PATENTS FOR INVENTIONS

ABRIDGMENTS OF SPECIFICATIONS

CLASS 64 (iii)

SURFACE APPARATUS FOR EFFECTING TRANSFER OF HEAT

[*other than* APPARATUS IN WHICH THE HEAT IS TRANSFERRED FROM PRODUCTS OF COMBUSTION]

PERIOD—A.D. 1909–15

LONDON:
PRINTED BY HIS MAJESTY'S STATIONERY OFFICE
PUBLISHED AT THE PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS,
CHANCERY LANE, LONDON, W.C.2.

1921

Price Two Shillings Net

PATENTS FOR INVENTIONS

ABRIDGMENTS OF SPECIFICATIONS

CLASS 64 (iii)

SURFACE APPARATUS FOR EFFECTING TRANSFER OF HEAT

[*other than* APPARATUS IN WHICH THE HEAT IS TRANSFERRED FROM PRODUCTS OF COMBUSTION]

PERIOD—A.D. 1909-15

LONDON:
PRINTED BY HIS MAJESTY'S STATIONERY OFFICE.
PUBLISHED AT THE PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS,
CHANCERY LANE, LONDON, W.C.2.

1921

NOTE.—The Patent Office does not guarantee the accuracy of its publications, or undertake any responsibility for errors or omissions or their consequences.

EXPLANATORY NOTE

The contents of this Abridgment Class may be seen from its Subject-matter Index, which includes all index headings, subheadings, and subdivisions allotted to this Class, as well as cross-references under them, although there may be no cases affected within the period covered by this volume. For further information as to the classification of the subject-matter of inventions, reference should be made to the *Abridgment-Class and Index Key*, published at the Patent Office, 25, Southampton Buildings, Chancery Lane, W.C.2.

It should be borne in mind that the abridgments are merely intended to serve as guides to the Specifications, which must themselves be consulted for the details of any particular invention. Printed Specifications, price 1*s*., may be purchased at the Patent Office, or ordered by post, no additional charge being made for postage.

SUBJECT-MATTER INDEX

Abridgments are printed in the chronological order of the Specifications to which they refer, and this index quotes only the year and number of each Specification.

(513) Wt. 32733—2778 500 5/21

ERRATUM

Page 3. *Delete* abridgment No. 4635.

CLASS 64 (iii).

SURFACE APPARATUS FOR EFFECTING TRANSFER OF HEAT,

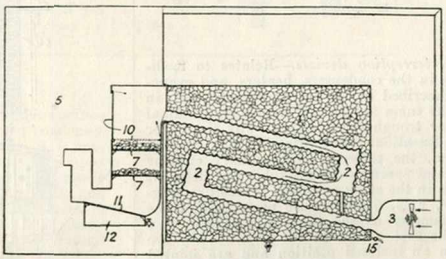
[*other than* APPARATUS IN WHICH THE HEAT IS TRANSFERRED FROM PRODUCTS OF COMBUSTION].

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

A.D. 1909.

198. Giletta, C. April 11, 1908, [*Convention date*].

Serpentine-tube apparatus. — Relates to apparatus for cooling the air in cold-storage rooms, trucks, refrigerators, schools, restaurants, hospitals, &c. Air, withdrawn from the upper part of the cooling-chamber 5, is forced by a fan 3 through a sinuous corrugated pipe 2 immersed in ice, and downwards through gratings 7, on which lumps of calcium chloride are placed, back to the cooling-chamber. Moisture condensed in the pipe 2 is drawn off by a cock 15.

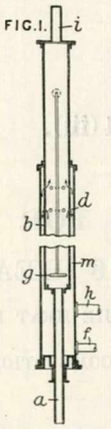


779. Brücke, O. Jan. 12.

Concentric straight-tube apparatus. — The liquid to be heated or cooled rises up the central column *b*, being admitted from a tube *a*, and, passing through apertures *d*, trickles

down the outer side of the column. The treating-medium enters through the rose distributor *g*, bubbling through the liquid in the tube *b*, and also through the tube *h*, passing over the surface of the thin layer of liquid falling in the annulus *m*. The exit for the treating-medium is at *i*, and for the liquid at *f*. The directions of flow may be reversed, i.e., the liquid and treating-medium may enter the annulus first, the thin layer being in this case on the inside of the inner column. In a modification, the direct heating &c. is supplemented by a jacket upon the inner column through which the medium flows.

FIG.1.



1682. Quiggin, D. A. Jan. 23. [*Addition to* 24,745/06.]

FIG.5.

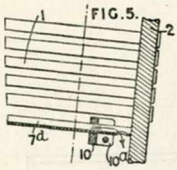
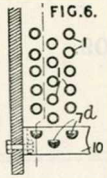


FIG.6.



Drip-interception devices.—Relates to modifications in the condensers, heaters, and evaporators described in the parent Specification, in which the tubes are formed with a longitudinal groove or trough for draining away the water of condensation. According to the present invention, the tubes are of ordinary circular section and special draining-tubes are fitted at intervals in the stack of tubes. These draining-tubes 7^d, Figs. 5 and 6, are preferably of the same diameter as the tubes 1, and are open along the top, except at the ends. They are fitted in an inclined position and are jointed in the tube-plates by blind ferrules or supported by bars 10 having feet 10^a. In condensers with long tubes and supporting-diaphragms at intervals of their length, the tubes 7^d may slope in alternate directions.

2049. Fawcett, Preston, & Co., and **Shield, H.** Jan. 28.

FIG.2.

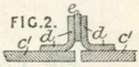
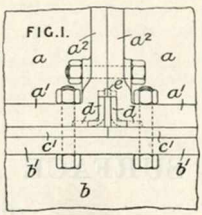


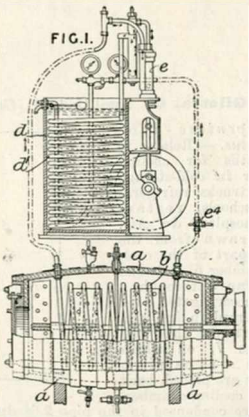
FIG.1.



Casings.—An Adamson ring joint, consisting of rectangularly bent plates *d*, Fig. 2, with or without an intermediate plate *e*, is applied to the tube-plates c^1 of the heating-belt of an evaporator. The tube-plates c^1 abut at the wall of the evaporator, Fig. 1, and lie between the flanges a^1, b^1 of the body plate *a* and the belt shell plate *b* respectively. The joint plates *d*, *e* are here brought up together to form a solid T-piece lying between the tube-plates c^1 and the horizontal and vertical flanges a^1, a^2 of the shell. The whole is made tight by means of rivets or bolts, as shown, and may be caulked or provided with a covering-plate.

2819. Pannell, H. *April 24, 1908.* [*Addition to* 17,461/07.]

FIG.1.

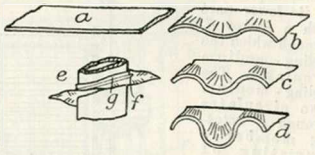


Coiled-tube apparatus.—In apparatus for cooling and carbonating beer of the kind described in Specifications 17,461/07 and 2803/08, [*Class* 14, Beverages], the beer in the barrel *a* is cooled by the circulation through the fixed coil *b* of carbon dioxide, ether, ammonia, &c., withdrawn

from the coil by a pump *e*, compressed into a coil d^1 immersed in a tank *d* through which water is circulated, and allowed to expand again into the coil *b* through a regulator e^4.

4299. Bennett, F. E., [executor of *Bennett, T. P.*]. Feb. 22.

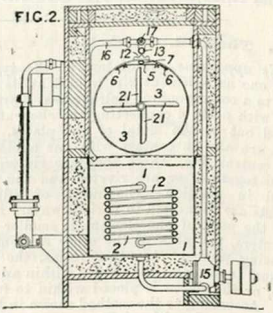
Gills for tubes. — Tubes for heating, cooling, or condensing apparatus are provided with spiral gills which, when applied, are substantially smooth. A metallic tape as at *a* is stretched before winding on the tube, by corrugating it in successive operations, as shown at *b*, *c*, *d*, in such a manner as to allow it to lie approximately flat when applied to the tube, as shown at *e*. The tape may be secured in position by soldering; or a wire *f* may be wound on to bear on tabs or a collar *g* on the gill itself.



4635. Adlam, E. G. Feb. 25.

Distributing liquids over inside of closed cylinder.—In apparatus for cooling and carbonating beer, stout, &c., the beer is distributed in thin films on the inside of a cylindrical vessel 3, while cooled brine is allowed to flow on the outside. Beer is fed to the vessel 3 either by a pump or by gravity through a perforated pipe 7 above a plate 5 attached to the crown of the vessel, and is delivered in thin films between the edges of the plate and the surface of the vessel. The thickness of the film is adjusted by screws 6. Brine from a tank 1 cooled by an expansion coil 2 is raised by a pump 15 and discharged by a perforated pipe 13 into gutters 12 extending along the vessel 3 and is distributed over the outside of the vessel. When the vessel 3 is charged with beer, either the brine pump 15 is stopped, or the brine is returned by a three-way cock 17 to the tank 1 through a pipe 16. Carbon dioxide is admitted to the vessel 3, and is incorporated with the beer by rotary agitators 21. The vessel 3 has a hinged removable door at one end for cleaning purposes.

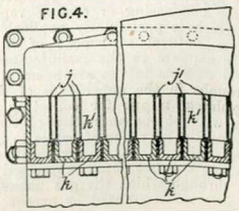
FIG. 2.



5108. Allen, R. March 2.

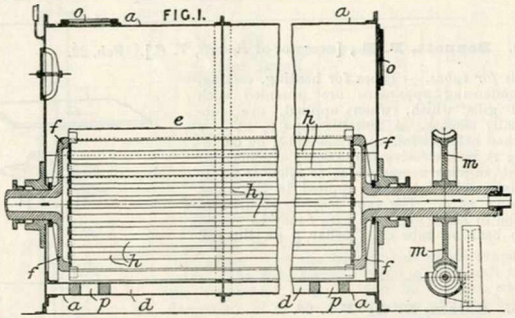
Plate apparatus.—In a steam traction engine; locomotive or the like, an air-cooled condenser shown in transverse section in Fig. 4 is employed. It consists of thin plates *j* clamped together in pairs between rectangular frames *k* of channel-section, placed side by side and secured by bolts passing through bolt holes in the sides and ends of the frames. The spaces between the two plates of each pair extend from one end of the condenser to the other, and open into the exhaust-steam and condensed-water headers at the ends. The air passages k^1 alternate with the steam passages and open at the ends into headers bolted to the underside of the condenser through perforations in the lower sides of the rectangular frames.

FIG. 4.



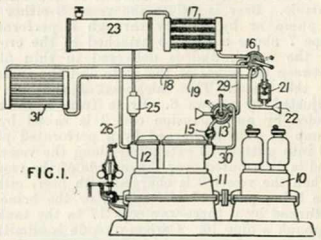
5438. Hawley, Ltd., J., and **Saunders, S. H.** March 6.

Straight tubes between headers.—Apparatus for cooling liquids consists of a container *a* provided at its lower part with a jacket *d*, through which the cooling-medium circulates. The cooling-medium also circulates through a rotating member *e* consisting of headers *f* connected by tubes *h*. The member *e* is rotated by worm gearing *m*. Specifications 14,651/92 and 15,031/02 are referred to.



6541. Tholt, S. March 18.

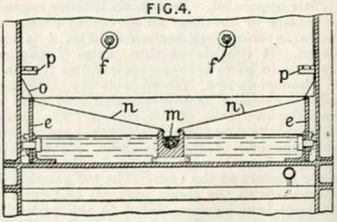
Plate apparatus.—Radiators of the type in which one half-element 2 is welded at its outer edges to a corresponding half-element 3 are provided with necks 4 connecting the elements and pressed out of the metal of the plates. The plates are also in contact with one another at their central line, where they are riveted and welded together, or are riveted and the rivets welded in position. The necks of adjacent elements are connected in various ways. In one form, the neck of one element is smaller than, and enters, the neck of the other element, the two being welded. In other forms, the necks are equal in size and are welded within an outer sleeve, or the sleeve is placed within to form a liner. According to the method shown in Fig. 7, nuts 6, tapped with right and left handed threads, are welded in the necks 4, and a hollow screw connector with threads to correspond is then screwed into the nuts 6. A tubular lining 7 may be fitted. In the method illustrated in Fig. 8, the tubular necks are dispensed with, and the circular edges of the apertures abut against each other and are welded.



6557. Kirkham, Hulett, & Chandler, and **Blake, E. W.** March 18.

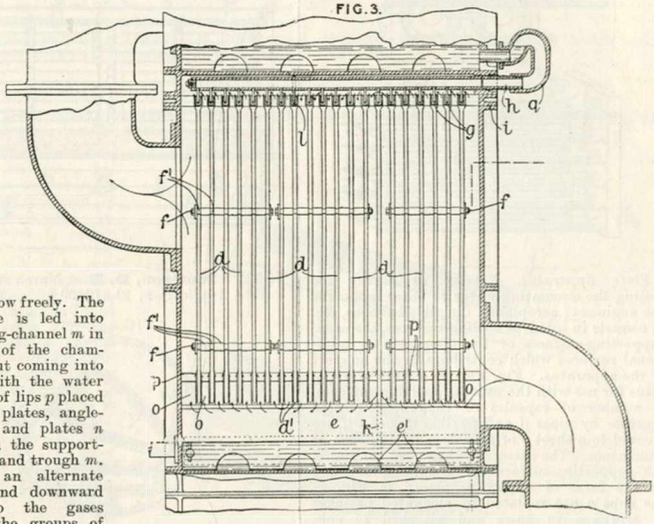
Plate apparatus.—Relates to surface apparatus for condensing or cooling vapours and gases, which is particularly applicable for inducing a natural settlement of heavy condensable vapours in the manufacture of coal gas, and consists in the arrangement of overflow troughs in the upper ends of the hollow cooling-plates, means for collecting the condensate without contamination of the cooling-liquid, and the provision of baffles to give a zigzag course to the gas under treatment. The apparatus comprises three superposed compartments, through which the gas passes upwards in the direction indicated by arrows. In each compartment are arranged groups of hollow plates *d* with plain or corrugated walls, united by bolts *f* or gas piping provided with distance-pieces f^1. The plates extend substantially the full width of the chamber, and consist of plain sheets folded at the centre to form a closed bottom d^1. The tops of the plates are expanded to receive troughs *g*, preferably forming part

FIG.4.



of a removable frame *i*, into which water is supplied from an inlet funnel, or the compartment above, by way of a connexion *q* and a duct *h* with a branch to each trough. The water overflows from the troughs, trickles down the plates, and escapes at the sides of the chamber into the base, the bars *e* supporting the plates being provided with openings e^1 to permit the water to flow freely. The condensate is led into a collecting-channel *m* in the base of the chamber without coming into contact with the water by means of lips *p* placed upon the plates, angle-pieces *o*, and plates *n* resting on the supporting-bars *e* and trough *m*. To give an alternate upward and downward course to the gases through the groups of plates, one or more plates are extended downwards as shown at *k*, and the cover of the chamber is provided with one or more ribs *l*, which depend into one of the troughs *g*.

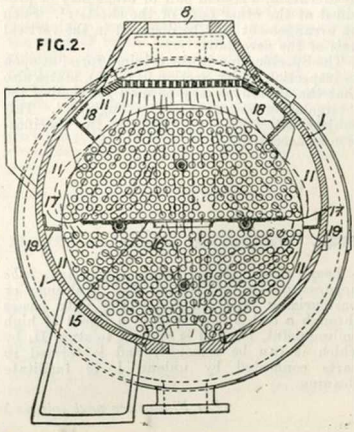
FIG. 3.



6716. Watson, H. B., and **Billetop, T. C.** March 20.

Straight tubes between headers.—In a surface condenser, the tubes are arranged in a circular stack placed eccentrically with regard to the shell 1, so as to leave a steam space 11 at the top and sides of the stack. Baffle plates 18, 19 are disposed in the space 11, so as to cause steam entering by the inlet 8 to pass through the stack. Across the stack is placed a baffle-plate 15, with a central draining-opening 16 and turned-up edges 17. The end chambers are arranged concentrically with the tube stack and the tube-plates are just large enough to hold the stack.

FIG. 2.



6745. Blériot, L. March 30, 1908, [*Convention date*].

FIG.1.

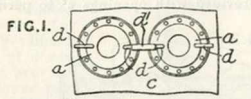


FIG.5.

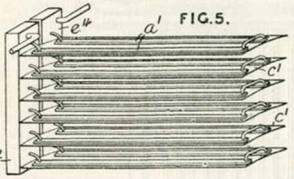


Plate apparatus.—Relates to means for cooling the circulating water or other liquid for the engines of aeroplanes, dirigible balloons, &c. It consists in using, as cooling-surfaces, the usual supporting-surfaces of the apparatus or additional surfaces which contribute to the support of the apparatus. Fig. 1 shows a form of apparatus for use with the usual supporting-surfaces. A number of capsules or caps *a*, connected together by pipes *d* and flexible unions d^1, are secured to a sheet *c* of flexible material, such as aluminium. The sheet *c* is then used for lining the supporting-surfaces of the aeroplane &c. In the form of apparatus shown in Fig. 5, the cups *a* are replaced by elongated passages a^1 arranged in pairs and attached to substantially thick sheets c^1, which form additional supporting-surfaces. The sheets c^1 are connected, either fixedly or movably, to two tanks e^2, e^4 forming inlet and outlet chambers. In a modification, a second pair of tanks may be provided at the other ends of the sheets c^1. Such an arrangement may be disposed in the vertical axis of the aeroplane.

