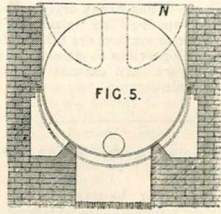


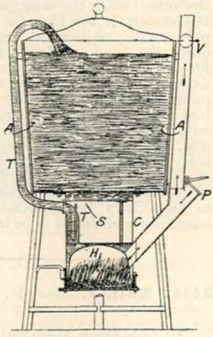
3449. Davison, R. Nov. 19.



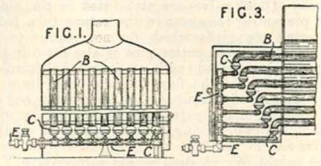
*Boiling-pans for wort.* The lower halves of the pans are composed of thin copper flanged all round and built in brickwork. The upper halves are made of glazed bricks or earthenware flanged plates, or, in some cases, of thin copper, riveted to the lower flanges, and covered with brickwork outside. The boiler has an opening at the middle of its length for the escape of steam &c. Within this may be suspended a perforated copper receiver or wire basket N for macerating hops, sugar, &c., instead of boiling them in the wort. The boiler is heated by a furnace or by steam; in the latter case, its bottom is double and forms a steam chamber. In a modified form, the boiler may consist of a cylinder the interior of which is of glazed brickwork in Portland cement, and the outer casing is grouted with liquid mortar, the intervening space being filled with cement concrete and the whole strengthened with a chain of angle-iron rings. Such a boiler is heated by a copper or like steam coil &c.

3485. Gedge, W. E., [Palau, P.], Nov. 21. [Provisional protection only.]

*Boiling-pans.*—An apparatus for washing linen consists of a wooden boiling-pan A and a furnace H. The liquids pass from the vat into the boiler C, the air in which issues by the siphon s until the boiler is nearly full. On raising steam, the hot liquids are expelled by the pressure through the tube T.

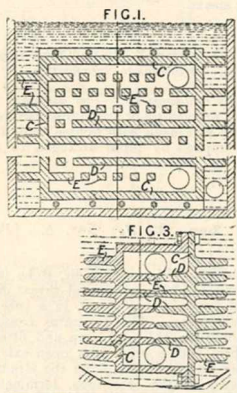


3523. Harrison, C. W. Nov. 23.



*Heating water.*—For heating water in boilers, gas from a main supply pipe E, Figs. 1 and 3, is led to a series of atmospheric ring burners C, which are placed close up to the open bottom ends of iron or other tubes B passing through the water space to the flue. The air supply to the burners is drawn in at the centre of the ring, the burner being brought close up to the tube to prevent the passage of air round the sides. In the case of horizontal or inclined tubes, the arrangement is as shown in Fig. 3, and in either case a door is provided to regulate the air supply.

3682. Ivory, T. Dec. 5.

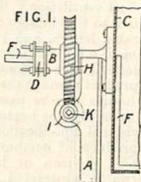


*Heating liquids.*—The liquid to be heated surrounds a box or chamber C, Fig. 1, which may be placed in a boiler or other vessel. The outer and inner surfaces of the box are studded with rods E and plates D. The heating agent, which may be hot furnace gases, or exhaust or live steam, &c., circulates through the chamber and gives up heat which is conducted to the liquid by the plates and

rods. In another arrangement, the rods E, Fig. 3, and plates D are cast on plates bolted together, as shown. Rods and plates alternate, and those on opposite plates may meet in the centre, or the projections on one plate may fit loosely into the soaces between the projections on the other, leaving a channel for the circulation of the heating agent.

**3696. Green, T.** Dec. 6.

*Boiling-pans.*—Bones or other articles are boiled in open pans which are mounted on gudgeons so that they may be tilted over to discharge their contents. The gudgeon is furnished with a gland D and a stuffing-box through which passes a steam pipe F. The other gudgeon is provided with a water pipe. A worm I on one of the gudgeon standards



A gears with a worm-wheel H on the gudgeon so that the pan may readily be tipped to discharge the contents. Superheated steam is admitted into the water in the pan C and, when bones are being treated, removes the grease from them.

**3712. Gedge, W. E., [Gaulfroy, C.]**  
Dec. 7.

*Non-conducting coverings.*—A fabric for covering steam generators, and steam or gas pipes to protect them from contact with the air and to prevent radiation of heat, is composed of a layer of flock or animal hair, and a coarse fabric woven from hemp, flax, flock, hair, or other suitable material and waterproofed by any suitable process before or after its union with the flock. The flock and fabric are made in bands or strips and are quilted, stitched, glued, or pressed together. A strip of woven fabric from one to two inches wide is left bare on one side of the band. When a band is wound upon a pipe, the two edges of flock come together, and the free-edge of woven fabric overlaps and covers the junction, and thus forms a tight joint. A core or partition formed of laths of wood joined the one to the other, or of shavings, straw, or vegetable waste may be placed in the middle of the layer of flock.

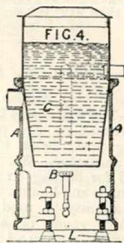
**3770. Bullough, J.** Dec. 12. *Drawings to Specification.*

*Heating air.*—Air is drawn by an exhaust fan through a coiled or helical pipe situated in the flue

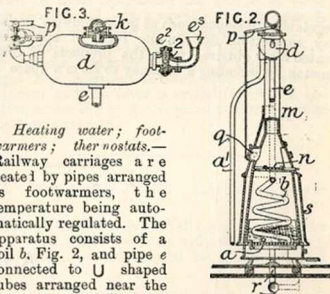
of a steam-boiler furnace, and, being then heated, is circulated through the pipes of yarn-drying apparatus.

**3772. Henley, T. F.** Dec. 12.

*Bed warmers; heating water.*—A Bunsen burner B heats a boiler C within a cast-iron casing A. Inlet and outlet pipes lead to a coil which is placed between the spring of a mattress for heating the bed in which it is placed. The height of the boiler may be adjusted by the screwed feet L. The lid may rest in an annular ring from which vapour rises to moisten the air.



**3807. Baker, W. C.** Dec. 16.



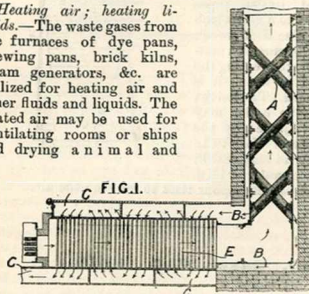
*Heating water; foot-warmers; thermostats.*—Railway carriages are heated by pipes arranged as footwarmers, the temperature being automatically regulated. The apparatus consists of a coil b, Fig. 2, and pipe e connected to U shaped tubes arranged near the footrests or under the seats of the car, the whole being filled with a saturated saline solution which, when heated, circulates through the pipes, coil, &c. An expansion vessel d, Figs. 2 and 3, is fitted with an elastic diaphragm o, Fig. 3, and lever p, which when the pressure and temperature of the solution become excessive, opens a damper q, Fig. 2, which admits air above the fire and cools the tube e. A damper may be also provided for the ashpit, and arranged so as to close as the damper q opens. A safety-valve, consisting of a vulcanized rubber ball or block k, is also provided. The valve rests on a metal seat and is protected by a metal plug or plate, and can be adjusted by screwing down the cap over the ball.

**3818. Fraise, P.** Dec. 17. *Drawings to Specification.*

*Digesters.*—A roasting-pan and saucepan, which form part of a portable cooking-apparatus, are formed with double bottoms in which the steam from a boiler circulates. The lids are jointed at the edge so as to obtain by pressure a temperature greater than 212° F.

**3901. Rydill, G.** Dec. 24.

*Heating air; heating liquids.*—The waste gases from the furnaces of dye pans, brewing pans, brick kilns, steam generators, &c. are utilized for heating air and other fluids and liquids. The heated air may be used for ventilating rooms or ships and drying a n i m a l and



vegetable substances such as grain, brewers' grains, hay, gun cotton, &c. In one form of apparatus, heated air is obtained from the products of combustion by jacketing a chimney to form a space A

which may be provided with cross air tubes so that the air, on entering through openings, will pass backwards and forwards through the air tubes till it reaches elbow tubes B at the bottom of the chimney, when it enters an air box or chamber C containing a number of metal tubes E, the air being caused to travel in a serpentine way through the tubes. The heated air may be conveyed to any required place by means of a fan or blowing engine. The funnels or other parts of the boilers of steam ships may be jacketed, and the funnels may be made telescopic to heat air for various purposes, and the cabins, holds, bilges, &c. may be connected to the casing or air tubes in the jacket to effect ventilation. The flue leading from the furnace to the chimney is preferably made of considerable length, and the air may be heated by means of a hollow jacketed air tube in the form of the letter D, the air passing through the jacket and the product through the inside of the tube. Fluids and liquids may be passed through the chamber C and tubes E to be heated by the waste gases. The Provisional Specification states that in some cases the products of combustion may be made to heat piles of pig-iron or brickwork, the heat being afterwards abstracted by cold air for drying purposes.

**3950. Camroux, S. G.** Dec. 30.

*Heating liquids; boiling-pans.*—Boilers and other heating-vessels are formed with recessed bottoms and are supported over ordinary gas brackets or oil or spirit lamps by frames or supports fitting the recessed bottoms and allowing free admission of air.

A.D. 1873.

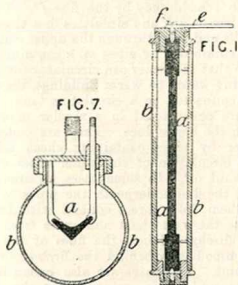
**62. Garon, F.** Jan. 6. [*Provisional protection only.*]

*Heating water.*—A portable apparatus for heating conservatories, baths, &c., consists of a rectangular boiler preferably made of sheet copper and having a rectangular concentric chamber formed in the interior, in which the fire is placed. Water circulates through pipes which are attached to the boiler by union joints. The boiler is placed on a stand having a sliding grating by which the fireplace is cleaned, and is provided with an ashpans with a perforated ventilator by which the fire is regulated.

**86. Whitwell, T.** Jan. 8. [*Provisional protection only.*]

*Heating air.*—For heating air for ventilation, a number of vertical tubes connecting chambers above and below the fire are placed at the back of a fireplace. The lower chamber communicates with the outer air, and the upper chamber communicates with openings covered by slides or caps and leading from the sides of the fireplace into the room. The products of combustion passing between the tubes on their way to the chimney, heat the air which flows in a current into the room.

91. **Konn, S. W.**, [Lodighin, A. N.]. Jan. 8.

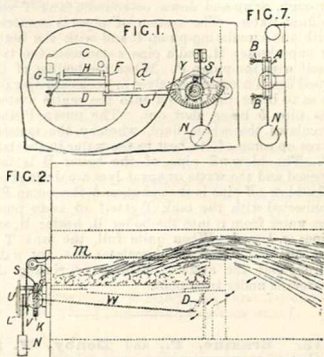


*Heating by electricity; heating air and liquids.*—An electric current passes through solid carbon rods *a*, Fig. 1, which are each enclosed in a hermetically sealed case *b* containing nitrogen or other non-supporter of combustion. Several of the rods are enclosed in a box and are connected in series by means of metal clips *e* turning on pins *f*. Air may be forced through the box, in which it becomes heated for use in buildings, drying-sheds, factories, &c. Liquids may also be heated on this system. For heating water in boilers, conducting wires are led along a horizontal tube above the water level and then down to boxes which enclose the carbon cases. These boxes are suspended from the horizontal tube by means of bolts passing through flanges on the tube and on clips attached to the boxes. In a modification, the carbons are V-shaped and are enclosed in spherical cases as shown in Fig. 7.

111. **Stell, S.** Jan. 11.

*Thermostats.*—A thermostat for actuating the damper *D* which controls the air &c. supply to steam-generator and other furnaces, consists of a metallic rod, or wire *m* or the like fitted in the furnace flues. One end of the rod is fixed, and the other end is connected to a chain which is coiled round a pulley *Y*, a weight *N* being suspended from the end of the chain. The pulley *Y* carries a friction disc *K* and toothed wheel gearing with a pinion *S*, the shaft of which carries a pointer *U* moving over a dial *L*. A lever *J* is formed to receive the disc *K*, its fulcrum being the axis of the disc. A friction click *Y* is carried by the lever *J*, and only acts when the wire *m* is contracting. The fire-door *C* carries a rocking shaft *H* having arms *F*, *G* formed upon it. The arm *F* is jointed at about the middle, the joint being arranged so that when the door *C* is opened the arm *F* passes over the lever *J*, and when it is closed the arm rests against the lever *J*. The rod *m* connects the damper *D* with the arm *G*, the connection being arranged immediately under the

centre of the hinges of the fire-door *C*. When the rod *m* contracts, the disc *K* acts on the click *Y*, and causes it to lower the outer end of the lever *J*,

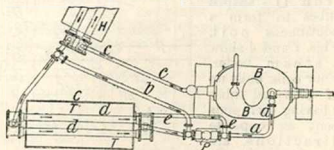


until it gets below the arm *F* of the rocking shaft *H*, and allows the damper *D* to close. The damper *D* is opened when the fire-door *C* is shut by the arm *F* coming against the lever *J*, or it may be opened by hand by pulling the arm *F* so as to catch the lever *J*. In a modification, the disc *K* is dispensed with, and two friction plates *A* are caused to nip against the lever *J* by two springs *B* with sufficient pressure to work the lever. The weight *N* is arranged so that when the wire is expanding and the lever is against the stop *d*, the friction plates slip on the lever and allow the wire to be kept stretched.

142. **Hunt, S.** Jan. 14. [Provisional protection only.]

*Heating buildings &c.*—Walls, floors, and other parts of buildings are made with special building-blocks which are perforated to forms flues for heating.

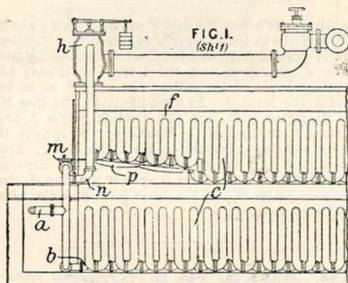
197. **Seitz, C. D. J.** Jan. 17.



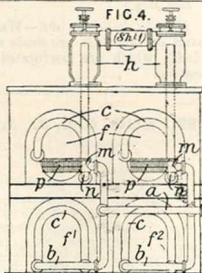
*Heating water.*—In connection with the apparatus described in Specification No. 3446, A.D.

1872, [*Abridgment Class Paper &c.*], for treating wood &c. in the manufacture of half-stuff and paper there is employed apparatus C constructed with a system of pipes *d* which pass through, or up and down, or round a tank T containing water. The system of pipes is connected with the circulating-pump P and with the heater or superheater H, and a pipe *e* connects the tank itself with the pump P. When the boiling of the wood &c. is completed, valves or cocks are operated so as to bring the pipes *d* into the centre system, the pipe *b* being shut out. The pump P then circulates the whole fluid, whereby the material gives up some of its heat to the water in the tank T. The blow-off pipe of the boiler B is then opened and the waste or spent lyes are drained off. The blow-off pipe is then shut, and the pump P is connected with the tank T itself, so as to pump the water from it into the boiler B, heater H, and pipes *a, b, c, d*. When quite full, the tank T is cut off, and the pump circulates the hot water throughout the system, washing or rinsing the materials under treatment.

312. Erskine, F., and Denby, W. S.  
Jan. 27.



*Heating water.*—Boilers for generating steam and heating water for warming buildings &c., are formed by connecting together a number of cast-iron U shaped tubes to form a continuous coil. Figs. 1 and 4 show a steam boiler. Four coils built up of U-shaped tubes *c* having their ends bent in opposite directions, are placed in brickwork flues, the firegrates *p* being placed within the forward ends of the two upper coils. The gases



pass along the two upper flues *f*; they then combine and return along the lower flue *f*<sup>1</sup> and thence to the chimney by the flue *f*<sup>2</sup>. The feed-water enters at *a, b*, and circulates first through the lower coils and then through the upper coils. The coils are connected by pipes *m, n* containing check valves so that the water can circulate continuously. For heating water to warm buildings, the pipes or coils are connected to a circulating tank. Economizers are constructed in a similar manner and placed in the boiler flues. They are connected to the boiler by pipes containing check valves, to obtain a circulation of the boiler water when the feed is shut off. In some cases, an arch may be placed in the flue underneath the pipes or coils to protect them from direct contact with the gases. To utilize the waste heat and gases from boilers, they are discharged into the flues of the tubular boilers immediately behind the firebox or at any other point. The gases are also exhausted from the flues and again returned to the flues or discharged into the furnaces or combustion chambers, by means of fans driven by turbines. The wheels or turbines are constructed with vanes, and they are enclosed in a box or casing formed in the steam pipes connecting the boilers with the engines. The steam passing through the casing imparts motion to the turbine, which may be used to drive the exhaust fan or for other purposes.

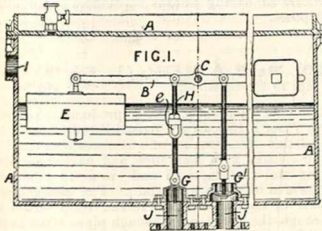
329. Rydill, G. Jan. 28. Drawings to Specification.

*Heating air and liquids; heating buildings.*—Relates to improvements in steam generators and furnaces which may be used on land or sea or for locomotives, and in arrangements for utilizing the waste gases from the boilers. The heated products of combustion, or heated air which is free from smoke, are used for warming factories, boiling water, or for drying purposes or they are utilized by themselves when sufficiently reduced in temperature or in conjunction with steam, to work an engine or engines. Arrangements of pipes are described for "retaining bisulphide of carbon, ether, aldehyde, alcohol, chloroform, essences of benzene or benzole, in the tube or tubes in boilers," for utilizing waste heat. The bisulphide of carbon &c. becomes heated and gives out its heat to the sides of the boiler tubes and heats water or air or any other liquids or fluids for obtaining motive power.

365. Paterson, J. Jan. 30.

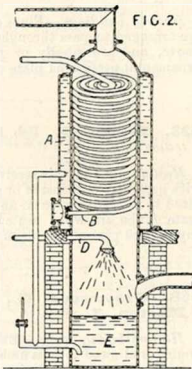
*Steam traps.*—In order to "equilibrate" the steam pressure, the water is discharged by two valves, one opening upwards and the other downwards, operated by opposite arms of a balance beam. The steam is led into the box A by the inlet pipe I. Condensed water collects in the box A and is discharged through the outlets J, J by lifting the float B at one end of the beam B pivoted

at C, and thereby raising the valve G and lowering the valve G'. The valve rod H is provided with an adjustable coupling e.



376. Rydill, G. Jan. 31.

*Heating liquids and gases.*—Relates to apparatus for utilizing the exhaust steam or hot air, or steam and air, from engines, for heating feed-water for steam boilers and other purposes, or for heating air for drying and other purposes, which apparatus may be used as a surface condenser and for other purposes. Fig. 2 shows one arrangement of apparatus. A coil of pipes B, or an arrangement of cross pipes, is placed within a cylindrical or other



shaped jacketed tank or casing A, as shown. The exhaust enters at the top of the casing and passes downward in contact with the coil, being met at the bottom by a water spray from a rose D. The water is pumped from the well E into the jacket A and thence flows through the coil B to the boiler &c. In the case of steam engines, the lower part of the casing may be placed in connection with the condenser. In another form of apparatus, the coil is placed within a non-jacketed casing and the well, rose, and pump are dispensed with. The coil or arrangement of pipes is carried in a metal frame so that it can be readily placed into and removed from the casing. The jacketed casing may be used in connection with the rose D and without the coil of pipes, the steam in this case passing upwards through the casing. The joints of the pipes or tubes are made by means of fixed couplings and bolts so as to allow expansion and

contraction. The Provisional Specification states that the exhaust may be utilized for preserving the heat in steam cylinders.

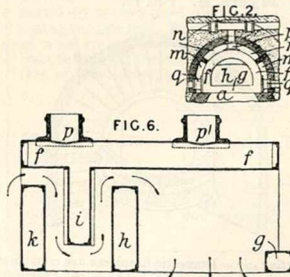
404. Andrews, J. C. Feb. 3. *Drawings to Specification.*

*Heating liquids.*—For heating water and other liquids, steam is passed into the containing vessel through a nozzle fitted in the bottom or other suitable part of the vessel. For promoting circulation, the nozzle is surrounded by a pipe open at both ends. A cone may be fixed above the enveloping tube to disperse the water &c. in a lateral direction.

494. Briggs, J., Willan, R., and Lewis, D. Feb. 11. [*Provisional protection only.*]

*Heating air.*—Air for use in drying warps is heated by passage along a tube containing a steam pipe.

500. Cowan, J. Feb. 11.

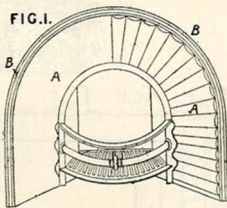


*Heating water.*—For heating greenhouses and horticultural and other buildings, the waste heat from a lime-kiln is utilized to heat a boiler placed above the kiln; the hot water from the boiler circulates through a range of pipes. The boiler shown in Figs. 2 and 6 is placed above the mouth of the lime-kilns a, Fig. 2, and the waste gases circulate in the spaces formed by the arched water-chamber f and transverse water-spaces g, h, i, k, Fig. 6, and through the spaces m, n, Fig. 2, between the boiler and the setting, and thence to the chimney. The hot water issues by the pipes p', p, and re-enters by the sockets q, q'. When not used in connection with a lime-kiln, the space between the water-chambers g, h is bridged by a firegrate. Other arrangements of the boilers may be used.

**510. Lawrence, F. L.,** [*Lawrence, C.*].  
Feb. 12. [*Provisional protection only.*]

*Boiling-pans ; heating water.*—An apparatus for automatically promoting circulation in a boiler for washing clothes, consists of a vertical tube, supported upon a base of considerably greater diameter than the tube. Within the base are a series of divisions or spiral scrolls, starting from the inner side of the base and leading to a central opening from which rises the vertical tube. The upper end of the tube is curved so that its orifice at that end is horizontal, and the orifice is expanded horizontally to give a fan shape to the issuing jet of steam. The base is open at the bottom, and has projections on its under edge to leave openings between the bottom of the base and the surface upon which it rests ; or the base may be perforated near the bottom. The apparatus is placed upon the bottom of the boiler, the tube rising to within a short distance of the top. The soaped clothes are put into the boiler together with small pieces of soap, the boiler is three-fourths filled with water and the cover is put on. When the water boils, a continuous jet of steam issues from the mouth of the tube, thus keeping the clothes in constant agitation, and driving a stream of suds and steam through them.

**512. Myers, S.** Feb. 12.



*Heating air.*—Domestic fireplaces are constructed with a chamber or space between the reflector A and the wall B, in which air entering at the back or lower part of the stove is heated and thence flows into the room.

**519. Ramsden, J. C.** Feb. 12. [*Provisional protection only.*]

*Heating gases.*—The waste heat in furnace gases is utilized to heat air or other gases. The waste gases are passed into receivers from which the air has been pumped and which communicate with chambers containing the gas to be heated. Each connecting pipe is closed at one point by a slab of rock-salt and a valve is placed in the pipe between this point and the receiver. Heat passes through the slab to the gas when the valve is opened. The same waste gas may be passed on through several

receivers giving up some heat at each stage. Pumps may be used to re-fill the chambers and receivers. The gases heated may be used in the process of dyeing fibrous substances or for other purposes.

**520. Barff, A.,** [*Kidd, J.*]. Feb. 12. *Drawings to Specification.*

*Heating buildings &c.*—The products of combustion from a furnace are passed through a radiator consisting of a number of chambers connected at their centres by a short pipe, and having a central horizontal diaphragm in each, so as to produce a large area of radiating surface. The escaping products of combustion are forced by a steam jet through the radiator or through pipes fitted in the building.

**530. Dennison, J. T.** Feb. 13. *Drawings to Specification.*

*Heating buildings.*—Flues of domestic fireplaces are arranged to pass through, and heat, the rooms above, and are wholly or partly surrounded by ornamental perforated plate or other material.

**533. Ermen, G.** Feb. 13. [*Provisional protection only.*]

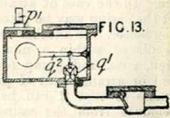
*Heating air.*—An air receiver, which is supplied with cold air from inside or outside a building, is fitted to the bottom, back, and sides of a domestic grate. The air, when heated, is led by pipes to any desired part of the room or rooms.

**568. Greenwood, G., Saville, T., and Morton, J.** Feb. 15.

*Heating buildings &c.*—Exhaust steam from an engine is allowed to pass underneath the floors and into direct contact with them. A siphon in which the steam condenses prevents the entry of cold air into the steam space.

