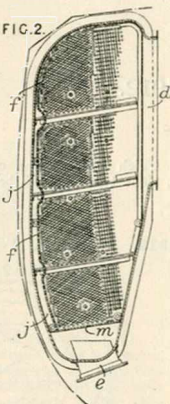


3933. Parsons, Sir C. A., and Cook, S. S. Feb. 16.

Straight tubes between headers etc.—In condensers which have a cross-sectional area less in one dimension than in another perpendicular thereto, and in which the natural direction of flow between inlet *d* and exhaust *e* is, owing to their relative positions, along a path of greater length than the shortest dimension of the condenser, the steam is caused to flow at approximately all parts in a direction substantially parallel to the shorter dimension by means of a perforated baffle plate *f* leaving a space *j* in communication with the exhaust and an imperforate baffle *m* preventing direct passage to the exhaust.



4036. Behrsin, E. Feb. 17.

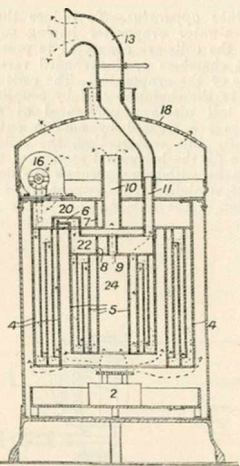
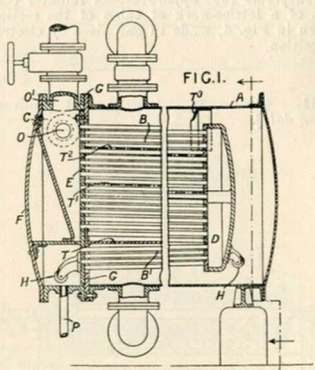


Plate apparatus.—An air-heater consists of a number of concentric hollow cylinders 4, 5, the upper parts of which are divided by partitions 7, 8. A fan 16 or the like impels the air

and combustion gases in the bonnet 18 into the space 20. After passing up and down the cylinder 4, the air leaves it by a passage 6 and enters the chamber 22 at the upper end of the cylinder 5. It then takes a tortuous path up and down round the cylinder 5 and leaves the apparatus by a pipe 11 and hood 13. The apparatus as shown is heated by a spirit or gas burner 2, the combustion gases from which pass through flues 24, 9, 10 to the upper part of the apparatus, but it may be heated by other means, such as steam.

4550. Griffiths, E., Tennant, N. S., and Barrs, E. Feb. 23.



Straight tubes between headers.—The live-steam inlet *O*, exhaust inlet *O'*, and outlet *P* for water of condensation are arranged in the side of the header *C*, and the nest of tubes can be removed without breaking a steam connexion. The tube-plate *E* abuts against an annular plate *G*, and is bolted thereto so that, when the cover *F* is removed and the bolts unfastened, the plate *G* together with the nest of tubes *B*, *B'* and header *D* can be run out of the casing *A*, for example on wheels *H* fitting in suitable rails, for inspection, cleaning, or repair. Baffles *T*, *T'*, *T''*, *T'''* cause the steam to take a sinuous path. In a modification, the tubes are vertical, and the lower tube-plate also rests on an annular flange similar to *G*, and is bolted thereto, the nuts being on the lower side and thus accessible on removing the lower header.

4807. McDonald, A. J. Feb. 26.

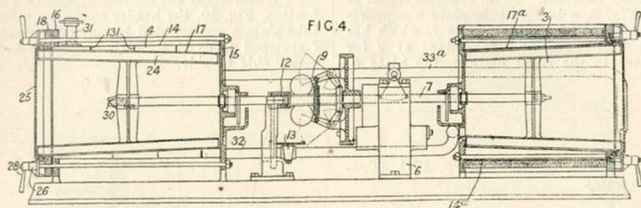


Plate apparatus.—Apparatus for processes in which liquids are heated, cooled, and stirred, comprises a reservoir mounted above a heater 3 and a regenerator 4, a turbine 6 driving agitators 24, and a boiler. The regenerator 4 comprises a removable inner cone 17 and an outer cylinder 14, both carried by rings 18, 16 respectively, and an end plate 15. The space between the two is divided by a spiral partition 131, and a cover 25 is secured by catches 26 and clamps

28. The heater is similarly constructed, but the spiral partition is omitted; the cone and cylinder are secured together, and the latter is lagged. In operation, the liquid flows from the reservoir through the pipe 31 to the cylinder 14, and then by the pipe 32 to the cone 17^a, the cylinder 14^a being supplied with exhaust steam from the turbine 6, and then by the pipe 33^a to the cone 17.

7989. Haegle, J. A., and Zweigle, G. April 2.

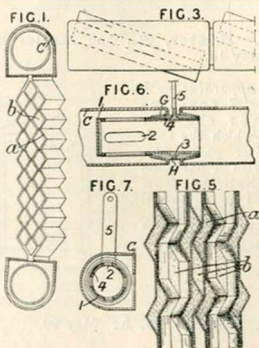
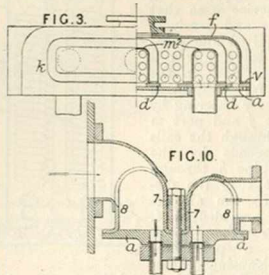


Plate apparatus.—In a radiator, particularly applicable to cooling the circulation water in explosion motors on flying-machines, separate cooling-elements consisting of plates are connected through their headers and valves so that one or more elements may be shut off. The plates are corrugated vertically and horizontally as shown in Fig. 5, and are so assembled in pairs that water spaces *a* project into the air spaces *b*, which run both horizontally and vertically. The inlet headers *C* may have inlet flanges *G*, which engage connecting nipples *H*. Each nipple may carry a cylinder 1,

which is closed at one end and has lateral slots 2. A second open-ended cylinder 4, having slots to coincide with the slots 2, is rotated by a handle 5 to serve as a rotary valve. The cylinder 4 has a collar 3 to engage a groove in the nipple *H*. Instead of this connexion, a hose or other coupling may be employed between the headers. The outlet headers may have flanges which slide one within the other. The cooling-elements are set at an angle to the plane of the headers, as shown in Fig. 3.

8023. Holden, S. D., Tiddeman, E. S., and Russell, F. V. April 3.



Headers.—Relates to headers for heat-exchangers, such as steam-superheaters, wherein tubes extend from and return to the flat bottom of a header having an horizontal inlet branch at one side and horizontal outlet branches at

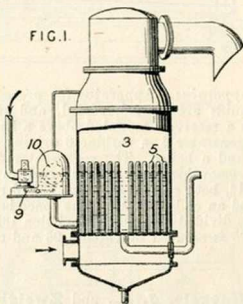
the opposite side. Such headers are made of pressed-steel elements. In an example shown in plan in Fig. 3, a bottom tube-plate *a* supports a front plate *d* and a back plate *f*, which has its ends bent round and flanged as at *v* for attachment to the front plate *a*, top plate *h*,

and receivers *m*², in which the steam is collected after transverse the heating-tubes. In a modification, Fig. 10, the header comprises a bottom tube-plate *a* surmounted by one or more plates 7 stamped so as to form channel-shaped chambers 8 side by side.

10,877. Dunn, J. E. Nov. 6, 1911, [Convention date].

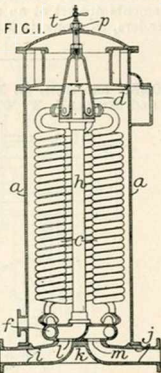
Air-vented vertical steam-tubes extending into bulk of liquid.—Solutions to be evaporated are circulated in chambers 3 in contact with substantially vertical steam-tubes 5 closed at their upper ends except for air vents, the level of liquid being maintained below the air vents by means of float mechanism, such as 10, 9. Discharge valves may be automatically operated by the action of the liquid upon floats when a given density is reached. The vents in the tubes may be connected by means of small diameter tubes with an exhausting-device. A number of vessels 3 may be arranged to evaporate the solution in stages.

FIG. 1



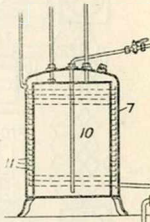
11,436. Morison, D. B. May 14.

Coil-tube apparatus.
—Coils *c* extend between upper and lower water-receivers *d, j* within a steam-filled casing *a*. The bottom receiver is detachably connected to the base *k*, and the upper has a lifting-device *p* so that the coils and receivers can be lifted and rotated to bring any coil opposite a door in the casing for inspection &c. Water entering by the pipe *j* and port *m* passes through the coils and descends by the central pipe *h* through the port *l* to the discharge *i*. An air release is provided at *t*. In the Provisional Specification, a peripheral steam cleansing-chamber is described fitted around the upper part and having alternating baffles which may be removable; the cover of the casing *a* has a flange which serves to cover the top of the chamber. The oil and water separated are collected in a compartment at the side provided with suitable discharge means.



11,553. Köster, R., and Kolleretzky, G. May 15.

Plate apparatus.—A condenser 7 contains an inner chamber through which the cooling-water passes, together with a partition 11 by which the steam is guided in a helical path between the chamber 10 and the wall of the condenser.



11,909. Riemer, G. A. May 20.

FIG. 3

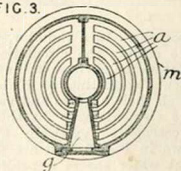
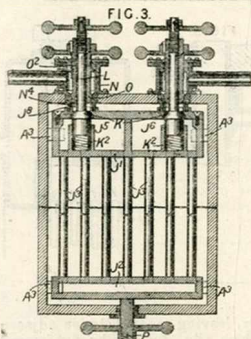


Plate apparatus.—The heating-surface of an evaporator is composed of curved hollow plates, the curvature of which can be varied, to remove deposits, by varying the steam pressure.

Fig. 3 shows the arrangement. The plates *a* are secured to the chamber *g* at one edge only by a bar which is perforated to register with corresponding perforations in the wall of the chamber *g*. The liquid to be treated passes downwards on one side of the apparatus and upwards on the other side.

12,599. **McIntyre, J., and Shetley, W.** de. May 28.

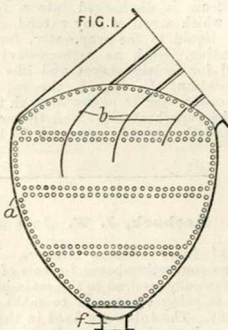


Straight tubes between headers bodily removable from casing.—A heat-exchanger which is bodily removable from a drying or evaporating pan is shown in plan in Fig. 3 together with the arrangements for admitting and exhausting steam after it has been lowered on to supporting-brackets *A*³ in the pan. It consists of tubes *J*¹ with headers *J*¹, *J*², of which one *J*¹ is divided into supply and exhaust compartments *J*¹, *J*². A tight joint with the steam-boxes *N* is made by means of annular flanges *N*¹ and grooves *J*¹, which are made to engage by pushing the exchanger bodily forwards by a screw *P*. The valves *K*, which are normally closed by springs *K*², are then opened by screwing the rods *L* downwards, and the valves *O* are opened by screwing their stems *O*² upwards.

12,938. **Jochims, J., and Kleinle,** [née Becher], **J.** June 1. Drawings to Specification.

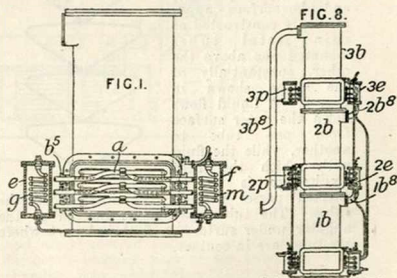
Gills for tubes.—Gilled pipes are made by threading on the pipe rings having radial or parallel corrugations which are contracted round the pipe by deepening the grooves either throughout their length or merely in the neighbourhood of the aperture. The contracting effect is increased by flattening the outer parts of the corrugations.

13,727. **Morison, D. B.** June 12.



Partitions among tubes.—The steam current at entry to the tube surface in the condenser *a* is directed by plates *b* so that its stream lines of flow through the chamber are towards the air exit *f*. The invention is applicable to condensing-chambers of all shapes, and the partitions may be only among the tubes or may end before the tube nest is reached. Specification 7321/09 is referred to.

14,332. **Davie, J.** June 19.



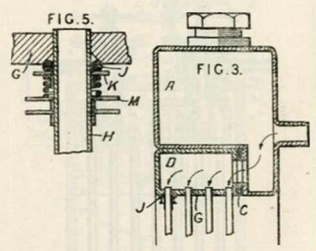
Coil-tube apparatus.—The admission and emission ends of the coils in a liquid heater or evaporator pass out of the casing at a joint, the opposing faces at such a joint being formed with semicircular openings, which may be adapted as stuffing-boxes. Registering grooves are formed upon the faces to hold the packing &c. In an apparatus, Fig. 1, embodying this arrangement, the ends of the evaporator coils *a* pass out at the junction of the door and the casing, stuffing-boxes *b*⁵ being provided. Low-pressure steam for heating enters the casing *e*

and is superheated by a live-steam or other heating-coil *g*. After passing through the coils *a*, the steam is discharged into a receiver *f* through which a coil *m* may extend, conveying water or liquid to the evaporator, for preliminary heating. Such an arrangement may be employed for multiple-effect and like processes of evaporation. In Fig. 8, the vapour from the first evaporator *1b* passes through the outlet *1b^s* to the superheater *2c*, and thence through the coils of the second evaporator *2b* to the re-

ceiver *2p*. Vapour from the second evaporator passes likewise from outlet *2b^s* to the superheater *3e*, through coils to the receiver *3p*. The vapour from the third evaporator *3b* together with the drain from the receivers *2p*, *3p* pass into the condenser main *3b^s* and constitute the gained water. Apparatus of the type shown in Fig. 1 is stated to be applicable to heating feed-water. The heating-medium may be either inside or outside the tubes in any of the apparatus.

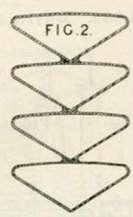
14,440. Roebuck, J. W. June 20.

Straight tubes between headers.—Tanks *D* serving as connecting-boxes for sets of tubes *H* are mechanically secured to the main headers *A*, packing *C* being interposed to make a watertight joint. The tubes are fixed in the tanks *D* also by mechanical means to facilitate replacement. One such joint is illustrated in Fig. 5, comprising a sliding collar *K* pressed by a spring, which abuts against a rib *M* on the tube, against packing *J* in a recess on the tube-plate *G*.

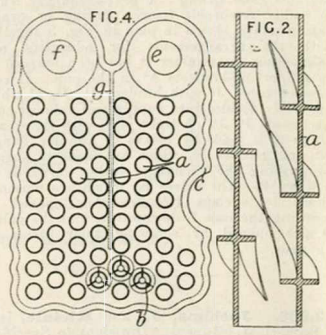


14,534. Ewing, M. June 21.

Tubes of special section.—Refrigerators, condensers, vaporizers, and like surface-apparatus are constructed of thin metal tubes mounted one above the other, substantially of the shape shown in Fig. 2. A liquid flows down the outer surface from one tube to another, while the fluid with which the heat exchange is to be effected passes through the interior of the tubes. The tubes may have, instead of the angular under surface, a flattened part where the tubes are in contact.



helicely, leaving spaces between adjacent strips into which ribs, formed by flat strips curved edgewise, are inserted so as to project inside and outside the tube, and electrically welding



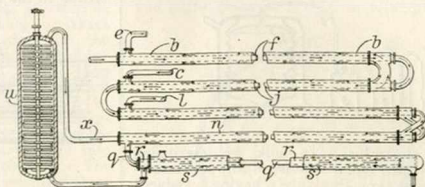
15,574. Allen, R. July 3.

Tubes of special section.—Externally and internally ribbed tubes *a* are formed by winding cross-irons, T-irons, or ribbed plates around a mandrel and welding or soldering the windings together, or by winding three flat metal strips

or otherwise closing the joints. In a superheater, Fig. 4, described by way of application, a chamber *c* is traversed by such tubes *a*, a baffle *g* directing the steam between inlet and outlet *e*, *f*.

17,427. Rigby, T., and Wetcarbonising, Ltd. July 26.

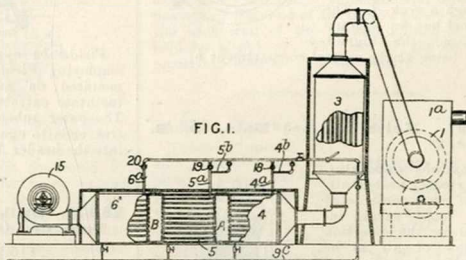
Concentric tube apparatus.—Heat-interchanging apparatus for effecting wet-carbonizing or similar heat-treatment of pulped peat comprises serpentine concentric tubes connected to a mixing-vessel *u*. Cold viscous pulp is first supplied to the inner tube *f*, which offers less resistance than the annular jacket *b*, through which from *c* to *e* may flow a counter-current of warm effluent from filter-presses in which the product is partly dried. In the next tube *j*, the raw pulp is further heated regeneratively by the wet-carbonized pulp traversing a jacket on its way to an outlet *l*. The raw pulp thus warmed is supplied to the jacket *n* of the next tube *x* and is heated by and acts as a lagging for the wet-carbonized material flowing therein from the mixing vessel *u*. In the final heating tubes,



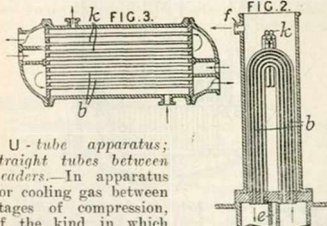
the pulp is supplied to the central tube at *q* and returns upon itself through a tube *r* enclosed by a steam jacket *s*, which may have internal spirals to increase the transfer of heat. Stationary agitating-means may be provided in the tubes, such as coned constrictions or spiral insertions, or indented tubes may be used. Specifications 10,834/03, 20,420/03, [both in Class 50, Fuel, Manufacture of], and 9105/11, [Class 55 (i), Coking &c.], are referred to.

18,027. Rebolledo, M. S. June 5, [Convention date].

Straight tubes between headers.—In an air-heating apparatus consisting of three sets of tubes separated by chambers A, B, the openings of the tubes on the two sides of the chambers are not opposite to each other so that the passage of the air through the heater is delayed.



18,670. Pokorny und Wittkind Maschinenbau Akt.-Ges., and Pick, L. K. Aug. 19, 1911, [Convention date].



