H. H. TRACY.

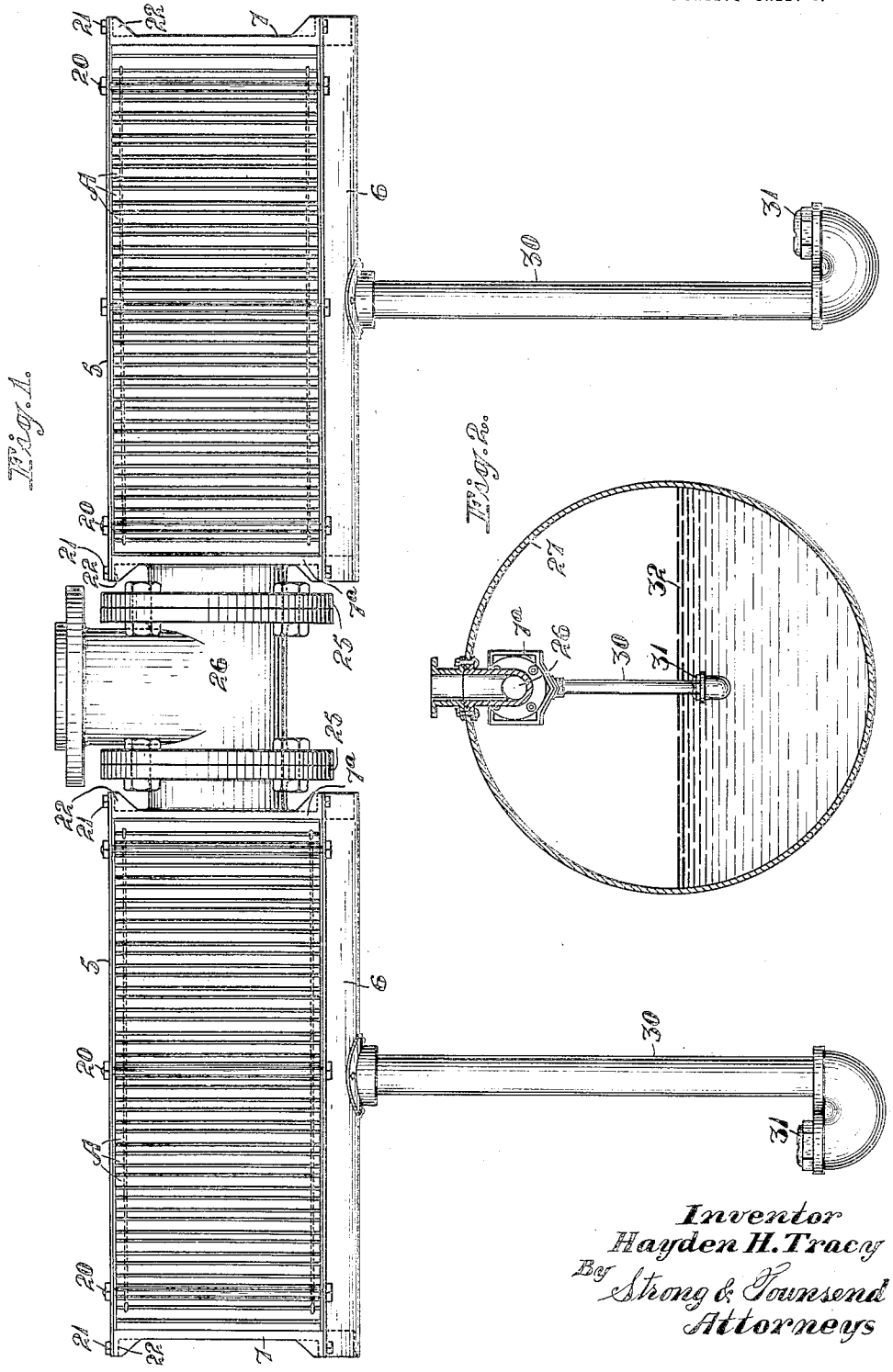
STEAM SEPARATOR.

APPLICATION FILED SEPT. 4, 1918.

1,336,870.

