

PATENTS FOR INVENTIONS.

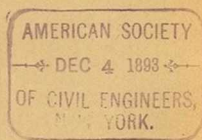
ABRIDGMENTS OF SPECIFICATIONS.

CLASS 64, HEATING.

Excepting FURNACES AND KILNS; STOVES, RANGES,
AND FIREPLACES;

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

PERIOD—A.D. 1877—83.



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EXPLANATORY NOTE.

The contents of this Abridgment Class may be seen from its Subject-matter Index. For further information as to the classification of the subject-matter of inventions, and for a list (with prices) of the Abridgment Classes for the period A.D. 1877-83, reference should be made to the *Abridgment-Class and Index Key*, published at the Patent Office Sale Branch, 38, Cursitor Street, Chancery Lane, E.C., price One Shilling, postage (parcel post) Sixpence.

It should be borne in mind that the abridgments are merely intended to serve as guides to the Specifications, which must themselves be consulted for the details of any particular invention. Printed Specifications, price Eightpence, may be purchased at the Patent Office Sale Branch, or ordered by post on the Patents Form C¹ (to be obtained from any Post Office), no additional charge being made for postage.

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HEATING.

Not including FURNACES or STOVES.

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

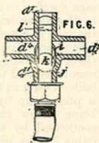
A.D. 1877

68. Gibbs, R. R. Jan. 6.

Coiled water tube boiler.—Tubes are arranged in the form of a horizontal cylinder. They may be connected up either continuously, in which case there is a single flow and return pipe, or in groups, when there are as many flow and return pipes as there are groups. The tubes themselves may be used as a firegrate, or firebrams may be mounted in the usual way inside the cylinder.

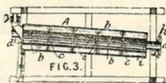
Water supply.—A special four-way connection fitted with a ball valve is used. The supply tube *k*, packed at *l* to fit the way *d'*, is introduced through the way *d'*, displacing the valve *i*. The way *d'* is connected with the flow pipe, and the way *d''* with the return pipe. The air driven by the liquid through the return pipe escapes through the way *d'*, which is capped when the system is charged. The tube *k* is then withdrawn, when the valve *i* falls on its seating *j*. As an additional precaution against leakage, the way *d'* may be capped.

Abridged also in Class *Valves &c.*



276. Balmer, T. Jan. 22.

Heating air for drying tea leaf.—A wooden or metal cylinder *A* is formed in longitudinal sections, to facilitate access to the interior, and has a non-conducting covering. The interior is provided with a series of shelves *b, b*, &c., straight or spiral and continuous or broken, and a series of diaphragms *c, c*, &c. The upper end is mounted on an adjustable end plate *d'* or on rollers carried by the frame, and the lower has a trunnion *d* which carries the bevel-wheel *h* by which the cylinder is rotated. The tea is fed in at the upper end of the cylinder from the hopper *D* by a rotating drum, actuated by pawls and ratchet-wheels from the rotating cylinder *A* and having cavities by which the tea is carried down. Cavities *i* are provided at



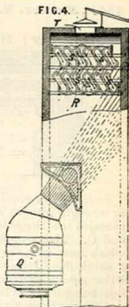
the lower end of the cylinder for the escape of the tea. A current of air heated by the exhaust steam of the engine or by furnaces, is driven through the drying-cylinder by a fan entering at the upper end of the cylinder. Superheated steam or other gas or vapour may be used instead of air. The withered tea is then subjected to the process of "curling," after which it is dried in a similar cylinder to that described but of smaller diameter, the air inlet being at the lower end.

Abridged also in Class *Drying.*

321. Cooper, A. Jan. 25.

Heating air and water by the waste heat from converter furnaces.—Fig. 4 shows a converter *Q*, the flame or heat from which diffuses itself into the stack *R*, impinges on the range or coil of pipes *S*, through which air, water, steam, or the like circulates, and escapes through the damper *T*. An arrangement is also shown and described with two converters, each with a stack *R*, placed back to back, but with a chamber between them containing the range or coil of pipes. The flame or heat from each alternately passes through the chamber and escapes by the damper of the other converter. In one modification, the flame or heated product may pass through the pipes and the air, water, steam, or the like be made to impinge on their surface. Chambers or flues may be substituted for the pipes. In another arrangement, the heated products of the converter are first passed through the apparatus for the purpose of heating it, and afterwards the air or water which is required to be heated is passed through.

Abridged also in Classes *Manufacture of iron &c.*; *Steam generators.*



381. **Clark, A. M.**, [*Guardiola, J.*]. Jan. 29.

Heating air for drying purposes.—The heater consists of two cylindrical shells O, enclosing between them an air space y. Each shell is closed at the top by plates r, t, and the inner one has a smoke outlet X

A pipe Q projects centrally into the inner shell, and is connected to the air space y by tubes w and by radial tubes u that support a firegrate r upon which a fire is placed. Air is forced by a blower through the pipes V, Q, u, and w into the space y, from whence it passes to a drying-apparatus. Air also passes by the pipe W to perforated pipes in the space y, where it is heated by the surface of the inner shell. A perforated pipe z beneath the grate r supplies air to the fire. By suitably arranging valves cold air can be supplied to the drying-apparatus by a branch pipe d'.

Abridged also in Classes *Brewing &c.*; *Drying.*

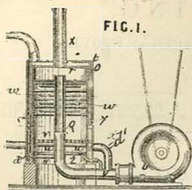
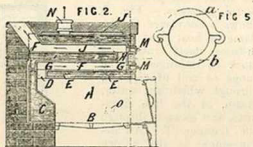


FIG. 1.

454. **Mercer, T. T.** Feb. 2.



Sectional boiler.—The segments are made of cast or wrought iron or copper. The first segment A contains the firegrate B and has a waterway bridge over C. The second segment F has recesses G, which form with the first segment horizontal flues, a short flue D communicating with the firebox. Other similar segments may be added as shown, the flue being made as long as possible. The different water compartments are connected. The segments are secured together by passing bolts through the corners, and more segments may be introduced at any time. Flow and return pipes are provided at N and O. The whole apparatus may be built in brickwork to prevent loss of heat; other non-conducting substances may be used; or the boiler may stand alone. A self-feeding hopper for fuel may be made through the water segments.

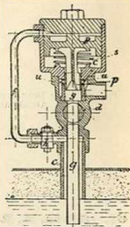
Abridged also in Class *Pipes &c.*

460. **Tongue, J. G.**, [*Silva, E. C. da*]. Jan. 3.

Steam trap.—The apparatus is capable of application as a self-acting feed regulator for a steam boiler, or for regulating the discharge of water from steam pipes, reservoirs, or from high-pressure condensers. A piston P, or an equivalent diaphragm moving within a cylinder c, carries a sliding valve p which opens or closes apertures u for the admission of the feed or discharge water.

The upper part of the piston is open to a passage f which extends down to the water line, and at its lower part surrounds the pipe g, which is carried below the water line. The piston P is drawn down in the cylinder c by the column of water in g, the passage f being uncovered and therefore containing steam, and the boiler being at that time fed. When the piston P is pushed up by the spring s, the end of the pipe f being below the water line, the steam in it is condensed by the colder water in g, and water rising in the pipe f the feed passages u are closed until the level of the water in the boiler again falls. d and h are cocks for disconnecting the apparatus for inspection whilst under steam. When regulating the discharge of water the passages u are arranged to open when the level of water closes the end of the passage f.

Abridged also in Class *Steam generators.*



513. **Blamires, T. H.**, and **Reddan, J. H.** Feb. 6.

[*Provisional protection only.*]

Digester.—The apparatus consists of an inner vessel and an outer vessel in which steam may be produced or into which it may be injected. The material to be treated is placed in the inner vessel and a steam-tight cover is screwed down on the outer vessel.

586. **Burnett, J., Caldow, A.**, and **White, T.** Feb. 12.

[*Provisional protection only.*]

Sectional boiler for heating conservatories and buildings, or for other purposes. The main body part of the boiler or heater, that is, the sides of the furnace, heating-chambers, and the flues, are formed of vertical tubes with conical ends which fit into corresponding sockets in cast-iron or wrought-iron end boxes with chambers either open, or strengthened with internal feathers, or formed as tubes along the line of sockets, with a web between them. The tubes may be of cast iron with their ends turned to fit bored conical sockets, or of malleable iron with their ends formed to a cone shape in dies. The boilers may be round or rectangular, and the fire-door opening may be

formed by making a few of the side tubes short and fitting their conical ends into a short cross tube forming the top of the door way, supported by two short tubes forming the sides. A hinged fire-door may be used.

Rectangular boilers may be formed with double rows of tubes, with spaces between them, to act as undulating flues. The tubes are held in their sockets by the bars which pass through the vertical tubes, and the spaces between the tubes may be filled up with rods and S-shaped bands of sheet iron to complete the inner surface of the furnace. The outer walls may be covered with a non-conducting covering. The arrangement of flues may be modified.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

657. Green, C. H., [*Car, E. B.*]. Feb. 17.
Drawings to Specification.

Heating water.—A water-heater with four or more compartments contained within a casing has its upper end formed to support a cooking-utensil, and is furnished with pipes for conveying steam or hot water to a washing-cistern.

Abridged also in Classes *Cooking &c.*; *Stores &c.*

723. Cornish, P. Feb. 22.

[*Provisional protection only.*]

Heating buildings.—Hollow spaces in the walls may be used to convey hot air for warming purposes.

Abridged also in Classes *Buildings &c.*; *Fire, Extinction &c. of*; *Ventilation.*

807. Royle, J. J. Feb. 28.

Steam traps.—Relates to apparatus controlled by expansion and contraction. The accumulation of water in the pipe D causes it to contract and bring the crossheads E, E' closer together, thus causing the bowed tension rods H to allow the valves B to open. When the water is discharged the hotter steam causes the pipe D to expand and shuts them again. The apparatus is adjusted by the nut F. A modification is shown in which the inlet and outlet pipes, instead of passing through the crossheads, have branches at their outer ends and are adjusted by a set-screw or cross-head E. Another modification is shown with one valve instead of two, and a fixed boss on the valve casing for the other tension rod to bear against.

Abridged also in Class *Steam generators.*

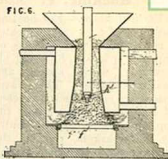


821. Hart, F. Feb. 24.

Water-heater or boiler.—

The invention relates to arrangements for burning slack which is supplied from a hopper with a narrow throat widening as it descends, and also relates to a form of vertical cylindrical tubular boiler. An annular vessel, Fig. 6, is provided with a central furnace. The fuel placed in the central hopper descends through the tapering passage to the firebars *f*, which are placed over a close ash-pit. Air for combustion is admitted through the central pipe and annular openings *k*.

Abridged also in Classes *Furnaces &c.* *Steam generators*; *Stores &c.*



843. Hamilton, W. March 2. *Drawings to Specification.*

Heating by steam.—Exhaust steam is admitted to the interior of pump plungers working heavy oils and similar substances requiring heat to melt them.

Abridged also in Classes *Pumps &c.*; *Steam engines*; *Steam generators.*

856. Ellis, G. H. March 3.

Heating-apparatus for baths.—An iron stand *q*, Fig. 8, terminating in a vertical pin, supports a suitably-shaped fire brick *p*, which is previously heated in an oven. In place of this apparatus a lamp or gas may be employed.

Abridged also in Classes *Closets &c.*; *Stores &c.*



950. Williams, M. March 9.

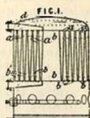
[*Provisional protection only.*]

Heating by steam, hot air, or gases.—Steam, superheated or not, hot air, or other heated gases are employed for boiling oils, melting gum, and heating spirits and other ingredients used in the preparation of varnishes, paints, lacquers, japans, enamels, printers' ink, and other compositions and for other purposes. In the preparation of varnishes which require a temperature exceeding 300° F., the ingredients are heated in jacketed pans by means of superheated steam. Two or three pans may be arranged for heating the several ingredients simultaneously. The steam may be superheated by passing it through a series of pipes arranged in an oven or other suitable heating-chamber.

Abridged also in Classes *Paints &c.*; *Starch &c.*; *Steam generators*; *Writing-instruments &c.*

983. **Hocking, F.** March 12. *Disclaimer.*

Vertical boiler.—For heating buildings &c. a water-heater is constructed with a series of annular spaces *a, b*, being alternately water spaces and heating spaces. The water spaces are connected by means of a pipe extending across the top and divided in the centre by a diaphragm, one of the pipes forming the inlet passage and the other the outlet. The inlet pipe is provided with a tube projecting nearly to the bottom of each annular water space, or an inlet pipe may be connected to the bottom of the annular spaces and an outlet pipe *d* to the top. A gas or oil burner or a firegrate may be fitted beneath the heater, and a chimney provided at the top. For baths, the burner or fireplace may be closed in and provided with an air pipe and the whole apparatus immersed in the bath.



Abridged also in Classes *Brewing &c.; Closets &c.; Cooling &c.; Distilling &c.; Steam engines; Steam generators; Stores &c.*

1034. **Bell, H., Bell, J., and Coleman, J. J.** March 15. *Drawings to Specification. 2 Disclaimers.*

Thermostats for controlling the steam throttle-valve in cold-air machines. (1.) The expansion of air in a tube causes a bell dipping in liquid to rise and operate the valve. (2.) The expansion of oil or non-conducting liquid causes an alteration in the levels of mercury in the limbs of a U-shaped tube, and completes electrical circuits at the upper and lower limits of temperature, through electromagnets which operate the valve.

Abridged also in Classes *Air and gases, Compressing &c.; Brewing &c.; Cooling &c.; Governors &c.*

1082. **Seaton, A. E., and Cameron, J. G.** March 17. *Drawings to Specification.*

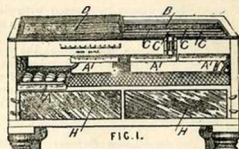
Heating water by steam.—A hollow perforated ring surrounding a safety-valve and delivering water close to the issuing orifice of the valve is stated in the Provisional Specification to be applicable also for this purpose.

Abridged also in Classes *Distilling &c.; Steam generators; Valves &c.*

1155. **Penman, J. G.** March 24.

Thermostat for fostermother and incubator. When oil is used to supply the heat, the wicks of the lamp are each covered by a sliding plate having a triangular opening therein. The heat is regulated by sliding the larger or the smaller part of the opening over the wick. This regulation may be effected automatically, by means of an air drum connected with pipes in the hot-water tank. The expansion of the air acts on the flexible end of the drum, and this is caused to work the plate. With

gas, a similar arrangement is made to regulate the supply, a bye-pass being provided to prevent the flame being extinguished.



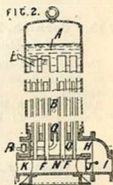
Boilers for incubators or fostermothers have straight or elbow flues.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Agricultural appliances for the treatment of land &c.*

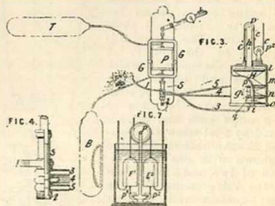
1173. **Sheppard, T., and Sheppard, W.** March 26.

Heating water &c.—The water is heated by exhaust steam coming in contact with it. *K* is the inlet for exhaust steam, which passes into the chamber *N* and thence up the internal tubes *F, F*, into the upper part of the external tubes *E, E*, which are closed at their tops. The steam then descends through the annular space between the outer and inner tubes to the outlet *H, I*. A self-acting relief valve *J* is arranged to act as a bye-pass for surplus steam to pass to the outlet *I* direct. *R* is a cock for removing mud.

Abridged also in Class *Steam generators.*



1198. **Hunt, N., and Cox, W. N.** March 27.



Thermostats.—Ventilators, window blinds, flue dampers, and the like, are automatically opened

and closed at certain temperatures by means of thermometric apparatus. In a pneumatic bellows arrangement P, Fig. 3, there is a rigid vertically-movable diaphragm, fixed to a movable frame G which can be counterbalanced by a lever and sliding weight L. The upper chamber of the bellows communicates with a closed glass or other vessel T which contains air, and is freely exposed to changes of temperature; the lower chamber communicates with a similar vessel B which is protected from changes of temperature. This second vessel eliminates the influence of barometric variations. When the temperature alters, the diaphragm is raised or lowered, moving a tubular slide valve S. The way 1, Fig. 4, is connected with the water supply, and the ways 3, 4, 5, with three separate chambers of a hydrostatic bellows H which is formed by a fixed plate *o* connected to movable plates *n, m, l* by india-rubber rings or cylinders. When the valve S descends, water is admitted to the chambers in order, the pillar *h* attached to the top plate is raised, and a cord *c*, which is fixed to the box, passing over a pulley on the top of the pillar and another fixed to the box, is pulled down. The other end of the cord is fixed to the ventilator, blinds, &c. The action is reversed when the valve ascends. A piston moving in a cylinder may be used instead of the pneumatic bellows. In other modifications, the thermometric vessel is partly filled with liquid, such as water or mercury, which is expelled by a rise of temperature into another vessel. This vessel forms part of some kind of balance connected with the ventilator, and by its increase of weight the balance is shifted and the ventilator regulated. If the temperature decreases, the action is reversed. In another form, a separate bellows is connected to each thermometer, and acts on either end of a balance connected as before with the ventilator. In another form, a hydrostatic balance is used, consisting of two vessels F¹, F², Fig. 7, partly filled with air, inverted under water, and connected by a cord over pulleys P, p¹, p². The air space of each is in connection with one of the thermometric vessels, and its volume is altered with change of temperature, causing one vessel to rise and the other to fall, thereby regulating the ventilator. The cord actuated directly or indirectly by the thermometric apparatus in any of the above arrangements may serve to liberate the escapement of a train of clockwork connected with the ventilator.

Abridged also in Classes *Agricultural appliances for the treatment of land &c.*; *Buildings &c.*; *Furnaces &c.*; *Furniture &c.*; *Stoves &c.*; *Ventilation.*

1269. Fleury, F. G. March 31.

[Provisional protection only.]

Thermostat for controlling ventilators.—The ventilator opens and closes automatically at any desired temperature. The valve or door is connected, either directly or through levers, with a metal coil or coils fastened to the frame of the ventilator. Attached to the coil or coils is another coil of a metal having a different coefficient of expansion. The compound coil is lengthened or shortened by change of temperature and the valve is operated accordingly.

1390. Lake, W. R., [Hoppenstedt, G.]. April 9.

[Provisional protection only.]

Non-conducting coverings.—The slag or mineral wadding commonly used is intimately mixed into a paste with silicate of soda and applied in this condition in layers of the desired thickness to the hot or cold surface to be protected. When dry it becomes solid and adherent, and does away with the necessity of using string, bands, canvas, tar, &c. Borax, alum, any soluble silicates, or inorganic solutions which produce the same effect may be used for forming the paste.

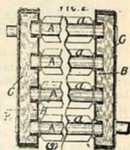
1406. Moy, T. April 11. Drawings to Specification.

Sectional boilers consist of front plates with chambers and rows of tubes surrounding the furnaces. There are generally two series of tubes, the side ones carried horizontally back from the chamber, then bent round and returning to the chamber again, and the centre ones, which are also carried back to form the roof of the furnace, then bent round and carried back to the front end, forming firebars. In modifications shown, one of those series of pipes may be omitted, or the boiler may be fired externally, or the nest of tubes may be arranged in a form other than a rectangle. A steam receiver is added.

Abridged also in Classes *Aeronautics*; *Furnaces &c.*; *Locomotives &c.*; *Steam engines*; *Steam generators*; *Stoves &c.*

1431. Byram, W. April 12.

Pipes for heating and ventilating buildings and rooms have longitudinal ribs *a*. One row of pipes is placed above the space between the other rows, to increase the heating or cooling surfaces. The ribs may be solid, or hollow to form water-ways, or of various other shapes, illustrated in the Specification.

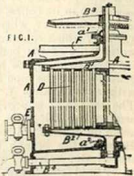


A box C forming a water chamber is fixed to the tube-plate B.

Abridged also in Classes *Pipes &c.*; *Ventilation.*

1547. Janig, H. April 20.

Tubular apparatus for cooling or heating liquids, vapours, and gases, and for condensing.—Within a casing A, Fig. 1, provided with an inlet E and outlet F is an apparatus consisting of two chambers B¹, B² connected by small tubes D, which is rotated in stuffing-boxes a¹, a² by any suitable means. Liquid or gas enters at an opening B¹ and flows through the chamber B¹,



tubes *D*, and lower chamber *B'*, finally leaving by a tap *B*. When used for cooling or condensing, the medium to be cooled passes through the rotating portion while a cooling-agent flows through the outer chamber *A*. For heating purposes, the heating-agent may be circulated either around or through the rotating portions *B'*, *D*, *B'*, the substance to be heated occupying the remaining space. Vertical wings within the vessel *A* prevent the fluid therein rotating with the moving portions. The invention may be applied to steam engines, vacuum pans, and distilling-apparatus.

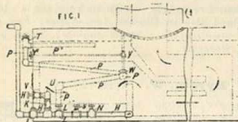
Abridged also in *Classes Breeding &c.; Cooling &c.; Distilling &c.; Steam engines.*

1589. Haddan, H. J., [*Ayer, J. M.*]. April 24.

Non-conducting coverings and linings.—India-rubber, alone or combined with paper or paper products, is used as a lining for refrigerator chambers or other structures.

Abridged also in *Classes Buildings &c.; Cooling &c.; Railway &c. vehicles; Road vehicles; Ships &c., Div. I.*

1617. Abel, C. D., [*Steele, G.*]. April 25.



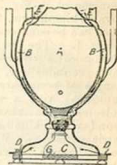
Coiled water-tube boiler for heating feedwater but applicable also generally. Arrangements are provided for effecting the circulation of water through the heating-pipes when the feed is stopped to prevent overheating, and means are provided for allowing the escape of steam or air from an intermediate point in the length of pipes in the firebox direct into the steam space of the boiler, to ensure the pipes being always filled with solid water. The invention also relates to means for maintaining circulation of the water through the pipes when a portion thereof is cut off for repairs. The pipe *H*, which leads from the feed pump, communicates by two branches *U* with the lower part of the water space of the boiler. A branch is connected to a pipe *P*, which is led round inside the firebox ascending in its course and passing out at the front end of the boiler, where it is provided with a stop-valve *T*, which communicates with a pipe *P*¹ in the water space of the boiler. *W* is a pipe which rises into the steam space to allow the escape of steam generated in the pipe *P*. The pipe *W* is provided with a stop-valve *Y* worked by a hand-wheel. The branch *U* is provided with a check valve *K*, arranged to fall open by its own weight when not acted on by the fluid below, and with a stop-valve *V*. Between the branch *U* and the feed pump is a second stop-valve *T*, which closes when not acted on by fluid from below. *L*, *N*, and *S*, are stop valves on the feed pipe.

Abridged also in *Class Steam generators.*

1766. Padley, S. May 7.

Heating water &c.—Urns and other vessels for heating liquids or keeping them hot are provided with a jacket *B* which is supplied with hot air from an enclosed lamp *C* or other heating-apparatus below. *D, D* are holes for the admission of air to the lamp, and *E, E* outlets for heated air.

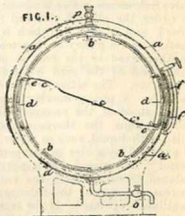
Abridged also in *Classes Cooking &c.; Hollow-ware.*



1894. Allott, J. B., and Barnsdale, O. May 15.

Boiling pans.—

Relates to improvements in revolving wash vessels. The wash vessel is furnished with a division plate, may be used with or without an outer casing, and may be circular or not. Fig. 1 is a vertical transverse section of a washing-machine, in which a revolving cylindrical wash vessel *b* is surrounded by a fixed



casing *a*, the wash vessel *b* being usually made of open metal grating, so that it will retain the goods being washed while allowing the water to enter and leave it freely. The wash vessel *b* is divided into two parts by the plate *c*, which is recessed at *c*^x and *c*^y, the division plate guiding and preventing the entanglement of the goods and a plate recessed as shown carrying the goods higher during the revolution than would a plane plate. Each part of the wash vessel is provided with a door *d* for the introduction and removal of the goods, and tearing is prevented by the loose rollers *e*. The outer casing *a* is provided with a door *f*, and a worm and wheel with ratchet and spring pawl is attached to the driving-shaft of the wash vessel for bringing the doors *d, d* in turn opposite the outer door *f*. The outer casing is usually strengthened by a close-fitting cover, so that a slight pressure of steam may be used, and this cover is provided with a door corresponding to those in the wash vessel and closed so as to form a tight joint. Steam is admitted through the cock *o* and water through *p*, a safety valve and wash out cock being also provided. When no outer casing is used, the wash vessel is constructed to hold water and provided with doors and also with an inlet and outlet for water, and for steam if desired. By preference the inlets are arranged in the driving-axle, the division plate being usually perforated in this apparatus, which may also be fitted with the worm and wheel arrangement for adjusting its position. A combined washing-machine and boiler is also described,

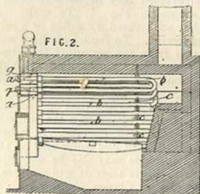
in, which the revolving wash vessel is made of open metal grating surrounded by a casing for holding the water. This casing is furnished with a safety-valve and wash out cock, and is built in brickwork over a furnace or flue. The inner wash vessel may be made removable by making the upper half of the outer casing to work on hinges.

Abridged also in Class *Washing &c.*

2016. Toope, C. May 23.

Non-conducting covering for steam generators, pipes, refrigerators, &c., formed of woollen rags, paper, or felt. In forming tubular coverings for pipes &c., an apparatus is employed having a revolving mandrel on which the paper &c. is rolled. A tension device, a "doctor" or rubber, and a paste trough are provided. The tube so formed is dried and severed longitudinally on one side, a longitudinal groove being cut in the inner surface of the opposite side to form a hinge. Pins or staples are used to join the edges. For flat or irregular surfaces separate layers of the paper with paste interposed are applied in succession to a former or block of the desired shape, and then pressed and dried. Several segments may be thus formed and joined by staples and further secured by iron or brass bands.

2073. Rivers, E. G. May 28.

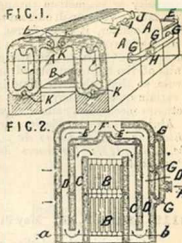


Sectional boilers.—The ends of bent tubes *b* are fixed by double nuts to a saddle-shaped circulating-chamber *a*. The bent ends of the tubes are supported by brackets *c* fixed to the walls of the furnace. They are thus easily disconnected for repairs without disturbing the setting. Free communication is maintained between the tubes and chamber by means of apertures *g*. The flow and return currents are separated in the chamber by a diaphragm, and the circulation is thereby rendered so rapid that no deposit of sediment takes place. The circulation is also improved if the tubes slope downward from front to back. For economy of heat, additional tubes in combination with the tubes *b* may be arranged in the flues.

Abridged also in Class *Pipes &c.*

2087. Harlow, B. May 29.

Saddle boilers are formed of cast-iron half-saddle-segments *A*, each of which is a complete boiler in itself. Equal numbers of these are arranged on an iron plate or on brickwork and masonry on each side of a fire-grate *B*. Each segment is traversed by two parallel flues *C, D*, either side by side or superposed.



Segments are also arranged at the back of the furnace, and more segments can be introduced at any time. The segments are connected by branches *I* of the flow pipe *J*, and branches *G* of the return pipe *H*. They may be further bound together by bolts passing through passages *K* or through external lugs. The top of the furnace between the segments is closed in by fire tiles *L*, and the top of the end chamber *E* by iron plates. The front of the furnace is preferably closed by a counterpoised vertically-sliding door, to direct the air into and through the fuel instead of over it, but this is not essential. The smoke traverses the flues in the directions indicated by the arrows, entering a chimney through an opening *F*. A fuel hopper may be inserted by removing one of the fire tiles.

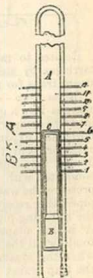
Abridged also in Class *Furnaces &c.*

2106. Biggs, J. H. W. May 30.

Consists of apparatus for evaporating brine, manufacturing salt and carbonate of soda, packing salt and other substances, and for regulating the density and temperature of liquids.

Thermostat.—For regulating heat, a thermometer, Fig. 11, is used having a piston and float *B* round which is a silver casing *C*. Wire No. 1 connects with a sufficient number of cells to turn the electric or magnetic engine. Wire No. 12 connects with enough cells to drive the engine at its highest speed, while intermediate wires connect with a graduated number of cells. As the heat increases the float rises and connects more wires, driving the engine faster. The float *B* may be connected to the density float or with a pyrometer or thermometer. In another arrangement, a radiometer is used, being sometimes combined with lenses, reflectors, and connecting wires, and caused either to turn a spindle

FIG. 11.



with varying velocity or to pass more or less electricity or magnetism through the instrument. To enable a very small current to be passed through the radiometer, it is preferred that the discharge wire shall have presented to it by clockwork &c. a succession of bars or receptacles for more or less units of the fluid and placed on a revolving glass drum, so that when the fluid in them amounts to a certain quantity they attract a time lever which actuates mechanism connected with the dampers.

Abridged also in Classes *Acids &c.*, *Div. II.*; *Bleaching &c.*; *Distilling &c.*; *Drying*; *Electricity &c.*, *Div. III.*; *Governors &c.*; *Moulding &c.*; *Packing &c.*

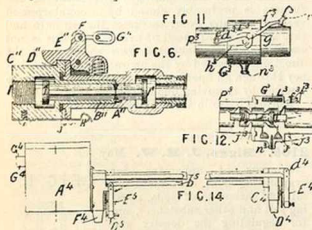
2115. Hirsch, H. May 31.

[*Provisional protection not allowed.*]

Heating water &c.—Flint pebbles or other silicious particles are immersed in the liquid, to divide it into attenuated layers or films.

Abridged also in Class *Steam generators.*

2226. Clark, A. M., [*American Car Heating & Brake Co.*]. June 7



Relates to radiating-pipes for heating railway carriages by steam, to couplings therefor, and to steam traps for freeing the pipes from water.

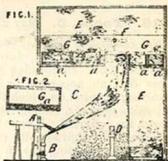
Steam trap.—The drip pipe G^4 , Fig. 14, discharges into a cylinder A^4 , which may be divided into two compartments by a central partition. Two horizontal expansion tubes are rigidly fixed to the cylinder, and two drip-pipes may be used, the double trap formed by the partition being thus connected with two sets of pipes having varying pressure, the water of condensation from the supply pipe being received in one part and the drip from the radiating pipes in the other; the heavy cylinder A^4 is thus adapted to retain heat sufficiently long to allow all the water to pass out without freezing when the steam is shut off from the pipes which the trap drains. Valves C^4 , F^4 open outwards and are kept open by springs D^4 , D^4 , as long as the tube is cold. The water can then freely escape. When the tube is heated, it expands more than parallel rods rigidly fixed to the cylinder, and turns the

lever E^4 on a fulcrum d^4 against the valve, closing it more or less. At the same time also, the valve F^4 is closed by the rod b^4 acting on the lever E^4 .

