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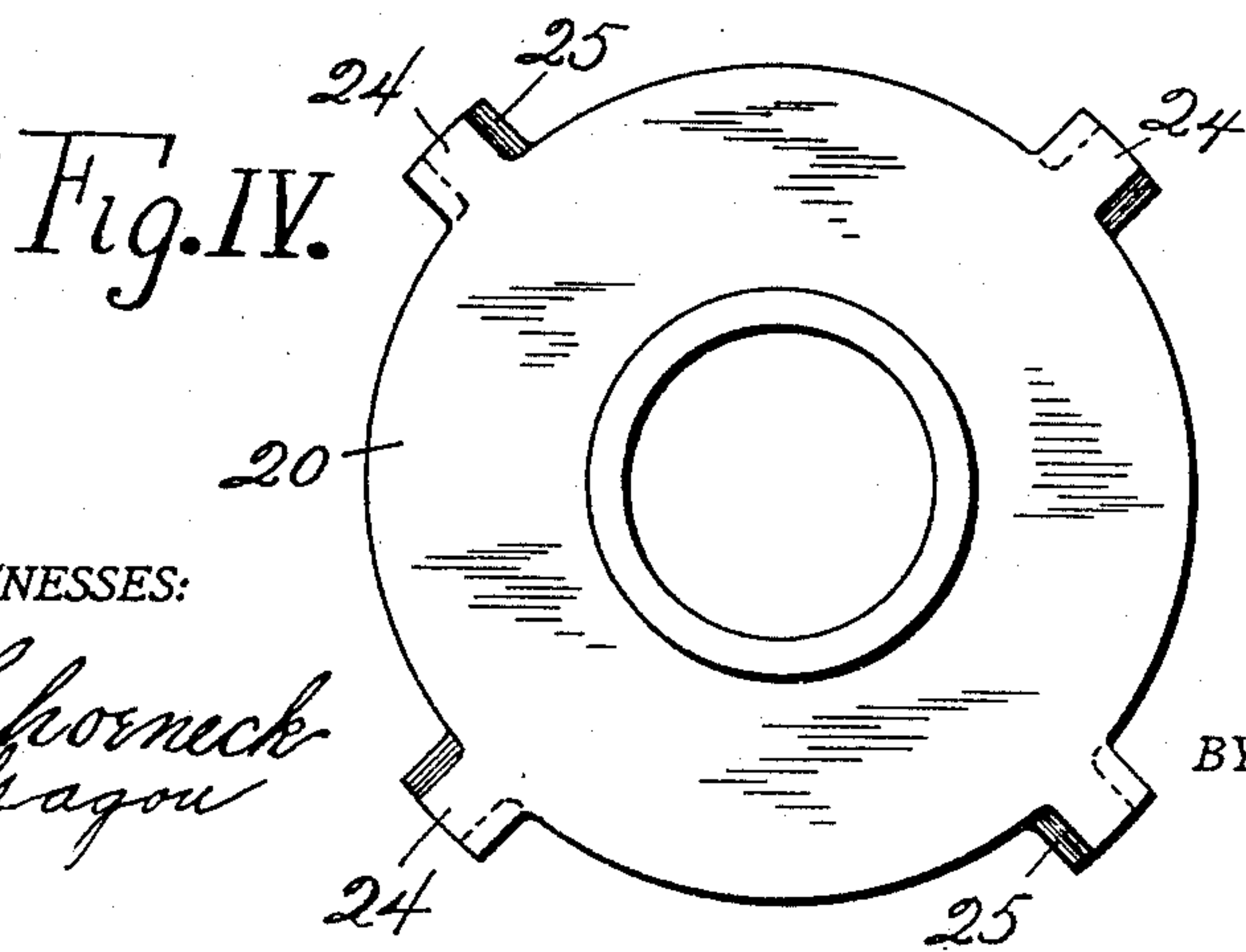
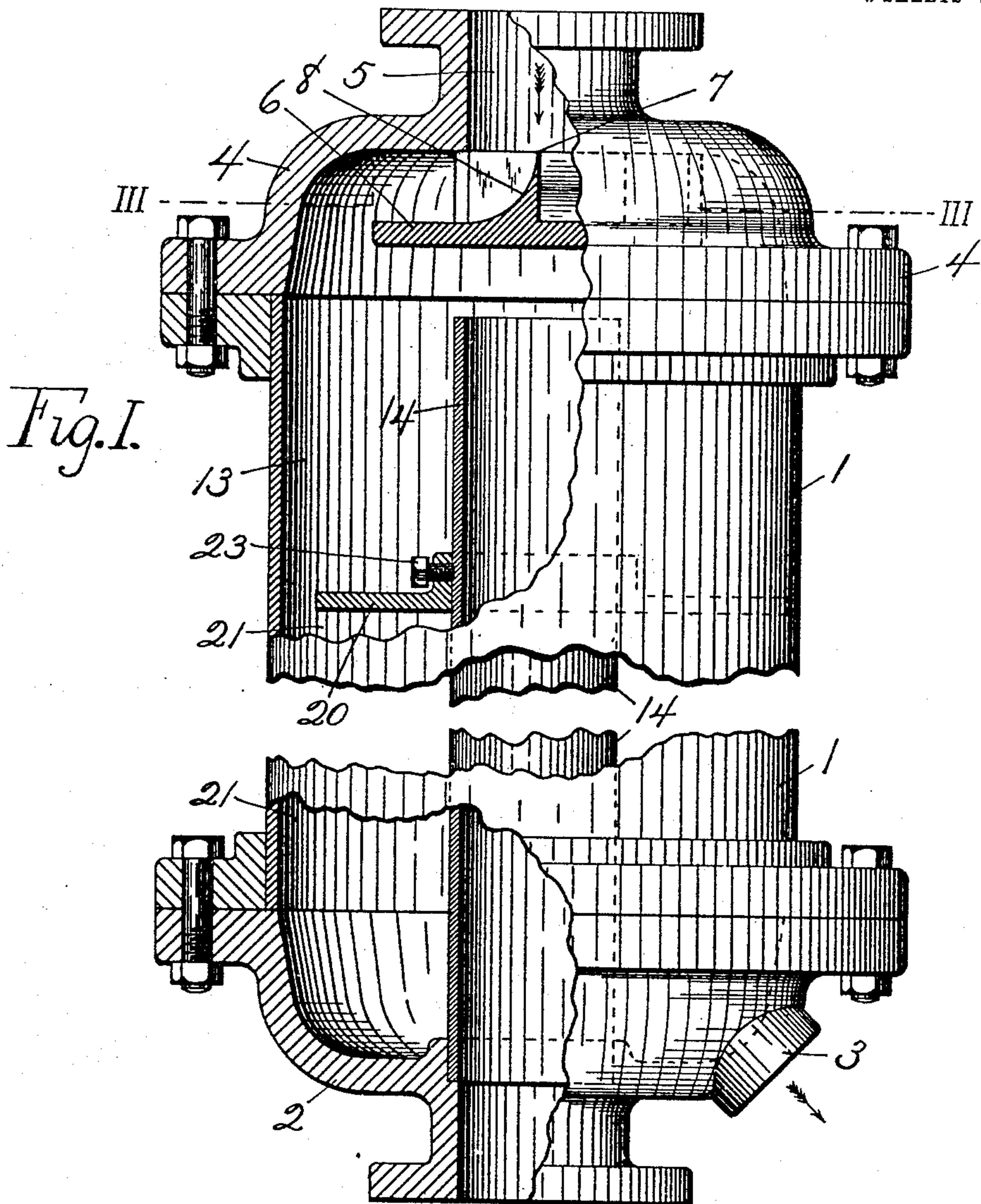
PATENTED AUG. 23, 1904.

