

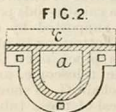
A.D. 1858.

49. **Johnson, J. H.**, [*Chameroy, E. A.*].
Jan. 12. [*Provisional protection only.*]

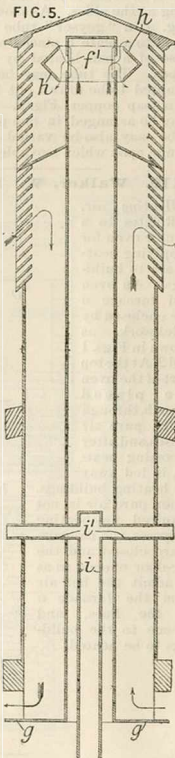
Heating water.—Boilers for hot-water or steam heating-apparatus for baths, wash-houses, and all domestic purposes are provided with external

metal tubes, having the end which communicates with the boiler open, and the other end closed. In some cases the tubes, which are of iron, copper, or other metal, may be bent in the form of a siphon, both ends being open and both communicating with the boiler.

52. **Muir, G. W.** Jan. 13.



Heating air; heating buildings.—Hot-water pipes *a*, Fig. 2, having tops with perforated flanges, are placed in "fresh air drains," or passages for supplying air to rooms. Over the tops of these pipes are placed perforated tiles, through which, and through the flanges, warm air is admitted. Fig. 5, representing an arrangement of concentric ventilating-shafts, shows a vertical flue *i* leading from over a gas light, and horizontal flues *h* which direct the hot air from this flue into the attics of the house, thereby serving to heat it.



60. **Woodcock, W., Blackburn, T., and Smalley, J.** Jan. 14. [*Provisional protection only.*]

Heating air; heating by air circulation.—Air is heated by passing through pipes placed within the flue of a boiler furnace or other heating-apparatus. The hot air is circulated by means of a fan or piston placed on a suitable frame, and connected by conducting-pipes to the pipes within the flues &c. Valves are fitted within the pipes for regulating the heat and for allowing it to pass away to any place in which it is required. For heating purposes, the hot air is retained in airtight vessels from which it is returned when cool to the heater. The above method of heating air is applicable for drying yarns or fibrous materials, heating mills, and boiling liquids.

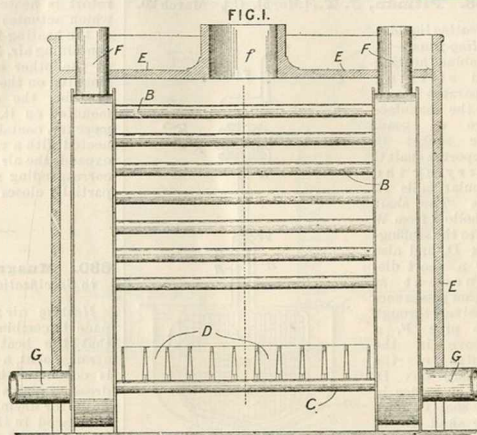
136. **Garnett, J., and Garnett, P.**
Jan. 26.

Non-conducting coverings.—Non-conducting coverings for boilers, boiling-pans, steam-pipes, roofs, &c. are formed by reducing woollen rags to pulp in a rag machine, and covering the article to be protected with the pulp. The covering is matted together by beating and is coated with a layer of finer pulp, clay, or other airproofing and waterproofing material. Cotton waste or other fibre may be mixed with the woollen pulp.

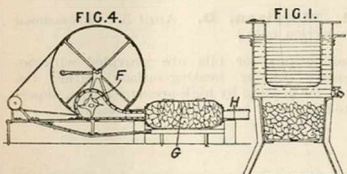
232. **Dench, E.** Feb. 8.

Heating water.—Relates to a boiler for heating water for the purpose of heating conservatories and buildings. The boiler, Fig. 1, consists of two hollow water spaces which form the sides of the boiler, and are connected by horizontal tubes *B* at the upper part and horizontal tubes *C* at the lower part. The latter are placed

beneath the firegrate *D*, the bars of which are arranged at right-angles to the tubes. The products of combustion ascend between the tubes *B*, pass over the side water spaces and descend into spaces formed between them, and a casing *E, E*, of cast iron or brick work. A forked flue leads from the sides of the water spaces to the chimney placed at the back of the boiler, or a flue *f* is provided at the top. Water enters the boiler by the pipes *F, F*, and leaves by the pipes *G, G*. When the boiler is built of iron, the side spaces are connected by two or more transverse water spaces, and the firebars are made of hollow tubes which are fitted into these transverse spaces and at right-angles to them. The boiler may be heated by gas jets, the tubes *B* in this case being placed all the way down between the water spaces.



298. **Coutts, J.** Feb. 16. [Provisional protection only.]



Heating liquids; heating air.—A vessel for warming an antifouling composition is shown in Fig. 1. An apparatus for warming the surface to which the composition is to be applied, consists of a fan *F*, Fig. 4, driving air through the furnace *G*, and a flexible tube *H*, directing the hot air so obtained on to the surface.

423. **Graveley, W. H.** March 3. *Drawings to Specification.*

Non-conducting coverings.—In an apparatus for distilling sea-water, felt is used as a lining to prevent loss of heat. An air jacket is similarly applied.

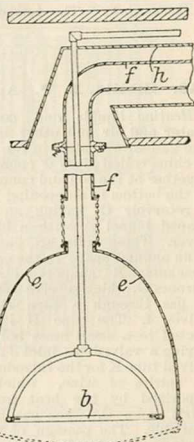
508. **Coupler, J. T.** March 12.

Heating by steam circulation.—For the manufacture of paper, pasteboard &c., the materials are boiled by means of superheated steam. The vessels for soaking and boiling have double bottoms, from which rise pierced tubes for admitting and distributing the steam, while consecutive tubes are connected by tubes passing from the upper part of one to the lower part of the other.

Soaking being effected and the liquor being drawn off, superheated steam is passed in to boil the mass, after which the straw is first washed by the waste steam passing from one vessel to the next, and then with hot water.

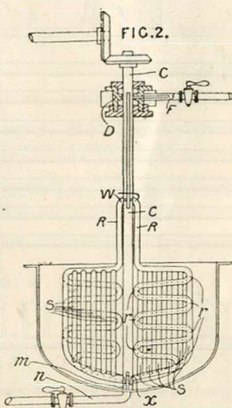
545. **Hine, T. C.** March 17. *Disclaimer.*

Heating air.—A room is lighted and ventilated by means of a ring burner *b* enclosed in a perforated glass or other translucent dome *e* which may be closed at the base by a perforated glass disc. The dome is connected by chains to a vertical outlet pipe *f* bent horizontally above the ceiling and surrounded by a fresh-air inlet pipe *h*, which may extend down to near the dome. The incoming air is thus heated by the pipe *f*. According to a memorandum of alteration filed Feb. 17, A. D. 1859, the tube *f* extends downwards into the socket of the dome *e*, which it supports.



588. **Pitman, J. T.**, [Morfit, C.]. March 20.

Heating liquids; boiling-pans.—A combined heating and stirring apparatus is used in the manufacture of soap. The socket *m* supports a shaft *C* carrying the tubular coils *R*, *r*, *s*. The shaft is hollow from *W* up to the stuffing-box *D*, and also for a short distance at *x*. Steam passes successively through the pipe *F*, a groove in the centre of the stuffing box *D*, and an orifice in the shaft *C*, down the shaft to *n*, through the coils, and out at *x* to the pipe *n*. The apparatus may also be used in the rendering of tallow. An alternative form of coil is described.



644. **Schlaesing, J. J. T.**, and **Roland, E.** March 26. *Drawings to Specification.*

Thermostats.—The temperature to which a

retort is heated is controlled by a thermostat, which actuates a valve in the air-supply passage of the heating-furnace. A tube within the retort, containing air, is closed at one end and connected at the other end with a mercury cup which is mounted on the upper end of one of the legs of a U tube, the other leg having an open cup mounted on it. On the open surface of the mercury, contained by the U tube, is a float connected with a valve through a lever. When heat expands the air in the tube within the retort, the corresponding rise of mercury in the open cup partially closes the valve.

680. **Musgrave, J.** March 31. *Drawings to Specification.*

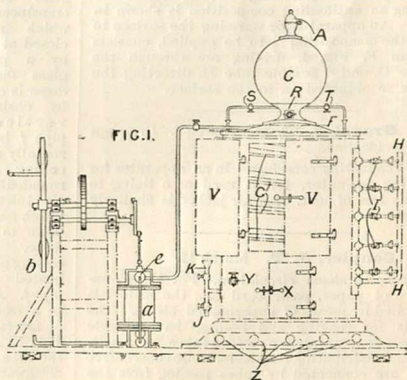
Heating air; heating water.—A singeing-furnace is combined with air or water heaters, so that the heat is completely utilized. In one arrangement, a boiler having an internal fireplace is connected by a flue under the singeing or dressing plates to an apparatus for heating air or water for drying purposes. Water chambers may be placed in the sides of the fireplace and flue, and connected to a boiler or otherwise.

712. **Morrison, D.** April 3. [*Provisional protection only.*]

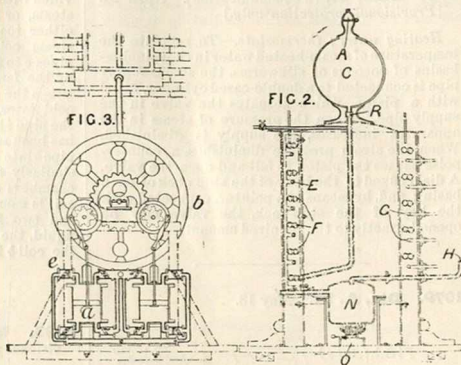
Boiling-pans for oils are provided with an extensive tubular heating-surface within the vessel, for heating by high-pressure steam, superheated steam, or hot water under pressure.

740. **Sibille, E. P.** April 7.

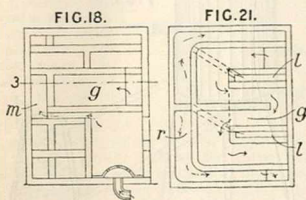
Heating liquids and gases.—Water and air and other liquids and gases are heated in two brass or china coiled pipes *F* connected together at the top and connected at the bottom to an opening *Y* and a reservoir *C* having an egg-shaped funnel *A* with a hinged cover. These coils are enclosed in an annular space in the casing. Brackets *E* support circular burners *G*, which receive a supply of gas through a pipe *H* and valves *I*. The pipe *H* is connected to a small brass boiler *N* having a valved gas inlet *J* and a valved tube *K* for the introduction of spirits of wine, which is vaporized by the heat from a spirit lamp *O*, when gas is not available. The passage of water or air to the tubes *F* is controlled by a valve *R*. Water may be introduced to these tubes through



a valved pipe S to moisten the air, when heating air. Air is admitted at openings Z to promote evaporation or combustion. The casing is provided with doors V, X as shown. A tap is provided to empty the coils F. Air may be drawn or forced through the apparatus by a pump having two cylinders *a*. When using the air to warm a habitation, the supply is preferably taken from outside the building. When the apparatus is large, separate compartments are provided for the heating and cooling agents. To regulate the pressure of the vapour in the burners, a small coil, closed at the top and communicating with the vaporizer N, is arranged in the reservoir C. The gas or vapour burners may be replaced by a coke, charcoal, or oil stove.

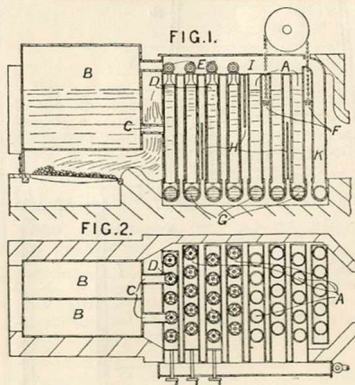


775. Brun, P., [Maniguet, F.]. April 10.



Heating air for ventilation and for warming purposes. Fig. 18 shows in vertical section, and Fig. 21 in horizontal section on the line 3, a furnace employed with a fan. The air, shown in full lines, is forced through a series of chambers *g*, &c. around and in contact with which the gases shown in dotted lines circulate through chambers *l*, *m*, *r*, &c.

vent the formation of scale. Scrapers F, arranged to rise and fall as described in the prior Specifications, are used to remove the soot. Horizontal pipes G are fitted with rotating spiral stirrers and cleaners. Plates H are arranged in the flues as shown. The steam generated passes through superheating-tubes K.



877. Green, E., and Green, E. April 21.

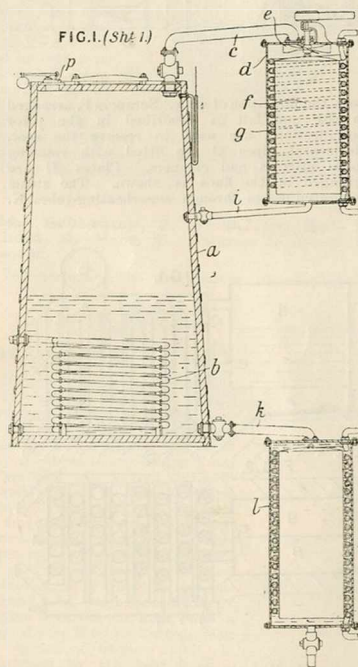
Heating air; heating water.—The apparatus described below for heating feedwater and generating and superheating steam is stated to be also applicable for heating air or water. A series of pipes, chambers, or passages, similar to those described in Specifications No. 10,986, A.D. 1845, No. 2882, A.D. 1853, and No. 2142, A.D. 1856, [Abridgment Class Pipes &c.], are arranged in the boiler or furnace flues. The water pipes A, which are connected to a boiler B by pipes C, contain metal, earthenware, or other stirring blocks D, which may be operated by bevel-wheels E. These stirrers pre-

In a modification, the stirrers are dispensed with, and the water tubes are enclosed by steam pipes depending from the steam pipe L. Curved or bent tubes may be used, arranged so that the steam to be superheated enters them where the waste gases escape from the flues, and these pipes may be connected together at the bottom.

906. **Luis, J.**, [a communication]. April 24.
[Provisional protection only.]

Heating water; thermostats.—To regulate the temperature of steam-heated water in the spinning-basins of cocoons of silkworms, the steam-supply pipe is connected to a double-cased cylinder, fitted with a piston, which actuates the valve in the supply pipe. When the pressure of steam in the apparatus increases, the supply is diminished. When the steam pressure diminishes, a counterpoise causes the piston to fall and open the valve. A dial is fixed to the body of the stop cock of each basin; and, by means of a pointer, connected with the key of the stop-cock, the valve may be opened exactly to the required amount.

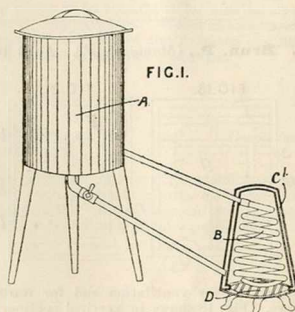
1079. **Dix, A. M.** May 13.



Boiling-pans.—In apparatus for brewing or obtaining decoctions of hops or other aromatic substances, the vapours are condensed and returned to the boiling-pan. The vessel *a* is pro-

vided with a double valve *p* to allow the escape of steam, or to admit air, when the pressure becomes either too high or too low, and is heated by a steam coil *b*. The vapours pass through the pipes *c* to the vessel *d*, where they are propelled, by the fan *e*, over the coil *g*, which is placed between the casings *d*, *f* and transmits a current of cold water. The condensed vapour flows through the pipe *i* back into the vessel *a*. When the liquid has been sufficiently boiled, it is run through the pipe *k* into the cooling-vessel *l*, which is constructed similarly to the vessel *d*. In a modification, the chambers *d*, *l* are dispensed with, a condensing-coil is mounted in the upper part of the vessel *a*, and two fans or agitators are used, one in the liquid, the other above the condensing-coil, and the coil *b* is used both for heating and cooling.

1093. **Hayden, D. W.** May 17. [Provisional protection only.]



Heating water; boiling-pans.—A vessel *A*, containing water in which food for stock is boiled, clothes are washed, &c., is connected to a water-heater *B* consisting of a grate *D*, above which is a coiled tube *B*, communicating at one end with an annular water space *c'*, and at the other with the vessel *A*. The annular casing is also connected to the vessel *A*, and the water is heated by circulation.

1143. **Hughes, E. T.**, [Boullenger, J., and Martin, L. J.]. May 22. [Provisional protection only.]

Digesters for use in decomposing fats into fatty acids and glycerine are connected with force-pumps for the application of pressure. Pipes are used to lead liquid from the lower part of the apparatus to the upper part, or it may be injected by any suitable means.

1244. Meiklejon, J. June 3.

Heating water, boilers for. In one form, the boiler, shown in Fig. 1 in end elevation as supported within a furnace chamber, is composed of lower horizontal drums H, H, from which extends a cruciform water-chamber I, the upper branches of which open to upper chambers J. The latter are joined to suitable arms K, to the backs of which are connected two sockets L which receive the ends of the outflow pipes. The furnace gases pass to the end of the boiler return by the spaces B between the arms of the boiler, and ascend as shown by the arrows in order to pass over the outflow pipes. In a modification of boiler, the chamber I is constructed with three arms,

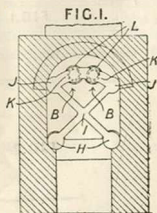
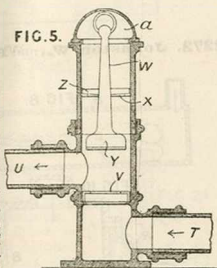


FIG. 5.

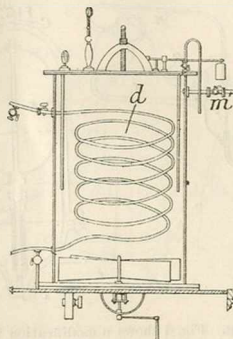


the third arm extending vertically from the central junction. Fig. 5 shows the valve, with its casing, which is used for controlling the passage of the circulating water. The casing is cast with sockets for carrying the inlet and the outlet pipes T, U. The valve Y beds upon the brass seating-ring V. The upper part of the casing carries the tubular piece W with its lifting-ring *a*. The stem of the valve W is cast with laterally projecting pieces Z, which form a cross-head and serve to support the valve when the ends of these projecting parts rest upon the internal flange X which is cast in two parts on the valve-box. The valve-box also answers as an expansive chamber. Another mode of arranging the valve is to cast the stem without its cross-head, so that it may be canted and wedged in position when a slight flow of water only is required.

1283. Lombard, J. B. A., and Esquiron, X. T. June 7.

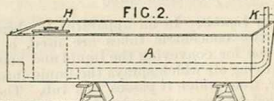
Digesters.—Cereals and vegetable matters are saccharified in "closed boilers heated either by a current of superheated steam or by an open fire, or by the introduction into these apparatus of air or any other gaseous body compressed, which delays the boiling point, the effect of

"which is the capability of raising the temperature of the mixture contained in the apparatus, which we effect either by a bath of fatty bodies, metal in fusion," or the like. In an example,



steam is passed through the worm *d*, until a temperature corresponding to four atmospheres is reached, when carbonic acid gas is admitted by the cock *m*.

