

58. HARVESTERS.

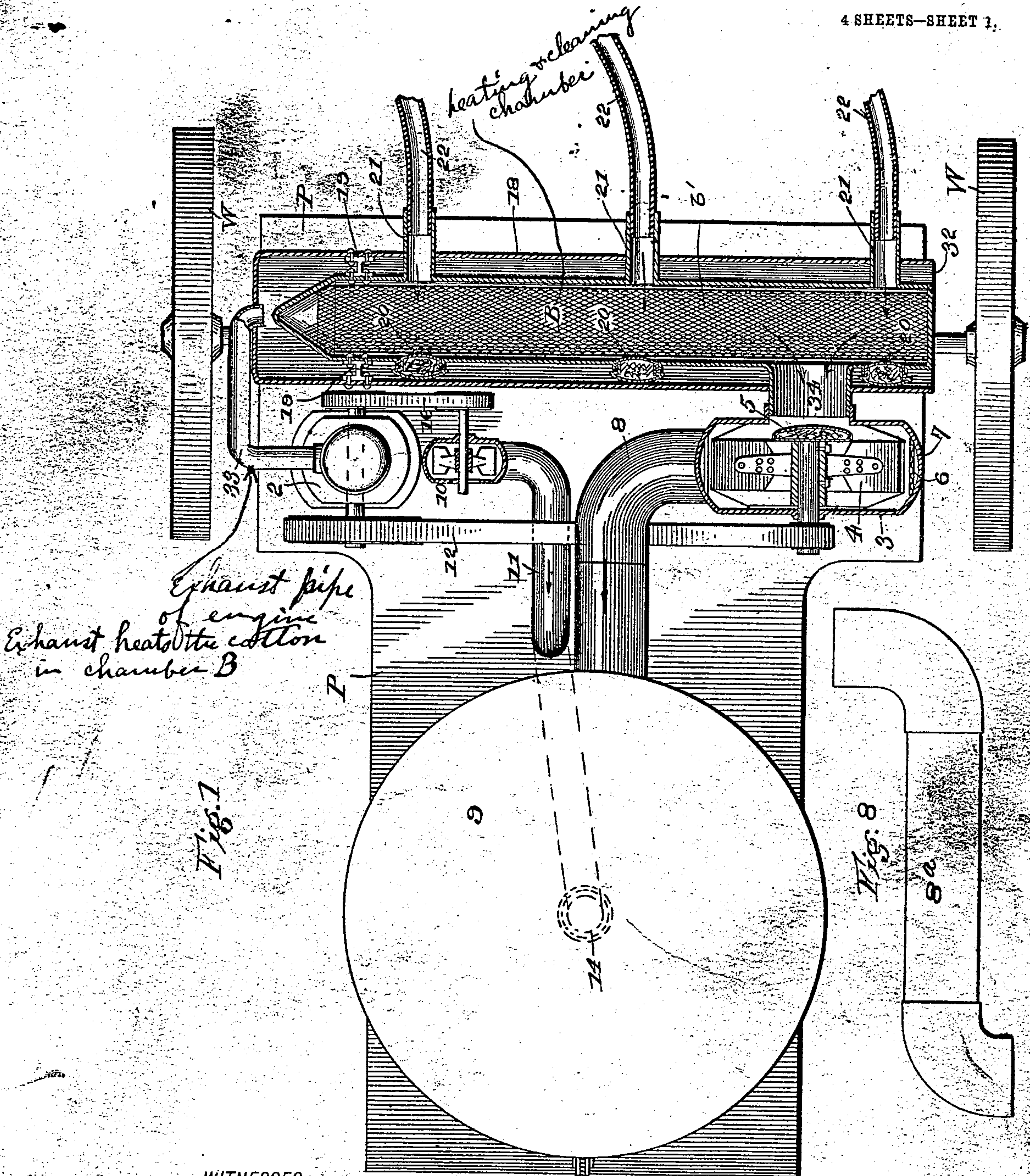
No. 850,700.

PATENTED APR. 16, 1907.

J. E. WORSWICK.
PNEUMATIC COTTON HARVESTER.

APPLICATION FILED MAY 19, 1906.

