No. 844,312. PATENTED FEB. 19, 1907.

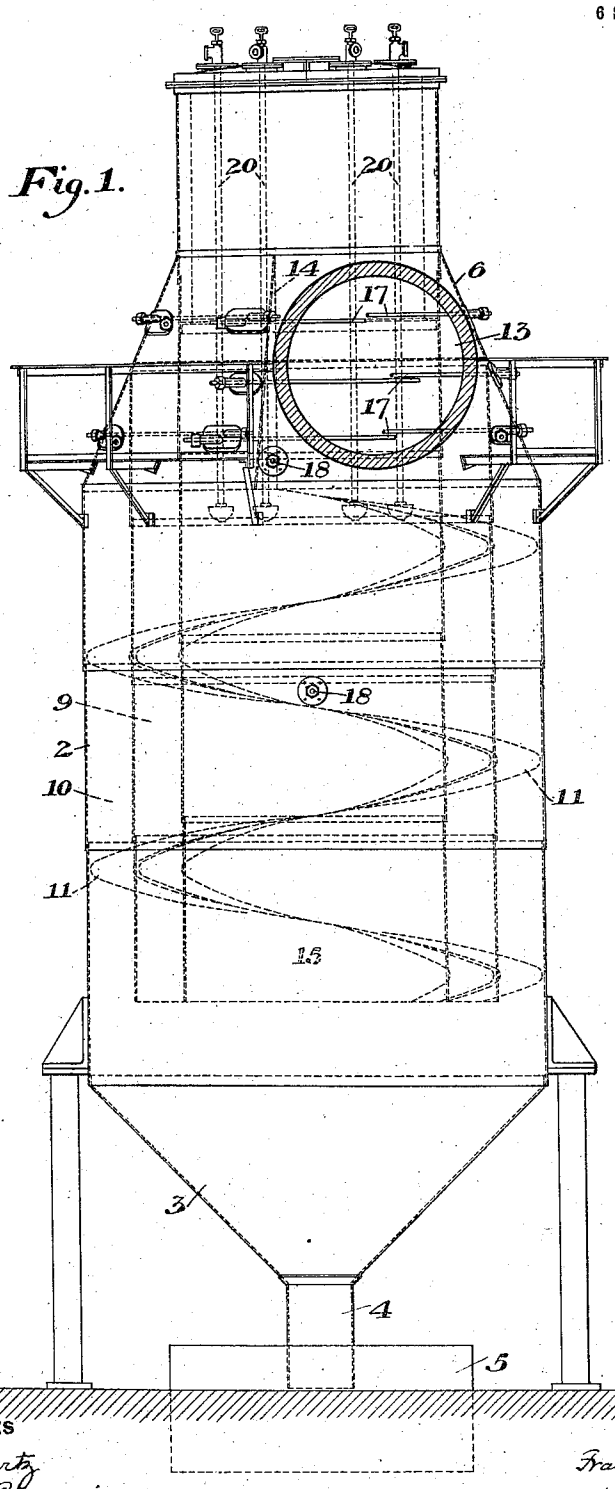
F. E. BACHMAN.

GAS WASHER.

APPLICATION FILED JAN. 27, 1905.

6 SHEETS—SHEET 1.

Fig. 1.



WITNESSES

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6 SHEETS—SHEET 2.

Fig. 2.

