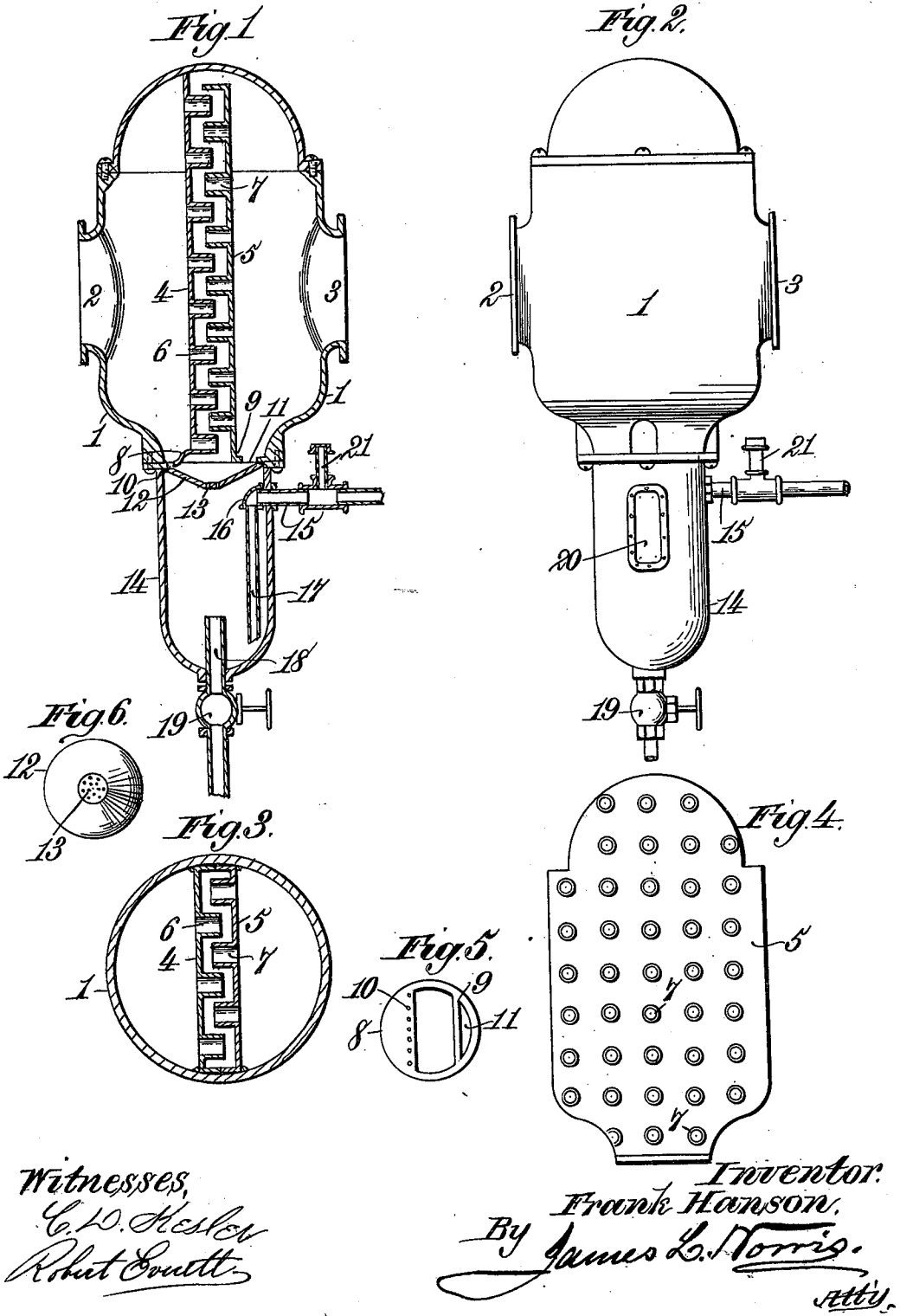


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SEPARATOR.

