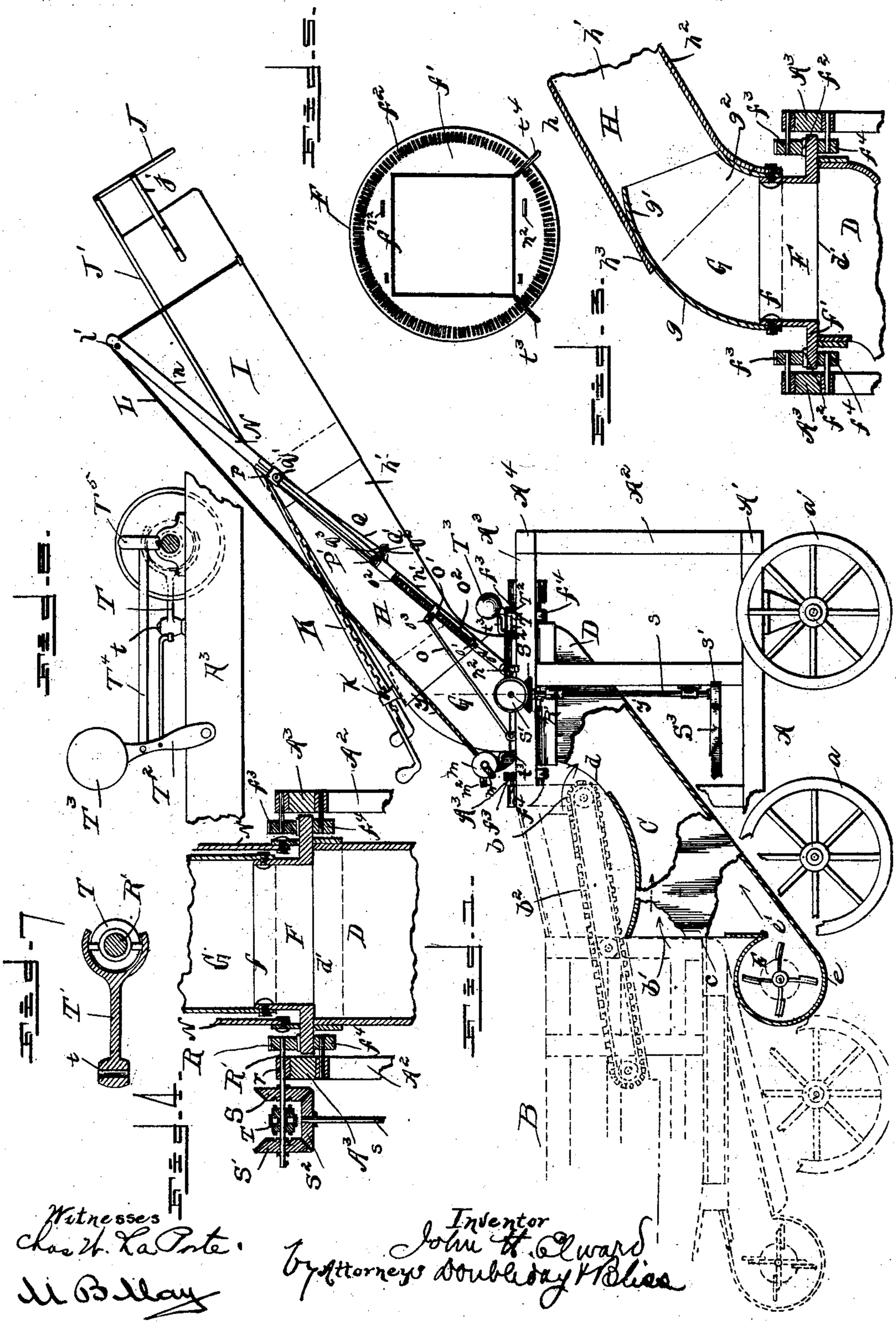
No. 688,400. Patented Dec. 10, 1901.

J. H. ELWARD.

PNEUMATIC STACKER.

(Application filed Jan. 5, 1893.)

(No Model.) 3 Sheets—Sheet 1.