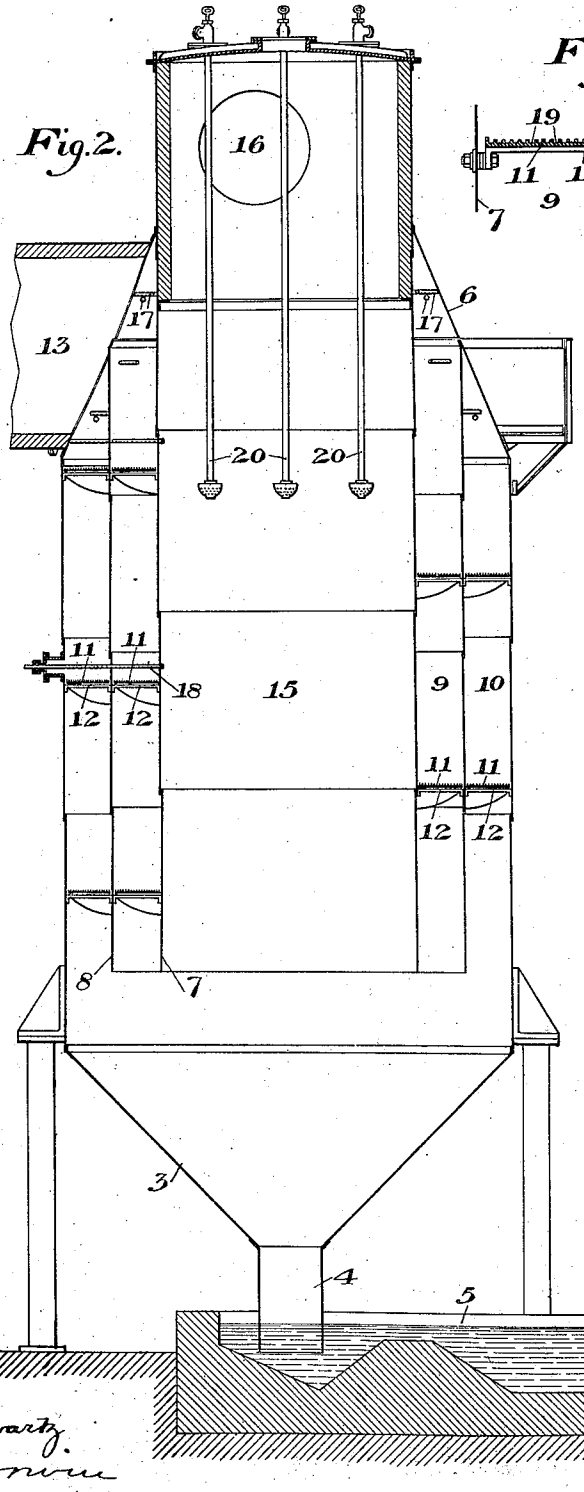
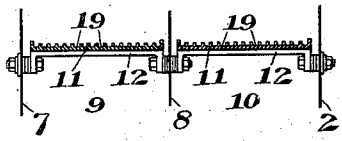


Fig. 4.



WITNESSES.

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No. 844,312. PATENTED FEB. 19, 1907.

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6 SHEETS—SHEET 3.

