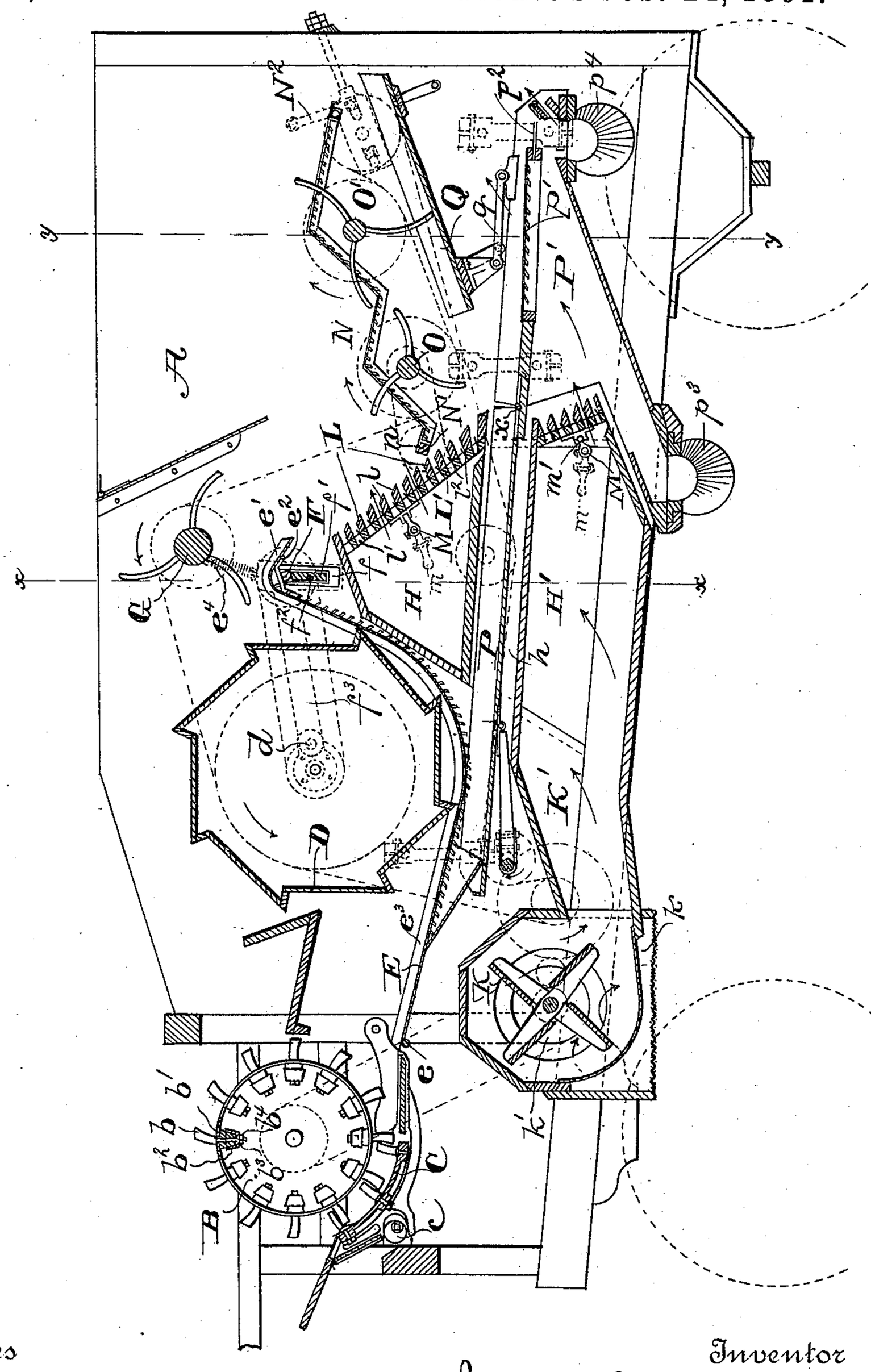
(No Model.) 3 Sheets—Sheet 1.

