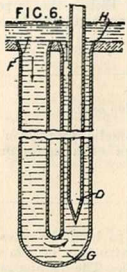
1714. Lake, W. R., [*Thirion, A. R.*]. June 3.

Heating liquids.—Apparatus for heating liquids is constructed with arrangements of depending U-shaped tubes to increase the heating-surface. The direction of the current in the limbs of the tube may be determined by using a displacing tube or rod D, which reduces the volume of liquid in one leg and thus accelerates the circulation of the liquid.

FIG. 6.



1747. Kinsey, H. June 5.

Heating water.—Fig. 1 shows a sectional boiler similar to those described in Specification No. 3684, A.D. 1868, and composed of water chambers *a* with corrugated sides connected by stays. The chambers are cast in one piece, preferably with the stays *s*, or screw stays or other fastenings may be used. They are connected at the bottom to pipes *c* to which the feedwater is supplied. The flues may be divided by plates *e* cast on the chambers, or the chambers may be bulged out for the same purpose. The stays may also be tubular, and open at each end; and the chambers may be of wrought metal with welded joints. In the latter case, the pipes *c* may be replaced by flat

FIG. 14.

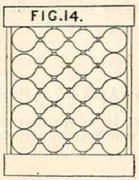
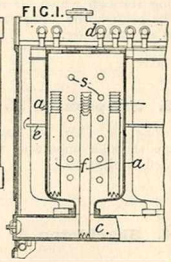


FIG. 1.

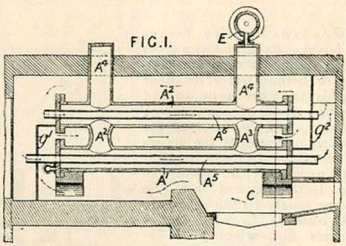


corrugated chambers. The chambers may have diamond or other shaped projections in place of the corrugations. Fig. 14 shows a boiler of corrugated or other shaped plates with distance-pieces between them, and the whole held together by the outer water chambers, connected by tie-bolts in a somewhat similar manner to that described in Specification No. 1052, A.D. 1863. For promoting water-circulation, tubes *f* are placed in the chambers or tubes of sectional or other boilers, open at the bottom as shown and formed at the top with numerous openings protected by guards to allow for variations in the water level. This may be done in various ways, but numerous funnel-shaped openings, as shown, are preferred.

1750. Leachman, W. B. June 5.

Heating water; heating buildings &c.—A boiler for heating water is formed of horizontal cylinders A^1, A^2 connected by short vertical tubes A^3 and set in brickwork as shown. Flue tubes A^5, A^6 traverse the cylinders. The flue space round the boiler is divided by partitions g^1, g^2 to cause the gases to take a circuitous route to the chimney as shown by the arrows. A similar arrangement may contain hot water and be used as a radiator in heating buildings. In this case, the cylinders are placed vertically.

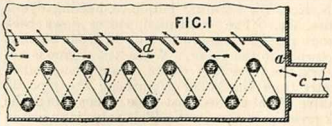
FIG. 1.



2085. Bannehr, J., and **Matthews, H.** July 10.

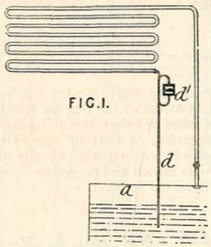
Heating air.—Air for use in drying fabrics, bottles, &c. is warmed by contact with hot-water pipes *b* in a chamber *a* at the bottom of the drying-chamber.

FIG. 1



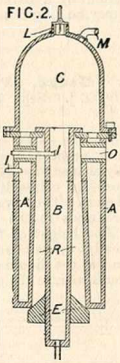
2114. Crispe, S. E., and **West, J.** July 13.

Heating by steam circulation.—The heating-coil is placed above the generator *a*, and the water of condensation passes from the lower part of the coil through the pipe *d* to the lower part of the boiler. A check valve d^1 is employed to prevent water from rising from the boiler into the coil. The arrangement may be applied to steam-heated evaporating-pans.



2142. Bernard, J. July 15.

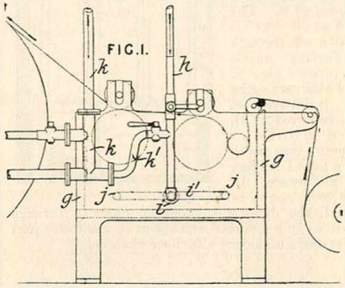
Heating gases.—Relates to means for obtaining and utilizing heat from slag from blast or other furnaces. Receiving-vessels for the slag are so arranged that a current of air, steam, or gases may pass and circulate round and about them to abstract the heat from the slag. One form of apparatus, shown in Fig. 2, consists of an outer chambered cylinder A and an inner cylinder B secured together by flanges. A domed top, fitted with a valve L and outlet pipe M, is bolted to the outer cylinder. A conical movable annular plug E at the bottom of the apparatus is kept in position by weights. The slag is conducted to the space R between the two cylinders by the pipe O, and its heat is imparted to the air or steam in the chambers. The slag is removed by lowering the conical annular plug. Inlet pipes I, I and the usual appliances fitted to steam boilers are provided. In a modification, the central cylinder B and dome C are dispensed with, and the slag is fed through a hopper removably fitted into the upper end of the chambered cylinder.



2150. Yates, G., and **Williams, J. R.** July 16. [*Provisional protection only.*]

Thermostats.—Relates to means for automatically closing and opening the lights of cucumber and other frames, and the ventilators of hot-houses and other places where an even temperature is necessary. When the temperature rises, a portion of the mercury in a closed vessel passes to a second vessel and, by its weight, opens a valve to admit a supply of fluid to a third vessel, which is fitted with a float connected by rods and levers to the ventilators, which are balanced. A fall of temperature causes the mercury to return, so that the valve is closed by a spring or weight, and the fluid in the float vessel is allowed to escape by a waste pipe. The actuating rods and levers may be connected direct to the third vessel, which is then arranged to fall by the weight of the fluid supply and be raised by a balance-weight or a spring.

2331. Livesey, T., and **Abbott, T.** Aug. 4.



Heating liquids.—In apparatus for boiling size, shown in Fig. 1 as applied in sizing yarns, unboiled or partly-boiled size is conveyed by a pipe *h* from a supply cistern to the size trough *g*. Steam from a pipe *k*, entering the pipe *h* through the elbow k^1, heats the size and forces it through pipes *i*, i^1, and out through the perforated pipes *j* into the trough.

2440. Pinkus, H. Aug. 16. *Drawings to Specification.*

Thermostats.—In applying "to a blast, cupola, "melting, puddling, reheating, converting or "cementing retort oven" or other furnace, "pyrometric bars," in accordance with the invention described in Specification No. 2792, A.D. 1867, the bars are placed in a recess covered by a plate of malleable cast iron protected by a plate of refractory heat-transmitting material, such as zirconia. Thus the bars become heated in proportion to the temperature of the furnace, and "regulate any determined or intermitting or "continuing feed of materials of combustion, as "also to throttle areas of vents of combustion" for manipulating metals in the furnaces.

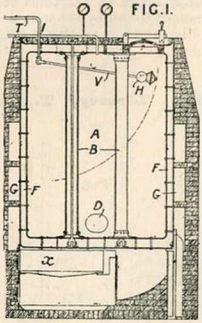
2482. Braby, F. Aug. 19. *Drawings to Specification.*

Heating air.—Air, which is to be forced into a still containing ammoniacal liquor in order to recover the ammonia, is heated by passing it through a series of small pipes placed in chambers through which exhaust steam is passed.

2547. Lake, W. R., [*Everett, C. J.*]. Aug. 27.

Digesters.—A digester A, for rendering and refining lard, tallow, and the like and for treating offal, is fitted with internal heating-flues B, a water jacket F, and flues G passing round it. The treated fat is drawn off through a floating nozzle H, pivoted pipe V, and delivery pipe T. Solid residues are removed at D, and noxious vapours pass away by a pipe I leading to a furnace. In the form shown in Fig. 1, the digester is mounted above a furnace grate *x*; in a modified arrangement, the lower part is tapered and enters a furnace chamber.

FIG. 1.



2559. Muir, C. S. W. Aug. 28. [*Provisional protection only.*]

Steam traps.—To provide for the escape of water from steam pipes, a valve box is provided into which the water drains. A valve is arranged in the bottom of the box to which is attached a rod of brass or other metal having a different rate of expansion to that of the valve box. When the valve box contains a quantity of water, the metal rod is cooled and caused to contract, thus opening the valve.

2635. Newton, A. V., [*O'Hara, C. M.*]. Sept. 7. *Drawings to Specification.*

Non-conducting coverings.—Ashes produced from coal, wood, or other vegetable substances are reduced to fine powder by sifting, grinding, &c., and placed round the exposed parts of a steam boiler in a dry condition. The material is retained in position by a covering of metal, wood, &c., which may be hinged to allow easy access to the boiler.

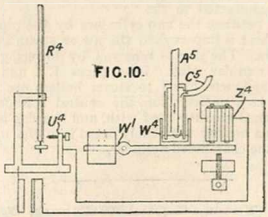
2677. Gedge, W. E., [*Moreau, P.*, and *Mouly, L.*]. Sept. 13. [*Provisional protection only.*]

Boiling-pans.—To prevent milk, soap, glue, chocolate, or other material from boiling over, a specially-shaped vessel is placed in the boiling-pan. The vessel is cylindrical at the centre, and has conical ends. The lower end is closed, and openings are made in the side of the vessel near its base. The height of the vessel is such that its upper end projects above the level of the liquid in the pan; as the liquid boils, it rises in the vessel and overflows into the pan.

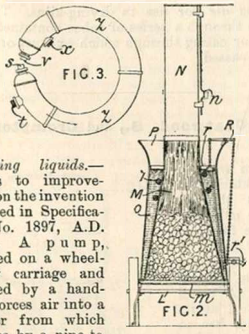
2728. Varley, S. A. Sept. 20.

Thermostats; heating water.—Fig. 10 shows an electric arrangement for regulating the supply of gas to a burner which heats the boiler of a hot-water system intended to keep at a constant temperature a room containing telegraph instruments. The gas is led through a pipe A^5 to a pipe c^5, the supply being cut off, when the temperature rises, by a vessel W^4 carried by a lever W^1 which is lifted by an electromagnet Z^4, on the closing of an electric circuit passing through a compound metal bar R^4 which bends and comes in contact with a stop U^4 as shown. In a modification, the gas is shut off by a mercury valve, the mercury rising and closing a pipe when the temperature rises. The boiler for heating the hot-water pipes consists of plates of perforated discs connected by pipes and encased by wrapping round and soldering to the discs a metal sheet.

FIG. 10.



2735. Gilbee, W. A., [*Chênes, E. P. J. L. T. des*]. Sept. 20.



Heating liquids.—Relates to improvements on the invention described in Specification No. 1897, A.D. 1868. A pump, mounted on a wheelbarrow carriage and operated by a hand-lever forces air into a receiver from which it passes by a pipe to the top of a receiver or cask containing wine or other liquid to be heated. The air forces the liquid from the cask through a pipe and into a worm or group of tubes I, Fig. 2, arranged in a hot bath O, from which it passes up into a discharge pipe, in a heated condition, the flow being regulated by suitable cocks. The bath O is heated by a furnace M, into which air for combustion enters through a grate *m*, the waste gases &c. escaping through a chimney N fitted with a damper *n*. An upper compartment P, communicating with the lower through a valve *r*, supplies water to the bath O, the valve *r* and a clearing-cock r^1 being controlled by the mechanism R. The whole heating-apparatus is mounted on a hand-carriage L. Wine may be cooled, immediately after being heated as described, by means of a copper tube *z*, Fig. 3, containing a worm which consists of a number of small tubes meeting and soldered to plates and screw union joints at the ends of the main tube. This apparatus is placed round the heating-apparatus shown in Fig. 2, and is coupled up to it in such a way that the liquid from the cask enters by a hole *t* and, leaving the tube *z* at *x*, enters the heating-worm I; from this it passes to the worm of the cooler, entering by a hole *v* and issuing at the other end *s*, from which the discharge pipe before referred to conveys it into a storage cask &c. By perforating the tube *z* with holes and placing it in a hot-water bath, it is converted into a heating-worm. The boiler of the heating-apparatus may supply steam, which may be conducted into the casks to cleanse them or into sluggish vats to stimulate the fermentation of the must. In another form the heating-apparatus is made with the receiver containing the hot bath having a central space in communication with the fireplace. A small apparatus, for use at table, is heated by a spirit lamp.

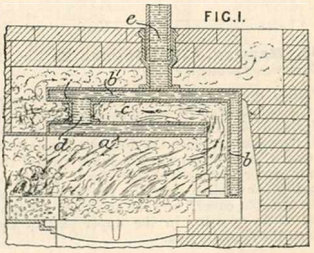
2749. Windsor, J. Sept. 22.

Heating air.—Air for use in desiccating and preserving potatoes is heated by driving it by means of fans through heated metal pipes, and is purified by passing it over charcoal placed on frames contained in the channels through which the air is to pass. In some cases, the charcoal may be contained in the heating-channels.

2804. Hastie, J. Sept. 27. [*Provisional protection only.*]

Heating liquids.—The combustion of solid, liquid, or gaseous fuel is effected in a close vessel supplied with air by a pump, and the products of combustion are led directly into or amongst water or other liquid or substance. The heated liquid may be used as a heating-medium by being passed through pipes &c. The gaseous products, alone or mixed with any generated steam, are used for driving a motive-power engine

2931. Jones, W. J. Oct. 8.

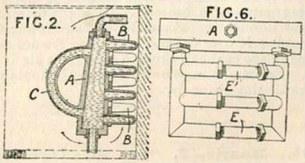


Heating water.—To an ordinary saddle boiler *a* is added a L-shaped water space or chamber *b*, b^1, the vertical portion of which forms the back and the horizontal flat portion the top of the boiler. The two water spaces are connected by water ways *d*, leaving a flue space *c*. The cold water is supplied to the lower part of the portion *a*, and the hot water passes off through a pipe *e* to heating-pipes. The boiler is preferably made of welded wrought iron, and is set in brickwork, on which it simply rests, as shown.

2981. Ellis, R. J. Oct. 13. *Drawings to Specification.*

Boiling-pans.—In order to break up foam or prevent priming in boiling operations, two series of vertical plates, one working through the other, are fitted in the boiling-vessel.

3310. Ching, C. Nov. 16.



Heating water.—Boilers for heating water for baths, or for warming apartments &c., are constructed with a rectangular water space A, forming the fire back, from one or more surfaces of which project dome-shaped or taper tubes B into the space by which the boiler is surrounded. Instead of short closed tubes, curved tubes C returning to the boiler may be employed. A tubular grating E, Fig. 6, may be formed across the fire-chamber, preferably in an oblique direction, to promote circulation. The dotted lines, Fig. 2, indicate the position of the boiler in the stove. The rectangular water space may be extended along the sides of the stove. The boiler may be made of hollow box-like form, specially for use in conservatories.

3333. Hartley, J., and **Sugden, Z.** Nov. 19. [*Provisional protection only.*]

Heating water.—A boiler for hot-water apparatus is constructed of wrought iron, preferably welded, and is made with a dome-shaped top, to the highest part of which the flow pipe is attached, the return pipe entering at the lower part of the annular water space. The fuel feed opening is formed at an incline near the top of the dome "with portable cover," and the smoke pipe is connected to an aperture in the upper part of the dome on the opposite side.

3362. Moseley, J. Nov. 20. [*Provisional protection only.*]

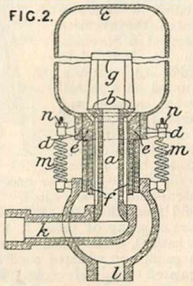
Footwarmers.—In the bottom of a boot, shoe, or slipper of felt or other material, made with a sole of leather &c., is arranged a tin or other box having a reservoir containing spirits of wine and fitted with a filling-aperture and screw plug. A burner and wick forming a spirit lamp are arranged in the box, and there is a rod and sliding-plate device for opening and closing an opening in the upper part of the chamber to regulate the passage of hot air to the shoe. The box is strengthened by suitable supports, and openings for the admission of air are provided. The upper surface of the box may be of zinc or other good conductor of heat.

3474. Forbes, J. Dec. 1. *Drawings to Specification.*

Heating air for use in drying-kilns. The air is drawn through a series of tubes contained in a cylinder or casing through which exhaust or other steam is passed.

3520. Chatwood, S., and **Crompton, J.** Dec. 4.

Steam traps.—Steam entering at *k* passes through the tube *a* having the valve face *b* at its upper part. A guard *g* is placed above the vertical pipe *a*. A vessel *c*, closed at its upper end, has at its lower end a neck *d* which carries the valve seating *e*. Grooves *f* are provided, through which the condensed liquid escapes to the exit *l*. Springs *m* adjustable by nuts *n*, are used to keep the valve closed until the accumulation of the water from the condensed steam in the vessel *c* overbalances them by its weight and opens the valve to allow the water to escape. A weighted lever on fixed weights may be substituted for the springs.



3564. Ballou, R. A., [*Greely, J. P.*]. Dec. 9. *Drawings to Specification.*

Non-conducting compositions.—Lampblack, with or without plaster of Paris &c., is used as lagging for steam pipes, boilers, safes, and refrigerators for preserving food, meat, &c.

3569. Logan, G. F. Dec. 10. *Drawings to Specification.*

Heating buildings.—Fireplaces for use in ventilating &c. are fitted with side chambers into which air may be conducted by pipes; from these chambers the heated air may be passed to any apartment to be heated.

3578. Barnett, J. Dec. 11. [*Provisional protection only.*]

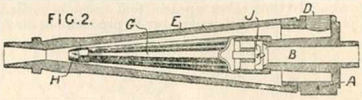
Non-conducting compositions.—Clay, loam, mud, mould, sand, sawdust, charcoal, coal, coke, ashes,

chalk, peat, or earth, pulverized or otherwise, are mixed with salt, a saturated solution of salt being preferably used. The mixture may be applied as a compost wet, or made into blocks and applied like brickwork.

3651. Foulds, W., [*Mack, W. B.*]. Dec. 17.

Heating water.—A corrugated conical nozzle G, H is fitted within a conical casing E, which is screwed to a hollow base-piece A having a central water connection B and a lateral steam connection D. The water in passing through the nozzle G is heated by the steam in the casing E, which combines with the water beyond the end of the nozzle. A valve J is provided to prevent the steam from forcing back the water.

FIG.2.



3673. Kinsey, H. Dec. 18.

Heating water.—Relates partly to a method of constructing headers or like chambers with corrugated sides for sectional boilers, surface condensers, water-heaters, and the like. Figs. 1, 2, and 3 show one form, consisting of a vertical chamber with corrugated sides formed in one piece with a tube at the bottom, and sometimes also with one at the top. To construct the form shown, a plate is bent end to end and brazed, riveted, or otherwise secured at its edges, except at the ends of the bottom tube. In another arrangement, the corrugations are transverse instead of longitudinal. The plate is a little wider at the centre, so that, when bent over, the lower tube may project a little, and these projecting ends are fitted with flanges or the like, brazed, riveted, or otherwise fixed to provide means of connecting other chambers to form the complete apparatus. Open-ended vertical circulating-tubes, such as described in Specification No. 1747, A.D. 1869, may be fitted in the chambers, as shown in Fig. 2. The corrugated sides of each chamber may be tied together with stays, as described in Specification No. 3084, A.D. 1868, [*Abridgment Class* Steam generators].

FIG.3.

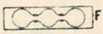


FIG.1.

FIG.2.

3737. Newton, W. E., [*Stilwell, E. R.*]. Dec. 24.

Heating water for use in steam boilers and for other purposes. The water is introduced into a chest A through a pipe f^1, which may be fitted with an overflow box *b*, and steam is directed across the thin inflowing stream to form a fine spray; it then flows, in a thin sheet, over a series of metallic shelves *a*, depositing large quantities of its crystallizable matters. The water passes through a filtering-medium F before leaving the casing. Steam enters the casing in two streams at *m*, *n*, and escapes at the top; the steam from the lower inlet *n* passes over and heats the water on

FIG.1.

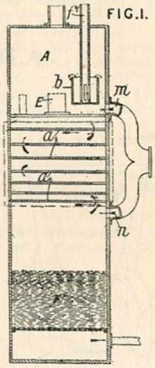
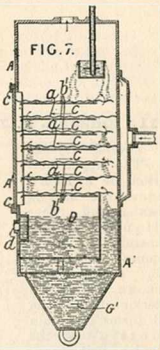


FIG.7.



the shelves. In another form of apparatus, the water flows over a distributing-disc, beneath which is placed a central vertical steam pipe provided with openings beneath each shelf. The water flows from shelf to shelf through apertures formed in the centres of the shelves adjacent to the steam pipe. Small dripping-troughs may be fitted beneath the apertures to receive the water and facilitate the action of the steam upon it. Fig. 7 shows another modification, in which the shelves C are formed of corrugated sections, the central ones *a* of which are readily removable for cleaning, and are held in position by pivoted bars b^1. The casing is fitted with a door A^1, which is held in position by adjustable rabbeted bars or blocks *c* and bolts and nuts. The lower portion G^1 of the casing is made conical to form a mud collector, and above this is arranged an upward-flow filter D, through which the water passes to the outlet *d*. In two

other modifications, the shelves are made up of separate bars placed at some distance apart and arranged to break joint. The filter may be placed outside the casing.

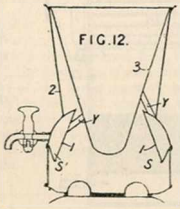
3756. Upward, A., Bannehr, J., and **Dale, T. P.** Dec. 28.

Heating air.—A shower of water is caused to pass down the chimney shaft of a furnace burning coke. It thus takes up acid, and becomes heated. The hot dilute acid is passed through coils of lead pipe in an air-heating chamber to produce hot air for evaporating &c.

A.D. 1870.

11. Duggan, F. J. Jan. 3.

Heating liquids.—The upper portion of a lamp stove for heating water and other liquids consists mainly of three cones 1, 2, and 3, arranged as shown. The interior of the cone 3 forms the main portion of the boiler, being connected by tubes Y with an annular water space S formed round the cone 1. In a modification, the portion S is suppressed, and pockets formed on the inside of a cone corresponding to 1, but joining the cone 3, form water spaces projecting from the main water space.



40. Rundle, R., and **Parker, T.** Jan. 5. [*Provisional protection only.*]

Heating buildings; heating water.—Hot water is circulated through a church, chapel, or other building to be heated, in small wrought-iron tubes. The boiler is constructed of a number of short pieces of similar tubing joined together at top and bottom by T-pieces, elbows, or bends. An "expansion tube" is used, connected underneath with a "bow"; and a feed-tube between the "expansion" and the boiler is connected to the return tube.

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77. Cochran, A., and **Kerr, J.** Jan. 11. [*Provisional protection only.*]

Steam traps.—Water from steam pipes drains into a vessel with an outlet valve below actuated by a float. The float is preferably solid, and is connected to levers arranged to open the valve inwards or outwards when the water accumulates.

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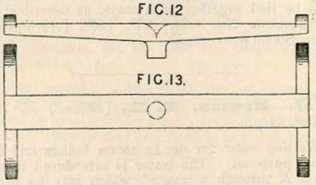
122. Bonneville, H. A., [*Grandjean, P.*]. Jan. 14.



Footwarmers.—Figs. 12 and 13 show in elevation and plan a "foot stove" or footwarmer for distributing heated air to railway carriages &c. The air is heated by an oil or spirit stove, and passed into the footwarmer.

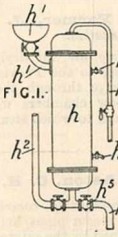
124. Wadsworth, J. Jan. 15. [*Provisional protection only.*]

Heating liquids.—A hot-water boiler is constructed of cast metal, and its lower part consists of a series of parallel longitudinal projections, the two outside ones forming the furnace walls. The projections open into a bottom passage, and they are divided internally to form cellular spaces through which the water circulates. A series of these boilers may be placed in line to form a flue, and thus utilize waste heat for heating water or other liquids. The boiler may be formed of sheet metal.

145. Barlow, H. B., [*Lancaster, W.*]. Jan. 18. *Disclaimer.*

Boiling-pans.— Size for use in sizing warps is boiled in a steam-tight vessel *h*, provided with a feeding-funnel and pipe h^1, a steam-supply pipe h^2, a pipe h^3 for blowing-off air, and a pipe h^4 leading to the size trough. A two way tap h^5 is also provided, for letting the size flow into the size box or for letting-off water when cleaning out the vessel. Taps h^6 serve for drawing-off samples.

FIG.1.



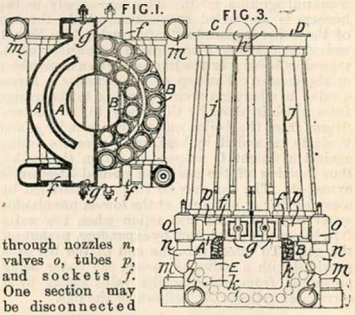
249. Adcock, W. H. Jan. 27. [*Provisional protection only.*]

Heating liquids.—Heaters for water and other liquid are constructed with internal partitions directed across the line of draught of the fire. The water spaces thus formed communicate with each other by openings or passages, and the coldest water is nearest to the flue outlet.

