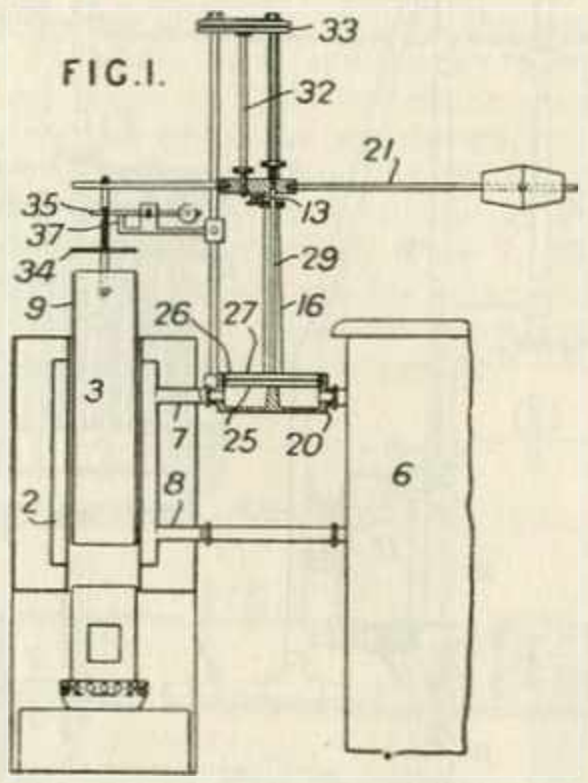
226,306. Soc. Anon. des Anciens Etablissements Skoda a Plzen, (Assignees of *Pais, A., and Claps, N. Constantinescu-*). Aug. 7, 1923, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].



Heat-storing apparatus.—Heat is transmitted through a liquid or gaseous carrier enclosed in a completely closed container, the nature and quantity of the carrier being preferably such that at the average operating temperature it is maintained in the critical state, in which its specific heat is a maximum. The carrier may be cooled to a low temperature at the time of filling the container, the use of ammonia at -35° C. being mentioned. A cooking stove is described comprising a series of tubes 2 containing the heat-carrier, for example ammonia, and closed at the end by plugs 3 or by welding &c. The space between the tubes is packed with metal powder 6, and the whole is contained in a casing of which the bottom 7 is heated from a fire-place 20 and the top 9 forms a hot plate. The stove is contained in a lagged casing of which the ends 32, 33 are removed whilst the fire is alight, during which period heat is stored in the heat-carrier. The ends are then replaced and the stored heat used as required by removing the lagged hot-plate covers 36, or in the baking or boiling chamber 31. Cooling-apparatus may employ a similar heat-carrier between the points of withdrawal and absorption of heat, a carrier being used of which the critical temperature is from zero to -10° C.

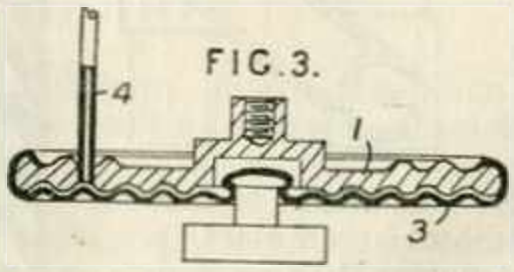
220,340. Barber, S. H. Feb. 21, 1923.

Thermostats.—In an arrangement for controlling the temperature of incubators or similar chambers heated by means of circulating hot water or air of the kind employing a heater 2 traversed by vertical flue 3 below which a lamp or other heating means is disposed, an open-ended auxiliary flue 9 depends into and is spaced apart from the wall of the flue 3 and is movable under the action of a thermostat towards or away from a damper 34 located above the upper end of the auxiliary flue. The position of the auxiliary flue may be regulated either by a single thermostat influenced by the temperature in the incubator or by the temperature of the heating-fluid, or partly by one of these methods and partly by the temperature of the external atmosphere. Similarly, the damper 34 may be fixed, or it may be movable and its movements thermostatically controlled by any of the methods referred to in connection with the auxiliary flue. In the construction shown the heating of the incubator 6 is effected by means of hot-water circulated from the heater 2 by connecting-pipes 7, 8. Disposed in the pipe 7 is a metal vessel 20 covered by means of a thermostatic capsule 25, above which is located an insulating washer 26 and a further capsule 27. Another capsule 33 is supported on rods 16, and the movements of the capsule 25 exposed to the temperature of the



heating-fluid, and of the capsules 27, 33 exposed to the atmospheric temperature are communicated by means of rods 29, 32 to a counter-balanced lever 21 pivoted at 13 and carrying the auxiliary flue 9. The damper 34 as shown is not thermostatically controlled, but is carried by a pivoted arm 35 which normally abuts against a stop 37, but is permitted an upward movement when the auxiliary flue 9 engages its under surface. The auxiliary flue is preferably made of a non-conducting material, such as fire-clay or asbestos, or of two concentric metal tubes having between them an annular space packed with asbestos or slag-wool.

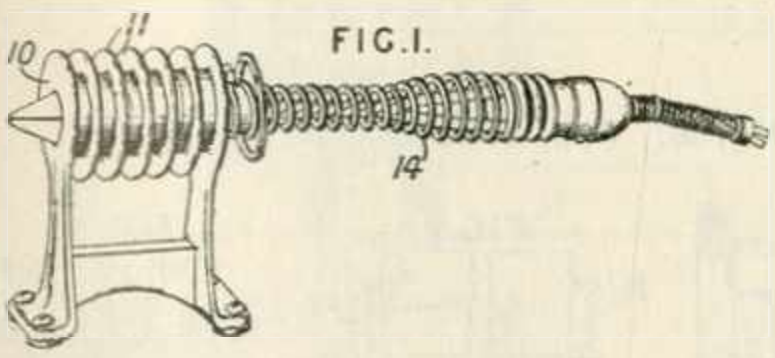
220,557. Wingfield, B. R. Feb. 6, 1924.



Steam-traps.—A capsule for a steam-trap has a rigid plate 1 corrugated on the inside in order that the diaphragm 3 may be corrugated after

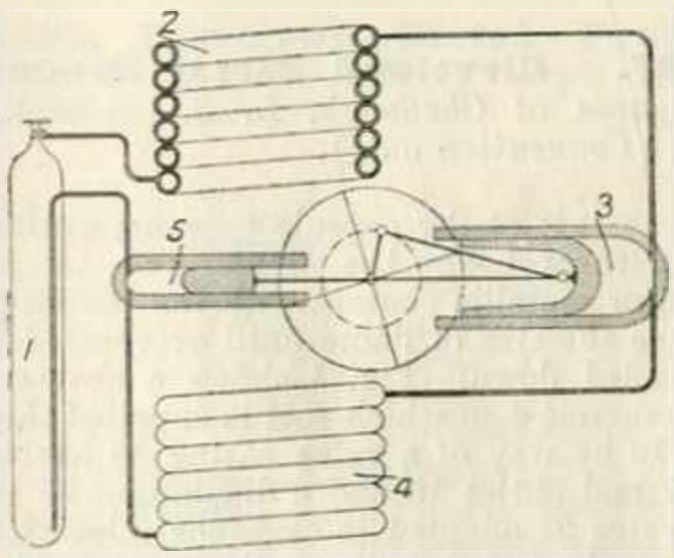
being brazed or welded to the plate 1. The end of the filling tube 4 is closed by brazing or welding whilst the capsule is under water and is then embedded in a groove in the plate 1. Specification 180,124 is referred to.

220,654. British Thomson-Houston Co., Ltd., (Assignees of *Abbott, C. C.*). Aug. 16, 1923, [*Convention date*].



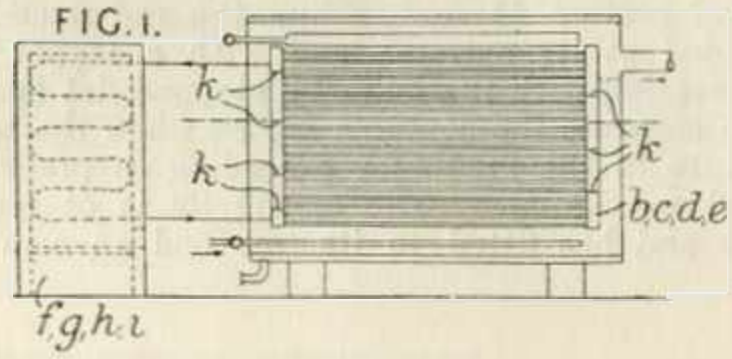
Heating systems and apparatus.—Soldering irons, flat irons, curling irons and other tools or like devices self heated by gas &c. are supported, when temporarily out of use, on a stand of heat conducting material having heat-dissipating vanes for preventing overheating of the device and maintaining it at its working temperature without control devices. A soldering iron 14 is shown supported in a stand 10 of heat conducting material such as cast iron, having vanes 11.

221,203. Gailhat, J. Aug. 28, 1923, [*Convention date*].



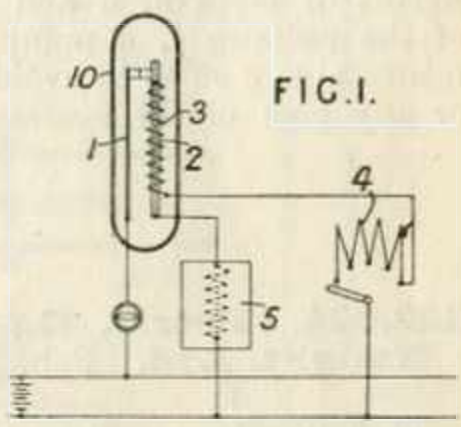
Solar and natural heat, utilizing.—In an apparatus for utiliizng solar heat or the waste heat from furnaces &c. a liquefied gas such as carbon dioxide is evaporated in a heater 1 at a temperature above the critical temperature of the gas, then heated to a higher temperature in a superheater 2 and allowed to expand in an engine 3, the exhaust passing to a condenser 4 which is maintained at a temperature slightly below the critical temperature of the gas and the liquefied gas being returned to the heater 1 with adiabatic compression by an injector 5 preferably worked by the engine 3. If the temperature in the heater 1 is sufficiently high, the superheater 2 may be dispensed with.

221,223. Fuchs, K. Aug. 28, 1923, [*Convention date*]. *No Patent granted (Sealing fee not paid).*



Heating by circulation of fluids.—A steam-heating system for petroleum distillation comprises a number of heating elements *b*, *c*, *d*, *e*, through which the steam passes, in series, superheaters *f*, *g*, *h*, *i* being provided to re-heat the steam between each pair of elements. To provide for changes in volume of the steam due to expansion, partitions *k* are provided in the headers, whereby the number of tubes comprising a group or element may be determined.

221,480. Aktiebolaget Birka Regulator. Sept. 8, 1923, [*Convention date*].



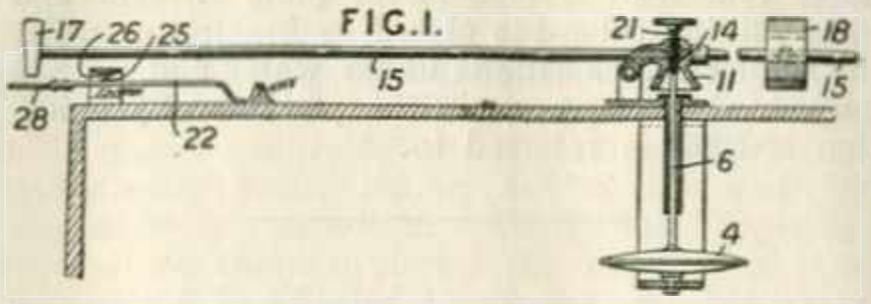
Thermostats.—The amount of energy supplied to an electric heater 5 is regulated by putting the heater in series with a thermal interrupter 1, 2, the heating winding 3 of which is placed together with a variable resistance 4 in a parallel circuit. When the winding 3 heats up, the strip 2 will bend to break both circuits. The frequency of the interrupter and the relative duration of the " open " and " closed " periods will depend on the amount of the resistance 4. The interrupter may be placed in a receptacle 10 which is evacuated or filled with an inert gas, but in the latter case the receptacle is preferably one with double walls separated by an evacuated space. The receptacle 10 together with the regulating switch 4 may be mounted in a wall plug or the like. A condenser may be arranged across the contacts 1, 2 to prevent sparking.

221,748. Johnson, A. March 25, 1924.

Thermostats.—Relates to thermostats for electrically heated incubators or like apparatus of the type in which a capsule 4 carries a rod 6 bearing against an adjustable screw 21 mounted in a counterbalnced lever 15 pivoted on the top of the

incubator &c., one end of the lever carrying an adjustable weight 18, while the other end actuates the switch controlling the heating circuit. According to the invention, the lever 15 is adjustably secured in a member 14 formed with a conical portion 11 for guiding the rod 6 and is provided at its extreme end with a tappet 17 co-operating with the end of a stepped flat spring 22 to separate the contacts 25, 26 when the temperature in the incubator exceeding a predetermined maximum. The spring 22 is of nickel silver and has fitted to its free end an arm 28 of insulating material against which the tappet 17 is adapted to bear.

FIG. 1.



221,864. Motor Experts, Ltd., and **Mills, S.** June 19, 1923.

FIG. 1.

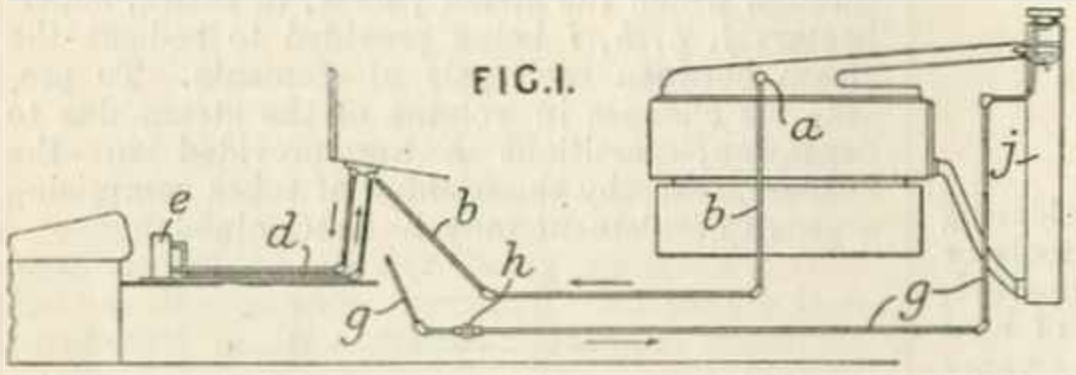


FIG. 8.

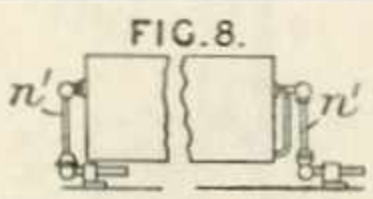
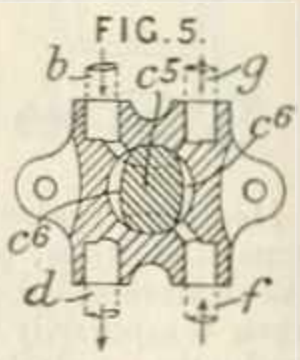


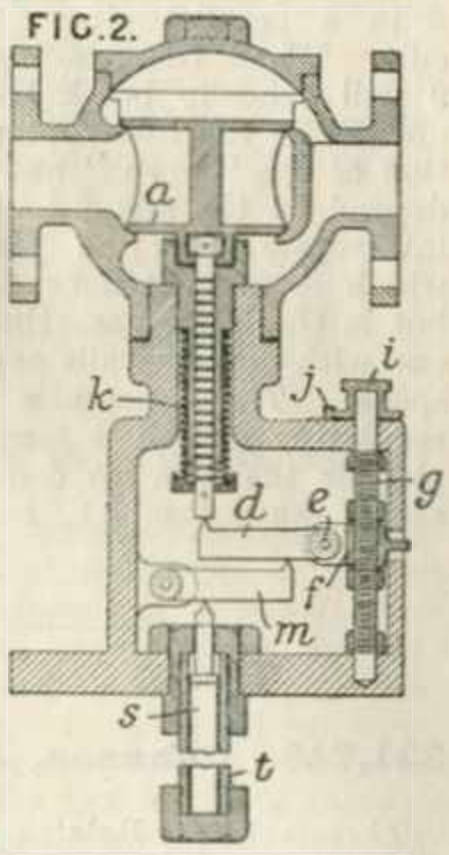
FIG. 5.



Heating.—In apparatus for motor vehicles, aeroplanes and airships, in which water is led from the cylinder jackets or outlet *a*, Fig. 1, to to a heater *e* in the interior of the vehicle by means of pipes *b*, *d* and is returned to the top of the radiator *j*, a pump *h* is arranged on the return pipe *g* so as to avoid pressure in the heater or any part of the system. The heater may be connected to the supply and return pipes by ball jointed connections n^1, Fig. 8, so that it may be placed vertically or may lie on the floor. The plug c^6, Fig. 5, in the distribution and central cock is formed with two grooves c^6. One groove connects the two pipes *b* and *d* for the heated water supply and the other groove connects the return pipes *f*, *g*.

222,024. Petrie, G., and **Petrie & McNaught, Ltd.** Feb. 1, 1924.

FIG. 2.



Thermostats. — Relates to thermostats for regulating the temperature in steam, hot-water and like heating systems of the kind in which the control valve *a* is regulated by the differential expansion of elements *s*, *t* exposed to the fluid being heated. According to the invention, the elements *s*, *t* operate in combination with a compound system of levers *m*, *d*, of which one lever *d* is mounted on an adjustable pivot *e*, and with a spring *k*, which normally tends to keep the valve *a* in the closed position. The pivot *e* is arranged on an adjustable nut *f* engaged by a rotatable screw *g* having a finger knob *i* co-operating with an index or pointer *j*.

222,497. Cleveland Metal Products, (Assignees of *Chadwick, L. S.*). Sept. 26, 1923, [*Convention date*].

Thermostats of the capsule type are positioned in oil burners below the flame and in juxtaposition or metallic contact with the burner parts to reduce the size of flame until overheated parts have cooled down. Fig. 1 shows a burner having a reservoir 4 to which fuel is supplied through a pipe 19 by way of a valve casing 15 having an inlet 17 and outlet 16 and a diaphragm 25 carrying a valve 21 adapted to close the inlet 17 upon the expansion of a bellows thermostat 28 containing a readily expansible fluid, and situated within the inner wick tube 1. An adjustable connection 29, 30 between the upper end of the thermostat and a yoke rising from the valve casing enables the valve to close at different temperatures; in one adjustment the flame is extinguished. In a modification the valve is adjusted by turning the thermostat casing, the neck of which is threaded into an elbow fitting secured to one side of the outer wick tube. In the form shown in Fig. 6, a horizontally disposed thermostat 50 is situated within the burner, one end being secured to a reinforcing plate 51 and the other adjustably connected through reversely threaded stems 52, 53, and a sleeve 54 to a flat

portion 55 of the inner wick tube, which constitutes a valve co-operating with the inner end

FIG. 1.

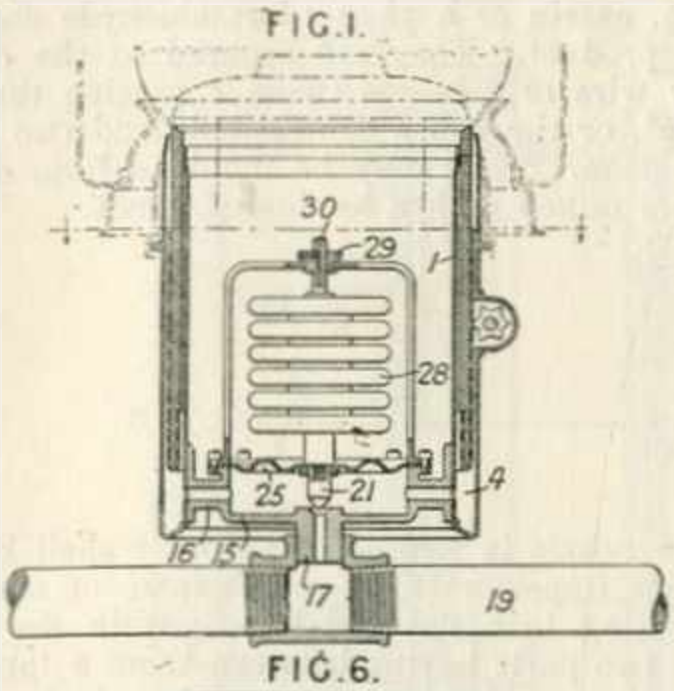
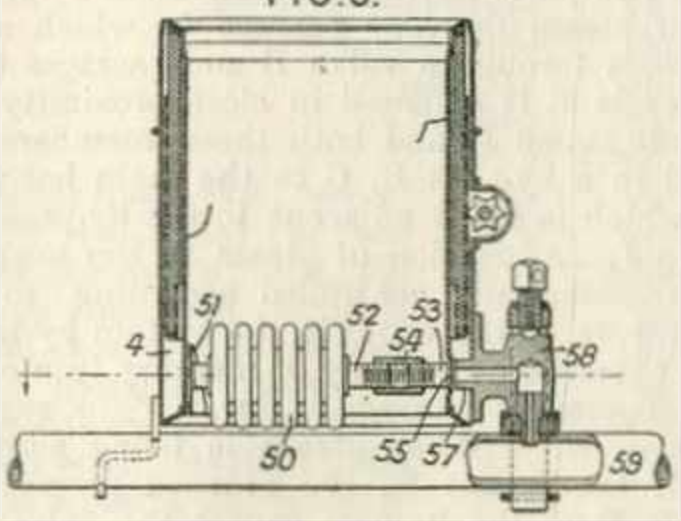


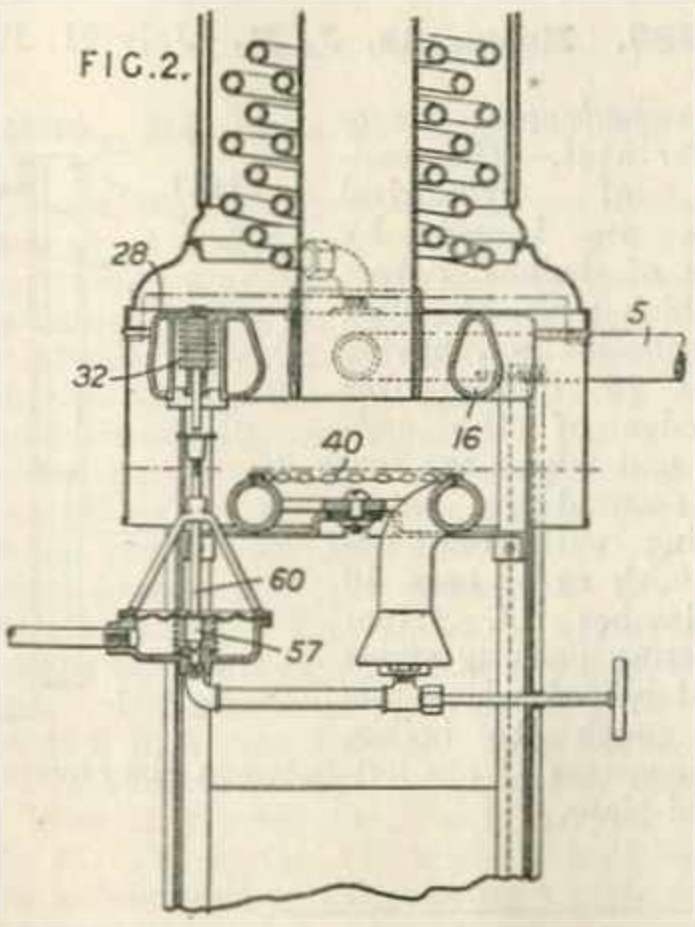
FIG. 6.



of a tubular extension 57 of an elbow fitting 58 leading to the fuel supply pipe 59.

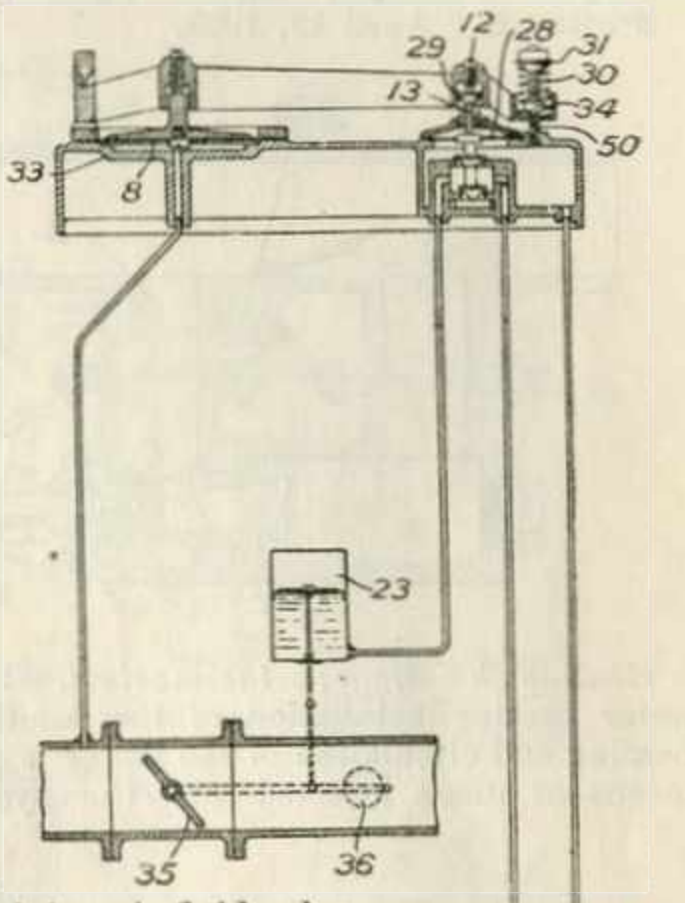
222,498. Cleveland Metal Products, (Assignees of *Resek, M.*). Sept. 26, 1923, [*Convention date*].

FIG. 2.



Thermostats.—A thermostatic capsule 32 is housed in an extension 28 of the lower part 16 of a tubulous water heater so as to operate to cut off the heating medium as soon as the whole of the water in a connected storage tank is at the required temperature as evidenced by hot water being supplied through the connection 5 from the bottom of the tank. The consequent expansion of the capsule 32 is transmitted by a rod 60 to a valve 57 controlling the supply of gas, in the example shown, to burner 40.

222,573. Sjöö, A. M. July 4, 1923.

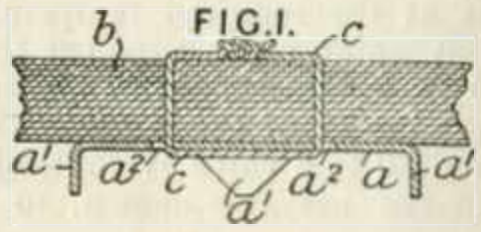


Thermostats.—A fluid relay adapted for controlling the temperature in drying chambers &c., is provided with a balanced control valve supported by the diaphragm. The control valve is interposed in the pipe line which conveys actuating pressure to the main actuating chamber and controls the exhaust from this conduit while the pressure supply is limited by a restricted orifice. The Figure shows the invention applied to a device for regulating gas pressure. The main valve 35 is closed against the action of a weighted arm 36 by liquid supplied by a centrifugal pump 19 under the control of an auxiliary valve, acting on a piston 23. The double beat auxiliary valve is actuated by a diaphragm 8 subject to conduit pressure and acting through a lever. The lever has a knife edge pivot at one end and is adjustably loaded at the other by a spring 30 bearing against an abutment 31 adjustably mounted on a pillar 50. The auxiliary valve is supported by a diaphragm 28 and has a spindle 13 held by a spring 29 against an adjustable tappet 12 on the lever. The stroke of the diaphragm is limited by a shoulder 33 in the diaphragm chamber and a stop 34 adjustably mounted on the pillar 50. The main valve may be arranged to open when the conduit pressure rises.

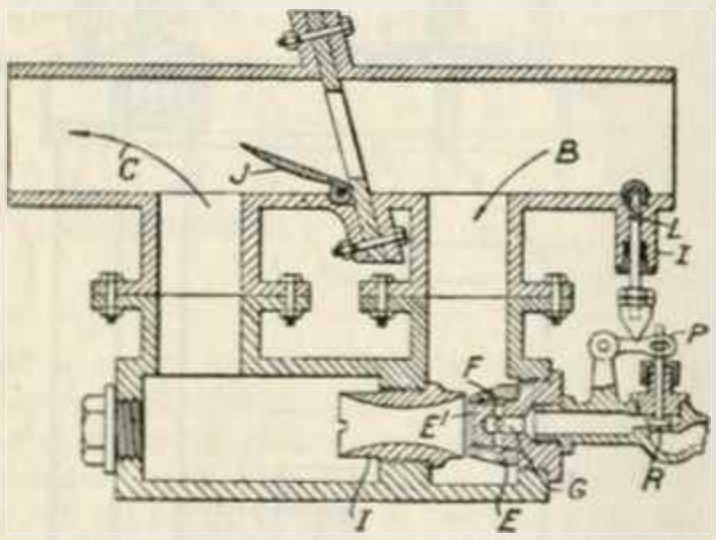
222,710. **Bell's United Asbestos Co., Ltd.**, and **Barratt, S. H. H.** Dec. 10, 1923.

Non-conducting coverings for heat.—Distance-pieces for maintaining an air space between a heat insulating covering *b* and the surface to be protected comprise rectangular sheets *a* of asbestos millboard with turned-down corners a^1 saturated with a hardening agent such as sodium silicate, casein or a phenol-formaldehyde condensation product. They are secured to the covering by wire or asbestos twine *c* passing through holes a^2, or through a central hole and two holes in a button. They may be moulded from asbestos fibre mixed with a hardening agent.

FIG. 1.



222,899. Pope, A., Vaughan, E, and **Pope, A.** April 12, 1923.



Heating buildings; thermostats.—In a hot-water heating-installation of the kind in which heating and circulation of the water is effected by means of steam injected into the system, the injector nozzle is formed of an outer shell E and an inner imperforate or solid centre or core E^1 terminating in a flat end lying within the shell E, the two parts having between them a tapering annular steam delivery passage to which steam has access through a valve R and passages G, F. The nozzle E is disposed in close proximity to a combining-cone I, and both these members are located in a by-pass B, C to the main hot-water pipe, which is fitted adjacent to the by-pass with a valve J. Admission of steam to the nozzle E is thermostatically controlled according to the temperature of the water in the system by means of the expansion of a body of mercury in a chamber L operating through a lever P to regulate the valve R. When steam is being admitted through the nozzle E, the reduced pressure on the side B of the by-pass causes the valve J to close and the circulating water passes wholly through the by-pass; when the temperature reaches a certain maximum, the supply of steam is cut off and the valve J opens.

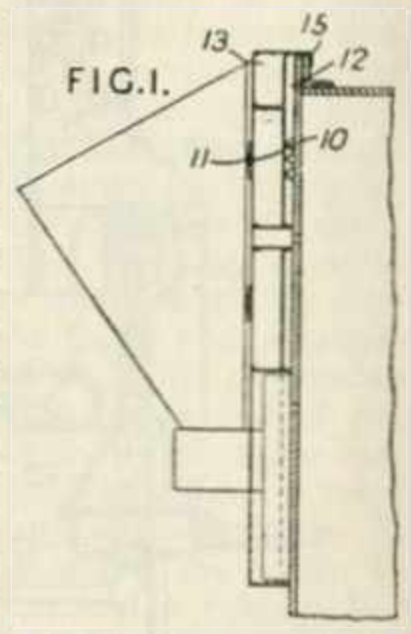
222,965. Delany, J. H. July 12, 1923.

Non-conducting coverings for heat.—A process of manufacture of heat-insulating articles comprising single or double walls such as containers for food, hollow bricks or tiles for walls &c. of buildings consists in introducing into the interior of a mass of molten glass a vapour or gas at a pressure equal to or greater than atmospheric which is easily condensed at a temperature lower than that at which the glass ceases to be ductile, withdrawing the blow-pipe and sealing or welding the aperture while the glass is still plastic. Instead of a vapour or gas a material capable of producing a vapour may be employed. It is stated that a vacuum has been produced by the volatilization and subsequent condensation of a piece of cast zinc. To create a vacuum in articles made from grades of glass which become brittle at very high temperatures, steam may be used.

222,989. Edwards, J. R. July 21, 1923.

Non-conducting coverings for heat.—The end-plates of cylindrical boilers are lagged by means of hollow covers 13, which may be filled with asbestos &c., having flanges 15 fitting over the edge of the end-plate, and which are further secured by inter-engaging with one another such as by bars 10 and latches 11. Non-conducting packing strips are interposed where the covers touch the boiler, and air spaces 12 are left between the covers and the end-plate.

FIG. 1.



223,223. Hanton, P. S., and **Dick, J.** Oct. 8, 1923, [*Convention date*].

FIG. 1.

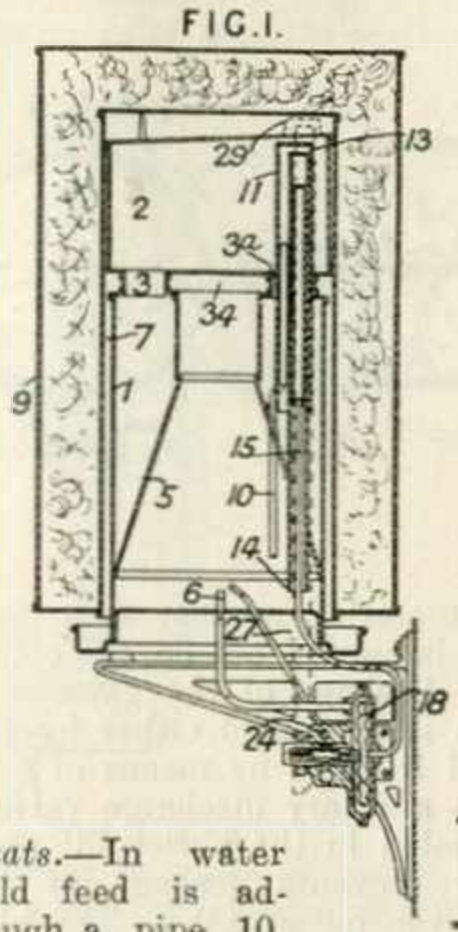
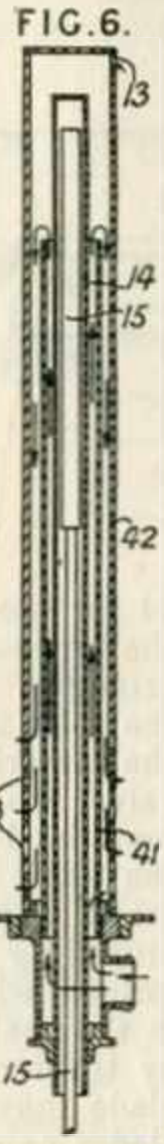


FIG. 6.



Thermostats.—In water heaters, cold feed is admitted through a pipe 10, through the wall 5 of a central coned flue to an open bottomed tube 11 which has an aperture 13 at its top end. Within this tube is a casing 14, containing the enlargement of a tube 15 filled with expansible fluid and connected to a capsule 18 controlling a spring-pressed valve 24 of the gas supply to the burner 6. Modified arrangements of the parts 10, 11, 14 are described in which the cold feed is directed on to the top of the tube 14, the tube 11 is made oval in shape or, as shown in Fig. 6, the feed is admitted through a pipe 41 surrounding the tube 14 into an outer casing 42 with apertures 13, 43.

223,284. Roucka, E. July 11, 1923.

Thermostats.—In apparatus for indicating or measuring at a distance physical or chemical values having a system sensitive to the value to be measured and a second system sensitive to automatically regulated electrical energy and tending to balance the first system, both systems acting mechanically on a movable part which is depressed periodically by auxiliary power to affect the controller of a servomotor, a deflection of the movable part when the balance is disturbed causes a proportional movement of the servomotor controller. Fig. 1 shows apparatus for indicating and recording the flow of liquid through a pipe. Differences of pressure on each side of a nozzle 2 in a pipe 1 arising from variations of fluid flow affect a diaphragm 6 which is connected to a lever 15 pivoted at 16 and carrying a flat spring 17. The spring 17 carries a knife-edge 18 which is depressed periodically by a plate 45, Fig. 2, operated through a plunger 46 by auxiliary power. When the pressure difference in the diaphragm chamber 5 varies, the knife-edge 18 moves over one or other of the levers 19, 20 which are connected through arms 24, 23 to the controlling piston 27 of a servomotor 29. One of the levers 19, 20 is thus depressed by the action of the plate 45 depending upon the position of the knife-edge 18 and the piston 27 is moved to a position corresponding to the deflection of the knife-edge 18 to allow the working medium to enter the servomotor 29 and regulate the resistance 33, 34, through the medium of the piston 30. The resulting variation in current from the battery 35 causes the moving coil 8 of an electrodynamic device 9, 10 to restore the knife-edge 18 to its neutral position and in consequence to restore the controlling piston 27 and cut off the working medium from the servomotor. The regulation of the resistance 33, 34 also produces an indication and record of the variation to be measured on the instruments 36, 37 respectively. A resistance 61 bridged across the resistance 33, 34, is provided in order that consideration may be taken of the pressure in the pipe 1 in measuring the flow of fluid. The resistance 61 is varied according to the pressure in the pipe 4 by a piston 57. Alternatively, the resistance 61 may be varied by a thermometer, in which case the indications take into consideration the variations of temperature. In order to prevent over-regulation a dash-pot 38, 39 is connected between the knife edge and the servomotor. A weak spring 11a is introduced between the movable coil 8 and the diaphragm 6 so that only a part of the power developed by the electrodynamic device is transmitted to the diaphragm. In consequence of this very fine variations of physical or chemical values may be measured by means of a large electrical energy. Specification 222,950, [*Class* 69 (ii), Hydraulic presses &c.], is referred to.

FIG. 1.

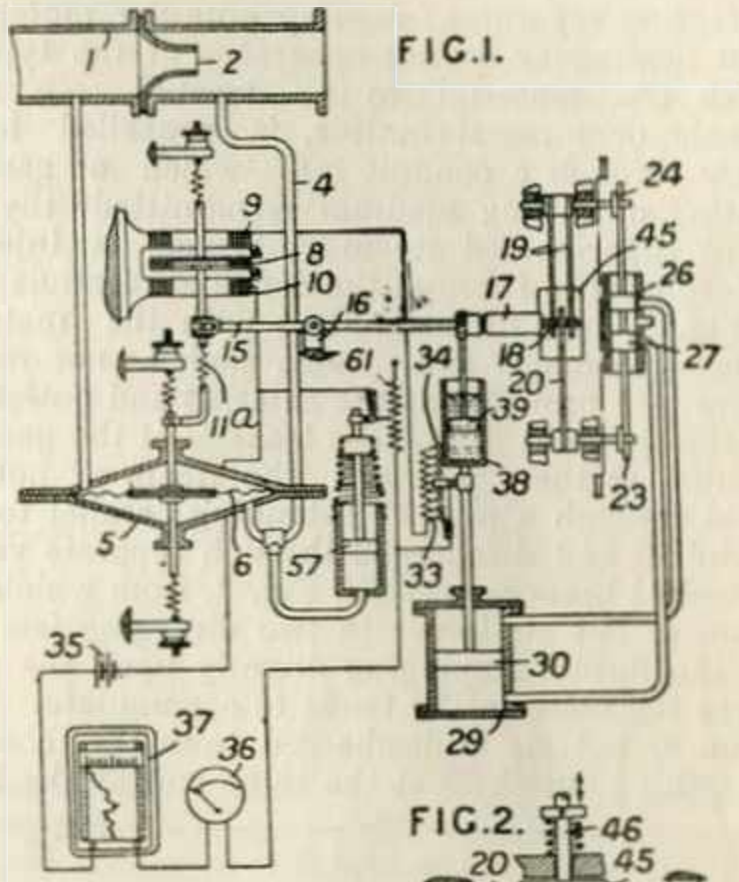
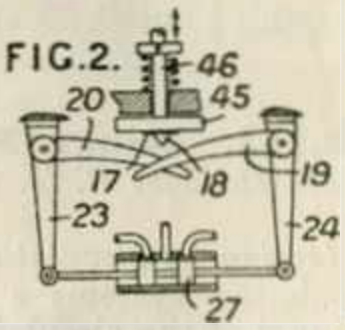
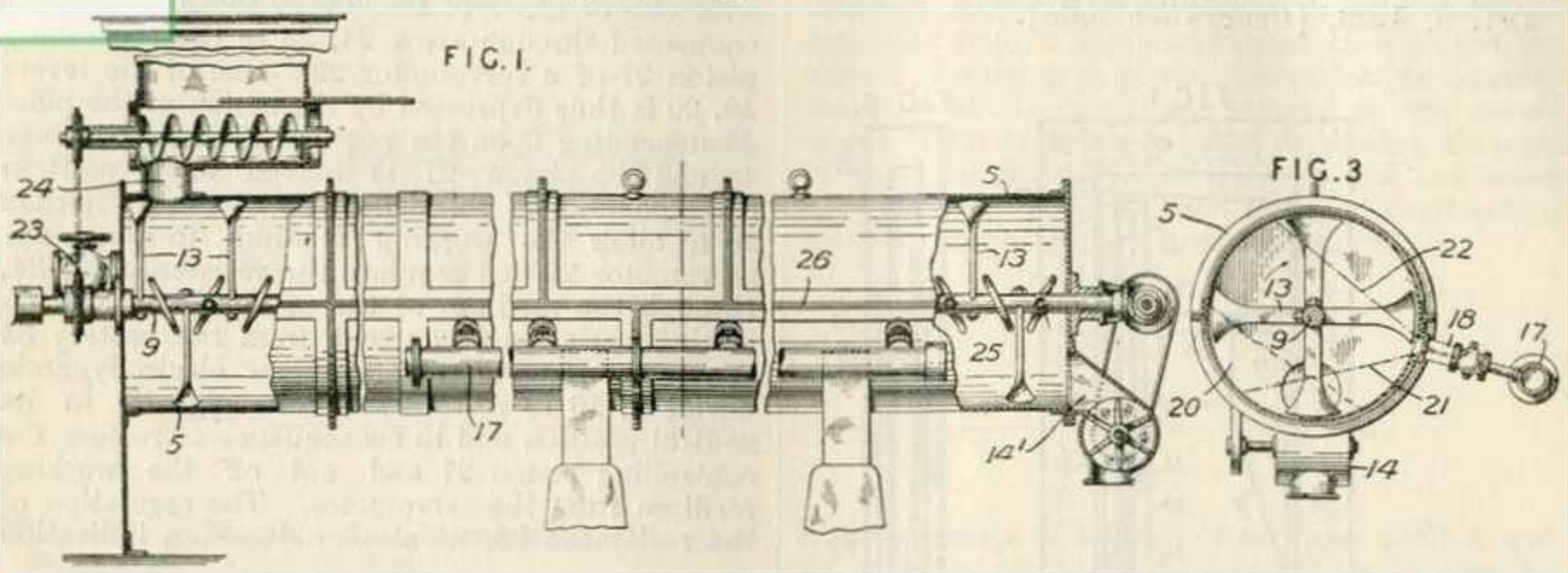


FIG. 2.