J. NAYLOR, JR.
STEAM SEPARATOR.

APPLICATION FILED AUG. 17, 1903.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES:

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M. E. Hagou

INVENTOR

James Naylor Jr.
BY *Alfred Wilkinson*
ATTORNEY.

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3 SHEETS—SHEET 2.

NO MODEL.

Fig. II.

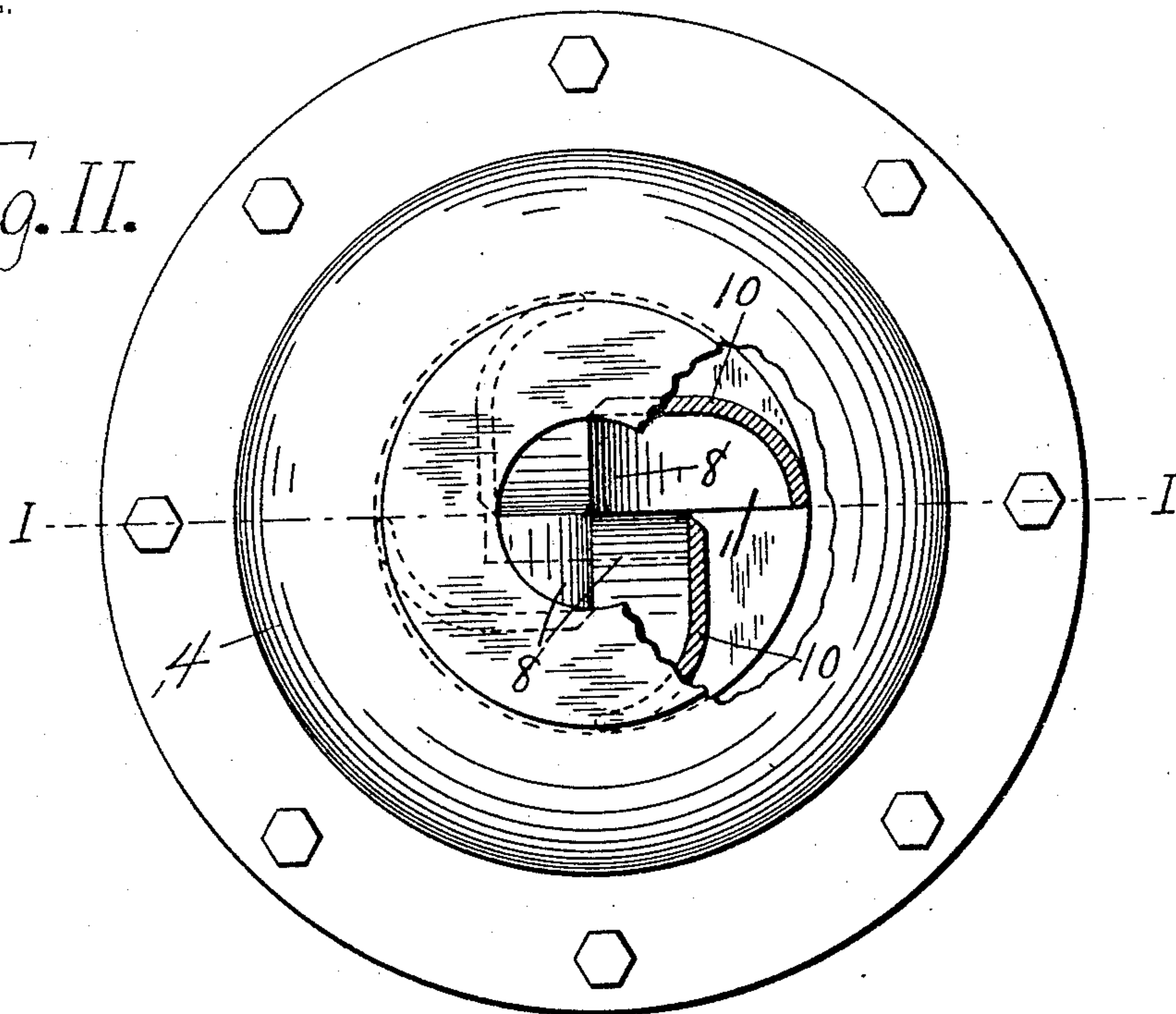
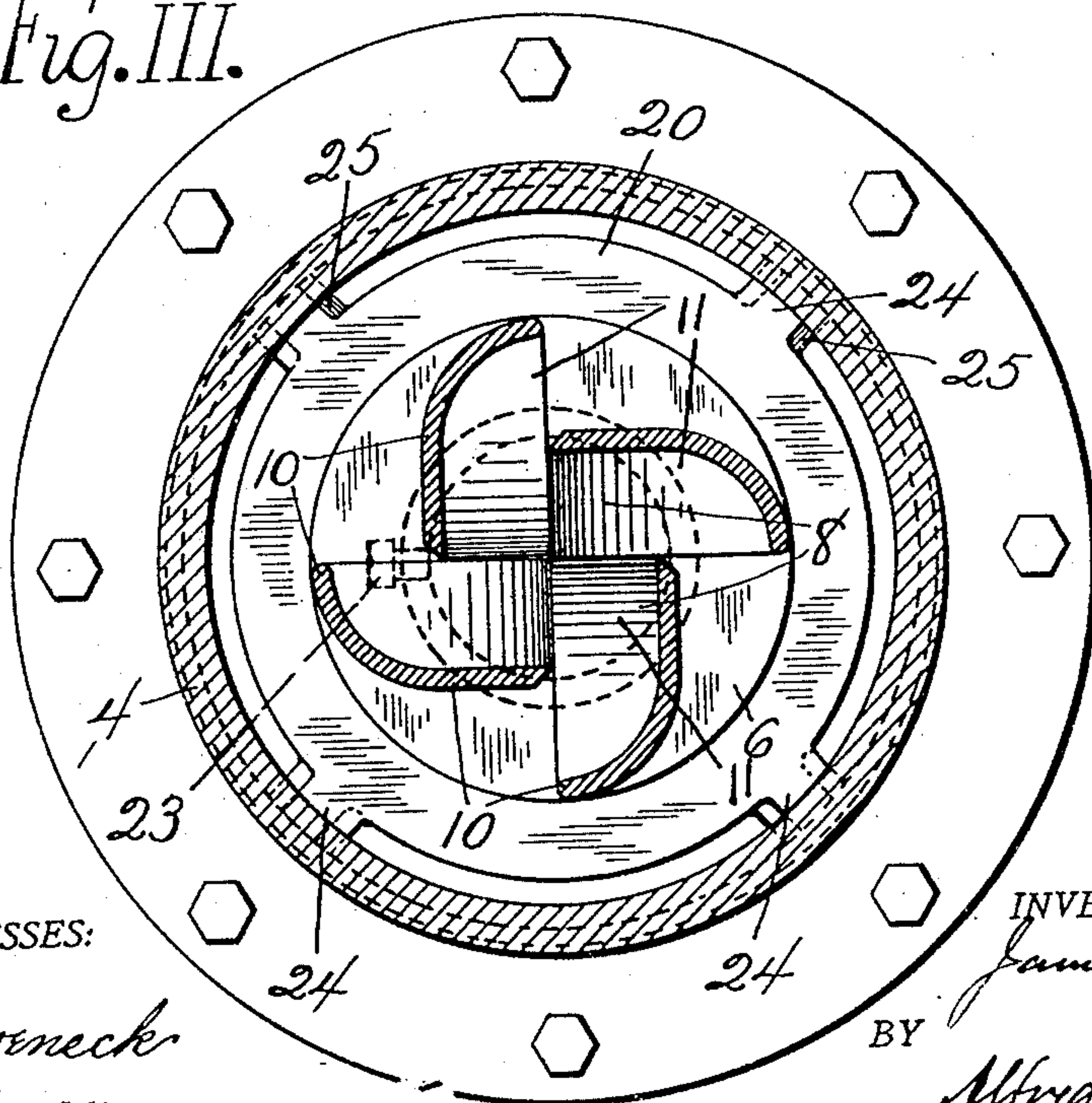


