(No Model.)

T. J. CLEAVER.

STEAM SEPARATOR.

No. 522,450. Patented July 3, 1894.

Fig. 1.

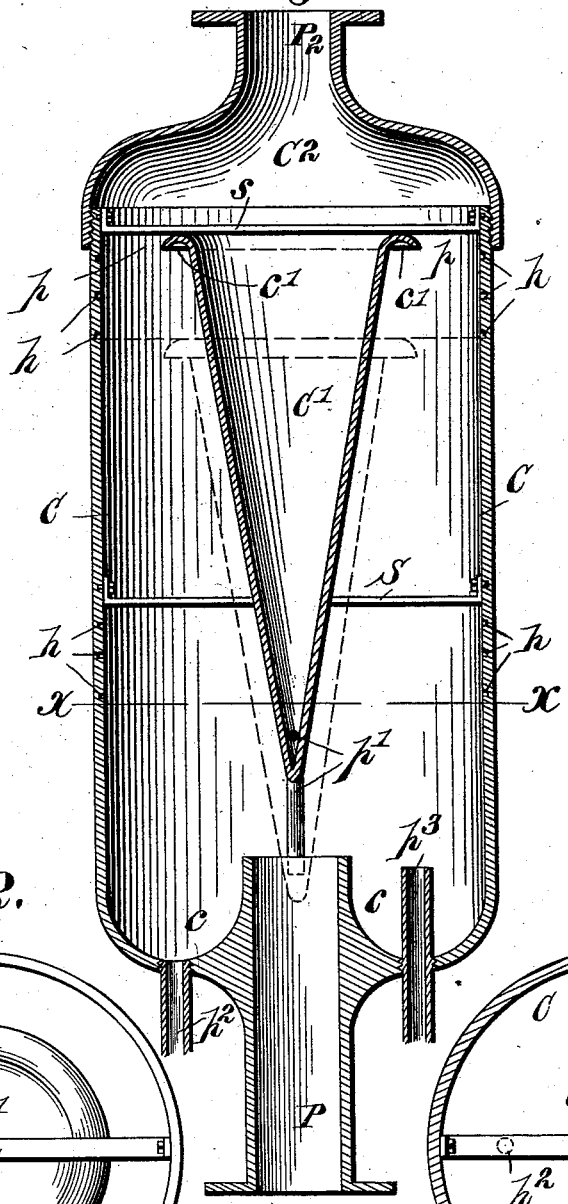


Fig. 2.

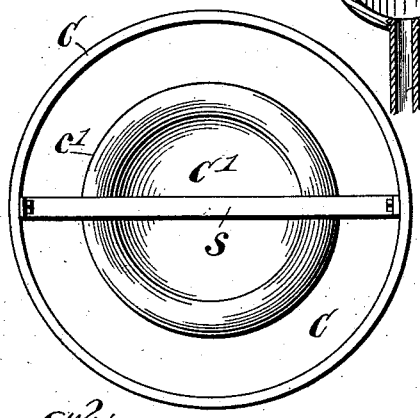
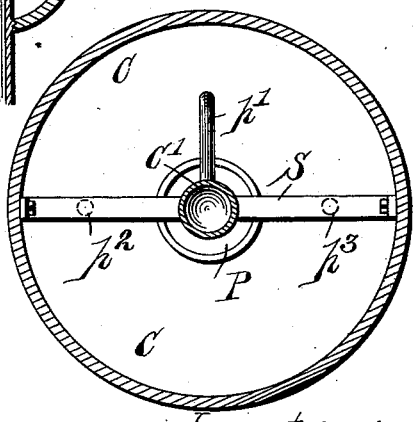


Fig. 3.



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THOMAS J. CLEAVER, OF CHESAPEAKE CITY, MARYLAND.

STEAM-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 522,450, dated July 3, 1894.

Application filed April 23, 1894. Serial No. 508,664. (No model.)

To all whom it may concern:

Be it known that I, THOMAS JEFFRIES CLEAVER, a citizen of the United States, residing at Chesapeake City, Cecil county, Maryland, have invented certain new and useful Improvements in Separators; 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 appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

My invention has relation to apparatus for separating water, oil, grease, and other matter that may be carried along with the exhaust steam from an engine cylinder, and it consists in the combination with the exhaust pipe, of an inverted separator cone provided with an overhanging annular flange at its wider end that forms with the cone, surfaces against or upon which the steam impinges, and whereby water, oil, grease, and other matter are arrested in their flight through the exhaust pipe, and are separated from the steam and precipitated; and in combination with the aforesaid cone, of means for draining off the matter separated from the steam, as will now be fully described, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical central section of a separator embodying my improvements. Fig. 2 is a plan view with the cap removed, and Fig. 3 is a section on line x—x of Fig. 1.