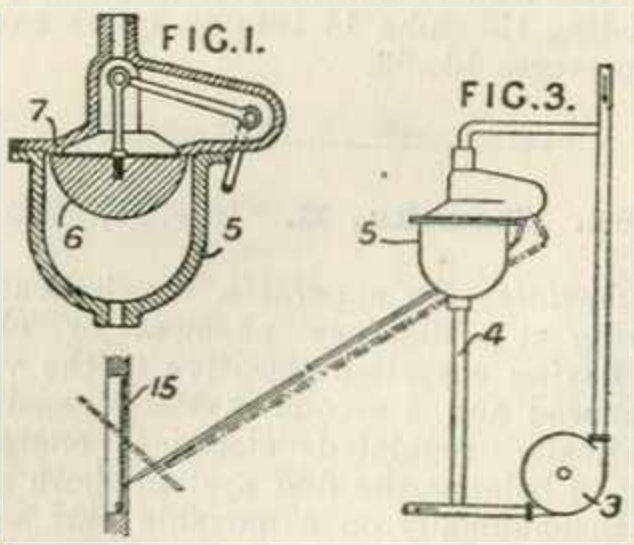
223,296. Sterling, Sir J. July 17, 1923.



Heating-apparatus; heating granular materials. —In heating or drying apparatus of the type in which the material to be treated, e.g. wet organic or mineral matter, is propelled by a screw through a conduit into which a gaseous heating or drying medium is admitted, the hot air or super-heated steam employed is injected under pressure through the conveyer conduit wall 5, Fig. 1, into direct contact with the material under treatment, and means, such as non-return valves, are provided at the inlet 24 and outlet 14¹ for the material to prevent leakage of the gaseous medium at these points. The steam or hot air is led through a pipe 17 extending parallel to the conduit 5 and discharged through separate valve-controlled branch-pipes 18, Fig. 3, from which the steam or hot air issues in two diverging jets 21, 22, the former impinging directly upon the area where the material 20 tends to accumulate. The steam or hot air is discharged from the conduit through an outlet 23 at the same end as the inlet 24 for the material, so that to a limited extent the process is carried out on the counter-current principle. Leakage of the gaseous medium at the inlet 24 is prevented either by the bulk of the material itself or by means of a hinged flap-valve, while a rotary discharge valve 14 for the material located in the outlet 14¹ and geared to the shaft 9 prevents leakage of the gaseous medium at the outlet 14¹. The blades 13 for propelling the material through the conduit are formed with stems adapted to engage apertures in the shaft 9 and to be secured by nuts so that, by turning the stem, the rake or pitch of the blade may be varied, while one or more of the blades as shown at 25 may be reversed so as to increase the time during which the material is subjected to the heating medium. In order to facilitate access to the shaft and blades, the conduit is split longitudinally at 26, both the upper and lower halves being built up of detachable sections.

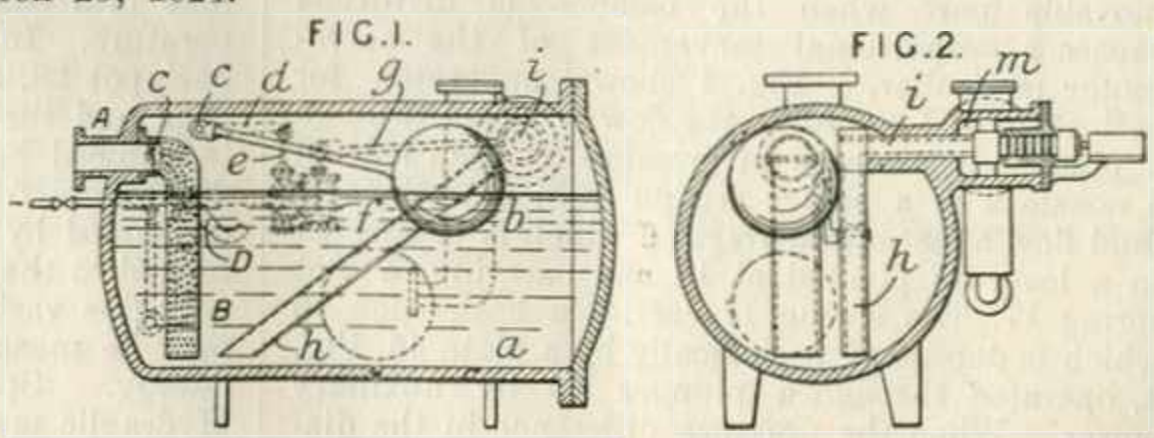
223,791. Kings Patent Agency, Ltd., (*Aktiebolaget C. T. C.*). Feb. 4, 1924.

Heating by circulation of fluids.—In hot water circulating systems a valve 6, in the by-pass piping 4 of the circulating-pump 3, is arranged to be held on its seat 7 in a casing 5 against weight, spring or like action by the water pressure during the operation of the pump, and to move to the open position to allow of thermal circulation through the by-pass when the pump ceases to work. The valve may be connected to a damper 15 in the boiler furnace to reduce the draught when the valve is open.



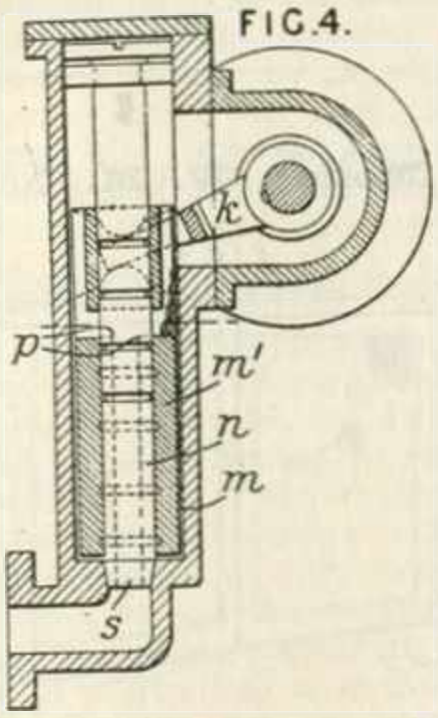
223,814. Eisenbeiss, E. March 25, 1924.

Steam - traps. — A steam separator or steam trap of the kind having a fluid pressure operated and float controlled discharge valve gear is characterized by the combination of the valve gear with a discharging member so displaceably arranged that it is surrounded by steam.



When the separator is filling and the discharge valve is closed but dips into the condensate when the valve is open for discharging. The cylindrical separator *a*, Fig. 1, has an inlet A and depending inlet tubes B in the upper part

FIG.4.

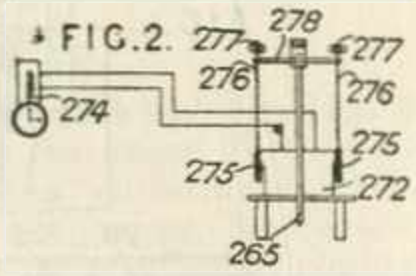


of which is a throttle valve C. A float *b* is pivotally mounted on a shaft *c* which also carries an arm *d* connected with rod *e* of a piston valve which controls a piston *f*. The piston *f* operates a hollow shaft *i* through the lever *g*. The hollow shaft carries a depending discharge tube *h* and communicates with a space *m*, Figs. 2 and 4, leading to the discharge valve which is controlled by the lever *k*. The valve consists of a fixed rod *n*, having an axial bore *s* and transverse bore *p*, and a sleeve m^1 which is movable on the rod by the lever *k*. In the positions shown the vessel is full of condensate and the pipe *h* and discharge valve are set for discharging the contents whilst the throttle C is closed. When the vessel is empty the float falls and operates to close the discharge valve and raise the pipe *h* which in rising contacts with the lever D and re-opens the throttle C. A counting mechanism may be driven off any suitable moving part. The discharge valve when closed is surrounded by steam only. In a modification, the pipe *h* is replaced by a vertically sliding pipe on the upper end of which is the actuating piston *f*. The pipe acts also as a valve and has peripheral openings which register with discharge openings in the enclosing guide member. In a further modification, the separator is divided into two portions, an inlet portion which supplies a float portion, the passage between the two being controlled by a valve carried by the vertically sliding discharge pipe. The connection of the float with the piston valve provides for lost motion during the rising and falling movements. In order to give a sharp control, a tumbler-weight lever may be included in the transmitting levers.

223,984. White, A. E., (*Hardinge Bros., Inc.*). July 31, 1923.

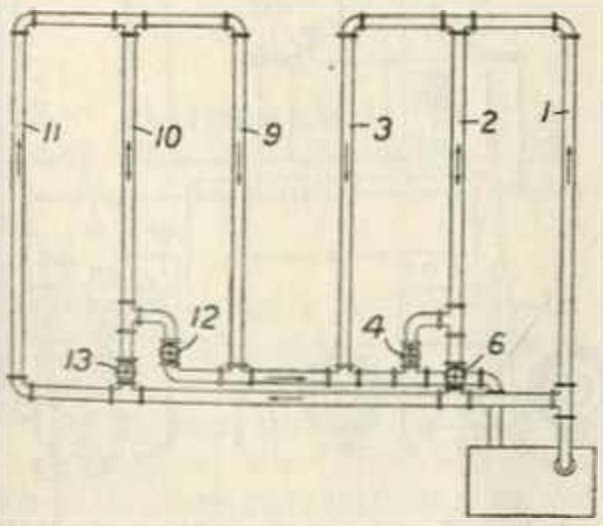
Thermostats. — The adjustment of a link to control the air and fuel supplies to a burner automatically to produce a maximum or minimum amount of heat is effected by a

FIG.2.



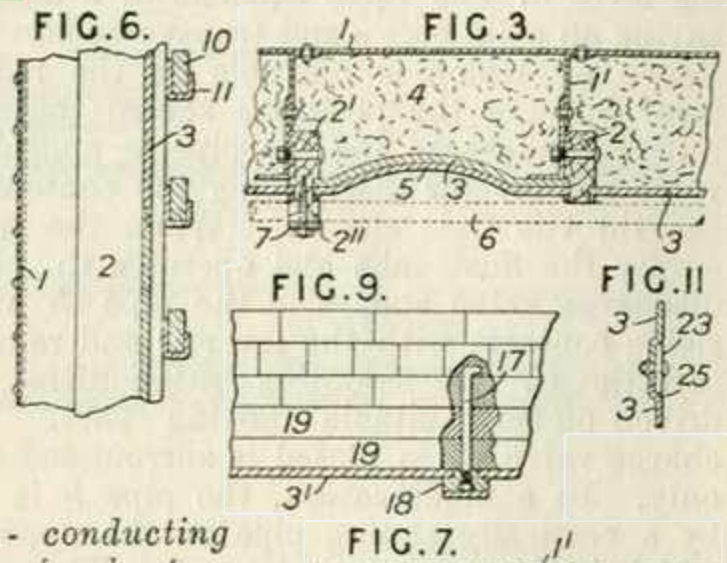
thermostat 274 controlling a motor enclosed in a housing 272. The motor 272 carries pulleys 275 attached to chains 276 which pass over pulleys 277 at the opposite ends of a lever 278 fixed to a rod 265 operating the link.

224,394. Fry, C. Dec. 7, 1923.



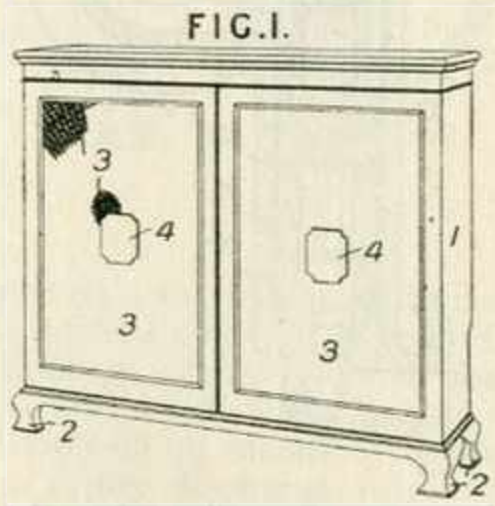
Heating buildings.—A hot-water installation for heating buildings such as greenhouses comprises a boiler and a set of three pipes, of which one always serves as a flow pipe, another always serves as a return pipe, while the third, by the operation of valves, is adapted to serve either as a flow or return pipe or to be rendered non-circulating. The sets of three pipes may be used singly or several sets may be interconnected but independently controlled. In the arrangement shown two interconnected sets of three pipes are shown, the pipes 1, 11 being the flow pipes, the pipes 3, 9 the return pipes, while the flow through the pipes 2, 10 can be controlled by operation of the valves 4, 6 or 12, 13 or, by closing all these valves, the pipes 2, 10 can be rendered non-circulating.

224,716. Thomson, E. A. Nov. 13, 1923.



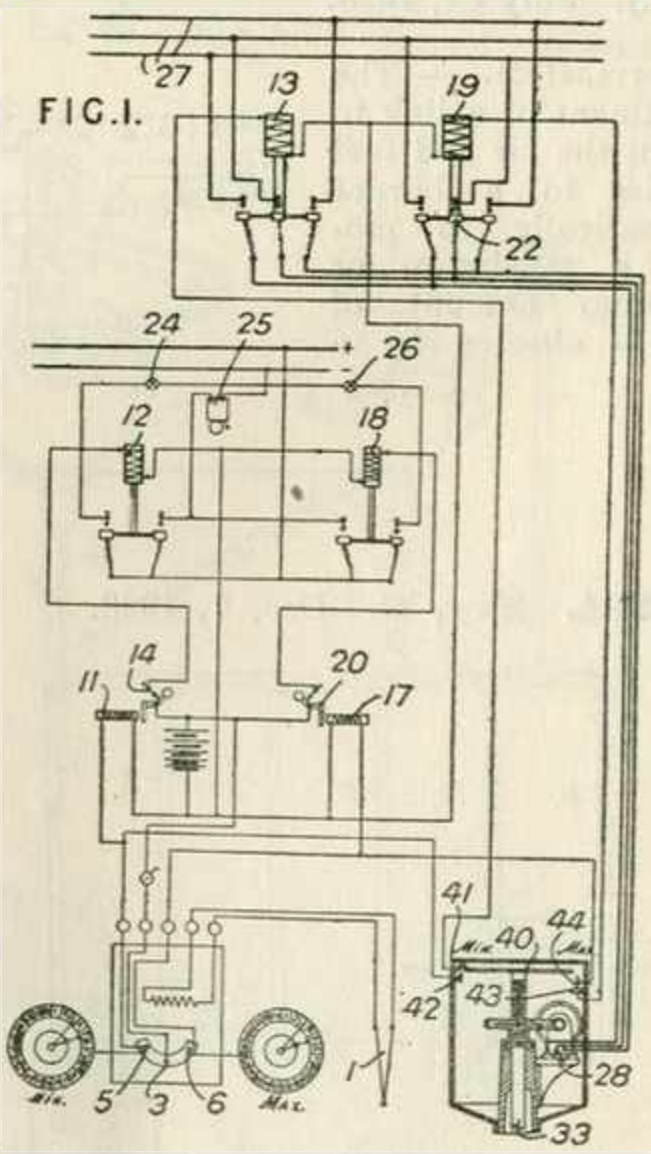
Non-conducting coverings for heat.—The linings or facings 3, Fig. 3, of heat insulation 4 for ship's refrigerating-chambers or for cold-storage rooms on land are made in the form of individually removable panels retained in position by wood studding or grounds 2, 2^1. These wood grounds project outside the insulation to minimize the tendency to decay and to permit frequent observation of their condition. The panels may be curved towards the outer wall 1 to reduce the amount of insulation 4 behind them and to provide an increased passage for air circulation behind the refrigerating pipes 6. Flat wood or concrete panels may be used, or curved cork panels may be faced with a panel layer 5 of cement. The distance battens normally fitted to the walls may be constituted by the extensions of the wood grounds, or battens 10, Fig. 6, may be removably supported in cleats 11 attached to the wood grounds. The brine pipes 6, Figs. 3 and 7, may be received in grooves or notches in extensions 2^{11} of the studding, which is bolted to beams or stiffeners 1^1 of the ship's frame and thereby partially insulated from the outer plates . The pipes are supported by capping 7, Fig. 3, secured by coach screws, or by channel irons 13, Fig. 7, secured by bolts 14. As shown in Fig. 10, sections of a wire-mesh lining 20 may be secured by clips 21 to flanges of the beams 1^1 and form a face to which cork panels 19 may be attached by bitumen, the cork being covered by panels 3^1 retained by studding 18 bolted to the beams. The edges of the panels transverse to the studding may be shaped to provide a tongue and groove or a stepped joint, or may be moulded with recesses 25, Fig. 11, for the reception of a joint strap 23 bolted to the panels. In the case of brick chambers, Fig. 9, the studding 18 is secured by built-in holes 17. Cork panels 19 are retained by panel linings 3^1, which may be of cement applied after assembly. The panels are preferably formed or provided with holes closed by screw plugs to enable the condition of the enclosed insulating material to be examined. The loose insulating material 4 may be sawdust, charcoal, slagwool, granulated cork or asbestos, and the panels may be formed of one or several materials, such as Portland cement and asbestos with or without reinforcement such as expanded metal, bamboo, laths and reeds, and may be corrugated to provide stiffness and increase of air space behind the pipes.

224,723. Moffat, W. M. Nov. 17, 1923.



Radiators.—A cover for a radiator comprises a wooden structure 1 open at the bottom and back, and formed with feet 2 which rest on the floor. An internal lining of asbestos or the like is provided, and the front 3 is formed of woven cane with ornamental plaques 4.

225,011. Schneegluth, W. Oct. 4, 1923.



Thermostats.—In apparatus for regulating the temperature of furnaces &c. of the kind in which

a pyrometer 1, Fig. 1, controlling a movable contact 3 is associated with maximum and minimum contacts 6, 5, the temperature is adapted to be varied according to any predetermined time-temperature vector by effecting an adjustment of the maximum and minimum contacts in the course of the heat process by means of a mechanism driven by a clockwork. In the construction shown in Figs. 2 and 3, a rock 54 carrying the contacts is driven in one direction by means of a disc 48 mounted on the spindle 47 of the hour hand and carrying a number of adjustable projections 49 for engaging the continuous teeth of a wheel 50, the spindle of which carries a pinion 52 engaging the rack 54 and also a ratchet-wheel 51 co-operating with a pawl. A similar gearing 56, 58, 59, 60 provided with a ratchet-wheel 57 drives the rack 54 in the opposite direction, one of the ratchet-wheels 51, 57 running free while the other is driving. In this way any sequence of adjustments can be given to the rack 54 and the contacts 56 carried thereby. The minimum contact 5 is associated with a relay 11 controlling a switch 14, with a second relay 12 actuated on closure of the switch 14 and associated with a lamp or like indicator 24 and an alarm bell 25, and with a third relay 13, which is in circuit with a switch

FIG. 2.

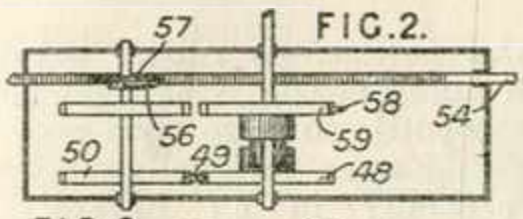
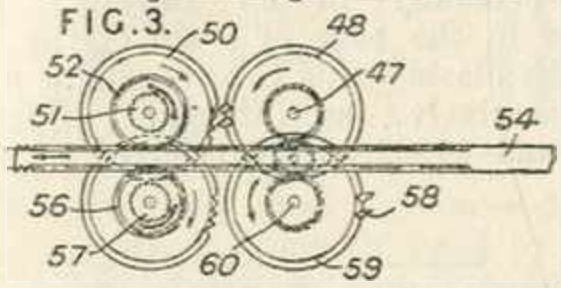


FIG. 3.



41, 42 and the armature 16 of which is adapted to complete a circuit from the mains 27 through a motor 28 controlling the adjustment of a spindle 33, which carries the gas or like control valve and also a plate 40 for opening or closing the switch 41, 42. The maximum contact 6 is similarly associated with relays 17, 18, 19, switch 20, bell 25 and lamp 26, armature 22 and switch 43, 44, and effects movement of the spindle 33 in the opposite direction to that effected by the contact 5. In operation, supposing the switch 41, 42 is initially closed and the pyrometer controlled contact 3 touches the contact 5, then the relay 11 is energized and by closing the switch 14 causes the lamp 24 to be illuminated and the bell 25 to ring. The relay 13 is also energized and by closing the motor circuit first causes the gas valve to be opened and then, when the switch 41, 42 is opened, breaks the circuit through the relay 13, thus stopping the motor 28 and the movement of the valve spindle 33. Simultaneously the switch 43, 44 is closed so that the parts are ready for actuation in the reverse direction whenever the movable contact 3 touches the maximum contact 6.

225,066. Kirschmann, L. Dec. 3, 1923.

Radiators.—A radiator for use alternatively as part of a central heating system or as an independent unit adapted to be connected at its lower end to one or more electrical or other heating elements has three rows of connecting nipples, the middle row being disposed above the heating elements. Electric heating elements *m* are secured by caps *k* in the bottom of the two central radiator elements *a*. The radiator is adapted to be connected through a check valve *e* which may be closed by a cap *g* in an upper end nipple *d* and by a cock (not shown) in the lowest row *b* to a central heating system. A safety valve *f* is provided. A gas or oil-heated chamber *o*, Fig. 2 is connected by screwed pipes *i* to central elements *a*, the remaining elements being connected to the chamber *o* by pipes *r*.

FIG. 1.

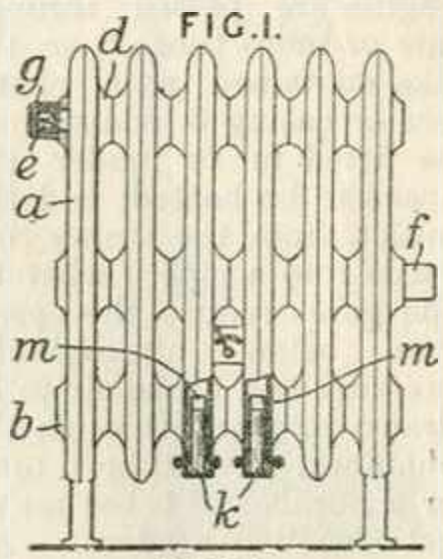
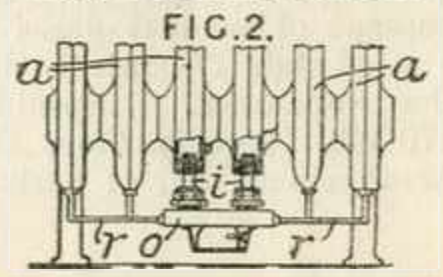


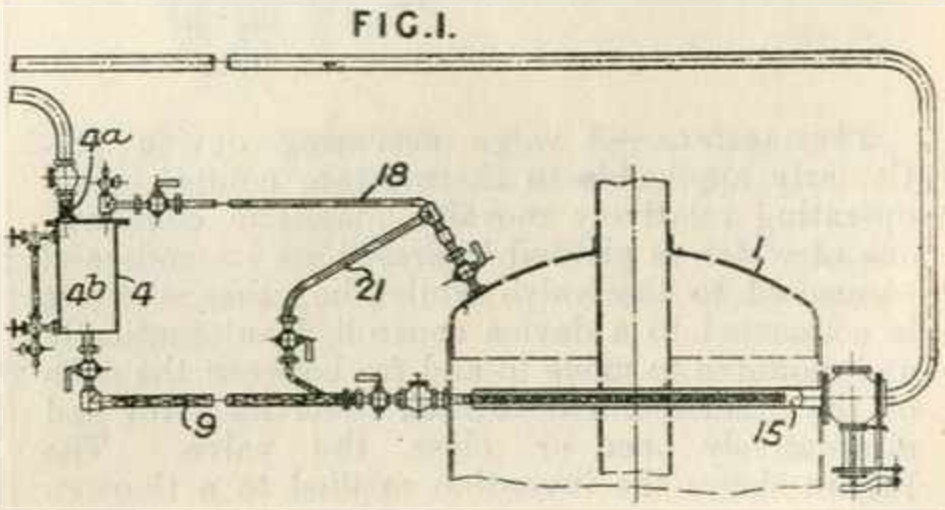
FIG. 2.



225,212. Carmichael, A., and **Carmichael, W. J.** Nov. 19, 1923, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].

Heating by circulation of fluids.—In a steam-heating system, the steam circulation is stated to be promoted and the water of condensation returned by means comprising a chamber fitted in the return pipe, the chamber being divided into two parts, one part having a relatively small passage leading into the other part, which has a relatively large passage. A chamber 4 to which

FIG. 1.

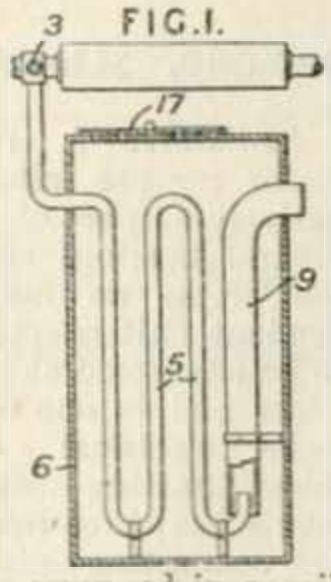


pipe 3 is connected consists of a small upper cylinder 4^a drilled axially and a relatively large lower cylinder 4^b. The chamber is connected to the boiler 1 by a pipe 9 fitted with twisted wires or rods or with other steam-flow retarding means. The pipe opens into the conduit 15 through which steam is withdrawn from the boiler. The chamber and the pipe may be placed in communication with the boiler through pipes 18, 21 fitted with stop valves.

225,399. Argen Car Heater, Ltd., and **Jones, A. Denman-.** Dec. 21, 1923.

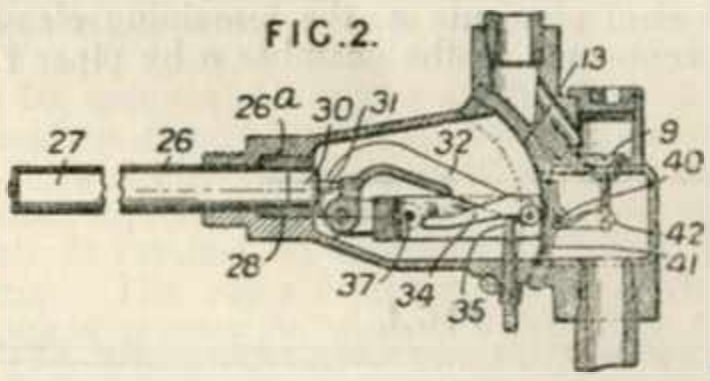
Radiators.—In a heating-device the exhaust gases from an internal-combustion engine are passed through one or more tubes 5 or the like contained in a chamber or casing 6 adapted to be fitted in or under the space to be heated, and the outlet from the tubes extends into a pipe 9 whereby the gases reduce the pressure below atmospheric-pressure and cause air to be drawn into and through the chamber. The tube 5 may be arranged in a coil or a number of tubes may be disposed in parallel between two headers. A valve 3 controls the passage of exhaust gases to the tube and a perforated slide 17 controls the passage of air through the chamber. Specifications 143,430 and 170,143, [both in *Class* 79 (iii), Motor vehicles, Arrangement &c. of parts of], are referred to.

FIG.1.



225,658. White, A. E., (*Yoder-Morris Co.*). Oct. 3, 1923.

FIG.2.

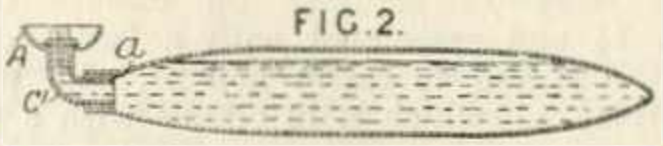


Thermostats.—A valve actuating device particularly applicable to thermostats comprises co-operating relatively movable magnetic elements, one of which is pivoted intermediate its ends and connected to the valve while the other element is connected to a device controlled automatically and mounted to move to and fro between the ends of the other element to rock it on its pivot and alternatively open or close the valve. The Figure shows the invention applied to a thermostat. The valve 9 is connected by an arm 42 to a rocking armature 41 pivoted at 40 adjacent to a non-magnetic partition 13 in the casing. The armature is rocked to open or close the valve by a horse shoe magnet pivoted at 37 and oscillated by a thermostatic element 27 acting through a compound lever mechanism 32, 34 provided with an adjustable pivot 35. The thermostatic element comprises a copper tube 26 which is secured in position by a flange 26^a and ring 28 and surrounds a porcelain rod 27 provided with a cap 30 having a projection 31 adapted to bear against the lever 32.

225,770. Read, C. W. April 29, 1924.

FIG.1.

FIG.2.



Hot-water bottles.—A rubber hot-water bottle having its filling nozzle A at right angles to the plane of the bottle so as to open above the water level therein has an internally-screwed nipple *a* inserted centrally in an inwardly projecting sleeve, or in the edge or seam of the bottle, to receive the closing plug C or an elbow filling tube C^1, respectively, as shown. Specifications 9650/98 and 11522/14 are referred to.

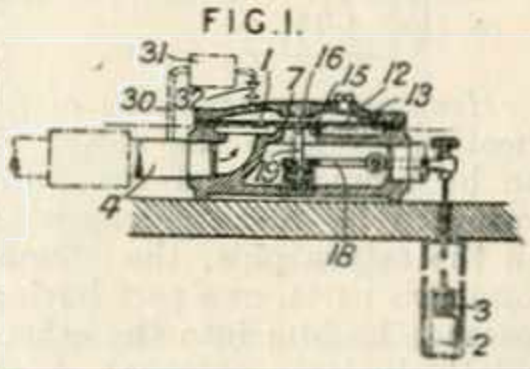
225,794. Beldam, W. R. Sept. 7, 1923.

Hot-water bottles; foot warmers.—A hot-water bottle is provided with a jacket of sponge-rubber. In the case of rubber or like bottles the jacket may be secured to or form part of the bottle. When the bottle is of earthenware the jacket would be retained as by buttoning the open end after insertion of the bottle.

225,864. Akt.-Ges. der Maschinenfabriken Escher, Wyss, & Co. Dec. 6, 1923, [*Convention date*].

Thermostats.—A diaphragm valve actuated by fluid pressure under the control of an auxiliary valve has the main and auxiliary valves adapted to open in opposite directions.

FIG.1.

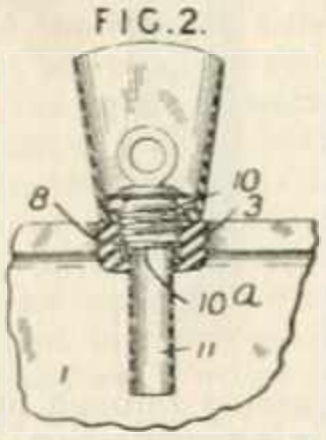


The Figure shows the invention applied to a thermostat. The diaphragm 1 has a central thickened part 7 adapted to act as a valve face and is loaded by a spring or initially stretched so as to engage a valve seat 15. A leakage hole 12 is formed in the diaphragm or a bye-pass 30 fitted with filter 31 and throttling device 32 is provided to establish communication between the inlet 4 and the actuating chamber 13. The auxiliary valve 19 co-operates with a central aperture 16 in the diaphragm and is supported on a spring loaded lever 18, the outer end of which is adjustably connected to a bellows 3. The bellows forms part of a closed chamber 2 containing a liquid with a high co-efficient of expansion. In a modification the auxiliary valve is electrically actuated. And in a further modification the complete device is used to control a third valve.

225,915. Beldam, W. R. Sept. 7, 1923.

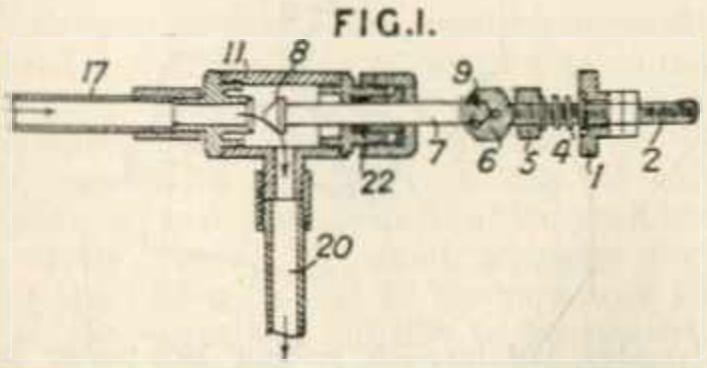
Hot-water bottles.—The outlet 3 has an extension in the form of a tube 11, which projects into the interior of the bottle 1 so that the inner end is below the level of some part of the interior of the bottle when the outlet is uppermost. This has the effect of retaining a part of the contents of the bottle on emptying so that boiling water used for refilling shall not cause deterioration. In one form the tube is fixed to the outlet while in that shown in Fig. 2 a detachable tube 11 is used, having a flange 10a adapted to be clamped between the socket 8 and the stopper 10 and to engage frictionally with the wall of the socket.

FIG.2.



226,144. Soc. A. Legrand et Cie. Dec. 11, 1923, [*Convention date*].

FIG.1.

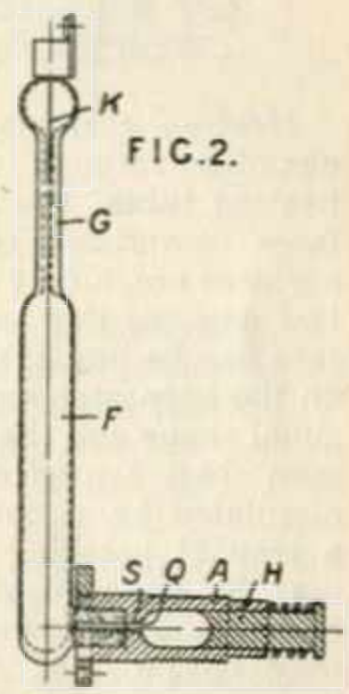


Steam-traps.—A steam-trap of the type having an open ended expanding tube adapted to co-operate with a fixed seat has a casing 11 fixed to the end of the tube 17 and provided with a stuffing box 22 adapted to work over the stem 7 of the fixed valve. The spindle 7 of the conical valve 8 is secured by a pin 9 in a socket 6 on a member 2 adjustably secured to a fixed support 1. The member 2 is yieldingly held in position by a spring 4 adjusted by a nut 5. The casing is fitted with a discharge pipe 20. The fixed abutment may consist of a bar cemented into the wall or a frame cemented into the ground.

226,249. Maclaren, R. June 23, 1923.

Thermostats.—A thermostatic regulator for electric steam or hot water radiators applicable also to gas heating, fire alarm, and refrigerating control devices comprises a mercury container F with a capillary extension G in which an electrode K is located, and an adjustable plunger H for varying the working temperature having a concave face and adapted to slide within a cylinder A having a dome-shaped end Q terminating in a capillary bore S leading to the container F.

FIG.2.



226,522. Wilkening, L. G. Dec. 22, 1923, [*Convention date*].

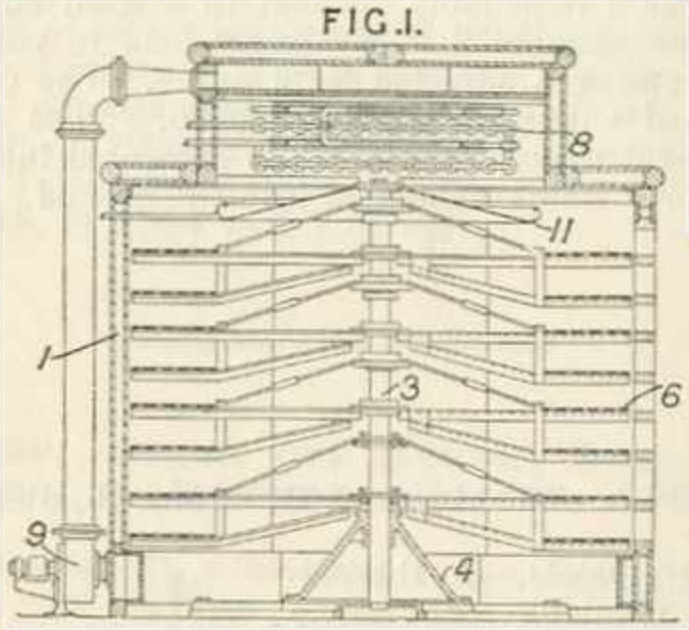
Non-conducting coverings for heat. — The lighter kinds of peat are coked for use as a heat-insulating material. The product may be either used loose or agglomerated with cement, lime, bituminous substances, &c. and moulded into blocks. It may be mixed with other heat-insulating materials such as kieselguhr, peat meal, cork meal, &c.

226,775. Courtot, L. Dec. 28, 1923, [*Convention date*]. *Addition to* 217,416.

Radiators.—Elements according to the parent Specification have all the parallel tubes cross connected.

227,085. Hass Ges., H. Jan. 5, 1924, [*Convention date*].

FIG. 1.



Heating systems.—Cocoa &c. is heated in a chamber through which air is circulated over heating tubes, the cocoa being supported on surfaces comprising concentric metal rings, which surfaces are, singly or in pairs, rotatable on a central axis, so that any desired portion of the surface can be brought opposite to the chamber door. In the apparatus shown, the chamber 1 is of octagonal shape and the surfaces are carried on a common shaft 3 rotating in a bracket 4. The air is circulated by a pump 9 and passes over tubes 8, a tray 11 catching drip. Further heating tubes may be arranged at the bottom of the chamber. Separate doors corresponding to the different trays may be provided, and a plurality of chambers may be arranged in series.

227,158. Bishop, H. S. Oct. 3, 1923.

Thermostats.—In a device for controlling the supply of a heating or cooling fluid, the temperature-sensitive member is of the kind comprising a number of elements formed of materials having different coefficients of expansion, and comprising a rod 1, Fig. 1, of silica &c. arranged within an open-ended tube 2 of similar material, around which is another tube 4 having a relatively larger coefficient of expansion, the whole being enclosed in a tubular element 8 also having a large coefficient of expansion. The upper end of the rod 1 bears on a lever 10, the outer end of which is in contact with the stem 13 of the valve which controls the supply of fluid. The valve comprises a chamber 15 having inlet and outlet passages 16, 17 and containing a fixed diaphragm 20 and a movable member 18 connected to the stem 13. The area of the chamber is considerably greater than that of a conduit permitting the maximum rate of flow of the fluid, and the total areas of the apertures in the diaphragm and in the movable element are each not substantially less than the area of the passage leading from the valve chamber. The apertures 21 in the diaphragm are formed in concentric grooves 22, the elevations 23 between which form the seating surfaces, and the apertures 24 in the member 18 are also formed in concentric grooves 25, the elevations 26 between which are in register with the grooves 22. The member 18 is mounted on a threaded spindle 29 which can be turned by a wheel 36 to adjust the valve independently of the temperature-sensitive device, the member 18 being prevented from rotating by a pin 30 carried by the diaphragm and

FIG. 1.

