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825. Smethurst, J. March 31. *Drawings to Specification.*

Heating by steam circulation.—Exhaust steam is utilized for heating buildings &c.

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899. Penson, R. K., [*Delcambre, A.*]. April 9. *Drawings to Specification.*

Footwarmers.—Warmers placed to come under the feet of the passengers in railway carriages are supplied with steam taken from a compartment of the engine funnel. By opening a door in this compartment the whole of the steam passes out into the air without entering the warmers.

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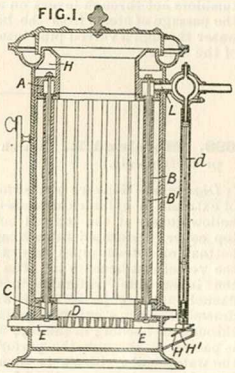
948. Marriott, A. April 15.

Heating water.—A boiler for heating buildings consists of an upper and a lower annular water space A, C connected by water tubes B, which surround the fuel space, the whole being secured by bolts B^1. The grate D can be rocked upon pivots E. The gases enter at one side of the annular space H, in order to escape to the flue at the other side. To secure automatic adjustment of the air-damper H^1 to requirements, the hot water is caused to flow from the upper end L of the boiler round a bulb, which, with the depending flexible pipe *d*, is filled with mercury. As the temperature of the water increases, the mercury expands and lengthens the elastic tube, which is secured to the damper so that the damper is closed. The tube is preferably formed of india-rubber surrounded by a coiled spring. The length of the rod connecting the damper and the pipe may be adjusted.

FIG. 1.



1019. Knowles, J., and **Jackson, S.** April 24. [*Provisional protection refused.*]

Heating water.—The water is heated in boxes or coiled or other pipes or tubes arranged in a steam boiler or other flue or chimney.

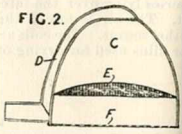
1052. Jeffreys, J. April 27. [*Provisional protection only.*]

Heating gases and liquids.—The apparatus is composed of thin fluted metal plates with flat ridges between the flutings arranged in pairs with the ridges in contact and in some cases soldered or brazed together. A boiler or other surface heating-apparatus for liquids is constructed in a similar manner. When the apparatus is heated by a fire, the mouths of the tubes formed by the plates are enlarged at the ends near the fire and are protected by metal shields.

1105. Bartlett, S. J. May 2.

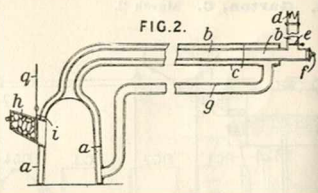
Heating liquids.—An apparatus for straining and drawing-off liquids consists of a siphon-tube D, communicating at one end with a suitable outlet, and at the other with an inverted cup C, in which are a wire gauze strainer E and a perforated plate F. The outflow tube may also be internal. The strainer may be applied to the taps of kitchen and other waste boilers.

FIG. 2.



1352. Pierce, G. H. May 29.

FIG. 2.



Heating buildings.—Relates to hot-water apparatus, for heating buildings, consisting of a boiler *a*, Fig. 2, with flow and return pipes *c*, *g*, and a furnace arranged within the boiler. The smoke and hot gases from the furnace are conducted through a flue *b*, which is arranged within the whole length of the flow pipe *c*, and has its exit at *d*, outside the building. The flue *b* is provided with a damper *e* and cleaning-door *f*.

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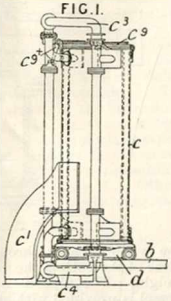
1376. Wilson, D., and **Cowper, E. A.** June 2.

Heating by air or steam circulation.—Heating-chambers c for stacks of cakes of cocoa-nut seed, linseed, or other seed to be pressed for the extraction of oil are arranged at the ends of the rails *b* leading to the press. The heating-chambers are formed of segmental jackets *c*, of which one is fixed to the bracket c^1 and the other two are pivoted by means of pivot joints in the steam or hot air pipes c^3, c^4. The pivoted segments are arranged to fit the vertical rods of the stack carriages and are provided with covering flaps for the joints. The lid C^9 is hinged, and has a tail piece C^{9x}, by which the lid is raised when the segments are opened. Instead of a segmental chamber, the chamber may be made in one piece arranged to drop over or be raised from the carriage.

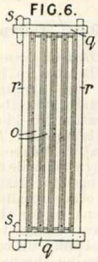
FIG. 1.



1399. Calvert, F. A. June 5.

Heating by steam circulation.—A steam heating-apparatus is constructed, as shown in transverse section in Fig. 6, of a number of pairs of plates with packing around the edges forming flat vessels which are kept apart by distance pieces *o* situated at intervals. The whole is secured together by vertical bars *r*, links *q* and cutters *s*.

FIG. 6.



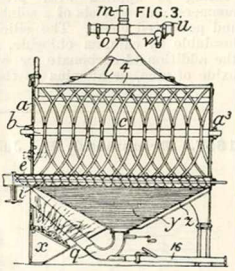
1423. Reynell, H. June 8.

Non-conducting coverings and compositions.—The corky matter of the coco-nut husk is separated by tearing, or otherwise, from the fibre and is mixed with india-rubber, gums, or other substances, or moistened with some liquid such as water, and is used for packing ice-chests, refrigerators, wine coolers, and the like.

1539. Watts, J. June 19.

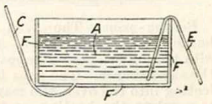
Heating air.—Malt is manufactured and dried in closed apparatus which is provided with agitating appliances and with means for the admission of water and of ordinary or heated air. Fig. 3 shows a longitudinal section of the apparatus. The air admitted through the pipe *q* is heated when necessary, by means of the fire *x* from which the products of combustion pass through a series of heating-tubes *y* to the smoke-box *z*.

FIG. 3.



1545. Kyle, D. D. June 20.

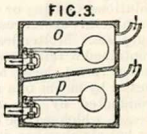
Heating water.—The water of baths is kept in agitation by hot air which is forced along pipes C, E, directly into the water, or into an air chamber or chambers F surrounding the bath A and perforated on the inner sides. The blowing or forcing apparatus is placed in or connected with a heated chamber, or is supplied by a tube passing through a fire.



1633. Blake, J. July 1.

Steam traps.—A number of steam traps *o*, *p* are used combined in a single casing, to enable pipes conveying steam at different pressures to be connected to different traps.

FIG. 3.



1650. Ransome, F. July 2.

Non-conducting coverings and compositions.—A thin coating for iron ships or iron for other purposes to protect it from rusting and to prevent radiation of heat is formed by first painting on a solution of a soluble silicate or double silicate and then washing this over with a solution of calcium chloride, first cold and then boiling. When a thicker coating is required, powdered chalk, and dry white carbonate of lead are

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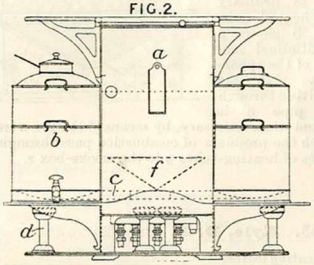
mixed with the soluble silicate. A still thicker coating is applied with pressing sticks or rammers, and consists of a soluble silicate, sand, and powdered chalk. The silicate is rendered insoluble by calcium chloride, as before, or by the addition of carbonate or oxide of lead, or oxide of zinc, or alumina to the mixture.

1657. Brinsmead, H. July 3.

FIG.2.



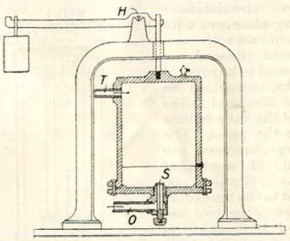
Boiling-pans.—The oven *a*, heated by gas burners *d* or otherwise, is fitted at each side with boiling or steaming apparatus *b* heated from the same source. The pans *b* have tubes *c*, projecting into the oven, and may be moved laterally to regulate the heating or to disconnect them. Burners are placed under the pans for use when the oven is not required, and a heat distributer *f* is placed in the oven.

1824. Duncan, C. S. July 21.

Heating-apparatus; heating liquids and gases.—Relates to the application of molten metals for heating liquids or solids, boiling and evaporating solutions, melting or dissolving animal, vegetable or mineral substances, heating air, and for other purposes. Molten lead, zinc, tin, or other metal is contained within the space between an outer and an inner vessel, heat being applied to the outer vessel by means of a grate, stove, or furnace, and conducted by the molten metal to the inner vessel, which may be in the form of a kiln, furnace, or hot-air chamber, in which the materials to be treated are placed, and exposed to an equalized heat without smoke. The vessels are fitted with taps or cocks, for withdrawal of the metal, and the inner vessel may be raised from the molten metal to regulate the heat.

1829. Alcan, G., (administrator of *Alcan, E.*), [*Gauchez, L.*]. July 21.

Steam traps.—A vessel, shown in section, is suspended from one arm of a lever H, and, when filled to a certain level with water, it is balanced by a weight on the other arm of the lever. When the condensed steam rises above this level, the vessel descends, and the spindle of the valve S, coming against the bottom plate, is raised, and



the water escapes through the pipe O. When clear of the bottom the valve S closes by its own weight. The pipe T admits the steam. The vessel is provided with an air-escape cock.

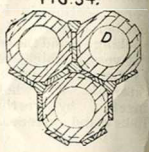
1903. Brooman, R. A., [*Gineston, J.*]. Aug. 1. [*Provisional protection only.*]

Bed-warmers; footwarmers.—A warming-pan, which by removing the handle may be used as a foot-warmer, is formed as a reservoir to contain hot water. The reservoir may be made of metal, porcelain, or other material. A filling-opening is closed by a screwed stopper provided with a rubber washer.

1928. Cowper, E. A. Aug. 5.

Heating air and other gases.—Relates to improvements in the arrangements and details described in Specification No. 1404, A.D. 1857, [*Abridgment Class* Furnaces &c.]. The invention is specially applicable to the heating of blast for blast furnaces and in other metallurgical operations, or for the heating of steam or gas to be used in distilling or boiling or for passing through coal, coke, or carbonaceous materials for the production of gas. In place of the cast-iron pipes which have been used in furnaces for the heating air, steam, or other elastic fluids, pipes of fireclay or other refractory material are employed. The pipes are lined or coated with glaze salt, oxide of iron, litharge, enamel, flux, porcelain, or other fine clay or other suitable close-grained substance that will not permit the transmission of gas through its sides. The refractory material prepared is fireclay, blacklead or materials such as are used for crucibles. Figs. 2 and 3 show views at right-angles to each other of one arrangement of gas-heating tubes disposed within a chamber through which gases from adjacent furnaces pass. The air or other gas is admitted to the pipes from

FIG.54.



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the trunk E, and is passed in a direction contrary to that of the furnace gases through the tubes D of each longitudinal row in succession until the firebrick-lined main F is reached. The communication between the pipes of each row is effected by bent pipes H, I. The lower connecting pipes I are carried on girders and are protected from heat by slabs K and by the admission of cold air to the chamber which contains them. Similar slabs form the roof of the furnace-gas chamber. To permit of the upward expansion of the tubes and at the same time to retain the tightness of the joints, the flanges of the bent connecting-pipes are pressed upon by curved springs O the compression of which is regulated by set-screws abutting against overhead girders L. Other methods may also be employed for retaining the

FIG.11.

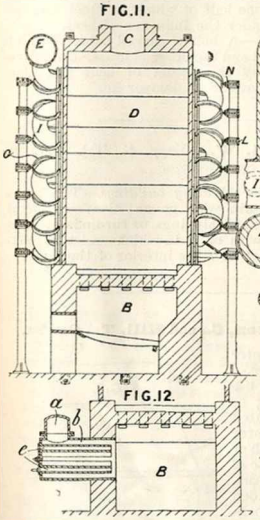


FIG.30.

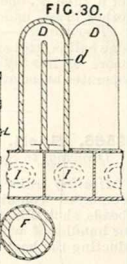


FIG.32.

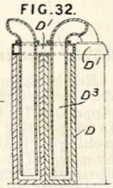


FIG.12.

connecting pipes in place. Thus, external springs may be dispensed with, in which case the bends may be secured in the same way as mouth-pieces are fixed to ordinary gas retorts, by means of T-headed bolts. Or, weighted bell-crank levers such as shown at O, in Fig. 36, may be used, the lever being carried by the girder L while the set-screw N is placed against the bend H. Coach-spring or spiral springs may also be used, or the bends themselves may be made flexible. When made of cast iron, flexible flanges may be provided, the joint being made by a cement of red lead and cast-iron dust which is placed in annular grooves on the abutting faces. In Fig. 42, the bend H is shown as constructed with thin metal disc chambers c which, for example, may take the forms shown in Figs. 44 and 51. Or, as shown in Fig. 49, the connecting-pipe H is formed of thin iron, steel or copper, with flanges *h* of cast iron, the springs O as before abutting against the girder L. Instead of employing the lower bends I,

FIG.2.

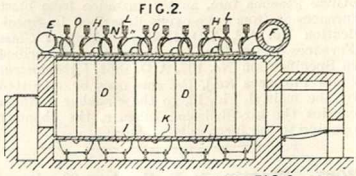


FIG.3.

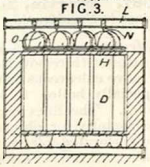


Fig. 2, cast-iron boxes may be used. They are made of such a way as to enable a man to enter for making the joints and for cleaning purposes. Fig. 11 shows the heating-pipes laid horizontally, the furnace grate B being below and the flue C above. The pipes are carried in the walls, as shown in Fig. 54, where they are enlarged are made of hexagonal shape. Pieces of fireclay are inserted between the contiguous hexagonal sides of the pipe, leaving spaces that are filled in with luting and with plugs. When the pipes are laid horizontally, they may be arched to enable them to carry their own

FIG.36.

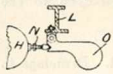


FIG.42.

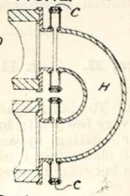


FIG.49.

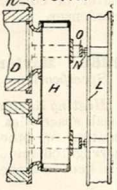


FIG.44.

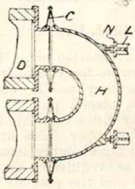
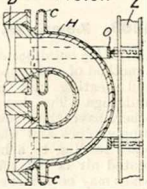


FIG.51.



weight. In order to distribute the air or gas over the interior of the tubes, loose blocks of various forms are placed in various positions in the tubes. The tubes may also take the shapes shown in Figs. 30 and 32. In Fig. 30, an ascending and descending pipe D is shown as made in one piece with the central partition *d* while in Fig. 32, the tubes are made up the internal

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descending column D and the outer close-ended chamber D, the latter carrying the fixed metal box D. The whole of the structure is bound together by suitable tie-rods and stays. To utilize gaseous fuel, as for instance from blast furnaces or from coke-ovens described in Specification No. 972, A.D. 1863, [*Abridgment Class* Furnaces &c.], or from gas producers as described in Specification No. 167, A.D. 1861, [*Abridgment Class* Furnaces &c.], the gas may be admitted by the main *d*, Fig. 12, to the chamber *b* which carries the air-admission tubes *e*, the chamber opening to the furnace B as shown.

2087. Martin, L. E. C. Aug. 22. *Drawings to Specification.*

Heating water.—A multitubular water heater is fitted with removable shelves and a filter so as to move calcareous and other matter from water, especially boiler feed water or the water in a boiler. The flues may be arranged vertically, horizontally, or obliquely. In one arrangement the perforated plates are arranged between the horizontal rows of smoke-tubes.