256. Weeks, A. W. G., Deal, G., Lillywhite, G., and **Launders, A. O.** Jan. 28.

Heating water.—Boilers of tubular, saddle, or other form for heating water for circulation in pipes for warming baths, tanks, cisterns, &c., are constructed in two or more separate sections, so that any one section may be removed without stopping the working of the remainder of the apparatus. Fig. 3 shows the application to an upright tubular boiler with its upper and lower water spaces each in two separate semi-annular castings A, B, and C, D, respectively. The lower portions are further subdivided into an inner and outer half ring, Fig. 1; two rings of vertical tubes *j* connect the upper and lower portions. The boiler is thus divided by a vertical plane into two distinct portions. Water-tube furnace bars *k* join two box castings E. The flow pipes are connected to the sockets *h*, and provided with a valve by which the two portions of the boiler may be brought into communication. The return pipes are connected to the castings E at the sockets *m*. Cleaning-holes *g*, *l* are provided. The water spaces E communicate with the boiler

FIG.1. FIG.3.



through nozzles *n*, valves *o*, tubes *p*, and sockets *f*. One section may be disconnected after closing one of the flow pipe valves and one of the valves *o*. The boiler is enclosed with an iron water jacket made in corresponding sections, the inner surface being provided with spiral projections to distribute the heat. The valves are formed with concave spheroidal seatings on which close convex spheroidal plungers attached by cup-and-ball joints to the screw spindles. The valves may also be formed with a rubber ring, partly recessed in a groove, against which the face of the valve is screwed down.

284. Johnson, J. H., [*Fontaine, H.*]. Jan. 31.

FIG.2.

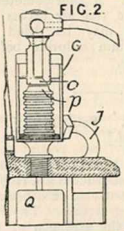
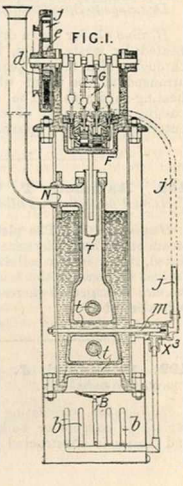


FIG.1.



Thermostats.—A steam engine of the "domestic-motor" class for driving sewing-machines, lathes, saws, presses, pumps, blowers, ventilators, kneaders, grinding-mills, and other machinery is

carried on the top of a vertical boiler of special construction heated by gaseous or liquid fuel. The supply of this fuel is automatically controlled by thermostats or manometers. The gas or liquid fuel is supplied to a ring of burners *b* surrounding a central ignition jet B. The fuel supply to the burners is controlled automatically. On the top of the boiler is placed a "safety valve" G, Figs. 1 and 2, comprising a corrugated expansible close-topped cylinder *p* or the like acting as a manometer or thermostat. The top of the cylinder *p* forms a valve to admit gas from the pipe *o* to the casing, from which it passes by the pipe *j* to the burners. Steam from the boiler enters the cylinder *p*, and tends to expand it by heat, or by pressure acting against a weight Q suspended within the boiler, thus shutting off the gas when normal pressure is exceeded. The gas may be further controlled by a copper bar *m*, arranged at the lowest permissible water level to come into action when the water falls below this point, and, by expanding, to shut off the gas. To effect this, the end of the bar *m* is provided with a valve, as shown, the water being prevented from entering the valve casing by a corrugated cylinder X^3, bellows, or the like.

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338. Shaw, W. T. Feb. 5. [*Provisional protection only.*]

Heating liquids.—Pans or vats used in making lard are fitted with revolving and stationary stirring-arms, which are made hollow and supplied with steam or hot air to heat the lard.

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415. Lake, W. R., [*Herbst, A.*]. Feb. 11. *Drawings to Specification.*

Heating air for use in drying sugar. A cylinder, heated by waste steam, is provided with tubes through which the air passes. A thermometer is arranged at the point where the air leaves the heating-apparatus. The air may be dried by passing over a layer of calcium chloride before entering the heating-apparatus.

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449. Rammell, T. W. Feb. 16. [*Provisional protection not allowed.*]

Heating water.—The plates and tubes of which steam and other boilers are constructed are ribbed, fluted, raised into a cellular pattern, or otherwise formed to increase the heating-surface. The ribs &c. are arranged to increase the strength of the plates or tubes.

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499. Hammond, J. Feb. 19. [*Provisional protection only.*]

Boiling-pans, circulating water in. Apparatus for use in coppers or boilers for washing clothes and fabrics, is constructed of a cylinder having a double conical false bottom, the upper cone being grooved and perforated, while the under or inner cone is plain. A taper tube extends up from the top of the double cone, and is fitted with a spreader, consisting of a rim or lip and a disc. The clothes &c. to be washed are placed in the cylinder, which is inserted in the copper and fits, at its upper edge, close to the sides thereof. As the water becomes heated, it flows through apertures near the top of the cylinder, and also ascends the central tube and passes from the spreader in continuous streams over the clothes, the water from these passing into the space between the cones to be reheated. The apparatus may be made without the centre tube, the double conical partition being then inverted. A raised cover and a small centre tube for carrying off steam are provided.

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527. Farmer, J. Feb. 23. *Drawings to Specification.*

Heating air for drying purposes. The air is, according to the Provisional Specification, heated by passage through the spaces between a series of hollow chambers which are formed by flat plates and to which steam is admitted.

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531. Aston, C. H. Feb. 23.

Non-conducting coverings and compositions for boilers, steam pipes, hot-blast pipes, cylinders, &c. are formed by the mixture of powdered carbon in the form of anthracite coal, coke, wood charcoal, or sawdust with china clay. Loam, sand, oxide of iron, oil, plumbago, and hair may also be added. Coarse canvas &c. may be saturated with the composition and wrapped round the pipes &c.; over this the composition is applied with a trowel; an outer covering of resin and sulphur or of pitch and tar may be added, and the whole protected by thin sheet iron.

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593. Clayton, T., and **Taylor, J.** Feb. 28. [*Provisional protection only.*]

Heating water.—The apparatus is intended principally for the production of gas from mineral oil, but it is available also for heating water. A jet of burning mixed gas and air is driven under pressure into the interior of a truncated cone surrounded by a conical envelope. The oil to be treated or water to be heated is supplied to the space thus formed by a tube, and is preferably caused to flow spirally round the inner cone surface. The blast of air required may be produced by a blower actuated by a spring or weight, and wound up at intervals.

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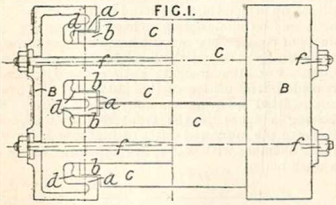
609. Bünger, F. L. H. W. March 2. [*Provisional protection only.*]

Steam traps.—Relates to steam traps such as are described in Specifications No. 2890, A.D. 1862,

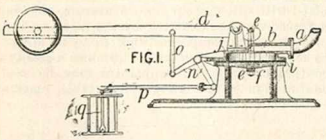
and No. 163, A.D. 1866. The chamber is divided by a corrugated flexible diaphragm, the upper compartment being filled with water. The condensed water from the steam pipes &c. flows into the lower compartment, the outlet from which is controlled by a double-seated compensating-valve connected with the centre of the diaphragm. When steam enters the lower chamber, its heat expands the water in the upper chamber, causing the diaphragm to close the outlet valve. The movement of the diaphragm is adjusted by a screw passing through a stiffening-box in the cover. The inlet passage to the lower chamber is divided, to deflect the steam and water from direct contact with the valve. The trap allows the escape of air before the valve closes to prevent escape of steam.

695. Truss, T. S. March 9.



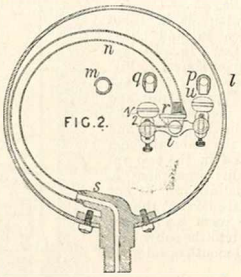
Heating water; heating buildings.—Tubular and other steam and water boilers and "coils," applicable for heating buildings by steam or hot-water circulation, are constructed in two or more sections united by flexible joints. Fig. 1 shows a boiler so constructed. The sections B are provided with recesses *a*, *a* to receive projections *b*, *b* on the sections C. The joints are made between the butting surfaces, which may be of undulating form, by the packing *d*, which is preferably of rubber in the form of a ring; they are tightened by the bolts *f*. In boilers the recesses *a* are formed, as shown, so as to be surrounded by the water, steam, &c., in coils, or where the joints are not subject to the action of the fire, this is dispensed with.

719. Brusch, F. March 11.



Thermostats.—Relates to an automatic apparatus for operating the dampers of steam-boiler and other furnaces. A cylindrical chamber *j*, to which steam from the boiler, or other elastic fluid, is conducted by the pipes *a*, *b*, is closed by an elastic diaphragm *i*, beneath which is placed a piston *f* connected by a strap *e* to the short end of a weighted pivoted lever *d*. Any movement of the diaphragm due to variation in the steam pressure &c. is imparted to the lever *d*, and thence to the damper *q*, through a link *o*, bell crank *n*, and rod *p*, or other mechanism. The pressure on the diaphragm *i* may be produced by the expansion of mercury or gas, or any elastic body contained in a closed vessel heated by the furnace.

726. Jackson, C. March 11.



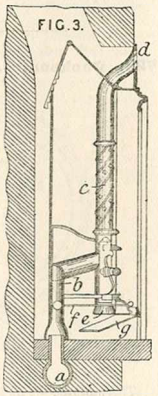
Thermostats.—The gas supply for the burners of a steam-vulcanizer furnace enters a vessel *l* by a pipe *m*, and leaves it through pipes *p*, *q* communicating with the burners. In the vessel *l* is a flat tube *n* closed at one end *r* (which is free to move) and bent into a curve and fixed in a block *s* communicating with the pipe of the pressure gauge of the boiler. The end *r* carries a lever *t*, on the ends of which are mounted valves *u*, *v*, having looped stems adjustable in position on pins or centres. If the steam pressure in the boiler, and consequently the temperature, become too great, the end *r* of the tube moves outwards, so that the valve *u* comes against and closes the pipe *p*, and then the lever *t* turns on its centre so that the valve *v* nearly closes the pipe *q*, the gas supply to the burners being thus diminished. As the temperature falls, the parts return to their normal positions, a spring 2 serving to press back the lever *t*. In a modification, the lever *t* is linked at its ends to the end *r* of the tube and to a hollow block common to the two pipes *p*, *q*, and is covered with india-rubber so as to form a valve for closing one pipe and nearly closing the other. In another modification, the chamber *l* is divided by a plain or corrugated plate to form a steam space communicating with the boiler, the deflection of the plate being made to effect the closing of the pipes. In some cases, the boiler is heated by a single burner, the regulating-mechanism being then modified accordingly.

791. Lavigne, G. de. March 17.

Non-conducting coverings for pipes, steam generators, cisterns, food receptacles, ice-houses, railway and other carriages, &c. are formed of cork, in sheets, pieces, or powder, enclosed in an outer casing. The cork may be applied as panels, or as thin sheets rolled into cylinders, or as staves held together by bands &c., or as solid cylinders or discs. It may be coated with oil colour mixed with cork dust.

840. Milne, J. March 22.

FIG. 3.



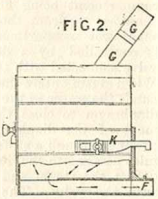
Heating air.—Consists in heating air in tubes arranged in and about firegrates. In the arrangement shown in Fig. 3, external air from the pipe *a* passes up and round the back of the grate in the pipe *b*, and enters the room through louvres *d* in the two upright discharge pipes *c*. External air can be cut off by the lever *f*, the air of the room being then drawn into the tubes *c* by the bell-mouth openings *e*.

922. Clark, G. March 30. [*Provisional protection only.*]

Heating liquids.—In one form of apparatus, the liquid to be heated passes along the narrow space between two concentric tubes, which may be of round, oval, corrugated, &c. section, and are preferably vertical. The outer tube is jointed to the end plates of a casing which contains the heating-liquid, steam, &c. The heating-liquid also circulates through the inner tube, which is prolonged beyond the casing, one end being connected with the supply, and the other forming the discharge. Any number of such double tubes may be employed in the casing. A number of plates may be placed across the inside of the casing, and provided with holes in varying positions to give a circuitous direction to the heating-liquid. Or air may be passed through the inner tubes. In another form, single tubes are arranged vertically through an outer casing, the upper end of the tube being closed and provided with side perforations to allow of the liquid &c. to be heated passing in from an upper trough to trickle down the inside surface of the tubes; at the same time air supplied from a box beneath, and introduced by small tubes projecting into the single tubes, passes upwards and is led off by similar small tubes at the upper end.

964. Wadsworth, J. April 2.

FIG. 2.



Heating water.—Relates to portable ovens which can be hung upon the bars of an ordinary firegrate or placed upon a stove, and are applicable for cooking or baking purposes, for heating apartments, or for use as a wash boiler. An oven suitable for attachment to a firegrate is shown in Fig. 2; it is provided with an inner and outer casing, and the hot gases from the fire pass through an aperture F, around the inner casing, to the chimney G, which leads them into the chimney of the fireplace. Adjustable hooks K are provided for attachment to the firebars, or the oven may be placed upon an adjustable stand in front of the fire, or it may be mounted upon legs. The entire products of combustion may be made to pass through the oven by covering the fire by means of a metal plate. For attachment to a stove, the aperture F is made in the centre of the bottom of the oven, and is fitted upon the chimney of the stove. By leaving a space at the front and bottom only between the inner and outer casings, and filling the inner chamber with water, the apparatus serves as a wash boiler.

975. Thornton, E. April 2. [*Provisional protection only.*]

Heating water.—In a circulating hot-water apparatus, the water, contained in a tank fitted with flow and return pipes, is heated by steam admitted to a closed jacket or casing by which the tank is surrounded. The condensed water passes from the jacket by a siphon &c.

996. More, J., and **Wright, W. L. G.** April 5. [*Provisional protection only.*]

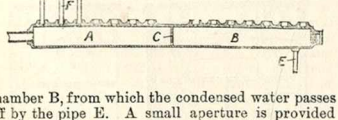
Heating liquids.—An apparatus for forcing and projecting liquids or fluids and raising the temperature of the same, for extinguishing fires, charging tubes or vessels with hot water for heating or other purposes, &c. is formed by combining an injector with an air vessel or chamber fitted with discharge pipes. Water or other liquid is forced into the chamber by the injector, and air or other gas is compressed therein by an air pump, to act upon the water &c. to produce a steady and continuous jet. The apparatus may be used in conjunction with stationary, portable, marine, or other boilers.

1027. Shackleton, J. April 7.

Heating buildings &c.—Relates to apparatus for radiating heat for heating rooms &c. Steam, hot

water, hot air, &c. is admitted to a chamber A, whence it passes upwards through a number of tubes F; these are curved round and joined to the

FIG.4.



chamber B, from which the condensed water passes off by the pipe E. A small aperture is provided in the partition C, to allow any condensed water to pass from the chamber A.

1139. Nolden, M. April 19.

FIG.1.

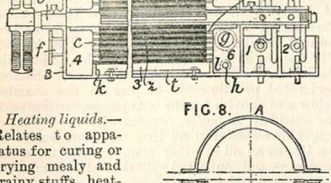
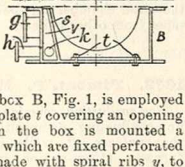


FIG.8.



Heating liquids.—Relates to apparatus for curing or drying mealy and grainy stuffs, heating, cooling, and mixing fluid substances, and condensing gaseous substances. A square or oblong metal box B, Fig. 1, is employed having a cover A and a plate *t* covering an opening in the bottom. Within the box is mounted a hollow pulley shaft *b*, to which are fixed perforated discs *c*, *c*¹. These are made with spiral ribs *y*, to which are attached metal strips *z* so as to form a "spiral or helical cylinder." The discs are encircled in partitions *q*, *r* which, together with a partition *s*, Fig. 8, divide the box into four compartments, communication between the compartments being made by means of holes *k*, *l*, &c. Two sets of scooping-pipes *d*, *e*, carried by and leading into the hollow shaft *b*, are arranged to work into compartments 1, 2 of a partitioned box at the end of the apparatus. When grain, seeds, &c. are to be dried or cured, or liquids are to be heated or cooled, they are put into the compartment 1, and are taken up by the pipes and conducted into the shaft, and thence through slots &c. to the innermost surface of the cylinder, travelling outwards and onwards over the slowly-revolving spirals until the bottom of the box is reached. Superheated steam or heated or cold air, as the case may be, is meanwhile introduced through a pipe *f*, passing through the discs *c*, *c*¹ and the material, and escaping by a pipe *g*. The dried material is removed through the bottom of the box, or the heated or cooled liquid flows in succession through the compartments 3, 4, V, and 6 and is discharged through a pipe *h*. When two liquids are to be mixed, they are placed in the compartments 1, 2, and are taken up and mixed by passage through the cylinder. When gases or vapours are to be condensed, they are introduced by the pipe *f*, and the cold water required for condensing them is introduced by means of the scooping-pipes, the exit pipe *q* being closed.

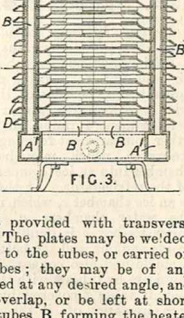
1185. Schermerhorn, L. C., and **Schermerhorn, C.** April 23. *Drawings to Specification.*

Heating liquids.—Relates to vats in which milk or curd is heated or cooled during the manufacture of cheese. Each vat consists of a long rectangular wooden vessel, standing on supports of different heights, and held in a horizontal position by inserting removable blocks below the shorter supports. Within the vat is a removable metal vat, fitting closely at the upper part, but leaving a space for the circulation of steam for heating the milk or curd or of water for cooling. The inner vat rests on transverse strips of wood, notched to receive perforated steam-supply pipes, or to afford passage for the water. Thin planks over the pipes serve for deflecting the steam currents. Suitable discharge valves and taps are provided. The milk &c. is agitated by floats or paddles carried by a horizontal rock shaft above the vats.

1191. Tillman, S. D. April 25.

Heating buildings &c.; heating gases.—To increase the heating-surface in air-heaters, steam condensers, and other apparatus for transferring heat from one fluid to another, the pipes used in their construction are each provided with a series of transverse plates or flanges. Fig. 3 shows a section of one form of heater, in which two annular chambers A^1, A^2 are connected by tubes B provided with transverse plates or radiators D. The plates may be welded, cast, or otherwise fixed to the tubes, or carried on external sleeves or tubes; they may be of any suitable form, and placed at any desired angle, and the edges may abut, overlap, or be left at short distances apart. The tubes B forming the heater may be arranged in any other suitable manner. Steam &c. is passed into the chamber A^2, whence

FIG.3.



it passes down the pipes B and escapes from the chamber A^1. The apparatus may be used as a condenser, thus utilizing the steam for warming rooms. For condensing purposes, the lower part of the apparatus may be enclosed by a water chamber, and the pipes &c. may be made of copper. An apparatus of similar construction to that shown in Fig. 3 may form the upper portion of a stove, the products of combustion passing up the pipes B to the chamber A^2. Air &c. may pass inwards between the plates D to the centre of the apparatus, or from the centre outwards. Dampers, chimneys, &c. may be provided for regulating the flow of the heated air &c.

1245. Murrell, O. April 30. [*Provisional protection only.*]

Heating liquids.—The firebars of boiler furnaces for heating water and other liquids are formed of tubes connected together to form a continuous passage through which the liquid from the boiler circulates. In some cases, the tubular firebars so arranged may form the boiler.

1289. Johnson, J. H., [*Hyatt, T.*]. May 5. *Drawings to Specification.*

Non-conducting compositions for safes, bank vaults, and other like structures. The parts of the structures may be packed with water to which one third of its weight of plaster of Paris has been added. Asbestos mixed with earths or any chemical salt containing water of crystallization, or both, may be used. Asbestos alone, or the asbestos mixtures described above, may be "combined with "liquid or semi-liquid vapour or steam-generating "materials" such as water, solutions of glycerine, gelatine, or mucilage may be employed.

1373. Peacock, E. G. May 13.

Heating by water circulation; heating by air circulation.—The apparatus is described mainly as a refrigerator, but may be used for heating, hot air and hot water being circulated through the apparatus. The sides of the apparatus are made with two separate compartments *g*, *i*, the outer compartment forming an air chamber, and the other compartment forming a chamber to receive ice-water, which may be siphoned from this chamber into an ice compartment *c* at the bottom of the refrigerator. At the top of the apparatus is an ice chamber *c*, which may communicate with the water chambers *g*. The bottom of the lower ice-box *c* is double, and preferably convex inside and out, and the bottom of the upper box *c* is single and also convex. The chambers *c* communicate by tubes *h* with the outer air chamber *i*, and air tubes *f* covered by conical caps f^1 allow free circulation of air through the provision, ice, and air chambers. The doors of the apparatus are double, with an inner sheet-metal chamber, to allow ice-water to pass down the doors and through taps into the bottom ice-box, which is also provided with a tap for drawing off waste water. The compartment *k* is used for cooling-water or

FIG. 3.

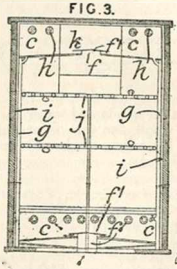
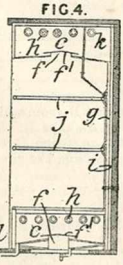


FIG. 4.



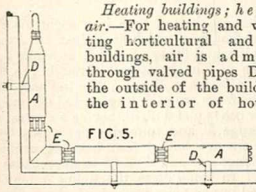
other liquid, which may be drawn off through the tap *l*. The shelves *j* are made of tubes, preferably of light metal, and are connected to the water chamber at the back. A movable shelf of perforated metal is placed over the bottom ice-box. The upper chamber *c* is covered with a jointed lid, the inside of which is double with an air chamber perforated to allow air to pass to the chamber below and provided with a valve or ventilator on the outside. A boiler, covered with a reflector of bright sheet metal in an iron case and heated by gas jets or an oil or other lamp, is placed under the apparatus, and connected with the water chamber, or the water chamber may be connected to circulating-pipes from other boilers.

1379. Pimont, P. May 14.

Non-conducting coverings and compositions.—A non-conducting composition, for application to the surfaces of walls, metal, wood, buildings, furnaces, steam-engine cylinders, steam boilers and pipes, &c. consists of a mixture of potters' earth, water, common oil, fish oil, "arachis, line, "or other plant," vegetable or animal black or charcoal, sawdust and hair. Instead of, or with, the potters' earth, chalk or chalky earth, or a mixture of both, may be used. Colouring-matters and other ingredients may be added. The radiation of heat from metal surfaces may be prevented by coating them with the composition, or more effectually if, after one or two coatings, wooden supports are placed on it, to receive lathwood impregnated with the composition, so as to leave an air space round the metallic surface. The lathwork may be covered with one or more coatings of the composition. Pipes are surrounded with hemp impregnated with the composition, and are then boxed with semicircular pieces of wood on which are fixed one or two sets of lathwork covered on both sides with the composition. To prevent the composition from cracking in large apparatus, holes are pierced to

form a communication between the air space and the external air. The casing may be partially prepared beforehand as follows:—The lathwork is placed on semi-tubes of wood to form cylindrical coverings, which for great lengths may be joined by movable felt coupling-boxes clamped on wickerwork. The lathwork is covered on one or both sides with the composition, of which a second layer may be applied, to be covered while wet with another layer of laths with composition over them. The semicircular casings thus prepared are joined on the spot by iron bands, and covered with composition and, finally, with a last layer of composition to which oil has been added. The casings of laths prepared beforehand may take the place of the wickerwork for receiving the felts often used to cover small pipes. Instead of laths, plants or twists of straw may be used. For curved pipes, wickerwork covered with composition is used. On the bends felt coverings arranged like coupling-boxes may be used. The plates of cylinders, domes of steam-chests, projecting parts of boiler tubes, manholes, &c. may be surmounted by tops covered with composition, or felt, with or without the interposition of an air space. For large steam apparatus and marine boilers, the casing may consist of several panels in lathwork secured by cramp irons or otherwise.

1382. Ormson, H. May 14.

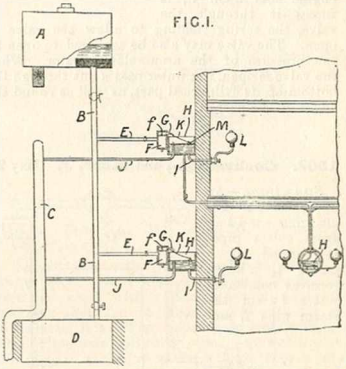


Heating buildings; heating air.—For heating and ventilating horticultural and other buildings, air is admitted through valved pipes D from the outside of the building to the interior of hot-water cylinders or pipes A, and passes into the building from the open spaces at the ends, where the water spaces are connected by the pipes E. Hot water is circulated in the annular space in the pipes, which may be of metal, earthenware, &c., and of circular or other section. The flow and return water pipes are connected to reduced sockets on the outer pipe, the inner air pipe being closed at that end. The foul air is carried off through hollow rafters.

