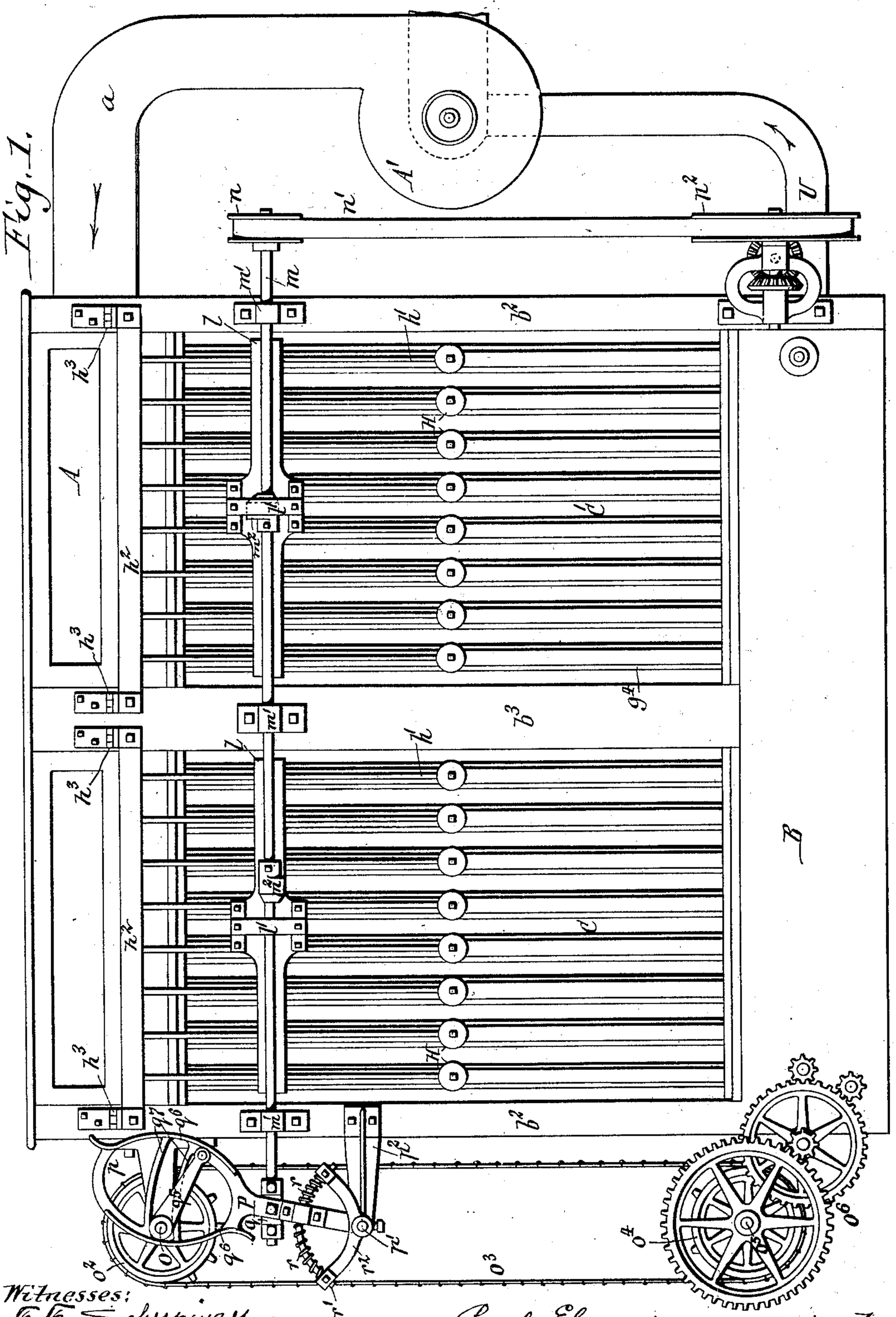
No. 703,124. Patented June 24, 1902.

P. EBERWEIN.

DUST COLLECTOR.

(Application filed Mar. 23, 1900.)

(No Model.) 4 Sheets—Sheet 1.



Witnesses:
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(No Model.) 4 Sheets—Sheet 2.

Fig. 2.