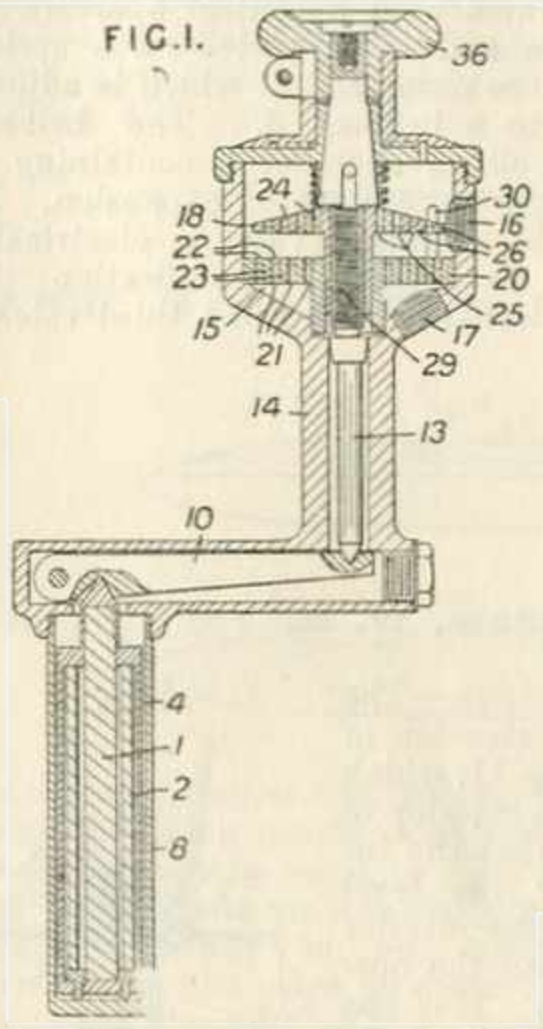
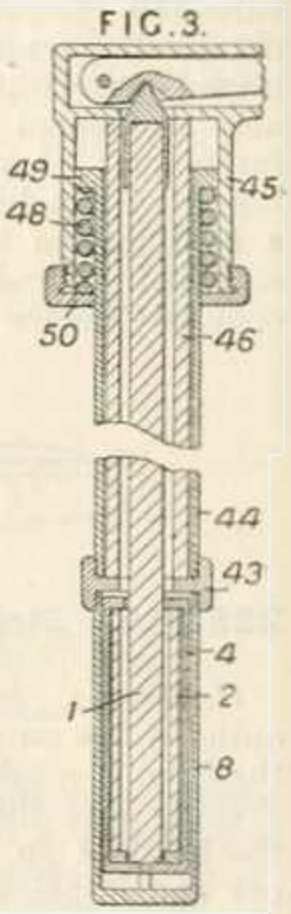
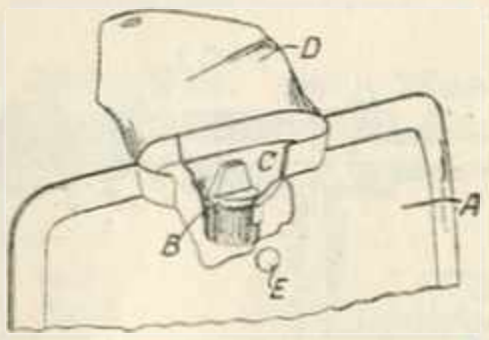


FIG. 3.



passing through an aperture in the member 18. In a modification, Fig. 3, the tube 8 is connected by a collar 43 to a tube 44 having a large coefficient of expansion and freely mounted in an extension 45 from the chamber 14. Within the member 44 is a tube 46 of silica &c. bearing at one end against the collar 43 and at the other end against the chamber 45, a spring 48 being interposed between a shoulder 49 on the tube 44 and the cap 50 of the chamber 45.

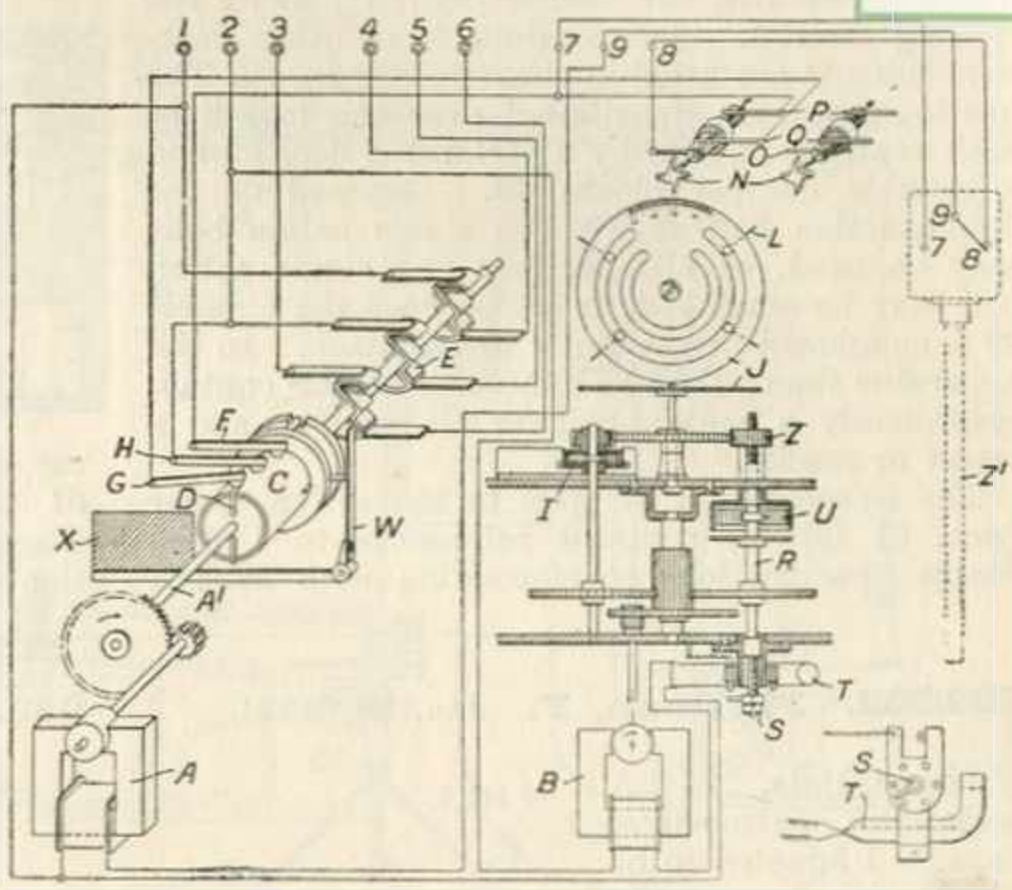
227,345. Lambert, S. May 22, 1924.



Hot-water bottles.—A rubber hot-water bottle having the stopper B sunk in a recess C so as to lie entirely below the end of the bottle body A, is provided with a rubber flap D which can be turned over and secured, as by a rubber stud E, so as to cover the aforesaid recess and stopper.

227,695. Matter, E. May 7, 1924.

Thermostats.—Relates to temperature-regulating mechanism for electrically-heated apparatus of the kind in which a thermostat is combined with a time switch operated by clockwork for cutting off the current supply at predetermined times, e.g. during particular hours of the day, independently of the operation of the thermostat, and consists in the particular construction of the combined apparatus including a motor-wound clockwork, a time switch and switch for the heating-circuit. The heating current is supplied from contacts 4, 5, 6 connected to the supply terminals 1, 2, 3 by a rotary switch E mounted on a shaft A^1 controlled by a motor A, the shaft A^1 also carrying a drum C with a conducting surface on which rest three contact arms F, G, H, one, H, of which is always in contact with the drum and is associated with the supply terminal 2, while the contact arm F is connected to the maximum temperature contact 7 of the thermostat and the contact arm G is connected through the time switch O, Q with the minimum temperature contact 8. Insulated strips D in the drum C maintain the arms F, G alternately out of contact with the drum. The circuit between the terminals 1, 2 is completed through the motor A and contact 9 of the thermostat. The rotary time switch comprises a brush O connected to the contact 8, contacts P, Q respectively connected to the contact arms F, G and a star-shaped member N which is actuated at predetermined time intervals by projections L on a dial J. When the time switch is in the operative position shown at the right-hand side with the brush O and contact Q connected, the switch E is controlled by the thermostat Z^1 to keep the temperature within the predetermined maximum and minimum limits. Thus, if the moving arm of the thermostat makes contact at 7, the motor A is started, causing the switches E and C, F to be opened, thus interrupting the heating and motor circuits and the switch C, G to be closed; when the temperature falls again and contact is made at 8, the motor circuit is closed, the switch C, G opened, and the switches E and C, F closed, thus restoring the heating circuits. An indicator W, X shows whether the switch E is in the open or closed position. The dial J is constantly rotated by means of clockworks I, U, the springs of which are wound by a motor B connected between the terminals 1, 2 in series with a switch T which is alternately opened and closed by giving the shaft R of the clockwork U an axial movement by providing one end of the shaft with a fine screw thread engaging an internal thread on a pinion Z. When the motor B is winding up the clockwork springs a driving-pin S on the other end of the shaft R approaches and finally engages one of a series of studs on the switch T and rotates it to break the motor circuit. The springs then unwind until the driving pin S is disengaged from the studs, when a spring restores the switch to its closed position and, the motor circuit being again closed, the springs are re-wound.



228,148. Puening, F. Jan. 23, 1924, [*Convention date*].

Heating-apparatus.—In heating-apparatus of the kind in which a body of heating-gases is passed alternately in opposite directions through a heating-chamber, the impelling member for the hot gases consists of a bell 1 vertically-movable in a chamber 12, and water-sealed at its periphery and around an opening 19, which connects the space above the bell with one of the conduits 22 leading to the chambers 25, 25^a to be heated. The other conduit 16 connects with the space beneath the bell. In each heating chamber fresh combustion products are supplied to the stream of reciprocating gases from a combustion chamber 29 or 42, delivering at about the mid point of the flow passage, and automatically-operated dampers 48, 49 are provided to permit the escape of a corresponding volume of heating-gases. Either of the heating-chambers can be put out of action by

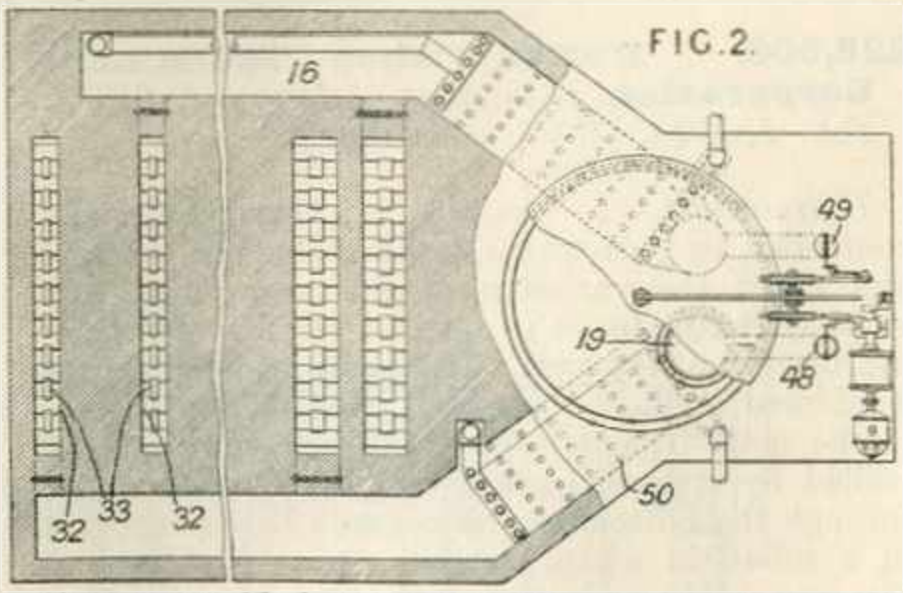
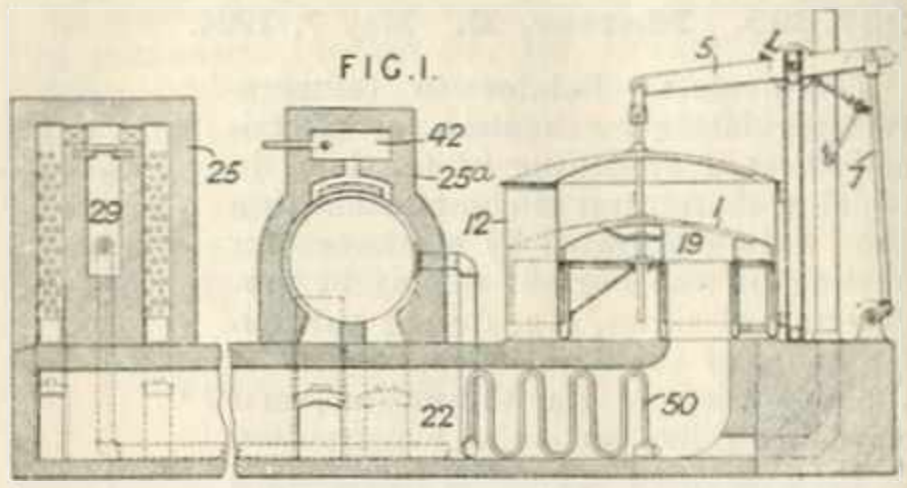


FIG. 2.

dampers, and the stroke of the bell can be reduced by shifting the connecting-rod 7 along the rocking lever 5. Recuperators 50 or other heating-elements are fitted in the conduits 16, 22. The heating-gases are distributed over the length of each heating-chamber by a perforated floor 32 and adjustable damper blocks 33. Instead of the double-action bell shown two single action bells may be used, or alternatively one single action bell may be employed, in which case the conduit 22 is connected permanently to the stack. In the apparatus shown the two chambers 25, 25ª contain respectively a heating-coil for oil-cracking and a retort or muffle.

The Specification as open to inspection under Sect. 91 (3) (a) contains references to United States Specifications corresponding with Specifications 208,170, 210,068; and 210,758, [*Class* 51 (ii), Furnaces and kilns for applying &c.]-These references do not appear in the Specification as accepted.

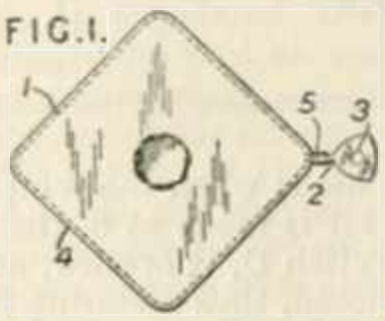
FIG. 1.



228,339. Freeman, F. Jan. 28, 1924.

Thermostats. — A seamless thermostatic capsule 1 adapted to be filled with a volatile fluid is formed in an electrolytic bath by the deposition of a suitable metal, such as copper, upon a core or former 4 composed of an easily fusible metal, such as lead, which is subsequently removed by immersing the capsule in a bath of molten solder. The former 4 is preferably shaped with a projection 2, around which a tube 5 is deposited to constitute a filling orifice and which terminates in an eyepiece 3 for suspension purposes. After being filled with the fluid, the capsule is hermetically sealed by soldering or otherwise closing the mouth of the tube 5. The capsule so formed is thickest at its edges, and the central portions of the flat faces may be strengthened for the purpose of attaching the necessary operating mechanism either by securing reinforcing plates or members to the finished capsule or by inserting the reinforcing members in recesses in the former 4 and uniting them integrally to the capsule during the deposition process.

FIG. 1.



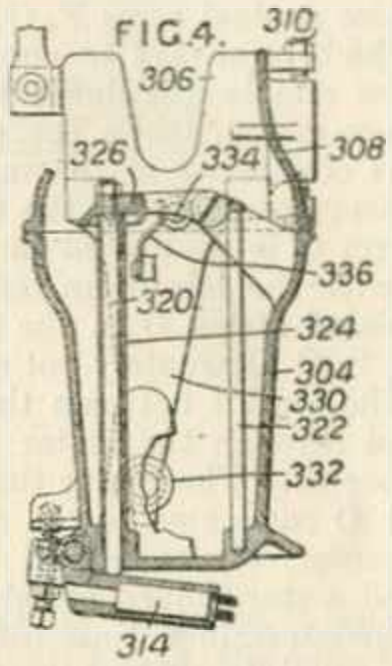
228,506. United Shoe Machinery Corporation, (Assignees of *Leveque, B. T.*). Feb. 2, 1924, [*Convention date*].

Thermostats.—A wax-pot is thermostatically controlled by rods which are immersed in the wax and effect the variation of the heat supply by varying the distance of an electrical heater from the bottom of the pot. The heating member 314 is pivoted and spring-pressed towards the bottom of the pot. The movement of the heater is controlled by rods 320, 322, the rod 320 extending through the bottom of the pot and being enclosed in a tube 324 which extends above the level of the wax. The rods 320, 322 bear on either end of a lever 326.

(*For Figure see next column.*)

228,506.

FIG. 4.

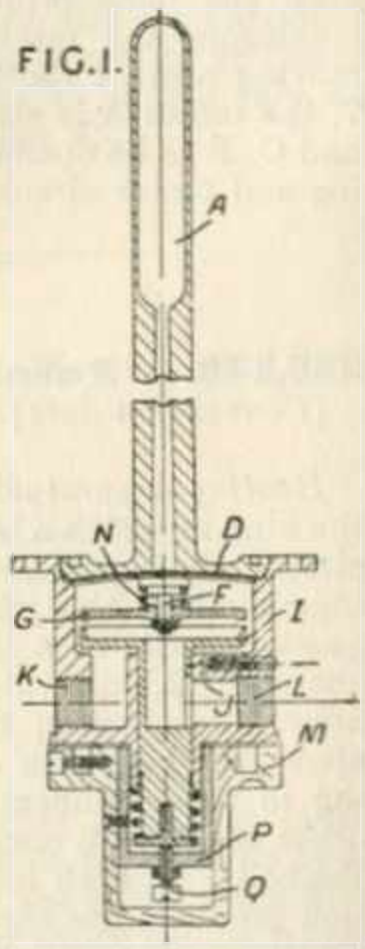


228,597. Maclaren, R. Oct. 31, 1923.

Thermostats. — In a thermostatic valve having an adjustable valve seat to vary the control point, a bulb A contains an expansible medium which acts upon a parabolic diaphragm D. The diaphragm carries a stem F on which a valve G is mounted, and is pressed outwards by a spring N. The valve seating I, which is cup-shaped, is carried by a sliding piston, and is adjustable by means of a screw Q to vary the control point. A cover P and casing M serve as a handle for adjusting the valve seating, and the inlet and outlet K and L are connected by a by-pass J.

Reference has been directed by the Comptroller to Specifications 26895/04, 6685/05, *and* 136,532.

FIG. 1.



228,652. Spencer, A. L. H., and **Spencer-Bonecourt, Ltd.** Nov. 14, 1923.

Thermostats.—A thermostatically controlled valve particularly applicable for controlling the supply of gas to gas heaters for steam boilers, steam superheaters, air and water heaters and the like and of the type in which a diaphragm main valve is actuated by fluid pressure under the control of a pilot valve has the diaphragm chamber fitted with an adjustable bye-pass K⁹ to permit the passage of sufficient gas to maintain the main burner always alight. The thermostatic device comprises a pair of concentric tubes M, N adjustably connected to the body A of the heater one at each end. At their free ends the tubes are slotted to receive a multiplying lever L adapted to bear against an adjustable abutment H⁹ on the spindle of the pilot valve G. The lever L is provided with a knee joint Y normally held in the straight position by an adjustable spring L^2 and passes through a bracket O^1 fitted with a spring stop O. The auxiliary valve is normally held to its seat by a spring H adjusted by a nut H^1, but when opened by the thermostat it admits inlet pressure to the back of the diaphragm E via ports D^2, F^1 and pipe G^9. The diaphragm is then closed by its own weight or elasticity or by a weight or spring load. To enable the valve to open when the pilot valve is closed the cover F is provided with a vent leading to atmosphere or a burner I. To maintain this burner alight in spite of the intermittent working of the apparatus, a bye-pass J controlled by a screwed member J^1 is provided. A fluid other than that passing through the valve may be employed for actuating purposes.

FIG. 1.

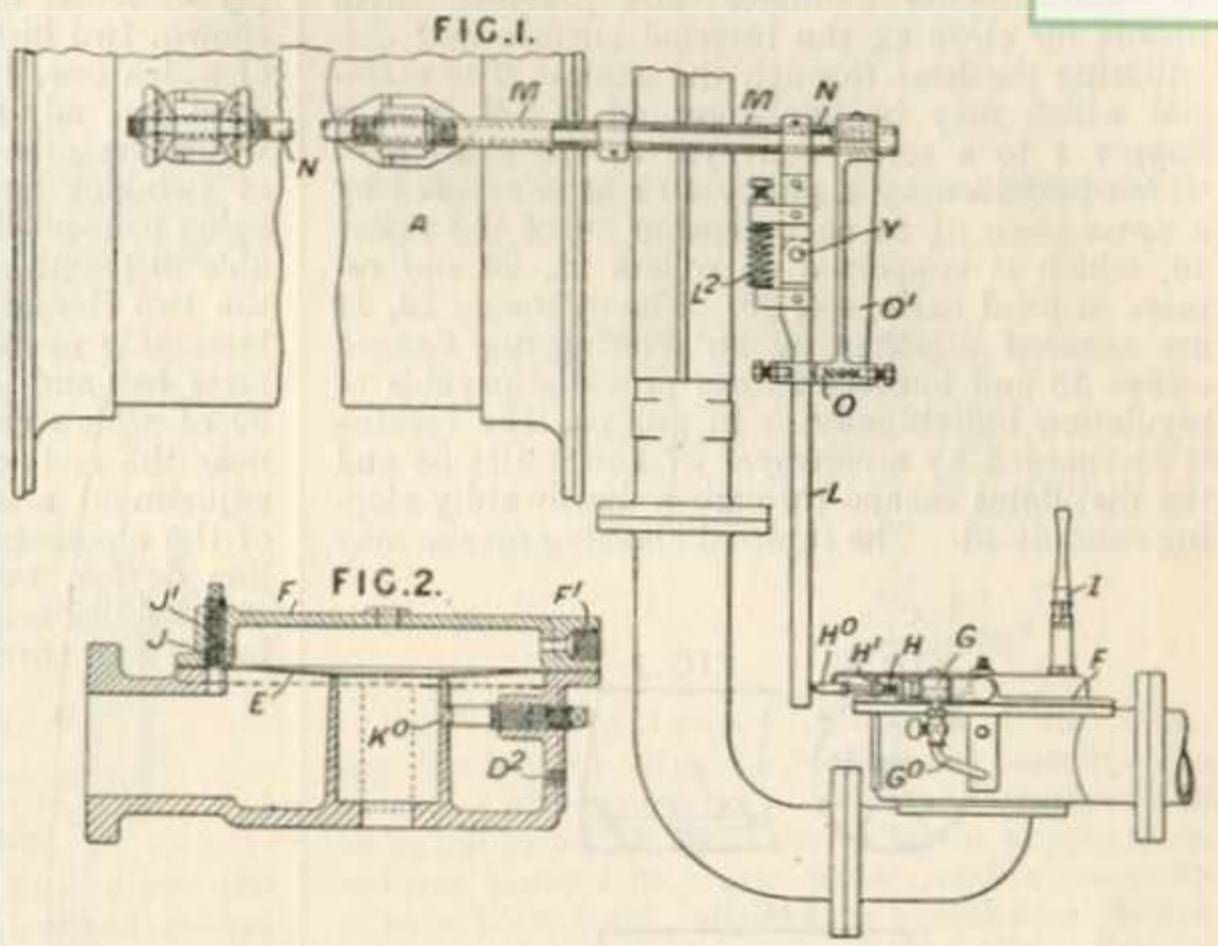
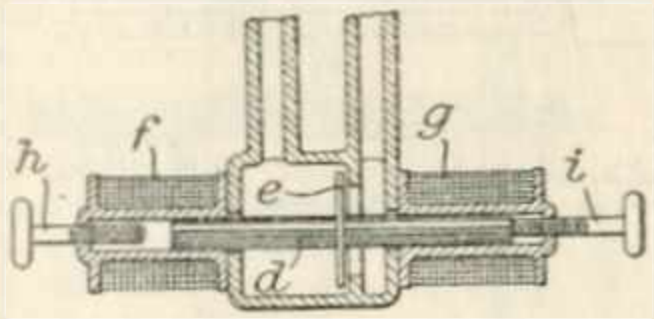


FIG. 2.

228,685. Foster, C. E. Jan. 1, 1924.

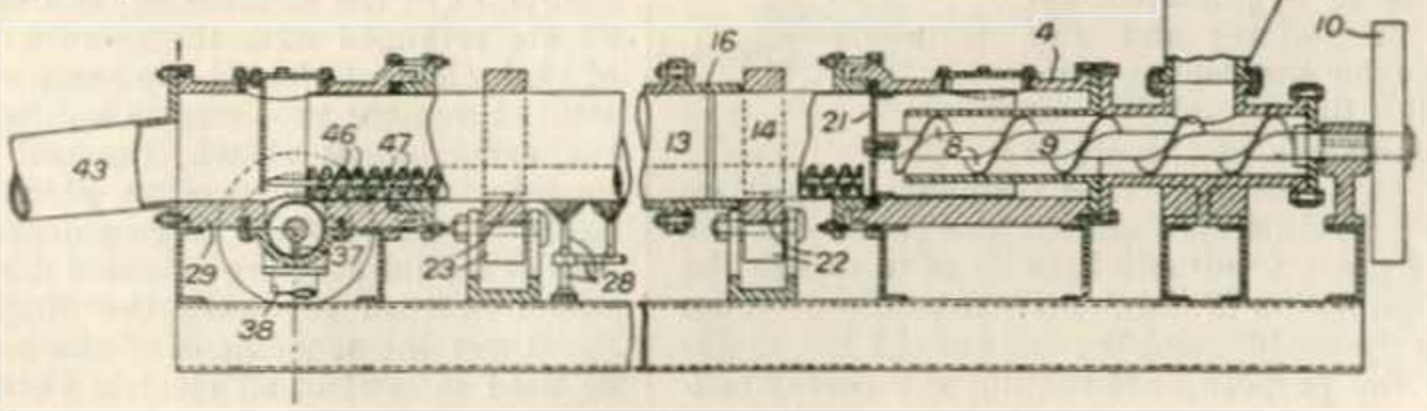


Thermostats.—An electrically actuated lift valve particularly adapted for use in the thermostatic control of furnaces fired with gas under natural draught comprises a lift valve member *e* mounted on the common core *d* of two solenoids *g* adapted to be alternately energized. The core works between two adjustable stops *h*, *i*, the stop *i* preferably being adjusted to maintain the valve slightly open. When used as a thermostat the electrical circuits are completed by the presser bar of a recording millivoltmeter connected to an electric pyrometer.

228,749. Griffiths, C. A. April 15, 1924.

Heating systems and apparatus.—Apparatus for distilling solid carbonaceous materials for the recovery of oils, pitch, and ammonia comprises a

FIG. 1.



ary externally heated retort of from three to twelve inches diameter and provided with means for cleaning the internal surface and distributing the heat through the charge. The material which may be finely ground is fed from a hopper 1 to a screw conveyer 8, the shaft 9 of which is driven by a pulley 10 and is secured by a cross-piece 21 to an extension 14 of the retort 13, which is supported on rollers 22, 23 and rotates in fixed casings 4, 29. The cylinders 13, 14 are secured together by an overlapping flanged sleeve 16 and burners 28 are provided capable of regulation individually or in groups. The residue is discharged by a conveyer 37 and outlet 38 and the distillates escape through a downwardly sloping conduit 43. The internal cleaning means may

FIG.5.

FIG.7.

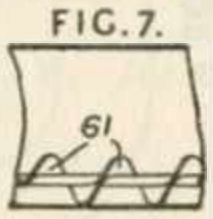
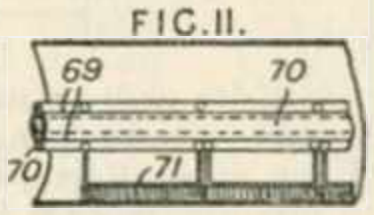


FIG.11.



consist of a loose core 47 carrying a helical wire brush 46, which serves to advance the material through the retort, or of a cylindrical mass of entangled wire lying loosely in the retort. Alternative means are chains loosely suspended from a tube 56 on the shaft 55, Fig. 5, or a screw conveyer 61, Fig. 7, lying on the bottom of the retrot or wire brushes 71 attached to a two-part sleeve 70 loosely arranged on the central rod 69, Fig. 11. Superheated steam or water or a heated gas may be injected into the retort to assist the distillation, and granular materials such as sand or metals may be introduced with the material to be treated either cool to assist the passage of the material through the retort or heated to assist the distillation.

228,772. Imrie, H., (*Parks-Cramer Co.*). June 6, 1924.

Thermostats.—In a thermostatic apparatus, particularly applicable to hygrometric apparatus of the wet and dry bulb type for controlling automatically the humidity or the temperature of the air in a room, two thermo-flexible elements subject respectively to different temperature conditions are mounted upon a suitable base so as to utilize the differential action of the relative lateral movement between the middle and the ends of the two members for the purpose of actuating the energy-controlling device, e.g. a valve regulating the supply of moist or warm air. In the construction shown, two bimetallic strips 13, 24 are employed of which one, 13, is mounted at its centre upon a fixed but adjustable support 14 on the base 1, while the other 24 is freely mounted by means of swinging supports, the ends of the elements being connected by rods 33, 34, which are adjustable in length so as to vary the initial relation of the two elements. The connections between the bimetallic elements and the rods preferably comprise ball-and-socket joints 38, Fig. 5, the stems 39 of which can be clamped at different points near the ends of the bimetallic element 13, such adjustment altering the relative actuating effect of the elements on the valve and energy-controlling device, for instance, in altering the degree of humidity required. The casing formed by the base 1 and cover 3, 4 is divided by partitions 7, 8

FIG.5.

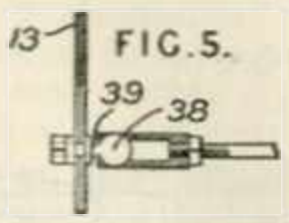


FIG.1.

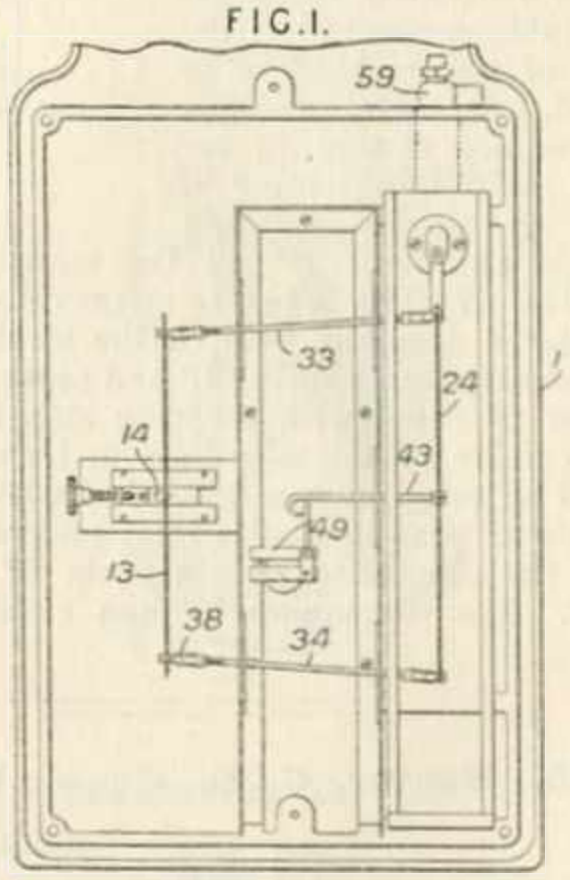
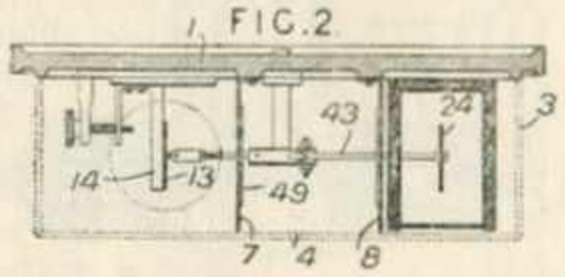


FIG.2.



so as to form a duct by which air from the room may be drawn over the bimetallic element 13, which is thus subjected to the dry bulb temperature, then saturated by spray from an atomizer 59 and passed over the second bimetallic element 24, which is thus subjected to the wet bulb temperature. A valve-actuating rod 43 is attached to the mid-point of the element 24, and the elements 13, 24 are arranged with the more expansible metal of each element, facing the same way so that the total movement produced is a differential one. In the arrangement shown, the end of the rod 43 operates a pivoted lever 49 which is adapted to cover or uncover to a varying degree the bleeding port of a fluid-pressure actuated diaphragm motor, which in turn regulates the supply of heat or moisture; the movement of the rod 43 may also be used to control an electric switch.

228,926. Schwartz, A. Feb. 9, 1924, [*Convention date*].

Heating by chemical action.—External signs of ignition and combustion are avoided in a submersible heater which comprises a conical container *a* detachably held against the lower end of a casing A within which is a striker B operated by a lever K. A cartridge *b* of a suitable chemical mixture evolving heat on ignition is enclosed within the container *a* and on raising the lever K a primer E is forced downward first through a friction igniter *g*, then through a protective layer of sand *e* into the primer *d* and mixture *c*. Gases evolved escape through the side apertures of the cap *f* and are absorbed in part in the expansion chamber H. The device is adapted for immersion, container downwards, in small quantities of liquid to be heated. In a modification the striker B is directly pushed down by a suitable handle on the end, the absorbent material is packed round the upper part of the chamber A and the cap *f* is made an integral part of the cartridge.

FIG. 1.

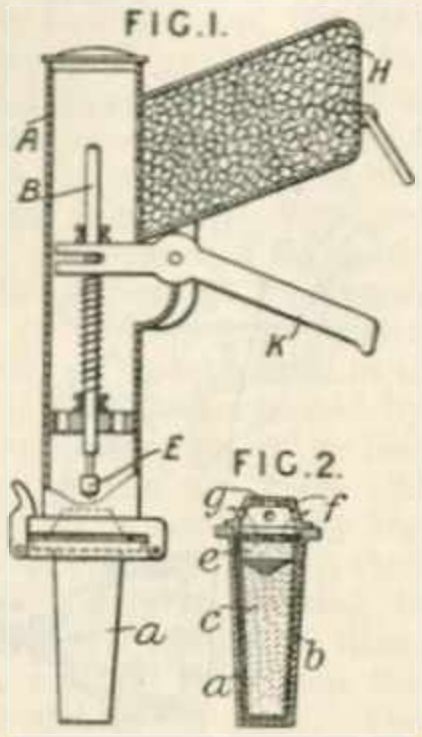
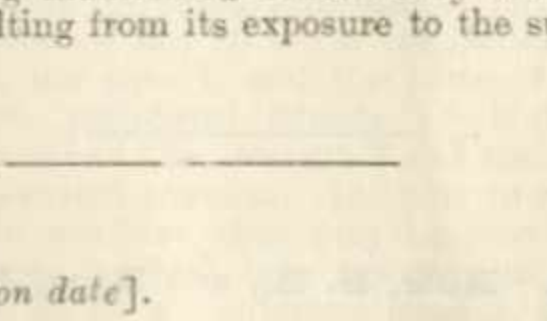


FIG. 2.

229,211. Gandillon, P. A., and **Garchey, L. A.** Sept. 15, 1924.



Solar heat, utilizing.—An apparatus for utilizing the energy of solar radiations comprises a reservoir of water A at a low level, a reservoir B at an intermediate level receiving its supply from natural sources or waste water, and a reservoir C at a high level, a pumping installation D for raising water from the reservoir B to the reservoir C, and a turbine or like installation E controlling the operation of the pumps B and driven by the descent of water from the reservoir C to the reservoir A, the level of water in the latter reservoir being maintained constant by the evaporation resulting from its exposure to the sun's rays.

229,652. Jennings, I. C. Feb. 21, 1924, [*Convention date*].

Heating systems and apparatus. — Apparatus used in connection with vacuum steam heating systems consists of water and air pumps on the same base with a tank connected to the return pipe of the system, and which supports a separator for air and water. All the air passages between the pumps and the tank are arranged in a single manifold. The parts are detachably secured to render all easy of access. The return pipe is connected to the outer end of the header 223, Fig. 1, through which water and air are supplied to the tank 13. Tubular posts on the base 10 support the tank and one of the posts 185 communicates with the interior of the tank to convey water to the suction side of the water pump, and water to prime the air pump. The water pump connection is at a slightly higher level in the tank than the air pump connection, so that the air pump always remains primed. An electric motor 11 is used to drive the pumps through a flexible gear connection 98 and is controlled by means of a float mechanism which actuates electromagnetic starters. The casing 240, Fig. 1, on the tank also contains a switch actuated by the air pressure in the tank. A separator casing 155 is carried by the tank and has dividing plates 160, 176 fixed as shown in Fig. 3. A channel 167 communicates between the chamber 161 and the tank 13 and is controlled by a float valve 170 to keep a constant level in the chamber

FIG. 1.

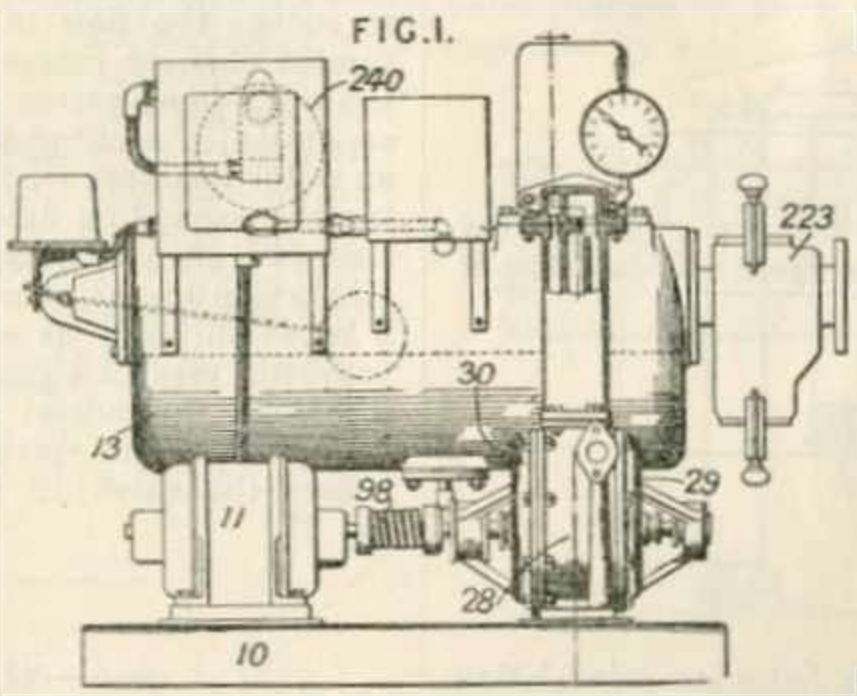
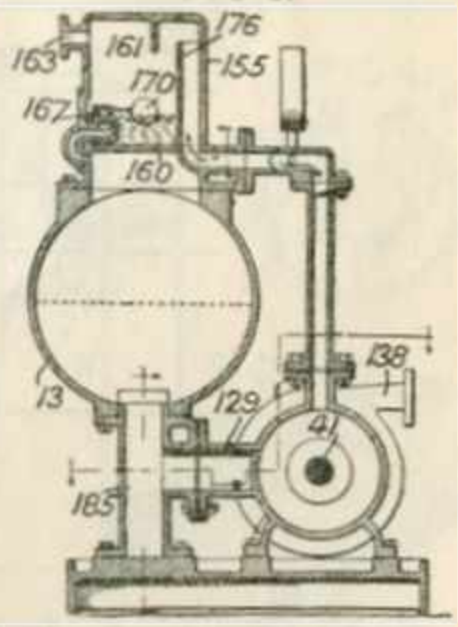
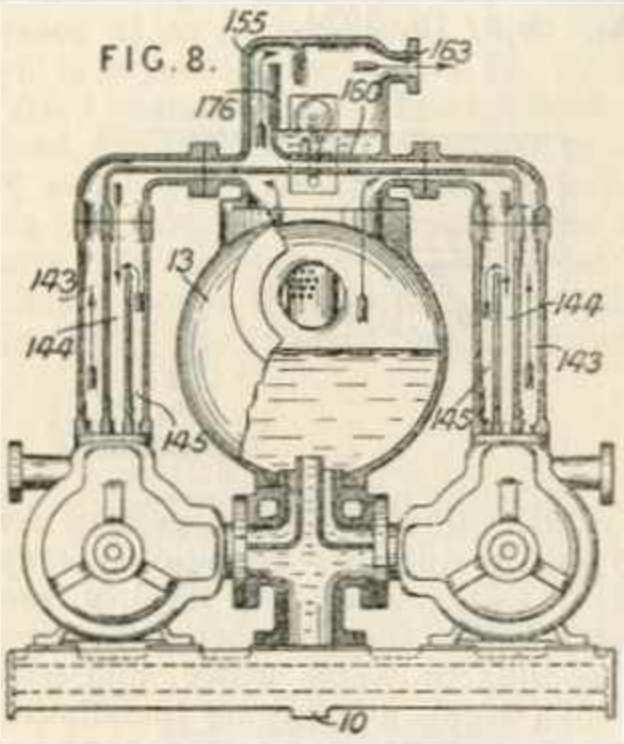


FIG. 3.



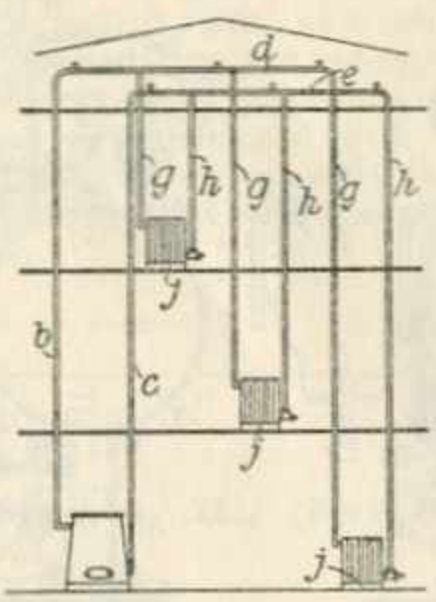
e air discharged from the pump passes through the pipes and chamber 161 and emerges from the outlet 163. The water from the tank 13 flows through the tubular support 185 and the pipe 129 to the suction side of the water pump from which it is conveyed to the discharge pipe

FIG. 8.



138. A double set of pumps may be used as shown in Fig. 8, and the ends of the manifolds can be closed by caps when the extra set is not required. Pumps of various sizes may be used, the manifold connections being all made to one size.

229,737. Row, S. S., and **Row, R.** Nov. 14, 1923.



Heating buildings.—In a hot-water circulation apparatus for heating buildings, the flow and return mains *b*, *c*, rise to the highest point of the building, and are continued horizontally at *d*, *e*. Each radiator or series of radiators *j* on each floor has service flow and return pipes *g*, *h* connected to it. The Provisional Specification describes also a combined regulating and drain cock in which a hollow ported cylindrical plug is rotated for regulating, and carries a seating for a lift valve controlled by a screwed plug in the end of the plug for draining purposes.

229,834. Schwartz, H. A. Jan. 24, 1924.

FIG. 1.

