

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. 1916-20 [100,001-155,800]



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1925

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EXPLANATORY NOTE

The contents of this Abridgment Class may be seen from its Subject-matter Index, which is in accordance with the 1910 edition of the *Abridgment-Class and Index Key* (now out of print), as amended up to date, and 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. A revised edition of the *Abridgment-Class and Index Key* is now in preparation.

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 1s., may be purchased at the Patent Office, or ordered by post, no additional charge being made for postage.

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

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

SUBJECT-MATTER INDEX

Surface-apparatus for effecting transfer of heat, (other than Apparatus in which the heat is transferred from products of combustion, e.g. steam-generators; super-heaters, steam).

This heading includes only the construction of apparatus composed of several plates, tubes, and other elements presenting relatively large surfaces to the heating or cooling medium in comparison with the volume of the medium to be heated or cooled.

Adaptations and arrangements of surface-apparatus for special purposes are indexed only under separate headings, such as Cooling gases &c., [Class 29]; Distilling &c. liquids, [Class 32]; Heating water &c., [Class 64 (i)].

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cleaning mechanically. *See* Pipes and tubes, Cleaning, [Class 99 (ii)].

coil-tube apparatus. *See* kinds &c. below.

concentric plate apparatus. *See* kinds &c. (plate apparatus) below.

drip-interception devices. *See* kinds &c. (straight-tube apparatus: misc.) below.

filling-pieces for tube-plate joints. *See* Pipes and tubes, Joints &c. for, [Class 99 (i)].

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The names in *italics* are those of persons by whom inventions have been communicated to the applicants for Letters Patent.

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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.

PERIOD 1916—20

100,250. **Redlich, A.** April 6, 1915, [*Convention date*].

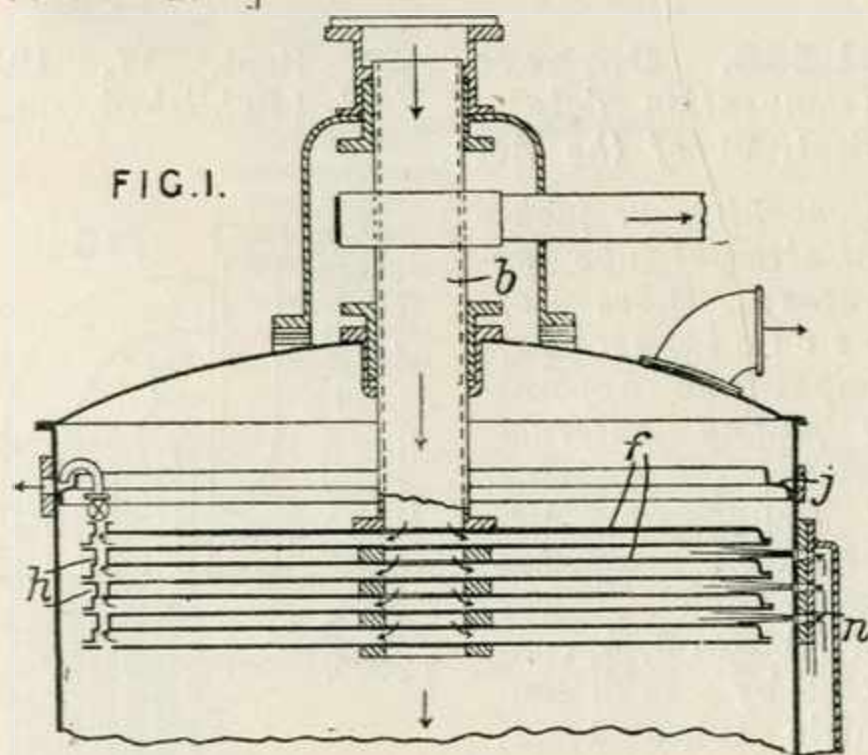
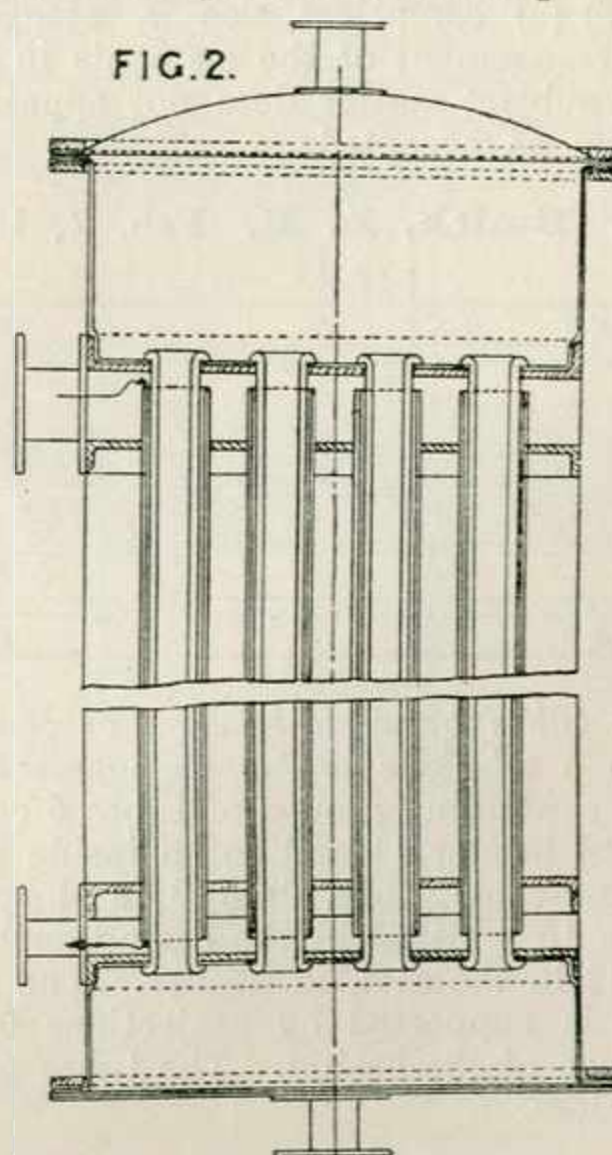


Plate apparatus.—The liquid to be evaporated is spread by centrifugal force in thin layers on hollow steam-heated bodies; the centrifugal force also spreads the water of condensation in thin layers on the interior of the bodies and drives it to the periphery. The apparatus comprises a number of hollow disk-shaped heating-bodies *f* mounted on a hollow rotating shaft *b*. The liquid is squirted on to the disks by nozzles *n*, and is spread in a thin layer by centrifugal force, being finally thrown off the edges of the disks on to the wall of the casing. The water of condensation driven to the periphery of the disks is led by pipe lengths *h* to an annular channel *j*. The thickness of the film is varied by altering the speed of rotation.

100,406. **Barbet et fils et Cie, E.** May 5, 1915, [*Convention date*].



Concentric or jacketed straight-tube apparatus.—In apparatus for manufacturing ether, decomposition of ethylsulphuric acid is effected in a bundle of lead tubes heated by steam passing through iron or copper tubes around the lead tubes.



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100,593. Anderson, L. N. May 29, 1915,
[Convention date].

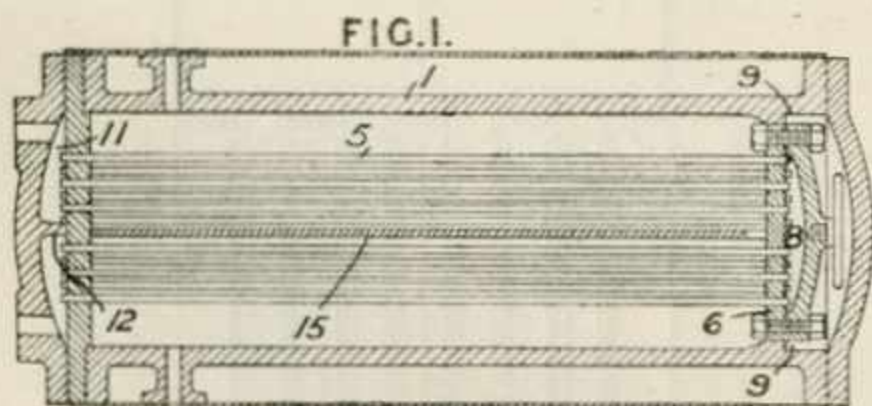
Plate apparatus.

—Motor-car radiators are built up of elements *a*, *b* spaced apart to form water channels and provided with a series of lateral right-angled bends with diagonal corners, forming three sides of air spaces *c*, the fourth sides being constituted by adjacent elements. The plates *a*, *b* are connected together at the front and back, as shown in Fig. 3, and adjacent elements are connected together by seamed joints at the top and bottom, as shown in Fig. 1.

The diagonal portions may contact only at the ends, so as to form inclined connecting air passages *e* between the contacting portions, as shown in Fig. 6.

The Specification as open to inspection under Sect. 91 (3) (a) comprises also a staggered or diagonal arrangement of the elements in a radiator. This subject-matter does not appear in the Specification as accepted.

100,671. Smith, L. E. Feb. 2, 1916.

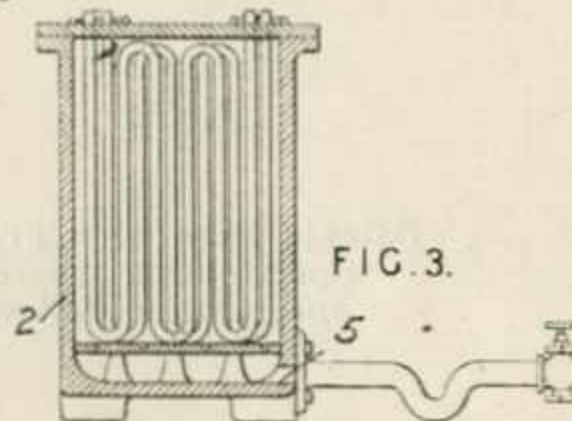
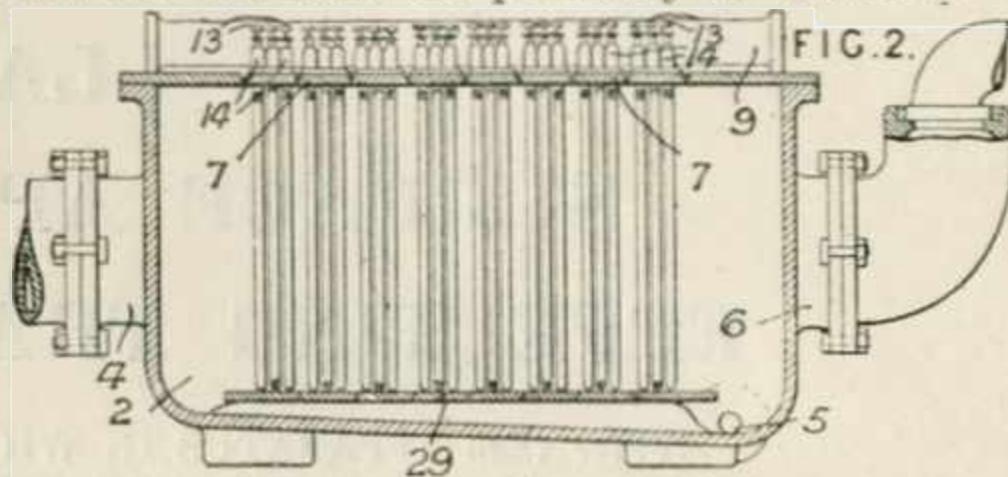


Straight tubes between headers or connecting-boxes.—In a tubulous heat-exchanger comprising a casing 1 containing groups of tubes 5 connected to a divided header 11 and to an inside header 8 having a movable tube-plate 6, a longitudinal baffle-plate 15 is fitted in the casing opposite the partition 12 in the divided header. The movable tube-plate is supported by projections 9 on the inner surface of the casing. The tubes are fitted with retarders.

101,307. Hough, A. Feb. 24, 1916.

Loop-tube and serpentine-tube apparatus.—A condenser for nitric-acid vapour consists of a disk-shaped container 2 with vapour inlet 4 and outlet 6, a cover formed of independently removable sections 7, a series of condenser members carried

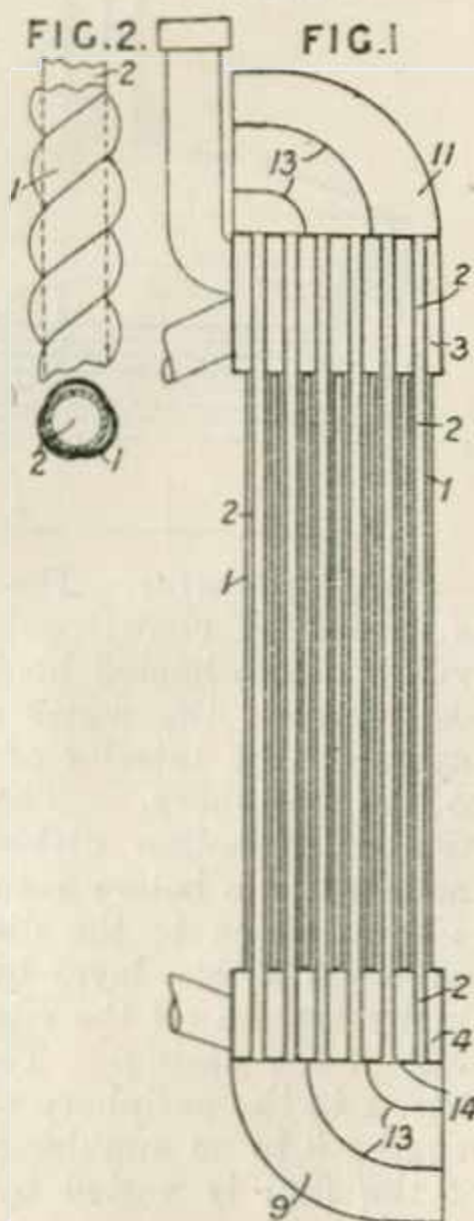
by the sections of the cover and having their ends protruding therethrough, and inlet and outlet headers 9 for the cooling-liquid circulating through the condenser members. The condensed acid flows away through a trapped outlet 5. The condenser members are preferably of three-loop



tubes, three such tubes in staggered relationship being carried by each cover section 7, and are supported on a perforated false bottom 29. The tubes are connected to the headers by nipples rigidly attached to the headers and fitted with taps 13, and by flexible tubing 14. The tubes are cemented into the sections, and the sections are cemented together.

101,548. Corbero, P. Sept. 17, 1915,
[Convention date]. Void [Published under Sect. 91 of the Act].

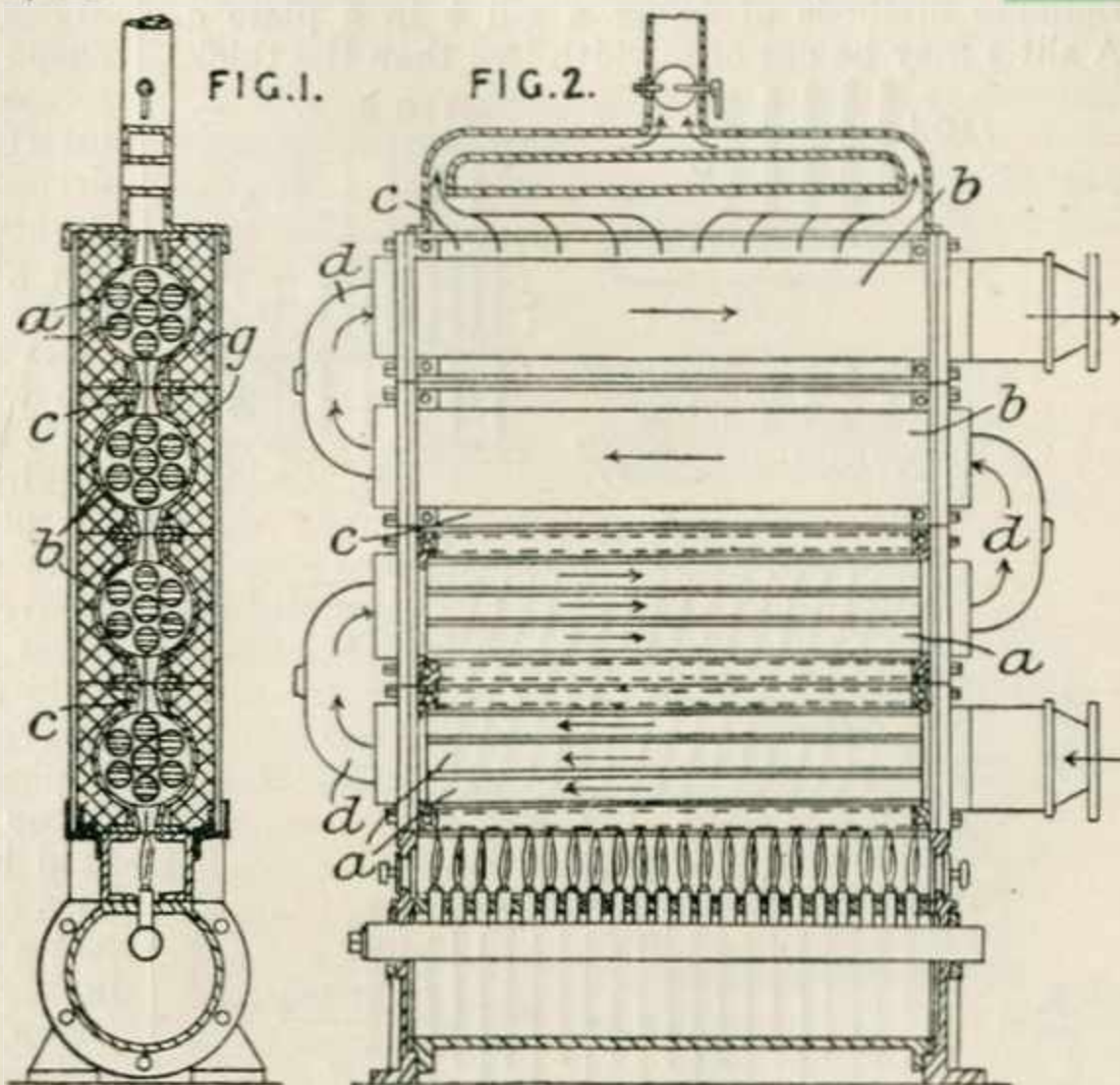
Concentric or jacketed straight-tube apparatus; tubes of special section; straight-tube apparatus having internal baffles.—A radiator for motor-cars, aircraft, &c., comprises upper and lower water boxes 3, 4, connected by sets of concentric tubes 1, 2, the water circulating in the spaces between the tubes being cooled by air passing through the inner tubes, which extend through the boxes to outer tube-plates 14. The inner or outer tubes may be fluted, prismatic, or cylindrical, one form being shown in Fig. 2.



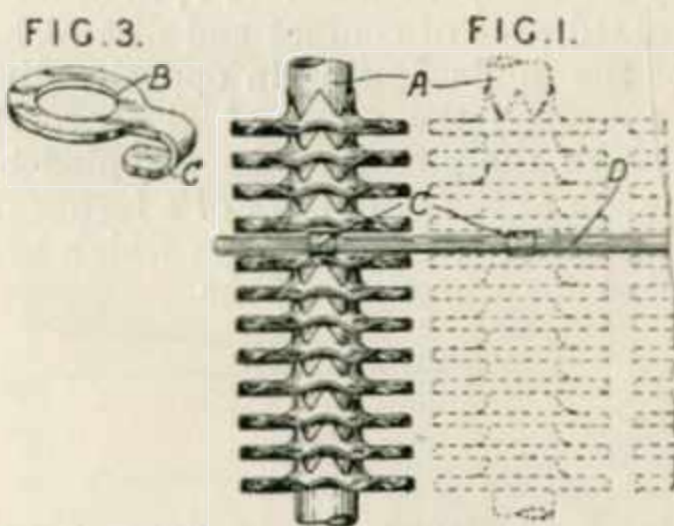


101,871. Haefely et Cie Akt.-Ges., E.
Oct. 18, 1915, [Convention date].

Straight tubes between headers.—Relates to horizontal-tube apparatus for heating air, water, oil, steam, or other fluid to be circulated in a heating system. The tubes *a*, through which the fluid is passed within the heater, are arranged in groups, each group being disposed in a casing *b* connected to adjacent casings by narrow channels *c*, through which the heating gases flow, and the groups are connected alternately at their ends by pipes *d*, which are not subdivided. The heating gases may be derived from a fire, gas-stove, or electric heater. The casings *b* are fitted with a non-conducting covering *g*.



102,880. Tyler, W. S., and Coventry Motor Fittings Co. May 13, 1916.

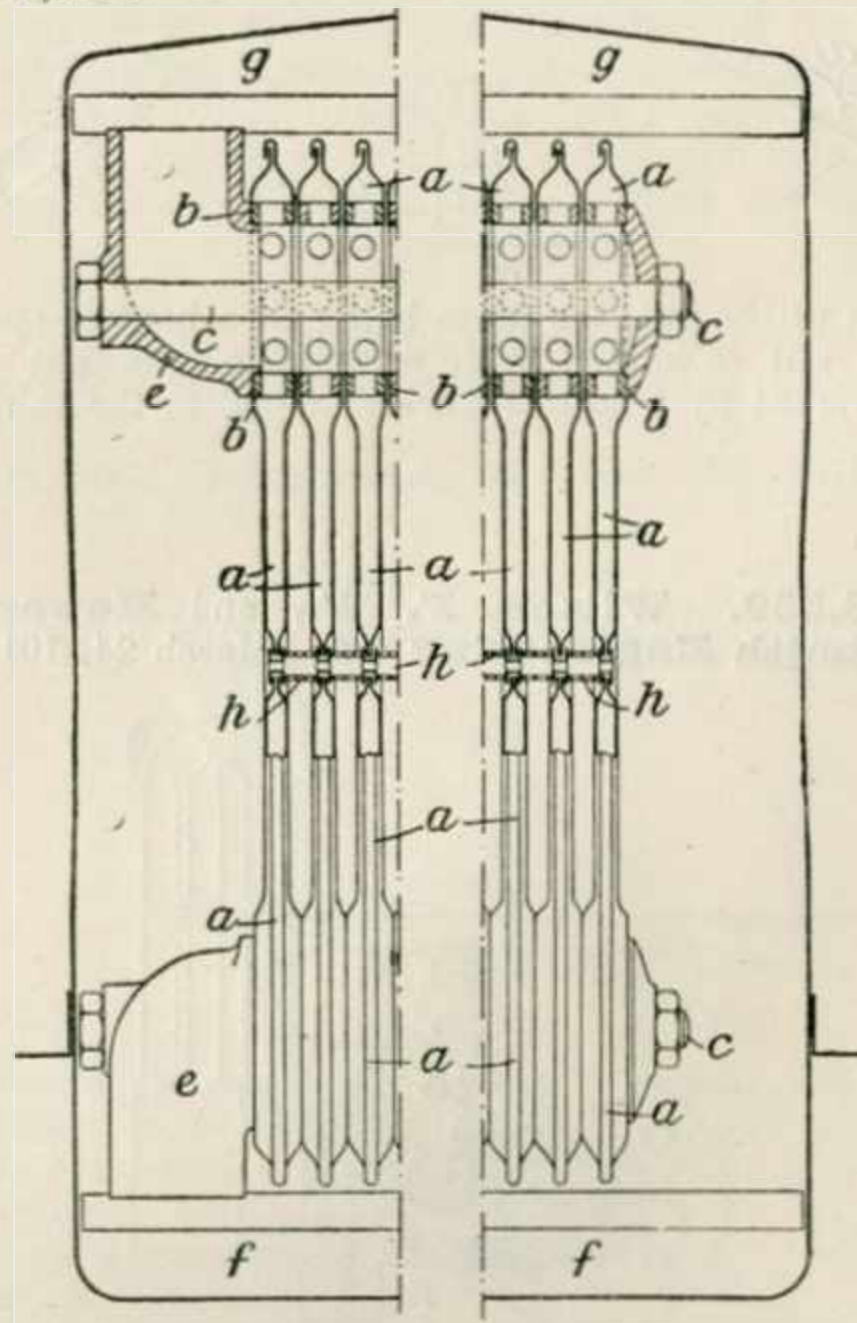


Tube-supports.—The tubes *A* of a radiator or condenser are stayed together by the provision of a clip on each tube adapted to engage a stay wire *D*. Each clip comprises a ring *B* mounted on the tube and formed with a tongue *C* bent around the wire. The tongues *C* may be soldered to the wire.

103,472. Goudard et Mennesson, M.
Jan. 20, 1916, [Convention date] Void [Published under Sect. 91 of the Act].

Plate apparatus.—The elements *a* of heat-exchange apparatus, such as the radiator of an internal-combustion engine, consist of parallel plates spaced apart at top and bottom by perforated rings *b* and secured together by bolts *c* passing through the rings. Junction-pieces *e* connect the interior of the elements to upper and lower reservoirs *g, f*. The elements may be secured together intermediate of their length by tubular pieces *h*.
(For Figure see next column.)

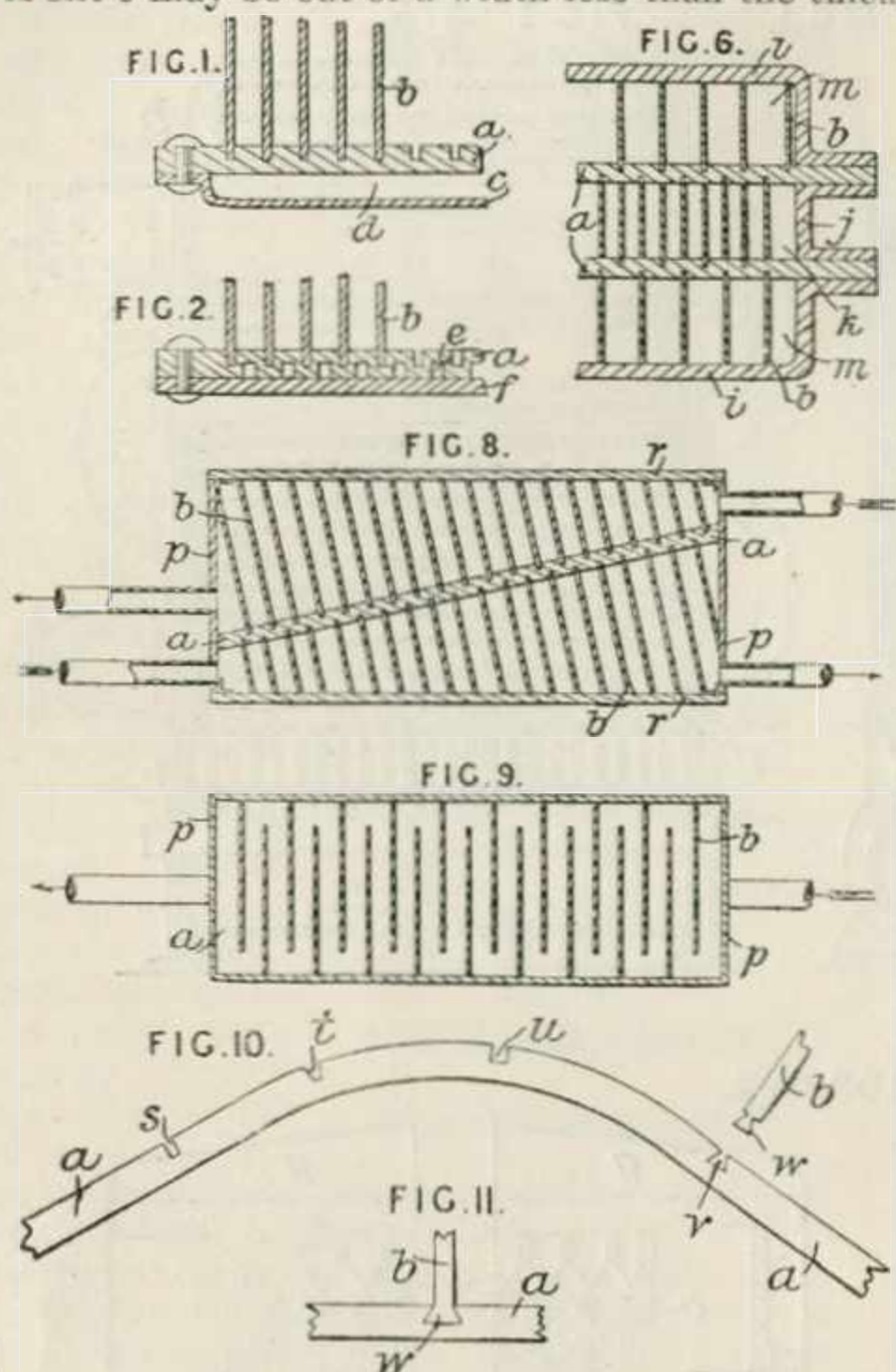
103,472.



103,492. Pease, E. L. Jan. 15, 1916.

Plate apparatus.—Relates to the fixing of heat-radiating gills to metal plates forming the walls of a radiator or other heat-exchanger or of a furnace, and to the arrangement of such gilled plates. The gills are received in slits which are sawn or simi-

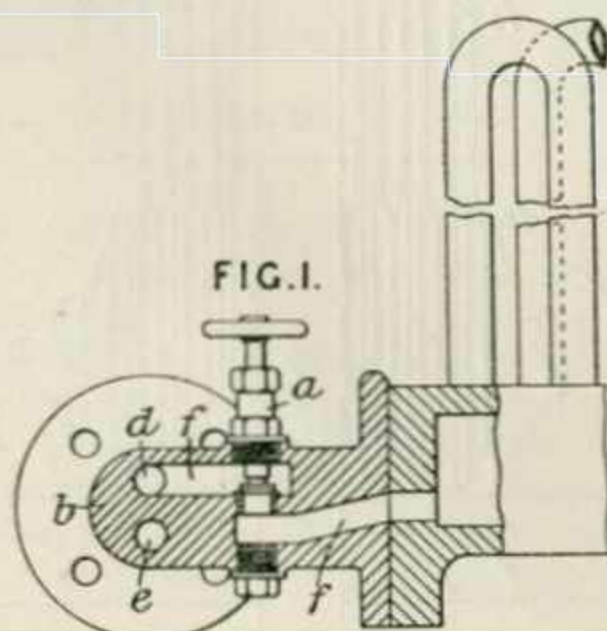
larly cut in the face of the plate. Figs. 10 and 11 indicate methods of fixing a gill *b* in a plate *a*. A slit *s* may be cut of a width less than the thick-



ness of the gill, the plate being then bent to open the slit as shown at *t*, whereupon the slit is traversed by a tool of a width equal to the thick-

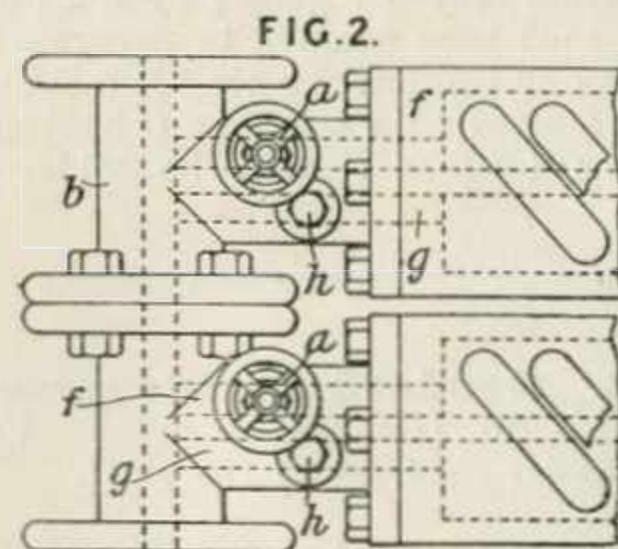
ness of the gill and assumes the form shown at *u*. When the plate is straightened, the slit is of the shape shown at *v* and receives a root *w*, Fig. 10, formed by grooving the gill *b*. The gill may be inserted in re-straightening the plate, or may be driven in from one end. The root *w* may be formed, as shown in Fig. 11, by a thickening of the gill *b*, in which case the first slit *s* is of a width equal to the thickness of the root. A thin plate may be bent, and a slit of a width equal to the thickness of the gill may be cut while the plate is so bent, one cutting operation only being required. A space *d* for the fluid on one side of the plate *a* may be provided by a flanged back-plate *c*, Fig. 1; or the fluid may pass through grooves *e*, Fig. 2, cut in the plate and covered by a flat plate *f* or by a similar ribbed and grooved plate with the grooves staggered in relation to the grooves *e*. Two plates *a*, Fig. 1, with ribs *b* may be placed back to back and separated by a distance frame to provide a space for the passage of a fluid between them; or a plate *a* with ribs *b* on both sides may be clamped to two flanged cover-plates such as *i*, Fig. 6. In a modification shown in Fig. 6, two such plates *a* are separated by a frame *j* providing a central space *k* for one fluid and outer spaces *m* for the other fluid. Tapered ribs as described in Specification 104,721 may be employed. Figs. 8 and 9 show, in section elevation and plan respectively, a plate *a*, with gills *b* on both sides, mounted at an angle in a casing formed by frames *p* with covers *r*, in order to provide increased area of contact and diminished rate of flow of the fluids flowing in opposite directions as they approach the point of discharge. The space between the gills may be occupied by solid material, such as the brickwork of a furnace, which it may be desired to cool, or from which heat is to be extracted for warming air &c.

103,559. Wilson, F. W., and Howard Smith Engineering Co. March 24, 1916.



U-tube apparatus.—In tubulous air-heaters, condensers, and like apparatus of the kind described in Specification 25097/06, the units are connected together by T-pieces upon the ends of the headers, or by extensions of the headers, the T-pieces or extensions having two conduits for supplying steam &c. to, and for discharging con-

densed steam &c. from, the headers. The branch passages *f* from the supply conduit *d* in the flanged



T-pieces *b* are fitted with screw-down valves *a*. The branch passages *g* from the discharge conduit *c* contain non-return valves *h*.

103,565. Bell, F. J. March 31, 1916.

Plate apparatus.—Relates to a radiator, more particularly for use with an internal-combustion

engine, of the kind comprising sheet-metal plates which are ribbed or shaped so that, when assembled, they are spaced to form vertical water-circulating channels and horizontal tubular air passages. The plates are spaced by folding back the vertical edges against the main surfaces. Each

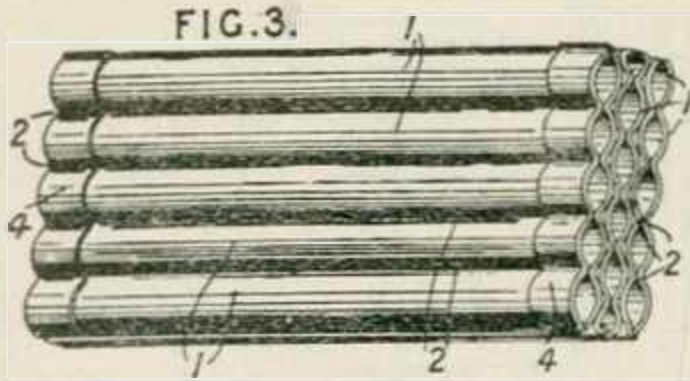
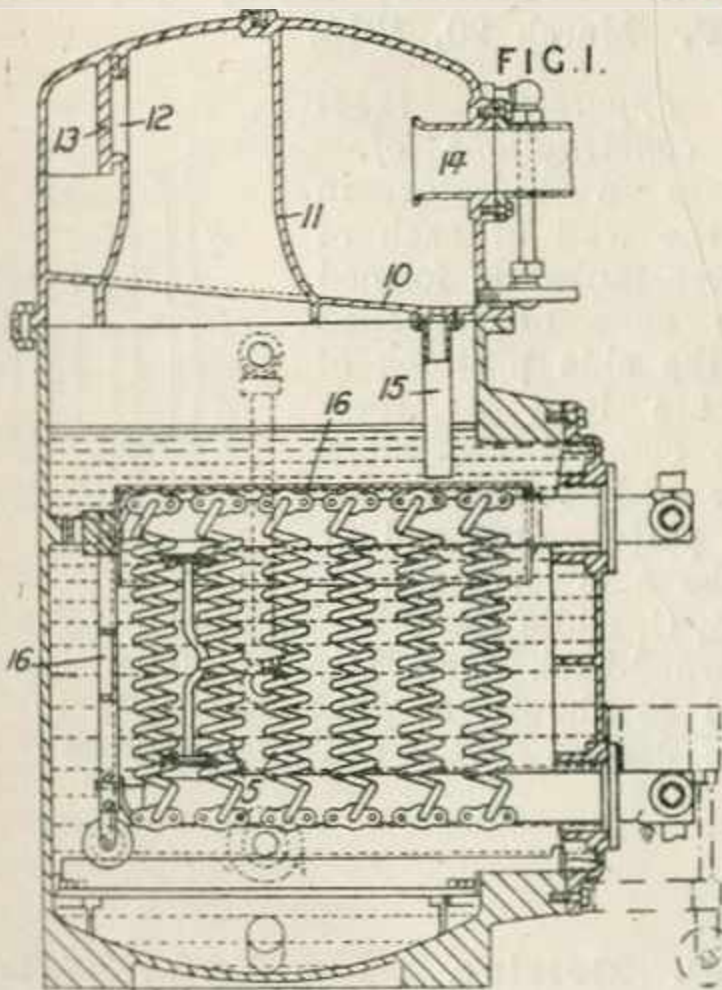


plate may be corrugated with rounded ribs 1 on the back and sharper ribs 2 on the face, the vertical edges being folded against the back as shown at 4. Each water-circulating channel is formed by placing two plates back to back with the ribs in staggered relation. The ends are completed by dipping into solder.

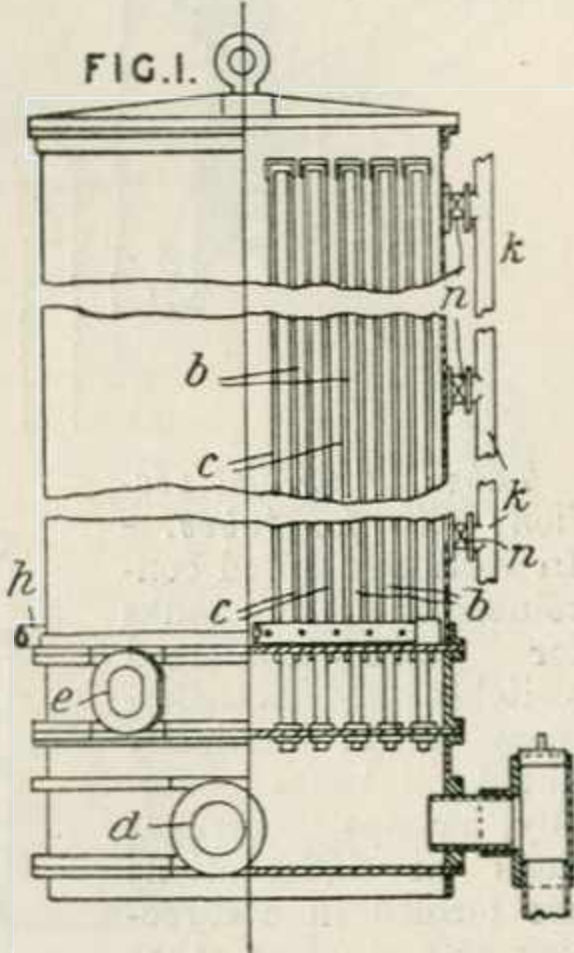
103,820. Griscom-Russell Co., (Assignees of Jones, R. C.). Feb. 1, 1916, [Convention date].



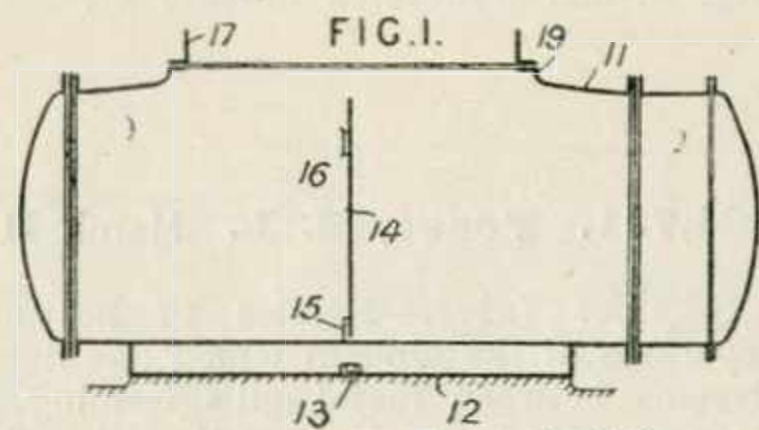
Coil-tube apparatus.—To prevent priming in a salt-water or like evaporator due to the rapid generation of vapour around the heating-coils 5, a baffle 16 is placed above the coils so as to deflect the vapour laterally. The coils are supported on rollers. The baffle 16 is of inverted-box form, and may be perforated.

103,917. Christopher, J. E. April 28, 1916.

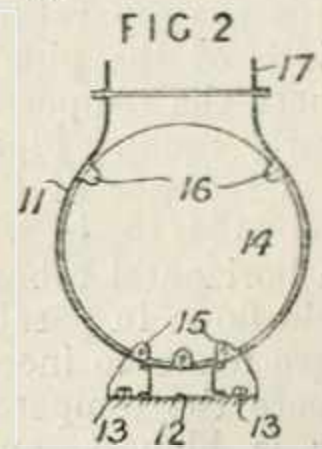
Field-tube and like apparatus.—In a gas-cooling apparatus with groups of concentric tubes *b, c*, the gas to be cooled passes through the inner tube *b* of each group and returns between the tubes *b, c* of the group, and cooling-medium surrounds the groups; the sum of the cross-sectional areas of the inner tubes *b* and the sum of the cross-sectional areas of the annular spaces between the tubes *b, c* are each approximately equal to the cross-sectional area of the gas inlet *d* or of the gas-outlet *e*. The cooling-liquid is supplied through a four-way perforated pipe system *h* or through a vertical pipe with straight or curved branches arranged at different levels; the liquid is maintained at the desired level by manipulating valves *n* leading to an overflow *k*. In a modification, the annular spaces between the tubes *b, c* of the group are divided by the provision of further tubes between the tubes *b, c*.



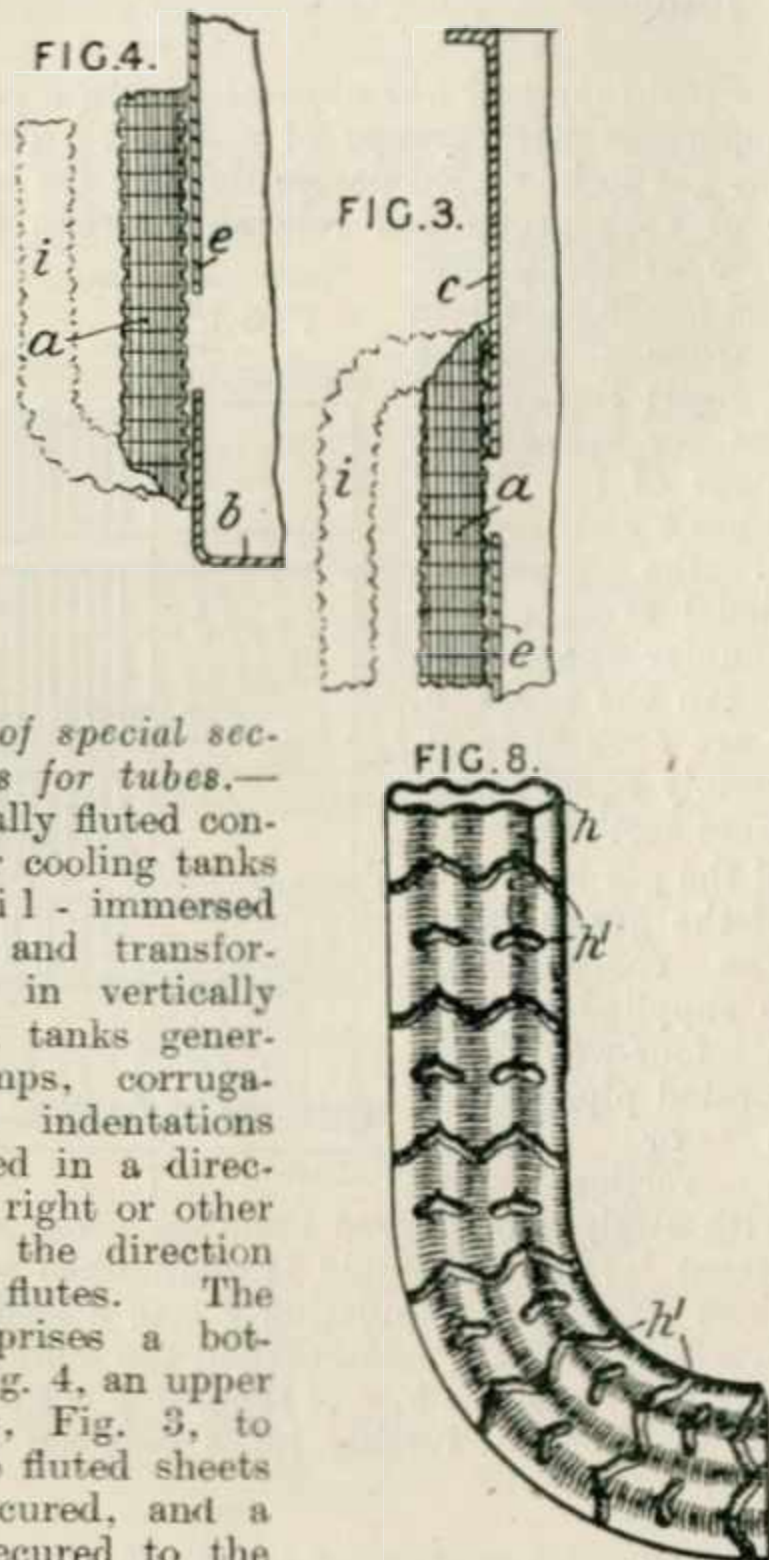
104,704. Baumann, K. Feb. 19, 1916.



Tube supports.—Relates to condensers arranged immediately below the outlet of the exhaust casing of a steam turbine. The sagging plates 14 supporting the tubes, only one of which is shown, are secured to the shell by lugs 15 at their lower edges only, the upper parts having a sliding support 16.



104,717. **Davies, J. H.** March 11, 1916.



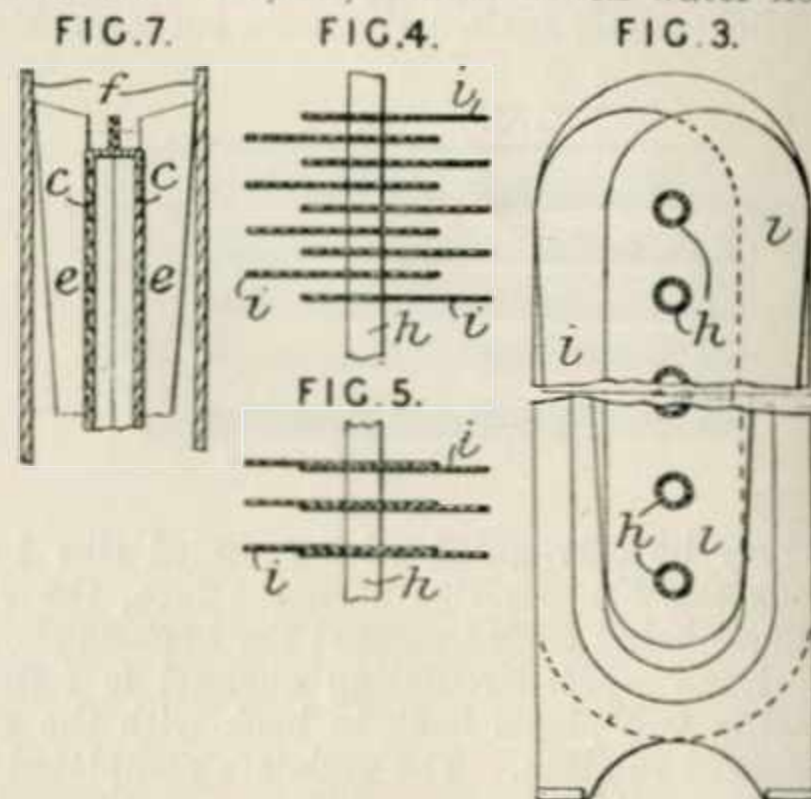
Tubes of special section; gills for tubes.—In vertically fluted containers or cooling tanks for oil-immersed switches and transformers or in vertically fluted oil tanks generally, crimps, corrugations or indentations are formed in a direction at a right or other angle to the direction of the flutes. The tank comprises a bottom *b*, Fig. 4, an upper portion *c*, Fig. 3, to which the fluted sheets *a* are secured, and a liner *e* secured to the flutes and spaced apart from the top and bottom. Tubes *i* may be combined with or replace some or all of the flutes, and the tank sides may be provided with crossed strengthening-strips. The tubes *i* are provided with vertical corrugations *h*, Fig. 8, and transverse indents *h'*.

104,721. **Pease, E. L.** March 11, 1916.

Gills for tubes.—Relates to heat-exchanging apparatus of the kind in which one fluid flows in streams between metal gills forming part of a structure separating it from the other fluid. The width of the gills is so varied as to be greater where the temperature of the two fluids are more nearly equal. Figs. 3 and 4 show the application to a radiator of the kind described in Specification 4154/15, in which vertical gills are threaded on horizontal tubes *h* through which the heating-fluid flows in parallel between headers. The gills *i* are made to increase in width towards the top, where the temperature of the upward stream of air is highest, and may overlap alternately on opposite sides, as shown. In a modification, Fig. 5, the gills are arranged in contacting pairs. In a further modification, the tubes *h* are arranged in two vertical planes with no two tubes in the

same horizontal plane, and the gills *i* are disposed symmetrically in relation to the tubes.

Plate apparatus.—Fig. 7 shows the application to plate apparatus constructed as described in Specification 103,492, and in which water flowing

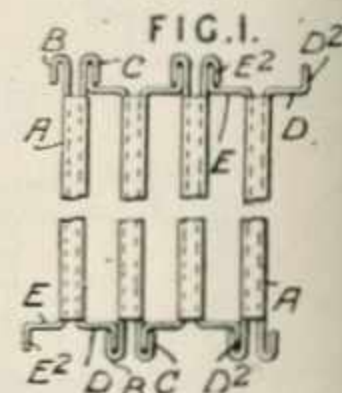


between two vertical plates *c* is cooled by air flowing through a casing *f* between gills *e* secured to the plates *c*. The width of the gills is increased in the direction of flow of the air.

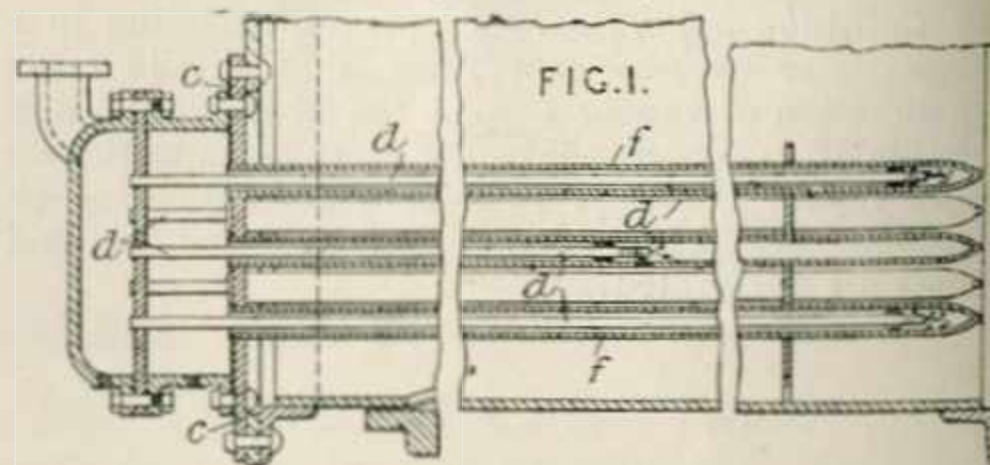
104,901. **Humber, Ltd., and Griffin, H. F.** March 20, 1916.

Plate apparatus; tube-plates, constructions of.—

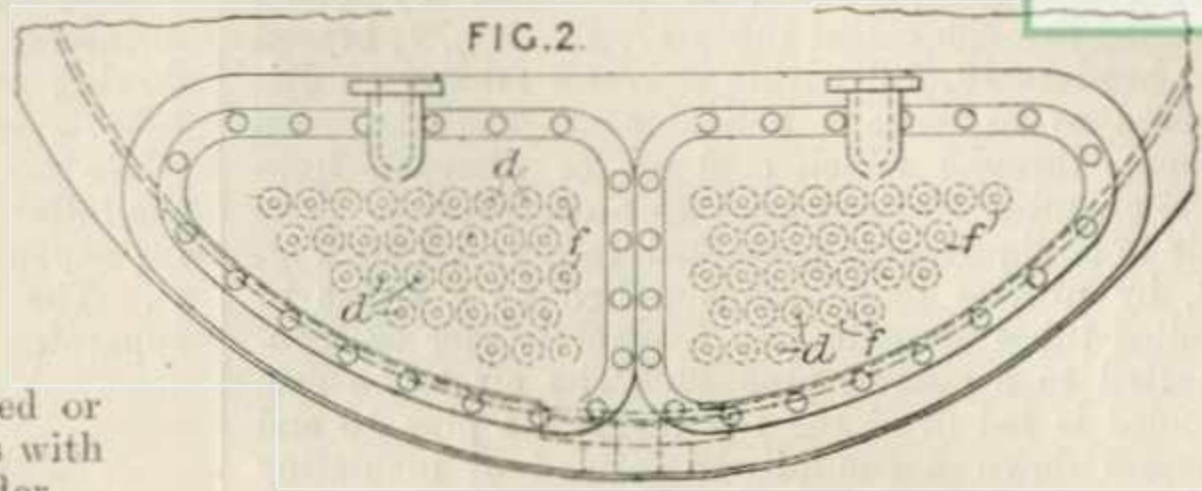
Comprises a radiator in which the wall of each of the water tanks is formed by the ends of flattened tubes, the side portions of which are bent at their ends to connect the tubes together and form a continuous plate. One end of each tube *A* is formed with hooks *B*, *C*, while the other end has flanges *D*, *E* with turned-back parts *D'*, *E'*. The tubes are arranged as shown, so that the hooks interlock with the flanges on the contiguous tubes.



104,969. **British Dyes, Ltd., Metcalf, A. T., and Welch, W.** May 25, 1916.



Field-tube apparatus.—A still or like apparatus is heated by independent banks of Field tubes *f*, the internal tubes *d* of each bank being of varying lengths, so as to equalize the temperature in the still, &c. The internal tubes are perforated at or near their open ends. The tube-plate *c*, into which the outer tubes of a bank are expanded, has an inclined or bevelled face, so as to support the tubes with a downward incline towards their header.



105,103. **Bynoe, F. O.** March 29, 1916.

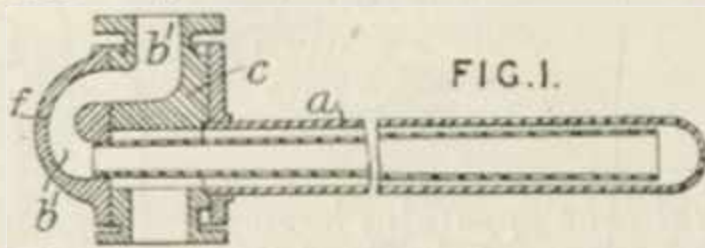
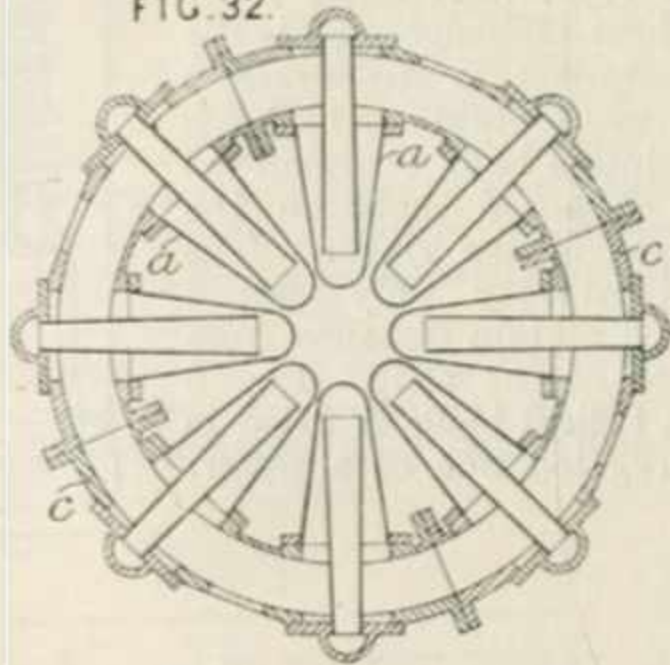


FIG. 32.



gradually increase in the direction of flow. The outer tubes may also taper. Field tubes with eccentric inner tubes are so arranged that the widest parts of the annular spaces between the tubes are in contact with the hottest gases. The tubes of the Field tubes may be replaced by similarly-arranged inner and outer chambers. The tube *a*, Fig. 1, opens into a header connector *c*

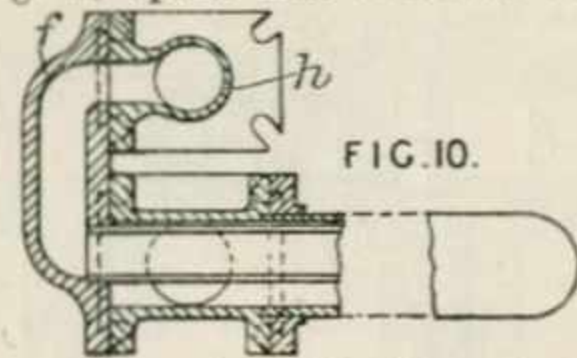


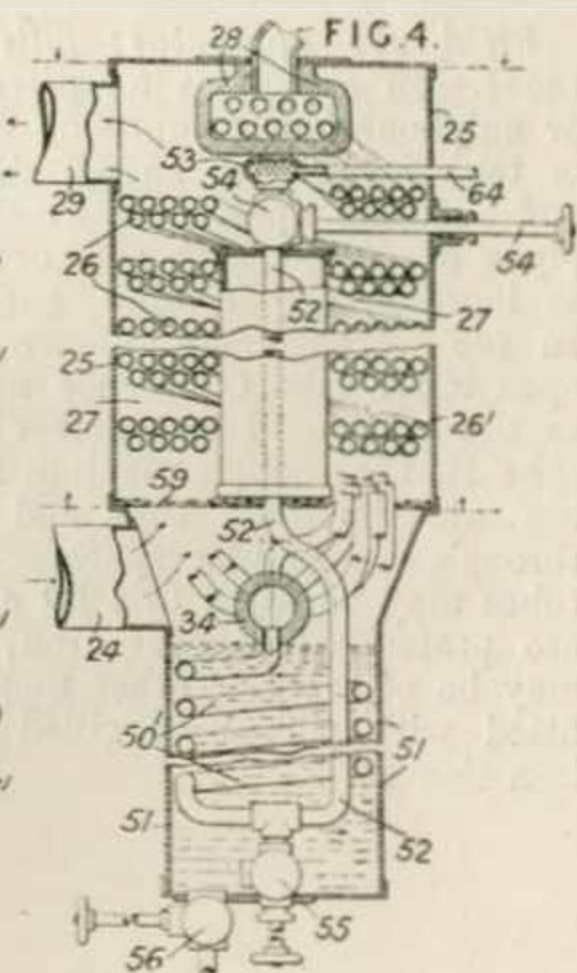
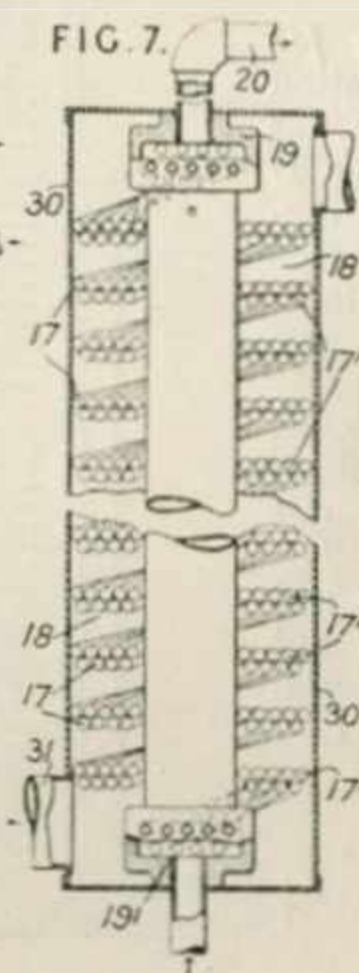
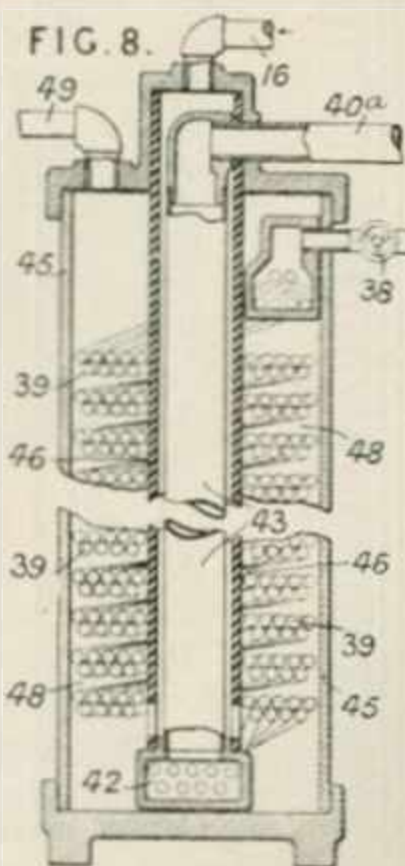
FIG. 10.

having a flanged cap *f*, which places the inner tube in communication with the inlet passage *b*¹. The cap may connect the inner tube directly to the collector *h*, Fig. 10. The ends of the outer tubes are protected by removable caps of refractory material. A superheater may be built up of tubes *a*, Fig. 32, opening into headers *c* arranged in a circle. According to the Provisional Specification, the tubes are used for heating vapours and gases.

Field-tube and like apparatus.—Field tubes for superheaters have tapering inner tubes so arranged that the sectional areas of the steam passages

105,106. **Place, J. F.** March 29, 1916.

Coil-tube apparatus. — In apparatus for liquefying air and, if desired, separating its constituents, oxygen and nitrogen, the liquefying and rectifying chamber 25, Fig. 4, contains two series of coiled tubes 26, 26' connected at the top to an inlet header 28, and at the bottom to a header 34 provided with a relief valve, and precooled compressed air to be liquefied is passed through the coils in heat-exchanging relationship to highly cooled air entering the chamber by a pipe 24 and passing through a wire net 59 and a passage 27 formed between the coils. The air entering the chamber 25 at the pipe 24, prior to being cooled by expansion in stages

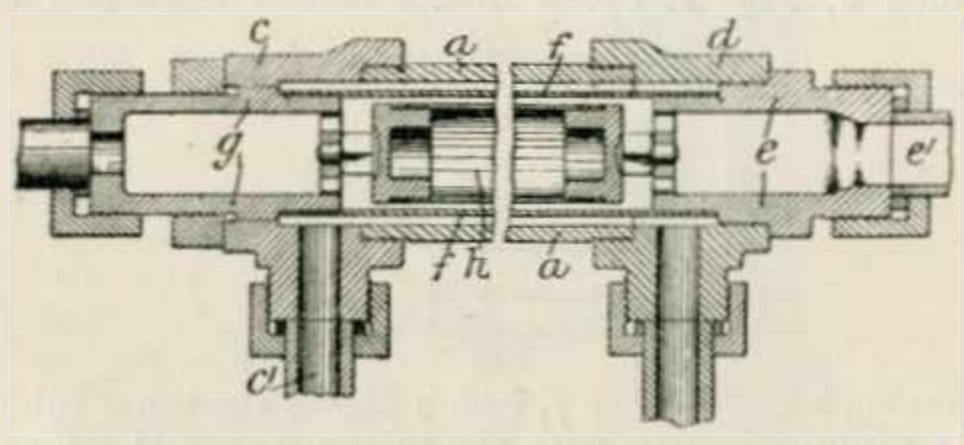




from a high pressure, is precooled by being passed through coiled tubes 17, 17', Fig. 7, brazed to headers 19, 19' within a vessel 30 and so disposed as to leave a helical passage 18 between them, through which cold air or nitrogen from the chamber 25 flows back to a compressor. The air to be liquefied is precooled, in a vessel 45, Fig. 8, by nitrous oxide gas supplied to a series of coiled tubes 39 ending in a lower header 42, connected to a central pipe 43. The air to be precooled is led in at the top through a pipe 16 and passes down a conduit 46 formed of insulating fibre, wherein it is cooled by the pipe 43, and thence along the helical passage 48 formed between the coils 39, passing out through a pipe 49 to the header 28 of the liquefying-coils.

steam, applicable for use on railway trains, is formed of three concentric tubes *a, f, h*, the fluids flowing only through the annular spaces. The tube *a* is screwed into the end castings *c, d*, while the tubes *f, h* are carried by end pieces *e, g*, the latter of which slides in the casting *c* to allow for expansion. Steam enters at *c'*, and water at *e'*. The Provisional Specification states that the apparatus may be used for condensing steam &c.

105,127. Sawyer, R., and Illston, A. C.
April 8, 1916.



Concentric or jacketed straight-tube apparatus.
—An apparatus for heating water by means of

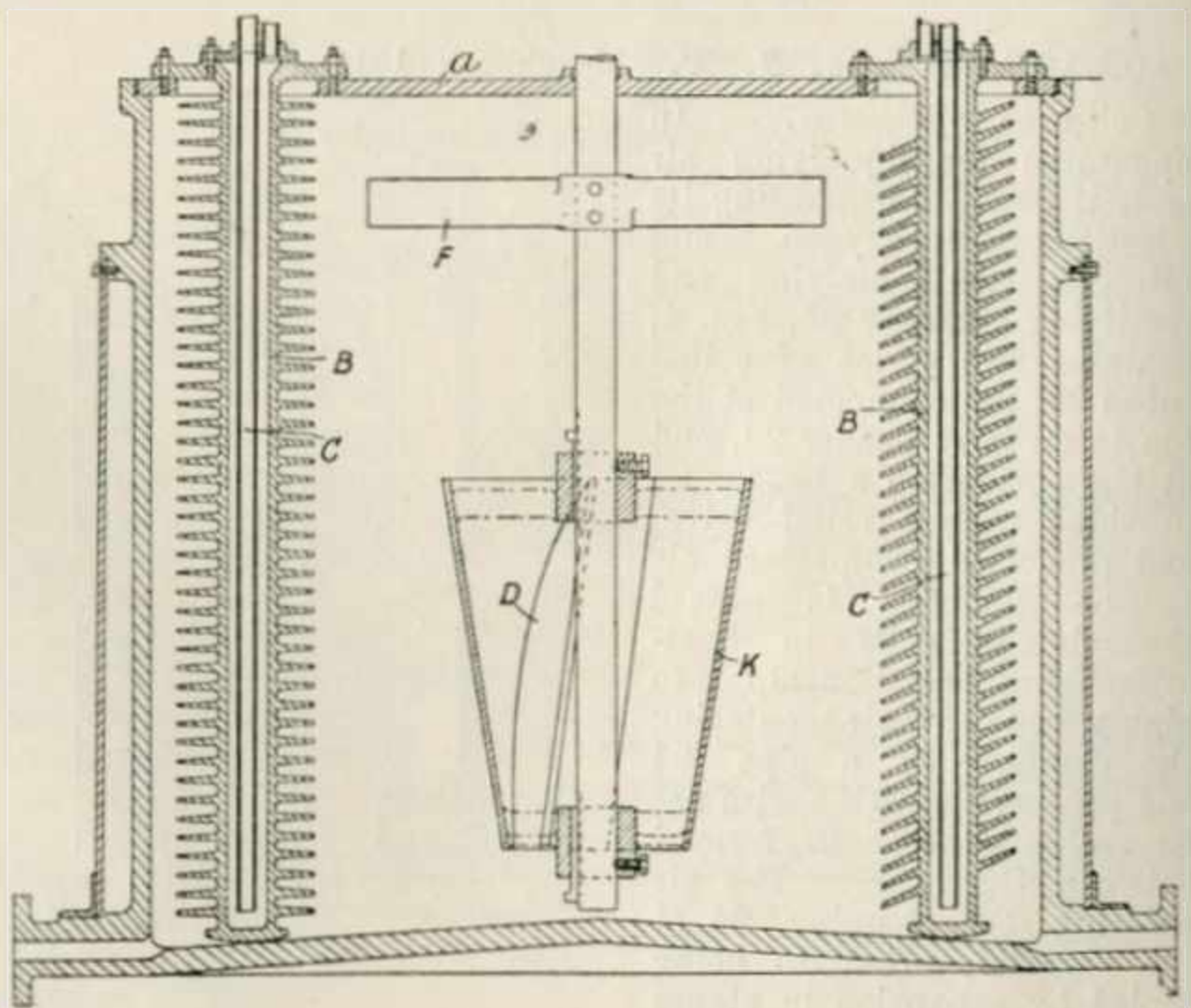
105,437. Jackson, W. J. Mellersh-
(Lovekin, L. D.). May 11, 1916.



Straight-tube apparatus having internal baffles.—A baffle *A* for use in heat-exchangers or boiler flues comprises a transversely corrugated metallic ribbon twisted into a helix of which the axis is disposed between the side edges of the ribbon. The corrugations may only extend inwards a certain distance from the sides of the strip. Fig. 6 shows a helical baffle *A* fitted in the corrugated flue of a water-heater.

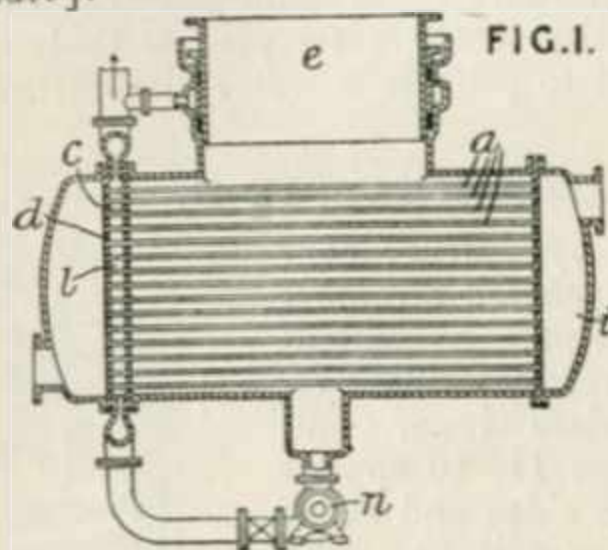
105,775. Leitch, J. W., and Lankshear, F. R. March 22, 1916.

Field-tube apparatus; gills for tubes.—In apparatus for nitration or sulphonation, comprising a vat or tank fitted with an agitator *D* and cooling-pipes, the cooling-pipes are fitted with ribs or gills to increase the cooling surface. In the arrangement shown, an open inner tube *C* extends nearly to the bottom of an outer closed tube *B*, the cooling medium flowing into the inner tube and out through the annular space. The tubes may be fitted to a lid *a* and are preferably of cast iron, but may be of steel or other material fitted with ribbed or gilled cast iron sleeves.



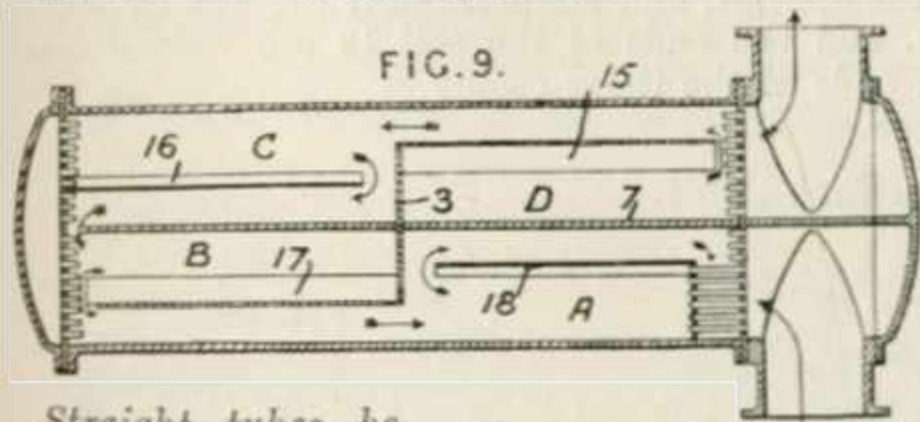


105,926. Maschinenfabrik Oerlikon, and Muller, E. April 26, 1916, [Convention date].

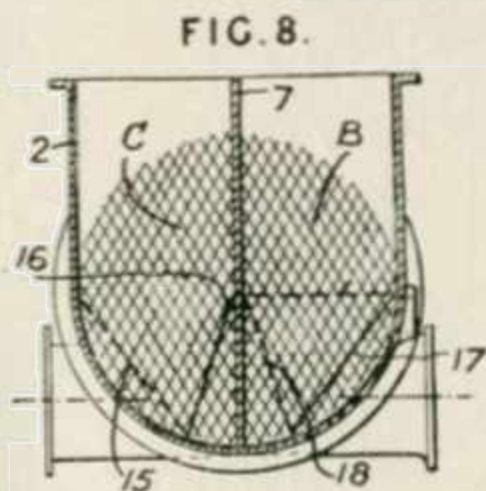


Tube-plates, constructions of.—In a surface condenser or like apparatus in which the tubes *a* have stuffing-box connexions with a tube-plate to allow expansion and contraction, to prevent leakage of cooling water past the tube connexions into the condensed-steam compartment, the tube-plate is formed with two walls *c, d* providing a double joint for each of the tubes. The space *l* between the tube-plate walls may be supplied with a fluid under pressure; for example, water from the condenser may be forced through the space by a pump *n*. The pressure medium may be supplied also to a space around the joint of the steam inlet *e*. In a modification, a pump withdraws water leaking into the space between the tube-plate walls and forces it into the cooling-water circuit.

106,106. Baumann, K., and Scanes, A. E. L. March 9, 1916.



Straight tubes between headers.—Relates to condensing steam turbine installations wherein the exhaust casing of the turbine is provided with guide walls adapted to divide into portions the steam leaving a row or rows of moving blades, and consists in dividing the condenser into a number of compartments each acting as a separate condenser by means of partitions forming continuations of some or all of the said guide walls, the object of the invention being to obviate deviations from the shortest steam path arising from the variations in the temperature of the cooling water throughout the condenser. Portions of the compartments A, B, C, Figs. 8 and 9, D, into which the partitions 3, 7 divide the condenser are divided off by plates 18, 17, 16, 15 to



form communication channels between adjoining compartments, so that the air and non-condensable-gases may be drawn by an air-extraction device in the direction shown by the arrows from the compartment D operating at the highest temperature through the compartments C, B, A of successively decreasing temperatures.

106,488. Fentress, J., (Assignees of Sperry, C. F.). April 28, 1916, [Convention date].

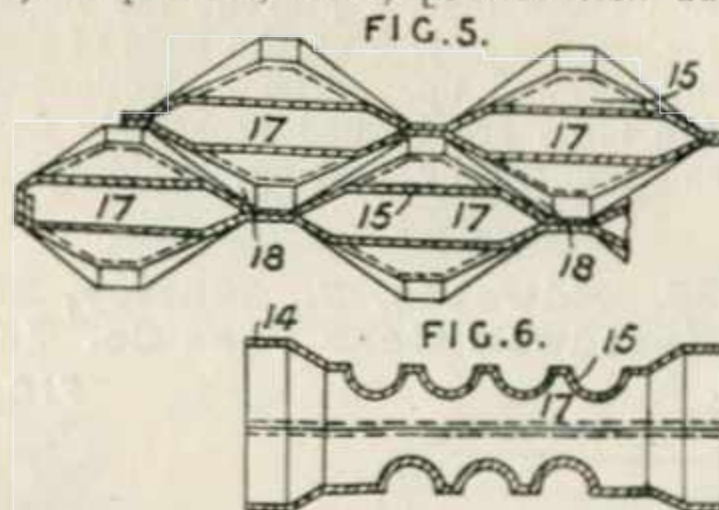


Plate apparatus.—In cellular apparatus having vertical zigzag water passages 18 between units formed of duplicate plates arranged to form transverse diamond-shaped air passages 17, the V-shaped projections in the plates are grooved at their apexes to form vertical paths 15 in the zigzag water passages. The inner faces of the grooves baffle the air currents. The units are assembled by soldering together their pressed-out edges 14.

107,163. Smith, H., and Watson, S. G. Dec. 21, 1916.

Honey-comb and like tube apparatus.—In radiators for motor vehicles, of the type comprising a nest or block of air tubes united by dipping the ends of the tubes into a solder bath, the front of the radiators is given a curved shape, as shown, by subjecting the united block to a pressing operation in a die.



107,652. Wood, T. E. July 10, 1916.

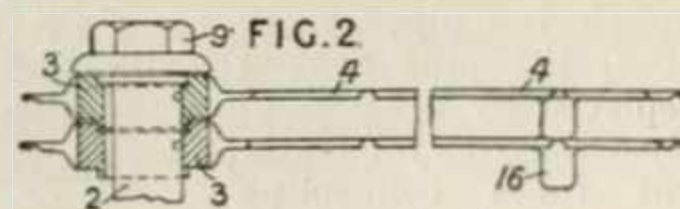
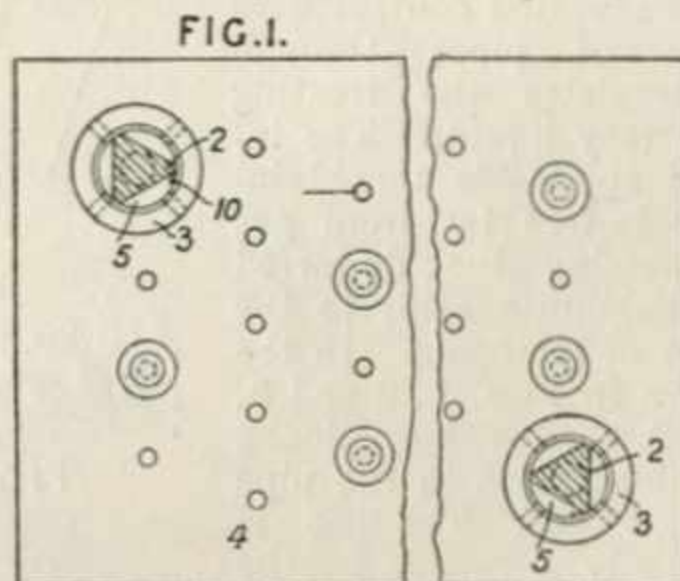


Plate apparatus.—Relates to plate apparatus comprising hollow units clamped together and connected in parallel to common feed and drain passages, the units being enclosed within an open-ended casing so that air &c. may circulate between them. The units 4 are clamped together by triangular or rectangular bolts 2 passing through the perforated bushes 3 in the units, thus forming segment-shaped feed and drain passages 5. Lugs 10 on the bushes prevent the bolts from turning when the nuts 9 on the ends of the bolts are being screwed up. The projections 16 between the units are formed separately from the units and secured by brazing, welding, or the like.

108,036. Edwards, J., Matthey, H. S., and Speedwell Gear Case Co. July 26, 1916.

