(No Model.)

G. A. BARNARD.

COOLING OR CONDENSING APPARATUS.

No. 522,549. Patented July 3, 1894.

FIG. 1.

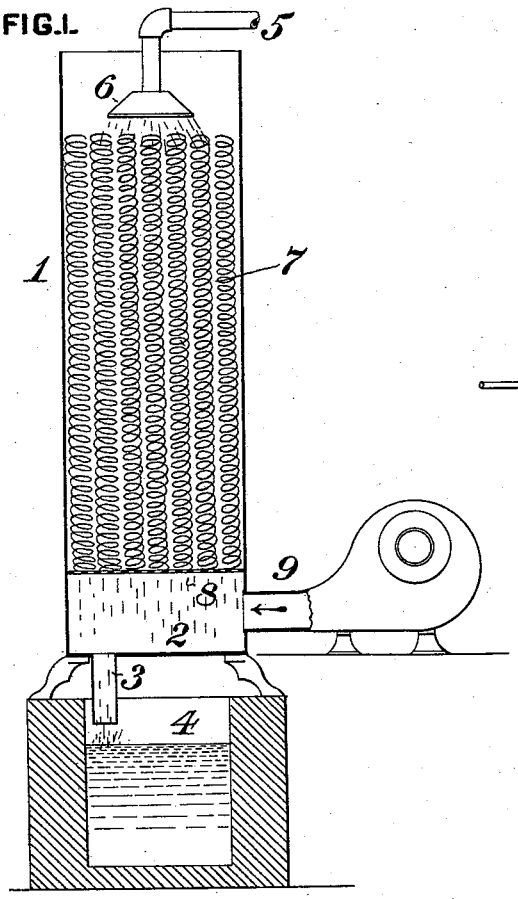


FIG. 2.

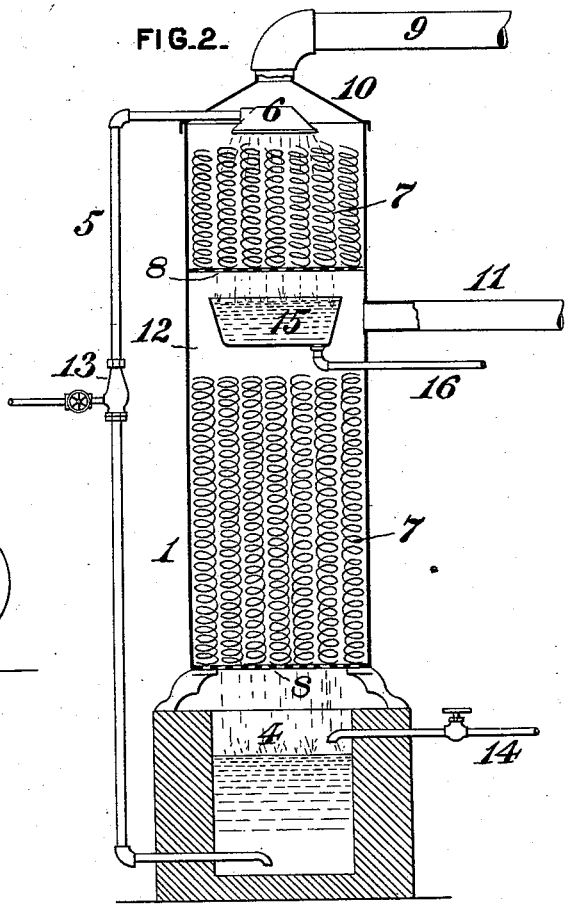


FIG. 3.

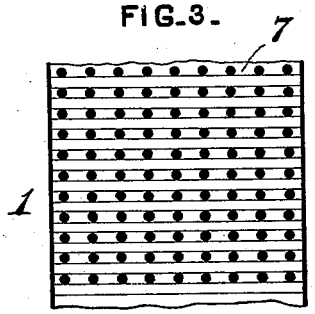


FIG. 4.

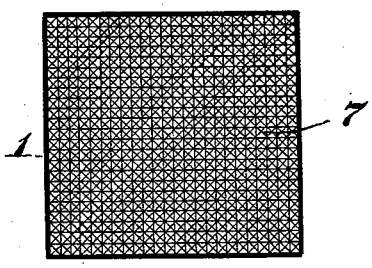
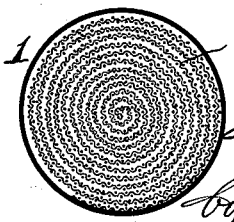


FIG. 5.