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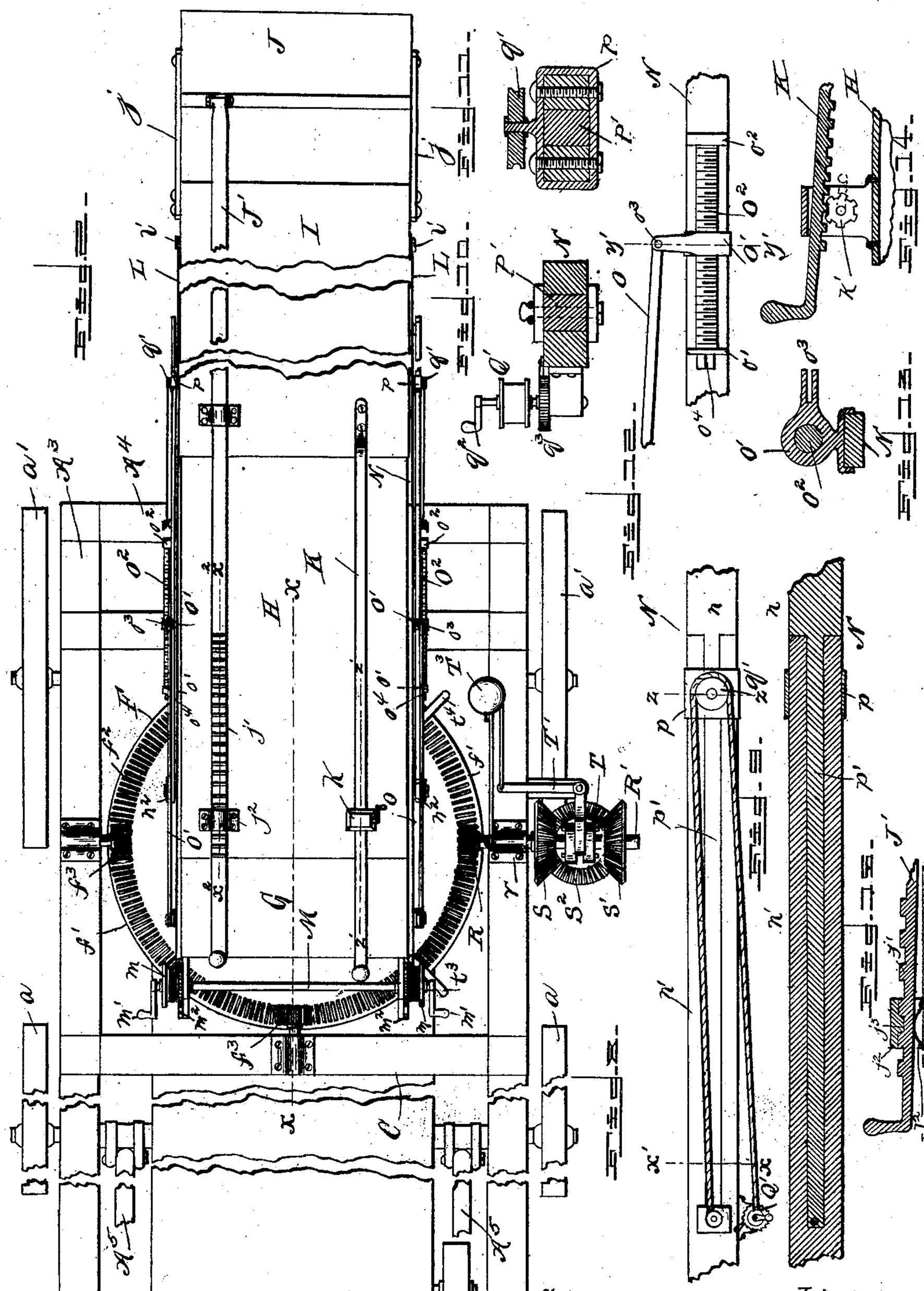