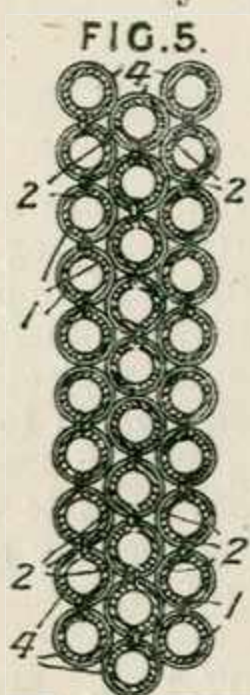
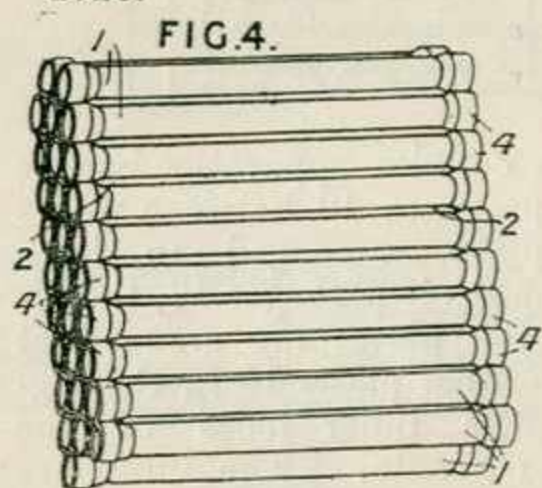
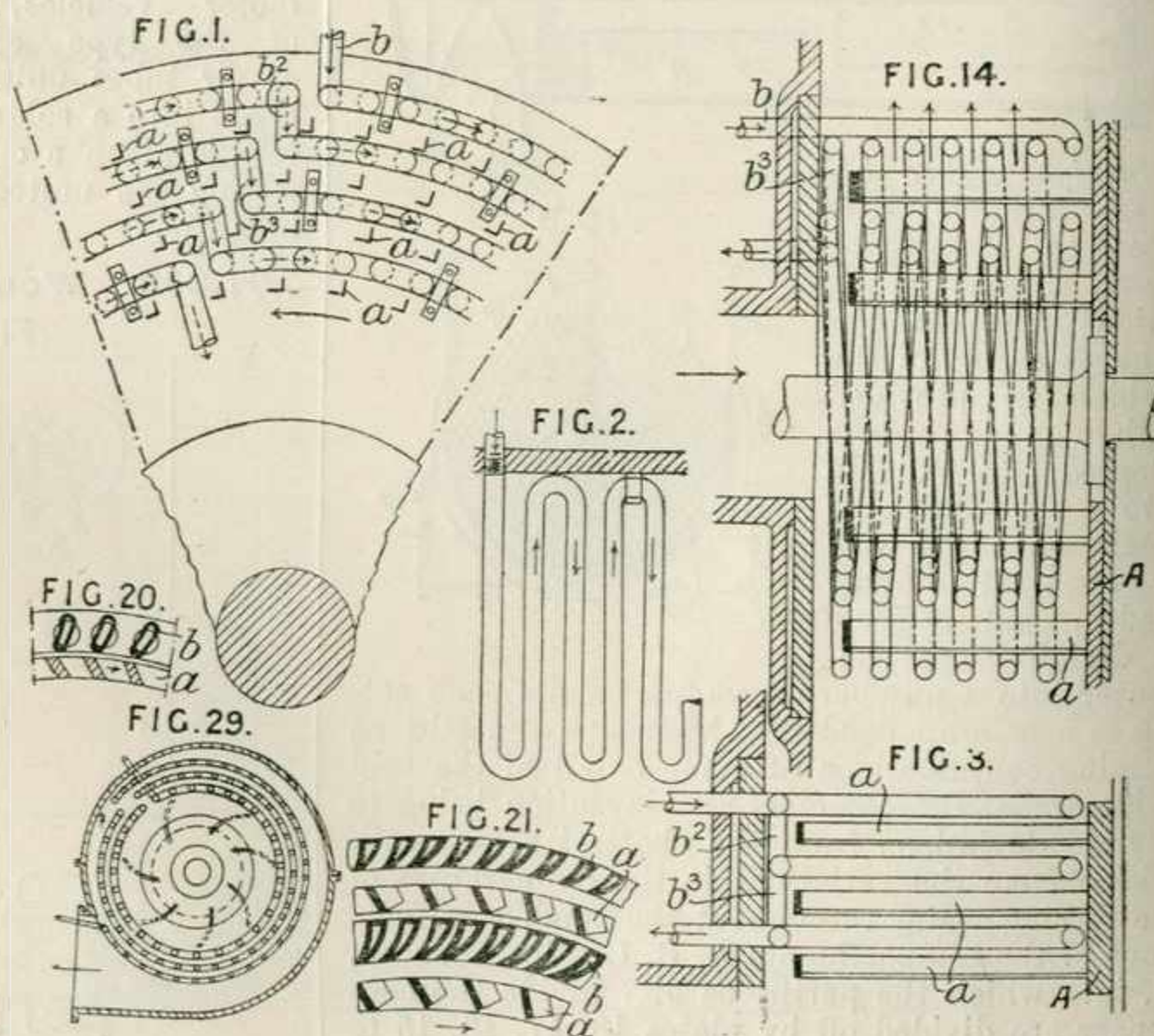


Plate apparatus.—Radiators for use with internal-combustion engines and for other purposes of the kind formed of members having the appear-

108,319. Theisen, H. E. Feb. 28, 1916, [Convention date].

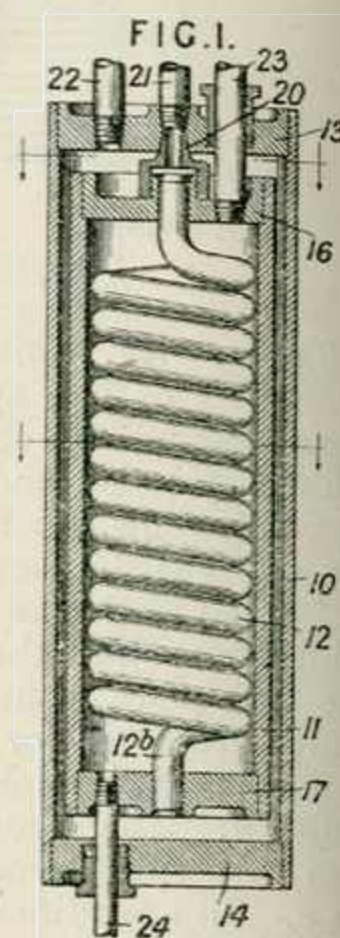
Coil-tube apparatus; loop-tube apparatus; straight tubes between headers.—In centrifugal apparatus for drying, cooling, heating, and purifying gases, vapours, and liquids, the substance to be treated (say gas) is moved by a centrifugal machine into repeated contact with a system of pipes through which circulates the treating substance (say liquid). The invention is applicable to obtaining moisture-free tar from gas and, by passing the de-tarred gas into sulphuric acid, to the production of ammonia. In the form shown in Figs. 1, 2 and 3, the rotor A carries L-sectioned bars a which rotate in the pipe system b, b², b³. The gas is forced radially outwards by the rotor and the liquid radially inwards through the pipes. In modifications, the pipe system may be replaced by a series of segmentally-arranged systems or by straight tubes connecting headers. The liquid may also



ance of a number of parallel small tubes 1 and produced from a single large tube, have the ends 4 of such small tubes enlarged or otherwise formed so that the greater part of their surfaces is separated to provide a water circulating space, as shown.

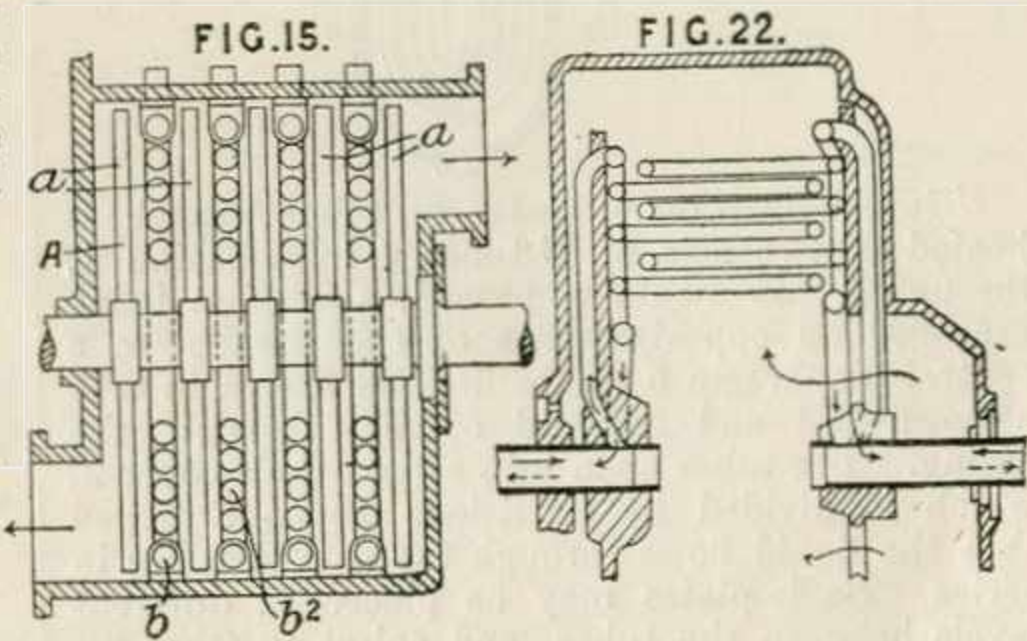
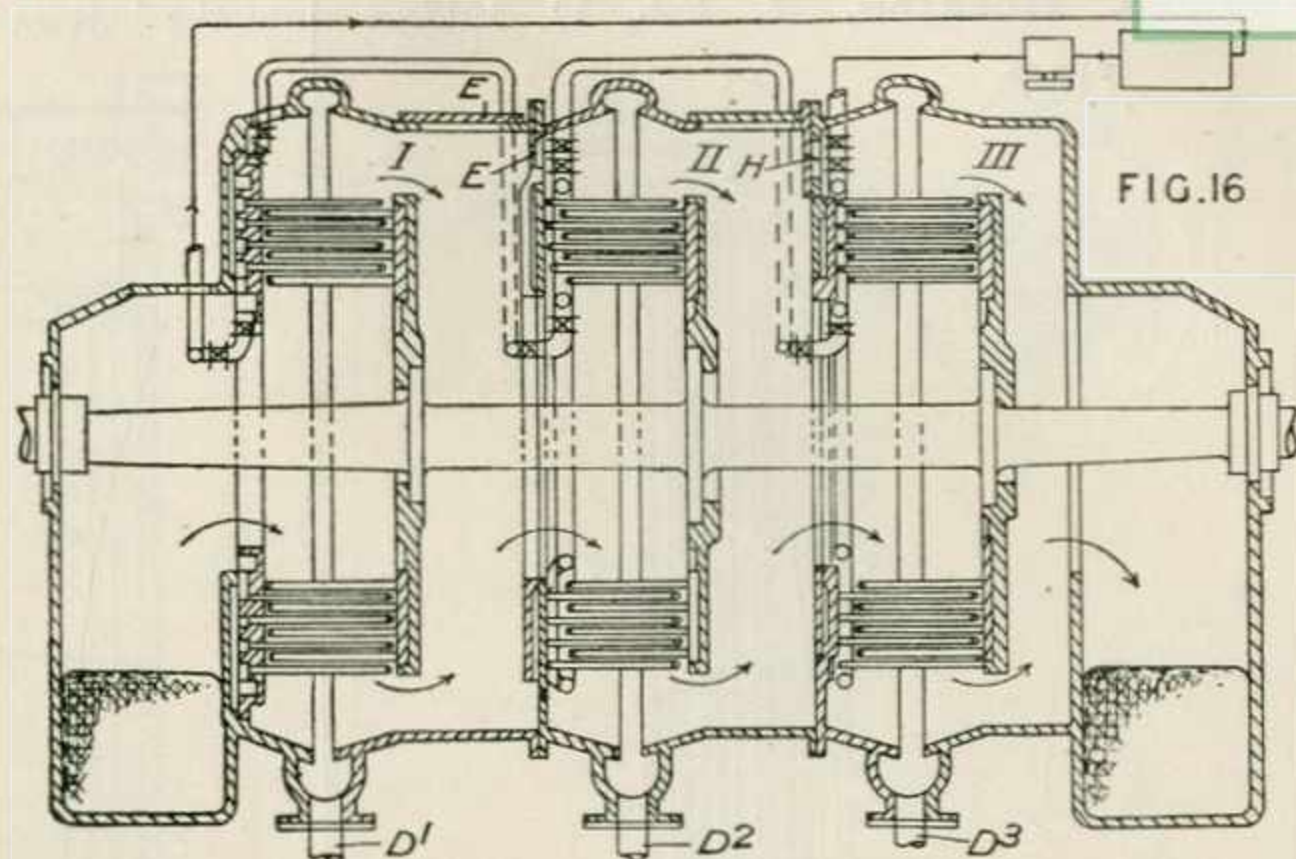
108,196. McClellan, B. S. July 27, 1916.

Coil-tube apparatus; concentric or jacketed straight-tube apparatus.—A condenser for a refrigerating system comprises inner and outer casings 11, 10 spaced apart at the sides and ends, and an inner coil 12. The refrigerating agent enters the inner casing as a vapour by a pipe 23 and leaves by a pipe 24 as a liquid, the pipes 23, 24 passing through stuffing-boxes in the ends 13, 14 of the outer casing and being screwed into the ends 16, 17 of the inner casing. Cooling-water enters the coil 12 through a pipe 21 and a screwed connecting-piece 20, and passes from the bottom 12^b of the coil into the space between the casings, from which it is discharged through an outlet pipe 22. The ends of the casings are recessed into the ends of the bodies of the casings, and are preferably secured by welding, and the ends of the coil 12 are welded into the ends of the inner casing.



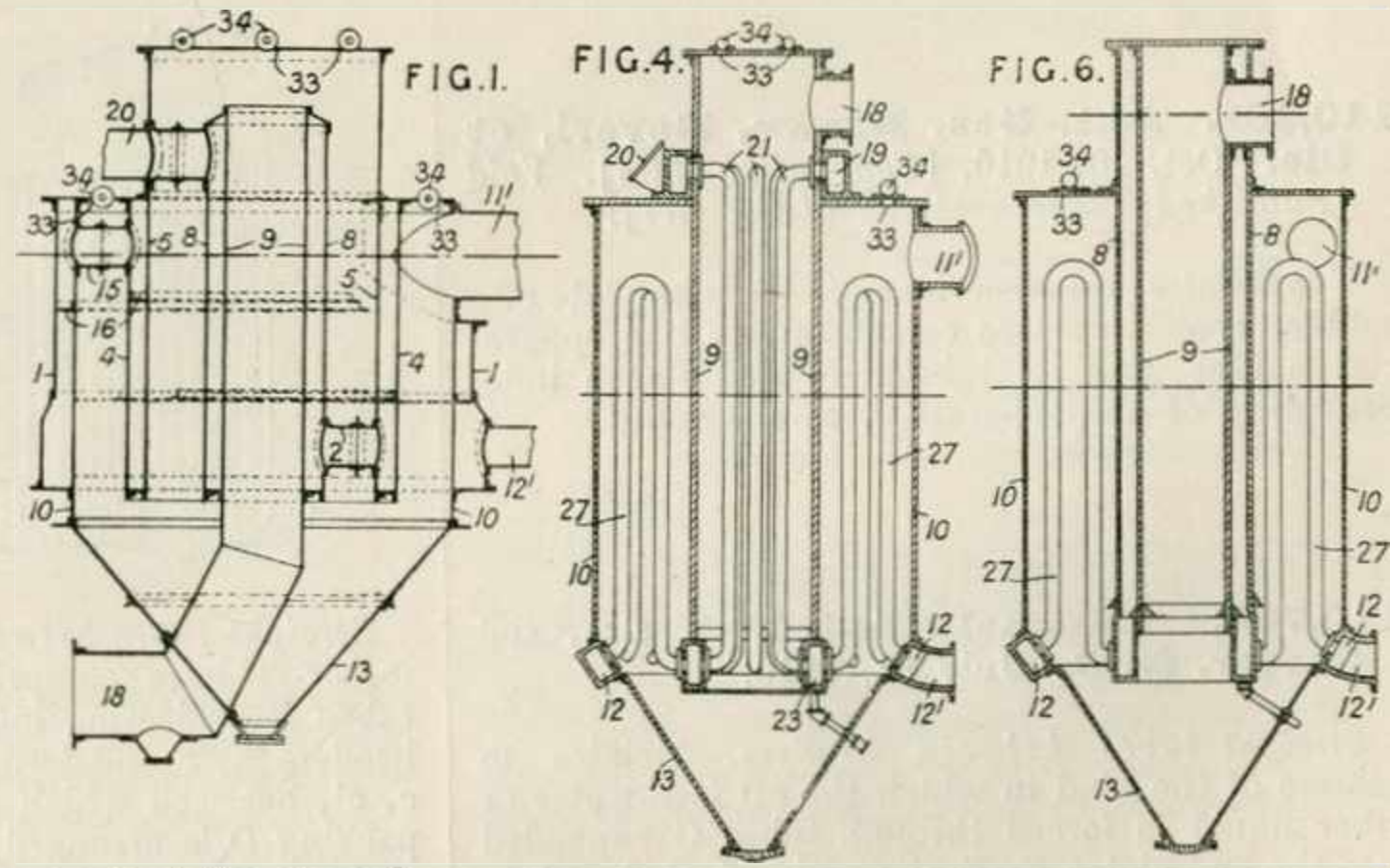


be forced through parts of the casing of the machine. The gas may be passed from one machine I, Fig. 16, to a second II and third III, the liquid being forced through the machines in the opposite direction. Any substances separated from the gas are discharged through openings D^1 , D^2 , D^3 . The parts may be inspected through manholes E, H, and the pipe systems and casings are provided with disconnectible joints to permit dismantling. The cross-sections of the bars a and pipes b may be varied, as shown in Figs. 20 and 21. The pipe system may be helical, Fig. 14, volute or spiral, Fig. 15, the rotor in the latter form having radial blades a . There may be two oppositely rotating pipe systems, Fig. 22, the rotating shafts having two sets of passages to permit the liquid to enter and leave. The machine may be in the form of a centrifugal fan arranged with a pipe system, as shown in Fig. 29.



108,710. **Lynn, A. H., Riley, L. A., and Rambush, N. E.** Aug. 14, 1916.

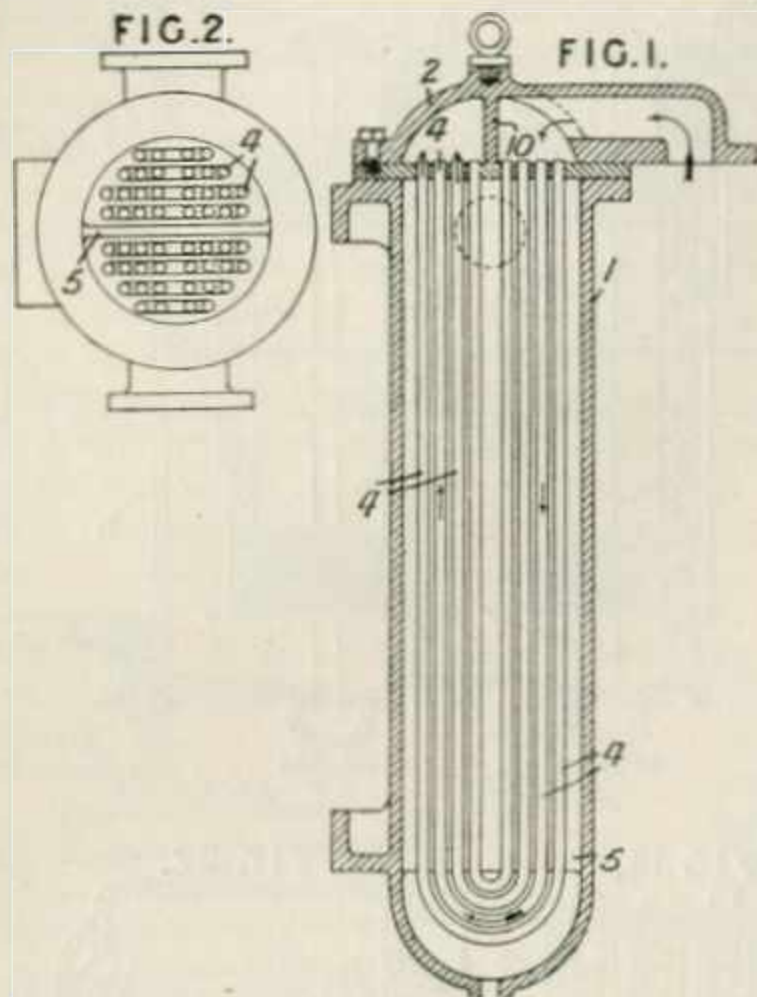
Concentric or jacketed straight-tube apparatus; U-tube apparatus.—A regenerator or heat interchanger for use in connexion with a gas generator comprises two or more concentric chambers, preferably cylinders, through which the producer gas passes in serial order, and two or more concentric chambers, preferably cylinders, through which air and steam pass in serial order to the producer, the latter chambers being arranged intermediate with, or intermediate with and surrounding, the first chambers. In a modification, some or all of the air and steam chambers are replaced by concentrically arranged parallel-flow conduits. In the apparatus shown in Fig. 1, gas enters tangentially at 11^1 and passes through chambers 10, 5, 9 to the outlet 16, dust falling into a conical collector 13; air and steam enter at 20 and pass to the outlet 12^1 through chambers 8, 4, 1 connected by pipes 2, 15. Baffling means 16 may be provided. In



the apparatus shown in Fig. 4, the air and steam passages comprise concentric groups of pipes 21, 27, the groups being connected together and to the inlet 20 and outlet 12^1 by headers 23, 19, 12. In the apparatus shown in Fig. 6, the air and steam passages comprise a chamber 8 and a circular group of pipes 27. Poke holes 33 closed by balls &c. 34 are provided.



109,926. Hocking, H. Feb. 12, 1917.



U-tube apparatus.—Water or other liquid is heated in two sets of U-tubes 4 in a casing 1, through which steam is passed, the tubes being arranged on opposite sides of and parallel to a central diaphragm 5 compelling the steam to take a downward and upward course through the casing. The tubes open into a removable cover 2, which is divided by partitions 10 so arranged that the liquid flows through the sets of tubes in series. Baffle-plates may be placed at different levels between the tubes, and spiral or other retarding plates may be placed inside the tubes.

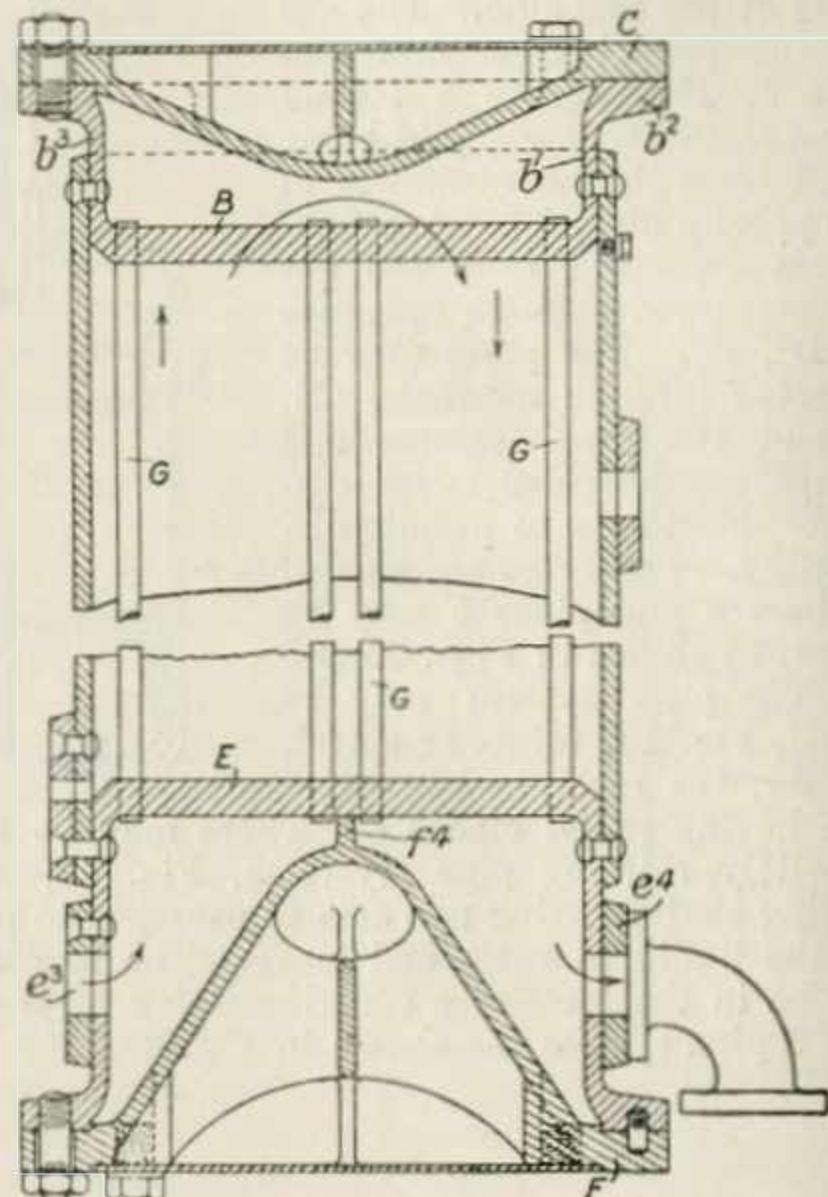
110,362. Akt.-Ges. Brown, Boveri, et Cie. Oct. 10, 1916, [Convention date]. Void [Published under Sect. 91 of the Act].

Tube-plates, constructions of.—A tube-plate of a tubular cooler, surface condenser, or like apparatus is cast with its tube-holes and flange independently of and separate from the tubes.

110,766. Cammell, Laird, & Co., and Carter, G. J. July 31, 1916.

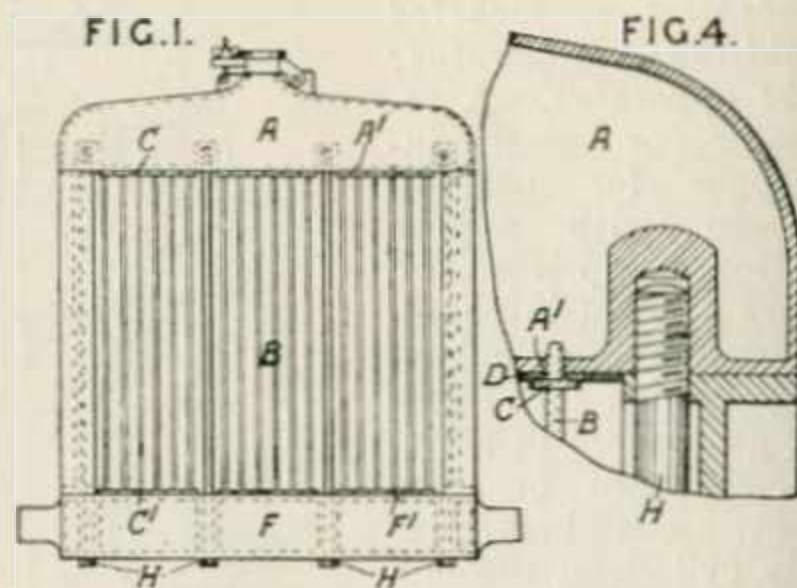
Straight tubes between headers.—Relates to heaters of the kind in which the oil feed-water or other liquid is forced through tubes G expanded into the end-plates B, E of a cylindrical shell into which steam is passed, and consists in making the flanged cylindrical part of an end-plate of sufficient length to provide for a circumferential riveted joint b^1 between the shell and the plate, and to provide a space b^2 between the end of the shell and the flange b^2 to permit of caulking the joint externally. The inlet and outlet connexions e^3, e^4 are attached directly to the cylindrical part

of the bottom end-plates. The cover-plates C, F



are dished, a dividing diaphragm f^4 being formed on the dished part of the bottom end-plate.

111,354. Yoxall, J. Dec. 2, 1916.



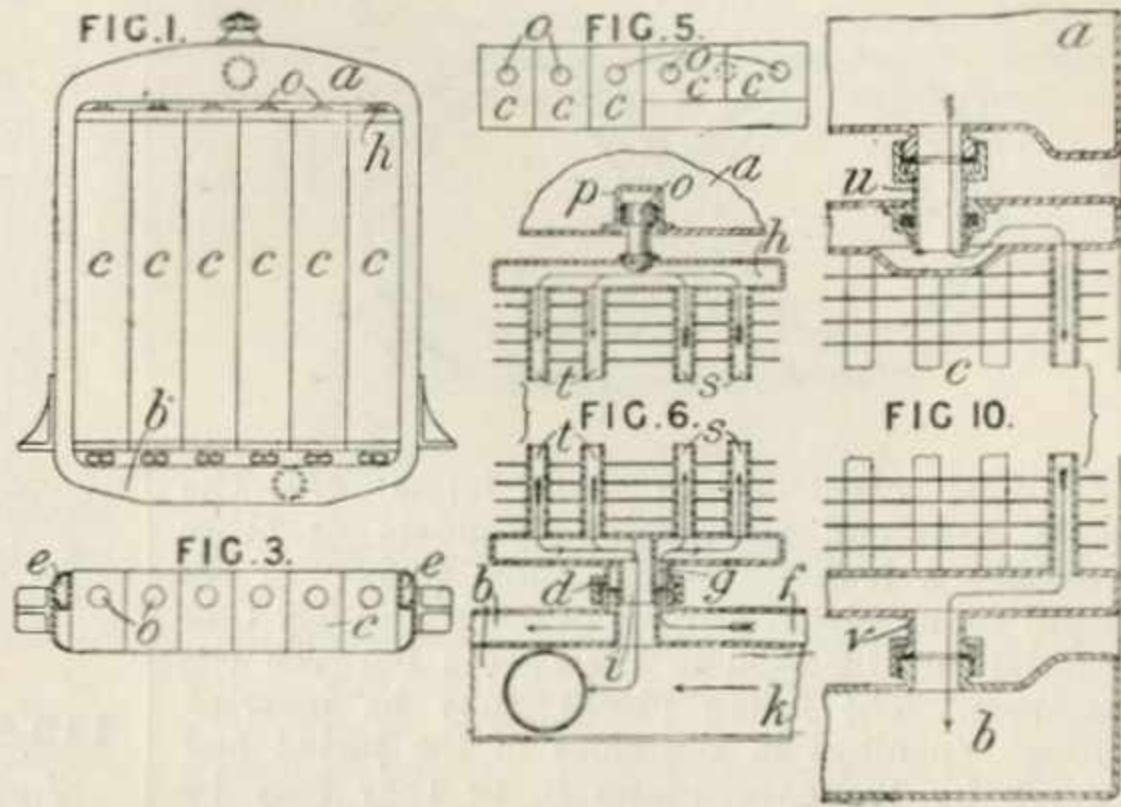
Straight tubes between headers.—A radiator for motor-vehicles comprises a number of straight tubes B projecting into top and bottom tanks or headers A, F and formed at each end with collars c, c^1 , between which and the tank plates A^1, F^1 packing D is arranged, the tanks being drawn together so as to effect fluid-tight joints with the tubes by means of long connecting-bolts H screwing into the top tanks.

Reference has been directed by the Comptroller to Specification 14440/12.



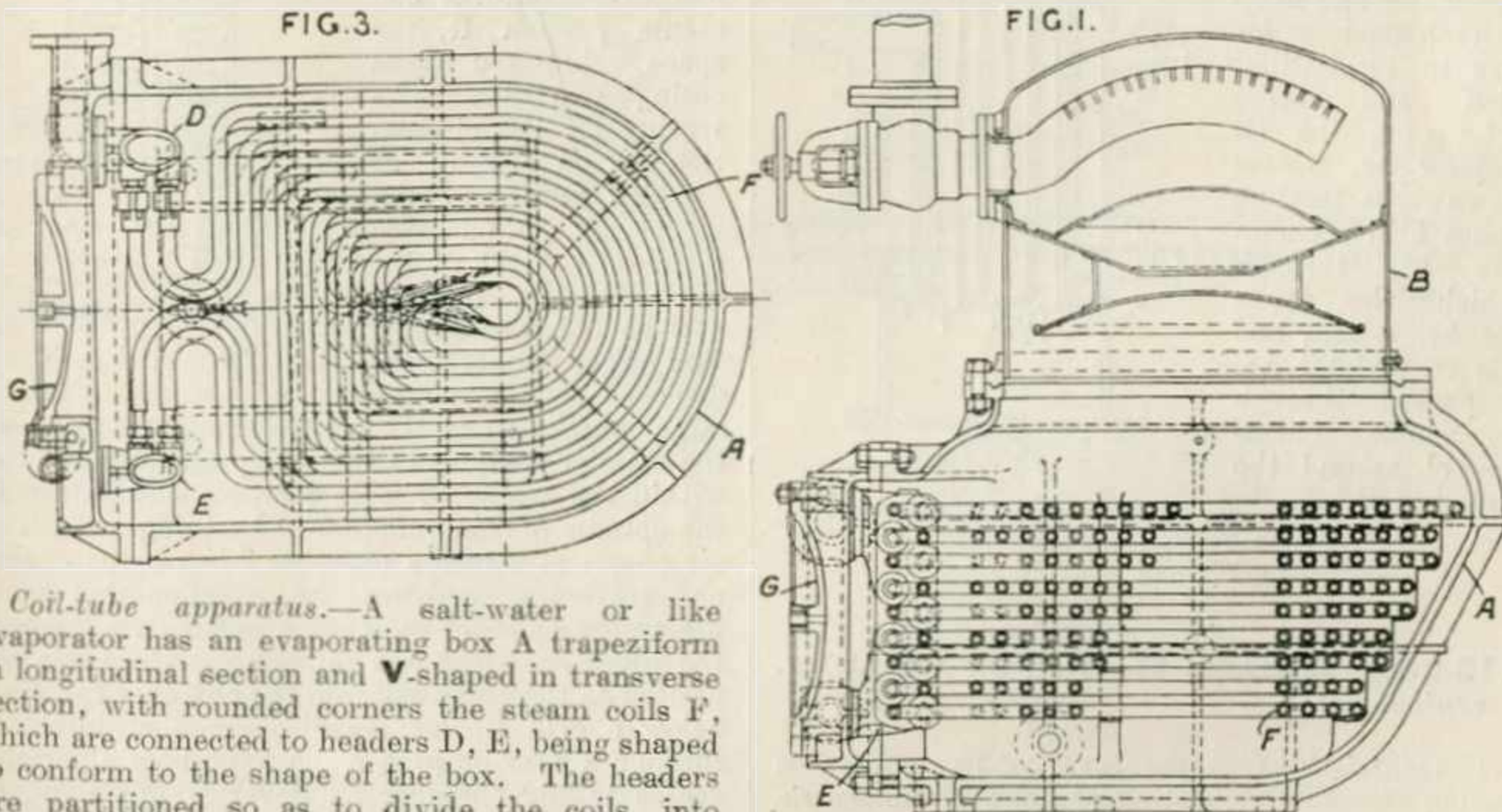
111,478. Jezler, H. Nov. 14, 1916, [Convention date].

Straight tubes between headers.—In radiators of the kind having separately detachable sections or elements *c* between end tanks *a, b*, the sections are of such a shape and are so connected that when one or more are detached for repairs &c. the gap produced is filled up by turning one or more of the remaining sections about their connexions, so as to present an unbroken plane surface on one side, and consequently maintain an even draught of air between the sections. In the first form described, the sections comprise a number of tubes between end chambers, Fig. 6, the lower chamber being connected to the bottom tank by a screwed connexion *d* and the upper chamber *h* having a pin *o* engaging a recess *p* in the top tank *a*. The water flows into the top tank and through the hollow side frame *e*, Fig. 3, into a passage *f* in the bottom tank, and thence by an annular passage *g* to one set of tubes *s*, returning to the main part *k* of the tank *b* through another set of tubes *t* and a passage *i*. The normal positions of the sections *c* and their connexions *o* are shown in Fig. 3, the re-arranged positions when one section is removed being shown diagrammatically in Fig. 5, the plane face preferably being towards the fan. By a further rearrangement, the removal of more sections may be provided for. In a



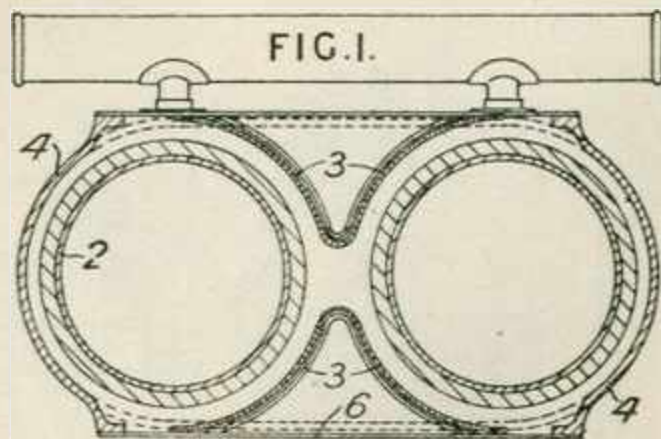
modification, Fig. 10, the sections *c* are connected to the bottom tank by a screwed connexion *r*, and to the top tank by a sliding piece *u* and screw union, in such a manner as to allow for expansion or axial adjustment, and the water flows directly from the top tank through the sections to the bottom tank. The sections may be arranged horizontally.

111,480. Duodo, A. Nov. 16, 1916, [Convention date].



Coil-tube apparatus.—A salt-water or like evaporator has an evaporating box *A* trapeziform in longitudinal section and **V**-shaped in transverse section, with rounded corners the steam coils *F*, which are connected to headers *D, E*, being shaped to conform to the shape of the box. The headers are partitioned so as to divide the coils into groups, through which the steam flows downwardly in turn. The upper group superheats the vapour on its way to the dome *B*. The inspection door *G* is secured by **T**-shaped bolts.

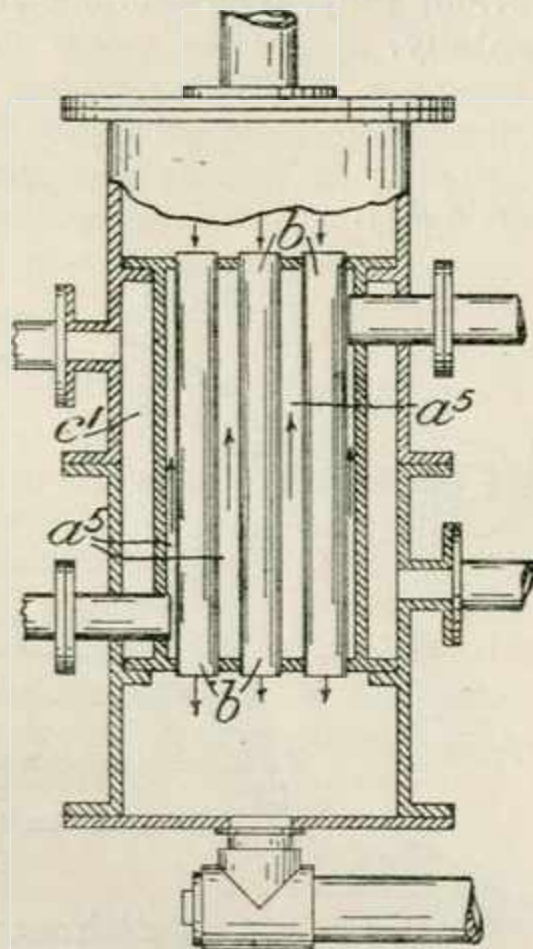
111,556. **Guy, S. S.** Dec. 13, 1916.



Casings, constructions and forms of.—The jacket 4 around the engine cylinders or other chambers 2 is fitted with hollow wedge or V-shaped filling pieces 3 made of comparatively thin material and inserted in the spaces between the chambers. The filling pieces may be inserted through openings in the sides of the jacket and secured by the cover-plates 6, or they may be formed integral with the cover-plates.

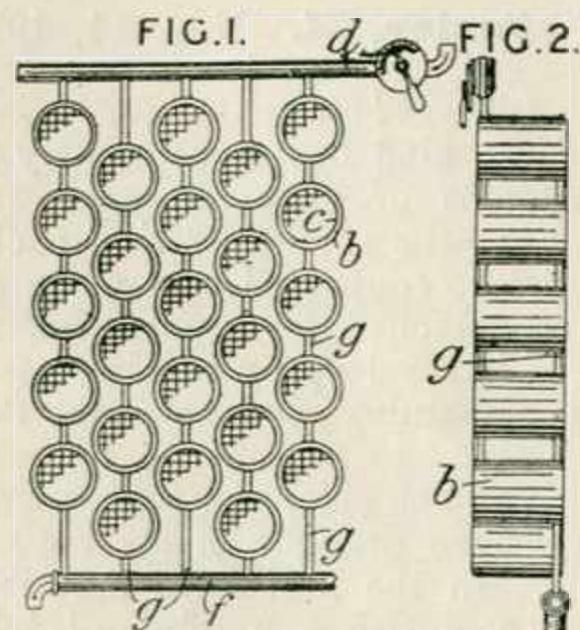
111,961. **Richardson, C. K., and Hammond, T. C.** March 14, 1917.

Straight tubes between headers; concentric straight-tube apparatus.—In a combined condenser and heat-interchanger for use in tar-distillation and other plants, the oil vapour &c. passes downwards through tubes *b* in a chamber *a*⁵, through which the crude tar &c. is fed, and the treated tar &c. is passed through an annular chamber *c*¹ around the chamber *a*⁵.



112,263. **Achard, R.** Dec. 27, 1916, [Convention date].

Concentric-tube apparatus.—In apparatus having elements consisting of pairs of concentric tubes or rings *b, c*, arranged parallel to one another and connected together alternately at opposite ends by short tubes *g*, the ends of the annular space between the tubes or rings of an element are closed by bending down the ends of the outer tube or ring on to the inner tube, and then soldering the edges of the two tubes together. Rows of

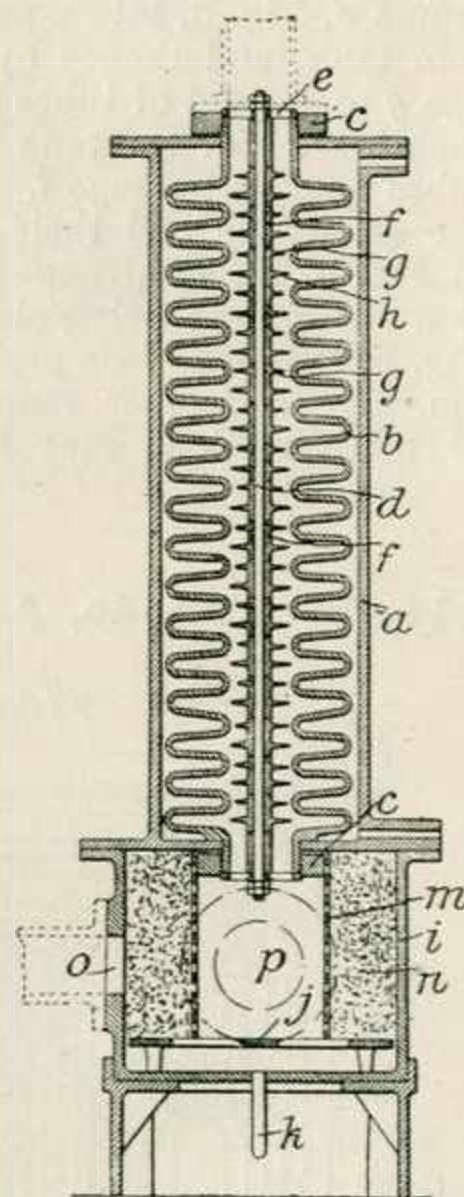


elements are connected to common inlet and outlet pipes *d, f*.

112,362. **Smethurst, H.** April 23, 1917.

Jacketed straight-tube apparatus; straight-tube apparatus having internal baffles; tubes of special section.

—Apparatus for cooling, heating, and extracting oil and moisture from compressed air comprises a casing *a* having within it a corrugated tube *b* through which the compressed air is passed and which contains a spindle *d* with flanged bobbin-like elements *f* upon it, the space between the casing and the tube serving for the circulation of a cooling or heating fluid and the flanges *g, h* ensuring intimate contact of the air with the internal surface of the tube. The larger flanges *h* are disposed opposite the larger portions and the smaller flanges *g* opposite the smaller portions of the tube, which is secured within the casing by nuts *c* on its screwed ends, the spindle *d* being supported by bridges *e*. The air enters at *o* into a chamber *i* below the casing and traverses wood-wool &c. *n*, supported by a perforated cylinder *m*, before passing up through the tube, on which the oil and moisture are deposited so that they fall into the chamber *i*, collect below a grid *j*, and are discharged at intervals through a blow-off pipe *k*. A hand-hole *p* permits access to the chamber *i*. Several apparatus are preferably arranged in series so that the oil is extracted in the earlier ones and the final cooling of the air and the extraction of entrained moisture are effected in the later ones. A further apparatus employing exhaust steam &c. may be used to heat the air, or the purified air may be circulated through the jacket of the first apparatus to heat it,





112,537. Oatway, J. W. March 31, 1917.

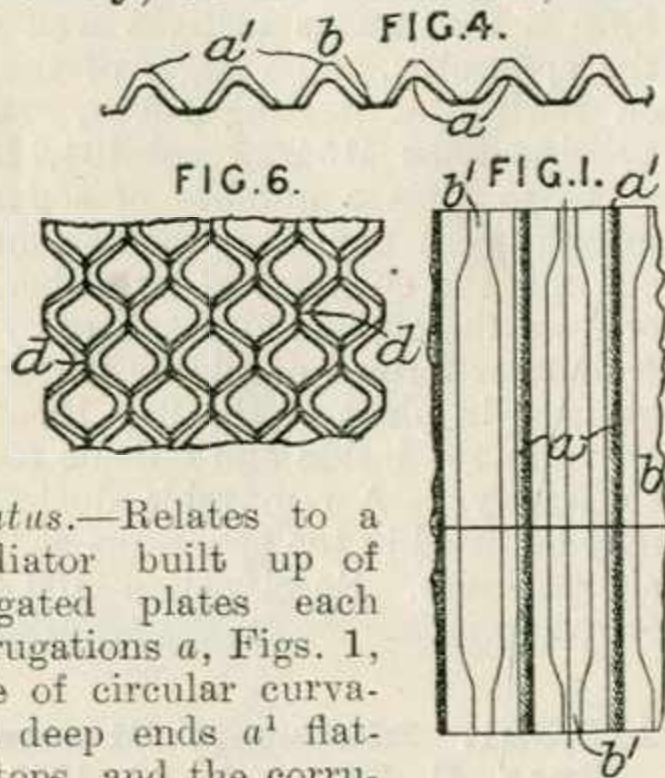
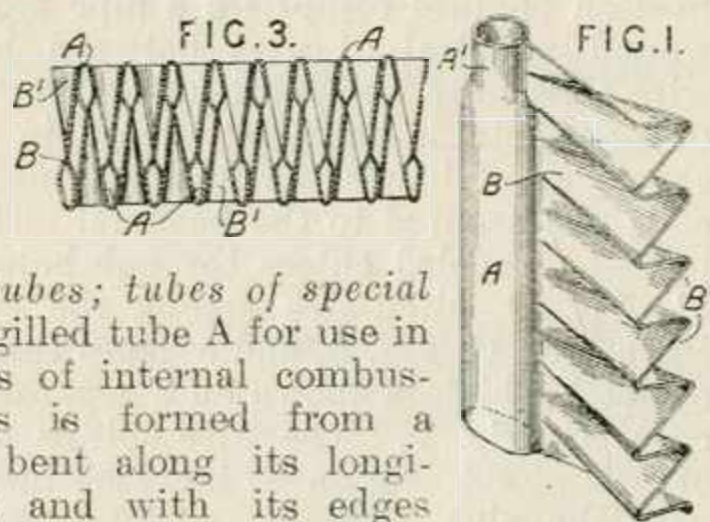


Plate apparatus.—Relates to a honeycomb radiator built up of pairs of corrugated plates each having the corrugations *a*, Figs. 1, 4, on one face of circular curvature and with deep ends *a¹* flattened at their tops, and the corrugations *b* on the other face formed with tops flattened throughout their length, the ends *b¹* of the tops being of the same width as the flat end-ports of the corrugations on the other face. The intermediate portions of the corrugations *b* are of greater width than the end portions, so that, when the plates are assembled, as shown in Fig. 6, the sinuous channels *d* between the plates are flattened at their sides and offer little resistance to the flow of the cooling-liquid.

112,666. Lamplough, H. Jan. 18, 1917.

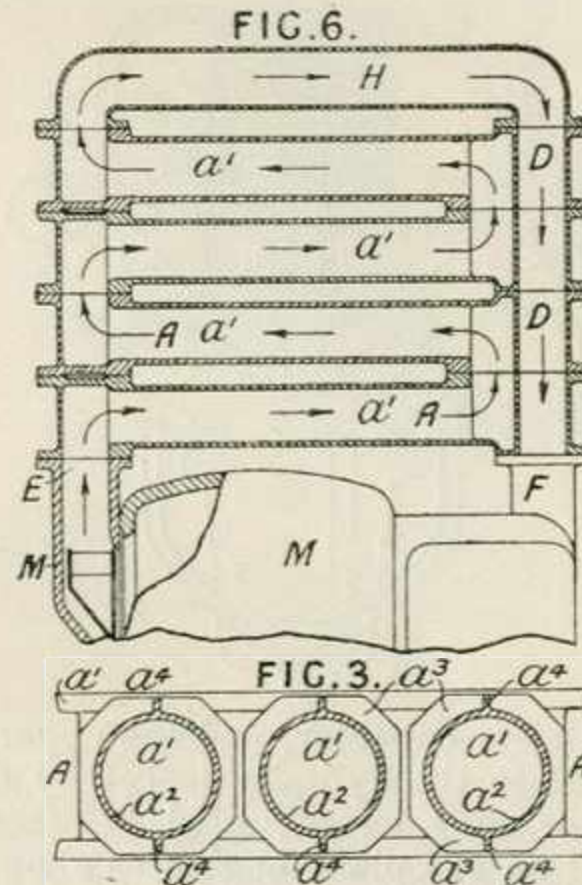


Gills for tubes; tubes of special section.—A gilled tube *A* for use in the radiators of internal combustion engines is formed from a metal strip bent along its longitudinal axis and with its edges united to form a longitudinal gill *B*. The tube *A* is of wedge shape, as shown in section in Fig. 3, and is formed by pressing the strip around a mandrel. The gill *B* is corrugated by means of dies and is soldered along its edge, the corrugations being deep at the outer edges *B¹* of the gill and gradually becoming shallower towards the tube. The tubes have circular necks *A¹* for securing to end-plates, and are assembled in a double row with the gills of each row projecting towards the other row, the gills thus forming a spacing means between the tubes. The gills of one row may be soldered to the tubes of the other row by dipping or otherwise.

112,800. Electromotors, Ltd., Longbottom, B., and Greenhalgh, E. Jan. 20, 1917.

Straight tubes between connecting-boxes; gills for tubes.—External cooling chambers for enclosed dynamo-electric machines are built up of a number of elements, the majority of which are of one pattern and may be castings or be con-

structed of sheet metal. Fig. 6 shows one construction, in which four flanged elements *A* are superposed in reversed order to form a zigzag passage *a¹* between the outlet *E* and inlet *F* of the enclosed machine *M*; a top element *H* of another pattern connects the passage *a¹* to the return passage *D*. The elements *A* are provided with transverse and longitudinal radiating fins *a³*, *a⁴*, Fig. 3, which Figure also shows each element having



three passages *a¹* arranged in parallel. Instead of being superposed, the elements may be placed side by side, and, instead of zig-zag paths for the air, the air may flow through the passages in parallel streams in the same direction. The elements may be fitted with cross pipes which are open to the atmosphere and round which the hot air passes as it circulates in the cooling chamber. Specification 16640/15 is referred to.

113,088. Soc. Lorraine des Anciens Etablissements de Dietrich et Cie de Luneville. Jan. 27, 1917, [Convention date].

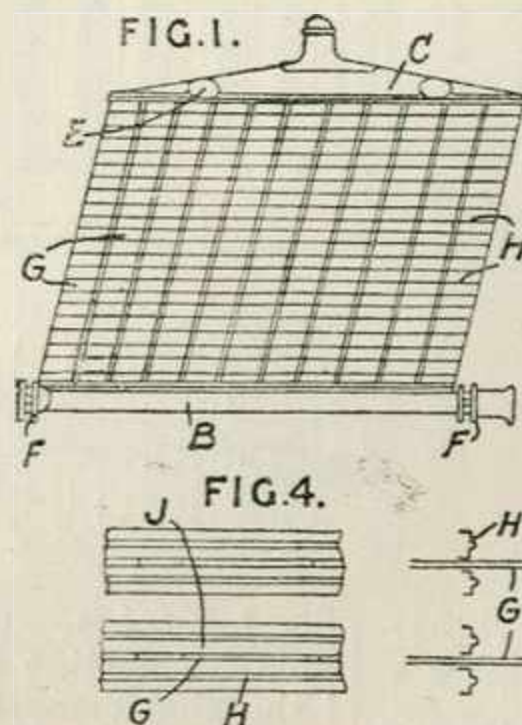
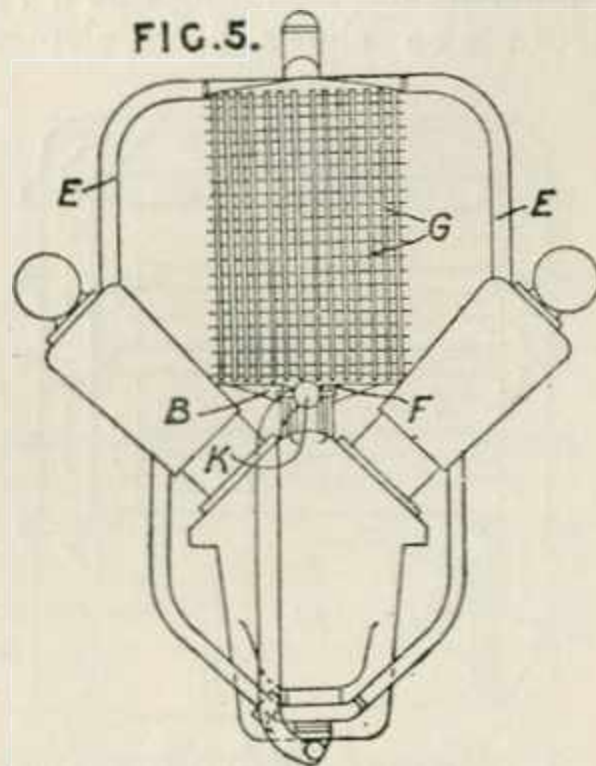


Plate apparatus; gills for tubes.—Parallel rows of flat water tubes *G* are spaced apart individually and between the rows by continuous stays *H*

united to the tubes as shown at J, Fig. 4, and to adjacent stays along their whole length by soldering, welding, or brazing. The assembled block is mounted between upper and lower collectors C, B, Fig. 1, the tubes extending into the collectors to give strength to the connexion. The circulating-pump connects with a perforated tube K, Fig. 5,



within the lower collector, and the upper collector is connected to the cylinder jacket by a tube E. The radiator may be mounted between the V-cylinders of an aeroplane engine as shown in Fig. 5, the pipe K in the lower collector being provided with attachment-lugs F, Fig. 1.

113,298. Pease, E. L. Jan. 16, 1917.

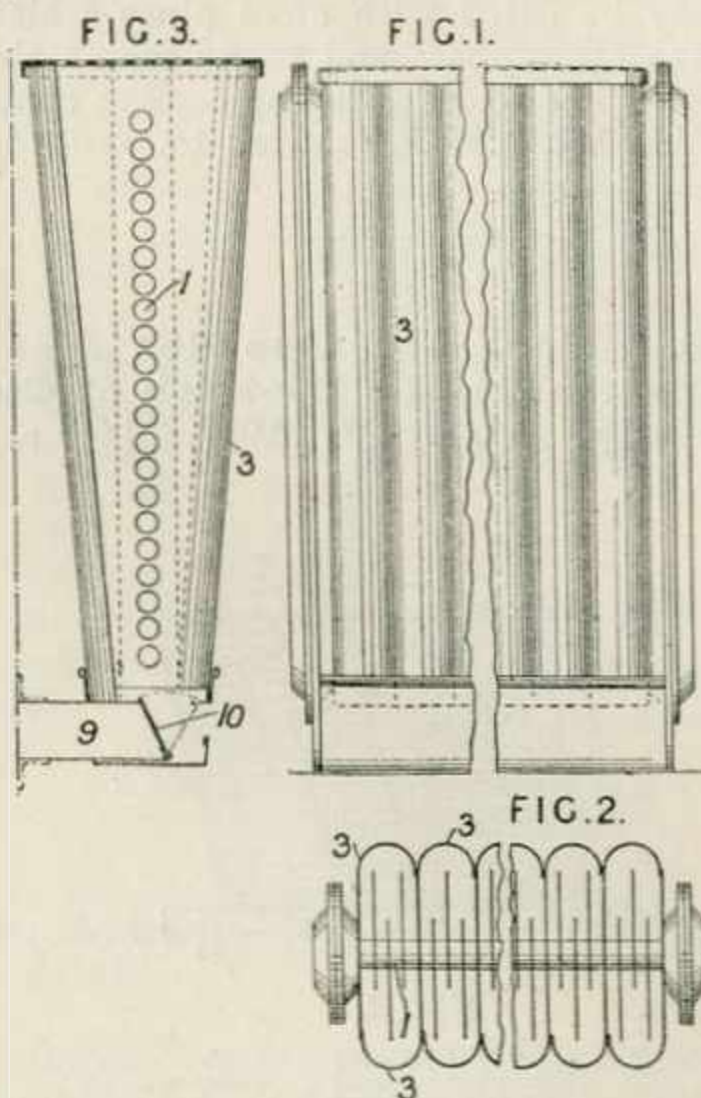
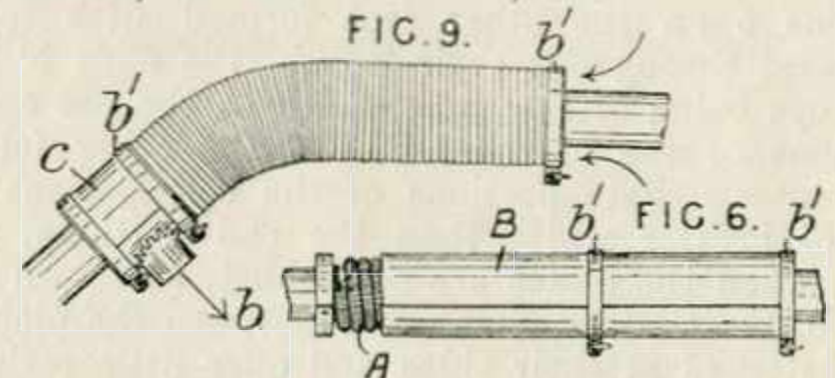


Plate apparatus; gills for tubes.—In heat-exchange apparatus suitable for heating the air entering buildings &c. of the kind comprising vertical metal gill-plates or strips which direct the air &c. entering at the bottom of the apparatus upwards over and in contact with heating surfaces, the edges of the metal gill-plates are bent over

and brought into contact with one another so as to form a continuous airtight wall on each face of the apparatus. The edges of the plates 3 strung on horizontal heating tubes, as described in Specifications 4154/15 and 104,721, are bent over so as to form a number of separate vertical air passages. A flap 10 at the bottom of the passages controls the entrance of air either from the room, or from the outside atmosphere by way of ducts 9. A damper formed of sliding perforated plates may be used in place of the flap 10. The supplies of air from the inside and outside may be controlled separately. A removable dust-collecting trough may be fitted in the apparatus at the bottom of the air passages. Specification 103,492 also is referred to.

113,331. Munster, Simms, & Co., and Eves, C. W. Feb. 23, 1917.



Concentric or jacketed straight-tube apparatus.—Surface apparatus of general application but designed particularly to heat air in internal-combustion engines comprises a pipe around which is wound a spiral of wire between headers. The wire coils form a support for a cover of thin metal or non-metallic material either in the form of sheets or of bands which are wound around the coils and secured to the headers. The fluid to be heated or cooled enters through holes in a header b^1 , Fig. 9, circulates among the coils A inside the casing B, Fig. 6, and escapes through a lateral outlet b which is shown on a separate sheet-metal cover C, Fig. 9. The wire spirals are preferably of half-round section to increase metallic contact with the pipe.

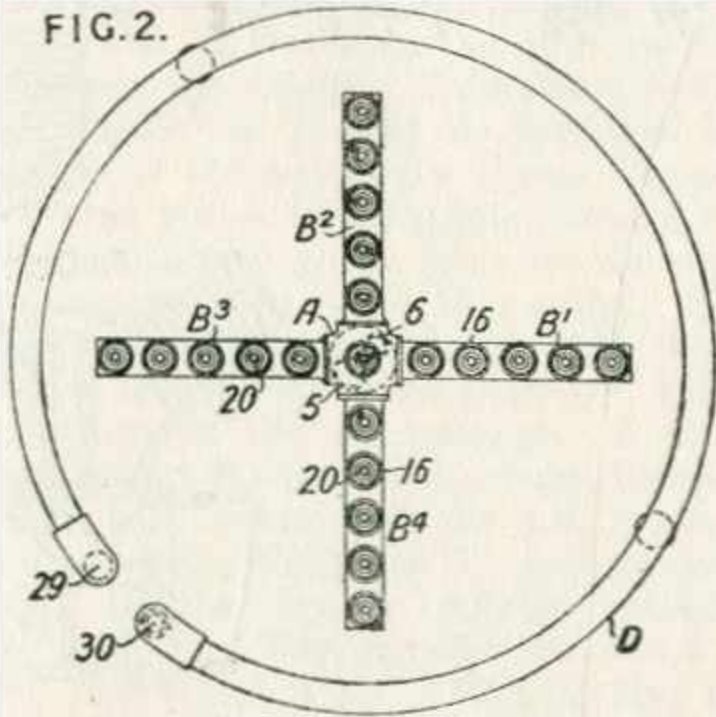
113,346. Robinson, P., (trading as Morton & Co., R.). March 7, 1917.

Field-tube and like apparatus.—Relates to surface-apparatus for heating or boiling liquids such as wort of the type in which a series of base tubes carrying internal and external vertical circulating pipes are fixed in the copper or like heating-vessel and connected to a steam supply and a condensed-steam outlet. The apparatus comprises a hollow central body A divided into two compartments 23, 23¹ by an horizontal web 11, and a number of base tubes B^1 , B^2 , radiating at equal intervals from the central body A and divided by an horizontal diaphragm 8 into upper and lower compartments 9, 10, communicating with those of the central body A, and a series of Field-tubes 16, 20 carried by each base tube and having the inner tubes 20 connected to the diaphragm 8. The flow of steam takes place through the inlet 5, through the lower compartments 9 of the base tubes B^1 , up through the inner tubes 20 and downwardly through the



outer tubes 16 to the compartment 10, and thence through a boss 22 in the central body A to the outlet 6. A central Field-tube 25, 27, is connected with the central body A. In the arrangement shown, four base tubes B¹, B², B³, B⁴, are employed, but any suitable number, preferably not exceeding six, may be used. A coil D, Fig. 2,

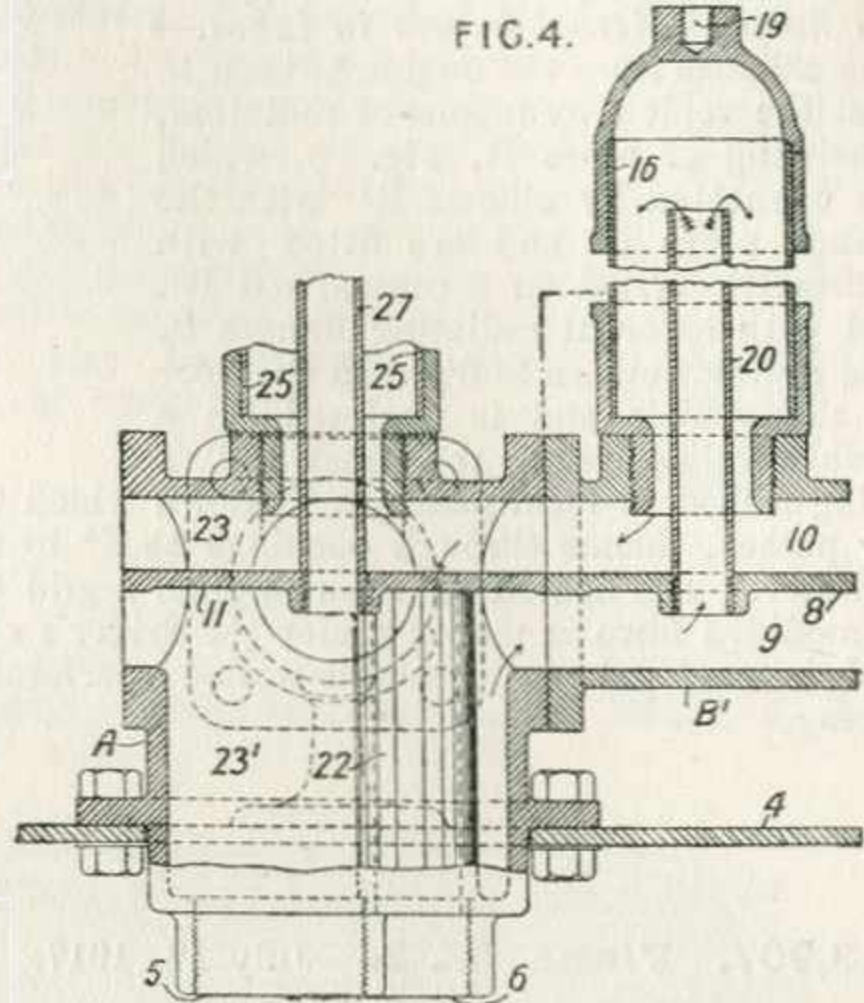
FIG. 2.



surrounding the tubes B¹, B², and having a steam inlet 29 and outlet 30 may be arranged near the bottom of the vessel 4 and used for heating the liquid while the vessel is being filled, and before admitting steam to the Field-tubes, thus preventing caramelizing of the liquid in the latter tubes. The tubes 16 are held in their relative

positions by means of a member having a number of radiating arms provided with holes, through which pass screws engaging recesses 19 in the

FIG. 4.

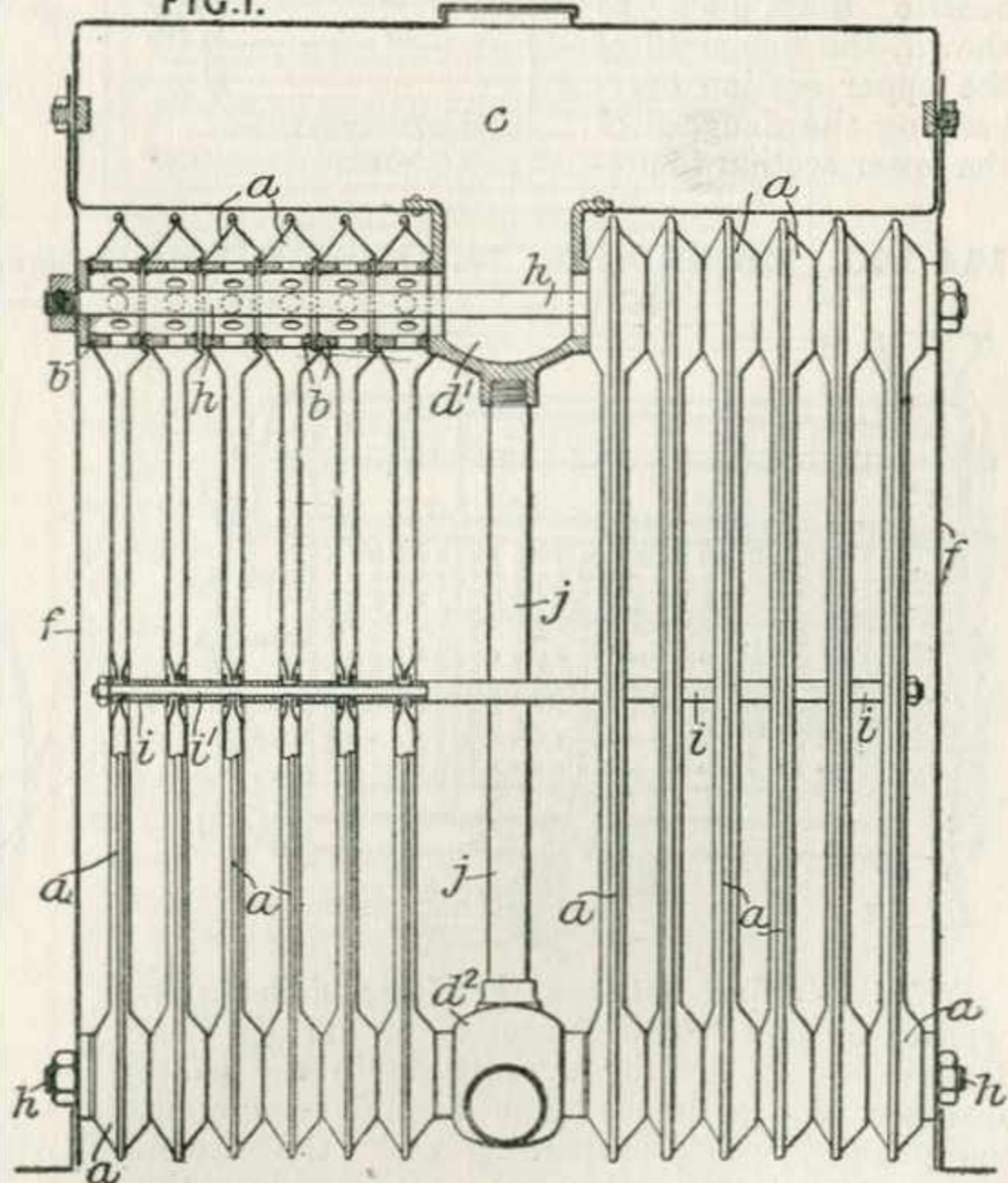


caps of the tubes 16. These arms may also support an inverted conical funnel over the series of tubes 16, the hot liquid rising up inside the funnel and flowing down over the outside.

113,651. Goudard, M., and Mennesson, M. Feb. 27, 1917.

Plate apparatus.—In radiators for internal-combustion engines of the kind comprising elements *a* formed of stamped sheet metal plates spaced apart by perforated distance rings *b* forming supply passages, a group of elements is arranged on each side of a central supply passage *d*¹ from a reservoir *c* and a corresponding central outlet *d*². The elements may be shaped so as to be easily centred, and the distance rings *b* are preferably formed from rolled sheets of such a strength that they may be crushed so as to form a good joint when the elements are assembled on bolts *h*. End plates *f* secured to the reservoir are held in position by the bolts *h*, so as to relieve the elements from stress. Where long elements are employed they may be spaced apart by tubes *i* seated in seamed openings and carried by rods *i*¹, or the elements may be formed with stamped bosses. A central upright stay *j* may be provided.

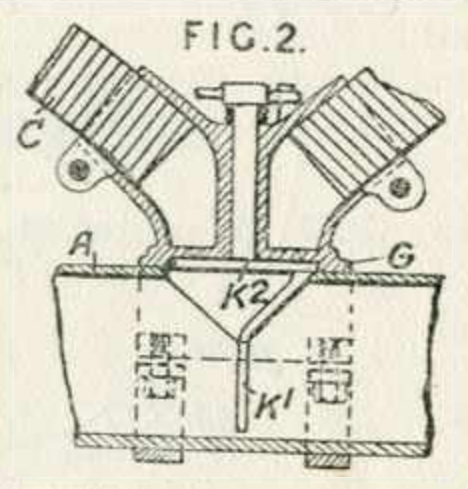
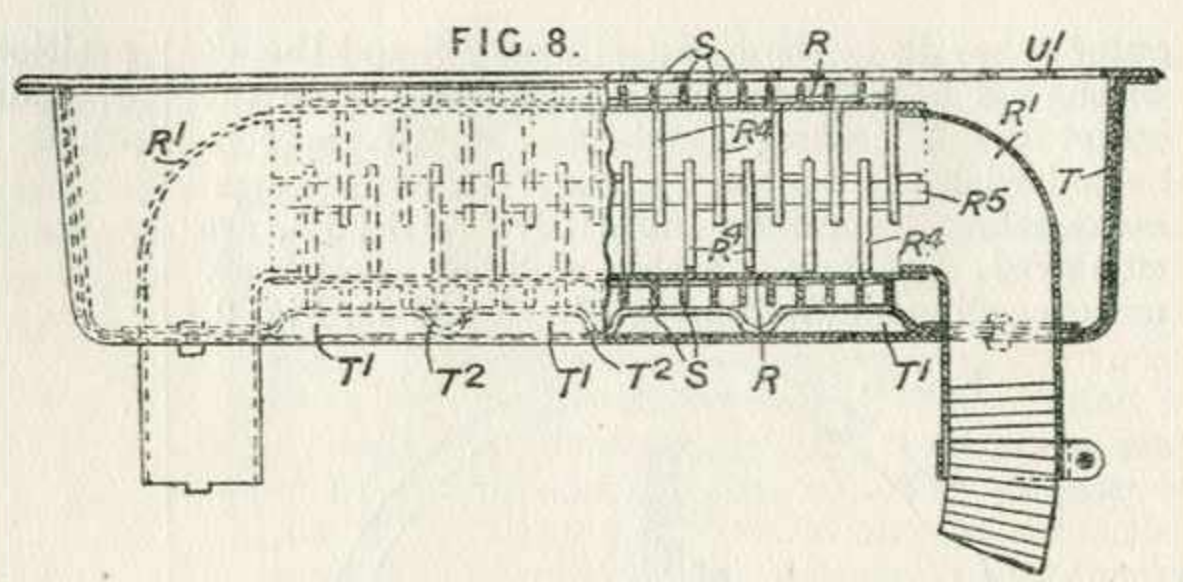
FIG. 1.





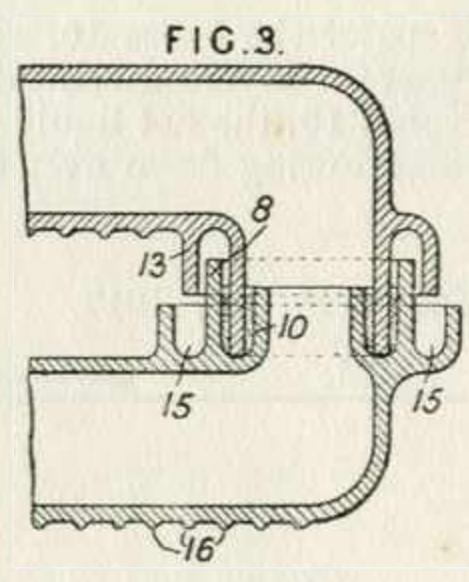
113,652. Bartholomew, G. A.
Feb. 27, 1917.

Gills for tubes; straight-tube apparatus having internal baffles in tubes.—The exhaust from the engine is used to heat the vehicle by means of radiators, consisting of pipes R, Fig. 8, which are connected by elbows R¹ with the branch pipes C and are fitted with baffles R⁴ carried on a central rod R⁵, and with external radiating flanges S. The radiator shown is fitted in the floor of the vehicle and is enclosed in a double walled casing the inner wall T being ribbed to form passages T¹ down which the air passes, thence through openings at T² to the radiator. The heated air rises through a grid U¹. A modified form is placed under the driver's seat and is enclosed in a single-walled perforated casing.



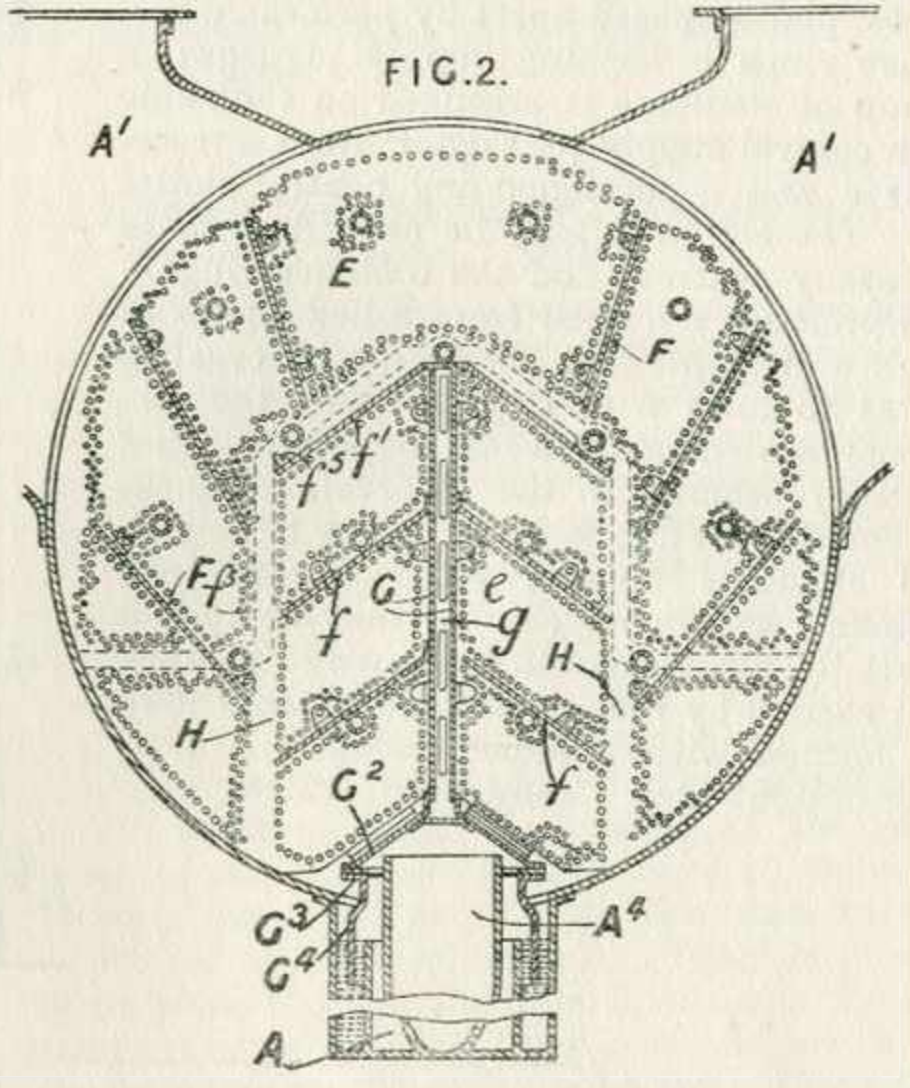
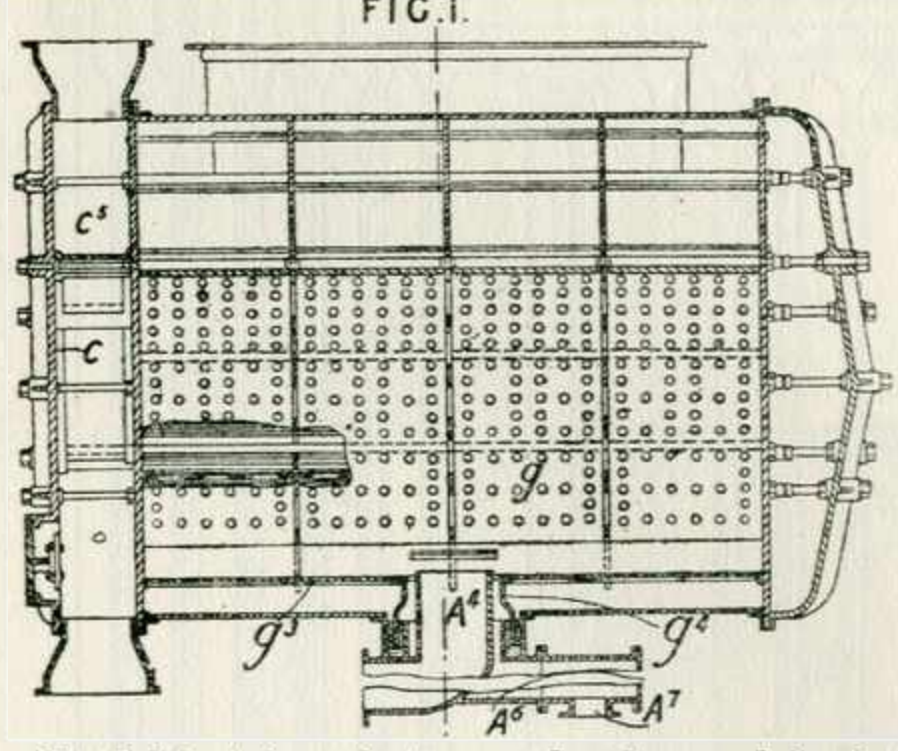
113,907. Finne, W. L. July 12, 1917.

Tubes of special section.—In horizontally-disposed pipes for the coils of gas condensers in which water &c. runs over the outsides of the pipes, the ends of each pipe section have concentric flanges as shown, the flange 13 of the upper section overhanging the flange 8 of the lower section to pre-



vent water entering the recess 10 in which suitable packing is placed. Condensed liquid entering this recess from the inside of the coil forms a liquid seal aiding the packing in maintaining the joint. Cooling-water overflows from the recess 15, and, to cause the water to fall from pipe to pipe in divided streams, each pipe section is provided with projections 16 on the under side.

