No. 711,760. Patented Oct. 21, 1902.

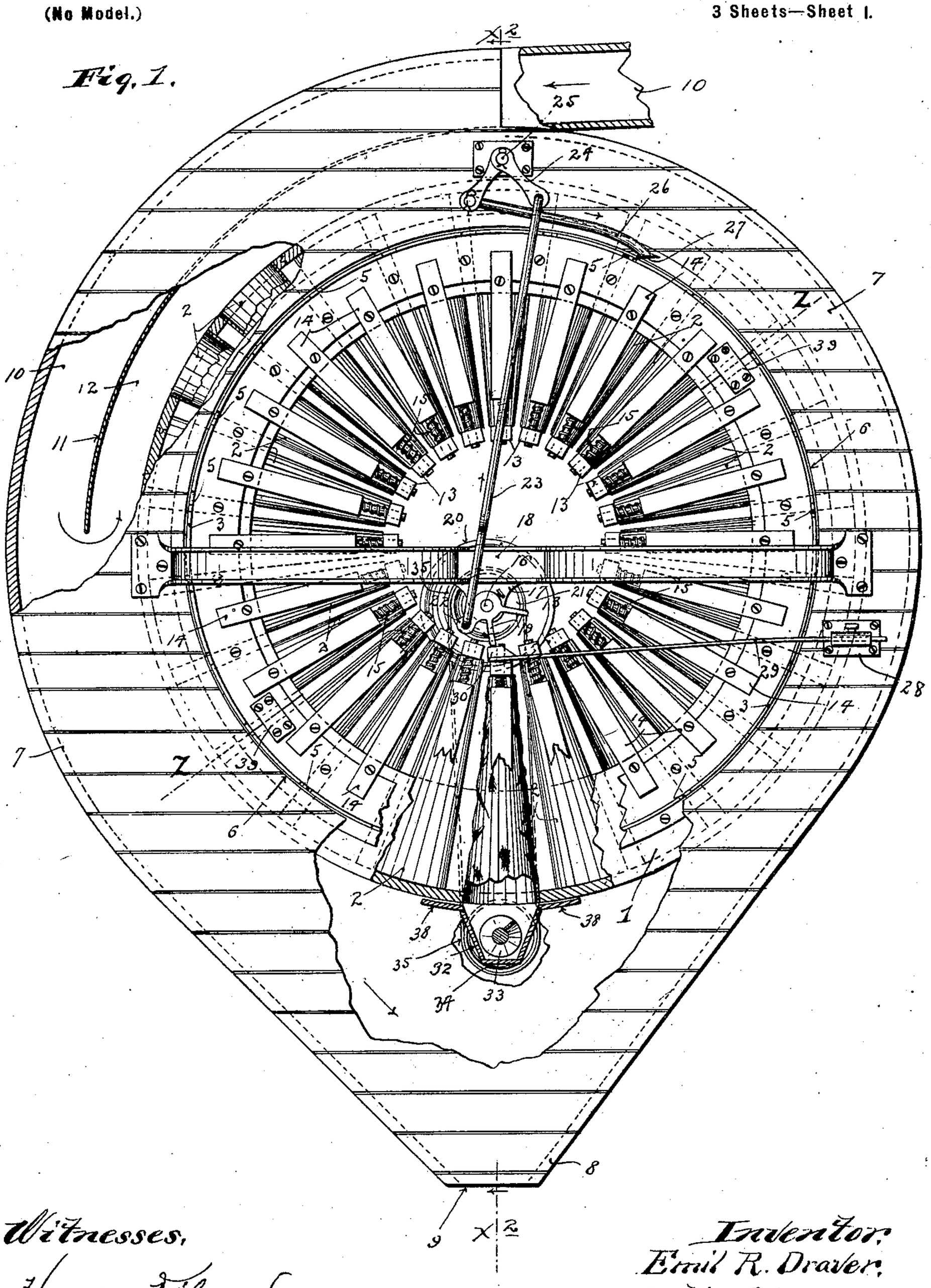
E. R. DRAVER.

DUST COLLECTOR.

(Application filed Sept. 5, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses,
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F. D. Merchant.