Abridged also in Classes *Pipes &c.*; *Railway &c. vehicles.*

2236. Clark, A. M., [*Elbers, A. D.*]. June 8.

Non-conducting covering.—Slag-wool is separated from globules and collected in pans to form sheets of the required size by means of an arrangement shown in Fig. 1. The liquid slag runs from a conduit A into the chamber C , where it meets a jet of air, steam, &c. issuing from the pipe B , whereby it is blown into woolly fibres and carried in the direction shown. It is afterwards subjected to the action of a lateral current issuing from D , the strength of which current is so adjusted that the light wool is blown into the upper part of the chamber or into another compartment E , while the heavy globules fall to the floor. The lateral current may be produced by an exhaust apparatus placed as at F . The pans G are made with loose bottoms a , and when reversed may be used to compress the wool as shown in Fig. 2. To make the sheets compact they are treated with glue or a mixture of glue and glycerine. To render the fibre waterproof and protect it from the action of the atmosphere, and also to decompose the calcium sulphide which it may contain, it is treated with bituminous, resinous, or gummy substances, either by melting the latter on the sheets and then if necessary heating to carbonize, or by placing the bituminous or like substances in the chamber E , where it is volatilized by the heat and condensed on the wool. The calcium sulphide may also be decomposed by treatment with dilute acids or acid vapours.



Abridged also in Classes *Cements &c.*; *Fabrics, Dressing &c.*; *Fire, Extinction &c. of*; *Medicine &c.*; *Paper &c.*; *Waterproof &c. fabrics*; *Weaving &c.*

2251. Pitt, S., [*Smith, W. G., Fell, T. F., and Bunster, H. B.*]. June 9.

Heating by liquid circulation.—Heated glycerine or a compound thereof is employed for heating, distilling, or concentrating purposes, either directly or by circulation through pipes &c.

Abridged also in Classes *Acids &c.*, *Div. III.*; *Distilling &c.*; *Steam engines*; *Sugar.*

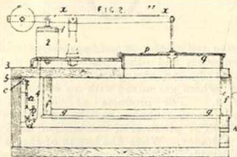
2342. Wright, J. June 15. *Drawings to Specification.*

Heating air.—Relates to arrangements of tubular feedwater-heaters for steam generators, stated to be

applicable also for heating air by exhaust steam for warming buildings or railway and tramway vehicles.

Abridged also in Classes *Electricity &c., Div. III.; Manufacture of iron &c.; Railway &c. vehicles; Steam engines; Steam generators.*

2343. Stott, L. H. June 15.



Thermostat for regulating temperature in incubators, buildings, &c. The expansion of fluids or solids is utilized to complete the circuit in an electromagnet the armature of which may control ventilators, dampers, or the gas supply to burners, heating boilers, &c. In an incubator, Fig. 2, in which the eggs are placed on the lattice bottom *g* of the drawer *f*, the heat is supplied by pipes *i, k*. Within the chamber is a tube *a, b* containing mercury and having a wire *d* sealed into the lower end, while a wire *c* passes into the upper end, reaching a point to which the mercury will rise when the maximum temperature is attained. Wires 3, 4, 5 connect the tube with the electromagnet 2 and with a battery &c. When the circuit is completed by the contact of the mercury with the upper wire, the magnet attracts the armature 1, which operates the balanced lever *x* to raise the ventilators *p, q*. In hot-water circulating apparatus a similar lever arrangement operates valves to admit hot or cold water to the pipes leading to the heating-apparatus.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Furnaces &c.*

2447. Packett, W. June 23.

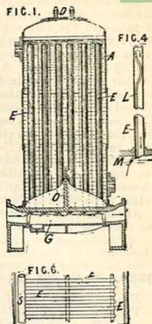
Heating water by gas jets.—The gas is burnt in an atmospheric burner in the lower part of a suitable metallic case kept submerged in the liquid by weights. The case may be flat, cylindrical, rectangular, or otherwise, and is provided with a number of transverse tubes, horizontal or inclined, which serve for the circulation of the liquor through the apparatus. Air is admitted through shafts leading from above the surface of the liquid to the bottom of the case, and is regulated by a sleeve, which slides on a vertical tube provided with one or more slits and connected to the burner.

Abridged also in Classes *Closets &c.; Stores &c.*

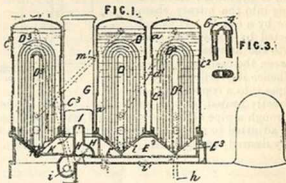
2458. Atkinson, J. June 26.

Tubular heating-apparatus in which tube fixed at one end and closed at the other are used in combination with circulating-pipes. The fixed ends of the tubes *E* open into a chamber or passage *G*. Each of the tubes *E* contains a circulating-tube *L*, Fig. 4, open at both ends. The circulating-tubes *L* have ends or mouths *M* which project into the path of the gases or steam, so as to form an induced current through themselves and the tubes *E*. The latter tubes are shaped at their open ends so as to assist in forming an induced current. In a modification, the tubes *E* project from a straight pipe *S*, as shown in Fig. 6. This arrangement is adapted for heating air or gases and for heating liquids in tanks, vats, or coppers.

Abridged also in Classes *Distilling &c.; Steam engines; Steam generators.*



2486. Wright, J. June 27.



Heating water and other liquids or gases.—Relates to apparatus for heating feed-water by means of exhaust steam and waste furnace gases, reference being made to a previous Specification No. 2342, A.D. 1877. It is stated that the apparatus may be employed for cooling air and other fluids. Each of the two heaters *C, C'* consists of an outer casing with a doubly-inclined base which forms two tube-plates. Two series of tubes *D, D'* are fixed in these plates and form passages through which the exhaust steam passes. The water spaces of the heaters are connected by the tube *d'*. An additional heater *C'* is provided, the tubes of which form a passage for the waste furnace gases; the water space is connected with that of *D* by a tube *m'*. The exhaust steam is conveyed to the chamber *E'*

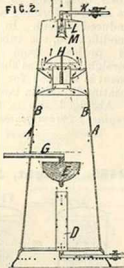
by a pipe *F*. It then passes through the tubes of the first heater to the chamber *E'*; then through the second heater to the chamber *E*, from which it passes to the chimney. A valve *H* is provided whereby a portion or the whole of the exhaust steam may be admitted to the blast pipe instead of passing to the heaters. A valve *K* is also provided for the purpose of admitting the waste gases, or any desired portion of them, direct to the chimney instead of their first passing through the heater *C*. The heater *C* may be used alone if desired. Straight tubes with cap pieces, as in Fig. 3, may be used in place of the bent tubes. When this arrangement is applied to the heater through which the waste gases pass, the inner side of the cap pieces are pointed as at 6, Fig. 3, to facilitate the return of particles of fuel.

Abridged also in *Classes Brewing &c.*; *Cooling &c.*; *Steam generators.*

2552. Lake, W. R., [Walker, A. R.]. July 3.

Heating water by hot air.

—The apparatus is made of metal. The outer casing *A* may be made of galvanized iron, and the inner *B* of copper. Water is admitted by a pipe *K* through a tapered nozzle into a chamber *L*, and is spread into a shower by a hemisphere *M*, or in any other suitable way. The spray meets the ascending current of hot air from a Bunsen burner *D*, but is prevented from falling into the burner chamber by a cap *H*. It is collected by a disc and falls into the annular space between the casings *A* and *B*. Thence it overflows by side pipes into a copper basin *E* directly heated by the burner, and finally escapes through a pipe *G*. The water and gas supply can be adjusted to give a continuous stream of water at any desired temperature.



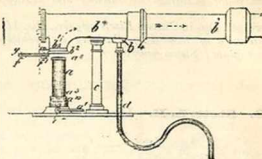
2733. Hanson, W. July 16.

[Provisional protection only.]

Steam traps.—An air escape valve is described as applied to steam traps, but it is applicable for other purposes. To the top of the trap is screwed a cup, perforated round its upper end, and containing mercury. A vulcanite spindle enters this cup, its other end carrying a valve having its seat formed in a bonnet, fitted on the top of the trap. When the trap is cool the valve is open, and allows the air within to escape; when heated it is closed by the expansion of the mercury.

Abridged also in *Class Valves &c.*

2787. Tidcombe, G. July 21.



Heating and ventilating buildings and other places.

—Greenhouses and other places are heated and ventilated by an arrangement partly shown in the Fig., where gas mixed with air is burned in a burner *a*. The products of combustion are received by a tubular radiator partly shown at *b*^o, *b*. The products of combustion finally pass into a chimney. When the length of the radiator is considerable, auxiliary burners are placed at the mouths of junction pipes along it. The radiator tube may be led in any desired direction. Immediate ventilation is effected by the intake of air to supply the burners.

Radiator.—The products of combustion from a burner *a* pass into a radiator partly shown at *b*^o, *b*, and from this into a chimney. The radiator is supported on pillars similar to the one shown at *c*. That part of the radiator tube near to the burner is preferably of iron, and the rest is of fireclay, but the radiator may be wholly or partly of iron, glazed earthenware, or fireclay. To equalize the distribution of heat, the tube may be thicker or have an enclosing pipe or part pipe near the burner, tapering in thickness away from it. For a tube having a diameter of 3 inches at the part *b*^o, the mouth *b*¹ is brought within an inch of the burner gauge *a*¹. The mouth *b*¹ has a lip turned up inside, so as to form an annular channel, and the sides of the mouth are sufficiently inclined to ensure any condensed products running into this channel, from which they may be drawn off or conveyed away. The bottom side of the tube *b*¹ slopes to a depression *b*¹, to which a pipe *d* is connected for draining away condensed products. Similar drain pipes are placed along the radiator where requisite. These drain pipes when of iron are coated with tin or other suitable material inside and outside. Other iron parts of the radiator may be similarly coated, where the temperature is not sufficiently high to destroy the coating. An annular cap may be put round the outside of the mouth *b*¹, to protect the burner from any liquid running down the outside. When the length of the radiator is considerable, junction pipes are connected to it where desired, and these have their mouths arranged like the mouth *b*¹ and have an auxiliary burner, the products from which are led into the radiator by a bend turned in the direction of the current, so as to rightly direct the entering products. The diameter of the radiator is increased in some cases, to compensate for the increased volume at these additions. In place of, or in addition to, the bent-junction pipes, diaphragms or plates, suitably inclined, may be employed to check back draught. The mouths have a damper *g* to

decrease the inflow of air when the flame is lowered. When the gas is shut off, the mouths are closed by a plate *f* which is swung under and closes it, thus retaining the heated air in the radiator. In order that the radiator may be easily cleaned out, a blank flange *e* can be taken off at each end and when necessary. When gas containing volatile salts is burned, the radiator has elbow-bends with doors through which any matter may be scraped out.

Abridged also in Classes *Agricultural appliances for the treatment of land &c.; Buildings &c.; Stoves &c.; Ventilation.*

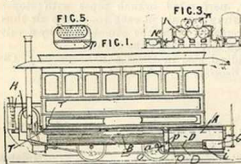
2825. Thompson, E. July 24.

[Provisional protection only.]

Heating water for heating ships.—Vertical water pipes are carried in the funnel, and are heated by the waste gases.

Abridged also in Classes *Agricultural appliances for the treatment of land &c.; Chimneys &c.; Fire, Extinction &c. of; Fuel, Manufacture of; Furnaces &c.; Lamps &c.; Ships &c., Div. I.*

3014. Clark, A. M., [Angamar, E. H.] Aug. 8.



Heating water to supply tramway-engine boilers.—A range of boilers I, Fig. 3, is placed over furnaces and the water in them heated to about 350° F. Tanks or boilers are placed above I and heated to say 212° F. by the waste gases from furnaces or by the exhaust from steam supply pumps. The boilers have valves and pipes with sliding coupling N' to temporarily connect them to car boilers, into which water is passed from low-pressure boilers to fill about three-fourths of the water space, the remainder being admitted from high-pressure boilers to raise the temperature of the whole to that corresponding to the working pressure.

Abridged also in Classes *Locomotives &c.; Railway &c. vehicles; Steam engines; Steam generators.*

3023. Montgomery, R. Aug. 8.

[Provisional protection only.]

Steam traps.—Two concentric metallic tubes are connected at their upper ends. A washer or ring on the inner tube rests on the top of the outer tube, and a perforated cap, screwed on the top of the outer tube, comes against the washer, and secures the tubes together. The top of the cap is screwed to form the inlet connection. The lower end of the inner tube carries a valve seating, the

external diameter of which fits the interior of the outer tube and acts as a guide. The valve is placed beneath the valve seating, and is kept in position by the conical end of a screw which comes against it and affords means of adjustment. The valve is opened or closed according to the temperature of the inner tube.

Abridged also in Class *Steam engines.*

3044. Mather, W. Aug. 9.

[Provisional protection only.]

Heating and ventilating hospital and other buildings. Air is drawn down a high shaft to escape dust and the like, and is forced by a blower through a multi-tubular apparatus heated by exhaust steam. This apparatus is preferably placed under the floor of the laundry to assist in drying the clothes. The condensed water and the waste steam are conducted to a special heating-apparatus and are utilized for bath and lavatory purposes. The heated air is distributed to the various wards &c., and may be specially heated to any desired temperature before entering a ward. Steam may be injected into any ward if the air is too dry.

Abridged also in Classes *Air and gases, Compressing &c.; Closets &c.; Drying; Ventilation.*

3053. Horner, W. W., Barker, G., and Hallam, S. Aug. 10.

[Provisional protection only.]

Heating water by steam for the preparation of infusions of tea and coffee and for other purposes. A metal cylindrical casing contains tubes the ends of which are fixed in tube-plates formed on or fixed to the case; or, the tubes may be fixed into a partition cast in the case, and at the other end into a block bolted to it. Steam is sent through the tubes, the water of condensation being removed in the usual way, or by means of a special trap. The water to be heated passes through the case in the opposite direction to that of the steam, and is in contact with the exterior of the tubes. If preferred the water may be passed through the tubes and the steam into the casing.

Steam trap.—Consists of two metal tubes having different degrees of expansion, one placed within the other, the space between them opening into the chamber into which the water of condensation flows. The lower end of the outer tube is fixed to a valve chamber, that of the other being attached to an adjustable valve, the opening or closing of the valve depending upon the presence of water or steam in the enclosed space.

Abridged also in Class *Hollow-wares.*

3056. Gedge, W. E., [Gaudfrey, C.] Aug. 10.

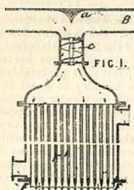
Non-conducting fabric made by spreading upon a table a layer of flock, cowhair, &c. Cords of the same material are placed across this layer about an inch apart, and on the top of the cords is placed another layer similar to the first. The lap thus obtained is placed upon a frame on which are arranged longitudinally thick threads of flock, at distances of from one to two inches apart, the whole

being then stitched together. Spiral springs are fastened to the fabric, and by reference run in the same direction as the length of the fabric, so as to form an air space between the fabric and the surface covered. When covering large surfaces, springs may be replaced by metal bands. The felt fabric may be used either with or without the springs or bands.

3081. Kelly, H. W., and McEntagart, J. G. Aug. 13.

Pipes for air for heating buildings.—The tubes F¹ for the passage of heated or cold air are formed with bell-mouthed ends F to reduce resistance. To prevent the return of air, a screw c is interposed to the air pipe. To divide the current, a wedge-shaped block a is arranged opposite the lateral aperture in the pipe B.

Abridged also in Classes *Cooling &c.*; *Drying*; *Mining &c.*



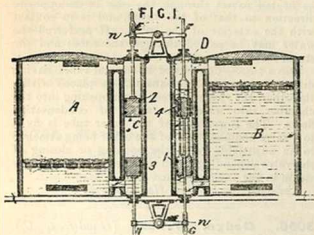
3095. McKean, J. Aug. 14.

[Provisional protection not allowed.]

Foot rests and warmers.—Shallow boxes with perforated tops and containing hot-water pans are employed. They may also be used as receptacles for other articles.

Abridged also in Classes *Boxes &c.*; *Railway &c. vehicles*; *Road vehicles*; *Trunks &c.*; *Wheels &c.*

3131. Beaugard, F. A. T. de. Aug. 16.



Non-conducting linings and compositions.—Oak is employed as a lining in cylinders, and may be covered with a mixture of granulated cork, paraffin, linseed oil, and cork dust.

Abridged also in Classes *Air and gases, Compressing &c.*; *Fire, Extinction &c. of*; *Hydraulic machinery &c.*; *Pumps &c.*; *Ships &c., Div. II.*; *Ventilation.*

3301. Feather, T., and Thurlow, C. J. Aug. 30.

[Provisional protection only.]

Steam trap.—Relates to an arrangement of valve, lever, and tube, operated by expansion and contraction due to variation of temperature. A whistle is attached to the valve end of the tube, the other end being placed to a certain level in the water, and ensures the tube being charged with water and the valve closed during the ordinary working of the boiler. When the level of the water falls below the end of the tube, the water is replaced with steam, the change of temperature in the tube opening the valve and sounding the whistle.

Abridged also in Classes *Steam generators*; *Valves &c.*

3607. Knott, K. Sept. 26.

[Provisional protection only.]

Heating air.—Air is blown through coils within a tank filled with hot water. The tank is covered with a non-conducting substance.

Heating and cooling buildings.—For large buildings the air is distributed by perforated pipes. In those with many rooms a main pipe from the tank passes around the structure and returns to the blower, perforated branch pipes with stop-cocks distributing the air in each room, the air thus lost being replaced from the atmosphere by a valve in the main inlet pipe of the blower.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*; *Distilling &c.*; *Ventilation.*

3637. Virgo, C. G., and Akeroyd, A. Sept. 28. *Drawings to Specification.*

Heating buildings and structures.—Relates to lamps in which the products of combustion are led away by pipes from the apartment or building. Several arrangements are described and illustrated in connection with gas lamps and fittings, and the improvements are stated to be also applicable to oil lamps. The escaping products of combustion may be utilized for heating and ventilation. A chamber, which receives the heated air from the lamp, is fitted with a series of tubes communicating with the external air for admitting warm air or extracting vitiated air.

Abridged also in Classes *Lamps &c.*; *Ventilation.*

3711. Barlow, H. B., [Sobbi, G. A. von, and Kärten, H. C.] Oct. 6.

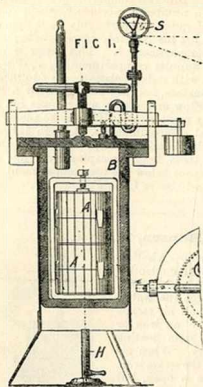
Increasing heating surfaces by means of ribs.

Vessels for boiling liquids &c. are formed with outside ribs as in Fig. 9.

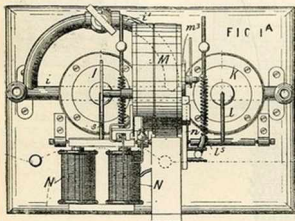
Abridged also in Classes *Cooling &c.*; *Furnaces &c.*; *Manufacture of iron &c.*; *Pipes &c.*; *Stoves &c.*



3729. Nawrocki, G. W. von, [Davidson, J.].
 Oct. 8.



Regulating temperature and pressure.—In an apparatus for vulcanizing rubber palates for false teeth &c., the rubber is enclosed in cases A placed in a closed water and steam chamber B provided with safety-valve, thermometer, and pressure gauge. Heat is applied by the gas burner H. The gas is admitted thereto through the tube *i*, Fig. 1A, in



which are two disc valves I, K. The valve I is held open against the spring *F* by the electromagnet *N*. The pressure gauge *S* is so arranged that an electric circuit is completed by a spring index-hand in contact with the pressure index-hand and which is released from such contact by a stop adjustable to any desired pressure. An arm *s* attached to the armature releases a pendulum to start a clock when the circuit is first broken. A bye-pass *l* keeps the flame alive when the valve I is closed. The valve K entirely stops the gas supply and is closed by the spring *l* at any set time when

a notch in the adjustable disc *m*³ rotated by the clock *M* admits the end of the slide *n*. Thus when the apparatus is started the pressure rises in the container B until the desired amount is attained. The pressure gauge then breaks the circuit, the valve I is closed, and the clock is started. Slight variations of pressure will repeatedly break and complete the circuit to maintain the desired temperature until the valve K is closed.

Abridged also in Classes *Electricity &c.*, Div. III.; *Medicine &c.*; *Registering &c.*

3736. Wedekind, H., [Heine, H.]. Oct. 9.
Drawings to Specification.

Boiler for heating water.—The boiler consists of two circular nests of tubes arranged horizontally one above the other, with suitable connecting end-chambers and cleaning-doors.

Abridged also in Classes *Furnaces &c.*; *Pipes &c.*; *Steam generators.*

3762. Cornish, F. Oct. 10.

Heating buildings.—The walls are built of hollow blocks which allow free circulation of air through the structure. This arrangement is stated to be suitable for the introduction and passage of hot air for warming purposes.

Abridged also in Classes *Buildings &c.*; *Cements &c.*; *Fire, Extinction &c.*; *Mining &c.*; *Moulding &c.*; *Ventilation.*

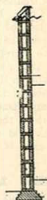


FIG. 3.

3769. Wotherspoon, J. Oct. 11.

[*Provisional protection only.*]

Non-conducting covering.—A development of the invention described in Specification No. 524 A.D. 1873. Wood pulp, especially Norway pulp, or other pulp made from refuse paper, card, &c. is mixed with asbestos or amianthus to form paper, cardboard, &c. Fibrous asbestos or asbestos refuse may be mixed therewith. The resulting material is unflammable and may be used as a tough coherent lagging or cladding for boilers.

Abridged also in Class *Paper &c.*

3946. Wotherspoon, J. Oct. 25.

Non-conducting covering.—Paper, pasteboard, cardboard, or millboard is rendered heat-resisting by coating it on one or both sides with asbestos. The wood or other pulp from which the paper &c. is made may have asbestos mixed with it, and in the Provisional Specification it is stated that the pulp or the separate layers of paper may have tung state or muriate of soda and sulphate of alumina mixed therewith. The coating may be effected in the paper machine, by causing the pulp and asbestos to flow separately thereto, so that the two layers are deposited on one another; or the layers

bestos may be attached by paste &c. A layer of such material may be placed next the boiler and the thickness of this may be increased by placing upon it other layers of paper, pasteboard, cardboard, or millboard.

Abridged also in Classes *Cutting &c.*; *Paper &c.*; *Pipes &c.*; *Steam engines.*

4030. Baatsch, C. Oct. 30.

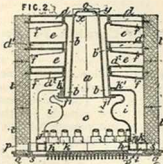
Non-conducting covering.—Slagwool is coated with alkaline silicate, whereby the emission of sulphuretted hydrogen and dust is prevented. Raw slagwool is applied direct to the surfaces and then covered with cloth or paper saturated with alkaline silicate over which powdered plaster of Paris may be applied.

Abridged also in Classes *Buildings &c.*; *Cements &c.*; *Moulding &c.*

4086. Dilworth, W. Nov. 2.

Circulating boiler.

—The horizontal section of the whole apparatus is circular. The firebox *c* is central, and is fired through the central space of an annular compartment *b* of a boiler, the top of which is closed by a cap *y*. Round



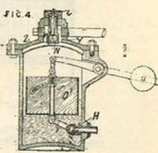
the base of the firebox is an annular compartment *h*, incomplete in front because of the fire-door. Into this compartment are symmetrically inserted a number of sockets *k*, which receive the spigots of radial compartments *i*, the upper ends *j* of which are inserted into corresponding sockets *k*¹ in the compartment *b*. This latter is extended into flat annular compartments *d*, *d*¹, *d*² which are provided with radial enlargements *f* to increase the heating-surface, and are supported by a fire-brick wall *l*. Flow and return water pipes are inserted at *o* and *p* respectively. The smoke passes between the radial compartments *i*, through tubes in the flat annular compartments, and through the spaces between them, finally escaping by a flue opening into the space below the top compartment.

Abridged also in Class *Furnaces &c.*

4307. Hanson, W. Nov. 17.

Steam trap.—A hollow float *O*¹ with a plug tap *H* controlled by the float *O*¹ is used to discharge the water. *C* is a small air-escape valve with an iron or vulcanite stem floating in mercury. When air only is in the steam trap, the valve is open, but when steam is admitted it heats the mercury *N* in the cup *Z* and by its expansion closes the valve.

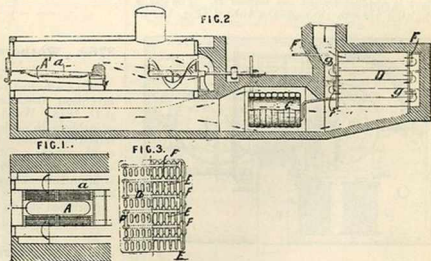
Abridged also in Class *Valves &c.*



4426. Lawrence, W. Nov. 24.

Heating water by waste furnace gases.—Fig. 2 shows a sectional boiler *C* placed in a furnace flue and fed from the heater *D* shown in section in Fig. 3. This heater is of a corrugated sectional form placed in the flues, with baffles *y* to cause the heated gases to pass backwards and forwards through the spaces *E*. The heater is filled with a saturated solution, such as chloride of calcium or acetate of soda, having a boiling-point higher than that of water, and the feedwater is passed through tubes *F* placed over the saturated solution.

Abridged also in Classes *Furnaces &c.*; *Steam generators*; *Stores &c.*



4433. Burgh, N. P. Nov. 24.

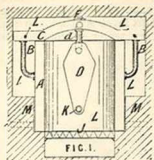
[Provisional protection only.]

Heating liquids and gases.—A metal casing is constructed round the heater to form a space or a number of communicating spaces. A pump conveys the waste gases from the smoke-box or flue to the spaces and back again. From the spaces they may be conducted to the firegrate, which may be enclosed from the atmosphere, to promote combustion. A non-conducting covering may be applied to the outer casing.

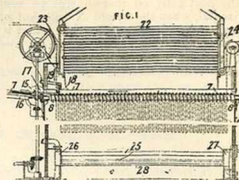
Abridged also in Classes *Furnaces &c.*; *Steam engines.*

4629. **Watson, J.** Dec. 6.

Boiler for heating conservatories, green-houses, &c., formed with three chambers. A horizontal horse-shoe shaped chamber A is connected by means of pipes B with a horizontal chamber C above it, which in turn communicates through pipes d with a chamber D placed within the space surrounded by the first chamber. The boiler is set in brickwork M in the usual way, fuel being burnt on the firebars J, the products of combustion passing through flues L round the chambers. The heated water passes into the circulating-pipes at F and returns to the lower parts of the chambers A, D. A plug K is provided through which the central chamber D may be cleaned. The chamber C may be dispensed with, suitable modifications being made in the connexions.



4917.

4945. **Lake, W. R.,** [Pratt, F. A.] Dec. 31.4740. **Smith, J.** Dec. 13.

[Provisional protection only.]

Heating air.—Air is passed by a fan or otherwise through vertical tubes fitted within a rectangular iron chest supplied with steam.

Abridged also in Classes *Bleaching &c.; Drying; Fabrics, Dressing &c.; Spinning.*

4795. **Roberts, M. J** Dec. 17. *Drawings to Specification.*

Steam trap.—The Provisional Specification describes a steam trap, for drawing water from steam pipes. The vessel into which the condensed steam falls is connected at its lower part with a balanced valve. A lever hinged at one end to the valve casing is attached to the rod connecting the two valves, and at its other end carries a float in the vessel containing the water from the condensed steam.

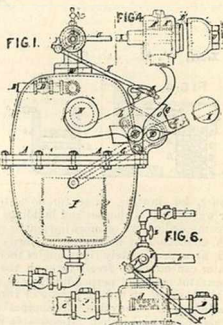
Abridged also in Classes *Steam engines; Steam generators; Valves &c.*

4917. **Smith, J.** Dec. 28.

Heating air.—Relates to apparatus for drying, steaming, and ageing fabrics and yarns. When supplied from beneath the chamber the air passes through vertical tubes within an iron casing filled with steam or hot water, but when supplied at the top it is heated by passing over a series of horizontal tubes 22 in the top of the chamber, connected to end casings 23, 24 through which steam circulates.

Abridged also in Classes *Bleaching &c.; Drying; Fabrics, Dressing &c.; Spinning.*

(For Drawing see next column.)



Steam traps: feedwater, supplying and controlling.

—The feed is admitted by the pipe B, with non-return valve D, to the reservoir A which is placed in a convenient place above the water level of the boiler. The water flows to the boiler along the bottom pipe with the non-return valve E, when steam is admitted from the boiler along the pipe U through the valve V. This valve, shown enlarged in Fig. 4, is of the "butterfly" class, rotated by the spindle X and provided with a small port B' communicating with the passages A' leading through the cock Z to the atmosphere, for the purpose of relieving the pressure in the reservoir A after the steam valve V is closed.

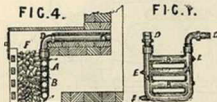
Automatic gear.—A float F is connected to a lever G mounted on the spindle H, which passes through a stuffing-box and is fixed to a lever J with a counterpoise K and actuating-pin P, which operates the lever O. This lever operates the steam valve V by the rod T with the pin S in the slot R, and is connected to a rocking beam L with a rolling weight N. When the float rises, the pin P gradually brings the beam L to a horizontal position, and continuing the motion inclines the beam the other way.

The weight N will now roll to the opposite end and tilt the beam to its limit, opening the valve V. When the float falls no motion will be communicated to the valve V until the beam again passes the horizontal, when the weight N will shut off the steam. By connecting the pipe U to the boiler at water level no steam will enter when water is above this level so that the operation of the feeder will be stopped. This apparatus may also be used to return water of condensation from a series of steam heating-pipes to the boiler.

Abridged also in Classes *Pumps &c.*; *Steam generators.*

A.D. 1878.

100. **Lea, W. E.** Jan. 8.



A boiler, for heating water for domestic uses and for warming greenhouses and buildings generally, is composed of two or more upright or inclined pipes A, connected by horizontal, inclined or other pipes B, at approximately right angles thereto, so that water can circulate freely through the whole. The apparatus is placed perpendicularly or diagonally at the back of an ordinary grate or furnace F, from which it is removable. The pipes may be cast in one piece or jointed. Removable plugs E are placed on either or all of the main pipes opposite the ends of the cross pipes to facilitate cleaning. Two or more of these boilers may be connected together by the same flow and return pipes D.

Abridged also in Class *Stoves &c.*

119. **Brierley, W., and Varley, G.** Jan. 9.

[Provisional protection only.]

