(No Model.)

2 Sheets—Sheet 1.

F. PRINZ.

DUST COLLECTOR FOR FLOUR MILLS.

No. 272,474. Patented Feb. 20, 1883.

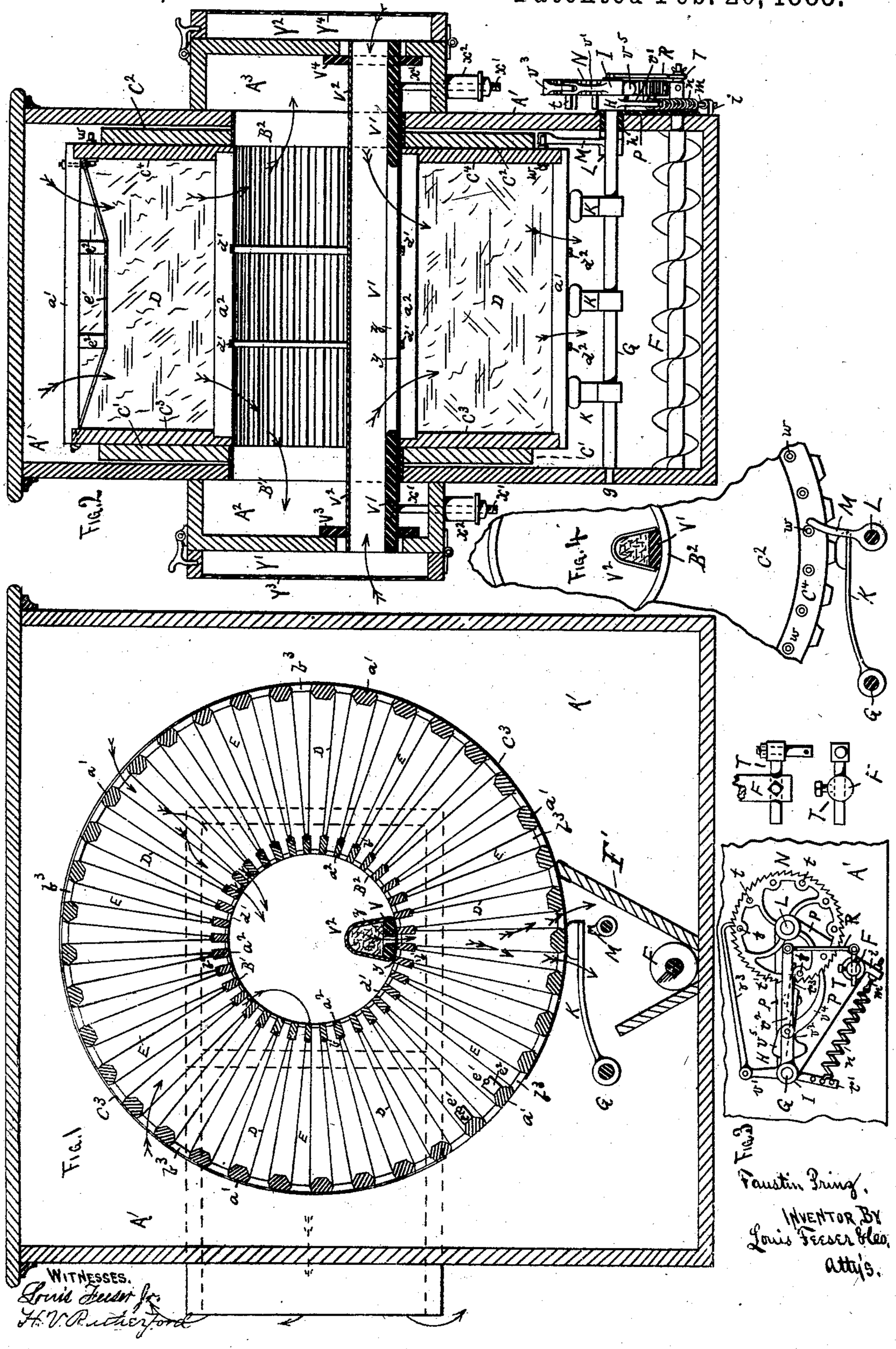

Fig. 2

Fig. 4

Fig. 1

Fig. 3

Witnesses.
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H. V. Rutherford

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Inventor By
Louis Fesser & Co.
Atty's.