4 SHEETS—SHEET 1.



WITNESSES
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Edw. W. Byrne

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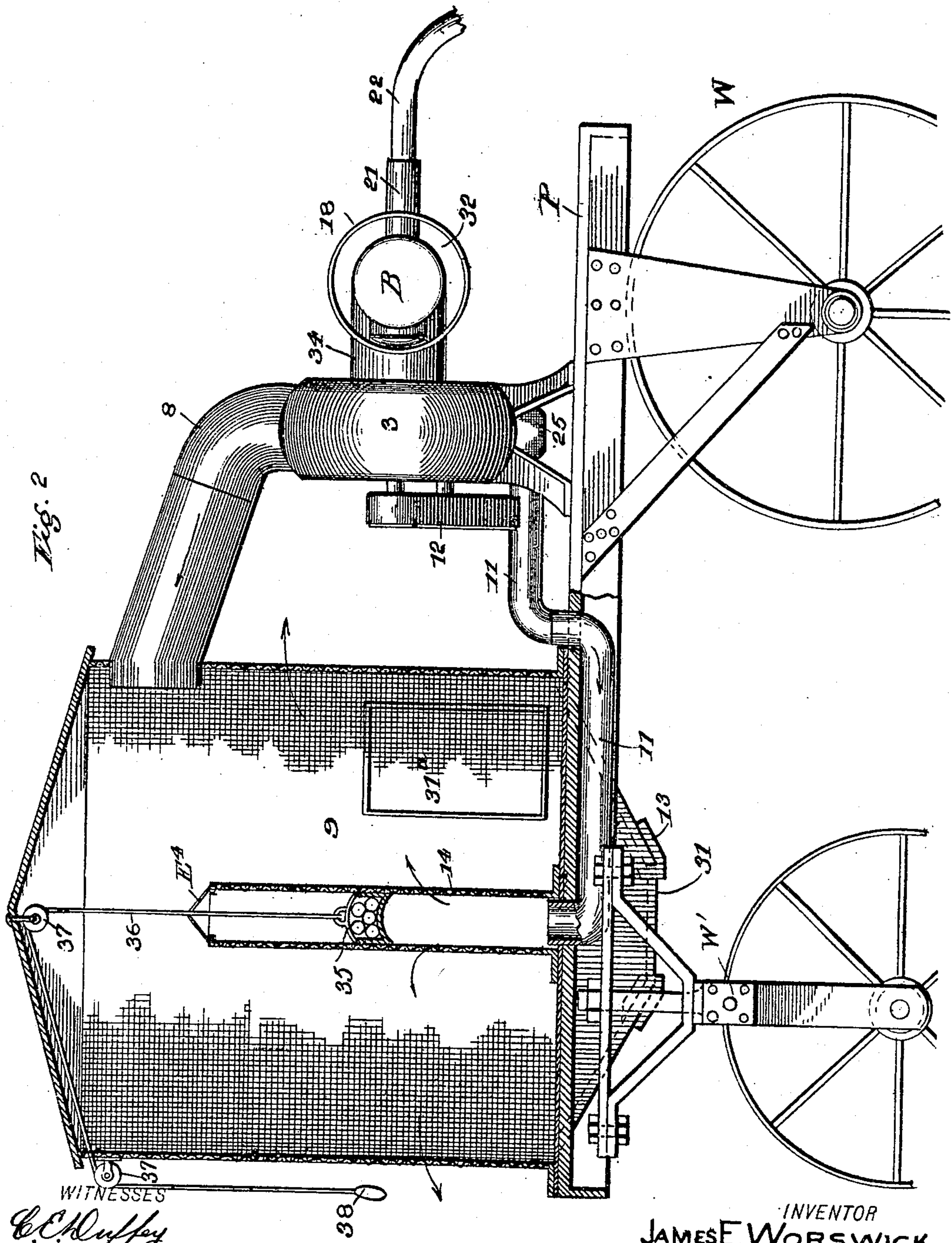