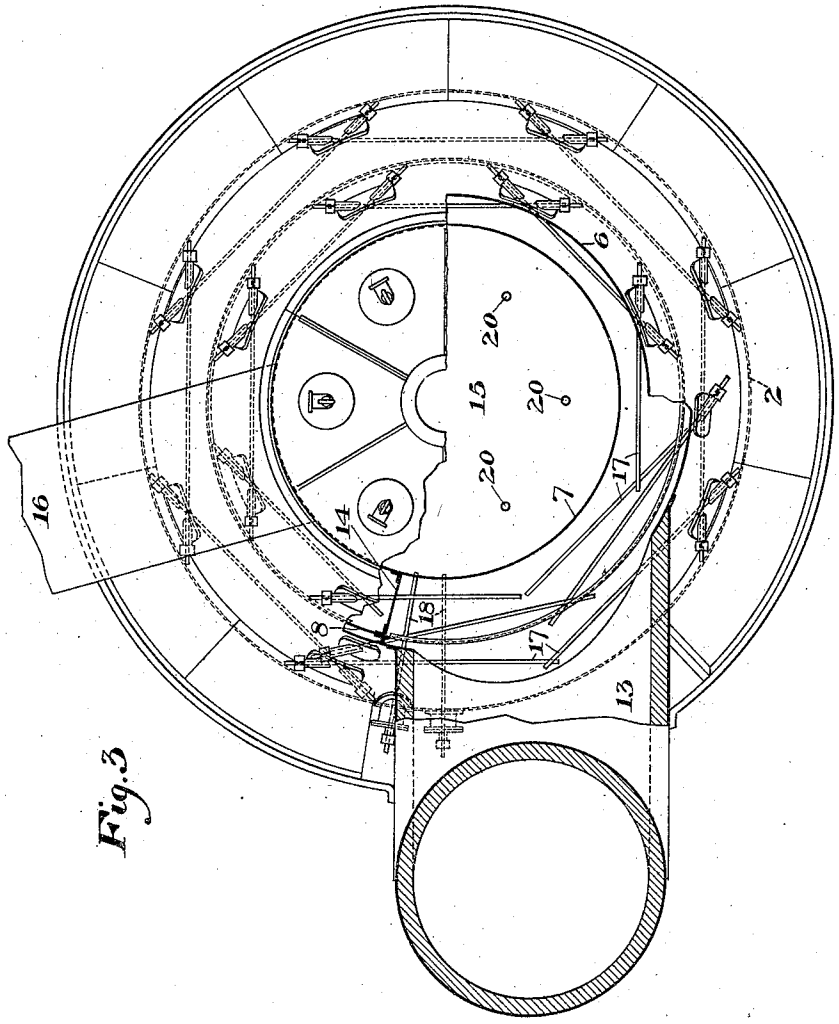

Fig. 3

WITNESSES

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No. 844,312. PATENTED FEB. 19, 1907.

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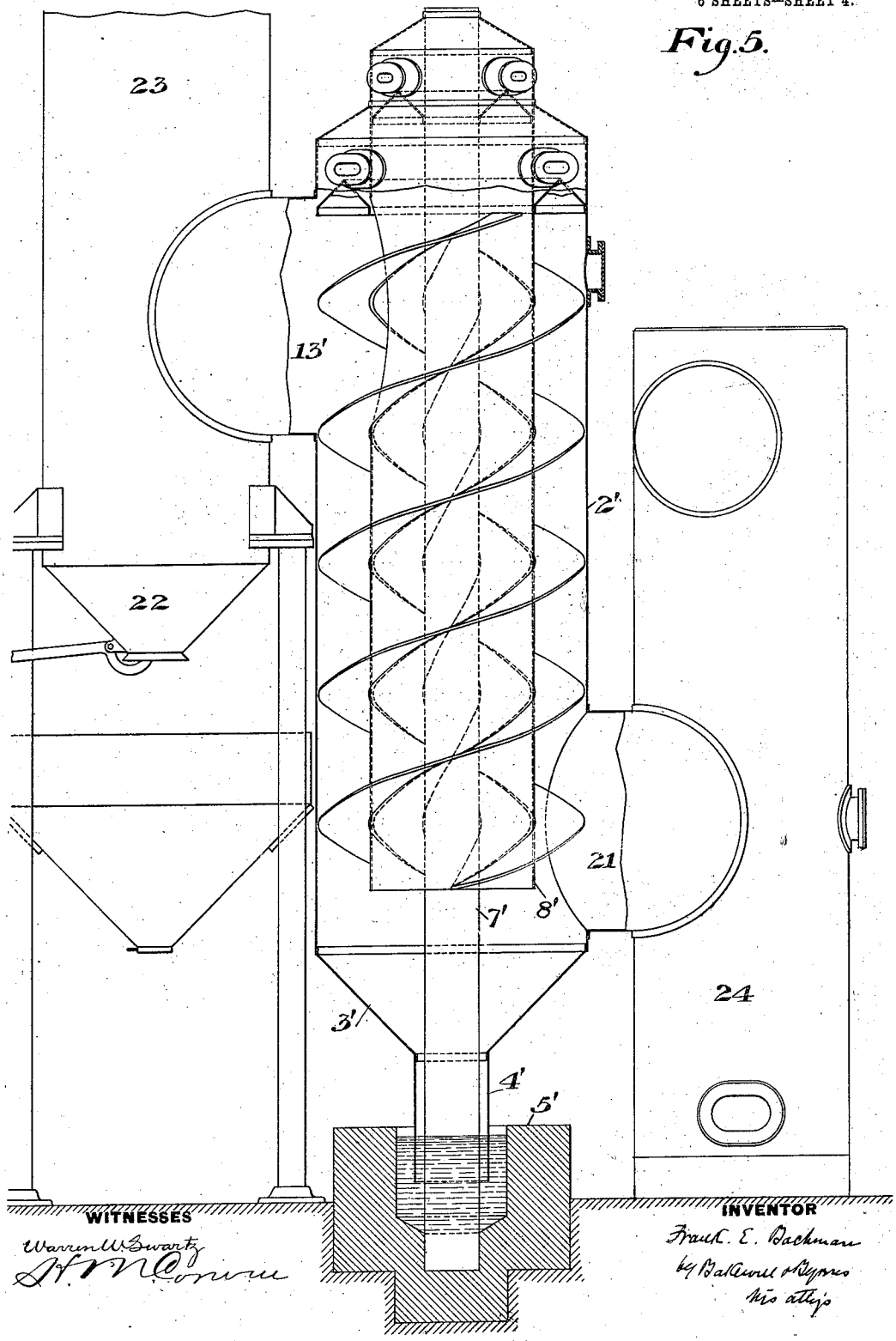
APPLICATION FILED JAN. 27, 1905.