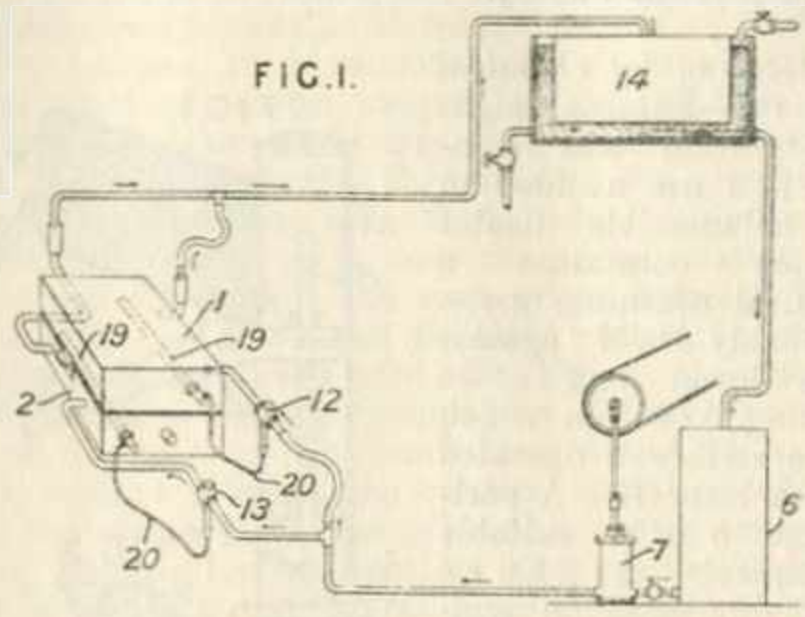
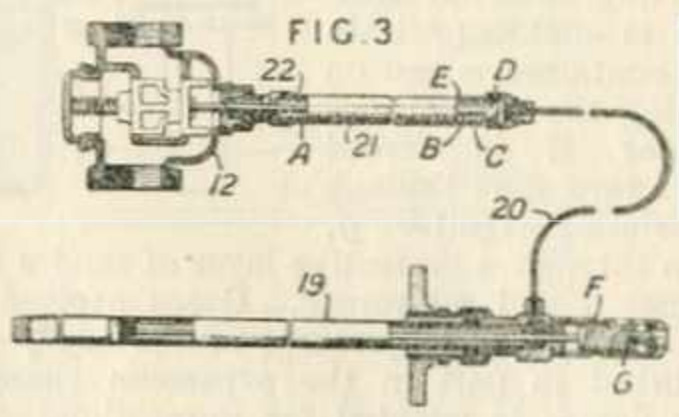


FIG. 3



Thermostats.—Thermostat control is employed to regulate the temperature of a mould used in casting metals, the flow of cooling fluid through the mould sections 1, 2 being controlled by valves 12, 13 which are actuated by means of thermostats 19, located in the mould. Thus when the temperature of the mould tends to rise as during the setting of the casting, the valves are actuated so as to increase the flow of the cooling medium, while as the temperature falls after ejection of the casting the valves are partially closed to reduce the flow of cooling fluid. Each thermostat element comprises a sealed casing A containing a loose piston D and an inner chamber B separated by a corrugated tube diaphragm E from an outer chamber C, the outer chambers containing the expanding fluid and being in communication with each other through a tube 20. The tube diaphragm of the thermostat 19, working against a relief spring F is adjustable by a screw G to vary the rate of expansion of the fluid, so that when the thermostat 19 attains a predetermined temperature the piston D in the member 21 causes the valve 12 to be opened through the rod 22.

230,090. Tagliabue Manufacturing Co., C. J., (Assignees of *Bast, F. J.*). March 1, 1924, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].

Thermostats.—Valve apparatus for controlling a series of operations in a plurality of tanks consists of a number of air-pressure-operated valves

and lever-cam devices actuated by clock-mechanism. The application to the pasteurization of milk is illustrated, the operation being such that when a cycle is completed in one tank, an intermediate point is reached in another, and the first step is occurring in another. The cycle with regard to the tank 10 is as follows:—The cam 27 is rotated by a clock 41, the lever 25, Fig. 4, is rocked about its pivot 26, a ball valve 19 is moved and air in a chamber of the inlet valve 13 is released. The tank 10 is thereupon filled with milk. Similarly a valve 15 is operated by a compound lever 31, 33, Fig. 3, to admit hot water to heating coils in the tank. The temperature is regulated by a thermostatic bulb 39 connected by a capillary tube 38 to a capsular spring 37 or like device, the lever 33 moving the air valve 22 according as more or less heat is required by the milk in the tank. The arrangement is such that both the filling of the tank and the heating to pasteurizing temperature require the same time, say 30 minutes. At the end of this time the cams allow the valves 13 and 15 to close. The outlet valve 17 is then opened by the action of a cam 30. The mechanism controlling the operations in the tanks 10^a and 10^b is similar.

FIG. 1.

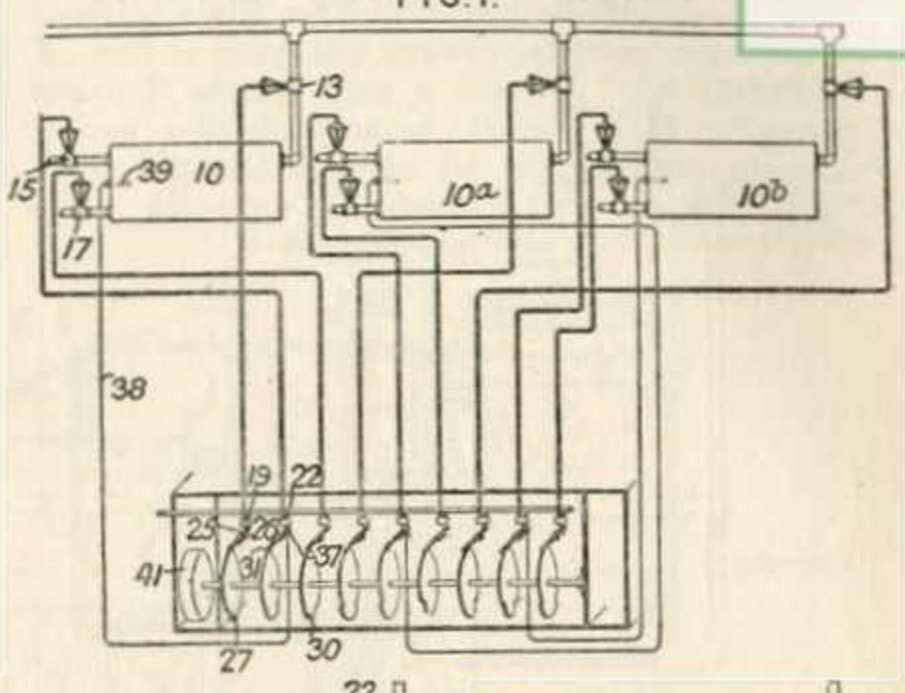


FIG. 3.

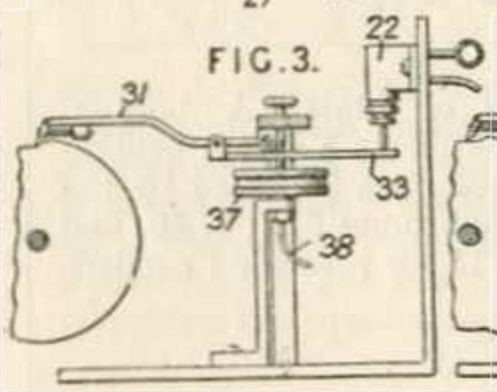
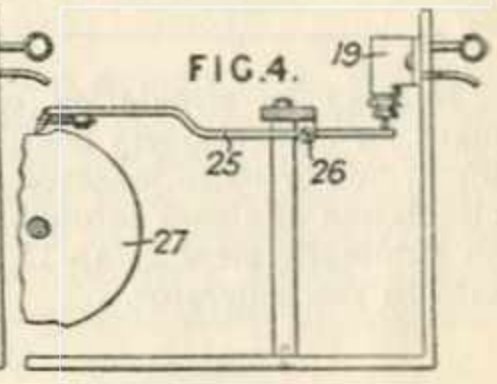


FIG. 4.



230,197. Johnson, S. Dec. 15, 1923.

Radiators. — A steam-heated radiator for ship's cabins or rooms comprises a central chamber C of oval section, to which steam is delivered by a nozzle B, connected at one end to a header D communicating with tubes E spaced round the central chamber and leading to a header F and the exit pipe for condensation water.

FIG. 1.

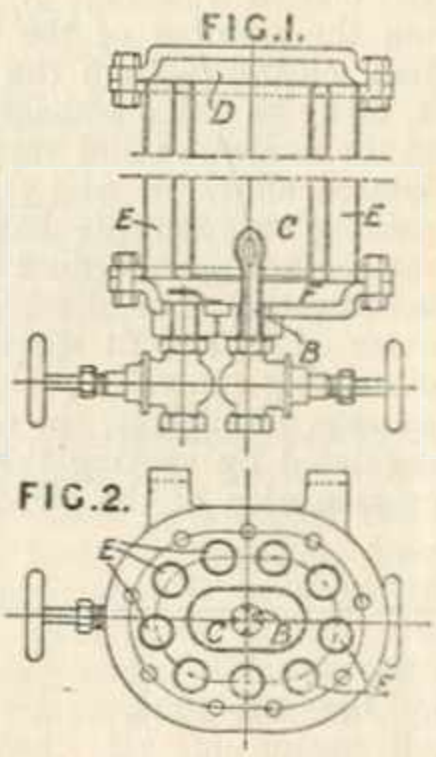


FIG. 2.

of being opened out so as to enable them to be placed on the pipe 1, and the plates 4 are provided with peripheral flanges 7 which engage over the ends of the sections 3 and maintain the same in a closed position. In order to retain the plates 4 in position, they may be provided with inner flanges 5 which bear against the pipe and are embraced by a tightening band 6, while the outer flanges 7 have upturned portions 7^a engageable by a clip. The abutting edges of each

FIG. 2.

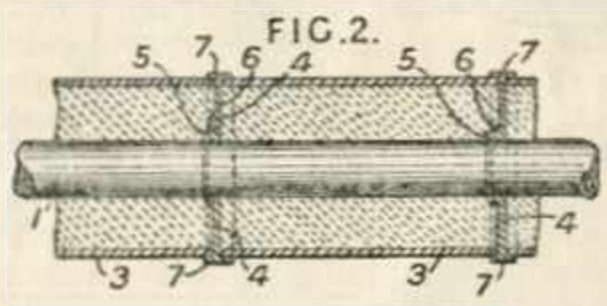
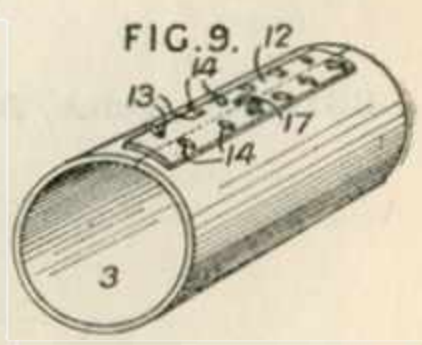


FIG. 4.

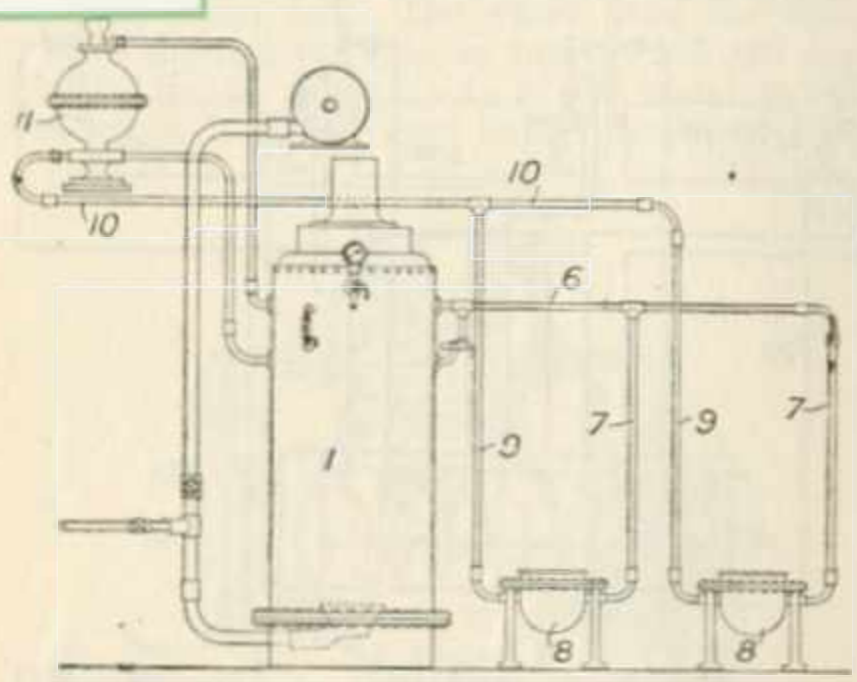
FIG. 9.



230,696. Nicholls, J. H. July 1, 1924.

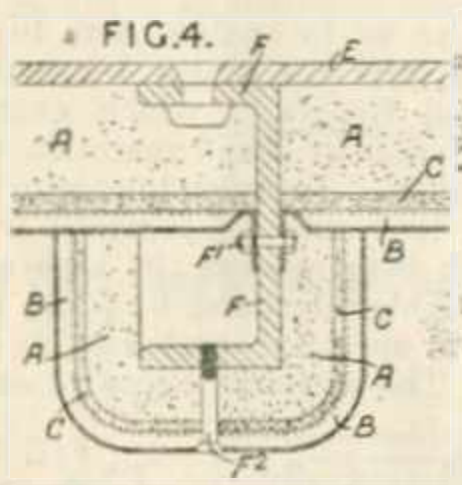
Non-conducting coverings for heat.—Relates to non-conducting coverings for steam and like pipes of the kind in which a casing is employed enclosing the insulating material and comprising a number of separate sections or compartments located end to end around the pipe and divided from each other by division plates encircling the pipe and to which the sections are connected. According to the invention, the short sections of casing 3 and the division plates 4, Figs. 2 and 4, are capable of the sections 3 may also be provided with similar upturned portions and a securing clip or, as shown in Fig. 9, the edges may be provided with upstanding wires 14 which are passed through holes 13 in a securing plate 12 and then bent over. Each section of the casing is preferably provided with a vent 17 fitted with a whistle or similar means whereby, in the event of a leak occurring, an alarm is sounded and the point of leakage indicated.

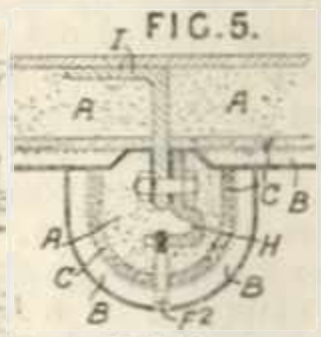
230,703. **Lloyd, J. C.** July 19, 1924.

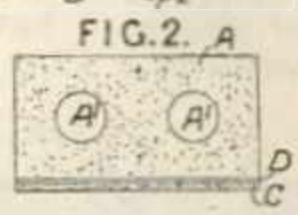


Heating by circulation of fluids.—A boiling-plant for confectionery comprises a steam generator 1, one or more jacketed pans 8 heated by the circulation of steam through pipes 6, 7, 9, 10, and an automatic steam trap 11 for returning condensate to the generator.

230,900. McEwan, J. L., and **McEwan, C.** Dec. 15, 1923.



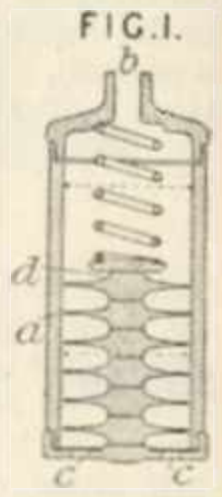




Non-conducting coverings for heat.—Thermal insulation slabs are made of silicate of cotton A, Fig. 2, faced up with a sheet of asbestos cement C with an interposed layer of asbestos board or millboard D. The slabs may be provided with suitable air cells A^1, and may be applied as lagging to pipes in which case they are made in semi-circular sections. The insulation is fixed to flat surfaces such as the deck of a ship, Fig. 4, by fittings B attached to the beams F by bolts F^1. The insulation surrounding the beam F is retained by strips B and bolts F^2. In the application of the insulation to bulkheads, a bracket H, Fig. 5, is bolted to the sectional material I and the cement sheets are held in position by bolts F^2.

231,504. Westinghouse Brake & Saxby Signal Co., Ltd., (Assignees of *Duchatel, E. E. H.*). March 26, 1924, [*Convention date*].

FIG.1.



Steam-traps.—A throttling-device for regulating the discharge from a steam-trap, but also applicable generally for regulating the flow of fluids, comprises a number of superposed discs *d* tapered towards their edges and having a slight clearance from a container *a* in which they are enclosed. These discs form a labyrinth which retards the release of fluid to outlets *c* from a passage *b*. By varying the number of the discs and their clearance from the container *a*, or by having a leakage groove in the lower part of the container and varying the number of discs located above it, as by means of a screwed rod passing through the base of the container, the rate of flow of the fluid may be regulated. In a modification, the discs are thickened at their outer edges and fit tightly in the container, each disc being centrally perforated to provide a small passage through it, the action of the device being regulated by varying the number of discs or the cross-section of the perforations.

231,611. Kiss, A. Ledacs-, and **Molnar, G.** Jan. 21, 1924.

FIG.1.

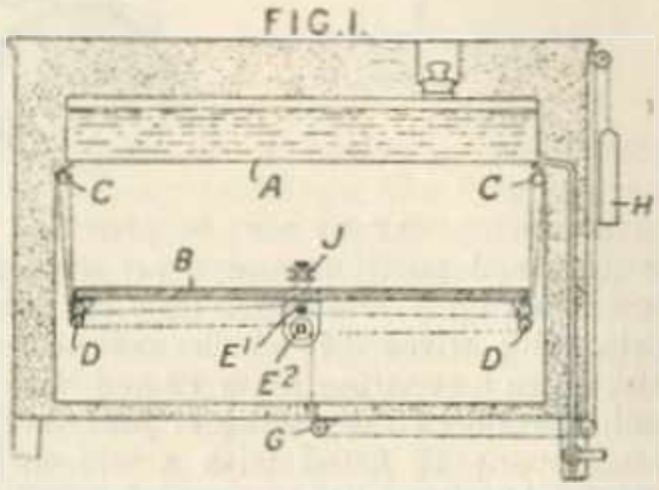
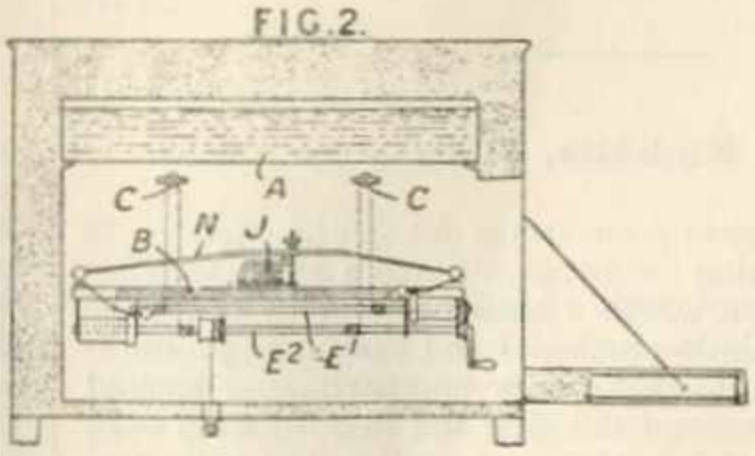


FIG.2.



Thermostats.—The temperature of the eggs in an incubator is regulated by movement of the egg tray towards or from a hot-water container, the movement being controlled by a thermostat.

In one form of the device the egg tray B is supported upon cords passing over pulleys C, D, Figs. 1 and 2, and wound upon spindles E^1, E^2. A weight H tends to raise the tray by means of a cord passing over pulleys G and wound on a drum upon the spindle E^2. Each spindle E^1, E^2 is geared to a speed regulator comprising centrifugal weights Z, Fig. 3, attached to flat springs to draw a sliding disc V into contact with a brake X, and is normally prevented from rotating by a brake P acting upon a disc W. A thermostat J moves a double-armed lever N that releases the brake on the spindle E^1 when the temperature rises, allowing the tray B to descend, and releases the spindle E^2 when the temperature falls, allowing the weight H to raise the tray. In another form the tray B is carried on wheels *b*, Fig. 5, gearing with vertical racks *a* and turned by worm gear e^1, e^2 from a spindle *e* that is actuated by a weight attached to a cord wound on a drum *r* and passing over pulleys G. A pinion *f*, Fig. 7, on the spindle *e* is slid into engagement with either of the rotary tappets g^2, g^3 that rotate in opposite directions when a brake is removed from the disc W of the speed regulator. The pinion *f* is slid by a lever connected to a thermostat, the lever having a double contact to release the brake on moving either up or down.

FIG. 5.

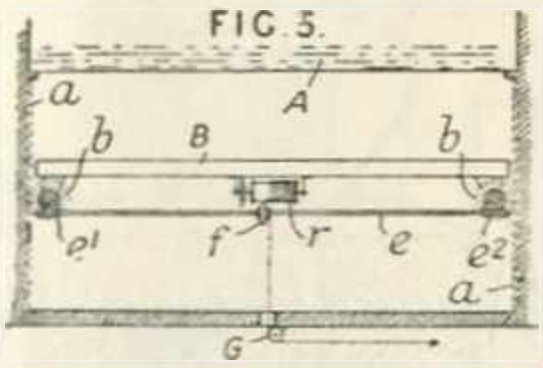


FIG. 3.

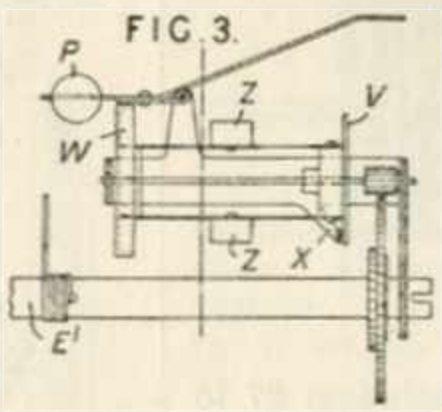
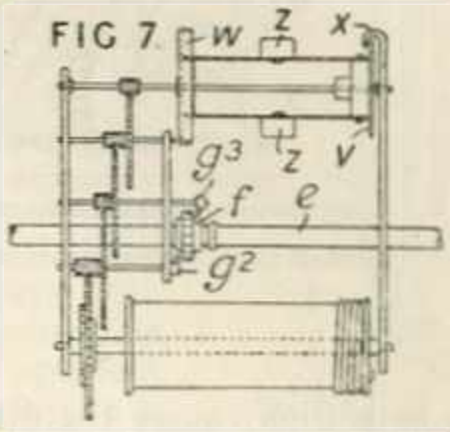
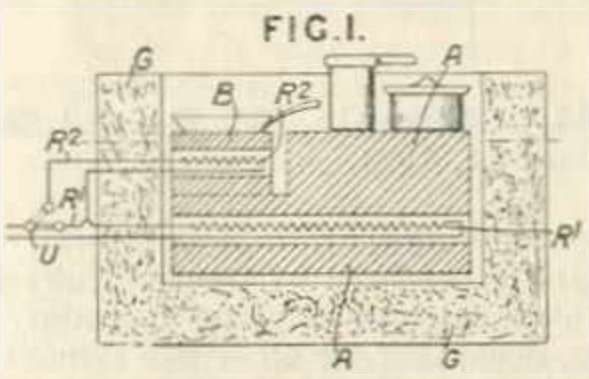


FIG. 7.



231,878. Sacerdote, S. April 2, 1924, [*Convention date*].

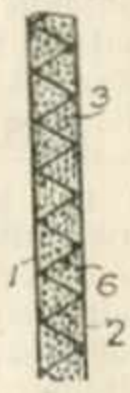
FIG. 1.



Heat-storing apparatus.—An electric heat-accumulator A for a cooking stove has one or more parts B capable of being raised to a higher temperature than the main body by bringing into circuit a supplementary resistance R^2 arranged in the said part or parts. The part B may be separate from the main body and of different composition, mechanism for varying the distance between them being provided. By this means the reciprocal heat transmission between them may be varied. The accumulator is surrounded by an insulating casing G and is heated by a resistance R^1. By means of a switch U either of the resistances may be energized.

231,892. Bagge, G. J. P. April 3, 1925.

FIG. 4.

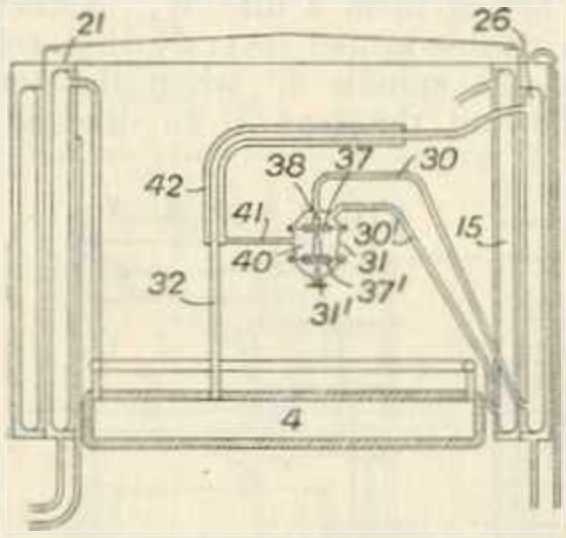


Non-conducting coverings for heat and sound. — Insulating boards or mats for use in buildings are made by placing sphagnum moss 3, alone or with other vegetable filling material, between outer layers 1, 2, of paper, felt or like fibrous material, which are secured together by sewing. The moss, impregnated, if desired, to resist fire or vermin, is prepared by dyeing, drying and carding. The outer layers may be impregnated. The lines of sewing may be curved or zig-zag so as to prevent settling and lumping of the filling-material when the board is placed vertically. One or more intermediate corrugated layers 6 of tar-board or impregnated paper may be provided. Tarpaulins and other covers may be made in this way, a cloth fabric being used for the outer layers.

231,998. Jauvert, P. M. March 6, 1924.

Thermostats.—The flow of refrigerant from the condenser 15 to the evaporator 26 of a compression refrigerating plant is regulated by a valve 38 actuated by a diaphragm 37 subjected to the pressure of a congealable medium such as salt water contained in a space 40 between the diaphragm 37 and a lower adjustable diaphragm 37^1 and in a pipe 41 and a jacket 42 surrounding the cold

turn pipe 32. When the returning vapour is abnormally cold the salt water congeals



and by its expansion causes the diaphragm 37 to close the valve.

232,172. Soc. Anon. Usines et Fonderies St. Roch. April 8, 1924, [*Convention date*].

Radiators.—In a radiator for heating buildings &c. of the kind in which each section has several vertical columns, the openings e^1, e^2 leading to the columns are varied in size according to the distance of the columns from the inlet *c* or outlet, the openings being greatest at the greatest distance from the inlet or outlet. The end columns *a* are preferably made of triangular, oval, parabolic or other section giving a relatively large radiating surface, while the inner columns *b* are of smaller cross-section, preferably circular, and provided with radiating ribs *f*.

FIG. 3.

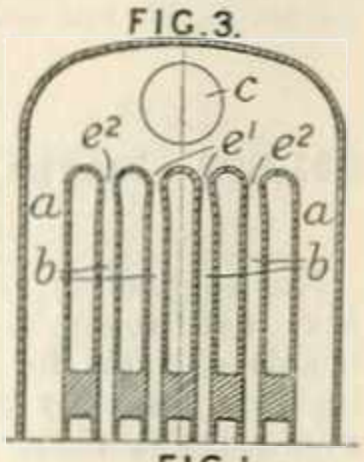


FIG. 1.

232,205. Metropolitan-Vickers Electrical Co., Ltd., (Assignees of *Vaughan, V. G.*). April 8, 1924, [*Convention date*].

Thermostats. — A thermostatic device for making and breaking the circuit of an electrically-heated appliance, particularly a hand-iron, when the temperature falls below or rises above a predetermined value, comprises a disc 53 carrying three contacts 73, insulated from the disc and from one another. The disc is mechanically secured to the heating element 32 by a stud 76 screwing into a tubular member 75, and the contacts 73 bridge the gaps between conducting segments 57 - - 60 mounted on a mica disc 56, the resistance wire of the heating unit being brought to terminals on two of the

FIG. 4.

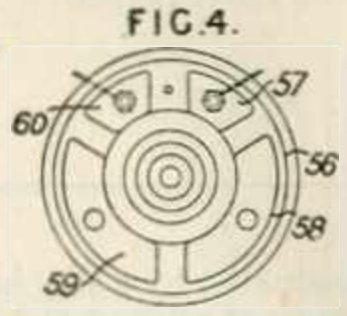


FIG. 1.

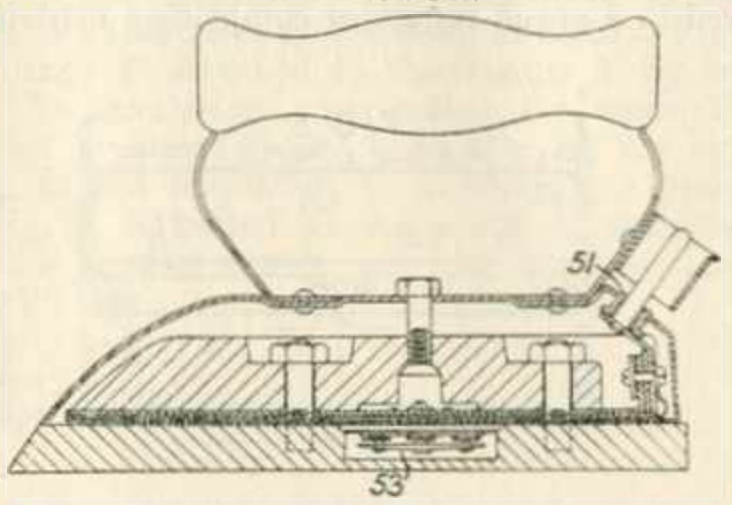
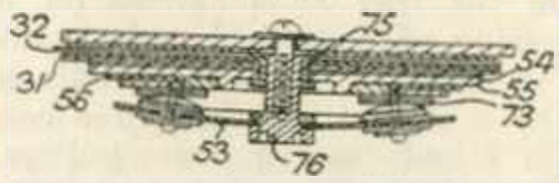


FIG. 3.



segments 57, 60. The mica disc is carried by a disc 55 which is carried by another disc 54 secured between the lower thin metal plate 31 of the heating unit and a flange on the tubular member 75.

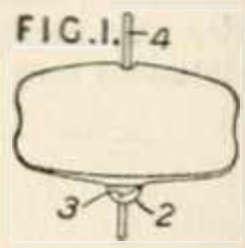
232,341. Semple, W. B., and **Garland, J.** Jan. 21, 1924.

Non-conducting coverings for heat; fireproof coverings are prepared by treating fully hydrated, precipitated calcium sulphate in water, and evaporating, decanting, or otherwise removing excess water to leave a plastic spongy mass. The heating may be done under pressure. The material may be used at once, or it may be dried and granulated, and rendered plastic with water when required. Other substances may be added to the calcium sulphate.

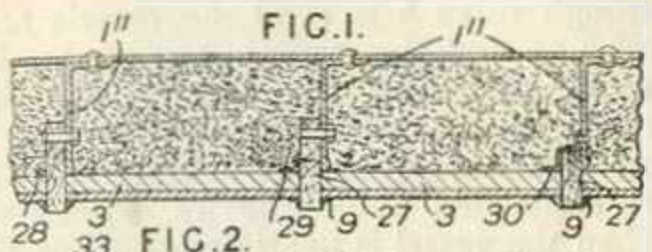
232,359. Tombs, J. Feb. 4, 1924.

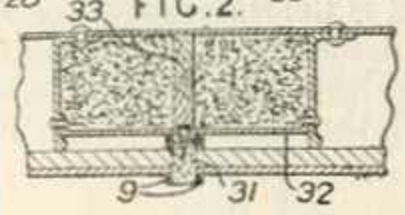
Steam traps. — In a steam trap of the float type, hammering of the valve as it falls back on its seat is eliminated by somewhat reducing the suction beneath the valve. This is effected by forming the valve portion 2 with a fine saw cut 3. Where steam under higher pressure is being dealt with, the saw cut may be supplemented by forming the valve spindle 4 passing through the float with a fine bore. Specification 11276/06 is referred to.

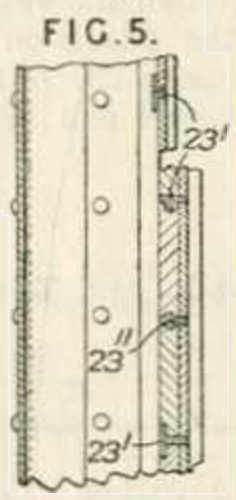
FIG. 1.



232,385. Thomson, E. A. March 7, 1924. *Addition to* 224,716.

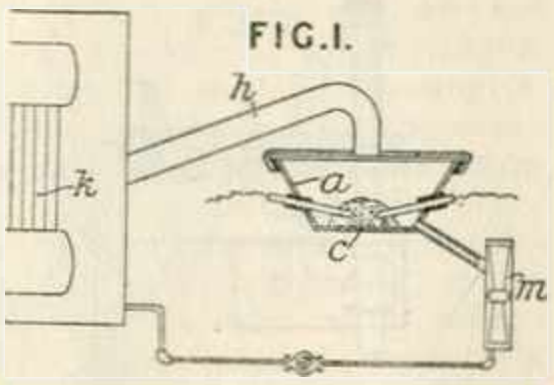






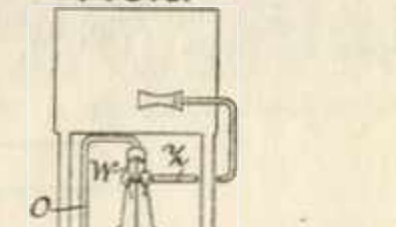
Non-conducting coverings for heat.—The wood studding or grounds 27 supporting removable panel linings 3 as described in the parent Specification are ungrooved, and have attached to them separate stop-pieces such as wood blocks 28 or angle members 29 against which the edges of the panels abut. With this arrangement grounds of smaller dimensions may be used. On one edge the panels may rest against the bulbs of the bulb-iron frames 1^{11} to which the grounds are secured. The grounds may be secured by Z-iron members 30 attached to the frames, in which case one flange of the Z-iron member may form the abutment for the panel. Where panels of moderate strength only are used, the ground 31, Fig. 2, may be supported by a strap 32 extending from one beam to another. A block 33 may be arranged behind the ground 31. The panels may be retained by fillets or cappings 9 secured to the projecting parts of the grounds, or by air space battens having their ends sunk into and secured to the grounds. The transverse edges of the panels may be connected by a reinforcing strip 23^{1}, 23^{11}, Fig. 5. Such strips may be of **T**- or **X**-section and recessed into grooved edges of the panels, or may be united to the edges of the panels before assembly by bitumen. The ends of these strips are preferably secured to the grounds.

232,554. Brand, C. April 15, 1924, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].



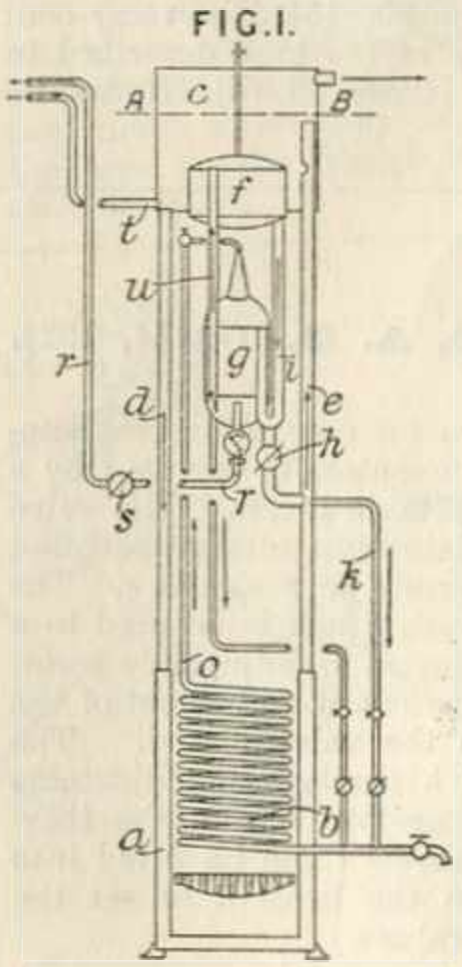
Heating by chemical action.—When titanium compounds such as titaniferous sands are heated to a temperature above 1700° C., it is stated that a large emission of heat due to atomic disintegration takes place. The heating of the material *c* may be effected in an electric furnace *a*, and the heat evolved is taken up by a current of air forced in by a fan *m*. The air may pass through a pipe *h* to a boiler *k*.

232,833. Rasmussen, R. Aug. 1, 1924.



Thermostats.—In an electrically-heated steam vulcanizer the current is controlled by a switch operated by a coil spring, one end of which is connected to the switch-arm, and the other to a pressure-controlled lever adapted to move the end of the spring from one side to the other of the pivot of the switch-arm. A spring *p* is connected at one end to a switch-arm *k* pivoted at *j*, and at the other end to a lever *h*, also pivoted at *j*. The lever *h* is adjustably connected through links *g*, *d*, *c*, with a Bourdon tube *b* mounted on the boiler *a*. On the pressure rising, the lower end of the spring is moved past the dead centre *j*, and opens the switch. In a modification, the Bourdon tube is replaced by a diaphragm which operates the spring directly through a bell-crank lever.

232,994. Pamart, L. E. April 28, 1925.



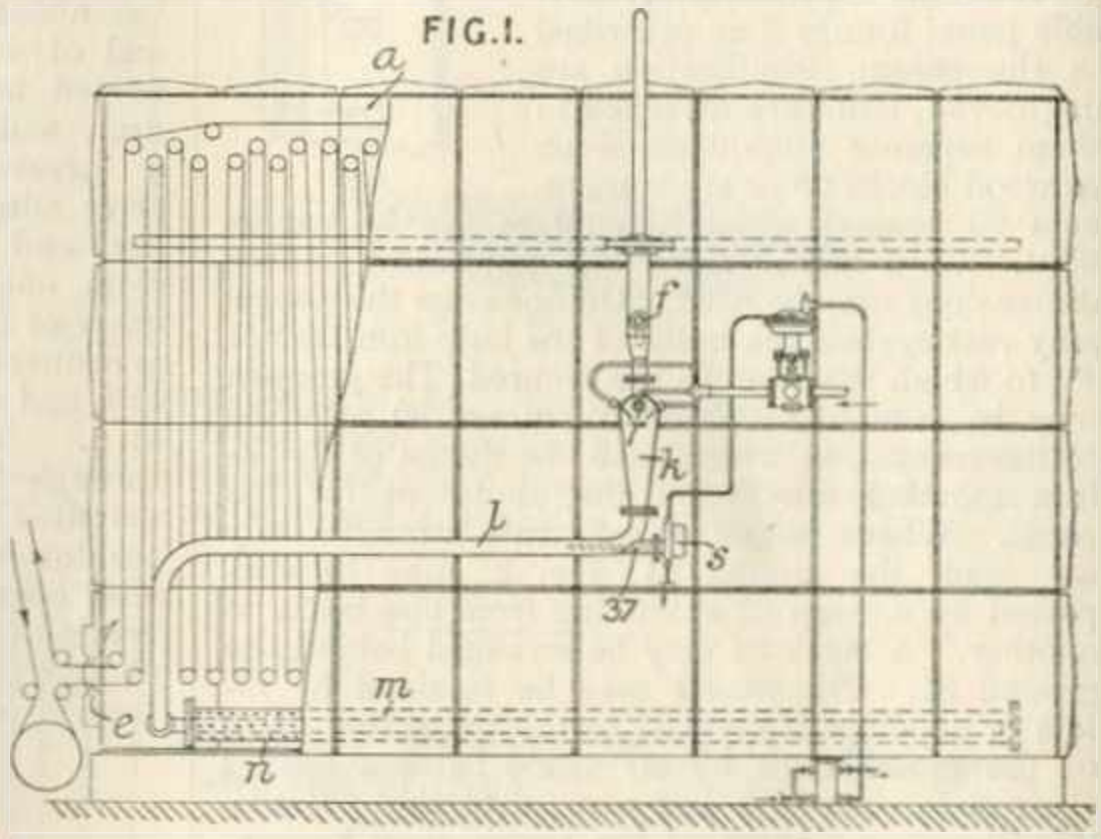
Heating buildings.—Water is circulated through a heating system in pulsations by means of steam produced in the auxiliary boiler supplied intermittently with water. The boiler comprises a water space *a* and coil *b*. The space *a* is connected by pipes *d*, *e* to an expansion

space *c*, and the coil *b* is connected by a pipe *o* to a "pulsator" *g*. Another pulsator *f* is connected to the pulsator *g* by a pipe *i*, and to the pipe *e* through a non-return valve *h*. The pipe *e* and coil *b* are connected by a pipe *k*. Water is supplied to the radiators through a pipe *r* having a valve *s* which allows the passage of water in the direction of the arrow, but not of steam. When the apparatus is full of water to the level AB, steam is generated in the coil *b* and passes into the upper end of the vessel *g*, forcing the water through the pipe *r* to the radiators and back through the pipe *t* to the chamber *c*. When the water in vessel *g* uncovers the pipe *u*, steam passes into the vessel *f* and forces some water into the vessel *g*, which condenses the steam. The reduced pressure draws water from the chamber *c* through valve *h* to refill the vessels *f*, *g*, and also coil *b* so that the cycle is repeated. In a modification, the coil *b* may be fed from the vessel *g*, and in another modification, Fig. 3, the supply and discharge of steam to and from the vessel *g* are controlled automatically by a float valve *w*. When the vessel is nearly empty, the float *x* closes the admision of steam through the pipe *o* and opens the outlet through the pipe *z*, so that the vessel can refill through the pipe i^1.

233,030. British Arca Regulators, Ltd., and **Lindsay, T.** Jan. 29, 1924.