1384. Meixner, F. N., and **Watmough, J.** May 14. [*Provisional protection only.*]

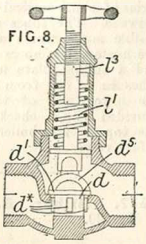
Heating water.—A boiler for baths and hot-water supply, applicable also to water-circulation apparatus for heating greenhouses &c., is formed of an upper and lower portion. The lower portion has two hollow sides, forming water spaces which rest on the brickwork, level with the firegrate and leave a passage under the boiler to form a flue. The upper portion is connected to the lower by a series of short vertical tubes, to leave flue spaces between. The tubes are jointed in sockets with fusible metal, which melts if the boiler becomes overheated. Dampers are arranged in the flues, and a sliding plate may be employed to allow ashes &c. to fall from the flue. The water enters the lower part of the boiler through a pipe provided with a check valve. The inlet pipe in the top of the boiler may be provided with a safety-valve.

1467. Silber, A. M., and **White, F.** May 20.



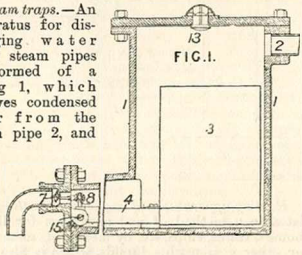
Heating-apparatus and methods of heating.—Relates to a method of and apparatus for lighting houses, trains, ships, &c. by means of mineral oils or other combustible liquids, which is also applicable for heating purposes. Fig. 1 shows the apparatus applied to a house. A main supply cistern A, placed outside the building and filled from the town's supply or in any other manner, supplies oil through branch pipes B, E to supply cisterns F, H fitted with float valves G, M. From these cisterns the oil is supplied through pipes I to bracket or pendent lamps L as shown. The oil enters each supply cistern H through a box F fitted with a filter *f* and cock G. The cocks G are controlled by china or porcelain floats M attached to the cocks by levers K. Overflow pipes J connected to the house waste pipe C are provided. The pendent lamps may have spherical enlargements to contain a supply cistern, as shown. The pipe B communicates with a cistern D or with the drain C, so that the cistern A may be readily emptied in case of fire &c. The burners employed are each formed of two concentric tubes containing the wick. In some cases the oil is passed into an inner vessel, whence it flows into an outer vessel when it reaches a certain level.

1472. Lloyd, T. H. May 21.



Steam traps for the cylinders of steam engines and other vessels or pipes. The valve d is cylindrical, with ribs d^4 to serve as guides. It has two seats, and is kept closed by a spring l^1 adjusted by screwing down the spindle l^3 until sufficient force is obtained to resist the highest pressure of steam. When condensed water accumulates, as the piston of the engine acts upon it, it forces it through the valve, the spring yielding to allow the valve to open. The valve may also be arranged to open by the pressure of the accumulated water. When the valve is open, the water passes out through the bottom of its cylindrical part, as well as round the edges of the part d^1.

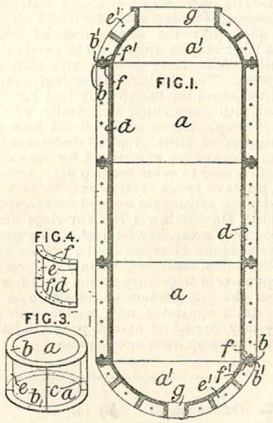
1502. Cochran, A., and **Kerr, J.** May 24.



Steam traps.—An apparatus for discharging water from steam pipes is formed of a casing 1, which receives condensed water from the steam pipe 2, and contains a float 3 attached to a lever 4 pivoted at 15 and actuating by the short arm 8 the outlet valve 7 which opens when the float is raised by the water in the casing. When the casing is empty, the weight of the float closes the valve against the steam pressure. The valve may also be arranged to open inwards. An air valve 13 is provided in the upper part of the casing.

1562. Manbré, A. May 28.

Digesters.—The apparatus described in Specification No. 2760, A.D. 1867, for converting cereal and vegetable substances into saccharine matter, treating and purifying saccharine matter obtained from starch, malt, fruit, and vegetables, treating fatty matters, and manufacturing chemical products, is made with fewer joints in order to facilitate its maintenance in a fluid-tight condition. To effect this, the lead or other non-corrodible metal lining consists of three cylinders *a*, *a*, *a*, Figs. 1 and 3, cast with a flange *b* at each end, and with four ribs or webs *c*, Fig. 3. Outside each



cylinder are bolted four iron segments *d*, Fig. 4, having flanges *f* which fit against the flanges *b* of the lining, and flanges *e*, which fit against the ribs or webs *c*. The bolts pass through the flanges *b* and *f*, as shown in Fig. 1. The top and bottom of the apparatus are each constructed of one piece of lead or other metal a^1, a^1, having a central opening *g*, a flange b^1, and four ribs or webs. Over each end piece are bolted four iron segments formed with flanges f^1 and e^1 to fit against those on the lining. In some cases, the lining *a* may be constructed in one piece instead of three pieces, thus further reducing the number of joints.

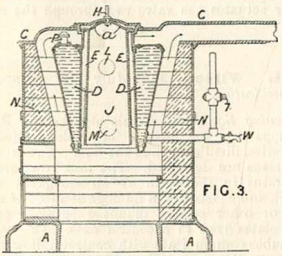
1575. Mather, C. May 30. *Drawings to Specification.*

Heating air for use in drying yarn in "slashers" and similar sizing-machines. The air is forced by a fan through tubes in a chamber to which high-pressure steam is supplied by a pipe.

1627. Gabb, J. June 4.

Heating water.—A boiler for heating churches, conservatories, and other buildings &c. is constructed of conical form, as shown at D, with a concentric central feed-opening E, and supported by its flow and return pipes L, M in a brickwork

setting N, N enclosed by an iron casing with base A and cover C. Supply and draw-off cocks T, W and an air plug P are provided. An inner central tube J may be fitted within the central feed-tube E.



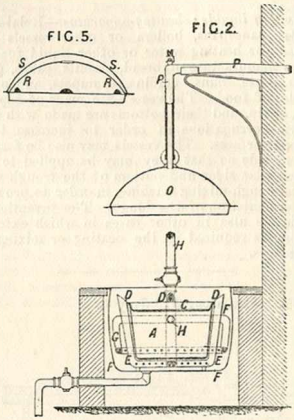
The tube E or the inner tube J may be extended above the top of the boiler, to hold an increased quantity of fuel. Air is admitted through the annular space between the tubes J and E, to consume smoke and ensure perfect combustion. Its supply is controlled by the regulator *a* attached to the lid H.

1640. Wilson, W. June 7. *Drawings to Specification.*

Thermostats.—As described in the Provisional Specification, the temperature of a gas-producing retort is regulated by the use of a pyrometer arrangement of mechanism which indicates the degree of expansion of the retort on a dial plate and may be connected to the damper of the furnace flue, which is thus made partially self-acting.

1763. Davey, H. T. June 21.

Boiling-pans.—Relates to a vessel for holding clothes or the like to be washed, which is inserted in a special copper, or may be used with any ordinary copper. The vessel is shown at A. It has a perforated bottom and a lid C of wirework. It rests by feet on the bottom of the copper F, which is heated by a perforated steam pipe G. The water, when boiling, rises on to the lid of the vessel A, and passes down through the clothes. Undue ebullition is prevented by the water passing down overflow pipes D connected to the vessel A and perforated at the part marked E. Steam is supplied to the copper by the pipe H, and cold water by a second pipe carrying also a "crane" extension terminating in a rose. The crane can be brought over the vessel A, and a shower of rinsing-water poured on the clothes &c. after the washing operation is finished. Superfluous steam is carried away by the cover O attached to a telescopic pipe P, or a condensing cover, Fig. 5, may be used, the steam being condensed in the space between the covers R, S.



1815. Rowan, D. June 27. [*Provisional protection only.*]

Steam traps with float-actuated valves. The valve is of the double equal-sized cylindrical chamber class, with a disc-headed feather valve working into the chamber on one stem, in the same axial line. The valve is enclosed within a small close trap collecting-vessel, connected to the lower part of the vessel to be drained by a pipe. The valve is worked by a large hollow copper ball float or the short horizontal arm of a bell-crank lever pivoted to a joint attached to the valve chamber in a vertical line over the pendent shorter arm which works the valve. The water escapes from the collecting-vessel through the hollow seatings and discs, and out through a central lateral branch, by which the valve chamber is fixed to the side of the vessel. The water discharge vessel and valve may be fixed in such a position that the condensed water may be discharged into the hot-well, when the apparatus is applied to steam-engine cylinder jackets.

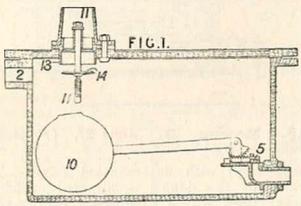
1816. Bonneville, H. A., [*Grandjean, P.*]. June 27. *Drawings to Specification.*

Footwarmers.—Relates to apparatus for heating, ventilating, or cooling railway and other carriages and boats. Air heated by a stove fixed beneath the car &c. passes through a number of tubes to a distributing-chamber, whence it is conducted by pipes to flat chambers or footwarmers in the floors of the various compartments Pipes from these chambers conduct the heated air under the seats.

1875. Stevens, E. July 2. *Drawings to Specification.*

Heating liquids; heating-apparatus.—Relates to kettles, saucepans, boilers, or other vessels employed for heating water or other liquid for use in the manufacture of bread, biscuits, cakes, puddings, paste, buns, muffins, crumpets, and other articles of food. The vessels are made of copper, iron, or tin, and their bottoms are made with concentric corrugations in order to increase their heating-surfaces. The vessels may also be formed on one side so that they may be applied to the semicircular sides and bottom of the trough of a special dough-mixing machine, in order to promote the fermentation of the dough. The invention is applicable also in other cases in which external heating is required in the heating or mixing of substances.

1888. Shanks, J. July 4.



Steam traps for discharging water and air from steam pipes and apparatus. The condensed water enters the vessel by the pipe 2, and, as the float 10 rises, it comes in contact with the adjustable projection 11 on the air valve, raising it until the valve disc 14 enters the cylindrical casing 13, after which the valve will close by the steam pressure. The piston or other sliding outlet valve 5, operated by the toothed rack &c. on the float lever, overlaps its seat so as not to open until the air valve is closed. The air valve is made much larger in area than the inlet pipe 2. The outlet valve may be arranged with a vertical seating, and the slide may be carried direct on the float. An air inlet pipe and an outlet pipe may be provided to drain off any water leaking into the float. The air valve may be arranged independently of the float, in which case it is actuated by a separate float, or enclosed in a casing so as to be closed by the rush of steam.

1889. Marriott, A. July 4. [*Provisional protection only.*]

Thermostats.—In boilers for heating buildings &c., the admission of air to the ashpit is controlled by a pivoted valve operated by a vertical rod, with which it is connected by a system of levers. A balance weight on the valve keeps the end of the rod in contact with a rubber disc on the bottom end of a closed tube filled with mercury. The tube of mercury is attached by flanges &c., inside an enlarged chamber on the flow pipe, and the expansion of the mercury by the heat of the water actuates the valve rod through the rubber disc.

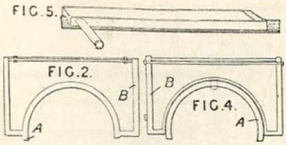
1994. Wilson, H. July 14. *Drawings to Specification.*

Heating liquids by circulating water. Relates to apparatus for heating or cooling liquids in breweries, distilleries, and the like. Two kinds of apparatus are described. The first is a revolving apparatus in the form of an elongated water-wheel, and consists of a number of tubes of round, flat, or other section mounted between parallel tube-plates fixed to a central axle. The ends of the tubes communicate with central hollow conical bosses on the discs. These bosses revolve on fixed conical plugs, which direct the flow of the circulating-liquid to two or more tubes at a time as the apparatus revolves, the liquid passing from end to end through the tubes. The liquid to be treated is discharged upon the tubes in a thin flat stream, and is slowly carried round and deposited in a trough below. In another form, the tubes are arranged in the form of a worm, and revolve in a shallow trough of spiral shape. The second kind of apparatus is of the class described in Specification No. 887, A. D. 1860. The liquid to be operated upon flows through a tank containing a number of baffle-plates, which cause the liquid to flow over and under, or to and fro, along a series of tiers of small flat tubes containing the circulating-liquid. The tubes are bent into an elongated U-shape, or are joined to U-shaped ends; the straight ends are attached by flanges to cast-iron frames provided on the outer side with screwed-down covers, which open continuous communication from one tube or set of tubes to another, and allow the circulating-liquid to be passed right through. For draining the tank, a tube is arranged along one side, and communicates by branch pipes with the divisions between the baffle-plates. Each branch pipe has a cock, and all the cocks are operated by one rod with a handle at the end. In a modification, straight tubes only are used, and are connected in pairs at one end by plates and covers, and at the other by cast-iron boxes which are held together by bolts passing transversely to the tubes.

2038. Taylor, A. L. July 20.

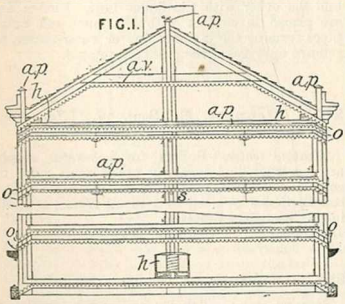
Heating buildings &c.; heating air.—Relates to apparatus for ventilating, heating, and moistening the air of horticultural and other structures, mines, &c. Pipes of ordinary character, for hot water, steam, hot air, or other heating-medium, are each provided with a trough resting thereon, and extending nearly the whole length of the pipe as shown in Fig. 5. The troughs contain water, which may be simply evaporated by the heat of the pipe for the purpose of moistening the air,

the trough being open, or the trough may be covered with a plate of any suitable metal for nearly its whole length, and fresh air for ventilation conveyed by pipes or otherwise into it, to be warmed before



discharge, through apertures in the cover, into the building or structure to be heated &c. The trough B may either be cast in one with the pipe A, as shown in Fig. 2, or be formed separately and applied to an existing pipe, as shown in Fig. 4. The trough may also be made to surround the pipe entirely, the water for evaporation being contained in the lower part of the trough underneath the pipe. When water is the heating-medium, the trough may be supplied from the pipe, holes being formed to cause the water to flow through the trough.

2042. Haggett, W. July 20

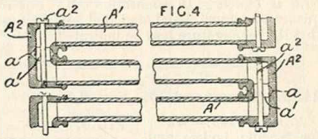


Heating buildings; heating air.—Consists in the application of undulated or corrugated plates for the purposes of ventilating and regulating the temperature of houses and other buildings. The corrugations in the plates are of the nature described in Specification No. 707, A.D. 1859. In applying such plates to the walls, ceilings, floors, windows, roofs, &c. of rooms or buildings, they are fixed so as to leave a space between them and the surface to which they are attached. The perforations for the outward passage of the vitiated air are made at the apex or the highest of the undulations, and the air, after passing through the plates, is carried away by suitable channels. Perforated plates and pipes are placed below or inside the skirtings to carry off any foul air that may lie near the floor. Pure air is admitted through perforations made in the lower or sunken portions of the undulated plates, which parts may be suitably ornamented. The plates may be covered by tapestry, silk, &c., through which the pure air may penetrate without causing a draught. Fig. 1 shows the application of the invention to a house or building. The pure air is admitted by pipes &c. *a.p.*, and may be heated by passing it through apparatus *h* containing hot water or other suitable heating-medium. In the case of the temperature being increased, the two outside pipes will be shut off, and the centre, closed at the top, will receive the hot air and pass it into the rooms at the points S. The vitiated air passes through the undulated plates into the passages *a.v.* and leaves the house by the openings *o*. The invention is also described as applied to churches, chapels, assembly-rooms, &c., the plates being fixed to the ceilings and arched roofs.

2075. Bailey, R. July 23. [*Provisional protection only.*]

Heating buildings &c.—Relates to apparatus for ventilating and heating buildings, greenhouses, &c. An ordinary firegrate is employed, provided with hollow backs and sides to which air is admitted by pipes from outside. Outlet pipes from the hollow back conduct the warm air to the rooms &c., and are provided with sliding gratings for regulating the draught. Hollow bars or hollow bottoms may also be employed in connection with the hollow backs &c. Partitions may be formed across the hollow back to divide it and increase the heating-surface. The interiors of the heating-chambers are coated with enamel, to prevent chemical action on the air passing through.

2112. Lake, W. R., [*Hutson, C. E.*]. July 27.

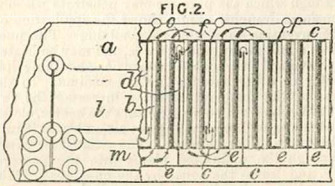


Heating water.—The grates of steam-boiler and other furnaces are formed of hollow bars or tubes A^1, connected at the ends by angle-pieces A^2, which come together at the points *a*, and make joints by means of packing-rings a^1 and bolts a^2. Water for feeding boilers or for other purposes is passed through the hollow bars, which are thus kept cool. A drum for collecting mud and sediment is

placed round the perforated part of a branch pipe which projects from the feed-pipe.

2196. Morton, R. Aug. 8.]

FIG.2.



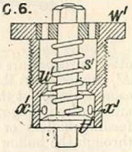
Heating liquids.—A multitubular or surface apparatus for heating liquids is constructed with a casing *a*, in which are arranged a series of vertical tubes *b* fixed in tube-plates *c*, *c*. Beneath the lower tube-plate is a chamber divided into a number of compartments *e*, and similar compartments are formed on the underside of movable covers; or in an open-topped apparatus, as shown in Fig. 2, projecting division plates *f* are placed on the upper tube-plate. These division plates are so arranged that the liquid to be heated &c. circulates through the entire series of tubes. The heating-liquid passes through the casing, preferably in a contrary direction, and is caused to circulate over the whole surface of the tubes by the alternate partitions *d* attached to the upper and lower tube-plates respectively. Cleaning-doors *l*, *m* are provided. The action of the apparatus may be reversed.

2354. Clayton, T., and **Bailey, W. H.** Aug. 27. [*Provisional protection only.*]

Thermostats.—In the manufacture of oil gas, a metal rod, which expands and contracts according to the heat, is employed to control the oil-supply cock, so that, when the heat becomes too great, the cock is closed. In connection with this rod a quadrant, pinion, hand, and dial are arranged so that the temperature may be indicated.

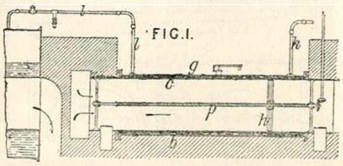
2430. Eastwood, J. Sept. 8.

FIG.6.



Heating water.—Water for feeding boilers and for other purposes is heated by circulating it around a jacketed flue or chimney. Fig. 1 shows one arrangement, in connection with a horizontal boiler; the gases are passed through a horizontal jacketed flue *b*, *c*, through the jacket of which water is passed by means of the pipes *k*, *l*. The pipes may be arranged to enable water to be circulated through the jacket, and used for warming buildings &c. For

FIG.1.



vertical boilers, the water jacket may be fitted round the chimney. The flue is cleaned by means of a circular scraper or metallic brush *h* moved to and fro by a screw *p* rotated through bevel gearing &c. Or projecting arms fitted with blades are revolved in the flue; or a coarse-pitched screw may be used. A vacuum-preventing valve *g* is provided, which consists of a valve t^1, Fig. 6, forced from its rest w^1 by a spring s^1, and working in a casing having holes w^1, x^1 for admitting air. When the internal pressure is above the atmospheric pressure, the valve is closed. The Provisional Specification describes another arrangement, in which spaces at the ends of the jacketed flue communicate by radial pipes with hollow trunnions working in pedestals fixed to the bottom of the flue, the cavity of one trunnion communicating with the water supply, and the other with the boiler feed. Chains &c. are placed in contact with the inner and outer pipes forming the jacketed flue or water-heater, to remove dust &c. as the pipes are rotated.

2573. Bennett, S. Sept. 27. [*Provisional protection only.*]

Heating water.—Boilers for hot-water supply are constructed of copper or other pipes coiled in conical &c. form, preferably in one piece. The coil may be supported in a metal frame, or built in the flue of the fireplace.

2771. Russell, J. Oct. 20.

Heating water.—Tubular boilers for supplying hot water for heating buildings &c. are constructed so as to obtain a circulation of hot water both in the boilers and in the circulating-pipes. Various forms of boilers are shown. The boiler is formed with a lower hot-water compartment A, having pendent tubes D in the fire or flue space. A partition C, which may be formed double and be filled with non-conducting material, forms an upper cool-water compartment B, and is fitted with tubes E depending into the tubes D. The water passes down the tubes E into the pendent tubes D, where it becomes heated and ascends to the hot-water space A. In the saddle boiler shown in Fig. 2, tubes E^1 leading from the cold-water

space may be suspended in the side water spaces; or the side spaces may be divided by a partition. Fig. 6 shows such a partition P applied to an annular vertical boiler. The partition P supports

FIG.2.

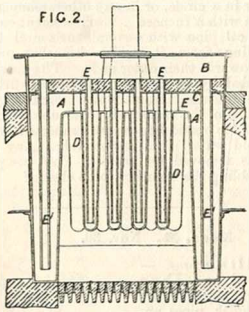
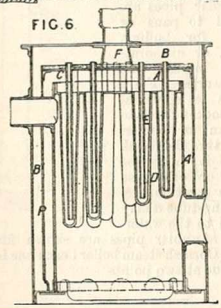


FIG.6

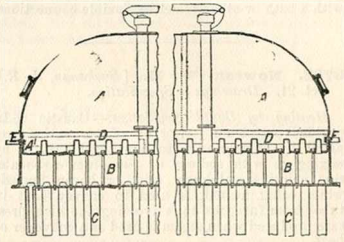


the horizontal partition C, and is provided with openings at the lower end to allow communication between the water spaces A^1, B^1. The cold water space from which the water is conducted to the inner tubes may be detached from the boiler, or the tubes may be connected to the supply pipe. To prevent the cold water from absorbing heat from the hot water before reaching the bottom of the tubes D, the inner tubes E are formed double, the intervening space being filled with non-conducting material such as sand, charcoal, silicious stone, plaster of Paris, asphalt, felt, &c.; or they may be formed entirely of non conducting material.

2774. Moberley, C. H. Oct. 21.

Heating water.—Relates to apparatus chiefly designed for evaporating saccharine liquids, but also applicable for heating water for hot-water apparatus, the principal object being to increase the heating-surface. The evaporating-vessel A is such as that described in Specification No. 22, A.D. 1867, [*Abridgment Class* Distilling &c.], and is intended to evaporate *in vacuo*. Instead of

FIG.2.



using the transverse steam tubes described in that Specification, vertical hollow projections D, D are screwed into tapped holes in the bottom A^1 of the vessel A. The liquid is admitted to the evaporating-vessel A by a pipe E and run off by the pipe F. It is heated by a boiler B, arranged so that the hollow projections D form part of the steam space, and thus give a large heating-surface to the vessel A. The projections D also form guides for conducting upwards bubbles of steam, as soon as they are generated at the bottom of the liquid. The heating-surface of the boiler B is increased by pendent tubes C, C.

2778. Stephens, J. Oct. 21.

Heating liquids.—Relates to apparatus for heating water and other liquids, and for producing a constant circulation of the same. The apparatus is portable, and may be used for heating water for baths and for hot-water supply, and for heating drying-chambers, hospitals, unions, schools, greenhouses, and other buildings &c., and also for heating the cooking-vessels of troops, emigrants, &c. Fig. 3 shows the apparatus applied for heating an urn for making tea, coffee, &c.; it consists of two pipes *a*, *b*, one within the other. The lower end of the outer pipe is closed, and is inserted in a fire, as shown. The object of the inner pipe is to

FIG.3.

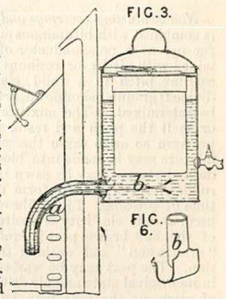


FIG. 6.

cause a circulation of the liquid contained in the apparatus. The end of the inner tube is fitted with a cap, one form of which is shown in Fig. 6, or it may be bent up. The tube *a* may be straight, so that it may be inserted between the bars of a grate, and both the tubes *a*, *b* may be connected with a bath or other vessel by flexible connections.

2782. Newton, W. E., [*Buchanan, J. R.*]. Oct. 21. *Drawings to Specification.*

Heating by liquid circulation.— Caustic soda, purified petroleum, tar, or oil of turpentine prepared by subjecting it to continued heat or by mixing it with sodium or potassium carbonate, zinc chloride, sulphuric acid, or boron fluoride while being heated, is used to convey heat in tubes from furnaces, thus avoiding the high pressure produced when steam is used as a conveyer of heat.

