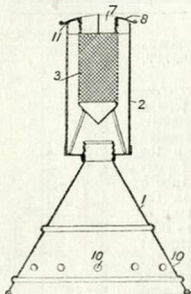
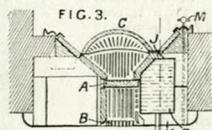


in a tank K^2 . The volume of the heater R is equal to that of the boiler K . The tank K^2 is connected to a system of radiators R^1, R^2, R^3 , and the volume of the tank K^2 is equal to the sum of those of the radiators R^1, R^2, R^3 . The tank K^2 is fitted with a cold-water supply-pipe W^1 and a hot-water delivery pipe W . A regulating-device D , consisting of a cylinder and piston, is provided by means of which irregularities of volume due to fitting &c. can be compensated for.

29,126. Meacock, T. Dec. 17.

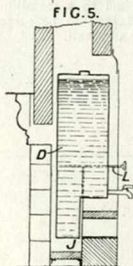


Washing-boilers.—A circulator comprises a conical petticoat 1, to which is secured a top chamber 2 having a cover 8 with a screwed portion 7 to hold a receptacle of wire mesh 3 containing the cleansing-composition. In use, water enters through the holes 10, rises up through the chamber 2, and passes out through the space 11 between the cover 8 and the wall of the chamber 2.



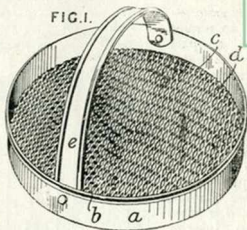
29,186. Jones, J. F., and Jones & Campbell. Dec. 18.

Block form boilers.—In connexion with a combined range and fire-place, a large rectangular non-pressure boiler D is used, which is reduced at its lower end as shown to present an increased surface to the hot gases. It has pipe connexions to a bath &c.



29,310. Read, J. C. C., and Godfrey, W. H. Dec. 19.

FIG. 1.



Boiling-pans.—A device for keeping vegetables, clothes, &c. submerged during boiling comprises a comparatively deep frame a having a bead b and a flange c to which is secured a plate d of perforated or expanded metal or a disk of woven wire; a pivoted ball e is provided. The frame is made of a strip of metal united at the ends; or it may be a stamping or a casting.

29,383. Rutter, J. M. Dec. 20.

FIG. 1.

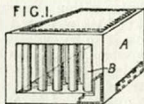


FIG. 11.

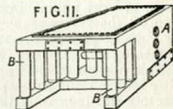


FIG. 8.

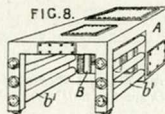


FIG. 15.

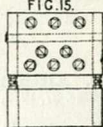
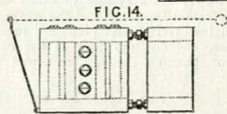


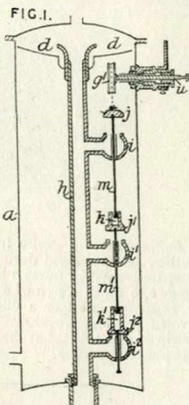
FIG. 14.



Internally-fired boilers; water-tube boilers.—The boiler, which is tunnel-shaped, comprises primarily a rectangular water jacket A , Fig. 1, which completely envelops a central flame-flue, the flue being intersected by water-tubes B . The sides and upper portions of the boiler may be extended so as to produce other modifications of the tunnel-shaped boiler, for instance those shown in Figs. 8 and 11, where the extended sides are formed of horizontal or vertical water-tubes b^1 or B . The extended upper and other portions may be detachably secured to the main portion, as shown in plan in Fig. 15 and in elevation in Fig. 14.

29,803. Heaford, J., and Augustus, E. M. Dec. 27.

Heating water.—In order to render available a part only of the water in the reserve tank, if desired, for circulation through the boiler in a domestic water-supply system, and thus to supply a small quantity of hot water quickly, the tank *a* is fitted with an interior pipe *h*, forming an extension of the outflow pipe to the boiler and provided with branches *i*, *i*¹, *i*² controlled by valves *j*, *j*¹, *j*², which are operated successively by a chain- and -sector device *g*¹ through links *m*, *m*¹ and lost-motion devices *k*, *k*¹. A perforated shield *d* is provided near the top to prevent undue circulation within the tank when all the valves are shut and the water within the topmost part of the tank is to be circulated. By turning the spindle *u*, the valves *j*, *j*¹, *j*² can be raised in succession, thus opening a passage to the boiler for the lower colder part of the water in the reservoir and increasing the quantity of water in circulation at will.

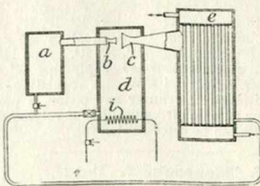


29,830. Altenkirch, E., and Tenckhoff, E. Dec. 27, 1912, [Convention date].

Heating water.—In a system in which the waste heat of a refrigerating-plant and the waste heat of the heat engine driving that plant are received by a condenser, the cooling-water of the condenser is used for passing through radiators to heat buildings.

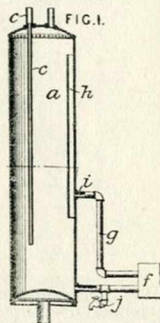
(For Figure see next column.)

29,830.



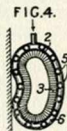
29,874. Quinn, M. J. Dec. 29.

Heating water.—The flow-pipe *g* from a domestic boiler *f* is connected at *i* between the open ends of a circulation tube *h* placed in the storage tank *a*. The water-inlet pipe *c* is brought down nearly to the bottom of the tank, whence sediment can be discharged by a bib cock *j*.



29,892. Junkers, H. July 1. [Addition to 15,196/13.]

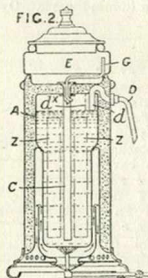
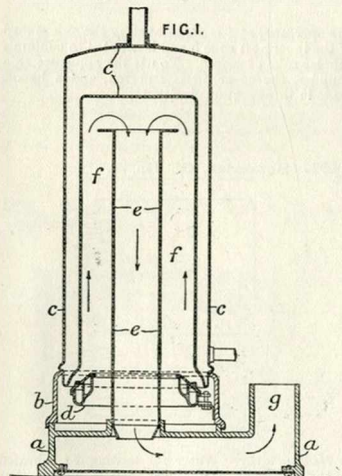
Water-tube boilers.—A water-heater of the shape described in the parent Specification is constructed of water-tubes in place of a water-holding shell. As shown, for example in Fig. 4, the heater is kidney-shaped in cross-section, vertical tubes 5 connecting horizontal tubes 6. Heat-conducting plates 3 are attached to a metallic lining 2. The apparatus is adapted to be suspended with its concave side against a wall.



A.D. 1914.

417. Harrison, A. F., Peard, O. L., and Oliver, C. Jan. 7.

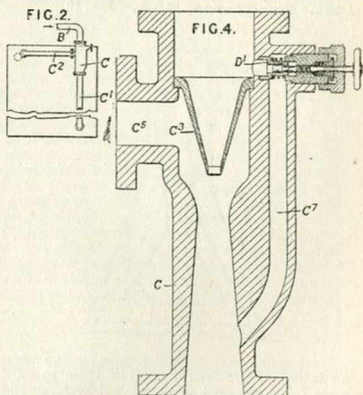
Block-form boilers; water supply and delivery.—A reservoir A is surrounded by non-conducting material and may have blocks Z of heat-storing material within its water-space. Water is supplied to it from a container E through the tube C leading to the bottom, the incoming water driving out the heated water at the top through a discharge pipe D. As a result of this method of supply and delivery of the water, the thermal capacity remains practically the same. A siphon *d* may extend within the reservoir to prevent dripping and may be, as shown at *d*^x, of larger section than the remainder of the discharge tube. A steam-escape tube G is provided. The heating may be effected by a burner as shown, or electrically.


706. Fletcher, Russell, & Co., and Fletcher, T. W. Jan. 10.


Annular boilers.—An annular boiler *c* rests on a ring *b* supported on a hollow base *a*. An annular gas burner *d*, which may have two separate rows of jets, is supported in the ring *b*. The gases from the burner pass up the annulus *f* between the boiler and the flue *e* and then through the flue and the hollow base *a* to the outlet *g*.

793. Semmler, C. Jan. 12. Drawings to Specification.

Heating water.—In a closed water-circulating system in which heat is absorbed from the cylinders, exhaust pipe, and silencer of an internal-combustion engine and is utilized in another part of the system, the water in the heat-absorbing part of the system is kept under sufficient pressure to prevent the formation of steam.

1026. Rowland, T., and Ross, A. Jan. 14.


Feed-water, heating.—In a feed water heater, the

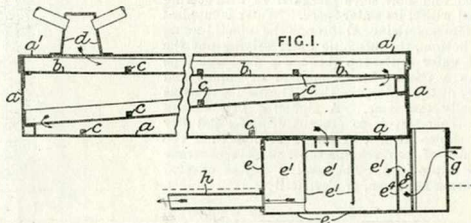
water from the pump passes from a pipe B through an injector C and down a long pipe C' devoid of bends near the injector to the bottom of the heater. In its passage through the injector, the incoming feed induces a supply of water from the heater through a pipe C'. The injector comprises a cone C' in connexion with the pipe B and a port C' for the induced water. Overloading of

the pump is prevented by a by-pass C' having a spring-pressed valve D', which may be manually operated to allow a constant flow of water. In a modification, the by-pass is formed as a separate external pipe. A relief valve opening to the atmosphere may be fitted in case the pressure should rise beyond the valve at which the by-pass valve opens.

1103. **Pomeroy, J.** Jan. 15.

Feed-water, heating.—

Feed-water, entering the casing *a* by the distributor *d* in a detachable lid *a'*, flows down detachable inclined trays *b* having catchment ribs *c* alternately projecting from either side, and finally enters a chamber *e* and flows under and over diaphragms *e'*, *e''*, *e'''* to the outlet *g*. Longitudinal partitions are also provided in the chamber *e*. Oil and sediment are thus trapped, and the sediment can be blown off by the tube *h*.



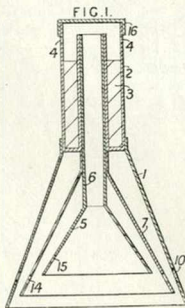
1427. **Neale, E. C. St. J. B.** Jan. 19.

Cognate Application, 4189/14. Drawings to Specification.

Boilers.—A collapsible oven formed of hinged plates may receive a seamless bag made of water-tight canvas and adapted to act as a water heater.

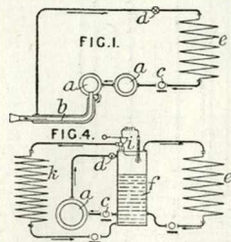
and apertured at 4 is penetrated by the extension 6 of the innermost cone 5 and is adapted to contain a tubular cake of soap 3. To use the appliance as a pounder, the cover 16 is removed, and a handle made in three sections is fitted.

1451. **Hawthorne, E. A.** Jan. 19.



Washing-boilers.—A clothes pounder and automatic liquid-circulator comprises three co-axial cones 1, 7, 5 arranged as shown and perforated at 10, 14, 15. A cylinder 2 mounted on the cone 1

1491. **Semmler, C.** Jan. 20.

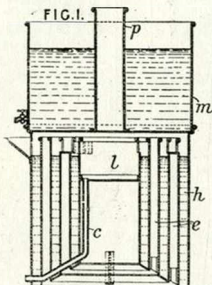


Heating water.—Water for heating &c. is heated in the jackets of internal-combustion engines, thus cooling the cylinders &c. at a pressure which prevents generation of steam there; before passing to the place of use, its pressure may be reduced, if desired, either sufficiently to permit generation of steam for use in the heating-circuit or to a less extent. In the form shown in Fig. 1, a pump *c* forces the water into the jackets of the cylinders *a*

and exhaust-pipe *b* of an internal-combustion engine. The water passes thence through a pressure-reducing valve *d* to the heating-system *e* and thence returns to the pump *c*. In the arrangement shown in Fig. 4, an accumulating-vessel *f* is provided. The water is drawn by the pump *c* from, and returned from the heating-system *e* to, the bottom of the vessel *f* and passes from the

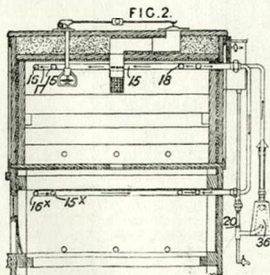
valve *d* to, and to the system *e* from, the top of the vessel *f*. In case the system *e* should not be able to utilize all the heat supplied to the jacket of the vessel *a*, an auxiliary heat-dissipating system *k* is provided to which the water passes by a valve *i*, which is opened automatically when the temperature or pressure in the vessel *f* becomes excessive.

1826. Muirhead, A. E. Jan. 23.



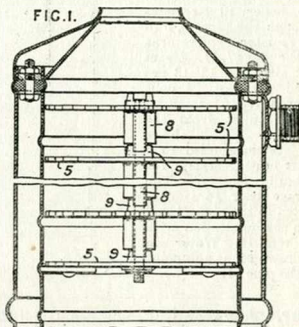
Boilers.—A series of concentric chambers *h* in communication with each other are arranged around and above the heating-medium in such a way that flues *e* are provided. The heated liquid finally passes over into the central chamber *l*, from which it may be drawn off through the pipe *c*. The portable reservoir *m* formed with the central flue *p* may be employed in the combination.

2366. Bond, L. June 4, 1913. [Cognate Application, 2367/14.]



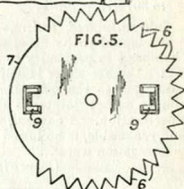
Boilers.—A boiler for heating water for incubators &c. is of conical shape with an internal heating space 36. The return pipe of the heating system opens into a cross pipe in the space 36.

2633. Barralet, T. E., and Parkinson Stove Co. Feb. 2.



Annular boilers.

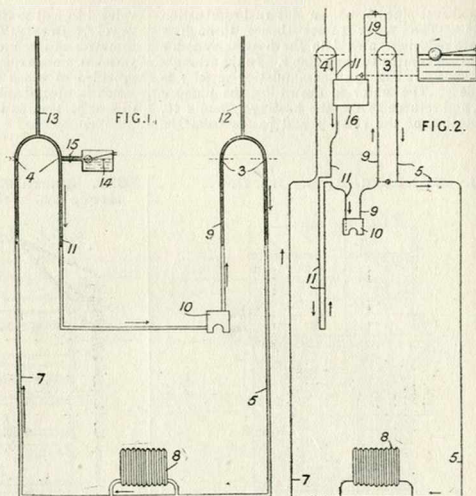
—The baffle-plates 5 in the flue of a geyser are formed with notches 6 extending partly around their edges, and with gaps 7, which, when the baffles are assembled, are arranged in successive baffles upon opposite sides of the flue. Distance-pieces 8 on the bottom of each baffle engage in sockets 9 on the top of the baffle below. The Provisional Specification describes a safety device for preventing gas from being turned on inadvertently and left unlighted. The pilot-jet cock is provided with a catch or pawl formed with a gap or recess which is held in engagement with an extension of the main gas-supply cock by means of a spring so that the main cock cannot be turned on until the pilot-jet has been turned on. The underface of the catch is rounded to permit the extension to pass over it and thus allow the main cock to be turned off after turning off the pilot-jet.



2681. Dodds, W. M., and Stoner, G. A. Feb. 2.

Heating water.—Relates to low-pressure hot

water heating-systems for radiators or hot-water supply. Fig. 1 shows in elevation the system applied to a radiator. The pipes are disposed as shown so as to form two U-shaped systems connected at their upper parts 3, 4; a supply-tank 14 being arranged to communicate with the return pipe 11 near its upper part. The water from the boiler 10 circulates through the pipes 9, 5 to the radiator 8 and returns by the pipes 7, 11. Steam and air vents 12, 13 are fitted as shown. A non-return valve 15 is arranged in the outlet from the tank 14. Fig. 2 shows the system applied to a water-heating system for domestic supply. The storage tank 16 is connected to the pipe 11 and is in communication with the vent 19. Water can be drawn off at any point of the pipe 11.

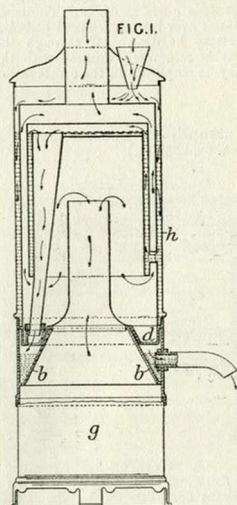


2937. Townsend, W. W. Feb. 4. [Addition to 5078/13.]

Internally-fired boilers.—A closed water-heater *h* is adapted to be fitted with a detachable water-chamber *b* in proximity to the heating-means, from which the hot water is delivered. This chamber is connected to the main body and to the base *g* by simple socket joints as described in the parent Specification. A cover *d*, which is also detachable and renewable, is hollowed to act as a collector for condensation water.

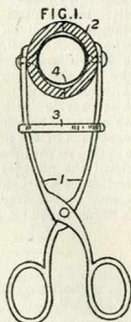
(For Figure see next column.)

2937.



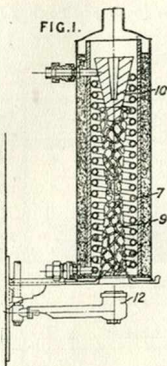
3066. Thwaites, J. Feb. 5.

Heating water.—Relates to a device for thawing or heating water in pipes. Tongs with hinged or spring arms 1 carry curved blocks 2 capable of being heated and held against the pipe 4. A clamping-ring 3 may be provided.

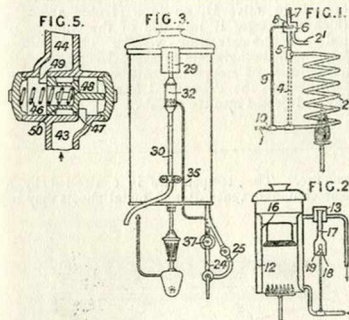


3132. Sharp, W. Y.
Feb. 6.

Heating liquids.—The space within the tubecoils 7 of a liquid-heater is filled with refractory material 9, preferably in the form of gas-fire 'fuel,' and at the upper end a cone 10 or equivalent is fitted to deflect the hot gases from the burner 12 between the convolutions. The casing is heat-insulated.



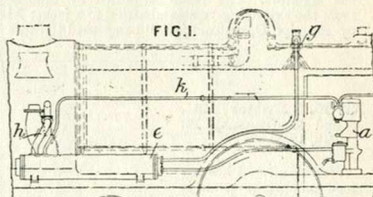
3300. Junkers, H. [Feb. 13, 1913, [Convention date].



Water supply.—In order to control the water supply of a geyser &c., the discharge pipe of which has an enlarged portion through which the water passes, a thermostatic device is placed in this enlarged portion above the water level or in a separate steam-chamber connected therewith. Means are also provided to retard the feed during a sudden outrush of hot water, so that the temperature is maintained. Fig. 1 shows an apparatus comprising a heated coil 2 fed by a pipe 1; a return pipe 4 ensures circulation, a non-return valve to prevent upward circulation being sometimes arranged in this pipe. Steam flows out through a chamber 6 forming an enlarged part of the outlet pipe 7. Water flows off through a pipe 2' connected to the bottom of the chamber 6 or to the pipe 5. The

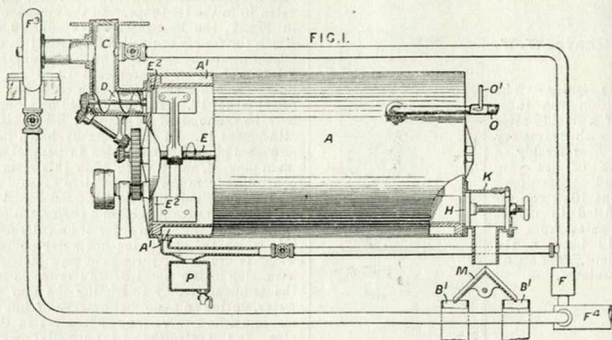
steam in the chamber 6 acts on a heat-sensitive capsule 8 connected by a hydraulic column 9 to a valve 10 in the feed-pipe. In the apparatus shown in Fig. 2, the heat-sensitive capsule 19 through which the feed is controlled is located in a chamber 18, connected by a pipe 17 with the upper, steam-filled, part of an enlargement 13 in the outflow pipe. The heater in this case comprises a cylindrical jacket 12. Heat is supplied by a burner and may be economized by a gilled heat-transmitting attachment 16. In the apparatus shown in Fig. 3, a by-pass pipe 25 is connected in parallel with the main pipe 24, and a valve 37 in this main pipe is controlled from the heat-sensitive capsule through a pipe 35. This capsule is wound round a flow-restricting cone contained in a perforated casing 32 connected to the steam space of an enlargement 29 into which the outflowing hot water pours. The water is drawn off through a pipe 30 with which the casing 32 is connected. In order to maintain the temperature, by restricting the flow of feed-water, during an abnormal outrush of hot water, a maximum-flow valve may be inserted in the feed-pipe. In this valve, the water normally flows through the pipe 43, Fig. 5, and slots 47, 48 and leaves by the pipe 44. A sudden rush of feed-water closes the valve against the spring 46 so that the passage 49 is throttled by the part 50 of the valve and the feed is retarded.

3622. Weir, G. & J., and Weir, W.
Feb. 12.



Feed-water, heating.—In a locomotive, feed-water which is at all times at about boiling temperature, is supplied by an independent pump and is passed through an exhaust-steam heater placed on the discharge side of the pump and then through a direct-contact live-steam heater in the boiler steam space. The exhaust from the feed-pump *a*, is led through a pipe *k* into the feed-heater *e* in addition to the main-engine exhaust, which is led into the heater through a pipe *h*. The feed-water passes into the boiler through a spraying-device *g* consisting of a mushroom valve pressed upwards against its seat by a spring on its spindle.

3664. **Powling, W. T., and Powling, B. B.,** [trading as Powling Bros.]. Feb. 12.

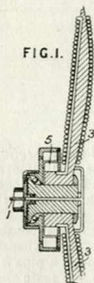


Digesters.—Apparatus for rendering tallow, or for extracting fat, oil, &c. from bones, fish, blubber, seeds, &c. of the kind described in Specification 8397/12, [Class 91, Oils &c.], is combined with a preliminary heating-vessel of such capacity as to supply two or more extracting-vessels, and this vessel is heated by the vapours from the extracting-vessels and by the exhaust steam from an engine driving the agitators. The preliminary heating-vessel A is fed from a hopper C by a worm D, and the material is cut up as it enters the vessel by knives E' attached to the agitators. The vessel is heated by vapours from the extracting-vessels admitted to a jacket A' by the pipe O, a steam-jet O' being used to cause

flow of the vapours. Water condensed from the vapour is collected in a vessel P, and the remainder of the vapours together with those from the interior of the vessel are passed by pumps F, F' to a flue F' leading to a furnace K. The material is delivered through an outlet K, fitted with a screw-down valve H, on to a pivoted shoot M which discharges it into one of the hoppers B' leading to the extracting-vessels. The agitators E, and also the agitators in the extracting-vessels, may consist of scoops or trough-shaped paddles. According to the Provisional Specification, ozone may be injected into the vessels.

3730. **Hailer, H., and Hofmann, H.** Feb. 12.

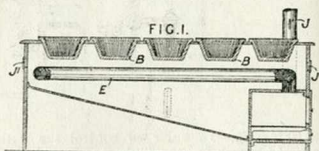
Heating air.—A heating medium such as steam is circulated through tubes coiled around the blades 3 of a fan to heat the air of a room &c., the heating medium being afterwards delivered to a turbine 5 driving the fan. The admission valve 1 may be controlled by a thermostat, and the turbine may perform additional work.



3867. **Änfossi, J.** Feb. 21, 1913, [Convention date].

Boiling-pans.—Fruit is heated with syrup in earthenware pans B in a flue E from a coal or

gas fire. The temperature is controlled by a register J and vents J', and metal sheets may be



placed beneath any pans receiving too much heat. The fire may be replaced by a steam heater.

3984. **Krieger, F.** Feb. 15, 1913, [Convention date]. Void. [Published under Section 91 of the Act.] [Addition to 9678/13, Class 75 (i), Burners &c.]