WITNESSES:

T. J. Hogan.

T. E. Galther.

INVENTOR.

Geo. A. Barnard.

by J. Bowden Bell,

Att'y.

UNITED STATES PATENT OFFICE.

GEORGE A. BARNARD, OF NEW YORK, N. Y.

COOLING OR CONDENSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 522,549, dated July 3, 1894.

Application filed April 17, 1893. Serial No. 470,683. (No model.)

To all whom it may concern:

Be it known that I, GEORGE A. BARNARD, of the city, county, and State of New York, have invented a certain new and useful Improvement in Apparatus for Cooling or Condensing Fluids, of which improvement the following is a specification.

The object of my invention is to provide an apparatus for cooling or condensing fluids, in which the cooling surfaces shall be so disposed as to thoroughly and effectively utilize the volume available within a determined capacity, and which shall be inexpensive in construction, and readily accessible for removal, cleaning, or repair.

To this end, my invention, generally stated, consists in the combination of an inclosing case or shell, fluid supply and discharge passages leading to and from said case, and a filling or body of piled or woven rods or wire, interposed between the supply and discharge pipes; also, in the combination of an inclosing case, fluid supply and discharge passages, an interposed piled or woven rod filling, and an air blast pipe discharging into and through said filling; also, in the combination of an inclosing case, fluid supply and discharge passages, an interposed piled or woven rod filling, and an exhaust steam connection.

The improvement claimed is hereinafter fully set forth.

In the accompanying drawings: Figure 1 is a vertical central section through an apparatus illustrating an embodiment of my invention; Fig. 2, a similar section showing a modification thereof; Fig. 3, a partial vertical section on an enlarged scale showing the filling in piles or layers, and Figs. 4 and 5, transverse sections, also on an enlarged scale, showing an interwoven or meshed filling.

In the practice of my invention, I provide an inclosing case or shell 1, which, as it is not subjected to any substantial degree of pressure, may be of any preferred material, as brick, sheet metal, or wood, and may be of circular, rectangular or irregular cross section as desired, and of such dimensions as are desirable under the conditions of service. The case 1 is set in an approximately vertical position, in order to admit of the traverse and discharge of liquid through it by the action of gravity, and may be either wholly open at top, as shown in Fig. 1, or be provided with a cap having an opening or a series of perforations, as preferred. The lower end of the case is closed by a bottom plate 2, from which is led a discharge pipe 3, the outer open end of which is located in or above a lower delivery receptacle 4.

A supply pipe 5, the end of which is preferably provided with a perforated spreader or sprinkler 6, in order to distribute liquid in a series of fine streams or jets, is located above the case 1, its exit end and sprinkler preferably projecting into the case, in order to prevent the dispersion of liquid outside thereof.

The interior of the case, between the supply and discharge pipes, is substantially filled by a body or filling 7, of material so arranged as to present a series of closely sub-divided cooling surfaces, and small or narrow interposed passages or interstices for the traverse of fluid from the supply to the discharge pipe. To this end, the filling 7 is most desirably composed of small rods or wires, placed as closely together as is compatible with the passage of fluid between them, and made preferably of metal, although other materials may be used if desired. The several members of the filling may be arranged either in layers or piles, as shown in Fig. 3, or be interwoven into sheets or netting having a series of meshes, as in Fig. 4, and, in the latter case, the interwoven sheets or netting may be piled one above another, or they may be coiled or rolled, as indicated in Fig. 5. A single sheet may be rolled spirally, or a series of sheets may be rolled one around another.

By the employment of closely adjoining rods or wires as a filling, as above described, a very large amount of cooling surface may be presented within a comparatively small compass, and wire being a good conductor, the cooling of liquid passing through the interstices or passages between the wires will be thoroughly and rapidly effected. It will also be seen that the filling may be readily removed and replaced when required for cleaning, renewal, or any other purpose.

The filling 7 is herein shown as resting upon a grated or skeleton frame support 8,

above the bottom plate of the case, but it may, if preferred, extend to or near the bottom plate.

