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frames D and connected in series by bends E in such a manner that two or more separate streams flow upwards through each column. The lowermost headers are connected by separate pipes G, H with the supply pipe F and the two or more uppermost headers by similar pipes with the delivery pipe K. When two or more columns are mounted side by side the gas between adjacent banks of tubes may be controlled by rotating dampers.

284,965. Carrier Engineering Co., Ltd., and **Groom, S. L.** Oct. 14, 1927.

Heating air.—A heater 7, disposed in the air supply duct 3 of a ventilation system, is controlled normally by a thermostat 15 arranged in the enclosure, and in addition a pair of thermostats 18, 19 are provided, one of which causes the supply of heat to be cut off when a predetermined maximum temperature is reached and the other operates to permit the passage of additional heat when a predetermined minimum temperature is reached. The heater consists of coils 7 to which steam is fed by a pipe 8 which is divided into two conduits 13, 14 controlled by valves 10, 11, 12. The valve 10 is normally open and is controlled by the thermostat 18, being adapted to be closed when the maximum temperature is reached. The normal thermostat 15 regulates the valve 11 in the conduit 13 according to fluctuations prevailing in the enclosure. The valve 12 is adapted to be opened by the thermostat 19 when the supply air is at a minimum temperature, and in this case the thermostat 15 may have operated to close the valve 11 due to the heat given off by people in the enclosure. The coil 7 may be divided into two parts 24, 25, Fig. 2, the coil 24 only being used under normal conditions, and the coil 25 coming into operation on the valve 12 being opened by the thermostat 19. The thermostats are adapted to operate the valves through a compressed air system and motors. Specifications 133,897 and 273,069, [both in *Class* 137, Ventilation], and 276,221, [*Class* 55 (ii), Gas manufacture &c.], are referred to.

FIG. 1.

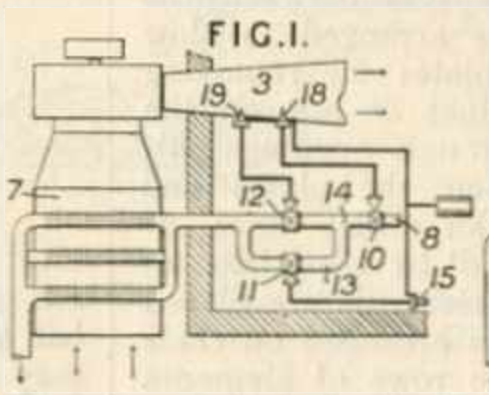
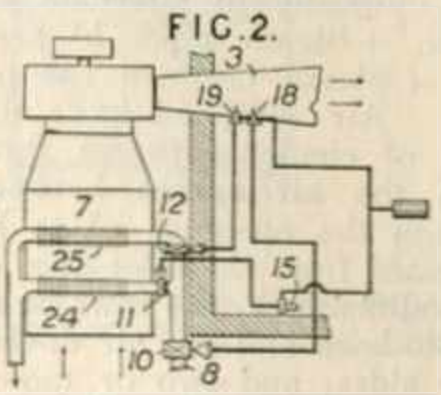


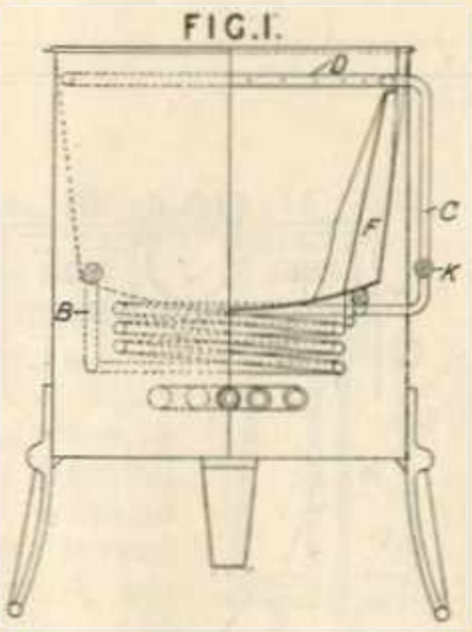
FIG. 2.



285,246. Ashworth, W. Feb. 9, 1927.

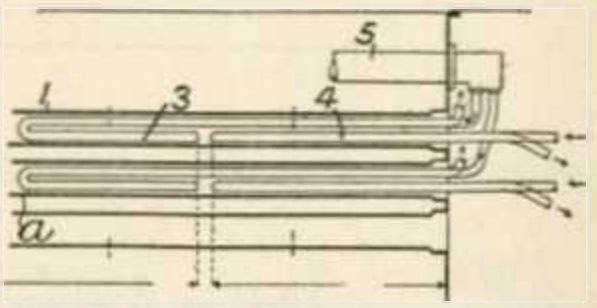
Washing-boilers.—A boiler with an external pipe-coil in the path of the heating gases connected at one end B to the lowest part of the boiler and at the other to a vertical pipe C with valve K, delivering to the upper part of the boiler, is provided with a perforated distributing ring-pipe D. A compartment F is formed in the pan itself with a valved connection to the riser pipe of the coil and provided with a draw-off pipe for heated water.

FIG. 1.



285,363. Soc. d'Exploitation des Procédés Dabeg, (Assignees of *Muchka, J.*). Feb. 14, 1927, [*Convention date*]. *Right to Patent relinquished.*

FIG. 1.



Feedwater, heating.—Steam superheating and feedwater heating-tubes are respectively located in the hotter and cooler portions of the boiler fire-tubes 1. A short loop 3 of the superheating-tubes, which branch off from a saturated steam pipe 5, extends from the firebox end *a* the rest of the fire-tube length being occupied by the feedwater tubes 4, so arranged that the fire-tube contains four branches at all cross sections and the transverse portions connecting the limbs of the **U**-tubes all lie close to the walls of the firetube and do not cross its centre.

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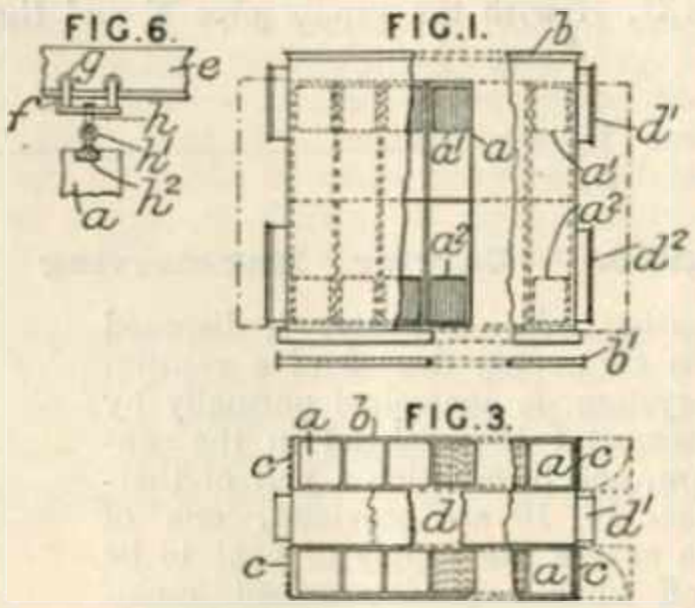
285,550. Owen, W. H. Nov. 16, 1926.

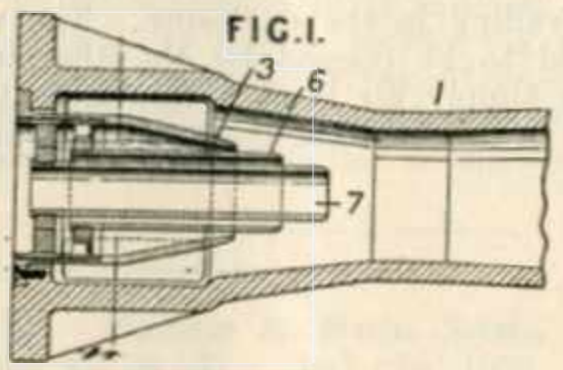
Heating air.—Air-heating elements in the form of bundles of plates *a* are inserted or removed one after the other through doors *c*, parallel with the plates, at the sides of the heater, i.e. at the ends of the rows of elements. The elements are constructed as described in Specification 228,218, the plates being enclosed in a sheet-metal casing having openings a^1, a^2 for the inlet and outlet of air, and are arranged in a casing *b* having openings at top and bottom for waste gases which pass upwardly in alternate spaces between the plates. Steam pipes b^1 are arranged to blow jets of steam between the plates for removing soot. Air supplied by a duct d^1 beween the rows of elements passes through openings a^1, down the air spaces between the plates and through the openings a^2 to an outlet duct d^2 separated from the inlet duct d^1 by a partition *d*. In modifications, the rows of elements are placed back-to-back and the air ducts arranged on their outer sides, and two or more rows of elements may be superposed in tiers. To facilitate insertion and removing of the bundles of plates a runway *e*, Fig. 6, may be arranged at the top of the casing *b* supporting on wheels *g* a trolley *f* having a hook *h* to engage an eye h^1 on a cross-



bar h^2 at the top of each bundle, or the bundles may have rollers on which they can be pushed into position. Specification 285,783 also is referred to.

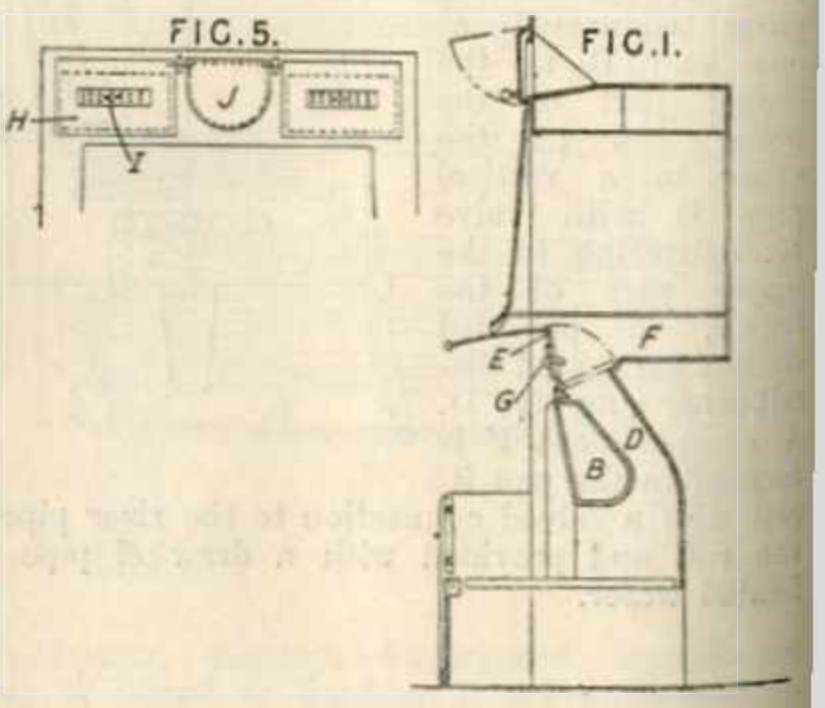
285,603. Brooke, R. G., and **Brooke, G.** Dec. 10, 1926.

Heating water.—In steam-jet water-heaters, steam from a single source at the same pressure is divided into three or more concentric streams introduced into the combining cone at points in its length such that each stream of smaller diameter extends beyond a stream of larger diameter. A construction comprises a combining cone 1 and concentric cones 3, 6, 7 projecting further the nearer the centre, all being supplied with steam from one source. Various modified means of mounting the cones are described. Several combining-cones may be mounted on a single steam chamber supplying the jets in parallel. Specification 5744/15, [*Class* 71, Injectors &c.], is referred to.



285,646. Ure, A. M. Feb. 16, 1927.

Boilers.—The boiler B has a forwardly-inclined front face and has a front-to-back depth at the top which is less than one-half of the corresponding dimension at the deepest part; a flue D extends up the back to the oven bottom flue F. A damper E provided with a cleaning-door G closes the flue D when desired.



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285,679. Master, P. S. April 4, 1927.

Composite boilers; internally-fired boilers.—Apparatus for heating water comprises a cistern 3 filled with water from a ball-tap 5, a water-tube coil 10 in communication with the interior of the cistern 3, a draw-off pipe 18 connected to the coil and a source of heat impinging on the coil throughout its length and upon a metal surface of the cistern. The coil 10 may be fitted below the cistern as in Fig. 1 or in vertical flue tubes 19 Fig. 2. The coil may be continued in the form of a straight length 12 through the water in the cistern, the draw-off pipe being connected to the straight tube.

FIG. 1.

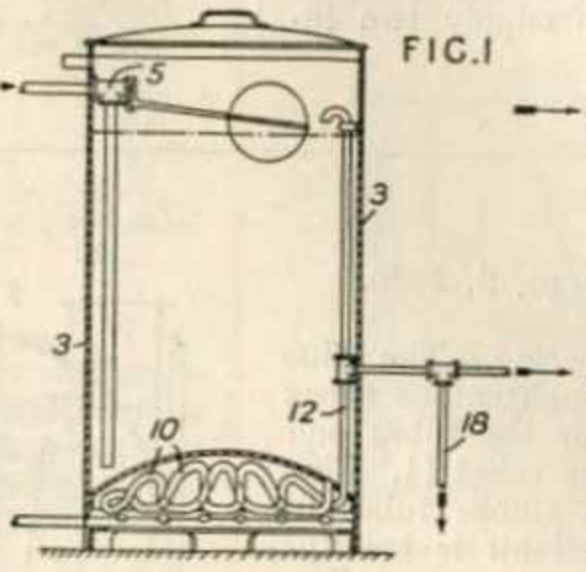
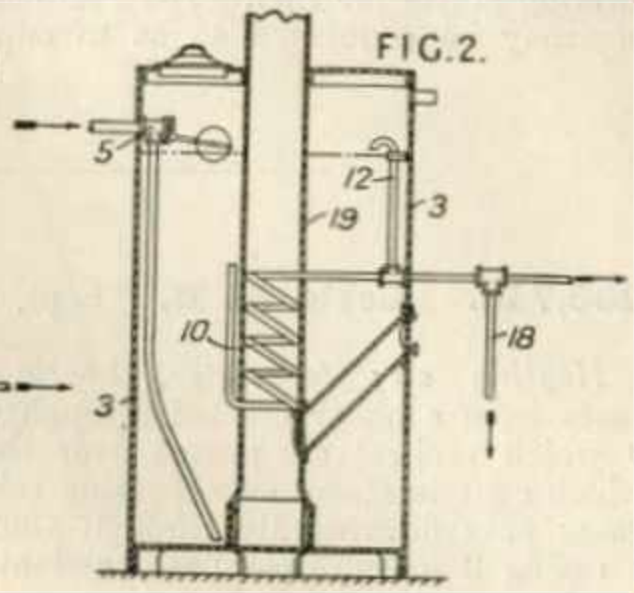


FIG. 2.



Reference has been directed by the Comptroller to Specifications 26397/07, 574/11, and 2339/11.

285,783. Owen, W. H. Nov. 16, 1926.

Heating air.—An air heater of the plate type has removable bundles of heating elements *a* arranged on each side of air inlet and outlet ducts d^1, d^2, the air spaces between the plates communicating with the ducts through openings a^1, a^2. A horizontal partition *d* separates the air inlet duct d^1 from the outlet duct d^2 so that the air passes downwardly while hot waste gases pass upwardly in alternate spaces between the plates, steam pipes b^1 being provided to act as soot blowers. Doors *c* for removal of the elements are placed at the ends of the rows of elements, as described in Specification 285,550. Two or more rows of elements may be superposed in tiers on each side of the air ducts.

FIG. 1.

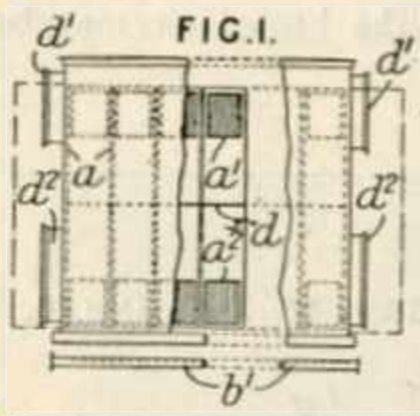
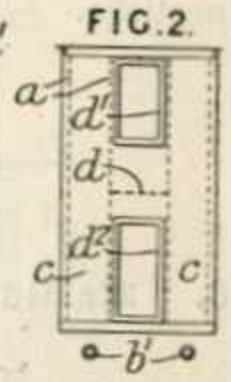


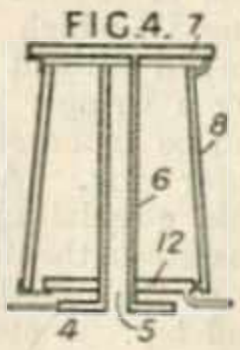
FIG. 2.



286,158. Tocchio, M. Aug. 15, 1927.

Geysers; composite boilers.—A water-heater comprises a plurality of receptacles 4, 12, 7 arranged one above the other, a flue 5 passing through them all except the uppermost, a water jacket 6 or spiral tube around the flue, an outer jacket 8, and means for connecting the jackets and receptacles in series. In the example each receptacle may have a partition to cause the water to traverse the whole surface of the receptacle and a perforated distributing ring may be fitted in the outer jacket.

FIG. 4.



286,513. Zepp, O. May 18, 1927.

FIG. 4.

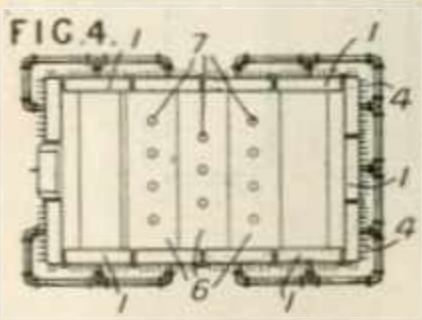
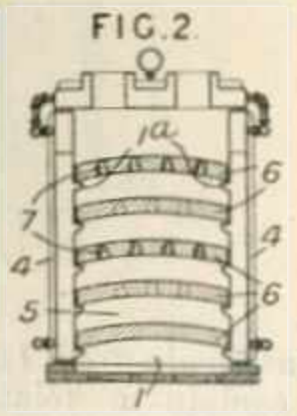


FIG. 2.



Internally-fired boilers.—A boiler constructed of closed shallow water-holding sections 1 enclosing

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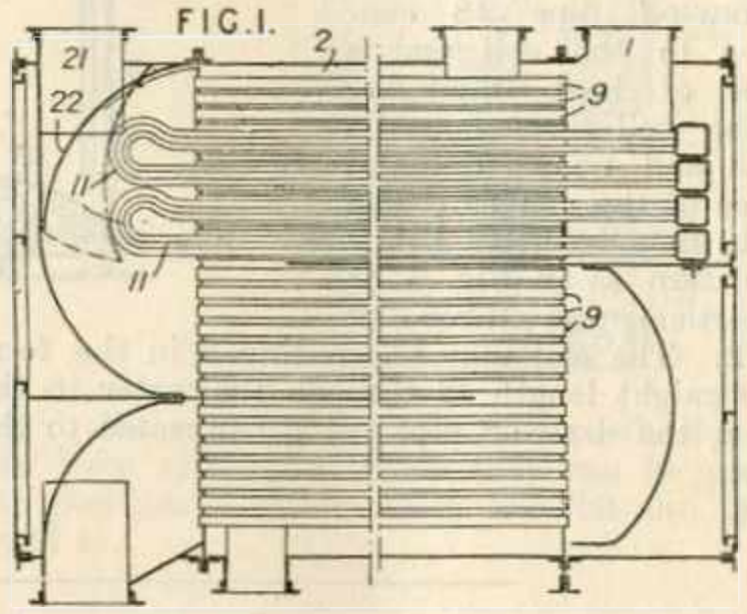
a furnace-chamber 5 is provided with ledges 1a to support a tier of sectional refractory arches 6 forming grates for fuel. The sections of the casing may be connected so as to supply two independent water systems, and may have gills 4. The arches may be provided with tapered apertures 7.

286,746. Leek, A. E. Sept. 2, 1926.

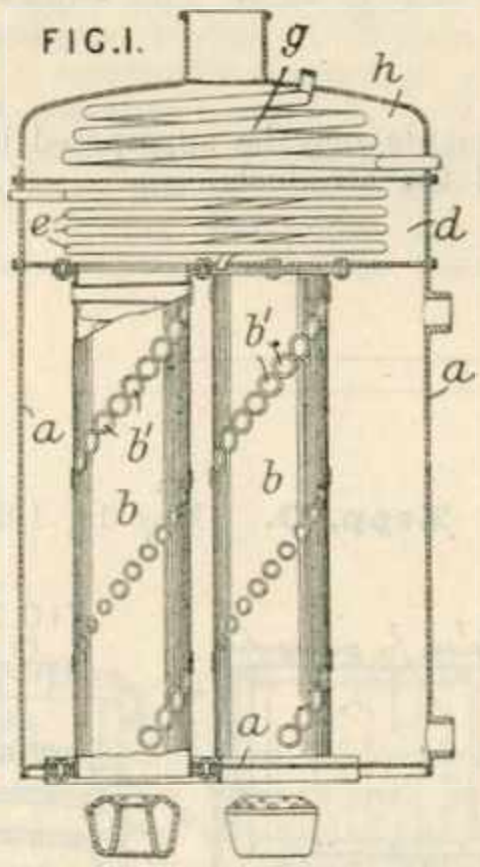
Heating air; feedwater, heating.—The flue gases from a boiler are led through smoke tubes 9 which preheat air passed over the tubes and which contain steam superheating tubes 11. Flue gases pass downwardly through smoke tubes in a casing 2 in multiple pass, and air is led upwardly over the tubes in a sinuous course. The superheating tubes are placed in the smoke tubes of the first flue pass. Feed heating tubes may be placed in the smoke tubes of the second and third passes. The first pass may be cut out of the gas circuit by supplying the gases through an inlet 21 at the opposite end of the casing to the usual inlet 1. The inlet 21 is normally closed by a hinged plate 22. Flue gases may be taken from several boiler flue passes to the heater flue passes under the control of dampers in the flue pipe connections. The heated air may be led into the second heater flue pass when the boiler is under a light load. Specifications 260,083 and 279,663 are referred to.

FIG. 1.



286,766. Halliday, T. E. Dec. 6, 1926.

FIG. 1.



Internally-fired boilers.—A casing *a* adapted to contain a relatively large body of water is fitted with one or more flues *b*, with spirally arranged tapered cross water-tubes b^1, as described in Specification 239,040. A flue may be surrounded by a spaced-out circulating-jacket having apertures at top and bottom.

286,854. Davies, C. Feb. 10, 1927.

Washing-boilers of the type in which the pan A is supported at the lower end by feet &c. B are provided with covers consisting of an outer ring D shaped to prevent spilling of the contents and a central lid E, removable or hinged to the ring D, which can be opened without disturbing a wringer &c. that can be mounted on the outer ring. A removable circulating device has strengthening cones G at the junction of the tube C with the bottom and top. A stepped flange H is attached to the bottom of the pan to act as a flame protector.

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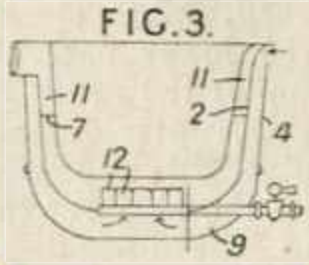
286,942. Brostrom, F. V., and **Abildgaard, J.** June 21, 1927.

Washing-boilers.—In a gas-heated washing or like boiler, in which combustion occurs in a closed space formed by a jacket 2 around the boiler, the only inlet for secondary air is through the centre of the ring burner 12. An apertured baffle wall 7 divides the combustion chamber from an upper chamber 11 to which the flue is connected. Both primary and secondary air may be heated in a space 9 formed by an outer jacket.

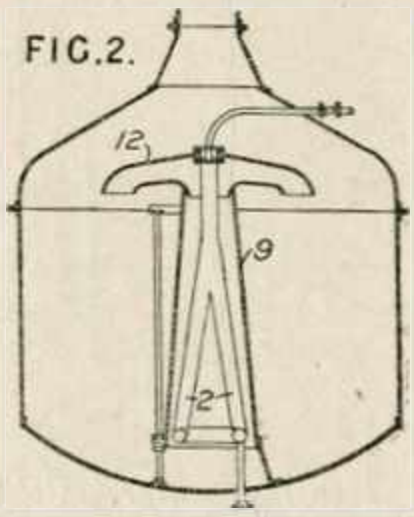
FIG. 3.



286,955. Kock, H., and **Quitt, R.** July 15, 1927.

Digesters. — The heating means of a digester comprises steam tubes 2 enclosed within an ascending pipe 9 provided at the top with downwardly directed orifices 12. The complete circulating device may be adjustable in height by means external to the boiler, and the distributor 12 may rotate under the influence of sidewise directed nozzles with or without the tube 9. The tube 9 may be made in semi-cylindrical parts hinged for easy access of the steam tubes. In a further modification, the heater comprises an annular steam space mounted in an external circulating pipe connected at the bottom and top of the boiler.

FIG. 2.



287,205. Owens, J. S. Dec. 7, 1926.

Block-form boilers; internally-fired boilers.—Relates to boilers in which the fire-space 3 is so arranged that the fuel is prevented from contact with the boiler 8, 39 on one or more sides by a vertical or steeply-inclined grate 15, 41, the upper end of which may be supported by the boiler. The heating flue leading to the rear uptake 9, 48, is bounded on its lower side by the ash-pan 28, 46 and on the upper side by the lower edge of the boiler at or about the level of the grate 13, 43. The front of the boiler may be ribbed as at 16. By alteration of the position of the damper 36 or, in the boiler, Fig. 6, the ash-pan 46, controlling the draught to the rear flue, and that of the canopy 21 with plate 25, Fig. 2, the passage of the bulk of the air through the fuel entering may be varied in one case at the front and passing out through the back grate under the boiler, or being more or less directly diverted to the top flue or entering the grate at the bottom end back of the fire, passing out through the front and top.

FIG. 6.

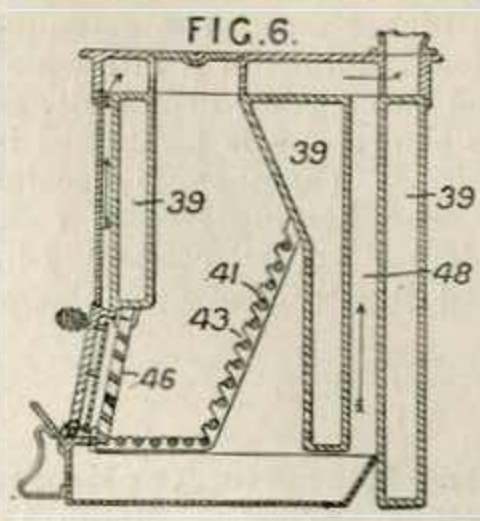
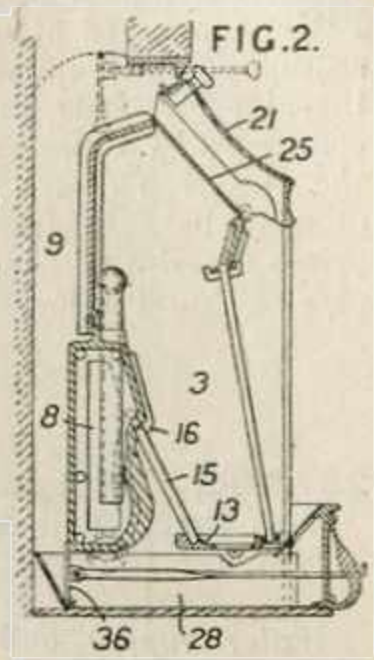
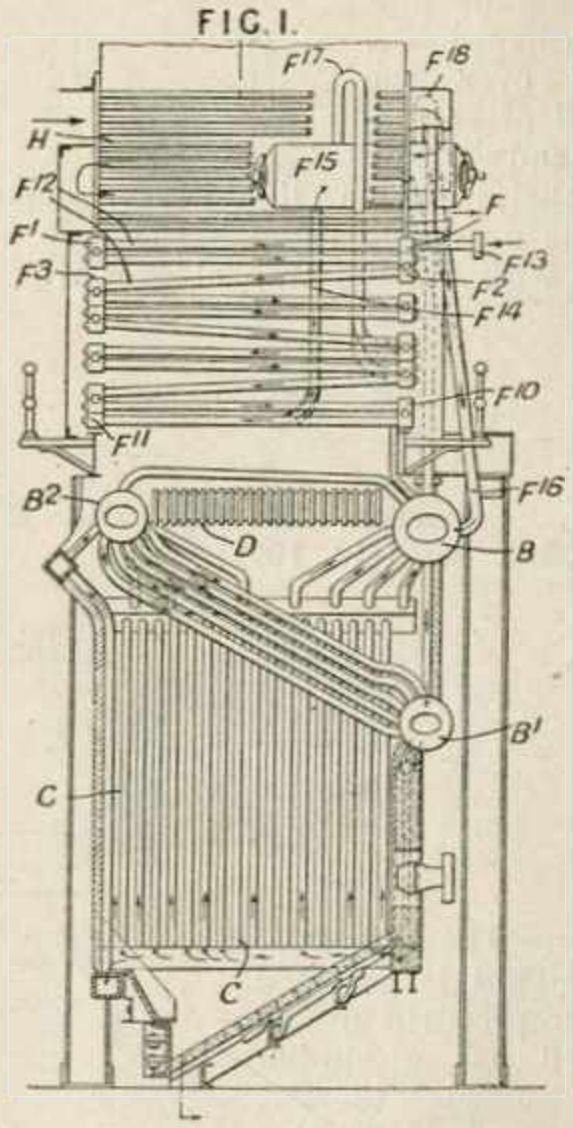


FIG. 2.



287,273. Vennum, G. C. Jan. 22, 1927.

FIG. 1.



Feedwater, heating.—In a boiler comprising a steaming section and a superposed water heating section, means for normally maintaining a body of water in the heating section and so preventing flooding of the steaming section are provided which consist of pipes F^{14}, F^{16} extending from the bottom of the heating section upward to a level corresponding substantially to the top

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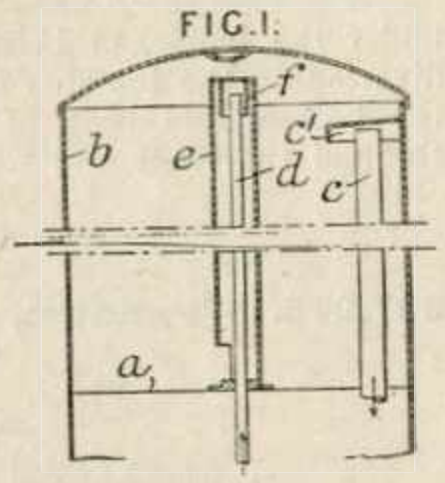
thereof and thence downwardly to the steaming section, and a steam and water drum F^{15}, located at the top of said pipes and into the bottom of which the pipe F^{14} opens and to which the pipe F^{16} is connected at a higher level. The steaming section comprises a steam and drum B into which the pipe F^{16} leads, and two further drums B^1, B^2 connected by tubes as shown and is positioned in the open top of a furnace chamber C located directly beneath it. The heating section comprises a series of headers F - - F^{11} connected by pipes F^{12} and is located directly above the steaming section in a single pass from the furnace chamber. The pressures in the drums B, F^{15} are equalized by a tube F^{18} connecting the top of each, while steam vent pipes F^{17} leading from the lower part of the heating section into the top of the drum F^{15} may be provided. In operation, water enters the heating section through a pipe F^{13} and after passing therethrough is led by the pipe F^{14} to the drum F^{15} and from thence to the steaming section by the pipe F^{16}. A superheater D and air-heater H are provided as shown.

287,704. Hotpoint Electric Appliance Co., Ltd., and **Sims, W. J.** March 11, 1927.

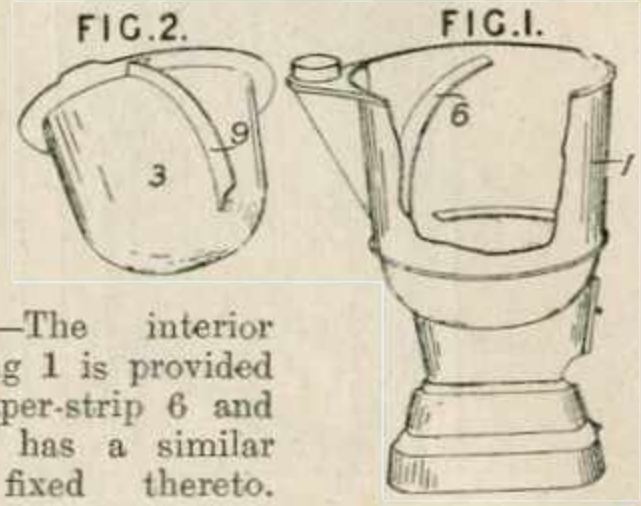
Water supply and delivery.—A liquid heater comprises in combination a container *b* an inlet pipe *d* passing upwards through the base to above the liquid level, a channel *e* open at both ends surrounding the pipe *d*, a cup-shaped deflector *f* over the upper end of the inlet pipe and within the channel, and a liquid level-determining outlet pipe *c* passing through the base *a* of the container with a scum trap c^1 over it.

FIG.1.



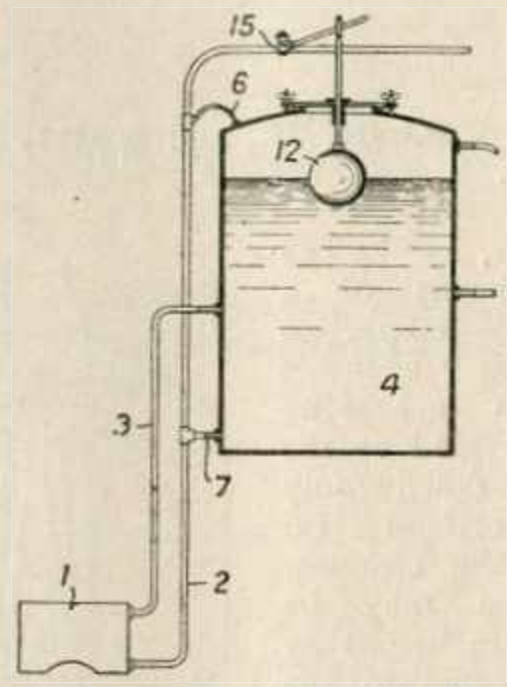
287,733. Smith, H. T., and **Clarke, E. J. B.** April 19, 1927.

FIG.2. FIG.1.



Set-pans.—The interior of the casing 1 is provided with a scraper-strip 6 and the pan 3 has a similar strip 9 fixed thereto. When the pan is in position for use the two strips are in contact. By rotating the pan in the casing the surfaces of both pan and casing are scraped for the removal of soot &c., which falls to the bottom.

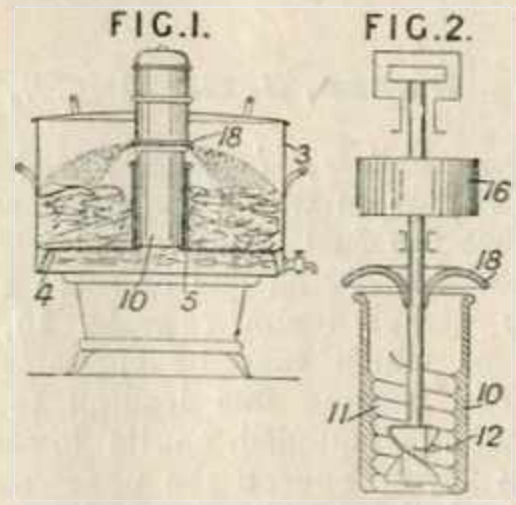
287,740. Bailey, M. I., and **Burgess, W.** May 3, 1927.



Heating water.—Cold water supplied directly to a boiler 1 from an external main 2, is controlled by a valve 15 operated by a float 12 in accordance with the level in the hot water tank 4. Circulating connections 3, 7 and a vent 6 are provided.

288,332. Ernstein et Cie, F. April 7, 1927, [*Convention date*].

FIG.1. FIG.2.



Washing-boilers.—A cylinder 5 is secured to a perforated false bottom 4 of the washing tank 3 and contains a tube 10 having an internal spiral thread 11. A screw propeller 12 is rotated within the tube, for example, by an electric motor 16

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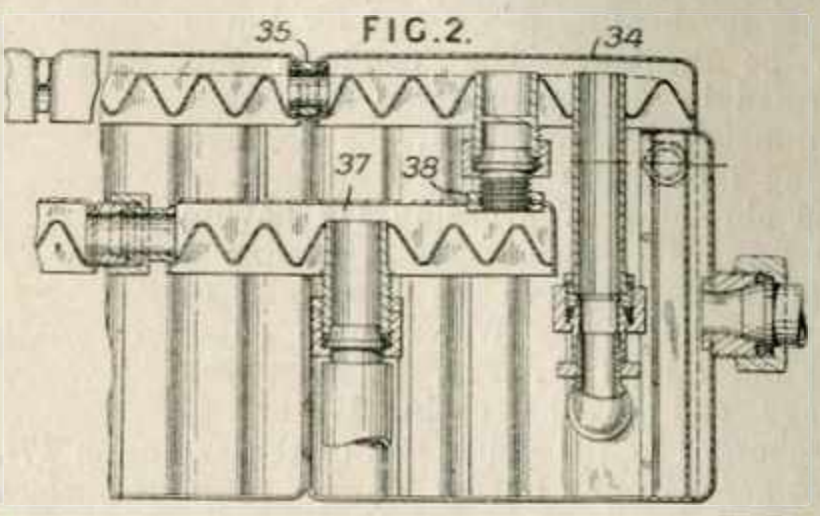
the water raised being deflected by a baffle plate 18. The direction of circulation may be reversed. The tank is heated by gas, electricity, coal or otherwise and may be provided with a heat-insulating cover.

288,443. Lambert, A. J., and **Lambert Heater & Engineering Co., Ltd.** May 2, 1927.

Internally-fired boilers.—A water heater comprises shallow rectangular cells through which the water flows preferably in succession heated by flame or internal electric resistances, arranged in a plurality of groups, some or all of the individual cells of one or more groups being secured together in series by readily detachable connections and some or all of the groups themselves are also secured together by detachable connections. In the example, the internal walls of the cells are corrugated. Certain of the top cells 34 are secured by fixed connections 35, certain of the lower cells 37 are secured by detachable connections, while the groups constituted by the cells 34, 37 are united by detachable and adjustable connections 38.

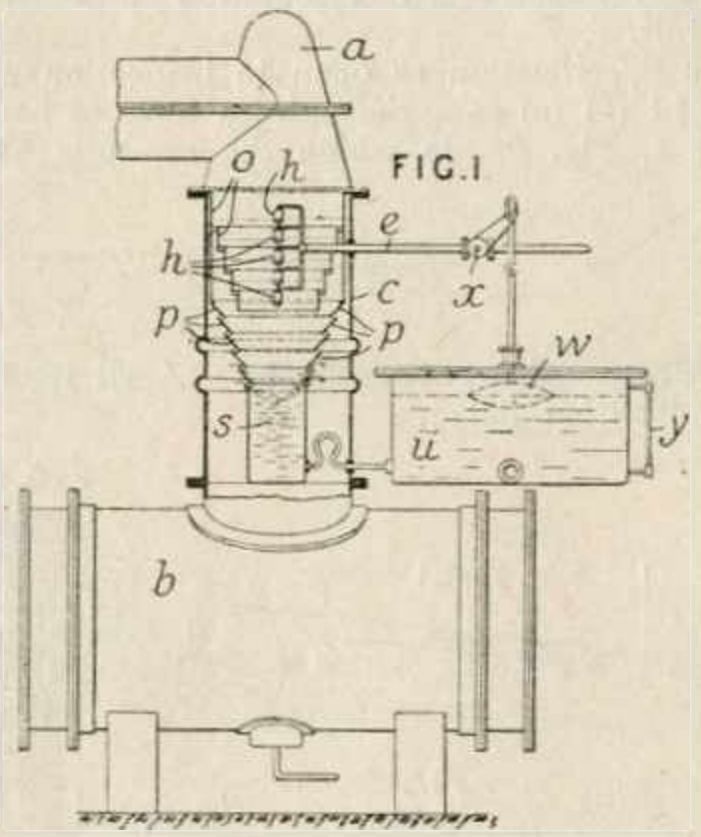
FIG. 2.



288,453. Olbricht, H. M. May 25, 1927,

Feedwater, heating.—An auxiliary steam condenser, fitted in the conduit *c* between the exhaust *a* of the power plant and the main condenser *b*, is provided with a water receptacle *s* communicating with a reservoir *u* from which the hot water may be withdrawn for use as boiler feedwater. The auxiliary condenser comprises superposed spraying-nozzles *h* adapted to direct films of water outwardly against a series of rings *o* of decreasing diameter downwardly, the space between the nozzles *h* and the receptacle *s* being fitted with spaced conical rings *p* to permit the residual steam to pass to the main condenser *b*. The reservoir *u* is fitted with a gauge *y* and a float *w* connected to a valve *x* in the pipe *e* supporting the nozzles *h*.

FIG. 1.

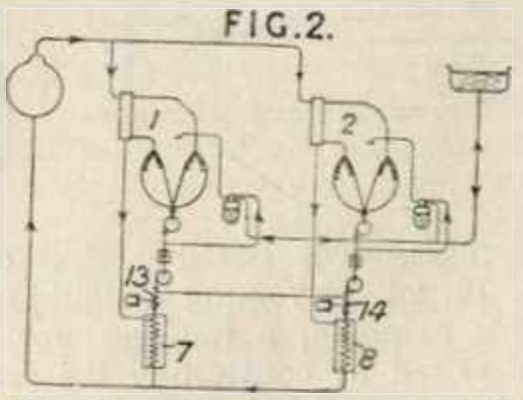


288,545. Akt.-Ges. Brown, Boveri, et Cie. April 11, 1927, [*Convention date*]

Feedwater, heating.—In steam plant employing turbines 1, 2 in parallel each with an associated feed-heater 7, 8 heated by tapped steam, the feed pipes are interconnected before the heaters, the flow through any preheater being controlled by valves 13, 14 in accordance with the load on the corresponding turbine. The control is effected by the pressure in the oil-actuated regulating-system of the turbine plant.

The Specification as open to inspection under Sect. 91 (3) (a) comprises also control effected electricially from the generator driven by the turbine or according to the steam pressure at the tapping point. This subject-matter does not appear in the Specification as accepted.

FIG. 2.



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288,594. Bastian-Morley Co., (Assignees of *Morley, J. P.*). April 13, 1927, [*Convention date*].

FIG.26

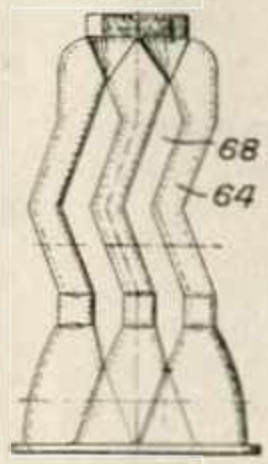


FIG.3.

FIG 9

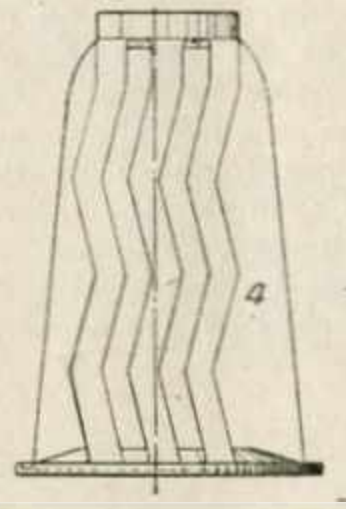
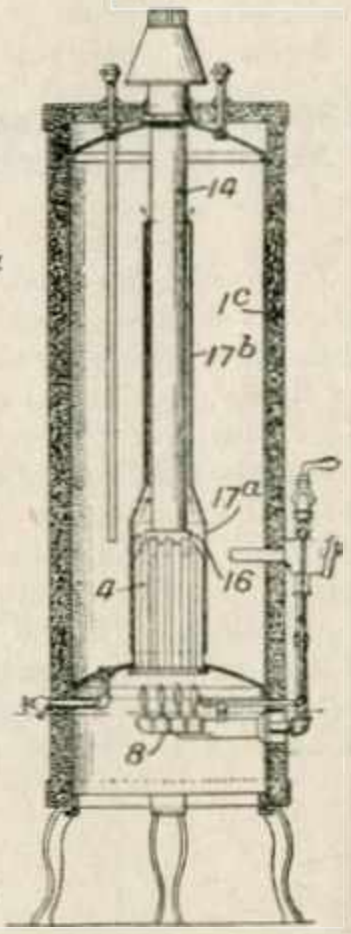


FIG.1



Internally-fired boilers.—In a heating apparatus, described as a water heater, a heat exchanging element 4 comprises a unit having integral conduits for heating gases and for liquid to be heated. The conduits are formed by deeply indented side walls symmetrically arranged, the element being mounted within a container 1c and shrouded by a casing 17a having an upward extension 17b encircling a flue 14 connected to the upper end 16 of the element. Water can enter the outer bays *b*, Fig. 3, past the lower end of the casing 17a and is discharged at the upper end of the extension 17b. Hot gases from a burner 8 sweep over the surface of the inner bays *a*, Fig. 3, and escape by the flue 14. In modifications, the indented sides of the unit 4 are of regular formation, Fig. 9, or of sinuous formation with curved surfaces and the central flue passage into which the indentation project may be straight or zig-zag. Instead of mounting the heating element in a large container as shown it may be mounted in a smaller casing connected by circulation pipes to a reservoir.

The Specification as open to inspection under Sect. 91 (3) (a) comprises also a form of heating element, Fig. 26, in which the conduits 64 for flue gases are separate, and passages 68 for water are formed between them. This modification now forms the subject-matter of Specification 300,618.

288,650. Castellazzi, A. April 15, 1927, [*Convention date*].

FIG.9.

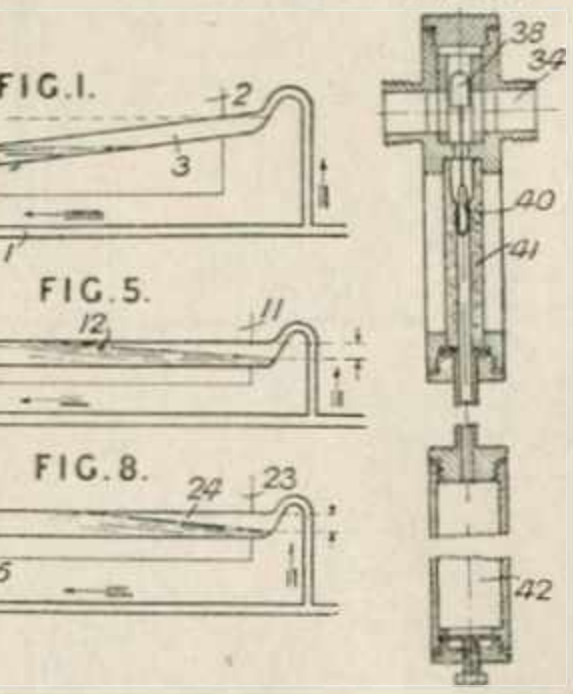


FIG.1.

FIG.5.

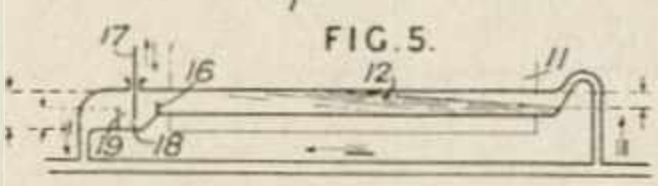
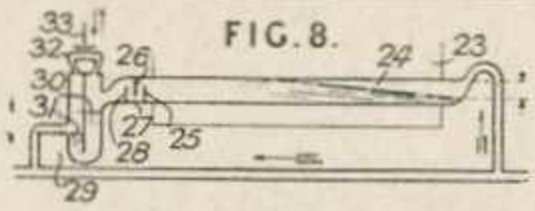


FIG.8.



Heating liquids.—The heating effect of steam in a pipe 3, 12, 24, traversing a liquid-container 2, 11, 23, for example, a radiator for heating buildings, is raised by controlling the amount of heating surface covered by condensate. The heating pipe 3 is connected at its end to piping systems serving for supply of steam and removal of condensate the pressures at inlet and outlet being substantially equal. In the examples, one steam main serves for both purposes, the heaters being connected directly at the outlet and through an uprising siphon-pipe at the inlet. The heating pipes may be inclined, Fig. 1, or horizontal, Figs. 5, 8. The control may be effected (1) by discharging the condensate from the heating body by an overflow, the sill level of which can be altered; (2) by discharging the condensate through an opening having a given passage area and working with a given head; (3) by discharging the condensate through an opening of determined area delivering into a space which is maintained at a given pressure. In carrying out (1) the variable weir may be obtained by a sliding plate 5, Fig. 1, the steam pipe 1 serving also for carrying away condensate being connected to the heating body at each end. In place of a sliding plate a flexible tube or movable inverted **U** pipe may be used. Fig. 5 shows a method of carrying out (2) a sliding plate 17 controlling an aperture 18, weirs 16, 19 being also provided. A rotating cylindrical valve or a flexible tube may replace the weir 19. The method (3) may be carried out as shown in Fig. 8, in which diaphragms 25, 26, 28 are provided in the heating body 24, the aperture 27 being of definite area. An outlet siphon 29 is provided with long and short branches 30, 31 which can be put into communication by passages in a

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valved tube 32. This valve 33 will control the difference in pressure in the two branches of the siphon, and hence the rate of outflow of condensate in conjunction with the fixed aperture 27. The heating effect may be varied automatically according to the temperature of the liquid heated, or at will from some distant point. Fig. 9 shows a liquid, for example, mercury, filled bulb 42 in connection with which is a glass tube 41 having a plunger 40 operating a plunger 38 which controls the passage 34 connecting the two branches of the siphon 29, Fig. 8. If the bulb 42 is immersed in the liquid to be heated the temperature will be kept constant. If the bulb is not so immersed but is surrounded by an electric heating-resistance control of the valve and hence of the heating may be effected from a distance and may be exerted over one or more heating bodies simultaneously.

288,849. Cannon, F. June 1, 1927.

Geysers are constructed so that internal trays, vessels, covers, chimney and funnel for introduction of water, tank, gas burner and water pipe can be readily removed from the casing or re-positioned therewith. In Fig. 1, the top vessel 23, trays 16 - - 20 and collector 9 are each supported by hooks engaging sockets on the casing, and by rods 16^b - - 20^b, or bracket 7. The casing may be heat-insulated and may open on one side as a door. In Fig. 9, the trays &c. are mounted one on the other, hot gases passing upwards through openings 38, 33 - - 36 through which also passes the descending water. Specifications 159,751 and 200,028 are referred to.

FIG.1.

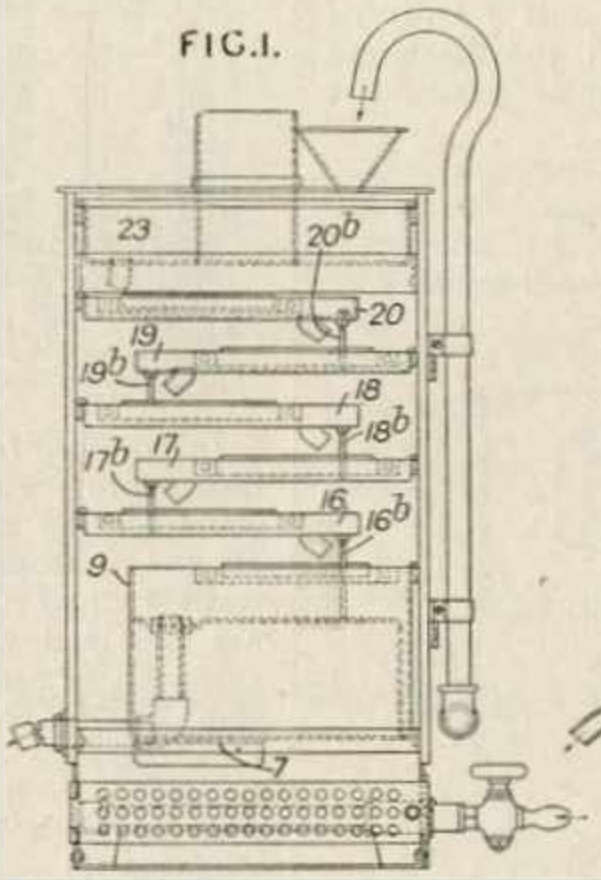
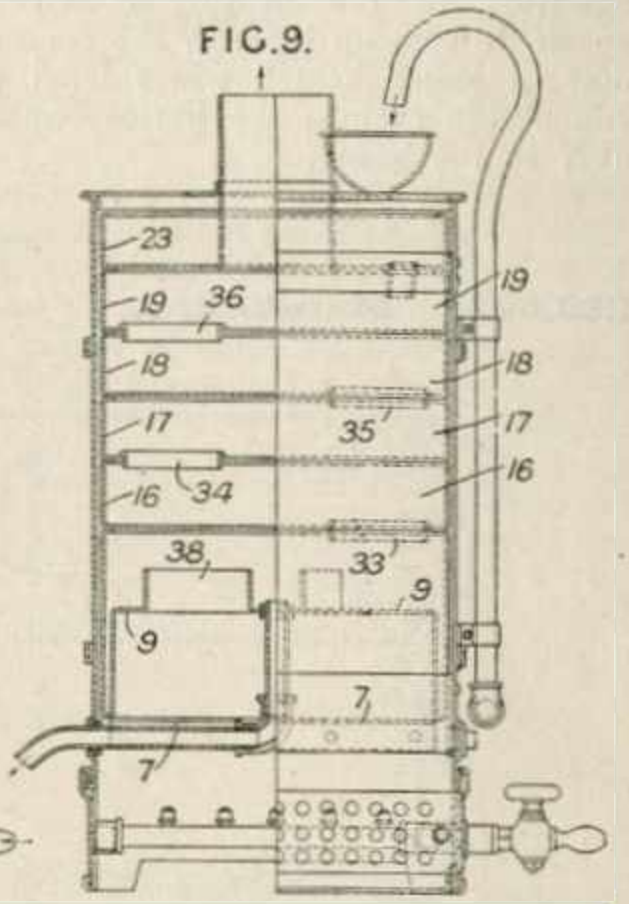


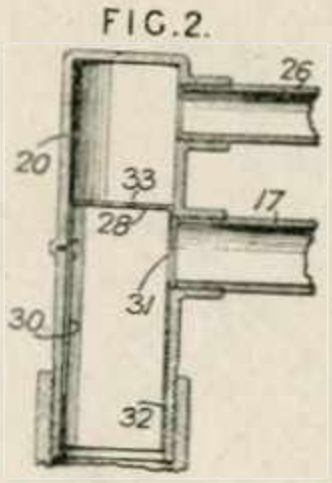
FIG.9.



288,906. Estabrook, O. L. Oct. 6, 1927.

Heating water.—To control the circulation between a boiler and a hot water tank, means are provided to restrict the flow from the boiler to the tank on drawing off hot water from the tank. In the example, a sliding sleeve valve 28 in a fitting 20 mounted on top of the tank and open at its lower end to the hot water, in the normal position shown permits water from the boiler to flow into the tank through the pipe 17 and aperture 31. On opening a tap on the service pipe 26 the valve 28 rises bringing a small aperture 32 opposite the pipe 17, the large opening 31 allowing water to pass from the tank to delivery. The valve has a guide slot 30 and a small relief aperture 33.

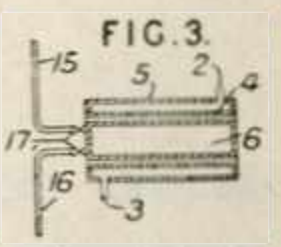
FIG.2.



289,237. McKean, J. G., and **Jones, R. F.** March 26, 1927.

Heating liquids.—Apparatus for heating oil &c. comprises a chamber 5 provided with a plug compartment 4 and a heating element 6 adjustable longitudinally in the plug compartment to vary the heating effect. The chamber has an inlet 2 and outlet 3. The heating element comprises a tube provided with flexible steam connections 15, 16, fitted with valves 17, and is carried by a rod adapted to slide in an eye formed on the chamber 5 and fitted with a set screw for securing the heater in the required position.

FIG.3.



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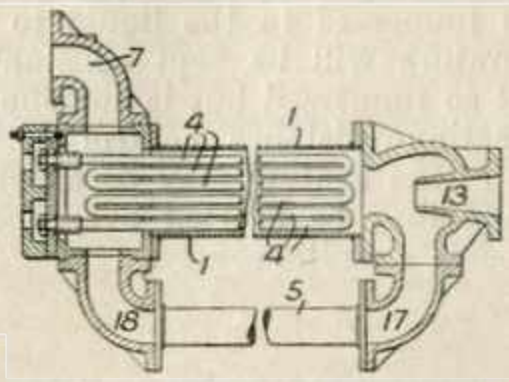
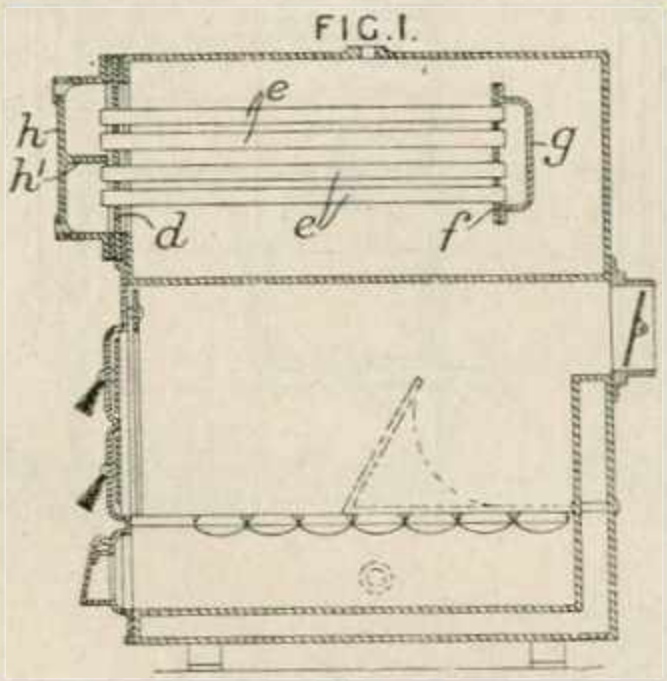
289,301. Wyndham, J. N., and **Wyndham, S. L.** July 29, 1927.



Feedwater, heating.—Steam-heated tubes 4 are mounted in a casing 1 through which feedwater passes, there being a conduit 5 opening to the casing at each end 17, 18, whereby water admitted to the heating chamber through a nozzle 13 sets up through the conduit 5 a return flow of lesser heated water from the discharge end of the casing; the hottest water passes out at 7 to the boiler.

289,622. Marshall, L. April 9, 1927.

FIG. 1.



Heating water.—A horizontal boiler is fitted with a tube-plate *d* over an opening in one end wall, carrying straight tubes *e* projecting horizontally into the water or steam space and united at their inner ends by a header *g* and tube plate *f*, a domed plate *h* with division *h*¹ covering the outer tube plate *d*. A separate supply of water is heated by passage through the tubes *e*.

289,844. Digeon, C. May 4, 1927, [*Convention date*].

FIG. 1.

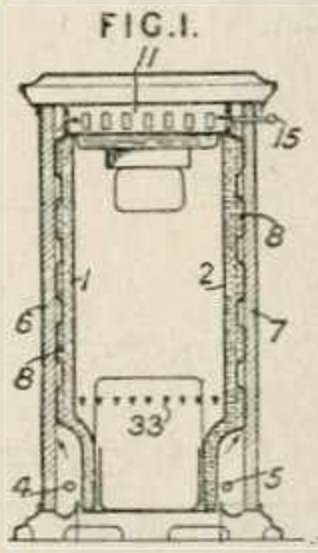
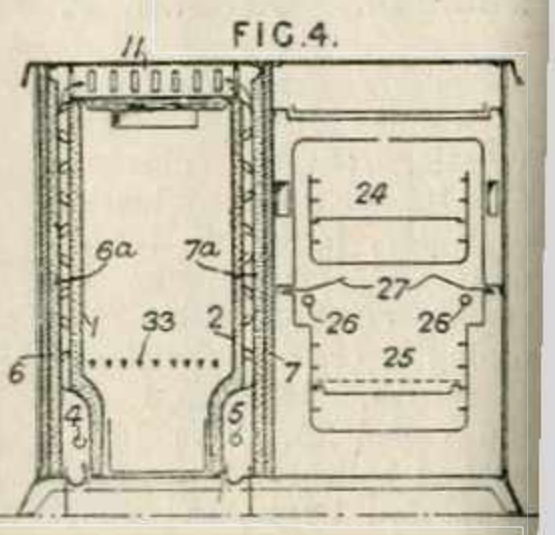


FIG. 4.



Internally-fired boilers.—Two separate heating means are used wholly or partially acting on the same heating parts of a boiler for central heating. In the example, Fig. 1, the opposite slab-like walls 1, 2 of a fire chamber, with coal grate 33, are provided with ribs or corrugations on both sides, those 8 on the outer sides serving to space the slabs from the insulating walls 6, 7 to provide flue-spaces through which pass the gases from gas or liquid-fuel burners 4, 5. Separate flue connections are provided, the exit from the chamber 11 connected with the side flues being controlled by a register 15. In the modification, Fig. 4, addition water-walls 6*a*, 7*a* are provided and a gas or liquid-fuel cooking range is shown combined with the boiler. In the cooker, gas burners 26 supply heat to roasting and baking ovens 25, 24, baffles 27 being provided.

289,948. Watson, G. Feb. 3, 1927.

Boilers.—The rectangular brickwork shell of an incinerator is replaced at one corner by a boiler, the structure being held together by angle plates *b* and straps *t*, *u*. The boiler is of vertical type and has an internal flue crossed by water-tubes *p* and in alignment with the external chimney *g*.

FIG. 2.

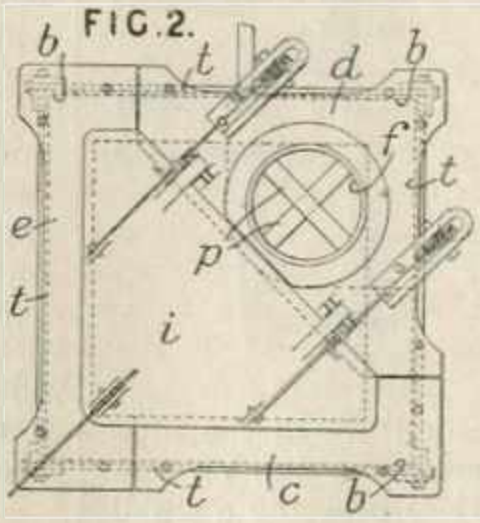
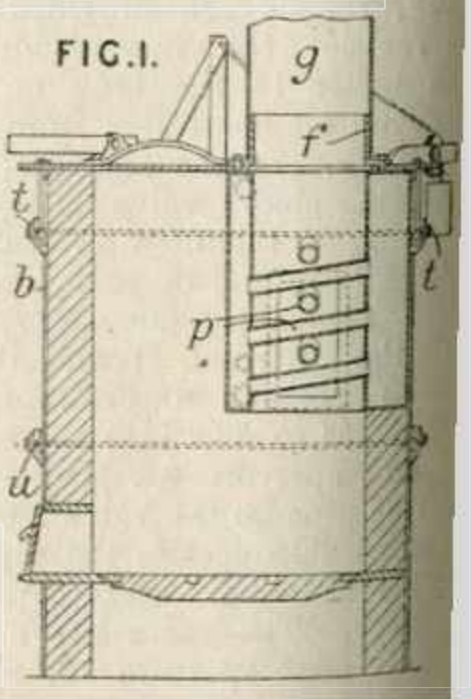


FIG. 1.



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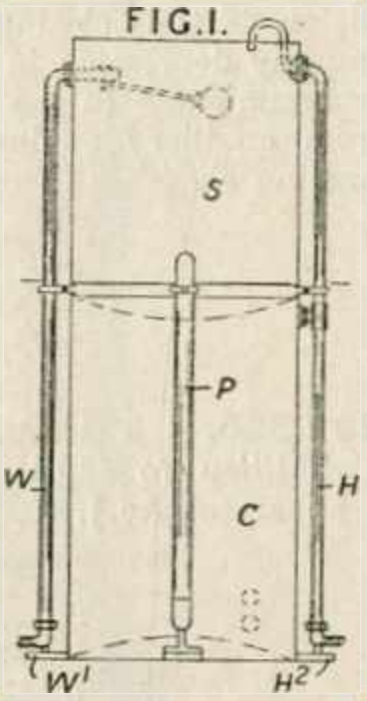
290,443. Crighton, J., and **Wright, J.** May 19, 1927.

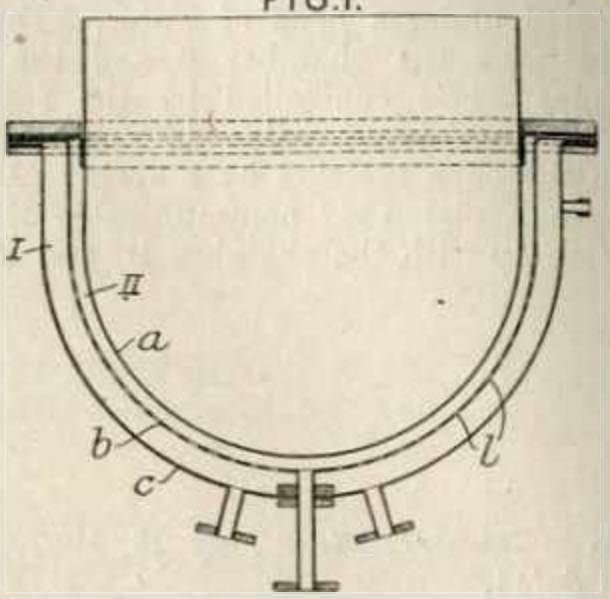
Heating water.—A cold-water feed-cistern S and hot-water storage tank C are mounted together upon tubular supports H, P, W which serve also to conduct water to and away from the tanks, all connections to external piping being made at the lower ends of the supports at the point of attachment of the feet W^1, H^2. An air-space may separate the two tanks.

FIG. 1.



290,496. Berndorfer Metallwaren-fabrik A. Krupp Akt.-Ges. June 30, 1927, [*Convention date*].

FIG. 1.



Boiling-pans.—A double walled cooking vessel &c. is provided within the jacket *c* with a single partition *b* having fine openings *l* thus dividing the jacket into two separate compartments I, II. The heating steam is admitted to one I and is forced in thin jets through the openings *l* on to the surface *a* to be heated. Specification 255,364, [*Class* 64 (iii), Surface apparatus &c.], is referred to.

290,598. Auxiliaire des Chemins de Fer et de l'Industrie. May 16, 1927, [*Convention date*].

Feedwater, heating.—Feedwater, supplied through the pipe 35 by a cold-feed cylinder 30 of the pump 36, is sprayed through a perforated pipe 7 in a chamber 6 to which exhaust steam is admitted through pipes 38, 2, 20, and regulator 1. Under the pressure existing in the chamber 6 water is transferred through a water seal 21, 22 to compartment 9 of chamber B, where contained air is released and it overflows a weir 9^a to compartment 10 from which the hot-feed cylinder 31 of the pump draws to deliver to the boiler inlet-fitting 32. Additional weirs 10^a, 11^a, control the passage of heated water in succession to further compartments 12, 27. From 12 surplus water passes to the suction chamber 13 which is also connected to the tender tank 15. Flood-

FIG. 1.

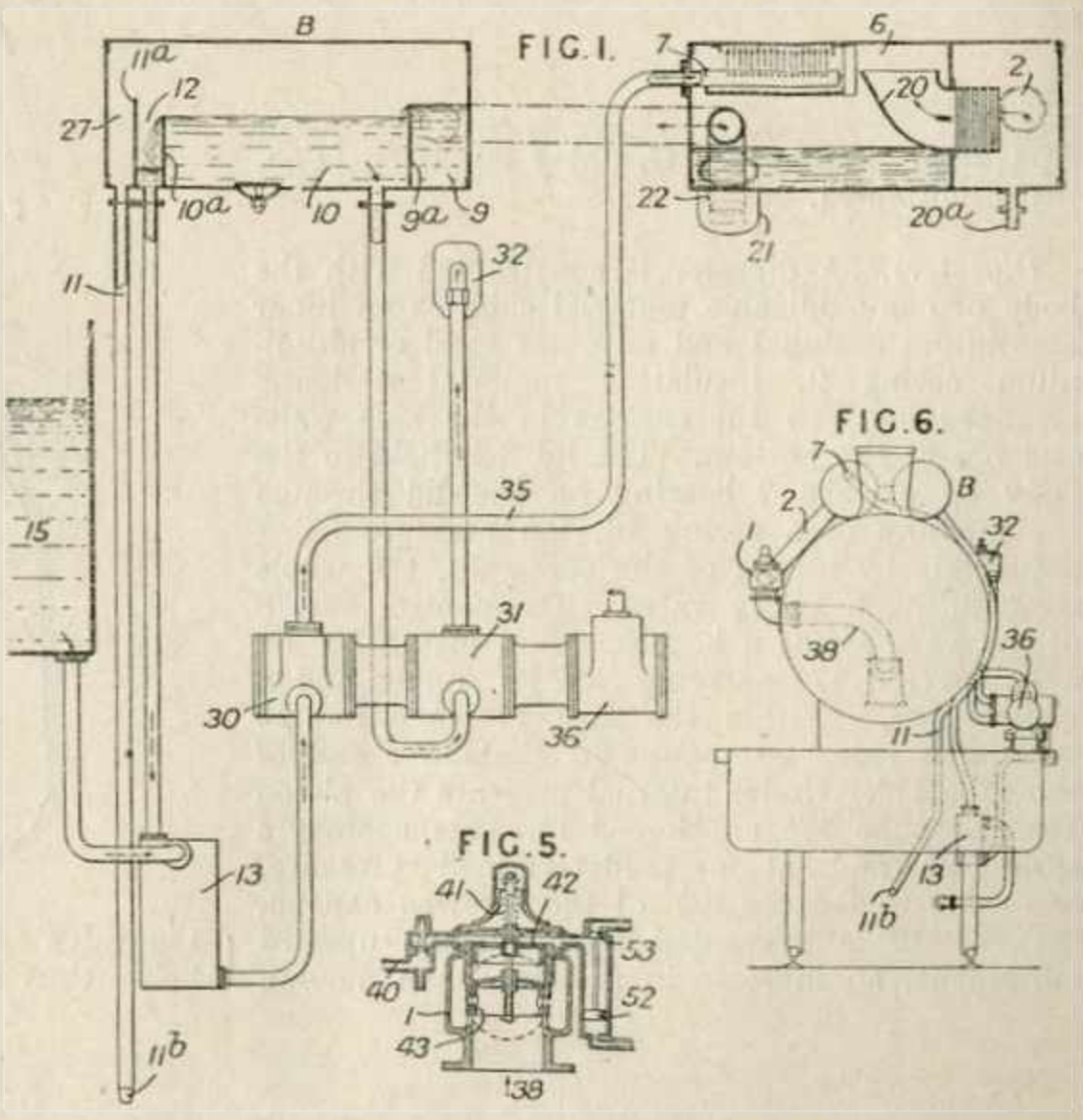


FIG. 6.