Water-tube boilers; internally-fired boilers.—Relates to the heating of water by the catalytic combustion of gas or vapour. In one arrange-

ment, asbestos fabric mantle-shaped bodies impregnated with platinum or other catalytic substance, each provided with a separately regulable burner, are surrounded by water-heating coils arranged in parallel or in series, and preferably surrounded by hoods which open into a common exhaust flue, the whole being enclosed in a metal casing provided with burner-igniting openings. Figs. 22 and 23 show a modified water-heater having burners adjustably arranged so that they may be used for heating the room. The burners 20 carrying the mantles 7 are fitted to a hollow plate 37 vertically-adjustable on a guide 38 provided with a buffer-spring 49 and supplied with gas through the jointed pipes 40. The mantles 7 fit in recesses in the internal wall of the heater, and the combustion products pass to the outlet 48 through the passages 46, 47.

FIG. 22.

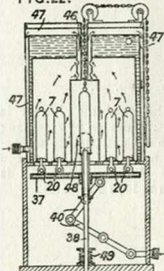
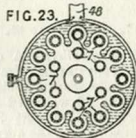


FIG. 23.



4252. Harrison, A. D. Feb. 18.

Feed-water, heating.—

Apparatus for transferring heat from one fluid to another, such as steam-generators, water-heaters, evaporators, condensers, are made of plates clamped together and provided with flanges &c. to form passages for the fluid, the arrangement being such that the fluid that loses heat passes through passages of decreasing cross-section. Figs. 2, 3, and 4 show an arrangement of circular plates suitable for a steam-generator, superheater, &c. The plate 1 is provided with a flange 7 round the circumference, a central opening 5 surrounded by a flange 6 and radial openings 8 extending between the flanges. The plates 2 are fitted with radial openings 10 corresponding to the openings 8 in the plates 1 and surrounded by flanges 12. Baffles forming distant-pieces are formed on the surface of the plates. The whole is surrounded by a casing 4. The furnace gases enter the casing 4, pass through the spaces 15 between the flanges 12 in the plates 2 and pass out by a central flue 17. The water spaces 14 are enclosed between the plates and the flanges 6, 7 in the plates 1 and communicate by the openings 8, 10 in the plates. Modified forms of plate suitable for condensers are also described. Figs. 8 and 10 show a pair of such plates in which the openings surrounded by the flanges 12 are divided by partitions 45 forming flow and return

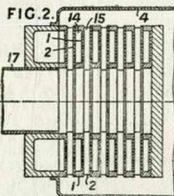


FIG. 3.

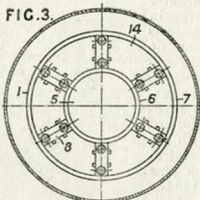


FIG. 8.

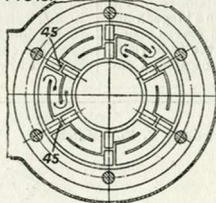


FIG. 4.

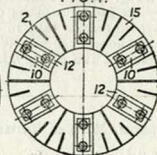
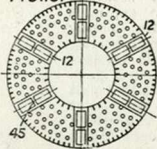


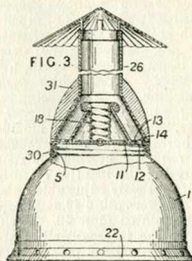
FIG. 10.



passages for the cooling water, baffles being provided as shown. The plates may be sloped to allow water of condensation to drain off and may be corrugated.

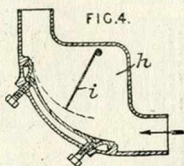
5027. Rogers, G. P. Feb. 26.

Washing-boilers.—A clothes-washing plunger is adapted for use as a circulating-device by removing the handle from the sleeve 18 and fitting an attachment 26 weighted by a collar 31 upon the screw threaded part 30. A valve plate 13 is adjusted so that the apertures 14, 12 register.



5438. Junkers, H. March 7, 1913, [Convention date].

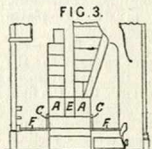
Boilers.—A water heater of the type in which the products of combustion do not come into contact with the water, is fitted with a gas-consumption regulator either formed integrally with the burner or introduced in the pipe line adjacent to the burner. In the form shown in Fig. 4, the gas-consumption regulator is actuated by the fluid flow acting on a hinged vane *i*, which is pivoted eccentrically in a curved casing so as to restrict the passage way as the vane rises. The curved part of the casing *h* is capable of ad-



justment by means of two screws for regulating purposes. In a modification, the part *h* is dispensed with and the flap is adjustably loaded by weights.

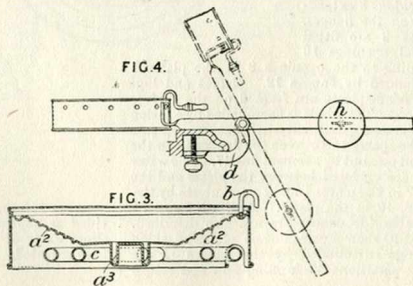
5553. Pickard, W. March 5.

Block-form boilers.—A boiler adapted to be fitted between two fire-grates of a double-fronted stove has a vertical flue rising through it. The boiler is mounted on two fire-bricks *A*, and forms with them a flue closable at either end by a door *C*, so that the boiler may be heated by either of the fires *F* or by both.



5646. Beeson, L., and Thurgood, J. L. March 5.

Geysers and instantaneous water-heaters.—Relates to apparatus for use with cooking stoves for rapidly heating water. In the arrangement shown in Fig. 3, water supplied by a pipe *b* passes over the interior of a corrugated or ribbed conical receptacle *a*² and reaches one or more deep narrow concentric channels *a*³, from which it is drawn off through the outlet pipe *c*. The pipe *c* is arranged in a spiral encircling the channel *a*³. The apparatus may be provided with a fixed or removable cover. In a modification, the water



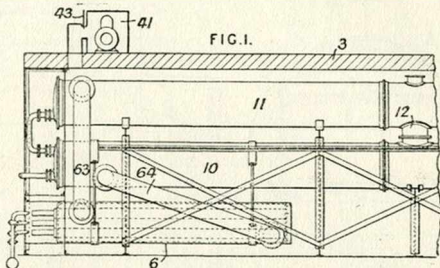
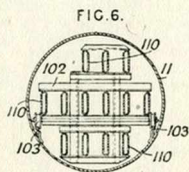
flows over the convex surface of the conical receptacle from the centre outwards. The heater may be simply placed on the stove, or may be

clamped thereto. The supply pipe may be arranged in a coil underneath the heater. The lifting of the heater from the stove is usually arranged so as to cut off the water supply. Fig. 4 shows a construction in which the heater is automatically raised when empty. The heater is mounted on a counter-

balanced arm *h*, carried by a bracket *d*. When the supply is opened the entrance of water into the heater causes it to descend. Water can be supplied from the ordinary service tap through flexible tubing.

5845. International Nitrogen and Power Co., Buckle, E. A., and Lucas, O. D.

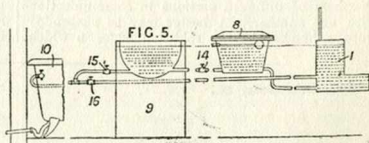
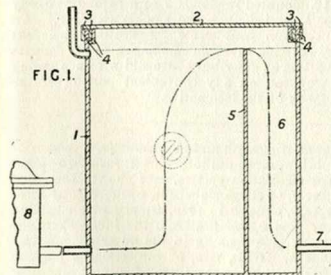
March 7.



Heating liquids.—Apparatus for heating pulped peat and the like consists of a chamber 3, Fig. 1, enclosing one or more vessels 10, 11, and one or more internally-fired water boilers 6 connected to them, the vessels 10, 11 being traversed by tubes conveying the peat &c. Products of combustion from the boiler flues, which are open ended, fill and heat the chamber 3, and are withdrawn by fans in upper flues 41, dampers 43 being operated by levers. Preferably two superposed vessels 10, 11 are mounted above two gas-fired boilers 6 of less than half the length, one at each end, three such sets

being arranged in the same chamber 3. Flow and return pipes 63, 64 connect the boilers to the vessels 10, 11 which are connected in the middle at 12. The peat tubes 110, Fig. 6, are preferably elliptical, and are looped within the vessels 10, 11, in which they are supported by frames 102 having small wheels resting upon rails 103. According to the Provisional Specification, the apparatus is employed in the process described in Specification 10,370/12, [Class 50, Fuel, Manufacture of].

5980. Cornes, J., and Cornes, H. M. March 9.



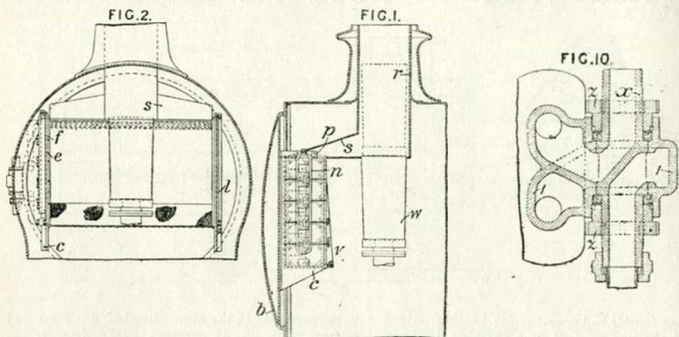
Heating water; boilers; washing-boilers.—In combinations of a range, copper, and bath as described in Specification 16,871/01 or otherwise,

the feed-cistern 8 is interposed between the copper 9 and the range boiler 1 and is connected directly to them; the copper and boiler are each connected

with the bath 10, valves 14, 15, 16 being provided so that the bath may be supplied from either of them. The boiler may be divided by a partition 5 extending to near the top of the boiler to form a separate hot-water chamber 6 with an outlet 7 near the bottom. A loose lid 2 with one or more

rims 3 fitting between, around, or both between and around, rims 4 formed on the upper edge of the boiler may be provided. The copper may be heated by a separate fire or by the range fire and may have a draw-off tap.

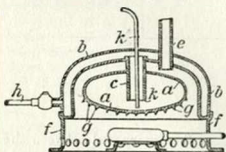
6396. Trevithick, F. H. March 13.



Feed-water, heating.—In a locomotive, marine, or other boiler having a feed-water heater carried by the smoke-box door, as described in Specification 28,019/11, the heater is supported by one or more brackets secured to the inside of the door. A heater, supported upon brackets *c*, Figs. 1 and 2, secured to a locomotive smoke-box door *b*, is built up of five sections, each of which consists of straight tubes connected to side headers formed by bolting together cast-iron or like plates *e*, *f* provided with webs or flanges on their inner faces. The sections are secured at one end by a strip *l* bolted to the bracket at the top and at the bottom and engaging with lugs on the headers. At the other end, the sections are secured by an adjustable strap *n* engaging with lugs on the headers and with a stop *p* at the top of the bracket. The lugs are formed with passages placing the header chambers of different sections in communication with one another. A heater may be suspended from a bracket having rabbeted edges in which

slide lips or ledges formed on the heater. A hood *s* integral with or attached to the chimney *r* extends over the top of the heater and is held by flanges engaging in grooves in the inside header plates. Spark-arresting frames or screens of wire netting are inserted in grooves formed at the rear, bottom, and front of the header plates, and an additional screen *v* may be arranged over the whole of the rear of the heater. A pipe *w*, between the blast-nozzle and the chimney, may be raised to a position inside the chimney when starting the boiler or when examining the boiler tubes. A hinged connexion for the inlet and outlet pipes of the heater consists of a two-way tubular fitting *x*, Fig. 10, mounted in glands *z* in a second two-way fitting *l* carried upon the smoke-box door. An exhaust-steam feed-heater for heating the feed before entering the main smoke-box heater consists of a section as described above slid within a casing and mounted on any convenient portion of the framework of the locomotive.

6446. Watson, M. Sept. 12.

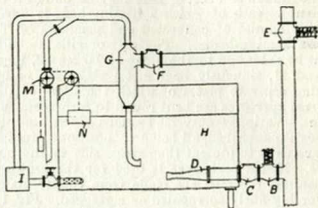


Boilers.—Relates to water-heaters of the type comprising a dome-shaped outer water chamber

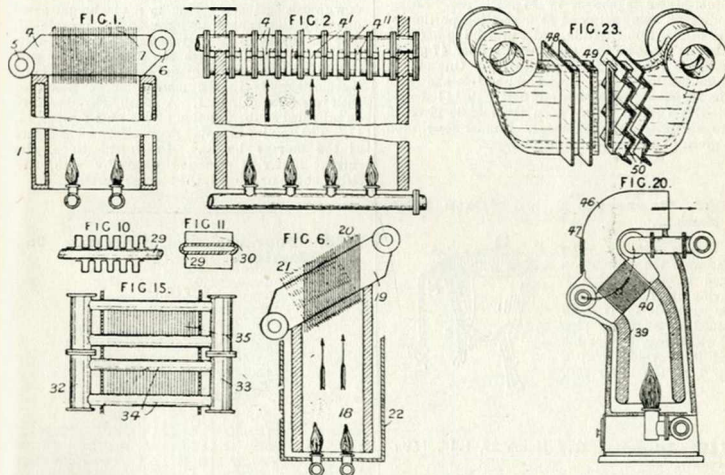
communicating with an inner chamber, a source of heat below, and outflow and return-flow pipes from a circulation system. As shown, the inner chamber *a*, of ellipsoidal shape, opens to the outer chamber *b*, circular in plan, by the pipe *c*. The outflow pipe *k* emerges from the inner chamber, the return pipe opening to the outer chamber by the pipe *h*. Gills, ribs, or projections *g* may be formed on the inner chamber. A gas burner may be provided below the heater within the casing *f*, the flue being shown at *e*.

6460. **Boot, H., and Phillips, R. J. Spencer-**, [trading as Boot & Partners, H.].
March 14.

Heating water.—Water in a tank H is heated by the discharge from an injector condenser G receiving the exhaust steam from a turbine through a non-return valve F. The supply of fresh water to the condenser is regulated by a valve M operated by a float N in the tank. Water is withdrawn from the bottom of the tank and returned to the condenser by a pump I. When the temperature of the water rises above a certain limit the exhaust steam passes directly into the tank through the loaded valve B, non-return valve C, and silencer D. A valve E in the exhaust-pipe allows the exhaust when it reaches a predetermined pressure to discharge into the atmosphere. The apparatus is intended particularly for use in breweries and similar works.



6757. **Junkers, H.** March 17, 1913, [Convention date].



Heating water.—Relates to water-heaters and steam-generators utilizing blast-furnace gases and composed of gilled elements. A gilled heating-body is mounted transversely in or over a combustion chamber of suitable form and is provided with either one or two flattened passages; several such bodies may be arranged in parallel connexion with each other. In the form shown in cross-section in Fig. 1, and longitudinal section in Fig. 2, the heating-bodies 4, 4', 4'' are mounted on a shaft or flue 1 having metal water-jacketed longitudinal walls, the heating-bodies being connected to common headers 5, 6 and having a rectangular

section with an internal narrow rectangular passage, and thin gills 7 being arranged on the outside. In modifications, the headers are bent upwards and downwards; each heating-body may be composed of two tubes with common gills; or it may be of a U-shape placed horizontally with one header above the other upon the same side, or S-shape with separated gills and opposite headers. Fig. 6 shows an arrangement in which the heating-bodies 19 are placed with an upward rake, the gills being either vertical, as shown at 20, or sloping, as shown at 21, and another combustion shaft 18 being surrounded by an open jacket 22 in which

the air for combustion becomes heated. In these forms, the headers or header-pipes may either be separate pipes, to the branches of which the heating-bodies are secured, or they may be built up of sections to each of which a heating-body is fixed, or may consist of connected end-members of T-shaped heating-bodies. The ribs or gills are built up as by soldering to the sides of bodies 29, Figs. 10 and 11, sinuously bent metal plates 30, or by affixing separate plates of which the edges of the internal apertures are bent round to form distance-pieces. Various transverse sections of the heating-bodies are described, all being so positioned in the apparatus as to present the narrow side to the hot gases. Nickel or bronze is used for the heating-bodies, and the gills are made from copper plate, preferably finely corrugated or zigzagged. Fig. 15 shows a form in which the elements consist each of header sections 32, 33 connected by two large middle pieces 34 between which the gills 35 are situated, and if the distance between the middle pieces be increased, the gills may be interrupted in the middle by a central solid hood. A complete liquid-heater is shown in Fig. 20, the heating-bodies 40 being situated at a slanting portion of the combustion shaft 39, and a protecting-hood 46 carrying off the spent gases, with a door 47 giving access to the gills for soot-clearing. One of the liquid-heating bodies thus employed is shown in Fig. 23, having both plain and corrugated U-shaped gill-plates 48, 50 riding upon the middle piece 49 provided with a single passage. Similar description is given of a form with two passages.

7036. Townsend, H., and Wilson, J. W.
March 20.

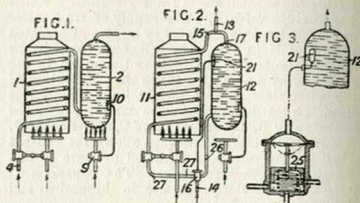
Washing-boilers.—To discharge the contents, a fixed interior pipe P having its outlet below the water-level is continued as an outer pipe P' which may be flexible and is provided with a tap T at the lower end.



7118. Junkers, H. March 22, 1913, [Convention date].

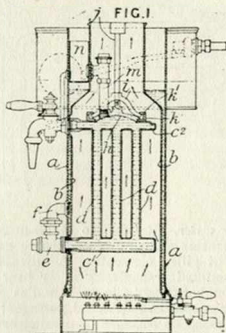
Heating water.—A water-heater for use in dwelling-houses and hotels comprises a current heater or geyser and a storage heater, which are so connected that the current heater does not begin to supply hot water until the storage heater has been wholly or partially discharged. The gas supply to the current heater 1, Fig. 1, which is connected in series with the storage heaters 2, is so regulated by a valve or the like in the water-supply pipe 4 that gas is turned on only when a large quantity of water is being withdrawn. The gas supply to the storage heater is regulated thermostatically so that the gas-cock 9 is turned full on when cold water reaches the level of a capsule 10. The heaters 11, 12, Fig. 2, are connected to the

supply and delivery pipes 14, 13 in parallel. The water supply valve 16 is operated thermostatically so that when the cold-water supply led to the storage-heater reaches the level of a capsule 21, the



supply-pipe 26 is cut off and the supply-pipe 27 of the current heater 11 is opened. The valve may consist of a piston 25, Fig. 3, which, when the heater 12 is full of hot water, is pressed downwards against a spring by a diaphragm acted upon by the vapour pressure in the capsule 21. The gas supply to the current heater is opened by the flow of water through the pipe 27. The gas-supply cock of the storage heater is regulated thermostatically in the manner above described with reference to Fig. 1. A mixing-chamber may be provided at the junction of the outlet pipes 15, 17. The mixing-chamber may be formed as a part of the storage heater. In modifications, the current heater is arranged co-axially with, and either above or around, the storage heater.

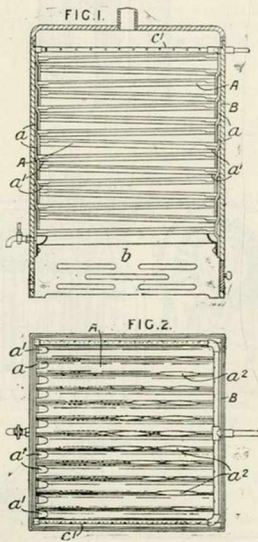
7198. Fourness Manufacturing Co., and Martin, J. March 21.



Heating water.—Apparatus for heating water comprises two shells *a, b* forming a narrow annulus. Two headers *c, c'* connected by preferably flat tubes *d* are arranged within the casing *b*. The header *c'* communicates with the

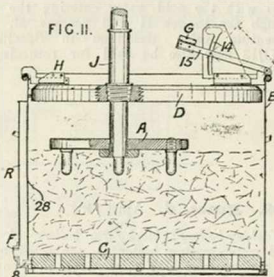
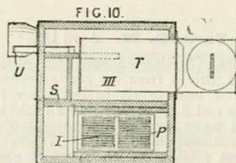
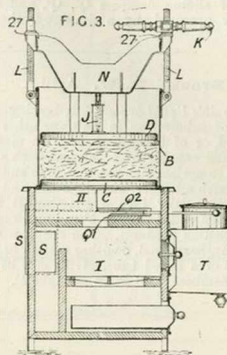
water annulus by a T-piece *e* and elbow *f*. The upper header is connected to the draw-off fitting, which may be also connected to the expansion box *m*, which is as usual connected to the header *c*² by a pipe *n*. The header *c*² has a removable cover *h* held by a screwed bolt *j* passing through a tripod *i*, which is held by the upper flange *h*¹ of a channel-shaped ring *k* surrounding the opening in the header. The pipe *m* is unscrewed before removing the cover.

7461. **Simmons, E. W.** March 24.



Geysers; heating liquids.—A water-heating apparatus comprises a casing *B* with a series of superposed corrugated plates *A* alternately inclined in opposite directions. The plates are positioned by bent vertical plates *a* which overlap as shown. The water to be heated is sprayed from the perforated pipes *c*¹ and flows from plate to plate by apertures *a*¹ in the bottoms of the corrugations at the lower ends of the plates. The heating-gases from a burner *b* pursue an upward zigzag course and pass through apertures *a*² in the tops of the corrugations. The number of apertures may gradually decrease towards the upper tray. The heating-gases may be arranged to heat the outside of the casing. In a modification, the casing may be formed as a water jacket.

7441. **Holzer, F. W.** March 26.



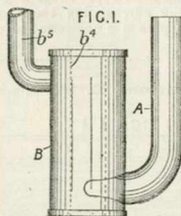
Heating water; washing-boilers.—A clothes-washing receptacle *B*, Fig. 11, is fitted with a perforated removable false bottom *C* positioned by pins *8*, and is provided with a vertical steam-escape passage *R* having a tap *F* and perforations *28*. The upper disk *D* serves alternatively as a support for the dolly *A*, or as a wringer press. The boiler is heated by a furnace having a combustion chamber *I* which can be put into communication with the boiler-heating chamber *II* and downwards with the chamber *III* for heating the supply liquor in the vessel *T*. This vessel slants outwardly both at

top and bottom, and outside the casing is fitted with a lidded extension and a draw-off cock. By means of sliding dampers Q', Q', and S, simultaneously operated by a draw-rod, the furnace

gases can pass into either of the chambers II or III, while by closing the damper U both chambers are heated.

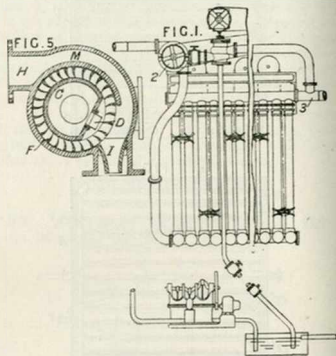
8891. Brooks, E. W. April 8.

Submersible liquid heaters.—A heating-apparatus capable of submersion in water or other liquid to be heated, or of being embedded in metals to be melted, and capable of other uses such as heating an oven, comprises a chamber A, one end of which is fitted with a burner, and the other end of which opens tangentially into a chamber B having a central open ended passage b^4 and an escape-pipe b^5 for combustion products. The chamber B may be of circular, hexagonal, or other section or may take the form of a coiled tube. Gills may be provided on the chambers A, B or on the tube b^5 .



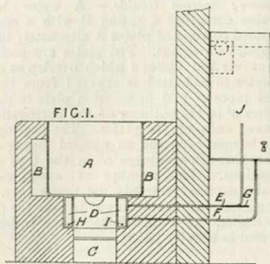
9203. Park, G. M. April 14.

Feed-water heating.—A centrifugal ejector pump 2, Fig. 1, driven from the gearing operating the scrapers is used to return hot water from the discharge end 3 of an economizer to the inlet end. The hot water entering the pump is discharged from a stationary drum C, Fig. 5, through a nozzle D against rotating blades F, which project the water at a high velocity into a cone I, where it mixes with the cold water entering the pump through the branch H and passage M. The momentum valve described in Specification 23,371/13 may also be used for returning hot water.



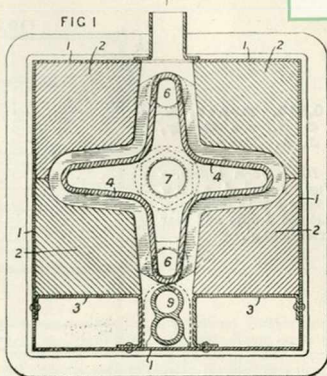
9209. Boast, C. April 14.

Washing-boilers; block-form boilers.—A three-sided water-heating boiler D, connected by flow and return pipes E, F respectively to a constant-level tank J, is fitted round the furnace C which is situated directly beneath an ordinary washing-copper A. The products of combustion pass from the furnace to the circular flue B through a semicircular depression in the top of the back of the boiler. One fire thus serves to boil the water in the copper and supply heated water to the tank at the same time. Short lengths of auxiliary tube G, H, I permit the insertion of brushes to clean the boiler and circulating-pipes. It is stated that the boiler and tank are especially suitable for fitting to existing coppers.



