

No. 645,322.

Patented Mar. 13, 1900.

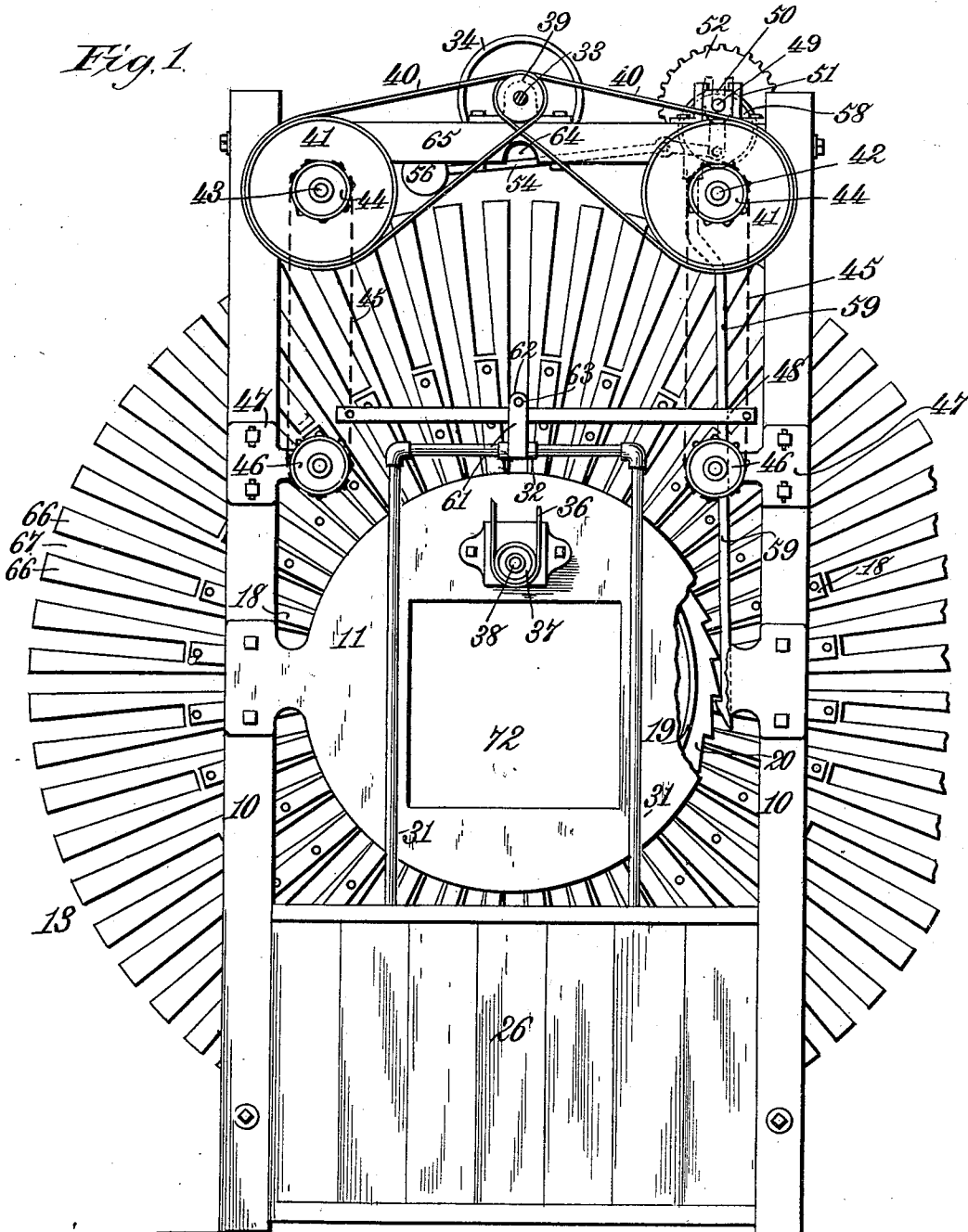
J. E. MITCHELL.
DUST COLLECTOR.

(Application filed Dec. 23, 1899.)

(No Model.)

3 Sheets—Sheet 1.

Fig. 1.