Patented Apr. 13, 1920.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

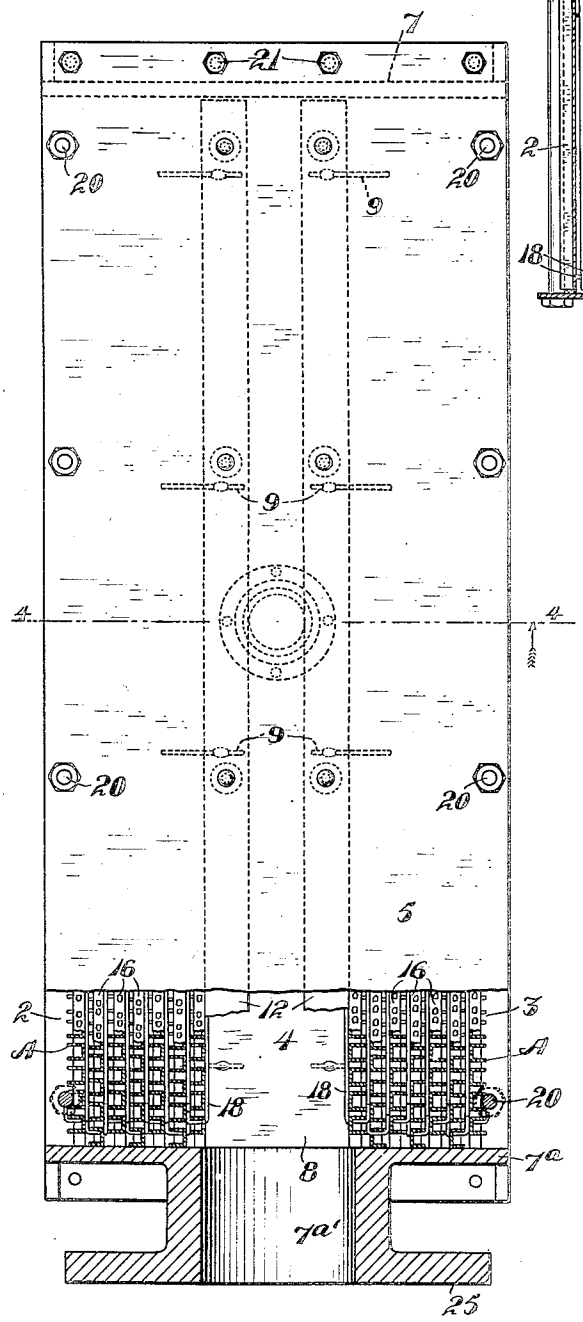


Fig. 4.

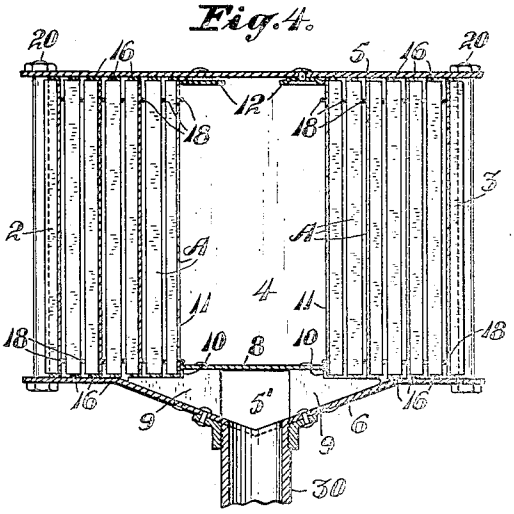


Fig. 5.

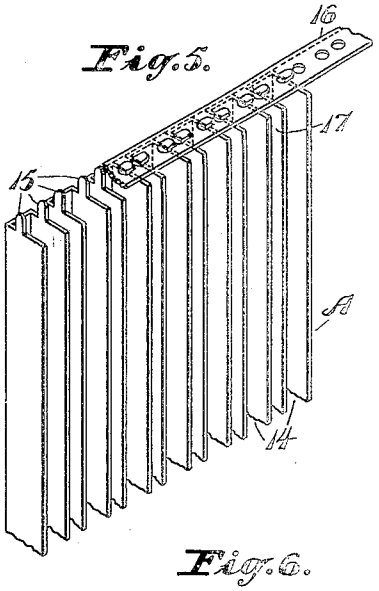
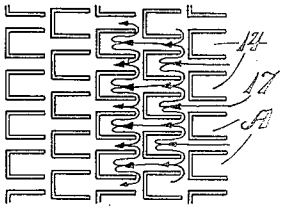


Fig. 6.



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UNITED STATES PATENT OFFICE.

HAYDEN H. TRACY, OF SAN FRANCISCO, CALIFORNIA.