N. PETERS, Photo-Lithographer, Washington, D. C.

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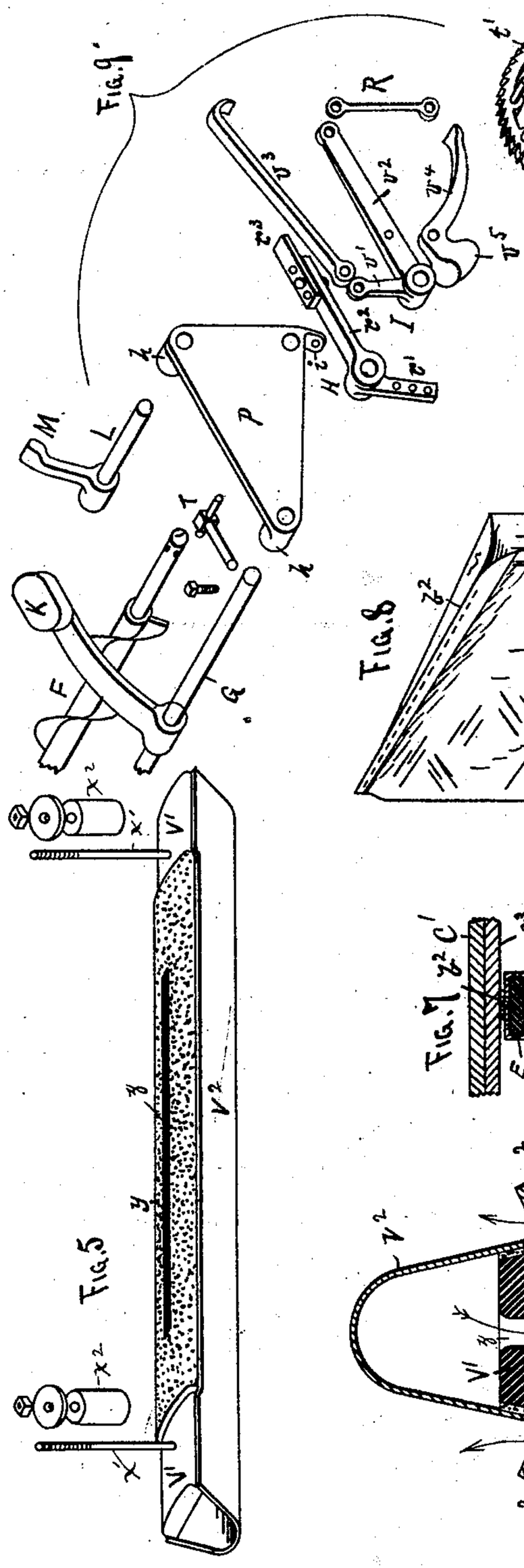

WITNESSES.
Louis Dieser Jr.
H. V. Rutherford

Faustin Prinz,
INVENTOR. BY
Louis Dieser & Les.
atty's.

N. PETERS, Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

FAUSTIN PRINZ, OF MILWAUKEE, WISCONSIN.

DUST-COLLECTOR FOR FLOUR-MILLS.

SPECIFICATION forming part of Letters Patent No. 272,474, dated February 20, 1883.

Application filed September 4, 1882. (No model.)

To all whom it may concern:

Be it known that I, FAUSTIN PRINZ, a subject of the Emperor of Germany, but having declared my intention of becoming a citizen of the United States, a resident of Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Dust-Collectors for Flour-Mills, of which the following is a specification.

This invention relates to dust-collectors for flour-mills; and it consists in the construction and arrangement of parts, substantially as specifically described and claimed.

In the drawings, Figure 1 is a cross-sectional view. Fig. 2 is a longitudinal sectional view. Fig. 3 is a detached detail view of the knocker and balloon revolving mechanism. Fig. 4 is a view of a portion of one end of the balloon, illustrating the manner of revolving it. Fig. 5 is a detached reversed perspective view of the back-draft supply-tube and cut-off. Fig. 6 is an enlarged cross-sectional view of a portion of the balloon and back-draft tube and cut-off, illustrating their construction. Fig. 7 is a sectional view of a portion of one of the dust-collecting bags and its wedge-shaped holding-plate. Fig. 8 is a perspective view of one of the dust-collecting bags and its wedge-shaped securing-plates. Fig. 9 represents perspective views of the different parts of the balloon, knocker, and revolving mechanism disconnected from each other.