FIG. 5.

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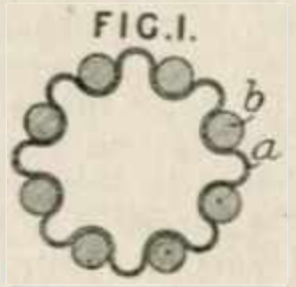
ing of the tank B is relieved through the pipe 11, connected to compartment 27, which is open to the atmosphere through a restricted nozzle 11^b. The tank B is mounted as high on the boiler as is practicable to enable the discharge to be effected under a head of water. The connection between the chamber 6 and the main exhaust pipe 38 is controlled by the regulator 1, Fig. 5, comprising a valve 43 normally held up and in the open position by a spring 41. The space above a piston 42 communicates through a connection 40 with the chamber B, and if pressure rises therein the supply of steam to the heating compartment 6 is reduced or cut-off. A smaller piston 52 is subjected on its under side to the pressure of steam admitted to the main engines and an attached valve 53 is kept closed. On shutting off the engines, the valve 53 opens and admits live steam to the space above the piston 42 thus closing the valve 43 and preventing any depression in the exhaust pipes 38 being communicated to the chamber 6. Exhaust steam from auxiliary engines can be supplied to the heating chamber through the pipe 20^a.

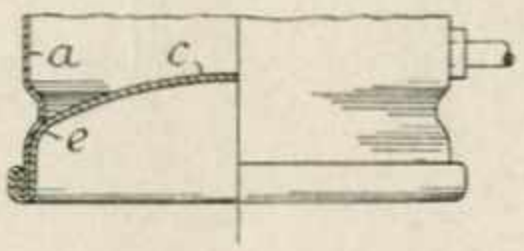
291,061. Debor, H. May 25, 1927, [*Convention date*].

Digesters. — A boiler for resisting high internal pressure has a corrugated wall *a* with bars *b* or equivalent reinforcing members. Such bars &c. may be secured in end plates and be braced with supporting bands along their length or with a helically-wound coil. If the container be divided by a diaphragm extending circumferentially outside the container, the bars &c. may pass through holes in the annular extension.

FIG. 1.



291,320. Fildes, T. S. Jan. 16, 1928. *Addition to* 140,184, [*Class* 69 (i), Hydraulic apparatus &c.].

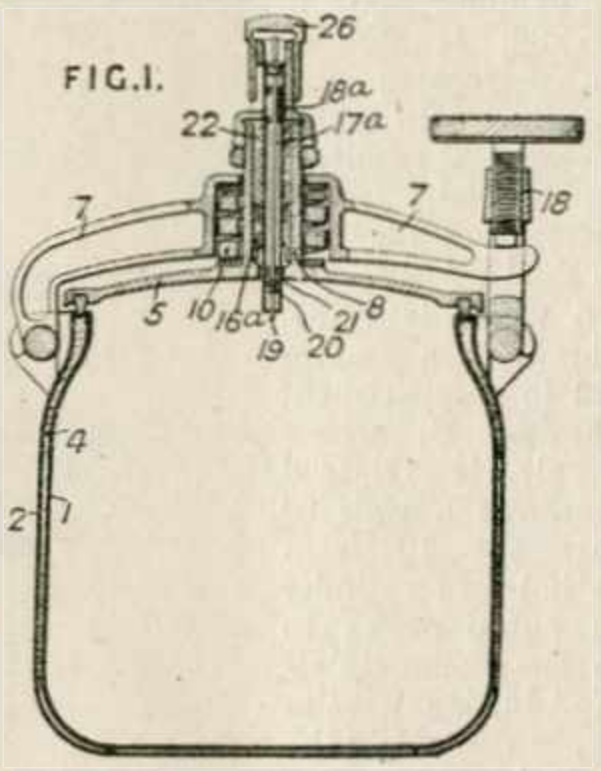


Heating water.—The bottom *c* of a hot water cylinder, secured to the side walls *a* by a double seam joint, has a flanged wall lying parallel to and matching the side wall of the tank for a distance greater than the depth of the seam. Preferably an internal ridge *e* is grooved in the side wall *a*.

291,364. Hautier, C. May 30, 1927, [*Convention date*].

Digesters.—A digester is constructed with the body of non-oxidizable material such as an inner aluminium casing 1 and an outer steel or aluminium casing 2, insulating material 4 being arranged between the casings in the side walls and not at the bottom. The lid 5 is held to the body by a yoke 7 bearing on the lid through the medium of a spring 10, the pressure being adjustable by means of the screw 18, the whole constituting a safety valve. The central part 8 of the yoke forms a housing for a piston 16^a on a hollow rod 17^a carrying at its upper end a whistle 18^a. Within the tube 17^a is a rod 19 bearing a valve 20 seating at the lower end of the tube 17^a. Under internal pressure the piston 16^a and tube 17^a are forced upwards against a spring 22 and at a predetermined pressure, according to the position of the screwed cap 26, the rod 19 is prevented from further upward movement, an increase in pressure then moving the valve seat 21 from the valve 20, the whistle being thus operated.

FIG. 1.



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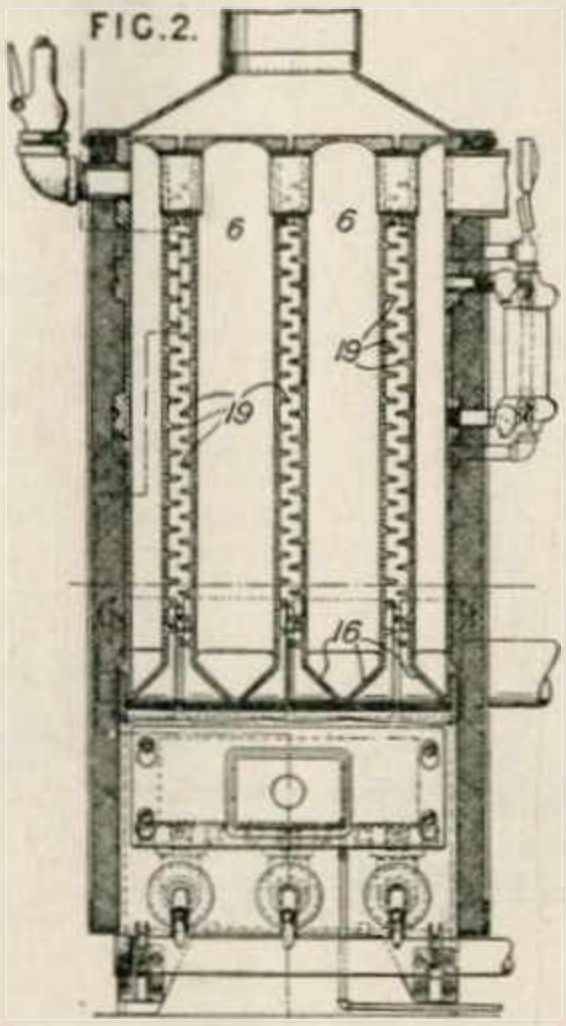
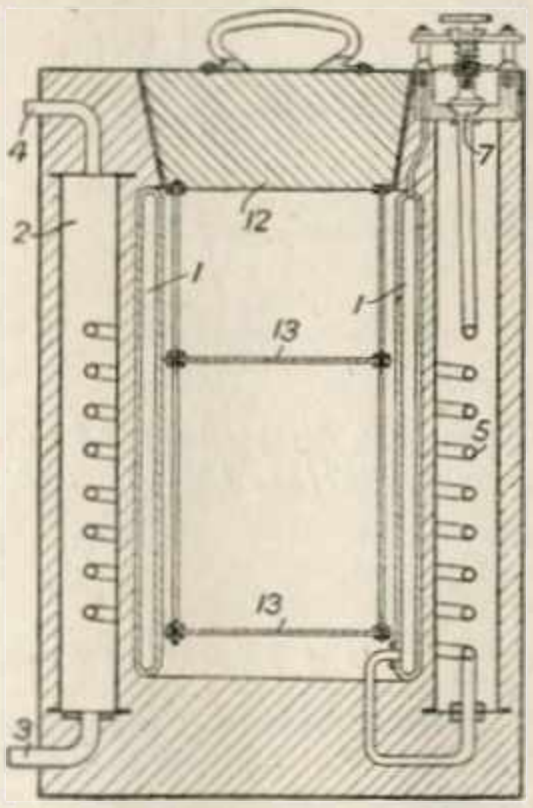
291,417. Bastian-Morley Co., (Assignees of *Clayton, M. M.*). June 4, 1927, [*Convention date*].

FIG.2.



Slab-form boilers.—A heater comprises a fire-chamber and a plurality of interconnected fluid-containing sections 6 with flue spaces between, into which extend horizontal ribs 19 which are out of horizontal alignment and in staggered relation. The lower ends 16 of the sections may be inclined. The flue spaces are closed at their sides by the insulating walls of the casing.

291,896. Sanders, G. March 16, 1927.

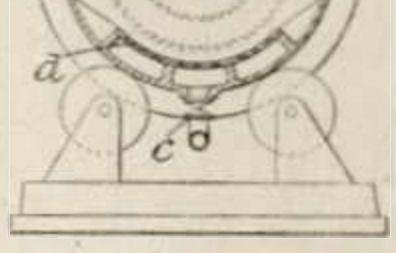


Heating water.—An annular boiler 1 surrounding a cooking space is connected through an adjustable spring-loaded valve 7 with a circulating pipe 5 arranged in an annular water chamber 2 having inlet and outlet connections 3, 4. The boiler is filled with water or other liquid and no circulation occurs until the vapour pressure is sufficient to lift the valve. The electric heating element is arranged in the boiler or the cooking space.

291,919. Wilder, F. L., Morris, E., Schiff, E., and **King, E. S.** April 6, 1927.

Digesters.—A rotary autoclave for treating ores with liquids under heat and pressure is fitted with a filtering partition *d* and steam heating coil *e*. The ores are introduced through a removable end plate and the liquids through cocks *b*. After the treatment the treating liquid is withdrawn through a cock *c*, the filter retaining the solid residue.

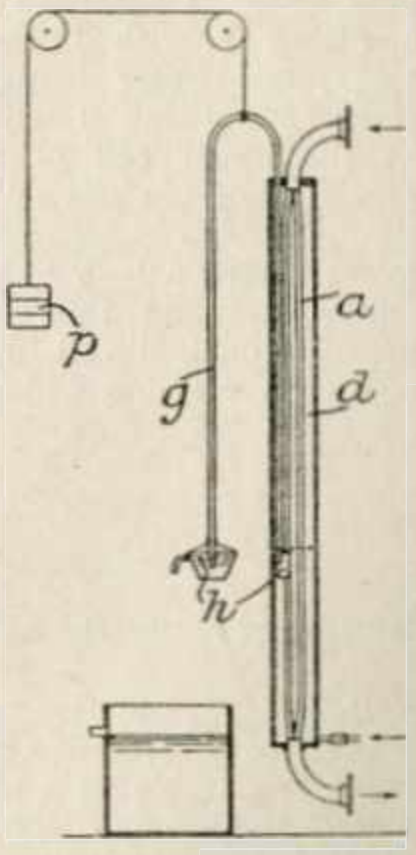
FIG.2.



292,070. Compagnie des Surchauffeurs. June 11, 1927, [*Convention date*].

Heating liquids. — In a heat-exchanger of the type in which the extent of the heat exchange is regulated by varying the amount of heat transfer surface exposed to both fluids, a movable syphonic take-off pipe varies the level of liquid in a casing *d*, through which tubes *a* carrying another fluid pass. The syphon pipe may be counterbalanced by a weight *p*. Receptacles *h* ensure that the syphon is kept filled with liquid.

The Specification as open to inspection under Sect. 91 (3) (a) comprises also a modi-



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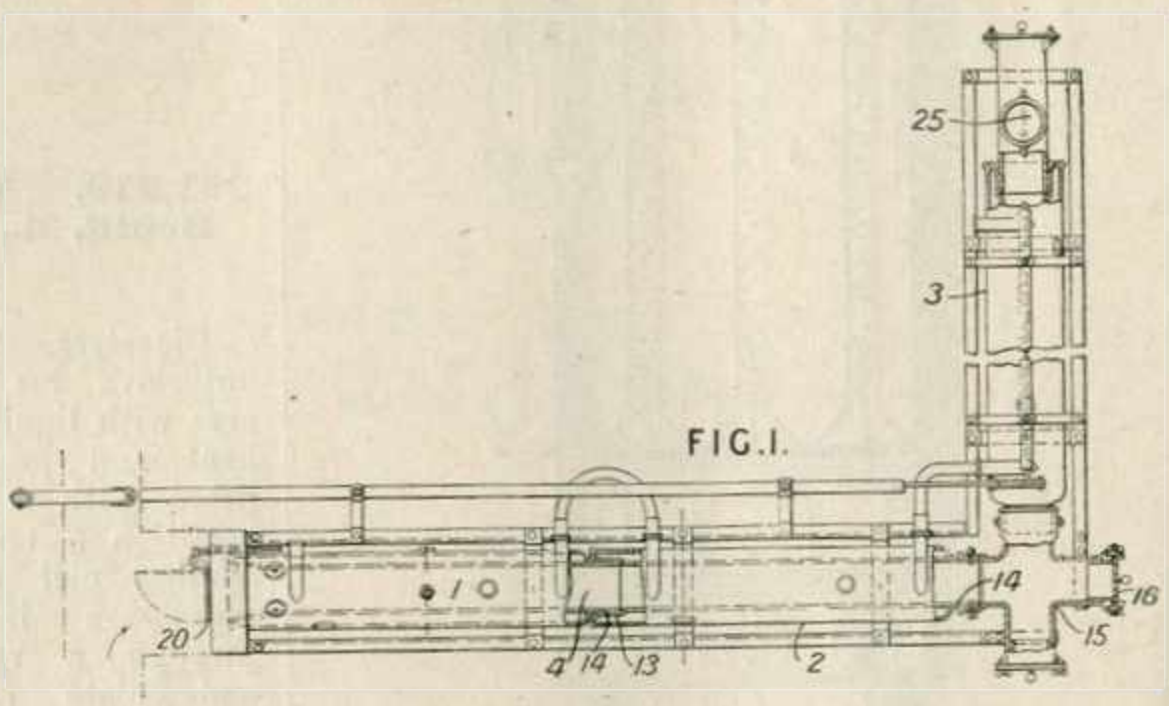
fication in which the level is controlled manually by a vertical series of cocks, and another in which the speed of flow of either or both heat exchanging fluids is controlled e.g. by suitable valves. This subject-matter does not appear in the Specification as accepted.

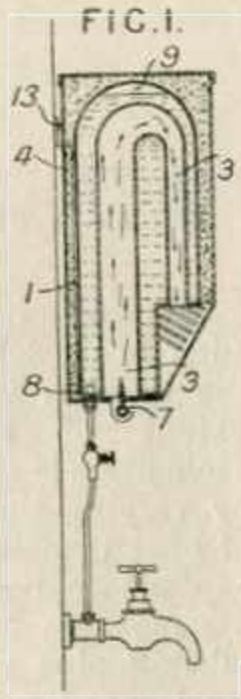
292,296. Veitch, J. April 8, 1927.

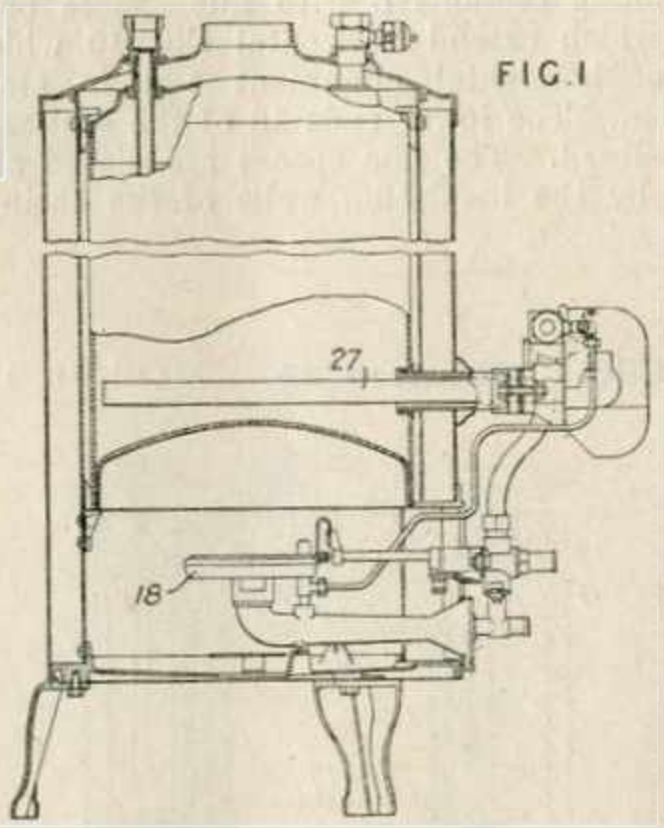
Heating liquids; feedwater, heating.—Water or other liquid is passed in series through casings 1, 2, 3 through which passes a continuous flue 4, or a number of such flues, adapted for series connection as by a spigot and socket joint 13, 14. Access to the flues is obtained from the ends of the straight junction box 15. The passage of hot gases is controlled by dampers 20, 25. In a modification the sections are inclined and mounted one above the other, the flues being connected by junction boxes.



292,545. Banz, J. C. June 22, 1927, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Acts*].

Block-form boilers.—A water-container 1 with insulating jacket 4 is provided with two substantially vertical flues 3 joined by a bend at the top and opening at different levels in the base plate. At the lower end the burner 7 is placed. Cold water is admitted through a fitting 8 with lateral apertures, hot water being drawn from an opening 9 which may be the upper end of an open pipe which, in passing down through the container, is formed with a loop to act as a water seal and thus create a pressure on boiling sufficient to operate a warning whistle.





Reference has been directed by the Comptroller to Specifications 13347/11, 153,737, *and* 223,223.

292,811. Brill, A. P. Sept. 19, 1927.

Boilers have a heat-regulating element such as a thermostat 27 controlling a gas-burner 18, both being removable as a single unit from the same side of the heater. A drain-cock may be disposed on the same side.

292,812. Comstock & Wescott, Inc., Whitney, L. F., and **Weaver, E. A.** Sept. 22, 1927.

Heating water.—In a refrigerating system in which the refrigerant vapour is circu-

lated by means of aspirator devices supplied with a vaporized propellant, such as mercury, the aspirators are provided with water-jackets 67, and the heated water circulates through a jacket 70 around the flue 9 of the propellant vaporizer 7, and through a storage tank 19, from which it is drawn, either directly or through auxiliary heating-devices, for household or other purposes. A thermostatically-controlled valve 74 allows hot-water to be emitted from the tank 19 when the temperature rises above a predetermined level.

FIG 5

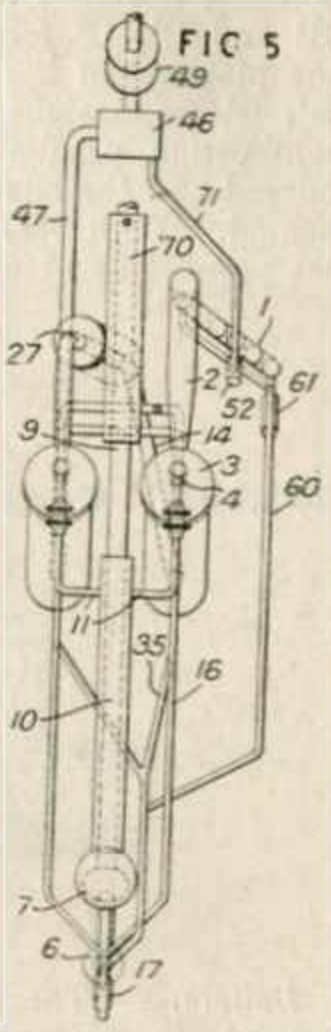
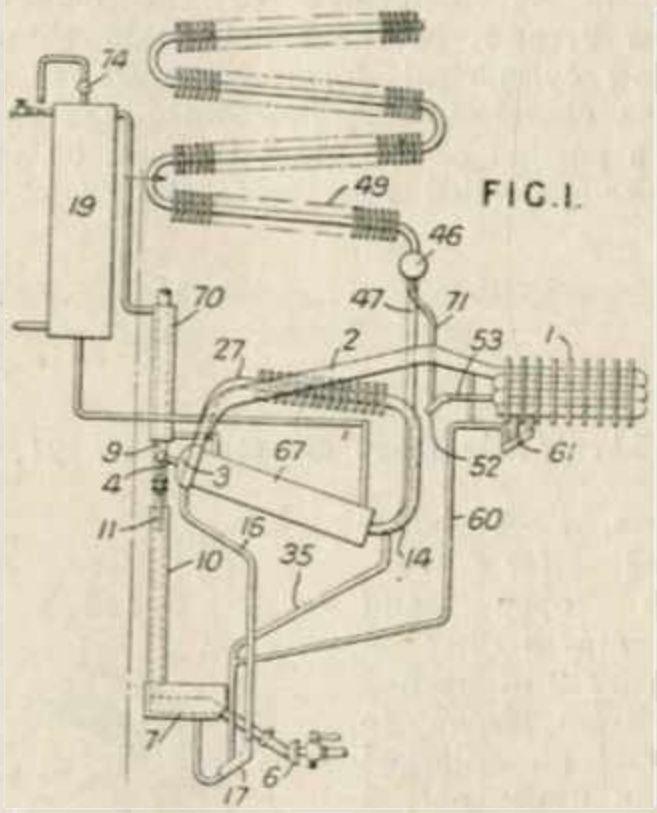


FIG.1.



293,077. Johnson, J. Y., (*I. G. Farbenindustrie Akt.-Ges.*). March 3, 1927.

Digesters.—Apparatus for carrying out chemical and other processes, particularly at high temperatures and pressures with gases, liquids, &c., containing hydrogen, oxygen, or sulphur is made of iron particularly free from impurities. The degree of purity must be such that the iron shows under the microscope no corrosion at the boundaries of the grains after treatment at a high temperature with gases or liquids containing oxygen or sulphur and preferably in presence of hydrogen. The requisite degree of purity may be obtained by subjecting iron, at high temperatures and under conditions precluding oxidation, to the action of gases which form gaseous compounds with the impurities (oxygen, sulphur, carbon, &c.). For example, mild steel may be treated with hydrogen at 900° C., or with a weakly oxidizing mixture of hydrogen-water vapour at 550—600° C. and 150 atmospheres. The apparatus may be further protected with a coating of resistant material such as chromium tungsten, uranium, manganese, aluminium, silver, copper, enamel, &c. Specification 275,662, [*Class* 32, Distilling &c.], is referred to.

293,282. Mennesson, G. Feb. 23, 1928.

FIG.3.

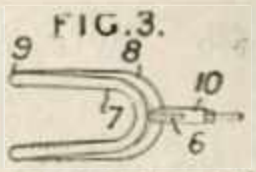
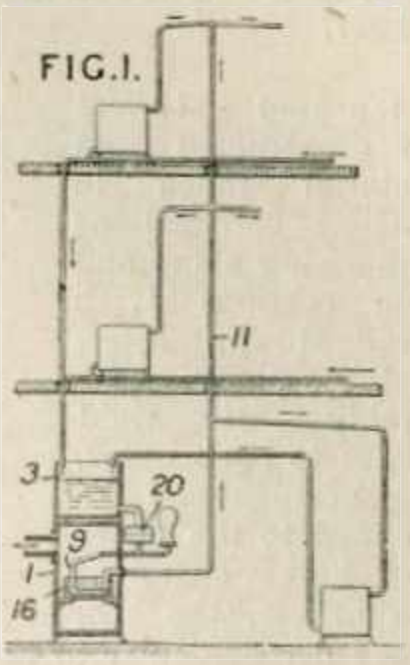


FIG.1.



Heating water; water-tube boilers.—In a plant for the pulsating circulation of hot water for central heating, comprising an open supply tank 3 delivering water intermittently through a disc-valve 20 into heating-tubes 9 in a furnace 1, the capacity of these tubes is arranged to be at least equal to the capacity of the main vertical distributing pipes 11 of the system. The tubes 9 may be embedded in a metallic mass 16. A second set of tubes may be arranged in the furnace chamber to supply hot water for heating indirectly a service supply. The tubes may form a bent loop 7, 8, 9, Fig. 3, connected at top and bottom 6, 10, to supply and delivery or may have a zig-zag shape in elevation.

293,611. Schulze, A. Oct. 15, 1927.

FIG.2.

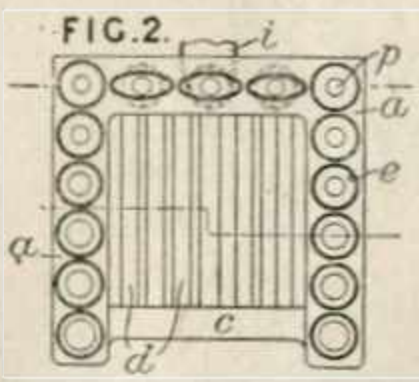
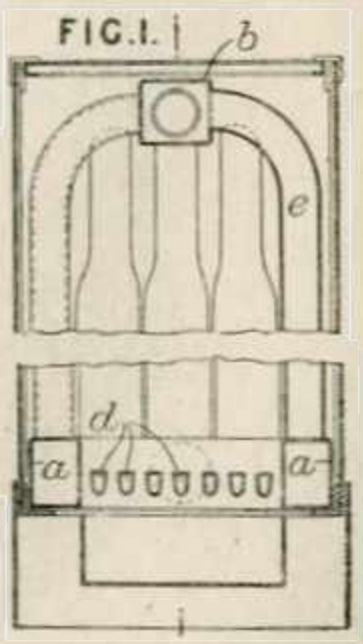


FIG.1.



Water-tube boilers.—In a boiler having tubes *e* forming the sides and rear walls of the fire

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space, the tubes are connected to an upper header *b* arranged in the middle of the boiler. The tubes open into the lower header *a* through apertures *p* which increase in size with their distance from the feed inlet pipe *i*. The inlet pipe projects into the lower header and is cut obliquely to prevent the water from flowing directly into the rear tubes. Hollow bars *d* extend between the rear of the bottom header and a tube *c* across the front of the header. The furnace gases escape between the upper ends of the rear tubes.

293,621. Cartwright, F. E. Nov. 8, 1927.

FIG.2.

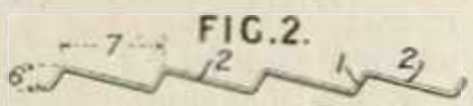


FIG.1.

Washing - boilers are constructed from material rolled to produce corrugations comprising short and long portions 1, 2 arranged in intersecting planes preferably at right angles to each other. The corrugations are inclined to the upper and lower edges of the article, the shorter corrugations being disposed perpendicular to the surface to act as ribs. The corrugations are of such depth that the edges of metal sheet so corrugated can be joined, beaded, or otherwise treated without first rolling out the corrugations. The depth 6 of the corrugations is advantageously about one fifth of the pitch 7.

293,759. Leveque, P., (Assignee of *Challe, B.*). July 11, 1927, [*Convention date*].

FIG.1.

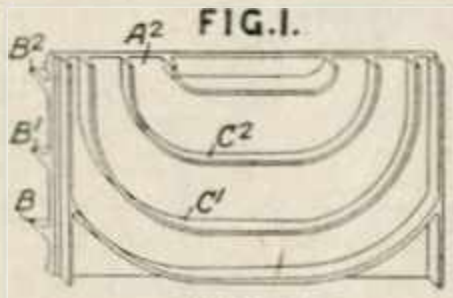
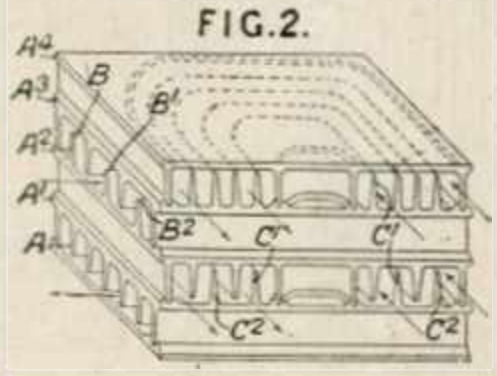


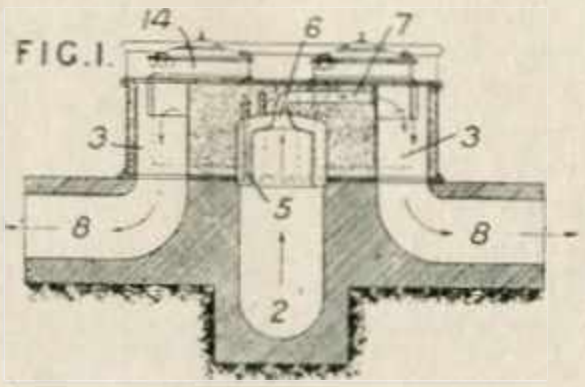
FIG.2.



Heating air.—Cast metal plates A, A^1 . . A^4 have fins fitting into slots on an adjacent plate forming channels into which project fins B, B^1, B^2 and C^1, C^2 formed on one or both sides of the plates. In the examples shown, the fins B, B^1, B^2 are straight and might be in contact with combustion products while the fins C^1, C^2 are curved and the channel may be used for air to be heated. Both sets of fins may be straight and set parallel or at any angle.

294,191. Carpineti, A. April 20, 1927.

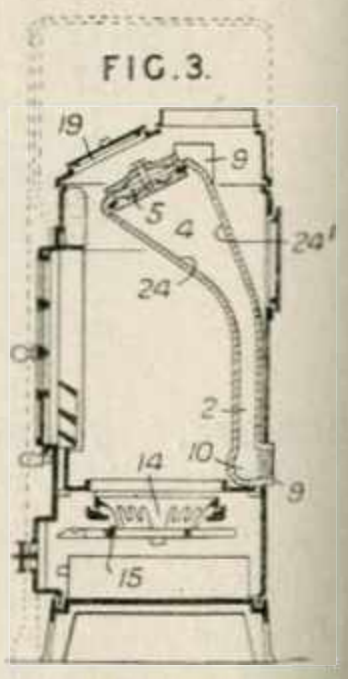
FIG.1.



Boilers. — The boiler 5 of a cooking-stove is housed in an extension of the combustion chamber 2, and, in the construction shown, is of hollow cylindrical form arranged co-axially with the chamber. A flue 6 through the top allows a portion of the gases to pass, by way of a damper-controlled tube 7, to the outlet 8.

294,451. Fiedler, S. G. Feb. 21, 1928.

FIG.3.



Boilers. — A boiler intended for convertible open and closed stoves has a lower part 2 of narrow depth from front to back, and an enlarged overhung upper part 4 with inclined and upwardly diverging front and rear walls 24, 24^1. The boiler has integral pipe sockets 9 at the rear and a bulged part 10 in front of the lower sockets to provide free passage for the flow. Access to a manhole 5 in the top is provided through a manhole 19 in the stove top. The part 2 of the boiler forms the fire-back, and the upper portion 4 is entirely surrounded by the combustion gases.

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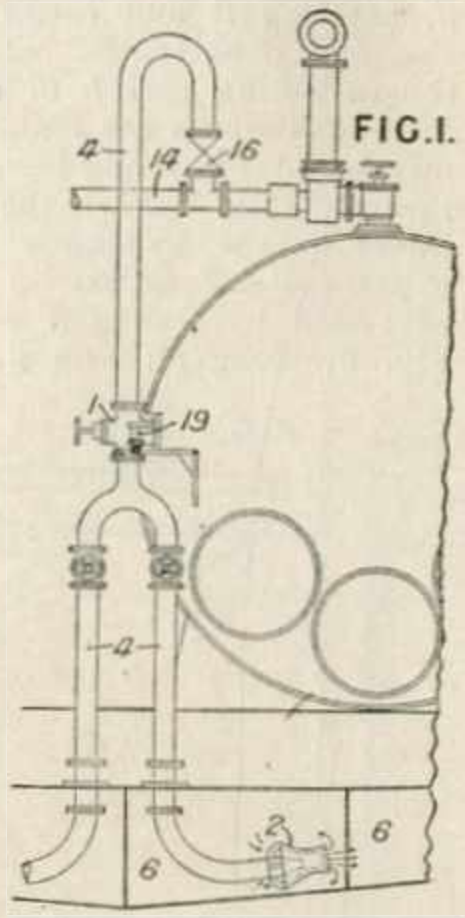
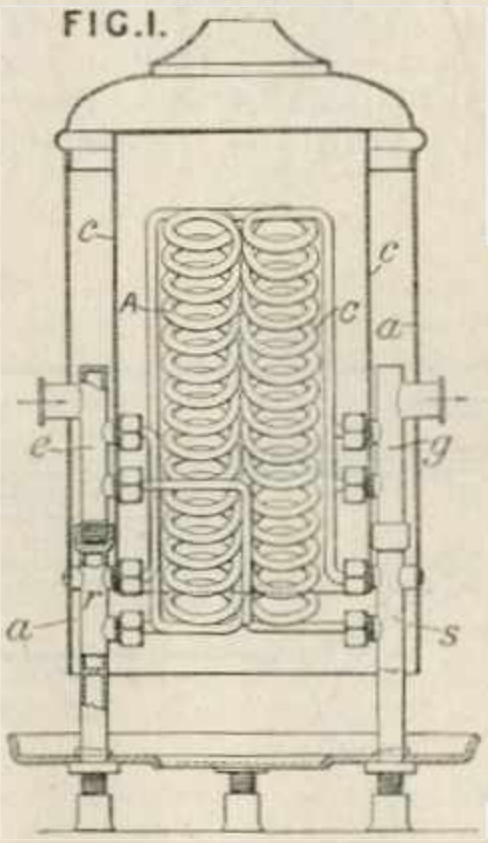
294,732. Bruce, W. J. W. May 20, 1927.



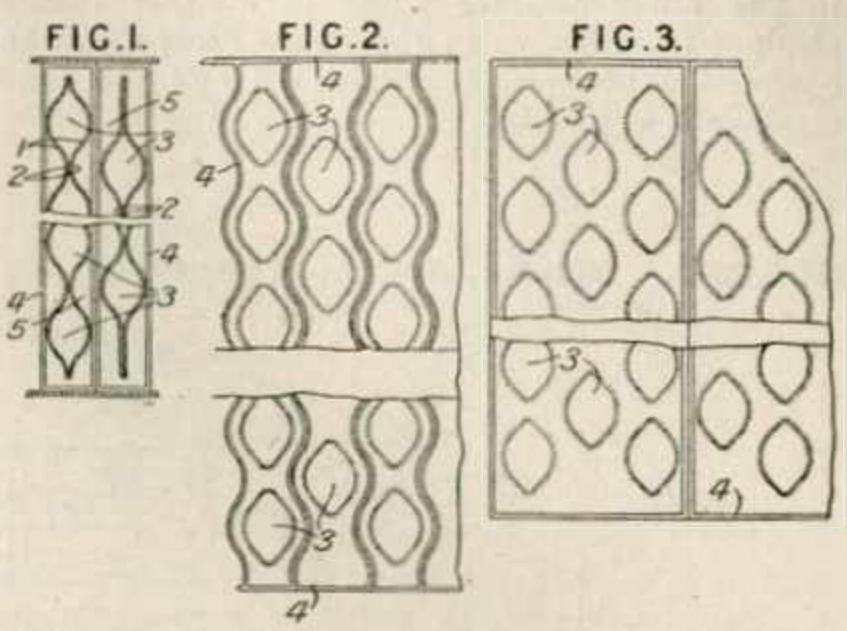
Feedwater, heating.—Excess steam from the safety or pressure relief valve of a ship's boiler is led into a condenser placed within or connected with the feed tanks in the ship's bottom. A branch pipe 4 from the main steam pipe 14 contains a cut-off valve 16 and a pressure relief valve 1, which is controlled by a pilot valve 19 as described in Specification 281,420, [*Class* 135, Valves &c.]. The branch pipe discharges excess steam through ejector condensers 2 in the feed tanks 6. The excess steam may be taken off from the discharge chest of the usual safety valve, and may be led into an ejector condenser placed outside and in communication with the feed tanks.

294,848. Self, S. A., and **Self Engineering Co., Ltd.** Jan. 23, 1928.



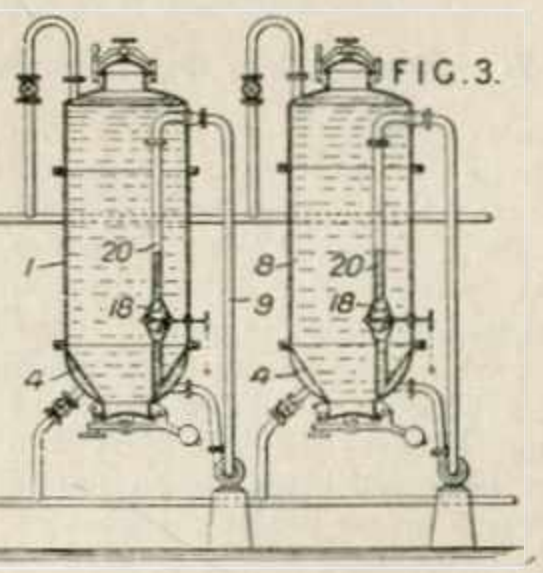
Water-tube boilers. — A number of vertical pipe-coils A, C are arranged in pairs within an inner casing *c* and are so connected to inlet and outlet pipes *e*, *g*, which are disposed between the inner and outer casings *c*, *a*, that the flow of water is through each pair of coils simultaneously. The coils in each pair are serially connected by junction boxes *r*, *s*.

295,106. Howden & Co., Ltd., J., and **Hume, J. H.** June 22, 1927.



Heating air.—An air-heater is of the type employing assembled pairs of corrugated plates 1 of which the ridges 2 on each plate of a pair are secured together forming ducts 3 for one fluid. Adjacent pairs forming sinuous passages 5 or the other fluid. Elements comprise one or more pair of plates secured to channel frames 4 at the ends, adjacent elements being connected at the end-frames. Fig. 1 shows elements having a single pair of plates. Fig. 2 shows elements, the frames 4 of which are of sinuous formation. Fig. 3 shows elements having three pairs of plates secured to each end-frame. The entrance and exit boxes connected to the end-frames may be subdivided and valve-controlled to give any desired number of passes through the element. Assembled banks of elements are mounted in the uptake of a boiler for heating air for combustion.

295,869. Buss, W. Nov. 9, 1927.



Digesters.—An apparatus for making extracts &c. by steeping, comprises a plurality of containers 1, 8, arranged for passing the liquid through them in series, each having therein a strainer 4 at the lower part and a tubular strainer 20 extending lengthwise through the material to be treated. As shown, the strainer 20 has a valve 18 and is connected at the top to the circulation pipe 9 and at the bottom to the lower

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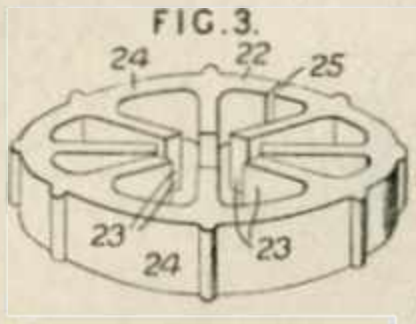
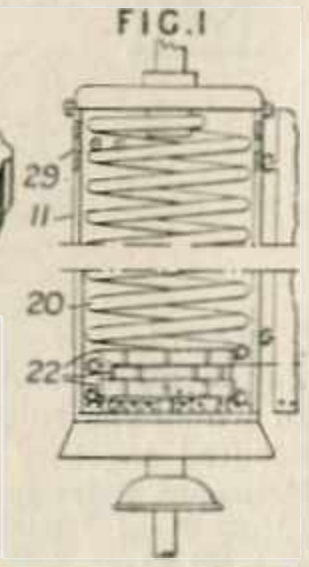
strainer 4. In one modification the tubular strainer is closed at the top and connected solely to the lower strainer while in another tubular strainer is as shown in the figure except that the connection between the valve 18 and the lower strainer 4 is omitted.

296,287. Hicks, J. April 26, 1928.

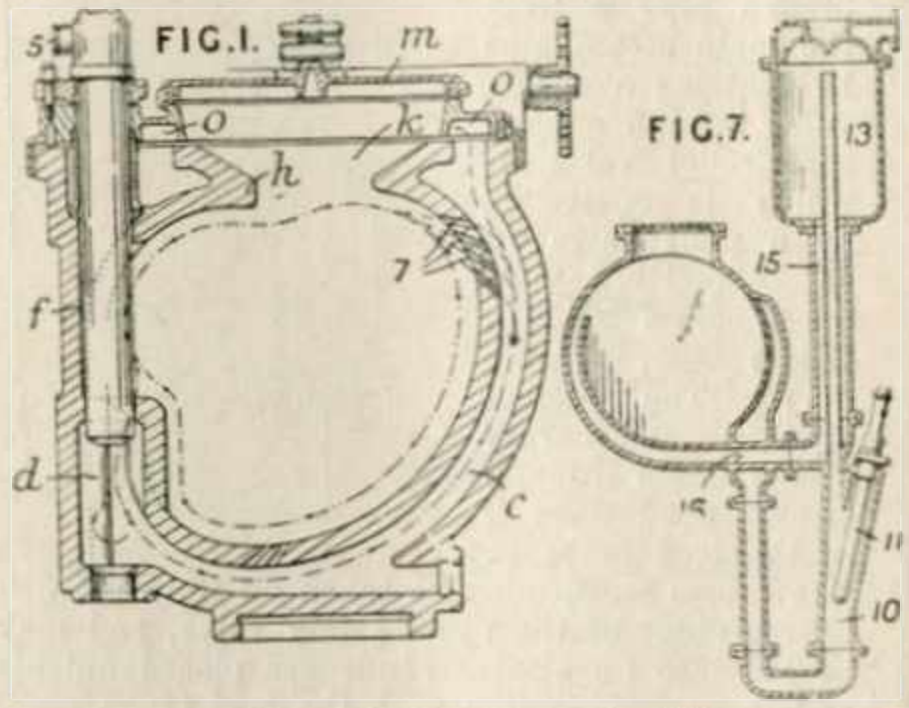




Water-tube boilers. — A combustion chamber for a fluid-heater comprises a number of separate identical ceramic sections 22 mounted one on the other, each section including a ring member 24, preferably split as at 25, and a number of inwardly extending baffle elements 23 staggered in respect of those on adjacent sections. In Fig. 1, a water coil 20 surrounds the sections 22 within a casing 11 which has additional air inlets 29 near the top.

296,525. Hammond, C. F., and **Shackleton, W.** April 13, 1927.

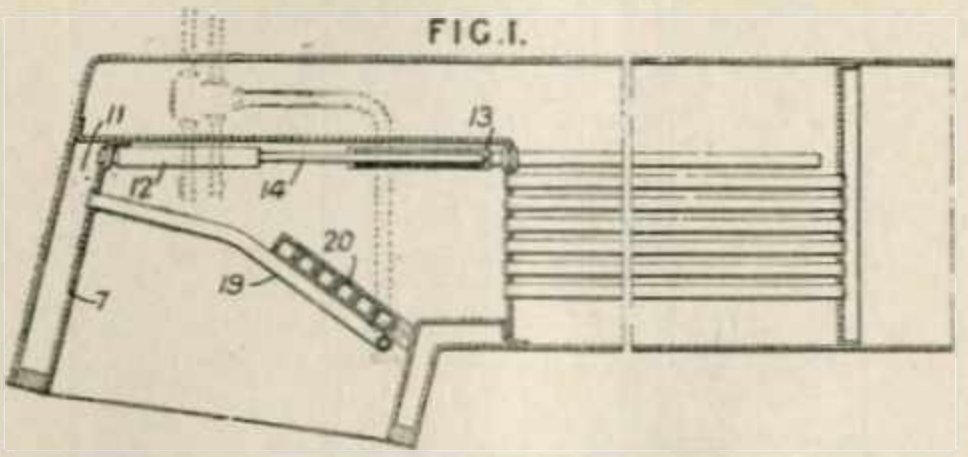
Heating liquids.—Liquid is heated and circulated by means of a submerged burner, in connection with the treatment of textiles. In Fig. 1, the burner *f* acts on the liquid in a sump *d*, aerating it and causing it to rise and re-enter the bath under the deflecting part *h* of a throat *k* through which the materials are introduced, the liquid being drawn through holes 7 down the duct *c*. Gases escape by the channel *o* to an outlet 5. The lid *m* may be raised by sliding a weight 3, Fig. 5, along an arm 2. The



sump *d* may be centrally situated. The supply of fuel and air to the burner may be controlled by a thermostat or by the pressure in the bath. In Fig. 7, the burner 11 in the sump 10 causes the liquid to rise into an upper tank 13 where gases are released, whence the liquid returns by passages 15, 16 to the vat. Where a high temperature is necessary, the vat may be jacketed and a liquid of high boiling-point circulated through the jacket by a submersible burner. Specification 265,254 is referred to.

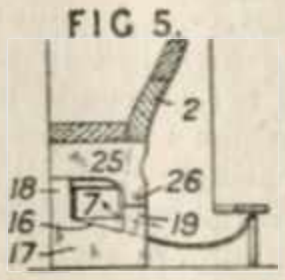
296,577. Baldyzar, S. Oct. 8, 1927.

Feedwater, heating. — In a locomotive boiler a feed-heating tube 19 passes across the firebox and delivers through the rear wall 7 into a water space 11 surrounding the firebox. Water heated therein is led to the forward part of the boiler, preferably through a series of curved pipes 14 connecting headers 12, 13. A fire arch can be constituted by a series of transverse water-heating tubes 20.



296,630. Wright, C., and **Johnson & Wright, Ltd.** Feb. 3, 1928.

Boilers.—The boiler 25 of a combination range is formed with a downwardly-stepped front part 26, and rests on the front and rear walls 19, 18 of a base block 17, the gases passing to the flue beneath the boiler through a central gap in the wall 19.



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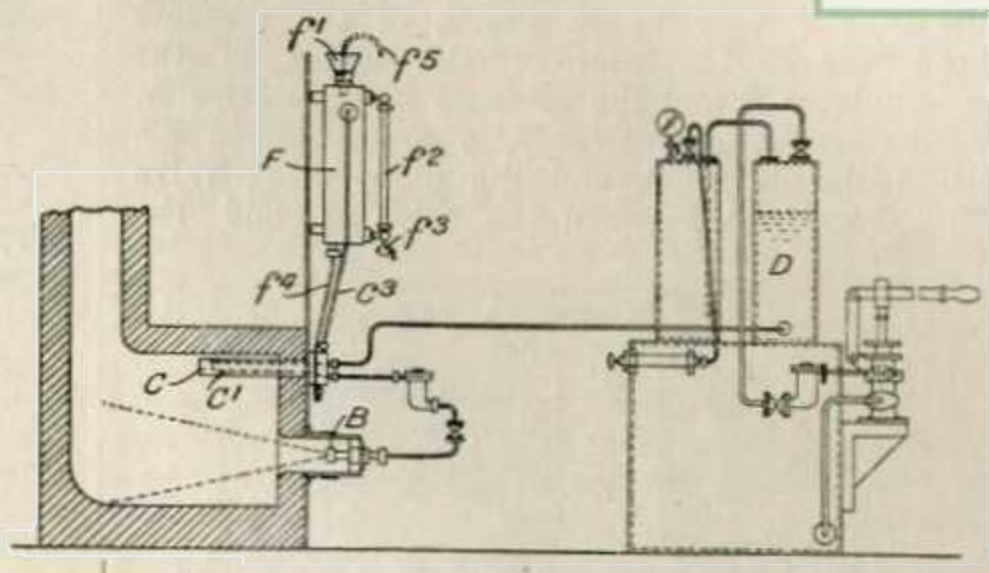
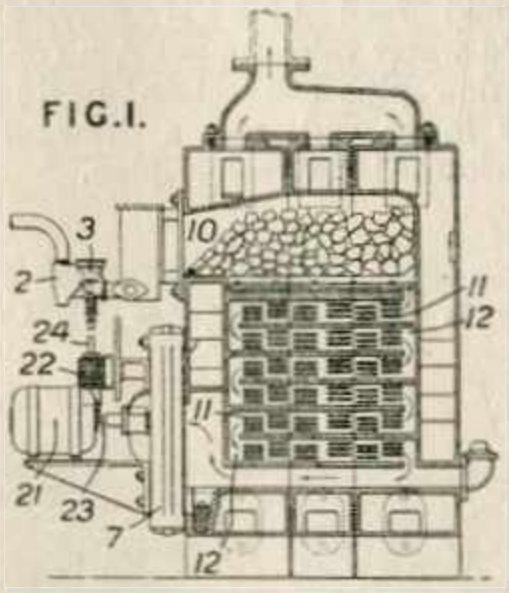
296,689. Kermode, J. J. May 2, 1927.

Heating liquids. — Liquid fuel is heated on its way to the burner by passage through a heater which is arranged in a furnace or furnace flue and is connected to a control tank containing water or other liquid, the fuel temperature being regulatable by varying the quantity of liquid in the heater and control tank. Liquid fuel supplied under pneumatic pressure from a day tank D to a burner B passes through a **U**-tube C^1 arranged in a water chamber C which is arranged in the furnace and is connected by pipes f^4, c^3, to a control tank F at a higher level. The tank F is fed with water through an opening f^1 which is either left open to the atmosphere or is fitted with a plug having a vent pipe f^5. The flame from the burner heats the water in the chamber C and causes by thermosyphonic action a circulation of water between the chamber C and tank F. The water level in the tank is indicated by a gauge f^2 fitted with a drain cock f^3. Where a constant water supply is available, the tank F may be fed with water through a cistern fitted with an adjustable float-controlled valve.

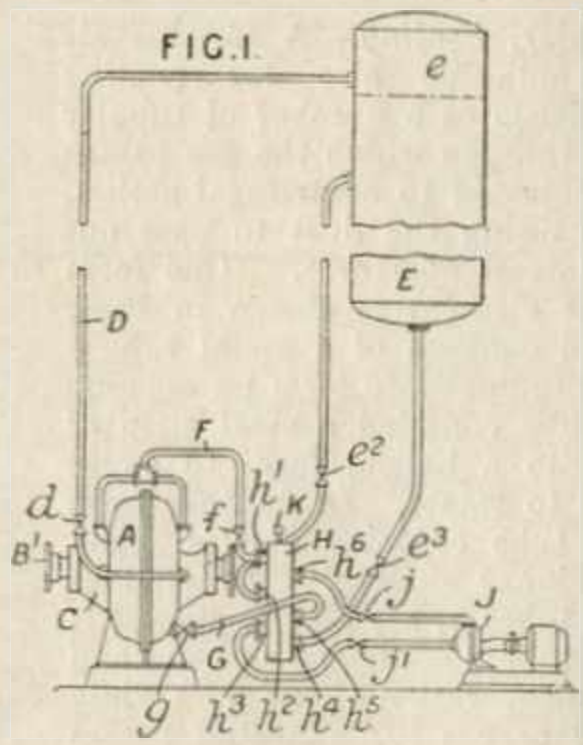


297,148. Pattison, C. M. June 16, 1927.



Internally-fired boilers.—Fig. 1 shows a boiler similar in construction to that described in Specification 241,264 except that the fins or bars 11 extend completely across the water-jacketed passages through which the combustion gases are drawn by a fan 7.

[*Class* 106 (ii), Dynamometers &c.], has a rotor B on a shaft B^1 driven from a prime mover. Passages *c* formed in the vanes of the stator C connect the points corresponding to the centres of the vortices with annular spaces *c* and these are connected through a valve *d* by a pipe D to the steam space *e* of an accumulator E. Passages c^2 formed in the vanes of the stator connect the water spaces between the vanes with annular spaces c^3 and water inlets F^1 terminating in a single pipe F. The water outlet pipe G is connected to the annular space B^2 surrounding the rotor. The pipes F, G are connected to the water space of the accumulator through a distributing valve H controlled through a rod from a governor (not shown). Thus when the inlet is wide open and outlet almost closed the power absorbing elements are packed full of water and the power consumed is a maximum and when the inlet is nearly closed and the outlet wide open, the power consumed is a minimum. A



297,158. Heenan & Froude, Ltd., and **Walker, G. H.** June 23, 1927.

Heating by friction.—A hydraulic absorption apparatus for the generation of heat comprises the combination with a hydraulic absorption apparatus of a heat accumulator, the steam space in which is connected with the interior of the hydraulic absorption apparatus at a point or points at or near the centre of the vortex or vortices set up therein, where under running conditions the pressure is relatively low. A heat generator A comprising a hydraulic brake similar to that described in Specification 24949/10,

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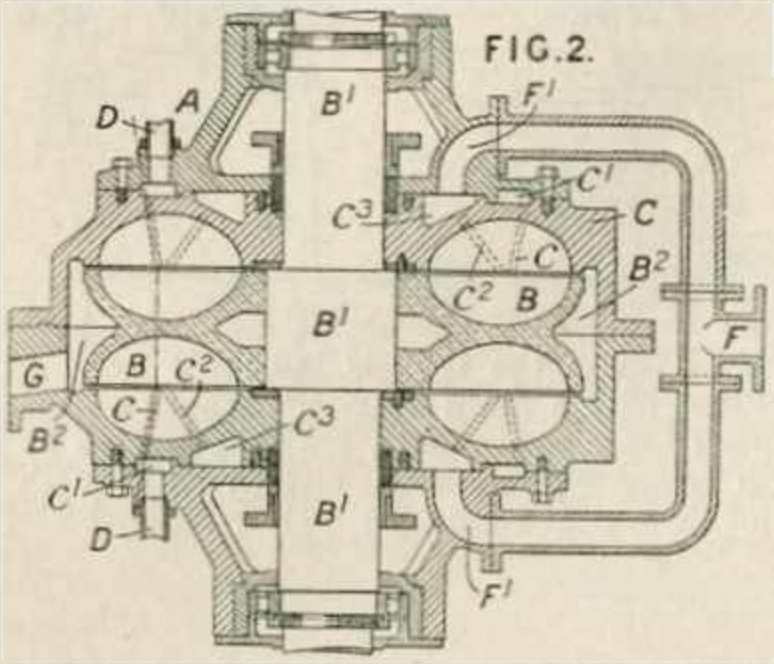
circulating passage J is preferably employed so that the pressure of the water supplied through the pipe F may be in excess of the pressure head between the level of the water in the accumulator E and the pressure in the device A. Suitable isolating valves *f*, *g* are arranged between the device A and the distributing valve H, valves *j*, *j*¹ between the valve H and the

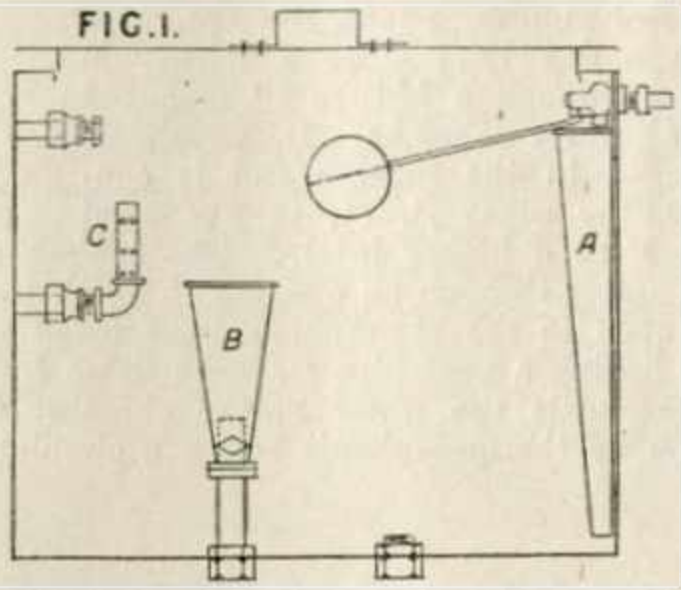
FIG.2.



pump J, valves e^2, e^3 between the valve H and the accumulator E, and a valve *d* in the pipe D. The distributing valve H comprises four pistons mounted in the rod K and adapted to control six parts h^1 - - h^6. In a modification, two butterfly valves are employed one in the pipe F and the other in the pipe G and there are connected to the rod the valve H being dispensed with.

297,296. Arthur, S. C., and **Arthur, H. H.** April 17, 1928.

FIG.1.



Heating water. — A combined hot-water reservoir and feed tank is provided with a tapered cold-water inlet funnel A a conical fitting B for the flow pipe connection, having an aperture at its lower end, and a draw-off fitting C with a perforated extension pipe.

297,423. Drake, W. C., Priebe, E. B., and **Buchert, H.,** (Assignees of *Coutant, J. G.*). Sept. 21, 1927, [*Convention date*].

Feedwater, heating.—A furnace air heater applicable also for heating water consists of a number of tubular elements through which the gas passes and is subjected to centrifugal action, thereby causing the dust to pass out through lateral apertures. One form of tubular element is shown in Figs. 5, 5ª, and consists of a metal tube *a* split longitudinally to form an opening a^1; the tube contains a steel strip a^2 twisted into a helical form to cause the gases to rotate. In another form the split tube contains a wire helix upon its inner surface. In another form two tubes *a*, a^5, Fig. 7, are used; the inner tube *a* contains the helix and causes the separation of the dust while the liquid or gas to be heated passes through the space between the tubes. The tubular elements are built into units of the sector type, as shown in Fig. 9, or the rectangle type as shown in Fig. 10. A plate *b* is arranged near the lower end of each unit casing *d* to catch the separated dust and lead it to the discharge opening from whence it is taken by a worm or other conveyer back to the combustion cham-

FIG.1.

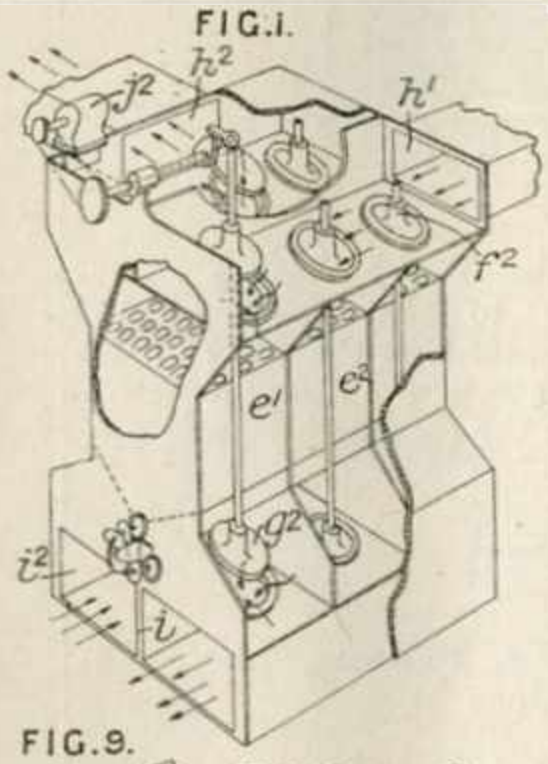


FIG.2.

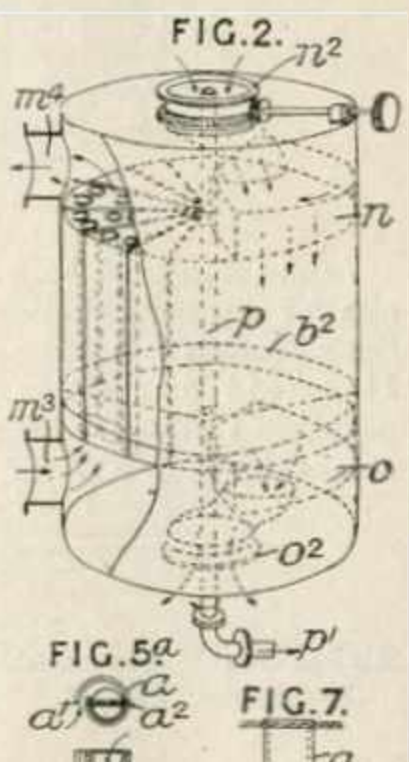


FIG.9.

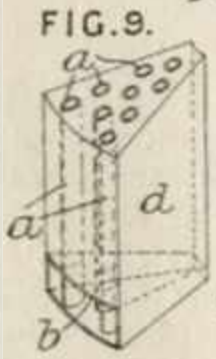


FIG.10.

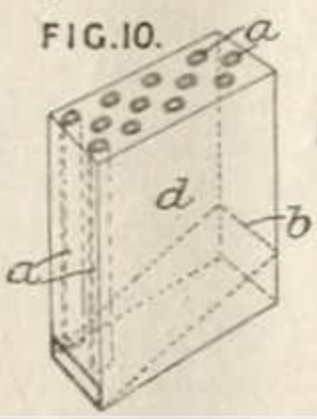


FIG.5ª

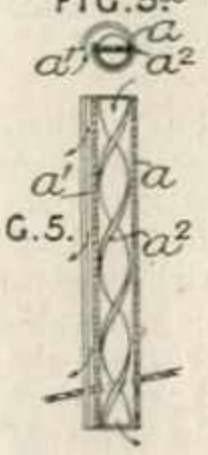
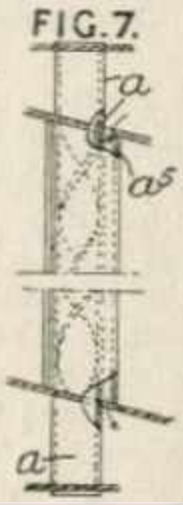


FIG.5.

FIG.7.



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ber. A number of rectangle-units are shown combined in Fig. 1 to form a pre-heater and separator, the apparatus being provided with connected valves f^2, g^2 to control the flow of gases. A motor j^2 operates the valves so that the units are open in pairs. With the parts in the position shown, the hot combustion gases enter the lower rear opening i^2, pass through a valve and upwards through the unit e^2, where they yield their heat and dust, then emerge through the upper open valve and pass out through the conduit h^2. The cold air to be heated enters through conduit h^1, passes through an open upper valve, through the unit e^1, where it is heated and escapes through opening i^1. After a certain time the valves are operated to change the units in use. In the form shown in Fig. 2, the units are built into a cylindrical form. The cold air to be heated enters through the pipe n^2 and passes through a rotary slide n to the tubular heaters. It leaves the heater by the lower rotary slide o and pipe o^2. The hot gases enter by the pipe m^3, pass through the tubular members not covered by the slides n, o, and leave the apparatus by the pipe m^4. The separated dust is collected by conical collector sheet b^2 and may be withdrawn through the hollow shaft p and the pipe p^1. In another form the pipes and slides n, o are stationary, while the tubular structure is rotatable.

297,451. Sulzer Frères Soc. Anon. Sept. 22, 1927, [*Convention date*].

FIG. 1.

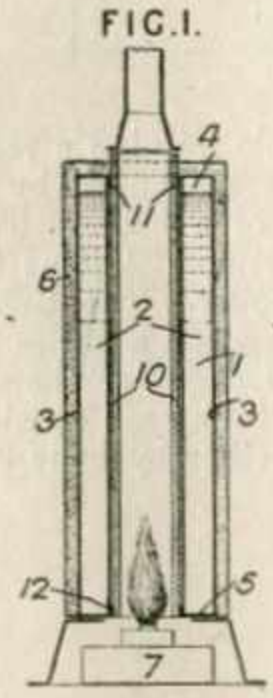
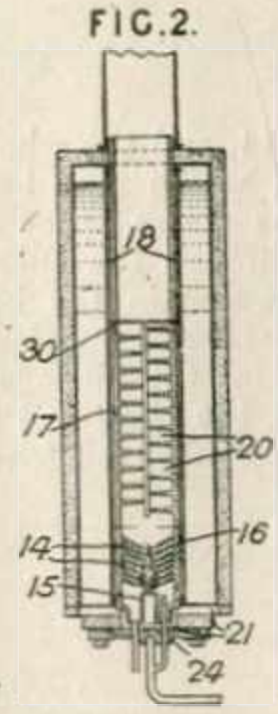


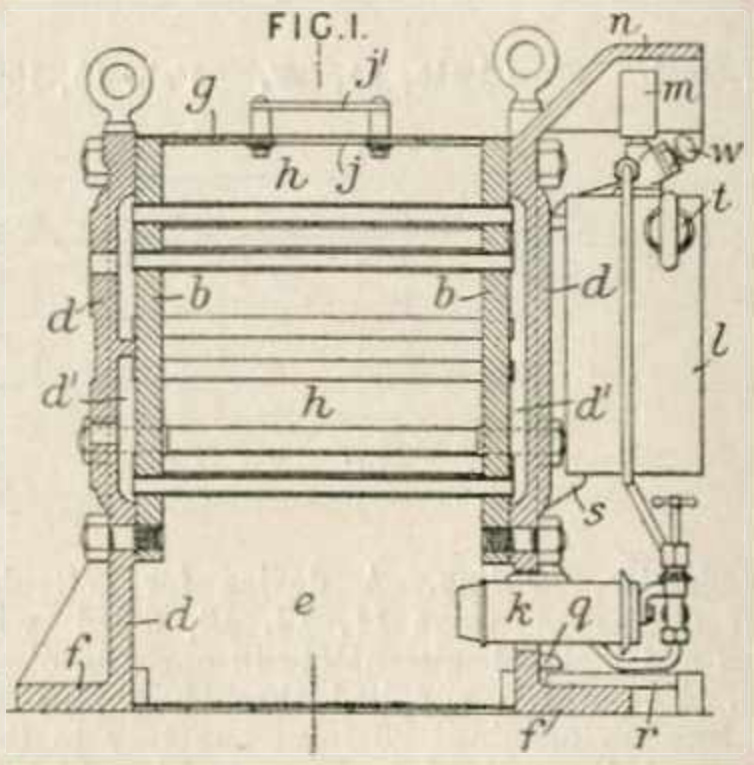
FIG. 2.



Protecting-plates for boilers.—The parts of the generator of an absorption refrigerating apparatus liable to corrosion due to heat and condensed moisture are protected by a liner, preferably removable, which may be in part of heat-conducting material such as aluminium and in part of ceramic material. The invention may be applied to continuous-cycle apparatus, but is particularly applicable to reversing apparatus, in which the generator-absorber 1, Fig. 1, may be formed of wrought-iron tubes 2, 3 welded to end covers 4, 5. The liner may be a continuous cylinder 10 of aluminium, cast iron, or ceramic material inserted in the central flue and made gas-tight at the points 11, 12. The source of heat may be an air-pressure oil-burner 7, and the outer walls of the generator may be protected by insulation 6. In the modification shown in Fig. 2, in which a gas burner 15 is employed, the liner may consist of a lower section 16 having gills 14, an intermediate section 17 having ribs providing a helical flue 20, and an upper section 18, the upper joint 30 being below the lowest liquid level. The section 18 is separated by an insulating space from the wall of the generator. The lower sections may be of aluminium and the section 18 of ceramic material or cast iron coated with asbestos or other heat insulation. The burner is arranged within a cover 24 and is supplied with air through passages 21.

297,608. Thompson, H. A., and **Swinney Bros., Ltd.** Dec. 19, 1927.

FIG. 1.



Heating liquids. — In an oil-fuel heating apparatus of the kind comprising a casing traversed by tubes through which the fuel circulates, the cover-plates d, which are spaced apart from the tube plates b so as to form the fuel spaces d^1, are extended downwardly to form the end walls of the burner chamber e and are provided with flanges f forming feet on which the apparatus is supported. An asbestos-lined sheet-metal casing g extends between the cover-plates d and encloses the burner and heater chambers e, h. An outlet j fitted with a baffle j^1 is provided in the casing g. Two burners k projecting into the burner chamber are fed with oil under pressure from a tank l supported by lugs s on one cover-plate d. The top of this cover-plate is extended over the tank to form a protecting hood n. The tank l is fitted with an air pump t, a pressure gauge m, and a pressure release w.

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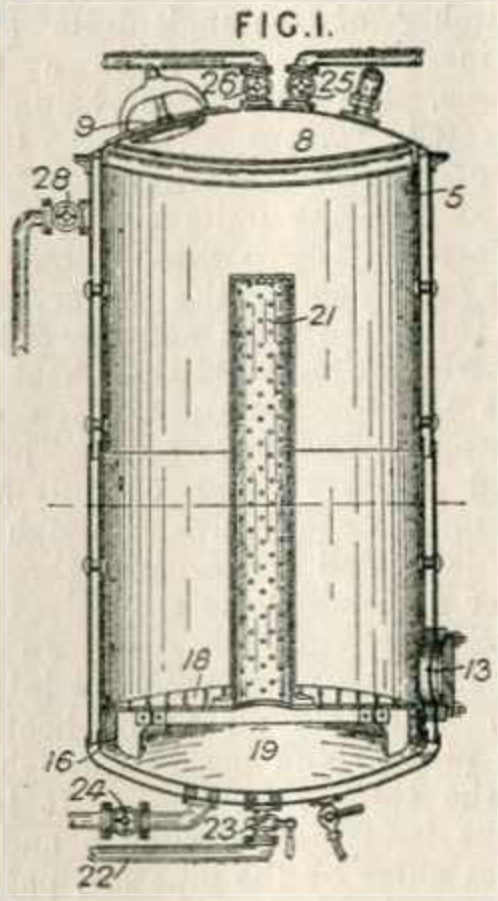
297,728. Gearin & Sons, Ltd., M., and **Cullen, J. R.** Sept. 26, 1927, [*Convention date*].

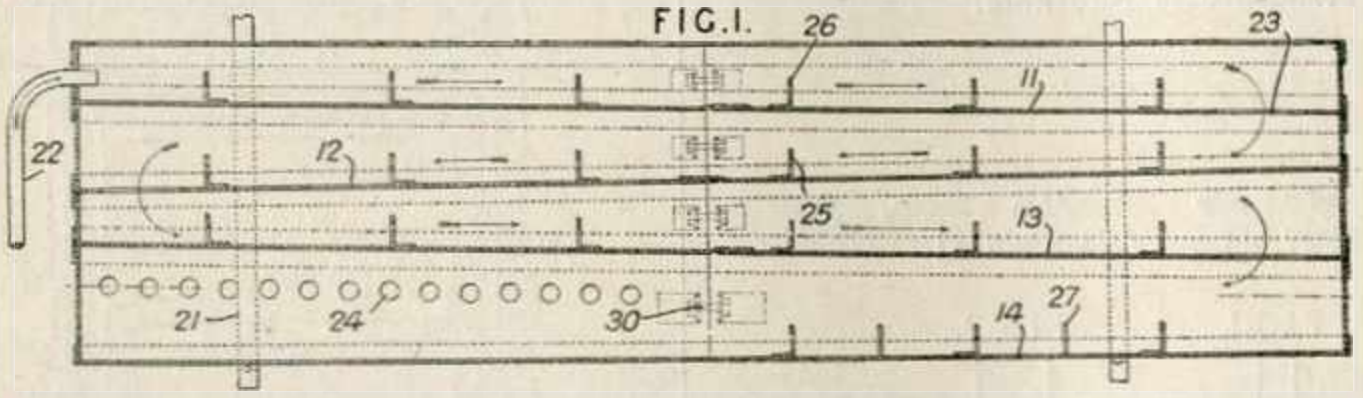
Digesters.—A steam-jacketed digester 5 for use in treating fatty residues has a jacketed base 16, a perforated false bottom 18 on which are mounted perforated draining tubes or cones 21, and a cover 8. Charging is effected at 9 and the treated material is discharged at 13. Steam at a pressure of 5—40 lbs. is passed through the charge by means of a valve 24 and escapes through a valve 26 to a condenser, and steam at a pressure of 30—80 lbs., and at a correspondingly higher temperature, is fed to the jacket through a valve 28. Fat collects in the space 19 and is removed by closing the valve 24, opening a steam supply valve 25 in the cover and a valve 23 in a discharge pipe 22. When the digestion is completed suction is applied to the treated material to remove moisture before discharge is effected.