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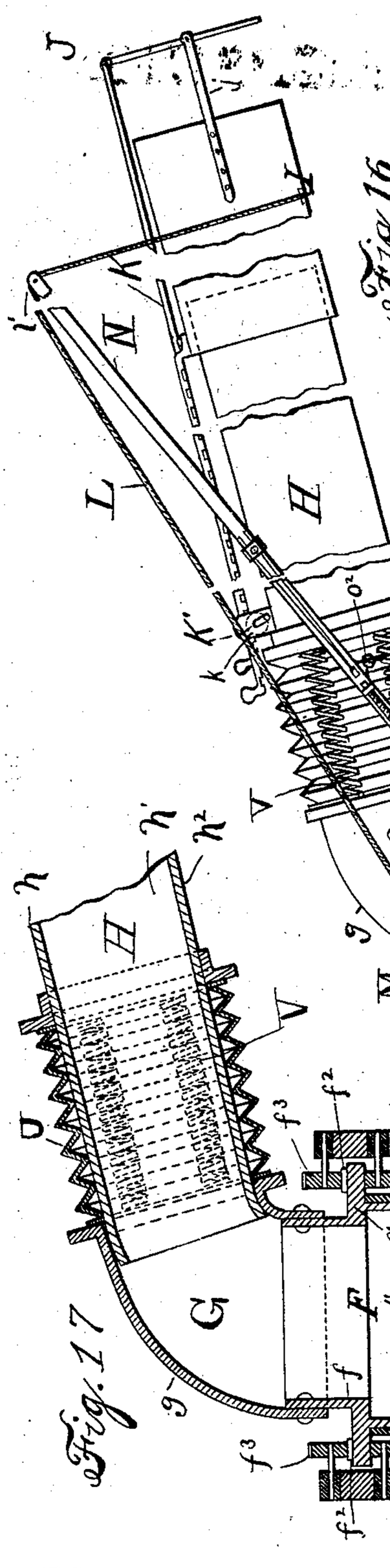

Fig. 16.

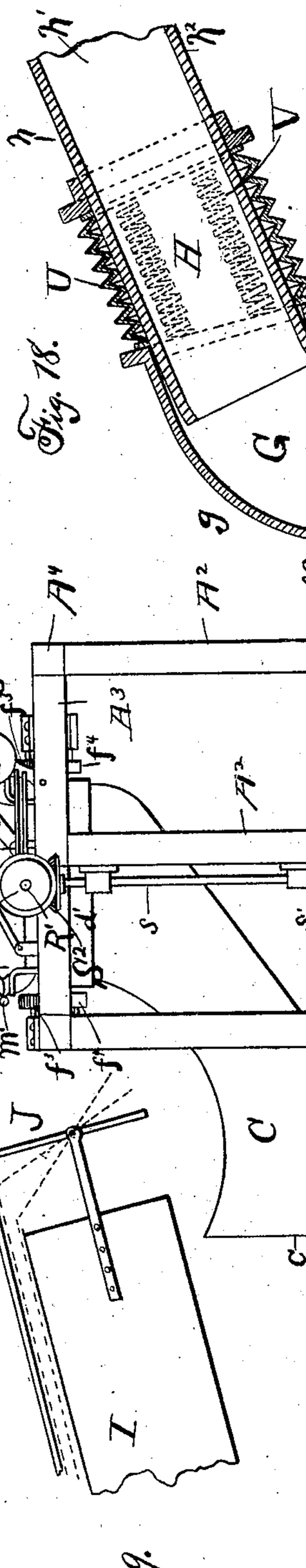

Fig. 18.

Fig. 17

Fig. 19.

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UNITED STATES PATENT OFFICE.

JOHN H. ELWARD, OF PEORIA, ILLINOIS.

PNEUMATIC STACKER.

SPECIFICATION forming part of Letters Patent No. 688,400, dated December 10, 1901.

Application filed January 5, 1893. Serial No. 457,328. (No model.)

To all whom it may concern:

Be it known that I, JOHN H. ELWARD, a citizen of the United States, residing at Peoria, in the county of Peoria and State of Illinois, have invented certain new and useful Improvements in Pneumatic Stackers, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a side elevation of a straw-stacking mechanism embodying my improvements. Fig. 2 is a top plan view. Fig. 3 is a vertical central longitudinal section on the line *x x* of Fig. 2. Figs. 4 to 15 show details. Fig. 16 is a side view of a modification. Fig. 17 is a vertical section of a part thereof. Fig. 18 is a section similar to that in Fig. 17, showing another of the adjustments of the spout or chute; and Fig. 19 is a view of the upper end of the chute or spout, illustrating the adjustments of the deflector.

In the drawings I have shown a portion of a threshing-machine sufficient to illustrate the manner of employing my mechanism in connection therewith, the elevator or stacker herein provided being adapted for use with any of several styles of threshing-machines.

In order to provide a strong and durable machine, I provide for the elevator or stacker a supporting-frame and transporting-wheels, which are separate from and independent of the frame and the wheels which carry the parts of the thresher proper.