**578. Wood, E.** Feb. 15.

*Steam traps.*—A siphon-box, Fig. 13, is applied to the cylinder of a steam engine for draining away condensed water. A discharge valve  $q^1$  is opened by the float when sufficient water has accumulated in the box. For collecting the water which condenses in the pipes between the high and low pressure cylinders of a compound engine, a chamber is provided into



which the exhaust pipe from the high-pressure cylinder passes down near to the bottom, where water collects and is withdrawn through a siphon-box, or is re-evaporated by a steam jacket; the steam is taken from the top of this chamber and led to the low-pressure cylinder.

**581. Verrier, A. B.** Feb. 17. *Drawings to Specification.*

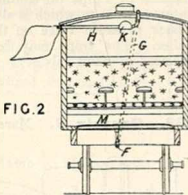
*Heating air.*—A chamber formed behind a fireplace is supplied with air from the room by openings under the fire or from outside the buildings. The hot air passes upwards from the chamber and is used to ventilate the room &c. in which the fireplace is used.

**583. Owen, W., and Hill, J.** Feb. 17. *Drawings to Specification.*

*Heating air.*—Cold air from any external source is passed into a chamber formed behind the fireplace and is there heated by contact with projecting gills on the back of the grate. The heated air rises and escapes into the room through an openwork arch over the fireplace, the room being thereby ventilated.

**625. Sanders, F.,** [*Sanders, R. D.*]. Feb. 19.

*Footwarmers.*—Compressed air for signalling on trains is heated by circulation through pipes in the engine smoke-box, and passes through a pipe F to signalling tubes G on the various carriages and to shallow boxes or pipes M which serve as footwarmers and for warming the carriages. Each box or pipe may have a small hole to permit a slow escape of the air and thus maintain circulation, and each may have a stop-cock for disconnecting it at pleasure.



**643. Topham, C.** Feb. 20. [*Provisional protection only.*]

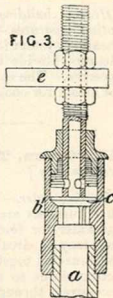
*Heating air.*—The stove and flue are surrounded by an outer casing so as to leave an intermediate space in which air can be heated to be afterwards led off by pipes for use in heating conservatories, warehouses, factories, and other buildings. The warm air may be admitted into rooms by means of valves.

**677. Corbitt, W.** Feb. 22. *Drawings to Specification.*

*Heating air.*—Cold air passes into a building through a passage which leads into an air chamber formed under and at the back of an open fireplace. It is there heated by contact with projecting gills on the back-plate, and finally escapes into the room &c. to be ventilated through openings over the fireplace.

**689. Smith, E., and Brierley, W.** Feb. 24.

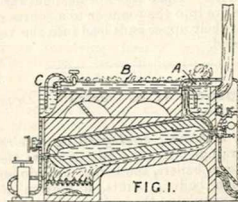
*Steam traps.*—For discharging the air from boilers, steam pipes, &c. when steam is first generated, a pipe *a* having a valve seating *b* at its upper end is fitted to the boiler, steam pipe, &c. The valve *c* is held in position by a support *e*. When the pipe *a* is cold, the valve seating is withdrawn from the valve, and air can pass in or out. The heat of the steam causes the pipe to expand, and brings the seating firmly against the valve. In a modification, the valve is supported by a cross-piece carried by two side rods. Bushes of wood are provided on the rods to prevent the conduction of heat through them.



**690. Horrocks, J.** Feb. 24. *Drawings to Specification.*

*Heating liquids.*—The lye for scouring and bleaching textile fabrics and yarns is heated by passing it through a coil arranged in a steam chamber.

**696. Tommasi, F.** Feb. 25.



*Heating liquids.*—Oil for operating a "hydro-thermic motor" by its expansion by heat, is heated



in a boiler compound of one or more cast-iron tubes set in brickwork, as shown, and capable of resisting 500 atmospheres. The oil circulates through the boiler, the heated oil passing from the upper end to the engine cylinders and being returned to the lower end in a cooled condition. A safety-valve is fitted at the upper end of the boiler; when it rises, it closes an electric circuit and actuates an alarm bell. Reference is made to Specification No. 175, A.D. 1871, [*Abridgment Class Hydraulic machinery &c.*].

**700. Hughes, E. T.,** [*Grimm, L., and Corvin, J.*]. Feb. 25.

*Heating buildings; heating by liquid circulation; heating-apparatus.*—The liquid used in the pipes of a heating system for buildings &c. is a solution of calcium chloride or similar hygroscopic salts in glycerine. The composition can be used "instead of steam for cooking and heated metal baths."

**747. Green, T.** Feb. 28. [*Provisional protection only.*]

*Heating water.*—Firebars for steam-generator and other furnaces are made hollow and arranged so that water for feeding boilers and for other purposes may be circulated through them. The bars are connected together at the ends by special connecting-pieces so as to allow the water to pass successively through them, and to keep up a continuous circulation, the first and last bar are connected to a cistern from which the heated water is supplied. The connecting-pieces are secured to the firebars, and the firebars to the bearing-bars, by means of bolts having dovetailed heads entering recesses in the firebars. The supply cock for the cistern is rendered self-acting by means of a float.

**763. Fawcett, W.** March 3. *Drawings to Specification.*

*Heating air.*—A number of vertical tubes are arranged round the firegrate of a stove or of an open fireplace. These tubes project outwards from under the fire into the room or to a source of fresh air, and at their upper ends lead into the rooms to be ventilated.

**774. Spence, J. B.** March 4. *Drawings to Specification.*

*Heating buildings; heating by liquid circulation.*—In an arrangement for utilizing waste steam for heating steam boilers, the boilers contain solutions having high boiling points, a portion of which solution is circulated through a coil to cool it and thus allow the exhaust steam to be absorbed. The coil or pipe may be passed through an apartment to heat it and thus utilize the heat from the

coil, or the coil may be used for other heating purposes, such as evaporating liquids.

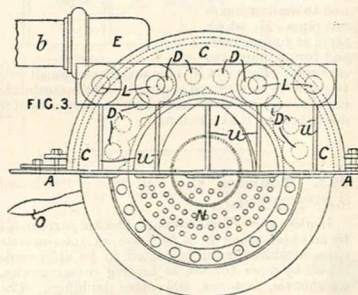
**796. Chappell, J. T.** March 5. [*Provisional protection only.*]

*Heating air.*—In domestic fireplaces, spaces are formed between the back and sides of the stove and the brickwork into which cold external air is admitted, the air, after becoming warmed, being admitted into the room through apertures fitted with regulating valves or slides. The air space is partly warmed by burning the smoke &c., which is led through two descending flues at the sides of the space into a shallow chamber or pan the cover of which forms the grate bottom. One or more vertical grids are cast or formed with the plate which forms the cover so as to be fixed within the chamber. Smoke &c. entering the chamber is heated and burned, and, passing up a flue at the back, heats the back-plate.

**826. Worroll, E.** March 7. [*Provisional protection only.*]

*Steam traps.*—A steam trap applied to ranges of pipes heated by steam is constructed with two passages so arranged that comparatively cold water condensed in the pipes escapes as usual, while hot water is returned to the boiler. The cold water escapes by a passage which is opened by the contraction of a pipe on cooling, while the hot water enters a passage which is always open and leads to a back pressure valve on the return pipe to the boiler. The traps may be dispensed with and replaced by hand valves.

**833. Gratrix, J.** March 8.

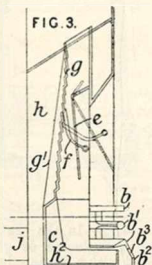


*Heating air.*—Domestic fireplaces and ranges are provided with arrangements for heating and distributing air for ventilation. The fireplace shown

in plan in Fig. 3 is provided with a firebrick back C with vertical chambers D connecting the bottom chamber E with an upper chamber provided with valve boxes and tubes L for leading the heated air to other parts of the building. Air is admitted to the chamber E by a pipe *b* leading from the exterior of the building or by gratings in the lower part of the front A. Circular hit-and-miss valves are fitted to openings on the front of the upper chamber to regulate the flow of heated air into the room. Wing or throttle valves in the valve boxes are moved by spindles *u* provided with pointers which indicate the position of the valves.

**836. Jobson, J., Jobson, E. W., and Jobson, G.** March 8.

*Heating air.*—Domestic fireplaces are fitted with a chamber at the back for heating air for ventilation. The plate *g* rising from the fireclay back *c* heats the chamber *h* which is supplied with air from the exterior of the building by a pipe *j* or by passages *h<sup>2</sup>* in the stove. Gills *g<sup>1</sup>* may be formed on the back of the plate *g*, which may be corrugated to increase the heating surfaces. The grate bottom is solid and the lowest firebar *b<sup>1</sup>* is continued downward by a plate *b<sup>2</sup>* perforated by holes *b<sup>3</sup>*. The air heating chamber may be utilized for heating the air of other apartments.



**859. Lawton, H. C.** March 10. [*Provisional protection only.*]

*Heating air.*—Flues for the admission of external air to a room are arranged in combination with a circuitous chimney flue from a stove or fireplace so that the air entering the room is heated.

**864. Woodcock, W.** March 11.

*Heating air.*—Fresh air entering a room from the outside passes over a pan of water in which stands a stove, and is thereby heated and moistened.

**895. Radcliffe, T.** March 12. [*Provisional protection only.*]

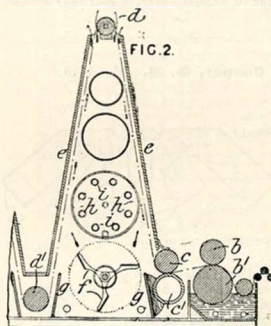
*Footwarmers.*—Relates to a gas stove for rooms, railway carriages, conservatories, &c. The stove,

which may be arranged as a fender or footwarmer, consists of a lower plate carrying a number of burners, the flames of which impinge upon an upper plate, which is provided with flanges to one of which is connected a pipe to carry off the products of combustion. A sheet of polished metal to reflect heat may be placed on the lower plate, and a few gas jets may be arranged at the top of the apparatus behind a transparent screen. When moist air is required, shallow basins for containing water are formed in the upper plate.

**896. Darwin, S. B.** March 12. *Drawings to Specification.*

*Footwarmers.*—The ash from a process of gas manufacture by the action of steam upon carbonized sewage and refuse, is withdrawn from the retorts, and may be used for heating footwarmers.

**913. Baerlein, M.** March 13.



*Heating air for use in the drying of sized yarns.* The invention is shown in connection with a "slasher sizing-machine." The sized sheet of yarn passes up and down in a series of boxes *e* and over and under rollers *d, d<sup>1</sup>*, as shown, being dried by hot air from revolving fans *f* working in troughs *g*. The boxes *e* have inclined sides and are open at the top. The fan shafts are enclosed in perforated tubes rotating with them and assisting in distributing the air. A steam chest *h* is fitted with air pipes *i* communicating, by a trunk at each end, with the central part of the fan; the fan draws the air through the pipes *i*, by which it becomes heated, and then discharges it upwards past the steam chest, whereby it is further heated. In some cases, the air is heated in a special chamber and then supplied to the fans, or cold air is forced by the fan against the pipes and other steam receptacles inside the chests. Two additional steam

chests and two pipes in the troughs *g* may be provided. The pipes *i* may be dispensed with, the air being drawn by the fan through tubes enclosing or surrounded by steam pipes. In a further modification, each fan *f* surrounds a perforated cylinder acting as a hot-air chest and containing a series of pipes supplied with steam, air being admitted through a central perforated pipe.

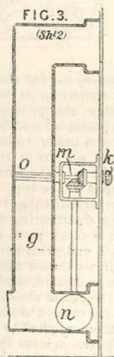
924. Fish, W. S. March 13.

*Non-conducting coverings and compositions.*—Asbestos fibre or powder is mixed with water and applied to the boiler or other surface as a paste or pulp. The boiler or steam-engine lagging may also be formed by mixing the asbestos fibre or paste with farinaceous or glutinous matters, gums, silicic acid, sodium silicate, precipitated silica, ground gypsum, plaster, lime, clay, or alum. Paper or millboard made of asbestos either with or without paper stock, or with hair, wool, or sawdust, may be laid upon or wrapped round the surface in one or more layers. Cloth made from asbestos with or without vegetable or animal fibres, or hair may also be used.

991. Cooper, G. B. March 18.

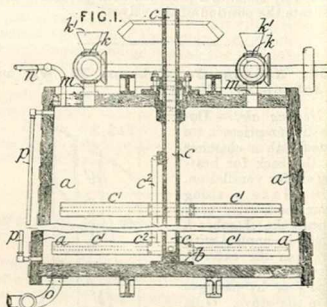


*Heating air.*—Relates to an open fireplace fitted with shafts &c. for heating and supplying air to the apartment in which the fireplace is situated or to other apartments. The grate consists of a ribbed plate which forms the top of an air chamber shown in sectional plan above. The air enters by the inlet *e*, which may be at the back of the chamber, and pursues a serpentine course among the diaphragms *e*, which are cast with the top of the air chamber. The passages leading to the outlets *d* are connected by other passages to outlets in the upper part of the room, or to outlets in other rooms. For regulating the flow of



air from the upper and lower outlets in a room, valves *o*, *n*, Fig. 3, of the ordinary throttle-valve type are placed in the passages *g*. The valves are operated by bevel-wheels *m* and a handle *k*, and are arranged so that one is shut when the other is open.

1044. Pearse, E. E. March 20.

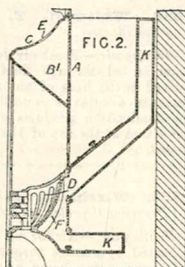


*Digesters.*—In the conversion of rice and other grain into glucose or grape sugar, the grain is digested with a dilute solution of acid in a wooden or metallic vessel *a*, Fig. 1. The liquid is heated by steam admitted under pressure through a hollow shaft *c*, from which it passes to a pipe *c'* and thence to the perforated arms or stirrers *c''*. The shaft and fittings are made of gun-metal or other suitable metal, and is revolved in a step *b* by bevel gearing from the main shaft which also drives the revolving grain feeders *k*. Each feeding apparatus consists of a hopper *k'*, by which the grain passes to a cylinder revolving in a hollow casing attached to the bottom of the hopper. Radial ribs or partitions divide the feed cylinder into several compartments which receive the grain in turn and deliver it to the digester through a pipe *m*. The outer edges of the partitions bear against the conical internal surface of the casing so that adjustment for wear can be made. In a modified construction, the internal surface is cylindrical, and each partition is fitted with spring packing on the edge or bearing-surface. A safety-valve is employed to regulate the pressure, and a glass gauge *p* indicates the liquid level within the digester. Acid is supplied to the digester by a pipe *n*, and the contents are drawn off through a pipe *o* at the bottom.

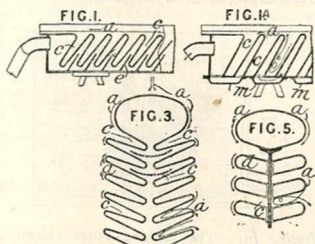
1082. Moorwood, T. P. March 24.  
*Disclaimer.*

*Heating air.*—An open fireplace is formed with a chamber at the sides and back of the

the flues and grate for heating air for ventilation. The bevelled part C of the front A encloses a space B<sup>1</sup> which communicates through holes in the plate A with the chamber K. The grate D is fitted with gills F for heating the air which is supplied through a grating. Openings E are formed in the arch C to allow the heated air to escape.

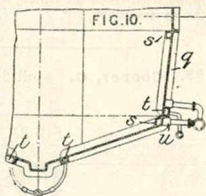


1083. Lawrence, W. March 24.



*Heating liquids.*

—The liquid to be heated is allowed to flow by gravitation in the direction *a* over a series of chambers, troughs, or trays, formed principally or partly of corrugated or bent surfaces of metal, or pipes, and the heating liquid is caused to flow in the opposite direction within or through these chambers or pipes. Figs. 1, 3, and 5, show different forms of the apparatus. Instead of the plates *e*, Fig. 1, stop-plates extending partly across the apparatus may be employed to block the passages between the chambers *c* and the bottom plate, or the bottoms of the chambers *c* may be soldered to the bottom plate, communication being established by dishing the latter at intervals or providing cap pieces *m*, Fig. 1<sup>a</sup>. The chambers *c*, Fig. 3, and pipes *d*, Fig. 5, may be arranged alternately. For boiling liquids, steam passages or channels *s*, Fig. 10, are either cast in one piece with plates *q* forming the framing of the boiler or vessel, or are cast separately and bolted to these

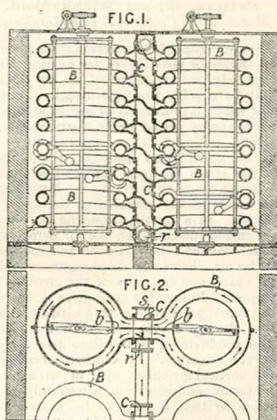


plates. The stem is supplied at *u*, and the water of condensation is drained off at *t*. The passages may be arranged either internally or externally.

1104. Brampton, F. March 25. *Drawings to Specification.*

*Heating air.*—Fresh air for the ventilation of a room &c. passes from the exterior into a recess in the wall in which the closed stove or fireplace casing is placed. The air is there heated and escapes into the room through the top of the ornamental open-work front of the stove.

1109. Nield, T. A. March 26.



*Heating liquids.*—A feedwater heater, stated to be applicable for other liquids, is constructed of a series of circularly formed cast-iron pipes B arranged at opposite sides of a central pipe C so as to form a stack. In the example shown, there are two or more of such stacks comprising the heater. The inlet and outlet openings to each of the pipes are separated by a dividing rib *b*, Fig. 2. The water to be heated enters the lowest ring on the left from the pipe *r*, and after circulating through it flows through a passage in the pipe C to the lowest ring on the right. On leaving this ring, the water is conducted to the next higher ring on the left. In this way the water is caused to circulate through all the rings in the two stacks suitable passages being formed in the pipe C by dividing ribs. The water is then conducted by a branch pipe *s* to the pipe connecting the next two stacks. In some cases, a single stack of rings may

be connected to one pipe, or each ring may be connected to two upright pipes, the water flowing from one pipe through all the rings to the other pipe, or it may be made to circulate through all the rings successively.

**1131. Landau, M. I.** March 26. *Drawings to Specification.*

*Heating buildings; heating air.*—To utilize waste gases for heating-purposes, flue pipes or passages are led from close stoves, fireplaces, or furnaces to the various rooms of houses &c., and they are fitted with special filtering or purifying dampers by which the hot gases are allowed to pass into the rooms.

**1155. Sellers, C., and Richardson, W. H.** March 28. [*Provisional protection only.*]

*Heating air.*—Relates to several arrangements of chambers in gas or coal stoves for heating air for ventilation. In one arrangement, an air chamber, which may have tubes passing through it, and the bottom of which is preferably of a conical, concave, or convex shape, is placed above a gas burner, the whole being enclosed in an outer casing. The products of combustion pass to the chimney through the space between the chamber and the casing. Fresh air is admitted to the lower part of the air-chamber and is delivered at the upper part of the stove. In a modification, the burner may be placed inside the chamber, the air being heated in the space between the chamber and the casing. To heat the air, shelves or diaphragms are placed in the air space, and the sides of the chamber may be corrugated. In another arrangement, the air is conducted through a chamber fitted with diaphragms or gills on the top of the stove. Tubes through which the products of combustion pass may be placed in the chamber. In another arrangement, a series of vertical air-tubes, with or without gills on the interior, communicate alternately at top and bottom so that the air to be heated passes from one to the other, or the tubes may be separate so that the air passes from the bottom to the top. A moistener and boiler may be provided. The outer casing may be formed of metal, terracotta, brick, or any of these combined, and may be double with an open space through which air freely circulates to prevent damage from overheating.

**1160. Davies, A.** March 28. *Drawings to Specification.*

*Heating liquids.*—Water or other liquid, heated by being circulated through a hollow furnace damper, may be conveyed to a tank and used for supplying a steam boiler or other vessel where heated water is required.

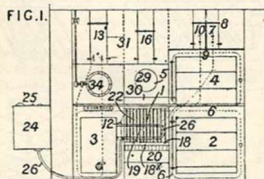
**1288. Whitwell, T.** April 8. *Drawings to Specification.*

*Heating air.*—Fresh air for the ventilation of a room is led through flues into an air chamber formed in the back of an open fireplace. It then passes up a series of vertical tubes, between which the combustion products pass, and is finally led out either at the top of the fireplace or into other rooms.

**1332. Wirth, F., [Dold, J. A.].** April 10. [*Provisional protection only.*]

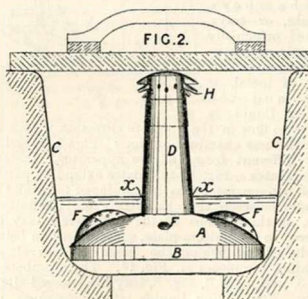
*Heating air.*—Air for use in drying yarn in cops, is heated by passage through a pipe in the flue of a furnace, a fan being employed for forcing the air through the pipe into the drying-apparatus.

**1360. Clough, S. W.** April 15.



*Heating air.*—The cooking-range shown in Fig. 1 is provided with a hot-air chest 5 which is supplied with fresh air which, when heated, is led to the rooms above.

**1483. Cooper, C.** April 24.



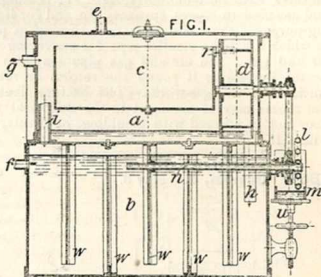
*Boiling-pans, circulating liquids in.* Relates to a steam washer for use in coppers for linen and

other fabrics. The washer is constructed with a convex plate A, provided with a flange or rim B, and a tube or column D rising from the centre and carrying a removable cap with nozzles H. Holes F in the plate are covered by perforated guards or domes F which form steam spaces. The apparatus rests in the copper C, which is filled with water &c. to the level  $x$ , the clothes being then placed on the plate A. The copper cover is then placed on and heat is applied. The bailing water rises through the column D and flows out of the nozzles H on to the linen and thence to the bottom of the pan, and so on. The washer may be of sheet metal, tinned copper, or block tin.

### 1552. Nolden, M. April 29.

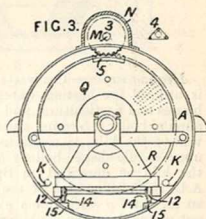
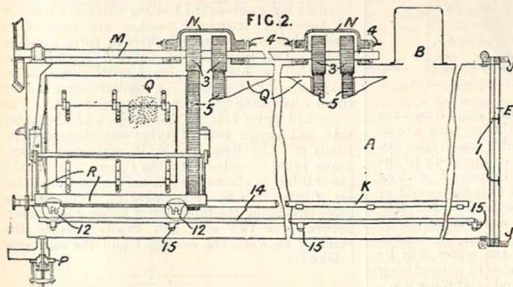
*Heating water.*—Relates to means for purifying and softening water for steam and other boilers &c. The water enters, by the pipe  $e$ , into the vessel  $c$  placed in the upper compartment  $a$  of the apparatus. Steam supplied through the pipe  $g$  heats the vessel  $c$ , and some of the impurities are deposited therein. The hot liquid overflows through the pipe  $r$  into the buckets of the water-wheel  $d$ , rotating the wheel and falling on to the floor of the compartment  $a$ , whence it passes through the pipe  $h$  into the lower compartment  $b$ . The water is caused to travel through the compartment  $b$  in a zig-zag direction, by means of diaphragms  $w$ , and is discharged through a pipe  $f$ ,

being heated before discharge, if required, by steam passing through the pipe  $i$ . Chemical reagents may be pumped into the compartment  $b$ .



For this purpose, they may be placed in the vessel  $m$  from which they are fed by the spiral tube  $l$ , driven by gearing from the wheel  $d$ . The rate of feed is regulated by the position of the vessel  $m$  and the speed at which the tube  $l$  is rotated. The solutions used depend on the impurities to be precipitated; for calcium sulphate, either sodium carbonate or barium chloride may be employed. When several reagents are required, several sets of vessels and pumps may be used.