U-tube apparatus; straight tubes between headers.—In apparatus for cooling gas between stages of compression, of the kind in which

nests of tubes distinct from each other are fitted in a single cooling-tank, the tubes are more or less straight and parallel to each other and are connected together at one end either by bends forming part of the tubes, or by a chamber into which they all open. Fig. 2 shows a two-stage cooler with independent nests of U-shaped tubes *b*, *k* crossing each other. The cooling-water is supplied by a pipe *e* to a central space, and then passes radially outwards between the tubes *b*, *k* before reaching the overflow *f*. Fig. 3 shows a modified construction, the gas from the first compression stage being cooled in the tubes *b*, and that from the second stage in the tubes *k*.

18,834. **Lobeck, O.** Aug. 16.

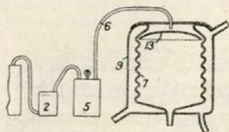
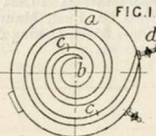


Plate apparatus.—In milk &c. sterilizing apparatus, the liquid is pumped into a pressure-vessel 5 and through a tube 6 having a reduced outlet, such as a capillary tube, on to a plate 13 by which it is distributed over a surface 7 heated by a steam-jacket &c. 9.

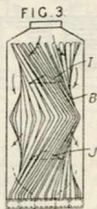
21,675. **Eigtved, H. P.** Sept. 24.

Plate apparatus.—Milk &c. is cooled in a water-cooled spiral channel *c*, which extends from an inner compartment *b* to the circumference of the vessel *a*, passing away through a cock *d*. The channel has an inclined bottom, the highest point being at the central compartment *b*.



22,097. **Keith, J., and Bain, D. B.** Sept. 28.

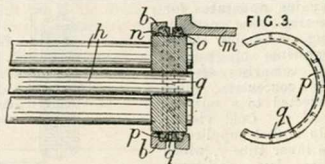
Loop-tube apparatus.—A steam-heated air-heater is constructed with loop tubes inclined to the direction of flow of air to be heated, and so disposed that the air strikes on the upper side of such tubes, water of condensation thus being conveyed quickly away from the surface exposed to the rush of air. In the form shown in Fig. 3, for example, each loop tube *B* is bent about midway of its length and baffles *I, J* cause the air to impinge on the tubes.



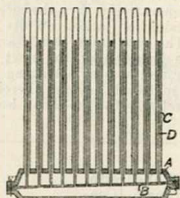
22,869. **Koppers, H.** Oct. 7.

Jacketed straight-tube apparatus; straight tubes between headers.—In a cooler comprising an outer tube and one or more inner tubes *h* connected to the casing *b* and header *m* by a packed joint to allow for expansion &c., a perforated ring *p* is arranged in the packing

dividing it into two parts *n, o*, the perforations *q* allowing leakage past either of the parts to escape to the atmosphere.

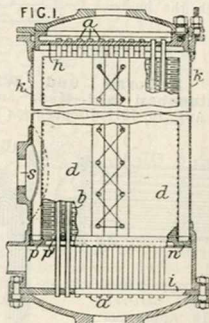


23,140. **Newman, A. H.** Oct. 10. *No Patent granted (Sealing fee not paid).*



Field-tube apparatus.—A steam air-heater employing Field tubes has the inner tubes *D* mounted on an inclined tube-plate *B* to facilitate extraction of water of condensation. The outer tubes *C* are squared at their upper free ends to enable them to be readily screwed into the header *A* or removed therefrom.

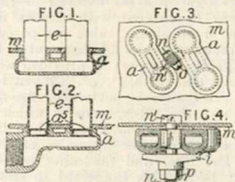
23,175. **Still, W. J., and British Still Tube Co.** Oct. 10.



Straight tubes between headers; gills for tubes.—In tubular heat-interchangers, especially

oil-coolers, of the type comprising a set of tubes passing through perforated plates as set forth in Specification 10,223/11, [Class 64 (i), Heating liquids &c.], a sheet of flexible material such as vulcanized fibre or sheet lead is wrapped round the edges of the perforated plates so as to form a chamber through which the oil &c. flows. In the form shown in Fig. 1, tubes *a* for the cooling-fluid connect headers *h*, *i*, and are surrounded by a casing *k*. The header *h* slides in a stuffing-box in the casing *k* to allow for expansion. The casing *k* is divided by a partition *n* into an outlet chamber and an inlet chamber. The oil enters by an inlet *s* and rises outside a sheet *d* wrapped round the plates *b* on the tubes *a*, and passes down between the tubes and through perforations *p* in the partition *n*. The sheet *d* is laced as shown, and fits round a shoulder *p* in the partition *p*. An open horizontal cooler is also described.

23,177. Still, W. J., and British Still Tube Co. Oct. 10.

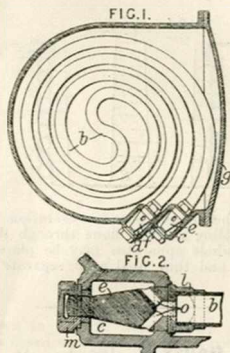


Loop-tube and serpentine-tube apparatus.—In tubular heat-interchangers in which tubes are arranged side by side and project through tube plates, adjacent tubes are connected by header-pieces, two or more headers being secured to the plate by a single bolt. The tubes *e* are expanded through the plate *m* and connected by the header *a*. Two adjacent headers *a* are pressed against the plate *m* by a piece *i* secured by a bolt *n* and nut *p*. The bolt *n* has a flattened end piece *n*¹ which is passed through a slot in the plate *m*, the bolt being then turned to hold it against the plate. The middle portion *o* of the bolt *n* is flattened at right-angles to the piece *n*¹ so that the headers *a* prevent the bolt from rotating. Fig. 2 shows the header *a* formed as an inlet or outlet for two tubes in parallel. Perforated thimbles *a*² may be placed in the tubes to render the distribution of steam &c. uniform.

23,403. Morison, D. B. Oct. 14.

Coil-tube apparatus.—In steam-heated evaporators &c. of the type in which a series of coils are placed one above another, the ends of the coils are connected to the inlet and outlet passages by coupling-pieces arranged tangentially, so that the coil can be brought into position for removal by a rotation round its axis without

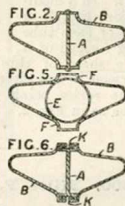
lateral movement. Fig. 1 shows a coil *b* thus arranged, to be withdrawn through the door *g*, the ends of the coil being connected to inlet and outlet passages *c*, *d* by coupling-pieces *e*, *f*



arranged as shown in Fig. 2. The coupling-piece *e* consists of a conical plug with passages *o* by which the coil *b* communicates with the passage *c*. The end of the piece *e* passes through the back wall of the passage *c*, and is there held by a nut *m*. The end of the coil *b* is secured in a socket *l* on the piece *e*.

24,595. Downs, S. Oct. 28.

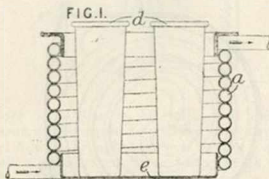
Tubes of special section; straight tube apparatus having internal partitions and fittings in tubes.—In milk-coolers of the type described in Specifications 6316/93, [Class 29, Cooling &c.], and 6795/10, wherein are employed superposed tubes *B*, these tubes are strengthened by means of one or two internal partitions *A* integral with or riveted to the tube, or by the use of an inserted tube *E* riveted at *F*. The tube may be built up on the partition as shown in Fig. 6, the edges being folded over flanges on the partitions and soldered at *K*.



26,355. Akt.-Ges. der Maschinenfabriken Escher, Wyss, et Cie. Nov. 18, 1911, [Convention date]. Void. [Published under Section 91 of the Act.]

Coil-tube apparatus.—The wall of a vessel for containing liquids to be heated or cooled or

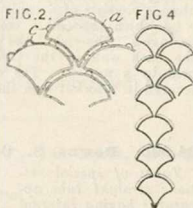
medium for transmitting heat or cold to liquids in vessels *d*, is constructed of a coil or coils of tube *a* the several convolutions being hermetically connected one to another. A bottom



e is attached to the lowest convolution. Heating or cooling medium flows through the tube *a*. The whole apparatus may be placed in a cupboard and thus used as a separate heater or cooler.

27,782. Gallay, J. Dec. 3.

Honeycomb and like tube apparatus; plate apparatus.—In a "honeycomb" radiator, tubes *a* of curvilinear triangle-section are used, studs *c* near each end serving to space the tubes apart. In a modification, Fig. 4, in place of each tube being formed of a single sheet of thin metal, a series of tubes is formed in one piece, the shape of each section of the series being substantially the same as a tube as in Fig. 2.



27,800. Miles, P. Dec. 3.

Straight tubes between headers; tube-plates.—The holes in the tube-plate *b* through which the set-screw *h* passes is threaded so that on removal of the nut *j* the cover *c* can be removed leaving the tube-plate still rigidly connected to the casing flange *e*. The flange *e* may be separate and screwed upon the externally threaded end of the casing *a*, which is made in this case of ductile metal. The tube-

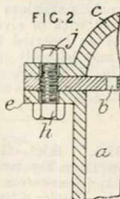
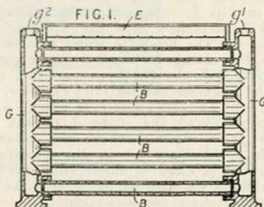


plate *b* may be of rustless steel and the cover *c* may be treated with a non-rusting composition.

28,012. Cuming, A. J. Roach. May 7.



Tubes of special materials.—In surface-apparatus for cooling and heating fluids, evaporative effects are obtained by allowing water to fall from a trough upon the exterior of the tubes, which may be covered with fibrous material, and some or all of the tubes are porous. The Figure shows a series of horizontal tubes *B* between vertical headers *G* provided with inlet and outlet apertures *g^1*, *g^2*. When liquid is applied externally, a perforated trough *E* is placed above the tubes, some of which may be covered with fibrous material. When the tubes are of two kinds, one of porous earthenware, clay, or the like, and the other non-porous, they may be suitably connected in sections for the passage of different fluids. The Provisional Specification refers also to the various heating, cooling, evaporative, and moistening effects obtainable by arranging and controlling the passage or access of fluids through or to the apparatus.

28,609. Samuelson, E., and Backhouse, J. Dec. 12.

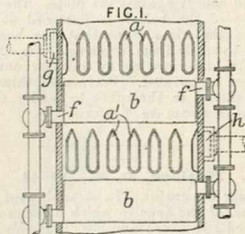


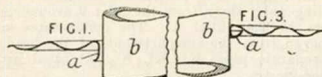
Plate apparatus.—In apparatus for heating, cooling, and drying grain and granular materials, of the kind in which the material falls

down a shaft between tubular divisions $a, a', b, b,$ e.g. of the shape shown, arranged in superposed horizontal rows, the tubes of adjacent rows are placed at an angle, for example a

right-angle, to one another, and alternate rows are placed parallel but in staggered relation. Hot or cold air is admitted and discharged at the ports $g, h.$

A.D. 1913.

1168. **Rheinische Schweisswerke Sieglar Ges.** Aug. 5, 1912, [Convention date].



Gills for tubes.—A method of securing flanges or gills on tubes, particularly intended for heat transmission, consists in providing the edge of the hole in the flange &c. with a cylindrical flange a which is rolled to the form shown in Fig. 3, by which means the flange grips the pipe b over a considerable contact surface. The gills may be concentrically corrugated or plane, and may be of circular, square, or polygonal form.

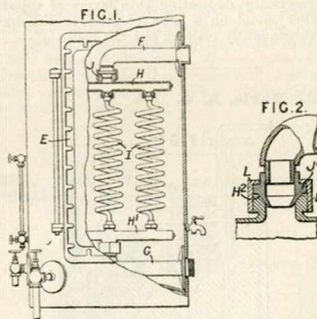
1389. **Akt.-Ges. der Maschinenfabriken Escher, Wyss, et Cie.** Feb. 3, 1912, [Convention date]. Void. [Published under Section 91 of the Act.] Drawings to Specification.

Plate apparatus.—A condenser for use with a refrigerating machine consists of concentric tubes, the inner tube being provided with longitudinal folds so as to present a star-shaped cross-section.

1704. **Power, J. A.** Jan. 27, 1912, [Convention date].

Coil-tube apparatus.—In evaporators intended primarily for salt or other water, the headers H, H' of the coils I through which the heating-steam is passed are adapted to turn upon, and are connected to, the fixed inner ends of the steam inlet and outlet pipes $F, G.$ The connexion between the headers and the pipes F, G

is shown in Fig. 2. Each header is provided with a coned seat H^2 to receive a corresponding nipple J^1 on the end of the steam pipe, the parts being connected by a nut $L.$ By releasing

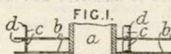


the nuts at the top and bottom headers, the coils can be rotated bodily so as to bring any one coil opposite the door E for renewal &c. The joints between the coils and the headers are similar to those between the headers and the pipes $F, G.$

3493. **Wharrad Engineering Co., and Wharrad, L. A.** Feb. 11. Drawings to Specification.

Gills for tubes.—A detachable heat-radiating device, applicable especially to the cylinders &c. of internal-combustion engines, comprises a sheet or strip of metal having tongues or projections punched and bent up at an angle to the sheet.

3864. **Danneberg, E.** Feb. 13, 1912, [Convention date].



Gills for tubes.—In a heat-exchanger in which a number of sheet-metal disks *b* are threaded upon a tube *a* of uniform dimensions and spaced apart by means of lugs *c* preferably stamped out near the periphery, feet or the like *d* are formed on the ends of the lugs, for example, by turning over the ends.

3823. **Feldkamp, F. A.** Feb. 14.

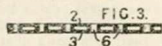


Plate apparatus.—A one-piece metal tape or band, applicable for use in motor radiators or for other purposes and capable of being wound on a reel or the like, comprises apertured face walls 2, 3 united at the edges by edge walls and having transverse tubular studs 6 extending between the apertures. It may be made by electrolytically depositing thin layers of copper or other metal on a tape of lead or the like and subsequently melting out the lead.

4550. **Davis, A. C.** Feb. 22.

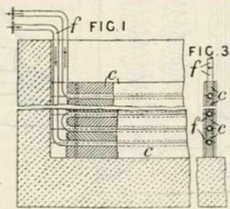


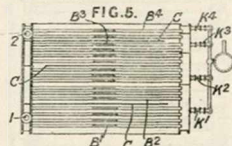
Plate apparatus.—In the plate or wall system of ice-making, the walls are composed of a number of superposed solid metal blocks *c* grooved on their upper and lower faces to receive and enclose a single serpentine freezing pipe *f*. The ends of the blocks may also be grooved in order to take the bends of the pipe.

5340. **Conan, W.** March 3. *Drawings to Specification.*

Straight-tube apparatus having internal fittings in tubes.—To prevent obstructions such as air-locks, the tubes of radiators &c. are provided with independent cores leaving passages extending continuously along and around the

cores. The pipes may be of circular, square, or other cross-section, and cylindrical or tapered. The cores may be of circular, cruciform, square, or other cross-section, either solid or hollow, and of rigid or flexible material. The cores may be disposed concentrically or eccentrically within the pipes.

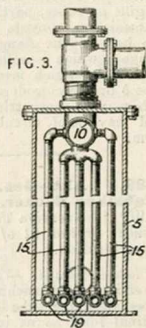
5368. **Schmidt, W.** March 3.



Straight tubes between headers.—A counter-current surface condenser for solvent vapours is formed with compartments for each of which the condensate is collected. The condenser is shown in plan in Fig. 5. The vapours flow through nests of horizontal tubes B^1, B^2, B^3, B^4 , separated by partitions *C*, and extending at their ends into partitioned headers. The cooling-water flows from the inlet 1 around the tubes to the outlet 2. The condensates are removed from the compartments of the header by separate pipes K^1, K^2, K^3, K^4 fitted with gauge-glasses.

7525. **Oberste, W., and Hartz, A. F.** March 31.

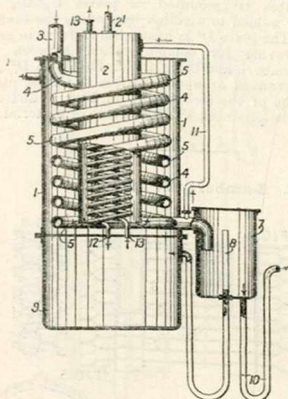
Straight tubes between headers.—A main steam distributing-pipe 10 is connected by a number of rows, more than two, of substantially vertical conduits 15 to a number of rows of lower conduits 19, the ends of which are connected by transverse pipes not connected to the outer casing 5, one of these having an outlet for the condensation water to the outside of the casing.



8110. **Ockel, R.** April 7.

Coil-tube apparatus.—Vapours are condensed by passage through coils 4, 5 of large diameter and coils 12, 13 of small diameter in succession, both coils being arranged in the same water-container 1. A division wall 2 may be fitted to ensure that the cooling-water entering by a pipe 2' shall pass over the coils 12, 13 to the bottom of the vessel 1 before passing over the coils 4, 5. The vapours pass from the inlet

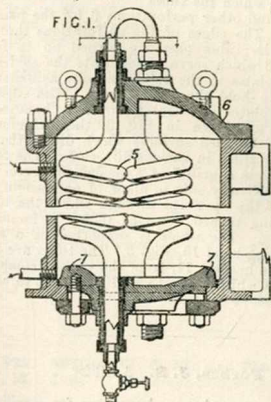
3 through twin coils 4, 5, and then through a pipe 11 to the coil 12, the uncondensed gases escaping through the coil 13. The liquid condensed in the pipes 4, 5 flows to a vessel 7



from which the heavier portion, for example water, flows away by a pipe 10, the lighter liquid, for example benzene, flowing through a pipe 8 to a reservoir 9 into which the coil 12 also discharges.

Reference has been directed by the Comptroller to Specifications 1939/86, [Class 91, Oils &c.], and 18,667/05, [Class 32, Distilling &c.].

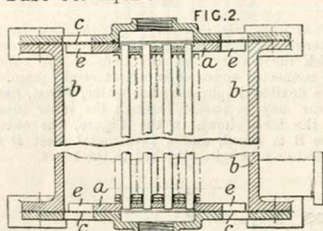
8217. Dahl, K. M. April 8.