6 SHEETS—SHEET 4.

Fig. 5.



WITNESSES

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No. 844,312. PATENTED FEB. 19, 1907.

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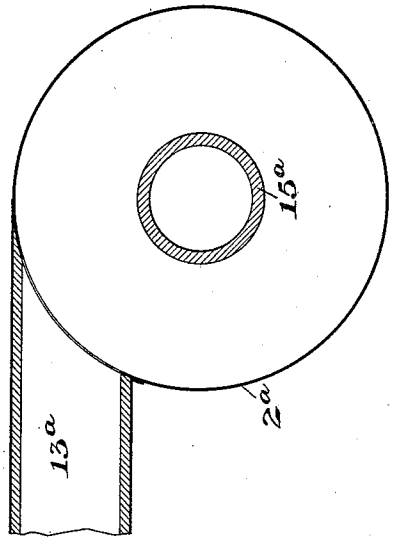
GAS WASHER.

APPLICATION FILED JAN. 27, 1905.

6 SHEETS—SHEET 5.

Fig. 7.



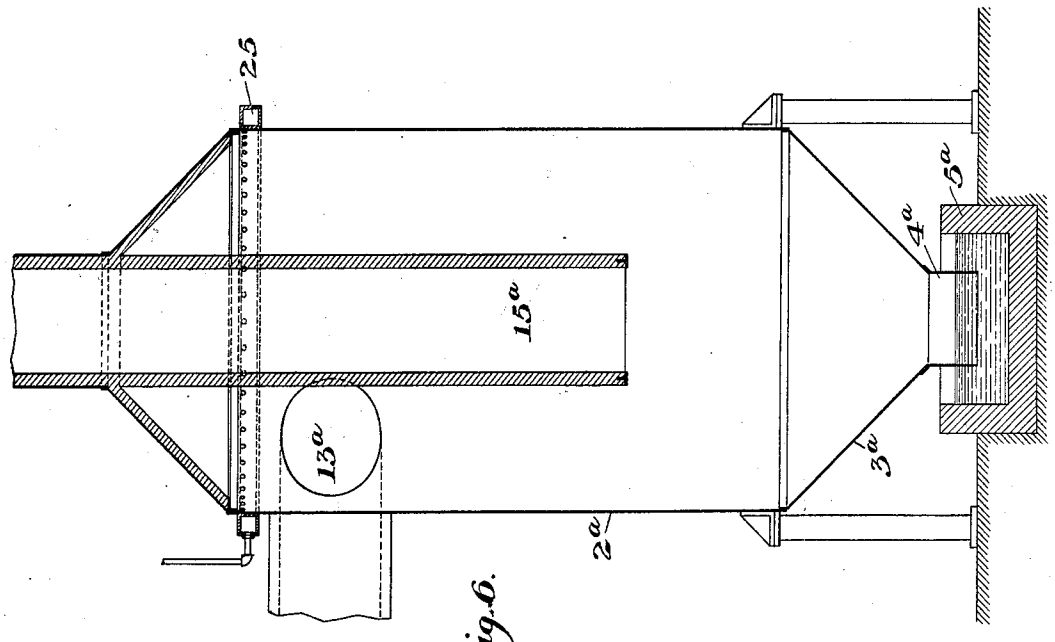


Fig. 6.

WITNESSES

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No. 844,312. PATENTED FEB. 19, 1907.

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GAS WASHER.

APPLICATION FILED JAN. 27, 1905.