FIG. 1.



297,943. Conduit, G. W. Feb. 18, 1928.

FIG. 1.

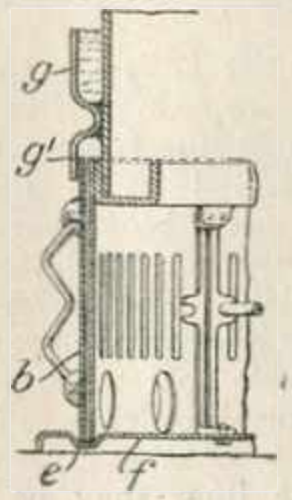


Feedwater, heating.—A device for softening water comprises trays 11, 12, 13, fitted with baffles and inclined alternately in opposite directions. The water, supplied through a pipe 22, falls through openings 23 from one tray to that below and is received in a tank 14, which is fitted with baffles 27 and has at one end a series of outlet apertures 24. The trays are supported one upon another, the lowest being supported by the tank 14, and the whole forming a rectangular structure, which may be suspended by stays 21 within the steam space of a boiler. The water passing through the apertures 24 joins the main body of water in the boiler. The baffle plates 25, 26 may have one large or a series of small apertures for the passage of water therethrough. As shown, the trays and tank each consist of two parts which are fixed together by bolts 30.

298,394. Barralet, J. H., and **New Geysers, Ltd.** Nov. 18, 1927. *Addition to* 238,678.

Geysers according to the parent Specification are modified so that while the main water spaces *g* are supported independently on the base *f*, the fretted portion surrounding the burner chamber is made in sections *b* of arcuate formation adapted to slide laterally in a circular path, for example, in grooves *e* in the base and at the top in a channel formed by suitably moulding the outer plate g^1 of the water jacket.

FIG. 3.



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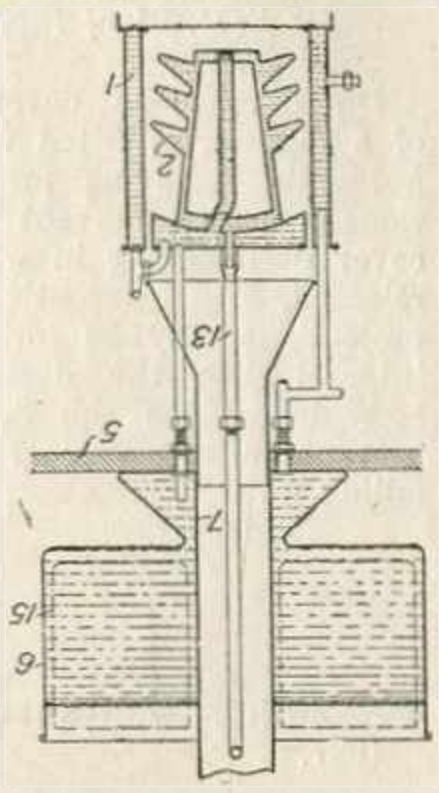
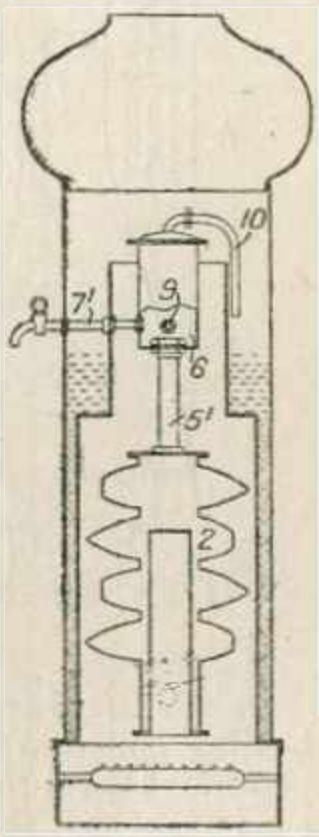
298,413. Jackson, E. Dec. 30, 1927.



Water delivery; internally-fired boilers. — A water-heater or boiler 1 with central chamber 2 is mounted below a counter or like fixture 5 and is a separate unit from the fountain carrying the flue 7 and expansion delivery pipe 13, mounted directly above it, connections being made by detachable unions. The fountain may be in the form of a water jacketed vessel 6 arranged round the flue 7 and adapted to contain and heat urns 15 or the like. Specification 244,594 is referred to.

298,414. Hodgkison, F. H. Dec. 30, 1927.

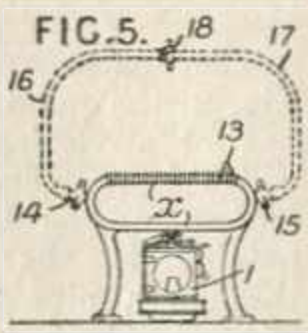
FIG. 1.



Water delivery.—The expansion box 6 of a café or like boiler is situated within the gas-escape flue. An expansion pipe 5^1 from the inner water chamber 2 leads into the bottom of the box, and one or more lateral draw-off pipes 7^1, 9 are provided, the inner ends of which may be upturned. The overflow pipe 10 may be extended within the box to below the level of the upturned ends of the draw-off pipes.

299,226. Lamp Manufacturing Co., Ltd., and **Punter, J. W.** Dec. 21, 1927.

FIG. 5.



Freezing, preventing, circulating attachments for.—A long-burning lamp 1 heats the water in a closed coil *x* having attached flexible tubes 16, 17 which are passed under the bonnet of a motor-car engine and secured together by a coupling 18. By adjusting cocks 13, 14, 15 on the coil *x* the circulation through the tubes may be varied. Freezing of the water in the radiator is thereby prevented and starting of the engine facilitated. In an alternative arrangement the lamp heats a straight tube connecting the ends of flexible tubes placed under the car bonnet.

299,265. Majuga, D. T. April 5, 1928.

FIG. 1.

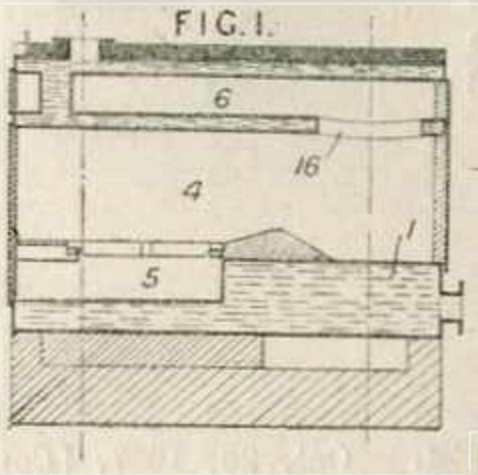
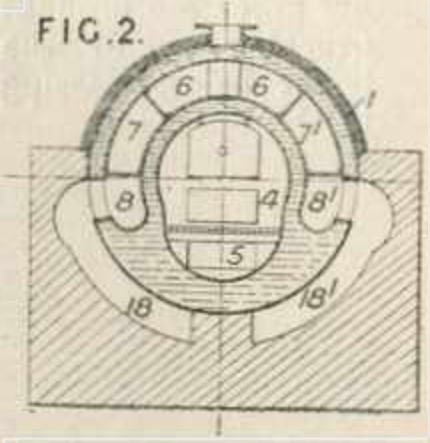
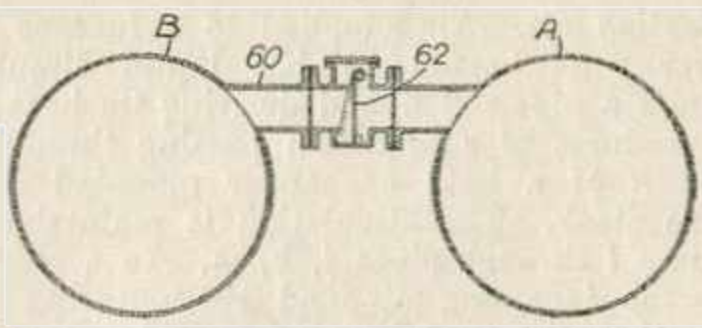


FIG. 2.



Internally-fired boilers.—An outer horizontal cylindrical shell 1 is provided with a central fire tube 4 enlarged at the furnace end as at 5, and an inner smoke-flue member with both sides concentric with the fire tube and having the cross section of a gapped ring. Longitudinal partitions divide the flue member so that flue-gases pass forward from a connection 16 with the fire tube through compartment 6, rearward through compartments 7, 7^1 and finally forward again through compartments 8, 8^1 to side flues 18, 18^1 in the setting.

299,281. Soc. L'Auxiliaire des Chemins de Fer et de l'Industrie. Jan. 20, 1928, [*Convention date*]. *Addition to* 290,598.



Feedwater, heating.—In a feed-heating plant according to the parent Specification the mixing compartment A and the reservoir compartment B are connected by a conduit 60 having a non-return valve as at 62 which operates to close under the normal steam pressure in the heating chamber A but permits back-flow if the steam pressure fails. This device may replace the valve-attachment of the regulator in the parent Specification or may be used additionally.

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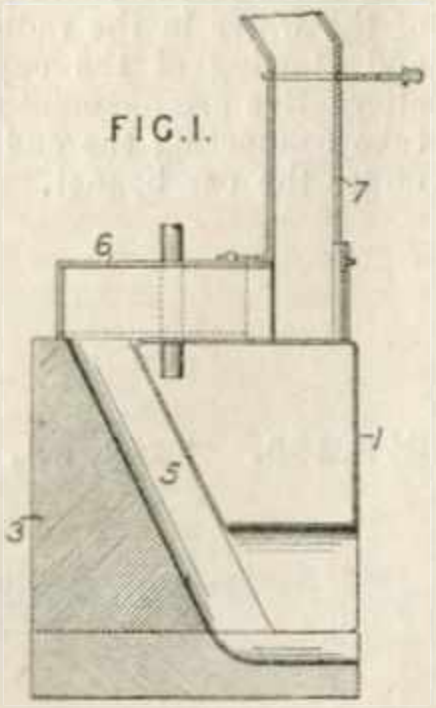
299,284. Taylor, T. W. June 16, 1928.

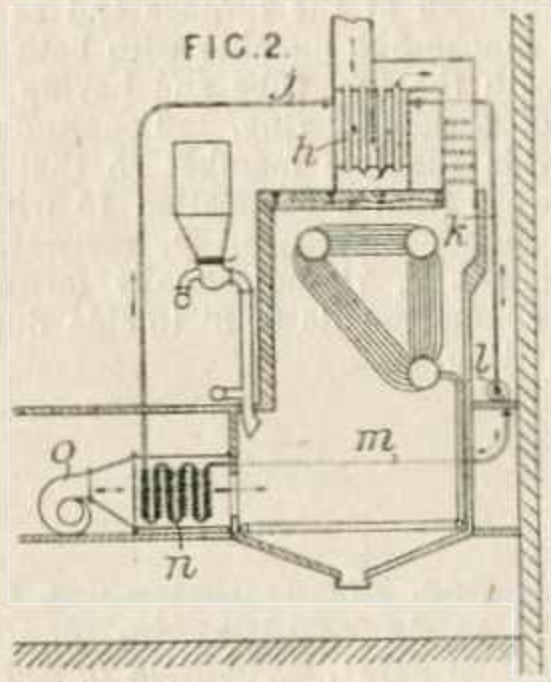
Block-form boilers. — A substantially triangular boiler 1, resting on a fire-brick backing 3 which has a channelled flue 5, is provided with a cover 6, supported on the backing at the rear and by the boiler in front, to form a flue through which the hot gases are brought over the top of the boiler before passing to the uptake 7.

FIG. 1.



299,436. Prat, E. Oct. 26, 1927, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Acts*].

FIG. 2.



Heating air.—Air supplied to a furnace by a blower *o* is heated by hot liquid circulating through a pipe-coil *n* and deriving its heat from the products of combustion passing through the tubes *h* of a heat exchanger mounted in the smoke stack. The circulation is maintained by a pump *l* through pipes *j*, *k*, *m*. In a modification the incoming air and the outgoing gases pass through conduits side by side, the tubes carrying the liquid medium, for example oil, extending through both conduits and the oil being kept in local circulation by a pump in a direction so that it is first heated by the hot gases and then heats the air in the adjacent conduit.

299,706. Soc. Anon. Record. Oct. 29, 1927, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Acts*].

Digesters.—The cover *b* of a digester is fitted with a handle 2 having projections 1 which prevent the cover from falling in when released. Alternatively, projections may be formed integral with the digester body below the rim 3, to prevent the cover from falling in.

FIG. 1.

300,298. Wollaston, T. R. Aug. 5, 1927.

FIG. 1.

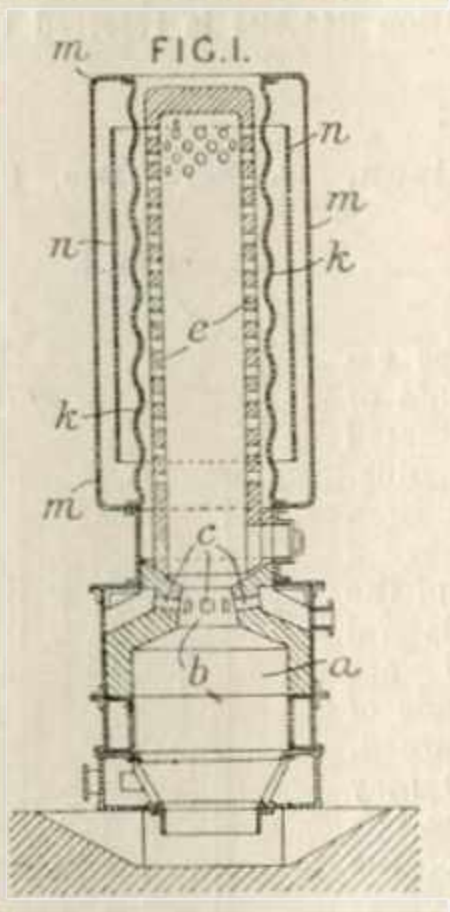
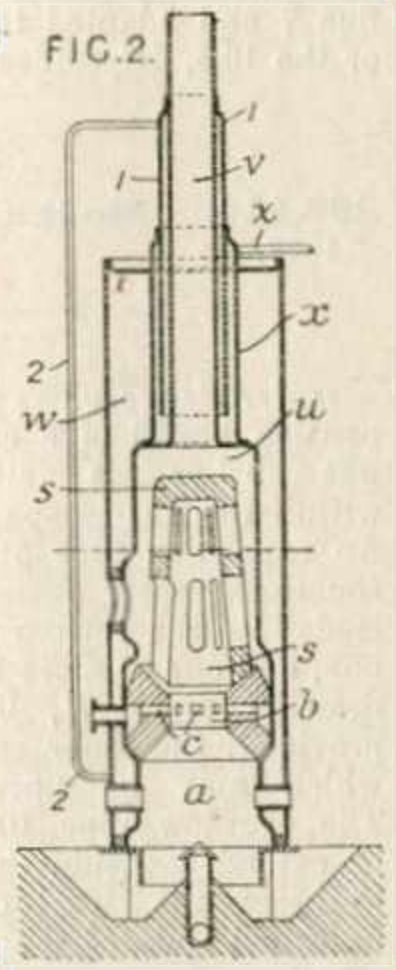


FIG. 2.



Boilers; feedwater, heating.—In apparatus for heating boilers &c., and of the kind employing a perforated heat-radiator *e*, Fig. 1, rendered incandescent by the combustion of gas which is generated in a combined producer *a* and supplied, at the entrance *b* to the radiator, with preheated air, the air for combustion is supplied, through the ports *c*, under pressure. Fig. 1 shows the invention applied to an annular fluid-heating device *m* which is formed with a corrugated inner surface *k* and fitted with an internal tubular baffle *n*. In the construction shown in Fig. 2, the radiator *s* is arranged within the fire-box of a vertical boiler *u*, the chimney *v* of which is provided with jackets 1, *x* for heating feedwater, the latter being supplied at *z* and passing to the water-space *w* of the boiler through a pipe 2. Specifications 243,092 and 274,286, [both in *Class* 51 (i), Furnaces and kilns, Combustion apparatus of], are referred to.

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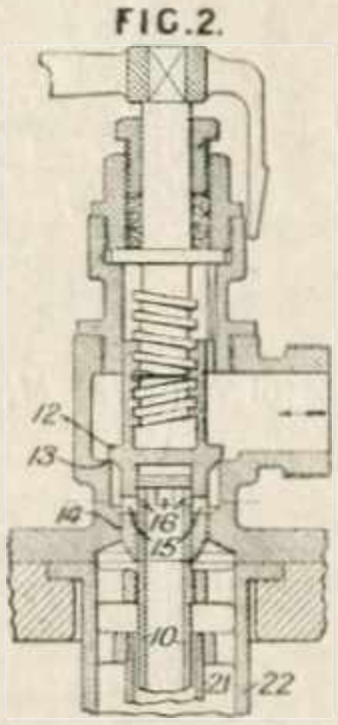
300,478. Holden & Brooke, Ltd., and **Brooke, R. W.** May 15, 1928.

FIG. 2.



Heating liquids.—Liquid heating apparatus comprises a steam-jet circulator of multi-concentric cone type with which is combined valve means adapted to supply steam to different parts of the circulator. In the example a valve 12 is movable axially and according to its position, shuts off steam entirely as shown, allows steam to pass over valve-seat 13, through ports 15, 16 to the central cone 10 only of a tri-cone circulator, allows steam to pass between its lower end and valve seat 14 to the outer cones 21, 22 only, or in its uppermost position additionally opens ports 16 so that the heating effect is at its maximum. Specifications 269,984, [*Class* 64 (ii), Heating systems &c.], and 285,603 are referred to.

300,618. Bastian-Morley Co., (Assignees of *Morley, J. P.*). April 13, 1927, [*Convention date*]. *Divided on* 288,594.

FIG. 2.

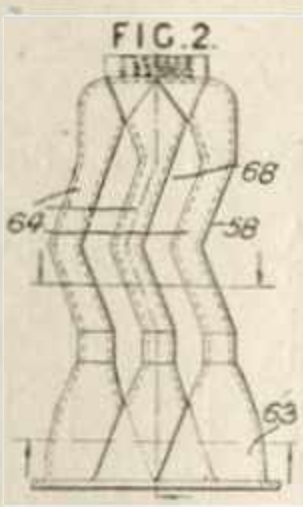
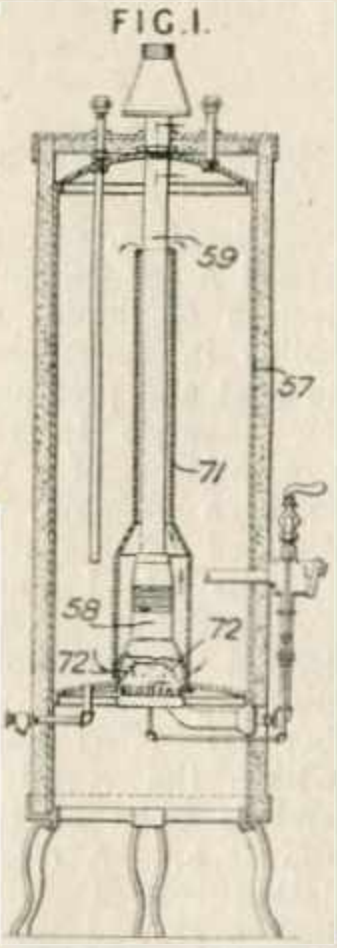


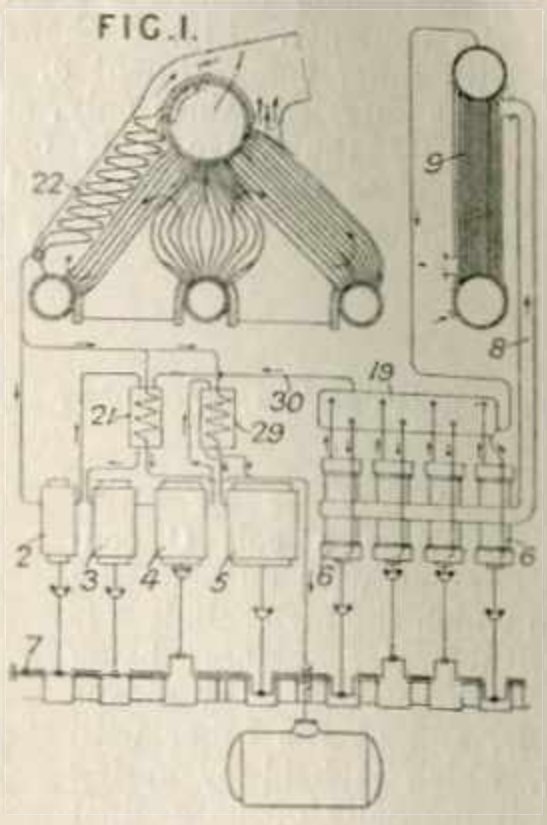
FIG. 1.



Internally-fired boilers.—In a boiler for heating water or generating steam the heating unit 58 is separable as a whole and comprises a series of spaced longitudinal flue passages 64 joining a bell 63 above the burner to a flue pipe 59, water passages 68 being formed between the passages. The unit may be enclosed in a casing 71 within a container 57, circulation passages 72 being left at the base of casing 71, or the unit may be fitted within a casing forming a circulatory heater external to the main water-holding casing 57. Specification 288,594 is referred to.

300,631. Schmidt'sche Heissdampf-Ges. Nov. 17, 1927, [*Convention date*].

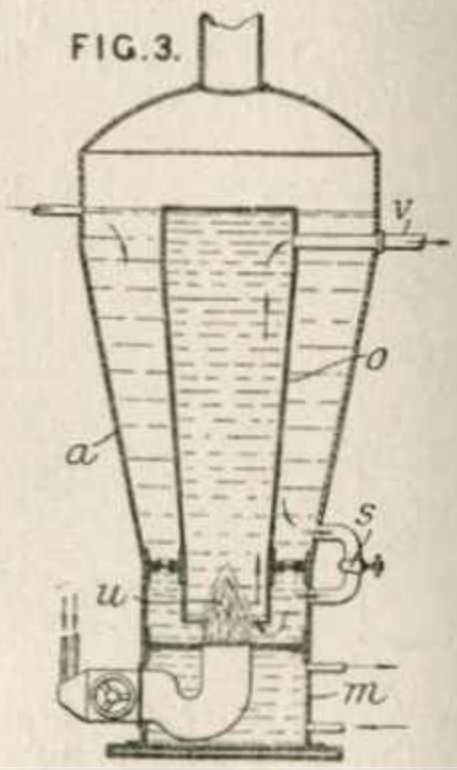
FIG. 1.



Feedwater, heating.—In a motor power plant comprising a two-pressure compound steam engine and an internal-combustion engine, the exhaust gases of the I.C. engine pass by a pipe 8 to a feedwater heater 9 for the boiler 1, and may then be used in an air preheater. The feedwater from the heater 9 may pass through a steam generator which is indirectly heated by steam from the cooling jackets of the I.C. engine cylinders.

300,819. Brunler, O. Dec. 21, 1927.

FIG. 3.



Heating liquids.—A plant for heating liquids by means of one or more submerged flames burning in an upright position comprises a container *a* for the material to be heated and an external burner structure *h*, *m* arranged so that the flame only enters the container. Fig. 1 shows a rotatably mounted drum, with a refractory lining, for

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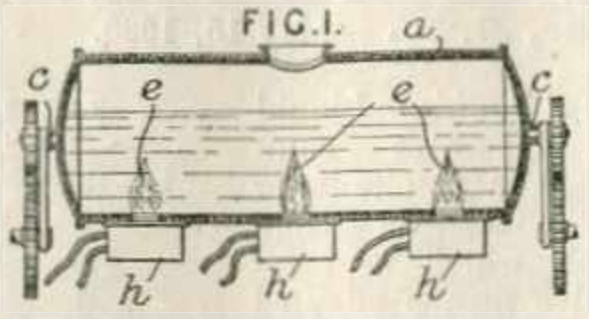
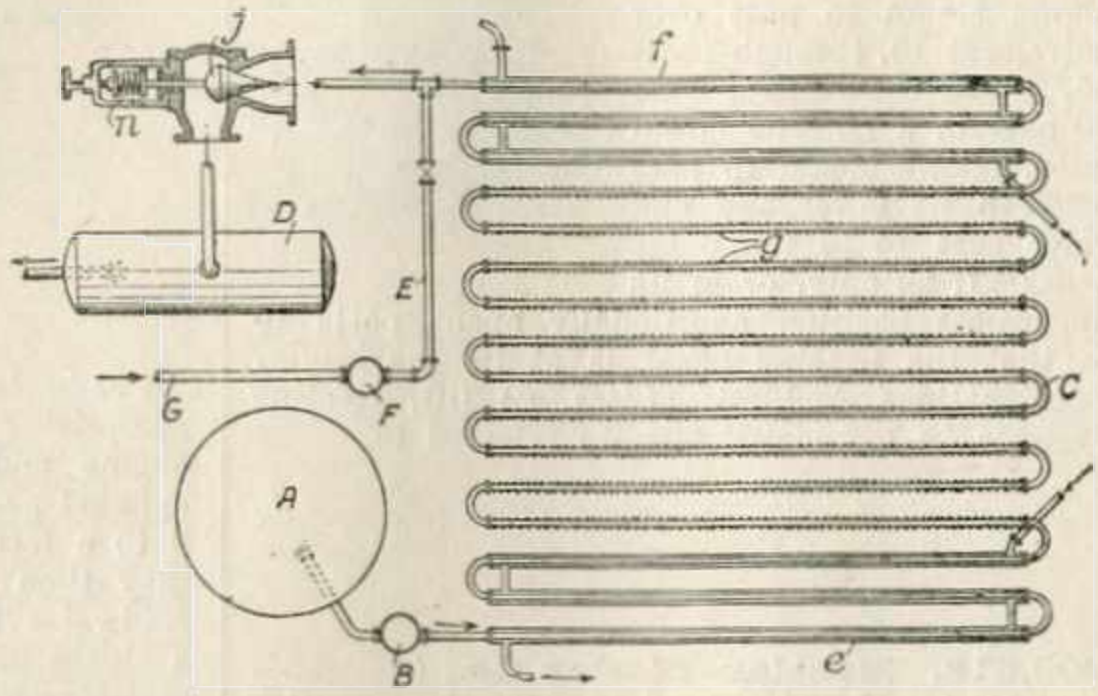
the manufacture of cement. During the process the flames *e* burn in an upright position, the drum being rotated on trunnions *c* for the discharge of the contents. Fig. 3 shows an evaporator *a* with inner compartment *o*. Liquid is admitted to the outer container only, at starting, and subsequently the valve *s* is opened and adjusted to regulate the flow of liquid past the flame *u*, the concentrated liquor being drawn off at *v*.

FIG. 1.



301,267. Hercules Powder Co., (Assignees of *Milliken, M. G.*). Feb. 23, 1928, [*Convention date*].

Digesters.—A digester for nitrocellulose comprises a coil C connected at one end with an agitating tube A, in which the nitrocellulose is mixed with water before being forced through the coil C by means of pump B, and at the other with a valve *j*, which is held by spring *n* so that it normally opens against a given pressure in coil C to discharge the nitrocellulose and water. The coil is jacketed at its inlet with a steam heating coil *e* and its outlet with a water cooling coil *f*, and the intermediate part *g* of the coil is covered with insulating material. The discharge of the nitrocellulose is facilitated by admission of water under pressure through pipe E, which is connected through pump F either to an independent water supply or to that in or overflowed from tank D into which the nitrocellulose is discharged. The apparatus may be made of chrome steel.



301,426. Aktiebolaget Svenska Järnvägsverkstäderna. Nov. 29, 1927, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Acts*].

FIG. 1.

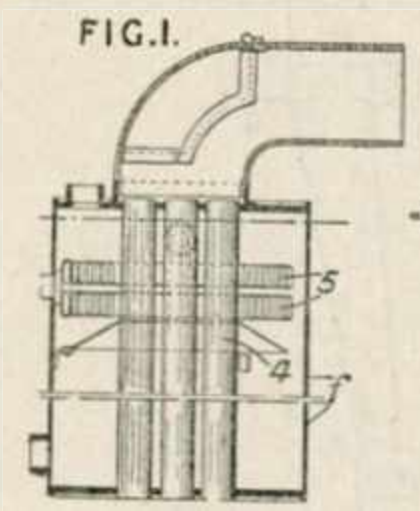
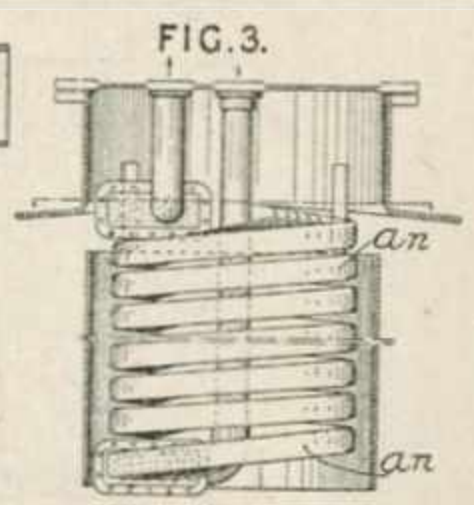


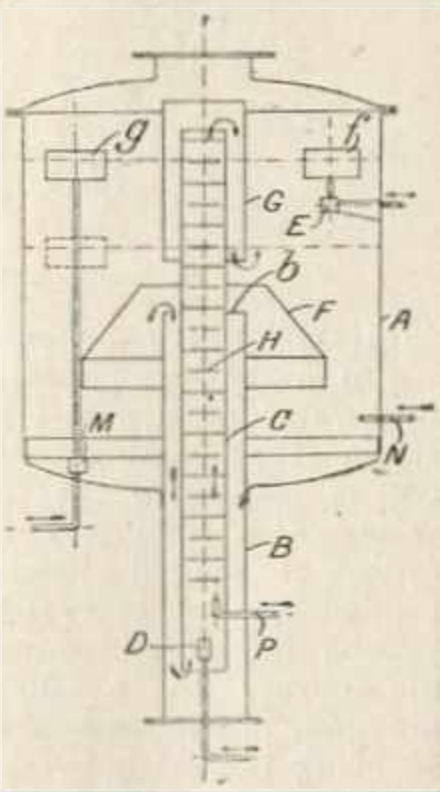
FIG. 3.



Heating-liquids.—One of the heat-exchanging fluids passes through a tube or tubes 5 of substantially flat section curved spirally or helically so that the axis of the spiral is parallel to the flat sides. Fig. 1 shows two spirally wound tubes. Fig. 3 shows a number of helically wound tubes *an*. The other heat-exchanging fluid passes around the tubes within a casing such as *f* which may be traversed by heating flues 4.

301,994. Barber, T. W. Sept. 30, 1927.

Digesters. — A vessel A for the subjection of liquids or solids in suspension to heat and pressure, for example in the separation of oil from a magma, is adapted for continuous feed and automatically controlled continuous discharge. A chamber B is formed within the vessel A and is open at the top at *b*. A circulating tube C with baffles H and hoods F, G passes down into the chamber B, which may extend outside the vessel A as shown. Continuous feed is effected, for example through the jets D for magma and N or P for treating liquid. Control of discharge is effected by the floats *f*, *g*, operating valves E, M for oil and impurities respectively.



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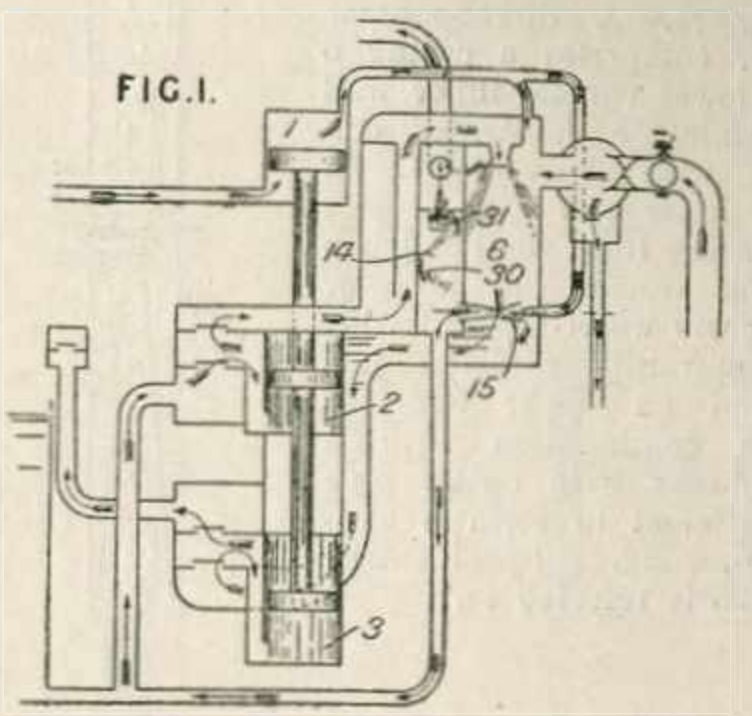
302,077. Penman, J. W. Jan. 31, 1928.

Digesters.—A false bottom is so fitted in a digester as to be slightly flexible or yielding between the rivets of the joint. This may be effected by providing a number of fine saw-cuts extending radially inwards from the periphery.

302,164. Soc. Française des Pompes et Machines Worthington. Dec. 9, 1927, [*Convention date*]. *Addition to* 276,933.

Feedwater, heating. — In a feed-heater as in the parent Specification with steam cylinder 1 operating cold and hot water pump cylinders 2, 3, the cold feed being delivered to and the hot water withdrawn from a direct-contact heat-chamber 6, the intermediate chamber 14 to which excess hot water is delivered by the injector 15 is provided with a cold-water spray 30 to act as an auxiliary condensing means. A float valve 31 may control the exit for separated gases.

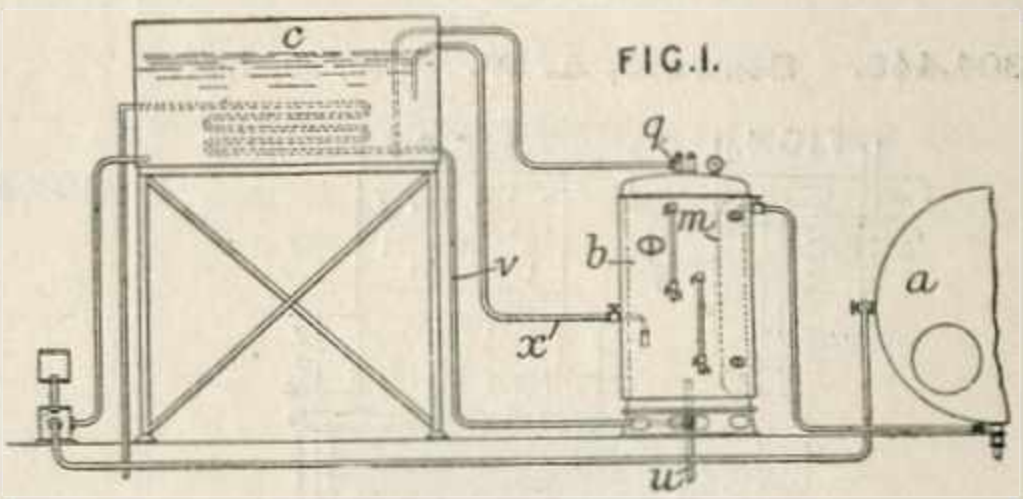
FIG. 1.



302,942. Filtrators, Ltd., and **Saks, V. V.** June 22, 1927.

Feedwater, heating.—Water blown down from a boiler *a* is led into a settling chamber *b* from which clean water is forced by the steam pressure in the chamber up through a pipe *x* into the feed tank *c*, and from which steam is led off through a pressure reducing valve *q* to heat the water in the tank. Dirty water is blown out of the settling chamber either directly through a pipe *u* or through a pipe *v* passing through the water in the feed tank.

FIG. 1.



304,236. Vedrinsky, A. Jan. 17, 1928, [*Convention date*].

Water-tube boilers.—A liquid heater for spraying plants &c., comprises a single tube through which the liquid is cause to flow spirally coiled to form three combustion chambers *g*, g^1, g^2 for burners *b*, b^1, b^2, the tube *f* rising in one coil, forming a cluster of coils f^3 above the central space, and descending in the other coil f^4, the space g^2 being formed by the concave sides of the coils *f* and f^4. The coils are enclosed in a dome *d* within an outer casing *e* with perforated top e^1. Liquid flow is controlled by a stop-cock in a portable tank connected to the heater by a tube *x* on which a cock *h* is fitted having a minimum setting. This cock can be opened further as desired by a lever i^2 placed near the handle a^2, whereby a rack *i* rotates the wheel h^1 fixed to the plug of the cock *h*.

FIG. 2.

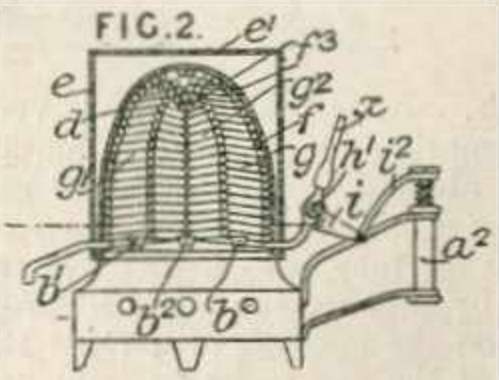
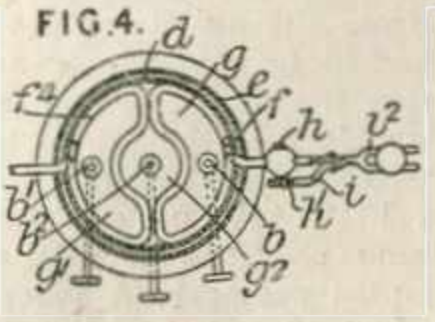


FIG. 4.



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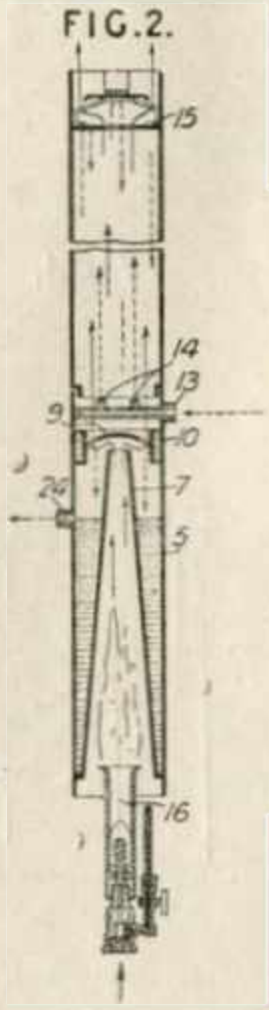
304,344. Paterson, F. A., and **McGlasson, A.** Oct. 17, 1927.

FIG.2.



Geysers.—A direct-contact geyser comprises a casing 5 with lower conical inner wall 7 forming a hot-water collector with delivery 24, an upper inner wall 10 to protect the casing from the hot gases passing around the deflector 9, a cross water-pipe 13 with two upwardly directed jets 14 and an upper deflector 15 in combination with a gas burner with outlet pipe 16 flattened to form a slot-like opening. Specification 9460/95 is referred to.

304,446. Stewart, A. W. Dec. 30, 1927.

FIG.4.

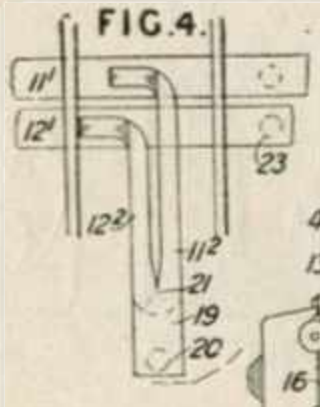
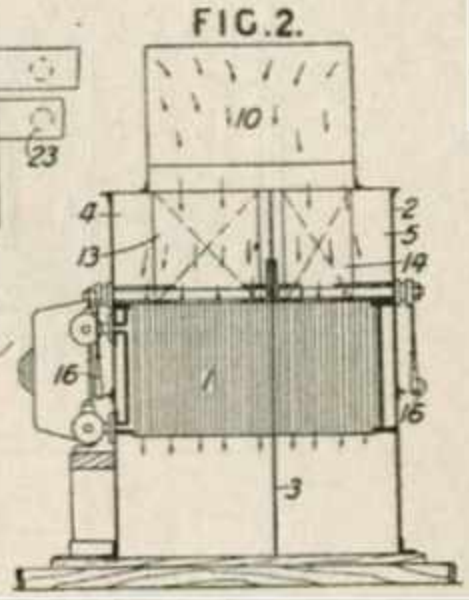
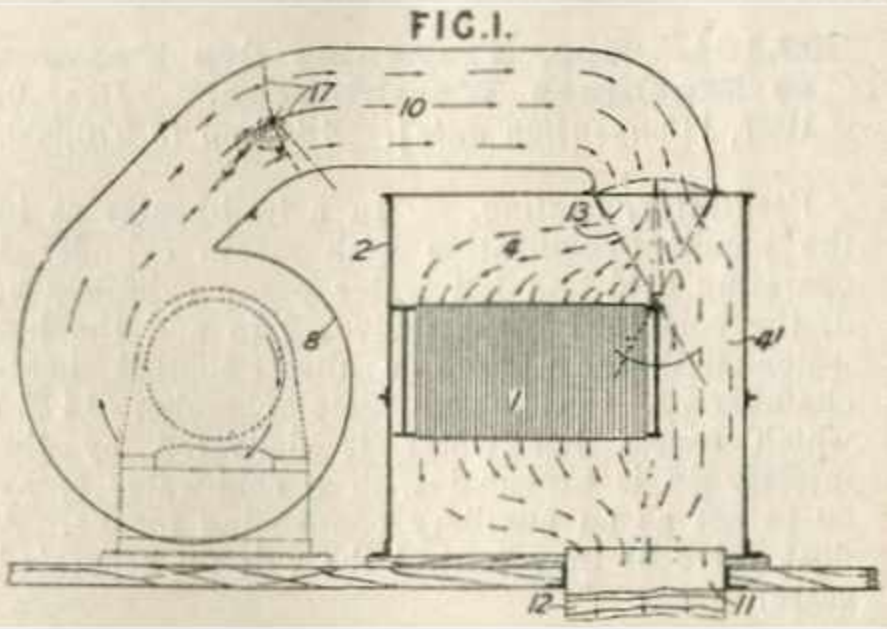


FIG.2.

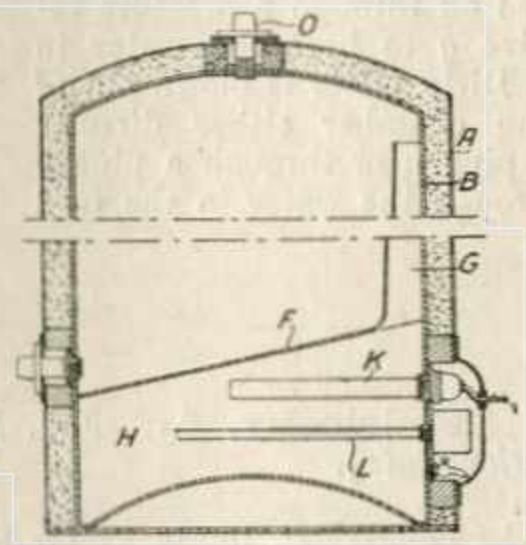


Heating air. — Air heating and ventilating apparatus comprises a casing 2 containing a heater 1 and divided by a partition 3 extending across the heater into two compartments 4, 5 in each of which air may pass to the heater and to a passage 4¹ by passing the same in proportions depending upon the position of a valve 13, 14, at the inlet end of the compartment, and two ducts 11, 12, leading from the outlets of the compartments, are connected to a nozzle or nozzles for delivering air from the ducts. A fan 8 delivers air through a duct 10 into the top of the casing 2, and the valves 13, 14 are adapted to be operated by handles 16 to take up any position between the extreme positions of closure of the heating and bye-pass passages. A valve 17 may be fitted in the duct 10. Part of the partition 3 may be displaced or arranged at an angle with respect to the other part. The outlet conduits 11, 12 are connected to supply conduits 11¹, 12¹, Fig. 4, from which are led branches 11², 12², merging into a common outlet branch 19 fitted with a nozzle 20. A mixing valve 21, regulatable to determine the proportions of air to be delivered from the two branches, is fitted in the branch 19, and nozzles 23 may be arranged in the conduits 11¹, 12¹. In the case of the ventilation of ships the branches 11¹, 12¹ are arranged under the deck beams, the branches 11², 12² being taken off in the space intermediate two beams.

FIG.1.



304,552. Nobbs, C. G. May 31, 1928.



Block-form boilers.—A hot-water boiler B with insulating jacket A is divided by a conducting partition F into a lower heating compartment H and an upper storage compartment to which cold water is fed and to which the hot water draw-off pipe O is connected. The lower compartment is heated, as for example by electrical heaters K controlled by a thermostat L, and is connected to the upper compartment by a relatively narrow internal vertical channel G formed between an upward extension of the conducting partition and the shell of the boiler.

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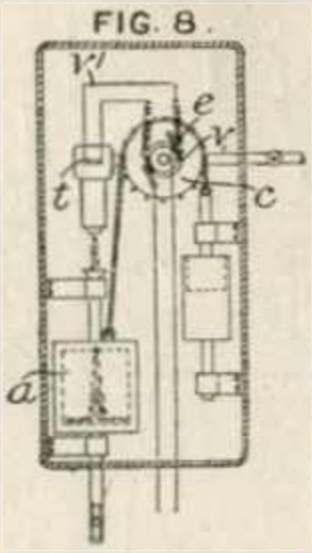
304,590. Graetzer, O. Jan. 21, 1928, [*Convention date*].

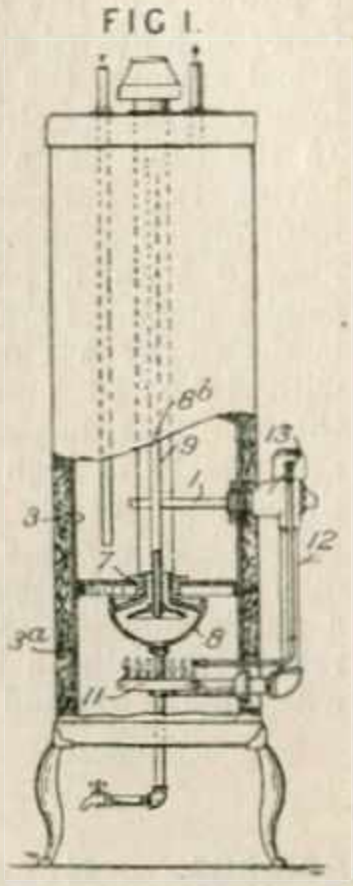
FIG. 8.



Water supply and delivery.—In automatic water supply cisterns having electrical heating means, the inlet valve *e* for the qlling of the cisterns is automatically closed or opened by means of a movable cistern *a* which is suspended and acts as a weight and is provided with a variable counter weight, the cistern itself thus directly forming the regulator of the inflow. When the outlet tap *a* is opened and water is drawn off, the cistern *a* rises and, by means of chain and pulley *c*, opens the supply valve *e* on the supply pipe. Should the cistern *a* subsequently fill up, it lowers and closes the supply valve *e*. For obtaining quick opening and closing movements, various arrangements of gearing, such as gear wheels of unequal size, or interrupted gearing of two different ratios, may be interposed between the wheel *c* and the spindle of the valve *e*, or the chain wheel *c* may be made elliptical.

304,675. Bastian-Morley Co., (Assignees of *Ginther, H. E.*). Jan. 24, 1928, [*Convention date*].

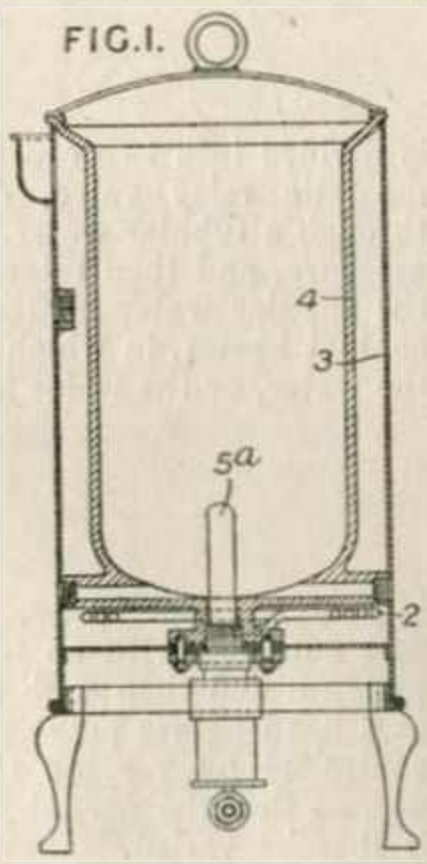
FIG 1.



Block-form boilers. — A water heater comprises a tank 3 with flue 9 and a wall 3a enclosing the burner 11 above which is a spreader 8 communicating by a neck 7 with the bottom of the tank and through a pipe 8b with the top thereof. The burner supply through a pipe 12 is regulated by a thermostat 1 extending into the valve chamber 13.

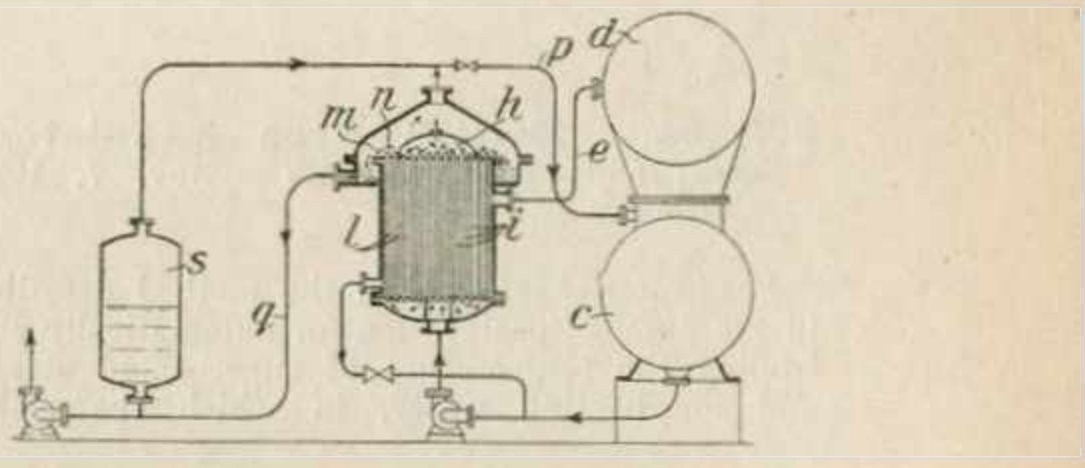
304,916. Lyons & Co., Ltd., J., and **Salmon, J.** Jan. 24, 1928.

FIG.1.



Set-pans. — An urn 4 is mounted in a jacket 3 containing heat-transmitting liquid heated for example by a steam coil 2, the heating being controlled by a thermostat the sensitive element 5a of which extends into the urn 4 and may, as shown, be concentric with the urn.

305,181. International General Electric Co., Inc., (Assignees of *Allgemeine Elektricitäts-Ges.*). Feb. 1, 1928, [*Convention date*].



Feedwater, heating. — The upper part of a feed-heater is surrounded by a chamber *n* into which feedwater, after traversing the tubes *i*, *l* in single or triple pass, falls over the edge of the upper tube-plate *m*. Air, disengaged in the chamber *n* and, if a triple pass is used, the chamber *h* is withdrawn through a pipe *p* connected to a source of vacuum such as the condenser *c*. Steam for heating is tapped from the turbine *d* through a pipe *e*. A pressure-equalizing vessel *s* may be fitted to the feed pipe *q*, with a connection to the air-pipe *p*.

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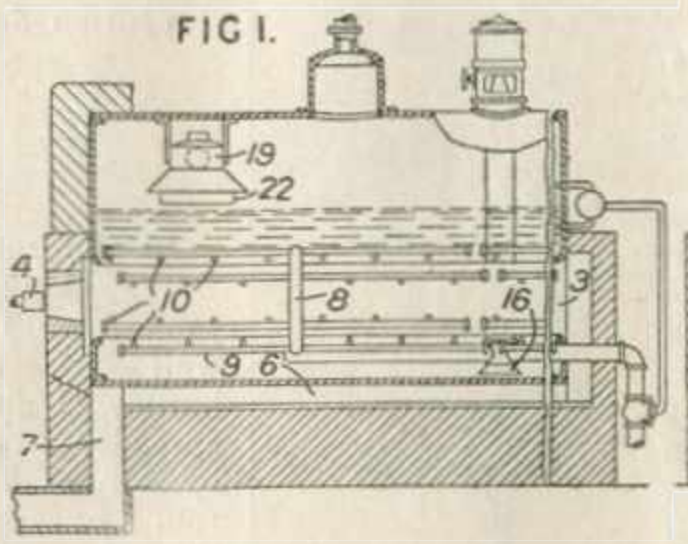
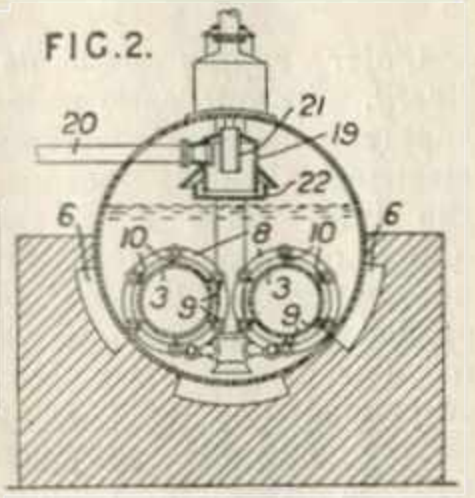
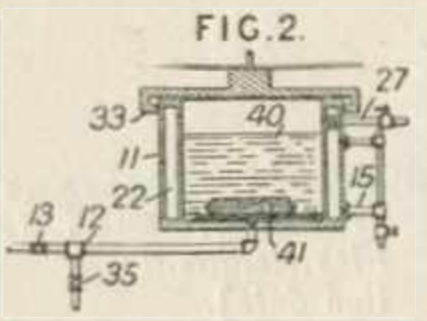
305,205. Stratford, C. W. Feb. 2, 1928, [*Convention date*].





Internally-fired boilers.—Fluids are heated by projecting through a plurality of jets against the exterior of a heated stationary cylindrical surface, the jets being uniformly spaced circumferentially. In the example, a still is shown having two burners 4 delivering into flues 3 connected by outside flues 6 with a passage 7 to a smoke stack. Liquid in the still is drawn by a submerged pump with inlet 16 and is delivered through ring headers 8, pipes 9 and jets 10 at high velocity on to the surface of the flues 3. The jets may be inclined to cause a rotary movement round the flue. A modification with an external pump and a single flue is described. A centrifugal separator comprising a tangential inlet 20, a hood 19 with uptake 21, and a fan 22 is provided, through which feed-liquid is supplied, to remove vapour. The application of the method of heating to steam generators and to the heating of liquids generally is mentioned. Specification 280,727, [*Class* 32, Distilling &c.], is referred to.

305,531. Goodyear Tire & Rubber Co., (Assignees of *Andrews, G. G.*). Feb. 6, 1928, [*Convention date*].



Digesters. — Rubber moulds are cleaned by immersion in an alkaline solution under heat and pressure. A pair of vessels 11 are employed which are connected by a pipe 12 fitted with a valve 13 and an exhaust valve 35. Each vessel is furnished with a steam jacket 22 and with a removable cover 33 adapted to be secured by lugs. In use, a mould 41 is placed in the bottom of the vessel and covered with cleaning solution 40, after which the cover 33 is secured in position and steam is circulated through the jacket 22 to vaporize the solution. After treatment, the valve 13 is opened to permit the solution to pass to the other vessel; this operation may be assisted by steam admitted through a pipe 27.

305,564. British Area Regulators, Ltd., and **Lindsay, T.** Nov. 7, 1927. *Addition to* 261,196.

Feedwater, heating.—In the method described in the parent Specification for automatically controlling the temperature of superheated steam, and for heating water, in which the steam is divided into two controlled portions by a thermostatic relay valve, one of which is passed through a tubular water heater to reduce its temperature, and then mixed with the other portion, the tubular water heater is replaced by a direct contact heater, in which the steam is passed into the water, or the water is sprayed into the steam.

305,577. General Carbonic Co., (Assignees of *Minor, H. R.*). Feb. 7, 1928, [*Convention date*].

Digesters.—Relates to apparatus for heating by steam and the like of the kind used for vulcanizing rubber, cooking &c. The heating chamber is first supplied with an inert gas at a controllable pressure and then with steam or like heated gas at a fixed higher pressure, the temperature being controlled by varying the pressure of the inert gas, so that the partial pressure of the steam &c. is thereby varied.

305,755. Tansley, G. E. Dec. 8, 1927.

Heating air.—An air heater comprises headers A, B joined by concentric tubes C, D so that air passes through the annular spaces between the tubes, while products of combustion in the flue E deflected by baffles F pass through the inner tubes and about the outer tubes. Both or either

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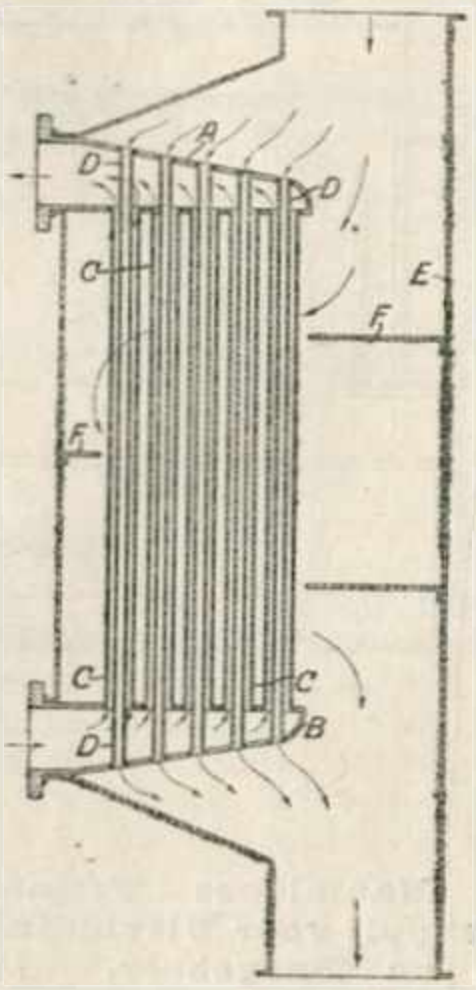
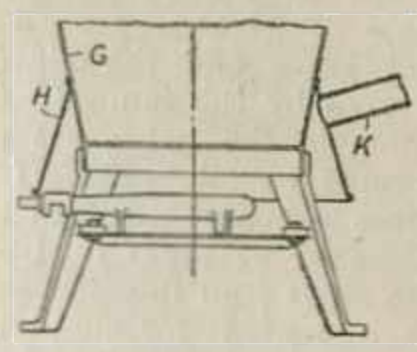
sets of tubes are provided with gills, projections or fins either inside or outside or both. Specifications 19291/11, [*Class* 64 (iii), Surface apparatus &c.], and 260,174 are referred to.



306,209. Peters, J. A. Nov. 28, 1927.

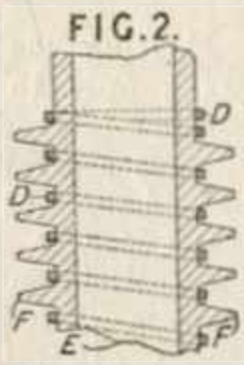
Washing-boilers.—A washing-boiler of the type in which a single pan G is supported at or near the bottom is provided with a skirt H forming a heat chamber round the lower part of the wall of the boiler substantially preventing fumes from the burner from rising around the upper part of the pan. In some cases the skirt may be fitted with a flue pipe K or, when outwardly extending as shown, a series of holes may be positioned near the lower edge. In a modification the skirt may be extended upwards to form a close-fitting jacket round the pan.



306,274. Green, F. W. Feb. 10, 1928.

Feedwater, heating.—Ribbed headers and tubes E of a fuel economizer are strengthened by wrapping tightly around them steel bands D which may be in the hollows between the spiral ribs F or may be embedded in the metal of the tube by casting the tube round it.

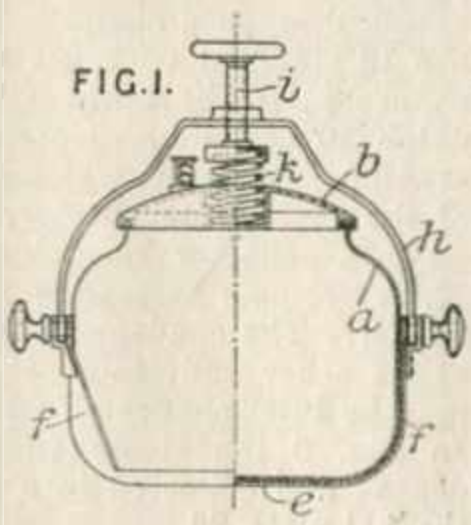
FIG.2.



306,830. Fritsch, W., Fritsch, P., and **Fritsch, O.,** (*trading as* Fritsch & Co.). Feb. 24, 1928, [*Convention date*]. *Void* [*Published under Sect.* 91 *of the Acts*].

Digesters. — The lid *b* of a cooking vessel *a* is secured against the opening by a clamp extending from a plate *e* bearing against the bottom of the vessel. In the example, side extensions *f* of the plate *e* carry forks into which fit the ends of the yoke *h* which bears a screw *i* pressing upon the lid through a spring *k*. A modification is mentioned in which a rod passes through the bottom of the vessel and the lid and is secured by a nut or clamp lever.

FIG.1.



307,027. Gasverarbeitungsges. March 1, 1928, [*Convention date*].

Heating gases.—Hydrogen for use in catalytic reactions is heated by passage through a heat exchanger in counter current with an inert gas such as nitrogen. The inert gas may be heated by passing it through a tube heated by direct flame or by molten metal. Preliminary heating of the cold gases to a temperature not greater than 400° C. is obtained by heat exchange with gases from the reaction. The gases may also be heated by passing them through a purification catalyst, and the heating effect so produced may be increased by the addition of carbon monoxide or oxygen, e.g. by the addition of 3 to 5 per cent of oxygen. Catalysts are employed for the purification containing metals of the eighth group or compounds which are converted into those metals. The water formed in the purification process may be removed by drying or freezing in known manner.

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307,161. Matthews & Yates, Ltd., and **Stott, O.** Jan. 19, 1928.

Heating air.—In connection with an air-heating fan *a*, passages *c*, *d* extending radially inwards are provided in the volute alternate of which are open to hot gases and the air delivered by the fan. In the example the hot gases are formed by oil burners *i* in pipes *h* connected with the passages by pipes *f*. Upon the shaft *j* an impeller may be mounted for supplying air to the burners and an impeller *k* for moving the hot gases through the passages *c* in the fan volute. Specification 26399/06 is referred to.

FIG.1.

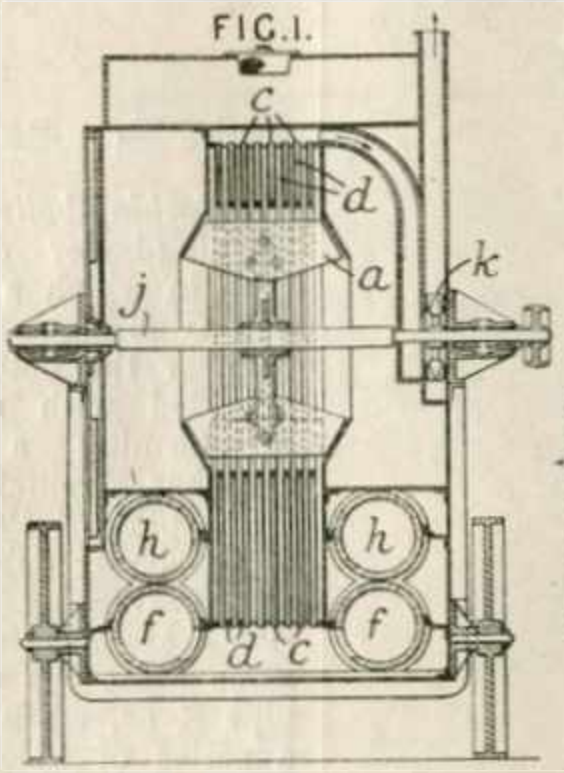
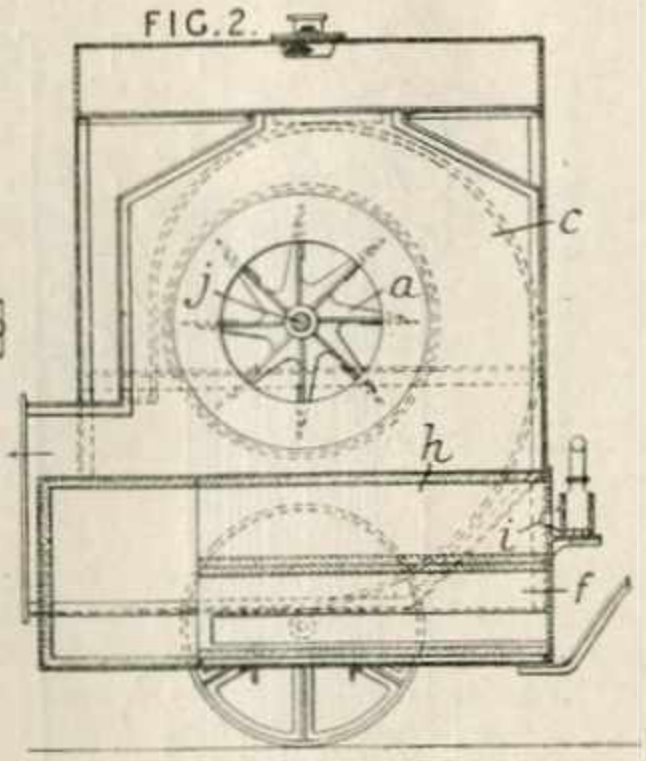
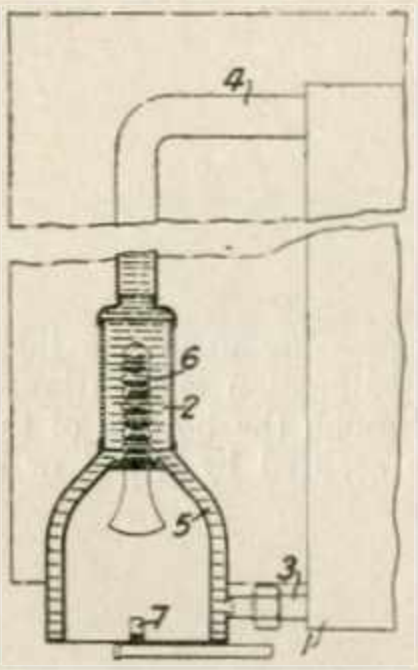


FIG.2.



307,253. Ewart, J. W. May 25, 1928.

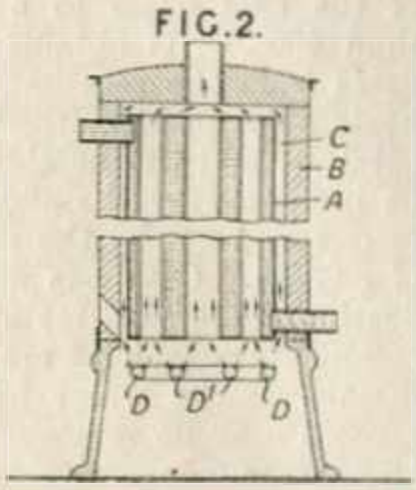
Boilers; freezing, preventing, circulating attachments for. — In a device comprising a main storage tank 1 and a supplementary tank 2 to which a source of heat is continuously applied, an element 6, or elements, of good heat-conducting material extends partly into the container 2 so as to occupy a considerable volume of the space thereof (e.g. $^1/_3$th) and the remainder is in close proximity to the source of heat 7. An annular extension 5 may surround the source of heat. The container 2 and connecting pipes 3, 4 may be heavily lagged.



307,669. Bündgens, F., and **Bündgens, L.** June 13, 1928.

Block-form boilers.—A gas-heated flued boiler A is mounted in a fire brick or like casing B, with an unrestricted flue-space C between, above a gas-burner with two rings D, D^1, either or both of which may be used at one time.

FIG.2.



307,850. Naamlooze Vennootschap Maatschappij voor Uitvindingen van Dikkers en Bargeboer. March 14, 1928, [*Convention date*].

FIG.3.

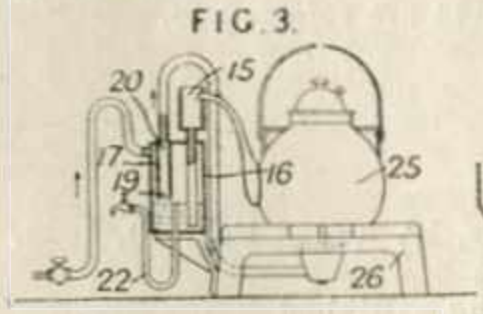
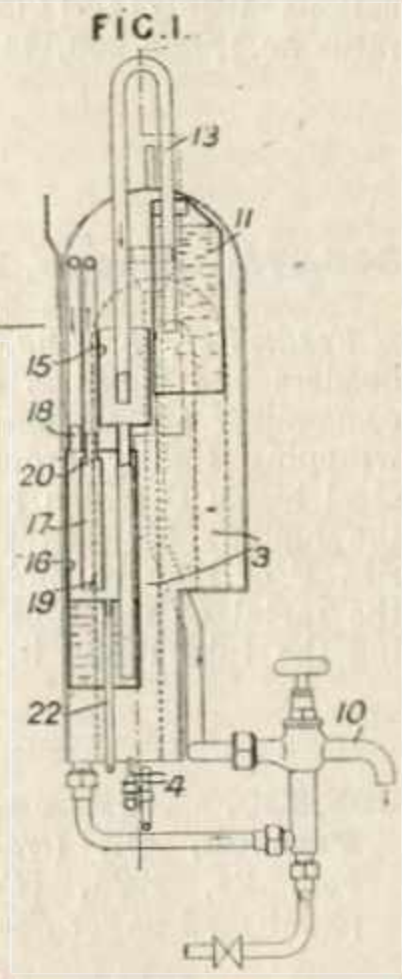


FIG.1.