1331. Lemière, L. F. June 11.



Heating liquids.—The coke stove H and pipe K is used for heating chemical solutions in the trough A during the process of washing and cleansing dirty linen or other articles or greasy or oily textile fabrics, or during the preparation of oakum substitutes.

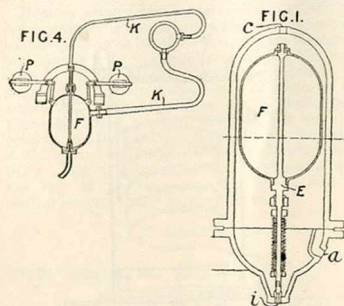
1580. Woodcock, W. July 14. Drawings to Specification.

Heating air.—Apparatus for heating air by means of steam, hot water, gas, &c., consists of metal pipes or tubes provided with "wings" constructed of flat plates transverse to the pipe or tube, or at any angle.

1698. Pougault, A. July 28.

Steam traps.—To prevent the admission of water to steam-engine cylinders, a float F, Fig. 1, is arranged in a casing having openings *a*, *c*, connected to the lower and upper parts of an enlargement of the steam pipe, and a water outlet *i*

controlled by a valve on the spring-supported guide E secured to the float. In a modification, the spring is replaced by a counterweight inside



the casing. Fig. 4 shows a modification in which the float is dispensed with, the casing being attached to the steam pipe by two pipes K and supported by weights P.

1718. **Luis, J.**, [a communication]. July 30. [Provisional protection only.]

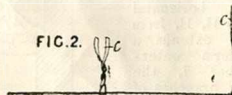
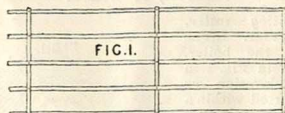
Heating liquids.—In an apparatus for heating liquids, two concentric tubes are used, a perforated one for conveying the liquid and another for conveying air which sprays the liquid into the receiver, from which it passes to a tub. The air is supplied by two or more hand or mechanically operated fan wings. Instead of using air, the liquid may be forced into a sprayer by a pump. If the tubs are arranged below the boiler, the pump also may be dispensed with.

1763. **Greenwood, J.** Aug. 3. *Drawings to Specification.*

Heating air; heating water.—Consists in providing deep undulations in the heating-surfaces of steam and water-heating boilers and air-heating apparatus. The invention is described as applied to steam boilers.

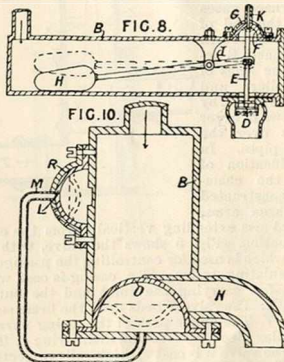
1967. **Wiart, L.** Aug. 30.

Heating liquids.—Boilers are fitted with internal heat-conducting fittings, consisting of copper or other metal strips, bands, or frames arranged to rest on the heated surface of the boiler. One form of frame is shown in Fig. 1. Other strips *c* may be fixed at right-angles to the longitudinal



and transverse bands as shown in Fig. 2. According to the Provisional Specification, the strips may be in spiral, convolute or serpentine form.

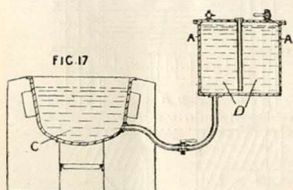
2272. **Johnston, W.**, and **Ross, W.** Oct. 12.



Steam traps.—The spindle E, Fig. 8, of the valve D which closes the outlet from the vessel B in which the condensed steam collects, carries a flexible cup-shaped diaphragm F, fixed over an opening in the vessel B. A cap or cover G, provided with air-holes, protects the diaphragm, and the spindle E passes through and is attached to the diaphragm by a button K screwed on its end. The diaphragm is made larger than the valve, so that the latter is kept closed by the steam pressure. A cork float H on the end of a lever I rises as the water accumulates in the chamber B, and opens the valve D. When the valve opens inwards, the float is attached directly to the spindle E. In another arrangement, the vessel B, Fig. 10, is fitted at the side with a flexible bag or vessel L containing water or other liquid. When the level of the water in the vessel B is below the bag, the heat of the steam causes the bag to swell out and close the aperture in a pipe M, which may be either the main outlet for the water, or the

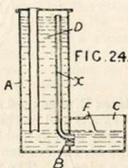
outlet of a flexible valve O closing the outlet N of the vessel B. Water passes through an opening into the interior of the valve O. When the water in the vessel B rises above the bag, the bag collapses and allows water to escape from the valve O, which then collapses and opens the outlet N. Holes are made in the cover R of the vessel L for the escape of the water.

2332. Allan, A., Whimster, T., and Gray, R. Oct. 19.



Heating water; boiling-pans.

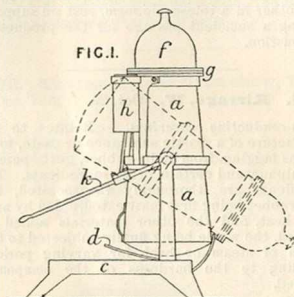
—The water supply to domestic boilers and pans is effected automatically by an arrangement which acts upon the principle of the "bird-fountain." The arrangement is shown in Fig. 17 as applied to an open vessel, Fig. 24, showing the fountain in a simple form with a contrivance for filling it. The normal level of the liquid in the pan C, Fig. 17, is on the same level as the open end of the pipe D which dips into the fountain chamber A, the pan and the chamber being in direct communication. When the level in the pan falls, air is admitted to the chamber A through the dip-pipe and a corresponding amount of water passed to the pan. As regards Fig. 24, the tube x opens inside and near the top of the fountain A, the other end opening in the vessel C a little below the level F at which the liquid is to be maintained. The fountain is filled through the dip-pipe D. If necessary, the pipe x and the communication B may be fitted with valves.



2334. Newton, W. E., [a communication]. Oct. 19.

Boiling-pans.—An apparatus for washing clothes consists of a vessel a hermetically closed by a cap /a flange g of which is provided on its underside with an annular groove packed with vulcanized india-rubber &c. which bears on a rounded edge at the mouth of the vessel a. Connected to the side of the vessel is a cylinder h of a single acting air-pump or any other exhausting apparatus, operated by a hand-lever k, so as to exhaust the air, causing hot water in the vessel to be thrown into violent ebullition and thereby facilitating

the washing of the clothes. The vessel a is mounted on trunnions in standards on a frame c so that it may be turned into the position indicated

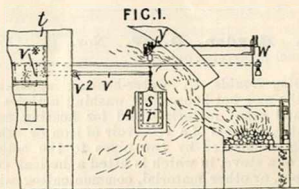


by the dotted lines for convenience of emptying, but when the vessel is charged it is held in a vertical position by a spring d attached to the frame c.

2338. Grant, J. Oct. 19. *Drawings to Specification.*

Heating water.—In a military cooking-apparatus, in which two or more ovens are arranged in a chamber situated between two furnaces, boilers or kettles for heating water or for cooking are arranged over the furnaces.

2364. Kennedy, R., and Armstrong, J. Oct. 22.



Thermostats for operating the furnace damper of drying-kilns. A long copper rod or wire t is placed in the kiln, which is heated by hot air from a chamber A' in connection with a furnace. The upper end of the rod is fixed near the top of the kiln, and the lower end is attached to the end v' of a lever v pivoted at v' so that when the temperature rises the other end of the lever rises and lifts the damper s, uncovering the opening r and so admitting cold air to the chamber A' and the kiln. The temperature is indicated by a pointer n.

- 2390. Bleakley, J.** Oct. 27. [Provisional protection only.]

Heating liquids.—In an arrangement of boiler flues, a number of shells, or boilers, inserted inside each other in a telescopic form, rest on supports, leaving a sufficient passage for the products of combustion.

- 2413. Kirrage, W.** Oct. 29.

Non-conducting coverings.—Relates to the manufacture of a plastic substance or paste, to be used as lagging, from india-rubber, gutta-percha, tar, sulphur, and certain other ingredients. The ingredients are thoroughly incorporated, the india-rubber being first masticated, aided by artificial heat, and the other materials added as required, the whole being finally subjected to the section of steam or heat for varying periods according to the hardness of the compound required.

- 2488. Matley, M., Miller, H., and Hall, T.** Nov. 6. [Provisional protection only.]

Steam traps.—The condensed steam drains into a vessel or receptacle having a discharge valve at its lower part. The apparatus is so constructed that, when the water has accumulated in sufficient quantity to overcome an adjustable lever and weight, the vessel sinks and causes the valve to open.

- 2526. Locke, E.** Nov. 10. [Provisional protection only.]

Heating water.—To allow the level of the water in gauge glasses &c. to be readily seen, a sponge or other wiper is so arranged in the interior of the glass that it may be operated from the exterior thereof.

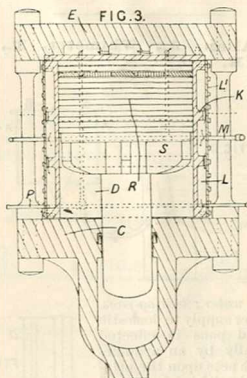
- 2585. Hayden, D. W.** Nov. 17. [Provisional protection only.]

Heating liquids.—A water-heating apparatus for baths and hot-houses, for washing articles of dress and other materials, and for heating food for cattle, consists of a reservoir of iron or other material, connected by two pipes to the hollow casing of a stove, in which is fitted a helical coil of copper, or other material, communicating with the hollow casing at points opposite the two pipes mentioned above. Stop cocks are provided at the top and bottom of the casing. The hollow casing may be used without the coil; or the coil may be used with a solid casing.

- 2586. Welch, E.** Nov. 17.

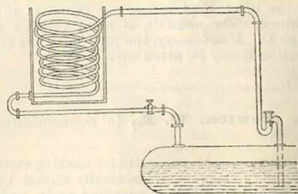
Heating by air circulation; heating by steam circulation.—In making spun tobacco, the tobacco is heated, by steam or air circulation, previously

to being pressed. Fig. 3 shows the heating-apparatus arranged in connection with a hydraulic press. Between the top plate C of the press cylinder and the crosshead E is arranged a chamber D. The doors and walls of this chamber, and the crosshead E, are made with ribs K, and enclosed by plates L¹ so as to form chambers L. The tobacco is cut into lengths and placed between



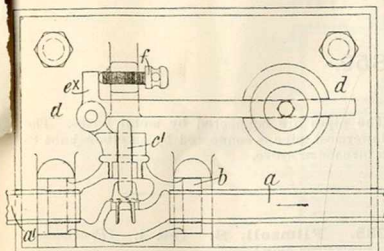
plates R, arranged in layers upon the press follower or ram S and within the chamber D. Steam or hot air is supplied to the chambers L through a pipe M, the condensed steam &c. being carried off by a pipe P. The pipe M is fitted with an elbow and union joint to allow the door of the chamber D to be opened or closed. The heating-apparatus may be arranged apart from the press.

- 2613. Howe, G., and Norton, J.** Nov. 19.



Boiling-pans; heating liquids.—A boiling pan or vat for water, wort, or the like in brewing, sugar-making, soap-making, drying, or for heating buildings, churches, chapels, or factories, contains a coiled pipe connected at the bottom and top with the steam and water spaces of a steam boiler.

2681. **Mather, C.** Nov. 25.



Steam traps.—A valve casing is screwed on to the inlet pipe *a* so that it moves, with the expansion and contraction of the pipe, between guides *d'* on the frame *d*. The valve *c* is held closed by a weighted lever pressing on the rod *c'*. The fulcrum of the lever is rigidly fixed to the valve casing, and a short arm *e''* projects from it. A set-screw *f* is held in a piece set on the frame *d*. Normally, the pipe *a* is so expanded by the steam that the arm *e''* is held out of contact with the screw *f*, and the lever holds the valve closed. When, by reason of accumulation of water, the temperature is reduced, the lever is pulled up by the arm *e''* and the steam pressure forces the water out at *a'*. The valve also allows air to escape and acts as a safety-valve.

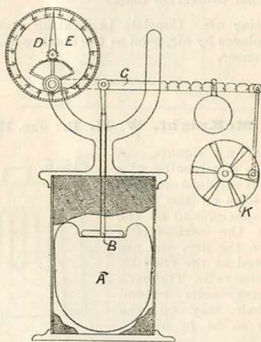
2700. **Pattinson, H. L.** Nov. 27. [*Letters Patent void for want of Final Specification.*]

Heating air &c.—The hot slag from blast and other furnaces is utilized for heating air and other gases. Preferably, the slag and air are passed in opposite directions through separate series of channels arranged close together.

2962. **Turner, F. W.** Dec. 27. *Drawings to Specification.*

Heating air.—Air becomes heated by being employed to cool a surface condenser, and is then used in a steam-generator furnace.

2975. **Taylor, W., and Grimshaw, W. D.** Dec. 29.



Thermostats.—A quantity of air is confined in a bag *A* which, as it expands, raises, through a piston *B*, a rod *C*, the movement of which is indicated on a dial *E* and which operates a register valve *K* for the admission of air &c. to a room.

2989. **Brooman, R. A.,** [*Charles, S.*] Dec. 30. *Drawings to Specification.*

Heating water.—A washing-machine for clothes is connected by pipes, controlled by taps, to a copper or boiler, by which the water is heated for washing or rinsing purposes.

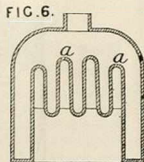
A.D. 1859.

65. **Williamson, A. W.** Jan. 8. [*Provisional protection only.*]

Heating air.—Consists in heating rooms and other places by air, used as the cooling-medium in a condenser.

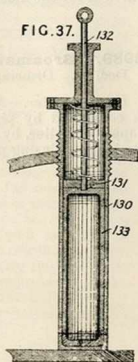
129. **McKnight, W. H. E.** Jan. 15.

Heating liquids.—A boiler is constructed of a series of upright cells *a*, which form on the inside water spaces, and on the outside the surface exposed to the fire, and are connected at the ends by transverse cells. The back transverse cells extend only half way up the furnace so as to form a bridge.



137. **Montgomery, J.** Jan. 17.

Thermostats.—Within the cylinder 130 is arranged a spring-pressed piston 131 resting on a "bag" 133 of "gum elastic" filled with mercury and hermetically sealed. The piston-rod 132 passes through a stuffing-box and is connected to the part to be controlled. In a modification, the thermostat case comprises a flexible bag formed as a bellows.



277. **Newcome, H. J.** Jan. 31. [*Provisional protection only.*]

Heating buildings.—A number of thin metal pipes are erected in tiers parallel with the walls.

The pipes are connected by metal boxes. The lowermost pipe is connected by an elbow-joint to a furnace or stove.

285. **Plimsole, S.** Feb. 1. [*Provisional protection only.*]

Heating air.—Air for heating buildings, drying, &c. is heated "by a cockle of iron enclosed in one "or more coverings of sheet iron," which may be enamelled.

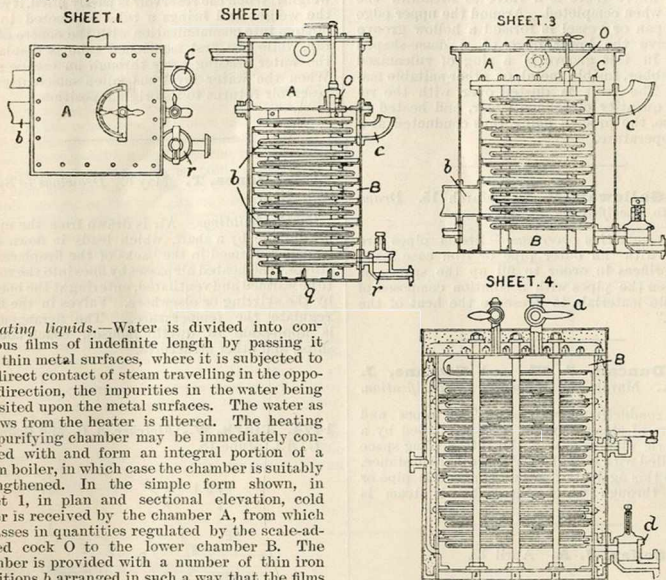
459. **Le Mire de Normandy, A. R.** Feb. 19. [*Drawings to Specification.*]

Steam traps.—Relates to improvements in the devices shown in Specification No. 1252, A.D. 1856. According to the Provisional Specification, a steam trap consists of a box of cast iron &c. containing a float, which may be made of copper, but is preferably made of stone or delfware. This float has a plunger, working within the box in a central vertical tube cast with the box. The bottom part of the tube is in communication with the condensed steam, and has on one of its sides a branch tube protruding out of the box, through which the condensed steam may flow when the float is up. When the amount of water in the box is insufficient to lift the float, the plunger fits the vertical tube and practically prevents the escape of condensed water and steam. When enough water is present to raise the float, the plunger is raised above the lateral opening, allowing condensed water, but no steam, to escape.

492. **Davies, G.,** [*Jouan, A.*] Feb. 23. [*Provisional protection only.*]

Heating liquids.—An appliance for use in sugar-boiling pans and for the "concentration of heat "for other purposes," consists of a convex upper part, with an upward-projecting tube, united to a concave, conical, or funnel-shaped lower part which is provided at its upper end with a tube which passes into the tube on the upper part, the tubes being united at their tops. The upper tube is perforated to permit the escape of air expanded by heat. Movable strainers are carried at the open top of the tubes, and on the neck of the outer tube. The appliance is forced beneath the surface of the liquid by means of rods passed through screw-threaded bushes.

505. Wagner, J. H. G. D. Feb. 24.



Heating liquids.—Water is divided into continuous films of indefinite length by passing it over thin metal surfaces, where it is subjected to the direct contact of steam travelling in the opposite direction, the impurities in the water being deposited upon the metal surfaces. The water as it flows from the heater is filtered. The heating and purifying chamber may be immediately connected with and form an integral portion of a steam boiler, in which case the chamber is suitably strengthened. In the simple form shown, in Sheet 1, in plan and sectional elevation, cold water is received by the chamber A, from which it passes in quantities regulated by the scale-adjusted cock O to the lower chamber B. The chamber is provided with a number of thin iron partitions *b* arranged in such a way that the films of water flow over them in succession and also in contact with the lower surfaces of the partitions. Exhaust steam is admitted to the chamber B by the pipe *b* and after traversing the compartments formed by the partitions escapes by the pipe *c*. Salts are deposited upon the partitions and also upon the bottom of the chamber, where they are prevented from passing away by reason of vertical ribs *g* which are also secured to the lowest partitions. As the water escapes, it passes through a copper sieve *r* covered with a felt disc. The partitions may be coated with a mixture of fish-oil and lampblack, and the joints of the apparatus packed with rubber bands. In the modification shown in Sheet 3, the chamber B is formed with the jacket C which, filled with cold water, acts as a steam condenser, while the form shown

in Sheet 4 may be brought into direct communication with a boiler. The steam is supplied to the upper and lower parts of the chamber B from the pipe *b*. The water enters from the feed-pump by the cock *a*, and, after traversing the chamber, is conveyed through the pipe *d* into the lower part of the boiler which is itself put in communication by another pipe with the cock *a*. The apparatus is surrounded with a jacket of sawdust or other non-conductor of heat. The partitions in this form of apparatus, which is specially for employment with marine boilers, are spread with a layer of sand in order to retain the salt precipitated. By attaching a chemical filter the water may be rendered potable. Instead of steam, any air or gas, heated or not, may be used.