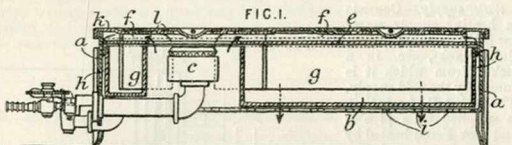
9481. Glover, T. April 16.

Boilers.—A water-heater consists of a vessel of cross or star shape supported in an opening of corresponding shape in a structure consisting of interchangeable fire-proof blocks. The blocks 2 are formed as shown and supported on lugs 3 in a casing 1. They enclose a space in which the vessel 4 is supported, preferably by gills formed on it. The vessel 4 is provided with openings 6, 7 for flow and return pipes and for cleaning, and is heated by a burner 9.



9375. Hipp, C. A. April 21, 1913, [Convention date].

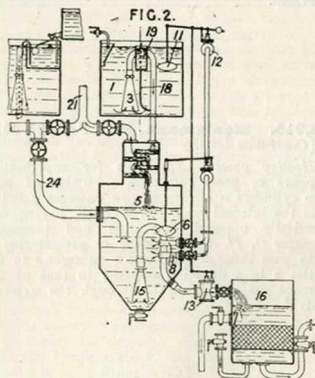
Block-form boilers.—A gas cooking-stove comprises a stand or casing *a* containing a boiler *b* with a loose cover *e* which has upwardly extending ribs *f* and deep ribs *g* extending into the water to facilitate the interchange of heat. The whole is covered by a hot-plate *h* with removable lids *l*. The ribs *f* conduct the gases from the burner *c* to spaces *h* between the boiler and the casing *a*, whence they pass away by



apertures *i*. Similar stoves may be fitted with two or more burners and boilers.

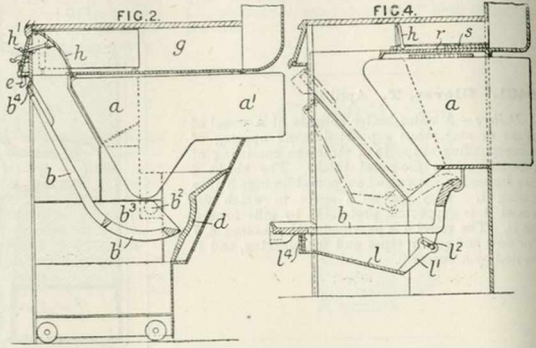
10,157. Maschinenbau-Anstalt Humboldt. Sept. 25, 1913, [Convention date].

Feed-water heating.—An upper tank 1 discharges through a siphon 3 to a heater 5, a second siphon 15 delivering the heated water to a filter 16. During the period of filling the upper tank 1, water in the heater 5 is heated by steam injected through nozzles 8. When the upper tank is nearly full, the float 11 rises and cuts off the steam to the jets by means of the valve 12, the same mechanism opening the outflow valve 13 from the heater 5. A definite quantity of water is thus transferred to the filter through the siphon 15. The valve 12 remains closed until the rising water in the tank 1 has filled the siphon and been discharged into the heater. The valve 13 is closed at the same time, and the water now in the heater raises the float 6 and admits steam to the nozzles 8 again. Exhaust steam may be admitted through the pipe 24 and any surplus escapes through the pipe 21. A siphon 18 may deliver a chemical reagent to the water in the tank 1 from a vessel 19.



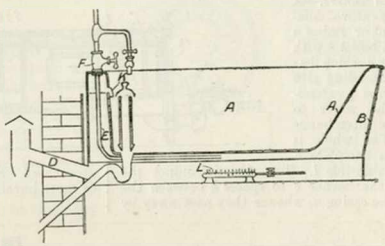
10,846. Bratt, L. G. J., and Getty, J. A. May 2.

Block-form boilers.— Figs. 2 and 4 show boilers *a* with forwardly-inclined fronts and rear extensions *a'*.



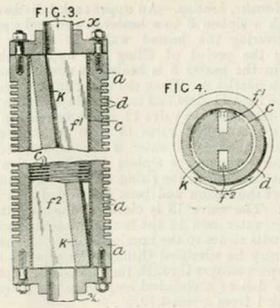
12,127. Cole, F. H. May 16.

Water supply.—Consists in heating supply water for baths, lavatory basins, sinks, tanks, &c. in a jacket from which it is forced by the cold supply. The jacket B of a bath A is supplied by a pipe E and cock F and heated by an electric or gas heater L. The heated water is forced through an opening K when the cock F is re-opened. A flue D is provided.



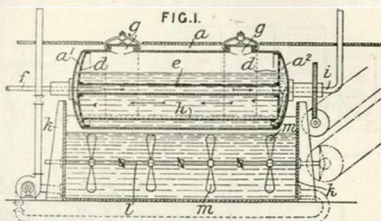
12,245. Honigmann, M. Sept. 22, 1913, [Convention date].

Heating gases.—Apparatus for superheating vapours or gases comprises a number of massive cylinders *a* having narrow passages *c* milled into the internal wall. A core *K* having diametrically opposed decreasing and increasing passages *f*¹, *f*² causes vapour or gas entering at *x* to pass through the narrow passages *c* to the outlet *z* in a direction opposed to that of the furnace gases which pass through the external slots *d*.



12,881. Milne, S. May 26.

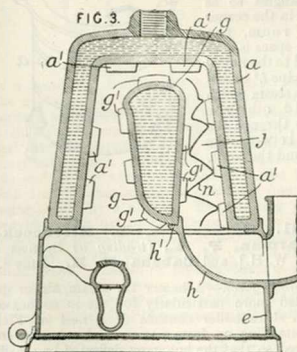
Digesters.—The rotary digester *a* of cylindrical, spherical, or other shape and for use in treating material for paper making &c. is fitted internally with two gratings *d* arranged near the ends to form spaces *a'*, *a''*, which are connected by a pipe *e*. A pipe *f* supplies steam to a nozzle for circulating the liquor from the space *a'* through the pipe *e* to the space *a''* and then back through the material to the space *a'* again. Steam may be supplied to both ends of the pipe *e*, which is then provided with an outlet opening near the centre. A pipe *i* supplies the liquor to a space beneath a longitudinal grating *h*, which is disposed opposite the charging-openings *g*. Baffles may be fitted in the digester. The contents of the digester are discharged into a tank *k*, where they are further treated by agitators *m* on a shaft *l*. The tank is preferably V-shaped with a rounded bottom, and is provided with a splash-guard. The material may be removed from the



tank by screws, buckets, &c. without further dilution, or may be diluted with waste liquor or water to consistency suitable for pumping. For short-fibred material, such as esparto, the discharge pump may be used for circulating the liquor in the tank. Alternatively, the tank may be provided with a grating and outlet cock for draining off the liquor and allowing the material to be washed. The tank may be sloped towards one end, in which case a series of tanks may be served by one conveying or transporting apparatus.

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13,093. Barralet, T. E., and Parkinson Stove Co. May 28.



Boilers.—In dome-shaped boilers having double walls *a* forming a water space, the transverse water chamber *g* is closed at the bottom and rests upon a ledge *h'* of a partition *h*, which separates the burner chamber *e* from the down flue *j*. The boiler and the transverse water space may have heat-absorbing projections *a'*, *g'*, and a zigzag baffle-plate *n* may be placed in the flue *j*.

13,098. Young, A. G. D. May 28.

Heating air.—Relates to plant for heating and supplying air to the driers used in tea factories &c. The air is drawn by a centrifugal fan successively across three separate sets of heating-pipes, the first containing the exhaust steam from the factory engine, the second live steam, and the third gases of combustion of a separate furnace; but the second or the third set of pipes, or both, may be cut out as desired. The fan may be driven off the factory shafting or by means of an auxiliary high-speed engine, which may, in case of need, serve to drive the factory shafting. Fig. 1 shows a plan of the whole plant. The main engine 2 is supplied with steam from the boiler 1, its exhaust passing into the header 9 of an air-condenser 10, either directly or through a superheater 7, the condenser being situated at the entrance of the air flue 12. The condensed steam is ejected by an ejector jet-pump 14 fitted at the bottom of the header 11. Any air contained in the exhaust steam is ejected by an ejector pump 15 fitted at the top of the header 11, the steam used passing through an auxiliary air-condenser 17 and so to the hot-well 20. The air next meets the live-steam heater section 23 furnished with a steam-trap 26 and regulator 27. The furnace-heated section consists of a stack of tubes 33 arranged between boxes 30, 31, the latter communicating with the chimney. The furnace is provided with a forced draught, and the temperature of the air is controlled by regulating this draught. The heated air passes through a chamber 32 fitted with a regulator 40 for admitting cold air, if the air is too hot. The fan 13 forces the air into the main duct 47, from

which it is distributed to the driers 50, 51, 52, 53 by branch ducts. In order to have a lower temperature in the last drier, where serial drying is

effected, a small fan 58 forces cooling-air into the last branch duct.

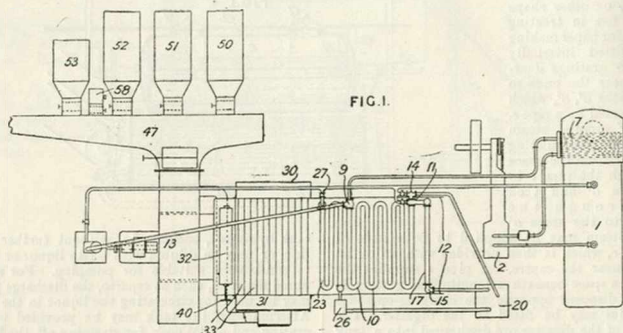
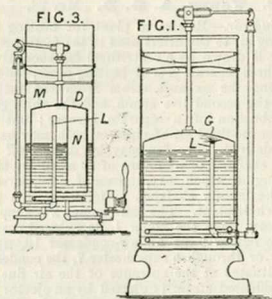


FIG. 1.

13,693. Stott, V. H., and Schofield, L.
June 5. [Cognate Application, 22,652/14.]
[Addition to 14,492/13.]



Water supply and delivery.—The water, instead of being allowed to fall upon the top of the bell or float as described in the parent Specification, is, according to the present invention, led along a pipe L, Fig. 1, into the steam space of the bell G. In some cases, a too rapid condensation of the steam is prevented by forming in the bell D a small chamber N, Fig. 3, to which the water is not supplied. The other part of the bell has a relief opening M which allows air to enter upon condensation of the steam.

13,694. Ewart, S. June 5.

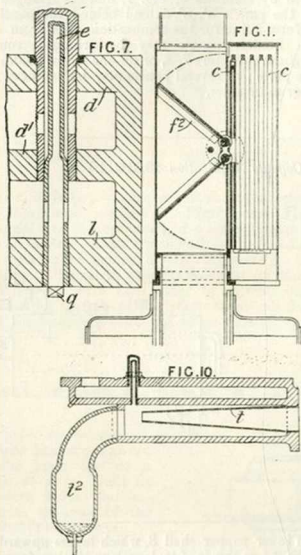
Washing-boilers.
—In a gas-copper a having the top b formed with two portions c, d at right-angles so as to fit in the corner of a room, the steam space is connected to the flue h¹ by a pipe h² to discharge steam which would otherwise escape through the joint between the lid f and the top b.



13,831. Spencer, A. L. Hitchcock, Sharman, P. A., [trading as Spencer & Co., W. H.], and Cabena, R. H. June 8.

Heating gases.—A heater for steam, air, or gas intended more particularly for use in connexion with a steam-boiler consists of a nest of Field tubes standing up from a two-chamber header and arranged so that the hot gases deflected by a baffle or damper in a flue or uptake flow around the lower part of the tubes and then flow around the upper part to an outlet above the baffle or damper. The steam-superheater c, Fig. 1, is arranged in a casing at the side of the uptake of a vertical boiler, the uptake being cut away to allow the gases to pass into and out of the casing. The course of the gases is determined by balanced pivoted dampers f² operated simultaneously through intermeshing

pinions. The dampers may cut off the superheater entirely from the uptake. The wet steam may enter the header through a cone *t*, Fig. 10, serving as a steam-separator, the separated water collecting

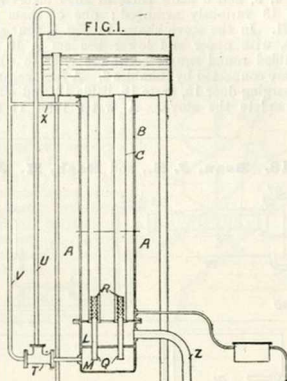


in a vessel *p*. Baffles may be provided to force the gases to take a zigzag course in their upward passage among the tubes. The outer tube of a Field tube is screwed into the top wall *d*, Fig. 7, and into the partition *d*¹ of the header, and the inner tube *e* has a swelled end and is screwed into the end of the outer tube and into the bottom wall *l* of the header, the end of the inner tube being closed by a plug *g*. The dampers may be provided with flat or dish-shaped removable facpieces, and instead of being pivoted at their inner edges, as shown, they may be pivoted at their outer edges. Instead of pivoted dampers, a single sliding fire-brick damper or inclined baffle-plates may be used. Specifications 14,853/86 and 5546/05, [both in Class 123, Steam generators], are referred to.

13,853. Saich, H. C. June 8.

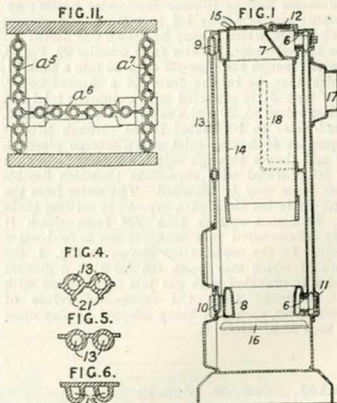
Heating water.—Apparatus for heating and circulating water consists of a casing *B* traversed by tubes *C* which connect an upper closed tank *A* and a lower header *L*, which is connected to the return pipe *Z*. Tubes *Q* passing right through the header *L* project into the tubes *C* and are drilled at their closed upper ends *R* and wrapped in copper

gauze. An ejector *T* supplied with steam from a pipe *V* draws in air from above the water in the tank *A* by a pipe *U*, and the mixture of air and steam is forced into a chamber *M*, where it passes



by the tubes *Q*. The steam is condensed by the water in the chamber *L*, and the air alone issues from the ends *R* of the tubes *Q* and causes the water to circulate through the tubes *C*, which are heated exteriorly by steam admitted to the casing *B* by a branch pipe *X* from the pipe *V*.

14,005. Courtot, L. Feb. 23, [Convention date]. Void. [Published under Section 91 of the Act.]

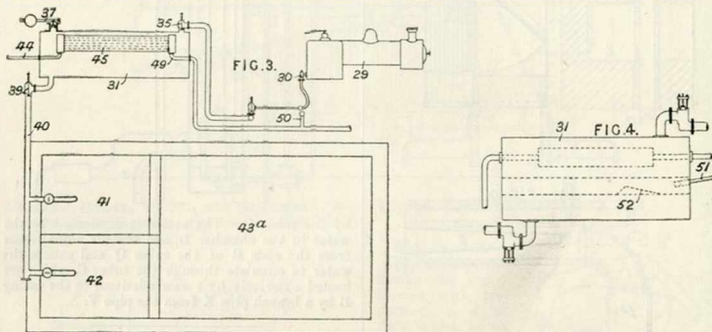


Water-tube boilers.—A stove or furnace for

heating water for a hot-water heating system has one or more walls or parts formed of plates in which are cast tubes of small cross-section connecting upper and lower headers or collectors. Figs. 4, 5, and 6 show parts of such plates with tubes 13 variously arranged; one of them has gills 21. In the stove shown in Fig. 1, four such plates, with upper and lower headers 9, 10, are assembled round square collectors 7, 8, to which they are connected by thimbles 6. A fuel magazine 14, charging-door 15, grate 16, baffle 18, and outlet 17 complete the stove. A water inlet 11 and

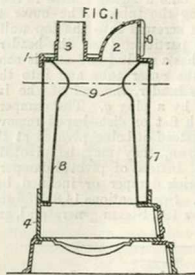
outlet 12 are provided. All the tubes 13 may be vertical, as shown; or some may be inclined and parallel or crossing. In the kitchen-range grate shown in Fig. 11, three panels a^b , a^c , a^d are connected by thimbles 6, Fig. 1, and are arranged so that the panels a^c , a^d extend behind the panel a^b and form a flue for the combustion gases from the fire. Similar panels may be arranged round polygonal collectors 7, 8, or on one or two sides of a fire-place; or several panels may be arranged on one or more sides.

14,618. **Bean, J. S., and Nash, H.** June 18. [Cognate Application, 23,516/14.]



Feed-water, heating.—The blow-down water from locomotives is led through a tank where it communicates heat to tubular feed-water heating apparatus and is finally led to settling and storage tanks from which it may be drawn and heated for use as feed-water. Water from a boiler 29, Fig. 3, passes through the blow-off cock 30 into a tank 31, which may be in the form of a disused boiler. The tank 31 is provided with automatic inlet and outlet valves 35, 39 and a safety valve 37 if desired. Feed-water to be heated is led through tubular apparatus 45 having inlet and discharge pipes 44, 49 and thence through suitable branch pipes such as 50 provided with stop-cocks to which flexible hose pipes may be attached. The water from the tank 31 is led through a pipe 40 to settling tanks 41, 42 and a storage tank 43^a from which it may be conveyed to a tank for use as feed-water again. In the modification shown in Fig. 4, the tank 31 which may be in the form of a disused boiler is provided with gas jets 51 supplied with gas produced from the smoke-box refuse of locomotives, such jets being adapted to play upon an arch 52 of firebrick.

to an inner copper shell 8, which tapers upwardly for about two-thirds of its length and is then formed with a rounded throat 9 and subsequently expands

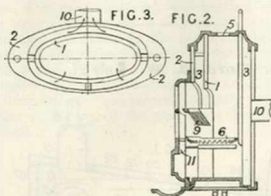


to meet the outer shell. The boiler rests on a cast-iron base 4 and has a cast-iron top 1 containing the feed-hopper 2 and smoke stack 3.

15,151. **Tod, D.** June 24.

Annular boilers.—Boilers of the annular type comprise a cylindrical outer shell 7 of copper brazed

- 15,679. **Chaboche, M. E. F.** April 30, [Convention date].

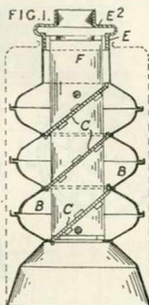


Annular boilers.—A boiler 1, 2, shown in vertical and horizontal sections in Figs. 2 and 3 and arranged in the upper part of a stove, comprises two concentric jackets which enclose the flue 3 and the central fuel chamber 5 above the grate 6. The boiler is elliptical in cross-section, and its jackets communicate with each other by suitable pipes. The heating surfaces of the jackets are so calculated that the temperature of the water escaping from

the boiler to a circulating system shall be sufficient to avoid noise in the mixing chamber of the system and that the temperature shall not exceed 90° C.

- 16,553. **Wilson, H. F.** July 11.

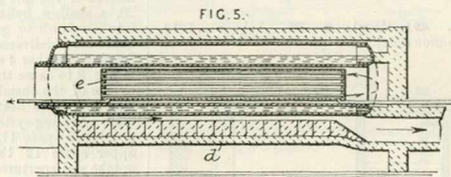
Internally-fired boilers.—In a water-heater of the type shown in Specification 13,558/10 and composed of superposed casings B, the flue gases are caused to take a circuitous course through the heater by inclined baffles C carried on a framework F. A cap E' fits in the chimney E and is attached to the framework F, which is removable with the baffles for cleaning purposes.



- 16,864. **Pfoser, A., Strack, O., and Stumm Geb.** July 15.

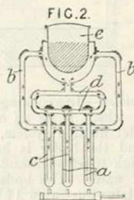
Feed-water, heating.—A tubular heater *e* is placed in the main flue of a boiler so as to limit its effective width and accelerate the flow of the combustion products.

Reference has been directed by the Comptroller to Specifications 5140/07 and 27,269/08.



- 17,190. **Higgins, E. B.** July 28, 1913.

Boiling pans; water-tube boilers.—Jacketed pans are heated by the circulation of liquid from a Field-tube heater *a*, *c* to a pan *e*, the circulation past the pan being in one direction only. A single tube *b*, *d* may connect each of the headers to the pan-casing, in place of the two shown.

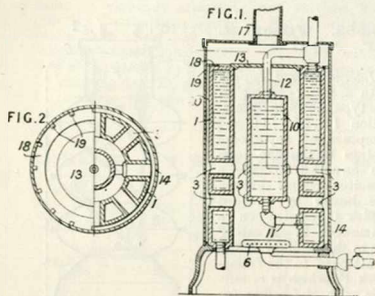


- 17,247. **Jarvis, H.** Jan. 29, [Convention date].

Boilers.—A water-heater consists of an annulus

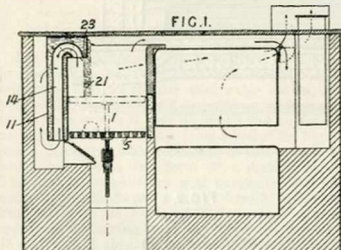
1 with a gas-burner 6 arranged so that the jets impinge horizontally on the interior wall of the annulus. The ascending products of combustion are deflected by a central cover-plate 13 and escape by

radial passages 3 into an annular space 20 between the annulus 1 and a casing 14. Before passing to the e-cape-pipe 17, the gases are baffled by a flat ring 18 having a series of narrow slots 19. A



cylindrical water-chamber 10 is arranged within the annulus and is connected therewith by pipes 11, 12.

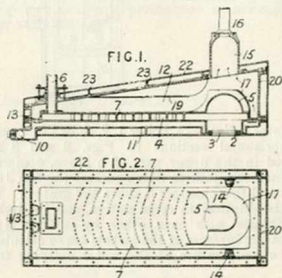
17,595. Giuliani, A. M. July 31, 1913, [Convention date].



Internally-fired boilers.—In a cooking-stove having a single fire-place which heats an oven and the boiler of a hot-water heating system, the oven is heated directly, and the boiler is heated by hot gases passing through tubes surrounded only by a small thickness of water. The boiler 11 around the fire-place 1 contains flue-tubes 14 bent over at their upper ends and opening through the under face of a part 23 of the boiler overhanging the grate 5. The gases pass around the outside of the boiler after leaving the flue-tubes. When the heating-system is not required, the capacity of the fire-place is reduced by raising the grate, and a shield plate 21 is so placed as to cut off the gases from the boiler. The grate is raised by a rack and

pinion operated through worm-gearing by a hand-wheel outside the stove.

17,712. Ford, R. W. July 27.

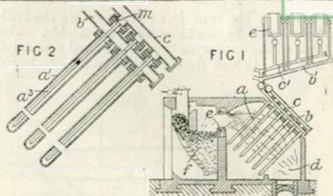


Boilers.—Apparatus for heating water, air, &c., of the kind in which the fluid to be heated is caused to travel in a direction opposite to the motion of the flue gases, comprises an outer casing 20, a shallow cylindrical combustion chamber 2 into which oil or gaseous fuel and air for combustion are delivered through an aperture 3, and a flat flue chamber 4 with baffles 7 arranged as shown in Fig. 2 to cause the flue gases to travel from side to side of the chamber as they pass to an uptake 6. The fluid to be heated, for instance return water from a heating-system, is fed through an inlet 10 to a lower space 11, which communicates with an upper space 12 through apertures 13 near the uptake and apertures 14 at the sides of the chamber 2, and the upper space is uniformly increased in depth from the inlet end to the chamber 2, above which is a dome-like enlargement 15 connected by a pipe 16 to the circulating system. In the space 12 are a curved baffle 17 partly surrounding the hemispherical top 5 of the combustion chamber, and a baffle 19 of which the bottom is slightly inclined upwards to the dome 15 and which may be made in two or more sections. The top and sides of the casing 20 are covered with a heat non-conducting casing 22, which is supported on webs 23 to prevent circulation of air.

17,881. Higgins, E. B. July 28. [Addition to 17,190/14.]