Fig. III.



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3 SHEETS—SHEET 3.

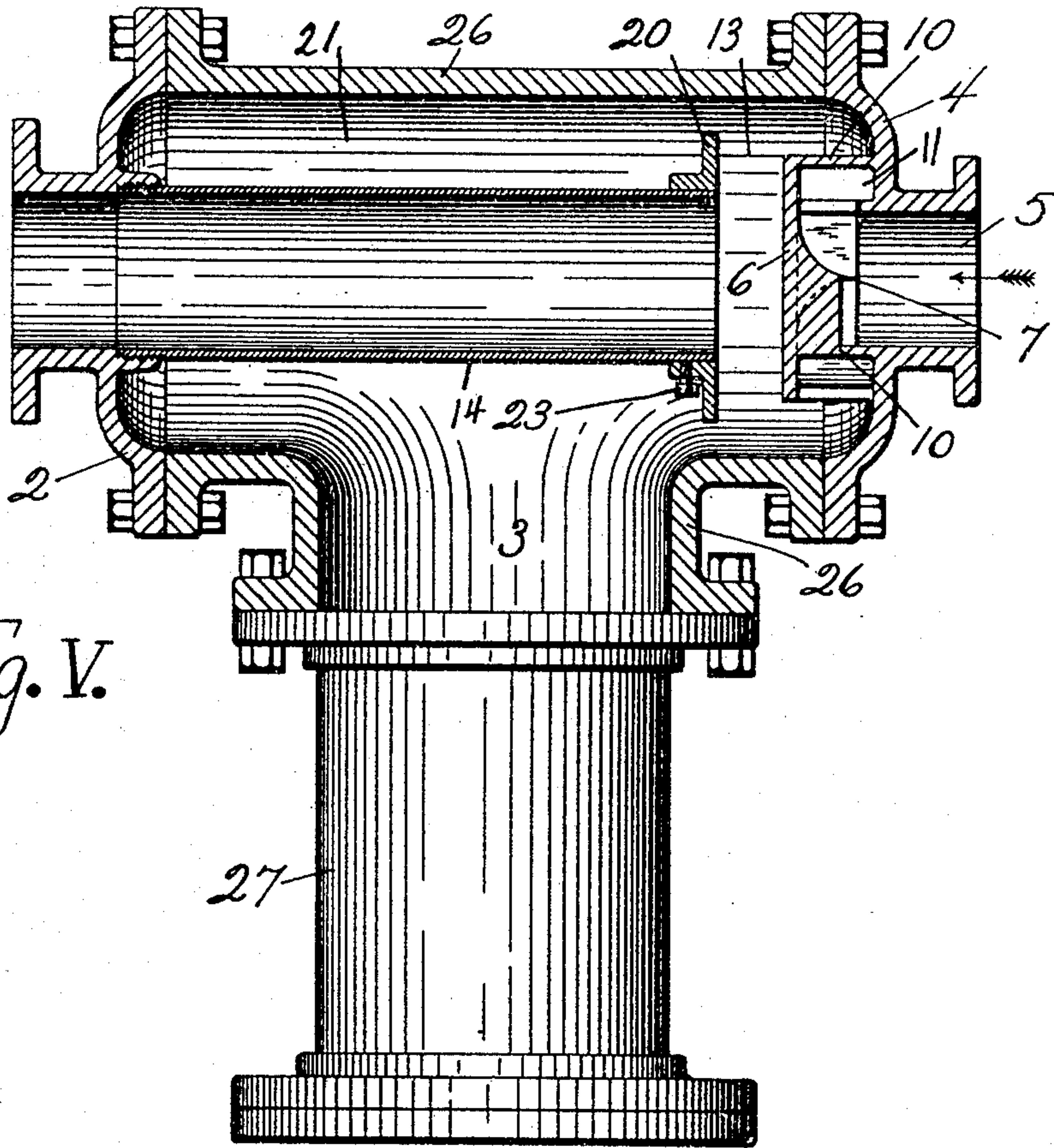
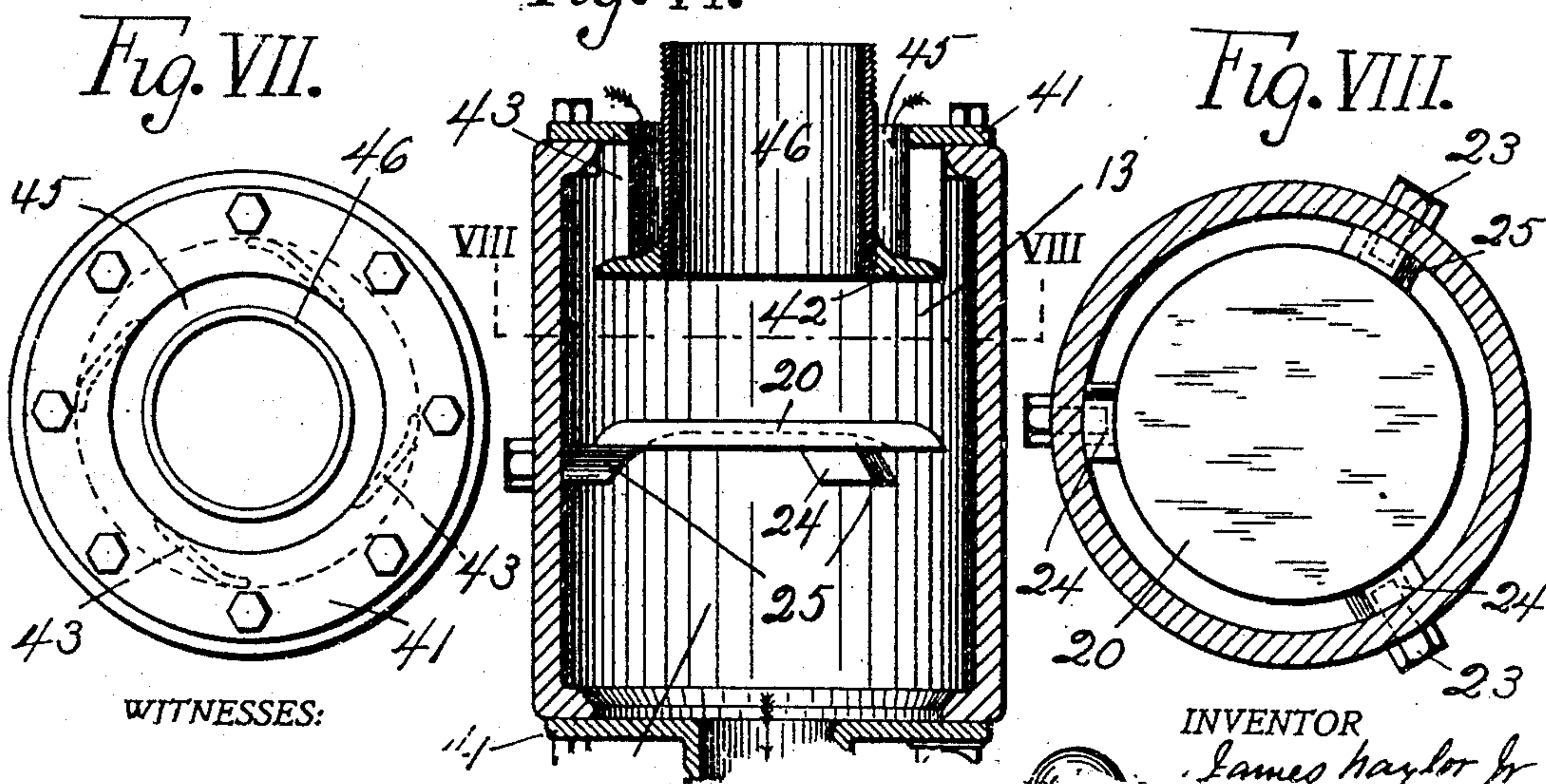