G. FRICK.

THRASHING MACHINE.

No. 447,043. Patented Feb. 24, 1891.



Witnesses

G. A. Tauberschmidt

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(No Model.) 3 Sheets—Sheet 2.

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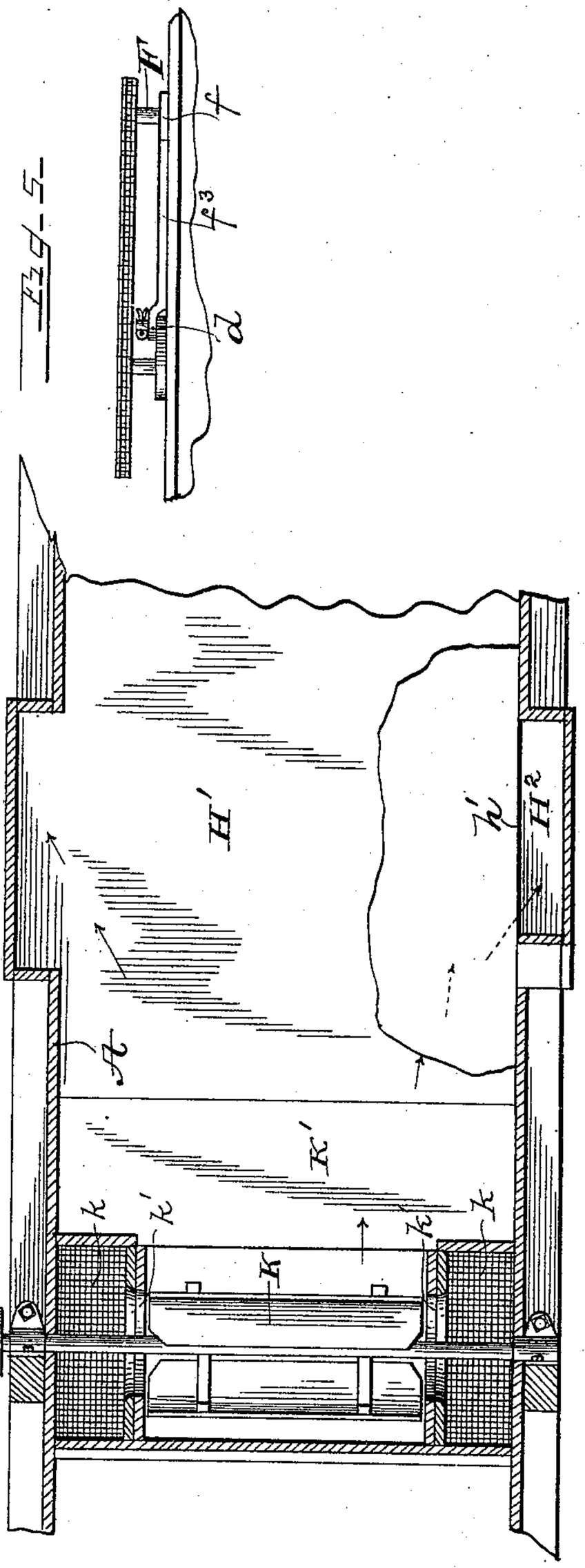

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UNITED STATES PATENT OFFICE.

GEORGE FRICK, OF WAYNESBOROUGH, PENNSYLVANIA.

THRASHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 447,043, dated February 24, 1891.

Application filed September 30, 1890. Serial No. 366,658. (No model.)

To all whom it may concern:

Be it known that I, GEORGE FRICK, a citizen of the United States, residing at Waynesborough, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Thrashing-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention is an improvement in thrashing-machines; and it consists in the novel features of construction and combination of parts hereinafter fully described and claimed.