Fig. 2

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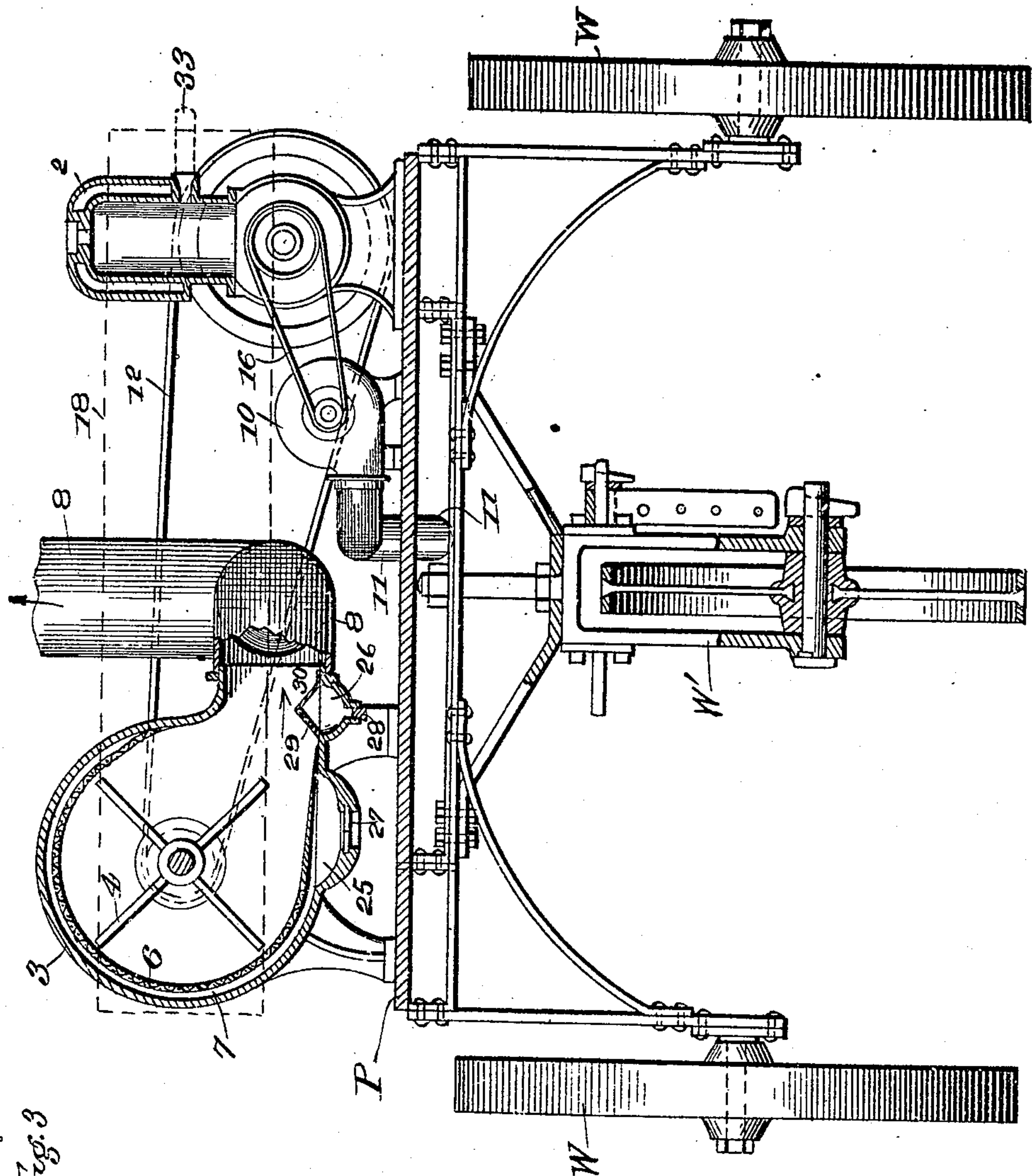
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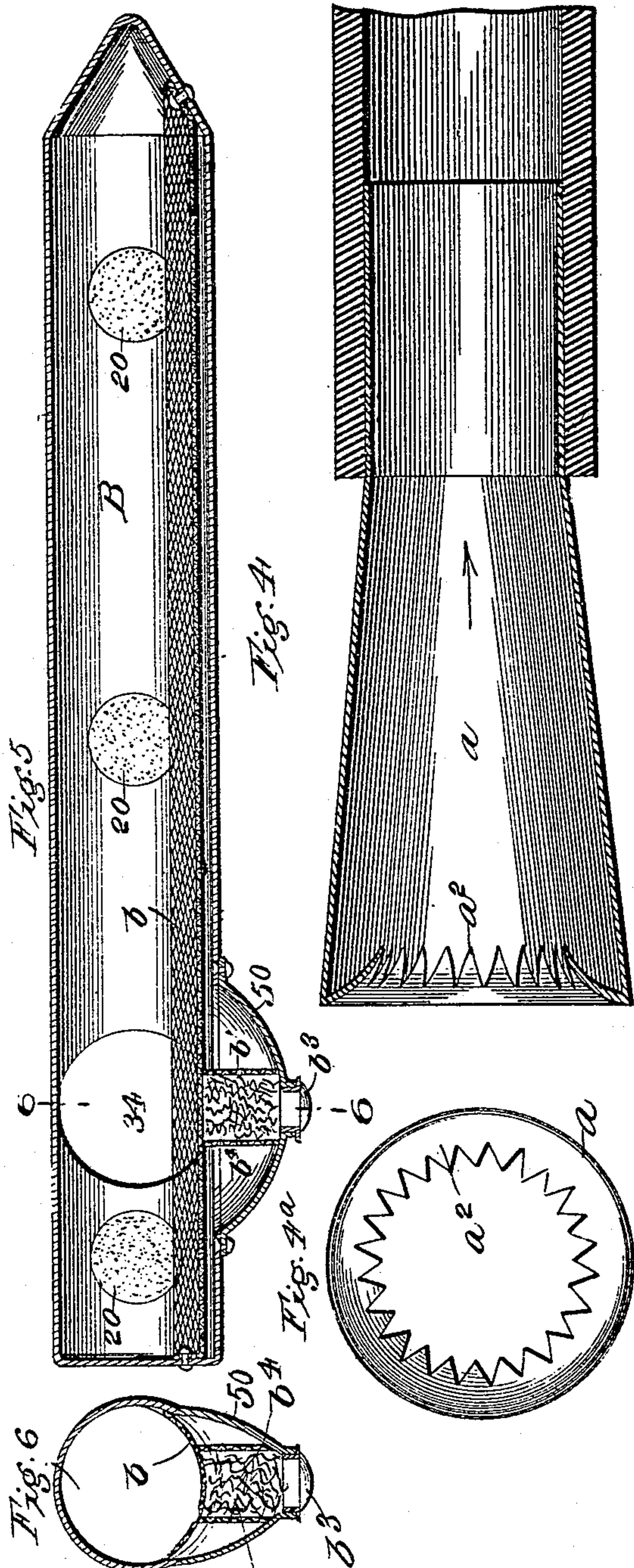
