

No. 683,313.

Patented Sept. 24, 1901.

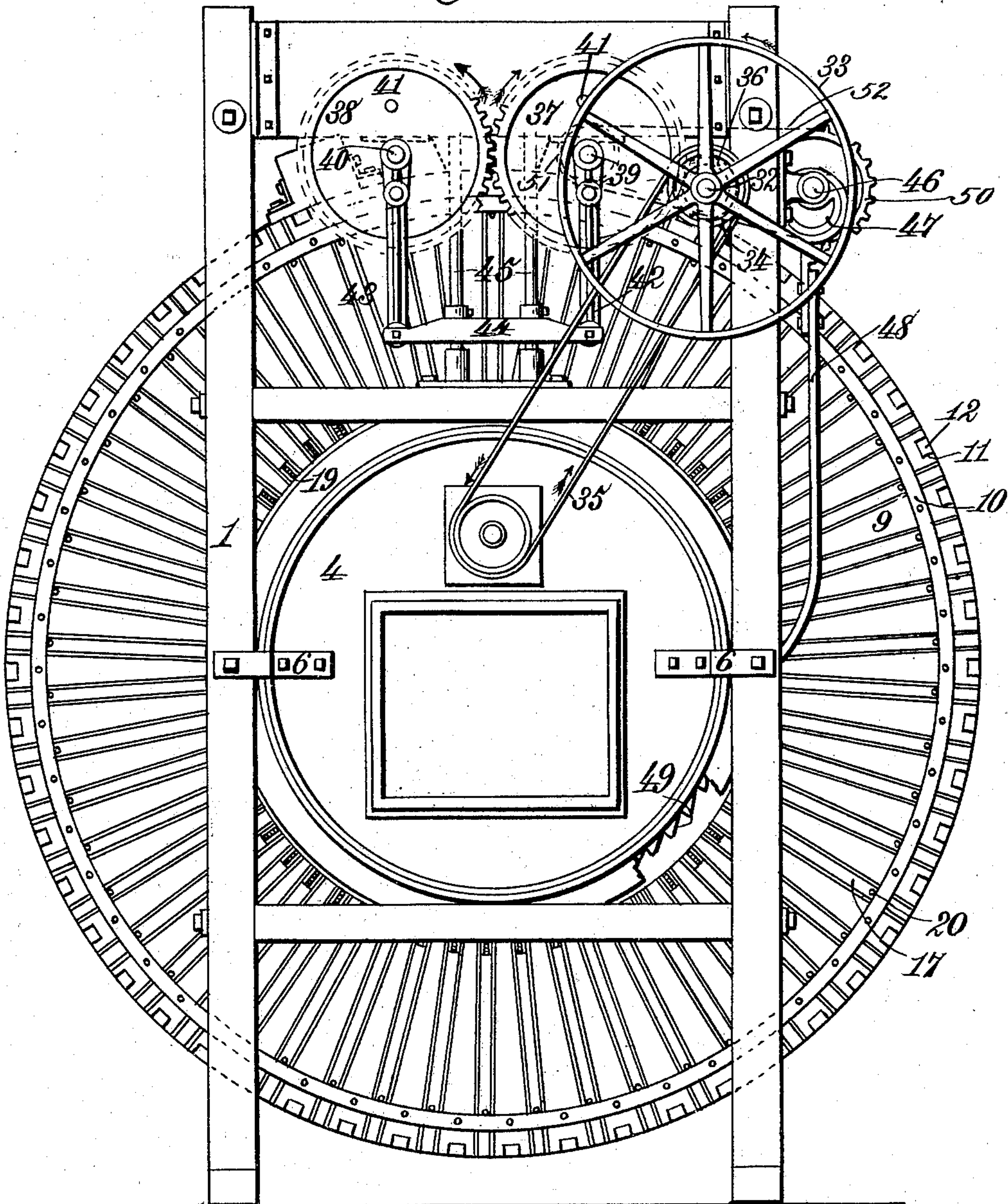
J. E. MITCHELL.
DUST COLLECTOR.

(Application filed Aug. 25, 1900.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1.



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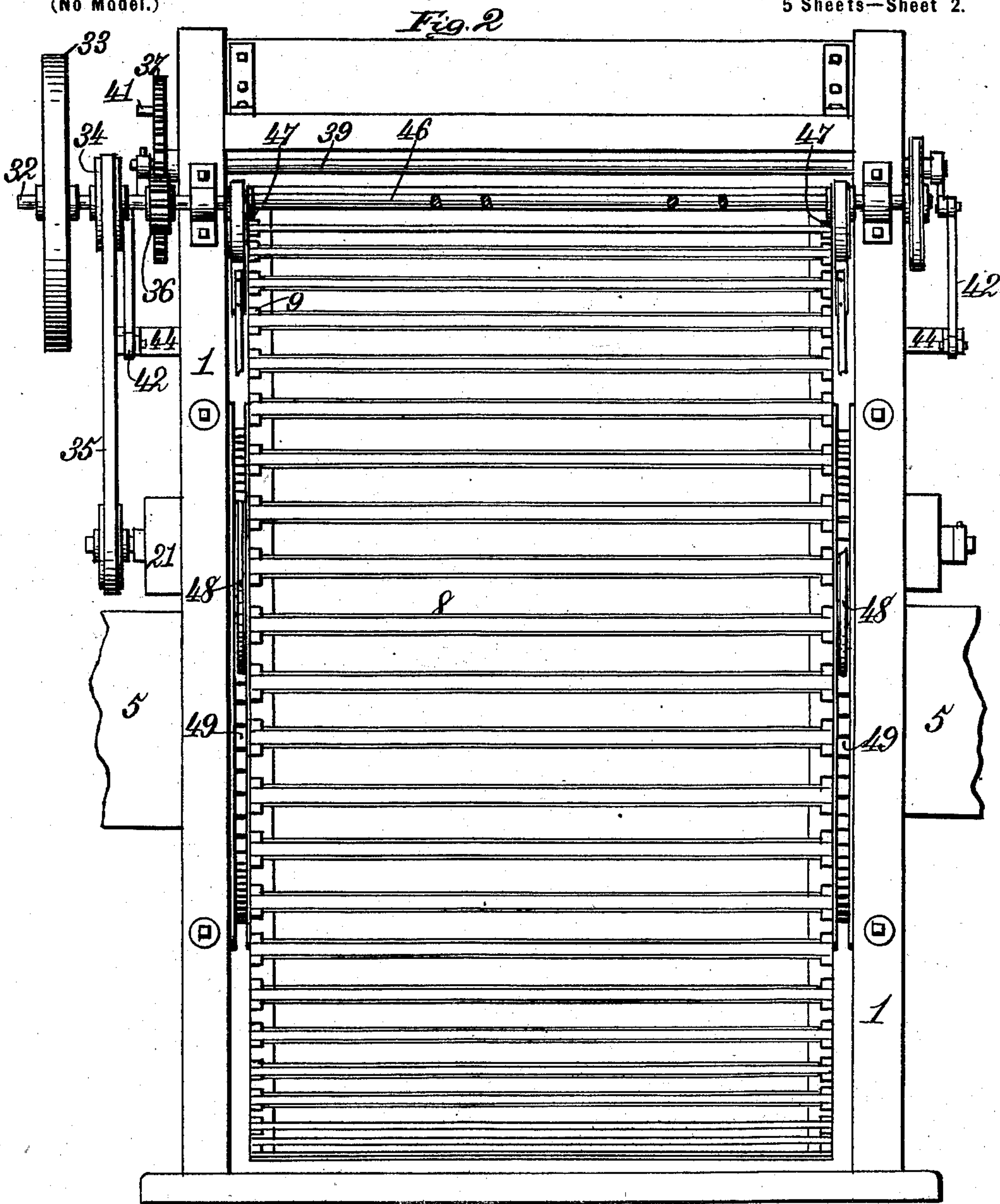
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(No Model.)