2116. Pragst, F. Aug. 27. *Drawings to Specification.*

Heating buildings; heating water and other liquids.—A portion of the steam from the high-pressure cylinder of a compound steam engine is utilized to heat buildings, dyeing-liquids, &c., the water of condensation being conveyed to the condenser.

2253. Riviere, H. Sept. 14. *Drawings to Specification.*

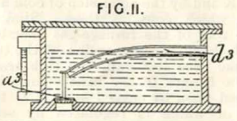
Heating liquids.—To obtain a large surface in a small space with very few joints, in a boiler, bath-heater, or other heating apparatus, bent or corrugated metal plates are used. The plates are bent in stages between dies or the like.

2266. Lewal, G. Sept. 16.

Heating buildings &c.; heating air.—Relates to a method of and apparatus for consuming smoke and heating and warming public and other buildings. Two boxes, placed parallel to each other, have their lower sides connected to air-supply pipes and their upper sides fitted with pipes leading to a hot-air chamber from whence heated air is led off as required; or the two boxes may be removed and the cold-air chamber fitted with pipes through which flame passes. Between the pipes is placed a coal chamber fitted with firebars, placed parallel to each other or in the form of an arch, in which coal is burnt. The Provisional Specification describes an apparatus in which the excess of smoke from the coal chamber is led below firebars fitted at the entrance of the two boxes mentioned above. To the front of these boxes also is attached the frame carrying the doors or slides through which fuel and air are supplied.

2383. Bailey, J., Blake, G. W., and **Bailey, W. H.** Sept. 28.

FIG. 11.



Steam traps.—The valve a^3 is operated to discharge the condensed steam by the straightening of a tube d^3, one half of which is steel and the other brass, under the influence of heat.

Thermostats.—A hollow curved tube, of which one half is steel and the other is brass, straightens more or less by the action of heat and thus operates automatically a damper &c.

2566. Snell, W., [*Yapp, G. W.*]. Oct. 20. *Drawings to Specification.*

Heating water; heating buildings.—The pipes employed contain wire gauze discs or metal beads, shot, filings, chippings, or turnings or nails or bundles of wire or rods, which assist in conducting the heat from the interior of the pipes.

2575. Garton, C., and **Hill, T.** Oct. 20.

Heating by water &c. circulation.—Apparatus for use in evaporating or melting is heated by means of water circulation with or without the use of heated air, steam, &c., and is provided with agitating-apparatus. Fig. 2 shows a transverse section of an evaporator B provided with heating-chambers I through which hot water is circulated; hot air, steam, &c. may be passed through the pipes or chambers J, or may be passed freely over the surface of the substance under treatment. The spindles C carry wooden rolls D bound by metal bands which bear arms F carrying archimedean screw vanes G.

FIG. 2.

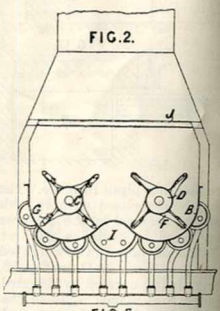
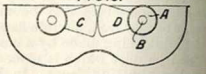


FIG. 5.



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The vapours produced are removed by a fan. Fig. 5 shows a transverse section of a pan for melting such substances as sugar, but applicable to the other purposes of the invention. The spindles B carry drums A each provided with one or more hollow or solid metal projections C, D, for breaking up the sugar. The pan is heated and otherwise arranged as in the other form of apparatus described above.

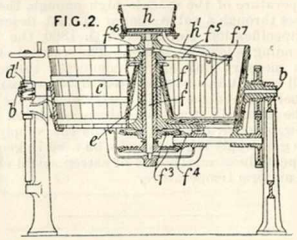
2846. Hargraves, E. Nov. 14.

Non-conducting coverings and compositions.—To prevent the escape of heat from the exposed portions of steam boilers, steam pipes, or other heated surfaces, they are covered with a mixture of plaster of Paris and water; or a fibrous substance, such as hair, is mixed with the plaster of Paris to cause it to adhere. The mixture is preferably composed of three parts of wood sawdust to one part of dry plaster of Paris with a little water.

2947. Carr, T. Nov. 23.

Heating liquids.—Relates to machinery for amalgamating or intermixing dry, semi-fluid, or aqueous materials, and for agitating solids with liquids for combining, dissolving, or washing the same. The materials are treated in a vat c supported on trunnions *b*. One of these carries a quadrant gearing with a worm d^1 so that the pan may be rotated for discharging purposes. A hollow pillar *e* in the vat carries hollow and solid shafts f, f^1 with arms f^5, f^6 upon which are bars f^7. The shafts are driven by bevel gearing f^8, f^9 so as to rotate in opposite directions. At the upper end of the shaft f^1 is fixed a vessel h supplying liquid to the vat by a pipe h^1 passing along one of

FIG. 2.

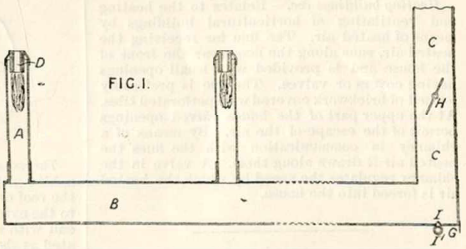


the arms f^6. When acid is employed the surfaces in contact therewith are covered with lead or other acid-resisting material. Among the modifications described is one in which the pan is heated by means of steam supplied to a false bottom or a coil of pipe by means of a pipe passing through the axis of one of the trunnions *b*, the condensed water being removed through the axis of the other trunnions.

3015. Clark, W., [*Subra, B.*]. Dec. 1.

Heating buildings.—Relates to means in combination with inverted or downwardly-inclined gas lamps, candles, and other lights for siphoning off the products of combustion and thereby maintaining the air supply for combustion and ventilating the room, and applicable to gas or other heating-apparatus. A means in combination with gas burners and applicable on a theatre stage is shown. The burners D are placed at the top of glass chimneys A secured in sockets on a horizontal pipe B, which is connected to a long vertical pipe C. The parts A, B, C constitute an inverted siphon. The pipe C is provided with a valve H and with an auxiliary burner I for starting the draught. In the part B, "any furnace may be "applied, which would possess the advantage of "being placed below the burner or burners, and

FIG. 1.



"thereby heated and lighted at the same time." In heating stoves, the burners are placed in the chimneys, in order to afford light, the products of combustion circulating in tubes for heating purposes.

3032. Clifton, R. L. Dec. 2. [*Provisional protection only.*]

Heating water.—Brewing is carried on in a vessel with four compartments, one above the other, of which the top one serves as a vessel in which water is boiled. The water is heated by means of a steam pipe fitted with a cock or valve to regulate the supply.

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3055. Varley, S. A., and **Varley, C. F.** Dec. 5. [*Provisional protection only.*]

Heating water; thermostats.—Boilers for heating conservatories, forcing-houses, &c., by water-circulation, consist of two or more water casings, connected to each other and placed one within another, and heated by a gas burner. In order to regulate the gas supply and cut it off when the temperature of the room is high enough, the gas passes through a valve similar to that described in Specification No. 2858, A.D. 1860, the inlet extending below the outlet. The valve is filled with mercury and spirit, connected through a small aperture, or separated by a vulcanized rubber film, and the spirit is expanded by the heat of the room till, at a temperature regulated by a screw plunger, the mercury cuts the supply off. This gas-supply regulator may be used in keeping the pendulums and pivots of astronomical clocks at a uniform temperature.

3082. James, H. B. Dec. 8.

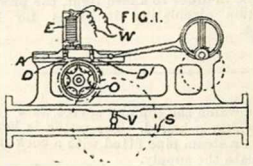
Non-conducting compositions for steam boilers, pipes, roofs, &c. The composition contains ivory black or lampblack, cow dung or the like, fullers' earth, chalk, or other earthy substance, Roman, Portland, or other cement, ordinary alkali, and a binding material, such as varnish, gums, &c. For covering cold surfaces, such as roofs, refuse railway grease or the like is added.

3094. Wason, P. R. Dec. 8.

Heating buildings &c.— Relates to the heating and ventilating of horticultural buildings by means of heated air. The flue for receiving the heated air, runs along the floor near the front of the house and is provided with small openings having covers or valves. The flue is preferably formed of brickwork covered with perforated tiles. At the upper part of the house valved openings permit of the escape of the air. By means of a chimney in communication with the flues the heated air is drawn along them. A valve in the chimney regulates the speed by which the heated air is forced into the house.

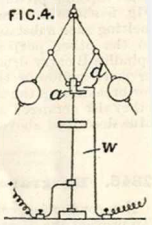
3096. Henry, M., [*Meynard, C. J. L.*]. Dec. 8.

FIG. 1.



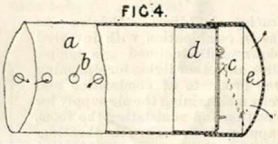
Thermostats.—Consists of electric means for operating throttle valves, slides and the like to regulate ventilation, pressure, temperature, &c. in conservatories, buildings, &c. To regulate steam pressure in steam engines for instance, a mercury gauge is connected to the steam pipe and arranged so that the mercury, on rising to a certain point makes contact between two previously insulated wires *w*, and energizes an electro-magnet E, Fig. 1. Two ratchet-wheels rotating in opposite directions are mounted beneath the carrier A of the magnet, which carrier in its reciprocation, drives one or other of the wheels by clicks D or D', thus gradually opening or shutting the valve V through suitable gearing O, S. The click D is lifted out of its operating position by the energizing of the magnet but falls again when the current fails. The wheel O may take into a rack to operate a sliding valve. Circuit may be made at the governor if one of the wires is bent over as shown at *d*, Fig. 4, to come into contact with a ring *a* on the shaft when the speed rises.

FIG. 4.



3124. Epps, A. Dec. 11.

FIG. 4.



Thermostats.—To regulate the temperature in a kiln or building, a tube *a*, Fig. 4, is fitted near the roof or ceiling or near the floor. It is open to the external atmosphere and is provided at each end with a perforated cap *e*. The tube is perforated as shown at *b* and is provided at either or at both ends with a hinged valve *c*, opening outwards or inwards, according as the tube is at the upper or lower part of the apartment. These valves are stated to open automatically, when the chamber becomes overheated, for the admission of cool air or the discharge of hot air. They may be fitted with adjustable weights.

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3196. Saunders, R. Dec. 18. *Drawings to Specification.*

Non-conducting coverings for buildings and parts of buildings, carriages, ships' bulkheads, &c. and formed of coco-nut waste or dust &c. packed between iron sheets supported by grooved wooden or iron standards.

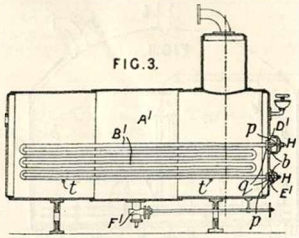
3278. Wilson, W. Dec. 28. *Drawings to Specification.*

Heating buildings.—Consists in the application of cast metallic tiles, slabs or segments, having embossed or relieved patterns or designs, for ornamenting the exterior surface of hot water and steam pipe "coil-cases." The tiles may be bronzed, polished, or enamelled, and they may be constructed to form frames to receive ornamental glass, china or other material. They may be held by headed studs which engage in holes and slots, or by any other means, or they may be embedded in cement, in the manner of ordinary earthenware tiles.

3294. Vanderfeesten, J. M. Dec. 29.

Heating liquids.—A close or open vessel suitable for heating, boiling, evaporating and distilling, *in vacuo* or otherwise, is fitted with horizontal or inclined coils of steam pipes, which are supported on frames with hollow rollers and are arranged to be removed or replaced as required. The boiler or receiver A^1 is provided with a number of coils B^1, consisting of straight pipes connected by curved junctions, and communicating by means of lateral openings *b* with the steam boiler through the pipe D^1, and with a pipe E^1 for drawing off the water of condensation. At their ends the pipes are provided with solid shanks *p*,

FIG. 3.



screwed to receive the nuts H by means of which the collars *q* formed on the pipes are tightened against the back of the receiver. The pipes may be removed through the doors or plates secured by nuts and bolts to the front of the receiver; and each coil rests on its own rollers *t* which turn on rods attached to forked brackets at the sides of the receiver. The inlet for the matters treated in the receiver is placed between the two rows of orifices D^1, E^1, and both the inlet and the outlet F^1 are furnished with stop-cocks. In a modification, the passages D^1, E^1 are dispensed with and the ends of the coils B^1 communicate through short junctions with vertical pipes, and are fitted with nuts working on the junctions.

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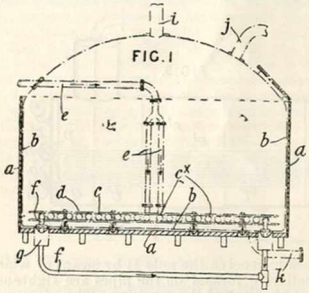
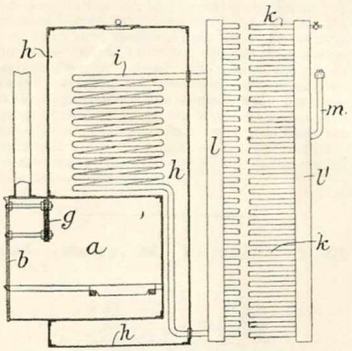
A.D. 1864.

101. Murphy, W. J. Jan. 14.



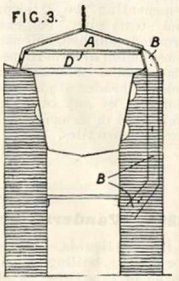
Boiling-pans.—A steam brewing-copper consists of a thin copper vessel *b* placed inside a wooden "back" *a*, lined with hair felt. A coiled copper steam pipe *c*, *c**, is fastened to the bottom of the vessel by bolts and holding-down bars *d*. Steam enters through the pipes *e*, and leaves by the pipes *f*, which are protected, when they leave the vessel, by jackets *g*. Liquid is fed through the pipe *j*, and discharged by the cock *k*. Vapours formed pass out through the pipe *i*.

342. Perkins, A. M. Feb. 9.



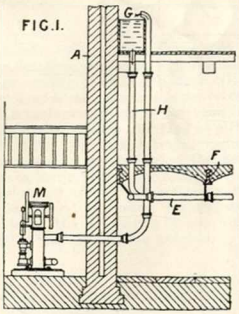
Heating buildings; heating water.—The water, circulating in the system of the tubes *k*, is heated in the coil *i*, which is surrounded by the water of the boiler *h*, into which the firebox *a* projects. The water in the tubes *k*, placed in the room or building to be warmed, is raised to the desired temperature by placing salts in the boiler water or by closing the boiler and fitting a safety valve. The tubes *k* may be connected by jointing into pipes *l*, *l*¹ at each end, as shown, or by any other means. Water is poured in the apparatus at the pipe *m*, which is so arranged that the upper tubes *k* are not filled. The plate *g* fitted to the furnace door prevents the direct passage of the draught to the flue.

357. Faget, J. M. Feb. 11.



Boiling-pans.—The metal or wooden cover A encloses the top of the boiler or cauldron, and also the orifice of a channel B, in the brickwork, which conveys the emanations and gases from the boiler to the ashpit. The ashpit and fire doors are hermetically closed, air being admitted through adjustable slides in the cover, or the cover may be raised by a wedge or screw for the same purpose. A circular inclined slot D is fitted inside the cover to "receive and expel" some products, the condensation of which is of little importance.

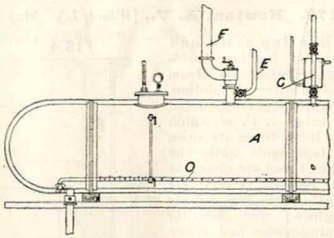
361. Denny, A., and **Denny, E. M.** Feb. 11.



