



PATENTS FOR INVENTIONS.

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ABRIDGMENTS OF SPECIFICATIONS.

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CLASS 64, HEATING,

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

AND FIREPLACES;

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

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PATENTS FOR INVENTIONS.

A BULLETIN OF THE PATENT OFFICE.

CLASS OF HEATING.

CLASS OF HEATING AND KINDS OF HEATING.

AND KINDS OF HEATING.

CLASS OF HEATING AND KINDS OF HEATING.

Period A.D. 1807-76.

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## EXPLANATORY NOTE.

The contents of this Abridgment Class may be seen from its Subject-matter Index. For further information as to the classification of the subject-matter of inventions, reference should be made to the *Abridgment-Class and Index Key*, published at the Patent Office, 25, Southampton Buildings, Chancery Lane, W.C., price 1s., postage 6d.

It should be borne in mind that the abridgments are merely intended to serve as guides to the Specifications, which must themselves be consulted for the details of any particular invention. Printed Specifications, price 8d., may be purchased at the Patent Office, or ordered by post, no additional charge being made for postage.

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 " G. ....'74. 180  
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 " W. ....'75. 4419  
 " W. L. G. ....'70. 996  
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- Yates, G. ....'69. 2150  
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## HEATING.

*Excepting FURNACES or STOVES;*

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

Patents have been granted in all cases, unless otherwise stated. Drawings accompany the Specification where the abridgment is illustrated and also where the words *Drawings to Specification* follow the date.

A.D. 1867.

**27. Lane, J.** Jan. 4. [*Provisional protection only.*]

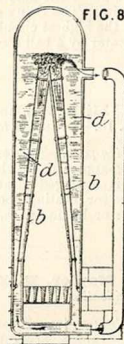
*Heating water.*—The water is contained in a reservoir which it enters near the bottom. Exhaust steam enters at the top of the reservoir, and strongly heats the upper part of the water, the temperature diminishing towards the bottom. A vertical pipe is fitted in the centre of the reservoir, and is perforated with a series of holes arranged spirally. A second pipe, closed at the top, fits closely over it and is also provided with a series of holes arranged spirally. The two series of holes are so arranged that by turning the outer pipe any one hole in it may be brought opposite the corresponding hole in the inner pipe. By this means, water from different heights, and therefore of different temperatures, may be supplied to the inner pipe, from whence it is conveyed away for use in baths or otherwise.

**249. Frideaux, T.** Jan. 30. [*Provisional protection only.*]

*Heating buildings; heating air.*—Heated air is supplied to a church or other large building by means of a double tube or flue passing round the interior of the building. The inner tube communicates at one end with a furnace, and at the other with a chimney. The outer tube opens at one end to the external air, and at the other end into the building, so that the air in passing through it becomes heated by contact with the inner tube.

**276. Fiskén, W., and Fiskén, D.** Feb. 1.

*Heating water.*—Relates to a form of boiler for heating water to be used for heating buildings. The internal heating-surfaces *b* are inclined as shown and provided with guide-plates *d*, which separate the cold water from that which is heated, so that the warm water has to complete the circulation before again entering the bottom of the boiler.



**303. Barlow, B.** Feb. 2. [*Provisional protection only.*]

*Heating liquids.*—Relates to boilers of the kind in which a hollow drum communicates by vertical tubes with a hollow water ring, the latter surrounding the fire and being in contact with the

burning fuel. The improvements consist, firstly, in using double instead of single water-tubes, one of each pair being directly connected by short tubular passages with the other so as to form an inner circle, and having its lower end, which is closed, continued downwards to some distance below its lower point of connection. Such lower ends are entirely immersed in the burning fuel. Instead of doubling the connecting-tubes, they may be constructed of a broad, flat form, so that a portion of each tube projects inwards into the fire. Such boilers may be used for generating steam or for heating water for warming public buildings, and for horticultural and other purposes. They may also be employed in the manufacture of salt from brine, the brine passing through one or two boilers according to the quality of salt required, and passing from them into the common evaporating-pans. They may be heated in the fues of puddling-furnaces, or one may be heated directly by a fire, the products of combustion being employed to heat the other.

**349. York, H. K.** Feb. 7. [*Provisional protection only.*]

*Heating buildings; heating water.*—In a hot-water circulating system, at or near its lowest part, the pipe is divided into several small pipes or waterways which are placed diagonally and fixed in two inclined plates, the sides being closed by two slabs of clay or other suitable material. Heat is applied under the inclined pipes by gas burners or otherwise. The rising pipe is left open at the top above the highest circulating level, and is supplied with water by a ball cock &c.

**439. Hill, W., and Wilberforce, H. C.** Feb. 18. *Drawings to Specification.*

*Boiling-pans.*—Relates to improvements in gas cooking-apparatus in which a gas-generating-apparatus is arranged near a cooking-range. The furnace for heating the gas retort is fitted with coppers or boiling-pans.

**679. Napier, R. D.** March 9. *Drawings to Specification.*

*Heating water.*—Steam passing from a pipe or passage into a larger pipe induces a current of water through a branch pipe. The apparatus is described as applied for reducing the noise of escaping steam, but it is stated to be applicable for heating water.

**756. Cowburn, T.** March 16.

*Heating water.*—Relates to safety-valves, fusible plugs, and safety apparatus for boilers. Hollow

weights filled with lead or other fusible metal, metallic ores, slag, sand, metal turnings and borings, or the like, are employed in place of solid weights in safety-valves of the kind described in the

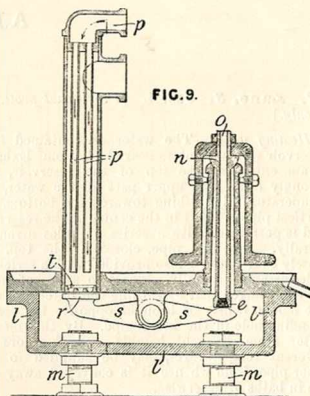
FIG. 4.



FIG. 7.



FIG. 9.



patentee's Specification dated June 13, A.D. 1856. The fusible plugs are fitted in dome-like valves or pockets which project into the water space, and which are provided with tubes *d* projecting into the furnace to conduct the heat. The tubes may be in one piece with the pocket as shown in Fig. 4, or they may be fitted in removable seatings as shown in Fig. 7, and the pocket may be screwed, riveted, or otherwise secured to the crown of the furnace. Two or more plugs or tubes may be fitted in each pocket, and the tubes may be separate or united in one casting; in the latter case they may be of triangular or other desired form in cross-section. To allow the plugs to be inserted

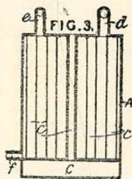
without entering the boiler, a cap *h* is provided in the outer shell, and the plug seating is formed with an upwardly-projecting tube *g* as shown in Fig. 7, or with a similarly-arranged rod, so that, after removing the cap *h*, fresh plugs may be dropped into place, or the seating removed for the insertion of new plugs. Fig. 9 shows a form of safety apparatus for circulating water-heaters. A vessel *l*, connected by pipes *m* with the heater, has a safety-valve *n* provided with a central pipe *o* closed by a fusible plug *e*. The descending current of water enters through the pipes *p*, and, if the velocity becomes too great, its impact on the plate *r* moves the lever *s* and opens the valve. Pieces of ice are retained by the grating *t* until melted.

**791. Semple, M.** March 19. [*Provisional protection only.*]

*Heating buildings; heating air.*—In order to heat several rooms by one fire, a closed casing or chamber, preferably of iron faced with firebrick, is constructed at the back and sides of, or in close proximity to, a stove, kitchen range, or fireplace. Air is conducted thereto by pipes from outside, and, after being warmed in the casing, is led up through pipes furnished with valves by which it is admitted into the various rooms. The inlet pipes may pass through or round the fireplace before reaching the casing.

**827. Haseltine, G.,** [*Sternfeld, A.*]. March 21.

*Heating buildings; heating air.*—For heating and ventilating buildings, air from any part of the latter, or from the external atmosphere, is forced by a fan or blower into a chamber *C*, and thence through tubes *c* in a chamber *A*. Exhaust steam from an engine, or live steam, admitted by the pipe *d*, passes between the tubes *c*, condensed steam escaping at *f*, while any that is uncondensed passes off at *e*. The air is thus heated and is conveyed by the tubes *c* to various parts



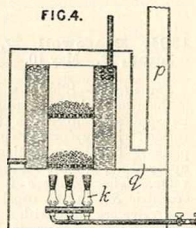
of the building. Preferably the apparatus is arranged to condense the whole of the steam.

**885. Moreland, R.** March 26. *Drawings to Specification.*

*Heating buildings.*—Spaces left between arched corrugated iron sheets, used in a system of building fireproof floors and ceilings, and the ceiling below are utilized for heating by hot air.

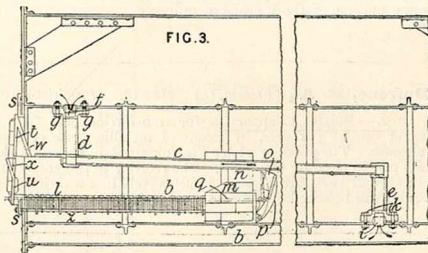
**936. Ball, E. W.** March 29.

*Heating water.*—Within an annular circulating boiler or coil for heating conservatories &c. two layers of pumicestone, plumbago, or other refractory substance are supported on gratings as shown. The pumicestone &c. is preferably soaked in a solution of cobalt and manganese chlorides and potassium nitrate, and is heated by a series of bunsen burners *k*, the top tubes of which are deeply corrugated. The heated gases pass down the outside of the boiler and along the flue *q* to the chimney *p*.



**1076. Barlow, S., and Edmeston, T.** April 11.

*Heating water.*—Within the flue of an ordinary boiler for generating steam or heating water are fitted a series of water tubes *c* which serve as firebars for an upper fire. At the front end they enter the horizontal limb of a D-shaped water chamber *d*, which communicates with the boiler by a coned bush *f* tightened up by the



bolts *g* so as to make it steam-tight. The back ends of the tubes enter a similar inverted chamber *e* fitted with a coned bush *i* and bolts *k*.

**1195. Gordon, G.** April 25. [*Provisional protection only.*]

*Heating apparatus; heating liquids; heating gases; heating by steam circulation.*—The steam or vapour, or steam and heated air, given off from a drying or evaporating apparatus, is conducted by pipes or passages into water or other liquid or amongst solids requiring to be heated, or into enclosed spaces or passages surrounded by or surrounding other spaces containing liquid or aeriform matters to be heated, or through heating-apparatus of any convenient kind in order to obtain increased heat and pressure for use as motive power. The passage of the steam through the substances or apparatus may be effected by means of a draught, an "injection," fan, air pump, or any forcing or exhausting contrivance. In drying and burning, calcining, or carbonizing granular substances the bottoms of the retorts employed are continued below or outside the kiln or furnace, and pass

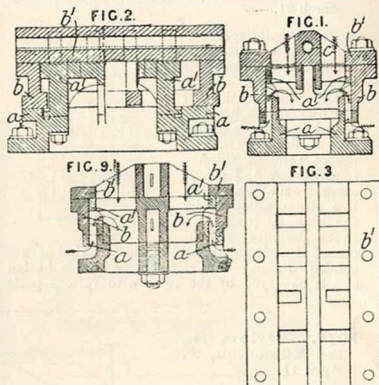
down through a vessel containing water to be heated or have internal chambers in which water circulates; in some cases the apparatus forms, at once, drying, calcining, and cooling chambers, the latter descending into or containing the water chambers. Perforated pipes or chambers, descending through the mass in the drying &c. portions, communicate with pipes which lead to heat-utilizing apparatus, as described above.

**1208. Booth, T.** April 26.

*Heat-retaining chambers and the like.*—Vessels for containing glue, size, starch, gum, dyes, colours, chemical solutions, food, or other liquids requiring to be kept hot are enclosed in one, two, or more outer chambers, one or all of which are filled with dried sawdust or other non-conducting material. Or the outer chambers may be filled with hot water or left open to the air. In case the heat is to be retained for a long period, a metallic heater may be placed in the chamber containing sawdust &c. A similar arrangement is used for keeping plates &c. warm; an opening, closed by a lid when required, is provided for the removal of the plates.

**1384. Bracewell, W., Pickup, W., and Lund, E.** May 10.

*Steam traps.*—Sliding and oscillating-disc valves as described below for steam engines are stated to be applicable to steam traps. The valves are formed with two or more parallel faces in different planes. The lower seating is seen at *a*, and the upper at *a'*; *b*, *b'* are the corresponding faces of the valve. The spindle *c* is worked by a tappet eccentric &c. in the usual manner. The seating and valve are made with eight or other number of perforations or ports in both faces. The parts between the ports are recessed to reduce labour in facing up the surfaces. The valve is shown applied to the cylinder of a vertical engine. Fig. 9 shows a section of an oscillating disc valve with two faces. To admit steam gradually, the ports in the valve and seating may be so shaped that, instead of opening the whole length of the ports simultaneously, they are made to open only at one point, to answer the purpose of the V shape in ordinary side valves.

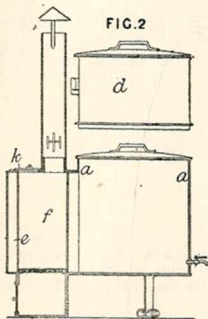


**1478. Dufrené, H. A.,** [*Fleurot, C.*] May 18. [*Provisional protection only.*]

*Heating gases.*—Relates to apparatus for transferring heat from one current of gas to another, for heating or cooling purposes, by means of metallic gauze or plates exposing large absorbing and radiating surfaces. The gauze or plates are contained in a receiver through "each part" of which the two currents pass in opposite directions. The receiver is preferably cylindrical, and mounted to rotate, so that "its various parts are presented successively like a series of prisms to the orifices of the two conduits, and will become hot and cold alternately by the passage of the two currents."

- 1497. Barford, V., and Skerman, J.** May 20.

*Boiling pans; heating water.*—Relates to a portable boiler suitable for agricultural purposes, such as boiling and steaming roots, heating water for washing, or for other purposes. The boiler consists of an upright cylinder *a* supported on legs or wheels. It is fitted with a lid, for which a steamer *d* can be substituted to contain roots &c. A firebox *f* is fitted in a projection *e* at the side of the cylinder so that it is surrounded by the water in the boiler. The fire is fed through a door *k*.



- 1595. Ritchie, W. B., and Willans, J. G.** May 29. *Drawings to Specification.*

*Heating air; heating water.*—Air for drying peat, bricks, &c. in special chambers is warmed by the gas or waste heat from a blast furnace. A cylindrical steam or water boiler is mounted horizontally in the top of the furnace in which iron is being smelted with the use of peat. A pipe leads the steam or hot water to a heating coil or apparatus arranged in the current of air entering the drying-chambers; the apparatus preferably comprises a number of spiral coils, placed one under the other, the steam passing through them in succession. The condensed water from the coils is collected and pumped back to the boiler. The waste heat of puddling, re-heating, and other reverberatory furnaces may be similarly employed, the boiler in this case being set up on end to form a part of the chimney or flue.

- 1673. Crowe, H.** June 7. [*Provisional protection only.*]

*Heating buildings; heating water.*—In a hot-water circulating apparatus, to obviate the necessity of placing the boiler below the level of the circulating pipes, the heated water rising from the heating-surfaces of the boiler is collected in a separate compartment in the upper part of the boiler, whence it circulates through the pipes, returning to a compartment under or round the boiler and ashpit. Feedwater enters the lower

compartment by a separate pipe. A vent pipe from the upper compartment is conducted to the feed-cistern.

- 1698. Crompton, J.** June 10. [*Provisional protection only.*]

*Heating liquids.*—For "warming" malt liquors or other beverages, air is exhausted by a small hand-pump from the vessels containing them, "thereby allowing the latent heat in the liquor to be developed."

- 1930. Gordon, G.** July 2. *Drawings to Specification.*

*Heating apparatus and methods of heating; heating liquids; heating gases.*—Consists in utilizing the steam or vapour arising from moist and liquid substances which are being dried or evaporated for heating "liquid, solid, or aeriform matters." The steam &c. may be caused to permeate the substance to be heated, becoming thus condensed and parting with its latent heat, or it may be conducted into enclosed spaces or passages surrounded by, or surrounding, the substance to be heated. It may be caused to circulate, together with hot air, by fans, injectors, exhausters, or otherwise; or its condensation may cause a further supply to enter the heating-apparatus. The application of the invention for employing the steam given off in drying articles that have been washed, to heat the water required for washing, is mentioned. The steam may be heated before it is thus utilized. Apparatus for washing, drying, and burning granular materials, such as charcoal, is illustrated in the Specification, in which the water used in cooling the material after "burning" is led to the washing-tanks.

