No. 610,516. Patented Sept. 13, 1898.

V. D. ANDERSON.

DRIER.

(Application filed Oct. 20, 1897.)

(No Model.) 3 Sheets—Sheet 1.

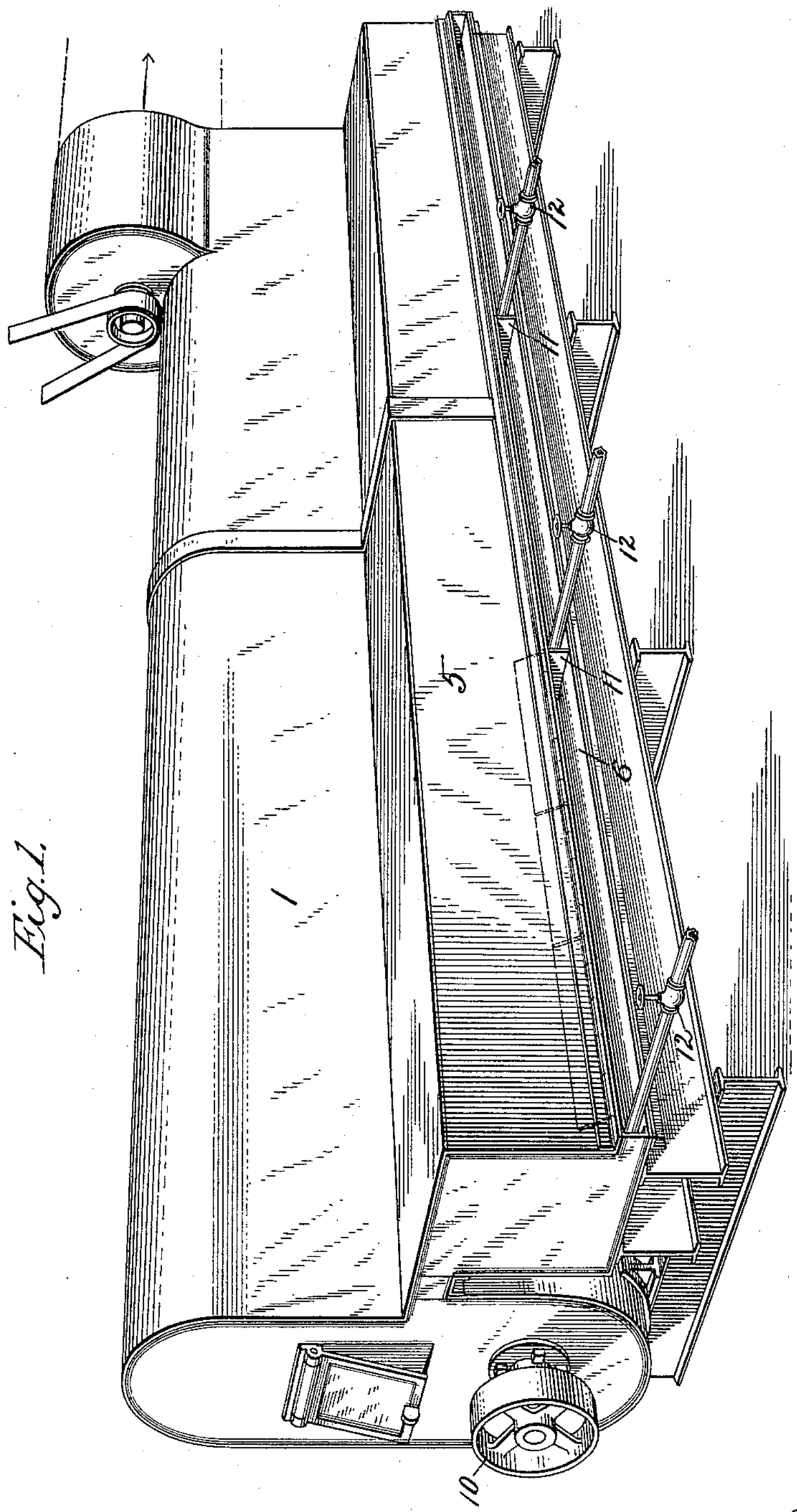


Fig. 1.

