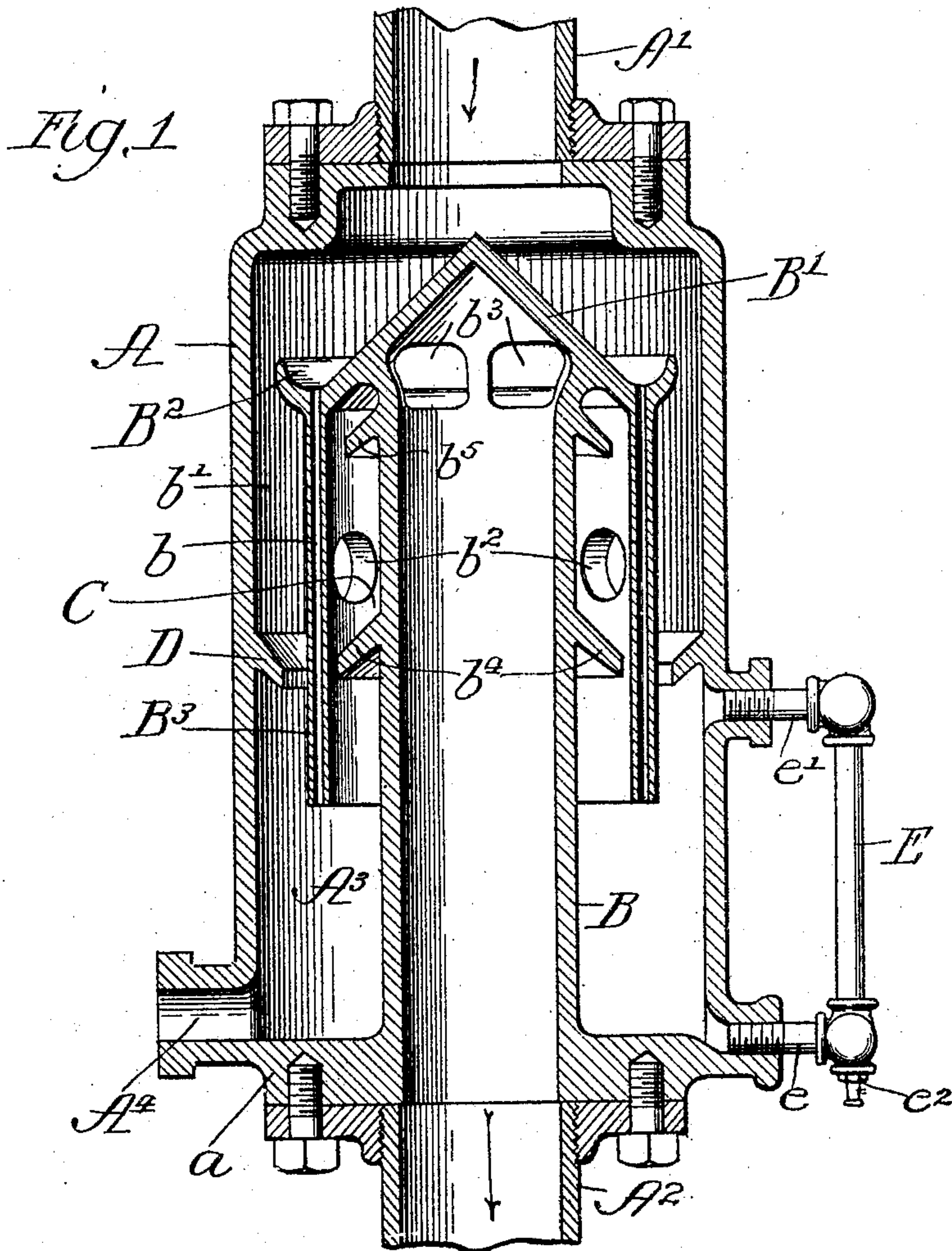