Coil-tube apparatus.—The tubes 5 in a

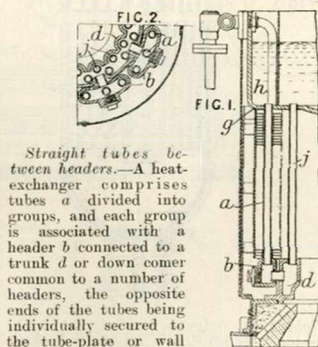
heater or condenser of the type in which the tube plates 6, 7 with attached tubes may be withdrawn bodily are so connected that the fluid within them flows through all the tubes in series. The tubes are jointed to the tube plates in such a manner that the connexions are all external and preferably such as are set forth in Specification 22,998/13, [Class 99 (i), Pipes and tubes, Joints &c. for].

8357. Still, W. J., and British Still Tube Co. April 9.



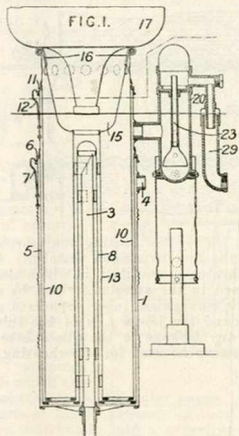
Tube plates.—Tube plates *a* in a straight-tube apparatus are connected to the casing *b* by flexible membranes or plates *c*, for example of lead backed with copper. One or both of the tube plates may be thus connected, and such plates are supported on feet *e* which slide on the bottom of the casing.

8358. Still, W. J., and British Still Tube Co. April 9.



Straight tubes between headers.—A heat-exchanger comprises tubes *a* divided into groups, and each group is associated with a header *b* connected to a trunk *d* or down comer common to a number of headers, the opposite ends of the tubes being individually secured to the tube-plate or wall *g* of a drum *h* or upper part of a receiver common to them. The tubes may be provided with external gills, for example.

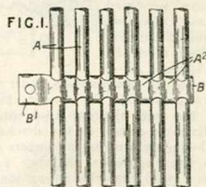
exchanger consisting of nested vessels 1, 5, 10 carrying tubes 3, 8, 13 respectively. In ope-



ration, liquid flows from a bottle &c. 17 through a cup 15, the tube 13, and between the vessels 5, 10 to the heater 20, where on boiling it

overflows the tube 23 and returns by pipes 20, 4, between the vessels 1, 5, and the pipe 8 to the outlet pipe 3. The top of the pipe 3 is bevelled or has two openings, to prevent siphoning. The bottle 17 is isolated by being supported upon wires or shoulders 16. The vessels 1, 5, 10 are connected by flanges 6, 11 and catches 7, 12.

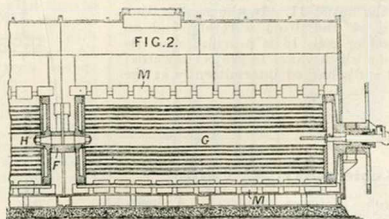
10,478. **Best, G. J., Iden, W. J., and Associated Equipment Co.** May 3.



Tube supports.—To prevent displacement of tubes extending between headers in condensers, radiators, and surface apparatus generally, the tubes are passed through a support constructed by drilling a tube B, passing the tubes A through the apertures and indenting the tube B between the tubes at A². The end or ends B¹ of the support may be flattened for fixing to the main casing.

12,237. **Simon & Sons, R., Simon, R., Simon, W. G., and Simon, F. R.** May 26.

Straight tubes between headers.—In apparatus of the type set forth in Specifications 9331/99 and 13,837/99, [both in Class 34, Drying], comprising reels or faggots of heated tubes rotating in the trough of a drying-machine, two such reels G, H are used, placed end on and driven separately at opposite ends from an outer shaft. Their inner ends are supported in a bearing F. They may be of different diameters and lengths, and by varying the gear wheels, their speeds of rotation may be varied. The material, fed by a hopper and



screw, is carried through the apparatus by shovels M. The trough may be headed or not.

13,232. **Willis, W. J. M., and Marshall, J. H.** June 7. *Drawings to Specification.*

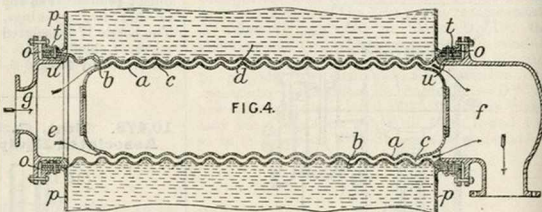
Gills for tubes.—The ribs on the tubes of an internal-combustion engine radiator are per-

forated and provided with scoops or projections to direct the air currents through the perforations. The perforations of successive ribs may be staggered, and those near the tubes may be without scoops.

14,076. Mackinder, J. H. June 18.

Straight-tube apparatus having internal baffles; plate apparatus.

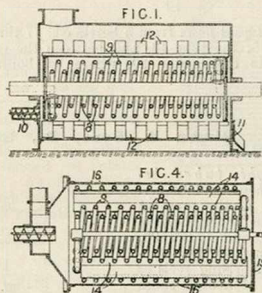
—In heating-apparatus of the type in which heating-fluid passes through the annulus formed between two screwed or corrugated tubes, one or more chambers are provided to serve as expansion and silencing chambers. When applied alone in the water space *d* of a steam-boiler or in conjunction with the usual heating-arrangements, the outer tube *b* is secured to the end plates *p* and contains the baffle *a*. Exhaust steam or the discharge from an internal-combustion engine enters at *g*, and passes into the expansion chamber *e*, through the annulus *c*, and into the expansion chamber *f*. In modifications, the interior of the baffle may form the second expansion chamber, or a



tube may convey the heating-fluid through the baffle to the first expansion chamber. A form of water-heater is described, in which the water is contained in the annulus formed by a third screwed or corrugated tube. Spaces *o* are arranged round the joints *t*, *u* of the tube ends to carry any leakage to the atmosphere. The apparatus may be used for superheating.

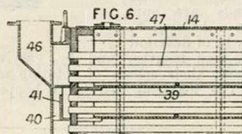
14,502. Otto, F. E., and Phonixwerk Ges. June 23.

Coil-tube apparatus. — In driers with rotary agitators consisting of coiled tubes, one within the other, to which steam &c. is admitted in parallel, the pitch of the coils is made to decrease towards the outlet end of the apparatus. In the form shown in Fig. 1, the material is agitated and heated by vanes 12 and the coils 8, 9, and is carried from the inlet 10 to the outlet 11. In the modification shown in Fig. 4, the drum is rotary and an additional coil or coils 16 is provided near its periphery from which vanes 14 project inwards; the material is discharged intermittently at the door 19.

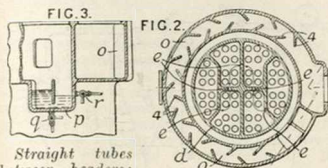


15,300. Kubierschky, K. July 2.

Straight tubes between headers. — A heat-exchanger for effecting partial condensation of oil vapours from a still and at the same time preheating the oil to be distilled consists of sets of tubes 47 arranged between partitioned headers 40. Baffles 39 direct the oil through a zigzag course around the tubes. Vertical plates 41 are fitted in the headers to cause the liquid formed by condensation to collect in the tubes 47 until, under the pressure of the vapours entering by the inlet 46, it flows over the plates 41 to the set of tubes next below.

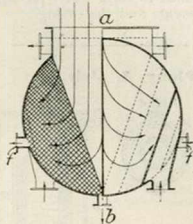


15,531. **Morison, D. B.** July 5. [Cog-nate Application, 29,706/13.]

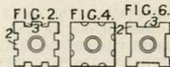


Straight tubes between headers; headers.—In feed-water-heaters of the kind comprising headers divided into two or more compartments and connected by tubes, the compartments in the headers are connected by small openings through which the air separated from the water passes from compartments of higher pressure to those of lower pressure and finally into a collecting-chamber. In the form shown, a header *c* with an inlet *i* and outlet *j* is connected by tubes *b* with a header *d* divided into compartments communicating with each other by small holes *e*. The compartment of lowest pressure is formed with an air-collecting chamber *k* provided with an outlet pipe *m*. The first compartment of the header may be connected directly with the pipe *m* by a pipe *n*. A form is also described in which the tubes *b* are placed horizontally and the header *b* slides in a packed joint in the casing of the apparatus, or is connected thereto by a flexible diaphragm. The heater may be surrounded by a chamber *o* furnished with baffles *f* for purifying the incoming steam and a collecting chamber *p*, Fig. 3, with outlets *q*, *r* for oil and water respectively. In the horizontal form, the separating-devices are removably arranged in a chamber on the top of the apparatus. The appliance is described as being especially applicable in connexion with the apparatus described in Specifications 3499/12, [Class 64 (i), Heating liquids &c.], and 15,413/13, [Class 110 (iii), Turbines &c.].

15,657.

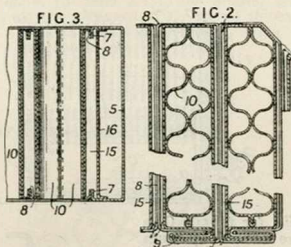


16,582. **Tyler, W. S.** July 19.



Gills for tubes.—In radiators having flat rectangular gills 2, the edges are formed with notches or indentations 3 to break up the plain or solid appearance of the front of the radiator. In the form shown in Fig. 2, the distance apart of the notches is made equal to the distance between adjoining rows of gills. Other forms of gills are shown in Figs. 4 and 6.

16,740. **Bowerbank, J. W.** July 21.



15,657. **Akt.-Ges. Brown, Boveri, et Cie.** March 28, [Convention date].

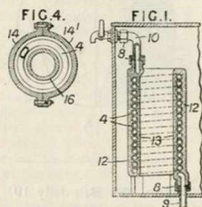
Straight tubes between headers.—Steam entering at *a* flows in an horizontal or nearly horizontal path through tubular cooling systems which are entirely or nearly separated from each other and which lie on both sides of the inflowing steam, the cooling-water passing from both sides towards the middle. Condensation water escapes at *b*, air being withdrawn from the connexions *f*.

(For Figure see next column.)

Plate apparatus.—The elements of a radiator for automobiles are formed from a continuous strip, which has edges 8 inturred on the same side and which is given a rectangular form, the ends of the strip being doubly seamed and soldered at the base 9. The water-passages 15 are formed by assembling elements with the edges 8 in contact and immersing them in the dipping-pan until the solder runs to the edge of the inturred portions 8. The space enclosed by the element is filled by strip 10 bent as shown. The end elements are soldered to the

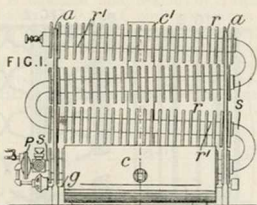
turned portions 7 of the casing 5, and plates 16 are provided to form water-passages between the end elements and the casing.

17,410. **Plony, J.** July 29.

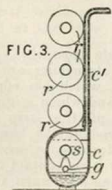


Coil-tube apparatus.—The coil 4 of a cooler for beer or other liquids is made of glass or other transparent vitreous material, and is provided with protecting covering layers 12, 13 of glass or other vitreous material so that the liquid can be examined while passing through the coil. The ends of the coil are threaded to receive unions 8 for connecting to the supply and delivery pipes 9, 10. The covering layers 12, 13 are preferably cast round the coil in a mould 14, 14' containing a cylindrical core 16. A number of supporting feet may be cast integral with the outer layer 12.

18,492. **Adamson, C. M., and Adams, A. L.** Aug. 14.



Gills for tubes.—Gills r are carried by rings r' encircling the tubes of a serpentine coil used as a radiator for rooms &c., those on the lowest length s straddling the burner g as shown in Fig. 3. The gills on the upper lengths alternately deflect the rising heated air in opposite directions.



19,159. **Gregory, H. S.** Feb. 23, 1914.

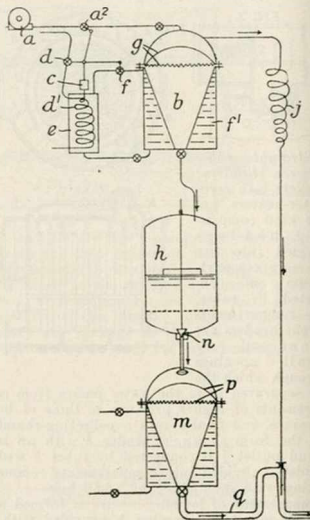


Plate apparatus.—Beer or other liquid to be sterilized is filtered by a serrated diaphragm g in a vessel b heated by a hot-water jacket f' . A cooler m is similarly constructed.

19,348. **Jackson, W. J. Mellersh-,** [Verhaaren & Borissowsky, H.] Aug. 26.

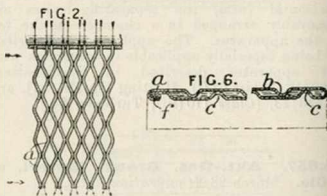
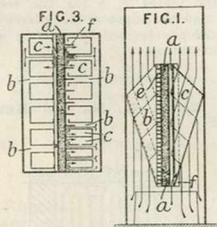


Plate apparatus.—The flat tubes a of a radiator have longitudinal ridges b, c pressed inwards from both sides alternately dividing the water-space into channels. Each tube, moreover, is corrugated transversely and arranged as shown in Fig. 2 so that the summits of the corrugations on adjacent tubes touch. Each tube may be made of a sheet-metal strip doubled and secured at the edge f , Fig. 6, by folding.

19,493. **Maybach, W.** Sept. 18, 1912.
[Convention date].

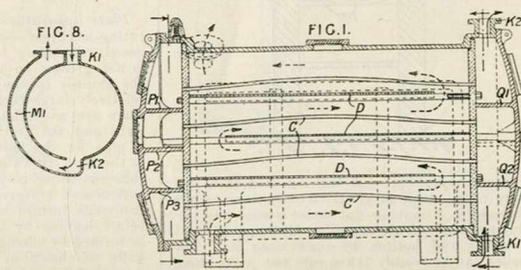
Plate apparatus. — Air &c. is caused to pass in close contact with a heated plate *a* by passing on its upward journey between cells *c* closed at their lower sides but open at their upper ends. Through access is only possible by traversing the passages *b* between the cells, and since these passages are closed at their upper ends the air is caused to pass around the inner edges and into the cells *c*. Ribs *f, e* are attached to the plate *a* to guide the air and facilitate heat transference.



19,970. **Watson, H. B., and Billetop, T. C.** Sept. 4.

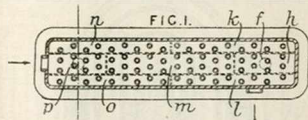
Straight tubes between headers; tubes with flared inlets; casings. — A heat-exchanger having slightly-bowed tubes *C*, as described in Specification 7023/11, in horizontal groups is provided with baffles *P1, P2, P3*, and a vertical partition in one header, and with baffles *Q1, Q2* in the other, so as to cause the fluid circulating through the tubes to make a double flow through each of the groups.

Horizontal partitions *D* guide the flow of the second fluid between the tube-groups. The ends of the tubes may be slightly flared, the coning extending partly into the tube-plate. As shown



in Fig. 8, the inlet *K1* to the interior of the tubes may be arranged at the top of the casing and a head-pipe *M1* fitted to the outlet *K2*; or a spring-loaded valve may be used.

21,308. **Knorr Brème Akt.-Ges.**
July 11, [Convention date].



U-tube apparatus. — In an apparatus for heating feed-water by passing it through U-tubes subjected to the heat of steam, the header is so divided by partitions that water entering at *f* into the compartment *h* passes by way of the tubes into two compartments *k, l*, and again through tubes to a single compartment *m*, and so on through the compartments *n, o* and exit compartment *p*.

21,470. **Harrison, H. C.** Sept. 23.

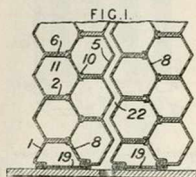


Plate apparatus. — Two adjacent series of horizontal air-tubes 11 are formed by suitably doubling sheets 1, 5 of metal in opposite directions and retaining the divisions 2, 6, formed by doubling, by a bent sheet 8 having projections 10 engaging with the divisions 2, 6. The units are completed by forming pockets on the

end of the plates 1, 8 for the reception of strips 19 and the edges of the plates 5. Water passages 22 are formed by spacing apart such units in mounting.

21,597. Lord, G. S., and Barlow, P.
Sept. 25.

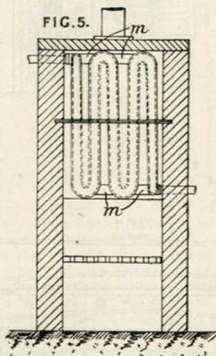


Plate apparatus.—A boiler heated in a furnace or by steam or electricity comprises, when assembled, a sinuous flat water space, the undulations of which are connected together at the top and bottom by connexions *m*. The boiler can be readily taken into two parts along a central joint or, in one form, by separating the two sides of the water space at its edges.

21,928. Fischer, J. Sept. 29.

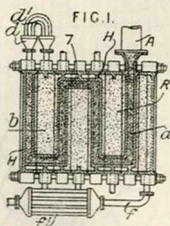


Plate apparatus.—A condenser in which vapours of substances of high boiling-points are fractionated is cooled by the vapours passing away from its condensation-space. The condenser, shown in plan, comprises hollow plates *H* of the construction described in Specification 13,225/99, [Class 32, Distilling &c.], together with frames *R* providing an enlarged cooling-space *b* and constructed with a transverse passage 7 connecting the condensation spaces *a*

formed between the hollow plates *H*. The vapours enter by an inlet *A* and pass in succession through the condensation space *a*, a cooler *d*, the cooling-space *b*, and then through a pipe *f* fitted with a cooler *d'* to the next condenser.

22,540. Akt.-Ges. der Maschinenfabriken Escher, Wyss, et Cie. Nov. 20, 1912. [Convention date]. Void. [Published under Section 91 of the Act.]

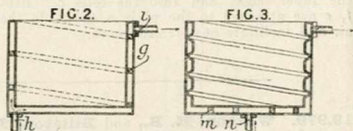
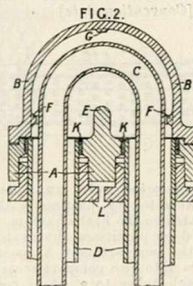


Plate apparatus.—An evaporator for refrigerating-machines consists of a double-walled vessel, the space between the walls of which is not greater in width than the thickness of the thinner of the two walls, so as to give a relatively large cooling-surface. In one form, there are no baffles or other parts between the walls and the refrigerating-medium enters by a pipe at the bottom and leaves by another at the top. In an alternative form, the refrigerating-medium may enter by a pipe *h* at the bottom and traverse a spiral path between the two walls formed by separate parts *g*, Fig. 2, before leaving by a pipe *i*, or the path may be formed by corrugations in the inner or outer walls, as shown in Fig. 3. A spiral guide *m* may also be fitted in the space between the walls at the bottom of the vessel, and the contact of the medium entering by a pipe *n* with the bottom plate prolonged thereby previous to its passage through the spiral outer channels.