Thermostats. — In processes in which live steam is used for effecting a chemical reaction such as for developing the colour of textiles, paper, &c., the moisture content of the steam is kept constant by circulation of the steam and by supplying automatically the amount of moisture required. Fig. 1 shows apparatus for carrying out the process. The material enters the chamber *a* through air-excluding flaps *c* and passes over a series of rollers. Live steam is introduced through a pipe *f* and, by injector action, withdraws steam from a pipe leading to the upper part of the chamber and forces it through a chamber *k* where it is supplied with water from jets *r*, and thence through a pipe *l* connected with a perforated pipe *m* in the chamber *a*. The moist steam from the mixing chamber *k* passes in contact with a bimetallic part 37 of a thermo-relay *s* of the kind described in Specification 206,154. The relay controls a regulating device of the kind described in Specifications 116,074, [*Class* 69 (ii), Hydraulic presses &c.], and 218,370, for the supply of water to the jets in accordance with the temperature of the steam. Instead of supplying moist steam, steam at any desired degree of superheat may be used.

FIG. 1.



233,229. Macefield, A. G. Oct. 4, 1924.

Thermostats.—A valve for controlling the supply of gas for heating incubators is operated by a thermostat through adjustable levers. The valve comprises a tube *a* containing a rotary apertured plug *b* mounted transversely in a sleeve *e*. The plug passes through a bush *g* and is secured to a lever *h*. The frame *n* carries an adjustable screw *k* adapted to limit the downward movement of the lever *h*, or to maintain the valve closed. The outer end of the lever *h* carries an adjustable screw *l* resting on a projection *i* from the thermostatic lever *x*. The screw *l* can be fitted into any one of the holes in the lever *h* to set the device to a given temperature.

FIG. 2.

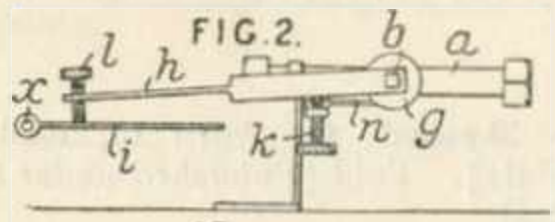
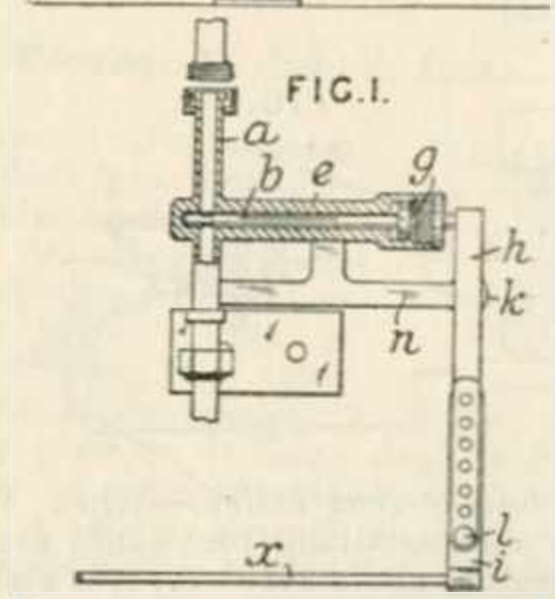
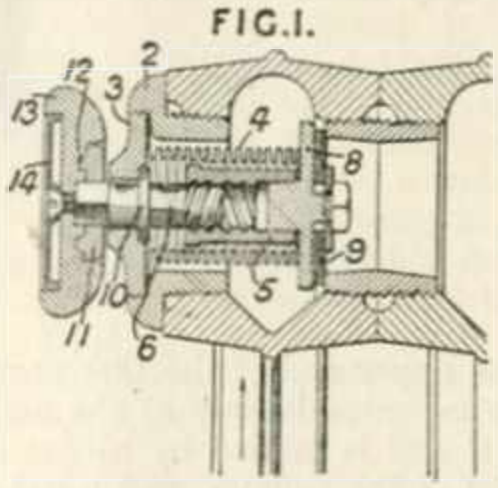


FIG. 1.



233,306. Compagnie Nationale des Radiateurs. April 29, 1924, [*Convention date*].

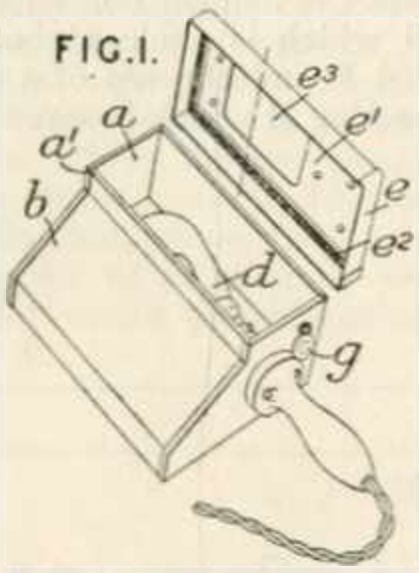
FIG.I.



Radiators.—A valve device for use on steam or hot water radiators is housed in the first section of the radiator and has a lift valve member adapted to close the upper connecting [illegible] connecting the first and second sections. The valve member 8 has a packing washer 9 and is secured to a nut 5 engaging a square threaded spindle 6 rotatably mounted in a plate 3 screwed in a member 2 itself screwed into the radiator. The plate 3 also secures a flange on a corrugated brass bellows 4 which is connected at its other end to the valve member to prevent leakage. The spindle 6 has a shoulder 10 bearing against the plate 3 and has a squared part adapted to engage a metal washer 11 having lugs 12 embedded in the handle 13. The handle is secured in position by a central screw which also holds an instruction tablet 14 in place. In a modification a larger plate 11 has a square part engaging the handle. The external parts of the valve are rounded to prevent the lodgment of dirt.

233,383. Jones, B. Aug. 28, 1924.

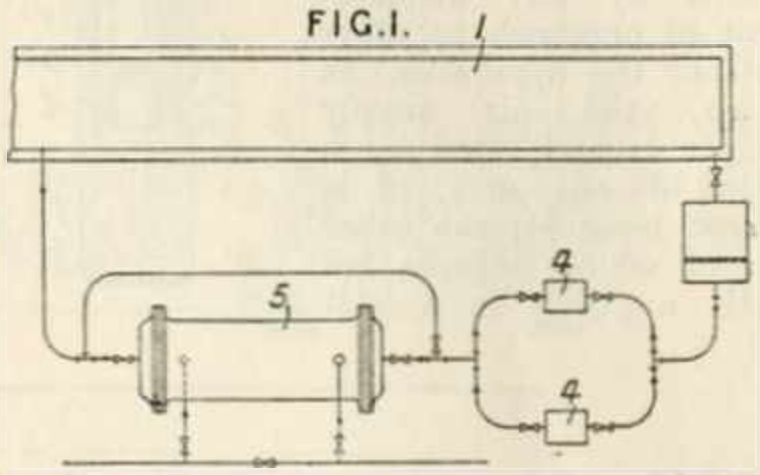
FIG.I.



Bed warmers and airers.—In a heating device particularly for use as a bed-warmer, or for preserving billiard tables and musical instruments, of the type comprising a substantially airtight metal container *a* having a detachable lid *e* and containing an electric lamp *d*, the container has a flat base and an integral or rigid surface *b* inclined thereto so that the heat is radiated upwardly and outwardly, and the lid is arranged parallel to the lamp or lamps to cover an opening through which the latter may be introduced. The container may be provided with a rectangular upstanding part a^1 for engaging the lid which is preferably fitted with a mica window e^3 and asbestos packing e^2 arranged between the lid proper and a false lid e^1. The container is also provided with a handle arranged coaxially with the lamp and a valve device *g*.

233,485. Bennis, A. W. March 15, 1924.

FIG.I.



Heating systems and apparatus.—Water in conveyer troughs 1 and like apparatus receiving hot ashes, coke &c. for quenching, flows through a circulating system including a heat-exchanger 5 prior to its return to the conveyer trough. The heat-exchanger may take the form of radiators for heating buildings, or a heater for boiler-feed or other water. In modifications the medium to be heated may flow through pipes arranged at the bottom or sides of the trough or through jackets surrounding the trough. Pumps 4 for circulating the trough-water may be controlled according to the level in the trough by a suitable float-operated device.

233,573. Helio Dynamo Co., Ltd., and **Marcuse, A.** Aug. 5, 1924.

Solar heat, utilizing.—In an apparatus for utilizing solar heat for heating purposes, the rays of the sun are reflected from a mirror 1, which follows the movements of the sun, through a lens 2 into a receptacle 3 having a reflecting interior surface, so that some of the rays fall direct upon the heating-tubes 6, through which the substance to be heated is passed, while other rays fall thereon after reflection. The lens or lenses 2, receptacle 3 and tubes 6 are preferably cylindrical, and the tubes 6 may themselves constitute a boiler, or they may serve as a heater for the feed-water to a

FIG.I.

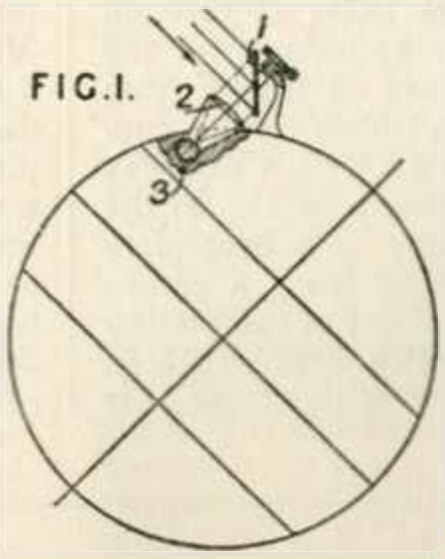
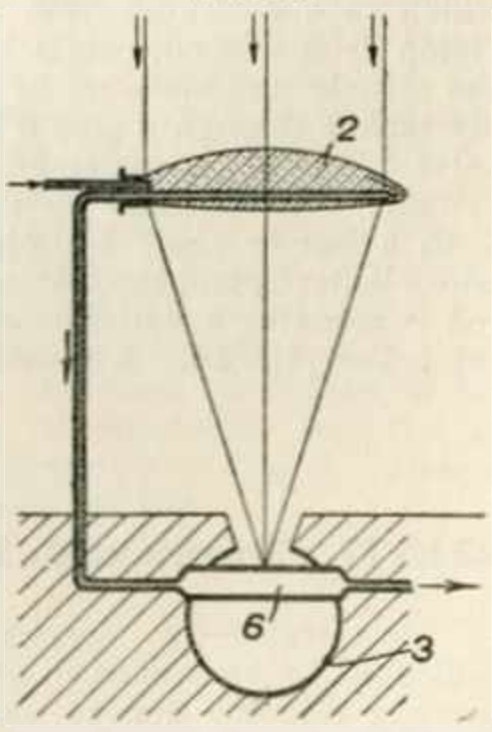


FIG.6.

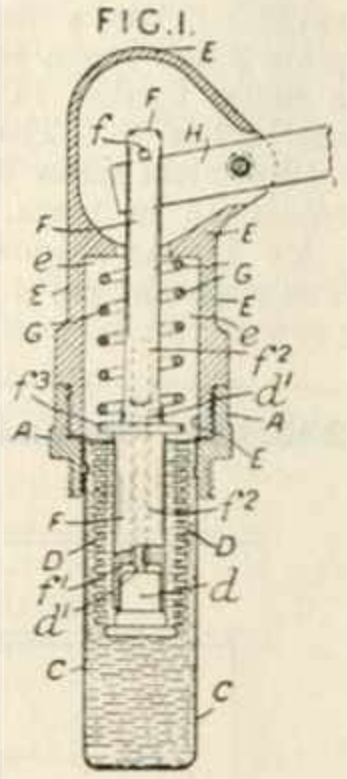


boiler, in which case they are preferably inclined to the horizontal so as to create a thermo-siphonic flow. In a modification, Fig. 6, the liquid to be heated is heated previously to entering the tubes 6 by circulation through conduits in the lens 2, which is thereby simultaneously cooled.

233,589. Case, W. G. Sept. 20, 1924.

Thermostats. — In a boiler furnace, of the kind in which the air supply damper is controlled by a thermostat immersed in the water of the boiler, the rod of the thermostat is independent both of the bellows of the capsule and of the lever connected to the damper, this arrangement preventing damage to the capsule by any displacement of or shock to other parts of the apparatus. As shown, the air supply damper is connected by a chain to one arm of a pivoted lever H, the other arm of which engages beneath a pin *f* in a slot

FIG. 1.

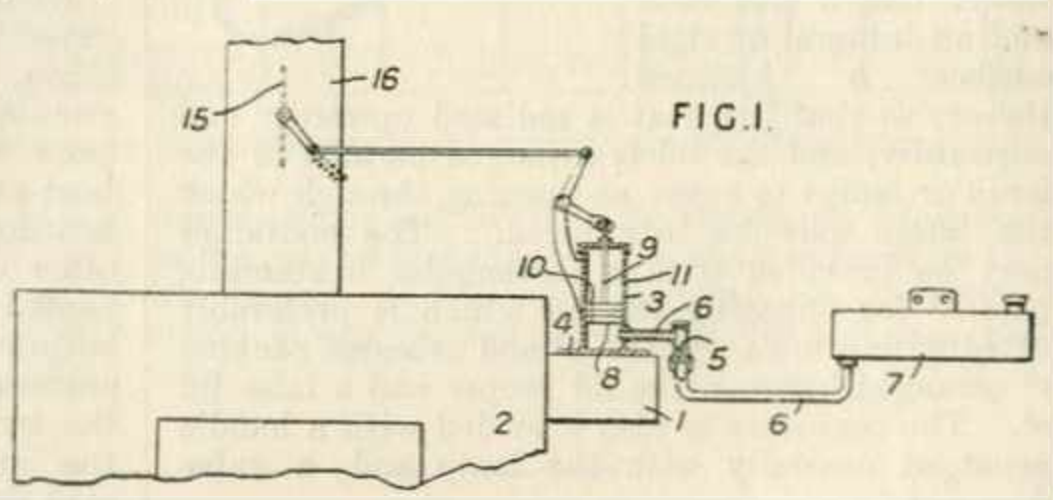


formed in the upper end of the thermostat rod F. The latter is mounted loosely in the bellows O of the capsule C and is guided by a boss *d*, formed on the bottom of the bellows, and a rod d^1, which engage in bores f^1, f^2, respectively. In operation, on contraction of the bellows D, the rod F is raised and allows the damper to move, by its own weight, towards the closed position; on fall of temperature, the rod F is moved downwardly, and the damper consequently opened, by a spring G which is enclosed between a flange f^3 on the rod F and the top of a chamber *e* formed in the casting E which is screwed to the fixing ring A.

233,846. Murgatroyd, G. F. April 5, 1924.

Thermostats.—Relates to automatic temperature-regulating apparatus for use in connection with boilers, heating-systems, furnaces, vulcanizers &c. of the kind in which a liquid-containing vessel or cylinder 3, Fig. 1, is fitted with a piston 8, the displacement of which by the expansion or evaporation of the liquid when the desired temperature is attained actuates a valve, damper or other element controlling the supply of heat. According to the invention, the piston 8 is provided with a restricted vapour outlet 10 and the cylinder 3 with pressure-release holes 11 through which vapour escapes from the cylinder after the piston is displaced, while losses of liquid from the cylinder are made up by an inflow from a supply tank 7 through a pipe 6 fitted with a one-way valve 5. In the arrangement shown in Fig. 1, the cylinder 3 is mounted by means of a base-plate 4 on a bar or shelf 1 projecting from a greenhouse boiler 2, and the displacement of the piston-rod 9 actuates a spring-controlled damper 15 in the boiler pipe 16. A greater heating-surface for

FIG. 1.



the liquid in the cylinder 3 may be obtained by forming the latter with a large flat hollow base. Modifications are described in which the cylinder 3 and the valve or damper are disposed in a conduit conveying steam or hot gases for heating purposes, in which the piston-rod directly controls a valve in a steam or liquid-fuel feed-pipe, and in which the piston-rod is fitted with a head adapted to compress a flexible tube conveying steam or liquid fuel. In a further modification, two cylinders are employed having their pistons rigidly connected together.

234,177. Burdick, C. L. Feb. 21, 1924.

Thermostats.—In mechanism automatically controlled by variations in an expanding and contracting element due to variations in heat or humidity, a multiplicity of expanding and contracting elements are combined with an arrangement of one or more levers designed to multiply the combined movement of the variable elements for the operation of valves for compressed air or

gas, and mechanism operated by the compressed air or gas is arranged to control supply valves or do other work. The variable elements 5, 5^a may be pieces of metal, vulcanized rubber, cotton threads, or other material which will vary in length or position with heat or moisture and are connected to levers 4, 4^a which multiply their combined movement to move a rod 13^a pivoted to a bar 9 controlled by a spring 10. The bar 9 is provided with four adjustable set-screws 22, 22^a, two of which are adapted to contact with two valve spindles, in each valve chest 2^a or 2 according to the contraction or expansion of the elements 5, 5^a the normal position of the bar 9 being controlled by an adjusting screw 8 and slider 6. Compressed air or gas is admitted to one valve in each chest by tubes 16, 16^a, 16^b, the other valve in each chest communicating with the atmosphere through an outlet 17, 17^a. Tubes 18, 19 connect the opposite ends of a pneumatic cylinder with a pressure and exhaust valve in opposing valve chests so that an upward or downward movement of the bar 9 due to expansion or contraction of the elements 5, 5^a opens one pair of valves to admit pressure to one side of the piston and to exhaust the other, the movement of the piston operating a valve, switch, belt or like means. In a modification, more than two levers may be employed, the adjustment by the screw 8 being at the point where the expanding material contacts the bar 9.

FIG. 1.

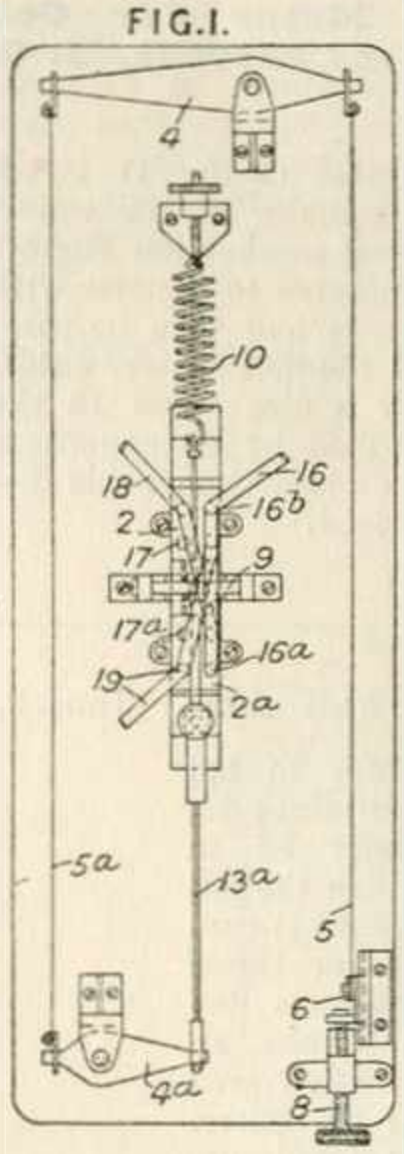
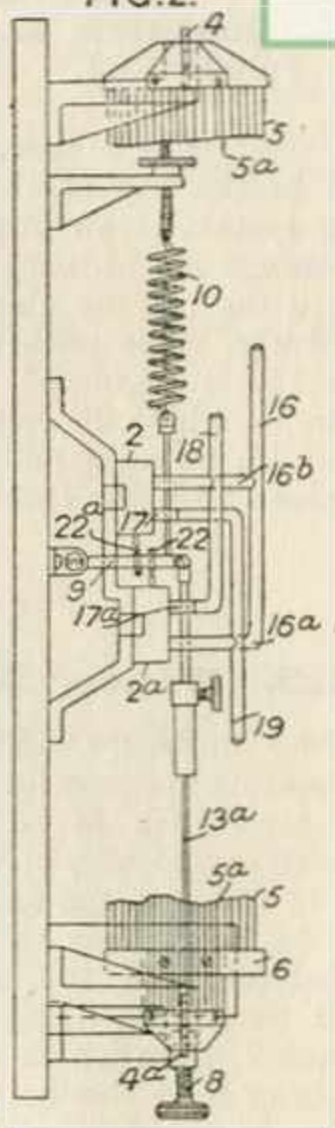
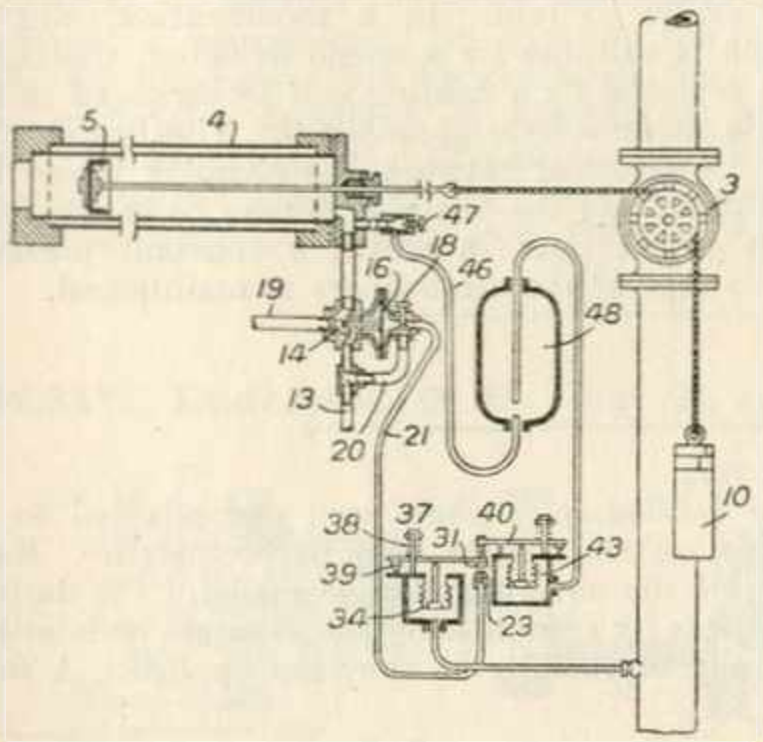


FIG. 2.



234,194. British Arca Regulators, Ltd., and **Lindsay, T.** Feb. 28, 1924.

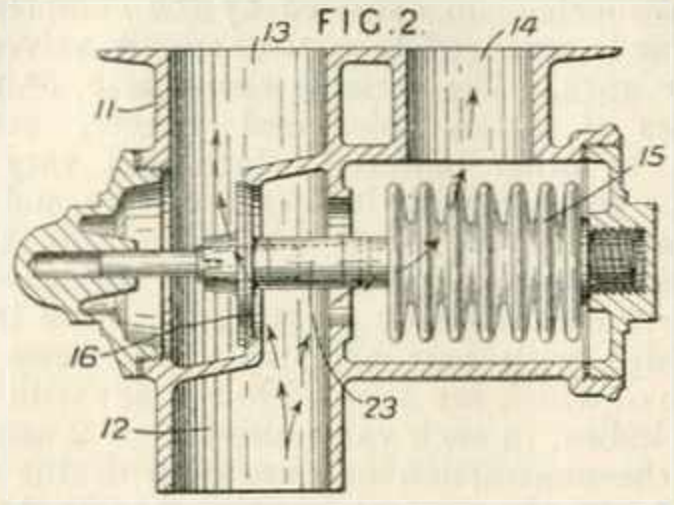


Thermostats.—A device applicable for controlling temperature and of the type in which variations of the pressure of a non-compressible fluid continuously passing through a discharge aperture are used for controlling the operation of the device, is provided with means for producing and transmitting by said non-compressible fluid a compensating impulse adapted instantaneously to check the tendency of the apparatus to over- or under-regulate. The Figure shows the application of the invention to the control of pressure in a steam pipe. The main valve 3 is opened against the action of a counterweight 10 by fluid pressure acting on a piston. Pressure is admitted to or exhausted from the cylinder through pipes 13, 19 under the control of a double-seated valve 14 itself actuated by a spring-loaded diaphragm 16. Pressure fluid is admitted to the diaphragm chamber through a pipe 20 and needle valve 18, and is exhausted through a pipe 21 and discharge orifice 23. The rate of discharge from the orifice 23 is controlled by a cup 31 mounted on a lever 37 with knife-edge pivots 39 and actuated by steam pipe pressure acting on a bellows 34 against the action of a spring 38. The lever 37 is elastically connected to a second spring-loaded lever 40 actuated by a bellows 43 subject to the pressure in an air vessel 48. The lower part of the air vessel is connected by a conduit 46 controlled by a needle valve 47 to the power cylinder so that when the pressure is increased or decreased in the power cylinder a corresponding impulse is transmitted to the bellows 43 tending to restore the cup 31 to its original position.

234,307. **Sunbeam Motor Car Co., Ltd., Coatalen, L.,** and **Stevens, H. C. M.** July 2, 1924.

Thermostats.—A thermostat casing 11 is attached to the top of the radiator of the water-cooling system of an internal-combustion engine, the openings 13, 14 being adapted to register with inlets to the cooling elements and to a by-pass, respectively. The path of the hot water, entering at 12, is regulated by a disc valve 16 the position of which is controlled by an expansion member 15, an adjustable or interchangeable distance-piece 23 being interposed.

FIG. 2.



234,318. Woude, D. van der. June 3, 1924, [*Convention date*].

Heating buildings.—Relates to hot water heating-systems for buildings &c. of the kind such as is described in Specification 156,829, in which the admision of water to the radiators is controlled by adjustable valves or throttling devices, and the water is discharged by a return pipe 6 into an open tank 7, from which it is delivered by a pump 8 to the boiler or heater. In order to avoid constant manipulation or adjustment of the throttling devices as the supply pressure varies, the water, before entering the radiators 4, is conducted into one or more intermediate chambers 9 at a high level in which an approximately constant pressure is maintained. In the arrangement shown in Fig. 1, which is suitable for a system including a large number of radiators, several intermediate chambers 9 are provided, each of which is open to the atmosphere and the level of water therein controlled by a float valve 10, while the supply of water to the radiators is controlled by valves 12 arranged in the outlet pipes from the radiators. Additional valves 13, 14, 15, 16 are provided for placing out of operation or draining individual radiators or the entire system. In a modification, Fig. 2, which is suitable for a single dwelling, the boiler 1 is replaced by a heating coil 18 arranged in the single intermediate chamber 3. The heater may also be arranged between the chamber 9 and the radiators, and the chamber 9 may be in the form of a closed tank in which a constant pressure above that of the atmosphere is maintained.

FIG. 1.

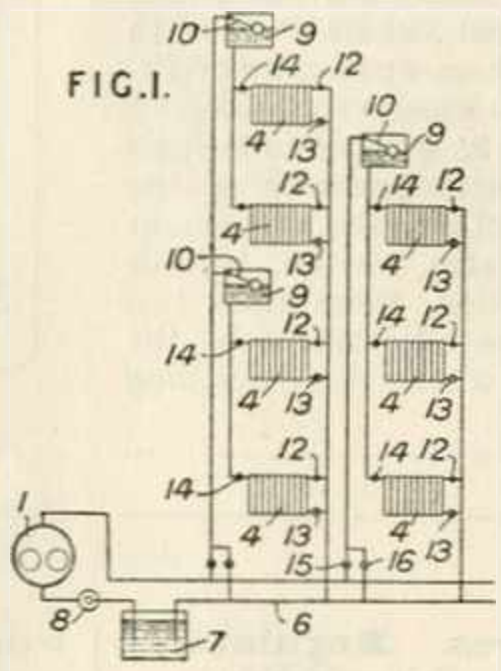
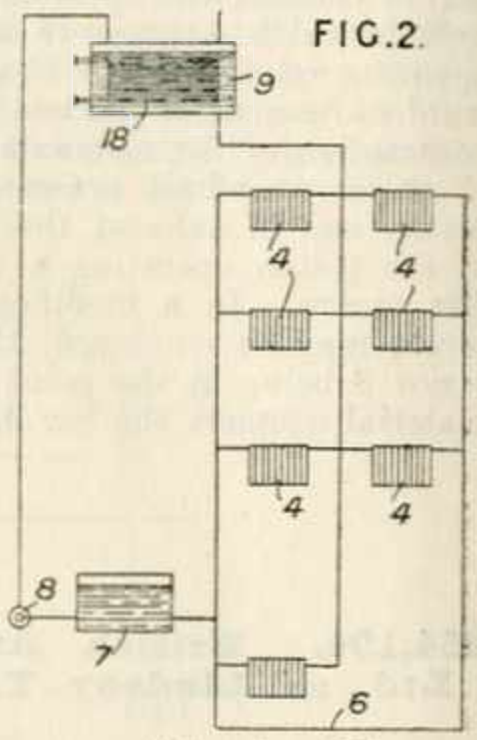


FIG. 2.



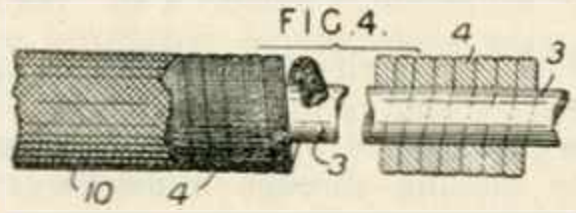
234,364. Humm, R. W. Oct. 20, 1924. *Drawings to Specification. No Patent granted (Sealing fee not paid).*

Non-conducting coverings for heat.—A hot-water tank may be heat-insulated by means of cow-hair packing in a surrounding casing.

234,447. Kristalco Glasfaser Verwertungs Ges. May 26, 1924, [*Convention date*]. *Sample furnished.*

Non-conducting coverings.—A heat-insulating covering for pipes or the like consists of a deformable tube of loosely woven or knitted fabric or wire 4 filled with glass wool and adapted to be wound on the article 3 to be protected. Each layer of the covering may be made of the desired thickness by compressing the separate coils either laterally or radially as they are applied. A final layer 10 of gypsum, jute bandages, or a sheet-metal covering may be applied to give a smooth finish. When the deformable tube is made of metallic wire, the latter is arranged with its flat face at right-angles to the length of the tube so as to reduce the heat conductivity of the tube.

FIG. 4.

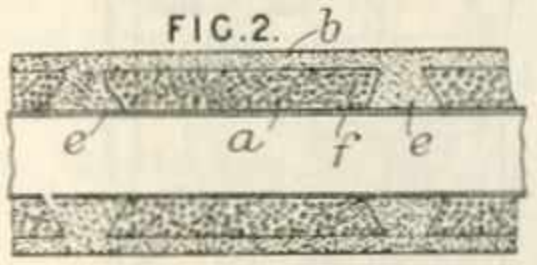


234,507. Caliqua Wärmeges. May 22, 1924, [*Convention date*]. *Drawings to Specification.*

Heating by circulation of fluids.—A hot-water heating system comprises a large capacity boiler capable of heating the water up to 200° C., the steam space of which serves as an expansion chamber. The various units of heat consumption are connected up as sectional parts of a closed system of circulation pipes which open below the normal water level in the boiler, the delivery pipe opening slightly above and the return pipe much below the minimum water level. The hot-water circulates by gravitation without the aid of a force pump, while subjected to the steam pressure prevailing in the boiler.

234,535. Bohlander, H. Jan. 29, 1924.

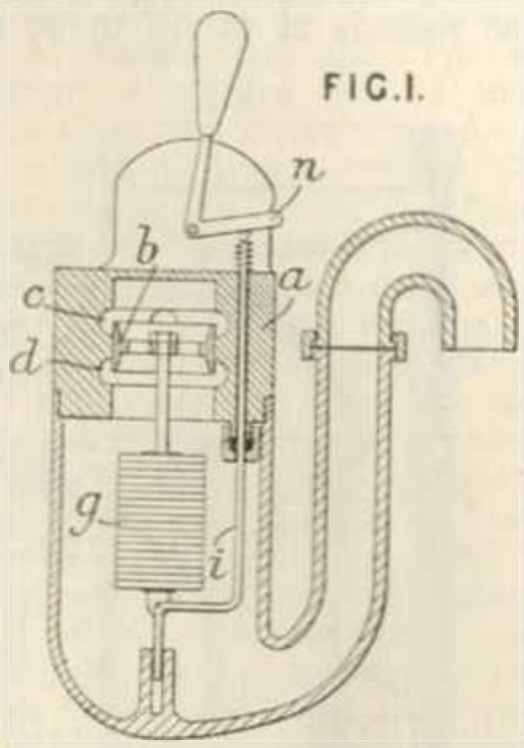
FIG.2.



Non-conducting coverings.—In heat-insulating coverings for pipes or other surfaces of the kind comprising two or more layers, one of which is characterized by a higher insulation value and the other by a greater mechanical strength, the insulation is built up on the article to be protected, such as a pipe *f*, and the outer layer *b* is of strong self-supporting insulating material having inward extensions *e* which rest on the article to be protected so that the loose inner layer *a* is not loaded or compressed. In applying the insulation the supports *e* are formed first, then the loose material *a* is placed in position in wire-netting containers coated with plaster, and finally the outer layer *b* is applied, the wire-netting protecting the loose inner layer from pressure while the outer layer is setting. For the inner layer suitable materials are Kieselguhr used either alone or in combination with slag-wool, glass wool, cork, or saw-dust, or chalk or magnesia mixed with slag-wool or glass wool, and for the outer layer furnace dust with a binding material such as clay.

234,563. Square, H. H. March 5, 1924.

FIG.1.



Thermostats.—A piston valve controlling the flow of hot and cold liquids to a mixing chamber is actuated by a thermostat which may be set to keep the temperature of the mixture at any required point. The valve body *a* is provided with annular passages *c*, *d* to which hot and cold water are supplied under the control of a piston valve *b* which is actuated by a thermostat *g* in the mixing chamber. The thermostat may be set to deliver water at any required temperature by means of a spring-controlled push rod *i*, the handle *n* being retained in position by a pawl and ratchet or the like associated with a temperature scale.

234,817. Ludeman, O. H. May 28, 1924, [*Convention date*].

FIG.14.

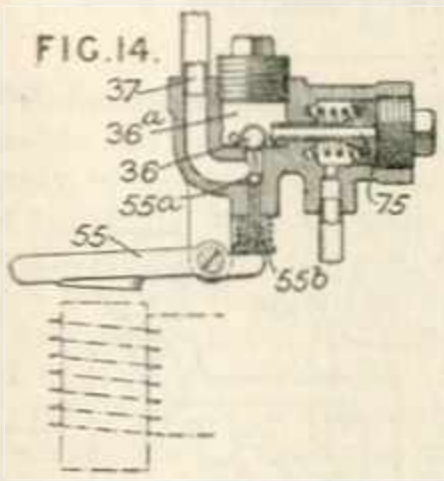


FIG.8.

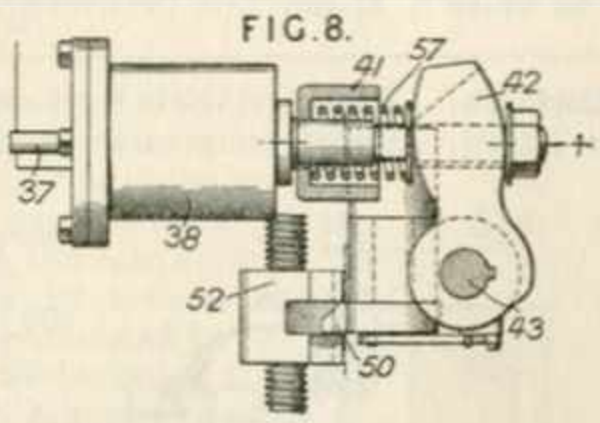
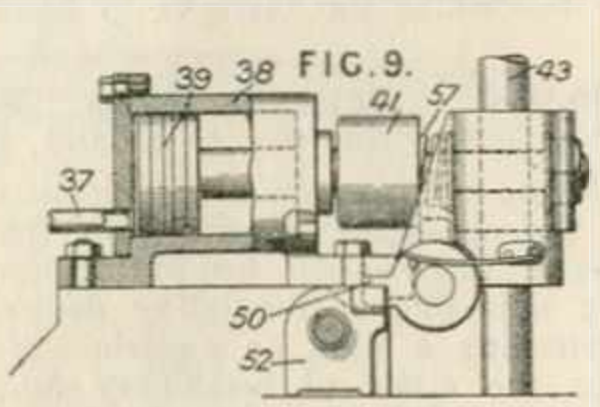


FIG.9.



Steam-traps. — A condensate-release valve is controlled by a second valve operated through a pressure-responsive member such as a diaphragm which is subjected on one side to the fluid pressure and that of a varying head of condensate and on the other side to the fluid pressure and an approximately constant hydrostatic head. Steam from the boiler enters the space 4 of the container 2 by the opening 3, passes down through the perforated plate 7 and up on the other side of a baffle 5 to ports closable by a valve 44 in the pipe 6 leading to the point of utilization. Water

accumulates in the container until the head is sufficient to move the diaphragm 9 against the practically constant head of condensate in the exposed pipe 11 connecting the space on the outer side of the diaphragm with the container. This movement of the member 9 alters the position of a valve 14, through the loosely connected rod 16, from the seat 15 to the seat 15a. The main discharge valve 28 moving in a cylinder 27 is normally kept on its seat 29 by a spring 32 and steam pressure communicated through a slotted guide 31 and the passage 25 to the upper side of the valve. The movement of the valve 14 cuts off the pressure and opens the passage 25 to the atmosphere through the discharge pipe 24. The steam pressure, operating through the discharge port 30 in the wall of the cylinder 27 upon a shoulder 28a of the valve, in an annular space above the seating 29, lifts the valve 28 and accumulated water passes to the discharge. To close the steam valve 44 when there is too great an accumulation of water than the trap can discharge normally, the abnormal operation of the flexible diaphragm 9 causes a rod 33 to displace

FIG.1.

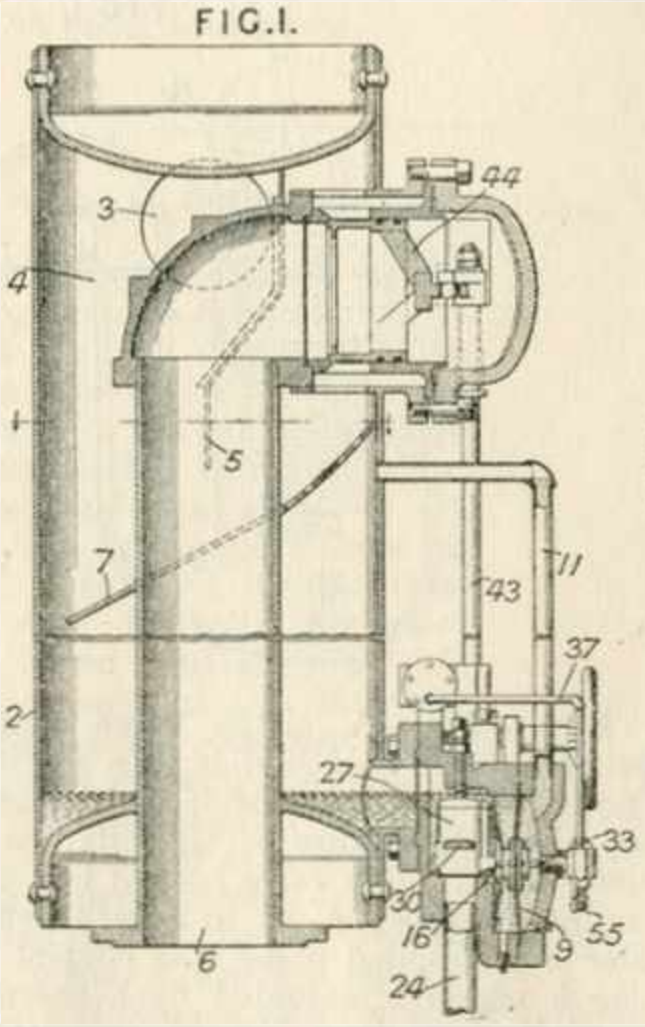
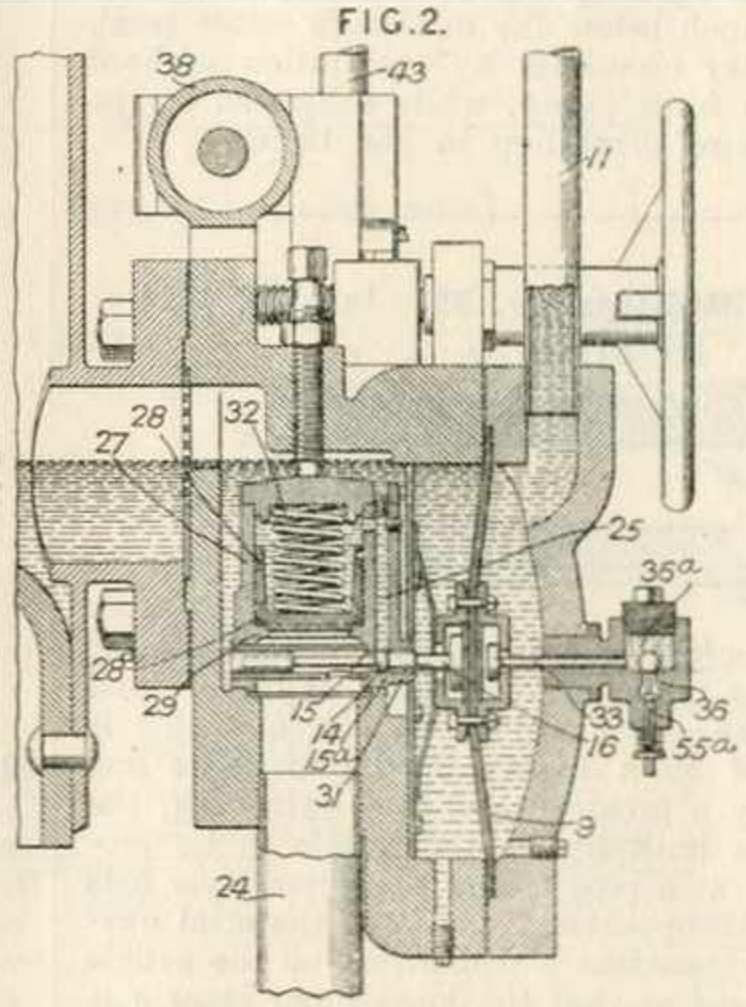


FIG.2.



a ball 36 in a chamber 36a communicating with the space on the outer side of the diaphragm, thus allowing steam pressure through a pipe 37, to move a piston 39 in a cylinder 38. A spring 57 is compressed and a part 41 bears against an arm 42 to rotate the valve spindle 43, locking means 50, 52 being put out of operation by the motion. The cylinder 38 can be drained for the return of the piston 39 by operation by the lever 55 of a relief valve 55a. Means are described for re-opening the valve 44 by hand. The valve 44 can be closed quickly during ordinary operation by admitting pressure to the cylinder 38 by pressing down the lever 55 to the full distance, again displacing the ball 36, the valve 55b closing the lower orifice. Means are described for displacing the ball 36 by fluid pressure on a piston operating the sliding tube 75, Fig. 14, in connection with a device for closing the valve 44 in case of development of too great a speed by the engine &c. driven by the steam supplied by the steam line in which the steam trap works.