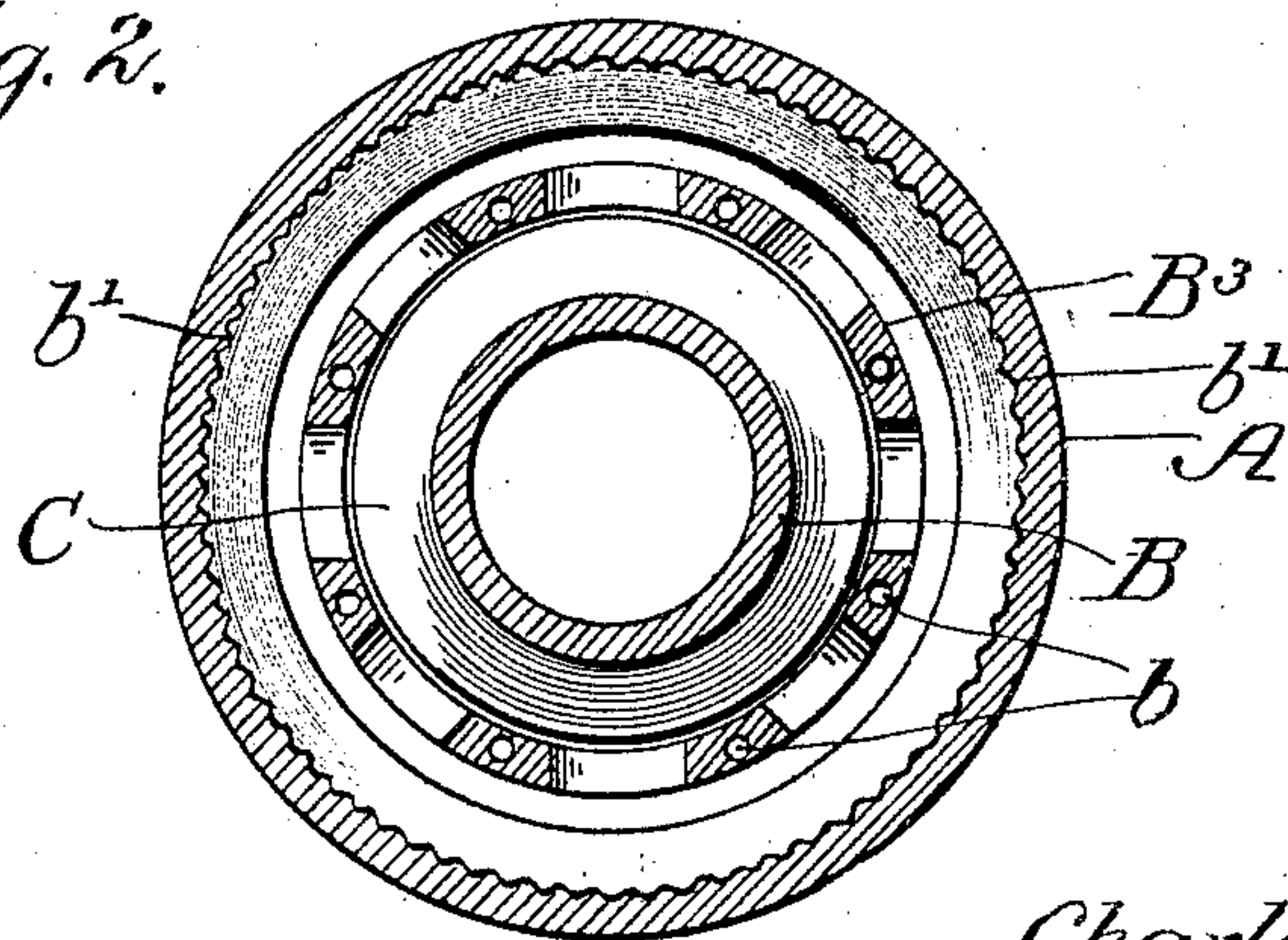
No. 796,429.