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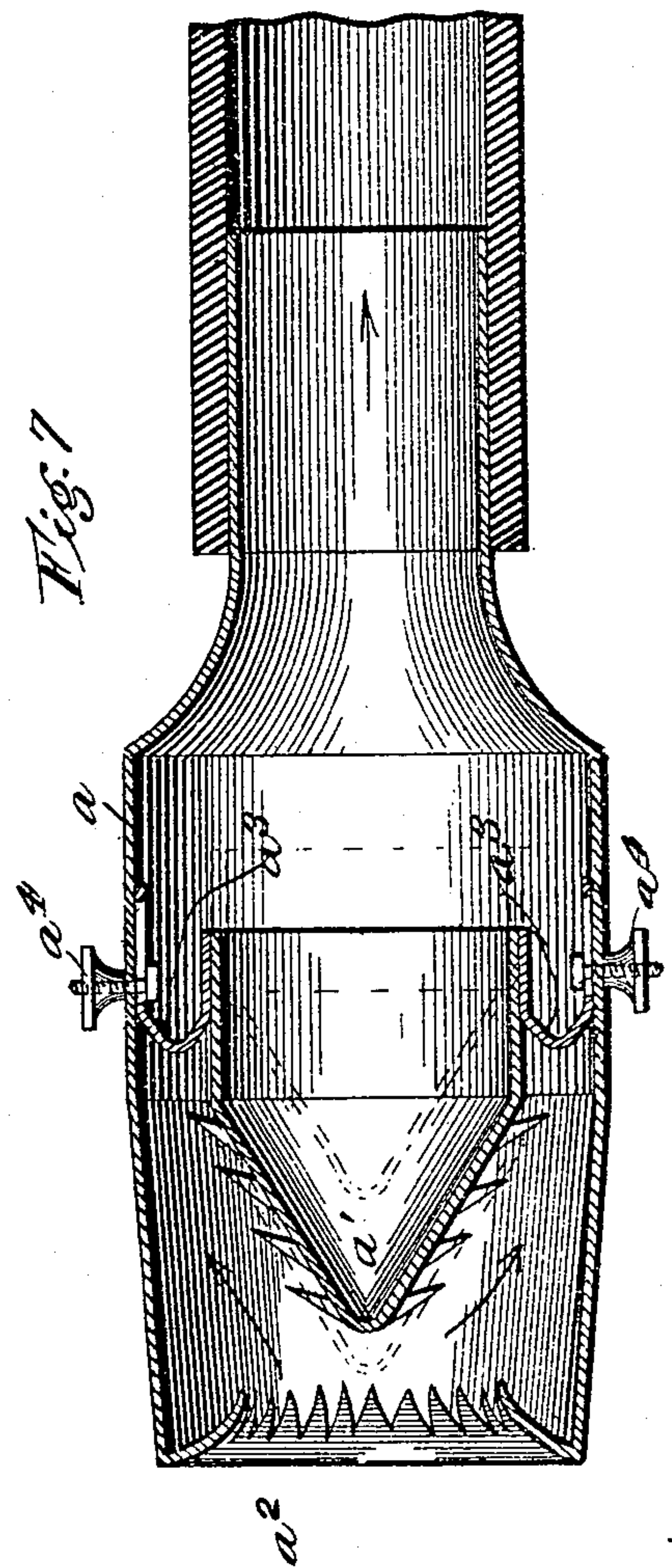
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UNITED STATES PATENT OFFICE.