Valveless steam traps.—The inventors describe their invention as follows:—"We employ casing of rectangular or other form divided by a compartment containing felt or other non-conductor of heat. The inlet pipe to chamber No. 1 is bell-mouthed, and is partly enclosed by a deflecting plate or box. The steam from compartment No. 1 passes, by way of a pipe, to compartment No. 2; this pipe is provided at its exit with bell-mouth and deflecting plate or box, its entrance being trapped or immersed in the water of condensation contained in a well of chamber No. 1. The outlet from chamber No. 2 is by way of a trapped pipe and well, as described in reference to chamber No. 1."

167. **Bigg, E. S.** Jan. 14.

[Provisional protection only.]

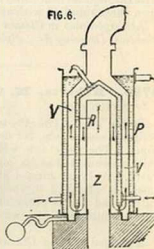
Boiling-pans and coppers have corrugated zig-zag or other uneven or wavy surfaces.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

493. **Wadsworth, J.** Feb. 6.

Heating urine and other liquids.

A series of tubes, each provided with a diaphragm near the top and, above this, with overflow openings, is placed in a heated chamber. The liquid to be evaporated is conveyed from a trough at the top of the chamber to the tubes by pipes dipping below the overflow openings. The liquid is rapidly evaporated by the current of warm gases passing through



the chamber, and the concentrated liquid falls into a trough on the floor of the chamber, whence it is pumped back to the trough on the top and passed through again until it has acquired a suitable consistency to mix with other substances to form manure. The tubes may be vertical or horizontal, and instead of the tubes a series of corrugated plates may be used filling up the entire width of the chamber, the fluid being made to flow between the plates by an arrangement at the top. Another apparatus consists of a horizontal steam-jacketed cylinder containing a series of revolving arms. The evaporation of the fluid is assisted by hot or cold air being forced into the cylinder at the top through a series of pipes or apertures; the vapour is allowed to escape. The apparatus shown in Fig. 6

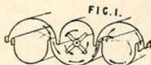
and modifications thereof may be also used for heating or cooling liquids generally.

Abridged also in Classes *Cooling &c.*; *Distilling &c.*; *Drying*; *Sewage &c.*; *Sifting &c.*

580. Lawrance, W., and Lawrance, G. Feb. 12.

Surface heating-apparatus.—Relates to improved construction of apparatus with corrugated, curved, or uneven metal surfaces for cooling or heating gases or liquids by means of other fluids at a convenient temperature. It consists in the combination of modes of staying the plates, together with the arrangement of the corrugations so that equal or unequal spaces or areas shall confront one another and such spaces and the interstices E between meeting-points of the corrugations shall vary in size; also in the combination with such apparatus of mechanical stirrers; also to arrangements and use of two such apparatus so that the heating and cooling may be interchangeable, and to the construction of such apparatus with a double or outside casing. Indentations or protuberances on the surfaces direct the flow of the liquid, and special seams unite the various parts together. Numerous diagrams show the various construction and arrangement of parts. Air for heating or cooling buildings and for ventilation may be heated or cooled in the above apparatus. The air may also be cooled by spray.

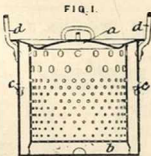
Abridged also in Classes *Brewing &c.*; *Cooling &c.*; *Ventilation.*



593. Bowden, S., [Berker, C.]. Feb. 12.

Boiling apparatus for boiling food without the risk of burning it, and for effectually draining off the boiling fluid. The same apparatus, slightly modified, is also adapted for boiling linen. The apparatus consists of an outer boiling-pot of ordinary form, and an inner pot perforated all over its surface to allow of the free circulation of the boiling fluid. The inner pot rests on a perforated rim *b*, which may be fixed to the inner pot, or detached. When the inner pot is lifted for the purpose of draining off the fluid, the support *b* is made to rest on projections *c* fixed on the inner surface of the outer pot; or the handles of the inner pot may be made to project outwards and rest upon the handles *d* of the outer pot; when the apparatus is used for boiling linen, two obliquely-slotted rods fixed to the outer vessel serve to support the inner one at various heights. The lid *a* covers both pots and is formed with a slotted rim so as to fit round the handles when the pot is to be closed. For boiling rice, the lid fits loosely into the inner pot and is perforated.

For boiling milk the inner pot is not perforated,



it has a flange at the top that extends to the edge of the outer pot so as to close the latter, and the lid is provided with a funnel to prevent the boiling over of the milk; the milk, rising in the tube of the funnel and escaping at the other end of the tube, falls, through a perforated diaphragm or sieve, into the boiling-pot.

Abridged also in Classes *Cooking &c.*; *Hollow-ware.*

830. Byram, W. H. March 1.

[Provisional protection only.]

Circulating-boiler.—Cast chambers at the front and back of the apparatus are connected by tubes, which form the firegrate. Supported over these chambers by brickwork is a chambered frame surmounted by a second chamber, the two being connected by vertical tubes. The upper chamber is provided with a chambered cover with which it is connected by a tube. The front and back chambers are connected by tubes to the lower chamber, into which the feed pipe also enters. The whole apparatus is built in brickwork with front, side, and back flues, the heated gases from the furnace passing round all the chambers. The furnace door is arranged to allow banking of the fuel and consequent slow combustion.

Abridged also in Class *Furnaces &c.*

833. George, A. March 1.

[Provisional protection only.]

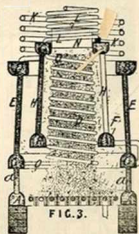
Boiling-pans for soap are immersed in a steam bath and are traversed by steam pipes, the steam from which is condensed in the bath.

Abridged also in Class *Oils &c.*

839. Newton, R. March 1.

Boiler for heating horticultural or other buildings. Refers to Specification No. 1972, A.D. 1874. A furnace is enclosed by two cages. The outer is formed by two annular water chambers C, D, connected by numerous tubes E, and the inner one by rings F, G connected by tubes H, H. The cages are connected by a pipe O, preferably spiral. The flow pipe is connected to the inner cage, preferably, by spiral pipes K, L, and the return pipe to a fifth chamber A connected to the outer cage by pipes a and provided with firebars, alternately solid and tubular. The furnace is stoked either from the top, which is closed by a lid N, or from the side.

Abridged also in Class *Furnaces &c.*



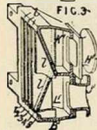
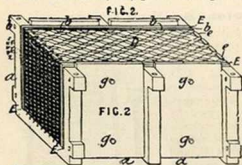
944. **Symonds, W.** March 8. *Drawings to Specification.*

[Provisional protection only.]

Thermostat for controlling the temperature in conservatories, and other buildings and places. By means of this invention, a room may be kept, automatically, to within one or two degrees of temperature. The automatic ventilator consists of a frame, a voltaic battery, and an adjustable electric thermometer. The frame carries vertical slips of glass mounted on centres so as to be capable of partial rotation on a vertical axis. When the ventilator is closed, these slips abut against fixed slips in the frame. Each vertical axis has a crank arrangement together with a connection to a horizontal connecting-rod which is common to all the cranks. When the connecting-rod is thrown to the right, the movable slips are turned at right angles so as to allow a current of air to pass between them; when it is turned to the left the ventilator is shut. At one end of the frame are electromagnets, one for opening the ventilator and the other for shutting it. The thermometer has a cold tube and a heat tube; the heat tube is connected with the electromagnet for opening the slips, and the cold tube with that for shutting them. By acting on the opposite sides of a lever armature at the end of the connecting-rod, by means of one or other of the electromagnets, the automatic regulation is accomplished. Another small electromagnet and spring arrangement, together with a disc, act as a lock when the slips of glass are either open or shut.

Abridged also in *Classes Agricultural appliances for the treatment of land &c.; Buildings &c.; Electricity &c., Div. III.; Ventilation.*

1099. **Pieper, C.**, [Drache, A.]. March 19.



Surface apparatus for heating or cooling liquids or gases, applicable to the heating and ventilation of rooms, or as condensers for steam engines and distilleries. Within a casing, Fig. 2, are a series of plates D separated by side pieces and end strips e so arranged that

the spaces between the plates are closed at the sides and have a number of openings at the ends, the vertical rows of which communicate with the spaces. The heating or cooling fluid enters, by a tube H¹, Fig. 3, a chamber K¹ in an end piece B¹ bolted to the casing, and is directed by channels 1, 3, 5, Fig. 3, and the rows of openings, Fig. 2,

into the spaces between the plates D, and leaves at the other end of the apparatus by a similar end piece. The fluid to be cooled or heated flows in the reverse direction, being admitted by parts corresponding to the tube J¹ and chamber L¹, Fig. 3, which form the exit, to the spaces between the layers of cooling or heating medium. The joint between the casing and the end piece is made tight by a plate of metal covered with india-rubber with openings corresponding to those between the plates D and the channels 1, 2, 3, &c. in the end B¹. The edges of the plates D are secured by a sheet of india-rubber pressed against them by a plate E, Fig. 2, and screws g, a cover being over the top of the casing. The plates D may be flat, embossed, or folded into flat tubes with the seams brazed or secured by india-rubber held by the plate E, Fig. 2. For corrosive liquids they may be made of glass. Special claim is made to a plate embossed into a series of pyramids the apexes of which support each other. When flat tubes are used the plates E, Fig. 2, may be omitted and movable covers placed in the sides. The end parts B¹, Fig. 3, may then consist of a single chamber for admitting the cooling-medium, the hot fluid entering and leaving through openings provided in the sides of the casing.

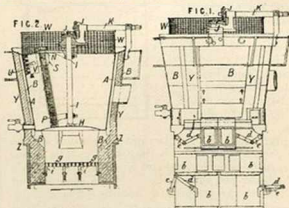
Abridged also in *Classes Brewing &c.; Cooling &c.; Distilling &c.; Steam engines; Ventilation.*

1112. **Smith, T. J.**, [Fuller, L. K.]. March 20. *Drawings to Specification.*

Heating air.—The air, for passing over the wood, is heated by a steam coil or other arrangement in the chamber or it may be passed through a heater before being admitted into the room.

Abridged also in *Class Drying.*

1121. **Fenwick, J.** March 21.



Boiling-pans.—Relates to boiling-pans for brewing and like purposes and to means for preventing boiling over and preventing incrustation; and to the arrangement of the furnace. The pan A, which is made of copper, iron or steel, and is supported upon brickwork B, in which are openings through which the heated gases pass. The bottom is made concave in order to render the heat from the furnace more effective, and the top is flanged to assist in preventing boiling over. A metal screen or guard W, made in sections, is placed on top

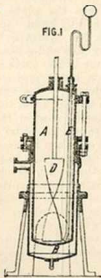
to prevent boiling over. The pan is supported by vertical metal frames forming ribs between which slabs are placed. The lower end of the frames are attached to the base Y of the furnace Z. Sliding doors *b, b* afford access to the furnace and ashpit.

Abridged also in Classes *Breecing &c.*; *Furnaces &c.*; *Steam generators.*

1148. Newton, W. E.,
[*Tcherniac, J., and Gunz-
burg, U.*] March 22.

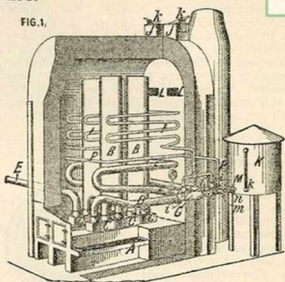
Digester for use in preparing ammonium sulphocyanide. Consists of a strong wrought-iron enamelled vessel A, heated by a steam jacket or boiler B of about half its height. A mechanical agitator D is provided, and a tube E, passing through the cover to the bottom, allows the ammonium sulphocyanide and sulphuretted hydrogen to escape to a refrigerator on opening the cock after the operation is completed.

Abridged also in Classes *Acids &c.*, *Dist. II.* and *III.*; *Distilling &c.*



1293.

FIG. I.



1322. Sumner, G. April 3.

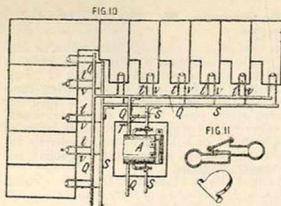
[*Provisional protection only.*]

Steam traps.—The valve and pipe are both arranged to slide and are so connected that, when the pipe moves in one direction, the valve moves in the opposite direction. The pipe has a finger connected by a rod with a lever which actuates the valve. On a portion of the tube, projecting outside the trap, is a screwed sleeve with which the forked end of the lever engages. By turning the sleeve the trap may be adjusted. The invention may be applied to steam traps with two valves arranged to be moved in contrary directions by the expansion of a metal rod or tube.

Valve faces, keeping clean.—The outer end of the spindle is provided with a hand-wheel by which the valve can be turned to grind or clean the valve faces. This mode of cleaning is applicable to other kinds of steam traps.

1293. Benson, M., [Salisbury, S. C.]
April 2.

Heating buildings &c. by air.—Fig. 10 represents the application of the apparatus for heat distribution. A is the apparatus, Q and *t* are the distributing-pipes, and V and S the return pipes. The balance



valve of refractory material, shown at T and in Fig. 11, is placed in a pipe connecting S and Q to counterbalance irregularities in the consumption of heat.

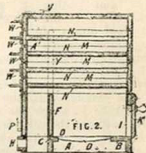
Abridged also in Classes *Fuel, Manufacture of; Furnaces &c.*; *Gas manufacture; Injectors &c.*; *Manufacture of iron &c.*; *Metals and alloys; Steam generators.*

(For other Drawing see next column.)

1334. Byram, W. H. April 4.

Circulating-boilers are constructed of a number of horizontal rectangular chambers M, the fronts and backs of which are connected by a number of horizontal pipes N. The whole apparatus is erected on a foundation plate A, and is covered with felt and boards.

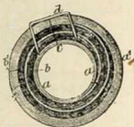
The fuel is consumed on firebars D supported by a dead-plate B and bridge C. The products of combustion escape through a flue H, and are preferably compelled to traverse the whole system by interposing a transverse water chamber F, in connection with the other chambers. This chamber may be further surmounted by a mid-feather or partition Y. The flue may however be arranged at the top of the



boiler. The fire is stoked through an aperture I provided with sliding fire-doors K. Each chamber is connected with the next by pipes not shown in the drawing and is provided with a cleaning-door. The water enters from the circulating-pipes at P, and passes to the front of the lowest chamber, whence it rises to the front part of the second chamber. Passing through the pipes to the back of this chamber, it rises into the third, and so on until it reaches the circulating-pipes at V.

1385. Toope, C. April 6.

Non-conducting covering for steam and hot-water pipes, steam boilers, &c., for preventing the freezing of gas and water pipes, pumps, tanks, &c., and as a lining for refrigerators &c. The covering consists of one or more layers of hair felt, each layer being enclosed in "mill-wrappers." The portion which is to be applied to any highly-heated surface is lined with asbestos, and the outside is covered with one or more layers of waterproof paper. For steam pipes the covering is made of a tubular form by coiling the materials on a rotating mandrel. In the Fig. a is the inner sheath of paper, b and b' are layers of hair felt separated by a layer of paper, and a² is the external sheath of paper. The pipe coverings have a longitudinal slit at c so that they can readily be put on the pipe and fastened by staples d. To give greater elasticity a layer of woollen paper or woollen rag paper may intervene between each two layers of mill paper in the outer sheath. For surfaces other than pipes the covering is made by superposing layers of asbestos, paper, and hair-felting in the same order as above. Canvas or roofing paper may be used instead of the mill wrapper paper.



1430. Baker, W. C. April 10.

Steam traps.—Relates to heating railway and other vehicles by steam, the chief object of the improvements being to prevent injury to person or clothing by hot pipes. Forms of steam traps, one of which serves as a vacuum relief valve, are also described. In one arrangement, the end of an expansible metal tube in which the steam enters forms the valve seating; the valve is carried by a less expansible outer tube and is adjustable longitudinally. The valve can also be turned round its axis so as to remove obstructions without altering its adjustment. Another form is shown in Fig. 5, in which the spring s, made of two metals of different expansibility, closes the valve when steam passes.

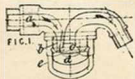
Abridged also in Classes Pipes &c.; Railway &c. vehicles; Road vehicles; Valves &c.



1596. Gedge, W. E., [Schraub, P., and Terrien, A.] April 20.

[Provisional protection only.]

Steam trap or automatic drain cock or valve.—This is applicable for letting out water condensed in steam-engine cylinders and apparatus for heating by steam. In steam engines it takes the place of the pet or purging cock worked by hand. The channel b is in connection with the steam cylinder. It terminates at the valve face and is continued in a shallow concentric groove in the valve seat, running round the exit c', which latter may communicate with the air or a condenser. The valve d is free and falls by its own weight when the engine is at rest. When the engine is started the air escapes and the steam drives all the water before it, until the dry steam arrives, when it causes the valve d to rise and close the orifices so as to permit nothing to issue excepting the water, which oozes drop by drop, as condensation takes place within the cylinder. The steam shut in the cup e cools by degrees when the water accumulates in it, and when it is full the valve again opens.



Abridged also in Classes Air and gases, Compressing &c.; Gas distribution; Steam engines.

1846. Stubbs, J. S. May 8. Drawings to Specification.

Water-heating coil.—A coil of pipe of suitable dimensions may be placed in a steam generator with its ends outside so that water may be heated therein for various purposes.

Abridged also in Classes Furnaces &c.; Steam generators.

1943. Browne, W. May 15. Drawings to Specification.

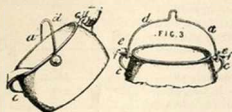
Non-conducting covering.—Silicate cotton or slag-wool in sheets or bands is woven in an ordinary hand loom, with or without a backing of hemp, jute, wire, or other material, or with strong cords projecting from the selvages, and is used for covering steam pipes, boilers, and other vessels, and as coverings, linings, or intermediate layers of walls, ceilings, or other purposes, rendering the same more proof against fire, heat, cold, sound, and the ravages of vermin.

Abridged also in Classes Buildings &c.; Cements &c.; Fire, Extinguishing &c. of; Weaving &c.

2098. Hellier, W. May 25.

Water-heaters consist of nests of thin conical annular chambers, connected by thin pipes and heated by gas, oil, or otherwise. Water is admitted to the top of the outermost chamber from a feed-cistern surmounting the apparatus, and is drawn off from the innermost.

2111. Clark, C. F., and Sanders, J. May 27.



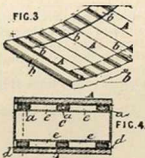
Boiling-pans.—Relates to the construction of handles for pots or pans. A combination of jug-handles *c* with bail-handle *a* is shown in Fig. 2.

Jointed stop-handles, Fig. 2^b, may be used in the place of jug-handles, either with a bail-handle crossing the pot by its shortest diameter, or *vice versa*. In another combination, shown in Fig. 3, jug-handles *c* are placed at the ends, and a bail-handle *d* crosses the pot by its longest diameter, being formed and hooked to the jug-handles as described below. With this combination jointed stop-handles may be added at the side. Fig. 7 shows a stop-bail handle, with washer removed and part of the back exposed. *i* is the handle itself, *k* being part of the eye on each of its ends, working on an axle *n* upon the side of the pot. *l* is a stop or projection from the inner side of the eye, which works in the opening *p* cut in the boss *m*. The bail-handle *d*, Fig. 3, has hooked ends *e*, by which it is attached to the jug-handles *c*. Fixed upon these ends are stops *f*, which limit the play of the handle within a semicircle. Each jointed stop-handle *x*, Fig. 2^b, has two outer knuckles *y*, joined by a pin to the middle knuckle which is solid with the side of the pot. *y*³ is a bridging bar between the two outer knuckles, which bears against a stop *z* when the handle is raised.

Abridged also in Class *Hollow-ware*.

2116. Lake, W. R., [Smith, B. F.]. May 27.

Non-conducting coverings for steam boilers and pipes, refrigerators, ice-chests, &c. Paper tubes open at both ends are compactly filled with the hulls of cotton or rice seed, or a mixture of both. The tubes are preferably cylindrical, but may be of any shape. Any desired number of the filled tubes *A*, Fig. 3, are then secured side by side by pasting or gluing them close together upon a backing *b* of tough paper or cotton cloth, preferably such as is known as "drilling." Those portions of the cloth *b* which extend beyond the sides and ends of the tubes are then turned over on the tubes and pasted or glued down as seen in Fig. 3. The covering thus made may be applied directly to a steam boiler &c. But it may also be used so as to form annular air spaces *e*, Fig. 4, between it and the body covered. For this purpose, tubes or bags of cloth are packed with cotton-seed hulls and



fastened at intervals round the pipe or boiler *C*, as at *a*. Pasteboard *d* is then laid on, and the covering is applied with the tubes *A* extending along the length of the pipe &c. The covering is secured in any suitable way, as by thin metal bands. In another modification, the hulls are mixed with water and clay, (very tenacious varieties being preferred), to a stiff paste, which can be applied to any surface by means of a trowel. The surface of the covering, if desired, may be covered by a thin sheet of metal. In cases where air spaces are utilized as indicated in Fig. 4, this pasty covering may be plastered on the pasteboard *d*.

2120. Rundle, R. May 28.

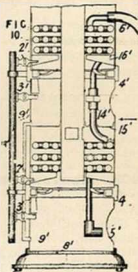
Heating water &c.—A boiler is formed of a number of tubes *A*, *A* connected by cross-pieces *D*, which form continuous transverse passages, arranged over a furnace in V-form. The upper cross tubes of each frame meet over the central line of the furnace. Flow and return pipes *L*, *K* are connected to the upper and lower cross tubes respectively. To lessen risk of explosion, the highest point of the system communicates with an air vessel. To fill the boiler the pipe is stopped at *H* and a way *E* is connected with a water supply. A centrifugal pump is used if sufficient pressure is not available. Air escapes through a way *J*. The passage at *H* is afterwards opened.

Abridged also in Class *Pipes &c.*

2180. Sweet, A. May 31.

Heating water.—The apparatus consists of a series of coils *2*, about three-sixteenths of an inch apart. The different series, which are a few inches from each other, are connected by a union *14*, accessible by a hole in the casing which also supplies air to the burner *4*; *5* is the inlet and *6* the outlet to the series of pipes, and brackets *16* support the coils. The condensed water from the upper coil falls on the plate *15*, through an opening in which the connecting pipe passes, and thence it runs off by the pipe *9* to the plate *8*, which also receives the condensation of the lower coil and is fitted with a discharge-pipe.

Abridged also in Class *Stores &c.*



2253. Franco, L. June 6. *Drawings to Specification.*

Non-conducting coverings.—A fireless tramway or road engine has its receiver lagged with a wood casing lined with cork and protected by sheet iron. This lagging is separated from the receiver by an air space.

Abridged also in Classes *Gas distribution*; *Locomotives &c.*; *Railway &c. vehicles*; *Railways &c.*; *Steam engines*; *Steam generators*; *Valves &c.*

2292. Siddaway, S., and Siddaway, T. W. June 8.

[*Provisional protection only.*]

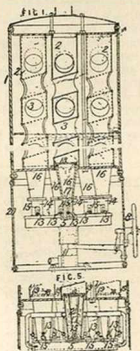
Water-heater for baths &c.—Plates are fixed near the top and bottom of a cylindrical vessel, heated by gas or otherwise. The chambers thus formed are connected by a number of tubes. Cold water passing from the upper reservoir through the tubes is heated, and may be drawn off from the lower reservoir.

Abridged also in Class *Closets &c.*

2370. Stammers, J. T. June 14.

Boiler.—The boiler consists of a vertical cylinder 1 with vertical flues 2, 2 through which run inclined water tubes 3 for promoting circulation. A separate gas burner heats each flue.

Abridged also in Classes *Furnaces &c.*; *Steam generators*; *Stoves &c.*



2402. Nawrocki, G. W. von, [Strelitz, P.] June 17.

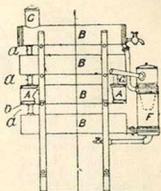
Non-conducting composition.—Consists of a mixture of clean fossil-dust, rye-meal or flour, coal tar, animal hair, cotton-seed oil, pulverized clay, and water. After thoroughly mixing the mass is allowed to ferment in a warm place. The composition can be applied to all hot surfaces, and to surfaces subject to constant shocks.

2497. Hocking, F. June 22.

Surface apparatus for heating.—In one arrangement, hot-water pipes B of annular section are arranged in a vertical tier, the inner tubes A being left open for the passage of air. The annular spaces D are connected together by tubes a, and are supplied with water from a reservoir F.

A water-heater F, the water space of which is preferably annular, is connected to the highest and lowest pipes. In another arrangement, the inner tubes B are inclined, to promote the circulation of air, and in another they are closed at the ends. Various modifications are described, suitable for heating conservatories and greenhouses, and offices and rooms, churches, and ships.

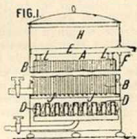
Abridged also in Classes *Drying*; *Railway &c. vehicles.*



2498. Mart, S., and Bradley, C. W. June 22.

Heating water &c.—A cylindrical water vessel A is surmounted by, and connected by pipes L with, a second shallow vessel E. Water is supplied to the bottom of the lower vessel, and is drawn off from the upper. The lower vessel is traversed by a number of thin metal tubes B of any section and form. The whole arrangement is enclosed by a box F, and is heated by gas burners D or by other means. The hot gases ascend through the tubes B, and, after passing along the under surface of the upper cylinder, descend through the space between the lower cylinder and the casing. To prevent the stoppage of the tubes B by water, their ends J are cut off at an angle.

Abridged also in Classes *Closets &c.*; *Drying.*



2620. O'Connor, P. July 1.

[*Provisional protection only.*]

Saddle-shaped circulating boilers may be provided with extra water chambers at the back and sides, and are enclosed in a hollow casing constructed in two or more pieces and filled with non-conducting material. Zig-zag flues may be formed by water chambers at the sides of the boiler. The firebars may be tubular for water circulation.

Abridged also in Class *Furnaces &c.*

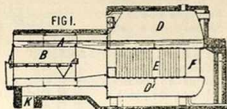
2653. Farrington, A. July 3.

[Provisional protection only.]

Heating food-warmer &c. by steam circulation.—The heater consists of inner and outer cylinders, of tin or other suitable metal, the inner being closed at the bottom and in diameter about half an inch less than the outer. A water-chamber is formed by a diaphragm in the outer cylinder and the lower part of the end of the inner, and is supplied by a cock through a pipe and fitted with a gauge. The water is heated by a lamp or charcoal placed inside the outer shell; the steam passes up into the space between the two. The food or other material to be heated is placed in closed vessels, fitting into each other, which are lowered into the inner cylinder upon a metal grate provided with two rods. The apparatus may be placed on wheels.

Abridged also in Class *Cooking &c.***2688. Stobbs, M., and Poole, H.** July 5.

Thermostat.—A cylinder placed at the part in which heat is to be indicated is provided with a perforated piston, which with its rod may be pressed towards the end of the cylinder by a spring but is restrained by a crystalline mixture. Should the temperature rise sufficiently to fuse the crystals the piston is liberated. The fusible mixture consists of various proportions of washing-soda, phosphate, hyposulphite, and acetate of soda, and Rochelle salt, to which may be added tallow. The apparatus is applicable to opening the ventilators of greenhouses &c. The piston-rod actuates a hinged ventilator. Several cylinders of different lengths with materials fusing at different temperatures may serve to open it to various extents.

Abridged also in Classes *Bearings &c.*; *Fire, Extinction &c. of*; *Steam generators.***2703. Kux, A.** July 5.

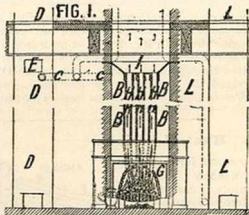
Boilers are constructed in three sections of which one A is cylindrical, and the others D, D' are segments of cylinders, the back ends of which are preferably spherical. The front ends are attached to the end plate of the first section. The under side of the upper segment and the upper side of the lower are flat, and are connected by tubes E, and at the rear by a wide tube F to promote circulation. The whole arrangement is set in

brickwork. Inside the section A are one or more cylindrical flues B, the products from which pass through and round the boiler, escaping finally through a flue K. The boiler is suitable for utilizing waste heat from puddling and other furnaces.

Abridged also in Classes *Distilling &c.*; *Steam generators.***2731. Carter, R. K.** July 8.

[Provisional protection only.]

Non-conducting coverings employed in conjunction with an air space formed by casting lugs or otherwise on the pipe to be jacketed. The outside casing is made of plaster of Paris and sawdust, with or without the addition of a silicate. It is cast in a mould the exterior of which is of polished brass, so that the inside of the casing has a polished surface to increase its reflecting power. It is then covered with paper coated with a fireproof and waterproof paint. The invention is stated to be applicable to steam pipes, boilers, hot-air blast pipes, and to water pipes &c. to prevent freezing.

Abridged also in Class *Hydraulic engineering.***2749. Dufrené, H. A.,** [Marmonier, M.], July 9.

Heating air for warming and ventilating rooms. The chimney B of an open fireplace is closed at the bottom by an iron cap G and higher up by a plate I. The chamber thus formed is traversed by sheet-iron pipes H, through which the products of combustion escape into the upper part of the chimney. Air admitted to the bottom of this chamber is heated and passes from the top through a duct c into a distributing-column D, from which it enters the room through a valve E, preferably near the ceiling. The arrangement may be adapted to heating silkworm breeding chambers.

Abridged also in Classes *Air and gases, Compression &c.*; *Medicine &c.*; *Stoves &c.*; *Ventilation.***2787. Hébert, L., and Kemp, C. R.** July 11. *Drawings to Specification.*

Heating air.—This invention consists of two distinct parts, the first relating to the distillation of petroleum, and the second to the construction of lamps for burning petroleum. A cylinder of refractory stone is arranged so that the flames from

a reverberatory furnace can circulate round it. The cylinder is placed vertically, and is provided with a series of perforated discs of stone. The air is delivered to the top of this heater from a blowing-engine, and the hot air is carried away by a pipe from the bottom. On its way to the still the air passes through a small iron cylinder into which cold air can be admitted, to regulate the temperature of the air.

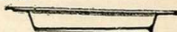
Abridged also in Classes *Distilling &c.*; *Gas manufacture*; *Lamps &c.*; *Railway &c. vehicles*; *Stoves &c.*

2867. Fox, H. B., and Smith, W. H. July 18

Boilers and heating-vessels generally.—The bottom of a plate, dish, vat, salt pan, boiler, cask, sugar pan, or other article of a similar nature is inclined, as shown.

Abridged also in Classes *Acids &c.*, *Div. II.*; *Casks &c.*; *Distilling &c.*; *Hollow-ware*; *Moulding &c.*; *Table articles &c.*

FIG. 4.



2901. Waller, R. July 20.

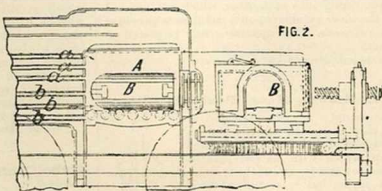
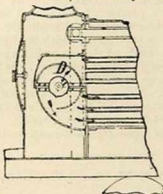


FIG. 2.