In the accompanying drawings I have illustrated the best form in which I have contemplated embodying my invention, and the same is fully disclosed in the following description and claims.

Referring to the said drawings, Figure 1 is a longitudinal section of my improved thrashing-machine. Fig. 2 is a transverse vertical section on the line *x x*, Fig. 1. Fig. 3 is a similar section on line *y y*, Fig. 1. Fig. 4 is a longitudinal horizontal section through the fan and air-passages. Figs. 5, 6, 7, and 8 are details of parts of the construction.

In the said drawings, A represents the framework or casing of the machine, which may be mounted upon suitable supporting-wheels, as indicated in dotted lines.

B is the thrashing-cylinder, which is mounted in the forward part of the frame. I form this cylinder of metal, preferably iron or steel, and it may be formed by bending a piece of plate metal into the cylindrical form and securing the ends together by welding or otherwise; or it may be made of welded tubing in one piece, and in any case the cylinder is of sufficient thickness to give the requisite amount of rigidity and strength. The cylinder is secured to the supporting-shaft in any desired manner, and is perforated to receive the shanks of teeth *b*, which are of any desired or usual form, and are provided with shoulders, which engage the outside of the cylinder. The shank of each tooth, after it is passed through the cylinder, is provided with a cone-shaped block *b'* of wood, vulcanized rubber, or other suitable material, the said block having a central aperture engaging the shank of the tooth. Upon the cone-shaped block *b'* is placed a hollow cone-shaped cap b^2 of metal, which fits over the block *b'*, and is provided at its closed end with a concave portion b^3. A nut b^4, having a concave portion, is placed on the shank of the tooth *b* and screwed up until the convex portion of the nut engages the convex portion b^3 of the cap, and the parts are drawn tightly together.

The cone-shaped block *b'* will brace the shank of the tooth against strains in all directions, and each tooth is thus held and braced independently. The block of wood or other material being slightly elastic, the parts will be held without the danger of becoming loosened, as is the case where all parts are entirely rigid.

C is the concave, which is of ordinary construction, and is provided with means for adjusting the same with respect to the cylinder, consisting, in this instance, of the eccentric *c*. The concave is also provided with teeth, which may be attached by the means hereinbefore described for attaching the cylinder-teeth, or they may be secured in place in any other manner, if desired.

In rear of the thrashing-cylinder is mounted a straw-propelling drum or cylinder D, which may be in the form of a ratchet-cylinder, as shown, or it may be constructed in the form of a plain cylinder having cleats, ribs, or teeth secured thereto; or I may employ a corrugated cylinder, if found desirable. Beneath the propelling-drum D is hung the yielding apron E, which consists of a perforated bottom, preferably of metal, provided with lips or tongues punched out and bent downwardly in a well-known manner. The apron E is pivotally supported in rear of the concave at *e*, and receives the straw and grain therefrom, and its rearward end extends in an upward direction conforming to the shape of the drum D, the upper extremity, after leaving the drum, being bent downward, as at *e'*, forming a lip. The rear end of apron E is provided with a bracket or brace e^2, which rests upon a knocker-shaft F extending transversely of the machine, and consisting in this instance of a square or polygonal shaft. The apron E is preferably provided at each side

with an angle-iron, as shown at e^3, to give it the desired strength and hold it sufficiently rigid.

The propelling-drum D receives the straw after it leaves the thrashing-cylinder and propels it forward, at the same time compressing it into the form of a sheet.

The grain which is separated from the straw in passing from the cylinder to the propelling-drum and up the apron passes through the apertures in the apron and falls on the grain-table beneath. In order to allow the apron a slight range of movement to compensate for the varying thickness of the sheet of straw passing between the drum and apron and to provide means for holding the apron up against the drum when a very thin sheet of straw is passing through, I provide the upper or rear end of the apron with springs e^4 e^4 connected to the frame-work of the machine and to the plates *f f*.