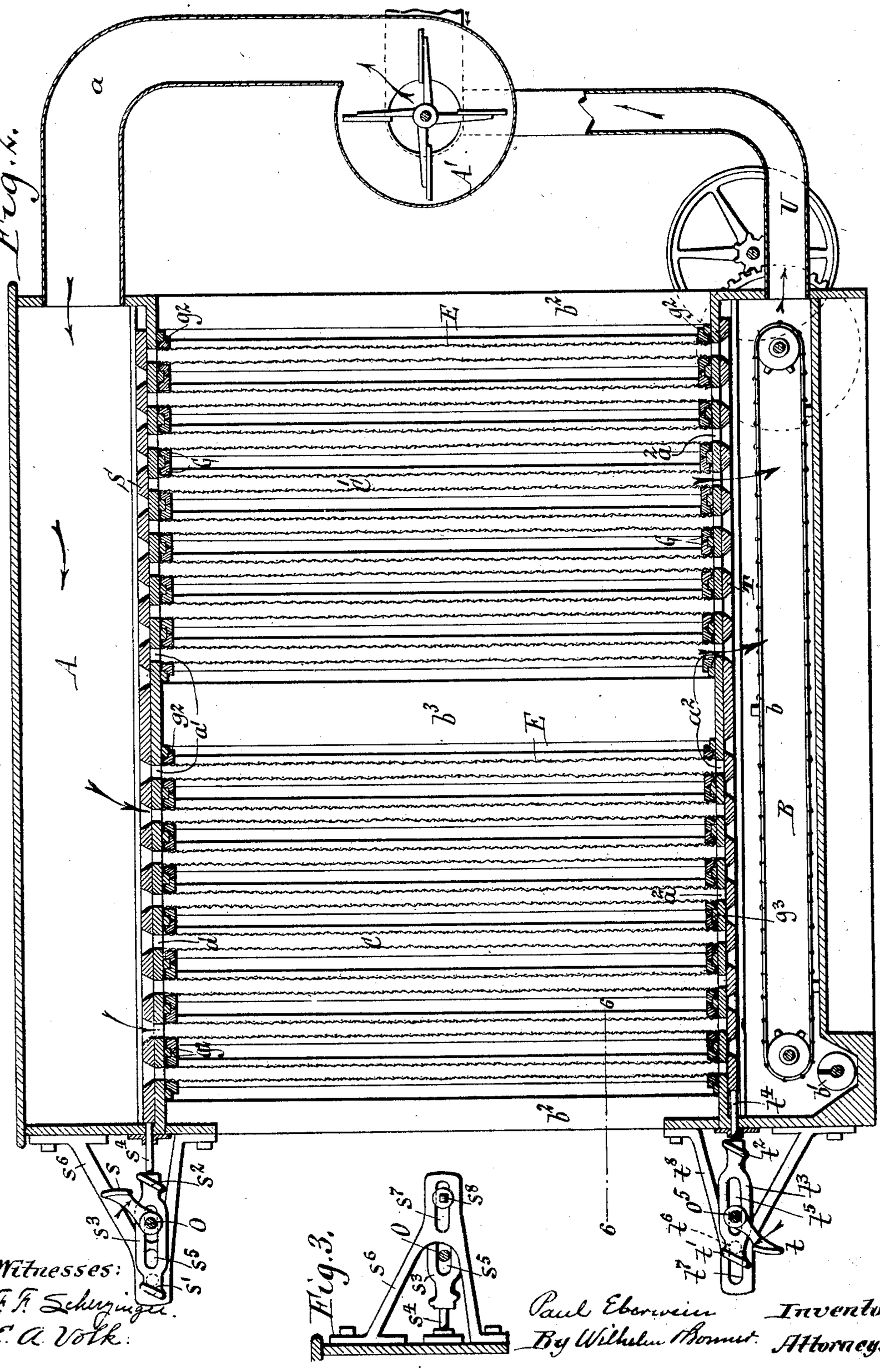

Fig. 3.

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(No Model.) 4 Sheets—Sheet 3.

Fig. 5.