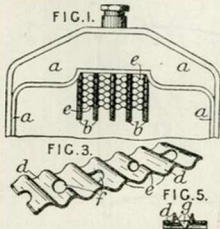
22,670. Rons, R. F., and Williams, H. R. Oct. 8.



Concentric straight-tube apparatus.—Relates

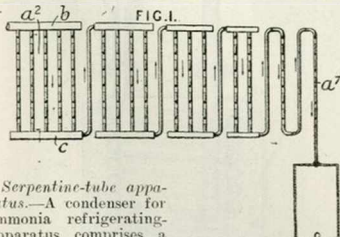
to condensers, evaporators, &c. of the type comprising concentric serpentine tubes, and consists in a construction of bend for the outer tubes. The outer tubes D are screwed or otherwise secured to blocks A, to which boxes B forming the bends are bolted. Projections F, G in the inside of the boxes B keep the inner tubes C in position, and baffles E are formed on the blocks A. The pipes D may be secured to the blocks A by means of collars K secured to the pipes and screwed into the blocks, the joints being made tight by glands L.

24,521. Shelley, R. T., and Shelley, Ltd., R. T. Oct. 29.



Gills for tubes.—In radiators of the gilled tube type, especially those adapted for use on motor-vehicles, the gills are made in strips or sheets of metal of waved or corrugated form and are secured together in such a manner as to form a succession of cells which may be circular, as shown in Fig. 1, or of any angular formation. The radiator tubes *b* are connected at the top and bottom to a header *a* and pass through holes *f* in the waved gill plates *d* having abutting troughs and crests *e*. The holes are arranged on the crests and in the hollows of the waves alternately, as shown in Fig. 3, and are formed by splitting the metal in directions at right-angles and punching the tongues *g*, Fig. 5, formed thereby up or down to act as bearing-surfaces for the tubes.

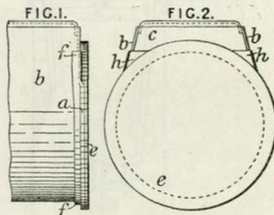
25,585. Dwyer, J. Dec. 30, 1912, [Convention date].



Serpentine-tube apparatus.—A condenser for ammonia refrigerating apparatus comprises a number of separate groups $a^2 \dots a^7$ of trombone or serpentine coils, each group having inlet and

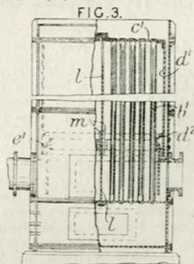
outlet headers *b, c*, the groups and headers being of gradually diminishing capacity towards the outlet group. The inlet group a^2 may consist of five coils, the next of four, and so on, the last two groups each consisting of a single coil as shown. The pipe forming the last group is of smaller cross-section than that of the preceding group. The invention may be applied to single-pipe or to double-pipe condensers.

25,782. Higgins, C. F., and Contrafio Condenser and Kinetic Air Pump Co. Nov. 11.



Casings.—A steam space is formed above the tubes of a condenser by attaching to each end of the curved body *b* an angle-formation, the leaf *f* of which extends around and is riveted to the body *b*, the face *a* bearing the tube-plate *e* and also being riveted to the plate *e* forming the end plate of the steam-space chamber. In a modification, the part *h* and leaf *f* are extended to form the end plate, and in a further development, the leaf *f* is eccentric to the ring *a*, so that the body *b* lies close up to the tubes at the bottom.

26,970. Beard, G. F. H., Scott, J. W., and Dempster, R. & J. Nov. 24.



Tube-plates.—In a vertical condenser of the type in which the upper tube-plate can move with the expansion and contraction of the water-tubes, the upper tube-plate *c^1* is water-

sealed and the upper water compartment is dispensed with, the water rising up the tubes *b*¹ and overflowing into the liquid-seal *e*¹. The liquid-seal may be at the top of the condenser, but the arrangement shown provides additional cooling surface since the overflowing water

cools the extension *d*¹ of the tube-plate. A hood *d*² deflects condensed liquor from the seal, and the part of the hood in the neighbourhood of the central baffle *l* of the condenser is provided with strips *m* engaging the baffle to prevent the passage of gas.

27,208. Todt, H. Nov. 26.

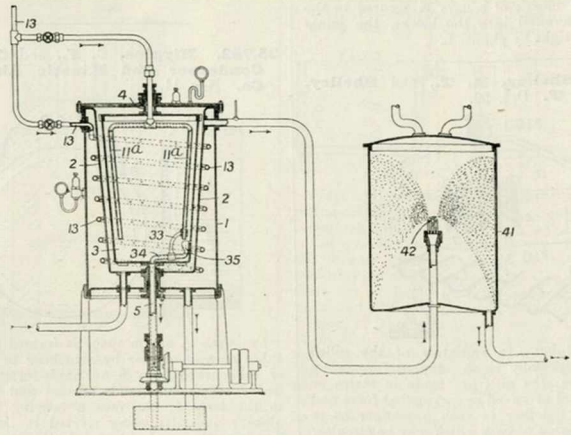
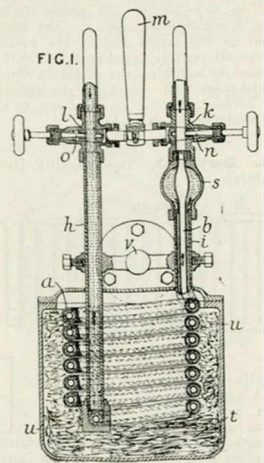


Plate apparatus.—In pasteurizing-apparatus in which the milk &c. flows between a rotary drum 3 and a jacketed vessel 2, steam &c. is supplied to the drum 3 and jacket 1 through pipes 11^a and a coil 13 respectively, which are performed adjacent to the heating-surfaces. The drum 3 rotates upon tubular axes 4, 5 and can be adjusted to vary its position in the vessel 3. Condensed water is taken up by a scoop 35 upon a pipe 34 carried by an arm 33 from a pipe 11^a, and passes through the axis 5.

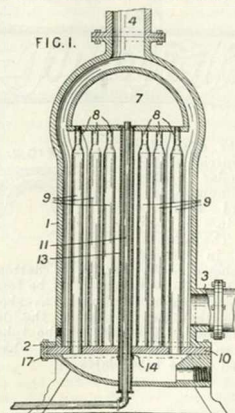
27,499.

27,499. Adams, W. Nov. 29.

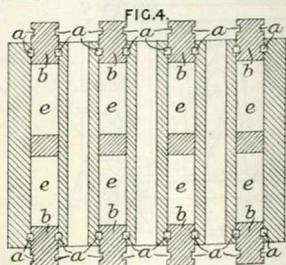
Coil-tube apparatus; jacketed straight-tube apparatus.—Apparatus for heating or cooling liquids consists of a coiled or sinuous tube *a* having vertical branches *h*, *i*. The inner tube *b* extends through the branch *i* and through the wall of the tube *a* beyond the other branch *h*. The upper end of the branch *i* is closed by a globular part *s* having a lateral outlet for the heated liquid. The upper ends of the inner pipe *b* and of the branch *h* are provided with stop-cocks *k*, *l* operated simultaneously by one handle *m*. Each of the stop-cocks is provided with a regulating-valve *n*, *o*. The tubes are surrounded by non-conducting material *t* enclosed in a casing *u*. The apparatus is suitable for domestic purposes and is carried by a bracket *v*.



(For Figure see next column.)

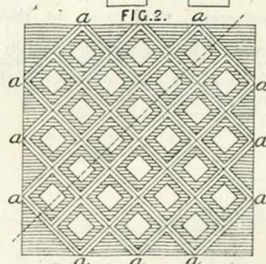
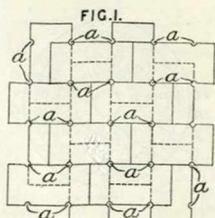
27,909. Guimont, J. W. Dec. 4.


Straight tubes between headers.—An inner header 7 supplied with steam by a central tube 11 is of substantially the same diameter as the main body 1, a bulbous enlargement being provided to accommodate it. Heating-tubes 9 extend from the header 7 to the base-plate 10 and have reduced upper ends 8. An outer insulating-pipe 13 surrounds the steam-pipe 11 to prevent cooling of the steam before reaching the header 7. Draining-means for the pipe 13 is provided at 14. The whole of the heating-surface can be withdrawn by removing the holding-down bolts connecting the outer casing with the flange 2, the tube-plate 10, and the exhaust header flange 17. A water inlet 3 and outlet 4 are provided as shown.

28,515. Clark, E. V., and Etchells, H. Dec. 10.


Preventing leakage between tubes.—In appa-

ratus in which gases flow through adjacent tubes or ducts at a high temperature, for example a recuperator, leakage of gas from a joint of one tube to a joint of another tube

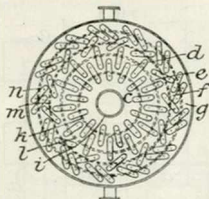


is prevented by means of a barrier of finely divided refractory material in the path that the gas would traverse in passing between the two joints. In the recuperator shown in plan in Fig. 1, tubes of square section are arranged in layers, those of adjacent layers being at right-angles, and channels *a* situated intermediately between the tube joints and registering through the structure are formed by registering grooves in the tube walls and are filled with sand or the like. In a modification, Fig. 2, the grooves constitute diagonal channels *a* throughout the structure and at the same time peripheral channels around each tube. Fig. 4 shows a horizontal section through a furnace for heating gases, in which the gases to be heated pass through banks of tubes which alternate with heating-fues *e*. The walls of the fues *e* are formed in part by brick-work *b* and the channels *a*, filled with sand &c., constitute barriers between the butt joints of the tubes and the joints between the brick-work *b* and the tubes.

28,541. Knorr - Bremse Akt. - Ges. Sept. 19, [Convention date].

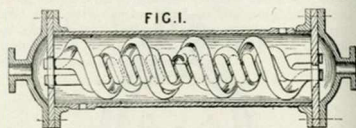
U-tube apparatus.—In a feedwater-heater

comprising a steam-chamber closed at one end by a water-chamber, partitions *i, k, l, m, n* divide the water-chamber into concentric spaces *e, d, e, f, g* connected in series by U-tubes in



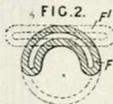
the steam-space, which may be similarly divided by partitions. The orifices of the several water-tubes are arranged radially and obliquely for the purpose of utilizing space to the greatest extent. The cross-section of the heater may be varied as desired.

29,061. Muers, P. Dec. 16.



Coil-like apparatus: tubes of special section.

—A tubular heat-exchanging apparatus is formed of tubes arranged in co-axial helices. The tubes are crescentic in cross-section, as shown at *F*, Fig. 2, or flattened, as shown at *F'*. The outer coils may be formed of greater pitch than the inner, as shown in Fig. 1, so that the lengths of the different tubes are equal. The ends of the tubes may be round to take nuts by means of which they are secured to the tube plates.



A.D. 1914.

191. Brierley, F. J., and Williams, A. S. Jan. 3.

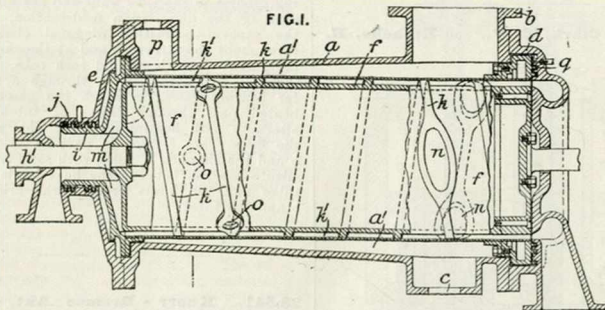


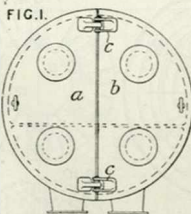
Plate apparatus.—A condenser for steam &c. | *b* for the steam and an outlet *c* for the condensed water, and a rotary double-walled drum

f between the walls of which the cooling-fluid is forced by vanes m on the drum. A partition k may be arranged in the space k^1 to cause the cooling water to take a spiral path. The drum is perforated at n to allow steam to pass into contact with the inner wall, and at o to allow the condensed water to pass out. The shaft h^1 is carried by a rotating trunnion i between which and the end wall e of the casing a a labyrinth gland j is arranged. A similar gland q is arranged between the drum and the other end d of the casing, and both glands are filled with fresh water under pressure to prevent access of the cooling fluid to the steam space a^1 . A connexion p to a dry-air pump is provided in the casing.

367. Bateman, J. T. Jan. 6. *Drawings to Specification.*

Straight tubes between headers.—Tubular apparatus for heating liquid by the steam &c. escaping from a distilling or deodorizing apparatus is so arranged that the liquid passes downwards through the tubes of the first heater and upwards through the tubes of the second. The liquid is evenly distributed between the tubes by means of a perforated plate in the inlet chamber.

434. Akt.-Ges. Brown, Boveri, et Cie. Jan. 20, 1913, [Convention date]. [Addition to 12,349/11.]



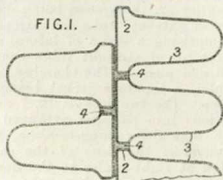
Headers.—The divided end doors a , b of headers in condensers as described in the parent Specification are hinged to one another as at c , being also connected to the header casing by bolts &c. in the usual way. After removing the bolts &c. of one half, that part may be swung back for inspection of the interior, being supported by the half remaining in position.

2570. Robinson, P., [trading as Morton & Co., R.]. Jan. 31.

Tubes of special section.—Relates to tubular apparatus of the kind described in Specification 23,985/02, in which rows of D-shaped tubes

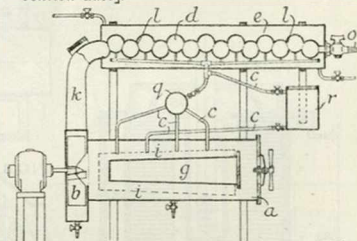
are soldered together in staggered arrangement back to back, and consists in forming each tube with a base 2 extending beyond the inclined sides 3 of the tube. Where the sides meet the

FIG. 1.



base, they are curved outwards, so that when the tubes are assembled with narrow seams of solder 4 between the bases, the bottom of each recess between the tubes is semicircular, as shown.

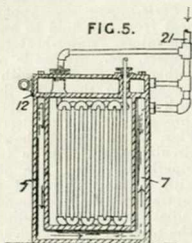
2950. Calcar, R. P. van, Ellerman, J., and Martijn, J. H. Feb. 26, 1913, [Convention date].



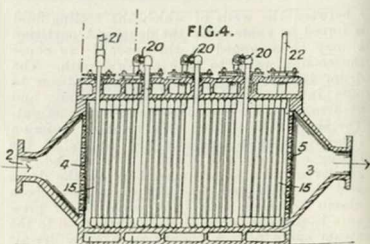
Tubes of special section.—A mixture of air and the vapour of a volatile liquid such as ether &c. is led into a water-cooled pipe d made of a number of globular parts joined together so as to form baffles l on which the vapour impinges and is condensed.

3331. MacCamy, H. E. Feb. 9.

Serpentine-tube apparatus.—Consists in a jacketed air-cooling chamber, for use in connexion with single or multi-stage air-compressors, having air inlet and outlet connexions 2, 3 and cooling-pipes 15 arranged to form rows across the chamber, in which a perforated partition 4 is disposed between the inlet connexion and the cooling-pipes so as to break



up and distribute the flowing column of air. In the form shown, a similar perforated partition 5 is disposed between the cooling-pipes and the outlet connexion. The cooling-pipes 15 form a continuous pipe system having an inlet 21 and an outlet 22, the system being divided into groups with external tube connexions 20, each group comprising a series of lateral serpentine tubes built up of straight tubes connected by U-shaped end pieces. The chamber is jacketed on all sides, a separate jacket being provided for the top. The two jackets 12, 7 are divided by partitions into passages arranged and connected so that the cooling-medium, preferably water, traverses the sides of the chamber in a direction at right-angles to the flow of compressed air, and passes from one passage to another in the same direction as the air flow. The jackets and the cooling-pipe system 15 may,



as shown, be supplied with cooling-water from the same source.

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

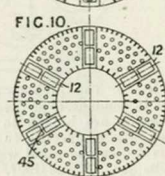
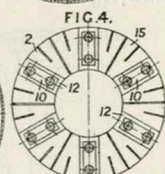
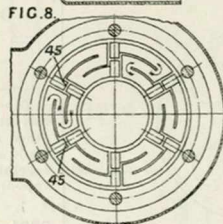
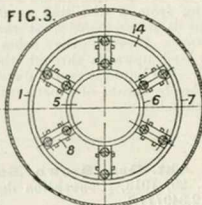
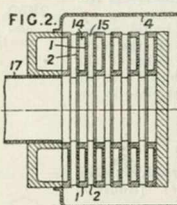
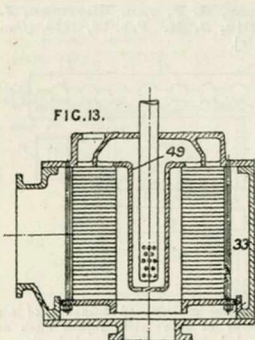


Plate apparatus.—Apparatus for transferring heat from one fluid to another, such as steam-generators, water-heaters, evaporators, condensers, &c., are made of plates clamped together and provided with flanges &c. to form passages for the fluid, the arrangement being such that the fluid that loses heat passes through passages of decreasing cross-section. Figs. 2, 3, and 4 show an arrangement of circular plates suitable for a steam-generator, superheater, &c. The plates 1 are provided with a flange 7 round the circumference, a central opening 5 surrounded by a flange 6 and radial openings 8 extending between the flanges. The plates 2 are provided with radial openings 10 corresponding to the openings 8 in the plates 1 and surrounded by flanges 12. Baffles and

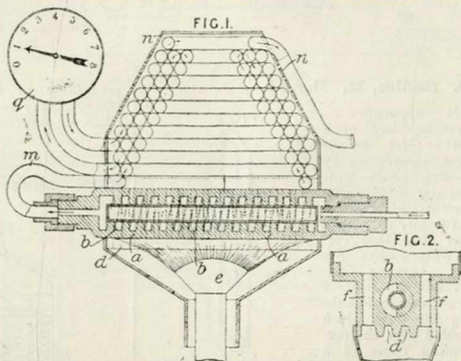
lugs forming distance-pieces are formed on the surface of the plates. The whole is surrounded by a casing 4. The furnace gases enter the casing 4, pass through the spaces 15 between the flanges 12 on the plates 2, and pass out by a central flue 17. The water spaces 14 are enclosed between the plates and the flanges 6, 7 on the plates 1, and communicate by the

openings 8, 10 in the plates. Modified forms of plate suitable for condensers are also described. Figs. 8 and 10 show a pair of such plates in which the openings surrounded by the flanges 12 are divided by partitions 45 forming flow and return passages for the cooling-water, baffles being provided as shown. The plates may be sloped to allow water of condensation to

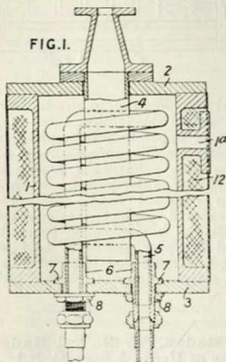
drain off, and may be corrugated. Fig. 13 shows a condenser built up of such plates, the steam entering through a casing 33, in which water is separated, passing between the plates, and striking on a corrugated central chamber 49 through which the cooling-water flows before passing between the plates.