589. Patrick, H. W. March 7. [Provisional protection only.]

Digesters.—A cast or wrought iron oval or egg-shaped vessel is provided with a double chamber in its upper portion, or has a single chamber carried by a portable head with tightly-closing doors. The lower part contains water, a safety-valve and thermometer being provided to regulate the temperature and pressure of the steam produced which may be led into the upper chambers for the purpose required. The digester may be parted at or near the top, midway, the parting

being left open, or closed by means of an openwork or other closure, and it may be used without water for dry heating, or as a hot bath with or without sand &c.

605. Ryder, J. N. March 8. [Provisional protection only.]

Boiling-pans.—Fresh fruit is preserved in a pan heated by a steam jacket or other means, and arranged so as to be evacuated by an air pump. The bottom of the pan slightly inclines to the

centre, where there is a valve to withdraw the charge when completed. Around the upper edge of the pan or vessel is formed a hollow groove to receive the lower edge of a dome-shaped cover. In this groove is a ring of vulcanized india-rubber, fusible metal, or other suitable material. The fruit is dusted over with the requisite quantity of refined sugar, and heated in *in vacuo*, the process being thus conducted at a low temperature.

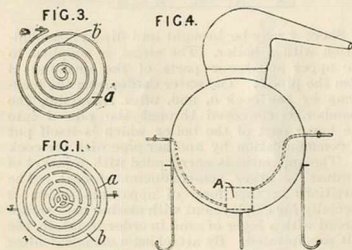
651. **Galloway, G. B.** March 15. *Drawings to Specification.*

Non-conducting coverings.—Steam pipes are covered with "an outer pipe or iron case made with orifices in order to fill up the spaces as between the pipes with a solution composed of suitable materials to preserve the heat of the steam."

694. **Duncan, J. W., and Gwynne, J. E. A.** March 18. *Drawings to Specification.*

Non-conducting coverings.—The pipes and cylinders of steam engines are surrounded by a concentric pipe or casing, the intervening space being filled with felt, glass, air, or other substance. Outside this again is another concentric pipe or casing, through which the exhaust steam is passed.

930. **Coffey, J. A.** April 13.



Heating liquids.—The liquid is heated by steam or hot air or liquid passed through coiled or other space *b* in a vessel *A* having intermediate open spaces *a*, through which the liquid treated circulates.

976. **Gedge, W. E.,** [Morel, A.] April 18. [Provisional protection only.]

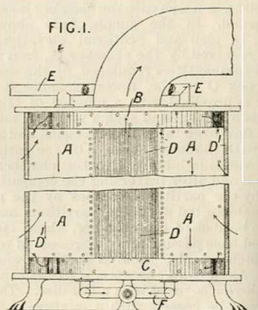
Steam traps.—Water of condensation from engine cylinders or elsewhere is led through a tube to the centre of a tap, and from a second tube into a reservoir connected by a double lever to a balance

weight. When the reservoir is partly filled, it raises the weight and brings a tube connected to the bottom into communication with the centre of the tap, while the first mentioned tube is displaced, the water passing away through an escape pipe. When the water level has fallen sufficiently, the reservoir returns to its original position.

1142. **Jones, T.** May 6. *Drawings to Specification.*

Heating buildings.—Air is drawn from the upper air outside by a shaft, which leads it down into chambers formed in the backs of the fireplaces or stoves. The heated air passes by flues into the rooms to be warmed and ventilated, entering at the bottom by the skirting or elsewhere. Valves in the flues regulate the temperature. The arrangement is applicable to dwellinghouses, coach-houses, ships, and other structures.

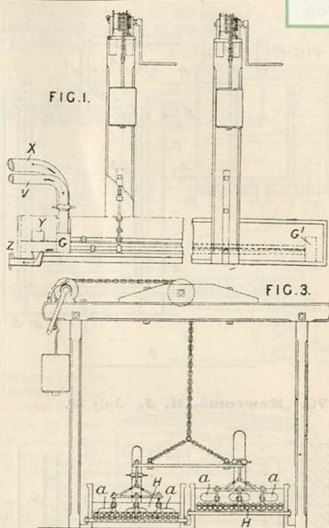
1474. **Clark, W.,** [Fletcher, A. C., and Redman, G. A.] June 18.



Heating air.—Exhaust steam is utilized for heating the air supply of furnaces. A series of narrow vertical chambers *A* for the steam are arranged radially round a central space *D*, and are connected at the ends with inlet and outlet chambers *B, C*. Air is drawn into the space *D* through the passages *a* between the chambers *A* by a fan which afterwards feeds it to the furnace. Wooden bars *D* of triangular section are placed opposite the outer ends of the passages *a* in order to distribute the air equally. A pipe *F* returns the condensed steam to the boiler.

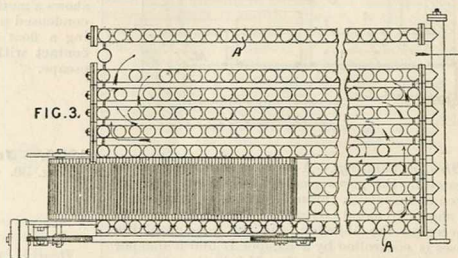
1627. Mathews, D. July 8.

Heating liquids.—In an apparatus for heating liquids, in which the liquid to be heated flows outside pipes through which a heating-medium such as steam, superheated or otherwise, or other fluid, passes in the opposite direction, a cast iron, wood, or other trough is divided longitudinally to within a short distance of one end, and the bottom of the two channels is made to form a continuous incline. One long trough may be employed instead of the double trough, or the troughs may be of a circular form. In the channels so formed are placed a series of longitudinal light, tinned, copper, or other heating-pipes, which are connected to boxes G, G¹ fitted at each end of the trough. The pipes pass through transverse bridges H, Fig. 3, provided with openings *a* which serve both as supports to the pipes and as dams to the liquid to be heated. The boxes G are placed at the top and bottom of the incline, and the box G¹ allows the heating-medium to pass from one channel to the other. The inlet pipe V and outlet pipe X of the heating-medium are connected to the lower and upper boxes G, respectively, by flexible pipes, so as to admit of the heating-pipes being raised by the winches and counter-weights attached to certain of the bridges H, as shown in Fig. 3. The liquid to be heated enters by the inlet Y and escapes by the outlet Z.



1642. Smith, J. July 9.

Heating water.—Fig. 3 shows a horizontal section of a boiler built up by vertical tubes A connected at top and bottom with horizontal headers. The tubes forming the sides of the firebox and flues are connected together by webs as indicated.



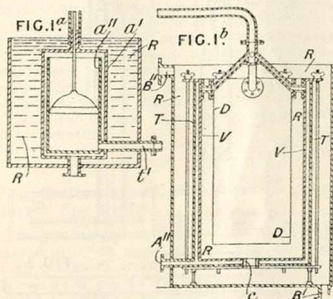
1766. Haeck, F. July 30.

Heating liquids and gases.—The liquid or gas is heated while passing through a force-pump, and further heated in a cylindrical heating-apparatus. The force-pump, Fig. 1^a, is formed with a double cylinder *a*¹, *a*², in the annulus of which the liquid or gas is heated by a liquid in a tank R in which the pump is arranged. A pipe *t*¹ communicates with the second heater, one form of which is shown in Fig. 1^b. Two concentric cylinders T, V, with conical tops, are arranged in a cylindrical tank containing the heating liquor R; the liquid or gas

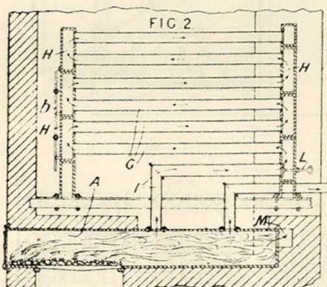
to be heated, entering by the pipe *t*¹, passes in a thin sheet between the heated surfaces of T and V, and emerges by a pipe A¹¹ at the bottom. The heating-liquid is caused to flow upwards from the inlet B¹ to the outlet B¹¹, passing into the interior (which may be partly occupied by an empty cylinder D) by the passage *c*. In a modification, two vessels are employed in which the heating-liquid passes from one vessel to the other in the opposite direction of the flow of the fluid to be heated.

(For Figures see next page.)

1766.



1770. Newcome, H. J. July 30.



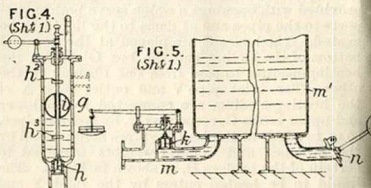
Heating buildings.—A concert or other room is heated by the gases passing from a stove or an oven or furnace A through pipes I, G, connected, as shown, to metal boxes H. The top box is connected to the chimney, and the passage of the gases is controlled by a damper L and a damper above the entrance of a flue M into the chimney. The pipes may be covered by a perforated screen, or trelliswork with a dished top to hold water for moistening the atmosphere. Water of condensation is drawn off through pipes b. Two or more sets of heat-radiating pipes, terminating in a box divided into compartments, may be used.

1778. Merrell, E. Aug. 1.

Boiling-pans.—An appliance for use in boiling-pans is composed of a cylindrical &c. zinc case,

provided on its opposite sides with flat zinc plates and enclosing a copper plate, which is held in place by means of two slips of wood to which it is fixed by pieces of gutta-percha. Each flat zinc plate is connected with the copper plate by means of a copper wire, the whole thus forming a galvanic battery. Holes are provided in the casing through which the soap-suds or other cleansing liquid, which acts as the electrolyte, can pass. The water &c. is stated to be rendered soft by the galvanic action, and the disagreeable odour, due to the washing of clothes, done away with.

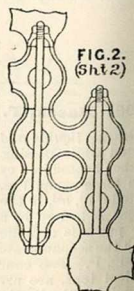
1835. Dunn, T. Aug. 9.



Steam traps.—Fig. 5 shows one form of a liquid-level regulator adaptable for use as a steam trap. The condensed steam accumulates in the vessel m' until a sufficient quantity is collected to force open the loaded valves k, m. Fig. 4 shows a method of collecting and discharging the condensed steam by means of a vessel g, containing a float i which lifts the valve h by coming in contact with the stop h', allowing the water to escape.

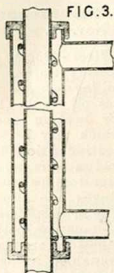
1970. Johnson, J. H., [Harrison, J.]
Aug. 30. Drawings to Specification.

Heating water; heating buildings. Boilers and radiators are constructed by bolting together a number of separate cells, preferably of globular form. Two or more cells may be cast together, and the castings are held together as shown by bolts, which pass internally through the cells.



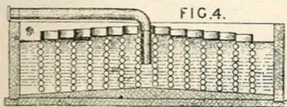
2043. Joule, J. P. Sept. 7.

Heating liquids.—The heater consists of one or more tubes arranged in an outer casing, each tube having a helix of copper or suitable wire placed outside as shown in Fig. 3. In the form shown in the Figure, steam passes through the central tube surrounded by the helix, while the water or liquid to be heated passes through the outer chamber, the action of the helix tending to circulate the water round the tubes. Modifications may be used in which the liquid to be heated passes through the tubes, in which case the helix is arranged inside or is dispensed with and deflecting plates used for circulating the liquid round the tubes.



2152. Davison, R. Sept. 21.

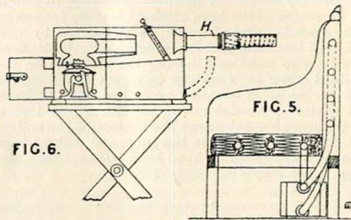
Heating liquids.—Consists in forming pipes, tubes, or holders for heating liquids, of corrugated sheets of copper or other metal riveted or fixed together with the concave parts opposite each other so that each pair of corrugations form a pipe or tube. The corrugated plates may be rolled, cast, or formed by placing them between a top and bottom die. The sides of mash tuns, and other vessels may be formed of the double plates, through which hot fluids pass for attenuating purposes. The plates are riveted or soldered at the top or bottom edges with an occasional rivet in the spaces between the corrugations as shown in Fig. 1. Both ends of the double plate are fitted with a metal flange box, with an india-rubber or other packing inside, which is connected by means of screws or bolts to a similar box on another double plate, so that a continuous tube or coil may be formed by attaching several of these plates together. A section of a coil so



formed is shown in Fig. 4. The wort or other liquid to be heated is made to flow through the tubes or upon the outside of them, and the heating-liquid circulates upon the opposite side. In another arrangement, similar tubes are arranged

in a circle, with boxes at the ends of a diameter so constructed that the liquid flows to and fro in the semicircular sections in a tortuous manner.

2196. Stanford, J. F. Sept. 28.



Heating-apparatus; footwarmers; bed-warmers.—Consists in combining a lamp stove with a stool, and heating-pipes with a seat or settee, for use by invalids, and in churches, theatres, carriages, ships, &c. Heating-pipes in connection with the stove serve also for warming beds. Fig. 2 shows a footstool in which a lamp is mounted on gimbals in a frame, set between the perforated plate D and the plate E. Air enters at the side gratings F; over the lamp is a dome B from which proceed flues C by which the warmed air escapes. For heating seats and settees, a box of this nature may be placed on the floor and connected to flues in the bottom and back, as shown in Fig. 5; the box may also be used as a footstool. Fig. 6 shows a similar arrangement for use as a bed warmer; the tube H is connected to metal flues arranged in the bed.

2259. Davies, G., [Gargan & Co.], Oct. 5.
Drawings to Specification.

Heating gases.—Air is heated by being forced through a spray pipe immersed in a bath of fusible metal kept in a molten condition. Heated metallic filings, or sand &c. may also be used in place of the molten metal.

2281. Barron, W. Oct. 6. [Provisional protection only.]

Heating water.—Hollow bars, triangular in section, are connected at their ends to a square tube of larger size. Two or more such sets of

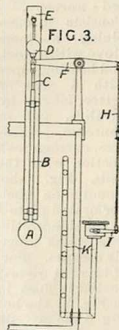
tubes are connected and form hollow firebrass. Water enters at the lowest bars, which are provided with a stop-cock to allow sediment to be run out.

2340. Conscience, J. F. Oct. 14. [Provisional protection only.]

Heating water.—A cylindrical boiler, in which a decoction of the bran of wheat is made for use in the manufacture of bread, is supported by two slotted iron uprights carrying an adjustable firegrate, two handles allowing the boiler to be inclined when it is desired to empty it. A screw in a cross-bar is actuated by a wheel so as to force it against a wooden cover, and force the liquor out through a tube near the bottom of the boiler. A fine sieve is fitted in the tube, and a sheet-iron cover is provided to keep back the heat from the fire, when emptying the boiler.

2458. Hodge, P. R. Oct. 27.

Thermostats.—Fig. 3 shows an apparatus for regulating the temperature of fermenting liquors. It consists of a copper bulb A communicating with a tube B in which a piston moves attached to the rod C, upon which a balance ball D and an index E are mounted. Connected to the piston-rod through the lever F and rod H is a lever I which operates the valve controlling the flow of water in the pipes K. A rise of temperature causes the liquid to expand and allow more water to pass through the pipes K. The position of the valve is adjusted by a right and left screw block.



2546. Hamer, J. Nov. 9.

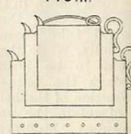
Non-conducting coverings.—Waste silk of any description which cannot readily be utilized for other purposes is applied to the heat-insulation of steam boilers and pipes, engine cylinders, valve-chests, and other vessels of the same nature. The waste is carded in an ordinary carding-engine and is allowed to accumulate upon a lap drum under a pressing-roller to any required thickness. If necessary, the material is first broken up in a machine such as is described in Specification No. 3145, A.D. 1857. [Abridgment Class Spinning]. The fleece obtained is applied in the same manner as the hair felt usually employed, or may be used as a lining for the wood jackets of boilers &c. Ravelled or uncombed waste or pieces of silk fabric may be cut up and secured to the boiler &c. by cement and canvas or wool casing, or may be stitched upon a coarse cloth. The fleeces may be used in com-

bination with hair felt, to prevent the felt from being charred by contact with the heated surface.

2574. Mennon, M. A. F., [Arbel, H. A. d'] Nov. 14.

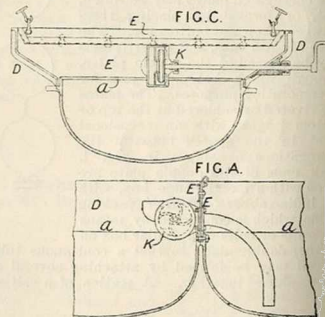
Heat storing apparatus; heating water; digesters; boiling-pans.—Relates to gas, oil or other lamp stoves for heating and cooking, which may be adapted for heating bricks to serve as footwarmers &c. Boilers or digesters for use with such stoves are also described. The brickholders, which are

FIG. II.



rectangular bottomless boxes, or the boilers or digesters, are placed in a bottomless box, which is contained by an outer casing, supported above the chimneys of one or more gas, oil, or other lamps. One form of boiler consists of a closed rectangular reservoir, fitted with stoppered outlets. Another form consists of two or more vessels, Fig. 11, placed one inside the other, and having the intermediate annular spaces filled with water. A similar form of boiler is fitted with a double lid. In another arrangement, a number of tubes, which may project up into the liquid, or downwards so as to form water pockets, are fitted in the bottom of the boiler.

2698. Robinson, H. O. Nov. 29.



Boiling-pans.—Pans for use in sugar manufacture are made in the shape formed by the intersection of two semi-cylinders, so that the top edges *a*, Figs. A and C, assume a rectangular form, or, the bottoms of the pans may be made spherical, the edges *a* being made rectangular in shape by cutting

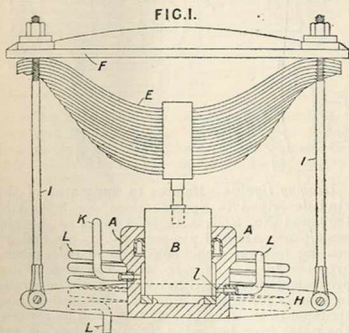


off four segments as in Fig. M. Instead of constructing the sides of the pans of brick, they are made separately and fixed to the edges *a* of the pans after these have been placed in position. The dividing plates *E*, parts of which are detachable to facilitate the removal of scum from one pan to another, are shown in transverse section in Fig. A, and the top plates *D* in the longitudinal section seen in Fig. C. The Provisional Specification states that curved upper pieces are used in connection with the spherical pans. Specification No. 10,345, A.D. 1844, is referred to.

