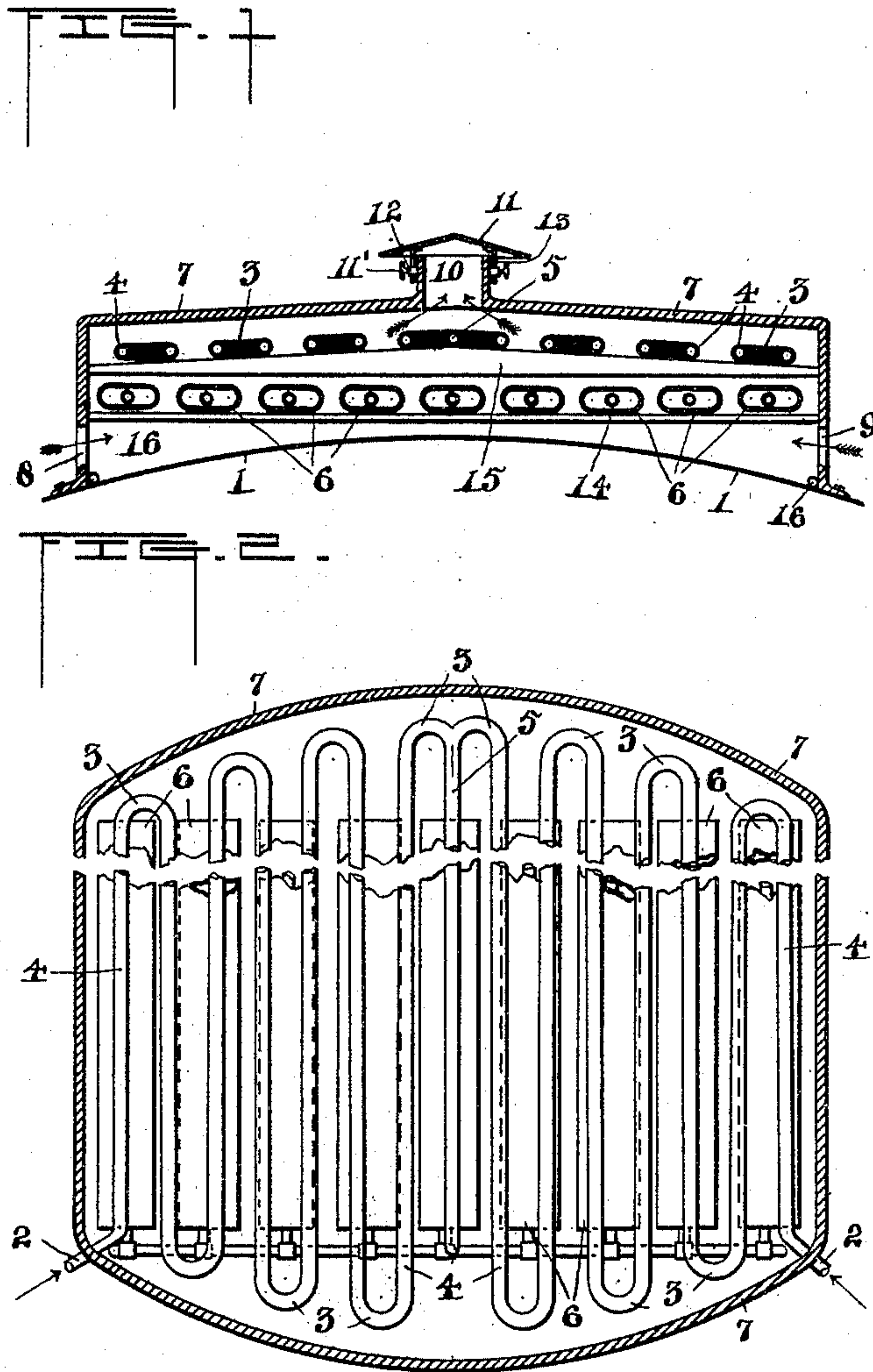


(No Model.)

W. E. PRALL.  
APPARATUS FOR CONDENSING STEAM.

No. 475,795.

Patented May 31, 1892.



WITNESSES

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# UNITED STATES PATENT OFFICE.

WILLIAM EDGAR PRALL, OF WASHINGTON, DISTRICT OF COLUMBIA.

## APPARATUS FOR CONDENSING STEAM.

SPECIFICATION forming part of Letters Patent No. 475,795, dated May 31, 1892.

Application filed August 3, 1891. Serial No. 401,571. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM EDGAR PRALL, a resident of Washington, in the District of Columbia, have invented certain new and useful Improvements in Apparatus for Condensing Steam; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

The object of the invention is to render invisible uncondensed exhaust-steam.

The improvement is primarily intended for use on vehicles propelled by the use of highly heated water stored in a tank and without an accompanying fire.

The invention consists in the construction hereinafter described and pointed out.

In the accompanying drawings, Figure 1 is a transverse section; and Fig. 2 is a horizontal section, a portion being broken out.

