

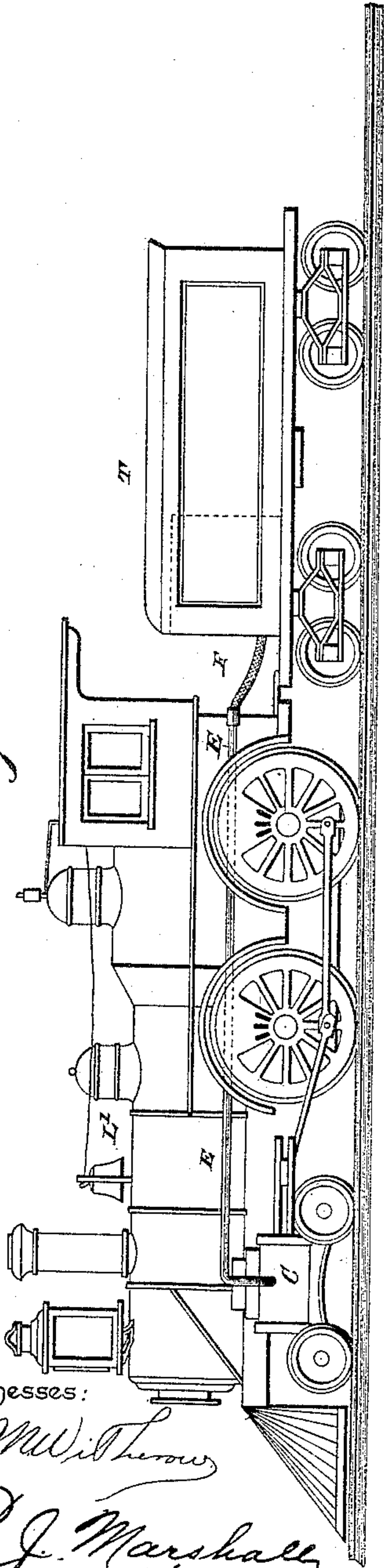
(No Model.)

I. J. HARTFORD.  
STEAM CONDENSER.

No. 442,885.

Patented Dec. 16, 1890.

Fig. 1.



Witnesses:

*J. M. Withers*  
*J. J. Marshall*

Fig. 3.