2725. Johnson, J. H., [McCormick, J., and Pincus, E.]. Dec. 1. [Provisional protection only.]

Boiling-pans.—A pan for preserving and cooking is formed with a water-jacket, the inner casing being made of metal, glass, or glazed earthenware, and the outer of thin sheet metal. A double felt-lined cover is used. Water is poured into the jacket through a siphon connected with the lower part of the outer casing, and fitted with a safety-valve.

2931. Brooman, R. A., [Cross, L.]. Dec. 23.



Heating buildings.—Relates to an expansion chamber for high-pressure hot-water circulating apparatus. A cylinder *A* is fitted with a ram or piston *B* attached to a strong spring *E* arranged in a frame *F, I, H*. The interior of the cylinder communicates with the hot-water system by a coil *L L* entering at *l*. A small pipe *K* acts as a cushion for the imprisoned air in the cylinder. Instead of springs, weights may be employed.

2935. Geyelin, C. K. Dec. 24. [Provisional protection only.]

Heating buildings, transparent metal tubes for use in. The metal, either solid or in tubes, is twisted in one or more threads round a mandrel which is afterwards withdrawn. The ends are fixed to a plate and the centre of the column is fitted with a coloured glass tube or other material, and the outside with a reversed thread.

2944. Rul, L. J. G. Dec. 24. [Provisional protection not allowed.]

Heating liquids.—For heating liquids in distilleries and breweries, a vessel is formed of two concentric cylinders in the interior of which is a shaft fitted with curved agitators and rotated by gearing. A coil of pipe is also mounted on the shaft, connecting at its top and bottom with hollow portions of the shaft. The heating-medium, steam or hot water, is caused to circulate in the annulus between the two cylinders and in the coil which with the agitators revolves in the liquid to be heated in the inner cylinder. The annular space is closed by a lid which may be made of two segments hinged to a central fixed portion.

A.D. 1860.

- 86. Carter, G.** Jan. 12. [*Provisional protection only.*]

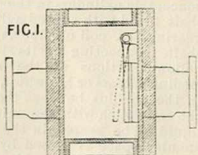
Boiling-pans.—Size or the like is boiled in suitably shaped vessels fitted with steam-heated pipes or chests. Agitators are provided.

- 233. Hodgson, H., and Crane, P. M.**
Jan. 30.

Non-conducting coverings.—Peat blocks are highly compressed, dried, and again compressed in order to form slabs, which may be used as non-conducting coverings of partitions, roofs, and other parts of buildings, or as coverings for steam pipes or steam generators.

- 376. Purnell, B.** Feb. 11.

Heating by water circulation.—At any part, but preferably near the end, of the return pipe of a circulating hot-water apparatus, a check valve is arranged for preventing the passage of cold water to the return pipe. The valve opens towards the cold water supply, so that it is possible to withdraw hot water from any part of the pipes, for use in baths, laundries, and like purposes. Fig. 1 shows a suitable form of valve, but any form may be adopted.



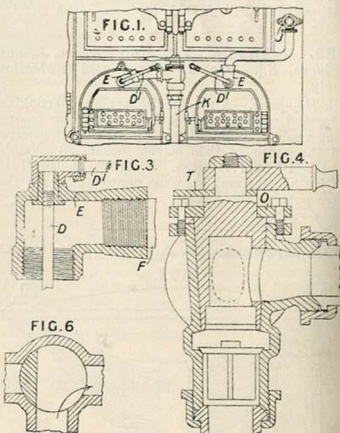
- 449. Bewley, R.** Feb. 18. [*Provisional protection only.*]

Heating air.—Air for use in drying bricks, tiles, or pottery wares, is heated in iron pipes enclosed in an oven in a similar manner to the pipes of a hot-blast stove.

- 478. Davison, R.** Feb. 22. [*Provisional protection only.*]

Heating liquids.—Wort and other liquids are boiled by means of superheated steam.

- 480. Bateson, S. S.** Feb. 22.

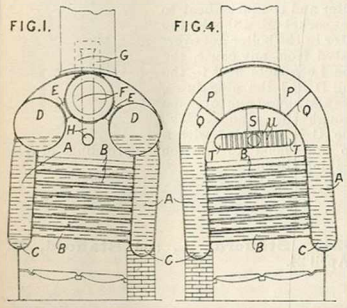


Heating liquids.—Relates to apparatus of the kind described in Specifications No. 809, A.D. 1859, and No. 2935, A.D. 1858, [both in *Abridgment Class Air and gas engines*], as applied for heating feedwater, and consisting of coils placed over the furnace of a boiler. The present improvements are stated to be applicable generally to vessels for heating liquids. The coil is constructed in the form of a U tube, and to prevent the water from becoming too highly heated, and also to prevent burning of the coil, water from the boiler or other source is supplied to the coil through a perforated pipe arranged within it. The apparatus is shown in Fig. 1 as applied to a marine boiler. One limb of the coil is placed over each furnace, the curved part being in the flue at the rear. The outer ends of the coil are shown connected to elbows E, one of which communicates with the feedwater-supply pipe K, and the other with the boiler by means of the stop-cock J. Concentrically within the feed coil is supported a perforated tube, which is connected at both ends with the water-space of the boiler by means of branch pipes D¹, and is secured to the elbow E as shown in Fig. 3. Instead of connecting the inner tube to the boiler, it may be connected to a water-tank. A check valve and three-way cock, Fig. 4, are fitted to the top of the feed pipe K, and by means of the cock the feedwater may be supplied direct to the boiler, or made to pass through the heating-apparatus.

Another form of cock which answers the same purpose is shown in Fig. 6. When applied to vessels for heating liquids, lengths of circulating tubes are fitted to the vessels in such a position as to be exposed to the action of the fire, such tubes opening at both ends into the bottom or sides of the vessel, and being provided with an inner perforated tube also opening at one or both ends into the vessel.

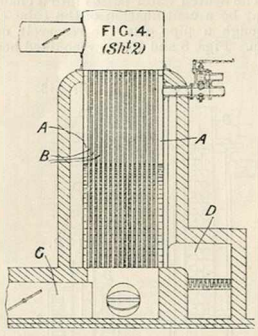
cylinders the inner one of which has a spiral rib; or two plates may be joined together with a zig-zag passage between them.

589. Ramsden, W. G. March 3.



Heating liquids.—An apparatus for generating steam and heating water or other fluids under pressure has a number of semi-cylindrical water or other fluid chambers A, the flat sides of which are connected together by tubes B. These upright chambers A are connected together at the bottom by pipes or passages C and at the top by drums D, Fig. 1, connected by pipes E with the wide ends of a drum F. In the modification shown in Fig. 4, the side chambers A are connected to an arched chamber P having partitions Q with openings at one end. The spaces between the side chambers A are closed by cleaning doors, or by additional water chambers which open into these main chambers or are detached.

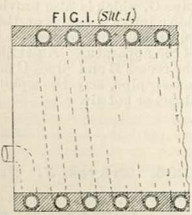
796. Weems, J. March 28.



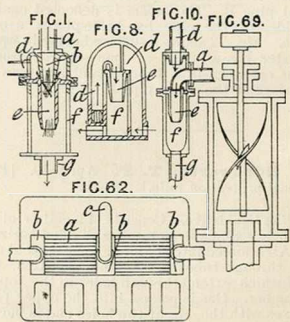
Heating air and water.—Fig. 4 (Sheet 2) shows a section of apparatus, which may be of a portable character, for heating air, for drying and ventilating, and for heating water. The boiler A, heated by a furnace D, or it may be by gas, is fitted with a number of internal open-ended tubes B through which air is passed, from an inlet G, on its way to a building to be heated or ventilated.

732. Sykes, T., Sykes, B. C., and Crossley, J. W. March 21.

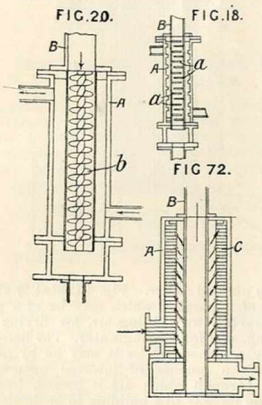
Heating gases and liquids.—Relates to apparatus for heating water, air, and fluids for heating buildings &c. Metal is cast upon wrought iron or other tubing sent into a spiral or other form, as shown, so as to form hollow cylinders and plates with two heating surfaces. A similar vessel may be formed of two concentric



830. Clark, D. K. March 31.



Heating liquids and gases.—Relates to improvements on the steam-generator feedwater heating apparatus described in Specification No. 813, A.D. 1859, [*Abridgment Class Steam generators*]. The apparatus is applicable for heating water and other liquids and gases. The exhaust steam or steam from the safety-valve is discharged by the pipe *a*, Fig. 1, through a nozzle *b*, and mixes with water entering through the annular opening between the nozzle *b* and a tube *c*. The heated water passes into a chamber *f* which may be a continuation of the tube *c*, and flows through a pipe *g* to the reservoir or the feed pump. Figs. 8 and 10 show modified heaters.



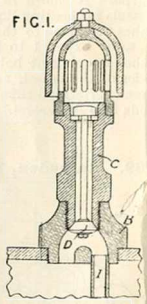
The steam enters by a pipe *a* and the water by a pipe *d*, and the steam and water mix in a nozzle *e*. In a further modification, the steam blows the water through a perforated diaphragm or bucket in a mixing tube. Figs. 18 and 20 show heaters in which the water contained in a chamber *A* is heated by steam passing down a central pipe *B*. The steam is deflected against the sides of the pipe by baffle-plates *a* or a spiral *b*. Fig. 72 shows a surface heater in which the water passes from a chamber *A* through annular openings in a tube *C*, and impinges on the surface of the steam pipe *B*.

983. Edgeworth, T. F. April 19. [*Provisional protection only.*]

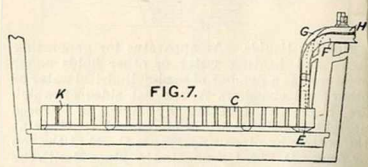
Heating liquids &c.—Consists of a coil or other vessel below which is a chamber divided horizontally. Air is forced into the lower compartment and passes through tubes set in the partition, the ends of which extend through holes in the top of the chamber. Gas is passed into the upper part and mixes with the air at the holes and is burnt.

1007. Harvey, J. April 21.

Heating water.—Relates to a safety device for hot-water apparatus for baths &c. A gun metal socket *B* is screwed into the upper part of the boiler. A safety pipe *C* is screwed to the socket *B*, the pipe *C* being normally closed by a fusible plug *D* which is kept seated by a bolt and nut. A pipe *I* dips to the bottom of the boiler and conducts heat to the socket *B*. Should the water in the boiler get overheated from any cause, the pipe *I* conducts heat to the plug *D* and the plug fuses, thus allowing steam to escape through the pipe *C*. The pipe *C* is provided with a cap and hood to prevent spreading of the escaping steam.



1024. Stafford, J., and Stafford, B. April 24.

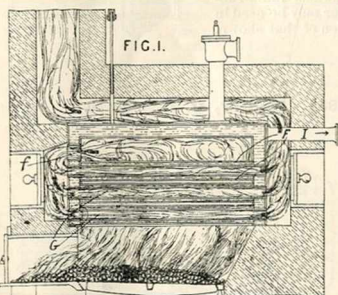


Heating liquids.—Relates to steam or hot-air apparatus for insertion into a vessel containing the liquid to be heated and consisting of a shallow iron or copper chamber, traversed by tubes *C* around which steam or hot air is made to circulate. The application in connection with boiling-pans used by bleachers and dyers is mentioned. Steam or hot air enters the chamber by a pipe *F*. When hot air is used, a pipe *H*, which is provided with a cock, allows for its escape. This cock is opened when steam is used to allow the escape of air, and is closed as soon as steam begins to escape. A pipe *G*, which is also provided with a cock, leads down into a recess *E* at the bottom of the vessel, and allows any condensed water to be blown out of the apparatus. A partition *K*, which separates the recess *E* and pipes *G* and *H* from the steam or hot-air pipe, may be employed for distributing the steam or hot air.

1326. Traves, J. May 29.

Heating water.—Relates to a boiler in which the water is partly contained within circular spaces formed by concentric tubes, the inner one of which

provides a smoke passage extending between end water spaces. These water spaces are in connection with an outer water space, which is enclosed between an inner and outer shell. This shell may be saddle-shaped, rectangular, cylindrical or elliptical. The boiler rests upon brickwork, which encloses the furnace, and is extended upwards so as to enclose the boiler. Smoke and gases from the fire pass up between the tubes, and



flow through an opening *f* in the front wall of the boiler. They return to the back of the boiler through smoke-tubes *G*, which pass through the water tubes *f*, and finally pass around the outside of the boiler to the chimney. Water enters at the bottom of the boiler and flows out at *I*. The boiler may consist of two concentric shells, with an intervening water space, in which case the furnace is arranged within the inner shell.

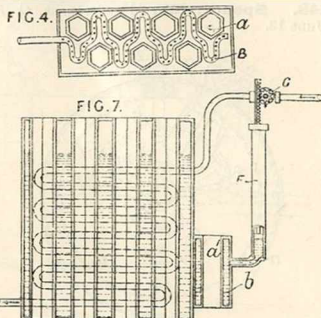
1338. Fletcher, L. E. May 31. [Provisional protection only.]

Thermostats.—An apparatus for regulating the temperature of superheated steam, for use in the marine engines &c. described in Specification No. 550, A.D. 1858 [Abridgment Class Steam engines], consists of a cylinder containing water which expands or vaporizes when the temperature becomes too high, and moves a piston to operate a cock for the admission of cooling water or steam.

1340. Newton, A. V., [Walker, L., and Vaux, C.] May 31.

Heating air; heating water; thermostats.—Relates to methods of utilizing steam for heating water intended to heat the air of buildings, and also to a thermostat for regulating the steam supply. The steam from a boiler circulates in a pipe, coiled or set in a serpentine form in a water vessel through which pass vertical air-warming tubes or channels; the condensed steam is led back to the boiler. In another form of apparatus,

shown in plan in Fig. 4, steam is led into the bottom of the heater by a pipe *B*, which is perforated over the whole length of pipe in the heater, so that the water is evenly heated. The air-tubes are shown at *a*. The thermostat by which the steam supply is regulated according to the temperatures both of the incoming cold air and

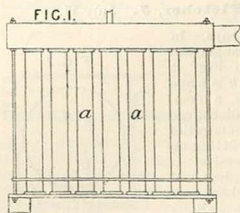


of the heater, consists of a "secondary heater" *b*, arranged either within the "primary heater," or as shown in Fig. 7, in contact with one side of it, and so that the incoming cold air passes through passages *a* in the secondary heater, in connection with a cylinder *F* in which works a piston with a racked stem operating the steam-supply valve *C*.

1371. Taylor, W. June 5. [Provisional protection only.]

Heating buildings &c.—Pipes for conveying steam, hot water, &c., for heating hot-houses and other buildings, are manufactured in suitable lengths, either with single or double passages, and of a flat form; for this purpose, sheet metal is bent round a mandrel, double lapped, and riveted.

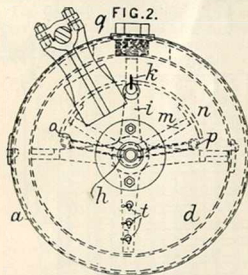
1373. Senior, C. June 5.



Heating air.—Air for use in heating and drying is heated in cast or wrought iron tubes *a* situated

in the chimney flues of steam-boiler or other furnaces. The tubes, which may be placed vertical or horizontal, are connected at the ends with inlet and outlet chambers.

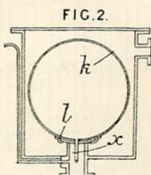
1448. Spence, W., [Vanderburgh, G. E.],
June 13.



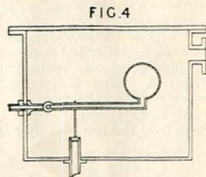
Digesters.—A digester, used in treating a silicious substance like sand with an alkali like soda or potash, and superheated steam, consists of a body portion *a* with double sides, and double ends *d*. A central pipe conveys superheated steam to radial arms or pipes *o* and so to a slotted longitudinal pipe *p*. Radial arms *l*, carried by a sleeve *h* on the central pipe have elevators *k* fitted to them, extending the whole length of the digester, and so arranged that the elevators *k* just clear the outer casing *a* and an inner curved shield *n* carried by arms *m* on the central pipe. By these means the undissolved silica is raised out of the liquid in the bottom of the digester continuously, so that the superheated steam may act directly upon it. Try cocks *t* are fitted to the digester, which also has a manhole stopper *g*, a thermometer, and the usual valves and discharge opening. Steam is supplied to the spaces between the double sides and ends, and the condensed water is withdrawn by suitable pipes.

1726. Fletcher, J. July 17.

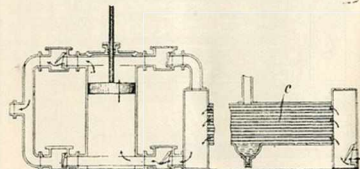
Steam traps.—In the arrangement shown in Fig. 2, the float *h* is made to act as a combined discharge and vacuum-relief valve by fitting on its underside a disc *l* of vulcanized india rubber. A small pipe *x* allows the float to be drained of any



liquid which may enter it. The float shown in Fig. 4 is drained through the hollow lever and valve spindle. A solid float, composed of cork coated with vulcanized india-rubber may be used in lieu of that shown.



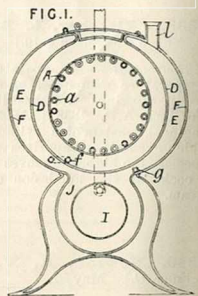
1851. Hedley, O. D. July 30.



Heating air.—Air for steam raising and evaporating purposes is first heated by passing through tubes *c*, round which exhaust steam circulates, and is further heated by being compressed by the piston pump shown.

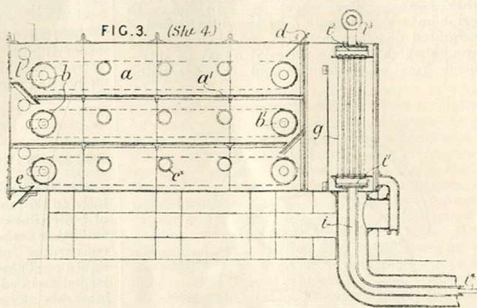
1884. Newton, W. E., [Coombs, H. M., and Nelson, L. W.], Aug. 3.

Heating water.—Relates to the construction of a washing machine combined with a water heating apparatus. The clothes receptacle *A* is supported within a double casing *D, F*, the enclosed space being open to the boiler space *J* surrounding the fire chamber *I*. Water is supplied to the boiler through a funnel *l*, and thence to the receptacle *A* through a pipe *f*. After washing, the dirty water is discharged through an orifice *g* and fresh water is supplied for rinsing. The vessel is again emptied and the cylinder rotated to "wring" and dry the clothes.

