

July 6, 1926.

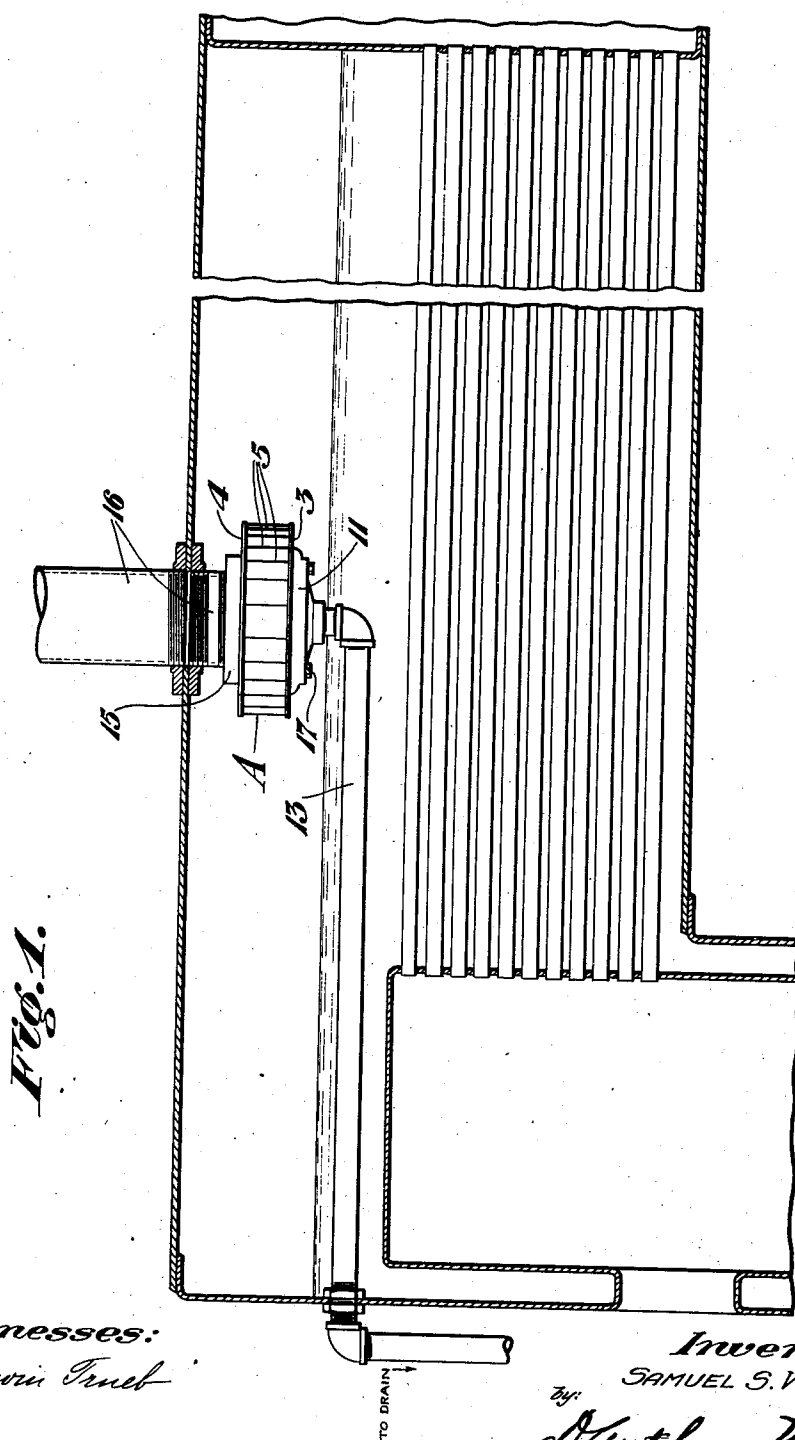
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1,591,147

SEPARATOR

Filed Nov. 26, 1924

4 Sheets-Sheet 1



Witnesses:

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Inventor:

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Filed Nov. 26, 1924

4 Sheets-Sheet 2

Fig. 2.