114,140. Lovekin, L. D. March 6, 1917, [Convention date].



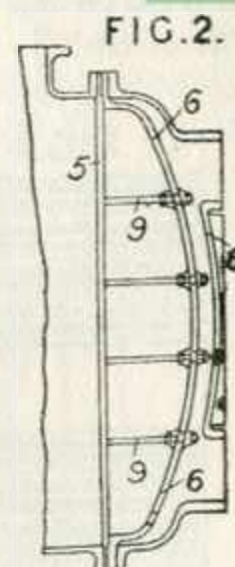
Straight tubes between headers; drip interception devices.—The tubes of a surface condenser are divided by a partition in the water chamber into primary and secondary groups, the primary group extending over the secondary group and down at each side, the arrangement being such that water of condensation from the space traversed by the primary



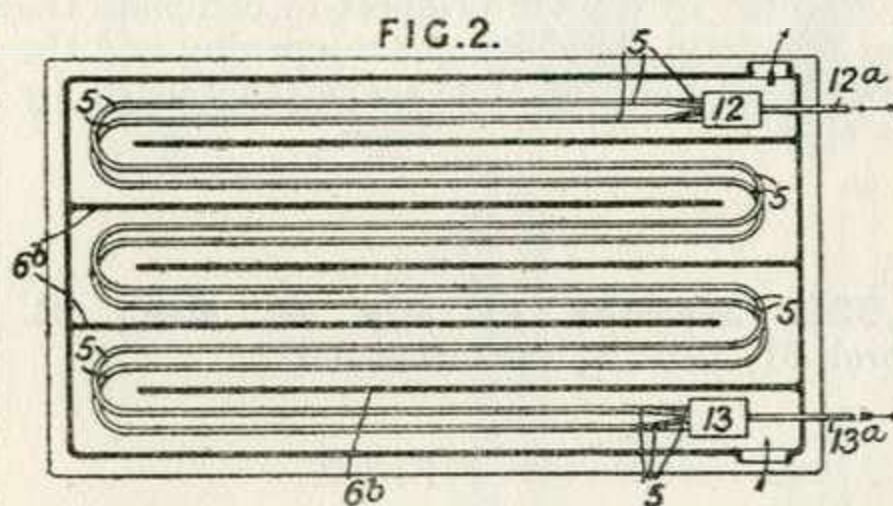
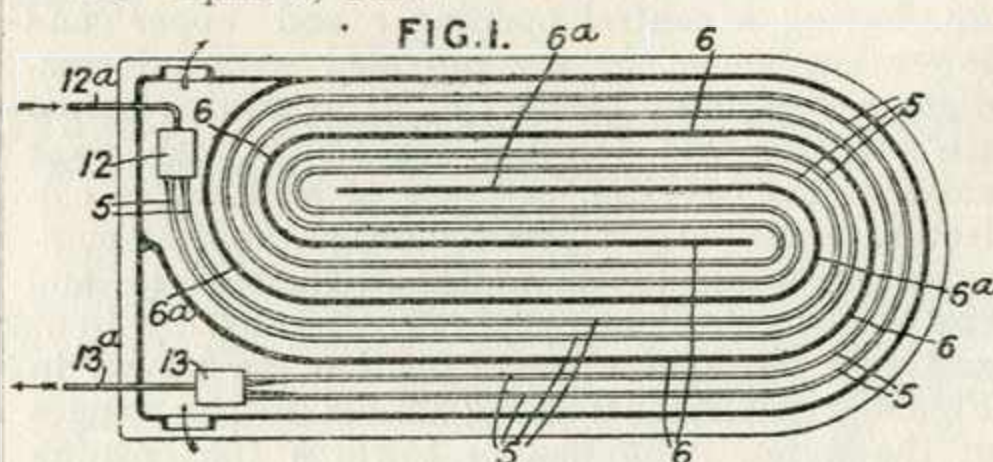
group is prevented from entering the space traversed by the secondary group. The secondary group of tubes *e* extends down to the bottom of the condenser shell and has vertical sides and a V-shaped top corresponding to the sides and top of the partition *C*⁵ in the water chamber *C*. Inclined baffles *f*¹, *F* at the top of the secondary group and among the tubes of the primary group *E* direct the water of condensation into vertical spaces *H* between the groups. Additional baffles *f* parallel to the baffles *f*¹ may be arranged between the tubes of the secondary group. Longitudinal perforated plates *G* extending through the middle of the secondary group form an air passage *g* in communication with the outlet. The plates *G* are connected at their lower ends to inclined plates *G*² and an horizontal plate *G*³, which closes the bottom of the air passage. A short pipe *G*⁴ dipping into a liquid seal around the outlet opens into the bottom of the air passage through an aperture in the plate *G*³, and the pipe *A*⁴ connected to the dry-air ejector extends through the pipe *G*⁴. The condensate pump is connected to the outlet *A*⁶. Alternatively, the pipe *A*⁴ and the outlet *A*⁶ may be closed and the outlet *A*⁷ connected to a wet air-pump. Short angle-irons *f*² are secured to the edges of the plates *f*, *f*¹, *F* to cause the water to flow off the plates in a number of displaced streams instead of in continuous films. Instead of two steam inlets *A*¹, the steam may be led into the sides of the primary condensing space through a single inlet divided by a partition.

114,478. Scanes, A. E. L. April 5, 1917.

Tube-plates, constructions and forms of.—A tube-plate 5 of a surface condenser is maintained in position by tension stays 9 connected to a separate skeleton cover or grid 6, which is so secured that it is not disturbed when the end cover 8 is removed. The skeleton cover may be formed integral with the water-box



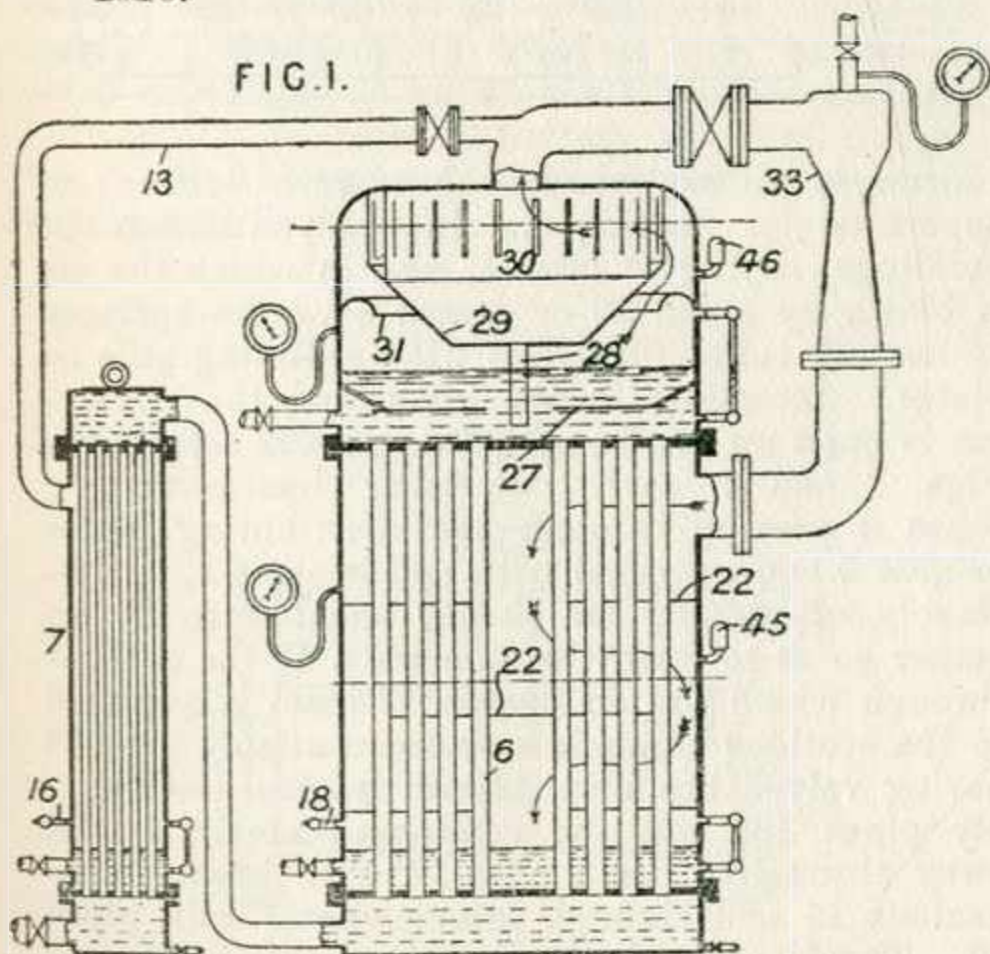
114,651. Stables, E. C., and Hall, J. & E. April 5, 1917.



Coil-tube apparatus; serpentine-tube apparatus.—In apparatus of the type comprising a coiled or serpentine tube arranged in a chamber or cell provided with partitions forming a circuitous passage, and particularly adapted for refrigerating plants, a number of distinct coils 5 in parallel layers are arranged in a shallow chamber having curved partitions 6, 6^a, Fig. 1, or straight partitions 6^b, Fig. 2, the coils being connected through common supply and discharge boxes 12, 13 within the chamber to single inlet and outlet pipes 12^a, 13^a. The fluid to be cooled passes through the coils and the water or other cooling fluid through the chamber, either in the same or in the opposite directions. Several chambers or cells may be employed. According to the Provisional Specification, the coils may have separate inlet and outlet pipes, and several chambers or cells may communicate with each other so that the cooling-fluid flows through them in series.

Reference has been directed by the Comptroller to Specification 936/74, [Class 55 (1), Coking &c.].

114,164. Baufre, W. L. de. Oct. 24, 1916.



Straight tubes between headers.—In evaporators in which the vapours are compressed, as by a steam jet 33, and used for heating the liquid, the heater consists of vertical tubes 6 around which the compressed vapour flows towards the centre and the outer wall alternately in a path formed by baffles 22.



114,798. Soc. Anon. des Etablissements L. Bleriot. Oct. 27, 1917, [Convention date].

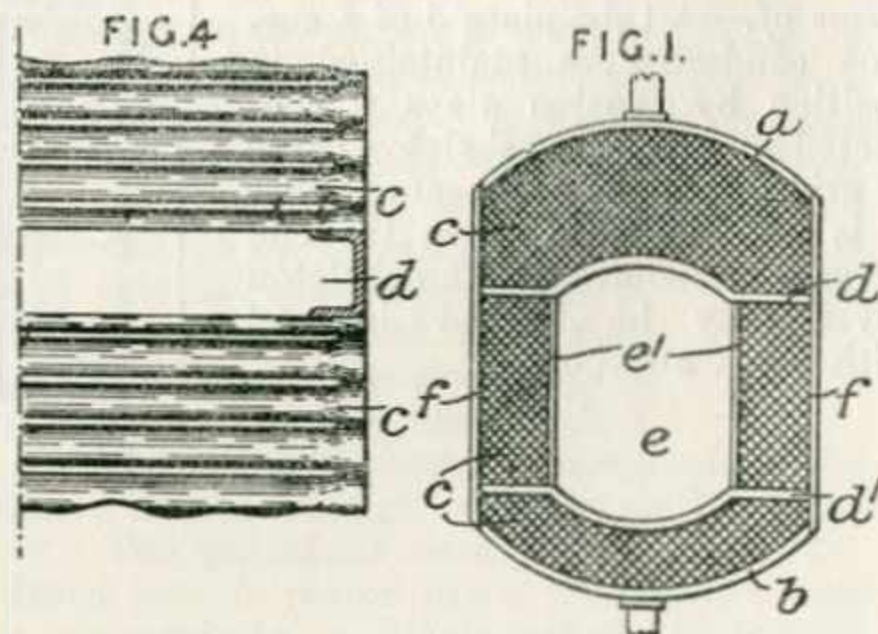
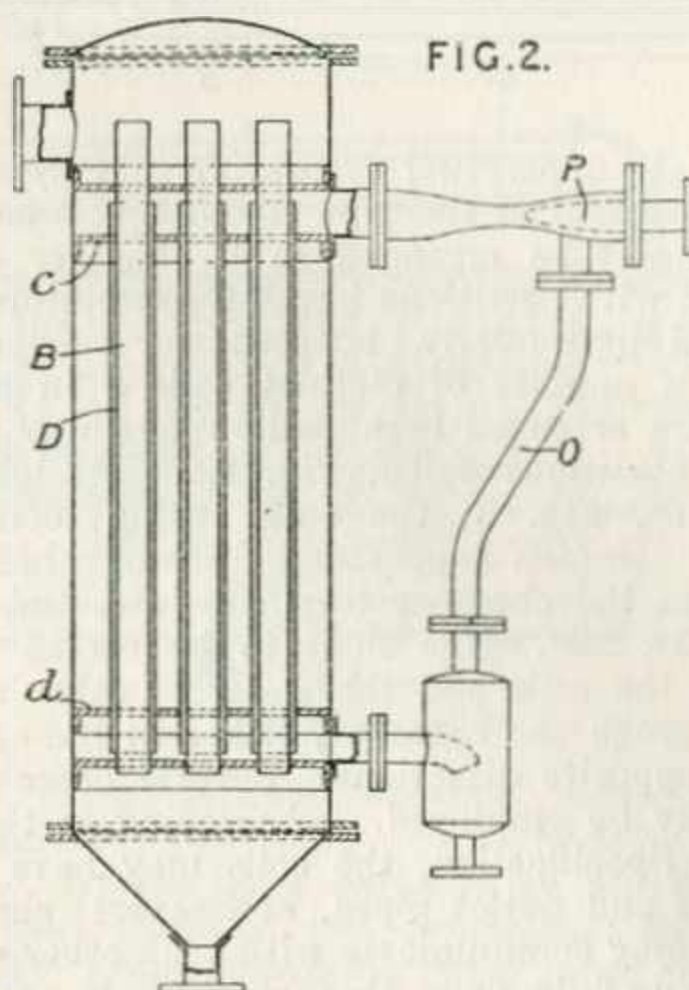


Plate apparatus.—Radiators for aircraft engines &c. having a central opening *e* and upper and lower headers *a*, *b*, are provided with intermediate collectors or headers *d*, *d'* extending across the radiator and forming the upper and lower sides of the opening, in place of an annular collector, as formerly. The cooling-elements *c* comprise corrugated plates united at their edges, and the headers *d*, *d'* are preferably formed by front and rear parts of channel section, as shown in Fig. 4, the elements being united to the flanges of the parts. The flanges towards the opening are connected by a plate or sheet to complete the header and form the sides of the opening and the side walls of the radiator are strengthened by plates *e'*, *f*.

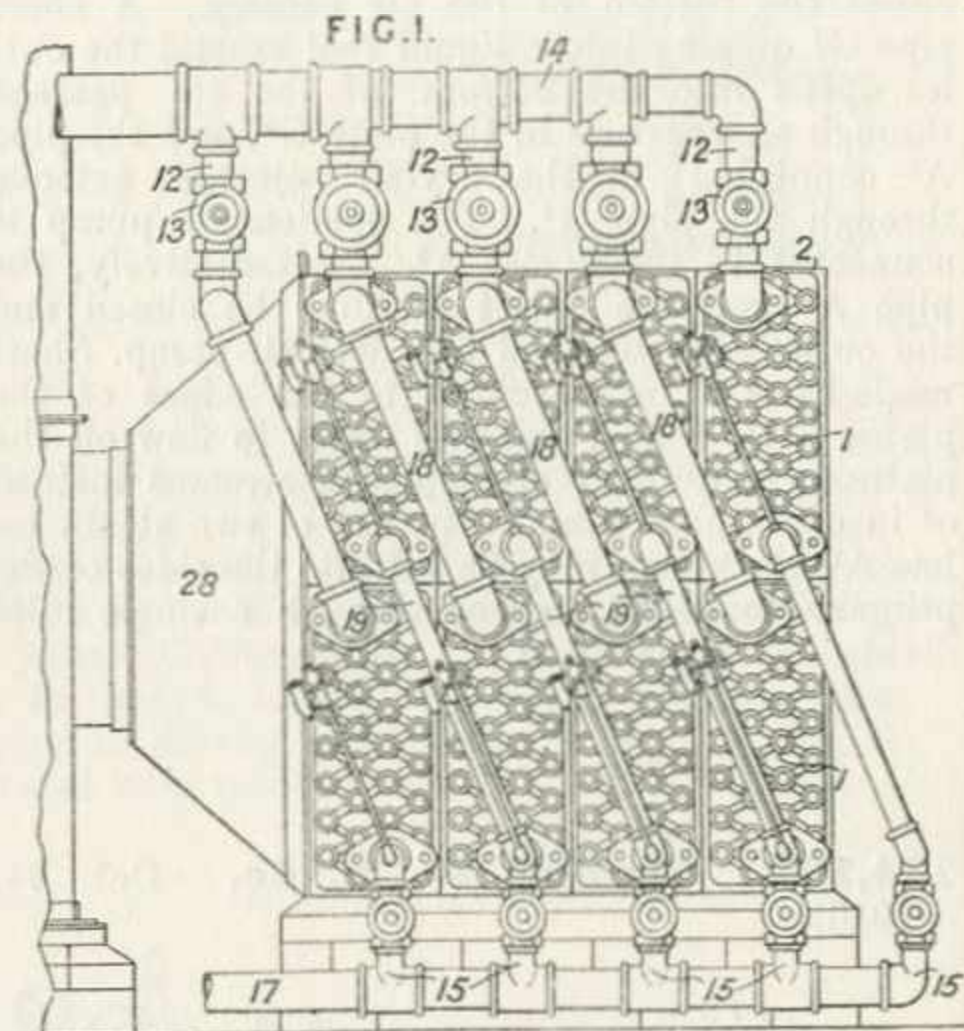
114,838. Barbet et fils et Cie., E. March 31, 1917, [Convention date].



Concentric or jacketed straight-tube apparatus.—In tubular evaporating, condensing, or cooling

apparatus, vapour flows at a high speed through annular spaces *D* formed by jackets placed around the tubes *B* through which a liquid is passed. The jackets are expanded into two inner tube-plates *d*, *c*, and project a certain distance beyond the tube-plates. The vapour is supplied by a fan or by an injector *P* connected by a pipe *O* to the space between the lower tube-plates so as to draw uncondensed vapour again into circulation through the jackets.

114,863. Pease, E. L., Bell, A., and British Still Tube Co. March 6, 1917.

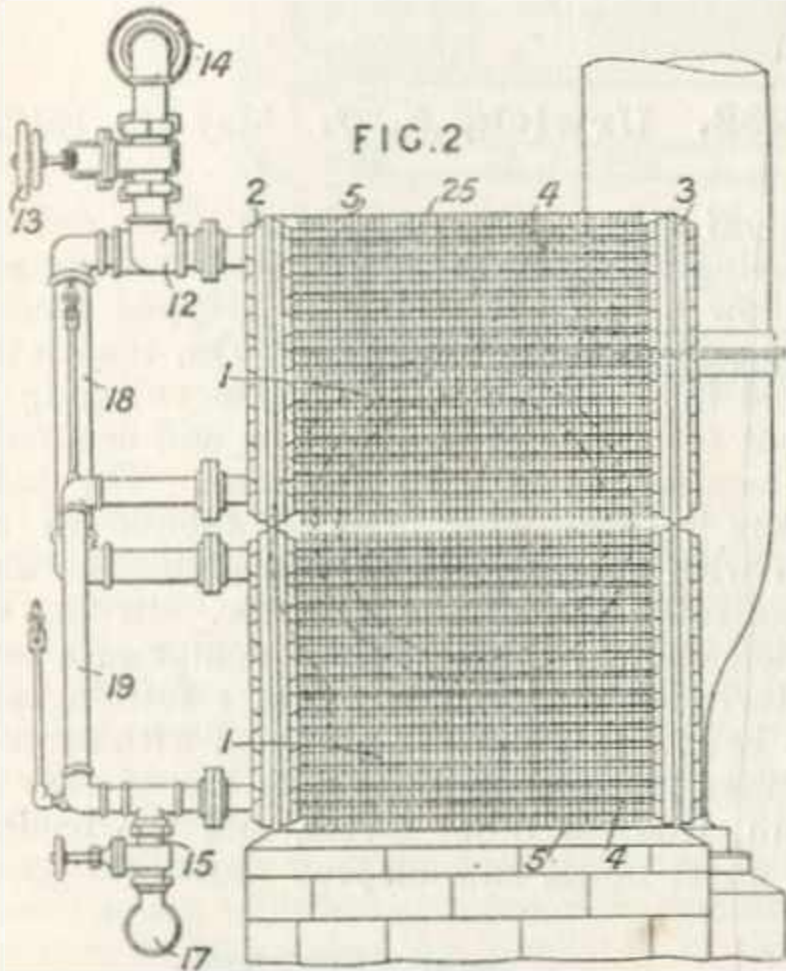


Straight tubes between headers.—Relates to apparatus for heating air in the ventilation of buildings, drying of fabrics, &c., in which the air is blown by a fan *28* or drawn over the surfaces of heating tubes furnished with radiating gills or plates. According to the invention, the apparatus is built up of two or more units or sections *1*. Figs. 1 and 2, each comprising heat-conveying tubes *4* passing through heat-distributing plates or gills *5* and provided with end heaters *2*, *3*, preferably of rectangular shape, adapted to fit together so as to form the side walls of the conduit through which the air passes. Steam is supplied to the sections through a common supply pipe *14* having valved branches *12* and intermediate supply pipes *18*, and the condensed steam is led away through a drain pipe *17* with branch connections *15* and through intermediate drain pipes *19*. The front header *2* of each section is divided by a horizontal partition so that steam entering a section from a pipe *18* passes to the rear header and returns to the lower part of the front header, whence it is conducted to the drain pipe *17*. In the arrangement shown, the sections are arranged in two tiers of four sections each and the pipes *18*, *19* are inclined and so connected with the sec-



tions that by operation of the valves 13, the first section of the lower tier or the last section of the upper tier can be cut out independently, the other sections being cut out in pairs. The number of the tubes 4 used in proportion to the number of radiating plates or gills 5 is chosen according to the temperature requirements. In order to facilitate the introduction of a cleaning tool or of an expanding tool for connecting the tubes to the plates 5, the headers 2, 3 may have removable end plates or be provided with openings opposite

pipe section. The pipes are supported in the troughs upon webs having apertures for the circulation of the cooling liquid. A bridge-piece 16 at the outlet end of a trough maintains the liquid

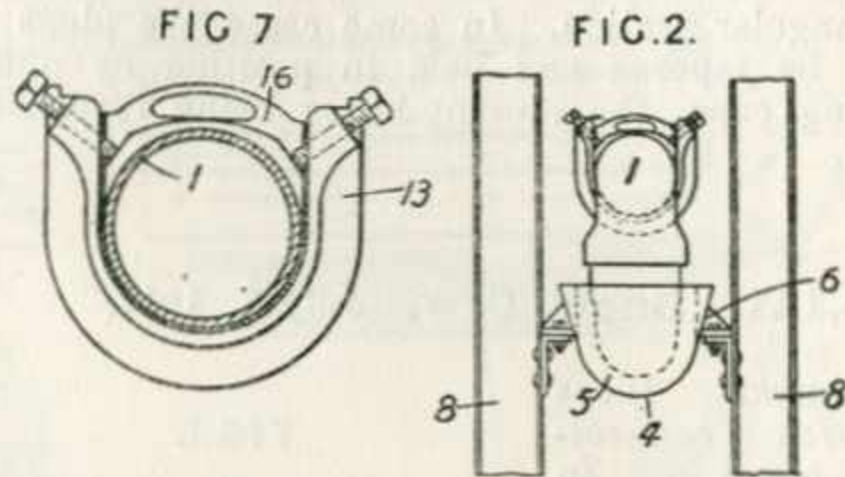


the tubes closed by screw plugs. A cover plate 25 forms the upper wall of the air conduit. Modifications are described in which the tubes are arranged vertically to form a high battery of small depth and in which the tubes are arranged horizontally to form a battery of small height, the headers being coupled directly with the steam supply and drain pipes.

114,945. Finne, W. L. July 12, 1917.

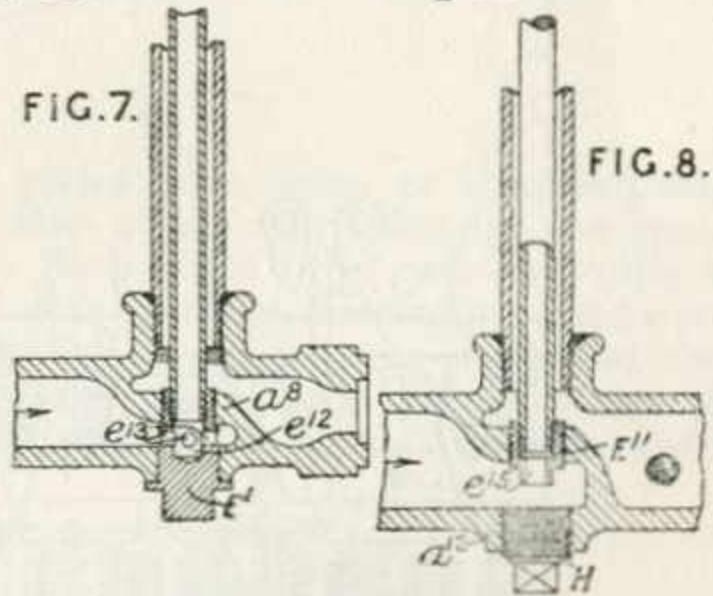
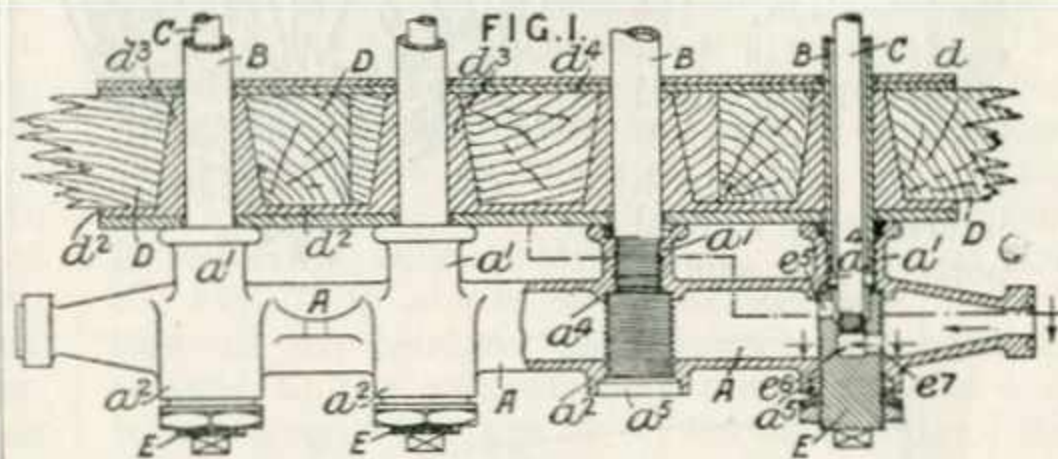


Serpentine-tube apparatus.—The straight portions of the sinuous vapour tubes 1 are enclosed by troughs 4 through which the cooling liquid flows downwards from one to the other in turn. Each trough has an upturned end 5 adapted to fit around a pipe section. A trough is supported at its upturned end by brackets 6 on vertical bars 8, and at the other end by a strap 13 around a



level in the trough above the top of the enclosed pipe. The pipe sections are joined together by the liquid-seal joint described in Specification 113,907.

115,055. Pluperfect Ice Co., and Wheater, J. W. Jan. 23, 1917.



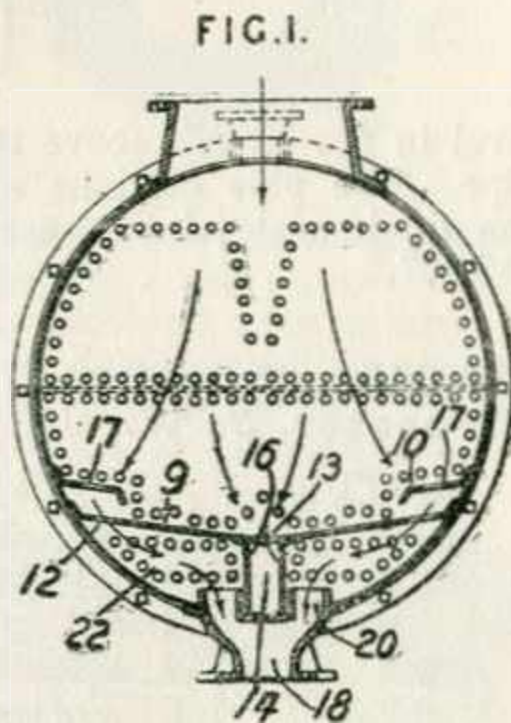
Field-tube apparatus.—In plate apparatus for ice-making in which a series of concentric tubes B, C are connected to a header beneath the freezing-tank, as described in Specification 13280/09, the outer tubes B are screwed into bosses a^1 on the upper side of the header section A, and the inner tubes are screwed into plugs E, Fig. 1, E^1 , Fig. 7, or E^{11} , Fig. 8, inserted from below, the plugs being provided with ports or passages so as to enable the refrigerant to flow in series through the concentric tubes. In the arrangement shown in Fig. 1 the plugs screw through lower bosses a^2 and bed against a packing a^4 , and are provided with opposite ports e^5 , e^7 and a central passage e^6 . A stuffing-box a^5 is provided around the plugs. In the modification shown in Fig. 7, the plug E^1 is screwed into a cross-web or mid-feather a^8 , and is provided with through ports e^{12} and a central passage e^{12} . In the further form

shown in Fig. 8, the plug is formed with a central bore e^{15} only, and is inserted through an apertured boss a^{12} closed by a separate plug H. The headers are formed with spigot and socket end and with attachment flanges, and may be of rectangular section. In some cases the plugs E may be tapered and held in position by outer closing caps, the stuffing-boxes being dispensed with.

also provided with lateral baffle-plates 10 formed with ports 17 and arranged above the basal baffle-plate. A longitudinal trough 14 collects the water of condensation and leads it to a suction outlet. Air ports 16 in the sides of the trough 14 communicate with the air-cooling space 22 below the basal baffle plate. The air suction outlet 18 is formed with upstanding throats 20. The water-tubes lie close to the side walls of the condenser and also to the baffle-plates.

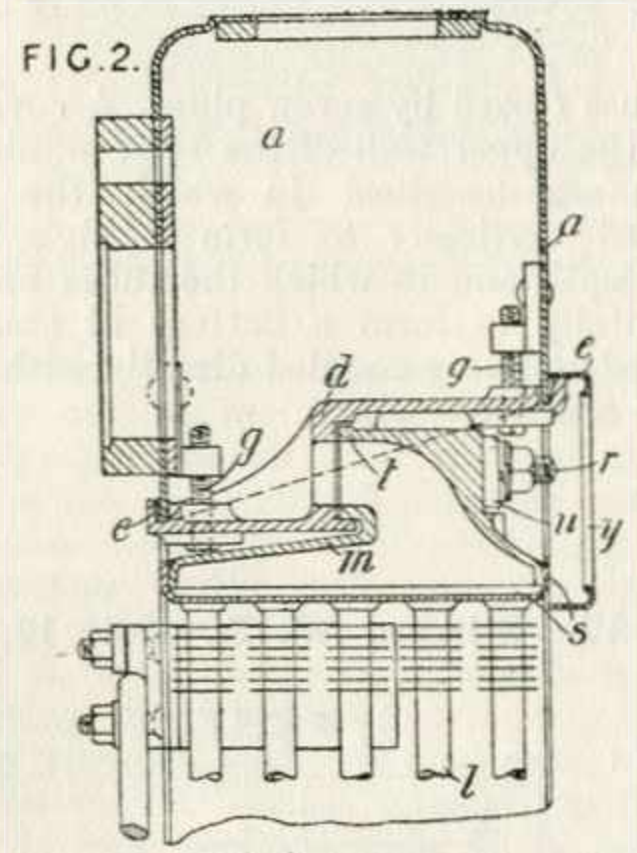
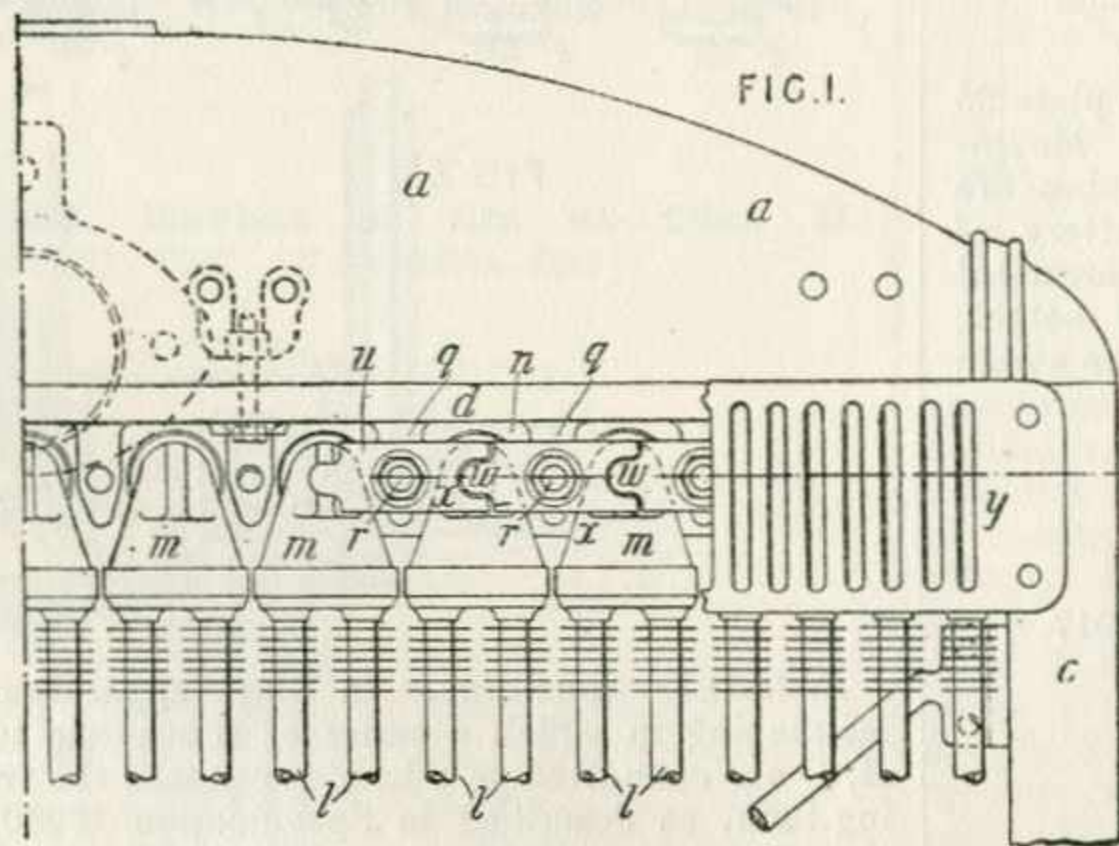
115,141. Snow, C. J. July 3, 1917.

Straight tubes between connecting boxes. — In order to distribute the steam evenly in a surface condenser in which the air and vapours are cooled and withdrawn separately from the water of condensation, the condenser is provided with a basal baffle-plate 9 formed with both lateral and central ports 12, 13, and is

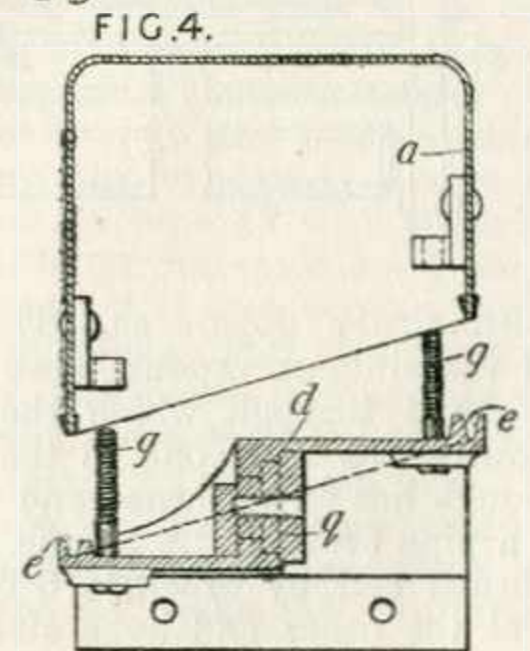


115,282. Urwick, A. J. May 10, 1917.

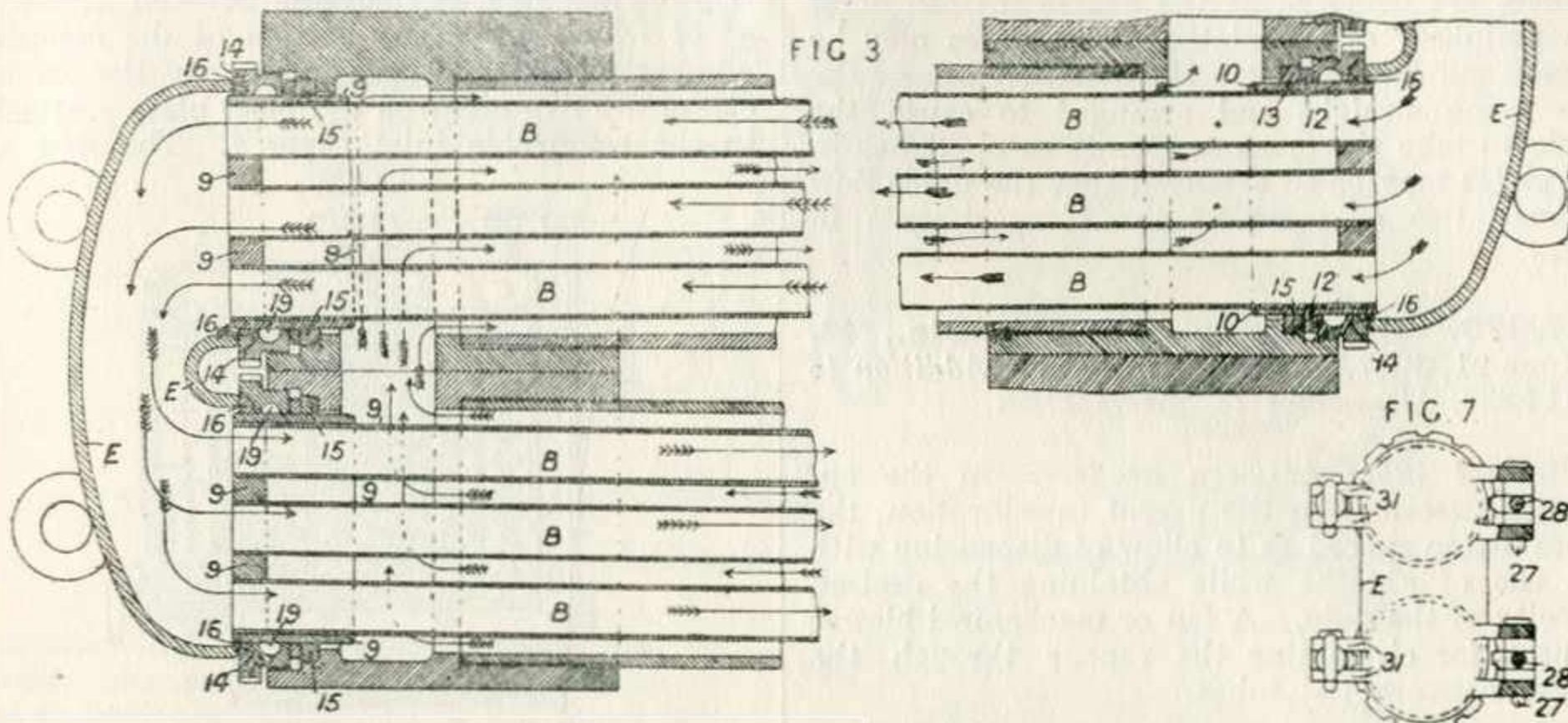
Straight tubes between headers. — In radiators comprising separate detachable sections connected by hollow caps or terminals to stepped faces on the top and bottom headers or tanks, the sections are held in position by yoke-pieces, engaging two adjacent terminals of the sections and secured by bolts located between the sections. The hollow caps are formed with cranked spouts for connexion with apertures in a stepped face in about the central plane of the radiator. In the construction shown, the sections l comprise a series of water-tubes soldered to plates s forming parts of the hollow terminals m provided with spouts t . The inner plates d of the tanks are of cast aluminium, iron, or other metal, and the bodies a are of sheet metal and adapted to fit into grooves



e in the cast plates. Solder is run into the grooves and adheres only to the sheet metal, so that the bodies may be readily removed by unscrewing bolts g . The yoke-pieces u , having tongues w and recesses x , are secured by studs r screwed into bosses q on the stepped face, and the joints may be hidden by a hinged or other perforated cover y . The side frame c may be of pressed metal. The joint between the plate s and the hollow terminal m may be made by wire caulking and solder, the ends of the wire being allowed to protrude to facilitate dismantling.



115,652. **Robinson, P.**, (trading as Morton & Co., R.). March 7, 1917.



Concentric or jacketed straight-tube apparatus; straight tubes between headers.—Relates to counter-current apparatus intended particularly for cooling milk, of the kind in which the cooling liquid flows in a zigzag course through a series of horizontal pipes connected by headers, and the milk flows through groups of small pipes inside the horizontal pipes. To prevent leakage of liquid through the pipe connexions in the headers, each group of internal pipes B is mounted in end collars 9, 10 secured by glands 14 in the headers. The gland at one end of a group of pipes presses an external flange 12 on the collar 10 against a der-

matine or like packing-ring 15. At the other end, the collar may move longitudinally in the gland to allow the pipes to expand and contract. The hinged U-shaped tubular connexions E between the pairs of superposed headers bear against packing-rings 16 in the glands. Liquid leaking past the packing escapes through annular grooves 19 and radial holes in the glands. The hinge pins 27, Fig. 7, in a tubular connexion pass through lugs on the headers and through eye-bolts 28 secured to the connexion by nuts. Similar eye-bolts engage with lugs 31 on the other side of the connexion.

116,786. **Harrison, A. D.** July 17, 1917.

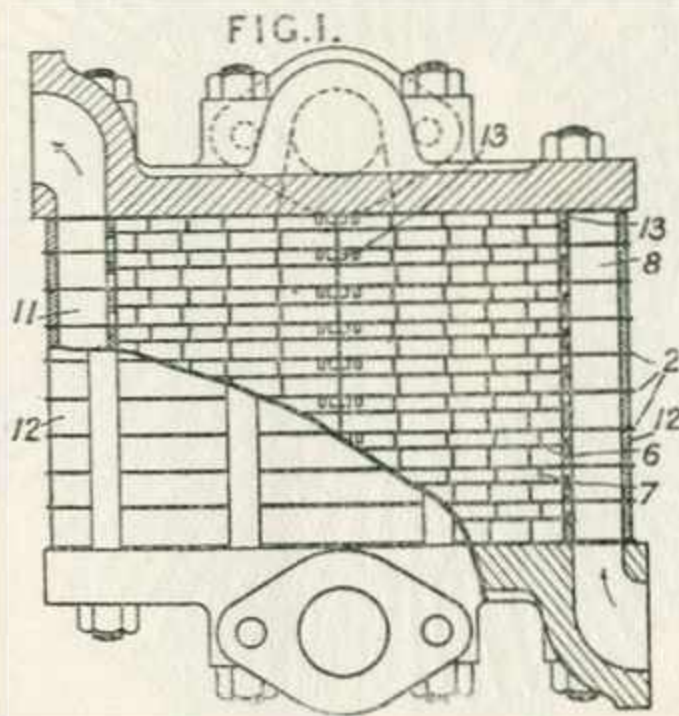
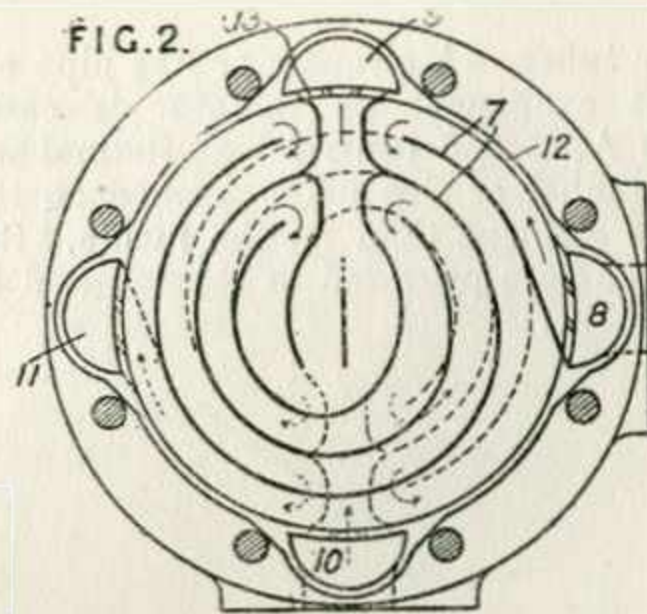


Plate apparatus.—Relates to apparatus of the type wherein two sets of plate elements arranged alternately are clamped together by bolts, the plates being spaced apart by flanges or distance pieces so as to form compartments through which the fluids flow in separate paths. Each of the plates of one set is formed with four apertures arranged coaxially with the inlet and outlet connexions for the fluids, and ribs on one or both

faces of the plates form spiral or sinuous passages for the flow of the fluids through the compartments. Each plate 6 is provided with a flange 12 and with openings forming inlet and outlet pockets 8, 9, 10, 11 running axially of the plates, apertures 13 being formed in the sides of the openings to provide communication between



the pockets and the passages between the plates. Ribs 7 on each side of a plate form spiral passages for the two fluids, the passage for one communicating with the pockets 8, 9, and the passage for the other communicating with the pockets 10, 11. Plain plates 2 having openings corre-



sponding with the pockets are placed between the ribbed plates. In a modification, two of the pockets are disposed at the centre instead of at the periphery of the plates. The plates may be square and have pockets at the four corners, the ribs being straight and arranged to cause the fluids to take sinuous courses. The apertures in the plates may be so arranged that the fluids flow through two or more of the compartments in series.

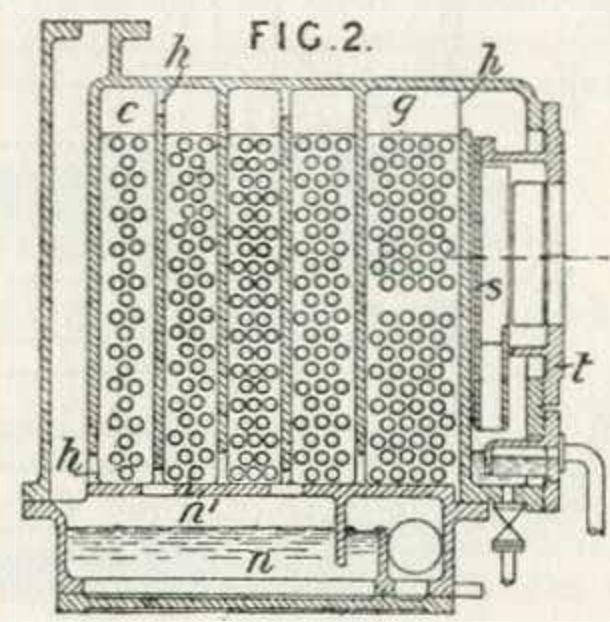
117,070. Barbet et Fils et Cie., E.
 June 21, 1917. [Convention date]. Addition to 114,838. Drawings to Specification.

Straight tubes between headers.—In the apparatus described in the parent Specification, the tubes are so spaced as to allow of dispensing with the use of sheaths while obtaining the desired velocity of the fluid. A fan or mechanical blower is used for circulating the vapour through the spaces between the tubes.

117,972. Contraflo Condenser & Kinetic Air Pump Co., and Higgins, C. F.
 Aug. 21, 1917.

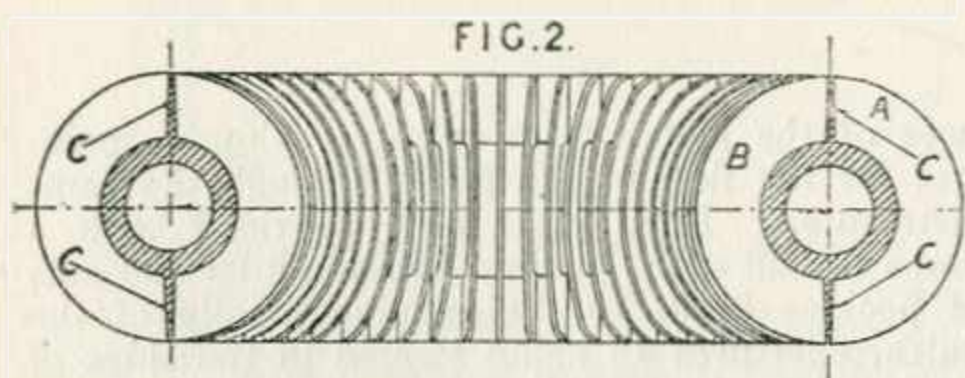
Straight tubes between headers or connecting boxes.—A surface condenser divided into a series

of compartments *c-g* by partitions having ports *h* so arranged that the steam takes a zigzag course is provided with a removable hot-well *n*, the top *n'* of which forms the bottom of the condenser compartments. Oil and water in the exhaust steam are deposited on a ribbed plate *s* attached to the removable inlet cover *t*. The first con-

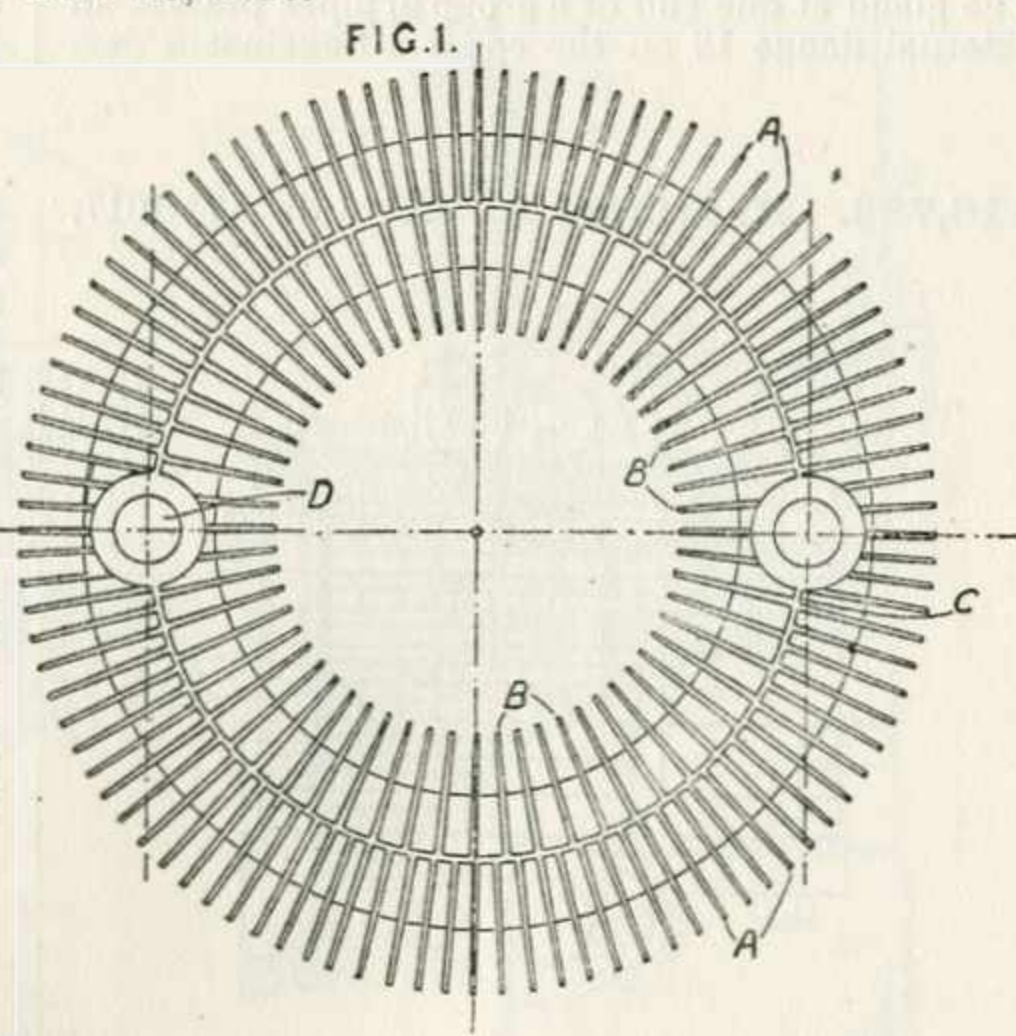


densing compartment *g* contains two groups of tubes and is made larger than the other compartments so as to offer less resistance to the flow of steam. The condensing water may flow through the groups of tubes on the first condensing compartment and through the second and third compartments either in series or in parallel.

118,375. Bruce, A. H., and Baynes, C. Nov. 28, 1917.



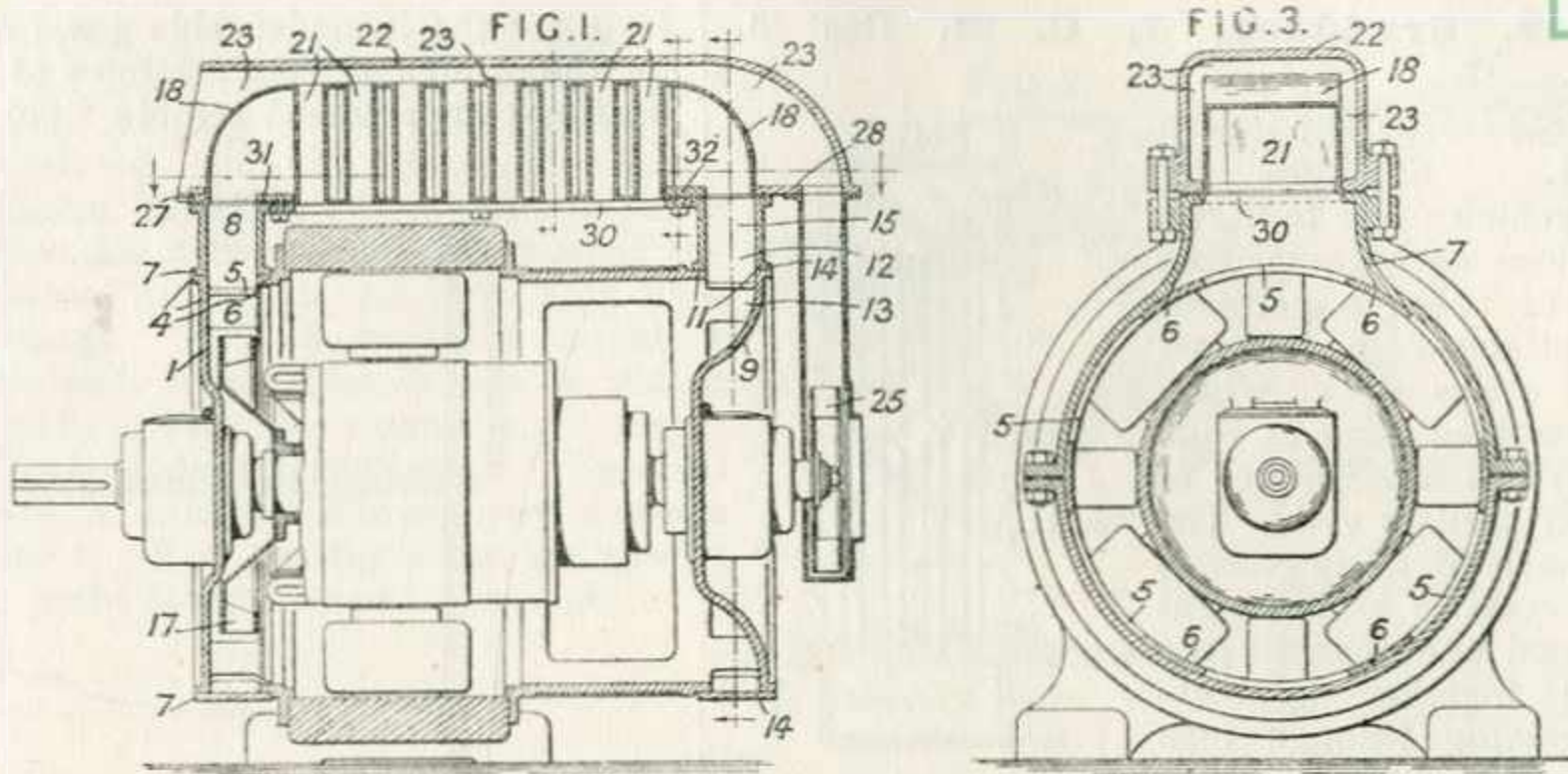
Gills for tubes.—A circular or like pipe element of a heat exchanger or radiator is cast with radial ribs *A*, *B* and central longitudinal webs *C*, a larger number of ribs being formed on the outside of the element than on the inside. Screwed connexions *D* are provided in the top and bottom of the element.



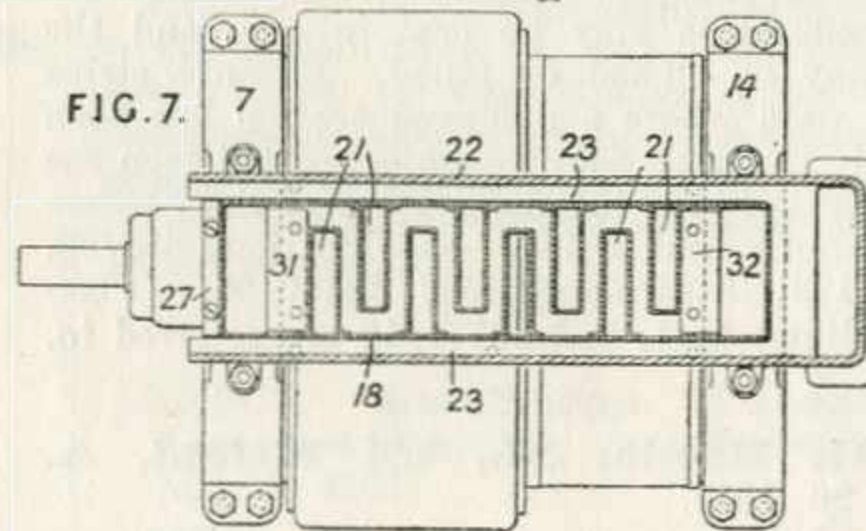
118,392. Burleigh, J. W. March 2, 1918.

Straight-tube apparatus.—The air contained within a totally-enclosed dynamo-electric machine is circulated by means of a fan *17*, Fig. 1, through

a thin metal radiator *18* surrounded by a cover or casing *22* through which cooling air or water is forced by means of a fan *25* or pump. Annular frame-members *7*, *14* supporting the radiator are mounted on turned seatings *4*, *11* on the end



bearing-brackets 1, 9 so that the radiator may be adjustable circumferentially. A zigzag path is formed through the radiator 18 by the use of hollow walls 21 which are preferably in connexion with the atmosphere at their upper and lower ends and also at the ends connected with the side walls. The radiator is secured to the frame-members 7, 14, 30 by means of flanges thereon and plates 27, 28, 31, 32. The hollow walls 21 may be of V or triangular cross-section.



119,450. Sonneborn, C. Sept. 21, 1917, [Convention date].

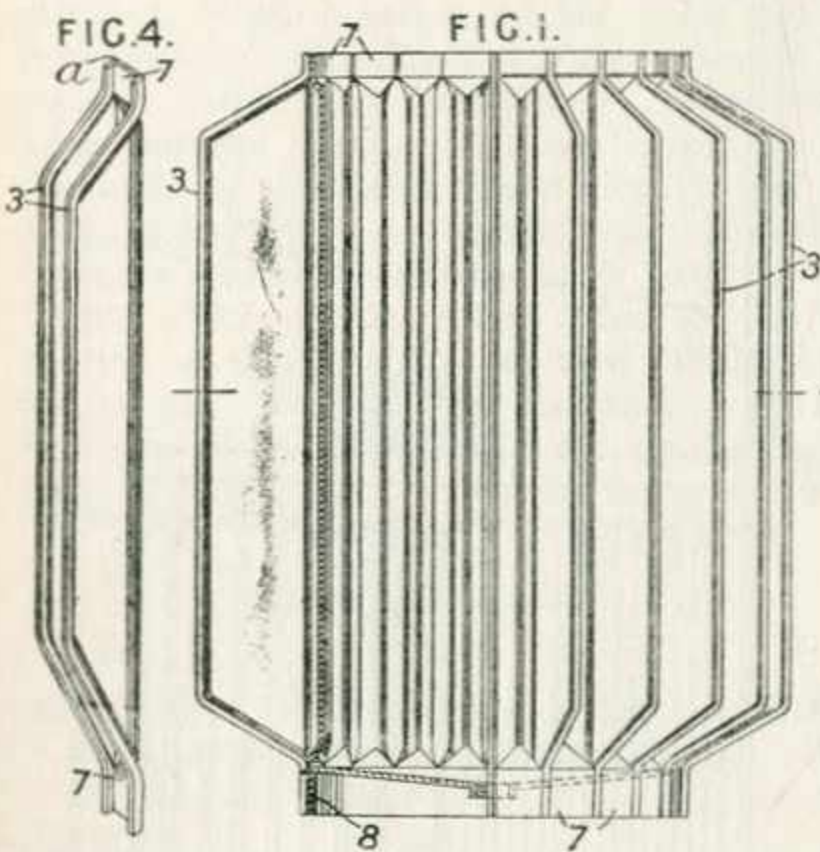
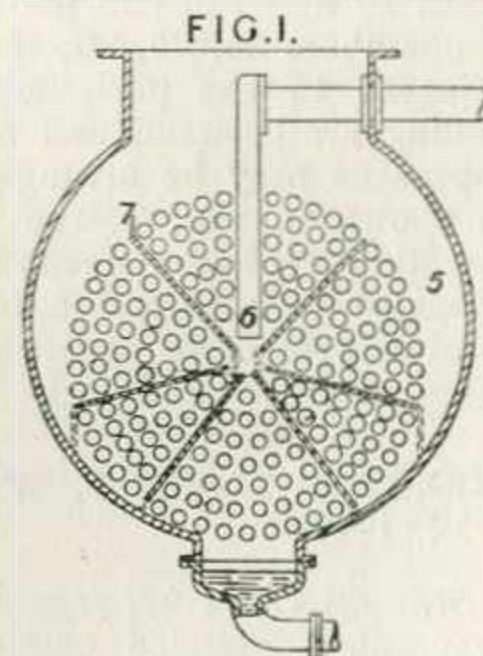


Plate apparatus; gills for tubes.—Tanks especially for use with transformers are constructed by welding together the flanges 3 of U-shaped units *a*, bending the sheet thus formed into shape to form the side walls of the tank, welding to-

gether the terminal flanges, and securing a bottom 8 to the lower portions 7. A top may be secured to the upper portions 7.

119,654. British Westinghouse Electric & Manufacturing Co., (Assignees of Ehrhart, R. N.). Oct. 1, 1917, [Convention date].

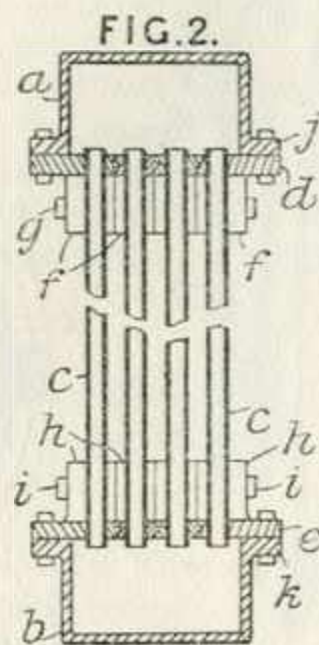
Straight tubes between headers.—In a surface condenser, the outlet 6 for air and non-condensable gases is arranged well within the rest of tubes, and baffles 7 radiate among the tubes from a point near the outlet. The lower baffles receive the condensate deposited on the upper baffles and deliver it into the crescent-shaped steam space 5 between the tubes and the casing. Specification 14793/14 is referred to.





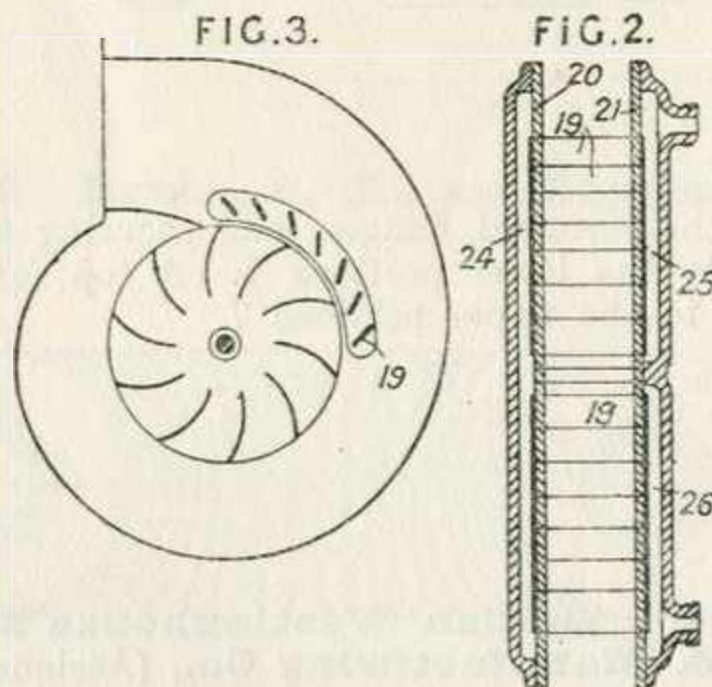
119,948. Craddock, J. C. B. Dec. 3, 1917.

Straight tubes between headers. — Radiators for motor-vehicles are built up of sections each comprising a row of tubes *c* permanently attached to top and bottom strips *d, e*, which are assembled edge to edge to form the inner plates of common headers *a, b*. The strips have engaging grooves and recesses to form a tight joint, and the sections are secured together by bolts *g, i* passing through lugs *j, h* on the strips. The tubes and strips may be cast in one, and the tubes may be ribbed or gilled. Dummy strips may be used where a damaged section has been removed. Packing may be employed between the strips and between the flanges *j, k* of the headers and the outermost strips. Specifications 488/83, [Class 122, Steam-engines], 18196/06, [Class 32, Distilling &c.], and 26771/10 are referred to.



let *g* for the incondensable gases and the drain *h* for the condensate are arranged at the back of the heating-compartment remote from the vapour in-

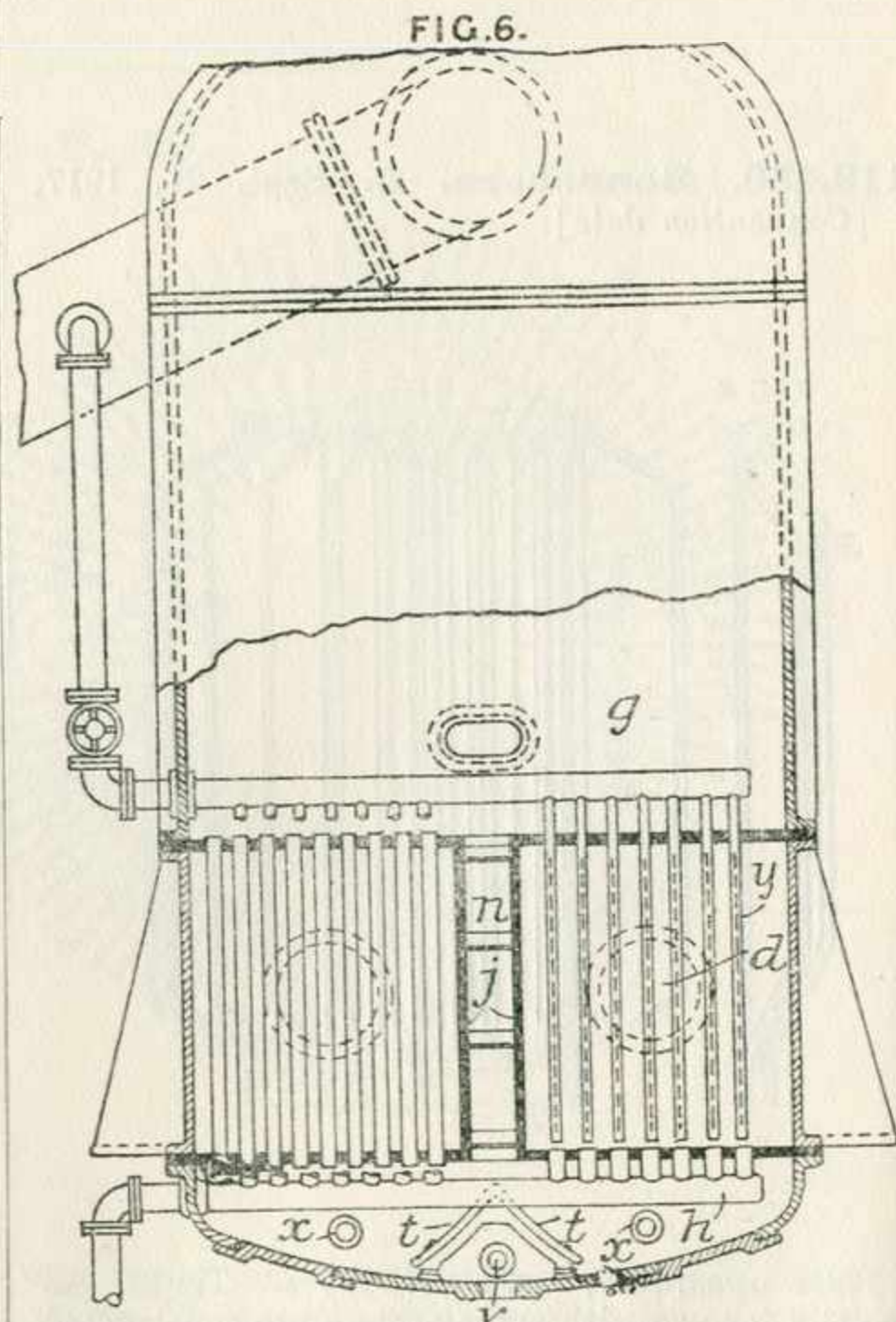
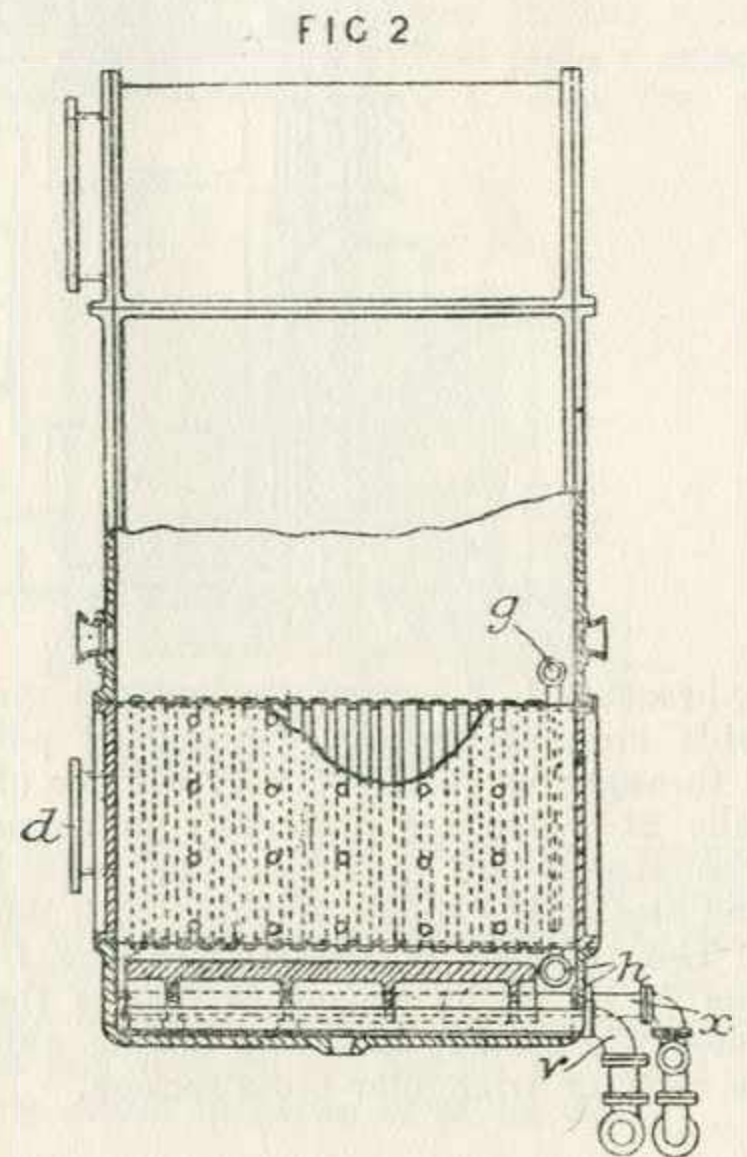
120,184. Boella, M., and Meiani, A. April 26, 1917.



Tubes of special section. — Apparatus for cooling lubricating oil comprises a series of small flat tubes *19* between end plates *20, 21* forming parts of chambers *24, 25, 26*, the whole being arranged adjacent to the periphery of a fan circulating cooling air between and around the tubes. The apparatus may be arranged within a fan casing, as shown in Fig. 3, the tubes being set in the direction of the current of air, or it may be arranged to surround a fan completely so as to form a protective cage. More than one row of tubes may be employed.

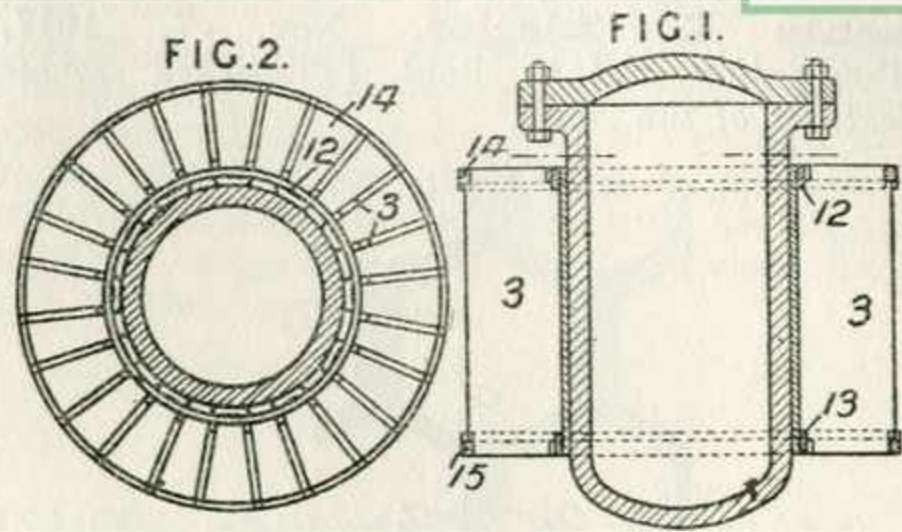
120,276. Herriot, W. S., (Deerr, N.). Nov. 12, 1917.

Straight tubes between headers. — Relates to an evaporator intended particularly for evaporating solutions such as beet and sugar cane juices, tan bark extracts, and the like, of the kind in which the heating steam or vapour flows around vertical tubes between rectangular tube-plates. The out-

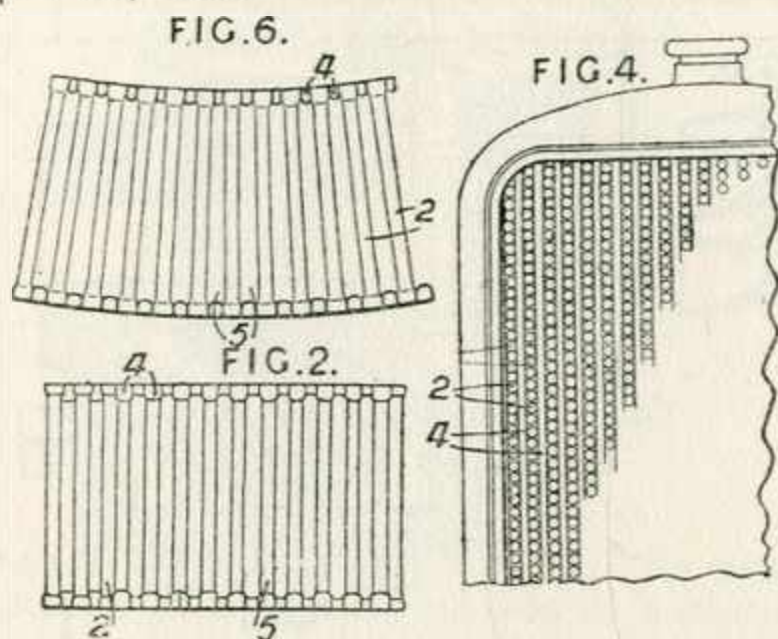


lets *d*, and the compartment is divided by one or more pairs of partitions *j* forming downtake passages *n*. The incondensable gases pass off

through perforated tubes *y* depending from the outlet pipe *g*. The condensate outlet pipe *h* is arranged directly below the tubes *y*, and is connected to the heating-compartments by tubular branches. The inlet pipes *x* for the solution are perforated and arranged beneath the bottom tube-plate on each side of a downtake passage. The concentrated liquid is withdrawn through a perforated pipe *v* placed directly below the downstroke passage and beneath perforated V-shaped deflecting plates *t*. The bottom tube-plate is inclined downwardly towards the outlet pipe *h*. The heating-tubes are spaced so as to form paths for the steam or vapour.



120,339. Smith, H., and Watson, S. G.
April 19, 1918.



Honeycomb apparatus.—The ends of the air tubes of radiators of the honeycomb type are spaced apart by distance members in the form of short thimbles 4, Fig. 2, open at one end, or U-sectioned strips 4, Figs. 4 and 6, at the back and front of the radiator, whereby the water space 5 between the air tubes 2 is increased. The strips may have parallel sides, or be scalloped, so as to fit the ends of the tubes more closely, and where a bow, V-shaped, or concave front is desired, the distance members at the back may be of a different width or size from those at the front, as shown in Fig. 6, or omitted altogether. The interstices between the distance members and the ends of the tubes are filled up during the dipping process.

120,368. Soc. Anon. des Ateliers de Constructions Mécaniques Escher, Wyss, et Cie. Nov. 21, 1917, [Convention date].

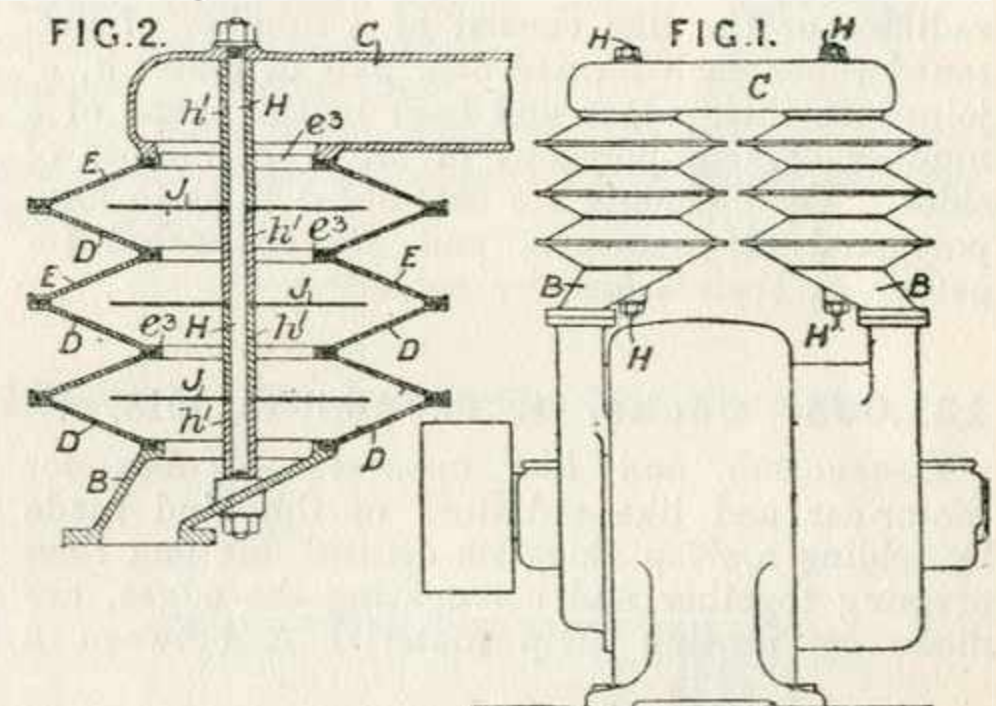
Gills for tubes.—Heat-exchangers are provided with ribs formed by U-shaped sheet-metal plates 3 secured in place by inner and outer rings 12, 13, 14, 15, and by dipping in solder. The plates and the rings are notched to interengage with each other. For long tubes, the ribs are disposed in groups along the length.