### 1556. Russell, C., [Moore, R., and Williamson, T. R.]. April 29. [Provisional protection only.]



*Boiling-pans.*—Sodium nitrate is manufactured in the boiling-tank shown in Figs. 2 and 3. A closed wrought-iron boiling-tank A, Fig. 2, with a wrought-iron steam dome B, is fitted with two perforated steam pipes K for boiling by steam and with a cast-iron cock P for drawing off water. Four perforated wrought-iron cars Q are attached to frames R, Fig. 3, which are fitted with cast-iron wheels 12. The wheels run on rails 14 fixed by rail chairs 15 to the inside of the tank A. The cars are rotated by means of a shaft M and toothed gear 3, 5. The spur-wheels 3 are enclosed in

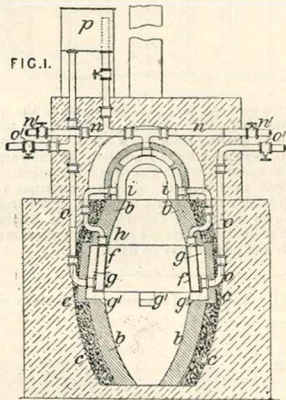
cast-iron boxes N riveted to the tank and fitted with stuffing-boxes 4, Fig. 2. The wrought-iron door E, which is hinged to the tank, is strengthened by two T-iron ribs 1 and tightened by square bolts with split cottars J.

### 1556. Mickle, W. May 7.

*Heating buildings; heating air and gases.*—The waste gases from gas or coke stoves and

furnaces are led through pipes arranged in buildings, conservatories, stables, barns, poultry-houses, cathedrals, halls, hotels, works, incubators, foster-mothers, zoological buildings, &c. For heating air and gas used in stoves, furnaces, &c. and for lighting-purposes, the waste gases pass through a pipe in which is fitted a smaller pipe for conveying the air and gas. The air and gas pipe may also be heated by passing it round the retorts or retort furnaces in the gas-works. The heating-pipes in the rooms may be arranged in the wall near the floor and be covered with mouldings of fireclay or with felt.

1665. Gowan, J. May 8.



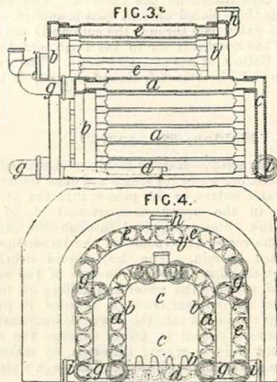
*Heating water.*—The waste heat from lime kilns is utilized for heating water for warming green-houses and horticultural and other buildings. An annular boiler *f*, forming a part or the whole of the wall of the kiln, is connected by pipes *h* with an upper saddle-shaped boiler *i* set over the mouth of the kiln as described in Specification No. 500, A.D. 1873. The back of the boiler *f* is heated by an air-space *g* with inlets *g'*. When the heat is not required in the buildings, the water may be caused to circulate through a cistern *p* by closing the valves *n*, *n'*, on the outlet and inlet pipes *n*, *o*.

1715. Jamieson, A. May 12. [*Provisional protection only.*]

*Thermostats.*—Relates to means for regulating the temperature of india-rubber vulcanizing-apparatus used in the manufacture of artificial teeth. A metal tube, through which passes the gas supply for the furnace or burner employed for heating the vulcanizing chamber or boiler, passes through the top of an adjustable glass tube let into the top of

the boiler. The tube contains mercury which, when the steam has reached the required temperature, expands sufficiently to close, wholly or partially, the gas tube, thereby cutting-off or regulating the gas supply.

1837. Metcalf, J. May 21.



*Heating water.*—Relates to the construction of boilers for heating and circulating water. To obtain a large amount of heating surface, a number of tubes of triangular section are secured to terminal ends or water chambers to form a saddle boiler. The inner set of tubes *a* connects the front hollow box or frame *b* with a flat water chamber *c* at the back. A similar outer set of tubes *e* is connected to terminal ends *b'*. The inner and outer sets of side tubes, and the outer side and crown sets of tubes are connected by bends *g*. The flow pipe *h* is connected to the upper tubes or ends *b'*, and the return pipe *i* to the lower tubes, as shown. For small boilers, the outer set of tubes may be dispensed with. The furnace gases pass along the inner set of tubes, then return between the two sets, and finally pass to the chimney between the outer set and the enclosing brickwork.

1960. Ray, A., [Heilmann, A.]. May 31. [*Drawings to Specification.*]

*Heating liquids.*—A boiler is heated by the waste gases from furnaces and kilns, by passing the gases through an internal pipe in connection with an external pipe which winds around the boiler.

1997. Milner, E. June 4.

*Heating air.*—Air is heated by passing it through a pipe or pipes situated in the flues and chimneys

of steam-generator or other furnaces or fireplaces. The heated air may be used for warming apartments, drying rooms, dye-houses, and bleach works, by passing it through pipes, or the end or ends of the pipes may be left open so as to admit the hot air into the room or rooms.

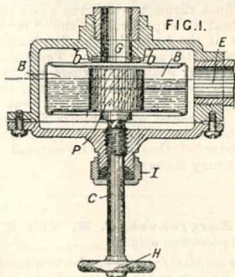
**2029. Gilbert, J.** June 7. *Drawings to Specification.*

*Non-conducting coverings and compositions for steam boilers or reservoirs.* Asbestos, blacklead, crude magnesia, sodium silicate, and water are made into a stiff paste and warmed gradually, and the boiler or reservoir is coated therewith to a thickness of 3 or 4 inches.

**2076. Bopp-du-Pont, L.** June 11. [*Provisional protection only.*]

*Non-conducting coverings.*—Thick felt fabric, which serves as the non-conducting material in a food-warmer, is coated with blackened silicate of potassium and strong oxide of zinc, and is in addition "magnetized." Straw pasteboard is placed over the fabric and is fastened to the zinc of the food-warmer with white ceruse, "which renders it adherent and impermeable. The whole is fixed" by means of glue with alkali or spirit (such as "resinous gum lac heated by steam and dissolved" in alkali) serving to homogeneity and solidify "the felt so as to avoid its deterioration."

**2097. Kidd, J.,** [Hawes, L. P.] June 13.

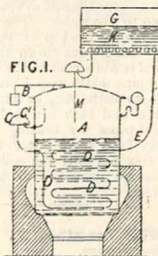


*Steam traps.*—Fig. 1 shows a steam trap suitable for draining heating apparatus. An expansive vessel B, of thin sheet metal, contains alcohol, or other liquid which vaporizes readily. When the vessel B is heated by steam it expands and closes the opening b, b of the pipe G. When, however, condensation water collects in the pipe, it cools the box B, which consequently contracts, and allows the water to escape by the pipe E. A cylindrical block of wood P, held by wires, prevents the collapse of the vessel, and in order to prevent

escape at the joints the vessel contains resin or a similar substance beneath the alcohol. The position of the box B is adjusted by a hand-wheel H and shaft C passing through a stuffing-nut I. The trap will operate either way up, and may be used with steam-engine cylinders.

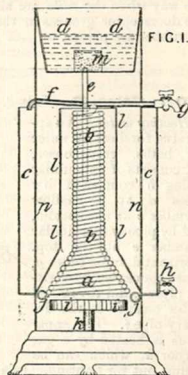
**2135. Wise, W. L.,** [Riot, L. M. T., and Roux, P.] June 18.

*Heating liquids.*—Steam of high temperature and low pressure suitable for heating liquids, is generated from solutions containing saline matter, glycerine, or other similar substances. The closed vessel A, Fig. 1, contains a solution of calcium chloride and is provided with a safety valve B which is loaded to about one and a half atmospheres. A valve C' situated in a box C, allows the steam generated in the vessel A to circulate through the coil D immersed in the solution in order to superheat it. The coil D is connected by a pipe E to a coil K situated in a vessel G containing the liquid to be heated. The steam which condenses in the coil K is returned to the boiler through the pipe M. Substances other than calcium chloride may be used. A higher temperature may be obtained by using a double chloride of calcium and zinc.



**2142. Evans, E.** June 18.

*Heating liquids.*—Relates to apparatus for heating water for baths, for heating conservatories, hot-houses, &c., and for domestic hot-water supply, and which may be used for heating liquids other than water. Water from an overhead covered reservoir d passes through a vertical pipe e to the bottom of the conical helix a and then rises through the coils a and b and overflows through the pipe f when heated, into the external casing or tank c. Hot water may be drawn





off either by the cock *g*, to which water flows in preference to overflowing through the pipe *f*; or by the cock *h*. Two circular atmospheric burners *i* and *j* supply the heat necessary. A cover is fitted to the reservoir *d* and a perforated rose *m* prevents dirt from passing down to the coil. The conical and cylindrical parts *a* and *b* of the coil may be made separately and provided with independent connections to the reservoir *d*. In a modification, the tank *c* is formed between the walls *l* and *n* and a perforated cylinder placed in this space supports a dome over the coil so that waste heat is conducted down to the water. The overflow pipe leads into a cup round the top of the wall *l* so that the overflow water runs down the hot wall. The reservoir *d* is connected to the bottom of the chamber *c* by a pipe which may be used as the water supply pipe to baths &c., or pipes connected the reservoir *d* and tank *c* may be used as the inlet and outlet pipes for heating by hot water &c. circulation. In a form stated to be specially applicable for this purpose, the coils are dispensed with and pipes are used which have the same external surface.

**2197. Jenkins, W.** June 24. *Drawings to Specification.*

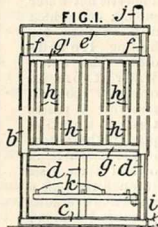
*Non-conducting coverings and compositions.*—Felt coverings for casks are preferably coated with lime or barium sulphate to render them less absorbent of heat.

**2303. Heywood, G., and Duckworth, J.** July 3. [*Provisional protection only.*]

*Kiers.*—A steam injector is used to withdraw fluid from the lower part of the kier and force it through a pipe, delivering it above the material boiled. The manhole doors are hinged and are secured by hinged bolts which can be turned out of the way when the nuts are slackened. Ridges on the doors enter grooves in the kiers in which rings of rubber are placed.

**2307. Giles, B.** July 3.

*Heating water.*—An apparatus for heating water for baths, greenhouses, &c. consists of an annular casing *b* connected by pipes *d* to a shallow chamber *c* at the bottom, and by pipes *f* to a similar chamber *e* at the top. Horizontal cross-tubes *g*, *g'* are connected by vertical pipes *i*, and the heated water escapes by the delivery pipe *j*. The apparatus is heated by a gas burner *k*, which can be swung out for lighting. In another form, a series of concentric annular water-chambers are employed instead of the tubes *h*. To increase the heating



surface, spiral coils of thin sheet iron or other metal are placed in the spaces between the tubes *h* or water chambers.

**2329. Hartley, J.** July 4. [*Provisional protection only.*]

*Heating water* for hot-water heating apparatus. A boiler is arranged with a water-way front in which is a clearing door, a water-way back, and water-way shelves with an oval cross check tube so as to form a zig-zag flue.

**2363. Cain, T.** July 8. [*Provisional protection only.*]

*Heating water.*—Firebars for furnaces and fire-places are made hollow, and water is passed through them to cool the bars and heat the water. The bars have two or more passages through them, and they are connected to hollow bearers from which the water circulates through the bars. The openings in the bars are closed by screw plugs which may be removed for cleaning the water passages.

**2370. Lee, R.** July 9. [*Provisional protection only.*]

*Heating liquids.*—A boiler for heating water for horticultural and domestic purposes is constructed of two cylindrical boilers, one placed within the other, the two being connected by pipes. A space is left between the boilers for the passage of the products of combustion. This space is provided with movable plates placed longitudinally, thus forming flues through which the gases pass until all the heat is expended on the "three water surfaces of the boiler." The fire is situated in the interior of the inner boiler. The boilers may be of any other shape, and, where the furnace is required for burning roots, wood, &c., the inner boiler may be saddle-shaped. The front ends of the flues are closed with circular flue boxes, the end of the boiler being closed by a water-way. The exterior of the boiler is covered with a non-conducting material.

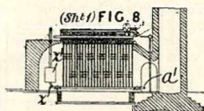
**2372. Hargreaves, J. E.** July 9. [*Provisional protection only.*]

*Heating garden frames.*—A horticultural frame is heated by hot water contained in an inverted double-cased cone supported beneath the frame and packed with a non-conductor of heat; inlet and outlet pipes are provided for the supply and removal of the water, the heat being maintained by a spirit lamp &c.

**2419. Salmon, P.** July 14.

*Heating gases.*—The air which is used in producing oil gas by a method similar to that described in Specification No. 147, A.D. 1873, [*Abridgment Class*

Gas manufacture], is passed through a heater consisting of a series of tubes in pieces or coils of metal or fireclay, or a vessel surrounding the furnace or flues. In the heater shown in Fig. 8, the

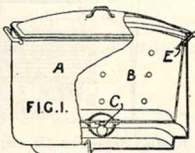


air enters by the pipe *a'* and passes out by the pipe *z*.

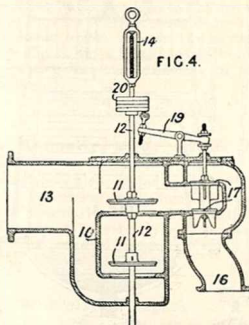
**2438. Johnson, J. H.,** [*Davidson, J. R.*]. July 15.

*Boiling pans.*—

Relates to steam washing apparatus. In a common cooking-stove boiler *A* is placed a vessel *B* having perforated sloping sides and ends. The clothes are placed in the vessel *B* and water and soap are placed in the boiler, the cover of which is then placed on. When heat is applied, steam passes through the perforations into the inner vessel and condenses to water which passes through a hole in the bottom into the boiler *A*; under the hole is a ball *C*, attached by wire or tin so as to be capable of moving up and down, within certain limits. The vessel *B* is fitted with loop or handles *E*.



**2489. Clark, M.** July 19.



*Thermostats.*—To regulate the temperature of air in a "stove" or air-heated drying-chamber automatically, a copper wire or band is led backwards and forwards over pulleys fixed in the stove,

and is connected to the rod of the equilibrium valve 11 through the adjustable coupling 14, so that its expansion or contraction will raise or lower the valve 11 to vary the inlet of hot air, which enters the valve chamber by the space 10 and passes through the branch 13 to the stove. When the outlet spaces for the hot air are diminished, cold air is also admitted into the stove through the passage 16 and past the equilibrium valve 17, which is operated from the disc 20 on the valve rod 12 through the pivoted lever 19. The copper wire is also connected by means of a lever to a damper in the air-heating furnace, which is closed and opened simultaneously with the valve. An indicating-bell or steam whistle may also be connected to the copper wire.

**2557. Lake, W. R.,** [*Locke, J. A.*]. July 26. Drawings to Specification.

*Heating air.*—An air-heater for supplying hot air to a drying chamber consists of a steam pipe enclosed within a casing through which the air to be heated is passed on its way to the chamber.

**2581. Stephens, J.** July 30. Drawings to Specification.

*Heating-apparatus.*—In order to produce heat by friction, a wooden &c. jacket consisting of boards connected together by spiral springs is reciprocated to and fro on the outside of an iron cylinder. Or the jacket may revolve round the cylinder.

**2594. Hurd, F., and Simpson, E. T.** July 31. Drawings to Specification.

*Heating water.*—Water for feeding boilers or for other purposes is heated by means of waste gases, which are forced into tanks containing water covered with sawdust, cork cuttings, or other floating matter to absorb the deleterious gases.

**2602. Casper, E.,** [*Farinaux, J.*]. Aug. 1. [Provisional protection only.]

*Heating water.*—Relates to apparatus for supplying water to steam boilers and other vessels and to water-purifying apparatus which may be used in connection therewith. The purifying-apparatus consists of an upper vessel containing a number of slotted superposed discs divided in series or sets by flanged collecting-plates having central holes, which vessel is fixed upon a second vessel having a conical bottom and connected to a regulator through which the water passes to the boiler. The water is allowed to flow over the discs and is heated to a high temperature by superheated or other steam. The feed apparatus is composed of a floating regulator "which is a metallic cylinder "provided with three tubes." One of these tubes serves for the introduction of water, another for the introduction of steam to equalize the pressure, and the third for the delivery of the water into the boiler. The third tube is connected by another tube with apparatus for maintaining a uniform level in the boiler. In the cylinder is a float which acts, through a sliding rod, upon a weighted lever and controls or operates, through a toothed sector,

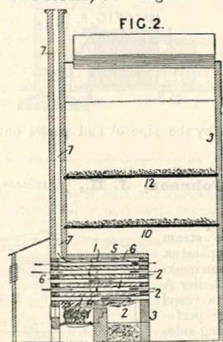
a double valve communicating with the feed-pump and the purifying-apparatus. The apparatus for maintaining a uniform water level consists of a casing fixed to the boiler and fitted with a valve, which valve is connected by an adjustable rod to a counterbalanced lever carrying a float.

**2624. Rydill, G.** Aug. 4. *Drawings to Specification.*

*Heating water; heating buildings &c.; heating by liquid circulation.*—Relates to improvements in steam boilers and to arrangements for utilizing waste heat. Reference is made to Specifications No. 3938, A.D. 1872, [*Abridgment Class Steam generators*], Nos. 329 and 376, A.D. 1873, and No. 691, A.D. 1873, [*Abridgment Class Steam generators*]. The waste gases may be led from the boilers into a chamber containing water and divisions for "raising steam and obtaining motive power." Or the gases are passed through a jacketed vessel fitted in the chimney or flue, and heated by the waste gases or by steam or hot air, through the jacket of which vessel water is caused to circulate from a cistern or from pipes conducted round rooms &c. for heating, warming, or drying. Or bisulphide of carbon, ether, aldehyde, alcohol, chloroform, essences of benzene or benzol, or other liquids or fluids may be heated in the jacketed vessel and passed through pipes for warming rooms, drying, or other purposes. The waste heat from gas lights or from mineral or vegetable oils and from the chimneys and flues of dwelling-houses, is utilized in a similar manner for warming and

drying purposes, by the use of a jacketed vessel or a coil of pipes.

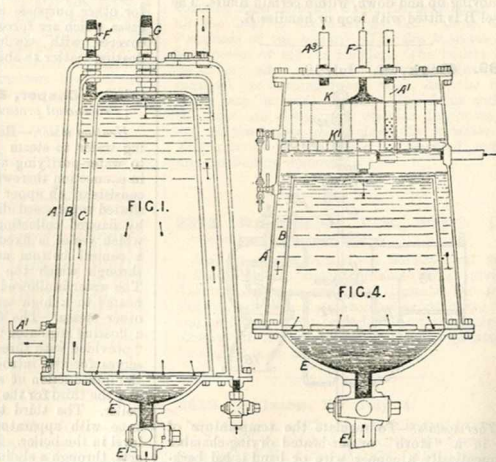
**2682. Wetherill, J.** Aug. 13.



*Heating air.*—The air required in a kiln for drying malt, barley, grain, chicory, roots, &c., is heated in the tubes 1 in the furnace 2, passing thence through the perforated floors 10, 12 to the malt &c. The walls 3 are of firebrick, and the furnace is covered by an arch 5 of iron or brickwork.

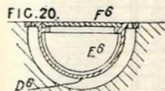
**2699. Hampton, J.** Aug. 15.

*Heating water.*—Apparatus for condensing steam and purifying and heating water for generating steam or for other purposes is formed of two or more concentric conical casings. Fig. 1 shows one form of apparatus in which three conical casings A, B, C are used, bolted at the bottom to the flange of a funnel E. Steam passes through the pipe A' into the space between the casings A, B, and water passes by the pipe F into the space between the casings B, C, thence through bottom openings into the casing C and away through the discharge pipe G in a heated condition. The impurities fall into the funnel E and are discharged through the cock E'. The steam may be passed into the space

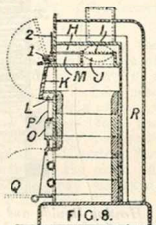


between the casings B, C and the water into the other space. In another arrangement, the outer casing is dispensed with and the apparatus is placed in a chamber at the rear end of the boiler flue, to be heated by the waste gases. Or a number of pieces of apparatus having double casings may be placed in a flue and the water passed through them in succession. Or a fourth casing may be added to form another water space outside the steam space. Fig. 4 shows another form of apparatus in which only two casings A, B are used, two perforated plates K, K' being fitted within the outer casing A, as shown. Steam is fed into the casing A, through the perforated pipe A' and water through the pipe F, and any uncondensed steam passes away by the pipe A". In another arrangement, having only two casings, the steam is passed through a coil arranged in the space between the casings.

2749. **Musgrave, J., and Shillington, T. F.** Aug. 20.



*Heating air; heating buildings.*—A stove in an underground chamber is connected to flues of semicircular section placed in covered air channels D<sup>δ</sup> in the floors of a building. Air from the stove chamber is further heated in these channels, escaping by perforations in the cover plates. The tops F<sup>δ</sup> of the junction boxes E<sup>δ</sup> are removable to give access to the interior. In another stove, shown in Fig. 8, air is heated in the iron casing R before passing into the apartment in which the stove is placed.



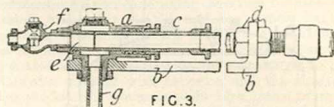
2813. **Kennelly, D. J.** Aug. 26. *Drawings to Specification.*

*Heating air.*—Air is heated by passing it through a vertical cylindrical iron chamber placed in the centre of a vertical retort used for distilling shale &c. The air so heated may be used for drying peat turfs or peat fuel blocks.

2903. **Worroll, E.** Sept. 4.

*Steam traps.*—The casing *a* of the steam trap is secured to one end of a bar *b* and is formed with a gland in which one end of a pipe *c* slides. The other end of the pipe is secured to the other end of the bar *b* by lock-nuts *d*, so that the expansion

of the pipe *c*, caused by heating, forces it against the seat *e*, closing the passage to the waste-pipe *g*. When steam is admitted to the range of heating-pipes in a building, the comparatively cold water



of condensation escapes to the pipe *g*; but when the pipes have been heated, the pipe *c* expands and the hotter condensed water is forced through the back-pressure valve *f* to the boiler.

2981. **Dixon, J. A., [Cobley, T. H.]** Sept. 11.

*Heating liquids.*—In the production of sulphuretted hydrogen from magnesium bisulphide, the bisulphide solution is decomposed in a vertical cylindrical boiler erected over a firegrate and having a central flue or fire space fitted with a damper. The boiler is enclosed in a chamber which permits the heated gases to pass round the outside as well as up the central flue, and the fuel is charged into the fire space through an opening at the top of the chamber. The boiler may also be heated by the waste heat from a black-ash furnace used in the production of calcium polysulphide.

2997. **Mason, S., and Alcock, M.** Sept. 12.

*Boiling pans.*—Relates to a method of circulating the washing liquor through the kiers used in cleaning wearing-apparel. The liquor flows from the lower part of the kier by a pipe *e* to an apparatus *b* similar to a steam injector which forces it up an ascension pipe *f*. The apparatus is fitted with a regulating spindle and the steam is discharged from a tapered nozzle into a contracting passage. The pipe *f* is connected to an annular perforated pipe *g* extending round the manhole *h* formed in the centre of the crown of the kier. Or an annular passage may be formed around the manhole. A hollow casting *i* fixed to the top of the pipe *f* carries a safety-valve, pressure-gauge, and connections for water &c. supply pipes. A gauge glass *n*, which may be surrounded with wire gauze, forms part of the tube *f* and enables the flow of the liquor to be observed. The Provisional Specification states that in kiers provided with revolving agitators, the blades &c. are formed on a tube closed at one end and fitted to revolve in a gland at the other end. The tube slides on the driving-shaft when withdrawn from the kier, in order to obtain access to the interior of the kier.

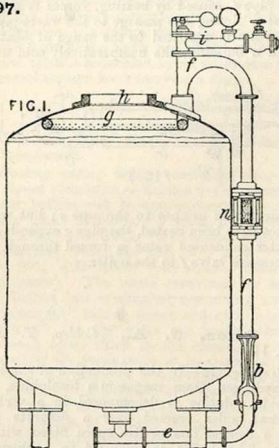
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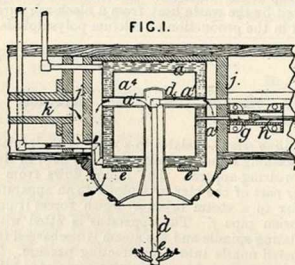
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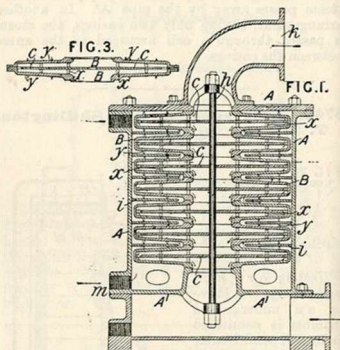
3017. Walker, W. Sept. 15.