The Specification in the original form, as open to inspection under Section 91 (3) (*a*), states also that the apparatus may be used for cooling the "circulation water of steam engines". This subject-matter does not appear in the Specification as accepted.

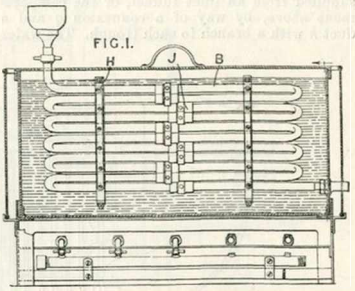
6930. Walkey, M. *Aug. 24.*

Loop-tube, U-tube and serpentine-tube apparatus.—In apparatus for scalding or pasteurizing milk, in which the milk passes through a coil B immersed in a liquid of high boiling-point, the coil is secured to stays H, by which it can be removed, and is formed in parts connected by unions J to facilitate cleaning.

(*For Figure see next column.*)

6930.

FIG.1.



7321. Morison, D. B. March 26. [*Cognate Application*, 21,472/09.]

FIG.1.

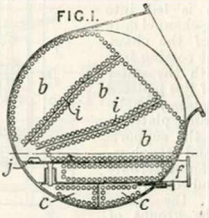
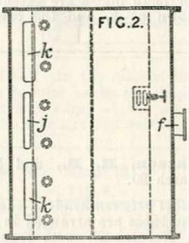


FIG.2.

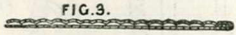


Partitions, baffles, and the like among tubes.—In order to promote even flow of steam through the compartments of condensers, guide-plates *i* are fitted, dividing the chamber into wedge-shaped sections *b*. The apertures connecting a compartment with that from which the outlet leads may be graduated in size or number the larger area *k* being further from the outlet *f* than the smaller *j*. Fig. 1 shows the application of both of these principles to a condenser having a condensation-water cooling compartment *c* in the base. Their application to condensers of various shapes is illustrated and described in the Specification.

7403. Harris, T. H. March 27.

Plate apparatus.—Hollow metal plates for use in cooling-devices, radiators, &c. are formed of two sheets of metal, or a single sheet of metal in two parts, one plane and the other corrugated. The two are fastened together so as to form a number of channels in the corrugations, as shown. The whole plate is then corrugated in a direction forming an angle with the first set. Several such plates may be

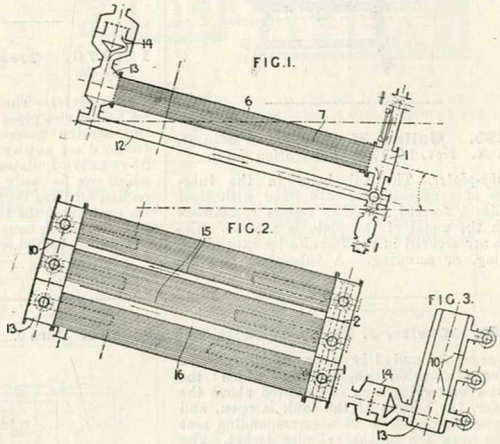
FIG.3.



connected together by means of hollow sockets and bolts.

9276. Soc. d'Exploitation de Procédés Evaporatoires (Système Prache and Bouillon). June 23, 1908, [*Convention date*].

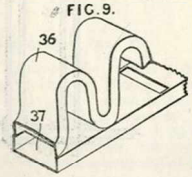
Straight tubes between headers. — Apparatus comprising a heater 6, composed of externally-heated inclined tubes 7, and a separate evaporating-chamber 13, is so constructed as to provide high circulating velocities for both the liquid in the tubes and the heating-medium around them. The circulation of the liquid is effected by using heating-tubes 7, of which the length is at least 75 times the diameter, in conjunction with upper and lower reservoirs 13, 1, connected by return pipes 12, and by maintaining the effective level of the liquid about midway between the reservoirs. The heating-steam passes downwards along the tubes, carrying with it the water of condensation. In order to maintain a high velocity of flow, the cross-sectional area of the passage is restricted by making the sum of the cross-sectional areas of the tubes at least one-third of the cross-sectional area of the compartment. The reservoir 13 is provided with a steam-separator 14. The apparatus may be divided into compartments, as shown in plan in Fig. 2 and in end elevation in Fig. 3, by means of partitions 15, 2, 10 in the steam-space 6, and reservoirs 1, 13, respectively. The partitions 10 are so arranged that part of the liquid from each compartment is returned by the pipe 12 to the reservoir 1 for further circulation, while the remainder overflows for treatment in the next compartment, which contains more concentrated liquid. The heating-steam passes from one compartment to another by means of passages 16 formed between the partitions 15. In modifications, the compartments are entirely separated and may be superposed.



9451. Lewis, L. L. April 27, 1908, [*Convention date*].

Plate apparatus.—For condensing the exhaust steam of a turbine, a serpentine tube 36, Fig. 9, combined with a flat tube 37, may be employed.

FIG.9.

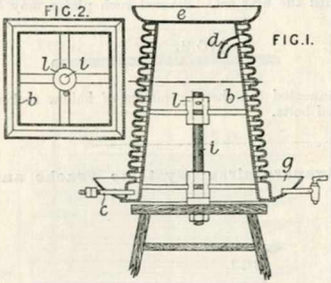


11,475. Jaacks, W. May 14.

Plate apparatus.—A milk cooler, of the kind in which the milk flows from a pan *e* over a corrugated cooled surface to a collecting-trough *g*, is made of pyramidal shape and is rotatably mounted on a support *i*. The inner wall *b* of the cooled surface has arms fixed to sleeves *l*, which embrace the spindle. Water enters by the inlet *c* and leaves by the outlet *d*.

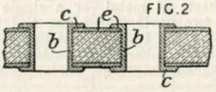
(*For Figures see next page.*)

11,475.



12,199. Gallon, H. E. A., and **Hiard, L. A.** Nov. 14, 1908, [*Convention date*].

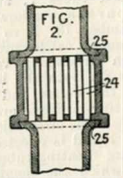
Tube-plates.—The tube-holes in the tube-plates of condensers &c. are lined with steel ferrules *b* formed with two collars *c*, between which the metal of the plate is pressed. The tubes are secured in the ferrules by expanding, beading, or screwing. A tube-plate may be formed of several sheets of metal, the ferrules ensuring the attachment of the sheets. A cracked or otherwise weakened tube-plate may



be repaired by applying sheets *e* of copper to the sides of the plate, the sheets being secured by the collars on the ferrules.

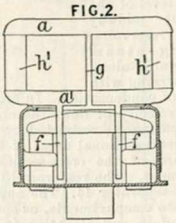
12,370. Green, G., and **Miller, J.** May 25.

Tube-plates.—The inlet and outlet pipes for the heating gases are formed on separate dovetailed plates 25 which can be easily slid on and off from the casing containing the tubes 24 across which flows the gas to be heated.



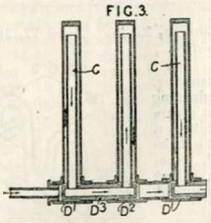
13,230. Hewitt, J. M., and **Hewitt Engines, Ltd.** June 5.

Honeycomb and like tube apparatus.—In internal-combustion engines in which the radiator or cooling-tank is mounted above the cylinder, the bottom of the tank is open, and has a seat adapted to fit a corresponding seat on the open top of the cylinder jacket. The radiator is fixed by a single bolt passing up from the cylinder head. The radiator may consist of two tanks *a*, a^1 connected by side-passages h^1. The upper tank *a* is connected to the top of the water-jacket by a pipe *g*, and the lower tank a^1 to the bottom of the water-jacket by pipes *f*. The side passages h^1 are perforated by air passages, and may be disposed obliquely so as to form a funnel.



13,280. Barr, J. June 7. [*Cognate Application*, 26,636/09.]

Field-tube apparatus.—In a refrigerating-apparatus outer tubes may be fitted with inner tubes C. The inner tubes are screwed into connecting-pieces D^3, and the outer tubes are screwed into other tubes D^1, D^2. The refrigerant passes up and down the compound tube B, C, which is surrounded by water to be frozen.



13,553. Gayley, J. June 9.

Loop-tube apparatus.—Air to be cooled for blast furnaces &c., after having been washed in a tower passes out through a pipe 13 and branch pipes 15 to pans 14, and from the airduct 16 to the refrigerating - building. Valves 30 control its passage to the chambers 29, where it is cooled by coils 31, through which cold brine is passed. Finally the air passes out through valves 32 to the off-take main 33. The pipes 15, Fig. 4, have valves 17 whereby the coil chamber may be cut off from the spray tower and air allowed to enter direct through valves 18 to the fans.

FIG. 4.

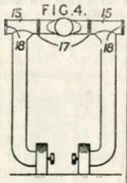
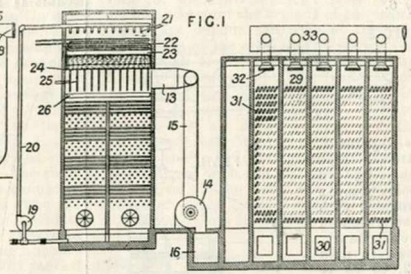


FIG. 1



13,716. Webb, W. H., Brettell, W. G., and **Adamson, A. J.** June 11.

FIG. 2.

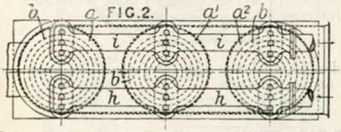
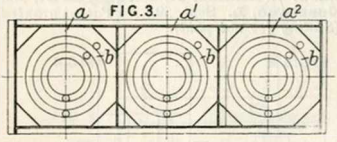


FIG. 3.

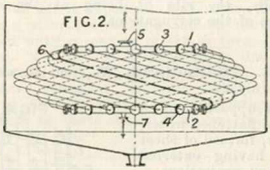


Coiled-tube apparatus.—In apparatus for cooling air, comprising chambers *a*, a^1, a^2 containing coils *b* with a relatively small area of passage between the coils and the walls, the inlets *h* and the outlets *i* for cooling-medium are arranged at the top as shown in Fig. 2, the air passing up and down alternate chambers at a high speed. In a modification, the coils are arranged between concentric cylinders. Specifications 378/80, 20,207/94, and 25,639/08, [all in *Class* 29, Cooling &c.], are referred to.

14,640. Krupovess, M. June 22.

Annular headers connected by curved tubes.—A heat-exchanging device for fitting within vessels containing liquids to be heated or cooled comprises ring-shaped headers 1, 2, connected by thin walled pipes 6, the connexions 3, 4 which are on the outside of the headers, the tubes being either curved in a continuous spiral about the axis of the device as shown, or being doubled back so that the connexion at the two ends of each tube are immediately below one another. Steam or other fluid enters at 5 and

FIG. 2.

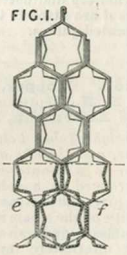


is discharged at 7. Tubes may extend inwards as well as outwards from the header so as to act upon the body of liquid lying in the interior of the apparatus. The device is stated to be adjustable in diameter, and also in height by suitably twisting or separating the two headers, the tubes being in position during the operation.

15,370. Hodgson, L. July 1.

Plate apparatus.—Strips of metal are corrugated hexagonally at their ends and in the manner shown in Fig. 1 between, so that when assembled in a motor radiator thin water spaces *e*, *f* are left surrounding air spaces in the form of tubes. In a modification, the intermediate corrugations are also hexagonal.

FIG. 1.



15,689. Bigwood, H. M., and **Hill, T. H.** July 6.

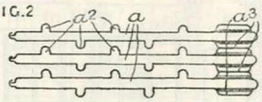
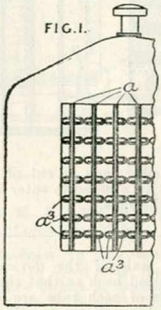
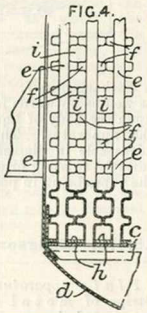


Plate apparatus.—Flattened tubes *a* connecting top and bottom tanks are provided with alternately-spaced vertical ribs a^2, as shown in plan Fig. 2, so as to provide a zigzag air passage, and also with pressed-out horizontal ribs a^3 at the front, those on adjacent tubes being in contact to give the appearance of a honeycomb radiator. In a modification, the flattened tubes are corrugated vertically, the ribs a^2 being at the outer portions of the corrugations.



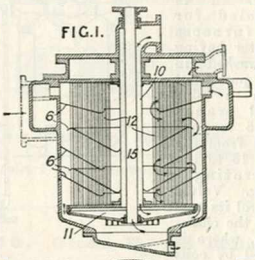
17,063. Mulholland, W., and **Coakley, F.** July 22.

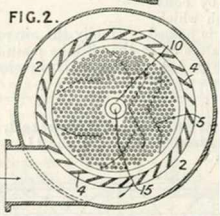
Plate apparatus.—A series of flattened water-tubes *e*, formed of sheet metal having external bosses or projections *f*, connect top and bottom perforated plates *c*, the projections on each tube being in contact with those on adjacent tubes to form air passages *i* from front to back of the radiator. Locking-strips *h* are fitted to the top and bottom plates between each tube, and external top and bottom plates *d* are fitted to the perforated plates.



17,255. Hopper, A. G., Greenwood, J. E. H., [representatives of *Greenwood, A.*], and **Andersson, K.** July 24.

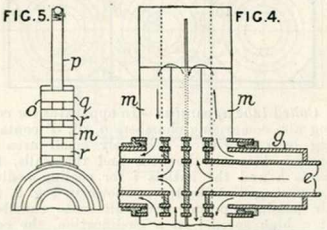
Straight tubes between headers; partitions, baffles, and the like among tubes.—The inlet of steam to a counter-current surface condenser is arranged as a volute 2 with guide-vanes 4 and gives the steam a spiral motion. The velocity of the steam is kept practically constant by baffles 6 and spiral guide-vanes 5, the path being alternately inwards to the centre and outwards. The downtake 10 to the cold-water chest 11 is fitted in the centre of the nest of

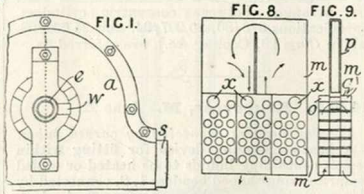




tubes 12, and the pipe 15 for withdrawing air is arranged inside it.

22,211. Williams, J., Forgas, R. J., and **Cosetano, L.** Sept. 29. *No Patent granted (Sealing fee not paid).*

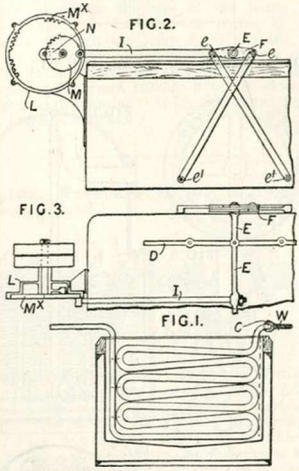




Honeycomb and like tube apparatus.—Relates to a rotary radiator applicable to the bringing

of air to any temperature with or without a perfume. It is applicable to dispelling poisonous gases or to regulating the temperature in submarines, carriages, and buildings. Blades *m* consisting of vanes *o*, *p*, *q*, for the passage of gases and liquids respectively, rotate around a stationary hub consisting of two concentric tubes *e*, *g*. The vanes *p* for the passage of gases communicate with the tube *e*, which supplies and discharges the air. The liquid enters the tube *g* by the inlet *w*, Fig. 1, and flows to the vanes *o*, which are provided with cross air-tubes *r*, as shown in Fig. 5. The vanes *o*, *q* on each side of the vanes *p* are connected by tubes *x*, Figs. 8 and 9, and each vane has partitions which cause the liquid to circulate in the manner shown in Fig. 8. The apparatus is enclosed in a casing *a*, Fig. 1, having a mouth *s*. The air forced from the outlet *s* is carried to the inlet end of the tube *e*. The ends of the vanes *p* are provided with ball valves, which may be opened at each revolution to allow foul gases to be thrown off through narrow adjustable slits in the frame *a*.

22,733. Downs, S., Ewing, M., Kilpatrick, P., and **Engineering and Foundry Co.,** [*trading as* The Parrett and Axe Vales Dairy Co., *and as* The Engineering & Foundry Co.]. Oct. 5.



Serpentine-tube apparatus. — In a cream-cooling vat &c., a reciprocating cooling-coil consists of a long length of solid-drawn copper tube forming a zigzag sectional or continuous jointless coil which is attached by clips or hangers to a carrying-frame. Leakage of brine is thus obviated by dispensing with soldered joints. The ends of the sections may be connected by clips C, the screw-threaded arms W of which fit into bosses on the arms D of the frame. The joints are outside the edge of the vat. The outer ends of the cross-shaft E of the frame are fitted with levers F, to which are connected levers *e* pivoted at e^1. The frame is connected by a rod I to a toothed wheel M mounted on an arm N on a rotating shaft. The teeth on the wheel M are always in gear with the teeth of a fixed rack M× bolted to a hollow disk L so that the frame is reciprocated. The coil may be arranged with the straight parts horizontal or vertical. The bends may be kept rigid by strips of metal soldered thereto. Specification 21,969/04, [*Class* 29, Cooling &c.], is referred to.