Inventor,
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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

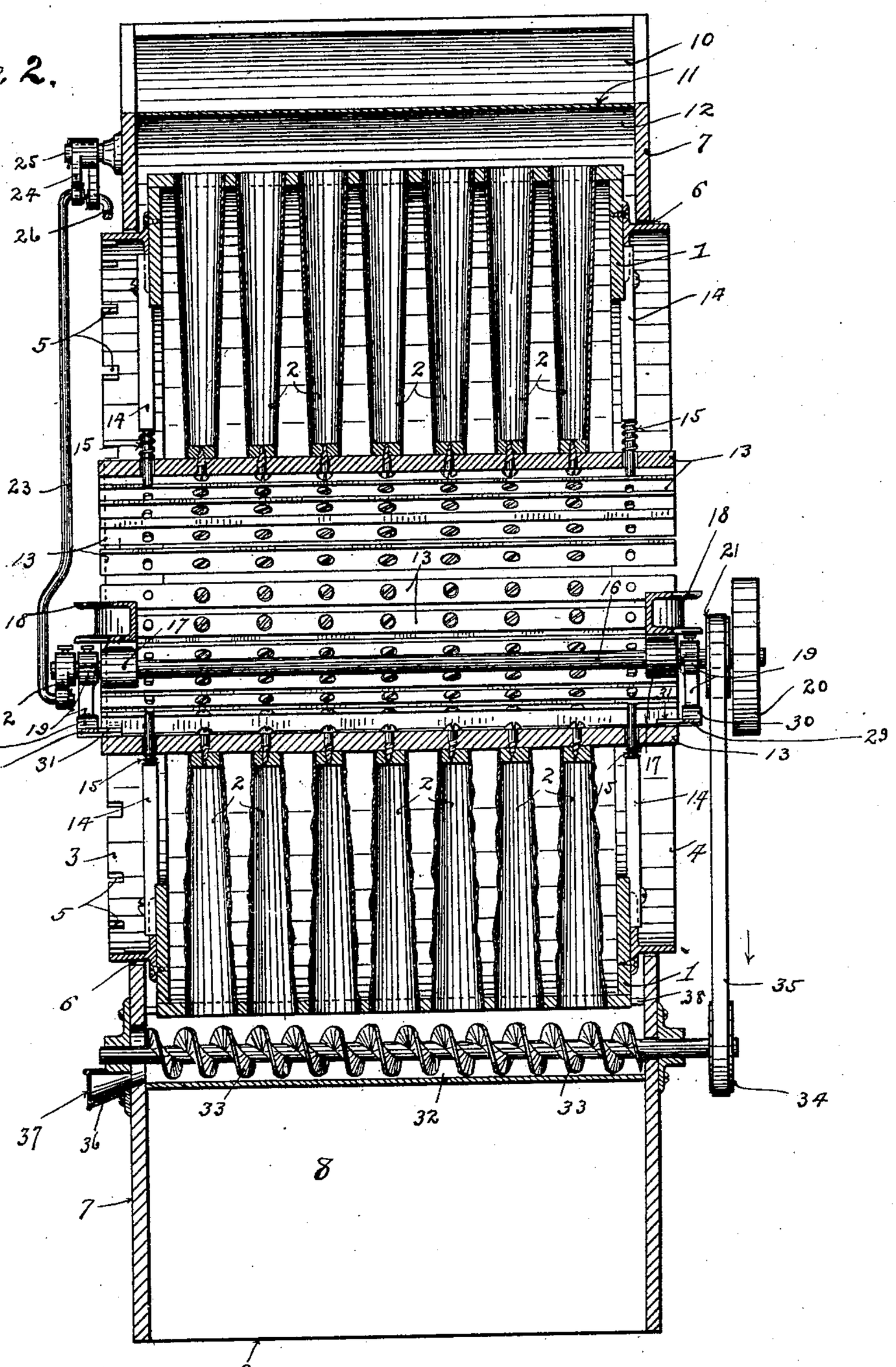

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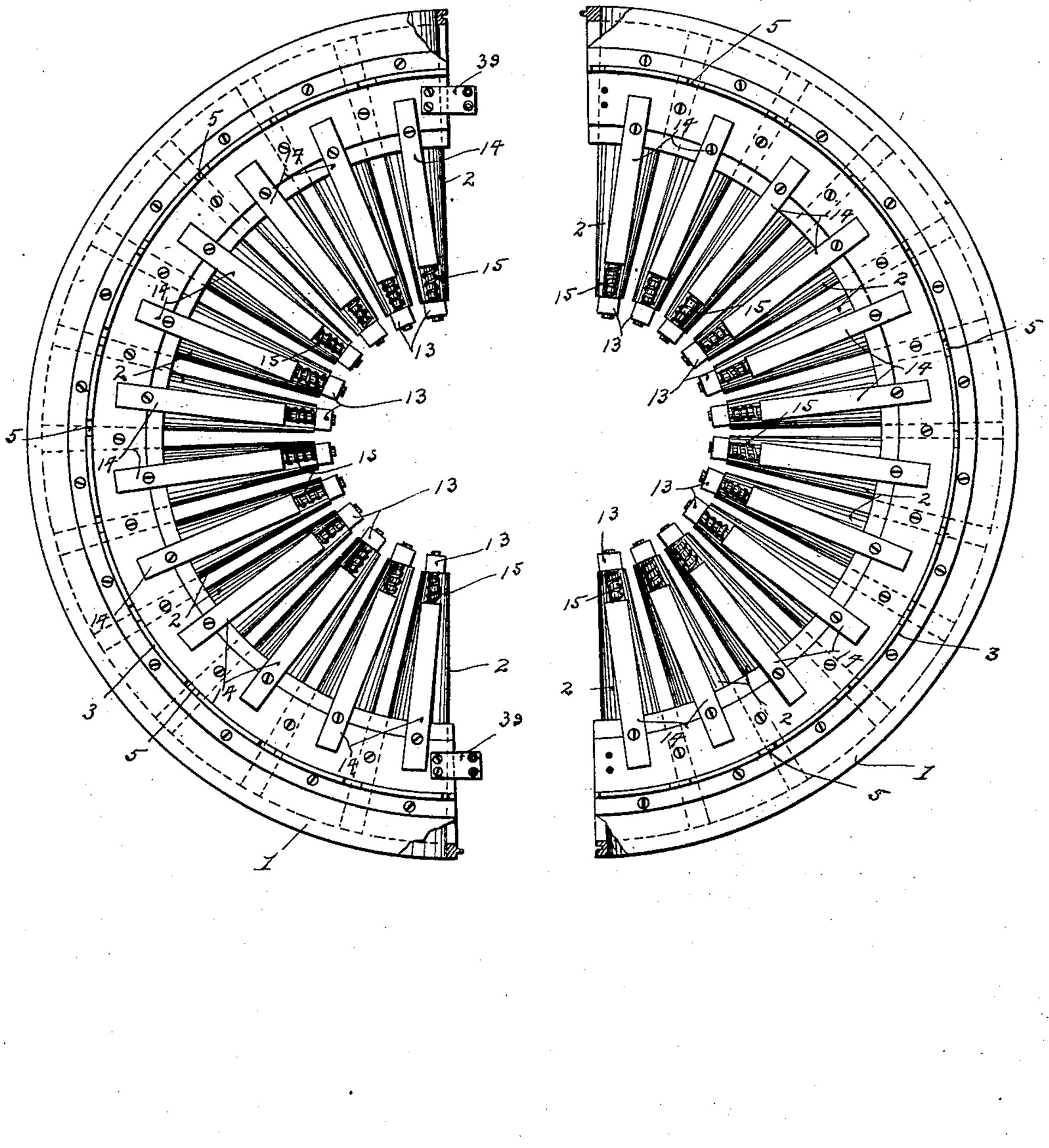
Fig. 3.



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Inventor.
Emil R. Draver.
By his Attorney,
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UNITED STATES PATENT OFFICE.

EMIL R. DRAVER, OF WINCHESTER, INDIANA.

DUST-COLLECTOR.

SPECIFICATION forming part of Letters Patent No. 711,760, dated October 21, 1902.

Application filed September 5, 1899. Serial No. 729,452. (No model.)

To all whom it may concern:

Be it known that I, EMIL R. DRAVER, a citizen of the United States, residing at Winchester, in the county of Randolph and State of Indiana, have invented certain new and useful Improvements in Dust-Collectors; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to dust-collectors of the balloon type, and has for its object to improve this class of machines with a view of securing increased efficiency.

To this end my invention consists of the novel devices and novel combinations of devices which will be hereinafter described, and defined in the claims.

The invention is illustrated in the accompanying drawings, wherein like notations refer to like parts thoughout the several views.

Figure 1 is a view in end elevation, with some parts broken away, showing the complete machine. Fig. 2 is a vertical section lengthwise of the machine on the line x^2 x^2 of Fig. 1, and Fig. 3 is an end elevation of the balloon detached or removed from its casing and showing the two separable sections as they would appear when pulled apart from each other.

The balloon-frame is in the form of an annular drum 1, adapted to serve as a rotary carrier for a multiplicity of dust-collecting tubes 2, disposed radially within the drum and arranged in a series of rows both circumferentially and lengthwise of the drum. This annular form of the drum affords a central space around the axis of rotation. The end pieces or heads of the drum 1 are provided with annular flanges 3 and 4, one or both of which are notched, as shown at 5, on the flange 3 for coöperation with other parts, hereinafter noted, to impart to the drum a step-by-step intermittent rotary motion. As shown, the drum-head flanges 3 and 4 rest directly on corresponding annular seats 6, formed in the end walls of the fixed casing 7, which surrounds the drum; but in practice it is preferable to have the said drum-head flanges 3 and 4 rest on antifriction-rollers (not shown) suitably supported within the casing 7 in any suitable way for rendering the drum more easy to turn.