The bearings for the knocker-shaft are formed in plates *f f*, located on opposite sides of the machine, and the sides of the machine are provided with vertically-disposed slots to allow for the movement of said shaft and the parts connected therewith. The plates *f f* are formed large enough to cover the slots in all the positions into which they may be moved, and in order to cause both plates to move simultaneously I interpose a cross-bar *f'* between the plates *f f*, the ends of which preferably engage raised flanges cast on the inner faces of said plates. A bar f^2 connects the two plates and is provided with a nut on one or both ends outside of the plates *f f*, whereby the nuts may be drawn up and the plates and cross-bars secured rigidly together.

The shaft F is driven from the shaft of the drum D by means of a sprocket chain or belt, and in order to keep the chain taut in all positions of the shaft I provide the bearing-plates *f f* with rigid arms f^3, which are pivotally connected to the bearing-plates of the drum-shaft, as shown at *d*. I might connect the arm f^3 to the shaft of the drum, if desired; but the above is my preferred construction, as it is more convenient in many ways.

Above the upper or rear ends of the apron E is mounted the beater or toothed cylinder G, which strikes the straw as it is pushed up into a nearly vertical position by the drum D, and beats it, thereby loosening the grain therefrom and shaking it out, and at the same time bending the straw sharply at right angles, loosening it up and separating it, leaving it in the best condition for the air-blasts to operate upon it.

Beneath the rear extremity of apron E is located the upper air-chamber H, which is supplied from a fan K, located for compactness near the forward part of the machine. Beneath the upper air-chamber H is an open passage *h*, through which the grain-bottom extends, and beneath this open space is the lower air-chamber H'. The upper and lower air-passages are connected by air-chutes H^2 H^2, which are located at the sides of the main frame of the machine, as indicated in Fig. 4. At each side of the passage *h*, through which the grain-bottom extends, is a sheet of iron or other metal *h'*, Fig. 4, which serves as the inner wall of the air-chute H^2, thereby allowing more space in said chute than if a thick board were employed.

The fan or blower K is made shorter than the width of the machine, and an inlet-port *k* is provided at each side which communicates with the fan-receptacle through the aperture *k'*. I provide the lower ends of the inlet-ports *k* with wire gauze or netting to prevent straws or other foreign matter from being drawn up into the fan-receptacle. The air passes from the fan-receptacle rearward through the air-passage K' into the lower and upper air-chambers, and I provide the said air-chambers with valves for controlling the blast of air at the points of its delivery therefrom, so that a considerable pressure of air is always maintained in the said chambers. In the construction and arrangement of the said valves I provide a series of fixed slats L, extending from one side of the machine to the other at suitable distances apart, forming a grate construction. The rearward edges *l* of these slats are inclined downward, and each slat extends over the innermost edge of the next lower slat, so that any grain falling upon the slats will be prevented from getting into the apertures between the same by the inclined edges *l*. In the form shown in Fig. 1 and in detail in Fig. 7 I provide a movable slat L' in rear of each of the slats L, the said movable slats being all connected at their ends by cross-bars *l'* for simultaneous adjustment by any desired means. Each of the movable slats L' is preferably provided with a deflector l^2, consisting, preferably, of a metallic strip, as will be clearly seen in Fig. 7. When the sheets or jets of air are desired to be reduced in size to decrease the blast, the cross-bars are moved in the direction of the arrow, Fig. 7, which will partially close the grated openings, as will be readily understood. Any desired means may be employed in effecting the adjustment of the said valves. In Figs. 1 and 2 I have shown one form, which consists of a shaft M, extending the entire width of the machine and provided with a lever *m* at each side of the machine. The shaft M is also provided with a projection *m'*, engaging a notched construction on the cross-bar of the movable slats, whereby the valves can be operated from either side of the machine. The levers may be secured in their adjusted positions by means of thumb-nuts, if desired. As before stated, these valves are provided for both the upper and lower air-chambers, and the construction is the same in both cases.