Witnesses.
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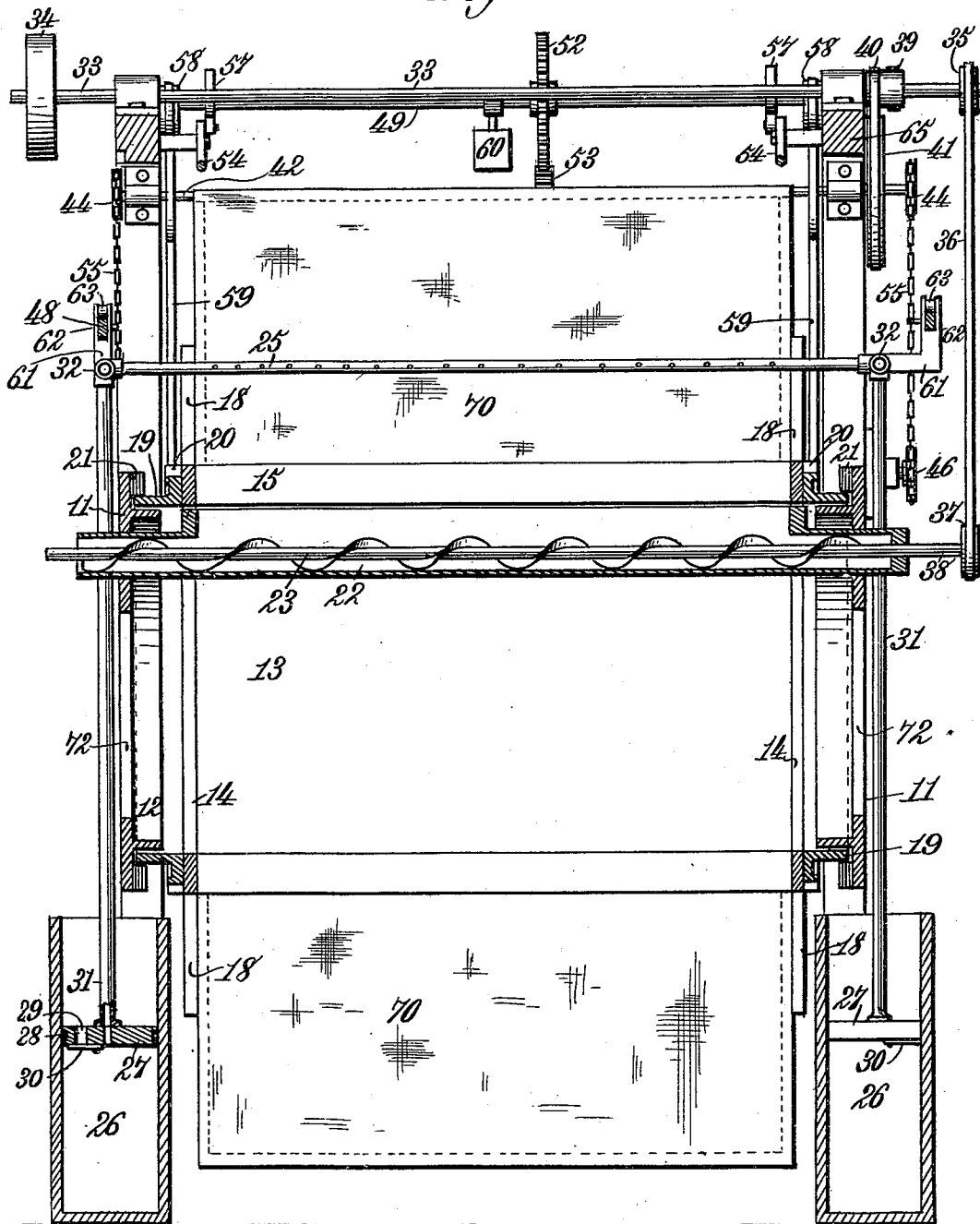
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(No Model.)

3 Sheets—Sheet 2.

Fig. 2.