Witnesses
C. C. Burdine
D. E. Burdine.

Inventor:
Valerius D. Anderson,
by Dodger Sons,
Attorneys.

No. 610,516. Patented Sept. 13, 1898.

V. D. ANDERSON.

DRIER.

(Application filed Oct. 20, 1897.)

(No Model.) 3 Sheets—Sheet 2.

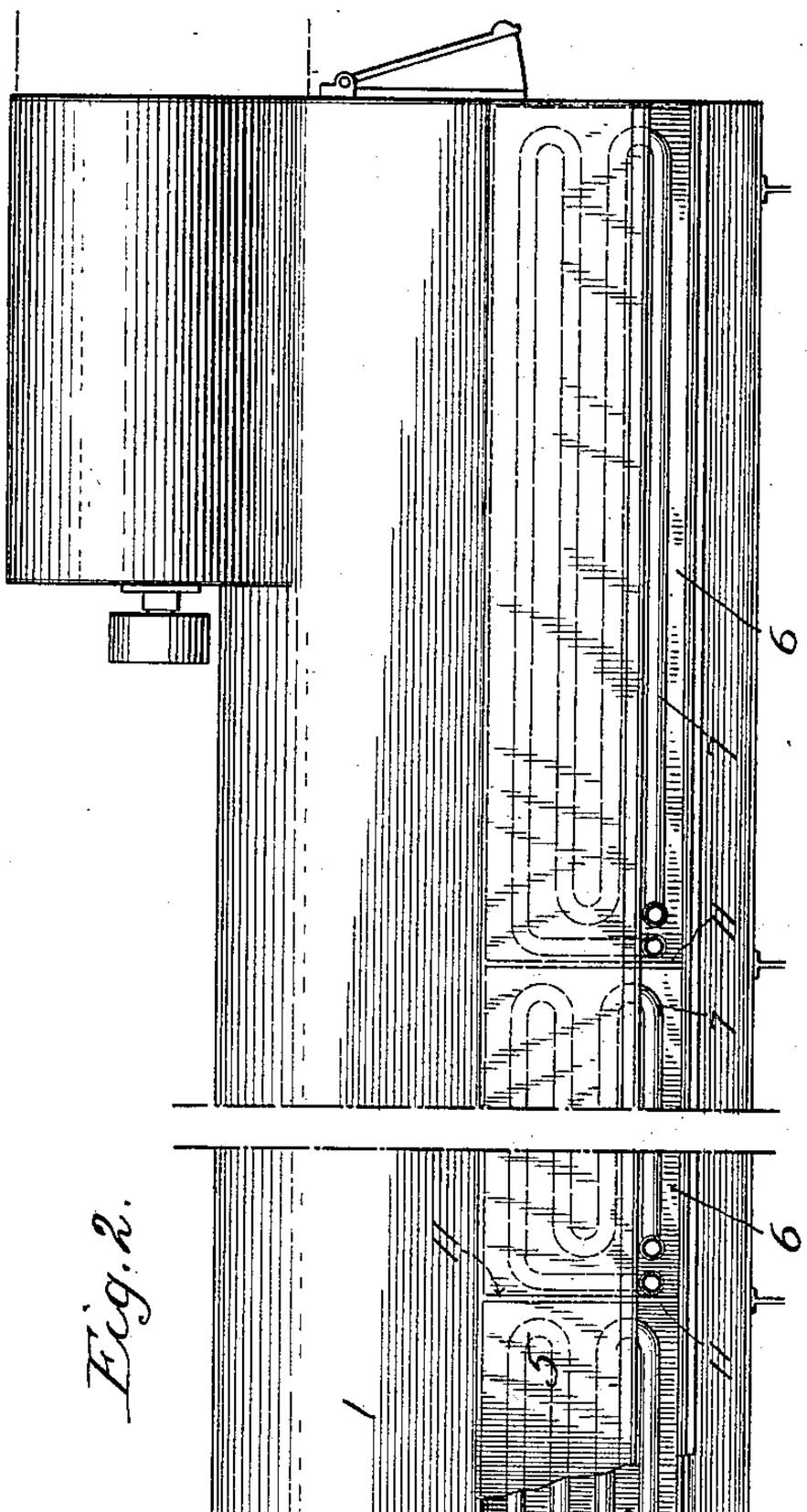


Fig. 2.