Instead of the form of valve just described, I may employ the form shown in Fig. 8, in which each fixed slat L is provided with a

rock-shaft l^3, carrying a narrow strip of metal or other material forming the valve. The said rock-shafts may be provided with arms l^4 for moving the same so as to partially close the apertures between the slats L, and said arms may be connected for simultaneous adjustment or adjusted independently of each other, as desired.

In rear of the valves of the upper air-chamber is the straw-bottom, which is formed of a series of perforated angularly-bent strips or bars N, leaving spaces between each two adjacent strips. These strips are provided with downward-bent lips, leaving perforations for the passage of grain therethrough, and the straw-bottom is stiffened at each end by means of angle-iron, as shown in Figs. 1 and 3. I prefer to give the straw-bottom the zigzag shape shown in Fig. 1, as it gives a much greater separating surface without increasing the length of the machine, and, further, the direction of the grain is changed several times, thus facilitating the action of the agitators, which are provided in connection with the device. The forward end of the straw-bottom is provided with a cross-bar of angle-iron n, which rests upon a square or polygonal knocker-shaft N′, (see Fig. 1,) which gives a jolting motion to the straw-bottom and facilitates the separation of the grain from the straw. The rear end of the straw-bottom is supported by hangers N^2, which are inclined in such a manner as to press the straw-bottom against the knocker-shaft N′, as shown in Fig. 1.

Beneath the straw-bottom are two agitator-shafts O O′, provided with arms which pass between the perforated strips or bars N, and I form the arms of the rearward agitator O′ considerably longer than those of the agitator O, and both agitator-shafts are driven in the same direction and at the same speed. As a consequence of this arrangement, the extremities of the teeth of agitator O′ move more rapidly than the extremities of the teeth of O. Hence the straw will be pulled apart and loosened and the grain shaken out more readily upon the perforated bottom, the straw during the period of its agitation being acted upon by the air-blast.

Any desired number of agitators might be employed in connection with the slotted straw-bottom, and the teeth of each made longer than those of the one forward, thus increasing from front to rear.

The grain-bottom P is located beneath the perforated apron E, and extends rearwardly in an inclined direction through the open space h between the upper and lower air-chambers, and is hinged or pivotally connected to the shoe P′ at x, as shown in Fig. 1. The shoe and grain-bottom are supported by suitable hangers, and are pivoted together to enable the forward end of the grain-bottom to be adjusted vertically to suit different grains. A shaking motion is imparted to the bottom P and shoe P′ from a counter-shaft p by means of cranks and connecting-rod, as shown in Fig. 1, or I may employ an eccentric and strap, if desired.

The shoe P′ is provided with a screen or riddle p', beyond which are the slats p^2, which receive the tailings. Beneath the riddle p' the shoe is provided with an inclined bottom, which conducts the clean grain to the cone-shaped grain-spout p^3, and beneath the slats p^2 is a similar cone-shaped spout p^4, which conducts the tailings to the tailings-elevator. I provide the shoe with a fixed slat p^5 and a movable slat p^6 to deflect the tailings into their delivery-spout and to regulate the outlet of the blast at that point, as seen in Fig. 1. It will be seen that the shoe is provided with two spouts, one for clean grain and another for tailings, and both are operated by the jolting or shaking of the shoe, thus dispensing with auxiliary mechanism for this purpose. Beneath the straw-bottom is an inclined chute Q, which is supported by hangers and connected to the shoe by a connecting-rod q, by means of which motion is imparted thereto. By these constructions just described the grain-bottom, the shoe with its riddle and grain-spouts, and the inclined chute Q are all jolted or shaken by means of the crank-shaft p, instead of employing separate means for jolting or shaking the separate devices.