6 SHEETS—SHEET 6.

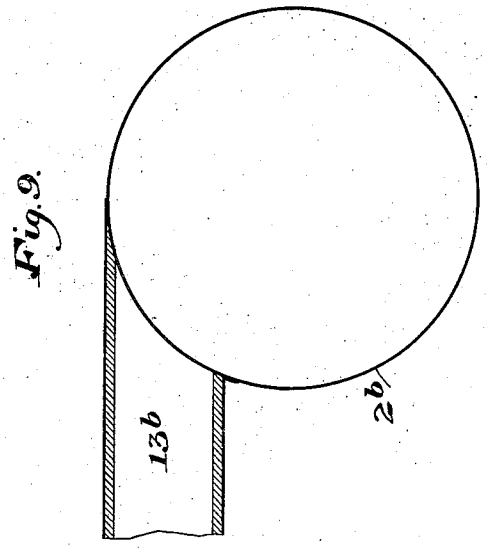

Fig. 9.

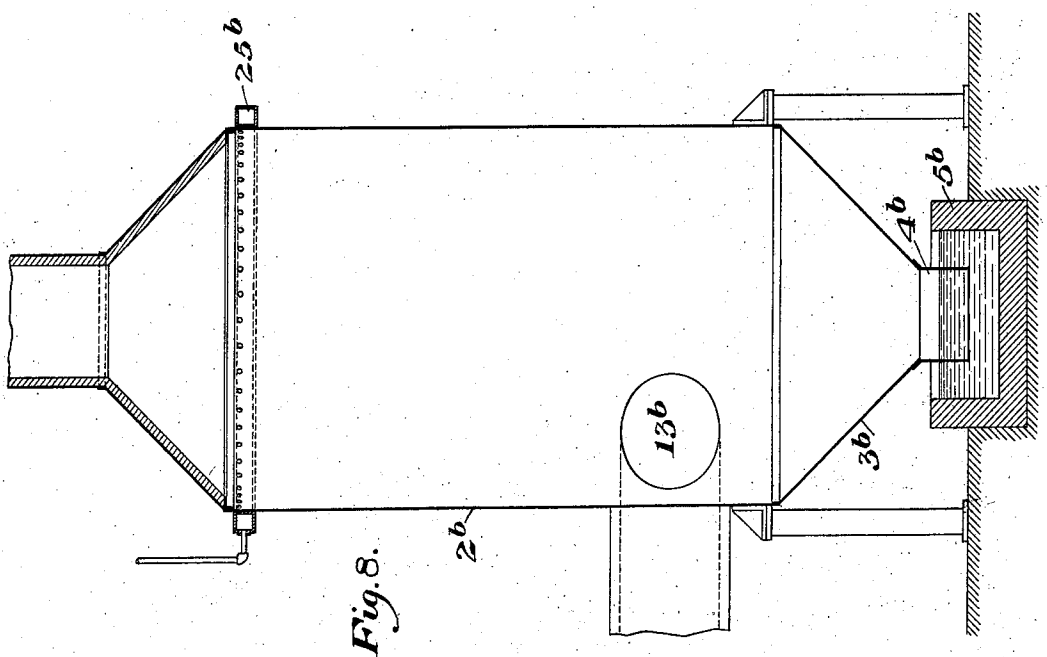

Fig. 8.

WITNESSES

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UNITED STATES PATENT OFFICE.

FRANK E. BACHMAN, OF PORT HENRY, NEW YORK.

GAS-WASHER.

No. 844,312. Specification of Letters Patent. Patented Feb. 19, 1907.

Application filed January 27, 1905. Serial No. 242,947.

To all whom it may concern:

Be it known that I, FRANK E. BACHMAN, of Port Henry, Essex county, New York, have invented a new and useful Gas-Washer, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation showing one form of my improved gas-washer. Fig. 2 is a central vertical section of the same. Fig. 3 is a top plan view. Fig. 4 is a detail view of the spiral shelf. Fig. 5 is a sectional side elevation of a modified form, showing a gas-washer and its connections. Fig. 6 is a vertical central section showing a modified and simpler form. Fig. 7 is a cross-section of Fig. 6, and Figs. 8 and 9 are views similar to Figs. 6 and 7, respectively, showing another form of the invention.

My invention relates to apparatus for separating dust from gases, and is designed to provide a simple and efficient apparatus of this character by which the dust will be thrown outwardly by centrifugal force against a wall, from which it is washed down.