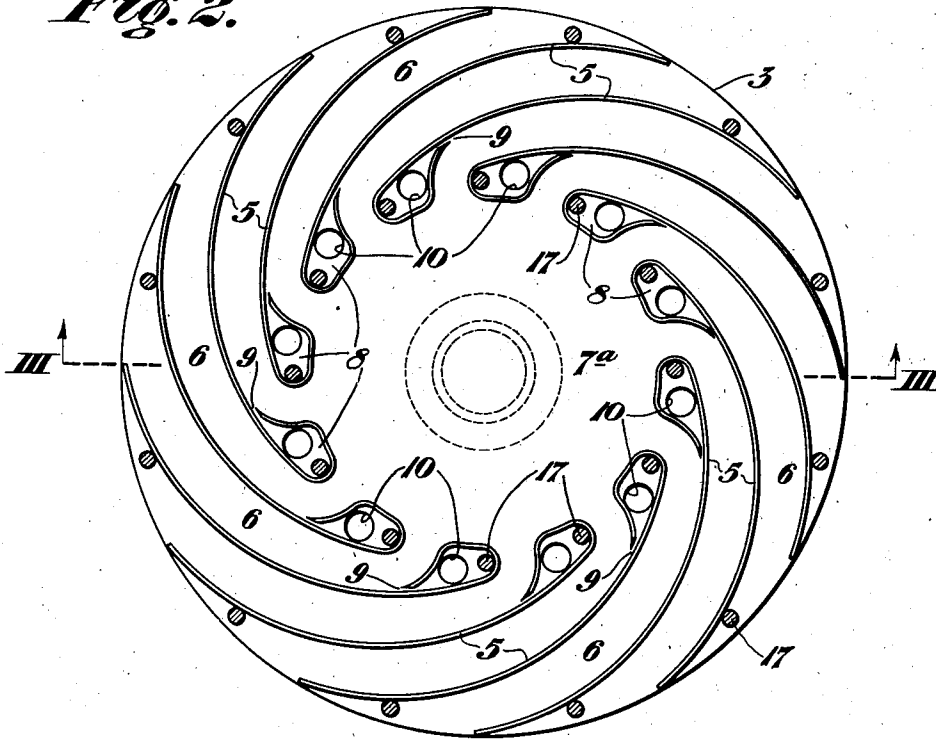
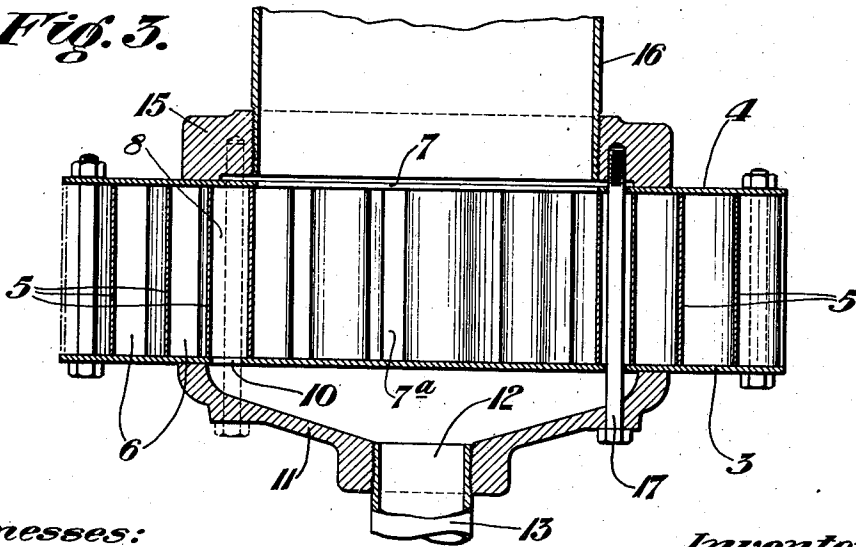


Fig. 3.