Heating buildings, &c.—Bacon-curing houses are heated in winter by circulating hot-air

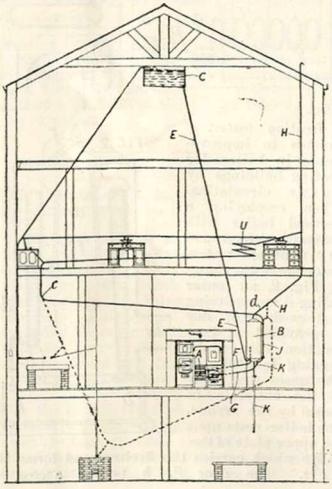
steam, or a heated liquid pipes E, suspended from the beams F of the ceiling. The heated liquid is raised by a pump M into a tank G; it then descends the pipe H, traverses a series of parallel pipes E, and thence passes to the boiler. To minimize external influences, the walls are made hollow.

552. Manbré, A. March 4. *Disclaimer.*



Digesters.—Glucose or grape or starch sugar is obtained by treating starch or fecula with dilute sulphuric acid at about 320° F. The operation is carried out in a wrought iron vessel A, lined with lead to prevent corrosion, and jacketed with sand or other non-conductor. Steam is admitted for heating purposes through a perforated leaden pipe O, the excess being allowed to escape through the pipe E. The starch &c. is supplied through the pipe G.

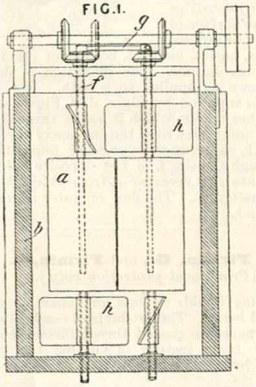
613. Wilson, W. March 11.



Heating water.—To prevent explosions due to the freezing and subsequent thawing of the water supply to a hot water boiler, a hot water cylinder B is connected to the flow and return pipes F, G of the boiler A and to a vertical pipe having a glass section J to show the height of the water in the cylinder. The hot-water cylinder B is connected by a pipe E to the cold-water supply cistern C above which extends the open end of an expansion pipe H. Sediment is discharged through a valved pipe K. Linen or clothes may be dried or towels hung on rails U.

639. Parkinson, T., Taylor, F., and **Burton, T.** March 14.

FIG. 1.



Heating liquids.—Liquids for sizing, dressing, and dyeing yarns and fabrics are boiled and mixed in a vessel *b*, in which copper or other steam cylinders *a* and agitators *h* are caused to revolve in the same or opposite directions by bevel or spur gearing. Steam is supplied to the cylinders through pipes *g* passing through the journals of the axles *f*, and the condensed water escapes through the lower journals to the ordinary condensing-box.

679. Griffiths, J., and **Jaffrey, J.** March 16. [*Letters Patent void for want of Final Specification.*]

Heating water.—Relates to alarms for indicating a deficiency of water in cisterns or in boilers used for domestic purposes. A vessel is arranged at about the normal water level so that it communicates with the water in the cistern or pipes above the said level, and within it is placed a float which, when it rises, closes a mushroom valve and prevents the further entry of the water. When the water descends, the valve opens and releases a catch of the alarm mechanism

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and by so doing allows a ratchet wheel of clockwork mechanism to revolve and strike a bell. In place of the mushroom valve, an elastic diaphragm may be used and, instead of a bell, a pointer or plate may be moved.

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699. Heywood, C. March 19.

FIG.2.

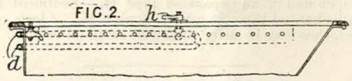

FIG.1.

Boiling pans.—Relates to apparatus for removing scum or impurities from the surface of water or liquids, in baths, basins, cisterns, boilers or other vessels containing liquids. The invention is described and shown as applied to a bath. Hot or cold water is supplied by pipes *d*, *d*, Figs. 1 and 2, to a chamber *e*, from which it issues through perforations, and passes over the surface of the water in the bath, carrying scum or other impurities with it through the slot *f*, in the opposite side of the bath, into the receiver *g*, from which it escapes by a waste pipe. The flow of water is controlled by a tap *h*.

---

716. Firmin, G., and **Firmin, C.** March 21. [*Provisional protection only.*]

Heating liquids in vats or tanks for steeping flax and hemp. The products of combustion from the furnace are passed through iron pipes in the vat or tank, instead of heating the contents thereof by steam as usual.

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773. Robbins, J. March 29. *Woodcut.* [*Provisional protection only.*]

Digesters, used for treating animal or vegetable matters with steam, hot air, or vapour in making manures, are arranged so that these gases or vapours may be passed from heating chambers first into one, then into another, of the digesters.

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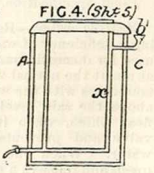
791. Smith, T. J., [*Haeck, F.*]. March 30.

FIG.4. (Sheet 5)



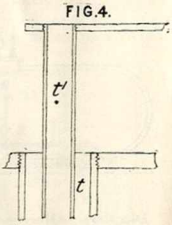
Heating liquids.—Portable apparatus for rapidly heating water, wine, beer, &c., consists of a wooden or other non-conducting casing A containing two concentric vessels. The liquid to be heated is introduced through the funnel C to the space *x* which is surrounded on all sides by the heating-medium.

904. Gedge, W. E., [*Maumenée, J. F.*, and *Dalifol, A.*]. April 11. *Drawings to Specification.*

Heating air.—Air used to cool a steam engine condenser may be employed to heat buildings and for drying purposes.

1178. Newton, A. V., [*Wiart, L.*]. May 9.

FIG.4.



Heating gases and liquids; heating buildings; heating by steam and by water circulation.—Apparatus constructed of tubes *t*, t^1, of which the inner tubes are open at both ends while the outer tubes are closed at the bottom, is used for heating air for hot-air engines; for heating drying-places and other buildings by hot air, water, or steam; for heating gases and vapours to a high temperature, and for transferring the heat of hot beer, dirty water, &c., to clean water surrounding the apparatus.

1400. Crook, B. E. M. June 6.

FIG.10.

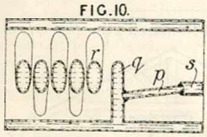
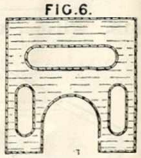
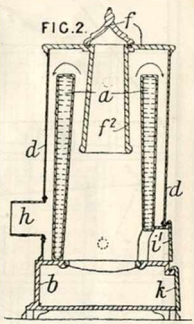


FIG.6.



Heating water.—Relates to improvements in boilers for heating buildings by water circulation. When employing a vertical boiler with central fuel-feed *f* and an annular water-space *a*, such as shown in Fig. 2, an outer casing *d* for enclosing a down-draught flue is provided in conjunction with a depending fuel-tube f^2. The gases pass away to the outlet *h* as shown by the arrows. The boiler rests upon the upper plate of the base *b* which carries the firebars and forms the ashpit *t*. The door i^1, *k* permit access to

FIG.2.



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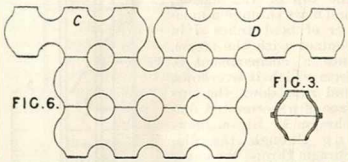
the fire and ashpit respectively. Suitable openings into the boiler at the desired levels provide for the circulation of the water. Another form of iron-welded boiler with transverse flues is shown in Fig. 6, while in the form shown in Fig. 10, the cylindrical boiler is provided with conical cross-tubes *r*, water-bridge *q*, bars *r*, and deadplate *s*.

1424. Johnson, J. H., [*Harrison, J.*]. June 8.



Heating buildings; heating water.—In boilers and hot-water apparatus for heating buildings constructed as described in Specification No. 1970, A.D. 1859, the "units of construction" therein described are stamped in halves, which are afterwards joined together as shown in Fig. 3. These units are made to comprise three or more globular chambers in a row, as shown at C and D, Fig. 6, in order to give increased strength when breaking joint.

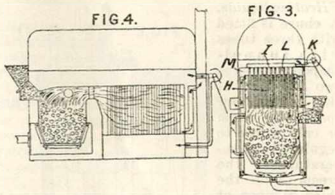
1606. Perks, W. June 27. *Drawings to Specification.*

Heating liquids.—The beverages delivered by any of the pumps of a beer-engine may be heated during delivery by hot water placed in an ornamental urn, which stands on the counter and is fitted with cocks attached to the various pump delivery pipes.

1615. Bodmer, L. R., [*Brown, C.*]. June 28. [*Provisional protection only.*]

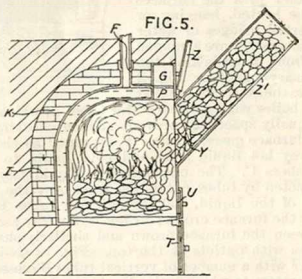
Boiling-pans; heating air.—In an apparatus for washing and cleansing linen and other articles, a wood-lined cast-iron pan is hermetically sealed by a plate iron cover, which presses on an india-rubber packing ring lying in a groove in the upper edge of the pan. Wooden gratings are provided in the cover and pan, between which the articles are placed. The air is exhausted and an alkaline solution run in through pipes having valves opening outwards and kept closed by weights. The air cock is then opened and the liquor drawn off, after which the vat is again exhausted. Steam, softened hot and cold water are next in turn run into the vats. The air for the drying-closets is heated by passing through tubes heated by waste furnace gases.

1663. Palmer, G. H. July 5.



Heating liquids. Relates to means for producing forced or natural circulation of liquids in heating vessels and consists in the arrangement of tubes H, Fig. 3, (which shows the application of such means to a steam boiler) above the furnace and feeding them with water by means of tubes L arranged within them, and connected at their upper ends with a chamber I, which is supplied with feedwater or with water from the upper part of the boiler, by a rotary pump K. Circulation is further promoted by arranging a cylinder M in the body of the boiler, or by connecting the chamber I, by means of tubes, with the lower part of the boiler. In the boiler shown in Fig. 4, water tubes behind the furnace are connected at their lower ends to a chamber which is supplied with feedwater or with water from the upper part of the boiler by a rotary pump.

2000. Milbank, J. Aug. 11.



Heating water. A hot-water apparatus, for heating conservatories and other buildings, consists of a saddle-shaped boiler arched at the back and sides, and heated by a fire contained in the interior, the front being enclosed by a plate provided with suitable doors. The boiler is surrounded by a flue-space around which the products of combustion circulate. Hot water leaves the boiler by the pipe F, and cold water returns by two pipes entering at opposite sides of the boiler near the bottom.

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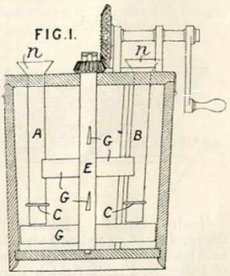
2008. Haseltine, G., [*Jebb, T. A.*]. Aug. 12.

Heating liquids. A churn is fitted with three tubes with funnel-shaped mouths *n*, two A closed at the bottom for containing warm or cold water to regulate the temperature of the cream and the third B open at the bottom for admitting air into the body of the cream.

FIG. 1.



2088. Cochrane, A. A. L. P. Aug. 24.

FIG. 1.

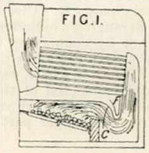
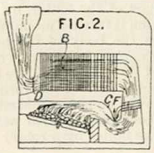
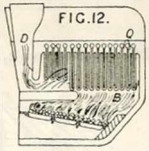


FIG. 2.



Heating liquids. To cause the heated products of combustion in a boiler furnace to be retained in contact with the surfaces to be heated, hanging or inverted bridges or water chambers C, D are arranged in front of or behind the ordinary bridges. Fig. 2 shows the invention applied to a boiler with vertical water tubes B, which are unequally spaced to prevent sudden checking of the furnace gases. Tubes F, arranged as shown, convey hot liquid from and cold liquid to the chambers C. The circulation of liquid may be promoted by tubes extending from near the surface of the liquid, and through the tubes B, to near the furnace crown; or hot water may ascend between the furnace crown and similarly-shaped plates with outlets at the top. Fig. 12 shows a boiler with a number of vertical tubes B closed at the bottom, to which cooler liquid may be supplied through pipes Q suspended centrally in them. In another modification, these water tubes are replaced by longitudinal flat cellular chambers in which circulating plates or pipes may be suspended. According to the Provisional Specification, cones or deflecting surfaces are applied to the upper ends of the vertical water tubes to diminish the priming effect.

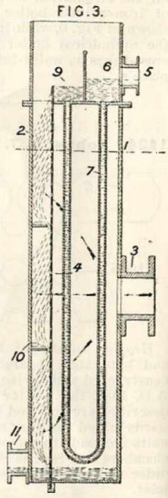
FIG. 12.



2213. Brodie, D. Sept. 10.

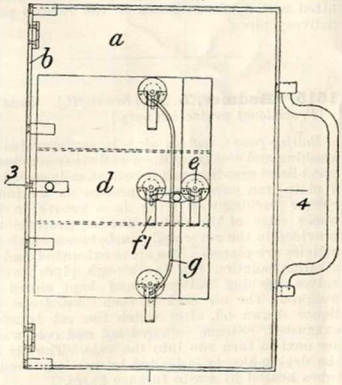
Heating water.—Waste steam, which may be exhaust steam from an engine, is utilized for heating water, by admitting it through a pipe 3 into a casing 1, 2, through which the water to be heated is passed. Water enters by a pipe 5 into a compartment 6 at the top of the casing, and flows through a number of bent tubes 7 in contact with the steam, into a compartment 9, from which it overflows, and runs down the surface of a perforated diaphragm 4. Steam blowing through the diaphragm throws the water against the side of the casing, and on to shelves 10. The water finally passes away in a heated state by a pipe 11. The steam is wholly or partially condensed, and any uncondensed steam may escape to the atmosphere; or the upper part of the casing may be closed, and fitted with an air inlet valve and a valve to open outwards when the pressure exceeds a certain amount.

FIG. 3.



2353. Hattersley, R. Sept. 24.

FIG. 1.



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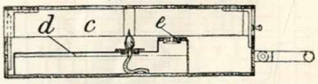
Footwarmers; hot-water bottles.—Consists in arranging one or more oil or spirit burners in a metallic casing forming the warmer. Fig. 1 is a plan with the lid or cover removed; Fig. 3 is a section on the line 3—4 of Fig. 1. The metal casing *a*, fitted with a hinged lid *b*, has openings left at c for the admission of air to support combustion, The oil is stored in a reservoir *d* having a raised portion in which an air inlet *e* is fitted. When the apparatus is being carried about, slides f^1 are forced over the wicks and are held down by spring arms *g* to prevent leakage. The cover may be replaced by a vessel containing water.

FIG. 3.



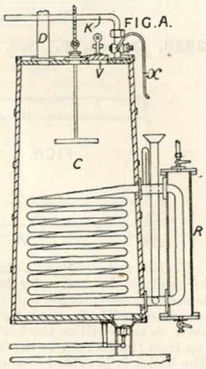
2545. Robinson, E., Washington, G., and **Smith, G.** Oct. 15. [*Provisional protection refused.*]

Heating liquids.—Liquids are heated by means of a spiral tube or pipe connected with the "hot-"air pipe" from a furnace and the steam pipe from a boiler. The steam pipe is passed through the furnace.

2635. Bousfield, G. T., [*Bacon, S. T.*]. Oct. 24.

Heating liquids.—In a special process for collecting from fermenting washes carbonic acid for use in making aërated bread according to the system described in Specification No. 2293, A.D. 1856, [*Abridgment Class Cooking &c.*], the fermenting tun C is fitted with an attemperator consisting of a spiral coil the upper and lower ends of which are connected by a vertical pipe passing through a cylinder R. The coil is filled with water, and steam or cold water admitted to the cylinder.