Fig. V.

Fig. VI.



WITNESSES:

INVENTOR
James Hayler Jr

UNITED STATES PATENT OFFICE.

JAMES NAYLOR, JR., OF ARLINGTON, NEW JERSEY.

STEAM-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 768,190, dated August 23, 1904.

Application filed August 17, 1903. Serial No. 169,707. (No model.)

To all whom it may concern:

Be it known that I, JAMES NAYLOR, JR., a citizen of the United States, residing at Arlington, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Steam-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.

My invention relates to a separator for the separation of the steam from its excessive moisture and the conducting of the dry steam and water therefrom in different directions, and has for its object to give to the inflowing steam an unobstructed whirling movement and permit it to move forward constantly to the outlet unimpeded, so as to thoroughly accomplish the separation.

My invention consists, essentially, in a shell of suitable size provided with a steam-inlet and a water-outlet. Adjacent to the steam-inlet is arranged a deflecting-plate to divide up the inflowing steam and deliver it with a whirling movement, but with an unimpeded flow, through a series of passages (larger in total area than the area of the steam-inlet) into an upper chamber. Centrally in this upper chamber and as near as possible to the steam-inlet, but on the opposite side of the deflecting-plate from the inlet, is arranged the steam-outlet pipe having its center arranged substantially to correspond with the center of the whirl. A dividing-plate is arranged within the shell to divide it into the upper or "whirling" chamber and the lower or "still" chamber. The dividing-plate is preferably provided with a series of sharp edges, which, so to speak, "peel" off the water from the steam, permitting the water to pass quickly through or around the dividing-plate into the still chamber.

My invention is shown in the drawings herewith, in all the figures of which corresponding reference-numerals are used.

Figure I is an elevation of the vertical type of my separator with portions broken away. Fig. II is a top plan view of same with portions broken away. Fig. III is a cross-section on line III III of Fig. I. Fig. IV is a

top plan of the dividing-plate. Fig. V is a vertical section of the horizontal type. Fig. VI is a vertical section of a modified form adapted for use inside a boiler. Fig. VII is a top plan thereof. Fig. VIII is a cross-section of Fig. VI on section-line VIII VIII.

In the figures, 1 indicates the cylindrical shell, to which is fitted the base 2, provided with a suitable water-outlet 3 and with the head 4, provided with the steam-inlet 5. To the head is secured the deflecting-plate 6, having one or more knife-like edges 7, preferably formed, as here shown, vertical on one side and curved on the other with the straight downward curve 8. 10 indicates the integral walls, (connecting the deflecting-plate to the head, if desired,) arranged at right angles to each of said knife-edges and forming with the respective curved surfaces 8 the inlet-passages 11. The outer edges of these walls 10 are curved, as here shown, in the arc of a circle whose radius is the same as that of the inlet. As shown in Figs. II and III, four inlet-passages are thus formed, the total area of whose mouths is larger than the area of the inlet and by the form of the curved surfaces and the walls deliver the steam with a rotary motion and without obstructing its flow into the upper chamber 13. The deflecting-plate and walls may be conveniently cast integral with the head. Centrally in this chamber, so that its center will correspond practically with the center of the whirl given to the steam in its vortex, is arranged the steam-outlet pipe 14, whose mouth is arranged as near as possible to the deflecting-plate and the inlet-passages.