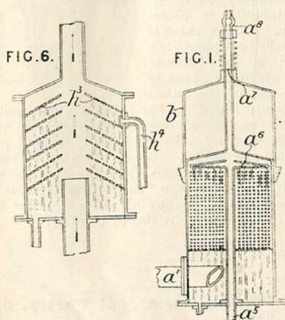


1899. Mornay, H. de. Aug. 6.

Heating air.—Air for use in drying tea is heated by means of steam pipes in a chamber *g* communicating with the drying-chamber *a*. The steam pipes open at the top and bottom into steam chests *i*¹, *i*², steam being supplied by a pipe *i* and the waste steam led away by a pipe *i*², the condensed steam in the chest *i*¹ escaping by a pipe *i*⁴.

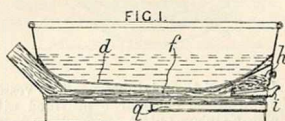


2050. Newall, J. Aug. 25.



Heating water. Exhaust or live steam is admitted to a vessel containing coils of wire, or thin corrugated or perforated plates of metal, which are thus heated, and over which the water is caused to flow. The vessel may be fitted with a telescopic upper part *b*, Fig. 1, which is counterbalanced by weights or springs, and which is raised by the steam admitted at *a*¹. Water enters at *a*² and rises up the central tube to a chamber *a*³, whence it falls in a shower over the coils of wire shown in section. Air is driven out through a tube *a*⁴, fitted with a cock *a*⁵, which is opened and closed by tappets as the sliding part *b* rises and falls. The sliding part *b* may be connected to the piston of an air or steam cushioning-cylinder below. In a modification, the sliding part *b* is dispensed with, a weighted flap valve being fitted to allow the escape of the air. Fig. 6 shows another modification, also without any sliding part, provided with perforated conical plates *b*² through which the water falls. The water is admitted at *b*¹, and steam passes continuously through the apparatus as shown by arrows.

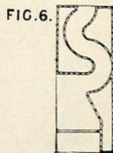
2084. Wilson, J. Aug. 29.



Heating water for baths. The apparatus consists of a removable grate *h* and ashpans *i* containing a fire, the flames being drawn along a flue *f* surrounded by water, below a perforated false bottom *d*. The bath is emptied by a cock in the side, and by a plug-hole in the bottom opening into a tray *q*.

2578. Tylor, W. H. Oct. 23.

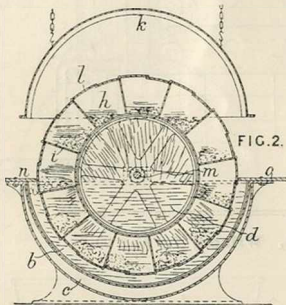
Heating water.—In apparatus for heating saline and other liquids for baths and other purposes, a boiler having a single straight or bent flue as shown (or two bent flues) is used. The boiler contains sufficient water to charge the bath once, or it may be connected to a storage tank for hot water.



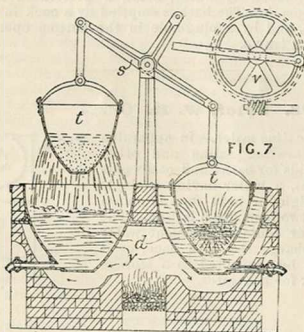
2623. Burch, J., and Booth, E. Oct. 27.

Boiling-pans; digesters.—Relates to apparatus for extracting colouring-matter from vegetable, animal, and other substances, and for making decoctions and infusions therefrom, the material being alternately dipped into and drained from the liquid. The apparatus is also suitable for brewing purposes. As shown in Fig. 2, a wheel is slowly rotated on an axle *m* in a vessel *b* con-

taining liquid *d* heated by steam, a furnace, or other means. The wheel is provided with peripheral compartments *i*, having sides formed of perforated or gauze material, and having doors *l* through which the raw material *h* may be introduced from a platform *o* and the exhausted



material removed to a platform *n*. The vessel is heated by a steam chamber *c* provided with a steam inlet, a siphon outlet for condensed steam, and a gauge. The wheel may be covered, when in use, by a suspended or hinged lid *k*, so as to form a closed vessel. In a modification, instead of



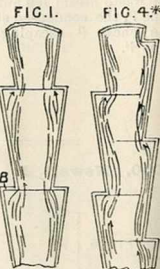
peripheral compartments, there are a series of peripheral perforated cylinders having their axes parallel with the shaft *m*. In the modification shown in Fig. 7, perforated vessels *t* are alternately raised and lowered into two boilers *y*, by means of the lever *s* actuated from a crank wheel *v*.

2758. Westhead, E. Nov. 8. [*Provisional protection only.*]

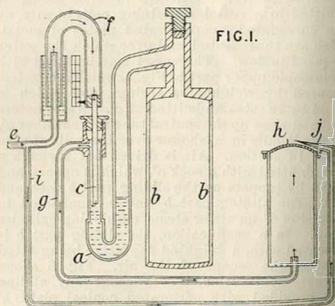
Heating liquids.—Soaps, saline solutions, and other liquids are evaporated or boiled by the introduction of heated air. Fires or other means of heating may be used in addition.

2813. Williams, C. W. Nov. 16.

Heating liquids.—Relates to the construction of boiler flues and tubes, and other surfaces for the conveyance of heat to liquids. Tubes are enlarged and contracted at intervals as shown in Fig. 1, and any heating medium passing through the tube impinges against the projections *B*. The tubes may be circular or rectangular in cross-section. Where there is deficiency of space, the projecting part of one side is arranged opposite the recess of the other as shown in Fig. 4*. The tubes may be made by riveting the conical portions together, or where it is not essential to have a sharply defined angle, they may be rolled. Where flues or tubes are used for evaporation and where they are placed in a vertical position, the "projecting face-plates" may be made to occupy all sides whether such plates or tubes are circular or angular.

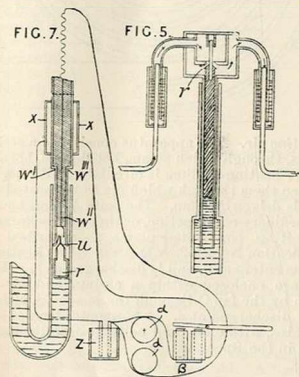


2858. Varley, S. A., and Varley, C. F. Nov. 22.



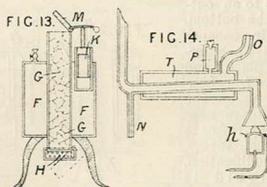
Thermostats; heating buildings; heating water.—Relates to thermostats or "thermo-regulators."

which may regulate the supply of gas, control the draught in furnaces, admit cool air to greenhouses, or actuate alarms or indicators, and to apparatus for heating tropical ferneries, or other buildings. One form of thermostatic apparatus, Fig. 1, consists of a vessel *b*, fitted with a side U-tube *a*, containing mercury in the bend. The vessel *b*, and the portion of the tube *a* above the mercury adjacent to the tube *b*, are filled with spirits of wine, air or other fluid. The gas-supply pipe *e* passes up through a fluid-seal joint to an inverted adjustable U-tube *f*, from which a pipe *c* extends through a stuffing-box into the tube *a*. A pipe *g* leads from the tube *a* to the burner *h*, which is preferably an atmospheric burner, consisting of a cylindrical casing with a wire gauze top and air inlets in the bottom. A pipe *i*, leading from the gas-supply pipe *e* to a small jet *j*, serves as a by-pass. When the temperature at the point where the vessel *b* is placed rises above a certain limit, the expansion of the liquid causes the mercury in



the tube *a* to close the end of the pipe *c*. The vessel *b* may be a single metal vessel, or a series of tubes which may be arranged side by side, or in a spiral, or in one long length, or in other forms. The lower end of the tube *c* may be cut off diagonally to allow the gas to be cut off gradually. The tube *c* may also have an outlet at the side to serve as a by-pass arrangement when the pipe *i* is dispensed with. In some cases, the vessel, and part of the tube *a*, are filled with a liquid which boils at the required temperature. When the tube *a* is not provided with a side tube *g*, the tube *c* is closed at the top and divided into two channels by a central partition. The gas, which enters by a side tube flows down one channel and up the other to another side pipe leading to the burner. When the liquid in the bend of the tube *a* reaches the partition, the gas supply to the burners is cut off. In a similar arrangement, the stuffing-box, through which the

tube *c* passes, is dispensed with by keeping the lower end of the tube *c* always covered by the liquid in the bend of the tube *a*. The tube *c* may be replaced by a fixed tube, and the apparatus adjusted by means of a leather bag containing mercury, which is attached to the tube *a*. Fig. 5 shows an arrangement in which the mercury actuates a valve *r*, fitted on the end of a rod, so as to open or close a passage in the gas main. This apparatus may also be employed to bring into play an auxiliary heating-arrangement on other sources of heat failing. In a similar form of apparatus, applicable to greenhouses and other chambers not heated by gas, the valve opens on the rod being raised so as to admit gas to a burner which heats a boiler. The steam generated actuates a piston which shuts off the air supply to the fire or admits cold air to the house. The vessel containing the expanding liquid, in this form of thermostat, may be placed inside a steam boiler, and the apparatus, which is to a certain extent a pressure gauge, is then arranged to actuate the furnace damper. Fig. 7 shows an arrangement in which the expansion of the liquid closes electrical circuits which indicate, by means of galvanometers *d*, that the

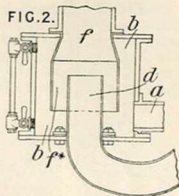
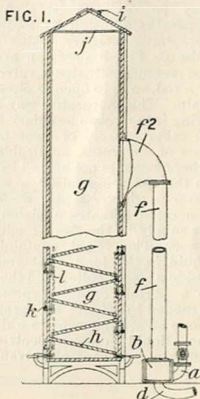


limits of temperature have been passed, and actuate, by means of an electromagnet *B*, a damper or sound an alarm. A float *r* has a conical "platina" end fitted with a non-conducting pin *u*. A piece of wood, to which are attached metal wires *w*, *w*¹¹, *w*¹¹¹, insulated from each other and connected to the battery *Z* as shown, slides between metallic guides *X*. The wire *w*¹ has on its tip a thin "platina" spring. When the float falls, the spring comes into contact with the wire *w*¹¹; when the float rises, it connects the wires *w*, *w*¹¹. In some cases, one galvanometer only is employed, being arranged to deflect in one direction or the other as the float rises or falls. An apparatus for heating a fernery consists of a cylinder *T*, Fig. 14, containing water, through which passes a flue conducting the products of combustion from a burner *h* outside the fernery. Any condensed moisture escapes by a side pipe *N* to which the tube inclines. The cylinder is kept full of water by a bird-fountain arrangement *P*. An opening *O* serves for the escape of air and vapour. In the arrangement shown in Fig. 13, a boiler *F*, having a central flue *G* situated above a fuel holder *H*, is fitted with a piston *K*, which, on rising, closes the damper *M*.

2934. **Jaques, J. A., Fanshawe, J. A., and Jaques, G.** Nov. 29.

Heating liquids.

—Wort or other liquid is heated by exposure in the form of spray to hot air. The liquid is supplied to a closed chamber *b* through a pipe *a* and driven up the pipe *f* in the form of spray by the hot air from a pipe *d*. This pipe is covered at the end by a grating and projects into a funnel-shaped chamber *f**. The liquid is deflected by a trumpet-mouthed outlet *f²* into a downcast shaft *g* having inclined boards *h* down which the heated liquid trickles to an outlet at the bottom. The air escapes through a perforated plate *j* and openings *i*. Louvres *k* under the boards *h* are connected by rods *l* to operating levers. In a modification, the liquid is ejected through a rose head, surrounded by the air inlet pipe, up the centre of a shaft having inclined boards at both sides. The cold liquid may be sprayed by rotary beaters and driven up a shaft by an air current.

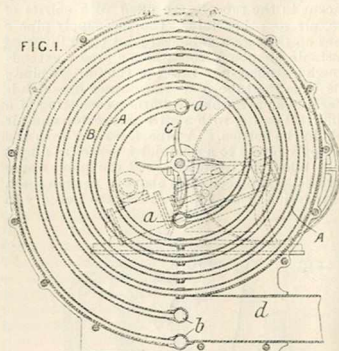


2995. **Musgrave, J.** Dec. 7. [Letters Patent void for want of Final Specification.]

Steam traps.—The condensed steam drains into a vessel supported on springs and fitted at the bottom with a discharge valve. A stop fixed below the vessel causes the valve to open

when the weight of condensed steam which accumulates overcomes the resistance of the springs. The discharge valve also acts as a vacuum-relief valve.

3027. **Davison, R.** Dec. 10.



Heating air.—The apparatus consists of a series of coils, through which steam, hot liquids, hot air, or other heating-medium is circulated, with spaces between them through which air to be heated or dried is driven by a fan. The coils *A*, Fig. 1, may be of ordinary construction, or they may be formed by uniting corrugated plates as described in Specification No. 2152, A.D. 1859. The heating-medium enters at *a*, and is discharged at *b*. The coils are enclosed within a casing, and air is driven by the fan *C* through the spaces *B*, and is finally discharged at *d*. A horizontal form of the apparatus, with elongated coils, is described and shown in the Specification.

3121. **Brooman, R. A.**, [Duhouset, J. D., and Thomas, P. E.], Dec. 19.

Digesters.—A closed vessel for treating caoutchouc is heated by a steam jacket or by an oil or molten metal bath. The material is agitated by a stirrer working in a stuffing-box, a glazed sight-aperture being provided in the side of the vessel.

A.D. 1861.

22. Pimont, P. Jan. 4. 7

Heating by steam circulation.—In a drying apparatus, where a series of carriages which support trays are run in and out on rails, the heating is effected by means of steam tubes within the apparatus, the tubes being arranged as much as possible in pairs. In the form shown in Fig. 7, where drawers *a* with perforated bottoms are employed, serpentine tubes *d* and *e* are used, the pipes being inclined so as to allow water to drain away to a siphon pipe.



38. Roberts, J. Jan. 5. [Provisional protection only.]

Footwarmers.—A combined hassock or footstool and footwarmer consists of a water-tight zinc vessel strengthened internally, and formed without projecting corners or angles, but with a depending rim, which is thickened at its lower edge, and provided with an annular or other inner support to serve as a base. The filling is effected through a screw plug, and the opposite side may be covered with wood or other non-conducting material, and fitted with hinged or movable lugs or handles. The footwarmer thus constructed is covered with felt and other material. A footstool for use under a writing table or desk is formed with an inclined upper surface.

53. Taylor, W. Jan. 9. Drawings to Specification.

Heating air.—Air for ventilating purposes is heated by passing it through a pipe surrounded by or enclosing a chamber or chambers to which a heating medium is introduced.

162. Pickstone, W. Jan. 21. [Provisional protection only.]

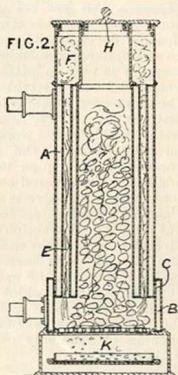
Steam traps.—A vessel is fitted at its bottom with a valve, which is operated by a float and allows escape of water by a pipe. The float is guided by means of stems on its upper and lower

sides, and the valve is attached to the lower stem, so that, in consequence of the space between the float and valve, the valve is always covered with water and so steam escapes.

243. Crook, S. T. Jan. 30.

Heating water.—

Relates to boilers for heating water for warming buildings. Two annular water chambers A and B, the upper one of which is provided with fire tubes, are connected together by openings C. The cylindrical shells are connected to the end plates by welding instead of by angle-irons as hitherto. The fire is arranged within the annular chambers, and rests upon a circular grate mounted upon supports at the bottom of the lower chamber. In making the boiler, the chamber A is entered into the chamber B, and the joint around them is caulked. They communicate by means of the passages C. The fire tubes E communicate with a smoke-box F, which is connected to the flue, and may be removed for sweeping the tubes E. Fuel is fed into the furnace through the cover H, and a fire-door is provided at the side of the chamber B. The air supply to the fire may be regulated by a ventilator upon the ash box K. A water tap is also fitted to the bottom chamber B.



503. Stevens, C., [Desanges, —]. Feb. 27 [Provisional protection only.]

Heating water and air.—A boiler for heating water for baths and other domestic purposes is arranged within a chamber, in the roof of a building, which is connected at the bottom with

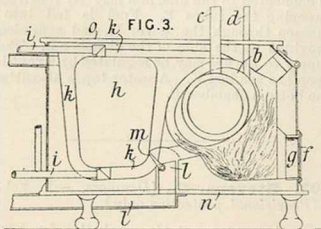
the chimney flues, and has an exit for smoke at the top. Air for heating apartments may be heated in an air receiver in connection with the chamber.

534. Haigh, T., and Robertson, R. A. March 2. *Drawings to Specification.*

Boiling-pans.—A pan for boiling wort by means of steam is made with a concave double bottom provided with a central pipe for discharging the wort.

Heating liquids.—A series of cylindrical casings, each of which contains a set of parallel tubes opening into end chambers, is used for heating liquids. In automatically operated attemperating-apparatus, for use in fermenting-squares, a current of water is maintained through the attemperating vessel, which consists of a vessel provided with a number of tubes forming through-passages, the flow being regulated by means of the expansion and contraction of air in a hollow floating cover of the square, which is connected to an appliance resembling a gasometer, in which mercury is used in place of water and which is enclosed in an airtight casing. The centre of the gasometer is connected with the lever of the water supply valve, which is preferably made with a double piston working in a cylinder having an inlet between the pistons, and an outlet connected by a pipe to the attemperator and adapted to be covered by one of the pistons. In some cases, the valve is surrounded by an elastic chamber, encased to prevent it from giving laterally but allowing contraction or expansion in the axial direction, an airtight casing is provided with taps, and the whole is surrounded by an external casing into which the water flows over the top of cylinder, and from which it is conducted to the attemperator. The underside of the piston at the discharge end, is oblique to allow the available opening to gradually enlarge as the piston is withdrawn.

663. Taylor, J. I. March 16.

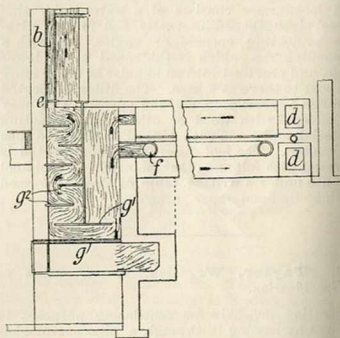


Heating water.—The waste heat from a retort furnace employed in gas making apparatus of the

kind described in Specification No. 730, A.D. 1860, [*Abridgment Class Gas manufacture*], is used to heat water for domestic and other uses. The air supply to the furnace may be regulated by a sliding door *f* having a fire lump slotted lining *g*. The water is heated in a tank *h* or tubes and circulates to and from conservatories, cabins &c. through pipes *i*. By closing a valve *m* in the flue *k*, the waste heat passes through a flue *l* beneath the furnace plate *n*. In a modification, an oven is situated above the tank and surrounded by flues through which the flow of heat can be regulated by valves.