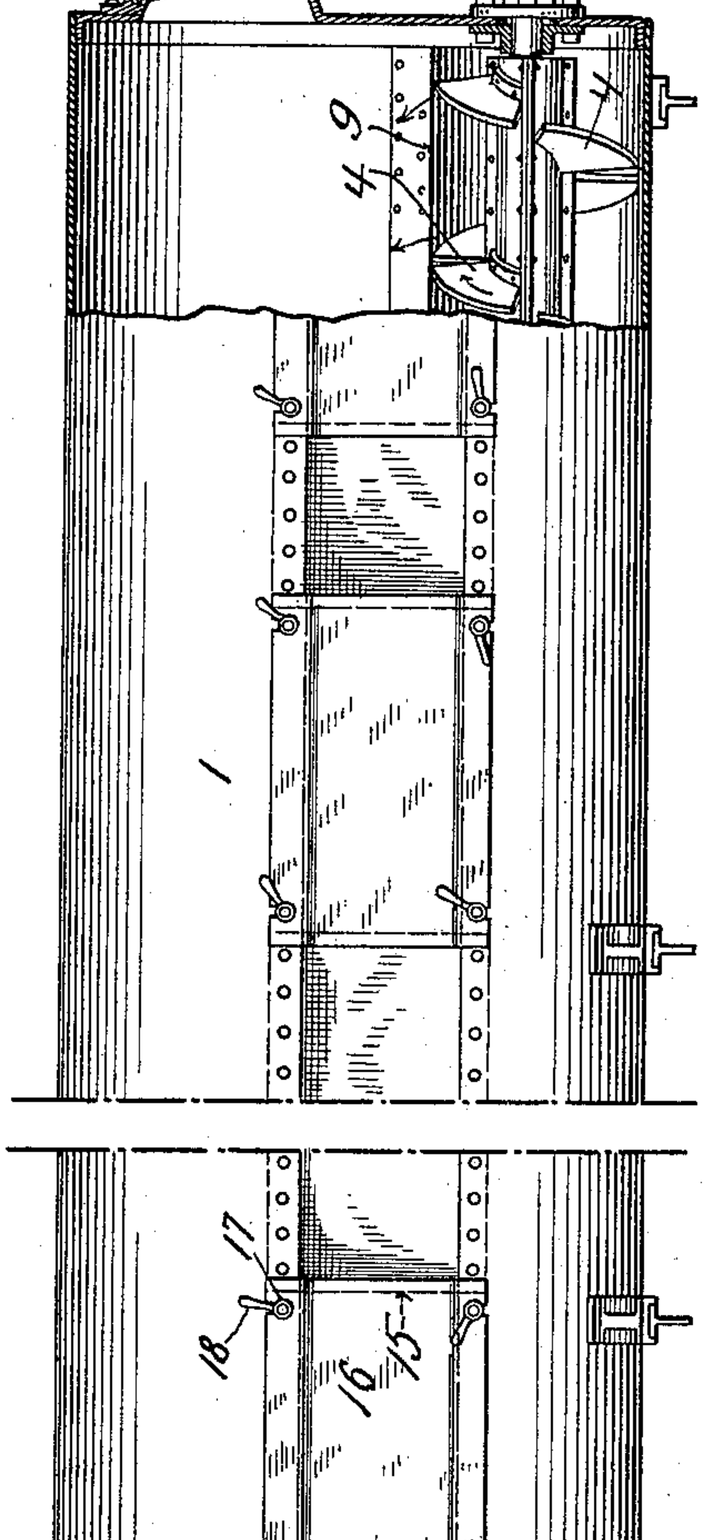