Heating air.—Various engines are described in all of which the heat is derived from blocks, heated in fixed furnaces at the stopping-places, and transferred to receptacles in the boiler by suitable carriages. The engine shown in Fig. 2 is of comparatively simple construction. The heated block B is placed in a box or cell A by a swivelling carriage shown at the rear of the engine. The heated air from the box is circulated through boiler tubes *a, b* by a fan D.

Abridged also in Classes *Air and gas engines*; *Bearings &c.*; *Cooling &c.*; *Furnaces &c.*; *Locomotives &c.*; *Metals, Cutting &c.*; *Steam engines*; *Steam generators.*

2945. Hunt, N. July 24.

Thermostat for operating window blinds, ventilators, dampers, &c. Improvements on Specification No. 1198, A.D. 1877. In Fig. 1 the apparatus is shown as applied to turning the laths of a venetian blind. A bellows-like or flexible bag H has a rod G attached to its upper part, so that it rises and falls according as the air in the bag H is increased or diminished in bulk. The rod G carries a rack F which engages in a pinion E fixed on a centre pin supporting one end of the top lath B. The amount of air in the bellows H is determined by a bellows or bag K, which is connected with the upper bellows by a pipe I and has a handle L with a graduated stem to charge the upper bellows H with air. A tap J stops the connection between the two bellows and, when shut off, any alteration in temperature of the upper bellows will affect the set of the laths. One regulator may be applied by branch pipes to any number of flexible bags or

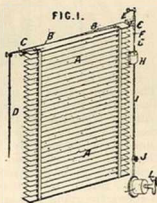


FIG. 1.

bellows, each regulating a ventilator &c. Applicable to the regulation of the temperature of buildings by governing dampers or valves in the flue or hot-water pipes.

Abridged also in Classes *Agricultural appliances for the treatment of land &c.*; *Buildings &c.*; *Furniture &c.*; *Hinges &c.*; *Ventilation.*

3065. Ritson, T., [Ritson, T. A.]. Aug. 2.

Relates to the transmission of heat and power by steam. Steam from a central station, at a pressure of about fifty pounds, is conducted through underground mains to houses, street hydrants, &c., to be utilized for various purposes.

Heating buildings.—(1). By steam: suitable arrangements of pipes may be supplied with steam through a reducing-valve and meter.

(2). By hot water: the water of condensation from a steam trap or heater may be circulated through suitable pipes, or water may be specially heated by a steam coil.

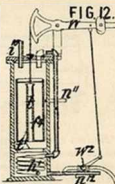


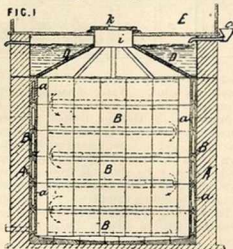
FIG. 12.

Steam trap and re-heater.—Fig. 12. The water of condensation from heating-pipes &c. runs back through a pipe n^0 into a floating cylinder f , from which it overflows into the body of the trap, and is supplied through a pipe n^1 to circulating heating-pipes in lower parts of the building &c., returning through a pipe n^2 . If the water is not hot enough, steam may be passed through a coil in the lower part of the trap. If too much water accumulates the float rises, and, by means of a balanced lever W , opens a waste cock W .

Non-conducting coverings for underground steam mains. The main is enveloped in asbestos and hair cloth covered with wood or metal lined with wood. This is again covered with zinc or tiles and embedded in sawdust or tan bark.

Abridged also in Classes *Air and gases, Compressing &c.; Fire, Extinction &c. of; Hydraulic engineering; Hydraulic machinery &c.; Pipes &c.; Registering &c.; Roads &c.; Valves &c.*

3085. **Harding, J.** Aug. 3.



Temperature of fermenting and other liquids, regulating.—Fermenting vats A , whether used in the production of alcoholic beverages or of vinegar, are internally lined on the sides, wholly or in part, with non-absorbent hollow tiles B of glass, porcelain, clay, or other suitable material, through the channels a in which a liquid is circulated at a temperature suitable to the requirements of the process. The vat is preferably made with rectangular sides, of brickwork or masonry, and the hollow lining tiles are sloped near the top towards a neck or manhole i . The latter is covered except as to an opening left for any froth to issue into a shallow cistern E set about the neck. The space between the sloping upper sides and the brickwork serves as a trough D into which the tempering-liquid is run, and from which it passes through the channels, preferably in a zig zag or to-and-fro course, down to horizontal tubes set for its discharge. The tiles are provided with mortices and tenons for facility of interlocking, and so channelled as to permit flow of liquid in the desired direction. The sides of the structure may have communicating channels; but it is preferred to separate each two adjoining sides by solid angle tiles.

Abridged also in Classes *Acids &c., Div. I; Brewing &c.; Cooling &c.*

3240. **Brewer, E. G.,** [Zsadyai, G.] Aug. 16.

[Provisional protection only.]

Surface heating-apparatus.—Additional surface is obtained by soldering to the ordinary surface thin sheets of copper set on edge, or bundles of copper wire.

Abridged also in Class *Cooling &c.*

3241. **la Penotière, W. P. de.** Aug. 16.

[Provisional protection only.]

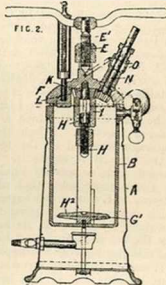
Heating liquids, surface apparatus for. Comprises means for increasing the heating-surface of tea kettles, saucepans, crucibles for melting metals, and other vessels for heating liquids, food, and other substances. When applied to a kettle the bottom is curved or dish-shaped, with a flat centre on which the kettle stands and from which radiate curved corrugations or flutings spreading and rising to meet the body. The body is of larger diameter than that formed by the upper part of the bottom, thus forming a ledge which may rest on the opening of a stove &c. The bottom might have vertical sides, the corrugations being straight or curved. In saucepans, the ledge formed by the corrugations supports the saucepan in the stove as above, and forms an inner ledge on which may rest an internal vessel the contents of which are to be heated by the water in the saucepan. The bottoms may be supplied separately for attachment to kettles or saucepans.

Abridged also in Classes *Cooking &c.; Hollow-ware; Metals and alloys; Metals, Cutting &c.*

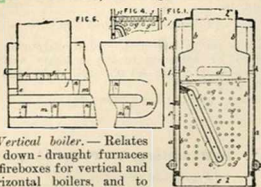
3300. **Brewster, E.** Aug. 21.

Boiler for treating celluloid or vulcanite in the manufacture of dental plates, for preparing extracts, and for similar purposes. Inside a sheet-iron heating-chamber A is a boiler B , heated by a Bunsen or other burner, and having a lid F fixed down by a screw E working in a hinged clamp E pivoted to B .

Abridged also in Classes *India-rubber &c.; Medicine &c.; Moulding &c.*



3323. Thacker, S. Aug. 23.



Vertical boiler.—Relates to down-draught furnaces or fireboxes for vertical and horizontal boilers, and to arrangements of flues, and hollow water grates or firebars in connection with the same. The shell and firebox are preferably square and suitably stayed together. The fuel falls on to the grate *i*, Fig. 1, from whence the gases pass downwards into a combustion chamber, across which water tubes *g* pass, then under the water baffle *f*, and finally leave by the flue *f'*. *d* is a fuel-stirring opening closed by an airtight flap door, and *k* are air-admitting tubes.

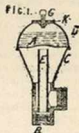
Water tubes.—The small tubes are screwed at one end and introduced through a hole in the shell, opposite to a hole in the tube-plate, and screwed into position. The opposite end of the tube is then expanded in the ordinary manner, and the hole in the shell closed by a screw plug.

Cornish and similar boilers, general arrangement of.—The gases from fuel on the grate *j*, Fig. 6, pass downwards and along rectangular flues *m* carried to the back of the boiler, and then to the front, as shown, or again to the back. Cross water tubes *n* are placed in flues and openings *d*, *e* provided for stoking and removing ashes.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

3324. Kidd, J., [*Hances, L. P.*]. Aug. 23.

Steam traps operated by the vaporization of a liquid confined in an expansible chamber as described in No. 2890, A.D. 1862, No. 163, A.D. 1866, and No. 2097, A.D. 1873. A flexible metallic diaphragm *A* is held by its edges between the two parts of the shell *C* and *D*, which are soldered together. When the diaphragm is seated on the top of the pipe *B* it closes it. The chamber *D* is charged with a volatile liquid which will expand at a temperature below that of the steam. Steam entering at *E* causes the expansion of the liquid which acts on the diaphragm to close the valve. If water only enters *E*, its heat is insufficient to heat the volatile liquid, and the valve remains open. The distance between the diaphragm and the mouth of *E* may be varied by screwing or unscrewing the conical casing *C*. *G* is a screw for filling the chamber *D* with volatile fluid.



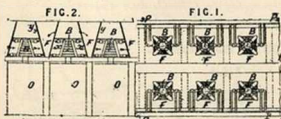
3355. Hallam, S. Aug. 26.

[*Provisional protection only.*]

Heating atmospheric air specially with a view to its application as a desiccating-agent in connection with machines for sizing yarns, calico printing, paper staining, or otherwise. Atmospheric air, set in motion by a fan or other mechanism, is passed over the surfaces of a series of heated pipes contained in a chamber, in which are a number of plates or baffles, so placed as to absorb heat from the pipes and transmit it to the air traversing the chamber.

Abridged also in Classes *Bleaching &c.*; *Cutting &c.*; *Weaving &c.*

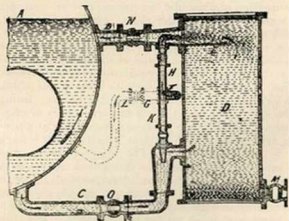
3464. Macadam, C. T. Aug. 31.



Heating water by waste heat from ore roasting furnaces and kilns. Water circulates in pipes *P* leading from a raised cistern to the flues *F* round the ovens, and is thereby heated. Boilers *B* of tubular or other construction may be placed over the ovens *O*, and each connected with the flow and return pipes *P*. Valves are employed by which each boiler may be shut off from the circulating system, and at the same time the heat in the flues is diverted by sliding dampers *x*, *y*. The hot water may be supplied to steam generators &c.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*

3479. Kennelly, D. Y. Sept. 2.



Boilers, promoting circulation in.—Reference is made to Specification No. 1286, A.D. 1878. A separator is employed in connection with steam boilers or vaporizing-vessels to promote circulation. The separator *D* is connected to the boiler (or other vessel) *A* by pipes *B*, *C*. All or part of the feed is led from the pipe *F* through one or

both branches H, K, the supply being controlled and regulated by cocks. The direct flow of the liquid is prevented by a deflector E fitted at the mouth of the pipe B.

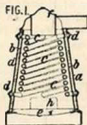
Clearing deposits &c.—The residue &c. is blown off through the cock and valve M, the pipes B, C being closed by cocks N, O. A branch L may be provided, fitted with a valve box G through which the boiler may be fed when the pipes B, C are closed.

Abridged also in Classes *Distilling &c.*; *Steam generators.*

3486. Wagstaff, R. Sept. 3.

Heating water &c.—An annular water chamber is formed by casings *a, b*, fixed to a base-plate. Opposite sides of the chamber are connected by four or more spiral tubes *c*. Flow and return pipes are inserted into the top and bottom of the casing. The fire is fed from the top, which is closed by a lid *f*, and a door *h* is provided at the bottom for lighting and for withdrawing the ashes.

Abridged also in Classes *Pipes &c.*; *Steam generators.*

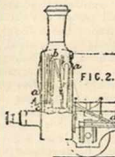


3503. Somerset, J. Sept. 4.

Heating air.—Relates to apparatus for heating railway carriages by an air-heater placed in the smoke-box or firebox of the locomotive. Fig. 2 shows the coiled pipe *b* in the smoke-box *a*, but, if preferred, a short copper pipe may be placed in the firebox. The air enters through the funnel *c*, and passes to the carriages by way of *d*; the rear end of the pipe is provided with a revolving ventilator or fan.

Temperature, regulating.—A stop-cock is placed in the hot-air pipe under command of the driver, and a valve or slide is provided which may be worked automatically by a mercurial thermometer.

Abridged also in Classes *Pipes &c.*; *Railway &c. vehicles.*



3564. Dawes, W. Sept. 9. Drawings to Specification.

Heating air for superheating steam. A coil of pipe is placed in furnaces or flues, and communicates with pipes passing through or near the steam pipes, terminating at the cylinder jacket. Air is forced in by a pump or pumps and is heated in the said coil, whence it passes to superheat the steam in pipes and cylinders, finally escaping through a safety-valve weighted to, say, three pounds per square inch.

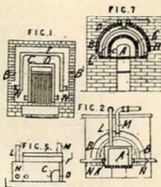
Abridged also in Classes *Bearings &c.*; *Furnaces &c.*; *Governors &c.*; *Steam engines*; *Steam generators.*

3654. Butt, F. W. Sept. 16.

Saddle boilers and settings.—Two are used, placed one over the other, or one only may be employed. The inner boiler A, Figs. 2 and 7, is flat at top with square edges and has its sides cut away at the back to form flue openings D. The outer boiler B (curved as usual) has its back end closed by a water space E, having a flue opening F through it, and is placed with its inner surface almost touching the square edges of the inner boiler so as to divide the space between these boilers into three flues. The boiler A is set over the furnace, the gases from which pass out of openings D, return to the front, and then divide. Part pass to back and the rest over the upper boiler. Valves may be fitted to shut off either boiler at will. N are the inlet and L, M the outlet pipes.

Saddle boiler for gas-retort furnace.—A baffle or arch C, Fig. 7, is placed over the retort A and has openings *c* through which the waste gases pass to the space between the said arch and the boiler. The gases are then led round the back of the boiler, returning to the front outside the boiler.

Abridged also in Classes *Furnaces &c.*; *Steam generators.*



3671. Bowen, A. Sept. 17.

[Provisional protection only.]

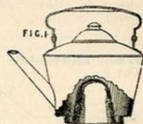
Heating liquids.—Metal boxes with closed compartments have all the boxes and compartments connected by pipes forming a circulatory system, with an inlet pipe at one end and an outlet pipe at the other. The whole is placed in the liquid to be heated, and a heating-medium passed through the pipes; or the liquid to be heated is passed through the pipes while the heating-medium surrounds the apparatus.

Abridged also in Class *Cooling &c.*

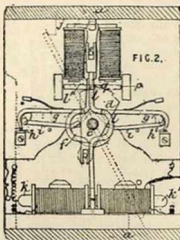
3791. Lake, W. R., [Bennett, W. H.] Sept. 25.

Heating liquids.—Relates to kettles, boilers, coffee pots, and other kitchen utensils, for heating water and other liquids. A portion of the bottom rises into the vessel to form a chamber exposing an increased heating-surface. Fig. 1 shows the invention applied to a kettle.

Abridged also in Classes *Cooking &c.*; *Hollow-ware*; *Tea &c.*



3794. **Symonds, W., and Symonds, G. B.**
Sept. 26.



Thermostat for operating the ventilators of incubators, conservatories, and other buildings, and automatic in its action. Electromagnets k, k^1 are put in circuit by an electric thermometer having maximum and minimum tubes. The conducting-wires of the electric thermometer are in circuit with a battery and are put into connection with the electromagnets, according to the position of the mercury in the thermometer tubes.

Abridged also in *Classes Electricity &c., Div. III.; Ventilation.*

3862. **Bell, H., Bell, J., and Coleman, J. J.** Oct. 1. *Drawings to Specification.*

Thermostat for cooling and regulating temperature and dryness of air, for purposes of ventilation and refrigeration. Air is compressed by steam pumps and, after a preliminary cooling by water and drying, is cooled to any desired extent by expansion in cylinders, the pistons of which are connected to the pump pistons, and is supplied to the places to be cooled or ventilated, either directly or through a filter of animal charcoal or other material. The amount supplied may be automatically suited to the temperature of the place by means of a long metallic bar, connected to a throttle valve in the steam pipe. Various arrangements of supply pipes are shown.

Abridged also in *Classes Air and gases, Compressing &c.; Cooling &c.; Drying; Governors &c.; Railway &c. vehicles; Ships &c., Div. I.; Steam engines; Ventilation.*

3974. **Lancaster, H., and Dixon, T.**
Oct. 9.



Steam trap.—Working within the casing a is an equilibrium valve actuated by the bell-crank lever k, l , rod, lever i , and rod h , one end of which latter rod is attached to the flange g of the

expanding tube e . The expansion and contraction of the tube e operates the valve. In a modified form, the lever i is dispensed with and a single rod employed, one end being connected to the lever k and the other being screwed, and provided with a milled adjusting-nut working between cheeks cast on the inlet box b .

Abridged also in *Class Metals and alloys.*

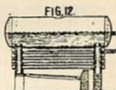
4043. **Fox, St. G. L.** Oct. 12. *Drawings to Specification. Disclaimer.*

Heating by electricity.—The inventor refers to his prior Specification No. 3988, A. D. 1878, which relates to electric lighting, including the construction of electric lamps with incandescent continuous conductors. In heating by electricity according to the present invention, a coil of fine wire may be used, which will be more or less heated when the electric current passes through it; the length and thickness of the wire (or foil employed) determining the intensity of the heat. Platinum is suitable for use, but iron will answer. Or a larger conductor of some bad-conducting refractory material, such as carbon (preferably graphite), may be used in conjunction with fireclay, magnesia, lime, or other refractory earth, to form an inner lining of a furnace. To obtain very high temperatures, as for melting metals, a furnace may be formed of the best non-heat-conducting material and shaped internally to correspond to the crucible to be heated, the heating-conductors being coiled or applied round the inner surface of the furnace and passed out through the sides or bottom. The furnace has a cover, and the heat is economized in its development, as the largest part of it is utilized, there being no constant draught through, as in other furnaces. The heating conductor should be of less resistance at the points of exit from the furnace, and metallic connection with conducting-wires. The furnace may be modified and used for roasting meat and the like. To vary the supply of light or heat, the electric current may be regulated by joining up in the circuit an instrument, which is provided with a hollow glass or like cylinder, partly filled with a liquid such as mercury, and containing an adjustable tapered or pointed rod, as of copper or silver, the flow of the current being regulated by adjusting the height of the rod so as to increase or diminish the resistance.

Abridged also in *Classes Cooking &c.; Electricity &c., Divs. I, III, and IV.; Metals and alloys.*

4052. **Donaldson, J.** Oct. 12.

Heating water &c.—A large horizontal cylindrical chamber has four (two at each end) large depending tubes between which are arranged two sets of horizontal smaller tubes (one set at each side of furnace), the tubes and lower half of the upper chamber being enclosed in a suitable casing. The tubes are, in one arrangement, screwed into both back and front plates, holes being provided in the tube between



these plates for the circulation of the water and the end closed by a suitable cap. Or, instead of the tube being screwed direct into the plate, it may have (screwed on it) conical nuts or washers of copper or other soft metal, fitting into coned holes in tube-plates, or the hole may be bored larger than the tube and a cup-shaped copper washer screwed on tube and expanded into the tube-plate by an internal steel ferrule. The screwed part of one end of the tube may be smaller than the other end. The Complete Specification also shows a method of expanding a plain tube by internal steel ferrules.

Abridged also in Classes *Pipes &c.*; *Steam generators.*

- 4165. Gedge, W. E.,** [*Schrabb, P., and Terrien, A.*]. Oct. 19.

[*Provisional protection only.*]

Steam trap.—Relates to apparatus for automatically discharging the water that may collect in steam or gas engine cylinders, heating-apparatus, or gas, air, and other conduits.

The water enters an annular groove *b*^d in the valve seat. When this apparatus is applied to a steam cylinder and the engine is at rest, the "washer" *d* falls by its own weight and the water can run out. When steam is turned on it drives the water before it and directly the dry steam arrives at the valve it causes the "washer" *d* to rise and close the passages and " permit nothing more to issue except the water " which oozes drop by drop." Should the cap *e* get full of water, the washer *d* " will open entirely."

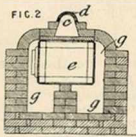
Abridged also in Classes *Air and gas engines*; *Air and gases, Compressing &c.*; *Gas distribution*; *Steam engines.*



- 4166. Stordy, J., and Hampson, F.** Oct. 19.

Boiler heated by waste gases from furnace employed in singeing fabrics. The object is to more fully utilize the heat of the furnace, so that the heat employed for singeing may be used simultaneously for heating water or producing steam. A wrought-iron boiler surrounds the furnace, and the products of combustion passing along the flue *c* heat the singeing-iron *d* and dampers admit of the same passing along the flue *g* at will, thereby heating the tank *e*, which is connected to the boiler by a pipe. A steam-chest is applied to the boiler when used for driving an engine.

Abridged also in Classes *Fabrics, Dressing &c.*; *Furnaces &c.*; *Steam generators*; *Stoves &c.*



- 4295. Beauregard, F. A. T. de.** Oct. 24.
Drawings to Specification.

Heating by water circulation.—Steam pressure is employed to circulate the water.

Abridged also in Classes *Hydraulic machinery &c.*; *Pumps &c.*; *Rotary engines &c.*

- 4305. Barraclough, A.** Oct. 26.

[*Provisional protection only.*]

Heating water and other liquids by steam.—Within the pipe through which the water &c. passes is placed a perforated steam pipe with the perforations inclined in the direction in which the water is flowing. Increased velocity as well as heat is thus imparted by the steam to the water in its passage along the pipe.

Abridged also in Classes *Bleaching &c.*; *Brewing &c.*

- 4407. Clark, A. M.,** [*Davis, C.*]. Oct. 31.

[*Provisional protection only.*]

Heating by electricity.—For this purpose the property of platinum, or other metallic wires, to become red-hot by the passage of an electric current through them is used; or the heat developed by the sparks from a Ruhmkorff coil may be employed. The wires or the sparks are brought into contact with the matters to be heated, so that the same results are obtained as when employing ordinary fuel.

Abridged also in Classes *Acids &c.*, *Divs. I. and II.*; *Electricity &c.*, *Div. IV*

- 4428. Pritchett, G. E.** Nov. 1. *Drawings to Specification.*

Heating buildings.—Pipes, tubing, or hollow-ware with curved webs or indented sides may be connected with apparatus for warming and drying air, and used in floors, walls, and portions of buildings, conservatories, greenhouses, and Turkish or other baths.

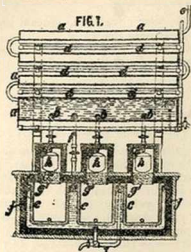
Abridged also in Classes *Buildings &c.*; *Chimneys &c.*; *Cooling &c.*; *Moulding &c.*; *Roads &c.*; *Ventilation.*

- 4429. Henderson, C. J.** Nov. 2.

Heating and ventilating churches &c.—Air is supplied to the building through a chamber level with or beneath the floor, in which it is heated by hot-water pipes or a stove. The chamber is preferably lined with bright metal, and circulation may be assisted by a fan driven from an external chamber. The various air passages are provided with valves; for heating the building, very hot air is supplied in small quantities, while for ventilation, when the temperature is sufficiently high, the valves may be fully opened. The vitiated air may be drawn off through shafts concealed in a pilaster and communicating with the roof space or open air.

Abridged also in Class *Ventilation*

4501. **Hogben, T.** Nov. 7.



Boiler for tea, coffee, &c. making. Water from a pipe *e* passes through tubes *a*, heated by gas burners *d* or otherwise, into a larger vessel from which, when at the boiling point, it is supplied, through pipes *b*, to boxes *g* containing tea or coffee in perforated receptacles *h*. The liquid then passes through sponge or charcoal filters *g'* into urns or receivers *c* surrounded by a hot-water jacket enclosed in a case lined with non-conducting composition. The jacket is supplied from the boiler *a* through a pipe *f* and may be further provided with a circulating-tube heated by a burner.

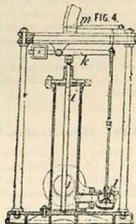
Non-conducting composition for tea and coffee urns &c. The composition may be traversed by hot-air, hot-water, or waste-steam tubes, and may consist of wool, oakum, and hair, or of a mixture of any of these or wadding or sawdust, with sand or plaster of Paris, and pitch or tar.

Abridged also in Class *Tea &c.*

4537. **Thompson, R.** Nov. 8.

Thermostat.—Relates to regulating-apparatus for passing air into a kiln at a fixed temperature. The hot blast acts on the brass rod *i*, which in expanding actuates a lever *k*, connected to the valve *l* for admitting cold air from the blowing-engine. The lever also acts on an index *m* outside, indicating the fluctuations of temperature. The regulator is adjusted so as to obtain such a mixture of hot and cold air as may have the proper temperature for drying the gypsum, the arrangement working automatically.

Abridged also in Classes *Acids &c., Dev. II.; Drying; Furnaces &c.*



4637. **Weston, G.** Nov. 15.

[*Provisional protection only.*]

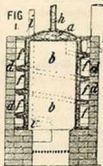
Heating air.—A number of pipes conveying fresh air to the room &c. pass through an iron case containing gas burners, and provided with a suitable inlet for air and outlet for products of combustion.

Abridged also in Classes *Stoves &c.; Ventilation.*

4687. **Johnson, W.**

Nov. 19.

Boiler. An annular boiler *a*, with flow pipe *h* and return pipe *i*, is set in brickwork, and is provided with a spiral enlargement which forms with the brickwork a spiral flue *f*. The fire space *b* is closed at the top, the products of combustion passing round the spiral flue to the chimney.



4758. **Olney, T. C.** Nov. 22.

[*Provisional protection only.*]

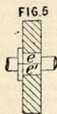
Boiler.—A vertical case is traversed by two sets of tubes. The inner communicate with a flue; the outer are partially closed at the top and serve to increase the heating-surface.

Abridged also in Class *Stoves &c.*

4761. **Gibbs, R. R.** Nov. 22.

Non-conducting coverings.—Where circulating pipes &c. have to pass through inflammable partitions they are insulated by non-conducting pieces *e, e'*, of porcelain or the like.

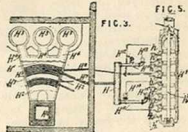
Abridged also in Classes *Cements &c.; Fire, Extinction &c. of; Furnaces &c.; Stoves &c.*



5154. **Corliss, G. H.** Dec. 16.

Heating by steam circulation.

—Consists of apparatus which is described for superheating steam for compound engines and for heating feedwater, but which is stated to be applicable for steam heating-apparatus. *H*, Fig. 3, is a large receiver connected with the high-pressure cylinder by the pipes *H*¹², *H*¹³, *H*¹⁰, and with the low-pressure cylinder by the pipes *H*¹⁴, *H*¹⁵, *H*¹¹. *H*² is a hot chamber for receiving the products of combustion from the boilers *H*³, through

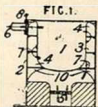


the passages H¹, H² and H³ are tubes extending from side to side of the chamber, and are heated by the waste gases passing to the chimney H⁴; H⁵ forms a steam regenerator and H⁶ a feedwater heater. The pipe H⁷ conveys steam from the receiver H and introduces it at lower end of the regenerator, a pipe H⁸ at the top conveying the dry steam away. The circulation of the condensed water and steam in the receiver through the regenerator is effected by a pump worked by the engine. The feedwater is forced by the feed-pumps through pipes fitted with valves to the feed-heating apparatus H⁹, and by disconnecting the receiver H the feedwater may be made to pass through the regenerator as well. By attaching pipes to the receiver H, the apparatus may be used where steam is required for heating purposes.

Abridged also in Classes *Governors &c.*; *Mechanism &c.*; *Pumps &c.*; *Steam engines*; *Steam generators*.

5161. Armstead, W. J., and Pannell, G. Dec. 16.

Flues for coppers &c.—The objects of this invention are to economize the fuel used in heating coppers, boilers, stoves, cooking-apparatus, and stills, and to utilize and more equally distribute the heat. The copper 1, Fig. 1, or other vessel to be heated is surrounded by an iron casing 2 which may be covered with brick-work or other non-conducting material. Between the vessel and the casing a number of iron partitions 3 form flues 4 which in Fig. 1 are shown surrounding 1 and connected by holes 7, but may be arranged as desired. The products of combustion pass along these flues to the chimney.



Flues, cleaning.—The flues are cleaned by removing the vessel 1 which rests upon stays 10. The furnace may also be removable. Air may be admitted into the flues to consume the smoke.

Abridged also in Classes *Cooking &c.*; *Distilling &c.*; *Stoves &c.*

5280. Scott, J. Dec. 26.

[*Provisional protection only.*]

Preventing freezing of domestic boilers and their connecting water pipes.—The supply pipes are

surrounded by or contain steam pipes, supplied from an auxiliary boiler which may be heated by the kitchen fire or by gas, and is provided with a safety-valve. The condensed steam returns to the auxiliary boiler, and the superfluous steam may be discharged or utilized to heat the water supply.

Abridged also in Class *Hydraulic engineering*.

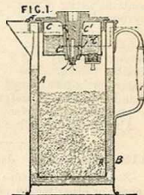
5295. Nottbeck, C. de. Dec. 27.

[*Provisional protection only.*]

Steam trap.—A cylindrical box has an entrance passage at one end through a boss with a screw thread for adjustment, and at the other is penetrated by a perforated tube, through which the water escapes. The exit of steam is prevented by a floating cylinder which slides on the tube with the rise and fall of the water, thereby covering the hole. On the closed upper end of the tube is fitted a metal disc, to direct the water towards the sides of the box, such disc being perforated for the passage of air.

5317. Templeman, J. Dec. 30.

Heating water by slaking lime &c.—The water &c. to be heated is placed in a casing B surrounding an inner vessel A containing unslaked lime. An upper vessel C contains sufficient water to slake the lime by which action the heating is effected. This slaking-water is admitted to the lime by a cock c¹ with a vent passage to pass gas &c. from A to the container C. Removable linings for the inner chamber A may be employed for readily replacing the charge of lime. Both the heating and heated chambers may be provided with safety-valves and with asbestos or other non-conducting covering.



Abridged also in Classes *Closets &c.*; *Cooking &c.*; *Medicine &c.*; *Railway &c. vehicles*; *Steam generators*; *Tea &c.*; *Toys &c.*

A.D. 1879.

85. **Cox, J. B.** Jan. 8. *Drawings to Specification.*

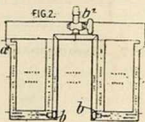
Boilers; non-conducting coverings; heat-storing apparatus.—Apparatus for retaining and storing for constant use heat generated in stoves &c. An "outer chamber" or sheathing is employed, which is lined with a mixture of asbestos and wool, or other non-conducting materials, and the products of combustion are carried off below the burner or other source of heat. The invention is stated to be applicable to steam and other boilers.

Abridged also in Classes *Steam generators; Stores &c.*

113. **Wentworth, S. W.** Jan. 10.