- 2000. Boulton, M. P. W.** July 8. *Drawings to Specification.*

*Methods of heating; heating air.*—Relates to air-compressors actuated by explosive gas, and consists, partly, in employing the products of explosion to heat the air compressed and for other heating purposes.

- 2045. Wilkins, F.** July 12. *Drawings to Specification.*

*Thermostats.*—In burners consuming carburetted air or gas, together with vaporized hydrocarbons, a metal rod is so arranged that, through its expansion by the heat of the flame, it actuates the cock regulating or checking the supply of gas or air.



**2095. Schofield, J., and Dawson, J. C.** July 17.

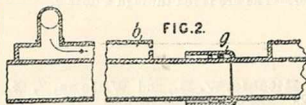
*Heating by steam circulation; heating buildings; heating liquids.—Relates to steam heating-apparatus, shown as applied to a drying-floor, but applicable for heating other buildings or for boiling in brewing or similar operations, or for other heating purposes. The pipes C, C', Fig. 2, fixed under the floor, are supplied with steam*



from the boiler A, the supply being regulated by the stop-cock B. The steam, after circulating through the pipes, returns—as hot water—to the boiler through the pipe D, which is provided with the air-cock E and the stop-cock F. The cock E is first opened to allow the air to escape from the pipes, and is then closed, the stop-cock F being then opened.

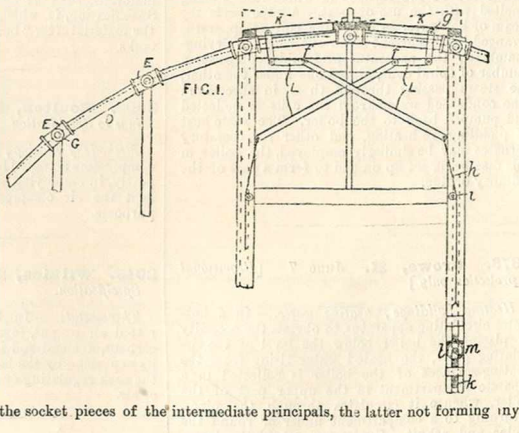
**2125. Taylor, W.** July 20.

*Heating buildings; heating air.—Relates to pipes for ventilating, heating, and 'vaporizing' hot-houses and other buildings and residences. The pipes are cast or fitted with closed troughs or chambers b upon them to contain water or other liquid to a certain depth, and above the surface of the water to form a passage for a current of air, the pipe proper conveying the heating-agent, either hot water or steam. The air passing through the chamber, as shown by arrows, becomes heated and moistened or charged with steam.*



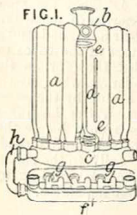
**2150. Simpson, W., and Howitt, W.** July 24.

*Heating buildings.—Relates to the construction of semicircular roofs for horticultural and other buildings, and to their application to the purposes of heating by hot-water circulation, being an improvement on the invention described in Specification No. 962, A.D. 1866. The principals are formed of a series of short lengths D of metal tubing, having turned and shouldered ends which are fitted into, and connected by, cruciform socket pieces E. The two end ones act, respectively, as the induction and eduction pipes, and communicate by means of horizontal tubes of metal which serve also as cross-ties or purlins, and pass through the socket pieces of the intermediate principals, the latter not forming any part of the system.*



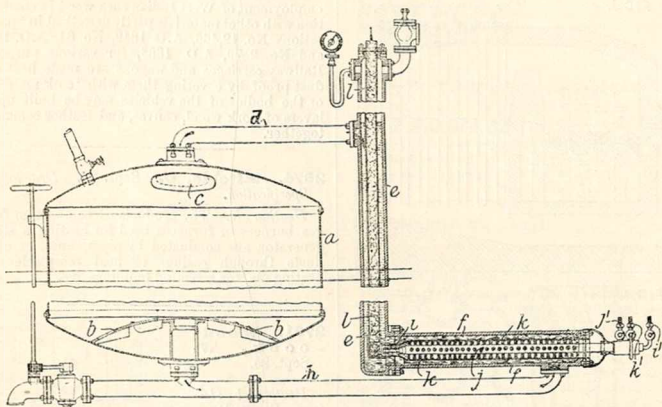
## 2235. Harlow, B. Aug. 2.

*Heating water.*—Relates to boilers which may be employed for heating water for public buildings and for horticultural and other purposes. The vertical pipes or tubes *a* are connected at their upper ends to a drum *b*, and at their lower ends to the hollow ring *c*, which may be connected by a pipe *h* with a hollow ring *f*



supporting tubular or other firebars *g*. The vertical pipes are double, the portion *d* being connected by the passages *e, e*; or the tubes *a* may be of a broad flat form projecting into the furnace. Several other modifications are shown and described in the Specification. The portion *d*, being more exposed to the action of the fire, promotes the circulation of the water. The boiler may be fitted with flow and return pipes. Such boilers may be in brick-work in the ordinary manner, but an additional flue is formed over the top portion of the tubes; or they may be heated by the waste gases from puddling or other furnaces. Such a boiler may also be set partly beneath the end of an ordinary cylindrical boiler, with which it is connected by a pipe or pipes.

## 2243. Smith, J. Aug. 3.



*Heating liquids.*—Relates to means for heating bleaching or cleansing liquid and thus promoting its circulation through kiers for bleaching raw flax, flax yarns, and linen fabrics, or for bleaching and scouring other fabrics and fibrous materials. The material is placed on a grid *b* in the kier *a*, which is charged through a manhole *c*. A pipe *d* leads from the upper part, and a pipe *h* from the lower part of the kier; a pipe connecting the pipes *d* and *h* is heated in order to produce a circulation as indicated by the arrow. In the form shown in the Figure, the liquid is heated by an atmospheric gas burner similar to that described in Specification No. 2636, A.D. 1865, consisting of an inner perforated tube *i*, and an outer perforated tube *j*. Gas and air are supplied to the inner tube by cocks *j*<sup>1</sup>, *k*<sup>1</sup> respectively, and air for combustion is supplied by a cock *i*<sup>1</sup>. The burner is enclosed in a casing *k* in a horizontal limb *f* of the tube which connects the pipes *f* and *h*; the products of combustion pass away by a pipe *l* through the vertical limb *e*. The upper part of the tube *e* is fitted with a gauge and safety-valve.

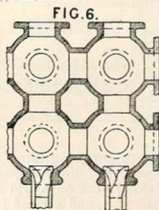
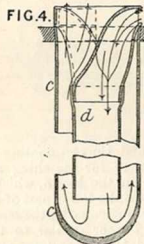
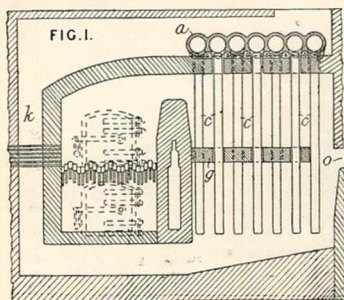
## 2361. Wavish, J. Aug. 17. [Provisional protection only.]

*Heating water for heating glass houses &c.* Over an oil lamp with a metal chimney, and within a casing, is placed a tubular boiler, one of the tubes, which is preferably conical, being immediately over the lamp. The tubes are provided with caps to retard the draught. Flow and return pipes to the boiler are connected with a cistern.

**2500. Graham, H. G.** Sept. 4. [*Provisional protection only.*]

*Heating liquids.*—Relates to apparatus for heating, boiling, agitating, and raising size and other liquids. The size &c. is passed through a spiral tube, which is wound around a straight tube, through which steam or heated air is passed: or two spiral tubes may be used, one within the other. Either of the above forms of apparatus may be enclosed in a steam-tight cylindrical vessel, with tubes communicating from it to the innermost tube. To raise or agitate the size &c., the apparatus is made to revolve in the manner of an archimedean screw.

**2593. Batho, W. F.** Sept. 13.



*Heating liquids.*—Apparatus for heating, evaporating, and cooling liquids is constructed of a horizontal chamber or "coil" with pendant circulating tubes. The pendant tubes may be applied to any description of boiler or apparatus. In the arrangement shown in Fig. 1, the "coil" consists of a cast-metal chamber *a* with a continuous serpentine passage from which the tubes *c, c* depend. A modified form of "coil," arranged in two superposed series, is shown in Fig. 6. Either form may be made in two parts by casting or stamping, the parts being united by flanged joints or otherwise. The tubes are constructed with an inner circulation

tube *d* arranged as shown to an enlarged scale in Fig. 4. They are secured in place by bushes of non-corrosive metal brazed or otherwise attached to their upper ends and screwed into the "coil." Or the tops of the tubes may be made slightly conical so that they form a tight joint in conical holes in a boiler &c. when inserted from inside. The tubes are heated by the gases from a furnace with side doors. After heating the tops of the tubes, the gases return below the partition *g* among their lower ends, and, ascending the flue *k*, pass above the "coil" to the chimney. A supplementary furnace communicating by the flue *o* may be applied in large apparatus.

**2630. Clarkson, T. C.** Sept. 19. *Drawings to Specification.*

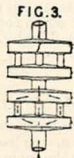
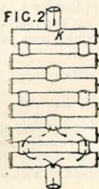
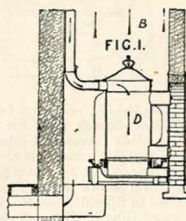
*Non-conducting coverings.*—Consists chiefly in the employment of West Indian cork wood in combination with other materials partly described in Specifications No. 12,466, A.D. 1849, No. 84, A.D. 1856, and No. 2579, A.D. 1863, for various purposes. Railway carriages and wagons are made heat and dust proof by covering them with "cork material," or the bodies of the vehicles may be built up of layers of cork wood, canvas, and leather cemented together.

**2674. Ritchie, C.** Sept. 23. *Drawings to Specification.*

*Heating air.*—The products of combustion from gas burners or furnaces used for heating a steam generator are conducted by pipes, flues, or other ducts through casings or heat receptacles for heating air, for warming buildings, &c.

**2701. Woodcock, W.** Sept. 25.

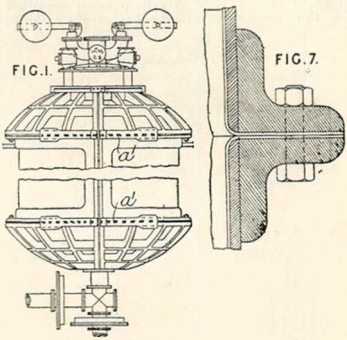
*Heating buildings.*—Stoves *D* are placed in a chamber *B* connected with the building to be warmed and ventilated by flues conveying cool air to, and warm air from, the stove. The heat of the products of combustion is utilized by causing them to pass through a dummy stove or metal drums *I* or pipes *K* attached to the end of the stove pipe, or the stove pipe itself may be enlarged.





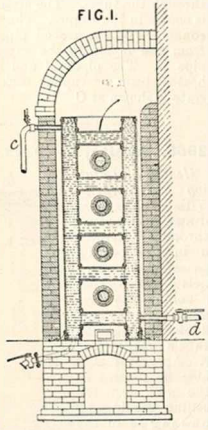
**2760. Allibon, G., and Manbré, A.** Oct. 1.

*Digesters.*—A metal-lined “boiler” or closed vessel for heating various substances under high pressure for the production of saccharine and other products is constructed of flanged sections of wrought or cast iron, sheets of lead or other lining metal being gripped between the flanges, which are bolted together, as shown in Fig. 7. Fig. 1 shows such a vessel constructed of semi-cylindrical section and domed ends. At the corners where four sections meet, the joints are made tighter by the use of clips *a*, *a*, which are bolted to the circumferential flanges and drawn together by screw bolts. Pieces are cut out of the lining plates, where they meet at the corner joints, and replaced by a single piece of the same metal to make a better joint. The apparatus is stated to be specially suitable for use in the conversion of cereal and vegetable substances into saccharine matter in the manner described in Specification No. 552, A.D. 1864. It may also be used for purifying saccharine matter obtained from malt, fruit, cane, or beet-root, for treating fatty matter with acid at a high temperature, or in other chemical operations. A pipe for introducing high-pressure steam to act on the material being treated may be fitted to the vessel.



**2773. Nelson, J. H., and Briggs, T.** Oct. 2.

*Heating water.*—For heating water to be used in steam boilers and other vessels, dye-pans and vats being mentioned, an “auxiliary fluid boiler” is placed in the main flue. It is fitted with cross water-tubes as shown. The water is supplied at *d* and passes through the pipe *c* to the main boiler.



**2780. Spence, W., [Marval, A. C. J. de].** Oct. 3. *Drawings to Specification.*

*Heating liquids; heating by liquid circulation.*—Consists in the application of hot-water coils for heating boilers or for other heating purposes. Three sets of coils are used, the lowest of which surrounds brickwork &c. in a furnace, and the other two are preferably arranged to give two grades of heat. The first coil is filled by a supply

pipe closed by a stopper; the system is fitted with a safety arrangement to allow for expansion, and with a pressure gauge.

**2792. Pinkus, H.** Oct. 4.

*Thermostats.*—Relates to automatic regulators for controlling the supply of liquid fuel, super-heated steam, and heated air to burner apparatus for furnaces, or for controlling the dampers of such furnaces. The regulation is effected by a bimetallic pyrometric bar, and the apparatus may be adapted to a continuous or intermittent supply. The bimetallic bar is fixed at one end and exposed to the heat of the furnace. In the form of apparatus shown in Fig. 1 (Sheet 8), the bimetallic bar (not shown) acts through the lever arm *p* and a segmental rack and pinion *g, h*, to rotate a cylinder *A* on which are mounted a series of projections corresponding to various temperatures, and so arranged that they come successively to the top as the corresponding temperatures are reached. The apparatus being set to act at a particular temperature, the corresponding projection, on coming to the top, moves, transversely, a sliding piece on a longitudinally-adjustable frame above the cylinder. The sliding piece is connected by levers and links as shown with the distributing-valve of a steam cylinder *B*, the piston of which is connected to a lever *e*. This lever operates the supply cocks or damper, and also adjusts the frame above the cylinder *A* so as to bring the transverse sliding piece into position to be acted on in the reverse way by the next higher or lower projection on the cylinder when the temperature has risen or fallen, in consequence of the adjustment, beyond a certain limit. Fig. 3 (Sheet 8) shows another form, arranged for controlling an intermittent supply. The pyrometric bar operates the valve of

the steam cylinder *A* directly, and the piston-rod acts, by means of tappet gear, as shown, to raise a weighted lever *f* until it falls over on the other side, thus opening or closing the supply cocks as

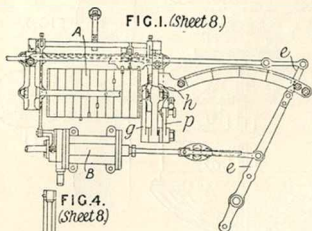
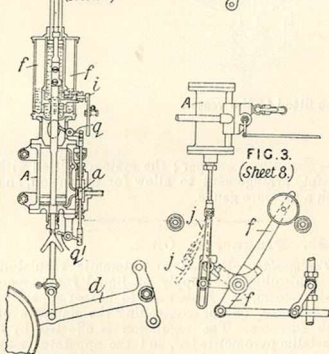


FIG. 4.  
(Sheet 8)



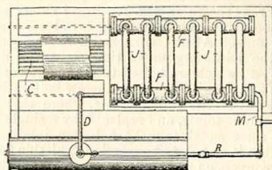
required. By means of the gab lever, shown in dotted lines at *j*, a positive connection may be made between the weighted lever and the piston-rod to convert the apparatus into a continuous regulator. In a third form, shown in Fig. 4 (Sheet 8), the regulator consists of a steam cylinder *A*, the piston-rod of which is connected below to a weighted lever *d*. The up-stroke of the piston is caused to lift the plunger of a cataract *f*. The valve *a* of the steam cylinder is automatically actuated by tappet levers *q*, *q'*, worked by rods connected to the cataract plunger so that the piston is continuously reciprocated at intervals depending on the position of the cock *i* of the cataract, which is adjusted by the pyrometric bar.

**2862. Wright, R. A.** Oct. 11. [Provisional protection only.]

*Heating buildings &c.; heating liquids.*—Consists in using a solution of glycerine in place of water for heating houses and other structures by means of circulation pipes. The solution may be heated by means of friction or by a furnace. In the

former case, the circulation pipes terminate in “a conical coil or box covered with flat rope or “other substance capable of producing heat by “friction.”

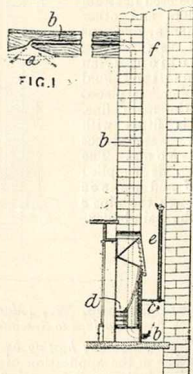
**2890. Bonneville, H. A.,** [Cornell, L. R.]  
Oct. 15. [Provisional protection only.]