(Application filed July 9, 1900.)

(No Model.)

2 Sheets—Sheet 1.



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(No Model.)

2 Sheets—Sheet 2.

Fig. 7.

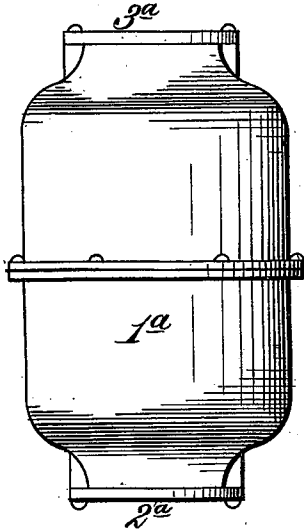


Fig. 8.

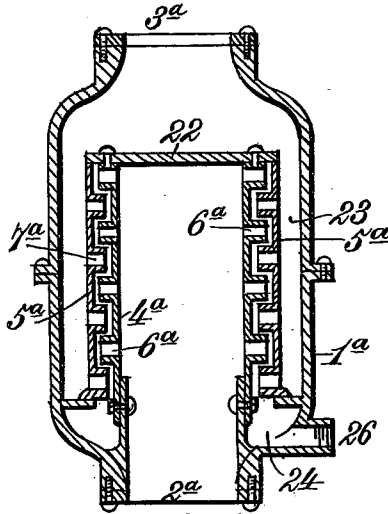


Fig. 9.

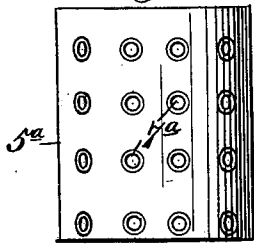
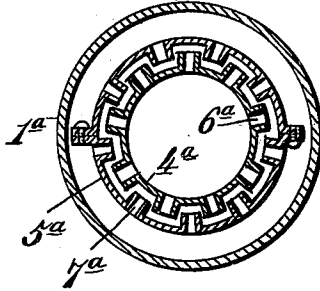


Fig. 10.



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UNITED STATES PATENT OFFICE.

FRANK HANSON, OF DALLAS, TEXAS.

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SPECIFICATION forming part of Letters Patent No. 675,276, dated May 28, 1901.

Application filed July 9, 1900. Serial No. 23,036. (No model.)

To all whom it may concern:

Be it known that I, FRANK HANSON, a citizen of the United States, residing at Dallas, in the county of Dallas and State of Texas, have invented new and useful Improvements in Apparatus for Separating Oil or Grease, Grit, and Water of Condensation from Steam, of which the following is a specification.

It is the principal object of my invention to provide an improved apparatus for separating oil or grease, grit, and water of condensation from steam, either live steam or exhaust-steam, as it passes to or from an engine or steam-pump.

Another object of my invention is to provide means for automatically separating the oil, grease, or other foreign matter from the water after the same has been separated from the steam, so that the water may be reheated, if necessary, and conducted to boiler-feed devices, to be thereby transferred to a boiler and again converted into steam.

My invention consists in features of construction and novel combinations of parts in a steam-separator and an oil-extractor, as hereinafter more particularly described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is a vertical longitudinal section of one form of my improved apparatus for eliminating oil and water from steam. Fig. 2 is an elevation of the same. Fig. 3 is a horizontal section of the steam-chamber. Fig. 4 is an elevation of one of the baffle-plates located in the steam-chamber and provided with tubes projecting therefrom on one side. Fig. 5 is a horizontal section of a lower portion of the baffle devices in the steam-chamber. Fig. 6 is a plan of a centrally-perforated concavo-convex disk that constitutes the bottom of the steam-chamber, separating it from a receiving-chamber beneath. Fig. 7 is an elevation of a modified form of the eliminator or apparatus for separating steam, oil, and water of condensation. Fig. 8 is a vertical longitudinal section of the same. Fig. 9 is an elevation of a modified form of baffle device. Fig. 10 is a horizontal section of the modified form of steam-chamber and baffle devices therein.