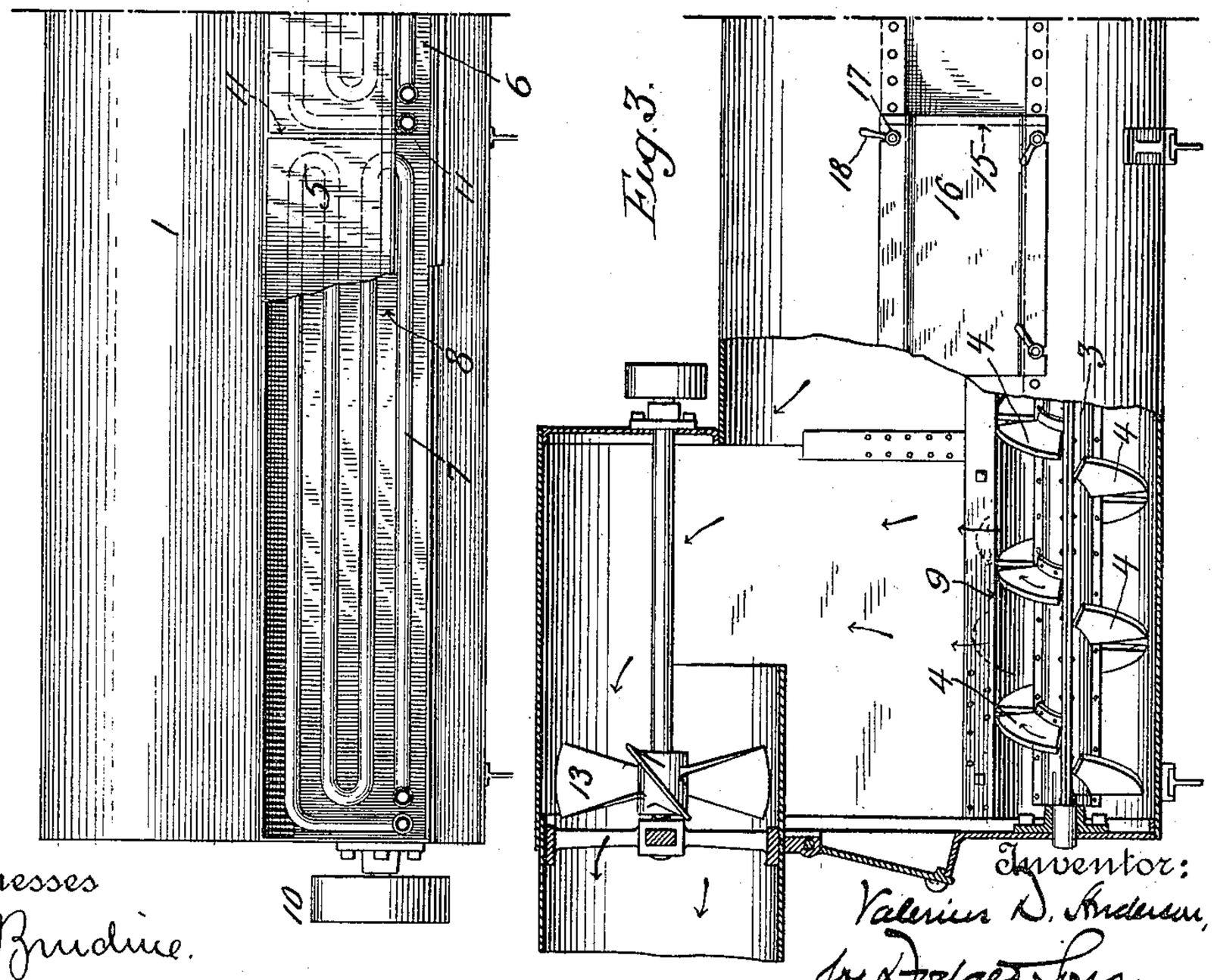