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PNEUMATIC COTTON-HARVESTER.

No. 850,700.

Specification of Letters Patent.

Patented April 16, 1907.

Application filed May 19, 1906. Serial No. 317,781.

To all whom it may concern:

Be it known that I, JAMES E. WORSWICK, a citizen of the United States, residing at Montgomery, in the county of Montgomery and State of Alabama, have invented a new and useful Improvement in Pneumatic Cotton-Harvesters, of which the following is a specification.

My invention is in the nature of a new cotton-harvester or picking-machine of that type which employs a pneumatic suction to withdraw the cotton from the bolls and transfer it to its receiving-chamber.

Owing to the fact that the cotton-bolls do not all ripen at the same time, it is usually necessary to pick the fields over three or four times at intervals of two or three weeks. Experience and observation has thoroughly demonstrated that it is not possible to endow a machine with any discriminating function in picking the ripe bolls without injuring the green ones, and my invention, recognizing this fact, utilizes the discriminating intelligence of human workers to direct and guide the picking-nozzles to the ripe bolls, while also utilizing the pneumatic principle for completing the operation.

My invention comprises a novel construction and arrangement of picking-nozzles, a novel construction and arrangement of the receiving-chamber with provision for drying wet cotton and removing sand and dirt and condensed water and in the novel construction and arrangement of suction and blowing fans in connection with a motor, and in the novel construction and arrangement of a ventilated storage-receptacle and its accessories, as will be hereinafter more fully described, with reference to the drawings, in which—

Figure 1 is a top plan view, partly in section, of my invention shown in place on the platform of a three-wheel truck. Fig. 2 is a sectional side view of Fig. 1. Fig. 3 is a front end view looking from right to left in Fig. 1, but having the cotton receiving and drying chamber removed and partially indicated in dotted lines and the suction-fan and other parts in section. Fig. 4 is a longitudinal section through the picking-nozzle, and Fig. 4^a an end view of the same. Fig. 5 is a longitudinal section of the receiving and drying chamber. Fig. 6 is a section of the same on line 6-6 of Fig. 5. Fig. 7 is a longitudinal

section of the picking-nozzle with central conical deflector, and Fig. 8 is a detail of a supplemental discharge-pipe.

Similar reference letters and numerals indicate the same parts in all the views.

Referring to Fig. 1 of the drawings, the numeral 2 is the motor for driving the suction and blower fans. This motor, as shown, is a gasoline-engine, but may be a steam-engine, electric motor, or any other form of motor. This motor is mounted upon one side of a platform P, which is wider at one end than it is at the other. The wider end of the platform is supported upon wheels W W and the narrower end is placed above a swiveling truck-wheel W'. (Seen in Figs. 2 and 3.)

On the broad end of the platform opposite to the engine 2 is mounted the suction-fan, consisting of an inclosing case 3 and a rotary fan-wheel 4. This fan has its suction side connected concentrically by a short pipe 34 with a transverse horizontal cotton-receiving chamber B, extending the full width of the machine.

Inside the fan-case 3 (see Fig. 3) and extending partly or wholly around the same is a perforated or woven wire screen 6, which allows the heavier dirt, sand, and water to be thrown through the same into the space 7 between the screen-lining 6 and the outer case 3, whence it is removed, as presently to be described. Concentrically with the axis of the fan and opposite the inlet-pipe coupling 34 is a flexible cushion 5, against which the cotton-seed and sand strike as they enter the fan-case and by which the cotton is prevented from wrapping around the fan-shaft and is deflected to the outer periphery of the fan, just inside the circular screen 6, through which the dirt passes. This cushion receives the impact of the cotton-seed and prevents them from being burst or bruised, and thereby rendered unfit for seed. This cushion-disk rotates with the fan and by its centrifugal action distributes the cotton in the fan-case.

Emerging tangentially from the fan-case is the outlet or discharge pipe 8, which enters the top part of the large storage-receptacle 9. This is a large upright ventilated cylinder which stands on the narrower end of the platform.

Near the bottom of the outlet-pipe 8

where it leaves the fan-case there is located one or more traps with discharge-doors for removing sand, dirt, and water. These traps are shown in Fig. 3. The first trap 25 communicates with the space 7 between the screen 6 and fan-case and catches the sand, dirt, and heavier impurities which pass through the screen and from which trap they are removed through a sliding gate 27. The second trap 26 is somewhat smaller and has a raised deflector 30 on one side and a wire screen 29 on the other side next to the fan. This trap receives the impurities which the other trap does not catch, the screen 29 guiding the cotton and seed over the deflector 30. A large cork 28 forms a sufficient closure for the outlet from this trap.

Mounted on the platform between the engine and suction-fan is a fan-blower 10, (see Figs. 1 and 3,) which I term a "volume-blower." This blower is driven direct from the engine by a belt 16, and another belt 12 connects the engine with the suction-fan 4. The blower 10 has a discharge-pipe 11, which passes under the platform (see Fig. 2) and communicates with a central stand-pipe 14, which rises within the storage-cylinder 9 to nearly the top of the same. The stand-pipe 14 is a pipe of perforated metal or woven wire through which air is discharged into the storage-receptacle in a diffused body, for the purpose hereafter described. In the bottom of the storage-cylinder 9 on one side of the central pipe there is a hopper-shaped depression 13, Fig. 2, with a sliding outlet-gate 31, through which the cotton is discharged. The purpose of the diffused air-blast introduced into the pipe 14 is to drive air through the cotton to dry it. 31^a is a door in the side of the storage-receptacle, which gives passage to a man or boy to clean out the receptacle when desired and for other purposes hereafter described.