Numerals 1 indicates the top of a car, and 2 2 pipes leading from the exhaust-port of steam-engines. These may be of any desired number.

3 is a steam-coil or primary condenser of any desired form. In the present instance it is shown as consisting of a series of connected tubes or bends of pipe 4, leading to a common exit 5, through which the coil communicates with a condenser or secondary part 6 of a condenser. This is preferably of such construction that air and uncondensed steam may pass through the interstices of its walls, which for this purpose may be made of fibrous, reticulated, or porous material.

7 indicates a case inclosing the pipes or other condensing devices of analogous character. This may be of any convenient form. It is supported in the present instance by legs or walls 8. 9 are air-inlets intermediate the said supports.

10 is an outlet for air, and 11 an adjustable cover for the same secured by suitable means.

The drawings are largely diagrammatic in character, and set-screws 11', loops 12, and legs 13 are used to indicate the adjustability of the cover. It is designed to exclude rain, snow, and dirt, and is made adjustable to afford means for regulating the draft through the case.

14 and 15 denote supporting tubes or rods

for the condensers, and 16 indicates outlets for water of condensation, which may lead to a suitable receptacle or to the ground. The steam-inlet pipes 2 may be arranged in any convenient and suitable location and may run up through the car from the steam-cylinders or on the outside of the car. The gist of the invention is independent of details of this nature.

In operation the heat of the pipe 4 or its equivalent warms the surrounding atmosphere and causes an upward current, which draws air from around the condenser or condenser-exit, and whereby air and steam are mingled and passed over the bends of said pipe 4 and their temperature raised. It is obvious that if the condenser were made of small capacity, with a single exit, exhaust-steam might escape in such volume as to hinder in large degree the operation desired, and it would be possible to so construct the parts that the case would be practically filled with steam to the exclusion of air. For this reason it is preferred to discharge the vapor from the condenser through numerous outlets—as, for example, through the interstices of a woven fabric—and to provide a condenser of considerable extent, whereby pressure within it is so reduced that all liability of the exhaust to blow out of the air-inlets or to exclude air from the case is avoided, and such defective operation will easily be avoided by the means pointed out or by the mechanical equivalents thereof. Exhaust-steam is conducted into the coil 3 or into an equivalent receiver and is more or less cooled therein by radiation, the heat thereof being absorbed by the air passing through the tubes. From the receptacle 3 the partially-condensed steam passes into the lower condenser 6, where additional condensation takes place, the heat of the steam being absorbed by the air, which ascends in contact with the condenser 3. It is intended that as much of the exhaust as practicable shall be condensed in condenser 6, and under favorable conditions, as in a dry and hot atmosphere, it may all be so condensed. In case, however, visible vapor is discharged from this condenser it and the accompanying air will be heated by contact with the walls of the primary condenser 3, and the capacity of the air for absorbing moisture will



thereby be increased, so as to render said vapor invisible when discharged from the apparatus. As respects this latter effect, it is only essential that the exhaust-vapor be discharged from the condenser into the presence of the external air and of suitable means for heating the mingled air and exhaust steam or vapor to a temperature higher than the initial temperature of said mingled air and exhaust, whereby the absorbing capacity of the former is increased.

I do not broadly claim the heating of exhaust-steam, as I am aware that such exhaust has been mingled with hot gases in a smoke-stack. Neither do I claim circulating the exhaust in conduits adjacent to those conveying the water of condensation. It is characteristic of my improvement that temperature of air and exhaust steam or vapor after it has passed out into the atmosphere is heated in the presence of the external air in proximity to the condenser-exit or within a case surrounding the condenser or its exit. A steam-coil is preferred as a means of heating the vapor or exhaust after it has passed from the condenser into the air, and an inclosing case of substantially the form shown is preferred; but the particular character of the heating device and the case are not essential to the principle of operation, the gist of which is the raising of the temperature of the atmosphere in the vicinity and outside of the exhaust-vapor exit, the latter being in free and direct communication with the atmosphere, as distinguished from mingling the exhaust with hot gases before their discharge into the atmosphere.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. A steam-condenser having an exit in direct communication with the external air, combined with a heating device in proximity to said exit and adapted to raise the temperature of the air and exhaust after the latter has been discharged and mingled with air, the condenser-exit and the heating device having free communication with the atmosphere, substantially as set forth.

2. The steam-condenser consisting of a primary coil or part adapted to receive exhaust-steam and deliver it to a secondary coil or part, and said secondary coil having an exit in communication with the atmosphere and adapted to discharge vapor mingled with air in proximity to the primary coil, substantially as set forth.

3. The combination of a steam-condenser consisting of a primary coil or part adapted to receive exhaust-steam and deliver it to a secondary coil or part, and said secondary coil having an exit in communication with the air and adapted to discharge vapor mingled with air in proximity to the primary coil, with an inclosing case having an air inlet and outlet, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM EDGAR PRALL.

Witnesses:

BENJ. R. CATLIN,  
S. G. HOPKINS.