The cylinder of the machine is driven by the main power-belt from the engine or other power device, and the fan is driven by means of a belt from the cylinder-shaft. The drum D, beater G, agitators O O′, and the shaft p are all driven by an endless sprocket-chain, as indicated in dotted lines in Fig. 1, the said chain passing over a pulley at the rear of the machine, which is adjustable, thereby enabling the entire chain to be tightened by means of one adjusting device. The chain is driven in any desired manner from the fan-shaft or from the cylinder-shaft. The knocker-shaft F is driven by means of a sprocket-chain from the shaft of drum D, and knocker-shaft N′ is driven from the shaft of the agitator O in a similar manner. Idle-wheels may be used where necessary to give the required direction of rotation to the various shafts.

The operation of my improved thrashing-machine is as follows: The grain is fed to the cylinder of the machine in the usual manner, and after leaving the cylinder it passes onto the perforated apron E. The straw is moved rearwardly in a thin sheet by the propelling-drum D, and a large part of the grain which has been separated from the straw by the cylinder will fall through the perforated apron, which is agitated by the knocker-shaft F, onto the grain-bottom P, which conducts it to the riddle p' of the shoe. The straw fed by the drum D passes up the rear portion of the apron E into an almost vertical position and is struck by the beater G, almost perpendicularly, thereby knocking a considerable amount of the grain out of the straw, bending the

straw sharply at right angles and loosening it up. The grain as it falls from the lip *e* or rearward extremity of the apron E is acted upon by the blast of air from the upper air-chamber, which blast is distributed and broken up into thin sheets or jets of air by the grated discharge-openings. One of the results accomplished by this construction is that the reduced discharge-openings will cause a constant air-pressure in the air-chambers, thereby tending to equalize the inequalities of the blast and render it even and regular. The straw then falls upon the jolting straw-bottom, where it is acted upon by the agitators O O′, as before described. As the greater part of the chaff is blown out of the straw as it descends upon the straw-bottom, the work of the agitators is greatly reduced, and they will shake up and loosen the straw, allowing the grain to fall through the perforated bottom. The air-currents act upon the straw during the whole period that it is on the straw-bottom, and the agitators serve to shake and loosen it up and at the same time to feed it rearward to the discharge end of the machine. The grain falling through the perforated straw-bottom falls upon the shoe P′ or the chute Q, which conducts it to the shoe, and the grain from the grain-bottom is also conducted to the shoe, as before stated. It will be seen that the grain which falls upon the shoe has been nearly cleaned, and all that remains to do is to effect the final separation. Hence a much smaller riddle or screen than usual may be employed, as will be seen in the drawings. The grain is fed upon the screen or riddle *p′* of the shoe and is acted upon by the blasts of air coming from the lower air-chamber. The cleaned grain falls through the said screen or riddle and is conducted to the grain-spout, while the tailings are conducted on over the screen and finally deposited in the chute leading to the tail-end elevator, light matter being separated from the tailings by the air-blast as the material passes over the slats p^2.

By the constructions herein described a very efficient thrashing-machine is produced, which is compact and occupies much less space than is occupied by the machines now in ordinary use.

By my invention the air-blast is controlled by a series of valves, and a pressure is maintained in the air-chambers instead of controlling the air-blast by regulating the amount of air admitted to the fan, and many other valuable results are produced by the use of my machine.

I do not desire to be limited to the exact details of construction herein shown and described, as the same may be considerably modified without departing from the spirit of my invention.

What I claim, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of the straw-propelling drum, the apron, and the spring supporting one end of the same.

2. The combination, substantially as hereinbefore set forth, with the straw-propelling drum, of the apron, pivoted at one end and a revolving knocker shaft engaging the apron adjacent to the other end.

3. The combination, substantially as hereinbefore set forth, of the straw-propelling drum, the apron pivoted at one end, a knocker-shaft supporting its opposite end, and springs supporting said shaft.

4. The combination, substantially as hereinbefore set forth, of the straw-propelling drum, the apron pivoted at one end, the knocker-shaft supporting its opposite end, links supporting said knocker-shaft, sprocket-wheels and chain, and springs supporting the outer ends of said links and knocker-shaft.