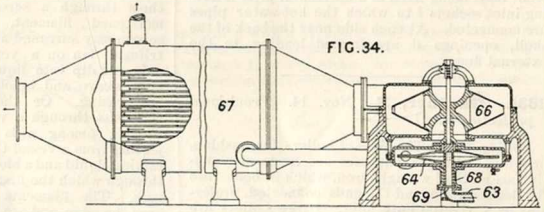
FIG. A.



2666. Laidlaw, D., and **Robertson, J.** Oct. 28.

Heating air for ventilation or drying purposes. A fan 66 forces air through a tubulous air-heating apparatus 67, so that it is heated by the exhaust steam of the turbine 64 for driving the fan.

FIG. 34.



2691. Davies, G., [*Grandjean, P., Henon, L., Colas, A.,* and *Colas, M.*]. Oct. 31. [*Provisional protection only.*]

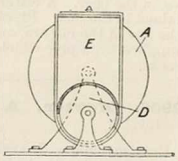
Foot-warmers.—Railway carriage foot-warmers are heated by air supplied by pipes connecting them to an air-heating apparatus on a van at the head of the train.

2748. Estourneaux, A., and **Beauchamps, L.** Nov. 7.

Non-conducting compositions.—Steam boilers and cylinders, steam pipes, pumps, cylinders and pipes containing water and other liquids, and apparatus of any kind which it is required to protect from radiation, are coated with a composition consisting of "glutinous earth" free from sand, fireclay, rye flour, boiled linseed oil, cows' or other hair, and water.

2811. Thurgar, W. C., and **Ward, R. A.** Nov. 11.

Methods of heating; heating water.—Heat is developed by moving surfaces of metal, wood, cloth or material against the sides of a boiler or container, or against blocks attached to it. The moving blocks may



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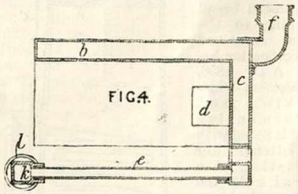
be put in motion by a steam engine, manual power, or otherwise. In one form of apparatus for carrying out the invention, the revolving block D, moving in contact with the inside of the boiler E, is rotated by a spring contained in the barrel A.

2828. Jones, T. Nov. 12.



Heating water.—Saddle-shaped boilers, suitable for applying hot water for heating buildings, hothouses, conservatories, and for similar purposes, are fitted with flues on the outer sides of the shell, so as to utilize the heat of the gases escaping from the furnace in the interior of the boiler. The boiler is provided at each side with a wing of rectangular section, and at the end with a hollow portion *c* having an outlet *f* leading to the hot-water pipes. This hollow piece *c* is connected by vertical pipes to a horizontal pipe which receives the back ends of the hollow firebars *e*, the front ends being fixed in a horizontal pipe *k* having inlet sockets *l* to which the hot-water pipes are connected. At each side near the back of the shell, openings *d* are formed leading to the external flues.

2834. Gardner, R. Nov. 14. [*Provisional protection only.*]

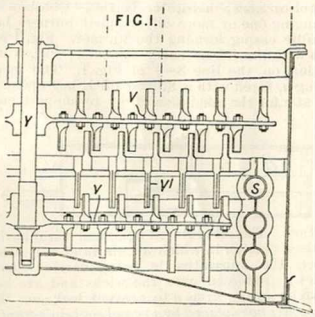
Boiling-pans.—The sides of boilers for washing, brewing, and other purposes are made of a continuous plate of wrought iron, which is bent into the desired form, and the ends connected, preferably by a riveted butt joint. Large boilers are made by joining plates, shaped and connected as above, one above the other.

2869. Grimes, R. G. Nov. 17. *Drawings to Specification.*

Heating liquids.—The cylinder of a beer-engine pump passes through a box or chest into which hot water, steam, or hot air may be passed so as to warm the beer. A cistern for water is also contained in the box. Pipes and cocks connect with the box of the cistern, and the heating medium is supplied by a pipe which screws on one of these cocks.

2906. Newton, A. V., [*Rostand, C.*]. Nov. 22.

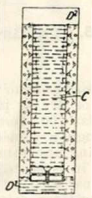
Heating liquids.—In sugar manufacture, partially boiled syrup is mixed with granular or raw sugar



at 70° C. The vat, heated by steam coils S or a suitable jacket, is formed with radial bars V^1 armed with vertical blades, between which pass the blades on the arms V of the stirring-shaft Y.

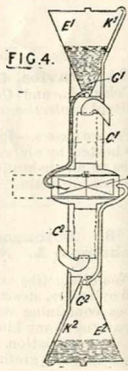
2937. White, J. Nov. 24.

FIG.3.



Heating air and other gases.—Air and other gases are moistened, purified, heated and cooled by drawing them through a screen of moistened filament. The screen may surround a centrifugal fan on a vertical axis and dip into liquid in trays above and below the fan casing. Or the air may pass through a vessel, Fig. 3, among gills projecting from a vessel C containing liquid and a block D^2 through which the filaments pass. The filaments hang over the edge and are passed to and fro through holes in the gills. Fig. 4 shows a combined impact wheel and centrifugal fan in which the liquid that moistens the air drives the fan J in flowing from one vessel E^1 to another E^2 that takes the place of the former when it is empty. Air passes to and from the vessels by pipes K^1, K^2 and ball valves G^1, G^2 allow liquid to flow out by the pipes C^1, C^2, and in by the apices in the vessels. Mercury and other liquid may be used to drive the fan which is also described as mounted upon a horizontal axis.

FIG.4.



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3046. Richardson, R. Dec. 6.

Non-conducting coverings for steam boilers, pipes, cylinders, and other heated surfaces are formed of felt obtained by pulping rags and other non-conducting textile and fibrous materials, spreading the pulp on wire gauze &c., and drying.

3128. Salmon, P. Dec. 17. [*Provisional protection refused.*]

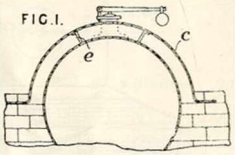
Footwarmers.—Railway and other carriages &c. are warmed "by the exhaust, or boiler or "expanded steam, hot water or air, conveyed in "tube from locomotive or other source." The heating-arrangements are modified in the different classes of compartments in all cases, main tubes may be laid along the floor or inserted in a space in the floor with a perforated wood or metal covering; "hot air from gas, perfumed or "plain wax candles may be introduced."

A.D. 1865.

4. Bevan, E., and **Fleming, A.** Jan. 2.

Boilers; non-conducting coverings.—Relates to jackets or protectors for preventing heat from being radiated from or communicated to vessels and structures containing solids, liquids, or gases. Instead of a solid palpable non-conductor of heat, such as charcoal, air or other gaseous fluids enclosed within a jacket or casing surrounding the structure are employed. Fig. 1 shows a boiler having a jacket *c* which is provided with suitable non-conducting distance and supporting pieces *e*. Where the temperatures are high and fluctuating, so that the air or gas is subject to variations of pressure, the casing may be provided with safety valves.

FIG. 1.



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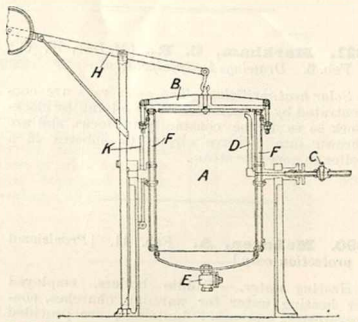
93. Lock, A. G. Jan. 11.

Digesters for use in extracting fats, and other bodies, from bones and other animal substances. The vessel A is mounted on trunnions, one of which serves for the admission of steam, and it is provided with a jacket F, lid B, and exit tap E. The extracted matter is either blown out through the cock E by the steam, or when more perfect extraction has been effected, by closing the steam



tap C and filling the jacket F with cold water, thus producing a vacuum. The tap E is opened and the contents of the vessel are discharged by removing the cover B by the lever H, and inverting the vessel by a screw and worm K.

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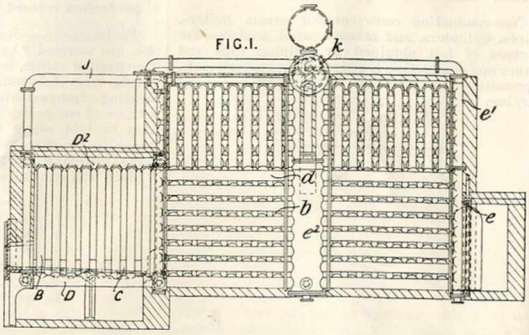
243. Twibill, J. Jan. 27.

Heating water. One form of a water-heater, which may be used for heating and ventilating buildings, or heating air for drying, or for the evaporation or crystallization of substances, consists of rows of tubes laid in the form of a Λ-shaped arch over a furnace. Fig. 1 shows one form of boiler, in which tubes B, connected to longitudinal side manifolds D and to one or more upper longitudinal manifolds D^2, are arranged above a furnace. The pairs of manifolds D, D^2 are connected by transverse pipes which are themselves connected so as to ensure circulation. The upper manifolds communicate by a pipe J with the heating apparatus. The return pipes are connected to the ends of the lower pipes.

FIG. I.



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255. Hughes, E. T., [*Beu, C.,* and *Boettcher, L.*]. Jan. 28. *Drawings to Specification.*

Heating air.—Air for drying wool &c. is heated by passing it through a number of tubes connecting the ends of a drum to which steam is admitted.

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321. Markham, C. R., [*McIvor, W. G.*]. Feb. 6. *Drawings to Specification.*

Solar heat, utilizing.—The sun's rays are concentrated by powerful lenses revolving by clockwork so as to be constantly in focus, and are thrown into concave circles or spheres in a boiler to generate steam.

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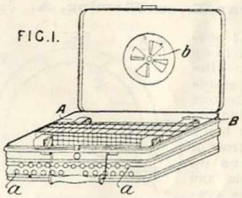
390. McLaren, A. Feb. 11. [*Provisional protection only.*]

Heating water. — Saddle boilers, employed for heating water for warming churches, conservatories, and other buildings, are provided with a water space which extends centrally between the two sides of the boiler. The space forms, with the boiler, flues, so that the products of combustion pass below the space to the back of the boiler, return above the space, and finally pass back over the boiler to the chimney.

477. Gedge, W. E., [*Stoker, F.*]. Feb. 20.

FIG. I.



Footwarmers.— The wire gauze case A, B contains a special fuel, which burns without smoke and flame. Holes *a* in one side of the warmer serve to admit air, while a regulator *b* in the cover or side serves to regulate the draught.

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493. Hulley, J. Feb. 22.

Heating water.—Boilers, particularly adapted for heating churches, chapels, mansions, horticultural buildings, schools, offices, warehouses, drying-rooms, and the like, are cast in separate parts *a*, *b*, *c*, *d*, with soot holes *p* to give access to internal flues and with sockets for connecting

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[1865

the parts of the boiler together. On the top of a boiler is mounted a dome *i*, Fig. 2, which is connected to an air or expansion pipe, carrying a safety valve, and to the hot-water pipes J. The lower part of the boiler, Fig. 12, consists of a casting in which hollow firebars *m* are cast with a hollow frame *a* through which water circulates. The casting is open at one or both ends, which are provided with recessed flanges and closed by plates screwed on to the ends. The bottom part of the horizontal internal flues is curved trans-

FIG.12.

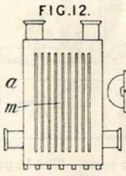
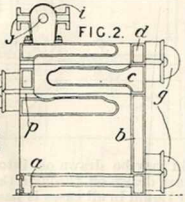


FIG.2.



versely so as to prevent the lodgment of soot in the bottom of the flue. The different sections are united by curved pipes *g* so as to form a continuous flue. In a modification, the top section is cast with a hollow back and sides, and fitted to the hollow firebars and frame shown in Fig. 12. The top of the boiler is covered with fireclay lumps or brick, and the whole is enclosed in brickwork, so that the products of combustion pass over the top and sides of the boiler. The boiler may be constructed of wrought iron, copper, or other metal.

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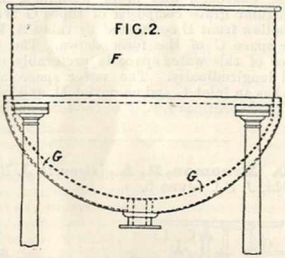
599. Brooman, R. A., [*Guillon, A.*]. March 3.

FIG.2.



Boiling-pans.—For heating a mixture of sugar and syrup, a double-bottomed pan F is employed, the space G being supplied with steam.

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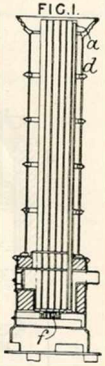
636. Perkins, L. March 7.

FIG.1.



Heating buildings &c.—Metal tubes *a*, closed at both ends and partially filled with water or other liquid, are used in apparatus for heating atmospheric air and other gases, for heating portable cooking ovens or drying or other rooms, or for heating and assisting the escape of foul gases in ventilating a building. In the apparatus shown, the ends of the tubes containing liquid are enclosed in a stove lined with firebrick and having a central grate *f*, and the parts of the tubes containing vapour are enclosed in a casing *d*. In a modification, a coil in a hot water tank or a room to be heated is connected to a blind coil immersed in boiling water.

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864. Le Roy, F. March 27.

Non-conducting compositions.—A cement for preventing radiation from steam boilers, pipes, or cylinders, or the like, is composed of slimy glutinous earth, fireclay, sand, coal ashes, wood charcoal, wood sawdust, cow hair, wheaten flour, water, and cotton foot oil or similar fatty matter. The ingredients are mixed together so as to form a paste.

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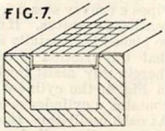
989. Welch, E. April 7.

FIG.7.



Heating buildings &c.—Churches, drying-sheds, &c. are heated by the passage through them of brick flues with iron tops and trellis gratings, as shown.

1144. Clark, W., [*Neyret, Orioli, Fredet*]. April 24.

Boiling-pans. Fabrics are heated under pressure, with ammonia solution, in a closed vessel which may be arranged over an open fire. The fabrics are enclosed in a centrally-arranged perforated vessel.

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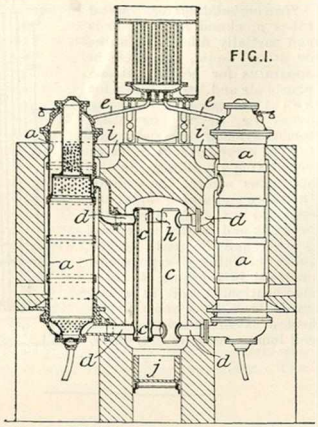
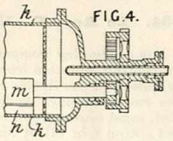
1168. Cabasson, F. D. P. J. April 26.

FIG.1.



Digesters.—Relates to apparatus for disintegrating vegetable and animal substances, especially green weed or genista for the production of filaments and fibres. The materials, introduced into cylinders *a* provided with perforated top and bottom receivers, are heated by the circulation of alkaline liquor through pipes *d* and annular boilers *c*. For regulating the temperature of the liquid, the boilers are enclosed in a chamber which is heated by a movable fireplace *j* and whence fumes escape by a flue *h*, while air may be admitted through openings *i*. The fireplace runs on rails and may be moved by a rack. Pipes *e* convey steam from the cylinders to a condensing-apparatus. If desired, the cylinders may be placed horizontally and be made to rotate so that the friction produced by spheres placed therein may assist the disintegration. As shown in Fig. 4, the cylinder *k*, oscillated on its axis, contains a cylinder *m* engaging a cutting-plate *n*. At each oscillation, the direction of the rotation of the smaller cylinder is reversed by the toothed gearing.