5041. **Levy, F.** Oct. 28, 1913, [Convention date].

Coil-tube apparatus.
— For vaporizing and heating liquefied gas, such as carbonic acid, the gas is subjected to the direct action of a burner *e*, further heated, as for instance in the coil *m*, passed through an expander *q*, and returned to the heating-coil. The gasifier *a* is provided with the helical passage *b* with transverse openings *f* and with spreaders *d* for the heating-flame. The heating-coil is contained in the casing *n*, formed as shown, in order to concentrate the heat from the burner *e*.



5308. **Smith, L. E.** March 2.



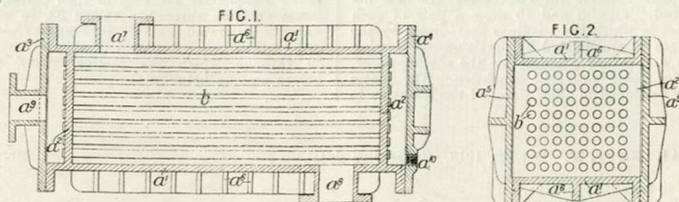
Coil-tube apparatus.—The liquid-fuel supply to boiler and other furnace burners is heated in a container 1 closed by cover-plates 2, 3, respectively carrying an inlet tube 4 extending

nearly the full length of the container, and one or more steam or other heating coils 5 encircling the tube. A single coil is shown, but in a modification, two concentric coils in series are employed. Coupling-pieces 6 with collars 7 and nuts 8 are provided on the ends of the coil 5. The container has a fuel-outlet 1^a, and is covered with a non-conducting jacket 12.

5749. **Berry, E. A.** March 6.

Straight tubes between connecting-boxes.—In straight-tube apparatus, the casing comprises one or more parts jointed to one other member of the casing only and removable for giving access to the outside of the tubes. The casing has top and bottom plates *a*¹ connected integrally by tube-plates *a*² supporting the ends of the steam-tubes *b*. The plates *a*¹ are provided with flanges for attachment by studs or bolts to the cover-plates *a*³, *a*⁴ and to the side plates *a*⁵ and may have strengthening-ribs *a*⁶. Water enters by the connexion *a*⁷ and is withdrawn through the connexion *a*⁸. The water of condensation of the steam entering through the inlet *a*⁹ is removed through a port *a*¹⁰.

(For Figures see next page.)

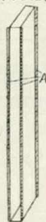


5895. **Sadler, H.** March 9.

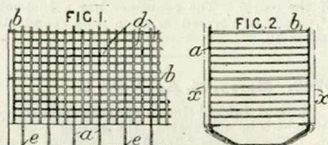
Plate apparatus.—

The cooling-block of a radiator for motor-vehicles is made up by assembling 'short wide rectangular tubes, forming horizontal passages for air, in such a manner that thin vertical water-ways are formed between adjacent tubes. Fig. 2 shows such a single tube having flanges A which are folded over the corresponding edges of a plain adjacent tube, which would be suitably spaced from the first tube so as to form the water space. Tubes with rounded ends at top and bottom may be employed.

FIG. 2.



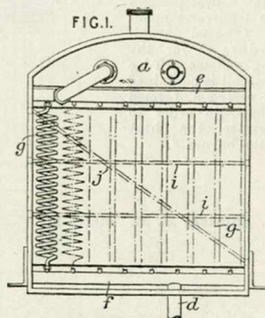
6974. **Royce, F. H., and Rolls-Royce, Ltd.** March 19.



Honeycomb and like tube apparatus.—In motor-car radiators having a series of air-tubes *d* spaced by wires secured to the tubes and to the outer frame, some of the wires *a*, *b* are carried round the edges of the frame, which is provided with grooves *e* to receive the wires, and are secured to the frame by soldering &c. so as to serve as bracing-members for the frame. The number of air-tubes in each group thus formed may be varied, and when other than rectangular air-tubes are used the wires may be arranged diagonally. The wires are

preferably in tension, and metal covering-pieces *x* may be secured over the wires at the edges of the frame.

8235. **Buddery, P. J.** April 1.

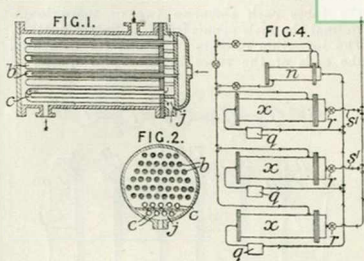


Coil-tube apparatus.—In a radiator for motor-vehicles, detachable coiled tubes *g* are connected to an upper transverse pipe *e* communicating with the filling-tank *a*, and to a lower transverse pipe *f* having a branch *d* leading to the cylinder water-jacket. Horizontal bars *i* and a diagonal bar *j* are provided to strengthen and protect the tubes. One or more radiators having coiled tubes detachably connected to upper and lower transverse pipes may be connected either in parallel or in series with the main radiator of a motor-vehicle.

8910. **Haden, W. N., and Haden, C. I.,** [trading as Haden & Sons, G. N.] April 8.

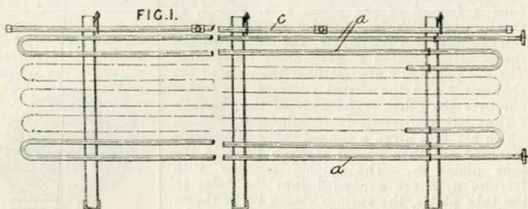
Field-tube apparatus.—To utilize the heat of the condense water from a steam calorifier of the kind in which the last set of heating-

tubes is cut off from the steam supply and is adapted to receive condense water and steam which are collected in and discharged from a separate chamber, the last set of tubes consist of single, for example U-shaped, tubes. The preliminary heating-chamber may be formed as part of or separate from the body of the calorifier. The heating-tubes *b*, Figs. 1 and 2, are Field tubes, and the last set of tubes *c* are U-tubes, which discharge into a pocket *j* in the cover. The pocket is connected to a steam-trap. Fig. 4 shows a battery of calorifiers *x* provided with steam-traps *q* and with a single preliminary heater *n*. Some or all of the calorifiers may be cut out of operation by valves *r* in the steam-supply pipes *s*^t.



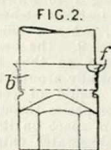
9101. Lightfoot, T. B. April 9.

Serpentine-tube apparatus.—The straight portions *a* of the tube through which the steam passes are given a slight downward inclination in the direction of flow so as to retain at the lowest parts some condensate over which the uncondensed gas must pass. The tube is cooled by spray from a distributing-tube *c*.



10,002. Zimmermann, H. April 22.

Honeycomb and like tube apparatus.—A ferrule at the end of each pipe fits closely around the pipe and is enlarged to an hexagonal or other form suitable for assembling with similar ferrules. The closely-fitting part *b* of the ferrule shown in FIG. 2 is formed with a flared top *f* to receive the molten metal securing the ferrule.



12,877. Pease, E. L. May 26. Drawings to Specification.

Gills for tubes.—The heat-absorbing walls of apparatus for transferring and utilizing the heat of combustion are composed of gilded metal tubes embedded in or packed externally with fire-brick or other refractory material, which is sandwiched between the gill plates. The surface of the refractory material exposed to the fire or heat may be plain or ridged, and the gill plates may or may not extend to the surface.

On the side away from the heated surface, the tubes may be exposed, or the embedding or packing material may surround them entirely. The tubes may be variously arranged, and single tubes may be similarly packed or embedded.

13,153. Weidmann, C. June 2, 1913, [Convention date].

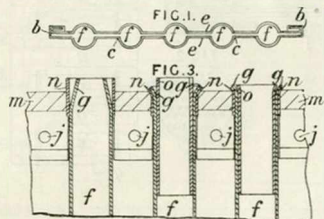
Tubes of special section.—Corrugated heating-pipes are made with a smooth surface at the top and bottom by corrugating a sheet-metal strip on opposite sides of a smooth central portion *c*, then bending the strip into pipe form, and finally welding together the free edges *d* which are left smooth.



13,493. Foy, F., and Mather, C., [trading as Reliance Manufacturing Co.]. June 3.

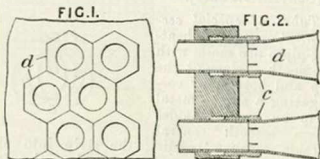
Plate apparatus.—Relates to radiators for motor-driven vehicles, water-coolers, oil-heaters, continuous heaters, &c. of the kind in which

the tubes each comprise two or more longitudinal channels connected by a flatter portion. The invention consists in means for attaching the ends of the tubes to tube plates, and in



the general construction of the device. Each tube is formed of two pieces *b, c*, Fig. 1, of sheet metal with longitudinal channels *f* and intermediate flat portions *e*, the sides *b* of the sheets being secured to each other by folding. The flat portions *e* are slit near the ends of the channels *f* and the slitted portions are folded one over the other. The ends of the channels *f* thus left projecting form spigots *g*, Fig. 3, which are first given a conical shape in suitable dies and are then passed through holes in the tube plates *m*. The spigots together with ferrules *n, o* are expanded into the holes in the tube plates, the various stages being shown in Fig. 3. One of both of the ferrules may be dispensed with. A portion of the folded part of the flat portion *e* is bent at a right-angle to form an abutment against the tube plate *m*. Corrugated, fluted, plain, or other plates are secured between each pair of tubes, and the various joints are made tight by dipping or immersing the device in molten solder. Holes *j* are made in the folded parts and in adjacent parts to promote the lodgment of solder.

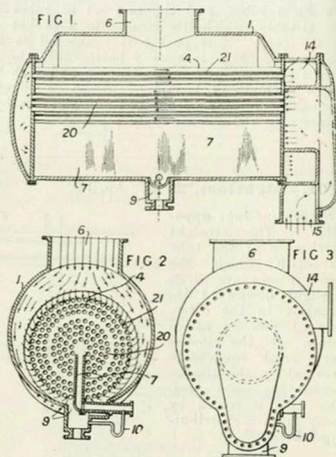
14,149. Morison, D. B. June 12.



Tubes with nozzles and the like. — The ends of the tubes of a steam condenser are provided with funnels, which are inserted in the ferrules securing the tubes to the tube-plates. The ends of the funnels *d* inserted in the tube ferrules *c* are slotted and sprung into the ferrules. The flared ends of each funnel in the construction shown is of hexagonal form and is in contact with the edges of the adjacent funnels.

The flared ends of the funnels may be circular or of any other convenient shape.

14,793. Ehrhart, R. N. July 2, 1913, [Concession date].

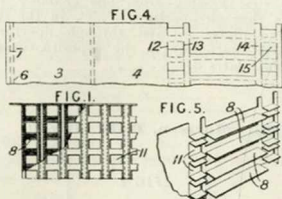


Straight tubes between headers or connecting-boxes. — The condenser is horizontally disposed and comprises the nest of tubes 4 within the casing 1 to which the fluid to be condensed, for instance steam, is admitted by the inlet 6 and, when condensed, is discharged by the outlet 9. The nest of tubes is situated eccentrically so that the steam is admitted substantially around the entire perimeter and that any liquid of condensation falling from the tubes passes through uncondensed steam in the steam space on its way to the outlet 9. Condensing-water entering the chamber 15 passes through the central tubes 20 and returns by the outer rings of tubes 21 to the annular chamber, which opens to the discharge port 14. Air or non-condensable fluid passes away by the upwardly extending chamber 7 which extends the length of the condenser, any liquid which may be entrapped there in passing away by the pipe 10.

15,562. Boischevalier, H. de, and Chevrolet, L. June 29.

Gills for tubes. — A gill construction for the spaces between the tubes of radiators for motor-vehicles &c. is made from a single sheet of metal which is stamped and folded to provide openings 11, Fig. 1, at the front and back

corresponding to the air passages formed by horizontal walls 8, which extend across the spaces between the tubes. The openings 11 and walls 8 are formed by slitting the sheet

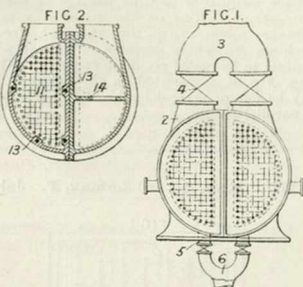


and then bending back the metal, as shown in Fig. 5. A tube and an adjoining set of gills may be formed from a single blank as shown in Fig. 4. The edge 7 of the part 3 is folded on the lines 6, and the part 3 folded on the part 4, thus forming the tube. The remaining part of the blank, having been stamped and bent as shown in Fig. 5, is folded successively about the lines 12, 13, 14, 15 so as to bring the openings 11 at the front and back and the walls 8 at right-angles to the sides of the tube. The various elements so constructed are secured together by dipping in a solder bath.

16,219. Mensforth, H. July 7.

Straight tubes between headers; casings.—To allow a part of a condenser to be cut out for cleaning and repairing operations without placing the whole condenser out of service, the condenser is made in two independent semi-cylindrical parts placed with their plane faces in juxtaposition. The inlet and outlet pipes 2, 5, Fig. 1, of the two parts of a condenser converge into common inlet and outlet pipes 3, 6, shut-off valves 4, 5 being provided in the separate pipes. The plane faces may be stayed

by sagging-plates 11, Fig. 2, secured by bolts passing through lugs 13 on the interior of the

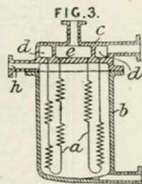


shells, or the shells may be provided with horizontal webs 14.

16,505. Tannenber, A. July 11, 1913. [Convention date]. Void. [Published under Section 91 of the Act.]

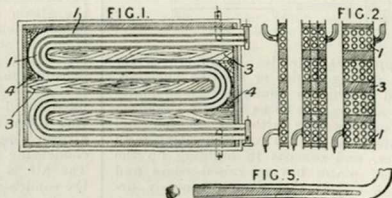
Coil-tube apparatus.

U-tubes *a*, with helical windings through which is passed oil or liquid fuel to be heated, are mounted with their ends fixed in the cover *c* of a vessel *b* through which steam is passed. The inlet ends of the tubes are arranged in a circle in a central chamber *e* of the cover, and the outlet ends are arranged in a concentric circle in an annular chamber *d*. The inlet *h* for the steam is formed in the side of the cover.



16,746. Semmler, C., and Wärme-Vertwertungs Ges. July 14.

Serpentine-tube apparatus.—In heat-exchanging apparatus wherein the media do not mix, one medium flowing through a sinuous tube while the other flows through a channel formed by partitions in a casing enclosing the tube, smooth tubes 1 are sinuously bent in one plane and arranged equidistant from each other to form a wall-like group, while the other medium flows in a parallel current of practically uniform cross-



section through the passages formed by the walls of the casing and the guides 3. Where

the direction of the tubes is reversed, guide-pieces 4 are also provided to form for the outside medium a parallel passage of constant cross-section. Ribs on the tubes may act as distance-pieces. In the case of freezing machines &c. where decrease of volume of the medium to be cooled occurs, a conical or tapered plug, Fig. 5, is inserted in the outlet. There may be one or several banks of tubes arranged in parallel planes.

17,207. **Kay, A., and Lomax, F.** July 21.

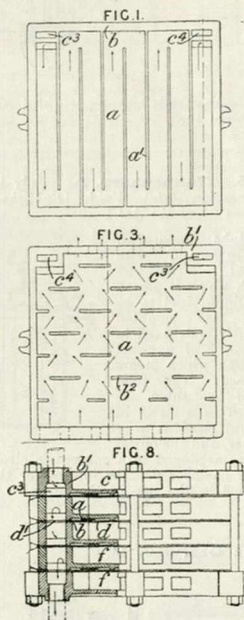
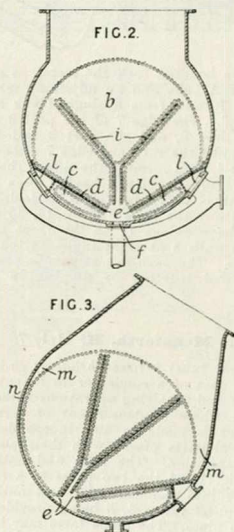


Plate apparatus.—Relates to apparatus for heating or cooling liquids or for like purposes, of the kind in which a number of metal plates are placed side by side so as to form chambers or cells communicating with one another and intermediate passages not communicating with one another, and consists in building up the apparatus of plates having raised edges and apertures in adjacent corners alternately arranged with flat plates having apertures in one corner. In a gas-heated water-heater, the plates *a* have raised edges *b*, *b'*, which form respectively the sides of water-chambers *c* and of

flue-passages *f*. Ribs *a'*, Fig. 1, forming zigzag passages for the water are provided on one side of a plate, and baffles *b'*, Fig. 3, on the other side: Water flows through the chambers in series, passing from one chamber to the other through apertures *c'*, *c'*, in the corners of the plates *a*, and through apertures *d'* formed alternately in the opposite corners of the flat plates *d*.

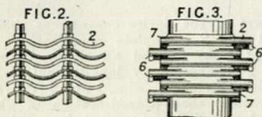
18,036. **Morison, D. B.** July 30.