5. The combination, substantially as hereinbefore set forth, of the apron having its rear end curved upward to nearly a vertical position, a propelling-drum engaging the straw on the curved portion of the apron, and the beater located above the discharge end of the apron for engaging the forward side of the straw as it leaves the apron.

6. The herein-described thrashing-machine, comprising among its members an air-chamber provided with a series of fixed slats having the outer ends inclined, a series of movable slats provided with deflectors extending into the spaces between the fixed slats, means for adjusting the movable slats with respect to the fixed slats, and air-forcing devices for supplying air to said chamber.

7. In a thrashing-machine, the combination, with the shoe and the straw-bottom, of an air-chamber having a series of discharge-apertures of small area discharging below the shoe and another air-chamber having a series of discharge-apertures of small area located in close relation to said straw-bottom, part of said apertures discharging above and part below said straw-bottom, and an air-forcing device for supplying air under pressure to said chambers, substantially as described.

8. The combination, substantially as hereinbefore set forth, with the cylinder of a thrashing-machine, of a tooth and tooth-securing means comprising a non-metallic cone-shaped block surrounding the shank of the tooth, the cap engaging the same, and the securing-nut.

9. The combination, substantially as hereinbefore set forth, with the cylinder of a thrashing-machine, of a tooth and tooth-securing means comprising a non-metallic cone-shaped block surrounding the shank of the tooth and engaging the interior face of the cylinder, the cap engaging said block having a concave portion, and a securing-nut having a convex portion engaging the concave portion of the cap.

10. In a thrashing-machine, the combination, with the shoe and the straw-bottom, of

an air-chamber having a series of discharge-apertures of small area discharging below the shoe, and another air-chamber having a series of apertures of small area located in close relation to said straw-bottom, part of said apertures discharging above and part below said straw-bottom, a grain-bottom located between said air-chambers for conveying grain to the shoe, and an air-forcing device for supplying air under pressure to said air-chambers, substantially as described.

11. A thrashing-machine comprising among its members a perforated apron adapted to receive material from the thrashing-cylinder, two air-chambers located in different horizontal planes, the shoe, a grain-bottom passing between said air-chamber and adapted to receive grain from the perforated apron and convey it to the shoe, and a common air-forcing device connected with both of said air-chambers, substantially as described.

12. The combination, substantially as hereinbefore set forth, of the apron having its rear end curved upward, a propelling-drum engaging the straw on the curved portion of the apron, a beater above the discharge end of the apron adapted to engage the forward side of the straw with a nearly horizontal stroke, an air-chamber located beneath the discharge end of the apron, said air-chamber discharging rearwardly into the material as it falls from the beater, and an air-forcing device for supplying air to said chamber.

13. In a thrashing-machine, the combination, with the shoe, of a straw-bottom located above the same, an apron discharging upon the straw-bottom, an air-chamber having a series of apertures of small area discharging beneath the shoe, another air-chamber having a series of apertures of small area, part of said apertures discharging between the apron and straw-bottom and part discharging between said straw-bottom and shoe, and an air-forcing device for supplying air under pressure to said air-chambers, substantially as described.

14. In a thrashing-machine, the combination, with the grain-bottom, the shoe, the straw-bottom located above the shoe, and a perforated apron having a part located above the grain-bottom and discharging onto the straw-bottom, of an air-chamber located beneath the grain-bottom and having a series of apertures of small area discharging beneath the shoe, another air-chamber located above the grain-bottom having a series of apertures of small area, part of said apertures discharging between said apron and straw-bottom and part discharging between said straw-bottom and shoe, and an air-forcing device for supplying air under pressure to said air-chambers, substantially as described.

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

GEORGE FRICK.

Witnesses:
L. P. WHITAKER,
OLIVE D. BAKER.