Heating water.—The gas supply to a water heater is reduced or cut off after the water has been at boiling point for a time by the collection of condensate from the steam generated in a vessel into which dips a pipe conveying gas to the burner. In the example, Fig. 1, the gas supply to burners 4 at the lower end of a ∩-shaped flue 3, passes through a chamber 16 supplied with gas through a tube 18 and connected to the burners by a tube 17 having a notch 19 at its lower open end. Steam generated in a vessel 11, which may be a compartment of the main water heater, passes by the syphon 13 to a collector 15 and thence to the chamber 16. A bye-pass passage 20 may lead gas to a pilot burner. The condensate-level tube 22 has a cock at its other end, to reset the apparatus, which may be inter-connected with the draw-off tap 10. In Fig. 3 the steam from a kettle 25 is condensed and collected in a chamber 16 carried by the hot-plate 26.

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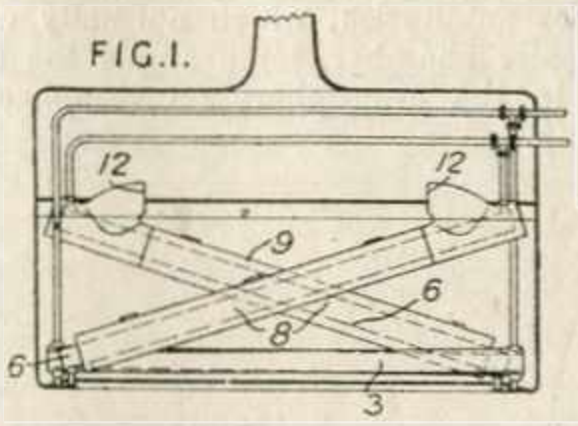
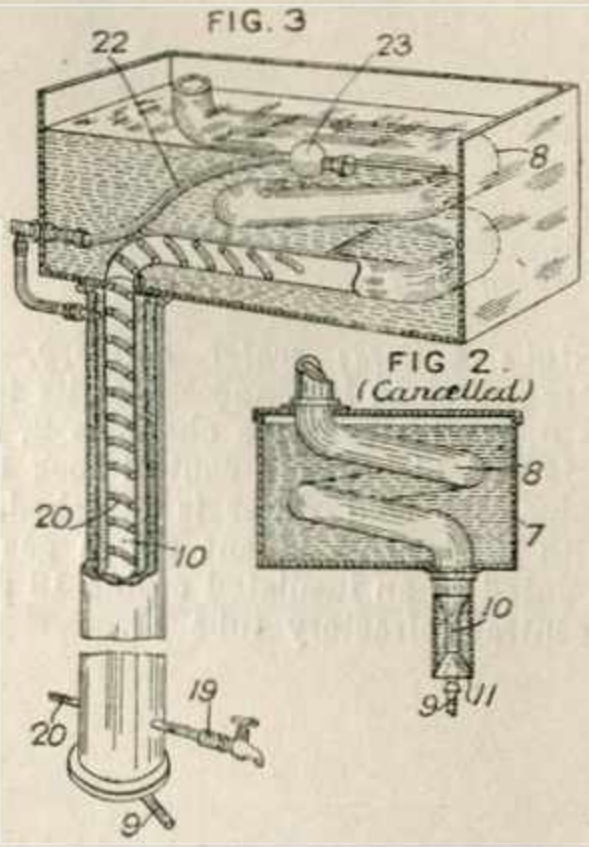
307,884. Gassberger, G. March 15, 1928, [*Convention date*].



Set-pans. — A heating and circulating device particularly for brewing vats comprises obliquely upward-pointing heating elements 6 enclosed within sleeve tubes open at both ends and shown as constructed in two removable parts 8, 9. Each sleeve is provided with a discharge hood 12 and the elements are so placed as to cause a circumferential circulation. Additional heaters 3, for example fed with lower pressure steam, may be placed horizontally in the lower part of the vessel.

308,195. Geake, W. H. G., Kerr, I. W., and **Roach, H.** March 19, 1928, [*Convention date*].

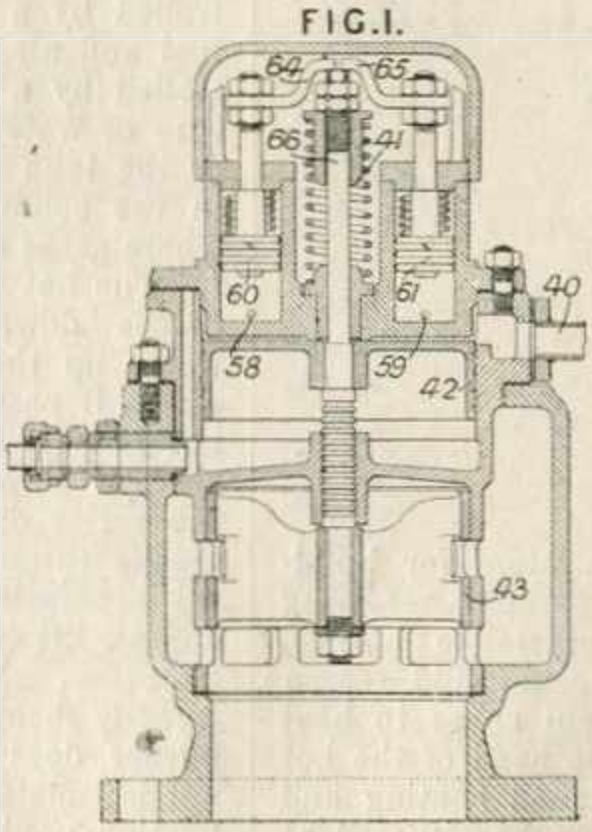
Block-form boilers; annular boilers; composite boilers.—A small continuously-burning gas burner 9 delivers into a water-jacketed induction pipe 10 leading to a flue 8 coiled in zig-zag form in a water cistern 7. The induction pipe may be lagged, and provided with a draw-off tap 19. Feed water may be supplied through a narrow bore coiled tube 20 in the induction pipe and flue. The main draw-off pipe 22 may be flexible with its open end supported by a float 23.

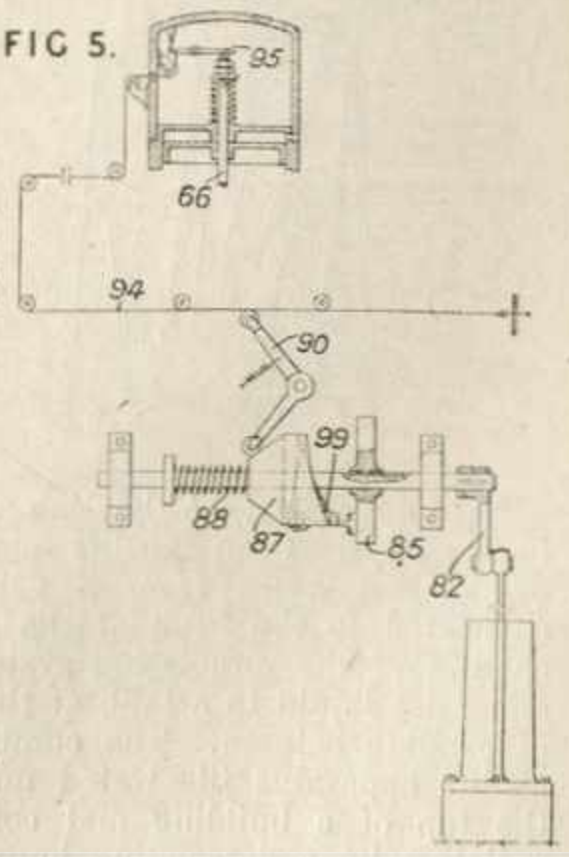


The Specification as open to inspection under Sect. 91 (3) (a) comprises also the use of a non-jacketed induction pipe 10, Fig. 2 (*Cancelled*) narrowed to cause a comparative slowing of the gases through the larger diameter tube of the flue 8. This subject-matter does not appear in the Specification as accepted.

308,964. Soc. L'Auxiliare des Chemins de Fer et de l'Industrie. April 2, 1928, [*Convention date*]. *Addition to* 290,598.

Feedwater, heating. — The regulator valve of the exhaust steam supply to the heater chamber of the parent Specification is modified to be shut on stoppage of the steam pressure from the main engine exhaust or the feed pump. In Fig. 1 the main regulator valve 43 normally held open by the spring 41 is caused to shut if the pressure in the heater-chamber rises by the action of the piston 42 forced down by pressure communicated through the pipe 40. A separate piston or pistons 60, 61 is kept in raised position under the pressure of the main engine or feed pump exhaust, through connections 58, 59. If one or both fail, as when the engine is shut off, the piston falls and a finger 64 or 65 depresses the stem 66 and main valve 43. The con-





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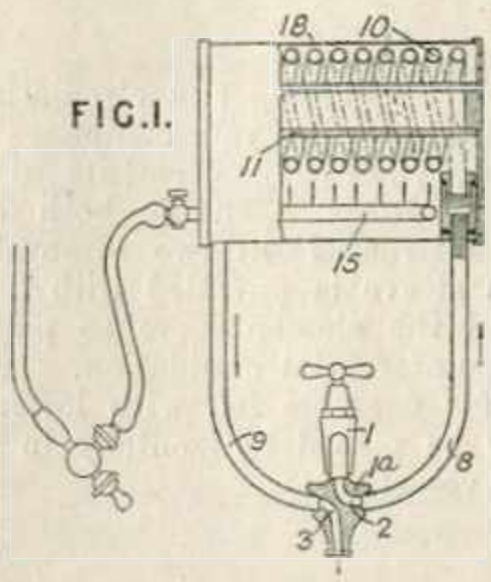
trol may be effected mechanically as in Fig. 5 where the feed-pump piston rod causes a crank 82 to rotate, a roller running up the cam contour 99 forces the cone 87 against a spring 88 and a bell-crank lever 90 causes a pull on a cable 94 whereby a lever 95 is held out of contact with the stem 66. On stoppage of the feed pump the cone is moved by the spring, the tension on the cable is relieved and the lever depresses the spindle 66 and the attached regulator valve. Provision is made for bye-passing the exhaust from other auxiliaries, which normally would go to the heater chamber, for example the air compressor, to the atmosphere on stoppage of the feed pump.

309,082. Lamarche, C. April 4, 1928, [*Convention date*].

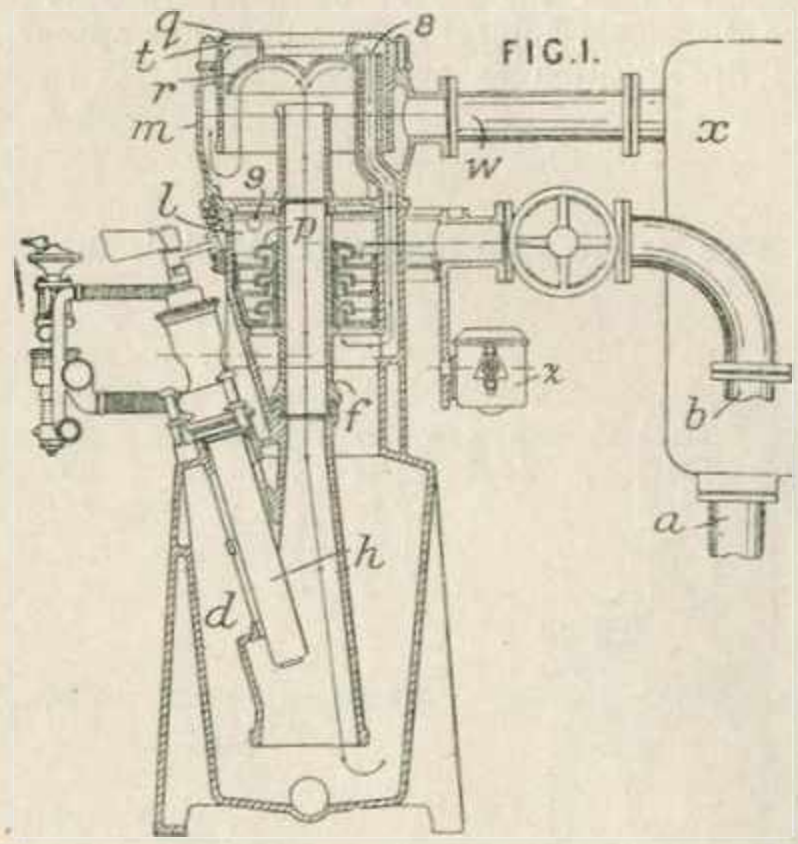
Water-tube boilers; water delivery.—A coil tube water heater 10 is connected at its two ends by pipes 8, 9 with separate channels 2, 3 in an element 1^a to which also a control cock 1 on the supply pipe for cold water is attached. The boiler with its heating means e.g. a gas burner 15 is mounted in an insulated casing 18 provided with a central refractory tube 11.

FIG. 1.



309,222. Hammond, C. F., and **Shackleton, W.** Jan. 6, 1928.

FIG. 1.



Heating water.—A heating system for buildings comprises an air-lift apparatus receiving combustion gases from a submersible burner, connected to the head of the cold-liquid return column of the circulating system so as to heat and raise liquid to a tank at the head of the hot descending column. The combined heating and air-lift apparatus illustrated may be situated at the top of a building and connected with the radiators by a descending hot-water pipe *a* and rising cold-water pipe *b*. The submersible burner *h* projects into the foot of the air-lift tube *f*, which projects downwards into a chamber *d*. The tube *f* passes through a heat interchange chamber *l* to a separator *m* having an annular deflector *r*. An annular space *t* is formed in the cover *q*, which also projects downwards into the chamber *m* to form a water seal. A delivery pipe *w* opens into a tank *x* at the top of the descending hot-water pipe *a*, and the rising cold water pipe *b* opens into the top of the chamber *l*. The water level in the chamber *l* is controlled by a float valve in a chamber *z*. The fuel and air supplied to the burner may be controlled by a thermostat subject to the temperature of water in the pipe *b*, or the chamber *m*, or the tank *x*. In operation, the aerated water in the column *f* overflows into the chamber *m* where gases are separated and pass into the space *t*. The hot water overflows into the tank *x* and passes down through pipes *a*, displacing cold water up the pipe *b* and into the chamber *l*, where it passes over the baffles *p* and meets the hot gases which have passed downwards from space *t* through passage 8 to the underside of the series of baffles. The cooled gases finally escape through opening 9. In a modification, the separating chamber *m*, heat interchanger *l*, and air-lift tube are all separated, and connected by pipes. In another modification, the water directly heated by the submerged combustion burner does not pass into the heating system, but is isolated in a separate chamber. The combustion products are thus purified, and are then supplied to a separate air-lift pipe. Specification 265,254 is referred to.

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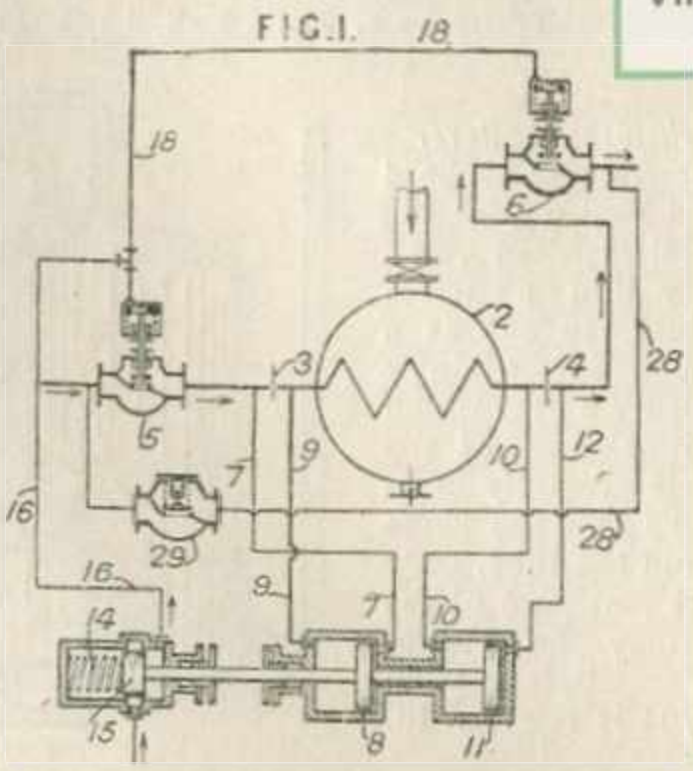
309,570. Akt.-Ges. der Maschinenfabriken Escher, Wyss, et Cie. April 13, 1928, [*Convention date*].

Feedwater, heating.—The fluid passing through the tubes of a heat exchanger 2, for example a feedwater heater, passes two pressure-plates 3, 4 one on either side of the exchanger, the pressures existing on each side of each plate being communicated to the sides of two connected pistons 8, 11 by pipes 7, 9 and 10, 12. On the breaking of a tube in the exchanger 2, the pressure differences set up cause the pistons 8, 11, and a third piston 15 in a separate cylinder, to move against the pressure of a spring 14. This allows pressure fluid to pass to stop-cocks 5, 6 through pipes 16, 18 and shut them, the fluid under treatment then being bye-passed through valve 29 and pipe 28.

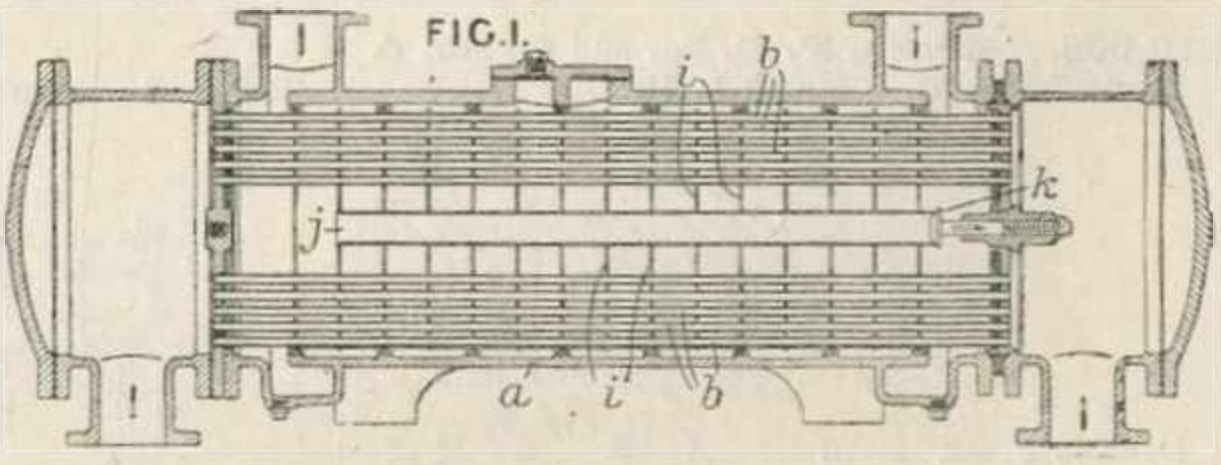
FIG. 1.



310,157. Serck Radiators, Ltd., Purchase, S. N., and **Wagner, C. O.** March 21, 1928.

Heating liquids.—An oil heater of the type comprising tubes *b* through which the medium flows and a container *a* with baffles *i* around which the oil passes, is provided with a bye-pass *j* having a spring or weight loaded valve *k* to allow oil to pass when the viscosity and consequently the pressure is high. The bye-pass may be central as shown or external and comprising a duct in the casing *a*.

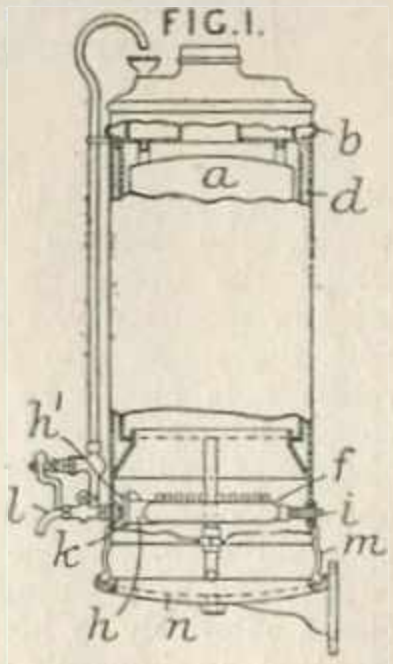
FIG. 1.



310,214. Righton, W. J. May 23, 1928.

Geysers.—In a water heater having a detachable inner chamber *a*, the supporting disc is provided with a rim *b* engaging the upper end of the inner wall of the water jacket *d*, the burner *f* is provided with means such as a screw *i* for forcing the gas-admission opening *h* of the burner against a collar *k*, with locating stud h^1, on the gas supply pipe *l*, and the geyser is supported by legs *m* resting in a dished bracket *n*.

FIG. 1.



310,433. Matthews, A. Oct. 26, 1927.

Boilers. — A boiler forming a hot-plate for a gas cooking-stove comprises a shallow metal body *c* with a water-space extending uninterruptedly completely round its sides, and having an outlet *h* in the upper face and an inlet *g* in the lower face for connection to a storage tank. The form shown in Fig. 1 is supported on the hot-plate frame by flanges *d*. Fig. 3 shows a modification consisting of water tubes *r* connected to a marginal hollow frame supported on flanges *u*.

FIG. 1.

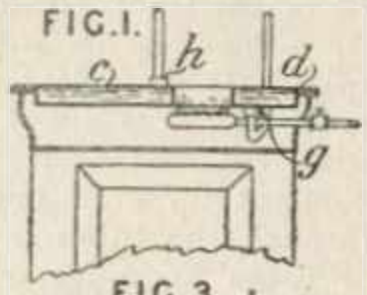
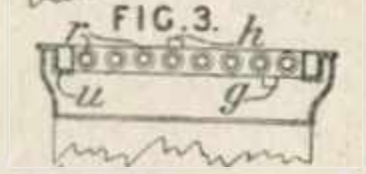


FIG. 3.



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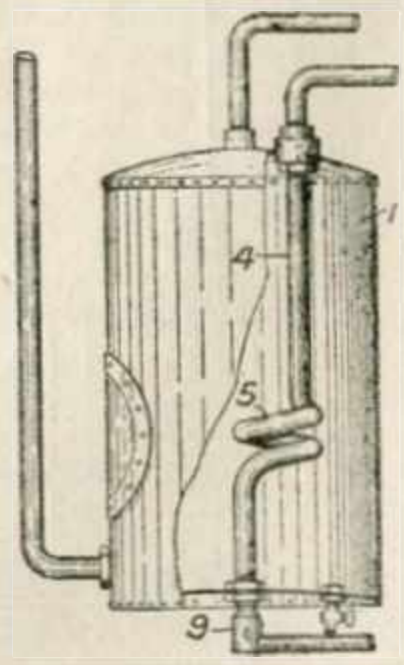
310,598. Wootton, G. Feb. 18, 1928.



Block-form boilers. —A convoluted tube 4 of good heat-conducting material is fitted vertically within a water container to act as a flue tube for a single gas burner 9 over which the lower end of the tube is directly disposed so that the flame is within the tube. Only a short portion 5 of the tube may be convoluted. Specification 17304/04 is referred to.

310,608. Green, F. D. L., and **Green & Son, Ltd., E.** March 5, 1928.

FIG. 1.

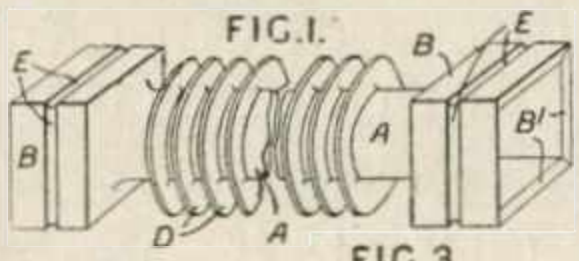
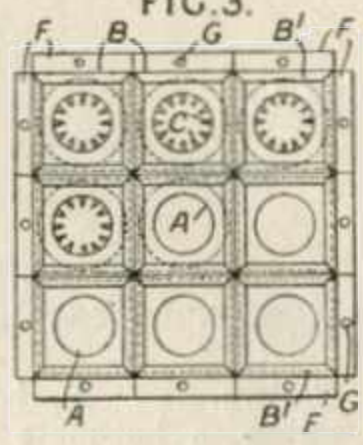


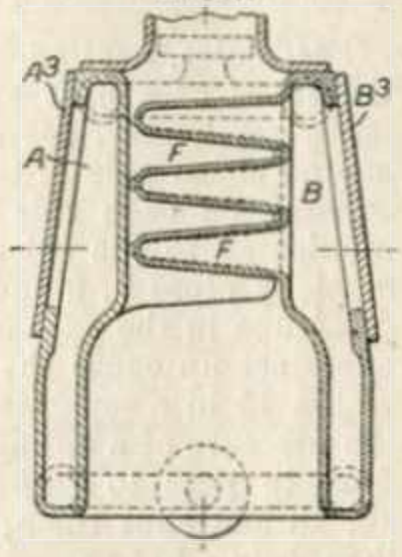
FIG. 3.



Heating gases. — In air or gas heaters built up of tubes A having box ends B clamped together, a groove E being provided around each box portion to take asbestos rope or other packing, the open edge B^1 of each box portion is formed as a knife edge to reduce loss of pressure. The tubes may be plain or provided with external and internal gills D, and may be built up in a flue, air or hot gases passing through the tubes in parallel or through groups of tubes in series while hot gases or air pass around the tubes. The boxes are clamped together by bolts and bars fitted around the outside or by bolts passing through the sides of the boxes, and the outer boxes are cast with flanges F to which the gas or air ducting is fixed by bolts passing through holes G. Spiral or staggered ribs may be provided and the tubes may be of oval section.

310,611. Clarkson, T. March 7, 1928.

FIG. 1.



Internally-fired boilers.—A water heater consists of two similar chambers A, B with inwardly-projecting tapering closed-ended tubes F placed opposite to one another to form the sides of the heating space, which is rectangular in cross section and which has a larger cross-sectional area at its lower end than at its upper end. The plates A^3, B^3 forming the outer walls of the chambers may be removable. The tubes may be formed integral with the inner walls of the chambers.

310,643. Sindall, R. A. April 17, 1928.

FIG. 2.

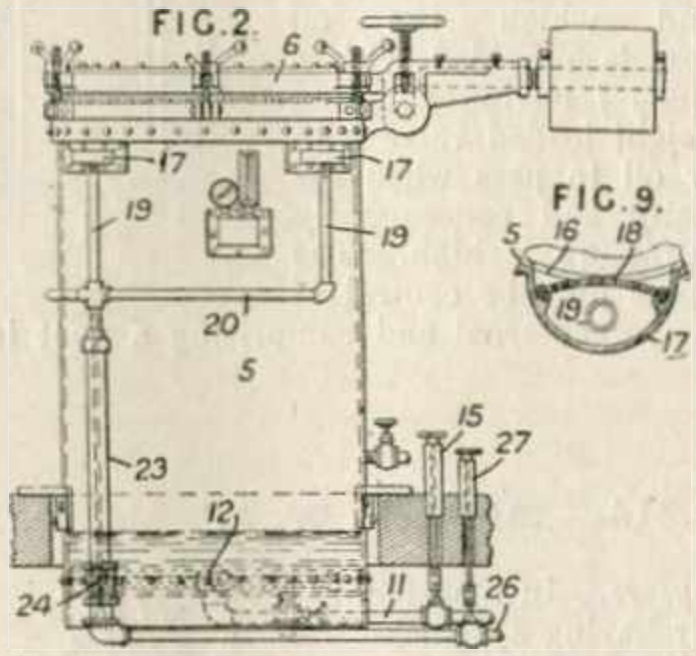


FIG. 9.

Digesters. — In a cooking retort, spraying elements are provided in the top and bottom of the vessel, the bottom sprayers supplying steam whilst the upper sprayers are associated with injector means which supply water to be sprayed with the steam into the top of the retort. The retort 5 is closed by a cover 6, and steam is supplied by a pipe 11 to a spraying head 12 consisting of radial pipes having perforations along one side of each pipe. The pipe 11 is controlled by a valve 15. At the upper end, the retort wall is provided with a number of spaced openings 16, closed exteriorly by housings 17. In each opening is fitted an inwardly-curved perforated spraying plate 18. A pipe 19 connects each housing 17 with a pipe 20, receiving steam and water from an injector 23 which is supplied with steam by a pipe 26 controlled by a valve 27, and sucks water from the bottom of the retort through a pipe 24.

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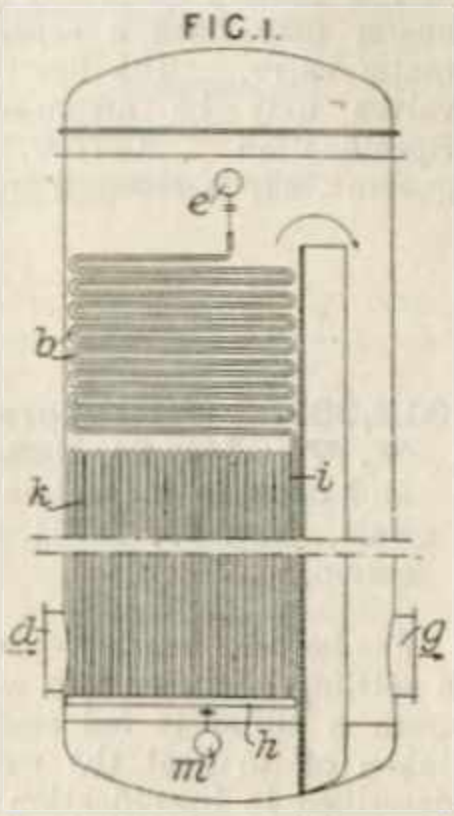
310,799. Superheater Co., Ltd., (Assignees of *Compagnie des Surchaufeurs*). April 30, 1928. [*Convention date*].

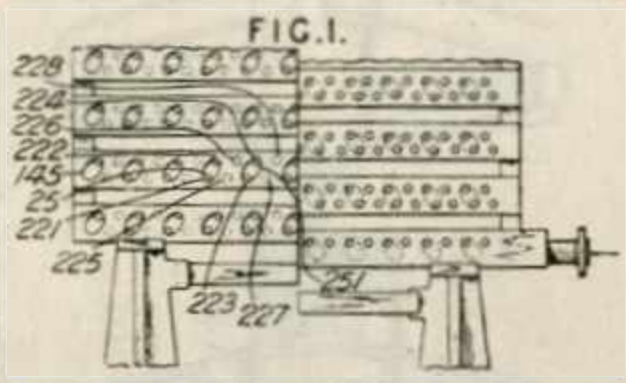
Heating air; heating water.—An apparatus for heating a fluid comprises the passage of the heating superheated fluid in counterflow, at a high speed while it retains superheat, and at a very much lower speed when the superheat has been lost. In the example the fluid to be heated passes in at *d* and out at *g*, in counterflow to the heating fluid which enters at *e* and passes through elements each comprising a pipe *b* for the high-speed part, and a connecting pipe *i*, a header *h* and condensing tubes *k* closed at the top for the condensing part, the condensate flowing out at *m*.

FIG. 1.



311,010. Babcock & Wilcox, Ltd., (*Babcock & Wilcox Co.*). Feb. 9, 1928.

FIG. 1.

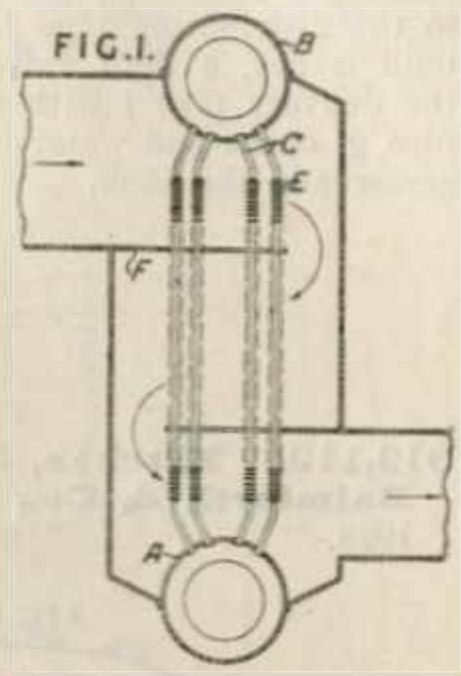


Feedwater, heating.—A feed heater comprises a number of headers at each end, some at least of which are provided with rows of tube openings formed into groups, each header being provided with handholes opposite alternate groups of tube openings. In the example shown, the tubes are in groups of two, and tubes 221, 222 are accessible for cleaning through the handhole 25 and tubes 223, 224 through the handhole 251 of the header 145. Tubes 225, 226, and 227, 228, of alternate groups are accessible through handholes of the headers at the opposite end of the heater.

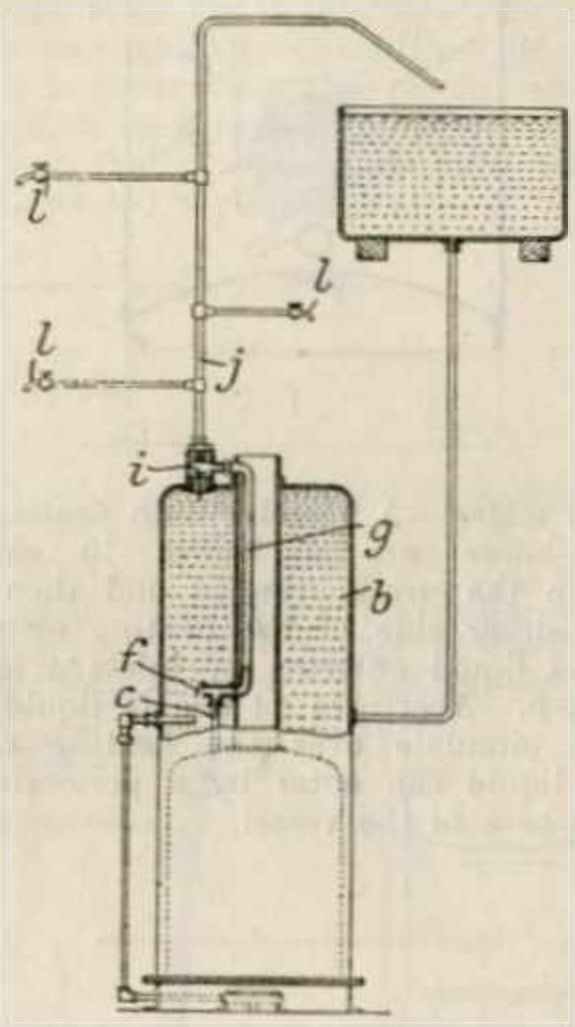
311,058. Green & Son, Ltd., E., and **Tansley, G. E.** March 30, 1928.

Feedwater, heating.—A feed-heater for water-tube boilers comprises two drums A, B one above the other in a flue-way, connected by steel tubes C carrying rings or corrugated envelopes E. Baffles F cause the heating gases to take a circuitous path. Specification 269,560 is referred to.

FIG. 1.



311,441. Barralet, T. E., Barralet, J. H., and **New Geysers, Ltd.** Feb. 10, 1928.



Internally-fired boilers.—A water heater is of the type comprising a boiler and a storage vessel or tank, the upper end of the water heater being adapted to deliver hot water to the tank through a valve in a pipe which is extended to connect with the delivery pipe, the lower ends of the boiler and storage being connected. The boiler comprises a geyser of the tubular or chamber heating type fitted with fins or conductors on the heating surface as described in Specification 187,674. In the example the outflow pipe *c* from the geyser delivers normally to the tank *b* through the valve

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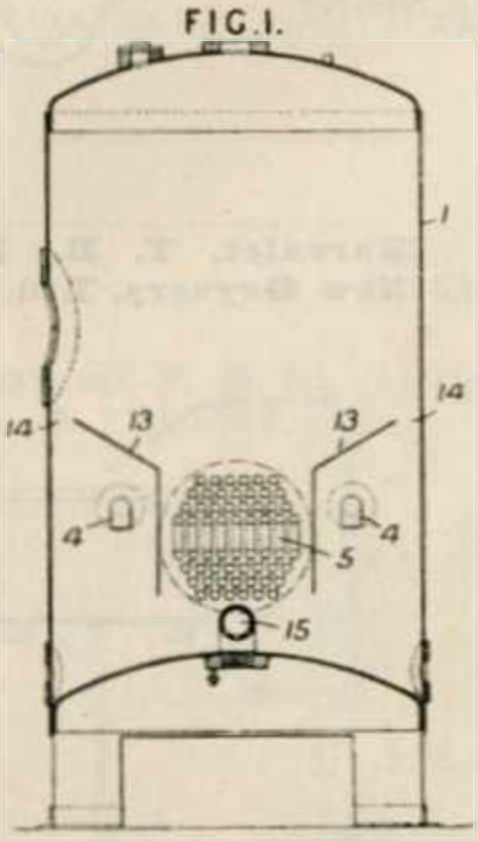
f. On drawing off at any tap *l* the valve *f* closes and, if the water in the tank is cold, all water pases through the geyser and pipes *c*, *g* to the distributing pipe *j*. If the water in the tank is hot, a light valve *i* at the junction of the delivery pipe *j* with the tank and with the pipe *g*, opens and water is drawn from both the geyser and the tank.

312,112. Kitchen, J., Herring, E., and **Balmforth & Co., Ltd., T.** Feb. 18, 1928.

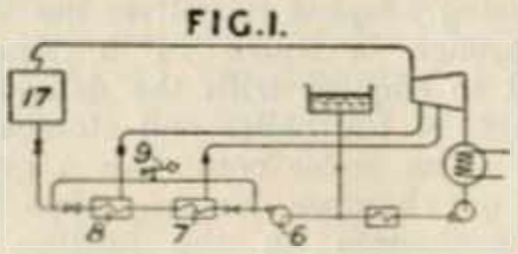
FIG.1.



Heating water.—A vessel 1 with heating tubes 5 in the lower part has baffles 13 extending away from the walls toward and then downward on either side of the heating element to direct cool liquid entering by inlets 4 to below the tubes 5. Apertures 14 enable liquid in the vessel to circulate over the heating element. Make-up liquid can enter by a perforated tube 15 at the base of the vessel.

312,157. Akt.-Ges. Brown, Boveri, et Cie. May 21, 1928, [*Convention date*].

FIG.1.



Feedwater, heating.—The feedwater normally supplied to a boiler 17 by a pump 6 through heaters 7, 8 is partly bye-passed when the supply is above the normal through a pipe containing a valve 9, which opens automatically upon the loss of water pressure between the inlet and outlet of the heaters exceeding a certain value. Each heater may have a separate by-pass and automatic valve. The bye-pass and the automatic valves may be arranged inside the heaters. Specification 2097/00, [*Class* 123, Steam generators], is referred to.

312,332. Filtrators, Ltd., and **Saks, V. V.** May 24, 1929. [*A Specification was laid open to inspection under Sect. 91 of the Acts, May 25, 1929*]. *Drawings to Specification.*

Feedwater, heating.—In apparatus comprising a settling chamber into which water blown down from a boiler is led and from which steam is taken off to heat the water in a feed tank, as described in Specification 302,942, the feed tank is placed at a level not higher than the settling chamber.

312,429. White, A. E., (*Bastian-Morley Co.*). March 20, 1928.

FIG.3.

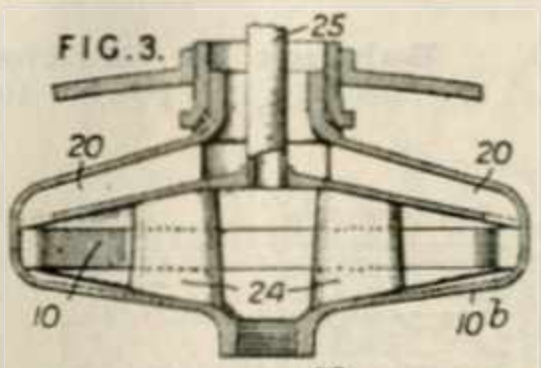
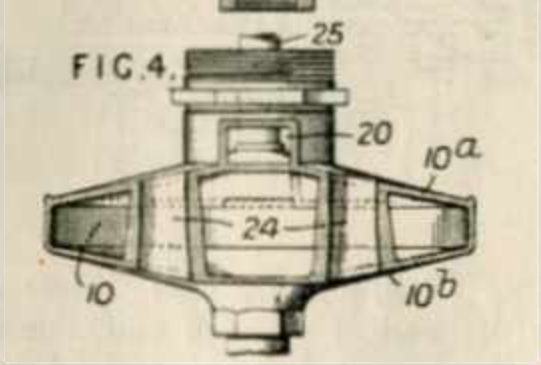


FIG.4.



Internally-fired boilers. — A spreader 10, for mounting above the gas burner in boilers, comprises conical upper and lower walls 10^a, 10^b forming a liquid heating and circulating chamber through which flue passages 24 extend. Circulation through the spreader is effected by cold liquid entering by the annulus being directed by two passages 20 to the outer edge of the spreader, delivery of heated water taking place by way of the central pipe 25.

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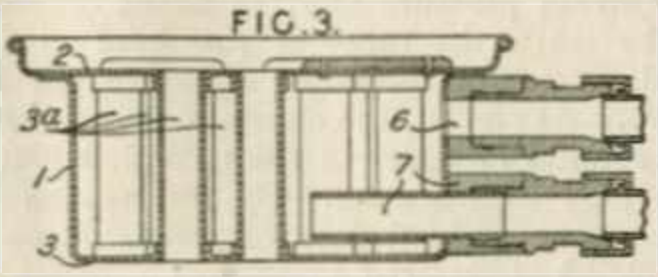
312,789. Senior, J. A. May 18, 1928.

FIG.3.



Block-form boilers.—A boiler adapted for connection with the circulation pipes of a fire-place boiler for alternative or additional heating by gas, comprises a flat cylindrical casing 1 with top and bottom tube plates 2, 3 joined by flue tubes 3a, the upper plate being formed to accommodate a pan or kettle and the body being provided with upper and lower pipe connections 6, 7, for attachment to the circulation system.

313,041. Schiele, E. L. R. A., and **Wittinburg, F. H.,** (*trading as* Freyer, R. O., [Firm of]), and **Margolis, A.** June 5, 1928, [*Convention date*].

Heating water.—An open hot water reservoir resting at or below ground level and rising to a height corresponding to the highest static pressure, may also be used to receive expansion water in a heating system. Heated water is distributed to pipes E leading to zones in the reservoir of different temperature, such zones being kept substantially distinct by plates K. Water may be drawn off as desired by various zone delivery pipes H leading to a collector J.

FIG.1.

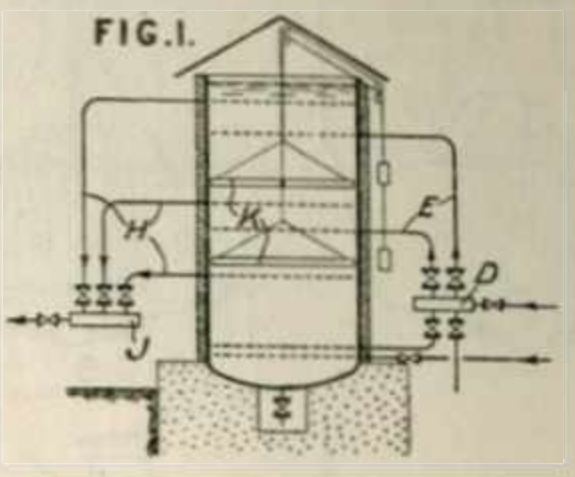
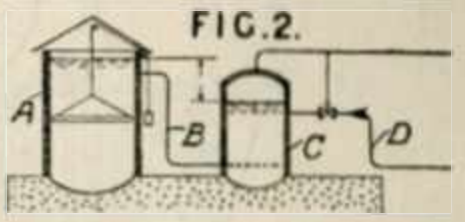


FIG.2.



In a modification, Fig. 2, a reservoir A has a single zone plate and is connected by a pipe B with a closed reservoir C the level of the water in which is lower than that in the reservoir A which maintains a pressure in reservoir C corresponding to that of steam liberated from superheated water fed through the pipe D.

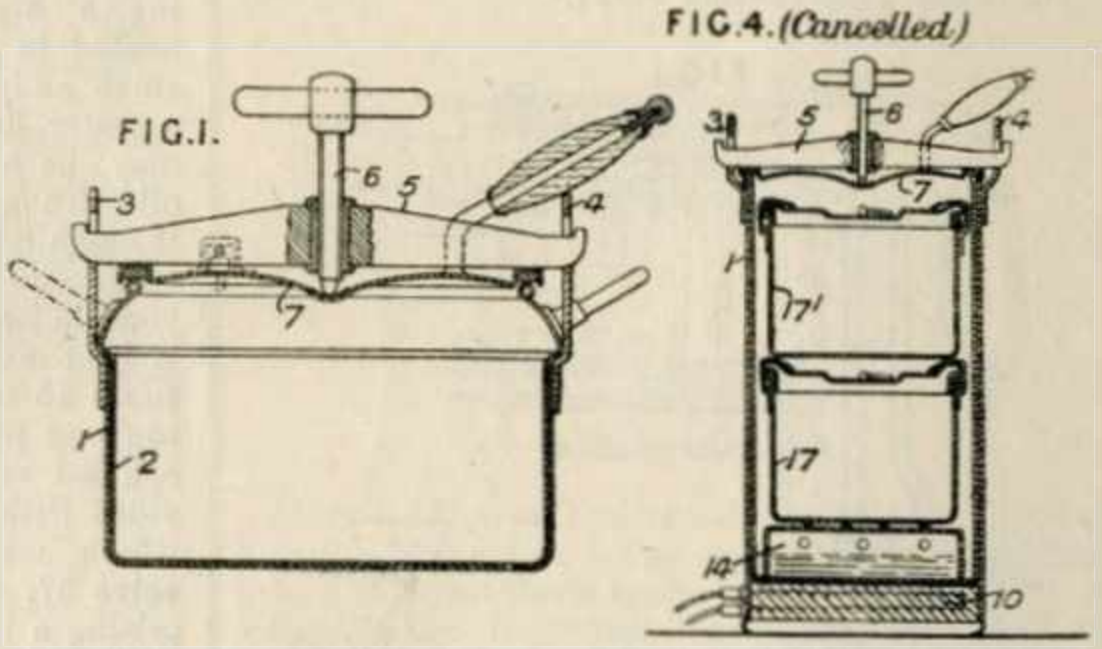
313,051. Sigg Akt.-Ges. June 5, 1928, [*Convention date*].

Digesters.—In a vessel for cooking under pressure, an inner removable pot 2 fits closely and is almost completely contained within an outer one-piece pot 1, which has fixed lugs 3 engaged by a removable yoke-like cross member 5, which has a screw 6 pressing on the lid 7 of the inner pot, the lid being removable on slackening the screw. The inner pot is of aluminium and the outer of iron.

The Specification as open to inspection under Sect. 91 (3) (a) comprises also one or more inner pots 17, 17¹ placed preferably on a perforated water vessel 14 above an electric heating unit 10 in the base of the outer pot. This subject-matter does not appear in the Specification as accepted.

FIG.4.*(Cancelled)*

FIG.1.



313,345. Morton & Co., Ltd., R., and **Robinson, P.** July 11, 1928.

Digesters; boiling-pans.—Vessels 1 in which liquids are heated by means of steam tubes 2 are fitted with hoods 3 modified to facilitate access to the tubes. In the examples, Fig. 1 shows a hood fitted with doors 6 hinged at 7, Fig. 3 shows a vertically divided hood and superimposed baffle 5, the two parts being adapted to

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run apart on rollers 12 mounted on rails 10, while in Fig. 5 the hood is pivotally mounted at 17 on a clip 16 with screw means 18, 19, to

FIG.1.

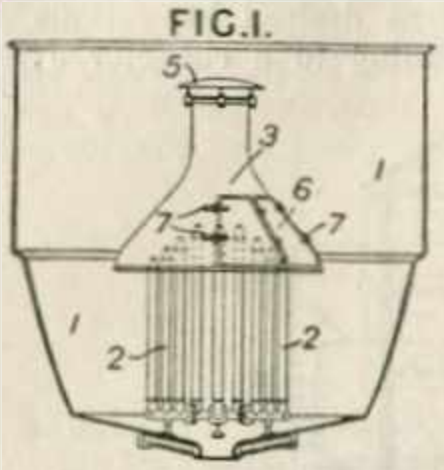


FIG.3.

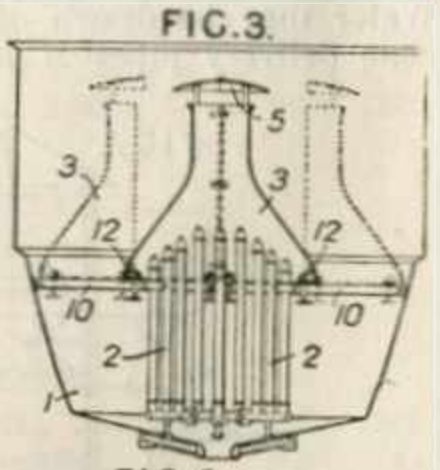
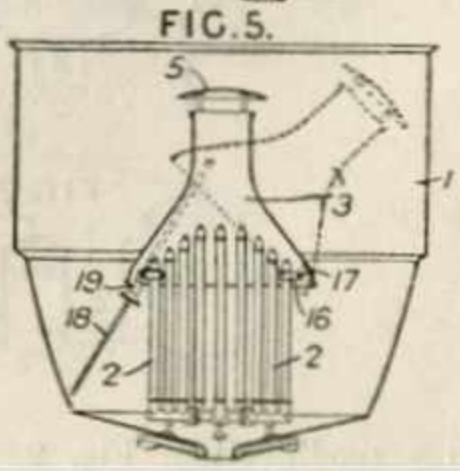


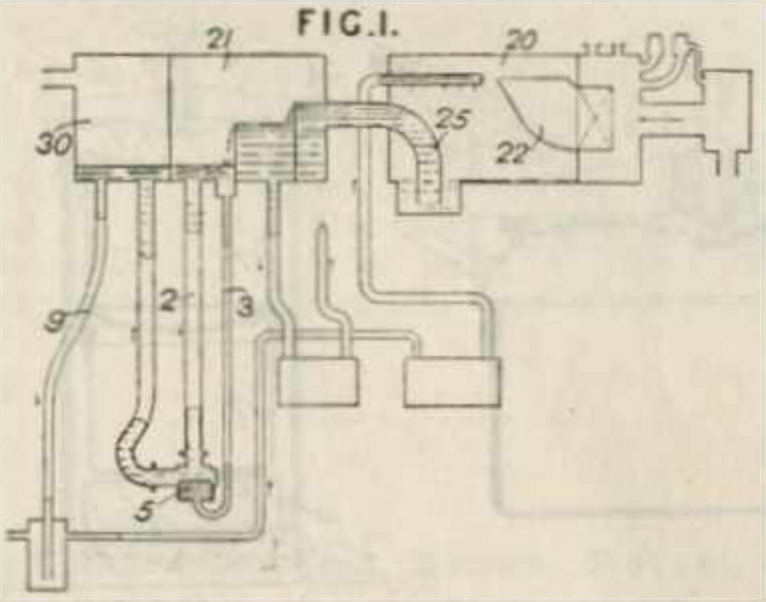
FIG.5.



cause the hood to tilt. Specifications 113,346, [*Class* 64 (iii), Surface apparatus &c.], 244,859 and 248,624 are referred to.

313,481. Soc. L'Auxiliaire des Chemins de Fer et de l'Industrie. June 12, 1928. [*Convention date*].

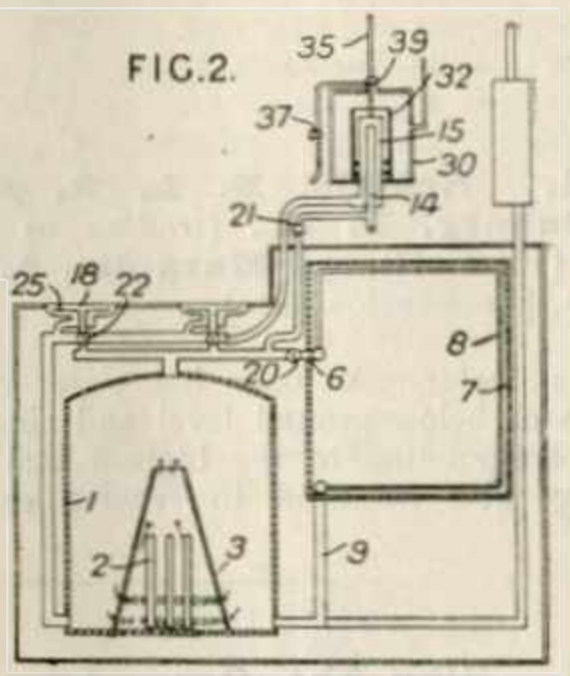
FIG.1.



Feedwater, heating.—Water to be heated is mixed in a chamber 20 with steam entering at 22 and is passed into a following chamber 21, through a water seal 25, both chambers being substantially closed and adapted to contain steam under pressure. Compartment 30 is under atmospheric pressure and is connected by a pipe 9 with the suction side of the feed pump. Hot water is delivered from chamber 21 to compartment 30 through a discharge tube 2 with a valve or other device 5 so disposed in the tube that one face is subjected to a pressure which depends on the steam pressure and the heads of water in the tube while the other is subjected to a substantially constant pressure added to the steam pressure. As shown, the constant pressure is that of the column of water in the tube 3, but it may be provided by a spring. By this means water is discharged without loss of steam. Specification 290,598 is referred to.

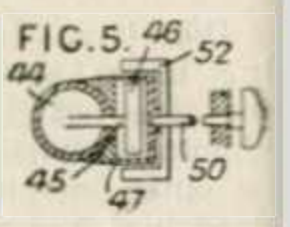
313,638. Kirkwood, J. C. P. Feb. 16, 1928.

FIG.2.



Heating water.—Liquid having a high boiling point is heated in a tank in an electric stove and is circulated through a water heater 30. The liquid may be a mineral lubricating oil with a flash point above 500° F., and flows through concentric tubes 14, 15 under the control of a valve 21. A pipe 39 for the purpose of preventing an air-trap is fitted to the tube 15, and is lead-sealed after the oil system is filled. The tubes 15 is surrounded by a shell 32 open at the top and perforated at the bottom. The heater is coupled to a hot-water storage tank and is provided with a pipe 35 for the outlet of steam from which hot water may be tapped by means of a valve 37. Fig. 5 shows a controlling valve comprising a butterfly valve 44 on a spindle 45 fitted with an iron core 46 arranged in a copper casing 47 and operated by a permanent magnet 52 mounted on a spindle 50. An electromagnet may be used instead of a permanent one. Electric heating elements may be fitted in the inlet pipe 14.

FIG.5.



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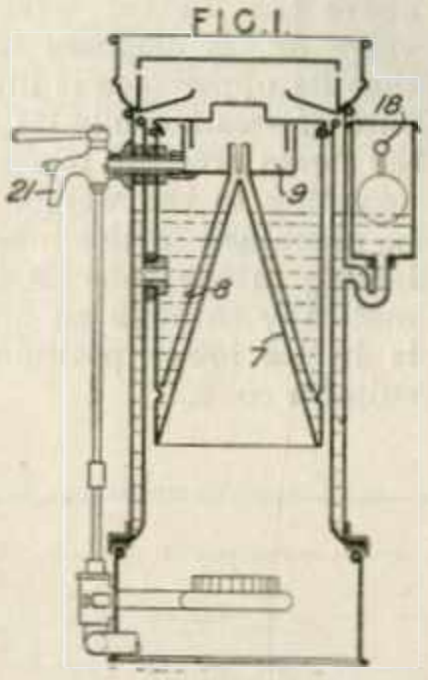
313,796. Winterflood, B. W. July 30, 1928.

Heating water. — In self-feeding boilers in which water is supplied through a ball float valve 18 and passes upwards between a heated domed or conical bottom 7 and a surrounding sleeve 8, the delivery from the sleeve is to a receiving tray 9 mounted above the normal water level. With a discharge pipe 21 an air or vacuum space may surround the sleeve 8. In modifications the heating is effected by a steam pipe or electric heating elements in the annular space between the parts 7, 8.

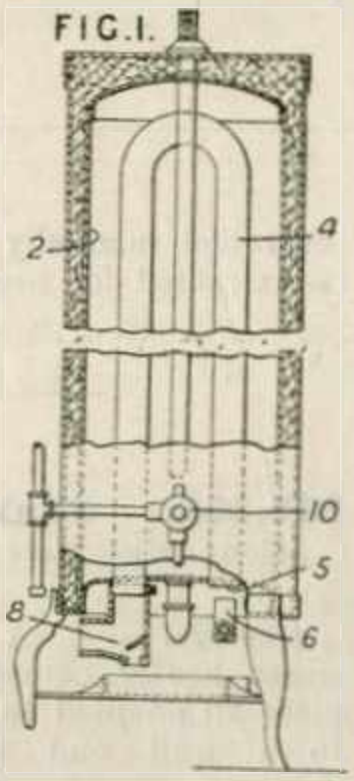
FIG. 1.



313,862. Holmes & Co., Ltd., W. C., (*Handley Brown Heater Co.*). Feb. 11, 1928.

Internally-fired boilers; block-form boilers.—In a jacketed storage vessel 2 the **U**-shaped flue-tubes 4 at one end 5 of each of which a small gas burner 6 is situated, are provided with an elbow 8 at the other end in which an aperture, protected by a baffle is formed for the discharge of water of condensation. The gas supply is controlled by a thermostat 10.

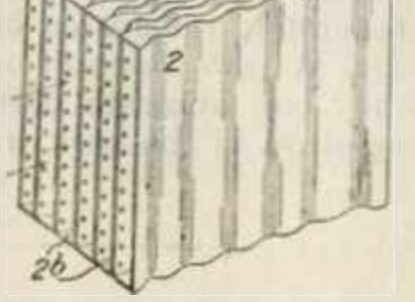
FIG. 1.



313,998. White, W. A. March 21, 1928.

Heating air.—A heat exchanger is built up of a number of like self-contained open-ended cells 2 similarly disposed with their open ends juxtaposed and directly connected together, each cell having corrugated metal sides and a duct therebetween running from end to end in a direction transverse to the corrugations, while the corrugated sides of adjacent cells are spaced apart forming vertical passages 3. Each cell is closed top and bottom by sinusoidal plates 2^a, 2^b splayed or enlarged at the ends so as to space the cells apart. The plates 2^a, 2^b may be welded in place or held in position by light bolts connecting the top and bottom plates, in which case they are provided with shoulders to limit the distance they enter into the cells. The invention is shown applied to the preheating of air for boilers, the heat exchanger being in halves and the air passing from the centre outwards to ducts leading to the furnace. The air may make a number of passes through the heater either at the same level or at different levels.

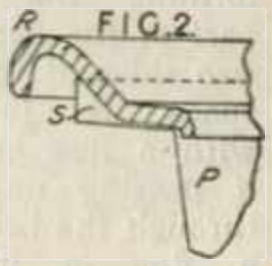
FIG. 1.



314,214. Redfern, W. D. June 23, 1928.

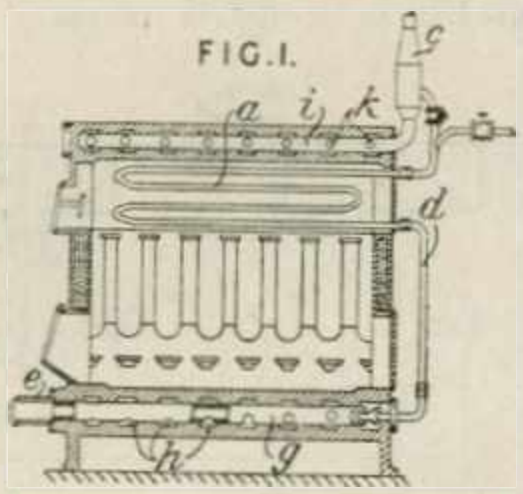
Washing-boilers.—The rim of a pan P is extended beyond the actual joint with the supporting rim R so as to form a circumferential space S in which moisture may collect and return to the pan.

FIG. 2.



314,349. Cobra - Handelsges. Ges., (Assignees of *Schünemann, E.*). June 25, 1928, [*Convention date*].

FIG. 1.



Internally-fired boilers.—In a hot water boiler a coil *a* is fitted in a flue connected at its outflow in an injector-like manner in the main outflow *c* of the boiler, its inflow end *d* being connected to a distributer pipe *g* connected to the return pipe *e* from the circulating system. The distributing and collector pipe *g*, *i* have apertures *h*, *k*, connecting with the various sections of the boiler, those, *k*, on the collector *i* being arranged horizontally while those *h* on the distributor *g* are arranged to be higher round the pipe in successive sections.

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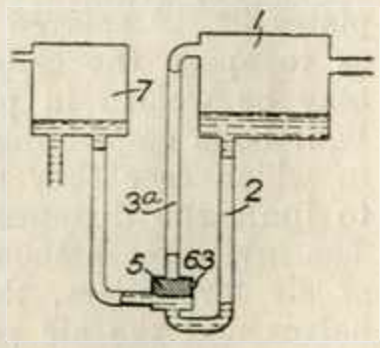
314,368. Soc. L'Auxiliaire des Chemins de Fer et de l'Industrie. June 26, 1928, [*Convention date*]. *Addition to* 313,481.

Feedwater, heating.—The plant claimed in the parent Specification is modified by forming the tube 2 containing the valve 5 for controlling the discharge of heated water from the heater 1 to the receptacle 7 as a **U**-shaped tube one branch

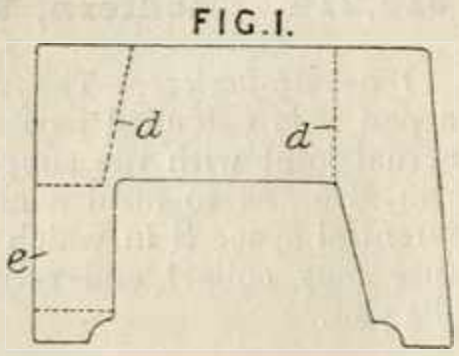


of which opens into the bottom of the heater while the other branch 3^a opens into the heater above the highest level of water therein. The valve &c. is disposed in one of the branches so that its upper face is directly subject to the pressure of steam while its lower face is subjected to the steam pressure increased by the pressure corresponding to the weight of any water which may be contained in the tube 2. Any condensate collecting in the tube 3^a is discharged either automatically through an opening 63 when the valve is in its lower position or by hand through a suitable cock.

314,406. Lewis & Grundy, Ltd., and **Pearce, J. H.** Feb. 27, 1928.

Block-form boilers.—A domestic boiler forming the lower part of the back and two sides of the fire-space is provided with a flue or flues *d* passing under or through the back and a flue or flues *e*

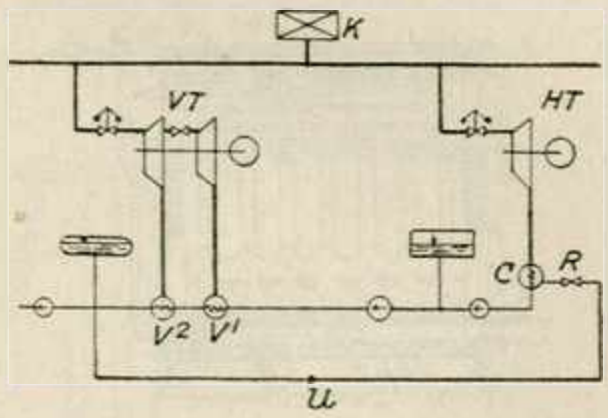
FIG. 1.



passing under or through one or both of the side legs; a damper or dampers being provided to control the subsequent passage of the gases to ovens, hot closets, and the like.

Reference has been directed by the Comptroller to Specification 18954/91, [*Class* 126, Stoves &c.].

315,274. International General Electric Co., Inc., (Assignees of *Allgemeine Elektricitäts Ges.*). July 10, 1928, [*Convention date*].

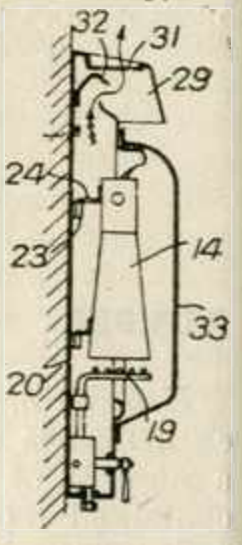


Feedwater, heating.—Relates to plant of the type in which a main turbine &c. HT exhausts into a condenser C, and the condensate is pumped back into the boiler K through feedwater heaters V^1, V^2 which are heated by the exhaust of a turbine VT which supplies current for the auxiliary machinery of the station. A bye-pass *u* is provided so that, if the main machine HT drops out, part of the heated feed water may be passed through the condenser C and cooled and then passed again to the pre-heaters V^1, V^2. The bye-pass is regulated by a valve R which may be controlled manually or automatically. Heat may be extracted for useful purposes in the bye-pass.

315,396. Junkers, H. July 13, 1928, [*Convention date*].

Geysers. — A gas-heated water heater comprises a base plate 20 adapted to be attached to a wall and a series of separate members such as a heat exchanger 14, gas and water connections, a burner 19 and controls and a covering shell 33, each mounted independently on the base plate. The flue outlet may be mounted at 31 upon a box-like base plate as shown, plates 32, 29 coacting to form a down-draught interrupter. The heat exchanger is separately removable from brackets 23 into which fit arms 24. The exit chimney may communicate with the cowl 29 through an aperture in the back wall.

FIG. 5.



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315,543. **Bazin, J. R.,** and **Burnell, A. G.** June 9, 1928.

FIG. 1.

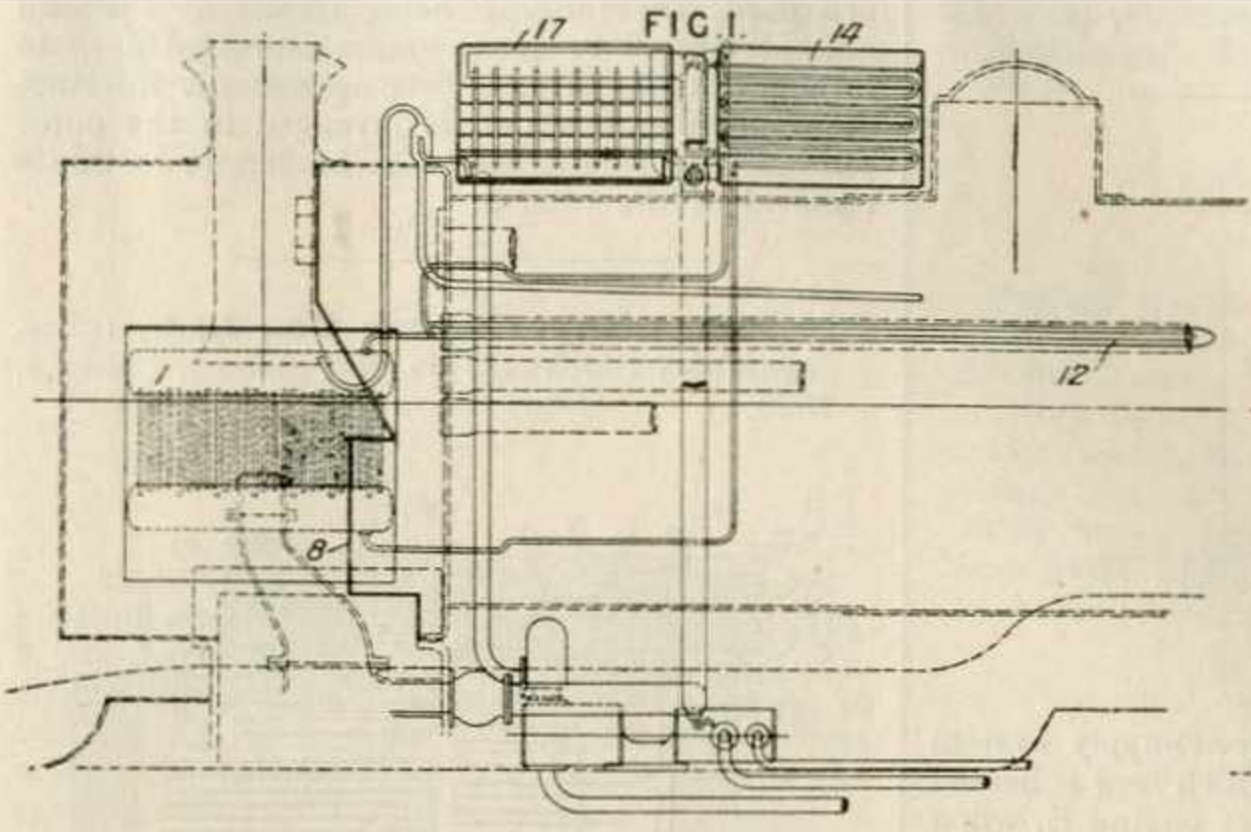
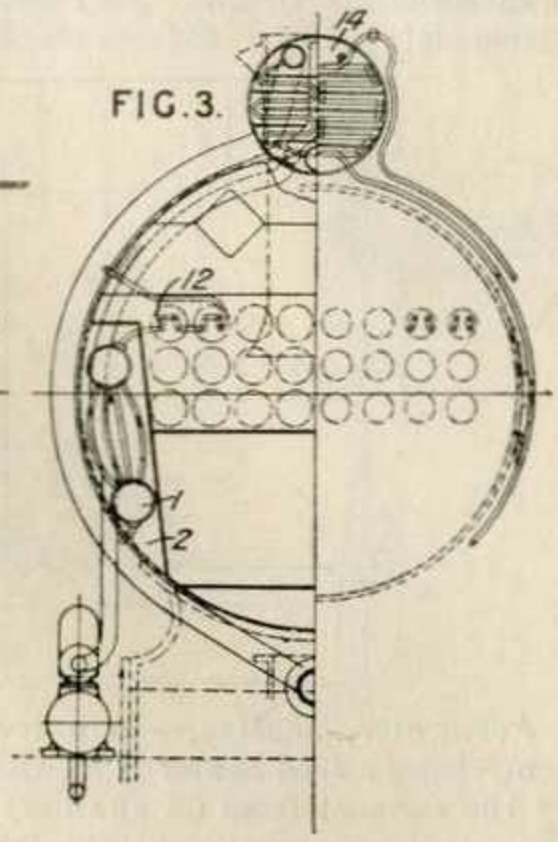


FIG. 3.



Feedwater, heating.—A vaporizer, for example a tubular boiler 1, is arranged in the smoke box of a locomotive inside channels 2, and forms part of a closed circuit in which a suitable medium such as distilled water is evaporated by exhaust or other waste heat and superheated in tubes 12, the vapour giving up its heat to feedwater in a heat exchanger 14. Controllable partitions 8 regulate the passage of gases over the tubes of the vaporizer. The feed may have been heated by exhaust steam in a preliminary heater 17.

315,865. **Sturtevant Co., B. F.,** (Assignees of *Derry, G. C.*). July 21, 1928, [*Convention date*].