23,363. Wilford, P. E. Oct. 12. *Drawings to Specification.*

Coiled-tube apparatus. — A radiator for an automobile consists of a coiled tube of very flat oblong section.

23,638. Morgan, E. H. Oct. 15. [*Addition to* 20,685/08, *Class* 7, Air and gas engines.]

Radiating-coatings.—Cylinders, gun barrels, and condenser tubes are freed from grease and are placed in a bath of water, which is heated until all air is expelled. Salt is then added to form a saturated solution and the heating continued until a coating of salt is formed on the metal. The article is then slowly dried. The coating of salt may be thickened in parts by further treatment. Suitable means are employed for preventing the penetration of the solution to parts which it is not required to treat with salt.

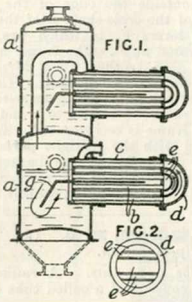
23,751. Musgrave, B. Oct. 16. *Drawings to Specification.*

Tube-plates. — An air-heating apparatus is formed of a series of tubes provided at their ends with square flanges which fit together to form walls, the air to be heated passing between the walls and combustion-products through the tubes.

23,864. Dicker, S. G. S., [*Maschinenbau Akt.-Ges. Golzem-Grimma*]. Oct. 18.

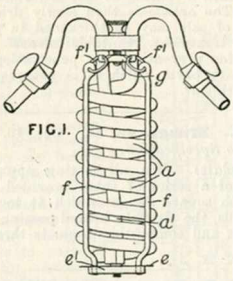
Straight tubes between headers.—Relates to apparatus for evaporating and concentrating liquids of the kind in which the liquid to be heated circulates through laterally-disposed heaters containing straight tubes opening into the liquid-container. The outer end of a heater *c* is closed by a detachable cover *d* having internal curved passages *e* through which the liquid circulates from the lower to the upper tubes *b* of the heater. A partition *g* is provided in the container between the inlet and outlet tubes of the heater, in order to promote the circulation of the liquid. Two containers *a*, a^1, may be arranged one above the other, so that the vapour from the lower container may be led through the heater of the

container above it. In a modification, the tubes of the heater are inclined so as to rise



in the direction of the circulation of the liquid. According to another modification, the heater is connected to the bottom of the container by a curved union of uniform or gradually tapering diameter. The cylindrical container may be disposed horizontally.

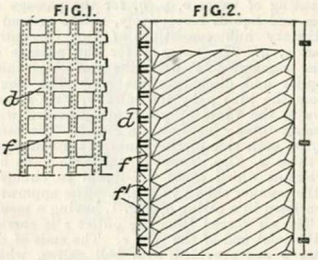
23,961. Moat, S. Oct. 19.



Coiled-tube apparatus.—Apparatus for warming or cooling milk &c., consisting of a coil of tubing *a* through which a heating or cooling fluid is passed while the coil is immersed in the milk &c., is provided with a mixing-plate at its lower end. A perforated mixing-plate *e* is held in place against the bottom of the inlet pipe a^1 by rods *f*, which are secured to an X-shaped piece e^1 below the plate and connected at their upper ends by rings f^1 to an adjustable plate *g*.

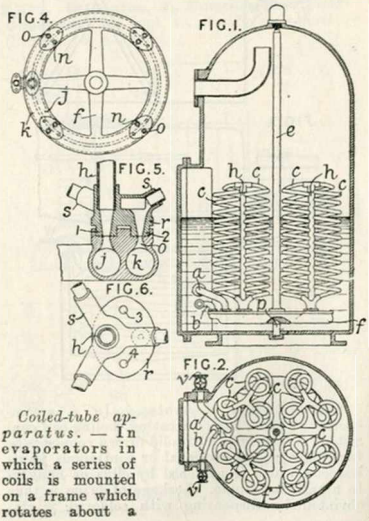
24,050. Bachten, L., and **Gallay, L.** Oct. 20.

Plate apparatus.—Relates to surface coolers or radiators for the cooling-water of explosion-motors, and of the kind consisting of hollow corrugated elements connecting upper and



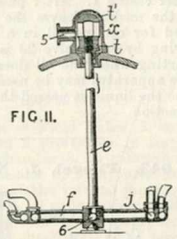
lower water chambers, as described in Specification 24,804/05, [*Class* 29, Cooling &c.]. The corrugations are inclined so as to direct the water towards the front of the radiator. A perforated plate *d* is attached to the front of the radiator to give it a neat appearance. The parts *f*, f^1 pressed in from the perforations serve to secure the plate to the elements and to maintain the elements at their proper distance from each other.

24,074. Morison, D. B. Oct. 20.

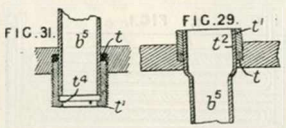


Coiled-tube apparatus. — In evaporators in which a series of coils is mounted on a frame which rotates about a

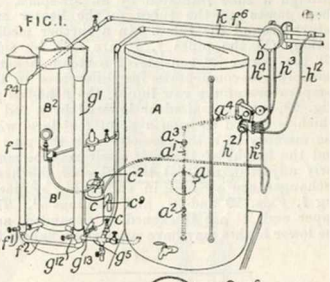
vertical axis, the steam supply and drainage passages are arranged to extend around, or partly around, the peripheral portion of the frame, and are connected by pipes to the steam and water control valves; or the steam passage is connected through a vertical steadying-tube to an external steam-supply pipe. In the form shown in Figs. 1, 2, and 4, groups of coils *c* are supported on the rotary frame *f*, in the rim of which are provided steam and water passages *j*, *k* connected by detachable pipes *a*, *b* to the control valves *v*, v^1. Steam is supplied to the top of each coil by the vertical pipe *h*. The frame is supported on a conical centre *p*, and is steadied by a central rod *f*. Figs. 5 and 6 illustrate the method of securing the coils to the frame. The steam supply from the channel *j* passes through the outlet *n* to the pipe *h*. The flange *r*, which is secured to the pipe *h*, is provided with branches *s*, which lead the condensed water through the passage *o* to the drainage passage *k*. The passages *n*, *o* are contracted like a Venturi nozzle to reduce the size of the joints 1, 2. The flange *r* is fixed to the frame by studs passing through the holes 3, 4. In the form shown in Fig. 11, steam is supplied by a pipe 5 to a dome *x*, whence it passes through the vertical tube *e* and passage 6 to the channel *j*. A loop-like extension t^1 is provided in the tube *e* for lifting the frame *f*.

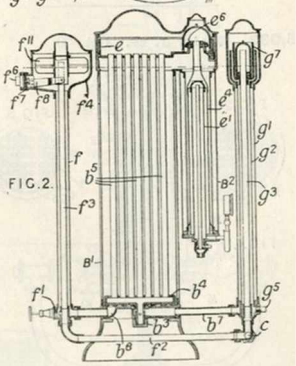


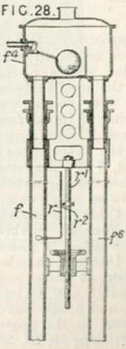
24,182. Forbes, J. S. Oct. 22, 1908, [*Convention date*].

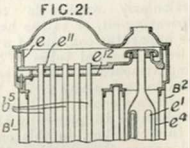


Concentric straight-tube apparatus; Field-tube and like apparatus; straight tubes between headers; tube-plates.—Apparatus for sterilizing water &c. comprises a tubular heat-exchanger B^1, Figs. 1 and 2, a heater B^2 in which the liquid rises to a discharge as it becomes hot or boils, a receiver A, a wash-out box C, and an automatic cut-off D. Water flows through a pipe f^6, valve f^7, pipe *f* and passage b^8, through the heat-exchanger B^1 into the heater B^2, where it rises up a tube e^4 past one or two steam-heaters e^1 and flows over a weir e^6 into the tubes b^5 of the heat-exchanger B^1, and thence by pipes b^7, g^1, g^2, g^5 into the receiver A. The apparatus can be steamed out through the pipe g^3. The heat-exchanger B^1 has a double-walled casing, and the tubes b^5 and end-pieces *e*, b^4 can be removed together by unscrewing a





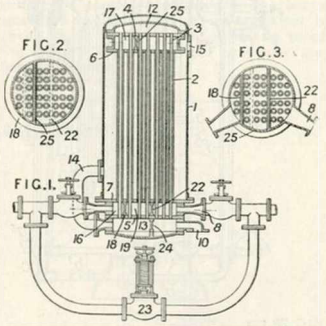




nut b^3. The tubes b^5 may be fixed to a lower plate and connected to the head *e* by nuts e^{11}, Fig. 21, a plate e^{12} keeping the tubes in position

when the head *e* is removed. In a modification, the water enters the heat-exchanger through a float valve at the top and runs to the bottom through a tube insulated by an air-space. It then passes up the tubes to the heater and returns round the tubes. In a further modification, (1) the pipes *f*, f^2 are side by side, (2) the heater B^2 consists of a steam-jacketed tube, (3) to compensate for differences in the temperature of the raw liquid, the float-box f^4, Fig. 28, may be raised or lowered by a rod r^1 which is moved to keep a pointer r^2 level with the mercury in a thermometer *r* in the pipe *f*, and the height of the weir itself may be similarly adjusted, and (4) the tubes of the heat-exchanger are secured in end-plates by packing *t*, Figs. 29 and 31, and bushings t^1. The upper ends t^2 are thickened or expanded, and the lower bushes may have supporting flanges t^4.

25,032. Weir, J. G. Oct. 30.



Concentric straight-tube apparatus.—Oils or other viscous liquids are heated or cooled while being passed through annular spaces of decreasing or increasing area, the method being particularly applicable to the cooling of lubricating-oil, or to the heating of liquid fuel. The apparatus consists of a shell 1 containing a series of co-axial tubes 2, 3, the inner tubes 3 being attached to tube-plates 4, 5 and the outer tubes to tube-plates 6, 7. When the apparatus is used as a cooler, the liquid to be cooled enters the chamber 16, passes up the tubes 2 connected to this chamber, in this case four in number, and enters the chamber 17, whence it passes through a series of six tubes into the chamber 19. After leaving this chamber, it passes successively through series of twelve and sixteen tubes and connected chambers, and finally leaves at 8. The chambers are formed in the spaces between the tube-plates by partitions 18, 22, 25. The cooling-medium enters at 10, and, by reason of the partition 24, passes up the inner tubes 3 into the chamber 12, and thence into the chamber 13, which is connected by a pipe 14 to the outer casing 1. After passing around the tubes 2, the medium leaves the casing at 15. When used for cooling oil in a lubricating-system, a spring by-pass valve 23 is arranged for use at starting when the oil does not require cooling. The apparatus may be used as a heater, in which case the liquid is passed through in the opposite direction.

25,943. Fliegel, J. Nov. 10.

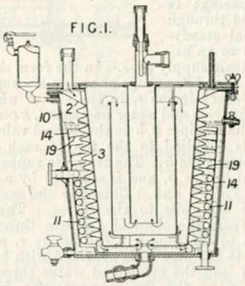
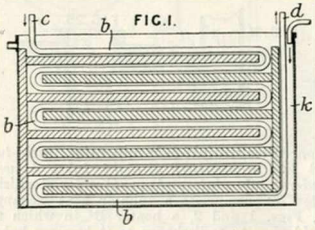


Plate apparatus.—In apparatus for heating liquids, particularly milk, wherein the milk flowing down in a spiral conduit formed between the casings 2, 3 is subjected to the action of a heating-medium flowing in an opposite direction, a steam-pipe 11 is provided in the water jacketing-chamber 10 at the lower part of a partition 14. This partition has projecting ribs 19. The water heated by the steam pipe circulates in close contact with the casing 2.

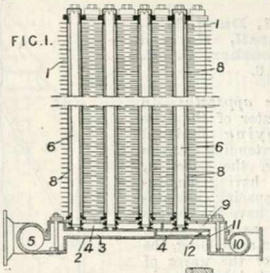
26,788. Douglas, T. Nov. 18.

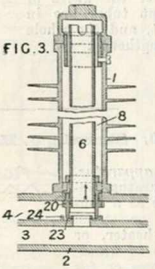


Serpentine-tube apparatus.—In a counter-flow condenser, the inlet and outlet ends *c*, *d* of the single pipe *b* conveying the fluid to be condensed, and also the ends of the conduit conveying the cooling-medium, are arranged at the top of the tank, the pipe *b* being provided with an upcast member arranged in a corresponding downcast part *k* provided in the conduit for the cooling-medium.

27,684. Bracq, G. Nov. 27.

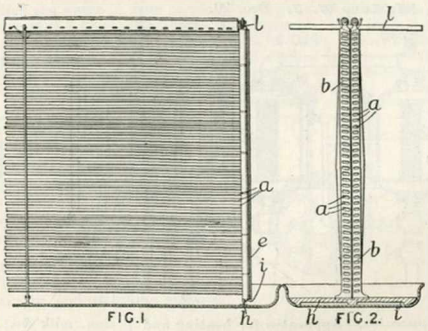
Field-tube apparatus. — Field tubes 1 are mounted upon collectors 2 preferably in staggered relation. The chamber 3, in connexion with the steam inlet header 5, distributes the steam to the upper end of the vertical pipes by means of internal tubes 6. Condensation water collects in the chamber 4 from the annular spaces 8. An extension of the chamber is on a level with the chamber 3, and from this any steam not condensed rises through the inner tubes 6 of a second set of tubes, the final condensate being collected by the chamber 9 and header 10. Water from the chamber 4 discharges by an aperture 11 past a water-seal 12. The outer tubes 1 are secured by the screwing of the inner tubes 6, thus drawing up a collar 20. A water seal 23, 24 prevents the direct escape of steam from the chamber 3 to the chamber 4 when the collar is in position.





28,365. Tripp, E. J. Dec. 4.

Straight tubes between headers. — In apparatus for cooling and aerating milk, worts, &c., tubes *a* of oval cross-section, over which the liquid to be treated flows, are arranged in sets, which may be adjusted relatively to each other so that a space may be left and regulated between them for the purposes of allowing some of the liquid to pass down between the tubes and set up a suction action. The tubes of one set are opposite those of the adjacent set, and have reduced ends fitted into end boxes provided with covers *e*. The boxes are provided at the lower ends with lips *i* and rest upon rails *h*. The upper ends are suspended from rails *l*. The boxes are also fitted with drain cocks.



28,471. Dunn, A. L., Nuttall, S., and **Scrouther, C. W.** Dec. 6.

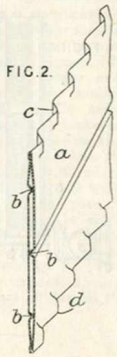


Plate apparatus.—In a radiator of the type employing flattened tubes extending between headers, the tubes *a*, besides having longitudinal spacing indentations *b* have their edges waved, as at *c*, *d*, so that, on assembling, the crests of the waves of adjacent tubes are in contact, and the whole is strengthened.

28,970. Sherwin, J. H. Dec. 11.

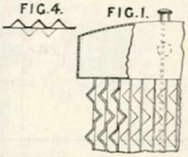


Plate apparatus.—Apparatus applicable as a condenser or steam water-heater, or for use in warming rooms or for cooling the water of internal-combustion motors, is constructed of pairs of plates having nodules closely spaced, the nodules of one plate entering those of the opposite plate. The nodules may be formed on one or both sides of the plates and in separate vertical rows, as shown in Fig. 1, or staggered as shown in Fig. 4.

29,175. Kroll, F. O. Dec. 14.

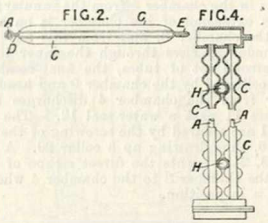
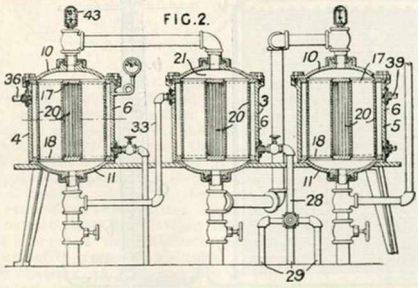


Plate apparatus.—Flat tubes C are strengthened by a wire A enveloped by the fold D in the metal at the front edge. A second wire may be enclosed in the fold E. The sides of the tubes are corrugated transversely; the corrugations of adjacent tubes may touch, or they may be separated and spaced by tubes H, extending from back to front.

29,767. McKee, W. J. Dec. 20.