*Thermostats; heating water.*—A thermostat, consisting of a piston operated by the expansion of air in a closed chamber and actuating a valve, is applied to gas lamps, furnaces, and stoves. In Fig. 1, the air chamber  $a'$  is shown placed between the floor and ceiling joists above the sun burner  $e$ , and surrounded by a water heater  $a$ , in which water for heating buildings and for hot-water supply to baths &c. is heated by the waste gases from the burner. The air in the chamber  $a'$  expands through a pipe  $a^2$  on its temperature rising, and forces the piston  $g$  outwards in its cylinder  $h$ . The piston  $g$ , being connected to a crank-pin on the gas-supply valve by means of a connecting-rod, turns the gas valve and shuts off the gas as required. The chamber  $a'$  may be placed in a boiler or furnace flue, and the piston  $g$  may operate a

damper to regulate the draught or a door to regulate the air supply to the furnace. The admission of steam to the furnace may also be regulated by similar means. In a modification, the cylinder  $h$  is vertical and the piston is loaded. The flue damper is connected to a piston in another cylinder communicating with the upper part of the first cylinder by a small pipe. When the temperature reaches a certain point, this pipe is uncovered by the first piston and the rush of high-pressure air into the second cylinder closes the damper suddenly.

3024. Paxman, J. N. Sept 15.



*Heating liquids and gases.*—Relates to an apparatus for heating and purifying feedwater, which apparatus may also be used as a condenser and for heating air and other gases, cooling liquids, &c. A number of flat chambers B, Fig. 1, fitted or not with diaphragms  $c$ , are arranged within a casing A, the whole being secured together by a central bolt  $h$  with nuts bearing on bridge-pieces. Diaphragms  $i$  are fitted in the casing A between the chambers B. The steam enters at  $k$  and passes through the interiors of the chambers B, while the water enters at  $m$  and flows in the opposite direction, acting on the exterior surfaces of the chambers. Any sediment from the water collects on the bottom  $A'$  and is removed. The water may flow through the chambers and the steam through the casing. The chambers B may be formed of dished plates secured together as shown in Fig. 3, or they may be cast in the form shown in Fig. 1. They may be corrugated to increase the heating surface. The diaphragms  $c$  may be held between the dished plates and perforated around the edges, or they may be supported on studs  $z$ . The diaphragms  $i$  are held between projecting studs  $y$ . The casing A may be divided into two parts vertically, or it may be built up of a number of rings so that any number of chambers B may be employed. The diaphragms  $i$  may be cast with the rings. In some cases, the chambers and the division plates are made of thin wrought metal. When the apparatus

is used as a refrigerator, cold water is caused to flow through it in one direction and the hot liquids to be cooled in the other. For heating air, steam is admitted outside the chambers B, and air passed through them.

**3082. Sanderson, S., and Proctor, A.**  
Sept. 19. [*Provisional protection not allowed.*]

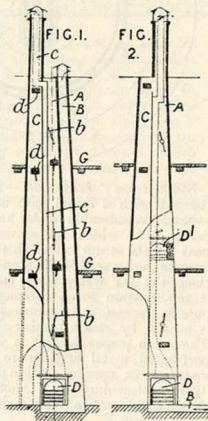
*Heating water.*—Relates to apparatus for economizing the waste heat and gases from boiler and other furnaces. The apparatus, which is placed in the furnace flue, consists of a series of inner and outer pipes depending from boxes or chambers so divided and arranged that a continuous passage is formed for water, steam, or other fluid throughout the whole series of pipes and boxes or chambers. The ends of the outer pipes are fitted with plugs and the chambers with covers, for cleaning &c. A series of scrapers are arranged to travel up and down the pipes to remove soot.

**3087. Scott, T. A.** Sept. 20. [*Provisional protection only.*]

*Boiling-pans.*—A casing or boiler forming the liquid receptacle of a washing-machine is made of copper or tinned or galvanized iron, or formed of a metal base and wood sides. A tap is fixed near the bottom, and the bottom may be plain or have a descending pot resting on a heating stove for boiling the water. The boiler may be made portable by forming a fireplace and heating flue below it, and securing handles at the sides. A wringing or mangling machine may be fixed, permanently or detachably, to the boiler.

**3094. Crane, E. A.** Sept. 20.

*Heating air.*—Air from the exterior of the building passes along an inlet shaft B, Figs. 1 and 2, and is heated by passing through pipes or between metal gills in an air chamber behind the stove D. Passing up the central shaft A, the heated air enters any of the upper rooms G through the corresponding register grating when a damper b is closed.



**3256. Hyatt, T.** Oct. 8.

*Non-conducting coverings and compositions.*—Relates to the application of asbestos to the manufacture of numerous articles, among which are mentioned non-conducting coverings for steam-heated and other heated surfaces, cosies, heat-retaining covers for meats, holders for sad-irons, ice covers, &c. Fine wire is wound with asbestos or coated with asbestos strips, pulp, or dough, or is otherwise covered with asbestos, and the thread thus produced is woven or plaited &c. into a fabric. Or asbestos flock, alone or with other fibres, is felted upon a perforated wire-netting, or sheet-metal foundation; or asbestos pulp or dough, which may be mixed with other materials, is consolidated upon a wire-netting &c. foundation. The sheets thus produced are used for making the various articles, and, in some cases, the asbestos dough alone may be used.

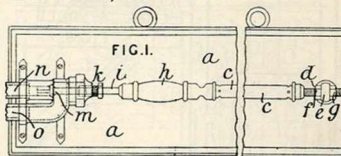
**3279. Hunter, J. W.** Oct. 9. [*Provisional protection only.*]

*Heating water.*—Water for baths and domestic use, and for heating conservatories, churches, &c. by hot-water circulation is heated in a water-tube boiler arranged around and behind the firegrate of a kitchen range or fireplace. Water is supplied from an overhead cistern, to which it returns when heated.

**3285. Wirth, F.,** [*Dold, J. A.*] Oct. 10.  
*Drawings to Specification.*

*Heating air.*—Air for drying yarn is forced by a fan through a pipe passing through a furnace flue, thus becoming heated.

**3297. Jones, W.** Oct. 10.



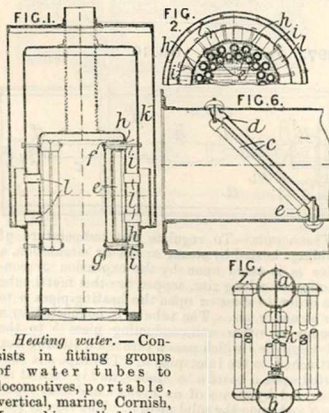
*Thermostats.*—To regulate the temperature of buildings heated by steam or hot-air circulation, a valve m is acted upon by the expansion or contraction of a long zinc, copper, or other metal tube c in order to close or open the heating-pipes o to the steam or air. The tube c is connected by a wooden or other non-conducting piece h to the valve spindle i which passes through a stuffing-box k attached to the inlet pipe n. The tube c is supported upon a board a by eyelets, and is fixed at its other end by means of an eyelet e and nuts f and g screwed upon the solid piece d. The tube is perforated at the ends and may be built up of several tubes placed side by side. The apparatus is set to

any desired temperature by adjusting the nuts *f* and *g* so that the valve *m* is closed after the room &c. has been observed to be at that temperature for some time. The valve *m* may act to shut off gas from heating gas burners. The tube *c* may be hinged to a rocking lever, the other end of which is hinged to a second tube placed parallel to the first and secured by lock-nuts &c. at the end nearest to the valve. By this means a greater travel of the valve is obtained. When applied to a system of hot-water pipes, the tube *c* acts on a pivoted lever which is connected by means of a chain with a lever on the axis of a throttle valve in the inlet pipe. Expansion of the rod is caused to shut the throttle valve. The chain of this arrangement may act on a sliding grid or valve to shut off the supply of hot air when that is used for heating or to allow of the entry of cold fresh air to the mill &c. in which the thermostat is placed.

**3311. Ellis, J.** Oct. 11. *Drawings to Specification.*

*Heating buildings; heating water; heating air.*—In a system of building in which a single central chimney is used, it is stated that facilities are gained for heating buildings by hot air, hot water, &c., "as hot-air chambers can be placed in connection with the chimneys for heating purposes; also cisterns and tanks for supplying hot water for heating or general domestic purposes can be placed in or round the chimney." Or a coil of pipes may be fixed in the spaces at the back of the grates and in proximity to the central chimney. Air may be heated in a similar manner for ventilation.

**3313. Massey, B., and Hill, J.** Oct. 13.

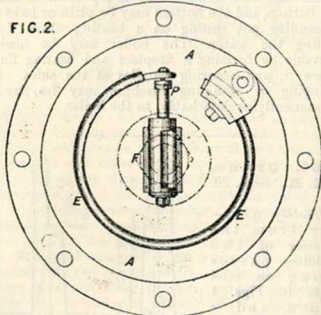


*Heating water.*—Consists in fitting groups of water tubes to locomotives, portable, vertical, marine, Cornish, Lancashire, cylindrical or other boilers, or in combining such groups to form a water-tube boiler.

The arrangements, which promote water circulation and reduce priming and incrustation, are also stated to be applicable to boilers for heating water and to economizers or feedwater heaters and surface condensers. Figs. 1 and 2 show a vertical boiler having groups of water tubes *e* arranged within the firebox. Each group consists of two, three, or more tubes connected at top and bottom to junction pieces *f*, *g* which have conical nozzles *h* fixed in openings in the firebox shell by means of bolts *i*, which also act as stays. Each group of tubes may be removed by withdrawing the bolts *i*. Fig. 6 shows a group of tubes *c* applied to the internal flue of a Cornish boiler, the junction pieces *d*, *e* being fixed by means of bolts and bridge pieces. The groups may be placed across any diameter of the flue. Fig. 7 shows the groups of tubes arranged in connection with drums *a*, *b* to form a water-tube boiler. The bolts which fix the junction pieces may pass across the drums and through both junctions, and they may have conical heads. The junction pieces of the tubes *k* are fitted with vertical nozzles and they are fixed by lower screwed ends and nuts. Or the connecting nozzles of the junction pieces may be provided with flanges and fixed by bolts.

**3350. Imray, J., [Peyer, A.]** Oct. 16.

FIG. 2.



*Steam traps; thermostats.*—A Bourdon tube *E*, charged with a liquid such as petroleum, which expands considerably under heat, is contained in a casing *A* to which the steam is admitted. The heat of the steam causes this tube to uncoil and operate the lever *P* of the stop-cock *F* which forms the outlet for water when used as a steam trap. A modification for a thermostat has the tube *E* outside the casing *A* immersed in the liquid which is heated by steam passing through the cock *F*. The steam passes through a wire gauze or finely-perforated metal strainer to prevent suspended matter from passing to liquids used in baths for dyeing, bleaching, &c. Another arrangement is shown and described with a disc valve in place of the stop-cock *F*.

**3357. Napier, J. R.** Oct. 17. *Drawings to Specification.*

*Boiling-pans.*—The lower portion of a boiler or water heater is formed with an annular water space projecting downwards and surrounding the fire contained in a suitable grate or holder.

**3360. Johnson, J. H., [Egnael, A.]** Oct. 17. [*Provisional protection only.*]

*Boiling-pans; digesters.*—Relates to apparatus which is specially applicable in the manufacture of chemical products, syrups, liqueurs, and extracts, and in sugar houses and refineries, breweries, distilleries, and in dye, soap, and glue works, for effecting the solution of the crude materials and the filtration of the solution. The "boiler" or apparatus is divided into two compartments, by a vertical removable partition forming a filter sliding in grooves. In the second or larger compartment, under which the fire gases pass after heating the first compartment, the solution of the crude materials is effected. The clear solution which

passes into the first compartment is heated by the fire gases in a flue which passes under and behind this compartment. Discharge cocks and openings are provided for drawing off the saturated solution and insoluble matters.

**3369. Galloway, G. B.** Oct. 17.

*Heating buildings.*—Exhaust steam from steam engines is utilized for warming mills, factories, and other buildings, &c. by passing it through suitably-arranged pipes.

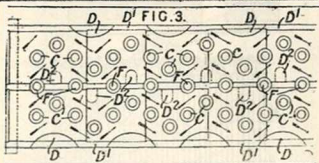
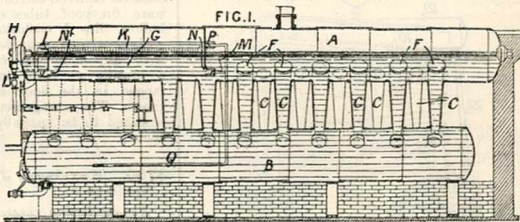
**3456. Branson, W. F.** Oct. 24.

*Heating air.*—In connection with the roasting of coffee, cocoa, and malt in a revolving cylinder, air, which is forced into the cylinder to aid in the operation, is first heated by passage through steel or porcelain tubes heated by the furnace which heats the cylinder. Or the air may be heated in a chamber or chambers by a separate blast air furnace.

**3456. Sanderson, W. A., Sanderson, R., and Sanderson, J.** Oct. 31.

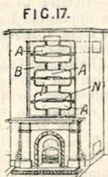
*Heating water.*—Relates to steam and other boilers. The boiler is formed by connecting two or more cylinders A, B by means of conical water tubes C, which are staggered or arranged in a zig-zag manner. The sides of the flues are fitted with projections or baffles D, D' and recesses D<sup>1</sup> to deflect the gases on to the water tubes. When two or more upper

and lower cylinders are used, forked or breeches pipes F are used for connecting them together. The feedwater is fed by a pipe H, valve I, and perforated pipe K into a trough-shaped vessel G, or closed cylinder, placed inside the boiler. The water passes into the boiler through the valve P and pipe Q, any sediment being deposited in the vessel and removed by opening the cock L, which communicates with the vessel G through the valve N'. Scum is removed by means of a funnel-mouthed pipe M connected to the vessel G by the valve N.



**3567. Rydill, G.** Nov. 1.

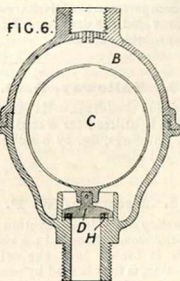
*Heating air.*—For heating fresh air to be admitted to apartments, sectional chambers A are placed in the hot-air chamber B. Perforated partitions N are placed in the chambers A to lead the gases over the inner surface, and are formed with a central manhole with a loose cover. The chambers A may be replaced by an apparatus consisting of a number of tubes arranged round a large central tube, which is covered by a loose plate, and is large enough for a man to pass up.



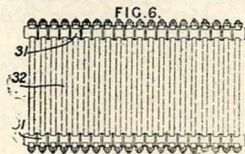
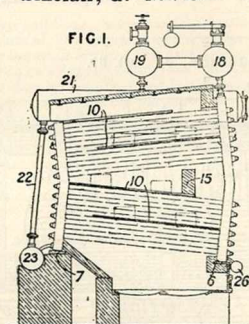


**3679. Sutcliffe, H., and Sutcliffe, W.**  
Nov. 12.

*Steam traps.*—A steam trap consists of a casing B enclosing a globe or wooden ball C attached to a valve D. The valve seat C enters a groove in the valve D in which is inserted a ring H wholly or partly of lead. Water collects in the casing B until the globe C floats, thus raising the valve and discharging the water.



**3693. Sinclair, G.** Nov. 13.

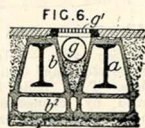


*Heating liquids.*—Relates to a construction of boiler stated to be applicable for heating liquids by the waste gases from furnaces. The boiler is similar to that described in Specification No. 3716, A.D. 1872, [Abridgment Class Steam generators]. The lower half of the tubes are inclined in the opposite direction to the upper half, the headers being adapted to suit the inclination of the tubes. The boiler is supported on cast-iron bearers 6, 7, carried by brickwork at the sides. The front header is connected with the steam drum 18 communicating with another drum which, in its turn, communicates with two side

steam and water drums 21. The drums 21 are connected at the back ends by pipes 22 with a lower drum 23 which communicates with the back headers. The front headers communicate with a drum 26 into which the feedwater is fed. The drums 23, 26 may be arranged directly under the headers. Holes, which are closed by plugs, are made in the headers opposite the ends of the tubes so as to facilitate fixing, cleaning, or repairing. In a modification, the separate headers at the front and back are dispensed with and single casings substituted; also, only one drum is arranged on the top of the boiler and a steam and water drum at the side. The casings are stayed by screwed studs or by T-irons riveted to the inner side of the plates and connected in the water space by bolts. The height of the boiler may be lessened by forming the fireplace amongst the lower tubes, the tubes in the middle being omitted to allow of this. Another form of heater consists of a series of vertical tubes 32, Fig. 6, connected at the top and bottom with casings 31.

**3714. Hornblower, L.** Nov. 15.

*Heating buildings.*—Heating-tubes *g* rest on concrete between earthenware fireproof tubes or hollow tiles *b* enclosing girders *a* and provided with air chambers *b'*, a grating *g'* being arranged in the floor as shown. The arrangement is stated to be specially applicable to warehouse floors.

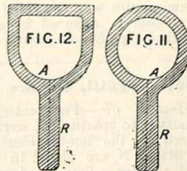


**3760. Harrison, J.** Nov. 19. *Drawings to Specification.*

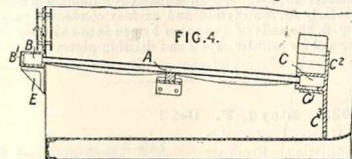
*Non-conducting coverings* are arranged on the exterior of a food-preserving or refrigerating vessel so that all parts are "equally invulnerable" to external heat. The corners of rectangular vessels are lined with a superior non-conductor such as wool, hair, or charcoal, and the sides may be lined with sawdust, straw, &c.

**3774. Moore, G. M.** Nov. 20.

*Heating water.*—Relates to hollow firebars and fire-bridges for steam-boiler, water-heating, and other furnaces through which water is circulated, and consists in arranging a number of hollow bars A, preferably constructed with ribs R as shown in Figs. 11 and 12, between front and rear bearers, or water chambers. The water passed through the firebars &c. may be used for warming purposes generally. Fig. 4 shows an arrangement for a marine boiler.

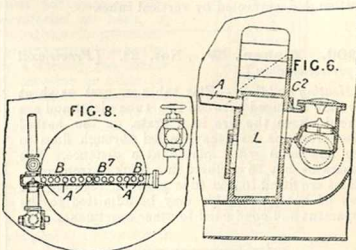


in which hollow bars A are fixed between hollow bearers B, C. The front bearer B is supported on brackets E, and the rear bearer C is supported on similar brackets or fitted with the flanges C<sup>1</sup>, C<sup>2</sup>.



to enable feedwater to pass through the bearer C, bars A, and bearer B to the boiler, or the boiler water to circulate through the bars and bearers when the feed is shut off. The rear bearer may be formed into a water chamber or feed-heater L, as shown in Fig. 6. The front bearer B may be formed in two parts, or divided by a diaphragm B<sup>1</sup> as shown in Fig. 8, the water then flowing in opposite directions through the two half-sets of bars. One part of the bearer is connected to the feed

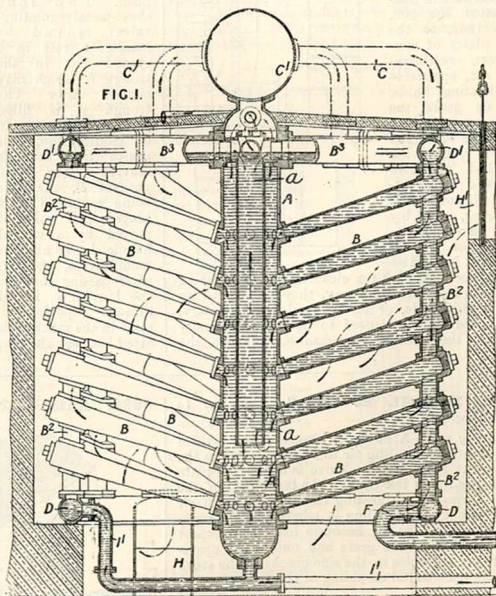
The bearers are fitted with covers B<sup>1</sup>, C<sup>1</sup> to facilitate the cleaning of the tubes. They are connected to the boiler, and also to the feed pump, by connections fitted with cocks and non-return valves, so as



and to the boiler and the other to the boiler only. Arrangements of divided front bearers for marine and double-flue boilers are shown.

3791. Twibill, J. Nov. 21.

*Heating liquids.*—A water heater is arranged in a flue at the back end of a boiler in a manner similar to that described in Specification No. 2378, A.D. 1866. The heater consists of a number of straight or tapered tubes B, Fig. 1, closed at the outer ends and arranged radially round a central chamber A. Each vertical row of tubes is connected at the top and bottom with annular pipes D, D<sup>1</sup>, and the tubes in each row are connected at their outer ends by short pipes B<sup>1</sup>. The upper annular pipe D<sup>1</sup> is connected with the central chamber by pipes B<sup>3</sup> and with the steam drum C<sup>1</sup> and with the feed pump C, when such is fitted, by pipes C. The central chamber is fitted with a pipe a for assisting the circulation of the water. The waste gases enter the casing through the opening H and pass out through the opening H<sup>1</sup>. The water is fed into the heater by the pipe F, and the sediment &c. is blown out through the pipe I<sup>1</sup>. The heated water passes out through a pipe beneath the steam drum. A heater may be constructed with two or more chambers, each with two rows of tubes arranged on opposite sides.



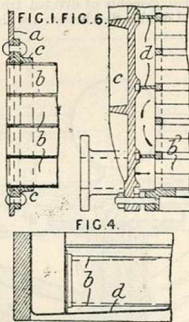
In a modification, the upper and lower annular pipes D, D' are connected by vertical tubes, or the central chamber may be omitted, and two concentric annular pipes arranged at the top and bottom and connected by vertical tubes.

**3900. Fisken, W.** Nov. 28. [*Provisional protection only.*]

*Heating buildings.*—Flat tubes or cast or sheet iron are arranged between two tube plates and are placed above the fire in a grate, or the heated gases from the grate may be led through flues to the apparatus when placed at a distance. The apparatus may be enclosed in a brick or iron oven. Slides are fitted to one tube plate to regulate the flow of hot gases. Air may be admitted to the apparatus and conducted to other apartments.

**3902. Morton, R.** Nov. 29.

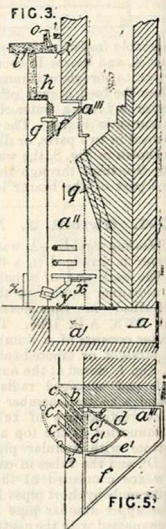
*Heating gases and liquids.*—For securing flattened or other shaped tubes, as described in Specification No. 939, A.D. 1862, to the side plates of condensers, refrigerators, &c., applicable for heating fluids, air, or gases, the tubes *b* are soldered or brazed to flanged sockets *c*, which are attached to the plates *a* by riveting, brazing, or soldering, or by bolts and india-rubber or leather washers. Instead of having the loose caps for cleaning the interior of the tubes in the channel way, they are placed on the opposite side, or on both sides if necessary. The liquid may be caused to flow longitudinally through the passages or channels between the



tubes, in which case the tubes are slightly inclined, as shown in Fig. 4, and have openings *d* at alternate ends for the passage of the liquid from channel to channel. In apparatus intended particularly for distillation and surface condensation, Fig. 6, the ends of the tubes *b* open into chambers formed by cellular caps *c* and division plates *d*.

**3925. Lloyd, F.** Dec. 1.

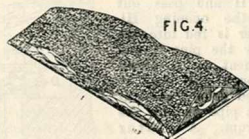
*Heating air for ventilation.* Fresh air passes through the flue *a*, Fig. 3, of an open fireplace into a chamber *a'*, from which it rises through upright flues *a''* on each side of the grate into the upper transverse flue *a'''*, containing a water trough *f*, and passes through a slot *i* or perforated plate in the mantelpiece. Two long sheet-metal regulating-valves moved by handles *o* rest in a groove cut in the trough *l*, which may contain water. The trough *f* is filled through a pipe *g*. In a modification, air passes out through louvres *c*, Fig. 5, in grooves *c'*, the flow being regulated by a hinged flap valve *d* moved by a curved handle *e'*. In another modification, the air, after passing through the louvres *c*, is led through a perforated plate in the mantelpiece. A sliding valve may be fitted between the chambers *h*, *a'''*, Fig. 3.



**3941. Russell, R.** Dec. 2. *Drawings to Specification.*

*Heating air.*—A stove or fireplace is provided with means for heating air to be distributed to the apartment in which the stove is fitted. A plate extending round the back of the lower part of the stove forms an air-heating chamber to which air from without the building is admitted by a regulating-valve. The air becomes heated by impact with the sides of the grate and enters the apartment through holes in the side checks of the stove or in an ornamental moulding at the front.