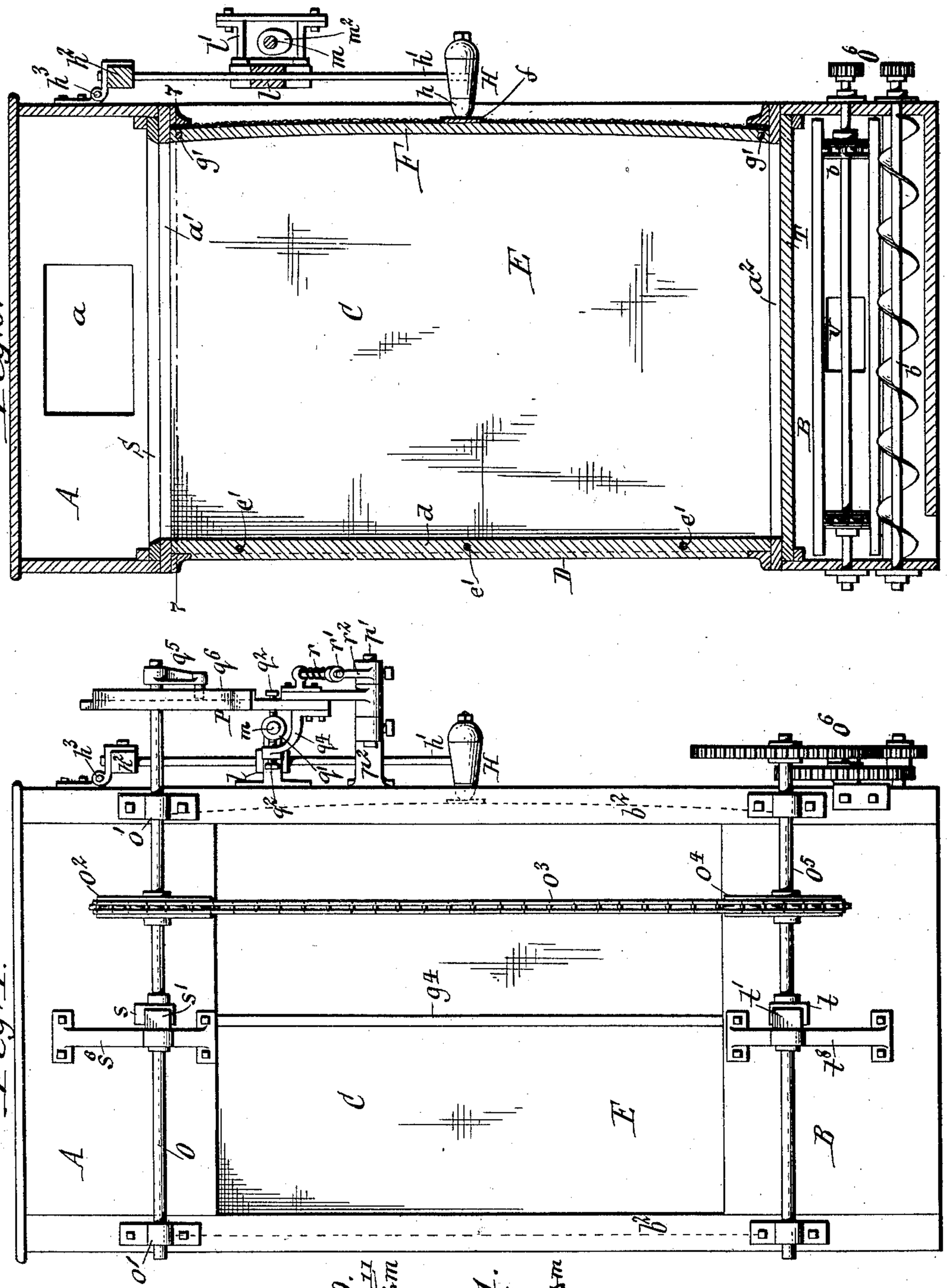

Fig. 6.

Fig. 10.

Fig. 11.

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Fig. 8.