*Heating gases.*—Consists, mainly, in so constructing pipes or tubes in which steam or other vapour is superheated that barriers are opposed to the passage of the steam or vapour, and in so arranging them that the steam or vapour to be heated is broken up and caused to strike against the sides of the tubes. At these points the tubes admit of the expansion of the steam or vapour, which is caused to contract on its further passage through the tubes. The arrangement of the tubes is shown in the Figure. The “cylinders” *F, F'* are connected by the arched pipes *J, J*. Steam is led from the boiler to the superheater through the pipe *D*. The pipes *M* and *R* convey the superheated steam or vapour back to the boiler. The grate is shown at *C*.

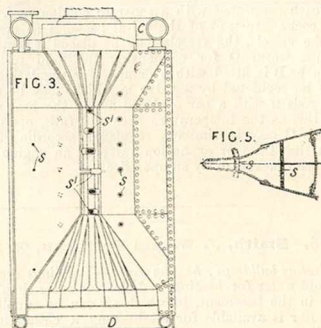
**2968. White, J.** Oct. 22.

*Heating air; heating buildings.*—Vitiated air is withdrawn from a room through apertures *a* in the ceiling, passes along channels *b* to a chamber *c* behind the fire-grate *d*, and is conducted through the tube *e* into the flue *f*. Apertures may also be formed in the wall near the ceiling leading by passages to the chamber *c*, which may, in some cases, be heated by gas or oil burners. Valves to regulate the draught of air may also be employed. The air heated in the chamber *c* may be made to pass around and thereby warm the room before escaping to the flue *f*.



**3000. Fischen, W., and Fischen, D. Oct. 25.**

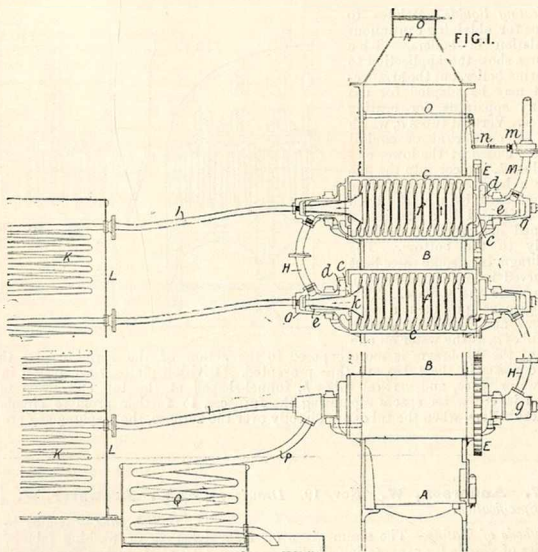
*Heating water.*—A steam or other boiler is constructed of wedge-shaped sections of the form shown in Fig. 5 in cross-section. Fig. 3 shows a longitudinal section of the complete boiler. The cross-sectional area of the inwardly-projecting portion of each section diminishes from the water-line downwards, the spaces between them for the passage of furnace gases being correspondingly enlarged. The sections are supported and connected together by solid or hollow stays  $s, s^1$  which may be supplemented by binding-rings outside. Feed is supplied from a ring D, which may embrace the boiler, and steam is drawn off from a receiving-ring C.



**3148. Brinjes, J. F. Nov. 7.**

*Heating liquids.*

—Relates to apparatus for distilling, also applicable for heating liquids. Fig. 1 shows apparatus for the fractional distillation of liquids. The distilling-vessels C, which are preferably cylindrical, are arranged one above another in a flue or heat chamber B over a furnace A, and are rotated by a main shaft through spur gearing E. The end covers  $c$  of the vessels C are each cast with a duct  $d$ , which communicates with the vessel C and with the hollow shaft  $e$ , and forms a continuation of a spiral or helical passage, formed in the vessel by a spiral rib or archimedean screw  $f$ . The ends of the trunnions  $e$  upon which the vessels C rotate fit into conical cast-metal ground caps  $g$ , connected with pipes H by which the vessels are coupled together, and pipes I leading to the condensing-worms K contained in a water-reservoir L. A mouthpiece  $k$  fits into each trunnion  $e$ , as shown, to convey the products of distillation to the pipes I. The liquid to be distilled is fed into the top vessel C through a pipe M, and after traversing the passage  $f$  passes thence to the lower vessels by the ducts  $d$  and pipes H. The vessels C



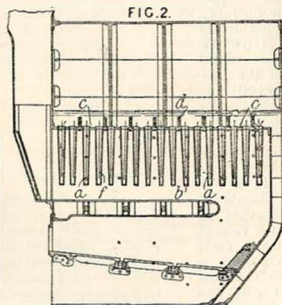
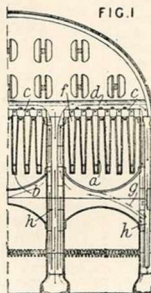
are each connected with a separate condenser from which the distillate may be drawn off by pipes and cocks. Instead of the spiral passages to ensure the liquid travelling from one end to the other of the vessels, the vessels may be placed slightly inclined. A pipe P connects the lowest vessel C with a worm Q for condensing the fluid residuum or "bottoms." The chimney N of the heat chamber B is fitted with a damper for regulating the draught. The supply of liquid to the apparatus may be regulated by a valve *m* which may be rendered automatic by connecting it through levers and rods *n* with a bar *o* placed across the heat chamber, so that the expansion and contraction of the bar, as the temperature rises and falls, operates the valve. The speed of the rotation of the vessels C may be similarly regulated, according to the heat of the furnace, by connecting the bar *o* with the steam or expansion valve of an engine driving the apparatus. The vessels may be heated by steam jackets or by an open fire.

**3155. Smith, J. W., and Petitjean, T.** Nov. 8. [Provisional protection refused.]

*Heating buildings; heating water.*—Buildings are heated by gas made in a producer which is jacketed to hold water for heating, and also by water circulation. The apparatus is placed in a chamber, preferably in the basement, to which air can be supplied for ventilation. The water surrounding the gas-producer is available for establishing a circulation of hot water through pipes to any part of the building.

**3212. Clark, A. M.,** [Barret, L.]. Nov. 13.

*Heating liquids.*—Relates to means for obtaining continuous circulation in boilers. The Figures show the application to a marine boiler, but the arrangement may be adapted for use in any apparatus for heating liquids. Vertical tubes *a*, which may be cylindrical or conical and are closed at the lower end by plugs *b*, project into the flue from a horizontal tube-plate *c* strengthened by ribs *d*. Each tube is divided by a vertical or inclined diaphragm *f* reaching nearly to the bottom. The diaphragm is in some cases bent or curved in horizontal section, to increase the surface. This arrangement produces a continuous and rapid current in the tubes *a*, as the water on one



side of the diaphragm is more exposed to the action of the furnace gases than that on the other, and deposits in the tubes are thus prevented. Division plates *g* are placed in the lower portion of the water space, and vertical tubes *h*, funnel-shaped at the top and made in detachable parts, are placed in the water spaces separating the furnaces, to further promote circulation. In the case of vertical boilers, when the tubes are directly over the furnace, the diaphragms *f* are inclined.

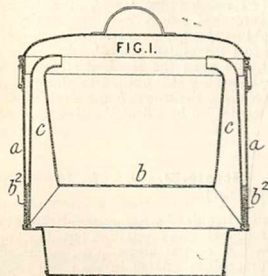
**3277. Anderson, W.** Nov. 19. *Drawings to Specification.*

*Methods of heating.*—The steam given off from a series of vessels for evaporating alkaline or other solutions is led to a steam chest in connection with "apparatus required to be heated."

**3290. Brewster, W.,** [Broun, J.]. Nov. 20.

*Boiling-pans.*—Relates to apparatus for use in boiling or washing fabrics, clothes, &c., and consists of means for circulating the wash liquor through the material. The vessel or vat *a* is fitted with a perforated false bottom *b*, and the space above the false bottom is put into communication with the space below it by tubes *c*, *c*. The false bottom is supported by legs or by a rim *b'*. The circulating tubes *c* may be attached to the

vessel *a* or may be carried outside it, and a double partition may be used.



**3385. Lake, W. R.,** [Dudley, D. B.]. Nov. 29.  
[Letters Patent void for want of Final Specification.]

*Boiling-pans.*—Relates to means for producing the circulation of water or other cleansing-liquid or steam through a boiler for use in boiling or washing fabrics, clothes, and fibres. The boiler is divided into an upper and lower chamber, separated by a perforated and lower partition and communicating with each other by means of tubes which extend from the lower chamber nearly to the top of the upper chamber in which the articles to be washed are placed. The boiler is closed, and is furnished with a safety-valve.

**3395. Newton, A. V.,** [Staples, M. W.].  
Nov. 29. [Provisional protection only.]

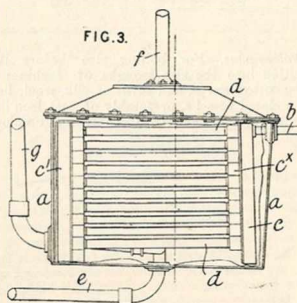
*Boiling-pans.*—A boiler for cleansing clothes is fitted with a perforated false bottom to receive the clothes, and at its sides vertical pipes are provided, which communicate with the space below the false bottom, and with the space at the upper part of the boiler, or above the pile of clothes. To charge the boiler, it is provided with a removable cover which is held in its place against internal pressure. Water is admitted to the space below the false bottom, and when the clothes are in place they may be covered by a loose perforated plate. On the application of heat, the water is forced up the vertical passages and discharged upon the perforated plate, or upon the clothes, whence it passes down through the mass, and again reaches the bottom of the boiler. This action is repeated, so that the circulation is continuous. The cover of the boiler is fitted with a safety-valve.

**3413. Woolfield, J. C.** Dec. 2.

*Heating water* for warming buildings. The boiler is constructed with a horizontal shell of

cylindrical, rectangular, or other form, and an inner flue tube united to it at the front end. The flue tube is divided longitudinally into a lower compartment or ashpit, an intermediate or fire space with doors in front and with a firegrate and dead-plate, and an upper or return flue leading to the chimney &c. The upper division wall may be of firebrick or in the form of a water bridge or space. The back end of the outer shell has a manhole cover for giving access to the boiler for cleaning purposes; in the case of a rectangular shell the manhole may be on the upper part.

**3457. Herring, W. A.** Dec. 4.

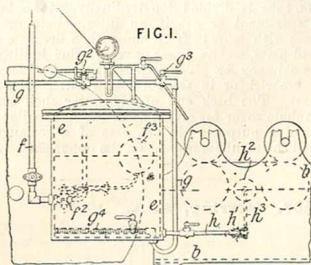


*Heating water.*—Relates to the application of the exhaust steam of high-pressure engines for heating water to warm the building in which the engine is situated. In a closed tank *a* containing water is placed a "coil" *d*, to which the exhaust steam is supplied by the pipe *b*. The pipes are inclined so that the water of condensation falls to the bottom and passes out by a tube *e* and may be returned to the boiler &c. The end boxes *c, c¹* are so arranged that the steam circulates through alternate rows of pipes. The water heated in the cistern *a* flows through the pipe *f* into the heating-apparatus in the building, and returns by the pipe *g*. The "coil" consists of a number of pipes *d* jointed at each end to sockets *c, c¹* by means of two india-rubber rings with a packing of hemp, gold size, and red lead between them.

**3487. Partington, J.** Dec. 7. [Provisional protection only.]

*Heating air; heating buildings.*—At the back of an ordinary fireplace is an air chamber of metal, fireclay, brick, &c. to which cold air is admitted through a pipe with a regulating-valve. The heated air ascends through pipes into the various rooms &c., into which it may be allowed to escape, or the rooms may be heated by radiation.

3627. **Kenyon, J.** Dec. 21.



*Boiling-pans.*—For boiling size before it is admitted into the size troughs of machines for sizing cotton warps, and yarns of silk, wool, linen, &c., a closed vessel *e*, preferably of cast iron lined with copper or entirely of copper, is employed,

connected to the size trough *b* by a pipe *h*. Un-boiled or partially-boiled size is forced into the vessel *e* through a pipe *f*, and, when the required level is reached, a float *f*<sup>3</sup> closes the valve *f*<sup>2</sup>. The cock *g*<sup>2</sup> in a steam pipe *g* is then opened to admit steam to a perforated pipe *g*<sup>4</sup>. The size is thus boiled, and when the required steam pressure is reached the cock *h*<sup>1</sup> is opened to allow the size to be forced into the trough *b*, the level in the latter being controlled by a float *h*<sup>2</sup> acting on a valve *h*<sup>3</sup>.

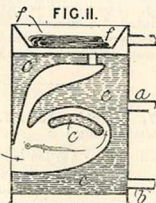
3678. **Steele, D.** Dec. 27. [Provisional protection only.]

*Heating liquids; heating gases.*—Relates to apparatus for heating and agitating liquid or fluid substances. A central steam pipe, connected with arms or a coil, is rotated in the vessel containing the substance under treatment. Steam is admitted at one end of the pipe and discharged at the other. A steam trap may be used to receive the condensed water. The coils may be perforated. Stationary pipes may be employed in a similar manner.

A.D. 1868.

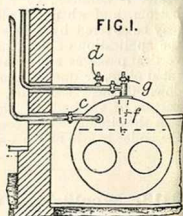
146. **Brooman, C. E.,** [Jacquet, F. A.]. Jan. 16.

*Heating water for baths.* Fig. 11 shows a gas water-heater for baths; the water enters by the pipe *a* and leaves by the pipe *b*, and fills the whole of the space *c*. A vessel *f* may contain towels &c. to be warmed.



161. **Burrows, S., and Burrows, E.** Jan. 17.

*Heating buildings.*—Steam heating-pipes are so arranged that the water of condensation is automatically returned to the boiler. An inverted hollow cone *f* is fixed to the top of the boiler by a flange. The apex of the cone terminates in a small tube, which extends below the low-water level. The heating-pipes are arranged to take a

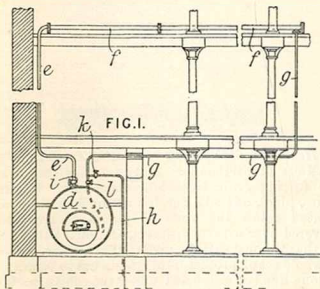


direct course through the building, and are preferably constructed of a small diameter. Steam is admitted to the pipes through a cock *c*, the valve *d* being open to admit of the escape of air. The valve *d* is then closed, and the water of condensation, being urged downwards by its own weight, passes through the cone into the boiler. This result may also be obtained by gradually reducing the internal diameter of the return pipes. A blow-off cock *g* is provided for maintaining a clear passage through the cone to the boiler.

**208. Havell, C. R.** Jan. 21. [*Provisional protection only.*]

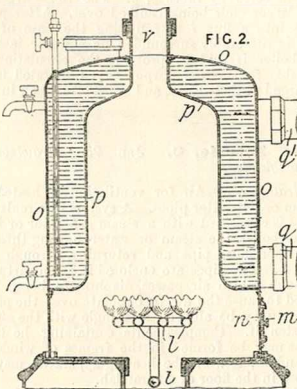
*Heating water for baths &c.* A closed metal chamber, submerged in the water, contains a burner, preferably formed of a coiled tube perforated on its upper and lower sides. The gas tube passes out through an inclined outer tube, which projects above the water level to admit air for combustion. A central chimney rises above the water. Charcoal or other fuel may be used instead of gas.

**237. Oram, W.** Jan. 23.



*Heating buildings &c.; heating by steam circulation.*—Relates to steam apparatus for heating buildings, glass houses, drying-cylinders, &c. A tube *e* conducts steam from the boiler or generator *d* into larger pipes *f*, laid in the various compartments of the building &c., and connected again with the boiler, as shown, by a small pipe *g*, considerably less in bore than the tube *e*. By this means a constant circulation is maintained. When steam is first turned into the pipes, the tap *k* of a discharge pipe *h* is opened simultaneously with the tap *i* of the steam pipe *e*, and is kept open until any water which may have accumulated in the pipes has been discharged, whereupon the tap *k* is closed and the tap *l* of the return pipe opened, so that the steam is enabled to circulate.

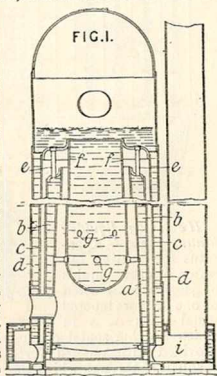
**239. Hodge, H.** Jan. 23.