**3984. Suffield, T.** Dec. 4.

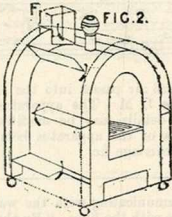


*Footwarmers; hot-water bottles; airers.*—The footwarmer shown in Fig. 4 is formed with inclined sides covered with felt, cloth, skin, &c., under

which travellers may place their feet. The metal sides are corrugated or indented diagonally, horizontally, or vertically. The apparatus is filled with hot water through a hole which is stopped by a plug removed by a key. Similar footwarmers may be constructed with one inclined side. The Provisional Specification states that with a few modifications the apparatus may be used for airing beds.

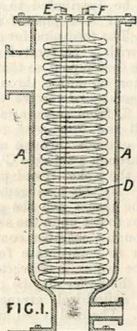
4016. **Read, T.** Dec. 6

*Heating liquids.*—A water-heater for circulating purposes is constructed saddle-shaped, as shown, and is closed at the back end with the exception of an opening or openings for the escape of the gaseous products. A full space is formed round the boiler by a metal casing. This full space is divided by baffles &c. in such a way that the products of combustion pass through the opening or openings at the back to the smoke box, then underneath the boiler to the front where the current is divided, each part passing backwards and forwards along the sides of the boiler until the chimney F is reached. A damper is fitted to allow the products to pass direct to the chimney when the fire is first kindled. The front of the outer case is fitted with fire and asphalt doors and also with soot doors. The boiler may be set in brickwork, the flues being suitably formed. The firebrars may be either of solid iron or of hollow circulating tubes.



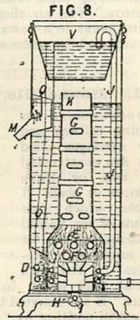
4056. **Todd,**  
**M.** Dec. 9.

*Heating water.*—The exhaust steam from a steam engine is utilized for heating water for wool washing and other purposes. The heater consists of a double or single coil of pipe D, preferably of copper, enclosed in a casing A through which the exhaust steam is passed. The water inlet and outlet are shown at E and F.



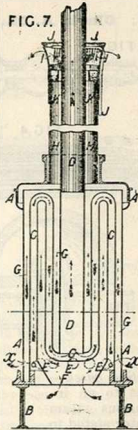
4096. **Verity, W., and Verity, B.** Dec. 12.

*Heating water.*—An annular boiler for heating water for warming conservatories or halls, or for baths, or for a domestic hot-water supply, is heated by a fireclay gas burner E, asbestos or other indestructible substance being placed between the water tubes D and coil J. The fireplace F and the uptake K are traversed by water tubes E, G. The water circulates through the coil J and passes from the vessel V by a pipe Q to the lower part of the apparatus. The heated products of combustion may be deflected on the surface of the water, and may be further moistened by a fine spray or shower, while passing from the outlet M. Air enters the gas-burner through the opening I, and gas is supplied by the pipe H. The vessel V may be omitted, and may be replaced by an inverted dished baffle-plate or by a chamber for airing towels, clothes, &c.



4111. **Henderson, C. J.** Dec. 13.

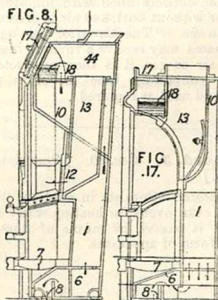
*Heating buildings; heating air.*—A stove for heating air for churches, glass houses, and other buildings, is placed in a separate apartment, the heated air passing into the church &c. near the roof. Cold air from the building passes into the apartment containing the stove and enters the stove by the openings E, F; it circulates through spaces G between flues C, D, heated by gas or other burners x, and passes from the flue H into the adjoining building or apartment. The stove pipe D is of serpentine form and is fitted with gills to increase the heating-surface.



4122. **Crossland, J.** Dec. 15. [Provisional protection only.]

*Heating buildings.*—Fresh air enters a stove chamber, ascends through pipes heated by the

180. Lewis, J. W., and Wood, G.  
Jan. 14.



*Heating air.*—Two forms of a fireplace for heating air for ventilating purposes are shown in Figs. 8 and 17. A main hot-air chamber 1 is formed round the back and sides of the firegrate and is in connection with upper and lower chambers 10 and 6 in which air is also heated. The chambers are provided with internal gills or baffle-plates which increase the heating-surface over which the cold air, entering by the passage 8, passes. The heated air before escaping into the room through the grating 17 passes over water contained in a vessel 8.

233. Lake, W. R., [Myers, A. G.]. Jan. 17.  
[Provisional protection only.]

*Heating buildings; heating air.*—Relates to ventilating and warming apparatus for rooms &c. The fresh air for ventilation passes through a pipe, extended through a wall or window of the room to be ventilated, into a dome-shaped jacket or cover of metal or other suitable material placed over a dished vessel of metal or earthenware, and so fitted to the latter that there is a space left between them all round and above the dished vessel. The jacket has perforations around the lower part of its periphery, where it rests on a flange formed around the lower periphery of the dished vessel. The apparatus is placed over a gas or other burner or heater, so that the dished portion is exposed to the heat, and the fresh air entering the jacket is heated and issues from the perforations into the space to be ventilated. The top of the dished portion may be provided with projecting pieces, to form curved passages retarding the exit of the air.

262. Woods, J. E. T. Jan. 21. [Provisional protection only.]

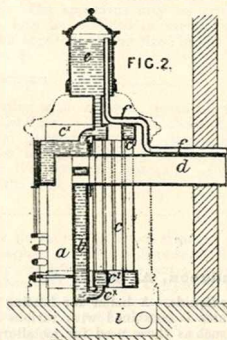
*Heating water.*—To increase the heating surface in internally-fueled boilers, a close-ended tube is

placed centrally in each flue and connected to the water space, thus forming an annular flue. The inner tube may extend the full length of the flue and a separate fire be employed under the shell or lower part of the outer surface of the boiler.

355. Reed, J. Jan. 28. [Provisional protection only.]

*Boiling-pans.*—Consists in collecting the steam from all open boilers for domestic and other purposes and delivering it under the furnace. The steam is collected in a perforated casing near the top of the boiler, whence it passes through pipes and flues to the ashpit.

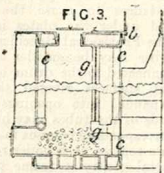
379. Snell, H. S. Jan. 29.



*Heating air.*—The waste heat of open or closed stoves is utilized by fitting a water chamber with tubes, round or through which air circulates for heating the building. In the arrangement shown, an open grate *a*, which may be replaced by a gas burner, is enclosed at the sides, back, and top by a water chamber *b*, communicating by short bent pipes *c'* with water boxes *c'*, connected by vertical tubes *c*. A reservoir *e* supplies the apparatus with water. Air is admitted to a chamber *i* below the apparatus, and rises up amongst the tubes *c*. The flue *d* may be formed with two or more tubes and may be surrounded by water. The pipe *f* carries off any steam generated to the chimney. In another arrangement, a water tank surrounds the back and sides of the fireplace and is traversed by vertical air tubes. Circulation of the water is ensured by connecting the top and bottom of the tank by an external pipe. A close stove is arranged with water pipes surrounding the water chamber, the inner casing of which forms the fuel-holder. The air rises in the external casing and, after circulating among the water pipes, escapes into the room.

**397. Dearman, R.** Jan. 31.

*Heating water.*—To economize fuel and consume smoke, furnaces are constructed so that the fuel will close the openings leading into the chimney flue and thus compel the products of combustion to pass through or over the burning fuel. Fig. 3 shows a section of a tubular hot-water apparatus for heating greenhouses and other buildings; the top water space *b* is connected to the back row of tubes *c* by elbow pipes *g*, the vertical spaces between which are filled in to form a vertical partition. A flat water chamber may be used in place of the tubes *g*. Fuel is fed into the furnace until it covers the lower portion of the partition, the gases passing up between the partition *g* and tube *c* to the chimney flue.

**529. Craps, J., and Derihon, J.**, [Reintjens, L. J.]. Feb. 11. [Provisional protection only.]

*Non-conducting compositions.*—A composition or mastic suitable for covering steam boilers, engines, cylinders, pipes, &c. consists of clay, pounded charcoal, hair, sea drift or seaweed, furnace waste, sawdust, rye flour, cotton-oil waste, and powdered plaster mixed together with water.

**552. Goater, J.** Feb. 13. *Drawings to Specification.*

*Non-conducting coverings and compositions.*—The walls &c. of safes, strong-rooms, &c. are rendered non-conducting by a powdered mixture of Portland, Roman, or Keene's cement, &c. with alum, soda, or other mineral which emits steam when heated, or by using alum, soda, &c. separately in thin boxes or cases of wood, papier mâché, cardboard, perforated sheet iron or tin, &c. surrounded by the cement.

**427. Brook, E., and Wilson, A.** Feb. 3. *Drawings to Specification.*

*Heating air.*—A portion of the heated air supplied from a Siemens' or other regenerator to boiler and other furnaces is employed for heating rooms and stoves, and also for heating the jackets of steam-engine cylinders and the drums for drying yarns and cloth. The regenerator is situated at the back end of the furnace. A system of pipes exposed to the waste gases may be substituted for the regenerator.

**627. Neuhoff, W.** Feb. 19. [Provisional protection only.]

*Heating water.*—A bath, bathing-tub, or vessel is heated by a slow-combustion stove placed at one end and partitioned off by a perforated screen. The stove, preferably of cylindrical form, has a firegrate and ashpit, and is provided with a perforated cover and with a handle for moving it.

**459. Newton, A. V.**, [Babbitt, B. T.]. Feb. 4. *Drawings to Specification.*

*Heating air.*—A current of air is used as the medium for condensing the exhaust from an engine. The air is exposed to waste furnace-gases either before or after circulating round the condenser. The heated air is then supplied to the furnace of the boiler or may be used for warming buildings.

**637. Rydill, G.** Feb. 19.

*Heating water.*—Relates to the construction of sectional and water-tube boilers similar to those described in Specification No. 3732, A.D. 1873, [Abridgment Class Steam generators], stated to be applicable as fuel economizers and for other purposes. A series of seven boilers each consisting of an upper and lower cylinder connected by water-tubes, are arranged side by side and close together so as to form their own flues and cause the products of combustion to pass in a serpentine direction, the tubes of the end boilers being arranged to form water-walls. The cylinders of the end boilers are slightly smaller in diameter than the other cylinders. The tubes are of the same diameter as the cylinders and are six in number to the end boilers and five in number to the remaining boilers. The third and fifth tubes of the second boiler are formed with reduced ends, like the neck of a bottle, or short tubes projecting from the cylinders may be connected by small tubes to allow the products to pass from one flue to another; the second and fourth tubes of the sixth boiler are treated in a similar manner.

**478. Hyatt, T.** Feb. 5.

*Non-conducting coverings and compositions.*—Asbestos "slip" or paste is combined with fibrous asbestos or with vegetable fibre or cow or horse hair, &c., to form a non-conducting felt for covering steam boilers, steam pipes, &c.

**493. Hock, J.** Feb. 7. *Drawings to Specification.*

*Methods of heating.*—The exhaust from a petroleum engine is conducted through pipes or chambers for heating purposes.

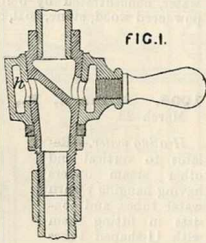
vertical boiler fitted with hanging U-shaped water tubes *a*. Both ends of each tube are fixed in the crown plate of the firebox, and one leg of each tube is fitted with an extension piece *c* having a curved shield *o* which tends to prevent priming and to direct the water current towards the other leg. The legs of the U-tubes may be curved so as not to be parallel. The extensions *c* are held in position by a ring plate *e* or other means.

**1032. Radeke, W.** March 25. [*Provisional protection only.*]

*Heating air.*—Relates to apparatus for heating air in sheds for drying peat and other fuel. Through one or more walls of the drying-shed is carried a row of flues of furnaces. The flue pipes are laid on the bottom of the shed and lead to a chimney or to an exhausting apparatus or blower. Between or under the pipes are arranged perforated pipes connected outside the shed with a wider pipe, which is connected with a chamber consisting of two funnels placed mouth to mouth and provided with a blower for forcing air through the perforated pipes into the shed.

**1055. Nield, T. A.** March 26.

*Steam traps.*  
The cocks, worked by floats for giving exit to condensed water, are formed with passages *h* in their casings so as to allow for equal expansion in all directions. Fig. 1 shows a cock with a fixed plug and a casing worked by hand, but the invention is also applicable to cocks having fixed casings and movable plugs.

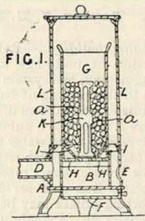


**1080. Raggett, G.** March 26. [*Provisional protection not allowed.*]

*Heating buildings &c.*—Relates to means for heating flower or plant cases fitted in the windows or other openings of buildings. Steam or hot-water pipes or receptacles are placed in the lower part of the case, the pipes communicating with the kitchen boiler.

**1065. Peacock, J. C.** March 27.

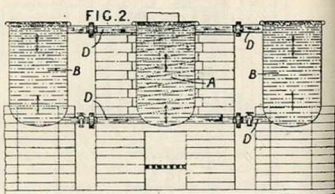
*Heating air.*—Fresh air for the ventilation of a room enters from the outside into an air heater surrounding or placed upon the top of the stove-casing *L*, and passes out through perforations in its walls to the room when heated.



**1067. Simpson, T.** March 27. [*Provisional protection only.*]

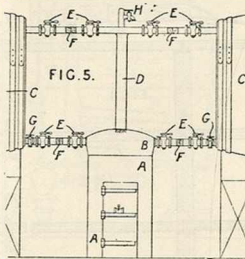
*Heating buildings &c.*—Greenhouses are heated by steam or water pipes at high or low pressure. The pipes are placed "on a medium level with the level of the water in the boiler," and the steam circulates in the pipes and condenses in the more remote pipes, and returns to the boiler through the same pipes. Where low pressure is employed, a pressure-regulating valve is constructed in the form of a supply cistern. The pipe connecting the cistern with the boiler is made with a dip in which a column of water is maintained by the pressure of steam. When the pressure exceeds that due to the water in the column and cistern, the steam blows off.

**1193. Gedge, W. E.,** [*Fabas, O. M.*]  
April 4.



*Heating liquids.*—An apparatus for heating water for domestic washing, and for sterilizing wines by heating them, and for use in mineral water factories, consists of a boiler *A*, Fig. 2, set in a furnace, and connected to two receivers *B* by pipes *D*, through which the liquid circulates as shown by arrows. The boiler and receivers, if fitted with hermetically-closed covers, should be provided with safety valves. Wooden false bottoms should be added to the receivers when

used as a washing-apparatus. In a modification, wine casks C, Fig. 5, or suitable receivers for washing, bleaching, washing wool, tanning, &c., are connected to the boiler B by a vertical pipe D and



horizontal pipes fitted with cocks E and screw couplings F. The casks are filled through funnels. The air-escape cock H and the temperature-testing cocks G are not required except when heating wines.

**1210. Matthews, F. C.** April 7. [*Letters Patent void for want of Final Specification.*]

*Heating air.*—Tubes are passed through the fire of an open grate or close stove, or are arranged as firebars. When the tubes are hot, a current of air passes through them from the interior of the building into the apartment.

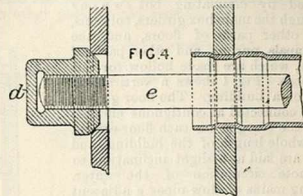
**1246. Brannon, P.** April 10.

*Heating buildings.*—"Russian stoves or warming or drying coils" are formed by constructing a skeleton of wood or bamboo covered by a netting of ropes, fibre, or cane, and embedded in a compound of cement, and fibre &c.

**1284. Appleby, C. J., and Cornes, C.** April 14.

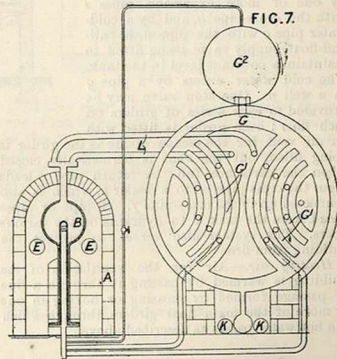
*Heating water.*—Water heaters and steam boilers are fitted with water-tubes arranged at right-angles to the path of the flame and gases. To facilitate withdrawal and cleaning of the tubes, holes are made in the outer casing opposite the ends of the tubes, as shown. The outer casing is stayed by rods *e* passing through the tubes and fitted with nuts *d* of brass or other soft metal; the nuts are formed with a conical bearing to prevent leakage. Light tubes may be used in the place of the rods *e*, each tube having holes at the ends, one on the underside and another on the

top side to increase the circulation. Some of the water-tubes may extend to the outer shell and act



as a support against the pressure of the nut *d*, the extended part being perforated.

**1300. Lake, W. R., [Renshaw, D.].** April 15.



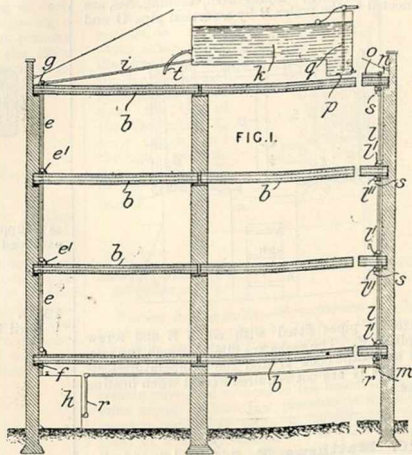
*Boiling pans.*—Superheated steam is used for heating steam generators, the invention being stated to be applicable also for soap-boiling. Fig. 7 shows the arrangement as applied to a water-tube boiler B, the superheater B being set in a "reverbatory" furnace A. The pipes L conveying the superheated steam enter or come in contact with the upper part of the boiler and, after passing between the tubes *G*<sup>1</sup>, are brought back again to the superheater. The flues E under the furnace A communicate with the flues K under the boiler for the purpose of utilizing the waste heat. Steam may be supplied to the superheater from the drum *G*<sup>2</sup> of the boiler.



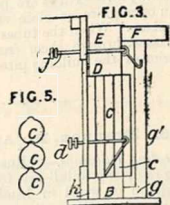
1331. Taylor, E. J., Milsted, A., and Clark, E. April 17.

*Heating buildings.*—A building is heated by circulating hot water through the main box girders, columns, and other parts of floors, and the principals, purlins, and other parts of roofs, which are made hollow for this purpose. Fig. 1 shows a vertical section of a building. The floor girders *b* are connected at contiguous ends so that the troughs on each floor extend the whole length of the building, and they are laid at a slight inclination to promote circulation of the water. Rising mains of flow pipes *e* adjacent to each vertical row of girders are connected at the top and bottom by cross-pipes *g, f*, and to each girder by branches *e'*; the return pipes *l* are connected by cross-pipes *n, m*, and to the top and bottom of each girder by branches *l', l''*, the latter branches having stop valves *s*. A tank *k* at the top of the building communicates by one or more expansion pipes *i* with the cross-pipe *g*, and by a cold-water pipe *o* with the pipe *n*, a ball-and-float supply valve being fitted to maintain a constant level in the tank. The cold water enters by a pipe *q* in a well *p*. One stop valve may be provided to each series of girders on each floor; each girder is fitted with an air vent for the escape of air as the girder is being filled, but the vent is hermetically closed when the parts are full. A return pipe *r* leads from the cross-pipe *m* to a boiler *h*, which is also connected up to the cross-pipe *f*. A pipe or pipes *t* lead from the tank *k* to hydrants on the various floors. The system also serves to protect the building from fire.

*Heating air.*—Air for the ventilation of the building is warmed by passing it through a flue or passage formed by encasing or boxing in one or more of the main floor girders, through which the hot water passes as described above.



back consisting of a number of cast-iron tubes *C* joined by ribs and grooves as shown in Fig. 5. Fresh air entering by openings *k*, Fig. 3, or otherwise, is heated in the tubes *C* and in the spaces between them, and is led into the room or other rooms from the casing of the fire-place.



1361. Southby, E. R. April 20.

*Heating liquids.*—Relates to apparatus for preventing acidity in beer by heating it. The beer is heated in a strong closed vessel which may be connected with a condenser. In the vessel is placed a vertical coil of tinned copper surrounded by an open cylinder of tinned copper. Steam or hot water is passed through the coil, and the condensed alcohol is returned to the beer. The beer may be heated in a steam-heated covered brewing-copper.

1403. Lake, W. R., [Cushing, M. A.]. April 22.

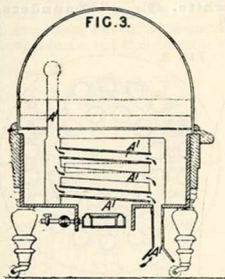
*Heating air.*—An open fireplace is made with a

1406. Wyatt, W. P. April 22.

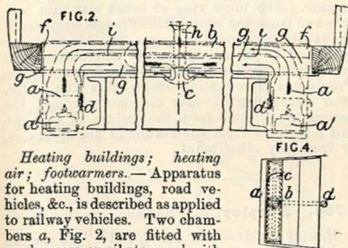
*Heating air.*—An apparatus described in Specification No. 3128, A.D. 1872, [Abridgment Class Closets &c.], for heating a Turkish or vapour bath is modified so as to supply heated fresh air to the bath chamber. Fig. 3 shows a section through a stove consisting of a terra-cotta or metal chamber containing inclined tubes *A'* through which passes the air to be heated. A gas, oil, or spirit burner may be used, the waste heat being utilized to heat the bathing chamber and the water for a shower or douche bath.

(For Figure see next page.)

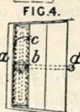
1406.



1431. **Brookes, W.,** [*Chaumont, J. J. A.*], April 24.

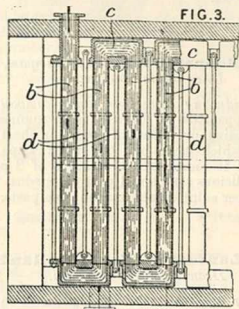


*Heating buildings; heating air; footwarmers.*—Apparatus for heating buildings, road vehicles, &c., is described as applied to railway vehicles. Two chambers *a*, Fig. 2, are fitted with gas burners or oil stoves *a'* with flues *b* which warm the metal compartments *f*, *g* separated by a partition *i*. Air enters the casing *d*, is heated in the compartment *g*, and is delivered by the pipes *h* from the compartment *f* to the carriage or apartment. The upper compartment *f* may be filled with air or with a liquid such as oil or glycerine and water. The top plate may form a footwarmer. In a modification, in which the carriage or apartment is not ventilated with warm air but is simply heated by the warming-chest *f*, *g*, the chamber *f*, *g* is not divided and the casings *d* are not fitted. The pipes *b* from each burner then extend to the opposite side of the carriage &c., and open into the chamber *f*, which is constructed with an outlet *c* at the bottom or other suitable part. In another form, the heating-pipes *c*, shown in plan in Fig. 4, are placed in a warming-chest *b* upon the floor of the carriage or building. One stove or burner, fitted with a flue *d* is used. The heating-pipes may radiate from a central fireplace *a*, the ends of the pipes opening into the heating-chest, in the bottom or side of which an opening is made for the efflux of the waste gases. The air for the combustion may be drawn from the interior of



the carriage &c. by enclosing the burner or fire-place and leading a pipe from below the seats or other place to the casing.

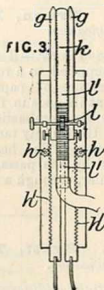
1436. **Mason, S., and Alcock, M.** April 24.



*Heating water.*—The water is circulated through one or two tubes *b* arranged, preferably horizontally, in the upper part of the flue leading from a boiler or other furnace to the chimney, or in a separate chamber through which the waste gases are passed. The tubes communicate with one another through junction-pieces *c* which fit on the ends and are secured by stay bolts *d*. In another arrangement, the tubes are of cast iron with semicircular ends connected together by bolts.

1438. **Werdermann, R.** April 24.

*Heating by electricity.*—An electric blowpipe, applicable for heating the rock face in mining and tunneling, consists of two carbons *g* adjustable by racks and pinions *h'* and *h* on a frame, and connected to a battery by wires leading from the racks. A carbon tube *k*, adjustable by a rack and pinion *l'* and *l* serves as a blowpipe, and blows a current of air, steam, or gas over the carbon points. In a modification, the carbon points are arranged between the poles of an electromagnet which repels the arc, producing a pointed flame, the blowpipe *k* being dispensed with.