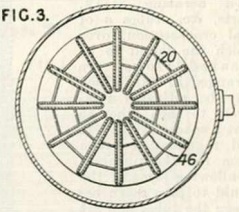
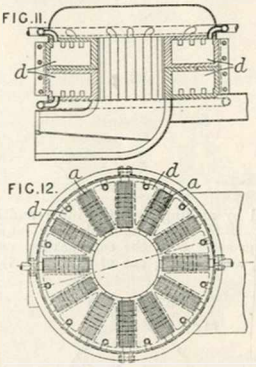
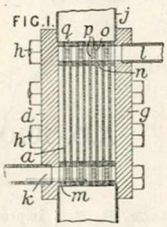
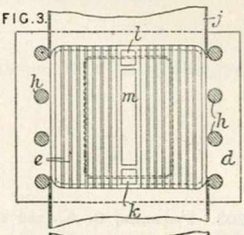


Plate apparatus.—Apparatus for heating and cooling liquids, as in pasteurizing milk, beer, &c., comprises vessels 3, 4, 5, each of which has plates 17, 18 between the bodies 6 and heads 10, 11 forming end chambers 21 connected by flattened tubes 20 secured in radial slots in the plates 17, 18 and connected by braces 46. The tubes 20 may be replaced by a sheet of metal bent to form a star-shaped passage. In operation, milk &c. is supplied by a pipe 28 to the vessel 3 and passes round the tubes 20 and by a pipe 33 to the tubes 20 in the vessel 4, where it is heated by steam supplied by a pipe 36 and from which it passes to the tubes 20 in the vessel 3, where it warms, and is cooled by, the incoming milk. The milk &c. finally passes to the tubes 20 in the vessel 5, which are cooled by brine supplied by a pipe 39.

30,363. Rusdell, W. J. Dec. 29.







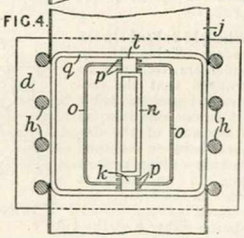
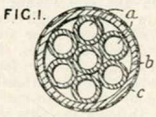


Plate apparatus.—In evaporators, condensers, steam-generators, superheaters, and other apparatus for effecting a transfer of heat between fluids, of the type in which a number of metal plates are separated by distance-pieces, and the fluids flow in the spaces between them, one of the fluids is distributed to the appropriate set of spaces by passages through the plates in such a manner that the two fluids move in approximately parallel directions and preferably in counter-current. Figs. 1, 3, and 4 show an arrangement applicable as a steam-generator to be placed in a flue *j*. The plates *a* are held between end pieces *d*, *g* by bolts *h*, and in alternate spaces between them are arranged distance-pieces *m*, Fig. 3, surrounding the water-inlet passage *k* and steam-outlet passage *l* and strips *e* allowing a free passage to the flue gases. The other spaces are surrounded by bands *q*, Fig. 4, and provided with strips *n*, *o*, *p* to distribute the water and steam in the spaces. Modifications are described in which the strips *e* are replaced by projections or corrugations on the plates, and in which the bands *q* are formed by bending over the edges of the plates or as flanges. Figs. 11 and 12 show an arrangement of such nests of plates built up into a steam-generator. The nests of plates *a* are separated by wedge-shaped distance-pieces *d* and built up into a ring, through the centre of which the flue gases pass upwards and then downwards through the nests of plates. The distance-pieces *d* are hollow and divided into two portions, the upper portions serving as steam-collectors, and the lower as water-distributors.

30,404. Hildebrandt, G. Dec. 29.



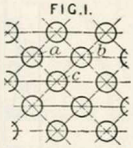
Tube-filled tubes.—A tubular conduit for temperature-exchanging apparatus consists of a nest of tubes *a* surrounded by a wider tube *b* and touching one another and the surrounding tube. One fluid passes through the interior of the inner tubes, and the other in the interstices. The conduit is flexible, and may be bent in any direction. The covering *c* is of slightly-extensible heat retaining and excluding material.

A.D. 1910.

4203. Parsons, C. A., and **Cook, S. S.** Feb. 19.

Straight tubes between headers.—Tubes &c. in condensers &c. are so arranged that the distance between two tubes *a*, *b* in one row is equal to the sum of the distances between each and the tube *c* lying nearest them in an adjacent row. In the Figure, the distance between *a* and *b* is twice the distance between either and the tube *c*.

FIG.1.



5020. Kestner, P. Feb. 28.

FIG.5.

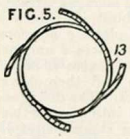
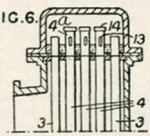


FIG.6.

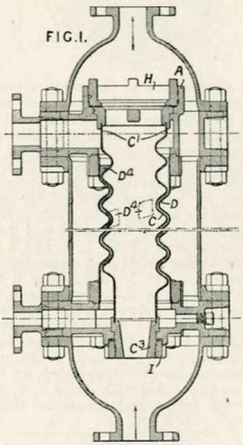


Tubes with nozzles and the like.—The apparatus described in Specification 12,502/06, [*Class* 32, Distilling &c.], in which the liquid rises through vertical tubes 3 and then together with the steam thus generated descends in thin films through vertical tubes 4, is provided with means for distributing the liquid to the descending tubes. These comprise the provision of extensions 4^a formed with slits 13, the upper ends of the extensions being preferably closed by caps 14 to ensure the passage of the steam through the slits with the liquid. The slits may be arranged, as shown in Fig. 5, so as to cause the liquid to take a spiral course over the surface of the tubes.

5145. Lovekin, L. D. March 1.

Concentric straight-tube apparatus.—The apparatus described in Specification 23,482/08 is improved by making both the inner and outer tubes C, D of thin heat-conducting material, spirally grooved with the corrugations nesting together, and causing one of the fluids to flow

FIG.1.



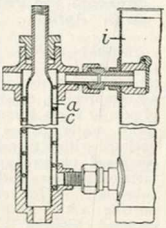
at a high velocity through the space between the tubes while the outer surface of the outer tube and the inner surface of the inner tube are subjected to the action of the other fluid. Lugs D^4 may be brazed on the tube D in order to space-out the tubes and prevent sagging. The inner tube C is so fixed, by suitable collars C^1, C^3 at top and bottom and screwed rings H, I, that it can be removed readily through the aperture at the top of the casing A.

5503. Lamplough, F. March 4. *Drawings to Specification.*

Tubes of special section.—The cooling-tubes of a radiator for use with internal-combustion

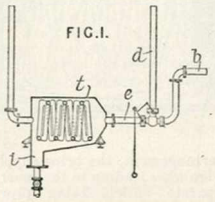
engines are formed with circular ends where they fit into the tube-plates, and with flattened intermediate parts.

6285. Barter, C., and **Bagley, S.** March 12.



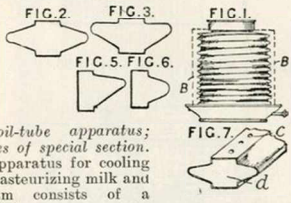
Concentric straight-tube apparatus.—A straight tubular element *a* connected with a steam-supply pipe has a surrounding spiral conduit *c* for the liquid to be heated, such conduit being connected to a reservoir *i* at each end and also being provided with an outlet tap for the heated liquid. In a modification, the conduit is formed by a thin flat tube wound spirally on the outer surface of the inner steam tube. For disposing of accumulated air in the pipes connecting the apparatus to the main steam-pipe, means such as are described in Specification 7040/09, [*Class* 64(ii), Heating systems &c.], may be provided.

6630. Kilburn, B. E. D., [*Sulzer, Geb.*]. March 16.



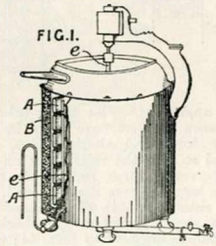
Adjustable apparatus for heating liquids by exhaust gases comprises elements pivoted together in chain fashion so as to be extensible either when first mounted in a chamber *t* or subsequently. The elements may be sectional.

6795. Ewing, M. March 17.



Coil-tube apparatus; tubes of special section.—Apparatus for cooling or pasteurizing milk and cream consists of a solid-drawn copper tube through which the cooling-medium circulates while the milk flows over the outside. Fig. 1 shows one form of apparatus in which the tube is in the form of a helix secured to an upper distributing-tray and a lower collecting-tray. The coils are arranged to present a solid front. When the apparatus is used as a pasteurizer, it is enclosed by a hood B to prevent loss of heat. The tube may have the forms shown in Figs. 2, 3, 5, and 6. In another form of apparatus, horizontal superposed tubes, of which the ends are blocked by welding plates *d* thereto, have apertures *c*, Fig. 7, by which the tubes communicate with each other. In a further modification, horizontal tubes are connected to vertical end chambers. Specifications 802/82, 6316/93, and 15,995/99, [both in *Class* 29, Cooling &c.], and 22,733/09 are referred to.

6796. Ewing, M. March 17. *No Patent granted (Sealing fee not paid).*

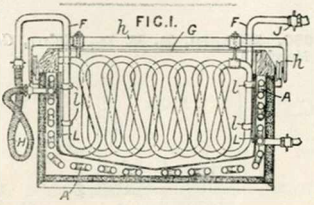


Coil-tube apparatus.—Apparatus for pasteurizing milk &c. is heated by a steam coil A of seamless copper tubing built up to have a flat surface. It is provided with wooden or other lagging B and a stirrer *e*. Specification 11,960/94, [*Class* 32, Distilling &c.], is referred to.

6797. Ewing, M. March 17.

Loop-tube apparatus.—In an apparatus for cooling cream &c., a vat G is provided with external and internal cooling-coils. The outer coils A are galvanized-iron tubes arranged in the space between the inner and outer walls of the vat. These coils are connected by a flexible pipe H to the inner movable copper coils F

mounted on a frame *h*. Brine &c., cooled in an evaporator, may be pumped to the inlet *l* and returned by the outlet J to the evaporator. In



another arrangement, the brine supply-pipe has separate branches leading to the inner and outer coils, separate outlets being provided. To agitate the liquid in the vat, the inner coils may carry plates L.

8906. Tattersall, W. April 13.

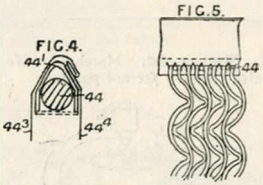
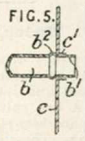


Plate apparatus.—Flat water-tubes, extending between headers, are bent in curves of alternate long and short radius, and then assembled so that the ridges rest on the inside of the curves of large radius. In a modification, the larger curves are flattened. The contiguous sides 44^3, 44^4 of adjacent tubes are united, as shown in Fig. 4. The back and front of the headers are held by bolts 44; where these lie between tubes, the sides are united above the bolt, an angle-piece 44^1 preventing actual contact with it.

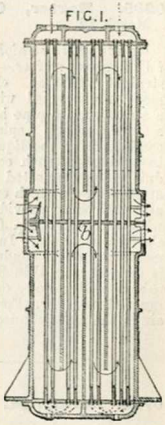
9111. Hill, W. C. April 15.

Honeycomb tube apparatus.—A honeycomb type of radiator is constructed with each tube *b* having a collar b^2 near each end against which the front and back tube-plates *c* abut. The apertures through which the tubes pass in the tube-plates are flanged outwards, as at c^1.



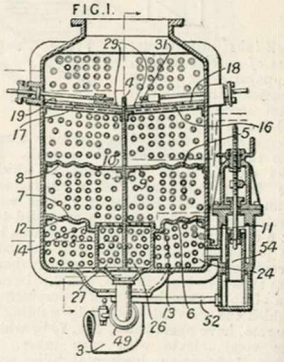
The tubes are fixed in place by expanding the part b^1 to a square or other shape, and the whole is made water-tight by dipping into solder.

9769. Belliss & Morcom, and **Pain, A. C.** April 21.



Straight tubes between headers.—In an air-cooler for use with air-compressors, a series of sets of tubes through which water passes is enclosed within a casing composed of two symmetrical portions with a tube-plate *b* for supporting the tubes clamped between the connecting-flanges. The edge of this plate divides the entering current of air, the two currents flowing in symmetrical paths between baffles in each half of the casing.

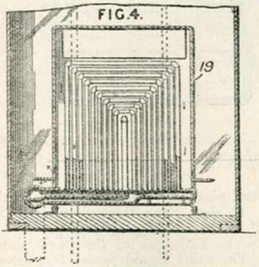
10,112. Snow, C. J. April 26.



Straight tubes between headers.—The flow of steam through a surface condenser is divided by a longitudinal partition 4 having on both sides corrugated baffles 5, 6, 7, 8 with apertures 9, 10, 11, 12. The baffles are sloped toward the centre and provided with gutters at their ends.

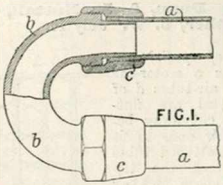
Baffles 6, 7 have also gutters 13, 14. Baffles 16, 17 have apertures 18, 19 on the outer edge and 29 near the centre. The latter are adjustable by moving the plates 31, the rate of condensation in the various compartments being equalized by admitting steam more or less directly into the lower compartments. In the centre of the bottom compartment are water-cooling chambers 26, 27, which can be used for steam condensing when required by opening the valve 49 controlling the discharge into the air-suction pipe 3. When used as a water-cooler the valve 49 is closed, the water passing through the tube 52 over the top of a sleeve 54 adjustable as to height into the compartment 24 of the condenser, whence it flows to the main air-suction pipe 3. A gradual drainage can take place, if desired, through a by-pass round the valve 49. The tubes in the condenser are spaced out near the apertures in the baffles, so as to avoid throttling the steam.

10,753. Mathys, A. W., [*Kalb, A. G.*]. May 2.



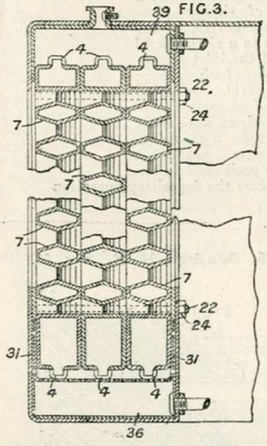
Loop-tube apparatus. — U-tubes, of the construction shown in Fig. 4, are used for heating air.

13,121. Hocking, H. May 30.



Loop-tube apparatus.—In evaporators of the type consisting of straight lengths of tube joined by bends through which steam passes the tubes are made of hard brass or a similar hard alloy that will not be injured by water and will endure the process of scaling. The bends are made of cast brass or the like, and are attached to the tubes by various forms of joint described. In the form shown in Fig. 1, the end of the bend *b* is tapered and enters the end of the tube *a*, which is expanded to fit it. The two are secured together by a nut *c*, fitting over the expanded end of the tube *a*, and screwing on to the bend *b*. Packing may be placed at the end of the pipe *a*. A second form of joint is described, in which the nut *c* screws into an extension of the bend *b*, and a third in which the edge of the pipe *a* is bevelled and fits into an outwardly coned surface in the bend *b*. The system of pipes may be carried by the door of the evaporator.

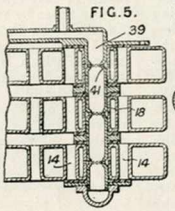
13,163. Feldkamp, F. A. May 31.

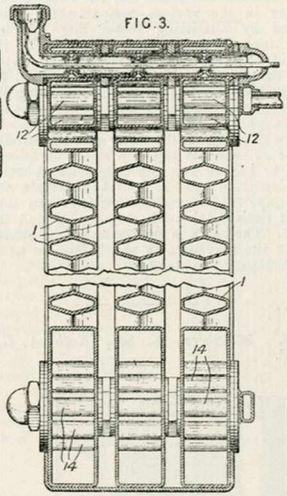


Honeycomb and like tube apparatus.—A number of sections 7 of honeycomb type, each constructed by electro-deposition on a fusible core, are clamped together after the adjacent surfaces of each section have been tinned, and, by heating, the whole is consolidated. Water-receiving chambers 39, 36 are fitted at top and bottom, communicating with the sections through saw-cuts 4. Bolts 22 pass through suitable openings in the sections, registering with one another, and are secured by nuts 24. The sections rest in a perforated pan 31. In the course of electro-deposition of the sections, the electrolyte in which the fusible core coated with graphite is suspended is rapidly agitated by non-metallic vanes inclined towards the anode and cathode.

13,164. Feldkamp, F. A. May 31.

Honeycomb and like tube apparatus. — A number of sections 1 of honeycomb type, each constructed by electro-deposition upon a fusible core, is assembled so that water supplying or removing tubes 39 pass through pipe-like passages 18 suitably disposed in each section, the tubes 39 having annular indentations 41 perforated to register with perforations in the passages 18 so as to communicate with the interior of each section. To strengthen the element at these points, a series of similar pipe-like passages 12, 14 are ranged in a circle round each of the inlet or outlet tubes, of which there are several. Modified forms of passages 18 are described, in some cases supported by non-electrolytic metallic sleeves positioned in the core before the depositing operation





15,215. Walker, H. S. *Dec. 28.*

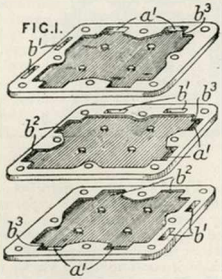
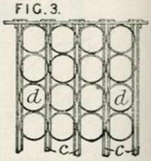


Plate apparatus.—In heat-exchanging apparatus of the type which is built up of a series of plates or frames forming two zigzag channels along which the liquids flow, the plates are all similar, and are made with thickened edges to form frames. Fig. 1 shows three such plates and their arrangement. One liquid flows through ports b^1 in the uppermost plate and passes by recesses b^2 in the frame surrounding the second plate into the space between the two plates. It then flows through recesses b^3 and ports a^1 in the second plate and ports b^1 in the third to the underside of the third plate, and so on. The other liquid passes from the space above the uppermost plate, by the recesses b^3 and ports a^1, to the ports b^1 in the second plate, and thence into the recesses b^2 in the third plate, and so into the space between the second and third plates, and so on.

