PATENTS FOR INVENTIONS.

ABRIDGMENTS OF SPECIFICATIONS.

CLASS 64, HEATING,

[*Excepting* FURNACES AND KILNS; STOVES, RANGES, AND FIREPLACES;

for which see Abridgment Classes 51, FURNACES &c.; 126, STOVES &c].

PERIOD—A.D. 1893-96.

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PUBLISHED AT THE PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS,
CHANCERY LANE, LONDON, W.C.

1899

PRICE ONE SHILLING.

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EXPLANATORY NOTE.

The contents of this Abridgment Class may be seen from its Subject-matter Index. For further information as to the classification of the subject-matter of inventions, reference should be made to the *Abridgment-Class and Index Key*, published at the Patent Office, 25, Southampton Buildings, Chancery Lane, W.C., price 1*s.*, postage 5*d.*

It should be borne in mind that the abridgments are merely intended to serve as guides to the Specifications, which must themselves be consulted for the details of any particular invention. Printed Specifications, price 8*d.*, may be purchased at the Patent Office, or ordered by post on the Patents Form C[1] (to be obtained from any Post Office), no additional charge being made for postage.

SUBJECT-MATTER INDEX.

Abridgments are printed in the chronological order of the Specifications to which they refer, and this index quotes only the year and number of each Specification.

NAME INDEX.

The names in *italics* are those of persons by whom inventions have been communicated to the applicants for Letters Patent.

ERRATA.

The following abridgments should be *deleted* :—

A.D. **1893.** 2076. 9808. 14,061. 18,978.

A.D. **1894.** 2588. 9404. 16,837. 16,838. 16,938. 21,697.

A.D. **1895.** 11,081. 11,793. 21,027. 24,611.

A.D. **1896.** 703.

HEATING.

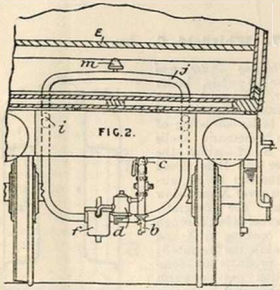
Excepting FURNACES AND KILNS, STOVES, RANGES, AND FIRE-PLACES;

for which see Abridgment Classes FURNACES &c.; STOVES &c.

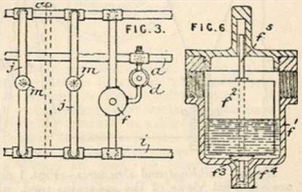
Patents have been granted in all cases, unless otherwise stated. Drawings accompany the Specification where the abridgment is illustrated and also where the words *Drawings to Specification* follow the date. The price of each Specification is 8*d.*, including postage.

A.D. 1893.

15. Shiels, A. Jan. 2.



Heating buildings and structures.—The apparatus, which is intended to utilize steam from a boiler, is described with reference to a railway carriage; it may be modified for use in buildings. Figs. 2 and 3 show the system in end elevation and plan respectively. Steam from the locomotive boiler, after passing through a reducing-valve, circulates through the main train pipe *a* which is provided with cut-off cocks and suitable couplings *b* for connecting up to the adjacent carriages. The



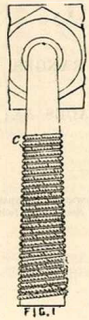
steam then passes through a local pressure-reducing valve *d* and a steam-trap *f*, and circulates through the system of pipes *o*, *i* running throughout the vehicle. The tubes *j* passing underneath the seats E are provided with air-moistening devices *m*, described in Specification No. 14, A.D. 1893, or orifices in the pipes may permit a small escape of steam to effect the same purpose.

Steam-trap.—The casing f^1, Fig. 6, contains a cylindrical float f^2 guided above by a stem f^3 and

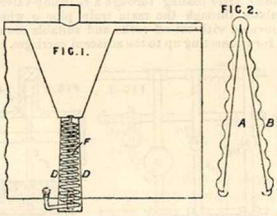
provided with a valve f^2 controlling the outlet f^4 below. The trap is placed at the lowest point of the system of steam pipes, whereby it collects the condensed water in the casing f^1, causing the float f^3 to lift and allow the water to escape.

25. Fletcher, J. A., and **Fletcher, S.** Jan. 2.

Heating water and other liquids.—Handles for steam and hot-water cocks, such as those on water gauges, are provided with helical grooves to receive cord *c* or the like, made of hair, linen, wool, cotton, or other bad conductor of heat, space being preferably left between the successive turns of cord. The ends of the cord are secured by knots in holes.

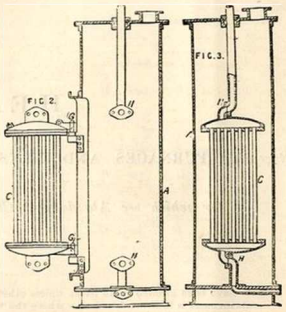


60. Moore, G. A. Jan. 2.



Heating buildings and structures.—Figs. 1 and 2 are sectional views of the apparatus used, which consists of a water container A of Λ-shaped cross-section with a coil of piping in a tube D connecting its upper and lower extremities. The coil F is heated by an oil or gas lamp, whereby the water contained in A becomes warmed; the apparatus may be used for heating greenhouses, offices, and the like, or for heating water for domestic purposes.

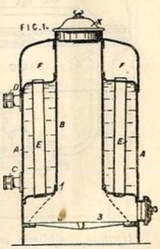
125. Normandy, A., and **Normandy, F.** Jan. 3.



Heating water and other liquids; heating air and other gases.—Figs. 2 and 3 are sectional elevations of the apparatus at right-angles to one another. The coil C for heating the fluid in A is pivoted on hinges G so that it can be swung outside the casing A for cleaning and repairs. When in position, as shown in Fig. 3, it is connected up to the supply pipe H by flanged joints. In a modified arrangement, the group of tubes C slides upon pivoted arms carried in the casing A. A lateral opening in the casing A covered by a door is provided to allow of the removal of the coil C.

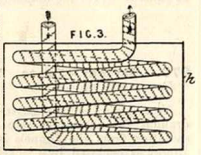
197. Whitfield, C. Jan. 4.

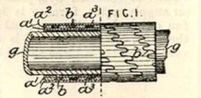
Heating water and other liquids, boiler for. Fig. 1 is a sectional elevation of the boiler consisting of two concentric shells A, B of which the inner one B is closed at the top by an air-tight cover X and below forms the firegrate. The fuel is fed through the opening at X and falls into the firegrate 3; the products of combustion pass upwards by the tubes E, heating the water contained in the annulus formed by the shells A and B; thence they pass into the smoke-box F and away to the chimney. The circulation water from the hot-water pipes has ingress and egress by means of the socketed nozzles C, D.



258. Crompton, R. E. B., and **Dowsing, H. J.** Jan. 5.

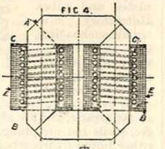
Heating water and other liquids; heating air and other gases. — Relates to means for heating by electricity. Reference is made to Specification No. 17,091, A.D. 1892. Copper or other metal tubes *g*, Fig. 1, are covered with layers of enamel a^1, a^2, a^3, between which are wound conducting spirals *b* for heating the tubes by means of an electric current traversing the circuit. The tubes are bent into the form of coils and inserted into a water or other container *h*, Fig. 3, for heating purposes. The fluid, such as air or water, to be heated may circulate through and around the tubes. The tubes are prepared by first coating their external surface with enamel in the ordinary way. They are then mounted in a lathe and the conducting wire is wound on and embedded into the still plastic enamel. An external coating of enamel completes the tube. The tubes are filled with silica and plugged at the ends during bending to prevent them from flattening.

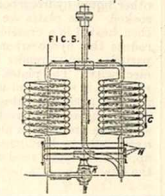




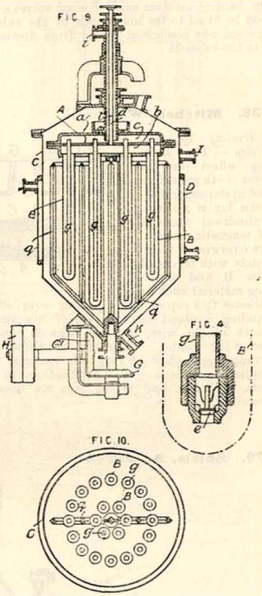
344. Scattergood, B. P. Jan. 7.

Heating water and other liquids by electricity. The apparatus is shown in sectional elevation by Fig. 4, while Fig. 5 shows the arrangement of water tubing forming the hollow secondary coil. A core A is provided with a pair of bobbins B upon which is wound the secondary coil consisting of the tubing C, shown by Fig. 5. Over this tubing come the primary coils E insulated from the secondary by sheets of asbestos. On passing a current through E, a heavy current is induced in the tubing C which serves to heat the water entering by the inlet J and escaping by the outlet K. Stout copper strips H complete the circuit in the secondary coil.





513. Fitzpatrick, H. D., [*Kleemann, F. A.*]. Jan. 10.

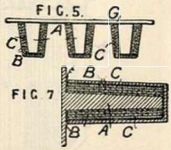


Heating water and other liquids; heating air and other gases.—Relates to means for heating such fluids as are apt to deposit solid matters. A number of concentric tubes containing the heating-medium are attached to a diaphragm chamber and are made to revolve in the vessel containing the liquid to be acted upon, or separate rotating stirrers are used, the tubes being fixed in position. The chamber A, Fig. 9, has a diaphragm *a* which divides it into two compartments *c* and *b*; vertical concentric tubes *g* and B communicate with the upper and lower compartments *c* and *b* respectively. The heating fluid enters by the inlet pipe *d*, through the chamber *b*, into the tubes B, and away by the tube *g* and outlet pipe *l*. The fluid to be acted upon is contained in the chamber C provided with inlet and outlet pipes K and jacket D. Stirrers *q* are provided in the chamber D turned by means of the bevel-wheels G, G and pulley H. In modified arrangements, the diaphragm chamber A and its

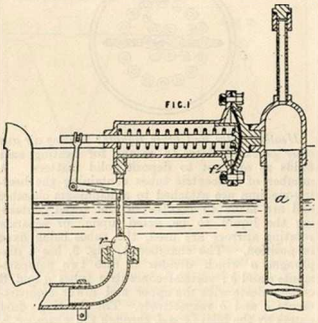
appendages are rotated and no stirrer is used, or no part is rotated, the stirrer being also dispensed with. When steam or other condensable fluid is used as the heating medium small conical valves *e*, Fig. 4, may be fitted to the lower ends of the tubes *g* to prevent any condensed liquid from flowing back into the tubes B.

538. Mitchell, W. Jan. 10.

Heating by electricity.—The heating effect derived from both resistance and hysteresis or magnetic lag is utilized. Cylindrical studs A of magnetic material are overwound alternately with layers of wire B and insulating-material such as asbestos C, a cap or cover coming over all. The winding is about the interval of five times the width of the wire, and the wire B runs from heater to heater. A group of these heaters arranged on a plate of magnetic material may be applied to various uses. Applications to coffee-pots, glue-pots, and frying-pans are shown and described.



779. Shiels, A. Jan. 13.



Thermostats.—The water circulating through the cylinder jackets of gas engines is kept at a constant temperature by a thermostat which controls an outlet valve from the tank. The thermostat *a* in the tank contains some sensitive fluid which on expansion acts on the diaphragm *f* and opens the discharge valve *r*. As the tank empties itself a ball-cock admits a supply of cold water. A piston may be substituted for the diaphragm.

970. Rymer-Jones, T. M. Jan. 17.
Drawings to Specification.

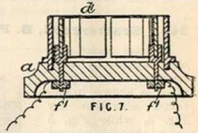
Heating air and other gases.—For heating forced draught for steam-generator furnaces the heat radiating from the funnels is made use of. The funnel is enclosed by a jacket through which the air supply to the furnace is forced by means of a fan either from the external atmosphere or from the ship. When the fan is not at work natural ventilation takes place through the jacket.

1315. Drake, B. M., and **Corham, J. M.** Jan. 21. *Drawings to Specification.*

Heating by electricity.—To prevent the freezing of water in pipes, an electric current is passed through a wire within the pipe, and generates sufficient heat to prevent the water freezing, or thaws ice already formed. The wires are led through insulating-plugs in the pipes to a battery or other generator.

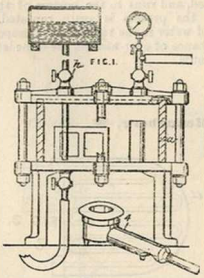
1354. Forbes, Sir C. S. Jan 21.

Heating by electricity.—Relates to the manufacture of thermal plates and tubes. Refractory materials, such as lime, clay, asbestos, magnesia silicate, are moulded into plates, tubes, and grids by the aid of water and binding material, such as tar, treacle, and are afterwards fired. The plates &c. while hot are plunged into paraffin, benzol, or other liquid hydrocarbon with which they become soaked. The plates &c. are afterwards dried and then heated in a crucible containing plumbago to reduce the hydrocarbon to the form of carbon particles, and so render the articles conductors of electricity. The plates, tubes, &c. are afterwards mounted in stands and used for heating water, air, and for general heating purposes. Fig. 7 shows one arrangement in vertical section, where d^1 is a split tube prepared as above and mounted in a base *a* connected by binding-screws f^1 to a circuit. This appliance may be used for heating water, air, and the like.



1355. Forbes, Sir C. S. Jan 21.

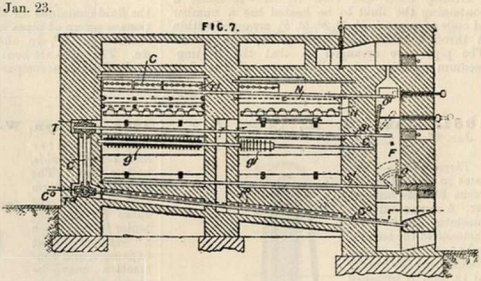
Heating water and other liquids; heating air and other gases.—Relates to means for heating by electricity, and has reference to saturating with carbon particles the electro-thermal plates, tubes, &c. described in Specification No. 1354, A.D. 1893. The articles to be treated are placed in a strong metal chamber *a*, and the air and moisture are removed by a special pump. A liquid or gaseous hydrocarbon is then allowed to enter by opening the tap *h*, and heat is applied by the burner 4, whereby some of the carbon is volatilized and absorbed by the plates and tubes. The hydrocarbon is afterwards drawn off and the air pump worked to remove any gas remaining in the chamber *a*.



1462. Pfleiderer, P. Jan. 23.

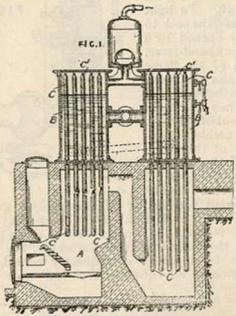
Heating by steam circulation.—The object is to regulate, or equalize, the temperature in different parts of ovens or in the several ovens of a group, and consists mainly in suitably arranging Perkin's tubes. Certain tubes are arranged cross-wise and project from one oven to another. Fig. 7 shows one arrangement in a quadruple oven. The lowest series of tubes C^0 are used as firebars and are carried through flues f^0 to a metal block T^0 from which vertical secondary tubes C rise to a second block T. Into this block are fitted the ends of the tubes S^1 the other ends of which project into the fireplace F. In the fireplace are fitted dampers or plates O, O^1 adapted to direct or divert the flames on to or away from the pipe. Equalizing-pipes as C are fitted across the oven from metal blocks T^1. They may be fitted with flanges or gills *g*, g^1 to distribute the heat. The pipes may be bent to any desired shape and be more numerous in the naturally colder parts of the oven.

FIG. 7.



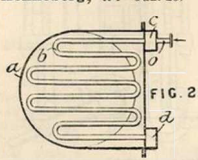
1467. Herz, E. Jan. 23.

Heating water and other liquids.—The boiler B is provided with a number of hermetically-sealed tubes C containing water. The lower ends of these tubes project into a furnace A, the heat from which evaporates the small quantity of water *c* placed in the tubes C, and causes it to ascend to the upper parts c^1 of the tubes C where it gives up its heat to the surrounding liquid,

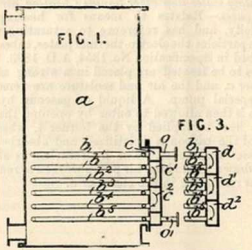


is condensed, and runs to the bottom of the tubes C, where the process is again repeated. The quantity of water in the tubes C is so proportioned that the chance of over-heating the same is reduced to a minimum.

1476. Henneberg, W. Jan. 23.



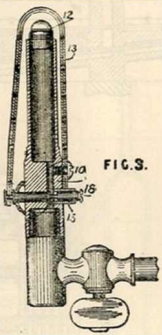
Heating water and other liquids.—A boiler *a* containing the fluid to be heated has a number of coils of pipes b, b^1, b^2, b^3, b^4, b^5, arranged within it through which the heating medium passes. The pipes are arranged so that the heating-medium entering at *o* passes round the first coil b, and then enters the second coil b^1 through the chamber *d*, and in a similar way traverses the whole series of tubes, emerging at o^1. In its passage through the tubes heat is given up to



the fluid contained in the boiler *a*. In modifications, a group of pipes is connected with each inlet chamber *c*, c^1, c^2, &c. and outlet chamber *d*, d^1, d^2, &c. The pipes are bent in various ways illustrated in the Figures accompanying the Specification.

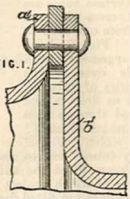
1861. Lake, H. H., [*Angell, E. F.*]. Jan. 27.

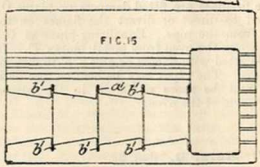
Thermostats. — Relates to cut-off apparatus for gas burners &c. A compound thermostatic band 13 is fastened to the burner-tube at 10, passes thence over the burner at 12, and is attached at its other extremity to the sliding cut-off or cock 15. To light the burner, the cock 15 is partly opened by a cam 18 on a hand-lever. The heat of the flame then causes the band 13 to further open the cock, when the lever 18 falls out of the way. On the accidental extinction of the flame the band 13 contracts, and closes the cock 15. The thermostatic arrangement for cutting off the supply of gas on the accidental extinction of the flame may also serve to regulate the supply. If too much gas is passing, the flame contracts somewhat, the thermostatic band 13 is consequently cooled, and partially closes the cut-off or cock 15.



1898. Parkyn, W. J. Jan. 28.

Heating water and other liquids, boilers for. The object is to form the sections or tubes forming the boiler flues in such a manner that expansion and contraction may be absorbed at or near the flanges. This is effected by constructing the



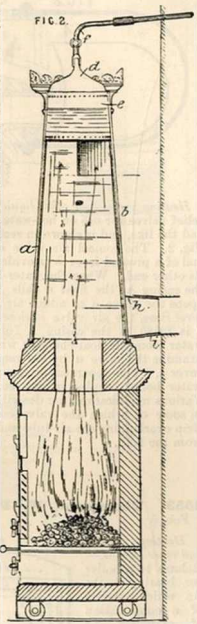


sections with an ordinary shallow flange a^1, Fig. 1, at one end and an extra deep flange b^1 at the other end. Various forms of flanges and their application to differently-shaped sections are described in the Specification and illustrated. Fig. 15 shows one form of complete flue.

2076. Muller, A. Jan. 31.

Heating buildings and structures.—Relates to a fumigating and air-moistening stove formed with two up-take flues separated by a down-take flue. An annular space between a double casing *a*, *b*, is in connection with the water container *e* by the lower ring of perforations shown, so that when the stove is lighted steam is rapidly generated. When the steam supply is to be checked the perforated cap *d* is put on and the steam led away by the pipe *f* to a receiver in the same or in another room where its heat is utilized. Pine branches or other fragrant or antiseptic materials may be placed in the water container. To facilitate cleaning the flue, the stove is mounted on rollers so that it can be moved away to disconnect the stove flue *h* and wall flue *i*, the end of the latter being then stopped by a plug while being swept.

FIG. 2.



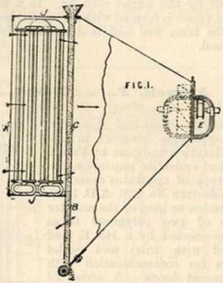
2105. Walworth, J. Jan. 31.

Heating air and other gases.—Relates to means for heating air for drying and conditioning grain &c. The material is passed downwards between two perforated walls B, C, through which air is drawn by a fan E. At the upper part of the apparatus is an air-heating arrangement consisting of a casing J, of which the outer wall K is perforated and the inner one is formed of the perforated wall B. The chamber contains steam pipes having wings or flanges to increase their radiating power. The material is cooled in the lower part of the apparatus before it is discharged.

(*For Drawing see next column.*)

2105.

FIG. 1.



2161. Miller, L. B., and **Woods, M. W.** Jan. 31.

FIG. 6.

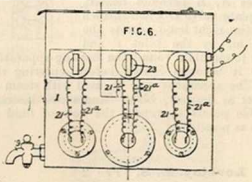
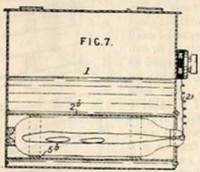


FIG. 7.

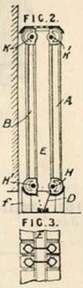


Heating water and other liquids by electricity. Figs. 6 and 7 are respectively a side elevation and a cross-section on the line, Fig. 6, of one form of apparatus. A number of horizontally-arranged tubes 2 traverse the interior of the vessel 1, which latter contains the water or other liquid to be heated. Each tube contains an incandescent lamp, supported in place by rings 5 of material such as asbestos. The terminals of the lamp are connected by conductors 21, 21a to switches 23, so that the current can be cut off from any lamp when desired. The liquid contained in the vessel 1 is heated by the radiation

from the incandescent lamps, and is afterwards drawn off by the outlet cock 19. In a modification, the vessel is formed with a recessed bottom in which the lamp fits, and is detachable from the lamp stand.

2213. Ashwell, F., and **Nesbit, D. M.** Feb. 1.

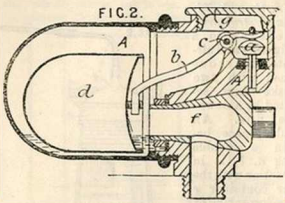
Heating buildings and structures.—The apparatus is shown in sectional elevation and plan by Figs. 2 and 3, and embodies improvements on the type of apparatus described in Specification No. 926, A.D. 1890. Each section or loop of the radiator consists of two polygonal tubes A, B, connected by a rib E, and provided with inlet and outlet passages for communication with the adjacent loops. A series of loops are strung upon the horizontal bolts H, H^1, K, K^1, and firmly bolted together to form the radiator. The air of the room passing between the ribs E and around the tubes A, B becomes heated, while a plate valve D when thrown over to the right hand admits the external air by the inlet *f* and allows it to circulate round the heating-apparatus, whereby it becomes heated before entering the room. The apparatus may be used with steam or hot water as desired; blank flanges are inserted at suitable points to render the flow of fluid as tortuous as possible.