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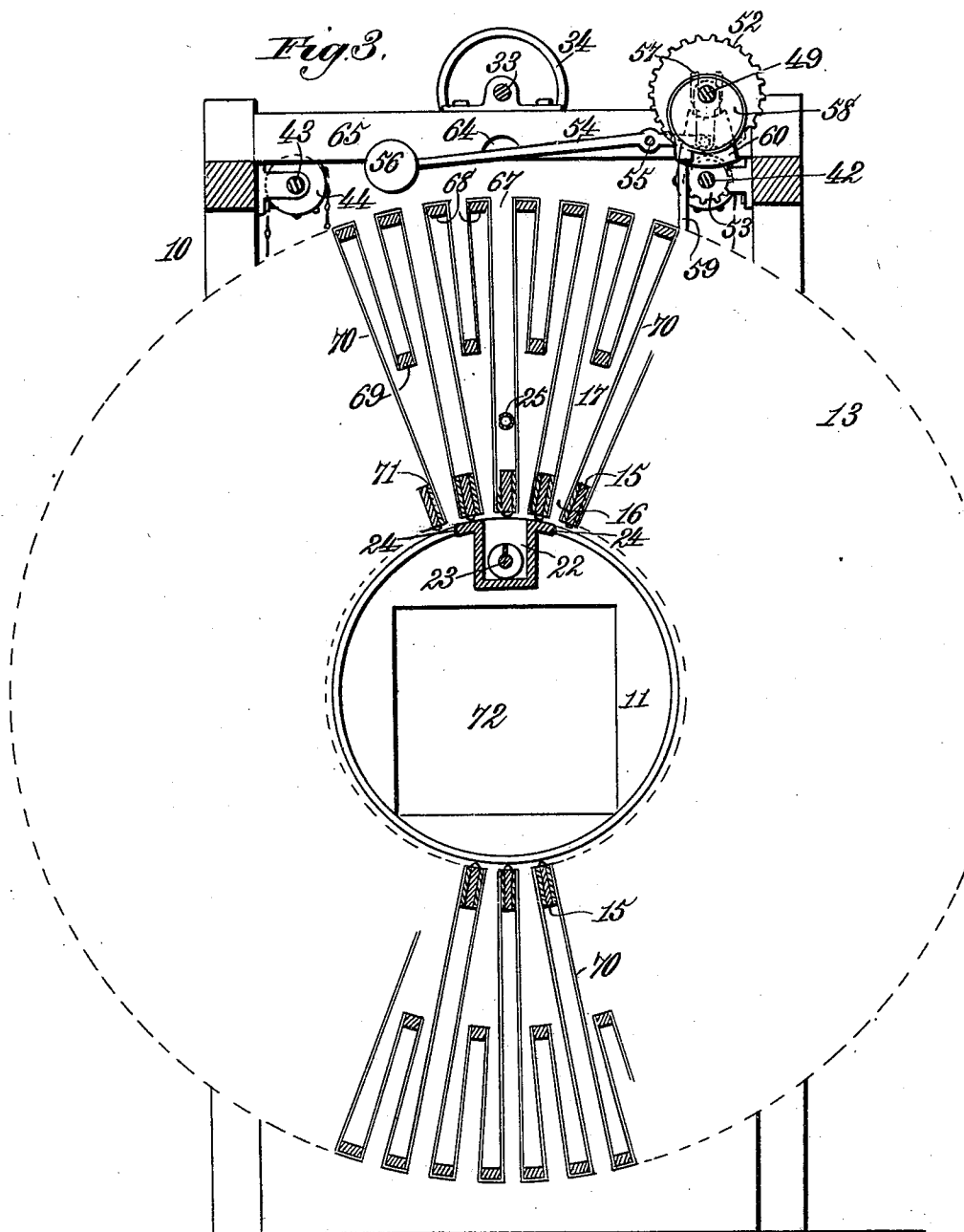
Patented Mar. 13, 1900.

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DUST COLLECTOR.

(Application filed Dec. 23, 1899.)

(No Model.)

3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

JOHN E. MITCHELL, OF ST. LOUIS, MISSOURI.

DUST-COLLECTOR.

SPECIFICATION forming part of Letters Patent No. 645,322, dated March 13, 1900.

Application filed December 23, 1899. Serial No. 741,487. (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.

This invention relates to dust-collectors, and has for its principal object to provide improved means for cleaning the cloth or porous filtering-walls by a traveling blast thrown against the outer surfaces of the radially-arranged air-filtering chambers, whereby the dust adhering to the inner surfaces of said chambers is removed.

My invention also has for its object to provide an improved construction of air-filtering chambers whereby a large area of filtering-surface may be employed in a small space.