The chamber B is a long horizontal cylinder, Figs. 1, 5, and 6, which is an intermediate receiving-chamber for the cotton between the picking-hose and the suction-fan. This receiving-chamber forms an artificially-heated drying-flue for the cotton, and for this purpose it is supported by brackets 19 concentrically within a sheet-metal casing 18, and into the annular space between the casing and the receiving-flue the exhaust-pipe 33 of the gasoline-engine is tapped, so that the hot exhaust-gases of the gasoline-engine are made to circulate around about the receiving-flue B, which heats and dries the cotton while in transit through the same. The opposite end of the casing 18 is open to the air, as seen at 32, to permit the gases to pass out.

Into the side of the receiving-flue B, Fig. 1, there are connected any desired number of thimbles 21, which pass through the casing 18 and connect with the flexible hose-sections 22, each of which bears on its end a

picking-nozzle, hereafter described. In the receiving-flue B at points immediately opposite the hose-thimbles 21 are impact-cushions 20 to receive the cotton and seeds as they are forcibly drawn into the receiving-flue, said cushions being of such a yielding nature to prevent the breaking or bruising of the seed. These cushions are formed in detachable cups or sleeves so as to be easily replaced.

In the bottom of the receiving-flue B (see Fig. 5) is a perforated screen or false bottom *b*, over which the seed, cotton, and impurities are drawn on the way to the outlet 34 to the suction-fan. Below this screen-floor or false bottom is a trap 50, having a cap-stopper *b*³ for its outlet, and above the outlet is a perforated sleeve *b*⁴, containing a sponge *b*⁴ for absorbing the condensed moisture and which may be removed from time to time through the cap to squeeze out the water and remove any sand or dirt from the trap.

Referring to Fig. 2, 35 is an air-float which slides up and down within the perforated stand-pipe 14 of the storage-receptacle and is suspended from a small rope 36, passing around pulleys 37 37 and provided with a handle 38 on the outside. Hinged doors *E*⁴ at the top of the stand-pipe close the upper end of the same to keep the cotton out of the stand-pipe, but allow of the passage of the rope and the insertion and removal of the float. This float is balanced on the air below it and causes the air to issue laterally into the cotton through the lower portion of the stand-pipe or through its entire height, according to the position of the float. The storage-receptacle is made of light galvanized sheet-steel or screen wire and is provided with a waterproof cover. Its open character permits the air to escape as it is forced through the cotton. The float has a concave bottom, and it is also made hollow with an opening in the top to receive adjustable weights to hold it down with a varying load to regulate the air-pressure below it. For a high air-pressure the weights in the float are increased and any variations in the air-pressure below it causes the float to rise and open more issue-orifices in the stand-pipe, while if the pressure falls the float correspondingly descends and closes some of the issue-orifices, thus causing the air to pass through the cotton at a practically uniform pressure. By this means not only is the cotton dried, but all dust and light trash is blown out of the cotton and the receptacle containing it.

Referring now to Figs. 4, 4^a, and 7, which illustrate the picking-nozzle, *a* is the picking-nozzle, which is made of galvanized sheet-steel or any other suitable material, with a slightly-enlarged mouth, having along its peripheral margin an integral intumed flange notched to form pointed inwardly-turned

teeth a^2 . This nozzle is inserted in the hose, which is made of flexible rubber and is from fifteen to twenty-five feet long. The purpose of the inturned teeth a^2 is to catch the cotton as it enters the nozzle from the suction, and if the cotton does not leave the boll readily the operator simply pulls back the nozzle a little, and as the fibers of the cotton have already become entangled in the teeth a^2 they forcibly withdraw the cotton from the boll when the nozzle is drawn back, and then the cotton freely passes into the nozzle from the suction of the fan. Inside the nozzle as an adjunct to the same I provide a conical deflector a' , (see Fig. 7,) which is considerably smaller than the nozzle and has its conical outer face provided with pointed and inturned teeth. This deflector is supported concentrically within the nozzle by brackets a^3 and set-screws a^4 and is adjustable longitudinally within the nozzle, as shown by the dotted lines. The inlet for the cotton is in this instance annular and more contracted than in Fig. 4, and a more powerful suction is created and the cotton fibers are seized by the teeth on both the teeth a^2 and those on the deflector so as to meet the conditions of drawing in damp or green cotton or frost-opened cotton, which does not respond so sensitively to the suction as the dry and fully-ripe fiber. By adjusting the deflector forward or backward the size of the annular inlet-orifice may be varied, with a corresponding increase or diminution of the energy of the suction.