2317. Lovejoy, E. S. Feb. 2.

Heating buildings and structures.—Relates to a portable glass case, which can be used as a flower stand or can be heated and used as a small hot-house or plant case. The case consists of a table 6 having glazed frames 7, 7 hinged at each end, and frames 8, 8 hinged at each side. Frames 9, 9 are hinged to the frames 8, 8, and are adapted for closing in the top. A glazed partition 2 is fixed in the centre of the table 6. Shelves 16 are adjustably secured to the partition 2. A heating appliance, consisting of a small boiler heated by a spirit lamp, is fixed on a shelf 15 below the table top 6. Heating-pipes 24 are connected to the boiler for heating the compartments formed by the said folding frames 7, 8, and 9. When all the glazed frames are turned down, the shelves 16 may be used as an ordinary flower stand, and at the same time enclosed glazed compartments are formed beneath the table 6.

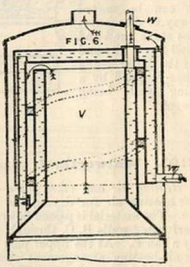
2419. Keith, J. Feb. 3.



Heating water and other liquids.—Relates to air relief valves for use on hot-water boilers, radiators, and the like, and is shown in sectional elevation by Fig. 2. The conical air valve *a* is carried at one end of a pivoted lever *b* provided with a float *d* at its other end. When the water-level is lowered in the casing A, the float *d* falls, and consequently opens the valve *a* to admit air; when the water-level rises, the air valve is closed. A hollow plug *f* is fitted in the casing A for shutting off the water from the float-chamber when it is desired to examine the valve *a* by the removal of the screw cover *g*. The apparatus is secured on to the hot-water boiler or pipe in any convenient position. Various modifications are described and illustrated, in some of which the valve consists of a leather strip overlapping the air-tube and operated directly from the float.

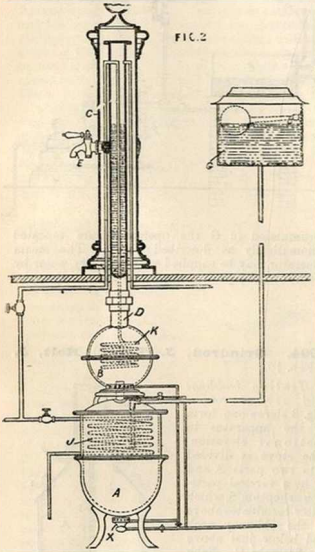
2553. Thompson, W. P., [*Galley, M.*]. Feb. 6.

Heating water and other liquids.—Relates to a boiler for heating baths &c. which consists of a combination of cylinders or prisms, readily detachable, with double walls for the circulation of water, and space between for the circulation of products of combustion. The walls may be corrugated for increasing the heating surface, and many modifications as to form are described, that shown in Fig. 6 being only an example. Water is introduced at *w*, and after flowing round the external cylinder passes to the interior and leaves by the pipe W. The products of combustion from the stove, preferably a gas stove, pass up the interior V of the



innermost cylinder, thence down spirals formed between the two, and finally upwards again to the exit at the top of the outer cylinder.

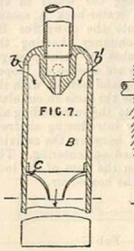
2613. Boulting, J. Feb. 6.

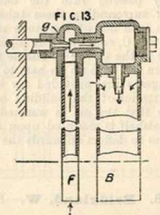


Heating water and other liquids.—The apparatus is intended for use in bars, and is shown in sectional elevation by Fig. 2. A and B are two boilers connected by a pipe, both being heated by gas burners X and also by internal perforated steam coils J and K. The upper boiler B terminates in a vertical siphon tube D provided with draw-off tap E and an ornamental casing C. The boilers A and B are kept constantly full by the self-supplying cistern G. The overflow water escapes through the open end of the pipe D. The upper boiler B is added to ensure the water being drawn off at the boiling point, and it may be dispensed with when the main boiler is in close proximity to the draw-off tap.

2709. Rosher, C. H. Feb. 7.

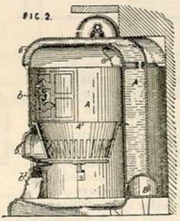
Heating water and other liquids.—The hand-rail round a swimming bath is made hollow and fitted with nozzles, which by turning the rail on its axis may be directed in different directions. Water is forced through the rails and nozzles into the bath to aërate the water. Fig. 7 shows a nozzle specially

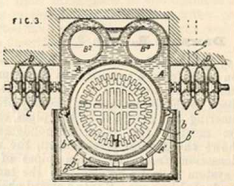




adapted for this purpose. Water enters the chamber B by a small orifice and passes through a cone C to the bath together with an induced current of air through holes b, b^1. Fig. 13 shows a modification combined with a steam-inlet nozzle g, which raises the water from the bath by the pipe F and then forces it in again by the nozzle B as described.

2723. Holland, T. Feb 7.





Heating buildings and structures.—A stove with a water-back A carries a fire-basket A^1 provided

with doors b, b^1 for introducing fuel and cleaning the grate, also dampers b^2 for regulating the draught; the doors are also fitted with mica panels for observing the interior. The products of combustion, after heating the water in the jacketed canopy B and the water-back A, escape through the aperture B^1 into the down flue B^2, finally passing into the chimney, heating the water surrounding these tubes in their passage. Upon each side of the stove are a series of looped radiators C, connected at top and bottom with the water in the stove; to enable the same to circulate therein and give up its heat to the surrounding air, passages e are provided for introducing air from the exterior of the building between the radiator C, so that the air is warmed on entering. The mantelshelf is mounted upon the tops of the loop C so as to deflect outwards the heated air.

2738. Bridgland, W. Feb 7.

FIG. 1.

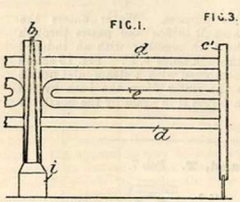
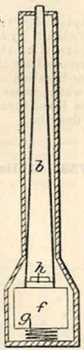


FIG. 3.

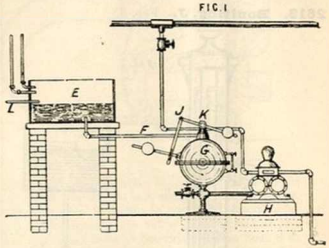


Heating water and other liquids, boilers for. The boiler b, i is fitted with pipes d radiating to pipes c^1 and intermediate loops e for hot water passing round from the pipes c^1 are provided to further increase the heating-surface. Inside the boiler is a flat taper chimney b against the bottom of which is pressed, by a spring g, the lamp-stove f for heating the water in the boiler and the pipes.

2897. Dawson, R. Feb. 9.

Heating by steam circulation; steam traps.—The invention has reference to apparatus for returning the water of condensation in a steam-heating system back to the boiler, and to thereby prevent the hammering and pounding in the pipes, caused by steam meeting this water of condensation. Fig. 1 shows the general arrangement, the water of condensation from the steam pipes of the heating system falls by gravity into the tank E, and is conducted by a pipe F into a closed chamber G containing a float which operates the steam valve K of the pump H, by means of the system of levers J. The hot water in G is withdrawn by the pump H and forced into the boiler, until the water level in G falls below the limit causing the float to shut the steam valve K. When the water has again

FIG. 1

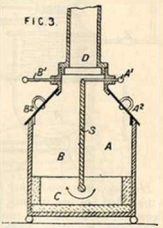


accumulated in G the operations are repeated automatically as described above. The steam generator may be supplied with ordinary water by means of the pipe L connected to the water supply.

2994. Grindrod, J. T., and **Holt, J.** Feb. 10.

Heating buildings and structures.—Fig. 3 shows one form of the apparatus in sectional elevation. The stove is divided into two parts A and B by a vertical partition or septum S, which latter terminates above at the chimney neck and below just above the firegrate C. Each part A, B is provided with charging-doors A^2, B^2, dampers A^1, B^1, and ash doors. The dampers of the stove are so arranged that the products of combustion from one part A pass below the partition S and traverse the fuel in B, finally escaping into the chimney D and *vice versâ*. By these means more perfect combination is obtained. The apparatus may be mounted on wheels to render it portable, and it may be used as an ordinary stove, if desired, by opening both dampers. Various modifications are described and illustrated.

FIG. 3.



3025. Pinckney, P. Feb. 11.

Heating water and other liquids.—Consists in means for boiling liquids by the combustion or

explosion of an admixture of gas and air within a chamber or chambers submerged in the liquid contained in the boiler. Either coal gas, oil gas, or other suitable fuel may be used. The mechanical arrangement may be of any form that will cause the heated and expanded products to escape into the water or other liquid to be heated or evaporated. Arrangements suitable for continuous combustion and for intermittent combustion are illustrated in the Specification, the latter being shown in section above in Fig. 1. The apparatus shown is supported on the bottom of the boiler, and comprises a conical combustion chamber B capable of sliding piston-like in a cylindrical seating M. The gaseous fuel is admitted through non-return valve at F, and exploded by an ignition device D. Feed-water is sprayed in at E. The products escape through openings G into the hood I from which they pass into the boiler through holes K. The rod A connected with the chamber B may pass out through a stuffing-box and be made to drive a crank.

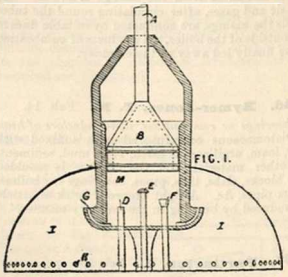


FIG. 1.

3057. Shiels, A. Feb. 11.

Thermostats. — Fig. 1 shows one form of the apparatus in sectional elevation. A chamber 5 containing a sensitive fluid, such as mercury or spirit, communicates with the underside of the regulating-diaphragm 1 by the pipe 17 and its branches 19 and 21, while compressed air in the chamber 28 exerts a pressure on the fluid by means of the safety-diaphragm 2^a. Any movement of the diaphragm 1 caused by the expansion of the sensitive fluid in the chamber 5 is communicated to the piston and piston-rod 45 and 46 bearing upon the diaphragm at its lower end 47 and pivoted to the lever arm 54 of a shaft 55, which latter controls the supply-valve of a refrigerating engine or the like; a spring 49 tends to keep the diaphragm 1 in its lowest position. Any further expansion of the sensitive fluid after the diaphragm 1 has reached its upper limit takes place in the chamber 25 by the lifting of the safety-diaphragm 2^a against the air pressure in the chamber 28, which latter pressure is always so regulated that the regulating-diaphragm 1 is lifted first. Suitable filling-cocks and pressure-gauges are provided. Modified forms of the apparatus are described and illustrated.

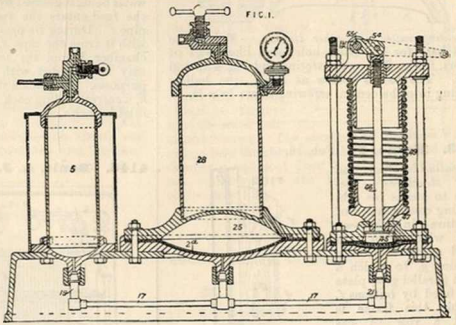


FIG. 1.

3131. Piper, H. B. Feb. 13.

Heating water and other liquids, boilers for. Fig. 3 shows the boiler in section. The casings A, B and C and D are hollow and connected up by flow and return pipes H, N, M^3, M^4, and G with suitable sockets. The firebars E are hollow tubes through which

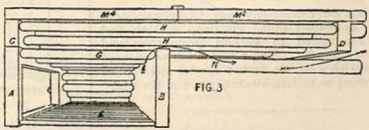


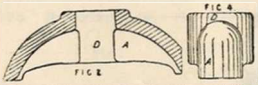
FIG. 3.

water circulates from the casings A and B. The hot air and gases, after circulating round the tubes inside the casings, are conducted by suitable flues to the outside of the boiler, the products of combustion being finally led away to the chimney.

3246. Rymer-Jones, T. M. Feb. 14.

Coverings or compositions, non-conductors of heat.—Diatomaceous or infusorial earth is mixed with clay, loam, argillaceous earth, river mud, sediment, or other material, and the mixture is moulded into blocks, slabs, tiles, pipes, coverings for boilers, steam pipes, &c. A light fireproof brick or article is produced by burning in the ordinary manner.

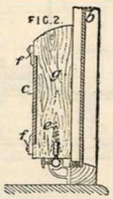
3367. Partington, J. Feb. 15.



Heating water and other liquids.—Relates to cross bars for the hand holes and like holes of boilers. Fig. 2 shows a section and Fig. 4 an end view. The bar is hollow as at A, the hollow opening into the central screwing-down boss D.

3453. Horne, F. Feb. 16.

Heating buildings and other structures.—Relates to means for preventing condensation of moisture in windows. The window *b* has fitted at the bottom a framing *g*, to which a short parallel glass plate *c* is fixed by buttons *f*. Within this frame is fixed a row of gas burners *e* protected by gauze, if desired. In place of the gas burners flat-flame oil burners may be used, or hot-water pipes or hot-air supply pipes may be substituted.

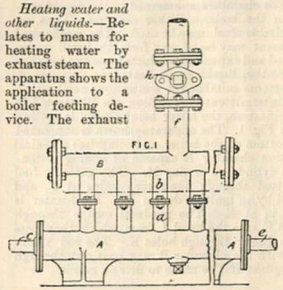


3507. Douglas, G. C., [*Don, W.*, and *Watson, T.*]. Feb. 17.

Coverings and compositions, non-conductors of heat.—Mica, bone-dust fibre, glutinous matter, and carbon are mixed in various proportions and ground to a powder. The composition when used is mixed with water to form a mortar and applied as a covering to boilers, steam pipes, and the like.

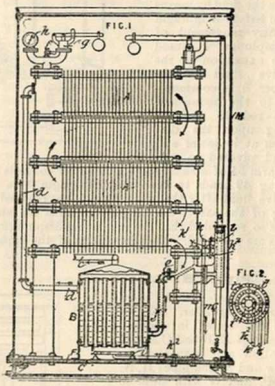
3530. Gowan, G. Feb. 17.

Heating water and other liquids.—Relates to means for heating water by exhaust steam. The apparatus shows the application to a boiler feeding device. The exhaust



steam is mingled with the cold feed as it passes to the boiler, the respective amounts of steam and cold water being regulated by suitable cocks. As shown, the feed enters the vessel A and escapes by the pipe *e*. During its passage exhaust steam is mixed with it from the pipe *f*, the steam traversing the chamber B and the branch pipes *b*. The latter may be provided with flange joints for cleaning purposes. The steam-regulating cock is shown at *h*, a corresponding cock being placed in the water-inlet branch *c*.

4146. Boult, A. J., [*Fleischer, B.*]. Feb. 24.



Heating buildings and structures.—A tubular boiler B is heated by a liquid or gaseous fuel

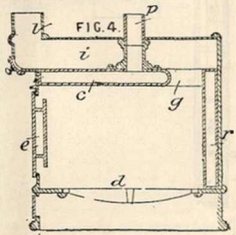
burner C, and the steam is led away by the pipe *d* to a series of rib-shaped heating-pipes A, through which it passes in the direction indicated by the arrows, finally returning to the boiler by the tube *e*; a tube *c* leads away the products of combustion from the burner C. The casing containing the tubes A is provided with a relief-cock *f*, a safety-valve *g*, and a pressure-gauge *h*, the whole arrangement being covered by a perforated casing M, and standing on a substantial base F. The burner consists of three concentric perforated rings *i*, i^1, i^2 having independent supply pipes *k*, k^1, k^2, Fig. 2, fed from the pipe *m*. The supply is controlled by a valve working in the casing *l*. A lever connected to a weighted piston moved by the steam pressure inside the casing, determines the position of the valve, but it is so arranged that the supply to the inner ring of the burner C is never cut off.

4218. Henderson, J. A. Feb. 25.

Coverings and compositions, non-conductors of heat.—The composition is made by mixing together stucco-cement, ground cork, jute, and water in suitable proportions; in a modification, the stucco-cement is replaced by an adhesive mixture made from alum, wheat-flour, and water. The cork is rendered practically non-combustible by boiling in alum, ferric acid, tungstate of soda, or the like. The mixture may be moulded into sheets and applied to boilers, heating-apparatus, and the like.

4493. Harvey, G. March 1.

FIG. 4.

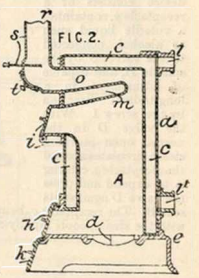


Heating water and other liquids, boilers for. The boiler is of the saddle-shaped kind, a section of one form being shown by Fig. 4, in which *d* is the firegrate, *e* the charging-door, *r* the hollow back, and *i* the flue communicating with the chimney. The products of combustion from the firegrate *d* heat the water contained in the saddle *c* and hollow back *r*, and afterwards escape by the opening *g* in the saddle into the passage or flue *i*, meeting the outgoing circulating-pipe *p*, the water in which is thus highly heated; the waste gases finally escape into the chimney *l*. Suitable cleaning doors and dampers are provided for the chamber *i*. Modified arrangements are described and illustrated.

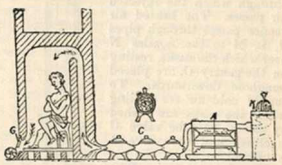
4494. Harvey, G. March 1.

Heating water and other liquids, boilers for. The boiler is of the vertical type, a section of it being shown by Fig. 2. The boiler A stands upon a base *e*, and is provided with a suitable charging-door *i*, a cleaning door *h*, and draught-regulating door *k*. The combustion products from the firegrate *d* heat the water contained in the annular space *c*, and circulating round the water-pocket *m* further heat the water contained therein. The combustion products finally escape into the chimney *r* which is provided with a damper *s* and soot door *t*. The hot-water pipes are connected to the boiler by the socketed connections *l*, l^1.

FIG. 2.



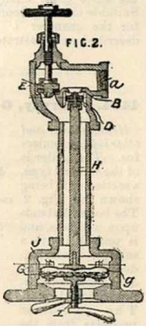
4562. Abbey, C. March 2.



Heating air and other gases for hot-air baths. Air is driven by a fan K through a coiled pipe heated at A. The hot air on its way to the bath shown passes through closed vessels C in which it is medicated as desired. A fan G exhausts the vitiated air from the bath. The air thus treated may be led direct to a patient in bed covered by hoops and blankets.

4834. Gold, E. H. March 16.

Steam traps.—The steam inlet *a* opens into a casing containing a screw-down valve E, and a valve D actuated automatically by an expansion device G situated in a chamber J outside the space to be heated. The expansion device consists of a receptacle *g*, containing a volatile liquid such as alcohol, connected to the valve D by the spindle H, and capable of adjustment in a longitudinal direction by the screw I. With the valve D in the normal open position, steam circulates around the receptacle *g*, causing it to expand and press the valve D against its seat B. The receptacle *g*, being then out of contact with the steam, cools rapidly and contracts, pulling away the valve D and allowing the condensed water to escape. The hand-operated valve E is for use in cases of emergency, such as the freezing of the trap and the like.



5016. Cuthbert, D. W. March 8. *Drawings to Specification.*

Heating, heat-storing apparatus for.—Relates to various means for heating by the employment of acetate of soda or other salt or solution which has the property of absorbing heat and slowly radiating it.

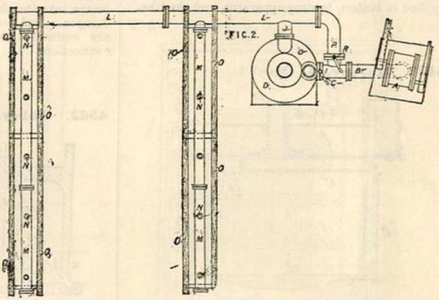
Heating buildings and structures.—Heated gases from a fire are led through pipes over which are cast-iron channels for the salt. Salt in solution may be arranged to circulate in ordinary hot-water heating-apparatus.

Boiling pans.—Steam jackets or pipes may be supplied with the salt or solution in place of steam.

Heating air and other gases.—The air or gas is passed over the heated salt or it may be caused to bubble through the solution under pressure, or the hot solution may be sprayed through the air or gas.

5124. Farrar, W. March 9.

Heating air and other gases.—Casks are dried and cooled, and hot air is supplied to drying rooms &c. by an apparatus as in the Figure. Air is blown by a fan A through a pipe B, fitted with a valve C, to a furnace D which is provided with vertical pipes through which the injected air passes. The heated air thence passes through pipes J, L, M to the nozzles N over which the casks, resting on the gantry O, are placed bunghole downwards. To supply cold air for cooling when the casks are washed by steam &c., the valve C is closed and the valve R is opened to allow the air to pass along the pipe P to the pipe L. In modifications, the air is filtered, and is heated by the waste gases from boilers already in use.

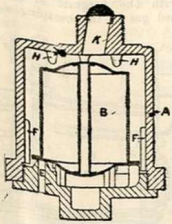


5267. Churchward, G. J. March 11.

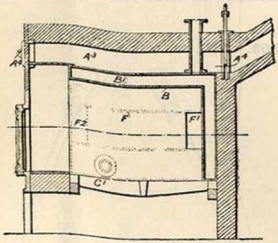
Steam-trap.—The casing A contains a float B free to move upwards, but prevented from turning axially by means of guides F. Water of condensation entering by the pipe K buoys up the float B lifting it and so uncovering the orifice E. The water of condensation thus escapes through the orifice E which is again closed by the float B on its descent. Projections H prevented the float B from rising too high.

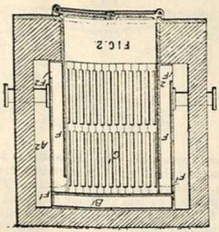
(*For Drawing see next page.*)

5267.



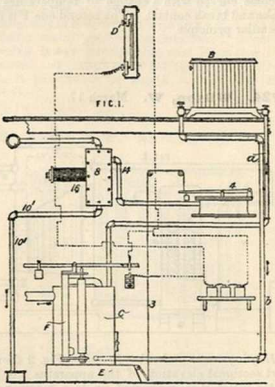
5372. Templeman, G. March 13.