STEAM-SEPARATOR.

1,336,870. Specification of Letters Patent. Patented Apr. 13, 1920.

Application filed September 4, 1918. Serial No. 252,627.

To all whom it may concern:

Be it known that I, HAYDEN H. TRACY, a citizen of the United States, residing at the city and county of San Francisco and State of California, have invented new and useful Improvements in Steam-Separators, of which the following is a specification.

This invention relates to a steam separator, and particularly to improvements on the structure shown in my former patent entitled, "Steam separator" Patent No. 1,124,556, issued January 12, 1915.

One of the objects of the present invention is to provide a series of interspaced channel shaped baffles for separating or removing the moisture from steam, said channel shaped baffles being arranged in plate-like formation and staggered with relation to each other to constantly change the path of flow of the steam as it passes through the baffle plates, and to trap and carry away the moisture contained.

Another object of the invention is to provide a light simple substantial housing for the reception of the baffling plates, said housing being so constructed that it may be readily dismantled if necessary to pass it through the manhole of a boiler or steam drum and to assemble it after insertion.

Another object of the invention is to provide a housing which is convertible to the extent that a number of the same may be connected with a manifold, or any one may be provided with single or double end outlets, and also to provide a housing in which the steam can freely escape without disturbing the water collected, and furthermore to provide means for automatically draining the water collected. Further objects will hereinafter appear.

The invention consists of the parts and the construction and combination of parts as hereinafter more fully described and claimed, having reference to the accompanying drawings in which—

Figure 1 is a side elevation of a pair of steam separators connected as a single unit.

Fig. 2 is an end view of the steam separator showing its position within the steam drum.

Fig. 3 is a plan view of the steam separator partly in section showing the staggered position of the channel shaped baffles.

Fig. 4 is a cross section on line 4—4, Fig. 3.

Fig. 5 is a detail perspective view of a portion of one of the baffling plates showing how the individual channel baffles forming a baffling plate are secured and maintained in interspaced position with relation to each other.

Fig. 6 is a diagrammatic view showing the staggered position of the channel baffles.

Referring to the drawings in detail, A indicates in general a series of baffle plates, which, in this instance, are arranged in two groups as shown at 2 and 3 to form a central steam passage 4. The baffling plates contained in each group extend from end to end of a housing, which consists of a top plate 5, a bottom plate 6, and a pair of ends or heads 7 and 7ª, respectively. The bottom plate 6 is V-shaped along the central portion as shown in Figs. 1 and 4 to permit a formation of the water collecting chamber 5′. The water collecting chamber is separated with relation to the central steam passage 4 by an intermediate plate 8, said plate being secured with relation to the bottom plate 6 by means of a series of lugs 9. The plate 8 is riveted or otherwise secured to the upper faces of the lugs, while the lugs proper may be formed integral with the bottom section or otherwise secured thereto. The lugs 9 are offset as at 10, first, to form a stop or shoulder for the innermost baffle plates 11, and also to form a seat for the three innermost rows of plates as shown in Fig. 4, the offset portion 10 of the lugs being on a plane with the outer edges of the bottom plate 6 so as to maintain all the baffling plates in each group in direct alinement in a vertical plane. A stop or shoulder is also formed in the upper part of the housing by securing thereto a pair of strips 12. These strips also extend from end to end of the housing, and therefore, serve the function in conjunction with the intermediate plate 8 to support the innermost baffling plates 11 in interspaced position, and in parallelism with each other.

The construction of each baffling plate is more clearly shown by referring to Fig. 5. It will here be seen that each baffle plate consists of a series of channel shaped baffles such as shown at 14. The upper and lower end of each channel baffle is provided with lugs 15, and as these are passed through a perforated securing strip 16 it can readily be seen that any distance desired may be maintained between each channel baffle as shown at 17, and also that each strip will be rigidly maintained in alinement with the

others. A baffle plate therefore consists of a series of interspaced channel shaped baffles vertically disposed and secured together in alinement by the perforated strips 16 and the lugs 15 passing therethrough, which are clenched and bent over to prevent the individual baffles from being removed. The baffle plates thus constructed are placed between the top and bottom plates of the housing, one plate outside of the other until as many rows of the same as desired are obtained, the channel shaped baffles in each plate being staggered with relation to each other as shown in Fig. 6 to constantly change the direction of the flow of the steam, as will hereinafter be described.