*Heating water.*—Relates to boilers heated by gas for supplying hot water for heating buildings. Two concentric domes *o* and *p* are secured together steam-tight, and the intermediate space is filled with water which circulates through pipes *q*, *q'* and the hot-water pipes in the building &c. The gas jets *l* are placed within the cylinder *p'*. They are lit at the door *m*, which slides over a wire-gauze sheet *n* through which air is admitted, if required. The air enters from an opening *i* under the floor, and the products of combustion and heated air are carried outside the building by the flue *v*.

**246. Allibon, G., and Manbré, A.** Jan. 23.

*Heating water.*—Relates mainly to steam generators, though the invention is applicable also to boilers for heating water for manufacturing, sanitary, and other purposes. Two concentric annular water chambers, with a flue space between them, are arranged as shown, the inner one *a*, *b*, which is open at the top, forming the firebox, and the outer one *c*, *d* being surmounted by a domed steam and water space. Tubes *e*, *e'* connect the upper water space



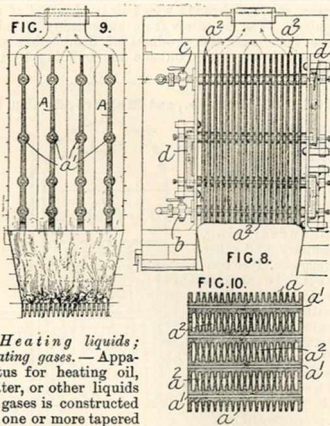
with the inner annular chamber, and a water chamber *f* depends into the firebox, with which it is connected by tubes *g, g*. The tubes are made slightly tapered, and are screwed into the plates, the larger ends being caulked over. After passing through the annular flue space, the furnace gases pass into a flue *i* surrounding the base of the boiler, whence it escapes by the chimney. The flue is preferably surrounded by a water jacket in which the feedwater is heated. This construction of boiler is said to promote the circulation of water. A modified form of boiler, more especially suitable for marine purposes, is illustrated in the Specification, in which the annular chambers are enlarged at their bases, and are shorter than in the construction here shown.

**265. Ritchie, C.** Jan. 25. *Drawings to Specification.*

*Heating air.*—Air for ventilation is heated by steam or hot-water pipes. A system of circulating pipes is connected with a steam generator or hot-water boiler, the steam or water flowing through the uppermost pipe and returning through the lowest. The pipes are enclosed in a compartment through which air passes, diaphragms being provided to cause the air to circulate over the pipes. Steam may be allowed to mingle with the air to moisten it. Compartments containing heating-pipes may be formed in the frames of windows, verandahs, &c., or the heating-apparatus may be placed in the floor of a verandah.

*Heating water.*—Metal rods or heat-conductors project from a boiler into the furnace which heats it, to assist the conduction of heat to the water.

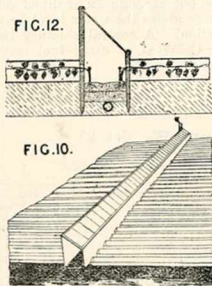
**272. Wirth, F.,** [Möller, P. C., and Walter, F.]. Jan. 25.



*Heating liquids; heating gases.*—Apparatus for heating oil, water, or other liquids or gases is constructed of one or more tapered metal walls *A, A* in which are horizontal channels *a<sup>1</sup>* and which are provided with tapered vertical gills *a* forming channels *a<sup>2</sup>* through which the hot gases pass. The liquid &c. to be heated enters by a cock *b*, passes

through the lower horizontal channel *a<sup>1</sup>*, through the connecting-piece *d*, then through the next horizontal channel, and so on, finally flowing out through the upper cock *c*. Near the furnace the gills or divisions *a* are formed thicker, and the horizontal channels *a<sup>1</sup>* are placed closer together.

**279. Rendle, W. E.** Jan. 27.



*Heating buildings &c.*—Relates to frames or shelters of earthenware and glass for protecting or forcing fruit trees and vegetables. Heating flues, pipes, or tanks for hot air or hot water are placed below the rows of plants or trees and covered over with sand, gravel, or similar substances so that the heat shall be given out gradually. When a whole set of protectors or frames has to be heated, a long flue is constructed under the centre portion having separate branch flues running right and left under each protector. At the end of each branch flue is a valve or damper, by means of which the temperature of any frame may be regulated so that it is possible to keep up a constant succession of fruit by bringing forward the protectors or frames one after the other. Other structures may be similarly heated.

**293. Hydes, T., and Bennett, J.** Jan. 28. [Provisional protection only.]

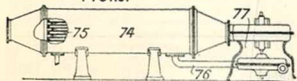
*Heating gases; heating liquids.*—The conduits or tubes through which the heating-medium or the liquid to be heated passes have guides to direct the liquids or gases on to the



surfaces thereof. In the case of a vertical furnace, flue guides are fixed inside the flue with horizontal partitions which cause the gases to follow a circuitous path. Chambers are formed on the outside of the flue through which cold air or water circulates. Flat surfaces may have similar guides or directing-plates.

360. **Weems, J., and Weems, W.** Feb. 3.

FIG. 16.



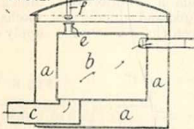
*Heating air.*—Air is heated for use in drying &c. by passage through tubes 75 fixed in metal ends in a cylindrical metal case 74 to which steam is introduced by a pipe 76. The waste steam of the steam fan 77 which forces the air through the apparatus, or the exhaust steam of a steam engine, or superheated steam, may be employed.

372. **Jones, R. A.** Feb. 4.

*Heating air.*—

Relates to means for heating air for ventilation. Fresh air is admitted by the pipe *c*, and is heated in its passage through a chamber or series of pipes *b*. The chamber *b* is enclosed in an outer vessel *a* containing water, and a valve *e* is provided by which steam from the outer chamber may be admitted to the inner chamber for the purpose of moistening the air. The outer chamber may contain sand or hot air instead of water. The air may be heated by hot-water or hot-air pipes in connection with a stove; or a gas or other burner may be placed beneath the vessel *a*, and the outer vessel may be connected with a circulating system of hot-air or water pipes. The air passages are provided with valves or dampers.

FIG. 2.

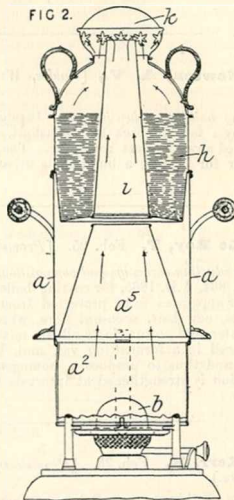


532. **Hinks, J., and Hinks, J.** Feb. 18.

*Heating water.*—Relates to oil-heated apparatus which also serves as a stove and a lamp for lighting. The body of the stove consists of a hollow perforated metal cylinder *a* fixed upon a glass cylinder *a*<sup>2</sup> with a perforated metal bottom through a hole in which the burner *b* passes. On the top of the cylinder *a* a hot-water boiler or reservoir *h* is fitted, having a conical flue *i* rising through it connected with *a*<sup>2</sup> by a hollow cone *a*<sup>5</sup>. A perforated cover *k*

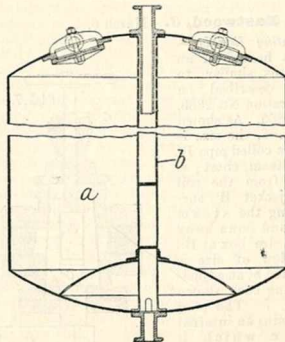
may be placed over the boiler and the flue to allow the hot gases and steam to escape and warm

FIG. 2.



the room. An oven or a combined boiler and steamer may be substituted for the boiler.

543. **Beeley, T.** Feb. 19.



*Kiers.*—A flanged perforated wrought-iron pipe *b* is introduced into the interior of kiers which are

subjected to pressure. This pipe reaches from one end to the other of the kier *a*, and the flanges are attached or riveted to the end plates, thus forming a strong stay and preventing explosion. The pipe is vertical and central in the kier, and is perforated to admit the steam or liquor.

**594. Newton, A. V.**, [Nobles, W. H., and Nobles, M. V.]. Feb. 22. [Provisional protection only.]

*Heating buildings; heating air.*—In steam-boiler or other furnaces the products of combustion are forced by a fan &c. back to the ashpit. The fan casing is fitted with a pipe from which the gases may be led away to heat rooms &c. The masonry surrounding the boiler is lined with pipes through which air for heating a building is driven by a fan.

**619. Le Roy, F.** Feb. 25. [Provisional protection only.]

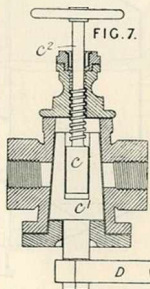
*Non-conducting coverings and compositions.*—Relates to compositions such as are described in Specification No. 864, A.D. 1865, for coating boilers, steam pipes, charcoal filters, pumps, cylinders, water pipes, and other apparatus to be protected from heat or cold. Brick clay, powdered charcoal, sawdust, fuel sweepings, cow hair, coco-nut fibre, wheat flour, yeast, residues from the conversion of starch into sugar, water, and cotton foots oil, are mixed by stirring in a suitable vessel. The mixed substances are then placed in a fermenting vat, and, by being exposed to a certain temperature, are caused to ferment and thus to produce a homogeneous self-adhesive substance. For covering boilers &c. the composition is strengthened at intervals by hoop iron secured by screws.

**636. Kerr, E.** Feb. 25. [Provisional protection only.]

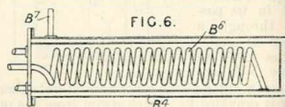
*Heating buildings &c.*—Relates to means for heating conservatories and the like. A trough or vessel containing water &c. is placed in the conservatory, and steam or hot air or gases passed through pipes or passages in it. The water is thereby evaporated, warming and moistening the atmosphere. Hot air is also introduced by fans &c.

**777. Eastwood, J.** March 6.

*Heating liquids.*—Size is heated in an apparatus similar to that described in Specification No. 2883, A.D. 1865. As shown in Fig. 6, the size is fed to a coiled pipe *B'* in a steam chest; it passes from the coil to a jacket *B'* surrounding the steam chest, and flows away to the size box at *B'*. The flow of size is regulated by an adjustable plug cock, shown in Fig. 7. The plug *c'* contains an internal plug *c* which is adjusted by a screw spindle *c'* and hand-



wheel. The cock is actuated by a lever *D* driven from a countershaft through bevel gearing, a crank, and pin-and-slot mechanism, or through an eccentric &c. Or the supply of size and steam is



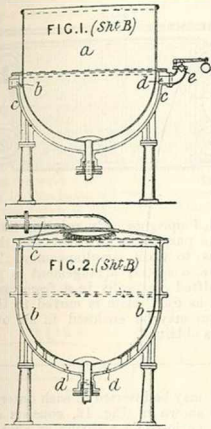
regulated by a piston valve operated by the pressure in the steam pipe transmitted through compound levers, or by a thermostatic arrangement in which mercury is used or by a float apparatus.

**936. Lane, J. E.** March 19. [Provisional protection only.]

*Heating water.*—Relates to hot-water apparatus for heating churches, greenhouses, &c. A boiler for heating buildings is constructed of a number of oblong water chambers placed one above the other, with intervening flue spaces along which the flames from the furnace circulate. The boiler may be enclosed in a non-conducting covering, and is connected with circulating pipes.

1082. Walker, A. B. March 30.

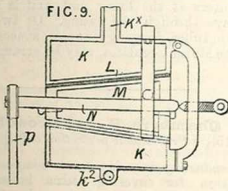
*Heating liquids; boiling-pans.*—Consists in the application of a hot-air blast for heating wort, oils, water, or other liquids. The blast is preferably heated as described in Specification No. 2416, A.D. 1865. Fig. 1 shows one form of boiling-pan heated by hot air. The pan *a* is fitted with a jacket *c*, which the air enters at *b*; the air passes round the pan, and is discharged at an outlet *d* fitted with a weighted valve *e*. The pan is discharged by a bottom pipe. Or, as shown in Fig. 2, the pan is completely enclosed in a casing *b*; the air enters from a pipe *c* and is discharged upon the surface of the liquid; it escapes by apertures *d*. Or the air may first pass through a worm immersed in the liquid, and then be discharged on its surface.



1088. Allen, W. March 31. [Provisional protection only.]

*Steam traps.*—The float is fitted with a taper plug which fits into the end of the outlet pipe when the float rises, thereby shutting off the escape of water. A weighted lever or spring is applied to the air valve in the lid of the steam trap to hold the air valve open till the air has escaped. The pressure of steam closes the valve again when it enters the steam trap.

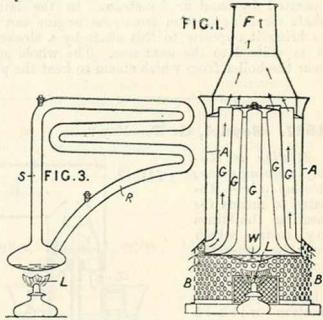
1201. Wright, R. A. April 9.



*Heating buildings &c.; heating by liquid circulation; heating liquids.*—Consists in the application

of a heated solution of glycerine, preferably of about 16° Bc., for heating baths, carriages, buildings, &c. by a system of circulating pipes. The glycerine may be heated by a furnace &c., or by the friction apparatus shown in Fig. 9. The glycerine enters by a pipe *k*<sup>2</sup> a chamber *K* in which is a conical recess *L* in which revolves a cone *M* covered with flat rope &c. The rope rubs against the inner surface of the recess *L* and heat is produced by the friction. The heated glycerine passes away to the circulating-pipes through a tube *K*<sup>x</sup>. In the case of railway vehicles &c., the spindle *N* is driven by a band *p* from one of the wheel axles.

1250. Johnson, J. H., [Johnson, J.]. April 16.

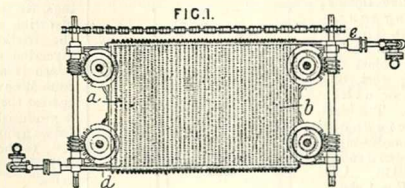


*Heating by steam circulation; heating air; heating buildings &c.; heating liquids.*—Relates to heating-apparatus for heating air for ventilation &c. and for other heating purposes, in which a small quantity of water &c. is contained in a closed vessel or coil of pipes and is heated by an oil or gas lamp or fire. The steam is used to heat air tubes passing through the vessel, or a liquid through which the coil passes. Fig. 1 shows an arrangement for heating air for ventilation or for heating a room &c. A lamp *L* in a perforated casing *B* heats a vessel *A* in the lower part of which is a depression containing water *W*. A ring of air tubes *G* passes through the vessel *A*. The water condensed from the steam runs back down the tubes to the bottom of the vessel. The heated air passes off at *F*, and may be led away to other rooms &c. In a modification, the depression is fitted with a vertical pipe leading to a separate vessel heated by the lamp &c. Fig. 3 is a diagrammatic view of an arrangement with coiled pipe *R*, *S* for general heating-purposes. The condensed water runs back into the heated vessel. The water may be replaced by ether &c., or by a saline solution when oils &c. are to be heated. The vessel or coil of pipes may be exhausted of air.

1343. **Brown, C.** April 24.

*Heating by steam circulation.*

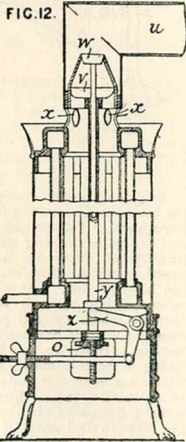
—Relates to surface apparatus applicable for various heating operations. The apparatus consists of a number of plates *a* set in a vertical frame one above the other. These plates are perforated with transverse channels *b*, each channel opening at each end into a longitudinal channel or pipe *d*, *e*. Steam can by this means be passed through the plates to heat them. The plates are supported by threaded collars mounted on threaded uprights. By rotating these collars the plates can be raised or lowered. Suitable gearing for the purpose is provided, and the collars supporting each plate are all geared together as shown, so as to work simultaneously. The gearing may be operated by hand or by steam. In the latter case, a special arrangement is provided by which a shaft receiving motion from the engine can be shifted vertically in a frame which carries it so as to bring it opposite to a sleeve or, and, as each plate is moved to the position required, it is shifted to the next one. The whole apparatus may be enclosed in an oven, and may be set over the boiler from which steam to heat the plates is obtained.



1527. **Seydel, G. T.** May 9.