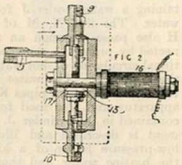


Heating water and other liquids, boilers for. The Figures show the apparatus in sectional elevation and plan. The boiler B is saddle-shaped having double walls B, with a water space between them. The products of combustion pass from the firegrate C^1 by the openings F^1 into the flues F which they traverse from the rear to the front. The hot air and gases escape by the outlets F^2 into the external side flues A^2, and from thence into the upper flues A^3 and the outlet pipe A^4. The water in the boiler is thus heated from both sides as well as by the internal flues.

5697. Watts, J. E. March 16.

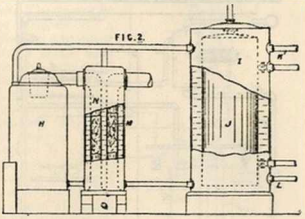


Thermostats.—A heat generator C, Fig. 1, connected to the radiators B by the supply and return pipes *a* and *b*, has its damper E regulated by a diaphragm which actuates the lever 4 and the cord 3 connecting it to the damper. The position of the diaphragm is controlled by a valve in the casing 8 which is actuated partly electrically and partly by water from the town main, which flows past it to the diaphragm by the pipe 14 and away to waste by the pipe 10^1. The spindle valve 7, Fig. 2, in its ordinary position is pressed against its lower seat by the water pressure acting upon its disc 15, thereby closing the outlet pipe 10, and allowing water from the high-pressure main to enter by the inlet pipe 9, and flow away to the diaphragm chamber by the pipe J, thus keeping the diaphragm actuating the damper of the heating-apparatus in a raised position and the damper consequently closed. When the thermostat in the room to be heated closes the circuit, the electro-magnetic poles 17 are energized by the coil 16 and attract the magnet piece 15 upon the valve stem, causing it to lift and open a passage for the water by the waste pipe 10. This causes the diaphragm to sink, and opens the damper until the temperature comes within the limits to which the themostat is set. A second thermostat F serves as a check upon the first one D by short-circuiting it if the temperature change is very sudden. The thermostat D consists essentially of two bars of unequally



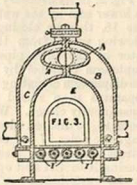
expansible metals joined together so that they become curved with a change of temperature and make and break contact. The second one F is upon a similar principle.

5724. Wilson, W. March 17.

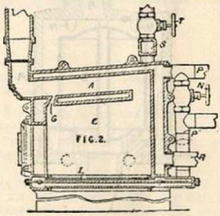


Heating water and other liquids.—Fig. 2 shows a part sectional elevation of the apparatus. A hot-water boiler H is connected up to a receiver containing a water boiler J for the supply of pure water. The flue N, M of the hot-water boiler H also passes through an auxiliary heater, connected by piping to the receiver, whereby a continual circulation of hot water takes place through the apparatus. The water may be drawn off by the flow and return pipes K and L of a heating-apparatus, and also used for heating pure water contained in the cylinder J. A modified arrangement is described and illustrated in which the low-pressure boiler of a kitchen range supplies the heating water, and there is consequently no danger of explosions.

5728. Astle, E. W. March 17.

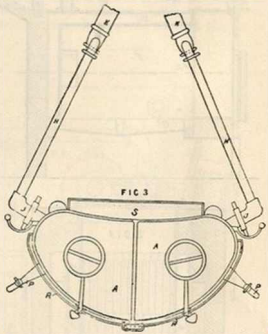


Heating water and other liquids, boilers for. Figs. 2 and 3 are a longitudinal and cross section respectively of the boiler, which consists of independent halves B, C bolted together and provided with a firegrate E and pear-shaped flue A. The firebars I are hollow pipes containing water, and connected together to form an independent high-pressure boiler. The sections B and C, together with the hollow fire-bars form three separate boilers which may be connected by pipes P, P', R provided with screw-down valves N to form one boiler. An aperture G connects the flue A with the firegrate E for igniting the unconsumed gas in the escaping waste products



of combustion, and a reservoir S is provided for drawing-off the heated water.

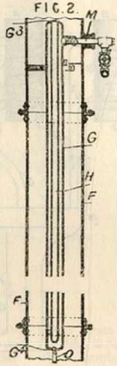
6303. Hill, W. March 24.



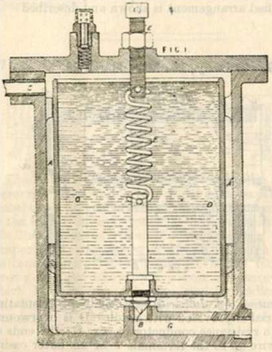
Heating apparatus.—The apparatus is for cooking, steaming, boiling, plate warming, drying, &c. and Fig. 3 shows the apparatus in plan. The boiler A is supported on legs and may be placed in front of the fire. It is formed with projecting tubes H, K which are placed between the bars, the boiler being heated by the circulation of hot water. The pipes H are jointed at J so that they may be turned up out of the way when the boiler is not in use. A rail R is fitted around the boiler for drying towels &c. A plate-warming box is arranged at S and a small oven at the lower part to serve as a food warmer &c. Suitable trays and cages are arranged for steaming meat, vegetables, &c. P are taps for withdrawing hot water.

6324. Glasgow, A. G. March 24.

Heating oil. — Relates to the construction of an oil heater for use in carburetting water gas. Within the vertical conduit F, leading from the superheaters or fixing chambers of the water-gas plant, is supported an oil heating tube G having a closed head G^3 and a contracted lower end G^4. Oil is introduced at the lower end by a pipe O, which enters through the wash-box underneath, and is conveyed away from the upper end by a pipe M to an oil injector at the top of one of the superheaters. In flowing through the tube G, the oil is compelled to travel in contact with the heated walls by a central rod H welded to the head. Any accumulation within the heater may be removed by a current of steam.

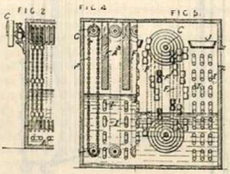


6366. Turnbull, A. March 25.

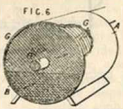


Steam traps.—The condensed water and steam enter by the pipe C and fall to the bottom of the casing. The outlet valve B carries a vessel D upon its spindle filled with water, the valve and vessel being partly supported by an adjustable spring F. When the condensed water has risen to a sufficient height to float the valve and attached vessel, the outlet pipe G becomes uncovered and allows the condensed water to escape. In a modification, the weighted can D is dispensed with and a differential expansion metal gridiron is interposed between the valve B and the adjusting stud E, so that the condensed and cooled water acting on the gridiron causes it to contract in length and uncover the outlet G.

6408. Jones, J. F. March 25.



Heating air &c.—A shower of the heating fluid is produced by means of chains, perforated bands, belts, discs, or sheets of wire gauze, or other material, flexible or otherwise, which are caused to work through the fluid and to raise it. These chains &c. work in a chamber containing the liquid and through which the air is passed. The chains may be fitted with cups, vanes, &c. to lift the liquid, which may be discharged into perforated trays from which it falls through the air. The buckets may be double-ended so as to work in either direction. Figs. 2, 4 and 5 show various forms with chains F, with or without single or double buckets F^1, driven by shafts C. The liquid is kept hot by circulating pipes I, which may also be placed in the air space. Perforated trays are shown at J and partitions to force the air through the liquid shower at A^3. Fig. 6 shows a modification with wire gauze or perforated plates G on a central spindle G^1 rotating in a casing A partly filled with liquid B.

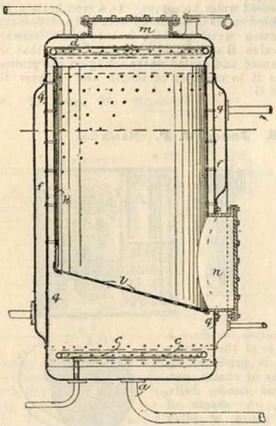


6485. Warner, H. G. March 27.

Digester.—The improved apparatus, shown in section by Fig. 1, is intended for digesting bones, fat meat, glue, and the like. It consists of a cylindrical boiler *q* provided with charging and discharging orifices *m* and *n* respectively, a steam jacket *f* and spray steam pipe *c*. The articles to be treated are placed in the cage *h* having a false bottom *l*, so that they may be subjected to the action of steam from the pipe *c* or air drawn through the apparatus by an exhaust fan attached to the outlet flue *a*.

(*For Drawing see next page.*)

6485.

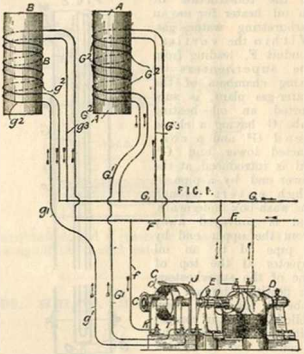


6500. Grandjean, P. March 28. *Drawings to Specification.*

Heating buildings &c. — Relates to fixed or portable heating apparatus for warming apartments, cafés, workshops, stores, greenhouses, bed-warmers, and the like. The warming-apparatus consists of a suitable water-tight receptacle containing a solution of 100 parts of caustic soda in 70 parts of water. The receptacle is heated by immersion in boiling water. Instead of using caustic soda, soda and lime, soda and alcohol, caustic potash, calcium chloride, carbonate of soda, or potassium chlorate may be employed.

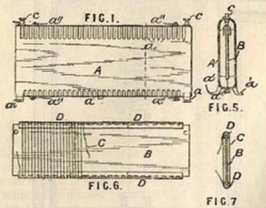
6517. Jenkins, S. B. March 28.

Heating by electricity.—Fig. 1 shows a general arrangement of the apparatus. A and B are two of a number of magnetic cores connected by a system of wires with a commutator C, a motor D, and the source of electricity by the mains F, G; the commutator C and motor D are upon the same shaft E and rotate together. With the commutator in the position shown, the circuit will be from the wire F, through wire f, brush K, extension C^1, commutator C, brush I, wire G^1, helix G^2 and wire G^3, to wire G, and the source of electricity. If the commutator be turned round till the brush J contacts with a conducting segment, leaving the brush I against an insulating segment, the circuit is then the same as before except that the wire g^1, helix g^2, and wire g^3, are substituted for the corresponding conductors mentioned above. The currents thus set up in the wires are in opposition



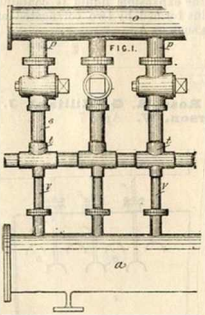
to the continuous current from the mains F, G, and the rotation of the commutator C causes a rapid alternation in the helices surrounding the cores A and B, whereby an induced current is set up and heat is evolved. This heating effect is utilized for heating the rooms or other places in which the cores are respectively situated. A modified arrangement is shown and described.

6559. Dewey, M. W. March 28.



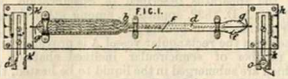
Heating by electricity.—A plate of insulating material B provided with saddles D is overwound with a resistance conductor or wire C; the ends of the wire go to the terminals c of an outer casing A, B (Figs. 1 and 5) which is divided longitudinally into two halves A and B, held together by the bolts a^{11}. Apertures a are provided at the top and bottom of the covers A and B to allow air to circulate through. Projections a^1 enable the heaters to stand upright. A number of these plates are arranged side by side to form an electric heater.

6604. Williams, J. G. March 29.



Heating water &c.—Exhaust steam from the cylinders of steam engines and the like is passed into the receiver *o* provided with a number of branches *p*, *s* connected to the cold-water supply pipe *t*. The exhaust steam mixes with the water and is condensed by it, thereby causing a considerable elevation of temperature in the water. The heated water escapes by the outlet pipes *r* into a dome-shaped receiver *a*, from which latter it can be drawn off as required for feeding boilers or for other purposes.

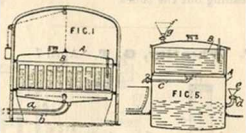
6754. Tunnard, H. S., and **Keays, A. M.** March 30.



Thermostat.—The thermostat has the form of a mercurial thermometer provided with expansion chambers *b*, *d* and *f* in the tube. The mercury in the tube F is so adjusted that it expands and fills the expansion chamber *f* at a certain fixed temperature, completing a circuit through the platinum wires g^1, *g*, the plates k^1, *k*, the binding screws o^1, *o*, and a battery in connection therewith, which latter causes a bell to ring for indicating that the higher limit of temperature has been reached.

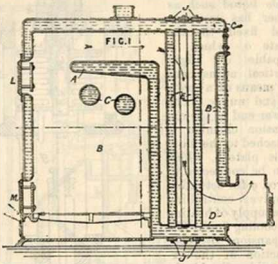
6838. Neuhauss, G. H., Gronwald, J. F. H., and **Oehlmann, E. H. C.** April 1.

Heating milk.—Relates to sterilizing milk in such a manner that it retains almost completely the qualities of fresh milk; and consists in keeping it in open vessels in a closed apparatus under steam pressure, raising it to the desired temperature, and



discharging it either under pressure, or after having been gradually cooled under a gradually reduced pressure so as to prevent any ebullition during the whole process. In one form of apparatus the milk is placed in an open pan B, Fig. 1, arranged so as to form narrow parallel passages, and contained within a closed vessel A into which steam is passed through *a*, while condensed water runs away through *b*. The treated milk is run off through a side tube. In a modification, the milk is contained in a shallow pan simply. Both these arrangements are intended for treating large quantities of milk. When smaller quantities are to be treated an apparatus, such as shown in Fig. 5, may be used, in which the closed vessel A contains water which is heated by an ordinary fire, while above is the milk receptacle B. The vessel is provided with charging funnel *e* and cock *d* for water, charging funnel *f* and cock *g* for milk, and discharge pipe *c* for treated milk. When milk is to be despatched in the vessels in which it is treated, such open vessels, as bottles, are carried in a perforated sheet or wire netting carrier in the upper part of the closed vessel A.

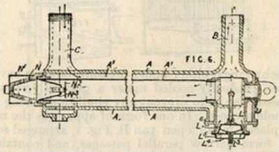
6985. Kitchen, J. April 5.



Heating water boiler. The apparatus is intended for heating buildings and the like, and Fig. 1 is a sectional elevation of the boiler having a combustion chamber B intersected horizontally and vertically by water tubes C and E respectively; a mid-feather A causes the hot gases from the fire-grate to take a sinuous path before escaping through the flue D. A suitable charging door L and ash

door M are provided for the firegrate, and mud plugs J are inserted in the outer shell of the boiler for cleaning out the tubes.

7147. Wheatley, G. T. April 7

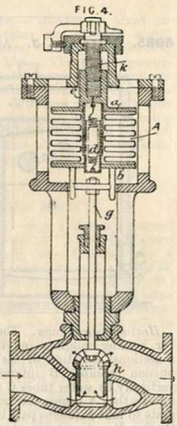


Heating water for warming railway vehicles. A longitudinal section of the heater is shown. It consists of two tubes A, A^1, between which the water is heated and circulates up the pipe B, through the warming-pipes, and back by the pipe C. The heat is generated from a Bunsen burner L, which is supplied by gas at L^3. The air supply passes through the two flat perforated plates L^1, L^2 and conical perforated plate L^6 to the burner, the heated current of air then passing along the pipe A^1 behind the baffle N^2, through the open end of the cone N^3 to the perforated cone N, and from thence through the perforated cylinder N^1 to the outer air.

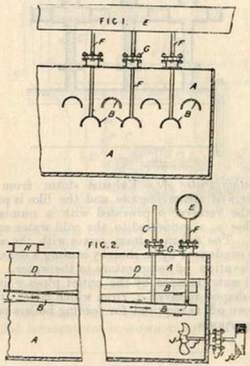
7160. Oehlmann, E. H. C. April 7.

Thermostat.—A corrugated expansion chamber A, filled with an expansible liquid such as ether, has its upper end fixed to the plate *a*, which is capable of slight vertical adjustment by means of a screw *k* and nut *e*. The lower end of the expansion chamber is attached to the movable plate *b*, which can be connected to a rod *g* for actuating a valve *h* controlling the supply of heating or cooling fluid. The expansion or contraction of the expansible liquid in the expansion chamber A, effected by a change of temperature, causes the plate *b* to move and actuates the valve *h*. A coiled spring *d* connecting the plates *a*, *b* serves to resist motion of the plate *b* in an outward direction. In a modification, the expansible liquid is contained within an annulus formed by two corrugated expansible chambers such as A.

FIG. 4.



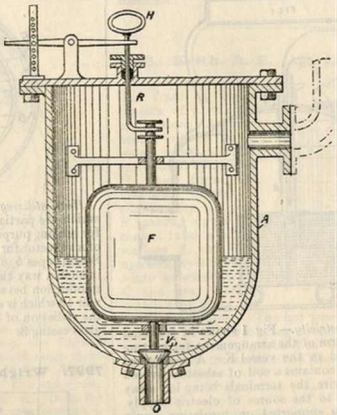
7169. Ross, R. G., Hilliard, J. B., and **Paterson, W.** April 7.



Heating water and other liquids.—Improvements in the apparatus described in Specification No. 10,836, A.D. 1892, applicable, among other things, for the heating or boiling of fluids by hot air. In one form the rectangular vessel A is provided with a number of semicircular inclined channels B which are submerged in the liquid to be heated, the latter rising as high as D. The hot air enters from a supply pipe E and branch pipes F beneath the lower end of the channels, and escapes through an outlet H after having heated or boiled the liquid. The inclination of the channels may be varied by means of rods C attached to their lower ends. The rods and branch pipes F pass through stuffing-boxes G. The liquid may be agitated by one or more fans J mounted on rods *j* passing through stuffing-boxes j^1, and driven by means of pulleys j^2. In a modification, the vessel is circular and the channels are arranged in an inclined spiral direction, while, in other modifications, the channels themselves may form the vessel. Various other slight modifications may be made in the apparatus.

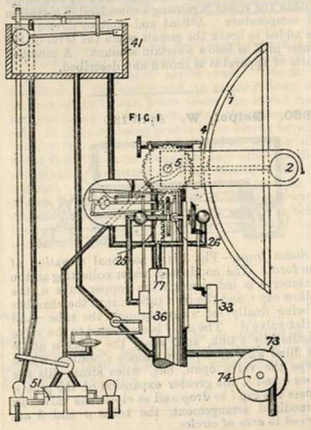
7251. Wilton, T., and **Wilton, G** April 8.

Steam traps. — The condensed steam and water enters the closed vessel A, and accumulates until it is able to lift the float F to which is attached the outlet valve V. The water then escapes by the outlet pipe *o* until it has sunk to its normal level, closing the valve V. A lever R can be utilized for opening the valve by hand. The appliance can be used for separating the ammoniacal liquor of gas works from the gaseous ammonia by discharging the former through the outlet pipe *o*.

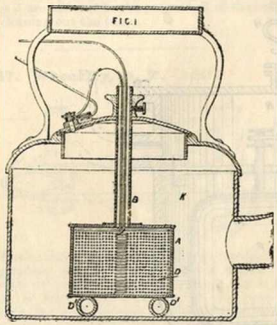


7436. Severy, M. L. April 11.

Heat, utilizing solar.—A steam generator 2 is mounted in the focus of a reflector 1 which is automatically rotated about a horizontal shaft 5 to follow the diurnal movement of the sun. It may be also adjusted about a vertical axis 4 by hand. The diurnal movement is effected by a piston in a cylinder 36, which moves a rack-bar 17 gearing with a pinion in gear with a wheel on the spindle 5. Water is admitted to the cylinder, from an elevated tank 41, by a slide valve which is automatically reversed at night to return the reflector to the position for receiving the sun's rays in the morning. The movement of the piston is controlled by clockwork 33 which rotates a wheel on the pipe 25 rotated with the reflector. Any relative motion between the wheel and the pipe opens or shuts a cock 26 controlling the water supply. In the arrangement shown, steam generated in the boiler 2 drives a pump 51 which fills the tank 41. When the tank is filled the water may be diverted in some other direction, or the steam may be supplied to a second pump which may be used to drain a mine, or the steam may be utilized in other ways. When the pumps fail owing to want of sunshine, the water in the tank may be used in a motor 73 which drives a pump 74. Other ways of storing energy may be used.

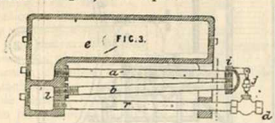


7600. Salomons, Sir D. L. April 14.



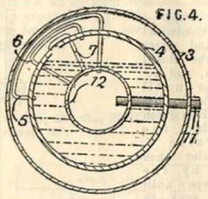
Heating by electricity.—Fig. 1 shows in sectional elevation one form of the arrangement for heating liquids contained in the vessel K. A corrugated copper casing A contains a coil of asbestos-covered German silver wire, the terminals being led away by the tube B to the source of electric supply. The casing A is supported on insulating knobs D, D^1 and is small enough to pass through the opening in the container. With this arrangement the heat developed in the wire, when a current is passed through the latter, is absorbed by the liquid within the vessel K causing a considerable elevation of temperature. A float and contact device may be added to break the circuit when the level of the water in K is below a certain amount. A modified form of apparatus is shown and described.

7860. Geipel, W. April 18.



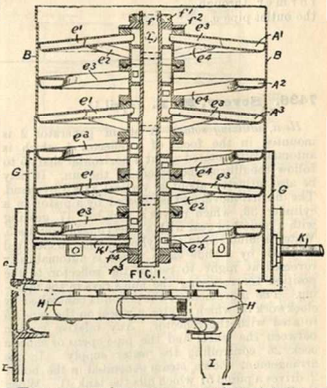
Steam traps.—Fig. 3 is a sectional elevation of one form. The condensed water collecting in the chamber *e* is led through the copper tube *a*, the hollow cap *i*, and the iron tube *b*, into the chamber *l*, being finally led away through the tube *r* and outlet valve *d*. The cap *i* is connected to the valve spindle *j* by a link, and, when the tubes *a* and *b* are filled with water, they assume a position which keeps the valve open, but, when steam fills the pipes *a* and *b*, the greater expansion of the pipe *a* causes the cap *i* to drop and so closes the valve. In a modified arrangement, the tubes *a* and *b* are curved to arcs of circles.

7864. Severy, M. L. April 18.



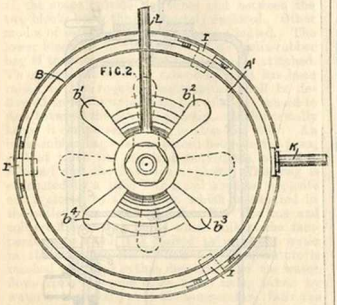
Heat, utilizing solar. — Relates to improvements which are particularly applicable to rotary boilers 4 for heating purposes that are supported in the focus of a reflector for being heated by the rays of the sun. Steam pipes 5, 6, 7 are arranged within the boiler in such a way that there may always be a free communication between the steam space and the reservoir 12 which is enclosed by the boiler. To prevent the radiation of heat, the boiler is surrounded by a glass casing 3.