The invention consists in features of construction and novel combinations of devices in a dust-collecting apparatus, as hereinafter described and claimed.

In the annexed drawings, illustrating the invention, Figure 1 is an end elevation of my improved dust-collector. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a vertical transverse section of the apparatus.

Referring to the drawings, it will be seen that the machine comprises a suitable framework 10, to which are secured cast-iron heads 11 at each end of the machine. These heads 11 are circular in form and are provided on their inner sides with annular flanges 12, that serve as bearings for a central drum or reel 13, which is composed of two circular rims 14, connected by slats or bars 15, extended lengthwise of the machine. These bars or slats 15 are spaced apart, so as to provide inlet-openings 16 for a series of radially-arranged air-filtering chambers 17, that are carried by the reel. Through these openings 16 the radially-arranged air-filtering chambers 17 communicate with the interior of the central drum or reel. The radial air-filtering chambers 17 are held in position by spokes 18, that are secured to the rims 14 of the reel. This arrangement makes it a simple matter to remove and replace any or all of the air-filtering chambers when necessary.

To the outer side of each reel-rim 14 there is secured a casting that comprises an annu-

lar flange 19 and a ratchet-gear 20. By means of the annular flange 19 the reel 13 is supported at each end on the annular flanges 12 of the heads 11. Packing-rings 21 may be placed around each annular flange 19 at the inner side of the heads 11, as shown in Fig. 2.

In the upper portion of the center circular space inclosed by the reel there is mounted a cut-off chamber 22, having a screw conveyer 23. This cut-off chamber 22 is provided longitudinally along its opposite sides with shields 24, Fig. 3, that will exclude the air from the inside of those air-filtering chambers 17 that are for the time being in position above the cut-off chamber and while the porous air-filtering walls of said chambers 17 are being acted upon on the outside by a traveling air-blast 25, as will be presently described.

Secured to the framework at opposite ends of the machine are air pumps or compressors 26, comprising vertically-arranged air-chambers having pistons 27 therein, that are adapted to be moved up and down in the operation of the pumps or compressors. A suitable packing 28 may be secured to the edge of each piston 27, so as to make nearly an air-tight joint with the casing of the compressor or pump. Each piston 27 is provided with air-inlet openings 29, that are controlled by flexible valves 30 on the inner side of each piston. These valves 30 will readily open on the upward stroke of each piston 27, and thus allow the compressors to be charged with air, but are capable of closing on the downward stroke of the pistons, so that air will be forced from the compressors or pumps upward through pipes 31, connected with each piston. As shown in Fig. 1, there are two of these pipes 31 connected with each piston. At their upper ends the two pipes converge and connect with a coupling 32, which also connects with one end of the traveling blast-pipe 25, as shown in Figs. 1 and 2. From this blast-pipe 25, which is provided with perforations along its opposite sides, the air is forced directly against the filtering-walls of two contiguous air-filtering chambers 17, between which the traveling blast is at that time operating. As shown in Fig. 3, the lower open ends of these two air-filtering chambers are at this time located directly over the cut-off chamber 22 and are

thereby cut-off from dust-laden air. By the operation of the air-blast upon the walls of these two chambers the dust is dislodged and falls into the cut-off chamber.