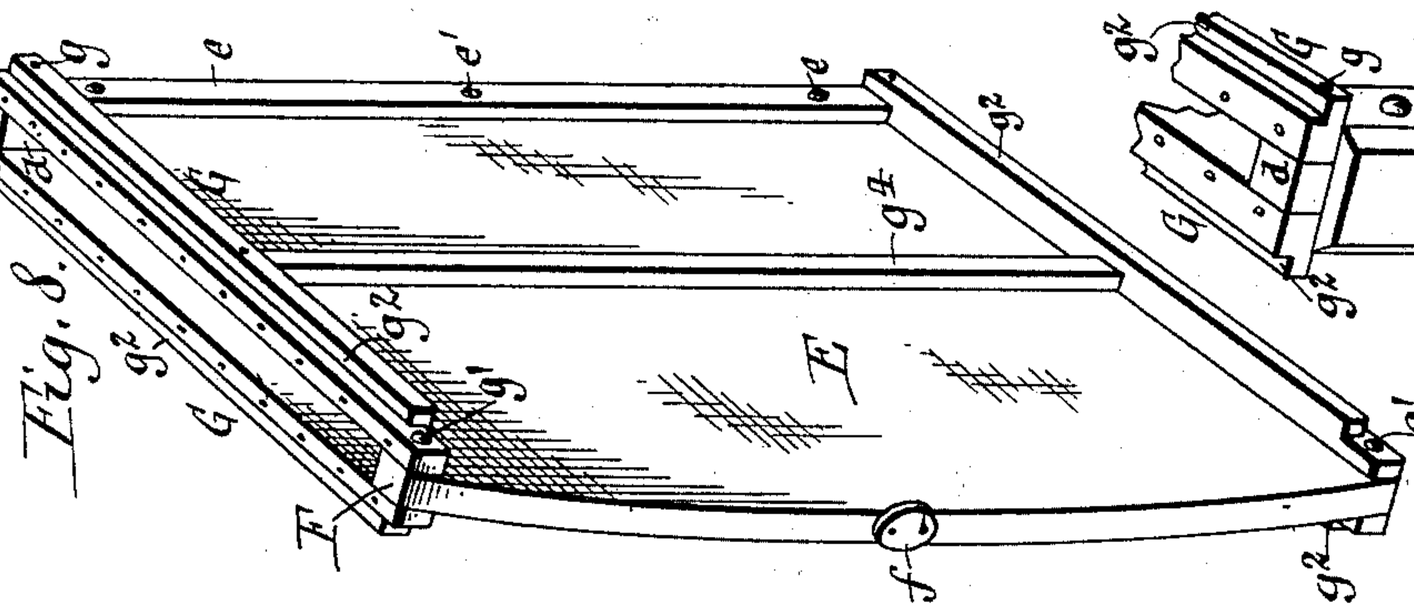

Fig. 9.

Fig. 7.

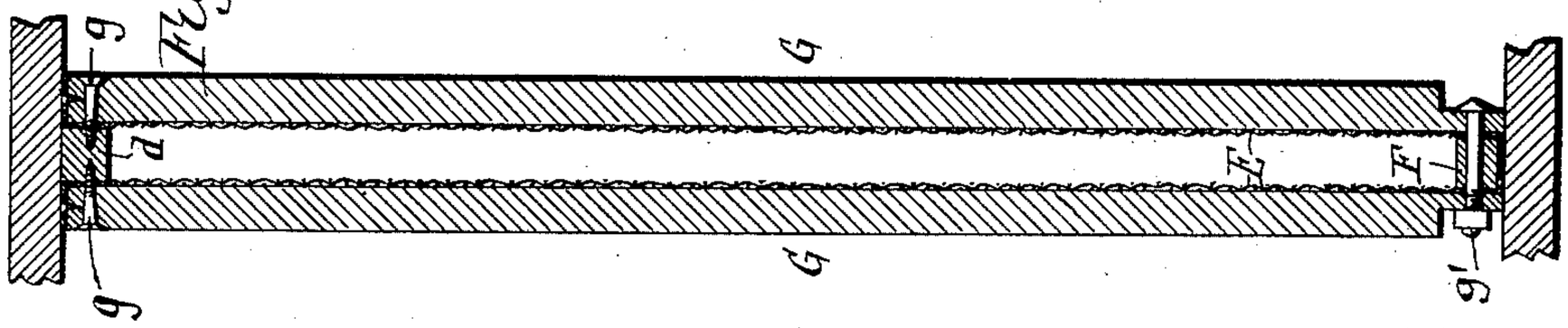

Fig. 6.

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UNITED STATES PATENT OFFICE.

PAUL EBERWEIN, OF JACKSON, MICHIGAN.

DUST-COLLECTOR.

SPECIFICATION forming part of Letters Patent No. 703,124, dated June 24, 1902.

Application filed March 23, 1900. Serial No. 9,862. (No model.)

To all whom it may concern:

Be it known that I, PAUL EBERWEIN, a citizen of the United States, residing at Jackson, in the county of Jackson and State of Michigan, have invented new and useful Improvements in Dust-Collectors, of which the following is a specification.

This invention relates to that class of dust-collectors which comprise upright filtering-chambers, which are open at the top and bottom—an upper chamber, into which the dust-laden air is blown and from which it passes into the filtering-chambers, and a lower chamber, which receives the separated dust from the filtering-chambers and from which the dust is discharged, while the purified air escapes through the cloths of the filtering-chambers into the surrounding atmosphere. A dust-collector of this kind is described and shown in Letters Patent No. 633,954, granted to me September 6, 1899.

The objects of this invention are to improve the means whereby the filtering-chambers are jarred for dislodging the deposited dust from the filter-cloths; also to improve the mechanism whereby the cut-off devices are actuated which control the admission of the dust-laden air to the filtering-chambers, so as to exclude the air-current from the filtering-chambers for a considerable period of time; also to improve the construction of the filtering-chambers, so as to facilitate the application of the cloth thereto and the dislodgment of the dust from the cloths; also to improve the cleaning action upon the cloths by providing the dust-receiving chamber with a suction-passage, by which it is placed in communication with the fan which delivers the dust-laden air to the filtering-chambers, so as to produce a reverse draft through the filtering cloths while the cloths are being jarred.