7997. Wright, G. E. April 20.



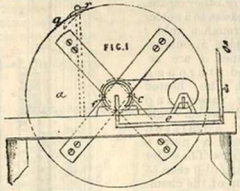
Heating water by gas. A number of hollow sections A^1, A^2, A^3, &c. are strung upon a central pipe *f*, being kept together by the nuts f^1, f^2 and washers f^3, f^4. The sections are surrounded by a casing B provided with a water jacket G and supported on the legs I. A gas burner H is mounted in the lower casting for heating the section. The water to be heated enters the upper section by the pipe L and passes outwardly to the periphery by the passages e^1 and e^3 and then inwardly by the

passages e^3 and e^4; it then enters the second section A^2, and so on, finally passing out into the water



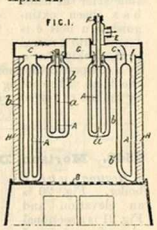
jacket G by the pipe K^1, and away by the outlet pipe K. The heated gases from the burner circulate round the sections and pass through them upwards through the apertures b^1, b^2, b^3, b^4, Fig. 2, heating the water as they ascend. The water may circulate in the opposite direction, viz., from the bottom to the top. A modified arrangement is shown and described.

8002. Williams, T. H. April 20.



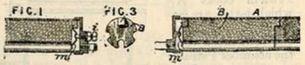
Heating water by gas. Gas is admitted through the pipe *e* and burnt in the hollow combustion chamber *c*, for the purpose of heating the water in the revolving receptacle *a* of the washing-machine.

8146. Keith, D. S. April 22.



Heating water boiler. One form of boiler consists of a number of sections A connected above to a water jacket C and surrounded by a casing H which forms the firegrate. Water is admitted by the pipe F, passing down the central tubes *a* of the sections A, and then upwards by the tubes *b* into the water jacket C, and away by the outlet pipe E to the heating-apparatus. The hot gases from the firegrate B, after circulating round the sections A, are carried away by the flue G. In modified arrangements the sections are placed horizontally.

8372. Gold, E. E. April 25.



Heat-storing apparatus for heating buildings. An outer casing A contains grooved blocks B, B of soapstone or unglazed earthenware. Steam is admitted to the casing and, in passing along the grooves in the blocks, heats them, the stored heat being radiated by the blocks when the steam is cut off. In place of being grooved the blocks may be made polygonal or cylindrical and of smaller diameter than the outer casing, or any other method of providing longitudinal steam passages may be adopted. They may be tongued and grooved, as shown, to assure the alignment of the steam-ways, and are held securely by a screw *i*, springs *m* being interposed to allow for the expansion and contraction of the casing.

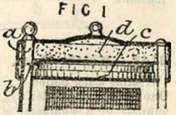
8817. Ruud, E. May 2. *Drawings to Specification.*

Heating water &c.—In distilling water for domestic purposes, the water to be distilled is led through the condenser where it condenses the distilled steam, becoming heated thereby. The excess of heated water thus obtained above that required for feeding the still is collected in a hot-water receptacle, such as a range boiler, and utilized for domestic purposes.

8932. Gothot, F., and **Höing, A.** May 4.

Thermostat for locking miners' lamps. To prevent the lamp from being opened until some time after the flame has been extinguished, a bolt *b* is forced into a recess in the locking-bar *a* by a compound thermostatic coil *c* arranged above the flame. The cooling of the coil may be retarded by the use of refractory material *d*.

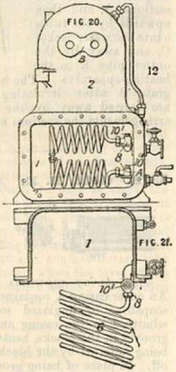
FIG 1



9548. Morison, D. B. May 12.

Heating water boiler. Fig. 20 is an elevation and Fig. 21 is a sectional plan of one form of the apparatus which consists of a chamber 1 provided with a domed top 2 and containing steam heating-coils 6 pivoted by the sockets 8 upon the plugs 10^1 of the steam cocks A, which latter are so arranged that when the coils are within the chamber 1 steam is free to flow through them, and when outside (see Fig. 21) steam is cut off. The liquid such as brine is contained within the chamber 1, while a suitable outlet serves for the discharge of the heated liquid. To maintain a constant level within the apparatus, a float valve is provided at a suitable point to regulate the flow and discharge of the liquid. Modified apparatus are described and illustrated.

FIG. 20.

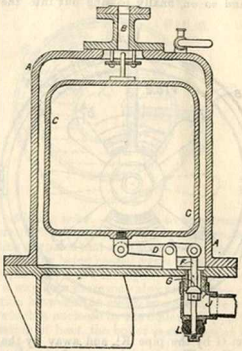


9564. Hunt, E., [*Love, R. T.*]. May 13.

Steam traps.—The apparatus consists of a closed chamber A containing a float C connected by a pivoted lever D with the stem F of the outlet valve G. The condensed water enters the chamber A by the pipe D and lifts the float C, thereby opening the valve G to permit the escape of water by the outlet J. A rubber spring or buffer L upon the valve stem moderates the action of the heavy float C.

(*For Drawing see next column.*)

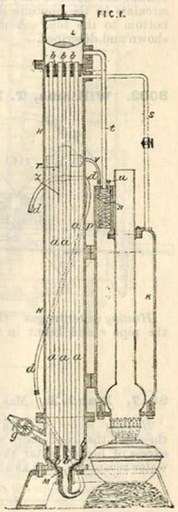
9564.



9808. Yagn, N. May 16.

Heating water &c.—Relates to apparatus for purifying water by heating it, the water being subsequently cooled. The water is heated in a chamber K by a lamp or other means, and passes to a cooler H through a tube *t* in which a number of pipes *a* are arranged through which the heated water passes, and round which cold water admitted through a pipe *g* circulates. The water entering at *g* rises to the top of the chamber H and feeds the heating chamber through a pipe S. The heated water leaves the apparatus through a pipe *d*. The tubes *a* are made square or hexagonal at the ends, and are covered with india-rubber ferrules *b* which take their shape, so that when the tubes are bound together the spaces between them at

FIG. 1.

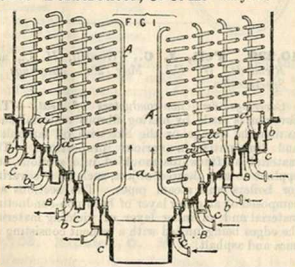


their ends are closed up, the ferrules forming a solid block by which they are fixed in the chamber H, the space outside the tubes and between the two blocks being thus completely enclosed. Other modes of securing the pipes may be adopted. The lower block fits in the mouth of an india-rubber bag M to whose lower end the tube *d* is attached. To ensure that no water excepting what has been raised to the required temperature shall be delivered from the apparatus, the tube *d* is caused to pass between the jaws of a clamp *z* which normally keeps it compressed so as to stop the flow. An india-rubber bag *r* is also placed between the jaws, so that when the bag is distended the tube *d* is released and the flow takes place. This bag is connected by a tube V to a coil *s* whose opposite end is closed by a cap *u* and which is situated in the outlet *p* from the chamber K. The bag and coil are filled with a liquid which boils at the temperature to which it is desired to raise the water in the chamber K. When this temperature is reached the bag *r* is thus distended and the water flows from the pipe *d*, its place being taken by water entering at *g*. If the temperature falls the bag collapses and the flow is stopped. L is an air escape valve.

9828. Martin, R. H. May 16.

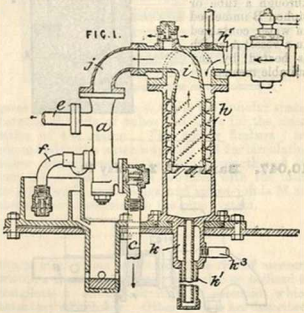
Coverings &c., non-conductors of heat.—Fibrous material, such as asbestos, in a soft flocculent condition has cementing material, such as starch, glue, &c. distributed through its mass in innumerable fine particles. The compound mass is then made into a sheet or bat of the required thickness and afterwards subjected to moisture, or a blast of low-temperature steam, to cause the cementitious material to become adhesive and bind the mass together. The material is used for non-conducting coverings for heated pipes &c. Where absolute non-combustibility is required the cementitious material may be plaster of Paris, lime, or certain of the silicates.

9838. Forstreuter, C. C. A. May 17.



Heating water boiler. The heating is effected by a number of separate coils A arranged in concentric circles and rising upwardly from the funnel-shaped bottom B of the boiler. The pipe *a* for the supply of the heating-agent to each coil A and the discharge pipe a^1 from the same enter separate circular chambers *c*, *b* for each row of coils, and these chambers *c*, *b* may be divided by partitions so that each coil has a separate supply and discharge chamber.

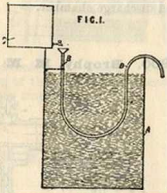
9900. Brophy, M. M. May 17.



Heating buildings &c.—Fig. 1 is a sectional elevation of an exhaust injector for heating and circulating water in a hot-water heating system for buildings and the like, and for supplying hot water to lavatories &c. The invention is shown applied to heating a railway carriage in which *a* is the exhaust injector, *e* the water-inlet pipe, *c* the water-outlet pipe, and *f* the overflow, the two latter pipes being provided with spring check valves to prevent the entrance of air. The exhaust steam is cleansed before entering the injector by passing from the inlet nozzle h^1 into a series of spiral grooves *h*, in which latter the grease is deposited, and the steam afterwards enters the injector by means of the curved pipe *i*, *j*. The lower part of the casing *h* is provided with a steam trap consisting of two concentric pipes *k*, k^1 and a discharge orifice k^2. The injector is fixed to any convenient part of the locomotive, and the outflow pipe *c* is led away to the carriages where it is laid down in heating coils under the seats or in any other convenient manner. Flexible connections are used for connecting the heating systems of adjacent carriages, and the coils in each compartment are enclosed in casings with lids movable by a crank and linkwork arrangement at the will of the passenger who can thereby regulate the heat in the compartment. The water after passing through the apparatus passes into a number of cooling coils arranged upon the tender and provided with suitable valves, stand-pipes, and grease collectors; the cooled water is afterwards fed to the injector

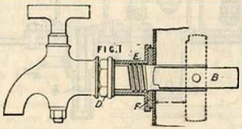
for use over again. The apparatus may be used for heating buildings by slightly modifying the arrangements.

10,023. Woodland, W. May 19.



Heating milk.—The milk from a tank, as C, is passed through a tube or siphon B immersed in water contained in a vessel A which is heated by any suitable means.

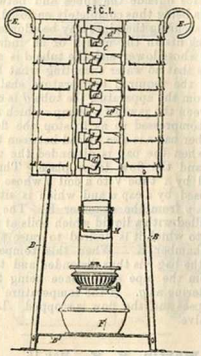
10,047. Banks, T. L. May 19.

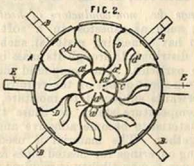


Heating water &c.—To the end of a boiler or other tap is pivoted a weighted piece D, which, when the tap is inserted, turns into the position shown in dotted lines for abutment against the inside of the vessel, the tap being then secured by the nut D which presses the sleeve E against the washer E. In a modification of a valve adapted for connection with a draw-off pipe, ribs, which abut against the inside of the vessel on turning the tap after insertion, are used in lieu of the piece B.

10,141. Reynolds, J. May 20.

Heating buildings &c., lamp-stove for. Figs. 1 and 2 are a sectional elevation and plan respectively of the apparatus. A number of metal sheets D are so cut, bent, and interlocked as to form, when put together, a heat-radiator consisting of two concentric cylinders A and C connected by curved wings D and provided with tongues a^1, d^1 for diverting the passage of heated air through them. The radiator is mounted upon legs B which latter carry an oil or gas lamp-stove F upon the support B^1. The inner tube C is continued below to slide in the lamp chimney H whereby the heated air from the lamp is caused to circulate through the apparatus. The lamp chimney is made of a bad conducting substance, such as mica, to prevent the heating of the lamp F, by the radiator, and at the same time to give out some light. To render the apparatus attractive in





appearance the tongues d^1 are shaped in the form of leaves, petals, and the like, while the light is surrounded by coloured glass. Handles E are provided for transferring from one room to another.

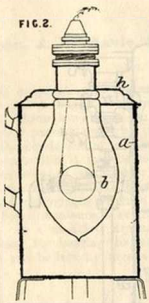
10,239. Fell, J. C., [*Goodell, H. C.,* and *Richards, W. E.*]. May 23. *Drawings to Specification.*

Coverings &c., non-conductors of heat. — The covering is made by mixing fibrous material such as manilla, sponge, or the like with oil lampblack and lime-putty in various proportions. The material is afterwards moulded into sections, and applied to any desired object, such as a covering for boilers and steam pipes. The sections are composed of an outer layer of hard non-conducting material and an inner layer of yielding material, the edges being united with a cement consisting of mica and asphalt.

10,501. Prichard, C. H. May 29.

Heating water by electricity.—The water or other liquid contained in the vessel *a* is heated by means of the electric vacuum lamp *b* fixed to the cover *h*. The vessel *a* is preferably made of glass so that the light emitted may be utilized.

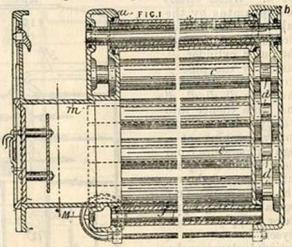
FIG. 2.



10,504. Poat, J. May 29.

Heating water boiler. Fig. 1 is a part sectional elevation of the boiler. The water-way ends *a*, *b* are connected by concentric tubes *c*, *d*, the inner tubes *d* being for the passage of the hot air and

FIG. 1.

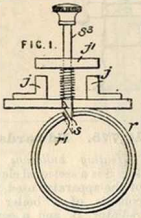


gases from the furnace *m*, while the annular spaces between the sets of tubes *c*, *d* serve for the circulation of the water. The hollow firebars *j* are connected to the water-way ends *a*, *b* for circulating water therethrough; they are strengthened by cast ribs. The boiler is provided with the usual settings, walls, and casings, and spigot-joints M are cast on for connecting to the pipe system.

10,569. Crompton, R. E. B., and **Dowsing, H. J.** May 30.

Thermostats.—The invention has reference to means for regulating the temperature in electrical heating and the like apparatus. Fig. 1 shows one form in which *r* is a compound metal ring with its free end r^1 interlocking with the catch *s* of the rod s^3, and thereby holding it down and completing a circuit through the contact-pieces j, j^1. Each heating-coil is controlled by one of these apparatus, so that if the temperature rises one coil after another is cut out and the heating effect is kept nearly constant. In a modified arrangement, strips of fusible metal serve to cut out the heating-coils. In other arrangements the circuit is controlled by means of thermo-electric couples placed in the apparatus, which energize an electromagnet whereby a contacting-bar is moved to switch in the current or break it; an exhausted corrugated chamber may also be used to actuate the contacting-bar by means of a system of levers. The rise of mercury within a thermometer tube may also be utilized to complete a circuit through a solenoid which actuates a switch-bar. Other devices are described.

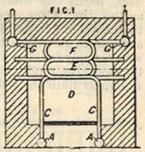
FIG. 1.



10,676. Cormack, W., and **Cormack, J.** May 31.

Heating water boiler, mainly for use in heating buildings. Water tubes C, connecting outflow and return pipes G, A, are curved as shown and placed with their horizontal portions in contact so as to form a combustion chamber D and flues E, F, which are connected at the ends so that the hot gases pass forward in the chamber D, return in the flue E, and again pass forward in the flue F to a chimney. They may also pass through flues at the sides. A lining may be provided to protect the tubes from direct action of the fire.

FIG. 1



10,708. Elphick, O. May 31.

Heating water.—Geyser for baths. Fig. 1 is a sectional elevation of the geyser, consisting of four hollow-walled cylinders a^1, a^2, a^3, a^4 connected to one another and to the hollow annular chambers d^1, d^2, d^3, d^4 by tubular stays *b*, *d*. The apparatus is heated by a battery of gas burners j^1, the waste gases

escaping by the outlet k. Water enters the apparatus by the tube f^1, and after circulating through the outer cylinder a^1, passes by the pipe g^1 into the annular chambers d^1, d^2, d^3, d^4 and from thence into the cylinders a^4, a^3, finally escaping at a high temperature from the cylinder a^2 by an outlet pipe, not shown. The apparatus for regulating the gas and water supply to the geyser is shown in sectional elevation by Fig. 5, in which n^1 is a solid piston worked by water pressure from the inlet pipe m. With the tap p in the position shown, water rises in the passages m^1, m^2, and presses down the piston n^1, the valve n^4 and the diaphragm r, thereby shutting off the supply of water into the apparatus by the pipe o, and of the gas to the burners through the pipe r^3. On turning the cock p a quarter turn the pressure of water on the piston is relieved and the valve stem n^3 rises partly by the aid of the water and gas pressure and partly by the aid of the spring r^1, thereby allowing water and gas to flow into the apparatus. Should the water supply fail, the weight n^2 is sufficient to close the gas valve, a pilot burner keeping the burners at a glimmer until the water again comes on.

FIG. 1.

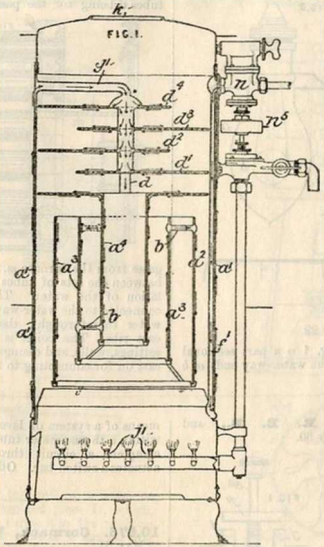
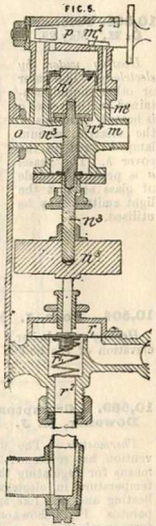


FIG. 5.



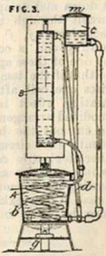
10,762. Birkbeck, H., [*Michell, H. C.*]. June 1.

Coverings &c., non-conductors of heat.—A mortar is made by mixing together mica and soapstone to which molasses is added to serve as a binder, a small proportion of bicarbonate of soda being added to render the mass cellular. The composition is applied to the pipe or other body by being poured into a surrounding jacket.

10,775. Edwards, E., [*Eicke, F.*]. June 1.

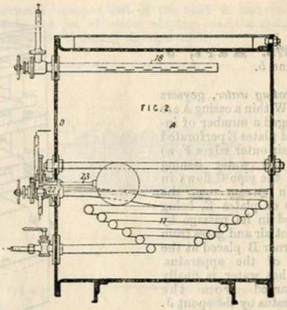
Heating buildings &c.—Fig. 3 is a sectional elevation of the apparatus used, which consists of a boiler A, a radiator B, and a compensating chamber C, connected together by the piping shown. The water in the boiler A is heated by a petroleum, gas, or other burner g, or by means of a coil wound round the vessel A, and through which coil an electric current is passed. The water in the coil b is thereby heated, and a circulating current is established through the radiator B and the pipes d back to the boiler A. The water is kept at a constant level by the compensating chamber C, which is fitted with a loose heavy cover m acting as a safety-valve. A modified apparatus for use in small rooms is described and illustrated.

FIG. 3.



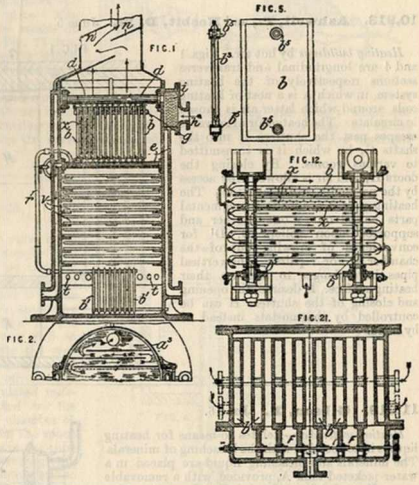
10,849. Wotherspoon, J., and **Davie, J.** June 2.

Heating water &c.—The evaporation of the sea-water contained in the boiler A, Fig. 2, is carried on by means of a worm 11 through which steam is allowed to pass, the vapour passing away by the perforated pipe 18 to the condenser of a steam engine, where, after condensation, it may be used as feedwater. The admission of sea-water is controlled by means of the valve and float lever 22 and 23. The worm and appendages are fixed to the movable end plate 8 for convenience of scaling, cleaning, and repairing. In a modified arrangement, the apparatus is used for heating the feed-water for steam engines and boilers by means of exhaust steam.



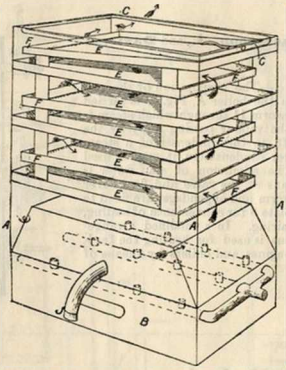
10,870. Fischer, J. June 5.

Heating water and other liquids.—Figs. 1 and 2 show a condenser, and Figs. 5, 12, and 21 show some of the forms of apparatus for the interchange of heat. These apparatus may consist of a number of hollow plates *b* which intercommunicate at b^5 and are drawn together by through bolts, hollow spindles, &c., or by wedging them in the casing. The whole may be cast in one or more parts or built up of wrought metal, and may be strengthened by ribs &c. Mid partitions b^3 or baffles of gauze, stamped plates, &c., such as at *x* and *z*, may be used to aid in the control of the fluid circulation. The plates &c. may be arranged vertically or horizontally and may be used with or without a casing, in the latter case being placed directly in the fluid to be heated. Filtering plates or cloths may also be used in conjunction with the apparatus, and an arrangement is also shown in Fig. 21 for blowing out and from the lower part F. This apparatus *b* is shown in the upper and lower parts of Fig. 1.