A A′ indicate the sills and cross-girths of such a frame, it being mounted upon front and rear wheels *a a′*. Uprights A^2 of suitable number are secured to the bottom frame A A′, and at the top they carry a horizontal framework having the longitudinal parts A^3 and the cross-bars A^4.

The frame and wheels constitute a vehicle separate from the thresher, and by means of a pole or draft devices at A^5 this vehicle can be hitched to the engine sometimes employed for transporting, or horses can be employed, as desired.

The elevator or stacker comprises as its essential elements an initial receptacle, an air-blast mechanism, and the upwardly-extended chute.

The thresher at B has an exit at *b* for the straw and one at *b′* for the chaff and fine foreign materials which are blown out from the winnowing-shoe. To receive the said chaff and fine material from the thresher-fan, I employ a spout, chute, or duct at C, which is preferably of larger cross dimensions at the mouth *c* than it is at points remote therefrom, so as to be adapted to register with the entire opening in the thresher at the rear of the shoe and also to permit the straw-carrier or beater-apron at b^2 to discharge the straw properly into the initial receptacle of the stacking mechanism. At *d* there is an opening or mouth, which can be brought close to the end of the said carrier b^2. Thus both the straw and the chaff or fine stuff can be thoroughly collected from the thresher, passages for each of them being provided in which they can travel on substantially the lines along which they normally escape from the thresher.

At the bottom and front end of the stacker-vehicle I place the ejector-fan E and the fan-casing *e*, there being a throat at *e′*, through which the jets of wind pass upward through the chute C, this throat being below the line at which the chaff escapes from the thresher-shoe. The currents of air are of such strength as to propel the chaff upward, and when they reach the straw which has been introduced through the orifice at *b* they also force it, together with the chaff, to a considerable distance.

To direct the material which is carried upward and backward by the wind to the places where it is desired to deposit it, I combine with the parts above described an adjustable mechanism for guiding the straw and the air-currents, as follows: The initial receptacle terminates in a circular portion at *d′*. Around the edge of this part there is mounted a ring F, it being formed with the vertical part *f* and a horizonal flange *f′*, the horizontal flange *f′* having a series of gear-teeth f^2. The ring F thus forms what may be termed a "rotary base" for the straw-guiding mechanism, and to support said base the horizontal flange *f′* is placed between antifriction-rolls $f^3 f^4$, some below it and some above. To the ring F, above described, there is secured a hood G, preferably formed of sheet-iron, having the rounded front part *g* and the backwardly-ex-

tending walls g' g^2, the parts g^2 being at the sides and the part g' being curved so as to form substantially the part of a cylinder. To this hood G is fitted the lower part H of the tubular duct or delivery-trunk. It is formed with a top h, the side pieces h', and the bottom h^2. It is flared or expanded somewhat at the inner end, so as to surround the inner parts g' g^2 of the hood G. In the construction shown in Figs. 1 to 3 the bottom plate h^2 is extended somewhat and at the inner end is formed of elastic material, by which elastic part the spout H is secured to the hood G or to the rotary base. When the parts are constructed and arranged in this way, flexure is provided, so that the spout H can be readily adjusted vertically to any desired position. It will be noticed that during such adjustments of the duct-section H the portions thereof in contact with or surrounding the walls g' g^2 of the hood or base section and not secured thereto will be moved on curved lines longitudinally of said base-section—that is, the said portions of the lower or inner end of said duct-section H are arranged to vibrate relatively to or move toward and from the rotary base or support when the vertical position of its outer end is varied. The delivery trunks or ducts are ordinarily made of sheet-steel, as is common, in which case there is sufficient flexure and resiliency, or, as above stated, a supplemental piece of elastic metal can be applied for these purposes. The edge h^3 fits snugly to the above-described curved part g', and the attachment of the section H is effected in such way that as the outer end is depressed or raised said edge h^3 shall remain in contact with said wall g' of the inner or base section G of the delivery trunk or duct.