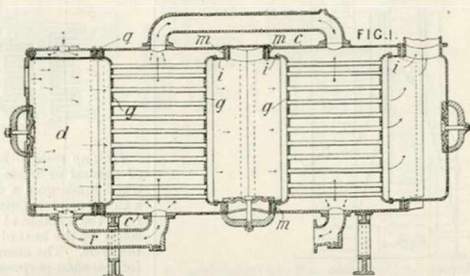
Boiling-pans; heating liquids.—To adapt the heating apparatus described in the parent Specification for use in installations operating upon a commercial scale, the thermo-siphon or Field tubes are mounted in a furnace setting. Inclined Field tubes *a*, Fig. 1, connected to flow and return pipes

b, c are arranged in a chamber *d* in the path of the gases from a producer *f*. Conduits *e* deliver air across the gases entering the heating chamber. Any one of the jackets *e* may be cut out of the circulation by valves in the pipes connecting the jacket to the main circulation-pipes *b, c*. The outer tubes *a*, Fig. 2, of the Field tubes are secured to flanges on the bottom of the pipe *b*, and the inner tubes *a*² are secured to plates *m* between flanges on the top of the pipe *b* and the bottom of the pipe *c*.



18,037. Bailey, W. M., and Cormack & Sons, J. July 30.

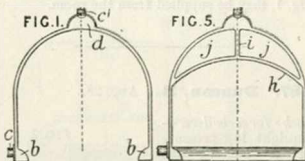
Boilers.—Apparatus for heating water by the exhaust gases from internal-combustion engines or other plant and for silencing the exhaust comprises tubular elements terminating in extensions which co-operate with extensions on adjacent elements or with cover-plates to form expansion chambers for the gases. Fig. 1 shows a heater formed of two elements, through which the water flows in turn in a direction opposite to that of the exhaust gases. The extensions *i* on the tube-plates *g* are riveted to the casing *c* either directly or through rings *m*. The water-space around the first expansion chamber *d* may be divided from the



rest of the water-space of the element by a ring *q*, the spaces being placed in communication with each other through a pipe *r*.

18,501. Tomsett, C. Aug. 10.

Boilers.—A saddle-shaped boiler has its inner and outer walls arranged closely together, the distance between the walls being say half inch in small boilers and one inch in large boilers, and has enlarged channels along its lower edges and at its top. The channels *b*, Fig. 1, along the lower edges of a boiler enable the return water entering through a pipe *c* to distribute itself equally, and provide room for the collection of sediment. The hot water collects in the top channel *d* and is taken off by a pipe *c*¹. In a wet-back boiler, the wet back is formed with a channel opening into the



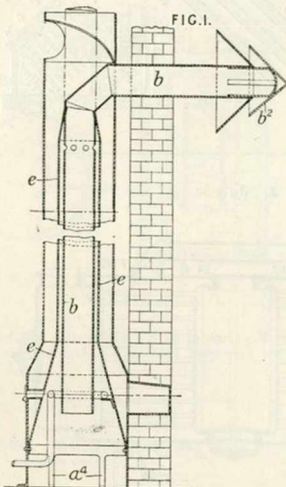
channels at the lower edges of the saddle. Water walls *h, i*, Fig. 5, may be provided inside a saddle to form return flues *j*.

18,536. Iinf, F. Aug. 11. [Addition to 27,807/13, Class 137, Ventilation.]

Heating air.—Apparatus as described in the

parent Specification for extracting foul air from a room and delivering fresh heated air, it may be modified as follows. A steam coil or the equivalent, as described in Specification 20,164/10, may replace

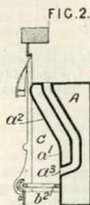
the burner. The cone b^1 of the cowl on the foul-air tube b may be fixed instead of adjustable. The bottom of the apparatus may be open and supported by legs a^1 . Forced draught may be used to impel



the fresh air, as described in Specification 20,164/10. Means for humidifying the fresh air may be provided. The fresh air may be admitted at atmospheric temperature by closing or dispensing with the passage between the tubes b, e , by lagging the tube b , and placing the heating means at or near the bottom of it. The air supplied for combustion may be fresh air from outside the room as described in the parent Specification or, as shown in Fig. 1, may be supplied from the room.

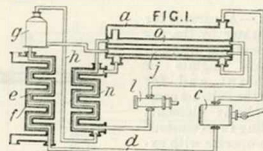
19,187. **Duncan, R.** Aug. 28.

Block-form boilers.—An upright low-pressure boiler A forming the back of a domestic fire-grate has a vertical back and an overhanging upper front plate a^2 , making an angle with the lower vertical front-plate a^1 and sloping backwards at the top. Laterally the boiler is shaped to fit the sloping side cheeks C of the grate, the part with the vertical front being narrowest,



and the overhanging front increasing in breadth upwards; alternatively the breadth is uniform. A wide tubular flue a^1 communicates with the fire-place slightly above the bottom grate b^1 , and conducts the gases into the chimney through an aperture in the top plate of the boiler which is either horizontal or slopes backwards. Several designs of boiler conforming to the general shape are described, the back-plate being either vertical or sloping forward at its upper part, and the flue following broadly the contour of the front plate. The base of the boiler rests upon the floor behind the grate.

20,267. **Beadle, C. H., and Power Progress, Ltd.** Sept. 28.

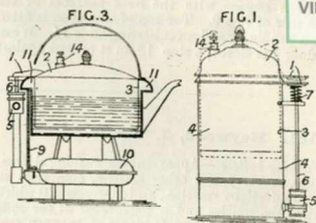


Heating water.—Energy is taken from a source of natural or waste heat by means of a solution which undergoes a cycle of thermal operations in a closed conduit circuit wherein the effusion of gas from the solution at one part of the cycle is effected solely by the heat of absorption at another part of the cycle. The energy is utilized in a prime mover for warming purposes. In the arrangement shown in Fig. 1, the gas effused in the generator a , which may, for example, be charged with hydrous ammonia and ammonia gas under about seven atmospheres pressure at normal temperature, is utilized in a motor c , the exhaust of which passes to a heating-coil e in a chamber f which is traversed by a current of air, brine, water, waste furnace gases, or exhaust steam. The warmed gas then passes to a controlling-device g to which weak solution is passed from the generator through a pipe h the heat from which may be utilized for heating water.

20,277. **Stott, V. H., and Schofield, L.** Sept. 28.

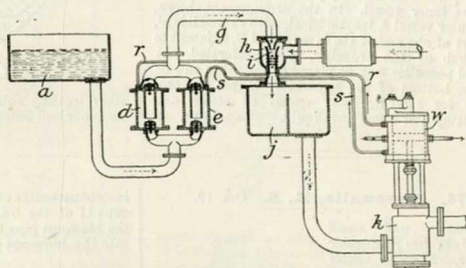
Portable and small liquid-heaters.—In water-heaters in which a float or inverted cup is used for regulating the gas supply, the float is formed with or has attached thereto a lip which projects outside the heater and contacts with a tappet lever operating the gas valve. The inverted cup or float 3 of an urn 4, Fig. 1, has a lip 1 on the crown 2, the lip engaging a long spindle 6 of the gas valve 5. A spring 7 tends to hold the gas valve in the closed position, and a relief valve 14 is fitted in the crown 2. The rise and fall of the float automatically controls the burner so that the water is brought to boiling-point and so maintained. In

a modification, a rod attached to the lip acts on a short valve spindle, and the spindles or tappets may be suitably enclosed. In another form, the lip acts on a rocking lever which in turn acts on the valve spindle. For use with kettles, the valve box 5, Fig. 3, is raised, a plate 9 shielding it from the burner 10. When shallow boiling-vessels are used, an enlargement 11 is formed to take up the volume of expansion with a small rise of the float, and a shoulder is formed to prevent the united pressure in the float at the moment of boiling from forcing water over the edge.



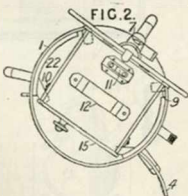
20,626. Caille, C. Oct. 6.

Feed-water, heating.—The water is fed to the direct-contact heater *h* from two receivers *d*, *e*, which are fitted with suction and delivery valves and are discharged alternately by the pressure of steam from two small pipes *r*, *s* connected to opposite ends of the steam cylinder *w* of the feed-pump *k*. The action of the receivers thus synchronizes with that of the feed-pump. The water is supplied to the receivers from an elevated tank *a* and is delivered to the heater through a pipe *g*, which extends above the maximum level of the water in the tank *a*. A settling-chamber *j* is fitted between the heater and the pump *k*, which

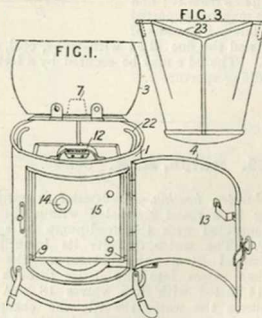


is preferably of the construction described in Specification 15,860,08. The heater consists of a casing with inlet pipes for the water and exhaust steam and with a perforated mixing-nozzle *i*.

20,943. Pilkington, W. Oct. 14.



Boiling-pans.—A casing containing gas burners is adapted to enclose and support either a boiling-pan or an oven. The casing 1, Figs. 1 and 2, having a hinged lid 3 and a door 4 is provided at its lower part with lugs 9, which support an oven 15, and at its upper part with circumferential projections 22, which support a boiling-pan having a flanged rim. Projections 10 on the bottom of

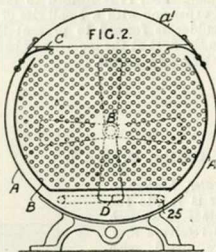


the oven engage with the back surfaces of the front pair of lugs 9. The top of the oven is fitted with a handle 12 and a ventilating-slide 11. When the door 4 is closed, a stop 13 on it presses against

the oven door-handle 14. The back of the boiling-pan, Fig. 3, is flattened, and a triangular opening 23 is formed at the top to allow steam to escape to the vent 7.

21,161. Heywood, J. Oct. 19.

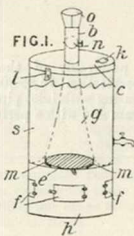
Washing-boilers.—Apparatus for washing clothes, textiles, crockery, and other articles, comprises an outer liquid-tight vessel A, an inner vessel B which contains the articles and is perforated at the ends and bottom, a propeller D situated between one end of the inner vessel and the outer vessel, baffle plates C attached to the outer vessel to deflect liquid over the edge of the inner vessel, and one or more perforated steam-pipes 25 below the bottom of the inner vessel. In the arrangement shown, the outer vessel A is cylindrical, with curved lids a' . A part of one end of the inner vessel B, adjacent to the hub of the propeller, is unperforated. A second propeller may be placed at the other end or at the bottom of the apparatus. Pipes are provided for carrying away excess of steam and admitting and removing liquid. Soap, blue, or



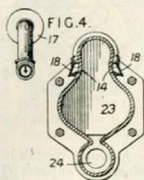
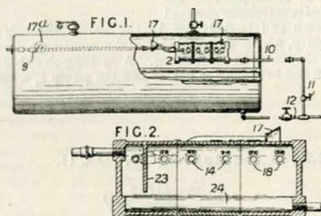
other treating substance may be placed between the inner and outer vessels.

21,174. Jassawalla, K. S. Oct. 19.

Portable and small liquid-heaters; annular boilers.—A water heater primarily for field or camp use, but such as may be used on farms or in private houses, consists of a boiler s with a tapering flue g , a removable lid c , and a stand h with doors f . The apparatus may be placed over a trench-kitchen fire, and heated by the waste gases from it; or a grate e may be supported in the flue g by means of lugs m and the flue filled with wood, coal, or dry refuse. The lid c may be secured by a lock l and has a filling-aperture k .



is connected at the upper part with scum cups 17 of the boiler and at the lower part with the blow-out pipe 10 and valve 11, which may open into the blow-out pipe 12 of the boiler. Another



21,552. Ralph, H. H. Oct. 26.

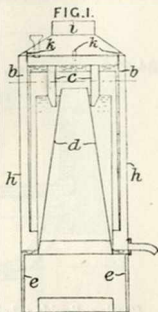
Feed-water, heating.—Feed-water is purified by heating in a vessel 2 situated within the boiler and connected with the feed-pump by a coiled pipe 9. The water deposits its impurities in the channel 24 at the bottom of the vessel and then passes into the boiler through openings 14 fitted with flap valves 18. A baffle 23 deflects the water towards the channel 24. For blowing out the sediment, the vessel 2

scum cup 17^a is connected with the coiled pipe 9. Non-return valves opening towards the purifier are fitted in connexion with the scum cups. The vessel 2 is shown made in sections.

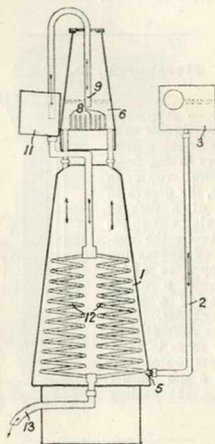
22,590. Jackson, C. L. H., and Abbott, Ltd., G. Nov. 16.

Heating water; geysers; internally-fired boilers.—

A geyser of the open type comprises tapering water chambers which may be readily inserted and removed and are so connected that they retain water when the supply to the geyser is cut off. The tapering annular water chamber *b* is suspended by lugs *k* from the removable top *i* of the casing *h*. Water flows from the chamber *b* through tubes *c* to a second tapering chamber formed around the conical flue *d*. It then flows over the top of the second chamber into a jacket *e* around the fire-box. The geyser may be converted into one of the closed type by placing plates on the tops of the water chambers and by connecting the second water chamber and the jacket *e* by a pipe passing through the flues.



with a non-return valve 5. The boiler is discharged by a siphon tube 9 brought into action by the steam generated by the heating. The liquid



22,720. British Electric Heater Co., and Kratt, C. Nov. 18.

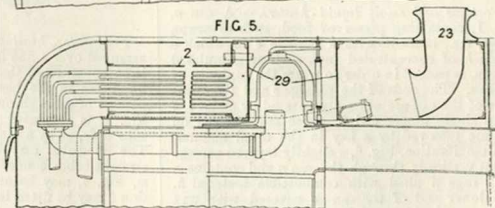
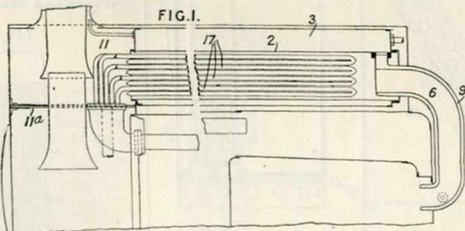
Water supply and delivery.—A tank 1 surmounted by a boiler 6 provided with an electric heater 8 is supplied with water or other liquid to be sterilized from a tank 3 with a ball cock, through a pipe 2

passes through an open tank 11 and through coils 12 in the tank 1 to an outlet 13. The coils 12 may be provided with valves so that one or more may be cut out. Specification 12,129/13 is referred to.

23,377. Spencer, A. Dec. 1.

Feed-water, heating.—

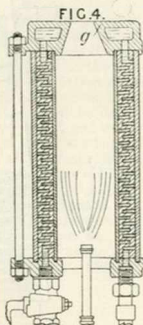
Relates to locomotive superheaters of the kind in which U-tubes are arranged within an outside flue conducting combustion products from the fire-box to the funnel. Feed-water is heated in a jacket around the outside flue. The jacketed flue 2, Fig. 1, arranged above a locomotive boiler, communicates at one end with the fire-box through a flue-pipe 6, and opens at the other end into a compartment 11 formed at the top of the smoke-box by a partition 11'. Feed-water is passed through the jackets 9, 3 around the flues. In a modification, Fig. 5, the top of the smoke-box is closed, and the hot gases are led from the smoke-box through the superheater flue 2 to a chimney 23 at



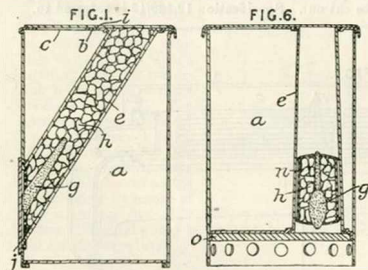
the back of the boiler. In a further modification, a water-jacketed superheater flue connected at opposite ends to the fire-box and smoke-box is arranged below the boiler.

23,517. Horsburgh, D. Dec. 4.

Boilers. — Apparatus for heating liquids comprises one or more disks or cylinders having deep, narrow, spiral grooves in their sides, the groove in one side of a disk or cylinder being cut in the metal between the convolutions of the grooves on the opposite side. Fig. 4 shows a water-heater having a single grooved cylinder. The grooves are connected by a header *g* so as to form a continuous water passage, and a gas burner is used as the heating means.



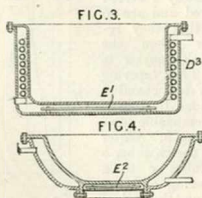
24,009. Kitchen, J. G. A., and Storey, I. H. Dec. 14.



Portable and small liquid heaters. — A can *a*, Fig. 1, containing preserved food, such as soups, stews, &c., is made with a passage *e* in which a filling *h* of concentrated fuel, such as granulated carbon, is packed in order to warm the contents of the can. The ends of the passage *e* and the opening *e* of the can are normally covered by strips *i*, *j* (or a single longer strip), which are soldered on and are removed by a key in the usual manner. In a modification, Fig. 6, a slightly tapered passage *e* rises vertically through the can *a* and contains a small cage *n* filled with combustible material *h*. The lower end of the can is covered with wax paper *o* or the like, and has a projecting rim at its

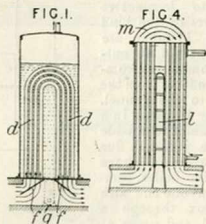
lower end perforated to admit air. The charges of fuel are packed with fuses *g*, such as tinder or a fusee, for initiating combustion.

24,218. Caunter, L. G. Dec. 17.



Heating liquids; boiling-pans. — A combined steam and electric heating or cooking apparatus is described with special reference to steam cooking and heating apparatus for use on trains, ships, &c., wherein live or exhaust steam, for example from the locomotive, is supplied to the apparatus, its effect being supplemented by electric heaters. Fig. 3 shows a double-cased boiling-pan heated by a steam coil *D*³ and electric heaters *E*¹. In a modification, Fig. 4, which may be used as a boiler or as a heater for kettles or other utensils which fit the inner vessel, steam is admitted to the jacket and electric heaters *E*² are fitted.

24,263. Dietzius, A., and Wärme-Verwertungs Ges. Dec. 18.

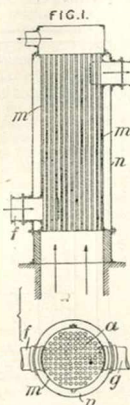
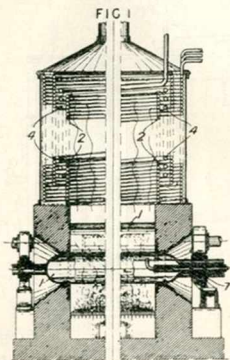


Feed-water, heating. — A vertical tubular heater arranged over a flue for the escape of waste gases is so constructed that the inlet and outlet of the flue-tubes in the heater are close together. The passage of gases through the U-shaped flue-tubes *d*, Fig. 1, is regulated by hinged dampers *f* at the tube ends, or by a binged wall *g* between the ends. The flue-tubes may be sinuous or V-shaped, or straight tubes connected at their top by a chamber *m*, Fig. 4, may be used. A heat-insulating partition *l* may be fitted in the water space between the flue-tubes.

24,264. Dietzius, A., and Wärme-Verwertungs-Ges. Dec. 18.

Heating air.—In an air-heating apparatus, more particularly for use in smelting-works, the air enters at *f* and is heated by waste furnace gases passing through tubes *a* and leaves by a passage *g*. To increase the rate of flow, an inner casing *m* is arranged within the outer casing *n*. In a modification, the tubes *a* are divided into two groups by a transverse baffle, and both the air and the furnace gases follow an up-and-down path. In a further modification, inverted U-tubes are used, thus dispensing with the upper tube-plate.

Reference has been directed by the Comptroller to Specifications 4567/85, [Class 7, Air and gas engines], and 13,152/01.

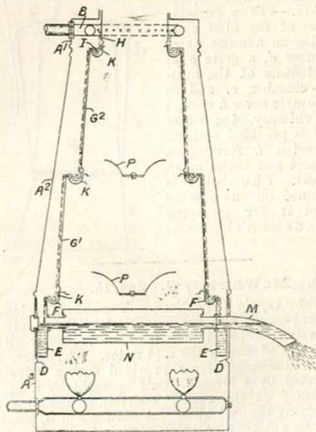

24,481. Blomquist, J. V. Dec. 22.


Feed-water, heating.—The feed supply to a rotary boiler 1 is heated in coiled tubes 2 arranged above the furnace.

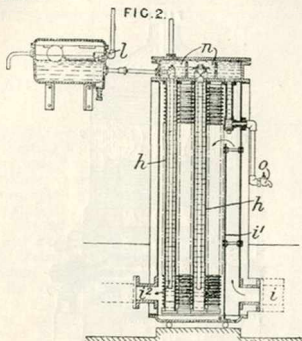
A.D. 1915.

31. Freeman, H. J. Jan. 1.

Geysers.—In a geyser of the type in which the liquid flows in a thin film over the outside of an inner casing through which the products of combustion from the heater pass upwardly, the casing is arranged to be readily removable. In the construction described, the inner casing comprises superposed sections E, F, G¹, G², H fitted together by sliding each section over the one immediately below it as shown at K. The lowest section E is of annular shape and rests on a ledge D of the outer casing. The section F and the upper ends of the sections G¹, G² are formed as troughs I. The liquid from the trough E may pass directly to the spout M or may first be further heated in a chamber N. Baffles P serve to direct the hot gases on to the walls of the inner casing. The outer casing comprises an upper section A¹ carrying the liquid inlet-pipe B, a lower section A³ carrying the heater, and an intermediate section A².



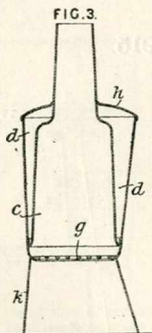
305. Crossley, Sir K. I., and Fielden, F.
Jan. 8.



Water-tube boilers.—The exhaust gases from an internal-combustion engine are used to heat water in the gilled Field-tube heater shown in Fig. 2. The gases enter at *i*, pass over the baffles *i'*, and escape at *i''*. The water is drawn from the engine-cooling system through a float valve *l* and, after being directed by perforated partitions *n* through each of the Field tubes *h* in succession, is drawn off at a cock *o*.

485. Vultch, A. W.
de. Jan. 12.

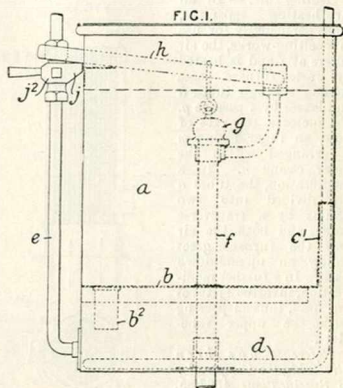
Annular boilers; portable and small liquid-heaters.—In a portable boiler of the kind comprising an annular water chamber *d*, a grate *g* at the bottom of the heating-chamber *c*, and a removable cover *h* around the chimney, the outer wall is provided with an extension *k* forming an ash-pit. The boiler is flattened on one side to adapt it for strapping upon a soldier's knapsack.



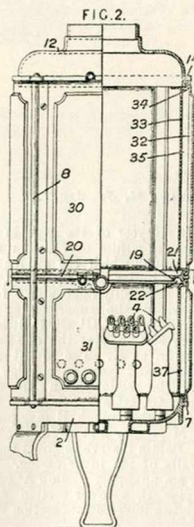
679. McWhirter, C. Jan. 15.

Water supply and delivery.—The cistern encloses heating-means and has a vertical discharge pipe, the valve of which is actuated simultaneously with the valve admitting the cold water. The cistern *a* has a discharge pipe *f* provided with a valve *g* operated by a lever *h*, itself operated by a projection *j* on the cock *j'* controlling the pipe *e* supplying the cold water. A heating-coil *d*, which may be a steam-pipe or an electric heater, is pro-

vided, and during heating, water circulates up through the space *c'* and down through the pipe *b'* in the partition *b*.

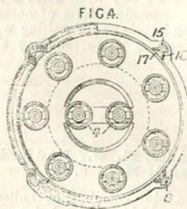


795. Humphrey, H. S. Jan. 18.



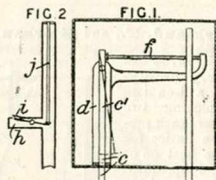
Instantaneous water-heaters.—A sectional shell for instantaneous water-heaters comprises a base, a

crown, and post and panel sides. From the base 2, Fig. 2, rise posts 8 up to the crown 12. The burners 4 are placed at the bottom, and the heating-coil is in the upper part resting on a ring 19, which also serves as a brace for the frame. The posts 8 have an outer beading 15, Fig. 4, and inner forked members 16 forming channels 17. The ring 19 has flanges 21, 22 notched at intervals to interact with the posts 8. The wall-forming panels 30, 31 are of segment form and consist of inner and outer plates 32, 33 with the edges seamed together at 34. The panels fit the spaces between the posts and are screwed to the forks 16 thereof, and also come close up with the flange 20 and flange 14 or 7. One upper panel 35 and one lower one 37 are hinged and act as doors to the coil and burner respectively. A thermostat may be fitted beneath the coil, as shown in Specification 16,482/98.