Referring first to Figs. 1 to 6, showing what may be termed a "horizontal" form of the

apparatus and in which the construction is such as to adapt the eliminator to be directly connected with horizontally-arranged steam inlet and outlet pipes, the reference-numeral 1 designates a steam-chamber having a lateral inlet-port 2 and a lateral outlet-port 3, placed opposite each other. This steam-chamber 1 may be somewhat vertically elongated, as shown, or may have any other suitable form.

Within the steam-chamber 1, Fig. 1, and extended across the same from side to side and top to bottom there are placed two opposing baffle-plates 4 and 5, Figs. 1, 3, and 4, of approximately trough shape and having open-ended tubes 6 and 7 projecting, respectively, from said baffle-plates and arranged with relation to each other, as shown in Figs. 1 and 3. These open-ended tubes 6 and 7 project inwardly between the baffle-plates 4 and 5 toward the opposing baffle-plate, but are not in line with each other, thereby preventing a direct passage of steam through said baffle-plates. The steam enters the inlet-port 2 of the steam-chamber 1, thence passes through the open-ended tubes 6 of the baffle-plate 4, and impinges against the inner side of the opposite baffle-plate 5, next passing through the open-ended tubes 7 of the baffle-plate 5 and thence outward through the outlet-port 3 of the steam-chamber. It will be observed by reference to Figs. 1 and 3 that the open-ended tubes 6 and 7 of the two opposing baffle-plates 4 and 5 are so arranged as to break joints with each other, so that the steam is compelled to take a tortuous or zig-zag passage through the space between the two opposing baffle-plates, being thereby subjected to friction and consequently broken up into minute particles, which greatly facilitates the separation of any water of condensation, oil or grease, or any foreign matter contained in the steam.

The oil and water of condensation entering the space between the two opposing baffle-plates will pass by gravity to the lower part of the steam-chamber, while the separated and cleansed or dry steam will leave the steam-chamber 1 through its outlet-port 3, to be conducted therefrom to any required destination.

The bottom portions of the two opposing baffle-plates 4 and 5 are constructed, respec-

tively, with outwardly-turned flanges 8 and 9, Figs. 1 and 5, one of which is provided with a series of perforations 10 and the other with a slot or opening 11 to facilitate escape from the lower part of the steam-chamber of any steam that might otherwise tend to accumulate at that point.

The bottom of the steam-chamber 1 consists of a concavo-convex disk or plate 12, that is located below and adjacent to the lower end portions of the two above-described opposing baffle-plates. In its center this concavo-convex disk 12 is provided with a series of perforations 13, Figs. 1 and 6, to permit the passage of oil and water of condensation, &c., from between the baffle-plates and into a receiving-chamber 14, Fig. 1, that is located below the steam-chamber.

From an upper portion of the receiving-chamber 14 there is led off a laterally-extended pipe 15, Figs. 1 and 2, to convey away the water of condensation. At its inner end this pipe 15 communicates through an elbow 16, Fig. 1, with a depending pipe 17, that is extended downward to near the bottom of the receiving-chamber. A vertically-extended drain-pipe 18, Fig. 1, is passed through the bottom of the receiving-chamber for draining off the oil or grease and similar foreign matter floating on the surface of the liquid contained in said receiving-chamber. The upper open end of this oil-drain pipe 18 is extended a suitable distance above the lower open end of the water-drain pipe 17, so that the lower end of said pipe 17 will not become fouled. In the oil-drain pipe 18 there is provided a hand-valve 19, that can be manipulated from time to time as required to effect drainage of the oil. A sight-glass 20, Fig. 2, is arranged in one side of the receiving-chamber for inspection of its condition. It will be understood that the weight or pressure of the liquid contained in the receiving-chamber 14 will force the pure condensed water of condensation to pass off through the pipe 17 to the pipe 15, by which it may be conducted in a nearly boiling condition to a feed-water heater or direct to the boiler, if required. An air-chamber 21, Figs. 1 and 2, is coupled with the pipe 15 and in communication therewith to equalize the pulsations of an engine or pump at this point between the eliminator or separator and the feed-water heater.