I indicates an outer duct-section fitted to the outer end of the part H and adapted to be moved out or in rectilineally in relation thereto. Preferably the two sections H and I are telescopically connected, so that the section I can be drawn down over the section H to make the apparatus compact when it is being transported. The mechanism for effecting this longitudinal movement of the section I comprises the rack-bar K, secured to it, and the pinion K', mounted in bearings at k on the section H. The end of the outer section I of the spout is provided with an adjustable guide or deflecting-apron J, adapted to direct the straw in any line desired. To adjust this, use is made of a bar J', extended back to points where it will be accessible and having combined with it means for locking it in any desired position. In the construction shown the bar J' is provided on its upper surface at an intermediate point of its length with a series of teeth or projections j'. This toothed or corrugated portion of the bar J' extends through a guide-clip j^2, mounted on the portion H of the stacker-spout, and within said clip is formed one or more lugs or stops j^3, adapted to engage with the said teeth j' and hold the bar J' stationary and retain the adjustable guide or deflector J in the desired position. A leaf-spring J^2 or equivalent device is arranged within the clip j^2 beneath the bar J' and serves to keep the teeth on said bar in engagement with the pin or stop j^3. The deflecting-apron is illustrated as being supported at a distance from the end of the delivery trunk or duct and is carried by arms or bearers j, to which it is pivoted. By thus arranging the deflecting-apron or guide it can be held in the position indicated in Fig. 1 entirely out of contact with and at a distance from the mouth of the stacker trunk or duct so that the air escaping therefrom is allowed to dissipate in all directions, or, as shown in dotted lines in Fig. 19, the deflector can be adjusted to contact with and form a continuation or extension of the upper wall of the delivery-trunk—that is, the straw and chaff are readily guided into the proper paths and deposited at the desired points by adjusting the deflector.

To raise and lower the delivery trunk or duct, use is made of ropes or cords L. They are secured at their outer ends to the spout-section I (preferably at or near the middle thereof longitudinally) and then extend up over sheaves l' and down to drums or spools m on a winding-shaft M, which is mounted behind the hood or base duct section G and is provided with cranks at n' for winding it and pawls n^2 for locking it. The sheaves or pulleys l' are mounted in the upper end of braces N. These are formed of two or more sections n n', so connected as to provide for extension, and each brace as a whole is pivoted at n^2 to the aforesaid ring or rotary base.

To permit of the longitudinal extension of the braces N, these braces are made in two sections n and n', as before stated. The parts n n' overlap, the part n being preferably slotted and the part n' being tongued to fit the slot. Metallic loops p can be placed around the overlapping parts, so as to hold them firmly in proper relation to each other and yet allow longitudinal movement. As shown, the part n' is moved upward by a rope Q, which has its end fastened to the lower end of the tongue p', and passes thence upward to a sheave q' on the loop p and thence down to a winding-reel Q', mounted on the part n and having a crank q^2 and a locking-ratchet q^3.

To hold each brace N at the desired angle of inclination to the plane of the ring F, I use bars O, which are pivotally connected to the ring and are connected to the brace-bar N by means of a nut O' and a screw-rod O^2, mounted in bearings at o' o^2 on the part n, the part O' having an extension o^3, to which the supporting-link O is pivoted. The screw O^2 can be rotated, as by applying a wrench at o^4, and the nut can be thereby moved up or down, as desired.

As it is desirable to deposit the straw not only at points in the vertical central longitudinal plane of the machine, but also at

points in planes at the sides thereof in order to distribute the stack over a ground area as large as possible, and is also desirable to constantly change the point of deposit, I combine with the mechanism above described means for automatically oscillating the stacker trunk or duct. R is a pinion meshing with the above-described teeth f^2 on the ring F of the rotary base or support for the delivery-duct, it being carried by a shaft R′, mounted in a bearing at *r*, secured to the top frame-bar A^3. This shaft has also two beveled wheels S S′, each adapted to engage with a beveled pinion S^2, mounted on a vertical shaft *s*, said shaft having a belt-wheel *s*′, driven by a belt S^3, extending to any suitable pulley on the thresher. The wheels S S′ are loose upon the shaft R′ and are continuously rotated in opposite directions. T is a clutch feathered to the shaft and adapted to engage said wheels alternately with the shaft. The clutch is automatically shifted, as follows: T′ is a bell-lever pivoted at *t*. T^2 is a vibrating lever having a weight T^3 to carry it past its center and temporarily hold it. This lever is preferably pivoted so as to vibrate in a plane which is tangent to the circle of rotation of the ring F and is connected with the lever T′, as shown. Said ring or some part carried thereby is provided with trip-pins t^3 t^4, and lever T^2 or a part connected with it lies in the path of their rotation. As shown, this lever T^2 is connected by a link T^4 to a lever T^5, which latter can be impinged on by said trip-pins t^4. When the pin t^3 reaches said lever T^5, it throws it and the lever T^2 over, so as to reverse the clutch, and thereupon the shaft R′ is reversed and also the ring F. This movement of the latter continues until the pin t^4 reaches lever T^5, whereupon the latter is thrown back and shaft R′ and ring F are again reversed. In this way the stacker-chute will be oscillated, so that the straw can be delivered from its outer end over a large area.