5 The mechanism for operating the traveling-blast cleaner and for imparting an intermittent rotation to the reel may be described as follows: Above the central portion of the machine there is mounted a driving-shaft 33,
10 with band-wheel or driving-pulley 34 thereon. This driving-shaft 33 also carries a pulley 35, that is connected by suitable belting 36 with a pulley 37 on the shaft 38 of the screw conveyor 23 for the purpose of operating the
15 same to convey out of the machine the dust that drops into the cut-off chamber. The driving-shaft 33 also carries a pulley or pulleys 39, connected by belts 40 with pulleys 41 on shafts 42 and 43, that are mounted in the
20 upper part of the machine-frame. These shafts 42 and 43 carry sprocket-wheels 44, that are located outside the framework 10 at each end of the machine. By means of chains 45 these sprocket-wheels 44 are connected
25 with sprocket-wheels 46, supported by brackets 47 on the ends of the machine-frame. The sprocket-chains 45 are arranged to travel in vertical directions and carry a cross-bar 48 at each end of the machine for raising and
30 lowering the traveling blast-pipe 25 and the pipes 31, through which it connects with the air-compressors and through which also each compressor is operated. Directly over and parallel with the shaft 42 there is a longitudinally-arranged shaft 49, mounted in boxes
35 or bearings 50, that are adapted to move up and down in guideways 51, as shown in Fig. 1. This shaft 49 has secured thereto a gear-wheel 52, which is adapted to mesh with a
40 corresponding gear or pinion 53 on the shaft 42 when the shaft 49 is in its lowered position. For the purpose of throwing the gears 52 and 53 into and out of mesh there is provided near each end of the machine a lever 54, that is fulcrumed intermediate its ends on the rod
45 55, Figs. 1 and 3. To one end of each lever 54 there is attached a weight 56, and the other end of each lever carries a fork 57, through which the boxes or bearings of the shaft 49
50 are normally lifted by the descent of the weighted ends of said levers. The shaft 49 is provided with eccentrics 58, that carry pawls 59 for engaging the ratchet-gears 20, through which the reel 13 is intermittently
55 rotated. On the shaft 49 there is carried a weighted arm 60 for the purpose of swinging the eccentrics and pawls to their lowermost position when the gears 52 and 53 are thrown out of mesh.
60 The operation of the mechanism above described is as follows: When the machine is in operation, the rotation of the shafts 42 and 43 will actuate the sprocket-chains 45 and attached cross-bars 48, so as to raise and lower
65 the traveling air-blast pipe 25 and the pipes 31, through which it connects with the pistons 27 of the air-compressors. As the per-

forated air-blast pipe 25 approaches the highest point of its travel and clears the radial air-filtering chambers it engages and raises
70 the weighted arms or levers 54, thus permitting the shaft 49 to drop or lower, so as to throw the gears 52 and 53 into mesh. The shaft 49 then begins to rotate, and the eccentrics 58, carrying the pawls 59, engaging the
75 ratchet-gears 20, will cause the entire reel to rotate or move far enough to bring the next-succeeding opening or space between the walls of two air-filtering chambers directly over the cut-off chamber. In the meantime
80 the perforated air-blast pipe 25 begins to descend into said opening or space between two air-filtering chambers, and thus releases the weighted levers 54, which in turn will raise the shaft 49 sufficient to throw the gear 52 out
85 of mesh with the gear or pinion 53. These gears 52 and 53 are thrown out of mesh just after the shaft 49 has completed one-half of its revolution. The weighted arm 60, secured to the shaft 49, will now swing said shaft so
90 as to complete its revolution, thus bringing the pawls 59 to their lowermost position, where they will be in readiness to engage the next-succeeding teeth on the ratchet-gears 20. It is obvious that the teeth of these ratchet-
95 gears should correspond in number and position with the spaces or openings between the radially-arranged air-filtering chambers.

The traveling air-blast pipe 25 is perforated on each side, so as to deliver a blast against
100 the walls of two contiguous air-filtering chambers. The blast is delivered only on the downward stroke of the compressors, the compressor-chambers being recharged with air during the upward stroke.
105

For the purpose of connecting the traveling bars 48 with the blast-pipe 25 the coupling 32 is provided with an upward-extended bracket 61, Fig. 1, having thereon a clip or loop 62, that loosely engages the bar 48 in such manner as to permit it to have sufficient endwise
110 movement in passing, with the chains 45, around the sprocket-wheels 44 and 46. If desired, this loop or clip 62 may be provided with an antifriction-roller 63, as shown. If
115 necessary, notches or recesses 64, Fig. 3, may be provided in the upper cross-bars 65 of the machine-frame, so as to permit the blast-pipe 25 to rise a sufficient distance to lift the weighted levers 54 for causing the gears 52 and 53
120 to mesh in rotating the reel.

The end walls of the radially-arranged air-filtering chambers 17 may consist of tapered wooden pieces 66, each of which is bifurcated or provided with an open-ended slot
125 67, extended outward from the spoke 18, to which said end piece is secured. The outer extremities of two of these end pieces 66 at opposite ends of the reel are connected by
130 slats 68, and a slat 69 is extended from the inner end portion of the slot 67 in one end piece to a corresponding point on the opposite end piece. The side walls of the air-filtering chambers 17 are composed of a suit-

able porous material 70, such as cotton cloth or the like. These cloth filtering-walls or cloth surfaces 70 are secured to narrow strips 71 at the inner ends of the air-filtering chambers and are extended outward to the slats 68 and thence inward to the slat 69, that is intermediate the ends of each air-filtering chamber. This construction affords an extended area of air-filtering surface without increasing the diameter of the reel. Each air-filtering chamber 17 can be readily removed for repairs, if necessary, and may be as readily replaced without disturbing any of the other air-filtering chambers.