235,026. British Arca Regulators, Ltd., (*Aktiebolaget Arca Regulatorer*). July 14, 1924. *Addition to* 116,074, [*Class* 69 (ii), Hydraulic presses &c.].

Steam-traps. — In a modification of the apparatus described in the parent Specification for automatically adjusting a regulating device controlling a fluid or electric current the speed of machinery &c., the servomotor operating the device has two liquid conduits provided with discharge nozzles each having before it a cap movable by that which is to be regulated to vary the liquid-pressure in the conduits which are arranged so that the liquids in them act on the servomotor in opposite directions to

FIG.3.

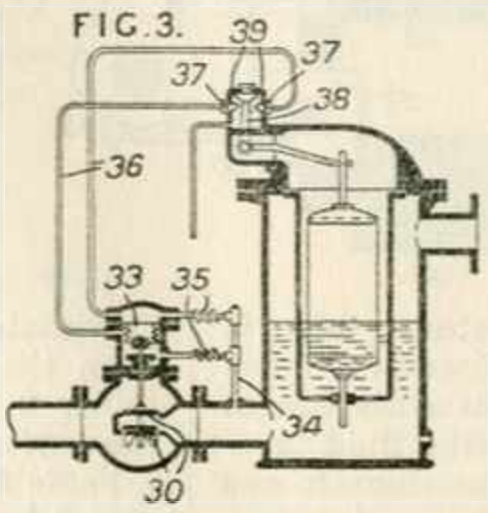
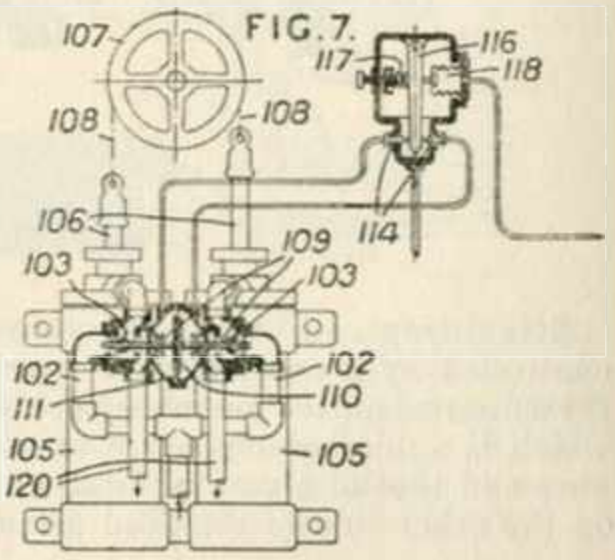


FIG.7.



neutralize the effect of fluctuations of pressure in the liquid-supply to the servomotor. The float of a steam-trap, Fig. 3, is connected to a lever 38 carrying caps 39 in front of which are nozzles 37 of two conduits 36 communicating with opposite sides of a diaphragm 33 connected to a discharge valve 30. Liquid is supplied to the nozzles from the trap chamber by a branch pipe 34 having throttling devices 35. In other applications, a piston takes the place of the diaphragm 33 and the lever 116, Fig. 7 carrying the nozzle caps is controlled by a spring 117 and a bellows 118 connected, for example, to a steam pipe in order to regulate a steam reducing valve. In the servomotor shown in Fig. 7, the regulating device is connected by a wheel 107, chains 108, piston rods 106 to a servomotor comprising cylinders 105 supplied with liquid by branch pipes 102 controlled by valves 103 secured to a diaphragm 111 in a chamber 110 through which liquid passes by way of passages 109 in the valve stems to the nozzles 114. Liquid is discharged from the cylinders through pipes 120.

235,130. Eggleston, L. W. June 9, 1924, [*Convention date*].

FIG.2.

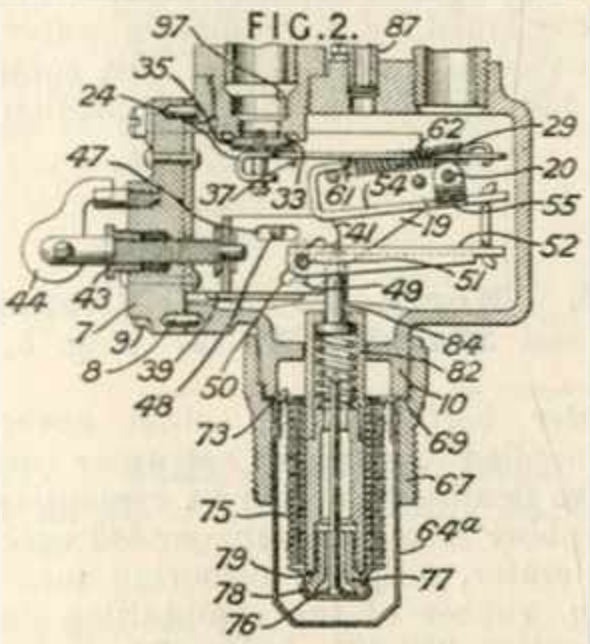
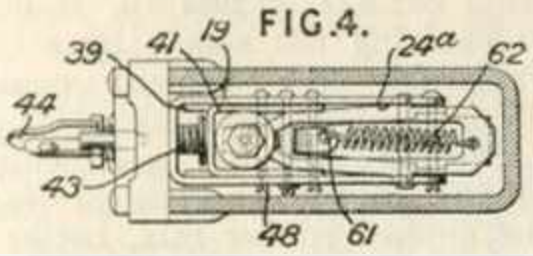


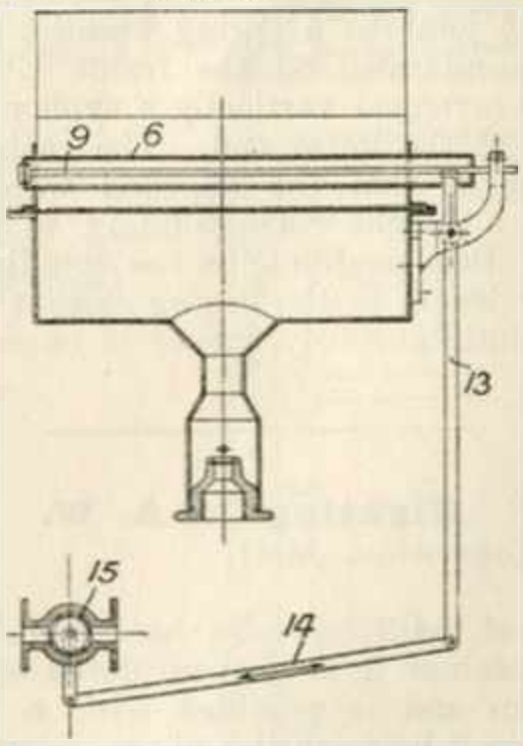
FIG.4.



Thermostats.—A valve device particularly applicable for use as a thermostat to control the supply of gas to a water heater has a valve member supported by a pivoted arm actuated by lever mechanism acting through a tumbler spring. The valve washer 35 is supported by a valve member 33 carried by a pin slidably mounted in the bent end of a slotted lever 24. Rotation of the valve is prevented by a tongue 37 engaging the slot. Intermediate its ends the lever 24 has projecting knife-edge pivots 29 adapted to engage V-notches in a frame 19 carried by a detachable cap 7. The cap is positioned by dowel pins 8 and secured by screws 9. A spring 62 is connected to the free end of the lever 24 and to the bent end 61 of a second lever 54 supported by ears 55 from a pin 20. The spring is arranged diagonally across the levers as shown in Fig. 4 so that a bearing surface 24^a on the lever 24 is always pressed against the frame 19. The bent end of the second lever is adapted to pass through the slot in the first lever so that as the second moves within the limits allowed by the stop pin 24, the spring first acts on one side and then on the other of the pivots 29 so that the valve is opened or closed with a snap action. The second lever is connected by a link to a third lever 52 provided with an adjustable fulcrum and in the form shown adapted to be operated by a pointed plunger carried by a thermal capsule. The adjustable fulcrum comprises a cross pin 51 mounted in vertical slots 49 in the frame 19 and in inclined slots 50 in an adjustable member 41. The member 41 rests on flanges 39 on the frame 19, is guided by a pin 48 engaging a horizontal slot 47 and is moved to and fro by a screwed spindle 43 provided with an indicating and operating handle 44. In the form shown in Fig. 2 the thermal capsule comprises a metallic bellows 75 connected at one end to a ring 73 supported by an internal bead on an outer vessel 64^a having a flange 69 adapted to be clamped against the end of a nipple 10 by a coupling nut 67 which is also screwed externally for attachment to the apparatus in which it is desired to maintain a constant temperature. A volume of kerosene or other mineral oil is sealed in the capsule. The lower part of the bellows is provided with an integral head 76 adapted to be spun over a bead 78 on an internal hollow plug 77. Resting on a shoulder 79 on this plug is a two-part sleeve 82 having at its upper end a spring-supported abutment 84 adapted to engage the lever 52. In a modification the casing 64^a is enclosed in a second casing through which liquid circulates or it is heated by conduction. A passage 87 leads to a pilot burner and the main valve may be provided with a valve-controlled bye-pass 97 to keep the main burners alight.

235,163. Selas Akt.-Ges. June 3, 1924, [*Convention date*].

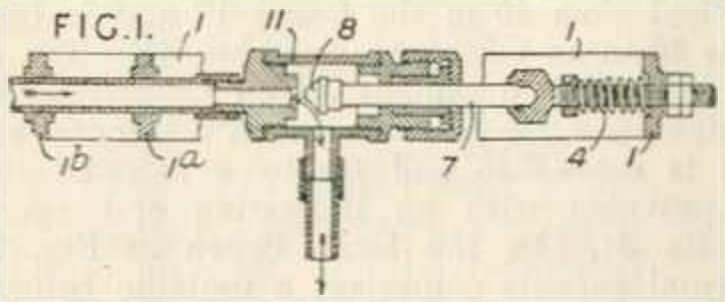
FIG.1.



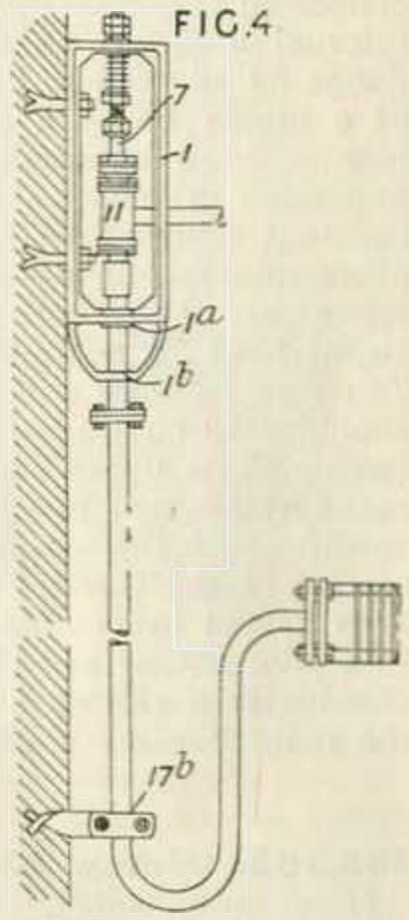
Thermostats.—A regulating device for air and gas mixing plants comprise an expansible rod

mounted in the core or coolest part of a control flame fed by the mixture and connected by a regulating lever to a valve controlling the proportions of the mixture. The expanisble body comprises a brass rod 6 mounted on and attached at one end to a rod 9 of low coefficient of expansion. The other end is slotted to receive the end of a lever 13 attached by a rod 14 to a throttle valve 15.

235,482. Soc. A. Legrand et Cie. Dec. 29, 1924. *Addition to* 226,144.

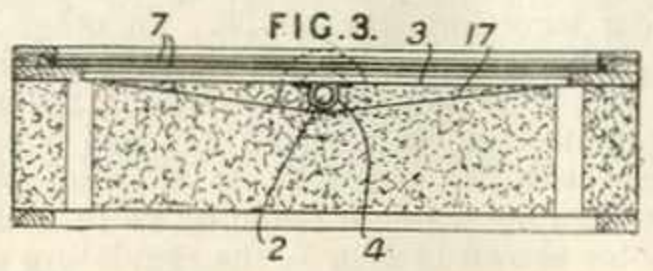


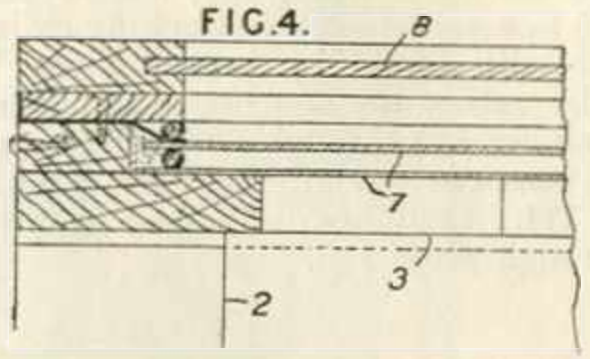
Steam - traps. — A steam-trap of the kind described in the parent Specification is actuated by the expansion and contraction of the pipe it is desired to drain. In the form shown the remote end of the conduit at a point 6 to 20 metres from the apparatus is secured by a clip 17^b to an abutment fixed to the wall or ground. The other end of the conduit passes through guides 1^a, 1^b in a fixed frame 1 and is secured to a movable casing 11 adapted to co-operate with a fixed valve member 8 carried by a spindle 7. The spindle 7 passes through a stuffing box in the casing 11 and is secured by a ball and socket joint to a spring pressed member 4 adjustably mounted on the frame 1. When the conduit is arranged vertically a syphon or pocket is formed at the lower end. The casing may be made fluid so that the expelled water may be raised to a height corresponding to the steam pressure. In a modification the spindle 7 is connected by levers to the casing so that valve and seat are simultaneously moved in opposite directions.



235,563. Nightingale, A. W. June 10, 1924, [*Convention date*].

Solar heat, utilizing.—To heat water by solar heat a container 2 is heat-insulated at its sides and bottom and is provided with a blackened copper plate 3 between it and one or more panes 7 of glass separated by an air space, and a removable wooden or other cover 8. The whole may be mounted on an adjustable tilting device. Projecting ribs, also blackened, may be provided on the upper surface of the plate 3. The container is preferably in the form of a pipe 2 supported by a sheath 4 attached to the underside of the plate 3 and also provided with ribs 17 at right angles to the pipe.





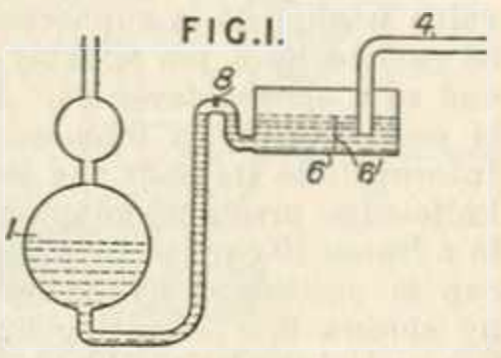
In the Specification as open to inspection under Sect. 91 (3) (a) the container may be in the form of a tank having two or more compartments and may be combined by a circulating water system with an external main tank. This subject-matter does not appear in the Specification as accepted.

235,743. North British Rubber Co., Ltd., and **Martin, W. G.** Aug. 5, 1924.

Hot-water bottles. — An outer covering or jacket is applied to a rubber hot-water bottle, ice-bag, or like flexible container by cementing thereto sheet rubber mixed or compounded with a suitable accelerator, sulphur, colouring matter, and fillers, e.g. rubber of the composition described in Specification 232,421, [*Class* 70, India-rubber &c.], and vulcanizing the sheets by a dry heat process. Preferably the cement consists of rubber mixed or compounded with an accelerator which will accelerate the dry heat vulcanizing process. Owing to the absence of lead compounds in the applied rubber mix, better colouring effects are stated to be obtainable.

236,238. Hemmerich, F. June 28, 1924, [*Convention date*].

Heating by circulation of fluids. — The condensed steam return pipe 4 of a low-pressure steam heating system is provided with a deaerator consisting of an open water tank 6 having a baffle 6^1 and a return pipe provided with an air vent pipe 8 to the boiler 1.



236,260. French, G. F. March 27, 1924.

Thermostats.—In liquid-fuel burning apparatus for generating combustion products under pressure, the rising temperature of the combustion chamber is utilized to effect the substitution of a heavier fuel for the light fuel, such as petrol, used for starting-up, and, when the temperature rises above a fixed limit, to supply water for reducing the temperature. As shown, air, water, petrol, and liquid fuel are led to inlets 14^a, 8^a, 7^a, 9^a, the former two being arranged in a casing 13 and the latter two in a casing 12 carried by the refractory-lined generator 10. In the casing 12 is an adjustable tubular element 15 having ports 16, 17 communicating with the petrol and oil inlets 7^a, 9^a, while within the element 15 is slidably arranged the end 21, having ports 23, 24 of a fuel vaporizing tube 22 which passes through the combustion chamber 11 and is connected by a pivoted lever 27 to a similar tube 29, anchored at 32, and delivering to a chamber 30. At starting, the ports 16 and 23 coincide so that petrol is supplied to the tube 22; rise of temperature effects expansion of the tubes 22, 29, which causes the end 21 of the tube 22 to slide within the member 15 until the ports 17 and 24 coincide, thus effecting the substitution of oil fuel for petrol. The casing 13, Fig. 3, is similar to the casing 12, rise of temperature effecting, through the expansion of tubes 37, 41, coincidence of the ports 36, 39, through which a supply of water is induced by the air nozzle 40.

FIG. 1.

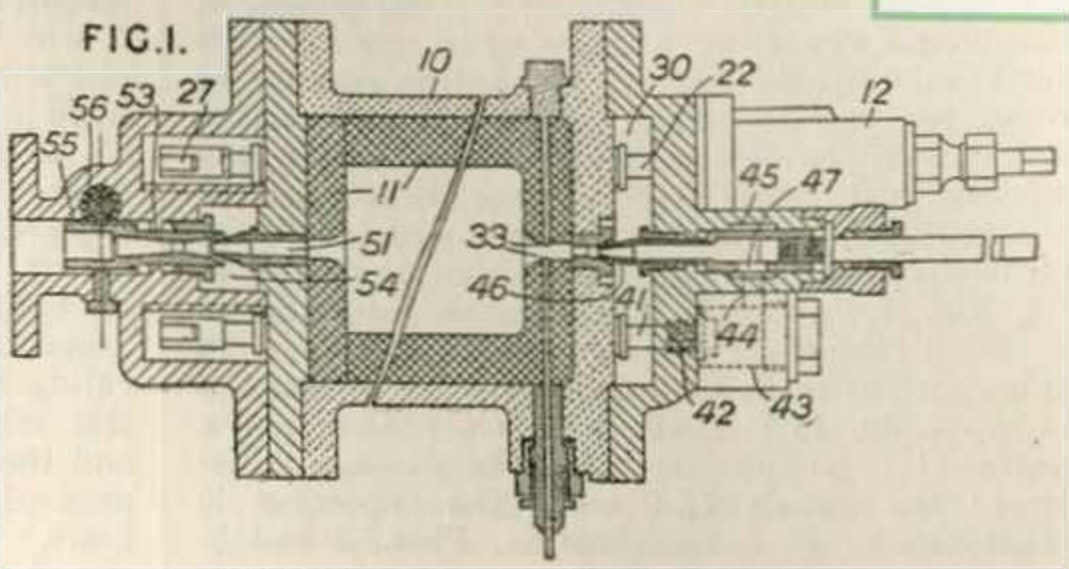


FIG. 2.

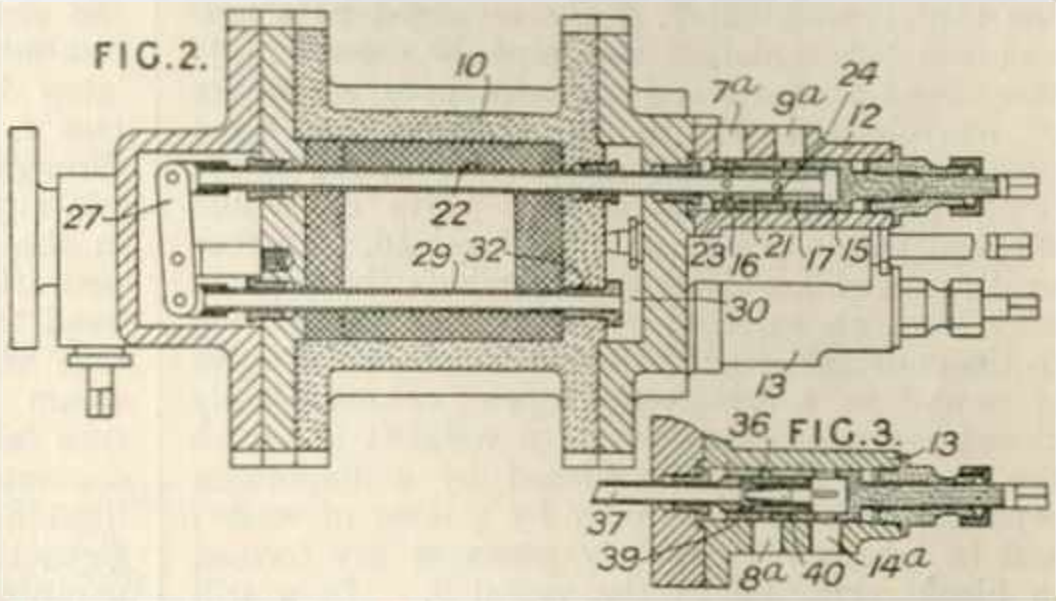


FIG. 3.

236,427. Still & Sons, Ltd., W. M., Still E. H. and **Adamson, A. G.** Oct. 17, 1924.

Steam-traps. — In steam-traps of the kind in which the flexible walls of capsules are adapted to serve as valves for controlling the discharge orifices, one or each flexible wall is formed with a hollow outwardly projecting marginal run having an upwardly extending flange which is fitted and soldered to a flange on the other wall. In the construction shown, the front wall d has a hollow marginal rim d^3 and the back wall d^1 a similar run d^6, the overlapping flanges being soldered together.

FIG. 2.

236,716. Beacham, T. E. June 17, 1924.

Thermostats.—Relates to temperature-regulating apparatus of the kind in which there is arranged in chamber 3, the temperature of which is to be controlled, a closed vessel 2 containing a gas or volatile liquid which, by its expansion,

FIG. 1.

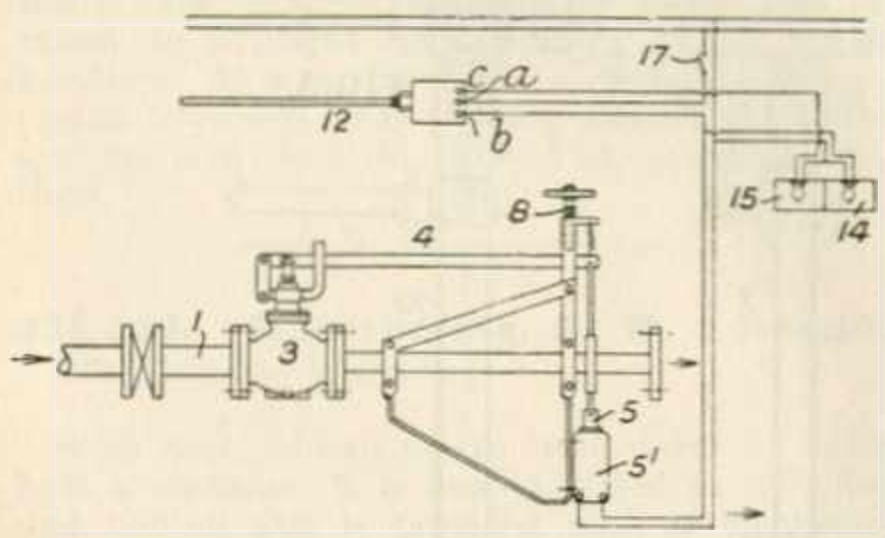
FIG. 9.

FIG. 2.

FIG. 3.

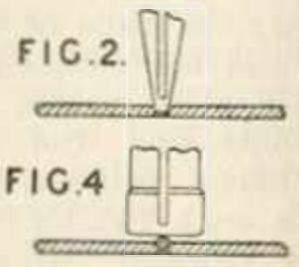
displaces another fluid, such as mercury, into an external vessel 7 containing a float, piston, or diaphragm operating a valve or electric switch for regulating the heating or cooling means. In order to prevent mixing of the gas or volatile liquid with the other liquid, or loss thereof into the external vessel, the passage 10 connecting the vessels is provided with a reduced, capillary, or labyrinthal portion such as that indicated at 95, Fig. 1, in which is shown an intermediate vessel 9 interposed between the vessels 2, 7. In this construction a steam supply valve 5 mounted on a spindle 15 is controlled by a float 6, and a valve 11 is adapted to close the passage 8 between the vessels 7, 9 when the apparatus is transported. In a modification, Figs. 2 and 3, the three vessels 2, 7, 9 are arranged as a unit and the lower end of the pipe 10 extends into the vessel 9 where it is formed with a number of convolutions 12, 13, 14 arranged in three planes mutually at right-angles. A sliding piston 6 controls the operation of a valve or switch through the intermediary of a lever 16. Further modifications are described in which the pipe 10 may have an external coiled portion in addition to the convolutions 12, 13, 14; in which the valve is moved to a completely open or completely closed position by means of a weight; in which the float or piston is replaced by a diaphragm separated from the mercury by a layer of water; and in which the capillary passages are formed in blocks arranged in the vessel 9. In a still further modification, Fig. 9, a mercury container 61 with contacts 62, 63 is mounted on the vessel 9, which is pivotally supported so as to form a rocking switch for regulating the heating current. The vessel 9 is formed at its ends with chambers 58, 59 containing mercury, the chamber 58 communicating with the pipe 10 and having the mercury displaced therefrom through a tube 60 into the chamber 59 when an expansion of fluid occurs in the vessel 2. When a gas is employed in the vessel 2 a separating liquid such as glycerine is disposed in the passage 10 and in the space above the liquid in the external vessel.

236,784. Kneppers, J. M. Oct. 20, 1924.



Thermostats.—In an apparatus for regulating the temperature of steam-heated boiling-vessels, drying-rooms, &c., by controlling the supply of steam, the supply pipe 1 is provided with a valve 3 which, by means of an adjustable stop 8 co-operating with a lever 4, can be adjusted by hand with the aid of two indicating lamps 14, 15 so as to give approximately the necessary steam supply, and is thereafter automatically adjusted, when any undue fall in temperature occurs, by means of a thermostat 12 operating in conjunction with an electromagnet 5^1 and armature 5 to further open the valve, one indicating lamp 14 being brought into circuit when this minimum limit of temperature is reached, and the second indicating lamp 15 being illuminated when the temperature reaches a maximum limit. The lamp 14 is arranged in parallel with the electromagnet 5^1 and is associated with the minimum contact *b* of the thermostat, while the lamp 15 is associated with the maximum contact *c*, and the third contact *a* is connected through the main switch 17 with one of the electric supply leads. Normally the steam pressure in the pipe 1 closes the valve 3 to the extent permitted by the stop 8, which is adjusted by hand to give a continuous supply of steam such that neither lamp 14 or 15 is illuminated. If the steam pressure and consequently the temperature falls, the electric circuit is completed at the contacts *a*, *b* of the thermostat, the lamp 14 is illuminated, and the electromagnet 5^1 is energized to further open the valve 3. As the temperature rises, the circuit is broken and the lever 4 returns to its position against the stop 8, thus reducing the steam supply to normal again; while any continued rise in temperature is indicated by the lamp 15, denoting that a new adjustment of the stop 8 is necessary.

236,887. Kölnrottweil Akt.-Ges. July 10, 1924, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].



Non-conducting coverings for heat. — Butt joints are formed in linoleum or other coverings which are plastic under heat by softening the abutting edges and widening them into a groove, inserting material of the same composition and uniting the whole by heat and pressure. The insertion may be in the form of a strip or powder. The invention may be carried out with the aid of an electrically-heated tool furnished with a pair of interchangeable heads, one of which is adapted to form a groove, as shown in Fig. 2, while the other, Fig. 4, is adapted to complete the joint. The invention is applicable to linings of cold storage wagons and for repairing damaged places in linoleum.

236,960. Metropolitan-Vickers Electrical Co., Ltd., (Assignees of *Mottlau, A. J.*). July 11, 1924, [*Convention date*].

FIG. 1

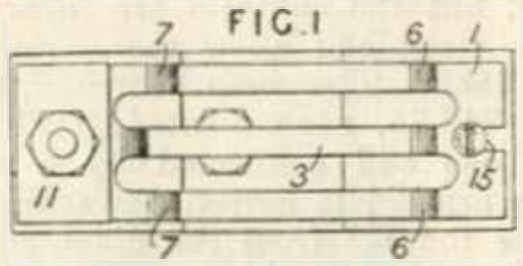
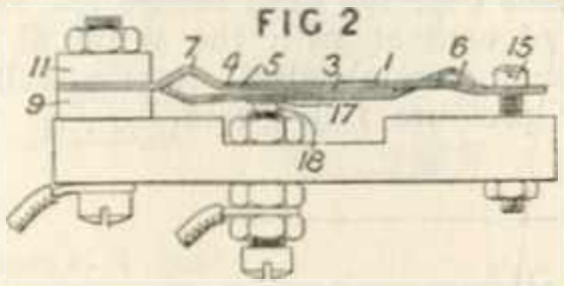


FIG 2



Thermostats.—A thermostat comprises a bimetallic metal frame, having a bimetallic strip extending across it, the parts being so shaped that a snap action of the bimetallic strip is obtained at a predetermined temperature. The device operates electrical contacts. The frame 1 may be composed of brass and nickel steel plates 4, 5 and is bent at 6 and 7. The bridging member 3 may be of any resilient material, but is preferably stamped from the same plate as the frame. In the stamping operation, the member 3 is elongated relatively to the frame, and the frame may be slightly shortened. The thermostat is mounted between insulating blocks 9, 11, and the opposite end is free to move on a bolt 15. At a predetermined temperature the member 3 moves suddenly to the opposite side of the centre line of the frame 1, and the electrical contacts 17, 18 are disconnected. Alternatively, the circuit may be closed at a predetermined temperature instead of opened.

237,074. Jackson, W. J. Mellersh-, (*Sherman, J. A., and Sheppard, W. H.*). June 24, 1924.

FIG. 1.

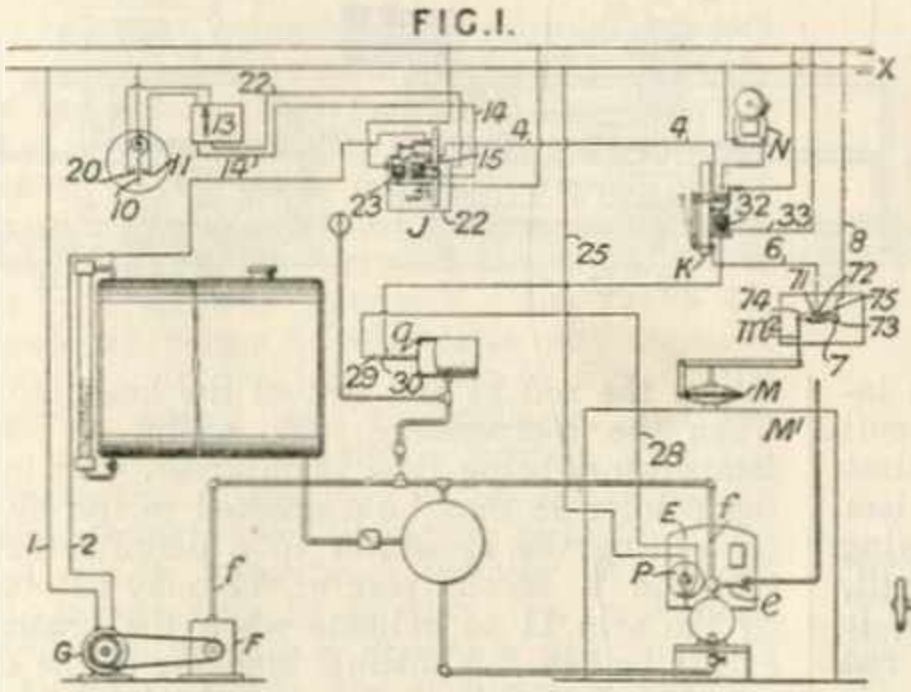


FIG. 2.

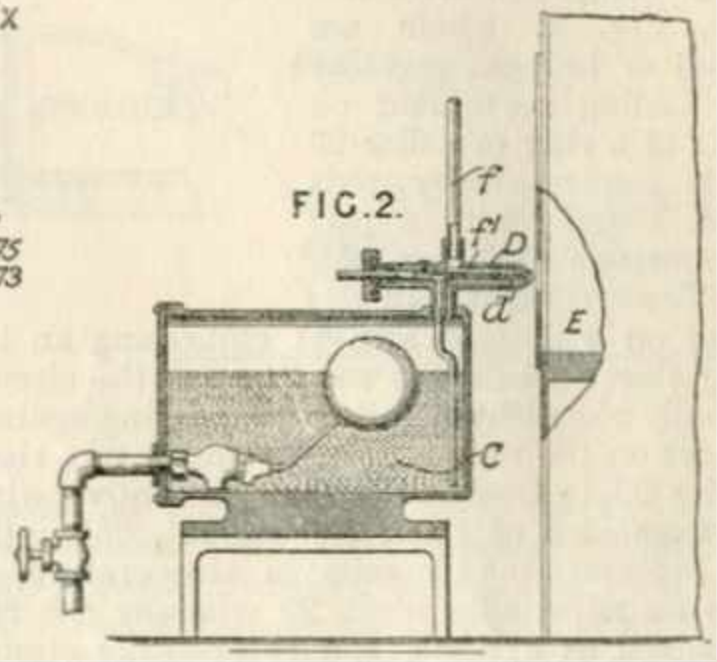
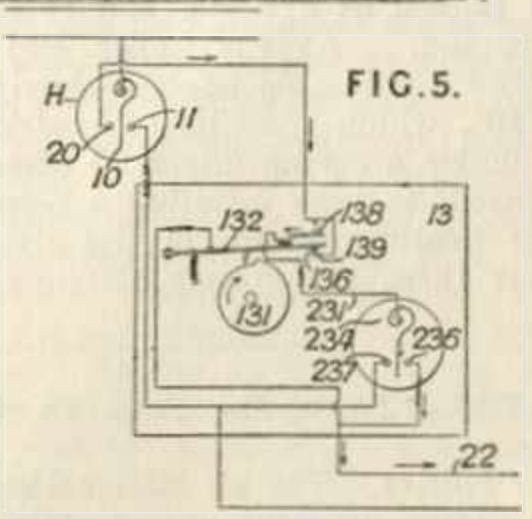


FIG. 5.



Thermostats.—In a heating system for buildings of the kind in which the supply of air and of oil or other liquid fuel to a burner D, Fig. 2, is controlled by means of an air pump F operated by an electric motor G, the circuit through which is made or broken as the temperature falls below or rises above predetermined values by a switch J under the control of a room thermostat H, the supply of fuel is obtained by the air pressure acting directly upon the surface of the fuel in a container in addition to any suction effect produced by the air supplied for combustion purposes. Also included in the motor circuit between the leads 1, 2; 4, 6 and 8 are a second switch K, which is controlled by a thermostat P located in the furnace E and adapted, to break the motor circuit and stop the pump F whenever, owing to accidental extinction of the pilot burner *e*, the main burner should fail to be lighted, and a third or snap switch 7, which is operated by a diaphragm M whenever excessive pressure arises in the boiler M¹ and also adapted to break the motor circuit. The thermostat H consists of a contact member 10 connected directly to a main X and associated with maximum and minimum contacts 11, 20, the former contact being connected through a time switch 13 with a line 14 controlling the releasing solenoid 15 of the switch J, while the contact 20 is connected through the time switch 13 with a line 22 controlling the resetting solenoid 23 of the switch J. The time switch is designed so that during the day-time, for example, when a higher

temperature is required, the thermostat H is operative, but at night time, when a lower temperature is required, contact at the points 10, 20 is permanently maintained and a second thermostat 234, Fig. 5, provided with maximum and minimum contacts 237, 236 is brought into operation. Selection of the thermostat H or 234 to the operative is effected by a pivoted lever 132, the position of which is regulated by a clockwork controlled cam 131, and which carries contacts 136, 138 co-operating with contacts 139, 231. The switch K, actuated by the cooling of the furnace owing to failure of the pilot burner to ignite the fuel mixture, is controlled by the thermostat P through lines 25, 28, contacts 29, 30, solenoid 32, and line 33. Energization of the solenoid 32 causes the switch K to open and simultaneously a circuit to be closed through an alarm bell N. The contacts 29, 30 are normally held together by the pressure in the pipe *f* acting on a diaphragm *q*, but the contacts are separated when the motor stops and allow the switch K to be reset by hand. The snap switch 7 consists of two arms 74, 75, each pivoted at 71 on an insulating base and connected by a spring 72. When the arm 74 is moved upwardly by actuation of the rod m^2 from the diaphragm M, the spring passes over the dead centre and snaps the arm out of contact with the terminal 73, the circuit being re-established automatically when the boiler pressure falls again.

237,417. Gréby, E. July 1, 1924.

Thermostats.—An electric switch for maintaining constant the temperature of a flat-iron, an antiseptic bath, or other electrically heated apparatus or for breaking the circuit permanently at a predetermined maximum temperature comprises contacts 10, 12, Fig. 1, which are separated or brought together by the sliding movement on a rod 21 of a ring or collar 23 which is connected by rods 24^1, 24^2, Fig. 3, with a pair of thermostatic elements 26^1, 26^2. The contact 12 is mounted on a pivoted arm 11 embracing an insulating sleeve 34 on the rod 21, and the circuit is normally closed by a spring 31^1 bearing against a shoulder on the rod. As the temperature rises the slider 23 is freely moved downwardly owing to the expansion of the elements 26^1, 26^2 until, at the predetermined maximum temperature, it engages an adjustable block 22 whereby the rod 21 is moved as a whole and the heating circuit interrupted. At the upper end of the rod is arranged a rotatable knob 16 having a projecting stop 16^1, which may be so positioned as to engage under a spring finger 20 when the rod 21 is depressed, thereby effecting a permanent rupture of the heating circuit, or, by giving the knob a quarter turn, the spring 31^1 may be allowed to return the rod 21 and restore the heating circuit when the temperature falls again, a constant temperature being thus maintained. An indicating pointer 18 may be connected to the block 22 for setting the apparatus to a definite temperature and a second pointer 14 may be operated by the arm 11 to indicate when the heating-circuit is broken. A manual breaking of the circuit may be effected by depressing the knob 16. The thermostatic elements may consist either of hollow slightly curved plates filled with a liquid, an alloy or air, or of uni-metallic or bi-metallic strips, or, in a modified construction described, of cylinders filled with expansible liquid and fitted with pistons which are connected to the rods 24^1, 24^2.

FIG. 1.

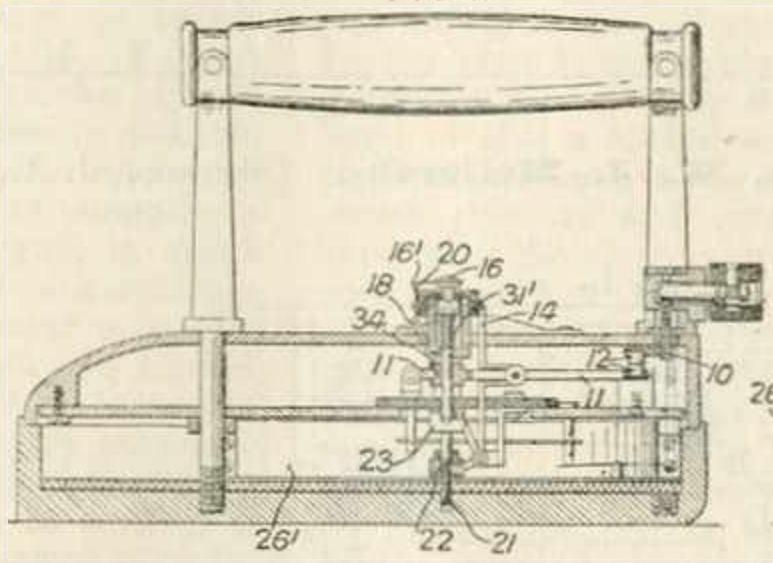
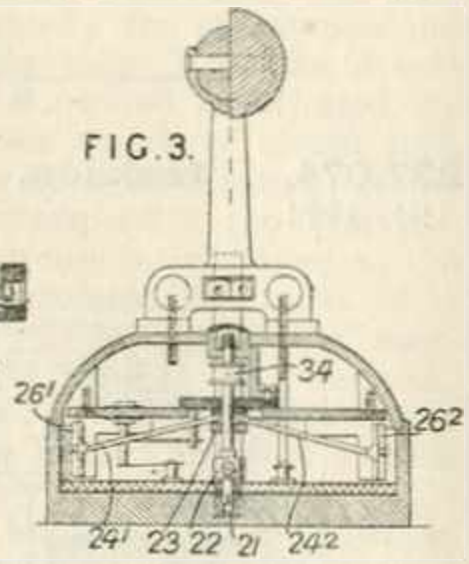
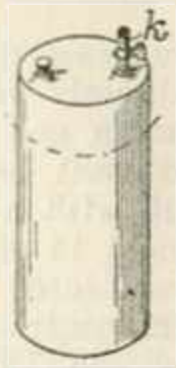


FIG. 3.