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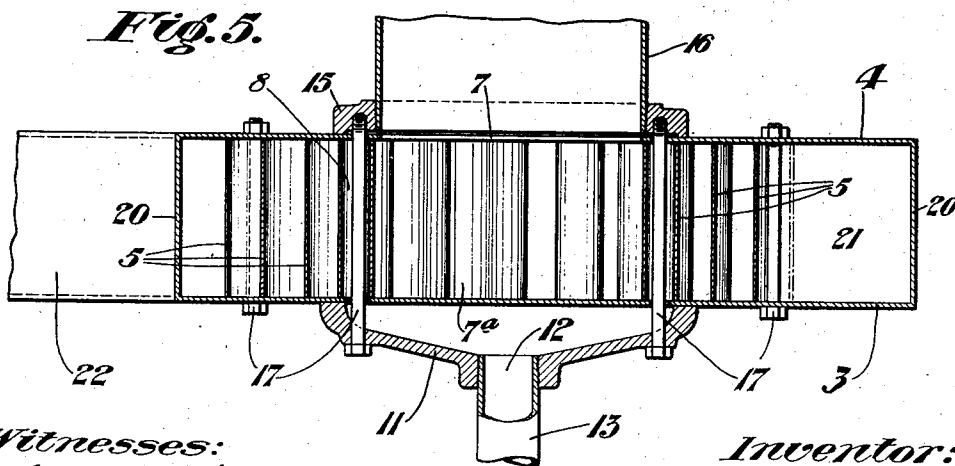
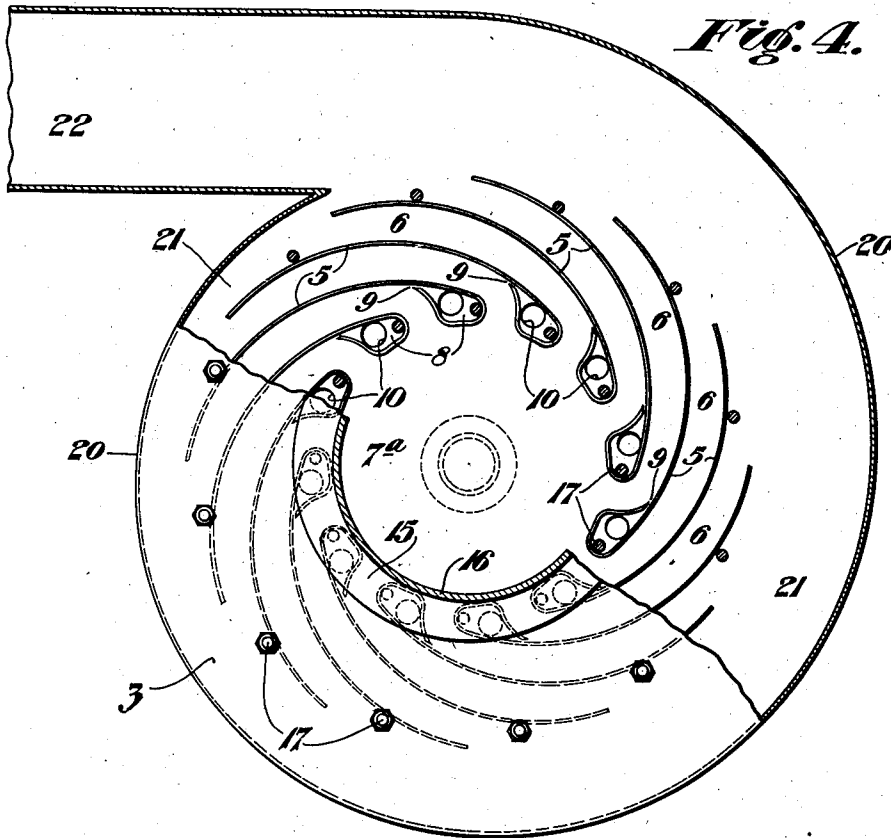
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4 Sheets-Sheet 3



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1,591,147

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4 Sheets-Sheet 4

Fig. 7.