17,069. Dunn, A. L., Nuttall, S., and **Scrouther, C. W.** July 18.

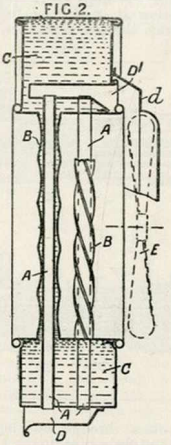
Tubes of special section. — In a motor-car radiator, air-tubes *d* of sheet metal are flattened or cut away between their ends to fit between flattened tubes *c* connecting the top and bottom water spaces.



17,806. Hadfield, W. E., and **Eccles, J.** July 27.

Concentric straight-tube apparatus.—Radiators for internal-combustion engines are made with the top and bottom casings *c*, *c* connected by water-tubes each containing an inner air-tube, one of each pair being grooved or channelled spirally so as to form a spiral passage in the space between the two tubes. As shown in Fig. 2, the spirally grooved tube B is outside the plain tube A, but this order may be reversed. The cooling-air flows round the outer tube and through the inner tube, while the water for cooling the engine flows in the spiral passage between the two tubes. The air ducts D, D^1 are in communication with the tube A, one opening at the front and the other at the back end of the radiator. When using a fan E, a hood *d* over the tips of the blades increases the efficiency of the device.

FIG. 2.



18,047. Foy, F., and **Mather, C.** July 29.

FIG. 1.

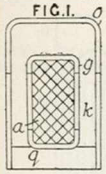


FIG. 5.

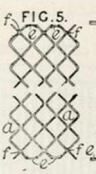


FIG. 6.

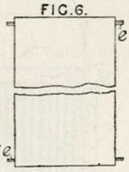


FIG. 11.

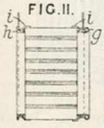


FIG. 13.

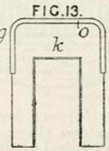


FIG. 14.

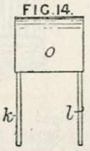
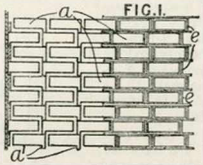


Plate apparatus.—Relates to means for assembling and securing together the corrugated tubes and casing of apparatus for use as a radiator for a motor-vehicle, a condenser, or the like. The tubes *a*, each of which presents two corrugated surfaces, are secured at top and bottom by solder or the like applied at the points *f* and at the parts joined by the strips *e*, which are made to project beyond the tubes, as shown in Fig. 6. To the inner faces of these projections are secured pieces *g*, *h*, which may extend any desirable distance round the sides of the group of tubes; covering-strips *i* and solder or the like complete the joints. The pieces *g*, *h* may have the sections shown in Fig. 11, and are adapted to carry the front and rear plates *k*, *l* of the chambers communicating with the interior of the corrugated tubes, suitable jointing-material being used. Means for assembling and connecting the parts *k*, *l*, *o*, *q* and the tubes *a* are described.

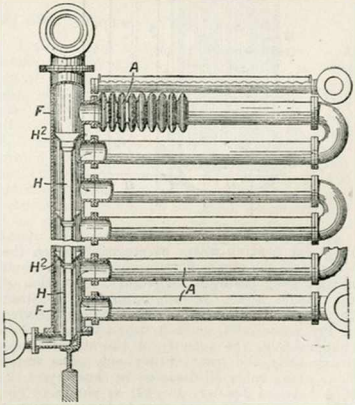
19,646. Sides, H. Aug. 23.

FIG. 1.



Honeycomb and like tube apparatus.—The space between the tubes of radiators &c. of the honeycomb type is divided into a number of vertical compartments into which the tubes project alternately from each side, forming zigzag passage-ways from top to bottom of the radiator. In the example shown, the barriers are formed by ridges a^1 upon the lower sides of each substantially rectangular tube *a*. The barriers may be plates, and the tubes made without the projections. In each case, the barriers stop short of the front and back, and interlocking strips *e* are fitted to hold the parts together.

23,576. Beckett, E. H. Oct. 11.



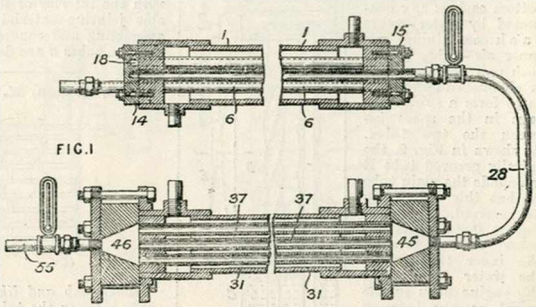
Loop-tube apparatus.—Relates to a modification of the evaporative condenser described in

Specification 18,522/07, [*Class* 122, Steam engines]. According to the present invention, the bends at one or each end of the pipes A are replaced by a stand-pipe F, which is fitted internally with a drainage pipe made in sections H. Each section is provided with a flared mouth H^2 to separate the two pipe openings above from the two pipe openings below it, and to collect the condensed steam from the two pipe openings above it.

24,162. Mollinger, T. G. Oct. 18.

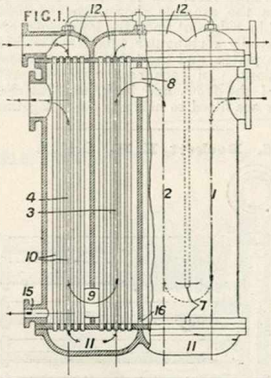
Straight tubes between headers; headers.—Milk is pumped through a heater comprising a steam jacket 1 containing tubes 6 which are connected to form a continuous passage by channels 18 in caps 14, 15. It passes by a pipe 28 to a cooler comprising a jacket 31 containing tubes 37 opening into conical end-chambers 45, 46.

FIG. 1.



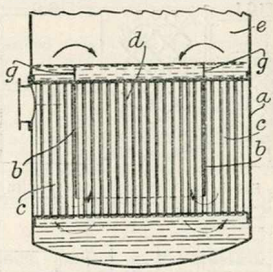
25,145. Hocking, H. Oct. 29.

FIG. 1.



Straight tubes between headers.—In apparatus for heating water by steam in which the water and the steam flow in opposite directions along zigzag passages, the total cross-section of the steam space is approximately constant throughout the apparatus and equal to the area of the steam-inlet, so that, when there is little condensation, the velocity of the steam is approximately the same throughout. The water flows along tubes 10 disposed in chambers 1, 2, 3, 4 between headers 11, 12, as shown. The steam is guided through the chambers 1, 2, 3, 4 by partitions as shown, passing through openings 7, 8, 9 therein. Water of condensation passes through openings 16 in the partitions to a drain-pipe 15.

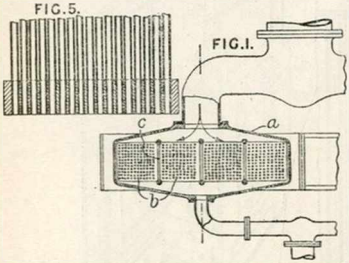
25,560. Scheinemann, F. Nov. 9, 1909, [*Convention date*].



Straight tubes between headers.—In evaporators having a steam chamber *d* traversed by tubes *c*, *d*, a cylindrical baffle *b* depends from the upper tube-plate, causing the steam to pass downwards among the outer ring of tubes *c* and upwards among those *d* in the centre. A partition *g* in the upper liquid space *e* prevents any excessive ebullition from affecting the circulation of the liquid.

26,771. Megevet, C. J. Nov. 17.

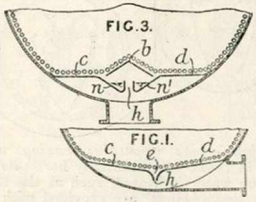
FIG.5.



Straight tubes between headers.—The tubes in a surface condenser are arranged in nests, each or any of which may be separately removed when necessary. Each group *b* is constructed of short straight tubes, metal being cast about their ends to serve as tube-plates, Fig. 5. The stacks of tubes are mounted in the casing *a*, air-tight joints being obtained by the use of copper-asbestos packing &c., and they are separated from one another by filling-blocks *c*, for example of wood. The pipes may be of any suitable section or material, or may be covered with an inoxidizable electro-plating or varnish. During the operation of casting metal about their ends, the tubes may be kept apart by means of wires or perforated plates, which remain in the solidified metal.

26,825. Morison, D. B. Nov. 18. [*Addition to* 7321/09.]

FIG.3.



Straight tubes between headers.—Relates to improvements in the condenser described in the parent Specification. To facilitate the removal of air from the lowest part of the condensing space plates are so arranged in the form of a wedge as to collect the air in a narrow slot through which it is drawn by the air-pump. Various arrangements are shown, the simplest being as in Fig. 1 where plates *c*, *d* cause the air to collect in the wedge *e* and be withdrawn through the slot *h*. In the form shown in Fig. 3, an additional deflector *b* is provided. Troughs *n*, *n*¹ may be formed on or attached to the plates to collect water of condensation.

27,281. Crossman, J. G. Nov. 23.

FIG.3.

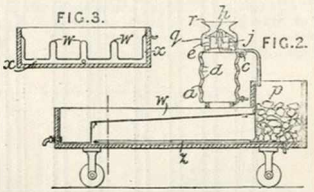


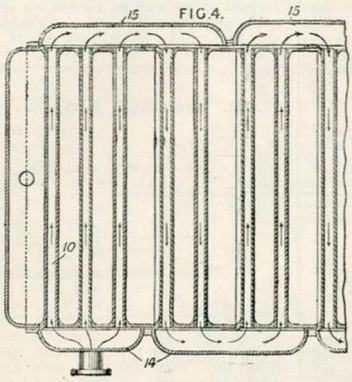
Plate apparatus; trough and open-channel apparatus.—Yeast delivered to a hopper *r* is thrown by a rotary distributor *h* against a hood *q*, whence it drops on a refrigerator *a* consisting of a corrugated double-walled cylinder through which a cooling-liquid passes. The cylinder may be provided with partitions *d*. The refrigerator may be mounted on a tank consisting of a metal-lined vessel fitted with longitudinal ridges *w*. Cooling-fluid from a receptacle *p* may flow through a pipe *z* to the space *x* and return along the underside of the ridges to the receptacle *p*. The tank may be mounted on wheels, and the cooling-fluid may be circulated by a pump arranged on the outside of the tank.

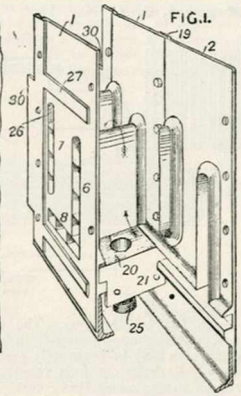
27,502. Potter, J. G. Nov. 25.

Trough and open-channel apparatus. — A cooler for creameries, breweries, &c. is built up of two or more sections, each of which consists of side plates and of tubes through which the cooling-medium flows. Between the side plates 1, 2 extend two vertical stacks of tubes 6, 7 and one horizontal row 8, which are connected by caps 14, 15 to form a sinuous path for the cooling-medium. The bottom of the stack 6 touches the row 8, but there is a gap between the bottom of the stack 7 and the row 8, so that the liquid to be cooled flows alternately over and under the stacks 6, 7. The two end sections have an additional vertical stack 10, and the outer tube of each horizontal row has a dished strip 20 provided with an outlet 25 and carrying a flange which may be bolted to a similar flange on the adjacent row, so that the sections are connected together by expansion joints. The top of each stack 7 carries a solid bar 26. The plates 1, 2 are connected by overlapping flanges 19 and are provided with strips 27. These strips with the flanges, which may have a rabbeted port 30, form a seating for the covers 14, 15.

(*For Figures see next page.*)

27,502.

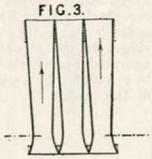




27,657. Prat, E. Dec. 3, 1909, [*Convention date*]. *No Patent granted (Sealing fee not paid).*

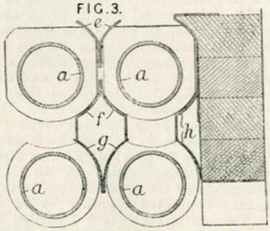
Honeycomb and like tube apparatus. — Relates to radiating and cooling apparatus in which the pipes are of circular cross-section and double conical formation, as described in Specification 16,822/03, [*Class* 29, Cooling &c.]. According to the present invention, the two coned portions meet at their smaller ends in a curve which corresponds to the flow of the air.

FIG.3.



27,772. Still, W. J., and **Still's Tube Syndicate, Ltd.** Nov. 29.

FIG.3.



Partitions, baffles, and the like amongst tubes.—In apparatus for heating or cooling a fluid passing through a series of straight gilled tubes *a*, baffles *e*, *f*, *g* are employed to fill in the spaces between the gills of adjacent tubes so as to cause the external heating or cooling fluid to pass more or less circumferentially round the tubes in thin streams. The baffles may rest on the gills. Certain baffles may be made hollow and fitted with further tubes for heating or cooling a third fluid. The gills may be constituted by transversely arranged external ribs and internal ribs as described, for example, in Specifications 5765/04, 29,510/04, [*Class* 99, Pipes &c.], and 27,774/10.

27,774. Still, W. J., and **Still's Tube Syndicate, Ltd.** Nov. 29.

FIG.3.

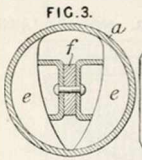
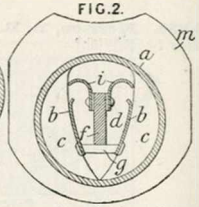


FIG.2.



Straight-tube apparatus having internal baffles in tubes.—Substantially horizontal tubes in which water is heated, such as the tubes of certain steam-boilers, are provided with means for constraining the water to flow upwards from the bottom and sides and downwards in the centre; also with means for separating the steam from the water and guiding it to the upper part of the tube. Each tube *a* is fitted internally with plates *b*, Fig. 2, forming lateral spaces *c*, in which the water circulates upwards, and a central space *d*, in which the circulation is downwards. The plates *b* are stayed together and supported in place by a longitudinal bar *f* and lateral ribs *e*, Fig. 3, on the tube. These ribs are preferably shaped so as to leave a heart-shaped opening in the centre of the tube. For separating the steam and guiding it to the

upper part of the tube, curved plates *i* overhanging the upper edges of the plates *b* are fitted as shown. The tube *a* may or may not have external flanges *m*.

28,273. Shuman, F., and **Sun Power Co.** Dec. 5.

Plate apparatus.—Hollow plates for heating and boiling water by solar heat or otherwise, also applicable as condensers, radiators, &c., are formed of two sheets of metal, one or both of which are provided with dot-like projections.

FIG. 3.

The two sheets are fastened together at their edges and at the dots by dipping into molten metal. Fig. 3 shows such a plate in section, *c* being the metal securing the sheets together.

28,925. Studer, J. S. Dec. 13.

Straight tubes between headers. — Relates to evaporating-apparatus comprising steam-heated tubes *b* through which the liquid flows to a separating-chamber *s*. The lower ends of the tubes are fitted with adjustable cones *f*, Fig. 3, in order to regulate the supply of liquid; the cones *f* are surmounted by inverted cones *i* which direct the liquid against the walls of the tubes. The steam is admitted to the casing *a* by openings in a steam-belt *o*, which openings are arranged either above or below the plane of the steam supply pipe *c*. A central space *n* is left in the tube casing *a*. The apparatus may be circulatory or non-circulatory. The Provisional Specification also describes an apparatus through which the liquid passes downwards to a separating-chamber.

FIG. 3.

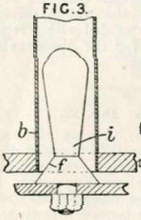
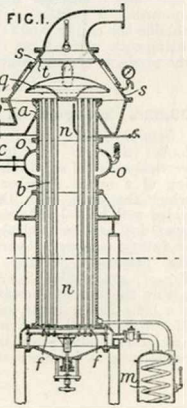


FIG. 1.



28,981. Stroganoff, I. A. Dec. 13.

Loop-tube apparatus. — An exhaust silencer and cooler, which may also be used as a water-heater, consists of a casing *a* enclosing two cylinders *c*, *d*, divided by partitions *e* into compartments of unequal length. The cylinders are connected by tubes *f*, which may be plain or ribbed as shown in Fig. 4. Water, which enters at *i*, Fig. 1, and leaves at *k*, surrounds the cylinder and tubes, and the exhaust gases flow in a counter-direction, entering at *g* and leaving at *h*. Water of condensation is drained away through sheets of asbestos between wire nettings placed in the branches *g*, *h*. Man-holes are placed at *o*.

FIG. 1.

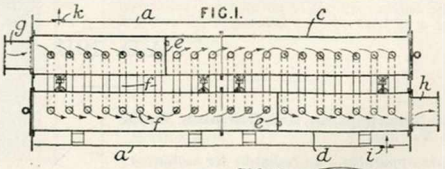
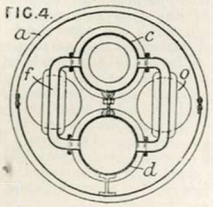
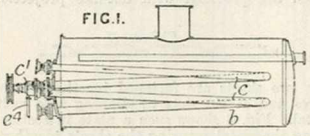


FIG. 4.