A′ is the outer casing or frame, made in any desired manner, upon either end of which square or other shaped hoods or boxes A^2 A^3 are placed, as shown.

Formed through the ends of the casing A′, in the centers of the hoods A^2 A^3, are circular openings, in which metal or wooden rings B′ B^2 fit. The outer ends of said rings come flush with the outer surface of the casing A′, and their inner edges project inside the casing far enough to receive two circular wooden heads, C′ C^2, which are secured thereto by screws, or by other means, while the outer edges of the rings are free to revolve in the openings through the casing.

Attached to the insides of the heads C′ C^2 are two other heads, C^3 C^4, somewhat larger than the heads C′ C^2, and connected to each other at their outer peripheries by wooden bars a', arranged at equal distances apart and parallel to each other. The centers of these inner heads, C^3 C^4, are cut out so that they are even with the rings B′ B^2, and the edges of these cut-out portions are connected to each other by small wooden bars a^2, equal in number to the bars a', as shown, and arranged parallel to each other, and with equal-sized spaces between them. By this means a circular balloon or cage is formed with annular ends, connected by two rows of parallel slats or bars, and leaving an open circular central space entirely through it, and suspended by the rings B′ B^2 in the frame A′, and adapted to be revolved upon said rings as journals. The outer slats, a' a^2, are formed with double angular sides, as shown, being the widest through the central part, and tapering toward the outer and inner sides, the object to be hereinafter set forth. These slats a' a^2 form the supports for the dust-collecting fabric, which is arranged thereon in a peculiar manner, which I will here describe. A section of cloth of the proper quality, a little wider than the distance between the heads C^3 C^4, and long enough to reach from the outer sides of the outer bars, a', to the outer surface of the inner row of bars, a^2, is taken and doubled over upon itself, with the fold across the center of the length of the cloth. The edges at right angles to the fold are then sewed together, forming a bag or pocket, closed at one side by the fold in the cloth and at the ends by the edges being sewed together, while the remaining side is left open. This is more clearly shown in Fig. 8, which represents one of these pockets detached.

D represents the main part of the cloth; b', the folded part; b^2, the sewed-up ends, and b^3 the open front. There are as many of these pockets as there are inner slats a^2, the folded edge b' of each pocket being attached to the outer side of one of these bars by tacking or otherwise through a cord, wooden strip, or other suitable binding, b^4, from the inside of the pocket. This cord or strip b^4 lies along the inside of the folded part b^2, and serves to prevent the cloth tearing loose when stretched. The cloth used on these machines is necessarily of a light porous nature. Hence, if the tacks were driven directly through the cloth, the latter would pull off from them; but by the use of the holding-strips b^4 the cloth is held

firmly the whole length of the bag, and will not pull out. The bags are attached to the slats a^2 before the slats are set in place on the heads C^3 C^4 or the ends sewed up. The slats a^2 are then placed in position, and the outer edges, b^3, of the attached bags D drawn through the space between the slats a' which comes opposite to the inner slat, to which the folded sides are respectively attached and tacked and glued to the outwardly-slanting sides of the ribs a', as shown in Fig. 6. The cloth will only then be in contact with the ribs a' outside their centers or on the outer angles of their sides, leaving the sides of the cloth from the center of the strips a' to the cords b^4 entirely free. By thus beveling the edges of the outer slats I am enabled to tack and glue the cloth fast more readily, as well as to more firmly hold the cloth, and the strain between the cloth and wood is at an angle, and draws the cloth down against the wood, and not away from it. Hence the tacks and glue will not be so liable to tear loose as they would if the strains were at right angles to or parallel with the surface of the wood. The wood of the bars a', by being cut away on the inside next the cloth, increases the cloth surface without materially decreasing the strength of the bars a'. This arrangement brings the sewed edges b^2 against the inner surface of the heads C^3 C^4, as shown in Fig. 7, which represents a section of one of these bags and a portion of one set of the heads C' C^3; and to secure these ends to said heads wedge-shaped blocks E are inserted into the bags D, and nailed or otherwise secured to the heads C^3 C^4 from inside the bags, thus firmly securing the ends of the bags between them. The outer ends of these blocks E are just wide enough to fit between the slats a', while the inner ends are just about as wide as cords b^4. The spaces between the slats a' are too narrow to admit the hand or an ordinary hammer between them to nail the blocks E to the heads. Hence before they are inserted into the bags the requisite number of nails c to hold them are set into them, as shown in Fig. 8, and then, when the blocks are properly placed, the nails are driven home by an implement made for the purpose. Screws may be substituted for nails, if desired. By this arrangement a dust-collecting balloon having the usual "zigzag" conformation of the cloth is produced, and in a manner to thoroughly prevent leakage, the cord b^4 securely holding the inner edges of the bags, and the tacking and gluing upon the beveled slats a' securely holding the outer edges, while the ends are very firmly secured by the sewing of the edges together and then nailing the blocks E over said sewed edges. To strengthen the bars a^2, a series of hoops, d', will be placed around their inner sides, to which each bar will be secured by screws or nails, the length of the machine determining the number of the hoops. For supporting the outer bars, a', hoops d^2 will be used, encircling the outer bars at suitable distances apart, and to which each bar is secured by nails or screws. In very long machines each outer bar a' will be provided with a truss wire or rod, e', secured at the ends of the bars or through the heads C^3 C^4 by nuts, so that they may be drawn up to tighten the rods. Bridge-blocks e^2 fit between the bars and rods, so as to cause the rods to assume the bracing form shown. By this means the bars in long machines may be kept from sagging by the strain of the cloth or their own weight. Light bars may thus be used, and made as strong by means of the rods and bridge-blocks as heavy bars.