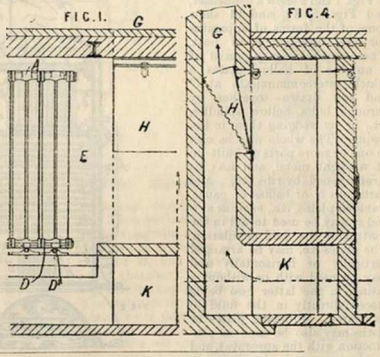
10,879. Hart, J. June 5.

Heating water, geysers for. Within a casing A are arranged a number of inclined plates E perforated at their outer edges F, so that the water issuing from the pipe C flows in a thin stream over the series of plates E, being heated in its passage by the hot air and gases from a burner B placed at the base of the apparatus. The hot water is finally discharged from the apparatus by the spout J.



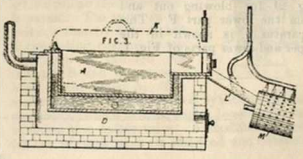
10,913. Ashwell, F., and **Nesbit, D. M.** June 5.

Heating buildings by hot air. Figs. 1 and 4 are longitudinal and transverse sections respectively of the heating system, in which A is a nest of heating coils, around which latter air is caused to circulate. The heated air afterwards escapes past the shutters H into the shafts G, by which it is transmitted to various rooms. By closing the doors H, cold air is allowed free access by the passage K to the shaft G. The heating coils A are made in segmental parts bolted on to one another and supported upon rollers D, D¹ for convenience of drawing out of the chamber E for repairs. The vertical pipes have flanges to increase their heating surface. If desired, the opening and closing of the shutters H can be controlled by thermostats instead of by hand.



11,019. Gibson, E. June 6.

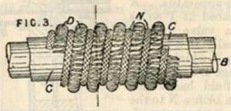
Heating water &c.—Relates to means for heating liquids in connection with the bleaching of minerals. The minerals and bleaching liquid are placed in a water-jacketed tank A, provided with a removable cover K, and heated from below by means of a fire in the flue D. By this arrangement the bleaching liquid is kept at its most efficient temperature avoiding the injection of steam into the liquid in A, which injection dilutes the liquid



and renders it less efficient. The minerals are afterwards scooped out of the tank A and passed into an inclined perforated cylinder M by the shoot L. A jet of water playing over the cylinder cleans the mineral of all dirt &c. which has been deposited upon it during the operation.

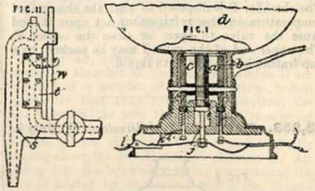
11,608. McElroy, J. F. June 13.

Heating by electricity.—The spindle B is surrounded by porcelain, asbestos, or other heat-resisting insulating substance C. A coil of wire D is wound round the sleeve C, the rings being separated by wicking N. Upon a current being passed through the wire the air or liquid surrounding it is heated.



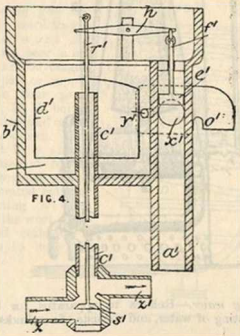
11,749. Woakes, A. B. June 14.

Heating liquids by electricity.—Fig. 1 is a sectional elevation of one form of the apparatus, consisting of a portable vessel *d* with a short cylindrical base containing a central electrode *a* surrounded by an annular electrode *b*, the space *c* being occupied by liquid from the vessel *d*. A current is passed through the electrodes *a*, *b* thereby heating the liquid contained in *c*, which rises and allows the colder liquid to descend and fill its place. The current can be broken at any time by means of the adjustable contacts *j* and k^2. Fig. 11 is a side elevation of another arrangement in which the siphon tube *s* is lined by two electrodes *t*. When water flows through the tube *s* the circuit between the electrodes *t* is completed and a current flows, thereby heating the water. An air inlet *w* is provided for emptying the tube *s* when the water has ceased to flow, thereby cutting off the current. An insulating piece may be thrust between the electrodes to partially stop the current, if desired. Modified arrangements are described and illustrated.



12,384. Barralet, T. E. June 23.

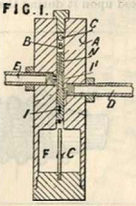
Heating water, geysers for. The gas valve s^1 for the gas-supply tube *z* and the water-supply controlling valve e^1 in the supply pipe a^1 are attached to a pivoted arm *h* by spindles r^1, f^1, of which the former has a forked connection to allow it to rise without disturbing the valve e^1. Water enters by the pipe a^1 and passes into the spout o^1 by the opening x^1 thereby raising the valve e^1 and so depressing the valve s^1 to admit gas into the pipe z^1 supplying the burners; when the water supply is cut off the valve s^1 drops and shuts off the gas supply. The gas supply is also regulated independently by means of a bell d^3 fixed to the spindle r^1 and working in a closed chamber b^1, which latter is supplied with water from the spout o^1 through the orifice y^1. The gas rises in the tube c^1 and presses upwards the bell d^3, thereby giving a constant tendency to cut off the gas supply and so regulate it. The gas is prevented from escaping by means of the water seal in the chamber b^1. In a modified arrangement, the independent regulation of the gas is dispensed with.



12,483. Puplett, S. June 26.

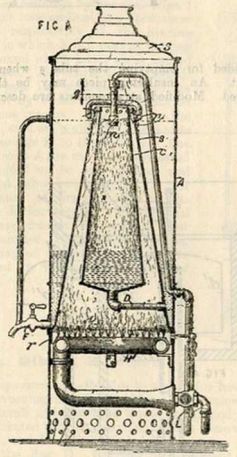
Thermostats.—The application is shown to an apparatus for supplying a fluid such as liquid carbonic-acid gas to a refrigerator, but is equally applicable to heating-apparatus. A rod I, reduced at I^1 so as to form a valve, moves longitudinally in a hole B in a casing A which has an inlet passage D and outlet E. The fluid has access through an orifice N to the space above the valve I, and thence through a tube whose ends are shown at C, E to the space F below it, which also contains mercury or some other liquid readily affected by changes of temperature. The chamber F is disposed so that the changes of temperature in the refrigerator act upon it and cause the valve to open or close the outlet E. The upper end of the valve I may be packed by a cup-leather and sealed with liquid.

FIG. 1.



13,253. Boult, A. J., [*Bernstein, S.*]. July 7.

FIG. 2.



Heating water.—Relates to apparatus for the rapid heating of water, and consists of a cylinder A with two concentric cones B, C fixed therein in the manner shown. Upon the outside of B and inside C water flows down from the supply pipes *m*, *n*, and is heated by the flames from the ring gas or other burner H, which flames circulate between B, C, and afterwards escape by the chimney *s*. The water collecting in the space between the cone B and the cylinder A is kept in communication with the water in C by the pipe D. A projection on handle of the water-supply tap L engages with the handle of the gas tap so that the gas cannot be turned on without simultaneously turning on the water, while the water can be turned on without turning on the gas. The hot water is drawn off by means of the tap F.

13,436. Wood, T. July 11.

FIG. 3.

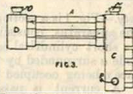
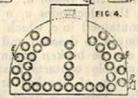


FIG. 4.



Heating water boilers. Fig. 3 represents an elevation and Fig. 4 a cross-section of the circulating tubular boiler. Front and rear water chambers K, C are connected with each other by water tubes E which surround and also divide the furnace. The auxiliary tubular section A is additionally provided at the rear. The whole is enclosed in a suitable setting. Outflow pipes are connected to sockets O, and the return pipes to sockets P, P. A removable plate F allows for inspection and cleansing. By means of the central tubular division in the furnace space either half of the furnace may be worked as desired.

13,437. Wood, T. July 11.

FIG. 3.

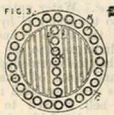
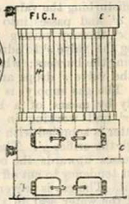


FIG. 1.



Heating water boilers. Fig. 1 represents a vertical elevation and Fig. 3 a sectional plan.

A circular row of water-tubes H enclosing the furnace connects the upper and lower water chambers E, C. In addition water tubes L divide the furnace space into two portions in such a way that either or both halves of the furnace may be worked as desired. The boiler may be built up with brick or form an independent boiler.

13,843. Barker, E. J. July 17.

FIG 1.

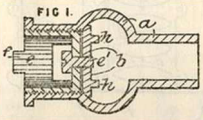
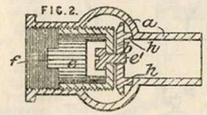


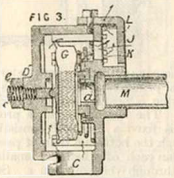
FIG. 2.



Heating water boilers, valves for. To the shell or bushing *a* is screwed a hollow member *e* having secured thereto, by a screw bolt e^1, a disc or valve *b* provided with projections *h* which, when the valve is screwed back or opened, abut against the shell as in Fig. 2. The valve is opened and closed by the tap spigot or end which engages with the lugs *f* of the member *e*. The arrangement is adapted for cisterns, boilers, hydrants, &c.

14,054. Gold, E. E. July 20.

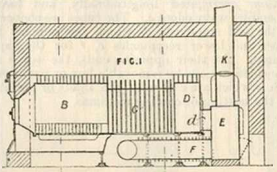
FIG 3.



Steam traps.--Fig. 3 is a sectional elevation of the trap, consisting of a capsule G within the casing D, seated upon a valve seat *a* and rendered adjustable by a set-screw and nut *c* and *e*. The pipe M receives the condensed water and steam, and the latter, acting upon the expansible liquid in the capsule G, causes it to press against the seating *a* and so prevent the water from escaping into the outlet pipe C until the temperature becomes less, when the capsule contracts and allows a free passage. There is an opening J in the casing, covered by wire gauze K and the perforated cover L, in order to allow air to traverse the casing and escape through J and thereby more quickly cool the capsule than if the casing was closed. In modified arrangements, the capsule is horizontal and there are two or more openings J.

14,061. Blackman Ventilating Co., [*Smead, I. D.*]. July 20.

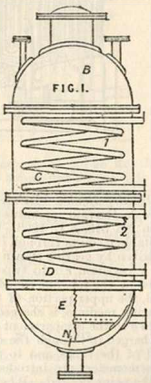
FIG. 1



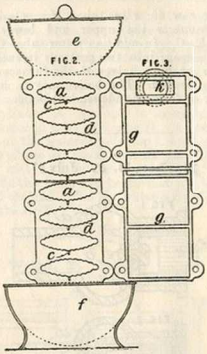
Heating air, stove for. The firebox B, the combustion chamber C, and smoke chamber D are composed of a number of flanged sections, bolted together so that they overlap one another, the space between the two thicknesses of iron being filled with cement. The products of combustion circulate in the chambers C, D, *d* and E, finally escaping along the flue F into the chimney K. Air flowing into the brickwork casing surrounding the stove is heated by circulating round the flanged sections, and afterwards escapes by an outlet pipe.

14,120. Johnson-Johnson, J. E. July 21.

FIG. 1.



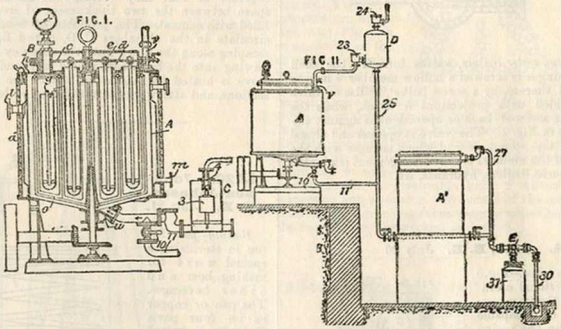
Boiling-pan for use in sterilizing a special wort for making beer and other beverages. The pan or copper is in four parts B, C, D, E bolted together and of the shape shown. The part E is steam-jacketed at N and is provided with a perforated coil for injecting steam into the wort. Two closed coils 1, 2 serve to heat the wort.



14,145. Baker, R. C. July 21.

Heating water and other liquids, counter-current apparatus for. The tubes *a* are of oval cross-section, corrugated longitudinally, and having depending wavy edges *c*. The tubes are connected to the end standards *d*, which also support the upper and lower receptacles *e*, *f* for the liquid treated. At their opposite ends, the tubes are connected in pairs by removable box or partitioned ends *g* which are cast with the inlets or outlets *k* for the heating or cooling mediums.

14,252. Kleemann, F. A. July 24.



Heating liquids.—Relates to apparatus for continuously or intermittently sterilizing milk and other liquids, the said apparatus working on the same general principle as the apparatus described in Specification No. 513, A.D. 1893. Consists of a vessel A having a heating jacket *a* fed with steam or other suitable medium through *l* and withdrawn through *m*. The heating-vessel is provided with an agitator *o* driven by gearing shown. At the top of the vessel is fixed a heater B consisting of a casing divided by a partition *c* into two compartments *d*, *e*. Through the bottom *h* thereof pass a number of tubes *f*, open at the top, but closed at the lower end, and within each of which is a smaller tube *g* open at each end, the upper portion of the latter passing tightly through the partition *c*. Steam, or other suitable heating medium, is charged into the compartment *d*, passes down the larger tubes *f* and up the narrow ones *g* to the compartment *e*, from which it is carried away by a discharge tube. The liquid to be heated is charged in through the connection *u*, and, after being subjected to the heating action of the jacket and of the tubes, and to agitation also, is discharged through *v* as fresh liquid enters at the bottom. Thermometers are introduced into the heating medium so as to enable the temperature to be kept at the point desired. When the operation is nearing the end, the treated liquid is discharged through 10 and 11. A modified apparatus is described in which the liquid to be heated passes upwards in tubes surrounding the tubes *f*. The same apparatus may be used for cooling liquids.

14,294. Perkins, L. P. July 24.

Heating water boilers. The water *d* in steam or other fluid-pressure boilers is heated through the medium of separate hermetically-sealed tubes *a*, each partially filled with liquid, the lower ends of such tubes depending into the furnace and flue space *b*, *c*. The liquid within the closed tubes is preferably water. The tubes may completely traverse the water space and be secured in the upper and lower plates, as shown, or simply pass into the water space, being fastened to the lower plate merely.

(*For Drawing see next column.*)

14,331. Chadborn, F. C. July 25.

Thermostats. — Relates to apparatus for automatically controlling the temperature of greenhouses and other structures. In Fig. 1 the apparatus is shown connected up to the hinged ventilator K of a greenhouse. The ventilator K is connected to the piston E of a water or other fluid-pressure cylinder D; the admission to and exhaust from the cylinder D is controlled by a three-way cock C which is actuated by two smaller water-pressure cylinders R, R¹, the admission and exhaust of which is controlled by a cock U (with an adjusting centre screw to reduce friction) controlled directly by a thermostat. The thermostat L consists of two triangular plates, one of hard rubber and the other of metal, riveted together, and is fixed at one end to a stiff spring M adjustable by a screw N, while, the free end by means of a slot and pin turns the lever of the cock U to right or left. The ventilator K is thus opened or closed according to the movement of the thermostat L. The thermostat may be disengaged from the cock U, when the ventilator may be controlled by hand by the cocks U or C.

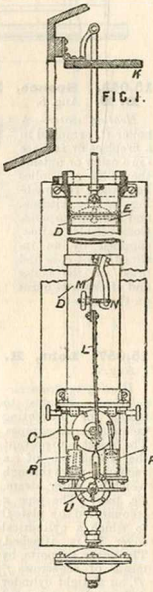


FIG. 1.

14,294.

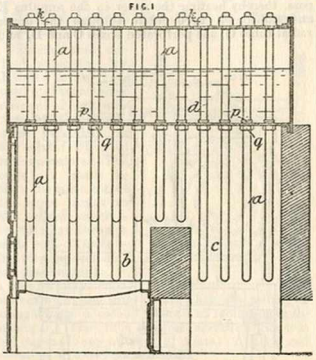


FIG. 1

14,383. Wilson, W. July 26.

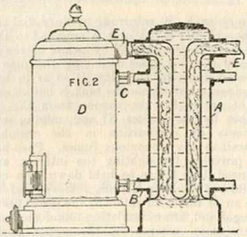


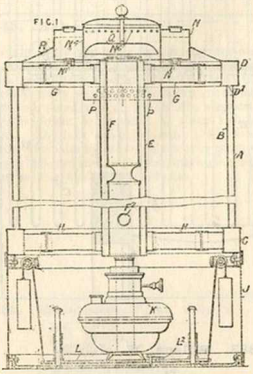
FIG. 2

Heating water by waste gases. The flue E of the hot-water boiler D before discharging into the chimney traverses a secondary boiler A containing water, which is thereby heated. The boiler A may be connected to the primary boiler D by flow and return pipes C, B, or it may be entirely separate. With this arrangement all danger of the flue E becoming overheated is avoided and the waste products of combustion are utilized.

14,496. Hawkins, F. July 27.

Heating buildings &c., radiators for. Fig. 1 shows the apparatus in sectional elevation, in which K is a lamp supported upon an adjustable stage L, and F is the central flue of the radiator

system through which the products of combustion pass, thereby heating the water in the annulus E and causing it to circulate through the upper radial tubes G, the perforated boxes C and D, and



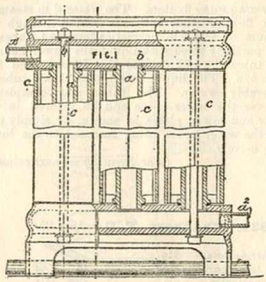
the annulus A, B, returning by the radial tubes H to the cylinder E. Water is supplied to the pipe system from the tank N by means of the orifices N^5, and the hot gases ascending the pipe F are deflected down by the plate Q so as to heat the water contained within the tank N before escaping at the outlet P; the vapour from the tank N escapes by the orifices N^6 and, mixing with the products of combustion in the chamber N^4, neutralizes any obnoxious fumes. Peep-holes F^2 are provided for sighting the interior, and the balanced stage L can be held down by a catch L^2 to allow of the lamp K being removed and cleaned. The air of the room enters by the lower perforated casing J and, after circulating round the hot-water pipe system, escapes by the upper perforated casing R. In a modified arrangement, the annulus A, B is replaced by a series of pipes arranged in a circle.

14,831. Parsons, H. Aug. 2.

Heating buildings &c., radiators for. The top and bottom circulating-boxes *b* communicate with one another by means of the vertical pipes *a*, which latter have casings *c* rigidly connected to them. The apparatus is kept together by means of the long through bolts b^2 passing through the pipes *a*. Steam or hot water enters the apparatus by the pipe a^1 and, after circulating through the pipes *a* and casings *b*, is led away by the outlet pipe a^2. The air of the building circulates between the casings *c* and the pipes *a*, thereby becoming heated.

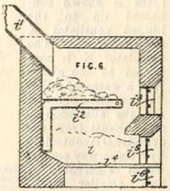
(*For Drawing see next column.*)

14,831.



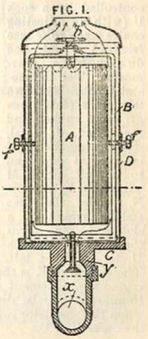
15,043. Spence, F. M., and **Spence, D. D.** Aug. 5.

Heating water.—A boiler i^2, arranged in a fireplace or furnace *i* in a cellar or outside the building, supplies hot water for washing, bathing, kitchen, and heating purposes. Combustible refuse, supplied by an inclined shoot i^3, is first dried on the boiler and afterwards burnt on the grate i^4.



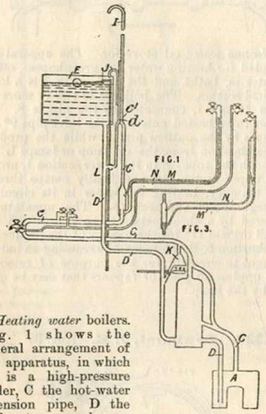
15,057. Löhr, H. Aug. 5.

Heating by steam circulation. — Relates to means for preventing vacuum in heating-pipes. The object is to prevent the formation of a vacuum in pipes through which hot water, steam, &c. pass. The pipe *x* is connected to a plate C to which a cylindrical cover D is attached. The cover supports, by means of set-screws *f*, f^1, an airtight cylinder A having a corrugated top on which a set-screw *b* rests. The set-screw passes through a movable frame B and thus communicates motion to a valve *y* which



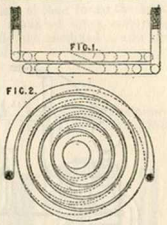
closes an orifice in the plate C communicating with the pipe x. When the pipe is being filled with hot water &c., the cold air flowing out past the cylinder A leaves its contents unaffected. As soon as it becomes warm, its contents expand and raise the corrugated cover, thus closing the valve y. When the pipes cool the valve y again opens.

15,130. Bark, J. P. Aug. 8.



Heating water boilers. Fig. 1 shows the general arrangement of the apparatus, in which A is a high-pressure boiler, C the hot-water ascension pipe, D the cold-water supply or descending pipe connected at the top with the main C by a pair of tubes c^1, d provided with lateral passages between them. The hot water from the boiler A circulates around the system of pipes there shown, and any overplus of steam or water discharges itself into the cold-water supply cistern E by means of the siphon tube J, while explosions are prevented by the open stand-pipe I. Water can be caused to circulate to any point by running a branch such as M to that point and providing an internal tube N to cause an induced current, or the tubes M and N may be separate and distinct, as shown in Fig. 3. A smaller heater K is connected with the main circuit so that, when the boiler A ceases to supply hot water, a small circulation is carried on sufficient to prevent freezing. One tap commands both the gas and water pipes, so that by shutting off the heater from the main circuit the gas supply is also cut off.

15,154. Hesketh, E., and **Thomas, W. H.** Aug. 8.



Heating water, surface apparatus for. Relates to the coils used to effect an interchange of temperature between fluids, more especially in the case of coils used in evaporators. The coils are made so that they are all of the same length so that equal amounts of fluid pass through each coil. The tubing forming each coil is coiled inwards in a spiral with the coils preferably in the same plane, then the tubing is brought into a second plane and coiled spirally outwards. The tube may be spiralled inwards and outwards any number of times. A plan and elevation of a coil are shown.

15,247. Illingworth, J. Aug. 10. *Drawings to Specification.*

Heating air for drying purposes. The furnace consists of a firebox above which are horizontal pipes, and also a number of plates riveted together at the ends in pairs, the furnace gases passing between the pairs of plates to the chimney and atmospheric air passing through the horizontal tubes and between the plates of each pair to a hot-air chamber communicating with the drying-apparatus.