**2028. Brannon, P.** June 10. *Drawings to Specification.*

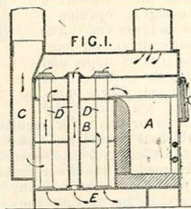
*Non-conducting coverings and compositions, for forming the linings of safes, and the skins and other parts and fittings of ships and boats. The composition consists of crushed "ballasting," burnt clay, bricks, pottery, clinkers, or slag combined with limes, cements, oils, resinous, bituminous or asphaltic matters, and in some cases mixed with fine wire, asbestos or slagwool, the whole being compressed into slabs and sustained by a continuous embedded network. In some cases, crushed ballast, sandstone, limestone, ironstone, chalk, flint, or grit and strong fibre with a bonding net of cordage may be used. Also comminuted wood, sawdust, spent bark, and cocoa fibre refuse mixed with oil, tar, bitumen, resin or asphalt and cemented together with grit, fibre or metallic filaments, may be used.*

**2055. Lake, W. R.,** [Coleman, J. A.]. June 13. [*Provisional protection only.*]

*Heating buildings &c.*—Steam apparatus for fire-extinguishing is utilized for heating buildings and supplying motive power. In the basement of a building in the centre of a town, city, or district are placed steam boilers connected to main pipes laid within brick conduits under the roads, streets, &c. and covered with felt. These mains communicate with a series of vertical and horizontal pipes extending through the floors of the buildings, which pipes are provided with hose connections &c. for fire-extinguishing. Branch pipes are connected with radiators for heating.

**2104. Whiting, J. B.** June 17.

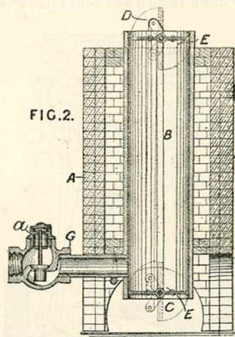
*Heating air.*—For ventilation purposes, external air enters a chamber E and passes to the apartment through a series of tubes D heated by the products of combustion from a fireplace A.



**2259. Lake, W. R.,** [Essex, H.]. June 30.

*Heating air.*—Relates to a hot-blast apparatus for cupolas, blast furnaces, and for smelting and other like purposes. One or more air heating and forcing vessels B, each provided with suitable openings C, D for the entrance of cold air and for the exit of waste hot air, are heated by being set, preferably in a vertical position, in a brick furnace A through the top and bottom of which they project. The inlet for cold air in the bottom of each

vessel, and the outlet D for waste hot air at the top, are fitted with valves E which are connected by a rod so as to open and shut together. Another outlet G for hot air or blast is fitted to each

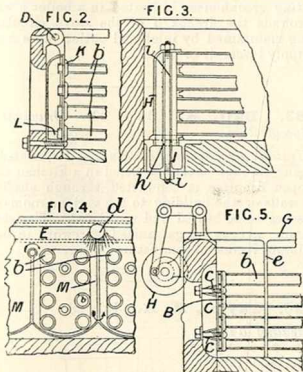


vessel and provided with a check valve *a*. When the valves at the top and bottom of the vessel are opened, the hot air therein will escape at the top, and be replaced by cold air entering at the bottom. The valves are then closed, when the air in the vessel will expand by the heat, and a part thereof will force its way through the check valve *a* into a blast pipe. Any number of vessels may be used together to produce the desired blast, which may be further heated by being passed through heating furnaces. The air in the vessels may be stirred by fans to facilitate heating.

**2397. Wilson, H., and Steel, J.** July 8.

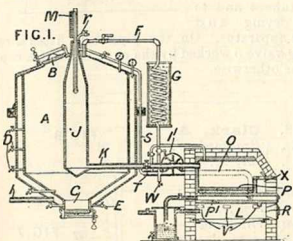
*Heating liquids and gases.*—Relates to the construction of apparatus for heating liquids and gases, being especially applicable to the apparatus described in Specification No. 975, A.D. 1871, [Abridgment Class Cooling &c.]. The tubes *b*, Fig. 5, are fixed at one end to a plate B which is secured to the water-course C by bolts *c*, the joint being made tight by elastic washers, or the tubes may be fixed to a box H, Fig. 3, having branches fitting into corresponding branches in the water-course I and secured by the bolts and nuts *i*, or they may be fixed to a plate *k*, Fig. 2, attached to the main body by a hinge D, the lower part fitting into the main waterway L and being secured by a bolt and nut. In each case, the fluid entering the waterways C, I or L, which are divided into cells each opening into one division of each tube box, passes along one set of tubes to a junction box at the other end and then returns to the next cell of the waterways, thus passing through all the tubes. The liquid to be operated upon passes alternately over and under diaphragms in the divisions M, Fig. 4, in the direction opposite to the heating water. The tubes may be round,

square or flattened. A current of hot air is discharged into or upon the liquid passing through the apparatus through a series of pipes *d*, Fig. 4, placed on the diaphragms and connected by the



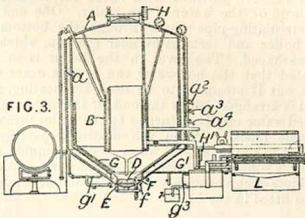
main E to a fan &c. The liquid in the cells is agitated by means of fingers *e* between the tubes *b*, Fig. 5, attached to an arm G to which motion is imparted from an eccentric H, or the apparatus may hang upon swivels and have an undulating motion imparted to it.

2419. **Lake, W. R.**, [Firman, H. S.].  
July 9.



*Digesters.*—In the rendering of fatty substances by means of hot air and steam, the substances are introduced through a manhole B, Fig. 1, into a digester A, which may or may not be provided with a steam jacket. Steam is admitted to the jacket, or to the digester itself, from a boiler by a pipe I, and air is admitted to a central drum J from a hot-air chamber O of a furnace L. Cocks are provided to regulate the supply of steam and air, and the

foul gases evolved during the process of rendering the fatty matters are conveyed away by a pipe F. A constant circulation of air is kept up between the hot-air chamber O and the drum J by means



of pipes S, T, K and a fan *l*<sup>1</sup>. Cocks D for drawing off the melted fat and water, a cock E for drawing off water from the jacket when the latter is employed, and a cock W for discharging the water of condensation from the condenser G are fitted, and the air may be allowed to escape from the drum J into a chimney by a pipe and cock *r*. A thermometer M and a discharge hole C are arranged in the digester. In a modification, the digester A has double walls *a*, Fig. 3, forming a semi-tight chamber extending almost round the tank. The intervening space between the ends of the steam-tight chamber is bounded on its inner side by a strainer plate, and its outer wall is fitted with draw-off cocks *a*<sup>2</sup>, *a*<sup>3</sup>, *a*<sup>4</sup>; the hot-air pipes also pass through this space. The hot-air drum B consists of metal plates united by means of strainer plates to form two or more semi-cylindrical or other shaped chambers, and is connected by double pipes with the main pipes communicating with the furnace and the smoke stack. A strainer may wholly or partially surround the drum B, the lower end of which communicates by a pipe with a strainer D lying loosely on a discharge plate E. A chamber F formed of strainer plates and fitted with a draw-off cock *f*, is arranged at the bottom of the tank. Steam is admitted to the digester itself to increase the pressure as well as to the jacket by means of branch pipe from the steam pipe G, and a hot-air pipe G<sup>1</sup> fitted with a cold-air pipe *g*<sup>2</sup> and cut-off valve *g*<sup>1</sup> connects the jacket with either the gas-consuming or boiler furnace. Thermometers H, H<sup>1</sup> are fitted to the hot-air cylinder and to the hot-air pipe. Instead of employing a separate furnace L, the boiler furnace may be used to supply the heated air to the digester and a cold-air pipe may also be connected with the cylinder.

2481. **Fearns, F. H.**, and **Jackson, W.**  
July 16. [Provisional protection only.]

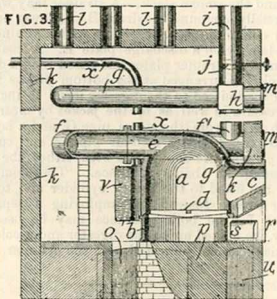
*Heating liquids.*—Relates to a boiler for supplying water for circulation in rooms and conservatories, the heating-apparatus being also applicable to the boiling of water or other liquids. The lower part of the boiler is supported by a casing

which encloses a series of gas burners forming the heating-apparatus. The bottom of the boiler is connected by a pipe with a chamber provided with non-return valves, the chamber being also connected with a cistern provided with cocks for regulating the level of the water in the boiler. One end of the circulating-pipe passes through the bottom of the boiler and terminates near the top, which is dome-shaped. The level in the boiler is so regulated that the hot water can always enter the pipe, but if steam is to be used for heating, the level is arranged below the end of the pipe. The cooled water may be returned to the boiler through suitable pipes. When the heating-apparatus is applied to the boiling of water or other liquids, the boiler is supported on suitable framework, and the products of combustion are passed round or through tubes fitted in the boiler.

2555. Clark, A. M., [Leydet, A.]. July 21.

*Non-conducting coverings and compositions.*—A plastic non-conducting composition for covering steam boilers, steam chests, and pipes consists of clay or aluminous earths, pulverized furnace slag, hair, broom, sawdust, pulverized charcoal, and glycerine. When applied to protect water pipes from frost, the covering is coated with a solution of india-rubber in ether, benzene, &c. or preferably in carbon bisulphide, with which is incorporated silicate of soda or potash. According to the Provisional Specification, sand may be used in place of furnace slag.

2566 Mouly, F. V. July 22.



*Heating air.*—Air to be heated for use in ventilating buildings and for heating drying-stoves &c., enters the stove casing *k* by the flue *o* and passes upwards among the horizontal heating-pipes or flues *g* which are arranged in two vertical series. The heated air escapes through the pipes *l* and is led to the required places by pipes or ventilating-flues.

The flues through which the air passes to distant rooms, buildings, &c. may be heated by hot water circulating in pipes round it.

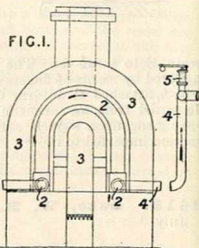
*Heating water.*—Water for the above purpose and for supply to baths and lavatories and for heating greenhouses is heated in a boiler *v* which surrounds the firebox *a* of the stove, circulation being maintained by inlet and outlet pipes *x* with a supply reservoir or pipes.

2583. Ball, A. July 23. Drawings to Specification.

*Heating air; heating buildings.*—Air, heated by passing through chambers fitted in a kitchen range or open fireplace, is conducted through shafts in the walls of the building to the various rooms and passages to be heated and ventilated. The shafts contain screens of galvanized wirework in order to obtain increased conducting power.

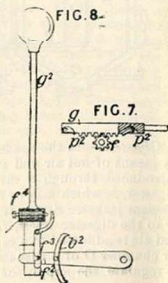
2626. Taylor, R. H. July 28.

*Heating air.*—Air for drying paper and fabrics, and for boiling rags in paper-making, and for heating buildings, is heated in arched tubes 2 set in a furnace 3. The air is pumped by a fan or other engine through the tubes 2 in a spiral course, and flows from the last arched tube into the tube 4 and to the drying and other apparatus. On the pipe 4 is fitted a regulating valve 5 worked by the expansion of a copper rod or otherwise.



2643. Clark, A. M., [Bradford, J. M.]. July 29.

*Thermostats; heating buildings; heating by steam circulation.*—Relates to electromagnetic apparatus for controlling the temperature in steam heating and drying apparatus, and comprises an engine for working a cut-off valve and a throttle valve of the steam heating apparatus,





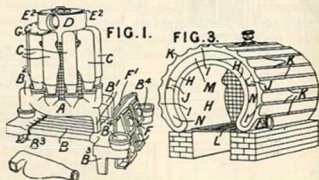
imparted to the cut-off valve in the chamber C through a sleeve *i* which is reciprocated along the rod *l* by an eccentric *h*, rock shaft *k*, and rods *l* and may be connected therewith by a pivoted pawl *m* engaging either of two catches *n, t*. The room &c. to be heated is provided with two thermometers *l', j'* fitted with iron rods *s', p'* with which the mercury makes contact when a certain temperature is reached and completes electrical circuits. When the mercury in the thermometer *j'* touches the rod *p'*, a circuit is completed which excites an electromagnet *d'* mounted in a frame *e'* on the rock shaft *b'*, and, by its action on an armature *e'* carried on a rock shaft *h'*, moves the valve *m* to stop the engine and so leave the main steam valve in the chamber D sufficiently open to only just maintain the necessary temperature. Should the temperature fall, the circuit is broken and the valve *M* again opened. Should the temperature continue to rise, a second circuit is completed which breaks the first circuit and sets the engine going and excites an electromagnet *r*, which attracts an armature *q* on the pawl *m* and causes one end of the pawl to engage the catch *t* on the valve rod *l* and so close the cut-off valve in the chamber C, and reverse the steam engine valve *K*. The movement of the pawl *m* breaks the first circuit and again opens the valve *M* to admit steam to work the engine, which is reversed by the movement of the valve *K* and closes the regulating valve in chamber D. When the temperature falls, the second circuit is broken and the pawl *m* is caused by a spring to engage the catch *n* and so open the cut-off valve in chamber C and again reverse the valve *K*. In a modification, the regulating valve is operated by the engine or other driving gear through rack and pinion gearing and a double-ended ratchet so that it may be reversed without reversing the engine. An eccentric rod *g'*, Fig. 8, carries an electromagnet *f'* and a lever or catch *f''* for engaging an arm *f'''* pivoted on the axle of a toothed wheel and carrying a double-ended pawl *b'* for engaging therewith. The toothed wheel carries a pinion *f*, Fig. 7, which gears with a rack *g* on the valve spindle. The position of the pawl is controlled by the position of the rod *l* of the cut-off valve. When the circuit is completed through the thermometer *j'*, the latch *f''* is held out of gear by the electromagnet *f'*. The rack *g* is provided with two pivoted pawls or teeth *p', t'*, to allow it to be disengaged while the pinion continues rotating and also to permit the ready engagement of the pinion when reversed. A single thermometer may be fitted with two or more wires for closing the different circuits. Several governors may be combined to form a machine for regulating the temperature in any number of rooms. The regulating valve may control one coil of large pipe, or a number of small coils which may be arranged in different rooms and cut off separately.

**2654. Broughton, W.** July 30. [*Provisional protection only.*]

*Non-conducting coverings and compositions.*—Steam boilers, pipes, and other heated surfaces are

first coated with a non-conducting composition preferably composed of fireclay, lamplack, peat, ground alum, and flax, jute, or similar vegetable fibre, over which is spread a thin coat of size and fireclay. Hair is pushed endwise into the composition with a pointed instrument, a layer of hair laid flat being then placed over it so as to cross the fibre. A coating of size and fireclay mixed with alum water is then applied, the surface being then gone over with the pointed instrument as before. Finally, a second coat of the non-conducting composition is applied, being beaten down when nearly dry and covered with mixed fireclay and vegetable fibre.

**2683. Harlow, B.** Aug. 1.

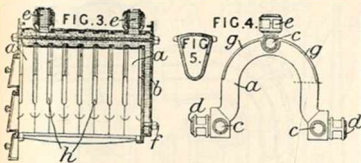


*Heating water.*—A boiler for hot-water heating apparatus constructed as described in Specification No. 2235, A.D. 1867, has the lower annular ring A, Fig. 1, from which the vertical pipes C rise, supported upon the hollow firebars B, the two feet B' resting on the bed-plate and the other foot B'' forming a water connection with the firebars, which are supported on the feet B' to form the ashpit. The vertical pipes C are jointed at the bends to the drum or annular ring D which is provided with a central opening for the supply of fuel. The flow and return pipes are connected at D and B' respectively. A smoke-box is formed around the drum D by a plate G resting on the pipes C and an upper plate resting on the rabbet E' and on the brickwork surrounding the boiler. The plate G is provided with segmental holes corresponding to the spaces between the pipes, so that when revolved horizontally it acts as a damper; it may be made solid and extended only half way across the tubes C, thus forming a baffle. Fig. 3 shows a cast-iron saddle shaped boiler, the inner and outer shells H and I communicating together at the bottom and through the side openings J, and forming flues M, N through which the products of combustion pass. Longitudinal ribs K are provided to enable the boiler to be covered with a non-conductor. This boiler may be heated by a fire on the bars L or used as an economizer in conjunction with the boiler shown in Fig. 1.

**2700. Wagstaff, J. G.** Aug. 4.

*Heating water.*—Relates to a boiler or water heater for use in hot-houses, conservatories,

churches and other buildings. A series of sections *a*, Figs. 3 and 4, of the cross-section shown in Fig. 5, are formed with openings *c* and bolted together between the hollow end plate *b* and the



furnace front by means of bolts *f*. The openings *c* are faced on one side and provided with annular spaces between ribs on the other side to make a water-tight connection, cement being used to make the joint. Inlet pipes *d* are provided on each side of one section, and two outlet pipes *e* are placed on separate sections. To provide spaces *h* between the sections through which the gases &c. from the furnace will circulate on their way to the side flues, ribs *g* are formed on each section; the gases pass from the side flues over the crown of the boiler. A hollow casing may be used to enclose the sections, and it is connected to the inlet and outlet pipes to allow the water to circulate through it. Ribs may be formed on the lower part of each section to promote circulation of the gases &c. The sections may be made with double water passages connected together at their upper and lower ends.

**2702. Roe, J.** Aug. 4. [Provisional protection only.]

*Steam traps* for apparatus for heating, drying, or evaporating by means of steam. A coil of pipe or other heater is placed at a higher level than the boiler and is connected at its lowest point to the water space of the boiler. The steam is condensed in the coil and flows back by its own weight into the boiler. Air-escape cocks are fitted to the coil, and a check valve is fitted on the return pipe where it joins the boiler.

**2733. Gedge, W. E.,** [Gaufrey, C.] Aug. 7. [Provisional protection only.]

*Non-conducting coverings.*—A quilted fabric, for covering steam engines and for other purposes, is constructed of two superposed layers of animal hair or flock, between which is placed a thick thread or weft of the same material, forming parallel lines. The whole is united by double stitching, “the threads of goat-hair crossing each other between each of the thick threads or weft which they intersect at a right angle.”

**2770. Dufrené, H. A.,** [Tellier, C.] Aug. 11. Drawings to Specification.

*Non-conducting coverings and compositions.*—Refrigeration chambers for preserving meat are isolated by walls made of tallow moulded into bricks built up between wood partitions. Skins treated with sulphurous acid, carbolic acid or an antiseptic may be used. Roughly-ground bones, or resin, either alone or combined with cork or oat chaff poisoned to repel vermin, may also be used.

**2820. Strugnell, A.** Aug. 15. [Provisional protection only.]

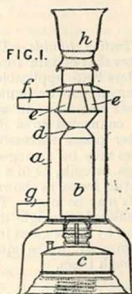
*Heating buildings &c.*—Two metal cylinders of nearly equal radii are placed one inside the other so that a receptacle of small capacity is formed between them. Hot water being placed between them, heat is radiated from the two cylinders to heat the apartment in which the apparatus is placed; the water may be supplied from a boiler &c. The apparatus may be portable for invalids' use and for heating greenhouses. A series of pairs of concentric cylinders or pipes may be employed, the surfaces being spiral, convoluted, or corrugated.

**2833. Peacock, J. C.** Aug. 17.

*Non-conducting compositions.*—Cork soot or sweepings is mixed with slaked lime, Portland cement or plaster of Paris, and water.

**2986. Heaps, E. K., and Wheatley, W.** Sept. 1.

*Heating water; foot-warmers.*—Relates to boilers used for heating water for heating greenhouses, offices, &c., and for baths &c. and stated to be applicable to foot-warmers for railway vehicles. The flue or flues *b* of the gas, oil, or spirit stove *c* consist of metal tubes passing vertically upwards through the boiler *a*, so that the water fed to and drawn from it through the pipes *g* and *f* is heated by direct contact with the flues. The chimney or flue *b* is constructed at the upper part *d* and is continued upwards under the open water vessel or air-moistener *h* in the form of two inclined pipes *e*. A central chimney consisting of a coiled metal tube may be provided within the boiler, or may be used separately from



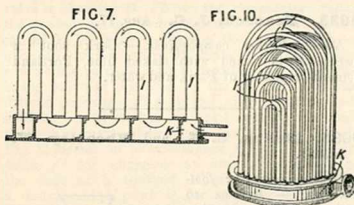


it, being in the latter case so arranged that water continually circulates through it. Circulating pipes may be placed transversely in the flues *b*.

**3290. Marriott, R.** Sept. 25. [*Provisional protection only.*]

*Heating liquids.*—Consists in forming the outer shell, firebox, cross-tubes, and the lower part of the central chimney of a boiler for heating water and other liquids of wrought sheet iron without a riveted or caulked joint. The cylindrical part of the firebox is formed of one plate with a vertical welded joint. A hole is then cut near the lower end for the furnace door, the edge being flanged outwards for welding to the outer shell; holes are also made near the top for the cross-tubes. The lower end of the firebox is flanged for welding to the outer-shell. The crown is dome-shaped and formed of a single plate, welded to the cylindrical part before being fully domed at the edges, this operation being completed afterwards. The lower part of the central chimney is welded to the edges of an opening at the centre of the crown. The outer main shell and top are formed in a similar manner.

**3306. Berryman, R.** Sept. 26.

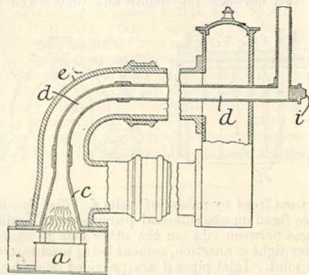


*Heating liquids.*—The Provisional Specification states that certain forms of feedwater heaters for boilers "are applicable either for heating or evolving vapours or liquids for any purpose." Fig. 7 shows one form in which a series of U-tubes *I* are connected to a divided tank *K* so that the water passes successively through them. Or the pipes may be arranged in a number of concentric rings or coils, or in a number of parallel or concentric loops, as shown in Fig. 10. Or flat zig-zag coils may be used. The water or liquid may be circulated through the heaters which are acted upon by waste gases in flues, or the heaters may be submerged in the liquid and exhaust steam passed through them.

**3458. Ezard, C.** Oct. 9.

*Heating buildings; heating water.*—In a system of heating conservatories, churches, &c., by hot-water circulation, a coal, coke, or gas stove *a* is

placed under the conical mouth *c* of a pipe *d* which passes along the interior of the water-pipes *e* and acts as a flue. By this means the waste heat in



the combustion products is largely utilized in heating the water. A plug *i* is provided for use in cleaning the flue *d*.

**3505. Körting, E.** Oct. 12. [*Drawings to Specification.*]

*Heating air for drying, distilling, evaporating, &c.* The air is heated by drawing it over pipes containing steam and air, or through a surface condenser, by means of an ejector.

**3509. Monckton, E. H. C.** Oct. 12. [*Drawings to Specification.*]

*Solar heat, utilizing.*—Direct or reflected heat is used to heat thermo-electric batteries. Reflectors or lenses for concentrating the heat are mounted on movable frames.

**3514. Shann, G.** Oct. 13. [*Provisional protection only.*]

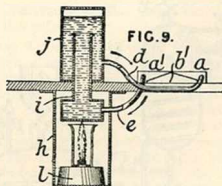
*Steam traps.*—Steam is admitted to a chamber closed at its upper end by an elastic diaphragm or plate of metal or other material, and at its lower end by a valve connected to the diaphragm by a spindle counterweighted by means of a weighted lever or spring. The valve may be arranged to open either when a certain weight of water has accumulated in the chamber or when the steam pressure rises beyond a certain limit, the valve then serving as a safety-valve.

**3636. Knowles, S., and Kay, J.** Oct. 22.

*Heating air.*—Air to be used for drying purposes is heated by passing through a chamber having

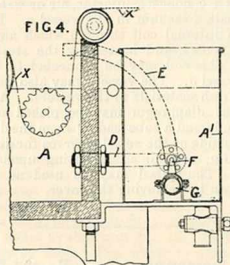


the casing *a* upon the upper part of the air vessel *b'*, and returning thence through a similar vessel *a'* and pipe *e* to the reservoir *i*. The lamp *l* is supported by a casing *h*, which is fitted with a lens to supplement the lighting of the railway stations



and track. A similar apparatus is fitted to each compartment. In a modification, water jackets completely surrounding a number of air vessels are supplied with hot water by pipes leading from the locomotive or from a small boiler on each carriage. In a modification for heating prisons &c., the internal air vessel passes obliquely through the water vessel, or the water may be circulated through two rows of heaters, between which the air is heated, and is conducted into the cells &c. by oblique plates. Two heaters *b'* may be placed end to end and utilized in apartments &c., air being supplied by gutters or a deep cutting. The vitiated air is withdrawn by a chimney communicating with conduits covered by gratings.