By employing an oil-drainage pipe from the water-drainage pipes 15 17 the water of condensation drawn off from the chamber 14 will be entirely free from oil and can be at once used over again in making steam.

It will be observed that the construction and arrangement of the baffle-plates and their tubes in the steam-chamber are such as to perfectly separate the water and oil from the steam, allowing the steam to pass on and bringing down the oil and water to the receiving-chamber. The means that I have provided for getting the separated water of condensation from under the oil floating thereon

and for conveying this pure water to the heater constitutes an important feature of my invention and is an item of large economy in the running of a steam plant, as it brings to the feed-water heater the same water that has been already once used in the form of steam and without any great loss of heat. In order to effect a perfect separation of steam with elimination of oil and extraneous matter, it is necessary to break up the steam into very small particles before it can be separated from foreign matter. This is thoroughly effected in my improved steam-separator and oil-extractor without involving any large expense in the construction of the apparatus. Besides with my apparatus there is absolutely no back pressure on the engine.

This apparatus for separating steam from oil and water of condensation, &c., may be employed to advantage in a variety of situations. For instance, it may be used to great advantage on a live-steam line to separate water of condensation from the steam and deliver dry steam to an engine or pump. It may be also used next to a heater on an exhaust-pipe to eliminate oil and pass the water at an already high temperature into a heater. If desired, it may be placed inside the heater to do the same work. It may be also employed to advantage on the exit end of an exhaust-pipe to separate oil and water from the steam, and thus prevent troublesome showering of oil and water on a roof or elsewhere, which is often a very objectionable annoyance.

In Figs. 7 to 10 I have illustrated a form of the apparatus that may be termed "vertical," the steam-chamber 1^a being provided with an inlet-port 2^a at the bottom and with an outlet-port 3^a at the top, as shown in Figs. 7 and 8. In this construction it is preferable to employ concentrically-arranged inner and outer baffle-plates 4^a and 5^a, each provided with small open-ended tubes 6^a and 7^a, Figs. 1, 8, and 10. As shown in Fig. 8, the concentrically-arranged baffle devices are supported at their lower ends from the bottom of the steam-chamber. The space inclosed by the concentrically-arranged baffle-plates 4^a and 5^a is closed at the top by a horizontally-arranged baffle-plate 22, Fig. 8, and an annular steam-space 23 is provided between the outer baffle-plate and the wall of the steam-chamber. An annular receiving-chamber 24 is provided at the bottom of the steam-chamber 1 and is located immediately below the concentrically-arranged baffle devices. This annular receiving-chamber 24 is separated from the annular steam-space 23 of the steam-chamber by a suitable horizontally-arranged annular partition 25, Fig. 8. A drain-pipe 26, Fig. 8, may lead from the receiving-chamber 24 at any suitable point for exit of oil, water of condensation, and other matter separated from the steam.

The form of apparatus illustrated in Figs. 7, 8, and 10 is termed "vertical" by reason of being arranged to connect with vertically-

arranged pipes for passage of steam to and from the separating apparatus. As shown in Fig. 8, steam will enter the separator or eliminator through the inlet-port 2^a into the space 5 enclosed by the concentrically-arranged baffle-plates. From this space the steam passes through the tubes 6^a outwardly and impinges against the inner side of the outer baffle-plate 5^a, thence passing through the small tubes 7^a 10 into the annular space 23, and so on to the outlet-port 3^a at the top of the apparatus. Any oil, water of condensation, or other extraneous matter contained in the steam will gravitate between the baffle-plates, and thus 15 enter the receiving-chamber 24, whence it will gradually pass off, the principle of operation of this form of apparatus being substantially the same as that already described, in that by passage of the steam between the 20 baffle-plates and through the small tubes thereon the steam will be broken into minute particles, with thorough and easy elimination of oil and water. A receiving-chamber having an interior construction similar to the receiving-chamber 14, hereinbefore described, 25 might be connected with the outlet 26 of the receiving-chamber 24, thereby providing for separation of oil from the water of condensation, so that the apparatus will be adapted to furnish pure water to a heater, as before 30 described.