Feedwater, heating.—In a feed heater comprising a succession of units each consisting of a pair of headers 20, 22 and conductors 18 joining them, the inlet and outlet openings 31, 32 being diagonally opposed so as to give substantially equal flow paths through the tubes, the sections extend laterally and longitudinally across the stream of flue gases and are arranged in a plurality of branches for parallel flow of liquid therethrough, all of said branches having common supply and discharge connections. The junction beads, 38, 64, 66, are of materially less cross-sectional area than the total area of all the tubes in a unit. The units may be connected in parallel flow as shown in Figs. 3 and 4, wherein an inlet 50 is branched to the inlet headers of the top two sections. Guide rails extend on each side, supporting the ends of the headers, the middle of the tubes 18, which are preferably gilled as at 24, being supported by transverse channel irons 28. The tubes are spaced so as to leave unequal distances at the ends of the headers so that on reversing adjacent units the tubes are placed in staggered relation.

FIG. 1.

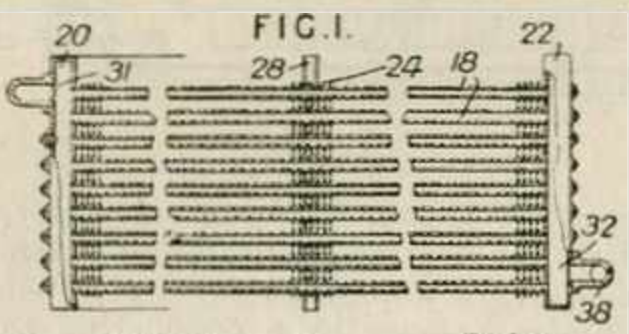


FIG. 3.

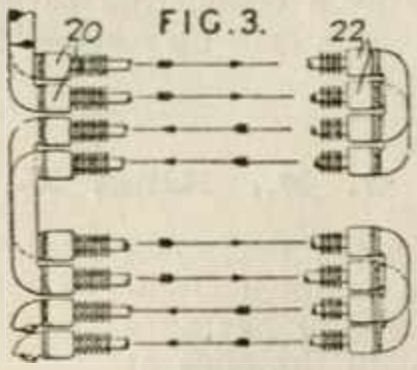
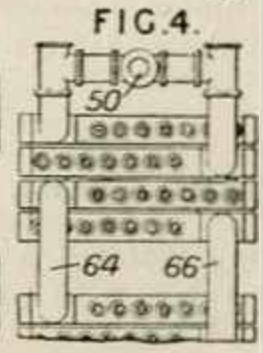


FIG. 4.



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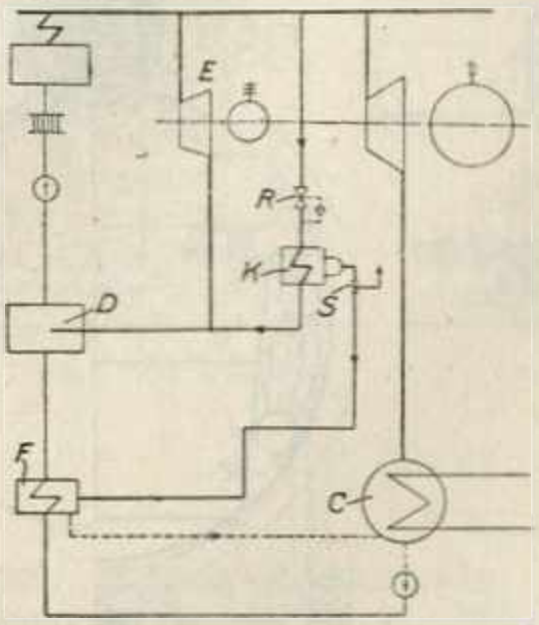
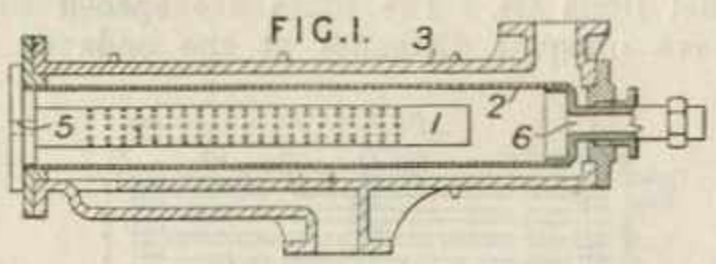
315,880. International General Electric Co., Inc., (Assignees of *Allgemeine Elektricitäts Ges.*). July 20, 1928, [*Convention date*].



Feedwater, heating.—In a feed-supply system comprising a feed heater D in which feed is heated by the exhaust from an auxiliary engine E, when the supply of exhaust steam fails, the heater is supplied with live steam passed through a pressure reducing valve D and a surface cooling apparatus K. The vapour generated from the cooling medium in the surface apparatus is condensed in a surface feed heater F, through which the feed passes on its way from the main condenser C to the heater D. A safety valve S allows vapour to escape to the atmosphere.

316,699. Wyndham, J. N., and **Wyndham, S. L.** Nov. 23, 1928.

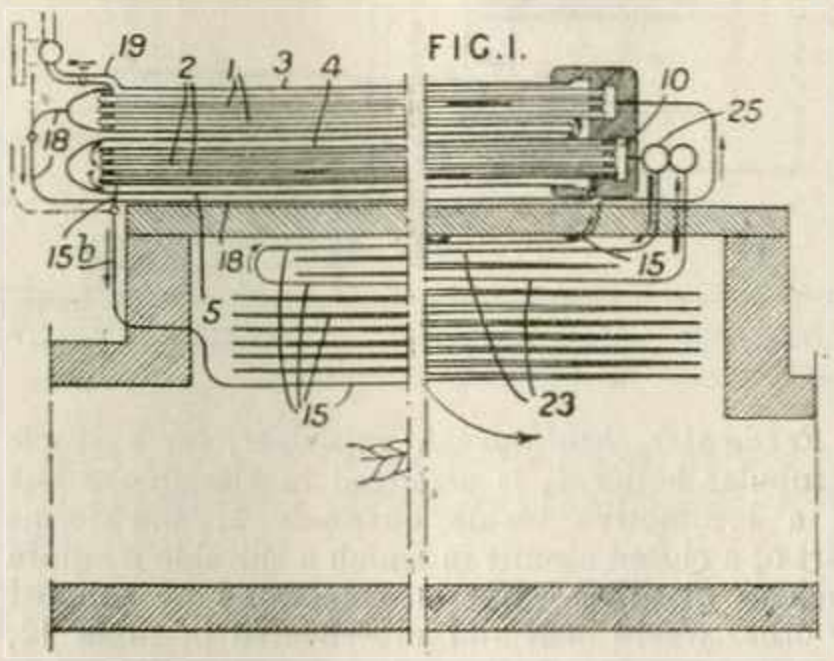
FIG.1.



Feedwater, heating.—A heat exchanger, more particularly for heating feedwater by steam, is of the type having a passage for water separated from a steam passage by a conducting partition wherein the heating fluid is split up mechanically and caused to impinge on the conducting partition. Three concentric tubular members, 1, 2, 3 are used, the inner 1 being closed at the end and perforated to cause steam admitted at 5 to impinge in the form of jets against the intermediate member 2 which is arranged in the outer joint 6 which can readily be broken to facilitate removal of the tube 2.

316,918. Superheater Co., Ltd., (*Compagnie des Surchauffeurs Soc. Anon.*). May 4, 1928.

FIG.1.



Heating liquids.—A water &c. heater of the kind in which the liquid is heated indirectly by the circulation of a heating fluid in a closed circuit comprises one or more heat-exchange units each consisting of at least two connected multitubular drums 3, 5 through which the heated and the heating fluids flow in series. In a steam boiler heated by the circulation of steam generated in tubes 15 heated by furnace gases, the heating steam passes through tubes 1 in one of the drums 3 of a heat-exchange unit and is then led through a pipe 18 to the opposite end of the unit into a casing 4 around the tubes 2 in the other drum 5. Condensed steam is returned to the generating tubes through a pipe 15^b. Water supplied to a unit by a pipe 19 flows first through the drum 3 and then through the annular space between the drum 5 and the casing 4, and finally through the tubes 2 into the outlet header 10.

317,112. Hill, J. N., King, F., and **Rickard, P. E.** May 7, 1928.

Heating water.—A boiler comprises a water-space with an inclined circulation coil beneath, the coil having a main diametral pipe with the ends at different levels and connected to the base of the container and branch pipes extending on either side of the main pipe. In the example, Figs. 1 and 2, the container 6 has connected to its base a main pipe 14 with semi-circular or semi-elliptical tubes 17 connected on either side of it. There may be an equal number of branches

FIG.3.

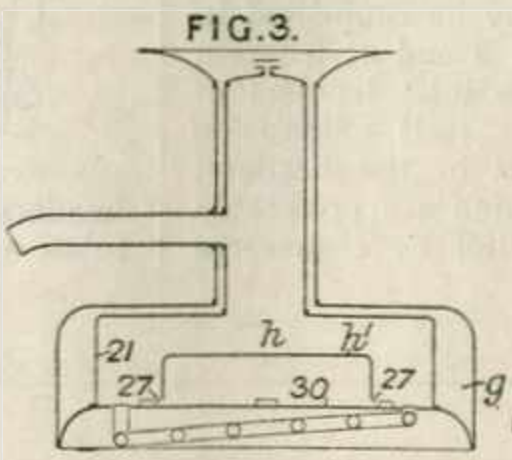
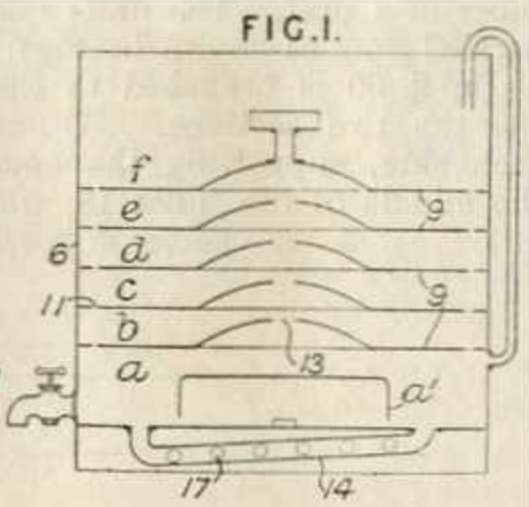


FIG.1.



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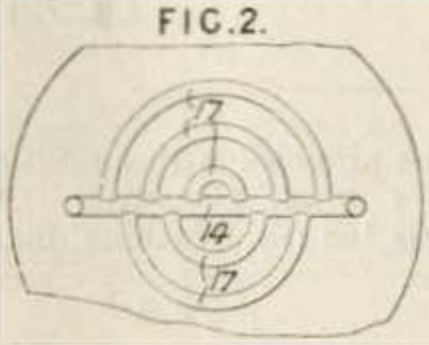
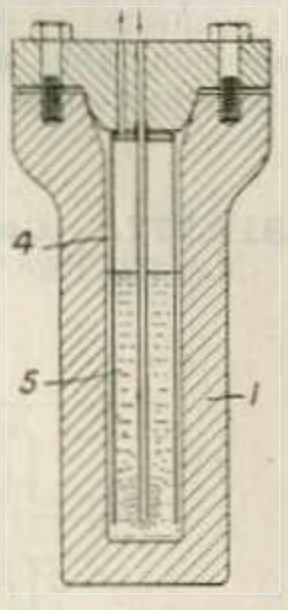
on each side of the main pipe 14. Within the water container a series of partitions 9 form zones *a* - - *f* interconnected only by perforations 11, 13. The lowermost zone may have a partition a^1 within it. Water is supplied to the topmost zone *f* and the partitions retain the hottest water in the lower zones, there being no

FIG.2.



substantial circulation. In the modification, Fig. 3, the partitions 21, h^1 and zones *h*, *g* are concentric and the base plate 30 is down-curved at the edges. Cold water is introduced into the outer zone and passes to the inner through the apertures 27.

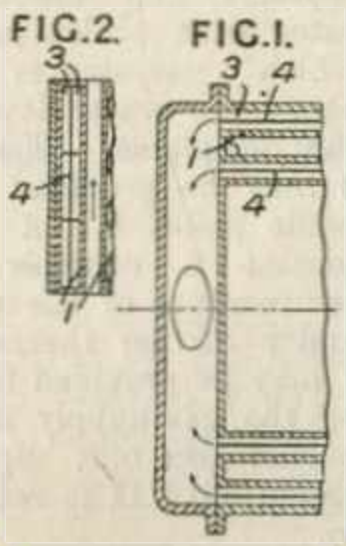
317,131. Gordon, K., and **Imperial Chemical Industries, Ltd.** May 12, 1928.



Heating gases.—Hydrogen-containing gases under high pressure are heated by bubbling through a bath 5 of molten metal, and kept from contact with the pressure-resisting walls of a chamber 1 by a baffle 4 depending into the bath.

317,264. Musker, A. Nov. 3, 1928.

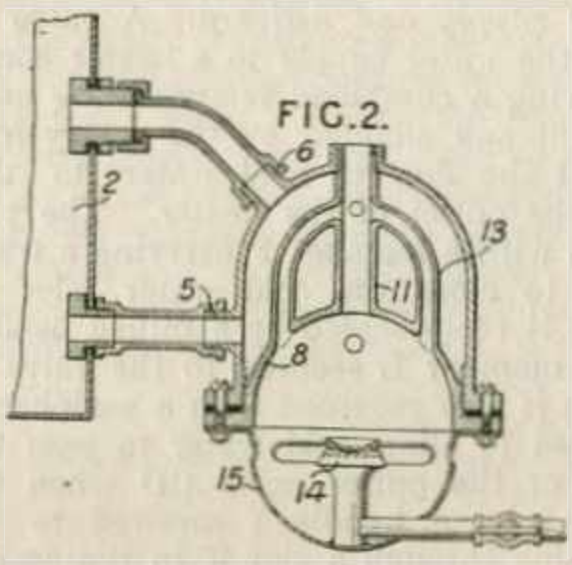
FIG.2. FIG.1.



Heating air. — Heat, emitted from the walls 1 of a conduit 3 through which air is passed, is absorbed and radiated by a metal sheet 4 or sheets substantially parallel to and spaced out of contact with the heated surfaces, which may be of metal with a refractory backing exposed to the heat of a furnace.

317,276. Darby, E. Nov. 29, 1928.

FIG.2.



Heating water.—A heating unit for application to a tank 2 or a supply pipe comprises a boiler with inlet 5 and outlet 6, a dished base portion 8 under which a heating means 14 can be placed for example in a shield 15, and a flue 11 extending upward through the top and one or more subsidiary flues 13 connecting the underside of the box 8 with the central flue.

317,421. Hill, F. May 16, 1928.

FIG.2.

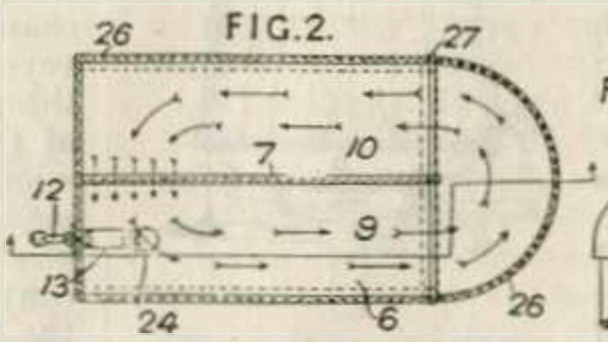
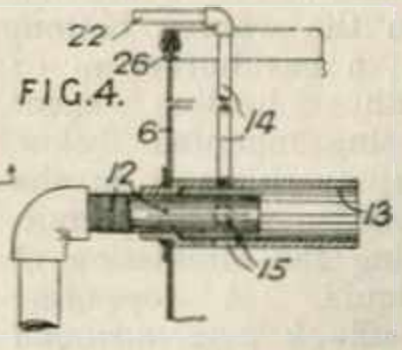


FIG.4.



Boiling-pans.—Apparatus for scalding animal offals, consists of a tank having a channel for the passage of the scalding liquid from the place where the offals are inserted to the place where they are removed, the flow of the liquid and also the heating thereof being caused by steam jets. The tank 6 is partitioned at 7 to form channels 9, 10 joined by a semicircu-

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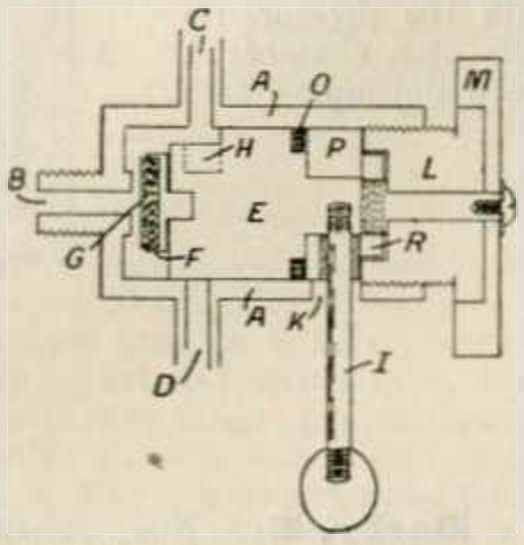
lar portion. The partition 7 is perforated at the charging end so that the liquid flows in a circular path, the flow being induced by steam, injected through a pipe or pipes 12. The pipe 12 is adjustably screwed into a bell 13 which is perforated at 15 to admit water from the tank, and is connected by a pipe 14, 22, to the atmosphere, air being thus admitted to the bell to prevent the steam from making excessive noise during injection. The offals are carried along by the current, or may be assisted by the operators. The partition is braced by a cross member 27, and the upper exposed edges of the apparatus are rounded off by beadings 26 to prevent damage to the hands and arms of the operators. Water is supplied in any manner to the tank, and draining is effected through the screw-plugged opening 24.

317,777. Carter, C., and **Hammatt, C.** May 22, 1928.

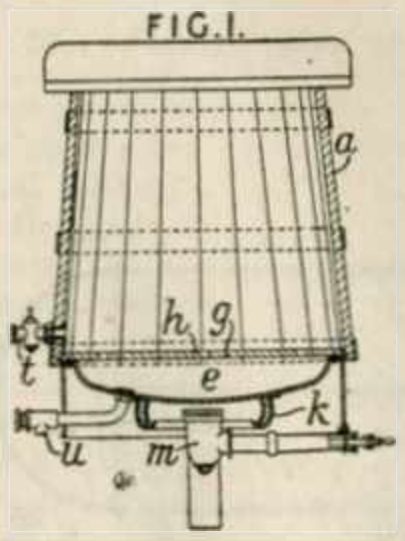


Water supply and delivery.—A valve for controlling the water supply to a heater comprises a plug having a combined reciprocating and rotary movement and adapted by the rotary movement to direct the flow of cold water to the inlet and/or the outlet of the heater. The plug E is provided with a member F carrying a washer and adapted to close the cold water inlet B when the plug is reciprocated by a milled head M on a screwed member L secured to the valve spindle. The plug is also provided with a peripheral recess H adapted to allow cold water to pass to either or both of the outlet ports CD when the plug is rotated by a handle I screwed to the plug and passing through a slot K in the casing A. A packing washer O is arranged on the plug and is adapted to be compressed by a nut R engaging a member P.

318,004. Eckford, W. Sept. 4, 1928.

Washing-boilers.—A domestic wash-tub &c. *a* is provided with a water heating attachment comprising a shallow pan *e* secured to the wooden bottom *g*, a gas burner *m* or other heating agent being mounted below it, apertures *h* in the wooden bottom permitting the circulation of liquid. A depending baffle *k* may surround the gas burner and the bowl *e* may be provided with an outlet *u* separate from that *t* from the tub. Specification 282,158, [*Class* 138 (ii), Washing, mangling, &c.], is referred to.

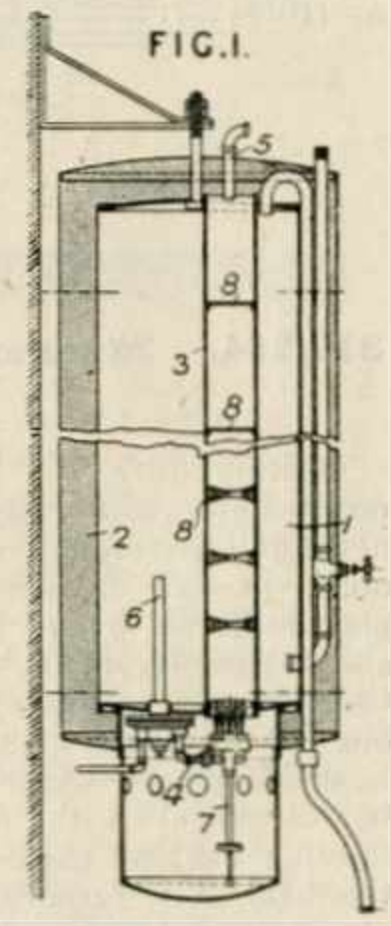
FIG. 1.



318,516. Ebersold, P. Sept. 4, 1928, [*Convention date*].

Heating water.—In a water heater 1 provided with an insulating jacket 2 and traversed by a single flue having a restricted gas outlet 3 and a burner 4 within the lower end, the flue of cylindrical shape extends to the top wall of the receptacle and communicates with outlet pipe 5 which terminates at about the water level in the receptacle. The flue 3 may be provided with baffle plates 8. A thermostat 6 controls the temperature of the water and a further thermostat 7 may be provided to cut off the gas supply if the burner goes out. Specification 8414/11 is referred to.

FIG. 1.



318,579. Krauss, F. E. Sept. 6, 1928, [*Convention date*].

Washing-boilers.—In a washing-boiler having a spout pipe c^1 secured to a perforated false bottom *c*, means for positively circulating water for washing articles that must not be boiled, for example silk and woollen goods, comprise a conveyer tube *d* which is inserted in the spout pipe through an aperture b^{11} in the dished portion b^1 of the cover *b*. The tube carries a shaft f^1 on which propellor blades *f* or other circulating devices are mounted, the shaft being driven by an electric or other motor *e* housed at the top of the conveyer tube. Apertures d^1 are provided near the top of the tube for circulating the water, and other apertures *i* are provided at the top of the

tube through which lather &c. can escape, passing back through holes i^1 in the cover. A rubber washer g held by a flange g^1 provides a sealed joint between the conveyer tube and the cover. Alternatively a sealed joint k, k^1 may be pro-

FIG. 1.

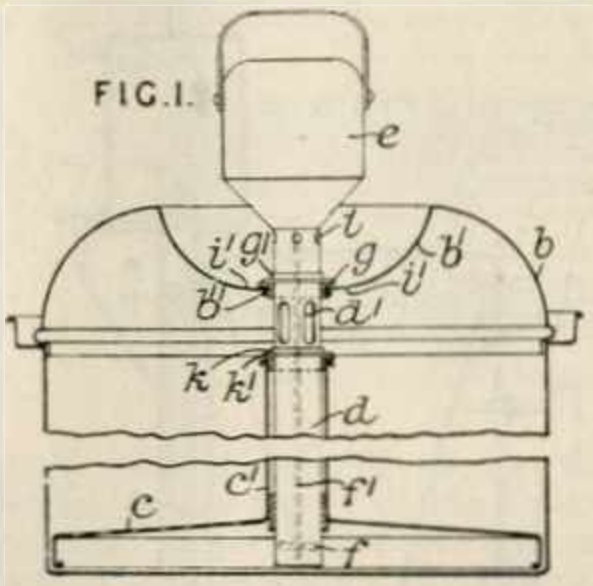
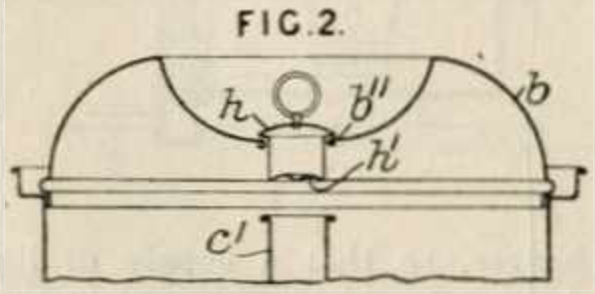


FIG. 2.

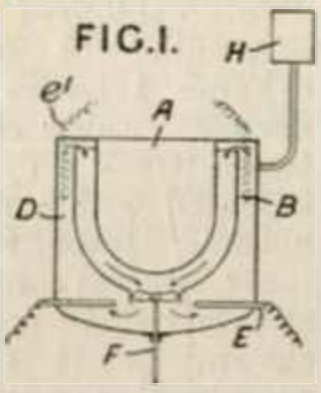


vided between the tube and the spout pipe. When the circulator is not in use the aperture in the cover is closed by a lid h having an inturned annular portion h^1, Fig. 2, serving as a deflector for the water rising in the spout pipe.

319,298. Reavell, J. A. June 19, 1928.

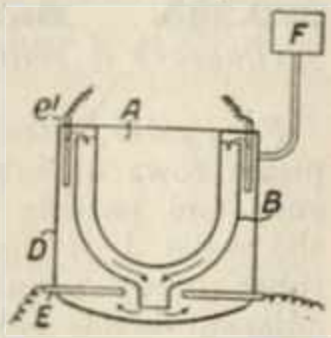
Boiling-pans.—The cauldron comprises a vessel A for containing bituminous or other material and provided with a number of intercommunicating jackets B, D, filled with a heat absorbing fluid, such as a heavy oil, one or more heating elements E, e^1 arranged in the jackets for heating the oil, and a force pump F to circulate the oil through the jackets. An expansion tank H is connected to the outer jacket. In a modification, four jackets are provided. Specification 319,391 is referred to.

FIG. 1.



319,391. Reavell, J. A. June 19, 1928.

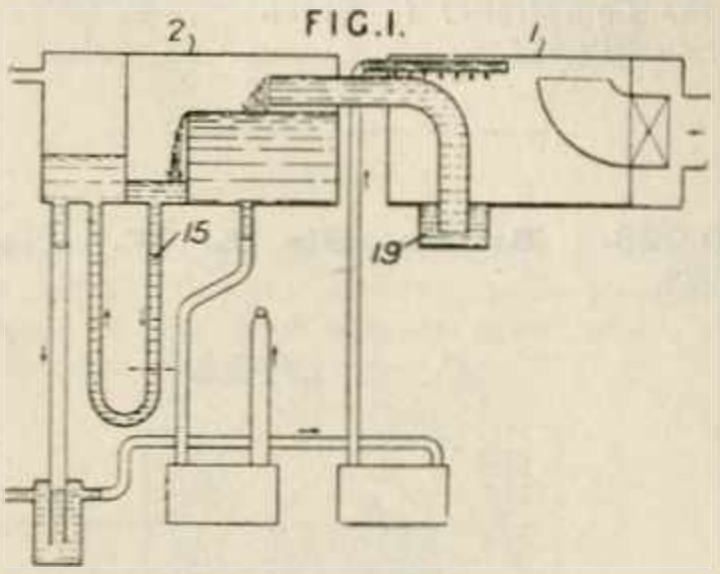
Boiling-pans.—A vessel A for containing bituminous or other materials is provided with a number of intercommunicating jackets B, D, containing a heat absorbing fluid, such as a heavy oil, and electric heating elements E, e^1 are arranged in one or more of the jackets to heat the oil and cause it to circulate. An expansion tank F is connected to the outer jacket. Specification 319,298 is referred to.



319,453. Fiedler, S. O. A. Aug. 2, 1928.

[*A Specification was laid open to inspection under Sect.* 91 *of the Acts, June* 16, 1929].

FIG. 1.

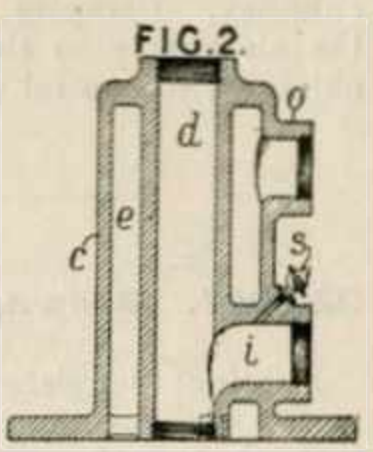


Feedwater, heating.—In a feed-heater water is heated in a mixing chamber 1 communicating with a distributing chamber 2 through a water seal 19, the chambers beings adapted to be under pressure and the mixing chamber to contain substantially no water, while the distributing chamber communicates with the atmosphere through a device adapted to discharge water but no steam, for example a second hydraulic joint such as a **U**-tube 15 of suitable height. The two chambers may be compartments of one casing. Specification 290,598 is referred to.

319,533. McCormick, G. H. Nov. 1, 1928.

Heating water. — In domestic hot-water systems cold make-up water is admitted to the storage cylinder through a conduit leading to the bottom, to which the return pipe to the boiler is connected at a point above the cylinder. This is effected by means of a fitment c mounted on top of the storage cylinder having a central duct d joined to the cold feed at the top and continued by a dip pipe attached to its lower end to near the bottom of the cylinder, a branch i being connected to the return pipe to the boiler. The annular space e is open to the top of the cylinder and is connected to the flow pipe from the boiler and to draw-off pipes at o. An air cock s may admit air to prevent syphonage if the circuit is broken for repairs &c.

FIG. 2.



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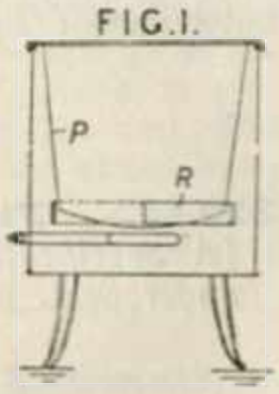
319,675. Redfern, W. D. June 23, 1928.

FIG.1.

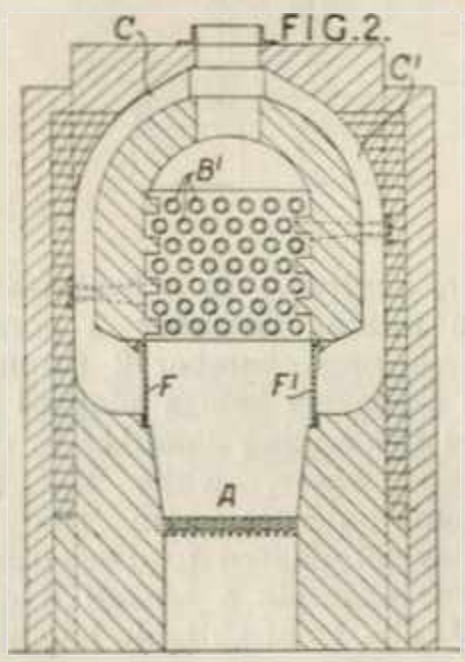


Washing-boilers.—In a gas-heated wash-boiler a deflector ring R surrounds the bottom of the pan P so that flames travelling outward from the burner impinge on the ring and are deflected on to the sides of the pan.

Reference has been directed by the Comptroller to Specification 212,844.

320,028. Brown, Sir A. W. May 1, 1928.

FIG.2.

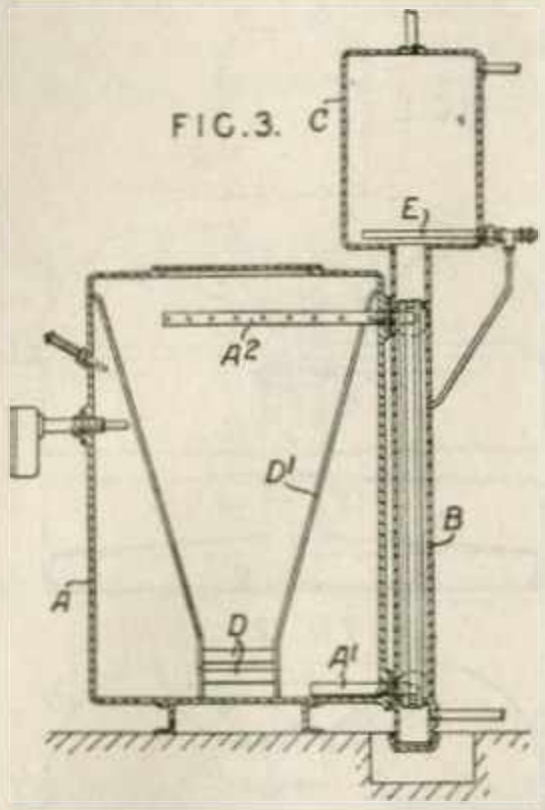


Water-tube boilers.—A heater for oil or other fluid or compound comprises a heating chamber containing vessels or tubes B^1 for the oil, a furnace A beneath, and controllable dampers F, F^1 or valves situated at the inlet to the heating chamber to control positively and simultaneously the passage of hot gases to the heating chamber and to a bye-pass C, C^1 to the chimney. Dampers may be provided to control the air supply to the furnace, and also, in the chimney, to control the exit of hot gases.

320,047. Brown, Sir A. W. May 1, 1928.

Heating liquids.—Heat is supplied to and stored in a medium such as oil, which circulates through a heat exchanger to transfer heat to a second liquid or other medium which is used for heating purposes. The temperature of the second medium is kept constant by controlling the flow of the first medium through the heat exchanger. The primary heat-storing liquid is heated in a tank A by an electric heater D removably suspended by straps D^1. The liquid circulates through two heat exchangers such as B, the communicating pipes A^1, A^2 each having a three-way valve at its junction with the branch pipes leading to the heat exchangers. A storage vessel C for the second liquid is provided with a thermostat E controlling a regulator which controls the flow of the primary liquid through the

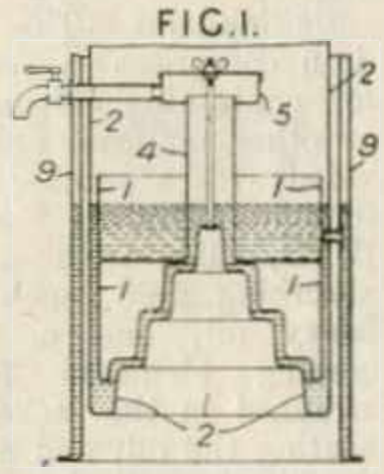
FIG.3.



heat exchanger, so that a supply of liquid at constant temperature is maintained in the vessel C. Specifications 20076/03; 258,977, [*Class* 39 (iii), Heating by electricity], and 270,364 are referred to.

320,184. Jackson, H. B. Aug. 20, 1928.

FIG.1.



Internally-fired boilers.—A filler or displacer cylinder 1 leaves only a narrow water-way between it and a cylinder 2 mounted within a water-holding jacket 9. The inner recess may be stepped and coned as shown, or it may be cylindrical, the outer side being stepped upwardly. The inner cylinder may be formed with a tubular extension 4 projecting into an expansion chamber 5 from which boiling water is withdrawn.

320,283. Babcock & Wilcox, Ltd., (*Babcock & Wilcox Co.*). Dec. 15, 1928.

Feedwater, heating.—A fuel-economizer comprises rows of tubes 1 supported between their ends and passing through gas-tight openings in the walls 3 of the economizer, the ends of the tubes being connected by return bends 8, 9, adjacent bends being of different lengths. The tubes may be clamped near the middle of their

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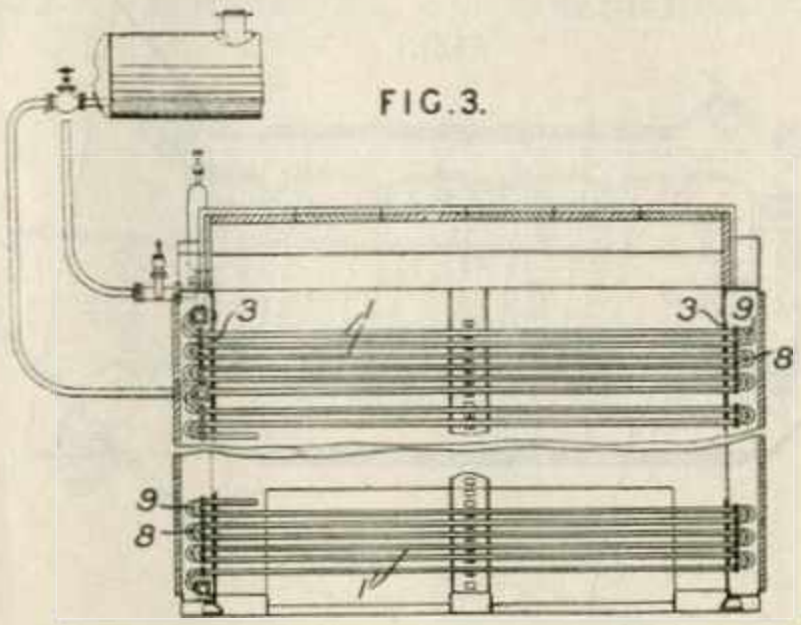

FIG. 3.

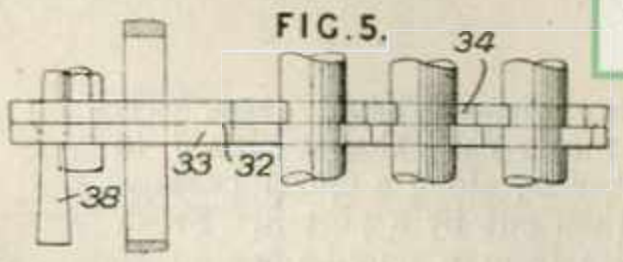

FIG. 5.

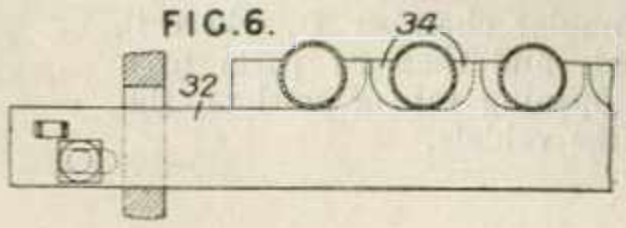

FIG. 6.

length as by pairs of strips 32, 33, having notches 34 somewhat deeper than half the diameter of a tube so that when the strips are moved in opposite directions each tube is clamped between the opposite edges of the notches in the two strips, which are then held fast as by wedges 38. The ends of the tubes may be upset where they pass through the walls.

320,464. Witzler, W., and **Güth, P. F. G.** Aug. 23, 1928.

Heating water.—A one-way stream of liquid to be heated is caused to flow downwardly in a thin film over the inner surface of a single-walled smooth upright shell rotating about a vertical axis and is heated by a one-way stream of ascending gaseous products of combustion. In Fig. 1 the gases from the burner *k* are in contact with the liquid flowing down the shell *a*, which is caused to rotate by impact of a jet of water on blades *f*. Heated water collects in the annulus *u*. In Fig. 2 the liquid flows down the inner surface of a drum a^2 closed at the lower end except for apertures allowing hot water to escape to a collector u^1, the gases pass upwards outside the drum. In modifications, the drum is rotated by an electric motor.

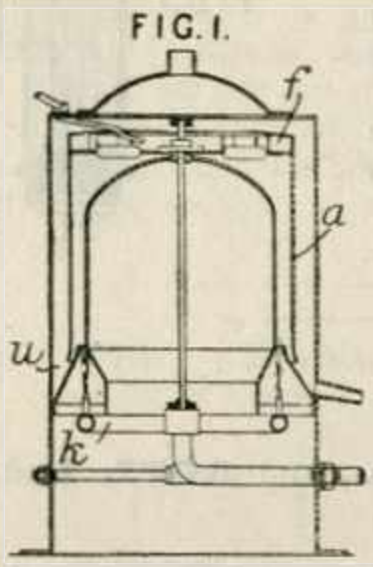

FIG. 1.

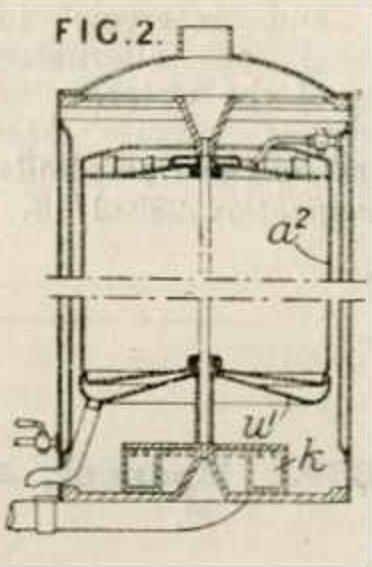

FIG. 2.

320,482. Lamb, A. Sept. 6, 1928.

Water-tube boilers.—A bank of water-tubes *d* is adapted to be swept by downwardly-flowing hot gases, the water flowing in a generally upward direction by natural circulation. Combustion of fuel is effected in another communicating chamber *b* into which certain of the tubes *e* may extend, the products of combustion being cooled by contact with the tubes and being thus caused to fall over the other tubes. Specification 12613/92 is referred to.

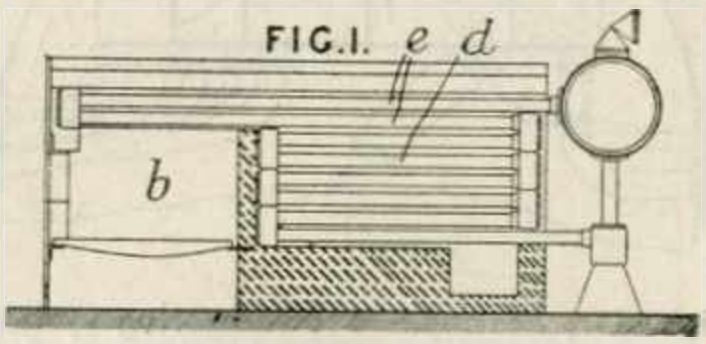

FIG. 1.

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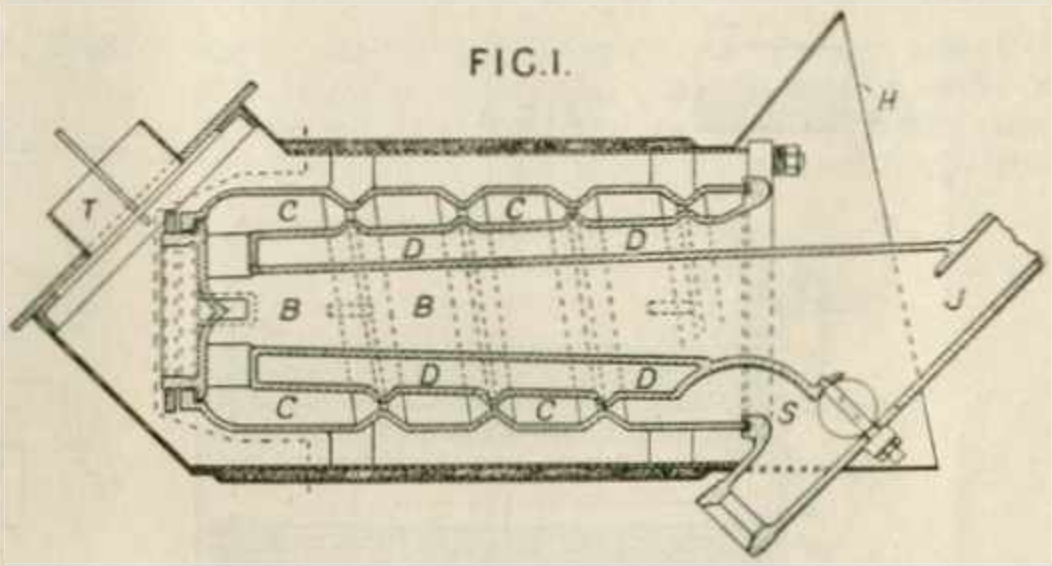
320,541. Miller, A. J. Nov. 1, 1928.

Heating air.—Exhaust gases pass from a motor car exhaust pipe J to a chamber B, along a spiral passage C and then out by a port S. Fresh air passes from a flared opening H to an annular chamber D, where it is heated, and then by ports to a pipe T opening into a cowl on the floor of the vehicle.

FIG.1.



320,554. Saxon, J. Nov. 21, 1928. *No Patent granted (Sealing fee not paid).*

Heating water.—A vessel 1 of small capacity containing a heating element 6 is fitted with a tap 5 and is arranged in a normal water-heating circuit between boiler and reservoir for additional or alternative heating of the water.

Reference has been directed by the Comptroller to Specification 28932/13.

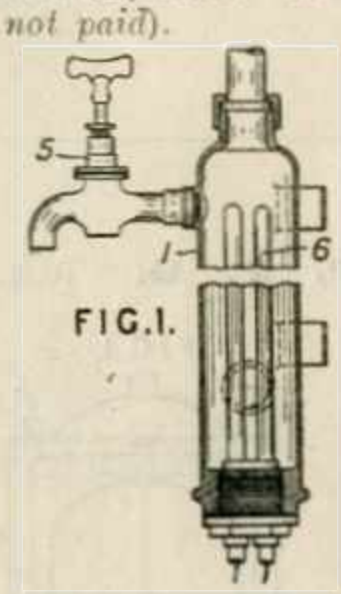


FIG.1.

320,669. Spencer, A., and **ACFI, Ltd.** July 20, 1928.

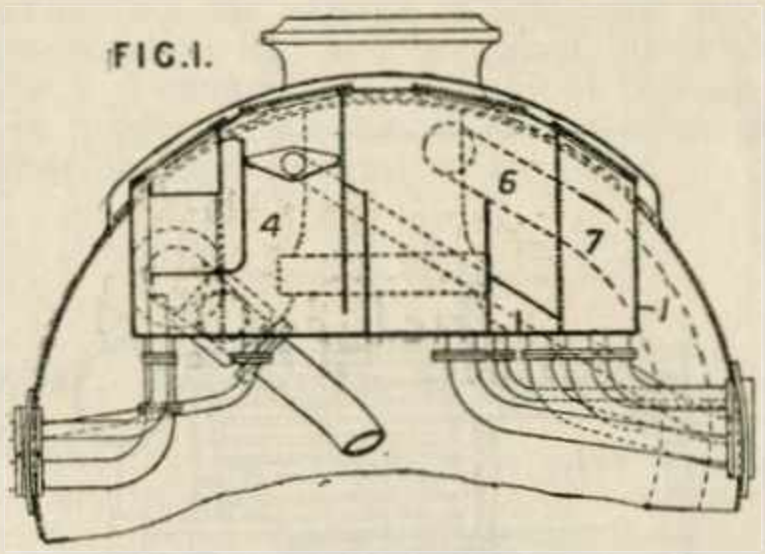


FIG.1.

Feedwater, heating.—A feed-heating system is of the type comprising two chambers 4, 6 connected to each other by a water seal, the water to be heated being pumped into the chamber 4 into contact with exhaust steam, the heated water under pressure passing to the other chamber 6, whence it is drawn by the hot-water pump. An overflow chamber 7 is provided. According to the invention, the mixing, distributing and overflow chambers are located within the smoke-box of a locomotive. In the example these chambers are formed by partitions in a tank 1 extending transversely across the top of the smoke-box. Specifications 171,966, 220,208; 224,220, [*Class* 102 (i), Pumps &c.], 252,700, [*Class* 123 (iii), Steam separators &c.], 313,481, and 319,453 are referred to.

320,686. Kochs & Co., Ltd., W. E., (*Föge, H.*). July 21, 1928.

Heating gases. — Tubular bodies for air or gas heaters are cast in sections in ordinary moulds without the use of cores and are provided with flanges at the ends. The castings *a* with end flanges *g* have contact surfaces *b* with grooves *c* for cement and are bolted together in pairs by bolts *d* to form tubes adapted to be surrounded on all sides by hot gases. The flanges *g* serve to space the tubes when assembled in groups, as shown in Fig. 5. The tubes may be egg-shaped or rectangular in cross-section.

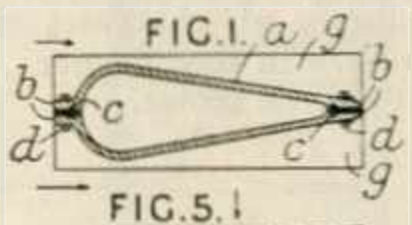


FIG.1.

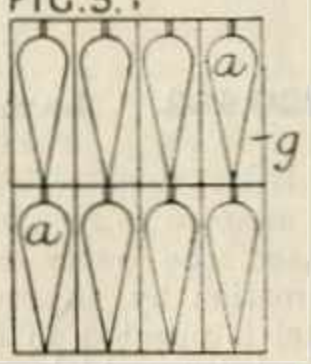


FIG.5.

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321,022. Boutin, L., and **Susbielles, Y.** Sept. 24, 1928.

FIG.4.

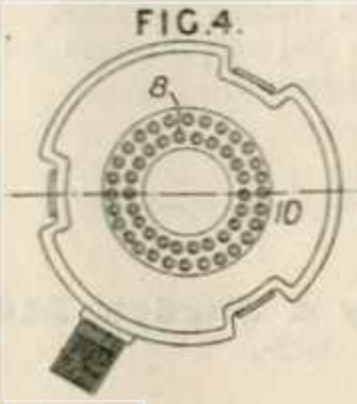


FIG.1.

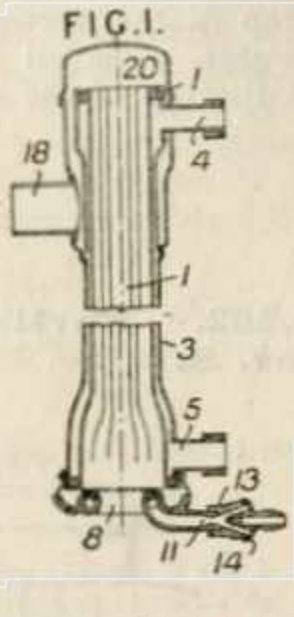
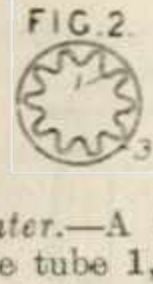


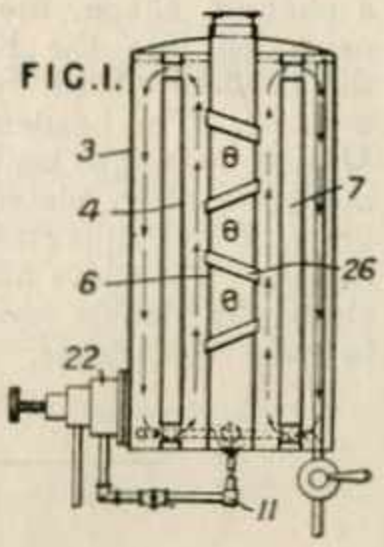
FIG.2.



Heating water.—A boiler comprises an inner corrugated flue tube 1, an outer shell 3 enlarged at both ends, inlet and outlet pipes 4, 5, a bell 20 covering the upper end, and a flue outlet, 18. The gas burner 8 is provided with a condensate-collecting ring 10, and the inlet gas nozzle 13 is adjustably mounted on a screw thread on the tube 11. A perforated shutter 14 is provided to control the supply of primary air.

321,044. Stow, A. A., and **Jones, E. H. P.** Oct. 12, 1928.

FIG.1.

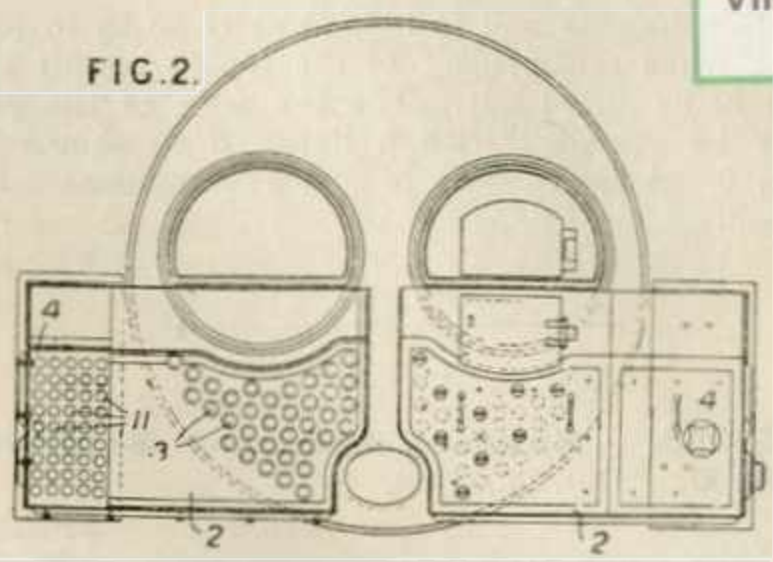


Annular and internally-fired boilers. — A boiler which includes a pair of coaxial annular jackets 3, 4 containing liquid, with an intervening space 7, has a source of heat 11 associated with the smaller jacket so as to heat its inner wall 6. The cold liquid inlet discharges near a thermostat 22 controlling the gas supply to the burner 11. Cross tubes 26 may be fitted within the central annulus.

321,461. Cruse, H. Aug. 11, 1928.

Feed-water, heating.—In a steam-generator of the Lancashire type in which the gases are passed to the front through smoke-tubes 3 arranged beneath the furnace tubes, the gases are wholly returned to the smoke-stack at the rear through tubular passages 11 in metal trunks 4 adjacent to, but not in contact with, the lower part of the sides of the boiler, the trunks forming counter-current air or feed-water preheaters. In the construction shown the gases pass from the tubes 3

FIG.2.



to the tubes 11 through cross-over chambers 2 at the front of the furnace; the tubes 11 extending only for a portion of the length of the trunk.

321,578. Mayer, A. Dec. 27, 1928.

FIG.4.

Water-tube boilers. — Water-heating devices associated with a gas cooking-stove hot-plate formed in sections, comprise, in one form, a pipe 3 formed in one or more coils arranged concentrically with the burner. The heaters are connected to one another and to water supply and discharge means.

321,836. Slack, R., and **Slack, C.,** (*trading as* Slack & Sons, H.). Nov. 23, 1928.

FIG.5.

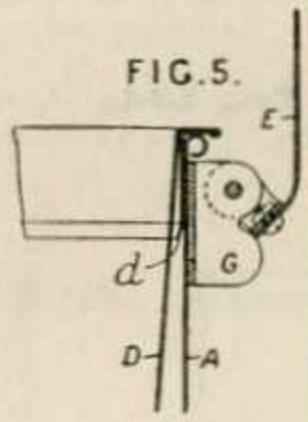
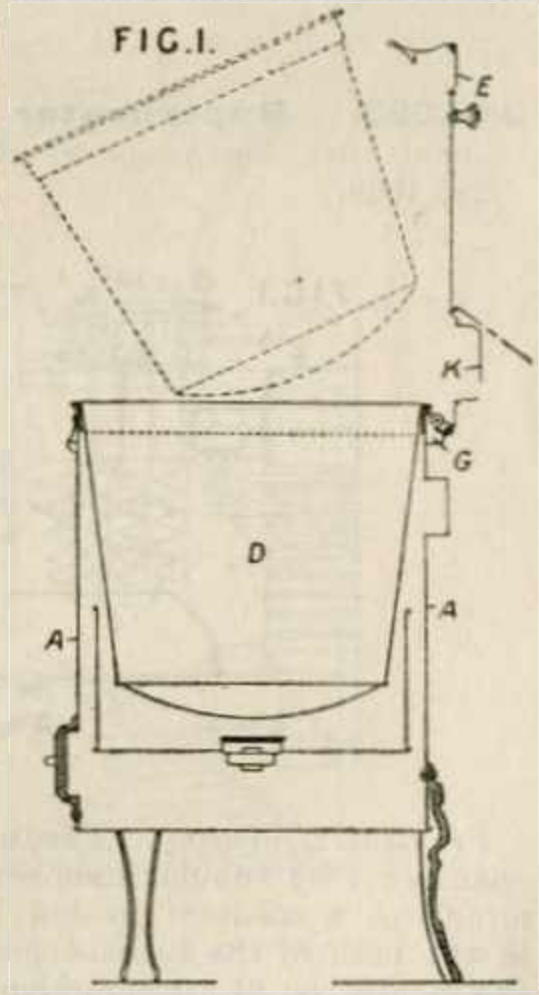


FIG.1.



Washing-boilers.—A rim-cover E for fitting over the top edges of a wash-pan D and casing A is

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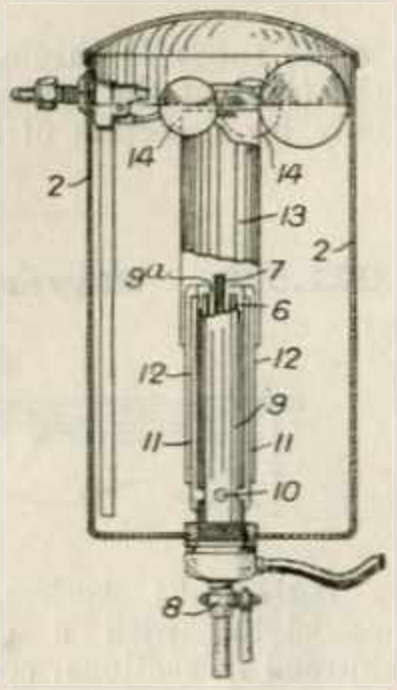
of dished-shape and is hinged at G so as to fold back when raised clear of the top to permit the pan being lifted out. The top edge of the pan may be provided with a flange *d* as shown in Fig. 5. A raised boss K acts as a condenser for vapours.

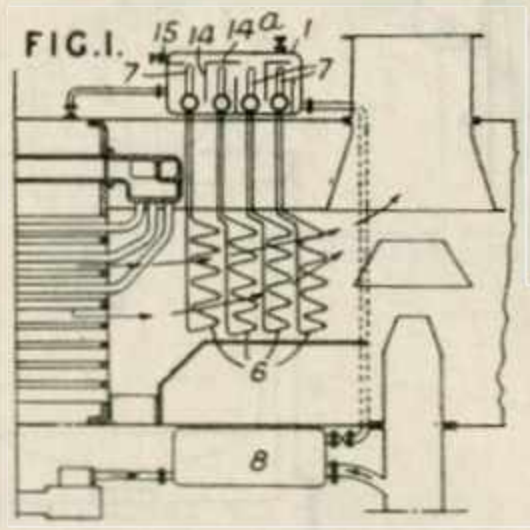
322,055. Santon, Ltd., and **Sanders, H. C.** Oct. 23, 1928.

Water, delivering.—Electric heating elements 6 are fitted in the lower part of the tank 2 and surrounded by a cylinder 9, closed at the top except for a hole 9a through which the draw-off pipe 7 passes loosely, and provided with openings 10 at the lower edge. Concentric tubes 11, 12 cause water from the lower part of the tank 2 to follow a devious path to the openings 10. A telescopic tube 13 surrounds the tube 12 and is supported by floats 14 to ensure the hottest water being drawn off by the tube 7 and cock 8. Specification 304,928, [*Class* 39 (iii), Heating by electricity], is referred to.



322,093. Superheater Co., Ltd., (*Compagnie des Surchauffeurs Soc. Anon.*). Nov. 28, 1928.

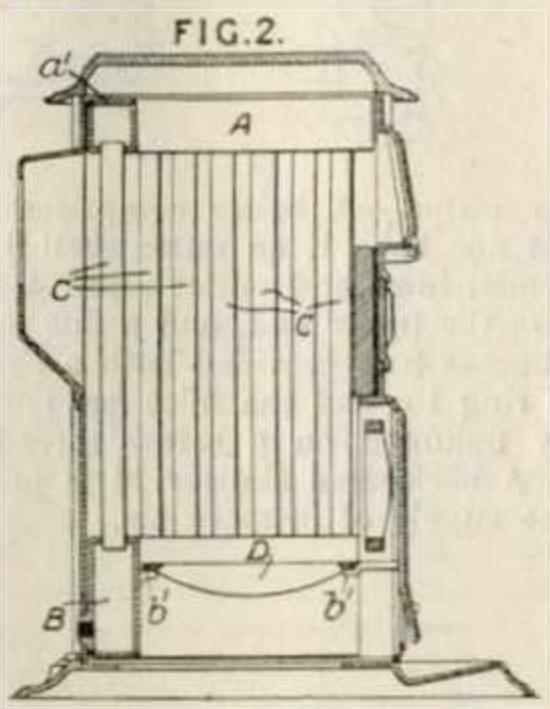
FIG.1.



Feedwater, heating.—Feedwater is heated in a chamber 1 by tubular members 7 through which circulates a medium heated in coils 6 arranged in the path of the furnace gases, for instance in the smoke-box of a locomotive boiler. The water may be heated before entering the chamber 1 by direct contact with exhaust steam in a heater 8. Vertical baffles 14 direct the water in a sinuous path through the chamber 1, and perforated, slotted or louvre-shaped horizontal baffles 14a at the top of the vertical baffles separate oil from the water. The oil is led off through an outlet 15 at the top of the chamber.

322,362. Hartley & Sugden, Ltd., and **Fox, S.** Dec. 19, 1928.

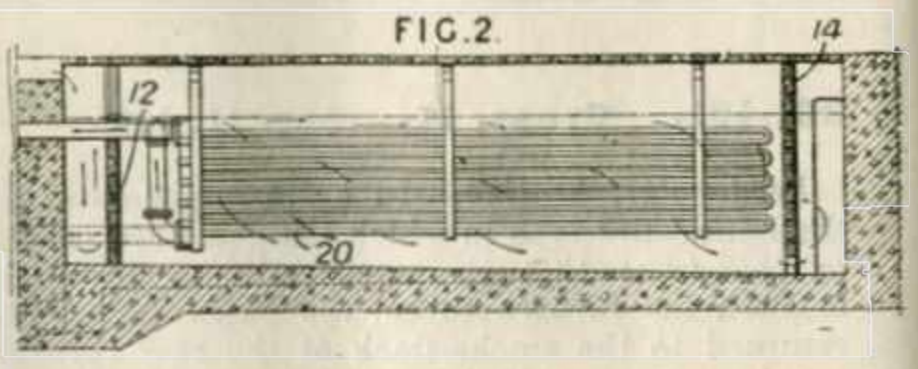
FIG.2.



Water-tube boilers.—Each of the headers A, B of a boiler for central heating or domestic hot-water supply is made by pressing sheet metal to a channel shape, the boiler tubes C being then expanded into the bottom of the channels and the headers closed by cover-plates a^1 secured by welding. The headers are made in the form of a **U** with a straight back, the front ends of the sides being closed by plates welded into the ends. The grate D is supported on lugs b^1 on the lower header. The sides and back of the boiler are enclosed by double sheets of metal with asbestos between the sheets.

322,366. Dehn, F. B., (*Whitlock Coil Pipe Co.*). Dec. 24, 1928.

FIG.2.



Heating liquids.—Waste hot liquids are passed through a chamber or series of chambers in each of which they enter by an inlet extending the whole width, such as over a weir 12, and pass

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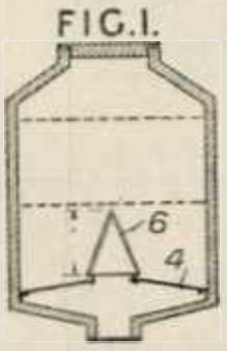
generally downwards to the other end through an outlet again extending the whole width, for example under a partition 14, whence they may pass over another weir either to waste or to another chamber. In each chamber a series of tubes 20 is arranged so that the liquid to be treated passes through them generally upwards in counter-current. The inlet partition 12 extends above the level of the pipe assembly 20.

322,741. Benthall, E. C., and **Spencer, E.** Sept. 10, 1928.

FIG.1.



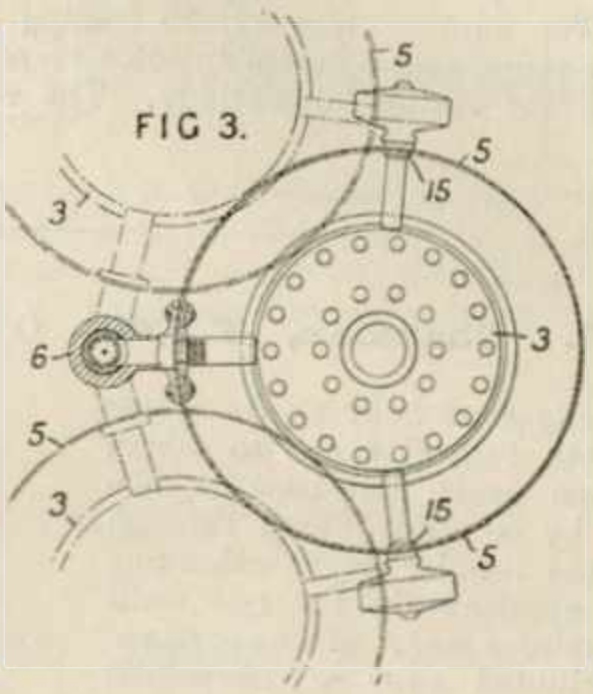
Digesters. — A method of extracting cellulose from vegetable material consists in arranging within a digester circulating means so that liquor passes downward over the fibres which are prevented from compacting within the digester as by having conical or tubular perforated projections 6 from the lower perforated plate 4, whereby cavities are formed from which the liquor can more readily be extracted. The projections are of such a height as not to project through the layer of material even when in its most compact condition. Specification 295,869 is referred to.

322,754. Benthall, E. C., and **Spencer, E.** Sept. 10, 1928.

Digesters.—In a process for digesting vegetable matter for recovering cellulose in digesters fitted with vomit pipes to the lower end of which a steam jet is directed, the vomit pipes are closed, as by valves therein at intervals, to cause a reversal of the circulation of liquor through the fibres, both during loading and digestion. In discharging liquor from the digester at the end of the process, the valves are shut and the pressure of residual steam in the digester is used to drive out the liquor through the fibres. Specifications 2868/80; 283,911 and 291,064, [both in *Class* 96, Paper &c.], are referred to.

322,883. Ewart, J. H., and **Ewart, J. W.** Nov. 29, 1928.

FIG 3.



Geysers.—A geyser of the type having a water chamber heated by a gas burner pivoted so as to be swung out to the side of a housing which contains the water chamber, is so constructed that the burner 3, pivoted at 6, carries a large segment 5 of the usual fit surrounding the burner and can be swung out to either side. Two handles may be provided, each being furnished with a catch 15, one of which may be operated to allow the burner to be swung out to the selected side only.

323,455. Nessi et Fils et Bigeault, E. Nov. 14, 1928, [*Convention date*].

FIG.2.

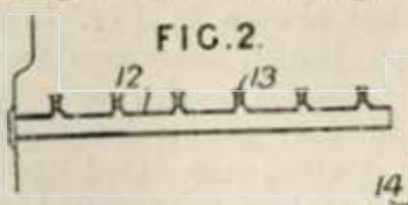
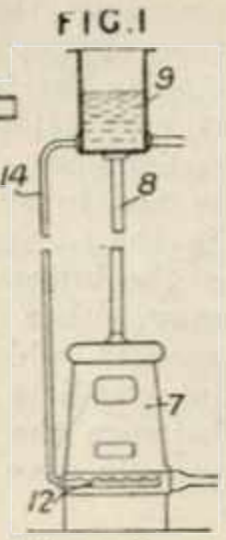
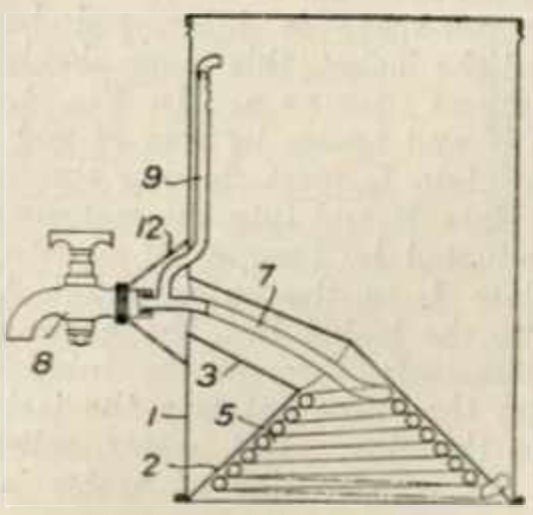


FIG.1



Heating water.—To accelerate the flow through the boiler 7 of a hot-water circulating system, a bye-pass circuit 14 connects either the expansion tank 9 or the riser pipe 8 with a tube 12 in the water space exposed to the hottest part of the furnace and connected with the boiler 7 by nozzles 13 of double-cone form. The tube 14 may connect with the pipe 8 and the connection may be at the mid-point of an injector-shaped part.

323,643. Chase, F. C. B. Jan. 8, 1929.



Internally-fired boilers. — A container 1 has a convergent flue 2 leading to a lateral pipe 3 extending through the side of the container, the opening being covered by a perforated cone 12

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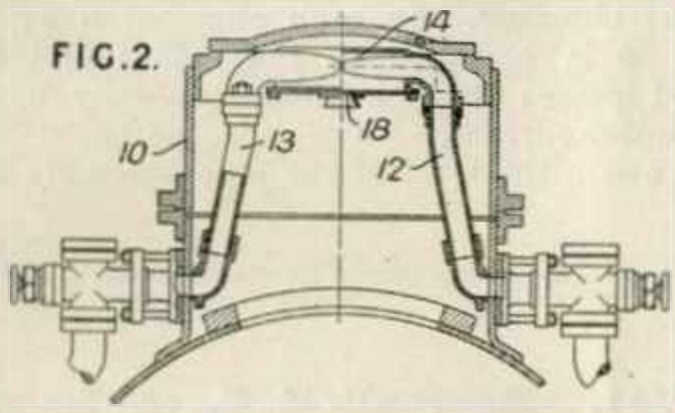
which serves to support the outlet tap 8. Spaced from but following the shape of the flue 2 is a coil 5 connected to the container at the bottom and at the top to the outlet tap 8 by a pipe 7 and to the upper part of the container by a return pipe 9 with perforated end.

323,649. Wagner, F. Jan. 10, 1929.

Feedwater, heating.—Heated feedwater is fed into the upper part of a boiler dome 10 through a casing 14 imparting a whirling motion to the water. The supply pipes 12, 13 leading from a hot-water pump and a steam injector respectively open into the casing tangentially. The water is discharged into the steam dome through one or more flanged openings 18 in the centre of the bottom of the casing. The pipes 12, 13 may open

FIG.2.



into separate compartments in the casing, each compartment having a separate central discharge opening.

323,807. Chapman, F. W. Oct. 11, 1928.

Internally-fired boilers.—In water heaters the central space to which combustion gases first pass is surrounded by a water space through which pass tubular ducts extending between apertures in the two walls of the water space. The apertures are distributed over a substantial part of the height of the walls, so that part of the products of combustion can flow outwards through the side walls of the water space near the bottom and part at higher levels. Two examples are shown, one, Fig. 1, in which the water chambers are sealed, and the other, Fig. 4, in which the heating gases can come into contact with the water. In Fig. 1, water passes from a jacket *b* to a bell-shaped water-space C, from which it is conveyed through the compartments *k*, *l* to the delivery *e*. Ducts *n* permit the passage of heating gases through the water-space, these ducts being arranged in two or more rings. In a modification (not shown), an additional bell-shaped water-space is interposed between the shell *c* and the jacket, this space also having rings of perforations such as *n*. In Fig. 4, the water enters at N and passes by way of and through O on to the plate L, part flowing through the slit Q to the plate H and into the water-way D, part being conducted by tongues M on the periphery of the plate L to the outer jacket A and part falling into the jacket B. The heating gases expand successively through the tubular ducts E and C into the space between the jackets A and B and to the flue. Hot water collects in the space R. A construction of heater is described

FIG.4.