The manner of operating the above-described machine will be readily understood. After the thresher B has been properly placed the stacker-vehicle is brought into the requisite position and adjusted so that the opening behind the thresher-chute shall register with the entrance *c* in the chaff-receiver C and so that the straw-exit at *b* shall register with the entrance-orifice *d* in the stacker. The belt S^3 is properly connected. The outer duct-section I is extended to the desired point. The proper angle of inclination for the braces N is provided by suitably adjusting the nuts at O′. The duct-sections H I are adjusted to the proper inclination, and the fan E is connected by a belt to its driving-pulley. As soon as the thresher begins to deliver straw and chaff they are immediately caught up by the blast of wind from the fan E and carried through the parts G, H, and I and thrown to the desired point. As the stack becomes higher the positions of the parts H, I, and J are varied by the adjusting devices at M, O′, and Q, and the position of the deflecter is varied as may be desired by its controlling devices.

In Figs. 16 and 17 I have illustrated the fact that the spout or duct section H and the hood G can be connected in a modified way. In this case there is a flexible canvas or leather joining device, (shown at U,) the ends of which can be fastened to the hood and to the said spout or duct section H. By the employment of this flexible covering device I avoid the necessity of an air-tight union between the vertically-adjustable portion of the delivery duct or trunk and the base section or hood G, although they should be fitted as closely together as is practicable without interfering with the desired play laterally and vertically of the outer end of the chute or spout. By examining Figs. 17 and 18 it will be seen that in a full-sized mechanism the lower or inner end of the chute or duct section H can be left sufficiently loose in the hood to permit of the required movements of its delivery end, and at the same time the flexible cover U insures that the air must escape through the chute H, so that the straw, chaff, &c., will not pass between the overlapping surfaces.

I am aware of the fact that mechanisms have been made or proposed comprising tubes one sliding upon another, in combination with means for effecting such sliding, these means including sometimes a rack and a pinion, as shown in the patent, No. 319,552, to I. Brokaw and W. Butler, and sometimes a rope and sheaves, as shown in the patent, No. 405,331, to L. Smith, and of course I do not wish to be understood as broadly claiming either of these old mechanisms for all such purposes; but I believe myself to be the first to have constructed a pneumatic stacker for threshing-machines in which the air trunk or chute could be varied at any time, even when in full operation, and by devices, such as aforesaid, accessible to the operator when standing near the inner or lower end of the duct, so that the material could be delivered at points gradually farther from the thresher without altering the elevation of the chute and in which the vertical position of the delivery end of the chute could be varied at any time, so that the straw could not only be carried first nearer and then farther from the thresher, but could also be gradually piled higher and higher, as well as taken farther and farther out, and while I have above given a specific description of the illustrated devices in order that the features of invention can be fully understood I wish it to be also distinctly understood that I do not limit myself to all of said specific matters, for there can be many modifications as concerns the details of construction and arrangement without departing from the invention.

What I claim is—

1. In a pneumatic straw-stacker, the combination of an ejector-fan, a rotary base, a

duct-section upon and rotating with said base, a second duct-section supported upon and having its lower end vibratable relative to the rotary base, and connected with the base duct-section to form a continuation thereof, a third, outer, duct-section telescopically connected to the second section, said second and third sections being adapted to have their outer ends raised and lowered relatively to the base, means rotatable around the axis of the base for adjustably supporting the outer duct-section at different elevations, and means for positively moving the third outer duct-section longitudinally outward relative to the second section and also positively moving it inward relatively thereto, whereby the operator can, while the machine is in operation, move the outer duct-section to elongate or shorten the total duct, substantially as set forth.

2. In a pneumatic straw-stacker the combination of an ejector-fan, a rotary base, a duct-section supported upon and rotating with the base, a second duct-section supported upon and having its lower end vibratable relative to the rotary base, and connected with the base duct-section, a third outer duct-section telescopically connected to the second duct-section, said second and third sections being adapted to have their outer ends raised and lowered relatively to the base, means rotatable around the axis of the base, for adjustably supporting the outer duct-section at different elevations, and an adjusting mechanism having one member connected to the second duct-section, and a second member connected to the third outer duct-section, said members engaging with each other and being adapted to advance the third outer duct-section outward and to draw said duct-section inward positively while the machine is in operation, substantially as set forth.