In the accompanying drawings, consisting of four sheets, Figure 1 is a side elevation of a dust-collector provided with my improvements. Fig. 2 is a vertical longitudinal section of the same. Fig. 3 is a reverse elevation of the slide guide-bar and bracket. Fig. 4 is an end elevation of the dust-collector. Fig. 5 is a vertical section of the dust-collector through one of the filtering-chambers. Fig. 6 is a horizontal section, on an enlarged scale, in line 6 6, Fig. 2. Fig. 7 is a horizontal section through the upper portion of one of the filtering-chambers in line 7 7, Fig. 5, on an enlarged scale. Fig. 8 is a perspective view of one of the filtering-chambers viewed from the front. Fig. 9 is a perspective view of the upper rear corner of one of the filtering-chambers. Fig. 10 is a side elevation of the bearing by which the hammer-shaft is connected with the shifting lever. Fig. 11 is a horizontal section in line 11 11, Fig. 10.

Like letters of reference refer to like parts in the several figures.

A represents the upper horizontal chamber, into which the dust-laden air is blown through a spout a by a fan A′.

B is the lower horizontal chamber, which receives the collected dust and from which the dust is removed by a longitudinal endless sweep b and a transverse conveyer b'.

b^2 b^3 represent the posts which connect the upper and lower chambers at the corners thereof and at the middle.

C C′ represent the two groups of upright filtering-chambers, which are arranged between the upper and lower chambers A B and connected at their open upper and lower ends with the upper and lower chambers by transverse slots a' a^2, formed, respectively, in the bottom of the upper chamber and the top of the lower chamber.

The filtering-chambers are each composed of a light rectangular wooden frame, which is open at its upper and lower ends and over which the cloth is stretched. These chambers are shown in detail in Figs. 5, 6, 7, 8, and 9, and are constructed as follows: D represents the upright rear bar or stile of the frame of each filtering-chamber. This stile is provided on its inner face or side with an upright rib d, which is as wide as the space within the chamber. E represents the filter-cloth, which is secured with its rear ends to upright strips e, which are secured to opposite sides of this rib by transverse bolts e'. F represents the upright front bar or stile, which has the same width as the rib d of the rear stile. This bar is made of springy or elastic wood and is normally curved in the direction of its length, so that its middle stands slightly farther from the rear stile than its upper and lower ends. The cloth is bent

around the front side of this front stile. The upper and lower ends of this front stile are connected with the upper and lower ends of the rear stile by horizontal bars G, which are secured to the sides of the rib d of the rear stile by screws g and to the front stile by transverse bolts g', Fig. 7. The space between the two bars G and the front and rear stile at the same end of the frame is open and registers with one of the slots of the adjacent dust-chamber. The bars G are provided on their outer sides with longitudinal rabbets g^2, by which the filtering-chambers are guided on the transverse rails or cleats g^3, which are secured to the top and bottom chambers A B. In fastening the cloth to the frame the front stile is straightened by external pressure. Upon releasing the front stile after the cloth has been fastened to the sides of the rear stile the front stile springs back to its normal curved form and stretches the cloth. As the cloth is free to draw around the front stile in stretching, the cloth is stretched to an even tension on both sides of the frame, which insures a uniform jarring of the cloth by the cleaning device. The upper and lower ends of the cloth are then tacked to the upper and lower sides, respectively, of the horizontal bars G.

When the filtering-chambers are of large size, the upper and lower horizontal bars G on the same side of the chamber are connected at the middle of each flat side by upright strips g^4, which support the cloth against the internal air-pressure, which bulges the cloth outwardly.

