(No Model.)

A. M. DOANE.

CONDENSER HEAD FOR THE EXHAUST PIPES OF STEAM ENGINES.

No. 408,296. Patented Aug. 6, 1889.

Fig. 1.

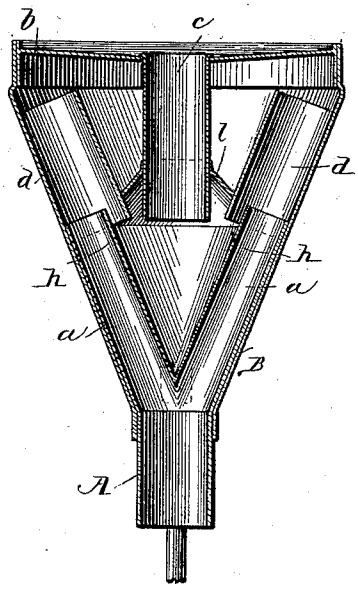


Fig. 2.

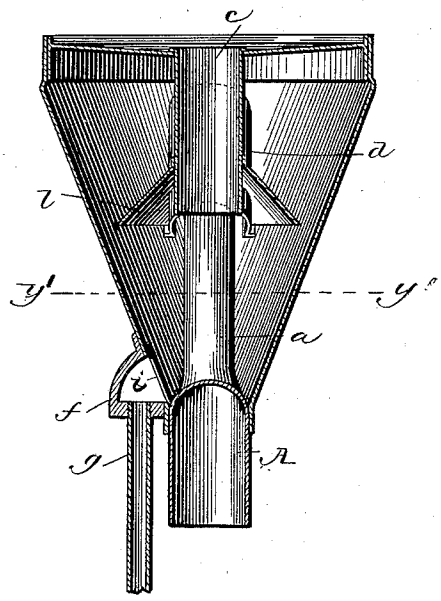
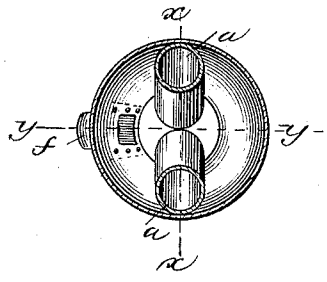


Fig. 3.



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AZADORE M. DOANE, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE LEEDS-BARRATT SUPPLY COMPANY, OF SAME PLACE.

CONDENSER-HEAD FOR THE EXHAUST-PIPES OF STEAM-ENGINES.

SPECIFICATION forming part of Letters Patent No. 408,296, dated August 6, 1889.

Application filed February 11, 1889. Serial No. 299,523. (No model.)

To all whom it may concern:

Be it known that I, AZADORE M. DOANE, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Condenser-Heads for Exhaust-Pipes of Steam-Engines, of which the following is hereby declared to be a full, clear, and exact description, sufficient to enable others skilled in the art to make and use the same.

The invention relates to condenser-heads for exhaust-pipes of steam-engines; and it consists of certain improvements in the construction of such heads, whereby the spent steam escaping from the engine may be in large part condensed and returned to a hot-water well or other suitable receptacle at the same time that the back pressure upon the engine is materially lessened. By condensing the exhaust-steam in the manner proposed the working of the engine is rendered much more economical, the hot water derived by condensation is utilized, and the objectionable discharge of grease, oil, and sediment which ordinarily occurs upon surfaces about the exhaust-steam pipe is entirely avoided.

The exact nature of the improvements proposed will appear from the description following, and be thereafter more distinctly pointed out in the claims at the conclusion thereof.

In the accompanying drawings, forming part of this specification, like letters of reference denote like parts hereof.

Figures 1 and 2 are sectional views of the condenser-head on lines $x\ x$ and $y\ y$, respectively, of Fig. 3. Fig. 3 is a cross-section view of such head on line $y'\ y'$, Fig. 2.

Mounted upon the upper end of the usual engine exhaust-pipe, or upon separate fitting at such end, as at A, is the inclosing-case B of the condenser-head. This case, which preferably is tightly joined to the exhaust-pipe terminal, may be of any desired shape, although preferably made conical in order to allow for the rapid drainage and discharge of the condensed water. The case is considerably larger than the exhaust-pipe from the engine to allow for the expansion of the steam therein and to expose a large surface for condensation. The terminal of the exhaust-pipe or of the fitting A extends within the case B of the condenser, and preferably is made with two or more branches, as at *a*, which constitute a union-joint with the pipe or terminal A. Branches *a* of the union-joint are arranged near the sides of the inclosing-case B, and about midway of the height of such case discharge into the open hoods *d*, which latter are conveniently sustained from the case B, and at their lower ends encompass the joint-terminals *a*, leaving passages, as at *h*, for the free admission of air. The hoods *d* range upwardly along the sides of the case B, and are closed from the outer air by the cap *b* of the case, which covers the top thereof and is furnished with an outlet or escape port, preferably at the center of such cap. The tube *c*, projecting within the case from the cap *b*, conveniently constitutes such outlet or passage, and at its inner or lower end terminates at about the level of the lower edges of the open hoods *d*.

A deflector or diaphragm *e* is preferably sustained from the tube-outlet *c*, and extends thence outwardly toward the walls of the case B and about the faces of the hoods *d*. Near the bottom of the case is a discharge-port *i*, opening into the box *f*, from which leads the pipe *g* for the return of the water of condensation to the well or other suitable receptacle provided therefor.

By the construction shown the spent steam escaping from the engine into the waste-pipe passes thence with the suspended watery vapor through the branches *a* of the union-joint into the chambers formed by the encompassing hoods *d*. Owing to the relation of the hoods *d* to the terminal branches *a*, a volume of air is freely drawn through the pipe *c* and channels *h* into the hoods *d*, and is there thoroughly mixed with the escaping steam and vapor. Rapid condensation is thus effected, the water accumulating as a fine spray upon the under side of the cap *b* and other parts of the head, draining thence away to the waste-port *i* and pipe *g*. The rapid condensation of the steam within the mixing-chamber, formed by the hoods *d* and beyond, tends to form a vacuum within the condenser-head, whereby back-pressure upon the steam-engine is correspondingly reduced and its working rendered more economical. The position of the outlet-pipe

c in relation to the channels *h*, leading into the hoods *d*, enables a copious volume of air to be discharged into the mixing-chambers, which result is also materially aided by the deflector *e*, which latter tends to direct the air into the channels *h* between the hoods and the terminals of the union-joint.

It is obvious that but one branch *a* need be employed in conjunction with the hood *d* and the inclosing-case B, although for balance and effective operation it is preferred to have double or union branches *a*, as shown, or even more.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In condenser-heads, the combination, with the expanded case and with the steam-inlet pipe joined tightly thereto and discharging therein, of the hood located within said case, inclosing the terminal of the inlet-pipe and open at both of its ends to constitute a mixing-chamber, whereby air may be freely drawn through the space between said terminal and its surrounding hood and be commingled with the steam within the hood to effect the rapid condensation thereof, substantially as described.

2. The combination, with the inclosing-case and its outlet, of the union inlet-pipes and the open hoods encompassing the same, substantially as described.

3. The combination, with the inclosing-case and its outlet-pipe projecting thereinto, of the union inlet-pipes and the open hoods therefor, having their lower edges at about the level of the inner end of the outlet-pipe, substantially as described.

4. The combination, with the inclosing-case and its outlet-pipe projecting thereinto, of the union inlet-pipes, the open hoods therefor, and the deflector extending from the outlet-pipe about said hoods and case, the lower edges of the hoods being about level with the inner end of the outlet-pipe, substantially as described.

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