PATENTED AUG. 8, 1905.

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STEAM SEPARATOR.  
APPLICATION FILED OCT. 12, 1904.



*Fig. 2.*



Witnesses  
H. E. Bennett  
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Inventor  
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# UNITED STATES PATENT OFFICE.

CHARLES E. HUXLEY, OF CHICAGO, ILLINOIS.

## STEAM-SEPARATOR.

No. 796,429.

Specification of Letters Patent.

Patented Aug. 8, 1905.

Application filed October 12, 1904. Serial No. 228,191.

*To all whom it may concern:*

Be it known that I, CHARLES E. HUXLEY, a citizen of the United States, and a resident of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Steam-Separators; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form a part of this specification.

This invention relates to devices known as "steam" or "oil" separators which are employed in steam-pipes either for separating from the steam free water carried thereby or for separating oil and water from exhaust-steam of an engine. In the first-mentioned use of the device it is adapted to be located in the pipe extending from the steam-generator to an engine, and in the second use referred to it is adapted to be located between the engine and a condenser or other device into which the exhaust-steam is discharged, thereby preventing the oil following the exhaust-steam into any place of use of the exhaust-steam or water condensed therefrom.

The invention consists in the matters hereinafter set forth, and more particularly pointed out in the appended claims.

In the drawings, Figure 1 is a central vertical section of a separator made in accordance with my invention. Fig. 2 is a transverse section thereof, taken through the steam-openings in the shell B<sup>3</sup>.

My improved separating device is designed more especially for use in vertical pipes; and it consists of a generally cylindric or other suitably-formed casing A, provided at its upper end with a steam-inlet opening to which is connected a steam-pipe A<sup>1</sup> and in its lower end with a steam-discharge opening adapted for connection with a discharge-pipe A<sup>2</sup>. If the separator be located between a steam-generator and an engine, the pipe A<sup>1</sup> directs live steam from the generator to the casing and the pipe A<sup>2</sup> directs the dried steam to an engine. If located in a pipe leading from an engine to a condenser or the like, the pipe A<sup>1</sup> directs exhaust-steam from the engine to the casing of the separator and the pipe A<sup>2</sup> directs the steam after water and oil are separated therefrom to the condenser. The lower part of the casing, constituting a water or oil chamber A<sup>3</sup>, which receives these liquids sep-

arated from the steam, is provided at one side with a water or oil discharge A<sup>4</sup>, adapted to lead the water of condensation or the oil therefrom to a suitable place for the disposal thereof. Located centrally in said casing and rising from the lower wall *a* thereof is a vertical tubular member or steam-passage B, which extends almost into the top of the casing and is formed at its upper end or is provided with a conical top B', the apex of which conical top is located near the inlet-opening of the casing. Said conical upper end of the tube B may be made separately therefrom or integral therewith, the latter construction being herein shown. At the base of said cone B' is formed an annular shallow trough B<sup>2</sup>, which receives free water which is contained in the steam, the steam striking said cone B' and the water falling by gravity into said trough. The steam and water is detained by such trough a sufficient length of time to permit the separation of water therefrom. Depending from said trough and surrounding the upper end of said tube B is an annular shell B<sup>3</sup>, which is made of such diameter as to provide an annular chamber C between it and the tube B and an annular chamber *b'* between it and the wall of the casing A. Said annular shell B<sup>3</sup> is provided with one or more of vertical passages *b*, which open at their upper ends into the annular trough B<sup>2</sup> and which conduct the water separated from the steam downwardly therethrough into the chamber A<sup>3</sup>, from which it passes outwardly through the passage A<sup>4</sup>. The annular trough B<sup>2</sup>, surrounding the base of the cone B', is made of less exterior diameter than the interior diameter of the casing A, and the steam spread outwardly by the cone B' passes between said trough and the wall of the casing into the annular passage or space *b'* between the shell B<sup>3</sup> and the wall of the casing. The interior of said casing-wall is herein shown as made corrugated. Said wall of the casing A is provided beneath said trough with an interior downwardly-inclined annular ledge or flange D, which extends at its inner margin closely to the shell B<sup>3</sup>, and its presence prevents water from being lifted out of the water-chamber A<sup>3</sup> by reason of sudden lowering of pressure in the inlet side of the device. The shell B<sup>3</sup> is provided at or above the said ledge or flange D with a plurality of relatively large openings *b*<sup>2</sup>, and the steam entering the annu-



