

W. L. CHURCH.  
Steam-Engine Condenser.

No. 217,845.

Patented July 22, 1879

FIG. 1.

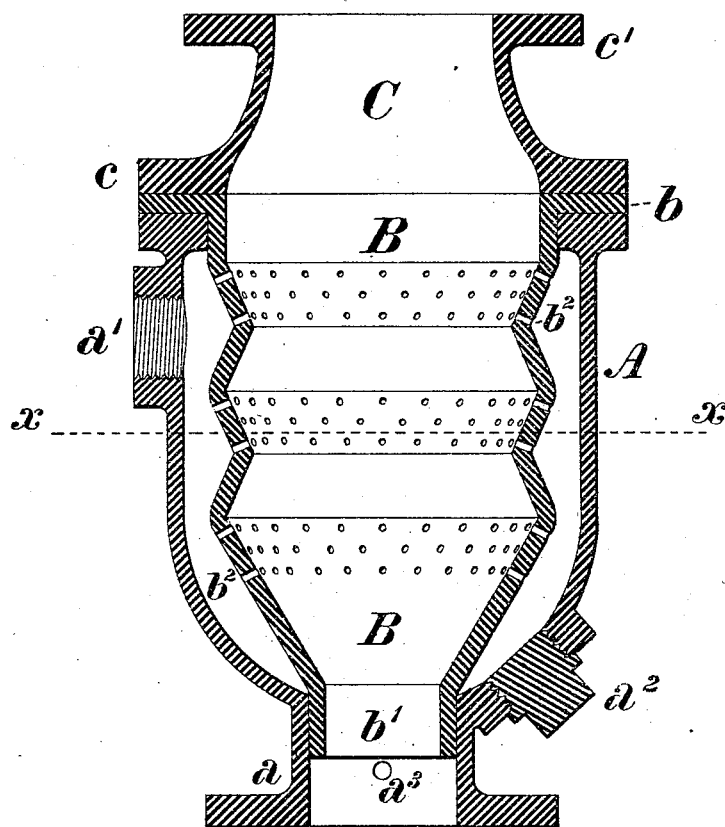
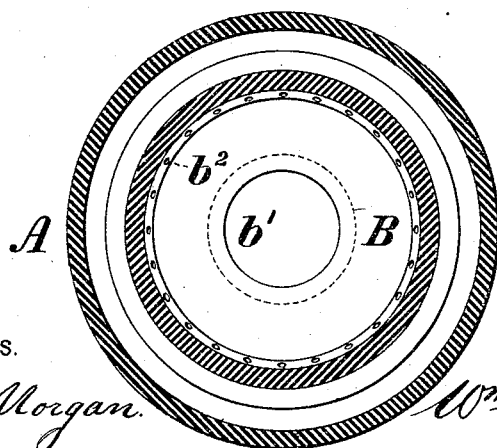


FIG. 2.



WITNESSES.

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*by J. Snowden Bell,*  
*att'y.*

# UNITED STATES PATENT OFFICE.

WILLIAM L. CHURCH, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF  
HIS RIGHT TO BUCKEYE ENGINE COMPANY, OF SALEM, OHIO.

## IMPROVEMENT IN STEAM-ENGINE CONDENSERS.

Specification forming part of Letters Patent No. 217,845, dated July 22, 1879; application filed  
April 16, 1879.

*To all whom it may concern:*

Be it known that I, WILLIAM LEE CHURCH, of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Steam-Engine Condensers, of which improvements the following is a specification.

The object of my invention is to provide, in a condenser of simple and economical construction, suitable means for obviating the objection which obtains in jet-condensers of the ordinary construction in regard to heating from failure or insufficiency of the supply of injection-water, and for admitting, as far as practicable, of the use of a minimum amount of injection-water relatively to a maximum temperature of hot-well, as also for furnishing convenient facilities for the removal of sedimentary deposits.

To these ends my improvements consist in the combination of an outer cylindrical chamber or chest having a side injection-nozzle near its top and a central discharge-nozzle at bottom, an internal steam-receiving chamber in the form of a series of frusta of cones united alternately upon their smaller and their larger diameters, and being alternately perforated and imperforate, said chamber being open at both ends, which connect, respectively, with the cap and discharge-nozzle of the outer chamber, and a flanged nozzle or cap, by which the outer and inner chambers are secured together, and through which communication is established with the exhaust-pipe of the engine.

My improvements further consist in the combination, with an outer chamber constructed as described, of a lower cleaning-opening and a door or plug, all as more fully hereinafter set forth.