Fig. 3.



Witnesses
W. C. Burdine.
D. E. Burdine.

Inventor:
Valerius D. Anderson,
by Dodger Sons,
Attorneys.

No. 610,516. Patented Sept. 13, 1898.

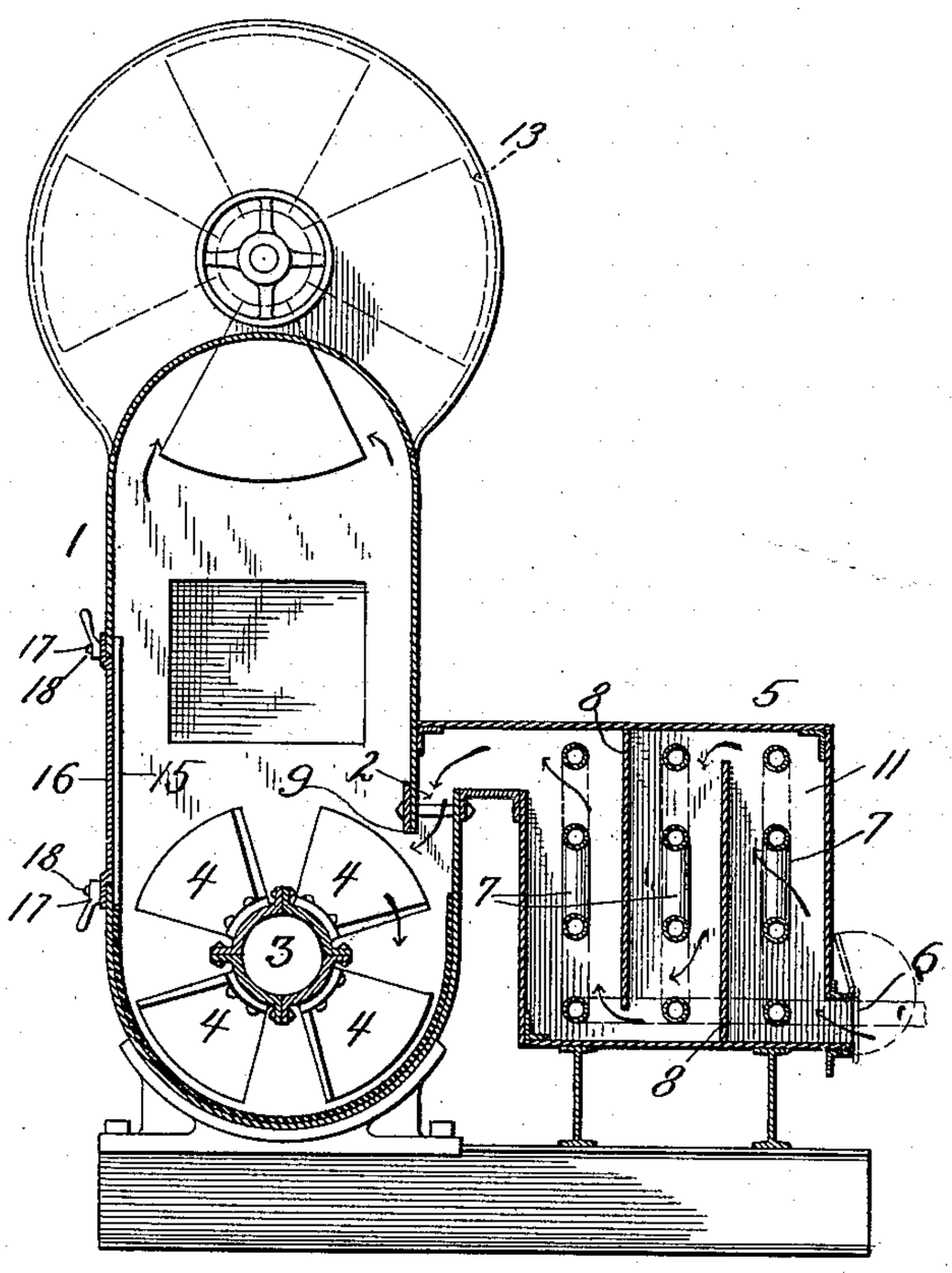
V. D. ANDERSON.

DRIER.

(Application filed Oct. 20, 1897.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 4.



Witnesses
A. C. Burdine
D. E. Burdine.

Inventor:
Valerius D. Anderson,
by Dodget Sons,
Attorneys.

UNITED STATES PATENT OFFICE.

VALERIUS D. ANDERSON, OF CLEVELAND, OHIO.

DRIER.

SPECIFICATION forming part of Letters Patent No. 610,516, dated September 13, 1898.