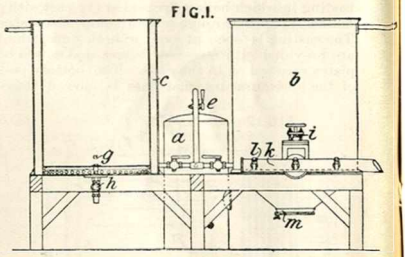
FIG.4.



1453. Sequelin, S. May 27.

Heating liquids.—Oils and fatty matters which are to be used for lubricating purposes are purified by being heated together with a small quantity of potassium iodide. The mixture is introduced into the vessels *b* and heated by means of the steam jackets *c*, the steam being supplied from the boilers *a* through the taps *e*. The impurities are precipitated and the clear liquid drawn off through the taps *g*, while the impurities are removed through the larger outlet *h*. Alternatively, a sliding valve may be provided worked by a screw *i* and in connection with a pipe *k*, the latter having several taps *l* by which the clear

FIG.1.



liquid may be drawn off into cans. The impurities are drawn off through the outlet *m*, and the clear liquid in all cases is passed through a sieve or filter.

1510. Knight, F. June 1.

FIG.1.

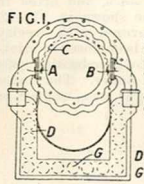
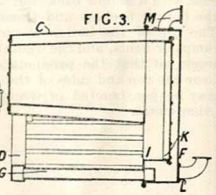
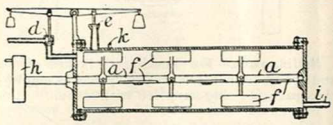


FIG.3.



Heating water.—A boiler, for use in heating hothouses, churches, and other buildings, has a rectangular grate composed of tubes G secured to a hollow front D connected by tubes A, B to a water space C of the form shown. The outer surface of this water space is preferably corrugated longitudinally. The water space at the back has an inlet L and an outlet M, and is built up of three sections I, K, F of the form shown.

1540. Brooman, R. A., [*Bennett, J. B.,* and *Gibbs, J. S.*]. June 5.



Digesters for heating and mixing the fat and lye in soap-making. A horizontal cylinder, heated in any convenient manner, is fitted with a central

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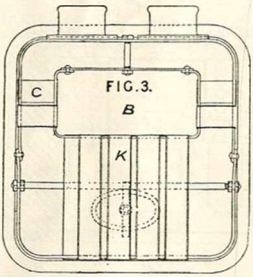
shaft *a* driven by a pulley *h* and carrying beaters *f*. The material is pumped in through a pipe *i* and escapes by the valve *d*, and the process may be either continuous or intermittent. A mercury bath *k* made of gas pipe is screwed into the cylinder and serves for the insertion of a thermometer.

1614. Ormson, H. June 14.



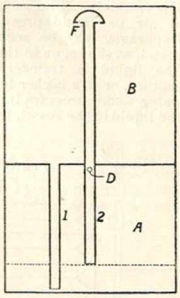
Heating water.—A boiler suitable for conservatories, hot-houses, &c. is shown in transverse section in Fig. 3. It is traversed wholly or partly by a large flue B, connected by vertical tubes K with an external furnace and by horizontal tubes C with a flue passing over the top of the boiler to the chimney. The heating surface may be increased by extending the sides of the boiler downwards to form the furnace walls and fitting them with smoke tubes.

1775. Longbottom, J., and **Longbottom, A.** July 5.

Non-conducting coverings and compositions.—Relates to the manufacture of an elastic material or composition, which may be used for ice bins and other purposes. It may be rolled, moulded, or otherwise shaped, or for additional strength, layers of fabrics, wood, or metal may be inserted between two or more thicknesses of the material. To a solution of india-rubber and ground shellac in coal-tar naphtha, is added a mixture of water, alum, ammonium sulphate, boracic acid, glue, molasses, linseed oil, and ammonium chloride. The blended solutions are then mixed with woody or fibrous material, prepared by heating flax, cloth, flock, or silk waste, hemp, cotton, blanket, plush, velvet, wool, hair, peat, cork, ground leather, or rags &c. in a solution of the double sulphate of potash and alum, sulphate of iron, and borax, and for this purpose, the machine is preferably enclosed in a steam jacket on the principle of the mixing-machine described in Specification No. 11,136, A.D. 1846. On leaving the mixing-apparatus, the homogenous mass is worked in a heated masticator, passed through a series of rollers kept at gradually-decreasing temperatures, and finally submitted to a cold bath of metallic salts.

1816. Dunfrené, H. A., [*Massot, F.,* and *Juquin, A.*]. July 8.

Boiling-pans. An apparatus for obtaining a circulation of hot water for washing linen, and for other purposes, consists of two tanks A, B containing tubes 1, 2, one of which leads from the upper vessel nearly to the bottom of the lower vessel, while the other tube terminates at the top of vessel B in a cover F, provided with openings in its under part, and opens into the vessel A at a level above the bottom of the first tube. The water is placed in the vessel A, which is heated from underneath. The pressure of the steam produced causes the liquid to rise through both tubes, into the vessel B. When the level of the water in A reaches the bottom of the tube 2, the steam will escape through this tube, and the water will return to the vessel A, the remainder of the steam escaping by the hole D in the tube 2.



1833. Dufrené, H. A., [*Tellier, C.*]. July 11. [*Provisional protection only.*]

Heating by chemical action.—The heat obtained by burning metals, such as iron and zinc, and other substances in oxygen is applied to melting iron, to moulding and to the preparation of moulds and of ignots for the forge.

1992. Boulton, M. P. W. Aug. 1. *Drawings to Specification.*

Heating gases.—Gases are heated by rods or plates &c. which are alternately dipped into and raised from heated liquid, or by revolving discs partially immersed in heated liquid.

2096. Westley, R. A. W., [*Pinkus, H.*]. Aug. 14.

Heating-apparatus, and methods of heating.—Fluids, such as naphtha or petroleum, &c., for heating purposes &c., are stored, preserved, and raised and discharged from one vessel or tank to another by apparatus such as that shown in Fig. 5 (Sheet 1). The fluid or liquid is stored in an air-

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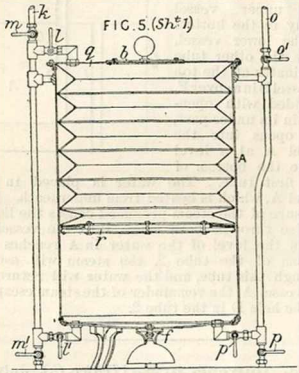
tight vessel A, which may be of the form of a tank, as shown, or of a cask &c., of wood, metal, glass, earthenware, or other material. The vessel, which may have a hinged top, or a fixed head, provided with a manhole *b*, is fitted with an expanding and collapsable diaphragm *f*, impervious to water or air, such as described in Specification No. 8207, A.D. 1839, and having a solid floating head or disc *r*, which may be packed by a ring expanded by air or liquid pressure, or otherwise. The diaphragm may be secured to the top of the vessel, as shown, or to the bottom, or the middle. The liquid is transferred from one vessel to another, or to a higher level, by admitting air or water under pressure into the diaphragm, above the liquid in the vessel, by means of a pipe *k*, con-

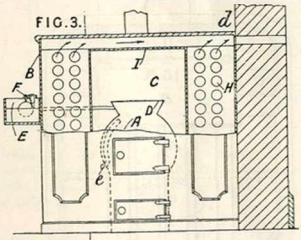


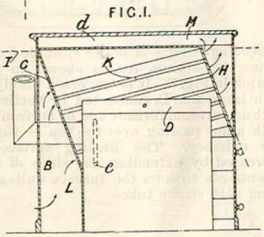
nected with the vessel, as shown, and with the air or water main, and provided with valves *l*, *m*, l^1, m^1, the liquid &c. being discharged through the pipe O, provided with valves o^1, *p*. The vessel may be flushed by opening the valve l^1, and the valve m^1 may be used for discharge. The vessel may be fitted with the liquid &c. by a reversed process. A discharge cock *f* is fitted at the base of the vessel to carry off the dregs. The disc *r* may be also actuated by mechanical means, a main discharge tap or cock being fitted to the side of the vessel. The disc may be adapted to receive a closed pan containing hot water or ice to regulate the temperature. Parts of the apparatus may be omitted or modified.

2184. Curley, E. A. Aug. 25. [*Letters Patent void for want of Final Specification.*]

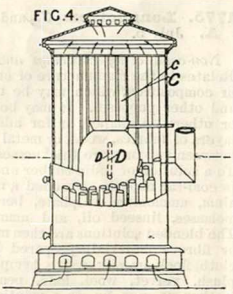
Heating liquids; thermostats.—An apparatus used to maintain a uniform temperature in a carburetting-apparatus, stoves, ovens, hot-houses, sick rooms, &c. comprises a chamber which contains a liquid and is heated by a flame, controlled by an automatically regulated valve. The valve is connected to a rod, which is contained by a tube, of different material, fixed inside the chamber, and the supply pipe is fixed to the tube; a variation in temperature of the liquid alters the relative lengths of the rod and tube and the flame is raised or lowered. The initial length of the rod may be adjusted by a screw in order to determine the constant temperature.

2255. Newton, A. V., [*Bulkley, H.*]. Sept. 1.





Heating air.—Apparatus for heating air for dwelling houses green-houses, and other buildings, by means of an atmosphere of steam, consists of a casing B, Figs. 1 and 3, containing a fire chamber A, and a chamber C, enclosed by tubes plates H, G and a top plate I, for containing steam generated in a shallow pan D on the top of the fire chamber; the steam is utilized for heating air, which flows from a cold-air chamber L, through tubes K, into the hot-air chamber M, and thence passes through openings *d* in the casing B to the place to be heated. Any excess steam in the chamber C



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passes through a pipe *e* into the fire chamber. The pan D is fed with water from a reservoir E, fitted with a ball cock F for maintaining the water in the pan at a constant level. A cylindrical stove constructed on the same principle is shown in Fig. 4. The fire chamber D is surrounded by vertical tubes C, through which air passes as shown by arrows.

2292. Parker, A. W. Sept. 6. [*Provisional protection only.*]

Heating water.— The temperature of a tepid bath is maintained by the heat absorbed by the water in the condenser of an ice-making and refrigerating apparatus.

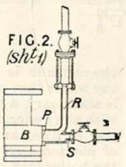
2361. Blundell, W. Sept. 15. [*Provisional protection refused.*]

Heating liquids.—The heating medium, which may be hot water, hot air, steam, or the like, is passed through a number of chambers, capable of being lowered bodily into, or removed from the liquid to be operated on.

2385. Fletcher, J. Sept. 19.

Heating water.—Steam and water are admitted to a tank for dissolving sugar through a chamber B fitted with a blending apparatus, shown in Fig. 2 (Sheet 1), consisting of a pipe P with water and steam branches R, S. This mixture of water and steam is likewise used in washing the charcoal filters used in sugar refining, the water being thereby heated and the steam partially condensed.

FIG. 2. (Sht. 1)



Steam traps.— A condensed steam box A, Figs. 2 and 3 (Sheet 3), mainly for use in connection with the steam pipe used for heating the vacuum pan for concentrating sugar solutions, is as usual provided with an inlet B and an open bell or float G. On the cover is fixed a valve E, together with lever mechanism having fixed centres at L, O, P, so that when the link I, which

FIG. 3 Sht 3

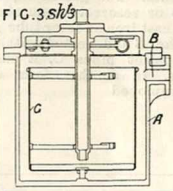
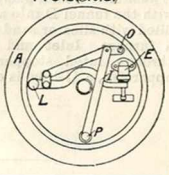


FIG. 2 (Sht 3.)



is preferably made of zinc, expands, consequent on the admission of steam in the box, the valve E closes and prevents the exit of steam, although previously allowing the escape of the air from the vacuum pan and pipes in connection therewith.

2471. Taylor, J. Sept. 27. *Drawings to Specification.*

Boiling-pans.—A copper or iron pan for washing, macerating in the preparation of chemicals, and in the preparation of inks and colours, is fitted with a steam jacket for heating purposes.

2480. Boffey, J., and **Smith, C. W.** Sept. 27.

Non-conducting coverings.—To prevent loss of heat by radiation, metallic surfaces, such as the surfaces of boilers, and the inside of iron ships, are coated firstly with a mixture of mastic, whiting and boiled linseed oil. Slate or shells may be added to this mixture. When the above is dry, subsequent coatings of a mixture of Roman or Portland cement, washed sand, cowhair, and water are applied. For coating steam pipes or cylinders, white lead is added to the first coat.

2494. Smith, I., and **Batho, W. F.** Sept. 28.

Heating liquids.—Tubes, such as those shown by Figs. 1 and 2, are fitted in the flues of boilers to promote circulation. Each of the tubes is fixed in the side of a flue and is closed at one end. Passages in opposite directions for the water are formed by various arrangements of partitions, shown in section at Fig. 2, sprung into position.

FIG. 1.

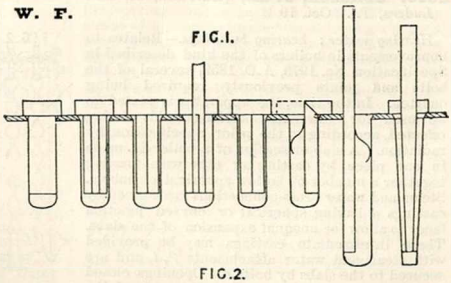


FIG. 2.

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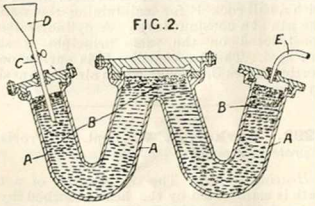
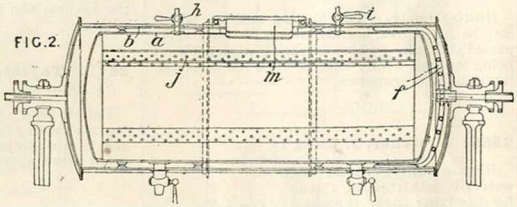
2535. Brooman, R. A., [*Renard, G.,* and *Lipman, A.*]. Oct. 3.



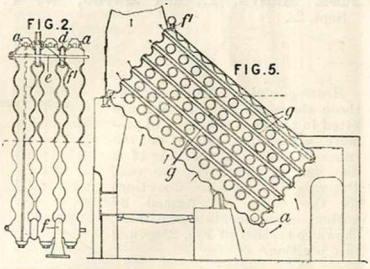
Heating gases and vapours. The gas or liquid is admitted from a pump or reservoir connected with the funnel D into a cast iron or other tube A filled with silex or sand &c. B and heated within a furnace. Inlet and outlet pipes C, E pass through luted stoppers. In another form of apparatus, a U-tube is employed.

2574. Clark, W., [*Nevret, Orioli, & Fredet*]. Oct. 6.



Heating liquids. — In apparatus for steeping paper pulp, rags, and fabrics in alkalies, specially applicable for use with ammonia, the materials are fed by a hopper *m* to a closed cylinder *a* enclosed in a cylinder *b* into which steam is passed through the bearings on the left, the ammonia being distilled and collected for re-use, on the completion of the operation, through cocks *h*, *i*. The apparatus may rotate, so that pallets *j* constantly stir the matters. A wheel *f* having involute arms serves to raise condensed water from the casing and conduct it back to the generator. When the process is complete, the apparatus is stopped with the manhole uppermost, and a pipe is attached to one of the upper cocks for collecting the ammonia, if such be used, the heating with steam being continued. During the operation, the manhole is hermetically sealed. To remove any water that may condense while the apparatus is stationary, a purge-cock or a pipe in connection with the generator, is provided. The apparatus may be fixed, and may be placed vertically instead of horizontally, in which case the feed cock of the boiler may be at the bottom, and the steam introduced at the upper end. The outer cylinder is provided with a non-conducting casing.