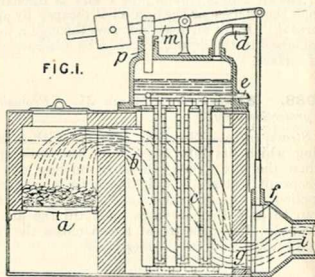
*Heating buildings; heating water; heating air.*

—Relates to means for heating buildings by steam, which may be generated in a series of water tubes placed in a chamber in connection with a cooking-stove or fireplace. This arrangement, shown in Fig. 1, is applicable also to hot-water heating-apparatus &c. A series of depending tubes, closed at the bottom by welding, are attached at the upper end to a container. Steam or water rises through the pipe *d* and the water of condensation returns by the tube *e*, and passes down through inner tubes, discharging at the lower ends of the pendent tubes. Or the generator may consist of a number of tubes closed at top and bottom with branches near the upper end to let the steam pass away. The feed-water pipes pass through the upper end to the bottom, or may be introduced at the bottom of the tubes. To increase the circulation of water, one or more concentric tubes with distance-pieces



may be inserted in each outer tube. The radiator, shown in Fig. 12, consists of a series of pipes enclosed in a casing of sheet iron &c., and connected by T-pieces, elbows, &c., through which the

steam circulates. Air controlled by a throttle valve enters at the lower end, and is heated in its passage through the casing. Or two or more concentric tubes, forming annular spaces through which the steam circulates, may be arranged in the casing.



steam circulates. Air controlled by a throttle valve enters at the lower end, and is heated in its passage through the casing. Or two or more concentric tubes, forming annular spaces through which the steam circulates, may be arranged in the casing.

1596. **Chambers, S., and Broadhead, C.** May 15. [Provisional protection only.]

*Non-conducting coverings and compositions.*—A composition for covering steam boilers, steam cylinders, and steam pipes is formed of a mixture of gannister, oak bark, cow or other hair, and tar. The pipes are first bound with hay or straw, on

which the composition, of the consistency of cement, is applied by a trowel &c.

1621. **Billington, E., and Jolley, W.,**  
 [Schaeffer, B. A., and Budenburg, C. F., partly].  
 May 18. [Provisional protection only.]

*Steam traps.*—A vessel communicating with the pipe to be drained by a flexible pipe is balanced at one end of a lever, and is provided at its lower end with an outlet valve with a projecting spindle. Water accumulating in the balanced vessel causes it to descend, and the valve is lifted by contact with a fixed stud. An air valve is also provided.

1639. **Griffen, T.** May 19.

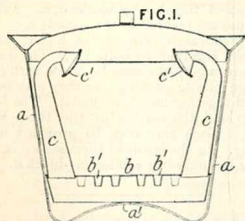
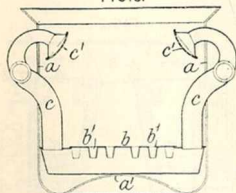


FIG. 3.



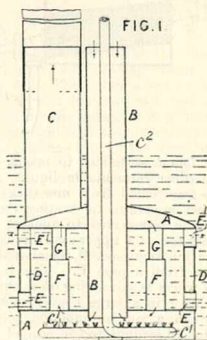
*Boiling-pans* for domestic and other washing. The washing-vessel *a*, Fig. 1, has a concave bottom *a'*, so as to form a channel round the lower part of the interior of the vessel. At a short distance from its bottom is a perforated plate or loose bottom *b*, which is provided with packing to prevent the passage of liquid between its periphery and the sides of the vessel. Each perforation in the plate has a short conical tube or deflector *b'* pointing downwards. The apparatus is provided with tubes or passages *c* communicating with the interior of the vessel below the loose bottom, and terminating in the form of roses *c'* within the upper portion of the vessel. These tubes, which are furnished with cocks, may, in some cases, be so bent as to form handles whereby the vessel may be lifted and carried. The vessel is filled up, to a

short distance above the loose bottom, with washing-liquid, and the clothes are placed on the loose bottom. On being heated, the liquid is discharged from the roses on to the clothes, and passes through them to be again heated, thus establishing a continuous circulation. If the circulation in the tubes be stopped by closing the cocks, the liquid in the bottom of the vessel will be forced upwards through the conical tubes, and thus the action of the liquid can be reversed. Fig. 3 shows a modified arrangement of the tubes &c.

1654. **Jones, D., and Jackson, J.** May 20.  
 [Provisional protection only.]

*Footwarmers.*—Relates to footwarmers heated by lamps, gas, or candles, and applicable for use in railway or other carriages, churches, &c. The flame of the gas &c. is enclosed in a chamber or box with air-supply apertures, preferably covered with wire gauze. A lamp burning spirit from sponge or other absorbent is preferably used. Above the flame is arranged a metallic plate or distributor, by which the heated products are diverted towards the sides of the chamber. Above the distributor is a wooden grating which may be removed for lighting. The lid of the box may be supported by brackets, and the feet are placed on the grating.

1656. **Havell, C. R.** May 20.



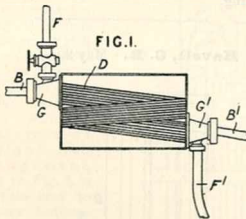
*Heating liquids.*—Relates to apparatus for heating water for baths &c., applicable also for heating other liquids. A vessel *A* is immersed in the water to be heated, and is provided with a ring gas burner *c'* supplied by a pipe *c''* passing down the air inlet shaft *B*. In the vessel *A* is a cylindrical chamber *D* through which the water to be heated circulates by passages *E*, *E'*. An annular

flue space F increases the heating-surface, and tubes G carry off the products of combustion to the chimney C, which is also used for igniting. Tubular stays may be employed, or two concentric annular water spaces, connected by radial tubes and heated by a ring burner, may be used. Oil or spirit may be employed in place of gas.

**1729. Morgan, J.** May 26. [Provisional protection only.]

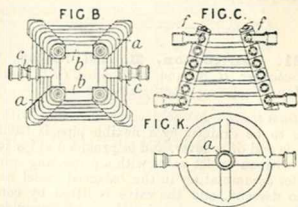
*Thermostats.*—The regulation of the temperature of conservatories, rooms, &c. is accomplished by a thermometer, the mercury of which is included in a galvanic circuit when it rises to a predetermined degree. On the mercury making contact with a wire in the thermometer tube, the circuit is closed through an electromagnet, the armature of which opens a window or ventilator. The window &c. is balanced so as to close by its own weight when the temperature falls, a dash-pot preventing concussion.

**1897. Des Chénes, E. P. J. L. T.** June 10.



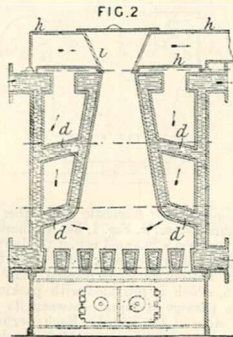
*Heating liquids.*—Relates to means for heating wines and other fermentable liquids as they are bottled or transferred from one cask to another. Fig. 1 shows apparatus for heating the liquid by steam as it is transferred to another cask. The liquid passes from the upper cask through a flexible pipe B to a junction piece G, which is also supplied with steam from a pipe F. The liquid passes through a worm D, consisting of a number of tin tubes enclosed in a large copper pipe, and runs away through a similar junction piece G' to a flexible pipe B' leading to the second cask. The steam passes off by a pipe F'. In another form, for heating wine &c. for bottling, the worm passes through a tank of hot water heated by a furnace &c., and the liquid afterwards is run through a second worm in a cooling-tank for regulating the temperature.

**1942. Dennis, T. H. P.** June 13.



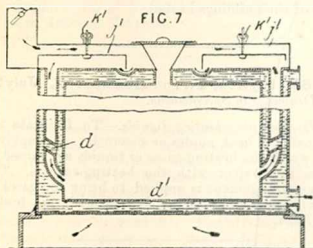
*Heating water.*—A tubular boiler for heating hot-water pipes &c. is formed of a series of metal tubular rings, any number of which may be connected together by suitable means. One form is shown in plan in Fig. B. The tubular rings *b, b* are connected together by blocks *a, a*. Inlet and outlet pipes are secured to the sockets *c, c*. Fig. C shows a vertical section of the boiler, the rings being held together by bolts *f, f*. The joints of the connecting-blocks may be made with cement, lead, or an elastic packing; or they may be faced and fitted together metal to metal. The form of the rings and the section of the tubes may be modified. Each ring may be provided with an inner ring. In the modified form shown in Fig. K, each ring has only one connecting-block *a*.

**2021. Johnson, C.** June 23.



*Heating liquids.*—Relates to boilers for heating and circulating water and other liquids for heating buildings &c. The boiler consists of two cylindrical or conical water chambers, one within the other, the annular space between them being traversed by one or more connecting-tubes *d*. Fuel is fed through a hopper *i* in the cover *h*, and

the gases escape through the annular space and through passages in the cover *h* to the chimney. A hollow water grate is preferably employed, consisting of a water chamber traversed by conical



holes as shown in Fig. 2, or of horizontal water tubes *d'* as shown in Fig. 7. Such a grate may be applied to any form of boiler, and it may itself constitute a boiler, in which case fuel is burnt on it, and the gases are drawn downwards through it. The boilers shown may be worked with upward or downward combustion. In another form of boiler, similar to that shown in Fig. 2, but with thinner water chambers, and with a single series of connecting-tubes at the bottom of the inner chamber, radial flues or passages pass from the throat of the fuel chamber through the upper water space to the escape flues.

2081. **Baxter, W., Waring, D., and Wooller, J. S.** June 29.

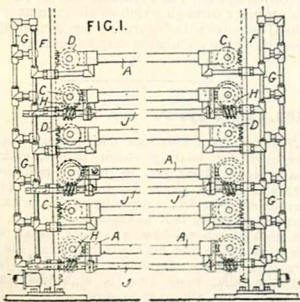


FIG. 1. *Heating liquids.*—Relates to drying-apparatus which may be used for heating liquids by immersing it in the liquid to be heated. Pipes A, A' are

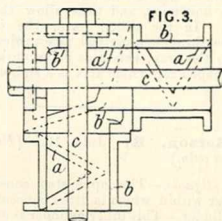
arranged in rows, which may be fixed to a supporting-frame or may be mounted so that they can be raised or lowered by toothed wheels D gearing in racks on the vertical supports F and operated by shafts J and worm gearing. Steam, hot water, or air is circulated through the pipes, inlet and outlet pipes being provided at G, G.

2089. **Drechsler, F. J.** June 30. [*Provisional protection only.*]

*Heating liquids.*—Relates to boilers heated by a fireplace or by gaseous fuel. The flues pass through the boiler in a sinuous course, and are constructed in two parts with flanges so that they may be fitted one within the other.

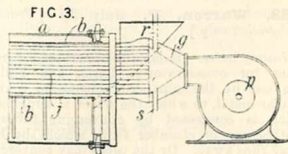
*Heating air.*—Air-heating ovens may be arranged between the flues and the water spaces of the boiler.

2091. **Bower, G.** June 30.



*Heating water.*—Relates to the construction of tubular boilers for heating water for heating buildings &c. The tubes *a* are of triangular or other section, and have at each end a cylindrical boss *b* with circular flanges. Any number of these tubes are secured together vertically or horizontally by bolts *c* passing through the circular bosses, and the joints are made water-tight by fireproof cement. The corner tubes *a'* with bosses *b'* are made rather larger.

2176. **Creasy, W.** July 9.



*Heating air.*—In apparatus for drying grain, malt, &c., in which a cylinder *a* revolves upon a

fixed tube *b*, air, which is forced by a fan *p* into the tube *b* and through hollow perforated blades *g* into the material, is heated by tubes *j* connected by a cone-shaped piece *g* to which steam is supplied by a tube *r*. Water of condensation is drawn off through the tube *s*. In some cases, instead of the steam, products of combustion from a specially-constructed stove are passed through the tubes *j*.

**2220. Farwell, W. B.** July 14. *Drawings to Specification.*

*Steam traps.*—In a system for heating a railway train by steam from the blast pipe of the locomotive or from a small boiler, the water of condensation which accumulates in the train pipes is automatically discharged by steam traps, two forms of which are described. In one form, the trap is provided with a float valve consisting of a hollow ball which is pressed down upon the discharge opening by the steam pressure until sufficient water has accumulated to cause it to rise by its buoyancy, and thus allow the water to escape. In the other form, the discharge takes place through a vertical pipe projecting upwards into the trap, this pipe being covered over by a bell-shaped cap which acts as a siphon.

**2239. Berson, R.** July 16. [*Provisional protection only.*]

*Heating liquids.*—The apparatus consists of a tin cylinder within which is fitted concentrically a smaller cylinder. This inner cylinder is supported on a horizontal partition near the bottom of the outer cylinder. It contains burning charcoal, and matters to be baked or boiled are contained in the space surrounding it. The part of the partition constituting the base of the inner cylinder is perforated. The outer cylinder may be divided into compartments; these are fitted with covers, or there is a single cover. The draught is increased by fitting a chimney to the inner cylinder. Air is supplied by perforations in the casing or by tubes from bellows acting on "the principle of the wheel and axle, moved by a weight with cord or the spring with lever."

**2288. Warren, F.** July 21. [*Provisional protection only.*]

*Heating water.*—Relates to apparatus for heating water for conservatories, baths, and buildings. The base of the apparatus consists of a ring of tubular metal, to which the water is supplied, and which is connected by converging tubes with another ring or chamber from which the heated water runs away. Or the tubes may converge to a point in the centre. The boiler thus formed is placed in a fire chamber in a metal casing lined with firebricks. Perforated bricks are used where

required, "together with the perforated plates as arranged upon Smith's principle of combustion." The boiler is covered in with firebrick, a passage being left for the products of combustion. A reservoir may be placed on the top of the heater, to contain feedwater or water for moistening the air of the buildings heated.

**2363. Hydes, T., and Bennett, J.** July 28. *Drawings to Specification.*

*Heating air; heating liquids.*—To facilitate the transfer of heat, guides or channels are employed by which the heating gases or liquids are caused to pass in contact with the heating-surface. The same arrangement is applied to bring the gases or liquids to be heated in contact with the heated surfaces.

**2408. Kittoe, G. D., and Brotherhood, F.** July 31. [*Provisional protection only.*]

*Heating liquids.*—Relates to apparatus for cooling wort or other liquids, applicable also for heating or tempering liquids by exposing them to the influence of a hotter liquid. The wort &c. circulates through rows of horizontal tubes arranged in tiers one above the other and so connected that the liquid passes from the top through each single tube, successively. The tubes are surrounded by larger tubes, and a cooling-liquid circulates from the bottom through the annular spaces between the tubes. A portion of the wort &c. may be caused to trickle over the surfaces of the outer tubes and be collected in a vessel below. The tubes may in some cases be arranged vertically or inclined. Doors formed with partitions are provided at the ends of the apparatus, to form channels connecting the tubes and to admit brushes &c. for cleaning. The apparatus may be employed in a chamber through which an air current is sent. When employed for warming or tempering the direction of the circulation may be reversed.

**2492. Le Roy, F.** Aug. 10.

*Non-conducting coverings and compositions.*—A compound for coating steam boilers, cylinders, steam pipes, filters, &c. to prevent radiation of heat, and pumps, pipes, &c. for water to protect them from frost &c., is made by mixing brick clay, charcoal, sawdust, fuel sweepings, cow hair, coconut fibre, starch residues, and flour, yeast, or the like with water and oil. After stirring the mixture is allowed to ferment. In covering boilers and the like, hoop iron is embedded in the composition, to allow for expansion.



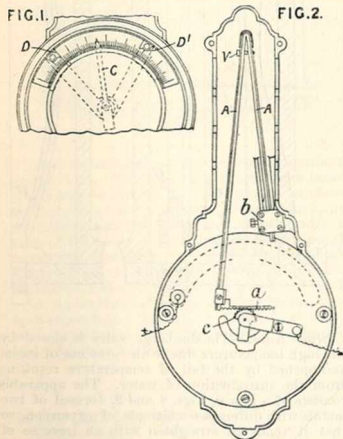
- 2560. Smith, A.**, [Smith, R.]. Aug. 17.  
*Drawings to Specification.*

*Boiling-pans.*—In apparatus for manufacturing sugar, the cane juice is heated in a series of rectangular pans having corrugated bottoms, the corrugations being connected by a channel to allow of draining the pans.

- 2602. Haigh, T.** Aug. 21. *Drawings to Specification.*

*Boiling pans.*—A hemispherical strainer of metallic gauze &c. is distended on a frame, and provided with horizontal arms, the outer ends of which are jointed to the base of the hemisphere, their inner ends being fitted with spring claw points which take into the throat of the discharge pipe of a pan for wort &c. The strainer may be suspended on a goose-neck crane &c. by which it may be applied to or withdrawn from the discharge pipe.

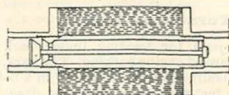
- 2733. Newton, W. E.**, [Fournier, J. B. N., and Lemaire, C. A.]. Sept. 4.