868. Stimson, E. F. Jan. 19.

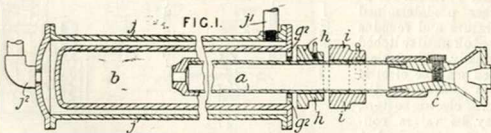
Heating water.—In a domestic hot-water system the return pipe in the storage water tank is so arranged in combination with a thermostatic device that initially only a small volume of water is in circulation, but when the water has been heated to a predetermined temperature, a larger volume of water is brought into circulation. The return pipe *c*, Fig. 1, is provided with an extension *c'* pivoted at its upper end in a frame *d* and connected to a thermostatic rod *f*. The expansion of the rod due to a rise in the temperature of the water in the tank turns the pipe extension about its pivot, thus opening the top of the return pipe and allowing the whole of the water in the tank to circulate. In a modification, the thermo-



static rod *j*, Fig. 2, operates a valve *i* in a branch *h* on the return pipe.

1357. Turner, E. Jan. 27.

Heating gases; submersible liquid heaters; annular boilers.—In gaseous-fuel combustion apparatus of the kind comprising an elongated combustion chamber provided with a burner projecting into the chamber and adapted to heat substances contained in or passed through a chamber surrounding the combustion chamber, the burner tube is capable of being adjusted within the combustion chamber to vary the combustion zone and the cross-sectional area of the exit of the combustion chamber is less, or adapted to be made less, than the cross-sectional area of the combustion chamber. The apparatus is stated to be applicable for heating tanks of water or other liquid, superheating steam, heating gases or vapours, evaporating liquids, maintaining baths of molten metal above a certain temperature, and melting waxes or soft metals. The gas-supply tube *a* is arranged axially and adjustably within the combustion chamber *b* pro-



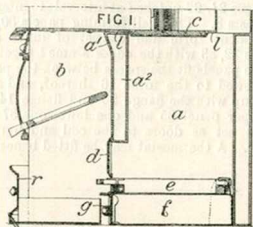
vided with outlets *g'* controlled by a damper *h*. The burner is adjusted by the bracket or bridle *i*. The air necessary for combustion is sucked into the tube *a* by the injector *c* or may be mixed with the gas prior to being supplied to the burner. Ignition of the gas is effected at the outlet *g'*. Fluid is heated in the jacket *j* provided with an inlet *j'* and exit *j''*. Ribs may be provided on the exterior of the combustion chamber to present a large heating-surface to the liquid in the jacket. If a large heating-surface is desired such as in heating gases or vapours, the combustion chamber may take the form of a tubular helix, the ends of the chamber being smaller in cross-section than the

mid-portion, which may be of uniform or variable cross-section. A modified form of heater adapted for evaporating liquids or for melting wax or soft metals contained in a surrounding chamber is

similar to that described above, except that the jacket is omitted and the combustion chamber is provided with external ribs.

1379. Brodie, G. G., Radford, F. W., and Wells, A. E. Jan. 28.

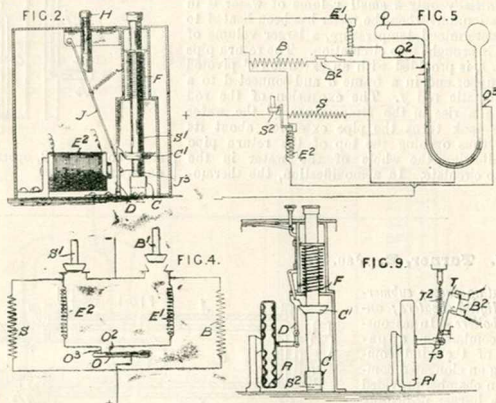
Boilers.—A slow-combustion boiler a^1 for a kitchen range, which is heated internally by a separate fire and externally by the ordinary fire of the range, has its upper part a^1 curved or inclined forwards at the front, as shown. The boiler is rectangular in horizontal cross-section.



2012. Kirkland, T., and Kiernan, T. J. R. Feb. 8.

Heating liquids and gases; safety arrangements.—In a heating system employing two distinct heaters each provided with a device for switching the heat on or off, a control apparatus is provided comprising means for switching both heaters off manually, and a thermometric regulation by which one heater is automatically switched off at a predetermined upper temperature, and the other heater is automatically switched off at a higher predetermined temperature and remains switched off until switched on manually. The devices operated may be electric switches controlling the circuits of electric heaters, or may be valves controlling gas, steam, or hot air.

Fig. 4 shows the electric circuits for an arrangement in which two electric heaters B, S are regulated by a mercury thermometer O through electro-magnetic devices E', E". The contact member C of the switch for each heater is carried by a plunger B' or S' fitted with a collar C'. Fig. 2, adapted to be engaged by a spring-pressed hook D forming the armature of the corresponding electro-magnet E' or E". Each plunger is pressed down manually to place the corresponding heater in circuit, and is raised by a spring F to open the switch when released from the hook D either manually or automatically. The manual release is effected by pressing down a spring-plunger H, which bears on a spring-controlled pivoted arm J

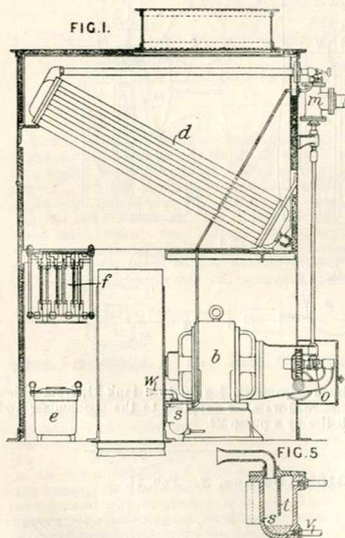


carrying two pins J', one bearing against each hook D. The automatic release is effected by the closing of a circuit in the bore of the thermometer and through the electro-magnet E' or E" when the mercury contacts with the wire Q^1 or Q^2. Fig. 5 shows a modified arrangement employing an air thermometer Q, in which the switch B^2 controlling the heater B is opened and closed automatically according as the temperature rises above or falls below that corresponding to the position of the wire Q^2, unless the temperature rises above that corresponding to the position of the wire Q^1, whereupon both switches B^2, S^2 are opened and can only be closed manually. The temperature corresponding to the wire Q^2, may be raised by the

use of multiple contacts and a selector switch. In case of breakage of the thermometer, the mercury falls into a cavity fitted with three terminals and completes the circuits for closing both switches. To avoid sparking at the wire Q^2 in the thermometer tube, the coil of the electro-magnet E^1 may be provided with a potentiometer device and a non-inductive shunt. In another modification employing a mercury thermometer, the switch B^2 is a double-throw switch, and trembling of the switch arm and sparking in the thermometer tube are prevented by the provision of an additional electro-magnetic device and a potentiometer resistance. Fig. 9 shows a further modification employing expansible capsules R, R^1 as the heat-sensitive elements for operating the

switch or valve devices S^2, B^2 respectively. At the lower of the two upper temperatures, the capsule R^1 operates the lever T of the device B^2 through a pin-and-slot connexion at T^2 and against the action of a spring T^3 . At the higher of the two upper temperatures, the capsule R operates the hook D to allow the spring F to operate the device S^2 , whereupon the device B^1 , being under master control from the device S^2 , is also operated, and both devices can then only be restored manually. The invention is applicable to the maintaining of a definite temperature or to the prevention of overheating in kettles, boilers, sterilizers, ovens, incubators, or the rooms of buildings. In the case of a kettle, the two upper temperatures are slightly below and slightly above the boiling point of water.

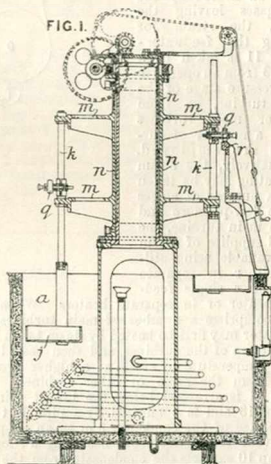
2177. Davidson, S. C. Feb. 10.



Heating air.—In a ventilating-apparatus supplying heated air to public buildings &c. the heater (steam, electric, or other) is cut-out or by-passed at regular intervals in order to produce a refreshing effect in the room. In the form shown in Fig. 1, the steam supply to the heater d is controlled by a time valve m , which is operated through reduction gear o of the spindle of the fan motor b . In a modification, a by-pass leads round the heater chamber, and the air is alternately directed through

the heater on the by-pass by a flap valve at their entrances actuated similarly to the valve m .

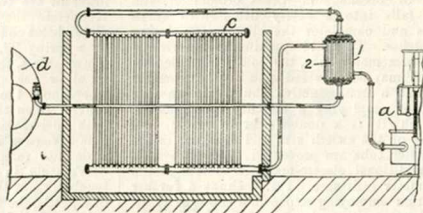
2269. Chignell, J., and Farrington Works & H. Pontifex & Sons. Feb. 12.



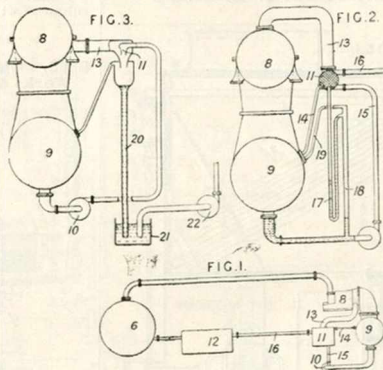
Heating liquids.—A machine for warming liquids to a desired temperature, more particularly chilled beers, comprises a heating-container a into which baskets j holding the bottles are lowered and raised as the supporting-shafts k are carried round. The sleeve n is rotated through suitable gearing and carries bracket members m in which the shafts k are adapted to slide, rollers q carried by the shafts k engaging an inclined track r supported on the edge of the tank.

2887. Brown, F. A., and Unit Engineering Co. Feb. 23.

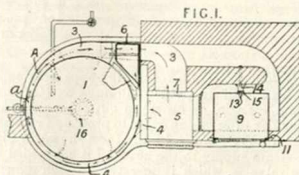
Feed-water, heating.—Before entering an economizer, the feed-water is heated in a heat-exchanger by the hot feed-water passing from the economizer to the boiler. The heat-exchanger may be of the kind described in Specification 15,215/10, [Class 64 (iii), Surface apparatus &c.]. The water from the feed-pump *a* passes through a heat-exchanger 1 containing tubes 2, through which the hot feed-water passes on its way from the economizer *c* to the boiler *d*.


3151. Baumann, K. Feb. 26. [Cognate Application, 7334/15.]

Feed-water, heating.—In a plant comprising a steam-generator 6, a main steam turbine 8, a condenser 9, a feedwater-heater 11, and an economizer 12 heated by the flue gases leaving the boiler, the steam for heating the feedwater-heater 11 is taken by a pipe 13 from an operative low-pressure stage of the main turbine, or from one or more turbines where a number of turbines are employed. Alternatively, the steam for heating may be taken from a number of stages in the low-pressure end of the main turbine, the several supplies of steam thus available being utilized either in separate stages of a single feed-water-heater or in separate heaters. When the plant comprises a number of main turbines, the feed-water may first be heated by steam taken from one or more of the turbines, and then heated to a higher temperature by steam at a higher pressure taken from the same or other turbines. The heater 11 is arranged below the lowest point of the pipe 13 and is connected by a pipe 14 to the steam space of the condenser 9 or to an air-pump to prevent the heater from becoming air-logged. A pump 10 extracts the condensate from the condenser 9 and supplies it through a pipe 15 to the heater 11, which supplies the boiler 6 through a pipe 16 and an economizer 12. The feedwater-heater may be of the surface type, Fig. 2, and have in addition to the connexions 13, 14, 15, 16 already referred to above, a siphon tube 17 for leading away condensed steam to a stand-pipe 18 connected with the condenser by a pipe 19. In Fig. 3, the heater 11 is shown of the direct-contact or jet type, the water from the hot well and the steam condensed in the heater being led away therefrom



by a barometric leg 20 to a tank 21, from which the feed-water is supplied to the economizer and boiler by a pump 22.

3193. Cornes, J. Feb. 27.


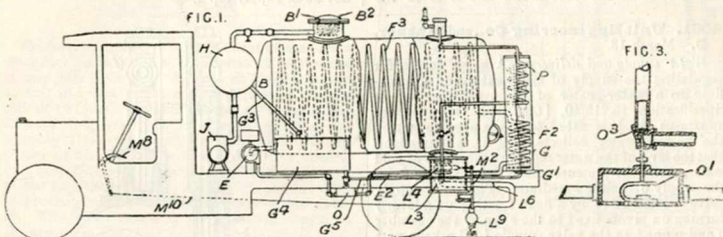
Washing-boilers; block-form boilers.—In combination ranges, coppers, &c. of the kind described

in Specifications 16,871/01 and 14,832/06, the copper 1, which may form part of the division between two compartments, is heated (1) by flue gases passing from the fire 5 to the flues 3, 4 round and under the boiler, (2) by heat conducted to the copper by a perforated metal plate 7 across the mouth of the flue 3, or (3) optionally by a burner 16 or an auxiliary grate. The gases in the flues

3, 4 meet at an opening a in a horizontal partition A about halfway up the boiler casing, pass through it and again divide and pass around the boiler to the outlet 6. In a modification, a boot boiler, such as is described in Specification 5980/14, is arranged behind the fire-place 5 and is connected by pipes to the copper, so that hot water for the bath and sink may be drawn from either boiler.



3276. Merrill, W. C. March 1.

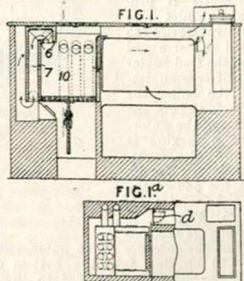


Heating liquids.—Consists in heating bituminous or other viscous material by the forced circulation of a liquid, the boiling-point of which is above 212° F., and the carbonizing-point of which is above the temperature to which the viscous material is to be heated. Fig. 1 shows a vehicle fitted with means for heating and spraying bituminous material admitted to a tank B through an opening B^1 fitted with a strainer B^1 . The heating medium, preferably oil, is circulated by a

pump E through a pipe E^1 and thermostat O to coils F^2 in an oil-burner heating-device G, from which it passes through coils F^3 in the tank B and back to the pump. The thermostat, shown in detail in Fig. 3, consists of a bent metal strip O^1 which expands and contracts under the action of heat and controls the valve O^1 supplying fuel from a tank G^1 through a pipe G^2 to the burner G^1 , so as to keep the temperature of the circulating medium at, say, 450° F.

3935. Giuliani, A. M. March 10. [Addition to 17,595/14.]

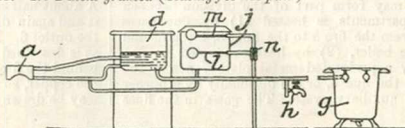
Internally fired boilers.—Consists in modifying the stove described in the parent Specification by providing a supplementary air inlet for the combustion products beneath the overhanging part 6, Fig. 1, of the boiler, and by (1) forming the ends of the boiler flue-tubes 7 with right-angle bends, (2) forming the flue-tubes of square or rectangular section, and (3) dispensing with the bent-over parts of the flue-tubes and forming the boiler with an overhanging top, as in the boiler described in Specification 4680/15. The supplementary air is admitted through an opening in the front wall of the boiler. A sliding damper is fitted at the front of the opening. A flue damper d , Fig. 1^a, is provided to cut off the communication between the boiler flue-tubes and the chimney when it is not desired to heat the boiler. The bent-over ends of the flue-tubes in the side 10 of the boiler may be inclined and terminate at the inner wall. The boiler may be placed out of use by raising the grate and closing the upper ends of the flue-tubes



by a side plate, as described in the parent Specification.

1911. Mills, G. H. March 11. *No Patent granted (Sealing fee not paid).*

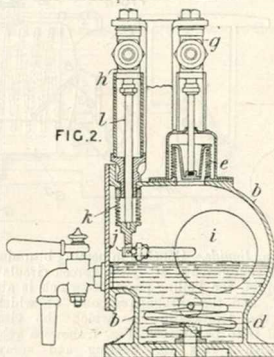
Boilers.—In a combination apparatus wherein a washing-boiler or copper *d* is connected to the saddle or like boiler *a* of a range or fire-place, a feed-cistern *j*, having means for maintaining two or more different levels of water in the copper is provided. In the example shown, a multiple-way stop-cock *n* supplies water to either of two float valves *l, m* so as to maintain one level in the



copper when it is used for boiling clothes, and another level when heating water for a bath *g* or a hot-water supply tap *h*.

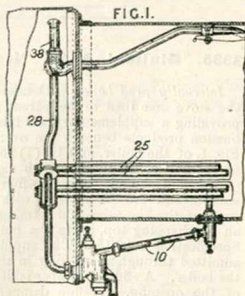
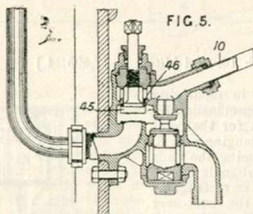
4001. Unit Engineering Co., and Mather, C. March 13.

Water supply and delivery.—A valve device, for regulating the supply of cold water and heating-fluid to a water-heater of the type described in Specification 15,215/10, [Class 64 (ii), Surface apparatus &c.], is fitted to a chamber in which the heated water collects, and is so arranged that the level of the water regulates the inflow of cold water, while the pressure above the water regulates the supply of heating-medium. The water-supply valve *h* is actuated by a float *i* acting on a lever *j* turning on pivots fixed to the sides of the chamber *b* and pinned to the valve spindle *l*. Leakage past the valve spindle is prevented by a bellows packing-device *k*. The steam valve *g*, preferably an equilibrium valve is actuated by bellows *e* connected to the spindle *c*. The steam, on its way to the heater proper, passes through a coil *d* in the collecting-chamber. The valves may be arranged within the chamber *b*. According to the Provisional Specification, a diaphragm or Bourdon tube may be used in place of the bellows and the regulator may be fitted to other types of heater.

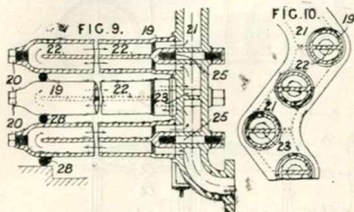


4085. Willans, G. H., and Luard, E. S. March 15.

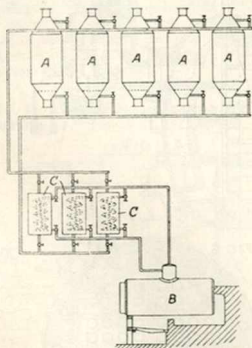
Feed-water, heating.—In feed-heating and water-circulating apparatus such as is described in Specification 21,118/13, the feed-heater is provided on its inlet side with a valve device so constructed and arranged that, when the feed-heater is cut out of communication with the boiler, the path for feeding the boiler through the water-circulating connexion is opened, and vice versa. The screw-down valve 45, Fig. 5, on the end of the inlet pipe to the feed-heater 25, Fig. 1, is adapted to engage a second seating 46 at the entrance to the water-circulating connexion 10 opening into the bottom of the boiler. Water may thus be fed to the boiler even when the heater is placed out of operation by closing the inlet pipe. The delivery pipe 28 may be cut off from the boiler by a valve



having a spindle extending through an air-tight jacket 38 to the outside of the smoke-box. The feed-heater 25 consists of twisted U-tubes placed in smoke-tubes and connected to headers so formed that the tubes are in communication with one another in series.

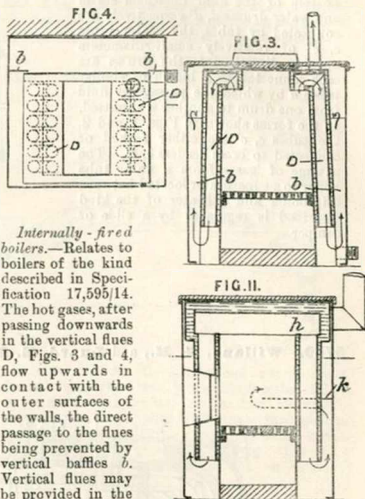
4158. **Goränkel, M.** March 16.

Feed-water, heating.—Each element of the heater comprises horizontal cast-iron tubes 19 each closed at one end by a plug 20, and at the other end secured in a socket of a vertical zigzag or straight collector 21, each tube being fitted with a partition 22 extending nearly to the closed end, and the collector 21 having partitions 23 in line with the partitions 22. Each tube is secured to the collector by a bolt 25 engaging holes in the thickened parts of the partitions 22, 23. Rollers 28 are provided to prevent bending of the free ends of the tubes 19. The water passes in the direction shown by the arrows in Fig. 9.

4278. **Marks, E. C. R.,** [A/S. Cellulose-patenter]. March 18.

Digesters.—In the manufacture of cellulose by digestion, the liquor is heated by circulation through external heaters C which are heated by steam from a boiler B, the steam condensing in the coils of the heaters being returned to the boiler. The heaters are in two or more sections, and may be connected by valves with any of the digesters, so that any one section may be out of use. A series of digesters A is used, and the digesters are charged and their contents heated in order, digestion being allowed to go on until it is time to prepare each

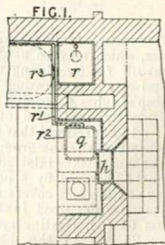
digester for the next heating, while the use of the heating-apparatus is continuous.

4630. **Soc. Odelin et Cie.** June 23, 1914, [Convention date].

Internally-fired boilers.—Relates to boilers of the kind described in Specification 17,595/14. The hot gases, after passing downwards in the vertical flues D, Figs. 3 and 4, flow upwards in contact with the outer surfaces of the walls, the direct passage to the flues being prevented by vertical baffles *b*. Vertical flues may be provided in the back wall as well as in the side walls. Straight flues, opening into a recessed flue space *h*, Fig. 11, formed in an extension of the boiler walls, may be provided in place of flues bent over at their upper ends. The upward flow of the gases may be retarded by an horizontal baffle *k*.

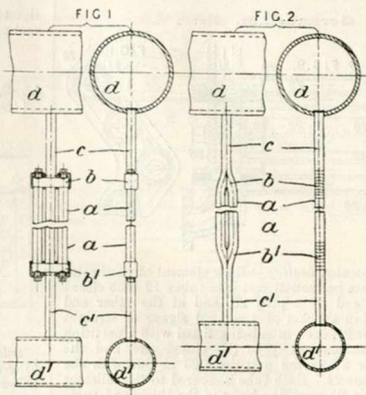
4869. **Clare, G. E.** March 29.

Block-form boilers; washing-boilers.—In a double-fronted combination cooking-range and sitting-room fire-place, a coil r^2 , forming part of a pipe r^1 connecting the boiler *q* and cistern *r*, surrounds the boiler *q*. The boiler *q* shown has a hinged lid so that it may be used as a washing-copper; but it may have a steam-tight lid to enable it to heat water for the service of the first floor.

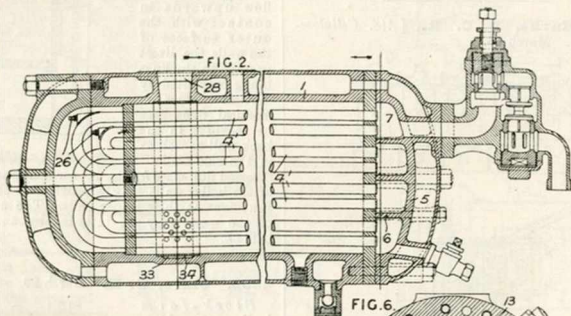


5356. Schmidt, W. April 9, 1914, [Convention date].

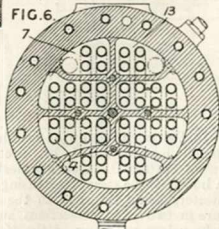
Feed-water, heating.—In feedwater heaters of the kind in which steam and water drums d, d' respectively are connected by tubes, the heater tubes c, c' of relatively small diameters opening directly into the drums are each connected to a bunch of similar tubes a by which the passage of fluid from one drum to another is admitted. In the forms shown in Figs. 1 and 2, the tubes c, c' are either forked or connected to cross headers b, b' . The passage of gases from a water tube boiler to a superheater located between this boiler and a heater of the kind described is regulated by a slide or damper.