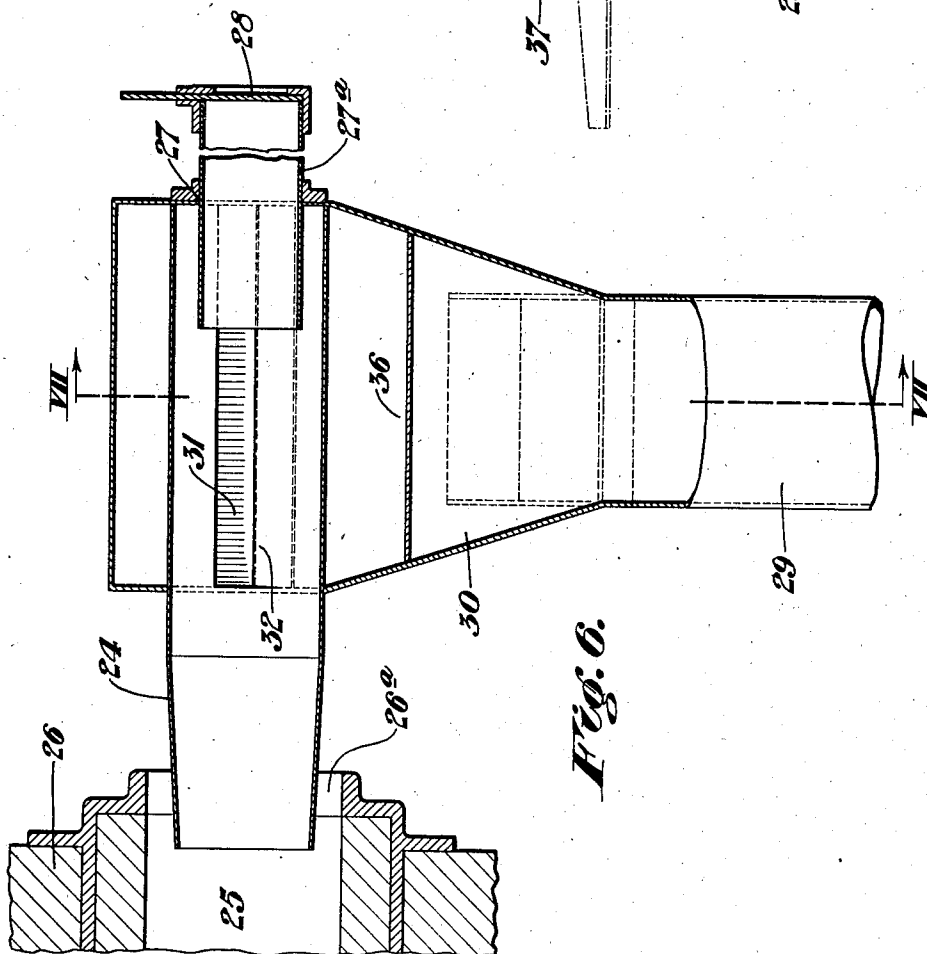
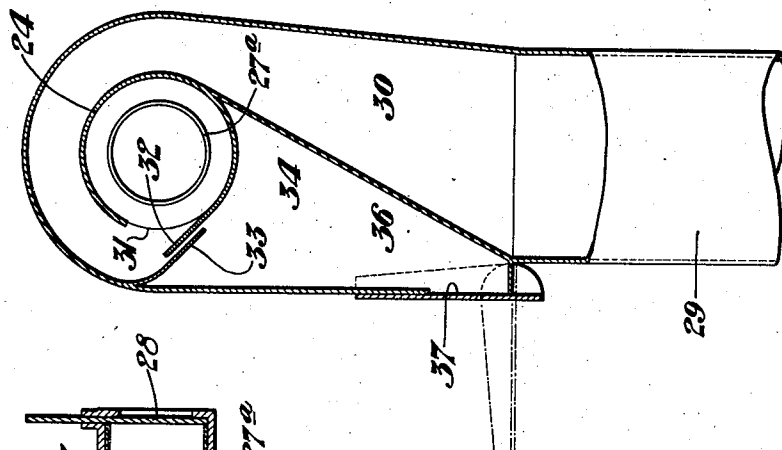


Fig. 6.

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UNITED STATES PATENT OFFICE.

SAMUEL S. WALES, OF PITTSBURGH, PENNSYLVANIA.

SEPARATOR.

Application filed November 26, 1924. Serial No. 752,343.

This invention relates to apparatus for and method of separating substances having different specific gravities, such as liquid and vapor, and gases and solids, and has for its object the provision of such an apparatus and method that will provide a more perfect separation than separators heretofore devised.

Another object is to provide a separator that is devoid of any moving parts, has a large capacity and will not clog.

A further object is to provide a separator that is simple in construction and operation, and capable of operation over wide ranges in velocities.

A still further object is to provide a separator having the novel arrangement, design and construction of parts hereinafter described and illustrated in the accompanying drawings.

In the drawings, Figure 1 is a sectional elevation through a boiler having one of my separators applied thereto for separating water from the steam.

Figure 2 is a top plan of the separator of Figure 1, having the top of the casing removed to show the vane construction.