As will be seen, the construction of this machine is such that a very large area of cloth or filtering-surface may be used in a small compass, and any or all of the air-filtering chambers can be easily and quickly removed and replaced. Easy access can be had to all working parts, and the mechanism for operating the machine is simple and durable.

By employing a traveling blast for cleaning the cloth, as shown, the blast will be delivered against only a small portion of the air-filtering surface at one time and can easily be made strong enough to thoroughly remove all the dust adhering to the inner surfaces of opposite sides of the cloth or filtering walls, and at the same time the volume of air forced through the cloth by the blast is so small that it easily finds its way out of the air-filtering chambers again and does not interfere with the falling of the dust into the cut-off chamber, whence it is discharged from the machine.

The usual method heretofore employed for cleaning the cloth or porous walls of dust-collectors has been to jar or jerk the cloth; but this construction is not always thoroughly effective, as it does not keep the cloth clean, but merely prevents a large accumulation of dust upon it. Another objection to this method is that when the cloth is in any way disturbed the dust will work into the mesh and some of it through the cloth, which necessitates the use of cloth with very fine mesh, and such cloth has only a very limited filtering capacity. By cleaning the cloth with a positive air-blast the cloth is not disturbed in any way, and the dust is not only prevented from accumulating on either surface of the cloth, but the mesh itself is kept free and open.

Currents of air have heretofore been used for the purpose of assisting in cleaning the cloth filtering-surfaces in dust-collectors by creating a suction on the cut-off chamber; but such a back draft is not effective by reason of the fact that if the suction created on the cut-off chamber was strong enough to remove the dust adhering to the cloth over the cut-off chamber the same suction would draw the dust out of the cut-off chamber back to the fan creating the suction. For this reason the suction must be so light that it has little

or no effect so far as cleaning the cloth is concerned. In my improved dust-collecting apparatus I create no suction on the cut-off chamber, but deliver a positive blast of air against only a small portion of the cloth filtering-walls of those air-chambers that are for the time being over the cut-off chamber, and while the force of the air is strong enough to dislodge the dust adhering to the filtering-surfaces the volume of air forced through the filtering-surfaces by this blast is very small and does not interfere with its falling or settling in the cut-off chamber, whence it is discharged by a conveyer. In order to clean a cloth in this manner and at the same time employ a large area of cloth surface in the reel, it is necessary to rotate the reel intermittently and at the same time cause the blast to move or travel along the filtering-surfaces.

My reasons for using the air pump or compressor for creating the blast, as shown, instead of a fan, are, first, because a fan does not create a positive blast, and while a fan will move a large volume of air if given free ventilation it cannot be made to force even a small volume of air with a great deal of force through the small openings in the delivery pipe of my traveling blast, such small openings being necessary in cleaning but a small portion of the cloth at a time. Another reason is that I am enabled to connect the delivery pipe or tube of the air-blast directly to the air pump or compressor and in communication therewith, so that the mechanism which operates the air pump or compressor also moves the blast-delivery pipe along the filtering-surfaces, whereas even if a fan could be practically used it would be necessary to make flexible or yielding connections between it and the traveling-blast-delivery pipe, and such connections would not be durable. The construction and operation of the air pump or compressor and traveling blast in my invention are such that the blast is not only thoroughly effective, but is made very simple and compact.

When the dust-collector is in operation, the dust-laden air enters through inlet-openings 72, Fig. 1, in the heads 11, on which the rotary reel 13 rotates. This dust-laden air enters all the radially-arranged air-filtering chambers 17 through their inner open ends 16, and while the air escapes through the porous air-filtering walls the dust adheres to the inner surfaces of said walls, and as the air-filtering chambers pass in succession and come to rest over the cut-off chamber the dust is dislodged from said chambers by the action of the traveling air-blast devices 25 and is thereby deposited in said cut-off chamber, and the conveyer 23 therein continuously discharges it from the machine.