(For Figures see next column).

120,546. General Chemical Co., (Assignees of *Jahn, F. W. de*). Nov. 3, 1917, [Convention date]. Drawings to Specification.

Concentric or jacketed straight-tube apparatus.—The Specification as open to inspection under Sect. 91 (3) (a) describes the subject-matter of Specification 124,762 (catalytic production of ammonia) which includes a tubular heat-exchanger. This subject-matter does not appear in the Specification as accepted.

120,605. Lo-Thermo Patents, Ltd., Longbottom, B., and Greenhalgh, E.
Nov. 9, 1917.



Gills for tubes.—In apparatus for cooling enclosed dynamo-electric machines by circulating air through the casing of the machine and through a heat-exchanging device, as described in Specification 16640/15, the heat-exchanging device consists of two vertical portions, consisting of similar units and connected by a horizontal casing at the top, so that the heat-exchanging surface can be increased or diminished as required. To junction pieces B mounted on the dynamo casing are secured series of dished plates D, E, with central openings, fitted together as shown. The plates D have flanges on their outer edges, into which the plates E fit, and the plates E have flanges *e*³ on their inner edges, into which the plates D fit. In a modification the plates D, E have interlocking flanges at both the inner and outer edge. The structure thus formed is held together by a vertical bolt H connecting the junction-piece B to the horizontal casing C at the top. On the bolt H are threaded baffle-plates J separated by ferrules *h*¹.

120,875. Soc. Anon. des Etablissements L. Bleriot. Nov. 7, 1917, [Convention date]. Void [Published under Sect. 91 of the Act].

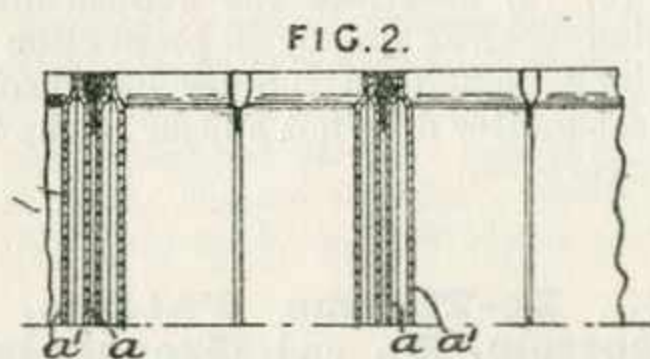
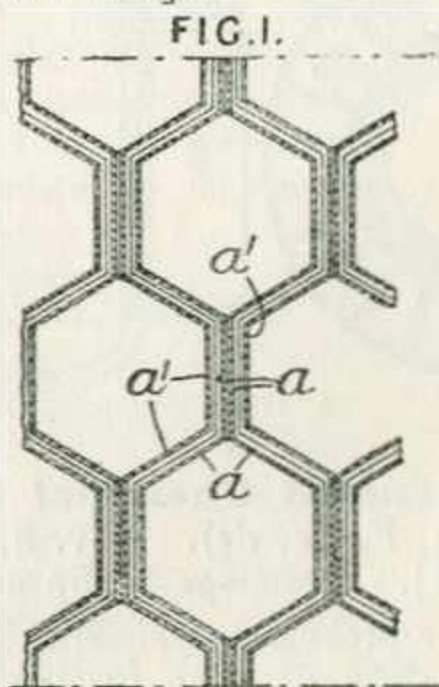
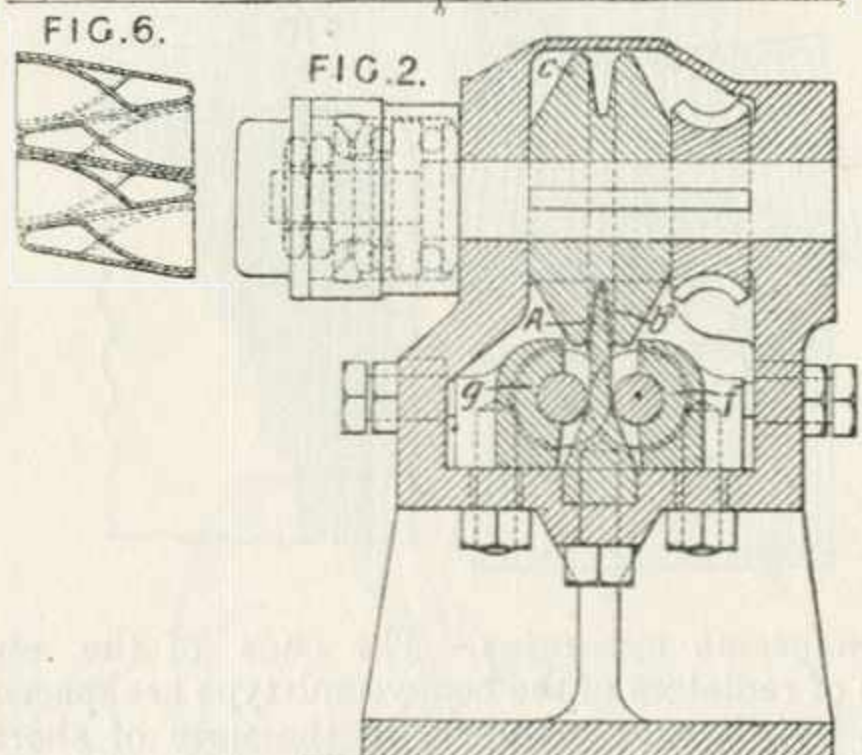
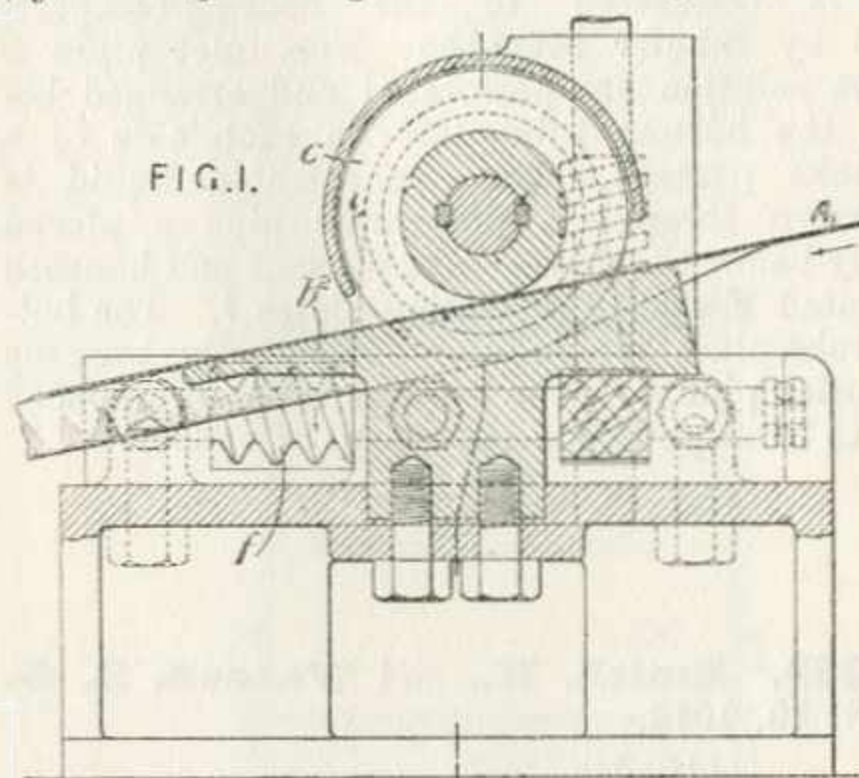


Plate apparatus.—The elements of a motor-car radiator or the like consist of a number of flattened tubes each formed of a pair of plates *a*, *a*¹ joined at their edges and bent in the shape of a number of semi-polygons of an even number of sides. The elements are assembled so as to form polygonal air passages, and are connected together at their edges by soldering.

121,065. Cooke, G. F. April 13, 1918.

Honeycomb and like apparatus.—Tubes for motor-car and like radiators of the kind made by folding a strap along its central line and then pressing together and corrugating the edges, are made by passing strip material *A* between a

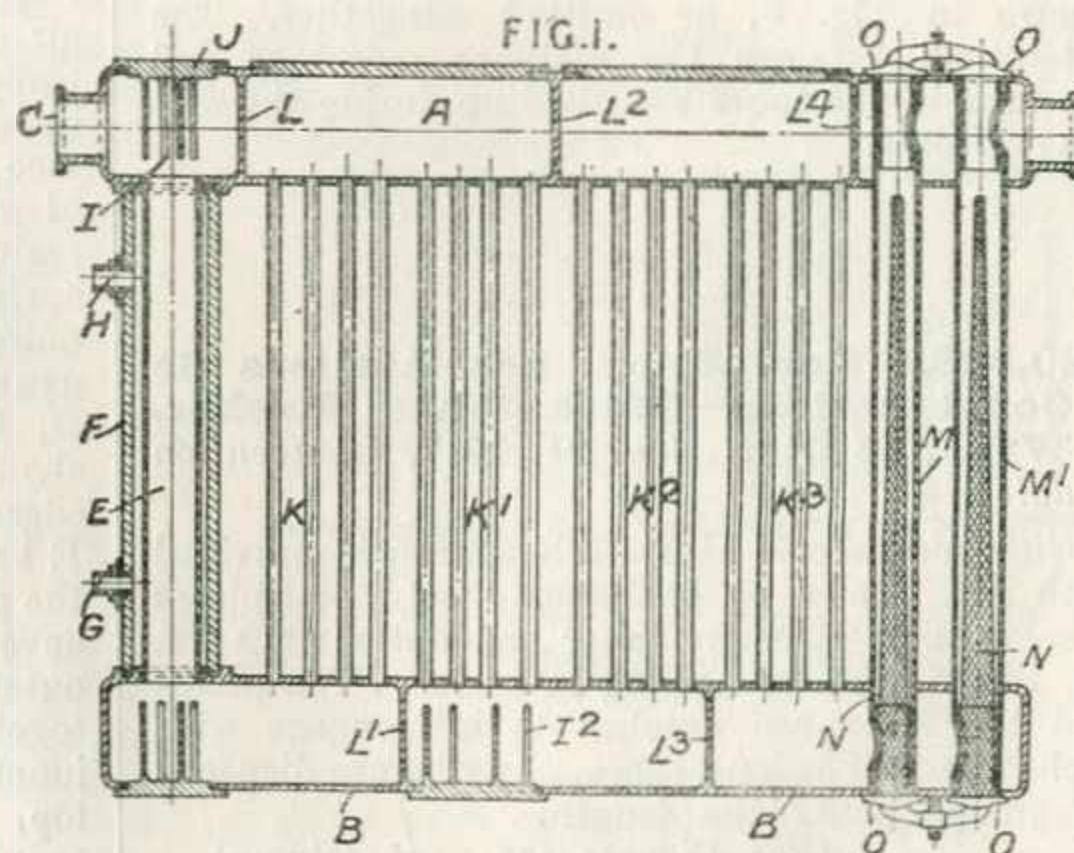
grooved roller *c* and an inclined former with a V-shaped upper surface *b*², the edges of the strip then passing between intermeshing helical rollers *f*, *g* which press together and corrugate the edges.



The edges are secured by soldering &c. The rollers *c*, *f*, *g* are positively driven. The finished tubes, which are of general V cross-section are nested together to form the radiator with the points of the V alternately in opposite directions, as shown in Fig. 6, which shows four tubes so assembled.

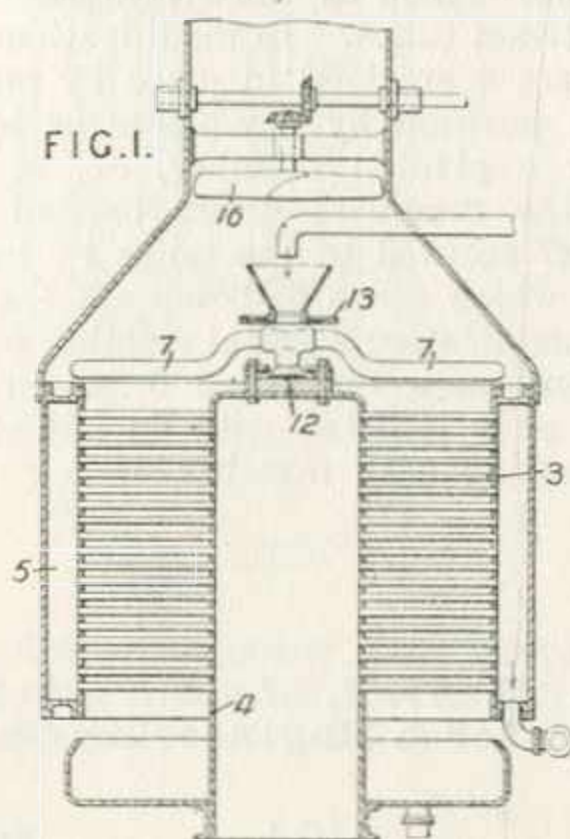
121,177. Smith, D. J. Dec. 5, 1917.

Straight tubes between headers.—Relates to means for cooling and filtering gas particularly for use in connexion with suction-gas plants for internal-combustion engines. The apparatus consists of two headers *A*, *B* connected by means of tubes. The header *A* is divided by partitions *L*, *L*², *L*⁴ and the header *B* by the partitions *L*¹, *L*³. The gas enters at *C*, impinges on baffles *I*, and then passes down a tube *E* to the header *B*. The tube *E* is jacketed and water flows around it, entering at *G* and passing out at *H*. The outer tube *F* may be provided with rubber packing-rings to allow for expansion &c. The



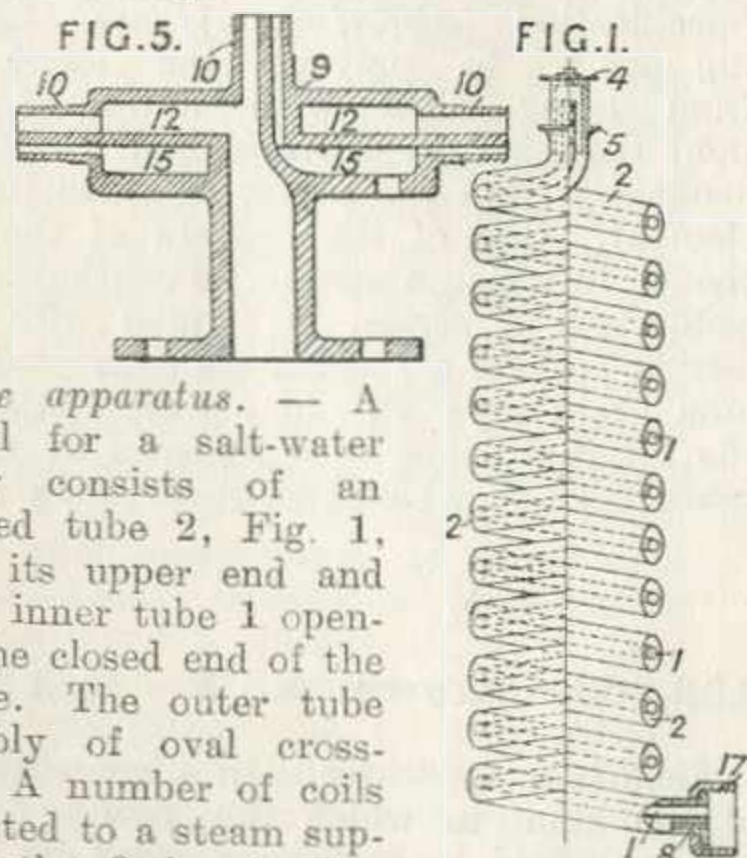
gas passes up through the pipes K, K', impinging on baffles I², thence through the pipes K², K³ to the filters M, M'. The baffles I &c. are integral with cover-plates J so that they may be removed for cleaning. If desired, pipes for the passage of cooling fluid may be arranged to pass through the pipes K, or the cooling may be accelerated by blowing air &c. on the pipes K. Specification 120,599, [Class 55 (i), Coking &c.], is referred to.

121,313. Portham, R. S. Nov. 13, 1917.



Straight tubes between headers.—An evaporative condenser or cooler consists of a stationary heat-exchanger comprising radial tubes 3 communicating with a distributing-chamber 4 and a collecting-chamber 5, together with a rotary liquid-supplying device 7 mounted above the tubes so as to drench each tube or group of tubes in succession with liquid. Air, preheated if desired, is caused to flow over the tubes 3 for example by means of a fan 16.

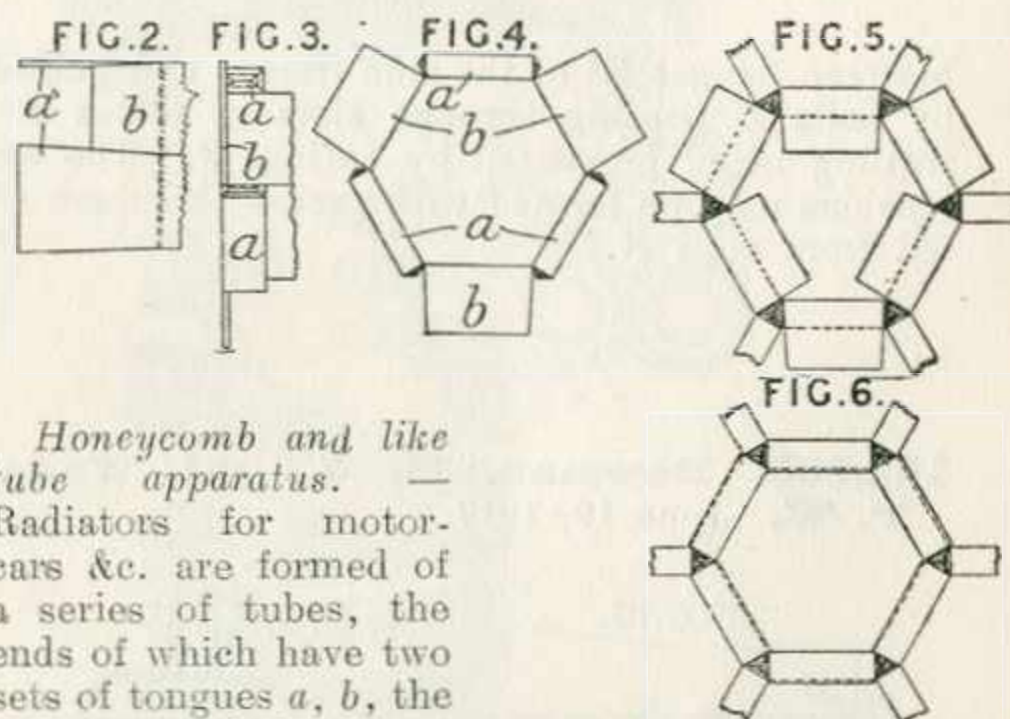
121,581. Morton, J. C. Dec. 21, 1917, [Convention date].



Coil-tube apparatus.—A steam coil for a salt-water evaporator consists of an outer coiled tube 2, Fig. 1, closed at its upper end and having an inner tube 1 opening into the closed end of the outer tube. The outer tube is preferably of oval cross-section. A number of coils are connected to a steam supply and outlet fitting 9, Fig.

5, by means of junction pieces 17 which screw on to nipples 10 projecting radially from the fitting. The inlet and outlet passages 12, 15 in the fitting open respectively into the ends of the inner tubes of the coils and into passages 8 on plugs in the ends of the outer tubes. The coils are kept upright by supports loosely fitting between flanges 4, 5 on their upper ends.

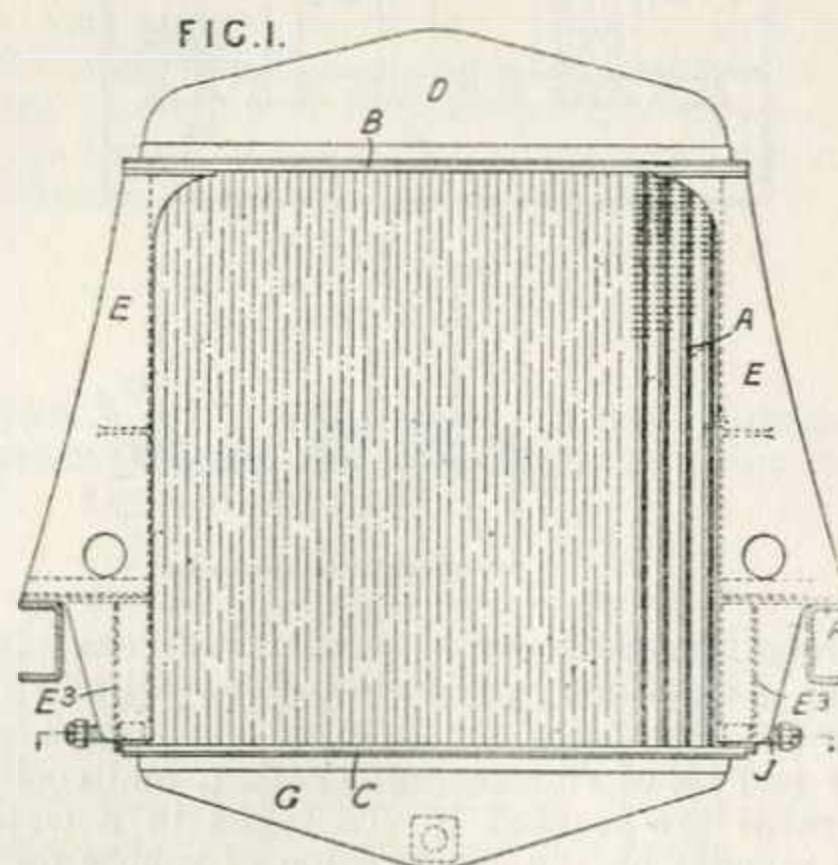
121,905. Gilbody, E. C. May 31, 1918.



Honeycomb and like tube apparatus.—

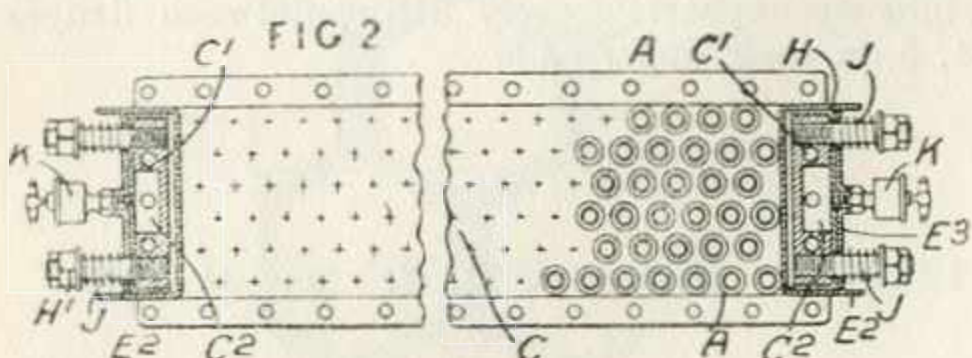
Radiators for motor-cars &c. are formed of a series of tubes, the ends of which have two sets of tongues a, b, the tongues a being bent back to form distance pieces, while the set b are folded into adjacent tubes, after assembly, to hold them together.

121,997. Clarkson, T. Dec. 27, 1917.



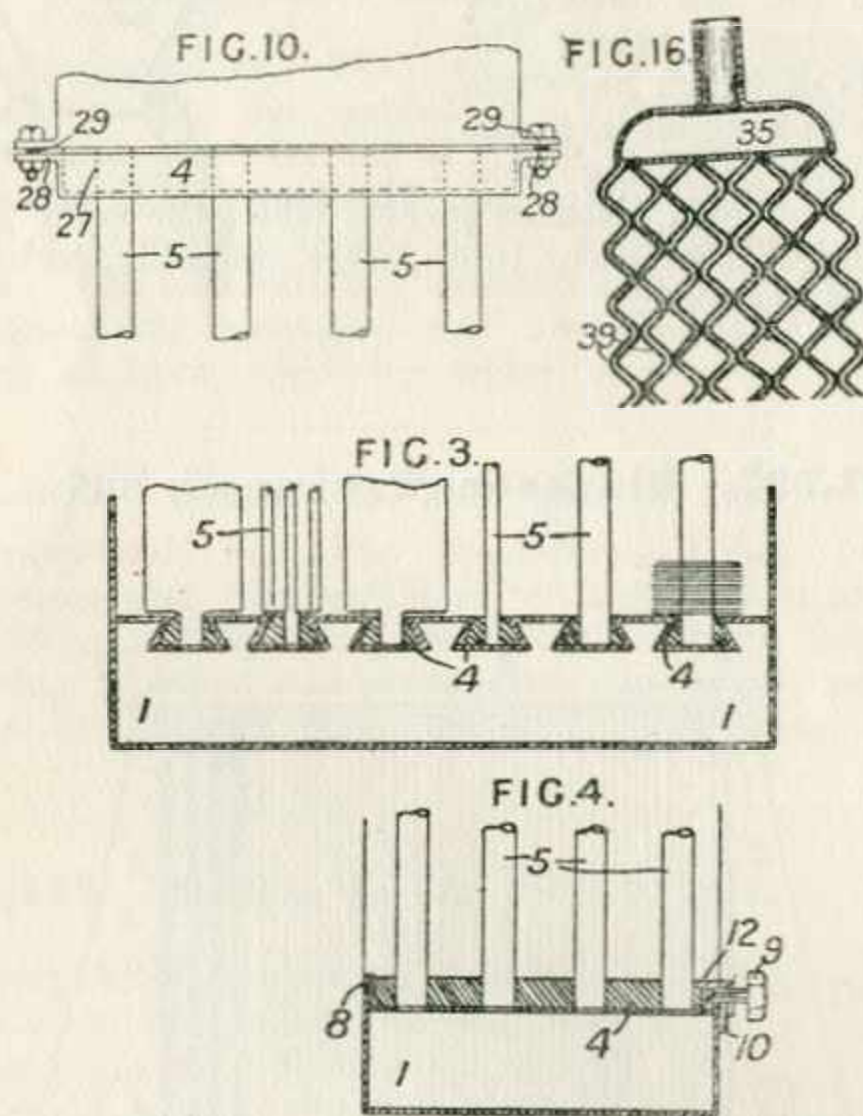
Straight tubes between headers.—In radiators or condensers for motor-vehicles comprising a set of parallel tubes A extending between headers D, G, one of the headers D is rigidly secured by bolts &c. to side frames E carried by a frame part F of the vehicle, and the other header G is

freely movable with respect to the frame, to allow for expansion and contraction of the tubes, which are rigidly connected to the tube plates B, C. The tube-plates at the parts between the tubes may be thinner than usual. The movable tube-plate C is provided with end extensions C¹ located



between flanges E² of the side frames and guided by bolts H passing through slots in plates E³, rattling being prevented by springs J. The extensions may be formed with grease chambers C² fed from cups K.

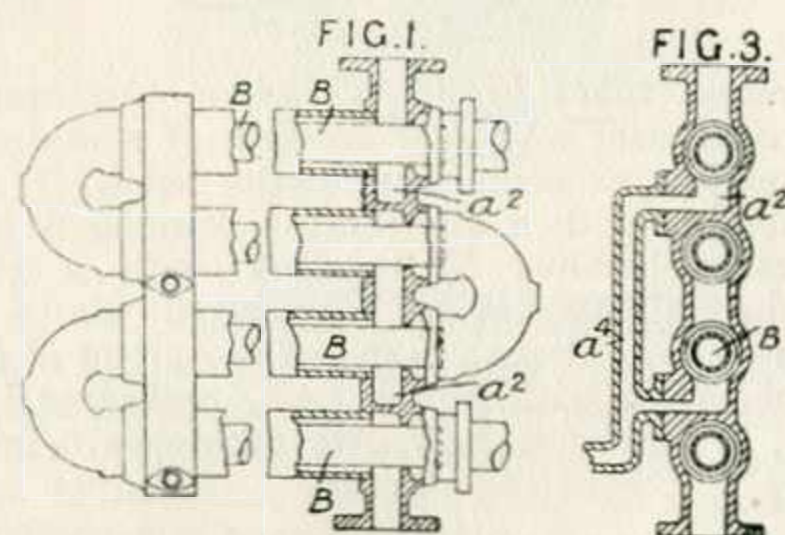
122,205. Bowman, E. J., and Wade, P. W. June 19, 1917.



Straight tubes between headers or connecting boxes; honeycomb apparatus.—The circulating tubes of a radiator for internal-combustion engines and other condensing, heating, and cooling apparatus are secured to the tanks in a water-tight manner by the compression of rubber members which surround the tubes tightly, the arrangement facilitating repair and tending to prevent fracture. The arrangement is such that each row of tubes may be dismantled separately from the rest. As shown in Figs 3 and 4, a series of tubes 5 are secured between the upper tank and lower tank 1 of a radiator by means

of dove-tailed or other shaped rubber members 4 fitting in similar grooves formed in the tanks, and as each row is assembled the rubber is compressed between a turned-up end 8 of the tank and a plate 12 actuated by a set-screw and carried by a detachable plate 10. The tubes 5 may be cylindrical or flat tubes and may be formed with gills. In modified forms each row of tubes may be replaced by a series of zig-zag tubes 39, Fig. 16, connected to small tanks 35 secured in position by rubber members as 4, or tanks such as 35 may be connected by three large vertical tubes connected together by radiating members, or by one chamber which is honeycombed with air-cooled partition tubes. In modifications, the rubber members 4 are held in place by metal plates secured in position by key-pieces or by a screw carried by a pivoted member, or, as shown in Fig. 10, the members 4 are carried by metal members 27 secured to the tanks by lugs 28 and screws 29 which serve to compress the members 4. In a modification a metal member with turned up ends embraces the tubes 5, and one of the turned up ends is fitted with an adjusting screw for compressing each member 4.

122,500. Reavell, J. A., and Kestner Evaporator & Engineering Co. Jan. 31, 1918.

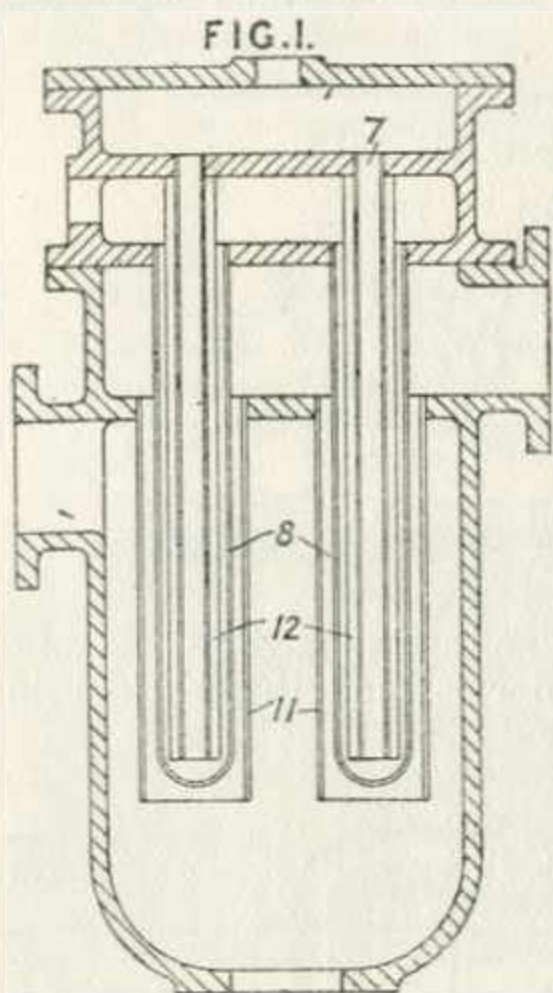


Concentric or jacketed straight-tube apparatus.—In horizontal concentric or jacketed tube apparatus for use in the manner described in Specification 24024/99, [Class 32, Distilling &c.], to prevent the lower elements from being filled with water of condensation, the water is collected and withdrawn independently from the jacket or outer tube of each element. One of the headers of the apparatus shown, in which a number of concentric tubes are connected in series, is formed with water-collecting pockets a², which are connected to a common drain pipe a⁴. In a modification, each of the internal tubes B is replaced by two smaller tubes through which the liquor flows in series.

122,563. Brown, A. W. April 22, 1918.

Field-tube apparatus.—In a condenser or cooler of the kind in which the cooling fluid flows through Field tubes 8 surrounded by jackets 11,

through which the fluid to be condensed or cooled is directed in close contact with the tubes, the internal tubes 7 of the Field tubes are provided

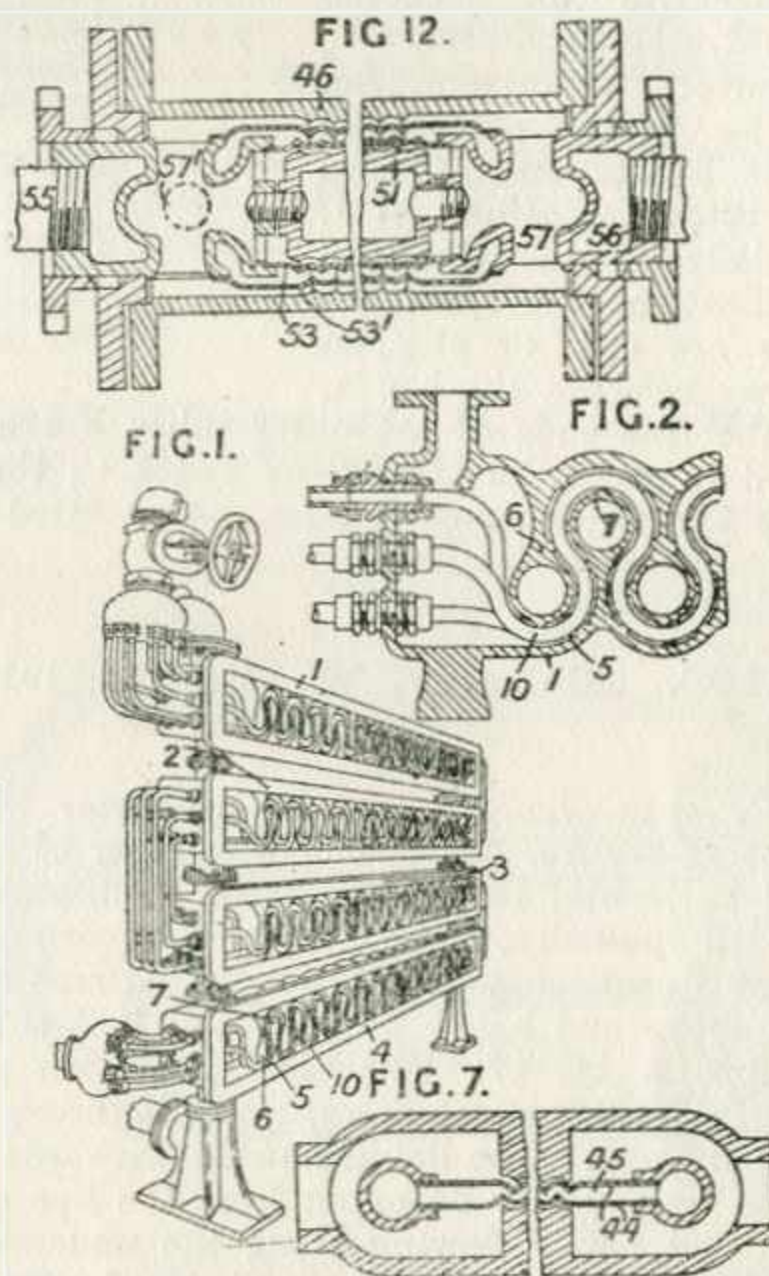


with heat-insulating coverings 12. Heat-insulating coverings may be applied also to the jackets around the tubes.

122,626. Shaw, E. Jan. 25, 1918, [Convention date].

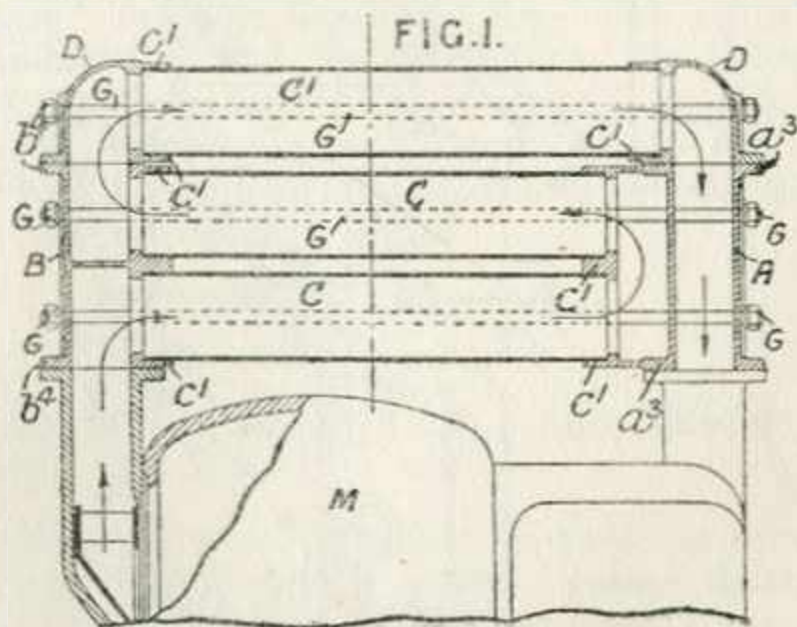
Loop-tube and plate apparatus; tubes of special section.—In an apparatus for the exchange of heat between two volumes of flowing fluids, the formation of films of low conductivity, which may tend to accumulate on the surface of the ducts, is prevented by leading one or both of the fluids through ducts shaped so as to give a continually changing direction to the flow therethrough. In the construction shown in Figs. 1 and 2, the apparatus comprises a series of casings or coil containers 1, 2, 3, 4, each of which is provided with a tortuous duct 5 formed by alternating bosses 6, 7, and through these ducts are led a series of pipes 10. The ducts 5 and pipes 10 of adjacent casings are connected at their ends, and one fluid is passed through the pipes 10, and the other fluid in the reverse direction through the ducts 5. In a modified construction, a series of pipes, each of which is bent into a number of figure-eight loops, are located in a single casing through which a flow of cooling liquid is maintained. In another modification, an inner duct or pipe of substantially rectangular cross-section is formed either from a circular tube or from two plates 44, 45, Fig. 7, brazed together, and is transversely corrugated, with the corrugations of the upper surface alternating with those of the lower surface, as shown. In a further modification, Fig. 12, an inner annular duct is formed

between two transversely ribbed cylindrical tubes 53, 53', and these tubes are located between outer and inner casings 46, 51, so that a flow of fluid is arranged through the duct from an inlet 55 to an outlet 56, while the other fluid flows on both sides of the duct in the reverse direction from an inlet 57 to an outlet 57'. In other arrangements, the two ducts are formed by two



concentric spirally corrugated tubes which give a spiral movement to the fluids in addition to the broken longitudinal movement. One or both of the concentric tubes may taper, in either direction, and the depth of the corrugations may vary along the length of the tubes, or the corrugations may entirely disappear at one end.

122,665. Electromotors, Ltd., Longbottom, B., and Greenhalgh, E. Nov. 2, 1917. Addition to 112,800.

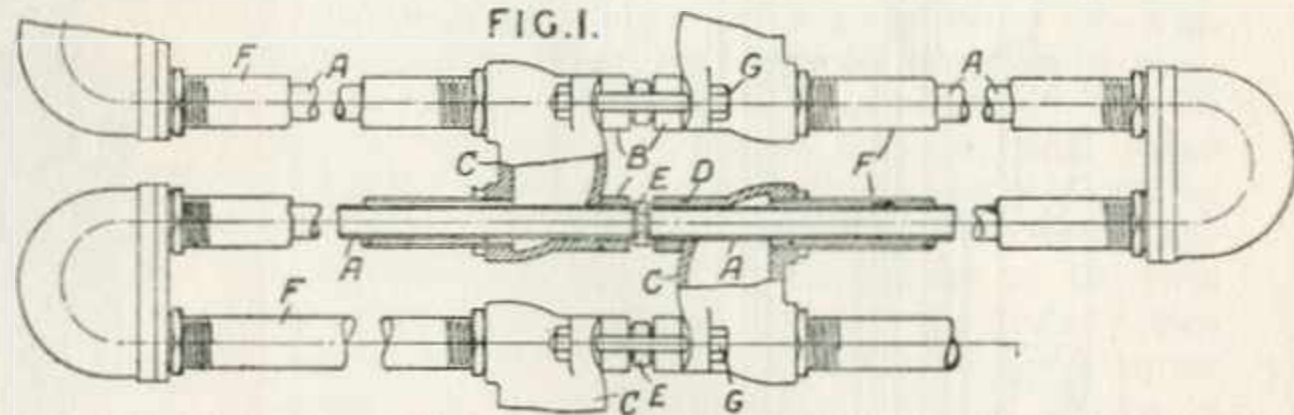


Straight-tubes between headers or connecting-boxes.—The external cooling-chamber of an enclosed dynamo-electric machine M comprises two end boxes A, B having jointing facings a^3 , b^4 and oppositely located sockets c^1 to receive the ends

of the tubular parts C. The top element consists of two similar boxes D receiving tubular parts C^1 . The parts are connected together by bolts G. Any number of elements may be superposed.

122,970. Rons, R. F., and Williams, H. R. April 11, 1918.

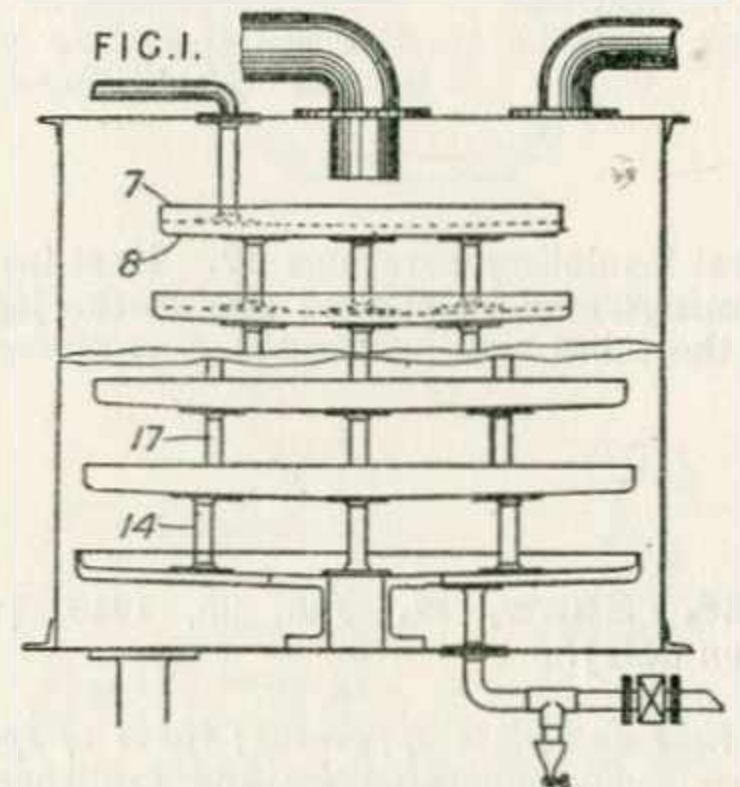
Concentric or jacketed straight-tube apparatus.—In condenser, vaporizers, &c. of the kind comprising double or concentric tubes bent into serpentine form, especially as described in Specification 22670/13, the tubes are cut or stopped midway between the bends, and the free ends of the outer tubes F are connected in pairs, as shown, by boxes C, through which the inner tubes A pass, being fitted with



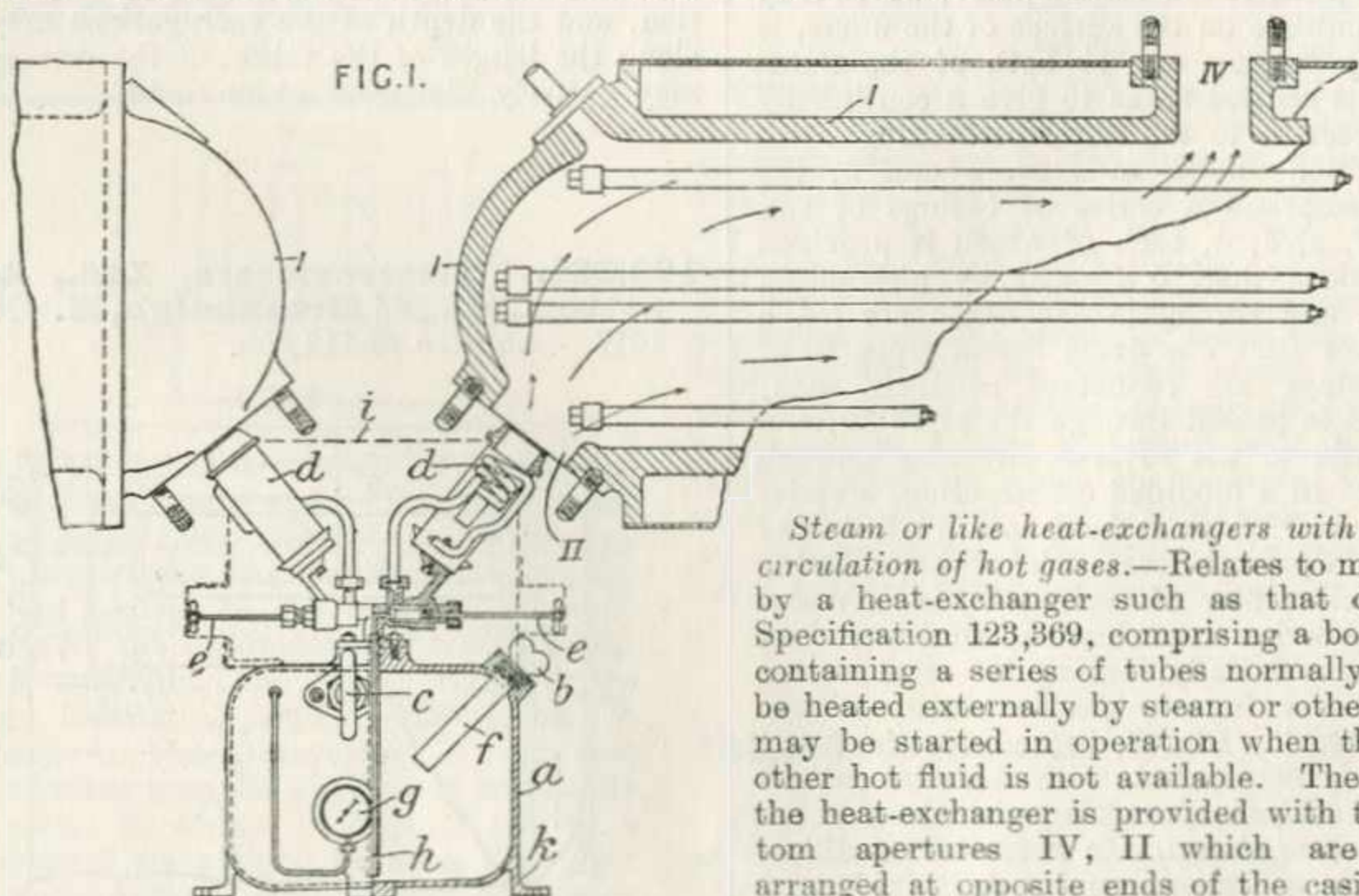
ferrules B and jointing-rings D, and separated by an adapter E, and the whole being held together by bolts G.

123,163. Blakeley, W. Feb. 14, 1918.

Plate apparatus.—A still or preheater for dehydrating tar &c. consists of a number of superposed horizontal troughs or trays 7, diminishing in width upwardly, and each provided with a false bottom 8 connected with the false bottoms of the trays above and below by means of hollow stools or supports 14, 17. The steam, furnace gases, or other heating-agent flows upwards through the series of trays. The liquid flows downwards from tray to tray, partly dropping from the lips of the trays, and partly flowing along the underside of the false bottoms. The stools 14, 17 of successive trays are spaced 60 degrees apart.



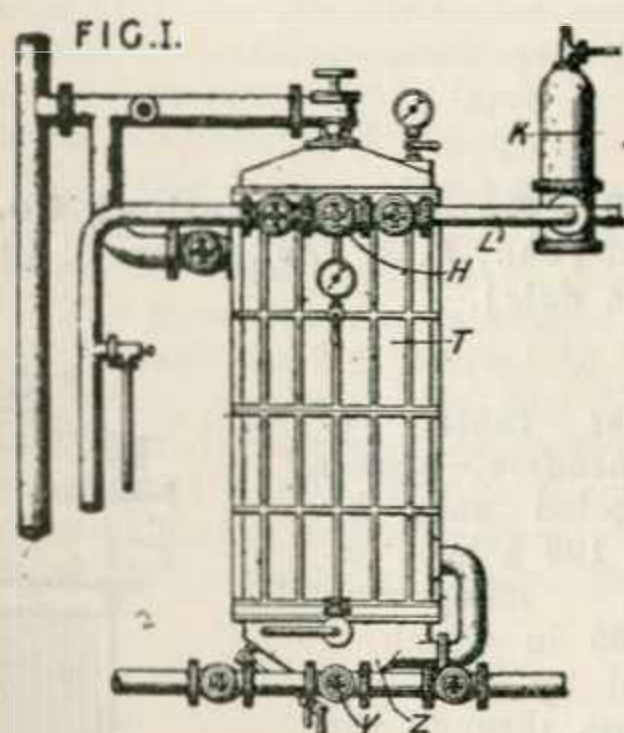
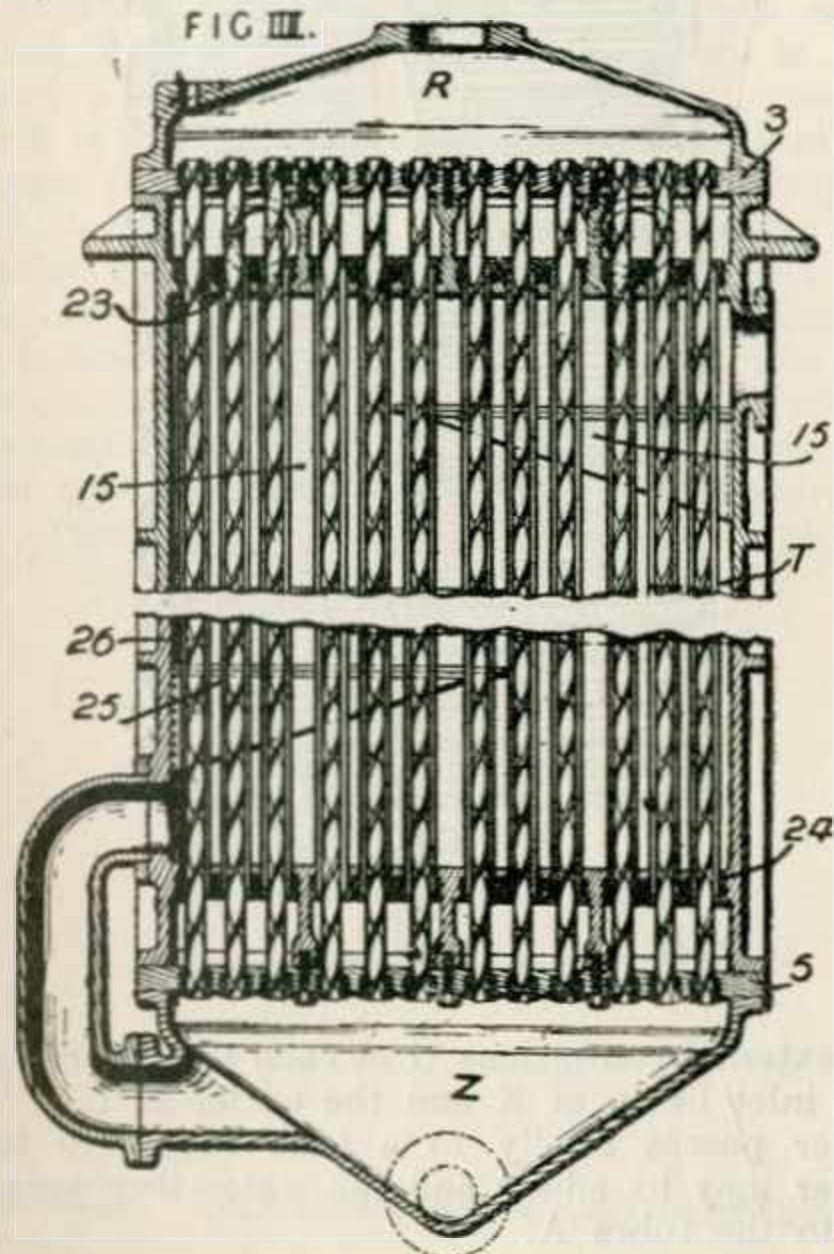
123,246. Thompson, H. A., and Brown, T. T. Feb. 15, 1918.



Steam or like heat-exchangers with preliminary circulation of hot gases.—Relates to means whereby a heat-exchanger such as that described in Specification 123,369, comprising a body or casing containing a series of tubes normally adapted to be heated externally by steam or other hot fluids, may be started in operation when the steam or other hot fluid is not available. The casing 1 of the heat-exchanger is provided with top and bottom apertures IV, II which are preferably arranged at opposite ends of the casing, and are

provided with detachable covers. To start the heat-exchanger, the covers are removed and burners *d* from a portable oil heater are applied to the lower openings II, so that the hot gases therefrom circulate through the casing. When the steam or other hot fluid is available, the burners are removed and the covers replaced.

123,354. Shiraki, T. Jan. 2, 1918.

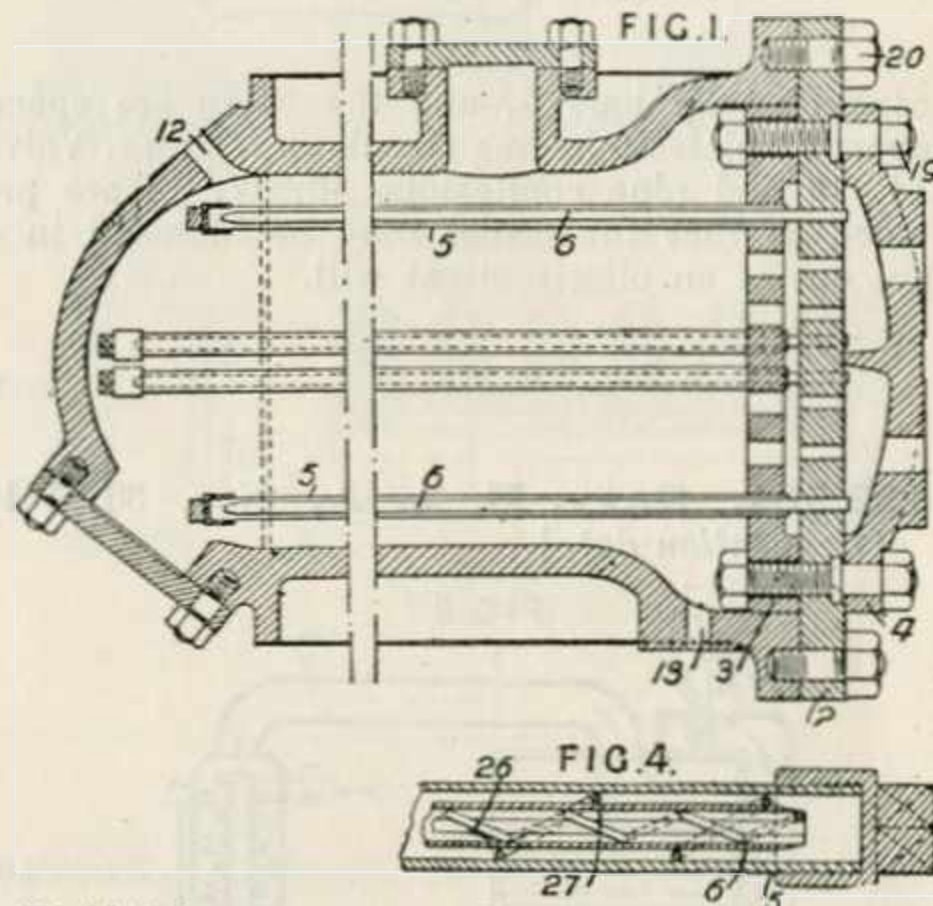


Concentric straight-tube apparatus.—A feed-heater consists of a casing T containing concentric tubes 25, 26, Fig. III, connected to upper and lower spaced tube-plates 3, 23 and 5, 24. The water enters the space between the upper tube-plates and flows downwards through the annular spaces between the tubes to the space between the lower tube-plates. Steam enters at the

upper header R and at the upper part of the casing, and flows downwards through the inner tubes and around the outer tubes. The inner tubes are fitted with helical retarders. Baffles 15 give the steam in the casing a zigzag course. The steam is discharged from the lower header Z through a cock Y, Fig. I, and is taken to the float tank of the feed-pump, the auxiliary condenser, or to the auxiliary air pump. Water may pass directly to the boiler feed pipe L through a by-pass valve H. The feed-pipe is fitted with a shock-absorbing air-vessel K.

Reference has been directed by the Comptroller to Specifications 5917/00, [Class 32, Distilling &c.] and 15359/04.

123,369. Thompson, H. A., and Brown, T. T. Feb. 15, 1918.



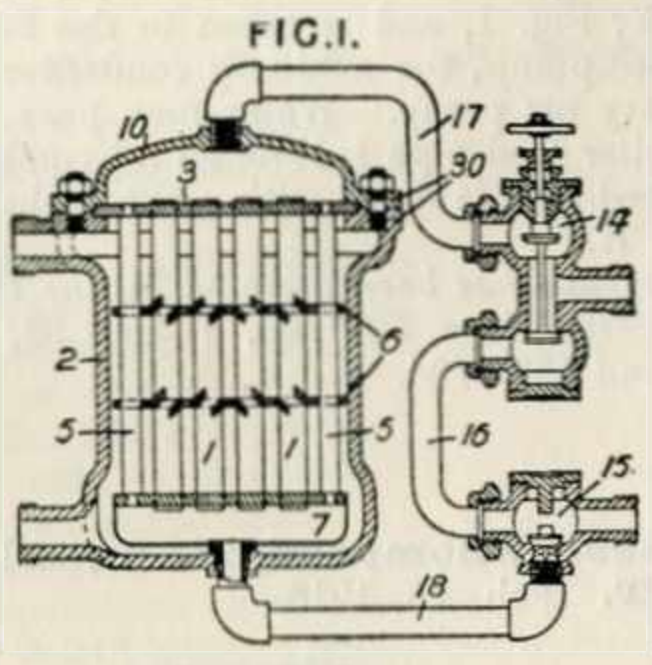
Field-tube apparatus.—In a heat-exchanger for use as a feed-water heater, evaporator, condenser, or cooler, but intended particularly for heating oil fuel, the inner tubes 6 of the Field tubes 5 through which the oil circulates are fitted with rods 26 having wire wound helically around them. Wire 27 may also be wound around the inner tubes. The free ends of the inner tubes are tapered to facilitate entry into the outer tubes. The inner tube-plate 3 and the cover 4 are secured by bolts 19 to the outer tube-plate 2, which is secured by bolts 20 to the end flange on the heater casing. In modifications, the bolts 19 are dispensed with, and the tube-plates are secured by bolts passing through the cover and into the flange on the heater casing. Steam enters the casing through an opening 12, and water is drained away through an opening 13.

123,540. Boella, M., and Meiani, A. April 26, 1917.

Straight tubes between connecting-boxes.—Lubricating-oil to be cooled passes downwards through a cluster of flattened tubes 1 removably

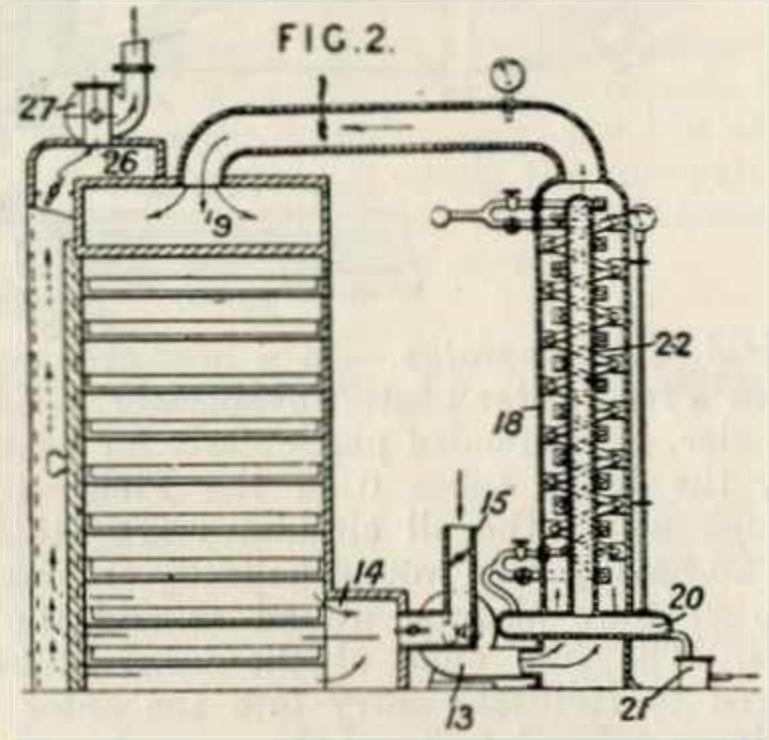


mounted in a casing 2 through which cooling-water circulates upwards. The tubes are connected at the bottom to a chamber 7 and at the top to a plate 3 clamped between flanges 30 on a cover 10 and the casing 2. The tube-plates are



connected by bars 5, and the tubes are spaced apart by plates 6 having struck-up tongues. Valves 14, 15 and pipe connexions 16, 17, 18 are provided so that the cooler may be included in or cut out of an oil circuit at will.

123,984. Savy, E. L. A. Nov. 30, 1916, [Convention date].

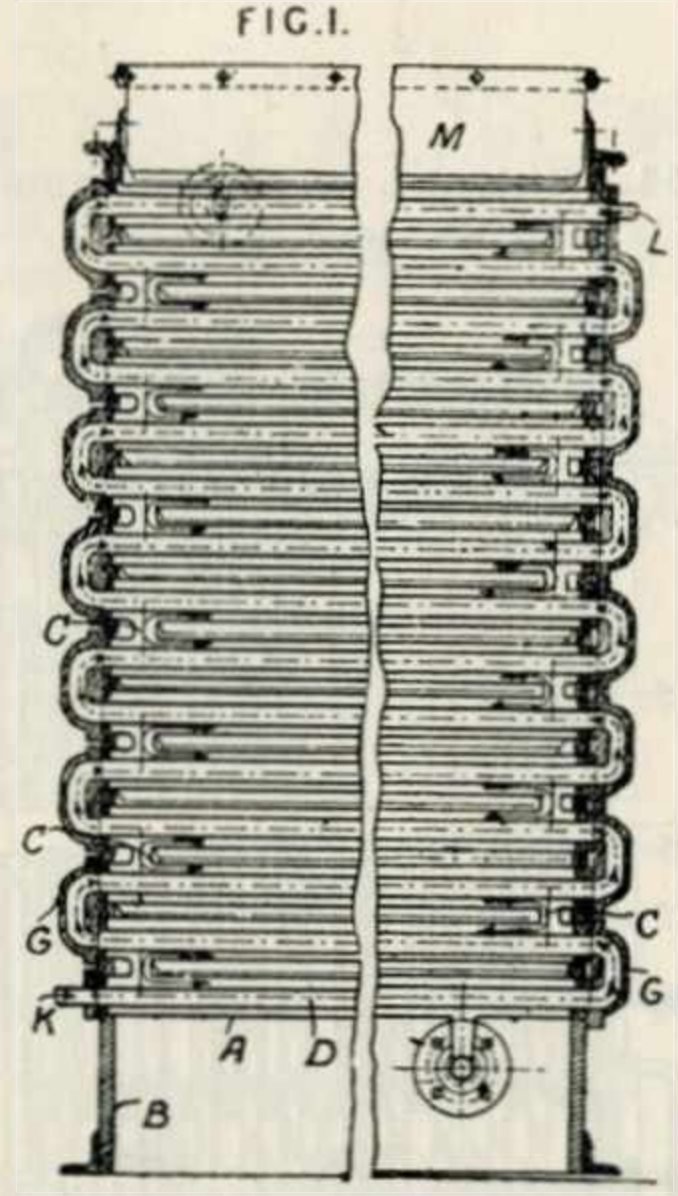


Coil-tube apparatus.—An air heater 18 for use with drying-apparatus comprises a double steam coil discharging its exhaust steam and water into a header 20 connected with a steam-trap 21. From the header, a cylindrical reservoir 22 extends upwards, which assists in heating the air and ensures its passing over the coils.

124,428. Ryffel, F. March 4, 1918, [Convention date].

Concentric straight-tube apparatus.—In a surface condenser, a number of steel tubes A are

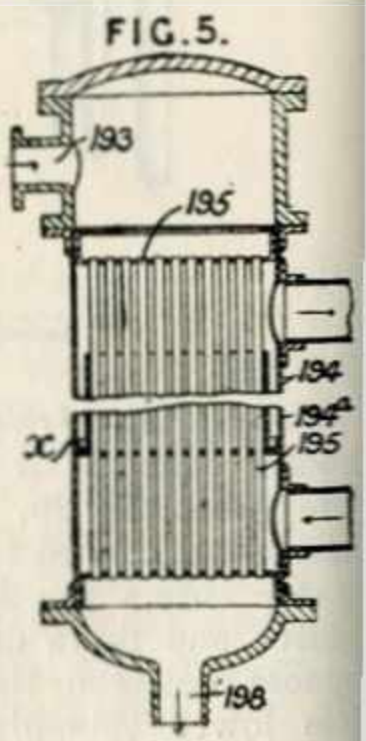
fixed into vertical head plates B, Fig. 1, and are connected alternately at each end by tubes C. The vapour to be condensed passes through the tubes A from top to bottom in a zigzag path. The cooling water passes in counter-current through concentric tubes D which are connected



by external connexions G at each end alternately, the inlet being at K and the outlet at L. The water passes finally to a tank M where fresh water may be added and the water then sprayed on to the tubes A.

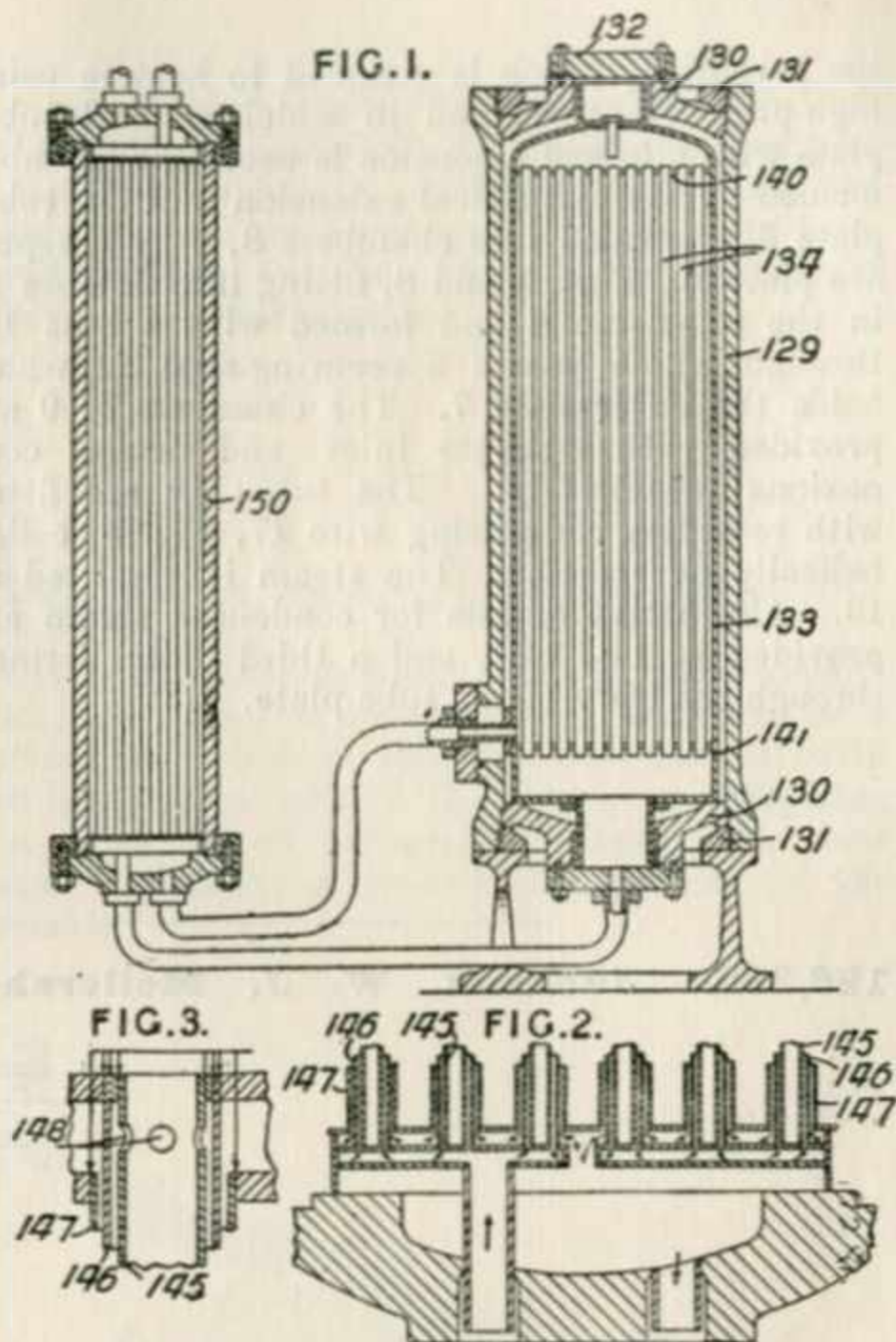
124,759. General Chemical Co., (Assignees of Jahn, F. W. de). Nov. 3, 1917, [Convention date].

Straight tubes between headers.—Gases to be cooled enter by an inlet 193 a heat exchanger, comprising tubes 195 in which it is cooled by air. The gases pass through the tubes 195 which are surrounded by an open-ended cylinder 194 and supported by a ring x, and leave at 198.



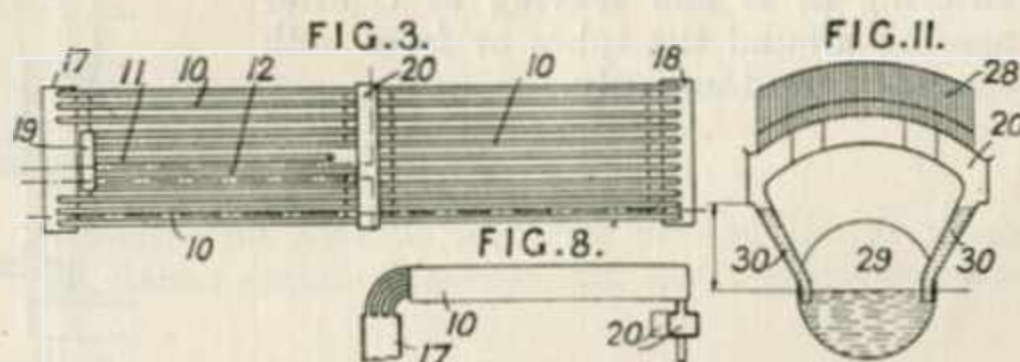
124,762. General Chemical Co., (Assignees of Jahn, F. W. de). Nov. 3, 1917, [Convention date].

Concentric straight-tube apparatus.—In association with a catalytic apparatus there is employed a series of heat-exchangers 150, one of which is shown. The lower part of the heat-exchanger is shown in Fig. 2 and the upper part of the tubes in Fig. 3. The gas traverses the two annular passages between the concentric tubes 145, 146, 147. The central tube 145 is closed at the bottom and serves merely to restrict the gas passage, but forms the exit at the top at which it communicates by holes 148 with the inner annular passage as shown in Fig. 2. In starting the operation, an external heater is employed which is subsequently cut out.



125,968. Aktiebolaget Ljungströms Angturbin. April 15, 1918, [Convention date].

Plate apparatus. — An air-cooled condenser consists of sections connected in series, the cooling-elements in each successive section decreasing in number or size from the steam inlet to the air-pump connexion. A form of apparatus in which plate elements are used is shown in plan in Fig. 3. The steam enters headers 17, 18 and flows through the first section 10 to a central collecting-pipe or header 20. Thence it flows through a smaller second section 12 to a collecting-pipe 19, and finally through the last section 11 to the air-pump. Another form of apparatus comprises two elements, resembling that



shown at the left-hand side of Fig. 3, arranged in parallel. In this form, the headers 20, Fig. 8, consist of boxes placed below the condenser 10 and communicating with it by means of pipes.

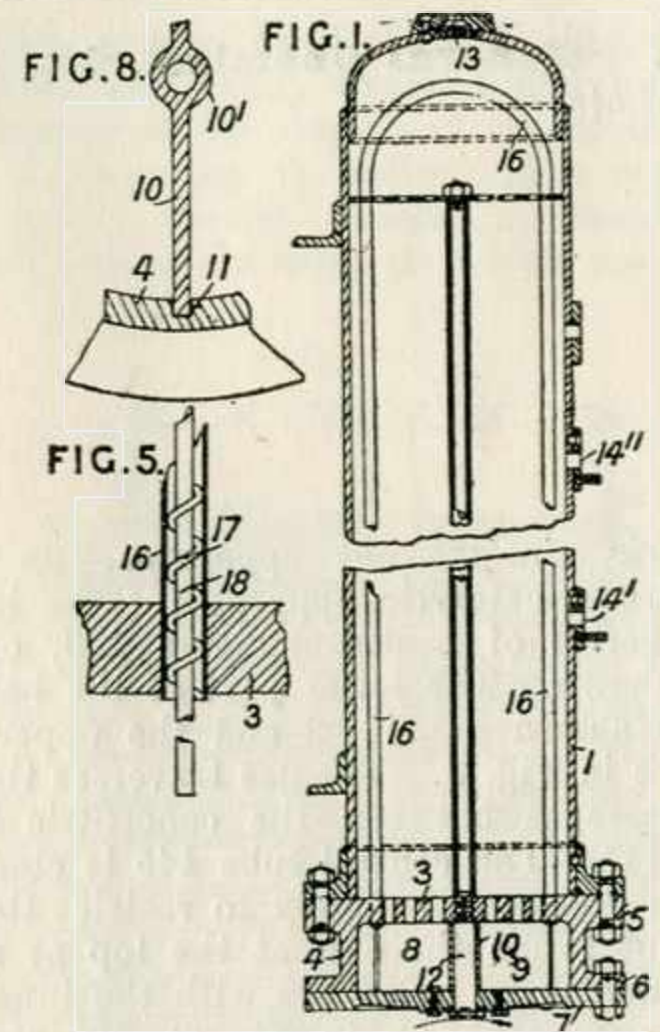
126,102. Cammell, Laird, & Co., Carter, Sir G. J., and Spencer, D. March, 30, 1918.

U-tube apparatus; straight-tube apparatus having internal baffles in tubes.—Relates to oil-fuel heaters, feed-water-heaters, or the like of the

Berryman type, for example as described in Specification 1966/76, and comprising a series of U-tubes, the ends of which are expanded into a tube-plate provided with an integral extension forming a chamber which is divided by a vertical plate into inlet and outlet compartments for the oil &c. passing through the tubes. According to

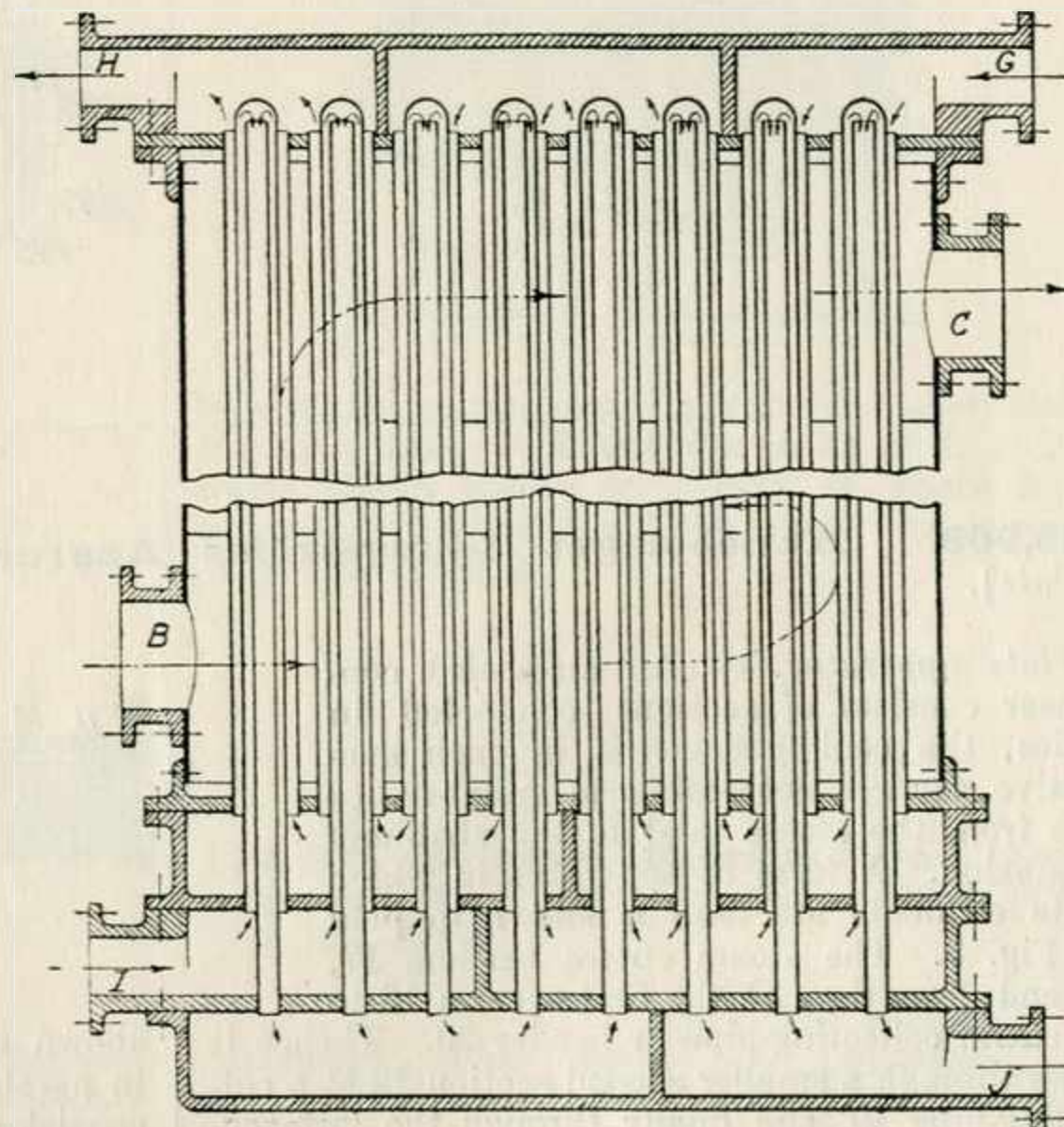


the invention, which is confined to heaters using high-pressure steam and in which a steel tube-plate with a forged extension is used, the chamber formed by the cylindrical extension 4 of the tube-plate 3 is divided into chambers 8, 9 by a separate plate 10, Figs. 1 and 8, fitting into notches 11 in the extension 4 and formed with a boss 10¹ through which passes a securing-stud 12 which holds the cover-plate 7. The chambers 8, 9 are provided with separate inlet and outlet connexions respectively. The tubes 16 are fitted with retarders comprising wire 17, Fig. 5, coiled helically on rods 18. The steam is admitted at 13. Alternative outlets for condensed steam are provided at 14¹, 14¹¹, and a third outlet formed through the body of the tube-plate.