lar passage  $b'$  passes through said openings  $b^2$  into the annular space or passage C between the tube B and shell  $B^3$  and from thence passes upwardly to the top of said space and enters the top of the steam-passage or tube through openings  $b^3$  in the walls of said tube B below the cone  $B'$  thereof. The steam passes thence downwardly through the tube B and outwardly through the pipe  $A^2$  communicating therewith. Said tube B is provided above and below the levels of said openings  $b^2$  of the casing  $B^3$  with exterior downwardly-inclined annular flanges or ledges  $b^4$   $b^5$ , respectively. The upper flange or ledge  $b^5$  constitutes a baffle-plate against which the steam strikes in passing upwardly through the passage C and causes a retardation of the steam, so as to permit free water therein to drop by gravity therefrom, and the annular oblique flange or ledge  $b^4$  below the openings  $b^2$  retards any steam which may pass downwardly beyond the oblique ledge D and enter the passage C from below. The retardation of such steam as may enter the lower end of the said annular passage C and strike the flange or ledge  $b^4$  provides an ample time for the separation of the free water from the steam. With this construction, therefore, ample opportunity is provided to permit the steam to be separated from the water contained therein, and the greater portion of the steam—to wit, that which passes through the openings  $b^2$  in the shell  $B^3$ —reaches the tube B through the openings  $b^3$  without passing through the water or oil which has been separated from the steam. The bulk of the steam, therefore, in its passage through the device and after the greater portion of the water or oil has been separated therefrom in the trough  $B^2$  is freed from the water or oil which is separated therefrom and passes out of said device free from said liquid constituents of the vaporous steam which enters the device.

A water-glass E is provided at one side of the water-chamber  $A^3$ , having a branch  $e$  at its lower end which is connected with the chamber  $A^3$  and at its upper end a branch  $e'$ , which is connected with the said chamber above the level of the shell  $B^3$  and by means of which the level of the water in the device may be determined. Said water-glass is provided with a valve  $e^2$  at its lower end by which it may be emptied. The presence of the flange or ledge D and the flange or ledge  $b^4$  prevents water or oil which may be contained in the chamber  $A^3$  from being carried upwardly by sudden reduction of pressure in the upper end of the casing and outwardly through the steam-inlet pipe  $A'$ , and the ledges or flanges  $b^4$   $b^5$  tend to prevent the water or oil being carried upwardly by the same means to the top of the tube B.

Changes may be made in the structural details of the device without departing from the

spirit of the invention, and I do not wish to be limited to such details except as hereinafter made the subject of specific claims.

I claim as my invention—

1. A separator for the purpose set forth, comprising a vertical casing provided in its upper end with an inlet-opening and at its lower end with an outlet-opening, an upright tube within the casing and communicating with the outlet-opening, a cone at the upper end of the tube and formed at its base to provide an annular trough, a shell surrounding said tube and depending from said trough, said shell being provided with a plurality of vertical passages which communicate at their upper ends with said trough and discharge at their lower ends into a liquid-chamber in the lower end of said casing, and provided also with an opening through which the steam is adapted to pass to the annular space between said tube and casing, and the upper part of the tube being provided with a plurality of openings through which the steam may pass from said latter annular space into the upper end of the upright tube and thence outwardly through the outlet-opening.