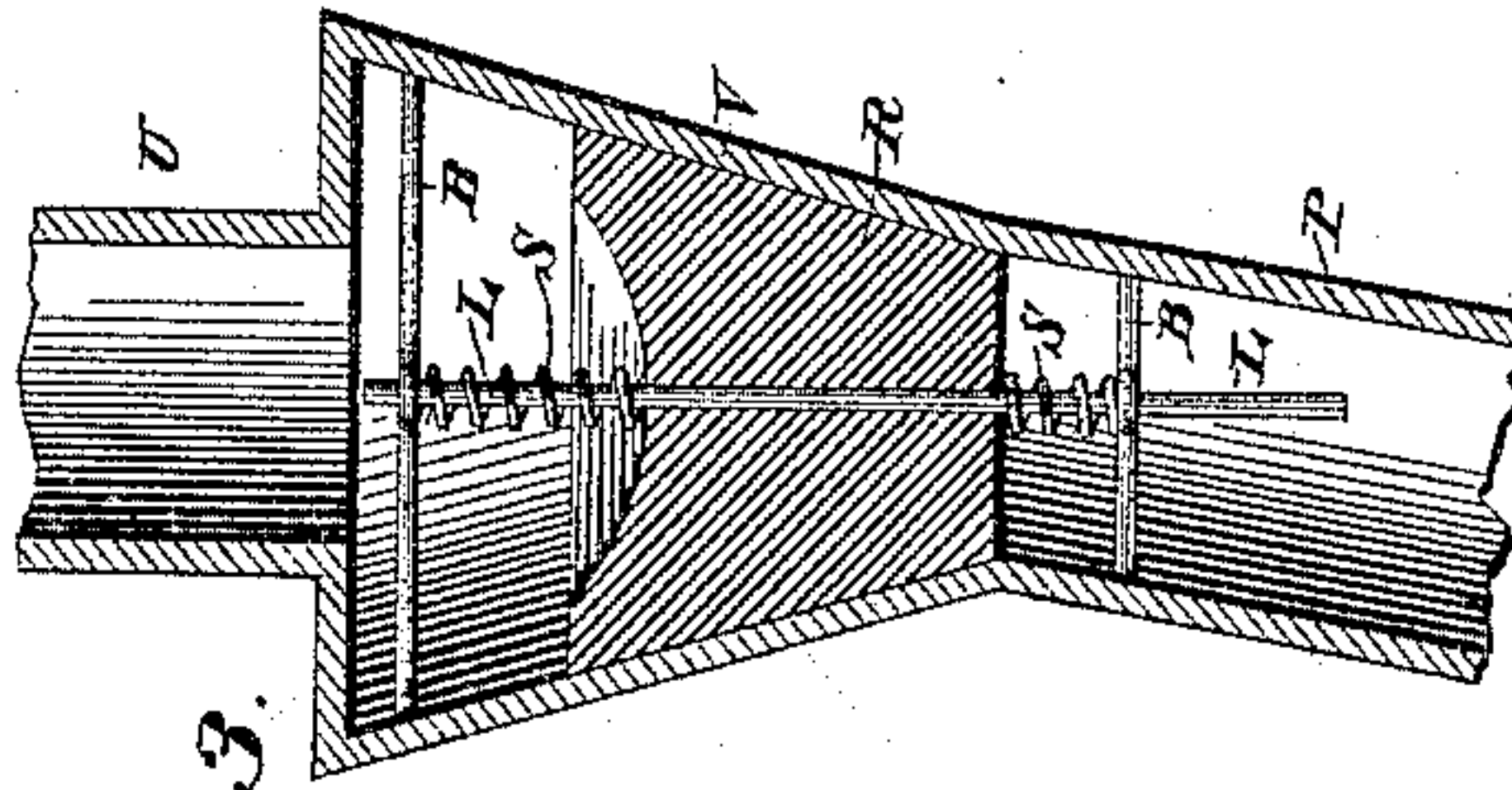
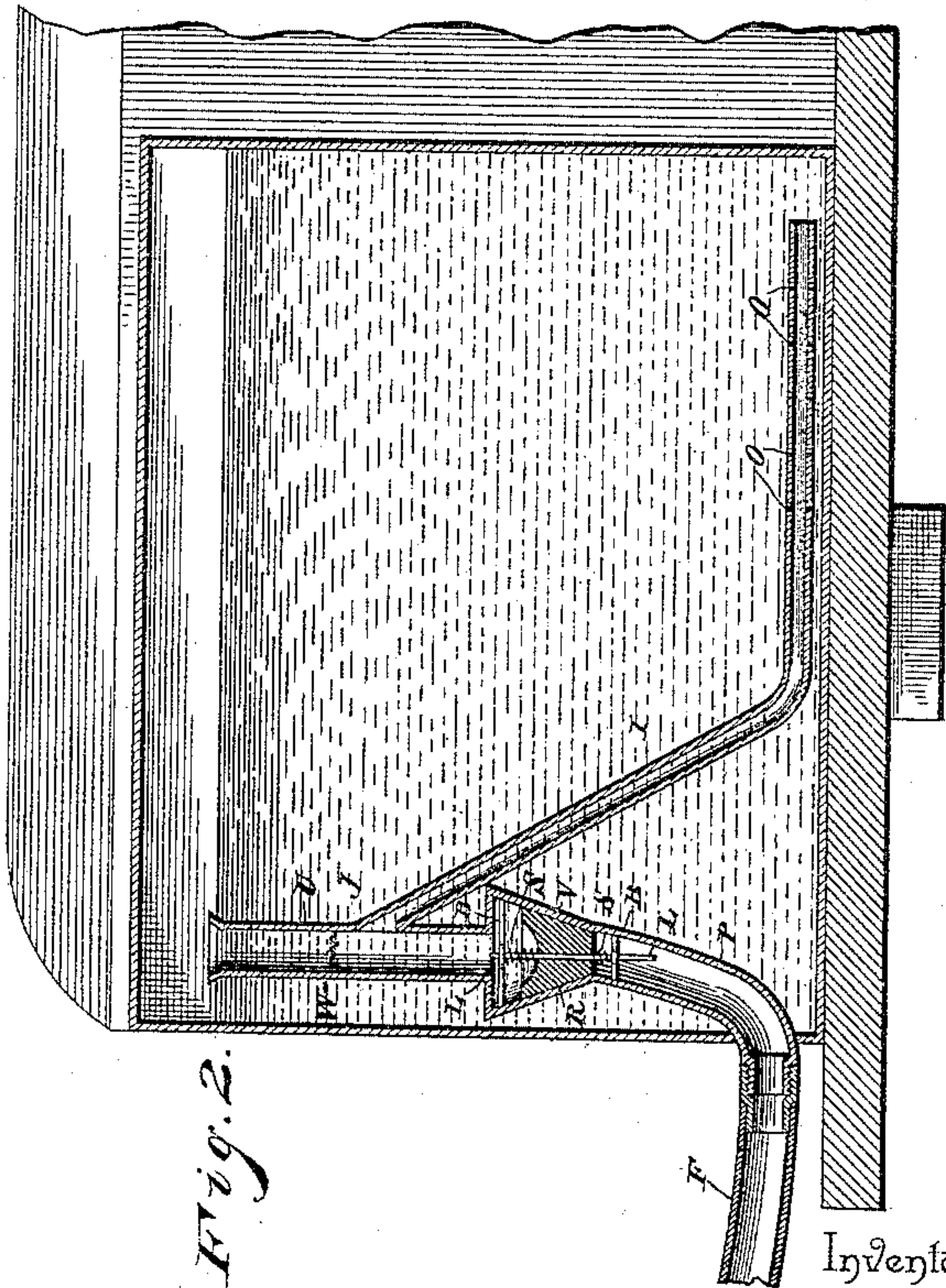


Fig. 2.