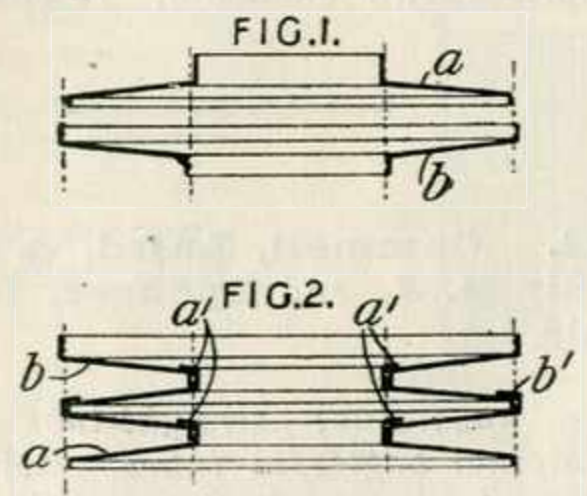
126,396. Jackson, W. J. Mellersh-, (Bombrini Parodi-Delfino). March 1, 1917.

Straight tubes between headers or connecting-boxes. — A heat-exchange apparatus consists of a number of concentric tubes as shown, so that the gas entering at G and leaving at H may receive heat either from gas entering at I and leaving at J, or from gas entering at B and leaving at C after passing around the tubes or from both sources simultaneously.



126,983. Debaugé, H. March 30, 1916.
No Patent granted (Sealing fee not paid).

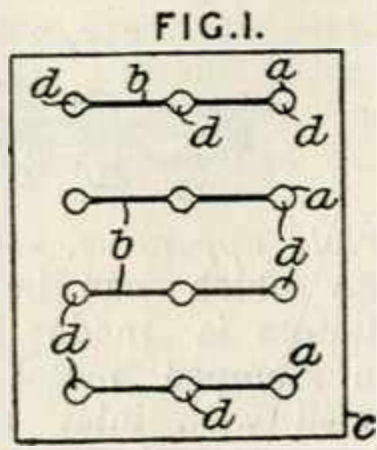
Plate apparatus.—Relates to heat-radiators applicable to the cylinders of internal-combustion engines and comprising male elements or ribs *a* and female elements *b* assembled by bezelling their edges *a*¹, *b*¹, and consists in connecting the elements together by autogenous soldering or brazing. A series of the elements may be used.





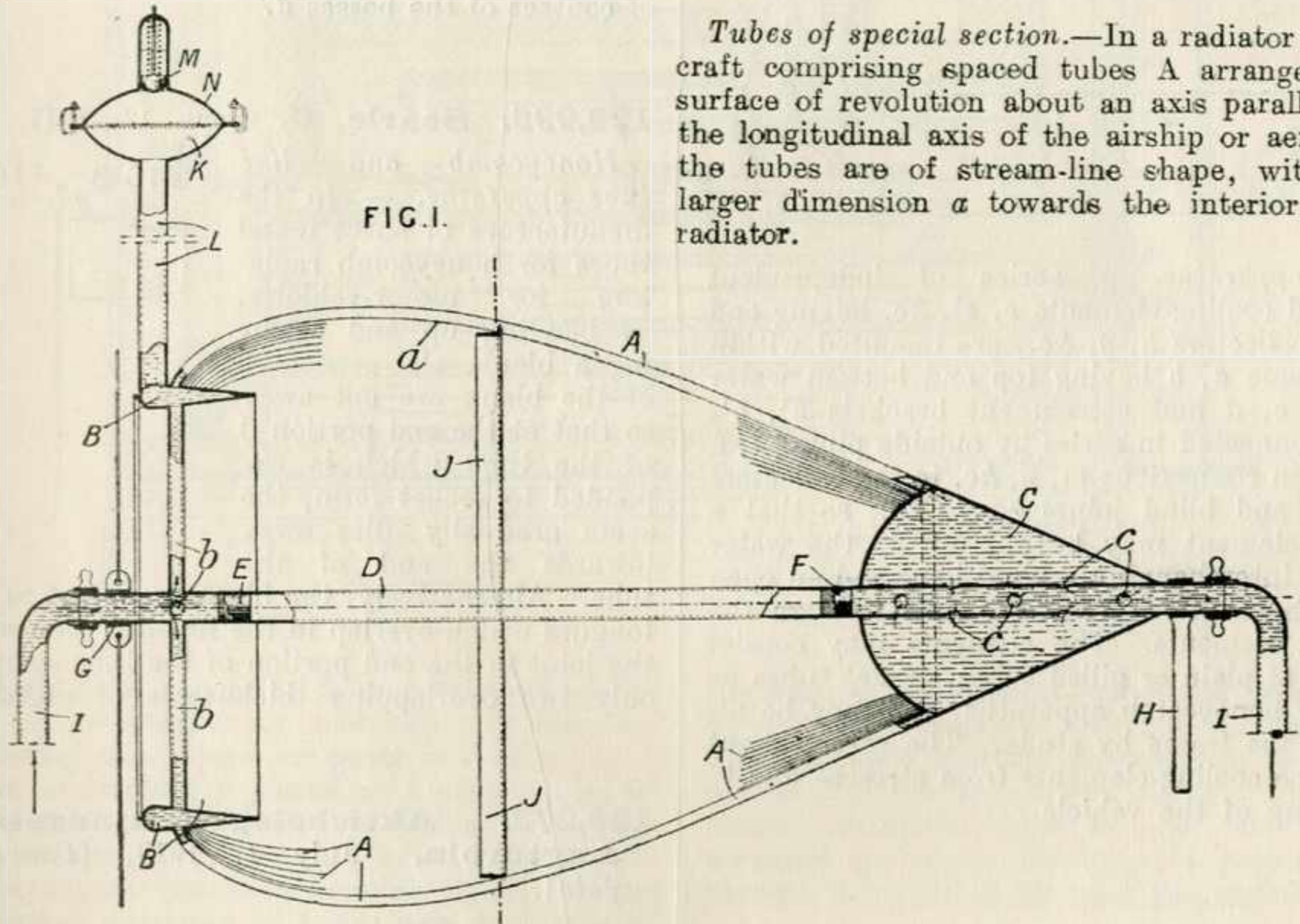
127,107. **Alford, F. E.** May 25, 1918.

Plate apparatus. — A radiator, particularly for use with internal-combustion engines, comprises a number of vertically-arranged elements *a* each formed by bending upon itself a channelled sheet of metal so as to produce a series of water channels *d* in each sheet, the elements being spaced apart by a



number of horizontally-disposed webs *c* which have openings shaped to fit the channelled portions of the sheets *a*. The portions *b* of the sheets between the channels *d* abut so as to form a web dividing the channels, and are soldered or otherwise secured together.

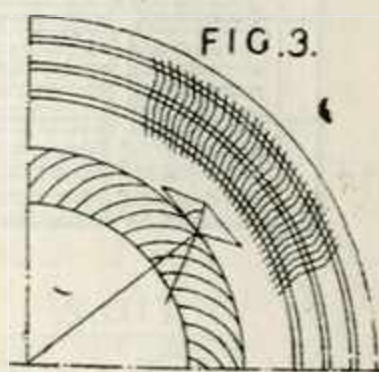
127,338. **Lamblin, A., and Cousin, H. P.** June 14, 1916, [Convention date].



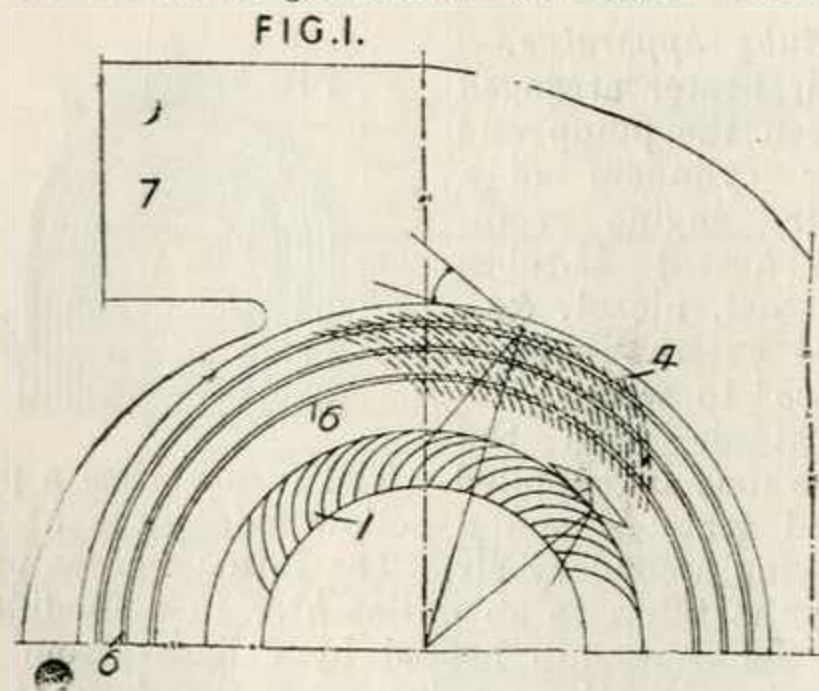
Tubes of special section.—In a radiator for aircraft comprising spaced tubes *A* arranged in a surface of revolution about an axis parallel with the longitudinal axis of the airship or aeroplane, the tubes are of stream-line shape, with their larger dimension *a* towards the interior of the radiator.

127,565. **Harter, E.** May 25, 1918, [Convention date].

Gills for tubes. — A heat-exchanging surface surrounds the runner *1* in a centrifugal fan. Gills *4* on the tubes *6* for heating or cooling medium are so shaped as to form fixed guide-vanes, being arranged so that they are at the angle at which the air leaves the fan blades on the inner sides, while leading the air without eddying to the exit *7*. The intermediate parts of the gills may be normal to the centre row of tubes, as shown in Fig. 3, or continuous gills may be used. If separate, as shown in Fig. 1, the number of gills to a given length of tube may be greater on the outer banks of tubes than the inner, to equalize the heat-exchange, and the gills



themselves may be made larger and thinner or of a better conducting-material the nearer the exit,



for the same purpose. The apparatus is described as for use for heating fluids.



127,578. **Voisin, A.** April 16, 1914, [Convention date].

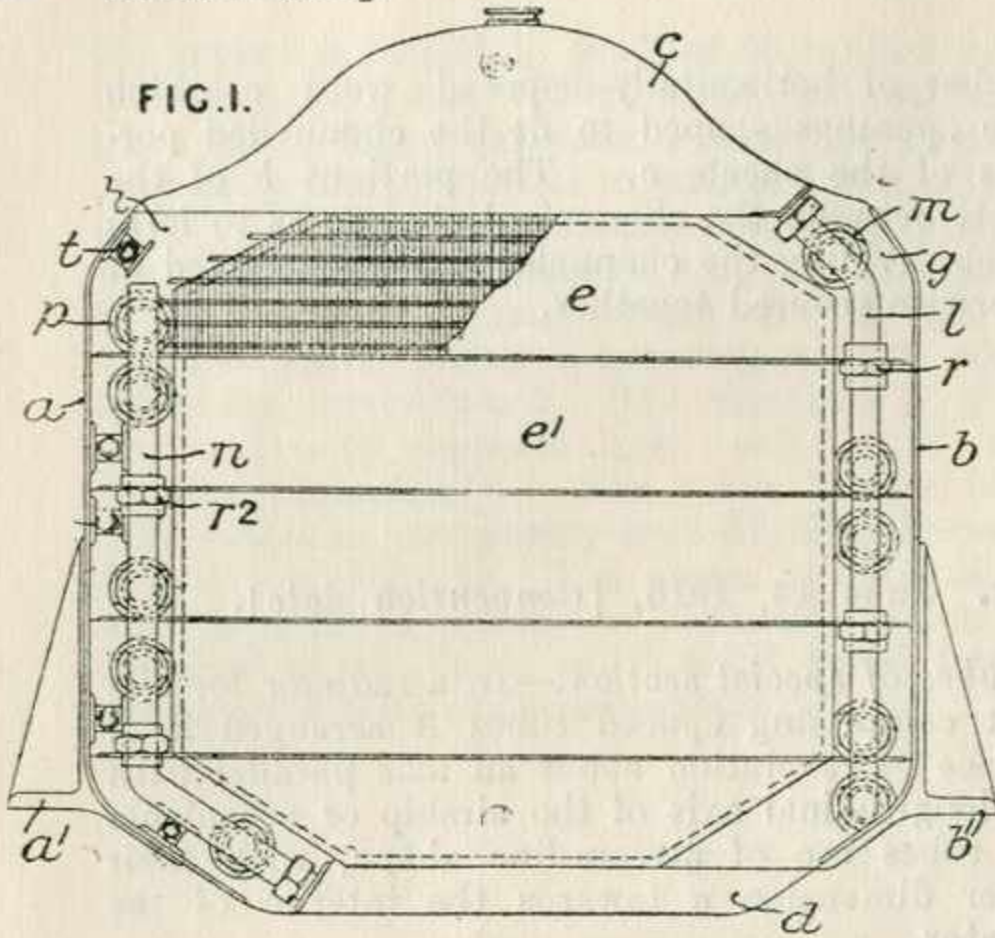
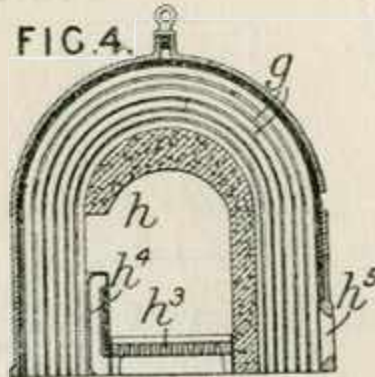


Plate apparatus.—A series of independent superposed cooling-elements *e*, *e'*, &c. having end boxes or collectors *h*, *g*, &c., are mounted within a rigid frame *a*, *b* having top and bottom water chambers *c*, *d* and attachment brackets *a'*, *b'*, and are connected in series by outside piping *l*, *r* having open connexions *m*, *p*, &c. to the collectors *h*, *g*, &c. and blind joints *r*, *r*², &c., so that a damaged element may be cut out of the water circuit by interchanging a blind joint and an open joint, without interrupting the flow through the remaining elements. The elements may consist of groups of plain or gilled tubes, or flat tubes as shown, or honeycomb apparatus, and may be attached to the frame by studs. The arrangement relieves the cooling-elements from stresses due to the running of the vehicle.

127,686. **Lanchester, F. W.** March 21, 1918.

U-tube apparatus.—

An air heater arranged between the pump and power cylinders of a hot-air engine comprises nested U-tubes *g* of steel, nickel, &c., heated externally by a furnace to which the exhaust air from the engine may be supplied.



The furnace has a perforated grate *h*³ and a hollow side piece *h*⁴ for supplying secondary air. The furnace gases pass along the tubes to an outlet *h*⁵. In a modification, the tubes are heated by exhaust from an internal-combustion engine, and the furnace is replaced by a closed fire-clay structure for retaining heat.

128,947. **Moreau, H.** Oct. 13, 1917, [Convention date].

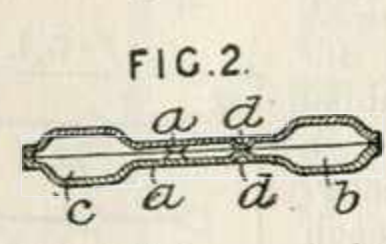
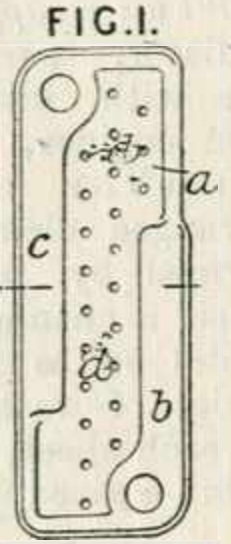
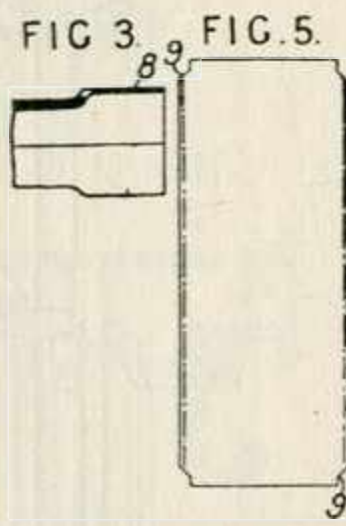


Plate apparatus.—A hollow plate which can be used in radiators is made from two thin stamped metal sheets *a* formed with inlet and outlet holes, water channels *b*, *c*, and inwardly projecting bosses *d*. The sides are united by autogenous welding along the edges and at the points of contact of the bosses *d*.

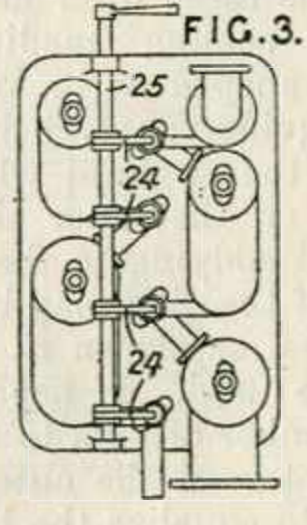
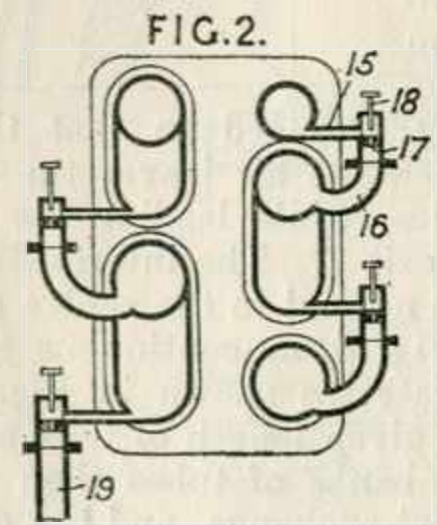
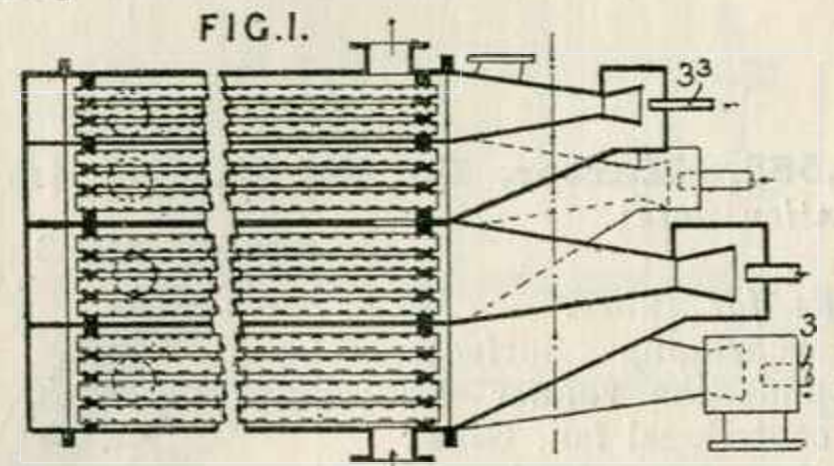


128,996. **Searle, C.** Sept. 17, 1917.

Honeycomb and like tube apparatus.—In the manufacture of sheet metal tubes for honeycomb radiators for motor-vehicles, by bending up and seaming a blank, the corners 9 of the blank are cut away so that at the end portion 8 of the tube which is expanded to socket form, the seam gradually dies away towards the end of the tube. Alternatively, the blank is slotted to leave tongues which overlap in the finished tube so that the joint in the end portion of the tube comprises only two overlapping thicknesses of metal.



129,273. **Aktiebolaget Ljungströms Angturbin.** July 1, 1918, [Convention date].

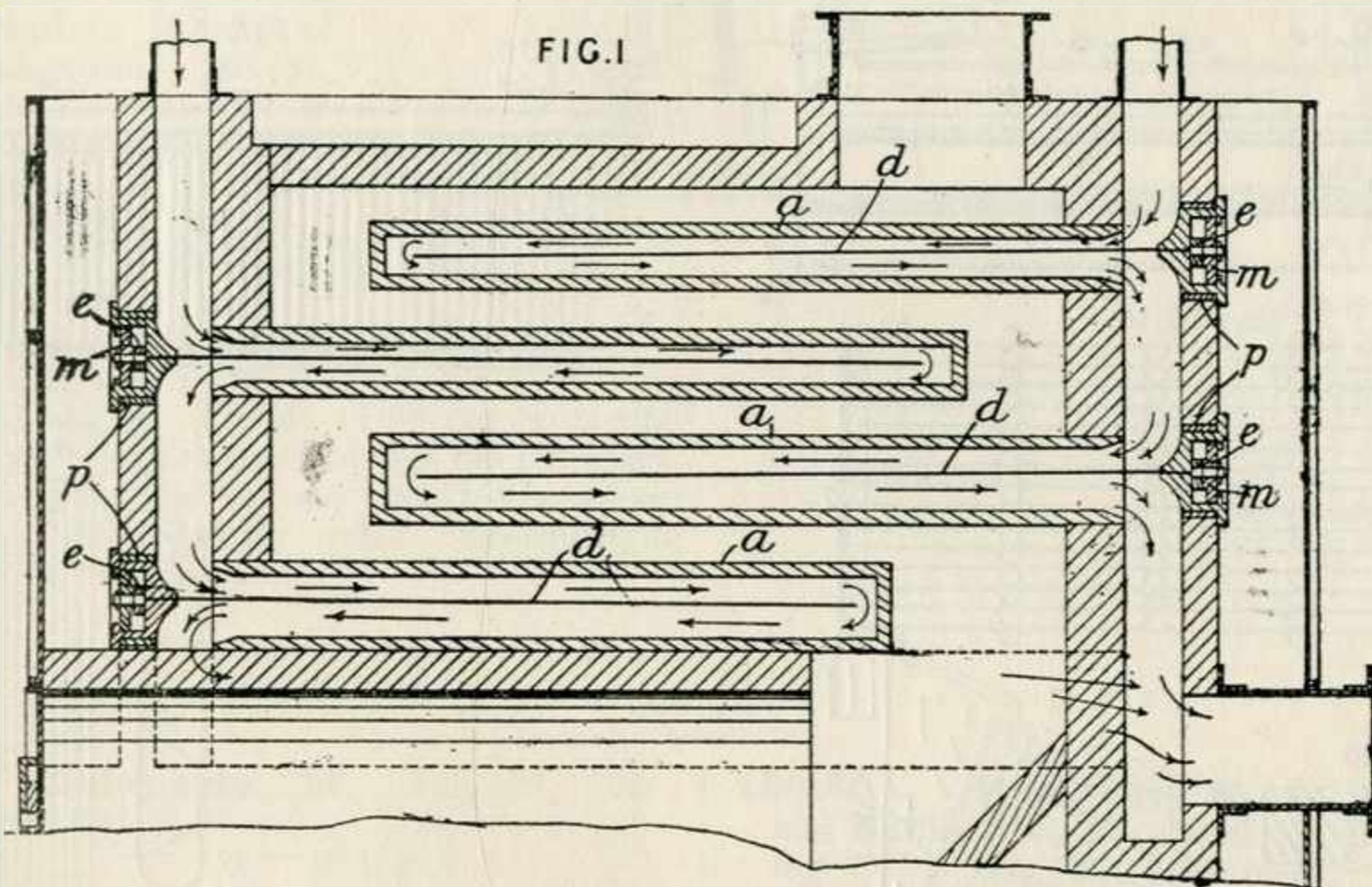




Headers, constructions and forms of.—In apparatus in which a number of ejectors 3 - - 3³ are arranged with intermediate surface condensers, the water of condensation from any section of the condenser escapes by a passage 15, calibrated hole 17, and a pipe 16 to the ejector and condenser of the preceding section. The holes

17 are cleaned by needles 18 which may be operated simultaneously or successively by means of arms 24 arranged on a rod 25. The condensate is finally drawn off through a pipe 19 after having passed through the surface condenser in a direction opposite to that of the entering air and steam.

129,391. Bynoe, F. O. April 9, 1918.

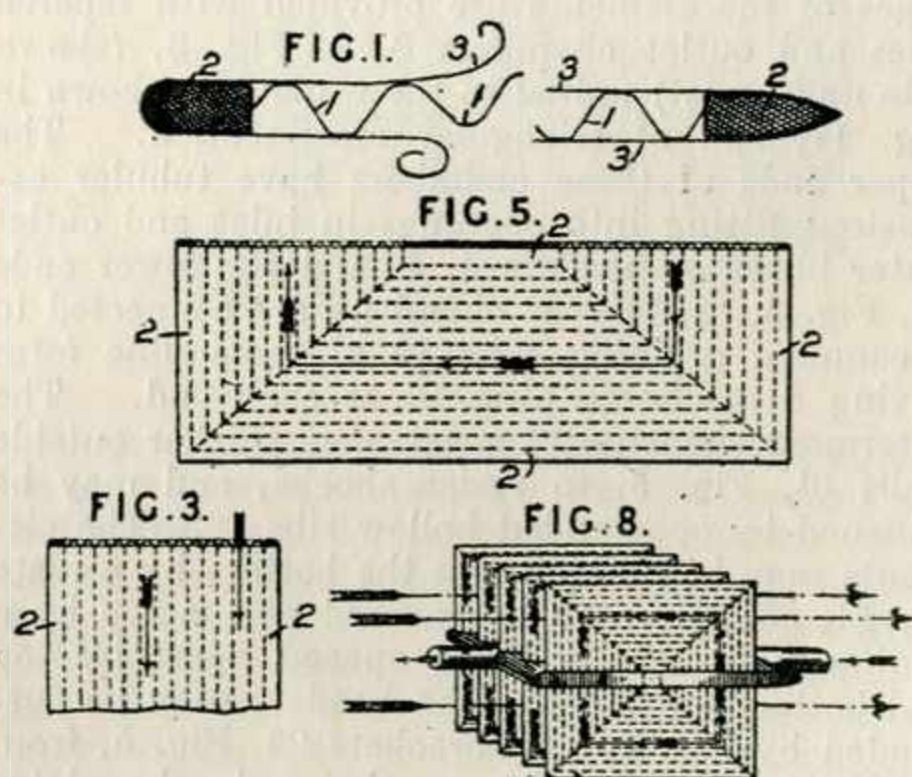


Straight-tube apparatus having internal partitions.—A rectangular or wedge-shaped chamber for heating air, vapour, or gases is divided by a removable diaphragm placed at a slant so as to form a passage for the air &c. gradually increasing in sectional area from the inlet to the outlet. The rectangular chambers *a* are divided by sliding diaphragms *d* carried by heads *e* in frames *p* in

the walls of the headers, the heads being secured by buttons *m* engaging with lugs on the frames. The chambers increase in sectional area in the direction of the flow of the air &c. Two wedge-shaped chambers open at one end may be arranged one above the other, a removable diaphragm being fitted between the chambers.

130,104. Cuau, C. April 3, 1917, [Convention date].

Plate apparatus.—Hollow plate elements for motor-car, aircraft and like radiators are made of very thin metal walls 3 strengthened at the edges by rigid internal members 2 and supported internally by thin corrugated metal sheets 1. The parts may be united by lining the metal walls 3 with thin layers of tin, and heating the whole while pressure is applied to the surfaces. The rigid frame members 2 are shaped so as to present a rounded edge in the direction of motion or opposite to the flow of air, and a sharp edge towards the rear. The elements may be constructed as shown in Fig. 3, so as to allow of a through water passage from a top to a bottom header, or triangular or trapezoidal elements may be combined to form plates having rigid mem-



bers on three edges and on a part of the fourth, as shown in Fig. 5. An arrangement of parallel plates on each side of a divided flat header is shown in Fig. 8. The front and rear edges of the header are rounded and sharp respectively, and

the water follows the direction indicated. The plates may be arranged radially around a central supply and discharge pipe, or may depend from a divided top header having inlet and outlet connexions.

130,109. Cuau, C. Feb. 2, 1918, [Convention date]. Addition to 130,104.

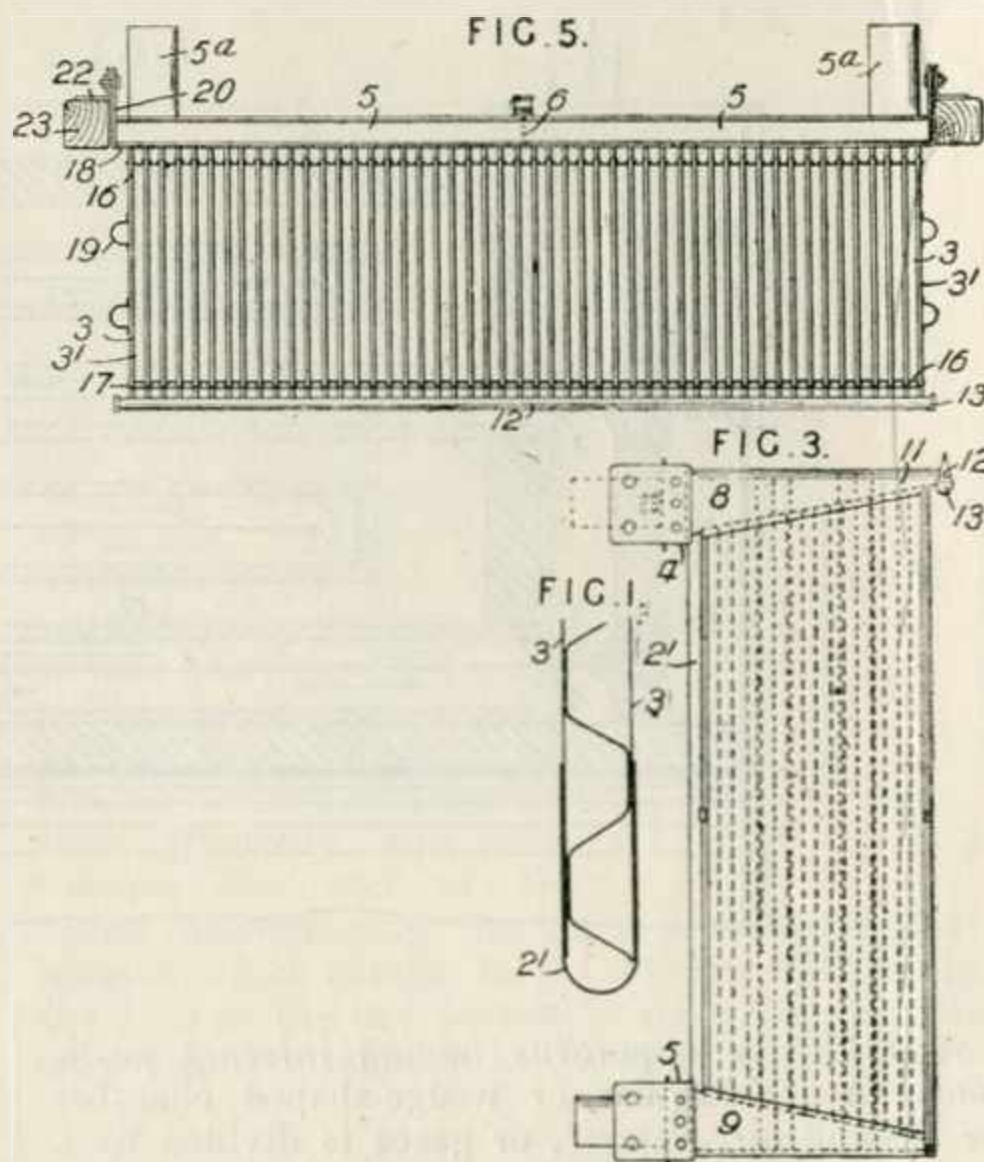
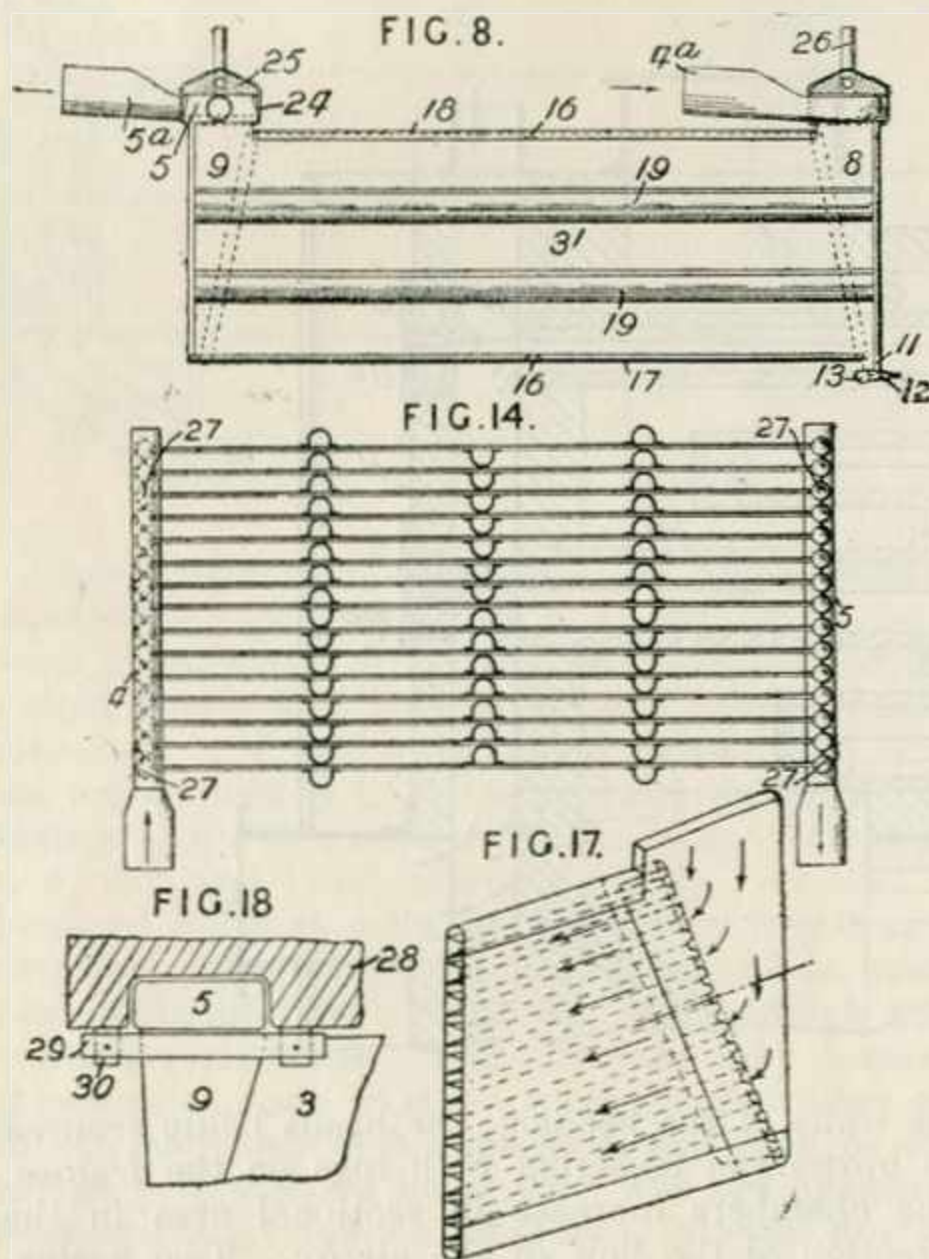
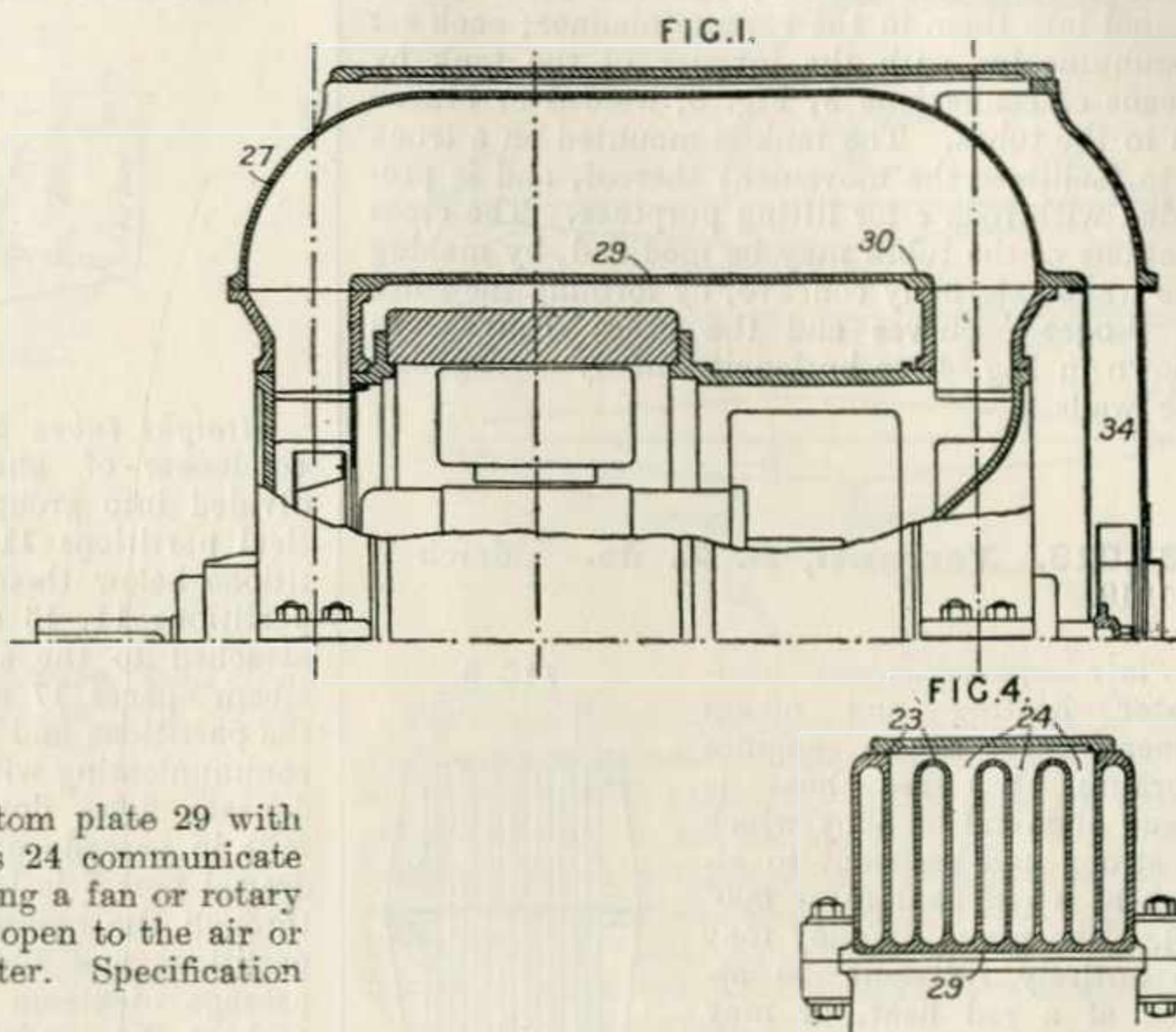


Plate apparatus.—The rigid internal borders of the hollow plate elements of radiators for aircraft described in the parent Specification are replaced by external folded strips 2', Figs. 1 and 3, of comparatively thick metal, united to the thin walls 3 of the elements. The front and back edges of the elements are provided with tapered inlet and outlet chambers 8, 9, Fig. 3, (shown side uppermost) united to the walls 3 as shown in Fig. 17, and of triangular cross-section. The upper ends of these chambers have tubular extensions fitting into openings in inlet and outlet water boxes or headers 4, 5, and the lower ends 11, Fig. 3, of the rear chambers are connected to a common draining tube 12 of streamline form having a discharge plug 13 at each end. The outermost elements of a set have thicker outside walls 3', Fig. 5, to resist shocks, and may be stiffened by open-ended hollow ribs 19. The elements may be protected at the bottom by a plate 17, Fig. 5, and may be covered at the top by a similar plate 18, and are spaced apart by top and bottom strips 16. The headers may be suspended by lugs 20 and brackets 22, Fig. 5, from longitudinal bearers 23, so that only the plates

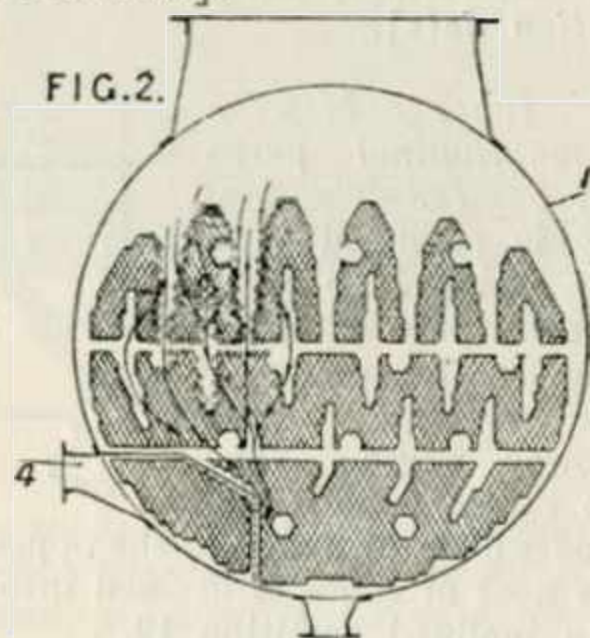
project into the path of the air current. The flow of water through the plates may be reversed by providing a partition 6 in the header and both inlet and outlet pipes 5a on the front header, but preferably the water inlet pipes 4a are arranged on the back header and the outlet pipes 5a on the front. Another method of supporting the radiator under the fuselage or under the wings of the aircraft is shown in Fig. 3. The headers are secured by straps 24 to cross bearers 25. Curved inlet and outlet pipes 4a, 5' are employed, and the headers may be fitted with pressure-gauge connexions 26 to enable the loss of head to be ascertained. In a further arrangement, the ribs 28, Fig. 18, of the wing may be notched to receive the headers, which are secured by bars 29 detachably connected to lugs 30. Fig. 14 shows (side uppermost) an arrangement of elements especially adapted for aircraft of moderate speed, the elements being deep but narrow from front to back. The elements are fitted with distributing tubes 27 connected to headers 4, 5, both tubes and headers being of streamline form. The water flows vertically through the elements.

130,435. **Burleigh, J. W.** May 30, 1918.

Plate apparatus. — Relates to apparatus for cooling dynamos &c. of the type in which air is circulated through the dynamo casing and passed through a heat-transferring apparatus mounted on the casing in the opposite direction to cooling fluid. The heat-transferring apparatus which may be mounted on the casing in the manner described in any of the Specifications 116,481, 116,571 and 118,392, [all in Class 35, Dynamo-electric generators &c.], is composed of two sets of flat-sided ducts 23 and 24. The ducts 23 are closed at the ends by walls 27 and communicate through openings 30 in the bottom plate 29 with the dynamo casing. The ducts 24 communicate at one end with a duct containing a fan or rotary pump and at the other end are open to the air or lead into a waste pipe for water. Specification 128,330 also is referred to.

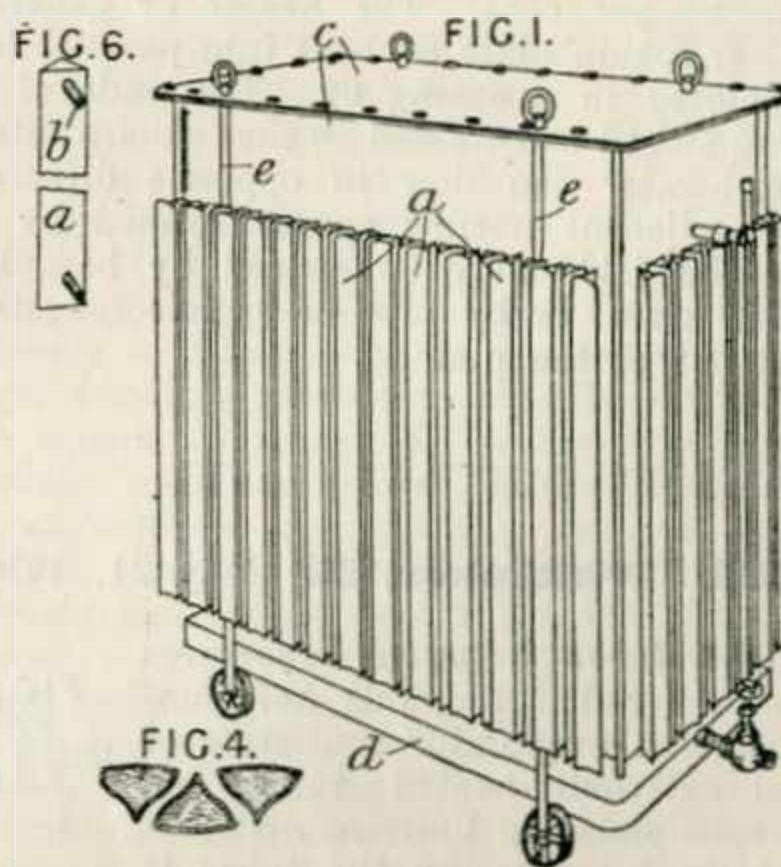


130,591. **Delaporte, M.** July 27, 1918, [Convention date].



Straight tubes between headers.—In surface condensers having the tubes arranged in groups with channels between them to facilitate passage of steam to the groups furthest from the inlet, the central portions of each of the groups are removed, as shown. The spaces thus made are in the lower part of the upper groups, and are in coincidence with similar spaces in the upper part of the lower groups. The arrangement of tubes thus becomes generally of inverted-V shape and provides for a more even distribution of pressure. The general direction of the recesses is from the steam inlet 1 to the suction orifice 4 of the gases.

130,805. **Pembrey, T. A., Kirby, A., and Kirby, W. H.,** (trading as Empire Welding Co.). Aug. 22, 1918.

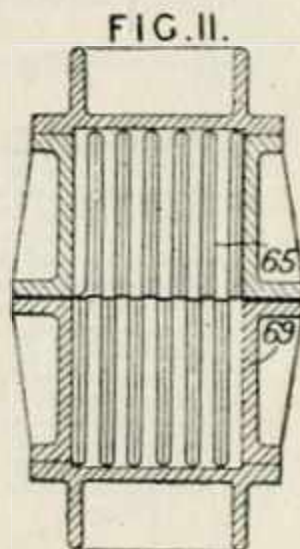


Tubes of special section.—A liquid heating and cooling system such as, for example, cooling the circulating liquid in the tank of an electric transformer, comprises a number of tubes of substantially triangular cross section communicating with the tank and arranged in spaced relation to each other with the bases of the adjacent tubes oppositely disposed to enable the air to have free access to their radiating surfaces. As shown in

Fig. 1, one set of tubes *a* is arranged with their bases towards the tank *e*, and the other set is nested into them in the reverse manner; each set communicates with the interior of the tank by means of connexions *b*, Fig. 6, welded or brazed on to the tubes. The tank is mounted on a truck *d* to facilitate the movement thereof, and is provided with rods *e* for lifting purposes. The cross sections of the tubes may be modified, by making the walls externally concave, by forming the sides as "ogee" curves and the bases convex, as shown in Fig. 4, or by longitudinally corrugating the walls.

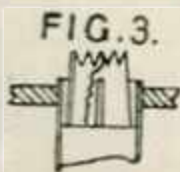
131,013. Ferranti, S. Z. de. March 7, 1918.

Plate apparatus.—A feed-water heating and steam generator for steam engines working at a red heat is made of metal or alloy which is strong and resistant to attack at a red heat (over 600° C.). The metal or alloy may be entirely resistant to attack at a red heat, or may form a resistant film which prevents further attack, and may be a metal of the chromium group, with or without a metal of the nickel group, boron, aluminium, silicon, or a rare-earth metal. A suitable alloy contains nickel 62 per cent, chromium 20 per cent, iron 5 per cent, carbon $\frac{1}{2}$ per cent, silicon 4 per cent, and aluminium $8\frac{1}{2}$ per cent. The heater or generator comprises a thin plate 65 bent into parallel folds and enclosed in a casing 69. The ends of the plate are sloped and welded so that exhaust steam and feed-water can flow in opposite directions through adjacent narrow spaces formed by the folds. The folds may be spaced by bars held apart by wires, or by pips or cross-corrugations pressed out of the plate.

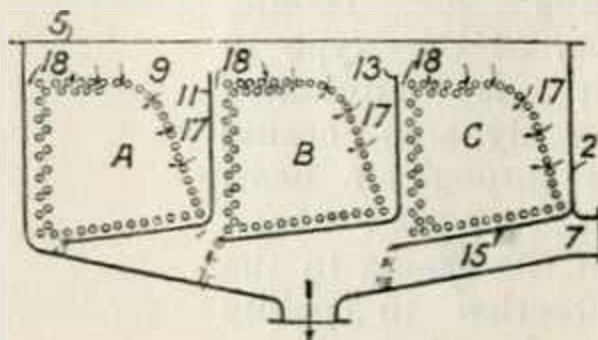


131,365. Whittaker, E. May 21, 1918.

Straight tubes between headers.—Apparatus for distilling oils &c. comprising a film evaporator consisting of vertical externally-heated tubes between tube-plates, a uniform distribution of the oil entering the tubes is ensured by fitting their upper ends with a sleeve of the construction shown in Fig. 3; these sleeves may be provided with hoods. Horizontal baffles may be provided in the space around the tubes in a preheater also consisting of vertical tubes between tube-plates; these baffles consist of plates formed with apertures through which the tubes pass, leaving an annular space between the tubes and the rims of the apertures for the passage of liquid.



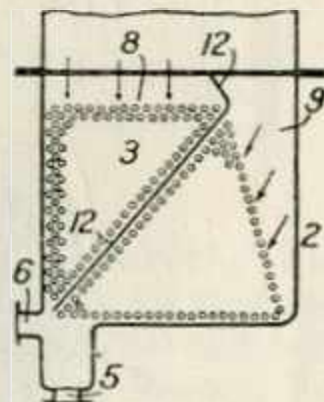
131,593. Ehrhart, R. N. Aug. 21, 1918, [Convention date].



Straight tubes between headers.—In a surface condenser of shallow design, the tubes are divided into groups A, B, C, separated by vertical partitions 11, 13, and having inclined partitions below them, formed by extensions of the partitions 11, 13 and by a separate partition 15 attached to the side wall 2. Converging free steam spaces 17 are left between the tubes and the partitions and a free space 9 above the tubes, communicating with the steam inlet 5. The condensate flows down the inclined partition and falls in cascade over their edges. The air-withdrawal port 7 is located so that the air is drawn through the cascades. Passages 18 between the partitions and the nests of tubes serve for the passage of steam directly through the cascades to heat the condensate.

131,594. Ehrhart, R. N. Aug. 21, 1918, [Convention date].

Straight tubes between headers; longitudinal partitions and baffles.—The nest of tubes 3 is arranged in a rectangular casing 2 so as to leave a steam-space 8 above the tubes and a steam space 9 at one side converging to one of the lower edges. The condensate outlet 5 and air-discharge port 6 are arranged at the opposite lower edge. The nest of tubes is divided into two sections by an inclined partition 12.

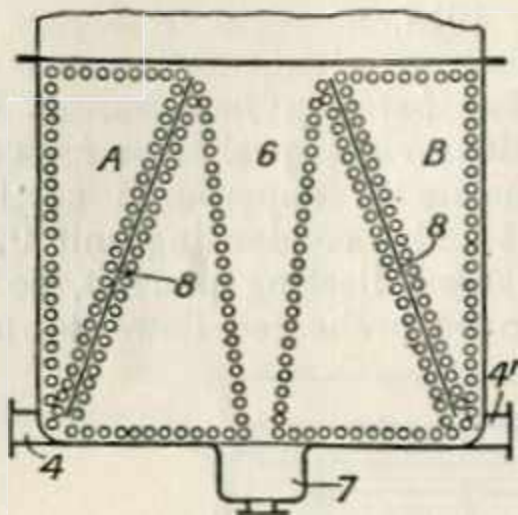


131,595. Ehrhart, R. N. Aug. 21, 1918, [Convention date].

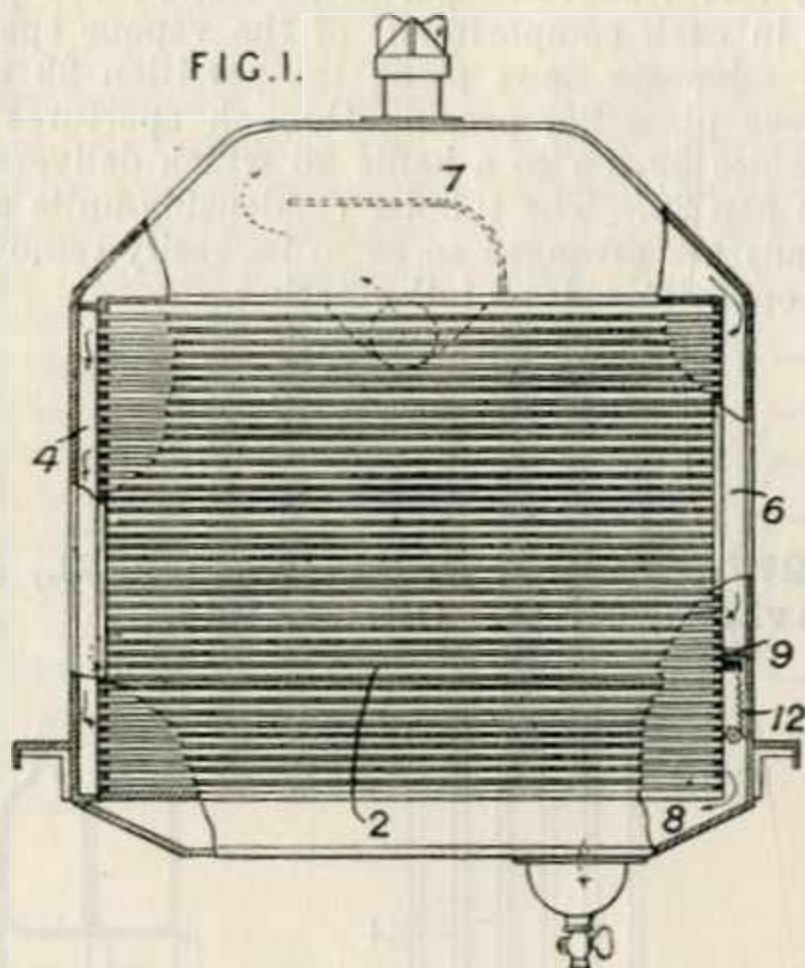
Straight tubes between headers.—Steam can enter either of two banks of tubes A, B, in a condenser of rectangular form, from two sides, one being on the top and the other facing a wedge-shaped passage-way 6. Each bank is divided by a baffle 8 into two wedge-shaped blocks in which steam flows in a path of decreasing section towards an air port 4 or 4'. Condensation water is withdrawn from a sump 7.

(For Figure see next page.)

131,595.



132,007. **General Radiators Co.,** (Assignees of *Cormier, J. O.*). Feb. 12, 1917, [Convention date].



Straight tubes between headers; tubes of special section.—To vary the cooling effect of a motor-car radiator, a movable partition is so fitted opposite one end of the water-circulating tubes that the volume of water passing through the tubes may be varied. Water from the inlet chamber 7 of a radiator flows into a vertical side passage or header 6, through the upper set of tubes 2, and into the opposite header 4, from which it flows through the lower set of tubes to the outlet chamber 8. A partition 9 fitted in the header 6 between the upper and lower sets of tubes may be moved vertically by a rack and pinion 12. The tubes are wedge-shaped and inclined downwards towards their front narrow edges, the partition being inclined to correspond with the inclination of the tubes.

132,317. **Heyworth, C. F.** Sept. 8, 1918.

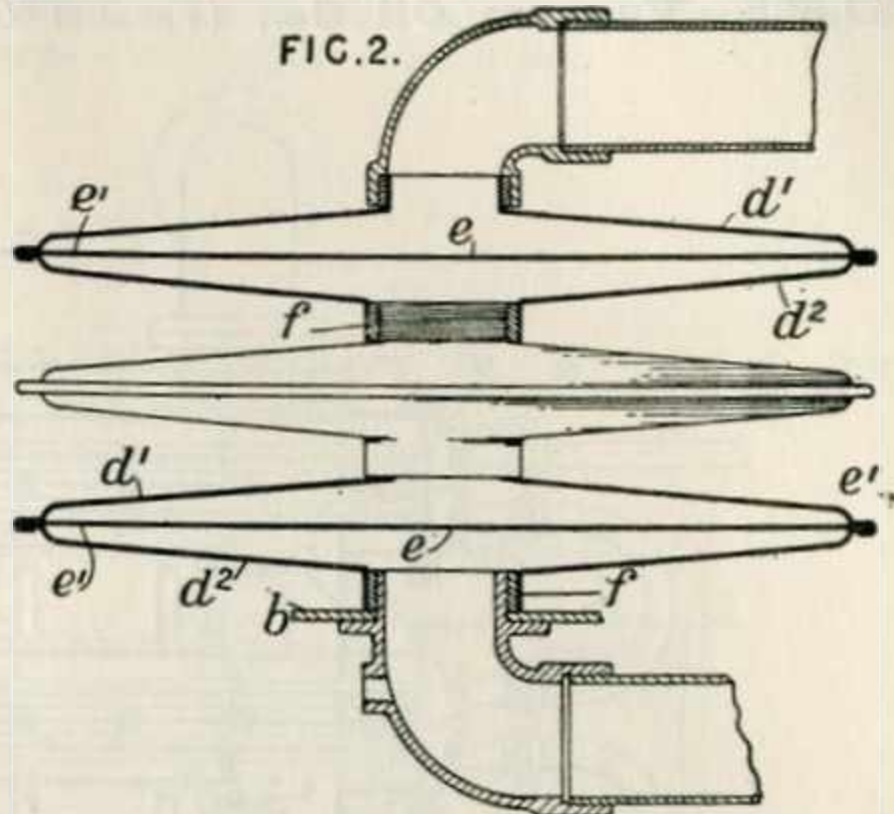


Plate apparatus.—A calorifier *d*, for use in circuit with a domestic boiler, is composed of a series of dished plates *d*¹, *d*² of non-corrodible metal having a central disk *e* provided with holes *e*¹ near the outer edge. The various parts are screw connected, as shown, or held together by a through bolt, in which case the central flanges *f* are fitted with distance pieces passing through the diaphragm *e*.

132,584. **Munro, H.** Aug. 26, 1918.

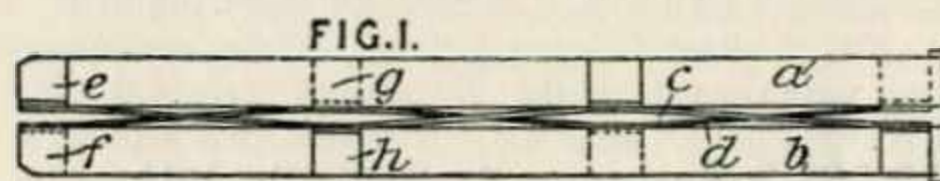
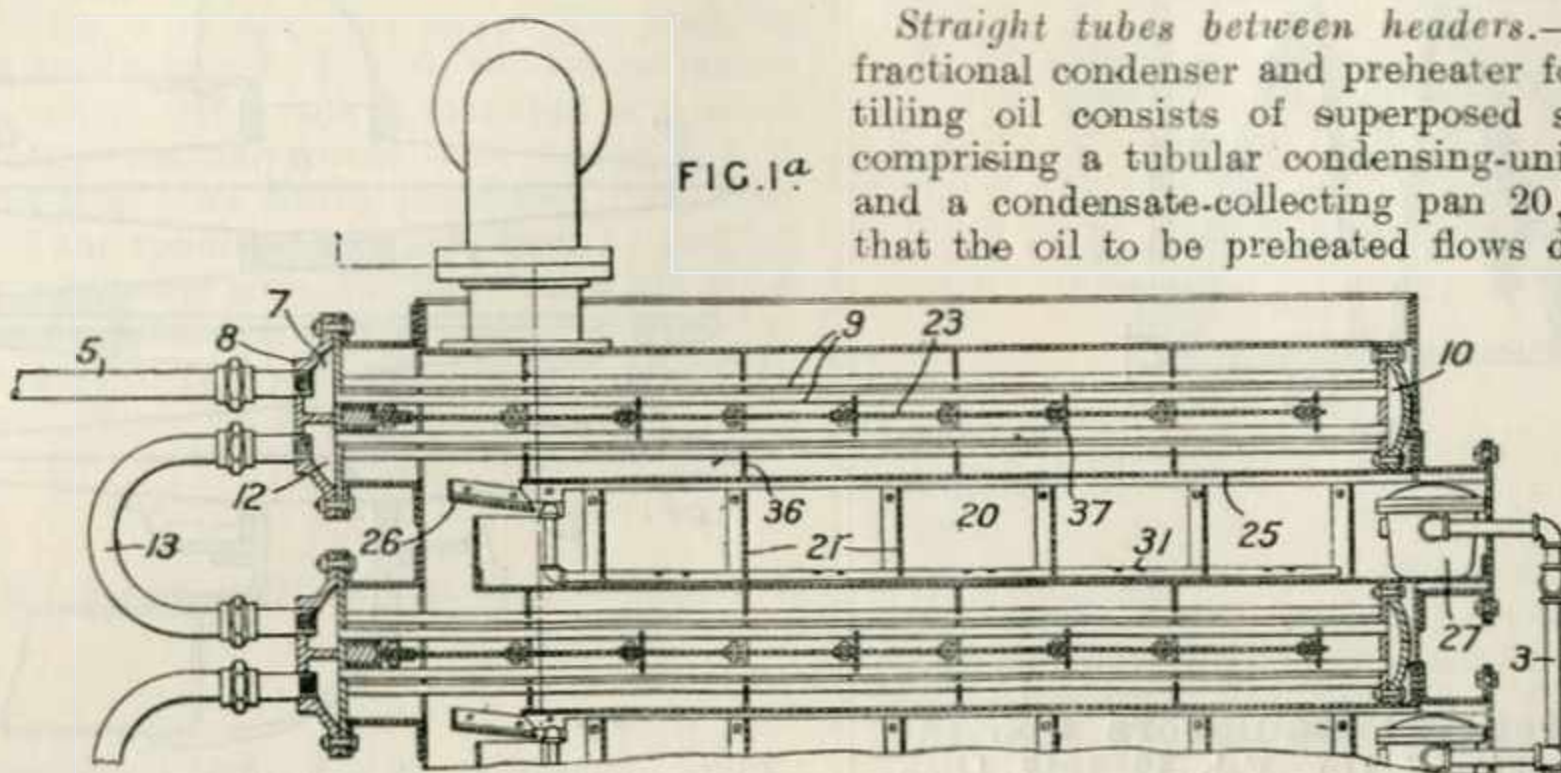


FIG. 3.



Baffles and partitions in tubes.—The tubes of heat-exchangers, for example of boilers, are fitted with baffles which have wings *a - - d* substantially radial and parallel to the tubes and so connected by angle-pieces *e - - h* or otherwise that compression is necessary to insert them in the tubes *c*¹. The wings, during compression, are in contact along their central edges and divide the tube into substantially equal segments. In one modification, the angle-pieces are flexible, and, in another, pairs of wings of **V**-section are used, united at intervals along their length, to effect the same purpose. One Provisional Specification describes baffles having hollows on their outer edges leaving a spiral path for the gases, and also slit on their outer edges to effect a better grip of the inner surface of the tube. The other Provisional Specification describes baffles made from a single plate corrugated longitudinally to a star or **Z** form, the provision of a stop on the baffles to prevent over-insertion, and the construction of radial winged baffles in which **U**-shaped portions are punched out from a bent strip forming two wings, a third wing being welded to the punched-cut parts. In this last modification, the **V**-portions may lie in recesses in the third wing to prevent obstruction of the passage of cleaning-tools.

132,828. Vacuum Oil Co., (Vacuum Oil Co.). May 21, 1918.



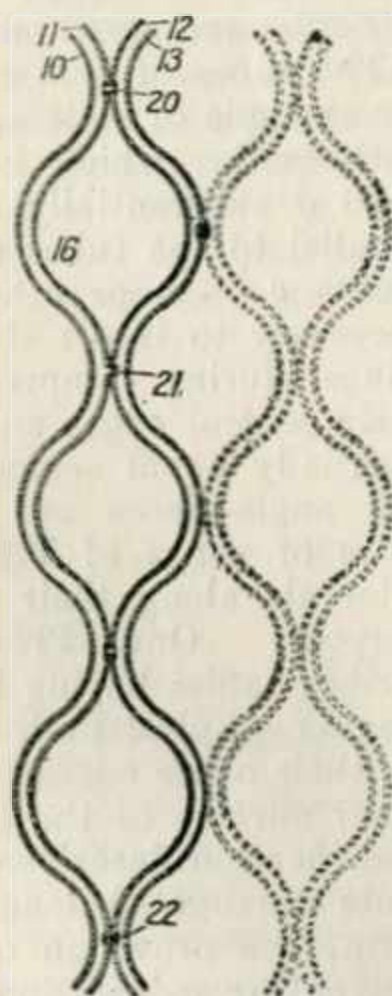
Straight tubes between headers.—A combined fractional condenser and preheater for use in distilling oil consists of superposed sections each comprising a tubular condensing-unit 9, Fig. 1^a, and a condensate-collecting pan 20, so arranged that the oil to be preheated flows downwards in

a zigzag course through the units 9, and the vapours flow in a zigzag course in the opposite direction. In each condensing-unit, the oil entering by a pipe 5 passes from one compartment 7 of the header 8 through the upper bank of tubes 9 to the header 10, and back through the lower bank of tubes to the other compartment 12 of the header 8, finally flowing by a pipe 13 to the next condensing-unit. The vapour space of each unit is divided into compartments by a par-

tion 23 between the upper and lower banks of tubes, and transverse partitions 36, 37 are provided in each compartment of the vapour space. The condensate flows along the partition 23 and the base plate 25, passing through apertures in the baffles 36, on to a baffle 26 which delivers it in the pan 20. The tubular condensing-units and the pans are arranged so as to be easily removed from opposite sides of the casing.

133,567. Baynes, C. Jan. 21, 1919.

Plate apparatus.—Radiators, built up of a number of corrugated strips, arranged in pairs to provide narrow water spaces and approximately circular air spaces, the ends being sealed in the usual manner are constructed with transverse water-passages to prevent the effects of choking of the ordinary water passages. The plates 10, 11 forming one set of water spaces and the plates 12, 13 forming an adjacent set are connected together by eyelets 20 through the plates 11, 12 providing communication. An alternative method is to punch holes



21 in adjacent plates at the point of contact in a manner to produce a burr which will effectively unite the plates. Additional security may be provided by uniting the plates with solid rivets 22. The shape of the plates is such as to form air spaces 16.

134,277. James, J. M., Talbot, E., and Davison, E. G. Oct. 24, 1918.

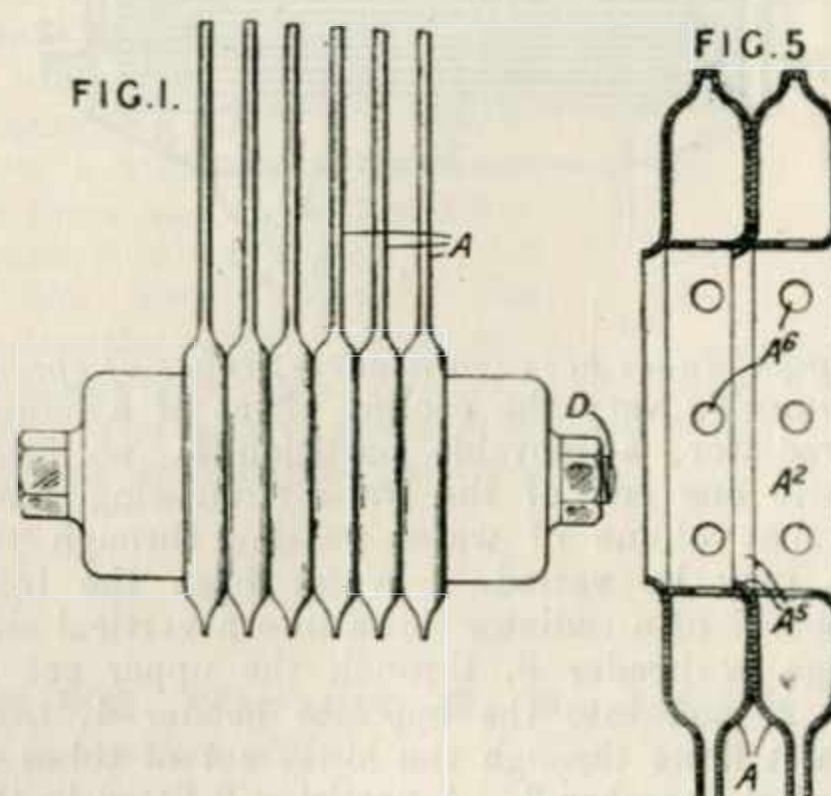


Plate apparatus.—Radiators for cooling fluids are constructed of flat hollow elements A held together by one or more bolts D passing through the apertures A² connecting the interiors of adjacent plates. In place of the separate distance-rings normally used in this type of apparatus to prevent crushing on tightening up the bolt, one plate of each unit is flanged inwards to bear against the opposite plate, and perforated as at

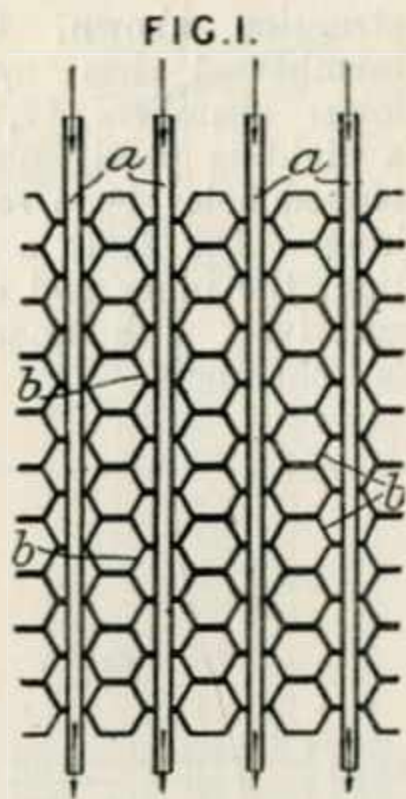


A⁶, Fig. 5. The other plate is flanged outward to form a spigot A⁵ which engages in the fancet formed in an adjacent plate. Or both plates may be flanged inwards. The invention is stated to be applicable to the formation of **D** or **V** fronted radiators by staggering the spigot in relation to the fancet in each unit, the axis of the aperture A² being thus inclined, or by arranging two groups constructed, as shown in Fig. 1, at an angle to the other and united by **T**-pieces. The plates may be corrugated.

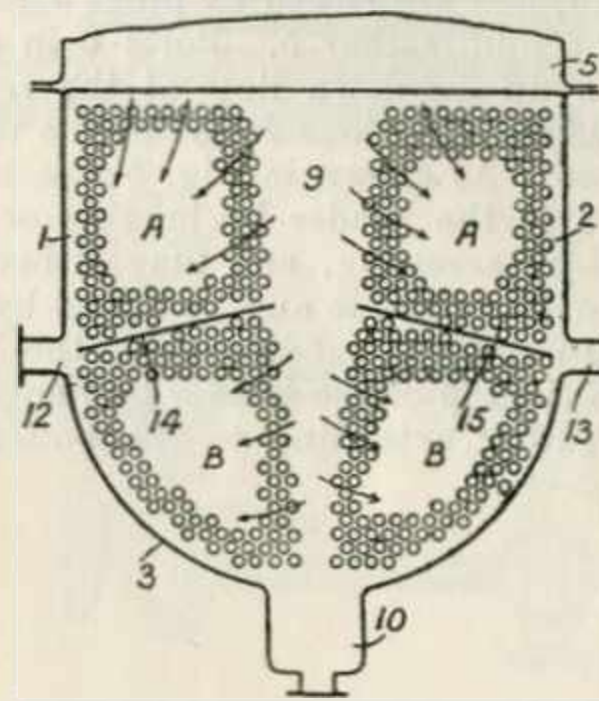
for the heating medium comprising a pair of interconnected annular shells 8, 9, tapering towards their upper extremities.

134,527. Berkovici, L. Oct. 30, 1918, [Convention date]. Void [Published under Sect. 91 of the Act].

Gills for tubes. — A radiator for internal-combustion engines comprises a number of water-tubes *a* of flattened, oval, or other section threaded through correspondingly shaped slots in a series of parallel corrugated plates *b* arranged at right-angles to the water-tubes and connected to the latter and to each other by dipping in a bath of solder. The corrugations in the plates are preferably shaped so as to form hexagonal air spaces when the plates are connected.



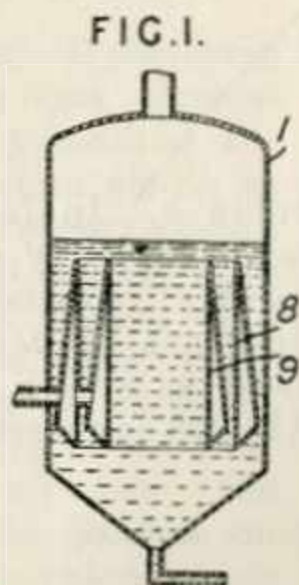
134,852. Ehrhart, R. N. Nov. 8, 1918, [Convention date].



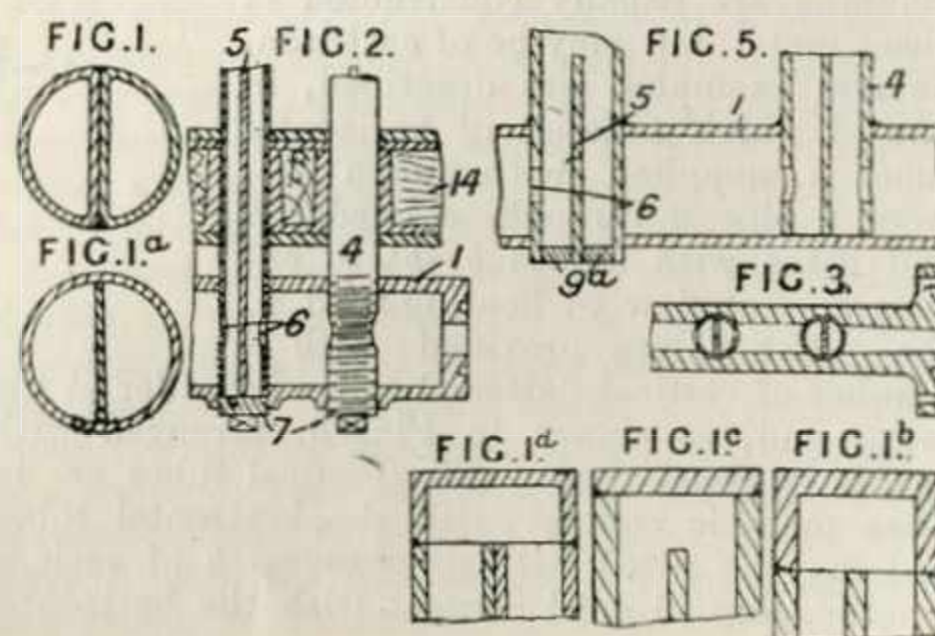
Straight-tube apparatus.—A surface condenser comprises a shell having parallel walls 1, 2 and a semi-circular bottom 3 which terminates in a condensate outlet 10. The fluid to be condensed enters by a port 5 and traverses two sides of nests of cooling-tubes A, B, arranged on either side of a central wedge-shaped passage 9 and separated by diaphragms 14, 15, directed towards lateral outlets 12, 13 for air and non-condensable fluids.

134,843. Akt.-Ges. Kumlner & Matter. Nov. 5, 1918, [Convention date]. Void [Published under Sect. 91 of the Act].

Plate apparatus. — In heat-interchange apparatus and evaporating devices for liquids, the cross-section of the vertical passages for the flow of liquid to be evaporated is enlarged in an upward direction for the purpose of providing more space for the increasing volume of vapour in the upper layers of the liquid. This end is achieved by providing the cylindrical container 1 for the liquid to be heated with a vessel



134,868. Ryder, F., and Pluperfect Refrigeration Co. Sept. 3, 1918.

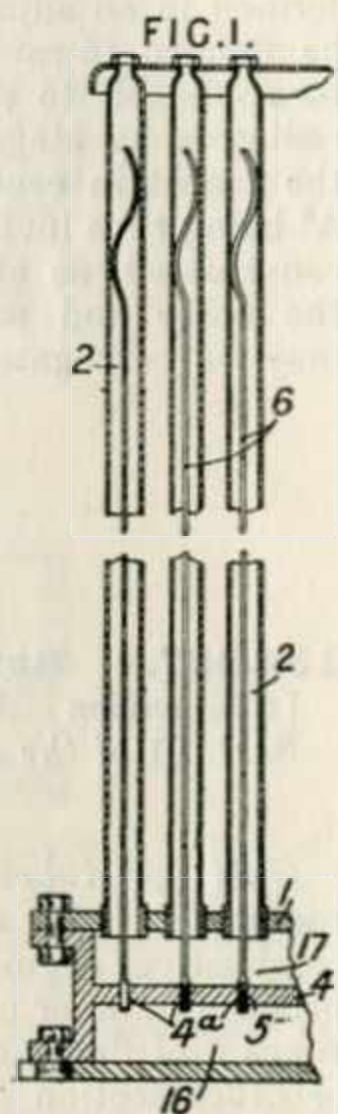


Straight-tube apparatus.—Relates to refrigerating-apparatus of the type described in Specifica-

tion 115,055, and consists in the adaptation, as ice-forming surfaces, of pairs of pipes of D-section placed back to back, or of single pipes having a mid-feather, the pipes being closed at their upper ends to obtain an up-and-down circulation of the refrigerant. In the form shown in Figs. 2, 3, the pipes 4 are screwed into, and entirely fill the passage in, the header 1 below the freezing-tank 14, and are closed by plugs 7 which abut against the mid-feather 5. Ports 6 in the tubes provide an up-and-down flow of the refrigerant. Figs. 1--1^a show various forms of the upper part of the tubes. As shown in Fig. 5, the tubes may be secured to the header by brazing or welding, instead of by screwing, and may either abut on the bottom, or protrude and be closed by a cap or cap 9^a. In another modification, the pipes are secured to the top of the header by flanged joints, the mid-feather extending to the bottom of the header.

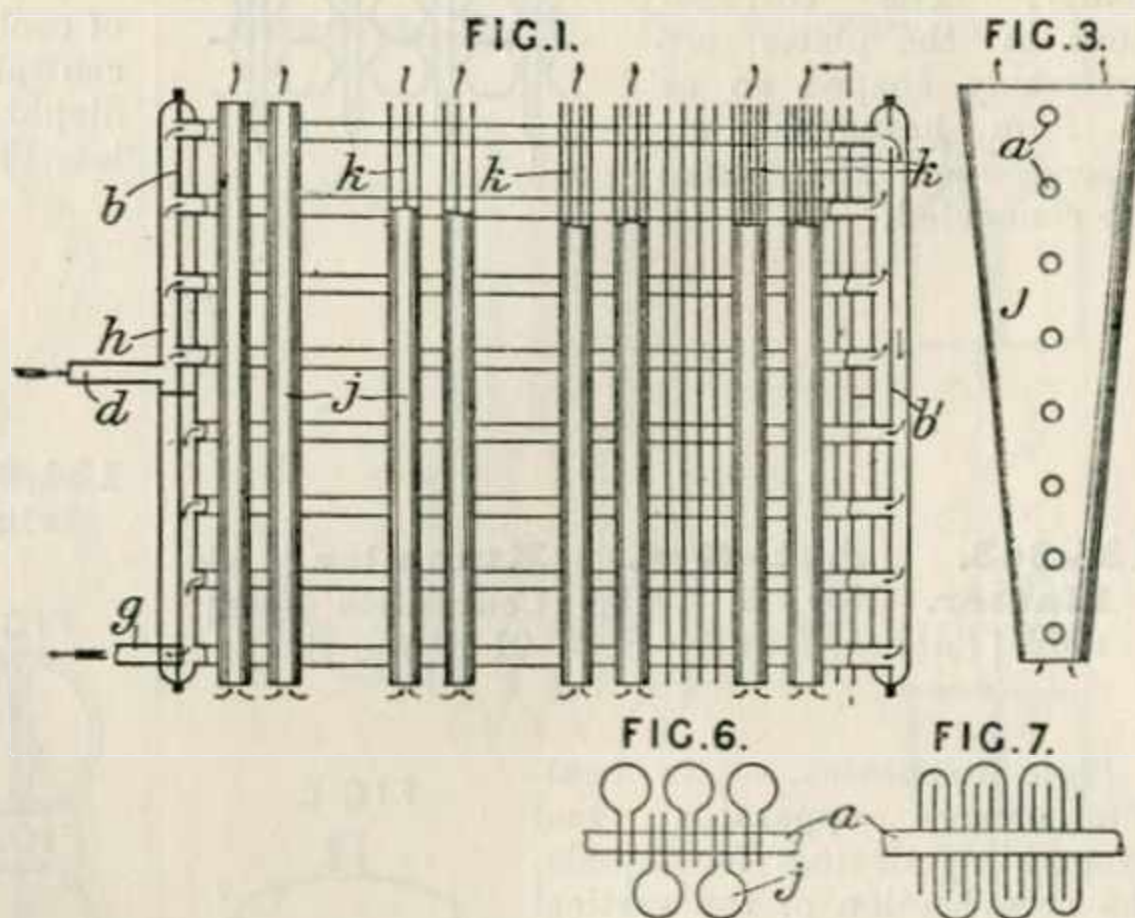
135,099. Harris, T. H. March 17, 1919.