689. Bolton, J. A. March 19.

Heating air; heating buildings &c.—Relates to apparatus with a large radiating surface for heating Turkish baths, vineries, hothouses, cooking-ovens, and buildings, and in which air is heated by furnace gases, the air and gases being circulated in opposite directions. In the case of Turkish baths, air passes through an area grating and down a shaft *b* to a flue under the floor of the room. The flue may pass towards a furnace and branch on each side. The top of the fireplace is formed with a heat-radiating metal plate *g*, near which is arranged a second plate *g'* fixed in the brickwork. The products of combustion are circulated through two flues *d* under the floor. A pipe *f* from the hot air chamber also is arranged under the floor, and the air escapes into the room

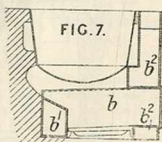


through branch pipes furnished with rotatory ventilators flush with the floor. Hot air enters the room also through perforated plates let into the floor. Reclining seats or cushions are arranged over the flues, spaces being left between the sides for the passage of hot air. In the arrangement shown, the hot plates *g*, *g'*, *g''* of the heating chamber are supplied with cold air from a down shaft *b* encircling the chimney, the plates being arranged as shown. Hollow

globes or alternately inverted bell-shaped receptacles may be used instead of plates; or the air to be heated may be passed through a single or double coil. The quantity of air supplied may be regulated by sliding plates e.

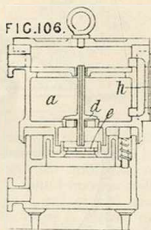
779. **Stratford, W.** March 28.

Boiling-pans.—The walls of furnaces for brewers' coppers and laundry coppers are constructed in the form of iron water-chambers, so as to prevent their rapid burning away and also injury due to stoking tools. In Fig. 7, which shows a section through a laundry copper, the side chambers *b* are connected together at the front and back by the chambers *b*² and *b*¹, the front chamber being continued upwards to form the flue. When applied to brewers' coppers, the side chambers are made sloping, and are connected together at the back. Steam from these chambers may be conducted to the flue, and the supply of water may be regulated by a ball and float.



786. **Cass, J.** March 30.

Steam traps.—The weight of the accumulated water in the spring-supported vessel *a* depresses it and causes the valve *d* to be opened by its stem being arrested by the grating *e*. Air escapes through the hollow valve stem. There is a window at *h*.



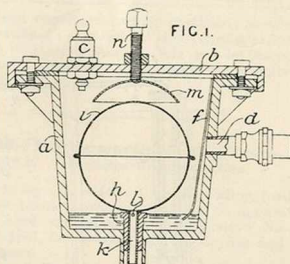
787. **Barton, G., and Soar, T.** March 30.
Drawings to Specification.

Boiling-pans.—In a washing, mangling, and wringing machine, the clothes are washed in a trough having three or more strips of wood or iron &c. secured to its bottom part, the interior of the trough being shaped to represent six sides of a decagon.

861. **Shanks, A.** April 8. *Drawings to Specification.*

Heating water. In a washing-machine consisting of a cask, to contain the clothes and water, oscillating on trunnions, the water is heated by steam blown in through holes in the trunnions.

941. **Vickerman, J.** April 17.

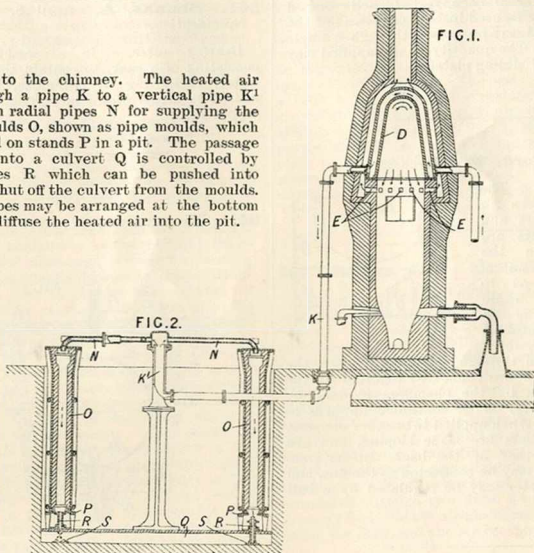


Steam traps.—The external casing of an apparatus for draining steam pipes, which is referred to in the Specification as a "siphon" or "siphon valve," consists of a rectangular box *a* to the top of which is jointed a cover *b*. The steam pipe *d*, which is to be drained, enters at the side of the box, and a screen plate *f* extends nearly to the bottom of it. The condensed water raises the hollow copper float *i*, and escapes from the box through a tube *k*, which is attached to the hollow float, and communicates with the interior of the box, when raised, by means of holes *l*. These holes are closed, when there is no water in the trap, by being inside of the screwed tube *h*, the upper end of which is higher than the lower edge of the screen. The lift of the float is regulated by means of a screw *n*, which is attached to the metal cup *m*. Any water which may have entered the interior of the float is drained off by the pipe *k*. A valve *c* allows for the escape of air and also for its re-admission when the steam is shut off.

957. **Jordan, C.** April 18.

Heating air; heating by air circulation.—Moulds, cores, and other articles are heated and dried by air heated by the waste gases of a cupola furnace. The air is forced through a hollow cowl or dome *D* placed over the furnace and heated internally and externally by the waste gases which pass through

apertures E to the chimney. The heated air passes through a pipe K to a vertical pipe K' provided with radial pipes N for supplying the air to the moulds O, shown as pipe moulds, which are supported on stands P in a pit. The passage of the air into a culvert Q is controlled by movable pipes R which can be pushed into sockets S to shut off the culvert from the moulds. The radial pipes may be arranged at the bottom of the pit to diffuse the heated air into the pit.



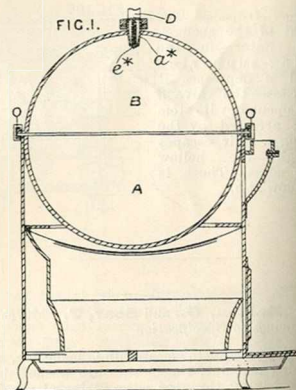
964. Riley, I., and Wolstenholme, T. C.

April 19. [*Provisional protection only.*]

Heating water.—Relates to apparatus for heating water for domestic and other purposes, whereby explosions arising from the effect of frost or deficiency of water are prevented. The pipes, which are connected to the boiler, instead of being connected directly to the hot-water cistern, communicate with an intermediate vessel, in which there is one pipe communicating with the bottom of a supply cistern. The circulating-pipe is attached at one end to the top of the intermediate vessel, and extends upwards to the required height; it then returns to near the bottom of the vessel. An escape pipe, for carrying off surplus water and steam, and preventing the bursting of the pipes, is fitted to the circulating pipe. A valve and air pipe are fitted to the top of the supply pipe for shutting off the water supply, so that repairs may be effected without extinguishing the fire.

1150. Newton, W. E., [*Prindle, D.*]. May 7.

Boiling-pans.—Two hemispherical vessels A, B, which may be used separately as cauldrons for boiling, are shown connected together for use as



a steam generator. The vessel A has a recessed flange resting on a casing which contains the furnace.

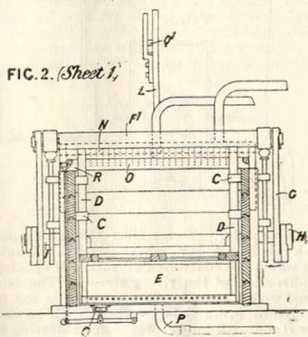
1559. Taylor, W. E. June 13. [*Provisional protection only.*]

Heating liquids.—In order to adopt oil-burning lamps and the like to the heating of vessels and their contents, the vessels are each formed with a depending flue which takes the place of the ordinary glass chimney of the lamp. The flue may be spirally or otherwise formed to increase the heat-abstracting surface.

1692. Jolley, R. July 3. [*Provisional protection only.*]

Heat-retaining chambers and the like.—Apparatus for heating, and for preserving liquids or solids, alimentary or otherwise, consists of an outer enclosure of any shape or size and made of non-conducting material. Within the top or any other part of this enclosure is fitted a vessel or vessels, through which hot water or air can be circulated.

1755. Ashwell, H. July 11.

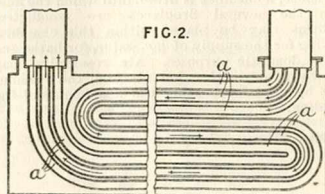


Boiling-pans.—In a machine for washing and cleaning clothes, the latter are contained in a wooden cage E, the bottom and the underside of the cover of which consist of round wooden rods covered with a network of copper, galvanized iron wire or other material. The cage is moved up and down vertically in the tub which is firmly bolted to the floor, and into which hot and cold water are supplied from perforated pipes O, N, respectively, and steam from a pipe P. The dirty water is run off from the tub by lifting a handle R and opening a valve Q.

1795. Butterworth, J. H., [*Tourné, J. E.*], July 17.

Heating liquids.—Water or other fluid to be heated circulates in tubes which are surrounded by metal

or alloy, fusible at low temperature. In the apparatus shown, the tubes traverse the vessel containing the metal several times, but they may traverse it once only, and they may be straight,



the end chambers having partitions to cause the water &c. to pass several times through the tubes. Two or more heating vessels may be placed over a single furnace by which the metal is melted and kept in a liquid state.

1796. Butterworth, J. H., [*Tourné, J. E.*], July 17. *Drawings to Specification.*

Heating air.—Molten metal or alloy, fusible at a low temperature, is employed in apparatus of the kind described in Specification No. 1795, A.D. 1861, for heating air for drying and other purposes.

1858. Wood, A. July 24. *Drawings to Specification.*

Heating liquids.—Attemperating vessels, for use in fermenting and storing beer and spirituous liquids, consist of shallow metal casings provided with a number of partitions attached alternately to one or other of the two sides and extending nearly across the casing so as to force the heating-liquid to take a zig-zag course. In addition, small partitions may be placed partly across the passages between the main partitions.

2045. Hill, H. C. Aug. 17. *Drawings to Specification.*

Heating buildings.—Columns and girders used in constructing buildings are made hollow, so that water can be circulated through them, in order to keep their temperature down in case of fire. Such columns &c. may be used for the ordinary water supply, and for heating the building.

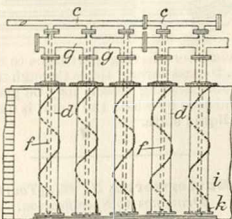
2059. Gossage, W. Aug. 19.

Steam traps. Steam for injection into the materials used in soap manufacture is passed through a bed of pebbles or similar material placed upon a perforated false bottom in a cylindrical iron vessel.

2084. Clark, W., [Sanges, L. de]. Aug. 21.
[Provisional protection only.]

Heating water; heating air.—Near the roof of the house, a chamber is fitted, into which the flues from the several fireplaces are conducted. Cisterns may be placed within this chamber, serving for the supply of hot water, for baths and other domestic purposes. Air reservoirs may also be fitted, so that hot air from the chamber may be used for heating the apartments of the building.

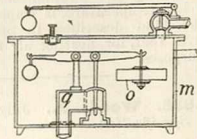
2108. Elson, S. Aug. 23.



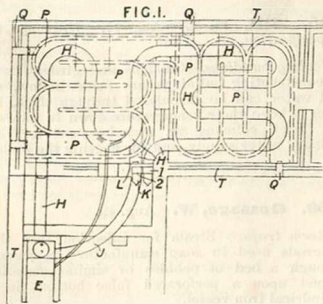
Heating water.—

A series of cylinders *d* is placed in furnace flues for heating water which comes from the hotwell of an engine. The water enters each cylinder by an open-ended pipe *f* and passes away by the pipe *g*. For cleaning the exterior of the cylinders, chains *i*, encircling the cylinders, are dragged round by means of rotating wheels *k*.

Steam traps.—A chamber *m* is provided with a float *o* and lever to raise the equilibrium valve *q*, in order to discharge accumulated water.



2120. Jones, R. W. Aug. 26.

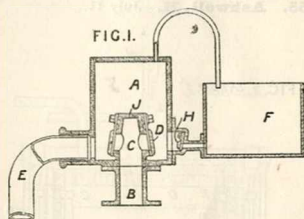


Heating buildings.—Turkish baths are supplied with hot air, vapour, and fresh air, at a suitable temperature, by means of flues *H* from the furnace *E*, and air passages *P*, separated by a floor from the heating flues, and covered over with tiled floor and sand. The air entering the passages *P* by the dampers *Q*, cools the upper floor

FIG. 4. u

and so prevents burning, distributes the heat, and regulates the temperature. By suitably adjusting the damper *K* of a chimney *2*, and the damper *L* of a chimney *1*, one room only may be heated, or the fire sent through the flue *J*, directly into the air. To prevent the escape of fumes from the flues *H*, the flues are covered with tiles having rabbeted edges, as shown at *u*.

2391. Furnell, H. Sept. 25.



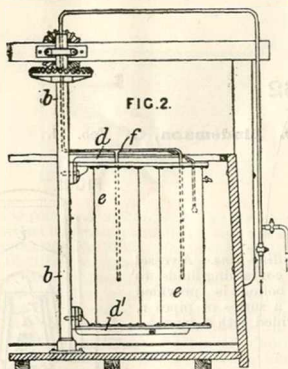
Heating water.—Water from the boiler passes into a receiver *A* through the box *C*, the outlets from which are controlled by valves *D* opening in the direction of the rising stream. The box is formed with a vent *J*. The receiver is fed from the cistern *F*, which is provided with an outlet valve *H* and with an air pipe communicating with the receiver. The water passes to the circulatory system by the flow-pipe *E*.

2392. Brooman, R. A., [Duballe, I.].
Sept. 25.

Steam traps.—The drain pipe *d* from the cylinder dips into the cup-shaped valve *f* in the bottom of the spherical vessel *a*. A spring *i* lifts the valve and allows the water to escape when the end of the cylinder to which the trap is connected is open to the exhaust. The valve-spindle is of triangular section.



2435. **Lush, J.** Sept. 30.



Heating liquids.—The temperature in mash tuns is raised and maintained by means of water vessels carried by rotating arms. The rotary shaft *b* carries arms *d, d'* which support metal cylinders *e*. The cylinders are charged with hot water, and steam or hot water is introduced, as required, through the pipe *f*.

2740. **Maling, E. A.** Nov. 1.

Heating garden frames.—The lower part of the frame consists of a metal-lined wooden tray. A tank, placed in the tray towards one end, is periodically emptied and refilled with hot water by means of two tubes or one flexible tube. An escape pipe for air and steam is provided.

2796. **Lepard, S.** Nov. 7. [Provisional protection only.]

Heating water.—A vessel or tank in the building to be heated communicates by two pipes with a boiler heated by gas jets &c. One pipe passes from the top of the boiler to the top of the vessel referred to, and the other passes from the bottom of the boiler to the bottom of the vessel. A circulation of the water is thus secured.

2866. **Lipsett, A. O.** Nov. 14. [Provisional protection only.]

Heating liquids.—Apparatus for heating or boiling fluids for domestic or other purposes consists of a conical vessel, tapering towards the bottom, where it is provided with a water-tight aperture, employed for fitting it upon a tube, fixed to a circular concave saucer or plate. The

vessel is heated by methylated spirit of wine or other spirit, which is placed in the saucer and ignited.

3058. **Bailey, J., and Bailey, W. H.** Dec. 6. Drawings to Specification.

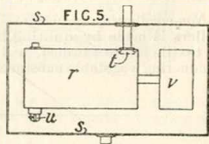
Steam traps.—A lever is employed in contact with the flange of a short copper or metal tube. The construction or expansion of the tube operates the lever which shuts and opens a valve letting off the steam or water according to its temperature.

3069. **Jolley, R.** Dec. 7.

Heat-retaining chambers and the like.—A "safe" for use in heating, cooling, drying, infusing, extracting, or absorbing vapours or gases for manufacturing, medical, or domestic purposes, or for preserving foods and other solids and liquids, is rendered non-conducting by a combination of fibrous, pulpy, and waterproof material. The safe has a double case stuffed with charcoal, soot, hemp, flax, tan bark, sawdust, hair, or other non-conductor, either or both cases being formed of double boarding. The boards of one layer cross those of the other, and outside or between the layers is placed asphalt, felt, cotton, or wool fabric, coco-nut, or any fibrous, pulpy, or waterproof, resinous, vitreous, or other material or liquid. The safe may be heated inside or outside by gas burners with a metal covering, or by steam, hot air, hot water, lime, or other liquid or solid. The upper part of the safe contains a corrugated, ribbed, or angled vessel or vessels, which may be used with steam, hot or cold water, air, or freezing mixtures. The pipes supplying water &c. may be perforated. The vessels may be made double, the space between them being exhausted and then filled with the cooling substance. For absorbing moisture and foul air, the vessels are perforated so that the vapours may mix with and be absorbed by the heating and cooling substances. An absorbent such as charcoal, is placed in the safe to preserve food &c

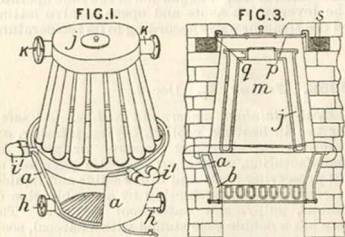
3235. **Needham, R.** Dec. 26. Disclaimer.

Steam traps.—The water of condensation from steam pipes, cylinders, tape legs, or other apparatus, passes into a vessel *r* suspended from a socket or ball valve *t* in a box *s*. The vessel is balanced by a weight *v* and carries a discharge valve *u* opened by contact with the bottom of the box.



A.D. 1862

6. Clarke, T. C. Jan. 1.



Heating water and other liquids.—Relates to water-heating stoves of the type known as "cast boilers," for heating and circulating water or oil through pipes for warming conservatories, halls, churches, and other buildings. Fig. 1 shows in perspective the stove and water-heater, and Fig. 3 a vertical section of the same with the brickwork setting. The hollow water-circulating bars *b* open to the annular wall or jacket *a* of the fuel chamber, which is connected by suitable pipes to the upper boiler *j*. Fuel may be supplied through a door in the side or through openings at the top. The boiler is fitted with connections *h, k* for the circulating pipes. The flues *m* lead around the top of the boiler to the exit *s*. A deflecting plate *p* carries sliding dampers *q*, the rods of which extend to the outside of the brickwork casing. The bottom of the annular jacket *a* is closed by a ring-plate and screws.

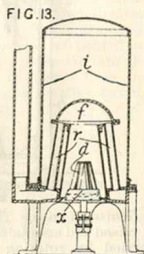
92. Parker, J., Wells, J., and Wells, B. Jan. 13. *Drawings to Specification.*

Non-conducting coverings.—Lagging for steam boilers is made by quilting between two layers of textile fabric sawdust, peat turf, or other non-conducting vegetable substance.

263. Pontifex, C. Jan. 31. [*Provisional protection only.*]

Heating air, water, &c.—The fluid to be heated is circulated through a conical or other shaped vessel containing one or more hollow discs through which the heating-medium is passed.