The invention consists in apparatus whereby the gas is given a rotary path, spray-pipes being used for washing the deposited dust from the casing on which the dust is deposited by centrifugal action.

The invention further consists in the preferred form in giving the gas a spiral path, the spray-pipes being used to wash the dust both from the spiral shelf and the casing.

It also consists in the construction and arrangement of the parts, as hereinafter more fully described and claimed.

In the drawings, referring to the form of Figs. 1 to 4, 2 represents an outer cylindrical vertical shell or casing having a bottom portion 3, which is preferably of cone shape and terminates in a pipe or channel 4, entering a water-sealing trough 5. The upper portion 6 of the casing is preferably of frusto-conical shape, and from it extend downwardly two concentric shells 7 and 8. These shells terminate above the lower end of the casing and form concentric annular chambers 9 and 10. In each chamber a spiral shelf 11 is supported upon suitable arms 12, these shelves being slightly narrower than the width of the annular chambers, so that a narrow space is left between their outer edges and the walls of the chambers. The dust-laden gas enters the upper frusto-conical portion through a conduit 13, which preferably leads in tangentially or non-radially, although this is not essential. At one side of the inlet-channel is located a partition or baffle 14, which extends to the inner shell 7, thus compelling the entering gases to flow around the shells 7 and 8 in one direction and flow in a spiral path over the shells until they reach their lower ends. They then pass up within the inner shell 7 through the outlet-flue 15 to the outlet-port 16.

During the downward passage of the gases over the spiral shelves the centrifugal action will cause the dust to deposit upon the outer walls and upon the shelves, and the dust is washed down from these surfaces by suitable water-spray pipes. In the form shown pipes 17 are arranged to throw water against shells 2, 7, and 8, and pipes 18 are arranged to spray water upon the spiral plates or shelves. In order to more effectually retain the water upon the shelves, I preferably provide them with longitudinal grooves or channels 19, as shown in the detailed cross-section of Fig. 4, the water flowing down along the spiral shelves through these channels. If it is desired to further wash the gases after they have reached the lower ends of the shelves, I may provide spray-pipes 20 within the central chamber or flue which supply a descending shower of water through the ascending current of gas, the water passing in the opposite direction to that of the gas. As the gas and water mix where they are coldest, if sufficient water is used to cool the gas, any steam which is formed is condensed, so that no water-vapor is carried along by the gas to lower its efficiency. The various water-pipes are supplied with suitable valves, and the pipes for spraying the shells may have a plug-cock to provide for washing and cleaning of the pipes if any of the openings become clogged.

In the use of the device the dust-carrying gas flows in a spiral path from the top toward the bottom of the washer, the dust particles being moved by centrifugal force against the inner surfaces of the shells 2 and 8 and dropping on the spiral shelves. As all these surfaces are bathed with water, the dust is immediately picked up and carried down and washed out of the device into the water seal, whence it passes through the sewer. Owing to the arrangement of the apparatus,

the dust is removed with a small amount of water, so that the initial heat of the gas is only reduced to a small amount. The rose-sprays in the ascending current of gas are not usually necessary, as I have found that the dust is very effectually removed in its downward passage over the shelves.

The apparatus may be used without the central uptake, as in Fig. 5. In this form 2′ is the outer shell, and 7′ and 8′ are inner shells, the gas passing in through the pipe 13′. In this case the gas after reaching the lower end of the shell 8′ flows out from the bottom of the washer through the offtake 21. In this figure I show a general arrangement of the washer in connection with a dust-catcher of a blast-furnace. In this case, 22 is the dust-catcher, into which the downcomer 23 from the blast-furnace leads. The pipe 13′ leads from the downcomer laterally into the washer, and the offtake 21, which in this case is at the bottom, leads into the gas-main 24, from which it is taken to the boilers or other place of use.

The important feature of my invention lies in causing the gas to flow in a rotary path or swirl within a cylinder or casing, the water being sprayed against the inner face of the casing or cylinder to wash down the dust carried against it by centrifugal force. I may therefore do away with the spiral shelf and direct the gas into a casing in a tangential direction or in a non-radial path, so that it will cause a swirl or rotary flow within the cylinder. Thus in Figs. 6 and 7 I show a casing 2^a with a gas-admission pipe or channel 13^a, which enters its top in a tangential or non-radial direction. In this form I have shown the outlet-channel 15^a as extending down within the cylinder concentrically therewith. 25 is a perforated water-box. In this form the gas enters the top of the cylinder, swirls around in a rotary path in descending, so as to throw the dust against the inner face of the casing-wall, and then flows upwardly through the central offtake. The water flows down over the inner wall of the casing and washes down the dust, as before.