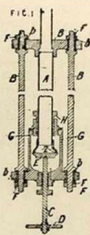
Heating water by gas.—A submerged annular chamber provided with air inlet and inlet passages contains a ring of gas burners *b*, the supply pipe *b'* of which is connected to any convenient supply by flexible tubing. The water or other liquid circulates through the chambers indicated, and passes out through apertures *a'* just below the surface.

Abridged also in Class *Closets &c.*



118. **Ewart, H.** Jan. 10.

Steam trap.—A pipe *A*, of copper or other highly expansive metal, is insulated from the framing *B* by non-conducting material at *b*. The lower part of the said framing is fitted with a valve *E*, having a spindle *C* and a hand-wheel *D* for adjustment, nuts *F* being also provided for rough adjustment. When steam is turned on, the trap being cold, there is an opening left at *Z* through which the water flows into a chamber *G* having an outlet until the arrival of steam, by expanding the pipe *A*, closes the opening at *Z*. When more water has accumulated in the pipe, the latter again contracts and so permits the water to flow away. The spindle *C* can, if preferred, be made hollow, and carried through the valve and partly up the pipe *A* for the escape of water. The chamber *G* is provided with stuffing-boxes at top and bottom. In lieu of that marked *H*, a guide or stay bushed with non-conducting material can be arranged to work upon the framing *B*. The insulation of the pipe *A* enables a shorter trap to be used.

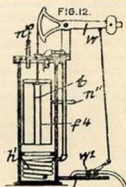


120. **Haddan, H. J.**, [Knapp, E. J.]. Jan. 11.

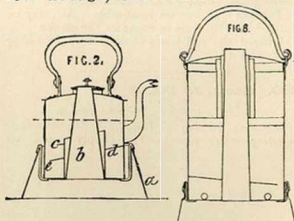
Heating buildings &c.; steam trap.—Relates to the supply of steam generated at a central station through mains to houses, street hydrants, &c. to be utilized for various purposes. Suitable arrangements of pipes are heated by steam from the main, passed through a meter &c. The water of condensation runs through a pipe *n'* into a cylindrical float *n*, from which it overflows through a central pipe *t* into the upper chamber of the trap, and passes out through a pipe *n''* connected with a circulating system for heating greenhouses, basements, &c., returning through a pipe to the lower chamber. If the water is not hot enough steam may be passed through a coil *h'*. If there is too much water the float rises and, by means of a balanced lever *W*, opens a waste cock *w*.

Non-conductors coverings.—The steam pipes are lagged with asbestos or haircloth.

Abridged also in Classes *Air and gases, Compressing &c.; Fire, Extinction &c. of; Hydraulic machinery &c.; Pipes &c.; Registering &c.; Roads &c.; Steam generators; Valves &c.*



170. **Savage, W. P.** Jan. 15.



Heating water &c.—The hot gases pass within a hood *a*, perforated above, and through a tapering tube or tubes *b*, widely flanged and soldered to the bottom of the kettle, saucepan, or other vessel, thus forming an enlarged heating-surface. In the tube *b* a short projecting tube may be placed when the vessel is not filled. The filling-hole around the tube *b* is provided with a filter *b*. Sediments retained beneath an inclined shelf *d* open at *e*, around a tube *c*. Boilers &c. are strengthened by stays and may

have two cocks, the lower communicating with two pipes perforated below, to withdraw sediment from beneath the shelf which is formed in two centrally inclined, detachable pieces. A water trough surrounds the top of the tube *b* in the upper part of which a smaller iron lining is fastened.

Abridged also in Classes *Cooking &c.*; *Hollow-ware*.

422. Yeaton, J. Feb. 1.

[*Provisional protection only.*]

Set-pans for brewing and domestic and other use. In the upper part of a frame mounted on wheels, or resting on supports, is a brick or other fire-resisting casing contracted below and arranged to receive a fire. The pan is placed at the top of the contracted portion, which has an opening through which the heat passes from the fire. A vertical or inclined midfeather ensures passage of the heat round the pan before reaching the chimney. A funnel conveys the steam from the pan into the chimney.

Abridged also in Classes *Brewing &c.*; *Furnaces &c.*

441. Schooling, H. Feb. 4.

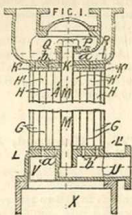
[*Provisional protection only.*]

Boilers.—The parts of the boiler which come in contact with the fire are made of cast or thick wrought iron or of copper, the other parts being sheet metal, or the boiler may be entirely of sheet metal or copper protected by plates of cast or thick wrought iron. The joints of the boiler are galvanized to make them water-tight.

Abridged also in Class *Stores &c.*

452. Price, J. Feb. 4.

Surface apparatus for heating, cooling, condensing, distilling, and like apparatus. In the arrangement shown, a number of vertical cylinders *G* are placed one within the other, forming annular chambers *H, H'*, closed at top and bottom by plates *K, L*, and lining-plates *K', L'*, the latter being preferably of paper, wood, vulcanite, or other slightly elastic material. The plates are held in place by the tubular stay *M*,

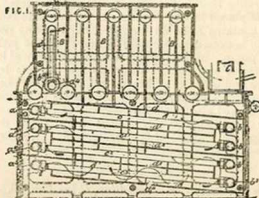


screwed at its lower end, and secured at the top by a nut. The plate *K* forms part of a chamber divided by partitions *P* into separate compartments *Q, R*, the former communicating by passages *b* with the annular chambers *H* and the tube *M*, and the latter by passages *a* with the chambers *H'*. The chambers *H* also communicate with a chamber *U* leading to the tube *M*, and those *H'* communicate with a chamber *V*. The gas, liquid, or vapour to be heated, cooled, or condensed, is led by suitable pipes to the chamber *R*, and passes through the chambers *H'* to the chamber *V*, and from thence to the receiver or

filter chamber *X*, and the heating or cooling medium circulates through the chambers *H, U*, and *Q*. The cylinders *G* may be corrugated to afford greater surface or strength, and may, if preferred be enclosed in an outer casing, or supported otherwise than in the manner shown. Also the chambers *H, H'* are not necessarily annular, but may be tubular, volute, elliptical, flat, &c. In using the apparatus as a condenser for steam engines, and in other cases where long tubes are used, the tubes are strengthened by rings, or bars of *T*, channel *H*, or *L* section, with holes cut through the horizontal web for the steam or other fluid to pass through. The ends of the tubes may also be strengthened by extra strips riveted thereto.

Abridged also in Classes *Cooling &c.*; *Distilling &c.*; *Steam engines*.

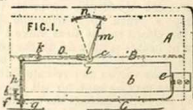
460. Hallam, S. Feb. 5.



Heating air for drying, in connection with machines for sizing yarn, calico printing, paper staining, and the like. A heating-chamber *A* has inclined ranges of pipes *c, c', c'', c'''*. The pipes of each range are connected at their upper ends to steam pipes *a, a', a'', a'''*, which are connected by cocks or valves to a main steam pipe, and at their lower ends to exhaust pipes *b, b', b'', b'''* which are also connected to a main pipe. Between the ranges are metallic partitions *d, d', d'', d'''*, with baffle-plates, which provide additional heating-surface and cause the current of air to take a certain course. The pipes may be arranged in series with partitions and baffle-plates, or each heating-pipe may have continuous ribs, spiral projections, or baffles, and be enclosed in a jacket through which the air is drawn.

Abridged also in Classes *Bleaching &c.*; *Cutting &c.*; *Drying*; *Weaving &c.*

563. Gilmore, J., and Clark, W. R.
Feb. 12.



Thermostats.—Relates to thermostatic apparatus for ventilating and regulating or indicating temperature actuated by a bimetallic spring. Fig. 1

shows a box A which may be let into the wall of the room & to be ventilated. The lower part has an opening *b* into the room, and the upper part has an opening to the exterior air. The bent bimetallic spring C is fixed at *e* and is supported on a collar *g* screwing on a rod *h*, which is attached to a lever D centred at *k* and moving a crank arm *l*, on the axis *c* of a valve B. The apparatus may be adjusted by the collar *g*, and lever D. A pointer *m* on the axis *c* shows on an arc *n* whether the valve is open or shut.

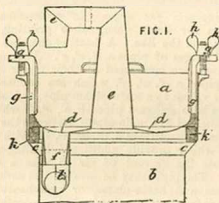
Abridged also in Classes *Cooking &c.*; *Fire, Extinction &c. of*; *Hollow-ware*; *Hydraulic machinery &c.*; *Metals, Cutting &c.*; *Philosophical instruments*; *Ships &c., Div. I.*; *Ventilation*; *Wearing-apparel, Div. I.*

630. Tellier, C. Feb. 17. *Drawings to Specification.*

Heating liquids for engine cylinder jackets. A coil is placed in the water space of the main boiler and contains a liquid having a high boiling point which is caused to circulate to and from the jacket by a pump. Metallic pins are driven or screwed into the tubes at frequent intervals and project both inside and outside to act as conductors of heat. These tubes are suitable for condensers or boilers.

Abridged also in Classes *Bearings &c.*; *Chimneys &c.*; *Distilling &c.*; *Furnaces &c.*; *Pipes &c.*; *Pumps &c.*; *Ships &c., Divs. I. and III.*; *Steam engines*; *Steam generators.*

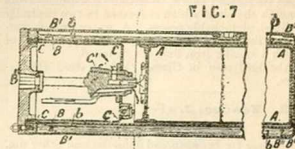
658. Simon, H., [*Bertling, C.*] Feb. 19.



Boiling milk &c.—Consists of the cylindrical boiler *b*, the cover *a* of which is secured tightly thereto by engaging the uprights *g* with bolts on each side and screwing down the nuts. The joint-making compressed cork ring *k* is fitted into a recess in the cover, and its edge is pressed into the part *c* of the boiler. Extending upwards from the curved underside *d* of the cover is the bent, tapering pipe *e* which opens over the aperture *f* in the cover, closed by the float valve *l*. On the application of heat, the milk &c. in the boiler rises in the pipe *e* and descending from the mouth thereof opens the valve *l* and re-enters the boiler. The circulation may be kept up till the temperature within the boiler exceeds the boiling point.

Abridged also in Classes *Moulding &c.*; *Pipes &c.*; *Preparing &c. cork &c.*; *Steam engines*; *Valves &c.*

700. Templeman, J. Feb. 21.



Footwarmers.—Fig. 7 shows a footwarmer consisting of a jacketed casing B, B' containing an inner vessel A, partly filled with lime, and a water vessel C, so that by setting the footwarmer on end and turning the cock *c* the lime is slaked and heat generated. The vessels may be removed for recharging. Modifications are shown and described fixed in the floor of a carriage and supplied with water from a separate cistern. The water chamber may be dispensed with and water supplied by an ordinary water can. The lime may be placed loosely in porous bags or perforated cases for ease of insertion and removal. The vapours may be allowed to flow into the jacket *b* or the latter may be dispensed with. In this case the vessel may be covered with a non-conducting material such as asbestos or other fabric.

Abridged also in Classes *Railway &c. vehicles*; *Road vehicles.*

718. Jack, W. F., and Greening, F. Feb. 22.

Non-conducting coverings.—Coal or wood fibre, or a mixture thereof, is dissolved—alone or together with oils, gums, resins, baryta, bone dust or lead, &c., and any desired colours—in alcohol, or in hydrocarbon oils. The solution may be formed into sheets &c. by rolling, pressing, &c.

Abridged also in Classes *Electricity &c., Div. II.*; *India-rubber &c.*; *Medicine &c.*; *Paints &c.*; *Preparing &c. cork &c.*; *Waterproof &c. fabrics*; *Wearing-apparel, Div. I.*

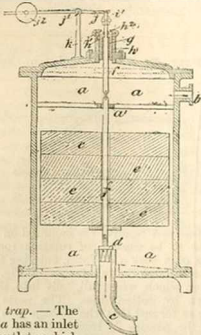
775. Kenwood, F. G., and Chapman, J. H. Feb. 26. *Drawings to Specification.*

Non-conducting coverings.—Reference is made to Specification No. 2466, A.D. 1871. Wood fibre or pulp is mixed to the required consistency and then pressed into moulds of the required shape, or between flat surfaces, or rolled out, to expel the moisture and consolidate it. It is then dried by exposure to heat or sometimes by heating the moulds &c. mentioned above. In cases where the packing will be in contact with steam or water it is soaked in linseed or other oil either alone or in combination with other waterproof materials. In some cases various metals may be worked up with the pulp into sheets, or wire gauze, flax, or cotton canvas may be combined. The sheet may be cut into the desired section and a suitable thickness obtained by employing several layers pressed or

cemented together, either with or without the metals or gauze &c. between.

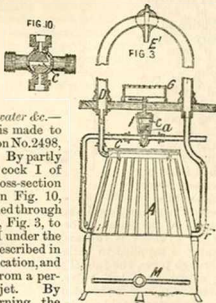
Abridged also in Classes *Bearings &c.*; *Buildings &c.*; *Cements &c.*; *Nails &c.*; *Pipes &c.*; *Railway &c. vehicles*; *Railways &c.*; *Road vehicles*; *Ships &c., Div. I.*; *Steam engines*; *Valves &c.*

777. Brookes, W., [*Thornton, C. J.*]. Feb. 26.



Steam trap.—The chamber *a* has an inlet *b* and an outlet *c*, which latter is closed by a valve *d* connected to a stone or other float *e* by links *f* passing through a guide *a'*. The float is partly counterbalanced by the weight *j* and its upward motion is limited by the stop *h* on the gland of the stuffing-box through which the packing-piston *g* passes. The accumulation of water, by raising the float *e*, opens the valve *d* until sufficient water has escaped.

838. Mort, S., and Eradley, C. W.
March 1.



Heating water &c.—Reference is made to Specification No. 2498, A.D. 1878. By partly opening a cock *I* of which a cross-section is shown in Fig. 10, gas is supplied through a passage *c*, Fig. 3, to a burner *M* under the heater *A* described in that Specification, and is lighted from a permanent jet. By further turning the

cock water is admitted through a passage *a* and pipe *C* into the lower part of the heater, from the upper part of which hot water escapes through a pipe *D* and jet *E'* into any vessel placed on a stand *G*, the excess returning to the heater through a pipe *F*. Modifications suitable for baths &c. are described.

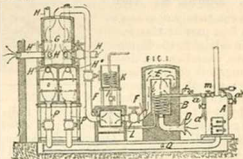
Abridged also in Classes *Closets &c.*; *Cooling &c.*; *Valves &c.*

868. Hull, J. S. March 4. *Drawings to Specification.*

Heating buildings.—Relates to the use of an air pump to exert pressure upon the combustible liquid (which may be a light oil, or spirit) in an airtight reservoir in connection with one or more burners in which the liquid is vaporized before it is consumed. The application of the invention to various purposes is described and illustrated. A vaporizing-burner as described in the Specification is employed to heat a steam generator on the ground floor. The steam passes through pipes to radiators in the upper storeys. The main oil reservoir is outside the building, the liquid being conducted by a pipe and branches to the various storeys. A compressed-air chamber, communicating with the reservoir, is placed within the building.

Abridged also in Classes *Cooking &c.*; *Food &c.*; *Furnaces &c.*; *Gas manufacture*; *Hollow-ware*; *Lamps &c.*; *Metals, Cutting &c.*; *Pipes &c.*; *Steam engines*; *Steam generators*; *Stores &c.*; *Valves &c.*; *Washing &c.*

905. Haddan, H. J., [*Pickhardt, W.*].
March 7.



Relates to apparatus for heating air by steam both for hot-air service and for cooking purposes, while utilizing the heat of the waste steam and air. The steam-space in the generator *A* communicates, by a pipe *a*, with the air-heating coil *B* in a cylinder. The small pipe *f*, opening into the upper part of the cylinder, is for letting a little steam into it, and thus moistening the heated air, when desirable. When the air is required to be of a sufficient temperature for cooking purposes, the steam supplied to the coil *B* is superheated by closing the stop-valve *m*, and forcing it to circulate through a pipe *a'*, which passes through the fire-chamber of the generator before issuing into *a*. The stop-valve of the pipe *f* is also closed in this case.

Heating water.—After heating the air, the steam may be passed, as in Fig. 1, by a pipe *I* into the steam-coil situated in a water-tank *K*, or it may pass straight into the water to be heated by it.

The cylinder assists in producing a uniform circulation of the air, but is not essential. As shown, it is open at the top. As the air in it becomes heated, it ascends into the surrounding chamber E, and fresh air is drawn up through a supply-pipe D. The chamber E has a slanting bottom, from the lower side of which issues a pipe F, which conducts the heated air into a collecting-chamber G. Near the bottom of this chamber are the mouths of the distributing-pipes H, provided with suitable regulating-valves. For cooking purposes, the hot air is further heated by passing the pipe F or, preferably, an enlarged section of it through a furnace, as shown at L.

Abridged also in Class *Cooking &c.*

1101. Pitt, S., [*Nottbeck, C. de.*] March 19.

[*Letters Patent void for want of final Specification.*]

Steam traps.—A perforated pipe the inner end of which is closed, projects into a chamber which receives the water of condensation. Around this pipe, within the chamber, is a similarly-perforated ring, which when rotated serves to open or close the holes in the pipe for the escape of water or air. This ring is actuated by a coiled spring formed of two metals expanding differently with heat, one extremity of the spring being fixed to the pipe and the other to an adjustable projecting arm on the ring. The adjustment is such that, according as the temperature of the chamber is raised or lowered by steam, air, or water, &c., so will the said holes be closed or opened.

1384. Leoni, S. April 7.

Non-conducting coverings.

—The first part of this invention relates to the lining of ovens, chambers for disinfecting cloth and bedding, for drying cloth, for japanning, and for Turkish baths.

The object is to prevent waste of heat by radiation and so economize gas. The second part describes a duplex lighting burner. Ovens and chambers in which a high temperature is required are lined with porous fireclay tiles coated with a non-conducting composition or cement. Over this a layer of slag-wool is placed, which is again covered with composition or fine cement such as Parian. The Provisional Specification also states that the tiles are covered with slag-wool soaked in solution of silicate of potash or soda and then with papier mâché, card or mill board, or a wooden veneer. When the interior of the oven is sufficiently hot the temperature may be maintained by a small gas burner.

Abridged also in Classes *Closets &c.*; *Cooking &c.*; *Drying*; *Lamps &c.*; *Medicine &c.*; *Paints &c.*; *Stoves &c.*

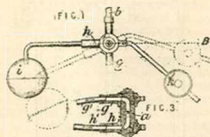
1458. Hauber, L. H. April 15. *Drawings to Specification.*

Heating buildings.—A number of stoves are arranged in sets in a chamber in the basement of a school or other building. Cold air is admitted to

the heating-chamber through a hinged valve and perforated plate, and warm air is admitted to the rooms through sliding valves and perforated plates in the walls, to ensure thorough distribution and to avoid draughts. The warm air is moistened by contact with strips of wet felt after passing through the plates. Foul air escapes through other perforated plates.

Abridged also in Classes *Air and gases, Compressing &c.*; *Stores &c.*; *Ventilation.*

1525. Pitt, S., [*Nottbeck, C. de.*] April 18.

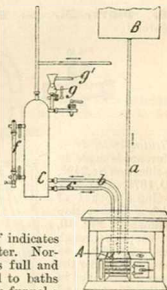


Steam trap.—A receiver *i* is mounted on tubular arms so as to be capable of rotation round the fixed plug of a cock *a*. Water, entering the cock at *b*, drains through the tubular arm *g*, Fig. 3, into the receiver, which, when full, falls into the position shown by dotted lines. The ports of the cock *a* are so formed that the passage *g* is always open but the passage *h*, leading to the outlet is only open when the receiver is in its lowest position. The steam pressure in the latter then forces the water up the hollow arm *h* to the outlet *c*. When the receiver is empty the counterbalance *k* raises it, to close the outlet and prevent the escape of steam.

1625. Haresnape, T. April 25.

Heating water.—

Relates to preventing the explosion of boilers. In addition to the ordinary supply pipe *a* from the cistern B, the boiler A is connected with a cylinder C by circulating pipes *b, c*, and in the event of the pipe *a* freezing may be supplied from any convenient source through a pipe or funnel *g*. A gauge *f* indicates the height of the water. Normally the cylinder is full and hot water is supplied to baths &c. through pipes, the funnel *g* being closed by a ball valve. An overflow pipe *g'* is provided in case the latter should fail to act.



1632. Leeds, L. W. April 25.

Heating buildings.—

A heating-apparatus is used in conjunction with an inlet ventilator in a window frame. Steam admitted from a supply pipe D to a horizontal chamber A, placed below a window E, circulates through chambers *b, b'* formed by partitions B' in vertical pipes B, the upper ends of which are closed by screw plugs *b'*. The water of condensation escapes through a pipe. Pipes, controlled by a cock or by an automatic arrangement, serve for the expulsion of the air on first admitting the steam. Water discharge and steam supply valves consist of elastic blocks of india-rubber and plumbago or other materials, which are pressed by screws and hand-wheels against apertures in partitions in the valve boxes C. Hot water may be substituted for steam. The heated air is moistened with vapour from a cistern F supplied with water by a ball valve *f*. In a modification, inner vertical pipes are substituted for partitions. An inlet ventilator is fixed in the lower part of a window frame E. A hinged flap *i* controls the supply of air, and a partition *k* of wire gauze or the like serves to remove dust &c.

Abridged also in Classes *Air and gases, Compressing &c.; Valves &c.; Ventilation.*

1827. Pollard, C. May 8.

Non-conducting coverings.—A composition suitable for protecting metallic and other surfaces such as steam boilers, engine cylinders, furnaces, pipes, tunnels, walls, woodwork, masonry, &c. Clay or other like substance is thoroughly dried, on a floor, preferably heated from below by pipes or otherwise. The dry clay is ground in a mortar mill or other machine and is mixed with hair, wool, or other fibrous substance. In this condition it may be packed and stored. When required for use it is mixed to the consistency of paste with hot water, and is then applied to the surfaces to be coated.

2036. Fisher, J. May 22.

[*Provisional protection only.*]

Heating air or water.—Relates chiefly to heating feedwater for boilers, although the heated water may be used for any other purpose. The invention may also be applied to heating air. In one form of the apparatus a cast-iron pipe is arranged in an

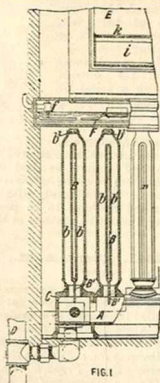


FIG. 1

inclined position, and is provided at the lower end with a cistern. Exhaust steam is led into the lower end of the inclined tube by a horizontal pipe so that the steam strikes the lower side of the tube and is directed along it towards its upper end. The water supply is admitted to the inclined tube from the upper side and is finely divided in entering. The force of the exhaust steam carries the water some distance up the pipe so that it becomes highly heated. The condensed steam and water then flow into the cistern, from whence it is supplied to the boiler. The water supply instead of being admitted directly into the tube may pass into a chamber at its lower end. The tube may be surrounded with a casing within which the cold water is allowed to circulate. Similar casings may be arranged round the exhaust steam pipe and the upper part of the cistern. Perforated plates attached to a rod may be provided within the tube to secure a more perfect contact of the steam and water; or the lower side of the pipe may be provided with ledges for the same purpose. In a modified form of the apparatus the tube is vertical and is fitted inside with a helical blade carried on a perforated pipe. The steam ascends the helix and the water passes through the perforations in the pipe and descends into the cistern. In each case live steam may be used instead of exhaust steam.

Abridged also in Classes *Registering &c.; Steam generators.*

2090. Lake, W. R., [Anclon, A.]. May 26.

[*Provisional protection only.*]

Footwarmers.—Boxes containing substances of great latent heat of fusion, such as fats, resin, wax, bituminous or tarry matter, stearic acid, paraffin, acetate of soda, or any acetate or phosphates fusible without decomposition, are heated by steam or hot water so as to fuse the contents, which in solidifying gradually give up their heat.

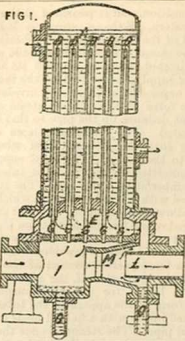
Abridged also in Classes *Cooking &c.; Railway &c. vehicles; Road vehicles.*

2154. Millar, W., and Davie, J. May 30.

Heating air, water, &c.—The liquid or gas to be heated or cooled is circulated by any suitable means through a chamber A containing tubes G, D, through which the heating or cooling medium, such as exhaust steam from a steam engine or other steam, air, or water, is drawn by an injector apparatus consisting of a nozzle L and diverging tube M. By the action of the injector a partial vacuum is formed in a chamber E, and circulation is set up from a chamber I through the inner tubes. Tubes O serve for the withdrawal of water when steam is the heating-medium. In a modification, the diverging tube M communicates with the inner concentric tubes, and the chamber E at the base of the outer tubes is supplied with water, the circulation as before being maintained by a jet of exhaust steam through the injector. Other modifications are described with injector apparatus distinct from the circulating tubes, and with double injector apparatus.

Abridged also in Classes *Cooling &c.; Distilling &c.; Steam engines.*

(For Drawing see next page.)



2237. Bell, J. June 6.

Non-conducting coverings.—Elastic casings, made ready for application like staves, or tubes, or split tubes which can be sprung into place, or which can be bent or opened out, and constructed as shown

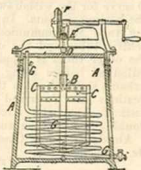
2403. Podewils, Baron A. de. June 17.

Heating air in combined apparatus for evaporating, deodorizing, and drying excremental and fecal matters and other liquid or semi-liquid refuse from towns. Air enters the drying-chambers E', E", Fig. 6, through tubes q, q', q", and takes a zig-zag course to reach the exhaust pipe r with which the pipe n is connected. The air passing to the pipe q from chambers F, G is heated, firstly by the vapours and gases passing from the flue t, Fig. 1, and pipes r and n, and then by the exhaust steam of an engine forming part of the apparatus. The whole of the gases and vapours, after passing coiled tubes in the chambers F and G, are exhausted by a fan H and discharged completely cooled into a chimney K.

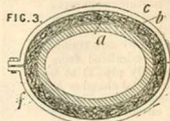
Abridged also in Classes *Drying*; *Injectors* &c.; *Mixing* &c.; *Sewage* &c.

2478. Voorde, P., van de. June 21.

Heating liquids in churns.—The coil G, Fig. 1, is placed within the body of the churn A so as not to interfere with the action of the revolving perforated beaters, and serves for the passage of warm



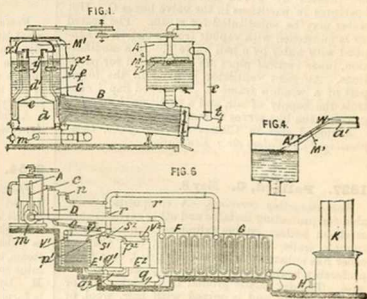
in Fig. 3 applied to an elliptical pipe. a is a tube of asbestos, millboard, or paper, felt or cloth, surrounded by a layer b of hair, felt, charcoal, cork, or other non-conductor, and bound on the outside with a spiral or other wrapping of oilcloth c. In this case the casing is split and sprung into position, then secured by clamps. The parts b and c may be laid on in repeated layers. Another covering consists of a tube of asbestos paper or millboard, with an air space between it and the pipe to be protected, the two being kept apart by chaplets or blocks at intervals.



2341. Clark, A. M., [la Barrière, D. E. M. P. de]. June 12.

Non-conducting coverings &c.—The pith enveloping the fibres of coco-nut husks is used loose or is filled into sacks, or is made into mattresses.

Abridged also in Classes *Agricultural appliances, Farmyard* &c.; *Buildings* &c.; *Casks* &c.; *Fabrics, Dressing* &c.; *Filtering* &c.; *Furniture* &c.; *Life-saving* &c.; *Preparing* &c. &c.; *Ships* &c., *Die. I.*; *Waterproof* &c. fabrics.



or cool water to keep the contents at any desired temperature.

Abridged also in Classes *Cooling* &c.; *Milking* &c.; *Mixing* &c.

2526. Everitt, W. E. June 24.

Footwear are made from seamless tubes a of copper, brass, &c. drawn the required shape. The cast end-pieces b, having a small ridge c fitting



into the tube *a*, are brazed or soldered thereto. An opening is closed by a screw plug *f* which is preferably hollow, and fitted with a small india-rubber valve *g* and spring *h* to compensate for the expansion and contraction of the water caused by its changes in temperature. They are supported at each end on rollers.

Abridged also in Class *Railway &c. vehicles.*

2561. Rydill, G. June 26.

Heating buildings; footwearers.—Warming rooms and beds by hot sand or the like contained in a metal casing. Or ordinary heating-pipes are covered with dry sand or the like to store up the heat. The material is placed on wagons and passed into a laker's or similar oven, or is heated by passing through the flue tubes of a steam boiler which is placed on end and heated in any suitable manner.

Abridged also in Classes *Bleaching &c.*; *Drying*; *Railway &c. vehicles*; *Spinning.*

2663. Lake, W. R., [*Sarumt, J., and Sarumt, C.*] July 1.

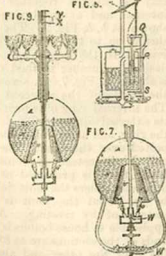
[*Provisional protection only.*]

Heating air &c.; heating water &c.—A plain or corrugated sheet-metal cylinder is placed above the grate. The smoke and gases pass through it, heating it and a number of tubes which encircle it. Any number of such cylinders may be placed one above another. The space within the cylinder may be utilized either as an oven or to receive an evaporating-vessel to moisten the air; or, when used for greenhouses, a boiler may be introduced. In this case the ends of the tubes may be closed and put in communication with the boiler.

Abridged also in Classes *Cooking &c.*; *Stoves &c.*

2682. Livesey, J., and Kidd, J. July 2.

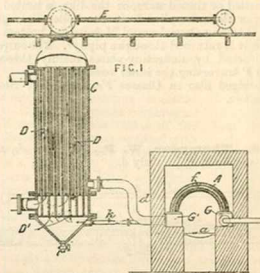
Thermostatic apparatus for carburetting-vessels. Fig. 5 shows a rod *Q* and attached plate *S* raised to the position shown when the gas tap is turned off to extinguish the light. When the tap is turned on, the rod is kept for a time in the same position by solidified sealing wax or other composition in a tube *P* immersed in hydrocarbon. When the required temperature is attained the sealing-wax melts, the rod *Q* drops, and the plate *S* falls, shutting off the carburetter from the direct action of the flame. Fig. 7



shows another arrangement. The rod of the adjustable valve *W* is supported on a flexible diaphragm, beneath which is oil or other liquid contained in a closed tube the end of which projects into the carburetting-vessel. When the temperature rises the oil expands, pushing up the diaphragm and partly closing the valve. In Fig. 9, the tube *Y*, made of a different metal and expanding more than the enclosed valve rod *X*, tends to close a valve when temperature rises. Modifications are shown with riveted strips of unequally-expanding metals outside the carburetter closing the valves by alterations in curvature as temperature rises.