360. Lindemann, G. Feb. 11.



Boiling-pans.—A vessel *i* for containing fluids to be boiled is provided with a series of pipes *r*, provided with a dome *f*.

393. McConnell, J. E. Feb. 13. *Drawings to Specification.*

Footwarmers.—Steam used to apply the brakes is also employed for heating the carriages. The steam is led by means of bye-passes from a main pipe, running from the engine along the whole length of the train, into the various compartments. It is here utilized in suitable heating-arrangements, and may also pass into a steam chest in the floor of the carriage, and thus serves as a foot-warmer.

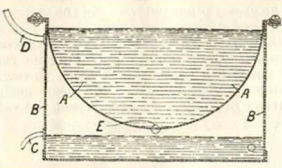
406. Law, G. H. Feb. 15. [*Provisional protection only.*]

Heating water.—The bottoms and other heating-surfaces of boilers are constructed in the form or manner of pyramids, cones, truncated pyramids or cones, triangular troughs, or the reverse of these figures, or in honeycomb form.

552. Parker, J. Feb. 28.

Heating air.—In apparatus for propelling and steering ships by jets of air and steam, the air pipes and nozzles are arranged in the smoke box of a boiler. Reference is made to Specification No. 2374, A.D. 1860, [*Abridgment Class Ships &c., Div. II.*]

614. Wright, R. March 7.



Boiling-pans.— Saccharine liquids are heated and clarified in apparatus similar to that described in Specification No. 2153, A.D. 1860, [*Abridgment Class Distilling &c.*], but without the revolving discs or surfaces therein mentioned. The apparatus consists of a vessel A heated by steam generated in the vessel B, which is open to the atmosphere by the pipe D. The water in the vessel B is heated by steam pipes or otherwise, and is prevented from rising above a certain level by the overflow pipe C. The saccharine liquids are drawn off by means of a cock at E.

Heating water.—Relates to portable gas-heated apparatus for heating water in baths &c. or for evaporating liquids. The heater is of bowl form and floats partly submerged in the water to be heated. The burner *h* is supplied with gas by a flexible tube, and is made removable for lighting. Air is supplied by way of passages *l* formed at intervals on the outside of the heater. Tubes *c* allow the water to pass to the inside of the bowl *a*.

698. Bolton, E. March 13. [*Provisional protection only.*]

Boiling-pans.— Consists in a method of and means for transferring liquid soap from one boiling-pan to another, or from the pan to the soap frames, cisterns, or the like. A vertical tube fitted with a telescope end, the movement of which may be regulated by a screw, is placed in a socket arranged in a socket placed over the centre of the pan, and a branch is fitted to this tube leading to the airtight soap frames. All the tubes are fitted with steam jackets, and the supernatant liquid is raised from the pan by the action of a suction pump connected to the frames. The liquid may be raised by steam being condensed in the frames or receivers.

734. Weems, J., and Weems, W. March 17.

Steam traps; thermostats.— Three forms of steam trap for steam engines, steam hammers, and the like are described, and also damper-actuating apparatus for a steam generator in which the motion of the parts of a steam pressure-gauge is taken advantage of.

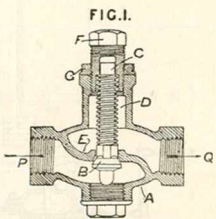
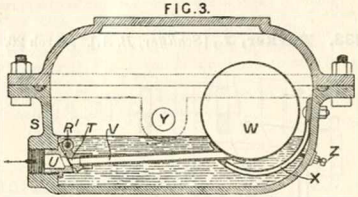
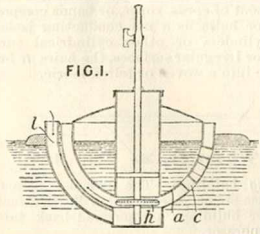


Fig. 1 shows a trap in which, while the cylinder of the engine is receiving steam, the pressure thereof, entering by the pipe P, presses the valve B upon its seating E, but during the exhaust stroke the spring D forces down the valve and water can then pass through to the atmospheric outlet at Q. The valve spindle C is guided by the screw cap F, by means of which the spring is regulated, a lock-nut G being provided. The valve may be arranged to open downwards. In a modified form the valve is kept closed by the steam pressure, but is opened during exhaust by

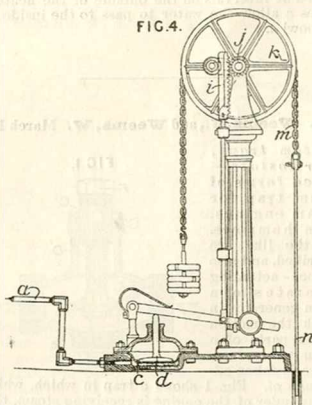
715. Pettit, G. B. March 15.



the pressure of the air and a spring upon an elastic diaphragm, the valve spindle carrying at its end a disc which is then in contact with the valve side of the diaphragm. A third form of trap is shown in Fig. 3 and consists of a steam-tight case S, perforated face valve T and port U which opens to the atmosphere. The valve with attached tube V and hollow float W are hinged at R', and as steam enters by the pipe Y it warms the adjustable expansion tube X and shuts the valve; but the water which collects will cool the

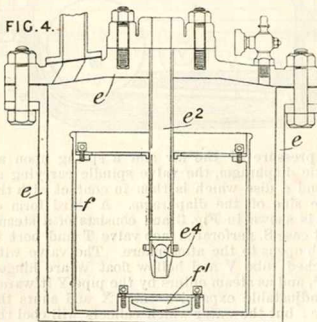
expansion tube and lift the float so that the steam may drive it out through the port U. It is stated that the arrangement is applicable to ball, elach, conical and other valves, that the expansion tube may be in whole or part filled with fluid, and may be applied generally as a thermostat or may act with a single valve for discharging fluids. Fig. 4

FIG. 4.



shows a furnace-damper regulator for steam generators, in which steam entering by the pipe *a* presses on the lower surface of a flexible diaphragm *c* bearing a disc *d*, thereby operating through linkwork the rack and pinion *i, j*, and determining the position of the wheel *k* with weighted chain *m* to which the damper *n* is attached.

833. **Parker, J.**, [Schäffer, B. A.]. March 26.



Steam traps.—The outer casing of the steam trap has an inlet at *e*, through which the water from the steam pipes enters. As the water in the outer vessel *e* rises, the inner vessel *f* is raised until the valve *f* closes the outlet pipe *e*² containing the non-return valve *e*⁴. The outlet remains closed until the inner vessel sinks through the accumulation of water, when the steam acting on the surface of the water forces it past the valve *e*⁴.

948. **Mann, A.** April 3. *Drawings to Specification.*

Thermostats. The Provisional Specification states that a table heated by gas jets, for use in finishing photographic prints, has its temperature regulated by the expansion of mercury, contained in the table, moving a piston and lever to turn the gas-supply cock.

970. **Humphreys, J. D.** April 4. [*Provisional protection only.*]

Thermostats.—Relates to apparatus for regulating the temperature of a reverberatory furnace, consisting of a metal box containing lead or other fusible substance which melts at the temperature required in the furnace. An ordinary governor is arranged above the furnace, and is connected by the governor spindle to a disc, which revolves in the melted substance. The rise and fall of the governor operates a lever, which is connected to a throttle-valve damper beneath the fire-door. The governor is driven by friction gearing, so as to allow it to stand still, when the substance in the box is hard, with the damper open. When the substance melts, the governor revolves, and the damper closes. A blowing-fan may be regulated by the governor in a similar manner.

1159. **Brooman, R. A.**, [Ruquois, C. L.]. April 21.

Non-conducting coverings. Consists in the employment of cords, ropes, or bands composed of bristles or hairs, as a non-conducting jacket, for pipes, cylinders or other cylindrical surfaces. For flat or irregular surfaces, the hairs or bristles are made into a woven or felted fabric.

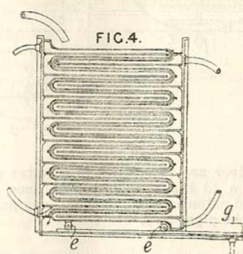
1193. **Wheatley, H.** April 24.

Heating buildings.—The exhaust steam and water from steam pipes used in heating factories and other buildings are pumped back into the steam generator.

1242. **Fletcher, J.** April 28. [*Provisional protection only.*]

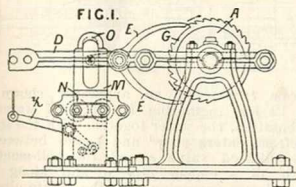
Boiling-pans.—An apparatus in which the clarifying, evaporating, and granulating operations may be performed successively consists of a steam-jacketed cistern with a corrugated bottom. Hollow tubes pass through the cistern, their ends communicating with the steam jacket. The pan is likewise provided with a cover and chimney, in which is a steam jet for removing the vapour.

1256. **Tizard, W. L.** April 29.



Heating water.—A surface apparatus is used composed of a number of separable sections of the form shown, the middle section being mounted on wheels *e* and the plates, forming the sides of the central bent channel, having flanges both sides. Steam is passed upwards through the outer chambers and the water passes through the central channel to a shallow trough *g*. The parts can be separated to facilitate cleaning.

1268. **Davies, G.,** [*Achard, F. F. A.*]
April 30.



Thermostats.—An electrically-controlled apparatus, described as used for regulating the feed of a steam boiler and for giving an alarm when the water level is too high or too low, is stated to be applicable to regulating the temperature of air in

rooms or factories. A ratchet-wheel *A* connected with a feed-cock or other regulating means is formed with two sets of ratchet-teeth pointing in opposite directions, and with a blank space *G*, and is arranged to be worked in one direction or the other, as far as the teeth allow, by a constantly oscillating lever *D* and a double pawl *E*, the direction of rotation being determined by an electromagnet *N* acting on an armature *M* suspended by a brass link *O* from a tail on the pawl *E*. When there is no current passing through the electromagnet, the weight of the armature causes the lower leg of the pawl *E* to act. If a current is passed through the electromagnet, the armature is held up, and the weight of the pawl causes its upper leg to act. The electric circuit is made or broken by a lever actuated by a float as shown in

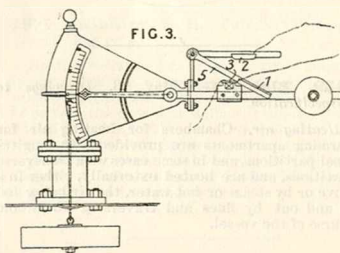


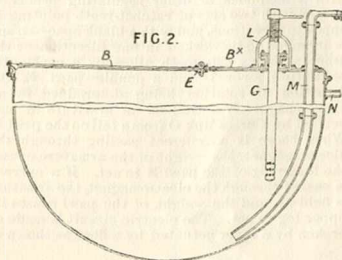
Fig. 3, a contact 3 on the lever being arranged to move into or out of contact with a contact 1 on a pivoted insulating-arm 5. Another contact 2 or another pivoted insulating-arm normally rests on the contact 3 and completes another electric circuit as long as the water level is not more than about an inch above or below its normal position. This electric circuit passes through another electromagnet arranged like the electromagnet *N*, Fig. 1, but on the other side of the lever *D*. The armature of this second electromagnet is engaged by a stud on the lever *D*. If the circuit is broken by the separation of the contacts 2, 3, Fig. 3, the armature is left free to be lifted up and down by the lever *D*, Fig. 1, and is thus made to actuate a lever *z* connected to an alarm bell. When used for regulating temperature, the contact 3, Fig. 3, is actuated by a thermometer.

1371. **Gossage, W.** May 7.

Boiling-pans.—A soap boiling-pan is provided with means for removing alkaline and saline solutions and liquid soap. The lid consists of movable and fixed parts *B* and *B**, the part *B* effecting an airtight closure by means of an india-rubber cord *E*. Steam or compressed air is admitted at *N* and forces the liquid up the pipes *G* or *M*. The pipe *G* can be adjusted so as to remove liquid from any level by screwing it through the bridge piece *L*.

(For Figure see next page.)

1371.



1439. **Blake, G.** May 13. *Drawings to Specification.*

Heating air.—Chambers for heating air for warming apartments are provided with longitudinal partitions, and in some cases with transverse partitions, and are heated externally, either in a stove or by steam or hot water, the air being led in and out by flues and traversing the whole course of the vessel.

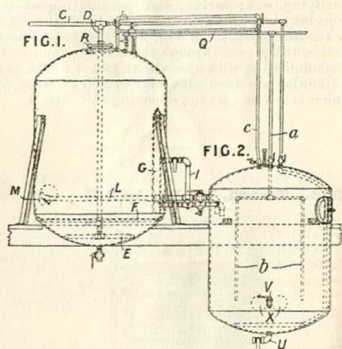
1516. **Morris, T., Weare, R., and Monckton, E. H. C.** May 19.

Heating buildings; heating liquids; heating by electricity.—Spiral or other coils of sheet platinum or other metal or flattened wire are heated by electric currents from powerful batteries, with or without induction coils such as those described in Specification No. 2,661. A.D. 1861, [*Abridgment Class Electricity, regulating &c.*], may be inserted into a liquid or other substance to be heated. The heat generated may be used for various purposes, such as warming houses, conservatories, &c., drying clothes and drying generally, cooking, &c. The "waste" electricity passing off from a magnetic engine" may also be used to warm a house.

1662. **Gray, C. E.** June 2.

Digesters.—In an apparatus for extracting fatty and other materials by treatment with steam, a digester, Fig. 1, and a receiver, Fig. 2, are both connected to a steam main C, and the extract or melted fat is discharged from the digester into the receiver, by gravity, or by a slight difference of steam pressure in the two chambers. The steam enters the digester through the pipe D and perforated coil E, and rises through the perforated false bottom F to the material above.

The extracts or melted fats are removed through the floating strainer M and jointed pipe L, or through the strainer G and pipe I. The digester

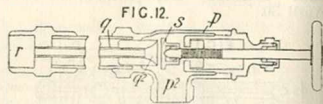


and receiver are connected to a water main Q, the pipe a to the receiver sometimes having perforated extensions b. Vapours may pass over through the pipes R, c.

1768. **Williams, T., and Cox, H.** June 14. *Drawings to Specification.*

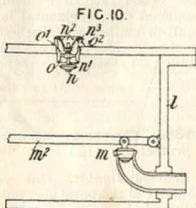
Heating liquids.—The lower part of a churn is provided with distinct chambers, into which hot water or other liquid may be poured.

1822. **Taylor, J. W.** June 20.



Steam traps.—In an apparatus shown in Fig. 12 for regulating the flow of water of condensation, the water together with the steam therefrom enters at p^2 and passes between a screw-adjusted valve s and the bell-mouthed end q^2 of a copper pipe q and along the pipe, thence escaping by the waste-pipe r . The pipe q is supported in an iron chamber p which carries the valve s . The relative expansion of the pipe q and chamber p adjusts the space between the end of the pipe and the valve, thereby regulating the flow of the water. In

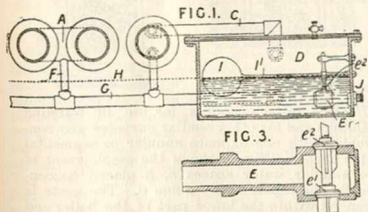
another arrangement, shown in Fig. 10, the discharge chamber *l* of the water is fitted with a valve *n* for the escape of air or steam. The valve *n* is arranged to lift against the seat *o*, and is fitted with a spindle *n*¹ which passes through a guide *o*¹ and is adjustably connected by a set-screw to a flaring cap *n*² having a turned edge adapted to rest on a seat *o*², as shown. The escape of water is regulated by an india-rubber valve *m*, actuated by a float ball, so that the valve is open only when the water has risen to a certain height. In a modified arrangement, the float lever *m*² is adapted to actuate a valve in a vertical position instead of a horizontal one, as shown.



1853. Collier, G., and Crossley, J. W. June 24. [Provisional protection only.]

Heating buildings &c.—Plates for heating apartments or chambers for various purposes are formed, by moulding of soft metal, such as zinc, pewter, or a combination of these with lead, tin, or other metals which are capable of being repeatedly cast in the same mould. The plates are preferably cast in parts, with passages for the circulation of the heating-media. To prevent the expansion of the plates in the middle by internal pressure, dovetailed or other projections on one part fit into recesses in the other.

1942. Dixon, T. O. July 3.



Heating buildings; steam traps.—Relates to steam pipes, so arranged that the water of condensation may be drawn off at various points in the circuit. The steam pipes A, Fig. 1, are placed in a zig-zag line, and slightly out of level.

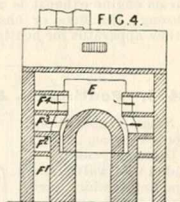
The condensed steam flows through the pipes F into the receiving pipe G, which conducts it to the steam trap D. Steam enters the trap by the pipe C. With the water at the level H the valve E closes; but as water is conducted into the box, the float I is raised, and the valve allows water to escape by the orifice J. The valve is shown in section in Fig. 3, the two covers *e*¹, *e*² being of equal area, so that the pressure on each may be the same. In a modification the float ball I is fixed directly to the valve spindle, and the lever I¹ is dispensed with. A tap provides an outlet for the air when steam is turned into the pipes, and is closed when the steam blows out.

1979. Hindley, E. S. July 9. [Provisional protection only.]

Heating buildings &c.—Pipes or tubes employed in apparatus for warming dwelling houses and other places by hot water circulation are formed at or near the ends with hollow or tubular "cross-heads" which, when held together by screw bolts, form a continuous passage, preferably at right-angles to the main series of tubes. A washer of india-rubber or other substance is inserted between each junction.

2127. Walton, J., and Moore, J. July 28.

Heating air; heating buildings &c.—Air is drawn through a number of chambers surrounding a furnace, and then passed along a pipe above the smoke flue into the rooms &c. to be heated. Fig. 4 shows a transverse section through the furnace and air chambers F¹, F², F³, F⁴, and E. Air enters the chambers F³ and F² at the front and then passes through the chamber F³ into the central heating chamber E at the front. Air enters the chamber F⁴ at the back, passing into the chamber E at the front. The heated air passes along the passage E, which forms the roof of the smoke flue leading from the furnace A to the chimney. The passage E is connected with the rooms to be heated through regulators and gratings near the floors. Air admission into the chambers is also regulated by valves, which in hot weather serve to admit a supply of cool fresh air.



2162. Wanklyn, W. July 30.



Steam traps.—In an apparatus for opening and conditioning East Indian and other tightly-compressed cotton, sheeps' wool, &c. by steaming, a branch steam pipe *j* is fitted with a valve *k* connected by rods *l* with a crosshead *k* on the end of the pipe. So long as the pipe *j* is sufficiently heated by the steam, the valve *k* is closed, but when the pipe is cooled by the accumulated condensed water, the valve is opened and the water escapes.