Field-tube and like apparatus.—In air-heaters of the type comprising inner and outer tubular members, such as Field-tube air heaters, the inner tube 6 is made of a non-ferrous ductile and non-corrosive metal or alloy such as hopper or brass, and is of very small diameter relatively to the outer tube 2. At its lower end 5, where it joins the base member 1, the inner tube is expanded and externally threaded or fitted with a threaded enlargement sleeve, and at its upper end is bent to a sinuous shape so as to keep it concentrically within the outer tube. In the construction shown, the base member 1 has upper and lower chambers 17, 16 with a dividing partition 4 having tapped holes 4^a to receive the inner tubes 2; in a modification, the inner and outer tubes communicate respectively with inner and outer concentric tubular chambers.



135,274. Pease, E. L. Nov. 18, 1918.

Gills for tubes.—Heat-interchanging apparatus consists of vertical tubular members both the internal and external surfaces of which are utilized as air-heating surfaces, the outer one also constituting a heat-radiating surface. These heating-columns are secured in good metallic contact with a vertical series of horizontal heating-tubes through which steam may be passed, and are arranged with spaces between each vertical tube. The heating-columns are usually constructed of sheet metal, but may be of cast-iron. Several examples are described, in one of which a series of horizontal tubes *a*, supplied with steam &c. from a pipe *d* through a header *h* and fitted with baffles *b*, *b*¹ to ensure correct flow of heating-fluid to the outlet *g*, are provided with a number of vertical flattened tubes *j* smaller at the lower end, as shown in Fig. 3, arranged with spaces between them. The vertical tubes are in close metallic contact with the horizontal tubes and may be fitted with diaphragms *k* of various lengths, also in good contact with the horizontal

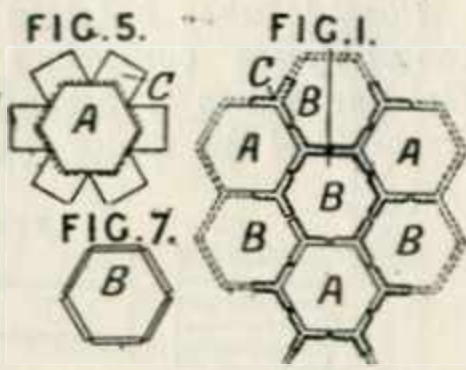


tubes *a*. In other examples, the vertical tubes are completely enclosed in a case, air being supplied at one end and exhausted at the other end. In place of vertical tubes, bent plates may be used as shown in Figs. 6 and 7. Specification 113,298 is referred to.



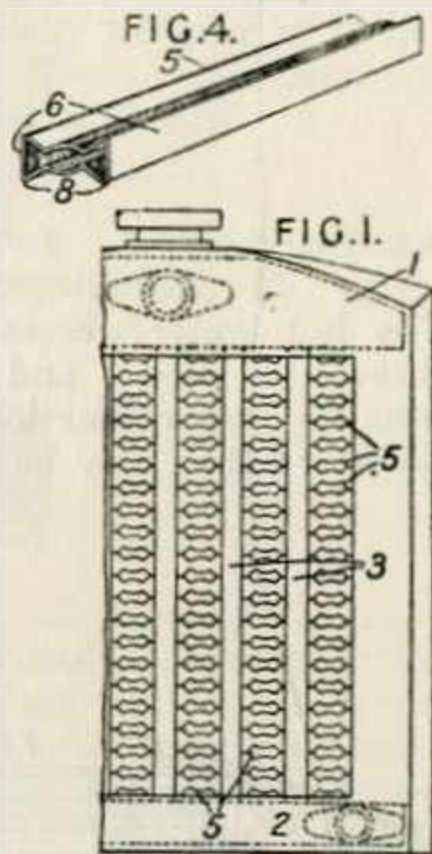
135,709. Gilbody, E. C. Feb. 13, 1919.
Addition to 121,905.

Honeycomb members.—In radiators in which split parts of tubes A are bent over to engage the edges of adjacent tubes B, each part C covers an angle of the tubes and a portion of two flat sides. The space between the tubes is regulated by the turned-over edges of the tubes B, as shown in Fig. 7.



136,281. Goudal, A., and Leroi, L. Dec. 16, 1918.

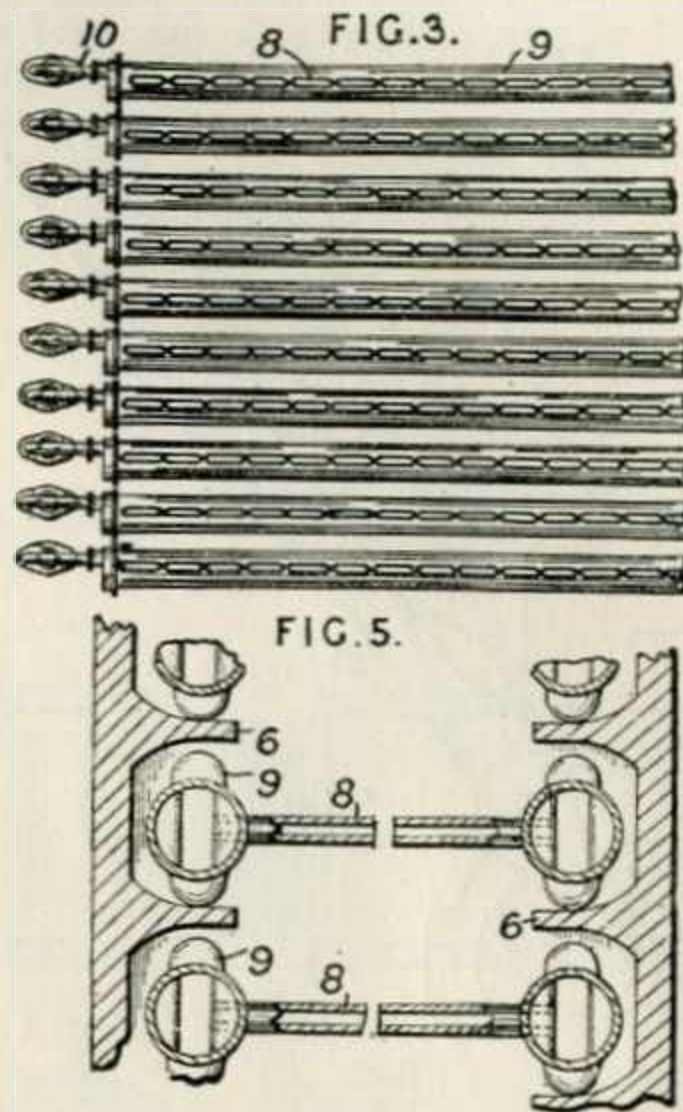
Straight tubes between headers or connecting-boxes.—In radiators for internal-combustion engines, of the type in which banks of corrugated tubular members 5 are located in the spaces separating flat water-tubes 3 connecting the headers 1, 2, the corrugations, as shown in Fig. 4, are so fashioned that, when assembled, an unbroken space extends between adjacent water-tubes and adjacent tubular members. The members are, moreover, formed with flat sides 6 which fit against the flat sides of the water-tubes, and with narrow flat surfaces 8 extending along their longitudinal edges. In a modification, the water-tubes and the bands of tubes are arranged horizontally. The flat ends of the corrugated members may also constitute the walls of the water-tubes.



136,703. Taylor, J. D. Feb. 7, 1919.

Plate apparatus.—A steam-heated drying-oven is provided with practically continuous shelves formed of flattened steam tubes extending between inlet and outlet tubular headers acting as supports; the flattened surfaces are horizontal. The headers are supported on ledges 6, Fig. 5, at the sides, and may be of flattened section with circular ends, the flattened portions being vertical. The ends of the tube 8 may be circular, oval, or rectangular, and may in the latter case be welded together before welding into the headers 9. Steam is supplied to the headers on one side of the oven, through expansion bends

10, Fig. 3, connected to springs 16 on caps closing the ends of the headers.



137,033. Berkovici, L. Dec. 27, 1918,
[Convention date]. No Patent granted (Sealing fee not paid).

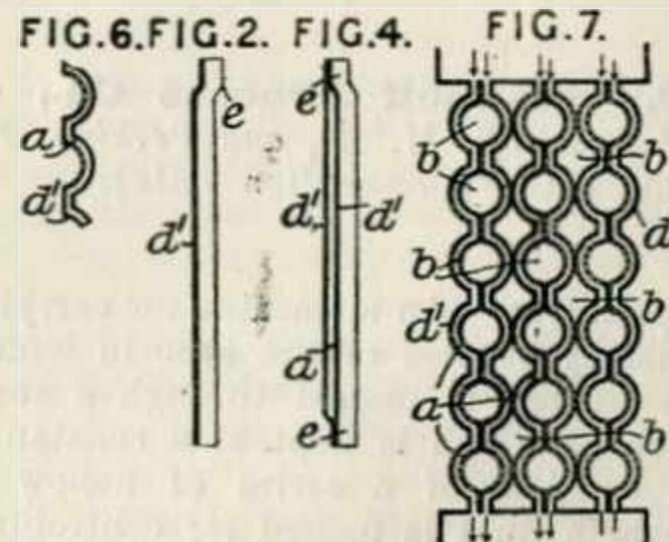
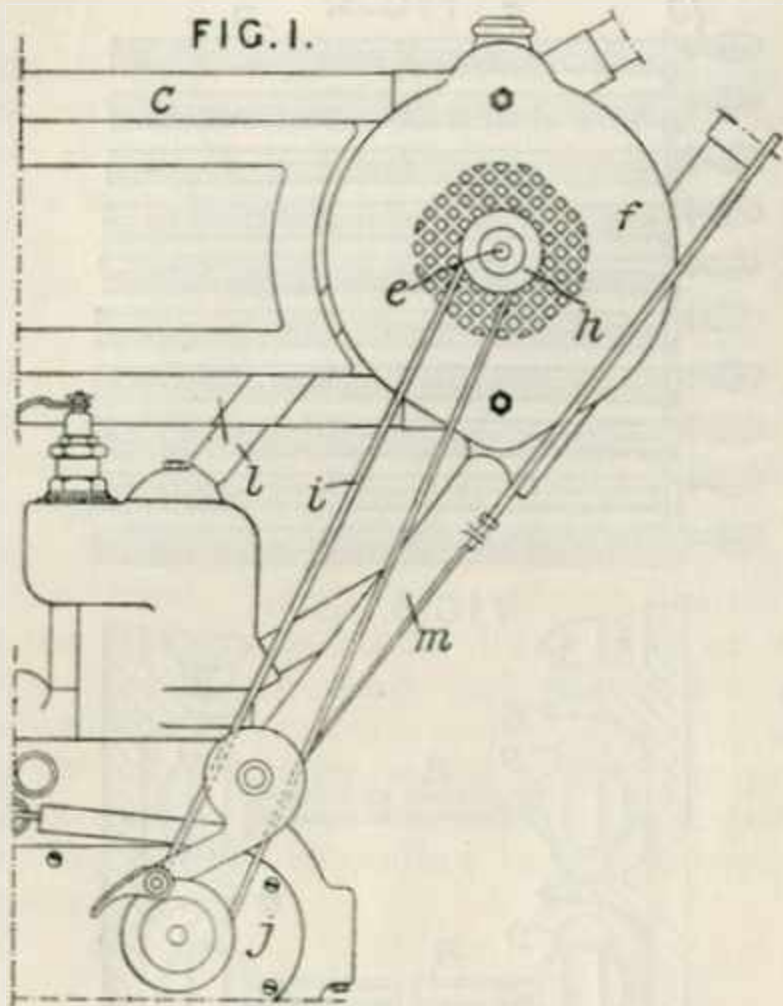


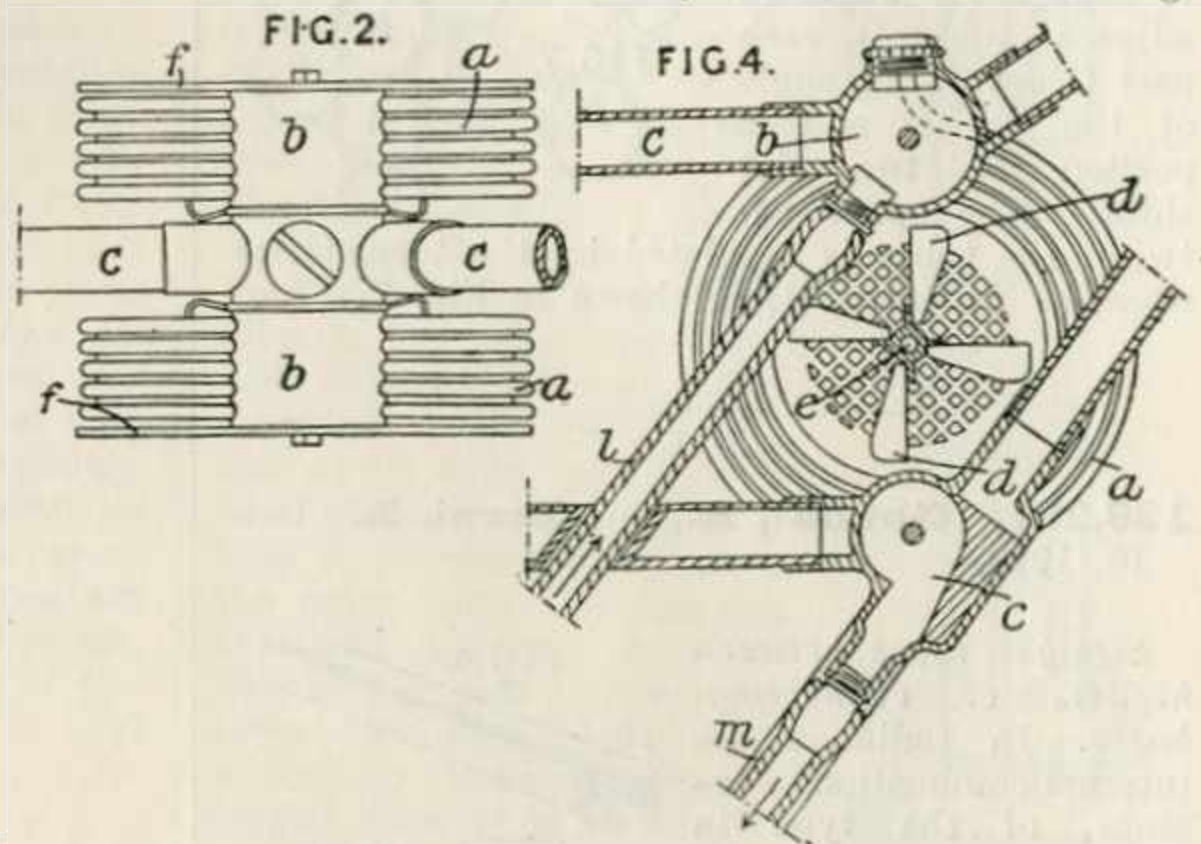
Plate apparatus.—The elements of a radiator for an internal-combustion engine are formed of two corrugated metal sheets d' , Figs. 2 and 6, which are spaced apart so as to form a water channel a between them by offsetting one of the edges e of each sheet which are at right-angles to the corrugations, and bringing the two sheets together, as shown in Fig. 4, so that the offset portion of one sheet is in close contact with the plain portion of the other sheet. A complete radiator is built up as shown in Fig. 7 by arranging a series of such elements with the apexes of the corrugations in contact so as to form air spaces b between the elements, the structure being united by immersion in a bath of tin.

Reference has been directed by the Comptroller to Specifications 28615/04 and 12528/06, [both in Class 29, Cooling &c.].

137,285. Viratelle, M. N. May 16, 1914, [Convention date].



Bowed tubes between headers.—A radiator for motor-cycles comprises a group of concentric circular tubes *a* arranged on each side of the frame *C* of the motor-cycle and connected through

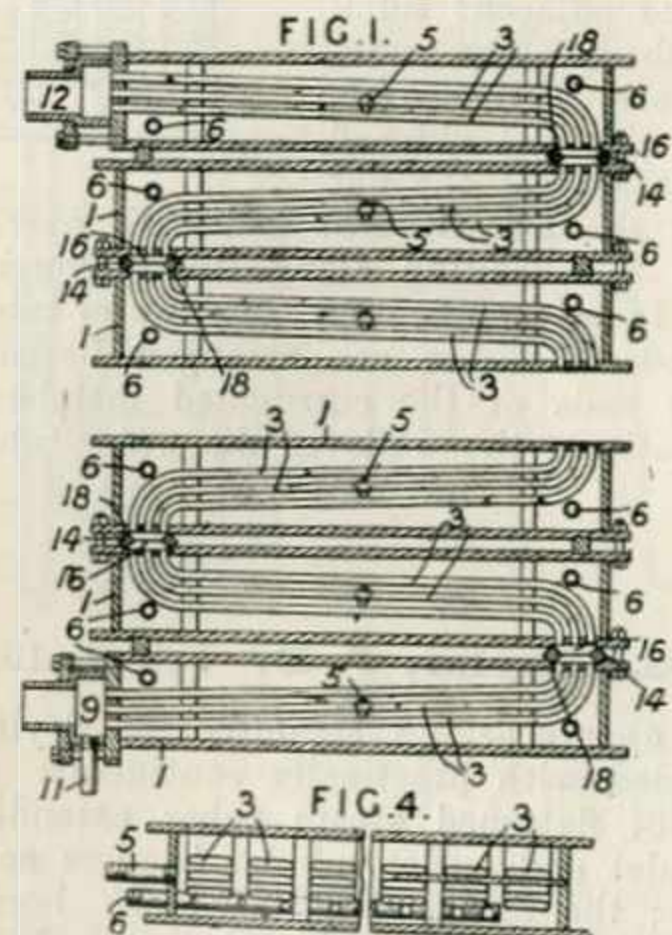


upper and lower chambers with the junctions *b*, *c* of the frame, which form parts of the collecting-boxes. A cover plate *f* provided on each side supports a central shaft *e* of a fan *d*, which is driven from the motor *j* by a belt *i* and pulley *h*.

The hot water passes to the upper junction through a tube *l* and the cooled water returns from the lower junction through a tube *m*. The radiator tubes may be round or flattened.

137,300. Rosanoff Process Co., (Assignees of Rosanoff, M. A., and Perkins, H. F.). Dec. 23, 1918, [Convention date].

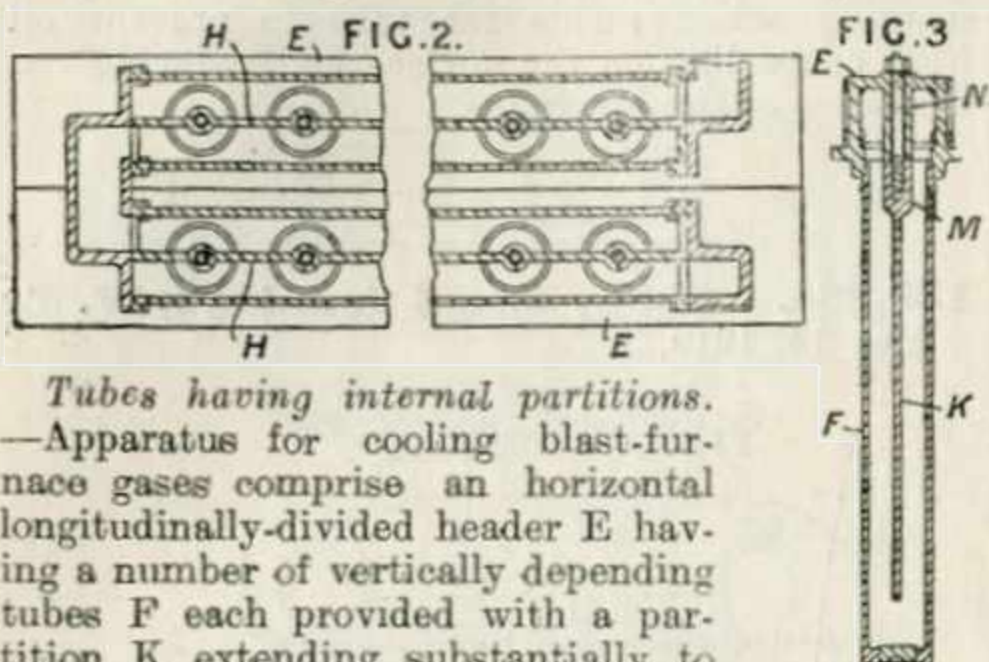
Plate apparatus.—An apparatus for carrying out a fractionating process of the type in which the substance treated is passed through a series of zones, each of which is kept at a constant temperature, consists of a series of hollow boxes through which fluid is passed for controlling the temperature and which contain a series of hollow conduits for the substance treated. The boxes 1 are arranged as shown and bolted together and are spaced from each other for insulation. The conduits consist of flat tubes 3 arranged as shown and opening at the upper and lower surfaces of the boxes into spaces 16 surrounded by metal pieces 14 abutting against packing rings 18 on the surface of the boxes. The fluid for regulating the temperature is introduced through openings 5 and withdrawn through perforated pipes 6, Fig. 4, extending across the boxes. The liquid enters the tubes 3 through a header 9, attached to the first box and provided with a draining tube 11 and leaves by a header 12 attached to the last



box. In a modification, the boxes are formed of castings the end portions of which are so formed as to replace the curved ends of the tubes 3.



137,378. Weyman, J. E. Jan. 16, 1919.



Tubes having internal partitions.
—Apparatus for cooling blast-furnace gases comprise an horizontal longitudinally-divided header E having a number of vertically depending tubes F each provided with a partition K extending substantially to the bottom of the tube and fixed in alinement with the longitudinal partition H in the header. This arrangement is designed to facilitate the forced circulation of the cooling-fluid down one side of the tubes in parallel, and then upwards to the other half of the header. The tubes F are secured in position by studs N working in thimbles M on the partitions K. Two or more headers of this type may be worked in series.

Tubes of special section; gills for tubes.—The elements of a heating or cooling apparatus are formed of flattened tubes having projecting ribs 3 arranged on the tubes so that the ribs of adjacent tubes cross one another as shown in Fig. 1. In a modification, the ribs on one side of the tube cross the ribs on the other side. In addition, both sides of the tube may be provided with trough-like depressions 4 in contact at their inner surfaces to prevent the sides from collapsing.

137,653. Aktiebolaget Ljungströms Angturbin, and Ljungström, F. Feb. 22, 1919.

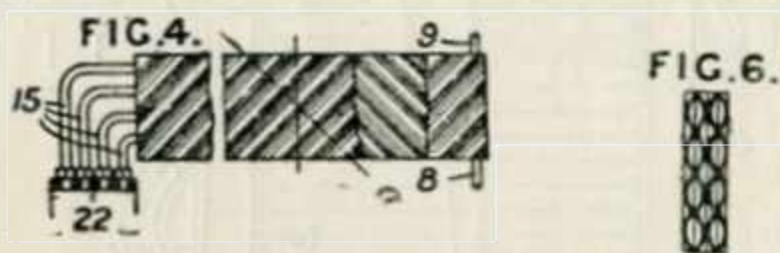
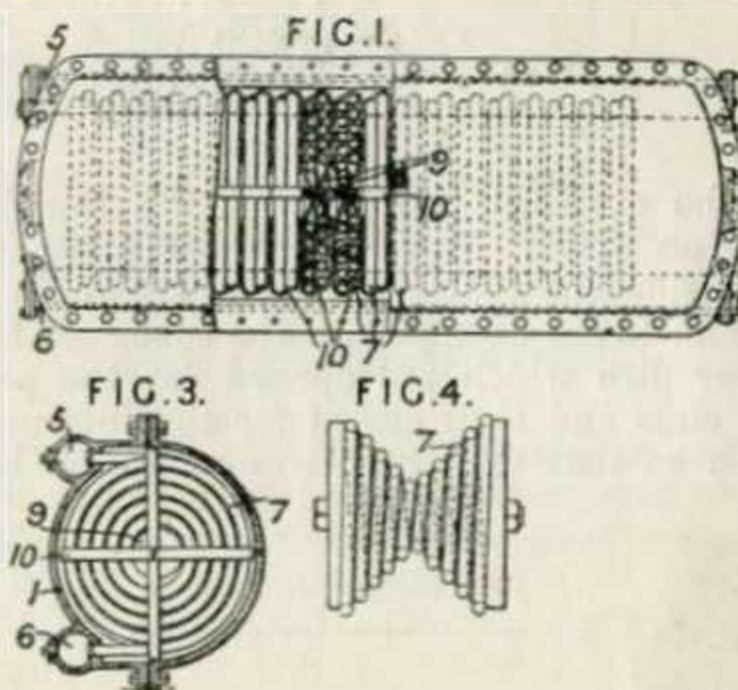


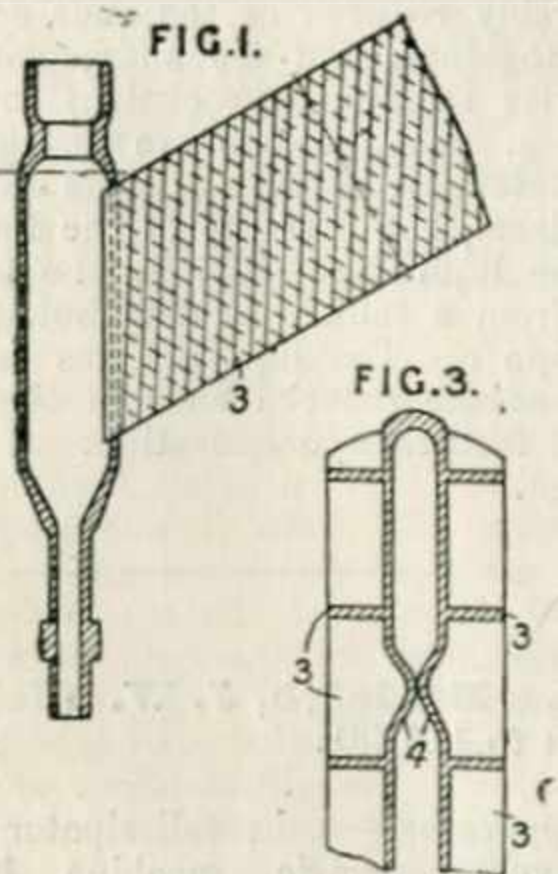
Plate apparatus.—An air-cooled condenser is constructed of juxtaposed corrugated plates as shown in side view in Fig. 4, and in vertical cross-section in Fig. 6. The condenser is connected by bent pipes 15, Fig. 1, to an horizontal tube 22.

138,870. Griscom-Russell Co., (Assignees of Price, J.). Feb. 8, 1919, [Convention date].



Coil-tube apparatus.—A casing 1 split longitudinally contains separately removable coils 7 connected to two manifolds 5, 6. Central baffles 9 cause the fluid in the casing, e.g. oil to be cooled, to follow a sinuous path in thin films between the turns of the coils. Straps 10 brace the coils and support the baffles. The coils are made by winding the pipe on halves of a double conical mandrel, Fig. 4, removing the mandrel and flattening the coils so that the turns are staggered. In one modification, the manifolds 5, 6 are divided to give series flow through all the coils, one of the pipes leading fluid to the casing passing centrally through all the coils so as to obviate the necessity for fitting baffles 9, and, in another modification, one end of each coil communicates with a longitudinal manifold, the other leading to an end header.

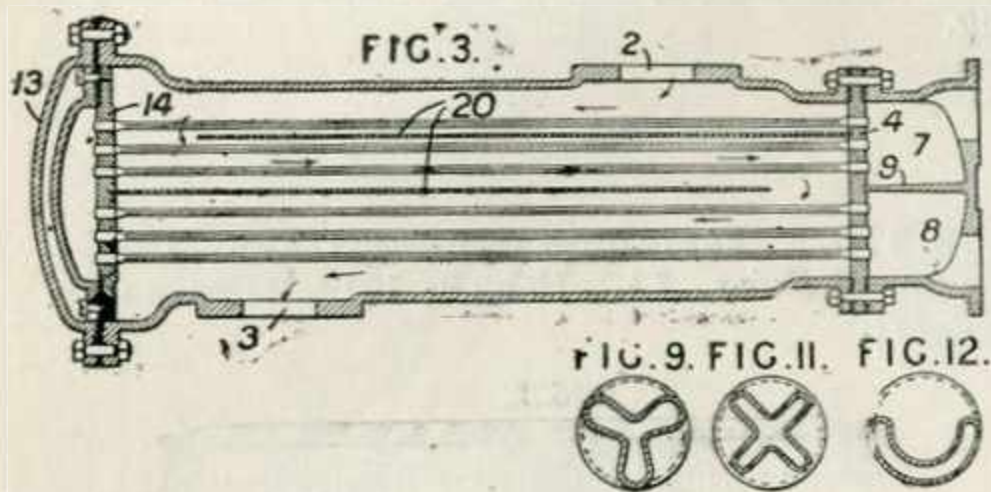
138,080. Aktiebolaget Ljungströms Angturbin. Jan. 21, 1919, [Convention date].



139,176. Griscom-Russell Co., (Assignees of Jones, R. C.). Oct. 26, 1918, [Convention date].

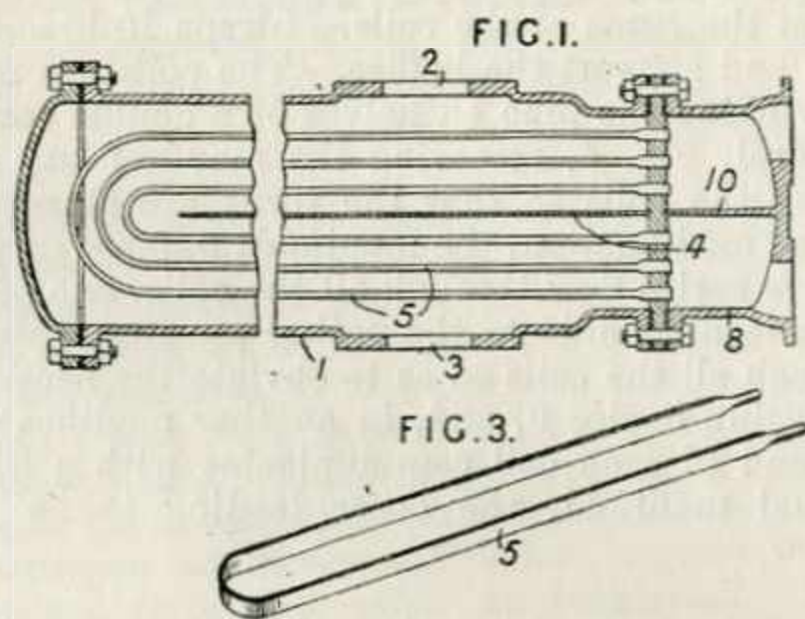
Tubes of special section. — Oil coolers and similar apparatus comprise tubes arranged between headers 4, 14, the tubes being circular in form at the headers but of different cross-sections between their ends. The feed drum comprises two chambers 7, 8 arranged with a baffle 9 between to provide for circulation of the oil through

the tubes. The cooling-fluid passes from the inlet 2 round the exterior of the tubes, being directed by baffle plates 20, to the outlet 3. The tube plate 14 is constructed so as to be floating to allow for expansion and contraction of the tube and is fitted with a cover 13. The tubes are of uniform perimeter but are closed together along the portion between the tube plates so that the passage of the oil or other liquid will tend to



scour the surfaces and prevent the liquid congealing on them. Various forms of cross-section are described of which the forms shown in Figs. 9, 11, and 12 are examples. The tubes are formed in roller dies which are opened for the passage of the ends and then closed for the intermediate position so that the desired cross-section is produced.

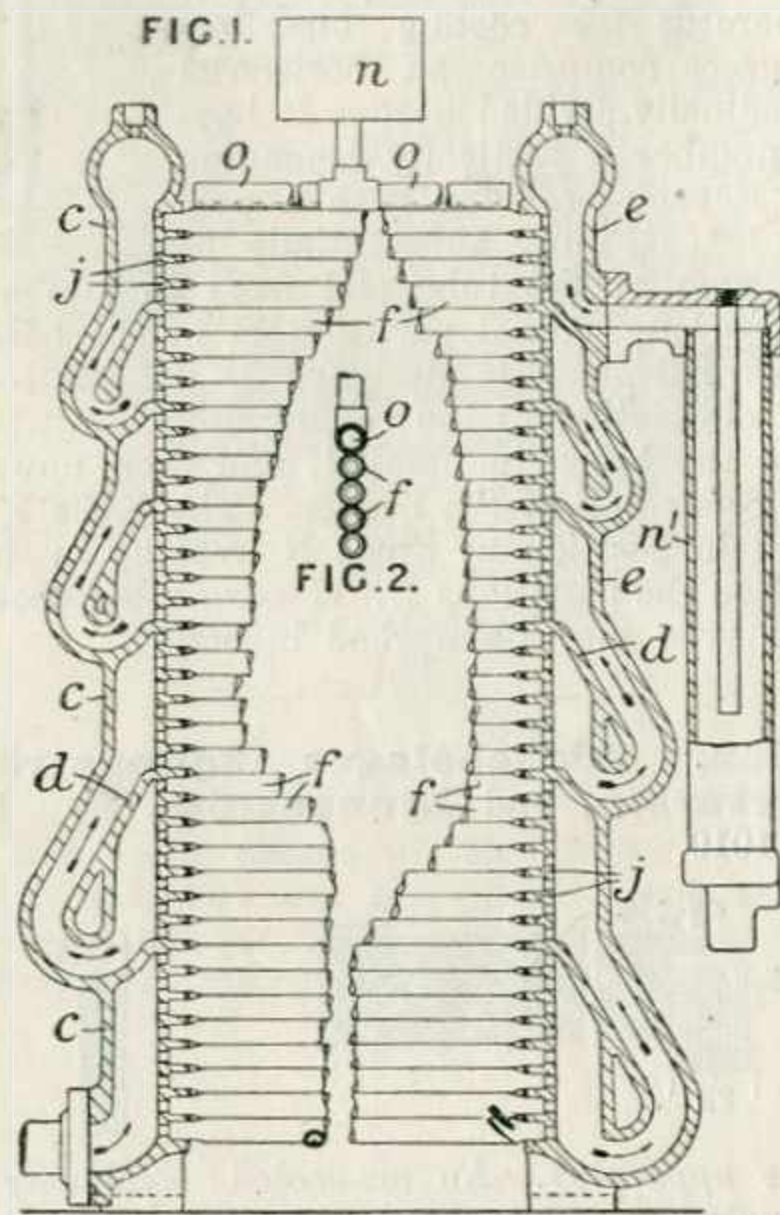
139,177. Griscom-Russell Co., (Assignees of Jones, R. C.). Oct 26, 1918, [Convention date].



Tubes of special section.—Apparatus for cooling oil and other liquids is constructed in the ordinary manner with a cylinder shell 1 having inlet and outlet passages 2, 3 for the cooling-fluid, but with tubes 5 of flattened cross-section for the liquid to be cooled. These tubes 5 have cylindrical ends and are bent to U-shape, one end opening into the inlet portion of the feed-drum 8, and the other end into the outlet portion. The two parts of the header 8 are separated by a plate 10. A vertically-arranged baffle-plate 4 is disposed as shown to guide the cooling-fluid. It is stated that the flattening of the tube in the

case of oil-coolers provides for the necessary scouring action inside the tube to prevent oil from congealing on the surface and reducing the efficiency of the apparatus.

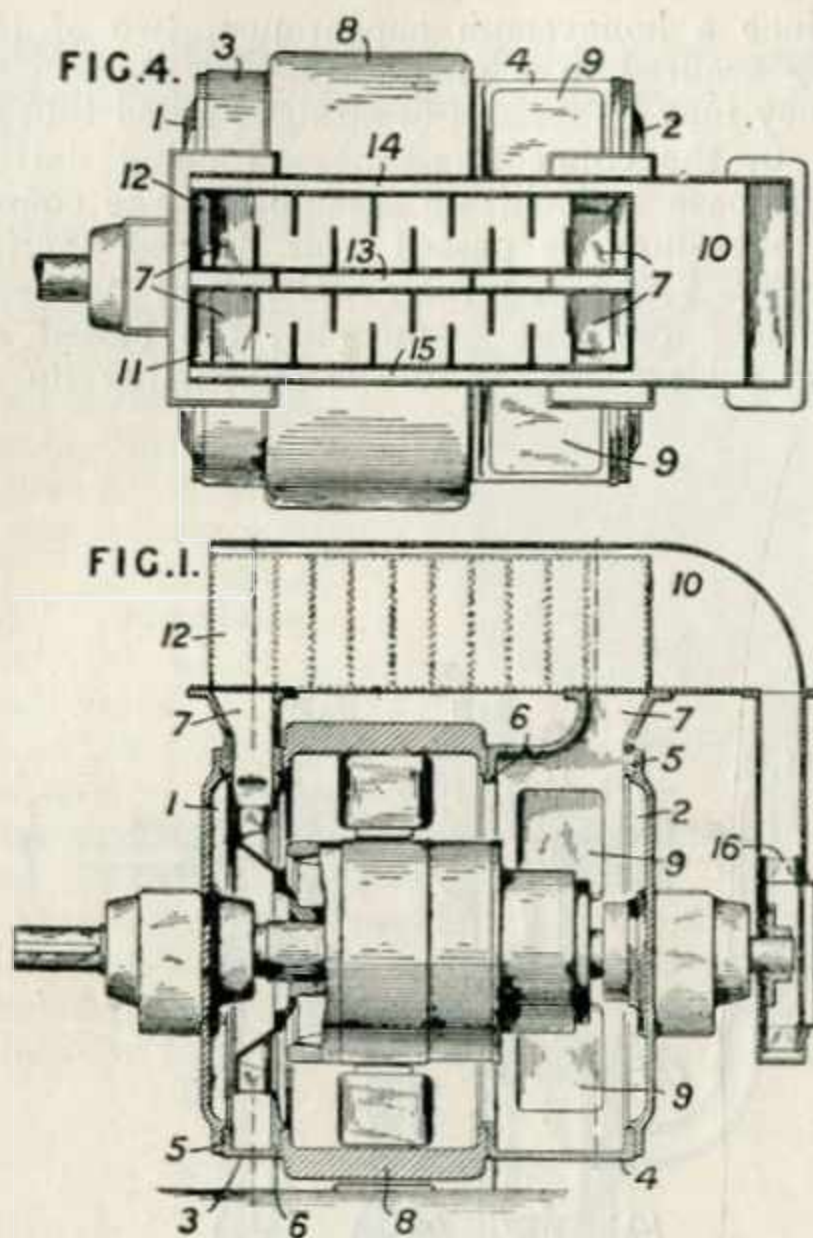
139,364. Chew, L., and Jennings, W. F. May 14, 1919.



Straight tubes between headers or connecting-boxes.—In atmospheric water-cooled condensers for refrigerating apparatus the vertical headers *c, e* are divided so as to provide groups of tubes *f* of gradually diminishing capacity from the inlet for the gas at the bottom to the outlet for the liquefied gas at the top, whereby an even velocity of flow of the gas is maintained. The tubes *f* are preferably reduced at the ends so that they lie close together, and are autogenously welded or otherwise secured in sockets *j* integral with the headers. The headers are formed with deflecting plates *d* and with pockets in which the liquid collects, the pressure of the incoming gas forcing the liquid gradually to the top. Water supplied from a tank *n* is distributed by a perforated pipe *o*. The liquefied gas tends to accumulate at the reduced ends of the tubes and thereby to facilitate condensation. A receiver *n'* is provided.

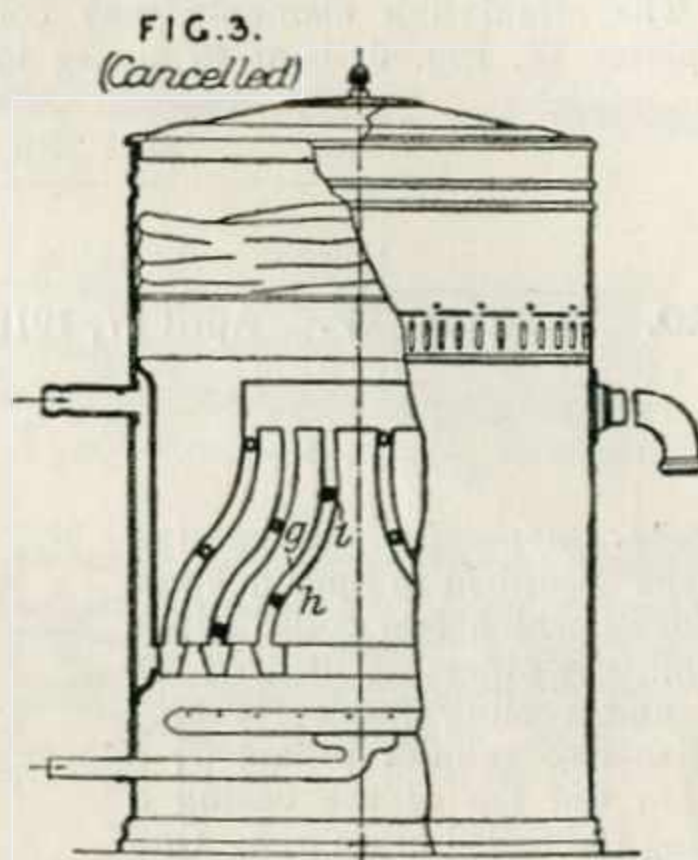
139,718. Burleigh, J. W. July 23, 1919. Addition to 116,481.

Plate apparatus.—A heat-dissipator for an enclosed dynamo-electric machine has zigzag



passages 11, 12 for the circulation of the hot air of the machine by way of the ports 7, cold air being supplied by a fan 16 through central and external passages 13, 14, 15.

subject-matter. A wire may be coiled between the walls of the plates to provide a circuitous path for the water. Similar elements may be employed in a bath-water heater, as shown in Fig. 3, (Cancelled), the wire *i* being coiled between the walls *g*, *h* of the elements. The plate



elements may also be used in domestic radiators through which an air current flows, and in other apparatus. This subject-matter does not appear in the Specification as accepted.

139,750. Chardard, J. B. D. L. March 3, 1919, [Convention date].

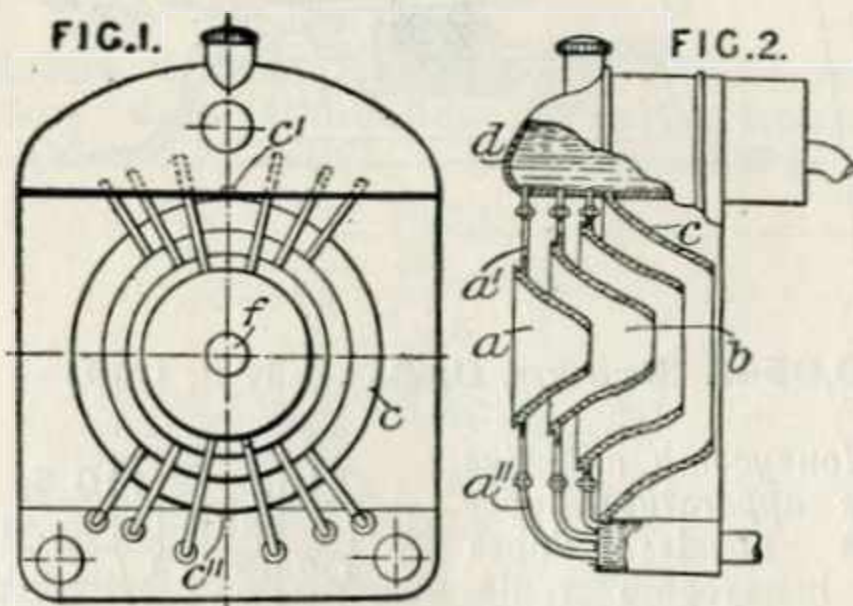


Plate apparatus.—The cooling-elements of motor-vehicle radiators are constituted by coaxial thin hollow plates *a*, *b*, *c*, of cylindrical, conical or paraboloidal form, the innermost element *c* being permanently connected as by soldering at *c*¹, *c*¹¹ to the flat faces of the headers *d*, while the other elements are connected to the headers by pipes *a*¹, *a*¹¹ having disconnectible joints to allow the elements to be detached. The plates may be made of copper.

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

140,553. Wade, P. W. Feb. 8, 1919.

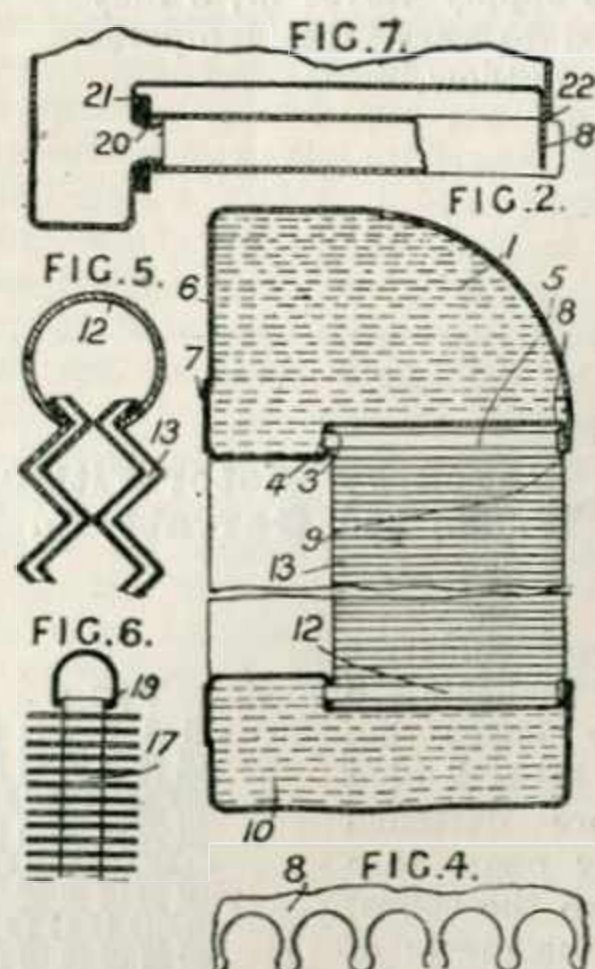


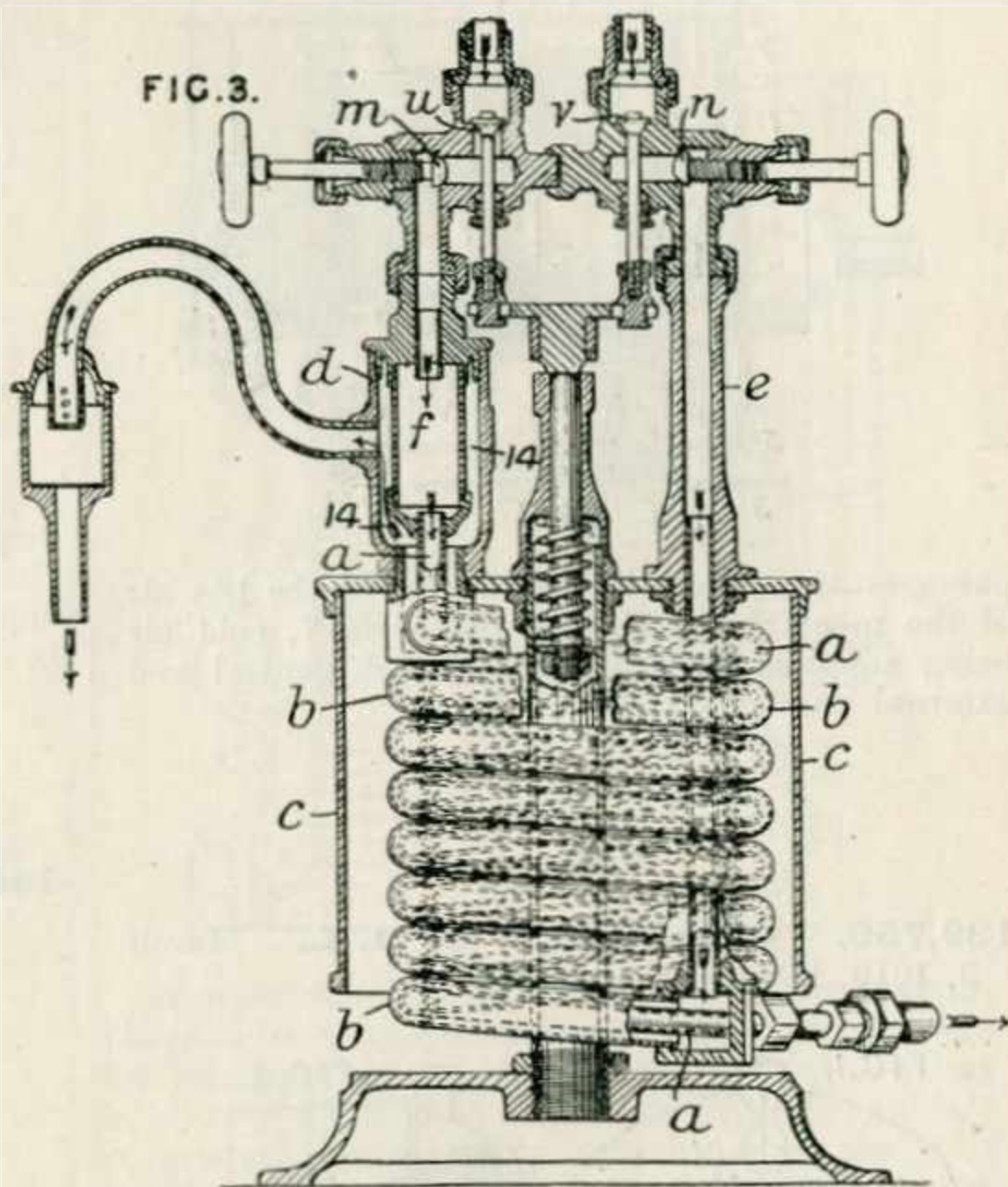
Plate apparatus; headers, forms of.—In radiators for internal-combustion engines, heating, cooling and condensing apparatus comprising circulating tubes or elements connected by top and bottom tubes to the depending and upstanding portions of tanks of L-shape in section, the

outer closed ends 9 of the connecting-tubes 5, 12 are supported and positioned by projecting lips or flanges 8 on the horizontal portions of the tanks 1, 10. The open ends 4 of the connecting-tubes are soldered to the walls 3 of the tanks, the opposite walls 6 preferably having openings closed by plates 7 subsequently to the soldering operation. The circulating elements may comprise hollow plates 13, Fig. 5, bent to zigzag form to

produce a honeycomb appearance, two of these being secured in a single tube 12 at each end, or they may be formed of straight gilled tubes 17, Fig. 6, the connecting-tubes 19 being flattened at the base to facilitate assembly. The connecting-tubes may be passed over flanged apertures 20, Fig. 7, on the tank walls, and be bedded against a resilient washer 21, the closed ends being soldered at 22 to the supporting lip 8.

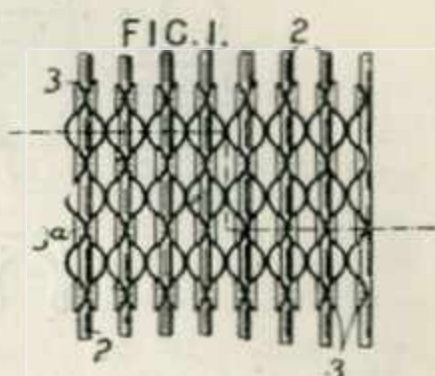
140,620. Adams, W. April 17, 1919.

Coil-tube apparatus.—Apparatus of the type described in Specification 27499/13, in which two coiled pipes one within the other are utilized for heating and cooling fluids, is provided with two tubular pillars *d*, *e* secured to the top of the casing *c* containing the coiled pipes *a*, *b*. One of the pillars has a hot-water outlet 14 enclosing a steam chamber *f* the lower end of which is connected with the steam coil *a*. The lower end of the water outlet 14 is connected to the water-pipe *b*. The bottom of the pillar *e* is connected to the lower end of the water-pipe, as shown. Combined stop and supply valves are secured to the pillars, the stop valves *u*, *v* being controlled by a hand-lever. The supply valves *m*, *n* may be regulated to vary the temperature of the outflow.



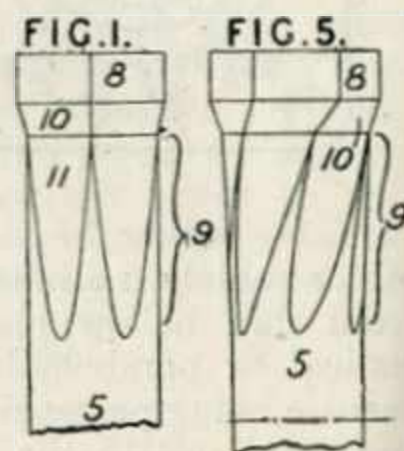
140,662. Coventry Motor Fittings Co., Tyler, W. S., and Garratt, L. June 2, 1919.

Gills for tubes.—Corrugated sheets 3 filling the space between flat tubes 2 of a radiator are flattened where they come into contact with the tubes, as at 3^a, the crests of the corrugations of adjacent sheets touching at other points.



140,954. Brown, C. A. July 9, 1919.

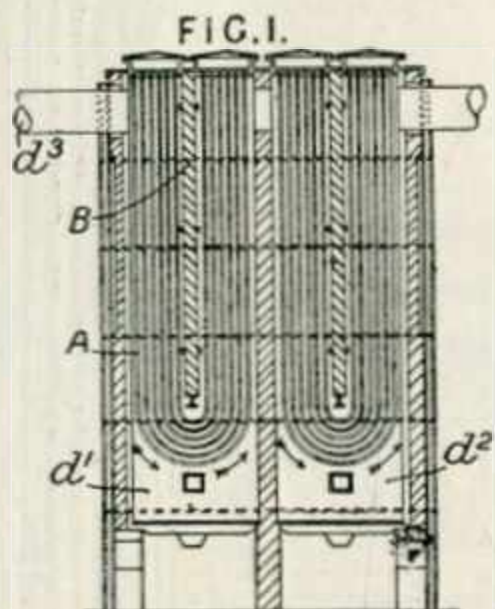
Honeycomb and like tube apparatus; tubes with nozzles.—Tubes for honeycomb radiators or for forming flared ends to straight tubes in heat-exchangers are constructed with a body 5 of cylindrical cross-section, a polygonal end 8, and connecting parts in two stages, the first 9 having flat faces 11 parallel to the axis of the tube and the second 10 of prismatic form. The part 10 may also have curved faces. The parts 9, 10 may be spirally twisted, as shown in Fig. 5.



141,097. Reavell, J. A., and Kestner Evaporator & Engineering Co. Dec. 4, 1918.

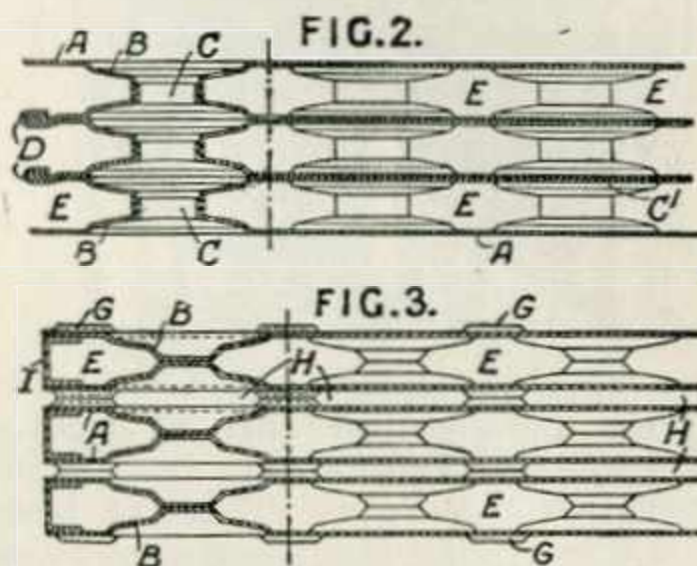
U-tube apparatus.

—Apparatus for cooling gases comprises one or more chambers d^1 , d^2 fitted with a number of upright U-tubes A of small diameter through which a cooling-liquid circulates, baffles B being located between the limbs of the tubes to cause the gases entering by the inlet d^3 to descend and then ascend in the chambers. The tubes communicate with headers at the top. Means may be provided for tapping the tubes automatically or otherwise to prevent the accumulation of dust.



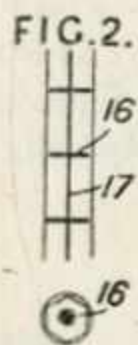
the paths taken by the steam from the different inlet points to the air outlet channels F are all equal.

141,469. Booth, C. F., and Gillison, T. March 3, 1919.

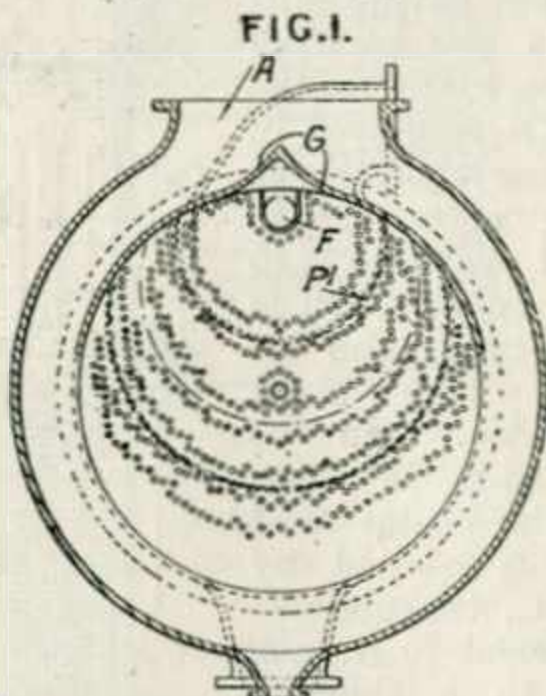


141,210. Plumbridge, D. V. May 14, 1919.

Straight-tube apparatus having internal baffles. — A condenser for volatile solvents is formed of tubes containing hexagonal baffles 16 on a central rod 17, as shown.



141,334. Soc. Anon. pour l'Exploitation des Procédés Westinghouse-Leblanc. April 5, 1919, [Convention date].

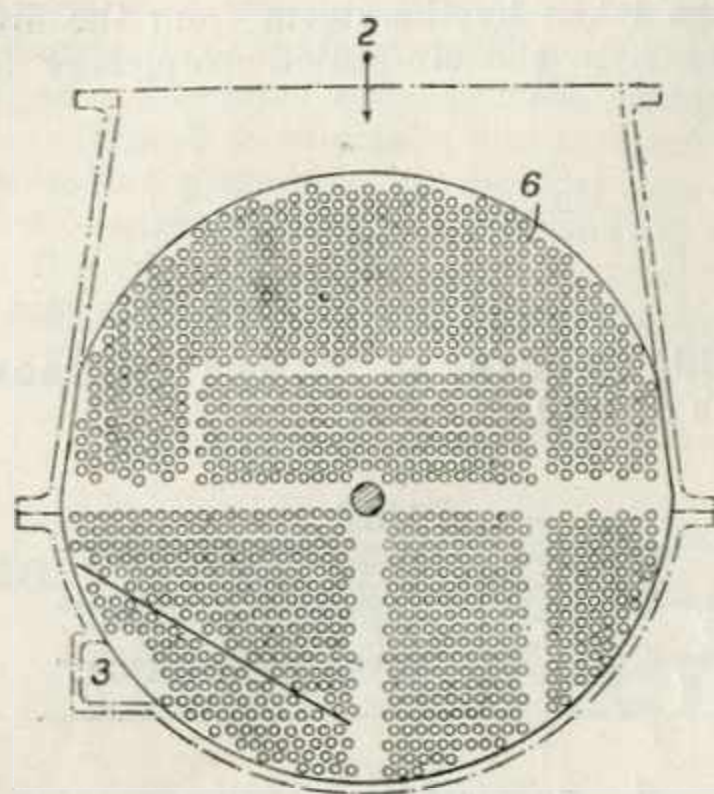


Straight tubes between headers.—In a surface condenser having a partition or screen G causing the steam to pass downwards from the inlet A and enter the tube nest at the lower part, the partitions P¹ in the headers so divide the tubes into a number of crescent-shaped groups that

Plate apparatus. — Relates to radiators for internal-combustion engines or like surface-apparatus of the type comprising a number of pairs of metal plates with protuberances stamped in them so that, when they are arranged in juxtaposition, two series of spaces are formed for the passage of the heating and cooling fluids respectively. In the construction shown in Fig. 2, the pairs of plates A are united round their entire margin D and are provided with relatively large convex and concave depressions B out of which central flanged apertures C of relatively small dimensions are pressed, these apertures forming tubular water passages communicating between the water spaces C¹, and also spacing the pairs of plates apart to form the air spaces E. In the modification shown in Fig. 3, the depressions B are not perforated, but are flattened at their axes where they contact with the next pair of plates. Each pair of plates are united along one pair of edges, and spaced apart along the other edges so as to form water passages H. Pairs of plates are connected along the latter edges by distance-pieces I so as to form air spaces E, and smaller depressions G are formed at the opposite sides of the plates to the depressions B so as to contact with each other in the water spaces H. The joints are completed by dipping in solder.

141,546. Scanes, A. E. L., and Metropolitan-Vickers Electrical Co. June 4, 1919.

Straight tubes between headers.—The tubes 6 of a condenser are so spaced that, near the steam inlet 2 and at the sides, straight parallel lines of steam-flow between the tubes are in the same direction as the flow of entering steam, while in

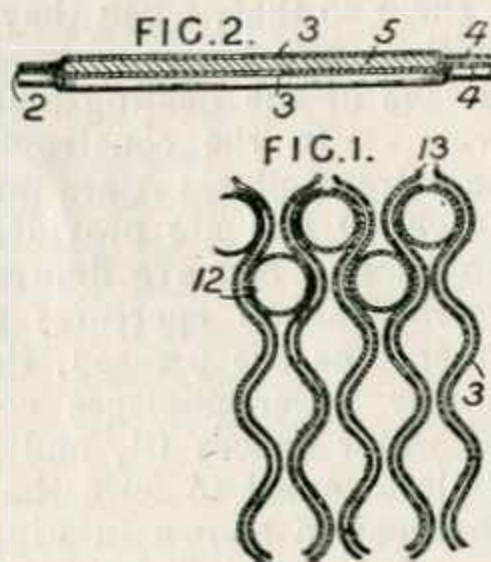


the centre of the condenser and near the air outlet 3, the parallel lines are at right-angles thereto.

141,596. Mosses, A. J. H., Searle, C., and Scales, H. L. Sept. 2, 1919.

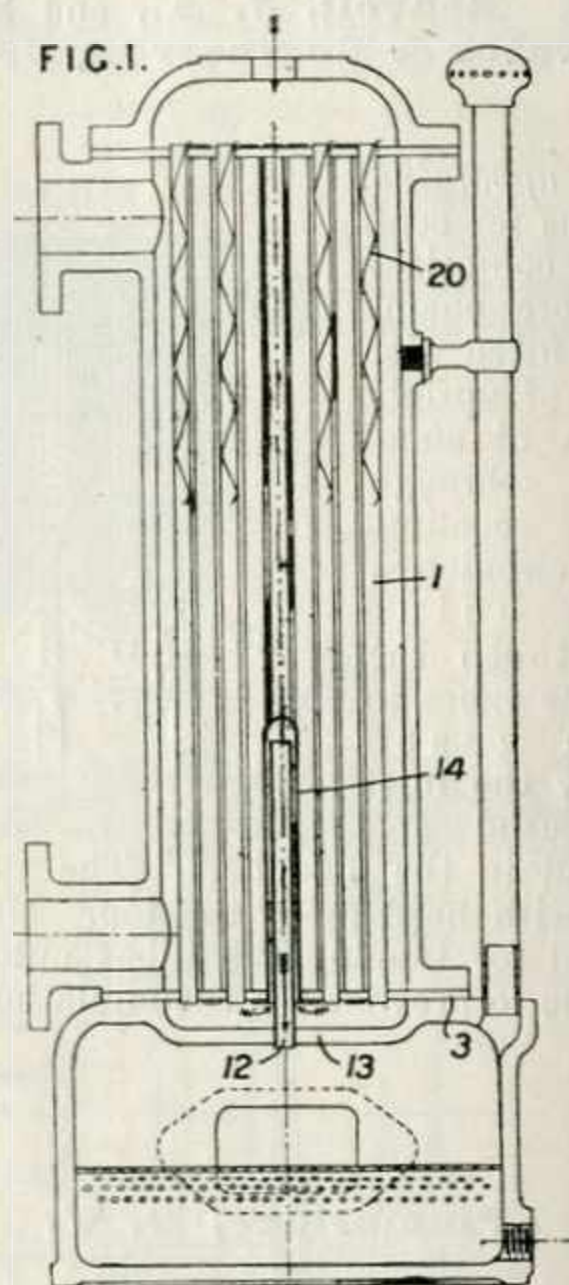
Plate apparatus.—

Radiators are built up of corrugated tubes or plates 3 formed of single sheets of metal which are in the first place bent to the shape shown in Fig. 2, a metallic core or separator 5, of a width slightly less than that of the partly formed tube, being used to form the water space and the edges of the tube being left free until the tube is passed through a pair of corrugated rollers. These rollers are formed with side corrugations at a greater distance from the centre than the main ones which bend the tube 3 and the separator 5 for acting on the edges 2, 4. The separator is removed by opening up the edges 4, and the edges 4 are preferably soldered together after the tubes are assembled to form the radiator together with hollow tubes 12 for the passage of air or other cooling medium. The tubes 12, 3 are soldered together, thus forming a watertight connexion between the inner ends of adjacent tubes 3 at the top of the radiator. The outer ends of the tubes are bent up at 13 and secured by solder.



141,792. Hocking, H. Jan. 20, 1919.

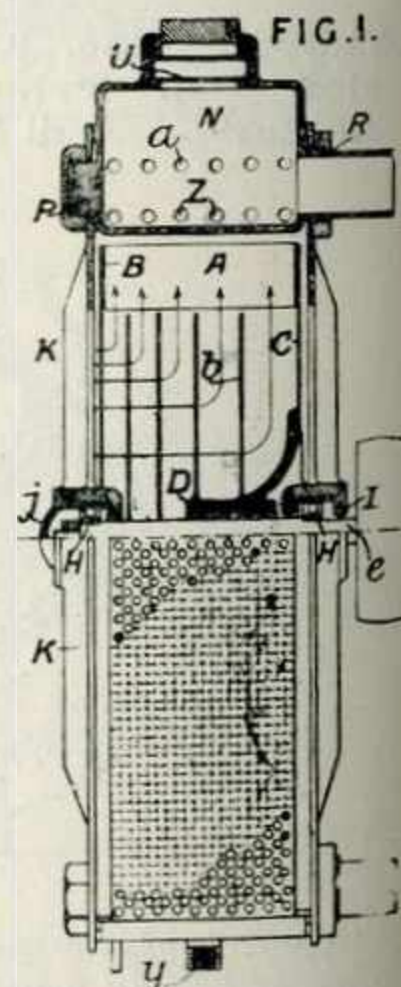
Straight-tube apparatus having internal baffles.—In the class of condenser in which the lower part of condensing-tubes 1 retains the con-



densate to cool it, the tubes 1 may be fitted with retarding devices 20 or close-ended filling tubes.

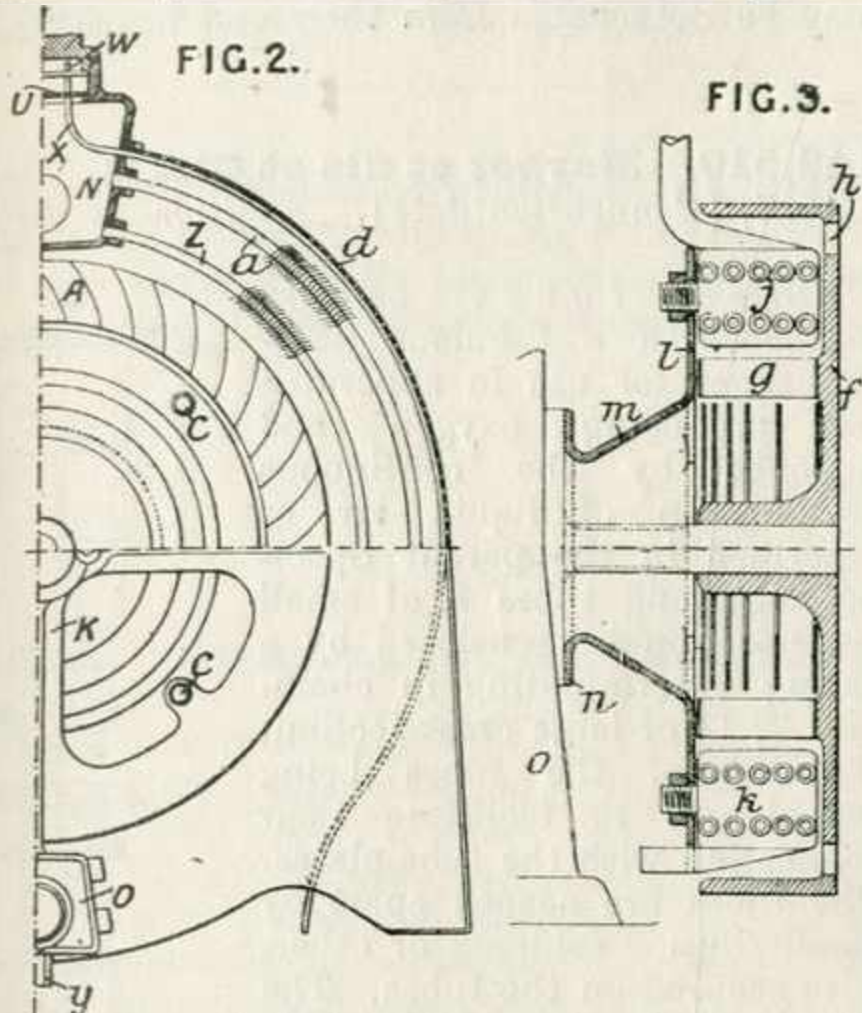
142,071. Harter, E. April 23, 1919, [Convention date].

Gills for tubes.—The heat-exchange apparatus described in Specification 127,565, comprising concentric tubes having gills shaped to form fixed guide-vanes for a centrifugal fan, is employed in radiators for cooling the circulating water of the motors of vehicles or stationary engines. The fan inlet may also be provided with fixed diffuser plates. In the radiator shown in Figs. 1 and 2, the blades A of the fan are carried by plates B, C, the plate C being attached to a boss D keyed to a shaft e driven by a pulley from the motor. The gilled tubes Z, a are hard-soldered in bosses on upper and lower headers N, O, and are enclosed by a perforated casing d. The headers have screw-threaded bosses P and nipples R whereby they are secured to the front





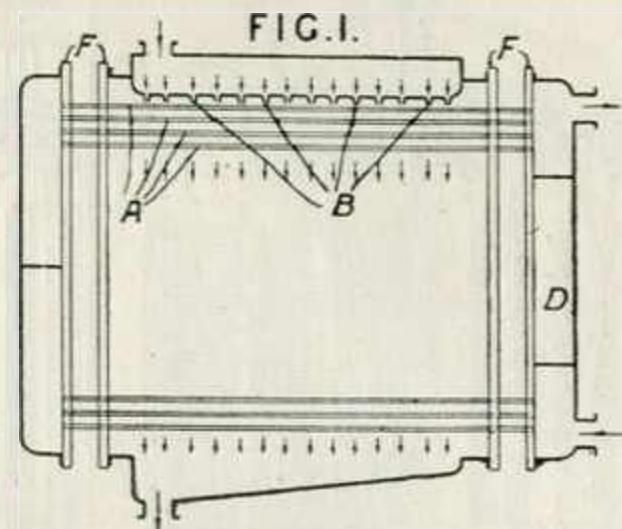
and back frames. In a modification, shown in Fig. 3, the fan *g* is carried by the fly-wheel *f* of the motor, the cooling-tubes being located within the rim of the fly-wheel and secured by the headers *j*, *k* to a fixed plate *l* carried by arms



m on a ring *n* bolted to the engine bed *o*. Air is drawn in through the openings between the arms *m* and is discharged through lateral openings *h* in the fly-wheel. Specification 137,274, [Class 110 (i), Centrifugal and screw fans &c.], is referred to.

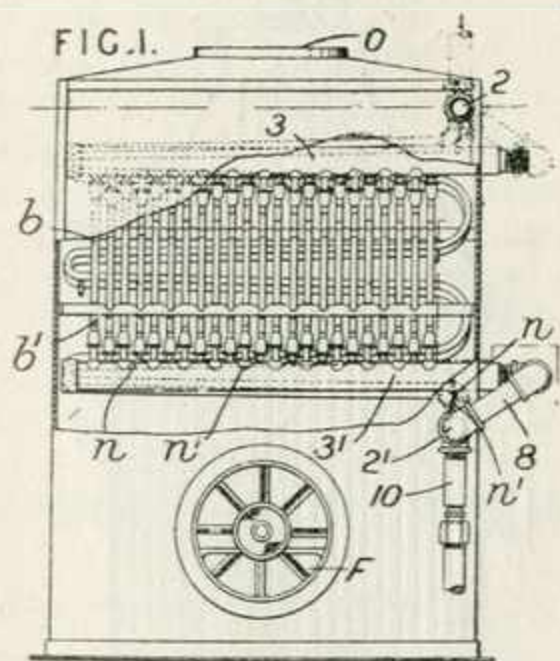
contained in the pipe 2¹. The air to be heated is drawn into the apparatus by a fan *F* and escapes through an outlet *O*.

142,454. Soc. de Condenseurs Delas. April 30, 1919, [Convention date].



Tube-plates.—Viscous liquids, such as oils, are allowed to fall in separate drops over the surfaces of superposed internally-cooled tubes so that the drops spread in a short film over each tube and then reform independently and fall to the next tube. The apparatus comprises a series of tubes *A* enclosed in a casing to exclude dust, and a series of spaced nozzles *B* through which the oil is distributed. The cooling water flows through the tubes in a sinuous path from the bottom to the top. In the case of lubricating oil for electrical apparatus where it is important to prevent the entrance of water into the oil, the water boxes or headers *D* may be separated by a space from the end tube plates *F* of the oil chamber. In addition to this, the oil chamber may communicate with a chamber containing an hygroscopic substance. To minimize the danger of water leakage, the water may circulate under reduced pressure.

142,352. Baetz, H. June 28, 1919.



Serpentine-pipe apparatus.—An air-heating apparatus comprises steam inlet pipes 2, 3 disposed along the inner surfaces of two contiguous walls and connected to the lower drain pipes 2¹, 3¹ by sets of coils provided with terminal bends *b*, *b*¹ of unequal size, the individual pipes of the coils being disposed in distinct planes and in staggered relation. The nipples *n*, *n*¹ by which the coil pipes are connected to the steam and drain pipes are alternately of different height and disposed in different planes. The drain pipe 3¹ is connected by an elbow fitting 8 to a water-collecting tube 10 containing a water discharge valve under the control of a thermostatic device

142,481. Matossi, A. April 30, 1919, [Convention date].

Concentric or jacketed straight-tube apparatus.—Apparatus applicable to radiators for motor-vehicles comprises a series of interchangeable cooling elements 1 connected to common inlet and outlet pipes or chambers 10, 11, and composed of end boxes 2, 3 and one or more gilled water tubes 4 having concentric air tubes 6, 7 passing through them. Valves 12, 13 are provided at the connexions between the boxes 2, 3 and the common chambers 10, 11 so that any element may be cut out of the circulating system. The air tubes of an element communicate with a single inlet and outlet bend at the top and bottom, as shown in Fig. 2. The valves are adjusted by first removing screw-caps 16,

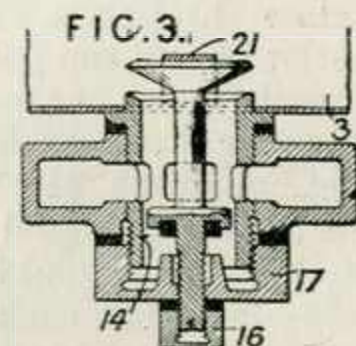
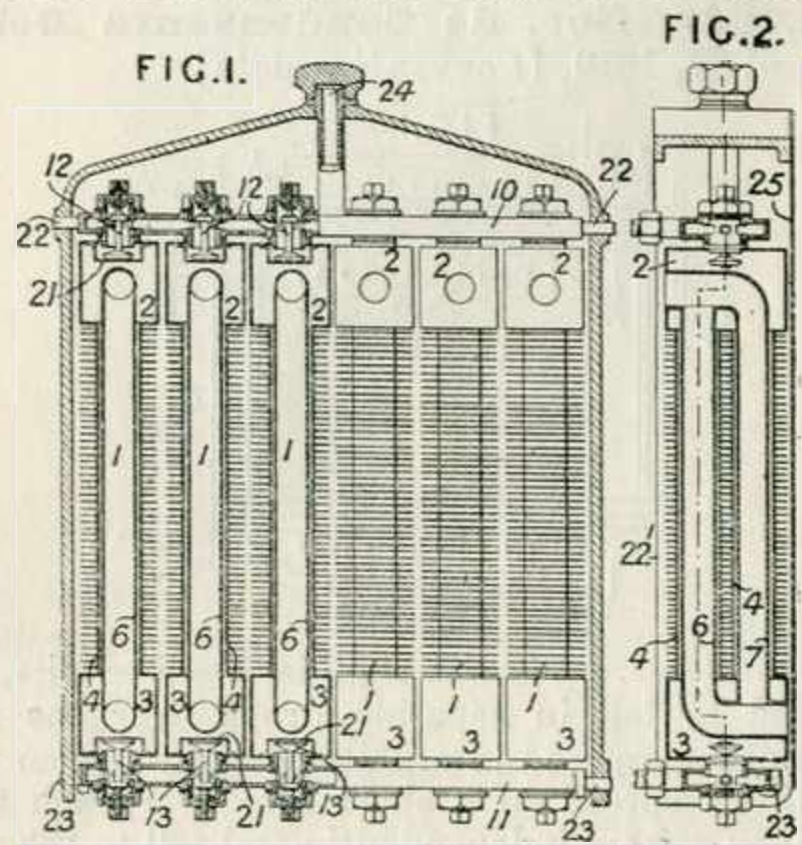


Fig. 3, and screwing the valve stems into or out of nuts 17 on apertured sleeves 14, the inner ends of which form valve seats. The sleeves 14 are attached to the end boxes, and the elements may be removed by first disengaging one water-chamber 10 from all the sleeves. Stops 21 are provided within the end boxes of the elements

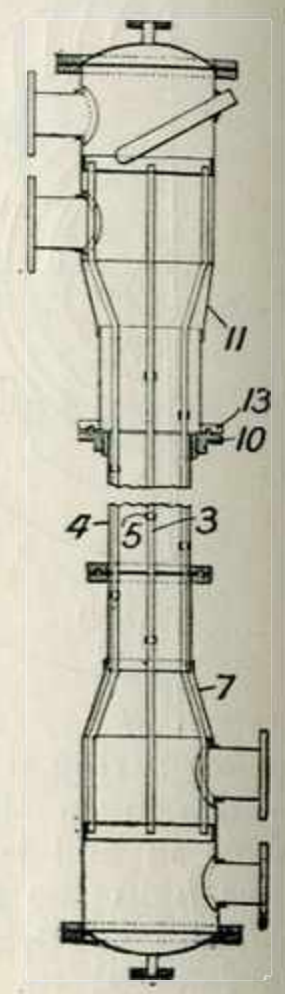


to limit the inward movement of the valves. The front of the radiator casing 22¹ may be provided with a perforated cover-plate 25. The whole of the elements and inlet and outlet chambers may be mounted within the casing by means of pivots 23 at the base and removable securing-pins 22 at the top, so that after removal of the steam

pipe 24, the cooling structure may be swung down out of the casing for inspection &c. In a modification, the radiator casing may be pivoted to the chassis of the vehicle and be turned down, the cooling structure being fixed. The water tubes may be detachable from their end boxes 2, 3.