5 Sheets—Sheet 2.



Witnesses.
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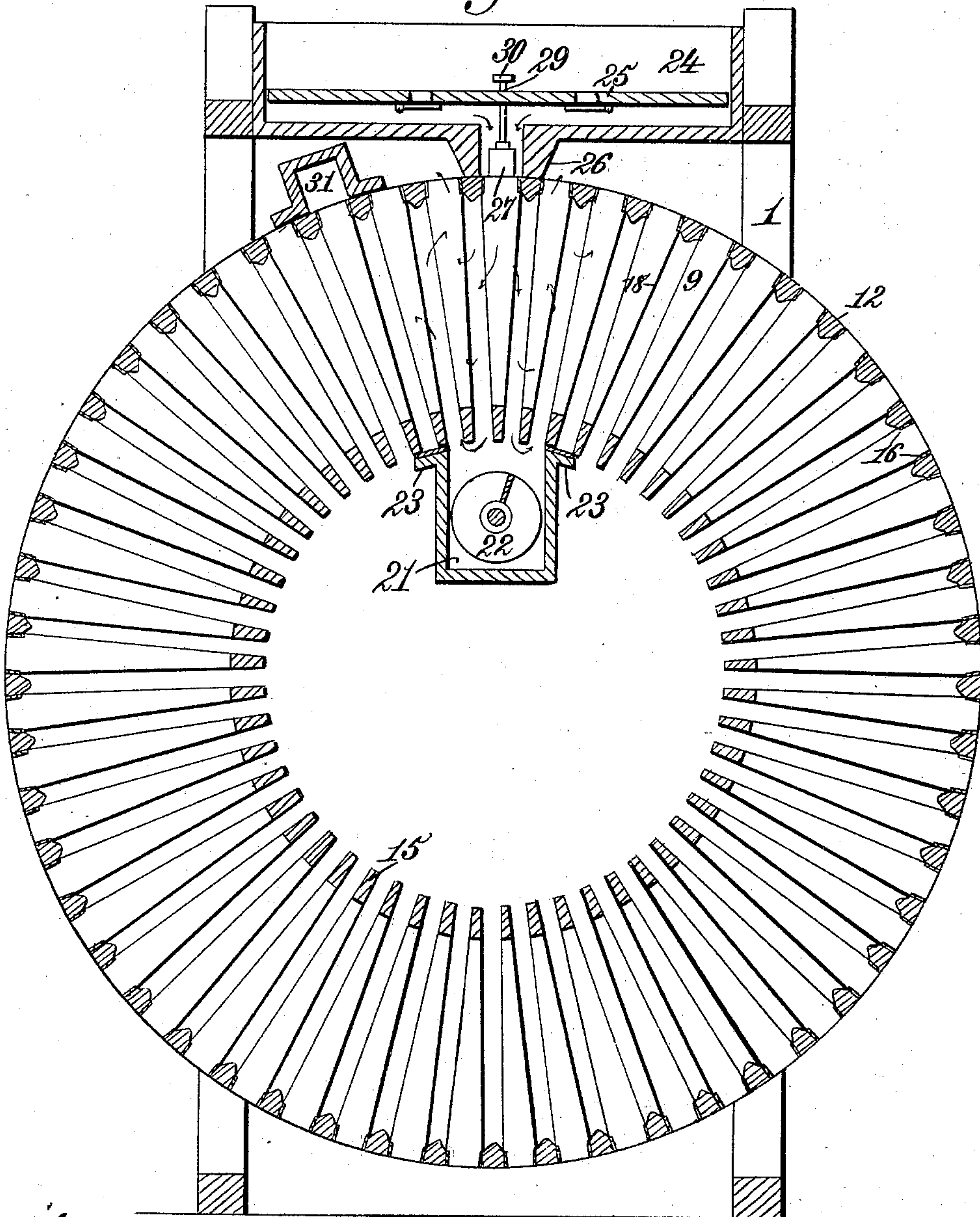
J. E. MITCHELL.
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(No Model.)

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Fig. 3.