What I claim as my invention is—

1. In a dust-collector, the combination of a rotary reel provided with radially-arranged dust-collecting and air-filtering chambers, a

traveling blast device for dislodging dust from the porous walls of said chambers, mechanism for moving said blast device in a radial direction between successive dust-collecting and air-filtering chambers, mechanism for imparting intermittent rotation to said reel, and means for controlling said reel-operating mechanism from the traveling blast device, substantially as described.

2. In a dust-collector, the combination of a rotary dust-collecting medium comprising a series of radially-arranged dust-collecting and air-filtering chambers, a cut-off chamber for shutting off the dust-laden air from one or more of said chambers in succession, and a radially-movable blast device extended lengthwise of the machine and adapted to be operated in a radial direction for dislodging or removing dust from the porous walls of one or more air-filtering chambers from which the dust-laden air is excluded, substantially as described.

3. In a dust-collector, the combination of a rotary reel comprising a number of radially-arranged dust-collecting and air-filtering chambers having porous walls, a cut-off chamber, and a traveling blast device operating in a radial direction between the porous walls of adjoining air-filtering chambers, successively, substantially as described.

4. In a dust-collector, the combination of a reel provided with a number of radially-arranged air-filtering chambers, means for imparting intermittent rotation to said reel, a cut-off chamber, a traveling blast device extended lengthwise of the reel for cleaning the porous walls of the air-filtering chambers in succession while said chambers are at rest over the cut-off chamber, and mechanism for operating said traveling blast device in a radial direction, substantially as described.

5. In a dust-collector, the combination of a reel provided with a number of radially-arranged air-filtering chambers, means for imparting intermittent rotation to said reel, a cut-off chamber, air pumps or compressors provided with valved pistons, a traveling blast device directly connected with the pistons of said air pumps or compressors, so as to move therewith and deliver a blast over the surfaces of the air-filtering chambers in succession, and mechanism for operating said blast device and air pumps or compressors together, substantially as described.

6. In a dust-collector, the combination of a rotary reel comprising a number of removable radially-arranged air-filtering chambers each having an open inner end adapted to communicate with a central space inclosed by the reel, a cut-off chamber mounted in the central portion of said reel to shut off air from one or more of said radially-arranged air-filtering chambers, means for imparting intermittent rotation to said reel, and a traveling blast device operating between two air-filtering chambers while the same are at rest over

said cut-off chamber, substantially as described.

7. In a dust-collector, the combination of a rotary reel, a number of radially-arranged air-filtering chambers carried by said reel, each of said air-filtering chambers comprising rigid bifurcated end walls connected by cross-slats and having porous or cloth side walls, means for detachably securing said air-filtering chambers to the reel with the inner open end of each chamber in communication with a central space inclosed by the reel, a cut-off chamber mounted in said central portion of the reel to exclude air from one or more of said air-filtering chambers while the same are at rest above said cut-off chamber, means for imparting intermittent rotation to said reel, and the traveling blast device arranged to operate between the porous walls of two contiguous air-filtering chambers while the same are at rest above the cut-off chamber, substantially as described.

8. In a dust-collector, the combination of a rotary reel provided with spokes, a number of radially-arranged air-filtering chambers detachably secured to said spokes and each having an open inner end in communication with a central space inclosed by said reel, a cut-off chamber mounted in said central portion of the reel to exclude air from one or more of said air-filtering chambers, means for imparting intermittent rotation to the reel, a traveling air-blast to dislodge dust from one or more air-filtering chambers while at rest over said cut-off chamber, an air pump or compressor, rigid connections between the blast device and the piston of the air pump or compressor, and mechanism for operating the blast device and the pump or compressor together, substantially as described.

9. In a dust-collector, the combination of a stationary framework and a rotary reel mounted in said framework, a number of radially-arranged air-filtering chambers closed at their outer ends and having their inner ends open to communicate with a central space in the reel for inlet of dust-laden air to the air-filtering chambers, a cut-off chamber mounted within the reel and provided with a conveyer, and a vertical traveling blast device operating between the porous walls of adjoining air-filtering chambers to dislodge dust from the air-filtering chambers in succession and deposit the same in said cut-off chamber to be removed thence by the conveyer, substantially as described.