The fixed casing 7, which surrounds the drum, is of approximately involute form, thereby affording an external section or channel 10, which serves as the inlet spout or passage for the dust-laden air, which passage 10 is separated from the main air-trunk 12 by the dividing-partition 11, as best shown in Fig. 1, and also affording this main air-trunk 12 of such form as to be of relatively large cross-section at and near the junction of the inlet-passage 10, and thereafter to become of gradually-decreasing size until it approximates the cross-section of the inlet-channel 10 in that part of the main trunk surrounding the larger part of the drum 1. This main air-trunk 12 is constantly in communication with the open outer ends of the collecting-tubes 2. At its lower end portion the casing 7 is shown as of hopper-like form, as indicated at 8, and is provided with a suitable closure at 9, which might be a removable drawer or any other suitable device. The substantially involute form of the casing 7, with the main air-trunk 12 related to the inlet-passage 10 in point of size and position, substantially as shown and above described, is important for securing a highly-efficient preliminary separation of the heavier particles of the dust from the air before the latter enters the collecting-tubes 2, as will later be more fully noted. The collecting-tubes 2 are composed of flexible fabric suitable for the purpose intended and are shown as of conical form, being larger at their outer or open ends and smaller at their inner or closed ends. At their outer ends the said tubes 2 are secured to the walls of corresponding openings in the otherwise closed or imperforate peripheral wall of the drum. At their inner ends the said tubes 2 are secured to bars 13, which, because of their function, may be called the "distending and shaking" bars. The said bars 13 are of greater length than the body of the drum, and their outer or projecting ends are perforated and mounted to work over the reduced inner or guiding ends of a series of radially-disposed guiding-arms 14, fixed to the drum-heads at their outer ends. On the reduced inner ends of the guide-arms 14 are mounted coiled springs 15, which react between the

larger parts of the guide-arms and the outer faces of the bars 13, thereby normally acting to hold said bars 13 in their innermost or tube-distending positions. Every one of the said bars 13 has attached thereto one of the series of rows of the collecting-tubes 2.

Through the central opening afforded by the annular form of the drum 1 is extended a shaft 16, which is supported in suitable bearings 17, carried by bridge-trees 18, secured at their outer ends to the fixed casing 7. As shown, this shaft 16 has attached thereto a pair of knockers, one near each end of the shaft, and which knockers are in the form of radial arms 19, projecting from hubs cast integral therewith and made fast to the shaft in any suitable way. The parts which coöperate with said knockers 19 for action on the shaking-bars 13 will be presently noted. Said shaft 16 has secured thereto at one end a pair of pulleys 20 and 21, and at its opposite end has attached thereto a crank-arm 22. The crank-arm 22 is connected by a pitman-rod 23 to one arm of a bell-crank lever 24, having its elbow pivoted to the fixed casing, as shown at 25 in Figs. 1 and 2. The other arm of the bell-crank 24 has pivoted thereto a long pawl 26, with hook end 27 for engagement with the notches 5 on the drum-head flange 3. In practice it is preferable to have both drum-head flanges notched, as hitherto noted, and to have two sets of cranks, pitman-rods, bell-cranks, and pawls for imparting the step-by-step motion to the drum. With this construction, as shown and described, it is obvious that under the rotation of the shaft 16 the drum 1 will receive an intermittent step-by-step motion. The shaft 16 is kept in continuous motion by a belt applied to the pulley 20 or otherwise, but at a slow speed. Hence the drum will have a considerable interval of rest between each two successive steps of rotary motion.

To keeper-brackets 28, secured to the end walls of the fixed casing, are adjustably attached spring-bars 29, which extend inward crosswise of the drum and are provided with cam-lugs 30 at their inner ends in proper position for coöperation with the knocker-arms 19, carried by the shaft 16. The cam-lugs 30 are also provided with offset fingers or projections 31, which extend inward and overreach the ends of the spring-bars 13, as best shown in Fig. 2. Hence under the rotary motion of the shaft 16 the knockers 19 will act on the cam-lugs 30, and through the projections 31 the bars 13 will be depressed at the proper times for coöperation with the springs 15 to secure the shaking action desired on the collecting-tubes 2.

Diametrically below the drum 1 in the casing 7 is located a collecting-trough 32, provided with a spiral conveyer 33. The conveyer-shaft projects outward at one end and is provided with a pulley 34, connected by a belt 35 with the relatively small pulley 21 on the main shaft 16. The collecting-trough 33 is located directly underneath the drum and is shown as delivering under the action of the conveyer 33 to an offleading-spout 36, normally closed by a gravity-gate 37. Said collecting-trough 32 is of the same length as the drum and is provided on its side walls with packing-flanges 38 of curvilinear form and properly disposed for coöperation with the peripheral wall of the drum 1 to cut off the dust-laden blast from the open end of the particular row of said dust-collecting-tubes 2 which is in vertical registration with the mouth of said collecting-trough 32 when the drum is standing stationary, as best shown in Fig. 1. The draft-cutting-off device 32 therefore affords a cut-off chamber, with which the open ends of the collecting-tubes register when in cleaning position.