In any suitable manner is sustained within the shell the dividing-plate 20, dividing the interior into the whirling chamber 13 and the still chamber 21, from the latter of which flows out the water to a steam-trap. The dividing-plate is best shown in Fig. I adjustably secured on the steam-outlet pipe by the set-screw 23 in its hub and is provided with outwardly-extending lugs 24, provided with sharp edges 25, whose function is to cut or peel off, so to speak, the water from the whirling mass of steam, thus promoting and insuring the separation.

The separator shown in Fig. V is the same as the preceding except that it is arranged horizontally and is provided with a T 26 for the water-outlet communicating with the supporting-column 27, through which the water flows out to the trap.

In Figs. VI, VII, and VIII, I have shown my invention embodied in a form for the interior of a boiler. Here the shell may be made much lighter, as it does not have to withstand steam-pressure, and the steam-inlet is arranged around the steam-outlet and concentrically therewith. 41 41 are end plates for the shell, and with the top one is made integral the special form of deflecting-plate 42, having radiating knife-edge partitions or vanes 43, arranged tangentially, so as to give the inflowing steam its whirling motion. The dividing-plate is preferably fixed by means of its lugs at a special point in the interior. The steam-outlet pipe 46 is threaded into the deflecting-plate and also at its outer end is threaded to engage with the shell of the boiler. The annular inlet 45 may be much greater in area than the outlet 46. At the lower end of the separator is arranged a balanced lever 47 and check 48 to close the water-outlet against the inflow of steam when the water is low, but permitting the water to flow out. This form, of ample size, may be easily placed in boilers already set up to which access is difficult, affording a means of relief in extreme cases where the use of a single separator in a pipe would fail.

The terms "upper" and "lower" applied to the two chambers are merely relative, as the separator may be arranged in any suitable position.

The action of my separator is to permit the saturated steam under pressure to enter the inlet, where it is divided by the knife-edges into separate streams and by the form of the inlet-passages permitted to flow forwardly in a changed direction, but with such easy turns as not to impede its flow, giving all the separate streams a whirling motion substantially in a horizontal plane, which whirling motion is greater than the velocity at the inlet, thus throwing off the suspended moisture to the outer surface of the chamber, where it flows down and around the dividing-plate to the lower chamber, whence it cannot return, while the dry steam is withdrawn from the center. All danger of retrograde movement common to separators is avoided.

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

1. In a steam-separator, the combination with a shell, of an adjustable dividing-plate dividing the shell into a whirling and a still chamber, said chambers provided respectively with a steam-inlet and a water-outlet, of a deflecting-plate arranged in the whirling chamber adjacent to the inlet to turn the inflowing

steam and to impart to it a whirling movement within the chamber, and a steam-outlet pipe from the whirling chamber having its mouth arranged adjacent to the deflecting-plate.

2. In a steam-separator, a shell, a dividing-plate arranged within the shell and of less diameter than the shell to divide it into a whirling chamber and a still chamber, projections on the plate having sharp edges; the whirling chamber being provided with a steam-inlet and the still chamber with a water-outlet; a deflecting-plate arranged adjacent to the inlet and having in combination edges to divide the inflowing stream, curved surfaces to turn the divided streams at right angles and curved walls to turn the streams in a tangential or whirling direction within the shell, so that the inflowing steam shall be turned tangentially to the side wall of the shell and in a plane at a right angle to its axis, and a steam-outlet pipe from the whirling chamber, substantially as described.

3. In a steam-separator, the combination with a shell divided into a whirling chamber and a still chamber, said chambers communicating and having a steam-inlet to the whirling chamber and a water-outlet from the still chamber, of a deflecting-plate having sharp edges arranged across the inlet, surfaces extending inwardly from said edges and curving from parallel to the inlet to a direction at right angles thereto and walls arranged parallel to the inflowing jet of steam and extending from the edges first radially and then gradually curving to a tangential direction with relation to the inlet, so that the inflowing steam shall be turned tangentially to the side wall of the shell and in a plane at a right angle to its axis, and a steam-outlet pipe from the whirling chamber, substantially as described.