**3797. Newton, W. E.,** [*Groshens, J.*]  
Nov. 3.



*Boiling-pans* for warp-sizing apparatus. A small size-heating tank *A'* is supported near the warp-sizing tank *A* and is connected therewith by a pipe *D*. High-pressure steam is supplied, through a pipe, to a long perforated pipe *G*, for heating the size, and a pipe *E*, fitted with an injector *F* which is fed with steam from the pipe *G*, feeds the tank *A* from the tank *A'*, a circulation being maintained through the pipe *D*. The pipe *D* is also fitted with an injector, for preventing clogging. Two

pipes such as *E* may be provided, in some cases. The warp *X* passes over the tank *A'* and becomes damped by the escaping vapour, on its way to the tank *A*.

**3801. Stone, J.** Nov. 4.

*Non-conducting compositions* in the form of cement or powder are composed of powdered glass, prepared, according to the Provisional Specification, as described in Specification No. 2652, A.D. 1871, and mixed with silica, calcium sulphate, calcium carbonate, sodium silicate, soot or charcoal, and alum. The powdered glass is the essential constituent, but any or all of the other substances may be used. Hair or other fibrous binding material is added when required.

**3919. Braidwood, J.** Nov. 13. [*Provisional protection only.*]

*Steam traps.*—The outlet pipe from the bottom of a vessel in connection with the steam pipe &c., has projecting upwards from it into the vessel a closed pipe formed with holes round its lower part and immediately over a collar which serves as a seat to a second closed tube surrounding the first. The outer tube is provided with a float which rises and uncovers the holes in the inner tube when water accumulates. The two tubes may be of comparatively large diameter, and a second collar or seat provided above the holes on the inner tube receives an internal shoulder on the outer tube when it is in its lowest position. For the escape of air from the steam pipes &c., an outlet in the upper end of a vertical pipe fixed to the top of the vessel is closed, when the vessel is heated, by a valve on the end of a rod of zinc or other metal which expands to a greater extent than the material of the vessel or pipe; when the vessel is cold, the outlet is open, so that air may escape.

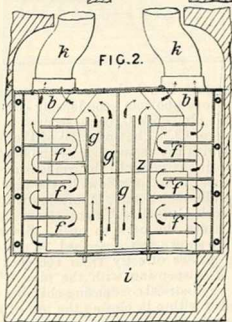
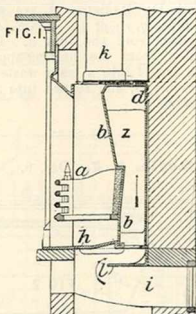
**3949. McAdam, W.** Nov. 17. [*Provisional protection only.*]

*Heating water.*—Water is circulated through a vessel fitted in the firebridge of a glass furnace and is afterwards used for heating purposes. The water supply is regulated by a ball-cock or equivalent means.

**3999. Shorland, G. L.** Nov. 21.

*Heating air; heating buildings &c.*—Relates to an air-heating fireplace described in Specification No. 1163, A.D. 1872, and to other air-heating fireplaces. A chamber *Z*, Fig. 2, into which project horizontal gills *f* and vertical gills *g*, is formed at the back *b* of the firegrate *a*, Fig. 1, by means of an enclosing plate *d*. Air admitted through a flue

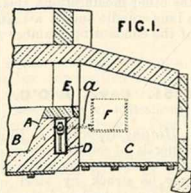
*i* is deflected by a plate *l*, and passes under a sole-plate *h*, on which the grate rests, into the chamber *Z* and thence through pipes *k* into the room



containing the fireplace, or to other rooms. The gills *f, g* are arranged as shown in Fig. 2, so as to retard the flow of air in the end portions of the chamber *Z*.

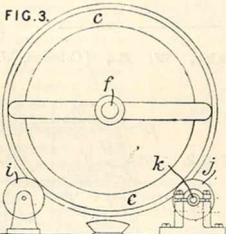
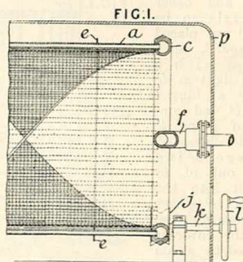
**4028. McAdam, W. Nov. 24.**

*Heating water.*—The bridges forming the ends of the tanks in which glass is melted are made hollow, and the spaces are fitted with rectangular vessels for heating water to be used for various purposes. The recesses in the bridges *A*, between the grates *C* and the tank *B*,



are not shorter than the breadth of the grates. The tank *D* is fed from a tank *F* through a pipe *a*, the supply being regulated by a ball or float cock or valve *E*.

**4133. Fridham, T. Dec. 2.**



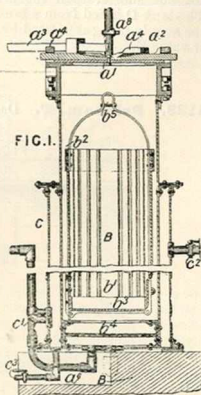
*Heating air.*—In an apparatus for drying tea &c. by hot air, a number of tubes *a* are carried at the ends by tubular rings *c*, steam or hot water &c. being supplied to one ring by a pipe *f*, and being discharged from the other ring in a similar manner. The cylinder formed by the pipes *a* is lined with wire gauze, and has one or more internal spirals by which the tea is conveyed forwards when the cylinder is rotated. The apparatus is surrounded by a casing *p*. Air is drawn through the apparatus by a fan, and, after being heated by passing between the pipes *a*, comes in contact with the tea and dries it.

**4176. Wise, W. H. R. Dec. 4.**

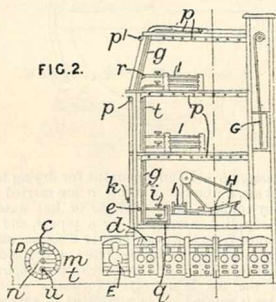
*Digesters.*—A boiler or digester for treating animal or other matter for the manufacture of manure, is provided with a cover *a*<sup>1</sup> secured by means of lugs *a*<sup>2</sup> on the cover engaging with snugs *a*<sup>3</sup> on the flange of the digester when the cover is turned by means of a lever *a*<sup>4</sup>. Steam is admitted



to the digester through a pipe  $a^1$ , and steam passes to and from a steam jacket C through pipes  $c^1, c^2$ , the condensation water being removed through a pipe  $c^3$ . Bones and other materials to be treated are placed in a cage B, which is fitted with a hinged bottom  $b^3$  having a hinged catch  $b^4$  and consists of bars  $b^1$  riveted to hoops  $b^2$ , the cage being raised out of, or lowered into the digester by means of an eye  $b^5$ . Before the cover is removed, the steam is blown off by a cock  $a^3$ .



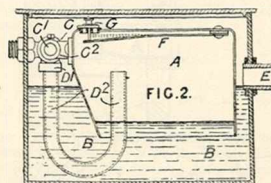
4230. Lake, W. R., [Coleman, J. A.].  
Dec. 9.



*Heating buildings.*—Relates to a system for supplying steam and water from a central station to the buildings of a district for fire-extinguishing and for heating. A number of steam boilers in the basement of a building &c. in the centre of the district are connected to a felt-covered main  $c$  placed within a brick conduit  $D$  under the street and extending through the various streets of the district. Each building is supplied with steam through a pipe  $d$  connected to the main  $c$  and communicating with a chamber  $e$  placed inside the front wall from which vertical pipes  $g$ , one to each storey and roof, rise. Each vertical pipe is connected to a perforated sprinkler  $p$  at its

upper end, and is fitted with a valve  $i$  operated by handles  $k$  from the outside of the building. Water may be admitted to the vertical pipes through a pipe  $m$  from a water main  $n$  placed in the conduit  $D$ . Radiators  $I$  are supplied with steam by pipes  $g, r$ ; or the steam for heating &c. may be taken from the pipe  $d$ . The water of condensation from the heating-apparatus passes through a pipe  $t$  into a main waste pipe  $u$  placed in the conduit  $D$ , and thence into a tank at the central station.

4237. Royle, J. J. Dec. 9.



*Steam traps.*—Fig. 2 shows one arrangement in which an open-bottom condensing-chamber A actuates the plug cock C, being secured to the plug  $C^1$  by the arm  $C^2$ . The outlet  $D^1$  of the cock communicates with the chamber A by the bent pipe  $D^2$ . The water discharged into the condensing-chamber fills the vessel B and overflows by the pipe E, while the steam fills the chamber A causing it to rise and close the cock C until sufficient steam again condenses to cause the cock to open. Several modifications are shown and described, in one of which the steam passes directly from the cock C to the chamber A, dispensing with the pipe  $D^2$ ; and in another, a cylindrical condensing-chamber acts on a spring valve within it, closing the top of a vertical inlet pipe; in the latter case, the bottom of the reservoir is carried upwards inside the condensing-chamber in order to displace the greater part of the water. The valve G for the escape of air may be controlled by an expansion bar F consisting of two flat strips of metal, say, iron and brass, riveted together. This bends, owing to the unequal expansion of the two metals, and closes the valve, as shown, when heated by the incoming steam. In the other modifications, this valve is provided with a long spindle and is actuated by the rise and fall of the condensing-chamber A.

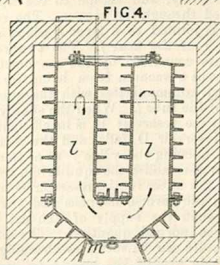
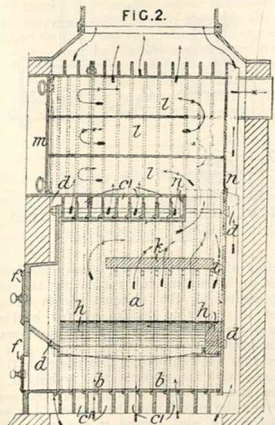
4251. Cave, J. O'C. Dec. 10. [Provisional protection only.]

*Heating-apparatus.*—Flints or other suitable minerals of suitable shape are arranged and fixed in a circular form on a support, so that they may be struck by steel or iron hammers on a revolving wheel and thus caused to emit sparks. Springs are provided upon the hammers to give

them the requisite elasticity. Or a steel or iron wheel may be revolved in contact with a smooth surface of flint &c.; or flints &c. may be arranged to strike or rub against one another. The sparks emitted are directed on to the substance or vessel to be heated.

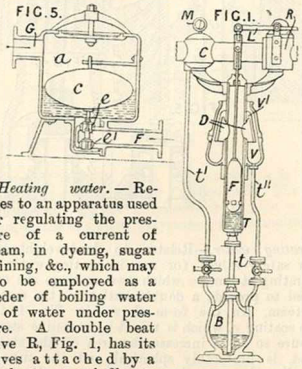
arrows marked with a cross. The air enters the chamber surrounding the stove through the floor, and passes into the room or other place through a flue near the top. In open stoves, the chambers are semicircular, with openings at the ends or front, or in the middle of the back.

4256. Eyre, G. Dec. 10.



*Heating air.*—A gill stove is surrounded by a brickwork or iron chamber for heating air for ventilation. Open stoves may be similarly arranged, and in some cases gas or other fuel may be burned. The flues or chambers *l*, Figs. 2 and 4, are made in segments, or the sides are cast in plates with ribs for increasing the heating-surface, the partitions being cast so as to fit into grooves in the plates. The joints are made with clay. The chambers *l* are U-shaped, as shown in Fig. 4, and the course of the combustion products from the fireplace *a* is shown by the

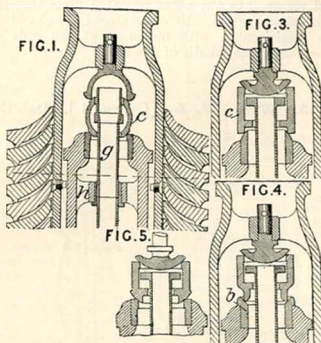
4325. Wise, W. L., [Coignet, A.]. Dec. 15.



*Heating water.*—Relates to an apparatus used for regulating the pressure of a current of steam, in dyeing, sugar refining, &c., which may also be employed as a feeder of boiling water or of water under pressure. A double beat valve *R*, Fig. 1, has its valves attached by a crank to a spindle on which is mounted a lever *L*, attached to a float *F* in an iron cylinder *T*. When steam is turned into the pipe by opening the service cock, it passes through the open valve *R* to a vessel *C* provided with a gauge *M*, and passes down through a pipe *t'* to exert pressure on the surface of mercury contained in a vessel *B*. According to the height to which the mercury is thus forced up the pipe *t*, the float *F* is or is not lifted sufficiently to cause the lever *L* to close the valve *R*. Any mercury thrown suddenly up the cylinder *T* escapes by the holes *D*, and is caught by the vessel *V* and bell *V'* so that it may be returned to the vessel *B* through the pipe *t''*. When used as a feeder of boiling water &c., the regulator controls the steam supplied to a heater from which hot water is pumped into a "digester." A supply of water under pressure at the dome of the "digester" enables steam under pressure to be distributed for the desiccation of paper pulp, for evaporation *in vacuo*, or for other operations requiring a constant pressure. By this means also boiling water may be distributed to shops or rooms.

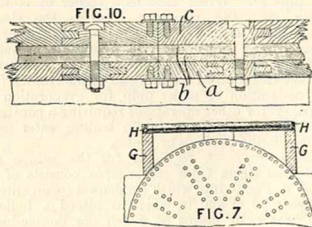
*Steam traps.*—A regulator for the escape of condensed steam from steam pipes consists of a vessel *a*, Fig. 5, into which condensed steam enters by the pipe *G* and in which is placed a hollow iron float *c*, by means of which the double-beat valve *e, e'* in the outlet *F* is controlled. When the condensed steam rises above a predetermined level, the float *c* rises, opening the valve *e, e'* so that water escapes.

4328. Jordan, J. Dec. 16.



*Heating water.*—Relates to dead-weight and other safety-valves for use in heating water or generating steam, in which two seatings are employed to provide a double outlet for the escape of steam. In the form shown in Fig. 1, the loose seating *c*, which is raised by excessive steam pressure so as to increase the area of the steam outlet, is preferably spherical, and the tube *g* extending down to the steam space is adjustable in the boss *h* to regulate the lift of the seating. In a modification shown in Fig. 3, the seating *c* is cylindrical; in that shown in Fig. 4, the fixed seating *b* is concave; and in that shown in Fig. 5, the seating *c* is cylindrical but with a curved lower bearing-surface. The tube *g* may be fixed to or formed in one with the loose seating and slide freely in the boss *h*.

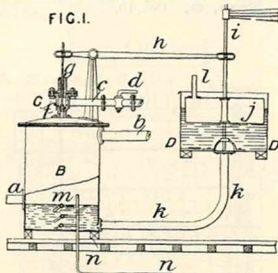
4405. Hopkinson, J. A., and Hopkinson, J. Dec. 22.



*Non-conducting coverings.*—To enable boilers to be exposed to view easily for examination &c., they are covered with sections *H* formed of two

thicknesses of wood *a*, *c* with interposed layers of felt *b*, and supported on iron or other frames *G*.

4450. Beaurepaire de Louvagny, L. R. R., Comte de. Dec. 26.



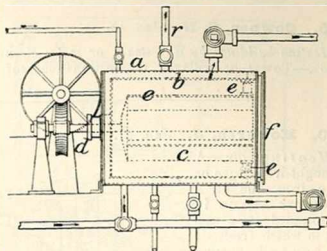
*Heating water; heating by steam circulation.*—Relates to apparatus for regulating the supply and pressure of the exhaust steam of steam engines in order to utilize it for heating in brewing, bleaching, dyeing, and paper-making, and in other cases in which baths of a fixed temperature are required. The reservoir *B* communicates with the apparatus to be heated. The exhaust and the boiler steam enter the reservoir *B* through the pipe *b* and the pipe *c* and valve box *C* respectively, and escape to the apparatus to be heated through the pipe *a*. The rod *g* of the valve *f* is jointed to a lever *h* which is jointed to the rod *i* of the float *j*. The two reservoirs *B* and *D* are connected by the manometric tube *k*. To prevent a vacuum from being formed in the float *j*, it communicates with the atmosphere by means of the tube *l*. When the supply of exhaust steam to the reservoir *B* is insufficient, the water in the reservoir *D* falls, and the float descends, thereby opening the valve *f* so as to admit boiler steam to re-establish the equilibrium by raising the level of the water in the reservoir *D* to its normal height; the reverse happens and the valve *f* is closed when the supply of exhaust steam rises above the normal quantity. The pressure and temperature can be varied by changing the length of the long arm of the lever *h*, or by altering the point of attachment of the lever *h* to the stem of the float, or by lowering the level in the reservoir *B* by running off water through the cocks *m* on the siphon *n*. The water of condensation is emptied through a siphon on the pipe *a*. For large pressures, the water manometric tube *k* is replaced by a mercury manometer. In this case, the reservoir *B* is provided below with a cup, into the bottom of which the mercury of the manometric tube rises. The water of condensation rests above the mercury and supports a float which actuates an overflow valve. To avoid a vacuum in this float, it may communicate with the outer air through

the hollow rod of the valve plug, a small pipe being applied if necessary so that warm water escaping "may not be forced into the enlargement." In another arrangement, designed to prevent contact in the reservoir B of the water of condensation with the steam, the reservoir B is provided with an inverted conical base which terminates in a siphon for carrying off the water. The manometer tube from the reservoir D enters an intermediate receiver containing mercury &c., and connected at the top to the bottom of the reservoir B; the water resulting from the steam condensed in the connecting-pipe escapes also through the siphon attached to the reservoir. To avoid the use of a long siphon, and to prevent the water of condensation from passing out too freely, a weighted or a spring valve is applied to the ascending branch of the siphon; a little mercury poured into the siphon has the same effect as the valve.

4452. **Bentley, G. W.** Dec. 28.

*Digesters.*—Relates to an apparatus for use in extracting grease from cotton waste &c. by means of carbon bisulphide &c. The material is placed

in a digester consisting of an inner perforated cylindrical vessel *c* open at the end and containing agitators &c. The vessel *c* is revolved upon wheels *e* within an outer cylindrical vessel *b* by



external gearing. The outer vessel *a* is steam-jacketed and has a cover *f* at one end. The carbon bisulphide &c. is admitted by a pipe *r*. The apparatus is tinned, galvanized, or enamelled.

A.D. 1875.

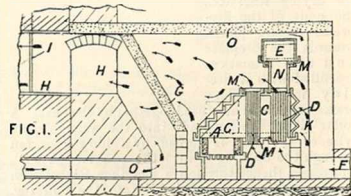
19. **Collier, J., and Holding, J.** Jan. 2.  
[Provisional protection only.]

*Heating water and other liquids; boiling-pans.*—To promote circulation in domestic "coppers" and other similar boilers used for manufacturing and chemical purposes, a convex or pyramidal plate with a vertical tube surmounted by a rose is placed in the pan or boiler. The water in the space enclosed by the plate and the bottom of the boiler becomes hot, ascends the pipe, and flows out of the rose, which projects above the surface of the liquor.

93. **Mackenzie, J. F.** Jan. 11.

*Heating air.*—Air for ventilating and warming buildings passes from the inlet *F* through flues or tubes *D* in a flue or combustion chamber *C* between the furnace *A* and the smoke-flues *N, E*. The flues *D* may be straight, curved, or twisted, and may be placed vertically, obliquely, or horizontally. The tubes may be of any section, and the interiors are ribbed longitudinally. The heated

air is filtered by a screen *G* and passes thence to an outlet *H* fitted with a damper *I*. Cold air from the inlet *O* may be mixed with the heated air. Pyramidal projections *K* are made on the iron



sides of the chamber *C* to increase the heating-surface. The joints *M* of the iron plates and fireclay quarries, which may be used to build the apparatus, are luted with chalk with an upper coating of sand or iron filings, or a mixture of



chalk, sand, and iron filings may be used. The brickwork casing is covered by fireclay quarries G. Modifications of the details are described.

may be heated or supplied with hot water from one or more stations by mains or pipes carrying steam, or hot water. Or hot air may be used in place of the steam or hot water. Each house and each room is supplied with a stop-cock, and cocks for drawing hot water for baths, washing, &c. are also provided. Where desirable, the stop-cocks may work together by means of one handle, so that as one is shut off another will open a new course.

**165. Cowper, C. N.** Jan. 15.

*Heating buildings by air, steam, or water circulation.*—Towns or villages, or sections thereof,

**240. Howarth, J.** Jan. 21.

*Heating air.*—A wrought-iron stove or the iron flue of a brickwork stove is surrounded by a casing in which fresh air is heated, flowing thence through flues to other apartments or apparatus for drying wool, yarn &c. Fig. 1 shows a stove for heating air for a few rooms. Air enters the casing M from under the ash-plate N, through openings O, and passes through the annular spaces W between the pipes P, U, Q, V. Cold air also enters the spaces W through the pipe X. Dampers Y are fitted to the air spaces W. A flue may be fitted to the top of the casing M<sup>1</sup> leading to a grating in the floor of the apartment above. In a modification, shown in Fig. 7, for heating air for large buildings and for drying wool &c., the ends of the firebricks D<sup>1</sup> are placed towards the fireplace and the interstices are filled with a fireclay mortar. The bricks and mortar are fused together by the heat. A collar E<sup>1</sup> of fireclay leads into the wrought-iron cylinder G<sup>1</sup>. Air is forced by a blower or fan through the opening S<sup>1</sup> into the annular space O<sup>1</sup>, and passes thence through a chamber R<sup>1</sup> between the wrought-iron flues Q<sup>1</sup>, M<sup>1</sup> into the building. An expansion joint is made by a collar I<sup>1</sup> on the plate H<sup>1</sup> and a pipe J<sup>1</sup> on the rim F<sup>1</sup>, and a similar expansion joint K<sup>1</sup> is made at the top of the cylinder G<sup>1</sup>. A door T<sup>1</sup> is fitted to enable the flue M<sup>1</sup> to be cleaned. The ends of the pipes used in the apparatus are joined by lugs U<sup>1</sup>,

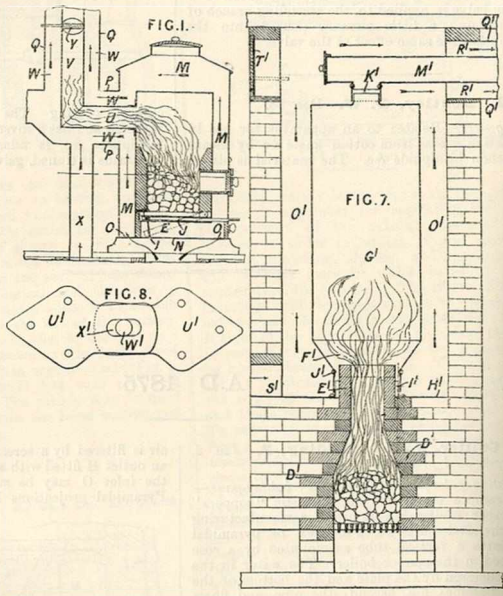
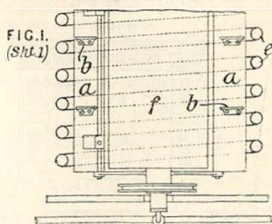


Fig. 8, connected by a pin W<sup>1</sup> sliding in a slot X<sup>1</sup>.