2. A separator for the purpose set forth, comprising a vertical casing provided in its upper end with an inlet-opening and at its lower end with an outlet-opening, an upright tube within the casing and communicating with the outlet-opening, a cone at the upper end of the tube and formed at its base to provide an annular trough, a shell surrounding said tube and depending from said trough, said shell being provided with a plurality of passages which communicate at their upper ends with said trough and which discharge at their lower ends into a liquid-chamber in the lower end of said casing, said shell being also provided with an opening into which the steam is adapted to pass to the annular space between said tube and casing, and the upper part of the tube being provided below said cone with an opening through which the steam may pass from said annular space into the upper end of said upright tube and outwardly through the outlet-opening, and a draw-off passage communicating with the liquid-chamber at the lower end of the casing.

3. A separator for the purpose set forth comprising a casing provided at its top with an inlet-opening and at its bottom with an outlet-opening and also at its bottom with a liquid-chamber, an upright tube within the casing communicating with the outlet-opening, a cone at the upper end of the tube against which the steam impinges, a trough surrounding the base of the cone, and of smaller diameter than the interior diameter of the casing, a shell depending from said trough and provided with a transverse opening through which steam may pass from the space between the shell and wall of the casing to the space be-



tween the shell and tube, said tube being provided beneath the cone with an opening through which steam may pass to the upper end of said upright tube, said shell surrounding the tube being provided with a plurality of vertical passages communicating at their upper ends with said trough and discharging at their lower ends into said liquid-chamber.

4. A separator for the purpose set forth comprising a casing provided at its top with an inlet-opening and at its bottom with an outlet-opening, a cone at the upper end of the shell against which the steam impinges, a trough surrounding the base of the cone, a shell depending from said trough and provided with a transverse opening through which steam may pass from the space between the shell and wall of the casing to the space within the shell, a tube depending from the cone and communicating at its lower end with said outlet-opening, said tube being provided beneath the cone with an opening through which steam may pass thereinto and thence to the outlet of the device, the shell surrounding the tube being provided with a plurality of vertical passages communicating at their upper ends with said trough and at their lower ends with the said liquid-chamber, the wall of the casing being provided beneath the level of the openings of the shell with an interior, annular, oblique ledge or flange.

5. A separator for the purpose set forth comprising a casing provided at its top with an inlet-opening and at its bottom with an outlet-opening, a cone at the upper end of the shell against which the steam impinges, a trough surrounding the base of the cone, a shell depending from said trough and provided with a transverse opening through which steam may pass from the space between the shell and wall of the casing to the space within the shell, a tube depending from the cone and communicating at its lower end with said outlet-opening, said tube being provided beneath the cone with an opening through which steam

may pass thereinto and thence to the outlet of the device, the shell surrounding the tube being provided with a plurality of vertical passages communicating at their upper ends with said trough and at their lower ends with the said liquid-chamber, the tube being provided above and below said transverse opening of the shell with exterior ledges or shell which extends toward but stop short of the inner wall of the shell.

6. A separator for the purpose set forth comprising a casing provided at its top with an inlet-opening and at its bottom with an outlet-opening and also at its bottom with a liquid-chamber, a tube rising from the bottom of the casing and communicating with the outlet-opening, a cone at the upper end of the shell against which the steam impinges, a trough surrounding the base of the cone, a shell depending from said trough and provided with a transverse opening through which steam may pass from the annular space between the shell and wall of the casing to the space between the shell and tube, said tube being provided beneath the cone with an opening through which steam may pass to the upper end of the vertical tube to the outlet of the device, said shell surrounding the tube being provided with a plurality of vertical passages communicating at their upper ends with said trough through which water is adapted to pass to the liquid-chamber below, the tube being provided in the space surrounded by said shell and above said inlet-opening to the shell with annular flanges which retard the passage of steam upwardly through said space.

In testimony that I claim the foregoing as my invention I affix my signature, in presence of two witnesses, this 12th day of September, A. D. 1904.

CHARLES E. HUXLEY.

Witnesses:

WILLIAM L. HALL,  
D. E. MARMON.