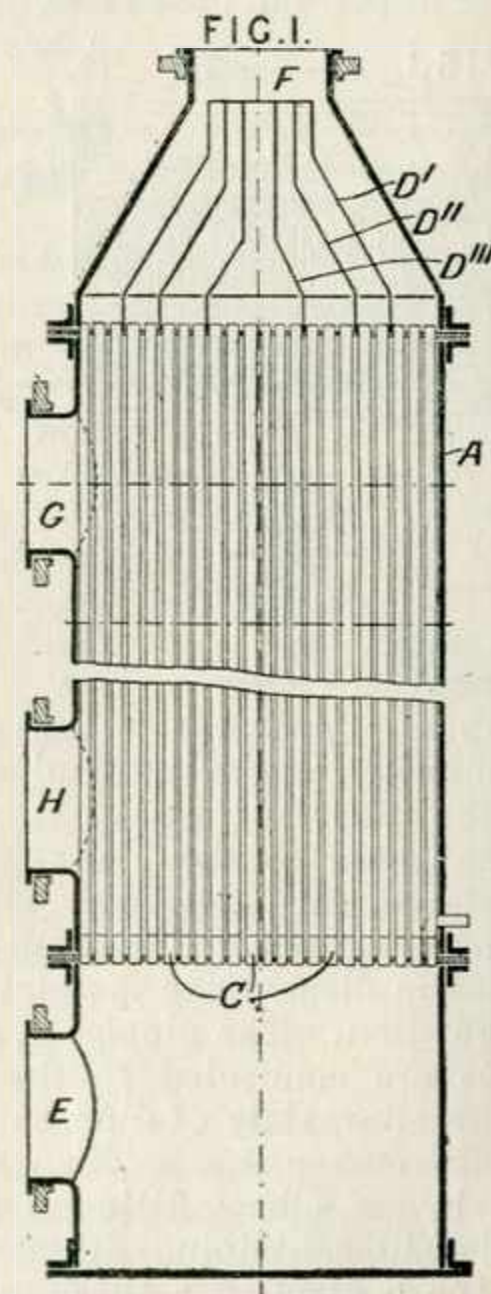
142,519. Barbet et fils et Cie, E. Oct. 9, 1917, [Convention date]. Addition to 131,321.

Straight tubes between headers.—In a tubulous heat-exchanger for use in apparatus for producing oxygen and nitrogen by the continuous rectification of liquid air as described in the parent Specification, long tubes 3 of small cross-section are enclosed by a casing 4 terminating in chambers 7, 11 of large cross-section, the ends of the tubes being spread out to facilitate their connection with the tube-plates. The tubes are spaced apart by small rings 5 soldered or otherwise secured on the tubes. The chambers are fixed to the ends of the casing after the tubes have been expanded in their tube-plates, the chambers being secured by bolts passing through flanges 10, 13.



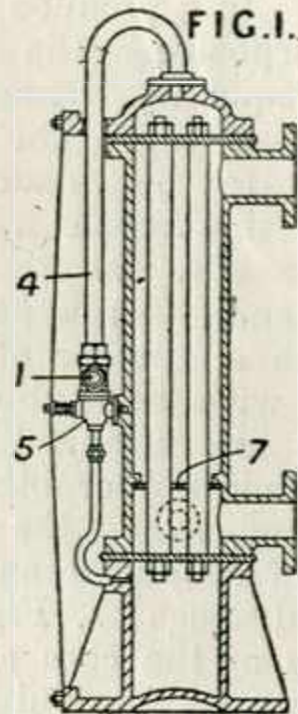
142,522. Audianne, P. Dec. 7, 1918.

Straight tubes between headers; straight-tube apparatus having internal baffles in tubes.—In a heat-exchanger for use in the contact process for making sulphur trioxide or sulphuric acid, in which the gases from the contact chambers circulate through a chamber A from an inlet G to outlet H and the gases on their way to the contact chamber pass through tubes C, which traverse the chamber A, from inlet E to outlet F, the cross-sectional area of the interior of the tubes is substantially equal to the cross-sectional area of the space outside the tubes. The dimensions of the exchanger with respect to the other parts of the plant are such that the speed of the gases is about 3½ metres per second, and the surface for heat-exchange is 5 square metres per ton of SO₃ per day when the gases are to be heated to 220° C., and 25 square metres when the gases are to be heated to 325° C. Throttling-devices to give the gases a rotary movement are placed in the lower ends of the tubes C, and the outlet dome F is fitted with conical partitions D¹, D¹¹, D¹¹¹, between which approximately equal volumes of gas will pass.



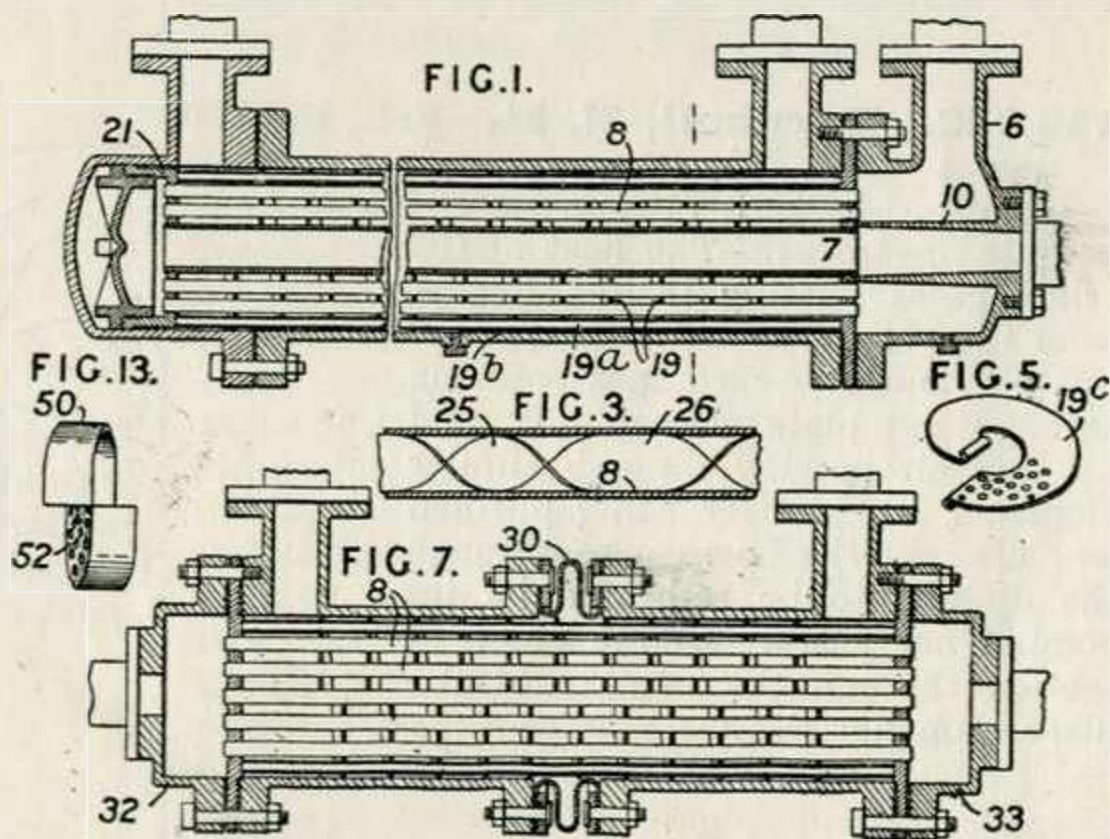
142,666. Porter, W. H. May 14, 1919.

Transverse distributing-partitions.—In a steam-heated water heater, the incoming water is distributed over the ends of the steam-tubes by a plate 7 having holes of larger diameter than the tubes.



142,715. Jackson, W. J. Mellersh-, (Griscom-Russell Co.). July 28, 1919.

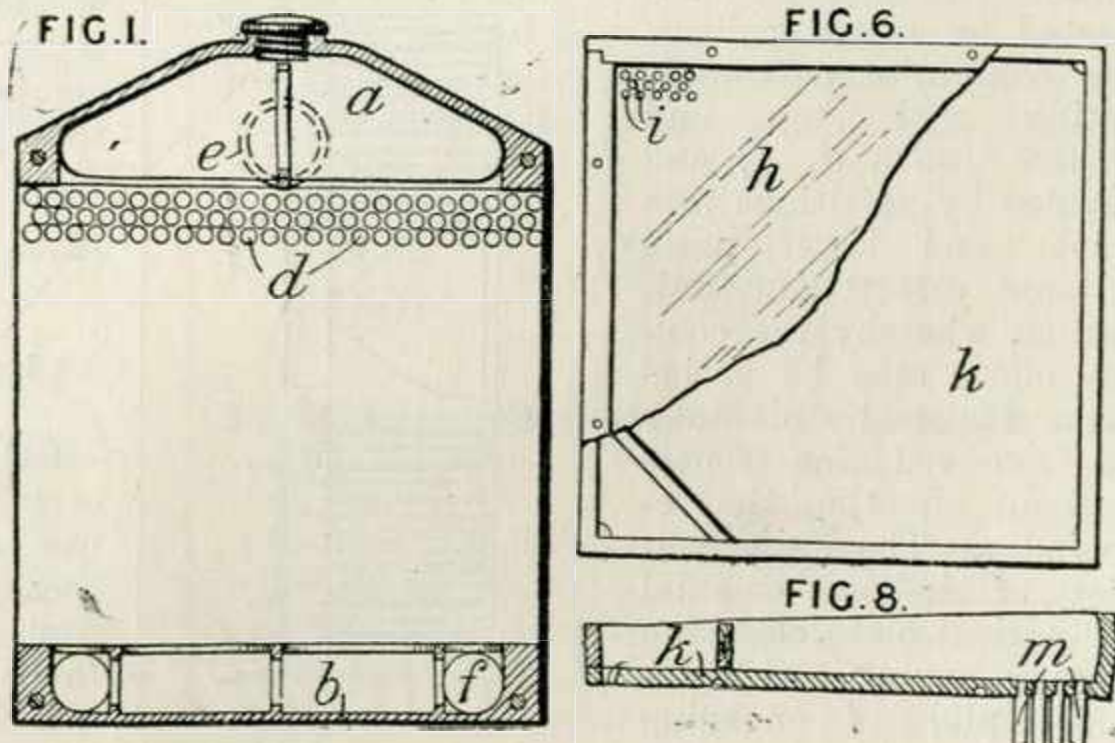
Straight tubes passing through helical baffles; expansion of tubes providing for; internal baffles in tubes; casings, constructions and forms of.—In heat-exchangers having straight tubes 8 passing through a helical baffle 19, this baffle is made of a number of sections each comprising a single turn. Fig. 5 shows one form 19^c made of sheet metal, shown in Fig. 1 as spaced apart by sleeves 19^b upon rods 19^a. Fig. 13 shows another form 52 in which a spacing flange 50 is attached to the edge. Various forms of complete apparatus are described; in one, Fig. 1, a central tube 7 leads to an outlet 10 in the header 6, cooling water which has passed to the sliding head 21 through the small tubes 8. In the form shown in Fig. 7, expansion or contraction of the tubes 8 is provided for by an expansion ring 30 in the casing, this form also



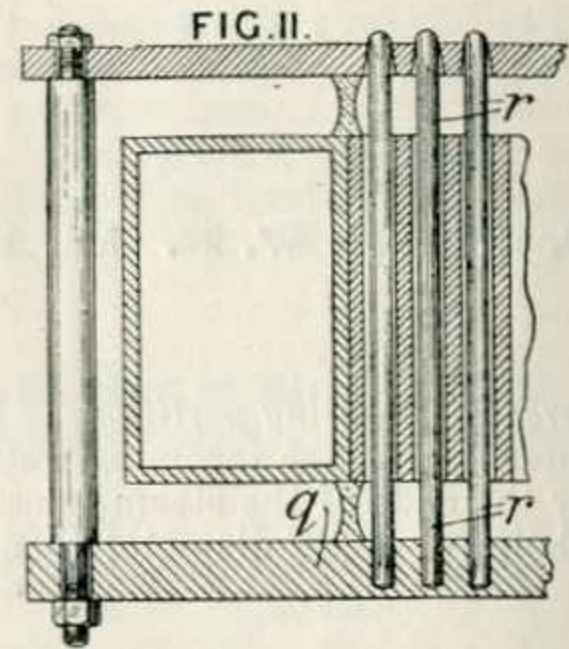
showing a single flow for cooling water from header 32 to header 33. The tubes 8 may be fitted with strip baffles 25, Fig. 3, reversely twisted from a central flat part 26.

142,933. Smith, H. R. Melland-. Feb. 14, 1919.

Honeycomb and like tube apparatus.—In heat-interchanging apparatus such as radiators for heating buildings, honeycomb radiators for motor-cars, &c., an electrolytically-deposited multi-tubular cell *d*, Fig. 1, is joined integrally with the other portions of the apparatus, such as the header *a*, sump *b*, and inlet and outlet connections *e*, *f*, so as to produce a complete radiator or radiator section. The process consists in joining the multi-tubular core of fusible metal on which the deposit is to be made to the headers &c. by soldering or



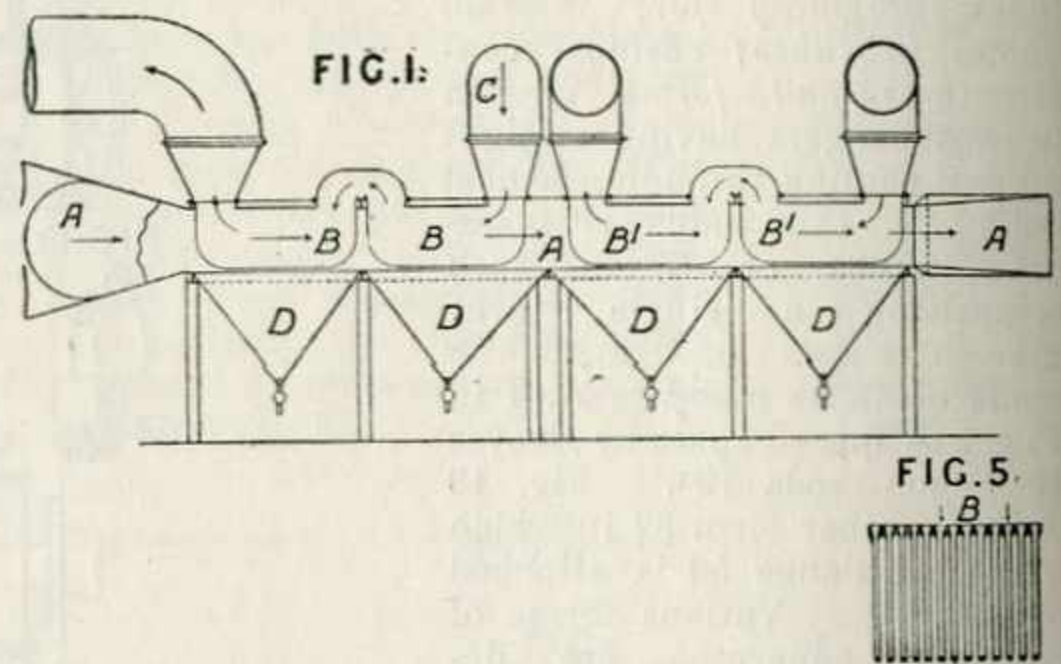
brazing so as to produce a continuous metallic joint, depositing the metal over the whole, and subsequently removing the metal of the core by melting. The core on which the deposit is to be made is preferably made by running the fusible metal in a molten condition into a mould, comprising a base *h* and a lid *k*, Figs. 6 and 8, each having a series of holes *i* into which a number of removable pegs *m* corresponding with the tubular parts of the cellular structure are fitted. The core is then joined to the aluminium or other metal header and sump &c., and forms the cathode in an electrolytic bath of which the anode is formed by a series of metal pegs *r*, Fig. 11, projecting through the holes of the core and held between conducting-plates *q* of aluminium. The fusible metal core is finally removed by immersing the whole in molten metal at the correct temperature, or by means of a muffle furnace. The com-



plete radiator may consist either of a single section as produced or of several sections bolted together.

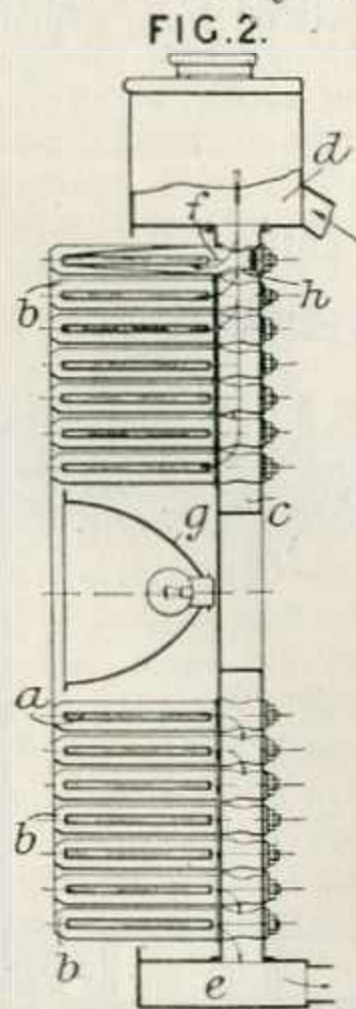
142,938. Turnbull, N. K. Feb. 15, 1919.

Plate apparatus.—The heat of the crude gases passing in the flue *A* from the blast furnaces is abstracted by previously cooled gas passing through flat plate elements *B*, and by cold air passing through similar elements *B'*. After being purified and filtered, the gases pass through the duct *C* to be re-heated by incoming hot gases. Fig. 5 shows a section through the mouths of the plate elements *B*.



143,179. Chardard, J. B. D. L. May 14, 1919, [Convention date].

Plate apparatus.—A motor-car radiator comprises a variable number of concentric cooling units detachably connected to a rear collecting column *c* communicating with top and bottom tanks *d*, *e*, and divided by partitions into upper and lower parts without direct communication, whereby the cooling effect may be varied or a damaged unit may be removed for repair without affecting the remainder. The units consist of hollow co-axial cylindrical plate elements *a* each having two apertured plugs *f* engaging



similar sockets *h* in the upper and lower parts of the collecting-column *c* respectively. When an element is removed, the corresponding sockets are closed by conical plugs. The elements may have ribs or gills *b*.

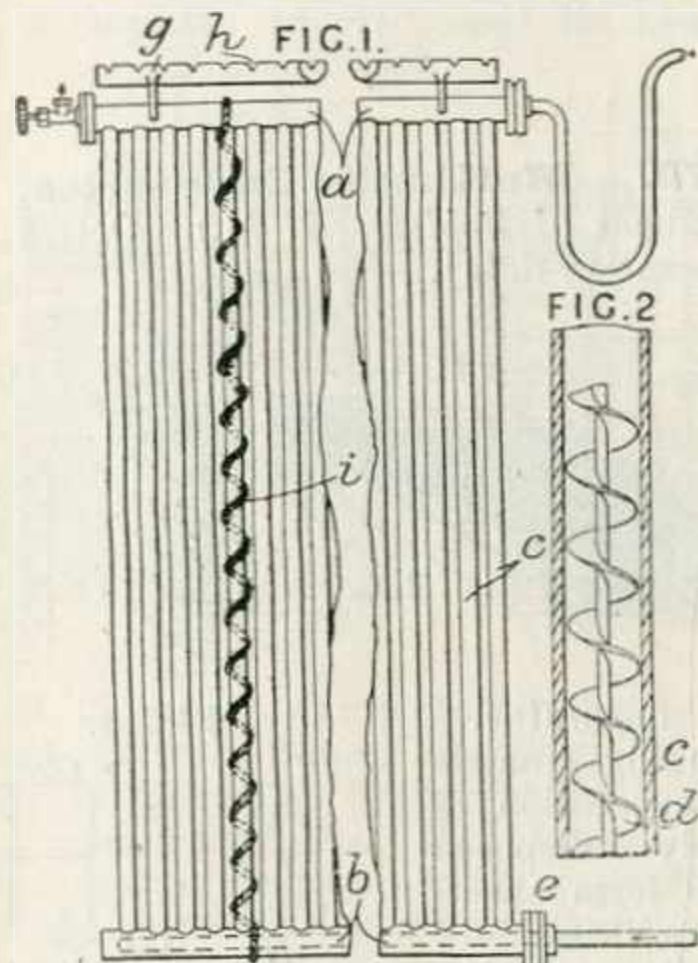
The Specification as open to inspection under Sect. 91 (3) (a) comprises also the employment of rectilinear or elliptic plates, shells, or tubes, either smooth or corrugated, or honeycomb elements. This subject-matter does not appear in the Specification as accepted.

144,413. McOustra, J. March 26, 1919.

Straight-tube apparatus having internal baffles in tubes.—Relates to atmospheric condensers for use in connexion with refrigerating apparatus of the type comprising a series of vertical tubes *c* connecting top and bottom headers *a*, *b*, the gas to be condensed being introduced in the bottom header *b*, and the condense discharged from the

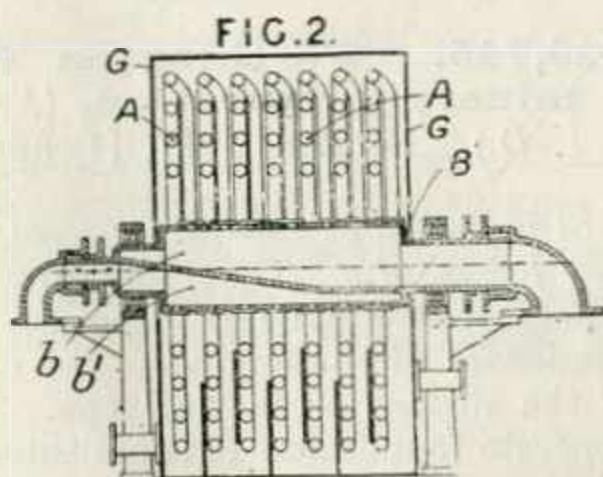
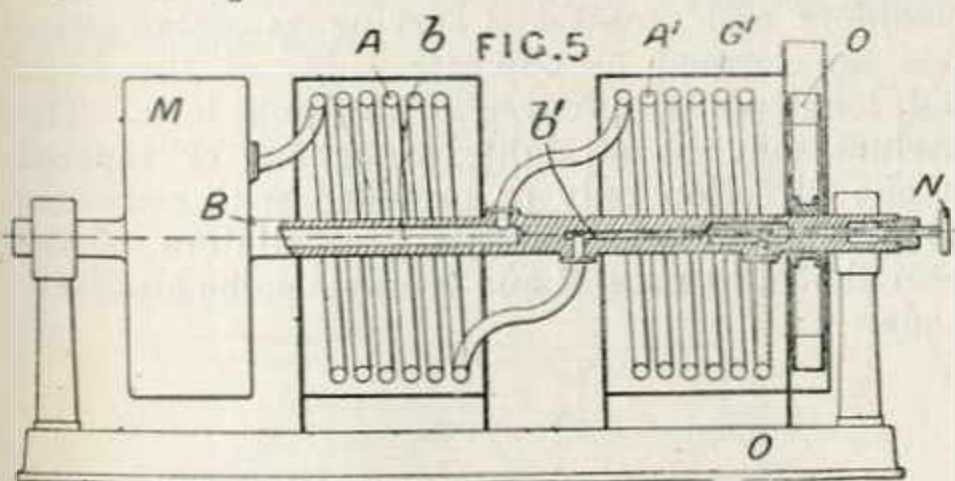


top header. According to the invention, the tubes *c* are fitted in the interior with a sheet-metal spiral *d* or an aggregation of twisted wire or gauze whereby the gas is caused to travel in a circuitous path and the condensing effect is increased. A perforated distributing pipe *e* is preferably located in the bottom header *b* so as



equally to distribute the gas to the series of tubes *c*. The cooling water is allowed to fall on to the tubes *c* from a trough *g* having overflow notches *h*, and the tubes are indented, ribbed, or provided on the exterior with spirally wound tow *i* to delay the descent of the water.

144,739. Rau, R. June 12, 1919, [Convention date].



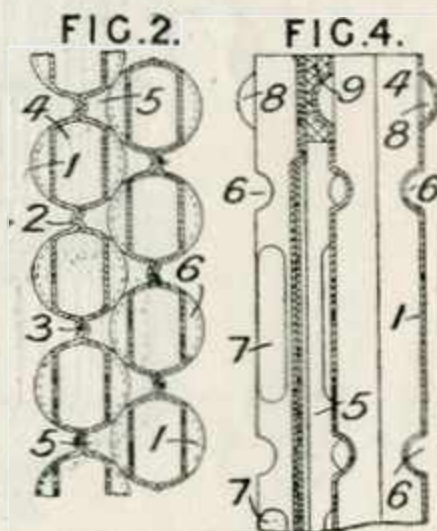
Coil-tube apparatus. — A condenser or cooler comprises one or more coils *A* rotating on a

hollow axle *B* divided into compartments the larger *b* of which passes vapours into the coils and the smaller *b'* passes the condensate back into the shaft. The coils rotate in a drum *G* in which is the cooling water or the liquid or air to be cooled. Fig. 2 shows a device with flat spirals, but other forms of coil-tubes may be used. The shaft may carry the condenser and the cooler of a freezing machine as shown in Fig. 5, in which the rotary compressor *M* draws gases from the cooler *A'* through the compartment *b* and compresses them into the coil *A*, the condensate passing by the passage *b'* past a valve *N* to the coil *A'* immersed in brine in the casing *G'*. If air to be cooled passes through the casing *G'* a fan *O* is provided.

144,870. Tritsch, D. T., Booth, C. F., and Gillison, T. May 30, 1919.

Plate apparatus.—

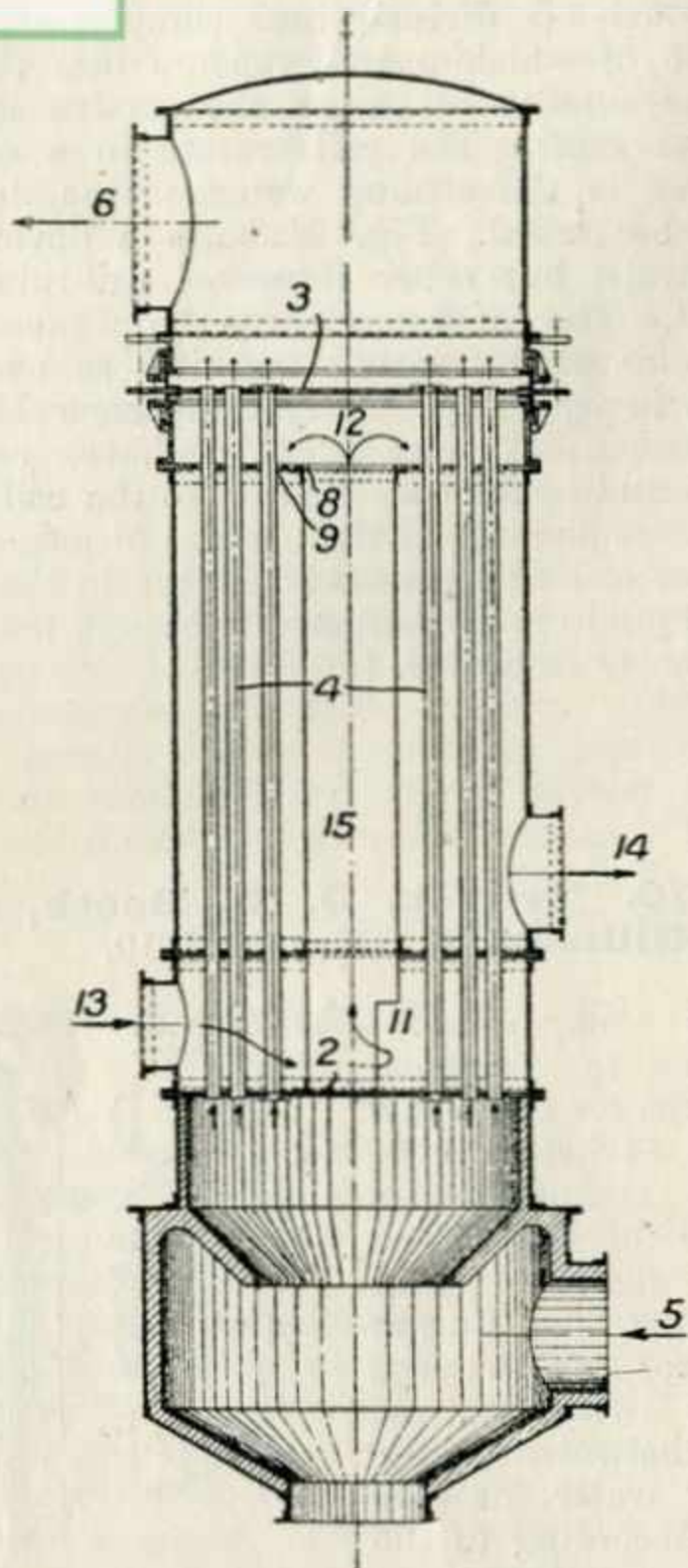
Relates to surface-apparatus for the transference of heat of the type comprising a number of corrugated sheet-metal plates assembled to form tubes for the passage of air with narrow spaces between for the flow of water or the like. According to the invention, the ap-



paratus is built up of a number of pairs of plates having rounded corrugations 1 with short interspaces 2 between the corrugations arranged in staggered relation, the convex face of the corrugations being provided with transverse channels 6, longitudinal channels 7, or both, except at the marginal portions so as to provide passages 5 for the water without the necessity of enlarging or expanding the ends of the tubes 4. Small V or like shaped projections 3 are pressed out of the interspaces 2 between the corrugations so as to interengage when the plates are assembled and prevent their relative movement. Projections 8 are also stamped out of the corrugations or the interspaces near the edges of the plates to fill up the interstices between the rows of tubes and to retain the solder 9 when the apparatus is dipped.

145,540. Eisenwerk Jagstfeld Ges. May 17, 1918, [Convention date].

Straight tubes between headers; transverse distributing-partitions.—A blast and gas cooler for use with gas generators comprises upper and lower headers 3, 2 in which tubes 4 are fitted. Hot gas enters at an inlet 5, passes through the



tubes 4, and escapes by an outlet 6. Cold air enters a chamber 11 by an inlet 13, passes up a centre tube 15 into a chamber 12 and through annular gaps 9 in a partition 8, is heated by contact with the tubes 4, and leaves by an outlet 14.

145,652. Rosanoff Process Co., (Assignees of Perkins, H. F.). July 2, 1919, [Convention date]. No Patent granted (Sealing fee not paid).

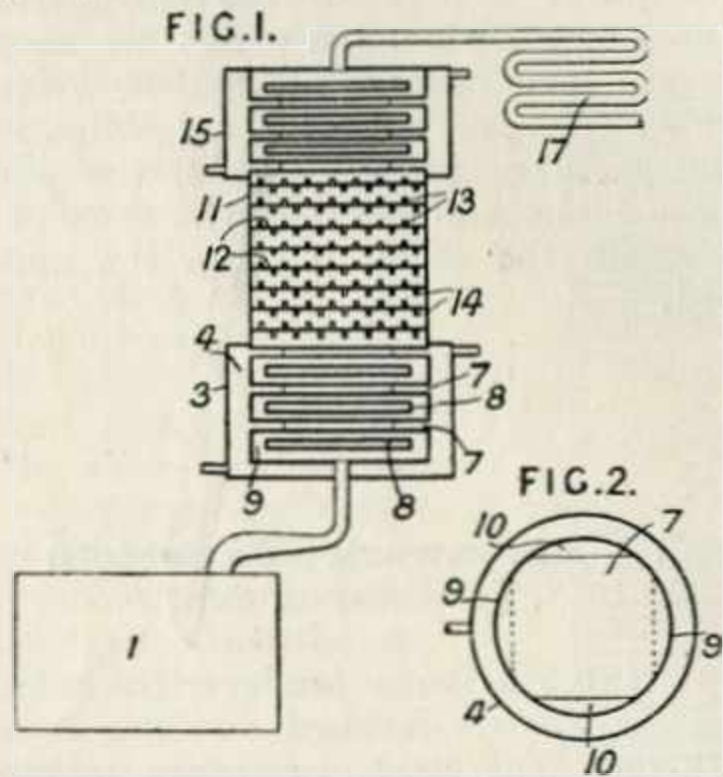


Plate apparatus.—Coolers 3, 15 forming part of an apparatus for distilling petroleum &c. are

formed with jacket 4 and cooling plates 7, 8 extending alternately from one side of the jacket to the other at right angles to each other, so that the vapours take a circuitous course, passing through side passages 9, 10 alternately.

Reference has been directed by the Comptroller to Specification 18579/02, [Class 32, Distilling &c.].

145,672. McKinnon Industries, Ltd., (Assignees of Boblett, K. M.). Oct. 1, 1914, [Convention date].

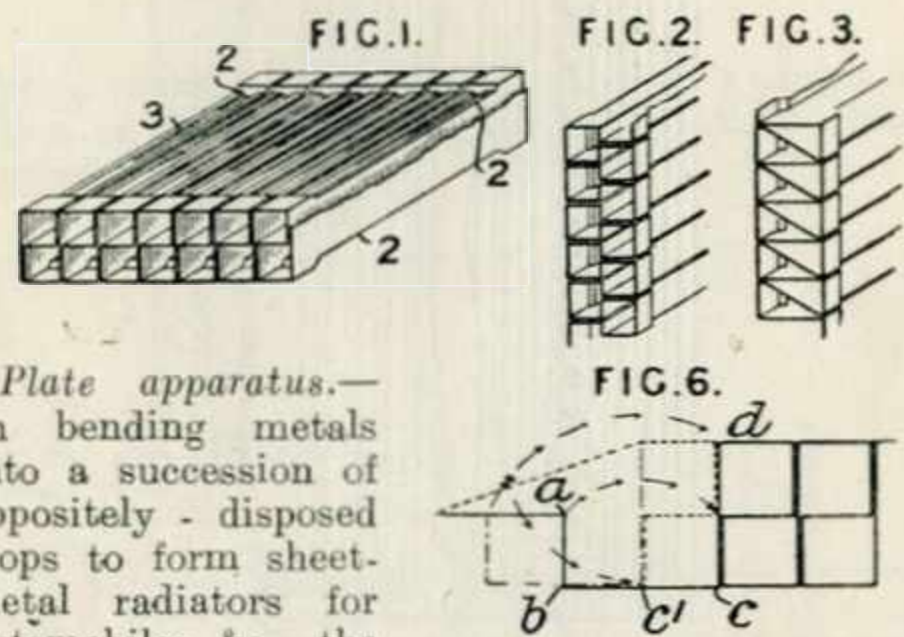


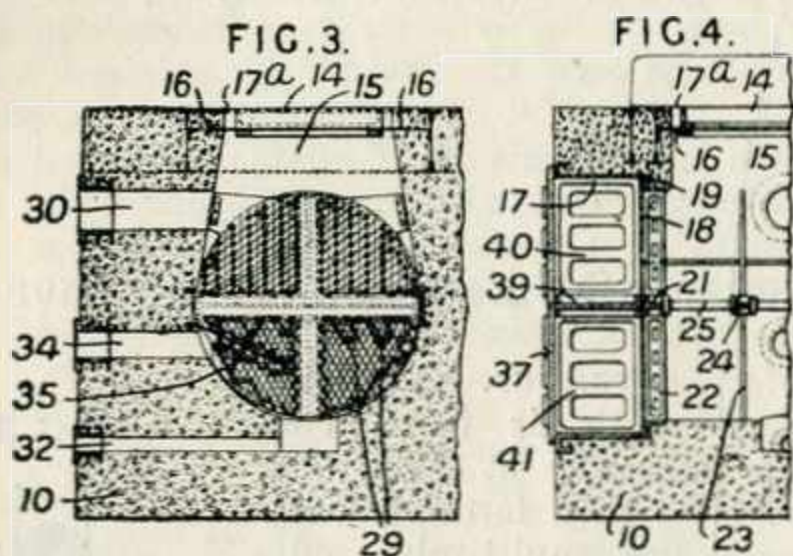
Plate apparatus.—

In bending metals into a succession of oppositely - disposed loops to form sheet-metal radiators for automobiles &c., the metal is alternately bent so as to form an offset portion, and the offset portion then bent intermediate its ends towards the finished portion. In making a radiator as shown in Fig. 1, a continuous sheet-metal strip is bent to the form shown at a, b, c, d, Fig. 6, and the strip then fed along through the space of one loop. The part b, c is then bent about the point c' to bring the end a against the part c, d to form the lower loop. The inclined portion of the strip is then bent to complete the top loop and form the U-shape for the next loop. Lateral shoulders and recesses 2 serving as water channels are formed at opposite sides of the loops and longitudinal grooves 3 in each loop. The product may be straight throughout or tapered in one direction only or provided with only one set of shoulders or off-sets. Radiators of the form shown in Figs. 2 and 3 may also be similarly made.

145,745. Worthington Pump & Machinery Corporation, (Assignees of Stone, J. D.). Sept. 6, 1917, [Convention date].

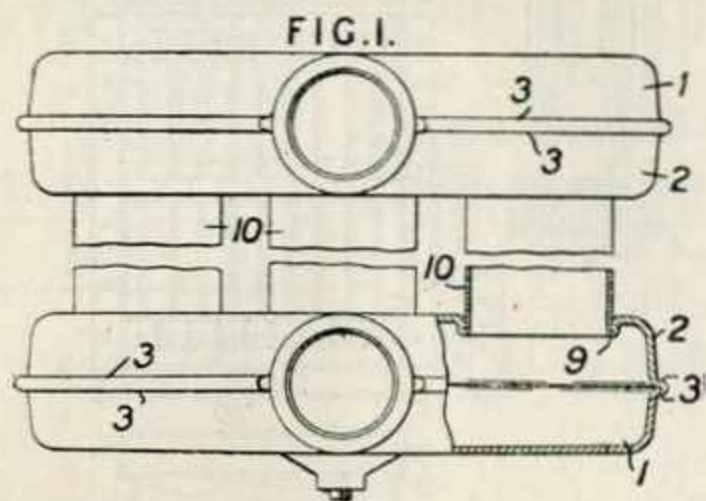
Straight-tube apparatus; casings, construction and forms of.—The foundation of a turbine or other steam-engine is used as the shell of the condenser of the engine. The condenser may be of the surface or the jet type. In one form, the concrete foundation 10 constitutes the steam space of the condenser, the exhaust steam entering directly by an inlet 15. To allow for expansion, an annular space 17^a is left between the exhaust

pipe 14 and the inlet 15; the space 17^a is closed by a metal plate 16 with one edge secured to the pipe 14 and the other embedded in the concrete. A free exhaust 30, air outlet 34, and condensate outlet 32 are formed in the concrete. At each end of the condenser are tube-plates 18, secured within rings 17, and preferably seated against flanges 19. The water-boxes formed by the rings 17 and tube-plates 18 are closed by heads 37.



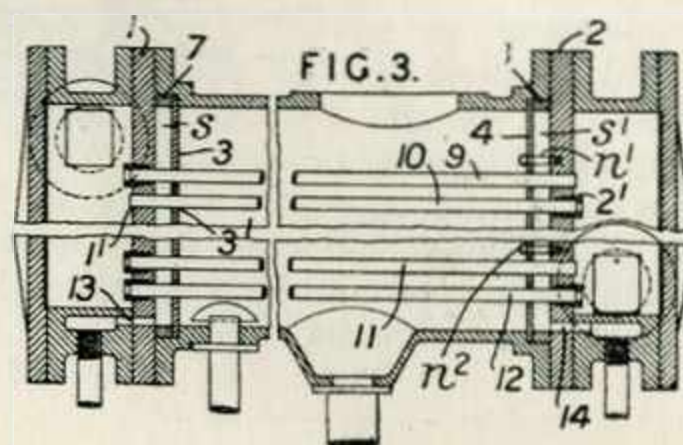
Braces 21, 22 and 39, 41 are provided in the steam space and the water-boxes. Sagging of the cooling-tubes is prevented by perforated plates 23 held by cross-braces 24. The tube-plates are supported against air-pressure by stays 25. The tubes in the upper part of the condenser, Fig. 3, are arranged in vertical sets with channels at intervals between them, and in the lower part are arranged as shown with short downwardly-leading openings 29 and with a baffle 35 under which the air escapes to the conduit 34.

146,130. Pressed Metal Radiator Co., (Assignees of *Sonneborn, C.*). June 22, 1916, [Convention date].



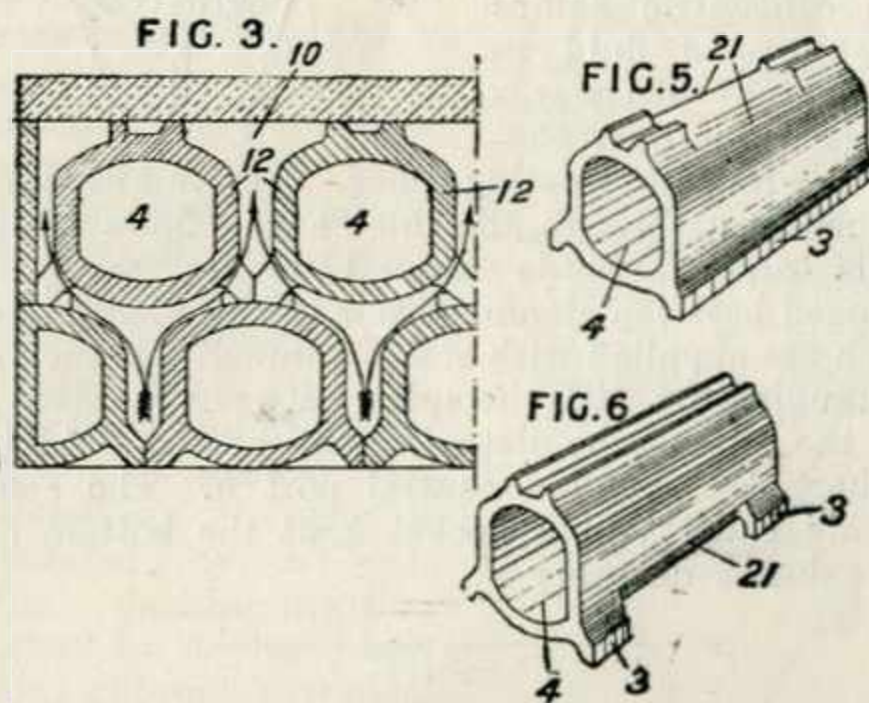
Headers and tube-plates, constructions of.—Tubes 10 enter the slightly coned inturned apertures 9 in a dished thin metal header 2 and are welded thereto. The outer halves 1 of the headers are united to the inner at their flanged edges 3 by welding.

146,506. Lillie, S. M. April 18, 1919, [Convention date]. Void [Published under Sect. 91 of the Act].



Tube-plates, constructions of.—A secondary tube plate 3, 4 is fitted in front of each main tube plate 1, 2 of a surface condenser so as to form flat chambers S, S', into which leakage water drains and is led out by passages 13, 14 to the main air-suction line. The plates may be secured by spacing rings 7, 8 and by expanding certain tubes 9, 10, 11, 12 at one end only into the two plates at 1', 3', the other being a sliding fit in the secondary and passing through a stuffing-box 2' in the main tube-plate, or studs n^1 with nuts n^2 may hold them.

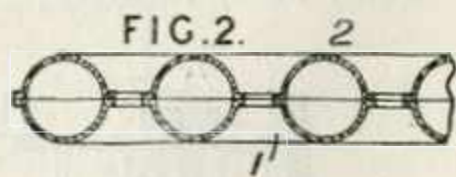
146,633. Thompson, W. P., (*Fours et Procédés Mathy Soc. Anon.*). April 12, 1919.



Tubes of special materials.—Heat is interchanged between fluid streams circulating parallel to one another through and around connected refractory pipes in superposed tiers. The waste gases for example, used for heating, flow from the interior 4 of one layer of pipes to another by means of headers. The air &c. being heated passes through the spaces 10 outside the pipes from layer to layer by means of gaps 21 in the edges 3 of the refractory sections 12 at the points where communication is desired. The pipes may be of triangular cross-section or may be rectangular without ribs or flanges 3, the passage of air from one tier to another being effected by bevelling a corner of an element at the desired place.

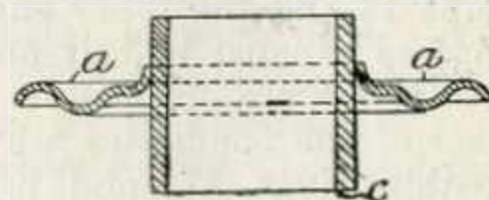
147,357. **Coleman, C. J.** July 31, 1919.

Right tubes between headers.—A tubular heating-grid for the tanks of washing-machines is made by forming two headers and a set of connecting-tubes in halves 1, 2 each from a sheet of metal suitably stamped and slotted and united by welding at their contiguous edges.

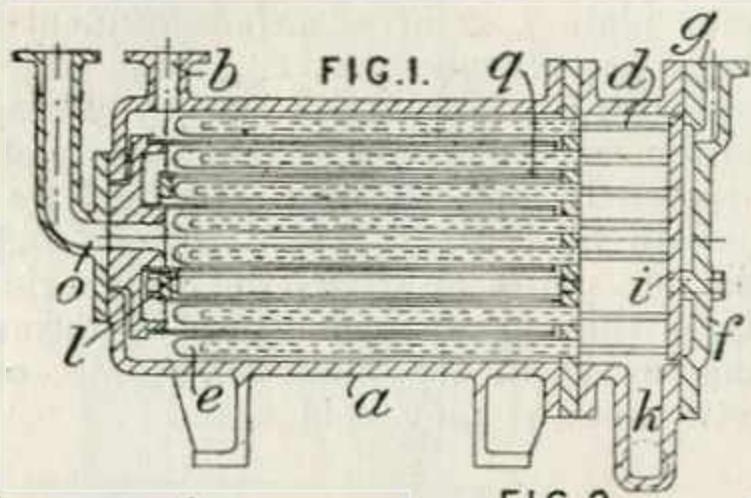


148,035. **Williams, L. W.** June 23, 1919.

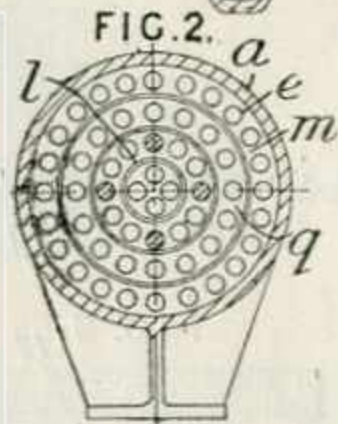
Gills for tubes.—A collar *c* adapted to be slipped over the steam-tube or the like from which heat is to be radiated, has a rib *a* preferably of crinkled form, pressed cold upon it and the two are welded together.



147,397. **McKean, J. G., and Jones, R. F.** Dec. 6, 1919.

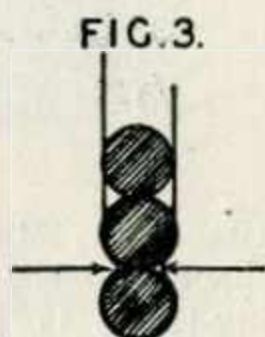


Field-tube apparatus.—A heater comprising a casing enclosing a number of horizontal closed-ended steam-heating tubes is fitted with concentric baffles directing the fluid to be heated backwards and forwards over concentric groups of heating-tubes. The fluid enters the casing *a* through the inlet *b* and flows backwards and forwards around baffles *m, q, l* arranged between steam tubes *e* of the Field type, which are supplied with steam through a branch *g* communicating with the space between the door *f* and the outer tube-plate *i*. The heated fluid is discharged through a central port *o*. The condensate collects in a pocket *k* at the bottom of the exhaust chamber *d*.



148,694. **Bowman, E. J.** Aug. 2, 1919.

Plate apparatus.—A heat-exchanger with air tubes connected together at their enlarged ends thus forming water passages has multi-tube units made by pressing a sheet of metal successively into the flutes of a mandrel. Fig 3 shows three flutes the metal having just been pressed into the first.



149,224. **Dehmel, M., and Zenker, W. A.** June 22, 1918, [Convention date]. Void [Published under Sect. 91 of the Act].

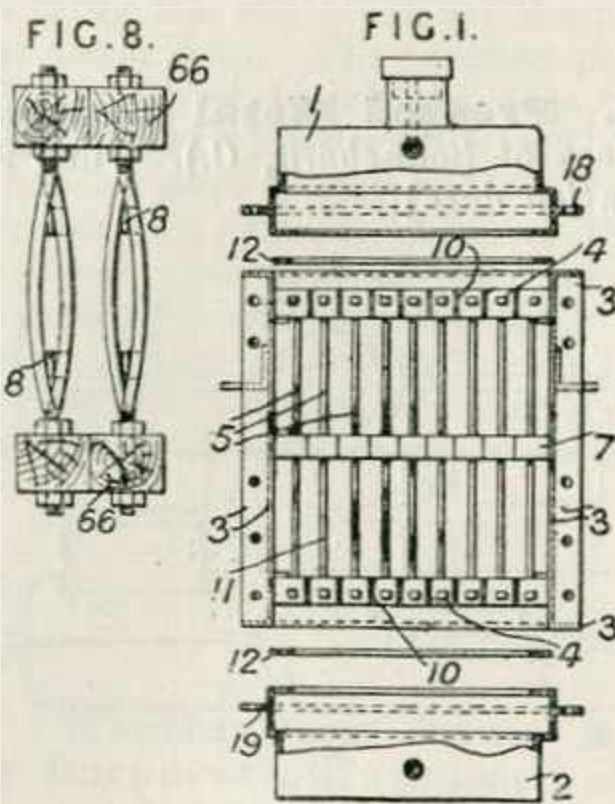
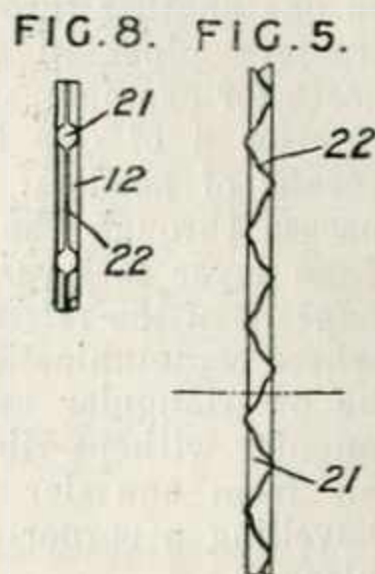


Plate apparatus; straight tubes between headers.—Apparatus particularly applicable to radiators for internal-combustion engines comprises a series of independent cooling-elements composed of a number of tubes or plate members connected to, or detachably mounted in, upper and lower water chambers or blocks of suitable material which communicate with upper and lower water tanks

147,973. **Randall, J. E., and Winterflood, A. J.** April 11, 1919.

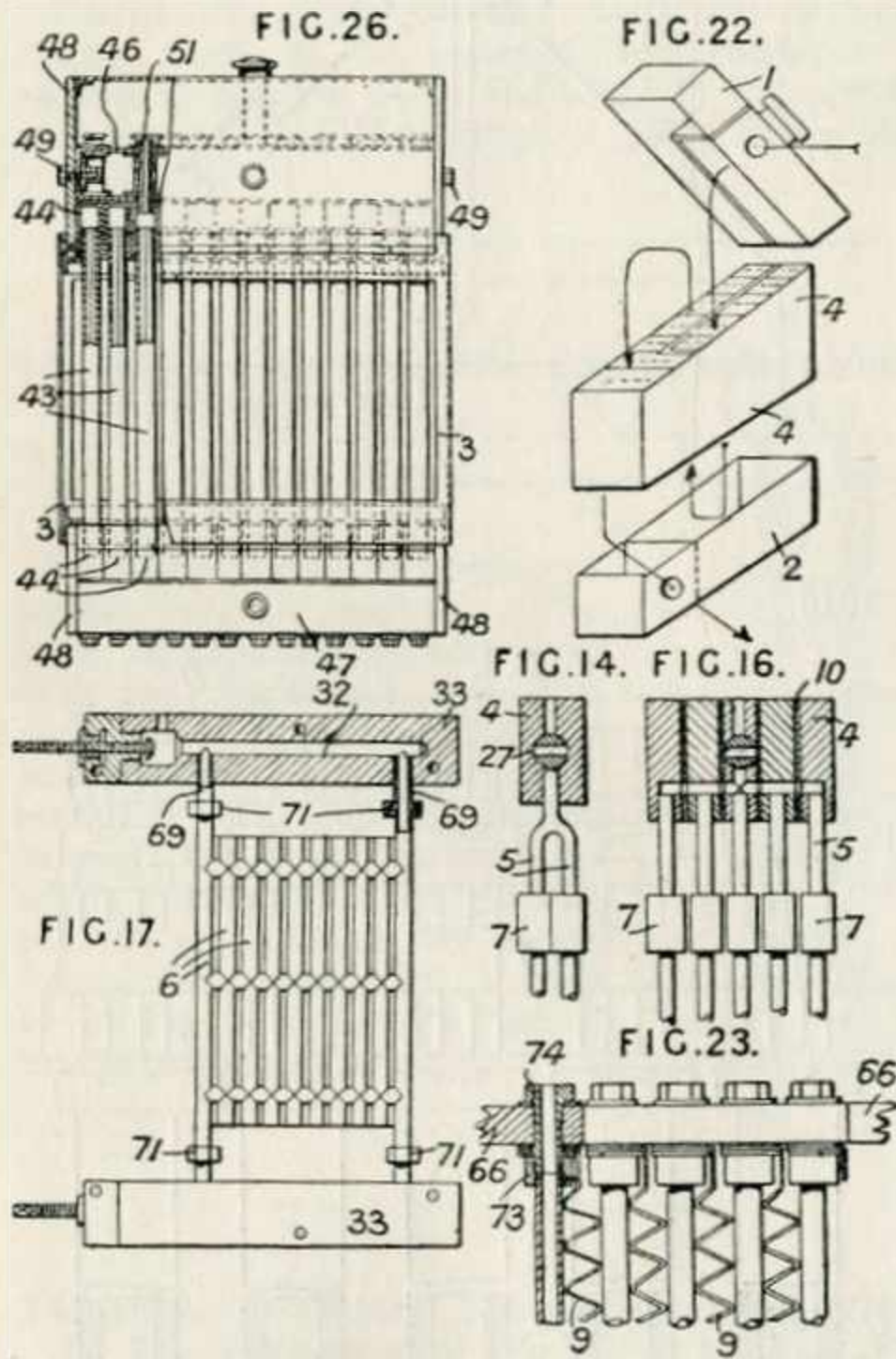
Tubes of special section.—Motor-car radiator tubes are constructed with one or more tubular waterways 21 and narrow waterways 22 of waved form on either side of them. The tubes are assembled so that the passages 21 in one tube are between those in adjacent tubes so as to leave sinuous airways through the stack.



and are provided with means for cutting-out a cooling-element in the event of a tube being damaged or in order to vary the cooling-surface. Modified forms of construction are described for cutting-out a cooling-element, for attaching the tubes &c. to the blocks or water chambers, and for connecting the cooling-elements to the water tanks. As shown in Fig. 1, the cooling-elements, which consist of tubes 5 secured or detachably connected to blocks 4, have packing-strips 10 inserted between the consecutive blocks and are secured together by tie-rods 11 passing through suitable holes in the blocks. Tanks 1, 2 are placed on packing-strips 12 on the top and bottom of the upper and lower sets of blocks respectively. Tubes may be stayed up against each other by blocks 7 or by means of strips 8, Fig. 8, or zig-zag strips 9, Fig. 23. In order to cut out a

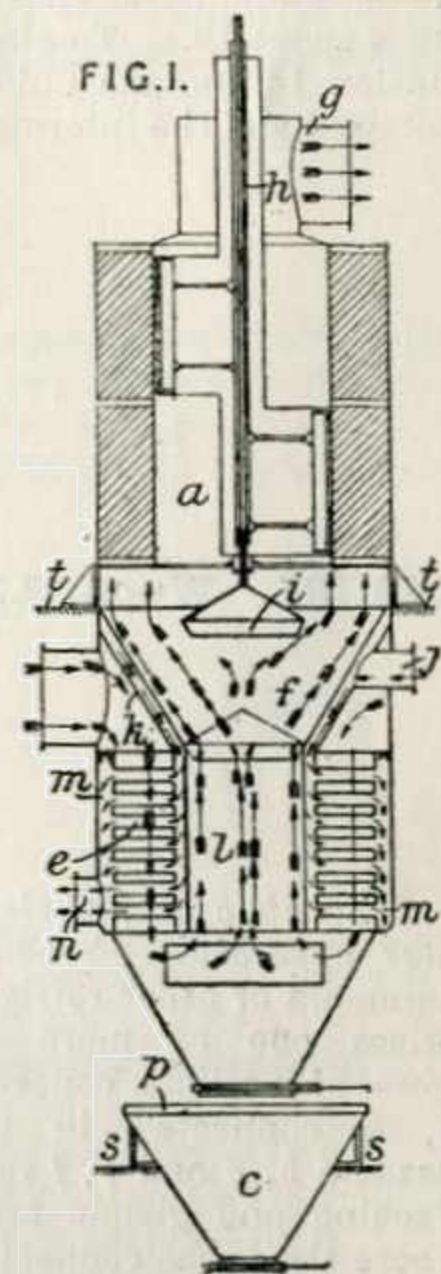
construction according to Fig. 26, the tubes are replaced by plate-like elements 43 one or more sets of which are connected to upper and lower water chambers 44 communicating with upper and lower water tanks 46, 47. These parts are assembled by means of plates 48 and bolts 49 which are adapted to engage closed sleeves in the tanks. Another form of construction is shown diagrammatically in Fig. 22, wherein the cooling-elements are divided into groups by subdividing the tank in such a manner that the water circulates through the tubes in series in the direction indicated by the arrows.

149,232. Deutsche Maschinenfabrik Akt.-Ges. May 12, 1919, [Convention date].



cooling-element, cocks 27 are provided each having as many bores as the element has tubes. The number of cocks may be diminished if the tubes are attached to the blocks as shown in Figs. 14 and 16. Valves may be employed instead of cocks, as shown in Fig. 17; in this form of construction the block 33 has a passage-way 32 and is provided with short tubes 69 to which are connected, by means of unions 71, the ends of the tubes or plate elements 6. In the form of con-

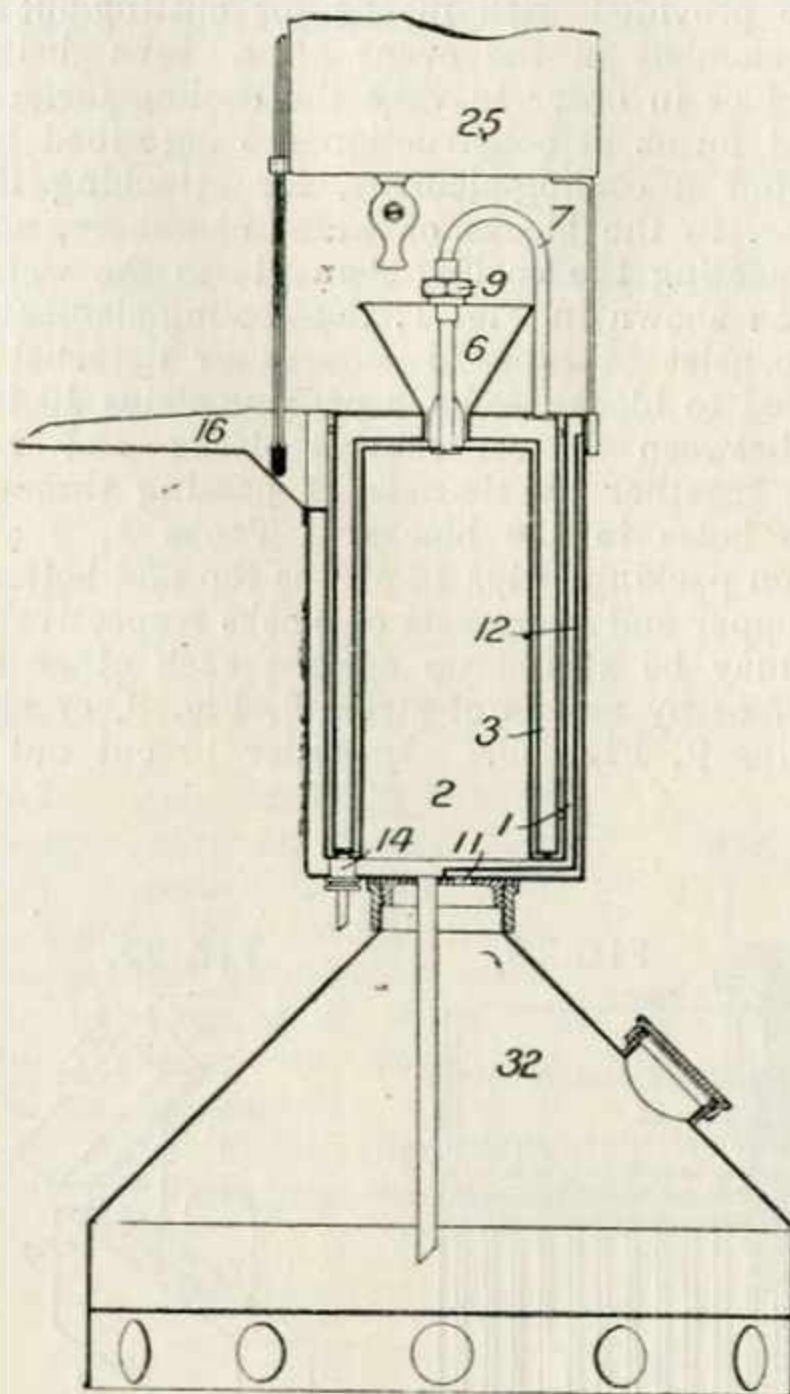
Straight tubes between headers or connecting-boxes.—In apparatus for purifying blast furnace and other gases without loss of temperature, in which a filter and a pre-heater are united in a single structure, the preheating-medium encloses the passage through which the gases pass to the filter. In the apparatus shown, the furnace gases pass down over heating pipes *e* and up through an inner cylinder *l* and a conical passage *f* to a filter *a*, and escape by a pipe *g*. The throat of the passage *f* is opened and closed by a plate *i* operated by a rod. The heating-medium enters by a pipe *j* and flows through a conical passage *k* and the pipes



e to an annulus *m* and an exit *n*. A dust-receptacle *c* is provided, having sliding doors and a flexible top *p* by which variations in the length of the apparatus between its fixed points *s*, *t* due to temperature changes may be taken up; this may be the usual furnace dust-receptacle. A pair of apparatus may be disposed side by side connected by a passage *a* divided by a plate and provided with a divided dust-receptacle.

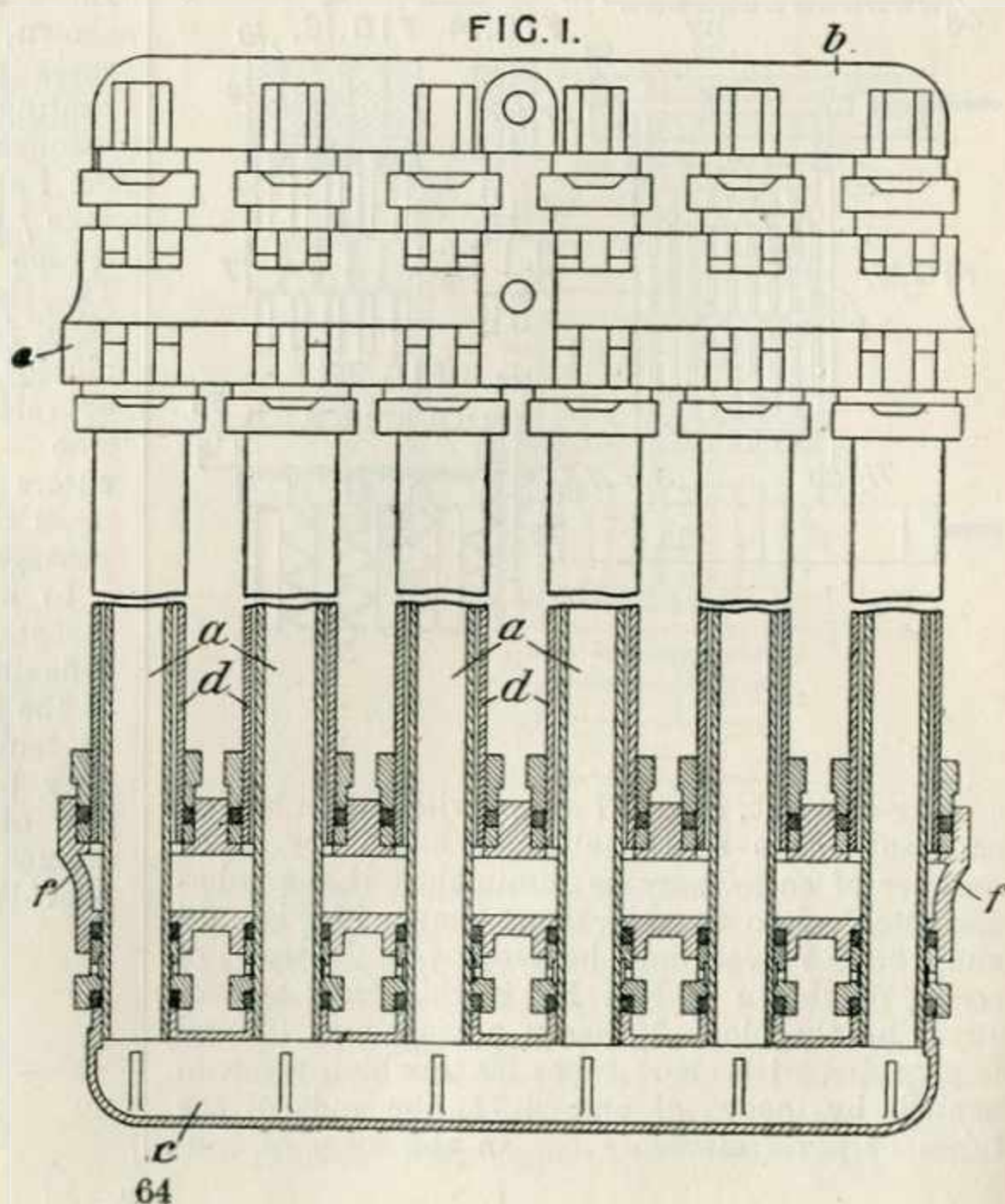
149,500. **Rogers, F. H., and Fremlin, W. T.** July 2, 1919.

Plate apparatus.—In a milk-sterilizing apparatus, steam from a boiler 32 passes through an opening 11 and pipe 12 into the upper part of an outer jacket 1 and from the lower part of the jacket into a central chamber 2 and by a pipe-connexion 7 therefrom into an intermediate annular chamber 3 and to an exhaust-opening 14. Milk passes from an upper vessel 25 into a funnel 6, and through the narrow annular spaces between the intermediate chamber 3 and the inner vessel 2 and outer steam-jacket 1, and flows away by a spout 16. To clean the apparatus, the connexion 14 and the union 9 of the pipe 7 are unscrewed and the intermediate vessel 3 is lifted out.

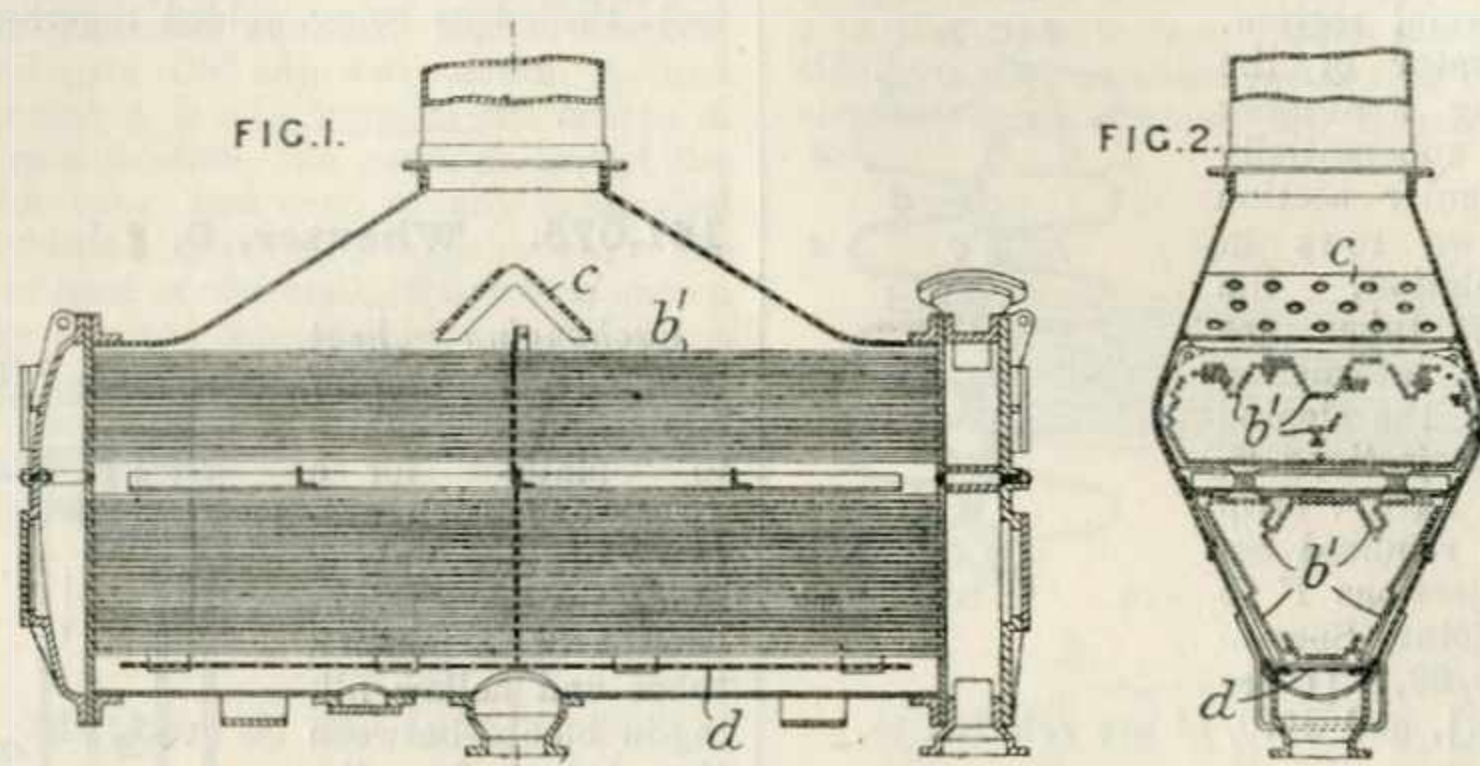


149,797. **Wood, A. G., and Hall, E.** May 29, 1919.

Concentric or jacketed straight-tube apparatus.—A condenser for ammonia or other refrigerant comprises one or more unenclosed rows of vertical concentric tubes *a, d* connected in parallel to headers *b, c* and *e, f* respectively. Packing and glands are provided where the tubes connect to or pass through the headers. The ammonia &c. enters the upper inner header *e* and passes through the annular spaces between the tubes, and is collected in the lower header *f*, while the cooling-water enters the lower header *c* and flows upwards through the inner tubes. According to the Provisional Specification, the water may circulate through the outer tubes and the gas through the inner tubes.



149,878. **Scott, H. B., and Smith's Dock Co.** Dec. 1, 1919.

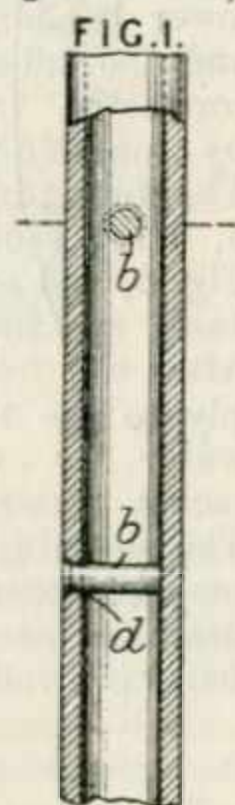


Distributing plates in fluid inlets and outlets; casings, forms of.—In a straight-tube condenser a perforated baffle *c*, above the tubes *b*¹ and placed transversely, and a partition *d* below them the

perforations in which are larger or more numerous towards the ends, facilitate the even distribution of steam. The casing is tapered to the bottom.

149,882. **Smith, W., and Stephenson, R.** Dec. 24, 1919.

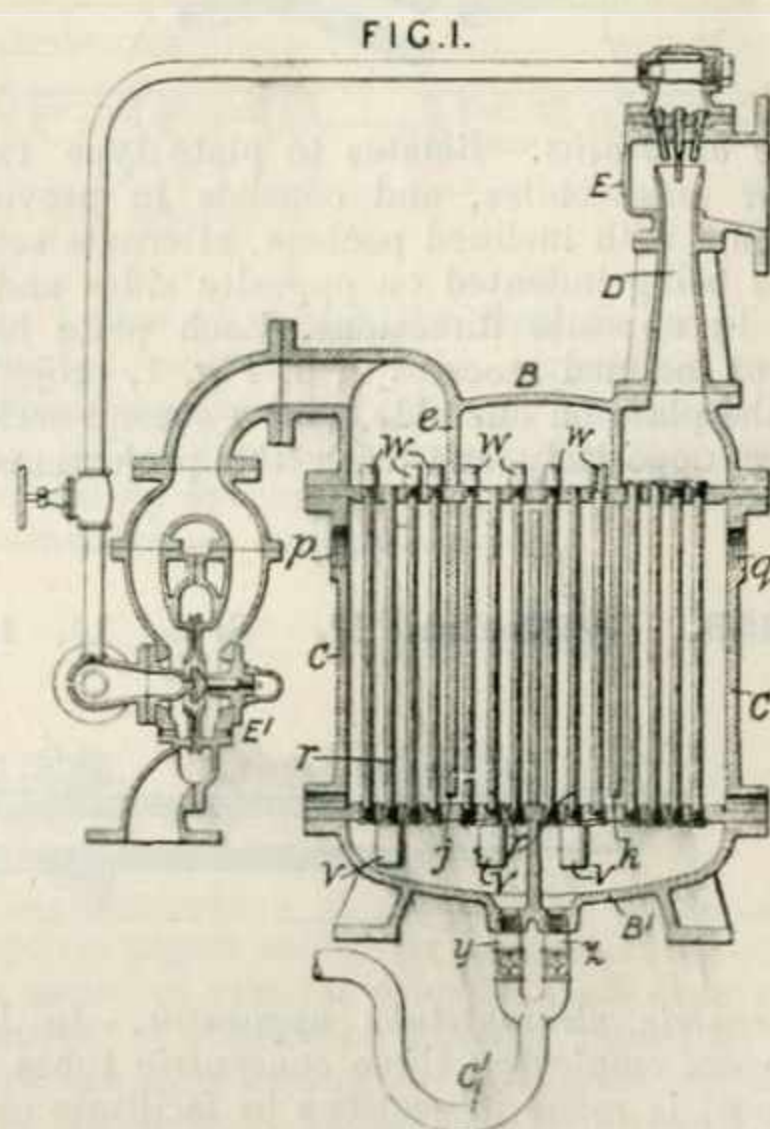
Straight - tube apparatus having internal baffles.—The tubes of superheaters and heat-exchange apparatus are furnished with a series of cross-bars *b* which disturbs or disintegrates the fluid passing through the tubes so that the whole of the fluid is brought into contact with the surface of the tubes. The cross-bars *b* may be in the form of pins welded into countersunk holes *d*.



*E*¹ or other pump. Any condensate accumulating in the upper header is prevented from flowing back through the condenser tubes by ferrules *w*, and is drawn off by separate drain-tubes *r* which have

149,939. **Wheeler Manufacturing Co., C. H.,** (Assignees of *Suczek, R.*). Aug. 16, 1919, [Convention date].

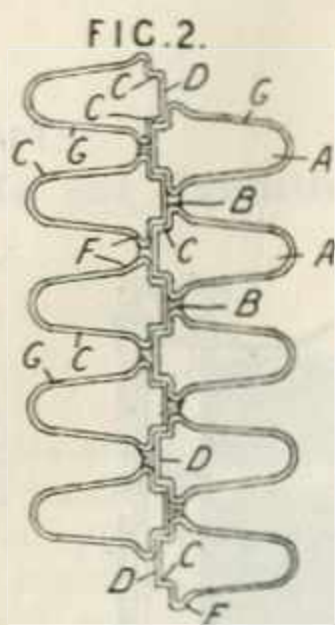
Tubes with nozzles; headers, draining; longitudinal partitions, arrangements of among tubes.—In apparatus for compressing gases, more especially when drawn from a condenser, a multi-jet ejector *E* discharges through a diffuser *D* into a condenser *C* having heads *B*, *B*¹ divided into compartments and connected by groups of vertical tubes separated by baffles *j*, *e*, *k* which compel the cooling-fluid entering at *p* to take a circuitous course to the outlet *q*. The last compartment of the top header is connected to a radial flow ejector



liquid seals *v* at their lower ends. Valve-controlled pipes *y*, *z* lead the condensate to a pipe *C*¹, which may deliver to either the steam or the condensate space of the main condenser.

Dyche, A. May 26, 1919.

Tubes of special section.
—In a refrigerator of the kind comprising a number of tubes A of substantially isosceles triangular section arranged in two rows in staggered relation, the bases D of the tubes are formed with interfitting rabbets C and the sloping sides G with projections F, so that only a narrow strip of solder B is required between the projections F to complete the joint. Specifications 15995/99, [Class 29, Cooling &c.], and 2570/14 are referred to.



150,075. Mantanus, J. May 28, 1919.

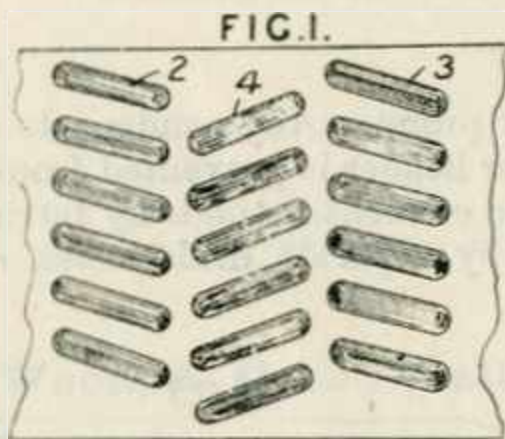


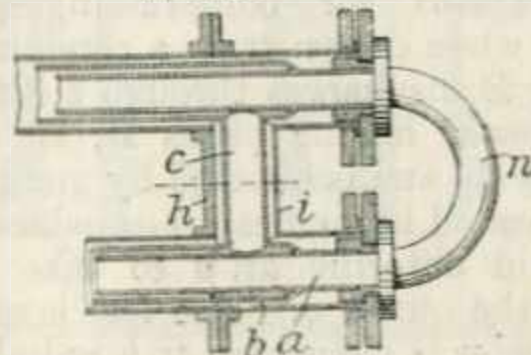
Plate apparatus.—Relates to plate type radiators for automobiles, and consists in providing each plate with inclined pockets, alternate sets of pockets being indented on opposite sides and inclined in opposite directions. Each plate has a series of inclined recesses 2, 3, Fig. 1, projecting from the plate on one side, and a second series 4 inclined oppositely and with the projections on

151,258. Wilhelm, F. Sept. 19, 1919, [Convention date].