Each filtering-chamber is jarred by an individual hammer or knocker, which strikes against the elastic front stile of the chamber. Each hammer is operated repeatedly for a certain length of time, so that the filtering-chamber is struck a number of times in order to thoroughly dislodge the dust which has been deposited against the cloth. The several hammers which act upon the same group of filtering-chambers are actuated simultaneously and the two groups of hammers are actuated alternately. This striking or jarring mechanism is constructed as follows: H, Figs. 1 to 5, represents the hammers or knockers, which are arranged on the front side of the machine, so as to strike against the elastic curved front stile F of the chambers, at or near the middle thereof. Each stile is provided with a wear plate or washer f where the hammer strikes the stile, and the hammer is preferably provided with a facing h, of rubber or other soft material, to deaden the sound. Each hammer-head is secured to the lower end of an upright flexible arm or bar h', and the upper ends of the arms of the same group of hammers are secured to a cross-bar h^2, which is supported at each end by a horizontal hinge h^3, connecting the cross-bar to the front wall of the upper air-chamber A. The hammer-arms of the same group are connected about midway between the ends of the arms by a horizontal bar l, which carries on its front side a yoke l'. m represents a horizontal shaft which is arranged across the front of the machine and passes through these yokes. This shaft is journaled in bearings m', secured to the posts b^2 b^3 of the machine, and is provided near each yoke with an actuating device m^2, which may be a cam or eccentric, as shown. The two actuating devices, cams, or eccentrics are so arranged on the shaft that when one of the same is in engagement with its yoke the other is out of engagement with its yoke, and that by a short longitudinal movement of the shaft in one direction or the other one actuating device can be engaged with and the other disengaged from its yoke. The shaft is rotated by any suitable means—for instance, as shown, by a pulley n and belt n' from a driving-pulley n^2. These pulleys are provided with flanges to prevent the belt from running off by the shifting of the shaft. The actuating-cam, which is in engagement with its yoke, moves the latter back and forth repeatedly, while this engagement lasts and vibrates the hammer-arms, whereby each hammer-head is caused to strike its chamber repeatedly. As the blows fall upon the elastic front stile of the frame of each filtering-chamber the cloth is thoroughly jarred.

As each filtering-chamber is struck separately by its individual hammer, each chamber is struck with full force and is thoroughly cleaned by the blow or blows. If the front stiles of the several chambers in the same group are not exactly in line, as is frequently the case, the cleaning of the several chambers is nevertheless effected thoroughly and uniformly, because each chamber receives the effect of the jarring mechanism individually. When a single hammer is arranged to act upon a group of such chambers, the latter are jarred unequally, because the blow is received by the chamber which projects farthest, while the chambers which stand farther back receive little or no agitation. Furthermore, as each individual hammer is attached to a separate flexible arm the hammers need not be exactly in line nor the arms of exactly the same spring tension or flexibility, as the swing or momentum of each hammer-head will bring the latter into forcible contact with the front stile of its chamber. The apparatus therefore works properly and efficiently under the variations in the position of the parts which are likely to exist in machines of this kind. As each hammer is sure to strike its chamber, the power required to strike an effective blow is not nearly as great as that which would be required to strike a group of chambers by a single hammer.

The mechanism whereby the hammer-shaft m is intermittently shifted is constructed as follows: O, Figs. 1, 2, and 4, is a horizontal shaft which is arranged across the end of the machine above the longitudinal hammer-shaft m and which is journaled in bearings

O'. The shaft O is preferably driven by a sprocket-wheel O^2 and chain O^3 from a wheel O^4 on a lower horizontal shaft O^5, which latter may be driven by a train of gearing O^6 from the endless sweep *b*, as shown in Figs. 1 and 4. P represents a rocking shifting lever which is connected with the end of the hammer-shaft for shifting the latter lengthwise. The upper portion of this lever has the form of an open elliptical loop *p*, and the lever is pivoted at its lower end upon a transverse stud *p'*, which projects forwardly from a bracket p^2, secured to the adjacent post. The shifting lever is connected to the end of the hammer-shaft, between the loop of the lever and its pivot, by any suitable means—for instance, as shown in Figs. 1, 4, 10, and 11, by a bearing *q*, which is held on the shaft between collars *q'* and horizontal screws q^2, which enter vertical slots q^3 in the sides of the bearing and are mounted on the lever and in a bracket q^4, secured to the rear side of the lever. The latter is oscillated by a crank q^5 on the end of the shaft O. The end of this crank engages alternately against actuating-faces q^6, formed on the opposite sides of the loop *p*. These faces are concentric with the shaft O, except that the entering end of each face is sloping to facilitate the engagement of the crank with the face. The loop *p* is preferably provided with a guide-loop q^7, which extends across the loop *p* from one actuating-face to the other concentric with the pivot of the lever and which straddles the shaft O and guides the lever in its oscillatory movement on the shaft. *r* represents two righting-springs, which bear against opposite sides of the shifting lever, between the pivot and the loop thereof, and which are mounted upon a rod *r'*, which is curved concentric with the pivot. This rod is secured at its ends to a bifurcated support r^2, which is secured at its middle to the front portion of the stud *p'*, which forms the pivot of the shifting lever. These springs tend to hold the latter in its vertical position, in which both actuating-cams m^2 are out of engagement with the yokes *l'* and both groups of hammers are at rest. The shifting lever is allowed to stand in this position during that part of the movement of the crank during which the latter does not bear against either actuating-face of the lever. When the crank engages against one of the actuating-faces, it swings the lever to one side of its perpendicular position, compresses the righting-spring on that side of the lever, and shifts the hammer-shaft toward that side, whereby the corresponding actuating-cam is engaged with its yoke and the corresponding group of hammers is actuated. The vibration of this group of hammers continues during the period during which the crank sweeps over this actuating-face. When the crank has passed beyond this actuating-face, the compressed righting-spring returns the shifting lever to its vertical position and shifts the hammer-shaft to the position in which neither actuating-cam is in engagement. The parts remain in this position until the crank reaches the opposite actuating-face, when the lever and shaft are shifted to the opposite side and the other actuating-cam is engaged with its yoke, thereby actuating the other group of hammers.