For unloading the storage-receptacle of its charge of cotton the receptacle is formed with the door 31^a large enough to admit a man. The pipe 8, leading into the receptacle, is disconnected and a supplemental pipe 8^a , Fig. 8, with two elbows, is made to connect the discharge side of the fan 3 with the wagon. Then the workmen take the several picking-hose and after removing their picking-nozzles the open ends of the hose are thrust into the cotton through door 31^a of the receptacle and the cotton is drawn out of the receptacle and delivered to the wagon through the same channels through which it has passed in going from the plant to the storage-receptacle—i. e., it goes through the cleaning and drying flue, fan, and screening devices and gets a second cleaning and drying in being thus delivered from the receptacle to the wagon and at the same time makes a rapid and easy way of emptying the storage-receptacle as well as improving the quality of the cotton.

My cotton-harvester is of such width that the truck bridges two rows of cotton and is made adjustable as to height and width and will be provided with guards or shields to protect the cotton when passing over it and from being run over by wheels. The picking-hose is so arranged that the cotton

be picked before passing over it. The machine is drawn over the field by animal or motive power furnished by the motor that drives the fans, but preferably animal power, as during the cotton season the teams have very little to do. When picking cotton, the laborer takes hold of the picking-hose anywhere from one to three feet from the mouth of the nozzle and directs or guides the nozzle to the open or ripe cotton, and when within from one to two inches thereof the cotton is drawn in by the suction created by the fan and is sucked in as fast as the operator can present the nozzles to the cotton. The operator can easily handle two picking-nozzles, one in each hand. With this machine one man can easily pick more cotton than four of the fastest pickers can pick by the human hand. The machine will be provided with from four to six or more picking-hose. The same air which draws the cotton from the plant into the exhauster is used for blowing the seed-cotton into the receptacle. The hose used in connection with the picking-nozzle is of the ordinary steam or water hose. I have picked cotton through a length of twenty-five feet satisfactorily; but the length of hose to be used in connection with the picking-nozzle when in general use will vary—that is, in sections where cotton does not grow over three feet in height longer hose will be used and shorter when cotton grows higher.

The four-hose picking-machine ready for work in the field weighs about six hundred and fifty pounds and is drawn through field by the motor which drives the fan or by one horse, mule, or ox. The motive power consists of a two-horse-power engine or motor to drive the machinery, and two men or boys of ordinary intelligence are all that is necessary to control and operate a four-hose picking-machine, as each man handles two picking-hose, one in each hand. With the four-hose machine eight rows can be picked in passing over the field, and it is practical to increase its capacity to cover and pick twelve rows and not increase the motive power to more than three-horse power. The field-hands that handle and operate the machine are on their feet when picking cotton, which will readily be understood greatly facilitates the handling of the picking device, and the machine is not encumbered by useless weight. The operating machinery is all mounted on the truck, whose frame is of light steel with broad-tire wheels. The truck-frame is eight feet long, bridges two rows of cotton, and can turn around in a space of less than its length.

My harvester prevents seed from being bruised or damaged in passing through the machine, cleans and dries the cotton from the time it enters the picking-nozzle until it is in the storage-receptacle. It is now gen-

erally known and admitted that when the seed-cotton is properly cleaned the enhancement in price is from two to five dollars per bale beyond the decrease in weight caused by taking out dirt, &c.

Damp or wet cotton will neither gin nor sample well, owing to the fact that the gin-saws will cut the lint and clog the saws. Cotton fiber is weak and delicate and subject to much rough treatment before it reaches its final destination in the woven fabric. Any system that improves the quality of the product in every operation is of great value. This my machine does from beginning to end. The seed as well as the cotton are dried out, so there is less danger of their heating or rotting, as is frequently the case with seed-cotton as now handled, and the dry seed bring the highest price. The quality of the lint is also greatly improved, owing to the fact of its being drawn by air a considerable distance through the picking-hose and discharged into the receiving-chamber, which I provide with cushions, also with perforated bottom forming a channel way for sand, dirt, water, &c., which is separated from the seed-cotton and is conveyed by same to the traps. As the seed-cotton is discharged into the flue it comes in contact with cushions, which prevents destructive impact and allows sufficient time to drop sand and other trash which is drawn over the perforated bottom and which the suction draws through into the channel-way and is arrested by the trap. Thus a large portion of sand, trash, &c., is taken from the seed-cotton before it reaches fan and it is impossible to mix back with the cotton.

When cotton has been wet by rain or heavy morning dew, a great deal of valuable time is lost to the planters by having to wait for the cotton to dry. With my machine this time will be saved and seed-cotton will be in as good condition after it is picked as if picked dry.

I do not confine my invention to the particular construction of the exhaust-fan shown, as this may be replaced by any ordinary exhaust apparatus.

I claim—

1. A pneumatic cotton-harvester, comprising a suction apparatus, a receiving-chamber, an inclosing heating-chamber and a plurality of suction hose-pipes extending through the heating-chamber and opening into the receiving-chamber and having terminal nozzles adapted to be manually presented to the individual cotton-bolls by the operators.