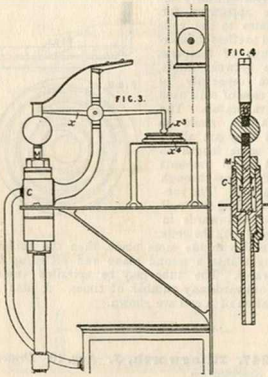
15,749. Hocking, R. P. Aug. 19. *Drawings to Specification.*

Heating air.—The air is heated by passing through a chamber traversed by flue tubes, above which is situated a rotary apparatus for drying coffee &c. The ends of the flue tubes which are next to the firebox are constricted by means of thimbles, and the hot air is prevented from escaping directly into the drying-apparatus at this end by means of a baffle extending about half the length of the chamber.

15,806. Matheison, J. Aug. 21.

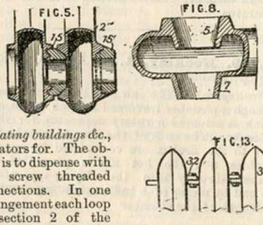
Heating water boilers. To automatically indicate when excessive pressure has been reached, due, for example, to the failure of the safety-valve, escaping steam operates a lever in such a way that contact is made in an electric bell-push and an alarm bell consequently rung. Fig. 4 represents in section the interior of the valve-cylinder C, Fig. 3. The steam at abnormal pressure entering the cylinder C raises the loaded valve M and

thereby tilts the spring balance lever x and causes its end x^3 to press upon the contact-maker x^4.



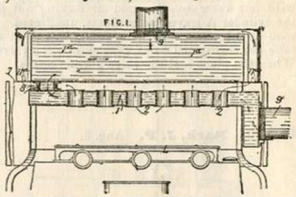
An electric bell circuit being consequently completed an alarm is rung. The steam escaping from the valve M is condensed in a tank J.

15,888. Tangney, T. Aug. 22.



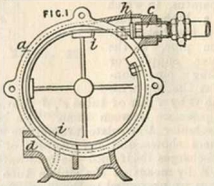
Heating buildings &c., radiators for. The object is to dispense with all screw threaded connections. In one arrangement each loop or section 2 of the radiator, Fig. 8, has a conical recess 5 at one side and a conical projection at the other; the projections and recesses on the adjoining sections fit into one another. Fig. 5 shows another form of joint with an internal ferrule 15. Suitable lugs are provided upon the section for fastening them together. Fig. 14 shows one form in which the lugs 31 and 32 fit over one another and are connected by bolts. Modified forms of joints and connections are described and illustrated.

16,096. Maycock, W. Aug. 25.



Heating water, oil stove for. The apparatus is adapted for heating water for greenhouses, offices, lavatories, baths, and the like. Fig. 1 is a longitudinal section. The boiler is in two or more sections 1^a and 1, connected by the nipple 8. The water to be heated enters by the inlet pipe 9^a and escapes by the outflow pipe 9, while the products of combustion from the oil lamp or lamps L pass through the tubes 2, in the lower section 1, around the upper section 1^a, and finally escape through the chimney, heating the water in its circuitous passage round the sections. The apparatus is covered by a sheet-metal casing 7 provided with small orifices 11^a for the passage of the products of combustion to the chimney, thus causing an induced current to circulate for the purpose of removing any unpleasant gases or vapours that may be given off by the lamp.

16,338. Dewhurst, J. H. Aug. 30



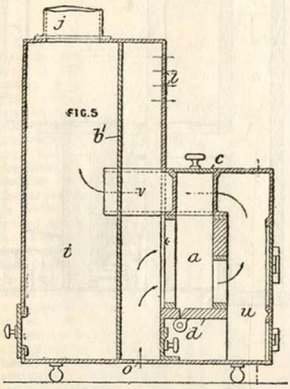
Steam trap.—The adjustable inlet c is fitted with a conical valve h attached to a curved metal rod i. When the apparatus is full of water the rod i contracts and opens the valve h, allowing steam to enter the casing through the inlet c and forcing the water out by the outlet d; the steam rapidly filling the chamber, heats the rod i and lengthens it again, thereby shutting off the steam through c.

16,414. Lishman, T. Aug. 31.

Heating water &c.; heating air.—Fig. 5 is a sectional elevation of one form of the apparatus, consisting of a fuel chamber a provided with a

charging door c and a hinged bottom d. Air for combustion enters the apparatus by the apertures o and takes the path marked by the arrows through the lower part of the fuel chamber a, the flue u,

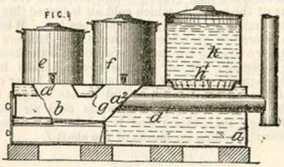
FIG.5



and passages v into the escape flue i, j. The air for warming enters by the apertures o and, after circulating round the chamber a, escapes in a heated condition through the apertures l into the room. If a supply of hot water is required, some or all of the heating surfaces may be jacketed to form water chambers, which can be furnished with suitable valves and taps. If the apparatus is fixed in an ordinary fireplace the flue i, j can be dispensed with, and the plate b^1 then forms the back. The apparatus can be mounted upon castors to render it portable; slightly modified forms are described and illustrated.

16,423. Lavater, D. Aug. 31. [Date claimed under SEC. 103 of PATENTS &c. ACT, 1883, February 3rd, 1893.]

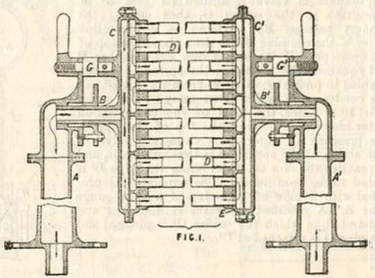
FIG.4



Boiling-pans.—The fireplace b is enclosed in a double casing a containing water and fitted with a dome h provided with a perforated bottom h^1. The fireplace is open above and may be divided transversely by a water channel g or a plate to form two openings a^1, a^2 above which boiling-pans e, f are placed. The flue d passes through the vessel a as shown. The vessel e is preferably an "American automatic washer" and contains lye; the pot f serves for rinsing and the dome h for boiling the clothes. The cover to the dome h may be hermetically fixed if it is required to place the water under pressure.

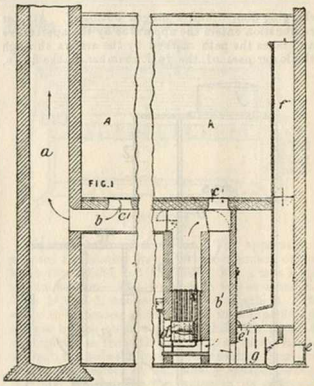
16,692. Collins, F. H. Sept. 5.

Heating water &c.—The apparatus shown in sectional elevation by Fig. 1 is for regulating the temperature of fermenting liquids. It consists of a series of flattened tubes D connected to tube-plates E and water casings C, C^1 at each end, and the whole arrangement is mounted by hollow trunnions B, B^1 in the two tubular pedestals A, A^1. The tubes are immersed in the liquid whose temperature it is required to regulate, and water is allowed to ascend by the pipe A^1, and after circulating through the tubes D in the manner shown by arrows, it escapes by the pipe A. The tubes are held in position by the bolts G, G^1, and can be turned round for cleaning or other purposes.



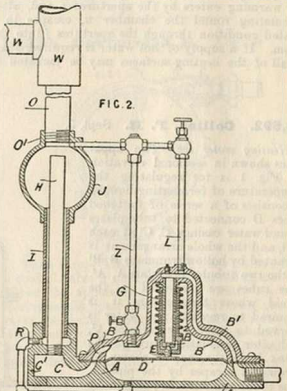
16,820. Langfield, J. Sept. 7.

Heating buildings &c.—The Figure shows an apparatus adapted for the purpose of heating, drying, cooling, and ventilating apartments or rooms in hospitals and the like; the dampers are shown in position for heating and ventilating. Air enters the building by the grating *e* and after passing through a purifier *g* it enters the tubes of the air-heating apparatus *d* of the class described in Specification No. 15,522, A.D. 1888, and flows through the floor grating *c* and displaces the cold air of the room A, which cold air is forced through the grating c^1 and away by the flues *b*, *a*. When it is desired to cool the apartment the dampers are thrown over to the dotted position and the damper e^1 lowered; the air in the room A then flows through the grating *c*, the flue b^1, to the lower ends of the air-heating tubes, and thence escapes into the outlet flues *b* and *a*, while cold air enters through the purifier and is led into the room A near the ceiling by means of the shaft *f*.



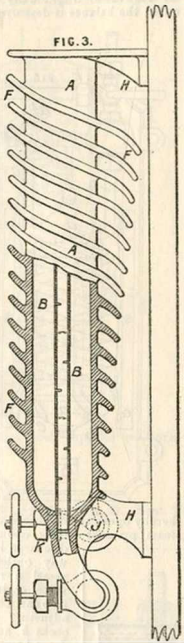
16,942. Lake, H. H., [*Gilmore, M.*]. Sept. 8.

Steam trap.—Fig. 2 shows a sectional elevation of the apparatus connected to the steam pipes W, W^1 by the pipe O. The condensation water from the steam pipes W W^1 falls into the receiver J, of the stand-pipe I, and afterwards flows by the pipes I and R into the diaphragm chamber A. Steam passes by the pipe H, the chamber C, and passage P into the upper diaphragm chamber B. The difference of pressure on the two sides of the diaphragm D is adjusted to be sufficient to press the diaphragm valve E against its seat B^2 in opposition to the spring G, thus closing the exhaust passage B^1. When the condensation water in the chamber J has risen above the top of the open pipe H, it escapes into the chamber B and equalizes the pressure; the spring G is then enabled to push the valve E from its seat B^2 and the condensation water flows away by the outlet pipe B^1. After the level of the condensation water has dropped below the top of the pipe H, the pressure of water in A closes the valve E. The action of the apparatus is thus automatic, and in practice the flow of water from the pipe B^1 is stated to be continuous. The apparatus is provided with a blow-off pipe L and a glass gauge tube Z. A modified apparatus is described and illustrated, in which the orifice O^1 is plugged and the pipe O is attached at C^1.



17,265. Denny, A., Scott, W., and **Smellie, J.** Sept. 14.

FIG. 3.



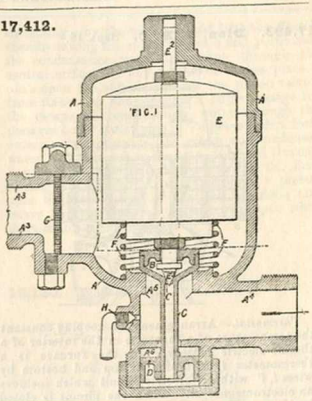
Heating buildings &c., radiators for. A box-like casting A is supplied with steam, hot water, air, or other fluid by the perforated pipe B, the fluid, after circulating in the chamber A, being discharged through an outlet J controlled by a valve K. The air of the apartment circulating between the curved grills P becomes heated and is displaced by the colder air, thus causing a continual circulation of heated air in the apartment. The grills F are gradually increased in size from the base upwards to promote the circulation. The apparatus is fixed by lugs H to the side walls of buildings or other structures.

17,412. Fraser, C. Sept. 16.

Steam trap.—The trap consists of a chamber A provided with an inlet A^3 and outlet A^4 connected by a vertical passage A^5 in which works a hollow valve C. Upon a guided spindle E^2 in the chamber A is carried a float E partly supported by a spring F, the conical end E^3 of the spindle controlling the port *e* of the valve C. The water of condensation accumulating in the chamber A lifts the float E and thereby allows water to flow through the hollow valve C into the cylinder A^6 below the piston D, which latter it buoys up, thereby lifting the main valve B to allow the discharge of the condensation water through the outlet A^4. A grid G is fitted in the entrance pipe A^3 to prevent solid matters choking up the apparatus, and a cock H is provided to test the working of the trap.

(*For Drawing see next column.*)

17,412.



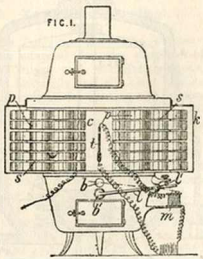
17,487. Patzelt, A., and **Schöche, A.** Sept. 16.

Heating water boiler. The vertical boiler shown in section may be used either for the generation of steam or for the heating of water. It primarily consists of three easily detachable portions, viz., the annular shell A, the U shaped chamber B supported in the fire-box and connected to the main water space of the whole structure by tubes *l*, and the upper steam and water drum C. The furnace gases circulate as shown by the arrows, that is around and over the chamber B into the chimney extension *o* and thence into the uptake *r*. The belt *s* of refractory material is removed for cleaning the boiler.

FIG 1.

17,493. Dion, J. B. C. Sept. 16.

FIG. 1.

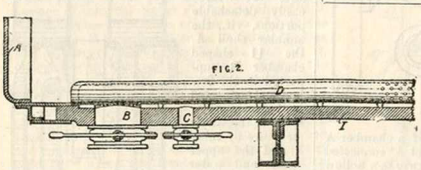


Thermostat.—Arrangement for keeping constant the temperature of a furnace *c* in the interior of a thermo-electric battery. In the furnace is a thermometer *t* connected at top and bottom by wires *l*, l^1 with an electric circuit which includes an electromagnet *m*. When the circuit is closed by the mercury in the thermometer rising as high as the wire l^1, the electromagnet *m* attracts the short arm of a lever b^1 which causes the other end to rise and close the opening *b* through which air is admitted to the furnace.

17,912. Billings, A. W. Sept. 23.

Boiling-pans.—Relates to brewing-vessels such as are described in Specification No. 8952, A.D. 1892, and which may be used as boiling-coppers. The invention consists in fixing in the

FIG. 2.

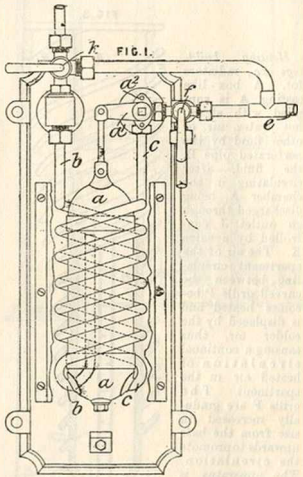


bottom of the vessel A a heavy metal plate I provided with discharge and wash-out openings B, C for the hops and wort respectively. On this plate is removably mounted a perforated or slotted strainer D which may be made in sections.

17,999. Raworth, J. S., and **Geipel, W.** Sept. 25.

Steam trap.—The vessel *a* is supported from the end of the lever a^1 of a discharge valve a^2, and is connected to the three-way inlet and outlet cocks *k* and *f* by the flexible pipes *b* and *c* respectively. As the vessel *a* gradually fills with condensed water, the balance is destroyed and it descends and

FIG. 1.

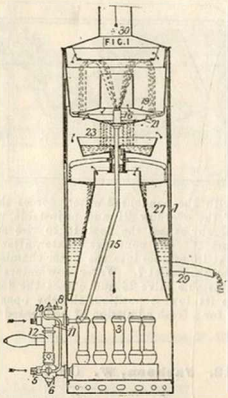


thereby opens the discharge valve a^2, to permit the steam pressure acting upon the water in *a* to discharge it through the three-way outlet cock *f*; as the vessel *a* rises it actuates the valve a^2 to close it. The steam trap can be cut out by suitably adjusting the handles of the cocks *k* and *f*, when the condensed water passes to the outlet *e* by the branch pipe *m*.

18,089. Hannam, W. H. Sept. 26.

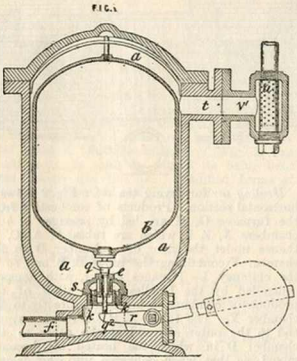
Heating water, geysers for. Fig. 1 is a sectional elevation of the apparatus consisting of a cylindrical casing 1 at the base of which are a series of gas burners 3 supplied with gas by the pipe 5 and having a pilot light 8. Water enters the apparatus by the pipes 10 and 15, and, escaping by an adjustable sprayer 16, flows over and through the perforated baffle-plates 19, 21, 23, &c., finally falling into the reservoir 27. In its passage downwards the water meets the hot air and gases from the gas burners 3 which gases are ascending in the paths marked by arrows to the chimney 30; in this way the water becomes heated before entering the reservoir 27

and it is drawn off for use by the outlet pipe 29. The water and gas cocks 11 and 6 are upon the



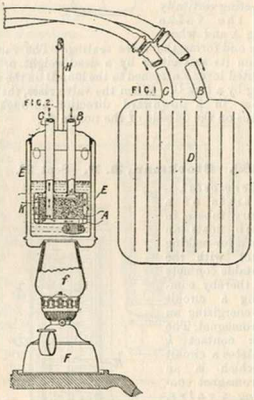
same spindle 12, so that both supplies are turned on or off at the same time.

18,118. Oxley, T., and **Dutch, E.** Sept. 27.



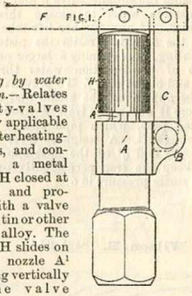
Steam trap.—The water of condensation enters the casing *a* by the pipe *t*, *w*¹ and lifts the float *b*, thereby raising the spindle valve *q* and permitting the condensation water to escape through the central orifice. If any further lift takes place a pin *s* upon the spindle *q* raises the piston valve *e* from its seating, thus opening a larger passage for the escape of condensation water through the passages *k* and outlet pipe *f*. To prevent dirt from entering the apparatus, the steam and condensed water, before it enters the trap, is passed through a perforated pipe, which pipe strains the fluid passing through it. A weighted lever *r* presses upon the lower end q^2 of the float spindle *q* and serves to keep the trap permanently open when there is no steam pressure in *a*.

18,130. Wilson, E. Sept. 27.



Hot water bottles &c.; bedwarmers &c.—The apparatus consists of a heater A, immersed in the water-heater E, and provided with flow and return tubes B, C connected to one or more heating-pads D. The vessel E is carried in a frame H and is heated by the lamp F, provided with a funnel *f*, which may be covered inside with asbestos. A block of cement K is inserted in the heater A to facilitate the heating and circulation of the water by the external water in the double-walled receptacle E. The heating-pads D may be used as substitutes for warming-pans, or hot-water bottles.

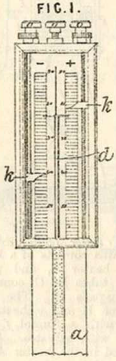
18,257. Rundle, R. Sept. 29.



Heating by water circulation.—Relates to safety-valves especially applicable to hot water heating-apparatus, and consists of a metal cylinder H closed at one end and provided with a valve facing of tin or other metal or alloy. The cylinder H slides on a fluted nozzle A^1 projecting vertically from the valve casing A and whose upper end forms the valve seating. The valve is kept on its seat either by a dead weight or by a weighted lever F attached to the loop B on the valve casing by a link C. When the valve rises, the fluid escapes in a downward direction through the grooves on the outside of the nozzle A^1.

18,289. Stockman, B. P. Sept. 29.

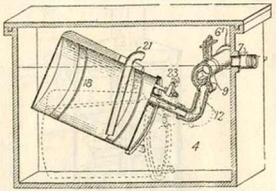
FIG. 1.



Thermostat.—Consists of a mercury tube *a* in which floats an index *d* for making contact with the adjustable contacts *k*, *k*, thereby completing a circuit and energizing an electromagnet. The upper contact *k* completes a circuit in which is an electromagnet controlling a valve, which latter regulates the flow of liquid or gas to an attemperator, while the lower contact is in connection with an electromagnet controlling a bolt for locking the valve in position.

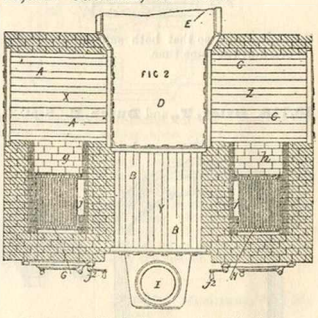
18,427. Newton, R. Oct. 2.

Steam traps.—A hollow float 18, supported by the bent trunnion arm 12, communicates with the steam pipes by a port 9. The condensed water flows down the pipe 6¹ into the trunnion arm 12 and into the hollow float, which assumes the lowest position, shown in dotted lines. The steam, which comes



over with the condensed water, forces the latter out of the overflow 21 and adjustable valve 23, and thereby causes the float 18 to rise and close the port 9. The condensed water, after leaving the float 18, escapes into the outer chamber 4, and away by the outlet 7. Water now enters through the adjustable valve 23 and causes the float 18 to assume its lowest position, thereby opening the port 9 for a fresh admission of condensed water.

18,612. Jackson, W. Oct. 4.



Heating air for drying tea &c. Fig. 2 shows a horizontal section. Products of combustion from the furnaces G, H are led by passages *g*, *h* to chambers X, Z in which are tubes A, A, C, C, thence under the floor of a chamber D to the chamber Y containing the tubes B, B, and so to the chimney I. Passages at *j*, *j*, with dampers controlled by the handles j^2, j^2, allow of the products of combustion being led directly to the chamber Y. The tubes A, B, C are open at one end to the outer air, and at the other to the chamber D in which the heated air becomes mixed, so that, when delivered into the drying-chamber E, it is uniformly heated.

18,978. Ward, C. H., and **Morris, G.** Oct. 10.

FIG.2.

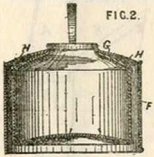
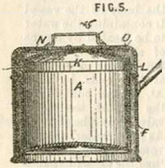


FIG.3.



Boiling pans are made in order to give the greatest heating-surface with a jacket or casing F extending below the bottom of the vessel and provided with openings H in the upper part G through which the hot air &c. passes. As shown in Fig. 5, a casing F is attached to the saucepan A by lugs, and the lid K is provided with a jacket or casing L having openings N, O for the escape of the products of combustion &c.

19,123. Stewart, R., and **Jones, F. M. H.** Oct. 11.

FIG 1.

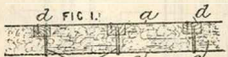
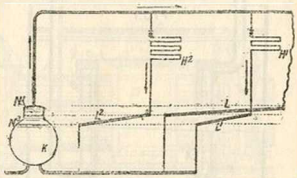


FIG 2.

Coverings &c., non-conductors of heat.—A compound sheet is constructed by taking a layer of silicate cotton *c*, Fig. 1, of sufficient thickness, and backing it with a thin flexible metal plate *a* and a corresponding inner sheet of wire net of the kind described in Specifications No. 7357, A.D. 1885, and No. 6977, A.D. 1892. The compound sheet is held together by staples *e* driven through the netting *b* into strips of wood *d* nailed on the inside of the metal sheet *a*. Suitable notches *f*, Fig. 2, can be cut into the sheet to permit its being bent round boilers and the like. Modified forms of sheeting are described and illustrated.