S, Fig. 2, represents the upper cut-off slide, which is arranged upon the bottom of the upper dust-chamber A and controls the admission of the dust-laden air alternately to the two groups of filtering-chambers.

T represents the lower cut-off slide, which is arranged underneath the top of the lower dust-chamber B and controls the admission of the dust to the lower chamber alternately from the two groups of filtering-chambers. These slides are constructed and arranged substantially as described and shown in my above-mentioned Letters Patent. In order to hold the upper slide closed and the lower slide open during a considerable period of time, sufficient to thoroughly jar the chamber of the group which is cut off and allow the dust to settle, these slides are not reciprocated by a crank-movement, as in my former patent, but by a cam-movement, which is shown in Figs. 2, 3, 4, and 6 and which is constructed as follows: *s* is a cam-arm or wiper which is secured to the upper shaft O and which engages alternately against cams *s' s²*, formed at opposite ends of a guide-bar s^3, which is secured to the outer end of the stem s^4 of the upper slide C and which forms a longitudinal continuation of this stem. This guide-bar is provided with a longitudinal slot s^5, by which it straddles the shaft O. s^6 is a bracket secured to the adjacent end wall of the upper air-chamber A and provided with a longitudinal slot s^7, which receives a guide pin or roller s^3 on the outer end of the guide-bar s^3. As the rotating cam-arm *s* engages against the cam *s'* it shifts the upper slide in one direction. The slide remains in this position during the time during which the cam-arm rotates from the cam *s'* to the cam s^2, which movement occupies the greater part of the semicircular path of the arm between the two cams. The arm then strikes the cam s^2 and shifts the slide in the opposite direction and leaves the slide in this position while it rotates toward the cam *s'*. By this means the slide is shifted from one position to the other by a short quick movement and remains in either position during a considerable period of time, thereby allowing ample time for keeping the dust-laden air shut off from the group of chambers which is being jarred and enabling the chambers to be thoroughly cleaned and allowing the dust to settle. The lower slide is shifted in like manner by a cam-arm *t*, secured to the lower shaft O^5 and engaging with cams *t' t²* on a guide-bar t^3, which is secured to the stem t^4 of the lower slide and provided with a longitudinal slot t^5, which receives the shaft O^5, and with a pin t^6, which is guided in a slot t^7 in a bracket t^8.

In order to facilitate the operation of dislodging the dust from the cloths, the lower dust-chamber B is provided with a suction-spout U, which connects this chamber with the eye of the fan by which the dust-laden air is propelled to the upper dust-chamber A. When the dust-laden air is shut off from a group of filtering-chambers by the upper slide and these chambers are placed in communication with the lower chamber B by the lower slide, an air-current is drawn into these chambers by the suction applied to the lower chamber by the spout U. Air is now drawn through the cloth inwardly or in a reverse direction while the cloth is being jarred, and this reverse current greatly facilitates the removal of the dust from the cloth.

I claim as my invention—

1. In a dust-collector, the combination of a filtering-chamber which is open at its upper and lower ends and which has an elastic front stile sprung to a bow shape and arranged with its concave side inwardly, a filter-cloth supported at the front of the chamber by said stile, whereby the cloth is stretched, and a hammer arranged to strike the salient portion of said stile for jarring the cloth, substantially as set forth.

2. The combination of an upper chamber which receives the dust-laden air, a lower chamber which receives the separated dust, vertical, flat, filtering-chambers arranged side by side between said upper and lower chambers and communicating therewith at their upper and lower ends, a corresponding series of individual hammers adapted to strike the narrow upright side of each filtering-chamber separately, flexible arms to which the hammer-heads are secured, and mechanism whereby said arms are actuated simultaneously, substantially as set forth.

3. The combination of an upper chamber which receives the dust-laden air, a lower chamber which receives the separated dust, vertical, flat, filtering-chambers arranged side by side between said upper and lower chambers and communicating therewith at their upper and lower ends, a cut-off device which temporarily shuts off the dust-laden air from said filtering-chambers, a series of individual hammers adapted to strike each filtering-chamber separately, flexible arms to which the hammer-heads are secured, and mechanism whereby said arms are actuated while the dust-laden air is shut off, substantially as set forth.