237,736. Jost, A. Aug. 13, 1924.

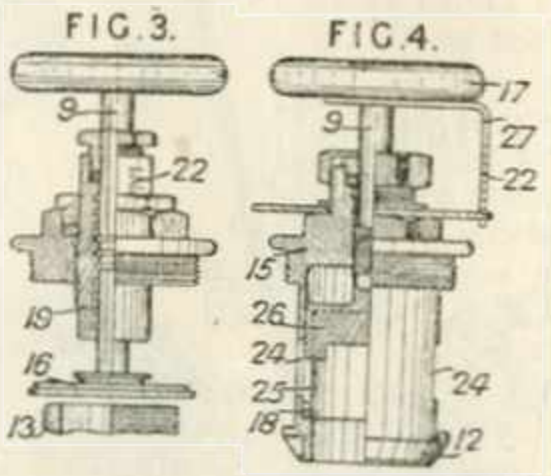
Hot bottles.—The air inlet cock of a hot bottle, containing a crystallizable substance such as acetate of soda, is provided with a chamber *k* in which a particle of crystal becomes deposited and is adapted on the cock being opened to be introduced into the substance in the bottle, in order to crystallize rapidly the substance and at the same time generate heat. Specification 9238/84 is referred to.



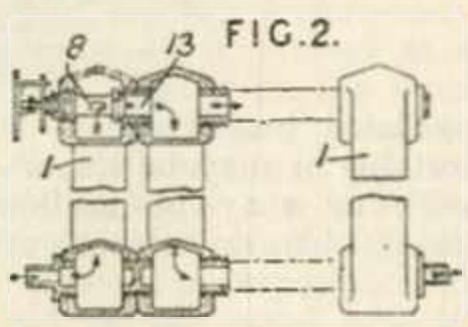
237,750. Speidel, R. Sept. 10, 1924. *Drawings to Specification.*

Non-conducting coverings for heat.—Filtering and heat insulating materials for use in a refrigerating chamber may consist of cork chips of different sizes waterproofed by liquid pitch sprinkled on the cork resting on a sieve which is shaken to remove superfluous pitch and prevent caking.

237,870. Noe, E. Aug. 2, 1924, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Act*].

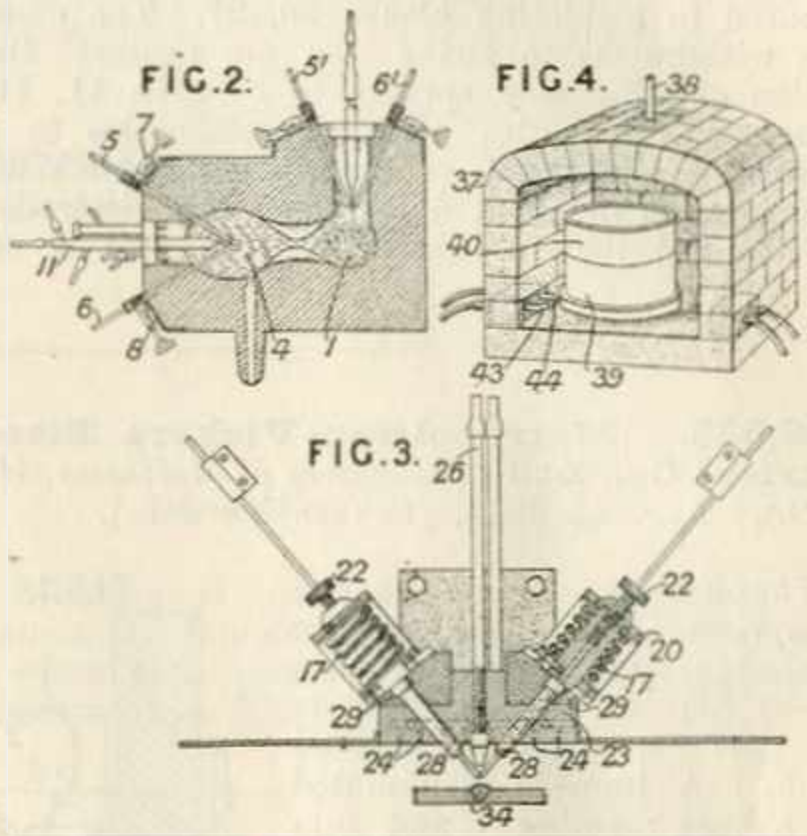


Radiators.—A radiator comprising several communicating columns arranged side by side, is provided with a control valve mounted in one of the columns and controlling the passage to the next column. The valve may be of the kind in which the maximum passage is separately adjustable. Fig. 2 shows the valve 8 mounted in the end column 1, and controlling the passage 13 to the next column. Fig. 3 shows one form of valve. A disc closure member 16 seats on the end of the screwed sleeve 13, and is carried by a screwed spindle 9. The sleeve 19, with scale 22, forms an adjustable stop to limit the opening. In the form shown in Fig. 4, the member 15 screws into the radiator, and the packing 12 is permanently in contact with the opposite seating. Openings 24 are controlled by a rotary sliding valve 18 having slots 25. The screwed spindle 9 carries a member 26 adapted to slide in the slots 25 to vary the maximum opening. The spindle 9 carries a stop 27 with scale 22 which limits the angular movement. Longitudinal movement of the member 26 is effected by removing the handle 17 and rotating the spindle continuously the required amount. In another modification, the valve 18 is omitted, and the member 26 has a slotted depending sleeve, the longitudinal movement of which regulates the maximum opening, while the angular movement regulates the actual opening.



237,898. British Thomson-Houston Co., Ltd., (Assignees of *Langmuir, I.*). July 30, 1924, [*Convention date*].

Heating by chemical action and molecular combination.—Heating is effected by dissociating hydrogen to the atomic state and utilizing the heat of recombination. In an example, applied to a scrap-melting furnace shown in horizontal section in Fig. 2, two electric arcs are used, one projecting into the chamber 1 where molten metal collects, and the other horizontal passage 4 leading to a stack. The electrodes 5, 6 and 5^1, 6^1 are provided with regulating devices 7, 8, and a stream of dry hydrogen is supplied through the tube 11, which is water-cooled and preferably tipped with refractory metal. The arc assumes a concentrated form with hydrogen at atmospheric or higher pressures and the hydrogen is dissociated into the atomic state. The latent heat set free when recombination takes place is utilized in the furnace, and oxidation is prevented by the atmosphere of hydrogen. In a welding apparatus, Fig. 3, the electrodes are each connected to an iron core within a coil 17. When a current flows in the coil, the core is lifted and a spring 20 is compressed. The length of the arc is controlled by a screw 22. A metal plate 23



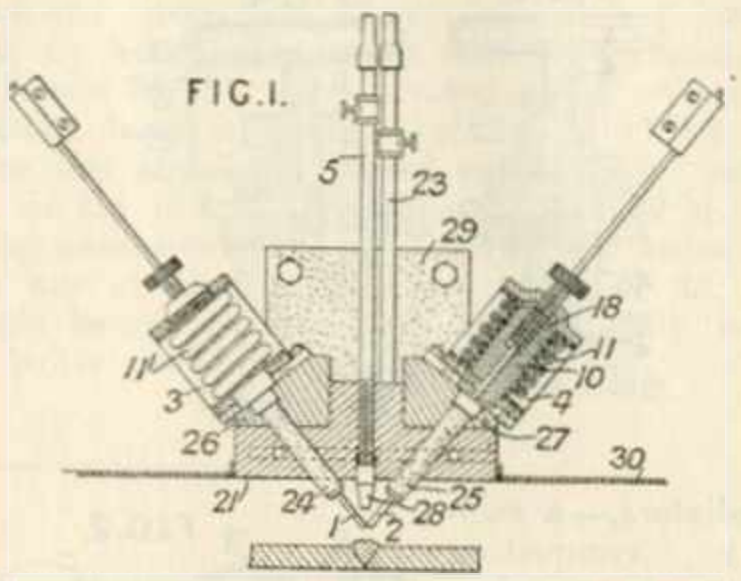
above the arc contains ducts 24 for supplying low-pressure hydrogen to prevent oxidation, and high-pressure hydrogen is supplied by a conduit 26. The electrodes are insulated from the plate 23 by bushes 28, and are mounted on refractory supports 29. The welding metal 34 may be an easily oxidizable metal such as chromium, zirconium or aluminium, oxidation being prevented by the hydrogen. Fig. 4 shows the application to a furnace 37 in which cylinders 39, 40 are brazed. Hydrogen is introduced through a pipe 38 to maintain a reducing atmosphere, and a number of arcs 43, 44, &c. are operated in the hydrogen. The high conductivity due to the presence of the atomic hydrogen enables the brazing temperature to be more readily obtained. Specification 237,901 is referred to.

237,901. British Thomson-Houston Co., Ltd., (Assignees of *Palmer, R.*). July 30, 1924, [*Convention date*].

Heating by chemical action and molecular combination.—The adjoining portions of metal members or added metal supplied between the

parts, or both, are fused to form a malleable joint devoid of oxides, nitrates, carbides, &c. by the heat developed by the reassociation of the atoms of dissociated hydrogen. An arc is struck between the ends of a pair of tungsten or like substantially non-consuming electrodes 1, 2 arranged at an angle or in line, and a jet of hydrogen is passed from a valved pipe 5 through a nozzle 28 of molybdenum or like refractory metal, transversely across the arc. The hydrogen is thus dissociated and impinges on the work, whereupon it is reconverted into molecular hydrogen and the heat evolved fuses the parts to be joined. Air is excluded by excess of hydrogen from the nozzle or by supplying hydrogen through dents in a metal cover plate 21 from a valved pipe 23. The electrodes are surrounded by lava bushings 24, 25 and may be clamped to magnetic cores 10 enclosed in holders 3, 4 secured to insulating blocks 26, 27. The cores are withdrawn to strike the arc against the action of adjustable springs 18 by coils 11, 11¹ connected in series with the electrodes to a source or alternating or direct current. With a separation of about ¼ inch between electrodes of about ¼ inch in diameter, a current of 40 amperes at 300 volts may be used, the distance between the electrodes and the work being about 1 inch. The parts may be provided with a heat protecting shield 30 and may be mounted on an

FIG. 1.

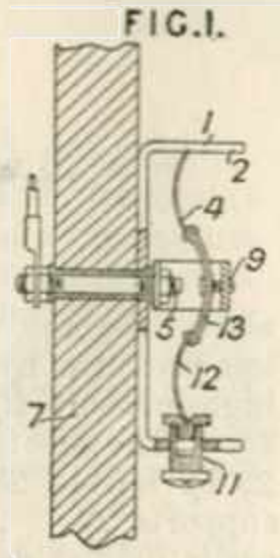


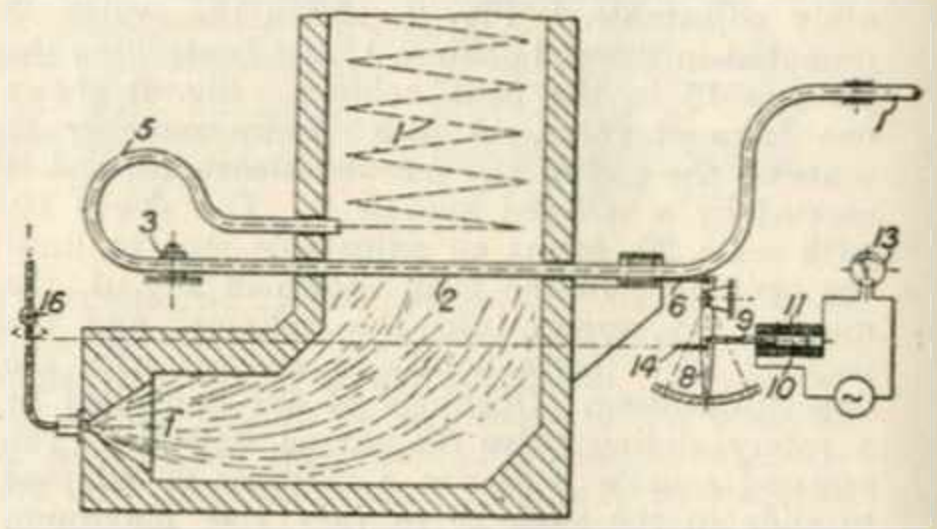
insulated bracket 29. The apparatus may be portable or may be traversed with respect to the work or may be stationary with respect to traversed work. Specification 237,898 is referred to.

238,532. Metropolitan-Vickers Electrical Co., Ltd., (Assignees of *Matthews, H. D.*). Aug. 14, 1924, [*Convention date*].

Thermostats.—A thermostat comprises a bimetallic element subjected to a compressive stress between two abutments so that it takes a buckled form. A frame 1 is mounted on a base member 7 and supports a composite thermostatic element 4 between an arm 2 and an adjustable abutment 11. The element 4 comprises a pair of curved springs 12 of steel or bronze with an intermediate bimetallic strip 13 having the more expansible material on the convex step. An electric contact 5 is provided on one side of the strip, and an adjustable stop 9 on the other side, the distance apart and the compressive stress being so adjusted that the strip moves to either extreme position with a snap action.

FIG. 1.





239,192. Löffler, S. Aug. 28, 1924, [*Convention date*].

Thermostats.—A pipe coil 1 which is adapted to carry gases, liquids, or vapours under high pressures, and to be externally heated by a furnace *f*, is connected by a flexible tube 5 to a straight portion 2 clamped at 3. The expansion of the tube 2 actuates a rod 6, lever 8, and rod 9 carrying an iron core 10 in a coil 11. The coil 11 is connected in the circuit of a source of current which indicates the expansion on an indicator 13. The rod 8 may also be connected by a rod 14 to a valve 16 controlling the fuel supply to the furnace.

239,361. Marks, E. C. R., (*Hart Manufacturing Co.*). Sept. 9, 1924.

FIG. 4.

FIG. 3.

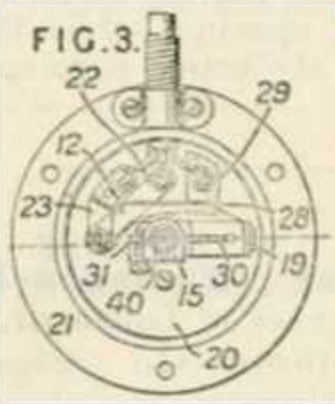
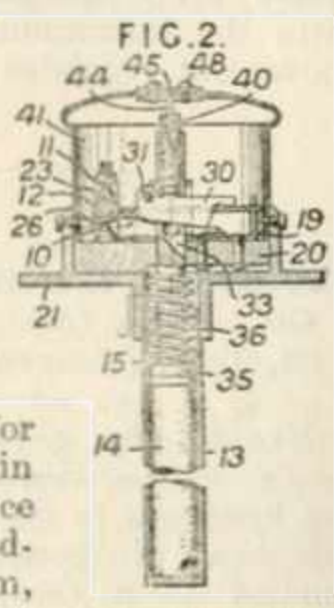


FIG. 2.



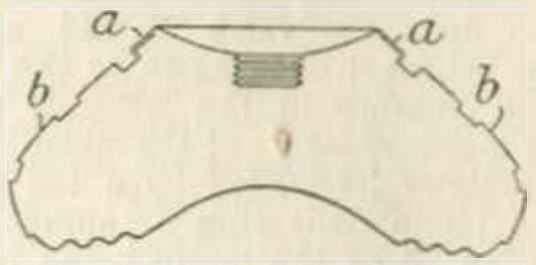
Thermostats. — A switch for electric heaters, ovens, &c., in which a heat-responsive device operates the switch through adjustable controlling mechanism, has the switch housed in a rotary cover provided with

means for setting or adjusting this control mechanism. As shown in Fig. 2, a pivoted switch arm 12 carries at its free end an insulated contact 26 co-operating with lower or upper fixed contacts 10, 11. The contacts 10, 11 are secured to metal terminal plates 22, 23 on the insulating base 20, current being led to the contact 26 through a blade spring anchored at one end in a slot 28 of a terminal plate 29 and pressing the contact arm 12 upwards with its other end. The arm 12 is pivoted by forming a recess near one end opposite a corresponding recess in the upturned end of a fixed bracket 19. The operation of the switch is produced by a carbon rod 14 resting in a metal tube 13 which is screwed into the base 21. Against the upper end of the rod the shoulder 35 of an intermediate rod 15 is pressed by the spring 36. The rod 15 is slotted at 33, Fig. 4, a lever 30 passing transversely through the slot. The lever 30 is pivoted at a fixed point 31, its free end bearing on the lever 12 near its pivotal point. An adjusting screw 40 is screwed down into the hollow upper part of the rod 15, its lower end bearing on the lever 30. Thus, when the rod 15 moves down under spring pressure owing to the differential expansion on heating of the carbon rod 14 and metal tube 13 the lever 30 is rotated and so moves over the contact arm 12, the arrangement of levers being such that a switching over action occurs with a comparatively small movement of the rod 15. To set the temperature at which the switch operates the rotatable cover 41 which houses the switch is provided with an adjustable plate 45 carrying a downwardly projecting plate 44 engaging the slot of the adjusting screw 40. The range of operation indicated by graduations on the cover is adjusted by rotation of the screw 40 with the cover removed, the cover being afterwards replaced in position with the plate 44 engaging the slot of the screw 40, and after final adjustment of the position of the plate 44 relative to the cover, this plate is clamped in position by screws 48.

240,485. Slate, T. B. Sept. 27, 1924, [*Convention date*]. *Drawings to Specification.*

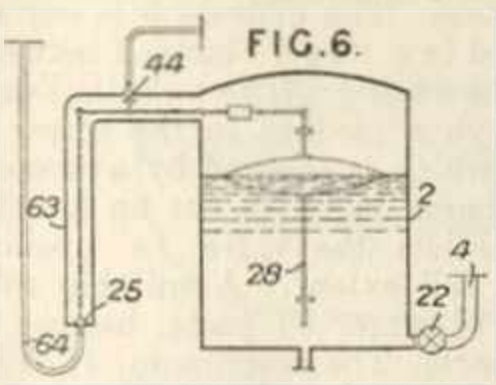
Non-conducting coverings for heat.—A cylindrical metal container for carbon-dioxide ice, which evaporates and escapes through an opening into a cooling-chamber, is insulated to prevent direct transfer of heat by a layer of hair felt, compressed by a winding of adhesive tape, a second layer of hair felt similarly compressed, and an outer covering of canvas or other waterproof material, which is blackened to render it heat-absorbing.

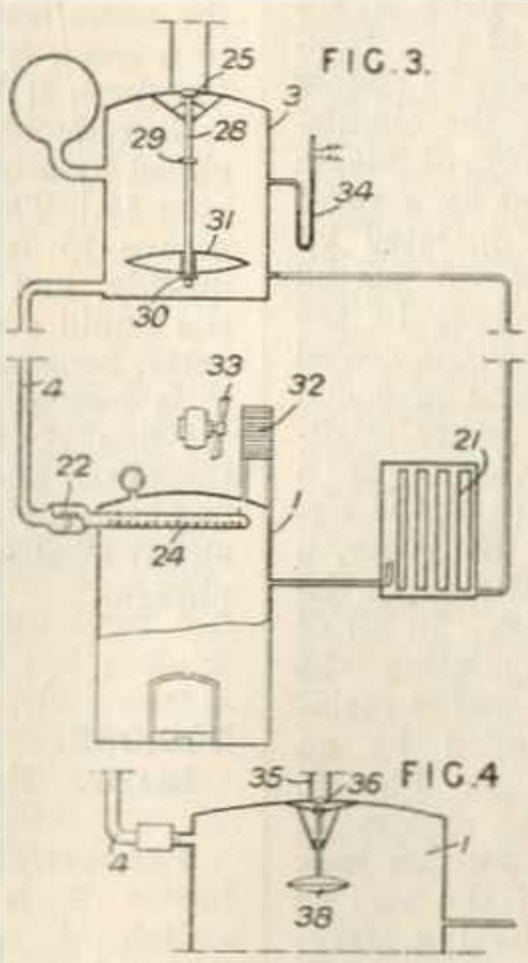
240,584. Bates, A., (*trading as* Willis & Bates). July 22, 1924.

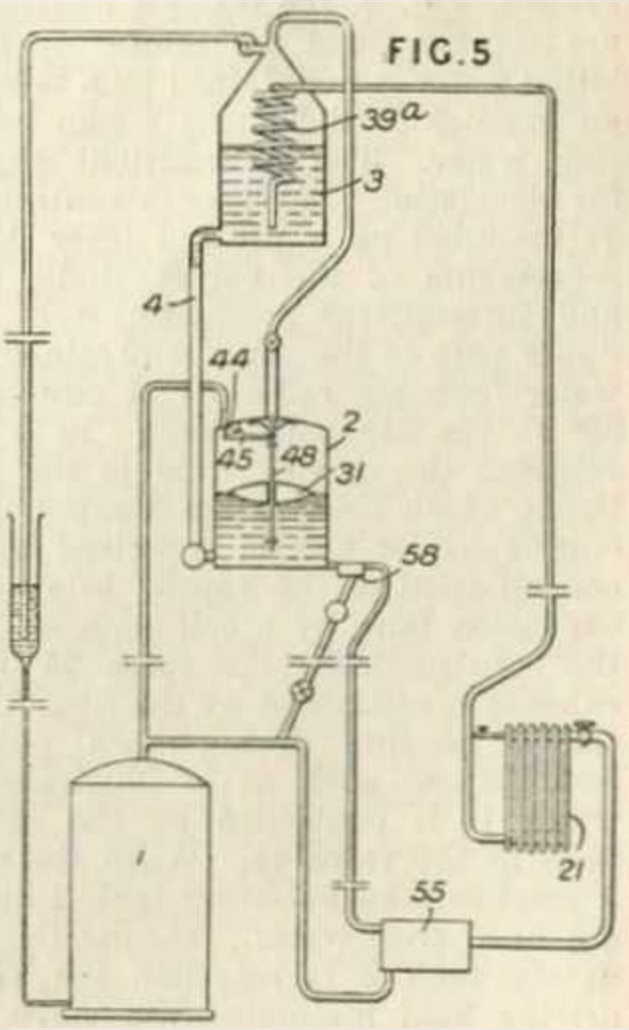


Bedwarmers and airers.—A bedwarmer of aluminium is made in one piece *b* up to the point *a* where it is joined to a saucer-shaped top provided with a filling aperture.

240,938. Moreau, H. July 15, 1924.







Heating buildings. — Relates to hot-water heating-mechanism for buildings &c. of the type, such as is described in Specification 209,251, in which an intermittent flow of water through the radiators 21, Fig. 3, of the system is obtained by the use of a pulsator tank, in which an intermittent pressure is obtained and which may form part of a boiler 1, and an expansion tank 3, from which the return of water is controlled by a float 31 arranged either in the expansion tank or the pulsator tank. According to the in-

vention steam or other vapour is employed as the driving fluid and the thrust is increased by effecting in some portion of the system a condensation of the driving fluid, thus producing a partial vacuum, while the valve 25, shown diagrammatically in Fig. 3, which controls the release of pressure from the expansion tank 3 or pulsator tank, is rendered fluid-tight during each pulsation by being flooded. In the arrangement shown in Fig. 3, the pulsating tank is formed in one with the boiler 1, and water is returned from the expansion tank 3 through a pipe 4 fitted with a non-return valve 22 and at its extremity with a perforated tube 24. After a discharge of water from the expansion tank 3 to the boiler 1, the float 31 sinks and by engaging a stop 30 on the valve spindle 28 opens the exhaust valve 25. Thereupon, as steam is generated in the boiler 1, the resulting pressure causes the valve 22 to close and a volume of hot-water to be driven through the system, the expansion tank again becoming filled and the float 31, by engaging a second stop 29, finally closing the valve 25. Subsequently, the pressure in the tank 3 increases to establish an equilibrium of pressure and prevent further circulation of water in the system. In order to open the valve 22 and allow the water to be returned once again to the boiler, a reduction of pressure in the latter is produced by effecting a condensation of the steam either by means of radiator 32 cooled by a fan 33 or by means of a pump delivering a spray of cold water, the fan 33 or the pump being controlled electrically by the displacement of mercury in a manometer 34 mounted on the tank 3. In addition, a valve 36, Fig. 4, connected to a float 38 in the boiler 1 may control a passage 35 communicating between the boiler and upper part of the tank 3, the valve 36 being closed so long as a substantial difference in pressure exists between the boiler and tank, but opening when the pressures become nearly equalized. In a modified system, Fig. 5, the boiler 1 and pulsating tank 2 are separate, and the temperature of the circulating water is maintained by a reheater 55 and/or an injector 58 delivering steam into the circulating water. The intermittent supply of steam for circulating the water is controlled by a valve 44 mounted on a pivoted lever 45 operated by movements of the valve spindle 48. A partial and intermittent condensation of steam in the upper part of the tank is obtained by the cooled water from the radiators 21 circulating in a coil 39^a in the expansion tank. In a further modification, the driving fluid is the vapour of a liquid which boils at the temperature of the circulating-water and is vaporized by the latter, a condensation of the vapour being effected in the expansion tank by a coil such as 39^a. In all of the constructions, the valve 25 regulating the exhaust is controlled by the float 31 and is maintained flooding during each pulsation by an arrangement such as is illustrated in Fig. 6, where it is controlled by the same system of links as the valve 44. When the expansion tank 3 empties, the pulsating tank 2 and the well 63 are filled with water. During the forcing stage, as the tank 2 is emptied, the pressure of the driving fluid maintains the valve 25 closed; at the end of the pulsation the float 31 opens the valve 25, and the pressure existing in the tank 2 expels the water from the well 63 and pipe 64, the valve 44 being closed.

241,511. Ribes, P. C. Oct. 15, 1924, [*Convention date*].

FIG. 1.

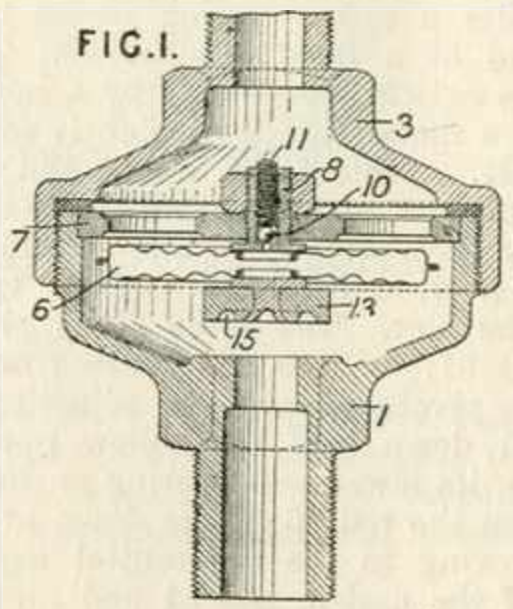
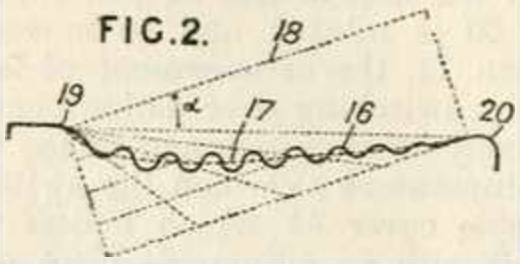


FIG. 2.

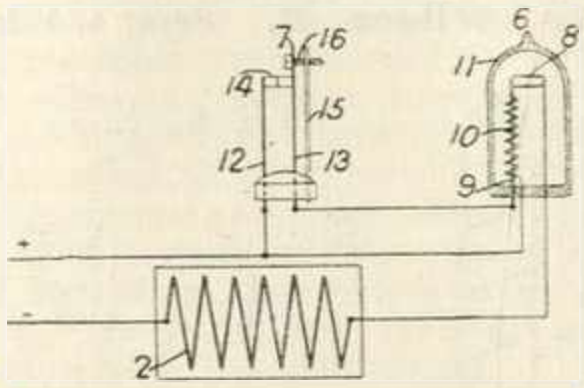


Steam-traps.—A steam trap of the type in which the water outlet valve is controlled by the expansion of a capsule containing volatile liquid, employs a mixture of water with organic compounds such as alcohols, ethers, and hydrocarbons in the capsule, the vapour pressure of such a mixture being greater, by substantially the same amount, than the vapour pressure of water at the same temperature. The capsule 6 is carried by a screw 8 secured in a ring 7 clamped between the parts 1, 3 of the casing. The volatile liquid is introduced through a passage in the screw 8, closed by a ball 10 which is secured by a screwed plug 11. The discharge valve 13 has an annular groove 15 which assists the valve in opening quickly, and to its full extent. A suitable volatile liquid consists of water 50 parts, hexane 25 parts, benzene 25 parts. The diaphragm, 16, Fig. 2, is corrugated on both sides of a parabolic centre line 17, the corrugations becoming flatter at the outer end, and merging into curves 19, 20. The axis of symmetry 18 of the parabola is inclined at about 20° to the mean plane of the diaphragm.

242,252. Aktiebolaget Birka Regulator. Nov. 3, 1924, [*Convention date*].

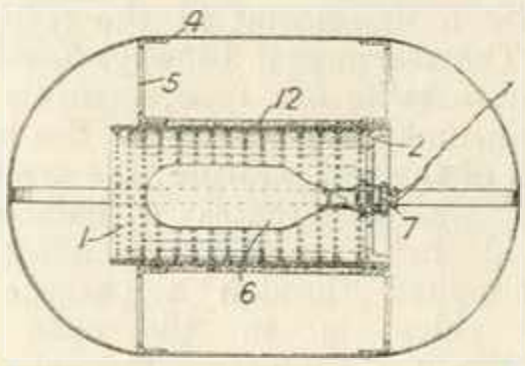
Thermostats. — The current to the electrical heater 2 is regulated by a main thermal switch 6 and an auxiliary thermal switch 7, the latter being arranged near the heater so as to open its contacts 14 when the heater reaches

a certain temperature and thereby removes a short-circuit from the heating coil 10 of the main switch, which then opens and closes its contacts 8 in a well-known manner so as to reduce the supply of current to the heater 2 to a suitable amount. The switches 6, 7 are preferably both of the bimetallic kind as shown. The auxiliary switch 7 comprises two springs 12, 13 carrying contacts 14, the strip 13 being engaged by the head of a screw 16 which is adjustably secured



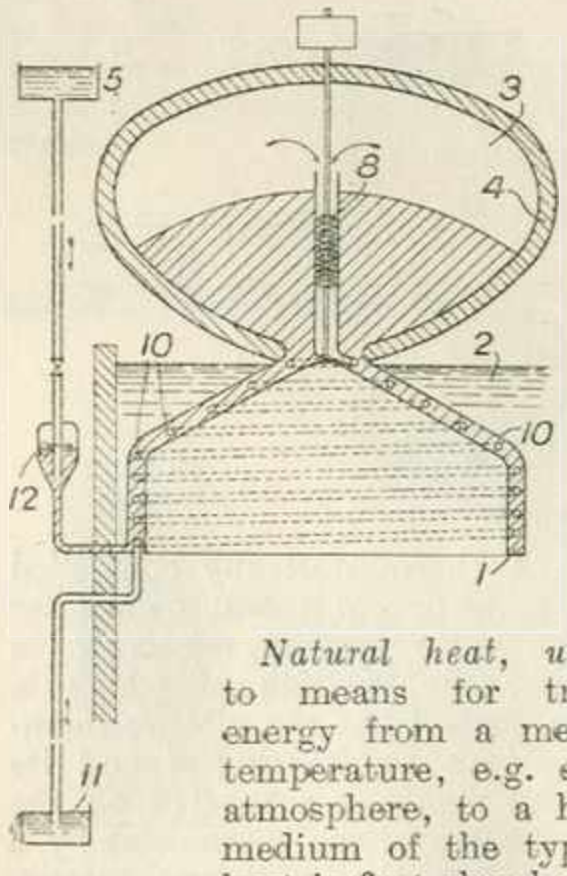
in the bimetallic member 15. The main switch 6 is enclosed in a receptacle 11 which is evacuated or filled with an inert gas. In a modification both switches are enclosed in such receptacles or they may be enclosed together in one receptacle which is placed in thermal relation to the heater 2. In this latter case, should the auxiliary switch 7 fail to act, the main switch 6 will still open its contacts, though at a somewhat higher temperature.

242,439. Barratt, S. H. H. Nov. 11, 1924.



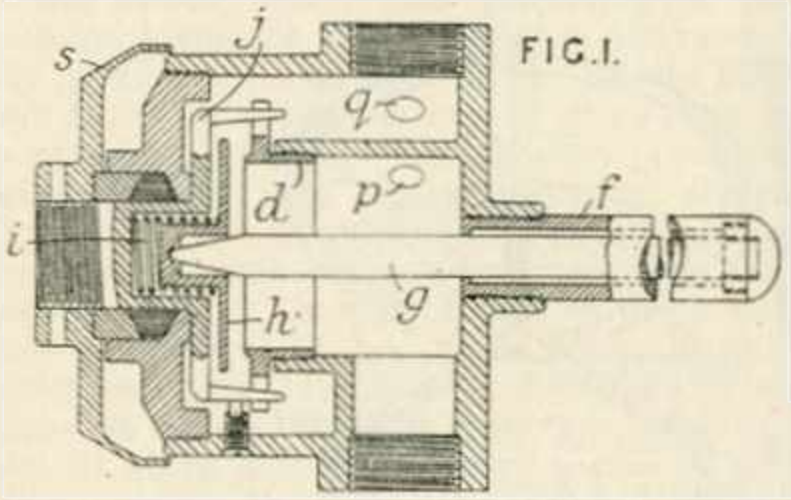
Bed warmers and airers.—A device for warming beds, cars, and the like comprises a cage 4 surrounding a perforated cylinder 1 fitted internally with a plate 2 carrying removable contacts 7 for locating an electric heating device within the cylinder and connecting the device to a supply source. The cylinder is insulated from the cage by a sheet 12 of asbestos and the plate 2 may be perforated. The cage may consist of a wire structure 4 of two hoops supported from the cylinder by means of perforated discs 5 or wire members in tension. A plane surface may be provided as a foot rest.

242,690. Dobbs, A. C. July 29, 1924.



Natural heat, utilizing.—Relates to means for transferring heat energy from a medium at a low temperature, e.g. sea water or the atmosphere, to a high temperature medium of the type in which the heat is first absorbed by a process of endothermic solution, e.g. using potassium nitrate and water, and then delivered to the high temperature medium, e.g. the steam evolved by evaporation, by separation of the solute from the solvent. The vapour obtained by evaporation at the surface of the solution, which constitutes a cooling mixture, is drawn through an engine or other apparatus, in which its energy is utilized, and then passing through the cooling mixture itself, so that any residual heat of the vapour, including its latent heat, is transferred back to the mixture simultaneously with the reintroduction in the opposite direction, on the counter-current principle, of the solvent into the mixture. In the apparatus shown the potassium nitrate or the like is disposed within an annular receptacle 1, which is immersed in sea-water 2 and to which water is supplied from a tank 5. The receptacle 1 communicates with a boiler 3 having a non-conducting covering 4, the lower part of the boiler also containing crystals of potassium nitrate. Steam-pipes or electric heating elements are arranged in the boiler near the surface of the solution, and the heat absorbed from the sea-water in the process of dissolving the potassium nitrate is recovered when the potassium nitrate is separated again from the water and deposited in the boiler. The steam evolved in the boiler may be employed for driving a turbine 8 and then condensed, preferably in a coil 10 located in the receptacle 1. The condensate may be re-circulated from the tank 5 at a rate regulated through the medium of a valve 12 by the pressure in the boiler, or it may be discharged at a level 11 situated at a distance below the apparatus not less than the height of the water barometer. In warm countries, the absorption of heat resulting from the dissolving of the potassium nitrate or the like may be made effective for cooling purposes. Also, if sea-water is supplied from the tank 5, a separation of the salts contained therein is effected in the boiler 3, and these salts may be removed at intervals.

242,774. Thorp, H. T., and **Thorp & Co., Ltd., T.** Oct. 30, 1924.



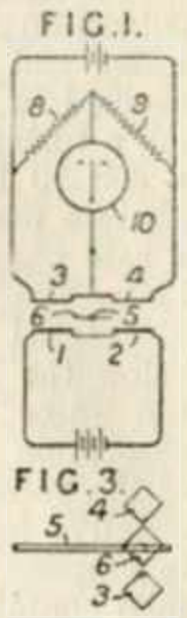
Thermostats. — A thermostatically controlled valve with a dial plate or equivalent means for screw-adjusting the valve seating relatively to the closure member the position of which is under thermostatic control has the closure member *h* situated between the seating *d* and its adjusting means and pivotally supported on the less expansible member *g* of the thermostat by a spring *i* bearing against the adjusting means. The seating *d* is adjusted by lugs on a bridge-piece *j* which carries externally of the casing a dial plate *s*. The expansible member *f* of the thermostat may be of copper. A by-pass consisting of a tube with a side orifice is fitted in the parts *p*, *q*. The adjusting means may be on the thermostat side.

242,852. McEwan, J. L., and **McEwan, C.** Dec. 12, 1924.

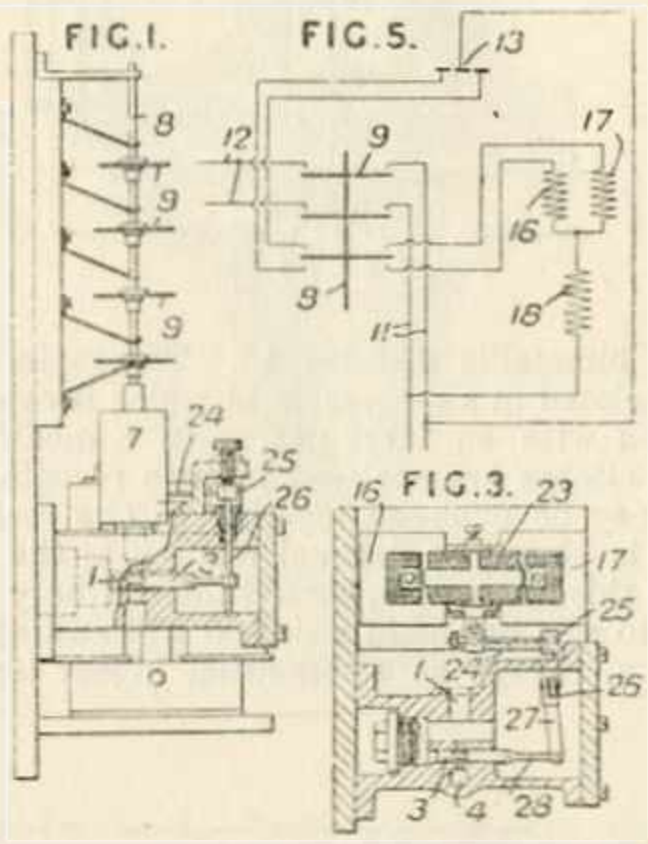
Non-conducting coverings.—Silicate cotton is teased out to separate slag particles from it, placed in a mould, impregnated with dilute silicate of soda, and quickly dried in a hot oven so that a cellular structure is obtained. The product is used for heat-insulation in ships, buildings, &c.

243,048. Foster, C. E. Aug. 14, 1924.

Thermostats.—An indicating or measuring instrument automatically controls the supply of fuel to a furnace, or affects lamps or their indicators, by varying the amount of heat falling upon resistances arranged in a Wheatstone bridge. A vane 6 on the pointer 5 of the measuring instrument is normally symmetrically positioned between sources of heat 1, 2 and resistances 3, 4 connected in the bridge with fixed resistances 8, 9 and a relay 10. When the pointer moves, e.g., by means of the current in a thermocouple inserted in the furnace, the resistances 3, 4 are heated unequally and the balance is upset, causing the relay to control the supply of fuel or close the circuit of the indicators. The source of heat 2 may be omitted. The Provisional Specification states that the sources of heat may be connected to the Wheatstone bridge, the temperature being raised by a reflecting vane.



243,461. Wilson, E. Sept. 4, 1924.