Figure 3 is a sectional elevation on the line, III—III of Figure 2.

Figure 4 is a top plan of slightly modified form of separator, usable as a line separator, part of the top wall of the casing being broken away for clearness.

Figure 5 is a sectional elevation through the separator of Figure 4.

Figure 6 is a sectional side elevation of a blast furnace stove burner having my separator applied thereto.

Figure 7 is a sectional elevation on the line VII—VII of Figure 6.

Referring more particularly to Figures 1 to 3 of the drawings, the numeral 2 designates a boiler which may be of any usual construction. The boiler 2 is provided with a separator A constructed in accordance with my invention, which is adapted to separate any water from the steam leaving the boiler.

The separator A comprises a casing composed of bottom and top members 3 and 4 and vanes 5 mounted between the members 3 and 4, forming a plurality of separating chambers or paths 6, through which the

steam from the boiler 2 must pass when discharging from the boiler.

The top member 4 is provided with a single outlet opening 7 and the vanes 5 curve gradually inward from the outer edge of the separator toward said outlet opening 7 and terminate on a line with the edge of the opening leaving a collecting space 7^a for the separated steam. The vanes 5 have their inner ends bent back upon themselves, forming hollow receiving chambers 8 having restricted inlet openings, or separating channels 9 in close proximity to the outside of the chamber or path adapted to receive and trap the water or other substances of heavier specific gravity which will be thrown into the outer portion of the stream or flow body of stream passing through the paths 6 due to centrifugal force. Each of the chambers 8 is provided with an outlet 10, through which the substance trapped into the chambers 8 is adapted to be discharged into a receiving and collecting bowl 11 secured against the bottom member 3 of the separator casing. The bowl 11 is provided with a single discharge opening 12 adapted to have a conduit 13 screwed therein through which the substance discharged through the outlet openings 10 into the bowl 11 is adapted to flow to a suitable drain or other point of disposal.

The outlet opening 7 in the casing member 4 is surrounded by a threaded flange member 15 adapted to have a conduit 16 threaded therein for conducting away the steam from which the substances having a greater specific gravity have been separated.

The outer ends of the spaces or paths between the vanes which are open to the interior of the steam chamber of the boiler serve as unrestricted inlet openings, while the open inner ends of such spaces or paths serve as outlet openings through which the separated steam discharges into the collecting space 7^a and outlet opening 7.

The casing members 3 and 4, vanes 5, bowl 11 and nipple 15 are all held in assembled position by a series of bolts 17.

The separating chambers or paths 6 gradually curve inward toward the outlet 7, due to the curved vanes 5, and as clearly shown in the drawings such chambers or paths are relatively narrow in a direction transversely

of the axis of their curve, and relatively wide in a direction parallel with the axis of their curve, so as to provide a relatively broad flattened flow path for the substances to be separated, and the combined area of the several chambers or paths 6 is preferably substantially equal to the outlet opening 7 so as to permit an unrestricted flow of steam therethrough.

It will be expressly noted that the flow paths or chambers 6 are free from abrupt changes of section and direction to facilitate flow conditions therethrough at a velocity to effect centrifugal action.

In Figures 4 and 5 I have illustrated a slightly modified form of separator for use as a line separator. In the separator of Figures 4 and 5 the outer ends of the vanes 5 terminate an appreciable distance short of the outer edge of the bottom and top members 3 and 4, forming a closed casing, having a supply passage 21 around its outer edge communicating with each of the inlet ends of the paths or chambers 6. A main inlet 22 is provided in the side wall 20 adapted to be connected with the line and the outlet conduit 16 is adapted to be connected to the continuation of the line.

The separator of Figures 4 and 5 is particularly adapted for separating water from the steam in a steam line. However, it may be used to separate solids or liquids carried in either liquid, vapor or gaseous flow bodies.

In Figures 6 and 7 I have shown a blast furnace stove burner embodying a separator constructed in accordance with my invention. In these figures the numeral 24 designates the burner tube as a whole, which enters a port 25 in the stove wall 26. The port 25 is of a greater diameter than the burner tube, so as to leave an annular space 26^a surrounding the burner tube for the inlet of air to support combustion. The rear of the burner tube 24 is provided with an opening 27 through which an air pipe 27^a projects. The pipe 27 is provided at its outer end with a plate control valve 28 for controlling the supply of air.