*Thermostats.*—Relates to thermometers in which a compound metal blade is used, and consists in combining therewith appliances for indicating changes of temperature, or for regulating gas or other heating apparatus. A compound metal blade A, fixed at *b* and regulated by a screw *e*, is provided with a toothed rack *a* which gears with a sector *c* on the indicating-finger C. The finger C moves over a dial provided with two adjustable

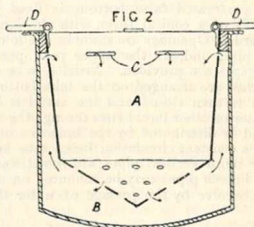
stops D, D', and both the finger and the stops are placed in circuit with an electric battery. When it is desired to maintain a temperature of from, say, ten to twenty degrees, the stops are placed on

FIG. 6.



the numbers ten and twenty on the dial. If the temperature varies beyond these limits, the finger C comes into contact with one of the stops and completes the circuit, which operates a bell or other signalling-apparatus, or operates the valve of a gas-heating apparatus through an electromagnet, or through a solenoid or bobbin as shown in Fig. 6. The core is formed of an iron tube or a copper tube surrounded by soft iron wire.

- 2757. Walker, J. C.** Sept. 7.



*Boiling-pans.*—Coppers or boilers for use in washing clothes, fabrics, &c., for obtaining extracts from organic matter, and for other purposes consist of a vessel B in which is supported a vessel or "circulator" A having a perforated conical or other bottom. Drop handles D are provided by which the vessel A may be put in and taken out. A cone or a false bottom of open wirework, upon which the articles to be treated are spread, may be placed in the vessel A. In action, a volume of steam rises and penetrates through the articles from below, while streams of water and steam are forced through openings *c* and projected on to the articles from above. More than one inner vessel may sometimes be provided.

- 2791. Tragheim, S.** Sept. 10. [Provisional protection refused.]

*Boiling-pans.*—An inverted perforated pan or flanged disc made of copper or other metal is supported inside the pan on hollow feet and is fitted

at its centre with a tube, closed at the top but open at the bottom, and having inclined hollow arms attached through which the boiling liquid is discharged upon the clothes &c.

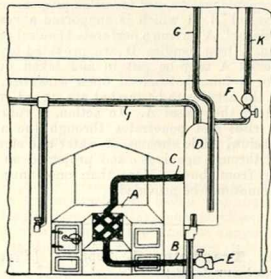
**2814. Turner, E.** Sept. 12.

*Boiling-pans* for treating linden bark for the manufacture of engine packing. The bark, together with an alkaline solution, is placed in a boiling-pan about ten feet square and five feet deep, having a perforated false bottom under which are placed, say, four coils of steam pipe to supply the necessary heat. The circulation is improved by passing the steam from the heating-coils into a central vertical pipe rising from the false bottom to about one foot from the top of the pan. The open ends of the steam coils are introduced into the lower portion of the tube to cause an upward current.

**2837. Campion, W., and Hall, G.** Sept. 15.  
[Provisional protection only.]

*Boiling-pans.*—In a pan or other vessel, fitted with a perforated false bottom, is fixed a pipe, preferably of a conical form, with the larger end downwards. Openings are made in the lower part of the pipe, and, at the upper part, perforated branch pipes are provided. Articles to be washed or bleached are arranged on the false bottom, and the top is then closed and the vessel is heated. The water or other liquid rises through the vertical pipe and is distributed by the branches over the articles, a constant circulation being thus kept up. Two or more vertical pipes are sometimes used, and the branch pipes may be mounted on an axis so as to revolve by the passage of water through them.

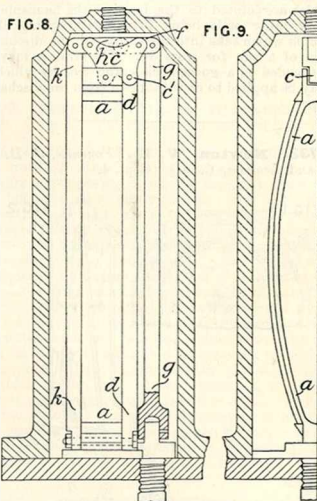
**2888. Dyer, F.** Sept. 19.



*Heating water* for baths and hot-water supply. At the back of an ordinary fireplace is placed a

malleable cast-iron or other tubular boiler A connected by a flow pipe C and return pipe B with a cylinder D. Hot water rises from the upper part of the cylinder through the pipe I, and returns by the pipe K. An expansion pipe is carried from the circulating-pipes, and its open end is turned over into the supply cistern, from which cold water is supplied to the lower part of the cylinder by the pipe G. A ball check valve is provided to prevent the upward flow of hot water in the return pipe K. A T-piece with cock E is provided for cleaning.

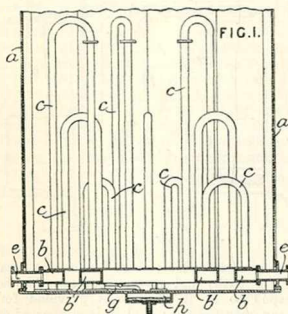
**2915. Leatham, W.** Sept. 22.



*Steam traps.*—The discharge valve is closed by the high temperature due to the presence of steam and opened by the fall of temperature resulting from the introduction of water. The apparatus consists of a bow *a*, Figs. 8 and 9, formed of two metals with different coefficients of expansion, so that it tends to straighten with an increase of temperature. The lower end is fixed to the bottom of the chamber, and the upper end is connected to a lever *c* the fulcrum *c'* of which is carried by an iron rod *d*. A small lever *f* has its fulcrum on the lever *c*, and carries at one end the valve rod *g*. The other end is connected to a lever *h*, the fulcrum of which is on a rod *k* connected to the bottom of the chamber. The lever *h* is also actuated by the lever *c*. When the bow expands, the lever *c* imparts an upward motion to the lever *h*, and a

downward one to the lever *f*, which is communicated to the valve rod. The motion of the valve rod is increased by the action of the lever *h* on the lever *f*. The valve may consist of two tubes, which slide over each other and have apertures which are brought into coincidence by the motion of the valve rod. In a modification, a coiled metal tube is fixed at its upper end to the interior of a chamber, and at its lower end to a valve plate. The contraction and expansion of the tube cause the valve plate to open and close the exit. A coiled metal pipe filled with mercury may be used.

2930. Woods, H. Sept. 24.



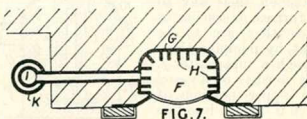
Heating water for use in breweries, distilleries, and the like. The water is contained in a tank *a*, which may be of any form. Steam is conducted through the pipes *e* to curved steam chests *b*, near the bottom, preferably arranged parallel with the sides of the tank. The steam circulates through a number of bent pipes *c* of varying heights to other steam chests *b'*, circulation being promoted by partitions in the chests. Water passes off by the pipes *g* into the chamber *h*, whence it is discharged by a steam trap. The steam chests *b*, *b'* may be made in one piece with the bottom of the tank, and may project below it.

2948. Ritchie, G. Sept. 25. Drawings to Specification.

Non-conducting coverings and compositions.—Waterproof and sun-proof &c. fabrics for covering walls, ceilings, or floors of rooms, (for preventing sound from travelling from one room to another), or for use in the construction of tents, sunshades, or weather protectors, are made by coating two cotton or other woven fabrics with a mixture of cork dust and waterproof and elastic gum or india-rubber cement, and placing the fabrics with their

coated surfaces together and passing them between rollers. The mixture of cork dust &c. is squeezed into and through the fabrics so as to form an external coating to them. In some cases the cork cement is inserted between two thin pieces of boarding, which may afterwards be covered with paint. For covering small summerhouses, sheets of cork are cemented between sheets of canvas.

2976. Wadsworth, J. Sept. 29.



Heating buildings; heating air.—A hollow casing *G*, surrounding the back and sides of the fireplace *F*, is open to the atmosphere at the bottom and provided with bars *H* at the back. The hot air and gases from the fire enter the casing and pass up a tube *I* which opens into the chimney and is surrounded by an open-ended tube *K*. A current of air is induced up the tube *K*, and escapes in a heated condition at the top. The tubes *I*, *K* may be arranged in the same apartment as the fireplace, and thus assist in warming it, or in any other room. In a modification, a casing at the back of the fireplace is connected by flow and return pipes with the tube *I*, which has an air passage passing up through it as well as one surrounding it. The air-heating medium may, in some cases, be water, and the inner casing may be heated by gas. The air to be heated may be supplied from the outside of the building.

3035. Howden, J. Oct. 5. [Provisional protection only.]

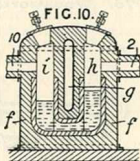
Non-conducting coverings and compositions.—Around the cylinder, boiler, pipe, &c. to be protected is placed a temporary or permanent casing of iron, wood, &c., leaving a space to contain the non-conducting material. Over joints, manholes, &c. small sections of casings or envelopes are formed and filled with composition. Plaster of Paris or other rapidly-solidifying non-conducting substance is poured in in a liquid state. The material may be run in dry in the form of a fine powder, charcoal being sometimes used. Or a cement may be formed of plaster of Paris and lime, and applied with a trowel; gelatinous or glutinous material may also be added.

**3054. Warren, F. P.** Oct. 7. *Drawings to Specification.*

*Heating water.*—Steam from the boiler of a cooking &c. stove is passed through a coil of pipes in a separate tank or vessel, in order to heat water contained therein.

**3101. Archereau, H. A.** Oct. 9.

*Heating gases.*—Combustible gases are superheated on their way to the furnace or crucible in which they are to be burnt, by pumping them through a superheater *f*. This consists of a vessel the upper portion of which is divided into two compartments *h* and *i* by a partition *g*. In the lower portion of the vessel is a liquid substance, such as melted oxide of manganese, kept at a high temperature by jets of mixed combustible gas and a gaseous supporter of combustion delivered under high pressure into the compartment *h* and burnt there, the products escaping through the pipe 2. The gas to be superheated is delivered into the compartment *i* and passes out by the pipe 10, and is thus kept separate from the burnt gases in the other compartment.



**3104. Tragheim, S.** Oct. 9. [*Provisional protection only.*]

*Boiling-pans; digesters.*—Relates primarily to apparatus for circulating water or dyeing-liquor through clothes or the like, or for spraying them while being boiled in an open copper or other vessel, but stated to be also applicable for dissolving substances of vegetable, animal, or mineral origin. In one form, the clothes rest on a perforated disc beneath which are placed fans for circulating the liquid. Some of the perforations may be protected by pegs or guards so that the clothes do not cover the perforations. Or a pipe or cone may be used, which stands on a serrated rim and carries at the top a sort of cowl with downwardly-projecting nozzles, or with a rotary series of nozzles acting on the principle of a Barker's mill. A perforated or plain bottom disc may be combined with the tube or cone. Or, finally, the clothes may be placed between the upper and lower ends of a serpentine pipe contained in the vessel.

**3146. Robertson, J.** Oct. 14. *Drawings to Specification.*

*Heating air.*—Relates to the utilization of waste heat from exhaust steam or vapour from motive-power engines. The exhaust steam &c. is caused

to generate a current of air by the use of annular jets or ejectors, and this air current may be used for supplying steam-generator furnaces, or for other purposes.

*Steam traps.*—In numerous arrangements in which turbines or other motive-power engines are actuated by mixed currents of steam, air, or furnace gases, produced by means of nozzles or injectors, special arrangements of steam traps are provided to receive the water of condensation.

**3170. Head, R.** Oct. 16.

FIG. 1.

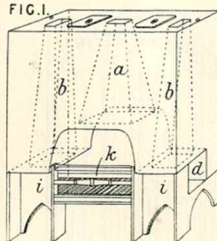
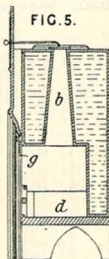


FIG. 5.



*Heating water.*—Relates to boilers for heating water for baths and other purposes. The boiler is shaped to fit in the recess provided for an ordinary open fireplace, and it is supported on an iron stool *i, i* provided with a firegrate *k*. It is arched in the centre over the fireplace, and is provided with tapering flues, preferably three in number, viz., a central one *a* and two side ones *b, b*. A stove front, with arched recess for the fire and with a movable soot door above the boiler, is employed. Sliding dampers over the flues are provided for regulating the draught. Tapering flues, as above, may be applied to kitchen-range boilers. A space is left between the walls of the recess and the top and sides of the boiler, which may communicate by side openings *d* with the fireplace.

**3176. Phillips, J.** Oct. 16. [*Provisional protection only.*]

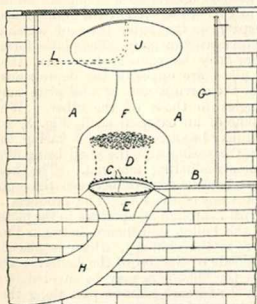
*Heating buildings; heating air.*—In warming and ventilating buildings, heat is supplied by a hot-water circulating apparatus preferably composed of wrought-iron screw-jointed pipes, the boiler being in the lower part of the building and connected with a cistern or expansion pipe in the upper part. A flue or air pipe of stoneware &c. surrounds one of the hot-water pipes and opens into the outer air at the top, having connections near the ceilings of the various rooms &c. for drawing off vitiated air. Fresh air is admitted

through a similar air flue surrounding the other hot-water pipe. The incoming air is thus warmed, and distributed near the floor to the various rooms. Where one hot-water pipe only is used it forms a partition between the two air flues, which are placed one on each side. The inlet air-flue pipe preferably surrounds the various branch hot-water pipes so that, when the hot-water circulation is checked by a stop valve &c., fresh cool air may be admitted to the room &c. Diaphragms are formed across the air passages to prevent the transmission of sound. The air flues may be built into the walls or constructed in the form of plasterers &c.

**3270. Harrison, C., and Wilson, R.**  
 Oct. 26. [Provisional protection only.]

*Thermostats for opening and closing ventilators, controlling gas supply, &c.* A thermometer and spirit level are adjustably mounted on one arm of a balanced lever, the other arm of which is connected to a second lever coupled to a ventilator or to the cock of a pipe supplying gas for heating or warming purposes. The expansion or contraction of the mercury &c. acting on the levers causes the necessary movement of the ventilators, or the partial opening or closing of the cock.

**3282. Smith, A. H.** Oct. 27.



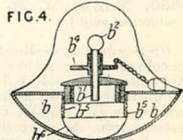
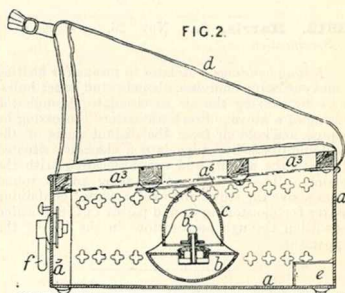
*Heating buildings &c.; heating air.*—In apparatus for warming churches, chapels, hot-houses, green-houses, &c. a square brick or iron chamber A beneath the floor contains a ring gas burner C and a fireclay water cistern E, the top part D of which contains pumicestone. A bottle-shaped casing F and a dome J are provided, as shown. A flue H, in connection with the flooring and covered with an iron grating, supplies air which becomes heated and moistened by the vapour from

the water and escapes through a grating at the top of the chamber A. By means of a lever L the dome may be raised for the purpose of lighting the burner. The gas is turned on and off by a spanner G. The heating-apparatus may be fixed above the flooring in an ornamental case.

**3391. Criddle, W. J.** Nov. 7. [Provisional protection only.]

*Boiling-pans.*—Relates to apparatus for washing linen and other substances. A perforated false bottom, from which rises a central vertical tube fitted at the top with radiating nozzles, is placed in a copper or boiler. The linen is placed on the false bottom, and soap is placed in the vertical tube or below the false bottom. The heated water rises in the central tube and is sprayed on to the linen; a constant circulation is thus obtained.

**3519. Jones, D., and Jackson, J.**  
 Nov. 19.



*Footwarmers.*—Relates to apparatus for imparting heat to the feet and body when travelling in railway or other carriages, or when seated in church &c. A perforated box a, provided with an open-work lid a^3, is fitted with a candle, oil, or spirit lamp b, preferably the latter. The perforations are covered by wire gauze to confine the flame of the lamp, and a baffle-plate a^2 is placed over the

lamp. A covering *d* may be fitted to the lid to form a kind of receptacle into which the feet may be placed. The bag or receptacle so formed may be utilized for receiving articles to be carried. A handle *f* is provided by which the apparatus may be carried, and a receptacle *e* for matches is fitted inside the box. The lamp *b* is hung on horizontal pivots *b'* so that it will always remain in a vertical position, and so prevent any oil or spirit from being spilled. The lamp reservoir may be provided with several wick-tubes *b'*, preferably fitted with wicks formed of bundles of wires connected by cotton wicks or fibres. The size of each flame is regulated by means of a disc and sleeve *b'*, which screws up and down the wick-tube. The air-hole in the reservoir may be closed by a screw cap or other contrivance. To prevent any escape of oil through the wick-tube when the lamp is tilted, wick or fabric *b'* is secured between two pieces of wire gauze *b'* below the wick-tube *b'*. A safety guard *c* formed of wire gauze or finely-perforated metal is placed over each burner. The footwarmer may be fixed or portable, and may be formed like a hassock or footstool. When portable, it may be provided with rings, straps, or buckles for attaching articles to be carried.