In the accompanying drawings, Figure 1 is a vertical central section through a condenser embodying my improvements, and Fig. 2 a transverse section through the same at the line *xx* of Fig. 1.

To carry out my invention, I provide an open-topped cylindrical chamber, A, the lower end of which is hemispherical, or so curved as to join a central cylindrical flanged discharge-nozzle, *a*, by which communication is estab-

lished with an air-pump of any suitable construction. An injection-nozzle, *a*<sup>1</sup>, is formed upon the side of the chamber A, and, preferably, as near as practicable to its top, and a cleaning-opening closed by a screw-plug, *a*<sup>2</sup>, or by a lid or bonnet, is provided near the bottom of the chamber, to admit of the removal of sediment and impurities which may be deposited therein. An internal steam-receiving chamber, B, open at both ends, and composed of a series of frusta of cones joined, alternately, at their lesser and greater diameters, is placed within the chamber A, a flange, *b*, on its top resting on the top of said chamber, and a cylindrical nozzle, *b*<sup>1</sup>, at its bottom fitting closely within the discharge-nozzle *a*.

The several frusta of which the chamber B is composed are, alternately, perforated throughout with a series of small openings, *b*<sup>2</sup>, and imperforate, each of the openings being substantially at right angles to the surface in which it is formed, and the arrangement of perforated and imperforate sections being such as to provide a continuous blank or solid surface of metal above each series of openings, against which the water entering through the openings strikes, and is effectually sprayed or dispersed throughout the interior of the chamber.

The chamber B is held in position by a nozzle or cap, C, having a bottom flange, *c*, which rests upon the flange *b* of the chamber B, and a top flange, *c*<sup>1</sup>, by which it may be connected to the exhaust-pipe of the engine, the cap and inner and outer chambers being connected by bolts passing through the flanges *c* and *b*, and into a flange formed on the top of the outer chamber, A. The joints at this point may be either ground or packed, as preferred. An opening, *a*<sup>3</sup>, in the discharge-nozzle *a* admits of the convenient connection of a pipe leading to the vacuum-gage.

In operation; the injection-water supplied to the outer chamber through the nozzle *a*<sup>1</sup> passes, in a series of small jets, through the openings *b*<sup>2</sup> of the inner chamber, B, and is sprayed around and into the current of steam entering the inner chamber through the cap C, its effect in condensing being materially enhanced by its subdivision and distribution

around the surfaces of the inner vessel, as compared with the ordinary system of jet-injection, the result being, as I have found in practice, to effect a considerable reduction in the quantity of injection-water relatively to a maximum temperature of hot-well and maintenance of an effective approximate vacuum.

In the event of the openings in the inner chamber becoming clogged by deposit, they can be readily cleared by shutting off the injection-water and blowing steam through them, the plug  $a^2$  of the cleaning-opening being first removed, and sediment deposited in the outer chamber can be removed through the cleaning-opening at its bottom.

If the condenser requires to be removed for the purpose of internal examination or repair, this can be done by breaking the joints at the cap and discharge and injection nozzles, and removal and replacement can be effected without disturbing any portions of the mechanism with which the condenser is connected.

It will be obvious that, if preferred, the cap might be formed in one piece with the inner chamber instead of separately therefrom, as shown; but for various reasons I consider the latter arrangement to be a more desirable one.

I am aware that an inner perforated shell and an outer inclosing-case have been heretofore known in condensers, and do not therefore broadly claim said elements, either separately or in combination.

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

1. As a new article of manufacture, a steam-engine condenser consisting of an open-ended

outer case having a bottom discharge-nozzle for connection to an air-pump, and a side injection-nozzle for the reception of condensing-water, an inner perforated chamber which fits at bottom into the discharge-nozzle of the outer case and closes the upper end thereof, and a flanged cap or nozzle connecting the inner chamber with the exhaust-pipe of an engine, these members being constructed and operating to provide a direct passage for the steam and products of condensation into the inner chamber and out of the discharge-nozzle to the air-pump, and a circumferential application of the condensing-water to the inner chamber, substantially as set forth.

2. The combination, in a steam-engine condenser, of an outer chamber which receives the injection-water and an inner chamber which receives the exhaust-steam, said inner chamber being formed of a series of frusta of cones united alternately at their smaller and at their larger diameters, and being alternately perforated and imperforate, substantially as set forth.

3. The combination, in a steam-engine condenser constructed substantially as described, of an inner perforated chamber, an outer chamber, and a cleaning-opening and plug or door, to admit of the removal of sediment from the outer chamber, or of the expulsion of deposit from the perforations of the inner chamber by blowing steam through the same, as set forth.

WM. LEE CHURCH.

Witnesses:

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