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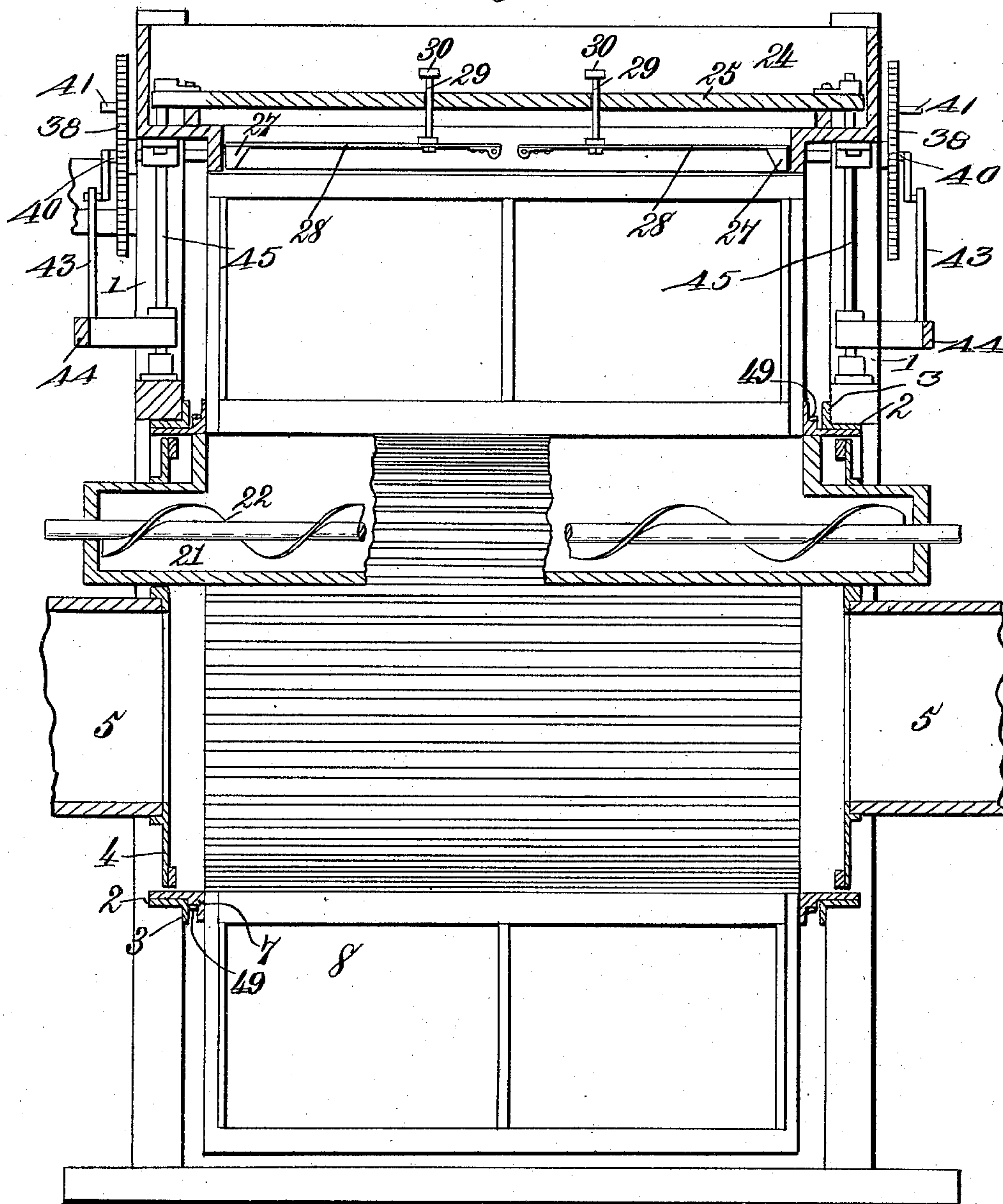
J. E. MITCHELL.
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(Application filed Aug. 25, 1900.)

(No Model.)

5 Sheets—Sheet 4.

Fig. 4.