2. A pneumatic cotton-harvester, comprising a suction apparatus, one or more flexible hose-pipes connecting therewith and having nozzles made of sheet metal having an inturned circular flange cut with notches to form a circular marginal ring of inturned teeth.

3. A pneumatic cotton-harvester, comprising a suction apparatus and one or more flexible hose-pipes connected therewith and each having a nozzle provided with an inturned flange and a concentric conical deflector adjustable to or from said flange.

4. A pneumatic cotton-harvester, comprising a suction apparatus and one or more flexible hose-pipes connected therewith and having nozzles provided with a concentric conical deflector and means for adjusting the same longitudinally.

5. A pneumatic cotton-harvester, comprising a suction apparatus and one or more flexible hose-pipes connected therewith, each pipe having a nozzle provided interiorly with a conical shell-deflector armed with inwardly pointed teeth located on the cone and brackets sustaining the shell in concentric position.

6. A pneumatic cotton-harvester, comprising a suction apparatus and one or more flexible hose-pipes connected therewith, nozzles each having inturned teeth around its mouth and a concentric deflector also having inturned teeth around the outer surface of the same.

7. A pneumatic cotton-harvester, comprising suction hose-pipes with nozzles, a suction-fan, and an intermediate receiving-chamber having flexible cushions fixed to the side of the receiving-chamber immediately opposite the points of entry of the hose-pipes for receiving the impact of the seed-cotton.

8. A pneumatic cotton-harvester having a suction-fan provided concentrically with a flexible cushion for receiving the impact of the seed-cotton.

9. A pneumatic cotton-harvester, comprising suction hose-pipes with nozzles, a suction-fan, and an intermediate receiving-chamber connecting the hose-pipes and fan and provided with means for artificially heating the same.

10. A pneumatic cotton-harvester, comprising suction hose-pipes with nozzles, a suction-fan, and an intermediate receiving-chamber connecting the hose-pipes and fan, a surrounding casing for the intermediate chamber, and an engine for running the fan having its waste heat turned into the surrounding casing of the intermediate receiving-chamber for drying the cotton in transit.

11. A pneumatic cotton-harvester, comprising suction hose-pipes with nozzles, a suction-fan and an intermediate horizontal receiving-chamber having a false bottom of reticulated form and a plurality of lateral inlet connections for the hose-pipes and a lateral opening into the suction-fan, and below said opening a trap device for receiving sand and condensed water and a detachable closure for the same.

12. A pneumatic cotton-harvester, comprising suction-pipes and a suction-fan, said

fan having an inner peripheral lining of reticulated material extending both above and below the fan, and a casing having an axially concentric inlet and a tangentially-arranged outlet and in its lower portion, near the outlet, a retaining-trap with outlet-door in the bottom of the same communicating with the space between the fan-casing and reticulated lining.

10 13. A pneumatic cotton-harvester, comprising suction-pipes and a suction-fan, said fan having an inner circular lining of woven wire or perforated material and two traps, one being in communication with the space
15 between the fan-casing and perforated lining and the other having a raised deflector with a screen in front of it.

14. A pneumatic cotton-harvester, comprising a suction-fan for picking the cotton,
20 a storage-receptacle for receiving it formed as an open or ventilated structure and a special pressure-blower having its discharge-pipe tapped directly into the storage-receptacle for continuously delivering a supplemental blast of air into the same to dry and
25 clean the cotton.

15. A pneumatic cotton-harvester, comprising a suction-fan for picking the cotton, a storage-receptacle for receiving the same
30 formed as an open or ventilated structure, a perforated or open-mesh standpipe arranged centrally in the receptacle and means for introducing a blast of air into the lower end of the same.

35 16. A pneumatic cotton-harvester, comprising a suction-fan for picking the cotton, a storage-receptacle for receiving the same

formed as an open or ventilated structure, a perforated or open-mesh standpipe in the receptacle, a balanced air-float in said stand- 40 pipe and a pressure-blower having its discharge-pipe tapped into the lower end of said standpipe for introducing a blast of air into the standpipe beneath the float.

17. A pneumatic cotton-harvester, comprising a platform, a transverse horizontal receiving-chamber mounted thereon and having hose-couplings on one side of the transverse receiving-chamber and extending to the front of the machine, a suction-fan 50 having its suction-pipe connected to said receiving-chamber, a storage-receptacle communicating with the discharge-pipe of the suction-fan, a blast-fan having its outlet-pipe discharging directly into the storage-receptacle and an engine for driving the two fans. 55

18. A pneumatic cotton-harvester, comprising a platform, a transverse horizontal receiving-chamber mounted thereon and having hose-couplings on one side, a suction- 60 fan connected to said receiving-chamber, a storage-receptacle communicating with the discharge of the suction-fan, a blast-fan also discharging into the storage-receptacle, an engine for driving the two fans, a casing surrounding the receiving-chamber and having a pipe connecting the same to the engine to utilize its waste heat to heat the receiving- 65 chamber.

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