Application filed October 20, 1897. Serial No. 655,822. (No model.)

To all whom it may concern:

Be it known that I, VALERIUS D. ANDERSON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Driers, of which the following is a specification.

This invention pertains to driers for treating distillery slops, brewers' grains, slaughter-house refuse, and other masses containing a large percentage of moisture, together with solids which are of value for fertilizing or other purposes.

The object of the invention is to produce a drier of simple, cheap, and durable construction which may be continuously operated when of reasonably large size and which, though drying with great rapidity, shall nevertheless avoid all burning or overheating of the matters treated.

The construction which I find best suited to the end in view is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of the drier; Fig. 2, a side elevation with the heater-casing partly broken away; Fig. 3, an elevation looking from the opposite side, the casing partly in section; Fig. 4, a vertical transverse section.

The structure comprises a body or shell 1, having parallel vertical walls connected by semicircular top and bottom walls, as seen in Figs. 1 and 4. The walls are formed of boiler-plate or of iron or steel of like character, using as large sheets as can be conveniently obtained and bending them to form the curved top and bottom portions.

As shown in Figs. 1 and 4, the bottom curve is of greater radius than the top curve and its center is set out of vertical plane with that of the top, so that while one extremity or edge of the curved wall unites with or forms a continuation of one side wall the other edge extends outward some little distance beyond the other side wall. The lower edge of the latter side wall and the upper edge of the curved bottom wall are extended past each other, as shown in Fig. 4, forming a passage or flue 2 between them for the admission of air.

Within the shell or casing 1 and concentric with its curved bottom is a shaft 3, preferably of the form and construction set forth in Letters Patent of the United States No. 352,907, granted to me on the 23d day of November, 1886, though other forms may be adopted, if desired. Shaft 3 carries a series of blades or wings 4, which are arranged in a spiral series about the shaft and set obliquely, so that they may serve both as beaters for breaking up or separating the mass and throwing the particles into the top of the shell or chamber and as conveyers for moving the material lengthwise of the shell or chamber. The form of the blades or wings may vary, any common or well-known form capable of performing the functions stated being available.

Extending lengthwise of the shell or chamber 1 from end to end and communicating therewith throughout its length by the flue or passage 2 is an air-heating chamber 5, at the outer and lower part of which is an air-inlet 6, likewise extending the full length of the chamber, preferably.

Within the heating-chamber 5 is a heating-coil or series of coils 7, which may be of any common form, though the simple "manifold" or return coil is cheap and efficient. In practice it is found expedient to employ several distinct coils, connected to form a series, each coil being separated from others by a vertical partition 8 in the chamber 5. By arranging the partitions to extend alternately from the top of the chamber to within a short distance of its bottom and from its bottom to within a few inches of its top there is formed a serpentine or zigzag passage for the air entering through inlet 6 and escaping through flue 2, and the air is caused to pass about each coil or pipe-section in turn and on all sides thereof, as will be readily understood upon reference to Fig. 4.

The chamber 5 may be divided into sections by transverse partitions 11, as indicated in Figs. 1 and 2, each having its own heating-coils and controlling-valve 12.

It will be noticed also upon referring to Fig. 4 that the lower edge 9 of that side wall of chamber 1 which constitutes one side of the flue 2 is carried nearly to the circumferential edge of the blades or beaters 4 or to the circle described by their outer edges. The

shaft 3 is provided at one end with a belt-wheel or pulley 10, Figs. 1, 2, and 3, through which it receives a rapid rotary motion from any convenient prime mover, the direction of rotation being indicated by arrow. The speed of rotation is such that the material in the bottom of the shell is thrown upward by the blades or beaters into the upper part of the shell and separated into comparatively small particles or bodies, in which state it may be effectively acted upon by the air entering the chamber through flue 2. As the blades or beaters move rapidly past the lower side of flue 2 they induce an inward flow of air through said flue, and consequently through chamber 5, which is greatly strengthened by an exhaust-fan 13 at the rear end of the shell or chamber 1 and at the top thereof. As the air enters chamber 1 through flue 2 it is drawn downward by the beaters or blades and carried beneath the shaft 2 into and through the matters in the bottom of the chamber, thus being brought into the most intimate contact possible with the matters under treatment. In this way the air is caused to become laden and saturated with moisture, and being previously dried and heated it is in the best condition for taking up moisture.