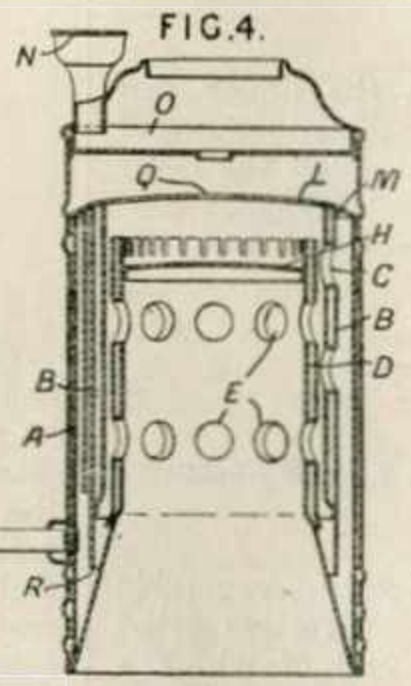
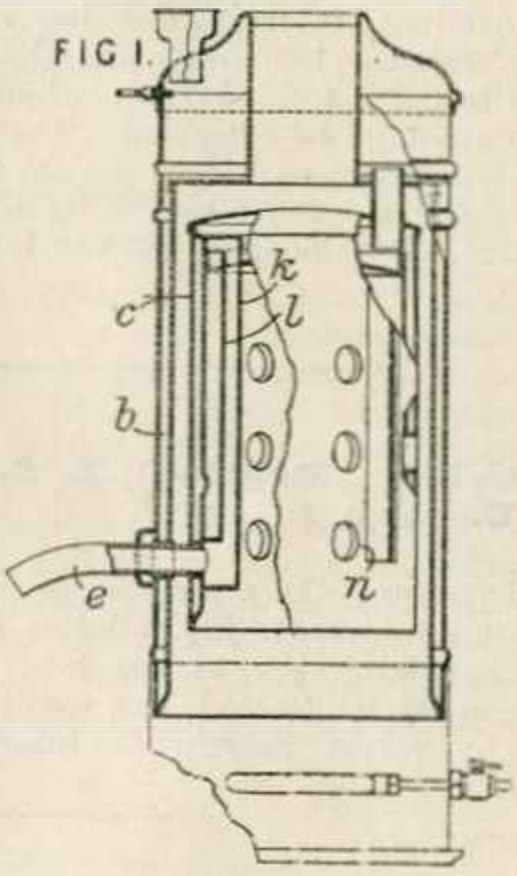


FIG 1.



in the first Provisional Specification which resembles that shown in Fig. 4, except that the three casings inner, intermediate and outer are single, the inner is perforated, the intermediate is corrugated and is attached to the outer by radial fins. Baffles are fitted over each aperture in the inner casing to prevent entry of water. In the second Provisional Specification, the wall of the intermediate casing and also the outer wall may either of them be formed with vertical pockets, which the water fills and overflows, the intermediate casing being preferably perforated between the pockets. Alternatively, the water pockets may take the form of encircling bands.

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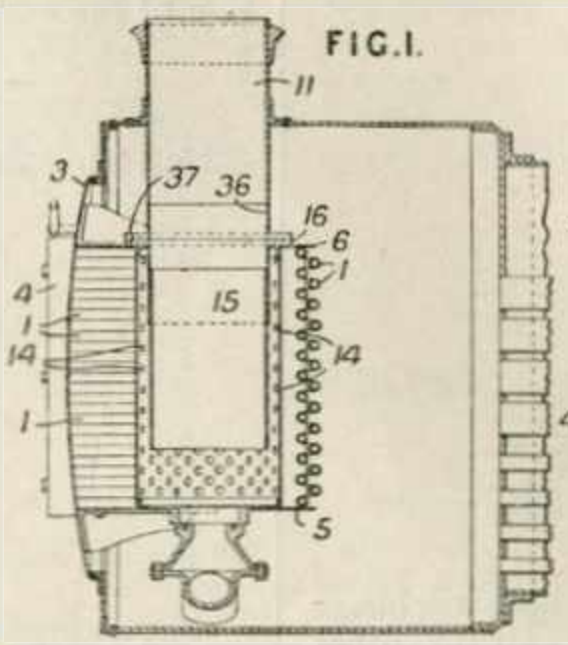
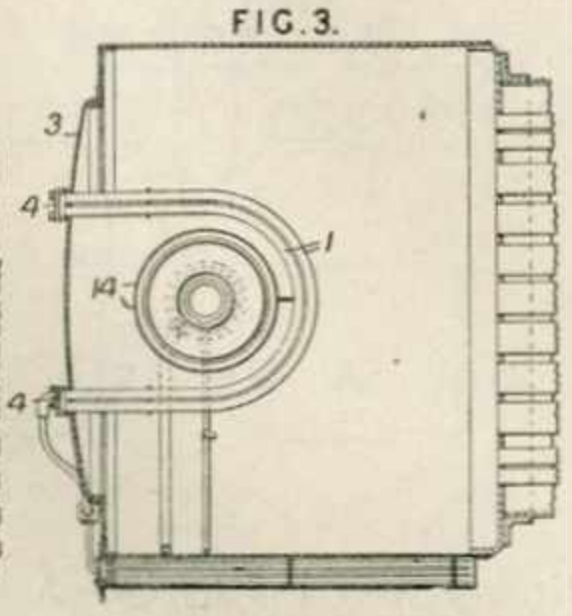
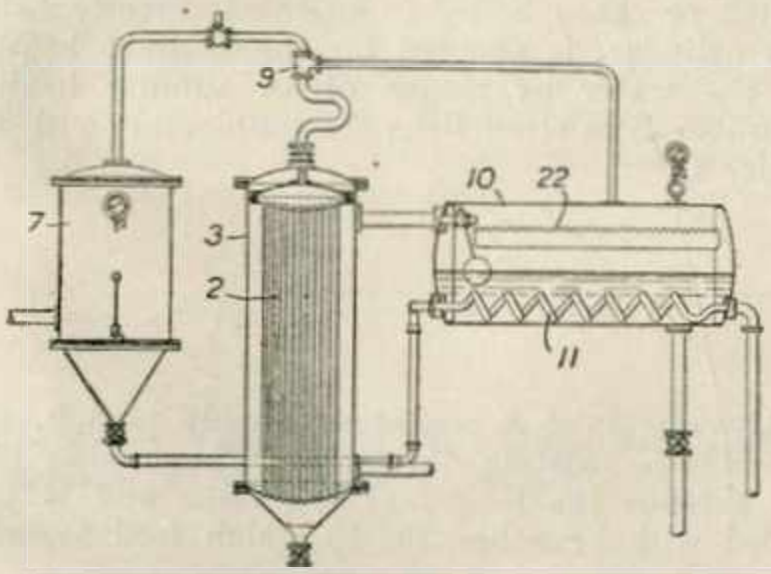
323,886. Trevithick, F. H. Dec. 5, 1928.





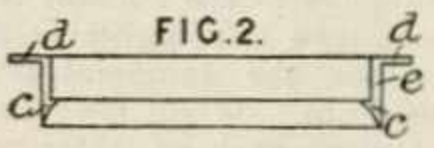
Feedwater, heating.—A feedwater heater **I** attached to the door 3 of a locomotive smoke-box, as described in Specification 170,326, encloses an open-ended tubular member 15 forming an extension of the chimney 11. Coiled or **U**-shaped feed-heating tubes arranged horizontally are connected to headers 4 on the outside of the smoke-box door. Plates 6, 5 at the top and bottom of the tubes force the furnace gases to pass between the tubes on their way to the chimney. A perforated cylinder 14 serving as a spark arrester is arranged between the tubes and the tubular member 15, which is so supported upon the plate 6 by a flange 16 held by pins 37 that the member may be readily removed, say when starting up. The chimney 11 may be formed with a separate lower part 36 resting upon the feed heater. In a modification, the spark arrester is **U**-shape and is supported by the smoke-box door. The feedwater is heated by main engine and pump engine exhaust, and by surplus boiler steam before entering the smoke-box heater.

323,891. United Water Softeners, Ltd., and **Marigny, H. G.** Dec. 13, 1928.



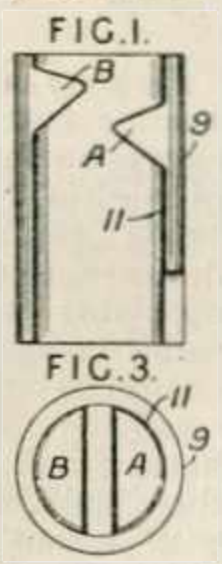
Feedwater, heating.—Steam from boiler blow down water in a closed expansion chamber 7 operates an injector 9 drawing off air and other gases from the feedwater in a closed hot-well 10, in which the feedwater is heated by the water flowing from the expansion chamber through a coil 11 in the hot-well. The steam and gases from the injector pass through tubes 2 in a heater 3 through which the feedwater is passed on its way to the hot-well. The water is broken up upon entering the hot-well by a serrated baffle 22.

324,035. Dymott, L. E. J. Oct. 15, 1928.



Washing - boilers. — For preventing boiling over, a ring is applied to or cast integral with a washing-boiler, there being vertical and horizontal parts *e*, *d* and an inwardly-projecting flange *c* with a flat upper surface and concave under side.

324,871. Tod, Ltd., D., and **Tod, D. V.** May 6, 1929.



Vertical boilers. — In an internally-fired vertical hot-water boiler consisting of inner and outer cylindrical shells 9 and 11, forming a jacket with two hollow baffles A and B of triangular shape, the baffles are of different height and extend less than half-way across the fire chamber.

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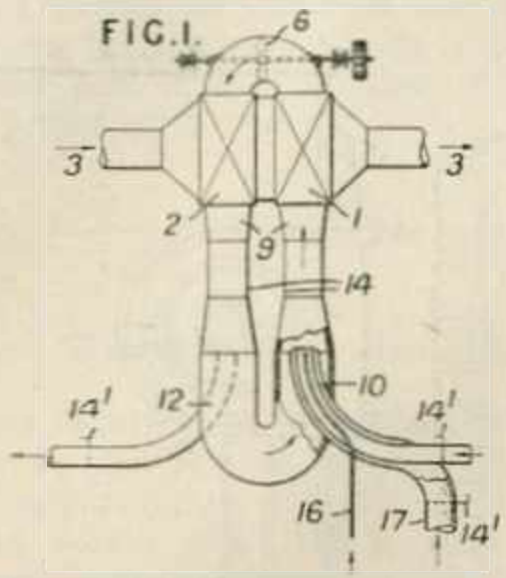
324,940. Haber, E. Sept. 3, 1928.

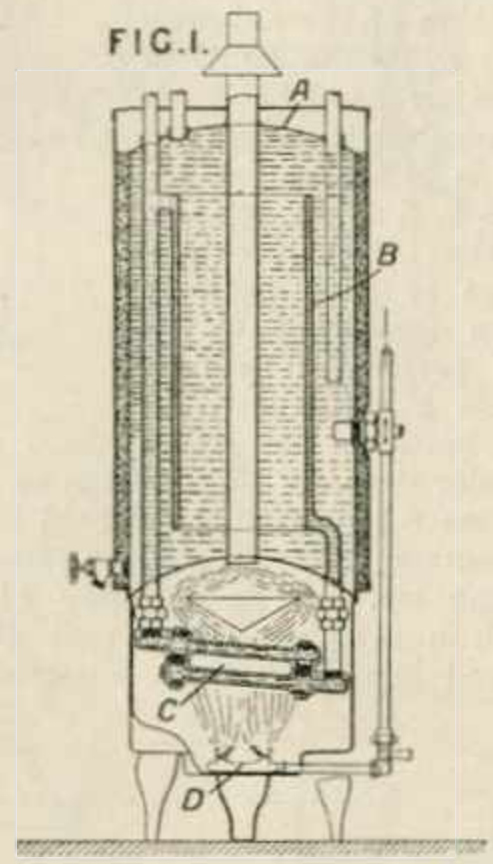
FIG.1.



Heating gases and liquids.—A heat exchange apparatus for heating or cooling air or other fluid and which may also operate as a condenser or steam generator comprises a closed circulation conduit 9 containing a fan 6, groups of heat-exchanging elements 1, 2 and pipes 10, 12 extending into the conduit for admission of fresh medium and discharge of part of the used medium, the conduit being restricted at 14 above the mouths of both the inlet and outlet pipes. The medium to be heated is passed through the heat-exchange elements 1, 2 in the direction of the arrows 3. Valves 14¹, which may be interconnected, control the supply and outlet of the heating medium, which may be smoke gases from a furnace, the walls of the conduit then being of refractory material. Cold fresh air may be supplied to the conduit through a central tube 16 or a tube 17 concentric with the pipe 10 to further reduce the temperature of the fresh heating medium. When used as a condenser, a cooling medium such as water may be circulated in the channel 9, fresh cold water being admitted at 10, and steam to be condensed may pass in the direction of the arrows 3.

325,242. Case, W. G. Nov. 14, 1928.

FIG.1.



Heating water. — A water heater of the kind comprising a storage cylinder A and thermostatically-controlled heating means D, directed to a coiled or other boiler C mounted directly below the cylinder, is adapted for the indirect heating of the water by means of an annular heating chamber B in circulating communication with the boiler C.

325,260. Jones, M. H., and **Hope's Heating & Lighting, Ltd.** Nov. 14, 1928.

Heating water. — A heating and circulating system having a number of outlets from which liquid can be withdrawn, such as a system supplying water to a series of shower baths, comprises means for supplying steam for heating and circulating the fluid, combined with means for automatically controlling the supply of steam in accordance with the temperature of the fluid in the system. In the example, a main circulating pipe 5 contains an injector comprising nozzle 6, baffle 7, a cold-water inlet 8 and steam-supply pipe 9, and possibly a swirling device 10. The mixing pipe 11 extends the length of the baths and is provided with branches 12, 13 which feed separate cubicles 14 through the sprays 15 with valves 16. The return ends of branches 12, 13 are connected to the injector at points 17, 18 behind the baffle. The nozzle 6 and baffle 7 are adjustable in position. The supply of steam is controlled by a valve according to the temperature of the water at suitable point where a control device 19 is placed.

FIG.3.

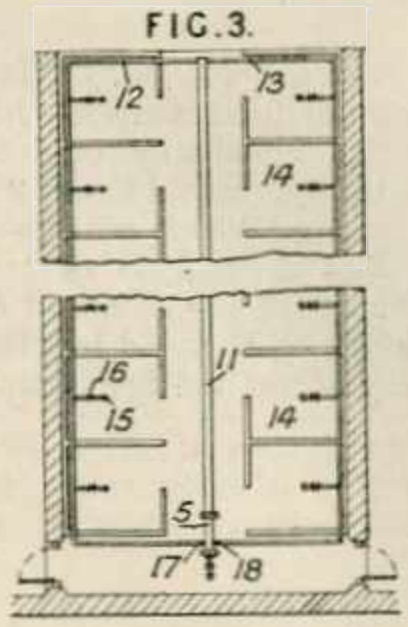
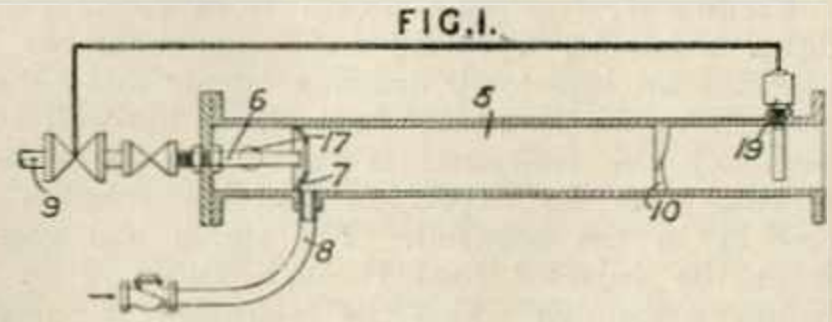
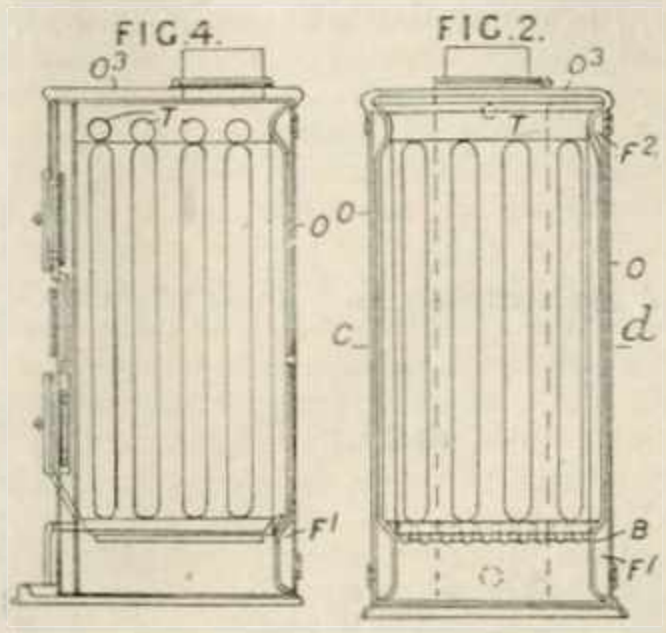
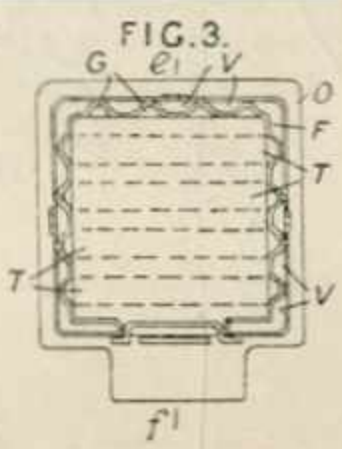


FIG.1.



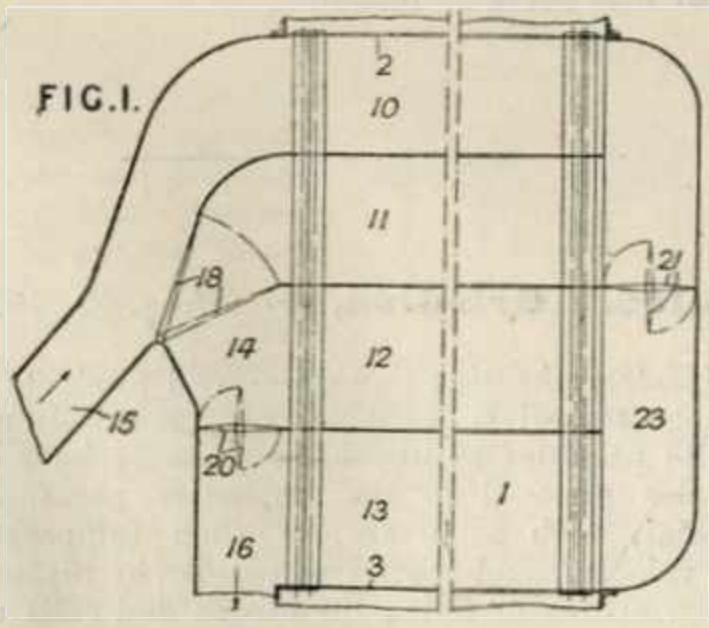
325,688. Binns, V., Binns, J., and **Binns & Speight, Ltd.** Feb. 14, 1929.





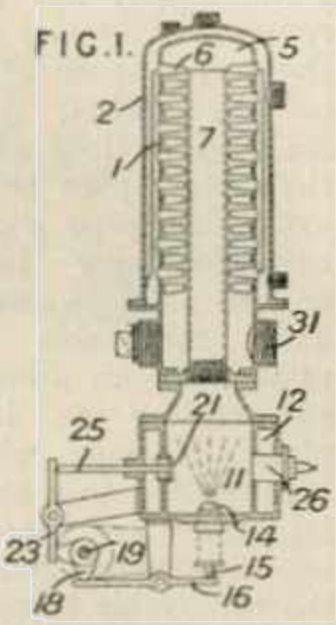
Internally-fired boilers.—A hot-water boiler is formed by the combination with the outer shell *o* of a one-piece fire-box F having corrugations contacting with the shell to form vertical waterways V on the one side, and channels G on the other to draw heat from the fire. The side corrugations do not extend wholly from the top O^3 to the bottom of the plate in which they are formed, and have upper and lower bulged in portions F^2, F^1, the upper of which are connected by weldless top cross-tubes T for the free circulation of water. The lower bulged-in portions of the fire-box form a seating for the fire-bars B. The corrugations may be semi-circular or of other shape.

325,697. Howden & Co., Ltd., and **Hume, J. H.** Feb. 25, 1929.



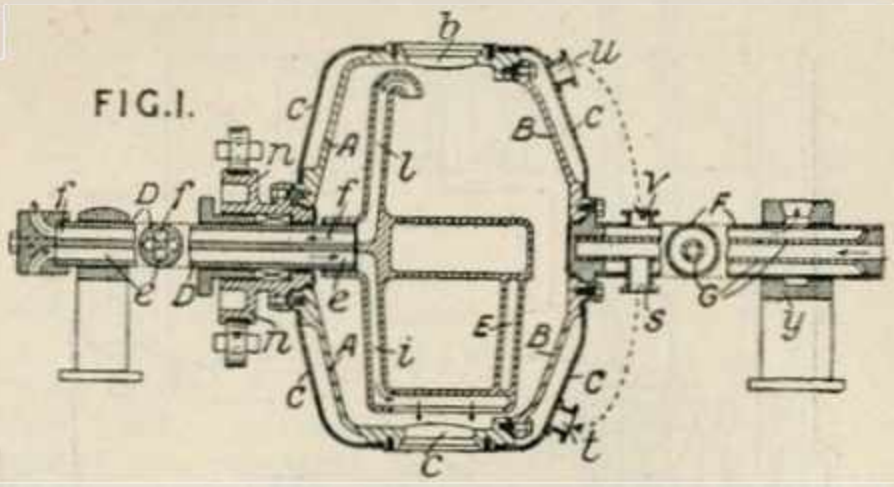
Heating air.—In air heaters for boiler furnaces and comprising a casing 1 having end tube plates 2, 3 and a number of passes 10 - - 13, extending between chambers 14, 23 disposed on opposite sides of the casing, and fitted with manually-controllable dampers 18, 20, 21, the air supply and discharge trunks 15, 16 are located on one side of the casing. The air heater passes are arranged in series when valves occupy positions shown in full lines and in series-parallel when in positions shown in dotted lines.

325,733. Fountain, H. J. March 28, 1929.



Internally-fired boilers; water-tube boilers. — A boiler comprises a water-jacketed cylinder 12, with thimble-like protuberances 6 forming a combustion chamber 5, a tube 7 disposed centrally therein, and means for intermittently supplying and igniting a combustible mixture. A cam 18 on shaft 19, by means of lever 23 and rod 25, opens valve 21 intermittently to allow air under pressure in chamber 12 to enter chamber 11 and tube 7. The cam also operates the spring tappet 15 of nozzle 14 through the rocker 16 to allow oil to be injected into chamber 11. The shaft 19 may be driven by an electric motor which may also operate the electric ignition device 26. The combustion products escape through an outlet 31.

325,760. Siller & Rodenkirchen Ges., Dr. Ing., and **Siller, W.** May 17, 1929.



Digesters are mounted on trunnions one of which serves for entrance and exit of heating or cooling medium for the jacket, while the other rotates about stationary conduits for admission and discharge of acid for the treatment of material in the vessel. The vessel comprises two parts A, B clamped together, the section A having the ports *b*, *c*. A pipe F mounted in a bearing *y* acts to discharge the heating or cooling

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medium, being connected to the jacket C by a pipe joining the connections *u*, *v*. A central tube G supplies the medium to the jacket by way of connections *s*, *t*. The other trunnion *n* rotates about a stationary conduit D which encloses supply and discharge ducts *e*, *f* for acid and which bears a stirring device E with ported tubes *i*, *l* in connection with the ducts *e*, *f*.

325,770. Stott, V. H., Stott, R. E., and **Schofield, L.** June 27, 1929.

Heating water.—An electrically or steam heated water heater has a readily removable interior enclosing the water space a^2 and the heating means, a pan *d* receiving boiling water from the water space through an expansion pipe d^1, and an insulating air jacket a^1 around the water space. The removable interior rests upon an annular base surrounding an insulation plate *c*, through which bars *b* connected to a source of electric current project into the water space. Water from a tank *j* flows into the space between the exterior casing and the removable interior C through a pipe j^1 passes downwards through a passage *f* on the outer wall of the interior and enters the water space a^2 through an opening f^1 at the bottom of the passage. The interior is secured in position by the screw-threaded shank of the draw-off tap *h* engaging in bushing held in the casings. The air jacket is open to the atmosphere through a pipe *e*. The water may be heated by a pipe coil through which steam is circulated.

FIG. 2.

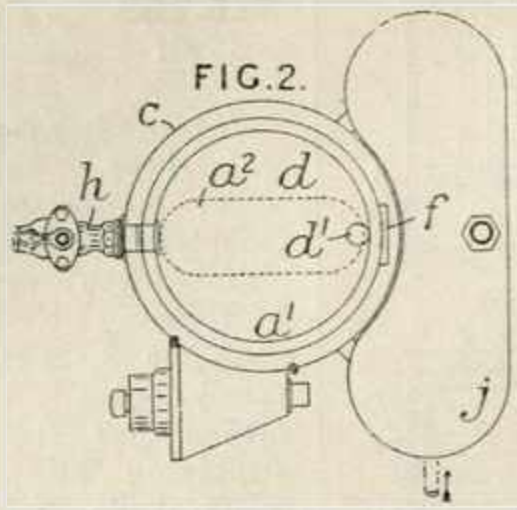
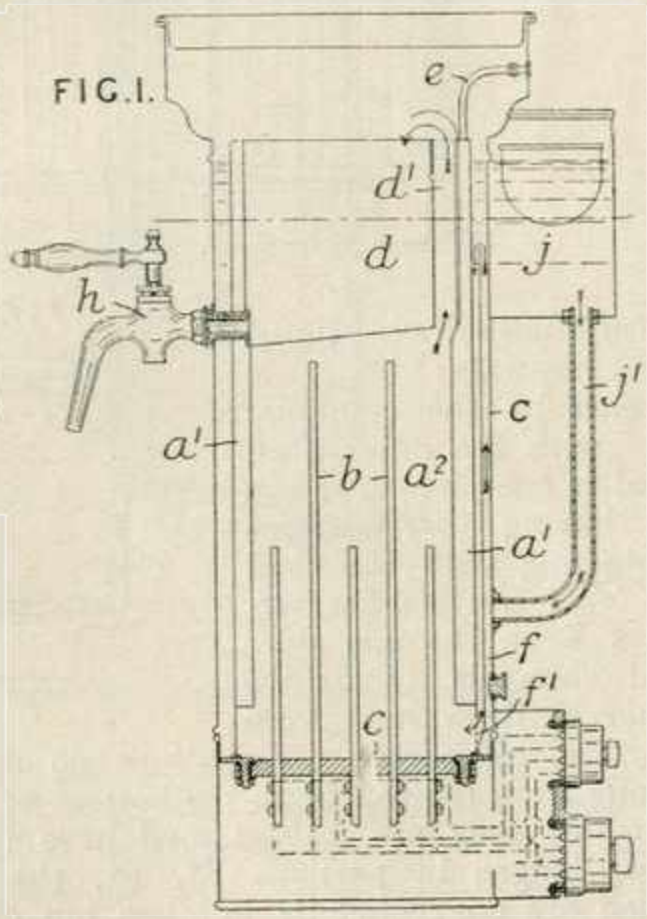
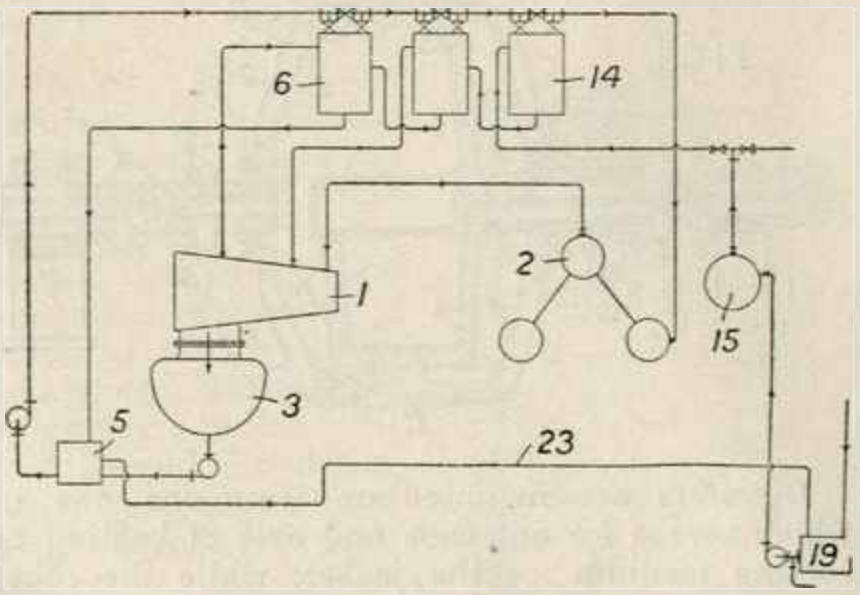


FIG. 1.



326,103. Smith. E. H., and **Workman Clark (1928), Ltd.** May 30, 1929.



Feedwater, heating. — Feedwater is heated in one or more of a series of heaters 6 by steam from an engine 1 operated by steam from a boiler 2, and in the final heater 14 of the series by steam from an auxiliary and separately heated boiler 15, the condensate from the final heater being led with the condensate from the other heaters into the hot-well 5 of the engine condenser 3 to serve as make-up.

326,156. Grindrod, G. Aug. 29, 1928.

Digesters; heating liquids.—Food products containing materials capable of presentation in minute particles to impactive pressure have such particles exposed to the impactive pressure of material, such as steam, of such temperature, high velocity, and inertia as rapidly to rupture or destroy spores or living organisms and cells upon impact, the impacting material passing to an outlet without building up an excessive pressure after impact. The velocity of the steam is of the order of 1400 feet per second. The food products may be wholly or largely sterilized by the

process, which may also serve to stabilize the proteins so that by subsequent cooling and concentration the products are obtained as solidified hydrated colloids or jellies. Milk, ice-cream mixture, ground meat or sausage, gelatin, cereals, &c. may be treated in this way. The steam, introduced through a hollow rotatable shaft 15 to nozzles 30, Fig. 2, formed by co-operating conical parts 28, 29, Fig. 4, escapes from the treatment chamber 10 through a valved vent pipe 13. The steam-treated material passes to a refrigerating chamber 32 and then to a concentrating chamber 37. The nozzles 30 are produced by drilling through the contacting edges of the parts 28, 29 with a drill approximately 0.05 inch in diameter and then rotating the part 28 to a slight extent. In another form of apparatus, the steam enters the treatment chamber through nozzles on the horizontal drum portion of a conveyer worm; and in a third form, the steam from fine jets impinges upon, say, a film of milk the particles of which are thus driven into the body of the treatment chamber.

FIG.1.

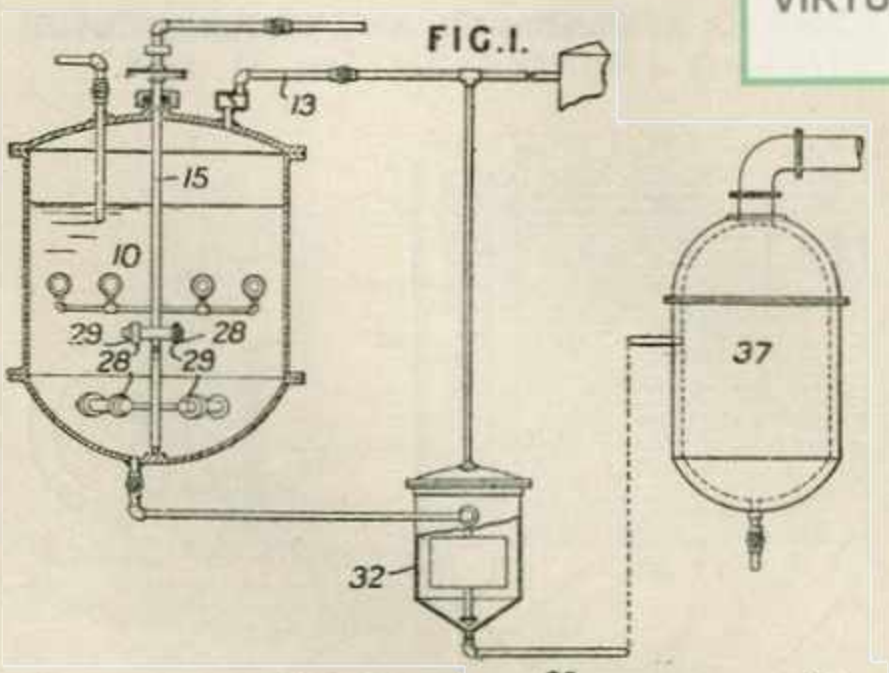


FIG.2.

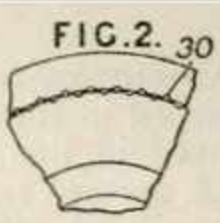
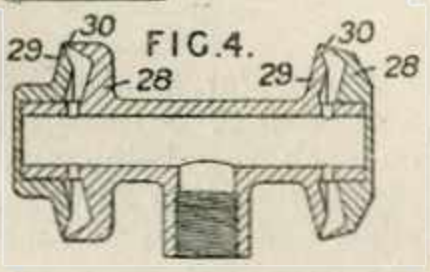


FIG.4.



326,381. **White, W. A.** April 11, 1929.
Addition to 313,998.

FIG.1.

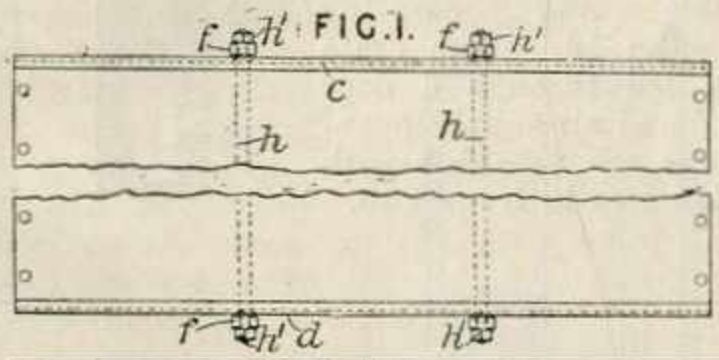
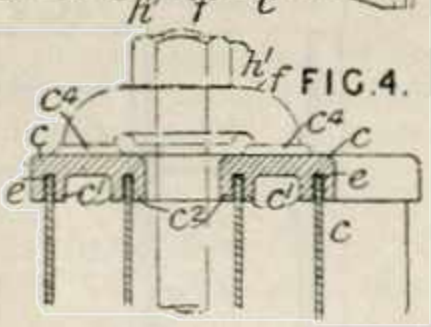


FIG.2.

FIG.4.



Heating air.—Heat-exchange apparatus such as air preheaters of the kind described in the parent Specification have the cells assembled in groups with the detachable top and bottom plates secured in place by means common to a number of cells in each group. If desired, the top or bottom plate only may be detachable. The top and bottom plates *c*, *d*, Figs. 1 and 2, are secured by bolts *h* and nuts h^1 carrying dogs *f* which engage with the detachable top and bottom plates of two or more cells. While each dog may be common to two cells, the group may consist of three or more cells with the dogs in staggered relation. The plates *c*, *d* are provided with inner and outer flanges c^1, c^2, Fig. 4, or with inner flanges only, and the plates may be provided with packing *e*. Bearing surfaces c^4 are provided for the dogs *f*. The outer flanges c^2 are cut away at the end of the plates where adjacent cells meet.

326,440. **Cox, G. H.** Sept. 7, 1928.

FIG.3.

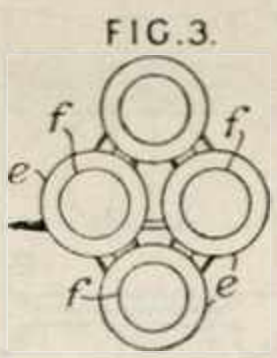
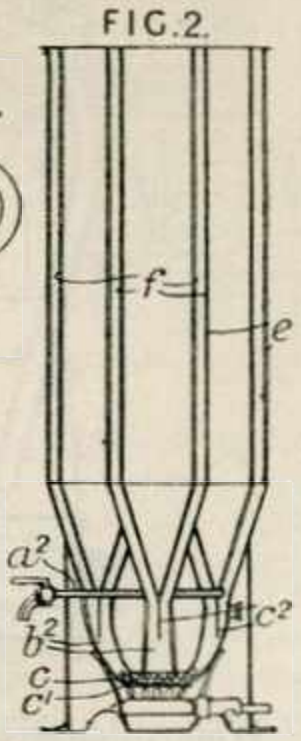


FIG.2.



Heating water.—Tubular radiator elements *e* heated by steam generated in a small boiler *c*, to which they are connected by pipes b^2, contain inner tubes *f* forming containers in which water may be heated; a draw-off pipe a^2 is shown connected to the lower ends of two of the containers.

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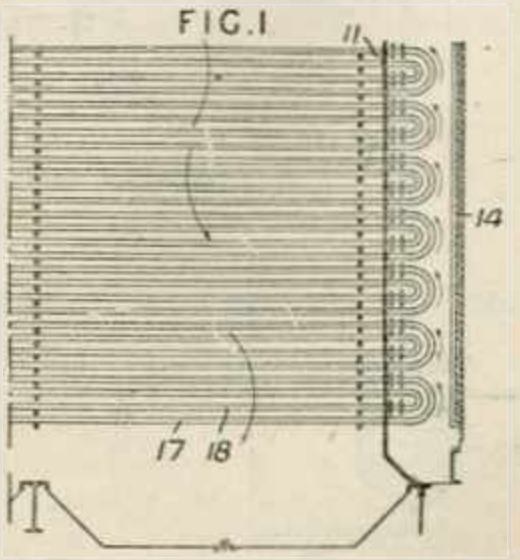
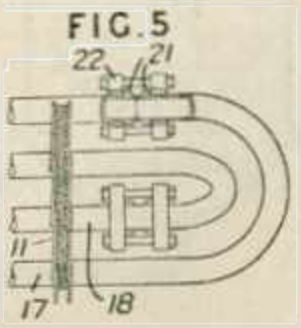
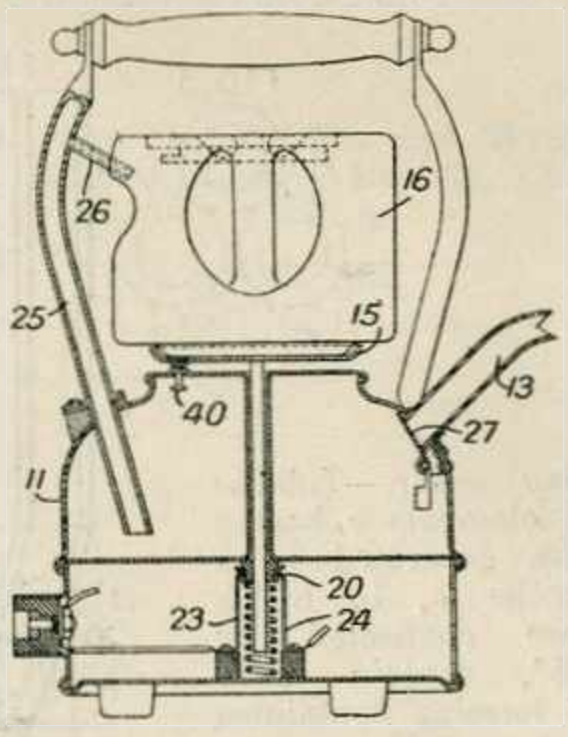
326,470. Babcock & Wilcox, Ltd., (*Babcock & Wilcox Co.*). Dec. 11, 1928.





Feedwater, heating.—An economizer comprises a number of **U**-tubes arranged in rows, the joints on each row being arranged in line, each joint comprising lugs 21, Fig. 5, formed near the tube ends, and plates 22 each provided with a hole for the tube, cut away on each side sufficiently to enable the lugs to pass through, the plate then being turned so that the lugs are opposite a part not cut away, the plates on adjacent tube ends being bolted together to cause the tube ends to abut. In the example, the **U**-tubes are in pairs 17, 18 connected together to form a serpentine heater, the joints lying between the outer casing 14 and a wall 11 made up of plates slotted so as to fit between the rows of tubes.

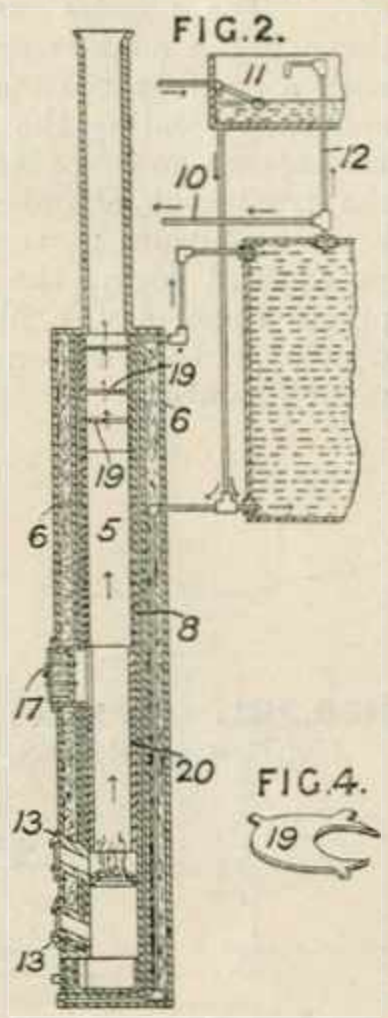
326,601. Lee, E. L., and **George, C. H. L.** Jan. 17, 1929.



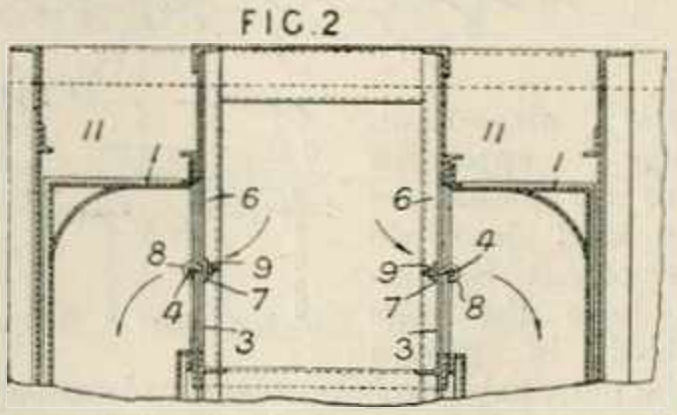
Water, delivering.—A container 11, fitted with electric heating means supporting a receptacle 16 for heated liquid such as a teapot on a platform 15 spring-pressed upwards, is fitted with a pipe 25 with spout 26 so that on the water boiling steam pressure delivers the water to the receptacle 16. The increased weight causes the support to move downwards, removing a conducting band 20 from between spring contacts 23, 24, thus breaking the electric circuit to the heating means. A safety or blow-off valve 40 and a weighted flap 27 for closing the spout opening 13 are provided.

326,749. Trinham, T. P. Aug. 12, 1929.

Internally - fired boilers; geysers. — A water heater consists of a jacket 8 extending around and below a fire shaft 5 surrounded by heat insulation within a body 6. The water circulates through the jacket and a storage cistern supplied from a cold-water cistern 11, the delivery pipe 10 being connected to an overflow pipe 12 leading to the cistern. A metal liner 20 preferably in three sections is fitted in the shaft 5, the top section being removable and carrying baffles 19. The grate is fed through a door 17 and air-supply openings are provided with dampers in frames 13.



326,844. Owen, W. H. Dec. 21, 1928.



Heating air.—Heat-exchange units comprising bundles 1 of cells mounted in a conduit 11 for hot fluid and formed by flat plates secured to transverse bolts 4, are held against inlet and outlet ports 3 in the conduit by hook or eye bolts 8 engaging the transverse bolts 4, passing through abutment bars 7 bearing against the outer faces of the ports or of side section-members 6 and being secured by nuts 9. Specifications 228,218 and 273,809 are referred to.

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326,845. Lambert, A. J., and **White Tile Heaters, Ltd.** Dec. 21, 1928.

Geysers. — In water-heaters of the geyser type a movable tray or receptacle is provided for the condensate. The water-containing unit is supported by rods 11 carried by lugs 30 formed on each of a pair of adjustable brackets 1 from each of which a projecting ledge 8 carries an inclined tray 9 with a drainage outlet 13; the tray is reversible end for end. The gap between the heater and the upper edge of the tray may be closed by a strip or bar 15. A central opening in the tray provides for access of flame and hot gases to the interior of the heater. A modification is described for adapting the tray for use with cylindrical water-containing units. A circular bracket 17, Fig. 6, has inwardly-projecting members 18 supporting the water-containing structure and brackets 22 carrying a circular condensate tray 21 with outlet 14 below the heater. The slope of the tray may be adjused by slots provided in the brackets.

FIG. 1.

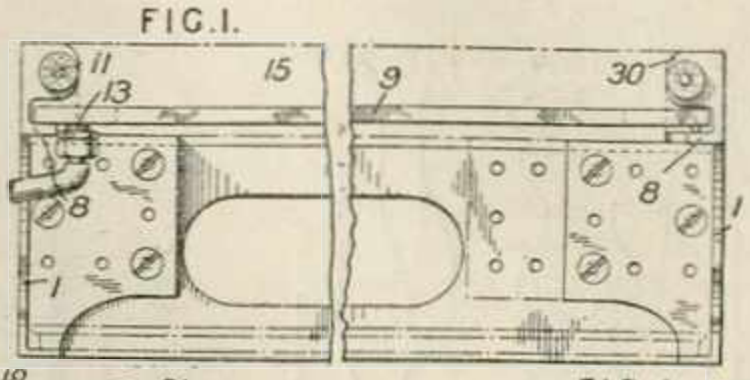


FIG. 6.

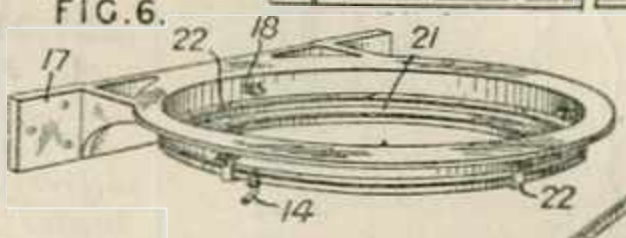
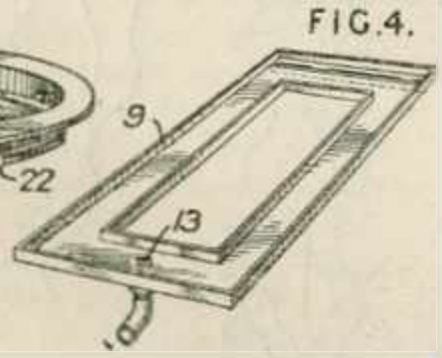


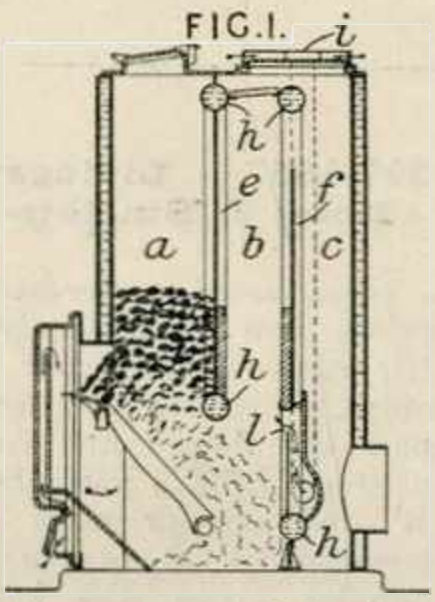
FIG. 4.



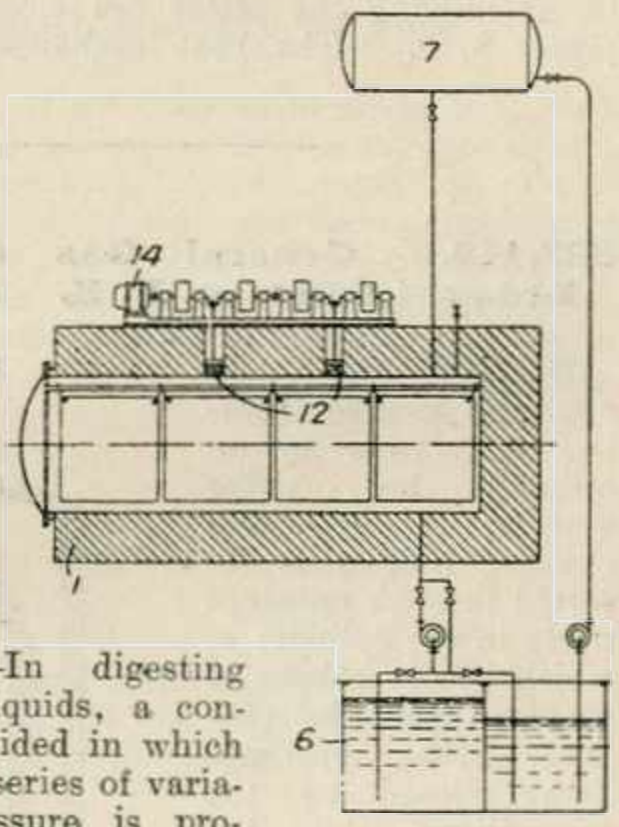
327,044. Treschow, M. May 9, 1929.

Boilers with a fuel magazine located above the combustion zone and a water-jacket have vertical water-tube walls separating the combustion chamber from the magazine and from the flue system. The magazine *a*, combustion chamber *b*, and one or more flues *c*, of a hot-water boiler are separated from one another by gas-tight tube walls *e*, *f* consisting of vertical tubes connected by iron strips or bars. The tubes are connected by cross-tubes *h* at the top and bottom to the water-space of the boiler. Secondary air which may be heated in an air-jacket surrounding a chamber *i* is admitted through apertures *l* between the wall tubes. The lower part of the combustion chamber may be protected by firebrick. The water tubes may abut, their ends being of rectangular formation, the short sides of adjacent tube ends being welded together and their long sides connected by seams to the cross-tubes.

FIG. 1.



327,146. Collins, V. A. Sept. 28, 1928.



Digesters.—In digesting solids with liquids, a container is provided in which a continuous series of variations in pressure is produced by means such as pistons working in cylinders connected to the container. The container 1 is supplied from a storage tank 6 having compartments for strong and weak liquor and is connected to an accumulator 7. The pressure variations are effected by pistons 12 actuated for example by an electric motor 14. Means may be provided for circulating the liquid through the storage tank and container while the operation proceeds. Specification 317,427, [*Class* 140, Waterproof &c. fabrics], is referred to.

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327,156. Howden & Co., Ltd., J., and **Hume, J. H.** Dec. 28, 1928.

FIG.2. FIG.4. FIG.2a

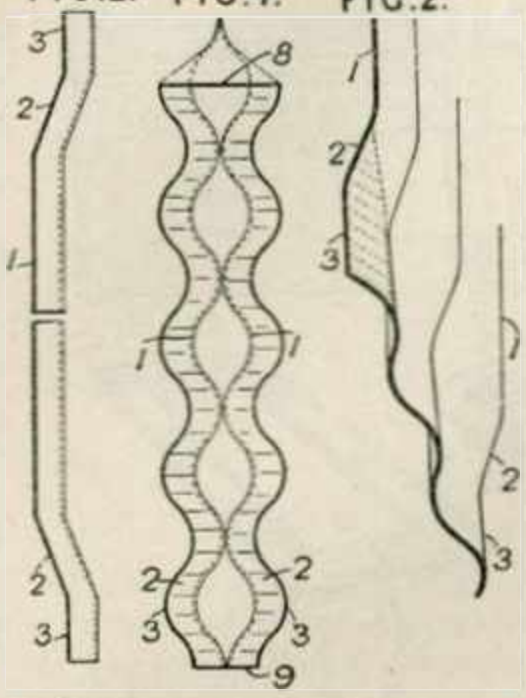
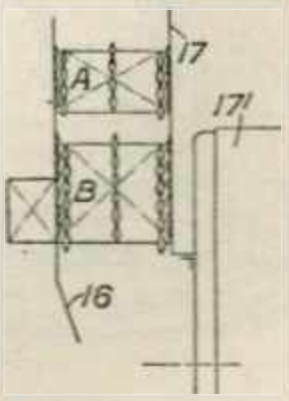


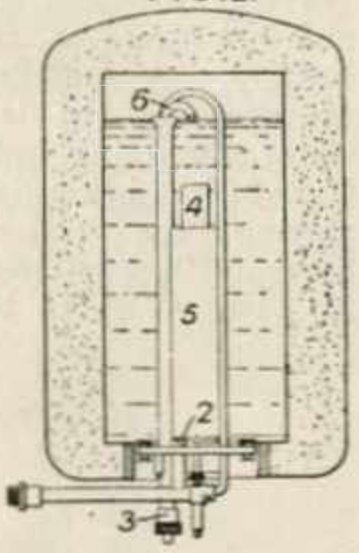
FIG.9.



Heating gases. — A heat exchanger comprises united pairs of corrugated plates 1, Figs. 2, 2a, and 4, the opposed edges 2, 3 of each plate extending transversely of the corrugations being offset, the plates of each element being welded along the ridges of their corrugations, and adjacent elements being connected together along the offset edges. The gap formed by the offset parts on assembling the plates are closed by welded pieces 8, 9. The heat exchange units A, B, Fig. 9, are interposed in series between the smoke-box 16 and the uptake 17 of a marine boiler 17¹, the passage of the air to be heated and of the flue gases being controlled by valves. The plates of an element may be corrugated lengthwise along waved lines. Specification 295,106 is referred to in the Provisional Specification.

327,314. Berry, H. H., and **Painton, C. A.** May 6, 1929.

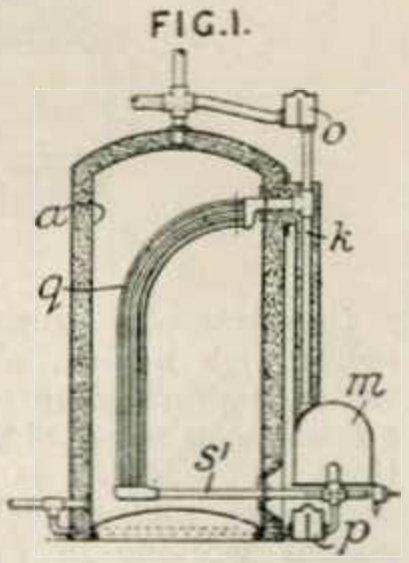
FIG.2.



Water supply and delivery. — In a water heater from which hot water is intermittently forced through a tube 3 by the admission of cold water through a tube 2, the outlet tube 3 is provided with a syphon tube 6 to lower the water level in the heater below the entrance to the outlet tube, thus preventing dripping when the cold water inlet valve is closed. The heating element 4 is surrounded by a circular tube 5.

327,412. General Gas Appliances, Ltd., and **Coleman, F. S.** Nov. 30, 1928.

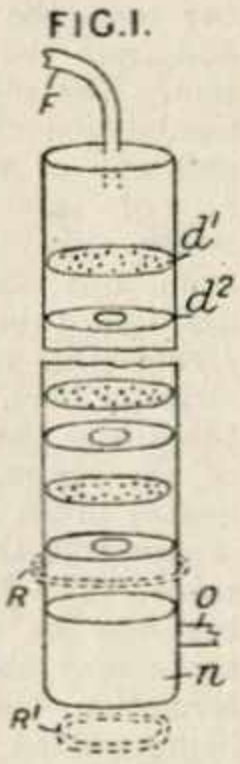
FIG.1.



Heating water.—To apply an indirect heating circulation to an ordinary hot-water system, a heat exchanger unit *q* is inserted through openings made in the cylinder *a*, which is not otherwise prepared for the purpose, the openings being closed by the connections to the heat-interchanger unit themselves. In the Figure the boiler *m* is connected by flow and return pipes *k*, *s*¹ to the unit *q*. Additional connection to the cold-water pipe and to the hot-water delivery from the cylinder are provided with air-holes *p*, *o* to prevent circulation therethrough. The indirect heater may have an independent cold-water supply and expansion chamber, or may have the same cold-water supply and a separate expansion pipe or air vent, or a separate cold supply and an air vent. Air-locks are used when the cold supply is from the same source to keep the circulations separate. Specification 4545/11, [*Class* 123 (i), Liquid-level regulating &c.], is referred to.

327,485. Livingstone, W. L., and **Ross, J. Sinclair-.** Jan. 22, 1929.

FIG.1.



Geysers.—A water-heater comprises two substantially concentric casings, the inner of which only is shown, between which pass the flames and combustion products from a lower burner-ring R¹ and one or more additional burner-rings R arranged in the annular space, the bottom and sides being thus heated. The inner casing is provided with a number of discs alternately pierced with a central hole as at d^2 and a concentric series of holes as at d^1, or other means for causing the water to follow a tortuous path from the inlet F to the collector *n* and outlet O. The outer surface of the inner casing may be covered by asbestos, gauze or other refractory material. A suitable annular partition and vent and air-holes in the outer casing may separate the burners.

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328,076. Underfeed Stoker Co., Ltd., and **Harlow, W. F.** Feb. 26, 1929.

Heating air. — In heat exchangers of the plate type in which alternate cells *a* have an entrance *d* on one face of the heater for one of the fluids concerned and an exit *e* on the opposite face for the other fluid, a change of direction of flow of the fluid is obtained by means of numerous deflectors *f*, *f*¹, placed one at each position at which the change is to occur. The surface of each plate is ruled with parallel lines, which may be at right-angles, and the deflectors of thickness equal to the width apart of the plates, welded or riveted to the plates at the points of intersection of the lines. The deflectors may be of crescent shape with faces which are circular arcs of different radii, the arc of longer radius being tangential to the ruled lines. Knife edges are preferably used on the deflectors.

FIG. 1.

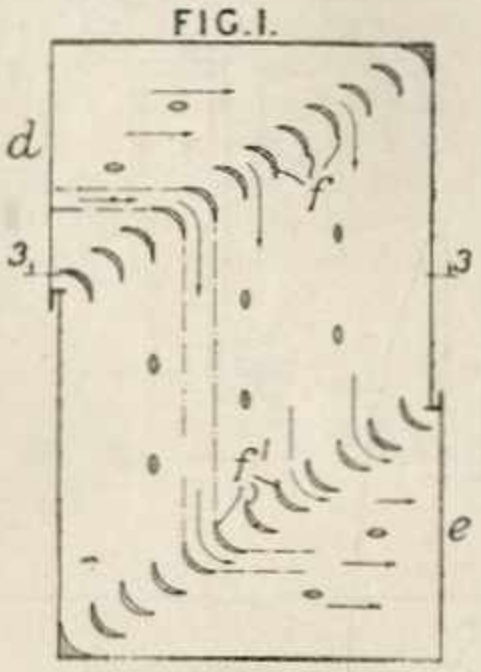
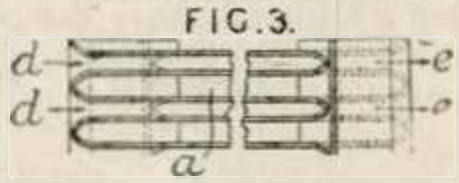
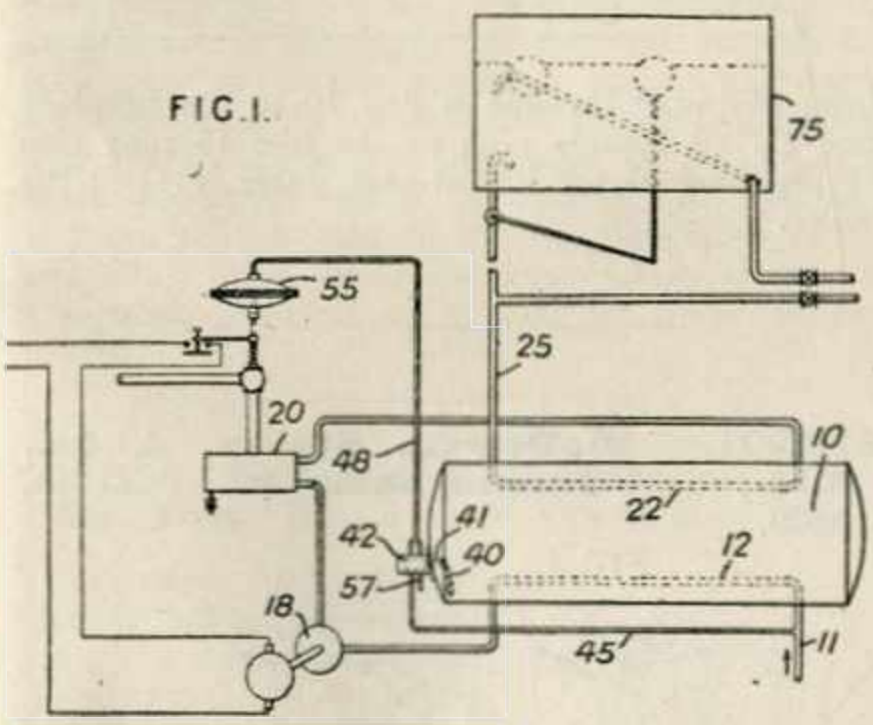


FIG. 3.



328,548. Ransom, L. L. Dec. 24, 1928.

FIG. 1.



Heating liquids.—Liquids are heated by circulation through a closed circuit under constant pressure being propelled as by a pump 18, the rate being predetermined to equal the average rate of withdrawal of the heated liquid, a heater 20 being provided and a storage body of liquid 10 being situated between the point of supply 11 and the point of withdrawal 25. The storage body is of sufficient size to compensate for temporary differences between the rate of withdrawal and the rate of heating. In the example the supply main itself is continued through the storage tank 10 to the pump 18, and the withdrawal pipe 25 similarly is connected to the heater 20, those parts 12, 22 of the connections which lie within the tank being perforated with graduated holes larger near the entry to the tank than near the exit. Means are provided for cutting off the supply of liquid from supply to heater when so much heated liquid has collected in the tank as to extend nearly to the bottom. In the Figure a bimetallic or like strip 40 is in the lower part of the tank and operates by a rod 41 a slide valve 42 when the temperature reaches a predetermined point, to move a port in the valve out of communication with the ends of the pipe 48 and a drip pipe 57 and connects the pipe 48 with another pipe 45 joined to the supply main 11. Pressure is thereupon exerted on a diaphragm in a casing 55 to operate a valve for shutting off steam or other heating medium to the heater and to break the circuit to a motor driving the pump. A further storage tank 75 for hot water may be provided.

Reference has been directed by the Comptroller to Specification 184,198.

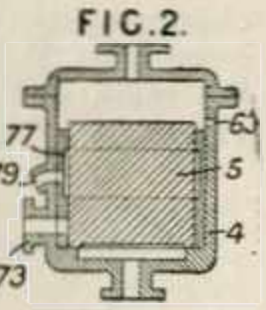
328,640. Still, C. Dec. 27, 1928.

Heating air.—Heat transfer to air to be heated is promoted by adding to it a small proportion (about 5 per cent at the maximum) of carbon dioxide, or carbon dioxide and steam, preferably in concentrated form. When the carbon dioxide &c. is added in diluted form the proportion of added gases should not exceed 10 per cent. The carbon dioxide may be obtained from the bye-product, recovery apparatus of coke oven or gas making plants.

328,872. Soc. L'Auxiliaire des Chemins de Fer et de l'Industrie. April 12, 1929, [*Convention date*]. *Addition to* 313,481.

Feedwater, heating.—In a direct contact steam feedwater heater the excess of hot water obtained is discharged, by an automatic valve, directly into the inflow of the cold water pump or into one end of the pump cylinder instead of into a receptacle connected to the pump inflow, as in the parent Specification. The cold water pump 24 discharges water into chamber 20 through the spring 23 where it is heated by direct contact with steam and then passes out in chamber 21. Excess hot water accumulates in tube 2 until its hydrostatic pressure raises valve 5 and the water escapes through orifice 73 into vessel

FIG. 2.



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70 from which pump 24 sucks. Pipe 3*a* connects the top of cylinder 4 to the steam space of chamber 21, thus causing a constant control pressure on valve 5, while a small orifice 63 allows any condensate above valve 5 which would interfere with working to escape without serious loss of steam. If water works up the side of valve 5 when the pressure in chamber 21 is low it enters the annular recess 77 and escapes through the outlet 79. The excess hot water may also pass directly into the end 89 of the pump cylinder through a passage 80 provided with a non-return valve 82. In that case cold water alone is supplied to the end 88 so that even if the end 89 fails owing to the high temperature of the water from chamber 4 chamber 20 is still supplied. Specifications 313,481 and 314,368 are referred to.

FIG.1.

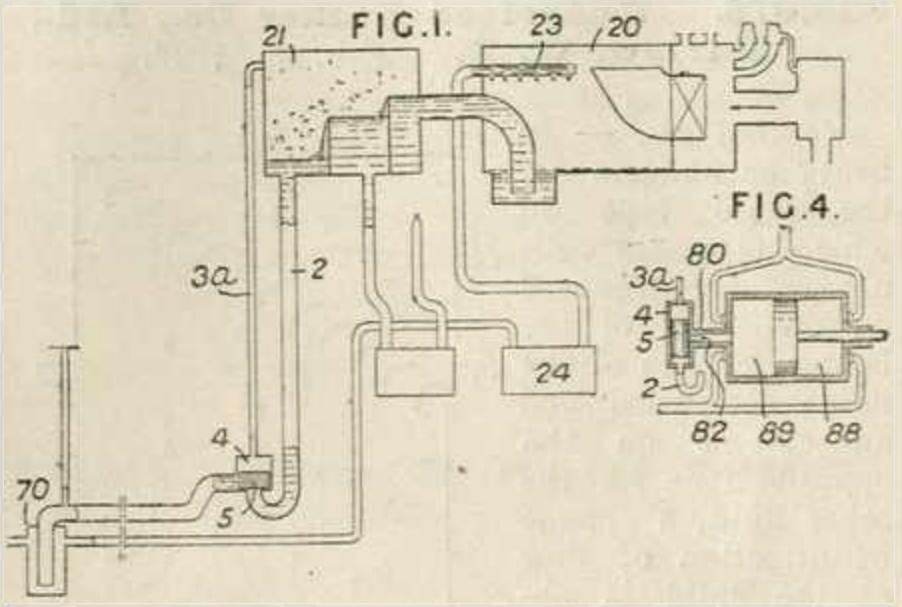
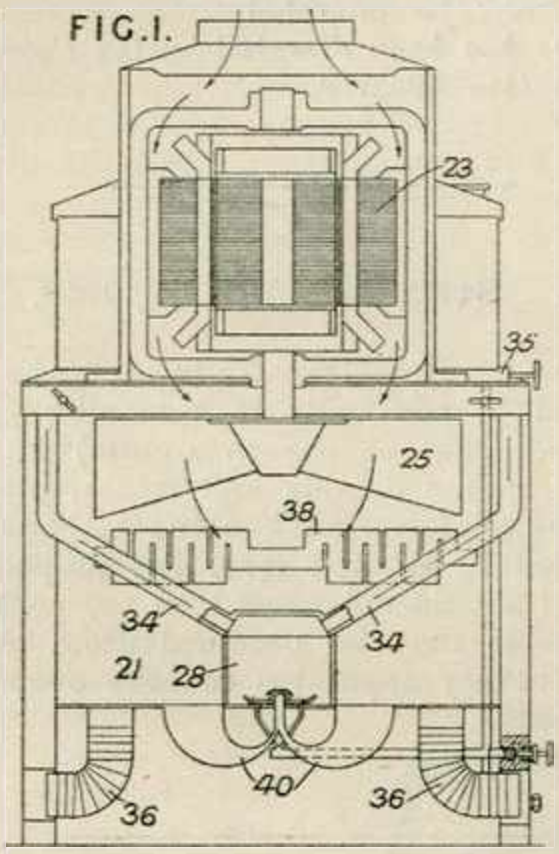


FIG.4.

328,994. Kuhn, M. Jan. 9, 1929. *Divided on* 327,731, [*Class* 20 (ii), Buildings and structures, Miscellaneous accessories &c.].

FIG.1.

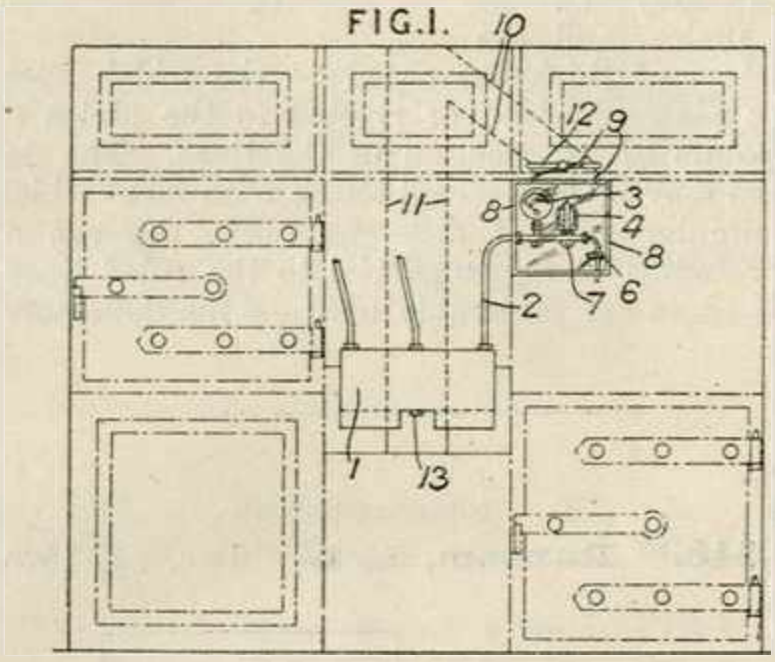


Heating air.—In apparatus for supplying hot air, a fan 25 forces air into a chamber 21 containing two heating means of different kinds, such as an oil burner 28 and an electrical heating element 38, the air escaping through pipes 36. The burner is supplied with warm air from chamber 21 through passages 40. The exhaust gases pass through tubes 34 and may then enter the main air current through draught-regulating valves 35. The incoming air cools the motor 23.

329,060. Slater, S. March 1, 1929.

Block or slab form boilers.—In domestic hot water supply systems, a fireback boiler 1 is fitted with an additional pipe 2 carrying a safety valve 4, a pressure gauge 3 and a water level testing tap 6. Lugs 7 on the pipe 2 support it in a casing 8 situated above the boiler and provided with a window or cut out for inspection of the pressure gauge 3. An outlet 9 with a damper 12 opens

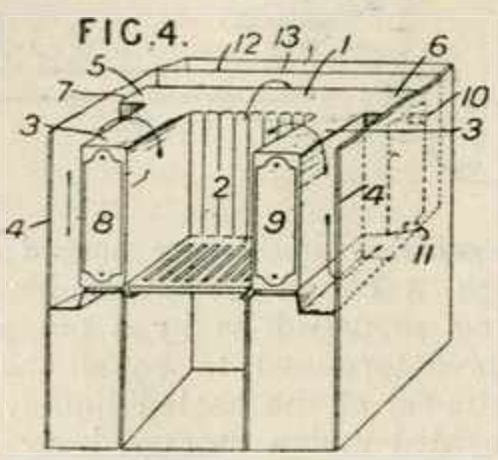
FIG.1.



from casing 8 through a flue 10 to the fireplace flue 11. A fusible plug or the like 13 may also be provided at the lowest safe water level of the boiler.