3. In a pneumatic straw-stacker, the combination of an ejector-fan, a duct leading therefrom, a base arranged to rotate around a vertical axis, an upwardly-extending duct-section connected to the base and rotating therewith, a second duct-section supported upon the rotary base and having its lower end connected with the base duct-section to form a continuation thereof, a third, outer, duct-section telescopically connected to the second duct-section, said second and third duct-sections being adapted to have their outer ends raised and lowered relatively to the base, means rotatable around the axis of the base for supporting the outer duct-section at different elevations, an adjusting mechanism having a longitudinally-movable member secured to, and upon the outside of, the third outer duct-section and a second member supported in rear of said outer duct-section, said two members mutually engaging with each other, and a crank, for actuating the last-said member of said adjusting mechanism, substantially as set forth.

4. In a pneumatic stacker, the combination of an ejector-fan, a horizontally-rotary base, a duct-section mounted on said base, a second duct-section connected with said base-section, a third outer, duct-section, telescopically connected with said second duct-section, devices for positively moving said outer duct-section longitudinally to either increase or decrease the length of the total duct, said devices comprising a movable member connected with the outer duct-section and extending longitudinally thereof and of the second section, to points adjacent to the inner end of said second section, and a relatively stationary member arranged adjacent to the base-section and engaging with the said movable member, whereby the operator can either increase or diminish the length of the duct from a point near the inner end thereof, while the machine is in operation, substantially as set forth.

5. In a pneumatic stacker, the combination of an ejector-fan, a rotary base mounted to turn about a vertical axis, a tubular hood or duct-section secured to said base, a second duct-section having its inner end connected with said base duct-section and having its outer end movable vertically, a third, outer, duct-section telescopically connected to said second duct-section, means adapted to turn about the axis of the rotary base, for supporting said third duct-section in line with the said second duct-section and the discharge-opening in the hood, means for adjusting both said second and third duct-sections vertically, and a rod connected at its outer end with the outer duct-section, and extending to points beyond the inner end of said third duct-section, for positively pushing the said third duct-section outwardly to lengthen the total duct and to draw said outer duct-section inwardly to shorten the total duct, substantially as set forth.

6. In a pneumatic stacker, the combination of an ejector-fan, a rotary base mounted to turn about a vertical axis, a hood or longitudinally-curved duct-section mounted on said rotary base, an intermediate duct-section connected with said hood, an outer duct-section telescopically connected to said second duct-section, auxiliary upwardly-extending supports for said outer duct-section mounted on the rotary base, and extending to points beyond the outer end of the second duct-section, one or more winding ropes bearing upon said auxiliary upwardly-extending supports and connected with said outer duct-section at a point near the outer end thereof, means for winding said rope or ropes to adjust both said outer and intermediate duct-sections vertically, and means extending to a point adjacent to the said hood for positively moving the outer duct-section outwardly to increase the length of the total duct and for positively moving said outer duct-section inwardly to shorten the total duct, substantially as set forth.

7. In a pneumatic stacker, the combination

of an ejector-fan, a rotary base adapted to rotate about a vertical axis, a duct-section mounted on said base to rotate therewith, a second duct-section communicating with said base-section, a third outer section telescopically connected with the said second duct-section, an auxiliary support having a member mounted to rotate about the axis of said rotary base and a member longitudinally adjustable of the first said member and extending to points beyond the outer end of said second duct-section, connections between the outer adjustable member of said auxiliary support and the third outer duct-section, means for simultaneously adjusting the outer and second duct-sections vertically, and means connected with the outer duct-section to positively move said section outwardly to increase the total length of the duct and to positively move said outer duct-section inwardly to shorten the total duct, substantially as set forth.

8. In a pneumatic stacker, the combination of a rotary base, or main support, a fan below said support, a hood or duct-section mounted on and rotating with said rotary base, a stationary conduit connecting the said hood with the fan-chamber, a second duct-section connected with said base-section, an outer duct-section telescopically connected to the last-said duct-section, a deflector adapted to direct the path of material issuing from said outer duct-section, independent means for positively moving said outer duct-section outward to lengthen the total duct and positively moving said outer duct-section inward to shorten the total duct, and adjusting means connected with the deflector, and extending to a point adjacent to the rotary base, whereby the operator can, while the machine is in operation, elongate or shorten the duct and adjust the deflector as desired, substantially as set forth.