Abridged also in Classes *Gas manufacture*; *Lamps &c.*

2687. Hoyne, J. F. July 2.



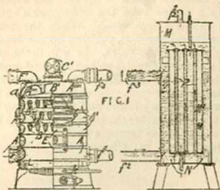
Heating air by steam.—Comprises arrangements for drying manure, malt, and cereals; applicable for heating, cooling, drying, or disinfecting other substances. Refers to Specification No. 4961, A.D. 1876. The material is spread over pipes *E* supplied with hot-air. The air passes through pipes *D* in a heater *C* traversed by superheated steam. Steam supplied at *k* is also conveyed into pipes *D'* traversing the tubes *D*, to increase the heating-surface, or the pipes *D'* may be replaced by solid heat-conducting cores or by slag or the like.

Abridged also in Classes *Brewing &c.*; *Cooling &c.*; *Medicine &c.*; *Steam generators.*

2709. Keith, J. July 3.

Boiler.—Superposed annular water-chambers *A'* are connected by vertical water ways, and bound together by bolts passing through these ways. Each chamber is provided with cross-tubes which themselves may be connected by cross-tubes. The feed pipe *F* is bolted to the lowest chamber and the outlet pipe *F'* to a dome-shaped upper chamber *A''*, preferably formed in two portions to facilitate casting. The grate, which can be tilted by a lever *k*, is surrounded by a fireclay ring *L* to facilitate combustion. The fire-door *E* and soot-doors are secured to the boiler by bolts passing between the sections. The flue is provided with a damper *C*

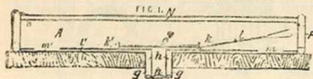
ULTIMHEAT® Heating water by steam or hot water.—Pure water circulating through a vessel M of porcelain,



enamelled or tinned ware, or the like, is heated by water or steam supplied from the boiler through a pipe f^2 to an external vessel M from the bottom of which it is returned through a pipe f^1 . The current is directed by deflecting-plates mainly through pipes P traversing the inner vessel.

Abridged also in Classes Furnaces &c.; Steam generators.

2714. Thompson, W. P., [Meresse, J., and Rondépierre, P.]. July 4.



Footwarmers.—Footwarmers for railway and other carriages serve as stoves burning carbon. The arrangements are stated to be applicable to other heating-apparatus. The carbon is placed, already lighted, in a small grate K which is then inserted in the footwarmer A by means of the handle L. A tube is fitted into the under part of the footwarmer to pass through the floor. The tube is divided into separate compartments some of which admit air, while the others carry away the combustion products. The former compartments lead the air to channels m, m' , which conduct it to the ends of the casing A. To diffuse the heat and prevent its striking the surfaces of the casing A, shields N are fitted therein; sand may be enclosed above the shield. The door P for removing and inserting the grate is preferably double, the two portions, which close against separate seatings, being connected by springs. The outer portion is fitted with india-rubber &c. forming a close joint.

Abridged also in Classes Railway &c. vehicles; Road vehicles; Stoves &c.

2831. Pettey, W. H. July 11.

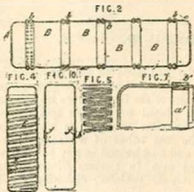
[Provisional protection only.]

Heating milk.—The containing-vessel may be partly or wholly surrounded by steam or hot water,

or a hinged coil of hot pipe may be let down into the milk, or the vessel may be heated by other means.

Abridged also in Classes Food &c.; Mixing &c.

2852. Lake, W. R., [Brown, W. H.]. July 12.



Boilers.—Relates to a method of constructing boilers and other similar vessels which are required to resist pressure. The two heads A, Fig. 2, are formed by subjecting iron or steel circular plates in a cold state to the action of a hydraulic press. The change of form is effected by stages, between which the metal undergoes an annealing process, and is coated with tin, copper, or some similar metal which acts as a lubricant, and as a preservative from oxidation. The middle sections B of the boiler or vessel are also seamless and are made in a similar manner to the heads, but when the cylindrical portion is drawn to the proper size, about two-thirds of the diameter of the head is cut out from its centre and the remaining portion is forced outwards to form part of the cylinder. Or the sections B may be drawn out in a cold state from cylindrical forgings. In some cases the heads A, A may be used with a boiler the cylindrical part of which is made of plates riveted in the usual way.

Joints and joint-closing.—The heads and sections may be jointed together by butt joints, with internal and external rings riveted to them as shown at b, b , Fig. 2. The external rings may be shrunk on to the joint. The end sections may be jointed to the heads by ordinary lap joints if desired. Another method of uniting the sections is shown in Fig. 7. A screw-thread is formed on the inside of the adjacent parts of two sections. The internal ring a' is provided with a thread on its external surface. The two sections screw on to the ring, and an external band b' is either shrunk or bolted over the joint. The screw-threads may be cylindrical instead of conical as shown, but the latter form is preferred as being stronger. For domestic boilers the butt joint first described may be used, but the joint is formed by soldering instead of by riveting. Another form of joint applicable to house boilers is shown in Fig. 10. The ends of the sections are so formed that one of them fits over the other and abuts against a shoulder j formed on it. An external band b' fits over the joint and is united to it by soldering.

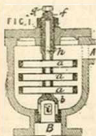
Bracing against external pressure.—Relates more

particularly to domestic boilers, and consists of a spiral brace E, Fig. 4, running round the interior of the boiler shell, and secured to it by riveting or soldering. The brace is preferably of a corrugated form as shown in Fig. 5, and is made of hard rolled metal.

Abridged also in Classes *Beverages; Distilling &c.; Metals and alloys; Metals, Cutting &c.; Milking &c.; Steam generators.*

2899. Holste, C. July 16.

Steam trap.—*a, a* are flat metallic cells which intercommunicate, so that all can be filled with a liquid through the opening of the pipe *h*, which is then hermetically stopped by the plug *g*. The under side of the lowermost cell carries a piston valve *b* with apertures *i*. The position of the valve is adjusted by turning the square head *f*. The operation of the valve depends on the varying volume of the liquid in the cells *a*, at different temperatures. At high temperatures the liquid expands, and the flat sides of the cells bulge downwards, and as the liquid cools the cells again contract. The amount of expansion and contraction is the sum of the movements of the several cells, so that the larger the number of cells, the greater is the range of the valve *b*. When the collected water is hot there is but little lying in the pipe, and expansion then closes the valve. As water accumulates, its temperature falls, the cells contract, and the valve is raised, allowing the escape of the water through the apertures *i*. A slide ring valve or a flat or curved slide valve may be used, in which latter case the outlet pipe B is horizontal, and a grit cock is fitted in the lower part of the trap. Instead of supplying the liquid



to all the cells through the pipe *h*, each cell may be separate and separately filled and stopped by a screw.

2911. Kilner, T. H. July 17.

[Provisional protection only.]

Circulating boiler for water for heating green-houses, schools, churches, chapels, and other buildings. An outer box or casing is connected by transverse water pipes, the lowest layer of which serves as a firegrate. Two boilers may be worked together.

Abridged also in Class *Furnaces &c.*

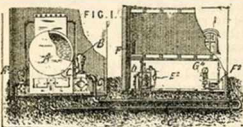
2928. Latham, B., and Way, J. T. July 18.

Heating liquids.—The water or other liquid is caused to descend in pipes A, Fig. 1, formed of heat-conducting material and driven or sunk into the ground to a depth at which the temperature is uniform. The pipes have supply and discharge branches C, B, and perforated diaphragms E and the bottom parts of the discharge pipes may be fitted with worms to cause the water to flow in a spiral path, and the upper parts A may be filled with filtering-material for purifying. The water may be caused to flow successively through each of a number of pipes arranged in a series. A cistern or coil may be buried in the ground and fitted with supply and discharge pipes, or a large cistern may have a single supply pipe and a series of discharge pipes. The discharge pipes may be surrounded by a non-conducting casing. The bottoms of the pipes may be made in the form of screw piles.

Abridged also in Classes *Cooling &c.; Filtering &c.*

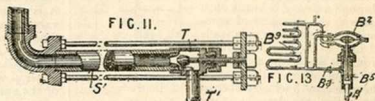


2987. Wheeler, F. B., [Prall, W. E., and Orlrick, H.]. July 23.



Distributing heat and power.—Hot water under high pressure from a boiler A, Fig. 1, is circulated, preferably by means of a force-pump B, through mains from which it may be drawn for various purposes, such as heating buildings, driving motors, or domestic purposes. A single line may suffice if the withdrawal of water is constant; in any case the deficiency is made up by a pump A². The main is covered with a suitable non-conductor, and is provided at intervals with expansion joints.

Heating buildings; generating steam.—A reservoir D, Fig. 1, in the basement is connected with the flow and return pipes so that there is a continuous circulation of hot water through it. The water passes through a reducing-valve E² into an inner vessel, in which under the reduced pressure it rapidly evaporates, receiving heat from the reservoir. The steam thus formed may be circulated through stacks of pipes F or analogous heating contrivances in the various rooms. In other arrangements the water evaporates without receiving additional heat. The evaporation may take place in a motor cylinder. The condensed water is returned to a tank F² from which it is from time to time pumped



the number of strokes of the pump as registered on a dial serving to indicate the amount used. An ordinary water-meter may however be substituted, and is preferably placed in the supply pipe. In a modification, a secondary boiler or feedwater heater is heated by the furnace gases, placed in the flue, and in some cases heats the returned water. Instead of heating the building by direct radiation from steam pipes, air heated to any desired temperature in special chambers may be circulated through appropriate shafts, arrangements being made, as before, to measure the consumption of water. In another arrangement no water is drawn from the main, water for circulation and steam generation being supplied from an external source. Hot water under full pressure may be circulated directly through the heating-pipes if they are sufficiently strong. When steam alone is required, the hot-water main may be surrounded in its entire length by a steam-generating pipe supplied with the necessary amount of water; steam may still however be obtained from the hot water by any of the above methods.

Steam traps.—The condensed water runs into a copper &c. pipe S', Fig. 11, closed by a fixed valve T. As the water and pipe cool the latter contracts away from the valve, and the water is thus allowed to escape into the circulation pipes until the temperature of the pipe again rises. In another form, Fig. 13, a valve B' is held open by a weighted diaphragm B' as long as the radiating pipes and connections B, B' contain water, but is closed by the pressure of the steam on the under side of the diaphragm when they are empty.

Abridged also in Classes *Locomotives &c.*; *Steam engines*; *Steam generators*; *Valves &c.*

2990. Hammond, J. July 23.

[Provisional protection only.]

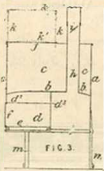
Circulating boiler.—The furnace is placed inside a horizontal cylindrical boiler, above which, and connected to it, is a second saddle-shaped boiler. The whole is built in brickwork and the flues are arranged so as to expose the maximum boiler surface. Both boilers communicate directly with the circulating pipes.

Circulating pipes for heating horticultural buildings. When it is necessary to cross doorways and the like the flow pipe is made to rise, the return pipe going underground as usual. In this way the necessity for placing the boiler in a deep stoke hole is obviated. Several different hothouses &c. may be fed by branch pipes from one main.

3009. James, S., and James, T. July 24.

Boilers for domestic and agricultural purposes. A cylinder *a* supported by legs *m, m* is divided by a horizontal diaphragm *b* into a boiler *c* and firebox *d*. Fuel supplied through a door *f* is burnt on a grate *e*, the products of combustion passing over side walls *d'* into a chamber, separated from the firebox by a partition *d''*, from which they escape through a flue *h* which traverses the boiler, the draught being controlled by a damper *i*. Hot water may be drawn off by a tap not shown. The top *j* of the boiler is hinged and may be surmounted by a steaming vessel with a perforated bottom.

Abridged also in Class *Cooking &c.*



3034. Cooper, H. E. July 25.

[Provisional protection only.]

Heating water.—A vertical series of horizontal tray boxes connected by short pipes and enclosed in a case is supplied from a tap or ball valve at the

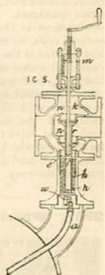
top and is heated by gas blowpipes at the bottom. The products of combustion pass alternately through flues through and round the boxes.

Abridged also in Class *Closets &c.*

3060. Budenberg, A., [Seufferth, A., and Budenberg, C. F.] July 28.

Temperature-regulating valves for steam heating apparatus.—A balanced valve *n* is operated by the pressure of vapour in the generator *a*. The vapour presses upon non-vaporizable liquid in the chamber *w*, thereby forcing up a piston *f* and closing the valves to which it is connected by a rod *r*. Non-vaporizable liquid is also placed in the cylinder *e*. The generator *a* may contain anhydrous sulphurous acid, carburetted hydrogen, water, creosote, heavy petroleum oil, mercury, or other suitable liquid, and it is placed in the vessel the temperature of which it is desired to regulate. The valves may be weighted to the desired pressure, or provided with a coiled spring which can be regulated by the rod and screw *k* provided with a finger *m* which indicates on a scale the temperature of the entering steam.

Abridged also in Classes *Breeding &c.*; *Philosophical instruments*; *Registering &c.*



3147. Hargreaves, H. Aug. 5

[Provisional protection only.]

Circulating boiler.—The return pipe is connected to an annular pipe, to branches of which a number of vertical conical pipes are secured. The latter are also attached to a central dome at the top of the boiler and their ends are prolonged and curved radially into the centre of the dome, at or near



which the flow pipe is inserted. The boiler is set in brickwork and the fire beneath it is fed by a shoot through the pipes.

Abridged also in Class *Furnaces* &c.

3305. Collingridge, A., and Brett, H. R.
Aug. 16.

[*Provisional protection only.*]

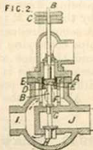
Boiling pans.—Apparatus for boiling wort after the addition of hops, and relieving condensers of atmospheric pressure upon their contents by means of a hanging suction tube kept full of liquid; also applicable to distilling. With closed coppers the boiling takes place at a higher temperature than that of boiling water, so that the "important constituents of the flavouring matter" of the hops are more thoroughly extracted, and fuel is economized. Stirring-apparatus may be used.

Abridged also in Classes *Brewing* &c.; *Distilling* &c.

3308. Bamford, G. Aug. 16.

Water circulation in boilers.

promoting.—Relates to valves for regulating the circulation of water or steam in boilers, and for allowing the escape of air or condensed steam. The valves may be separate or in combination; in Fig. 2 they are combined. The valves are placed in the return pipe I, the part J leading to the boiler. The air escape valve A opens downwards. Its under face, which is of larger



area than the seat, fits loosely in the casing F and is by preference hollowed out as at D. Air passages E, E connect the hollow D and the interior of the cylindrical casing just below the upper face of A. B is the spindle and C the adjustments. The automatic regulating back-pressure valve G, H is on the same spindle B. The pressure of steam or water in the boiler and passage J keeps H closed, A being at the same time open. When the air and condensed steam have escaped by the air passages E, E, and the pressure in the return pipe I has risen sufficiently, the undersides of H and D are pressed upwards, thus opening G and H, and closing A, when the circulation in the boiler begins. If two sets of pipes are worked from the same boiler, an additional back-pressure valve between J and the boiler should be used.

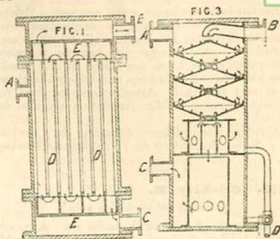
Abridged also in Class *Valves* &c.

3573. Rickaby, A. A. Sept. 5.

Relates to apparatus for circulating, heating, and purifying water for steam boilers, breweries, wash-houses, aerated water manufacturers, and dyers.

Surface apparatus.—A wrought-iron vessel, Fig. 1, contains tubes D connected at their ends by cellular caps E. Steam is admitted at A, and the feedwater enters at B, circulates through the tubes, and flows out at C.

Heating water by steam.—One form of apparatus consists of a vertical cylindrical vessel



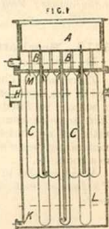
within which is a vertical spindle carrying horizontal circular trays. Water and steam enter at opposite inlets at the bottom and, impinging against a fan fixed on the spindle, causes it to revolve, thus "disintegrating" the water and forcing it out at the top, all sediment being deposited in the trays. In a second arrangement, the feedwater enters at B, Fig. 3, passes over and through a number of conical trays, as shown by the arrows, leaving sedimentary deposits on the ridges with which the trays are provided, and finally passes through and over sludge boxes, escaping at the outlet C. Steam enters at A and promotes the precipitation of solid matter. Outlets for blowing out deposits are shown at D.

Abridged also in Classes *Brewing* &c.; *Filtering* &c.; *Steam generators*.

3588. Abel, C. D., [Braun, O.] Sept. 6.

Heating liquids.—Surface apparatus specially adapted for condensing steam mixed with non-condensable gases, but available for heating fluids of any description. The chamber L through which the fluid to be heated passes is packed with a number of tubes C, not necessarily of equal length, through which heating-fluid from a reservoir A is circulated. The supply pipes B are preferably of non-conducting material. In the case supposed the steam and air enter at H, and the water leaves at K. If the sections of the tubes are triangular, square, or hexagonal, the interstitial spaces are narrow and regular, but if otherwise the spaces must be partially filled up with rods of suitable section. The ends of the tubes are contracted to avoid unnecessarily weakening the plate M to which they are secured.

Abridged also in Classes *Cooling* &c.; *Distilling* &c.



3655. **Smith, J.** Sept. 12. *Drawings to Specification.*

Heating buildings by air, water, or steam.—Relates to arrangements of flues in connection with domestic fireplaces for heating air which is conducted to other rooms for heating purposes. Water-circulation tubes are fitted in the smoke flues which heat the air flues, and boilers and steam pipes may be fitted. Arrangements of flues for heating incoming air for ventilation are also described.

Abridged also in Classes *Chimneys &c.*; *Cooking &c.*; *Sifting &c.*; *Stores &c.*; *Ventilation*; *Washing &c.*

3675. **Crichley, H.** Sept. 13.

[*Provisional protection only.*]

Heating air for Turkish baths &c. A nearly cubical brickwork chamber, provided with suitable inlet and outlet apertures, is traversed by a number of horizontal tubes extending from a furnace to a flue, and provided with joints packed with pulverized loam. The inflowing current of air is spread by a perforated metallic plate and is moistened by vapour from a trough of water resting on the plate into which metallic plates connected to the heating-tubes dip. A high-pressure boiler may be placed at the back of the furnace.

Abridged also in Class *Air and gases, Compressing &c.*

3691. **Wekey, S.** Sept. 15.

[*Provisional protection only.*]

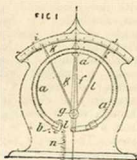
Heating air.—Carburetted-apparatus may have an air jacket to maintain a constant temperature, and the pipes may be enclosed in larger pipes which may be used for heating or ventilating.

Abridged also in Classes *Gas distribution*; *Gas manufacture*; *Ventilation.*

3712. **Bowkett, W. D.** Sept. 16.

Thermostat.—The free end of the Bourdon tube *a* which is filled with fluid may be connected with an apparatus for controlling the air supply to a room &c.

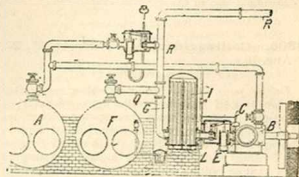
Abridged also in Class *Philosophical instruments.*



3850. **Hanson, R.** Sept. 24.

Heating by steam circulation.—Utilizing waste heat of exhaust steam for bleaching, dyeing, printing, and other like purposes, by mixing it with low-pressure steam, and superheating the mixture. High-pressure steam is led from the boiler *A* to the engine *B*, after actuating which it passes to the exhaust pipe *C*. A reducing-valve *E* is here provided, which prevents steam from passing back

into the cylinder. Between the exhaust pipe and the low-pressure boiler *F*, is placed a superheater *G*, consisting preferably of a cylindrical chamber,



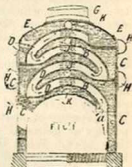
through which pass coils or tubes *I*, opening out into a steam chest *L*, to which steam is admitted from the high-pressure boiler. The exhaust steam passes through the body of the superheater, and mixes with steam from the low-pressure boiler arriving through the pipe *Q*. The mixed steam is dried and superheated by the high-pressure steam passing through the tubes *I*, and is then led away by the pipe *R* to be used for bleaching, dyeing, &c. A second reducing-valve is provided between the pipe conveying high-pressure steam to the engine and the pipe which carries off the superheated steam. This is for the purpose of maintaining a difference of pressure between the two boilers.

Abridged also in Class *Steam generators.*

3942. **Shaw, C.** Oct. 1.

Heating-water boilers are constructed with horizontal water spaces *B* curved in cross section and formed in one with, or joined to, alternate sides *C, C*. When made in separate sections the water spaces are connected at one end by *T* pipes *J* and at the sides by the junction pipes *H, H*. A circular opening through the top water space connects the flue *D, D* with the chimney *G*. Atmospheric gas burners may be used with small boilers for baths, glass-houses, &c.

Abridged also in Classes *Closets &c.*; *Furnaces &c.*; *Steam generators.*

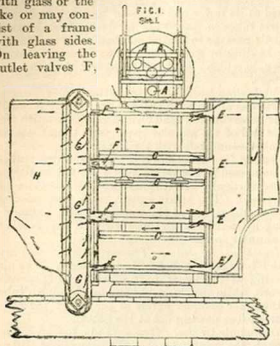


4035. **Wilson, H.** Oct. 6.

Refers to Specification No. 1398, A.D. 1879, and comprises arrangements for blowing, exhausting, moistening, cooling, heating, filtering, and disinfecting air, gas, and fluids for ventilating mines, ships, hospitals, halls, rooms, &c.; cleaning clothes, cloth, &c., and drying grain, flour, and like substances.

Heating air.—The air is drawn through cotton wool or other filters *J*, Fig. 1, and valves *E*, by plungers *C* operated by a triple crank *A* and

working in a square or other chamber divided by partitions as shown. The chamber may be lined with glass or the like or may consist of a frame with glass sides. On leaving the outlet valves F,



the air is acted on by fine water-jets, and strikes cloth or like flaps G carried by a travelling chain or series of connected links or flaps, and passing through a trough of water. For heating air and purifying it by combustion, the cloth flaps G are replaced by perforated metal, wire-gauze, chain, firebrick, or other flaps which pass through a fire or through the flame of a gas blowpipe or burner; or the flaps and chain are dispensed with, and the conduit H is fitted with a slowly-revolving frame having arms, each of which carries a fire in an iron cage. To prevent excessive combustion in the fires, each enters a recess in the conduit out of range of the blast during part of each revolution. An arrangement described in the Provisional Specification comprises revolving chains or drums carrying cages charged with coke or coal and placed in a case having conduits for discharging the air. Each cage passes at intervals out of the case to prevent overheating. In another arrangement described in the Provisional Specification, the air is heated by a series of gas burners fitted in conjunction with asbestos or the like, in a sheet-iron or other case in the drying or other chamber. The case is fitted with an air inlet and outlet so that the fire does not touch the material treated. Fig. 8 shows another arrangement in which the blast passes through a perforated shell and a fire holder formed in concentric rings.

Heating liquids. The following description applies to the cooling or condensing of liquids, steam, vapour, or gas, but may be modified for heating or distilling. The liquid, gas, &c. is passed in a thin stream over the internal surface of a cylindrical or other vessel corrugated or chequered

or having alternate depressions and elevations produced by punching. The vessel may be rotary, a thin annulus being arranged for passage of the liquid. The exterior of the vessel is cooled by air driven by a blower through a series of cloth or other flaps suspended from an endless chain or like carrier and dipping at one point of their journey into water or other liquid. In another arrangement, the liquid &c. to be cooled, and the cooling air pass over opposite sides of a corrugated or other flat or cylindrical stationary or movable copper diaphragm.

Abridged also in Classes *Air and gases, Compressing &c.; Beverages; Bleaching &c.; Brewing &c.; Cooling &c.; Distilling &c.; Drying; Furnaces &c.; Gas manufacture; Grain &c.; Lifting &c.; Manufacture of iron &c.; Medicine &c.; Mining &c.; Ships &c., Div. I.; Sifting &c.; Ventilation. Washing &c.*

4159. Baker, J. M. B. Oct. 14.

[*Provisional protection only.*]

Non-conducting composition and preservative composition for steam boilers &c. consists of a mixture of asphalt, varnish, cement, sand, and granulated cork.

Abridged also in Classes *Paints &c.; Steam generators.*

4180. Lake, W. R., [*Anclon, A.*], Oct. 15.

Footcarriers and the like for heating railway carriages &c., instead of containing hot water, are filled with some solid body possessing a high latent heat of fusion, such as fatty substances, resin, wax, acetates, and phosphates. The cases &c., containing any of these substances are heated by plunging them into hot water &c., and they will afterwards give out heat during the whole time the substance is solidifying. In using acetate of potash or soda dissolved in its water of crystallization retardation of solidification is prevented by introducing into the mass in fusion anhydrous acetate, and placing an india-rubber bag inflated with air in the box to prevent a vacuum occurring as the mass contracts by cooling. This invention may be applied to heating rooms &c. and to imparting heat for a long time to cooking-utensils &c. without fire.

Abridged also in Class *Railway &c. vehicles.*

4226. Pass, E. de, [*Soc. Galante, H., et Fils.*], Oct. 18.

Footcarriers.—Relates to rugs, cushions, carpets, and the like, formed with continuous india-rubber &c. pieces *a*, a placed between two pieces of fabric *b*. Hot water &c. may be retained or made to circulate through the tubes for warming carriages.



Abridged also in Classes *Furniture &c.; Medicine &c.; Railway &c. vehicles; Road vehicles; Weaving &c.*

4355. **Davis, W., Walker, J., and Wilcox, W. H.** Oct. 25.

[Provisional protection only.]

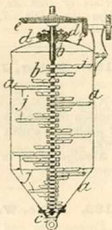
Steam trap or automatic drain valve.—Consists of a valve, box, and expanding chamber, arranged to be used as a stop valve should the automatic action become deranged. By lifting the expanding chamber the steam sweeps the valve and box perfectly clean.

Abridged also in Classes *Steam engines; Valves &c.*

4496. **Jensen, P., [Sparre, S., Count de].** Nov. 4.

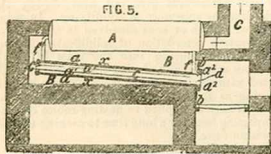
Digester with mixing-appliances.—For the production of alcohol from potatoes, maize, &c. an apparatus is constructed with a vertical shaft *b*, mounted in bearings *c, d*, and rotated by bevel gearing *e, f*. Steam is admitted through two openings in the lower part of the vessel, and the starchy matters are agitated and mixed by the rotating of the twisted arms *j* on the vertical shaft.

Abridged also in Classes *Beverages; Brewing &c.; Mixing &c.*



4563. **Johnson, J. H., [Mignon, J. B. J., and Rowat, S. H.].** Nov. 8.

FIG. 5.



Surface apparatus.—The liquid &c. to be heated circulates in thin capillary layers in apparatus which is easily taken to pieces for cleaning and is constructed of pairs of concentric tubes *a, a'*, Fig. 1, with narrow annular spaces *x* between. Each pair may be held together by a collar *b* and an annular disc secured by screw clamps. One of the fluids introduced by the tube *d* with radial tubes *s* circulates in the space *x*, while the other fluid circulates inside the inner tube *a'* and outside the outer tube *a*.

Boilers.—Steam generators are



constructed with the concentric tubes *a, a'*, Fig. 5, fixed in an inclined position and connected by tubes *f, f'* to the water and steam reservoir A; a tube *c* closed at its lower end *d* passes through the concentric tubes to spread the products of combustion in their passage to the hot air chamber B and flue C. For heating by gas the gas flows into the central pipe *c*, in which is provided a number of orifices or burners.

For heating buildings a circulating boiler is constructed as above with the substitution of a small water reservoir and feed cistern connected with the lower end of the annular space, and a small steam chamber connected with the upper end.

Heating liquids by steam.—The concentric tubes are immersed in the liquid to be heated and supported vertically at a distance from the bottom of the vessel. The steam enters by a pipe passing through the centre of the inner tube and communicating by radial branch pipes with the upper end of the annular space.

Heating air by steam.—The concentric tubes are placed between two concentric cylinders. The air entering at the lower part of this casing passes upward, while the steam passing up through a tube in the inner cylinder enters at the top of the concentric tubes passing out at the bottom.

Heating air by gas. The air to be heated passes through the annular space, the concentric tubes being arranged in a brickwork casing so that the heat from a ring gas burner placed beneath them may circulate over the outside of the concentric tubes. The walls of the combustion chamber may be made hollow and the products of combustion caused to circulate inside them.

Abridged also in Classes *Brewing &c.; Cooling &c.; Distilling &c.; Manufacture of iron &c.; Steam engines; Steam generators; Stoves &c.*

4584. **Ower, C.** Nov. 11.

[Provisional protection only.]

Thermostat.—Inlet and outlet valves are operated by an adjustably-balanced lever, the other end of which is connected to an inverted bell which floats in glycerine or the like, and communicates with a sealed vessel containing air. As the temperature fluctuates, the air expands and contracts, and the bell rises and falls.

Abridged also in Classes *Drying; Ventilation.*

4685. **Stobbs, M., and Seagrave, G.** Nov. 18. *Drawings to Specification.*

Heating air.—Air is passed through a series of compartments separated by others containing steam.

Abridged also in Classes *Bleaching &c.; Cooling &c.; Drying; Furnaces &c.; Medicine &c.*

4756. **Yeomans, D. M.** Nov. 21.

[Provisional protection only.]

Heating air for warming carriages &c. Air is heated in a chamber, in or beneath the floor of the

carriage, which contains hot-water pipes communicating with boilers suitably heated. The hot-air flues are provided with the necessary valves.

Abridged also in Classes *Railway &c. vehicles; Road vehicles.*

4884. Whitehead, F., and Cummings, G.
Nov. 28.

[*Provisional protection only.*]

Heating buildings.—Sheet-iron boxes containing gas burners are connected with sheet-iron flues, which are led round the building to be heated and finally outside or into chimneys. Applicable to heating public buildings, conservatories, &c.

4952. Jordan, T. B., and Jordan, T. R.
Dec. 3.

[*Provisional protection only.*]

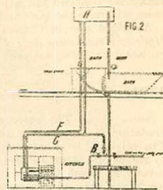
Thermostat.—A thin metal vessel is surrounded by a ring of tubing of the same material one end of which is connected to the vessel, the other being open to the air. The whole is filled with alcohol or like fluid, and accurately poised so that the ring can revolve in a vertical plane. The tube is only partially filled with the liquid, the end of which is stopped by a thread of mercury. As the liquid expands and contracts with changes of temperature the mercury shifts, altering the centre of gravity so that a new position of equilibrium is assumed. Applicable to controlling ventilators or gas-heaters, starting fire-alarms, and other purposes.