The balloon frame or drum 1 is constructed in sections which are separable from each other without displacement or disturbance of any of the collecting-tubes 2 or any of the devices carried by the drum for coöperation with said tubes. As shown, the drum is constructed in two separable sections divisible on a common diametrical line, as shown in Fig. 3. It is obvious, however, that the sections might be more or less in number and that the divisions might take place otherwise than on diametrical lines. When the parts of the drum are in working position, the separable sections are rigidly secured together in any suitable way, such as by the coupling-plates 39, as shown in Fig. 3. This separable feature in the construction of the drum is of large importance for the commercial handling of the machine. To meet the requirements of ordinary merchant mills, a dust-collector of this type must have a balloon of large diameter. Ordinarily the diameter of the balloon must be too great to permit the balloon to be taken into or out of a mill through the ordinary door or window openings or to permit the balloon to be moved about through the contracted passage-ways usually found in the closely-crowded rooms of the modern merchant mills. By constructing the balloon frame or drum in sections, as described, this difficulty is entirely overcome. The machine is readily knocked down for removal, package, storage, shipment, and reassembling.

All the parts of the machine have now been noted and the actions thereof are probably for the most part clear from the detailed description of the parts. Attention may be called, however, to one or two features of the general action.

In virtue of the construction of the casing 7 of substantially involute form, affording the curvilinear inlet-passage 10 for the dust-laden air, divided off from the contracted part of the main air-trunk 12 and delivering to the enlarged part of said main air-trunk 12, a preliminary separator is afforded, which is of high efficiency, as hitherto noted. The inrushing dust-laden air delivered to the inlet-

pipe 10 under pressure passes out therefrom into a relatively large expansion-chamber afforded by the enlarged part of the main air-trunk 12, and such portion of the air as takes an upward path into the contracted portion of the main air-trunk 12 must turn around the dividing-partition 11. All the inflowing dust-laden air is therefore subject to a multiplicity of changes in direction by the deflecting-surfaces of the casing with which it comes in contact, and this occurs in a trunk of larger area for any given section at or near the point of entrance to the main trunk than the area of the inlet pipe or channel, and hence opportunity is afforded for a most favorable action of gravity on the particles of dust carried by the air. All the heavier particles of dust will therefore be eliminated from the air before it enters the open outer ends of the collecting-tubes 2. The work on the collecting-tubes 2 is therefore very greatly reduced. By actual test in a full-sized working machine I have demonstrated that this machine has double the capacity of a corresponding balloon without preliminary separation.

Having regard to some of the details of the action on the collecting-tubes, it is of course obvious from the construction described that the tubes are most favorably disposed for efficient clearing action. When the tubes are in position to be shaken, they stand large end downward over the collecting-trough, with the dust-laden blast cut off from their open ends. While in this position the knockers strike the cam-lugs carried by the spring-arms and force the particular bar 13 for that row of tubes downward, thereby compressing its reacting springs 15, and when the knockers pass off from the cam-lugs 30 the springs 15 pull the bar 13 backward with a sudden jump, thereby imparting a most efficient jarring action to the tubes. The details of the knockers and some of the other details of the machine could of course be changed without departing from the spirit of my invention. It may be noted that in practice the joint between the casing and the drum 1 should preferably be packed in some suitable manner, so as to make the same substantially air-tight. The casing or preliminary dust-collecting chamber is of such construction that the dust-laden blast is forced to pursue a curvilinear path under pressure, thereby successively impinging against the walls of the casing on substantially tangential lines. Gravity and centrifugal force, therefore, work to the greatest advantage for effecting the precipitation of the heavier particles of dust. It should also be noted that the collecting or cut-off chamber for the balloon or drum itself is located above the bottom of the casing, thereby affording clearance between the said cut-off chamber and the bottom of the casing for the passage of the dust-laden blast underneath said chamber in its travel through the air-trunk afforded by the casing. It should be further noted that this air-trunk afforded by the casing encompasses the periphery of the drum and delivers the dust-laden blast to the open ends of the tubes throughout the entire periphery of the drum, except the portion thereof to which is applied the cut-off chamber. The fact that the collecting tubes or pockets are arranged in rows circumferentially of the drum, with the rows spaced apart from each other, should also be noted. This is an important feature for affording the necessary clearance for the escape of the filtered air lengthwise of the rows of tubes in the open atmosphere. The ends of the drum or balloon are open or cut away for a similar reason. Otherwise stated, the tubes are exposed in the open atmosphere for nearly their entire length, being actually exposed for their entire length, with the exception of the receiving ends of the same where attached to the periphery of the drum. Without this provision for the free escape of the filtered air into the atmosphere the drum or balloon would have far less capacity in proportion to cloth surface. As shown, the pockets are in the form of tubes, and these tubes are of conical form, or, more exactly stated, the tubes are truncated cones closed at their inner or smaller ends and open at their outer or larger ends to receive the dust-laden blast. This tubular form of the pockets, with the tubes of conical shape, open at their larger and closed at their smaller ends, is of itself an important feature of novelty for securing an improved and more efficient action than could otherwise be secured. Inasmuch as the dust-laden air enters the tubes through their larger ends, the pressure remains effective for a longer time in the passage of the dust-laden blast to the smaller end of the tubes, thereby bringing into action the whole surface of the cloth for filtering purposes. Then when the tubes are brought into cleaning position they stand with their large ends downward and in registration with the collecting-trough of the cut-off chamber, and hence under the cleaning action the dust will be the more readily dislodged and discharged from the tubes because of the conical shape thereof, increasing in cross-section in the direction of the discharge. The tubular form of the pockets also permits the same to be arranged in rows longitudinally of the drum as well as circumferentially thereof, and this again increases the available cloth surface and the available clearance for the escape of the filtered air into the atmosphere. The tubes are yieldingly distended. They are suspended from the periphery of the drum from their larger ends, and the walls of the pockets are free from the drum or other supports, thereby being distensible pockets. This affords a free collapsing action as preliminary to the snap back or spring shake in the cleaning action. This distensible feature of pockets suspended radially inward or disposed radially inward from the periphery of the drum is broadly new in dust-collectors of the balloon type.