4. In a steam-separator, the combination with a cylindrical shell, of a base fitted to one end thereof and provided with a water-outlet and a steam-outlet opening; a corresponding head fitted to the other end and provided with a circular steam-inlet corresponding to the steam-outlet opening; a deflecting-plate, integral with the head, having two sharp edges arranged across each other at right angles to divide the inflowing steam into four streams, the edges being respectively straight on one side and having curved surfaces on the other, said surfaces gradually curving from the edges to a direction at right angles to the inlet, walls on the deflecting-plate arranged parallel to and at about the margin of the inflowing stream, said walls extending from said edges first radially and gradually curving into a tangential direction with reference to the inlet; a steam-outlet pipe connected to the steam-outlet opening within the shell and having its mouth arranged adjacent to the deflecting-plate; a dividing-plate, less in diameter than

the cylindrical shell, fitted to the pipe to divide the shell into a whirling chamber and a still chamber, a set-screw in the dividing-plate to secure it adjustably on the pipe, and lugs having sharp edges on the perimeter of the dividing-plate, substantially as described and shown.

5. In a steam-separator, the combination with a shell, having an open interior so as to permit the unimpeded whirl of the steam therein and having a steam-inlet and a steam-outlet and a water-outlet, of a deflecting-plate arranged adjacent to the inlet and provided with curved surfaces to turn the inflowing steam substantially at right angles outwardly toward the shell-wall, and with curved side walls to direct in a tangential direction the outwardly-turned steam, so that the inflowing steam shall be turned tangentially to the side wall of the shell and in a plane at a right angle to the shell-axis without impeding the steam-flow, substantially as described and shown.

6. In a steam-separator, the combination with a cylindrical shell having an open interior so as to permit the unimpeded whirl of the steam and having a steam-inlet and a steam-outlet and a water-outlet, of a deflecting-plate arranged within the shell across the inlet and at a right angle thereto, formed to turn the inflowing steam at a right angle toward the shell-periphery and also tangentially to said periphery.

7. In a steam-separator, the combination with the shell, of a dividing-plate arranged substantially at a right angle to the axis of the shell to divide the shell into a whirling chamber and a still chamber with communications therebetween, said chambers being provided respectively with a steam-inlet and a water-outlet, and a deflecting-plate in the whirling chamber adjacent to the inlet to turn the inflowing steam and to impart to it a whirling movement within the chamber, said whirling chamber being also provided with a steam-outlet, substantially as described and shown.

8. In a steam-separator, the combination with a substantially cylindrical shell, of a dividing-plate arranged substantially at a right angle to the axis of the shell to divide it into a whirling chamber and a still chamber, said plate being less in diameter than the inner diameter of the shell and said chambers being provided respectively with a steam-inlet and a water-outlet, and a deflecting-plate in the whirling chamber adjacent to the inlet to turn the inflowing steam and to impart to it a whirling movement within the chamber, said whirling

chamber being also provided with a steam-outlet, substantially as described and shown.

9. In a steam-separator, the combination with a substantially cylindrical shell, of a dividing-plate less in diameter than the shell and dividing the shell into two chambers communicating through the annular opening around the perimeter of the plate, lugs having sharp edges on the perimeter of the plate, the shell being provided with steam-inlet and steam-outlet to the first chamber, and water-outlet from the second, and of a deflecting-plate arranged adjacent to the inlet to turn the steam substantially at right angles and to impart to it a rotary movement.

10. In a steam-separator, the combination with a substantially cylindrical shell, of a dividing-plate dividing the shell into a "whirling" and a "still" chamber, with communication between the chambers, the shell being provided with a steam-inlet and an adjacent steam-outlet to the "whirling" chamber and with a water-outlet from the "still" chamber, and of a deflecting-plate arranged adjacent to the inlet and having sharp edges arranged across the inlet to divide the inflowing steam, the edges being straight on one side and gradually curving on the other side to a direction substantially at right angles to the inlet, and of walls on the deflecting-plate extending from the edges first radially and gradually curving into a tangential direction with reference to the inlet and to the shell-surface.

11. In a steam-separator, the combination with a cylindrical shell, having a steam-inlet, a steam-outlet and a water-outlet, of a deflecting-plate provided with sharp edges crossing each other and arranged across the inlet to divide the inflowing steam into a plurality of streams, said edges each being straight on one side and having a curved surface on the other, said surfaces gradually curving from the edges and parallel to the inlet to a direction at right angles to the inlet, walls on the deflecting-plate arranged parallel to and substantially at the margin of the inflowing steam, said walls extending from said edges first radially and gradually curving into a tangential direction with reference to the inlet and the wall of the shell.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES NAYLOR, JR.

Witnesses:

C. C. SCHOENECK,
M. E. GAGON.