Abridged also in Classes *Fire, Exinction &c. of; Ventilation.*

5032. Hargrave, C. Dec. 9.

Heating water.—An ordinary kitchen circulating boiler is provided with two outlet pipes F, G, one at least of which is open to afford a free passage for steam and overflowing water. A hot-water cistern H is placed preferably above the highest point at which a supply is required, and in any case the supply of cold water to the boiler, and therefore to some extent the withdrawal of hot water, is controlled by a valve B. The general arrangement will be understood from Fig. 1.

Abridged also in Class *Stoves &c.*



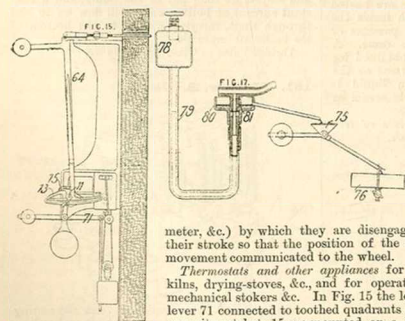
5148. Bray, G. Dec. 16.

[*Provisional protection only.*]

Heating buildings.—The burnt gases and heated air from a combustion chamber in which gas is burned, or from an ordinary gas stove, are passed through one or more pipes of sufficient length and area to abstract the heat therefrom before reaching the chimney.

Abridged also in Class *Stoves &c.*

5274. King, H. J. H. Dec. 24.



Relates partly to engine stop gear and partly to a form of ratchet motor mechanism suitable for governors and various other purposes such as recording pressure, power, speed, temperature, and as relay apparatus for operating valves, sluices, water gates, dampers, louvres, &c. It is also adapted to lifting-mechanism. The motor mechanism consists essentially of uniformly-moving ratchet levers driving a wheel or wheels actuating the controlling or registering mechanism, such ratchets engaging with sectors (adjusted by the governor, pyrometer, manometer, &c.) by which they are disengaged during a portion or the whole of their stroke so that the position of the sector will determine the amount of movement communicated to the wheel.

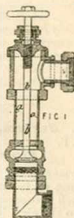
Thermostats and other appliances for regulating the temperature of malt kilns, drying-stoves, &c., and for operating furnace dampers, and controlling mechanical stokers &c. In Fig. 15 the louvres, dampers, &c. are operated by a lever 71 connected to toothed quadrants or portions of ratchet-wheels 13. Two opposite ratchets 15 are mounted on a lever constantly vibrated by clockwork and are disengaged by the sector 11 which is coupled up by an adjustable nut with a lever 64 connected to an ordinary pyrometer. Fig. 17 shows a special apparatus with a bulb 78 exposed to the heat and containing air or other fluid. This bulb is connected to a tube 79 filled with mercury which acts as a seal to the end of a tube 81 connected to a constant supply of water. The level of the mercury varies with

the temperature and so controls the water passing from 81 to the vessel 80, from whence it flows by the funnel 75 to a tank 76 poised on a lever connected to the ratchet-adjusting sector mentioned above. This tank has a constant but adjustable exit so that if the water flows out faster than it enters the counterpoise will raise the tank and *vice versa*.

Abridged also in Classes *Brewing &c.; Drying; Furnaces &c.; Governors &c.; Hydraulic engineering; Hydraulic machinery &c.; Lifting &c.; Mechanism &c.; Philosophical instruments; Registering &c.; Rotary engines &c.; Steam engines.*

5304. Stubbs, J. S. Dec. 29.

Steam trap.—The valve which controls the escape of the water of condensation is actuated by the expansion and contraction of the valve rod. The valve and rod *b* are enclosed in a tubular casing *a*, and the valve is adjusted by means of a screw formed on that part of the rod which passes through the cover. If steam fills the casing the valve is closed; but when the steam condenses the rod contracts, and the valve opens and allows the water to escape. A pipe provided with a swivel joint is attached to the outlet so that the water may be ejected in different directions. The valve is guided on to its seat either by being provided with guiding-feathers, or by causing the rod to pass through a crossbar. The position of the valve may be adjusted either by a hand-wheel, or by means of a removable key.



A.D. 1880.

36. Abel, C. D., [Wolheim, L.]. Jan. 5.

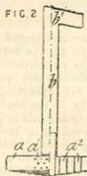
[Provisional protection only.]

Heating water and air and other gases.—Heated ore, slag, metal, &c. from smelting or other furnaces is passed into closed receptacles or chambers, and air, gas, or other fluids are heated by being brought in contact therewith inside the receptacles, or are conducted through passages or flues surrounding or traversing the same. A supply of heated air or gas is thus obtained for use in metallurgical furnaces or otherwise; or the steam or vapour generated, when a liquid is used to absorb the heat, may actuate steam or vapour engines.

Abridged also in Classes *Manufacture of iron &c.; Metals and alloys; Steam generators.*

39. Griffith, C., [Humble, W., and Nicholson, W.]. Jan. 5.

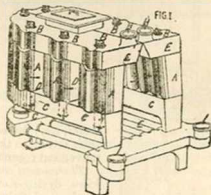
Coppers.—Promoting circulation in washing coppers or boilers. A circular case open at the bottom and closed at the top and fitting tolerably close on to the bottom of the boiler, is fitted with a curved passage or passages *a* leading from perforations such as *a'* in the side to a vertical central pipe *b* or to a horizontal pipe communicating with two vertical pipes arranged at the sides of the case. The copper is nearly filled with water and the apparatus



and a piece of soap placed therein. The fire thereunder is then lighted, and the water in the case *a* quickly boils and flows up the pipe or pipes *b* and out of the spout *b'* or from a deflector fitted over the pipes. The clothes having been previously soaked and soaped are then put in the boiler, and a constant current of boiling water will flow on to and through them, carrying with it to the bottom of the boiler all impurities.

Abridged also in Class *Bleaching &c.*

161. Harlow, B. Jan. 14.

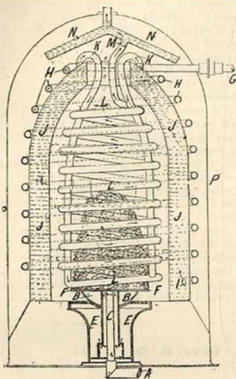


Heating water &c.; heating air.—A circulating boiler for steam, hot water, or hot air. Cast-iron segmental chambers *A* are bolted to hollow castings *C, E* by hollow rods *B* which form flues. Flue spaces are also left between the segments. The whole is arranged on water firebars *E*, connection

being made by pipes G, and may be built up in a brick chamber. The usual flow and return pipes H, H, I, I are provided. The joints are made with special packing-rings. Instead of this arrangement, wrought-iron segments might be bolted together and cast in with the upper and lower chambers. The invention is applicable to any form of segmental boiler.

Abridged also in Classes *Furnaces &c.*; *Pipes &c.*; *Steam engines*; *Steam generators.*

179. **Yates, C. D.** Jan. 15.



Boiler.—Heated by gas or otherwise. Water entering by a pipe G passes through a coil H and into the annular chamber J at the bottom. From the top of this chamber it flows down through pipes K, and ascends, through an inner coil L, into a saucer-shaped vessel N arranged in the path of the heated gases. From this latter the hot water is discharged. The whole apparatus is enclosed in a casing P.

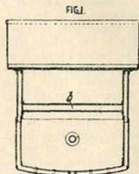
Abridged also in Class *Stoves &c.*

277. **Moss, C. A., Johnson, T., and Wright, R.** Jan. 22.

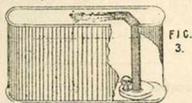
Boiling-pans. Regulates to steam-jacketed vessels for boiling brewers' worts and other liquids. Cross-tubes b are secured to the inner vessel, and open into the steam space, so that, for additional heating, the steam circulates through them.

Abridged also in Classes *Acids &c., Dic. II.*; *Brewing &c.*

P 7488.

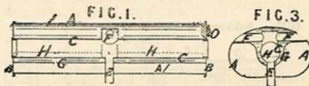


336. **Hoyne, J. T.** Jan. 26.



Copper.—Apparatus for promoting circulation consists of a hollow base part which is made of galvanized iron &c. and is shaped to fit the bottom of the boiler. Within it are tortuous, or alternately right and left, spiral passages leading to a vertical tube or discharge pipe. The boiler being filled about two-thirds with water and the apparatus placed therein over the hottest part of the fire, the clothes &c., which have been previously well soaked, are placed in the boiler. The boiling water is constantly drawn up the tube and discharged upon the clothes &c. as shown, thereby thoroughly cleansing them, without the injury occasioned by hard rubbing &c. A copper chamber or dome is inserted in the base for the purpose of retaining heat.

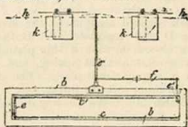
382. **Abel, C D., [Morel, A.]** Jan. 28.



Footcarmers &c. for use in carriages, apartments, &c. are fitted with a slow-combustion fuel tube C, closed at the ends by covers having adjustable ventilators O. Horizontal tubes F allow of the escape of the lighter, and a vertical tube E of the heavier, products of combustion. A perforated box H, or a grating, containing blocks of fuel made of carbonaceous and argillaceous &c. matters, is inserted in the tube C. Air is admitted by the valves, to maintain the fuel in slow combustion. Oil lamps or gas may be used in place of the block fuel. The heat escaping from the outlet may be utilized for heating water &c. The space between the vessel G and outer case A may contain fresh fuel. In a modification suitable for railway carriages &c., the tube C does not extend quite to the centre, and the products of combustion are carried off by a pipe passing through the floor.

Abridged also in Classes *Fuel, Manufacture of*; *Railway &c. vehicles*; *Stoves &c.*

461. **Hiscocks, J.** Feb. 2.

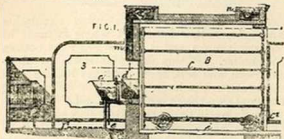


Thermostat.—The expansion of a fixed metal rod c is magnified by a series of levers connected by

boilers, one of which is adjustable in length. The whole is fixed to a wooden frame *b*.

Abridged also in Classes *Agricultural appliances for the treatment of land &c.*; *Buildings &c.*; *Ventilation*.

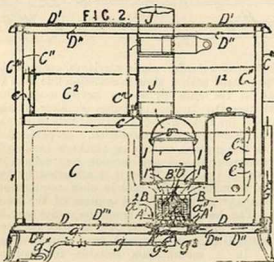
500. **Combe, W.** Feb. 4.



Wash-house boiler.—The boiler *d* is provided with a steam inlet pipe and the heat and vapour are carried off by the flue *m*. The various hot and cold water pipes with their respective cocks are suitably arranged. A modification of the boiler has a hood with a hinged flap.

Abridged also in Classes *Buildings &c.*; *Drying*.

601. **Adams, J.** Feb. 11.



Non-conducting coverings for stoves. The outside casings *C*¹, *C*², Fig. 2, are made of cast or sheet iron, upon which a coating of copper, or (preferably) of a copper and zinc alloy, has been deposited by the electro-chemical process, which is said to effect at the surface of junction a chemical combination having very low radiating properties. The two casings are about an inch apart, forming a double shell secured airtight to the strong basement plate *D* and top-plate *D*¹. Both top and bottom are closed in with a thin plate-lining *D*¹¹ forming a similar airtight casing, and are connected by a strong front-plate. The doors are made with an inner airtight lining.

Abridged also in Classes *Cooking &c.*; *Stoves &c.*

629. **Sykes, J. F. J.** Feb. 13.

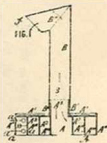
[*Provisional protection only.*]

Heating air.—Influx and efflux currents for ventilating purposes pass respectively through the inner and outer of two concentric shafts arranged round the flue of a stove.

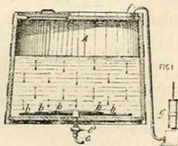
Abridged also in Class *Ventilation*.

653. **Mackay, D.,** [Mackay, J.]. Feb. 14.

Boiling-pans for washing clothes &c. A shallow circular or other shaped box *A* of zinc, galvanized iron, &c. is open at the bottom and is fitted with a vertical pipe *B* having at the top one or more spouts *B*¹¹ or a deflecting-plate. Inside the box is a scroll chamber *B*¹¹¹ formed by edge feathers *A*³, or a radial channel, formed by radial feathers, leading to the pipe *B*, or the box may be left plain, except for the holes *a* formed in its side. The apparatus is placed in a boiler, copper, or pan partly filled with water, and the clothes &c. are put round it together with any desired soap or other washing-material. The water enters the box *A* through the holes *a*, and as soon as it boils flows rapidly up the tube *B* and is discharged in a constant stream over the clothes, and thoroughly cleanses the same, in passing through them. After this the clothes only require to be rinsed in clear water.



682. **Cave, G. G.** Feb. 17.



Heating water &c.—Apparatus for oxygenating, aerating, attemperating, rousing, and "blending malt or other liquors, and for analogous purposes." The vat or reservoir *A* that contains the liquid to be treated is closed airtight. From the upper part a pipe *f* leads to an air pump *g* while in the bottom of the vessel there is a system of perforated pipes *b*, or a flat vessel perforated in its upper part. A pipe *e* with a valve *e*³ to prevent a backward flow, leads from this distributing-arrangement to the substance that is to be introduced, whether this is oxygen, air, or another liquid, and either of these is sucked in by working the air pump that draws out air from the top of the vat. Hot or cold air is drawn through for attemperating, and to simply aerate, the entrance pipe is connected with the pump, and the same

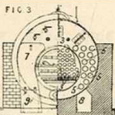
quantity of air passes continually through the liquid. The vat may be open at the top, and the gas pumped into the distributor, instead of proceeding as above.

Abridged also in Classes *Beverages*; *Brewing* &c.; *Cooling* &c.; *Mixing* &c.

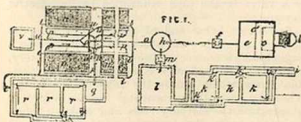
731. Bellamy, J. Feb. 19.

Boilers.—The products of combustion from the furnace or firebox, after passing through the firetubes 3 to a flue at the back, are returned by larger tubes 5 through the boiler to the chambers 7 at the front, and from thence by the external flues 8 and 9 pass under the boiler to the chimney. This form is applicable for steam generators, and modifications are also shown and described for heating and circulating water for horticultural and other purposes.

Abridged also in Classes *Furnaces* &c.; *Steam generators*.



742. Tongue, J. G., [Knauer, W.]. Feb. 19.



Heating water by steam or water.—The apparatus *n, n*, Fig. 1, is described as applied to cooling purposes and consist of cooling-pipes, opening on both sides, and with ends open into cast-metal side chambers screwed to a foundation. On the latter, between the pipes, iron or other partitions form cases which are loosely covered with wood &c. Each chamber has a screwed cover, against which, and the chamber-back, perforated covers are pressed by screws. A revolving screw may be placed in each pipe. Purified factory &c. discharge water from the tank *h* enters the first chamber through the pipe *o*, rises through the pipes, and is heated by hot discharge-water, waste steam, &c., and, leaving the apparatus by the pipes *p*, flows into the tank *q* where lime is added. The hot mixture flows into the settling-tanks *r*, provided with sluices, and the oxalate of lime deposit in the first tank *r* passes at *s* into the second tank *r* where chlorate of manganese in the form of alkali is added; the precipitates collect in the remaining tanks *r* whence they are removed by the sluices. The hot cleansed water &c. passes by the pipe *t* into the top of the apparatus *n, n*, descends therein—circulating round the pipes and thereby helping to heat the remaining discharge-water—and passes at *u* into the reservoir *v*, whence it is pumped into a gradation tank, in

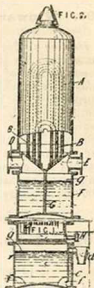
which it is cooled and cleansed, and may be conveyed thence for further use or may be discharged into the river &c.

Abridged also in Classes *Cooling* &c.; *Filtering* &c.; *Hydraulic machinery* &c.; *Sewage* &c.

744. Wright, J. Feb. 19.

Heating water by steam.—The heater is of the "Berryman" type with a heating-chamber A having the usual inlet and outlet pipes and bent heating-pipes B through which passes the heating steam from the pipe D to E. In this invention a chamber F (shown longitudinally in Fig. 2, and transversely in Fig. 1) is formed to receive the water condensed during the process of heating. This chamber is divided by a midfeather G which prevents the direct passage of steam from D to E and supports the tube-plate, and is perforated at *f* to allow the water at the two sides to communicate. The surplus water flows up the passage *c* into the funnel *d*, into which also is discharged the mud &c. from the heater A through cock H. If the steam passes into the heater quicker than it can flow through the tubes B, the water in F will be blown out and the steam will find additional vent through the openings *f*. A perforated grid *g* may float on the surface of the water or be fixed in some convenient place to prevent disturbance of the water by the impact of the steam.

Abridged also in Classes *Filtering* &c.; *Steam generators*.



771. Skene, R. Feb. 21.

[Provisional protection only.]

Boilers.—Two or more boilers are used in which the water is kept at different temperatures. The furnace is placed under the hottest one, the others being heated by the waste heat therefrom. The auxiliary boilers are fed from the next higher one (in temperature).

Abridged also in Classes *Furnaces* &c.; *Hydraulic machinery* &c.; *Steam engines*; *Steam generators*.

850. Dade, D. H. Feb. 26. Drawings to Specification.

Non-conducting coverings for pipes to prevent the condensation of steam or freezing of water are described in the Provisional Specification. Silicate cotton is secured to the pipes by covers of canvas or of tin, zinc, or wire gauze, to which a coating of silicate paint may be applied.

Abridged also in Classes *Buildings* &c.; *Cements* &c.; *Cooking* &c.; *Filtering* &c.; *Hydraulic engineering*; *Medicine* &c.; *Moulding* &c.; *Preparing* &c. cork &c.; *Wearing-apparel Div. II.*; *Weaving* &c.

859. **Suchet, S.** Feb. 27.

[Provisional protection only.]

Heating air.—Metal chambers with compartments through which the air is circulated are placed in chimneys.

Abridged also in Class *Chimneys &c.*

888. **Winward, A.** Feb. 28. *Drawings to Specification.*

Heating air for drying fabrics, yarns, and other materials. Air for this purpose is heated by steam chests formed of parallel tubes connected at their ends by cross tubes provided with flanges for fixing purposes. The tubes, which are of any suitable section, may be cast together in one piece with connecting webs if desired, or they may be bolted together in sections. The steam inlet and outlet are preferably at opposite corners of the chest and flanged for connections. Greater heating surface and power are attained, as steam may be used up to 100 lbs. pressure per square inch.

1099. **Lake, W. R.,** [Perry, C. J. C.] March 13.

[Provisional protection only.]

Coppers for cleansing clothes and the like. To promote circulation a circular metal box open at the bottom and shaped somewhat like an inverted funnel is fitted with a central vertical tube, which is made in two parts sliding telescopically together, and adjustable to suit the height of the boiler. The water enters the box through apertures therein, and as soon as it boils, flows up the vertical tube, and is deflected over the clothes &c. by a cap. The lower part of the tube, which is fixed to the box, is enlarged by a bell-shaped mouthpiece, to assist the upward flow of the water.

1237. **Roekner, C. H.** March 23.

[Provisional protection only.]

Boilers for generating steam, boiling fibres, and similar purposes are constructed of a series of annular tubes connected together, or to a steam receiver and supply reservoir. Heat from the furnace acts both upon the inner and outer surfaces of the tubes. For boiling fibrous materials, the circulation of the liquid is promoted by mechanical agitation, and also by means of a steam condenser. A vacuum may be obtained by any suitable means during the process of boiling.

Abridged also in Classes *Paper &c.*; *Steam generators.*

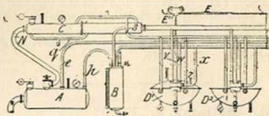
1266. **Abel, C. D.,** [Maschinenbau-Aktiengesellschaft]. March 25.

Heating air.—The pipe N conveying air from A to the sugar pan D¹ is surrounded by a steam casing C.

Abridged also in Classes *Drying*; *Sugar.*

(For Drawing see next column.)

1266.



1307. **Lake, W. R.,** [Azford, H. W.] March 30.

[Provisional protection only.]

Heating air.—The heater consists of a treble-walled case the inner wall forming a cylinder within which are vertical pipes fitted into top and bottom plates. The source of heat is below the bottom plate. A central pipe is also placed in the cylinder and communicates with the flame chamber; the top of this pipe is capped over to prevent smoke entering the hot-air chamber surrounding the pipes. The flame chamber is heated by the tube of a fountain lamp which enters an aperture in the bottom plate of the chamber. An inverted truncated cone surrounds the flame chamber and forms a cold-air chamber from which the air passes to the hot-air chamber and thence through a pipe to the oven. The supply of hot air is regulated by a valve in the pipe controlled by an electric thermostat.

Thermostat.—One end of a wire dips into the mercury in a gauge; the other end is coiled round a magnet, and is connected to one pole of a battery, the other pole of which is connected to an adjustable screw which enters the tube of the gauge. When the heat of the incubator reaches a proper temperature the mercury rises and makes contact with the screw, thus completing the circuit and causing the magnet to attract a lever which closes the valve in the hot-air supply pipe. When the oven cools the mercury falls and breaks the circuit, the lever falls from the magnet and allows a spring to open the valve and admit the hot air to the oven.

Abridged also in Classes *Agricultural appliances, Farmyard &c.*; *Electricity &c., Dic. III.*; *Stoves &c.*

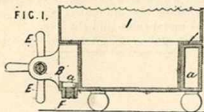
1313. **McIntyre, J., and Saunders, S.** March 31.

[Provisional protection only.]

Heating buildings; boiler.—When the circulating pipes are below the level of the boiler, the flow pipe is carried up to a height at least equal to the depth of the lowest part of the return pipe, and is provided with a safety outlet. Water is supplied through a special pipe. A separate compartment may be connected to a hot-water cistern. The circulating boiler is supplied from the hot-water compartment, and by a suitable arrangement of cocks the temperature of the circulating pipes may be regulated by sending a varying proportion of water to the cistern.

Abridged also in Class *Closets &c.*

1514. **Lake, W. R.**, [Comins, C. S.]. April 13.



Heating water by steam.—The lower part of an open vessel I is encircled by a divided annular casing a through which steam is passed. By tightening or loosening the ring by means of a screw E passed through lugs B it may be made to embrace the vessel more or less closely, and thus to facilitate or retard the passage of heat. Modifications are mentioned.

1613. **Pritchett, G. E.** April 20. *Drawings to Specification.*

Heating by liquid circulation.—Hot or cold water, oil, spirit, glycerine, &c. is circulated in a thin film between double-corrugated plates of metal, earthenware, &c. placed near together. These plates may be used for milk cans, churns, skirtings, dadoes, linings for walls, railway-carriages, &c., &c.; they may be formed in any shape, and with tubular pivots are used as pivoted and folding screens, drying-horses for clothes, and medical purposes. In a similar manner double sheets of flexible waterproof material are formed, being strengthened by fastening together at intervals, and are used for medical purposes. When used in systems of ventilation the doubled plates are used as wall linings, the air being led up behind to any desired height above the floor.

Heating water &c.—A boiler of spherical, conical, tubular, &c. shape is suspended by an adjustable lever arrangement over a fire or gas or oil flame, and flow and return pipes connect the boiler with the double plates.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Buildings &c.; Closets &c.; Cooling &c.; Drying; Furniture &c.; Medicine &c.; Milking &c.; Mixing &c.; Preparing &c. cork &c.; Railway &c. vehicles; Ventilation.*

1614. **Pritchett, G. E.** April 20. *Drawings to Specification.*

Thermostat.—Relates to an apparatus consisting of bulbs and tubes of either glass or metal containing mercury, spirit, or any similar substance. The mercury tube is so supported that variations in temperature or pressure cause the instrument to vibrate upon its support. These changes of equilibrium are indicated on a scale, or electrically by an alarm, or may be registered automatically on a moving drum covered with sensitized paper. Or the apparatus may be made to actuate shutters for the purpose of ventilating mines or factories &c., or it may be used for the purpose of regulating the heating of buildings and structures.

Abridged also in Classes *Electricity &c., Div. III.; Fire, Extinction &c. of; Philosophical instruments.*

1777. **Mills, B. J. B.**, [Harvey, J. M.]. April 30. *Drawings to Specification.*

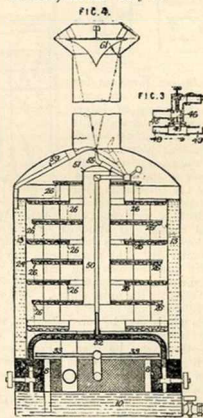
Non-conducting coverings.—The vessel, steam pipe, &c. in which heat is to be retained is surrounded with feather cushions protected by paper, felt, asbestos, or like materials. Abridged also in Class *Cooling &c.*

1806. **Engel, F. H. F.**, [Fischer, W., and Stiehl, T.]. May 3.

[*Provisional protection not allowed.*]

Heating water by steam.—Steam is introduced through noiseless injectors into the hot-water pipes of hot-water apparatus of the kind in which the water remains below the boiling-point. The upper extremity of the system consists of an open cistern with the usual overflow pipes.

1927. **Irvine, A. K.** May 11.



Heating water.—The sides and bottom of the apparatus consist of water spaces 13, 10, connected by circulating pipes 8. The products of combustion from a gas burner 33 or other source escape through a tortuous flue formed by a series of annular trays 26, through which water descends in a continuous shower, perforations being made for the purpose in the rim of each tray. The trays are supplied partly by the overflow from the annular chamber 13, and partly by a spray 59 which is directed upwards by a steam jet 55 to create a draught, the water being intercepted by a baffle 61. When as at starting the steam jet is not sufficiently powerful

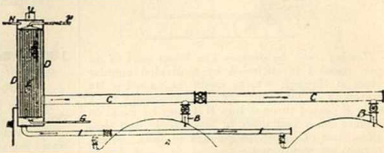
to produce a draught, the balanced lid 51 of the central flue 50, which is otherwise held down by the reaction of the jet, is opened. A modification is described in which a water jet is substituted for the steam jet. A fan or other means may also be used to promote the draught. Similar arrangements may be applied to water heaters in which the water traverses metal tubes and the like.

Abridged also in Classes *Furnaces &c.*; *Gas manufacture*; *Registering &c.*; *Steam generators.*

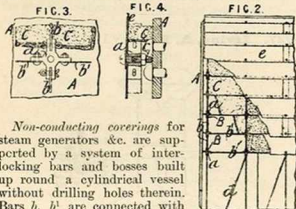
1967. Wilson, J. C. May 13.

Boiling-pans.—The steam generated in the copper A passes through the pipes B and C, to the surface condenser D. The condensed vapour returns to the coppers by the pipe I, or to a separate receiver. Where only one copper is used the condenser may be placed in the steam pipe leading therefrom.

Abridged also in Classes *Beverages*; *Brewing &c.*; *Distilling &c.*



1997. Cameron, J. G. May 14.

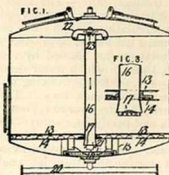


Non-conducting coverings for steam generators &c. are supported by a system of interlocking bars and bosses built up round a cylindrical vessel without drilling holes therein. Bars *b, b'* are connected with angle bosses *a* and the spaces formed by the intersecting bars are filled in with non-conducting material which may be enclosed in asbestos, cloth, or wire gauze envelopes. An outer sheet-metal casing *e* is attached by screws, and distance screws and nuts keep the casing away from the boiler &c. The cross pieces may be dispensed with and the bars laid flat wise, screws passing through them where they cross to hold them together with the outer sheets. Vertical bars only may be used, and be kept in position by the outer sheets which may be corrugated. A number of separate rectangular frames or boxes loosely bolted together may be used. For temporary walls, partitions, or screens the outer sheets are attached on both sides and strong vertical bars are used as standards.

Abridged also in Classes *Buildings &c.*; *Ships &c.*, *Div. I.*

2035. Sinclair, G. May 19.

Boiling-pan &c.—This is provided with a perforated drainer 13 over a diaphragm or false bottom 14 to which is attached the lower, bell-mouthed end 17 of the central vomiting-pipe 16. Or two



or more lateral vomiting-pipes may be employed. Drain pipes 18 projecting below the mouth 17 are also attached to the bottom 14. Steam enters the space 15 from the tube 20 and rose 21 to heat the contents of the boiler. It also carries with it up the vomiting tube the heated liquid collecting in the chamber 15, causing it to pass repeatedly through the boiler. A conical deflector 23 and hollow head 22 may be attached to the top of the vomiting-pipe and a perforated plate with suspended tubes, Fig. 3, may be placed across the lower mouth of the pipe. Reference is made to Specifications No. 2004, A.D. 1877, No. 1388, A.D. 1878, and No. 1704, A.D. 1879.

Abridged also in Classes *Bleaching &c.*; *Furnaces &c.*; *Paper &c.*; *Steam generators*; *Valves &c.*

2059. Johnston, T. R. May 20.

[*Provisional protection only.*]

Footcarners for railway carriages. Heaters of corrugated sheet copper extend across the carriage and are supplied from the locomotive, suitable flexible pipe couplings being provided between the carriages.

Abridged also in Class *Railway &c. vehicles.*

2537. Hartley, J. G. June 22.

[*Provisional protection only.*]

Non-conducting covering.—For covering iron decks or floors waste wood is cut and glued, or otherwise connected together, to a uniform thickness of, say, 3 inches. This layer is secured in sections to the iron surface by cement or other adhesive substance, and planks or boards to form the deck are secured upon it by nails. Or a layer of Portland cement or asphalt may be laid on the slab foundation. The covering is also applicable for cooling-chambers.

Abridged also in Classes *Buildings &c.*; *Moulding &c.*; *Ships &c.*, *Div. I.*

2603. Mechesney, A. June 26.

[*Provisional protection only.*]

Boiling-pans.—Apparatus for circulating boiling liquids and for spreading the same over or through substances under treatment consists of a flat plate

provided with a perforated rim which rests upon the bottom of the containing-vessel; a tube, preferably conical, projects upwards from the plate above the level of the liquid &c. contained in the vessel, and it is provided with an inverted perforated conical discharge piece formed with an annular discharge passage.