2610. Johnson, J. H., [*Harrison, J.,* and *Luders, T.*]. Oct. 10.



Heating water; heating buildings.—Relates to improvements in boilers of the kind described in Specification No. 1970, A.D. 1859, several of the bolts and joints previously required being omitted. In the title, the apparatus is stated to be used for warming buildings, this being effected, according to the prior Specification, by radiation. A slab or section of a boiler is made in one piece by casting or otherwise forming together a number of hollow spherical chambers. Steam and water cross-connections are formed by castings *d* having spherical or curved junction faces to allow for unequal expansion of the slabs. These intermediate castings may be provided with steam and water attachments f^1, *f*, and are secured to the slabs by bolts *e*. Openings closed by screw caps *a* are formed at the ends of the

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slab for cleaning purposes. Stationary boilers are set in brickwork, but the exterior slabs may be cast with thin webs *g*, suitably joined together to form tight metal walls at the outside of the slabs. The slabs are arranged edgewise over the furnace, the lowest corner resting on a bearer, and the gases circulate between the slabs, and escape from the lowest part of the slabs to the chimney. Large slabs may be formed of two or more smaller slabs joined together edge to edge by suitable bolts, so that a defective part of the slab may be easily replaced. In lieu of bolts passing through the slabs, flues or tubes *g*, Fig. 5, may be inserted longitudinally through each series of spheres except the one nearest the fire, which is left free for the better circulation of the water. In this modification, the furnace gases circulate between the spheres and enter the flues *g* at their lower ends, and pass to the chimney in the direction shown by the arrows.

2661. Wise, F., Field, E., and **Aydon, E. H.** Oct. 16.

FIG.1.

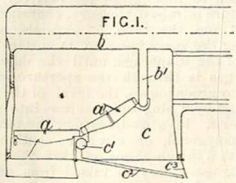
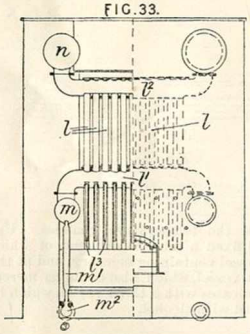


FIG.33.



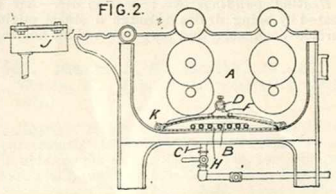
Heating liquids.—Relates to steam boilers and other apparatus for heating liquids. In a firebox *b*, Fig. 1, the grate is arranged as shown, the upper part of the grate a^1 being supported by a depending water chamber b^1. Behind a stepped firegrate in a boiler is arranged a depending bridge composed of double water tubes partly covered with firebricks. Passages may be formed in the firebrick for the admission of hot air. Double, conical, or tapered depending water-tubes may be arranged in fireboxes and flues. Each inner tube may have straight, spiral, or other hexagonal sides and an open T-shaped or like top. These inner tubes may be replaced by diaphragms with reflectors at the upper ends as described in Specification No. 2956, A.D. 1862. Fig. 33 shows a water tube boiler with water tubes *l*, l^3, connected to series of parallel pipes l^2, l^1 connected to drums *n*, *m*. Tubes m^1 depending from the drums *m* are connected to pipes m^2 with blow-off cocks.

2853. Thys, J. Nov. 4. [*Provisional protection only.*]

Non-conducting compositions.—A composition consisting of a paste formed with silicious earth, carbonized sawdust, coke dust, cow hair, common size, refuse cotton seed or other oil or grease—the oil or grease being mixed with sawdust in the carbonizing vessel—is used for covering steam boilers, steam pipes, or other apparatus where steam is used for motive power heating purposes, or for pumps, vessels, water pipes, or other apparatus liable to be acted on by low temperatures or frost. Lampblack with other carbonaceous materials may be employed for the same purpose.

2883. Eastwood, J. Nov. 8.

FIG.2.



Heating liquids.—In a machine for sizing yarns for weaving, the size in the pan A is heated by means of a copper steam-chest B having a convex top. The steam enters the chest B through an inlet pipe, and the condensed water is discharged through a pipe C¹. The size enters the pan A through a coiled pipe H in the steam-chest B, so that it is partially heated before admission to the pan. Paddles or scrapers F are attached to a shaft D which is reciprocated by mechanism actuated by a crank-disc, so that the paddles agitate the size and prevent it from sticking to the steam-chest. The shaft D works in stuffing-boxes, and may be operated by hand when the machine is at rest. The top of the steam-chest may be formed concave, the shaft D and the paddles having a rotary motion, or the paddles may be stationary and the steam-chest revolve.

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2935. Gill, S. L. Nov. 14. [*Provisional protection only.*]

Heating air.—Two concentric cylinders, the inner one of which is closed at the top, are connected by a number of small inclined tubes. The inner cylinder is provided, near its lower end, with a ring of gas burners, and the top of the outer cylinder is connected to a flue. Air enters at the bottom of the inner cylinder and, after passing through the heated tubes, escapes into the room. In a modification, the air passes first through the tubes, and then escapes through the top of the inner cylinder.

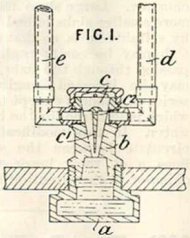
2986. Hemming, G. P., and **Coyle, H.** Nov. 20. [*Provisional protection only.*]

Heat-storing apparatus.—One or both edges of the sides of the liquid-sealing groove which is formed or applied round the upper edge of a vessel for retaining the heat in water or other liquid, are turned over into the groove itself, leaving a space between them for the rim of the cover. These turned-over edges prevent the escape of the sealing liquid when the vessel is tilted.

2996. Newton, A. V., [*Fletcher, A. C.*]. Nov. 21. *Drawings to Specification.*

Heating buildings &c.; heating air.—Air is heated by being drawn through a steam engine surface condenser and may be used for heating, buildings and the like, drying or desiccating animal, mineral, or vegetable substances, or textile fibres or fabrics, or for seasoning wood.

3268. Planck, H. Dec. 18.



Thermostats.—For regulating the heat obtained from the combustion of gas in dentists' or gas furnaces or in greenhouses, by altering the area of the passage way for the gas, a conical plug *c*, fitting in a hole in the tube *b*, is divided into two parts by a diaphragm c^1 having at the top an aperture c^2, placed opposite the pipes *d*, *e* leading from the gas supply and to the burner respectively. As the temperature is raised, mercury, contained in the vessel *a* and the tube *b*, expands, gradually narrowing the space between its surface and the bottom of the diaphragm until the only passage for the gas is through the aperture c^2. When applied to greenhouses, the level of the mercury is adjusted by a plug which screws into a part of the vessel *a*. In a modification, the plug c is of square, polygonal, or circular section, and is fitted with a thumb screw, so that the bottom of the diaphragm c^1 may be raised from, or lowered towards, the level of the mercury.

A.D. 1866.

41. Wheeler, J. F. Jan. 5. [*Provisional protection only.*]

Footwarmers.—The case is covered with felt or the like and is provided with recesses for the feet. A stoppered aperture for the introduction of hot water is provided.

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76. Shaw, R. Jan. 10. [*Provisional protection only.*]

Thermostats.—A valve for controlling the admission of air to a chamber is actuated by a lever having at its ends vessels containing mercury and alcohol, the expansion and contraction of which causes the lever to turn on its axis as the temperature changes. Upon the lever is fixed a tube, at one end of which is an open vessel containing mercury, and at the other end is a vessel, which also contains mercury, and communicates with a third vessel, which is closed and filled with alcohol.

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163. Norton, J. L., and **Bünger, F. L. H. W.** Jan. 17. [*Provisional protection only.*]

Steam traps.—In apparatus of the kind described in Specification No. 2890, A.D. 1862. The steam and water chamber consists of a spherical casing, within which a cylinder with corrugated

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ends and full of water is suspended. The spindle of the outlet valve is attached to the lower disc. The expansion and contraction of the water in the cylinder operates the discharge valve.

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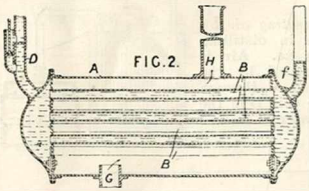
218. Prideaux, T. Jan. 23.



Heating water.—The water, which may be supplied from an overhead tank or by a pump, is heated in a series of tubes B traversing a chamber A through which exhaust steam is passed. The inlet and outlet connections for the steam are shown at G, H and those for the water at D, *f*. A separate pipe, not shown, is provided for draining off the condensed steam.

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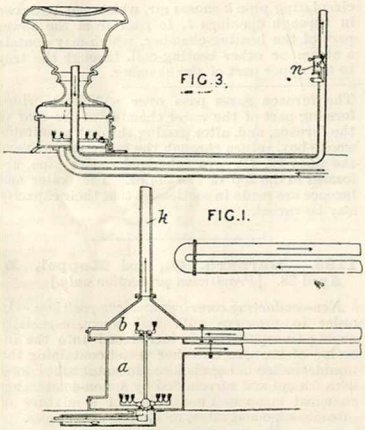
346. Willington, T. A. G. Feb. 3.



Heating buildings.—In an apparatus for heating conservatories, apartments, or boilers, two or more gas "stoves" are employed, one serving to heat the apartment, the others creating a draught for the first. In one arrangement, Fig. 1, heated air and gases from a burner enclosed in the lower portion *a* of a casing pass through heating-pipes to the upper portion *b* of the same casing, where a second burner creates a draught through the outlet pipe *k*. In another arrangement, Fig. 3, the heated air and gases from a burner placed in a hollow vase or basin, which may hold water, are carried off by an outlet pipe containing a burner *n*.

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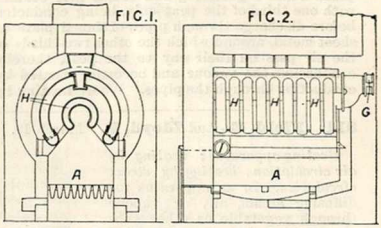
429. Cumming, G. W., and **Edmonds, J. K.** Feb. 10.



Heating water.—A saddle or other shaped boiler used in heating water for circulation through pipes used for heating hot-houses and buildings, and for other purposes, is enclosed in a series of water tubes H, which are connected to the boiler so that the water may circulate through them. The hot gases from the furnace A pass around the boiler and the tubes, and escape through the flues. Suitable connections are made at G and I to the heating-system.

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447. Marland, S., Smith, W. H., and **Wells, W.** Feb. 13. [*Provisional protection only.*]

Heating by molecular combination.—Relates particularly to means for heating the volatile liquids employed in apparatus for obtaining artificial light, such as is described in Provisional Specification No. 2998, A.D. 1865, [*Abridgment Class* Gas manufacture], Sulphuric acid and water, contained in separate vessels, are allowed to drop into a mixing-vessel communicating with another vessel in which the volatile liquid is to be heated.

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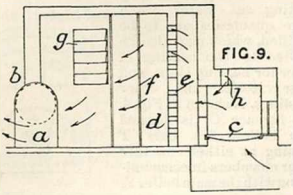
545. Brunton, J. D. Feb. 22.



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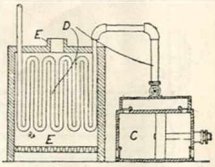
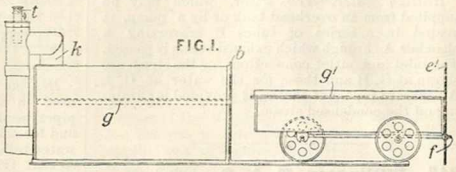
Heating air; heating by water circulation.—In apparatus for drying peat, Fig. 9, a fireplace *c* for burning smokeless fuel or gas is provided with air admission flues *h*, the products of combustion passing through a perforated brick partition *e* and wire-gauze screens *f* placed in the chamber *d*, at the extremity of which is the fan *a* for delivering the gases into a drying-chamber *b*, regulators *g* for the admission of cold air being provided. In order to condense the aqueous vapour arising from the drying of the peat, one-third of the air used passes through the fireplace c and regulator *g* and comes into contact with one third of the peat only, being conducted before discharge through pipes of tinned plate or sheet metal, around which the other two-thirds of the air pass on their way to the peat, thereby condensing the vapour and becoming heated by conduction through the pipes. Where heating by hot-water pipes is adopted, the aqueous vapour is withdrawn by a fan and forced into the boiler.

606. Newton, W. E., [*Vincent, J. P., Richards, J. S., Noble, O., Lovrein, C. H., Rawle, H.*, and *Fales, L. S.*]. Feb. 27.



Heating air for use in distilling oils &c. Air is forced by the pump C through the coil D in the furnace E.

811. Field, E., and **Lloyd, F.** March 19.

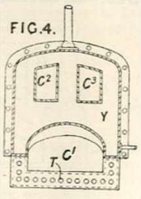


Heating-apparatus; heating by air circulation; heating by steam circulation.—In an apparatus for diffusing steam, air, or vapour through vegetable or other substances, the substances are carried by a perforated or pervious tray, forming a horizontal screen in a closed chamber in which the gases are circulated. In one form of apparatus, the tray, which rests upon bars *f* carried by wheels, is provided with flanges g^1, e^1, which form with corresponding flanges *g*, *b* in the heating-chamber tight joints. The bars *f* are formed of such cross-section, that, on turning them, the tray is elevated from, or lowered on to, the flanges *g*. A steam jet-blower contained in a circulating pipe *k* causes air, which may be drawn in through openings *t*, to pass from the lower part of the heating-chamber, which may contain a steam or other heating-coil, through the tray to the upper part of the chamber.

1014. Johnson, J. H., [*Renner, H. E.*]. April 9. [*Provisional protection only.*]

Digesters.—Relates to an apparatus for the hydrolysis of vegetable and animal fats and oils by means of water, a mixture of water and steam, or an alkaline solution. It consists of a cylindrical copper vessel provided with inlet and outlet pipes, pressure gauges, thermometer or pyrometer, safety-valve, proof cocks, and an air discharge cock. Heat may be applied either externally or internally, and in the latter case, by means of flues.

1134. Wilson, J. H. April 21.



Heating water.—An apparatus for preliminarily heating sea-water when large quantities are to be distilled, which may also be applied to the heating of water for heating ships, and conservatories and other buildings, is shown in Fig. 4. The furnace C^1 is formed with hollow fire bars T opening at either end into water chambers in communication with the main boiler Y. The furnace gases pass over a hollow bridge forming part of the water chamber at the rear of the furnace, and, after passing through a suitable smoke-box, return through the boiler by means of the flues C^2, C^3. An inlet and outlet pipe are formed in the top of the boiler. The boiler and furnace are made in sections so that their capacity may be varied.

1198. Burnard, G., and **Koppel, L.** April 28. [*Provisional protection only.*]

Non-conducting coverings and compositions.—In order to preserve milk and cream, especially during transport, ice is introduced into the interior of the can or other vessel containing the liquid, the ice being enclosed in metal tubes lined with flannel and surrounded by a non-conducting chemical compound consisting of a mixture of sal-ammoniac and nitre, or similar substances.

1327. Jones, J. A. May 9.

Non-conducting coverings and compositions.—Peat, turf, bog, silt, coal or charcoal dust, or other similar vegetable, or partly vegetable matter, is

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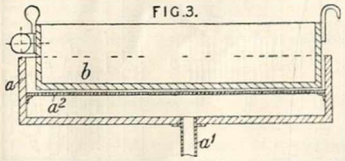
used in a plastic state, or in slabs, either alone or in combination with cement, iron oxide, lime, sand, cow hair, sulphate of lime, and mineral oil, for covering or lining steam, air and water pipes, boilers, heaters, cylinders, vessels, and ice-houses, wine cellars and other buildings. Wire network is sometimes placed over the composition.