2821. Lees, R. Oct. 27. [*Provisional protection only.*]

Heating water.—A low-water alarm for a water-heater is formed by mounting a steam whistle on the upper end of a pipe which extends to the low-water level inside the boiler. The upper end of the tube is closed by means of a disc or plug of gutta-percha. The pipe usually remains filled with water, which is not hot enough to affect the gutta-percha, but, when the low-water level is reached, steam enters the pipe, melts the gutta-percha, and sounds the whistle.

2831. Willans, J. G. Oct. 27.

Non-conducting coverings and compositions.—Peat is combined with bituminous or resinous substances for use as a non-conductor of heat. The peat is mixed with pitchy or resinous substances, such as coal-tar pitch in a solid state, but sufficiently divided (granulated or powdered) for the particles to be intermixed. The mixture is heated to soften or melt the pitch and resin, and then exposed to pressure so as to cause the mass to adhere. The mixture may be made into blocks from which the desired shapes may be sawn or cut or reduced by rolling, or the desired form may be made at the time of pressing. Light fibrous peat is preferably used, and, if elasticity is desired, the greater part of the fine brown peat is preferably separated by "maceration" and washing from the fibrous portion. The peat may be washed, and may be used in its original state and air-dried after the addition of pitch, or the peat may be dried and torn or rasped before being mixed with the pitch. The pressure is not applied until the peat is sufficiently dried to allow the pitch to adhere.

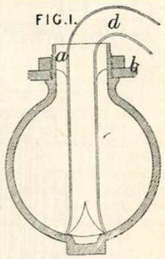
2909. Brotherhood, P. Nov. 4. [*Provisional protection only.*]

Heating liquids. — Boilers are formed of a number of elements or parts arranged side by side, or in a circle, or in any other manner in connection with a furnace. Each element consists of a vertical pipe with several horizontal branches projecting from it, which branches preferably taper towards their outer ends. The vertical pipe is divided by a vertical partition, or fitted with a central tube, from which circulating tubes project into the branches. The upper and lower ends of the vertical tubes are connected to the hot and cold water pipes respectively. Any element may be removed for repairs. Caps are provided for enabling the branches to be cleaned.

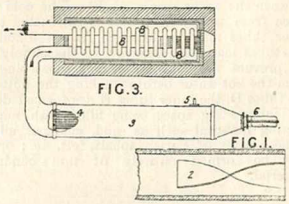
3137. Lees, R. Nov. 30.

Boiling-pans. — Spherical or other shaped water pockets or annular pipes are attached to pans or coppers for boiling, heating, or evaporating, to increase the heating-surface. Fig. 1 shows a spherical water pocket fitted to the pan or copper *b* by a threaded neck *a*; or it may be riveted or otherwise fixed in position. A circulating-tube *d* may be fitted to the water pocket. Annular pipes are shown fitted to the flue of a Cornish steam boiler; each one is connected to the flue at two points.

FIG. 1.



3163. Weems, J., and **Weems, W.** Dec. 2.



Heating air.—In apparatus for heating air by forcing it through tubes, Fig. 1, which are surrounded by steam, thin diaphragms 2, which may be straight, curved, or made in the form of a screw blade, are inserted in the inlet ends of the

tubes, in order to give the air a swirling or screw motion. Fig. 3 shows apparatus for heating air first by steam and then by fire heat. A fan or blower 6 forces the air through tubes 4 in a casing 3, to which steam is admitted by a pipe 5. The air is then further heated by passage through a series of tubes 8, surrounded by fire heat. The tubes may be of saddle or other form. Steam which has served for driving the fan 6 may be used in the casing 3, or high-pressure steam may be passed into this casing. Where fans or blowers are used for producing forced combustion in smithy fires or furnaces, the waste steam may be thus employed for heating air on its way to the fire.

3296. Gamgee, J. Dec. 16. *Drawings to Specification.*

Heating liquids.—Water and other liquids are heated by passage through the inner tube of a double tube, the outer space of which contains steam. The inner and outer tubes of the double-tube are fixed at each end to tube-plates, and the spaces between the opposite pairs of tube-plates are covered in by curved pieces to form steam chambers.

3341. Best, S. J., and **Bale, J.** Dec. 21. [*Provisional protection only.*]

Heating buildings &c.; heating water; heating air.—Relates to heating-apparatus, principally adapted for heating conservatories, halls, churches, rooms, offices, &c. Piping, tubing, &c. are bent and arranged in the form of a coil, serpentine, worm, or other circulating tubular contrivance, and are surrounded by a tubular water casing or jacket. Heat is applied at one end of the coil &c. by means of a gas jet or other heating-appliance. The heated air and products of combustion pass through the coils &c. to the place to be heated. The apparatus may take the form of two water chambers, between which the air coils &c. pass. Heat is applied to one chamber, and the heated water flows from this chamber, through the jacket, to the second chamber. Air is admitted through orifices in the first chamber. A hot-plate, grates, grid, &c. may be fitted to the top of either or both chambers, for heating food &c.

3364. Rawson, C., Ovenden, P., and **McCree, W.** Dec. 24. [*Provisional protection only.*]

Heating air for use in drying, evaporating, &c. The air is passed through tubes fixed, side by side, in a vessel supplied with waste &c. steam from a boiler. In a modification, the steam passes through the tubes and the air circulates between them.

3365. Bell, A. Dec. 24.

FIG. 1.

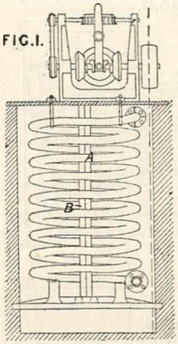
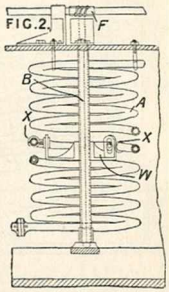


FIG. 2.



Heating water.—A fuel-economizer for heating water, superheating steam, or for other purposes, by means of waste furnace gases, is formed of a series of coils A arranged in a flue and connected alternately at the top and bottom. In the centre of each coil is placed a vertical shaft B, on which slides a boss carrying three arms W, each provided with a scraper or ring X fitting round the pipe. The shafts are driven through worm gearing F and a reversing-motion, as shown, and the scrapers consequently move up and down the coils and keep them clean. Specification No. 2671, A.D. 1861, is referred to.

A.D. 1871.

36. Norton, F., and **Davies, J. S.** Jan. 7.

FIG. 13.

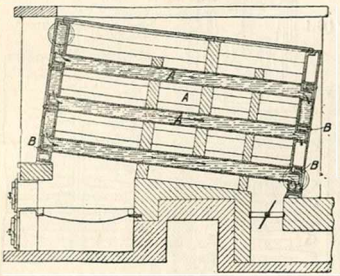
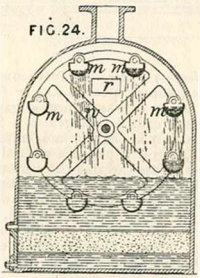


FIG. 24.



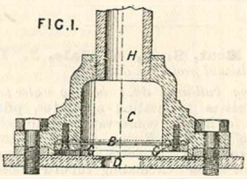
Heating water.—A boiler for heating water for hot-water apparatus is formed of two end chambers joined by a series of inclined tubes A as shown. The tubes are joined to the end chambers by faced surfaces pressed together by wedges B. Fig. 24 shows an apparatus for heating water by steam. The wheel *n*, carrying perforated scoops *m*, rotates in a chamber containing water below and having an inlet *r* for steam above. The scoops pick up the water, which falls in fine streams through the steam space. The scoops may be mounted on an endless chain instead of on a wheel.

37. Vogan, J. Jan. 7. [*Provisional protection only.*]

Heating water.—To prevent explosions in bath and other domestic boilers a hollow plug, in which is soldered, or otherwise secured, a plate of lead, tin, or other soft metal, is screwed into the boiler. The solder yields to excessive pressure, and will melt if the water supply fails.

43. Russell, J. Jan. 7.

FIG. 1.



Heating water.—To prevent the explosion of boilers in ranges and hot-water apparatus, a hole is formed in the upper part of the boiler and covered with some material, such as india-rubber or thin sheet metal, which is strong enough to withstand the normal pressure within the boiler, but will burst under excessive pressure. In the arrangement shown in Fig. 1, a disc B of thin metal is clamped within a socket or flanged tube C, mounted over the aperture D of the boiler. A pipe H from this tube may be led into the chimney &c. and convey away the steam. For securing rubber diaphragms the clamping-ring G is provided with a projecting rib.

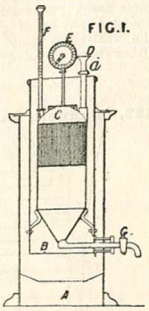
63. Randell, W. Jan. 10. [*Provisional protection only.*]

Heating water.—To prevent explosions in bath and domestic boilers a safety valve, or valves, is so fitted that it has to be acted upon before water can be drawn from the boiler. The valve may be adapted to the tap for drawing off the water, or it may be fitted to the pipe between the boiler and the draw-off tap. It is kept closed by weights or by a spring.

141. Lake, W. R., [*Gilman, S. H.*]. Jan. 19.

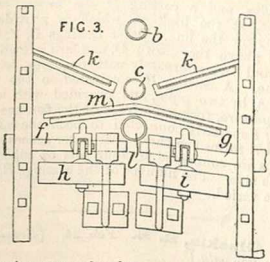
Heating liquids. — An apparatus, for refining and ageing liquors, such as spirits, new wines, cider, beer, ale, and porter, consists of a sheet copper &c. vessel C, which is nearly filled with the spirits &c., through a funnel D and a stop cock *d*, and is provided with a pressure gauge E, a thermometer F, and a discharging-pipe and cock G. In order to cause the spirits &c. to be heated equally, the vessel C is filled with thin vertical sheet copper heat-conducting diaphragms, soldered to its sides and bottom, and divided horizontally at about their middle into two sections, the upper and lower sections being turned at right-angles to one another. The vessel containing the spirits &c. is immersed in a water-bath B, which may be provided with a loose cover and an upper steam-escape pipe, and may be set in the furnace A, and heated directly by fire or by bottom steam coils connected with a boiler. Heat is applied to the bath B, the cock *d* being left open until as much atmospheric air and aldehyde are expelled as will escape at a temperature of 170° F., until the water boils and the spirit thermometer indicates a temperature of 210°–212° F., and the required pressure is attained. The apparatus is then allowed to cool gradually down to nearly atmospheric temperature, when the spirits &c. may be withdrawn, and the apparatus re-charged. The withdrawn liquor is allowed to stand to allow the crystallized fusel oil and the carbonized and acidified herbaceous matter to settle, and the clear liquor is drawn off.

FIG.1.



163. Warwick, R. H. Jan. 21.

FIG.3.



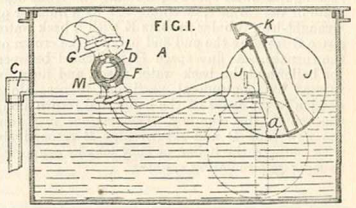
Heating water for breweries &c. by means of exhaust or other steam. Water is admitted to a closed tank through a pipe *b*, perforated on its upper side ; it falls on to shelves *k* and is presented in thin sheets to the steam issuing from perforations in the pipe *c*. The steam and water supply are controlled by external cocks by floats *h*, *i* attached to arms on the shafts *f*, *g*. The air and any uncondensed steam pass off by the perforated pipe *l*, over which is a shield or baffle *m*. When exhaust steam from an engine is used, it is conducted to the tank by a second perforated pipe placed above the pipe *b*.

174. Waterson, J. P. Jan. 23. [*Provisional protection only.*]

Heating water.—To prevent freezing in water-supply pipes or cisterns and in heating-apparatus for buildings, baths, &c., a vertical iron vessel is connected at its upper and lower ends with the flow heating pipe or supply to the cistern. An open flue tube passes through the vessel, and a lamp or gas burner is placed beneath it.

253. Robinson, W. Jan. 31.

FIG.1.



Steam traps for allowing the escape of air and condensed water from steam pipes, steam chests, drying-cylinders, &c. The trap is constructed with a specially-arranged cock D, F and an open water vessel A having an over-flow pipe C. A two-way conical plug D is attached horizontally to the lower end of the steam pipe &c., and round it works the body or sleeve F, one way or passage L leading to the outlet G, the other M to the closed vessel or float J, into which is screwed the vent pipe K. The float is first filled with water, when it becomes immersed and opens the passages L, M fully. Air from the steam pipe then escapes at G, and condensed water passes into the float ; when steam passes, it forces the water out at the vent K, and the float rises, leaving only a small passage at M by which condensed water passes into the float ; a small aperture *a* is provided to drain the float. The vessel J, instead of floating in a cistern of water A, may be counterbalanced by a weight attached to the pipe G, and the outlet K may be extended to join the pipe G.

285. Tomkins, E. Feb. 2. [*Provisional protection only.*]

Footwarmers.—Exhaust or live steam from a locomotive engine or boiler may be led through articulated or other flexible pipes between railway vehicles to a system of pipes enclosed in perforated casings within the vehicles arranged to serve as footwarmers or other heating-apparatus.

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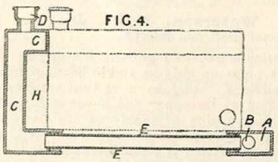
315. Mee, F. J. Feb. 6.

FIG.4.



Heating water.—Relates to circulating-boilers for heating buildings, glass houses, &c. In connection with an ordinary saddle &c. boiler, a rectangular water space A, forming the front dead plate of the furnace, is connected by a number of wrought-iron tubular firebars E with a back water space C forming the end and part of the crown of the furnace. A flue space H is formed between the boiler and the back water space, and flues are formed by longitudinal partitions to pass along outside to the front of the boiler and return along the top to the chimney. Connections may join the flow pipe D and return pipe B respectively with those of the boiler, or they may be connected to separate circulating systems.

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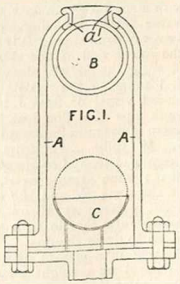
400. Jennings, T. Feb. 16. [*Provisional protection only.*]

Heating water.—Relates to a form of "safety-valve" for preventing explosions in kitchen and other domestic boilers, and boilers generally, when the water has fallen below a predetermined level. Fig. 1 shows the arrangement preferred, in which a valve or float B is placed within a casing A connected to the boiler in such a manner that at normal water levels the water will rise within it and lift the valve B against a seat a^1 at the top of the casing. Should the water level fall, the valve B will descend, until arrested by a cup C, and allow any steam to escape. In some cases, particularly for domestic boilers, the casing A may be of glass so that the position of the float-valve may be observed at any time. Other forms of valve or casing may be used.

FIG.1.



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436. Cannell, H. Feb. 18.

FIG.3.

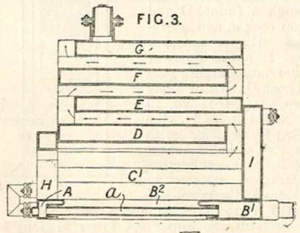
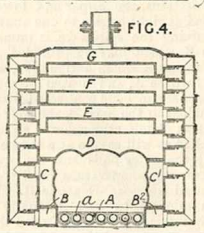


FIG.4.



Heating water.—Circulating boilers for heating buildings &c. are constructed of a number of separate hollow castings communicating with each other by pipes. The first casting B, B^1, B^2 forms the back and side water spaces of the rectangular base, and it is joined to the front water space A by a number of tubular firebars *a*. Two hollow castings C, C^1 form the sides, and a casting D the crown of the furnace, at the back of which is provided an opening for the flue. Other castings E, F, G are placed above the crown D, and are provided at front and back alternately with openings forming the flue. A casting H, connected to the water space A by two pipes, and provided with a fuel feed aperture, forms the front of the furnace; the casting I similarly connected to both the castings B^1 and E forms the back. The water spaces in the castings are connected by four sets of pipes, two on each side. The number of the castings E, F, G may be varied.

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492. Glaskin, E. E. Feb. 24. [*Provisional protection only.*]

Heating water.—Relates to safety valves, for kitchen boilers and other water-heating apparatus

&c. The valve, which is stated to be "an indicating lock-up safety valve," has a conical seat and guiding-feathers working in a cylinder, and it is pressed down by means of an adjustable spring; the whole is covered by a perforated bonnet. A cylinder may be cast on the valve seating to enclose the spring and valve, the pressure being adjusted by means of a cap. The valve may be adjusted by means of a screw tapped into the bonnet, or a ratchet cast on the cap which fits in the cylinder.

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528. Haseltine, G., [*Perkins, E. L., Moulton, J. H.,* and *Sawyer, C. E.*]. Feb. 27.

FIG.3

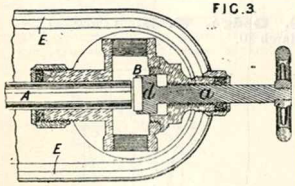
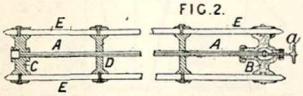


FIG.2.



Steam traps for steam drying and heating apparatus. The trap is constructed to act automatically by the expansion and contraction of a metal pipe communicating with the steam pipe &c. The end of the pipe A seats against an elastic block *d* carried on the screwed spindle *a* of the valve B. The supports C, D of the pipe A and the valve casing B are held in a frame of wood or other non-expanding material E. When the pipe A is full of condensed water, the valve spindle is adjusted to allow the water to pass out slowly; when steam enters the tube, the tube expands against the valve seat *d* and closes the outlet. The elastic block or seat *d* may be readily renewed.

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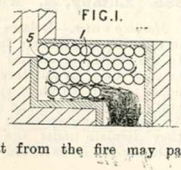
535. Truswell, J., and **Truswell, W.** Feb. 28.

Heating air for heating buildings, glass houses, drying-rooms, &c. The apparatus is constructed with a number of open-ended chambers or pipes 1 placed in rows across a chamber, so that the heat from the fire may pass between the rows, as shown, to the chimney 5. The air to be heated passes from a cold-air chamber through the pipes 1 to a hot-air chamber, whence it is distributed by flues to the building &c. to be heated. The pipes may be fitted to admit of separate removal, and a cleaning-door is arranged over the firegrate.

FIG.1.



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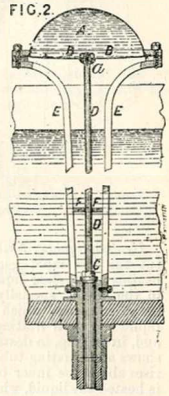
543. Common, A. A. March 1.

Heating buildings.—Relates to apparatus for opening and closing valves to prevent bursting of tanks and pipes by freezing, which is stated to be applicable to hot-water apparatus. A vessel A is attached to the valve seat or other part by supports E. The bottom B is curved inwards, or corrugated, and is attached to the valve C by a rod D centered by a guide F. The vessel is filled with water through an aperture which may be closed by the screwed end *a* of the rod. The vessel is placed in an exposed position, so that, on the occurrence of frost, the water is frozen, and, the bottom being bulged out as shown, the valve is pressed down on to its seat. When the temperature rises, the action is reversed. The apparatus may be arranged to open the valve, for emptying pipes or cisterns. A greater movement of the rod is obtained by connecting it to two or more chambers. An air vessel may be placed at the highest point of the water pipes, so that, when a valve is opened by the apparatus, the water is forced out by the air which has previously been compressed by the water rising in the pipes.

FIG.2.



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640. Sutherland, M. A. March 10.

Non-conducting coverings and compositions.—Foliated or fibrous silicates, or bisilicates, or massive steatite (preferably asbestos) is or are compounded in suitable proportions with caoutchouc and sulphur or other vulcanizing-material, and vulcanized in the ordinary way. A material is thus produced which is a bad conductor of heat and is not easily injured by steam &c., and which is applicable for use as steam packing &c. The material may be applied to canvas or other fabric for making hose, belting, &c.

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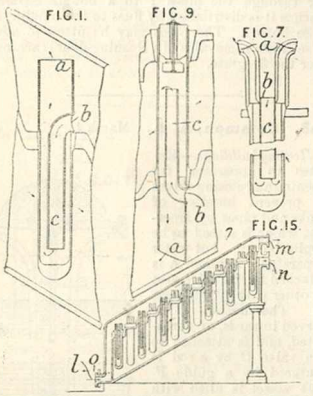
644. Kaeuffer, P. March 10.



Heating liquids; heating gases.—Relates to apparatus for the rapid generation of steam or for heating or cooling liquids and gases, and consists in the use of specially-arranged circulating-tubes or other means which cause the water or other liquid or gas, in heating, to rise to a higher level, and, in cooling, to descend to a lower level. Fig. 1 shows a circulating-tube in which the outer tube *a* rises above the inner one *c*; when the outer tube is heated the liquid, which descends the inner tube, rises to the top of the outer tube and so reaches a higher level. The circulating tubes may be of various shapes and they may be ribbed or corrugated to increase the heating or cooling surface; the upper end of the outer tube may be bent over to form a side discharge opening, or it may be formed with two lateral portions as shown in Fig. 7. Fig. 9 shows a circulating tube arranged for cooling liquids or gases; the outer tube *a* is cooled and liquid ascends the tube *c* and descends the tube *a* reaching a lower level as shown. Float valves or small tubes are provided for allowing any air &c. to escape. A heating or cooling apparatus is formed by arranging a number of circulating tubes in an inclined casing. Fig. 15 shows a heating apparatus; the liquid or gas to be heated enters at *l* and passes out at *m* while the heating medium enters at *n* and passes out at *o*. The tubes for cooling may be arranged in a similar manner. Heating and cooling apparatus so constructed may be used for mixing liquids. The circulating tubes may be applied, in various ways, to steam boilers.

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738. Kendall, J. March 18. [*Provisional protection only.*]

Heating water.—Relates to water-level indicators and alarms for circulating water boilers, kitchen boilers, &c. A cylindrical or other shaped vessel is connected to the circulating system, and provided with a float, carrying on a rising stem a valve fitting a valve seat in the top of the vessel. Over the valve seat is fixed a glass tube into which projects an indicator carried on the valve. On the upper end of the glass tube is an alarm whistle. When the water falls, the valve is opened allowing steam to escape and sound the alarm. The rising stem of the float may be tubular and pass up through the valve, being closed at its upper end by a weighted valve which would open by excessive pressure in the event of the float not falling.

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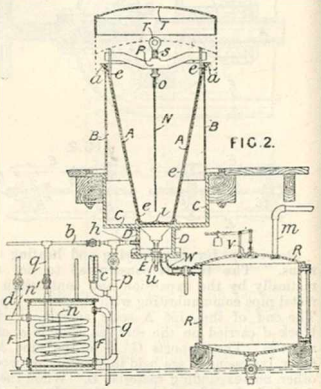
849. Gedge, W. E., [*Partz, A. F. W.*]. March 30.



Heating air.—For drying sugar in a mould A, hot air is forced through it. The air is heated on its way to the mould by passing it through a coil *n* in a vessel F containing water which is heated to the boiling point by steam admitted to the vessel through a pipe *q*.

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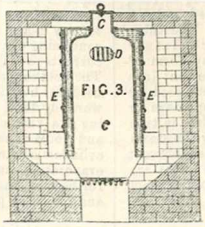
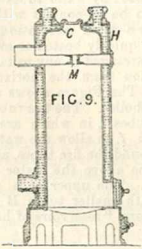
854. Lumby, E. March 30.

Heating water.—Relates to various improvements in water-heating boilers for heating buildings &c. In cylindrical or conical vertical boilers having exterior flues, an aperture is formed through the upper part of the water space and covered with a grating D, Fig. 3, for the passage of the hot gases &c. from the fire space to the exterior flue where they circulate under the mid feathers E. The water space is extended across the top and a

central feed tube C for fuel is provided therein. A supplementary water space H, Fig. 9, is applied to the top of welded &c. boilers whether such boilers are independent as shown in Fig. 9 or placed in a setting with an annular flue as shown in Fig. 3. The supplementary and main water spaces are connected by pipes M, the space between the pipes being enclosed by brick-work or by an iron band leaving a space, which may be covered by a grating, for the passage of the hot gases. Several applications of the central feed tube and the supplementary water space separately and together are shown, also an arrangement with an external flue as in Fig. 3 communicating with the firebox by an opening through the crown.





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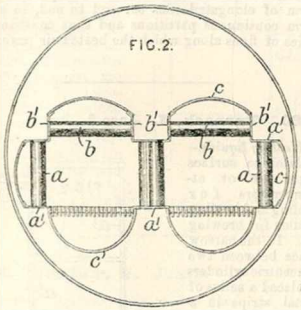
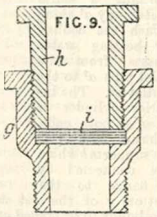
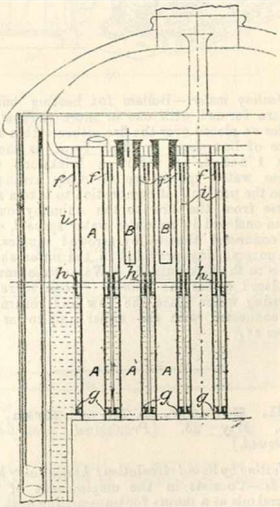
934. Atkins, T. April 8.