The separator consists of a casing C provided with a steam inlet pipe P that projects some distance above the bottom of said casing to form an annular receiving chamber c. Within the casing is suitably supported an inverted separator cone C′ whose apex lies axially of and slightly above the outlet of the inlet pipe P, the wider end of the cone being provided with an outwardly projecting annular and preferably downwardly curving flange c' of such a diameter as to leave between it and the inner wall of casing C an annular passage p for the exhaust steam. The casing is provided with a cap C^2 having an outlet branch P^2, the apparatus being in practice interposed in the exhaust pipe. Near its apex the cone C′ is provided with a drip pipe p' that extends downwardly nearly to the bottom of the receiving chamber c. The latter chamber is provided with a drain pipe p^2 whose inlet is flush with the bottom of said chamber, and with an oil eduction pipe p^3 that extends into the chamber to a point sufficiently below the outlet of pipe P to take the supernatant oil and grease and carry the same off. The pipes p' p^3 will in practice be provided with a suitable cut-off, as a stop cock, not shown, for the purpose of regulating the discharge of the water of condensation and of the oleaginous matter separated from the steam, and if desired the water of condensation may be returned to the boiler, and the oil or grease allowed to run to waste.

The operation of the apparatus is as follows: Steam entering by pipe P will impinge upon the outer surface of the cone C′ and upon the under face of the flange c', the impact resulting in the separation of the water of condensation, the oil or grease, and gritty matter which may be carried along with the steam from the engine cylinder or cylinders, the dry exhaust steam freed from oil, &c., passing through the annular passage p around the flange c' of the cone C′ to the atmosphere or to some point for further use. The water of condensation is allowed to accumulate in the chamber c until oil or oil and water escape from pipe p^3, when the cut-off in pipe p^2 is opened and the outflow of the water of condensation so regulated as to maintain the level of water in said chamber slightly below the inlet of pipe p'. If it is not desired to recover the oil, the pipe p' can be dispensed with. Such steam as may condense above the cone will either flow down along the inner walls of the apparatus to chamber c or drop into the cone, from whence it discharges into chamber c through drip pipe p'. In the drawings I have shown the separator cone arranged with its apex slightly above the outlet of pipe P. Under some conditions of use it may be found more advantageous to arrange the cone with its apex projecting more or less into the outlet of cone C′, as shown in dotted lines in Fig. 1, in which case the said outlet of pipe

P may be made to flare outwardly more or less, the location of the drip pipe p' being altered accordingly.

It is obvious that the apparatus may also be interposed in the feed pipe for the engine cylinders for the purpose of separating the priming from the live steam. It is also obvious that the separator cone can be adjustably secured within its casing through the medium of the support and retaining devices for said cone. In Fig. 1 I have shown a retaining device in the form of a cross bar or strap s, and a supporting device in the form of a spider S provided with a central opening for the reception of the small end of the cone, both bolted or otherwise secured to casing C. I have also shown a plurality of superposed bolt or screw holes h for the reception of the fastening bolts for each of said devices, whereby the said cone can be adjusted vertically in its casing within the desired limits.

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

1. The combination with a vertically arranged steam pipe, of a separator comprising a casing interposed in said pipe and provided with a steam inlet opening into said casing above the bottom thereof, and with a steam outlet diametrically opposite said inlet, and an inverted separator cone between and having its major axis in the axial plane of said steam inlet and outlet, said cone provided at its upper wider end with an overhanging annular flange, for the purpose set forth.

2. The combination with a vertically arranged steam pipe, of a separator comprising a casing interposed in said pipe and provided with a steam inlet opening into said casing above the bottom thereof, and with a steam outlet diametrically opposite said inlet, and an inverted separator cone between and having its major axis in the axial plane of said steam inlet and outlet, said cone provided at its upper wider end with an overhanging flange, and means for discharging water and oil or grease separately or together from the casing, for the purpose set forth.

3. The combination with a vertically arranged steam pipe, of a separator comprising a casing interposed in said pipe and provided with a steam inlet opening into said casing above the bottom thereof, and with a steam outlet diametrically opposite the said inlet, and an inverted separator cone between and having its major axis in the axial plane of said steam inlet, said cone provided at its upper wider end with an overhanging annular flange, means for discharging water and oil or grease separately or together from the casing, and a drip pipe opening into the smaller end of the cone and into the casing, for the purpose set forth.

4. The combination with a vertically arranged steam pipe, of a separator comprising a casing interposed in said pipe and provided with a steam inlet opening into said casing above the bottom thereof, and with a steam outlet diametrically opposite the said inlet, and an inverted vertically adjustable separator cone between, and having its major axis in the axial plane of said steam inlet and outlet, for the purpose set forth.

In testimony whereof I have hereto signed my name in the presence of two witnesses.

THOMAS J. CLEAVER.

Witnesses:
WAITMAN SMITHERS,
H. H. BRADY.