5780. Willans, G. H., and Luard, E. S. April 17.

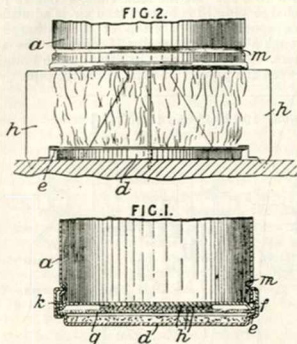


Feed-water, heating.—An exhaust-steam feed-heater, which may be used when the feed supply is cut off for circulating the water in the boiler, comprises a steam casing 1 containing groups of U-shaped tubes 4, opening into a header 5, which is divided by partitions 6 into a number of chambers 7 . . . 13 so arranged that the water flows through the chambers and the groups of U-tubes in series. The exhaust-steam inlet 25 opens into an annular channel 33 covered by a perforated ring 34. The casing and the end covers are vacuum-jacketed in the manner described in Specification 21,622/12, [Class 64 (ii), Heating systems &c.]. Cleaning-plugs 26 are in the bends of the U-tubes. Valves are provided for cutting out the heater and for allowing boiler water to circulate through the tubes when the feed supply is stopped, as described



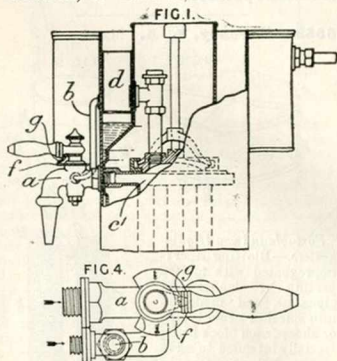
in Specification 4085/15. The heater may be used in combination with the fire-tube feed-heater described in Specification 4085/15.

5948. Jovignot, C. April 20.



Portable and small liquid-heaters.—A food-container *a* is fitted with a stove attachment comprising a shallow receptacle *d* for solid alcohol or like fuel, having a circular rim *e* bearing against a circular projection *f* at the bottom of the container, with the interposition of an air-tight disk *g*, plates *h* adapted to support the container during heating being normally disposed flat between the disk and the bottom of the container, and the attachment being held against the container by a fixing-ring *k*. In one construction, Fig. 1, the upper rim of the ring *k* engages in a groove *m* in the wall of the container. In another construction, the upper rim of the ring engages a roll joint at the bottom of the container.

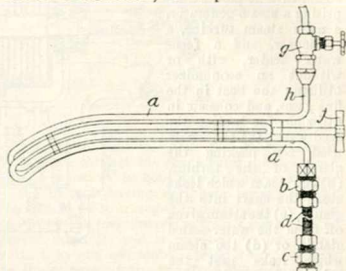
5997. Fourness Manufacturing Co., and Martin, J. March 21, 1914.



Geysers; water delivery.—Apparatus of the kind described in Specification 7198/14 is arranged for

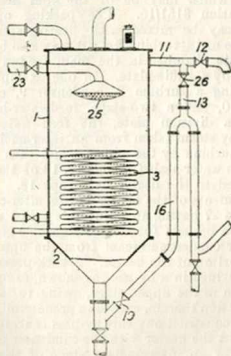
the delivery of either boiling water or water not so hot by means of a single three-way tap *a* which may be set to place the expansion box *d* of the geysir in communication with the delivery bib by means of a pipe *b*, or to place the header *c* of the geysir similarly in communication for the delivery of water below boiling temperature, or to cut off both these pipes from the bib and allow water to circulate between them. The positions are defined by means of an indicator plate *f* and pointer *g*.

6135. McCreath, H. April 24.



Heating liquids.—Consists of one or more steam-heated tubes which can be readily inserted into a tar barrel to thin the tar. In the form shown, the copper coil *a* is supplied with steam through connexions *b*, *c* and a flexible pipe *d*, the steam leaving the coil through a pipe *h* and valve *g*. The coil is inserted into the bung-hole of the tar barrel by means of a handle *j*.

6137. Magoolaghan, W. April 24.



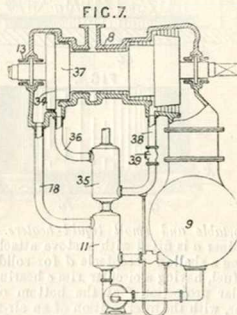
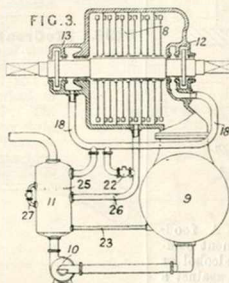
Boilers; feed-water, heating.—In a heater evaporator or the like having an inverted U-shape discharge pipe provided for the purpose of maintaining a constant level in the evaporator while

water is being run through it to clean it out, means are provided for controlling the inlet of air to the evaporator and to the discharge pipe, one valve preferably controlling the air inlet to both. The evaporator 1 is heated by a steam coil 3, and has a conical bottom 2 for the collection of sediment. When the evaporator is to be cleaned out, steam is

let off and cold water admitted through the pipe 23 and a rose 25. At the same time, a cock 19 in the discharge pipe 16 is opened, and air is admitted to the evaporator and the top of the discharge pipe through a cock 12 in a pipe 11 open to the atmosphere. A cock 26 may be fitted in the branch 13 between the pipe 11 and the discharge pipe.

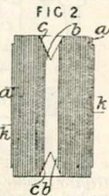
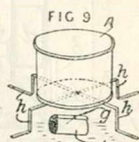
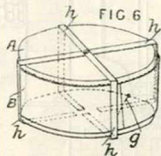
6156. Baumann, K. Ap il 24. [*Cognate Applications, 10,732/15 and 14,476/15.*]

Feed-water, heating.—Relates to condensing steam-turbine plants comprising a steam-generator, a main steam turbine, a condenser, and a feed-water-heater, with or without an economizer utilizing the heat in the flue gases, and consists in utilizing, for heating the feed-water, (a) the steam used for packing the glands of the turbine, (b) the steam which leaks along the shaft into the glands, (c) the steam given off from the water-sealed glands, or (d) the steam which leaks past the balance pistons, the steam in all cases being at a pressure below atmosphere. Two or more of these sources may be used in combination, and the feed-water may be heated in addition by steam from one or more low-pressure stages of the turbine. Several constructions are described embodying the above features. The packing or leakage steam may be used in an independent heater. This heater may be used in connexion, for example in series, with another heater, such as the main feedwater-heater, which may be of the kind described in Specification 3151/15. The packing or leakage steam may be mixed with heating-steam taken from the main turbine &c.; it may also be used in a separate chamber in the main feedwater-heater formed by a baffle-plate. In one example, Fig. 3, comprising a turbine 8, condenser 9, extraction pump 10, and a two-stage feedwater-heater 11 having a division plate, the feed-water is first heated by steam taken from an intermediate stage of the turbine by the pipe 26, and then by steam from the water-sealed glands 12, 13 of the turbine conducted to the heater by a pipe 18. The two compartments of the heater 11 are inter-connected by a pipe 27 having an adjustable relief valve and a drain for condensed steam from the upper to the lower portion of the heater. A back-pressure valve 22 is provided in a by-pass, as shown, to open when the steam in the upper stage, owing to insufficient condensation therein, exceeds a predetermined limit. In other constructions, this by-pass is arranged so as to connect the heater with the condenser or turbine exhaust or an intermediate stage of the turbine. The by-pass may take the form of a siphon tube containing a water seal. A drain-pipe 23 leads from the heater to the condenser. In the construction shown in Fig. 7, wherein a reaction turbine



8 has two end-thrust-balancing pistons 37, 34, the feed-water is first heated in a heater 11 by steam from the water-packed gland 13 and by steam leaking past the balance piston 34, a pipe 18 conveying such steam to the heater. A second heater 35, in series with the heater 11, is supplied through a pipe 36 with steam leaking past the balance piston 37. A pipe 38 with a non-return valve 39 connects the heater 35 with a point in the turbine 8 at which the pressure is equal to that existing in front of the last balance piston 34.

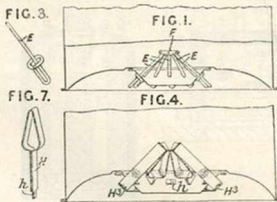
6553. Garchey, L. A. May 1.



Portable and small liquid-heaters.—Blotting paper is impregnated with melted paraffin or alcohol and glycerine, and made up into spiral or other blocks or sheets, each block being specially intended to serve as the fuel necessary to cook one ration contained in a package. In the form

shown in Fig. 2, a band of blotting-paper *a* is rolled into a spiral block having a central tube *b*, and is provided with notches *c* at each end and secured by an outer band of paper or cloth *k*. It is then thoroughly impregnated with melted paraffin. In other forms, the blotting paper may be rolled up spirally with corrugated paste-board, or be folded up in any way to form a block. When alcohol and glycerine are used, the block may be afterwards dipped in melted paraffin or in caoutchouc to prevent loss of alcohol. One method of using this fuel to warm a ration consists in surrounding a ration box *A* of preserved food with an impregnated band *B*, and securing its ends by a pin *g*. Crossed metal bands *h* are then placed over the box as shown in Fig. 6. When the food is required, the metal bands are taken off, and the lower ends bent outwards, so that the whole forms a stand for the box, as shown in Fig. 9. The impregnated blotting-paper is then rolled and secured by the pins as shown at *B'*, for use as the fuel for warming the food in the box placed above. The metal bands may be coiled horizontally around the box, and the fuel may be in the form of disks or the like of impregnated blotting-paper placed in a recessed end or ends of the box. In the latter case, the disks &c. would be rolled or folded to form the fuel block for heating the contents of the box.

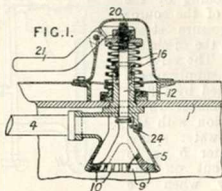
6692. **Baron, F. E.** May 5.



Boilers.—A kettle, boiler, or other vessel is provided with pieces of metal extending through the wall of the container to increase the area of the parts in contact with the contents of the vessel and with a heating-medium outside the vessel, the ends of the exterior portions being brought into contact with and secured to the wall of the vessel. The pieces are of a metal, such as copper, and each piece, where it passes through the wall of the vessel, may be surrounded by a packing that is less efficient as a conductor of heat. The metal pieces may consist of wire *E*, bent as shown in Fig. 3, and applied as shown in Fig. 1, the inner ends of the wires being connected to a ring *F*; or flat strips, bent as shown in Fig. 7, may be used. In the latter case, the ends *H* are passed out through the wall of the vessel and bent to form loops *H³*, Fig. 4, on the exterior, and the extreme ends *h* are

secured to the vessel by soldering or by being returned to the interior of the vessel.

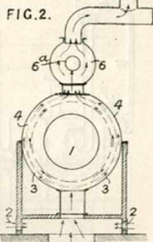
7096. **Willans, G. H., and Luard, E. S.** May 11.



Feed-water, heating.—The feed-water supply pipe 4 passes through the steam space into a conical casing 5 bolted to the boiler shell 1, and is sprayed by the plate 9 having peripheral serrations 10. The spindle 12 is arranged to descend as far as the stop 24 by the pressure of the feed-water or by the pivoted lever 21, and is returned to its normal position by the adjustable spring 16, which, with the upper part of the spindle 12 &c., is located outside the shell 1 and protected by the casing 20. The inner edge of the casing 5 may be serrated in lieu of the serrations in the plate 9. Specifications 2118/13, [Class 78 (i), Conveyers &c.], 4085/15, and 5780/15 are referred to.

7283. **Marschall, J.** March 10, 1914.

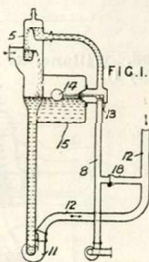
Heating air by waste heat from thermopiles. Air which has been heated in cooling a thermo-electric battery is collected in a chamber 6 and, after being further heated by a pipe 6^a conveying exhaust or smoke gases from the hot face of the thermo-electric battery, is utilized in a heating system, especially for air. In the form shown, the battery is grouped round an horizontal heating-pipe 1 and is surrounded by a cooling jacket 3, of which parts 4 are made as hinged flaps to allow access. Air is drawn from a cold chamber below, such as a cellar, or through closable side apertures 2, preferably by a fan, which may be driven by the battery. The collecting chamber 6 communicates by pipes with the heating system.



7335. Baumann, K. May 15. [*Cognate Application, 9144/15.*]

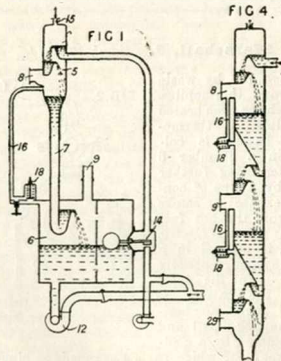
Feed-water, heating.—

In a direct-contact heater having a barometric leg, a float valve is provided in the feed-supply pipe to prevent flooding of the heater and of the source of low-pressure steam should, say, the discharge pump fail. The valve 13 in the feed-supply pipe 8 is so operated by a float 14 in a chamber 15 in communication with the steam and water spaces of the heater 5 as to reduce or cut off the feed-supply when the water level in the heater rises above a certain height. The feed then passes through a by-pass 18 fitted with a non-return valve, to the discharge pipe 12 of the discharge pump 11. In a modification in which the heater has an atmospheric discharge, the by-pass 18 dips into the water seal at the bottom of the barometric leg. As an additional safeguard against failure of the discharge pump, the heater may be provided with an overflow pipe fitted with a float or loaded valve and opening into the condenser or other part under vacuum in the system.



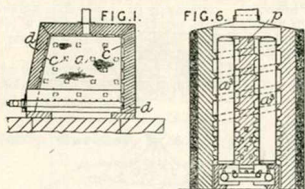
such a manner that the water passes through all the heaters in succession and is discharged from the final heater, or from a seal well connected to the final heater by a water leg, by a lift pump. In the two-stage heater shown in Fig. 1, the lower-pressure steam is admitted to the heater 5 through the inlet 8, and the higher-pressure steam is admitted to the heater 6 through the inlet 9. The heated water is removed by a lift pump 12. A float-operated valve 14 controls the supply of water to the heater 5 in the manner described in Specification 7335/15. The steam spaces of the heaters are connected by a tube 16 containing a pressure-operated valve 18, which allows excess steam in the heater 6 to pass into the heater 5. The heater 5 is connected to the main condenser through an outlet 15. Steam or air is prevented from escaping from the heater 6 through the water leg 7 by forming the leg with an upwardly-extending end, as shown. A float-operated valve may be fitted in the first heater to allow water to escape through the pipe 16 when the water-level rises. In place of the relief valves, the heaters may be connected by siphon tubes containing sealing-water. Fig. 4 shows a heater adapted to utilize steam from three sources at different pressures. The steam enters at the inlets 8, 9, 29. The water may have an atmospheric discharge or may be removed by a lift pump. Specification 6996/15, [*Class 32, Distilling &c.*], also is referred to.

7336. Baumann, K. May 15.



Feed-water, heating.—A feed-water heater of the jet or contact type is adapted to utilize low-pressure steam at different pressures obtained, for example, from two or more points in low-pressure stage of a steam turbine, or from a low-pressure stage and from the packing-glands of a turbine. A number of heaters are connected by water legs in

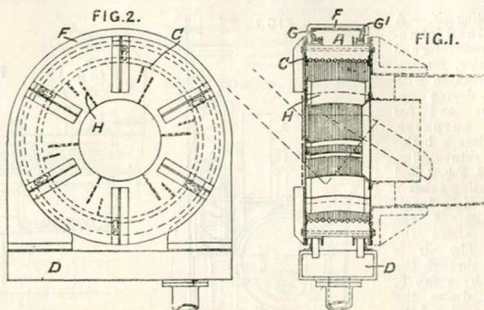
7356. Valentine, H. S. May 17.



Block-form boilers; annular boilers.—A gas-heated boiler is enclosed by a brick casing, and the flue spaces between the boiler and the casing are provided with baffles formed by studs or projections arranged in staggered order. The flue spaces may also have spiral or zigzag baffles. Fig. 1 shows a block boiler *a* enclosed by bricks *d* having staggered projections *c*. Similarly enclosed horizontal, cylindrical, vertical, conical, and annular boilers are described. The internal flue of the annular boiler *a'*, Fig. 6, is fitted with a studded and ribbed core *p*. The baffles may be formed on the boiler instead of on the brick casing, or they may be separate from the boiler and the casing. Specification 16,959/14, [*Class 126, Stoves &c.*], is referred to.

7415. **Park, G. M.** May 18. [Addition to 2661/14, Class 29, Cooling &c.]

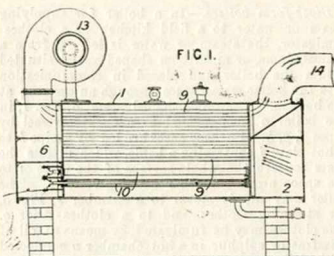
Heating water; feed-water, heating.—In apparatus for cooling cement clinker as described in Specification 2661/14, [Class 29, Cooling &c.], the first rotary chamber is modified so that the water used in cooling the clinker is recovered for boiler feed or other purposes. The rotary chamber is provided with an annular grating C, in segments or in a complete ring, and with an annular opening A through which the water, after receiving heat from the clinker, passes into a chamber D. The rotary lifting-plates H are employed as described in the parent Specification, and condensed steam and moisture are collected by a hood F provided



with flanges G, G'. The chamber may be fitted to an ordinary existing cooler as described in the parent Specification.

7433. **McKinnon, F. L.** May 18.

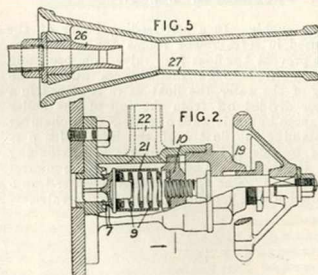
Heating air.—Two sets of tubes 9 are mounted between headers in a vessel 1 containing liquid which is heated by one or more electric heaters inserted in tubes 10. The air enters through a chamber 2 and passes through the lower tubes 9 to a compartment of the chamber 6 and is drawn thence through an external conduit to the fan 13, and expelled through another compartment and the upper tubes 9 to the outlet 14.



7774. **Willans, G. H., and Luard, E. S.**

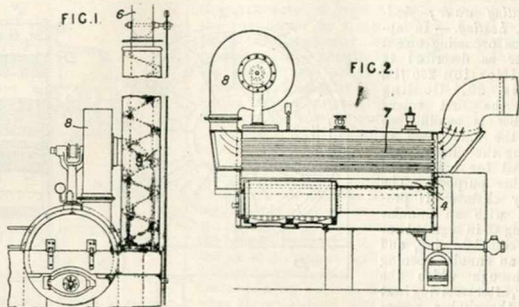
May 25.

Feed-water, heating.—A locomotive or other boiler having a feed-storage tank is fitted with a surplus-steam valve which automatically opens at a certain pressure below that at which the safety-valve opens and allows steam to pass into the storage tank. In the surplus-steam valve shown in Fig. 2, a poppet valve 7 is loaded by a spring 9 held against a disk 10, which may be moved in and out, in order to adjust the compression of the spring, by a screw and hand-wheel 19. A ferrule 21 is fitted between the valve and the disk to limit the lift of the valve. A screw-down lift valve may be provided in the outlet passage 22. The steam-pipe is connected in the storage tank to a jet 26, Fig. 5, surrounded by a double cone 27 provided to promote the water circulation and to lessen the noise of the entering steam.



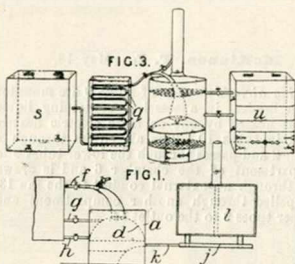
7867. **McKinnon, F. L.**, [Okrassa, R.]. May 27.

Heating air.—A combined internally-fired boiler and air-heater, for use in connexion with grain-drying apparatus and for other purposes, comprises a boiler with return fire-tubes 4, Fig. 2, and air-heating tubes 7 extending longitudinally of the boiler above the flue. The air is forced through the tubes by a fan 8, which draws the air through a helical air-heating passage 9, Fig. 1, around the chimney 6.



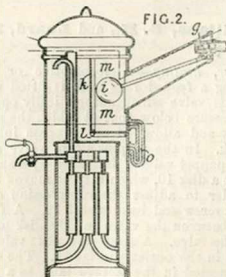
8995. **Wright, C. A.** June 18.

Block-form boilers.—In a boiler for supplying steam or water to a field kitchen or a clothes-fumigator, the steam or water is led off from a conical, dome, or mushroom shaped vessel situated within the boiler and placed in communication with the boiler water space through an opening at the bottom. The dome-shaped vessel *d*, Fig. 1, in the boiler *a* is connected to a cooking-vessel by pipes *f*, *g*, *h*. Furnace gases are led by a pipe *k* to a hot-plate *j* containing a baffle, which directs the gases beneath the whole surface of the plate or to the space around another cooking-vessel *l*. The boiler may supply steam to a chamber *s*, Fig. 3, for steaming clothes, and to a clothes-drier *g*. The clothes may be fumigated by means of oil of sassafras or sulphur in a hot chamber *u* connected to the boiler.



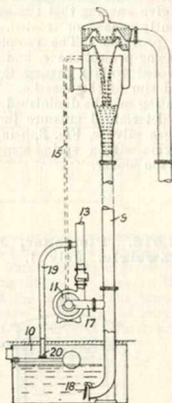
9075. **Jackson, E.** June 21.

Water supply.—In a self-feeding boiler of the kind used in refreshment rooms for making tea &c., to prevent the float feed-valve from becoming rapidly worn through disturbances due to the boiling of the water, the float valve is placed in a chamber divided off from the top of the boiler water space by single walls or plates. The chamber *m* containing the float *i* of the inlet valve *g* is formed by side and bottom plates *k*, *l* extending across the boiler. The chamber communicates with the main water space through a water-trap *o* or through a pipe containing a non-return valve.



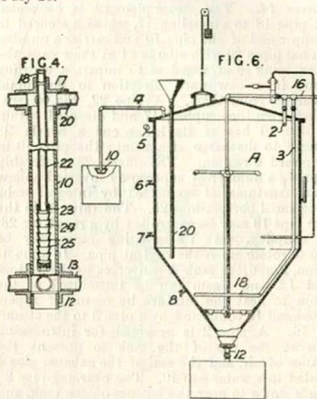
9143. **Baumann, K.** June 22.

Feed-water, heating.—Relates to a feed-water heater, applicable also as a condenser, in which steam at a pressure below that of the atmosphere is employed, and in which the heated water flows through a barometric leg to a seal well. A pipe 19, leading from the discharge pipe 13 of the lift pump 11 to the seal well 10, is provided with a float-controlled outlet 20 for maintaining the desired level of the water in the well. The pump 11 draws water through a pipe 17 from the barometric leg 9, provided at its lower end with a non-return valve 18. A pipe 15 leading from the pump to the heater allows air bubbles to escape from the pump.

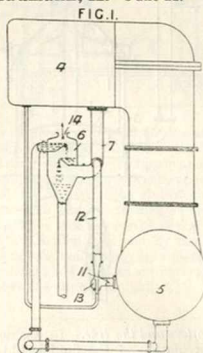


device 13 may be a water or air ejector, or, as shown, a steam ejector utilizing steam from the turbine or other source, such steam being subsequently utilized in the heater 6.

9395. **Dicker, S. G. S.,** [Reuter Process Co.] July 26.



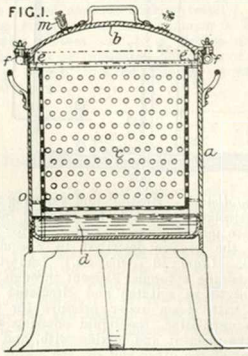
9145. **Baumann, K.** June 22.