Heating water.—The internal flues of Cornish and other boilers for heating water and generating steam, are built up of iron plates between which are arranged series of vertical, horizontal, or inclined tubes. Fig. 2 shows a double-flued boiler in which vertical tubes *a* are arranged between plates a^1 and horizontal tubes *b* between plates b^1; the plates a^1, b^1 are connected by curved plates *c* to allow expansion and contraction. The tubes are fixed in the plates by means of special apparatus. A fusible plug or safety-valve for preventing explosions is formed by fixing thin plates of fusible metal *i* in a cylinder *g* by means of a screwed plug *h*.



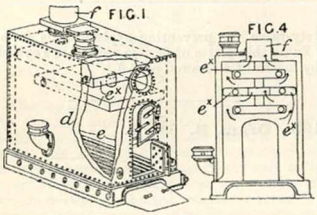
1183. Oram, S. May 3.



Heating water.—The smoke-tubes of boilers for raising steam for evaporating and other purposes,

are enclosed by water tubes to cause a thin film of water to be in contact with the heating-surface, whereby a rapid circulation is produced and the water is quickly heated or evaporated. The tubes may be arranged in any suitable manner and at any inclination from the horizontal in any form of boiler. The Figure shows one arrangement in a vertical boiler. The fire tubes A are enclosed by water tubes *i*, in which are formed openings or slots *g*, *h*, *f*, to allow the water to circulate in thin films around the fire tubes, and to allow the steam to escape above the water level and so prevent priming. The upper ends of the fire tubes are fitted with smaller tubes B to partly block them and so form "reservoirs of heat" in the tubes.

1301. Green, T. May 13.



Heating water.—Boilers for heating buildings &c. are formed with one or more shallow water spaces *e*× placed over the fire, either within a water space of box shape or other form, as shown in Figs. 1 and 4, or within a brickwork casing. These water spaces are variously arranged to cause the products of combustion to take a zig-zag course from the fire to the chimney outlet *f*. When enclosed in an outer water space *d*, *e*, they are connected thereto by screwed nipples, hand hole covers being provided in the outer shell for access to the lock nuts &c. Water tubes may also be placed across the firebox. When there is no enclosing water space, the flow and return pipes are connected with the upper and lower water spaces *e*×.

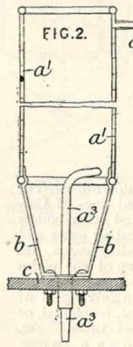
1381. Granger, T. H., and **Ryan, J. P. L.** May 23. [*Provisional protection not allowed.*]

Heating by liquid circulation; heating air; heating liquids.—Consists in the employment of heavy mineral oils as a means for transmitting heat. The apparatus in this method of heating may be similar to those used for heating by means of heated water or air, the oil being contained in pipes or vessels heated by fire or by heated air, and the heat from the pipes or vessels is transmitted to any place and used for any purpose. Pipes containing the heated oil may be used for heating currents of air flowing in contact with them. The method of heating by mineral oils may be used in heating bakers' ovens and cooking or warming food, and in dyeing, brewing, and distilling; in the manufacture of sugar, varnish, soap, and india-rubber; for heating the rollers and cylinders of dressing and finishing machines; for evaporating, and for drying powders, malt, &c.; for heating rooms and preparing food for animals and for every purpose where heat is required.

1479. Chadwick, E. June 3. *Drawings to Specification.*

Heating buildings.—Walls and floors built of two layers of tiles separated by distance-pieces are utilized for heating the building, hot air or gases being introduced into the interior of the walls and floors. The distance-pieces may be in the form of elongated tiles set end to end, so as to form continuous partitions and thus constitute a series of flues along which the heated air passes.

1480. Turnock, J. June 3.



Heating liquids.—Relates to surface apparatus or attemperators for cooling and heating liquids for brewing &c. In the narrow space between two concentric cylinders is placed a series of metal strips in a slanting direction forming a spiral water way a^1 along which the cooling or heating water passes from the inlet pipe a^2 to the outlet a^3. The interior cylinder is open at both ends. The apparatus rests on supports *b* which are connected by a flange to the bottom *c* of the vat &c. and it is immersed in the liquor to be cooled or heated.

1493. Stephens, J. June 5. *Drawings to Specification.*

Heating air.—In a system of forced ventilation for use in hospitals &c., a series of tubes which convey fresh air to various parts of the building are passed through stoves or other heating-apparatus, in order to heat the air before it is discharged from the outlets.

1530. Poupard, W., and **Thomson, J.** June 9. [*Provisional protection only.*]

Heating air.—In ventilating tunnels, buildings, &c., the fresh-air supply is heated by passage through a coil of pipes placed in a vessel filled with hot water.

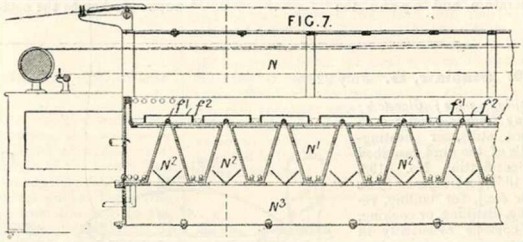
1587. Russell, R. June 15. *Drawings to Specification.*

Heating air.—In apparatus for drying sheets of paper &c. between wire racks in a special chamber, air enters by a channel into a chamber in the lower part of the apparatus and rises through holes into another chamber containing hot-air or steam pipes. The air, thus heated, rises through a grating into the drying chamber. A damper regulates the current of air.

1656. Payne, J. B., and **Newton, W. E.** June 23.

Heating air.—The air used for drying yarns in a system of polishing and finishing yarns, is heated by passage through tapered passages N^2 arranged across a steam chest N^1. The mouths of the passages are controlled by cam-shaped rollers f^1 which act as valves, and are covered over by perforated plates f^2 which disperse the air currents. The air is supplied by a blowing engine to the chamber N^3 beneath the steam chest.

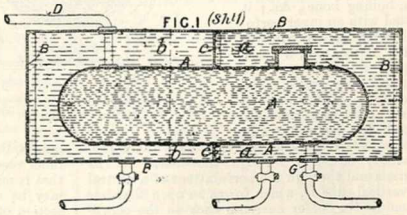
FIG. 7.



1666. Sinclair, G. June 24.

Heating liquids.—Relates to the cooling, distillation, and evaporation of the spent lye resulting from the preparation of paper stock from wood, esparto, straw, &c., the heat given up during cooling being used for heating new lye, while oils, turpentine, soda ash, and other substances are recovered for useful purposes. After the boiling of the wood &c., the hot lye and steam are blown through a pipe D into a cylindrical or other vessel A situated in an oblong, square, or other tank B which is fitted with a partition *c*. The division *a* is filled with water, while the division *b* contains fresh lye. The lye in the vessel A is thus cooled, while hot liquor for the next charge of the boiler and hot water for washing the pulp or the boiler are obtained. The spent lye may then be run off through a pipe G to distilling or evaporating apparatus.

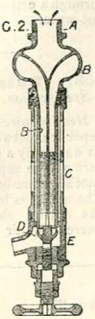
FIG. 1 (Shift)



1876. Vaughan, H. July 18.

Steam traps for drawing-off condensed fluids from locomotive, traction, and other steam engines, steam-jacketed cylinders, steam hammers, pressing cases, steam pipes for heating, &c. A brass globe is fitted with a pipe B, capible of expanding and contracting and furnished with a valve seat at the lower end to receive the valve D, which is adjusted to its seat by a hand-wheel. An outlet branch is formed on the valve-case E, and the wrought-iron casing C is slotted to admit air. The apparatus is attached to the pipe or vessel to be drained by the screw A, and when water has collected in the pipe B it contracts with the change of temperature and opens the valve D. For locomotive engines the apparatus may be inclined 5° from the horizontal.

FIG. 2.



1892. Douglas, J. July 19. [*Provisional protection only.*]

Heating air; heating water.—Relates to the heating of air and water for heating buildings, glasshouses, &c. A stove is placed in an air-heating chamber, which is furnished with gratings to admit cold air and allow heated air to pass to the church, hall, conservatory, or other building. In the centre of the stove and immediately over the firegrate is a boiler fed from a cold-water cistern at one side. The hot water circulates from the boiler through a coil passing round the stove to an "expansion box," whence it passes again to the feed pipe. The coil serves, together with the radiant heat from the stove, to heat the air. A steam pipe from the coil is led into the top of the "expansion box," and another steam pipe from the expansion box to the cold-water cistern.

1930. Sinclair, G. July 22.

Boiling pans; digesters; heating liquids.—Relates to boilers, stills, or heating-vessels of the kind described in Specification No. 3193, A.D. 1869, [*Abridgment Class* Paper &c.], for boiling, reducing, distilling, or cooking, and consists essentially in the use of a perforated or porous vessel or lining, within the outer vessel or boiler, with a clear space between the two vessels for the circulation of the water or liquid. Fig. 1 shows a portable boiler for boiling clothes, cooking food for horses and live stock, boiling bones, &c.; it is fitted with an inner perforated vessel A for containing the clothes &c., a space *a* being left between the inner and outer vessels. The water flows in a strong current up the annular space, through the perforations in the inner vessel towards the free space at the top, whence it descends through the centre of the materials and through the perforations of a central and vertical tube B, which forms an open chamber to conduct the colder currents back to the centre of the bottom space to supply the continual upward flow of the hotter side currents. The centre tube may be dispensed with or more than one tube may be used. Ribs or feathers may be fixed to the perforated vessel to divide the space *a* into channels and cause the liquid currents to flow radially and longitudinally along and up the channels. The inner vessel A may be fitted with a handle A^{II} so that it may be lifted out of the outer vessel, which may be emptied by the pipe 3. Fig. 2 shows a section of a vertical boiler built within a furnace 4 and surrounded by a spiral flue 8 leading to the chimney 6. It is fitted with conical ends, the upper one having a cover 9 and the lower one a discharge opening 10. The inner perforated vessel is formed of segments secured to the outer vessel by bolts A^{III}. The boiler is emptied through the

FIG. 1.

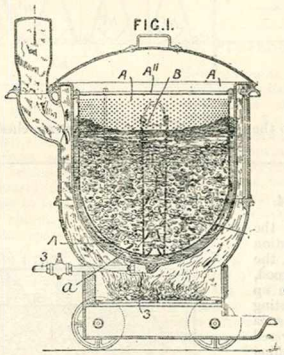
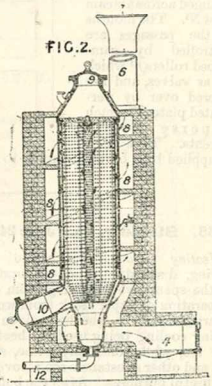


FIG. 2.



pipe 12, and the pressure in the boiler may be used to force the liquid into a high cistern to be used again. In a modified form of boiler for boiling, treating, and cleansing yarn and other textile goods, the liquid is heated by means of steam or water passed through a coil, which may be perforated.

1955. Morrison, J. D. July 25. [*Provisional protection only.*]

Heating water for baths &c. Water, after passing through a siphon filter containing cotton wool, is led into the bottom of an upright condenser, from the top of which it descends, through a pipe, to a heated cistern between the condenser and a boiler still. The steam, evolved in the still, passes to a receiver over the still and its condenser, and the heated cistern. Branches from the top of the two condensers supply with hot water baths, cooking-apparatus, hot-water circulating apparatus, &c. The boilers may be tubular, like a poker, and may be conveniently kept constantly in the fire, or heated by gas, oil, or spirit.

2009. Simpson, J. July 31. [*Provisional protection only.*]

Heating water.—Relates to saddle boilers for horticultural and other purposes, and consists in arranging the boiler to be fixed at a side arch, placed about midway the length of the boiler. The combustion products pass in opposite directions to the ends of the boiler, and are guided backwards and forwards on both sides from the ends to the middle by four wings which form continuations of the water space of the boiler, and act as divisions between the flues. The firebars lie across the boiler and the soot doors are placed at one end; one of these doors may be used for "pushing the "live coal from end to end of the boiler, the fresh "fuel is thrown in at the side arch and the smoke "whilst traversing over the live coal at each end is "partially consumed."

2066. Roberts, E. Aug. 5. [*Provisional protection only.*]

Heating buildings by air-circulation. A chamber for heating air is formed at the sides and back of a firegrate, openings for the entrance and exit of air being made in front of the grate. The heat radiating surfaces of the chamber are made of fireclay, terra cotta, &c., but not of metal.

2218. Johnson, J. H., [*Berryman, R.*]. Aug. 23. *Disclaimer.*

Steam traps.—The regulator of a feedwater-supplying apparatus may "be employed as a means "for opening the valve of a steam trap." Cold water is fed to the heater through the pipe L, vessel M, and perforated pipe L¹, and the supply is regulated by a flat J in a vessel H which communicates with the heater through the pipes *h*, *h*¹.

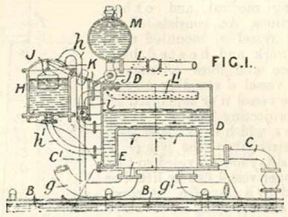


FIG. I.

The float J is carried on one arm of a weighted lever K which operates the cocks *i*, *j* on the pipes C¹, L¹. When the water in the heater falls below the level of the pipe *h*, steam enters the vessel H and the water therein runs back into the heater, the float J falling and causing the lever K to close the steam cock *i* and open the water cock *j*. When the heater is filled, the condensation of steam in the vessel H causes the water to rise therein, which raises the float and reverses the valves *i*, *j*. A separate regulator may be used for operating each valve. A counter can be attached to one of the valves to enable the quantity of water which has been fed to the boiler, and consequently evaporated, to be calculated.

2245. Amos, J. Aug. 26. [*Provisional protection only.*]

Boiling-pans.—Relates to a mode of and means for ventilating or carrying off the odours from cooking-ranges and open boilers or heating-vessels, &c. For open boiling-vessels, such as those used for tallow melting, a hood placed over the boilers opens at the top into an annular flue surrounding the chimney shaft. The annular flue communicates with the chimney at any elevation.

2250. Webber, J. H. Aug. 28.

Heating air for ventilating purposes. A tube A is built into a chimney flue E so as to form a chamber F around it. A valve or grating L admits fresh air which is heated by the tube and passes to the apartment through a valve or grating M.

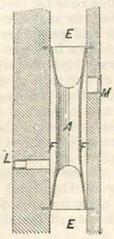
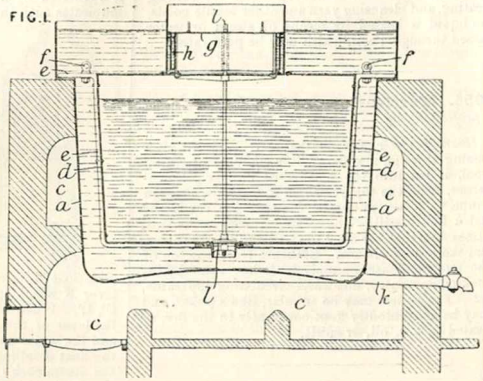


FIG. 9.

2290. Leadbetter, J. Aug. 31.

FIG. 1.



Boiling-pans; digesters.—An apparatus for boiling wort for brewing, cooking food, and making medical and other decoctions, &c., consists of an outer vessel *a*, mounted upon brickwork and heated by a furnace and flues *c*, and an inner vessel *d* standing on feet in the vessel *a* or supported by the projecting ends of iron bands *e*, which cross underneath and strengthen the vessel *d*. Eye bolts *f* are provided so that the inner vessel can be lifted or moved by a crane &c. A cover *g* has a rim dipping into a water joint *h*. The water is sufficiently deep to prevent the evaporation of the whole before the end of the operation, or it is maintained at the desired level by means of a float acting on a valve or tap. A valve *l* is used to discharge the inner vessel and a tap *k* to empty the outer vessel. The invention may be applied to a cooking vessel for ordinary domestic purposes. When great heat is desired, the outer vessel may be enclosed by a cover fastened into a water joint by four hasps and having a safety-valve at the top.

2438. Prosser, W. Sept. 15. [*Provisional protection only.*]

Heating liquids.—A pipe is encased by a larger pipe. "One end of the enlarged pipe is closed or "plugged up while the corresponding end of the "inner pipe is open. A fluid sent in along the "inner pipe traverses the space formed between "the two pipes." This form is stated to be used for heating "other liquids."

2445. Murdoch, J. Sept. 16. [*Provisional protection only.*]

Boiling-pans for clothes &c. Consists of a boiler contrived to make currents or jets of water to play on and pass through the clothes while being boiled. The boiler is in the form of an ordinary open washing-boiler with the heating-flues arranged to act on the sides as well as the bottom. A series of circulating-passages are formed in the sides, each passage having one end in communication with the bottom of the boiler, while the other end communicates with the upper part of the side. The action of the heat on the water in these passages causes a violent circulation, the water passing up them and being projected from their upper ends towards the centre of the boiler and upon the top of the clothes.

2521. Muratori, C. Sept. 23.

Non-conducting compositions.—Relates to a composition for forming boards, ceilings, ornamental flooring, roofing, cornices, mouldings, furniture, or water pipes, for coating iron boilers, guns, and similar objects, for the reproduction of objects of art or utility, for the construction and lining of boats and ships, for the wads of cartridges, and for other purposes. The composition consists of rock alum, glue or size, sawdust, and water, and it may be made waterproof by the addition of shellac, or gutta-percha, or both. The composition may be treated like wax or pressed into moulds, or spread or otherwise shaped into the forms required. The articles into which it is made may be polished, coloured, varnished, and gilded, and metal filings, powders, or gold or silver leaf may be mixed with the outer portions of the composition.

2531. Baudot, E., and **Roettger, E.** Sept. 25. *Drawings to Specification.*

Natural heat, utilizing; heating liquids.—A "heat producing apparatus," for evaporating or generating the steam or vapour for use in the cylinders of an air and gas engine, is formed of an airtight boiler or reservoir containing a liquid and surrounding a copper coil "through which passes a "current of water, air, or other matter at its "natural temperature." The boiler is in communication with a cylinder fitted with a piston, and when the piston moves, steam &c. is produced from the liquid to fill the cylinder, "and for this "purpose it takes the heat from the current in the "copper coil." This apparatus, for the production of heat by evaporating liquids *in vacuo*, may be

used in combination with an ammonia engine. The generator is heated by the vapour or steam produced, and after all the ammonia has been driven off, the heat from the remaining water is utilized by passing the water through the coil of the apparatus, the water being thus cooled down so as to be able to re-absorb the ammonia and so produce a nearly absolute vacuum behind the piston. This system "allows the utilization of the differ- "ence of temperature between the atmosphere and "a fountain or spring, or any difference of "temperature existing between two bodies" It can also be applied for cooling liquids and for utilizing the waste heat of steam engines and boilers.

2545. Gedge, W. E., [*Gaudefroy, C.*]. Sept. 27. [*Provisional protection only.*]

Non-conducting coverings.—Relates to an anti-radiating felt or fabric consisting of a woven fabric, having a warp of hemp, flax, hair, or animal fleece, upon which is superposed a lap or nap of flock, hair, or shag of the same nature as the material of the weft of the woven fabric. The layers are made to adhere by means of size or glue and simple pressure or by quilting. In the middle of the lap of flock &c. may be placed straw, hay, seaweed, moss, dry leaves, or other cheap material. The fabric is specially applicable to steam engines and to steam, water, and gas pipes, for preventing loss, or protecting from variations, of temperature.

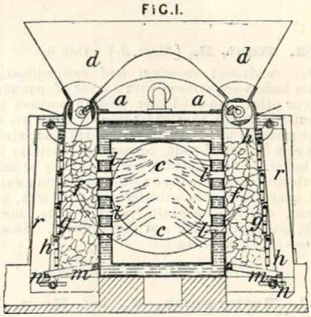
2588. Goreham, W. Sept. 30. *Drawings to Specification.*

Heating air.—The waste gases from an annular kiln, for drying and burning Portland cement, bricks, tiles, pottery, &c., are used to heat air or steam, which may be used to dry slip, semi-fluid brick stuffs, or brick material, &c. Instead of drying the slip &c. on annular plates mounted on rollers in flues through which the waste gases pass, pipes for heating air or steam are placed in these flues.

2636. Sidebottom, J. Oct. 5.

Heating water.—In steam-boiler, water-heating, and other furnaces, the fuel is effectually burnt in the form of a vertical or inclined column, contained in the space between two vertical or inclined grates. Two or more of these grates are arranged in combination with a combustion chamber, so that the smoke escaping from one grate or furnace may be consumed by the heated air and flame from the other. The grates may be formed of slabs of firebrick, or of metal or other material, or they may be constructed with chambers and tubes for the circulation of water, and sometimes the walls and crown of the furnace may also contain water spaces. Fig. 1 shows an arrangement of vertical grates and combustion chamber as applied to the front of a boiler *a* having a central flue *c*. The combustion chamber is formed as a hollow rectangular or other shaped water casing communicating with the steam and

FIG. 1.



water spaces of the boiler; its opposite sides are fitted with smoke tubes and form the back of the two vertical fireplaces *f*. The outer grates are formed of perforated plates or doors *g* pivoted in adjustable frames *h* which may be moved to alter the width of the fire. The grate bottoms *m* are hinged and rest upon brackets *n* so that their inclination can be adjusted to remove ashes &c. The supports for these grate bottoms may be made readily removable, so that the fire may be allowed to fall into a water trough should the water in the boiler become too low. In another arrangement, the hollow casing is replaced by upper and lower water chambers connected by water tubes which form the backs of the grates. The outer grates are pivoted and adjusted by pawls moving over racks. In a further arrangement, applied to a double-flued boiler, the lower front part of the boiler is cut away, and water tubes, forming the backs of the grates, are fixed between the upper part of the boiler and a lower water casing. The water casings and feed hoppers may be dispensed with, the vertical grates being formed by outer adjustable grates and inner fixed grates formed of bricks or slabs and enclosing a combustion chamber between them. The furnace may be mounted on wheels and the water tubes may pass through a stuffing-box to allow for movement. To clean out sediment from the water chambers or casings, they are fitted with troughs having lids which are normally open. Both trough and lid collect sediment, to remove which the lid is closed and water blown off through the trough. The troughs may be fitted with screws for removing scale or sediment which may adhere to them. When a flue leads from the furnace to the boiler or heater, it is formed of one or more water jacketed tubes communicating with the boiler. The water tubes may be connected to the casings by riveting the ends, by screwed nipples, couplings, and lock nuts, by

screwing the ends of the tubes, or by other means. In some cases the larger pipes or chambers to receive the smaller ones are formed by joining a number of "tees" by means of nipples. The larger pipes may be welded together, or they may be cast on to the smaller tubes.

2652. Hunt, B., [*Stone, J.*]. Oct. 6.

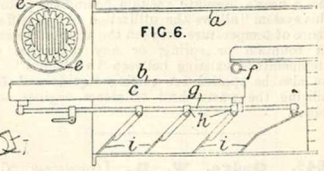
Non-conducting coverings and compositions.—Steam boilers are covered with a layer of pounded glass or other non-conductor held in position by an outer casing of thin sheet iron. The glass or other material may be finely pounded and mixed with clay or melted resin, or cast in sheets to fit the boiler. The following materials may be used as substitutes for the glass:—Pottery, china ware, flint, quartz, resinous substances, sealing wax, jet, cement, concrete, asphalt, marble, slate, mica, shells, brick, tile, stone, and gutta-percha. Sheets of glass may also be used.

2712. Butterworth, E., and **Heap, J.** Oct. 13.

Heating water.—Ribs or projections *e* are formed on the sides of vertical boilers or fireboxes, as shown in horizontal section in Fig. 2, and on the top and sides of the fireboxes of horizontal, or saddle-boilers and furnaces for heating water, warming buildings, &c., so as to expose a large

FIG.2.

FIG.6.

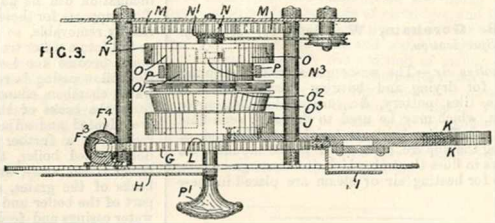


surface of the boiler to the action of the fire. Stationary firebars *c*, Fig. 6, containing water, are placed between the moving firebars *b* in a furnace through which the fuel is passed by such bars. The steam produced passes through holes in the sides of the bars *c* or the water passes from the boiler, through the bars, and back to the boiler A water bridge *f* is provided.