29,705. Groeling, A. F. G. C. P. J. von, and **Rewse, H. S. Smith-.** Dec. 21.

FIG.1.



Loop-tube apparatus.—An apparatus for heating liquid to be distilled by means of vapours generated in the distillation consists of rising pipe coils *c* through which the vapours pass upwards. A portion c^1 of the coil is carried outside the casing, and is provided with a regulating-cock, and a pipe e^4 for the discharge of the products of condensation.

29,824. Koegler, A. J. Dec. 22.

Straight-tube apparatus having internal baffles in tubes.—In a grain drier formed of a vertical series of separable sections, each consisting of a steam chamber through passages in which the grain falls, these passages are provided with helical deflectors formed with central apertures and inclined plates, so that the grain in falling is forced towards the heated sides of the passages. In the apparatus shown in Fig. 1, grain-tubes 2 are secured in heads 3 within the insulated casing. Within the tubes 2 a helix 25 carries at intervals inclined plates 27, projecting through holes 26. When maize and other coarse grain is to be treated, apparatus such as is shown in section in Fig. 5 is employed having a second series of tubes 32, preferably formed as shown, between the steam

FIG.5.

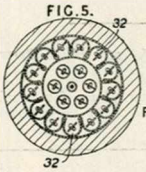
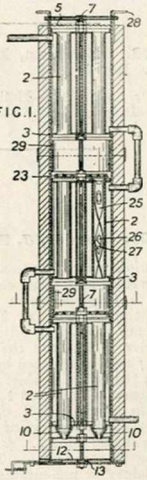


FIG.1.

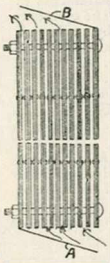


chamber and the outer wall, both sets of tubes having deflecting-members.

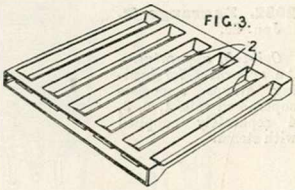
A.D. 1911.

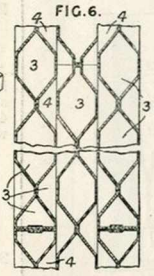
213. Tuckfield, C., and **Garland, W. G. de F.** Jan. 4.

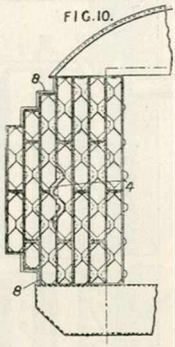
Plate apparatus.—In radiators for motor cars &c. of the type consisting of hollow plates through which the water flows, the plates are placed vertically and surrounded by a frame so as to form a series of enclosed flues, in which a natural draught is set up, so that a fan can be dispensed with. Inclined plates B, A are arranged above and below the radiator so as to direct the draught caused by the motion of the car between the plates. The plates are made of corrugated sheets folded together at their edges, and are threaded on inlet and outlet pipes passing through slotted washers placed between the sheets.



562. Boeck, C. G. Jan. 7, 1910, [*Convention date*].







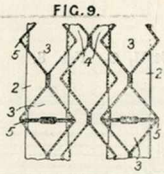
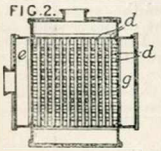
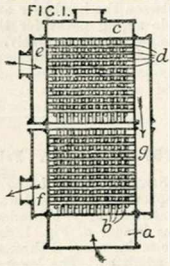


Plate apparatus.—Each element is made with longitudinal depressions 2, which form in the interior of the element a series of open-ended air passages 3; the depressions 2 are so formed as to leave plain margins at the front and rear, as shown in Fig. 3. The radiator is built up of elements of various heights, arranged one above the other and side by side in such a manner as to form continuous zigzag water passages 4, Figs. 6 and 10, from top to bottom. If desired, the elements may be fitted horizontally instead of vertically. Where the sides of the radiator are irregular or stepped, they are sealed by sheet-metal caps 8, Fig. 10, soldered in place. In the modification shown in Fig. 9, projections or raised portions 5 are formed at the sides of the passages 3.

---

775. Reynolds, A. *Feb. 11.*



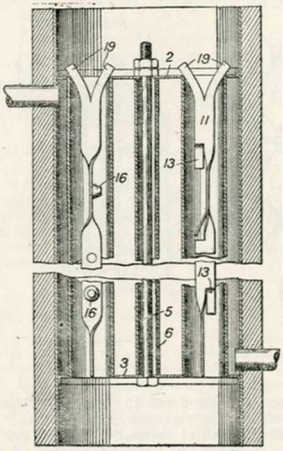


Straight tubes between headers.—In a heat-exchange apparatus for gases, more particularly adapted for use in connexion with furnaces and steam boilers, of the kind comprising sets of tubes the interspaces between which are filled with a solid or liquid, two sets of tubes *d* arranged in parallel layers at right-angles are provided for the cold gas, while the hot gases pass through a third set *b* at right-angles to and interlacing with the first two sets. The tubes extend between headers *a*, *c*, *e*, *f*, *g*, and, as shown, two or more casings each with its sets of tubes may be connected together. The spaces between the tubes may be filled with water, crude petroleum, lead, a packing of carbon and tar, or scrap iron &c., into which molten lead or iron may be run to fill the interstices. According to the Provisional Specification, the apparatus may be used as a feed-water heater.

1260. Koegler, A. J. May 12, 1910, [*Convention date*].

Straight-tube apparatus having internal baffles in tubes.—Grain, while passing through steam-jacketed tubes before grinding, is agitated by a spirally bent strip 11 hung centrally in each tube. The strip is provided with projecting pieces which aid in throwing the grain from the centre against the walls of the tube. The projections may take the form of tongues 13 cut from the strip and bent obliquely; or they may be conical studs 16 riveted to the strip. The strips are supported on diverging arms 19 formed by cutting and bending the upper end of the strip. The top

and bottom plates 2, 3 are connected by a strengthening-rod 5 passing through a tube 6.



1803. Behringer, E., and **Behringer, H.** Jan. 24.

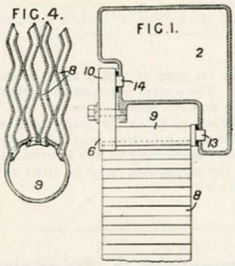
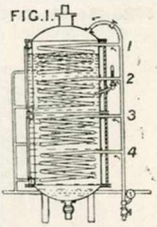


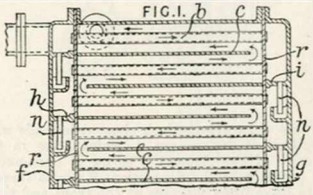
Plate apparatus.—Each element of a radiator comprises top and bottom headers 6 having a vertical portion 10 and an horizontal portion 9, connected by a number of flattened tubes 8, corrugated as shown in Fig. 4, or straight with corrugated strips of metal between them. The headers fit side by side into recesses in the top and bottom water-tanks, the top headers being shown in Fig. 1 fitting under the top tank 2 and communicating therewith by nipples 13, 14. In a modification, the nipples 13 are merely stays.

2022. Lagrange, P. Jan. 26.



Coil-tube apparatus.—An apparatus for heating syrups comprises superposed coils 1, 2, 3, 4 separately supplied with steam.

3269. Still, C. Feb. 8.



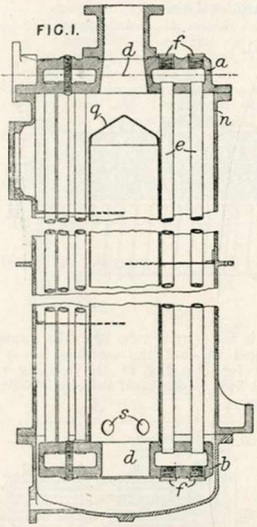
Straight tubes between headers.—A reflux condenser or dephlegmator comprises nests of horizontal tubes *b*, through which in succession the vapours pass from top to bottom, and around which the cooling-medium passes in a reverse direction, together with means for draining away the condensed liquid to prevent further contact with the vapours. Partitions *c* between the headers *r*, and partitions *h*, *i* in the spaces between the headers *r* and the covers *f*, *g*, provide zigzag paths for the cooling-medium and the vapours respectively. Drainage pipes *n* dipping into liquid seals are provided in each of the partitions *h*, *i*.

3787. Weir, W. Feb. 15.

Straight tubes between headers.—Comprises improvements in feed-water heaters of the type consisting of two headers connected by tubes. The header *a*, Fig. 1, is of circular form with a circular space *d* through which exhaust steam is admitted. The lower header *b* is suspended from the upper by the water-tubes *e*. A metal cylinder *q*, with drain-holes *s*, fills up the central space in order to deflect the steam over the tubes. Screw plugs *f* are provided in the outer header plates to render the tubes accessible. The headers are divided into a number of compartments by radial partitions, those of the upper header being staggered with respect to the lower so that the water passes up and down

through the tubes a number of times. A casing *n* surrounds the apparatus.

FIG. 1.



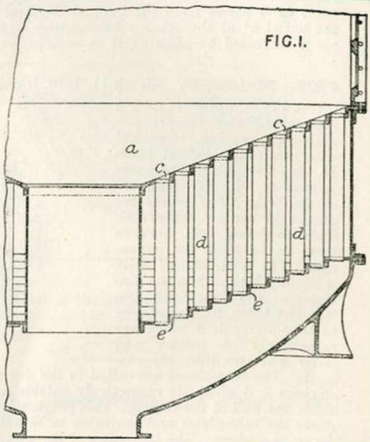
4775. Tate, E. W., and **Wyllie, J.** Feb. 25.

Straight tubes between headers; tube-plates.—The tube-belt of an evaporator comprises an upper coned tube-plate *a* provided at its underside with bosses *c* drilled vertically for the reception of the tubes *d*, and a lower tube-plate concentrically stepped or terraced as at *e*, the horizontal steps being drilled for the lower ends of the vertical tubes *d*. In a modification, both tube-plates have bosses as at *c*.

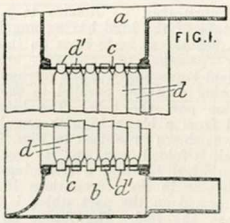
(*For Figure see next column.*)

4775.

FIG. 1.



4792. Lamplough, F. *March 4, 1910.*

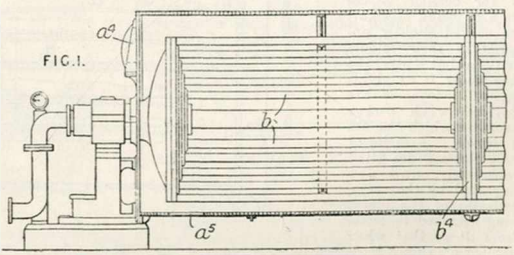


Tubes of special section.—The tubes *d*, which connect upper and lower headers *a*, *b* in a radiator, are made with their ends d^1 of circular section, expanded into tube-plates *c*, the intermediate portions being flattened.

4991. Watson, J. B. Feb. 28.

Straight tubes between headers.—An evaporator is provided with a rotary tubular heater *b*, divided into sections by chambers b^4 and heated by hot air or the like, the arrangement being such that the temperature of the heating-medium falls as it passes from section to section, and the material under treatment is thus

FIG. 1.

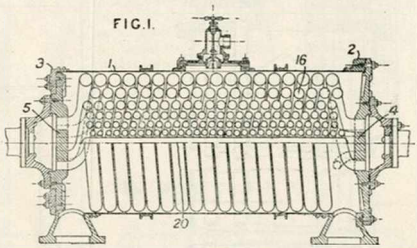


subjected to successively diminishing temperatures as it passes from the inlet at one end to the outlet a^5 at the other. The cooling of the air is increased by allowing it to expand, each successive section being for this purpose formed either of greater numbers of tubes of the same size, or of the same number of tubes of larger cross-sectional area.

6308. Mejani, P. March 11, 1910, [*Convention date*].

Coil-tube apparatus. — A feedwater-heater comprises a cylindrical casing 1 packed with concentric helical tubes 16, the diameter of the tubes increasing with the diameter of the helix. The helices are almost in contact, only such distance being left between them as to allow for expansion. The pitch of any helix is slightly larger than the diameter of the tube composing it. The tubes 16 are secured to tube-plates 4, 5 which are respectively of greater and lesser diameter than the casing 1. The tube-plates are bolted to the flanges of rings 2, 3 which lie respectively outside and inside the wall of the casing. This construction allows the tube-plates and the tubes to be withdrawn as a whole. The free space of the central helix is filled by a tube 20. The apparatus is arranged so that the sectional areas of the spaces for the flow of the heating and the heated fluid is constant, thereby avoiding back-pressure.

FIG. 1.



6971. Behringer, E., and **Behringer, H.** March 20.

Plate apparatus. — Relates to a radiator cooling-tube of the kind having angular corrugations disposed so as to form an internal circulatory passage of uniform cross-section throughout transversely to the corrugations, the latter being arranged parallel to the external circulation past the tube. The tube is constructed from a blank 15 with angular corrugations, as shown in section in Figs. 7 and 10; the blank is folded over, and its free edges 20 are interlocked to form a stiffening-flange 30 perpendicular to the corrugations 16. Crimps 18 are formed on the part which is folded to strengthen the fold. The flange 30 may be off-set, as shown in Fig. 7, so that the corrugations only project beyond the flange on one side of the tube.

FIG. 7.

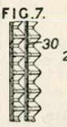


FIG. 9.

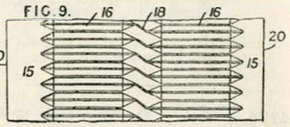
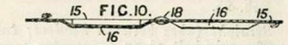


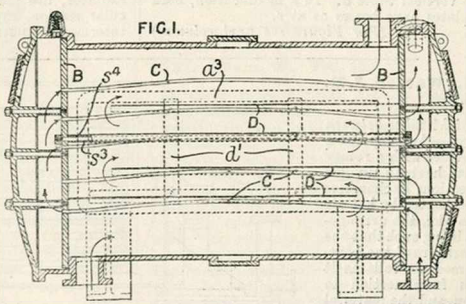
FIG. 10.



7023. Watson, H. B., and **Billetop, T. C.** March 21.

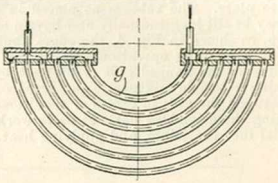
Straight tubes between headers; baffles amongst tubes.—The tubes *c* of a heat-exchanger described as for cooling oil in place of being straight, are curved slightly upwards in their middle portions but enter the tube-plates B at right-angles. Stays S^3 are provided with outer covers S^4, which also act as sleeves. A series of baffle plates D are fitted transversely, and are supported by the stays, the sides of the plates being attached to cross-pieces d^1 so that when the door a^3, shown in dotted lines, is removed the baffles can be removed *en bloc*.

FIG. 1.



8112. Jaeger, C. H. July 28, 1910, [*Convention date*].

Loop-tube apparatus.—In cooling-devices for rotary air-compressors &c. in which water flows through a series of pipes, the pipes are arranged in groups, the pipes in each group being in parallel and the groups in series. The groups comprising the longer pipes also contain more pipes, so that the resistances of the different groups are approximately equal. In the arrangement shown, the water passes first through the single short pipe *g*, then through two longer pipes in parallel, and then through three still longer pipes also in parallel.



8563. Dean, J. April 6.

FIG.2.

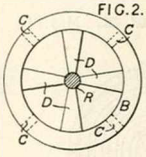


FIG.3.

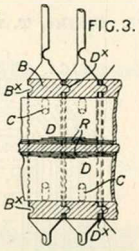
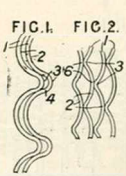


Plate apparatus. — The elements of plate-apparatus of the kind set out in Specification 4129/08 are prevented from collapsing when the securing-bolts are screwed up by the use of solid annular bushes B perforated for the flow of fluid at C. To keep the rod R central, webs D are fitted either to the bushes, as shown in Fig. 2, or to the rod R, as shown in Fig. 3. In the latter case, a concentric rib D× on each wall fits into the depression B× on the adjacent bush.

9213. Tattersall, W. *Nov. 14, 1910.*

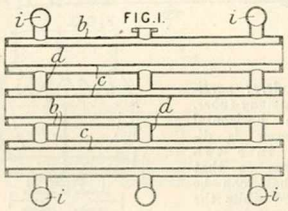
Plate apparatus.—Flattened tubes 1 with alternate large and small transverse corrugations are arranged in a radiator &c. in contact with each other and with the large concavities 2 all facing in one direction. The ridges 3 of the small corrugations of one tube may rest either in the hollows 4 between the large convexities of the adjacent tube, as shown in Fig. 1, or on the large convexities 6 themselves, as shown in Fig. 2. Specification 8906/10 is referred to.

FIG.1. FIG.2.



9368. Hildebrand, [*née* Settele], **M.** April 15.

FIG.1.