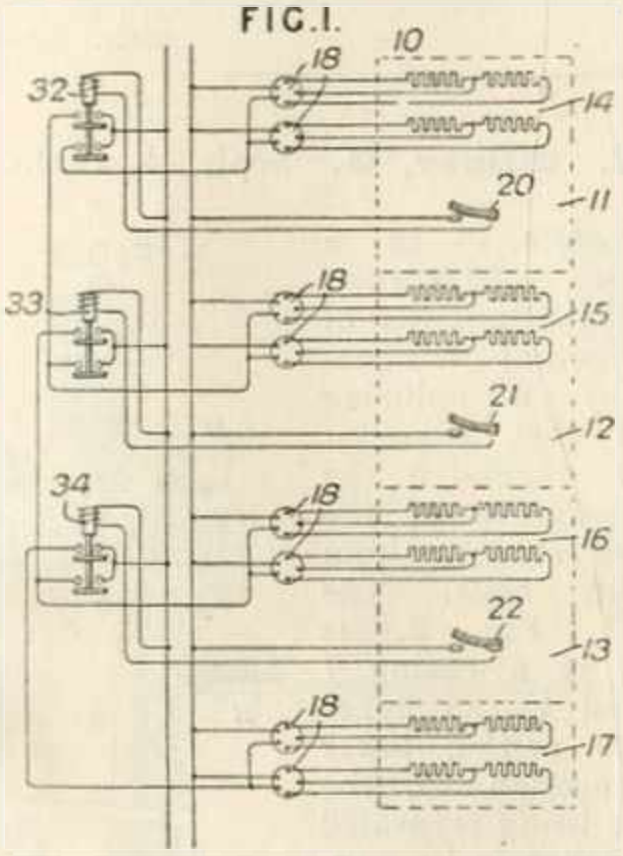


Thermostats.—The electric driving motor of a refrigerating machine for cooling a domestic refrigerator is controlled by the flow of cooling-water through the machine, the water-supply valve being moved by an electromagnetic relay controlled by a thermostat in the refrigerating-chamber. The thermostat 13, Fig. 5, which may be of the bi-metallic bar type, controls the circuits of electromagnets 16, 17 for the lower and upper limits of the temperature, the armature 23, Fig. 3, of which actuates a balanced sliding valve 3 in the water conduit. The water is supplied through a passage 1, and when the valve is in the open position shown in Fig. 3 has access through a channel 4 to a cylinder 7, Fig. 1 containing a piston fitted with a switch rod 8 carrying contact discs 9. The armature 23 is connected by a rod 24 to a crank arm 25 on a shaft 26 which actuates the valve through an arm 27 and valve-rod 28. The armature carries springs acting as buffers against brackets carried by or formed on the magnets 16, 17. The lowermost switch contact disc 9 coacts with two pairs of spring contacts, to break the circuit of one thermostat contact and prepare for closing the circuit of the other thermostat contact, while each of the other discs 9 coacts with a single pair of spring contacts to control the supply of current to the motor from mains 11 to supply wires 12. A lamp 18, Fig. 5, included as a resistance in the electromagnet circuits, may serve as a signal when the source of water supply fails al-

together, resulting in stoppage of the motor and ultimately in the setting of the thermostat in its higher position. The switch rod 8 may control the operating circuit of a contactor type starter, the current in the wires 11 being derived from a battery or other independent source. Alternatively, a hydraulic prime mover of greater power than the cylinder 7 may be employed to rotate known cam shaft mechanism for operating a series of contactors, or the electric motor may be controlled by a multiple-finger starter controlled from the piston 7 by tappet switches. A single electromagnet may be used for actuating the water valve in opposite directions alternately, by the intermittent turning movement of a disc. According to the Provisional Specification, the thermostat may act directly on the water valve, or it may control a small electric motor for actuating the water valve, and a double-acting water-pressure cylinder may be used for controlling the main motor.

243,464. British Thomson-Houston Co., Ltd., (*General Electric Co.*). Sept. 6, 1924.

FIG. 1.

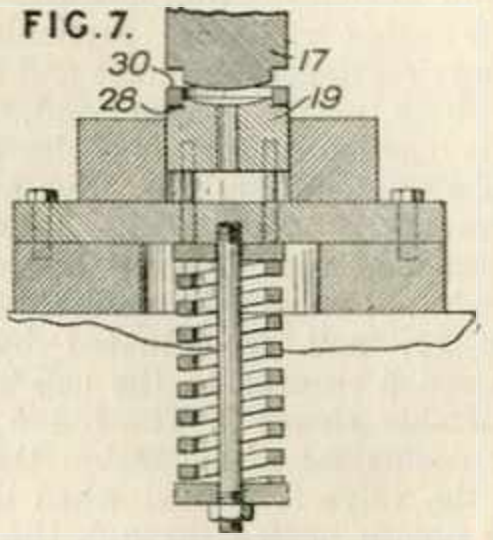


Thermostats.—The heating units of multiple compartment ovens radiating heat to a plurality of compartments are controlled by temperature responsive devices in each compartment jointly in accordance with the temperatures of the compartments into which they radiate. Electric heating units 14, 15, 16 are provided in the top of compartments 11, 12, 13 of an oven 10 and a heating unit 17 is also provided in the bottom of the lowest compartment. Each of the heating units comprises two sections and is regulated by a manually operated three-heat snap switch 18. Automatic temperature responsive control devices 20, 21, 22. e.g bimetallic thermostats, are arranged in each compartment and at predetermined maximum and minimum temperatures operate respectively two-way relay switches 32, 33, 34 in circuit with the several heating units. Thermostat 20 also controls the circuit of heating unit 15 jointly with thermostat 21 which in turn controls the circuit of unit 16 jointly with thermostat 22, and thermostat 22 also has sole control of unit 17. In a modified arrangement the thermostats control only one section of the heating unit in the adjacent compartment.

243,511. Spencer, J. A. Nov. 10, 1924.

FIG. 1.

FIG. 7.



Thermostats.—In making a bi-metallic thermostatic element, the metal is clamped and heated to a temperature above its working range, the clamping preventing change of shape upon change of temperature. The method is particularly applicable to disc-shaped elements which alter their shape suddenly at a critical temperature. The clamp comprises a cylinder 1 adapted to receive a number of discs 3 separated by spacers 5, the discs being maintained flat by a clamping screw 11. The clamp is then placed in an oven and heated to about 450° C. for one hour. When the discs are released, they are concave on the side having the higher expansion coefficient, and operate more uniformly when in use. If the discs have a central aperture, the clamping bolt may pass through them. The discs are then shaped in a press, Fig. 7, between dies 17, 19, the movement of the upper die being limited by washers 28 and a ring 30. The temperature during pressing is preferably 100—150° C. above that at which the discs are to be used. After pressing, the discs are heated on a hot plate or oven to 50—100° C. above the maximum temperature in use, for 10—30 minutes. Specifications 19011/09 and 178,103 are referred to.

243,630. Benham & Sons, Ltd., and **Allensby, C. R.** June 12, 1925.

FIG. 3.

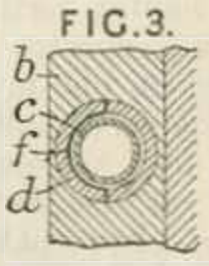


FIG. 4.

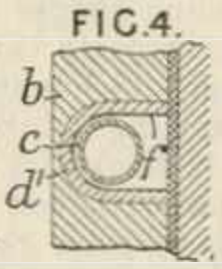


FIG. 6.

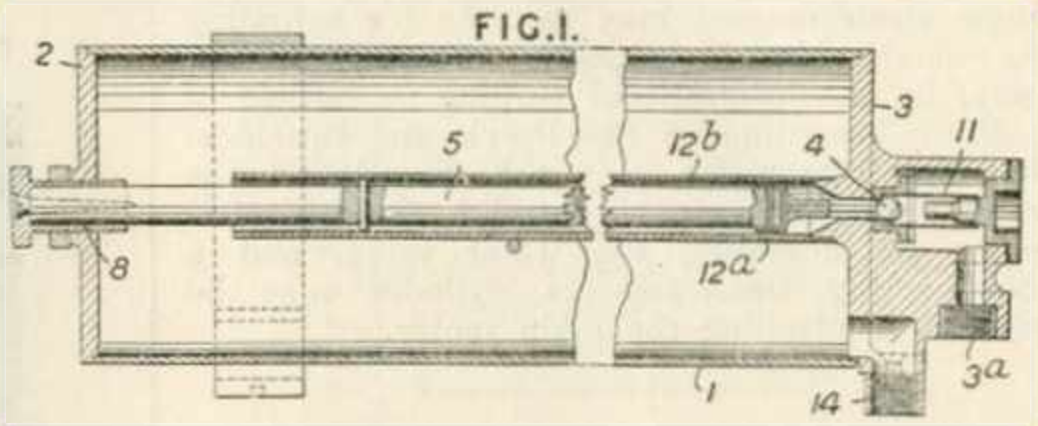
Radiators.—In the heating of buildings by means of pipes embedded in the walls, cracking

of the walls is prevented by surrounding the pipes, wholly or partly, by larger tubes slightly spaced away from the pipes. In Fig. 3, the pipe *c* is surrounded by two half-tubes *d* embedded in the wall *b*, and formed of a fireclay composition having a similar coefficient of expansion to that of the wall. To facilitate transfer of heat, a metallic film or coating *f* may be applied to the inside or outside of the tube *d*. In Fig. 4, the enclosing tube d^1 is of **U**-section. The tube *d* may be corrugated externally as in Fig. 6, or internally, and may be similarly coated with a metallic film.

244,311. Still & Sons, Ltd., W. M., and **Adamson, A. G.** March 21, 1925.

Heating vehicles; thermostats.—In a steam-heated radiator, particularly for railway carriages, the inlet and outlet are both at the same end, and steam is carried to the opposite end by a tube surrounding the valve actuating rod. The radiator tube 1 has a cap 3 provided with inlet 3^a and outlet 14. A ball valve 4 is mounted in a strainer 11, and is actuated by a wooden rod 5 secured to the cap 2 by an adjustable sleeve 8. The rod 5 has a lower coefficient of expansion than the tube 1, so that the valve is opened when the tube 1 contracts. Steam passes through the tube 5 to the further end of the tube 1, and small holes 12^b are provided in the tube for the passage of a small quantity of steam, and a hole 12^a for drainage. Specifications 29285/12 and 107,134 are referred to.

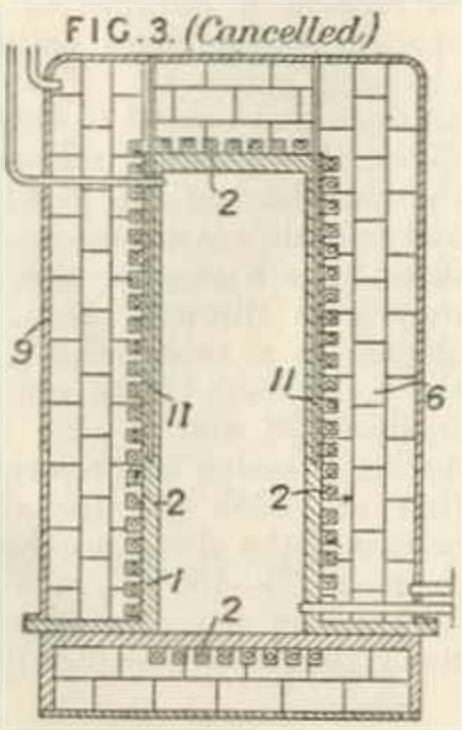
FIG. 1.



244,426. Siemens - Schuckertwerke Ges., (Assignees of *Heraeus-Vacuumschmelze Akt.-Ges., and Rohn, W.*). Dec. 15, 1924, [*Convention date*].

Thermostats.—The Specification as open to inspection under Sect. 91 (3) (a) describes an electric furnace with a metal heating chamber 1 having holes containing quartz or porcelain rods 11. The differential expansion of the rods and chamber opens or closes a contact controlling the heating circuit. This subject-matter does not appear in the Specification as accepted.

FIG. 3. *(Cancelled)*



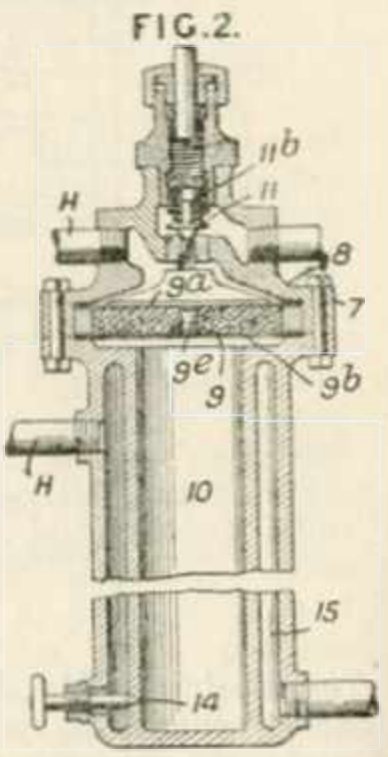
244,509. Payne, M. Sept. 13, 1924.

Non-conducting coverings for heat.—Heat-insulating slabs, including shapes having flexibility in all directions, comprise an asbestos slab formed of long fibres, and having on one or both faces a flexible backing of material such as casein glue, which is heat and also waterproof. The slab may be strengthened on one or both sides with a net of asbestos or other material, the slab being felted upon one net when two are employed, and the other net being attached by adhesive or other means.

244,538. Hilger, G. Sept. 24, 1924.

Thermostats. — In a compression refrigerating system the admission of the refrigerant is controlled by a reducing valve 11 that is automatically regulated by the temperature of the refrigerant returning from the cooling coils. The valve 11, Fig. 2, is arranged in a casing 7 constituted by an upper section 8 and a lower annular section 15, the two parts being separated by a diaphragm 9 consisting of two flexible discs 9^a separated by heat insulating material 9^b and a spacing member 9^c. A sealed chamber 10 formed by the section 15 is charged with refrigerant and the variations in the temperature of the refrigerant returning through the annular section 15 cause variations of pressure in the chamber 10 to regulate the valve 11.

FIG. 2.

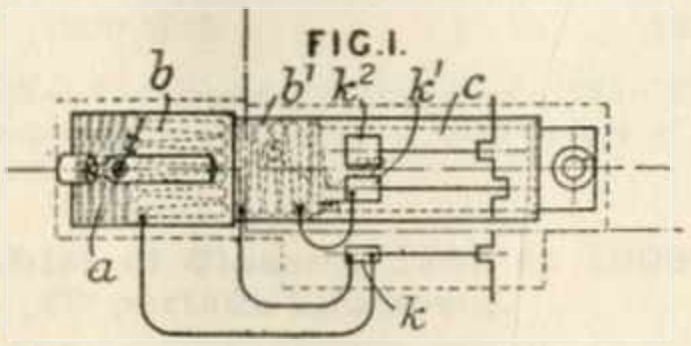


244,564. Wolf, M., and **Mertz, A.** Nov. 6, 1924.

Waste heat systems and apparatus.—An old portable heating and power installation comprising a compound engine k^1, k^2 and a horizontal

tubular boiler *c* is supplemented by a high-pressure boiler *a* and a high-pressure cylinder *k* connected up to the old engine shaft. Each are mounted on extensions of the brickwork. The old boiler is heated by the waste gases of the new boiler and may also receive steam from the engine, and is used solely as a thermal storage vessel. Superheaters *b*, b^1 are arranged between

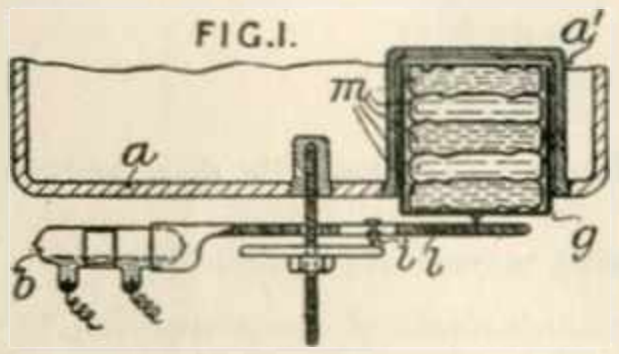
FIG. 1.



the boilers *a*, *c*. The steam from the boiler *a* at 80 atmospheres pressure passes through the superheater *b* to the high-pressure cylinder *k*, it then passes to the superheater b^1, and then to the old compound engine k^1, k^2. A turbine may be used in lieu of the cylinder *k*. In a modification the boiler *a* is arranged parallel to the boiler *c*, and the superheater b^1 is arranged transversely between them.

244,783. Legendre, L. Dec. 19, 1924, [*Convention date*].

FIG. 1.



Thermostats.—A boiler or the like *a*, the temperature of which is to be controlled, is provided with a recess a^1 containing a casing *g*, in which a number of elastic capsules *m* containing expansible fluid are placed. The movements of the casing *g* are transmitted through a lever *l* pivoted at *i* to a tilting mercury switch *b* controlling the heating circuit. The lever *l* is adjustable by moving the knife edge *i* along a slot, and the sensitiveness of the thermostat is adjustable by varying the number of capsules *m* or the liquid which they contain.

LONDON
PRINTED UNDER THE AUTHORITY OF HIS MAJESTY'S STATIONERY OFFICE
By the COURIER PRESS, Bedford Street, Leamington Spa
Published at the PATENT OFFICE, 25, Southampton Buildings,
Chancery Lane, London, W.C.2.

1928

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33, Drains and sewers.
34, Drying.
35, Dynamo-electric generators and motors, (*including* Frictional and influence machines, magnets, and the like).
36, Electricity, Conducting and insulating.
37, Electricity, Measuring and testing.
38, Electricity, Regulating and distributing.
39, Electric lamps and furnaces.
40, Electric telegraphs and telephones.
41, Electrolysis, (*including* Electro-deposition *and* Electro-plating).
42, Fabrics, Dressing and finishing woven and manufacturing felted, (*including* Folding, Winding, Measuring, *and* Packing).
43, Fastenings, Dress, (*including* Jewellery).
44, Fatenings, Lock, latch, bolt, and other, (*including* Safes and strong-rooms).
45, Fencing, trellis, and wire netting.
46, Filtering and otherwise purifying liquids.
47, Fire, Extinction and prevention of.
48, Fish and fishing.
49, Food preparations and food-preserving.
50, Fuel, Manufacture of.
51, Furnaces and kilns, (*including* Blowpipes and blowpipe burners; Smiths' forges and rivet hearths; *and* Smoke and fumes, Treating).
52, Furniture and upholstery.
53, Galvanic batteries.
54, Gas distribution.
55, Gas manufacture.
56, Glass.
57, Governors, Speed-regulating, for engines and machinery.
58, Grain and seeds, Treating, (*including* Flour and meal).
59, Grinding, crushing, pulverizing, and the like.
60, Grinding or abrading, and burnishing.
61, Hand tools and benches for the use of metal, wood, and stone workers.
62, Harness and saddlery.
63, Hats and other head coverings.
64, Heating, (*excepting* Furnaces and kilns; *and* Stoves, ranges, and fireplaces).
65, Hinges, hinge-joints, and door and gate furniture and accessories, (*excepting* Fastenings, Lock, latch, bolt, and other).
66, Hollow-ware, (*including* Buckets, Pans, Kettles, Saucepans, *and* Water-cans).
67, Horseshoes.
68, Hydraulic engineering.
69, Hydraulic machinery and apparatus, (*excepting* Pumps and other means for raising and forcing liquids).
70, India-rubber and gutta-percha, (*including* Plastic compositions *and* Materials of constructive utility, other than metals and stone).
71, Injectors and ejectors.
72, Iron and steel manufacture.
73, Labels, badges, coins, tokens and tickets.
74, Lace-making, knitting, netting, braiding, and plaiting.
75, Lamps, candlesticks, gasaliers, and other illuminating-apparatus, (*excepting* Electric lamps).
76, Leather, (*including* Treatment of hides and skins).
77, Life-saving, (Marine), and swimming and bathing appliances.
78, Lifting, hauling, and loading, (*including* Lowering, winding, and unloading).
79, Locomotives and motor vehicles for road and rail, (*including* Portable and semi-portable engines).
80, Mechanism and mill gearing.
81, Medicine, surgery, and dentistry.
82, Metals and alloys, (*excepting* Iron and steel manufacture).
83, Metals, Cutting and working.
84, Milking, churning, and cheese-making.
85, Mining, quarrying, tunnelling, and well-sinking.
86, Mixing and agitating machines and appliances, (*excepting* Centrifugal machines and apparatus).
87, Moulding plastic and powdered substances, (*including* Bricks, building and paving blocks, and tiles, *and* Pottery).
88, Music and musical instruments.
89, Nails, rivets, bolts and nuts, screws, and like fastenings.
90, Non-metallic elements.
91, Oils, fats, lubricants, candles, and soaps.
92, Ordnance and machine guns.
93, Ornamenting.
94, Packing and baling goods.
95, Paints, colours, and varnishes.
96, Paper, pasteboard, and papier mâché.
97, Philosophical instruments, (*including* Optical, nautical, surveying, mathematical, and meteorological instruments).
98, Photography.
99, Pipes, tubes, and hose.
100, Printing, Letterpress and lithographic.

101, Printing other than letterpress or lithographic.
102, Pumps and other means for raising and forcing liquids, (*excepting* Rotary Pumps).
103, Railway and tramway vehicles.
104, Railways and tramways.
105, Railway signals and communicating-apparatus.
106, Registering, indicating, measuring, and calculating, (*excepting* Signalling and indicating by signals).
107, Roads and ways.
108, Road vehicles.
109, Ropes and cords.
110, Rotary engines, pumps, blowers, exhausters, and meters.
111, Sewage, Treatment of, (*including* Manure).
112, Sewing and embroidering.
113, Ships, boats, and rafts, Div. I.
114, ——————— Div. II.
115, ——————— Div. III.
116, Shop, public-house, and warehouse fittings and accessories.
117, Sifting and separating.
118, Signalling and indicating by signals, (*excepting* Railway signals and communicating-apparatus).
119, Small-arms.
120, Spinning, (*including* the preparation of fibrous materials *and* the doubling of yarns and threads).
121, Starch, gum, size, glue, and other stiffening and adhesive materials.
122, Steam-engines, (*including* Details common to fluid-pressure engines generally).
123, Steam generators, (*excepting* Furnaces).
124, Stone, marble, and the like, Cutting and working.
125, Stoppering and bottling, (*including* Bottles, jars, and like vessels).
126, Stoves, ranges, and fireplaces.
127, Sugar.
128, Table articles and appliances.
129, Tea, coffee, cocoa, and like beverages.
130, Tobacco.
131, Toilet and hairdressing articles, and perfumery.
132, Toys, games, and exercises.
133, Trunks, portmanteaux, hand and like travelling bags, baskets, hampers, and other wickerwork.
134, Umbrellas, parasols, and walking-sticks.
135, Valves and cocks.
136, Velocipedes.
137, Ventilation.
138, Washing and cleaning clothes, domestic articles, and buildings.
139, Watches, clocks, and other timekeepers.
140, Waterproof and similar fabrics.
141, Wearing-apparel.
142, Weaving and woven fabrics.
143, Weighing-apparatus.
144, Wheels for vehicles, (*excepting wheels for* Locomotives and tramway and traction engines; Railway and tramway vehicles; *and* Toys).
145, Wood and wood-working machinery.
146. Writing-instruments and stationery, and writing-accessories, (*including* Educational appliances).

(B.)—List of Classes, 1909 to 1925 (3 periods as above).

1 (i), Chemical processes and apparatus.
1 (ii), Inorganic compounds other than metallic oxides, hydrates, oxyacids, and salts, (*including* Alkali manufacture *and* Cyanogen compounds).
1 (iii), Oxides, hydrates, oxyacids, and salts, Metallic, (*other than* Alkali manufacture *and* Cyanogen compounds).
2 (i), Acetylene.
2 (ii), Cellulose, Non-fibrous, and cellulose derivatives, (*including* Artificial filaments, sheets, and the like containing same).
2 (iii), Dyes and hydrocarbons and heterocyclic compounds and their substitution derivatives.
3 (i), Advertising and displaying apparatus, Moving and changing.
3 (ii), Advertising and displaying other than by moving and changing apparatus.
4, Aeronautics.
5 (i), Farmyard and like appliances, (*other than* Housing and feeding animals).
5 (ii), Housing and feeding animals, (*other than* Chaff and vegetable cutters).
6 (i), Cultivating implements and systems.
6 (ii), Gardening and like appliances, (*including* Miscellaneous agricultural appliances).
6 (iii), Harvesting appliances.
7 (i), Combustion-product and hot-air engines.
7 (ii), Internal-combustion engines, Arrangement and disposition of parts of, (*including* Construction of parts peculiar to internal-combustion engines).
7 (iii), Internal-combustion engines, Carburetting-apparatus, vaporizers, and heaters for.
7 (iv), Internal-combustion engines, Igniting in.
7 (v), Internal-combustion engines, Starting, stopping, and reversing.
7 (vi), Internal-combustion engines, Valves and valve gear for, (*including* Other means and methods for regulating and controlling internal-combustion engines).
8 (i), Air and gases, Compressing, exhausting, and moving, (*including* Bellows *and* Vacuum and like dusting and cleaning apparatus).
8 (ii), Air and gases, Treating otherwise than by compressing, exhausting, and moving.
9 (i), Ammunition and ammunition receptacles.
9 (ii), Torpedoes, explosives, and pyrotechnics.
10, Animal-power engines and miscellaneous motors.
11, Artists' instruments and materials.
12 (i), Bearings and bearing-surfaces.
12 (ii), Lubricating passages, channels, reservoirs, and baths, and lubricating cans.
12 (iii), Lubricators and lubricating bearing-surfaces, (*other than* Lubricating passages, channels, reservoirs, and baths).
13, Bells, gongs, foghorns, sirens, and whistles.
14 (i), Aerating liquids, and gazogenes, seltzogenes, and siphon bottles.
14 (ii), Beverages, malt products, and organized ferments, (*other than* Aerating beverages).
15 (i), Dyeing and otherwise treating textiles, textile materials, and the like with liquids and gases, Apparatus for, (*including* Bleaching and washing, Processes and materials for).
15 (ii), Dyeing, Processes and materials for.
16, Books, mercantile forms, and the like.
17 (i), Boots and shoes, Apparatus for making and repairing.
17 (ii), Boots and shoes, Construction of.
17 (iii), Boots and shoes, Protectors and trees and other accessories for.
18. Boxes and cases.
19, Brushing and sweeping.
20 (i), Buildings and structures, Kinds or types of.
20 (ii), Buildings and structures, Miscellaneous accessories and details applicable generally to.
20 (iii), Doors and windows and their accessories.
20 (iv), Floors, roofs, walls, and ceilings.
21, Casks and barrels.
22, Cements and like compositions.
23, Centrifugal machines and apparatus, (*other than* Centrifugal fans, pumps, and reels).
24, Chains, chain cables, shackles, and swivels.
25, Chimneys and flues, (*including* Ventilating-shaft tops).
26, Closets, urinals, baths, lavatories, and like sanitary appliances.
27, Coin-freed apparatus and the like.
28 (i), Bread-making, confectionery, and cooking-appliances.
28 (ii), Kitchen and like appliances other than cooking-appliances.
29, Cooling and ice-making, (*including* Refrigerators *and* Ice-storing).
30, Cutlery.
31 (i), Cutting and severing machines for paper, leather, fabrics, and the like.
31 (ii), Punching and perforating machines and hand tools for cutting, punching, perforating, and tearing paper, leather, fabrics, and the like.
32, Distilling and evaporating liquids, (*including* Condensing vapours *and* Crystallizing).
33, Drains and sewers.
34 (i), Drying gases, clothes, and materials in long lengths.
34 (ii), Drying systems and apparatus, (*other than* Drying gases, clothes, and materials in long lengths).
35, Dynamo-electric generators and motors, (*including* Frictional and influence machines, magnets, and the like).
36, Electricity, Conducting and insulating.
37, Electricity, Measuring and testing, (*including* Electric resistances and inductances).
38 (i), Electric couplings, and cut-outs other than electromagnetic and thermal.
38 (ii), Electric currents, Converting and transforming other than by rotary converters and rotary transformers, and condensers.
38 (iii), Electric motor control systems and motor and like controllers.
38 (iv), Electric supply and transmission systems and apparatus not otherwise provided for.
38 (v), Electric switches and electromagnetic and thermal cut-outs, (*other than* Motor and like controllers).
39 (i), Electric lamps, Arc and incandescent-arc, and vacuum or low-pressure apparatus for electric discharges through gases or vapours.
39 (ii), Electric lamps, Incandescent.

39 (iii), Heating by electricity, (*including* Electric furnaces and ovens).
40 (i), Electric signalling systems and apparatus, (*other than* Telegraphs *and* Telephones).
40 (ii), Phonographs, gramophones, and like sound transmitting and reproducing instruments.
40 (iii), Telegraphs, Electric.
40 (iv), Telephones and telephone systems and apparatus, Electric.
40 (v), Wireless signalling and controlling.
41, Electrolysis, (*including* Electrodeposition *and* Electroplating).
42 (i), Fabrics, Finishing and dressing.
42 (ii), Fabrics, Treating otherwise than by finishing and dressing.
43, Fastenings, Dress, (*comprising* Buckles, Buttons, Jewellery, *and certain other fastenings specially applicable to wearing-apparel*).
44, Fastenings, Lock, latch, bolt, and other, (*including* Safes and strongrooms).
45, Fencing, trellis, and wire-netting.
46, Filtering and otherwise purifying liquids.
47 (i), Fire-escapes and fire and temperature alarms.
47 (ii), Fire-extinguishing and fire preventing and minimizing.
48, Fish and fishing.
49, Food preparations, food-preserving, and the like.
50, Fuel, Manufacture of.
51 (i), Furnaces and kilns, Combustion apparatus of, (*including* Details in connection therewith).
51 (ii), Furnaces and kilns for applying and utilizing heat of combustion, (*other than* Combustion apparatus and details in connection therewith).
52 (i), Furniture, Fittings and details applicable generally to, and articles of furniture not otherwise provided for.
52 (ii), Furniture for sitting and lying upon.
52 (iii), Tables, desks, and leaf turners and holders.
52 (iv), Upholstery, wall furniture, screens, and looking-glasses.
52 (v), Window, stair, and like furniture, brackets, racks, and stands, (*including* Antimacassars *and* Table and like covers).
53, Galvanic batteries.
54, Gas distribution.
55 (i), Coking and gas-producers.
55 (ii), Gas manufacture other than gas-producers and retorts.
56, Glass.
57, Governors, Speed-regulating, for engines and machinery.
58, Grain and seeds, Treating, (*including* Flour and meal).
59, Grinding, crushing, pulverizing, and the like.
60, Grinding or abrading, and burnishing.
61 (i), Hand-tool, brush, mop, and like handles.
61 (ii), Hand tools, (*other than* Wrenches and bolt, nail, screw, and like inserting and extracting tools *and* Boring and drilling tools).
61 (iii), Wrenches and bolt, nail, screw, and like inserting and extracting tools.
62, Harness and saddlery.
63, Hats and other head coverings.
64 (i), Heating liquids and gases.
64 (ii), Heating systems and apparatus, (*other than* Heating liquids and gases *and* Surface apparatus for effecting transfer of heat).
64 (iii), Surface apparatus for effecting transfer of heat, (*other than* Apparatus in which the heat is transferred from products of combustion).
65 (i), Door and gate operating-appliances, furniture, and accessories, (*other than* Fastenings, Lock, latch, bolt, and other *and* Hinges and pivots).
65 (ii), Hinges and pivots.
66, Hollow-ware, (*including* Buckets, Pans, Kettles, Saucepans, *and* Water cans).
67, Horseshoes.
68 (i), Excavating earth and rock, booms, buoys, canals and rivers, ferries, and water supply.
68 (ii), Subaqueous buildings and structures, diving, and raising sunken ships and objects.
69 (i), Hydraulic apparatus not otherwise provided for.
69 (ii), Hydraulic presses, meters, motors, and like apparatus for use with high pressures.
69 (iii), Spray-producers and liquid-distributing sprinklers and nozzles.
70, Indiarubber and guttapercha, (*including* Plastic compositions *and* Materials of constructive utility other than metals and stone).
71, Injectors and ejectors.
72, Iron and steel manufacture.
73, Labels, badges, coins, tokens, and tickets.
74 (i), Braid and braiding-machines, crochet, lace and lace-making, and net-making machines.
74 (ii), Knitting and knitted fabrics.
75 (i), Burners and burner fittings.
75 (ii), Lamp chimneys, globes, lenses, shades, reflectors, and smut-catchers, and holders therefor.
75 (iii), Lamps for lighting and heating, Details and accessories applicable generally to, (*including* Lighting burners, pipes, cigars, and the like).
75 (iv), Lamps for lighting and heating, Kinds or types of, (*including* Lighting, Systems of).
76, Leather, (*including* Treatment of hides and skins).
77, Life-saving, (Marine), and swimming and bathing appliances.
78 (i), Conveyers and elevators for dealing continuously with articles and materials in bulk.
78 (ii), Lifting, lowering, and hauling not otherwise provided for.
78 (iii), Lifts, hoists, and jacks.
78 (iv), Loading and unloading, (*including* Transporters and cranes).
78 (v), Winding and paying-out apparatus for lifting, lowering, and hauling, (*including* Pulley-blocks and the like).
79 (i), Locomotives and tramway, traction, portable, and semi-portable engines.
79 (ii), Motor vehicles, Arrangement and disposition of driving, transmission, balance, and reversing gearing on.
79 (iii), Motor vehicles, Arrangement and disposition of parts of, not otherwise provided for, (*including* Construction of parts peculiar to motor vehicles).
79 (iv), Motor vehicles, Frames and undercarriage work of.
79 (v), Motor vehicles and locomotives, Steering and controlling.
80 (i), Gearing, Belt, rope, chain, toothed, and friction, and gearing for converting and conveying rotary or reciprocating motion.
80 (ii), Gearing, Variable-speed, differential, and reversing, and for stopping and starting, and shafting and its accessories.
80 (iii), Link-work, cams and tappets, and ratchet and screw-and-nut gearing.
80 (iv), Mechanism not otherwise provided for.
81 (i), Disinfecting and deodorizing, and medical and like preparations.
81 (ii), Medical, surgical, and dental appliances.
82 (i), Metals, Extracting and refining, and alloys.
82 (ii), Washing granular, powdered, and like materials, and amalgamating, cleaning, coating, and granulating metals.
83 (i), Casting and moulding metals.
83 (ii), Metal articles and forms, Combination apparatus and processes specially designed for producing and treating.
83 (iii), Metals, Cutting.
83 (iv), Metals, Working.
84, Milking, butter-making, and cheese-making.
85, Mining, quarrying, tunnelling, and well-sinking.
86, Mixing and agitating machines and appliances.
87 (i), Bricks, building and paving blocks, slabs, tiles, and pottery.
87 (ii), Moulding plastic and powdered substances, (*including* Casting substances other than metals *and* Presses, Mechanical).
88 (i), Musical instruments, Automatic.
88 (ii), Music and musical instruments other than automatic.
89 (i), Bolts, studs, nuts, washers, and rivets.
89 (ii), Hooks, nails, cotters, pins, staples, wedges, and wood-screws.
89 (iii), Nailing and stapling and wire-stitching.
90, Non-metallic elements.
91, Oils, fats, lubricants, candles, and soaps.
92 (i), Ordnance and machine-gun carriages and mountings.
92 (ii), Ordnance and machine guns.
93, Ornamenting.
94 (i), Packing and wrapping-up for transit and storage, (*including* Baling).
94 (ii), Paper bags, sacks, wrappers, and the like, (*including* Making envelopes).
95, Paints, painting, and the like.
96, Paper, pasteboard, and papier mâché.
97 (i), Optical systems and apparatus.
97 (ii), Surveying, navigational, and astronomical instruments.
97 (iii), Thermometers, meteorological and mathematical instruments, and miscellaneous philosophical instruments.
98 (i), Photographic cameras and auxiliary apparatus therefor.
98 (ii), Photographic processes and apparatus other than for taking photographs, (*including* Photographic plates, films, and papers).
99 (i), Pipes and tubes, Joints and couplings for, (*including* Joints for tubular framework *and like* Wire and rod couplings and joints).
99 (ii), Pipes, tubes, and hose, (*other than* Joints and couplings for).
100 (i), Feeding and delivering webs and sheets.
100 (ii), Printing processes and apparatus, (*other than* Type setting and composing).

100 (iii), Type making, setting, and composing, (*including* Type-bar-making machines).
100 (iv), Typewriters and like machines.
102 (i), Pumps, Reciprocating, for liquids, (*including* Steam-engine air-pumps *and* Combined pumps for liquids and gases).
102 (ii), Water and other liquids, and semi-liquids, Raising and forcing otherwise than by pumps.
103 (i), Brakes and retarding-apparatus.
103 (ii), Rail and road vehicles, Details applicable generally to.
103 (iii), Railway and tramway vehicles, Accessories for.
103 (iv), Railway and tramway vehicles, Body details and kinds or types of.
103 (v), Railway and tramway vehicles, Draught, coupling, and buffing appliances for.
103 (vi), Railway and tramway vehicles, Undercarriage and underframe details of.
104 (i), Railway and tramway crossings and points and switches.
104 (ii), Railway and tramway permanent way other than crossings and points and switches, and railway and tramway systems other than electric.
104 (iii), Railways and tramways, Electric, (*including* Electric traction).
105, Railway signals and communicating-apparatus.
106 (i), Calculating, counting, and cash-registering apparatus.
106 (ii), Dynamometers, gauges, measures of length, steam-engine and like indicators, and testing-apparatus.
106 (iii), Fares and admission-fees checking, revolution and speed indicators, and odometers.
106 (iv), Indicating, recording, and registering apparatus not otherwise provided for.
106 (v), Measured quantities delivering, measures of capacity, and sampling liquids.
107, Roads and ways.
108 (i), Road vehicles, Body details and kinds or types of.
108 (ii), Road vehicles, Undercarriage details and draught appliances for.
108 (iii), Springs and vibration-dampers.
109, Ropes and cords.
110 (i), Centrifugal and screw fans and pumps.
110 (ii), Rotary engines, pumps, blowers, exhausters, and meters, (*including* Rotary pump plant).
110 (iii), Turbines and reactionwheels and motor power plant.
111, Sewage, Treatment of, (*including* Manure).
112, Sewing and embroidering.
113 (i), Ship and boat fittings and accessories, and pontoons and rafts.
113 (ii), Ships and boats, Kinds or types and structural details of.
114, Ships, boats, and rafts, Propelling, steering, and manœuvring.
115, Ships, boats, and rafts, Rigging, sails, and spars for, (*including* Boat raising, lowering, and disengaging gear).
116, Shop, publichouse, and warehouse fittings and accessories.
117, Sifting and separating.
118 (i), Indicators and burglar and like alarms.
118 (ii), Signals, (*including* Marine signals).
119, Smallarms.
120 (i), Spinning, Preparation of fibrous materials for, (*including* Obtaining, opening, carding, and like treatment of fibres in general).
120 (ii), Spinning, twisting, and winding yarns and threads, (*including* Winding cords, wire, and the like).
120 (iii), Yarns and threads and miscellaneous spinning accessories and processes and treatment of fibres.
121, Starch, gum, size, glue, and other stiffening and adhesive materials.
122 (i), Engine and like cylinders, connecting-rods, crossheads and guides, flywheels, piston-rods, and pistons.
122 (ii), Steam-engine distributing and expansion valves and valve gear and valve-actuating arrangements therefor.
122 (iii), Steam engines, Kinds or types of and details not otherwise provided for, (*including* Steam and other fluid-pressure hammers and presses).
122 (iv), Steam engines, Regulating or controlling, starting, stopping, and reversing.
122 (v), Stuffing-boxes and substitutes therefor, (*including* Packing therefor).
123 (i), Liquid-level regulating, indicating, and registering, incrustation and corrosion preventing and removing, and door lids and covers for resisting fluid pressure.
123 (ii), Steam generators.
123 (iii), Steam separators and superheaters.
124, Stone, marble, and the like, Cutting and working.
125 (i), Bottles, jars, and like vessels, (*including* Non-refillable bottle, jars, and vessels).
125 (ii), Bottles, jars, and like vessels, Filling, opening, and closing, (*other than* Stoppers, lids, covers, and capsules).
125 (iii), Stoppers, lids, covers, and capsules, Bottle, jar, and like.
126, Stoves, ranges, and fire-places.
127, Sugar.
128, Table articles and appliances.
129, Tea, coffee, cocoa, and like beverages.
130, Tobacco.
131, Toilet and hairdressing articles, and perfumery.
132 (i), Amusement and exercising apparatus other than games and toys.
132 (ii), Games.
132 (iii), Toys.
133, Trunks, portmanteaux, hand and like travelling bags, baskets, hampers, and other wicker-work.
134, Umbrellas, parasols, and walkingsticks.
135, Valves and cocks.
136 (i), Cycle, velocipede, and like vehicle brakes, steering-mechanism, and miscellaneous accessories.
136 (ii), Cycle, velocipede, and like vehicle driving-mechanism, (*including* Human-power driving-mechanism for apparatus other than vehicles).
136 (iii), Cycles, velocipedes, and like vehicles, Kinds or types and structural details of.
137, Ventilation.
138 (i), Washing and cleaning buildings and domestic articles other than clothes and dry cleaning clothes and other absorbent materials.
138 (ii), Washing, mangling and wringing, ironing, and starching clothes.
139, Watches, clocks, and other timekeepers.
140, Waterproof and like fabrics.
141, Wearing-apparel.
142 (i), Looms, Driving, reversing, stopping, and starting, and loom shedding-mechanism and pattern cards, chains, surfaces, and the like.
142 (ii), Looms, Kinds or types of, and details not otherwise provided for.
142 (iii), Looms, Weft supplying, inserting, beating-up, cutting, doubling, and twisting in.
142 (iv), Woven fabrics and articles, and warping, leasing, balling, and beaming yarns, (*including* Pile fabrics *and* Floor coverings).
143, Weighing-apparatus.
144 (i), Wheels for vehicles, (*other than* Wheel tyres, Pneumatic and other elastic, and rims for use therewith).
144 (ii), Wheel tyres, Pneumatic and other elastic, and rims for use therewith.
145 (i), Wood, Cutting, (*other than* Sawing).
145 (ii), Wood, Working, (*including* Sawing).
146 (i), Filing paper and like sheets.
146 (ii), Stationery, wafers and seals, educational appliances, and ciphers and codes.
146 (iii), Writing-instruments, ink, and receptacles for writing materials.

FIFTY YEARS SUBJECT INDEX, 1861–1910.

A subject index of all complete specifications for the period 1861–1910 is published in 271 volumes corresponding to the new series of Illustrated Abridgment Classes (List B above). To some extent the headings in the "Fifty Years Subject Index" may be regarded merely as a compilation of the corresponding headings in the abridgment volumes, and, so far as this is the case, the Index may be used with the abridgments. But, generally speaking, the headings represent an improved and extended classification of matter, and it may often be found more convenient to use the "Fifty Years Subject Index" with the Specifications, as the contents of the new Index headings will not always be found collected in any one Abridgment Class.

For a continuation of the "Fifty Years Subject Index," the searcher should consult the Abridgment Volumes for the periods 1909–15 and 1916–20 and the annual and quarterly indexes from 1921 onwards.

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