2761. Welsh, J., Hope, D., and **Stevenson, J. C.** Oct. 17.

Thermostats for use in connection with the ventilation of mines, tunnels, ships, and other structures. Surmounting the air-supply pipe is a cistern F^1, filled with mercury, containing a number of vertical tubes connected with the pipe. Communicating with the cistern is a cylinder F^4 containing a piston to which is connected the piston-rod F^3 furnished at its upper end with a toothed rack. The rack gives motion to a wheel G which moves the fingers H and I indicating the temperature required. Through a train of toothed gearing L, M, N motion is also communicated to the chain pulley O^2 by means of the friction pulley O and clutch N^2. The chain passing round the pulley O^2 actuates, through suitable gearing, the inlet valves. The relative positions of the chain pulley and wheel G can be adjusted by means of the catch K^1 and levers K in connection with the clutch box J, which for this purpose is put into gear with the chain pulley O^2 through the friction pulley O^3, the clutch N^2 being simultaneously released. This motion is effected by means of the clutch levers P in connection with the knob P^1, when the latter pulley is forward. By turning the knob P^1 in one direction or the other, the cam P^2 causes the clutch levers P to give grip or release the drum O^1 rigidly connected with the friction pulleys O and O^3. The expansion of the mercury caused by a rise of temperature gives upward motion to the piston F^2, the return motion being due to the weight of the latter assisted by the counterweight S^3 acting through a cord on the drum N^1; this arrangement also prevents backlash.

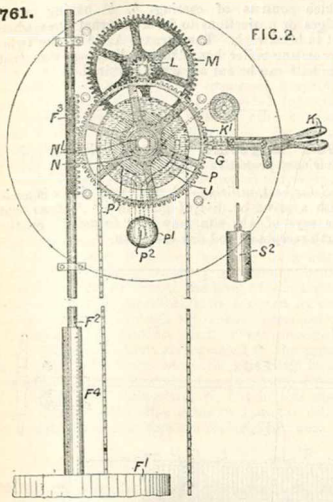
FIG.3.



(*For Fig. 2 see next page.*)

2761.

FIG.2.



2812. **Jackson, H.** Oct. 21.

Heating liquids.—Relates to an apparatus for condensing vapours and heating water or liquid by means of steam. A number of specially-shaped trays with flanged openings B are arranged one above another, as shown, so that steam can flow through in the direction of the arrows and heat the water which enters at D and overflows each of the trays through the openings B. Flanges on the underside of each tray dip into the liquid of the tray beneath to form a steam-tight joint. A central air space formed by the openings L may communicate with air spaces between the different sections. These air spaces may be dispensed with. The water &c. after leaving the heater is conducted by openings F to the underside of a filter consisting of a suitable medium placed between upper and lower perforated plates G, H, through which it ascends and overflows into a chamber to the exit pipe. Steam passes through the top of the filter on its way to the water heater.

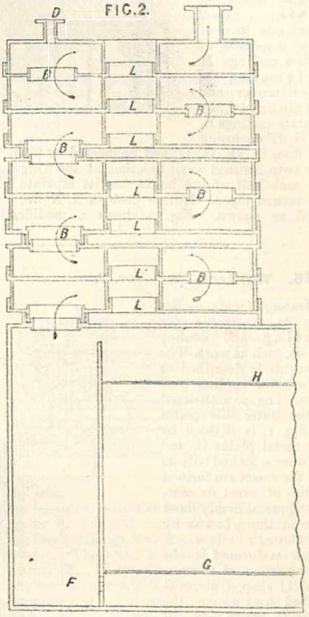
(*For Figure see next column.*)

2848. **Hornblower, L.** Oct. 24. *Drawings to Specification.*

Heating buildings.—In a special method of constructing fireproof buildings, the walls and floors are of concrete built round fireclay tubes, which serve to conduct air to the rooms &c. for warming and ventilating purposes.

2812.

FIG.2.



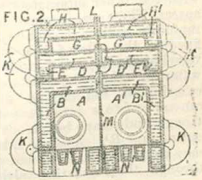
2912. **Bates, M.** Oct. 31. [*Provisional protection only.*]

Heating buildings.—Tiles or slabs are supported on the top and bottom flanges of the joists of fireproof floors and ceilings, and the intervening space is used as a heating-flue, some or all of the tiles being perforated.

2921. **Machen, S. J.** Oct. 31.

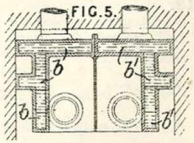
Heating water.—Boilers for the circulation of hot water for heating hot-houses and other structures are each formed of a number of hollow angle-shaped castings arranged in pairs to form two tiers, either or both

FIG.2.



of which may be used as the water heater. Fig. 2 shows one form of boiler consisting of hollow castings B, B^1 forming the boiler proper and surmounted by separate castings E, E^1, H, H^1 enclosing the flues D, D^1, G, G^1 and connected by pipes K. The twin castings meet together at the flanges L, and each half of the boiler has its separate flow and return pipes. Hollow firebars N, N^1 are provided as shown. Fig. 5 shows a modification

FIG.5.



which consists of castings b, b^1 having water ledges or projections to form external flues when set in brickwork. The furnace A, A^1 of the twin-circulating boiler has plates M dividing it so that one half can be cut off when required.

2961. Edgcome, T. L. B. Nov. 4. [*Provisional protection only.*]

Solar heat, utilizing.—A dry earth closet is made with a prism or disc of glass in its roof, so that the rays of the sun may be "focussed' on the earth receptacle and dry the earth.

3026. Willison, R. Nov. 9.

Heating liquids. — Relates to apparatus for heating and cooling liquids, such as wort. The apparatus is described as applied for cooling purposes. The space enclosed by the outer side plates B, Fig. 1, is divided by thin metal plates C, and the other sides and bottom F of the vessel are formed by slips of wood or castings of metal firmly fixed between the plates by long through bolts *a*. A trough is formed in the upper portion of the vessel by U shaped pieces G inserted between the plates C, which are cut away for the purpose. Ports or passages J are formed in the bottoms of each alternate piece to communicate with the spaces between the thin plates C. Two similar troughs are formed below the bottom of the vessel; one trough J^2 has ports or passages J^1 corresponding to the upper trough, and the other has similar passages communicating with the other alternate spaces. These spaces communicate with a trough fixed to the side of the vessel at the top, so that water or other liquid entering at the bottom can overflow into the trough and escape by the outlet pipe R^1. A cover L having a vent pipe L^1 may be provided. The hot wort or liquid enters through the regulating-valve N, passes through

FIG.1.

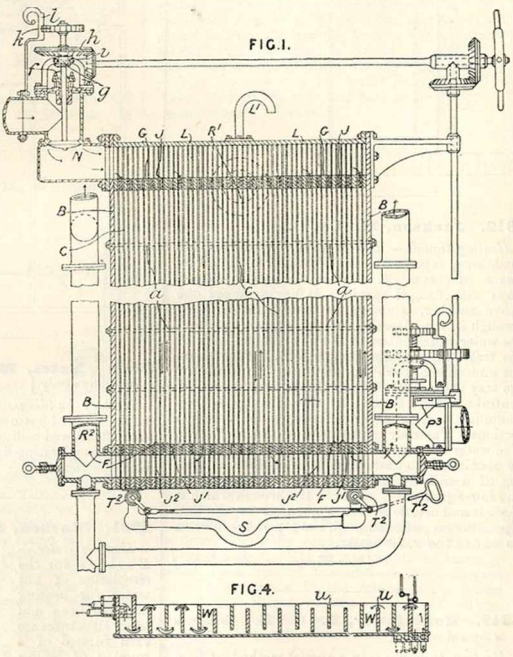


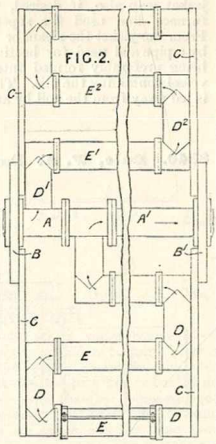
FIG.4.

the ports J and descends to the bottom of the vessel where it escapes through the ports J^1 into the trough J^2 and rises in the stand pipe or pipes R^2,

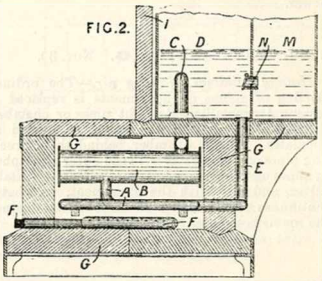
whence it may be led by pipes to a receptacle. The screwed spindle of the valve N passes through a nut *f* free to revolve in the bracket *g* when acted on by the bevel-wheels *h* and *i*. The valve is adjusted to its seat by means of a toothed wheel *k* prevented from revolving by means of a spring catch *l*. A similar valve P^3 is provided for controlling the inlet of the cold water or other cooling liquid to the bottom part of the vessel. By means of bevel gearing the two valves may be operated simultaneously, and the valves may be arranged to have either the same or a differential movement. The cooling liquid passes up into the space between the plates and escapes by the pipe R^1. Suitable stop-cocks are provided for emptying the apparatus and doors for cleaning. The two series of cells are also connected together by a glass siphon S containing mercury or strong brine covered with oil, so that if the level of the liquid falls in one series equilibrium is restored by the passage of liquid through the siphon. Stop-cocks T^2 operated by a common handle r^2 are provided. Fig. 4 shows a separate arrangement of the apparatus suitable for places where there is little head room. The liquids flow as before in reverse directions between the thin plates W, but in this case under and over the slips *u* inserted in the cells. In a modification, the slips are replaced by tubes.

3071. Mitchell, J., and **Mitchell, J. H.** Nov. 14.

Heating liquids.—The waste heat from steam-generator or other furnaces is utilized to heat the feedwater for the boiler, or for heating liquids or fluids to be applied to other purposes. A hollow shaft A, consisting of a series of flanged pipes, is fitted with two discs B, B^1, to which are bolted a number of arms C. Elbow pipes D are bolted to the arms and serve to connect a series of horizontal pipes E in such a manner that the water to be heated may pass through the whole of the pipes in succession. The hollow shaft A is divided by a solid flange, so that water entering at A passes through the elbow pipe D^1 to the horizontal tube E^1 and through the pipe D^2 to the tube E^2. In this way the water passes from side to side of the apparatus until it is delivered from the pipe to the part A^1 of the hollow shaft, whence it is supplied for use. The apparatus is placed in the flue leading from the furnace to the chimney, and is mounted on bearings. A rotary motion is imparted to it by any suitable means. The inlet and outlet pipes of the apparatus are connected to the revolving shaft by means of stuffing-box conical joints, and the outlet pipe is fitted with a safety-valve.



3162. Gent, P. Nov. 22.



Heating water.—Relates to a boiler for supplying hot water for domestic and culinary purposes, and for heating buildings, hot-houses, and other similar structures. The boiler is heated by an atmospheric gas-burner F. It consists of a coiled tube A, leading into a reservoir B, placed above it. Above this reservoir is a hot-water tank D connected to the reservoir by a pipe C, from which the hot water is drawn as required by means of a suitable branch pipe and tap. Water is supplied from a cold-water cistern M to the hot-water tank D through a supply-pipe N fitted with a non-return valve. Water passes from the tank D through the pipe E to the coil A, thence to the water chamber B and through the pipe C back into the tank. The whole apparatus is enclosed in a terra-cotta, firebrick &c. casing G, I. The waste gases from the boiler chamber pass through openings and circulate around the tank D. A second water chamber may be placed beneath the burner. The burner may be replaced by an ordinary fire. In another arrangement, the boiler is combined with a cylindrical steam-generator, which is arranged on the same level as the supply tank. The steam from the generator passes to a "Banbury" or steam-cooking apparatus arranged on the top of the water-heating and steam-generating apparatus. The boiler may be combined with the portable gas oven described in Specification No. 3023, A.D. 1871, [*Abridgment Class* Stoves &c.]. In one arrangement the boiler is placed in the bottom of the oven and the supply tank on the top, but it may be otherwise arranged. The terra-cotta &c. casing G is shown as forming the oven.

When the boiler is used for circulating hot water, the tank is dispensed with and the circulating pipes are led from the coil A and water chamber B.

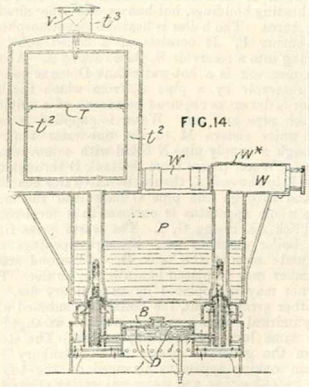
3225. Körting, E. Nov. 29. *Drawings to Specification.*

Heating by steam circulation.—The exhaust steam of steam engines is divided into two parts, high and low pressure, by special "pressure restoring "apparatus," the high-pressure portion being used for various purposes, such as heating, or developing power.

3242. Lankester, W. G. Nov. 30.

Heating buildings; heating air.—The ordinary skirting of rooms or apartments is replaced by rectangular metallic watertight pipes or chambers, through which hot water, steam, or heated air circulates. An air chamber behind these circulating pipes communicates with the outer atmosphere by pipes or other channels controlled by suitable valves, and also with the apartment, so that a continuous supply of heated fresh air is obtained, the rooms being also heated by radiation.

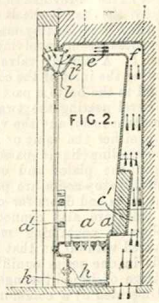
3254. Silber, A. M., and **White, F.** Dec. 1.



Heating liquids.—Relates to apparatus heated by lamps or stoves. In the form shown in Fig. 14, a rectangular vessel P provided with vertical flues is placed over the lamps or stove as shown. In another form an annular vessel is placed over a single burner.

3260. Taylor, J. Dec. 2.

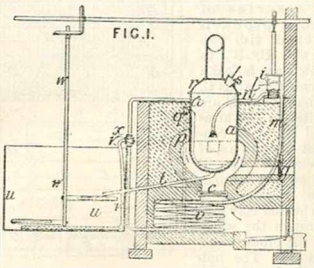
Heating air.—Relates to improvements in connection with stoves such as are described in Specification No. 1662, A.D. 1859. A flue *f* for fresh air for ventilation is constructed behind the grate *a* and over the top of the fireplace; it terminates in a valve *l* which is constructed with end plates l^2, l^2 so weighted that it remains either open or closed without any fastenings. Ribs *c*¹ may be cast on the back plate to increase the air-heating surface.



3301. Steele, R. J. Dec. 7. [*Provisional protection only.*]

Heating liquids.—In the manufacture of varnishes, the gums and resins to be used are melted by superheated steam or hot air admitted to a jacket surrounding the containing-vessel. The jacket may also, if desired, be surrounded by a furnace flue used for superheating the steam. From the jacket the steam or hot air is led away by a pipe and used for heating the oils, the pipe being preferably formed into a coil within the vessel containing the oils. The waste steam or air is led away from the coil by an escape pipe.

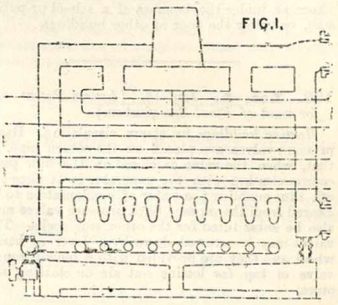
3340. Dale, W. A. Dec. 11.



Heating liquids.—In the manufacture of varnishes, the gums are melted in a pan *a* either by the direct heat of a fire, as shown, or by superheated steam or hot air forced into a jacket

surrounding the pan. By closing the damper *c*, the heat can be cut off from the pan, which may also be cooled by admitting cold air through the damper *g*. To further control the temperature of the gum, air may be compressed by pumps *i* and directed by a three-way cock *l* into either of the pipes *m* and *n*. The pipe *m* leads to the coil *o* in the flue of the furnace, and a pipe *p* with a cock *q* leads from the coil *o* into the vessel *a* within which it forms a perforated coil. If desired, the temperature can be lowered by blowing in cold air by the pipe *n*. The hood *r* for carrying away the vapours to be condensed is provided with a stoppered hole at *s* through which the operator can examine the contents of the vessel *a*, or a bell hood may be used. When the gums are melted they are thinned with oil and allowed to flow by a pipe *t* into the mixing pan in which the oil has been boiled and oxidized. The vessel *u* may be heated by superheated steam passed through a closed coil contained therein, but in the arrangement shown hot air is used being led from the coil *o* by the pipe *v* which forms a perforated coil at the bottom of the pan. The melted gums having been run in, the stirrer *w* is set in motion and the gums and oils are thus mixed, the temperature being controlled by turning off the hot air and, when required, substituting the cold air, which is done by means of the three-way cock *x*. Cold air is also used to cool down the mixture before the spirit is added to thin and finish off the varnish.

3341. Verity, W., and **Verity, B.** Dec. 11. [*Provisional protection not allowed.*]



Heating water.—Circulating tubular boilers for heating baths, hot-water pipes, hot-water coils, &c. are provided with a lower set of tubes which divide the flames round upper flat tubes, as shown in the Figure. The boiler is made of copper, brass, &c., and is heated by gas, oil, or spirit.

A.D. 1872.

41. Gilbee, W. A., [*Argall, J.*]. Jan. 5. [*Provisional protection only.*]

Heating water.—A steam water heater is constructed of concentric cylinders forming alternate annular steam and water chambers, the steam chambers being connected to a steam box at each end and the inner water chamber being connected by a pipe with a pump. The outer steam chamber is open to the exhaust steam, and the inner one is covered with a perforated cap. The cylinders are secured together by end cross pieces and a central bolt. A deposit box is fixed to the lower end of the outer cylinder, and a pipe attached to the upper end may lead into the boiler. An "attemperator" "which is placed in the tank" is employed in connection with the heater; it consists of an annular chamber connected with the exhaust steam pipe of the heater; "an escape "pipe which faces towards the inside is placed at "the lower part."

57. Parker, T. Jan. 6. [*Provisional protection only.*]

Heating buildings by water circulation. Churches, schools, public halls, and other buildings are heated by conveying hot water to "heaters," arranged in any part of the building, by flow and return service

pipes of small bore which run from the main pipes. The heaters are formed of galvanized iron, block-tin, &c. and they are of circular, rectangular, or other shape. They may be placed in the pews of churches, under the benches of a school or public hall, or below the floor of other buildings.

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128. Lee, A. Jan. 16. [*Letters Patent void for want of Final Specification.*]

Heating buildings by steam circulation. Back-pressure valves are placed on the return pipe, so that, when the valve is closed on the flow pipe, communication with the generator is at once cut off, thus enabling the water of condensation to be cleared from the pipes. Back-pressure valves may also be substituted for the other stop cocks. The valves may be screwed down by a lever or hand-wheel and they are provided with a blow-through valve or tap for letting out air or clearing the pipes.

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137. Macintosh, J., and **Boggett, W.** Jan. 17.

Heating-apparatus; bed-warmers; hot-water bottles. —Comprises the use of hollow, globular, tubular, or other india-rubber vessels expanded as described in Specification No. 1226, A.D. 1871, [*Abridgment Class* India-rubber &c.], and enclosed in lengths of elastic tubular fabric and filled with hot water, for applying heat to the human body, for warming beds, and for applying heat for other purposes.

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301. Amies, J. Jan. 31. [*Provisional protection only.*]

Footwarmers. — Relates to a slipper shaped warmer constructed to receive the feet, and made up either of an inner and an outer shell, or of two inner shells enclosed by an outer shell, the hot water being introduced through a filling-aperture closed by a screw or stopper. The shells are connected by stays, or preferably by a longitudinal rib. The foot-warmer is preferably of tin, and may be covered outside with non-conducting material and inside with fabric or wadding. A carrying strap or handle may be attached.

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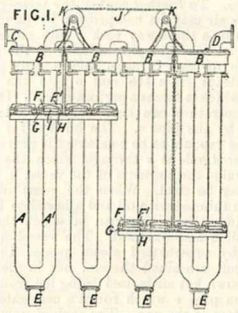
350. Calvert, J. C., and **Taylor, J.** Feb. 3.

Heating liquids.—Relates to apparatus to be placed within the flue leading from a boiler or other furnace, for heating water, steam, or other fluid. The apparatus consists of a number of U-shaped pipes A, A^1 which depend from boxes or chambers B arranged so that the water, steam, or other fluid circulates through the whole series, entering at C and being discharged at D. A special apparatus is provided for cleaning the pipes on the exterior and covers E are provided for cleaning the interiors.

FIG. 1.



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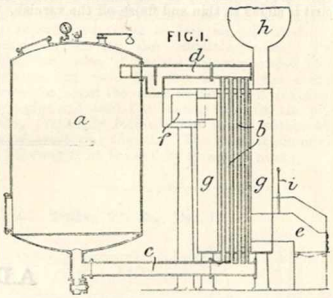
463. Roeckner, C. H., and **Lunge, G.** Feb. 14.

FIG. 1.



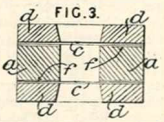
Boiling-pans; heating liquids.—Relates to boilers for treating rags &c. for paper making, or for other purposes, and consists in arranging the heating-apparatus separate from the main boiler. The heating-apparatus is heated either by a direct fire or by hot air or steam. The Figure shows one arrangement heated by a furnace *e*. The main boiler *a* which contains the material is connected by circulating pipes *c*, *d* with a separate tubular heating-apparatus *b* which may be surrounded by an annular steam generator *g* having a steam dome *h*, to prevent overheating when the liquid is run off. The contrivance shown at the junction between the pipe *d* and boiler *a* prevents the steam from passing over without carrying liquid with it. In another arrangement, the boiler is heated by steam injected at the bottom of a vertical pipe connected to the

boiler *a* by pipes similar to *c* and *d*. The use of a separate heater produces a constant circulation of the liquid.

468. Bear, T. Feb. 14.

Heating water.—Consists in the employment of mica or talc in the construction of water gauges for steam and other boilers. Fig. 3 shows a section of a gauge in which sheets of mica or talc *c*, bedded with thin india-rubber *f* and secured by slotted plates *d* bolted on, are used for closing the front and back of a metal chamber *a* connected by pipes with the boiler.

FIG. 3.



502. Bell, A., and **Walker, J.** Feb. 16. [*Provisional protection only.*]

Heating-apparatus; heating liquids.—Spiral or helical pipes for the passage of heating or cooling liquids or fluids in distilling, brewing, and chemical and other processes, are made of cast iron, which resists the action of acids &c. better than wrought iron, copper, or the like.

569. Rendle, W. B. Feb. 22. [*Provisional protection only.*]

Heating buildings &c.—Glass houses and the like are heated by an iron flue placed lengthwise of the building and surmounted by a tube or vessel containing water.

646. Southby, A. G. March 1.

FIG. 1.

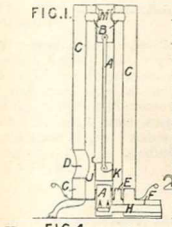


FIG. 3.

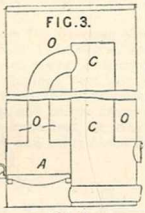


FIG. 4.

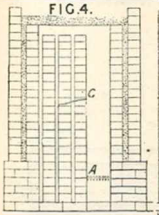


FIG. 5.

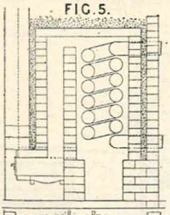
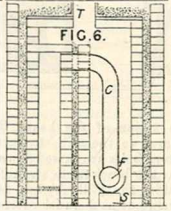


FIG. 6.



Heating buildings; heating air; heating water.—Relates to arrangements of stoves and furnaces for heating buildings, whereby the products of combustion, with or without air, after rising in the combustion chamber or chimney, pass into a descending flue or casing by siphon action. The application to stoves burning gas and ordinary fuel is described as well as arrangements of furnaces or apparatus with brickwork settings, and the apparatus is also shown in connection with air and water heating pipes and passages. Fig. 1 shows a gas stove. The combustion chamber and chimney A communicate by a passage B with the top of an annular cylinder C surrounding it; the gases pass down C, which may contain refractory material, to the pipe F leading outside the building. Air for combustion is supplied by the pipe H which may be placed within the flue F. Air enters the annular space between the chamber A and casing C by openings D and E, and it is moistened by a pan of water in which the casing C stands. In a modification, the descending flue takes the form of a half or crescent-shaped casing. Fig. 3 shows an arrangement adapted for use with coal or coke, A indicating the ascending and C the descending flue, which flues are, in this case, surrounded by a water casing O. This water casing may be connected with water circulating pipes. Fig. 4 shows an arrangement in which the products of combustion from a fireplace A descend through interstices in a mass of brickwork C which is enclosed in an iron casing or by double walls with sand between them. The gases heat the bricks and are conducted by a gathering flue to the chimney. Air heating passages may be formed in the brickwork casing. In the arrangement for warming by hot air shown in Fig. 6, air is heated by causing it to rise through a chamber heated by a series of pipes C leading the fire gases downward. Air enters at S and is discharged at T to the rooms to be warmed. The discharge pipe F for the furnace gases may stand in or be formed with a pan of water to moisten the air. Fig. 5 shows another form with a water-heating coil arranged in the descending flue for heating water to supply hot-water pipes.