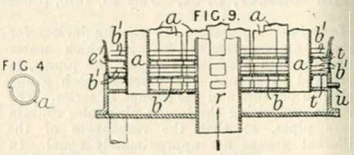
Concentric or jacketed straight-tube apparatus.—A surface-apparatus consists of a battery of superposed tiers of tubes *b* adapted to be immersed in one medium and to contain the second medium, each tube of every tier communicating at several places with the corresponding tube of the next lower tier by means of tubes *d*. All the tubes of the top and bottom tiers communicate with each other by means of cross-tubes *i*, and each tube *b* has fitted within it one or more open-ended tubes *c* adapted to be traversed by the first-mentioned medium. The inner tubes *c* may communicate with those in another tier by means of tubes extending within the tubes *d*.

10,223. Still, W. J., and **British Still Tube Co.** *Oct. 27.*

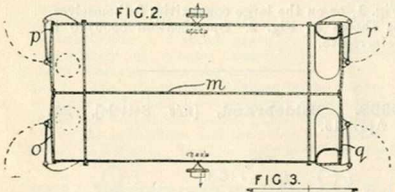
Tubes of special section; gills for tubes.—In a surface-apparatus for exchange of heat, vertical tubes *a* are provided with additional gills b^1 between those *b* which are flanged at *e* to

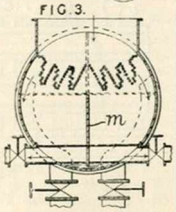
form the outer casing. Steam enters at *r*, and water of condensation is removed at *u*, holes *t* being provided to permit water to pass from plate to plate. The tubes *a* as placed in position may be slit longitudinally and have a slight overlap, as shown in Fig. 4, the edges abutting after an expanding operation. The tubes may be united to the flanged gills or plates *b* by introducing a fusible mixture in powdered condition between the gills in excess of requirements, vibrating the assembled parts so as to work the material into the joints, and applying heat.

FIG 4



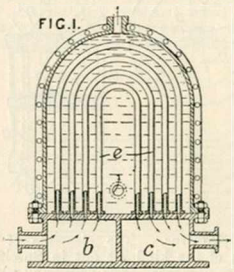
12,349. Akt.-Ges. Brown, Boveri, et Cie. June 8, 1910, [*Convention date*].





Headers; partitions among tubes.—An horizontal condenser is divided into two portions so that one half can be cleaned while the other is in use. Swing doors are provided at the ends of the condenser. The headers are divided by horizontal partitions in the ordinary way so as to cause the water to take a zigzag course. They are also divided by a vertical partition *m*, which is continued across the steam-space but does not divide it completely, as shown. It stops a little short of the bottom, where the water of condensation forms a seal. Each side of the condenser is connected to the air-pump, and by cutting-off one side the steam is drawn to the other and the first side can be cleaned. The ends of the condenser are formed as swing doors *o*, *p*, *q*, *r*.

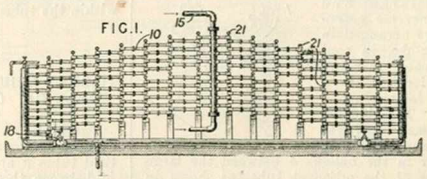
13,075. Clarke, T. W. H. May 31.



U-tube apparatus.—In feedwater-heaters of the type in which waste steam &c. pass through arched tubes in a casing containing the feedwater, the casing is made rectangular in plan and of an arched cross-section as shown. In the base of the casing are two chambers *b*, *c* for the admission and collection of the heating-medium to and from the tubes *e*. It is stated that the appliance acts as an exhaust-silencer or as a spark-arrester.

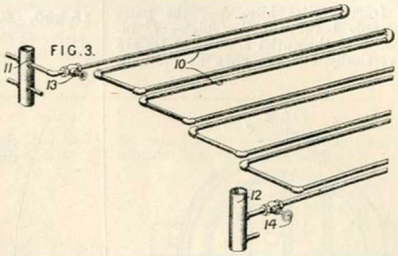
13,569. Reimers, G. June 4, 1910, [*Convention date*].

Loop-tube apparatus.—A surface-condenser for hot ammonia gas in ice and cold-storage plants, or other gases, or for cooling milk and other liquids, comprises a number of stepped-coil systems 10 of the form shown in Fig. 3, each connected to a



feed-header 11 and a discharge header 12, and superposed as shown in Fig. 1, which illustrates an ammonia condenser, each half of which may be worked separately if desired. The hot gas is supplied to both ends 15 of the feed-header, and two series of the usual drip pipes 21, provided with water-spreading flanges, discharge water over the vertical portions of the coil systems, the condensed liquid in each coil system being rapidly conveyed by gravity into a discharge header. Valves 13, 14 permit each coil system to be isolated, and valves 18 permit each half of the condenser to be isolated. The discharge header is connected at the top by the usual equalizing-pipe provided with a foul-gas cock.

FIG. 3.



13,700. Behringer, E., and **Behringer, H.** June 8.

FIG. 1.

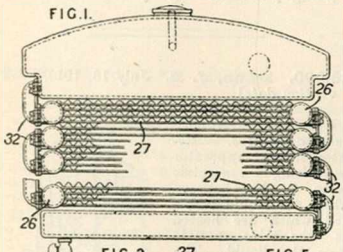


FIG. 3.

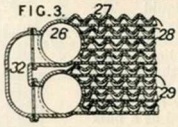


FIG. 5.

Plate apparatus.—In a radiator made up of horizontal tubular removable sections, flat tubes 27 are employed extending between headers 26 connected by bends 32. The tubes may have flat undersides 29 with transversely corrugated upper surfaces 28, or the undersides may be corrugated as shown in section in Fig. 5 at 30 or ridged longitudinally. A modified form of header is also described in which the connexions 32 are on the face of the radiator instead of the edge as shown.

14,670. Eschellmann, G., Harmuth, A., and **Ges der Tentelewschen Chemischen Fabrik.** June 21.

FIG 1

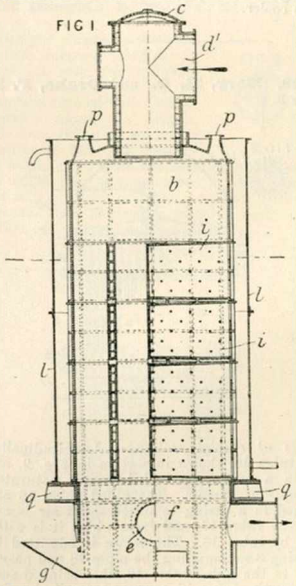
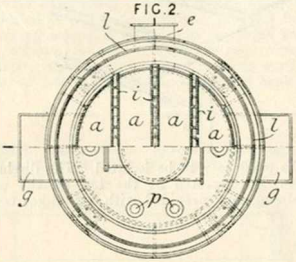


Plate apparatus.—In a tower for cooling the

hot gases from pyrites kilns &c., the gases pass downwards between hollow plates *i*, internally cooled, to the outlet *e*. The plates are arranged vertically and are open at the ends

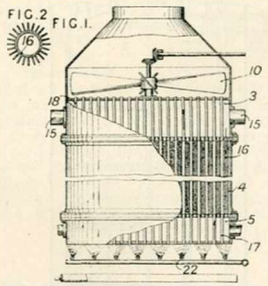
FIG. 2



to communicate with a water jacket *l* which surrounds the tower. The jacket *l* rests on a cast-iron ring *q*. Openings *p* are provided for flushing the tower, and a cover *c* affords access to the cooler.

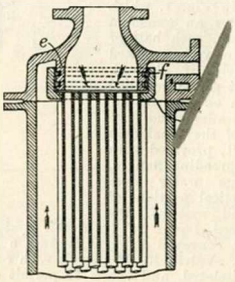
15,428. Berg, H. O., and **Drake, F. E.** July 3.

FIG. 2 FIG. 1.



Tubes of special section. — Longitudinally-gilled tubes 16, shown in section in Fig. 2, are used in a condenser cooled by air saturated with aqueous vapour. The gilled tubes 16 are arranged in a casing to which moist air is admitted by tubes 17, and from which it is withdrawn by tubes 18. The steam is admitted to the casing 3 surrounding the pipes 18 and passes thence to the gilled tubes 16, the casing 5 surrounding the tubes 17 acting as a collector for water of condensation.

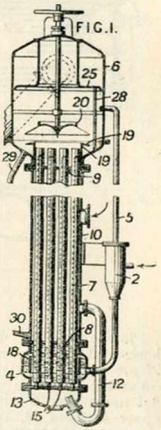
15,890. Sandberg, J. T. July 8.



Headers; tube-plates.—In heating and cooling apparatus comprising a nest of tubes attached to a movable tube-plate so as to allow for expansion, the tube-plate *c* has an extension embracing an inwardly-extending neck *e* in the cover of the casing, and is provided with packing-rings *f* to make a tight joint.

15,990. Dunn, J. E. July 18, 1910, [*Convention date*].

FIG. 1.



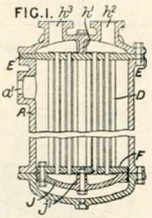
Concentric straight-tube apparatus. — Relates to an evaporator comprising concentric tubes 7, 15, between which the liquid passes and which are heated on the side remote from the liquid. The evaporator is either of the construction shown in which the liquid after passing once through the apparatus is discharged therefrom by a pipe 29, or is arranged as a bulk evaporator of the calandria type with an internal or external circulation of the liquid. The heating-medium enters the chamber 10 surrounding the tube 7 and passes thence by a pipe 12 to a chamber 13 supplying the inner tubes 15. The inner tubes are closed at their upper ends except for a small aperture through which uncondensed vapours escape. The outer tubes extend beyond the tube-plates

8, 9 and may be bevelled at their lower ends. A distributing-baffle 18 is fitted in the supply chamber 4. When arranged for multiple effect, the successive evaporators are provided with heating-elements having a decreasing number of tubes, each of increasing evaporating surface; particulars of the dimensions adopted are given in the Specification.

16,040. Meijer, A., Pullen, G. A., and **Pullen, W. L.,** [*trading as* Pullen & Co., F. A.]. July 11.

Straight tubes between headers. — The tubes D of a feed-heater are fixed in a tube-plate E at one end and at the other in a plate F of a movable header with domed cover J. Divisions h^1, j^1 in the fixed and movable headers direct the water so that it makes four passages through the tubes between the inlet and outlet h^2, h^3. Steam is admitted to the casing A through the port a^1.

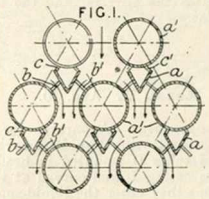
FIG. 1.



16,896. Oddie, P. F. July 24.

Drip-interception devices.—Beneath each tube a^1 in surface-condensers and like apparatus is fitted a draining-strip *a*, into which the water condensed by the tube immediately above it drips and is carried away to the end of the condenser. Each strip is of such a size as to pass through the tube holes in the tube-plates, and is fitted with brackets *b*, b^1 to support it upon the tubes below it and projections *c*, c^1 to steady it against the tube immediately above it. Specification 1682/09 is referred to.

FIG. 1.



16,948. Parsons, Sir C. A., Cook, S. S., and **Douglas, L. M.** July 24.

Straight-tube apparatus having internal baffles in tubes.—A core for insertion in the tubes of coolers or heaters is formed with flats at intervals along its length, such flats being at an angle to adjacent flats and contacting at the sides with the interior of the tubes. The baffle may be constructed as shown in section in Fig. 2 by pressing a smaller tube flat, alternate flats being in a plane at right-angles to that of the intervening flats.

FIG. 2.

17,219. Lallemand, E. July 27, 1910, [*Convention date*]. *Void.* [*Published under Section 91 of the Act.*]

Tubes of special section.—A radiator for aeroplanes, automobiles, &c. comprises a pair of water-boxes 4, 5 connected by tubes through which small air-tubes 10 pass transversely. Each water-tube is detachably connected to the boxes by rings 8 sliding on the ends of the tubes and on connexions 6 on the boxes and soldered thereto. The tubes may be of circular, oval, square, or other section, and may be arranged quincuncially; a fan may be arranged between two rows of tubes.

FIG. 1.

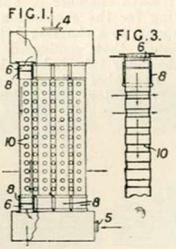
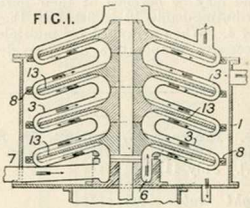


FIG. 3.

18,050. Poulsen, C. Aug. 9, 1910, [*Convention date*].

Plate apparatus. — Apparatus for heating liquids, as in pasteurizing milk, comprises a corrugated chamber formed of members 3 detachably connected by collars 8 and enclosed in a steam-chamber 1. Milk &c. is fed through a pipe 7 and channel 6, and is stirred by rotary ribbed plates 13. The milk &c. may pass instead through the outer chamber, which in this case contains the stirrers, and the members 3 may be flat.

FIG.1.



18,163. Rossi, U. Aug. 10.

L-*tube apparatus.*—Apparatus for evaporating and concentrating liquids comprises a nest of inclined tubes D mounted in headers P, P¹ in a steam casing L and curved at their lower ends so that they enter the liquid-supply chamber B in an horizontal plane. Liquid entering the tubes is given a spiral motion by means of helical surfaces, shown in Fig. 5, which are inserted in the lower ends of the tubes. The mixture of vapour and liquid leaving the tubes enters a separator S tangentially. The vapour passes up through the cone C and liquid passes to the tube A. A series of concentrators may be arranged in multiple effect, steam from the casings L serving to heat the liquid preliminarily.

FIG.1.

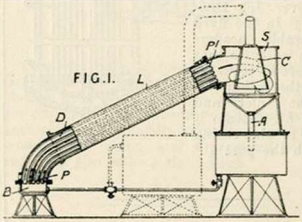
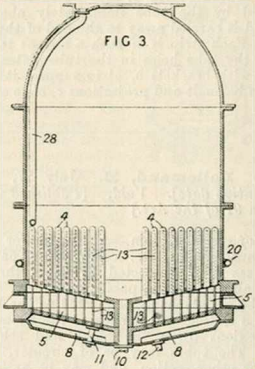


FIG.5.

18,216. Sanborn, T. F. Aug. 11.

Field-tube apparatus.—An evaporator is provided with a heat-exchanger consisting of tubes 4, 13, the outer tube 4 being fed with the heating-medium from a chamber 5, and the inner tube 13 serving for the evacuation of the uncondensed vapours to a chamber 8, the arrangement being such that condensed liquid may drain from the outer tube independently of the inner tubes. The tubes extend inwards from a wall of the evaporator, preferably from the bottom.

FIG 3

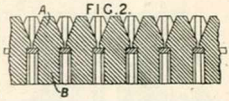


19,280. Knowles, P. Aug. 29.

Studded surfaces. — Metal surfaces for the transmission of heat between two media are studded as shown in Fig. 2. Each stud consists of a stem B and a head A, the stem and head

being of any shape in cross-section, and the whole is fixed in the plate by any suitable

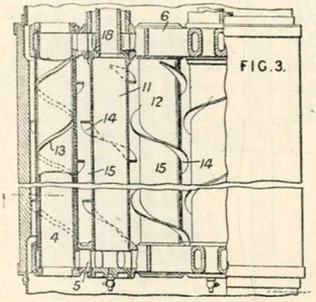
FIG. 2.



means. Various shapes are shown in the Specification.

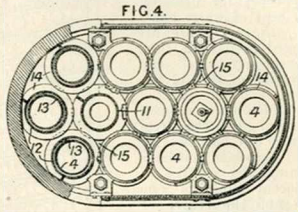
19,291. Waller, W. W. Sept. 3, 1910, [*Convention date*].

FIG. 3.



Concentric straight-tube apparatus.—In an apparatus, adapted for cooling, heating air, water, &c., or for condensing vapours, a tubular heat-exchanger consists of upper and lower headers 6, 5 connected by jacketed air-pipes 4. The headers consist of several hollow inter-communicating portions. The pipes 4 extend through the headers, and one medium, introduced into the upper header, passes through the space between the tubes 4 and their jackets 12 to the lower headers, whence it returns by single large pipes 11 to branches 18 leading to the

FIG. 4.



outlet main. The air &c. pass upwards through the pipes 4 and through the space 15 between the jackets 12 and the pipes 11. The pipes 11 and jackets 12 are provided with external helical baffles 14, and similar baffles 13 are placed in the spaces between the pipes 4 and 12. The side of the casing is hollowed out to direct the air &c. against the jackets 12.

19,653. Luypaerts, V. May 9, [*Convention date*].

FIG. 3.

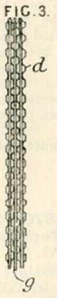
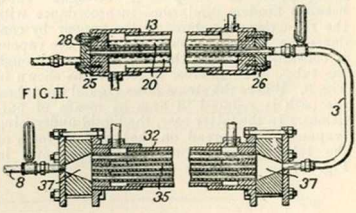


Plate apparatus.—In a motor-car radiator, flat tubes, the sides of which have horizontal corrugations *d*, alternate with strips *g* of plain metal, so that the tubes and strips are in close contact.

20,634. Mollinger, T. G. Sept. 22, 1910, [*Convention date*].