1342. White, J. May 10.

FIG.3.



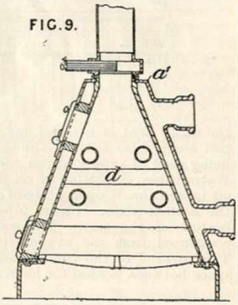
Non-conducting coverings and compositions. — Hair felt for covering steam boilers and steam pipes, and for other purposes, to prevent radiation of heat, is made with square edges to facilitate jointing, by means of apparatus such as that shown in Fig. 3. The hair to be felted is laid on the perforated false bottom a^2 of a steam chest a, into which steam is admitted by a pipe a^1, the hair being felted by a reciprocating box or board b, which is actuated by a crank and connecting-rod.

1450. Longbottom, J., and **Eastwood, J.** May 23. *Drawings to Specification.*

Heating liquids and air.—Consists in the application of steam and superheated water circulating in a system of tubes, part of which is coiled and placed in a furnace, to the heating of liquids and air. The tubes are immersed in the substance to be heated.

1457. Green, T. May 24.

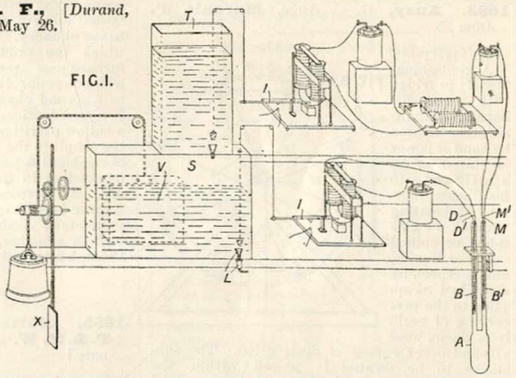
FIG.9.



Heating water. —A boiler for heating water for greenhouses and other uses consists of an external casing, provided with sockets a^1 for the heating-pipes, within which is fitted a conical or tapering firebox having cross water tubes d.

1470. Weatherdon, B. F., [*Durand, J. J. M.,* and *Pichoin, C.*]. May 26.

FIG.1.



Thermostats. — Mercury expanded in the limbs B, B^1, Fig. 1, of a thermometer A, completes electric circuits by connecting the ends of platinum wires D, D^1, M, M^1, suitably arranged within the thermometer. Electromagnets, acting on levers I, cause valves L in the tanks T and S, to open or shut, so that the position of the float V, which actuates a damper X, is regulated by the temperature of the thermometer. In a modification, a U-tube is used as a thermometer, one limb being connected to a platinum or other vessel containing dry nitrogen.

1576. Fraser, W. J. June 8. [*Provisional protection only.*]

Heating water.—The internal fireboxes of vertical boilers are provided with water tubes, portions of which form the firebars of a down-draught furnace. The firebox is closed at the top, so that the products of combustion pass to a combustion chamber below the firebars and escape thence, either through tubular or annular flues in the boiler, or through external flues. The water tubes, which lead from the lower part of the firebox to the upper part, are flattened in the portions supporting the fuel, so as to be arranged closely together.

1623. Knaggs, W. June 14.

Heating air ; heating water.—An evaporating-pan for sugar juice is combined with a boiler, and

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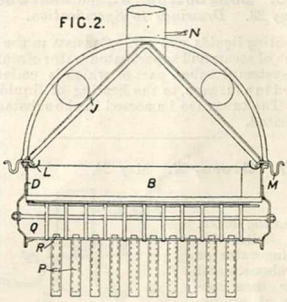
FIG.2.

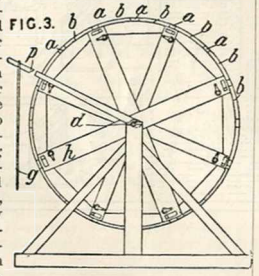


the waste heat is utilized for heating air. The pan has a false bottom, the space Q thus formed being used to supply steam for the evaporation. Water tubes, consisting of an outer tube P, and an inner tube R open at both ends, are fitted in the bottom plate. Steam pipes pass along the bottom of the pan. The water used is that condensed from the evaporation of the syrup. The cover J of the pan is made double, and the space between is used for heating air.

1693. Auxy, G. C. Ange, **Marquis d'.** June 25.

Heating liquids. —A containing-vessel provided with means for imparting an oscillatory motion by hand or power is stated to be applicable to heating, or otherwise treating mineral, vegetable, or animal solids or liquids, and is especially described as applied to the preserving of grain from damp, weevils and other causes of destruction. The substance to be treated is placed within the cylinder, shown in end view and composed of timbers *a* forming a frame, between which are the staves *b*, perforated in the case of sifting-apparatus. The ends or heads, completing the frame, are pivoted on a central spindle *d*, and have hooks, rings, or catches *h* attached to them, with which the operating levers *p* engage in their oscillating motion about the spindle and shake the whole cylinder. Where the masses are considerable, a rope *g* is attached to each lever and moved like the rope of a bell, or the motion may be derived from cams or eccentrics. The cylinder is capable of extension longitudinally by means of framings within it, and there are openings on the staves and at the ends, the covers of which can be locked in the closed position.

FIG.3.



1694. Field, E., and **Wise, F.** June 25.

FIG.5.

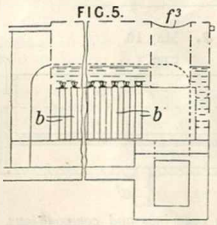
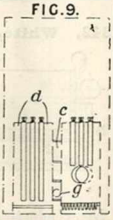


FIG.9.



Heating liquids. — Relates chiefly to boilers fitted with water tubes which project into the furnace or flues and to vertical boilers. The tubes may be of the kinds described in Specifications No. 2956, A.D. 1862, and No. 2661, A.D. 1865. Fig. 5 shows a saddle-shaped boiler in which the furnace and furnace flue are surrounded by water spaces connected with the boiler. The products of combustion from the furnace, which is fed from above through an opening f^3, pass downwards between the depending water tubes *b* to external lateral flues, in which they circulate on their way to the chimney. Fig. 9 shows a vertical boiler in which the products of combustion from the furnace pass around one side of a water space *c*, which is connected by water tubes *g* to the boiler, to a second chamber *d* provided with an outlet. In a modification, the water space *c* is replaced by a hollow partition through which air passes from the ashpit to the top of the firebox. The products of combustion pass over the top of this partition, descending in the second chamber to an outlet near the bottom. In another modification, the furnace is built outside the boiler casing and the products of combustion led into a furnace combustion chamber, arranged as shown in Fig. 9, through a lateral opening in the boiler casing.

1855. Norton, J. L., and **Bünger, F. L. H. W.** July 16. [*Provisional protection only.*]

Steam traps.—A discharge valve in a spherical vessel, in which the water of condensation collects, is operated by the expansion or contraction of a closed cylindrical vessel, containing water, which is suspended within the spherical vessel. The cylindrical vessel is suspended from a rod extending up through the spherical vessel, by means of which the apparatus is adjusted. The lower end of the cylindrical vessel is connected to the valve, which is protected from grit by a perforated screen placed across the lower part of the spherical vessel. A guard, mounted on the rod, prevents the water of condensation from directly

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impinging on the cylindrical vessel as it enters the apparatus. The steam trap is applicable to apparatus of the kind described in Specification No. 2890, A.D. 1862.

1887. Burgess, W. July 20. [*Provisional protection only.*]

Boiling-pans.—The receptacle of a washing-machine is made of iron, coated with vitreous substances, or, enamelled, to prevent corrosion, and is heated directly by gas jets or a suitable furnace.

1909. Ramsbottom, J. July 23. [*Provisional protection only.*]

Steam traps.—Steam traps used in connection with condensing steam engines consist of an outer closed casing containing a second vessel which rises and falls with the variation of the water level, and actuates a discharge valve.

1913. Bousfield, G. T., [*McKenzie, J. F.*]. July 23. *Drawings to Specification.*

Thermostats.—A thermostat, by means of which the temperature of the steam from a generator controls the supply of the feedwater, consists of brass and iron bars riveted together and twisted round a spindle so that it revolves in either direction as the temperature changes.

2068. Weatherdon, B. F., [*Leroy, C., Durand, J. J. M.,* and *Pichoin, C.*]. Aug. 11. [*Provisional protection only.*]

Thermostats.—In a thermostatic arrangement applicable to fluids generally, a mercury "thermometer," having two tubes in which electrodes are arranged, closes an electric circuit, when the temperature rises above a limit. By means of electric piles and magnetic coils, the valves &c. of the supply and discharge passages are operated.

2269. Nelson, E. Sept. 4.

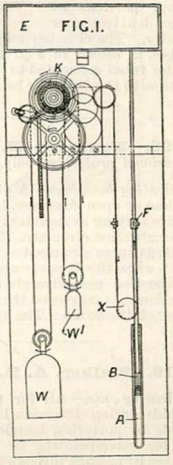
Boiling-pans.—Relates to pans for treating hemp, flax, &c. by means of argillaceous matters to remove the silicious cuticle and albuminous matter in the fibre. Egg-shaped pans similar to those used by soap boilers are employed, and are made so that when the portion exposed to the fire is burnt out it can be replaced. The pan has a grated false bottom for the fibre and perforated plates or gratings, or an inner or grated cage, to prevent the fibre coming directly in contact with the heated iron plate. A branch steam pipe perforated or open at its end is coiled or otherwise disposed in one or more tiers and supported near the bottom of the pan by bars or studs; high pressure or other steam is supplied to prevent carbonization. Fireclay or potters' clay or other aluminium compound is dried, powdered and soaked in hot or cold water to make it into a creamy state, and the fibres are placed in alternate layers in the pan, a layer of clay being at the bottom, the steam being turned on, and the fire lighted to prevent choking of the steam pipe by subsidence of the substances above it. A valve, which closes by the back pressure of the liquor in the pan when the steam is turned off, is placed near the end of the pipe. A steamtight lid may be secured by clamps or thumb-screws to the boiling-pan, which has a safety-valve, the steam from which is conducted to the bottom of another boiling-pan and so on, so that there are a continuous series of boiling-pans each blowing off at successively decreasing pressures. Solutions of boracic acid and its compounds may be pumped in to aid the fluxing of the alumina, silica, iron, &c. A close-ended dip pipe containing oil or stearine, affixed to the side of the boiling-pan, gives the temperature of the fibres which are sufficiently treated at from 350° to 450° F. and when the cuticle can be readily severed from the fibre. The fibre and clay are rinsed with water pumped out into a receptacle and allowed to subside.

2330. Bennett, R. Sept. 10. [*Provisional protection only.*]

Non-conducting coverings.—To prevent condensation in steam and other fluid pressure engine cylinders, they are covered with wood, wool or other non-conducting material.

2353. Horstmann, F. G. A. Sept. 13.

Thermostats.—Relates to motors operated by the dilatation of mercury or other liquid and of the kind described in Specification No. 752, A.D. 1866, [*Abridgment Class* Watches, &c.], and adapted for driving clocks and the like, for automatically operating the windows of greenhouses and the like, and for ventilating other buildings in which a uniform temperature is required. As adapted for driving a clock, a liquid-containing vessel E opens into a tube A containing a piston B adapted to be acted on by the expanding liquid. The piston rod F acts through pulley and belt gearing X on a drum K containing a spring and from which weights W, W¹ are suspended. The larger



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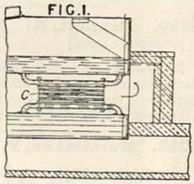
weight W, when raised, drives the clockwork mechanism. In a modification, the piston acts directly on the clockwork mechanism. As adapted for greenhouses and the like, the piston is connected to window opening and closing mechanism and to the gas cock of the heating-stove.

2376. Creasy, W. Sept. 15. *Drawings to Specification.*

Heating air.—In modifications of the apparatus for drying grain, brewers' grain, and the like, described in Specification No. 3276, A.D. 1865, [*Abridgment Class* Drying], the air, which circulates through the grain, is heated by means of steam pipes arranged in the casing of the apparatus. Where endless bands or chains passing over rollers are employed, the pipes are arranged between the two parts of the bands or chains.

2378. Twibill, J. Sept. 15.

FIG. 1.



Heating water.—A water chamber is fitted in the flues or fireboxes of steam boilers or water-heaters, such as those described in Specification No. 243, A.D. 1865, and connected to the upper and lower portions of the boiler or heater. The chamber may be provided with fire tubes, as shown in Fig. 1, or it may consist of water tubes connected to headers which communicate with the boiler or heater.

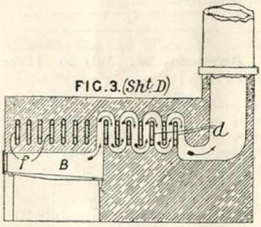
2396. Newcome, H. J. Sept. 18. [*Provisional protection only.*]

Heating buildings.—A pipe, serving as a flue of a close or open fireplace, is connected to circular boxes serving as radiators in which the products of combustion circulate. The boxes are provided with dampers arranged at an angle sideways, so that, when the dampers are open, the products of combustion pass straight up the pipe, but when the dampers are closed the gases pass successively through the boxes. The apparatus is portable.

2416. Walker, A. B. Sept. 20.

Heating air.—Air for use in attemperating liquids during fermentation, drying hops, malt, goods for potteries, laundries, bakers' ovens, &c., or for attemperating or ventilating rooms, is heated by passage through a series of pipes placed over a furnace and connected to end casings. Fig. 3 shows a vertical section. The flat pipes *d* in the flue are uncovered, while those *f* immediately above the fireplace B are protected by firebricks. The air passes in parallel courses

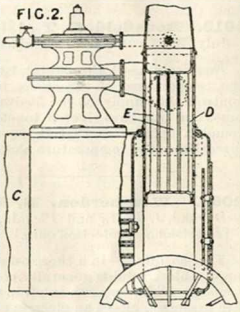
FIG. 3. (Sht. D)



through all the pipes *d* simultaneously, and returns through the pipes *f*.

2486. Betts, J. Y. Sept. 26.

FIG. 2.



Heating air.—Air used for drying grain and other crops is heated by the hot gases from the furnace of a portable boiler. A fan for supplying the air is mounted on the boiler and is driven by a steam turbine placed over it and connected to the same shaft. The air is forced through a chamber D, which contains tubes E through which the furnace gases pass.

2560. Underwood, G. Oct. 4. [*Provisional protection only.*]

Heating water.—A method of heating steam cooking-apparatus by boiling water circulating in a double tube, one end of which is inserted in a fire-grate, is stated to be applicable for heating water for buildings. The tubes are connected to the boiler, by passing them through a male socket with a flange which is held against a male screw plug or tube fixed to the vessel, by a female screw nozzle. The end inserted into the fire is fitted with a cap containing a chamber. A single tube bent at the end placed in the fire, the bend being protected or not by a socket, may be used.

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2567. Schröder, F. H. Oct. 5. [*Provisional protection only.*]

Heating by water circulation.—Improvements in incubators or apparatus for hatching eggs are described, and it is stated that they may be partly or wholly applied to other heating-apparatus. The incubators are heated by means of hot-water cisterns or vessels connected with separate boilers or other heating-apparatus by flow and return pipes. The heaters or boilers may also be connected to jackets or casings surrounding "nurses" or chambers for chickens, which contain wool or other soft material. The cisterns are preferably circular and overhang or overlap drawers or other egg compartments filled with chaff or other material. They may be provided with perforated coverings and plate-glass bottoms, and test pipes may be added in order that the temperature may be ascertained. The bottoms of the egg drawers are perforated, and a vessel of slightly warmed water is placed beneath them. The drawers are also provided with ventilators in connection with an air shaft. Curtains or screens are employed to exclude or regulate light or draught.