The apparatus may of course be made in varying sizes, both as to length and as to cross-section; but it is more especially designed for handling large masses of material, and consequently will ordinarily be of large size, or at least of considerable length, so that the process of drying may be carried on continuously.

In using the apparatus the matters to be treated are fed into the machine at the forward end, as the machine is viewed in Fig. 1, through a door 14 or by any common form of feed device, such as a screw conveyer, and is gradually carried toward the rear end, being fully dried in its passage from end to end of the apparatus. This of course requires a reasonably long travel; but where this is impracticable the feed and the delivery may be intermittent, the outlet being kept closed until the treatment is finished. The material as it enters the chamber of course contains its greatest percentage of moisture and is therefore least liable to injury by heat. Hence it is found expedient to employ a higher temperature in the receiving end of the chamber and to reduce the temperature as the delivery end is approached. It is for this reason that the heating-chamber 5 is divided by partitions 11 and that separate coils and controlling-valves 12 are furnished.

It will of course be understood that any convenient form of heating apparatus may be used, the coils being represented merely as illustrative of a type. In many situations the exhaust-steam from engines will be available for heating the air preparatory to its use in the chamber 1. In other cases, as where the stock is not liable to injury thereby, the products of combustion—that is, the flames or the smoke, gases, &c.—from a furnace may be carried directly into the chamber through the flue 2, or the air may be carried through a flue or chamber surrounded by the flames and gases.

If desired, the inlet 6 may be controlled by doors or dampers, though this is found unnecessary, generally speaking.

Owing to the presence of large and heavy bodies—such as bones, sticks, stones, and the like—which are frequently found in garbage, the blades or beaters are occasionally broken, and under former constructions it has been necessary to stop the machine, empty it, cut off the heat, and enter the casing or shell to repair or replace the broken blade. I now provide the shell with a series of manholes or openings 15, having removable doors or covers 16, secured in place by lever-nuts 17, screwing upon threaded stems or bolts 18, or by any equivalent fastening capable of ready release. These doors being arranged along the whole length of the shell above the axis of the beater-shaft and close enough together to permit the attendant to reach all parts of the shaft, it is no longer necessary to empty the shell; but it is sufficient that the shaft be stopped and the proper door removed, whereupon the injured blade may be renewed or repaired without bodily entering the chamber. The saving in time and labor thus effected is very considerable, and the exceedingly unpleasant task of entering and working within the chamber is avoided.

The form or type of exhausting device here represented by the fan-wheel 13 may be varied at will—that is to say, any common and well-known form of exhausting device may be used.

The machine or apparatus herein described is found to give exceptionally high efficiency in drying and is simple, cheap, and durable in construction.

The extension of the edge 9 of the side wall downward past the upper edge of the curved bottom and in close proximity to the beaters prevents the material thrown off by the beaters from entering the flue 2, and it also serves to give a downward initial direction to the inflowing air.

Having thus described my invention, what I claim is—

1. In a drier, the combination of a chamber; a rotary shaft in the lower part of said chamber, provided with beaters; an air-inlet on the descending side of said shaft; and a guard covering said inlet and serving to direct the air downward toward the bottom of the chamber, and to exclude material from the inlet.

2. In a drier, the combination of a shell or casing; a rotary beater located within said casing; an air-inlet at one side of the casing; and a shield or guard extending downward from the upper side of the air-inlet to a point near the periphery of the beater; whereby

air drawn in by the beater is directed downward into the mass of material in the lower part of the casing.

3. In a drier, a shell or casing having upright side walls connected at the top, and a curved bottom forming a continuation of one side wall but extending outward and upward beyond the lower edge of the other side wall substantially as shown, whereby an inlet-flue is formed, and the lower edge of the side wall is made to serve as a wall and guard for said flue.

In witness whereof I hereunto set my hand in the presence of two witnesses.

VALERIUS D. ANDERSON.

Witnesses:

CHAS. W. TOLAND,

WM. H. DE WITT.