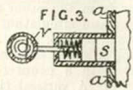
Heating liquids.—Heating and agitating apparatus, particularly applicable for treating fats and oils in the manufacture of soap, and for carrying out the process described in Specification 10,199/13, [Class 91, Oils &c.], comprises a tank containing a tubular element through which the liquid to be agitated and circulated passes together with steam under pressure for effecting such circulation, the liquid entering at one end of the element and mixing with, and being forced out at the other end by the steam which enters from the other end and thus acts both as a heating and circulating agent. The saponification or other tank 6, Fig. 1, is provided with a bottom sloping towards the centre, and with an opening 7 fitted with a suitable extractor, for example, the main air pump, through an outlet 14. The

at its lower end a coupling 11 into which are threaded a number of radiating pipes 13 and a short pipe 12. At the outer ends of the pipes 13 are T-pieces 14 carrying short pipes 15 and brackets 16 secured to the tank. The inlet pipes 12, 15 terminate slightly above the bottom of the tank. A supply pipe 35 fitted with a regulating-cock 37 and a filler 36 is connected to one of the T-pieces 14. The steam-pipe 19 is connected by a pipe 18 to a coupling 17, which is secured to the upper end of the pipe 10 and carries a number of radial pipes 20 with elbows 21 at their ends, the elbows being so arranged as to impart a whirling motion in a downward direction to the liquid discharged from them. A pipe 22, Fig. 4, suspended from the coupling 17 and disposed within the pipe 10 has at its lower end a nozzle 23 arranged to discharge steam into the pipe 10 in an upward direction. The nozzle 23 preferably comprises a number of superposed inverted hollow conical frustums 24 connected by integral webs having small perforations 25. The valve 27 in the steam pipe 19 may be controlled by a regulator 28. The coupling, with its radiating pipes may be made to rotate upon the central pipe. In a modification, Fig. 6, the tank A converges to the bottom outlet 12, and steam can be introduced at the bottom to heat the mixture by means of a perforated coil 18 connected by a pipe 3 to the steam-pipe 16. A pipe 2 is provided for introducing steam at the top of the tank to prevent the entrance of air, and the end of the exhaust pipe 4 is sealed in a water-pan 10. The charging-pipe 20 extends down to near the bottom of the tank, and a pressure gauge 5 and test cocks 6, 7, 8 are provided.

9803. Draycott, T. J., and Draycott, G. July 6.

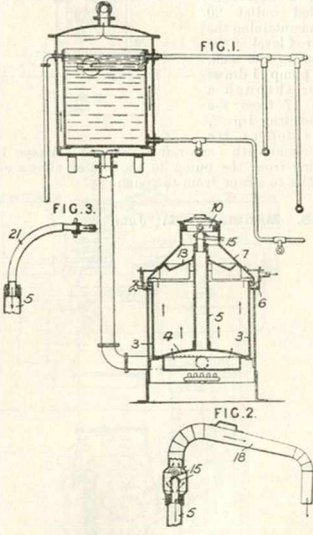


Digesters.—A digester comprises a receptacle *a*, Fig. 1, containing water, a removable internal perforated support or receptacle *c*, and a detachable



hermetic lid *b* provided with a valve *m*, through which steam can escape at a predetermined pressure to give warning that the contents have been sufficiently cooked or treated. A safety-valve *o* may be provided. The receptacle *c* has feet *d* and spacing-projections *e*, and the lid is secured by pivoted bolts *f* passing through slots in the cover and rim of the vessel *a*. The supply of gas for heating may be diminished on the attainment of a predetermined pressure in the cooker or digester, a gas valve *v*, Fig. 3, being operated by its connexion with a spring-controlled valve *s* mounted on the cooker.

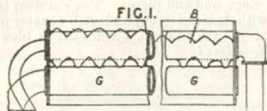
10,616. Fleischer, J., and Haegele & Zweigle. July 21.



Washing-boilers and the like.—In washing-boilers in which a circulation of the fluid is obtained by means of a riser pipe, this pipe is also used for drawing off the dirty water and for supplying clean water. The riser pipe 5 is connected to the loose perforated bottom 4 and is fitted with a spreader 15. The boiler 3 is closed by a lid 7 which enters a water seal 6. This lid is fitted with a smaller lid 10 and with a perforated conical plate 13. To draw off the dirty liquid, the small lid 10 is removed and the end of a pipe 18, Fig. 2, is fitted over the riser pipe. To supply clean water, the spreader 15 is removed and a pipe 21, Fig. 3, is

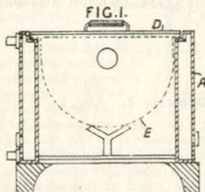
attached. The waste gases from the furnace are passed around the water-supply tank, from which extend suitable supply pipes.

10.859. Bromhead, H. K. July 27.



Water-tube boilers; geysers and instantaneous water-heaters.—Water is heated as it flows through a tube or channel B, by a burner G which gives out a progressively increasing degree of heat in the direction of the flow of the water. The burner holes may gradually increase in size, or the burner may be inclined so as to be nearer the water-tube at the outlet end than at the inlet end.

11,021. Gould, W. July 29.

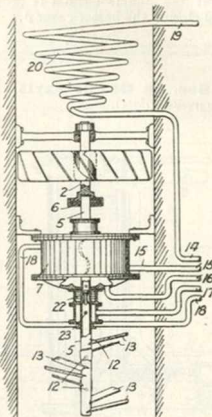


Annular boilers; washing-boilers and the like.—Consists of a combined annular boiler for heating and circulating water, and a copper or cooker which fits into and closes the top of the central heating-chamber of the boiler. The rim of the copper or cooker E rests in a recess formed in the top of the boiler A. When the copper or cooker is removed, the top of the boiler is closed by the lid D. The outer wall of the boiler may be extended upwards and formed with a flange to support the copper or cooker above the top of the boiler.

11,249. Yates, H. Aug. 4.

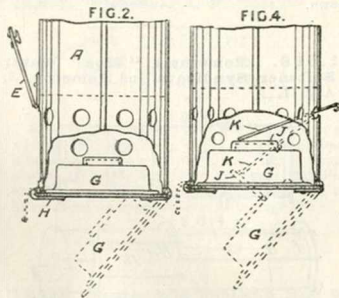
Heating air.—A ventilating and air-conditioning apparatus specially for textile factories, consists of a fan 1 driven directly by a steam turbine 7, the hollow shaft 5 of which is extended and provided with perforations 12 emitting live or exhaust steam; if desired, vanes 13 mix the air and steam, and a steam coil 20 heats the air. The shafts 2, 5 are connected by a spring coil 6. The apparatus may be variously operated. To supply air without heating or moistening it, the supply and exhaust

pipes 15, 16 are opened and all others are closed. To heat and moisten the air, the pipes 19, 14, 15 are opened and the pipe 16 is closed; the exhaust steam lifts the valve 22, and passes into the air



through the perforations 12 in the hollow shaft 5. To supply heated air with the maximum of moisture, steam is supplied also by a pipe 17 in connexion with the heating-coil 20, and passes through apertures 23 to the shaft 5. The pipes 18, 16 enable the turbine to be reversed.

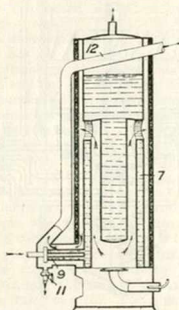
11,398. Hogan, R. Aug. 7. [Cognate Application, 16,417/15.]



Portable and small liquid-heaters.—Relates to a flask or receptacle having a perforated double bottom carrying a heater. The heater G, Fig. 2,

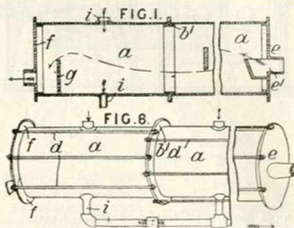
is hinged to the double bottom of the flask A and is held in position when raised by a catch H. A door E is provided in the side of the double bottom. In a modification, Fig. 4, the door is dispensed with, and a rod K projecting through the walls of the double bottom is provided for opening and closing the heater cover J.

11,502. Soc. du Gaz de Paris. Sept. 12, 1914, [Convention date].



Internally fired boilers; annular boilers.—The products of combustion from a gas-heated boiler are first cooled to free them of water vapour and are then reheated to induce a draught. The products escaping from the annular boiler 7 are cooled by contact with a number of copper tubes 9, through which flows the cold feed or return water. The condensed vapour is discharged through a cock 11. The products may be reheated by means of an auxiliary burner, or by leading the escape flue 12 through the boiler steam space as shown.

11,588. Pomeroy's "Moa" Water Softener Syndicate, and Pomeroy, J. Aug. 11.

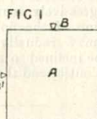


Feed-water, heating.—A direct-contact feed-

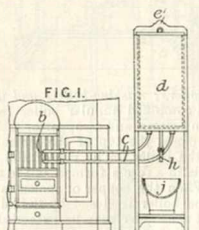
heater arranged in the boiler steam space, for heating and softening the water and for removing oil, mud, &c., consists of a tubular chamber built up of sections held together by bolts, so that it may be inserted in the boiler in sections and may be readily taken apart for cleaning purposes. The sections *a* are held between rings *b* and end plates *e, f* by bolts *d* lying in recesses in the edges of the rings and end plates. The chamber is provided with baffle-plates *g* and with a water pocket in front of the inlet *e*. Sediment is blown off through outlets *i*.

11,638. Briggs, F. Aug. 12.

Block-form boilers; protecting-plates for boilers.—A detachable protecting-plate A for range boilers is made with two lugs B, B', either of which may be fitted into a slot in a bracket fixed above the boiler. It is secured by a cotter and may be readily removed when it is desired to turn or renew it.



11,784. Dickie, J. Aug. 14.

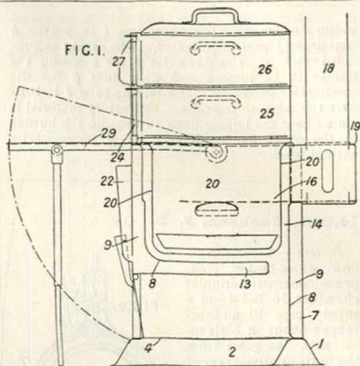


Water-tube boilers.—Relates to portable water-heating apparatus of the kind in which a looped tube extending from a tank is inserted between the bars of a fire-grate. An horizontal looped tube *c* inserted between the fire-bars *b* opens into a tank *d* in a cabinet having a cover *e* and an open bottom frame, in which a vessel *j* may be placed below the draw-off cock *h*. Non-conducting material may be placed between the tank and the cabinet.



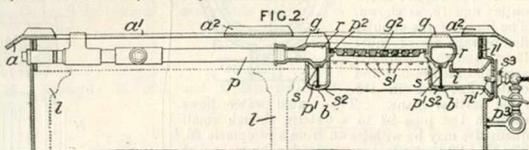
12,108. Gillies, G., and Gillies, G. G.
Aug. 23.

Internally fired boilers.—A portable domestic cooking-apparatus combining an oven and steam cookers comprises a boiler 9 which is formed by two casings 7, 8, and has a water space 13 projecting above the fire-place and forming with the casing 8 a flue connecting the fire-place and the combustion chamber 14. The boiler is filled through a funnel 22.



12,676. Mountain, H., and Worsfold, J. Sept. 3.

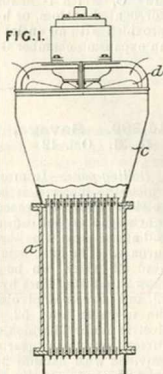
Annular boilers.—A gas cooking-apparatus comprises an annular water-heater r , the underside of which forms the body of the gas burner b , the body of which has a U-shaped section and has top edges serrated to form flame apertures s . The upper surface of the part r has utensil-supporting lugs g , and its upper side has projections p^2 , or a continuous ring, for supporting a grilling-plate g^2 . The device may be fitted in an enclosure with closed ends and back and an open front formed by legs l , and with a top a formed with apertures a^1 and utensil supports a^2 .



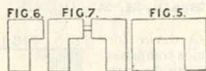
A water vessel may be mounted over one of these apertures and may be connected to the part r by pipes p , which may have branches, one provided with a tap for drawing off water. That part of the enclosure under the water vessel forms a hot-closet.

12,872. Haden, W. N., Haden, C. L.,
[trading as Haden & Sons, G. N.], and
Adlam, T. N.
Sept. 8.

Heating air.—In apparatus for heating or cooling air, comprising a fan adapted to force air through a receiver containing a battery of tubes surrounded by the heating or cooling medium, the receiver a is located beneath the fan d , to which it is connected by a short chamber c , as shown.



13,337. Florence, A. P. Sept. 18.

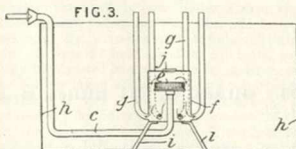


Block or slab form boilers.—Fig. 5 shows in plan a boiler which may be arranged so as to enclose a kitchen-range fire on three sides. Fig. 6 shows a similar boiler with a back extension, and Fig. 7 shows two such boilers connected so that they may be arranged on opposite sides of a range fire.

13,535. South Metropolitan Gas Co., and Chandler, D. Sept. 24.

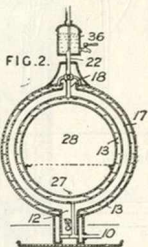
Submersible liquid-heaters.—The burner head of an atmospheric gas burner is arranged within a

casing *f* which is supported on feet *i* in a tank *h* containing liquid to be boiled. The casing is provided with a screw-down lid *j* for enabling the burner to be ignited and with flues *g* for the combustion products. The mixing-tube *c* is bent over the edge of the tank. Refractory material is placed near the burner head to reignite the burner in the event of the burner being momentarily extinguished.



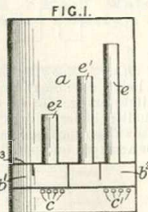
14,080. Jackson, J. D. Oct. 5.

Boilers.—A continuous-flow water-heater comprises concentric annular chambers 13 fed from a supply pipe 10 and arranged about an horizontal axis, the gases from the horizontally-arranged fire-box 12 dividing and passing through the bifurcated passage 17 to the outlet flue 18, as shown. The limbs of the annular flue passage are of equal length and cross-sectional area, and the fire-box and outlet flue are in the same vertical plane. The heated water flows through the pipe 22 to a cistern, though small quantities may be withdrawn from a receptacle 36. The pipe 22 is also in communication by means of a pipe 27 with the bottom of the chamber 28, which is used for sterilizing or steaming purposes. In modifications, the bifurcated flue passage may be divided into a series of passages, either by vertical partitions with staggered projections so as to present a more circuitous path for the hot gases, or by means of vertical corrugations on the annular walls.



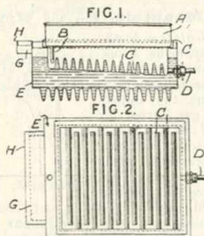
14,122. Brain, H. R. Oct. 5.

Boilers.—A device for heating liquids comprises a containing vessel *a* with one or more heating-chambers *b*, *b'* and a series of open-ended tubes *e*, *e'*, *e''* of various heights mounted thereon, so that when heat is applied by either of the burners *c*, *c'*, a circulation is set up through the tubes and the desired amount of hot water is available. By using the electric heater *c'* for example, the water above the tube *e'* is circulated through the tubes *e*, *e'* and heated. When the heater *c* is used, the water circulates through the orifice *e''* and the tube *e''*, the whole of the water in the container being thereby heated.



Instead of electric heaters, gas burners may be used. Thermostatic devices of known construction may be used in conjunction with the water-heaters to control the heat supply.

14,200. McCulloch, A., and Walkey, W. R. Oct. 7.

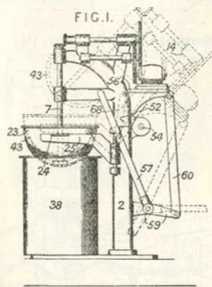


Heating liquids; geysers; boiling-pans.—Milk or liquid is supplied by a tank *A* and pipe *B* to a zig-zag channel formed by staggered corrugations in a tray *C*, which is heated by a bath *E* having a corrugated bottom, or by direct heat. The tray is provided with an outlet pipe *D*, and the bath has an expansion chamber *G* covered by a lid *H*.

14,389. Savage, R. J., and Schultz, C. E. Oct. 12.

Boiling-pans.—In machines for making candy in which the material is heated in an open pan or kettle 23 above a furnace 38, the stirring-device 43 is arranged so that it can be swung out of the way, and at the same time the kettle is raised from the furnace. The fixed column 2 is hinged at 54 to a head 52, which can be swung into the position shown in dotted lines by means of a lever 57, crank 59, and pitman 60 pivoted to a shaft 56 carried by the electric motor 14 which drives the shaft 7 of the stirrer through the gearing shown. The kettle is provided with handles 24 which are secured to a yoke 25 connected by a link 68 to the movable

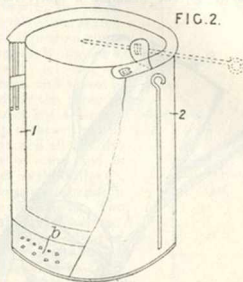
head, so that as the head moves either to the right or back again, the kettle is raised or lowered.



14,810. Blomefield, C. Oct. 20.

Portable and small liquid-heaters.—A rations-

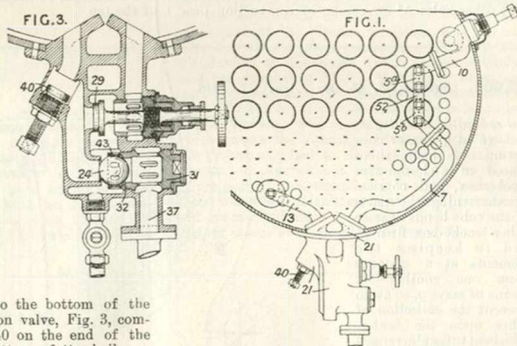
containing tin 1 is fitted with a sealed jacket 2, at the bottom of which is placed calcium carbide *b* covered with packing. The food is heated by un-



sealing the jacket, removing the packing, introducing water or snow, and igniting the acetylene generated.

14,976. Willans, G. H., Luard, E. S., and O'Donnell, J. P. Oct. 22. [*Cognate Application, 17,211/15.*]

Feed-water, heating.—In a combined feed-water-heating and boiler-water-circulating apparatus of the kind described in Specifications 21,118/13 and 4085/15, the U-shaped heating-tubes are placed in the enlarged smoke-tubes usually provided for receiving superheating-tubes, preferably in the outside vertical row of such tubes. The two U-tubes 5^a, 5^b, Fig. 1, are detachably connected to a pipe 10 extending into the boiler, and to a pipe 7 leading from the combination valve 21 secured to the bottom of the smoke-box. The combination valve, Fig. 3, comprises a screw-down valve 40 on the end of the pipe 13 opening into the bottom of the boiler, a screw-down valve 29 for cutting out the heating-tubes, and a ball valve 24 having a seating 32 on a sleeve 31 screwed into the valve casing at the top of the supply pipe 37. The inner end portion of the sleeve is formed with slots 43. The tubular



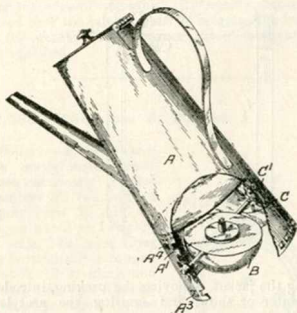
connector 52 between the U-tubes may be replaced by a box formed with a chamber divided into inlet and outlet compartments, and with a chamber connecting the compartments.

15,507. Heath, F. P. Nov. 3.

Portable and small liquid-heaters.—The heating-device is pivotally mounted below the vessel con-

taining the liquid to be heated so that it remains upright when the vessel is tilted for pouring.

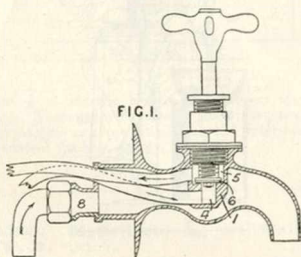
The side walls of the vessel A, for example a coffee-pot or hot-water jug, are extended downwards as shown at A¹ to form a stand, and the heating-device B, for example a spirit lamp, is



carried by trunnions C pivotally mounted in the extension A¹, the trunnion axis being parallel to the axis about which the vessel is tilted for pouring. The ends of the trunnions are screw-threaded to receive retaining-nuts C¹. The extension A¹ is formed with holes A² for admission of air, and with other holes A³ for escape of combustion pro-

ducts. As a modification, a gimbal mounting of the heating-device may be employed.

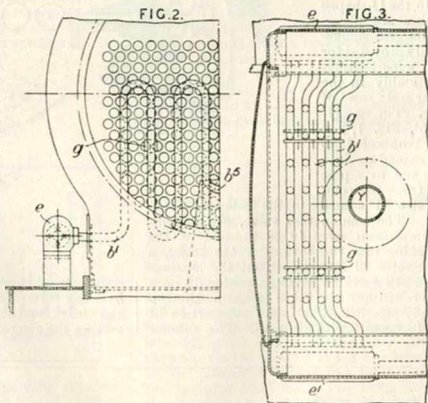
15,864. Downie, H. C. Nov. 10.



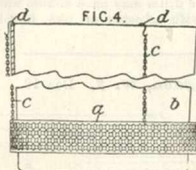
Heating water.—A combined cold-water supply and hot-water discharge tap for water-heaters comprises a casing 1 with two chambers 4, 5 connected respectively to the cold-water main and to the boiler, and a valve 6 controlling the communications. A free passage 8 for hot water is provided, so that when the tap is operated cold water is supplied to the heater and hot water is forced out and discharges through the passage 8 to the spout of the tap.

15,901. Sams, J. G. B. April 11, 1916.

Feed-water, heating.—Relates to a heater consisting of bent tubes placed in a locomotive smoke-box, and consists in shortening the parts of the tube bends near to other smoke-box fittings, and in keeping the parts at a distance from one another by means of stays g, so as to prevent the collection of ashes upon the heater. The bent tubes b¹ are arranged in front of the blast pipe Y are connected to outside headers e, e¹ on each side of the boiler. The central portion b⁵ of the element nearest the blast pipe is shortened, as shown.



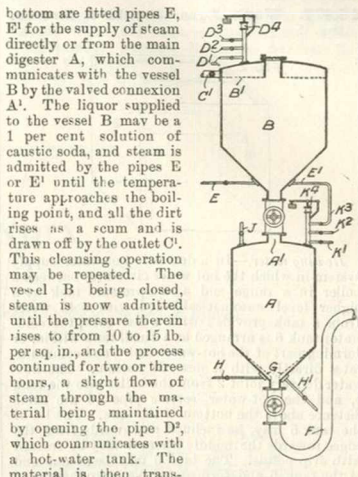
- 16,170. **Legrand, R. P., and Perthuis, A. L.** Aug. 4, [Convention date]. Void.
[Published under Section 91 of the Act.]



Portable and small liquid-heaters.—A flexible combustible material, which may be used for heating receptacles of any kind consists of a wick or band *a* of spongy fabric with large meshes, impregnated with paraffin, stearin, ozokerit, vegetable, animal, or mineral wax, or with other combustible fatty substances. The wick or band *a* is preferably applied to the receptacle *b* rolled around the base thereof in the form of a belt, suspended by small chains *c* or other incombustible support, secured by hooks *d* to the upper edge of the receptacle. The bands can also be arranged edgewise under the receptacle, either rolled up or in zigzag form.

- 16,488. **Raitt, W.** Nov. 23.

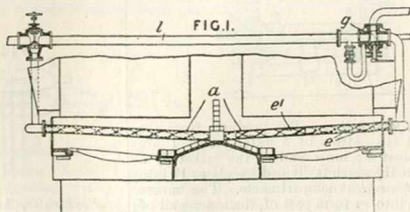
Digesters.—Bamboo, wood, grass, straw, reeds, jute, &c., are treated in an apparatus such as that shown, the invention being an improvement on that described in Specification 15,779/12. The chopped material is supplied to an auxiliary digester B, which is fitted with a screen *B*¹ near the top, above the screen, with an outlet pipe *C*¹, hot water, air, and steam pipes *D*¹, *D*², *D*³ respectively, and a safety-valve *D*⁴, while near the



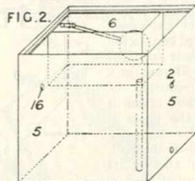
bottom are fitted pipes E, E' for the supply of steam directly or from the main digester A, which communicates with the vessel B by the valved connexion B'. The liquor supplied to the vessel B may be a 1 per cent solution of caustic soda, and steam is admitted by the pipes E or E' until the temperature approaches the boiling point, and all the dirt rises as a scum and is drawn off by the outlet C'. This cleansing operation may be repeated. The vessel B being closed, steam is now admitted until the pressure therein rises to from 10 to 15 lb. per sq. in., and the process continued for two or three hours, a slight flow of steam through the material being maintained by opening the pipe D', which communicates with a hot-water tank. The material is then transferred to the digester A which is fitted below with the connexions H, H' for the admission of steam and the withdrawal of liquor respectively; the upper part of the digester is fitted with an air valve J, with the valved connexions K', K' for the introduction of liquor and live steam respectively, with the connexion K' for the supply of steam from the vessel A to the vessel B, and with a safety-valve K'; the lower part of the digester is conical and is provided with a screen or false bottom G which covers the openings of the pipes H, H'. The liquor supplied to the digester A contains an amount of caustic soda corresponding to about 13 per cent of the original weight of the charge of grass, and, when of this strength, the spent liquor will contain sufficient free caustic soda to treat a further charge of material in the vessel B.