Witnesses.
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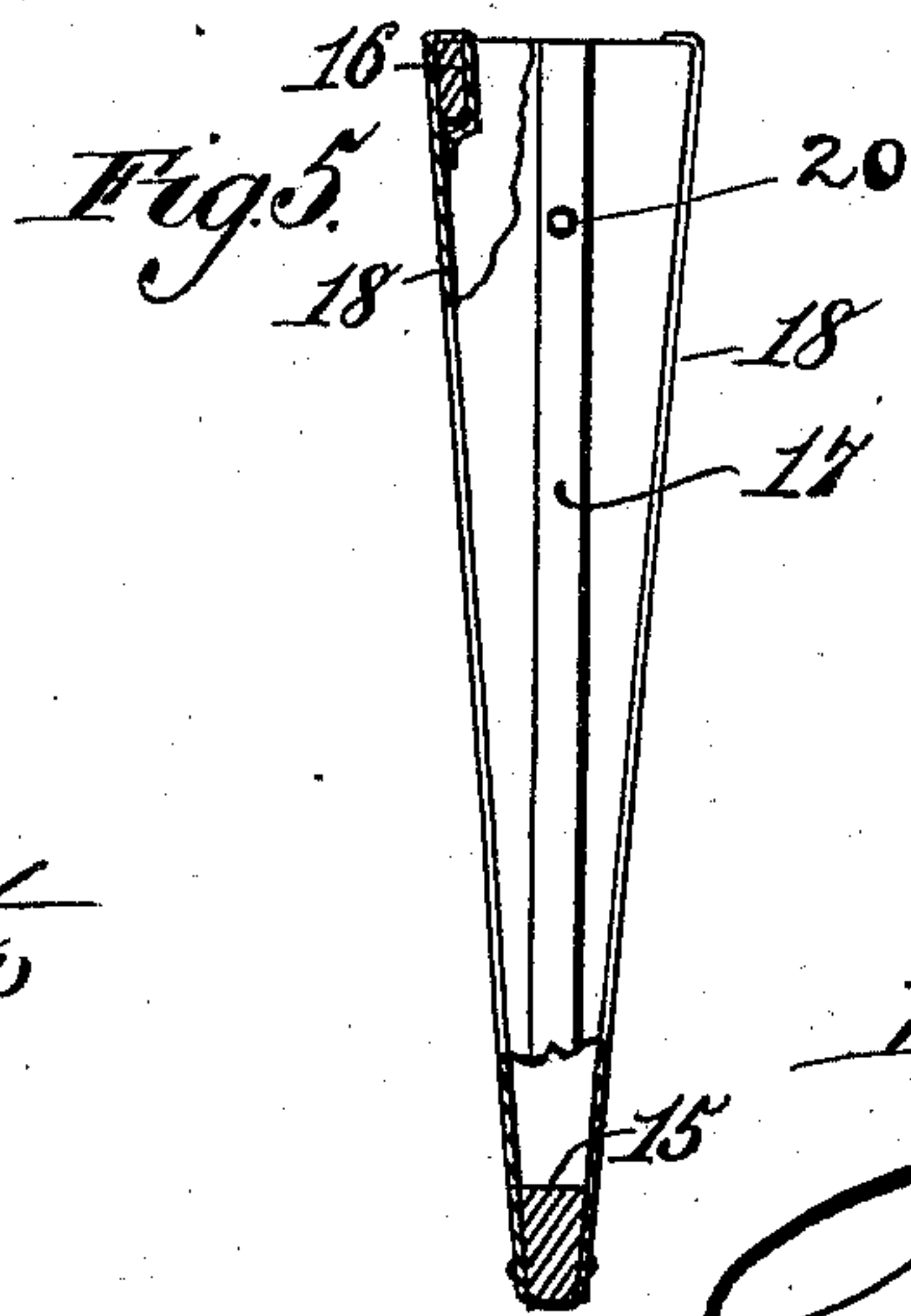
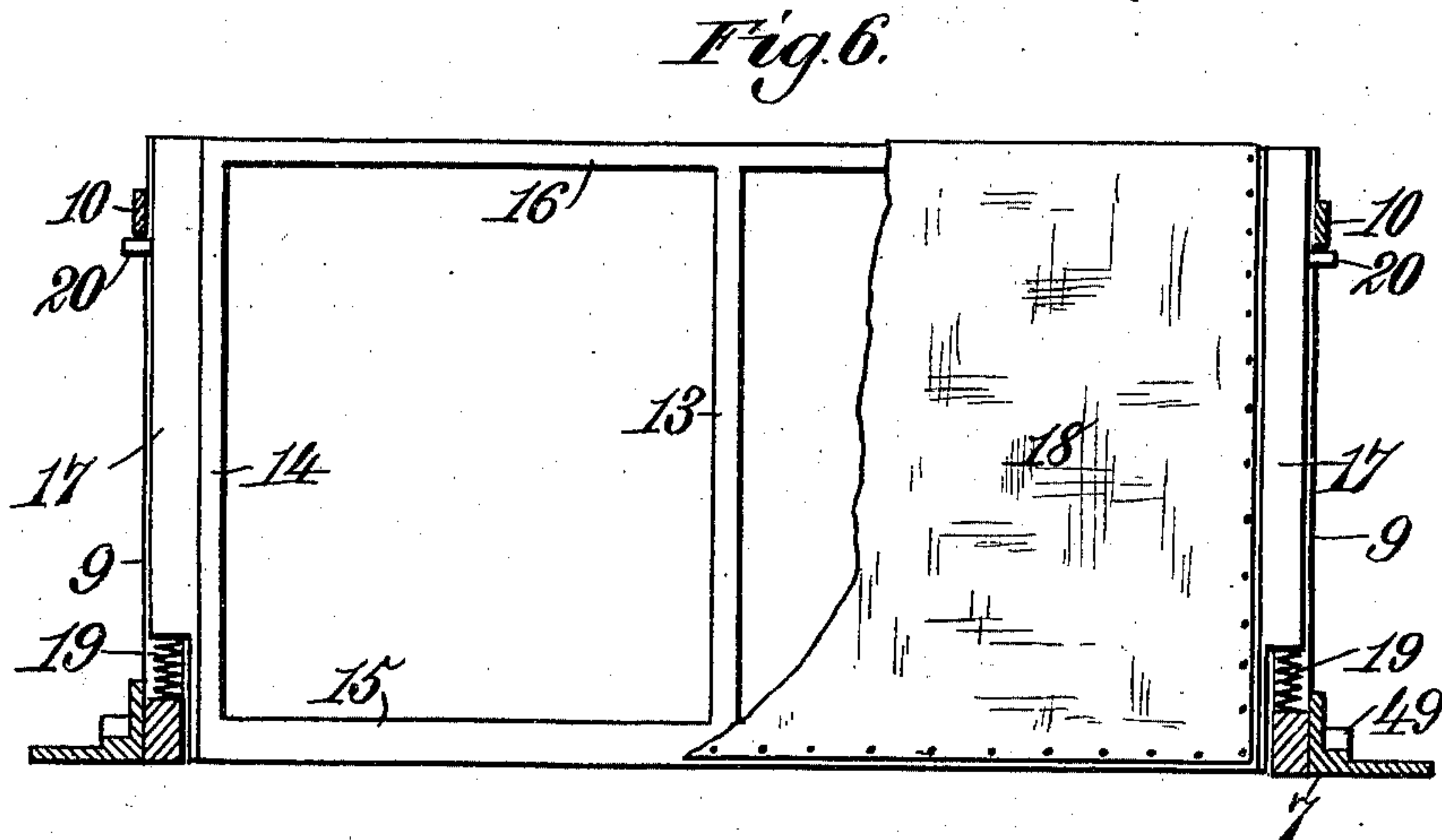
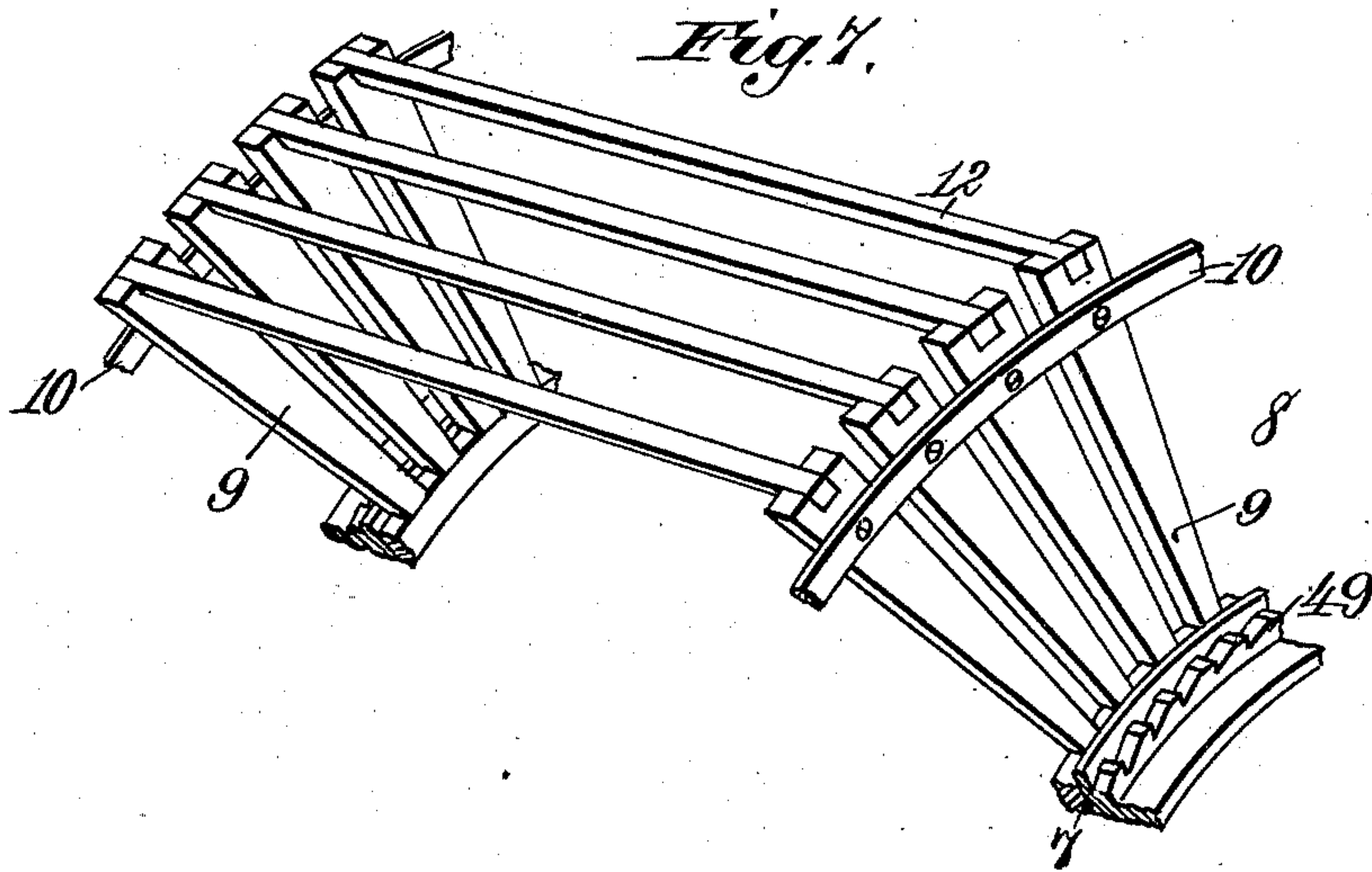
Patented Sept. 24, 1901.