In the broad point of view, of course, the terms "pockets" and "tubes" as employed in this case are interchangeable terms. Otherwise stated, a single tube could have any cross-section and might, for example, extend for the entire length of the drum as long as it was free from the end walls of the drum or made up a complete cloth pocket or tube. On the other hand, as hitherto noted, in the narrower point of view the tubular form of the pockets secure important special advantages, and even the conical form of the tube materially adds to the efficiency thereof. It must further be understood that some important features of the invention are not dependent on the intermittent motion of the drum. Otherwise stated, so far as some of the important features of the invention are concerned the motion of the drum might be continuous at a slow speed.

It should be noted that the annular drum or balloon frame has a periphery in the form of a true circle, which is always maintained intact, and hence a tight joint can be made therewith by the packing-flanges 38 of the draft-cutting-off device 32. The collecting-tubes in my machine herein disclosed are suspended from the periphery of the drum radially inward, and hence whatever pull comes from the tubes onto the staves of the drum tends to hold the staves inward or closely jointed to the annular heads of the drum. When radial tubes are distended outward, they tend to pull the staves away from the retaining-heads of the drum, thereby opening joints in the periphery of the drum and rendering such machines more or less inoperative. Unless the form of the periphery of the drum be maintained intact a cut-off device cannot be made to properly coöperate therewith.

The machine herein disclosed has gone into extensive use in the trade because of the radical improvement in results secured thereby as compared with other collectors of the balloon type hitherto in use.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:

1. In a dust-collector of the balloon type, the combination with a casing constructed to afford a preliminary collector encompassing and delivering to the balloon the partly-cleaned air, of a revoluble drum or balloon frame mounted in said casing; distensible, collapsible collecting-pockets suspended radially inward from the periphery of the drum, in the open atmosphere, which pockets are closed at their inner ends and are open at their outer ends to receive the dust-laden blast, a blast-cutting-off chamber with which the open ends of said pockets register when in cleaning position, and means for collapsing and jarring said pockets, while the dust-laden blast is cut off therefrom, to clean the pockets, substantially as described.

2. In a dust-collector of the balloon type, the combination with a casing constructed to afford a preliminary collector encompassing and delivering to the balloon the partly-cleaned air, of a revoluble drum or balloon frame mounted in said casing, distensible, collapsible, collecting-pockets suspended radially inward from the periphery of the drum, in the open atmosphere, which pockets are closed at their inner ends and open at their outer ends, to receive the dust-laden blast, means for yieldingly distending said pockets with freedom for a collapsing action thereof, a blast-cutting-off chamber with which the open ends of said pockets register when in cleaning position, and means for collapsing and jarring said pockets from the inner ends thereof while the dust-laden blast is cut off therefrom, to clean said pockets, substantially as described.