- 16,581. **Gowans, T.** Nov. 24.

Feed-water, heating.—Feed-heating pipes *a* extending through a boiler furnace are fitted with retarders *e* giving a rotary motion to the feed-water. A three-way cock *g* in the feed-pipe allows the water to pass either through the heater or directly into the supply pipe *l*. Parts *e*¹ of the edges of the retarders are cut away or recessed.

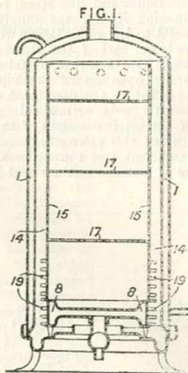


16,977. **Work, J., and Mould & Brown.**
Dec. 2.



Heating water.—In a domestic hot-water supply system in which the hot water circulates between a boiler in a range and a non-pressure tank at a higher level automatically fed with cold water from a tank provided with a ball-cock, the cold-water tank 6 is arranged as a small tank within, or forming part of the hot-water tank 5 and communicates directly with it near its bottom. The hot-water delivery joint 2 from the boiler into the tank 5, and the hot-water service pipe 16 are some distance above the bottom of the tank. The lid of the tank 5 may be inclined downwards from the edges towards the middle where it may be formed with drip points. The tank 6 may be at one end of the tank 5 and formed by the introduction of two partitions having an air space between them.

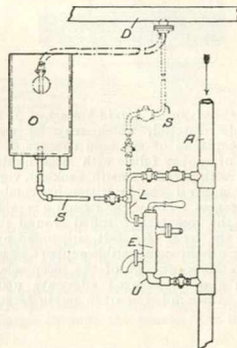
17,359. **Keesing, H. M.** Dec. 10.



Internally-fired boilers.—The products from the burner 8 at the bottom of a water jacket 1 are directed against the inner wall of the jacket by a central drum 15, which is divided by plates 17 into a number of air-tight compartments. The burner may project into, or form part of, the inner wall of

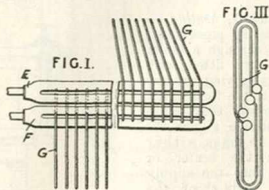
the flue space 14. The inner wall of the jacket may have vertical or horizontal hollow or solid ribs or projections. The drum and burner may be provided with projections 19. Plain or woven wire may be placed in the jacket to increase the heating-surface. The drum may have double walls or may be covered with asbestos or like heat-insulating material.

17,731. **Ogden, W. J.** Dec. 18.



Feed-water, heating.—To prevent deterioration of the tubes of an economizer due to condensation of furnace gases upon the cold tube surfaces, the feed-water is initially heated by means of a steam injector, which draws water from the economizer supply or delivery pipe and delivers it to the economizer inlet. To prevent overheating of the water in the tubes when the pump delivery is insufficient, the injector may draw water from a reserve-feed tank. The water-inlet pipe L and the discharge pipe U of the injector E open into the economizer supply pipe A. Branch pipes S from the inlet pipe connect the injector to the delivery pipe D and the reserve-feed tank O.

17,928. **Daneri, A.** Dec. 22.



Feed-water, heating.—A heater consists of

headers E, F, each being in the form of a flattened O and without joints in the parts exposed to the furnace gases, and of two series of upwardly or downwardly extending looped tubes G. The

heater may be placed in the smoke-box of a marine boiler, the downwardly-extending tubes being arranged opposite the spaces between the ends of the fire-tubes.

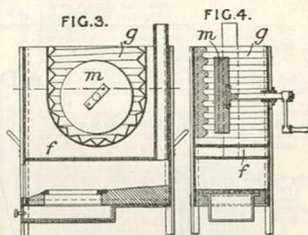
APPENDIX.

The following abridgments should be inserted in place in the present volume.

A.D. 1910.

4752. Plattner, W. Feb. 25.

Washing-boilers &c.—The clothes are placed in a corrugated receptacle *g* within a copper *f* and are squeezed and rubbed by means of a rotatable fluted disk *m*. In a modification, the sides of the receptacle and copper are inclined to facilitate the actuation of the disk.



14,334. Brunner, E. June 14. *Drawings to Specification.*

Tubulous heaters of economizer type.—In feed-water-heating tubes having internal spiral

baffles, the baffles are formed with serrated or notched edges in order to prevent erosion of the sides of the tubes by overheating. The baffles may be made with knife-edges.

A.D. 1914.

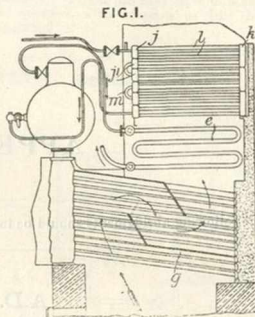
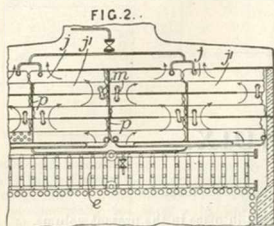
24,162. Soc. J. et A. Niclausse. Jan. 23, [Convention date].

Feed-water, heating.—A Niclausse boiler fitted with an economizer *l* is provided with baffles *g, p* so arranged that the hottest furnace

gases come in contact throughout with the tubes containing steam and water at the highest temperatures and the coolest gases come in con-

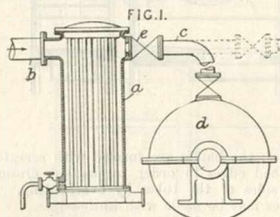
tact with the tubes containing steam and water at the lowest temperatures. The economizer is built up of elements each having a single back header *k* and two front headers *j*, *j*¹. The front headers are so connected by tubes *m* that

the direction of flow of the water from the top to the bottom of the economizer is always opposite to the direction of flow of the furnace gases around the baffles *p*.

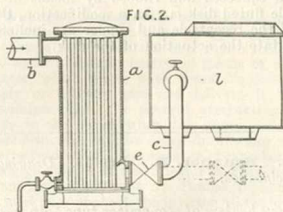


A.D. 1915.

6789. Morison, D. B. May 6.



Feed-water, heating.—In feed-water-heating apparatus with vertical water tubes and having the outlet for excess steam arranged at a remote point in the direction in which the flow of steam from the inlet *b* to the heater *a* is desired, the excess steam is discharged from the heater through a valve *e* and pipe *c* to a section of



a steam turbine *d* or to the receiver *l* of a reciprocating steam-engine. The circulation of steam as the result of the discharge of surplus steam prevents the accumulation of air in the heater. Specifications 3499/12 and 15,413/13 are referred to.

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(A.)—Illustrated Abridgments classified in 146 volumes for each of nine consecutive periods, dealing completely with all Specifications published from 1855 to 1908. The price of each volume is 2s. per period, including inland postage. Postage to Colonies and foreign Countries extra.

List of Periods.

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1884-1888.
1889-1892.
1893-1896.
1897-1900.
1901-1904.
1905-1908.

List of Classes.

1. Acids, alkalies, oxides, and salts, Inorganic.
2. Acids and salts, Organic, and other carbon compounds, (including Dyes).
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6. Agricultural appliances for the treatment of land and crops, (including Gardening-appliances).
7. Air and gas engines.
8. Air and gases, Compressing, exhausting, moving, and otherwise treating.
9. Ammunition, torpedoes, explosives, and pyrotechnics.
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11. Artists' instruments and materials.
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27. Coin-freed apparatus and the like.
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29. Cooling and ice-making, (including Refrigerators and Ice-storing).
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33. Drains and sewers.
34. Drying.
35. Dynamo-electric generators and motors, (including Frictional and influence machines, magnets, and the like).
36. Electricity, Conducting and insulating.
37. Electricity, Measuring and testing.
38. Electricity, Regulating and distributing.
39. Electric lamps and furnaces.
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42. Fabrics, Dressing and finishing woven and manufacturing felted, (including Folding, Winding, Measuring, and Packing).
43. Fastenings, Dress, (including Jewellery).
44. Fastenings, Lock, latch, bolt, and other, (including Sashes and strong-rooms).

45. Fencing, trolleys, and wire netting.
46. Filtering and otherwise purifying liquids.
47. Fire, Extinction and prevention of.
48. Fish and fishing.
49. Food preparations and food-preserving.
50. Fuel, Manufacture of.
51. Furnaces and kilns, (including Blowpipes and blowpipe burners; Smith's forges and rivet hearths; and Smoke and fumes, Treating).
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54. Gas distribution.
55. Gas manufacture.
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69. Hydraulic machinery and apparatus, (excepting Pumps and other means for raising and forcing liquids).
70. India-rubber and gutta-percha, (including Plastic compositions and Materials of constructive utility, other than metals and stone).
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79. Locomotives and motor vehicles for road and rail, (including Portable and semi-portable engines).
80. Mechanisms and mill gearing.
81. Medicine, surgery, and dentistry.
82. Metals and alloys, (excepting Iron and steel manufacture).
83. Metals, Cutting and working.
84. Milking, churning, and cheese-making.
85. Mining, quarrying, tunnelling, and well-sinking.
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89. Nails, rivets, bolts and nuts, screws, and like fastenings.
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91. Oils, fats, lubricants, candles, and soaps.
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93. Ornamement.
94. Packing and baling goods.
95. Paints, colours, and varnishes.
96. Paper, pasteboard, and paper maché.
97. Philosophical instruments, (including Optical, nautical, surveying, mathematical, and meteorological instruments).
98. Photography.
99. Pipes, tubes, and hose.
100. Printing, Letterpress and lithographic.
101. Printing other than letterpress or lithographic.
102. Pumps and other means for raising and forcing liquids, (excepting Rotary pumps).
103. Railway and tramway vehicles.
104. Railways and tramways.
105. Railway signals and communicating-apparatus.
106. Registering, indicating, measuring, and calculating, (excepting Signalling and indicating by signals).
107. Roads and ways.
108. Road vehicles.
109. Ropes and cords.
110. Rotary engines, pumps, blowers, exhausters, and motors.
111. Sewage, Treatment of, (including Manure).
112. Sewing and embroidering.
113. Ships, boats, and rafts, Div. I.
114. ————— Div. II.
115. ————— Div. III.
116. Shop, public-house, and warehouse fittings and accessories.
117. Sifting and separating.



118. Signalling and indicating by signals, [excepting Railway signals and communicating-apparatus].
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120. Spinning, (including the preparation of fibrous materials and the doubling of yarns and threads).
121. Starch, gum, size, glue, and other stiffening and adhesive materials.
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123. Steam generators, (excepting Furnaces).
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126. Stoves, ranges, and fire-places.
127. Sugar.
128. Table articles and appliances.
129. Tea, coffee, cocoa, and like beverages.
130. Tobacco.
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132. Toys, games, and exercises.
133. Trunks, portmanteaux, hand and like travelling bags, baskets, hampers, and other wickerwork.
134. Umbrellas, parasols, and walking-sticks.
135. Valves and cocks.
136. Velocipedes.
137. Ventilation.
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141. Wearing-apparel.
142. Weaving and woven fabrics.
143. Weighing-apparatus.
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145. Wood and wood-working machinery.
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List of Classes.

- 1 (i), Chemical processes and apparatus.
1 (ii), Inorganic compounds other than metallic oxides, hydrates, oxyacids, and salts, (including Alkali manufacture and Cyanogen compounds).
1 (iii), Oxides, hydrates, oxyacids, and salts, Metallic, (other than Alkali manufacture and Cyanogen compounds).
2 (i), Acetylene.
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3 (i), Advertising and displaying apparatus, Moving and changing.
3 (ii), Advertising and displaying other than by moving and changing apparatus.
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5 (ii), Housing and feeding animals, (other than Chaff and vegetable cutters).
6 (i), Cultivating implements and systems.
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6 (iii), Harvesting-appliances.
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7 (iii), Internal-combustion engines, Carburetting-apparatus, vaporizers, and heaters for.
7 (iv), Internal-combustion engines, Igniting in.
7 (v), Internal-combustion engines, Starting, stopping, and reversing.
7 (vi), Internal-combustion engines, Valves and valve-gear for, (including Other means and methods for regulating and controlling internal-combustion engines).
8 (i), Air and gases, Compressing, exhausting, and moving, (including Bellows and Vacuum and like dusting and cleaning apparatus).
8 (ii), Air and gases, Treating otherwise than by compressing, exhausting, and moving.
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9 (ii), Torpedoes, explosives, and pyrotechnics.
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11, Artists' instruments and materials.
12 (i), Bearings and bearing-surfaces.
12 (ii), Lubricating passages, channels, reservoirs, and baths, and lubricating-cans.
12 (iii), Lubricators and lubricating bearing-surfaces, (other than Lubricating passages, channels, reservoirs, and baths).
13, Bells, gongs, foghorns, sirens, and whistles.
14 (i), Aerating liquids and gazogenes, soltrogenes, and siphon bottles.
14 (ii), Beverages, malt products, and organized ferments, (other than Aerating beverages).
15 (i), Dyeing and other otherwise treatize textiles, textile materials, and the like with liquids and gases, Apparatus for, (including Bleaching and washing, Processes and materials for).
15 (ii), Dyeing, Processes and materials for.
16, Books, mercantile forms, and the like.
17 (i), Boots and shoes, Apparatus for making and repairing.
17 (ii), Boots and shoes, Construction of.
17 (iii), Boots and shoes, Protectors and trees and other accessories for.
18, Boxes and cases.
19, Brushing and sweeping.
20 (i), Buildings and structures, Kinds or types of.
20 (ii), Buildings and structures, Miscellaneous accessories and details applicable generally to.
20 (iii), Doors and windows and their accessories.
20 (iv), Floors, roofs, walls, and ceilings.
21, Casks and barrels.
22, Cements and like compositions.
23, Centrifugal machines and apparatus, (other than Centrifugal fans, pumps, and reels).
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25, Chimneys and flues, (including Ventilating-shaft tops).
26, Closets, urinals, baths, lavatories, and like sanitary appliances.
27, Coin-freed apparatus and the like.
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28 (ii), Kitchen and like appliances other than cooking-appliances.
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31 (ii), Puncturing and perforating machines and hand tools for cutting, punching, perforating, and tearing paper, leather, fabrics, and the like.
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34 (ii), Drying systems and apparatus, (other than Drying gases, clothes, and materials in long lengths).
35, Dynamo-electric generators and motors, (including Frictional and influence machines, magnets, and the like).
36, Electricity, Conducting and insulating.
37, Electricity, Measuring and testing, (including Electric resistances and inductances).
38 (i), Electric couplings, and cut-outs other than electro-magnetic and thermal.
38 (ii), Electric currents, Converting and transforming other than by rotary converters and rotary transformers, and condensers.
38 (iii), Electric motor control systems and motor and like controllers.
38 (iv), Electric supply and transmission systems and apparatus not otherwise provided for.
38 (v), Electric switches and electro-magnetic and thermal cut-outs, (other than Motor and like controllers).
39 (i), Electric lamps, Arc and incandescent-arc, and vacuum or low-pressure apparatus for electric discharges through gases or vapours.
39 (ii), Electric lamps, Incandescent.
39 (iii), Heating by electricity, (including Electric furnaces and ovens).
40 (i), Electric signalling systems and apparatus, (other than Telegraphs and Telephones).
40 (ii), Phonographs, gramophones, and like sound transmitting and reproducing instruments.
40 (iii), Telegraphs, Electric.
40 (iv), Telephones and telephone systems and apparatus, Electric.
40 (v), Wireless signalling and controlling.
41, Electrolysis, (including Electro-deposition and Electro-plating).

LIST OF CLASSES

- 42 (1), Fabrics, Finishing and dressing.
 42 (ii), Fabrics, Treating otherwise than by finishing and dressing.
 43, Fastenings, Dress, (comprising Buckles, Buttons, Jewellery, and certain other fastenings specially applicable to wearing apparel).
 44, Fastenings, Lock, latch, bolt, and other, (including Safes and strong-rooms).
 45, Fencing, trellis, and wire netting.
 46, Filtering and otherwise purifying liquids.
 47 (i), Fire-escapes and fire and temperature alarms.
 47 (ii), Fire-extinguishing and firepreventing and minimizing.
 48, Fish and fishing.
 49, Food preparations, food-preserving, and the like.
 50, Fuel, Manufacture of.
 51 (i), Furnaces and kilns, Combustion apparatus of, (including Details in connexion therewith).
 51 (ii), Furnaces and kilns for applying and utilizing heat of combustion, (other than Combustion apparatus and details in connexion therewith).
 52 (i), Furniture, Fittings and details applicable generally to and articles of furniture not otherwise provided for.
 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.
 54, Gas distribution.
 55 (i), Coking, gas-producers, and retorts.
 55 (ii), Gas manufacture other than gas-producers and retorts.
 56, Glass.
 57, Governors, Speed-regulating, for engines and machinery.
 58, Grain and seeds, Treating, (including Flour and meal).
 59, Grinding, crushing, pulverizing, and the like.
 60, Grinding or abrading, and burnishing.
 61 (i), Hand-tool, wrench, mop, and like handles.
 61 (ii), Hand-tools, (other than Wrenches and bolt, nail, screw, and like inserting and extracting tools).
 61 (iii), Wrenches and bolt, nail, screw, and like inserting and extracting tools.
 62, Harness and saddlery.
 63, Hats and other head coverings.
 64 (i), Heating liquids and gases.
 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 (i), Door and gate operating-appliances, furniture, and accessories, (other than Fastenings, Lock, latch, bolt, and other and Hinges and pivots).
 65 (ii), Hinges and pivots.
 66, Hollow-ware, (including Buckets, Pans, Kettles, Sauce-pans, and Water cans).
 67, Horseshoes.
 68 (i), Excavating earth and rock, booms, buoys, canals and rivers, ferries, and water supply.
 68 (ii), Subaqueous buildings and structures, diving, and raising sunken ships and objects.
 69 (i), Hydraulic apparatus not otherwise provided for.
 69 (ii), Hydraulic presses, 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).
 71, Injectors and ejectors.
 72, Iron and steel manufacture.
 73, Labels, badges, coins, tokens, and tickets.
 74 (i), Braid and braiding-machines, crochet, lace, and lace-making, and net-making machines.
 74 (ii), Knitting and knitted fabrics.
 75 (i), Burners and burner fittings.
 75 (ii), Lamp chimneys, globes, lenses, shades, reflectors, and sun-catchers, and materials in bulk.
 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).
 76, Leather, (including Treatment of hides and skins).
 77, Life-saving, (Marine), and swimming and bathing appliances.
 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).

- 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 undercarriage work of.
 79 (v), Motor vehicles, Steering and controlling.
 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.
 81 (i), Disinfecting and deodorizing, and medical and like preparations.
 81 (ii), Medical, surgical, and dental appliances.
 82 (i), Metals, Extracting and refining, and alloys.
 82 (ii), Washing granular, powdered, and like materials, and amalgamating, cleaning, coating, and granulating metals.
 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.
 84, Milking, churning, and cheese-making.
 85, Mining, quarrying, tunnelling, and well-sinking.
 86, Mixing and agitating machines and appliances.
 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).
 88 (i), Musical instruments, Automatic.
 88 (ii), Music and musical instruments other than automatic.
 89 (i), Bolts, studs, nuts, washers, and rivets.
 89 (ii), Hooks, nails, cotters, pins, staples, wedges, and wood-screws.
 89 (iii), Nailing and stapling and wire-stitching.
 90, Non-metallic elements.
 91, Oils, fats, lubricants, candles, and soaps.
 92 (i), Ordnance and machine-gun carriages and mountings.
 92 (ii), Ordnance and machine guns.
 93, Ordnance.
 94 (i), Packing and wrapping-up for transit and storage, (including Baling).
 94 (ii), Paper bags, sacks, wrappers, and the like, (including Making envelopes).
 95, Paints, painting, and the like.
 96, Paper, pasteboard, and papier mâché.
 97 (i), Optical systems and apparatus.
 97 (ii), Surveying, nautical, and astronomical instruments.
 97 (iii), Thermometers, photometers, meteorological and mathematical instruments, and miscellaneous philosophical instruments.
 98 (i), Photographic cameras and auxiliary appliances therefor.
 98 (ii), Photographic process and apparatus other than for taking photographs, (including Photographic plates, films, and papers).
 99 (i), Pipes and tubes, Joints and couplings for, (including Joints for tubular framework and like Wire and rod couplings and joints).
 99 (ii), Pipe, tubes, and hose, (other than Joints and couplings for).
 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.
 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.
 103 (i), Brakes and retarding-apparatus.
 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 accessories for.
 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).

105. Railway signals and communicating-apparatus.
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.
106 (v). Measured quantities (delivering, measures of capacity, and sampling liquids).
107. Roads and ways.
108 (i). Road vehicles, Body details and kinds or types of.
108 (ii). Road vehicles, Undercarriage details and draught appliances for.
108 (iii). Springs and vibration-dampers.
109. Ropes and cords.
110 (i). Centrifugal and screw fans and pumps.
110 (ii). Rotary engines, pumps, blowers, exhausters, and meters.
110 (iii). Turbines and reaction-wheels.
111. Sewage, Treatment of, (including Manure).
112. Sewing and embroidering.
113 (i). Ship and boat fittings and accessories, and pontoons and rafts.
113 (ii). Ships and boats, Kinds or types and structural details of.
114. Ships, boats, and rafts, Propelling, steering, and manoeuvring.
115. Ships, boats, and rafts, Rigging, sails, and spars for, (including Boat raising, lowering, and disengaging gear).
116. Shop, public-house, and warehouse fittings and accessories.
117. Sifting and separating.
118 (i). Indicators and burglar and like alarms.
118 (ii). Signals, (including Marine signals).
119. Small-arms.
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.
121. Starch, gum, size, glue, and other stiffening or adhesive materials.
122 (i). Engine and like cylinders, connecting-rods, cross-heads and guides, fly-wheels, piston-rods, and pistons.
122 (ii). Steam-engine distributor 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, (including Engine turning-gear).
122 (v). Stuffing-boxes and substitutes therefor, (including Packing thereto).
123 (i). Liquid-level regulating, indicating, and registering, immersion and corrosion preventing and removing, and door lids and covers for resisting fluid pressure.
123 (ii). Steam-generators.
123 (iii). Steam separators and superheaters.
124. Stone, marble, and the like, Cutting and working.
125 (i). Bottles, jars, and like vessels, (including Non-refillable bottles, jars, and like 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.
126. Stoves, ranges, and fire-places.
127. Sugar.
128. Table articles and appliances.
129. Tea, coffee, cocoa, and like beverages.
130. Tobacco.
131. Toilet and hairdressing articles, and perfumery.
132 (i). Amusement and exercising apparatus other than games and toys.
132 (ii). Games.
132 (iii). Toys.
133. Trunks, portmanteaux, and like travelling bags, baskets, hampers, and other wickerwork.
134. Umbrellas, parasols, and walking-sticks.
135. Valves and cocks.
136 (i). Velocipede, cycle, and like vehicle brakes, steering-mechanism, and miscellaneous accessories.
136 (ii). Velocipede, cycle, and like vehicle driving-mechanism, (including Hand and foot driving-mechanism for apparatus other than vehicles).
136 (iii). Velocipede, cycles, and like vehicles, Kinds or types and structural details of.
137. Ventilation.
138 (i). Washing and cleaning buildings and domestic articles other than clothes.
138 (ii). Washing, mangle and wringing, ironing, and starching clothes.
139. Watches, clocks, and other timekeepers.
140. Waterproof and like fabrics.
141. Weaving-apparels.
142 (i). Looms, Driving, reversing, stopping, and starting, and loom shedding-mechanism and pattern cards, cminas, 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 Felt fabrics and Floor coverings).
143. Weighing-apparatus.
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.
145 (i). Wood, Cutting, (other than Sawing).
145 (ii). Wood, Working, (including Sawing).
146 (i). Filing papers and documents.
146 (ii). Stationery, waters and seals, educational appliances, and cipherers and codes.
146 (iii). Writing-instruments, ink, receptacles for writing-materials, pads, and blotters.

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A subject index of all complete specifications for the period 1861-1910 has now been published in 271 volumes corresponding to the new series of Illustrated Abridgment Classes (List B above). The classification is in accordance with the "Abridgment Class and Index Key," as amended up to date. To some extent the headings in the "Fifty Years Subject Index" may be regarded merely as a compilation of the corresponding headings in the abridgment volumes, and so far as this is the case, the Index may be used with the abridgments. But, generally speaking, the headings represent an improved and extended classification of matter, and it may often be found more convenient to use the "Fifty Years Subject Index" with the specifications, as the contents of the new index headings will not always be found collected in any one Abridgment Class.

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