Straight tubes between headers.—In a condenser having an air-receiving or outlet chamber formed at its base by one or more transverse partitions, as described in Specification 7321/09, the steam admission space between the condenser shell and the tubes is carried down from the steam inlet to the junctions of the transverse plates with the shell. The condensing-chamber *b*, Fig. 2, is separated from the air-receiving chamber *c* by a V-shaped partition *d* formed with a central outlet aperture *c* for the air and condensed steam. The air-receiving chamber may contain tubes for condensing vapour and for cooling the air. The air is withdrawn through outlets *l*, and the condensate is discharged through the branch *f*. To equalize the lengths of the paths of the steam through the condensing-chamber, the chamber may be divided by plates *i* to form V-shaped compartments, the central compart-

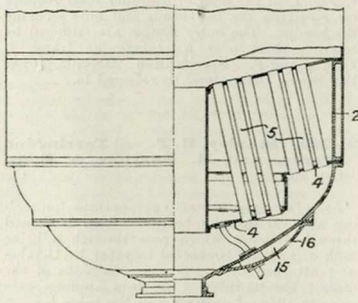
ment being shortened, as shown. In a condenser having the steam inlet at the side, the steam-admission space *m*, Fig. 3, at one side terminates at a point *n* at such a distance around the shell that the distances between the terminations of the admission space *m* and the outlet *c* are equal. In a condenser having each tube-plate formed in two pieces, the space between the nests of tubes is closed by a transverse partition.

18,768. Tyler, W. S., and Hatfield, C. E., [trading as Coventry Motor Fittings Co.]. Aug. 18.



Gills for tubes.—In radiators of the gilled tube type, such as are used on motor-vehicles, either the edges of certain of the gills are set back from the face of the radiator formed by the edges of the remaining gills, or all the gills are arranged with their faces flush with one another and some of them are left with raw or unfinished edges. In the preferred construction, the gills 2 consist of corrugated copper strips running across the whole width of the radiator. One edge 6 of each strip is finished by being turned back on itself, while the other edge 7 is left unfinished. Finished and unfinished edges are arranged alternately and in staggered order, as shown. The tubes may be of oval section with sharp front and rear edges. The unfinished edges of the gills may be notched.

19,567. Fawcett, Preston, & Co., and Lang, A. M. Sept. 9.



Tube-plates.—In an evaporator having a

heating-chamber containing tubes extending between upper and lower downwardly inclined tube-plates, the tubes are inclined so as to enter the tube-plates at right-angles, and the lower tube-plate is formed in two or more stepped parts. By forming the lower tube-plate 4 of the heating-chamber 2 in steps as shown, the lower ends of the inner set of tubes 5 come close to the bottom of the evaporator, thus improving the circulation at that part. Steam may be introduced into a jacket 15 formed by an annular concave plate 16 secured to the bottom of the evaporator.

20,017. Munters, A. J. E. Sept. 24, 1913, [Convention date].

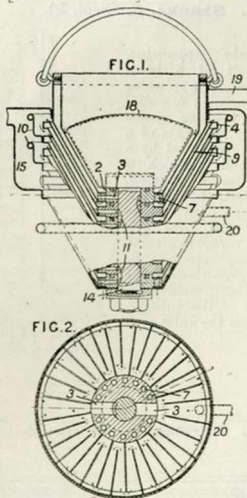


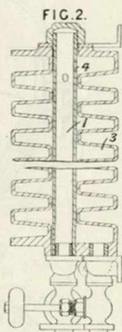
Plate apparatus.—Relates to apparatus comprising a number of hollow elements mounted on a central shaft and so arranged one above the other as to leave spaces between the elements, the elements being in communication with one another through passages in the shaft and the spaces between the elements being in communication with one another through other passages. The spaces between the elements are placed in communication with one another at their outer ends by parts projecting from the elements. The hollow conical elements 4 are secured to rings 2 on a central shaft 14. The elements communicate with one another through radial holes 3 in the rings and channels 11 arranged alternately on opposite sides of the shaft. The spaces 9 between the elements communicate with one another at their inner edges through

vertical holes 7 in alternate rings, and at their outer edges through basins 10 formed by plates on the upper ends of the elements. The fluid to be cooled or heated is introduced over the float gauge or fixed distributor 18 inside the top element. The fluid flows downwardly through each of the spaces between the elements in turn, and escapes through the vertical holes in the lowest ring. The heating or cooling fluid is conducted through a pipe 20 to the lowest element and flows upwardly through the elements to the outlet 19. Baffles in the lowest element compel the fluid to take a zigzag path through the element. A casing 15 open to the atmosphere is provided around the top of the elements.

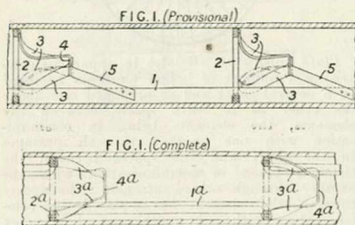
20,022. Shanks, J. Sept. 22.

Coil-tube apparatus.

—A unit of a heat-exchanger, applicable particularly as a radiator for heating apartments &c., consists of a tube 1 surrounded by a hollow coil 3 which is formed as a casting. The steam, hot water, or other fluid passes through the tube and coil in turn, apertures 4 opening into one or more convolutions of the coil being provided in the end of the tube remote from the inlet connexion.

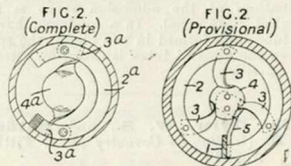


20,534. Barclay, A. W. Oct. 5.



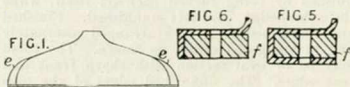
Straight-tube apparatus having internal baffles.—A heat-diffusion device for insertion in smoke or fire tubes of steam-generators or tubes of tubular air-heaters of the kind which is adapted to divert the gaseous fluid passing through the tubes from the walls of the tubes towards the centre and from the centre of the

tubes towards the walls consists of a series of interconnected annular or partly annular baffles and disks adapted to be inserted into or removed from each tube as a complete unit.



One form of the device consists, as shown in Figs. 1 and 2 (Complete Specification), of a series of disks 4^e and annuli or incomplete annuli 2^a connected by longitudinal strips 1^a and twisted strips 3^a. Figs. 1 and 2 (Provisional Specification) show a modification in which a series of annuli 2 are connected to disks 4 by twisted strips 3. Slots in the annuli 2 engage with slots in the longitudinal strip 1. Strips 5 connecting the disks 4 with the strip 1 prevent angular movement of the baffles.

20,991. Foy, F., and Mather, C., [trading as Reliance Manufacturing Co.], Oct. 15. [Cognate Application, 5653/15.]



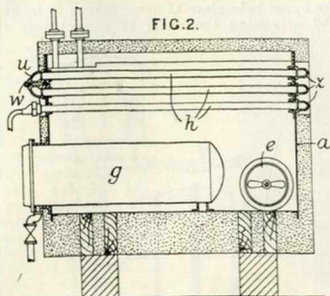
Headers.—A detachable header for motor-car radiators is made of sheet metal stamped into shape to form the required cavities and the inside or outside flanges for the attachment of the tube-plate and side panels. Ridges *e*, Fig. 1, at the ends of a header form recesses for receiving the bolt heads and nuts securing the header. The outer flanges are stiffened by bending them over a rectangular frame *f*, Figs. 5 and 6. Specification 20,853/02, [Class 123, Steam Generators], is referred to.

21,249. Stanley, H. F., and Farrington Works, and H. Pontifex & Sons. Oct. 20.

Loop-tube apparatus.—In apparatus for cooling and carbonating beer, the beer is passed through tubes *h* which pass through a brine tank *a*, and are connected together by U-tubes *u*, *z* attached by screws *v* to the walls of the tank. The U-tubes *z* fit into stuffing-boxes so as to allow of expansion of the tubes *h*.

(For Figure see next page.)

21,249.



21,463. **Foy, F., and Mather, C.,** [trading as Reliance Manufacturing Co.]. Oct. 24.

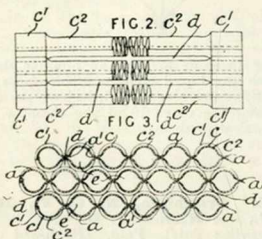
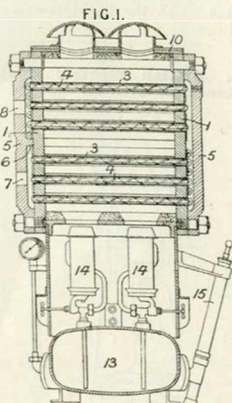


Plate apparatus.—Relates to radiators built up of corrugated sheet metal and of the kind in which each sheet has corrugations of different form at the edges from that of the central parts, so that the edges of adjoining sheets can be soldered together, leaving channels between the central parts. The face of each sheet is formed with a series of ridges or surfaces a' disposed approximately in one plane from edge to edge, and the back of the sheet is formed with a series of elevations c, c' of circular or other curvature from edge to edge and of greater radius at the edges c' than in the central parts c . Sheets so constructed are assembled face to face and back to back, as shown, forming tubes e with intermediate channels d . A single sheet may be folded upon itself to form one element of the radiator. Specifications 26,795 / 03, 25,242 / 05, and 25,243 / 05, [Class 99, Pipes &c.], are referred to.

21,834. **Thompson, H. A., Stroughair, J. W. H., and Smith, L. E.** Oct. 31.

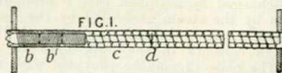
Straight-tube apparatus having internal

baffles.—Liquid fuel for the burners of steam-boiler and other furnaces is heated in tubes enclosed in a casing 10, which is heated by one or more burners 14. The tubes 3 are mounted



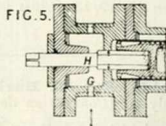
in plates 1, and their ends are enclosed by covers 5, partitions 6 being provided to ensure the flow of the oil through the tubes in a sinuous path from the inlet 7 to the outlet 8. The tubes may be fitted with spiral or other retarders 4; as shown, each retarder consists of a rod provided with a spiral projection, which reduces the volume, and restricts the flow, of the liquid in the tube.

22,636. **Day, C., Farmer, A., and Sandison, W. M.** Nov. 17.



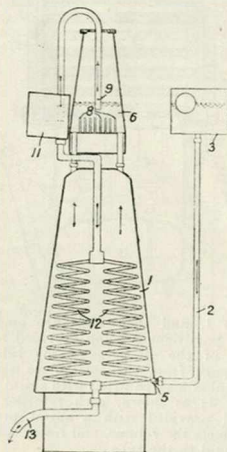
Straight-tube apparatus having internal baffles.

In tubular apparatus for evaporating, concentrating, and heating liquids, the tubes are provided with cores having helical ribs forming helical passages for the liquid, and with retarders which interrupt the continuous flow of the liquid through the passages. The cores may have alternate lengths of right-handed and left-handed helical ribs. Helically ribbed cores b, b' , Fig. 1, of larger diameter than the main



cores *c* having retarders *d*, are provided at the entrances to the tubes. The cores may be rotated by spindles *H*, Fig. 5, formed with hexagonal ends engaging in the ends of the cores. The spindles pass through end chambers *G* through which the liquid flows on its way to the tubes.

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

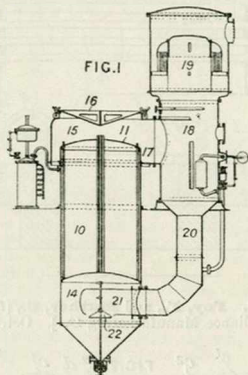


Coil-tube apparatus.—A tank 1 surmounted by a boiler 6 provided with an electric heater 8 is supplied with water or other liquid to be sterilized from a tank 3 with a ball cock through a pipe 2 with a non-return valve 5. The boiler is discharged by a siphon tube 9 brought into action by the steam generated by the heating. The liquid passes through an open tank 11 and through coils 12 in the tank 1 to an outlet 13. The coils 12 may be provided with valves so that one or more may be cut out. Specification 12,129/13, [Class 64 (i), Heating liquids &c.], is referred to.

22,844. Soc. E. Barbet et fils et Cie. July 10, [Convention date].

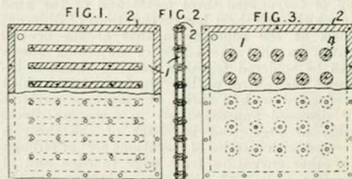
Straight-tubes between headers.—Relates to an evaporator comprising a heating-drum 10 containing externally heated tubes through which the liquid circulates, together with a lateral pipe 17 leading liquid and vapours to a vapour-separating chamber 18, 19, from which the unevaporated liquid returns by a pipe 20 to a chamber 14 beneath the heating-drum, and consists in preventing the liquid

ejected from the heating-tubes into the chamber 15 from dropping back into the tubes by making the upper tube-plate 11 dome-shaped or inclined and arranging the drum to project into the



chamber 15 so as to leave an annular channel in which the liquid collects. The upper ends of the tubes are also extended above the upper plate, and the cover 16 of the chamber 15 is made conical or dished.

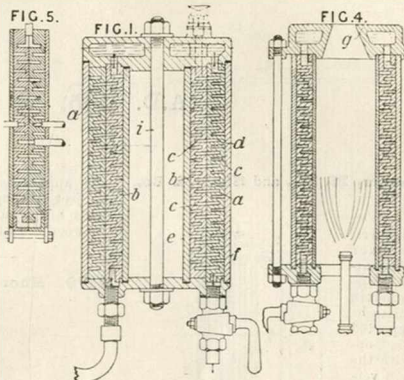
23,445. Gronholm, N. C. F., Höög, A. J., and Nilson, F. O. Dec. 3, 1913, [Convention date]. Void. [Published under Section 91 of the Act.]



Special materials for making.—Radiators or heating elements are made from fibrous materials such as asbestos mixed with a binding agent such as Portland cement and can be pressed or moulded and reinforced with wire netting. Plates 1 secured to a frame 2 form a hollow element for the passage of the heating-medium. If desired, supporting-pieces 4 of circular or rectangular form may be used.

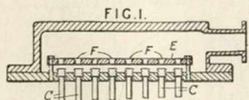
23,517. Horsburgh, D. Dec. 4.

Plate apparatus.—Apparatus for heating and cooling liquids and gases comprises one or more disks or cylinders having deep, narrow, spiral grooves in their sides, the groove in one side of a disk or cylinder being cut in the metal between the convolutions of the groove on the opposite side. A steam-heated water-heater, Fig. 1, comprises two concentric cylinders *a, b* so arranged that the outer groove *c* on the inner cylinder comes opposite the inner groove *d* on the outer cylinder, thus forming a spiral passage through which the steam is passed. The open sides of the grooves on the inside of the inner cylinder and on the outside of the outer cylinder are closed by cylindrical plates *e, f*, and the water passages thus formed are placed in communication with one another through a header at one end of the cylinders. Fig. 4 shows a water-heater having a single grooved cylinder. Steam may pass through the inside groove and water through the outside groove, or, as shown, the grooves may be connected by a header *g* so as to form a continuous water passage, and a



gas burner used in place of steam. The heater shown in Fig. 5 consists of two grooved flat plates provided, as in the heater shown in Fig. 1, with covering-plates for the outer grooves forming the water passages, and arranged so that the inner grooves forming the steam passage come opposite to one another. The pitch of the grooves in a disk or cylinder may gradually increase towards one end and may be deeper at one end than at the other end.

24,430. Scanes, A. E. L. Dec. 21.

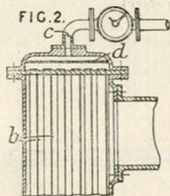


Distributing-plates.—To prevent the deposition of flocculent matter on the ends of condenser or like tubes *C*, a perforated plate *E* is placed in front of the tubes with the perforations *F* registering with the tube ends. The perforations are countersunk or otherwise suitably shaped to afford an easy access for the cooling-water. The plate may be made of aluminium or other metal electro-positive to the metal of which the tubes are made, to counteract electrolytic action in the condenser.

24,605. Bateman, J. T. Jan. 6.

Straight-tubes between headers.—A heat

exchanger for preheating oil by waste steam consists of sets of tubes *b*, through which the oil, entering by a pipe *c*, passes downwards and upwards in succession. The oil is distributed



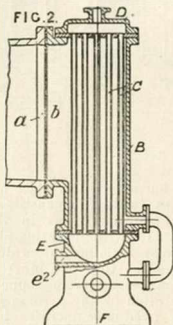
by a perforated plate *d* having apertures arranged vertically over the tubes. Specification 367/14 is referred to.

A.D. 1915.

430. Travers, M. W., and Shaw & Co.,
F. Jan. 11.

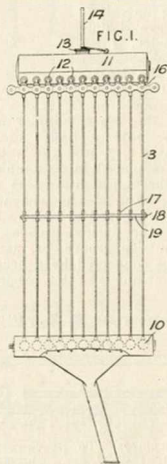
Straight - tubes between headers.

—A condenser used in evacuating a drying-chamber wherein the material to be dried is supported on trays, is connected with the chamber by a vertical slot *b* or series of slots which open directly to corresponding openings *a* in the wall of the drying-chamber. The condenser shown is fitted with upper and lower headers *D, E* connected by tubes *C*, the inlet *e²* for the cooling-fluid being formed in the lower header. Between the condenser and chamber, a layer of heat-insulating material is provided.

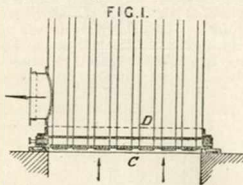


the apparatus. In a modification, the tubes project through the casing wall, and their ends are secured in a second wall, the space between the two walls being open to atmosphere.

2379. Short, H. L. Feb. 15.



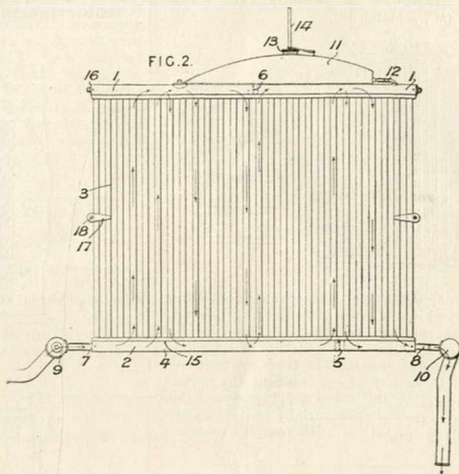
513. Berninghaus, K. Jan. 13, 1914,
[Convention date].