I have shown both the rings d^2 and rods e' and bridge-blocks e^2 arranged on one machine to simplify the drawings; but in practice the rings will be used only on short machines and the trusses used only on long machines.

In the lower part of the casing A a screw conveyer, F, is arranged to carry off the dust that falls from the surface of the balloon. The shaft of the conveyer runs through both ends of the casing, and one end of it, outside of the casing, is provided with the belt-pulley or gear by which the conveyer is revolved, while the other end outside the casing is provided with a crank-arm, T, the object of which will be hereinafter explained.

G is a shaft passing through the casing A parallel with the conveyer F, but at a greater elevation and off to one side, as shown. It is journaled at one end in the casing, at g, while the other end passes through the casing, and is provided outside thereof with two bell-cranks, H I, the crank H being tight upon the shaft G and the crank I loose upon the same shaft.

Attached to the shaft G, inside the casing A, at intervals, are knockers K, adapted to strike the rib a', which for the time being happens to be in a line directly beneath the center of the balloon, a series of blows, as hereinafter set forth.

L is a third shaft, passing through the casing A parallel with the shaft G and conveyer F, and provided on the end, inside the casing, with a cam or arm, M, and on the outside with a ratchet-wheel, N.

P is a triangular metal plate, through the corners of which the two shafts G L and the shaft of the conveyer F are journaled, the plate thus forming a hanger or frame for the shafts and conveyer, and preventing them from wearing the wood of the casing. Hubs h will be formed upon the inside of this plate P, around the shafts, to project through the casing A, and thus prevent the shafts from coming in contact with the wood, and also to form longer bearings for the shafts.

i is a small lug, projecting from the lower corner of the plate P, through which a threaded bolt, m, passes, and is provided with nuts upon both sides of the lug, so that the bolt may be set back and forth through the lug to tighten or loosen a spring, n, which connects the lower arm, r', of the bell-crank H and the bolt m, as

shown. The upper arm, r^2, of the bell-crank H projects in a nearly horizontal line toward and a short distance beyond the rim of the ratchet-wheel N. Projecting from the inner rim of the ratchet-wheel N are a series of pins, *t*, adapted to strike the end of the arm r^2, force it down, and stretch the spring *n*, and then, when the pins pass beyond the end of the arm, the spring will throw the arm r^2 up again, ready for the next pin. This action oscillates the shaft G, and causes the knockers K to be moved downward by the pins *t* forcing the arm r^2 down, and then to be suddenly thrown up against the rib a' by the reaction of the spring *n*, thus delivering as many blows to the ribs a' as there are pins in the ratchet-wheel N. The ribs a' will be protected by a sheathing of band-iron where the knockers strike them, to prevent wear. The outer end of the arm r^2 is provided with a small adjustable plate, r^3, which may be set farther away from or nearer to the shaft G, to lengthen or shorten the arm r^2 to regulate the distance which the pins *t* shall move the arm downward, the shorter the arm r^2 r^3 the shorter the stroke of the knockers, and the longer the arms the longer the stroke. By this means heavy or light blows may be struck, as desired.