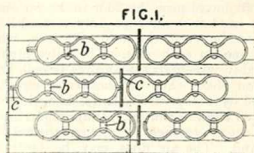
**3612. Harris, A.** Nov. 26. *Drawings to Specification.*

*Heating buildings.*—Relates to means for heating and ventilating churches, chapels, and other buildings by causing the air to circulate through the casing of a stove. Fresh air enters the casing by a pipe, and cold air from the distant parts of the building passes by a pipe into a chamber, situated beneath the ashpit, and communicating with the casing. The air from the casing passes round flues above the stove and over a vessel containing water for moistening it, and passes out in a heated condition through perforations in the top of the apparatus.

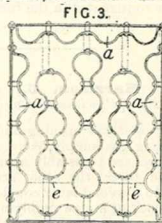
**3680. Banks, J. H.** Dec. 3. [*Provisional protection only.*]

*Heating buildings.*—Relates to churches, chapels, school-rooms, &c. formed with metal skeletons. An ordinary cockle-stove, built in the outer wall or elsewhere and below the floor line, has a built flue running in any suitable direction. At a certain distance from the stove the flue is arched in and cut off from the other part by a cross-wall. Continuous pipes, having flanged or socket joints packed with vulcanized india-rubber or cement, are laid from piping built into the cross-wall. The flue has a cast-iron curb to receive air grids, and terminates in a chimney.

**3684. Kinsey, H.** Dec. 3.



*Heating water.*—Sectional boilers are constructed of series of water chambers formed of corrugated plates and arranged in various ways. The water chambers may be arranged vertically, as shown in Figs 1 and 3. Each may consist of a single plate riveted or welded



at one end, or of two plates secured by flanges as shown at *c*. The opposite sides of the water chambers are connected by riveted distance-pieces *b*. Covers may be cast, riveted, or welded on the chambers, and a water tube, into which the feed-water is led, is cast on to the bottom of each chamber. The chambers may be cleaned through apertures formed in the covers, and they are connected at their upper parts by pipes. In the form shown in Fig. 3, the shell of the boiler consists of a water space *a*, the outer plate of which may be either corrugated or plain. The plates forming the chambers may be connected so that the ridges of one plate are opposite the depressions of the other, or the corrugations of one plate may be at right-angles to those of the other. When the outer plate of an external shell, Fig. 3, is corrugated, it may be surrounded by a casing, the space between the casing and the shell being filled with some non-conducting material. The horizontal plate *e*, *e* forms a division between the upper and lower portions of the flue. The products of combustion pass through an aperture in the plate at one side of the boiler, and thence between the water chambers to the chimney, which is placed at the opposite side of the top of the boiler. The flues between the chambers may be divided by plates, to cause the furnace gases to pass along the boiler several times before reaching the chimney.

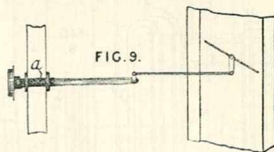
**3761. Jackson, W. S.** Dec. 10.

*Digesters.*—Bones are treated with hydrochloric acid or other solvents under pressure. A strong iron cylinder, mounted on axles supported on bearings and capable of being rotated, is employed; a flanged convex cover furnished with stop-cocks is

secured on water-tight to a corresponding flange at the end of the cylinder by a caoutchouc ring compressed between the flanges by screw bolts. A pipe connected with a hydraulic pump and fitted with a socket joint is carried through the centre of one of the axes into the cylinder, to obtain high pressure after the vessel is charged with bones and filled with the solvent solution employed. The cylinder may be slowly rotated, or turned over at intervals.

**3771. Bailey, W. H.** Dec. 11.

*Thermostats.*—A pyrometer may be arranged to act upon a damper in such a manner that the damper is opened or closed at a certain temperature. Fig. 9 shows one arrangement, in which a pyrometer *a* is connected by a rod to a pivoted damper. In another arrangement, the pyrometer is connected by a rod and bell-crank to a sliding damper.



**3818. Scriven, J. E.** Dec. 15. [*Provisional protection only.*]

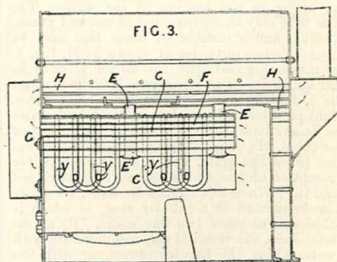
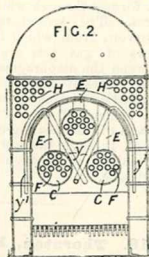
*Heating water.*—A boiler is fitted in the smoke-box of an air-heating or other furnace, and may be provided with pendant circulating water tubes passing down some of the flue tubes. The pipes to or from the water cistern may pass through the flue which connects the smoke-box with the chimney.

**3865. Petrie, J., and Cheetham, W. T.** Dec. 18. [*Provisional protection only.*]

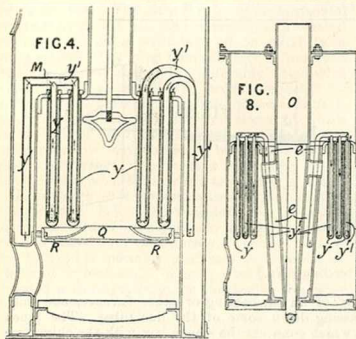
*Heating buildings &c.*—Steam at atmospheric pressure is used for warming apartments, conservatories, and other structures. The boiler is fed with water from an adjacent vessel, and is provided with an outlet through which the steam passes as soon as generated to circulate through the heating-pipes &c., whence the water of condensation passes by a pipe to the feed vessel or boiler. The supply of water may be controlled by a ball cock in the feed vessel or boiler, or by a bird-fountain arrangement. The boiler is heated by ordinary fuel, or by a gas or oil lamp.

**3908. Smart, S.** Dec. 22.

*Heating liquids.*—Consists principally of three improvements in connection with different kinds of boilers:—(1) Arranging water chambers, through which are passed smoke-tubes, in the fireboxes of boilers; (2) arranging water tubes so that they will become emptied when the boiler is blown-off; and (3) placing baffle or protecting plates under the closed ends of water tubes. Water chambers C, C, traversed by flame



tubes, Figs. 2 and 3, are suspended in the fireboxes of longitudinal multitubular boilers by water tubes E, E, which connect them with the boiler. Smoke-tubes F, F pass through the water chambers, and



a second series of smoke-tubes H, H passes through the boiler. The tubes are arranged so that the furnace gases pass through the water chambers to a smoke-box G, Fig. 3, and thence through the tubes H to the chimney. The crown plate is made stronger than usual, to support a number of U-shaped water tubes *y* which are fitted with inner or siphon tubes *y'* as hereafter described in connection with Fig. 4. Fig. 4 shows a section of a vertical water-tube boiler, in which water tubes *y*, closed at the bottom, extend into the firebox. Each tube is provided with an inner bent tube *y'*, having an extension depending into the water space. The outer leg preferably terminates at a lower level than the inner one, so that the tube forms a siphon and empties the water tube when the boiler is blown-off. When steam is being generated, a reverse current is set up in the inner tube, owing to the heating of the water. The siphon tube may be constructed of several pieces, if desired, and a number of inner legs may be connected to one outer leg as shown at M, Fig. 4. They may either rest upon the crown plate or be raised above it. The transverse U-shaped water tubes *y*, Fig. 2, are provided with siphon tubes. In light portable boilers where no external water space is available for the above arrangement of water tubes, the smoke flue O, Fig. 8, may be extended below the grate, and a water space *e*, for the reception of the siphon tubes, is constructed around it. Where this cannot be done, the inner legs are connected to a tubular ring, to which is attached one or more two-way cocks. By means of these cocks, the vessel H may communicate with the water above the furnace crown, or with the blow-off pipe. In the first case, the water circulates downwards through the inner tubes and upwards through the outer ones; and, in the

second case, either the blow-off pipe acts as a siphon to empty the tubes or the pressure of steam in the boiler forces the water from the tubes into the blow-off pipe. This arrangement is applicable to boilers having water casings. A wrought-iron plate, as shown at R, Q, Fig. 4, is placed underneath the ends of the tubes, to protect them from injury and to equalize the heating effect of the furnace. The siphon tubes act in general as circulating tubes.

**3909. Gisborne, F. N.** Dec. 22. [*Provisional protection only.*]

*Heating apparatus.* Relates to means for utilizing gas for heating. The gas is burnt in a special combustion chamber, and heats the water in a steam generator, and an oil-gas retort. The steam, which may be superheated by the products of combustion, is used, alone or mixed with the products, for heating purposes by causing it to circulate through suitable tubes. Or the hot water from the boiler may be similarly used for heating, stand-pipes or other means being employed to keep the tubes full of water and allow for expansion.

**3917. Maughan, B. W.** Dec. 23.

*Heating water for baths &c.* The water is supplied to the upper part of a heating-chamber, through which it flows, in finely-divided films or streams, down diaphragms of metal, wire, or woven fabric, or along wires, chains, or cords, or down the sides of the heating-chamber. The metal diaphragms may be corrugated transversely, and the water spread over them at the top by perforated pipes, which may be enclosed between two segments of larger pipes, the lower edges of which almost touch the opposite sides of the diaphragms. Where wires are used, an upper trough or cistern is employed, having a corrugated bottom in the lower parts of which perforations are formed through which the water passes to the wires. The heated water collects in a lower reservoir, from which it passes to the baths &c. Rows of gas jets are arranged in the spaces between the diaphragms &c., and are protected by metal plates at the top and sides, the products of combustion passing up in contact with the liquid; or a current of hot air may be introduced at the bottom of the heating-chamber. The hot air may escape through the top of the heating-chamber, or may pass through pipes in the hot-water receptacle.

**3918. Thornton, E. M.** Dec. 23. [*Provisional protection only.*]

*Hot-water bottles and similar heating-apparatus; footwarmers.* — Relates to footstools, hassocks,



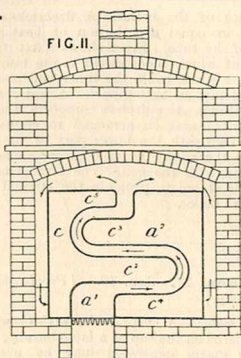
couches, and other articles of furniture with heating-arrangements, for the use of invalids and others. The article contains a receptacle charged with hot water, and surrounded, except above, by a non-conductor. The heat passes through a perforated cover hinged, or otherwise fastened, to the receptacle and is diffused over the external covering of the article.

**3926. Warren, F. P.** Dec. 23.

*Heating water.*—Relates to boilers for heating water for heating buildings &c. The internal flue  $a^1, a^2$  is made serpentine or tortuous, as shown in Fig. 11, passing round projections or pockets  $c^2, c^3, c^4, c^5$  on the boiler  $c$ . The boiler is built in with brickwork, or provided with casings to complete the requisite flues.

(For Figure see next column.)

**3926.**



**A.D. 1869.**

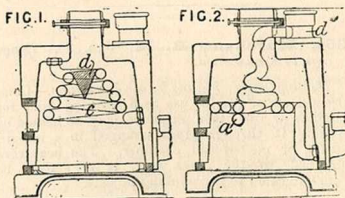
**2. Singleton, T.** Jan. 1. *Drawings to Specification.*

*Heating liquids.*—According to the Provisional Specification, size for sizing warps is boiled by passage through bent or spiral tubes connected to globes, the tubes and globes increasing in dimensions towards the outlet, and the heating being effected by steam. In some cases the size is boiled by passage through a spiral tube in one of the steam-heated drying-cylinders of the sizing-machine.

**6. Green, T.** Jan. 1.

*Heating water.*—Consists in arranging coiled or other water tubes in the fireboxes of vertical

boilers constructed as described in Specification No. 1457, A.D. 1866. Fig. 1 shows the arrangement



of a coiled water tube  $c$ . The coil is conical, and the upper and lower ends are connected to the

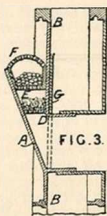
water space of the boiler. A firebrick cone *d* facilitates an equal distribution of heat among the coils of the tube. Fig. 2 shows a flat coil, the outer end of which is connected to the lower part of the water space, while the inner end is carried up and led into an exit pipe *d*. A water tube *a* passing through the firebox supports the coil. Straight tubes may be arranged to connect the furnace crown with the lower part of the water space, and these may be used either alone or in combination with the coil. The arrangement of the tubes is stated to promote the circulation of water in the boiler.

96. **Aitken, H.** Jan. 13. [*Provisional protection only.*]

*Heating water.*—A small boiler with or without tubes, is placed on the top of a lamp burning heavy oils. The steam generated may be used for inducing air supply to the lamp.

243. **Lake, W. R.,** [*Howard, H.*]. Jan. 26.

*Heating air in ventilators.* Fresh air enters through the perforated shelf *D*, which supports a sponge or other porous absorbent *E*, and then passes through the perforated removable box *F*, holding charcoal, into the room to be ventilated. The air supply is regulated by the sliding valve *G*. The sponge &c. absorbs moisture from the air, which is then filtered and deprived of deleterious gases and suspended organic matter by the charcoal; the air is also heated by friction, the removal of moisture, and the heat of the chamber through which it passes.

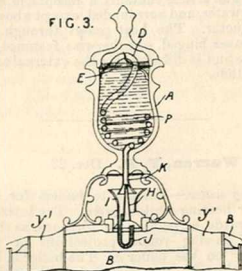


264. **Marchant, R. M.** Jan. 28. *Drawings to Specification.*

*Heating gases; heating by air circulation.*—Compressed air or gas, for use as a working fluid for engines or for other purposes, may be heated by passing it through pipes arranged in a hot-air, steam, or melted-lead chamber. The heat thus supplied to the gases may, it is stated, be communicated to surrounding objects.

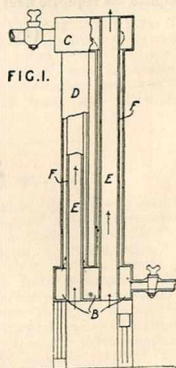
403. **Johnson, J. H.,** [*Johnson, J.*]. Feb. 9.

FIG. 3.



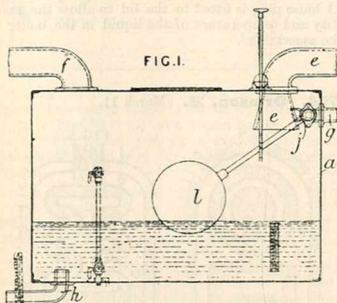
*Heating buildings &c.; heating by steam circulation; steam traps.*—

Relates to improvements in the heating - apparatus for heating air for ventilation &c., and for other heating purposes, described in Specification No. 1250, A.D. 1868, in which steam or other vapour from a suitable generator passes to a radiating and condensing surface and back again in the liquid state to the generator. This invention consists, partly, of improvements in radiators for warming and ventilating apartments, and partly of a self-acting feedwater supply for the steam generator. Fig. 1 shows an arrangement of the radiator and ventilator. Steam from a generator enters the lower box *B*, and passes through an annular space *F* between the hollow outer tubes *D* and the central tubes *E*, and escapes into the upper box *C*, the tubes *D* and *E* being in contact with the external air. Any number of such concentric pipes or tubes may be employed. The walls of the steam chamber may be corrugated &c. to secure a larger radiating and condensing surface. Fig. 3 shows an arrangement for the supply of feedwater to the steam generator, which also regulates the steam pressure. A coiled pipe *P* ends in a curve *D*, the end *E* dipping just below the surface of water contained in the vessel *A* enclosing the pipe *P*. The lower end *K* of the pipe *P* is trumpet-shaped, and opens into a cup *I*, into which steam also issues from the pipe *H*. Condensed water falls into the cup *I*, and thence, through a bent pipe *J*, partially filled with water,



and forming a steam trap, to the heater B. Condensed water collects at the end E of the pipe P, and any reduction in the pressure within the heater causes this water to re-enter the heater, and air also follows. A moderate pressure in the heater may be obtained by bending one of the coils of the pipe P so that it may be filled with water. The air of an apartment passes through tubes  $y'$ . The apparatus may be constructed in rectangular form, or in the shape of articles of furniture, such as tables, sideboards, desks, &c. Gas or other lamps, or solid fuel, may be used to heat the steam generator.

520. **Barton, J.** Feb. 19.