19,130. Martini, C. H. Oct. 11.

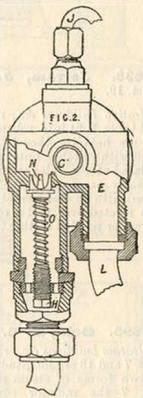
Heating by steam circulation.—The Figure is a diagrammatic view of a steam heating-apparatus of the ordinary kind in which K is the boiler. H^1, H^2 are the radiators. Between the highest and lowest water levels N^1 and N^3 of the boiler K are arranged a series of large air storing-pipes L, L^1 and L^2 in which the air contained in the system can collect without interfering with the working of the apparatus. The pipes L, L^1, L^2 may be straight or looped as desired.



19,156. Laycock, W. S. Oct. 12.

Heating by steam circulation.—Relates to a combination of valves and a pressure gauge for use specially in steam heating-apparatus for railway vehicles. C is the seat of a valve affording communication with a chamber E, to which are connected a pipe J leading to a pressure gauge, a pipe L leading to the heating-apparatus, and a safety-valve N. The latter is loaded by a spring O which can be adjusted by a screw H so as to keep the pressure in the chamber E uniform.

FIG.2.

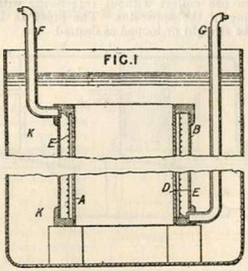


19,283. Segundo, E. C. de, and **Derham, W.** Oct. 13.

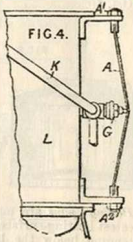
Heating by electricity.—The Figure shows the apparatus in sectional elevation. A and B are two casings of polygonal or other cross-section closed at their ends by caps; the inner casing A is covered with a layer D of soft non-conducting material, such as asbestos, and overwound with a naked wire E of low conductivity joined up to a circuit by the conductors F, G. For heating water the apparatus is placed in the water-container K, and for heating air the apparatus may be placed open in an apartment, or within a casing through which air is passed.

(*For Drawing see next page.*)

19,283.

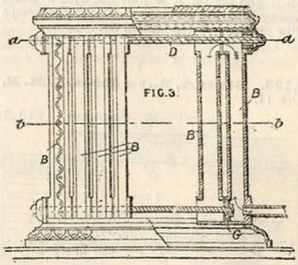


19,416. Royle, J. J. Oct. 16.



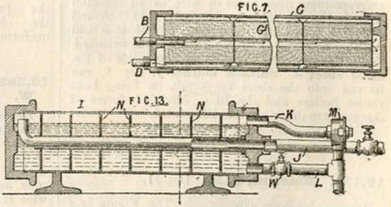
Thermostats.—Upon the body of the vessel L containing the water to be heated by means of steam is placed a tension-bar A secured at the ends by nuts A^1, A^2 and controlling the lift of the steam valve G in the pipe K. As the water in the vessel rises in temperature the vessel expands and pulls the bar straighter, thereby cutting off the steam supply.

19,638. Jerram, J., and **Furner, T.** Oct. 19.



Heating buildings &c., radiators for. The vertical tubes B fit into rebated castings at each end, and are held together by means of bolts D provided with suitable nuts and washers; a baffler G is placed at the inlet to create an upward current of water or steam. The external casing is furnished with an ornamental casting fixed thereto by pins riveted over, and a marble top is inserted in the upper rebated casting.

19,695. Gold, E. E. Oct. 19.

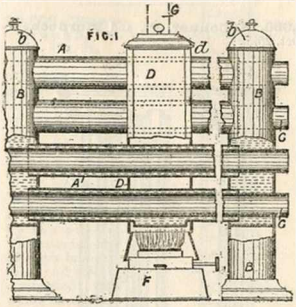


Heating buildings &c., radiators for. Figs. 7 and 13 are longitudinal sections of two forms of steam radiator. In Fig. 7 the radiator consists of a cylindrical casing C containing fluted storage bricks or sections G^1; steam is admitted to the centre by the pipe B and circulates around the sections G^1, and thereby heats the air of the compartment or room; the condensed steam escapes by the pipe D to a steam trap. In the modified arrangement shown by Fig. 13, the storage sections are dispensed with and steam enters the heater by the pipe J and is allowed to condense, any surplus water being drained off by the pipe K and trap M. The effective heating-surface of the trap can be controlled by the pipe L and valve W, whereby the water-level in the casing I can be regulated, and thereby also the steam space. To prevent agitation of the water perforated diaphragms N are introduced. Several modified arrangements are described and illustrated.

19,799. Boult, A. J., [*Jones, J. D.*]. Oct. 20.

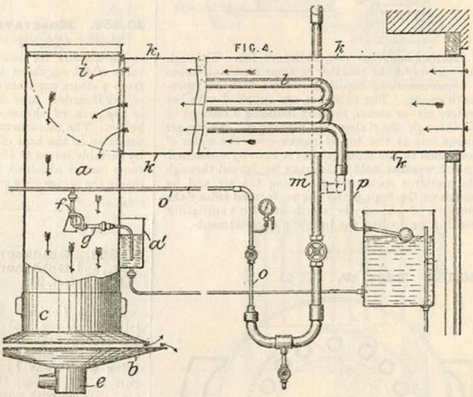
Coverings &c., non-conductors of heat, consisting of a mixture of kieselguhr, mica, fireclay, and mineral carbon.

19,828. Poore, R. Oct. 21.



Heating buildings &c.; heating-water boilers. A number of horizontal tubes A, connected at their ends by the water columns B, are heated at the centre by means of an oil stove F, the products of combustion circulating inside the casing D and afterwards escaping by the flue G. Through the tubes A pass the concentric open tubes C, in order to enable the air of the apartment to circulate through and become heated in its passage. Covers *b* are provided for filling the apparatus with water, and a sliding door *d* allows of the removal of soot and the like which collects in the casing D.

19,998. Lofthouse, R. Oct. 24.



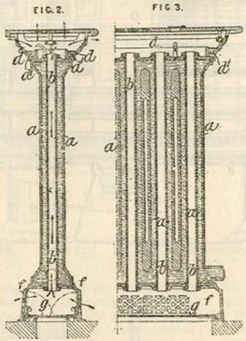
Heating air for ventilation. An air-delivery tube *a* is provided with an adjustable end part *c* opposite a deflecting-plate *b*. A spray device *f*, *g* is arranged within the tube *a*, steam being supplied thereto by pipes *o*, *m*, whilst water is supplied from a cistern a^1 fed from a cistern *p*. Waste water passes off by a pipe from a receiver *e*. A dual valve *i* may be employed to facilitate the use of air contained in a building or fresh air from an inlet pipe *k*. A heating-coil *l*, supplied with steam from the pipe *m*, may be arranged as shown; the steam therefrom may supply the spray device. A steam gauge and regulating-valves are provided.

20,040. Webb, R. Oct. 24. *Drawings to Specification.*

Thermostat.—Relates to a thermostat for regulating the temperature of incubators. A U-shaped bent tube seated at one end is filled with spirit and mercury. When the spirit expands under the influence of heat, the mercury raises a plunger resting upon it and so operates a lever carrying a

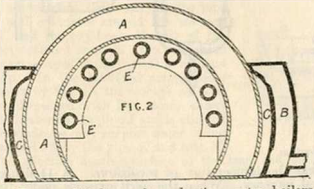
damper for opening or closing a flue through which the heated air within the incubator can escape and thus lower the temperature to the required point.

20,080. O'Connor, P., and **Murdoch, T.** Oct. 25.



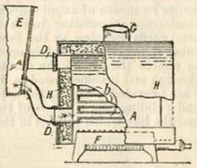
Heating buildings &c., radiators for. Through the centres of the radiator sections *a* pass air-tubes *b* communicating top and bottom with an open-work casing. The radiators are supplied with hot water, air or steam, thereby inducing a current of air through the tubes and heating it. As the air passes out at the top it passes over the water d^1 contained in the trough *d* and is thereby moistened. In hot weather cold water may be forced through the radiator sections for cooling the air, and by means of the flaps *g* and the perforated sides *f* the currents of air may be controlled for ventilating, heating, or cooling the building or apartments.

20,142. Edge, W. Oct. 25.



Heating buildings &c.; heating water boilers. Fig. 2 is a cross-section of the boiler A of the horse-shoe type, provided with water-tubes E inside the firebox. The products of combustion from the grate, after circulating round the tubes E, pass to the back of the boiler and return along the flues C between the boiler A and connected water-jackets B and afterwards escape to the chimney by an overhead flue not shown. With this arrangement a large heating-surface can be obtained with a small grate area.

20,209. Lee, J. U. Oct. 26.

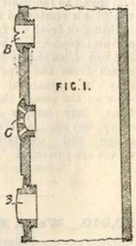


Heating water for baths. The multitubular boiler A is connected by flow and return pipes D with the bath E, so that the water in the latter, by circulating through the tubes *b* and water-casing, becomes heated by the gas burner F. The products of combustion escape by the flue G; a layer of non-conducting material H surrounds the boiler.

20,359. Musgrave, J., and **Dixon, G.** Oct. 28. *Drawings to Specification.*

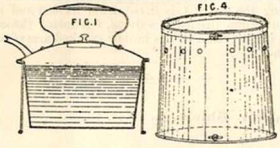
Thermostats for controlling the position of a valve which regulates the supply of steam to and from a steam superheater. In one arrangement a coiled Bourdon tube filled with mercury is placed in the path of the steam as it escapes from the boiler. The movement of the tube caused by the variation in the heat of the steam is communicated by suitable levers to the valve mentioned. Where room can be obtained metal rods or tubes placed inside the steam pipe may be employed.

20,362. Goldthorp, H., and **Goldthorp, A. J.** Oct. 28.



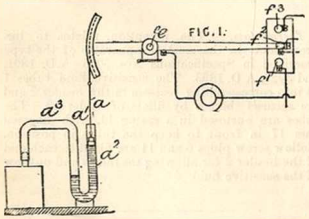
Heating liquids.—Relates to steam nozzles. To prevent the orifices of heating pipes from being worn away by the current of steam, they are provided with nozzles such as are shown at B, or C, which can be removed when necessary.

20,443. Maycock, J. B. Oct. 30.



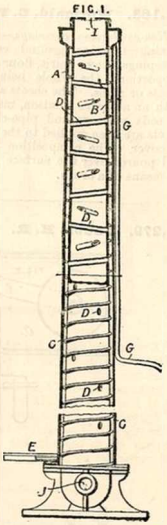
Boiling-pans.—An outer casing or chamber is arranged on cooking &c. utensils &c. to retain the hot gases and thus more readily heat the vessel. Fig. 1 shows the invention applied to a kettle. Fig. 4 shows a casing detached.

20,469. Hünerwadel, F. P. Oct. 30.



Heating air.—The object of the invention is to maintain a constant ratio between the temperature and hydroscopic state of the air in spinning and weaving factories. For this purpose a float a^1 is suspended by a hydroscopic thread a from a balanced lever e and rests on the mercury a^2 of an air thermometer a^3, so that if the temperature and degree of moisture increase equally the mercury a^2 rises just as much as the thread a shortens and the lever is not moved. If the temperature rises or falls in excess of the degree of moisture, then the lever e makes contact with one or the other of the electric terminals f^1 or f^3 by which mechanism for stopping the heating and opening more fully the moistening apparatus, or *vice versâ*, is operated. When equilibrium is restored, the lever returns to its central position and makes contact with the terminal f^2 by which the heat and moisture controlling apparatus are brought to their normal position.

FIG. 1.

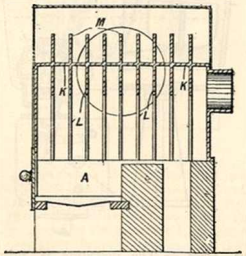


20,608. Wansbrough, W. D. Oct. 31.

Heating water, geysers for. Into the annulus formed by the concentric tubes A and B water is supplied from the pipe E, and after traversing the spirals C is discharged in a heated condition by the pipe G. The water is heated by a gas burner J, the products of combustion from which circulate in the inner tube B and around the cross tubes D, finally escaping by the chimney I.

21,103. Tattersall, W. Nov. 7.

FIG. 4.

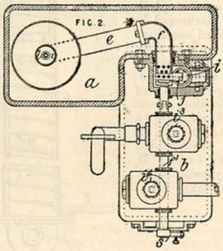


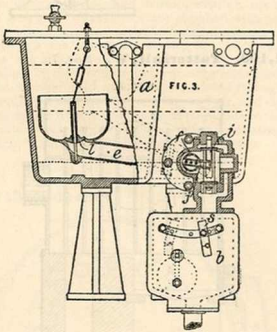
Heating air.—The roof K of the air-heating furnace is provided with internal and external ribs L, M respectively so that the heat from the firegrate A may be more readily given up to the air passing through the casing N and over the ribs M.

21,163. Wormald, C. F. Nov. 7.

Non-conducting coverings.—A paste is made by mixing together ground cork, loom dust, flax sweepings, pitch, spirit, flour water, &c. in various proportions, the whole being then pressed into sheets or slabs. The sheets are afterwards coated with an adhesive solution, made by mixing silicate of soda with ground pipe-clay and water; the sheets are then applied to the surface it is required to cover. The composition may also be melted and poured over the surface, or it may be applied by means of a brush.

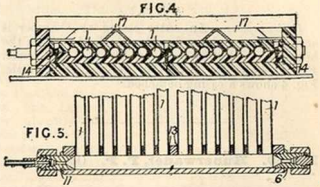
21,279. Chubb, H. R. Nov. 9.





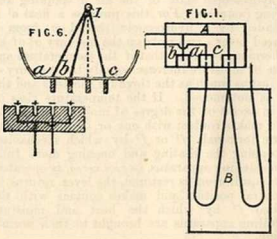
Steam traps. — The invention is primarily described as applied to the feeding of steam boilers with water. It is, however, unnecessary portions being removed, equally applicable as a steam trap. Fig. 3 represents a partial sectional elevation of the arrangement and Fig. 2 a partial sectional plan of the same. The condensed steam which accumulates in the tank *a* raises the hollow float *d* until, the float being no longer able to rise, the water overflows its edges and sinks it. In so doing the valve *l* is lifted from its seat and the equilibrium discharge valve *i*, *i* is raised through the intervention of the hollow cranked arm *f* and cam-lever *j*.

21,395. Shiels, A. Nov. 10.



Thermostats. — The invention relates to improvements in thermostatic apparatus of the type described in Specifications Nos. 6035, A.D. 1891, and 3057, A.D. 1893. The sensitive fluid tubes 1 fit into corresponding recesses in the header 2 and are secured thereto by fillets of solder 13. The tubes are enclosed in a casing 14, with diagonal bars 17 in front, to keep the tubes in position. Hollow screw plugs 6 and 11 are fitted to each end of the header 2 for allowing the inflow and outflow of the sensitive fluid.

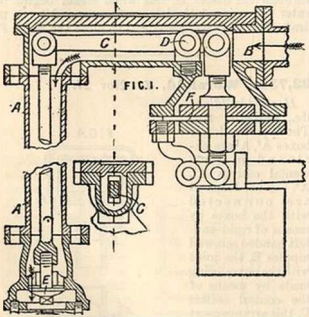
21,435. Schindler, F. W. Nov. 10.



Heating by electricity.—Fig. 1 shows one arrangement diagrammatically. B is an electric heater as a frying pan or the like, consisting of sets of

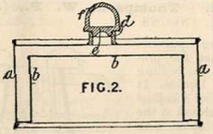
resistance wires. A is the movable contact plug or socket. *a*, *b*, *c* represent three contacts connected as shown to the leading wires. According to the position of the plugs, one or both of the heating wires are in the circuit. Fig. 6 shows an arrangement with four contacts. I is a common point for the heating wires, and the dotted line indicates a direct connection with this point.

21,816. Greer, D. Nov. 15.



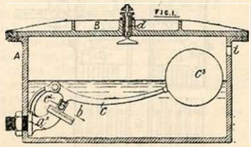
Steam traps.—A flexible diaphragm F is mounted near the inlet B and is attached to the shorter arm of a lever C fulcrumed at D, to whose larger arm is attached a valve E situated at the bottom of a tube A. The lever C is counterweighted so that, until the tube A fills with water, the valve E remains closed. When the tube is full, the weight within it opens the valve E, and the water escapes. A piston may be used instead of the diaphragm F.

22,034. Shaw, W. A. Nov. 17.



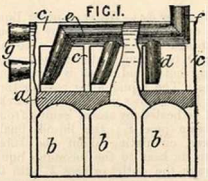
Heat storing apparatus.—Relates to plate &c. covers which are adapted to contain cold or hot water &c. for the purpose of cooling or warming articles of food such as butter. The water is contained between the outer and inner casings *a*, *b* of the cover, and is poured out after use through the socket *d*. The socket is normally closed by the screw plug *e*. The plug is provided with a handle or bow *f* for convenience in lifting and carrying the cover and inserting and removing the plug. The outer casing may be covered with felt or other non-conducting material.

22,242. Coombs, H., Burley, W., and **Self, W. N.** Nov. 21.



Steam traps.—Within the closed chamber A is a pivoted ball float lever *c* provided with a fork c^1 for actuating the slide valve *b*. The condensed water is admitted by the inlet *i*, thereby causing the float c^3 to lift and move the slide valve *b* to uncover the port for the escape of water through the passage a^x. The float c^3 falls as the height of the water-level decreases and thereby closes the port. An air relief valve *d* is provided on the cover B.

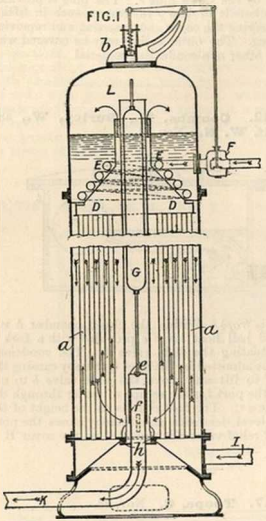
22,417. Toope, C. Nov. 22.



Heating water, boiler for. Relates to improvements in apparatus of the type described in Specifications No. 2983, A.D. 1885, Nos. 4142 and 4694, A.D. 1886, No. 17,413, A.D. 1887, and No. 6816, A.D. 1890. The boiler *c* is heated by a series of oil lamps placed in the chambers *b*, the hot air and gases circulating through openings in *a*, the flues *d* and *e* to the outlet flue *f*. The hot water from the boiler is distributed to a series of flow and return pipes by means of the outlets *g*.

22,425. Squire, L. R. L. Nov. 23.

FIG.1

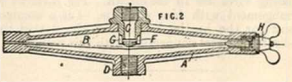


Heating water &c.—Water or other liquid under pressure enters the apparatus by the pipe I and rises through the thin tubes *a* to the upper chamber D, becoming heated in its passage by the outflowing hot liquid which is circulating around the tubes. The liquid, after passing through the chamber D, overflows into the topmost chamber L, where it is heated by steam issuing from a perforated steam pipe E; the liquid finally passes downwards, circulating about the tubes *a* and giving up its heat to the incoming liquid, escaping through the outlet orifices *h*, into the outlet pipe K at a temperature not much greater than that of entrance. The outlet opening is governed by a cylinder *e* sliding over the pipe *f* and regulated by a float G, while the admission of steam is controlled by a piston *b* actuated by the steam pressure in the chamber L so as to control the admission valve F and keep the temperature tolerably uniform. Slightly modified forms of apparatus are described and illustrated.

22,465. Royle, J. J. Nov. 23.

Steam traps.—Within the casing A, provided with an inlet C and an outlet D, is located an expansion bar B, one end of which is cast into the casing and the other regulated by a thumb-screw H; the lower end G of the inlet C acts as a guide to a valve F. In the normal position the valve is

FIG.2

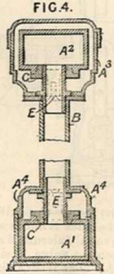


open to allow water of condensation to escape through the outlet D, but when steam begins to enter the casing A the latter expands and tends to draw the bar B straighter and so close the valve F.

22,738. Worsfold, J. Nov. 27.

Heating buildings &c., radiators for. The upper and lower boxes A^3, A^1 are enclosed in ornamental casings A^2, A^4. The loops B are connected with the boxes by means of right-and-left handed screwed nipples E, the joint with the boxes being made by means of the conical collars C, this arrangement allowing of the easy removal of the loops B. In a modified apparatus the radiator loops have three passages, the centre one being for the heating fluid, while the two others are for the circulation of the air to be heated; the upper and lower water casings may also be cast in one with the ornamental casings.

FIG.4.



22,805. Thompson, W. P., [*Steinsiek, G. G.*]. Nov. 28.

Boiling-pans.—Appliance for preventing the boiling over of liquids. It consists of a hollow body *a* closed at the top but fitted with tubes *c*, dipping into the liquid. When in a state of ebullition, the liquid rises up the tube and falls over the edge *d* into the pan again. The

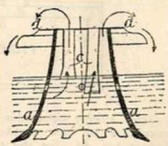
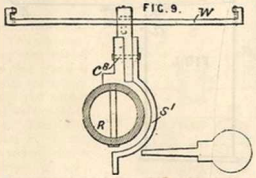


FIG.2.

appliance *a* may rest on the bottom of the vessel, or may be suspended therein. The tubes *c* may be continued and bent over so that the liquid falls on to the surface of the liquid in the pan. The tube may be fitted with a rose.

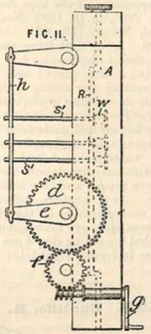
22,836. Paine, H. E. Nov. 28.

FIG. 9.



Heat, utilizing solar. — Upon a stationary frame A, Fig. 11, are carried a number of rotary vertical axes R, to which latter are attached adjustable mirror frames *w*, shown to a larger scale in sectional plan by Fig. 9. The mirrors can rotate about the horizontal axis c^8, their position being controlled by long arms S^1 linking with the rods *h*, which latter can be shifted by the lever *e* and worm gearing *d*, *f*, *g*. The vertical axes R are rotated by means of a clockwork arrangement. The mirrors can thus follow the diurnal path of the sun, and their reflected rays can be concentrated upon a heat receiver such as a boiler or the like.

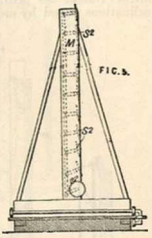
FIG. 11.



22,837. Paine, H. E. Nov. 28.