2212. Fenis de Lacombe, F. H. M. C. D., Chevalier de. Aug. 7.

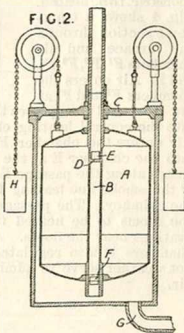
Heating buildings &c.—Relates to a system of warming the dwellings of towns or other localities by means of warm air. The arrangement is combined with apparatus for supplying carburetted air for illuminating purposes. Air is drawn from outside the town, the required pressure being given by means of gasometers, fan blowers bellows, or other means and passes through pipes to a carbureter. Air for warming purposes is supplied by means of branch pipes or other means and is suitably heated.

2315. Oakley, J. T. Aug. 18.

Heating buildings &c.—Steam from a boiler or steam engine exhaust is superheated and passed through the flues or chambers of a "stove" or other apparatus for heating buildings &c.

2405. Pontifex, E. A. Aug. 29.

Steam traps.—Condensed steam enters a balanced vessel provided with valves and openings which are opened and closed as the vessel rises and falls. In the arrangement shown, the vessel *A* slides up and down the inlet pipe *B*, which is rigidly secured to the plate *C*. This pipe is stopped at *D*, and the water and steam pass through the ports *E*, placed opposite each other, into the vessel *A*. The counterbalance weights *H* are gradually overcome, and, on the vessel *A* descending, the water

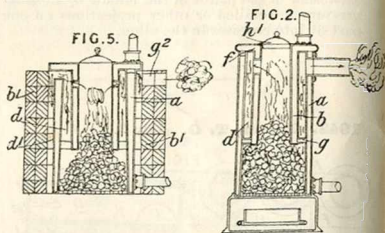
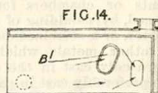
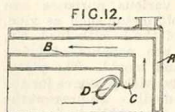


escapes through the orifices at *F* and runs off by the waste pipe *G*. This form of the apparatus may be used without the external case, which is fitted on account of a slight escape of steam from the vessel *A*. In a modification, the vessel is balanced on a horizontal hollow axis. Upon the equilibrium being disturbed, the vessel oscillates on the axis and uncovers ports, through which the condensed steam may escape.

2434. Garton, C. Sept. 3. [Provisional protection only.]

Heating liquids.—Hot water or other fluid, whereby a temperature not exceeding 212° F. is obtained, is used as the heating medium in the manufacture and refining of sugar. A chamber or coil of pipes or a series of such are connected with a boiler, by means of flow and return pipes, the former entering the chambers or coils and boiler at a higher level than the latter. When chambers are used, they are fitted with partitions, extending nearly through their entire width, and also with pipes to allow of the escape of air.

2570. Bridge, D. C., and Dyson, J. Sept. 19.



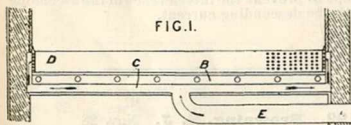
Heating water.—Boilers for use in warming buildings and for other similar purposes are constructed with one or more annular or segmental water spaces. Fig. 2 shows the employment of two annular water spaces *a*, *b* placed concentrically and separated by a flue *d*. The grate is arranged within the lower part of the boiler and is fed with fuel through the loose cover *h* in the top water space *f*. Tubes *g* connect the spaces *a*, *b* with the construction shown in Fig. 5, the brickwork *b'* forms an additional flue *d'*, which communicates with the flue *d* through a passage formed by cutting away the water space *a* at one side. A baffle separates the passage from the

outlet opening g^2 . This form of boiler may be modified by dispensing with inner annulus b or with the annulus b and brickwork b^1 . In the former case, smoke tubes are led through the annulus a to the flue d^1 , while in the latter water tubes, crossing each other at right angles, are provided in the fire space. Fig. 12 shows a segmental or saddle boiler having a water back A. The fire space is traversed by a horizontal water chamber B having a pocket at C. A water tube D restricts the passage for the furnace gases. Fig. 14 shows a similar boiler in which a water tube B¹ is placed between the furnace and the opening leading to the chimney.

2644. Moule, H. Sept. 29. [Provisional protection only.]

Heating buildings &c.; heating garden frames.—A chamber is formed beneath the floor of the hot-house or the bed of the garden frame, and is supplied with steam, preferably from "Moule's "patent vapour-fed stove." The roof of the chamber is made of pantiles or fitted with gratings, and the floor is made of iron, slate, tile or the like and forms the roof of a smoke flue running beneath. If dry heat is required, steam is dispensed with, and air is heated in the chamber by the smoke flue.

2656. Haseltine, G., [Robbins, E. Y.] Oct. 1.



Heating air; heating buildings.—The floor and the lower part of the walls of a church, school-room, or other building, and also the fresh air supplied, are heated by hot air in a chamber B containing pipes through which pass steam, hot water, or furnace gases. The fresh air is supplied through a channel E to a heating-chamber C extending upwards behind the skirting boards D. The fresh air may enter the room through perforations or slits. In the case of churches, school-houses, and other crowded rooms, the fresh air should be discharged under the seats also. The ventilation may be promoted by a fan or air pump.

2761. Smith, S. Oct. 14. [Provisional protection only.]

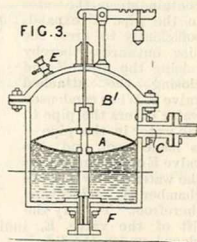
Boiling-pans.—Boilers or kettles are made with tubes leading from the bottom to the back, sides, or other part, and with an arch from the bottom terminating at the back or sides.

2802. Nelson, E. Oct. 16. Drawings to Specification.

Heating gases; heating water; boiling-pans.—The apparatus consists of a helical coil of porcelain which is inserted in the annular space formed between two iron cylinders, or, according to the Provisional Specification, the coil is embedded in a cylinder of porous clay with a surrounding cylinder of iron, the intervening space being filled with plumbago, magnesia, or rottenstone. In the case of the coil within the annular space, the coil is packed with a mixture of equal parts of burnt fireclay and plumbago or plumbago alone. Holes are tapped near the bottom and top of the outer cylinder to admit the connecting pipes which are secured to the superheater. Nuts and washers are used for securing the pipes, the washers being formed of asbestos in iron or copper wire gauze made into a coil of the required size.

2816. Gedge, W. E., [Brasseur, G.] Oct. 18.

Steam traps.—The water of condensation formed in the steam pipes of steam heating-apparatus is conveyed by the tube C, Fig. 3, into the reservoir B', in which is a float A. When the water reaches a certain level, the float rises and opens the triangular valve F, through which the water escapes. The cock E allows for the escape of air, and air re-enters by an orifice in the reservoir. The reservoir is provided with an orifice, closed by a bolted plate, for cleaning-purposes.



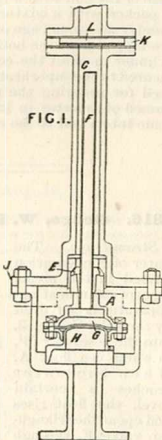
2842. Spence, J. Oct. 22. Drawings to Specification.

Non-conducting coverings and compositions.—Boilers, pipes, cylinders, and other vessels and surfaces are protected from loss or gain of heat,

by being coated with a mixture containing clay mixed with water or other liquid, oil cake, fish or train oil, cow hair, soot or ground charcoal, and bone dust or ash; any chemically equivalent materials may be used in place of these. For a finishing-coat of the same materials, with the exception of the bone dust and the addition of a proportion of linseed oil, glue, and paint or other colouring-matter, may be added. To enable the finishing-coats to be applied regularly to pipes, wooden rings are fastened on them. Hay or straw bands, or spun yarn, may be twisted spirally round pipes, the composition being filled in between. Wooden laths may also be applied in some cases as, for instance, on boilers, for assisting in binding the various layers of the composition.

2890. **Bünger, F. L. H. W.**, [Andreae, B.].
Oct. 27.

Steam traps.—Consists of a pipe C, in communication at the top with the vessel from which condensed water is to be discharged, and in which is arranged a closed tube F, which is filled with water, and is enlarged at the lower end, where it is fitted with a disc G of india-rubber, steel, or other elastic material, resting on a stop H. When the pipe C contains steam, the water in the pipe F expands sufficiently to press the disc outwards, thereby raising the pipe F and closing the attached valve E. When condensed water enters the pipe C, the water in the pipe F is made cool, and the valve E opens, and allows the water to flow into the chamber A, and escape therefrom. To vary the lift of the valve E, india-rubber packing is placed under the lid J of the chamber A. A box K is arranged within the pipe C, and contains a slide L of wire gauze, which intercepts any impure matter in the water.

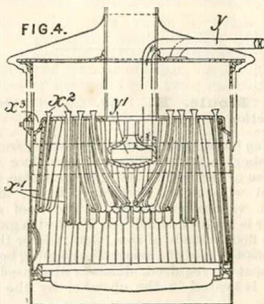


2905. **Jeffreys, J.** Oct. 28. [Provisional protection only.]

Heating gases and liquids.—Surface heating-apparatus is built up of fluted or corrugated plates arranged in pairs with, in some cases, the

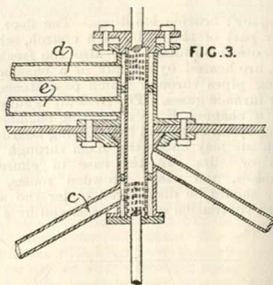
parts in contact soldered or brazed together. The sets of tubes thus formed may be soldered or brazed together, or may be connected by turning up the edges of the plates of which they are formed, and enclosing them in a split tube into which cement or solder is cast.

2956. **Merryweather, M., Merryweather, R. M., and Field, E.** Nov. 1.



Heating liquids; heating by water circulation.—In double-tubular fluid-circulating apparatus for boilers, or for heating by hot water, in which fluid circulates down a central tube x^2 and up an outer tube x^1 , the upper end of the inner tube is made of a trumpet or bell-mouth or flanged shape to prevent the interference of the ascending with the descending current.

3192. **Browning, S. J.** Nov. 28.

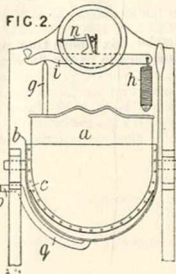




Heating liquids.—A mash-tun is fitted with a rotary agitator, and a hot or cold water pipe system which revolves with it. Fig. 3 shows, in section, the arrangement at the junction of the inlet pipe *d*, the outlet *e*, and the pipes *c* which form a complete circuit and rotate with the stirrers.

3196. Adams, J., and White, W. C. Nov. 28.

Boiling-pans.—In apparatus for boiling and evaporating solutions and liquids, as in the manufacture of sugar, preserves, sweetmeats, and preparations from drugs and chemicals. two pans *a, b* are used mounted in bearings on a lever of the first or second order and supported by a spring *h*. The pan is heated by steam or hot air issuing from perforations in a spiral or other passage or tube *c*. A heat-reflecting plate *p* is arranged below the tube *c*, and the water of condensation is discharged through a pipe *q*. The heating-fluid may be admitted through hollow levers and trunnions. The weight of the liquid and the loss of weight by evaporation are indicated by a pointer *n* which may be operated by a lever *i* connected to the spring *h* and a rod *g* resting on the pan-supporting lever.



3210. Penson, R. K., [Delcambre, A.]. Nov. 29. [Provisional protection only.]

Footwarmers.—Chambers, of a flat tubular, or other form are placed between the seats of railway carriages, and receive exhaust steam drawn from a compartment in the locomotive funnel. The supply may be cut off by a door. The warmers in different carriages are connected by flexible pipes, so that the steam circulates through them all, and then escapes to the air.

3254. Lewal, G., [Fondet, J. B.]. Dec. 4.

Heating buildings &c.—Consists of an apparatus, placed in the chimney, for heating fresh air supplied from the outside. A hole, cut in the bottom of a box, is placed in communication with

the external air by a pipe, flue, or other means. On the upper side of the box there is a grating pierced with ranges of square holes, to which are fitted vertical tubes to a cylinder which is "placed parallel to the box" and communicates with the room. The apparatus, which replaces the back of the grate, slopes towards the apartment.

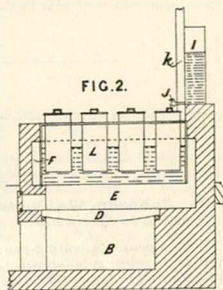
3271. Thorp, R. Dec. 6. [Provisional protection only.]

Non-conducting coverings.—Dry sand is placed between a covering of sheet iron, or other metal, and the boiler or other heated surface, and over the covering is a coating of plaster of Paris, or similar material, which is preferably cased in with wood.

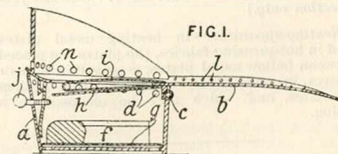
3296. Mirland, V. Dec. 9.

Boiling-pans.

Rhubarb is cooked in the tightly-closed cylindrical kettles *L*, which are placed in the boiler shown. The water in the boiler is heated from the flues *F*, as well as by the fire *E*, beneath which are the grate *D* and the ash-pit *B*. Cold water enters the boiler from the cistern *I* by the tap *J*, and steam passes out by the pipe *k*.



3439. Clark, W., [Bibet, J. M., Leger, E., and Faury, A.]. Dec. 24.

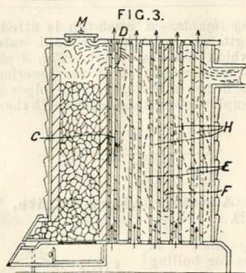


Footwarmers.—A heating apparatus for the heels of shoes and boots is in the form of a hollow metal heel *a* hinged to a sole plate *b* at the point *c* and secured by a pin or spur *j*. Carbon paste in the form of a horse-shoe *f* burns slowly within the heel, being supplied with air through holes *d* and

resting on a wire gauze *g*. A piece of wire gauze *h* acted on by the spring *i* holds the carbon in place and moderates the heat. The apparatus is fixed to the boot by means of the holes *l, n*. Carbon paste may also be used for heating ordinary foot-warmers.

3463. Riddell, J. H. Dec. 29.

Heating air.—In the smoke box *E* of a slow combustion stove are arranged vertical or sloping metal or earthenware pipes *H* in which air, in passing, is heated. The rapidity of this current of air may be increased by fans or other convenient means. The hot gases from the fire pass, by the pipes *D*, at the top of the chamber *C*, into the



smoke box where they pass under the partition *F* and thence to the flue.

A.D. 1863.

126. Johnson, W., [*Macfarlane, T.*]. Jan. 14.
Drawings to Specification.

Boiling-pans.—A boiling-pan for making sodium-carbonate solution is formed of a lead pan covered with a brick lining, and protected from the heat of the fire by an open vertical space between the grate and the pan.

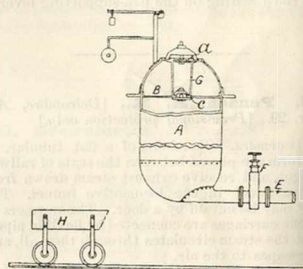
181. Kirk, J. M. Jan. 21. [*Provisional protection only.*]

Heating-apparatus.—In heating metal plates used in hot-pressing fabrics, the plates are placed between hollow metal plates, arranged in tiers or shelves, in which steam or other heating-medium circulates, and which may be enclosed by a casing.

273. Blake, G. Jan. 29. *Drawings to Specification.*

Heating buildings &c.—Corrugated, zig-zag, waved, or like fireclay or metal parts are used in construction of steam or water heated stoves.

467. Clark, W., [*Ladd, W. F., and Walsh, S. A.*].
Feb. 20.



Digesters.—Relates to boilers for the reduction of vegetable substances to the condition of pulp suitable for paper, or for their disintegration for any other purpose, either with or without the aid of alkalies or other chemicals. To ensure the complete submergence of the substances in the liquor during the boiling-process, a diaphragm *B* is fitted in the upper part of the boiler *A*. The boiler is charged with vegetable substances through manholes *a, c*, arranged at each end of a

perforated cylinder G, up to the level of the diaphragm, and after the manhole c has been closed, the liquor or other solution is introduced, in such quantity that the diaphragm is just covered. Heat is applied to the boiler by means of steam heating-coils, or by the direct application of fire contained in a travelling furnace H. The boiler is discharged through a valve F by steam pressure.

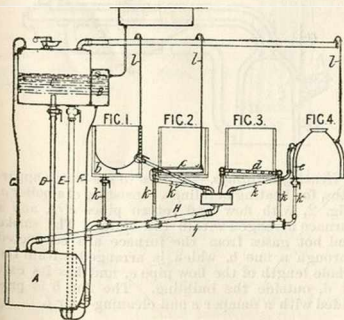
528. Lee, T. V. Feb. 25.

Heating air.—Coils similar to those described in Specifications No. 2969, A.D. 1853, and No. 1229, A.D. 1855, may be used for heating air. The coils are fitted into pipes, sockets, or siphon bends. Three or more series may be used, each series lying over the interspace of the two below it. The air is forced through by a blast fan or other means. The coils are placed beneath retorts or kilns used for drying or carbonizing peat.

577. Murrell, O. March 2. *Drawings to Specification.*

Heating water; boiling-pans.—The firegrates of water boilers and large coppers are composed of tubes, which form part of the heating surface. The arrangements are described in connection with steam boilers.

584. Garton, C. March 2.



Heating liquids.—A temperature not exceeding 212° F. is obtained in the manufacture and refining

sugar, by the use of a chamber b, c, or coil of pipes d, or a series of such, or a jacket e, through which water or other fluid from a boiler A is caused to circulate by main flow and return pipes H, I and branch pipes k. The chambers b, c and jacket e are fitted with partitions extending nearly throughout their width, and with pipes l to allow of the escape of air. To the boiler A is connected the supply cistern B, the flow and return cistern C, pipes D, E, and the feed and safety pipes F, G.

645. Whittles, H. March 9. [*Provisional protection only.*]

Steam traps.—In apparatus for collecting the water of condensation from steam and returning it to the boiler, the waste steam passes into a compound box containing a float attached by a rod and chain or cord to a balance wheel carrying one or more pins or tumblers. These pins or tumblers act through levers on a tap controlling the passage of steam from the boiler to force the water through a valved pipe into the water space of the boiler.

698. Moreland, R. March 14. [*Provisional protection only.*]

Digesters.—Hops are treated for the preparation of extracts in cylindrical vessels provided with hollow covers at the top and bottom. From the top cover, perforated tubes reach nearly to the bottom, and steam pipes enter the top cover and the vessel just beneath it. The lower cover has the inner side perforated and covered with flannel, and a pipe is fitted whereby liquid is drawn off. Hops and hot water are introduced through an opening in the top, after which steam is passed in through the perforated pipes until the water boils. Steam is then passed directly into the top of the vessel and forces the liquid into the lower cover, whence it is drawn off. The lower cover can be removed so that on passing in steam again the spent hops are forced out.

718. Miller, T. N. March 17. [*Provisional protection only.*]

Heating buildings.—Heated products from fires pass through flues on or near the floors of horticultural buildings. These flues may be enclosed at the sides, to form enclosed chambers, and on these chambers, or directly on the flues when these are not enclosed, water troughs with perforated covers are arranged. Tan, earth, sand, or other material may be placed on these covers for use as a hot bed.