9. In combination with the telescopic trunk, the deflector hinged to the outer trunk-section, an operating-rod attached to said deflector and extending back along the trunk, and operating means connected to said rod and mounted on and carried by the inner trunk-section, substantially as and for the purpose hereinbefore set forth.

10. In combination with the telescopic trunk and the guide attached to the outer section, a deflector hinged to said outer section, an operating-rod attached to said deflector and extending back through and beyond the guide, and operating means connected to the said rod, and mounted on the inner trunk-section, substantially as and for the purpose hereinbefore set forth.

11. In a pneumatic straw-stacker, the combination of an ejector-fan, a trunk or duct for wind and straw communicating with the fan-casing and having an inner section and an outer section telescopically connected to the inner section, a deflector at the outer end of the telescopic section, means for positively moving said outer telescopic section together with the deflector longitudinally of the duct, and means for adjusting the deflector independently of the telescoping section, whereby the deflector can be adjusted bodily toward and from the fan and also into different positions relative to the path of the air and straw, substantially as set forth.

12. In a pneumatic straw-stacker, the combination of an ejector-fan, a discharge trunk or duct communicating with the fan-casing and having an outer section adapted to be adjusted longitudinally of the trunk to vary its length, a horizontally-vibrating base-support for said trunk, a deflector at the outer end of the trunk, and two independent sets of adjusting devices carried by the vibrating base-support, one set for positively moving the outer section of said trunk inward or outward to vary the total length of the trunk, and the second set for positively adjusting the deflector relatively to the discharge end of said trunk, substantially as set forth.

13. In a pneumatic straw-stacker, the combination of an ejector-fan, a discharge trunk or duct communicating with the fan-casing, and having an outer section adapted to be adjusted longitudinally of the trunk to vary its length, a horizontally-vibrating base-support for said trunk, a deflector at the outer end of the trunk movable independently thereof and three independent sets of adjusting devices carried by the vibrating base-support, one set for positively moving the outer section of said trunk and the deflector inward or outward, a second set for positively adjusting the deflector relatively to the discharge end of said trunk, and a third set for adjusting the outer end of the trunk vertically bodily, substantially as set forth.

14. In a pneumatic straw-stacker, the combination of an ejector-fan, a discharge-trunk having an inner section communicating with the fan-casing, and an outer section adapted to be telescoped longitudinally on the inner section, a deflector at the outer end of said telescoping section, and adjusting mechanism for moving the telescoping section longitudinally, comprising a toothed wheel and rack one of which is supported stationarily relatively to the inner trunk-section, and the other of which is connected to the telescoping section, and devices independent of said wheel and rack for adjusting the deflector relatively to the telescoping section, substantially as set forth.

15. In a pneumatic straw-stacker, the combination of an ejector-fan, an escape-duct leading from the fan, a trunk adapted for the passage therethrough of wind and straw having its outer end vertically adjustable and its inner end supported at the end of the fan-duct to move vertically relatively thereto, said trunk being formed in two parts of which one can slide on the other and have its outer delivery end movable longitudinally while in operation to vary the position of the edge over

which the straw escapes, a deflector situated at the outer end of the sliding part of the trunk, and adjustable relatively to the longitudinal axis thereof, adjusting mechanism for moving the deflector and the sliding part of the trunk toward and from the fan comprising two mutually-engaging devices, one connected to the inner part of the trunk and the other connected to the sliding part, and a crank for actuating the said adjusting mechanism, substantially as set forth.

16. In a pneumatic straw-stacker, the combination of an ejector-fan, a rotary base mounted above said fan, a duct-section mounted on said base to rotate therewith and communicating with said fan-casing, a discharge-trunk having its inner end communicating with and movable relatively to the upper end of the base duct-section, ropes or cables for supporting the outer end of said trunk, means for adjusting said ropes to raise or lower the outer discharge end of the trunk, a pivotally-mounted deflector at the outer end of said trunk, a rod connected to said deflector and extending rearward along the trunk, and a locking device engaging said rod to hold the deflector in any position of adjustment, substantially as set forth.

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

JOHN H. ELWARD.

Witnesses:

GEO. B. SUCHER,

LYSANDER CASSIDY.