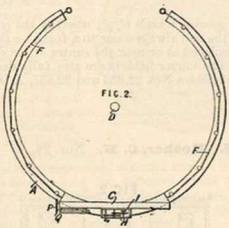
Heat, utilizing solar.—An inclined railway track is constructed in the form of a circular arc, the length and inclination of the track being dependent upon the apparent path of the sun across the heavens, in the place where the apparatus is set up. Upon this track is carried a mirror frame M, Fig. 5, provided with a large number of adjustable mirrors S^2 for reflecting the rays of the sun upon a heat receiver placed at or near the centre of the railway track. Each mirror is held in a frame consisting of four arms radiating from a centre and provided with adjusting set screws; each frame is pivoted to the adjusting apparatus by a knuckle joint, so that any desired inclination can be given. The mirror holders are also fully described in Specifications No. 22,836 and 22,839, A.D. 1893. The mirror frame M is driven by means of a cord attached at its ends to opposite sides of the frame, and passing round the track over suitable guide pulleys, and over the pulley attached to the driving shaft of a weight motor.

FIG. 5.



22,838. Paine, H. E. Nov. 28.

FIG. 2.

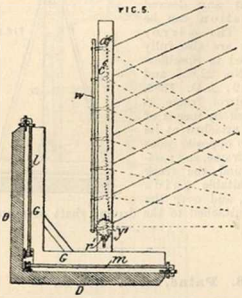


Heat, utilizing solar.—The apparatus is shown in plan by Fig. 2, in which C is a mirror holder carried by rollers upon a circular railway track A, and adjustable by means of a cord F passing several times round the axle I on the frame C, the axle I being rotated by a suitable chain of gearing H for adjusting the position of the apparatus. The mirrors are carried in adjustable holders, their inclination being regulated by the toothed wheels P, Q, so that the reflected rays of the sun are always upon the heat receiver D. The adjusting device is also described in Specification Nos. 22,837 and 22,839, A.D. 1893. The movement of the frame C and its mirrors may be effected by any suitable power.

22,839. Paine, H. E. Nov. 28.

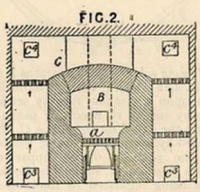
Heat, utilizing solar.—The invention consists of a frame G shown in elevation by Fig. 5, carrying a number of adjustable mirrors a^6, a^6, &c. The frame G is carried on a circular inclined railway

track D by rollers on the shafts *l* and *m*, motion being obtained by means of a weight motor. The mirror frames are pivotally supported and their inclinations varied by means of the vertical rod W



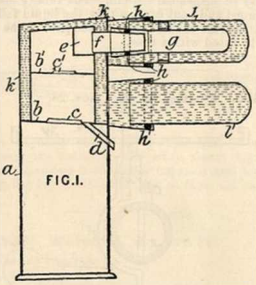
and the gearing wheels r^1, y^1, whereby the reflected rays of the sun always come to a focus on the heat receiver placed at or near the centre of the circular track. The mirror holders are also fully described in Specifications Nos. 22,836 and 22,837, A.D. 1893.

22,866. Rosher, C. H. Nov. 28.



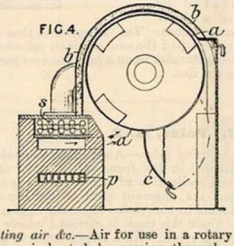
Heating air.—For ventilating and heating theatres, laundries, Turkish baths, dwelling houses, and the like, the air is first passed through a chamber containing a series of cloths of flannel or other fabric arranged on interchangeable frames for purifying the air. Afterwards the air is led into the outer chamber C of the furnace B by means of the inlets c^3, and, after circulating round the furnace and becoming heated thereby, escapes by the outlets c^4 for use in warming and ventilating. Instead of an ordinary firegrate *a*, receptacles or containers for holding the fuel may be placed on the trolley supporting the firegrate.

22,962. Toope, C. Nov. 29.



Heating buildings &c.—Relates to improvements in apparatus of the type described in Specifications No. 2983, A.D. 1885, Nos. 4142 and 4694, A.D. 1886, No. 17,413, A.D. 1887, and No. 6816, A.D. 1890. A vertical lamp casing *a* is provided with horizontal diaphragms *b*, b^1 perforated at *c*, c^1, and having a baffle-plate *e* over the end of the pipe *f* connecting the casing with the horizontal flue *g*, while an opening in the casing controlled by a flap serves for the admission or withdrawal of a lamp. The hot air and gases from the lamp in the casing *a*, escaping into the flue, heats the water contained in the water-jacket *k* and pipe *j*, thereby causing a continuous circulation through the outflow and return pipes *j* and *l* for heating greenhouses and the like. Any moisture collecting on the interior of the casing escapes by the pipe *d*. The ends of the various pipes are made conical with various angles, so that a packing ring *h* can be wedged between the cones to form a tight joint.

23,069. Cunliffe, R. Dec. 1.



Heating air &c.—Air for use in a rotary drying cylinder *a* is heated by passing through pipes *s* above the fire box of a furnace and through the hollow tapered fire bars.

23,272. Leigh, T. R. Dec. 4.

Heating water by liquids &c. The invention has reference to means for heating water by mixing with steam or hot water. Figs. 1 and 2 are an elevation and sectional plan of the apparatus in which *l* is a valve controlling the cold water pipe *c*, and *m* a similar valve controlling the steam or hot water supply pipe *d*. The valve spindles *h*, *h* are connected by a crosshead *o* adjustable in position by a screw *p* and hand wheel *r*, whereby both valves can be opened to admit the cold water from the pipe *c* and the hot water or steam from the pipe *d* to mix in the chamber *e*. The lower end of the pipe *c* is perforated and an outlet pipe *g* for the heated water is provided.

FIG. 1.

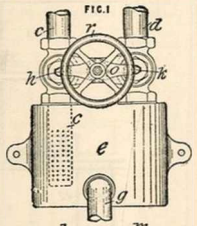
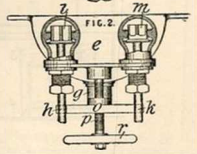


FIG. 2.



23,342. Statham, S. E. Dec. 5.

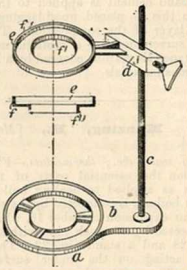
Hot-water bottles.—Consists in the manufacture of seamless rubber articles, such as water bottles, by dipping a cone of the shape of the required article into a bath consisting of a solution of india-rubber in naphtha. When a coating of the required thickness has been formed by repeating the dipping process, each layer being dried before the dipping is repeated, the rubber is vulcanized. In order to prevent the condensation of moisture on the rubber, the core is heated by the passage of steam or hot air through its interior and the chamber in which the process is conducted is supplied with dry air.

23,371. Sussmann, A. Dec. 5.

Heating water &c.—Stands or supports for cooking and boiling purposes. The stand is formed with a base *a b* and a vertical rod *c*. On *c* is adapted to slide a block *d* carrying an annular plate *e* having upwardly and downwardly extending flanges *f*, *f*[1]. The vessel to be heated is placed on the plate *e*, and a lamp is placed on the foot *a*.

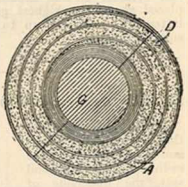
(*For Drawing see next column.*)

23,371.



23,378. Johns, H. W. Dec. 5.

Non conducting coverings.—The invention is described with reference to coverings for pipes. Upon a mandrel G is wound a sheet of asbestos D, and over this is wound several layers A of plastic material such as hemp, sponge, fibrous asbestos and the like backed by felt, canvas, or other suitable material. Any suitable cementing material such as silicate of soda is used to hold the different layers together. The finished annulus is afterwards cut through ready for applying to the pipe or other cylindrical body which it is required to cover.



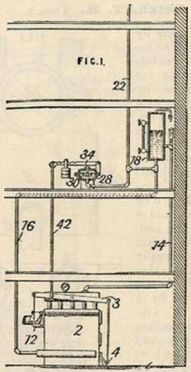
23,887. Thompson, W. P., [*Improved Zigzag Grate Bar Co.*]. Dec. 12. *Drawings to Specification.*

Heating water, boiler for. At the rear of an external furnace two transverse water-chambers are provided, one of which is placed on the front face of the bridge-wall while the other is immediately below the boiler. These chambers, between which the combustion products pass away to the flues, are connected up to each other and to the boiler so that a circulation of the water in the boiler may take place through them.

23,949. Sellars, J. C., and **Ropes, C. A.** Dec. 13. *Drawings to Specification.*

Non-conducting coverings for pipes, conduits, &c. A layer of a mixture of silicate of soda, baryta,

and Portland cement is applied to the pipe &c., and upon this is placed wood-lagging, and then an outer layer of the composition. The pipe &c. may be surrounded by a metallic meshwork at some distance therefrom, covered by a layer of the cementitious materials.

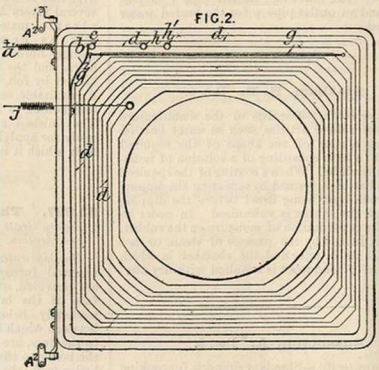


24,093. Munzing, H., [*Mercer, A.*]. Dec. 14.

Heating water &c.; thermostats.—Fig. 1 shows in elevation the essential parts of the heating apparatus as applied to heating buildings. The hot water boiler 2 is connected by the pipes 14 and 16 with an expansion chamber 18, which latter is also connected by a branch pipe with a diaphragm cylinder 28 and a stand pipe 22. The hydraulic pressure acting on the under surface of the diaphragm 30 regulates the movement of the lever 34 and the motion is thence transmitted by the link 42 to the pivoted lever 3, which latter regulates the dampers 4 and 12. The thermostat cylinder 28 and expansion chamber 18 are placed above the highest group of coils, which latter are connected up to the boiler 2 in any suitable manner.

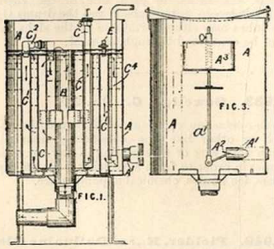
24,111. Lagrelle, A. D. Dec. 15.

Heating by electricity the seats of water closets and commodes. Over the ordinary seat is a second seat, the underside of which is shown in Fig. 2, hinged at A^2. The current comes in by the wire *a* to the spring *b* in contact with the terminal *c*, and thence through the cut-out h, h^1 and wires *d* (which may be fixed directly to the wood or to asbestos fitted to the wood) to the out going wire *j*. There is a copper thermostat *g* with its free end g^2 made to bear against the spring *b* and so break the circuit when the temperature becomes too high. Different forms of thermostat may be used according as it is required to break the circuit slowly or quickly. The movement of the seat on its pivots may be used to open and close the circuit, as shown in the vertical section Fig. 7. Two studs *c*, c^2 pass through



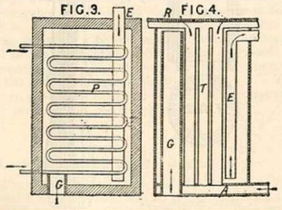
the upper seat, so that, when the seat is down, contact is made between the wires *a* and *d*, *d* and *j* as shown, and when it is up, this contact is broken.

24,410. Evenden, R. E. Dec. 19.



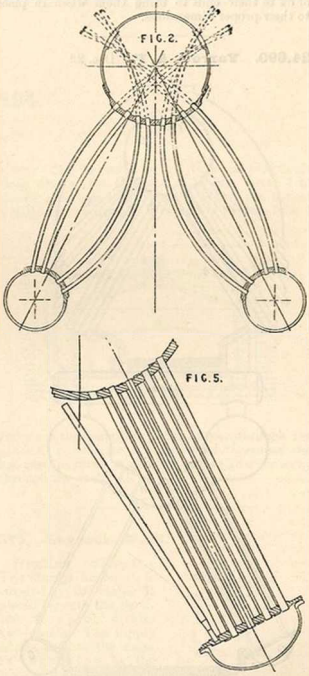
Heating water &c.—The apparatus, shown in sectional elevation by Fig. 1, consists of a portable milk container A provided with annular steam-heating chambers C, C¹ and a central outlet B. The milk enters by a pipe A¹ and, after circulating round the heating chambers C, C¹, overflows into the pipe B and escapes. The flow of milk into the apparatus is regulated by a throttle valve A², Fig. 3, and float A³, the latter being adjustable on the vertical rod a^1. The chambers C, C¹ are connected by a pipe C² so that the steam entering by the pipe C³, after circulating through the inner annulus C², passes over into the outer annulus C¹ and finally escapes by the outlet C⁴. For cooling milk, cold water is allowed to pass through the chambers C, C¹.

24,423. Cox, J. B. Dec. 19.



Heating water, air, &c.—Apparatus for heating fluids in which the heated gases from a furnace pass in an upward direction through or around the heating tubes, and are then caused to flow in a descending direction before being finally withdrawn through a chimney, or in which the furnace gases are introduced at the top and flow downwards only. Fig. 3 is an example of the application of the invention to water heating, and Fig. 4 to air-heating. In each case the heated furnace gases enter at G and escape at E. In the former case the water circulates through the pipe P or other suitable form of boiler. In the latter, air enters at A, traverses the tubes T, and leaves in a heated condition at R.

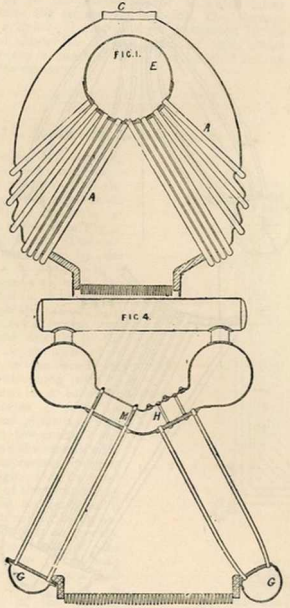
24,689. Yarrow, A. F. Dec. 22.



Heating water, boiler for. Relates to various devices whereby the water-tubes of tubulous boilers may be conveniently removed or replaced

without interfering with the other tubes. In one of these arrangements, the water-tubes are so curved that each may be withdrawn into the upper and steam drum and thence removed through the end-cover. In another case, as shown in Fig. 2, the curved tubes are taken out through plug-holes in the drum. This method may be also adopted when the tubes are straight. In a further arrangement, as in Fig. 5, the ends of the tubes are reduced in diameter to allow of the necessary inclination being given to the tubes when removal is taking place. Ferrules are employed for filling up the spaces in the tube-plate caused by the reduced ends. Further, short water-tubes may be used, lengthening pieces being afterwards screwed into or on to their ends to bring them when in place to their proper dimensions.

24,690. Yarrow, A. F. Dec. 22.



Heating water, boiler for. In the form shown in Fig. 1, a series of close-ended water-tubes A diverge from the steam and water drum E and enclose the furnace space B. The tubes may contain inner pipes for circulation purposes, or be formed with internal partitions for producing the same effect. The products of combustion pass between the tubes within a casing up to the chimney C. As regards the arrangement shown in Fig. 4, the tubes on each side of the furnace stretch between water-slabs H and the drums G, G. The tubes may either terminate at the slabs, as at H, or be continued through, as at M.

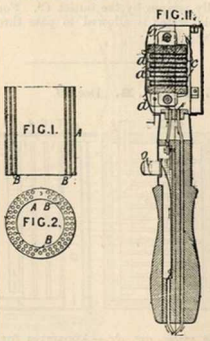
24,933. Sewell, J. C. Dec. 28.

Non-conducting coverings.—Silicate cotton, slag wool, or other like non-conducting material is woven with wire or wire netting in any convenient manner in order to form a covering for steam-pipes, boilers, ice houses, chemical apparatus, &c.

24,949. Fielder, H., and **Dailuaine Glenlivet Distillery.** Dec. 28. *Drawings to Specification.*

Heating air.—In an apparatus for drying brewers' and distillers' grains &c., an air-heating arrangement is employed consisting of a series of chambers, one above another, communicating at each end alternately and containing steam or hot air pipes, the air for drying purposes being forced over these pipes and into the drying apparatus.

25,009. Schindler, F. W. Dec. 29.



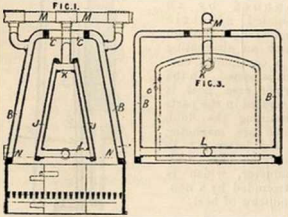
Heating by electricity.—Relates to electrical heating devices applicable for heating air or water or for cigar lighters. In the form shown in Figs. 1 and 2

a tubular block of refractory material A is provided with perforations B for the reception of heating wires, preferably of platinum coiled on cores of asbestos paper. The central space serves for the circulation of air or other fluid, or the reception of materials to be heated or kept warm. When used for a water heater, the block may be in the form of a narrow tube with a metallic lining and casing forming a passage for the circulation of the water. Or the block may be enclosed in a casing and suspended in the liquid to be heated. In the cigar lighter shown in Fig. 11, the heating block *d* has a conductor *c* sunk in narrow grooves on the lighting face, and is fitted in a casing *a* with an opening a^1; the block is fixed between two half rings which permit of its easy removal and a switch, actuated by a button *o*, is fitted in the handle. Modifications are described.

A.D. 1894.

75. Newsum, G. Jan. 2.

FIG.1.

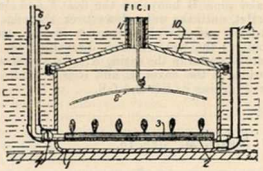


Heating water.—Figs. 1 and 3 are transverse and longitudinal vertical sections respectively of the boiler, which consists of an outer water-casing B rectangular in plane and conical in cross-section. Inside it are two inclined flat water-chambers J, communicating with one another through pipes K and L, the former of which is also connected to the outflow pipe M and the latter with the bottom of the outer casing, as shown in Fig. 3. The return pipes are connected at N, N, and an opening C is provided for the supply of fuel.

76. Hanrahan, J. T. Jan. 2.

Heating water for baths and the like. A copper vessel 1 with a conical top 10 is provided with side tubes 4 and 5 and a central tube 11. This apparatus is lowered into the vessel containing the water to be heated and the gas burner 3 contained within it lit, whereby the hot air and gases circulating within the chamber 1 heat the surrounding water. The burner 3 is fed by a gas pipe 6, air being drawn into the pipe 6 by the mixer 7 to ensure complete combustion. When the burner is alight a down-draught is caused in the side tube 4

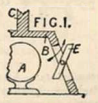
FIG.1



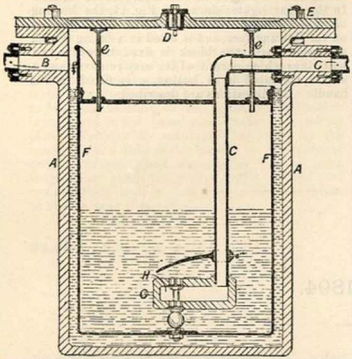
and air is thus supplied to the burner through the gauze 2; a deflector 8 is provided to spread the hot gases as much as possible before passing away through the outlet 11.

275. Laycock, W. S. Jan. 5.

Heating buildings.—The storage heater A is covered by the casing B placed beneath the partition C which divides two rooms. The supply of hot air into the room is regulated by the pivoted door E, which is operated by levers from within the room. The pivoted door may be replaced by a sliding door provided with grids.

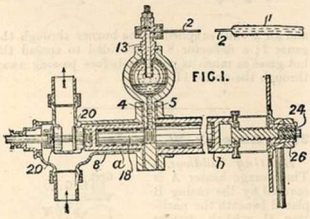


754. Longton, J. Jan. 12.



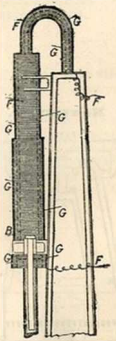
Steam traps.—Within the casing A is a floating bucket F having attached thereto an equilibrium valve H, sliding in the valve casing G of the discharge pipe C. Condensed water entering by the inlet pipe B buoys up the float F and closes the outlet, until the water flows over the edge of the bucket and thereby depresses it and opens the outlet; the water is then discharged by the pressure of steam in the casing A. An air valve D is provided in the cover E, and rods *e* guide the bucket F during its lift and fall.

805. Paul, E. Jan. 13.



Thermostats.—An apparatus, which is especially adapted for use in attemperating fermenting wort in brewing, consists of a rigid copper reservoir 1 placed in the vat and connected to the union piece 13 by means of the pipe 2. The casing 8 contains a pair of elastic rubber reservoirs *a*, *b* securely fixed by their flanges 4, 5 and having their capacity diminished by the plugs 18. The reservoir *a* is connected to a double beat valve 20 controlling the supply of attemperating liquid, while the reservoir *b* is connected to a nut 26 and screw 24 so that it can be pulled out and its capacity altered. The apparatus is filled with mercury nearly up to the level of the union 13, while the reservoir *a* is filled with an easily-dilatable liquid, such as alcohol, whose expansion forces out the valve 20 and regulates the supply of attemperating liquid. By suitably modifying the capacity of the reservoir *b*, the flow of liquid is altered and, if desired, clock-work can be attached to the screw 44 to effect the adjustment.

908. Williams, W. L., Goolden, W. T., and Ravenshaw, H. W. Jan. 15.



Heating by electricity.—The invention is for heating hydraulic machinery, and is described in connection with a hydraulic crane; the cylinder B is surrounded by an insulated electric conductor F, through which an alternating or a continuous current is passed. In the former case, heat is generated in the parts containing the fluid, which are magnetic; in the latter, it is generated in the conductor, which is surrounded by a non-conductor of heat.

1162. Warner, J. W. Jan. 18.

Heating water.—A boiler and furnace consist entirely of sections A, B, C, D, E, F, bolted together at G in any desired number or arrangement, for surface or reservoir stoking, or both. All the sections may communicate with two circulating vessels, one, K, at the top, and the other (not shown) at the bottom on one side of the apparatus. Or the sections may be connected separately or in groups with several independent hot water circuits. The intermediate sections B are all similar; each has vertical water channels at the sides, connected by horizontal channels B^2, B^3, B^4, B^5, the edges of which fit those of adjacent sections, except where openings are left for cleaning. The channels B^2, B^3, B^4 are connected by vertical central channels. Openings *b* through the channels B^2, B^3, B^4 are formed as circular tubes. A tube I extends transversely through each section B, D, E to support a part of a grate. Each tube I must be connected at one end to a