10. In a dust-collector, the combination of a stationary framework, a rotary reel mounted in said framework with air-inlet openings at each end, a number of radially-arranged air-filtering chambers carried by said reel and having open inner ends to communicate with the interior of the reel, a stationary cut-off chamber mounted in the reel to exclude air from one or more of said air-filtering chambers, a blast-pipe adapted to be operated in

the space between two air-filtering chambers while at rest over the cut-off chamber, said blast-pipe having perforations in its opposite sides to direct a blast against the walls of two
 5 contiguous chambers, air pumps or compressors at opposite ends of the machine, valved pistons for said air-pumps, rigid pipe connections between said pistons and the opposite ends of said blast-pipe and through which the
 10 blast-pipe is in communication with said air pumps or compressors, mechanism for moving the air-blast pipe inward and outward between the walls of two air-filtering chambers and for operating the air pumps or compressors through the rigid pipe connection between
 15 said air-blast pipe and the pump-pistons, and lever mechanism through which the driving mechanism for intermittently rotating the reel is controlled from the blast-pipe, substantially as described.

11. In a dust-collector, the combination of a stationary framework, a rotary reel mounted in said framework and carrying a number of radially-arranged air-filtering chambers each
 25 of which is bifurcated in its outer portions to provide extended filtering-surfaces, a cut-off chamber, an air-blast pipe extended lengthwise of the reel to operate in a radial direction between the porous walls of contiguous
 30 air-filtering chambers, in succession, air pumps or compressors at opposite ends of the machine, rigid pipe connections between the ends of said blast-pipe and the valved pistons of said air pumps or compressors, sprocket
 35 mechanism mounted at each end of the machine on opposite sides of said blast-pipe, means for connecting said sprocket mechanism with said blast-pipe, a driving-shaft for actuating said sprocket mechanism, mechanism
 40 for imparting intermittent rotation to the reel, and levers controlled from the blast-pipe for throwing the reel-driving mechanism into operation, substantially as described.

12. In a dust-collector, the combination of
 45 a framework, a rotary reel mounted in said framework and provided with a number of radially-arranged air-filtering chambers each closed at its outer end and having an open inner end, a cut-off chamber, a conveyer in
 50 said cut-off chamber, a laterally-perforated air-blast pipe extended lengthwise of the reel and adapted to be moved radially inward and outward between the porous walls of two contiguous air-filtering chambers, in succession, air pumps or compressors at opposite

ends of the machine, rigid pipe connections between the opposite ends of said blast-pipe and the valved pistons of said air pumps or compressors and through which said blast-pipe and air pumps or compressors are in
 60 communication, mechanism connected with opposite ends of the blast-pipe to cause it to travel inward and outward between the radially-arranged air-filtering chambers and at the same time to operate said air pumps or
 65 compressors, a shaft for imparting intermittent rotation to said reel through intermediate pawl-and-ratchet connections, and lever mechanism controlled by the traveling blast-pipe for throwing said shaft into and out of
 70 operation, substantially as described.

13. In a dust-collector, the combination of a rotary reel provided with radially-arranged dust-collecting and air-filtering chambers, a traveling blast device for dislodging dust
 75 from the walls of said chambers, operating mechanism for causing said blast device to move radially inward and outward between said dust-collecting and air-filtering chambers of the reel, and mechanism for imparting
 80 intermittent motion to said reel, said mechanism being controlled by the traveling blast device, substantially as described.

14. In a dust-collector, the combination with a rotary reel comprising a number of
 85 radially-arranged dust-collecting and air-filtering chambers having porous walls, of a traveling blast device operating inward and outward in a radial direction between the porous walls of adjoining air-filtering chambers, successively, substantially as described.

15. In a dust-collector, the combination of a rotary dust-collecting medium, comprising a number of chambers, a traveling blast-cleaner for dislodging dust from the walls of
 95 said chambers, mechanism for causing said blast device to move radially between adjoining chambers, an air-compressor, and direct and rigid connections between the piston of said compressor and the traveling blast device, whereby the said piston and traveling
 100 blast device are caused to move together, substantially as described.

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

JOHN E. MITCHELL.

Witnesses:

FRANK E. EICHLER,
 RICHARD F. RALPH.