Inventor

*Isaac J. Hartford,*

By *his* Attorneys,

*C. A. Snow & Co.*



# UNITED STATES PATENT OFFICE.

ISAAC J. HARTFORD, OF KIRKSVILLE, MISSOURI.

## STEAM-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 442,885, dated December 16, 1890.

Application filed July 24, 1890. Serial No. 359,790. (No model.)

*To all whom it may concern:*

Be it known that I, ISAAC J. HARTFORD, a citizen of the United States, residing at Kirksville, in the county of Adair and State of Missouri, have invented a new and useful Steam-Condenser, of which the following is a specification.

This invention relates to steam-engines, and more particularly to that part thereof known as a "condenser;" and the object of the invention is to effect improvements upon devices of this same general character heretofore existing.

To this end the invention consists in the specific details of construction hereinafter more fully described, and illustrated in the drawings, in which—

Figure 1 is a side elevation of a locomotive and tender with my invention shown as applied thereto. Fig. 2 is an enlarged central vertical longitudinal section of the condensing device proper within the tank of the tender. Fig. 3 is an enlarged sectional detail view of the valve.

Referring to the said drawings, the letter L' designates the locomotive, and T the tender, the latter having a cold-water tank within its body, as is usual.

E is an exhaust-pipe leading from the cylinder C alongside the locomotive L' and connected by a flexible pipe or piece of tubing F with the condenser proper, which is located within the tank of the tender, by which means the steam as it is used in the cylinder is passed through the pipe E and flexible pipe F to the condenser proper. The latter is of the following specific construction:

P is a pipe leading upwardly within the tank of the tender and having a conical portion forming a valve-seat V within its body, above which it is extended upward, as at U, to about the water-level in the tank, where its upper end is left open, and the rubber pipe F is connected to the lower end of this pipe P, whereby the exhaust-steam will be caused to pass upwardly through the pipe. Within said conical valve-seat V is a correspondingly-shaped rubber valve R, having longitudinal stems L, around which are placed coiled springs S, which bear at their outer ends against cross-bars B within the pipe P, as best seen in Fig. 3.

I is an inlet-pipe arranged along the bottom of the tank and having a number of openings O in its body, whereby cold water will be admitted thereto, and this pipe is joined to the pipe P at the junction J above the valve R, as shown. Above this junction a wire screen W extends across the pipe P.

The steam, flowing rearwardly through the exhaust-pipe E, flexible pipe F, and condenser-pipe P, raises the valve R against the tension of its springs S, passes around said valve upwardly by the junction J, through the screen W, throughout the extension U, out of the upper end of the latter, and into the cold water within the tank. The condensation of the steam by reason of the surrounding body of cold water produces a partial vacuum within the extension U, and the upward flow of the steam out of the upper end of said extension also assists in setting up an inward current from the cold water within the tank, through the openings O into the inlet-pipe I, and through the junction J of the same with the extension U, where it joins the steam just before the screen W is reached. The water and steam in a mixed condition then pass through the wire screen, whereby the mixture is converted into spray or fine streams, and the latter pass out of the upper end of the extension U and fall over into the water within the tank. In this manner the steam has every opportunity of becoming condensed, not only by the action of the cold water surrounding the pipe P, valve-case V, and extension U, but also by its mixture with cold water at the junction J and by its separation into fine streams by means of the wire screen W. When the engine ceases to operate, the water in the tank by its pressure, as well as the springs S, closes the valve R to its seat V, and for this reason does not pass through the exhaust-pipe E into the cylinder.

Having thus described my invention, what I claim is—

1. The herein-described steam-condenser, the same comprising an upright pipe located within a cold-water tank, connected at its lower end with the steam-exhaust, open at its upper end within said tank, having a downwardly-closing valve within its body, a wire screen across said pipe above the valve, and an inlet-pipe leading from the bottom of the



tank upwardly into said pipe at a point between the valve and the screen therein, the whole operating substantially as and for the purpose set forth.

5 2. In a steam-condenser, the combination, with the exhaust-pipe E, the upright pipe P, connected therewith and located within a cold-water tank, its upper end being open within said tank, and a downwardly-closing  
10 valve R within said upright pipe, of a wire screen W across the upright pipe between the valve and the upper end of the pipe, the whole operating substantially as and for the purpose set forth.

15 3. In a steam-condenser, the combination, with the exhaust-pipe E, the upright pipe P, connected therewith and located within a cold-water tank, the conical valve-seat V in said upright pipe, the extension U above said  
20 valve-seat opening at its upper end within the

tank, and the wire screen W across said extension, of the cross-bars B within said pipe, the conical rubber valve R within said valve-seat, provided with longitudinal stems L, moving loosely through holes in said bars, springs 25 S between said valve and bars, and the inlet-pipe I, provided with openings O near one end which lies along the bottom of the tank, the other end of said inlet-pipe being extended upward and joined obliquely, as at J, 30 to said extension U between the valve and screen, the whole constructed and operating substantially as hereinbefore described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in 35 presence of two witnesses.

ISAAC J. HARTFORD.

Witnesses:

THEODORE BRIGHAM,  
J. D. MARKEY.