Straight - tubes between headers. — In apparatus comprising vertical tubes expanded in the walls of a casing for heating the air blast and cooling - gas in connexion with gas - producers, a partition plate *D* is provided and the tubes are expanded therein, thereby bracing and supporting the casing wall *C*, and air or water is circulated through the space between the plate *D* and wall *C* to cool the joints. A plate *D* may also be provided at the top of

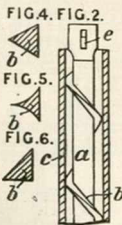
Straight tubes between headers.—A radiator for cooling the circulating water in internal-combustion engines, more particularly for use on aeroplanes, comprises a number of similar sections detachably connected to common supply and delivery pipes, so that any section may be removed for repair &c. The sections comprise upper and lower horizontal tubes 1, 2 connected by vertical tubes 3, which may be of flattened cross-section. The water is supplied from a common supply pipe 9 having a number of nozzles connected to corresponding nozzles 7 on the respective sections by means of rubber joint pieces, and the outlet nozzle 8 of each section is similarly connected with a nozzle on a common delivery pipe 10. Baffles 4, 5, and 6 are arranged in the upper and lower tubes 1, 2

to reverse the direction of flow of the liquid through the tubes 3, openings 15 being provided in the baffles to allow vapour to pass from one part to another and to facilitate the draining of the section. The tank or tanks 11, which may be shaped to a stream line form, are preferably detachably supported on the upper tubes 1 of the sections, and are connected thereto by a number of joints 12. A vent tube 14 is fitted to the tank, preferably in the filling-nozzle 13. The ends of the tubes 1 are clamped between end plates 16 extended at each side of the radiator so as to receive outside clamping-bolts, and distance-pieces 17 for the tubes 3 are carried on rods 18.



3389. Scott, G. March 3.

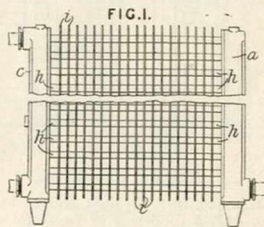
Straight-tube apparatus having internal fittings in tubes.—A retarder for heating or cooling tubes consists of a central core or rod *a* on which a wire *b* of substantially V-shaped (triangular) cross-section is tightly wound in the form of a helix, the dimensions of the rod and wire being such that the outer edge of the wire bears against the inner surface of the tube *c*. Figs. 4, 5, and 6 show sections of various forms of wire which may be employed. The rod *a* is formed with a T-shaped or like head at one end, and is secured by a cotter *e* at the other end; or the head may be replaced by a pin &c. inserted in a transverse hole in the rod.



4154. Pease, E. L. March 16. [Cognate Application, 8432/15.]

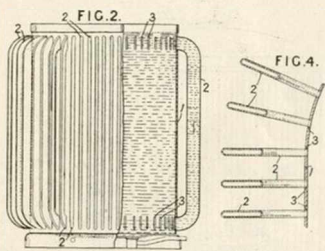
Gills for tubes.—In a radiator suitable for heating buildings, vertical metal

strips *i*, each extending the full height of the radiator, are threaded on a vertical series of horizontal tubes *h* connected to side headers *a*, *c* so as to form a number of



vertical air passages open at the sides and top. The strips may be alternately of different widths, or strips of the same width may be arranged in staggered order. According to the Provisional Specification 8432/15, the tubes of an air heater comprising a cylindrical chamber enclosing vertical heating-tubes arranged in a circle have gills of rectangular, circular, or other form alternately of different widths, or of the same width and arranged in staggered order.

4263. Babcock & Wilcox, [Babcock & Wilcox Co.]. March 18.



Loop-tube apparatus.—The tank 1 containing a liquid which is used for cooling electric apparatus such as transformers, is provided with tubes 2 allowing a circulation of the liquid through the openings 3. The tubes are flattened wholly or in part in places substantially normal to the tank; or the tubes are in cross-section wholly or in part of substantially oval formation or of oblong formation, with rounded ends.

4264. Climie, W., and Lees, W. Sept. 19, 1914.

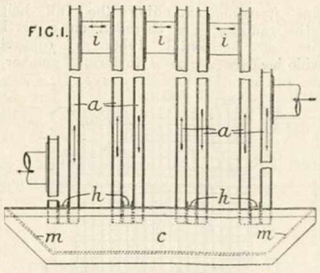
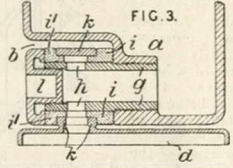
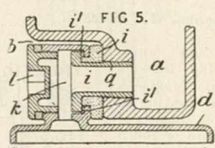
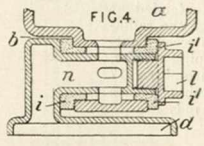
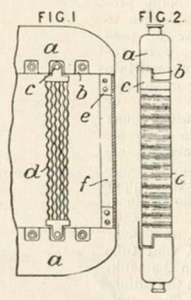


Plate apparatus; straight tubes between headers, etc.—A condenser or cooler for use in gas manufacture comprises a series of vertical pipes *a* arranged in pairs with their open lower ends dipping into an open water or like receptacle *c*, adjacent pairs of pipes being connected by pipes *i*, and each pipe having an opening in its side; a cover-plate *h* is arranged over the opening to connect the pipes of each pair and form a passage open at its lower side. The water may fill these passages, so that the gas has to be forced through it. The pipes may be formed by bending over thin channel bars and attaching side plates thereto. The tank *c* may have sloping ends and contain a conveyor for removing deposits.

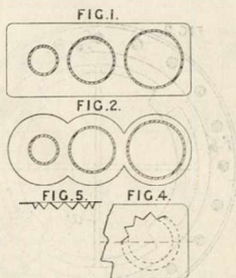
5335. Behr, J. F., and Suddenteche K hlerfabrik. April 9.



Straight tubes between headers or connecting-boxes.—In a radiator for internal-combustion engines having detachable cooling-units fixed in recesses in the upper and lower water chambers, the units are secured by a yielding joint, preferably of an electrically-insulating nature. Recesses *b*, Figs. 1 and 2, or a single longitudinal groove in the water chambers *a* receive the heads *c* of the cooling-elements *d* so that the latter are flush with the chambers *a* as shown. The chambers are connected together by channel-irons *f* attached by screws to plates *e*. The cooling-elements *d* may be fixed to the

chamber *a* by a ferrule *g*, Fig. 3, screwed into the chamber and having apertures *h* to communicate with an annular space formed by an eye *k* on the cooling-element. The whole is secured with rubber packing-rings *i*, *i*¹ by a screwed plug *l*. In the modification shown in Fig. 4, the ferrule *n* is formed integral with the cooling-element, the plug *l* being at the back. In another form, Fig. 5, the ferrule *g* serves to hold the ring *k*, and the rubber ring *i*¹ may be omitted if electrical insulation is not required.

show the formation of a gill plate with serrated edges to its opening, which edges may be turned

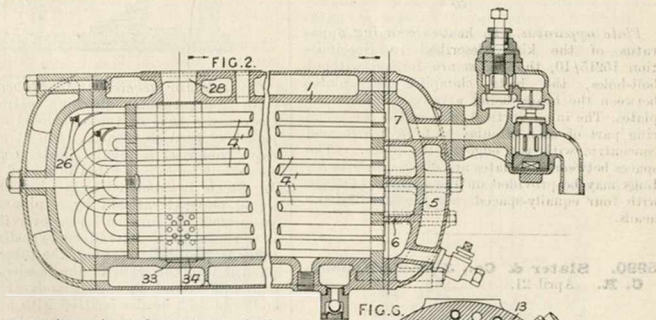


5701. **Pickford, W. E.** April 16.

Gills for tubes.—Hand-operated gas-compressing pumps are fitted with radiating gills which may be formed integral with the pump barrels or screwed or otherwise fixed thereon. Figs. 1 and 2 show forms of plates constituting gills for three parallel pump barrels. Figs. 4 and 5

up or down to provide a spring clip on the barrel.

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



U-tube apparatus.—An exhaust-steam feed-heater, which may be used when the feed-supply is cut off for circulating the water in the boiler, comprises a steam casing 1 containing groups of U-shaped tubes 4, opening into a header 5 which is divided by partitions 6 into a number of chambers 7 . . . 13 so arranged that the water flows through the chambers and the groups of U-tubes in series. The exhaust steam inlet 28 opens into an internal annular channel 33 covered by a perforated ring 34. The casing and the end covers are vacuum jacketed in the manner described in Specification 21,622/12, [Class 64 (ii), Heating systems &c.]. Cleaning-plugs 26 are fitted in the bends of the U-tubes.

5976. **Unit Engineering Co., and Mather, C.** April 21.

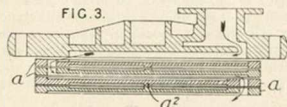
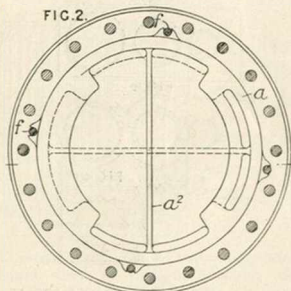


Plate apparatus.—In heat-exchanging apparatus of the kind described in Specification 15215/10, the plates are formed without bolt-holes, the bolts clamping the plates between the heads being arranged outside the plates. The inner vertical faces of the thickened ring part of each circular plate *a*, are formed concentric with the edge of the plate. The spaces between the plates are divided by ribs *a*². Lugs may be provided on the plates to engage with four equally-spaced rods *f* secured to the heads.

5990. **Slater & Co., J., and Allensby, C. R.** April 21.

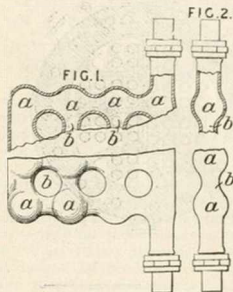
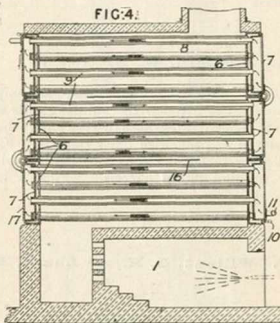


Plate apparatus.—A heat radiator consists

of an open-work panel or grid composed of a series of hollow bulbs *a* connected by tubular fillets *b*, the whole being made in one piece by electro-deposition.

6660. **Smith, J. S.** May 4.

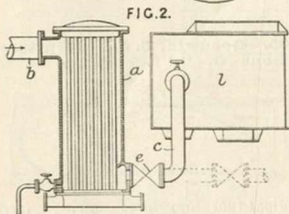
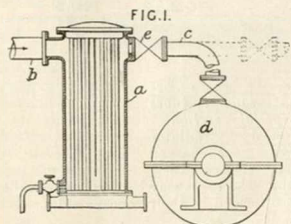


Concentric or jacketed straight tube apparatus.—An apparatus for distilling petroleum &c. comprises a tube or tubes enclosed in a steam-jacket exposed to furnace. One form of apparatus comprises a tubular heater consisting of concentric tubes 8, 9 fitted in nested headers 6, 7. Steam is admitted by a pipe 10, and the liquid under treatment by a pipe 11. The gases from the furnace 1 pass over the tubes 9 in a zigzag path determined by baffles 16. In order to facilitate cleaning, the tubes 9 are expanded into the walls of the headers 7 at one end and extend through glands at the other end, and each header is fitted with a removable cover 17. The sets of tubes 9 can thus be withdrawn with the header into which they are expanded, leaving the tubes 8 accessible to cleaning implements.

6789. **Morison, D. B.** May 6.

Straight tubes between headers.—In feed-water-heating apparatus having the outlet for excess steam arranged at a remote point in the direction in which the flow of steam from the inlet *b* to the heater *a* is desired, the excess steam is discharged from the heater through a valve *c* and pipe *c* to a section of a steam turbine *d* or to the receiver *l* of a reciprocating

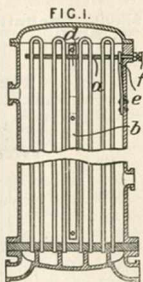
steam-engine. The circulation of steam as the result of the discharge of surplus steam prevents



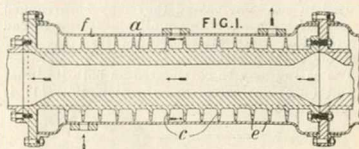
the accumulation of air in the heater. Specifications 3490/12 and 15,413/13, [both in Class 64 (i), Heating liquids &c.], are referred to.

6933. Knorr-Bremse Akt.-Ges., and Vielmetter, J. P. May 8.

U-tube apparatus; straight tubes between headers.—In a boiler feed-water-heater of the kind comprising a steam casing containing water-tubes and a removable tube-plate or a tube-supporting plate inside the casing, the tube-plate or the tube-supporting plate is maintained in position by resilient means adapted to bear on its edge at one or more points. The tube-supporting plate *a*, Fig. 1, is held in position by the bent-up resilient ends *d* of the guide-bars *b* and by a resilient strip *c*. The resilient strip ends and the resilient strip are pressed against the edge of the plate by screws *f*.

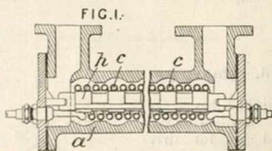


8841. Chorlton, A. E. L., and Livens, F. H. June 16.



Concentric or jacketed straight-tube apparatus.—In apparatus for heating water or other fluid, of the kind in which the fluid is passed through interconnected annular cells formed in a casing around an internally ribbed tubular chamber through which waste gases are passed, the annular cells are formed by ribs on the tubular chamber, and the inlet and outlet ports are so arranged that the fluid passes through the apparatus in the contrary direction to the flow of the gases. Fig. 1 shows several chambers *a* bolted together at their flanged ends. The casings *f* are so enlarged at their ends that the bends of the enlargements take up the differences of expansion and contraction between the parts. The apertures *e* in the ribs *c* may be arranged so that the fluid takes a zig-zag course through the apparatus. The casings may be formed in removable sections to facilitate cleaning.

11,015. Parsons, Sir C. A., Howe, R., and Cook, S. S. July 29.

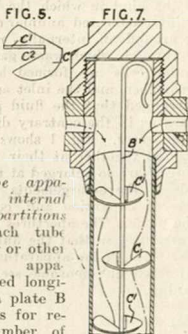


Coil-tube apparatus.—In a liquid-cooler intended particularly for cooling lubricating-oil, the cooling-water passes through one or more helical tubes surrounding a corrugated core and enveloped by a corrugated tubular casing in such a manner that the stream-lines of the oil flowing through the casing are repeatedly broken up and subdivided and fresh layers of oil are brought into contact with the cooling-tubes. The depressions in the casing *a* around the helical tube *c* are arranged between the depressions in the core *h*. The tube may be supported by longitudinal ribs projecting from

the core. The casing may be jacketed and the cooling-water passed through the jacket after leaving the tube. When two or more tubes are used in the same casing they may be arranged concentrically or in multiple screw-thread formation, and the cooling-water may flow through them either in series or in parallel. The casing may be corrugated on both its inner and outer surfaces. Specification 16948/11 is referred to.

11,127. Watson, H. E., and Billetop, T. C. July 31.

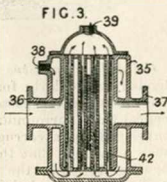
(Faint, mostly illegible text describing the apparatus, likely related to the figures shown.)



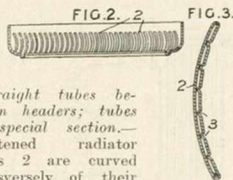
Straight-tube apparatus having internal baffles and partitions in tubes.—Each tube of a condenser or other heat-exchange apparatus is divided longitudinally by a plate B having notches for receiving a number of similarly-shaped baffle-plates C, which are alternately reversed and set on opposite sides of the plate so as to compel the fluid to take zigzag paths through the tube. The baffles are secured by means of the turned-up edges c' of the V-shaped recesses c'' .

11,716. Hoar, A. Aug. 13.

Straight-tubes between headers.—Compressed air for driving a motor, not shown, enters a vessel 35 through the inlet 38 and after heating by the tubes 42 &c. passes to the pipe 39. The tubes 42 &c. are heated by the exhaust gases of an internal-combustion engine which enter the vessel at 36 and leave it at 37.

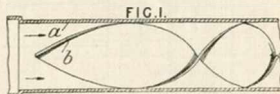


12,067. Harvey, J. Aug. 21.



Straight tubes between headers; tubes of special section.—Flattened radiator tubes 2 are curved transversely of their length. The tubes may be divided by indentations 3 formed in their concave sides.

14,165. Goodwin, C. J., and Guttman, & Sons, O. Oct. 6.



Straight-tube apparatus having internal baffles &c.—A retarder, adapted for insertion in the inlet ends of tubes a for heating, cooling, condensing, and cleaning or purifying fluids, comprises a helical member b with a decrease of pitch in the direction of flow. The application to the condenser tubes of the nitric-acid condensing plant described in Specification 13,694/01, [Class 32, Distilling &c.], is referred to.

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

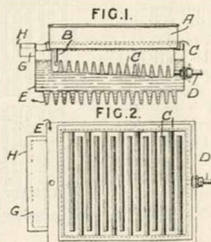
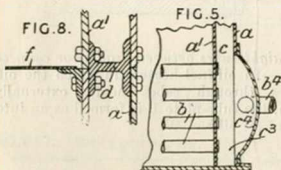
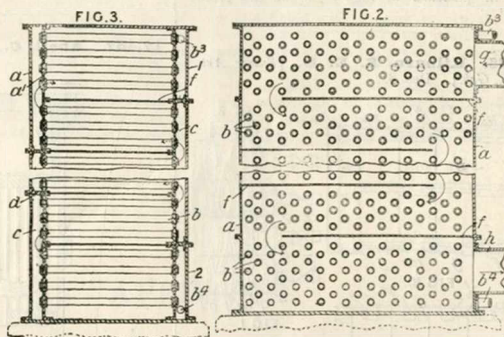


Plate apparatus.—Milk or liquid is supplied by a tank A and pipe B to a zigzag channel formed by staggered corrugations in a tray C, which is heated by a bath E having a corrugated bottom, or by direct heat. The tray is provided with an outlet pipe D, and the bath has an expansion chamber G covered by a lid H.