The gas for the burner is supplied from a main 29, which connects to the tubular lower end of the separating member 30, which extends upwardly and is gradually flattened and broadened and curved around the burner tube 24.

The curved portion of the separating member 30 is relatively narrow in a direction transversely of the axis of the curve and relatively wide or broad in a direction parallel with the axis of the curve similar to the separating chambers of Figures 1 to 4.

The burner tube 24 is provided with a longitudinally extending inlet 31 opening in its side wall communicating with the separating member 30 at the end of its curved

portion. A flange 32 projects into the member 30 from the lower edge of the opening 31 and a second flange 33 curves downwardly and inwardly toward the burner tube 24 and extends below the flange 32 in spaced relation and parallel therewith, forming a restricted separating channel or outlet 34. The gases flowing to the burner tube 24 pass through the curved flattened and broadened portion of the separating member 30, and due to its curved formation sufficient centrifugal force is imparted to the flowing gases to throw out the dust and other substances, having a greater specific gravity than the gases, into the outer portion of the flow body, and as the gases pass over the flanges 32 and 33 the heavier substances will pass into the channel or outlet 34 between the flanges and be trapped.

Any suitable receiver may be provided for catching the separated matter from the outlet 34. In the present construction I have formed an integral bin or catcher 36 having an outlet 37 at its lower end for the discharge of accumulations of dust.

Many other variations of my invention will readily present themselves to those skilled in the art and, therefore, I do not wish to be limited to the specific construction shown or described, since many variations may be made without departing from the scope of my invention as defined in the appended claims.

It will be understood that the word substance as used in this specification and claims is used in its broadest sense, to include either solids or fluids.

I claim:—

1. A separator for effecting separation of substances of different specific gravities, comprising a casing having a plurality of inlets leading to a single outlet, means co-operating with each of said inlets to form a plurality of separate paths of travel gradually extending toward said outlet and having individual discharge openings communicating with said outlet, the combined area of said individual discharge openings being approximately as great as the area of said outlet, means extending into each of said paths of travel to form a restricted separating channel in a defined zone of each path, and means communicating with each of said channels for collecting substances discharged therethrough.

2. A separator for effecting separation of substances of different specific gravities, comprising a casing having a plurality of inlets leading to a single outlet, means co-operating with each of said inlets to form a plurality of separate paths of travel gradually converging toward said outlet and having individual discharge openings communicating with said outlet, the combined area of said individual discharge openings

being approximately as great as the area of said outlet, means extending into each of said paths of travel to form a restricted separating channel adjacent one edge thereof, and means communicating with each of said channels for collecting substances discharged therethrough.

3. A separator for effecting separation of substances of different specific gravities, comprising a casing having a plurality of inlets leading to a single outlet, means cooperating with each of said inlets to form a plurality of separate paths of travel gradually curving inwardly toward said outlet, said paths being relatively narrow in a direction transversely of the axis of their curve, and relatively wide in a direction parallel with the axis of their curve, so as to provide a relatively broad flattened flow path for the substances to be separated, said paths having individual discharge openings communicating with said outlet, the combined area of said individual discharge openings being approximately as great as the area of said outlet, said paths being free from abrupt changes of section and direction to facilitate flow conditions therethrough at a velocity to effect centrifugal action on the substances being separated, means extending into each of said paths of travel to form a restricted separating channel adjacent the outer edge

thereof, and means communicating with each of said channels for collecting substances discharged therethrough.

4. A separator for effecting separation of substances of different specific gravities, comprising a casing having a plurality of inlets leading to a single outlet, means cooperating with each of said inlets to form a plurality of separate paths of travel gradually curving inwardly toward said outlet, said paths being relatively narrow in a direction transversely of the axis of their curve, and relatively wide in a direction parallel with the axis of their curve, so as to provide a relatively broad flattened flow path for the substances to be separated, said paths having individual discharge openings communicating with said outlet, said paths being free from abrupt changes of section and direction to facilitate flow conditions therethrough at a velocity to effect centrifugal action on the substances being separated, means extending into each of said paths of travel to form a restricted separating channel adjacent the outer edge thereof, and means communicating with each of said channels for collecting substances discharged therethrough.

In testimony whereof I have hereunto set my hand.

SAMUEL S. WALES.