The individual plates A forming each group are interspaced with relation to each other on a longitudinal plane by wire rods 18 extending from end to end of each plate. There are a pair of wire rods on each plate, that is, an upper and a lower rod, and these rods are secured by merely perforating the outermost channel baffles and passing a wire therethrough, and then securing the wire ends by clenching or bending the same. The size of the wire or rods employed is comparatively small so that the spacing between the individual plates will not be too great.

The top and bottom plates between which the baffling plates are positioned are secured together by means of bolts 20 passing through the outer edges of the plates as shown in Figs. 1, 3 and 4, the heads 7 and 7^a being similarly secured by bolts or capscrews 21, the heads being flanged as at 22 to form substantial seats for the top and bottom plates, and also to permit capscrews such as shown at 21 to be employed if desired. The housing thus assembled may be provided with a single or double end outlet if desired, a single end outlet for each housing being shown in Fig. 1, that is, two independent steam separators are here shown, both provided with single outlets as at $7^{a'}$. These outlets are flanged as at 25, and may, therefore, be rigidly secured to a T fitting 26, or the like, which passes through the shell of the steam drum shown at 27. If a double outlet is desired, it is possible to place a head member such as shown at 7^a on each end of the housing, thus permitting both ends to be connected with separate outlets, if desired. Similarly, if one steam separator alone is employed, it is possible to connect the head 7^a with an elbow.

In actual operation referring to Figs. 1, 3 and 6, it will be seen that the steam has free entrance to the housing from each side. The steam thus entering will pass between the spaces 17 in the outermost row of the baffling plates, and as the spaces through which steam enters is in direct alinement with the channels of the second row, it can readily be seen that the steam will impinge in the bottom of said channels, and that the flow of the steam will be reversed, as it will have to pass outwardly over each side of each channel shaped baffle, and then through the spaces 17 formed in the second plate. The steam thus escaping from the second baffling plate again impinges in the channels of the third plate where the direction of the flow is again changed, the change of flow of the steam being constantly changed until it finally escapes through the innermost plates 11 into the central passage 4. The steam is here thoroughly dried, and will finally pass out through the head 7^a and the T 26. The impinging of the steam against the several channel shaped baffles during its passage through the several plates has a tendency to precipitate or remove any moisture contained. Any moisture thus collected is trapped in said channels, and will, therefore, drain downwardly and enter the collecting chamber 5′ where it is permitted to automatically drain through pipe 30, on the lower end of which is mounted a check valve 31, the lower end of the pipe 30 and the check valve 31 being extended to a point where they are submerged below the water level 32, thus preventing steam from backing up through the pipe 30 and escaping without passing between the baffling plates.

To more thoroughly understand the need and the performance of the steam separator here shown it must be understood that many boilers have a tendency to foam. The condition known as foaming may be described as a mass of bubbles entirely filling the steam space of the boiler, and said bubbles being so durable that they remain a considerable time without breaking, therefore, instead of only steam leaving the boiler, the discharge is composed of foam, which becomes broken up in its journey to the engine, said bubbles when broken precipitate water in such quantities that it not only reduces the efficiency of the engine, but often causes serious damage.

Another difficulty is that scum or mineral matter are often carried out on the bubbles or possibly inside of the same. This scum deposits a soft scale in the superheaters, the steam piping and on the blades of the steam turbines, thereby interfering with their proper and efficient performance.

The steam separator here shown is provided with an exceedingly large separating surface that therefore not only removes the scum referred to, but it also serves the function of thoroughly breaking up the foam, and it also thoroughly removes the water and moisture contained, said water being permitted to constantly drain downwardly to the collecting chamber 5′ and permitted to escape through the pipe 30. The provision of the intermediate plate 8 prevents the steam after entering the central passage 4

from carrying away any of the water collected.

The construction of the housing is exceedingly simple, and such that it may be readily dismantled, so that the individual parts may be passed through a comparatively small manhole if required, said parts being just as readily assembled once inserted. The separator is furthermore convertible as each separator may be provided with single or double end outlets, and it is furthermore light in construction as the channel baffles forming the several plates are constructed of thin sheet metal and secured between top and bottom plates 5 and 6, which, themselves, may be constructed of comparatively thin plates, the only castings required being heads 7 and 7ª, and any fittings which may be required.

The materials and finish of the several parts of the separator may be such as the experience and judgment of the manufacturer may dictate.