680. Lake, W. R., [*Morrell, J. A.*]. March 5.

Heating air ; heating by electricity.—Air currents for evaporating saccharine liquids and syrups, saline solutions, &c., and for heating buildings &c., are heated by forcing the air through a pipe or system of pipes or an air chamber containing a series of wires, plates, or pieces of metal, preferably coils of zinc and copper wire, arranged to form a battery. Should higher temperatures be required, the pipes conveying the air blast are heated in a furnace.

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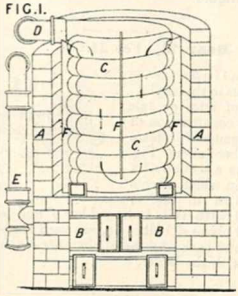
761. Deards, S. March 13.

Heating water for warming conservatories and other buildings. A close coil of piping C with flow pipe D and return pipe E is set in a cylindrical casing of brickwork A over a fireplace B. The annular space between the coil and the casing is divided into zig-zag flues by vertical plates F The close coil of piping is preferably constructed of segments faced and screwed at the ends and

FIG.1.



connected by clips which are cast on to make a tight joint.

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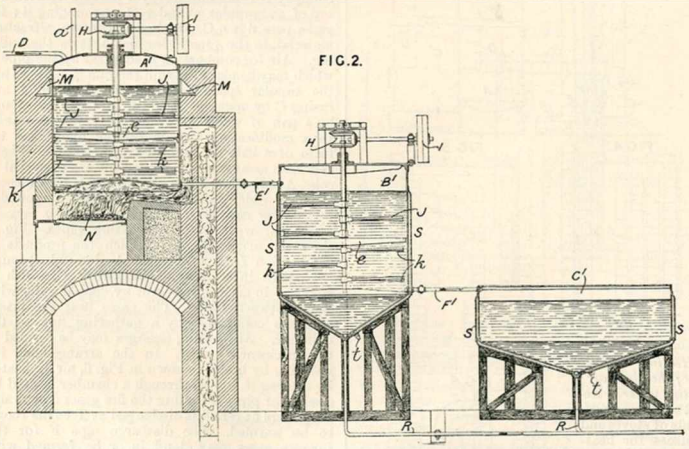
799. Benson, M., [*Honell, H. F.*]. March 16.

FIG.2.



Heating liquids.—Apparatus is shown for washing, cleansing, and purifying crude petroleum and residuum, from the ordinary process of distilling, in order to produce lubricating-oils. A closed still A^1 is suspended on iron brackets M or their equivalents over a furnace N, thus leaving the bottom of the still free to expand or contract by the action of the heat. The bracket M may be secured to the still, by screw bolts or rivets, and strong bolts are passed down through the brickwork near the brackets to strengthen the whole. Fitted within the still A^1 are two sets of agitators or stirring arms J and *k* carried on separate spindles, one arranged within the other and rotated in

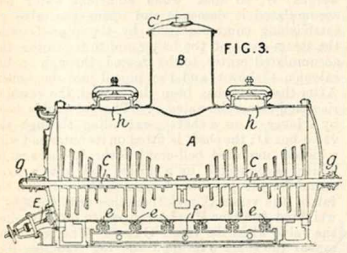
opposite directions, the inner one in a foot stop attached to the bottom of the still and outer one in a cross beam *e*, by means of bevel gearing H and pulleys I &c. The open still B^1 is fitted with similar agitating arms &c. The residuum or oil is supplied to the still A^1, through a pipe D, by means of a pump or by gravitation, and chemical agents are added through a manhole at the top, and, when sufficiently heated and agitated, the oil &c. is discharged through a pipe E^1 to the open still B^1 where it is agitated and washed by heated water applied to its surface through jets. The open still B^1 and the settling tank C^1 are steam jacketed as shown at S, the condensed steam escaping by cocks *k*. The furnace is constructed so that any part of it may be removed and reset without interfering with the outer walls, and the furnace flue may be carried round the still by division walls or made to pass out at the side as shown. The oil may be agitated by forcing currents of air into the lower ends of the still, the air pipes being extended above the surface of the oil.

831. Pye-Smith, A., and **Ribbans, C.** March 19.

Non-conducting compositions for covering steam pipes, cylinders, and engines, locomotives, cold-water pipes, refrigerators, &c., consist of mixtures of clay, wood sawdust or shavings, cow hair, tar, sodium silicate, and creosote oil, and in some cases cork dust, chalk, lime, soap, and refuse from the purification of gas. Ashes, bone dust, &c. may be substituted for the sawdust, and other fibres than cow hair used.

880. Hollefreund, H. March 22.

FIG. 3.

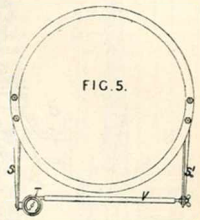


Digesters. — Starchy vegetable matters are treated, to obtain saccharine and other products for making spirits, in a closed cylinder A, into which steam is admitted through an opening *f* and ball-valves *e*. Condensed water may be run out through a cock E. Material is fed through holes *h*, and hot water or malt paste is admitted through a suction pipe fitted with a valve. The part B is connected through a valve to a condenser and an exhausting air pump. The cylinder is fitted with a series of revolving arms or cutters C spirally arranged on an axis turning in stuffing-boxes *g*.

949. Bailey, W. H. March 30.

Boiling-pans. — The expansion of pans, boilers, &c., into which it would be inconvenient to introduce a pyrometer, is utilized for ascertaining the temperature of the contents. Fig. 5 shows a plan of a pan &c. to which are fixed brackets S, S^1; one of these brackets carries the indicator T while the other carries a wooden or other non-expansive rod V for acting on the usual quadrant-arm of the indicator.

FIG. 5.



970. Don, T., and **Wright, R. A.** April 2. [*Provisional protection only.*]

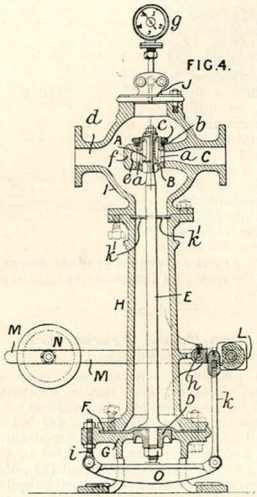
Non-conducting coverings and compositions.— Fibrous, ligneous, and textile substances and fabrics for the production of substitutes for leather, gutta-percha, papier mâché, &c. for use as non-conducting linings or coatings for steam boilers, baths, and refrigerators, are treated in the form of pulp &c., in such a manner that the cellulose or lignine is attacked, dissolved, or partly dissolved, and the materials are rendered glutinous or tenacious, waterproof, and capable of being manufactured into various articles. The pulp or paper &c., combined in layers &c. with other matters or alone, is treated with an ammoniacal solution of copper, sulphuric acid, or a caustic alkali. During treatment the pulp may be supported on a frame of wire gauze, perforated metal, or other reticulated material. The excess of reagent is expelled and the product is shaped by pressure, forcing by means of rollers, moulds, &c. Fibrous or ligneous materials, such as the bark of trees, or straw, may be treated with the reagent without being manufactured into pulp or fabric, and layers of the product are super-imposed until the desired thickness is obtained. Manufactured or partially manufactured or waste or worn materials, such as old cordage, cotton, cord, and loose cotton and other fibrous or textile material or fabric may be similarly treated. The solution may be prepared by placing granulated copper in a strong ammoniacal liquor. Air may be passed through the liquid to assist saturation or the ammonia may trickle on to the copper or be poured on to it in thin streams.

1098. Clark, A. M., [*Legat, D. M.*]. April 12.

Thermostats.—Relates to apparatus for automatically regulating the temperature of a

hat-blocking chamber, applicable also for regulating the supply of steam to the drying-cylinders of paper-making machines and for other purposes. A double or equilibrium valve A, Fig. 4, is contained in a spherical chamber I, and is connected

FIG.4.



by a rod E with the regulating piston D. A cylindrical valve socket B is formed with rectangular orifices *a*. A ring nut *c* and washer *b* ensure an airtight joint. A membrane of india-rubber F forms a joint at the base G of the apparatus and is covered with water. The piston-rod E is supported on a lever O which is pivoted at *i* and connected by a rod *k* with a cross-bar L connecting two levers M, M which are pivoted at *h*. Weights N, N are adjustable on the levers H, H for loading the piston D according to the required steam pressure. The upper part of the apparatus is closed by a cover J which is fitted with a pressure gauge *g* and safety-valve. A perforated diaphragm k^1, *k* prevents water from rising into the upper part of the apparatus. Steam entering the pipe C passes to the valve A by a circular channel *e* made in the valve casing *f*, *f* and after expansion escapes by the outlet *d*. The weights N may be so adjusted as to produce a counter pressure on the piston D equal to the pressure of the expanded steam, thus keeping the equilibrium valve open only to a sufficient extent to allow the passage of the requisite quantity of steam. The method of balancing the piston D may be varied, as by using springs, or a reservoir of air or other fluid adjusted by a hand-wheel or other means. The piston and valve may be modified or replaced by equivalent arrangements.

1139. Edwards, E., [*Blessing, J. H., Townsend, F.*, and *Jackson, G. P.*]. April 17.

FIG.1.

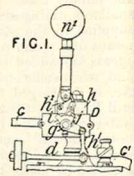
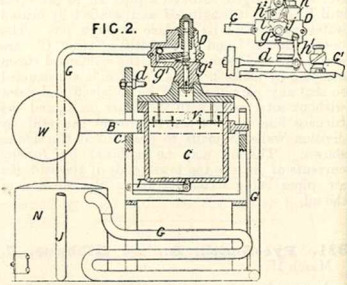


FIG.2.



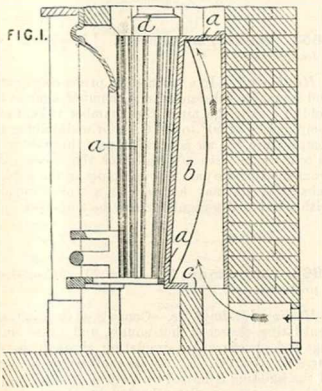
Steam traps for use with apparatus for warming buildings with steam. The Figure shows a steam boiler N with a short coil of heating-pipes G arranged to show the connections between the trap and boiler. The water of condensation from the heating coils is forced by boiler pressure through a lift valve (not shown) into the vessel C where it falls through a perforated plate *v*. The vessel C is suspended in a lever B, resting on a knife edge or fulcrum *c* and counterbalanced by a weight W, so that when sufficient water has accumulated it descends and opens the valve g^2, establishing communication by the pipe G with the steam space of the boiler and thus causing the accumulated water to be forced through a lift valve (not shown) and the pipe J into the boiler. After the water has been discharged, the vessel C rises and closes the valve g^2. The valve g^2 is held by a lever g^1 on a shaft *g* extending through the valve-box D; the shaft is fitted on its outer end with a loosely mounted bell-crank lever *h*, one arm of which is connected by a slotted rod h^1 to a fixed arm *d* for the purpose of opening the valve on the fall of the vessel C, and the other arm engages a weighted tumbler h^2, n^2 arranged to quickly close the valve when the vessel C rises. The bell crank moves the shaft *g* through the lug *j* coming into contact with the ears of a forked segment *i* fixed on the shaft *g*. The vessel C may be of spherical or cylindrical form; in the latter case it is guided by the rod T.

1169. Shorland, G. L. April 19.

Heating buildings; heating air.—The back *a* of an ordinary open grate is formed like a hollow box, the front part being curved to make the back and

sides of the fireplace. Fresh air enters the back at *c*, and two outlets for heated air are formed at the upper end of the back which communicates with

FIG. 1.



passages *d* for conducting the hot air to the required part of the building.

1265. Cowper, E. A. April 27. *Drawings to Specification.*

Thermostats.—A "pyrometer," consisting of a long weighted metal rod, is placed between the furnace and the boiler of a paper-pulp making plant and in the spiral flue surrounding the boiler. When the temperature rises unduly, the extension of the rod opens, by means of a bent lever and a connecting link, a damper or valve which admits air to the flue for cooling the furnace gases.

1359. Carter, G. H. May 4.

Heating buildings by products of combustion and water. Relates to arrangements in connection with a gas stove for heating public and private buildings, pineries, hot-houses, graperies, &c. A helical plate C with an opening in the centre is placed in a cylinder A above the gas burner B. The cylinder A and a part or the whole of the pipe H leading from it are filled with twisted strips of metal D placed above the plate C which check the upward passage of the heat and form a large heating surface for the air. The cylinder A may be surrounded by a water jacket F, the water from which circulates in pipes G.

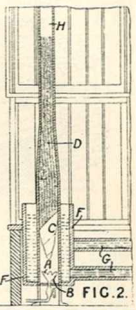


FIG. 2.

1423. Jensen, P., [*Erichsen, J.*, and *Maardt, J. G.*]. May 10.

Heating buildings &c.; heating water; heating air.—The waste heat from a series of the coke ovens described in Specification No. 1122, A.D. 1872, [*Abridgment Class* Fuel, Manufacture of], is used for heating apparatus for houses or other buildings, using hot air or water, or for other heating purposes.

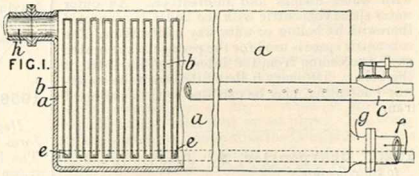
1461. Fearnley, W. G. May 14. *Drawings to Specification.*

Heating air.—Air for warming rooms is heated by passing it through a pipe or pipes placed in a furnace which is used for heating a gas retort.

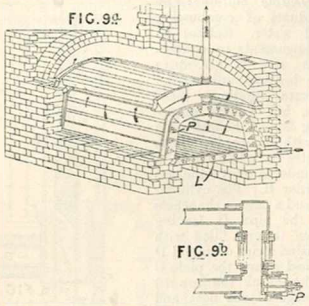
1477. Fryer, A. May 15.

Heating liquids; boiling-pans.—A tank for heating saccharine solutions for the manufacture of cane sugar is constructed with a number of leaves or boxes *b*, *b*, Fig. 1, to which steam is admitted by branches from a steam pipe *c*. The steam, after traversing the boxes *b*, escapes by branches *e* to the exhaust pipe *g*. The boxes *b* are raised from the bottom of the tank *a* to allow the juice to flow under and between them as it passes from the pipe *g* to the overflow pipe *h*. The leaves or boxes *b* are preferably inclined on one or both sides to prevent the saccharine liquid from adhering to them, and are arranged so that any of them may be detached and removed for cleaning, repairs, &c.

FIG. 1.



1545. Messenger, T. G. May 21.



Heating liquids.—A boiler for heating with hot water is constructed with a water space L, Fig. 9a, at the end of the furnace bars and triangular tubes "which alternate the width of the boiler" by means of special spigot-and-socket joints. The water is brought to the space L by a return pipe and flows up the tubes into a water space at the back and thence into a saddle-shaped water space and, by it, into all the tubes connected with the same, and also, by means of a connection, similar to that shown in Fig. 9b, at each corner of the saddle, into an upper layer of tubes. The water then passes into the flow pipe. Blank sockets or caps P are fitted into sockets on the water spaces and held up by T-irons; these arrangements admit of taking out the water tubes for cleaning &c. The pipe couplings may be applied to a water space having a valve attached to a quadrant which is turned by a screw spindle and hand-wheel, for regulating the flow of water or other liquid. In the case of two pipes in conjunction, the valves to each pipe may be worked at the same time by one quadrant and spindle.

1698. Hartley, J., and **Sugden, Z.** June 5. [*Provisional protection only.*]

Heating water for warming buildings &c. Boilers, instead of being set in brickwork, are constructed with water casings and midfeathers. An outer water space concentric with the boiler, is connected therewith by hollow or waterway midfeathers. The concentric space is used for the passage of the heated gases proceeding from the interior or flue space of the boiler. Ordinary boilers fitted with the waterway midfeather may be enclosed with a casing of iron.

1720. Charpentier, P. June 7. *Drawings to Specification.*

Heating water. — The products of combustion from gaseous-fuel furnaces are passed through water in a special apparatus, to remove objectionable matters. The water thus heated may be used for heating railway carriages &c.

1853. Abate, E. June 19. [*Provisional protection only.*]

Heating air.—In a method of preserving animal and vegetable substances in a chamber, such as the hold of a ship, the air in the chamber is kept at a temperature of 50° to 60° C. For maintaining the temperature, the air is made to pass through pipes in connection with a furnace, or the waste gases from the furnace pass through pipes in the hold, or exhaust steam may be used, or a stove provided with a self-acting regulator may be employed.

1863. Housman, E. June 20. [*Provisional protection only.*]

Heating buildings &c.—Consists in heating and ventilating churches, hot-houses, and other buildings and structures by circulating through them a current of heated air. An air shaft below the floor of the building is heated by a stove or other means such as pipes or plates heated by steam or hot water. The shaft communicates with the outer air at its lower part, and it has inlet openings provided with regulating valves to admit heated air to the building at or above the floor level. The building has also outlet openings provided with valves, which openings are also placed at or near the floor level; in certain cases these openings may be connected with an ascending shaft with means for regulating the outlet openings at the top of the shaft. The regulating valves of the air inlet and outlet orifices &c. may be connected so that they may be worked simultaneously.

1910. Hartley, J., and **Sugden, Z.** June 24. [*Provisional protection only.*]

Heating water.—For heating water for warming buildings &c., an outer water space is constructed concentric with and joined by water-ways or midfeathers to an interior boiler. The flue gases are made to pass through this annular space after leaving the flue. Cylindrical boilers with ordinary midfeathers or with the waterway midfeathers are enclosed in a casing of iron.

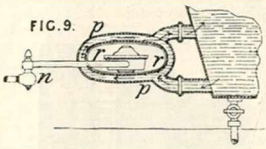
1956. Phillips, T. H. June 28.

Heating water for baths. Fig. 9 shows a special form of gas burner applied for heating a bath. The burner is carried on a swivel joint *n* so that it can be placed in a chamber *r* enclosed by a water casing *p* communicating with the bath by flow and return pipes.

(*For Figure see next page.*)

1956.

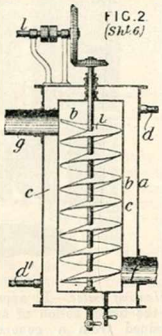
FIG. 9.



1964. Russ, B. June 29.

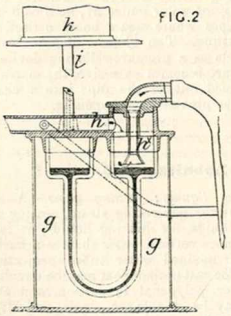
Heating gases.—Relates to apparatus for heating and drying or cooling illuminating-gas. The apparatus consists of an inner cylinder *b* and an outer cylinder *a*, the space *c* between them being filled with steam or cold water admitted at *d* and passing out at d^1. The gas enters at *f* and escapes at *g*, being drawn through the chamber *b* by a screw *i* driven by bevel gear from a shaft *l*.

FIG. 2 (Sh. 6)



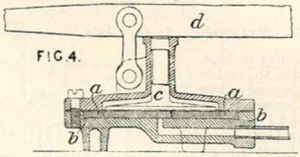
1999. Wallace, J. July 2.

FIG. 2



Thermostats.—Relates to apparatus for maintaining a constant temperature in gas stoves and a constant pressure in steam boilers. In the arrangement shown in Fig. 2, gas is supplied by a pipe *h* to a chamber at the top of one limb of a U-tube *g* containing mercury, when it passes by a bell-mouthed tube $h^\times$ to the burner. A closed chamber at the end of the other limb of the

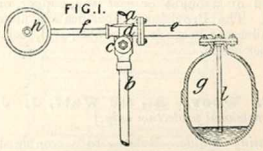
FIG. 4.



U-tube is connected by a pipe *i* to an air vessel *k* placed near the stove and provided with an air-tight valve. To regulate the apparatus, the valve is opened until the stove is heated to the desired temperature; it is then closed, when any increase of temperature in the chamber *k* causes the mercury in *g* to rise and seal the bell mouth of the tube $k^\times$, thus cutting off the gas until the temperature in *k* falls, whereupon the tube $h^\times$ is unsealed and the gas is lit by a pilot jet fed through a bye-pass. A uniform pressure is maintained in gas-heated steam boilers by causing the steam pressure to act against a diaphragm rubber bag connected both with the gas cock and with a damper in the flue. In the arrangement shown in Fig. 4, a piston *c* is held down by a lever *d*, loaded by means of weights or springs, upon a flexible diaphragm *a* or an india-rubber bag, contained in a chamber *b*. Water is conveyed by a pipe from the boiler to the space below the diaphragm or the interior of the bag by which, on the pressure rising, the lever which is connected at one end with the damper, and at the other with the gas supply is moved.

2136. Robertson, J. B. July 17.

FIG. 1.

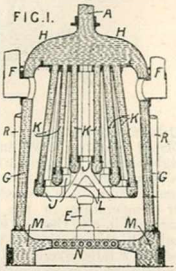


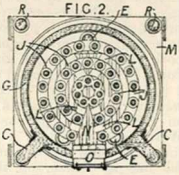
Steam traps for draining steam-pipes, drying-cylinders, and the like. A shell *d*, Fig. 1, attached by arms *e*, *f*, to the chambers *g* and balance weight *h*, is mounted on a plug *c* which is connected rigidly to the inlet and outlet pipes. The arm *e* has two passages; one unites the inlet pipe *a* to the upper part of the chamber *g*, the other with the plug *c* connects the outlet pipe *b* with the pipe *l* in the chamber. The plug interrupts the outlet of the steam till the water in the chamber *g*, rising above the end of the pipe *l*, overbalances the

weight *h*, when the shell *d* rocks on the plug *c*, and the water is discharged by the pressure of steam. The shell *d* may be provided with glands or may rest on the upper part of the plug only.

2159. Smeaton, J. G. July 18.

Heating water.—Relates to boilers for heating water for hot-water circulation. An annular water chamber G rests on a bottom or base chamber M and is surrounded by a dome H. A series of rings J connected to each other by pipes L and to the base M by pipes E, are arranged within the chamber G and connected to the dome by tubes K. The rings are divided, as shown in Fig. 2, to allow for expansion. The base M carries the firebars N, which may be hollow, and it is connected to the chamber G by elbow pipes C. The furnace gases escape through the side smoke flues F. The flow pipe A is connected to the centre of the dome H and the return pipes R to the base M. This arrangement isolates the return water from the parts acted upon by the fire and ensures the circulation of the water. The boiler may be formed of wrought or cast iron, copper, or other metal. The Provisional Specification states that the boiler may be made of circular, oval, rectangular, or other shape.

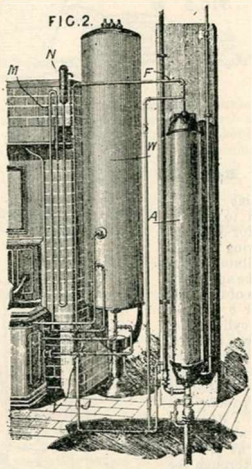




2257. Woove, A., and **Watt, J.** July 29. [*Provisional protection only.*]

Heating liquids.—Relates to a combined apparatus for heating and moving or forcing liquids, applicable for heating and moving worts, chemicals, and other liquids in breweries, distilleries, dye-works, paper manufactories, &c. A rectangular or other heating is provided with liquid and steam inlets and outlets, so that liquids are heated by direct contact with exhaust or live steam. The vessel is combined with a force pump which has a plunger working in a chamber the outlet of which is fitted with only one valve.

2268. Brown, W. M., [*Houghton, C.*]. July 30.



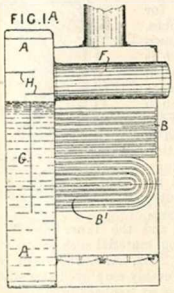
Heating water.—In apparatus for raising water by the direct action of steam, the steam may be obtained from a generator combined with a kitchen range. When not required for this purpose, the steam may be employed for heating water. Fig. 2 shows a steam-vacuum pump A which is supplied with steam through the pipe F. By turning the cock V, the steam may be admitted to the hot-water boiler W, no dips being made in the pipes where steam could collect and thus cause rattling. The U-tube M contains mercury which acts as a pressure-relieving device in case the pressure becomes excessive, the mercury being then forced out of the pipe into a chamber N leaving the pipe as a vent opening.

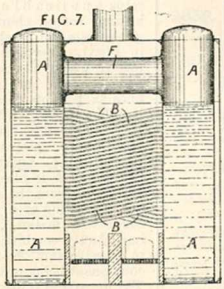
2319. Löbnitz, H. C. Aug. 3.

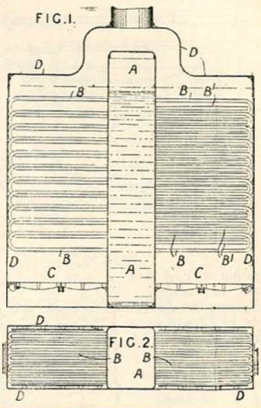
Heating liquids; heating gases.—A boiler or apparatus for generating steam, heating or superheating fluids, or heating liquids, is formed of one or more vertical water chambers having horizontal or inclined water tubes projecting from them. The water chambers may be circular, square oblong, or polygonal in section, and the water tubes may be double or single and fitted with internal tubes or diaphragms to promote water circulation. Figs. 1 and 2 show one arrangement of boiler having a central vertical water chamber A fitted with projecting double, or return tubes B and single tubes B^1. Grates C are placed below the tubes as shown, and the whole is enclosed in a

metal or other casing D. In another form of boiler the tubes B are inclined. A number of tubes B may radiate from a central cylindrical chamber, the boiler being enclosed in a cylindrical casing.