329,201. McDowall, Steven, & Co., Ltd., and **Cunningham, P.** June 19, 1929.

FIG.4.



Block or slab form boilers.—A boiler 1 provided with front extensions 3 and lateral extensions

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5 and 6 is surrounded by a case 4 so that gases from the grate 2 pass over the top and down the back of the boiler 1, and up over the inner surfaces and down over the outer surfaces of extensions 3, finally passing under extensions 5 and 6 to flue 13. A baffle 12 directs the gases down the back of the boiler. Doors 8 and 9 are provided in extensions 3 and in door extension 5. Circulation pipes 10 and 11 are attached to extensions 6. In a modification, extensions 5 and 6 are replaced by baffles.

329,210. C. A. **Berry, H. H.,** and **Painton,** June 25, 1929.

FIG.1.

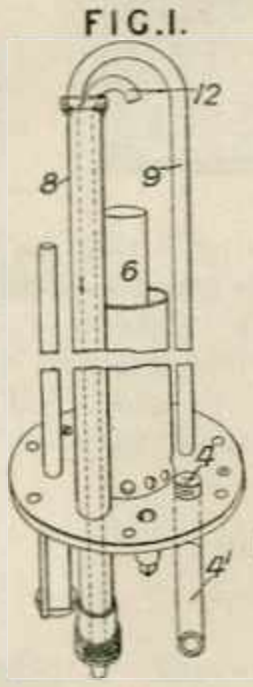
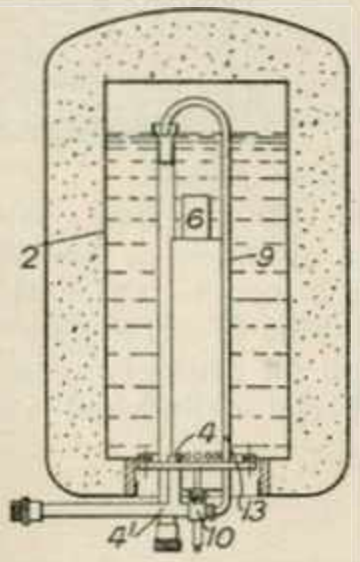


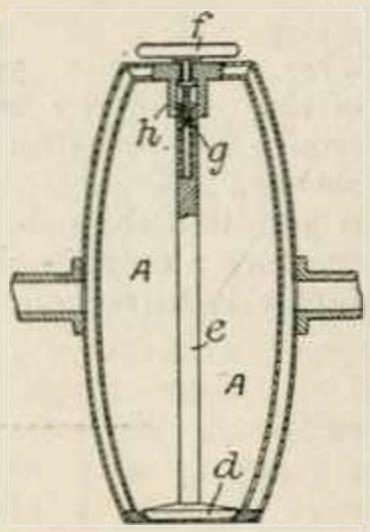
FIG.3.



Water supply and delivery.—In an electric water heater consisting of a heating element 6 in a tank 2, a bye-pass 9 with a cock 10 allows cold water from inlet pipe 4 to enter the outlet tube 8 and mix with hot water leaving the tank. To avoid dripping down pipe 8, the cock 10 may be left open and water siphoned out of the tank through the cold water inlet 4 and bye-pass 9 into the outlet 8 until the level in the tank is below the upper end of the tube 8. An aperture 13 may be provided in the bye-pass 9 to cause siphoning even when the cock 10 is closed or a separate siphon tube 12 may be placed in the tube 8.

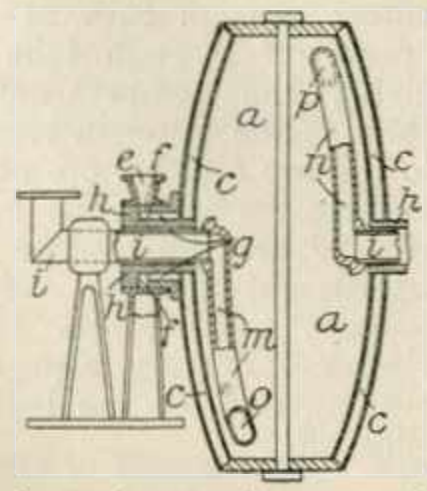
329,257. Siller & Rodenkirchen Ges., Dr. Ing. Dec. 4, 1928, [*Convention date*].

Digesters. — The discharge and supply opening of a rotary digester A is closed by a valve body *d* having a stem *e* carried through the interior of the vessel and guided in a boss *h* secured to a point diametrically opposite the opening, a screw spindle *g*, fitted with a handwheel *f*, being provided for operating the valve.



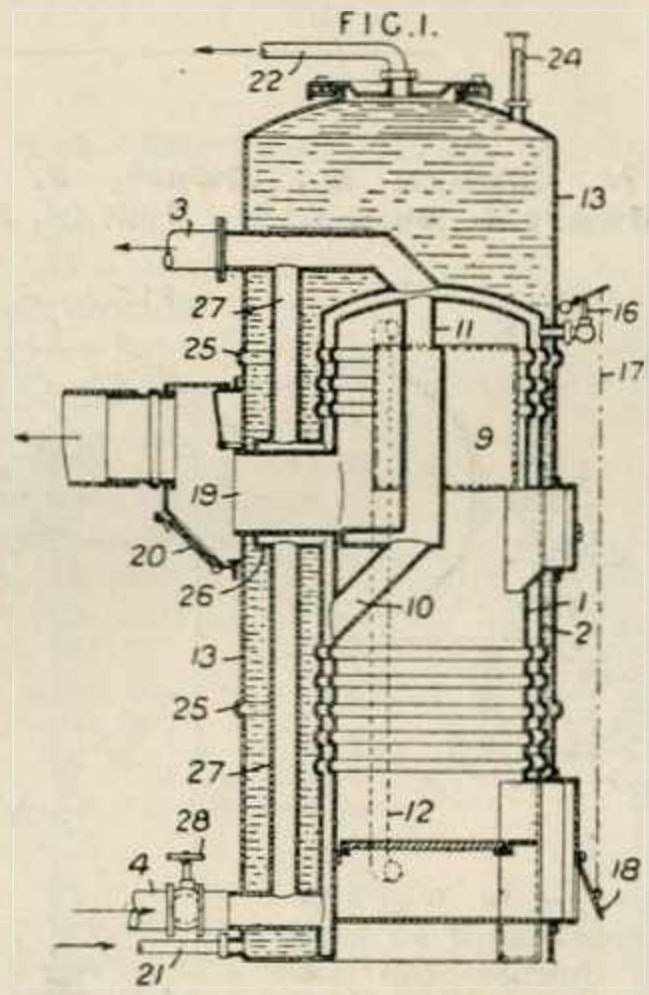
329,600. Siller & Rodenkirchen Ges., Dr. Ing., and **Siller, W.** Sept. 25, 1929.

Digesters. — In a digester for the extraction of glucose from wood, and consisting of a cylindrical vessel *a*, with a jacket *c* rotatably supported on trunnions *h*, acid is supplied by a tube *i* through one trunnion connected to a tube *m*, and discharged through a pipe *n* and a second tube *i* in the other trunnion, the openings *o* and *p* of the tubes *m* and *n* being turned in the direction or rotation of the vessel. The medium for the jacket is poured through a funnel *e* into grooves *f* in the trunnions *h* and thence through passages *g* in the jacket, the medium finally escaping by similar passages in the other trunnion.



329,882. Schenkl, A. July 1, 1929.

FIG.1.



Heating water.—An annular boiler 1, 2 forming part of a central heating system is entirely enclosed by a water receptacle 13 which provides a hot water supply. The boiler 1, 2 is fitted with a water pocket 9 connected by tubes 10 and 11 to increase the heating surface, and the flue gases pass out through a flue 19 enclosed by a jacket 26; a door 20 is provided to allow cleaning of the flue 19. The draught is regulated by a door 18 moved by a chain 17 from a regulator 16. Tubes 3 and 4 form the connections to the central

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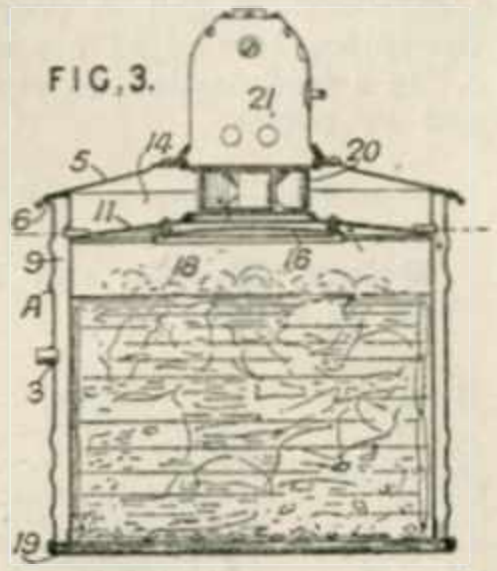
heating system and a valve 28 regulates the flow. A tube 27 allows of circulation in the boiler when valve 28 is closed. Cold water for receptacle 13 enters through tube 21 and the hot water is drawn off through tube 22, a thermometer 24 giving the temperature. Tubes 12 passing through the water in receptacle 13 and connected to the top and bottom of boiler 1, 2 increase the heating surface. The boiler is fluted, and two ribs 25 are provided in the receptacle to allow adjustment to stress and to increase the heating surface. Receptacle 13 may be fitted with electrical heating elements to serve as a heat accumulator for the boiler when the furnace is shut off.

330,358. Barker, P. E. April 22, 1929.

Washing-boilers.—A washing-boiler consists of an outer cylindrical vessel A and a removable concentric unit comprising a washing chamber 18, and a chamber 14 containing a suction fan 20 driven by a motor 21. The fan chamber is closed by a lid 5 overhanging the outer vessel and is separated from the washing chamber by a diaphragm 11 having a central opening protected by a baffle 16. The fan exhausts the air from chamber 18 and the washing liquor rises, forming a water seal 19 which is then constantly broken, air rushing in and agitating the liquid and articles to be washed. The annular chamber 9 is freely open to the atmosphere by constructing the cover 5 and border rim 6 to leave air

FIG. 3.



passages. An overflow opening 3 may be so disposed as to allow a predetermined quantity of washing liquor to enter the washing chamber. The machine is preferably portable and may be heated on an ordinary domestic stove. The surfaces of the cylindrical vessels may be corrugated.

330,417. Ewart, S., Ewart, J. W., and **Ewart & Son, Ltd.** June 24, 1929.

FIG. 8.

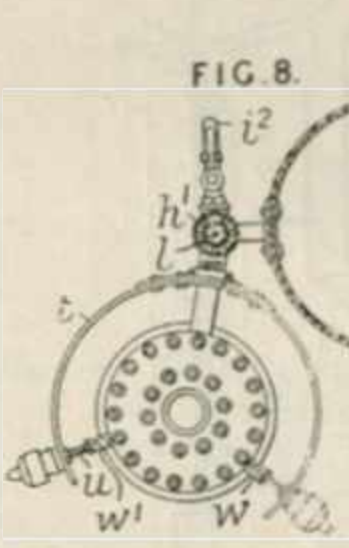
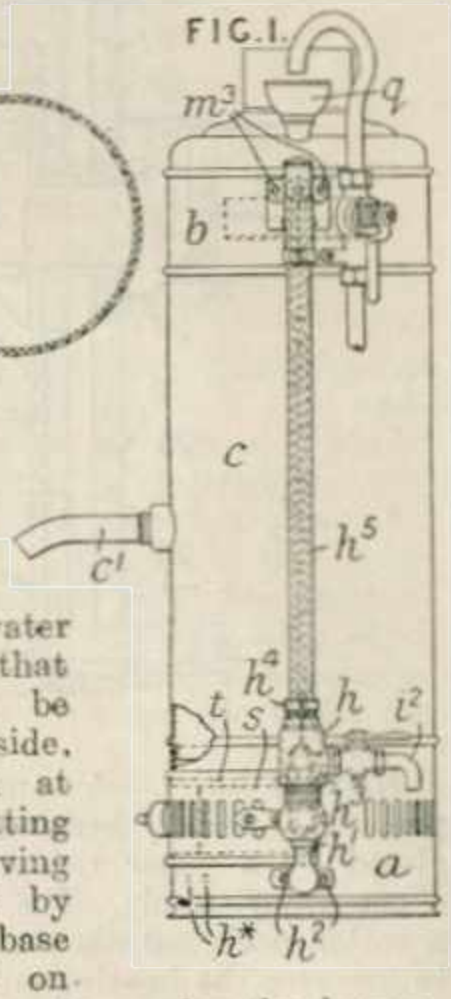


FIG. 1.



Geysers. — In a water heater constructed so that the gas burner can be swung out to either side, the burner is hinged at the point h^1 to a fitting attached to the revolving top b of the heater by screws m^3 and to the base a at points h^2 or h on opposite sides of the opening s for the burner. A door t attached to the burner can be held on either side by the screw u passing into either socket w or w^1. The middle part c of the heater is rotatable with respect to the other parts to bring the water delivery spout c^1 to any required position. The direction of the gas supply pipe i^2 may be varied by loosening the screws h^4 and s that hold the part h^3 of the fitting in position. The water enters through a tube o and funnel q and weighs down the vessel n^2 mounted on a

FIG. 3.

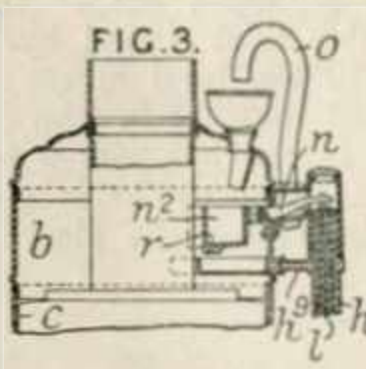
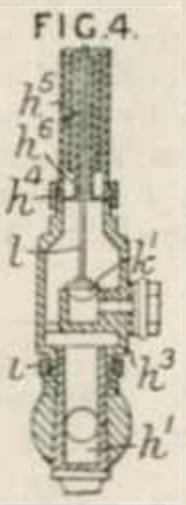


FIG. 4.



lever n and thus operates a gas supply valve k^1 in the part h^3 by means of a rod l to which is attached a bell dipping in a water seal formed between the concentric tubes h^5 and h^6; water is admitted through the branch h^9. A discharge aperture r empties the vessel n^2 when the water supply is turned off.

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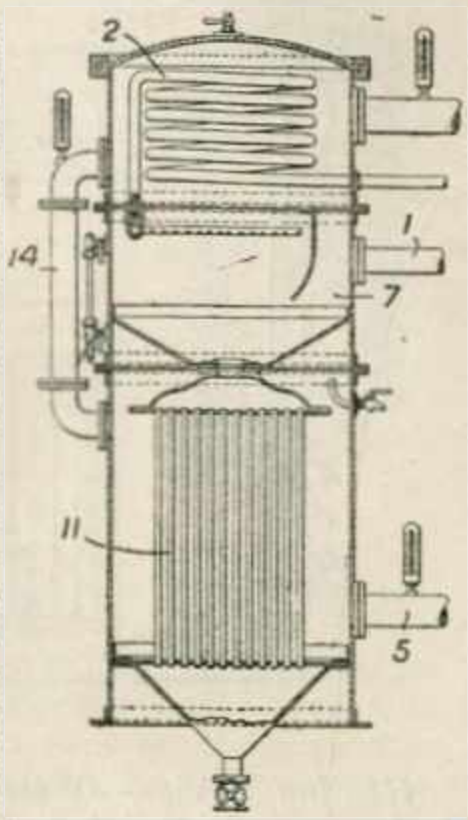
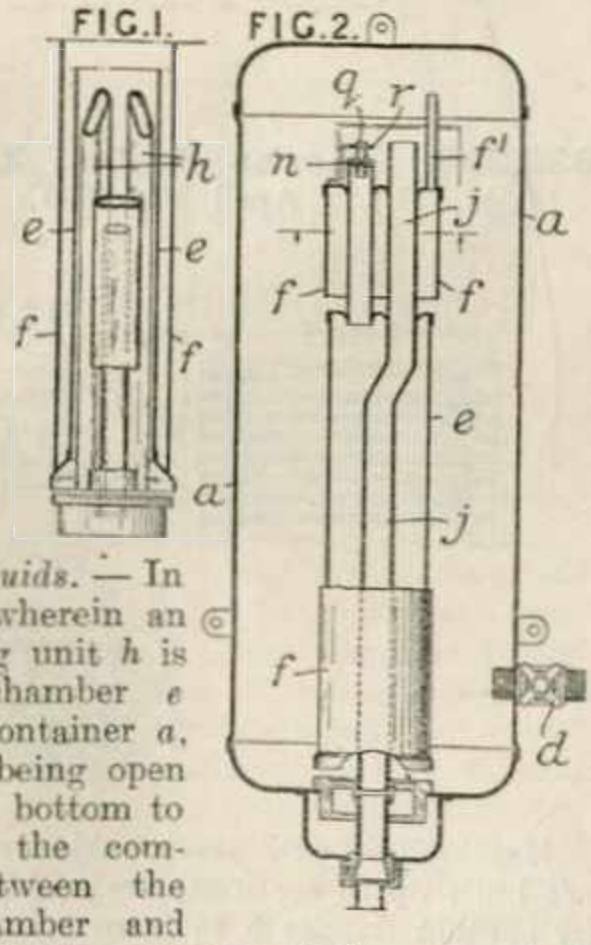
331,140. United Water Softeners, Ltd., and **Marigny, H. G.** Sept. 11, 1929.



Feedwater, heating.—In apparatus for utilizing the heat of boiler blow down water for heating feedwater, blow-down is led through a pipe 1 into an expansion chamber 7, from which the water and the steam separated therefrom pass respectively through heat exchangers 2, 11, which together with the expansion chamber are enclosed by a single casing. The feedwater enters the casing through a pipe 5 and first passes around the exchanger 11, it then flows through a pipe 14 and around the exchanger 2.

331,383. British Brass Fittings, Ltd., Conly, W. P., and **Dunn, W. L.** June 26, 1929.

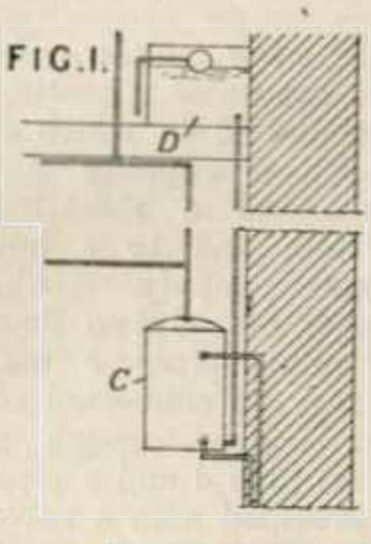


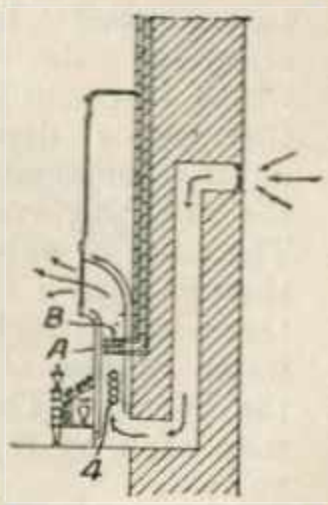
Heating liquids.—In an apparatus wherein an electric heating unit *h* is located in a chamber *e* in a liquid container *a*, the chamber being open at the top and bottom to the container, the communication between the top of the chamber and the contents of the container is by way of an outlet *q* of small bore at the normal surface level and an opening of greater bore arranged at a lower level and normally closed by a lightly loaded valve *n*. The valve may comprise a washer mounted on the tube *q* engaged by a guide *r*. Hot water is discharged through the outlet pipe *j* when the inlet valve *d* is opened. The chamber *e* is surrounded by an air jacket *f* having a vent f^1. The outlet pipe *j* may be external to the chamber *e* or may pass through the air jacket. The pipe *q* may be separate from the valve *n*. A baffle may be fitted around the valve and the upper end of the outlet tube.

331,838. Imperial Chemical Industries, Ltd., and **Bramwell, F. H.** Jan. 9, 1929.

Digesters.—In a vessel for effecting chemical reactions, and in which the inner wall is protected from corrosion by a rubber lining, separation of the lining is prevented by forming the vessel with a double wall, the inner wall of which is perforated and has the lining affixed to its inner surface; the space between the walls is connected to a source of pressure lower than that existing within the apparatus.

331,944. Burnside, G. B. April 19, 1929.





Heating water.—A boiler B is arranged in a vertical duct A in which air for ventilation is heated by an electric heater 4. The air heating and ventilating arrangement is similar to that described in Specification 324,777, [*Class* 137, Ventilation]. The boiler may be a sinuous tube connected to a circulating tank C fed from a cistern D. The heater may be controlled by a thermostat. A boiler with one or more vertical flue tubes and an annular boiler surrounding the air duct and having transverse water tubes passing therethrough are described. Specification 330,334, [*Class* 137, Ventilation], also is referred to.

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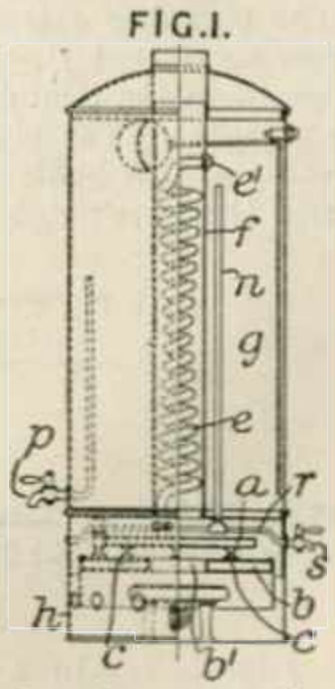
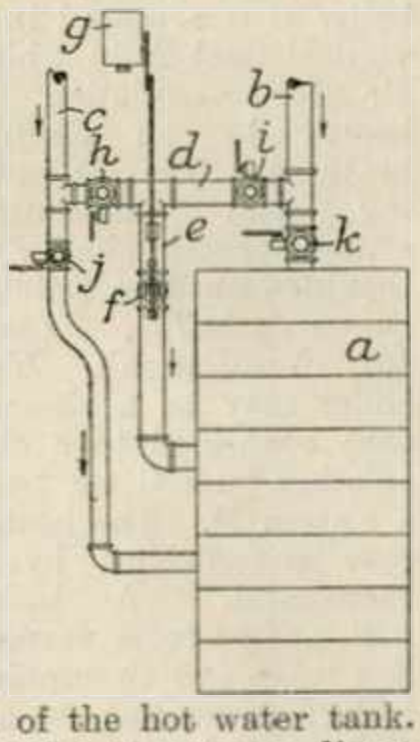
332,068. Duff, W. A. July 25, 1929.

FIG.1.



Internally-fired boilers; water supply and delivery.—In a water heater consisting of a vertical coil or pipe *e* within a flue *f* surrounded by an annular water-jacket *g* and connected at its lower end to a shallow pan disposed over a burner, the upper end of the coil being connected to the water jacket at the point e^1 and the lower portion of the water jacket being connected to the pan, two independent draw-off outlets *p* and *s* are provided; the outlets *s* draws water from the rapidly heated region near the end e^1 of the coil through the pipe *n*, and the outlet *p* draws water from the middle or bottom of the jacket. The pan arrangement may consist of a number of pans arranged one above the other (two *a* and *b* are shown) and provided with communicating passages *c*, the bottom pan having a central orifice b^1 for the flame from the burner.

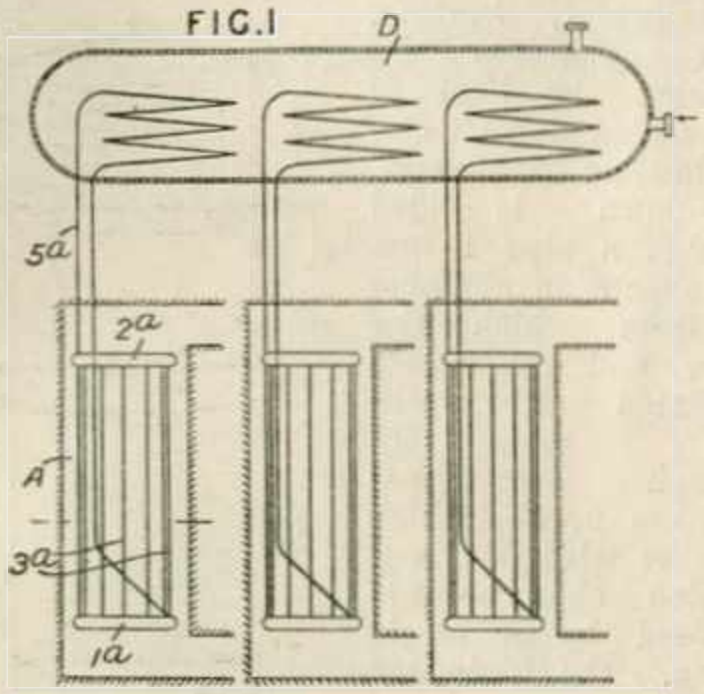
332,110. Hope's Heating & Lighting, Ltd., and **Bassett, C. T.** Aug. 23, 1929.



Heating water.—In a hot-water heating installation in which a boiler *a* supplies hot water to a radiating system and to a hot water supply tank, either of the two flow or return pipes *c* and *b* may be connected to the boiler through a cross pipe *d* and a pipe *e* provided with a valve *f* controlled by an electrical device *g*, which is controlled by thermostats dependent on the temperature of the radiating system and of the hot water tank. The pairs of valves *h*, *j* and *i*, *k* serve to divert through pipe *e* the water of the system with the thermostat which is controlling the valve *f*, the water of the other system passing straight to the boiler. The pairs of valves *i*, *k* and *h*, *j* may each be replaced by a single multi-way valve.

332,274. Superheater Co., Ltd., (*Compagnie des Surchauffeurs*). April 16, 1929.

FIG.1



Heating liquids.—Water or other liquid in a boiler D is heated indirectly by waste gases of varying temperature flowing in flues A leading from, say, the Cowper heaters of a blast furnace, the heat being transferred by the circulation of fluid in a number of independent tubular apparatuses 5^a. The heated part of each heat transfer apparatus consists of upper and lower circular headers 2^a, 1^a connected by tubes 3^a. Specification 287,166, [*Class* 123 (ii), Steam generators], is referred to.

332,280. Kochs & Co., Ltd., W. E., (*Föge, H.*). April 17, 1929.

FIG 5

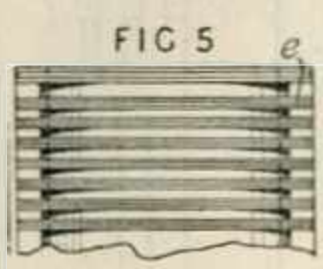


FIG 1

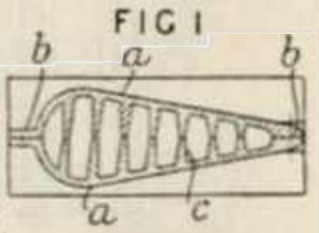
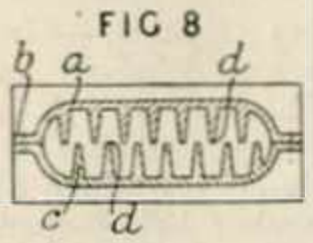


FIG 8



Heating air and gases.—Air or gas heaters *a* are built up in sections, preferably halves united by contact flanges *b* to form tubes, in which internal ribs *c* are provided extending to the medial plane of the pipe. External ribs *e* lie at right angles to the internal ribs *c*. In Fig. 8 the free edges *d* of the ribs are displaced with regard to those of other halves. The tubes may be pear-shaped or parallel sided in cross-section.

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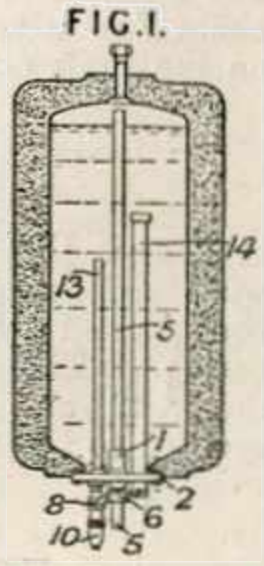
332,401. Haussauer, L. P. July 16, 1929.

FIG. 1.



Water supply and delivery.—In an electric water heater of the kind in which cold water is admitted through an inlet cock near the bottom and discharges hot water through a hot water outlet pipe extending upwardly through the base of the heating chamber to a point near the top, the end of the outlet pipe in the heater can be raised above or lowered beneath the normal water level to avoid dripping down the pipe owing to the expansion when heated of the water just admitted. The outlet pipe 5 fits in a sleeve 1 working in a stuffing-box and the cold water inlet cock 8 besides its normal lever handle 10 has a second handle working in a recess in the ring 6 attached to the pipe 5 so that when the cock 8 is shut off the pipe 5 is raised. The heating element 14 and a thermostatic attachment 13 are mounted on the same base plate 2 as the water connections.

332,575. Thompson, E. H. April 23, 1929.

FIG. 1.

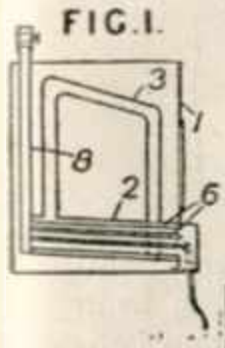
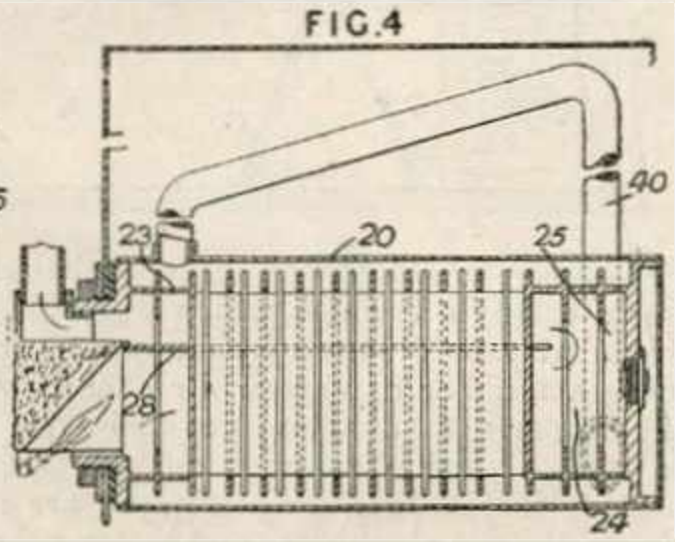
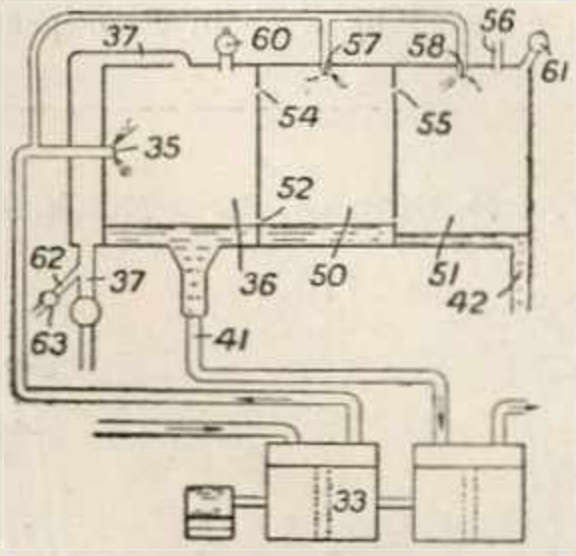


FIG. 4.



Heating water.—A water heater has an auxiliary tubular chamber 2 spaced from the walls and base of the main tank 1, and provided with one or more flue tubes 6. The tubular chamber communicates with the tank by a small hole at the top of a circulation pipe line 3 running from the upper wall of the chamber to the lower wall of said chamber. The flue gases pass to flue pipe 8 which extends through the liquid in the tank. In a modification, the tubular heater 20, Fig. 4, has the combustion chamber and flue pipe at the same end and forward and rearward terminal chambers 23, 24 communicating by segmental flue passages 25. Horizontal partitions 28 guide the gases in the direction of the arrows. A central water passage extends vertically between the flue passages. The tank water is heated by conduction through the wall 20 and also by the circulation pipe 40. Specification 281,430 is referred to.

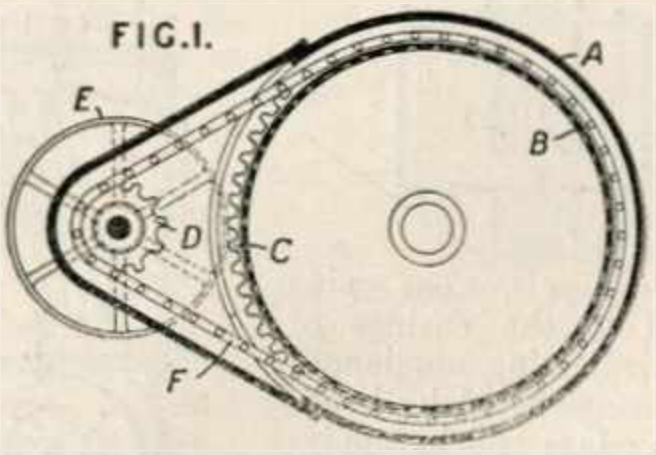
332,885. Soc. Française des Pompes et Machines Worthington. Feb. 22, 1929, [*Convention date*].



Feedwater, heating.—A feedwater heater consists of a main direct contact steam heater 36, with cold water inlet 35, steam inlet 37, and warm water outlet 41, combined with two or more auxiliary heaters 50 and 51, the first of which receives excess water and non-condensed steam from heater 36 through aperture 52, and the second communicates with the first and so on. Excess water from the final heater is returned through a duct 42 to the suction side of the cold water pump 33 the auxiliary heaters having cold water inlets 57 and 58 to progressively condense the excess steam. Gas vents to the atmosphere may be provided for every heater, or apertures 54 and 55 may connect the upper parts of the heaters, the last heater being open to the atmosphere through vent 56. The principal heater and the last auxiliary heater may be provided with safety valves 60 and 61 and other auxiliary heaters may be so equipped. When steam from an auxiliary engine is used in the heater it may be admitted direct to an auxiliary heater in which the pressure will be less than in the principal heater. If the auxiliary engine exhaust be admitted through pipe 62 direct to the principal heater, a check valve 63 is provided to shut off connection when too great a back pressure exists in the heater.

333,059. Krüger, H. Jan. 2, 1929, [*Convention date*].

FIG. 1.



Digesters.—Apparatus for use in the decomposition of animal carcases &c. by steam under

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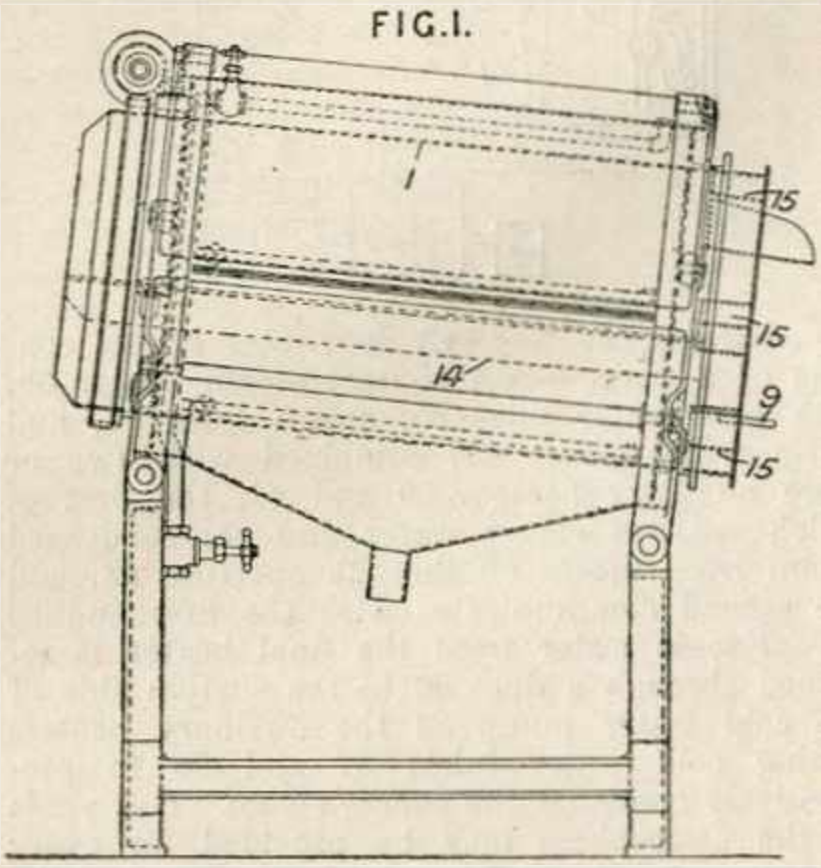
pressure consists of a vapour tight vessel A having a rotary screening drum B disposed therein. The drum is provided with direct driving means consisting of a ring of teeth C on the drum engaged by a chain F or gear wheel drive mounted within vessel A or an extension thereof. A cylindrical rotary screening drum C and a horizontal extractor are provided, and the chain F is driven by a sprocket wheel D mounted on the shaft of a driven pulley.

333,157. Seligman, R. March 28, 1929.

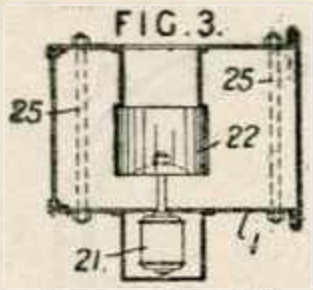
FIG.I.



Heating liquids.—In an inclined rotary cylinder 1 for heating jams or other viscous liquids by an external spray of heating liquid, scrapers 14 for controlling the height of the material in the cylinder extend for part of the length of the cylinder. The cylinder is peripherally mounted in members one or both of which is or are pivoted to the framework. A series of buckets &c. 15 are arranged adjacent the delivery end of the cylinder to raise the fluid and drop it on to a delivery shoot. External scrapers 9 deflect the heating liquid.

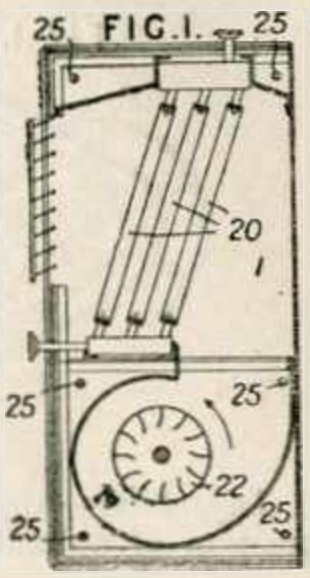
333,326. Stark, E., and **Stark, G.,** (*trading as* Netzschkauer Maschinenfabrik F. Stark & Söhne). Nov. 13, 1928, [*Convention date*].

FIG.3.



Heating air.—The side walls 1 of the casings of wall air-heating appliances are so constructed by bending the edges and by applying strips in the form of bars or angle irons or by pressing in guiding grooves

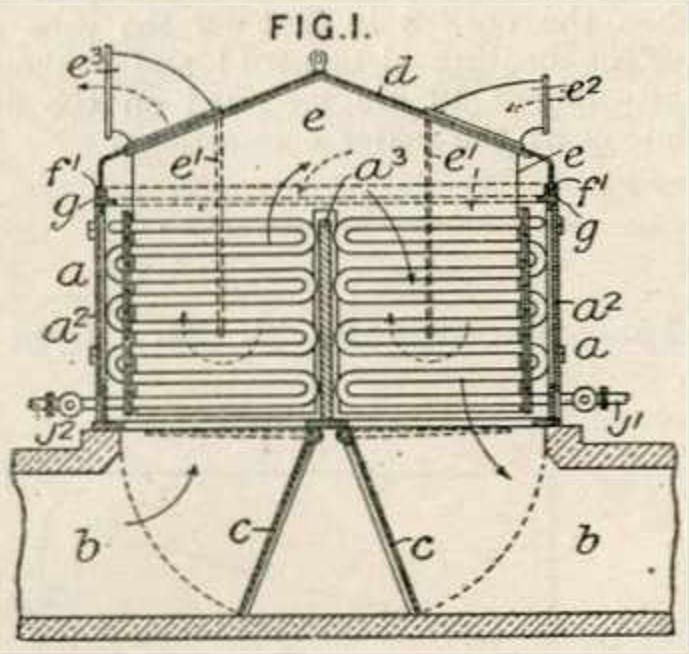
FIG.1.



or flanges that they can be united to the other walls and thereby fitted together. The walls are then united by screw bolts 25 to form a rigid casing. The supports for the blower 22, the motor 21 and the heating battery 20 may be secured to the side walls in advance e.g. by spot welding.

333,397. Woodroffe, F. K. Aug. 14, 1929.

FIG.I.



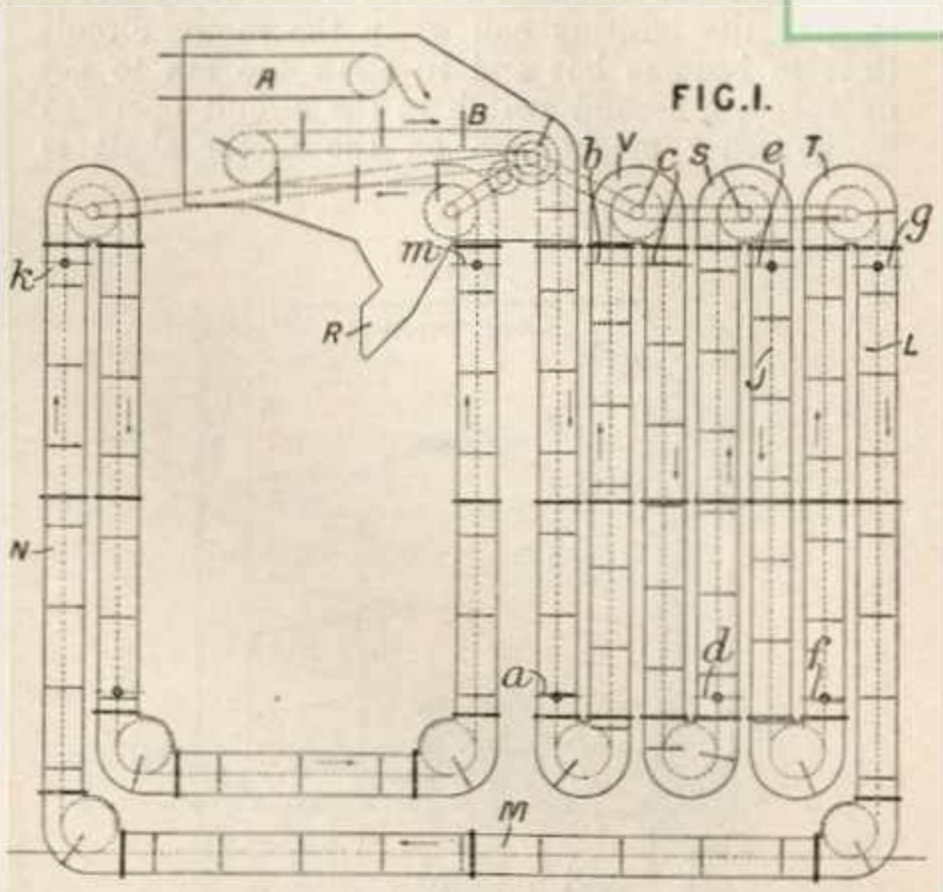
Feedwater, heating.—A heat exchanger comprises a casing *a* through which waste gases from a flue *b* may be diverted by dampers *c*, and containing a number of narrow air chambers *e* with plain or corrugated sides provided with a common inlet e^2 and a common outlet e^3 leading to a heating installation. Water pipes are arranged between the air chambers, and water passes from an inlet j^1 to an outlet j^2 and the heating installation. The side walls of the casing are composed of metal or refractory material, and the end walls a^2 are hinged doors which will yield at a predetermined pressure. A metal roof *d* is removably mounted on the casing, its edge resting in a groove f^1 provided with refractory packing *g* such as sand. The air chambers are provided with baffles e^1, and the casing is provided with a baffle a^3 to direct the course of the waste gases.

333,426. Holmes, J., and **Kingcome, H. A.** Sept. 20, 1929.

Digesters.—In the digestion of fibrous vegetable matter for the extraction of cellulose, the material is fed by a conveyer A to a mechanical

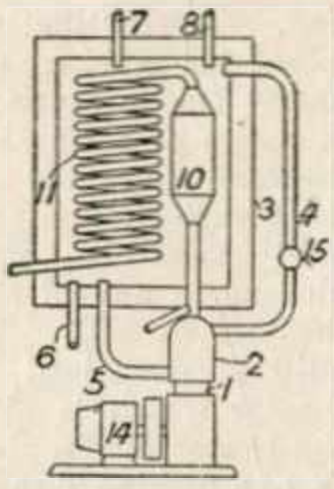
conveyer B which passes it through the apparatus as indicated by the arrows. The material first passes through boiling water zones *a*, *b* and *c*, *d* a vacuum head V being maintained corresponding to these two columns. A column of treatment liquor *e*, *f* is maintained in the vertical member J. The vapour pressure in the head S added to the pressure of the column *e*, *f* gives a higher pressure in the vapour head T, the vapour of which extends from *f* to *g*. Liquor is maintained in the vertical members L, N between the levels *g*, *k*, the desired maximum digestion pressure being thus obtained in the horizontal member M. Heating of the member M is effected by a steam jacket. The condensate may be used to heat the vertical members for the water treatment to further extract heat, the final condensate being admitted at *m* as wash-water. The discharged material passes out of the apparatus at R. A simpler apparatus omitting the vacuum treatment may be used for esparto grass. Pumps connected by pipes at suitable points in the apparatus may be used to circulate the cooking liquors and wash water and to agitate the material.

FIG. 1.



333,527. Heath, H. D. May 13, 1929.

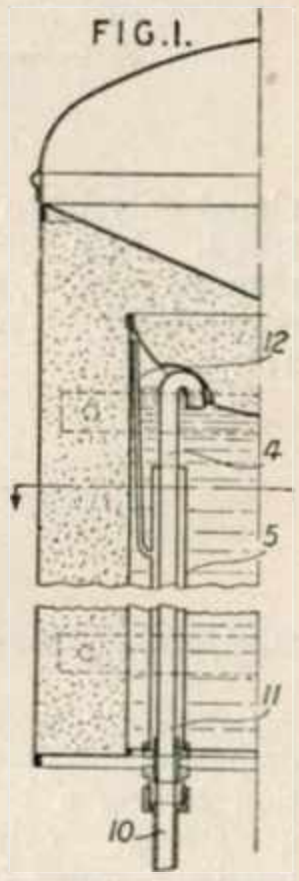
Heating water. — The water jacket 2 of an internal-combustion engine 1 is connected through pipes 4 and 5 with a tank 3 provided with a cold water inlet 6, hot water outlet 7, expansion pipe 8, and a chamber 10 connected with coil 11 through which the exhaust gases from the motor are discharged. A thermostatic regulator 15 in tube 4 may restrict the circulation when starting from cold in order to provide a small quantity of very hot water at the top of the tank. The motor 1 may drive a dynamo 14, part of the current from which may be used in electrical heating means in tank 3.



333,869. Foy, F. Feb. 19, 1929.

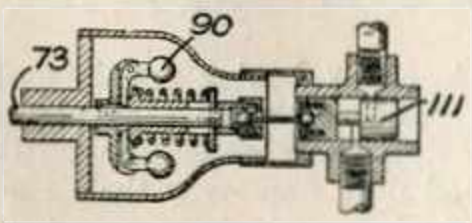
Water supply and delivery. —In an electrical apparatus for heating water, dye liquors, or other liquids the greater portion of the siphon discharge tube 4 is surrounded by an air jacket 5 to prevent cooling of the liquid during discharge. A tube 12 fitted to the jacket allows any steam generated in the heater to pass to the outlet pipe 10 by way of the jacket and an aperture 11 in the siphon discharge tube.

FIG. 1.



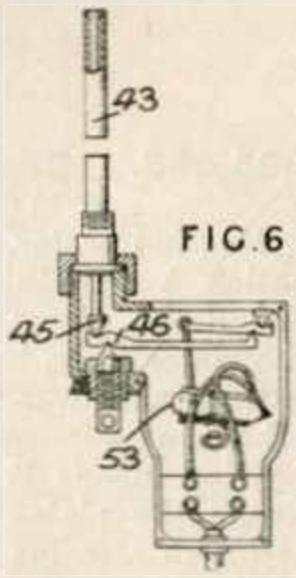
333,891. Wilson, L. A. May 17, 1929.

FIG. 5.



Internally-fired boilers.—A water or other liquid heater 16 contains a helical flue 11 through which the products of combustion from a burner

FIG. 6



14 are drawn in a downward direction by a fan 26, the operation of which and the operation of the fuel supply valve are controlled by a thermostat 43 in the heater. When water is withdrawn from the top of the heater through pipe 24 and cold water admitted through pipe 23, the outer tube of the thermostat contracts and pushes an inner bar 45, Fig. 6, against a lever 46, which, acting through further levers, tilts a mercury switch 53 completing the circuit through a motor 71 operating the fan, and through a solenoid 31 operating the fuel-supply valve of the burner 14, which has adjustable openings 35 for the admission of air, and a flared deflector 38 for the combustion gases.

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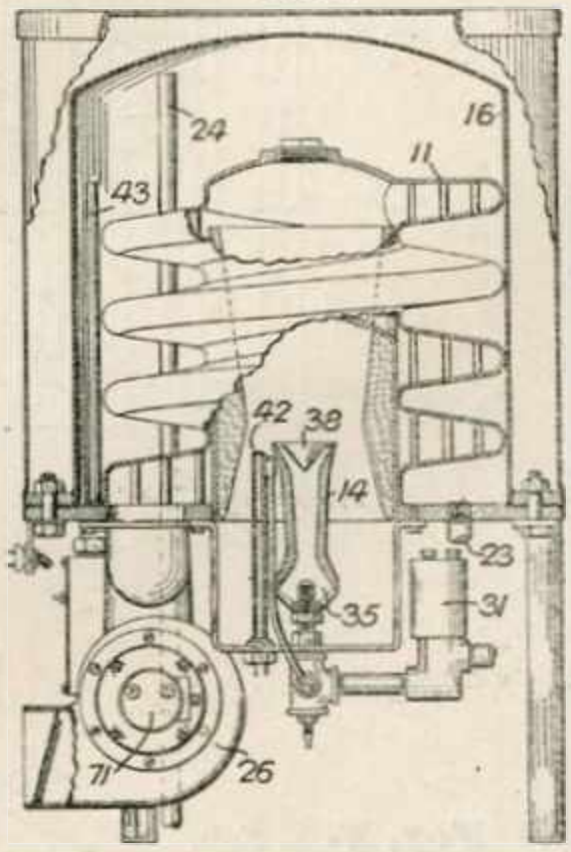
To retard the opening of the fuel-supply valve to give the igniting coil 42 in the motor circuit time to become hot and to allow the fan to get up speed, a second switch in the circuit operated by governor mechanism on the motor shaft is

FIG. 1.

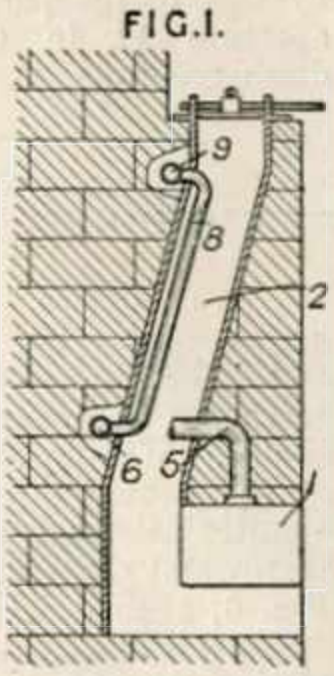


closed only when the motor is running at a high speed. In a modification, the governor mechanism 90, Fig. 5, on the motor shaft 73 is directly connected by a rod to a sliding fuel-supply valve 111.

334,039. Brownbill, E. Aug. 9, 1929.

Composite boilers.—In a domestic hot-water installation having a boiler 1 and a storage cylinder, an auxiliary water heater consisting of a number of upwardly extending tubes 8 is located in the flue 2 above the boiler. The up flow pipe 5 from the boiler enters a header 6 at the lower ends of the tubes while the upper header 9 is connected to the storage cylinder. The return from the storage cylinder passes direct to the boiler. The headers may be located within the walls of the flues and if the tubes are arranged on two or more walls bent headers may be used. The tubes may be curved or wavy and provided with fins. Specification 28246/07 is referred to.

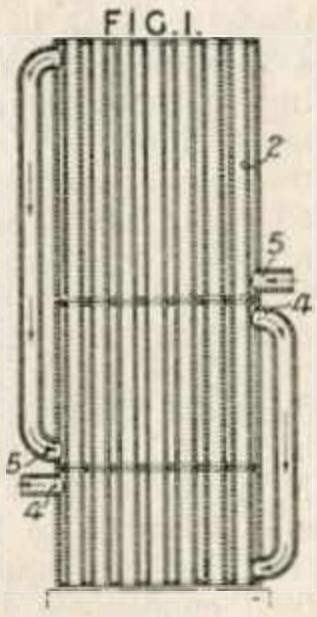
FIG. 1.



334,117. Yamada, A. Oct. 28, 1929.

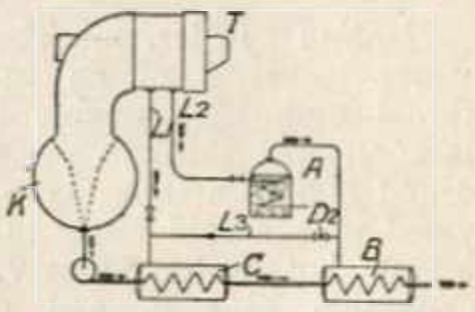
Feedwater, heating.—Water heaters are composed of a set of two or more superimposed heaters, preferably of increasing height, the fire tubes 2 of which register, and each is provided with a water outlet 4 in its upper part connected to a water inlet 5 in the lower part of the adjacent heater. In a modification, the fire tubes are provided at both ends and at intermediate positions with hexagonal or tetragonal flanges, and a set of heaters formed by soldering the tubes together at the flanges and disposing the bundle within a hexagonal or tetragonal casing.

FIG. 1.



334,141. Akt.-Ges. Brown, Boveri, et Cie. Dec. 5, 1928, [*Convention date*].

Feedwater, heating. — Distillation plant for making up boiler feed comprises a series of feedwater heaters connected so that vapour from the still may be condensed in any of the heaters at will. To increase the output of the still at peak load, the vapour is passed into a heater which is at a lower temperature. The feedwater is circulated from the main condenser K of a turbine T through heaters C, B. Normally, the heater C is heated by steam drawn from the turbine at L1, and the vapour from the evaporator A is condensed in the second heater B. At peak load, a connection L3 is opened by a cock D2 and the pipe L1 is shut off. The vapour then passes to both heaters, and the output of the evaporator is increased without raising the final temperature of the feedwater.



335,066. Cross, C. D. Sept. 26, 1929.

Heating water.—A water heater consists of a casing A containing series of corrugated plates *c* and *d* the plates having their ends free so that the water to be heated may flow over their corrugations and over their free ends from one to the other in succession. The hot gases from the heating means B pass upwards in the space between the plates and pass between the whole series of streams of water passing over the ends of the plates from their corrugations. As shown

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in Fig. 4, a single series of plates is interspaced with a double series or two or more series of plates may be interspaced with each other. The plates may also be in spiral formation as shown in Fig. 6. The water enters by a pipe P^1 and

FIG. 1.

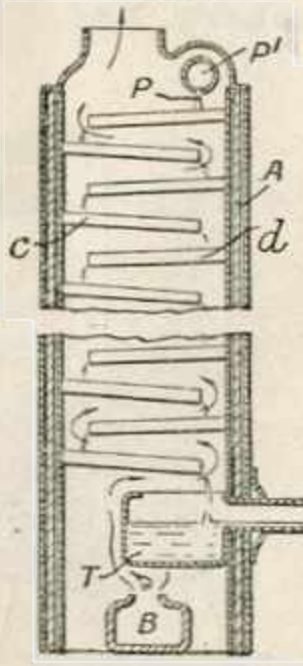


FIG. 4.

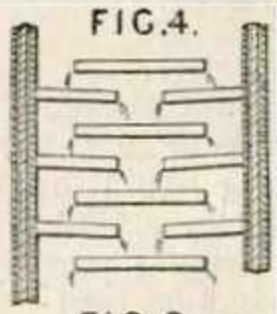
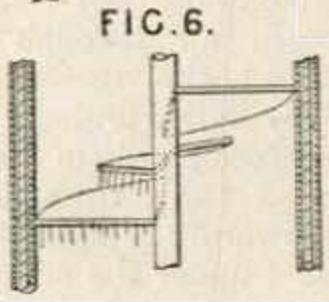


FIG. 6.

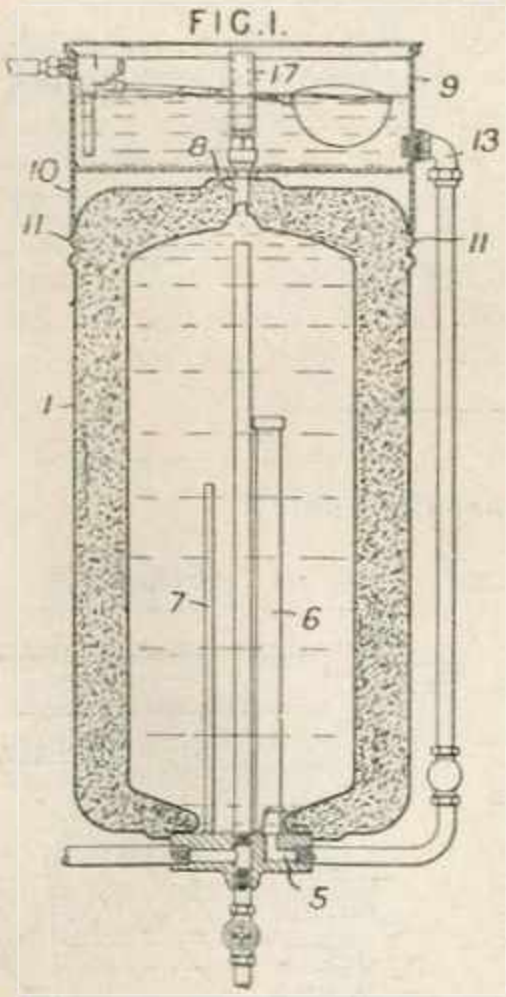


escapes from perforations P in it and finally falls into a trough T from which it is conducted out of the container.

Reference has been directed by the Comptroller to Specification 13017/87.

335,323. Haussauer, L. P. Aug. 2, 1929.

FIG. 1.



Heating water.—An electric water-heater has a coldwater feed tank detachably secured to the top thereof and communicating with the heater by a coldwater feed pipe passing outside the heater and opening into the bottom thereof, and an air vent opening into the coldwater tank and shielded from the water therein. The heater consists of a lagged storage-tank 1 containing an electric heating element 6 and thermostat 7. The feed tank 9 is formed with a downwardly-projecting rim 10 standing on a ledge 11 on the tank 1. The coldwater pipe 13 passes from the tank 9 to a bottom fitting 5 on the tank 1. The air vent 8 passes into the tank 1 and is provided with a light hood 17 which lifts to permit the passage of air but retains an insulating-layer of air between the pipe 8 and the water in the tank 1. Alternatively, the pipe 8 may pass through a concentric pipe fixed to the bottom of the tank 1.

335,364. Starkie, H. Nov. 13, 1928, [*Convention date*].

FIG. 5.

FIG. 4.

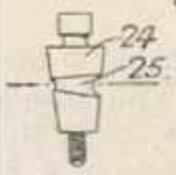
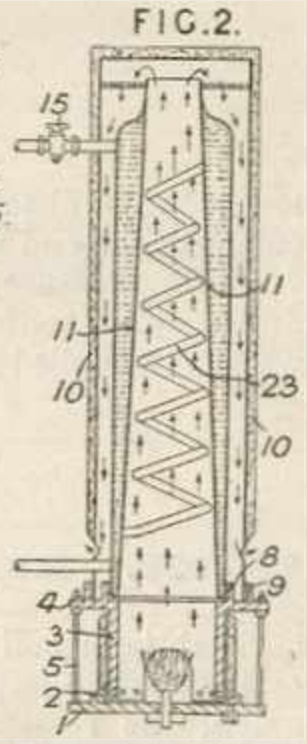


FIG. 2.



Vertical boilers.—In a gas-fired water heater comprising an enclosure for a thin film of water surrounding a tapering vertical flue 11 which communicates with an annular chamber between the boiler and the outer casing 10, the boiler and the outer casing are carried by a metal base frame comprising a lower plate 1 in which the burner is positioned and a surmounting annular wall 3 formed at the top with an outwardly projecting flange 4 connected by distance bolts 5 with the lower plate. The flange 4 is formed with two upwardly projecting rings 8, 9 the latter of which is a split ring to enable each when closed with a clamping bolt to grip the water container and the outer casing respectively. A helically shaped pipe coil 23 may be disposed within the flue 11 connected to the water container at top and bottom. The flow of water is regulated by a valve 15 which is of the plug type 24, Figs. 4 and 5, having a groove 25 extending only a part of the way round its periphery and of a width and depth increasing from nothing at one end to its maximum at the other.

335,442. Duncan, W. O., (*Aldawade Electrical Appliances Proprietary, Ltd.*). Nov. 18, 1929.

Heating water.—In a water-heater having a heating chamber 5 and a storage tank 6 insulated

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in a common casing 4 and having circulation connections between the chambers including a pipe 7 connected to chamber 5 and projecting into tank 6, the pipe 7 is provided with means for restricting the passage of steam from the chamber 5. The pipe 7 has only a small opening at its

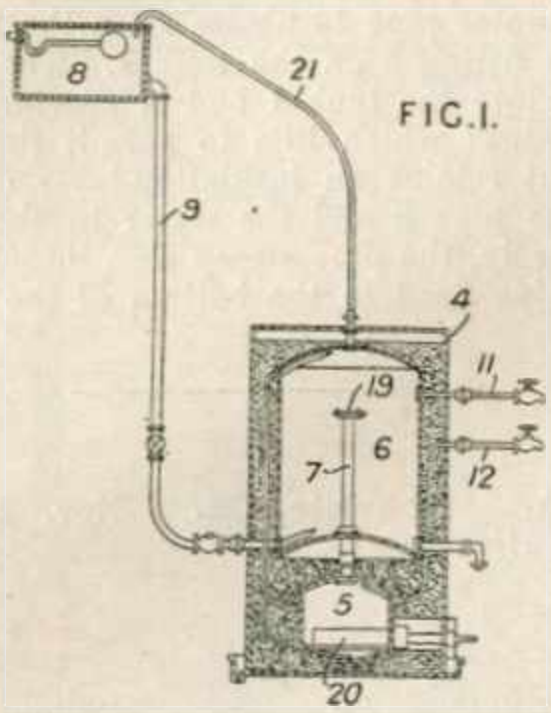
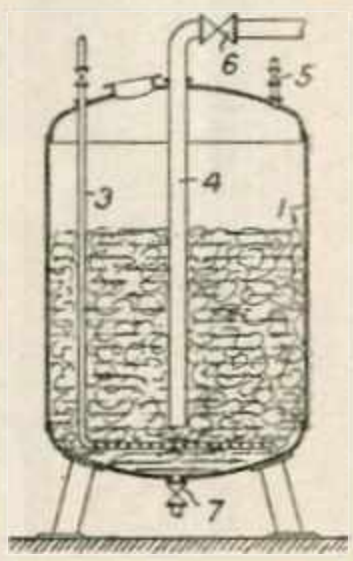


FIG. 1.

lower end in chamber 5 and a metal plate 19 rests on its upper end and lifts when the steam in pipe 7 exerts pressure. Boiling water can be withdrawn from container 6 through tap 11. Cold water is supplied from a cistern 8 through a pipe 9, and an expansion pipe 21 returns to the cistern. The heating may be electrical and a heating element 20 is shown.

335,457. British Bemberg, Ltd. Dec. 15, 1928, [*Convention date*].



Digesters. — Cotton fibres are cleared out of a digester 1 after the treating liquid has been run off by agitating them with fresh liquid by the introduction of compressed air through pipe 3 until the material is evenly distributed and then forcing them out of the vessel through a downwardly extending pipe 4 under the action of the compressed air which collects in the vessel. At the commencement of the agitation, cock 5 is open to allow compressed air to escape. When the material is to be forced out, cock 5 is closed and cock 6 is opened. The cock 7 serves for draining and, if a sieve be placed in front of it, can be used for withdrawing the treating liquid by suction.

336,089. Russell, E. Oct. 3, 1929.

Block-form boilers.—The bottom *e* of the boiler or the surface impinged on by the flames is corrugated, the recesses *c* of the corrugations being inclined upwards and away from the point where the flames first impinge and the ridges of the corrugations being provided wtih inclined ribs *d*. Condensed moisture runs along these ribs and is thus caused to drop clear of the burner *b*.

FIG. 1.

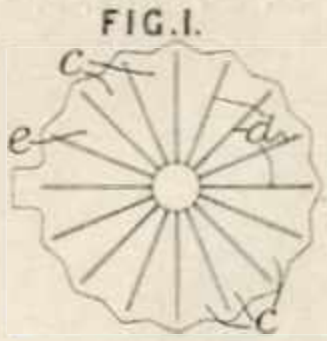
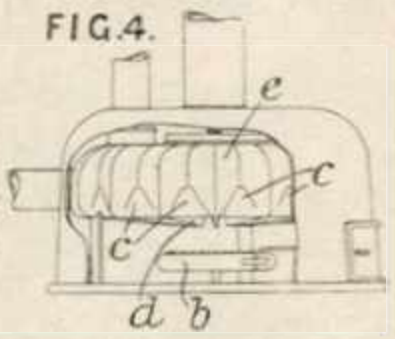


FIG. 4.



336,095. Mather & Platt, Ltd. Oct. 9, 1928, [*Convention date*].

Heating air.—An air heater of the type in which air is blown over steam tubes comprises a single two-chambered header, for steam entrance to the tubes and for condensate collection respectively, the condensate passing to a discharge chamber by means of further cooling tubes. Steam enters the inlet chamber 28 and passes directly to the condensing tubes 14 which are **U**-shaped and extend from the chamber 28 to an intermediate chamber 30, the condensate formed collecting in this chamber. The vertical partition wall 32 between

FIG. 1.

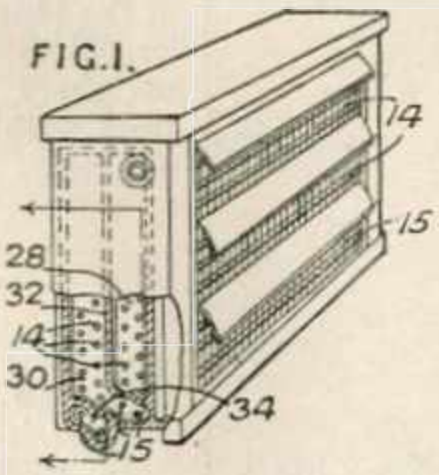
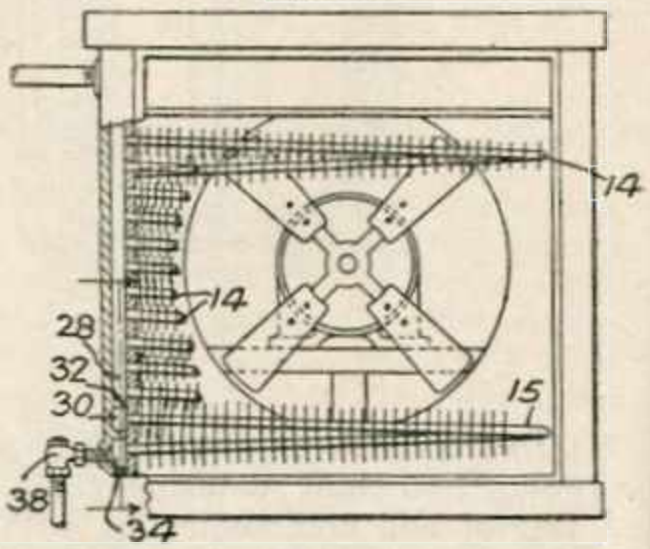


FIG. 2.



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the chambers is turned inwards near the base of the header to separate a series of cooling tubes 15 from the steam inlet tubes. The condensate drains to the pocket beneath the partition 32 and enters the cooling **U**-tubes 15. The latter drain to a discharge chamber 34 and the condensate is then of such a temperature as to effect the opening of a thermostatic trap 38 without undue collection.

336,125. Hope's Heating & Lighting, Ltd., and **Harpin, J. H.** Oct. 31, 1929.

Heating water.—In a combined hot-water supply and heating system having a thermostat dependent on the temperature in the storage tank, and another thermostat dependent on the room or radiator temperature with a change-over switch to determine which thermostat is in operation, the switch is actuated automatically by the first-mentioned thermostat. The storage tank *a* is provided with a thermal mercury switch *b* in a circuit which includes the secondary of a transformer *k* and an electromagnetic switch *l*. The latter completes the circuit of a motor *d* operating a blower *c* supplying fuel to the boiler. When the water in the tank *a* rises to a predetermined temperature, the thermostat *b* is actuated to place the thermostat *f* in circuit, so that the boiler is then controlled by the room temperature, unless the tank temperature again falls below the required minimum. An additional thermal switch *g* is provided by which excessive boiler temperature operates to stop the motor *d*.

FIG.1.

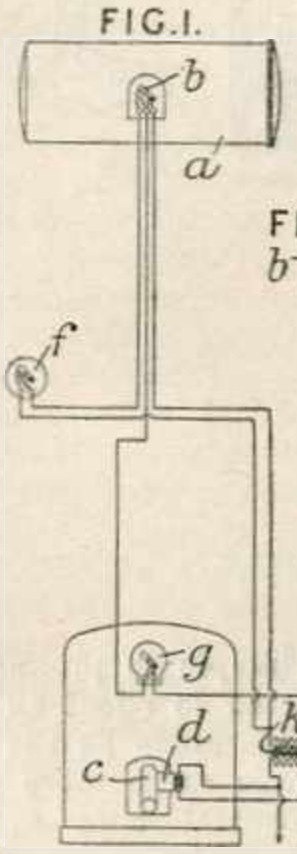


FIG.2

336,421. Lambert, F. T. Oct. 10, 1929.