The bell-crank arm I is also provided with the two arms v' v^2, similar to the arms r' r^2 of the bell-crank H, except that the short arm v' projects upward instead of downward.

Pivoted to the upper end of the arm v' is a dog, v^3, adapted to catch over the teeth of the ratchet-wheel N, above the center, while another dog, v^4, is pivoted to the arm v^2, and adapted to engage with the teeth of the ratchet-wheel below the center, as shown. The dog v^3 remains in contact with the teeth of the ratchet-wheel by its own weight; but a counter-weight, v^5, or a spring will be necessary to hold the dog v^4 in contact with the teeth. The pivoted points of the dogs v^3 v^4 are at equal distances from the center of the shaft G.

R is a small rod connecting the outer end of the arm v^2 with the small crank T, before mentioned. By this arrangement the constant revolution of the conveyer causes the crank T to revolve and move the arm v^2 up and down and the arm v' back and forth. This action causes the dog v^3 to catch over the teeth of the ratchet-wheel N when moved away from it and revolve it a short distance toward the shaft G. It then slips back with the return-stroke and catches again on the next tooth, while at the same time the dog v^4 is slipping over the teeth at the upstroke of the arm v^2 and catching upon them at the downstroke, and revolving the wheel while the dog v^3 is making its return-stroke. By this means the dogs v^3 v^4 act alternately and keep the ratchet-wheel steadily revolving, there being no perceptible pause between the changes of the dogs.

Upon the outer side of the head C^4, between the outer rims of the heads C^2 and C^4, are small projecting pins *w*, one for each slat a', against which the cam or arm M strikes when the shaft L is revolved by the action of the dogs v^3 v^4, and thus the balloon is revolved the distance between two of the bars a', and remains stationary until the cam comes around again.

The pins *t* on the ratchet N are arranged to occupy about three-fourths of the circumference of the wheel N, leaving an open space, t'. This is to cause the knockers K to remain inactive while the balloon is being revolved, the open space t' being formed at the proper point to bring the arm r^2 r^3 inside of it while the cam M is in contact with one of the pins *w* on the balloon. By this arrangement the revolution of the conveyer F imparts the revolving motion to the ratchet-wheel N and its shaft L, and causes the cam M to catch one of the pins *w* on the balloon and revolve it until the cam passes beyond the pin, when it will leave the balloon stationary until it comes around again and catches upon the next pin. While the cam M is in contact with the pins *w* the open space t' will be opposite the arm r^2 r^3, and not affect the knockers; but as soon as the cam M leaves the pin *w* and the balloon again becomes stationary the pins *t* again begin to act and operate the knockers K. In the drawings eight of the pins *t* are shown; but a greater or less number may be used, as desired, the open space t' being enough so that the knockers will not operate while the balloon is in motion, as, if they operated unintermittently, part of the blows would be struck between the ribs a'. Thus each rib a' will be struck eight light rapid blows at each pause of the balloon, and the knockers remain stationary when the balloon is in motion.

V′ is a flat plate, usually of wood, lying through the interior of the balloon, wide enough to cover four or more of the ribs a^2, and with its ends extending through the covers of the hoods A^2 A^3, and armed with a felt or other suitable packing, *y*, where it comes in contact with the ribs a^2, so as to make an air-tight joint between them. This packing is formed by a thin sheet of rubber, felt, or other suitable material, stretched over the wooden plate, with a layer of cotton, wool, or other soft substance between them. By this means the soft surface presses into all irregularities of the ribs a^2 and forms a perfectly air-tight joint at all times.

V^2 is a hollow sheet-metal covering to the plate V′, attached to its sides, these two parts—viz., the plate V′ and covering V^2—forming a tube having a convex bottom fitting the concave form of the interior of the balloon and opening at either end through the hoods A^2 A^3. Through the bottom of the plate V′ a slot, *z*, is cut the width of one of the spaces between the ribs a^2 and the length of the space inside the heads C^3 C^4. By this means communication is opened between the spaces between the cloth bags D and the tube V′ V^2, one after the other, as the balloon is revolved, to afford a back-draft to assist in cleaning