Concentric straight-tube apparatus.—In heat-exchangers employing three concentric tubes, the outermost is made in sections to facilitate cleaning of the outer space. The two inner tubes a, b may be welded at their ends, but the outermost is made in sections, two of which A, A, in the example shown in Fig. 1, are slightly smaller in diameter than the middle section B and connected at each joint by stuffing boxes f, f. The

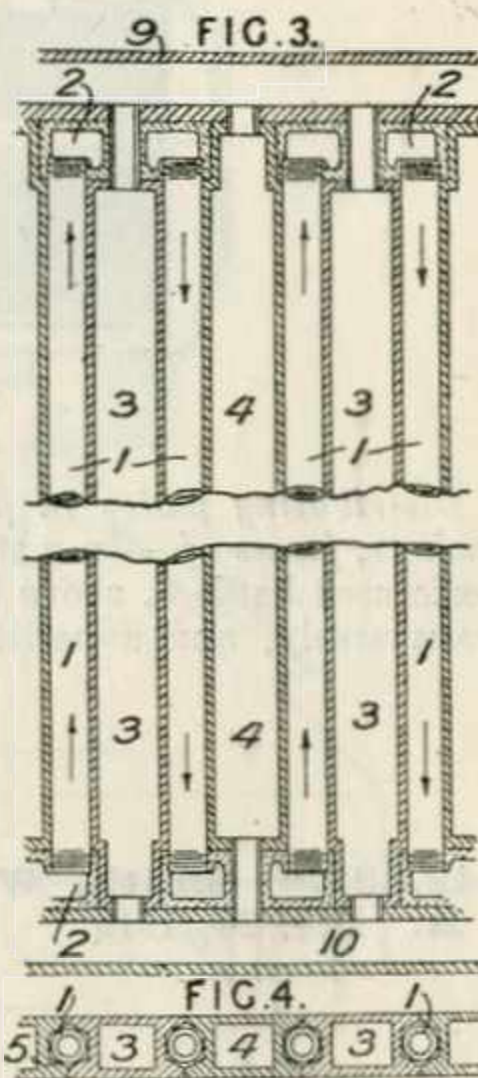
FIG. 3.



the other face. Two plates are assembled to form an element with the recesses such as 4 in contact, the edges being welded together.

151,075. Wheater, C. June 13, 1919.

Exchanging heat with one or other of two fluids.—Relates to "plates" for a direct expansion system of ice-making made up of straight lengths of expansion tubes and hollow filling-in blocks between the tubes for the passage of a thawing-medium. According to the invention the filling-in blocks 3, 4, which are recessed at their edges 5 to enclose the expansion tubes 1, are connected in parallel between upper and lower headers 9, 10, and the tubes 1 are connected in series by junction-boxes 2. The filling-in blocks

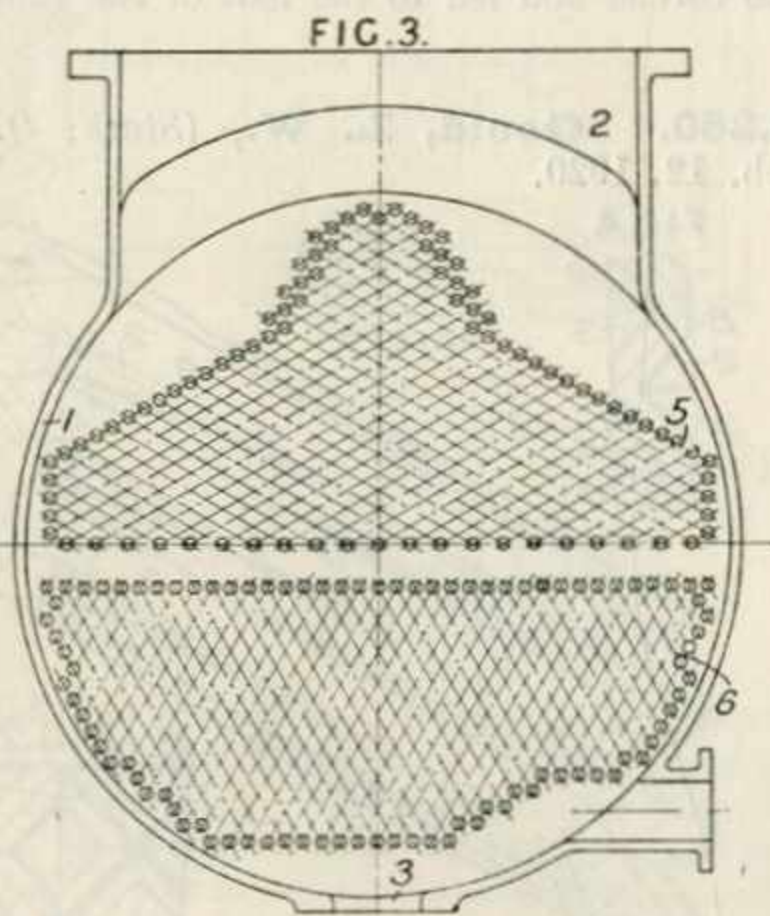


3, 4 are reduced at alternate ends, as shown in Fig. 3, and end blocks reaching to the walls of the tank are provided to complete each "plate." After the freezing operation, the refrigerant supply to the tubes 1 is cut off and steam or hot water, for example warmed condenser or engine-jacket water, is circulated through the blocks. The draining opening of the thawing-passages may be controlled in such a way as to ensure the drainage of the thawing-medium when the refrigerant valves are opened for freezing.

two parts comprising the middle section B are united by a flange joint *g*. To take apart, the flange *g* is disconnected and each half of the section B is slid over the adjacent section A, and then each section A is slid towards the centre in turn. In a modification, the sections are of the same diameter tube, and each or any is divided longitudinally and united by flange joints. To prevent loss of heat at the ends, the device shown in Fig. 3 may be used comprising two stub tubes joined by a channel *i* to cover the ends of the tubes *a* and the connexion *c*, the whole being bolted to a supporting plate *h* and bearing flange connexions for the bends *n*.

nular sleeves *b* which are stamped out with an annular groove *d* on one face and a circular spigot *e* on the opposite face. Each sleeve is stayed inside by a cast or sheet metal ring *c*. The tubular elements thus formed are threaded on slotted

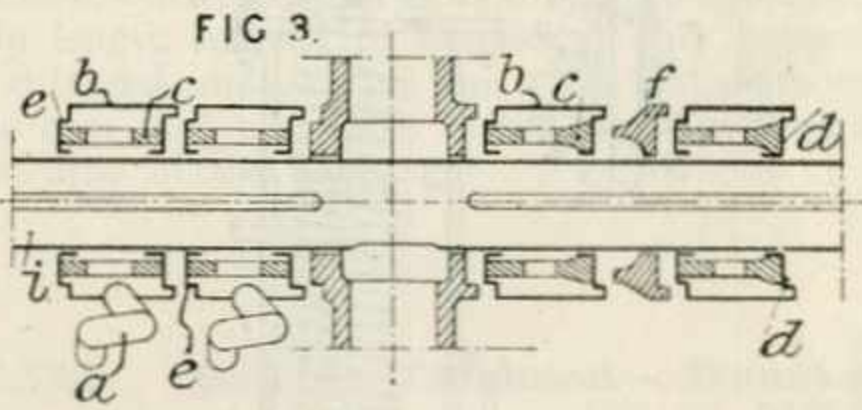
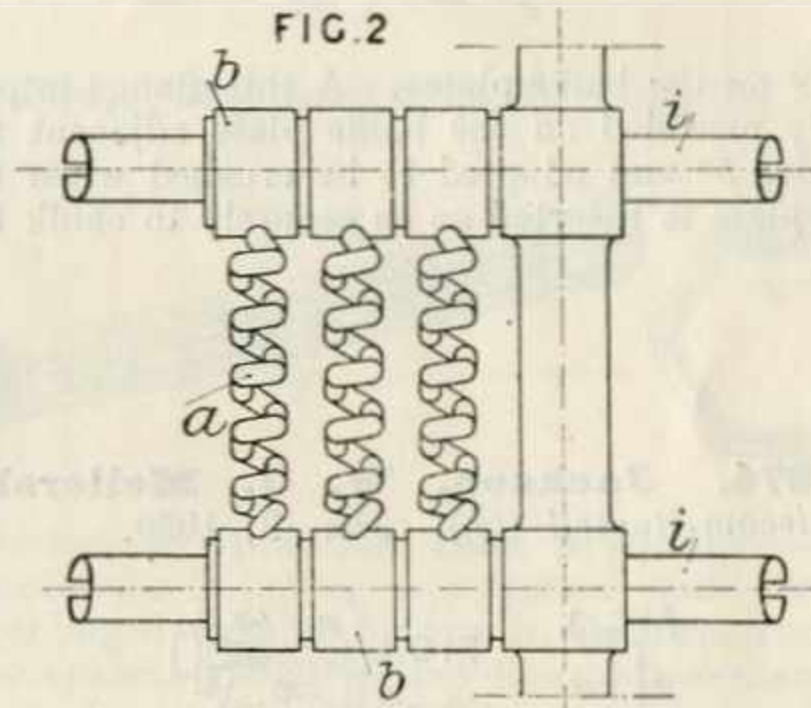
151,525. Mather, J. W. Feb. 9, 1920.



Straight tubes between headers.—The condenser casing 1 is provided with an entrance 2 for fluid and outlets 3 for air and water, and the tubes are arranged in two groups 5, 6. The tubes in each group are in equilateral triangle formation, but the centre-lines of the rows of tubes are inclined to one another in the two groups. The horizontal spacing of the tubes in group 5 is thus greater than the horizontal spacing in group 6, so that the greater volume of steam near the inlet flows through passages of greater cross-section.

151,551. Maison F. Fouche. March 20, 1920.

Serpentine-tube apparatus.—A heat-interchanging apparatus, applicable to steam condensers and coolers for water and other liquids, and gases, comprises a number of tubular elements which may be threaded on perforated or slotted tubes for the inlet and outlet of the fluid. A number of flat coils *a* are provided at each end with an-

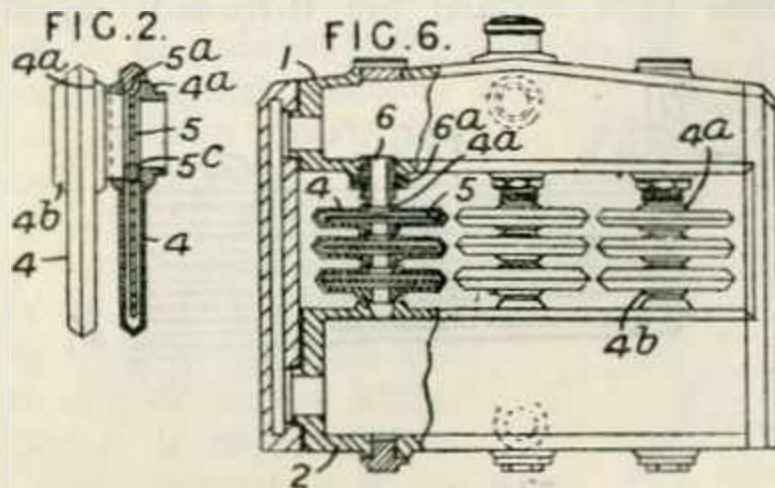


tubes *i* through which the fluid is supplied and exhausted, and the whole structure may be clamped together by nuts on the ends of the tubes. The distance between the elements may be varied by spacing rings *f*, and the tubes *i* may be horizontal or vertical.

151,814. Alexander, A. E., (Betan Co.). Sept. 18, 1919.

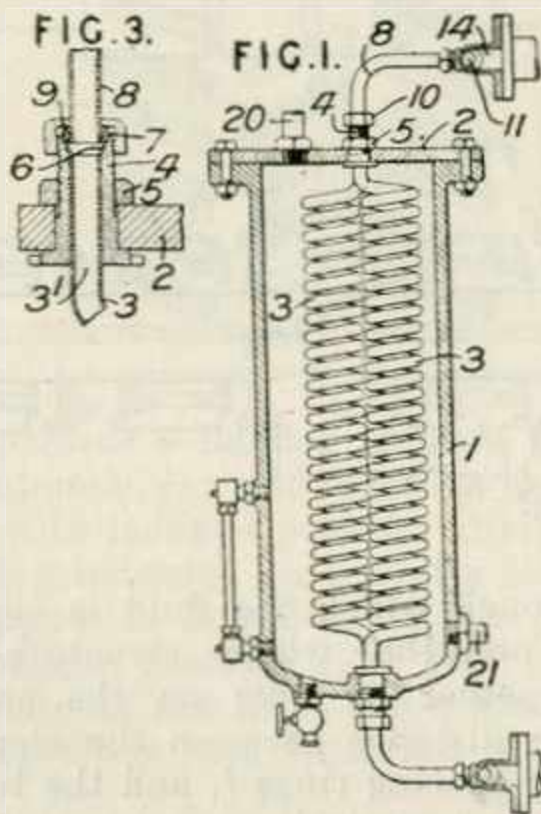
Plate apparatus.—A radiator for motor-cars &c. comprises upper and lower headers 1, 2 connected by a series of vertical columns each consisting of a number of circulation units 4 formed by a thin hollow chamber having one end open, but adapted to be closed by a baffle-plate 5 provided with a shoulder 5^a. The chambers communicate with each other and with the headers by means of tapering sockets 4^a and nipples 4^b provided on the upper and lower walls of the chambers. In order to tighten these joints, the uppermost chamber of each column co-operates with an ex-

ternally threaded nipple 6 adjustable in the upper header by means of a nut 6^a. When the joints are being tightened, collapse of the chambers themselves is prevented by means of supporting



lugs 5^c on the baffle-plates. A thin flange is preferably provided on the baffle plate adjacent the shoulder 5^a and adapted to be crushed when the baffle-plate is inserted so as securely to caulk the joint.

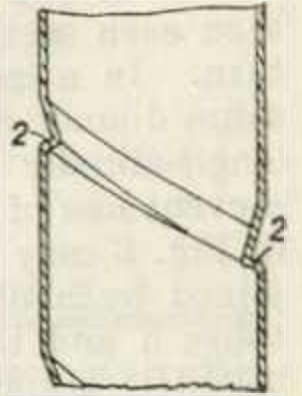
151,874. Jackson, W. J. Mellersh-,
(Griscom-Russell Co.). Jan. 2, 1920.



Coil-tube apparatus.—In apparatus for heating oil fuel of the kind wherein the oil is passed through coils heated by boiler steam and the pipe joints are all external to the heating chamber, the straight ends 3¹ of the three coils 3 pass through thimbles 4, screwed into the casing 1 or cover-plate 2 and secured by nuts 5. The ends 3¹ of the tubes 3 are formed with conical seats 6 to receive reversed flanges 7, on the feed or return tubes 8, which are secured by ferrules 9 and unions 10. The three feed and return pipes 8 are connected to manifolds 14. Live steam is led to the chamber 1 by tube 20, and exhausted to the feedwater system of the boiler by a pipe 21.

151,943. Aktieselskapet de Norske Saltverker. Oct. 4, 1919, [Convention date].

Tubes of special section.—Tubes for film type heat exchangers are made with one or more shallow helical threads 2. The threads are approximately V-shaped in cross section with one arm of the V, substantially at right angles to the tube surface and the other diverging at a small angle. The grooves may be internal and the ribs external, in which case the right-angled sides of the V would be on top. In each case the film of liquid within the tube is stated to flow across the threads while the condensed steam is collected by the right-angled side of the thread and led to the foot of the tube.



152,260. Goold, L. W., (Stark, O. G.)
Feb. 12, 1920.

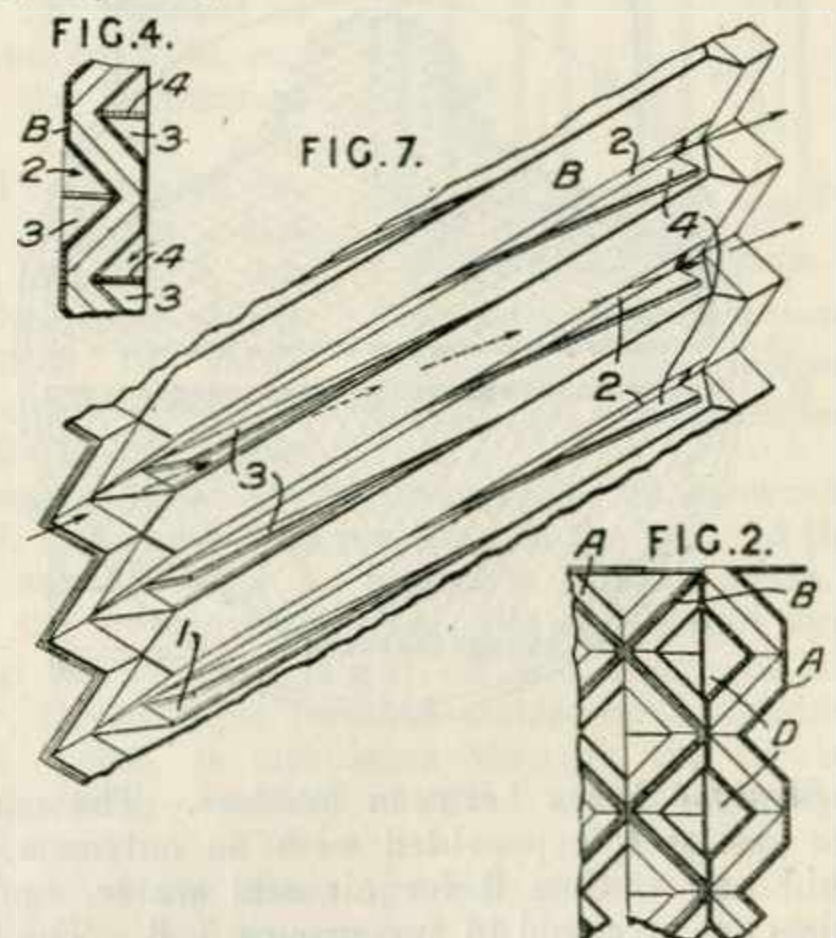


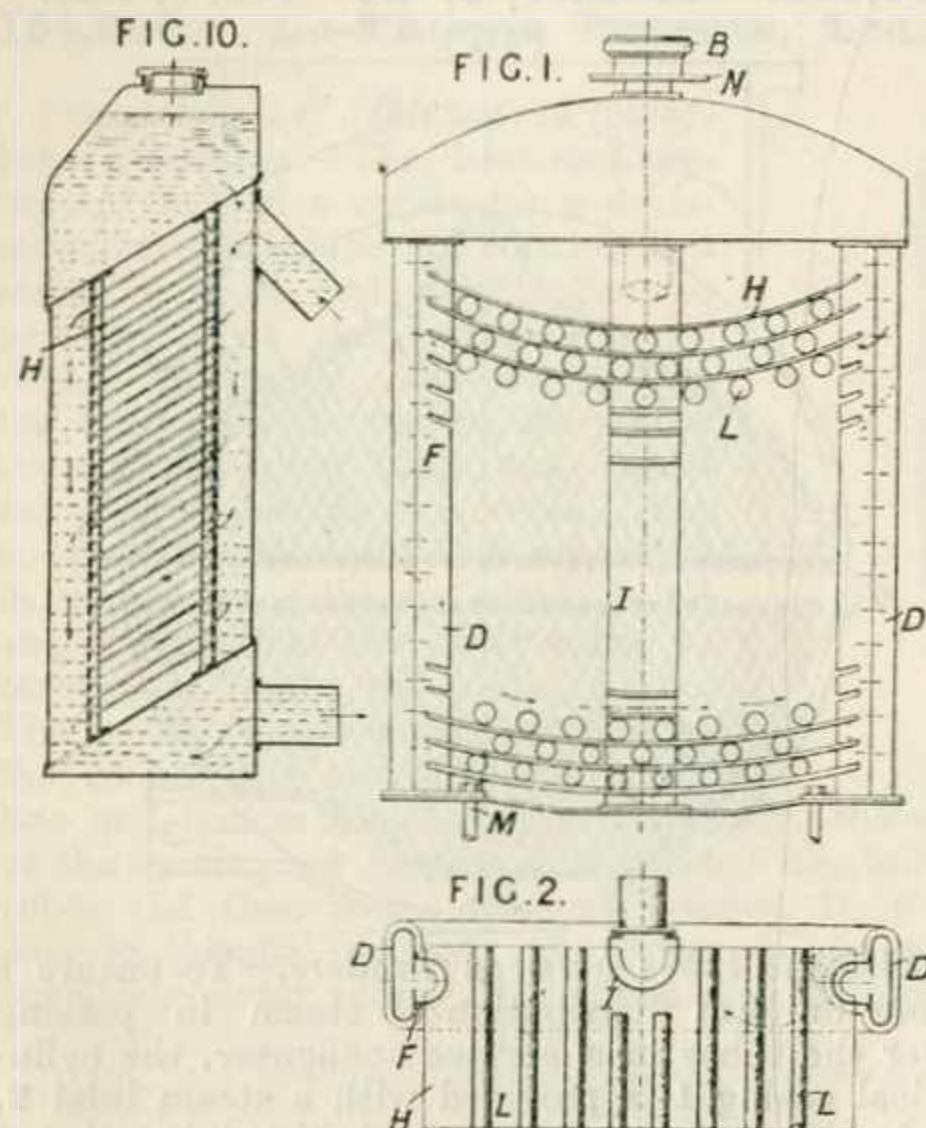
Plate apparatus.—A radiator for motor-cars comprises alternate water and air chambers constructed from flat plates. Water from a top header passes through zigzag passages in the elements A. The air chambers B are similar in shape, but their walls are slotted at each end at 1, 2 in staggered relation and the slotted parts 3, 4 bent out so that in addition to air passing straight through the passages D in the radiator, air is caught by the fins 3, and led into the air chambers B, finally emerging through the rear slots 2.

152,330. Lamblin, A. Oct. 8, 1919,
[Convention date].

Plate apparatus.—A series of parallel hollow plates H are connected to a central rear chamber I and to side chambers D, F extending the whole depth of the radiator, so that the hot water is

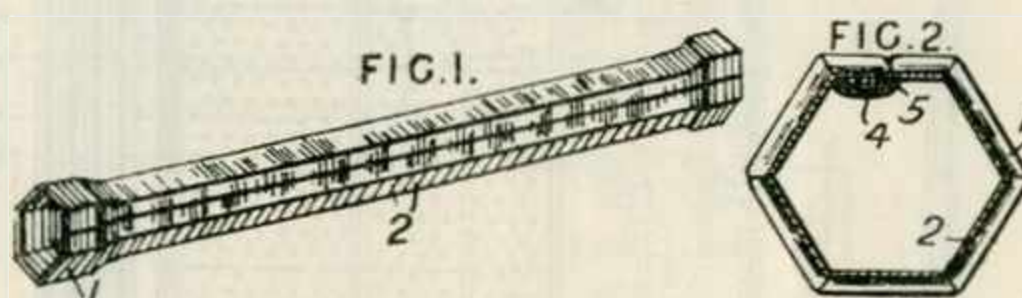
admitted uniformly to the interior of the plate elements either from the side chambers F, as shown, or from the central chamber, and circulates by gravity only. The plates are spaced apart by tubes L extending from the front to the rear, air thus being free to pass between the plates and through the tubes. The plates are secured to the chambers by soldering, and may be disconnected

is inserted in a groove in the nipple, and the inner end 3 of the nipple is expanded behind the conical end of the tube. The shape of the inner wall of the nipple is such as to ensure an action on the entering fluid like that of a De Laval expansion nozzle. The nipple has slots 5 for the reception of a spanner, or helically-shaped blades 7, Fig. 5, sprung into position. The blades 7 produce a rotary motion in the fluid passing through the tube. Nipples of different internal diameters may be used to vary the rate of flow so that liquid passes through the tube in accordance with the temperature inside the cooler &c.



by unsoldering the joints. The radiator is secured within a casing by a flange N on the filling-plug B, and by bolts M. Modifications are described in which the hollow plates are curved upwards, or pointed upwards or downwards at the centre. A form suitable for stationary engines or slow-moving vehicles is shown in Fig. 10. The plates H are inclined upwards from the front to establish a natural flow of air through the radiator.

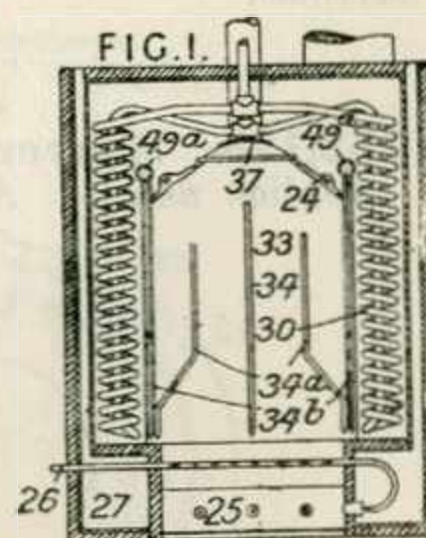
152,734. Richards, E. J. July 14, 1919.



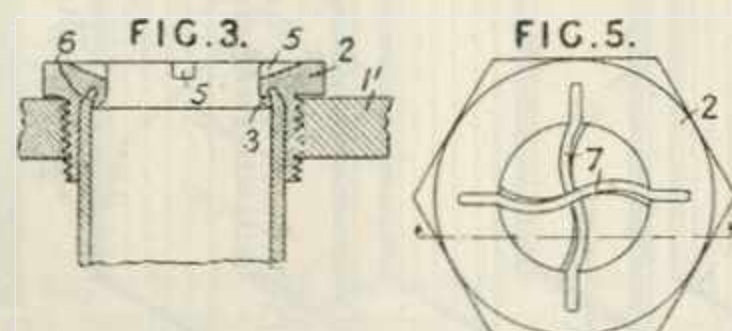
Honeycomb and like tube apparatus. — A seamed tube 2 having a polygonal cross-section and enlarged ends 1, for use in the construction of honeycomb radiators and like heat-exchangers is formed with the seam extending throughout the whole length instead of extending only between the enlarged ends. The lap 4 of the seam extends over half the width of the inner surface of a flat side of the tube.

152,785. British Thomson - Houston Co., (General Electric Co.). July 23, 1919.

Plate apparatus. — A boiler for vaporizing mercury and other liquid having a high boiling point is built up of a number of flat vertical spaced sections, each formed of thin sheets of metal welded or otherwise joined at their edges, the liquid being so directed that it flows through each section initially in the same direction as the heating gases and finally in the opposite direction. The sections are supported at one end only in order that they may be free to expand and contract. A section is made of thin metal plates welded along their edges and spot welded over their entire surfaces. External ribs 34, 34^a form the sides of the flues 33 between the sections. Mercury is supplied through headers 49^a, from which it flows through vertical passages or preheaters 34^b on both sides of a sec-

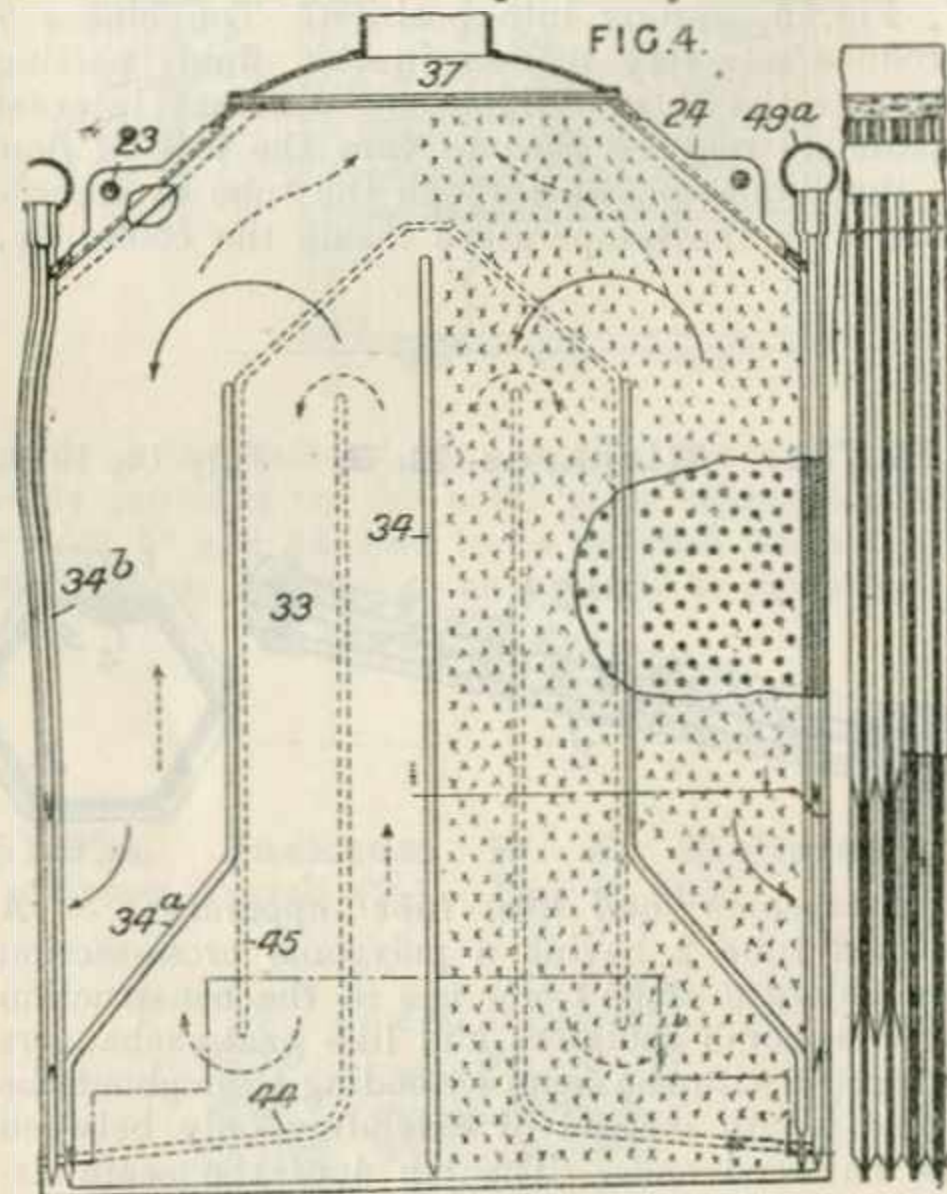


152,620. Schweizerische Stellwerkfabrik. Oct. 15, 1919, [Convention date].



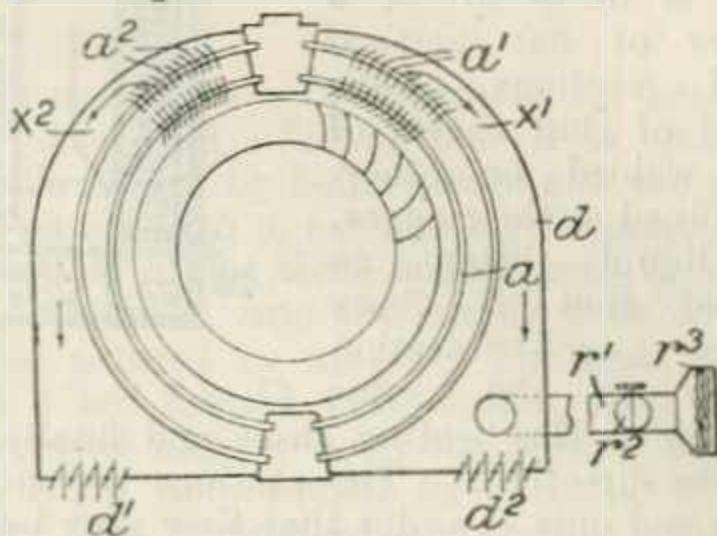
Tubes with devices for restricting flow of liquids.—In joining tubes to plates in heat-exchanging devices such as coolers and steam generators, a nipple 2, Fig. 3, having a tapered screw-thread is screwed into the plate 1', and the tube end 6, which is conically reduced in section,

tion. Partitions 44, 45 direct the mercury, which flows from the preheaters through openings near the bottom, in upward and downward courses as indicated by the dotted arrow lines. The vapour flows through narrow openings at the top of the sections into a superheating chamber 37. The sections are suspended by means of rods



23 passing through ears 24 projecting from the upper edges of the sections. Liquid fuel is supplied to the furnace 25 by pipes 26, and air for combustion is heated in a casing 27 completely surrounding the boiler. Steam generated in condensing the exhaust mercury vapour is superheated in coiled tubes 30 at the sides of the sections.

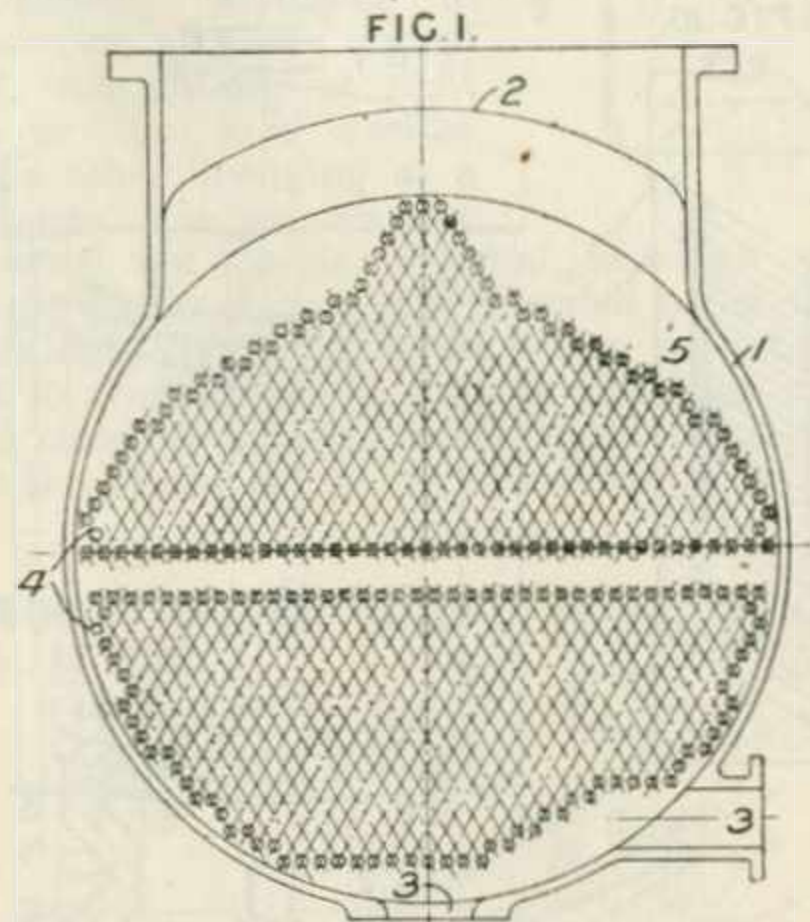
153,175. Harter, E. April 23, 1919, [Convention date]. Addition to 142,071.



Gills for tubes.—The radiator described in the parent Specification is provided with a closed casing *d*, and the gills on the cooling tubes *a* are sloped in reverse directions on either side of the centre of the radiator, as shown at *a'*, *a''*, so as to cause a discharge of the air in two currents towards adjustable outlets *d'*, *d''* in the bottom of

the casing. The outlets may be fitted with adjustable louvres controlled by the driver. In cold weather these louvres may be closed and the warm air led through one or more pipes *r'* fitted with dampers *r''* and filter screens *r'''* into the body of the vehicle to heat it.

153,509. Mather, J. W. Feb. 9, 1920.



Straight tubes between headers.—To ensure a more uniform distribution of steam in passing over the tubes in a surface condenser, the cylindrical casing 1 is provided with a steam inlet 2, and outlets 3 for water, and the tubes 4 are arranged so that a tapering passage 5 is provided at each side. The path for the steam is of greater sectional area at the inlet than at the greatest cross-section of the condenser. The tubes may be spaced as described in Specification 151,525.

153,550. Prat, E. Nov. 4, 1919, [Convention date].

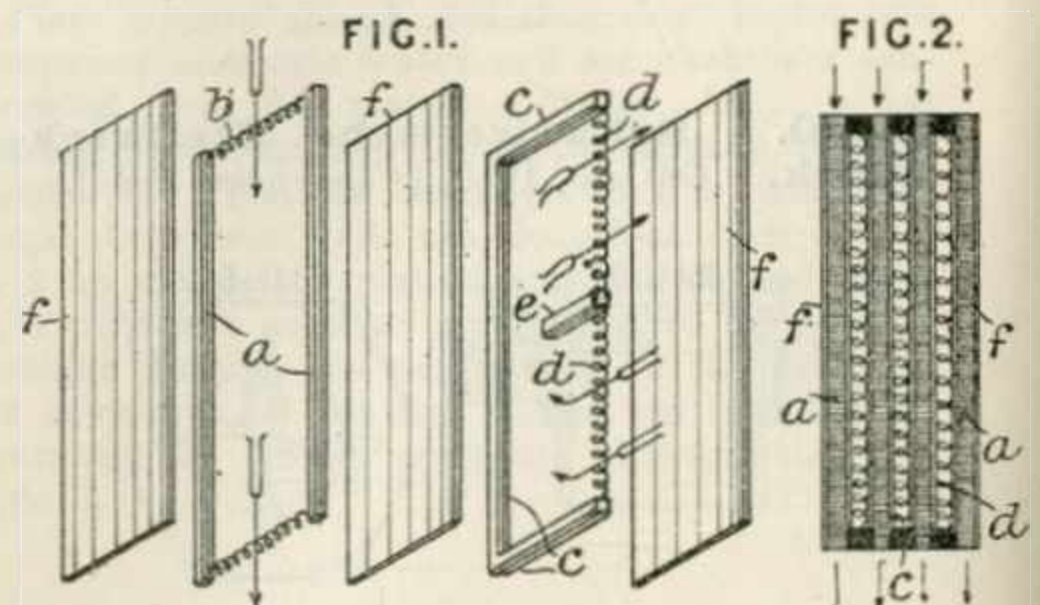


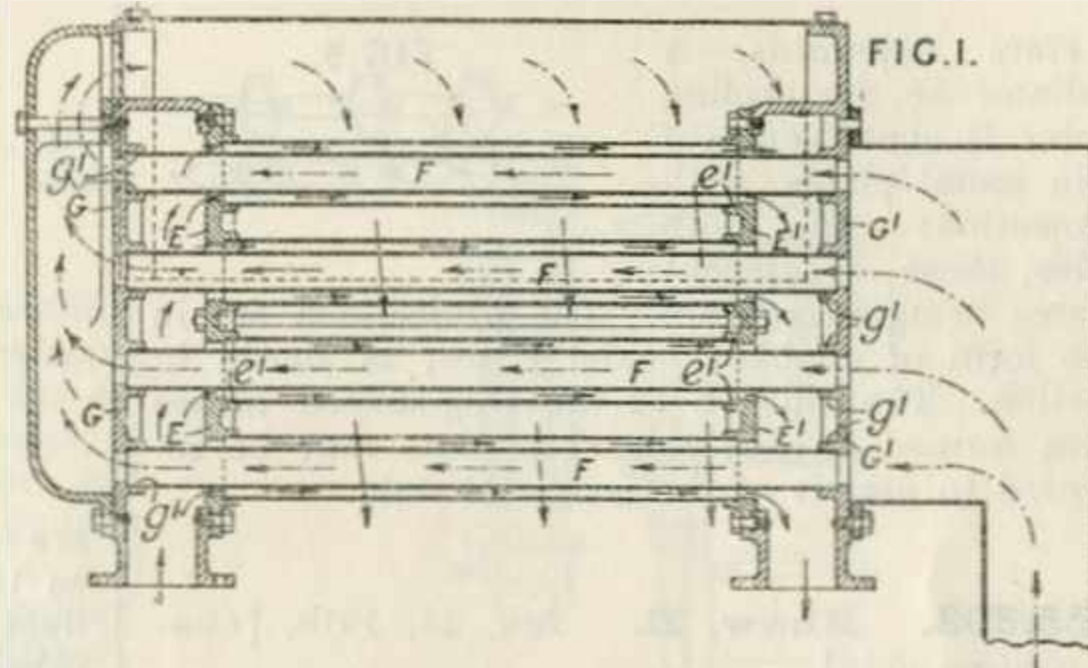
Plate apparatus.—An air-heater, radiator, refrigerator, condenser, feed-water heater or other like apparatus is built up of flat plates *f* spaced apart by frames *a*, *c* formed partly of helical springs *b*, *d* or other elastic members, which, when the plates and frames are assembled, exert

pressure against the plates and, at the same time, allows the media to pass into the spaces between the plates. In an air-heater, for example, hot gases pass vertically between plates separated by the frames *a* and springs *b*, and the air circulates around baffles *c* between plates

separated by the frames *c* and springs *d*. In modifications, the elastic members extend only partly along the sides of the frames, which may be formed of channel irons surrounded by asbestos. The plates may be clamped or welded together.

154,290. Lo-Thermo Patents, Ltd., and Burleigh, J. W. Aug. 18, 1919.

Concentric or jacketed straight-tube apparatus.—The heat-exchanging surfaces of a cooler for a dynamo-electric machine are formed of a series of inner and outer tubes so arranged that the casing air traverses the annular spaces between the tubes and the cooling air passes through the inner tubes and round the outer tubes or vice versa. The ends of the inner tubes *F* are fitted in recesses *g*¹ in the end plates *G*, *G*¹ and the ends of the outer tubes in recesses *e*¹ in the bed plates *E*, *E*¹. The paths of the casing air and of the cooling air are shown by full line and broken line arrows respectively. Instead of the cooling air passing first through the inner tubes and then round the outer tubes, it may pass in parallel through the inner tubes and round the outer tubes. The tubes may be circu-



lar or rectangular in cross section, and several inner tubes may be placed in one outer tube. Specification 128,330, [Class 35, Dynamo-electric generators &c.], is referred to.

154,308. Nielsen, H., and Marshall, F. D. Aug. 21, 1919.

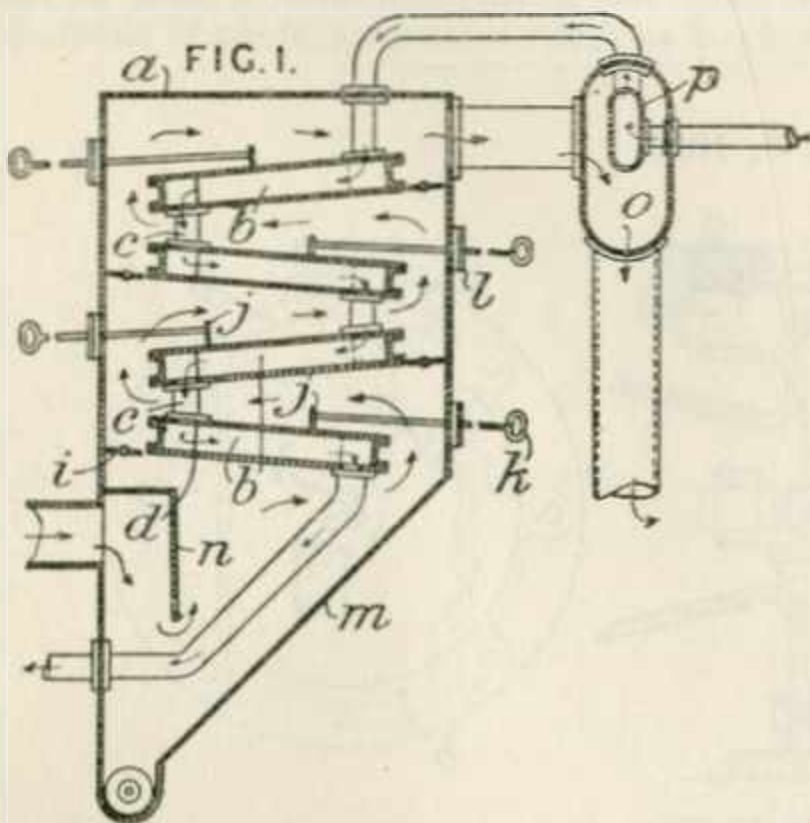
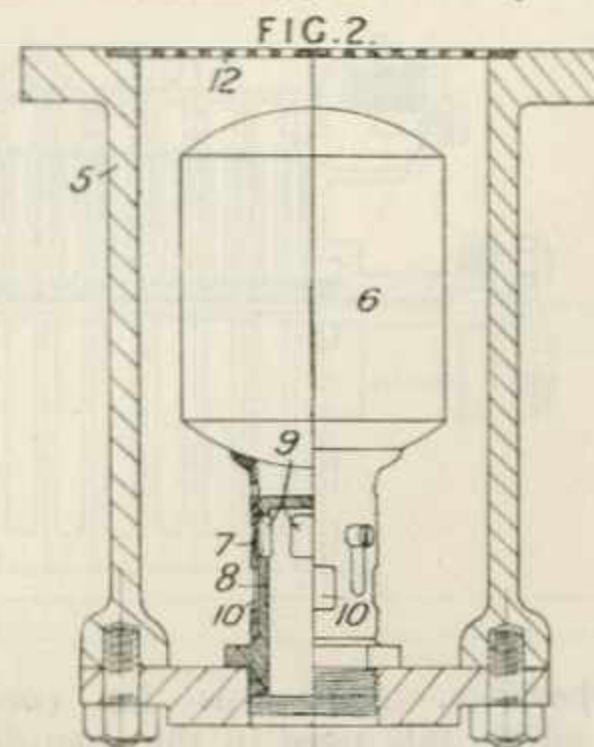


Plate apparatus.—A heat-exchanger for producer gas comprises a casing *a* and a series of closed flat units *b* connected by short distance pipes *c* to provide a zig-zag passage for one of the heat-exchanging mediums. Each unit has internal baffle plates *d* to cause the gas to flow through a tortuous path. The casing has doors *l* and scrapers *j* for removal of dust, dampers *i* for controlling the direction of flow around the boxes *b*, and

a downward extension or hopper *m* in which dust collects, with or without a water seal *n*. The hot gases leave the casing by a main *o* which encloses the main *p* for the gas entering the boxes.

154,956. Hocking, H. July 10, 1919.

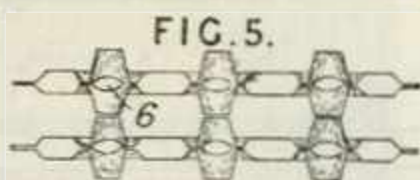


Casings, constructions and forms of.—A float-controlled steam trap is combined with heat-interchanging apparatus used for heating feed water, condensing in non-vacuum type of condensers, and cooling fluids. The heater is mounted on the casing *5* of the steam trap, a strainer *12*

being interposed between the two. A cylindrical float 6 carries a sleeve valve 7 provided with ports 10, which slides over the upper end of the outlet pipe 8 which is provided with ports 9. When the condensed steam reaches a predetermined level, the float 6 rises, and the ports 9 and 10 register so that the water is discharged. The float then falls and closes the valve.

155,062. Gell, J. Sept. 26, 1919.

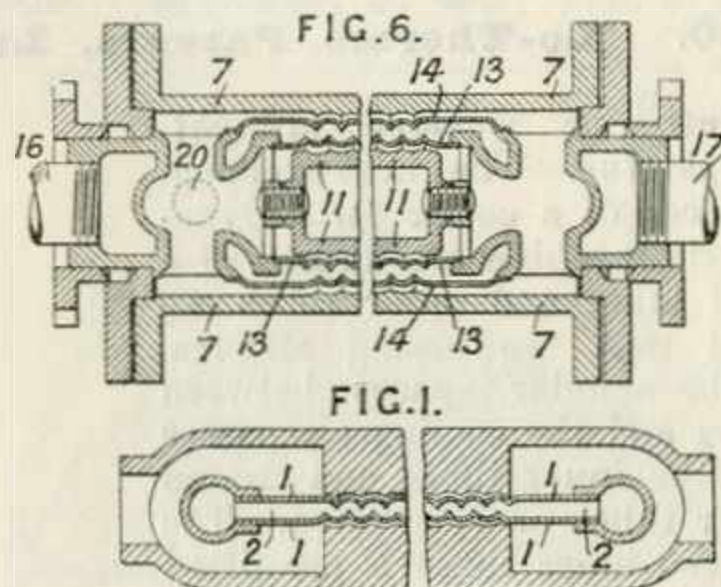
Plate apparatus.—A radiator &c. for cooling water is constructed of thin metal plates with projections on both sides, those of adjacent plates being in contact. The projections are in the form of double co-axial cones, as shown in section. The sides 6 of the ring-shaped bosses thus formed on one side of a plate may be indented to permit of the access of fluid.



155,303. Shaw, E. Jan. 25, 1918, [Convention date].

Plate apparatus; concentric straight-tube apparatus; tubes of special section.—In an apparatus for the exchange of heat between two volumes of flowing fluids, the formation of films of low conductivity, which may tend to accumulate on the surfaces of the ducts, is prevented by leading one or both of the fluids through ducts shaped so as to give an abruptly changing direction to the flow therethrough. In one construction an inner duct or pipe of substantially rectangular cross-

section is formed either from a circular tube or from two plates 1, 1, Fig. 1, brazed together, and is transversely corrugated, with the corrugations of the upper surface alternating with those of the lower surface as shown, the whole being mounted in a casing. In a modification, Fig. 6, an inner annular duct is formed between two transversely ribbed cylindrical tubes 13, 14, and these tubes



are located between outer and inner casings 7, 11, so that a flow of fluid is arranged through the duct from an inlet 16 to an outlet 17, while the other fluid flows on both sides of the duct in the reverse direction from an inlet to an outlet 20. In other arrangements, the two ducts are formed by two concentric spirally-corrugated tubes which give a spiral movement to the fluids in addition to the broken longitudinal movement, or, where the spiral movement is not desired, a longitudinal partition extends along the annulus. Apparatus as in Fig. 1 may be used in catalytic reactions, the space outside the duct 2 being packed with catalyst and the temperature regulated by passage of a fluid through the duct.

155,477. Clayton, W., and Nodder, G. Nov. 6, 1919.

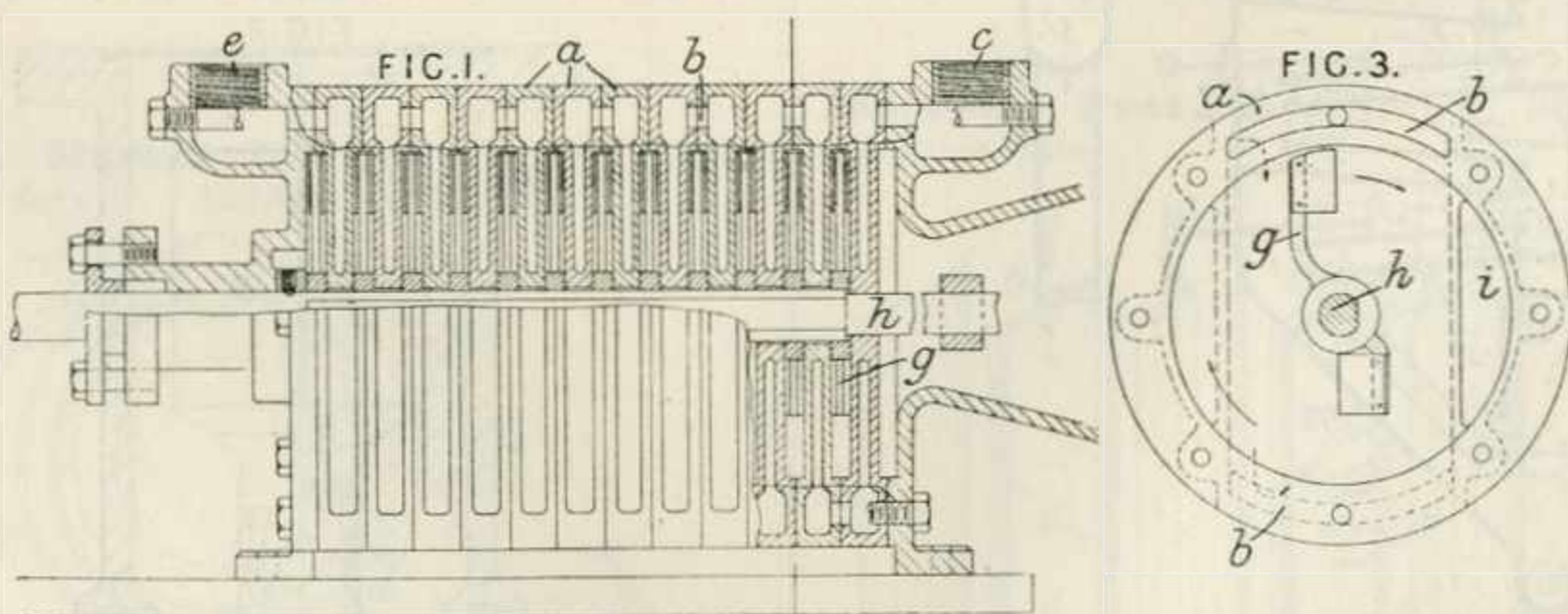


Plate apparatus.—Apparatus for cooling and solidifying edible fats used in the manufacture of margarine or lard substitutes comprises a series of hollow disk-like plates *a* communicating with one another through openings *b* so as to form a continuous zig-zag passage for a cooling-medium entering by an opening *c* and leaving by an open-

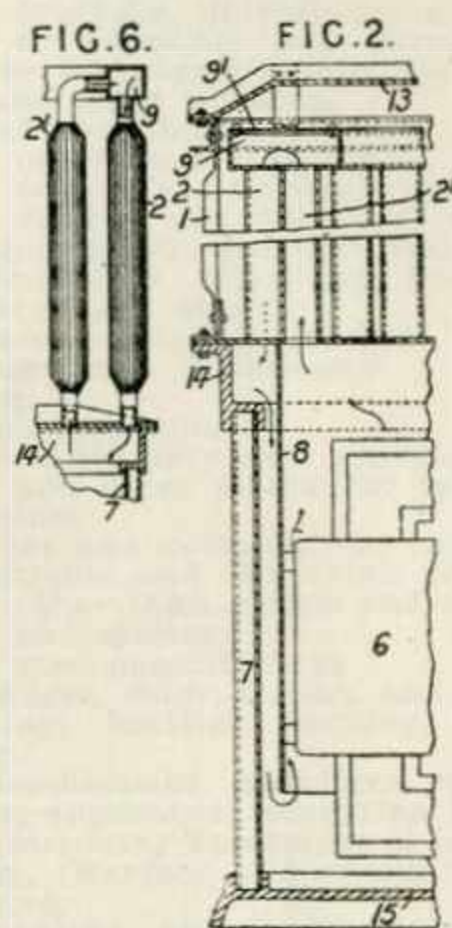
ing *e*, the fats being forced through passages between the plates and the solidified material being removed by scrapers *g* on a rotating shaft *h*. The passages for the fats communicate with one another through alternate openings *i* in a position at right angles to the openings *b*.

APPENDIX

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

111,474. Nobuhara, K. Oct. 28, 1916,
 [Convention date]. Void [Published under
 Sect. 91 of the Act].

Straight tubes between headers or connecting-boxes.—Apparatus for cooling liquids circulating around heated or heat-producing bodies, for example oil in oil-cooled electric transformers or other electric apparatus, comprises inner and outer rings of tubes 2, 2¹ arranged vertically over the casing 7 containing the transformer &c. 6, and exposed on their exterior to the surrounding air. The tubes may be ribbed or corrugated longitudinally, and open at their lower ends directly to the casing 7, and at their upper ends connect with an annular header or chamber 9. The oil is supplied through a pipe connected to the header 9 and fills the casing 7 and the tubes. A partition 8 may extend downwards within the casing 7 so as to produce a circulation of oil upwards through the less cooled inner row of pipes 2¹ and downwards through the outer tubes, as shown by the arrows. The wall of the casing 7 may be ribbed or corrugated, and is held in position between a flanged base 15 and a channelled ring 14. The tubular apparatus is preferably removable as a whole, and



the top plate 9¹ of the header also is removable. A top bar 13 and upright bars 1 form a supporting frame for the tubes. A modified arrangement of tubes is shown in Fig. 6.

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- 64, Heating, (excepting Furnaces and kilns; and Stoves, ranges, and fireplaces).
- 65, Hinges, hinge-joints, and door and gate furniture and accessories, (excepting Fastenings, Lock, latch, bolt, and other).
- 66, Hollow-ware, (including Buckets, Pans, Kettles, Saucepans, and Water-cans).
- 67, Horseshoes.
- 68, Hydraulic engineering.
- 69, Hydraulic machinery and apparatus, (excepting Pumps and other means for raising and forcing liquids).
- 70, India-rubber and gutta-percha, (including Plastic compositions and Materials of constructive utility, other than metals and stone).
- 71, Injectors and ejectors.
- 72, Iron and steel manufacture.
- 73, Labels, badges, coins, tokens, and tickets.
- 74, Lace-making, knitting, netting, braiding, and plaiting.
- 75, Lamps, candlesticks, gasaliers, and other illuminating-apparatus, (excepting Electric lamps).
- 76, Leather, (including Treatment of hides and skins).
- 77, Life-saving, (Marine), and swimming and bathing appliances.
- 78, Lifting, hauling, and loading, (including Lowering, Winding, and Unloading).
- 79, Locomotives and motor vehicles for road and rail, (including Portable and semi-portable engines).
- 80, Mechanism and mill gearing.
- 81, Medicine, surgery, and dentistry.
- 82, Metals and alloys, (excepting Iron and steel manufacture).
- 83, Metals, Cutting and working.
- 84, Milking, churning, and cheese-making.
- 85, Mining, quarrying, tunnelling, and mine-sinking.
- 86, Mixing and agitating machines and appliances, (excepting Centrifugal machines and apparatus).
- 87, Moulding plastic and powdered substances, (including Bricks, building and paving blocks, and tiles, and Pottery).
- 88, Music and musical instruments.
- 89, Nails, rivets, bolts and nuts, screws, and like fastenings.
- 90, Non-metallic elements.
- 91, Oils, fats, lubricants, candles, and soaps.
- 92, Ordnance and machine guns.
- 93, Ornamenting.
- 94, Packing and baling goods.
- 95, Paints, colours, and varnishes.
- 96, Paper, pasteboard, and papier mâché.
- 97, Philosophical instruments, (including Optical, nautical, surveying, mathematical, and meteorological instruments).
- 98, Photography.
- 99, Pipes, tubes, and hose.
- 100, Printing, Letterpress and lithographic.
- 101, Printing other than letterpress or lithographic.
- 102, Pumps and other means for raising and forcing liquids, (excepting Rotary pumps).
- 103, Railway and tramway vehicles.
- 104, Railway and tramway.
- 105, Railway signals and communicating-apparatus.
- 106, Registering, indicating, measuring, and calculating, (excepting Signalling and indicating by signals).
- 107, Roads and ways.
- 108, Road vehicles.
- 109, Ropes and cords.
- 110, Rotary engines, pumps, blowers, exhausters, and meters.
- 111, Sewage, Treatment of, (including Manure).
- 112, Sewing and embroidering.



LIST OF CLASSES

VIRTUAL MUSEUM

- 113, Ships, boats, and rafts, Div. I.
- 114, _____ Div. II.
- 115, _____ Div. III.
- 116, Shop, public-house, and warehouse fittings and accessories.
- 117, Sifting and separating.
- 118, Signalling and indicating by signals, (excepting Railway signals and communicating-apparatus).
- 119, Small-arms.
- 120, Spinning, (including the preparation of fibrous materials and the doubling of yarns and threads).
- 121, Starch, gum, size, glue, and other stiffening and adhesive materials.
- 122, Steam-engines, (including Details common to fluid-pressure engines generally).
- 123, Steam generators, (excepting Furnaces).
- 124, Stone, marble, and the like, Cutting and working.
- 125, Stoppering and bottling, (including Bottles, jars, and like vessels).
- 126, Stoves, ranges, and fireplaces.
- 127, Sugar.
- 128, Table articles and appliances.
- 129, Tea, coffee, cocoa, and like beverages.
- 130, Tobacco.
- 131, Toilet and hairdressing articles, and perfumery.
- 132, Toys, games, and exercises.
- 133, Trunks, portmanteaux, hand and like travelling bags, baskets, hampers, and other wickerwork.
- 134, Umbrellas, parasols, and walking-sticks.
- 135, Valves and cocks.
- 136, Velocipedes.
- 137, Ventilation.
- 138, Washing and cleaning clothes, domestic articles, and buildings.
- 139, Watches, clocks, and other timekeepers.
- 140, Waterproof and like fabrics.
- 141, Wearing-apparel.
- 142, Weaving and woven fabrics.
- 143, Weighing-apparatus.
- 144, Wheels for vehicles, (excepting wheels for Locomotives and tramway and traction engines; Railway and tramway vehicles; and Toys).
- 145, Wood and wood-working machinery.
- 146, Writing-instruments and stationery, and writing-accessories, (including Educational appliances).

(B.)—Abridgments classified in 271 volumes :—

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NOTICE.—The price of each volume is 2s., including inland postage. Postage to Colonies and foreign Countries extra. These volumes can also be obtained sheet by sheet, as printed, by payment in advance of a subscription of 5s. for each volume, including inland postage, and 7s. 6d., including postage abroad. The sheets already printed can be seen in the Patent Office Library and in some of the principal provincial Libraries.

List of Classes.

- 1 (i), Chemical processes and apparatus.
- 1 (ii), Inorganic compounds other than metallic oxides, hydrates, oxyacids, and salts, (including Alkali manufacture and Cyanogen compounds).
- 1 (iii), Oxides, hydrates, oxyacids, and salts, Metallic, (other than Alkali manufacture and Cyanogen compounds).
- 2 (i), Acetylene.
- 2 (ii), Cellulose, Non-fibrous, and cellulose derivatives, (including Artificial filaments, sheets, and the like containing same).
- 2 (iii), Dyes and hydrocarbons and heterocyclic compounds and their substitution derivatives.
- 3 (i), Advertising and displaying apparatus, Moving and changing.
- 3 (ii), Advertising and displaying other than by moving and changing apparatus.
- 4, Aeronautics.
- 5 (i), Farmyard and like appliances, (other than Housing and feeding animals).
- 5 (ii), Housing and feeding animals, (other than Chaff and vegetable cutters).
- 6 (i), Cultivating implements and systems.
- 6 (ii), Gardening and like appliances, (including Miscellaneous agricultural appliances).
- 6 (iii), Harvesting-appliances.
- 7 (i), Combustion-product, compressed-air, hot-air, and vacuum engines.

- 7 (ii), Internal-combustion engines, Arrangement and disposition of parts of, (including Construction of parts peculiar to internal-combustion engines).
- 7 (iii), Internal-combustion engines, Carburetting-apparatus, vaporizers, and heaters for.
- 7 (iv), Internal-combustion engines, Igniting in.
- 7 (v), Internal-combustion engines, Starting, stopping, and reversing.
- 7 (vi), Internal-combustion engines, Valves and valve gear for, (including Other means and methods for regulating and controlling internal-combustion engines).
- 8 (i), Air and gases, Compressing, exhausting, and moving, (including Bellows and Vacuum and like dusting and cleaning apparatus).
- 8 (ii), Air and gases, Treating otherwise than by compressing, exhausting, and moving.
- 9 (i), Ammunition and ammunition receptacles.
- 9 (ii), Torpedoes, explosives, and pyrotechnics.
- 10, Animal-power engines and miscellaneous motors.
- 11, Artists' instruments and materials.
- 12 (i), Bearings and bearing-surfaces.
- 12 (ii), Lubricating passages, channels, reservoirs, and baths, and lubricating-cans.
- 12 (iii), Lubricators and lubricating bearing-surfaces, (other than Lubricating passages, channels, reservoirs, and baths).
- 13, Bells, gongs, foghorns, sirens, and whistles.
- 14 (i), Aerating liquids and gazogenes, seltzogenes, and siphon bottles.
- 14 (ii), Beverages, malt products, and organised ferments, (other than Aerating beverages).
- 15 (i), Dyeing and otherwise treating textiles, textile materials, and the like with liquids and gases, Apparatus for, (including Bleaching and washing, Processes and materials for).
- 15 (ii), Dyeing, Processes and materials for.
- 16, Books, mercantile forms, and the like.
- 17 (i), Boots and shoes, Apparatus for making and repairing.
- 17 (ii), Boots and shoes, Construction of.
- 17 (iii), Boots and shoes, Protectors and trees and other accessories for.
- 18, Boxes and cases.
- 19, Brushing and sweeping.
- 20 (i), Buildings and structures, Kinds or types of.
- 20 (ii), Buildings and structures, Miscellaneous accessories and details applicable generally to.
- 20 (iii), Doors and windows and their accessories.
- 20 (iv), Floors, roofs, walls, and ceilings.
- 21, Casks and barrels.
- 22, Cements and like compositions.
- 23, Centrifugal machines and apparatus, (other than Centrifugal fans, pumps, and reels).
- 24, Chains, chain cables, shackles, and swivels.
- 25, Chimneys and flues, (including Ventilating-shaft tops).
- 26, Closets, urinals, baths, lavatories, and like sanitary appliances.
- 27, Coin-freed apparatus and the like.
- 28 (i), Bread-making, confectionery, and cooking-appliances.
- 28 (ii), Kitchen and like appliances other than cooking-appliances.
- 29, Cooling and ice-making, (including Refrigerators and Ice-storing).
- 30, Cutlery.
- 31 (i), Cutting and severing machines for paper, leather, fabrics, and the like.
- 31 (ii), Punching and perforating machines and hand tools for cutting, punching, perforating, and tearing paper, leather, fabrics, and the like.
- 32, Distilling, concentrating, evaporating, and condensing liquids.
- 33, Drains and sewers.
- 34 (i), Drying gases, clothes, and materials in long lengths.
- 34 (ii), Drying systems and apparatus, (other than Drying gases, clothes, and materials in long lengths).
- 35, Dynamo-electric generators and motors, (including Frictional and influence machines, magnets, and the like).
- 36, Electricity, Conducting and insulating.
- 37, Electricity, Measuring and testing, (including Electric resistances and inductances).
- 38 (i), Electric couplings, and cut-outs other than electro-magnetic and thermal.
- 38 (ii), Electric currents, Converting and transforming other than by rotary converters and rotary transformers, and condensers.
- 38 (iii), Electric motor control systems and motor and like controllers.
- 38 (iv), Electric supply and transmission systems and apparatus not otherwise provided for.
- 38 (v), Electric switches and electro-magnetic and thermal cut-outs, (other than Motor and like controllers).

LIST OF CLASSES



- 39 (i), Electric lamps, Arc and incandescent-arc, and vacuum or low-pressure apparatus for electric discharges through gases or vapours.
- 39 (ii), Electric lamps, Incandescent.
- 39 (iii), Heating by electricity, (including Electric furnaces and ovens).
- 40 (i), Electric signalling systems and apparatus, (other than Telegraphs and Telephones).
- 40 (ii), Phonographs, gramophones, and like sound transmitting and reproducing instruments.
- 40 (iii), Telegraphs, Electric.
- 40 (iv), Telephones and telephone systems and apparatus, Electric.
- 40 (v), Wireless signalling and controlling.
- 41, Electrolysis, (including Electro-deposition and Electro-plating).
- 42 (i), Fabrics, Finishing and dressing.
- 42 (ii), Fabrics, Treating otherwise than by finishing and dressing.
- 43, Fastenings, Dress, (comprising Buckles, Buttons, Jewellery, and certain other fastenings specially applicable to wearing-apparel).
- 44, Fastenings, Lock, latch, bolt, and other, (including Safes and strong-rooms).
- 45, Fencing, trellis, and wire-netting.
- 46, Filtering and otherwise purifying liquids.
- 47 (i), Fire-escapes and fire and temperature alarms.
- 47 (ii), Fire-extinguishing and fire preventing and minimizing.
- 48, Fish and fishing.
- 49, Food preparations, food-preserving, and the like.
- 50, Fuel Manufacture of.
- 51 (i), Furnaces and kilns, Combustion apparatus of, (including Details in connexion therewith).
- 51 (ii), Furnaces and kilns for applying and utilizing heat of combustion, (other than Combustion apparatus and details in connexion therewith).
- 52 (i), Furniture, Fittings and details applicable generally to, and articles of furniture not otherwise provided for.
- 52 (ii), Furniture for sitting and lying upon.
- 52 (iii), Tables, desks, and leaf turners and holders.
- 52 (iv), Upholstery, wall furniture, screens, and looking-glasses.
- 52 (v), Window, stair, and like furniture, brackets, racks, and stands, (including Antimacassars and Table and like covers).
- 53, Galvanic batteries.
- 54, Gas distribution.
- 55 (i), Coking, gas-producers, and retorts.
- 55 (ii), Gas manufacture other than gas-producers and retorts.
- 56, Glass.
- 57, Governors, Speed-regulating, for engines and machinery.
- 58, Grain and seeds, Treating, (including Flour and meal).
- 59, Grinding, crushing, pulverizing, and the like.
- 60, Grinding or abrading, and burnishing.
- 61 (i), Hand-tool, brush, mop, and like handles.
- 61 (ii), Hand tools, (other than Wrenches and bolt, nail, screw, and like inserting and extracting tools).
- 61 (iii), Wrenches and bolt, nail, screw, and like inserting and extracting tools.
- 62, Harness and saddlery.
- 63, Hats and other head coverings.
- 64 (i), Heating liquids and gases.
- 64 (ii), Heating systems and apparatus, (other than Heating liquids and gases and Surface apparatus for effecting transfer of heat).
- 64 (iii), Surface apparatus for effecting transfer of heat, (other than Apparatus in which the heat is transferred from products of combustion).
- 65 (i), Door and gate operating-appliances, furniture, and accessories, (other than Fastenings, Lock, latch, bolt, and other and Hinges and pivots).
- 65 (ii), Hinges and pivots.
- 66, Hollow-ware, (including Buckets, Pans, Kettles, Saucepans, and Water cans).
- 67, Horseshoes.
- 68 (i), Excavating earth and rock, booms, buoys, canals and rivers, ferries, and water supply.
- 68 (ii), Subaqueous buildings and structures, diving, and raising sunken ships and objects.
- 69 (i), Hydraulic apparatus not otherwise provided for.
- 69 (ii), Hydraulic presses, meters, motors, and like apparatus for use with high pressures.
- 69 (iii), Spray-producers and liquid-distributing sprinklers and nozzles.
- 70, India-rubber and gutta-percha, (including Plastic compositions and Materials of constructive utility, other than metals and stone).
- 71, Injectors and ejectors.
- 72, Iron and steel manufacture.
- 73, Labels, badges, coins, tokens, and tickets.
- 74 (i), Braid and braiding-machines, crochet, lace and lace-making, and net-making machines.
- 74 (ii), Knitting and knitted fabrics.
- 75 (i), Burners and burner fittings.
- 75 (ii), Lamp chimneys, globes, lenses, shades, reflectors, and smut-catchers, and holders therefor.
- 75 (iii), Lamps for lighting and heating, Details and accessories applicable generally to, (including Lighting burners, pipes, cigars, and the like).
- 75 (iv), Lamps for lighting and heating, Kinds or types of, (including Lighting, Systems of).
- 76, Leather, (including Treatment of hides and skins).
- 77, Life-saving, (Marine), and swimming and bathing appliances.
- 78 (i), Conveyers and elevators for dealing continuously with articles and materials in bulk.
- 78 (ii), Lifting, lowering, and hauling not otherwise provided for.
- 78 (iii), Lifts, hoists, and jacks.
- 78 (iv), Loading and unloading, (including Transporters and cranes).
- 78 (v), Winding and paying-out apparatus for lifting, lowering, and hauling, (including Pulley-blocks and the like).
- 79 (i), Locomotives and tramway, traction, portable, and semi-portable engines.
- 79 (ii), Motor vehicles, Arrangement and disposition of driving, transmission, balance, and reversing gearing on.
- 79 (iii), Motor vehicles, Arrangement and disposition of parts of, not otherwise provided for, (including Construction of parts peculiar to motor vehicles).
- 79 (iv), Motor vehicles, Frames and undercarriage work of.
- 79 (v), Motor vehicles, Steering and controlling.
- 80 (i), Gearing, Belt, rope, chain, toothed, and friction, and gearing for converting and conveying rotary or reciprocating motion.
- 80 (ii), Gearing, Variable-speed, differential, and reversing, and for stopping and starting, and shafting and its accessories.
- 80 (iii), Link-work, cams and tappets, and ratchet and screw-and-nut gearing.
- 80 (iv), Mechanism not otherwise provided for.
- 81 (i), Disinfecting and deodorizing, and medical and like preparations.
- 81 (ii), Medical, surgical, and dental appliances.
- 82 (i), Metals, Extracting and refining, and alloys.
- 82 (ii), Washing granular, powdered, and like materials, and amalgamating, cleaning, coating, and granulating metals.
- 83 (i), Casting and moulding metals.
- 83 (ii), Metal articles and forms, Combination apparatus and processes specially designed for producing and treating.
- 83 (iii), Metals, Cutting.
- 83 (iv), Metals, Working.
- 84, Milking, churning, and cheese-making.
- 85, Mining, quarrying, tunnelling, and well-sinking.
- 86, Mixing and agitating machines and appliances.
- 87 (i), Bricks, building and paving blocks, slabs, tiles, and pottery.
- 87 (ii), Moulding plastic and powdered substances, (including Casting substances other than metals and Presses, Mechanical).
- 88 (i), Musical instruments, Automatic.
- 88 (ii), Music and musical instruments other than automatic.
- 89 (i), Bolts, studs, nuts, washers, and rivets.
- 89 (ii), Hooks, nails, cotters, pins, staples, wedges, and wood-screws.
- 89 (iii), Nailing and stapling and wire-stitching.
- 90, Non-metallic elements.
- 91, Oils, fats, lubricants, candles, and soaps.
- 92 (i), Ordnance and machine-gun carriages and mountings.
- 92 (ii), Ordnance and machine guns.
- 93, Ornamenting.
- 94 (i), Packing and wrapping-up for transit and storage, (including Baling).
- 94 (ii), Paper bags, sacks, wrappers, and the like, (including Making envelopes).
- 95, Paints, painting, and the like.
- 96, Paper, pasteboard, and papier mâché.
- 97 (i), Optical systems and apparatus.
- 97 (ii), Surveying, nautical, and astronomical instruments.
- 97 (iii), Thermometers, photometers, meteorological and mathematical instruments, and miscellaneous philosophical instruments.
- 98 (i), Photographic cameras and auxiliary appliances therefor.
- 98 (ii), Photographic processes and apparatus other than for taking photographs, (including Photographic plates, films, and papers).
- 99 (i), Pipes and tubes, Joints and couplings for, (including Joints for tubular framework and like Wire and rod couplings and joints).



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LIST OF CLASSES

- 99 (ii), Pipes, tubes, and hose, (*other than* Joints and couplings for).
- 100 (i), Feeding and delivering webs and sheets.
- 100 (ii), Printing processes and apparatus, (*other than* Type setting and composing).
- 100 (iii), Type making, setting, and composing, (*including* Type-bar-making machines).
- 100 (iv), Typewriters and like machines.
- 102 (i), Pumps, Reciprocating, for liquids, (*including* Steam-engine air-pumps and Combined pumps for liquids and gases).
- 102 (ii), Water and other liquids, and semi-liquids, Raising and forcing otherwise than by pumps.
- 103 (i), Brakes and retarding-apparatus.
- 103 (ii), Rail and road vehicles, Details applicable generally to.
- 103 (iii), Railway and tramway vehicles, Accessories for.
- 103 (iv), Railway and tramway vehicles, Body details and kinds or types of.
- 103 (v), Railway and tramway vehicles, Draught, coupling, and buffing appliances for.
- 103 (vi), Railway and tramway vehicles, Undercarriage and underframe details of.
- 104 (i), Railway and tramway crossings and points and switches.
- 104 (ii), Railway and tramway permanent way other than crossings and points and switches, and railway and tramway systems other than electric.
- 104 (iii), Railways and tramways, Electric, (*including* Electric traction).
- 105, Railway signals and communicating-apparatus.
- 106 (i), Calculating, counting, and cash-registering apparatus.
- 106 (ii), Dynamometers, gauges, measures of length, steam-engine and like indicators, and testing-apparatus.
- 106 (iii), Fares and admission-fees checking, revolution and speed indicators, and odometers.
- 106 (iv), Indicating, recording, and registering apparatus not otherwise provided for.
- 106 (v), Measured quantities delivering, measures of capacity, and sampling liquids.
- 107, Roads and ways.
- 108 (i) Road vehicles, Body details and kinds or types of.
- 108 (ii), Road vehicles, Undercarriage details and draught appliances for.
- 108 (iii), Springs and vibration-dampers.
- 109, Ropes and cords.
- 110 (i), Centrifugal and screw fans and pumps.
- 110 (ii), Rotary engines, pumps, blowers, exhausters, and meters.
- 110 (iii), Turbines and reaction-wheels.
- 111, Sewage, Treatment of, (*including* Manure).
- 112, Sewing and embroidering.
- 113 (i), Ship and boat fittings and accessories, and pontoons and rafts.
- 113 (ii), Ships and boats, Kinds or types and structural details of.
- 114, Ships, boats, and rafts, Propelling, steering, and manœuvring.
- 115, Ships, boats, and rafts, Rigging, sails, and spars for, (*including* Boat raising, lowering, and disengaging gear).
- 116, Shop, public-house, and warehouse fittings and accessories.
- 117, Sifting and separating.
- 118 (i), Indicators and burglar and like alarms.
- 118 (ii), Signals, (*including* Marine signals).
- 119, Small-arms.
- 120 (i), Spinning, Preparation of fibrous materials for, (*including* Obtaining, opening, carding, and like treatment of fibres in general).
- 120 (ii), Spinning, twisting, and winding yarns and threads, (*including* Winding cords, wire, and the like).
- 120 (iii), Yarns and threads and miscellaneous spinning accessories and processes and treatment of fibres.
- 121, Starch, gum, size, glue, and other stiffening or adhesive materials.
- 122 (i), Engine and like cylinders, connecting-rods, cross-heads and guides, fly-wheels, piston-rods, and pistons.
- 122 (ii), Steam-engine distributing and expansion valves and valve gear and valve-actuating arrangements therefor.
- 122 (iii), Steam-engines, Kinds or types of, and details not otherwise provided for, (*including* Steam and other fluid-pressure hammers and presses).
- 122 (iv), Steam-engines, Regulating or controlling, starting, stopping, and reversing.
- 122 (v), Stuffing-boxes and substitutes therefor, (*including* Packing therefor).
- 123 (i), Liquid-level regulating, indicating, and registering, incrustation and corrosion preventing and removing, and door lids and covers for resisting fluid pressure.
- 123 (ii), Steam-generators.
- 123 (iii), Steam separators and superheaters.
- 124, Stone, marble, and the like, Cutting and working.
- 125 (i), Bottles, jars, and like vessels, (*including* Non-refillable bottles, jars, and like vessels).
- 125 (ii), Bottles, jars, and like vessels, Filling, opening, and closing, (*other than* Stoppers, lids, covers, and capsules).
- 125 (iii), Stoppers, lids, covers, and capsules, Bottle, jar, and the like.
- 126, Stoves, ranges, and fire-places.
- 127, Sugar.
- 128, Table articles and appliances.
- 129, Tea, coffee, cocoa, and like beverages.
- 130, Tobacco.
- 131, Toilet and hairdressing articles, and perfumery.
- 132 (i), Amusement and exercising apparatus other than games and toys.
- 132 (ii), Games.
- 132 (iii), Toys.
- 133, Trunks, portmanteaux, hand and like travelling bags, baskets, hampers, and other wicker-work.
- 134, Umbrellas, parasols, and walking-sticks.
- 135, Valves and cocks.
- 136 (i), Velocipede, cycle, and like vehicle brakes, steering-mechanism, and miscellaneous accessories.
- 136 (ii), Velocipede, cycle, and like vehicle driving-mechanism, (*including* Hand and foot driving-mechanism for apparatus other than vehicles).
- 136 (iii), Velocipedes, cycles, and like vehicles, Kinds or types and structural details of.
- 137, Ventilation.
- 138 (i), Washing and cleaning buildings and domestic articles other than clothes.
- 138 (ii), Washing, mangling and wringing, ironing, and starching clothes.
- 139, Watches, clocks, and other timekeepers.
- 140, Waterproof and like fabrics.
- 141, Wearing-apparel.
- 142 (i), Looms, Driving, reversing, stopping, and starting, and loom shedding-mechanism and pattern cards, chains, surfaces, and the like.
- 142 (ii), Looms, Kinds or types of, and details not otherwise provided for.
- 142 (iii), Looms, Weft supplying, inserting, beating up, cutting, doubling, and twisting in.
- 142 (iv), Woven fabrics and articles, and warping, leasing, balling, and beaming yarns, (*including* Pile fabrics and Floor coverings).
- 143, Weighing-apparatus.
- 144 (i), Wheels for vehicles, (*other than* Wheel tyres, Pneumatic and other elastic, and rims for use therewith).
- 144 (ii), Wheel tyres, Pneumatic and other elastic, and rims for use therewith.
- 145 (i), Wood, Cutting, (*other than* Sawing).
- 145 (ii), Wood, Working, (*including* Sawing).
- 146 (i), Filing papers and documents.
- 146 (ii), Stationery, wafers and seals, educational appliances, and ciphers and codes.
- 146 (iii), Writing-instruments, ink, receptacles for writing-materials, pads, and blotters.

FIFTY YEARS SUBJECT INDEX, 1861-1910.

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

For a continuation of the "Fifty Years Subject Index," the searcher should consult the Abridgment Volumes for the period 1909-15 and the annual and quarterly indexes from 1916 onwards.

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