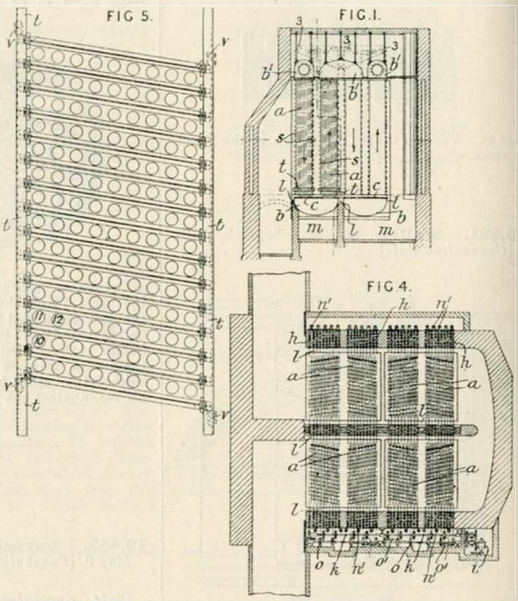
Straight tubes between headers; headers.—Milk is pumped through a heater which comprises a steam jacket 13 containing tubes 20, which are connected by channels 28 in caps 25, 26 to form a continuous passage. It passes by a pipe 3 to a cooler which comprises a jacket 32 containing tubes 35 opening into end-chambers 37, and then by a pipe 8, preferably through a pressure regulator, to a tank having an air-vent surmounted by a filter. Specifications 5446/03 and 25,393/07, [both in *Class* 125, Stoppering &c.], are referred to.

FIG. II.



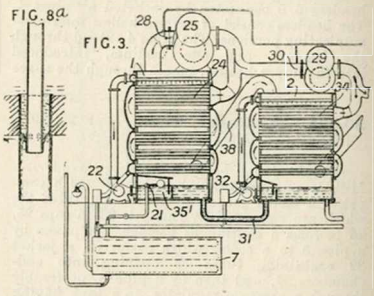
21,420. Mathesius, W. Sept. 28.

Straight tubes between headers. — In tubular heat-exchange apparatus for utilizing the heat of waste gases &c., the tubes are arranged in parallel rows transversely to the direction of flow of the gases and in parallel rows inclined at a small acute angle to the direction of the hot gases in such a manner that lines joining the centres of adjacent tubes of one row and the centre of the intermediate tube of the next row form an irregular acute-angled triangle. Means are provided for cleaning the external surfaces of the tubes and tube headers. A furnace regenerator comprises, as shown in Figs. 1 and 4, groups of tubes *a*, connected to the flat surfaces of headers *b*, b^1 and arranged within a flue as shown, the air to be heated being admitted to one of the end top headers b^1 and passing up and down in a sinuous course in the opposite direction to the waste gases. The tubes are arranged in the manner set forth above and indicated by the reference numerals 10, 11, 12, Fig. 5.



22,670. Söderlund, O., Boberg, T., and Techno-Chemical Laboratories. Oct. 14.

Straight tubes between headers; tubes with nozzles and the like; partitions amongst tubes. —The cross-sectional area of the vapour passages afforded to the heating-vapours in film evaporating-apparatus comprising straight tubes between headers diminishes in accordance with the reduction in volume of the vapour by condensation, so that the rate of flow of the vapour is constant. Where the steam passes through the tubes, their number is reduced as shown in Fig. 3. Where the steam flows around the tubes, the path is reduced in area by means of partitions. In the latter case, the liquid undergoing evaporation is spread on the inner surfaces of the tubes by means of the device shown in Fig. 8a.



23,436. Forrester, H. J. C., [*Griscom-Spencer Co.*]. Oct. 24.

FIG. 3.

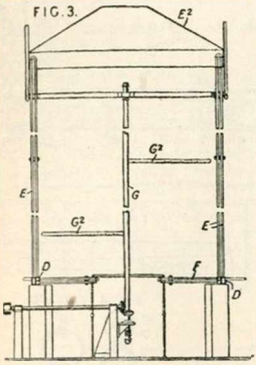


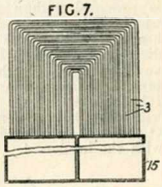
FIG. 10.

U-*tube apparatus.*—An apparatus for evaporating liquids to dryness, in which the liquid in the form of streams is brought into contact with a current of hot air, comprises a chamber into which air currents are introduced both laterally and in a counter direction to the direction of the streams. The drying-chamber is constructed with side and bottom walls E, F, Fig. 3, consisting of heating-coils through which the air is sucked. The headers D to which the coils E, F are attached are divided into chambers d^1, d^2, d^3, Fig. 10, so arranged that the steam enters the chamber d^1, passes through the tubes E to the chamber d^2 and thence through the tubes F to the chamber d^3.

23,561. Osborne, W. S. Oct. 26, 1910, [*Convention date*].

U-*tube apparatus.*—A drying-chamber in which liquid, in the form of spray is brought into contact with a current of hot air is formed with side walls 15, each constructed of headers communicating with a set of tubes 3 for heating the air as it enters the upper part of the chamber.

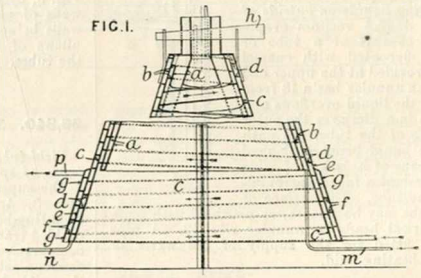
FIG. 7.



23,646. Levinsohn, I. Oct. 26.

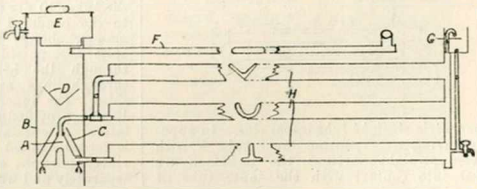
Plate apparatus.—Apparatus for pasteurizing milk &c. comprises an annular water-heater *a* on which is a helical ledge *b*, a casing *c* on which is an oppositely-disposed helical ledge *d*, and a casing *e* on the lower portion of which is a helical ledge *f* enclosed by a casing *g*. The water in the vessel *a* is heated by a lamp &c. and milk &c. enters by a pipe *m* and flows up the helical ledge *b* and then down the helical ledge *d* to the outlet *n*, while cold water flows up the ledge *f* to the outlet *p*. The parts can be separated on removing a wedge *h*. The water-heater may have cross-tubes, and the ledges *b*, *d* may be on the insides of the casings *c*, *e* respectively.

FIG. 1.



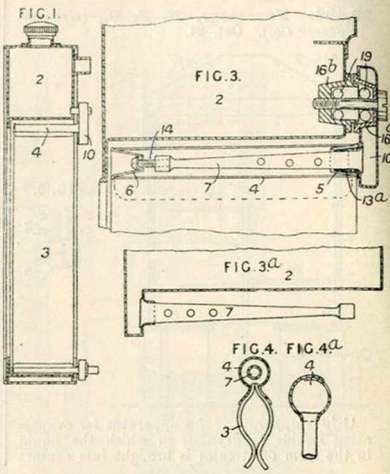
24,872. Mills, D., Mills, W., and **Mills, G.** Nov. 8.

Tubes of special section.—A self-contained radiator or stove comprises T, angle, or half-round section pipes A for facilitating interchange of heat.



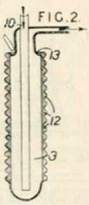
25,665. Harris, T. H. Nov. 17.

Plate apparatus.—In a condenser, cooler, radiator, or the like in which a number of cooling-sections 3 are removably disposed between top and bottom tanks, the cooling-sections are detachably secured to an external frame carrying the water-tank. The cooling-sections consist of plates or tubes connected to headers 4, into each of which extends a coned spout 7 communicating with the water-tank 2. Each spout is detachably secured to the corresponding header by means of a screw 14 passing through a thimble 6 on the header. The spout is provided with a rubber ring 13^a, against which is drawn the cone 5 on the end of the header. The spouts may enter the tank 2 directly as shown in Fig. 3^a, or they may enter auxiliary tanks 10, which communicate with the tank 2 through a union consisting of a part 16^b which fits within a corresponding part 16^a, with parts having perforations 19. Figs. 4 and 4^a shows the connexion of the plates and tubes with the headers 4.

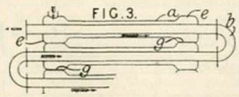


25,800. Fernbach, A. *May 17, 1912.*

Tubes of special section; distributing liquids on outside of tubes &c.—A vacuum evaporator consists of a tube or tubes 3 coated with enamel and provided at the upper end with an annular basin 13 from which the liquid overflows and passes in a film over the outer surface of the tube, the path of the liquid being prolonged by means of a jacket of wide mesh asbestos fabric surrounding the tube. The surface of the tube may be smooth, or provided with semi-cylindrical beads or annular ribs 12. A pipe 10 is fitted for the supply of hot water or other heating-fluid.



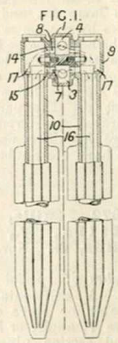
26,231. Maschinenfabrik Surth Ges. March 27, [*Convention date*].



Concentric straight-tube apparatus.—In apparatus having a serpentine inner tube *b* with jacketed straight portions, the jackets *a* are welded into contact with the inner tube at their ends and communicate with one another either by short welded tubes or, as shown in Fig. 3, by means of apertures *g* in the adjacent walls of expanded end boxes *e*, such adjacent walls being welded together. This construction allows of free expansion and contraction in the tubes.

26,340. Lomschakow, A. Nov. 24.

Field-tube apparatus; tubes of special section.—The superposed chambers 3, 4 of the distributing-header 1 are divided transversely into compartments which communicate either with the ribbed or smooth outer tubes 10 or the inner circulating-tubes 16 through ports 7, 8, 14, 15. The heads 9 of the tubes 10 are secured to the header 1 in the manner shown, or long bolts are passed right through the heads or through lugs at their sides. The inner tubes 16 are provided with a lateral extension which is forced against the ports by wedges 17. The ribbed portions of the tubes 10 may be made separately and welded to the smooth portions.



26,557. Loziano, L., and **Soc. Anon. Montbarbon.** Nov. 27.

Plate apparatus; tubes of special section.—A number of elements *a*, Fig. 4, having upturned sides a^1 and extensions a^2 are stacked one above the other and kept in position by a sheet-metal wrapping *b*, Fig. 9. The elements are spaced out by means of grooves b^1 in the wrapping and are retained by beading over the extensions a^2, as shown. The columns thus formed are mounted side by side in the usual radiator frame, so that the water to be cooled passes down the passages formed by the juxtaposition of the concave sides of the columns, while the cooling-air passes through the elements horizontally.

FIG. 1.

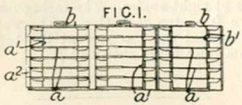


FIG. 4.

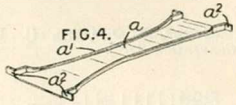
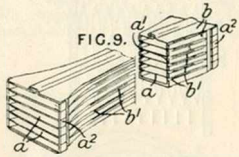


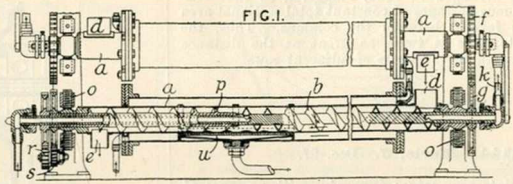
FIG. 9.



27,823. Ceipek, N. Dec. 11.

Coil-tube apparatus.—An apparatus for heating or cooling liquids in order to obtain solids therefrom by crystallization or solidification comprises superposed elements *a*, jacketed or not, through which the material is moved by a conveyer *b* having hollow threads through which a heating or cooling agent is passed in a direction opposite to that in which the material is impelled. Inlet and outlet tubes *d*, *e* are provided at opposite ends of each element. The heating or cooling agent passes from the hollow shaft of one element to that of the next by flexible connexions *k*, and set-screws *o* are provided to allow the elements to be moved into an inclined position. The conveyers in the separate elements may be driven at different speeds by means of change-wheel gearing *f*, *g*. The apparatus is applicable to the crystallization of ammonium nitrate, salt, alkali hydrates, &c., to the crystallization by heat of substances more soluble in cold water than in hot, and to polymerization, as in the condensation of oils to resins.

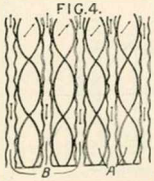
FIG. 1.



28,276. Bondin, C. Dec. 15.

Plate apparatus.—In radiators employing flattened tubes B with corrugated sides, plates A are inserted between and in contact with the tubes to support them and also to increase the radiating-surface. The plates are either formed by causing two corrugated plates to cross at intervals by suitable slots or by soldering two corrugated plates together along the ridges of contact.

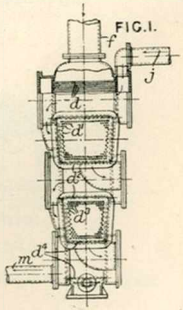
FIG. 4.



28,922. Crighton, J. Dec. 22.

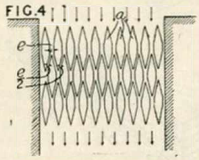
Straight tubes between headers.—A vertically-arranged surface condenser comprises a series of superposed nests of water-tubes *d*, d^1, d^2, d^3, d^4 arranged so that the tubes of one nest lie close and at an angle to those in the adjacent nests. In the example,

FIG. 1.



they are at right-angles. The casing may taper as shown from top to bottom. The water may enter either at the top *j* or at the bottom *m*, the steam inlet being shown at *f*.

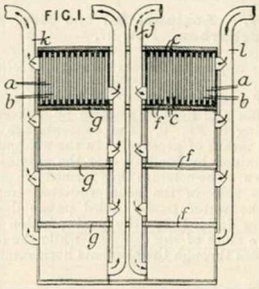
29,094. Meyer, R. O., [Firm of]. Dec. 24, 1910, [*Convention date*].



Straight tubes between headers; tubes of special section.—Vertical heating-members *a*, of rhombic section with flattened sides as shown, are arranged in rows, staggered so that continuous passages of constant total sectional area are formed between the columns. Thus, the distance *e* is twice as great as the distance between the members of adjacent rows.

29,144. Mérie, J. Dec. 27.

Plate apparatus; apparatus with passages of constant area. — In apparatus for sterilizing milk, comprising a regenerator having adjacent spiral passages and a sterilizing coil immersed in a water-bath, the passages for the milk throughout are of constant area, so that the milk travels at constant speed and liberation of gases is prevented. Preferably, the milk passes by a pipe *j* to a number of superposed regenerators arranged in parallel, and thence by a pipe *k* to the sterilizing-coil, returning by a pipe *l*. The regenerators comprise metal sheets *a*, *b* separated by soldered strips *c* and closed by rubber &c. sheets *f* and copper plates *g*.



29,393. Büttner, A. Jan. 5, [*Convention date*].

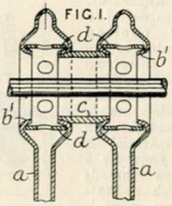
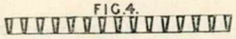


Plate apparatus.—For joining the adjacent sheet-metal elements *a* of a radiator, a double coned nipple *c* is used in conjunction with perforated internal rings *d* to prevent collapse of the elements. The coned parts bear against flanges b^1 round the apertures of the elements, which flanges may be either bent inwards, as shown, or outwards, forming in either case an elastic fluid-tight joint.

A.D. 1912.

2204. Porzel, J. Jan. 27.

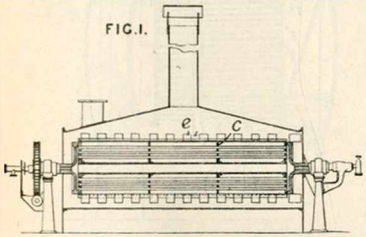
FIG.4.



Honeycomb tube apparatus.—A radiator consists of a lattice-work of tubes of the section shown in Fig. 4, made in one piece by electro-deposition.

2461. Weise, H. Jan. 30, 1911, [*Convention date*].

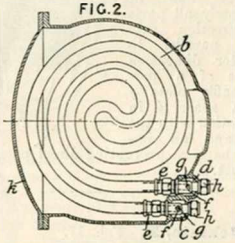
FIG.1.



Straight tubes between headers.—In a rotating nest of tubes used in a drying-apparatus, a central stout tube carries partitions *c* which support the outer tubes and scoops *e*. The tubes extend between headers.

2812. Weir, W. Feb. 3.

FIG.2.



Coil-tube apparatus.—To reduce the weight of a sea-water evaporator having superposed coils *b*, the coils are connected to pressure and exhaust chambers *c*, *d* arranged vertically in the side of the evaporator. The coils are connected to the chambers *c*, *d* by coupling-pieces *e* and tail pieces *f* perforated at *g*. The couplings are secured by nuts *h* outside the shell. By this construction, the coils can be made to fill the horizontal section of the shell, and can be withdrawn through the door *k* by a single straight-line movement after the disconnexion of the nuts *h*.

2813. Weir, W. Feb. 3.

Straight tubes between headers.—A horizontal condenser *b* is constructed with enlarged ends which are fitted internally with cylindrical plates *d* having perforations in their upper portions. The steam enters by passages *f*, and passing around the plates *d* reaches the interior of the condenser at the top. The air-pump suction *o* is fitted at the middle of the bottom of the condenser. Specification 2812/12 is referred to.

FIG.1.