Boiling-pans. — An oil-jacketed cooker is characterized by the provision of two separate thermostatic control devices, one acting to regulate the heating of the oil to any desired temperature and the other acting either to regulate the flow of oil to the jacket or to regulate the heating of the oil, this thermostatic control being operated by the temperature of the cooking vessel. The boiler or oven *a* is surrounded by a jacket *b* enclosed in lagging *d*. The electric heater *j* is contained in an external heating chamber *h* communicating through upper and lower conduits *i*, i^1 with the jacket. The heater chamber *h* is connected by pipes *l*, l^1 to a tube *m* containing the sensitive element of the thermostat which is regulable by a pointer *o* working over a dial o^1. The element is connected by a lever n^1 to a mercury switch *p* balanced on a pivot p^1. The thermostat thus cuts off the current when the temperature rises sufficiently. Alternatively, a variable resistance switch may be used to regulate the strength of the heating current. The variable resistance switch may introduce or cut out resistances in series with the heating element, or it may control the series-parallel connections of multiple heating coils, by means of suitable contacts upon a blade moved by the sensitive element. A second sensitive element *q* is placed in a water receptacle *r* which is warmed after a predetermined time to an extent which operates the thermostat to depress the lever n^1 by the rod q^2 so as to cut off the current. The return of the rod is prevented by a pawl engaging with a stop. The second thermostat may, alternatively, regulate the flow of oil into the jacket which may have an expansion chamber to allow for dilution of the oil when heated. In a modification, the heating is effected by gas burners arranged beneath the oven and the thermostats control the supply of gas to the burners.

FIG.2.

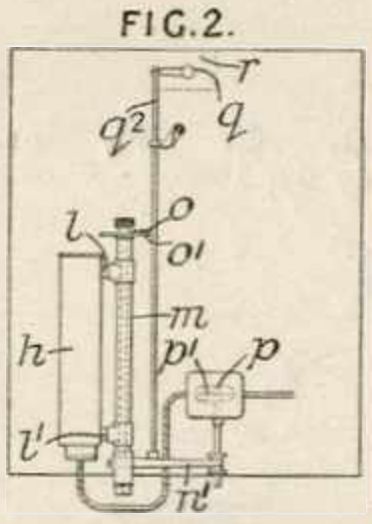
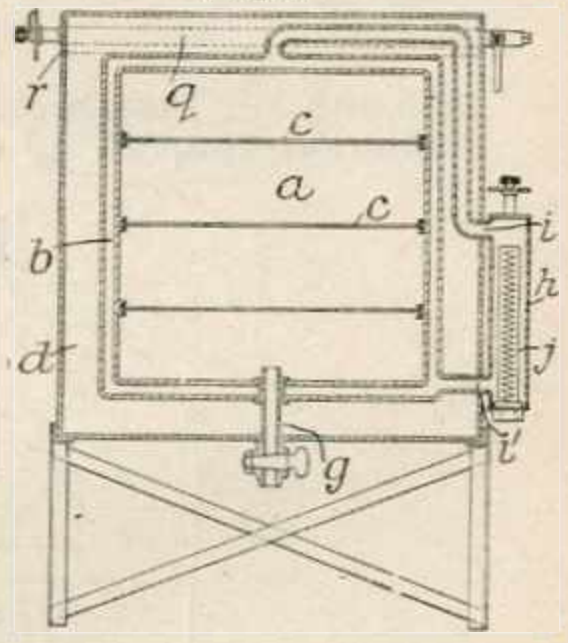


FIG.1.



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336,899. Robertson, T. E., (*Foster Wheeler Corporation*). Jan. 23, 1930.

Feedwater, heating. — An economizer having a flue of oblong cross-section consists of a bank of tubes extending transversely of the flue in the direction of greater dimension, and another bank of tubes in the direction of lesser dimension, the fluid passing through the groups in series. Water flows from the lower bank of tubes 16 through the rightangled tubes 20 to a manifold 21, and passes to the second bank of tubes 22. The uppermost return tube bends 23a connect to tubes 24 which communicate with the drum 11. The latter connects with the boiler system 10. Products of combustion leave the boiler by way of the flue 12 and escape at 13 to the stack. Gilled tubes may be used and a row of a bank of tubes may be staggered with respect to an adjacent row.

FIG.3.

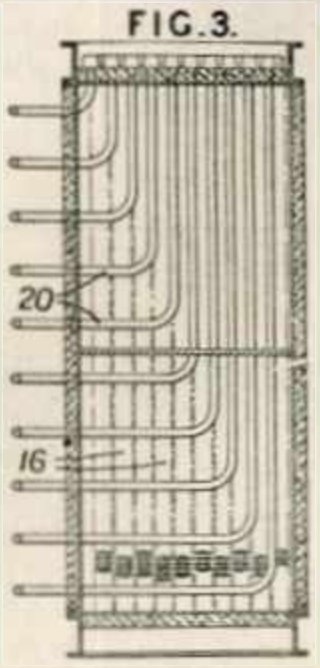
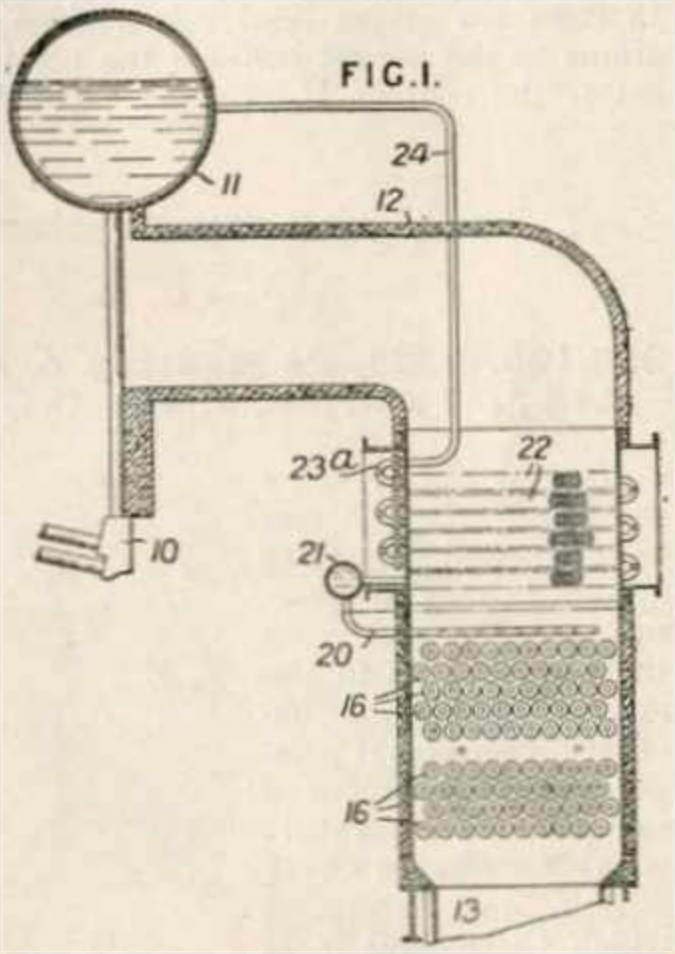
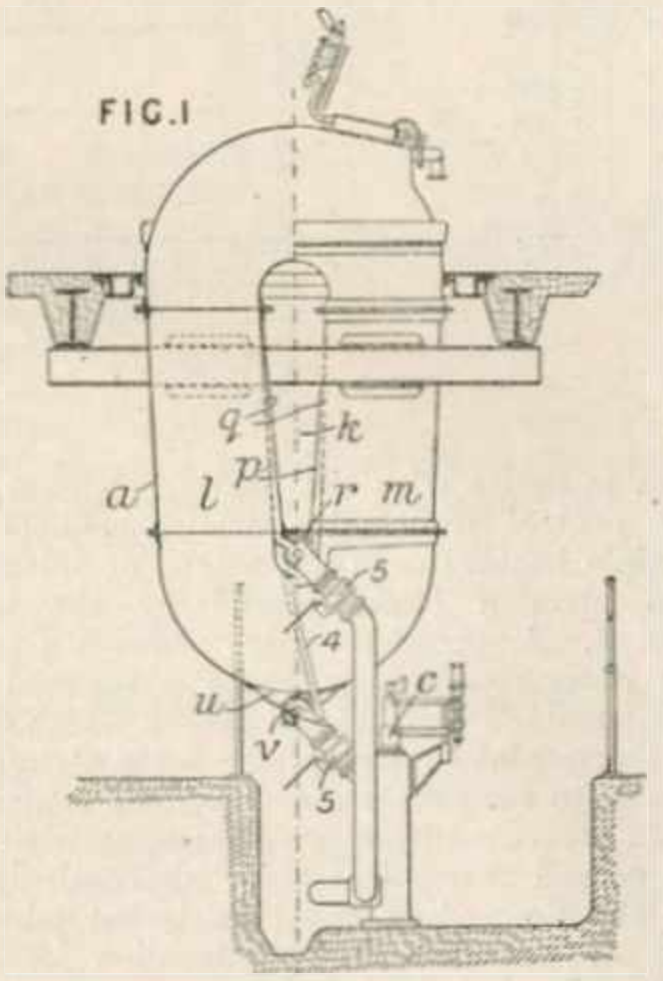


FIG.1.



336,963. Hammond, C. F., and **Shackleton, W.** July 22, 1929.

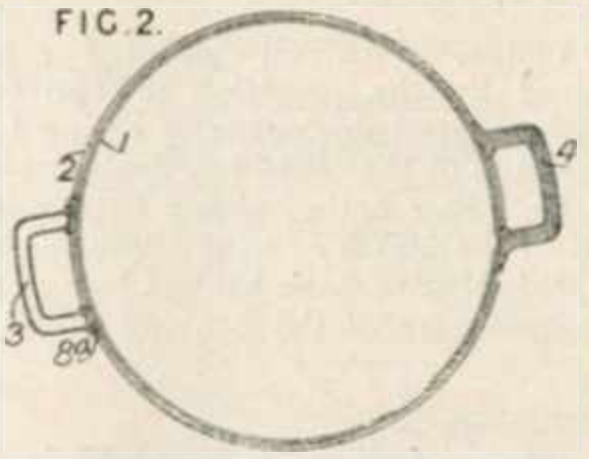
FIG.1



Heating liquids; set-pans.—Apparatus for the liquid treatment of textiles &c. comprises a circulation chamber *a* for the materials and liquid, composed principally of two vertical columns *l*, *m* connected at top and bottom, and one or more submerged flame burners or other aerating medium *c* to supply gases at *u* a substantial depth below the top of one column, the liquid in that column being aerated and lifted on the air lift principle to promote circulation. The gases are stated to effect an opening-up of the treated materials since as the circulating liquid ascends the gases come more and more out of solution. The central core *k*, the return valve *r*, and delivery valve *v* are preferably adapted for reversal of the direction of circulation, the valves being connected together by a link 4, and the returning liquid escaping by either pair of screens *q* and chambers *p*. The textiles &c. may be held in perforated cages positioned in the liquid columns. Control valves 5 may be fitted on both delivery and return pipes. Specification 296,525 is referred to.

337,313. Sfinx Spojené Smaltovny a Továrny na Kovové Zbozi Akc. Spol. Dec. 24, 1929, [*Convention date*].

FIG.2.

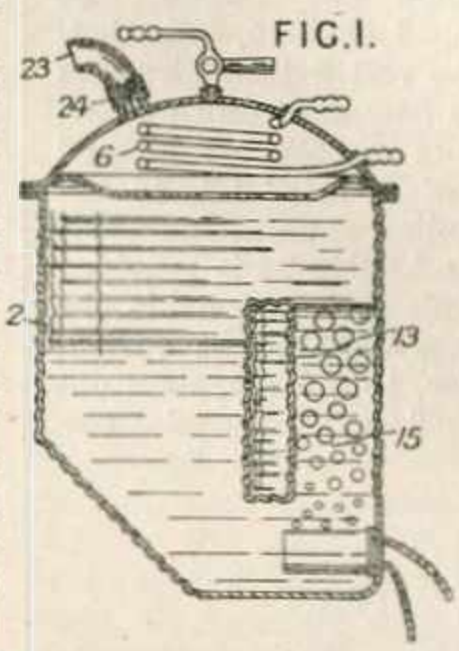


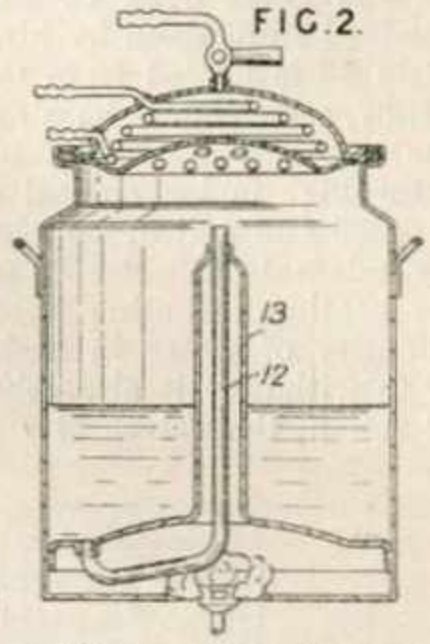
Boiling-pans.—Heating vessels comprising an inner vessel 1 of rustless steel or other metal

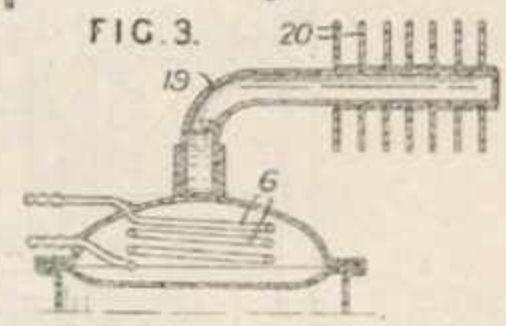
fitted with an outer sheath or jacket of another metal of higher conductivity, such as aluminium or copper, are provided with outwardly projecting metal parts such as 8^a secured to the inner parts and closely fitting openings formed in the jackets. The metal projections may serve for the attachment of handles 3, welded thereto, or may be formed integral with the handles, as shown at 4; they also prevent relative movement of the vessel and the jacket.

337,763. Munters, C. G. May 31, 1929.

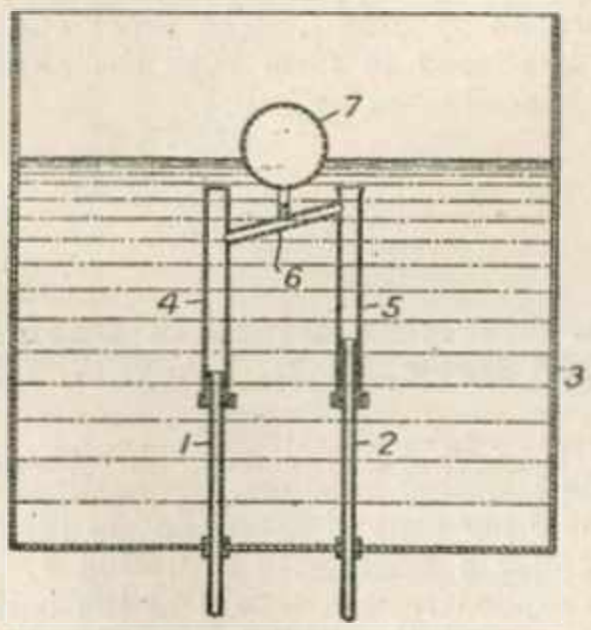
Washing - boilers. — Apparatus for cleansing clothes &c. comprises a container 2, Fig. 1, formed into two parts by a partition 13, the liquid 15 in one part being heated to provide circulation of the liquid, and the vapour given off passing through a condenser 6, which may be located within or around the upper part of the container. In addition, a liquid-operated ejector may be provided to suck vapour from the container through a conduit 23 which preferably contains a valve 24 adapted to open automatically when the pressure in the conduit is less than that in the container. Fig. 3 shows the top of a container which, in addition to the condenser 6 which employs flowing water, is provided with an air-cooled condenser comprising a closed pipe 19 containing at one end a liquid, and at the other end cooling flanges 20. In a modification, a conduit 12, Fig. 2, led through a sleeve 13 to the vapour space of the container, is subjected to the heat of the burner so that part of the liquid vaporizes although much of the liquid is at a comparatively low temperature.





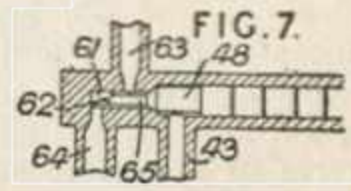


337,991. Rolyat Tank Co., Ltd., and **Penrose, H.** Nov. 13, 1929.



Heating water; water delivery.—In a hot water supply system comprising a storage cylinder 3 connected by flow and return pipes directly to a boiler, interconnected tubes attached to a float 7 cause the water rising from the boiler through pipe 1 to pass directly to the hot water supply pipe 2 or the upper part of the cylinder. Tubes 4 and 5 are jointed telescopically on the ends of pipes 1 and 2. Tube 4 is closed at the top so that hot water from the boiler passes up the inclined pipe 6 and either enters the cylinder through the open end of tube 5 or passes directly into pipe 2. The float 7 maintains the upper end of tube 5 at a fixed distance below the water surface.

338,161. Pfeiffer, W., and **Reiss, K.** April 18, 1929, [*Convention date*].



Heating liquids. — In heating apparatus in which heat is transmitted from an accumulating element to the place of consumption by a liquid medium contained in a closed circuit, the heating effect is regulated by alteration of the quantity of the contained liquid. The invention is described as applied to a cooking-stove, in which pipe coils 1 - - 4 are embedded in a heat-accumulating block A containing an electric heater 8. Each pipe coil forms part of an independent heating circuit, two of which include respectively two series of oven-heating pipes 11, 12, and the other two comprise tubes heating two hot-plates, one of which is shown at 13. Water evaporated in the coil 1 passes as steam

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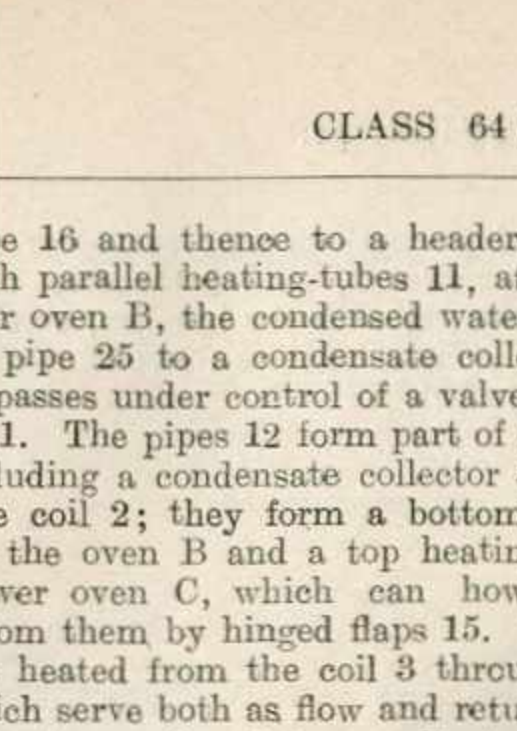
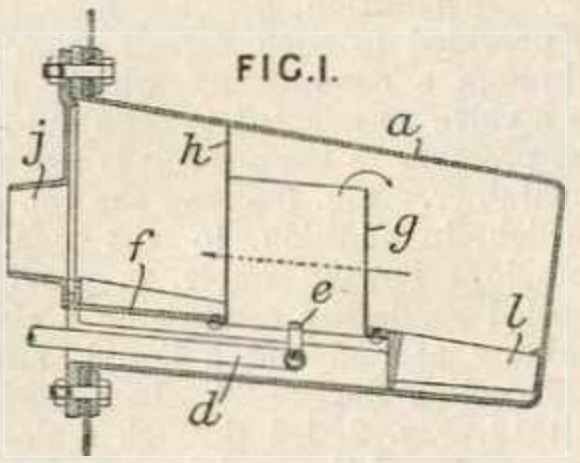
up the pipe 16 and thence to a header pipe 17 and through parallel heating-tubes 11, at the top of an upper oven B, the condensed water flowing through a pipe 25 to a condensate collector 31, whence it passes under control of a valve 21 back to the coil 1. The pipes 12 form part of a similar circuit including a condensate collector 32, valve 22 and the coil 2; they form a bottom heating means for the oven B and a top heating means for the lower oven C, which can however be shielded from them by hinged flaps 15. The hot-plate 13 is heated from the coil 3 through pipes 35, 37, which serve both as flow and return pipes, the condensate passing into a collector 33 and returning, under control of a valve 23, to the pipe 35 and coil 3. A similar system, including a condensate collector 34 and valve 24 is provided for heating the other hot-plate. To enable the quantity of water in each system to be varied, or to withdraw it altogether, to put a system out of action, the valves 21 - - 24 each comprise two



controlling members, one of which regulates the passage of the liquid round the heating circuit and the other connects the circuit to a pipe (not shown) leading to the bottom of an annular hot-water container G which surrounds the heat-accumulator A, or to a separate container if distilled water or other liquid is employed. Fig. 7 shows one form of double valve comprising a conical valve 48 controlling the passage between pipes 63 and 43, leading respectively to a condensate collector and to the tank G, and a valve 61 controlling the passage between the pipe 63 and a pipe 64 leading to the evaporator coil. The valve 61 is connected to the valve 48 by a stem 65, and is formed with a cut-away portion 62; rotation of the combined valve thus controls the passage between the pipes 63, 64, and a longitudinal movement the passage between the pipes 63, 65. The water is introduced into the system when the latter is cold, being drawn in owing to the vacuum which then exists. A construction of condensate collector and spring-loaded valve serving also as a pressure regulator is described for use in cases where the heating circuit is emptied when not in use. Water is heated in the tank G by radiation from the heat-accumulator A and in an auxiliary tank H by radiation from the hot-plates and parts of the heating-circuits adjacent it. The tanks are connected by a pipe 5, and a vent pipe 6 is provided. In cases where distilled water or other liquid is employed in the heating-circuits the hot liquid withdrawn from them passes through a collector in the hot-water tank, gives up its heat to the latter, and passes to a separate container. Where ordinary water is employed it is delivered when withdrawn into the tank G.

338,358. Radiation, Ltd., and **Yates, H. J.** Nov. 12, 1929.



Internally-fired boilers.—Water is heated in storage tanks by means of a heating unit which can be inserted in the side of the tank. The unit comprises an inclined cylindrical chamber *a* having a longitudinal partition *f*, beneath which passes a gas pipe *d* to the burner *e*. Burnt gases from the latter pass up the chimney *g* into the space beyond the chimney and above the partition *f* and circulate back through openings in the front side *h* of the chimney, escaping into the atmosphere through opening *j*. The inner end of the partition is shaped to form with the chamber a recess *l* for condensed moisture.

338,584. British Glues & Chemicals, Ltd., and **Drew, R. B.** Aug. 17, 1929.

Digesters. — In extracting glue and gelatine from chrome leather cuttings, the cuttings mixed with about 3 per cent of magnesia are introduced into a digester *a* fitted with a grating *b*. Cold water is supplied from a pipe *g* to the bottom of the digester until the leather is covered, and a pump *l* is then reversed to circulate the water which is withdrawn through pipes *k* and *m* and returned by the inlet *e*, through a three-way valve *p*. The solution containing magnesia and soluble matter in the leather, is withdrawn through a pipe *r*. Hot water is now supplied to the digester from a pipe *h* and circulated as before. A heating coil *c* maintains the temperature at 90—100° C. The leather acts as a filter to separate the insoluble chromium oxide formed,

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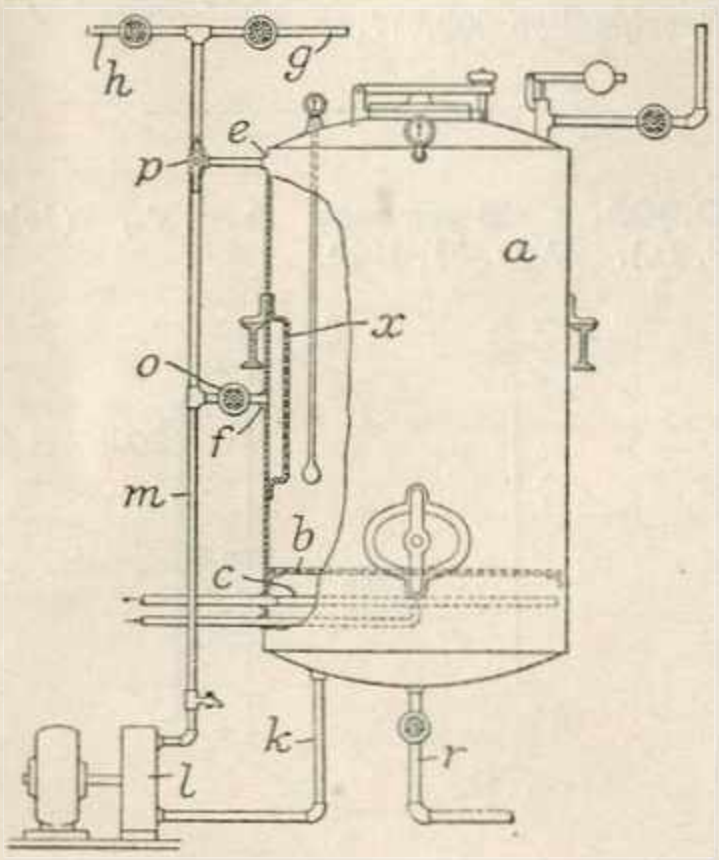
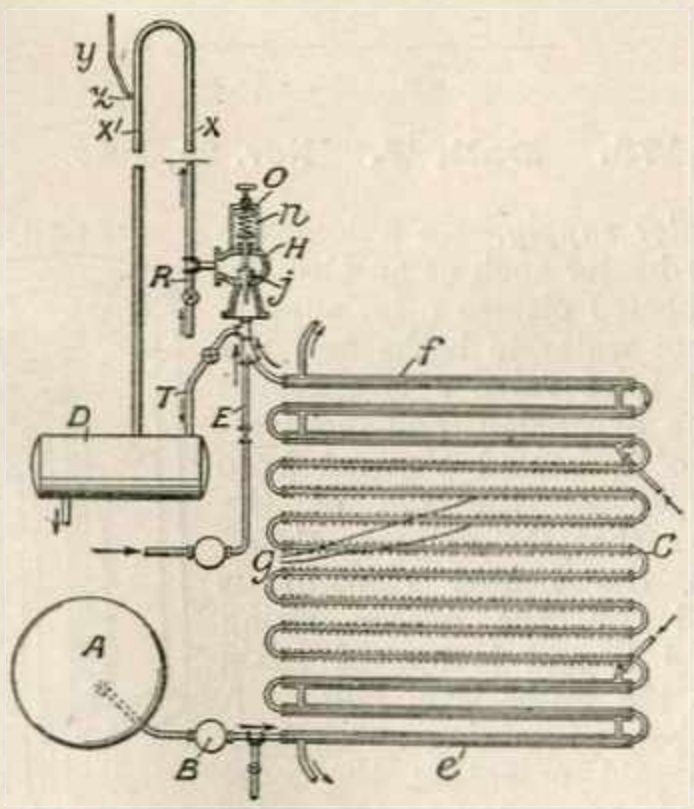
and is loosened by reversing the direction of circulation for short periods, the valve *o* being



opened and the inlet *e* closed and loss of solid matter prevented by a screen *x* over the outlet *f*.

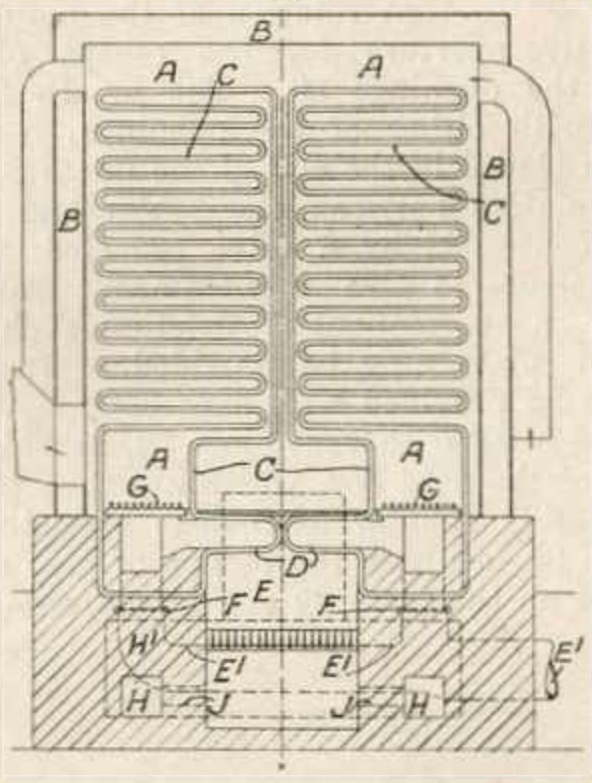
338,941. Hercules Powder Co., (Assignees of *Milliken, M. G.*). May 29, 1929. *Addition to* 301,267.



Digesters.—In apparatus of the kind described in the parent Specification for the digestion of nitrated cellulose or for the purification of cellulose, the material is forced under pressure together with water through a restricted passage such as a coil of substantial length and relatively small cross-section, a valve being provided for controlling the discharge from said passage, the valve being replaced by or employed in conjunction with a stand-pipe or chamber to effect a substantial equalization of the pressure in the coil between the inlet and discharge ends. As applied to the treatment of gun-cotton, the material is treated in a tube A, fitted with agitating gear, and is forced together with water by a pump B through the coil C at a pressure of 80 lbs. per square inch and a velocity of about 2 feet per second. The apparatus may be made of chrome steel. The coil is steam-heated at *e*, insulated at *g*, and provided with a cooling jacket at *f*, the preferred temperature range being 130—160° C. The material passes from the coil through a valve *j* to the stand pipe X, and from thence to the tank D. The valve *j* is a conical member pressed against its seat by a spring *n* positioned between the valve stem and an adjustable stop O so as to open wider in case jamming of the gun-cotton being forced through causes a building-up of pressure. The operation of the valve is ensured by a stream of water which is forced into the coil C through a pipe E adjacent to the valve casing H. A pipe is provided for releasing back-pressure in the stand-pipe, and by means of a pipe T the coil C may be discharged directly into the tank D. A vent pipe *y* controlled by a valve *z* is provided in the downward extension X¹ of the stand-pipe.

339,043. Jamieson, J. S. Oct. 7, 1929.

FIG.I.



Heating air.—The air is passed through a chamber A having insulated walls B and containing high pressure heating pipes C of the circulating steam tube type arranged vertically in close formation and having loops D in the furnace E, the pipes being arranged in sets, the heating of which can be controlled independently by dampers F to vary the temperature of the air. The floor G of the chamber A is heated by the waste gases from the furnace, which may pass to a preliminary heater for the air supplied to

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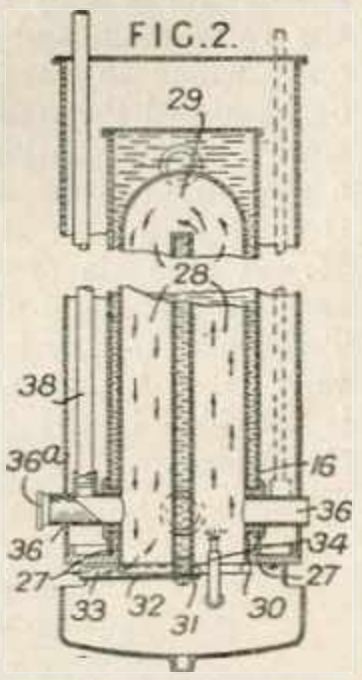
the chamber A. The air supply to the furnace E through passages H^1, H is heated by the waste gases, which pass through a flue pipe E^1 in the chamber H^1, the heated air entering the furnace through openings J. The air flows in thin films between the pipes. Baffles may be arranged in the chamber A to distribute the air uniformly over the pipes. Two furnaces may be used each heating two separate sets of pipes.

339,233. Burt, Ltd., A. & T. May 25, 1929, [*Convention date*].

Internally-fired boilers.—In a gas heated water system comprising a storage tank supplied with cold water and in circulatory connection with a heater, the heater consists of a cylinder 16 provided with two parallel semi-circular flues 28 joined by a bend 29, having a burner 34 within the lower end of one flue and a plate 32 at the end of the other flue to control the escape of gases. The plate 32 is of semi-circular form with its centre screwed to a cross bar 31, and its edge is upturned round a flange 27 having cut out portions 30 provided round the base of the heater. The plate 32 is provided with a mouth 33 so that rotation of the plate varies the effective aperture for the escape of gases through the openings 30. The mouth 33 may register with either of the openings, and the burner is placed in the end of the uncovered flue. The circulation between the heater and storage tank is controlled by a valve provided with a small aperture to give a permanent minimum flow, or a permanent restriction such as an apertured plate may be provided. Inspection apertures 36 provided with caps 36^a may be provided and fitted with vent pipes 38, in which case rotation of the caps 36^a, which are then provided with tapering tubular extensions extending into the ports 36, controls the escape of gas, and the mouth 33 on the plate 32 can be dispensed with.

FIG.2.

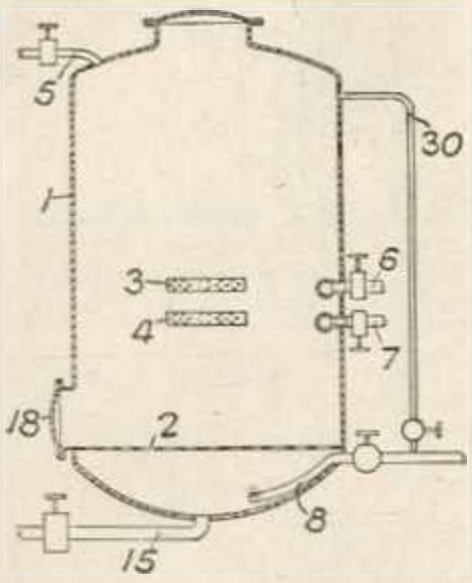


339,303. Industrial Process Corporation. Nov. 26, 1928, [*Convention date*].

Digesters.—In the process of raising the temperature of vulcanizing &c. containers by the use of a condensible gas and an inert gas such as steam and carbon dioxide, whereby the temperature and pressure are rendered independent of each other, the amount of condensate formed is taken into account in calculating the pressure of the inert gas to give the required results. A worked example is given in the Specification. Specification 305,577 is referred to.

Reference has been directed by the Comptroller to Specification 305,577.

339,305. Burgess, A. F., (*Johnson, C. O.*). Aug. 31, 1929.



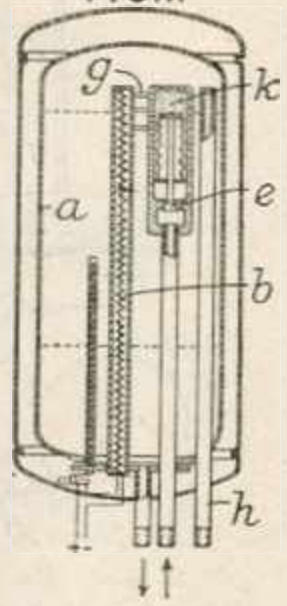
Digesters.—A digester 1, for use in extracting oil from blubber &c. has a removable perforated false bottom 2, steam supply pipes 8, 30, and oil outlet pipes 3, 4, 6, 7, which may be fitted with detachable strainers. The exhausted material is withdrawn through an opening 18, and the sludge through a pipe 15 having a gate valve. During the process steam is let off continuously through a pipe 5 from the space above the charge.

Reference has been directed by the Comptroller to Specification 352,023, [*Group* III].

339,475. Dall, T. Nov. 26, 1929.

Water supply.—In a domestic water-heater such as an electrically heated cistern *a* for supplying hot water to baths &c., the water inlet valve *e* is operated by the expansion and contraction of a heated element *k* so arranged at the top of the cistern that the valve is closed when the heated element is cooled by the water rising around it and is opened again when the water level falls. A chamber containing an expanding liquid operating the inlet valve is connected to the water heating element *b* by heat-conducting bars *g*. An overflow pipe *h* projects into the upper part of the cistern. The inlet valve may be operated by the expansion and contraction of a rod heated by an electric resistance in the circuit of the heating resistance *b*. In a further modification, the inlet valve is operated by an expanding liquid in a tube projecting outside the cistern and heated by a gas flame.

FIG.1.



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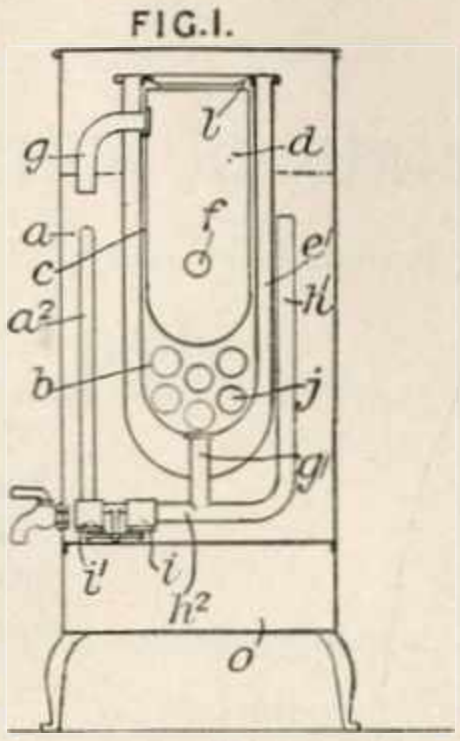
339,734. Low & Sons, Ltd., A., and Low, D. W. Oct. 24, 1929.

FIG. 1.



Water supply and delivery.—Relates to a water heater comprising a bulk water chamber *a*, an electrically heated boiling chamber *b* communicating therewith, and a collecting chamber *d* provided with a tap *f* and connected to the boiling chamber by an expansion pipe or passage *c*. The overflow from the chamber *d* passes through the pipe *g* to the top of the bulk chamber, and the boiling chamber inlet g^1 is fed from the bottom and top of the bulk chamber by pipes h^2, h^1 respectively. The bulk chamber is fed from a float controlled cistern through the pipe a^2. The outlet of the pipe a^2 to the bulk chamber and the inlet of the pipe h^2 are controlled by normally balanced valves i^1, *i* carried on a pivoted arm. When water is drawn from the boiling chamber cold water flowing through the pipe a^2 tilts the arm to close the valve *i* so that the boiling chamber is fed only by hot water from the top of the bulk chamber. The boiling and collecting chambers are surrounded by a jacket e^1 containing air or heat insulating material. A cover *l* for deflecting the water into the boiling chamber is provided.

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22, CEMENTS AND LIKE COMPOSITIONS	22, Cements and like compositions	V.
23, CENTRIFUGAL DRYING, SEPARATING, AND MIXING MACHINES AND APPARATUS.	23, Centrifugal machines and apparatus, (*other than* Centrifugal fans, pumps, and reels).	II.
24, CHAINS, CHAIN CABLES, SHACKLES, AND SWIVELS.	24, Chains, chain cables, shackles, and swivels	XXV.
25, CHIMNEYS AND FLUES, (*including* Ventilating-shaft tops).	25, Chimneys and flues, (*including* Ventilating shaft tops). ...	X.
26, CLOSETS, URINALS, BATHS, LAVATORIES, AND LIKE SANITARY APPLIANCES.	26, Closets, urinals, baths, lavatories, and like sanitary appliances.	I.
27, COIN-FREED APPARATUS AND THE LIKE ...	27, Coin-freed apparatus and the like	XVIII.
28, COOKING AND KITCHEN APPLIANCES, BREAD-MAKING AND CONFECTIONERY.	28 (i), Bread-making, confectionery, and cooking-appliances. 28 (ii), Kitchen and like appliances other than cooking-appliances.	VI.
29, COOLING AND ICE-MAKING, (*including* Refrigerators *and* Ice-storing).	29, Cooling and ice-making, (*including* Refrigerators *and* Ice-storing).	XIII.
30, CUTLERY	30, Cutlery	XIV.
31, CUTTING, PUNCHING, AND PERFORATING PAPER, LEATHER, AND FABRICS, (*including* the general treatment of paper after its manufacture)	31 (i), Cutting and severing machines for paper, leather, fabrics, and the like. 31 (ii), Punching and perforating machines and hand tools for cutting, punching, perforating, and tearing paper, leather, fabrics, and the like.	VIII.
32, DISTILLING, CONCENTRATING, EVAPORATING AND CONDENSING LIQUIDS, (*excepting* Steam-engine condensers).	32, Distilling and evaporating liquids, (*including* Condensing vapours *and* Crystallizing).	III.
33, DRAINS AND SEWERS	33, Drains and sewers	I.
34, DRYING	34 (i), Drying gases, clothes, and materials in long lengths ... 34 (ii), Drying systems and apparatus, (*other than* Drying gases, clothes, and materials in long lengths).	XIII.
35, DYNAMO-ELECTRIC GENERATORS AND MOTORS, (*including* Frictional and influence machines, magnets, and the like).	35, Dynamo-electric generators and motors, (*including* Frictional and influence machines, magnets, and the like).	XXXV.
36, ELECTRICITY, CONDUCTING AND INSULATING	36, Electricity, Conducting and insulating	XXXVI.
37, ELECTRICITY, MEASURING AND TESTING ...	37, Electricity, Measuring and testing, (*including* Electric resistances and inductances). (1909–15 *out of print.*)	XXXVI.
38, ELECTRICITY, REGULATING AND DISTRIBUTING.	38 (i), Electric couplings, and cut-outs other than electro-magnetic and thermal.	XXXVI.
	38 (ii), Electric currents, Converting and transforming other than by rotary converters and rotary transformers, and condensers. (1909–15 *out of print.*)	XXXV.
	38 (iii), Electric motor control systems and motor and like controllers. (1909–15 *out of print.*)	XXXVII.
	38 (iv), Electric supply and transmission systems and apparatus not otherwise provided for.	XXXV.
	38 (v), Electric switches and electro-magnetic and thermal cut-outs, (*other than* Motor and like controllers).	XXXVII.
39, ELECTRIC LAMPS AND FURNACES	39 (i), Electric lamps, Arc and incandescent-arc and vacuum or low-pressure apparatus for electric discharges through gases or vapours.	XL.
	39 (ii), Electric lamps, Incandescent 39 (iii), Heating by electricity, (*including* Electric furnaces and ovens). (1909–15 *out of print.*)	XI.

Series (A)—List of Classes (1855–1908).	Corresponding Classes—Series (B) (1909–1930).	Corresponding Group Volume —Series (C) (1931 *onwards*).
	40 (i), Electric signalling systems and apparatus (*other than* Telegraphs *and* Telephones).	XXXVIII.
	40 (ii), Phonographs, gramophones, and like sound recording and reproducing instruments.	
40, ELECTRIC TELEGRAPHS AND TELEPHONES. (1884–8 *out of print.*)	40 (iii), Telegraphs, Electric	XL.
	40 (iv), Telephones and telephone systems and apparatus, Electric.	XXXIX.
	40 (v), Wireless signalling and controlling. (1909–15 *out of print.*)	XL.
41, ELECTROLYSIS, (*including* Electro-deposition *and* Electroplating).	41, Electrolysis, (*including* Electro-deposition *and* Electroplating). (1909–15 *out of print.*)	XXXVI.
42, FABRICS, DRESSING AND FINISHING WOVEN AND MANUFACTURING FELTED, (*including* Folding, Winding, Measuring, *and* Packing).	42 (i), Fabrics, Finishing and dressing.	VIII.
	42 (ii), Fabrics, Treating otherwise than by finishing and dressing.	
43, FASTENINGS, DRESS, (*including* Jewellery)....	43, Fastenings, Dress, (*comprising* Buckles, Buttons, Jewellery, *and certain other fastenings specially applicable to wearing apparel*).	VII.
44, FASTENINGS, LOCK, LATCH, BOLT, AND OTHER (*including* Safes and strong-rooms).	44, Fastenings, Lock, latch, bolt, and other, (*including* Safes and strong-rooms).	XXV.
45, FENCING, TRELLIS, AND WIRE NETTING ...	45, Fencing, trellis, and wire netting	I.
46, FILTERING AND OTHERWISE PURIFYING LIQUIDS.	46, Filtering and otherwise purifying liquids	I.
47, FIRE, EXTINCTION AND PREVENTION OF ...	47 (i), Fire-escapes and fire and temperature alarms	XXI.
	47 (ii), Fire-extinguishing and fire preventing and minimizing	
48, FISH AND FISHING	48, Fish and fishing	VI.
49, FOOD PREPARATIONS AND FOOD-PRESERVING	49, Food preparations, food preserving and the like	
50, FUEL, MANUFACTURE OF	50, Fuel, Manufacture of	XII.
51, FURNACES AND KILNS, (*including* Blowpipes and blowpipe burners; Smiths' forges and rivet hearths; *and* Smoke and fumes, Treating).	51 (i), Furnaces and kilns, Combustion apparatus of, (*including* Details in connection therewith).	XII.
	51 (ii), Furnaces and kilns for applying and utilizing heat of combustion, (*other than* Combustion apparatus and details in connection therewith).	
52, FURNITURE AND UPHOLSTERY	52 (i), Furniture, Fittings and details applicable generally to, and articles of furniture not otherwise provided for.	XIV.
	52 (ii), Furniture for sitting and lying upon	
	52 (iii), Tables, desks, and leaf turners and holders	
	52 (iv), Upholstery, wall furniture, screens, and looking-glasses.	
	52 (v), Window, stair, and like furniture, brackets, racks, and stands, (*including* Antimacassars *and* Table and like covers).	
53, GALVANIC BATTERIES	53, Galvanic batteries	XXXVI.
54, GAS DISTRIBUTION	54, Gas distribution	XXIX.
55, GAS MANUFACTURE	55 (i), Coking and gas-producers	XII.
	55 (ii), Gas manufacture other than gas-producers and retorts	
56, GLASS	56, Glass	XXIII.
57, GOVERNORS, SPEED-REGULATING, FOR ENGINES AND MACHINERY.	57, Governors, Speed-regulating, for engines and machinery...	XXVI.
58, GRAIN AND SEEDS, TREATING, (*including* Flour and meal).	58, Grain and seeds, Treating, (*including* Flour and meal) ...	I.
59, GRINDING, CRUSHING, PULVERIZING, AND THE LIKE.	59, Grinding, crushing, pulverizing, and the like	II.
60, GRINDING OR ABRADING, AND BURNISHING ...	60, Grinding or abrading, and burnishing	XXIII.
61, HAND TOOLS AND BENCHES FOR THE USE OF METAL, WOOD, AND STONE WORKERS.	61 (i), Hand-tool, brush, mop, and like handles	XXIII.
	61 (ii), Hand tools, (*other than* Wrenches and bolt, nail, screw, and like inserting and extracting tools *and* Boring and drilling tools).	
	61 (iii), Wrenches and bolt, nail, screw, and like inserting and extracting tools.	
62, HARNESS AND SADDLERY	62, Harness and saddlery	I.
63, HATS AND OTHER HEAD COVERINGS	63, Hats and other head coverings	VII.
64, HEATING, (*excepting* Furnaces and kilns: *and* Stoves, ranges and fireplaces).	64 (i), Heating liquids and gases.	XIII.
	64 (ii), Heating systems and apparatus, (*other than* Heating liquids and gases *and* Surface apparatus for effecting transfer of heat).	
	64 (iii), Surface apparatus for effecting transfer of heat, (*other than* Apparatus in which the heat is transferred from products of combustion).	
65, HINGES, HINGE-JOINTS, AND DOOR AND GATE FURNITURE AND ACCESSORIES, (*excepting* Fastenings, Lock, latch, bolt, and other).	65 (i), Door and gate operating-appliances, furniture and accessories, (*other than* Fastenings, Lock, latch, bolt, and other *and* Hinges and pivots)	XXV.
	65 (ii), Hinges and pivots.	
66, HOLLOW-WARE, (*including* Buckets, Pans, Kettles, Saucepans, *and* Water-cans).	66, Hollow-ware, (*including* Buckets, Pans, Kettles, Saucepans, *and* Water cans)	XVII.
67, HORSESHOES	67, Horseshoes	I.
68, HYDRAULIC ENGINEERING	68 (i), Excavating earth and rock, booms, buoys, canals and rivers, ferries, and water supply.	XXI.
	68 (ii), Subaqueous buildings and structures, diving, and raising sunken ships and objects.	
69, HYDRAULIC MACHINERY AND APPARATUS, (*excepting* Pumps and other means for raising and forcing liquids).	69 (i), Hydraulic apparatus not otherwise provided for ...	XXIX.
	69 (ii), Hydraulic presses, meters, motors, and like apparatus for use with high pressures.	
	69 (iii), Spray-producers and liquid-distributing sprinklers and nozzles.	
70, INDIA-RUBBER AND GUTTA-PERCHA, (*including* Plastic compositions *and* Materials of constructive utility, other than metals and stone).	70, India-rubber and gutta-percha, (*including* Plastic compositions *and* Materials of constructive utility other than metals and stone).	V.

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Series (A)—List of Classes (1855–1908).	Corresponding Classes—Series (B) (1909–1930).	Corresponding Group Volume —Series (C) (1931 *onwards*).
71, INJECTORS AND EJECTORS	71, Injectors and ejectors	XXVIII.
72, IRON AND STEEL MANUFACTURE	72, Iron and steel manufacture	II.
73, LABELS, BADGES, COINS, TOKENS, AND TICKETS.	73, Labels, badges, coins, tokens, and tickets	XV.
74, LACE-MAKING, KNITTING, NETTING, BRAIDING, AND PLAITING.	74 (i), Braid and braiding-machines, crochet, lace and lace-making, and net-making machines... ... ... 74 (ii), Knitting and knitted fabrics.	VIII.
75, LAMPS, CANDLESTICKS, GASALIERS, AND OTHER ILLUMINATING-APPARATUS, (*excepting* Electric lamps).	75 (i), Burners and burner fittings. 75 (ii), Lamp chimneys, globes, lenses, shades, reflectors and smut-catchers, and holders therefor. 75 (iii), Lamps for lighting and heating, Details and accessories applicable generally to, (*including* Lighting burners, pipes, cigars, and the like). 75 (iv), Lamps for lighting and heating, Kinds or types of, (*including* Lighting, Systems of).	XI.
76, LEATHER, (*including* Treatment of hides and skins).	76, Leather, (*including* Treatment of hides and skins) ...	VIII.
77, LIFE-SAVING, (MARINE), AND SWIMMING AND BATHING APPLIANCES.	77, Life-saving, (Marine), and swimming and bathing appliances.	XXI.
78, LIFTING, HAULING, AND LOADING, (*including* Lowering, winding, and unloading).	78 (i), Conveyors and elevators for dealing continuously with articles and materials in bulk. 78 (ii), Lifting, lowering, and hauling not otherwise provided for. 78 (iii), Lifts, hoists, and jacks. 78 (iv), Loading and unloading, (*including* Transporters and cranes). 78 (v), Winding and paying-out apparatus for lifting, lowering, and hauling, (*including* Pulley-blocks and the like).	XXX.
79, LOCOMOTIVES AND MOTOR VEHICLES FOR ROAD AND RAIL, (*including* Portable and semi-portable engines).	79 (i), Locomotives and tramway, traction, portable and semi-portable engines. 79 (ii), Motor-vehicles, Arrangement and disposition of driving, transmission, balance, and reversing gearing on. 79 (iii), Motor vehicles, Arrangement and disposition of parts of, not otherwise provided for, (*including* Construction of parts peculiar to motor vehicles). 79 (iv), Motor vehicles, Frames and under-carriage work of. 79 (v), Motor vehicles and locomotives, Steering and controlling.	XXXI.
80, MECHANISM AND MILL GEARING. (1877–1883 *out of print*).	80 (i), Gearing, Belt, rope, chain, toothed and friction, and gearing for converting and conveying rotary or reciprocating motion. 80 (ii), Gearing, Variable-speed, differential, and reversing, and for stopping and starting, and shafting and its accessories. 80 (iii), Link-work, cams and tappets, and ratchet and screw- and nut gearing. 80 (iv), Mechanism not otherwise provided for	XXIV.
81, MEDICINE, SURGERY, AND DENTISTRY ...	81 (i), Disinfecting and deodorizing, and medical and like preparations. 81 (ii), Medical, surgical, and dental appliances.	VI.
82, METALS AND ALLOYS, [*excepting* Iron and Steel manufacture].	82 (i), Metals, Extracting and refining, and alloys. 82 (ii), Washing granular, powdered, and like materials, and amalgamating, cleaning, coating, and granulating metals.	II.
83, METALS, CUTTING AND WORKING	83 (i), Casting and moulding metals. 83 (ii), Metal articles and forms, Combination apparatus and processes specially designed for producing and treating. 83 (iii), Metals, Cutting. 83 (iv), Metals, Working.	XXII.
84, MILKING, CHURNING, AND CHEESE-MAKING ...	84, Milking, butter-making, and cheese-making	I.
85, MINING, QUARRYING, TUNNELLING, AND WELL SINKING.	85, Mining, quarrying, tunnelling, and well-sinking	XXI.
86, MIXING AND AGITATING MACHINES AND APPLIANCES, [*excepting* Centrifugal machines and apparatus].	86, Mixing and agitating machines and appliances	II.
87, MOULDING PLASTIC AND POWDERED SUBSTANCES, (*including* Bricks, building and paving blocks, and tiles, *and* Pottery).	87 (i), Bricks, building and paving blocks, slabs, tiles, and pottery. 87 (ii), Moulding, plastic and powdered substances, (*including* Casting substances other than metals *and* Presses, (Mechanical).	X. V.
88, MUSIC AND MUSICAL INSTRUMENTS	88 (i), Musical instruments, Automatic. 88 (ii), Music and musical instruments other than automatic.	XXXVIII.
89, NAILS, RIVETS, BOLTS AND NUTS, SCREWS AND LIKE FASTENINGS.	89 (i), Bolts, studs, nuts, washers, and rivets. 89 (ii), Hooks, nails, cotters, pins, staples, wedges, and wood-screws.	XXV.
	89 (iii), Nailing and stapling and wire-stitching	VII.
90, NON-METALLIC ELEMENTS	90, Non-metallic elements	III.
91, OILS, FATS, LUBRICANTS, CANDLES, AND SOAPS	91, Oils, fats, lubricants, candles, and soaps. (1909–15 *out of print.*)	III.
92, ORDNANCE AND MACHINE GUNS	92 (i), Ordnance and machine-gun carriages and mountings. 92 (ii), Ordnance and machine-guns	XXI.
93, ORNAMENTING	93, Ornamenting	XV.
94, PACKING AND BALING GOODS	94 (i), Packing and wrapping-up for transit and storage, (*including* Baling). 94 (ii), Paper bags, sacks, wrappers, and the like, (*including* Making envelopes).	XVII.
95, PAINTS, COLOURS, AND VARNISHES	95, Paints, painting, and the like	III.
96, PAPER, PASTEBOARD, AND PAPIER MACHE ...	96, Paper, pasteboard, and papier mache	VIII.

Series (A)—List of Classes (1855–1908).	Corresponding Classes—Series (B) (1909–1930).	Corresponding Group Volume —Series (C) (1931 *onwards*).
97, PHILOSOPHICAL INSTRUMENTS, (*including* Optical, nautical, surveying, mathematical, and meteorological instruments).	97 (i), Optical systems and apparatus. (1909–15 *out of print.*) 97 (ii), Surveying, navigational, and astronomical instruments. (1909–15 *out of print.*) 97 (iii), Thermometers, meteorological and mathematical instruments, and miscellaneous philosophical instruments.	XX.
98, PHOTOGRAPHY	98 (i), Photographic cameras and auxiliary apparatus therefor. 98 (ii), Photographic processes and apparatus other than for taking photographs. (*including* Photographic plates, films, and papers).	XX.
99, PIPES, TUBES, AND HOSE	99 (i), Pipes and tubes, Joints and couplings for, (*including* Joints for tubular framework *and like* Wire and rod couplings and joints). 99 (ii), Pipes, tubes, and hose, (*other than* Joints and couplings for).	XXVIII.
100, PRINTING, LETTERPRESS AND LITHOGRAPHIC	100 (i), Feeding and delivering webs and sheets. 100 (ii), Printing processes and apparatus, (*other than* Type setting and composing). 100 (iii), Type making, setting, and composing, (*including* Type-bar-making machines). 100 (iv), Typewriters and like machines.	XVI.
101, PRINTING, OTHER THAN LETTERPRESS OR LITHOGRAPHIC.	101, Now included in 100 (ii).	
102, PUMPS AND OTHER MEANS FOR RAISING AND FORCING LIQUIDS, [*excepting* Rotary Pumps].	102 (i), Pumps, Reciprocating, for liquids, (*including* Steam-engine air-pumps *and* Combined pumps for liquids and gases). 102 (ii), Water and other liquids, and semi-liquids, Raising and forcing otherwise than by pumps.	XXVIII.
103, RAILWAY AND TRAMWAY VEHICLES ...	103 (i), Brakes and retarding apparatus	XXXIV.
	103 (ii), Rail and road vehicles, Details applicable generally to. 103 (iii), Railway and tramway vehicles, Accessories for. 103 (iv), Railway and tramway vehicles, Body details and kinds or types of. 103 (v), Railway and tramway vehicles, Draught, coupling, and buffing appliances for. 103 (vi), Railway and tramway vehicles, Undercarriage and underframe details of.	XXXII.
104, RAILWAYS AND TRAMWAYS	104 (i), Railway and tramway crossings and points and switches. 104 (ii), Railway and tramway permanent way other than crossings and points and switches, and railway and tramway systems other than electric. 104 (iii), Railways and tramways, Electric, (*including* Electric traction).	XXX.
105, RAILWAY SIGNALS AND COMMUNICATING-APPARATUS.	105, Railway signals and communicating-apparatus	XXX.
106, REGISTERING, INDICATING, MEASURING AND CALCULATING, (*excepting* Signalling and indicating by signals).	106 (i), Calculating, counting, and cash-registering apparatus. 106 (ii), Dynamometers, gauges, measures of length, steam-engine and like indicators, and testing-apparatus. 106 (iii), Fares and admission-fees checking, revolution and speed indicators, and odometers. 106 (iv), Indicating, recording, and registering apparatus not otherwise provided for.	XIX.
	106 (v), Measured quantities delivering, measures of capacity, and sampling liquids.	XVIII.
107, ROADS AND WAYS	107, Roads and ways	X.
108, ROAD VEHICLES	108 (i), Road vehicles, Body details and kinds or types of. 108 (ii), Road vehicles, Undercarriage details and draught appliances for.	XXXII.
	108 (iii), Springs and vibration-dampers	
109, ROPES AND CORDS	109, Ropes and cords	XXV.
110, ROTARY ENGINES, PUMPS, BLOWERS, EXHAUSTERS AND METERS. (1877-83 *out of print.*)	110 (i), Centrifugal and screw fans and pumps. ... ... 110 (ii), Rotary engines, pumps, blowers, exhausters, and meters, (*including* Rotary pump plant).	XXVI.
	110 (iii), Turbines and reaction-wheels and motor power plant	
111, SEWAGE, TREATMENT OF, (*including* Manure).	111, Sewage, Treatment of, (*including* Manure)	I.
112, SEWING AND EMBROIDERING	112, Sewing and embroidering	VII.
113, SHIPS, BOATS, AND RAFTS, DIV. I	113 (i), Ship and boat fittings and accessories, and pontoons and rafts. 113 (ii), Ships and boats, Kinds or types and structural details of.	XXXIII.
114, ——————— DIV. II. ...	114, Ships, boats, and rafts, Propelling, steering, and manoeuvring.	XXXIII.
115, ——————— DIV. III. ...	115, Ships, boats, and rafts, Rigging, sails, and spars for, (*including* Boat raising, lowering, and disengaging gear).	XXXIII.
116, SHOP, PUBLIC-HOUSE, AND WAREHOUSE FITTINGS AND ACCESSORIES.	116, Shop, public-house, and warehouse fittings and accessories.	XVIII.
117, SIFTING AND SEPARATING	117, Sifting and separating	II.
118, SIGNALLING AND INDICATING BY SIGNALS, (*excepting* Railway signals and communicating-apparatus).	118 (i), Indicators and burglar and like alarms ... ... 118 (ii), Signals, (*including* Marine signals)	XXXVIII.
119, SMALL-ARMS	119, Small-arms	XXI.
120, SPINNING, (*including* the preparation of fibrous materials *and* the doubling of yarns and threads).	120 (i), Spinning, Preparation of fibrous materials for, (*including* Obtaining, opening, carding, and like treatment of fibres in general). 120 (ii), Spinning, twisting, and winding yarns and threads, (*including* Winding cords, wire, and the like.) 120 (iii), Yarns and threads and miscellaneous spinning accessories and processes and treatment of fibres.	IX.

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Series (A).—List of Classes (1855–1908).	Corresponding Classes—Series (B) (1909–1930).	Corresponding Group Volume —Series (C) (1931 *onwards*).
121, STARCH, GUM, SIZE, GLUE, AND OTHER STIFFENING AND ADHESIVE MATERIALS.	121, Starch, gum, size, glue, and other stiffening and adhesive materials.	V.
122, STEAM-ENGINES, (*including* Details common to fluid-pressure engines generally).	122 (i), Engine and like cylinders, connecting-rods, cross-heads and guides, fly-wheels, piston-rods, and pistons. 122 (ii), Steam-engine distributing and expansion valves and valve gear and valve-actuating arrangements therefor. 122 (iii), Steam-engines, Kinds or types of and details not otherwise provided for, (*including* Steam and other fluid-pressure hammers and presses. 122 (iv), Steam-engines, Regulating or controlling, starting, stopping, and reversing. 122 (v), Stuffing-boxes and substitutes therefor, (*including* Packing therefor).	XXVI.
123, STEAM GENERATORS, (*excepting* Furnaces)...	123 (i), Liquid-level regulating, indicating, and registering, incrustation and corrosion preventing and removing, and door lids and covers for resisting fluid pressure. 123 (ii), Steam-generators ... ... 123 (iii), Steam separators and superheaters	XVIII. XIII.
124, STONE, MARBLE, AND THE LIKE, CUTTING AND WORKING.	124, Stone, marble, and the like, Cutting and working... ...	XXIII.
125, STOPPERING AND BOTTLING, (*including* Bottles, jars, and like vessels).	125 (i), Bottles, jars, and like vessels, (*including* Non-refillable bottles, jars, and vessels). 125 (ii), Bottles, jars, and like vessels, Filling, opening, and closing, (*other than* Stoppers, lids, covers, and capsules). 125 (iii), Stoppers, lids, covers, and capsules, Bottle, jar, and like.	XVII.
126, STOVES, RANGES, AND FIREPLACES	126, Stoves, ranges, and fire-places	XI.
127, SUGAR	127, Sugar	VI.
128, TABLE ARTICLES AND APPLIANCES	128, Table articles and appliances	XIV.
129, TEA, COFFEE, COCOA, AND LIKE BEVERAGES	129, Tea, coffee, cocoa, and like beverages	VI.
130, TOBACCO	130, Tobacco	
131, TOILET AND HAIRDRESSING ARTICLES, AND PERFUMERY.	131, Toilet and hairdressing articles, and perfumery	XIV.
132, TOYS, GAMES, AND EXERCISES	132 (i), Amusement and exercising apparatus other than games and toys. 132 (ii), Games ... ... 132 (iii), Toys	XV.
133, TRUNKS, PORTMANTEAUX, HAND AND LIKE TRAVELLING BAGS, BASKETS, HAMPERS, AND OTHER WICKERWORK.	133, Trunks, portmanteaux, hand and like travelling bags, baskets, hampers, and other wickerwork	XVII.
134, UMBRELLAS, PARASOLS, AND WALKING-STICKS.	134, Umbrellas, parasols, and walking-sticks	VII.
135, VALVES AND COCKS	135, Valves and cocks	XXIX.
136, VELOCIPEDES, (1877–83 *out of print.*) ...	136 (i), Cycle, velocipede, and like vehicle brakes, steering-mechanism, and miscellaneous accessories. 136 (ii), Cycle, velocipede, and like vehicle driving-mechanism, (*including* Human power driving mechanism for apparatus other than vehicles.) 136 (iii), Cycles, velocipedes, and like vehicles, Kinds or types and structural details of.	XXXI.
137, VENTILATION	137, Ventilation	X.
138, WASHING AND CLEANING CLOTHES, DOMESTIC ARTICLES, AND BUILDINGS.	138 (i), Washing and cleaning buildings and domestic articles other than clothes, and dry cleaning clothes and other absorbent materials. 138 (ii), Washing, mangling and wringing, ironing, and starching clothes.	XXIII. VIII.
139, WATCHES, CLOCKS, AND OTHER TIMEKEEPERS	139, Watches, clocks and other timekeepers	XVIII.
140, WATERPROOF AND SIMILAR FABRICS... ...	140, Waterproof and like fabrics	VIII.
141, WEARING-APPAREL	141, Wearing-apparel	VII.
142, WEAVING AND WOVEN FABRICS	142 (i), Looms, Driving, reversing, stopping, and starting, and loom-shedding mechanism and pattern cards, chains, surfaces, and the like. 142 (ii), Looms, Kinds or types of, and details not otherwise provided for. 142 (iii), Looms, Weft supplying, inserting, beating-up, cutting, doubling, and twisting-in. 142 (iv), Woven fabrics and articles, and warping, leasing, balling, and beaming yarns, (*including* Pile fabrics *and* Floor coverings).	IX.
143, WEIGHING-APPARATUS	143, Weighing-apparatus	XVIII.
144, WHEELS FOR VEHICLES, [*excepting wheels for* Locomotives and tramway and traction engines; Railway and tramway vehicles; *and* Toys]. (1877–83; 1893–96; 1901–04 *out of print.*)	144 (i), Wheels for vehicles, (*other than* Wheel tyres, Pneumatic and other elastic, and rims for use therewith). 144 (ii), Wheel tyres, Pneumatic and other elastic and rims for use therewith.	XXXIV.
145, WOOD AND WOOD-WORKING MACHINERY.	145 (i), Wood, Cutting, (*other than* Sawing) ... ... 145 (ii), Wood, Working, (*including* Sawing)	XXIII.
146, WRITING-INSTRUMENTS AND STATIONERY, AND WRITING-ACCESSORIES, (*including* Educational appliances).	146 (i), Filing paper and like sheets. 146 (ii), Stationery, wafers and seals, educational appliances, and ciphers and codes. 146 (iii), Writing-instruments, ink, and receptacles for writing-materials.	XV.

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To supplement the information relating to the Group volumes of Abridgments given in column 3 above, a full list of the 40 Groups showing the Classes of the present classification covered by each Group is given below.

Group.	Corresponding Classes in existing Classification.
I. Agriculture. Fencing. Filtering. Sewage	5 (i–ii). 6 (i–iii). 26. 33. 45. 46. 58. 62. 67. 84. 111.
II. Metals and alloys. Mixing. Pulverizing. Separating	23. 59. 72. 82 (i–ii). 86. 117.
III. Chemistry, Inorganic. Distillation. Oils. Paints	1 (i–iii). 32. 90. 91. 95.
IV. Acetylene. Cellulose. Chemistry, Organic. Dyes and dyeing.	2 (i–iii). 15 (i–ii).
V. Cements. Indiarubber. Moulding, Non-metallic. Starch.	22. 70. 87 (ii). 121.
VI. Beverages. Food production. Medicine and surgery. Tobacco.	14 (i–ii). 28 (i–ii). 48. 49. 81 (i–ii). 127. 129. 130.
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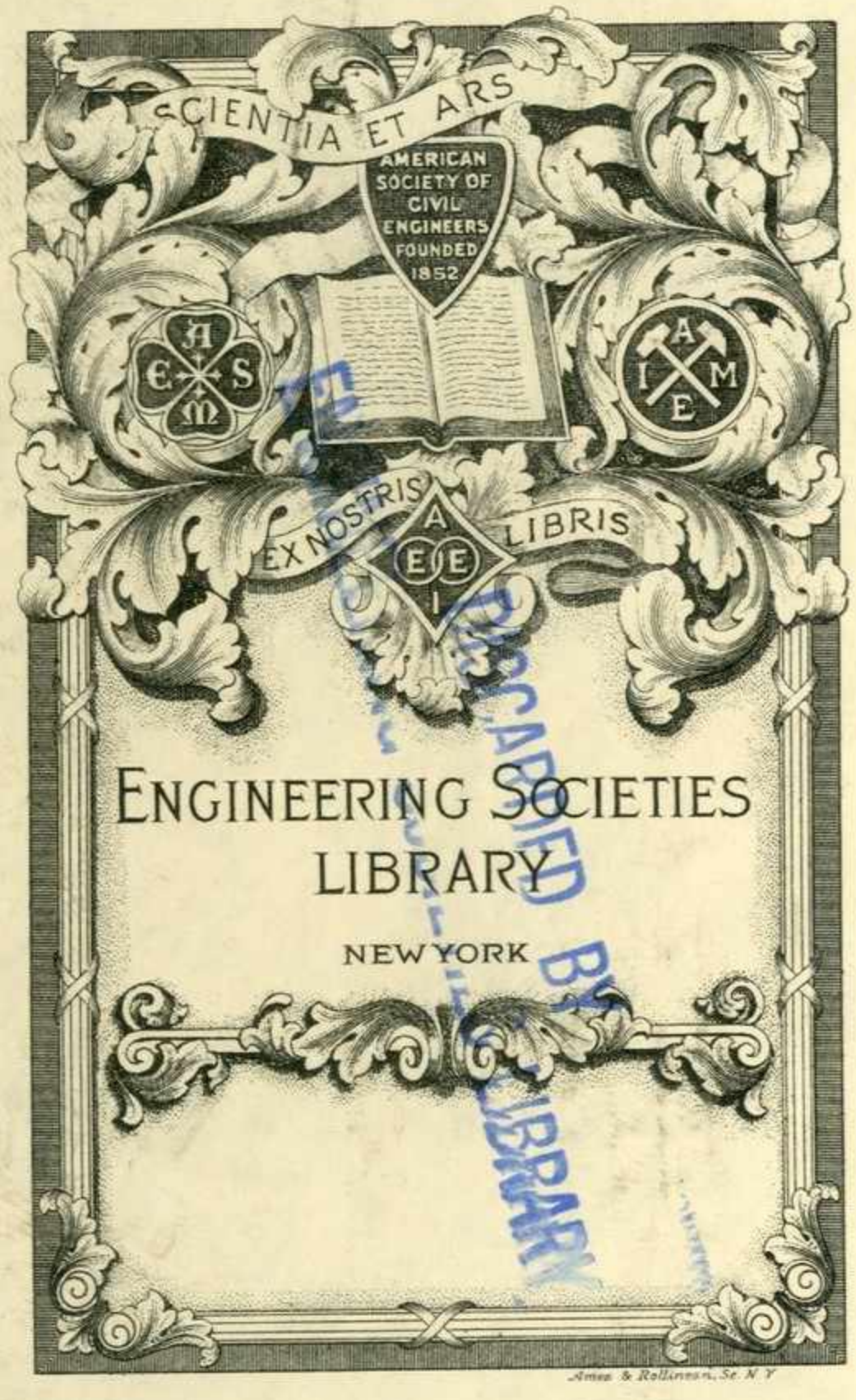

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