In the form of Figs. 8 and 9 I show the inlet-channel 13^b as entering at the bottom of the washer-casing 2^b in a tangential direction. In this case the gas flows in a swirl or spiral path while ascending and passes out through the top outlet 15^b. In this case the water-box 25^b is employed, as in Figs. 6 and 7.

The advantages of my inventions result from the rotary path through which the gas flows, which effectually deposits the dust upon the walls of the passage, also from the washing down of the dust over these surfaces and the small reduction in the initial heat of the gases owing to the small amount of water which is necessary. In practice the apparatus is found to remove the dust so efficiently that the rose-sprays in the uptake, where this uptake is used, are not found necessary where gas is cleaned for stoves or boilers.

I have shown the gas as flowing through two concentric annular chambers provided with spiral shelves, where such spiral shelves are used; but one such annular chamber and shelf may be used or any desirable number of such chambers and shelves, and many other variations may be made in the form and arrangement of the chamber, the means for washing down the dust, and the other parts without departing from my invention.

I claim—

1. In a gas-washer, a stationary cylindrical vertically-extending chamber, having an inlet and an outlet for the gas, means for directing the gas in a helical path through the chamber, and means for wetting the inner cylindrical wall of the chamber without spraying the gas; substantially as described.

2. In a gas-washer, a stationary cylindrical vertically-extending chamber, having an inlet and an outlet for the gas, means for directing the gas in a helical path through the chamber, and means adjacent the inner cylindrical wall of the chamber for wetting said wall without spraying the gas; substantially as described.

3. In a gas-washer, an annular chamber having a stationary spiral shelf or path therein, connections arranged to pass dust-laden gas through the chamber and over the spiral shelf, and means for wetting one cylindrical wall of the chamber without spraying the gas; substantially as described.

4. In gas-washers, an annular chamber having a stationary spiral shelf therein, said chamber extending in a vertical direction and having water-spray pipes in its upper portion arranged to direct water against the outer wall without spraying the gas, and means for passing gases downwardly through said chamber and over the shelf; substantially as described.

5. In a gas-washer, an annular chamber having a spiral shelf extending from its inner wall to a point adjacent to its outer wall, and means for wetting the inner surface of the outer wall without spraying the gas; substantially as described.

6. In a gas-washer, a plurality of annular chambers containing stationary spiral shelves and an offtake-flue formed by the inner wall of the inner annular chamber and arranged to lead the gas in the opposite direction to that in the annular chambers; substantially as described.

7. In a gas-washer, an annular chamber containing a stationary spiral shelf, an offtake-flue formed by the inner wall of the annular chamber and arranged to lead the gas in the opposite direction to that in the annular chamber, and means for wetting the in-

ner surface of the outer wall of the chamber without spraying the gas; substantially as described.

8. In a gas-washer, an annular chamber containing a stationary spiral shelf, an off-take-flue formed by the inner wall of the annular chamber and arranged to lead the gas in the opposite direction to that in the annular chamber, and means for wetting the inner surface of the outer wall of the chamber; substantially as described.

9. In a gas-washer, an annular chamber containing a stationary spiral shelf, an off-take-flue within the annular chamber and arranged to lead the gas in the opposite direction to that in the annular chamber, and spray-pipes in the annular chamber; substantially as described.

10. In a gas-washer, an annular chamber containing a stationary spiral shelf, an off-take-flue within the annular chamber and arranged to lead the gas in the opposite direction to that in the annular chamber, and spray-pipes in the annular chamber and the return-flue; substantially as described.

11. In a gas-washer, a stationary vertically-extending cylindrical chamber having a gas-outlet, a gas-inlet therefor extending in a non-radial direction, and a water-distributing device arranged to flow water over the inner surface of said casing; substantially as described.

In testimony whereof I have hereunto set my hand.

FRANK E. BACHMAN.

Witnesses:

L. D. FRAUNFELDER,

Q. I. GOBEL.