J. E. MITCHELL.
DUST COLLECTOR.

(Application filed Aug. 25, 1900.)

(No Model.)

5 Sheets—Sheet 5.



Witnesses.
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UNITED STATES PATENT OFFICE.

JOHN E. MITCHELL, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE MITCHELL-PARKS MANUFACTURING COMPANY, OF SAME PLACE.

DUST-COLLECTOR.

SPECIFICATION forming part of Letters Patent No. 683,313, dated September 24, 1901.

Application filed August 25, 1900. Serial No. 28,059. (No model.)

To all whom it may concern:

Be it known that I, JOHN E. MITCHELL, a citizen of the United States, residing at St. Louis, in the State of Missouri, have invented new and useful Improvements in Dust-Collectors, of which the following is a specification.

My invention relates to dust-collectors, the object of the same being to provide improved means for automatically cleaning the cloth or filtering-walls and means for preventing the escape of fine granular dust that would ordinarily pass through the filtering-walls immediately after they are cleaned.

A further object of the invention is to provide an improved construction and means for mounting the cloth-frames in the rotary wheel whereby a large area of filtering-surface may be obtained in a comparatively small space and whereby the said frames may be separately removed and replaced in the reel.

Other objects and advantages of the invention will hereinafter appear, and the novel features thereof will be set forth in the claims.

In the drawings forming a part of this specification, Figure 1 is an end elevation of a dust-collector embodying my improvements. Fig. 2 is a side elevation of the same. Fig. 3 is a cross-section. Fig. 4 is a central longitudinal section. Figs. 5 and 6 are detail views of one of the cloth-frames employed. Fig. 7 is a detail view of a portion of the reel.

Like reference-numerals indicate like parts in the different views.

To the main frame 1 of the machine are secured at opposite ends the bearing-rings 2 for the rotary reel, which, as shown, are circular in form and are provided with flanges 3, extending outwardly therefrom. Within each of the bearing-rings 2 is located a stationary head 4, having a rectangular opening therein, with which the wind-trunks 5, carrying the dust-laden air from the fan or blower, communicate. The heads 4 are secured in place by the brackets 6, which are attached thereto and to the upright beams of the frame 1.