3. In a dust-collector of the balloon type, the combination with a casing constructed to afford a preliminary collector encompassing and delivering to the balloon, the partly-cleaned air, of a revoluble drum or balloon frame mounted in said casing, distensible, collapsible collecting-tubes of conical form suspended radially inward from the periphery of the drum, in the open atmosphere which tubes are closed at their inner or smaller ends and are open at their outer or larger ends to receive the dust-laden blast, means for yieldingly distending said tubes with freedom for a collapsing action thereof, a blast-cutting-off chamber with which the open or larger ends of the said tubes register, when in cleaning position, and means for collapsing and jarring said tubes from the inner ends thereof while the dust-laden blast is cut off therefrom, to clean said tubes, substantially as described.

4. In a dust-collector of the balloon type, the combination with a casing constructed to afford a preliminary collector encompassing and delivering to the balloon the partly-cleaned air, of a revoluble drum or balloon frame mounted in said casing, distensible collecting-pockets disposed radially inward from the periphery of the drum, in the open atmosphere, which pockets are closed at their inner ends and open at their outer ends, to receive the dust-laden blast, and are arranged in circumferential rows spaced apart from each other and the end walls of which drum are open or cut away, whereby clearance is afforded for the escape of the filtered air, lengthwise of the drum between the rows of pockets, a blast-cutting-off chamber with which the open ends of said pockets register, when in cleaning position, and means for cleaning said pockets, while the dust-laden blast is cut off therefrom, substantially as described.

5. In a dust-collector of the balloon type, the combination with a casing constructed to afford a preliminary collector encompassing and delivering to the balloon the partly-cleaned air, of a revoluble drum or balloon frame mounted in said casing, distensible

collecting-pockets in the form of conical tubes, disposed radially inward from the periphery of the drum, in the open atmosphere, which pockets are closed at their inner or smaller ends and are open at their outer or larger ends, to receive the dust-laden blast, and are arranged in rows circumferentially and longitudinally of the drum, with the circumferential rows spaced apart from each other, and the end walls of the drum open or cut away to afford clearance for the filtered air, means for yieldingly distending said tubes, a blast-cutting-off chamber with which the open ends of the rows of tubes register in succession, when in cleaning position, and means for cleaning said tubes while the dust-laden blast is cut off therefrom.

6. In a dust-collector of the balloon type, the combination with a revoluble drum or balloon frame, of distensible collecting-pockets disposed radially inward from the periphery of the drum, in the open atmosphere, which pockets are closed at their inner ends and are open at their outer ends to receive the dust-laden blast, a blast-cutting-off chamber directly underneath the drum, with which the open ends of said pockets register, when in cleaning position, means for cleaning said pockets while the dust-laden blast is cut off therefrom, and a scroll-shaped casing in which said drum is mounted which casing is constructed to afford a curvilinear air-trunk, for the blast of dust-laden air, passing underneath said cut-off chamber and encompassing the balloon or drum, and which casing operates as a preliminary collector removing the heavy particles of the dust and delivering the partly-cleaned air to the open ends of the pockets of said balloon, substantially as described.

7. In a dust-collector of the balloon type, the combination with a casing constructed to afford a gravity action preliminary collector encompassing and delivering to the balloon the partly-cleaned air, of a drum or balloon frame intermittently revoluble in said casing, rows of collecting-tubes open at their outer and closed at their inner ends, suspended radially inward from the periphery of said drum, in the open air, spring-held distending-bars carried by the rows of tubes at their inner ends, radial guides for said distending-bars, carried by the drum, a draft-cutting-off device affording a cut-off chamber underneath the drum with which the open ends of the tubes register, when in cleaning position, and means for jarring the row of tubes, in cleaning position, from the inner ends of said tubes, while the dust-laden draft is cut off, substantially as and for the purposes set forth.

8. The combination with the casing 7, substantially of involute form, constructed to afford the main trunk 12 encompassing the balloon and the intake-channel 10 divided off from the adjacent portion of the main trunk 12, by the partition 11, of the annular drum or balloon frame rotatively mounted in said casing and surrounded by the main air-trunk thereof, the rows of collecting-tubes open at their outer and closed at their inner ends, suspended radially inward from the periphery of said drum, the spring-held distending-bars carried by the inner ends of the rows of tubes, the radial guides for said bars, the dust-receiving trough 32, underneath the drum, provided with packing-flanges 38 which coöperate with the periphery of the drum to cut off the dust-laden draft from the row of tubes in registration with said trough, jarring devices mounted for action on the said distending-bars to shake the row of tubes, in cleaning position, from their inner ends, when the dust-laden draft is cut off, and means for imparting a step-by-step intermittent motion to the said drum, all for coöperation, substantially as described.