the cloth, as hereinafter set forth. Small bolts x' may be set down through the outer ends of the plate V′, and surrounded by rubber or other springy collars x^2, so that by screwing the nuts of the bolts x' up the plate V′ may be drawn down upon the ribs a^2, to increase the pressure in event of wear and prevent leakage, the spring-collars x^2 allowing the plate to give a little, to permit it to adapt itself to any irregularities of the surface of the ribs. By this means the tube V′ V² may be kept pressed upon the ribs with sufficient force at all times. Any other suitable means may be employed to secure the tube, however, as I do not wish to confine myself to this particular method of fastening. The holes in the covers of the hoods A² A³, through which the ends of the tube V′ V² pass, are larger than the tubes, to permit the requisite adjustment by the bolts x', and to prevent leakage at these points collars V³ V⁴ are arranged around the tube to cover these open spaces, as shown in Fig. 2.

Y′ Y² are two frames, covered with cloth, Y³ Y⁴, and hinged or otherwise attached to the hoods A² A³, as shown in Fig. 1, to form screens to remove the dust from the air which enters the tubes V′ V², as hereinafter shown. These frames Y′ Y² are made removable, as shown, for cleaning or for other purposes.

Leading from the sides of the hoods A² A³ are spouts, which connect with a suction-fan, A⁶, (see small diagram, Fig. 10,) by which the dust-laden air from the purifiers is drawn through the machine. The dust-laden air from the purifiers will enter the casing A through an opening in the side, top, or bottom of the casing, preferably through the bottom. This opening is not seen in the sectional drawings; but it is so common that it need not be illustrated.

The operation is as follows: The fan or fans A⁶ being set in motion, the dust-laden air is drawn through all the sections of cloth, except those covered by the plate V′, from the outside toward the inside, and at the same time, by reason of the ends of the tube V′ V² opening out into the mill, draws a strong current of air into the tube down through the slot z and out through the sections of cloth on either side of the space into which the slot z opens in the reverse direction to the air passing through the remainder of the cloth, as indicated by the arrows in Figs. 1, 2, and 6. At the same time, as before described, the rib a', that for the time being is directly downward, is struck a series of blows by the knockers K, to shake the adhering dust loose from the cloth, these two agents—viz., the back-draft of air and the knockers—effectually removing all the dust. By the means described each section of the cloth, as it becomes coated with dust and chop, is brought beneath the slot z, and there held stationary while the rib a' is struck a series of blows, and a strong current of air is passed through the section of cloth in a direction opposite to that taken by the current which deposited the dust. The adhering dust is thus quite effectually removed, and the operation is continued or repeated as often as is found necessary. Many small particles of the dust and chop become so firmly attached to the cloth that the mere shaking or jarring of the cloth will not remove them; but by forcing a current of air back through the cloth from the opposite side every adhering particle of dust will be driven loose from the cloth and drop into the conveyer F and be carried off. The dust will usually fall from the section being cleaned in a mass or thick stream, so that the main current of air will not affect it, but it will fall into the conveyer F; and to more effectually prevent any interference by the air-currents, one side, F′, of the trough of the conveyer F is extended up to the ribs a' of the balloon, and provided with a soft felt or rubber packing-strip to form a tight joint between the ribs and side of the trough, so that no passage of the air back and forth beneath the balloon is permitted. Hence the falling dust is undisturbed.

It frequently happens that the air in the mill surrounding the casing A is impregnated with dust. In such case, the draft would draw any such loose dust into the tube and drive it into the cloth from the inside; but I effectually prevent this by drawing my supply of air for the back-draft through the cloth Y³ Y⁴, thus removing any dust and furnishing pure dustless air only for the back-draft.

By making the casings Y′ Y² removable they can be easily cleaned when clogged by dust.

The crank T consists in a main arm or shank, set through a hole in the end of the shaft of the conveyer F, as shown in detached enlarged figures at the side of Fig. 3, and held at any point by a set-screw, the crank-pin for the lower end of the rod R being secured in the outer end of this shank, as shown. By adjusting the crank-pin nearer to or farther away from the conveyer-shaft the throw of the dogs v^3 v^4 may be increased or reduced, and the number of teeth of the ratchet caught by them at each stroke likewise increased or decreased to regulate the speed of the revolution of the balloon.

It will of course be understood that, instead of drawing the air through the balloon and slotted tube by suction, it may be forced through by separate blowers, one blower impelling it through the balloon and the other through the tube, in which case the current through the tube could be weaker than that through the balloon. Such change is obvious, and either method may be used.