Fig. 7 shows another form in which two cylindrical chambers A are connected by oppositely-inclined tubes B, and an upper drum F which forms a stay and acts as a portion of the steam chest. A







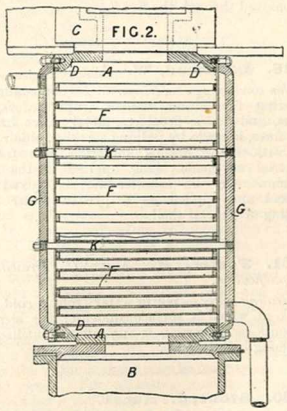
cylindrical and a rectangular chamber may be used, each being separately fitted with projecting tubes. Fig. 1A shows a boiler having a single chamber A fitted with tubes B, B1 and a drum F. Plates G, H are fitted in the chamber A to promote water circulation and prevent priming. Any desired number of the water chambers with their projecting tubes may be arranged in a circle, square, oblong, or in parallel rows, to form large boilers. In one arrangement three rows of vertical chambers are connected by horizontal tubes.

2386. Sutcliffe, R. Aug. 10.

Heating water.—Relates to apparatus for utilizing exhaust steam for heating feedwater for boilers and other purposes. Fig. 2 shows a section of the apparatus, which is fixed between the steam cylinder C and the ordinary condenser B; it consists of a number of copper or other tubes F fixed between tube plates in a chamber A fitted with recessed covers G. The water from the hot well is forced through the tubes F, the steam coming in contact with the tubes as it passes through the chamber A. Or the steam may be passed through the tubes and the water through the chamber. The covers G are bolted to the internal flanges D, as shown, and they are held by through stays K.

(*For Figure see next column.*)

2386.



2395. Williams, J. G. Aug. 12. [*Provisional protection only.*]

Heating liquids.—Relates to apparatus for heating, cooling, and fomenting liquids, and for infusing, mashing, &c., especially applicable in brewing and distilling. A tub is fitted with a coil having two or more arms furnished with gearing for revolving it, and a shaft with hollow ends perforated to serve as steam or cold water inlets or outlets, the steam descending or the cold water ascending through the coil.

2477. Truswell, W., and **Holden, R. W.** Aug. 20.

FIG. 3.

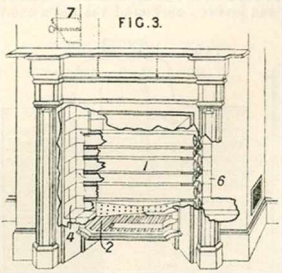
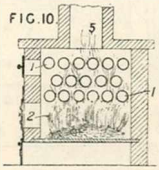


FIG. 10



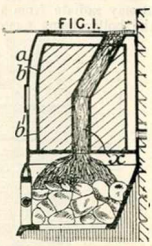
Heating air.—Relates to means for heating the air supply to furnaces and kilns, to bakers' and other ovens, and to rooms and public buildings, being a modification of the apparatus described in Specification No. 535, A.D. 1871. The pipes 1 are fixed in rows across the chamber 2, Figs. 3 and 10, so that the products of combustion from a fire may pass between them. The cold air enters the pipes from the chamber 6, and passes through the pipes to the hot air chamber 4, from which it is removed through the flue 7.

2518. Lochhead, W. Aug. 24.

Non-conducting coverings. — A non-conducting covering for steam boilers, superheaters, and pipes, and stoves, fireplaces, metal smoke funnels, and flues, is made by pulping asbestos, either alone or with other fibrous materials, the felt-like material so made being applied in the usual manner. Or the asbestos may be mixed with cement and applied as a plaster under wood lagging or a metal shell.

2543. Stone, J. Aug. 27.

FIG. 1.



Heating air; heating water; heat-storing apparatus. — A heating-apparatus applicable for heating rooms, churches, glasshouses, &c. is shown in Fig. 1. A vessel *b* is placed inside a vessel *a* and has one or more flues *x* passing through it. The space b^1 between the vessel may be used to heat air for circulation through the buildings. The vessel *b* is filled up with two layers, the outer one consisting of a non-conducting material, and the inner one of an imperfectly conducting material such as described in Specification No. 2652, A.D. 1871, the glass component being preferably employed as a silicate. The apparatus is placed at the back of a fire grate, and when required for use it is drawn forwards, so that the gases and smoke from the fire pass up the flues *x*. When the material in the vessel *b* is sufficiently heated, the apparatus is pushed back, and the flue closed; the material will then slowly give up heat for a considerable time. The material may be replaced by water saturated with a salt to raise its boiling point.

2545. Morfit, C. Aug. 27. [*Provisional protection only.*]

Heating liquids; boiling-pans.—A vat or vessel for use in chemical and manufacturing operations involving the use of acids, is formed with the sides, ends, and bottom of single cross-ribbed cast-iron plates, coated with porcelain or enamel internally, flanged on the upper edges to form a rim, and packed externally between the ribs with felt or wood. India-rubber is applied at the junctions of the plates to secure tight joints. Heat is supplied by enamelled steam pipes, either open pipes or closed coils, placed in the vat. The cover of the vat is a wrought-iron plate with an internal convex surface coated with "stearic pitch paint." Plug holes fitted with conical india-rubber plugs on iron handles are provided at different levels in the vat. A manhole is provided, and also a vapour outlet leading to a chimney.

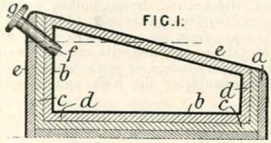
2551. Foster, H. Aug. 27. *Drawings to Specification.*

Heating water.—Warm water from a cold-water tank in which a surface-condenser for steam or vapours is immersed, is run off and utilized for warming buildings &c.

2580. Stone, J. Aug. 30.

Footwarmers.—A footwarmer suitable for railway carriages &c. is made of various shapes and consists of a thin metal vessel *b*, Fig. 1, enclosed within a wood or strong metal vessel *a*, the space between the two vessels being filled up with two layers of material. The outer layer *c* consists of a non-conductor of heat, and the inner layer *d* of an imperfectly conducting material preferably that described in Specification No. 2652, A.D. 1871, the glass component of which is, however, "employed as a silicate." Water saturated with a salt to raise its boiling point is heated and admitted into the vessel *b* by means of the pipe *f* which is fitted with a screw cap *g*. The vessel *a*

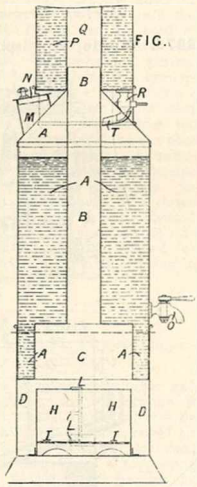
has a covering *e* of felt or carpet. In a modification, the water is replaced by the material referred to above, preferably in the powdered form and mixed with pieces of iron, or it may be replaced



by clean sand or gravel. In either case the material is heated in an iron pot or cauldron, and then introduced into the vessel *b*. Such a footwarmer retains heat for a considerable time.

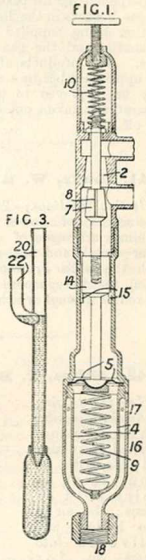
2629. Clarke, J. Sept. 4.

Heating water.— A portable water heater, shown in Fig. 1, consists of an annular copper or other suitable sheet-metal casing A with a central flue B passing through it. The lower end of the flue B terminates in a chamber C into which the firegrate H is raised, and retained during the heating of the water in the casing. Water is introduced into the casing at the opening M after removing the cover N, and withdrawn at the tap O. The casing is supported on a sheet-metal frame D having folding doors in one side, through which the firegrate H is introduced. Vertical slots, one at the meeting of the doors, and one in the casing diametrically opposite, and provided with horizontal notches L, serve as guides to handles fixed on the firegrate, in raising the grate up to the chamber C, and the slots L receive the handles. For heating a larger quantity of water, another annular casing P is placed above the casing A, the extension of the flue B serving to retain it in position by fitting into the flue Q of the casing P. Water is admitted at an opening in the top and delivered into the casing A through a tap R into a shoot T which throws it against the flue B.



2659. Lockhart, J. Sept. 7.

Thermostats. — Relates to apparatus for regulating the supply of gas to burners used for heating water for baths &c., and also applicable for actuating the dampers of furnace flues and ventilation valves. The opening 2 through which the gas passes on its way to the burner, is regulated by the valve 7, the spindle of which is actuated by the diaphragm 5 closing the chamber 4 which contains a liquid boiling at a suitable temperature, a mixture of methylated spirit and water being used when the instrument is applied for regulating the temperature of hot water. The boiling of the liquid in the chamber 4 raises the diaphragm 5 and valve 7, thus reducing the supply of gas through the passage 2. The valve 7 opens again when the temperature decreases. A groove 8 in the valve 7 prevents the gas from being completely shut off. The motion of the valve is controlled by springs 9 and 10 applied on opposite sides of the diaphragm. The valve spindle is prevented from turning by ribs 15 fitting into grooves in the enlargement 14. The chamber 4 is enclosed by an outer shell 16 having openings 17 formed round it, and is connected with the cold water supply pipe 18. In a modification, the expansion of mercury is utilized. The gas is admitted into the upper end of a tube 20 and passes to the burners by a lateral branch 22. When the desired temperature is reached the mercury rises and nearly closes the opening into the branch pipe 22. When the instrument is applied to furnace dampers, the diaphragm is connected to the rods or levers which actuate the damper. When applied to steam generators, the water or steam may be made to act on the closed vessel. For actuating ventilating valves, the chamber 4 is filled with ether or other volatile liquid boiling at a low temperature, the diaphragm 5 being connected to the ventilating valve.



2678. Turton, G. Sept. 10. [*Provisional protection only.*]

Heating liquids. — Water or other liquids in baths, or for use in heating greenhouses and for other purposes, is heated by an immersed water-tight gas-heated apparatus. A water-tight vessel is divided into an upper and lower chamber connected by perpendicular air passages. The vessel is heated by gas burners in the lower chamber, air for combustion being supplied by an upright air shaft or shafts, and the gas by means of a flexible tube. The products of combustion escape from the upper chamber by a shaft or flue. A ball lever may be employed to turn off the gas when the apparatus is taken out of the water, or the water run off.

2741. Lake, W. R., [*Briggs, J.*]. Sept. 14.

Heating buildings.—The chimneys or flues A of houses and other buildings are made of cast iron or other metal, and are placed flush with the walls J, or project from them, for the purpose of heating the rooms through which they pass.

FIG.4

2742. Gibbs, T. B. Sept. 14.

Heating air; heating buildings &c. —A domestic stove is fitted at its back and side with an iron casing up which cold air passes; the air is thus heated, and delivered into rooms &c. for warming. In the arrangement shown in Fig. 1, the chamber D is either cast with, or fitted to, the stove A, and air is admitted into the chamber through holes C in the plate B, or from the exterior of the building. The air is heated in its passage through the chamber, and is delivered into pipes I, which pass to various parts of the room or structure to be heated, and terminate in a rose or in perforated lengths. In some cases the pipes I pass from the rooms to a staircase, and then lead up above the house tops, where they are covered with a cowl. A pipe J is also fitted above the chamber, and provided with a throttle valve actuated from the knob K, so that the hot air may be passed up the chimney direct; a valve may be fitted in the pipes I to cut off the hot air from the rooms &c.

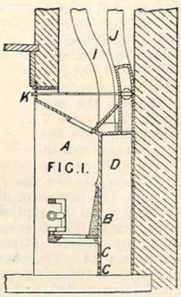


FIG.1.

2828. Martin, T. J., and **Harper, J. M.** Sept. 25. [*Provisional protection only.*]

Heating liquids; heating by steam circulation.—Relates to compound steam engines used in conjunction with heating, drying, boiling, and pulping machinery requiring a supply of steam. This steam is taken from the engine through a valve or series of valves connected with one or more of the high-pressure cylinders or with passages between the high-pressure, or the high and low-pressure cylinders.

2858. Hacking, W. H., Hacking, T., and **Mallison, J.** Sept. 28. *Drawings to Specification.*

Heating air.—In apparatus for drying warps, fabrics, &c., by passing them round winces, cages, or rollers in drying-compartments formed by steam chests &c., air drawn into the compartments by fans or steam jets, is heated by passage through zig-zag channels formed under the steam chests.

2875. Boyle, H. Sept. 30.

FIG.2.

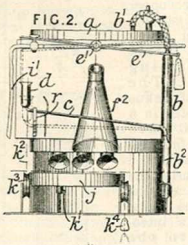
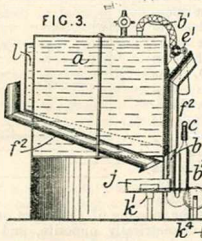


FIG.3.



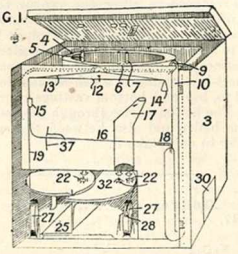
Heating water; thermostats.—A water-heater with thermostatic attachments for heating hot-houses, rooms, buildings, chemical or medical baths, mushroom beds, &c. and for incubating purposes, is shown in Figs. 2 and 3. For incubating purposes a closed cylindrical vessel *a* of sheet metal is filled with water and heated by gas or oil below.

A siphon tube b communicates with the top of the vessel a by a flexible non-elastic tube b^1, and its lower end is bent round and communicates with a fine tube c through a piece of rubber tubing. The tube c is supported nearly horizontally and terminates in an open funnel d. The funnel is suspended from one end of the arm e which is pivoted at the point e^1 and counterweighted. Mercury is poured into the funnel d until the shorter arm of the tube b is filled. The water is heated by the gas or oil, the waste gases from which pass through flues f^2 in the vessel a, and, as the heat increases, the water and mercury expand, the mercury flowing along the tube c towards the funnel d. The counterbalance weight is arranged so that at a fixed degree of heat the mercury flows along the tube c until the counterweight is overcome, and the funnel d is lowered. A cord k^2 passes from the funnel d round the pulley k^3 to a shallow oil vessel j which is pivoted to the stand k^1 and carries the burners which supply the heat. When the funnel falls through excessive heat, the cord k^2 is slackened, and a weight k^4 causes the vessel j to rotate about the pivot k^1, and the burners are carried from below the vessel a under the flue f^2 which conveys the heat away. As the water in the vessel cools, the mercury contracts until the counterweight raises the funnel and the cord k^2 rotates the vessel j so that the burners are brought under the vessel a again. In the case of heating by gas, the gas pipe i^1 for supplying the burners has a tap actuated by the pivot e^1 of the arm e and the quantity of gas is regulated by the heat of the water. A guide r, with pins, controls the range of movement of the funnel, and india-rubber springs s prevent sudden movements. A waterproof bag is connected with the vessel a by flexible tubing, and rests upon the eggs to be hatched. In some cases the vessel a is surrounded by a closed concentric vessel containing water which is heated in the above manner and conveys heat to the water in the vessel a. This system is used for heating rooms &c., the circulation pipes being in communication with the vessel a.

2876. Boyle, H. Sept. 30. [*Provisional protection only.*]

Thermostats.—In a combined incubator and foster-mother for chickens, the temperature is maintained constant by regulating the burners by means of the expansion of water or compressed air employed in the heater. The water or compressed air is contained in an annular vessel 4 supporting the egg trays. It is heated by oil burners 22 placed below chimneys or flues 5, 6, 7 passing through the water. Two of the burners are placed on a shelf 32 which can be moved about a vertical pivot so as to remove the burners from the flues 6 and 7 and bring them under an external flue 17. The water vessel is connected by a tube 9 with one limb of a U-tube 10 containing mercury. The other limb is connected by a flexible tube 18 with a fine glass tube 15 ending in an open bulb 15 which is suspended from the arm 13 of a balance 12. The other arm of the balance is loaded by a weight 14. Springs 37 also control the movement of the tube 16. Expansion of the water forces the mercury along the tube 16 and lowers the arm 13 of the balance, thus releasing a thread 19 which

FIG.1.



passes over a pulley 27 and is connected to an arm 25 of the pivoted shelf 32. A weight 28 connected to the shelf by a thread passing over a pulley then turns the shelf round. As the water cools and contracts the reverse operation takes place. If gas is used the balance regulates the gas tap.

2901. Whittle, W. Oct. 2. [*Provisional protection only.*]

Heating water.—Consists in placing a series of U-shaped water tubes in the fireboxes of boilers used in connection with hot-water heating-apparatus; both ends of the tubes communicate with the water space of the boiler, and the tubes are arranged so that the action of the fire is stronger on one arm than on the other to cause circulation.

3042. Sims, J., and **Holmes, C.** Oct. 15.

FIG.3

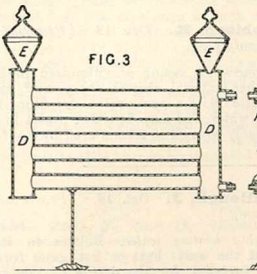
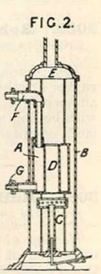


FIG.2.

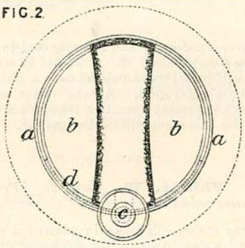


Heating buildings; heating water.—A radiator for heating conservatories, hot-houses, churches,

and other buildings is built up of sheet-iron coils D, Fig. 3, which are connected, one above the other, to two vertical water tubes, as shown. Two cups on these tubes condense and return to the radiator any vapour which rises. These cups may be removed to allow the vapour to moisten the air of the room &c. One of the vertical tubes is connected by inlet and outlet pipes F and G, Fig. 2, to a water heater or annular boiler A heated by an atmospheric gas burner C and surrounded by a sheet-iron casing B which is mounted in, and secured to, top and bottom castings connected by bolts. The hot gases rise through the central tube D of the boiler and also between the casing and the boiler to an uptake E.

3059. Dodge, G. P., [*Dodge, T A.*] Oct. 17.

FIG.2.



Hand-warmers.—A cylindrical or partly-cylindrical bag of vulcanized india-rubber, filled with hot water or hot air &c., is placed inside an ordinary muff, or is suitably covered to form a muff in itself. Fig. 2 shows two bags or compartments *b* fitted in a muff *a* and filled with hot air or water through a trough *c* and passages *d*.

3083. Robison, K. Oct. 18. [*Provisional protection only.*]

Hand-warmers.—A casing of vulcanized india-rubber or other material, shaped like a muff, has an opening fitted with a screw valve, for filling it with boiling water, and may be either placed in a muff, or suitably covered to form a muff by itself.

3085. Bullough, J. Oct. 18. [*Provisional protection only.*]

Heating air; heating water.—Relates to the utilization of the waste heat or hot gases from steam-boiler furnaces, for the drying of yarn in sizing-machines. Near the rear end of the boiler is constructed a chamber forming a part of the ordinary flue and containing a pipe or pipes, one end of which extends to the outside of the chamber, while the other leads to the casing of an exhaust fan. The air passing through the pipes becomes heated, and is discharged by the fan through a series of pipes in the machine; or the air may be thrown directly on the yarn. In some cases, heated water is used as the drying-medium, the water being forced from a cistern through a like heating-chamber and coiled pipe or pipes by means of a pump which also discharges the water, through pipes, into the cistern.

3136. Oddy, F. Oct. 23.

FIG.6.

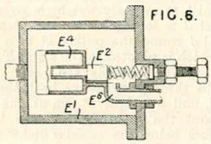


FIG.14.

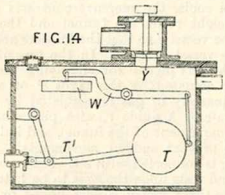
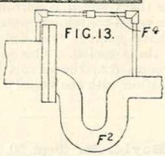
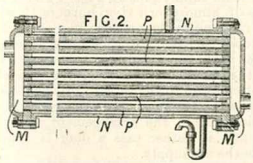


FIG.13.



Heating buildings; heating air; heating water; steam traps; thermostats.—The exhaust steam from steam engines, steam hammers, &c. is utilized for heating buildings and drying rooms, and for heating air and water. For heating buildings &c., the exhaust steam is first passed through a pipe to a valve-box containing a pressure, regulating valve. One outlet of the valve-box communicates with the circulating pipes and the other with the waste steam pipe. The pressure of the steam is also controlled by a valve E^2, Fig. 6, situated in the casing E^1 and operated by the expansion of mercury contained in the cylinder E^4. When the pressure or temperature of the steam is too great the valve E^2 is operated so as to close the port E^6. Siphon pipes F^2, Fig. 13, are inserted in the pipes to control the too rapid circulation of steam, which is trapped by the water of condensation until the pipes are fully supplied with steam

through the small pipe F^1. The water is finally expelled into the return tube by the pressure of steam. Check valves are also fitted in the pipes for preventing the steam in the return tube from entering the pipes which do not require to be heated. A siphon outlet pipe is also fitted in the pipes and provided with an inverted lift valve which allows of the flow of water but closes to the pressure of steam. At the terminating end of the return pipe a valve, described as a mercurial valve, is fitted, having a float T, Fig. 14, on the valve rod T^1, the float being balanced by a lever and weight W A dead-weight safety-valve Y is also provided. For heating air and water, the exhaust steam from steam hammers &c. is passed



into the chambers M, Fig. 2, and through the pipes P fitted in the vessel N. The air or water is admitted to the space outside the tubes. The air or water pipes may be encased by an outer tubing, the space between the two being occupied by exhaust steam.

3144. Browne, J. C., and **Davenport, M.** Oct. 24. *Drawings to Specification.*

Heating buildings &c.—The different compartments of warehouses or structures used for storing explosives and made with double walls are heated by air supplied by pipes arranged in the space between the walls.

3277. Lee, R. J. Nov. 5. [*Provisional protection only.*]

Heating air.—Warm moist air, to be inhaled in the treatment of bronchitis and throat diseases, is obtained by injecting steam in a tube through which air passes. The apparatus consists of a copper boiler heated by a lamp, and fitted at the upper part with a cross-tube open externally at both ends; a pipe is led from the steam space to the interior of the cross-tube, terminating in a jet parallel with the axis of the tube. The passage of steam through the jet draws air through the tube, the air by this means being warmed and moistened. A pipe of vulcanized rubber terminating in a mouthpiece may be attached to the cross-tube. The apparatus may be used to supply heated air to medical baths. The air may be heated, previously to moistening it, by connecting a pipe heated directly by the lamp to the open end of the cross-tube.

3290. Grether, E. Nov. 6. [*Provisional protection only.*]

Heating air.—When cavity drying-cylinders are employed in "tape legs" or "slashers" for sizing yarn, their interior surfaces are utilized for warming or drying air previous to circulating it amongst the layers of yarn. An exhaust fan is used for circulating the air.

3375. Verrier, A. B. Nov. 13. [*Provisional protection only.*]

Heating air.—For heating air for warming and ventilating rooms &c., the stoves or fireplaces are constructed with openings in connection with chambers or exhaust boxes formed at the sides, front, &c. The exhaust box or chamber is fitted with an air pipe one end of which is inserted in the exhaust box or chamber while the other end communicates with the chimney. The openings above the stove &c. will serve to carry off the impure air which may accumulate in the upper part of the room. The openings in the top and bottom distribute the heated air to the lower part of the room.

3397. Clark, A. M., [*Gold, S. J.*]. Nov. 14. [*Provisional protection only.*]

Thermostats.—For regulating the temperature of air heated by furnaces, stoves, &c., a vessel containing water is placed in the air-heating chamber, and is connected by a pipe with a receiver containing a piston or diaphragm. The piston-rod passes out through the top of the receiver, and is attached to a lever pivoted on a bracket. To the extremities of the lever are attached chains, one of which is connected with fire-door, and the other with the draught door. When the temperature is too high, the steam operates the piston or diaphragm which actuates the lever, and opens the fire-door admitting cool air into the fire chamber, and at the same time closes the draught door. A pipe open at both ends may be inserted in the wall of the air chamber, so that its inner end may be directly opposite the side of the water vessel. Another pipe is inserted in this pipe, having its outer end closed, and a number of holes in its sides. By drawing the inner pipe outward so as to close some of its holes, a stream of cold air is projected against the boiler so as to keep down its temperature, and allow the temperature of the air to be increased.

3444. Tall, J. Nov. 18. *Drawings to Specification.*

Heating buildings.—Hot air is forced into hollow spaces made in a specially-constructed concrete floor, and thence through openings in the skirtings.