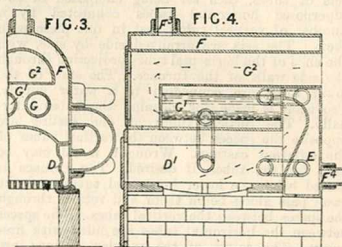


*Heating water.*—The water to be heated is contained in a vessel  $a$ , to which it is supplied through a pipe  $g$ . Exhaust or live steam is conveyed to the vessel through a pipe  $e$ , any excess being carried off by the pipe  $f$ . The heated water is led by a pipe  $h$  to a boiler, to pipes for heating buildings, or to vessels for hot-water supply. The level of the water in the chamber is controlled by a float  $l$ , which actuates a tap  $j$  in the water supply pipe; or a float attached to a chain passing over a pulley and connected to the valve, may be used. The cold water is preferably delivered into the conical mouth of the steam pipe as shown.

537. **Foster, R.** Feb. 20.

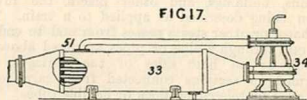
*Heating water.*—Boilers for heating water are formed in parts arranged to enclose the fire. The boiler consists of four hollow castings, three of which  $D, D', E$  are supported by metal bearers resting on brickwork. The two castings  $D, D'$  are parallel, and form the sides of the furnace. The third chamber  $E$  is situated at the end of the chambers  $D, D'$ , and a saddle-shaped chamber  $F$  rests on the upper parts of the three chambers. Two flues  $G, G'$  pass through the upper chambers  $F$ . The furnace gases pass to the rear of the boiler between the side chambers, and return through the flues  $G, G'$ . They then pass through

a flue  $G^2$  to the chimney. The four chambers are connected with one another by pipes, so that water entering the chamber  $E$  circulates through the other



chambers and escapes from the top of the boiler through the pipe  $F^2$ . It returns again to the lower part of the rear chamber  $E$  through the pipe  $F^4$ .

539. **Weems, J., and Weems, W.** Feb. 22.



*Heating air; heating buildings &c.*—In order to heat air for drying purposes, it is forced by means of a steam fan 34 through a number of tubes in a cylindrical metal case 33, to which steam is admitted by a pipe 51. Waste steam from the fan &c., or superheated or other steam, may be thus employed. This apparatus is also suitable for heating and ventilating hospitals, asylums, workhouses, floorcloth and other factories, drying-rooms for floor- and oil- cloths, tarpaulins, calico printed goods, &c., and other buildings. Reference is made to Specification No. 360, A.D. 1868.

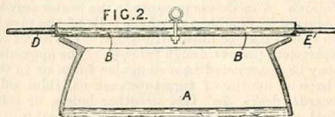
600. **Townsend, J.** Feb. 26.

*Heating gases.*—Air and other gases to be used in heating stills for the extraction of oil from minerals and other materials, or for distilling liquids, are heated by passing them through piping immersed in a bath of molten metal or alloy, or of a salt or salts in solution or fused. Metal filings, or metal, sand, or other refractory material, in a granular or similar form, may also be used to heat the gases.

**603. Markham, C.** Feb. 26. [*Provisional protection only.*]

*Heating water.*—A sectional boiler is built up of sets of tubes, each set being composed of two superposed horizontal tubes connected by a number of vertical tubes cast in one piece with them. The sets are arranged side by side, with the ends of the horizontal tubes projecting through the side walls of the furnace. The ends of the lower tubes are connected to a water supply. Provision is made for cleaning the tubes internally. The vertical tubes of one casting are opposite the spaces between the vertical tubes of the adjacent castings. Wrought metal may be used for the tubes, if desired. The furnace is placed below the lower horizontal tubes, and the gases pass along below them, and return through the spaces between the vertical tubes. The spaces between the horizontal tubes are filled with firebrick. The joints of the tubular sections are arranged outside the furnace.

and E. Cold water, or other liquid, or air, is caused to circulate through the lid, so that vapours arising from the boiling-liquids &c. coming in

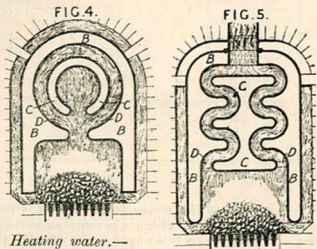


contact with the lid are condensed and returned to the boiler. Or a stream of cold water may be allowed to play on the lid and escape by a trough. A loose plug is fitted to the lid to allow the quantity and temperature of the liquid in the boiler to be ascertained.

**701. Turnbull, R., and Piton, J. G.** March 8. [*Provisional protection only.*]

*Heating buildings &c.*—Comprises combined steam heating and signalling apparatus for trains, buildings, and other places, the invention being described as applied to a train. The exhaust or other steam passes from end to end of a train through a pipe or pipes, arranged above or below or on both sides of the carriages, and formed in sections connected from carriage to carriage by telescopic slides or flexible tubes. The pipes may have branches with taps for warming the carriages, and may have valves for the escape of water. They are secured to the carriages by elastic straps or carriage springs. The handle of a whistle, which also forms a stop cock in the pipe of each carriage, is connected by pull cords or wires with each compartment. The stop-cocks may be dispensed with.

**754. Ormson, H.** March 11.



*Heating water.*—The outer part of a saddle shaped boiler is made annular or convoluted, as shown in section at B, Figs. 4 and 5. A water chamber C is constructed within the boiler, and corresponds in shape to it. This chamber may form part of the boiler, or may be connected to it by water tubes D, which promote the circulation of the water. The space between the boiler and the water chamber forms the flue, and, in the form shown in Fig. 4, the interior of the annular water chamber also forms part of the flue. A modification is shown in Fig. 6, in which tubes C connect a central depending chamber with the sides of the boiler B. The Provisional Specification states that the boiler may be fired externally or internally.

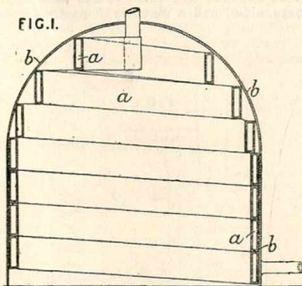
**710. Briggs, R.** March 9. [*Provisional protection only.*]

*Thermostats* for use in heating vineries, conservatories, or rooms. The valve controlling the admission of steam, hot water, or hot air for warming purposes is operated by the expansion of mercury contained in a J-shaped tube, at the upper end of which is a rubber diaphragm, on which rests a piston connected with the valve by levers.

**746. Waddington, J., Waddington, A., and Bell, F.** March 11.

*Boiling-pans.*—The lid B of a pan A for boiling liquids, wort, &c. in breweries, distilleries, &c. is fitted with removable inlet and outlet pipes D

832. Walker, A. B. March 18.

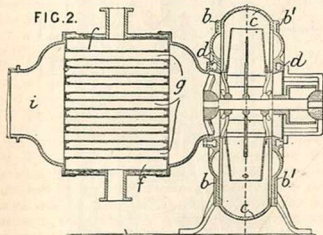


*Heating air.*—A coiled copper or other tube *a* is enclosed in a casing *b*, and is heated by a fire or by gas, or by placing it within a steam boiler. Air is driven through the coil by a blowing-machine. The heated air is used for roasting and drying purposes.

888. Maury, M. F., [Burton, W. L.].
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- March 24. [Provisional protection only.]

*Heating by electricity.*—Apartments, buildings, railway and other carriages, steamers, &c. are heated by the passage of electricity through a chain or coil made of alternate obstructions and free conductors. Or a continuous obstructing-medium may be used with reservoirs or radiators attached at intervals. Or the reservoirs may be connected by short pieces of obstructing-material, the size of which is reduced at intervals.

940. Lake, W. R., [Sturtevant, B. F.].
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- March 29.



*Heating air.*—Relates to a fan with heating or cooling appliances for ventilating hospitals, factories, dwellings, &c., or for supplying air for drying lumber, bricks, &c. The heater or cooler

comprises a jacketed thin copper or other drum *f*, the heads of which are fitted with copper tubes *g* brazed or soldered to flanges. The drum has bonnets *i* contracted to an area equal to the joint areas of the tubes *g*. The whole is secured to the fan by bolts, the heads of which work in a dovetail groove *d* on the casing, and it may thus be turned in any direction. It may be similarly attached to the delivery pipe of the fan. The drum is heated by steam, or cooled by ice and salt or water. For drying lumber, bricks, &c., the air may be cooled in entering the fan so as to deposit its moisture, and be heated in leaving.

1011. Howden, J. April 3.

*Non-conducting coverings and compositions.*—Cylinders, boilers, pipes, &c. are covered with plaster of Paris run in a liquid state into temporary or permanent casings surrounding them. Gelatinous or glutinous matter may be mixed with the plaster of Paris, and it may then be easily applied with a trowel. Lime may also be added. The composition may be covered with iron, wood, lead, canvas, &c., or may be painted. For fastenings of pipe joints &c., small detachable sections of the coverings are employed.

1029. Cairns, C. April 5.

*Heating by steam circulation; heating liquids.*—Steam coils, dye vats, and other articles are heated by means of steam raised to any desired temperature by compressing it by a pump or pumps between the boiler and the article to be heated.

1122. Azambuja, A. d'. April 12.

*Non-conducting coverings.*—Relates to the manufacture of a non-conducting felted fabric. Hair cloth or "thibande" composed of animal hair and fibrous material is spread on a piece of canvas, and layers of animal hair are placed thereon and covered with another piece of haircloth, over which a second piece of canvas is spread; the edges of the two pieces of haircloth are then sewn together or are otherwise attached. The whole is next felted together to form a compact fabric, the outside cloths being then removed. In place of or in addition to the haircloth, fabrics of cotton, hemp, flax, &c. may sometimes be employed, and the fabrics are, in some cases, applied on one side only of the layer of animal hair. The upper and under pieces of canvas may sometimes be dispensed with in making the material. The material is applicable for lining boilers and other steam apparatus, in order to prevent loss of heat, and as a covering for pipes, waterways, and tanks for protection against frost. It is also applicable for dinner mats, carpets, carpet linings, linings for boxes for preserving food and keeping it hot and fresh, and for other purposes.

**1133. Gillespie, W.** April 13. *Drawings to Specification.*

*Heating air for drying and other purposes. The air is heated by being passed through the hollow firebars of steam-boiler and other furnaces.*

**1159. Brooman, C. E.,** [Goguel, E. F. A.]. April 14. *Drawings to Specification.* [Provisional protection only.]

*Heating buildings.*—The hot compressed air which escapes from the casings of turbines driven by a combined current of steam and air produced by a jet of steam blown into the mouth of a pipe, may be used for heating or ventilating workshops and other rooms.

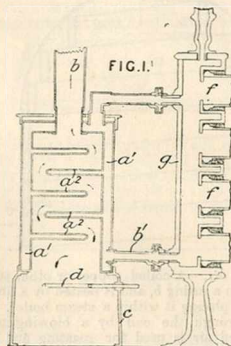
**1166. Bramwell, F. J.** April 15. *Drawings to Specification.*

*Heating air.*—Air is heated in a steam-engine surface condenser, and a portion of it is led to the furnace and the remainder to the chimney; or a portion may be led away for use in drying grain, sheaves of corn, grass, or other green crops. The air thus abstracted may be, in some cases, further heated in a surface apparatus exposed to the waste furnace gases.

**1188. Amies, T.** April 17.

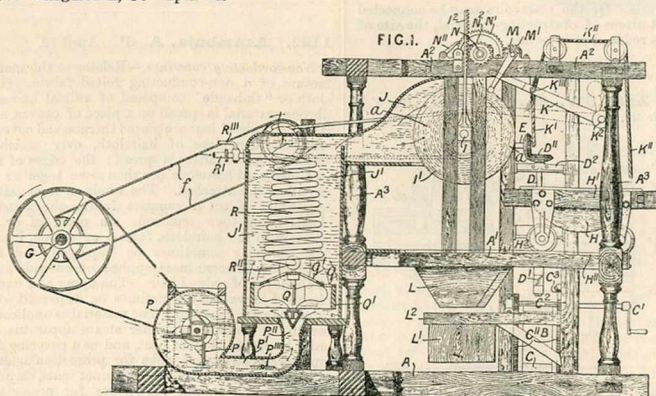
*Heating water; heating buildings.*—A boiler, constructed of sheet metal, has water spaces *a*<sup>1</sup> at

the sides, back, and top, the front being formed by a door. Horizontal water spaces *a*<sup>2</sup> of sheet metal are soldered or riveted to the back and to alternate sides, and a chimney *b* passes through



the top. Air for combustion enters the stand *c* through a regulating-damper to the gas burner *d*. The boiler may supply water to baths &c., or for warming greenhouses and other buildings, it may be connected by the flow and return pipes *b*<sup>1</sup> with a circulating system of pipes preferably formed by hollow end standards *g* with intermediate pipes *f*.

**1275. Engholm, O.** April 24.



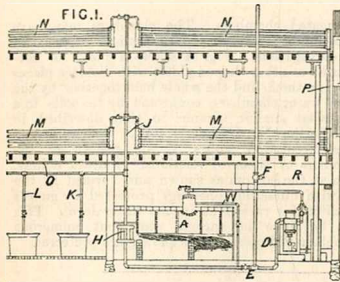
*Heating air for drying purposes. The apparatus consists of a pair of fans P driven by a belt from the main shaft G. The air passes through conical distributing-ducts P<sup>1</sup>, P<sup>2</sup>, and the centre of*

the screw-bladed fan *Q*, which gives it a twisting motion up through the annular and radial spaces *q*, *q*<sup>1</sup> of the casing *Q*<sup>1</sup> and fan *Q*, and thence through the chamber *J*<sup>1</sup> containing the heating-coil *R*. Steam is driven through the coil; it enters at *R*<sup>1</sup>, and leaves at *R*<sup>2</sup>, the supply being regulated by the cock *R*<sup>3</sup>. The air supply is regulated by the cock *P*<sup>3</sup>. In another form of apparatus, air under pressure is driven through a small nozzle into a large pipe, across a conical opening through which air is drawn from the atmosphere. Either the large or the small current may be heated, the temperature of the mixed current being regulated by varying the supplies by means of valves &c.

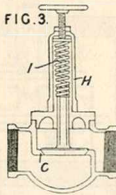
**1303. Simpson, J. H.** April 27. [*Provisional protection only.*]

*Heating air.*—Air, for use in connection with the pneumatic propulsion of trains, is heated by passage through apparatus which is constructed in the form of a honeycomb of brickwork and is "heated at pleasure."

**1354. Shackleton, J.** May 3.



*Heating liquids; heating buildings.*—Exhaust steam from steam engines is used for heating or boiling water or other liquids in the processes of dyeing, scouring, soap-boiling, brewing, cooking, &c., and for heating or warming the rooms of buildings, factories, or railway carriages. As shown in Fig. 1, the exhaust from the engine passes by the pipe *D* to the coils *H* in the boiler-furnace flue, whereby it becomes superheated. It then passes through a pipe *J* into a series of heaters *M*, *N*, *K*, *L* for warming buildings, heating dyers' kettles, &c. The condensed steam flows back through pipes *P*, *O* into the tank *R*, from which it is returned to the boiler. When the engine is not at work, the valve *E* is closed, steam being taken directly from the boiler *A* through the pipe *W*. A valve *F* in the exhaust pipe opens when the back pressure is too great. This valve is shown in Fig. 3, a spiral spring *I*, regulated by a screw and hand-wheel and contained in a tube portion *H*,



serving to hold the valve down on to its seat *C*; the construction of the valve may be somewhat modified. The heating-pipes *M*, *N*, Fig. 1, may be bent into *D* form, and arranged one within the other.

**1503. Harlow, R.** May 17. [*Provisional protection only.*]

*Heating water.*—A hot-water boiler is constructed so that the fire is surrounded by a cylindrical enclosed casing of cast or wrought iron, copper, &c., tapering towards the upper end. An inner tapered casing, provided with a 'field' tube for promoting circulation of the water, communicates with the interior of the outer casing, and also with the interior of a dish or flange on which the flame impinges.

**1511. Lake, W. R.,** [*Herbst, A.*] May 17. [*Provisional protection only.*]

*Heating air* for use in drying sugar loaves. The apparatus consists of a cylinder with tubes like a multitubular boiler. The air passes through the tubes, and is heated to the required temperature.

**1628. Beesley, L., Beesley, W., and Beesley, J.** May 27. [*Provisional protection only.*]

*Heating water, boilers for.* To increase the heating-surface, an inverted conical or tapered metal box is applied to the boiler, so that the water circulates through it, entering at the bottom and passing out through holes at the top. In the case of a firebox boiler with a cross-tube, the tapered box may be connected to the cross tube.