The hubs 7 of the rotary reel 8 consist of

rings which fit within the bearing-rings 2 and are mounted and supported therein. These hubs or rings 7 have secured to them and extending radially therefrom the segmental spokes 9, which are connected to each other near their outer ends by the rings 10, said rings 10 serving to brace or support said spokes and hold them spaced apart at regular intervals. The outer end of each of the spokes 9 is formed with a notch 11, the said notches forming seats for the longitudinally-extending ribs or bars 12, the said bars connecting the spokes 9 at opposite ends of the reel. The segmental spokes 9, secured to each other and to the rings 7, constitute the open circular heads of the reel 8. Within the reel 8 are removably mounted the cloth or filtering frames 13, each of said frames being made up of segmental end pieces 14, connected together at their inner or contracted ends by the longitudinally-extending strips 15, and connected together at their outer or wider ends by the narrow metallic or wooden strips 16. Secured to the outer surfaces of the segmental end pieces 14 are the rectangular ribs 17, having parallel side walls and of the same width as the spaces between two adjacent spokes 9 of the reel 8. The filtering cloth or wall 18 is secured to each frame 13 by folding the same around the narrow strips 16, connecting the outer ends of the end pieces 14, and tacking it along its side and bottom edges to the edges of the segmental end pieces 14 and to the longitudinally-extending strip 15. Constructed as described, the cloth-frames are adapted to be inserted into the reel 8, with the ribs 17 thereon fitting within the spaces between the spokes 9 of said reel. The inner ends of said frames are supported upon the coil-springs 19, projecting from the rings 7, and outward movement of said frames is prevented by the removable stop-pieces 20, which, as shown, are in the form of screws projecting laterally from the sides of the ribs 17 and engaging the inner edges of the rings 10 of the reel. These stop-pieces serve not only to prevent the accidental removal of the cloth-frames from the reel, but also serve to maintain the springs 19 in a slightly-compressed condition. When it is desired to remove the

frames 13 from the reel for the purpose of repair or for any other purpose, all that is necessary to do is to remove the screws 20 and slip the frames outwardly in a manner readily understood. It will thus be seen that any one or all of the cloth-frames may be readily removed and replaced and that when they are in place within the reel the inner ends thereof or the strips 15 form a central drum into which the dust-laden air is discharged by the wind-trunks 5 at either end of the machine through the stationary heads 4. It will also be seen that when the cloth-frames are in place an extremely large filtering-surface is provided within the comparatively small space in which said frames are located.

Within the upper part of the central drum formed by the inner ends of the cloth-frames when the latter are in place is located a cut-off or dead-air dust-receiving chamber 21, and in this chamber is mounted a rotary conveyer 22, designed for the purpose of carrying off the accumulation of dust within said chamber. The said cut-off chamber is provided at its upper end with laterally-extending wings 23, whose upper edges lie in close contact with the inner edges of the strips 15, and is designed to exclude dust-laden air from two or more cloth-frames or filtering-walls at the uppermost portion of the reel. As shown in Fig. 3 of the drawings, two of the passages leading to the cloth-frames are cut off from the dust-laden air in the central drum by the wings 23 of the chamber 21, while four of the passages leading into said cloth-frames are in communication with said cut-off chamber. Above the rotary reel 8 and secured to the framework 1 of the machine is an air-compressor 24, consisting of a box or cylinder and a reciprocating piston or plunger 25. The said compressor is formed with a discharge-nozzle 26, designed to conduct the air forced by the piston 25 into the cloth-frames 13 and through the filtering-walls thereof as said frames are brought in succession opposite the same. As heretofore stated, two or more filtering-walls or cloth-frames are in communication with the cut-off chamber 21 at the same time. This permits the air from the compressor 24 to be forced through the cloth 18 on one of said frames and to escape through the cloth on the other or others on either side thereof and in the meantime to deposit the dust removed into the cut-off chamber 21, whence it is discharged by the conveyer 22. By mechanism which will be described later the reel 8, carrying the cloth-frames 13, is given an intermittent movement to bring each of said cloth-frames in succession opposite the nozzle 26 of the compressor 24 and also opposite the cut-off or dead-air chamber 21, containing the conveyer 22. As each frame is brought opposite the nozzle 26 the piston 25 is depressed, which causes a positive reverse blast to be forced through the filtering-walls of said cloth-frame, the same passing down into the cut-off chamber 21, where the dust which has

been removed from the cloth lodges, and thence out through the adjacent cloth-frames, which are also in communication with said cut-off chamber. The said cut-off chamber 21 is therefore ventilated through those cloth-frames which are in communication therewith, but which are not subjected to the reverse blast referred to. The pressure exerted by said reverse draft may therefore escape from the cut-off chamber 21 without permitting the dust carried thereby to escape. This is an essential feature of construction of my invention. In addition to providing the reverse blast through the filtering-walls of the cloth-frames from the nozzle 26 of the compressor 24 I also provide means whereby each of the cloth-frames as they are subjected to the reverse blast referred to may be given a slight jar, which will tend to complete the dislodgment of the dust from the walls of said frames and more effectively clean the same. This means consists of a pair of hammers 27, attached to the outer ends of levers 28, fulcrumed upon the under side of the compressor 24 and located and adapted to move within the nozzle 26. Near the fulcrum-point of each of said levers is attached a rod or arm 29, which extends upwardly through the piston 25 and has a head 30 thereon, which is adapted to be engaged by said piston for the purpose of elevating said levers. Upon the upstroke of the piston 25 the levers 28, carrying the hammers 27, are raised; but upon the downstroke thereof, at which time the reverse blast is caused to pass through the cloth-frame then being cleaned, the hammers 27 are allowed to drop and strike against the opposite ends of the cloth-frame 13, imparting a slight jar thereto against the action of the supporting-springs 19, upon which said cloth-frame is mounted. This jar or agitation of the frame, which is imparted simultaneously with the reverse blast of air through the filtering-walls thereof, tends to completely dislodge the dust from said filtering-walls and discharge the same into the cut-off chamber 21.

The filtering-walls 18 of the cloth-frames 13 will ordinarily collect practically all of the dust contained in the air passing through the same; but in some cases the nature of the dust is such that it has a tendency to pass through the cleaned filtering-walls immediately after passing the cut-off chamber 21 when the first gust of dust-laden air strikes them. To prevent the escape of dust at this point, I employ a supplemental cut-off chamber 31, mounted in contact with the periphery of the reel 8. A suction is created in any suitable way in the supplemental chamber 31, which tends to carry off any dust which may pass through the cleaned filtering-walls of the cloth-frames which may be in communication therewith. This dust is therefore prevented from escaping into the atmosphere, and the provision of this supplemental chamber makes the apparatus practically dustless, as

there is very little, if any, tendency for the dust to escape at other points in the machine.