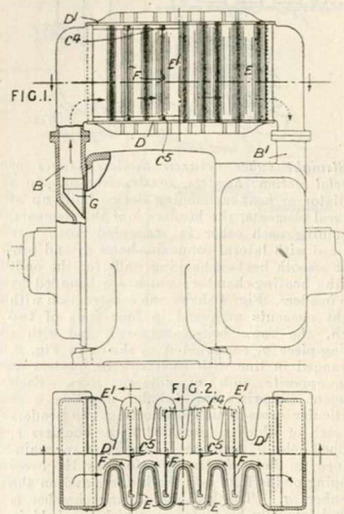
16,416. Vanston, T. A. Nov. 22.

Straight tubes between headers or connecting-boxes.—A gas condenser, of the type in which the gas and the cooling medium traverse sinuous or zigzag paths at right-angles to each other, comprises sets of tubes *b*, each set being connected to its neighbour by spaces *c* between the outer and inner walls *a*, *a'* of the apparatus. In the form shown, the spaces *c* are formed by flanged bars or girders *d* serving to connect the plates forming the walls *a*, *a'*, as shown in Figs. 3 and 8. Between



the sets of tubes are diaphragms *f* extending partly across the apparatus, so that the gas from the inlet *g* follows the path indicated by arrows in Fig. 2, escaping by an outlet *h*. A cooling-medium under pressure enters the lowest space *c* by an inlet *b'*, and traverses a zigzag path through the tubes *b* and the spaces *c* to the outlet *b''*, as indicated by arrows in Fig. 3. Each series of tubes *b* forms a unit comprising a plate *a'* at each end and a diaphragm *f*. The diaphragms may be slightly inclined or concave or of corrugated metal, or if flat may have their ends serrated in order to facilitate the downward flow of the products of condensation. The spaces *c* may be provided on all four sides of the apparatus. When air under pressure is used as the condensing medium, the lower chamber *c'*, Fig. 5, is enlarged by the provision of a cover *c''* fitted with a feed pipe *b''*. If suction devices are employed, the upper chamber is similarly arranged. If the apparatus is to be used as an atmospheric condenser, the upper and lower plates 1, 2 are removed, leaving the ends of the upper and lower sets of pipes *b* open to the atmosphere.

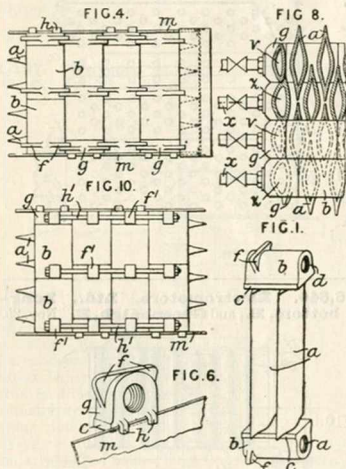
16,640. Electromotors, Ltd., Longbottom, E., and Greenhalgh, E. Nov. 25.



Gilled chambers formed with zigzag passages.—Air is circulated by fans *G* from one end *B* to the other end *B'* of a totally enclosed dynamo or electromotor through an atmospherically-cooled chamber *E*, *E'*, which is constructed with sinuous side walls and with ribbed top and

bottom-plates D^1 , D . Baffle plates F are arranged within the cooling-chamber and are held in position by lugs e^4 , e^5 on the plates D , D^1 .

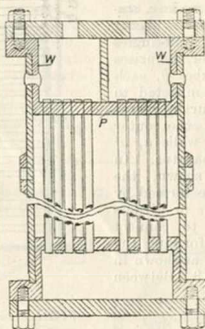
17,236. **Kilburn, B. E. D.**, [Sulzer Akt.-Ges., Geb.]. Dec. 8.



Straight tubes between headers; tubes of special section; headers, construction of.—In a radiator or heat-exchanging device built up of several elements, the headers b of the elements, adjoining each other in staggered rows, are formed with lateral connexion-holes d , and provide smooth heat-exchanging walls for the ends of the heating-chamber, which are bounded by the headers. Fig. 4 shows one construction with eight elements arranged in four rows of two each, the rows being staggered, and with a filling-piece g , constructed as shown in Fig. 6, arranged in line with each row of headers at the opposite ends of adjacent rows. Each element comprises two tubular members a of lenticular cross-section connecting two headers b , each of which is provided with shoulders c , tapped holes d , and lugs f . The rows are maintained in their relative positions by the overlapping of the lugs f on the headers and on the members g . The heat-exchanging chamber is closed laterally by plates m , which are held in place by lugs h on the members g . In a modification, Fig. 8, alternately wider and narrower members g are employed in adjacent rows, and upper and lower members are connected by conduits z , v for the heating-medium. In another modification, Fig. 10, the rows are rigidly con-

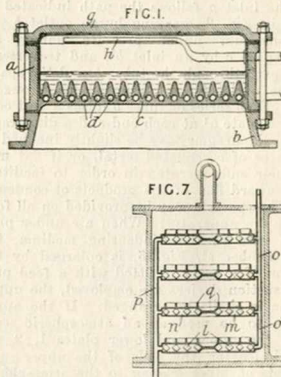
nected together by rods h^1 engaging lugs f^1 formed on the headers b and members g .

17,467. **Abell, C. J.** Dec. 14.



Straight tubes between headers or connecting-boxes.—In oil-fuel heaters in which the oil circulates through tubes heated externally by steam, the tube-plate P is formed as an integral part of an oil-box W .

17,672. **Dunsford, F. T., and Seay Syndicate.** Dec. 17.



Tubes of special section; gills for tubes; plate apparatus; straight tubes between headers.—In an absorption refrigerating-apparatus, the

absorbing-agent or the product resulting from absorption is retained during generation or absorption in comparatively thin layers on a surface divided by ribs or corrugations so as to facilitate the action of a heating or cooling medium circulating through pipes arranged in the floor of or forming shelves or trays within the generator or absorber. A convertible generator-absorber is shown in Fig. 1, in which cooling or heating coils *d* are arranged within a ribbed or corru-

gated floor or base *c*. Several chambers comprising the intermediate part *a* and floor *c* may be arranged one above the other on a base *b* and fitted with a cover *g*. In the arrangement shown in Fig. 7, the heating or cooling pipes *l* are themselves provided with ribs *q* and communicate through diametrical headers *m*, *n* with the inlet and outlet pipes *p*, *o*. The pipes may be straight or in concentric circles, and a built-up chamber may be fitted with this form of heating or cooling surface.

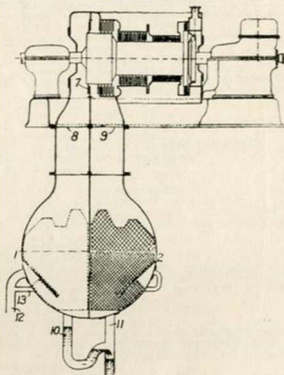
APPENDIX.

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

A. D. 1912.

29,841. Delaporte, M. Dec. 27, 1911, [Convention date]. Void. [Published under Sect. 91 of the Act.]

Straight tubes between headers.—Additional power is obtained in a steam-turbine, without increasing the amount of cooling-water used in the condenser, by providing two exhaust conduits 8, 9 between which is situated an additional stage 7. The conduits 8, 9 lead to two condensers 1, 2 arranged in a common casing and traversed in series by the cooling-water but in parallel by the exhaust steam. The vacua maintained in the condensers 1, 2 are consequently higher and lower respectively than that of a single condenser. The water-pump is connected to the condensers by pipes 10, 11, the former being siphoned in such a manner that the difference of levels balances the difference of pressures in the condensers. The air-pump is connected to pipes 12, 13, the latter leading to the condenser 2 being of smaller cross-section to limit the suction. The tubes are spaced wider apart in the condenser 2 than in the condenser 1.



ABRIDGMENTS OF SPECIFICATIONS

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

List of Periods.

1855-1866.
1867-1876.
1877-1883.
1884-1888.
1889-1892.
1893-1896.
1897-1900.
1901-1904.
1905-1908.

List of Classes.

1. Acids, alkalies, oxides, and salts, Inorganic.
2. Acids and salts, Organic, and other carbon compounds, (including Dyes).
3. Advertising and displaying.
4. Aeronautics.
5. Agricultural appliances, Farmyard and like, (including the housing, feeding, and treatment of animals).
6. Agricultural appliances for the treatment of land and crops, (including Gardening-appliances).
7. Air and gas engines.
8. Air and gases, Compressing, exhausting, moving, and otherwise treating.
9. Ammunition, torpedoes, explosives, and pyrotechnics.
10. Animal-power engines and miscellaneous motors.
11. Artists' instruments and materials.
12. Bearings and lubricating apparatus.
13. Bells, gongs, foghorns, sirens, and whistles.
14. Beverages, (excepting Tea, coffee, cocoa, and like beverages).
15. Bleaching, dyeing, and washing textile materials, yarns, fabrics, and the like, (excepting Dyes).
16. Books, (including Cards and card cases and the like).
17. Boots and shoes.
18. Boxes and cases, (excepting Trunks, portmanteaux, hand and like travelling bags, baskets, hamper, and other wickerwork).
19. Brushing and sweeping.
20. Buildings and structures.
21. Casks and barrels.
22. Cements and like compositions.
23. Centrifugal drying, separating, and mixing machines and apparatus.
24. Chains, chain cables, shackles, and swivels.
25. Chimneys and funes, (including Ventilating-shaft tops).
26. Closets, urinals, baths, lavatories, and like sanitary appliances.
27. Coin-freeze apparatus and the like.
28. Cooking and kitchen appliances, bread-making, and confectionery.
29. Cooling and ice-making, (including Refrigerators and ice-storing).
30. Cutlery.
31. Cutting, punching, and perforating paper, leather, and fabrics, (including the general treatment of paper after its manufacture).
32. Distilling, concentrating, evaporating, and condensing liquids, (excepting Steam-engine condensers).
33. Drains and sewers.
34. Drying.
35. Dynamo-electric generators and motors, (including Frictional and influence machines, magnets, and the like).
36. Electricity, Conducting and insulating.
37. Electricity, Measuring and testing.
38. Electricity, Regulating and distributing.
39. Electric lamps and furnaces.
40. Electric telegraphs and telephones.
41. Electrolysis, (including Electro-deposition and Electro-plateing).
42. Fabrics, Dressing and finishing woven and manufacturing felted, (including Folding, Winding, Measuring, and Packing).
43. Fastenings, Dress, (including Jewellery).
44. Fastenings, Lock, latch, bolt, and other, (including Safes and strong-rooms).

45. Fencing, trellis, and wire netting.
46. Filtering and otherwise purifying liquids.
47. Fire, Extinction and prevention of.
48. Fish and fishing.
49. Food preparations and food-preserving.
50. Fuel, Manufacture of.
51. Furnaces and kilns, (including Blowpipes and blowpipe burners; Smith's forges and rivet hearths; and Smoke and fumes, Treating).
52. Furniture and upholstery.
53. Galvanic batteries.
54. Gas distribution.
55. Gas manufacture.
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. Hand tools and benches for the use of metal, wood, and stone workers.
62. Harness and saddlery.
63. Hats and other head coverings.
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, Sauce-pans, 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, gasoliers, 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 well-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. Railways and tramways.
105. Railway signals and communicating-apparatus.
106. Registering, indicating, measuring, and calculating, (excepting Signalling and indicating by signals).
107. Roads and ways.
108. Road vehicles.
109. Ropes and cords.
110. Rotary engines, pumps, blowers, exhausters, and meters.
111. Sewage, Treatment of, (including Manure).
112. Sewing and embroidering.
113. Ships, boats, and rafts, Div. I.
114. ————— Div. II.
115. ————— Div. III.
116. Shop, public-house, and warehouse fittings and accessories.
117. Sifting and separating.

118. Signalling and indicating by signals, (excepting Railway signals and communicating-apparatus).
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. Stopping and bottling, (including Bottles, jars, and like vessels).
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. Toys, games, and exercises.
133. Trunks, portmanteaux, hand and like travelling bags, baskets, hamper, 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 tramways 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:—

1909-1915.

1916-1920.

(In course of Publication.)

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), Farnyard 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-oils.
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 organized 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 materia' 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 window 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-troed 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 and like controllers).
38 (i), Electric couplings, and cut-outs other than electro-magnetic and thermal.
38 (ii), Electric currents, Metering and transforming other than by rotary converters and rotary transformers, and condensers.
38 (iii), Electric motor control systems and motor and like controllers.
38 (iv), Electric supply and transmission systems and apparatus not otherwise provided for.
38 (v), Electric switches and electro-magnetic and thermal cut-outs, (other than Motor and like controllers).
39 (i), Electric lamps, Arc and incandescent-arc, and vacuum or low-pressure apparatus for electric discharges through gases or vapours.
39 (ii), Electric lamps, Incandescent.
39 (iii), Heating by electricity, (including Electric furnaces and ovens).
40 (i), Electric signalling systems and apparatus, (other than Telegraphs and Telephones).
40 (ii), Phonographs, gramophones, and like sound transmitting and reproducing instruments.
40 (iii), Telegraphs, Electric.
40 (iv), Telephones and telephone systems and apparatus, Electric.
40 (v), Wireless signalling and controlling.
41, Electrolysis, (including Electro-deposition and Electro-plating).

LIST OF CLASSES

- 42 (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, Sauce-pans, and Water cans).
67, Horseshoes.
68 (i), Excavating earth and rock, booms, buoys, canals and rivers, ferries, and water supply.
68 (ii), Subaqueous buildings and structures, diving, and raising sunken ships and objects.
69 (i), Hydraulic apparatus not otherwise provided for.
69 (ii), Hydraulic presses, motors, and like apparatus for use with high pressures.
69 (iii), Spray-producers and liquid-distributing sprinklers and nozzles.
70, India-rubber and gutta-percha, (including Plastic compositions and Materials of constructive utility, other than metals and stone).
71, Injectors and ejectors.
72, Iron and steel manufacture.
73, Labels, badges, coins, tokens, and tickets.
74 (i), Braid and braiding-machines, crochet, lace, and lace-making, and net-making machines.
74 (ii), Knitting and knitted fabrics.
75 (i), Burners and burner fittings.
75 (ii), Lamp chimneys, globes, lenses, shades, reflectors, and smut-catchers, and holders thereof.
75 (iii), Lamps for lighting and heating, Details and accessories applicable generally to, (including Lighting burners, pipes, cigars, and the like).
75 (iv), Lamps for lighting and heating, Kinds or types of, (including Lighting Systems of).
76, Leather, (including Treatment of hides and skins).
77, Life-saving, (Marine), and swimming and bathing appliances.
78 (i), Conveyors and elevators for dealing continuously with articles and materials in bulk.
78 (ii), Lifting, lowering, and hauling not otherwise provided for.
78 (iii), Lifts, hoists, and jacks.
78 (iv), Loading and unloading, (including Transporters and cranes).
78 (v), Winding and paying-out apparatus for lifting, lowering, and hauling, (including Pulley-blocks and the like).
79 (i), Locomotives and tramway, traction, portable, and semi-portable engines.
79 (ii), Motor vehicles, Arrangement and disposition of driving, transmission, balance, and reversing gearing on.
79 (iii), Motor vehicles, Arrangement and disposition of parts of, not otherwise provided for, (including Construction of parts peculiar to motor vehicles).
79 (iv), Motor vehicles, Frames and undercarriage work of.
79 (v), Motor vehicles, Steering and controlling.
80 (i), Gearing, Belt, rope, chain, toothed, and like 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), Metal 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 Proses, 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.
89 (iv), 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 therefore.
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).
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 lifting 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).

LIST OF CLASSES

- 105, Railway signals and communicating-apparatus.
106 (i), Calculating, counting, and cash-registering apparatus.
106 (ii), Dynamometers, gauges, measures of length, steam-engine and like indicators, and testing-apparatus.
106 (iii), Fares and admission-fees checking, revolution and speed indicators, and odometers.
106 (iv), Indicating, recording, and registering apparatus not otherwise provided for.
106 (v), Measured quantities delivering, measures of capacity, and sampling liquids.
107, Roads and ways.
108 (i), Road vehicles, Body details and kinds or types of.
108 (ii), Road vehicles, Undercarriage details and draught appliances for.
108 (iii), Springs and vibration-dampers.
109, Ropes and cords.
110 (i), Centrifugal and screw fans and pumps.
110 (ii), Rotary engines, pumps, blowers, exhausters, and meters.
110 (iii), Turbines and reaction-wheels.
111, Sewage, Treatment of, (including Manure).
112, Sewing and embroidering.
113 (i), Ship and boat fittings and accessories, and pontoons and rafts.
113 (ii), Ships and boats, Kinds or types and structural details of.
114, Ships, boats, and rafts, Propelling, steering, and manoeuvring.
115, Ships, boats, and rafts, Rigging, sails, and spars for, (including Boat raising, lowering, and disengaging gear).
116, Shop, public-house, and warehouse fittings and accessories.
117, Sifting and separating.
118 (i), Indicators and burglar and like alarms.
118 (ii), Signals, (including Marine signals).
119, Small-arms.
120 (i), Spinning, Preparation of fibrous materials for, (including Obtaining, opening, carding, and like treatment of fibres in general).
120 (ii), Spinning, twisting, and winding yarns and threads, (including Winding cords, wire, and the like).
120 (iii), Yarns and threads and miscellaneous spinning accessories and processes and treatment of fibres.
121, Starch, gum, size, glue, and other stiffening or adhesive materials.
122 (i), Engine and like cylinders, connecting-rods, cross-heads and guides, fly-wheels, piston-rods, and pistons.
122 (ii), Steam-engine 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, (including Engine turning-gear).
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 like.
126, Stoves, ranges, and fire-places.
127, Sugar.
128, Table articles and appliances.
129, Tea, coffee, cocoa, and like beverages.
130, Tobacco.
131, Toilet and hairdressing articles, and perfumery.
132 (i), Amusement and exercising apparatus other than games and toys.
132 (ii), Games.
132 (iii), Toys.
133, Trunks, portmanteaux, and like travelling bags, baskets, hampers, and other wickerwork.
134, Umbrellas, parasols, and walking-sticks.
135, Valves and cocks.
136 (i), Velocipede, cycle, and like vehicle brakes, steering-mechanism, and miscellaneous accessories.
136 (ii), Velocipede, cycle, and like vehicle driving-mechanism, (including Hand and foot driving-mechanism for apparatus other than vehicles).
136 (iii), 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, mangle 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 fabric and articles, and warping, leasing, balling, and beaming yarns, (including Fife 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 annual and quarterly indexes from 1911 onwards.

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