What I claim as my invention is—

1. In an apparatus for separating oil, water of condensation or other extraneous matter 35 from steam, the combination of a steam-chamber provided with an inlet-port and an outlet-port, baffle devices located in said steam-chamber intermediate its outlet and inlet ports and provided with small open-ended 40 tubes, the tubes of each baffle device being arranged to break joints with the tubes of an adjoining baffle device, whereby the steam is caused to take a zigzag passage between the baffle devices and is broken into minute particles, a receiving-chamber in communication 45 with the space between the baffle devices to receive oil and water of condensation therefrom, and separate drainage devices for water and oil leading from said receiving-chamber, substantially as described. 50

2. In a steam-separator, the combination of a steam-chamber provided with an inlet-port and an outlet-port, baffle-plates located in said steam-chamber intermediate its said 55 ports and each provided with numerous small open-ended tubes, the said tubes on one baffle-plate being arranged to break joints with the tubes on the adjoining baffle-plate, whereby the steam entering the steam-chamber is 60 caused to take a zigzag passage through said tubes between the baffle-plates, with separation of oil and water from the steam in the space between said plates, and a receiving-chamber located in communication with the 65 lower portion of the space between said baf-

fle-plates to receive oil and water of condensation therefrom, and separate drainage devices for the oil and water of condensation, substantially as described.

3. In a steam-separator, the combination of 70 a steam-chamber provided with an outlet-port and an inlet-port, baffle-plates located vertically in said steam-chamber between its said ports and each provided with numerous small open-ended tubes, whereby the steam that enters 75 said chamber is caused to pass in a zigzag direction through said tubes and between said plates, to break up the steam into small particles and eliminate oil and water of condensation, a perforated disk constituting the 80 bottom of said steam-chamber, a receiving-chamber located beneath said perforated disk and provided with separate drainage devices for water and oil, and an equalizing air-chamber connected with the water-drainage device, 85 substantially as described.

4. In a steam-separator, the combination of a steam-chamber provided with an inlet-port and an outlet-port, opposing baffle-plates arranged vertically in said steam-chamber between 90 its said ports and each provided with numerous small open-ended tubes, the tubes of one baffle-plate being projected toward and arranged to break joints with the tubes of the adjoining plate, a receiving-chamber located 95 below said steam-chamber, a perforated concavo-convex disk or plate constituting the bottom of said steam-chamber and the top of said receiving-chamber, and separate drainage 100 devices for oil and water of condensation, leading from said receiving-chamber, substantially as described.

5. In a steam-separator, the combination of a steam-chamber provided with an inlet-port and an outlet-port, baffle-plates located in said 105 steam-chamber and each provided with numerous small open-ended tubes, the tubes on one baffle-plate being arranged to break joints with the tubes on an adjoining baffle-plate, whereby the steam entering said steam-chamber 110 is caused to pass in a zigzag direction through said tubes and between said baffle-plates, a receiving-chamber in communication with the space between the baffle-plates, a drainage-pipe for water of condensation 115 leading upward from a lower part of the receiving-chamber and outward from an upper part of said chamber, an oil-drainage pipe leading from the receiving-chamber at a point above the lower end of the water-drainage 120 pipe, and a valve for controlling the oil-drainage pipe, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

FRANK HANSON.

Witnesses:

WM. BURR,
IDA L. BURR.