The mechanism for operating the various movable parts of my machine consists of a drive-shaft 32, having a belt-wheel 33 thereon, connected with any suitable source of power, and also having a belt wheel or pulley 34 thereon, around which passes the belt 35, the said belt transmitting the motion of the drive-shaft 32 to the rotary conveyer 22. Secured to the drive-shaft 32, adjacent to the belt wheel or pulley 34, is a pinion 36, which meshes with one of a pair of intermeshing spur wheels or gears 37 38. Said gears 37 38 are loose upon the crank-shafts 39 40, but are provided on one side with laterally-extending projections 41 41, adapted to engage the cranks on the shafts 39 and 40, respectively. To the cranks on said shafts are pivoted the links 42 43, attached at their lower ends to a cross-head 44, adjustably secured to the piston-rods 45 of the piston 25, forming part of the air-compressor 24. During the rotation of the drive-shaft 32 a continuous rotary movement will be imparted to the conveyer 22 through the belt 35. A continuous rotary movement in opposite directions is also imparted to the gears 37 and 38. Upon the upward movement of the projections 41 on said gears the said projections engage with the crank portions of the shafts 39 and 40 and turn said shafts with them. When said crank portions reach their uppermost positions, however, at which time the piston 25 is raised, said shafts are permitted to turn independently of the gears 37 and 38 and continue to turn in the same direction, but at an accelerated rate of speed, with the result that the piston 25 drops by gravity, compressing the air beneath the same and forcing it out through the nozzle 26 and through the filtering-walls of the cloth-frame which is in communication with said nozzle. At the same time the hammers 27 are permitted to strike against the ends of the cloth-frame beneath the nozzle 26, and a jar is thereby imparted to said cloth-frame, which serves to assist the reverse blast in removing the accumulated dust from the inner surfaces of the filtering-walls. To provide for the intermittent rotation of the reel 8, I employ an eccentric-shaft 46, which is suitably geared with the crank-shaft 39 and is driven therefrom. To the eccentrics 47 at the opposite ends of the shaft 46 are connected the downwardly-extending pawls 48, which are adapted to engage with the ratchet-teeth 49 on the rings 7. Upon the downstroke of the pawls 48 the engaging ends thereof ride over the inclined walls of the ratchet-teeth 49; but upon the upstroke of said pawls they are in engagement with the shouldered portions of the teeth 49 and rotate the reel 8 a distance corresponding to the thickness of one of the cloth-frames mounted in said reel, so as to bring a new cloth-frame to be cleaned opposite the nozzle 26 of the compressor 24. The

connection between the crank-shaft 39 and the eccentric-shaft 46 is by way of reducing-gearing, which provides for the rotation of the eccentric-shaft 46 at a slower differential of two to one and permits the compressor 24 to deliver two blasts of air and the hammers 27 to operate twice on each cloth-frame 13 before the reel 8 is rotated and the next succeeding cloth-frame is brought into position for cleaning.

I have found that to accomplish the best results in automatically cleaning the cloth in the dust-collector it is not only necessary to jar the cloth while the dust-laden air is excluded from its inner surface, but that it is also necessary to force a powerful current of air through the opposite side of the cloth simultaneously with the striking of the hammer. It is therefore apparent that the cut-off chamber 21 must be well ventilated without permitting the escape of dust. I find it most practical to ventilate this chamber back through the cloth again, and for that purpose enough cloth is always in communication with the cut-off chamber to allow twice as much filtering-surface for the air to pass out as the surface being cleaned. This permits free ventilation of the air and prevents the escape of dust. Other means, however, may be provided for ventilating the cut-off chamber 21, and I therefore do not desire to be limited to the exact construction and arrangement of parts shown.

I am aware that it is not new to create a reverse current of air through the cloth being cleaned; but this is usually accomplished by means of a back draft applied to the cut-off chamber, which is not very effective by reason of the fact that it is impossible to create sufficient draft in the cut-off chamber to assist to any great extent in cleaning the cloth in communication with said chamber without drawing the dust back into the inlet of the fan, and this, as is well known, is objectionable.

As a means for giving the eccentric-shaft 46 the slower differential of two to one compared with the crank-shaft from which it is driven said eccentric-shaft 46 may be driven from the adjacent crank-shaft 39 by means of sprockets 50 and 51 and chain 52 at the opposite end of the machine from that shown in Fig. 1. The sprocket 50 on shaft 46 being twice the diameter of the sprocket 51 on the crank-shaft 39 would of course give the eccentric-shaft 46 a speed of one-half that of the crank-shaft.

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

1. In a dust-collector, a reel, radially-arranged filtering-walls therein, separated from each other to form spaces, the adjacent pairs of said walls being closed at their inner and outer ends alternately to form inner and outer spaces, the inner spaces communicating at their inner ends with a central drum into

which dust-laden air is introduced, and the outer spaces communicating with the outside, a ventilated cut-off or dust-receiving chamber in said drum communicating with
5 and adapted to exclude dust-laden air from a plurality of said inner spaces, a nozzle communicating with and closing the open outer end of one of the outer spaces over said chamber, means for forcing a reverse current of
10 air through said nozzle, and means for jarring the filtering-walls between which said reverse current is introduced.

2. In a dust-collector, a reel, radially-arranged filtering-compartments therein having open outer ends, the inner ends of said
15 compartments forming or communicating with a central drum into which dust-laden air is introduced, a ventilated cut-off or dust-receiving chamber in said drum communicating with and adapted to exclude dust-laden
20 air from the inner ends of a plurality of said compartments, a nozzle communicating with and closing the open outer end of one of the compartments in communication with said
25 chambers, means for forcing a reverse current of air through said nozzle, and means for jarring the compartment receiving the current of air from said nozzle.

3. In a dust-collector, a reel, radially-arranged filtering-compartments therein having open outer ends, the inner ends of said
30 compartments forming or communicating with a central drum into which dust-laden air is introduced, a ventilated cut-off or dust-receiving chamber in said drum communicating with and adapted to exclude dust-laden
35 air from the inner ends of a plurality of said compartments, a nozzle communicating with and closing the open outer end of one of the compartments in communication with said
40 chamber, means for forcing a reverse current of air through said nozzle, and means for simultaneously jarring the compartment receiving the current of air from said nozzle.