9. In a dust-collector of the balloon type, the combination of a scroll-shaped casing having a tangentially-arranged air-inlet in one side of its upper part, a settling-chamber in a lower part of said casing, an intermittently-revoluble dust-collecting medium mounted in said casing, above said settling-chamber and comprising rows of collecting-tubes, open at their outer and closed at their inner ends, a cut-off chamber in tight contact with a peripheral portion of said dust-collecting medium, with which chamber the open outer ends of successive rows of collecting-tubes register, when in cleaning position, mechanism for periodically cleaning successive rows of collecting-tubes, when successively in register with said cut-off chamber, and means for separably removing deposits from the settling-chamber and from the cut-off chamber, whereby the heavy or coarse dust and the comparatively light-weight dust are separably collected, substantially as described.

10. A dust-collector of the balloon type having a rotary balloon in the form of an annular drum containing the collecting-pockets, in radial arrangement, which drum is constructed in sections separable lengthwise of the drum without displacement of the collecting-pockets or the devices carried by the drum, for coöperation with the tubes, substantially as described.

11. A dust-collector of the balloon type consisting essentially of a preliminary dust-collecting chamber or casing, wherein the dust-laden blast is forced to pursue a curvilinear path successively impinging against the walls of the casing, on substantially tangential lines, a revoluble balloon-frame and rows of porous dust-collecting tubes radially arranged in said balloon-frame and each having one end closed and the other end open and in communication with said preliminary collecting-chamber, to receive the dust-laden air therefrom, substantially as described.

12. In a dust-collector of the balloon type, the combination with a casing constituting a preliminary dust-collecting chamber, wherein the dust-laden blast is forced to pursue a curvi-

linear path, successively impinging against the walls of the casing on substantially tangential lines, of a balloon-frame revoluble in said casing, rows of collecting-tubes each open at one end and closed at the other, and all radially arranged in said balloon-frame with their inner portions exposed to the air, a draft-cutting-off device affording a cut-off chamber with which the open ends of said tubes register, when in cleaning position, and means for cleaning successive rows of said tubes, while the dust-laden draft is so cut off, substantially as described.

13. In a dust-collector of the balloon type, consisting of a preliminary dust-collecting chamber, wherein the dust-laden blast is forced to pursue a curvilinear path successively impinging against the walls of the casing, on substantially tangential lines a revoluble balloon-frame mounted in said chamber, rows of porous dust-collecting tubes radially arranged in said balloon-frame and each having one end closed and the other in communication with said preliminary dust-collecting chamber to receive dust-laden air therefrom, a cut-off chamber for isolating the porous tubes, in succession, from communication with said preliminary collecting-chamber, means for clearing the porous tubes, in succession, while their open ends are over said cut-off chamber, and means for effecting a separate removal of the dust deposited in said preliminary collecting-chamber, substantially as described.

14. In a dust-collector of the balloon type, the combination with a preliminary dust-collecting chamber or casing, wherein the dust-laden blast is forced to pursue a curvilinear path successively impinging against the walls of the casing, on substantially tangential lines, of a revoluble drum or balloon frame mounted in said casing, distensible collecting-pockets in the form of conical tubes suspended radially inward from the periphery of the drum, in the open atmosphere, which pockets are closed at their inner or smaller ends and are open at their outer or larger ends, to receive the dust-laden blast, and are arranged in rows circumferentially and longitudinally of the drum, with the circumferential rows of said tubes spaced apart from each other and the end walls of the drum open or cut away to afford clearance for the filtered air, means for yieldingly distending said tubes, a blast-cutting-off chamber with which the open ends of the rows of tubes register, in succession, when in cleaning position, and means for cleaning said tubes while the dust-laden blast is cut off therefrom.

15. In a dust-collector of the balloon type, the combination with a preliminary dust-collecting chamber or casing, wherein the dust-laden blast is forced to pursue a curvilinear path successively impinging against the walls of the casing, on substantially tangential lines, of a revoluble drum or balloon frame mounted in said casing, distensible collecting-pockets in the form of conical tubes, suspended radially inward from the periphery of the drum and free from the end walls thereof, in the open atmosphere, which pockets are closed at their inner or smaller ends and are open at their outer or larger ends to receive the dust-laden blast from said preliminary collecting-chamber, and are arranged in rows circumferentially and longitudinally of the drum, with the circumferential rows spaced apart from each other and the end walls of the drum open or cut away to afford clearance for the filtered air, means for yieldingly distending said tubes, a blast-cutting-off chamber with which the open ends of the rows of tubes register, in succession, when in cleaning position, means for jarring said tubes from their inner ends, when in said cleaning position and while the dust-laden blast is cut off therefrom, and means for imparting an intermittent or step-by-step motion to said drum, substantially as described and for the purposes set forth.

In testimony whereof I affix my signature in presence of two witnesses.

EMIL R. DRAVER.

Witnesses:
F. S. CALDWELL,
A. L. NICHOLS.