**250. Lancaster, W.** Jan. 22.

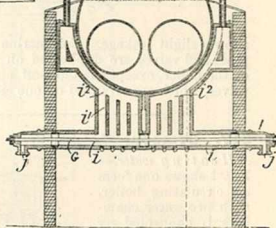
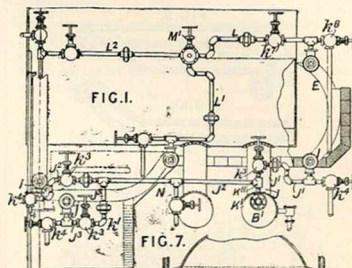
*Heating air; heating liquids.*—In yarn sizing and dressing machines, the fans employed for creating a current of heated air for drying the yarn have transverse flanges or ribs b projecting from the fan boards or blades a and serving to break the air current, so that it does not run towards the centres of the boards. The three

bars which carry the boards, at each end of the fan, may be attached direct to the fan pulley; in the centre of the pulley is a loose adjustable bush, by the use of which the fan can be located



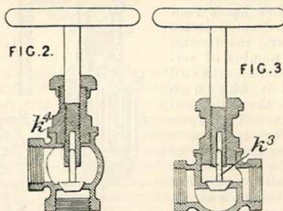
exactly in position inside the frame. The blades *a* may sometimes be made in sections, and the current breakers may consist of flat rings. A steam coil *e* may surround the fan, and a coil may surround the cylinder *f* inside the fan; or the steam cylinder *f* may be replaced by a cluster of longitudinal tubes. In connection with the size-boiling arrangements, a double steam injector, situated outside the size-box, draws the size through a pipe from the lower part of the box and forces it along other pipes which return it, boiled or heated, into the upper part of the box, at each side, thus keeping up a constant circulation. The size is fed through a tap into a pipe leading to the injector. Reference is made to Specification No. 1569, A.D. 1874.

lining at the front of the furnace consists of two sections, each containing a circular passage *i* communicating by passages *i*<sup>1</sup> with a circular passage *i*<sup>2</sup> shaped to the lower surface of the boiler. The



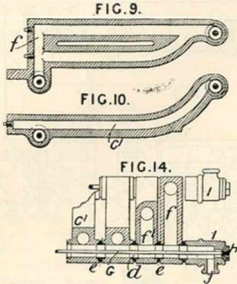
**310. Lake, W. R., [Farris, W. H.].**  
Jan. 27.

*Heating water.*—The grate of a water-heating boiler consists of hollow bars constituting part of the water space of the boiler. Additional water spaces are also arranged in the flues at the back end of the boiler and as a lining for the front of the furnace. Figs. 1 and 7 show a longitudinal elevation and section of the boiler at the front end, respectively, and Figs. 10 and 14 show sections through the firebars and the front part of one half of the grate, respectively. The centre bars *c*<sup>1</sup> are curved at their back ends to form a firebridge and are provided at the ends with side openings forming a continuous passage communicating with T-pipes *I* at the sides, as shown in Fig. 14. The side bars are formed in a similar manner with vertical passages *f*, *f*<sup>1</sup> of different heights at the front ends; in some cases these bars have two longitudinal passages, as shown in Fig. 9. The bars are inclined upwards from the front and are held together by rods *G*, Fig. 14, having nuts *H* seated in the pipes *I*, the joints between the side openings being formed by split ferrules *d* and copper rings *e*. The water spaces at the back end of the boiler are formed by bent pipes *E* having side openings at the end and held together in a similar manner to the bars. The



passages *i* communicate with each other and with T-pipes *I* at the sides, and the sections are held together by rods *G* as described above for the bars. The arms *f* of the T-pipes at the lower ends of the water spaces are connected by pipes *J*<sup>1</sup>, *J*<sup>2</sup>, *J*<sup>3</sup> with a drum *B*<sup>1</sup> into which the water for the boiler is fed. These pipes terminate in a three-way piece *K*<sup>1</sup> of a pipe *J* communicating with the drum through a valve *K*, and are provided with check valves *k*<sup>2</sup> and blow-off valves *k*<sup>4</sup>, the constructions of which are shown in Figs. 2 and 3. The water enters the boiler again at or near the water level through pipes *L*, *L*<sup>1</sup>, *L*<sup>2</sup> terminating in a horizontal pipe *M*<sup>1</sup> and fitted with check valves *k*<sup>1</sup> and waste valves *k*<sup>3</sup>. In case of a leak or disablement of any of the sections, necessitating the

closing of the valve  $K^1$ , a connection  $N$  with a tank enables water to be circulated through the pipes without entering the boilers, or the valve  $k^1$ , and the check and waste valves may be opened to



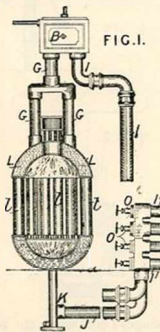
allow a slight leakage. For marine purposes, the pipes and valves are duplicated on opposite sides of the boiler, except the blow-off and waste water valves, which are arranged on one side only.

**317. Ormson, H.** Jan. 27.

*Heating water.*—Fig. 1 shows one form of circulating boiler, with two water chambers  $L$  connected by tubes  $l$ . Another form of boiler has a rectangular water jacket enclosing the furnace and a number of vertical tubes placed round it through which the water circulates. This form may be used as a heating-apparatus or may be connected to circulating-pipes. Another boiler has a shell, egg-shaped in section, built into brickwork.

*Heating buildings*

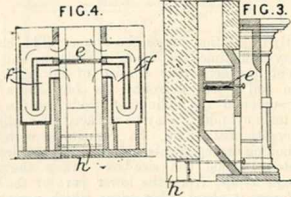
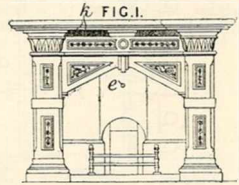
*&c.*—The boiler is connected by flow pipes  $G$  to a circulating-box  $B$  and thence by a pipe  $I$  to the heating-pipes  $l$ , returning by a pipe  $J$  to a dip-pipe  $K$  under the boiler. The water flows through one or more of the series of pipes  $l$ , which may be horizontal or vertical, according as the valves  $O$  are opened or closed.



**365. Doulton, J.** Jan. 30.

*Heating air.*—The chimney-recess or fireplace is divided by two vertical partitions into three portions. The outer ones are closed in front by tiles, and the central one is closed to within about

twelve inches of the hearth on which the fire is lit. When the damper  $e$  is open, the hot products pass direct to the chimney, but when it is closed, as shown in Fig. 4, the products pass through flues  $f$  in the side compartments. Air is admitted by



an opening  $h$ , controlled by a damper, to the side compartments, in which it is heated, finally escaping into the apartment through gratings  $k$ , or through openings near the ceiling. When the fireplace is not in an outer wall, a flue leads air to the opening  $h$ . This arrangement of air-heating flues may be applied to close stoves.

**434. Gedge, W. E.,** [Gaufrey, C.] Feb. 5.

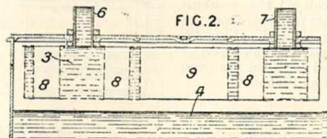
*Non-conducting coverings, for steam engines and other steam and hot-water apparatus.* A quilted fabric consists of two sheets of hair or flock between which is placed a thick thread of the same material running across in parallel lines. The whole is sewn together by a double thread of goats' hair. The stitching runs lengthwise crossing the warp thread at right-angles.

**453. Shann, G.** Feb. 6. [Provisional protection only.]

*Steam traps.*—A steam trap, serving also as a steam pressure-relieving valve, consists of a chamber closed at its upper end by an elastic diaphragm or plate of india-rubber, metal, or other material, and at the lower end by a valve, the spindle of which is connected to the diaphragm. A counter-weighted lever or a spring is attached to the valve spindle. When a certain weight of water accumulates in the chamber, or the steam pressure is excessive, the valve is opened. The valve and diaphragm may be placed in branches projecting towards each other in the chamber. The valve,

which opens upwards, is pressed down by a spindle connected to a palm or sole bearing against the diaphragm. In another modification, the valve is placed in the lower part of the chamber and is kept closed by a lever, the other end of which is connected to a diaphragm in a branch on the upper part of the chamber.

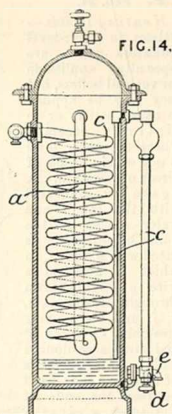
520. **Smith, H. N.** Feb. 12.



Heating water, for baths and for other purposes, by steam or water. A heater 3, connected by circulating-pipes 6 and 7, with the bath, cistern, or tank, is placed in an ordinary kitchen boiler 4 or in a tank connected by circulating-pipes with the boiler. The heater 3 has openings 8, 9 through it, or may be made with corrugated walls or constructed otherwise to provide a large heating-surface.

539. **Bailey, W. H.** Feb. 13.

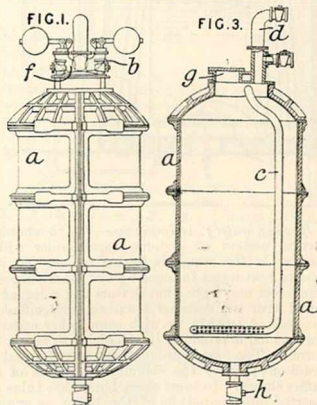
Heating water; steam traps.—Fig. 14 shows a steam-heated apparatus for supplying boiling water, which apparatus is fitted with an arrangement for automatically discharging the water of condensation. Water is circulated through the coil *a* and steam is admitted to the casing. When the water of condensation rises in the casing, a pipe *c, c*, which is normally filled with steam, becomes filled with water and is thus caused to contract, whereby the valve *d* is allowed to open and the water is discharged through the spout *e*. A similar arrangement may be applied to act as a steam trap for withdrawing water of condensation as it accumulates. The Provisional Specification states that a test cock or valve, consisting of a weighted valve fitted with a lever by which the weight can be lifted at any time, may be used as a safety-valve and draw-off cock for domestic boilers.



562. **Secombe, J., and Talling, R.** Feb. 16. [*Provisional protection only.*]

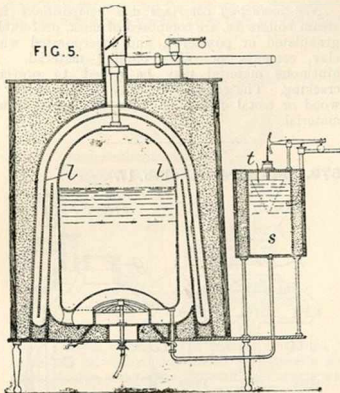
Non-conducting coverings and compositions for steam boilers &c. are composed of mica, preferably granulated or powdered, and incorporated with clay, cements, or other binding material. A glutinous material may be added to prevent cracking. The composition may be covered by a wood or metal casing, or with canvas or other material.

579. **Manbré, A.** Feb. 17.



Digesters.—A converter or digester constructed as described in Specification No. 1562, A.D. 1870, but with the addition of a still, is used in the extraction of fatty matters from fruits, cereals, seeds, roots, nuts, or other vegetable substances, so that the starchy and saccharine matters contained in the fruits &c. are rendered more suitable for the production of spirits, wines, vinegar, cider, and perry. After disintegrating the fruits &c., grinding them with water, and treating them with acid, they are forced through a pipe *b*, Fig. 1, into a converter *a*. High-pressure steam is admitted through a perforated pipe *c*, Fig. 3, and, meeting the descending fatty and starchy mixture, divides it into numberless particles, coagulating the albuminous and nitrogenous matters and converting the starchy matters into a saccharine solution. The empyreumatic oils and fatty matters are distilled through a pipe *d* connected to a condenser. The pipes *b, c, d* are fitted with cocks, and the apparatus is fitted with safety-valves *f*, Fig. 1, a steam gauge, and a thermometer. A manhole *g*, Fig. 3, and a discharge cock are provided.

590. Peacock, J. C., and Rudkin, T.  
Feb. 18.



*Heating water; boiling-pans.*—Fig. 5 shows a vertical section of a dome-shaped boiler with a concave bottom which is heated by gas jets and used to heat water for cooking and other purposes. The boiler may have a flat bottom and is lagged all round with the material described in Specification No. 2833, A.D. 1874, or with some other material. An opening is provided in the casing to admit the burner. The heated products are caused to take a circuitous path to the chimney by means of the baffles shown. In some cases, horse-shoe tubes are inserted into the bottom of the boiler, an annular baffle being placed between their inlet and outlet ends. Water is supplied to the boiler from a vessel *s* in which a float *t* maintains a constant water level. This vessel is lagged in a similar manner to the boiler. The burner may be star-shaped, each ray being screwed into a central chamber, and being straight or bent to suit the bottom of the boiler, or it may be of grid-iron or other form. Each ray of the burner is provided with a short chimney running its whole length, and the spaces between the rays are stopped to prevent the entrance of air. When open coppers are set as shown in Fig. 5, the casing *l* is not of bell form, but is simply a conical ring fitting under the top of the copper. The outer annular flue is replaced by one or two small flues.

606. Lillie, J. Feb. 19.

*Heating water.*—A kitchen oven, made of fire-clay or other material, and having a square or other shaped section, is surrounded by tortuous flues which separate it from a cast-steel water-heating &c. boiler. The flues *C*, Fig. 2, between the oven *A* and the boiler *B*, are divided by partitions *D*,

having openings at alternate ends. Two ovens and boilers may be arranged side by side, and another pair may be placed above these, the combustion products of the fireplaces passing through some or all of the flues. In a modification, the combustion products from the fireplace *K*, Fig. 12, pass over an oven *J* and between the oven *M* and boiler *L*.

FIG. 2.

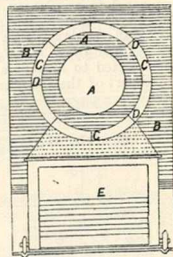
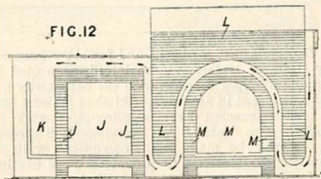


FIG. 12.



675. Henriot, F.  
P. Feb. 24.

*Heating liquids.*—Relates to water-level indicators which are especially applicable for vertical boilers, but they may be applied to other boilers or to cisterns generally where the water level is not within reach of direct observation. A vessel *a* connected with the steam and water spaces of the boiler by pipes *c*, *c'* is fitted with a float *f*, to which is attached a wire *g* passing down through the tubes *d*, *n*, *k*, *j*, and carrying stretching-weights *h* and variously-coloured balls *l*. The tube *k* is of glass and it is fixed between the ends of the tubes *n*, *j*, at a convenient height for observation, as shown, the water level being indicated by the balls *l*, which are seen through the tube *k*. A valve *m* fixed on the wire *g* works in conjunction

FIG. 1.

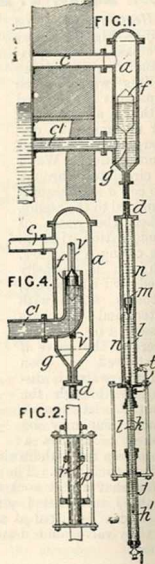


FIG. 4.

FIG. 2.

with a seating at the bottom of the tube *n* and prevents escape of water in case the glass *k* is broken. A small bye-pass *t* is fitted to equalize the pressure above and below the valve and enable it to open after a new glass has been fitted. In a modification shown in Fig. 4, the float *f* is inserted in the up-turned end of the tube *c* and connected to the wire *g* by a yoke-piece *v*. This arrangement only allows steam to enter the chamber *a* and tubes *d*, *n*, *k*, *j*. The glass tube *k* may be replaced by a copper tube *p*, Fig. 2, and the water level indicated by a suspended magnetic ring *r* which follows a piece of soft-iron attached to the wire *g*. Or the ring *r* may be of soft-iron and a magnet attached to the wire. In another arrangement, a magnet inside the copper tube acts on a needle fitted to slide over the graduated exterior of the tube.

**775. Gooch, Sir F. S.** March 3. [Provisional protection only.]

*Thermostats* for automatically regulating temperature in cooling liquids in brewing operations &c. Electro-thermometers in the tun, or in pipes leading thereto, actuate small electromagnets having lever armatures to complete the circuit of a powerful electromagnet, the armature of which controls the flow of the liquid through the refrigerator, or of the refrigerating medium, so as to obtain the desired temperature. When two electro-thermometers are employed, one may be arranged to act by a rise and the other by a fall of temperature.

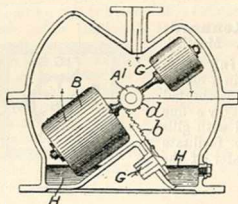
**808. George, R.** March 4. [Provisional protection only.]

*Heating water; heating air.*—A cylindrical or other shaped stove is surrounded by or enclosed in a receptacle for heating water, or is enclosed in a cylinder or coil communicating with the external air, as described in Specification No. 2853, A.D. 1867, for heating air for ventilation.

**721. Kelen, L. V.** Feb. 26. [Provisional protection only.]

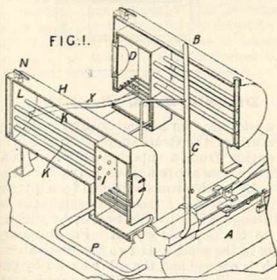
*Heating air.*—A circular tapering vessel, terminated at its lower end by a funnel and pipe leading from the external atmosphere, is placed in a metal outer casing and heated by a gas burner consisting of a flat metal reservoir, the upper surface of which is perforated. To the upper end of the inner vessel is soldered a  $\square$ -shaped ring, the outer flange of which passes over the rim of the outer casing and projects into an annular trough filled with sand or other material. The upper end of the air chamber may be fitted with a perforated ornamental cover.

**826. Johnson, J. H.,** [Geneste, P. E., Herscher, C. G., and Herscher, E.]. March 5.



*Steam traps.*—The condensed water accumulates at H and lifts the float B, which is mounted with a counterweight G upon a shaft A. The wheel *d* winds up the fusee chain *b*, opening the valve E and discharging the water.

**751. Mosman, D. F.** March 1.

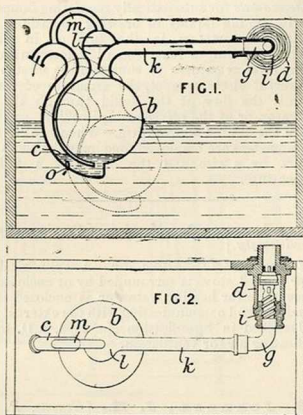


*Heating air.*—The air for the furnace D of a steam generator B is heated by the water in a vessel H which is constructed like a locomotive boiler and serves as both feed-tank and condenser. The engine A exhausts through a pipe P into the water space L of the heater H, and the water heats the air passing through the firebox I and tubes K of the heater. The heated air is then led through the pipe X into the furnace.

**830. Hilton, W., and Clarke, F. R.** March 6.

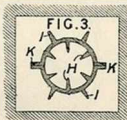
*Steam traps.*—A valve box *d* contains a conical valve on a short hollow stem *g* provided with a quick-threaded screw working in the nut *i*. The turning of the hollow stem *g* opens or closes communication between the steam pipe and the outlet pipe *k* leading to the ball or float *b* to which it is attached. The ball, when filled with water entering through the orifice *o*, sinks to the position shown by dotted lines and opens the valve. The steam drives the water out through the siphon *c* and the ball, being lightened, rises and again closes the valve. Air escapes through the chamber *l* and

pipe *m*. The trap may be applied to steam pipes, steam chests, or drying-cylinders.



**846. Kennard, H. J.** March 8.

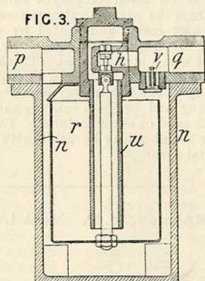
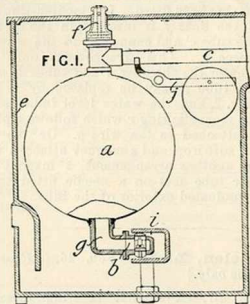
*Heating air.*—The air in a closed channel is heated by a stove flue provided with gills *H, I* to facilitate the transfer of the heat.



**996. Allmann, J.** March 18.

*Steam traps.*—In one arrangement of steam trap, applied to steam pipes, drying-cylinders, &c., the long tubular arm *c*, Fig. 1, and ball *a* are in connection with the steam pipes and are supported by the counterbalanced lever *j*, so that the double-beat valve *b* is held as required in the elbow *g* by the bridle piece *i* on the casing or vessel *e* in which the apparatus is suspended. When water accumulates in the ball *a*, the valve *b* is opened to allow the water to escape into the casing *e*; otherwise, the weight on the lever *j* holds the ball *a* up, so that the valve *b* remains closed. A valve *f* is provided for the escape of air from the ball *a*. In a modification, the elbow *g* is dispensed with, the valve *b* being attached directly to the ball and working in a seat attached to the casing *e*. In the arrangement shown in Fig. 3, the water which enters the vessel *n* by the pipe *p* lifts the open vessel *r* so that the valve *h* is pushed upwards against its seat; when the water accumulates, it enters the vessel *r* and finally opens the valve *h* so that it may rise up the tube *u* and escape through the

pipe *g*. An air valve *v* is also provided. In a modification of this arrangement, the valve *h* is placed in an elbow on the bottom of the tube *u*.



**1012. Dixwell, G. B.** March 19.

*Thermostats &c.* for automatically regulating the temperature of the steam supplied to the cylinder of an engine from a superheater *G*. When the temperature rises above a given point, the steam is diverted, by mechanism controlled by a pyrometer *I*, through pipes *c, d, e* passing through the boiler *E*, or through a feed-water heater, by which it is cooled to the required extent. For this purpose, there are in the pipes *c, H* two throttle-valves, one of which is opened and the other closed by pinions *h, i* in gear with a wheel *g*. This wheel is actuated by one of two pawls *n, o*, mounted on a rocking-arm *p* connected by a link *q* and bell-crank lever *v, r* to the valve-rod *n*, and the pawls are controlled by a shield *h*, carried by an arm *k* connected by an adjustable link *a', b'* and levers *y, z* to the pyrometer. The shield is preferably graduated to indicate the temperature in the cylinder by means of a stationary pointer. The superheater and the cylinder may be provided with separate pyrometers, the former of which is graduated by

experiment for different cut-offs and is arranged to actuate an electric alarm bell at a rise or fall of temperature beyond the given amounts.

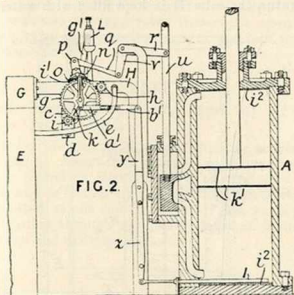


FIG. 2.

1052. Dahne, F. W. March 22.

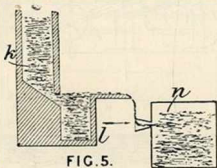


FIG. 5.

*Non-conducting compositions.*—Granulated slag for use as a non-conductor for covering steam boilers or pipes is obtained by directing a jet of steam *l*, Fig. 5, against slag as it issues from a furnace *k*, so that the slag is forced through a bell-mouth opening into a receptacle *n*.

1068. Harlow, B. March 24. [*Provisional protection only.*]

*Heating water.*—Boilers connected with hot-water heating-apparatus are constructed with two flow-pipe connections, one being at the top and the other at a lower level. These are connected together by a vertical pipe carried above the level of the boiler, and a branch from this pipe at the lower level then becomes the flow pipe proper. The usual return pipe is provided. The necessity of sinking a "stoke hole" is avoided and the boiler may be placed above the ground.

1033. Lessware, J. N. March 24. [*Provisional protection only.*]

*Heating liquids.*—In the manufacture of glucose, infusions, or extracts, and in the washing of malt in brewing and the extraction of colours for dyeing

purposes, the substances which act upon each other are discharged from a closed receptacle, in which they may be agitated, into a conical hopper or "converter" underneath, and are there heated by means of a steam coil. A circulating-pump draws the mixture from the bottom of the hopper and discharges it back again at the top, thereby causing the two substances to be intimately brought together. The charge may otherwise be fed into the hopper by the pump, so that any necessary pressure may be employed.

1084. Kusenber, A. March 24.

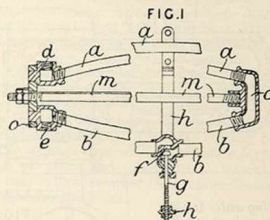


FIG. 1

*Steam traps.*—Two curved tubes *a*, *b* are united at one end by the tubular-socket connection *c* and have two hollow castings *d* and *e* attached to the other ends, the upper one being for the admission of steam and the lower for the escape of water. A tie-rod *m* is secured to the socket *c* and passes through a plate *o* fitting on the castings *d* and *e* and is there secured by nuts. A valve *f* in the pipe *b* has its stem *g* carried by a yoke *h* firmly secured to the tube *a*. Steam in the tubes causes them to bulge apart thereby closing the valve, but when condensation takes place, the tubes contract, the valve opens, and the water escapes.

1208. Hilton, R. L. April 3. [*Provisional protection only.*]

*Heating water.*—Boilers for heating water for circulation in horticultural erections or other buildings and for other purposes are constructed with tubes projecting from the rear compartment of a chamber and containing internal circulating-tubes communicating through a partition with the front compartment of the chamber. The water passes from the rear compartment to the heating system and is returned to the front compartment. A number of these sections may be arranged together, the water being passed from one to the other, or the current may be divided to flow through the separate sections. Vertical partitions, with openings alternately at the top and bottom and side doors for the removal of soot, are arranged between the sections. Each divided chamber is formed in one casting and provided with a removable cover. A fusible plug or plugs are provided at the end or ends of one or more of the outer