2571. Gordon, G. Oct. 6.

FIG. A. (*Sht. 1.*)

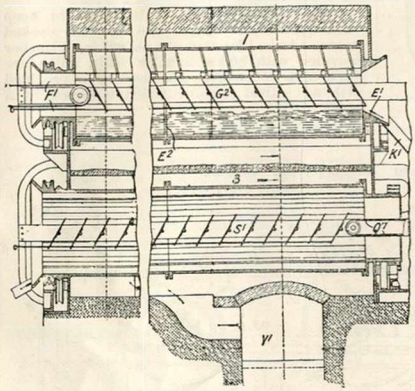
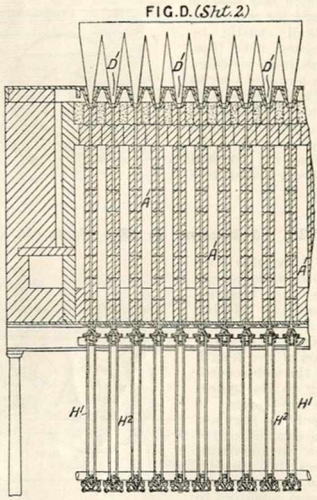


FIG. D. (*Sht. 2.*)



Heating water.—Relates to a process for revivefying animal charcoal which has been used in sugar-refining, in which the charcoal is successively washed with hot water and dried, and then reburnt. The apparatus, shown in Fig. A (Sheet 1), consists of a washing-cylinder 1 and two drying-cylinders 3 heated by means of the gases from two furnaces Y^1, each situated at the feed end of the drying-cylinder. The cylinders are charged by means of belts F^1, Q^7 and are formed with internal vanes, which, revolving with the cylinders, lift the material therein to certain height, discharging it on to the fixed adjustably-inclined plates G^2, S^1. The material is thus slowly transported through the cylinders. A hollow hexagonal prism with short ribs on its sides is preferably employed for washing the charcoal. It is formed with four partitions E^1, E^2 &c. which successively diminish in height so that the wash-water flows off in an opposite direction to the charcoal. The charcoal is reburnt and afterwards cooled with the aid of water in the apparatus shown in Fig. D (Sheet 2). The hot water thus obtained is used for washing purposes. The charcoal is fed into the furnace by the hoppers D^1 and slowly passes through the retorts A^1 into the coolers H^1, which are formed with a central chamber H^2 through which water circulates. Automatically-actuated slide valves at the base of the coolers regulate the rate at which the charcoal passes through the apparatus.

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2618. Wilson, L. Oct. 10. [*Provisional protection only.*]

Heating water in baths. The water circulates through a cylindrical vessel heated internally by a fire or by gas or oil burners. In addition, a coiled or other pipe, connected with the bath, is fitted above the fire or burners.

2671. Swan, A. Oct. 16.

Boiling - pans.— In apparatus for evaporating or recovering lyes, which may also be used for rendering alkali caustic by boiling with lime, the liquid is heated by means of a series of hollow vessels, to which steam is introduced and which may be made in the form of toothed wheels and made to rotate. In a modification, submerged heating cylinders are connected to an end casing, to which steam is supplied. Fig. 6 shows a cross section of another form having a boiler *b* provided with a flue *c*, submerged in the tank *a*. Fig. 7 shows a steam boiler *a* surmounted and partly enclosed by an evaporating-pan *b*.

FIG. 6.

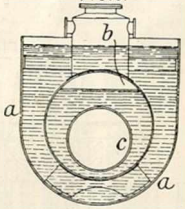
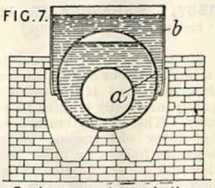


FIG. 7.



2722. Booth, T. Oct. 22. [*Letters Patent void for want of Final Specification.*]

Heat-retaining chambers.—In order to keep warm plates, dishes, and like utensils, cooked meats and the like, they are placed in a chamber provided with hollow annular walls, which are filled with hot water. The chamber is provided with a vertical opening which is closed by a door.

2728. Johnson, J. H., [*Smith, R.,* and *Ellsworth, O.*]. Oct. 23.

Apparatus for automatically regulating temperature.—In drying machine-made paper, the variation of the length of the web according to its hygrometric state is used to regulate the temperature of the drying-cylinders by varying the quantity of steam admitted to them. An endless apron or felt J, passing partially around the cylinders A, A^1, A^{11}, is guided and supported by friction-rollers H, while the paper web D passes over rollers H^5, H^4, H^3, R, H^2, H^1. If the paper becomes more than usually damp, the part passing over the roller R is increased, so that this roller is pressed up by springs L under its bearings, and the consequent raising of a connecting-rod K, 7, 9, 10, opens a balanced valve 40 to admit more steam by pipes 41, 42, 43 from a pipe C^1 to the cylinders Excess of heat causes a contraction in the paper and a descent of the movable roller, so that steam is shut off at the valve. To prevent the admission of too much steam in the event of a breakage in the paper, the axis of the roller H^4 normally bears upon the arm 25 of a rod *y*, so that, when the paper breaks, a spring 26 bearing against a fixed lug 27 causes the rod to disconnect a hook 5 from a stud on the part 7, and any subsequent movement of the roller R is rendered inoperative upon the valve.

FIG. 1.

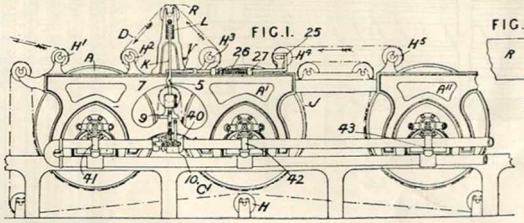
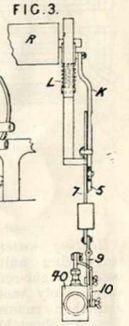


FIG. 3.



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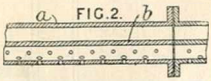
2734. Hollingdrake, R. Oct. 23.

Heating buildings.—The pipes *a* used for heating buildings are divided into two compartments, one of which takes the heating water; the other can be connected to the boiler in case of fire, and thus allow steam to enter the room through perforations.

FIG. 2.



2744. Watts, J. Oct. 24. *Drawings to Specification.*

Heating air.—Air, for supporting combustion in furnaces, may be heated by being passed round the flues through which the products of combustion pass. This heated air is passed through a pipe, and, prior to its introduction to the furnace, may be used for drying, evaporating and ventilating.

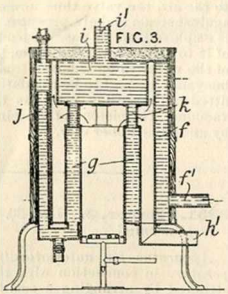
2755. Brooman, C. E., [*Bourrieff, J. B. M. A.*]. Oct. 25. [*Provisional protection only.*]

Heating buildings &c.—The products of combustion from hexagonal lanterns, shaped as pyramids at their upper and lower ends, are carried off by a pipe, which, in theatres, may be enclosed in a box and utilized for warming the feet of the audience. When gas is the illuminant, the supply pipe may be arranged within the ventilating pipe, and, in summer, the heat of the ventilating pipe may be neutralized by circulating cool air, by means of fans, through the enclosing box.

2908. Thomson, J. Nov. 8.

Heating water.—A water-heater, applicable for heating water for conservatories, baths, and other purposes, consists of two concentric annular water spaces *f*, *g* and a circular vessel *i* connected together and enclosed in a casing. The spaces *f* and *g* communicate by a pipe *j*, and the space *g* and vessel *i* by pipes *k*. The products of combustion from a gas burner, located within the inner annular water space, pass round the vessel *i* and between the spaces *f*, *g*, to an outlet h^1, which may lead to an arrangement for condensing the products of combustion. An inflow pipe f^1 and an outflow pipe f^1 are provided. In a stove consisting of a casing enclosing a gas burner, the casing is divided into two parts, the lower of which may be an annular water space.

FIG. 3.



3026. Morton, E. W., [*Morton, E. J.*]. Nov. 19. *Drawings to Specification.*

Non-conducting compositions. — In making vehicle wheels, an intermediate tyre of india-rubber &c. is protected from heat, while the outer metal tyre is being shrunk on, by a coating of a composition formed of fullers' clay, borax, and glue, dissolved in water.

3036. Gibbs, W. A. Nov. 19.

Heating air.—A current of air, drawn by a fan from the smoke-box of an engine driving the fan, is employed for drying and for elevating cut crops and hay. The cover of the smoke-box is replaced by a disc with a central hole, in which is fitted a conical pipe, and which is covered internally by a perforated plate or its equivalent, leaning towards the boiler. Smokeless fuel is used.

3048. Robertson, J. Nov. 20.

FIG. 3.

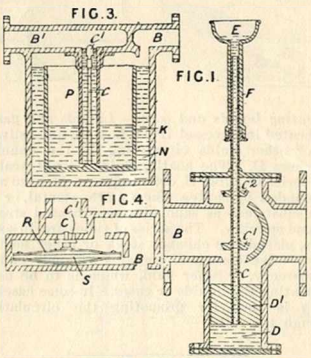


FIG. 1.

Heating by steam circulation; steam traps.—To enable condensed water to be removed from steam-heating pipes, it is allowed to run from a pipe B, Fig. 3, into a reservoir N. A second and independent vessel K floats in the reservoir and has a spindle *c* attached to its bottom, a plug lift valve c^1 being attached to the upper end of the spindle. A tube P integral with the casing projects downwards and envelopes the spindle. When sufficient water has overflowed from the reservoir into the vessel K, the latter sinks, drawing down the

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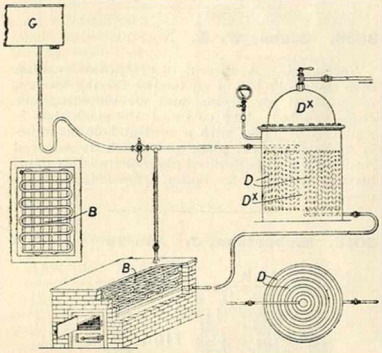
spindle and opening the valve. Steam pressure then forces the water in the vessel K up the tube P and out at the orifice B^1. For effecting discharge of air without loss of steam in steam-heating pipes, the air is passed through an opening B to an outlet C, Fig. 4. The outlet is normally closed by a valve c^1 mounted on the upper of two brass strips R which are attached to a central iron bar S. Increase of temperature caused by the admittance of steam causes the brass strips to become bowed, thus lifting the valve c against its seating.

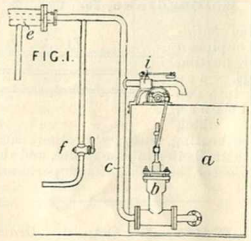
3179. Coffey, J. A. Dec. 3.

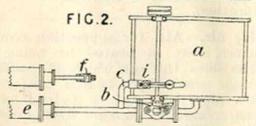


Heating liquids and gases.—Liquids and gases are heated in a vessel D^x by hot oil, quicksilver, air or other fluids circulating in the annular chambers D. The heating-fluid is itself heated in a series of tubes B, coiled above a furnace and surrounded by molten zinc, or other metal, or by such substances as sand, oils, superheated steam, air, and mercury. The series of tubes are, in some cases, placed in a chimney stack or other heated place. The cistern G contains a supply of the oil, mercury, or other fluid, which is to be used for heating the liquids or gases. In some cases, a pump is used for promoting the circulation through the coils.

3311. Hall, H. Dec. 17.

Heating liquids.—Size is prepared by heating raw farinaceous material with water in a steam-jacketed tube or coil. The apparatus consists of a cistern *a* containing the mixed farina and water, fitted with a force pump *b* which charges the tube *c*. There is a weighted safety-valve *i*, which opens under internal pressure and returns excess of size to the cistern. The steam jacket *e* is connected with a separate boiler, and during the heating operation the safety-valve *i* keeps the





contents of the pipe at a sufficient pressure to burst the starch granules and convert them into dextrine. The tap *f* delivers the prepared size for use.

3345. Graham, D. A. Dec. 20. [*Provisional protection only.*]

Steam traps.—In a steam trap of the "float" type, which is applicable generally for removing liquid of condensation from pipes, cylinders, and the like, a float in a casing operates an equilibrium discharge valve. The casing, which may be spherical or cylindrical in form, is provided at the bottom with a valve, the hollow stem of which passes through the float to a piston moving in a socket in the upper part of the casing. The hollow stem passes through the piston and is open to the air, the valve thus formed being balanced against steam and air pressure. If a hollow float is employed, an air passage leads from the bottom of it to the hollow valve stem, so as to allow part of the water to be removed from the float and the buoyancy thereof to be regulated. A check valve fitted in the casing prevents the formation of a vacuum. The piston in the casing may be replaced by an india-rubber disc.

3351. Baker, J. Dec. 20. [*Provisional protection only.*]

Apparatus for automatically regulating temperature in connection with thermopiles is constructed by arranging a small steam boiler in connection with the flue of the stove, so that, when the heat is excessive, steam is generated and blows into the fire so as to damp it.

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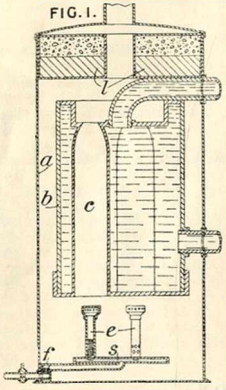
3438. Shrewsbury, G. Dec. 31.

Heating water.—A water-heater *b* for heating apartments, conservatories, and baths, has vertical tubes *c* passing through it, and is heated by gas burners *e*, which are placed at the bottom of these tubes. The burners are connected to the gas-supply pipe by a hinge at *f* so that they may be readily swung outside the casing *a*. Above the boiler are placed layers of firebrick and sand, or other non-conducting material. The tubes *c* are contracted towards the top, as shown.

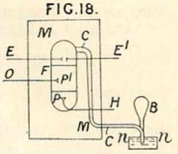
FIG. 1.



3448. Clark, W., [*Heustebise, A. P. V.*]. Dec. 31. [*Provisional protection only.*]

Heating liquids.—Hydrogen is exploded with oxygen or air in a closed chamber for the purpose of heating liquids. The vessel F, divided internally into three parts by metal gauze, is placed in the liquid M to be heated. Oxygen and hydrogen are passed into the respective compartments P^1, P by the pipes O, H. and the gaseous mixture is exploded at intervals, regulated by a pendulum, by electric sparks passed between the electrodes E, E^1. A pipe C for the circulation of the gases has its open end below the water surface *n*; B is a ball for receiving the unconsumed hydrogen. When the apparatus is used "for heating boilers, the latter "must be tubular, and preferably with return "flues for the introduction of the gases; the water "is represented by M, the tubes and flues com-"municating therewith, at which point the "hydrogen is collected."

FIG. 18.



APPENDIX.

A.D. 1856.

2363. Clark W. S., [a communication]. Oct. 9.

Heating liquids.—Milk or cream is heated, during churning, by forming the beaters of the churn, Fig. 5, hollow to contain hot water. The butter gatherers, Fig. 2, may also be made hollow. The beater may have only three of the curved hollow blades; or the central part may take the form of a hollow cylinder, forming, with the four blades, five separate chambers.

FIG. 2.

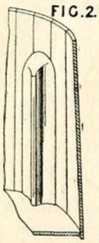
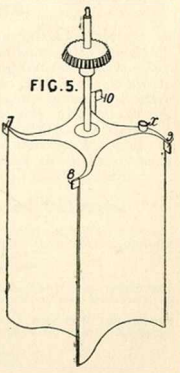


FIG. 5.



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