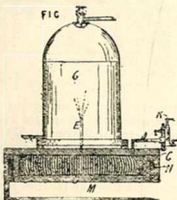
Abridged also in Class *Bleaching &c.*

2624. Graddon, J. June 28.

Heating air;

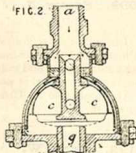
boiler.—One or more tubes are coiled into the form of a cylinder which is again coiled into a scroll or spiral &c. and is placed in a chamber C over a furnace M with flues N. The bottom O of the chamber may be removed and the coil heated direct by the furnace. The chamber C may contain mercury, oil, or other heat-retaining medium. The air or water supplied by the injector &c. K is heated and converted into steam, gas, &c. and issues by the pipe E. The coil may be dispensed with and the liquid, gas, &c. passed over the heated mercury &c. The coils may be taken apart for cleaning, or steam &c. may be passed through them for this purpose.

Abridged also in Classes *Air and gas engines; Air and gases, Compressing &c.; Furnaces &c.; Steam engines; Steam generators.*



2646. Davis, W. June 29.

Steam traps.—Steam is admitted through holes in the centre piece round the dome-shaped guard which encloses an expanding chamber c filled with ether &c. The heat of the steam expands the chamber to close the adjustable outlet g. When water accumulates and covers the bottom of the guard it is forced round the chamber, cooling it and causing it to contract and open the outlet.



2777. Dade, D. H. July 7.

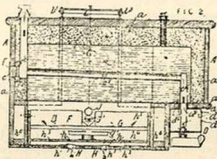
[Provisional protection only.]

Non-conducting covering.—Pipes which run along walls are covered with canvas pieces, glued to wooden strips for nailing them to the walls. The space between the canvas cover and pipes is filled with silicate cotton or slagwool. The cover may be coated with silicate paint or other anti-hygrosopic coating; or be made of wire gauze,

tin, or zinc, with flanges for nailing it to the wall. Bricks, slabs, or sheets of silicate cotton are covered, by steeping, painting over, or otherwise, with plaster of Paris and clay, or either mixed with Irish moss decoction, liquid glue, or other gelatinous or binding substance; or clay or Irish moss is used alone. To protect the slag against acids the coating is covered with soda solution, or previously combined therewith. To prevent mildew and give great pliability Peruvian bark or other tannic extract is applied. The bricks &c. may be formed of silicate cotton and plaster of Paris, mixed or not with gelatinous material, and silicate cotton may be filled into a recess or recesses in the middle or faces thereof and the top and ends be coated with one of the aforesaid solutions. The silicate cotton may be placed in a wire box mould, with hinged sides and lid, when dipping or coating it with the solutions. The bricks, slabs, or sheets are applied for building walls or partitions to prevent radiation of heat and transmission of sound.

Abridged also in Classes *Buildings &c.; Cements &c.; Hollow-ware; Moulding &c.; Paints &c.; Pipes &c.*

2818. Tomlinson, H. July 9.



Thermostats for automatically regulating the temperature in incubators or fostermothers. A glass or china tube J passes along the middle of the egg drawer F, between the eggs and tank C. One end of the tube is inserted in a metal case by which it is secured to the incubator. Projecting down from the tube is a mouthpiece j' over which is stretched an india-rubber or other diaphragm. A little water, mercury, or other fluid rests upon the diaphragm, thus forming a fluid seal to prevent the escape of air therefrom. As the air in the tube becomes more or less heated the diaphragm expands or contracts. Below the diaphragm and pivoted to brackets depending from the metal case in which the tube is placed is a short padded lever which is connected to a rod passing up the ventilating-shaft and attached to the regulating-valve. This valve may consist of a metal case L having a screw cover and two side openings, which are controlled by a swing or balance valve hung upon pivots P and formed with stops or feathers, which uncover both openings when the valve is moved one way and covers both when moved the other way. An opening in the valve allows some air to pass through even when quite closed. The valve may be operated by the direct pressure upon the padded lever of the elastic diaphragm, or the diaphragm may impart motion to a delicate spring which acts upon the lever. In another arrangement the cup portion is arranged to project into the ventilating-shaft, so

that the diaphragm operates a long lever which is connected with two plates or feathers, connected by cross-bars and arranged to open and close the air openings. By removing the cover of the valve case the valve mechanism in this arrangement may be removed for cleaning or transit. The regulators may be otherwise connected with the valve.

Abridged also in *Class Agricultural appliances, Farmyard &c.*

2867. Bauer, M., [*Suehet, S.*]. July 12.

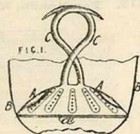
[*Provisional protection only.*]

Heating air.—The apparatus consists of a casing divided by vertical and horizontal partitions into chambers which form a continuous tortuous air passage of considerable length and is placed in the chimney above the fireplace. Cold air entering at the open bottom is heated as it passes through the apparatus, and “rises at the sides of the chimney” through hot-air holes provided for the purpose.

2944. Partridge, W. E. July 17.

Boiling-pan for washing clothes, rags, wool, cotton waste, lace curtains, &c., applicable also for mixing or agitating and for extracting the juices from hops, malt, roots, barks, &c. Fig. 1 shows a form of apparatus which consists of a corrugated conical vessel A fitted within a boiler B and provided with two or more vertical pipes C. The depressed portions *a'* of the corrugations are perforated, or openings covered with wire gauze are provided, in which case the gauze covers may be made conical or hemispherical in shape. A series of jets may be arranged around the outside edge of the conical vessel A either in conjunction with or separate from the central pipe C. A wire case similar in shape to the boiler B may be attached to the vessel A. As the water or other liquid contained in the boiler B becomes heated it passes upwards through the conical vessel A and pipes C and is discharged on to the clothes &c. A siphon or other mechanical means is employed for circulating the liquid when it is to be kept at a low temperature.

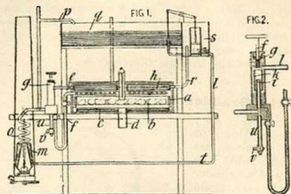
Abridged also in *Classes Beverages; Bleaching &c.; Brewing &c.; Medicine &c.; Mixing &c.*



3014. Challinor, R., and Mawdsley, W. H. July 22.

Thermostats.—The egg drawer has a perforated bottom *b, b* and is supported over a tray which contains water and is fitted with a central air tube. A coiled pipe containing air communicates, by means of a tube *f, f* and a heat regulator *g* with a hot-water reservoir *h, h*. The bend of the tube *f, f* is filled with mercury and a vertical pipe *i* within the regulator *g* is provided with a cup or bell *k* forming a valve. The water in the boiler *m, m* is heated by a lamp and passes through the

coiled pipe *o*, regulator *g*, pipe *l*, reservoir *h*, and pipe *r* to the hot-water cistern *s, s* and thence



returns to the boiler by the pipe *t*. When the temperature rises above the required point, which may be regulated by a screw, the mercury expands and presses the cup *k* upwards, thereby causing it to shut off communication with the pipe *l*. Then the hot water from the boiler instead of passing to the reservoir *h* flows up the tube *p*, which also serves as a steam escape, and falls into the cold-water cistern *g*. As the temperature falls the mercury falls and the valve *k* opens. Should the mercury rise above the pipe *i* it falls into a pocket *u* from which it may be drawn by the tap *v*. Another form of heat regulator is described consisting of two tubes placed one within the other, the inner one communicating with the heat reservoir, and the outer containing mercury. A third tube closed at the top passes over the inner tube and rests in the mercury, and is connected with the water supply tap. As the mercury rises and falls the floating tube opens or closes the tap.

Abridged also in *Class Agricultural appliances, Farmyard &c.*

3099. Seelig, J. July 28.

[*Provisional protection only.*]

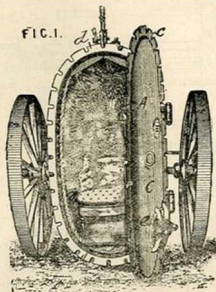
Heating water by lamps and burners. On a central tubular pivot rotate a number of trays. The upper one contains hot and cold water. Gas or spirit for heating the water is supplied by the central tube.

Abridged also in *Classes Advertising &c.; Table articles &c.*

3172. Lyon, W. Aug. 3.

Heating by steam circulation.—Apparatus for purifying and disinfecting wearing-apparel, bedding, &c.; also applicable for drying, heating, cooking, &c. An inner chamber A is enclosed by an outer chamber, or jacket, and provided with a steam-tight door. The articles to be treated are placed within the chamber A and steam is admitted, steam of a higher pressure having been previously introduced into the jacket to prevent condensation. When the apparatus is employed for airing clothing, bedding, &c., or for drying and other purposes where a dry heat is required, steam is only introduced into the outer chamber, but when a moist heat is required for preserving or cooking meat,

the steam is admitted to both chambers. An aperture *e* is formed in the door for introducing



small articles into the chamber, and safety-valves, steam gauges, thermometers, &c., are provided for regulating and ascertaining the temperature &c.

Abridged also in Classes *Cooking &c.*; *Drying*; *Medicine &c.*

3176. Northcott, W. H. Aug. 3. *Drawings to Specification.*

Heating air.—Air warmed in a gas-engine cylinder jacket may be used to heat buildings.

Abridged also in Classes *Air and gas engines*; *Furnaces &c.*; *Locomotives &c.*; *Metals, Cutting &c.*; *Pumps &c.*; *Steam engines*; *Steam generators*; *Ventilation.*

3212. Clark, A. M., [*Culver, J. E.*]. Aug. 5.

Heating buildings.—A mixture of furnace gases and steam is passed through a radiator consisting of horizontal and vertical tubes, and provided with a chimney for the escape of the gases.

Abridged also in Classes *Distilling &c.*; *Fire, Extinction &c. of*; *Furnaces &c.*; *Rotary engines &c.*; *Steam generators*; *Ventilation.*

3248. Specht, A., [*Bischoff, P.*]. Aug. 9. *Drawings to Specification.*

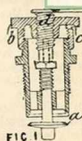
Thermostat.—The temperature of the water bath is regulated by a rod composed of two different metals the unequal expansion of which acts so that a rise of temperature tends to close the gas cock of the heating-lamp; a fall of temperature tends to open the cock.

Abridged also in Class *Gas manufacture.*

3283. Collier, W. Aug. 11.

Steam traps.—The box which forms the vacuum valve seat, and which screws into the cylinder or other apparatus to be protected from collapse, has a prolongation above its flange, and upon this is screwed a flanged cap *b* with perforations *c* for the admission of air or the exit of fluid. The valve *a*, which is kept to its seat by the usual spring surrounding the spindle, can be set open to any desired extent by a regulating-screw *d* which works in the cap, and has a cylindrical recess for receiving a guide pin formed on the upper end of the spindle. By turning the regulating-screw backwards the valve is released, and is kept closed by the spring as usual, until a reduction of the internal pressure causes it to open. A modification is shown, in which a transverse spindle fitted with a cam takes the place of the regulating-screw.

Abridged also in Classes *Drying*; *Valves &c.*



3304. Mann, F. Aug. 14.

[*Provisional protection only.*]

Boiling-pans.—An automatic circulation of the water is effected by employing a dome of copper or other metal of about the same diameter as the bottom of the boiler in use; a pipe reaches from the centre of the dome to within an inch or so of the top of the boiler. When the apparatus is at work the water flows through openings or spouts in the top of the pipe.

3309. Collingridge, A., [*Leerf, R. F.,* partly]. Aug. 14. *Drawings to Specification.*

Heating water &c.—Apparatus for heating wort with hops under pressure, and with the use of a vacuum condenser, the apparatus being also useful for distilling, for extracting essences, &c. The boiler is a closed vessel with sides bowed inwards, strengthened with exterior tie-rods reaching from corner to corner. The wort is heated with the hops, preferably by a steam coil, for 35 to 56 minutes at 360° F., and then cooled and treated as usual.

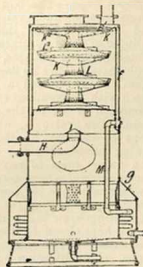
Abridged also in Classes *Brewing &c.*; *Distilling &c.*; *Medicine &c.*

3327. Wise, W. L., [*Zschech, G. H.*]. Aug. 17.

Heating water by steam.—In the arrangement shown in the Fig., the water passes to an annular chamber *f* by the pipe *M* after being heated in the annular chamber *g*. It overflows a lip *B*, passes over the cones *K, L*, where it is brought in contact with steam rising from the pipe *H* protected by the cone *I*, and falls to the bottom of the chamber,

is filtered through a large area of removable filtering-material as it passes out through the holes into the annular chamber *g*. The water is drawn off from this chamber to be used as required. The bottom of the main chamber falls to the centre, where there is an outlet provided with a sludge cock. The cones *K* and *L* have concentric ledges or dams *K'* and *L'* and suitable openings at the junctions of the several cones for steam and water.

Abridged also in
Classes *Filtering &c.*;
Steam generators.



3440. Sutcliffe, W. L., and Ferguson, R. C. Aug. 25.

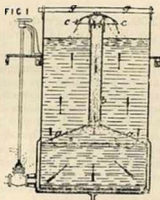
[Provisional protection only.]

Steam traps, applicable as or in combination with a steam separator. The shell is provided with an upper outlet for the escape of air or waste steam, and a lower outlet for the water, the latter having a horizontal valve-seating at its inner end on which rests a hollow cylindrical or other float. The outlet pipe is bent up into a siphon and the water retained in the trap causes the float to rest gently on the seating. Any excess of water in the shell will then raise the float.

Abridged also in Class *Steam generators.*

3454. Atkinson, J. Aug. 26.

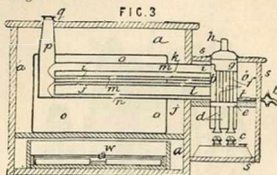
Boiling-pan.—Relates to apparatus for boiling beer &c. which prevents the liquid from boiling over and causes its continual circulation. The boiling-pan is heated at its lower part by a steam jacket, or otherwise. Resting on a support some distance from the bottom of the boiler is an inverted, funnel-shaped apparatus *a*, with a tube *b*



that extends upwards from its apex to above the level of the liquid. At a little distance above the top of this tube there is a curved plate *c* that directs the rising liquid downwards outside the tube. The funnel-shaped apparatus is perforated, and thus the boiling liquid continuously passes up inside the funnel and tube and down outside. The deflector is kept in position by weighting it or by a bar *g* that extends over it, and may be arranged so that its height above the top of the tube may be adjusted.

Abridged also in Class *Brewing &c.*

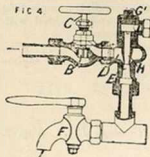
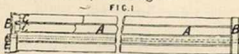
3506. Dunn, C. H., and Cartwright, H. T. Aug. 30.



Heating water &c. for incubators &c. A boiler *b* is arranged beside the incubator *a* and heated by the lamp *c* or otherwise. The products of combustion pass through two flues *d* into a box *e* and thence to the chimney *h* through tubes *f*. Tubes *i* and *j* pass from the boiler *b* through the incubator cistern *o* to the pipe *p*, which is fitted with a screw cap *q* and is used for filling the boiler. Suitable pipes are provided for filling and emptying the cistern *o*, and a pipe *t* and cock *l* serve to empty the boiler. A pipe for the escape of steam is also provided. The tube *j* has a cylindrical core *l*, and the tube *i* a semi-cylindrical core *k*, the water space being shown at *m*. As the water in the boiler becomes heated it circulates through these tubes and heats the water in the cistern *o*. When the required temperature is reached the lamp may be extinguished for a time. The egg drawer is provided with a thermometer. The lower part of the casing *s* of the boiler is fitted with a perforated door to give access to the lamp *c*. The same heating-arrangements may be applied to fostermothers.

Abridged also in Class *Agricultural appliances, Farmyard &c.*

3530. Hart, F. Aug. 31.



Heating buildings &c.—A number of pipes *A*, Fig. 1, are connected to two chambers *B*, to one of which steam is supplied, and from the other of which water is withdrawn, by any ordinary devices.

Heating water &c.—Steam may also be utilized to heat water

for hot-water supply by means of a device illustrated in Fig. 4. The water passes through a check valve *B* into a chamber *D* from which it can be drawn by taps *F*. The steam passes through a similar valve into an injector nozzle *H* on issuing from which it mixes with and heats the water. The temperature depends on the quantity of water allowed to pass the injector, and this can be regulated by altering the size of the annular space

between the chamber D and the tube E by screwing the nozzle up or down by means of a screw-driver introduced through a plugged aperture G¹. Both valves may be shut down by screw-spindles C.

Abridged also in Class *Pipes &c.*

3542. Davidson, W. Sept. 1.

Thermostat.—The temperature of a grain drying chamber is regulated by air admitted through sliding doors, which are opened and closed, automatically, by the contraction and expansion of a series of metal rods.

Abridged also in Class *Drying.*

3561. Coulong, J., and Robertshaw, J. Sept. 2.

[*Provisional protection only.*]

Steam traps.—To the end of a steam pipe is attached a two-way plug, working on which is a body or arm with two ports leading into a hollow sphere attached at one end of the arm. The wet steam is admitted through one of the ports to the sphere, which when full falls by the weight of condensed water and fully opens the outlet port. A weight is preferably employed to accelerate the opening and closing of the ports.

3573. Singleton, T. Sept. 3.

[*Provisional protection only.*]

Heating size.—The cold size is pumped into a series of tubular coils placed in a box heated by steam, and at each end of the series of pipes is a two-way cock, one being connected to the size supply and to a steam supply and the other cock connected to the size trough and to a vessel for receiving the blown-through size. By this arrangement steam can be blown through the coils for cleaning. In another arrangement the supply pipe has a self-acting valve and a steam cock, the former closing whenever the steam is turned on, which may be done by hand or by suitable mechanism.

Abridged also in Classes *Valves &c.*; *Weaving &c.*

3624. Lake, W. R., [Genty, E.] Sept. 6.

[*Provisional protection only.*]

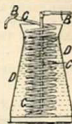
Thermostat.—If it is desired to keep the carburetted-apparatus described at a regular temperature its lower part is surrounded by a vessel closed on all sides and containing a small quantity of water or some liquid which will evaporate easily. A bellows is connected with the interior of this vessel or a suitable piston pump may be used instead. A stem is fixed to the bellows or pump and is attached to a connecting bar which acts as a lever on the cock of a gas burner placed beneath the vessel. When the heat is too intense the steam generated thereby acts on the bellows or piston and partially closes the gas cock. As the temperature falls the blower collapses and the cock opens again. To maintain the heat a sheet-metal casing is provided, open at its upper part to allow the air to circulate. If the apparatus is large means may be adopted for giving more heat than a single burner.

Abridged also in Class *Gas manufacture.*

3770. Fitch, E. Sept. 17.

Heating milk.—Relates to cooling or warming milk. A coiled pipe C is arranged as shown in a churn D or other vessel containing milk, and is connected by an india-rubber pipe B with either a hot or cold water cistern, from which hot or cold water is run through the coil to heat or cool the milk. An india-rubber pipe may serve simply as an outlet or may be connected with a coil in another churn &c. Hot or cold air may be forced through the coil instead of water.

Abridged also in Class *Cooling &c.*

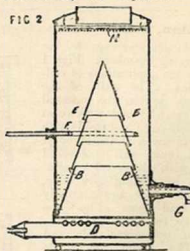


3839. Ritchie, R. M. Sept. 22. *Drawings to Specification.*

Heating air.—A series of tubes partly filled with water or other liquid and afterwards hermetically sealed are ranged vertically or in an inclined direction round the inner walls, floors, or casings of drying or other chambers or ovens, and their lower ends rest upon or are suspended in a furnace or hot flue leading therefrom. The tubes are made in parallel pairs or in a series of any number, welded or coupled together at the ends, or in circular rings bent at one part so as to form a projecting U-piece for insertion in the furnace; for coupling the tubes together a screwed sleeve is used, a V-knife edge being formed on the end of one tube biting into the facing of the other or knife edges are formed at the ends of both tubes indenting a washer placed between them. The steam or vapour formed in the upper part of the tubes, radiating its heat to the air in the chamber, becomes condensed and a continuous circulation and condensation is maintained. The heated air may be conducted where desired.

Abridged also in Classes *Drying*; *Pipes &c.*; *Ventilation.*

3909. Standing, W. Sept. 27.

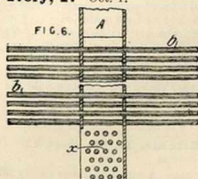


Heating water.—Water escaping under pressure from jets in a ring F strikes against a dash-plate by which it is broken up into fine spray, and, falling, is heated by a stream of hot gases from a burner D which is protected from the spray by a series of cones E, B. The hot water collects at the

of the casing and is drawn off for use in baths or otherwise by a pipe G, and the gases escape round the dash-plate and through an aperture at the top.

Abridged also in Class Closets &c.

3972. Ivory, T. Oct. 1.



Heating buildings &c.; heating air.—Through the flue A of a stove heated by gas, coke, or other smokeless fuel run a number of rods or tubes b, their ends being outside the flue; the tubes are preferably placed at an angle; the whole apparatus may be enclosed in an outer casing. Bars or tubes x may also be placed altogether within the flue, which is opened at the side opposite to them. The apparatus may be heated by hot water, steam, or other heating-agent.

Abridged also in Class Stoves &c.

4004. Boxall, H. Oct. 2.

[Provisional protection only.]

Heating buildings; footcarriers.—A portable metal case with a stoppered aperture is filled with earth or other heat-retaining substance and heated in an oven. It may be used for heating rooms, in place of a hot-water bottle, or as a foot-stool either in the house or when travelling, or for airing beds &c.

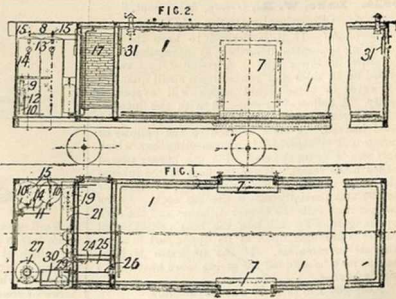
Abridged also in Class Drying.

4122. Linn, S. H. Oct. 11.

Non-conducting coverings &c. for food-preserving chambers. Figs. 1 and 2 show the applications to railway wagons. The walls of the chamber are double, the external one being covered outside with a coat of waterproof paint and inside with a layer of bitumen and a layer of felt. The inner wall is covered externally with a layer of a cellulose made by mixing cork, tale, sulphur, and rubber, and internally by zinc or lead plates. The space between the two is filled with a mixture of pulverized talc and kaolin. The doors are made similarly and are watertight.

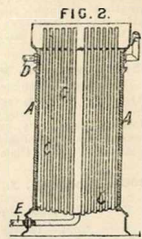
Heating buildings &c.—27 is a hot-water heating-apparatus from which come the heating-pipes 30 fed from the reservoir 29.

Thermostat.—The temperature



4008. Jennings, G. Oct. 2.

Heating air.—Steam is admitted by a pipe D to a chamber A traversed by a number of tubes C which are open at the bottom to a chamber supplied with fresh air and at the top to the place to be warmed and ventilated. Any number of such apparatus may be supplied from a central boiler, the water of condensation being returned by a pipe E, and the excess of steam either discharged into the atmosphere or conveyed by a pipe F to a similar apparatus.



Abridged also in Classes Air and gases, Compressing &c.; Railway &c. vehicles; Ships &c., Div. I.; Ventilation.

4106. Sheard, E. S., Denton, J. A., and Firth, G. Oct. 9.

[Provisional protection only.]

Boilers for heating greenhouses, heating water for baths, and for other purposes are heated, preferably, by a gas burner underneath, which is lighted and supplied with air through special openings. The inner copper shell constituting the boiler is provided with horizontal and vertical water tubes, and the usual flow and return pipes. An outer shell enclosing an air space round the boiler is extended at the top to form a water tray through which the flue passes, and by which the air is kept moist.

Abridged also in Classes Air and gases, Compressing &c.; Closets &c.

is regulated by air or other thermometers which control the valves for admitting air. In the chamber I are electric or metallic thermometers 31, connected by wires to a dial, and with signals to indicate when the temperature is too high or too low. Or apparatus acting by the expansion of air or mercury may be used.

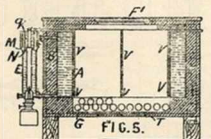
Abridged also in Classes *Air and gases, Compressing &c.; Cooking &c.; Cooling &c.; Drying; Food &c.; Medicine &c.; Railway &c. vehicles.*

4196. Love, W. Oct. 15. *Drawing to Specification.*

Heating air.—Air is heated by flues through which the products of combustion of stoves are conducted away &c.

Abridged also in Classes *Lamps &c.; Stoves &c.*

4308 Clark, A. M., [Martin, O.] Oct. 22.



Relates to improvements in incubators, some of which are applicable to other purposes.

Heating water &c. by a lamp. A thermo-siphon consists of a cylindrical chamber E, Fig. 5, connected to a water jacket A by circulating pipes. The upper part of the chamber E is supported by water tubes N and the outside of a circular chamber M. Products of combustion from the lamp pass up the centre and enter the chamber M, from which they escape by flues q, or from the outside of the chamber M under an inclined external flange.

Thermostats.—When the temperature rises to a certain point a weighted bellows is liberated by an electric battery and blows the lamp out. The wires of the battery circuit are led into the stem of a mercurial thermometer, and when the mercury rises and closes the circuit, an electromagnet attracts an armature fixed to a lever arrangement; this liberates the bellows and also breaks the circuit again. The levers may be operated by the expansion of a metal or liquid.

Abridged also in Classes *Agricultural appliances, Farmyard &c.; Electricity &c., Div. III.; Fire, Extinction &c. of; Stoves &c.*

4337. Lake, W. R., [Bernhardi, B.] Oct. 23.

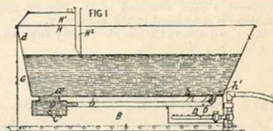
[*Provisional protection only.*]

Heating buildings.—In place of water for heating houses, ovens, &c. a solution of chloride of magnesium is employed. It may be pumped through the apparatus or otherwise treated as

water, and is said to possess the advantages of not freezing or evaporating, and having a higher boiling point.

Abridged also in Class *Cooking &c.*

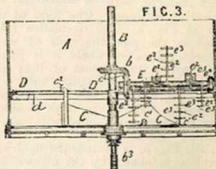
4365. Sugg, W. T. Oct. 26.



Heating water for baths. The bath is supported in a casing B which contains the heating-apparatus. The circular gas burner D, which swings out for lighting, heats the pipes B and causes the water to circulate through them from the well C. The fumes pass by a flue G to an opening d whence they are deflected by the removable conductor H and partially absorbed by the water. A flue H' may be provided and a box H' for towels. The openings into the bath are covered by perforated removable plates. A waste cock is provided at C' and the bath may be mounted on wheels.

Abridged also in Class *Closets &c.*

4403. Cave, G. G. Oct. 28.



Heating water &c.—The mash tun &c. A, Fig. 3, is provided with the hollow shaft B which is rotated by toothed gearing &c. Attached to, and communicating with, the shaft are the hollow ploughs C, provided with runners. The hollow shaft E carries rakes, consisting of the hollow radial arms c' carrying hollow triangular prongs e', and is caused to rotate by the shaft B through

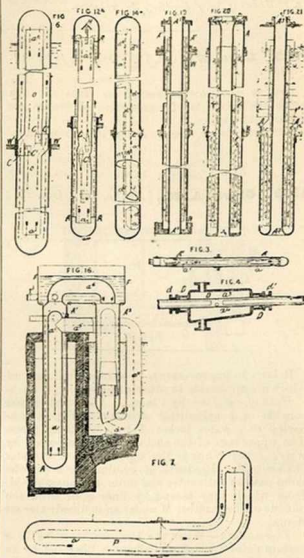
the wheels b and c , the motion being transmitted through the pinion e^1 to the rack D. The shaft E is supported at its inner end in the bearing e^2 on the shaft B, and the arms and prongs may communicate with the shaft E. Steam or hot or cold water may be admitted by a pipe to the shaft B and the ploughs C, and from the shaft B, by a pipe, to the shaft E, the arms e^1 , and prongs e^2 ; and the water &c. passes off at the outlet b^2 by means of a cock &c. Equal quantities of malt and raw grain &c. are introduced into the tun &c. and are successively mashed, stewed, and boiled, the desired temperatures being attained by steam, admitted to the ploughs and rakes as described. After the "mash" has boiled for a time, the steam is turned off; cold liquor is then admitted through the bottom shaft, and after circulating through the ploughs and rakes, passes off at b^2 . The malt required is then admitted to the tun &c. and the mashing is completed in the usual way.

Abridged also in Classes *Beverages; Brewing &c.; Cooling &c.; Mizing &c.*

4516. Wise, W. L., [Roeder, B.]. Nov. 4.

Heating by water or other liquid circulation.—Relates to the transmission of heat to boilers, evaporating and concentrating vessels, and to similar apparatus, by means of pipes or vessels specially constructed to admit of a free circulation of liquid or gas within them. These pipes or vessels are filled with a liquid or substance which is capable of absorbing heat at one part of the tube, and of giving it up at the point desired. The substance may be water, or a chemical compound which decomposes when heated, the constituents reuniting and giving off heat in the cool part of the tube. Substances such as carbonic acid, which stores up heat in changing form, may be used; or the tubes may be supplied with a solution of a salt which simply serves to convey heat from one part to another. The pipes are fitted so as to pass through a wall which separates the heating-space from the chamber or boiler to be heated. This wall may be protected from heat by a plate of refractory material, between which and the wall may be left an air space. One form of the pipe is shown in Fig. 3. The circulation tube a, a^1 is inserted in the pipe the ends of which are then secured. In cases where it is particularly desired to avoid transmission of heat from the currents within the circulating tube to those outside it, the walls of the tube are made of non-conducting material, or with double walls, the space between being filled with asbestos or some similar substance. When one end of the tube A, A', Fig. 3, is heated, the fluid within it will circulate as shown by the arrows, and will part with its heat at the further end. The pipe may be made in two parts which are connected together by a screwed internal piece provided with two holes for filling. These holes are covered when the parts of the pipe are screwed together. Another form of pipe is shown in Fig. 6. The lower end absorbs heat which is carried to the upper end and imparted to the water or material to be heated. The circulation tube a, a^1 is so arranged that the current of heated fluid passes upwards

through the annular space between the tube a, a^1 , and the outer pipe as far as the partition wall W'. The current is then diverted through channels C, C', into the inner cylindrical space o of the circulation



tube. When the current reaches the top of the tube it spreads outwards and descends through the annular space in the upper part of the tube, and imparts its heat to the water or other substance to be heated. When it reaches the partition W' it passes into the inner tube a, a^1 and thus to the bottom of the pipe to be re-heated. The channels C, C' are arranged so that the ascending and descending currents do not merge into one another at that point. A modification arranged horizontally is shown in Fig. 7, where the part exposed to the fire is provided with a partition p . The current then flows along the upper surface of the partition and through the circulating tube to the top of the pipe, from whence it descends through the annular space, and after parting with heat, passes along the under side of the partition to be re-heated. Other slightly modified forms of this arrangement are described and illustrated in the Specification, the differences consisting in the arrangement of the passages for keeping separate the upward and