4. The combination with a series of filtering-chambers arranged side by side, of a corresponding series of individual hammer-heads adapted to strike each chamber separately, a corresponding series of flexible arms to which the hammer-heads are secured, a cross-bar connecting said arms between the supported ends of the latter and the hammer-heads, and an actuating device whereby said cross-bar is moved back and forth, thereby moving said arms and hammer-heads simultaneously, while said hammer-heads are also capable of individual movement by reason of the flexibility of said arms, substantially as set forth.

5. The combination with the filtering-chambers, of a series of individual hammers adapted to strike each chamber separately, means whereby the arms of said hammers are connected for simultaneous operation, a rotary shaft capable of longitudinal movement, an actuating device mounted on said shaft and adapted to be engaged with and disengaged from said connecting means by the longitudinal movement of said shaft, and means for shifting said shaft lengthwise, substantially as set forth.

6. The combination with the filtering-chambers, of a series of individual hammers adapted to strike each chamber separately, a cross-bar connecting the arms of said hammers and provided with a yoke, a rotary shaft capable of longitudinal movement, and an actuating-cam mounted on said shaft and adapted to be engaged with and disengaged from said yoke by the longitudinal movement of said shaft, substantially as set forth.

7. The combination with the filtering-chambers, their striking device, and the longitudinally-movable rotary shaft whereby the striking device is actuated, of a rocking shifting lever connected with said shaft for moving the same alternately in opposite directions and provided with two opposite actuating-faces, and a rotary crank which engages alternately with said faces and shifts said rocking lever from one side to the other and holds the lever in either position while traveling over the faces of the lever, substantially as set forth.

8. The combination with the filtering-chambers, their striking device, and the longitudinally-movable rotary shaft whereby the striking device is actuated, of a rocking shifting lever connected with said shaft and provided with two opposite actuating-faces, a rotary crank which engages alternately with said faces and shifts said lever from one side to the other, and righting-springs bearing against the lever and tending to hold the same in its central position, substantially as set forth.

9. The combination with two groups of filtering-chambers, their striking devices, and a longitudinally-movable rotary shaft provided with means whereby each striking device is actuated, of a rocking shifting lever connected with said shaft and provided with two opposite actuating-faces, a rotary crank which engages alternately with said faces and shifts said lever from one side to the other, thereby alternately engaging one of said actuating means with the striking device and disengaging the other from its striking device, substantially as set forth.

10. The combination with two groups of filtering-chambers, their striking devices, and a longitudinally-movable shaft, of means whereby a continuous rotary movement is im-

parted to said shaft, a rocking shifting lever connected with said shaft for moving the same alternately in opposite directions, an actuating device whereby said shifting lever is alternately shifted from one side to the other, and cams for actuating said striking devices arranged on said shaft in such position that one of said cams is engaged with its striking device and the other is disengaged from its striking device by the longitudinal movement of the shaft, substantially as set forth.

11. The combination with an upper chamber which receives the dust-laden air, a lower chamber which receives the separated dust, and vertical filtering-chambers arranged between said upper and lower chambers and communicating therewith at their upper and lower ends, of a cut-off slide which controls the communication of one of said chambers with said filtering-chambers, a rotary arm for actuating said slide, and cams connected with said slide and adapted to be alternately engaged by said arm, thereby shifting the slide alternately from one position to the other and allowing the slide to remain at rest while the arm rotates from one cam to the other, substantially as set forth.

12. The combination with an upper chamber which receives the dust-laden air, a lower chamber which receives the separated dust, and vertical filtering-chambers arranged between said upper and lower chambers and communicating therewith at their upper and lower ends, of a cut-off slide which controls the communication of one of said chambers with said filtering-chambers, a guide-bar connected with the outer end of said slide and provided with two oppositely-arranged cams, a stationary guide device which engages with said bar, and a rotary arm which alternately engages said cams, substantially as set forth.

13. The combination with the upper chamber which receives the dust-laden air, the lower chamber which receives the separated dust, upright filtering-chambers arranged between said upper and lower chambers and communicating therewith at their upper and lower ends, a cut-off device which controls the communication of said upper chamber with said filtering-chambers, and the fan which propels the dust-laden air to said upper chamber, of a suction-passage connecting said lower chamber with the suction side of the fan, whereby a reverse air-current is drawn through the cloth of the filtering-chambers when the latter are cut off from said upper chamber, substantially as set forth.

Witness my hand this 17th day of March, 1900.

PAUL EBERWEIN.

Witnesses:
JOHN L. BENTLEY,
J. G. MUNDY.