In cases where the temperature of the fluid to be cooled is sufficiently high to render the application of an external refrigerating medium necessary or desirable, a current of air may be forced through the filling, in order to exert a cooling action upon the currents of fluid passing through the same. For this purpose, an air blast pipe 9, is led from a fan or pressure blower into the shell, the air blast either entering the same at its lower end and passing upwardly through the filling, as in Fig. 1, or being admitted at top and passing downwardly through the filling as in Fig. 2, as may be preferred.

In the operation of the apparatus, water supplied to the apparatus by the pipe 5, passes downwardly, by gravity, through the filling 7, and is cooled by contact therewith, and by the air blast entering by the blast pipe 9, when the latter is employed, the cooled water being collected in the lower receptacle 4.

The modification illustrated in Fig. 2 is designed for the condensation of steam without a vacuum, and the provision of purified water for boiler feed. The filling 7 is, in this case, inserted in two independent bodies, each resting upon a grated or skeleton frame support 8, similar to that of Fig. 1. The air blast pipe 9 is led into the top of the case 1, which, except as to said pipe, is closed by a conical cap 10, and an exhaust steam connection pipe 11, through which exhaust steam is delivered, is led into the space or chamber 12 between the upper and lower sections of the filling 7. Water is supplied to the upper portion of the case by a supply pipe 5, having a perforated spreader or sprinkler 6, said pipe being preferably led from the lower delivery receptacle 4, and being provided with a suitable lifting device 13, as a pump or injector. The initial supply of water to the receptacle 4, as well as supply to compensate losses from evaporation or otherwise, is effected by a pipe 14. An open topped pan or feed water receptacle 15, is located in the chamber 12, in position to receive water passing out of the upper section of the filling 7, as well as to be heated by the steam entering at the adjacent end of the exhaust connection 11. Heated and purified water is drawn off from the receptacle 15, by a pipe 16.

In operation, steam entering the case through the connection 11, is condensed by the air blast from the pipe 9, and the currents of water from the supply pipe 5. The condensed water passes downwardly through the filling, and is cooled in its passage through the same and returned to the supply pipe and spreader, the small percentage lost by evaporation and leakage being made up by supply through the pipe 14. The receptacle 15 will be kept filled with purified water from the upper section of the filling, and such water, which will be raised to a high temperature by the heat of the exhaust steam, may be desirably used for boiler supply, for which or for other purposes, it is taken off through the pipe 16.

I claim as my invention and desire to secure by Letters Patent—

1. In an apparatus for cooling or condensing fluids, the combination of an inclosing case or shell, fluid supply and discharge passages leading to and from said case, an interposed piled or woven rod or wire filling, and an exhaust steam connection, substantially as set forth.

2. In an apparatus for cooling or condensing fluids, the combination of an inclosing case or shell, fluid supply and discharge passages leading to and from said case, a piled or woven rod or wire filling interposed, in separate bodies, between the supply and discharge passages, an exhaust steam connection leading into the case between the bodies of filling, and a feed water receptacle located within the case adjacent to the exhaust steam connection, substantially as set forth.

3. In an apparatus for cooling or condensing fluids, the combination of an inclosing case or shell, fluid supply and discharge passages leading to and from said case, a delivery receptacle below the case, a lifting device for elevating liquid from the delivery receptacle to the supply passage, a piled or woven wire or rod filling interposed, in separate bodies, between the supply and discharge passages, and an exhaust steam connection leading into the case between the bodies of filling, substantially as set forth.

4. In an apparatus for cooling or condensing fluid, the combination of an inclosing case or shell, fluid supply and discharge passages leading to and from said case, an interposed piled or woven rod or wire filling, an air blast pipe discharging into and through said filling, and an exhaust steam connection, substantially as set forth.

5. In an apparatus for cooling or condensing fluids, the combination of an inclosing case or shell having fluid supply and discharge passages leading to and from said case, a filling or body of piled or woven rods or wires interposed between said supply and discharge passages, and means for admitting a fluid body under pressure in contact with fluid passing from the supply duct and percolating through said filling toward the discharge passage, substantially as set forth.

GEORGE A. BARNARD.

Witnesses:
J. SNOWDEN BELL,
CHARLES P. ROBINSON.