4. In a dust-collector, a reel, radially-arranged filtering-compartments therein having open outer ends, the inner ends of said
45 compartments forming or communicating with a central drum into which dust-laden air is introduced, a ventilated cut-off or dust-receiving chamber in said drum communicating with and adapted to exclude dust-laden
50 air from the inner ends of a plurality of said compartments, an air-compressor, a nozzle thereon communicating with the open outer end of one of the compartments in communication with said chamber, a piston for forcing a reverse current of air through said nozzle, actuating means for said piston, and
55 means thrown into operation by said actuating means for jarring the compartment receiving the current of air from said nozzle.

5. In a dust-collector, a cut-off chamber, a plurality of filtering-compartments in communication therewith, means for forcing a reverse current of air through the filtering-walls of one of said compartments and allow-

ing it to escape through the walls of the adjacent compartment or compartments, and means thrown into operation by the reverse-
70 current-actuating means for simultaneously jarring the filtering-compartments through which said reverse current passes.

6. In a dust-collector, a ventilated cut-off chamber, a plurality of filtering-compartments in communication therewith, an air-compressor for forcing a reverse current of
75 air through the filtering-walls of the compartments in communication with said chamber, hammers for simultaneously jarring said filtering-compartments, and connections between said hammers and the piston of said compressor whereby the former are actuated
80 by the latter.

7. In a dust-collector, a rotary reel, radially-arranged cloth-frames mounted in and carried by said reel, the inner ends of said
85 cloth-frames communicating with and forming a central drum into which dust-laden air, under pressure, is introduced, a cut-off chamber in said drum in communication with, and adapted to exclude dust-laden air from, a
90 plurality of said frames, an air-compressor comprising a box or cylinder having a nozzle thereon communicating with one of the cloth-frames which are in communication with said cut-off chamber, and a piston bodily movable in said box designed to force a reverse current of air through said nozzle and through
95 the walls of the cloth-frame in communication therewith, actuating means for said piston, means for imparting an intermittent movement to said reel to bring said cloth-frames successively opposite said nozzle and means for jarring said frames simultaneously
100 with the actuation of said piston, as and for the purpose set forth.

8. In a dust-collector, a rotary reel, radially-arranged cloth-frames mounted in and carried by said reel, the inner ends of said
110 cloth-frames forming a central drum into which dust-laden air, under pressure, is introduced, a cut-off chamber in said drum in communication with, and adapted to exclude dust-laden air from, a plurality of said
115 frames, an air-compressor comprising a box or cylinder having a nozzle thereon communicating with one of the cloth-frames which are in communication with said cut-off chamber, and a piston designed to force a reverse
120 current of air through said nozzle and through the walls of the cloth-frame in communication therewith, a plurality of hammers pivotally mounted in said nozzle and adapted to strike the outer ends of said cloth-frames, connections between said hammers and said
125 piston, whereby the former are actuated by the latter, actuating means for said piston, and means for imparting an intermittent movement to said reel for successively bringing said cloth-frames opposite said nozzle, as
130 and for the purpose set forth.

9. In a dust-collector, cleaning mechanism for the filtering-surfaces, comprising a venti-

lated cut-off chamber, and means for forcing a reverse current of air through the filtering-surfaces in communication therewith, and a supplemental cut-off chamber for preventing the escape of fine particles of dust from the cleaned filtering-surfaces, the said supplemental chamber being located at a point opposite that at which the cleaned surfaces or filtering-walls receive the first gust of dust-laden air after passing from said cleaning mechanism.

10. In a dust-collector, a rotary reel, a series of radially-arranged cloth-frames mounted in and carried by said reel, the inner ends of said frames constituting a drum into which dust-laden air, under pressure, is introduced, a cut-off chamber in said drum in communication with, and adapted to exclude dust-laden air from, a plurality of said frames, means for cleaning the filtering-surfaces of the frames in communication with said chamber, and discharging the dust thereinto, and a supplemental cut-off chamber for preventing the escape of fine particles of dust which pass through the cleaned filtering-walls of said frame, the said supplemental chamber lying in contact with the periphery of said reel and located at a point opposite that at which the cleaned cloth-frames receive the first gust of dust-laden air from said drum after passing from the cut-off chamber.

11. In a dust-collector, a reel, a series of radially-arranged cloth-frames therein bodily movable independently of said reel, springs supporting said frames at their inner ends, and means for jarring said frames.

12. In a dust-collector, a rotary reel, a series of radially-arranged cloth-frames therein, bodily movable independently of said reel, the inner ends of said frames constituting a drum into which dust-laden air under pressure is introduced, springs supporting said frames at their inner ends, a cut-off or dead-air chamber in said drum, and means for jarring said frame in opposition to said springs as they are successively brought opposite said chamber.

13. In a dust-collector, a reel comprising a pair of rings constituting the hubs thereof,

radially-extending, segmental spokes secured at their inner ends to said rings and separated one from the other, a ring connecting the spokes on each of said hubs, and longitudinally-extending rods or bars connecting the spokes on opposite hubs, a series of cloth-frames whose end pieces are provided with ribs which fit within the spaces between said spokes, and removable stops on said frames engaging the inner edges of the rings which connect said spokes.

14. In a dust-collector, a reel comprising a pair of rings constituting the hubs thereof, radially-extending, segmental spokes secured at their inner ends to said rings and separated one from the other, a ring connecting the spokes on each of said hubs, and longitudinally-extending rods or bars connecting the spokes on opposite hubs, a series of cloth-frames whose end pieces are provided with ribs which fit within the spaces between said spokes, springs interposed between the inner ends of said frames and said hubs, removable stops secured to said frames and engaging the inner edges of the rings which connect said spokes, and means for jarring said frames in opposition to said springs.

15. In a dust-collector, a reel whose heads are made up of radially-extending spokes separated one from the other, and cloth-frames removably mounted in said reel, each of said frames comprising segmental end pieces, a longitudinal strip connecting the inner ends of said end pieces, longitudinal strips connecting the outer ends of said end pieces, a sheet of filtering material connecting each of the outer longitudinal strips, with the inner longitudinal strip and secured to said end pieces and to said inner longitudinal strip, and lateral ribs on said end pieces fitting within the spaces between the spokes of said reel, as and for the purpose set forth.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

JOHN E. MITCHELL.

Witnesses:

AUGUSTINE GALLAGHER,
FRANK E. EICHLER.