I also wish it understood that various changes in form, proportions and minor details of construction may be resorted to within the scope of the appended claims, and that I do not wish to limit myself to the specific design and construction here shown.

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

1. A steam separator comprising a housing, a plurality of baffling plates extending from end to end of said housing, means for maintaining said baffling plates in parallelism and interspaced with relation to each other, a central steam passage formed in the housing between the baffling plates, a water collecting chamber extending from end to end of the housing formed below the steam passage and a separating wall between said steam passage and said water collecting chamber.

2. A steam separator comprising a series of interspaced baffling plates, said baffling plates being arranged in two groups parallel with each other and interspaced to form a central steam passage, a top and bottom plate between which the baffling plates are secured, a pair of end plates secured to the top and bottom plates, a V shaped offset in the bottom plate forming a water collecting chamber extending from end to end of the baffling plates, a plurality of lugs on the bottom plate, and an intermediate plate secured on said lugs to separate the water collecting chamber from the central steam chamber.

3. A steam separator comprising a series of interspaced baffling plates, said baffling plates being arranged in two groups parallel with each other and interspaced to form a central steam passage, a top and bottom plate between which the baffling plates are secured, a pair of end plates secured to the top and bottom plates, a V shaped offset in the bottom plate forming a water collecting chamber extending from end to end of the baffling plates, a plurality of lugs on the bottom plate, an intermediate plate secured on said lugs to separate the water collecting chamber from the central steam chamber, means for automatically draining water collected, and means permitting the free escape of steam which enters the central passage.

4. In a steam separator, a plurality of baffling plates, each plate comprising a top and bottom securing strip, a plurality of channel shaped baffling members secured between said strips and interspaced with relation to each other, said securing means comprising bendable lugs on the upper and lower ends of each channel-shaped member, and perforations formed in each strip, through which the lugs are extended and secured.

5. In a steam separator, a plurality of baffling plates, each plate comprising a top and bottom securing strip, a plurality of channel shaped baffling members secured between said strips and interspaced with relation to each other, means on each baffling plate for maintaining it interspaced with relation to a succeeding plate, said means comprising a wire rod extending from end to end of each baffle plate, and secured at each end thereof.

6. In a steam separator, a plurality of baffling plates, each plate comprising a top and bottom securing strip, a plurality of channel shaped baffling members secured between said strips and interspaced with relation to each other, means on each baffling plate for maintaining it interspaced with relation to a succeeding plate, said means comprising a pair of wire rods extending from end to end of each baffling plate, one at the upper end of the plate and one at the lower end of the plate, said wire rods passing through perforations at each end of a baffling plate and secured therein.

7. In a steam separator comprising a housing having steam inlet passages in its side walls and a steam outlet passage in an end wall thereof, a group of baffling plates mounted within said housing adjacent each side of the wall, said groups being interspaced to form a central steam passage, and each group comprising several series of baffling plates, each of which extend between the opposite end walls of said housing, a central water collecting chamber formed in the bottom of said housing extending the entire length thereof, a separating wall between said collecting chamber and said central steam passage, said wall also serving to hold the lower ends of the baffling plate groups against inward move-

ment, and means secured to the top wall of said housing to hold the upper ends of said baffle plate groups against inward movement.

8. In a steam separator comprising a housing having steam inlet passages in its side walls and a steam outlet passage in an end wall thereof, a group of baffling plates mounted within said housing adjacent each side of the wall, said groups being interspaced to form a central steam passage, and each group comprising several series of baffling plates, each of which extend between the opposite end walls of said housing, a central water collecting chamber formed in the bottom of said housing extending the entire length thereof, a separating wall between said collecting chamber and said central steam passage, and means for automatically draining water entering the water collecting chamber.

9. In a steam separator comprising a housing having steam inlet passages in its side walls and a steam outlet passage in an end wall thereof, a group of baffling plates mounted within said housing adjacent each side of the wall, said groups being interspaced to form a central steam passage, and each group comprising several series of baffling plates, each of which extend between the opposite end walls of said housing, a central water collecting chamber formed in the bottom of said housing extending the entire length thereof, a separating wall between said collecting chamber and said central steam passage, and a downwardly extending pipe connected to said collecting chamber, having a check valve secured on its lower end for automatically draining the water entering said collecting chamber.

In testimony whereof I have hereunto set my hand in the presence of a subscribing witness.

HAYDEN H. TRACY.

Witness:
ROBERT R. RUSS.