I reserve the right to claim in a seprate application the construction embracing the truss-wires e' and bridges e^2.

I do not claim, broadly, in this application the back-draft feature, as the same is claimed in an application heretofore filed by me on or about the 7th day of July, 1881.

What I claim as new is—

1. In a dust-collector, a dust-collecting medium formed into separate compartments, in combination with a device for isolating a portion of said compartments from the others and permitting air to pass into said isolated portions through the end next to said device, and means for inducing an air-current through said isolated and other compartments, substantially as set forth.

2. In a dust-collector, a dust-collecting medium formed into separate compartments, in combination with a device for isolating a portion of said compartments from the others, and means for inducing an air-current through the isolated portion from one end and through the other portion from the opposite end, substantially as and for the purpose set forth.

3. In a dust-collector, a dust-collecting medium formed into separate compartments, in combination with means for inducing an air-current through a portion of said compartments from one end and then through another portion from the opposite end, substantially as set forth.

4. In a dust-collector, a dust-collecting medium formed into separate compartments, in combination with a device for isolating a portion of said compartments from the others, means for admitting an air-current into said isolated portion, and means for purifying the air before its admission into the isolated portion, substantially as specified.

5. In a dust-collector, the combination of a dust-collecting medium formed into separate compartments, a device for isolating a portion of said compartments from the others, means for admitting a current of air to such isolated portion, means for purifying the air before its admission into said isolated portion, and mechanism for jarring the isolated portion, substantially as specified.

6. In a dust-collector, a dust-collecting medium formed into separate compartments, in combination with a tube connecting a portion of said compartments with the outside air, substantially as specified.

7. In a dust-collector, a dust-collecting medium formed into separate compartments, in combination with a tube connecting a portion of said compartments with the outside air, and a screen for purifying the air before its admission into said tube, substantially as specified.

8. A dust-collecting balloon having separate compartments composed of dust-collecting material, in combination with casing A′, hoods A^2 A^3, and tube V′ V^2 having the slot *z*, substantially as set forth.

9. In a dust-collector, the combination of a dust-collecting medium formed into separate compartments, a device for isolating a portion of said compartments from the others, and means for automatically adjusting said device, substantially as specified.

10. A dust-collecting balloon having separate compartments composed of dust-collecting material, in combination with hoods A^2 A^3, back-draft tube V′ V^2, flexible packing *y*, and means for regulating the tension of said tube, substantially as set forth.

11. The dust-collecting-balloon frame consisting of heads C′ C^2 C^3 C^4, supporting-rings B′ B^2, outer ribs, *a*′, and inner ribs, a^2, in combination with supporting-rings *d*′ d^2, substantially as specified.

12. In a dust-collector, the combination of the pocket D, supporting-ribs therefor, a strip, b^4, for strengthening the material of the pocket, and means for securing the strip to the supporting-rib, substantially as and for the purpose set forth.

13. In a dust-collector, the dust-collecting medium D, in combination with inner supporting-ribs, a^2, and rib *a*′, beveled on its inner and outer edges, the medium being secured to the outer beveled edge, substantially as and for the purposes specified.

14. In a dust-collector, the combination of pockets D, heads C^3 C^4, ribs *a*′ a^2, and blocks E, the ends of the pockets being turned and secured to the heads by the blocks, as shown, for the purposes specified.

15. In a dust-collector, the combination of pockets D, the strip b^4 in its fold, ribs *a*′ a^2, heads C^2 C^3, and blocks E, the ends of pockets D being turned and secured to the heads by the blocks, as shown, for the purposes specified.

16. The combination of the conveyer F, having the adjustable crank-arm T, shaft G, having the knockers K and bell-crank H fast thereon, spring *n*, bell-crank I, having the dogs v^3 v^4, shaft L, having the arm M and ratchet-wheel N, provided with pins *t*, connecting-rod R, plate P, and a dust-collecting balloon provided with pins *w*, substantially as and for the purpose set forth.

17. The dust-collecting balloon consisting of the heads C′ C^2 C^3 C^4, ribs *a*′ a^2, cloth sections D, and supporting-rings B′ B^2, in combination with the casing A′ and division-plate F′, whereby air-currents are prevented from passing back and forth beneath the balloon, as and for the purpose set forth.

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

FAUSTIN PRINZ.

Witnesses:
GEO. L. JONES,
ALBERT B. ROEDER.