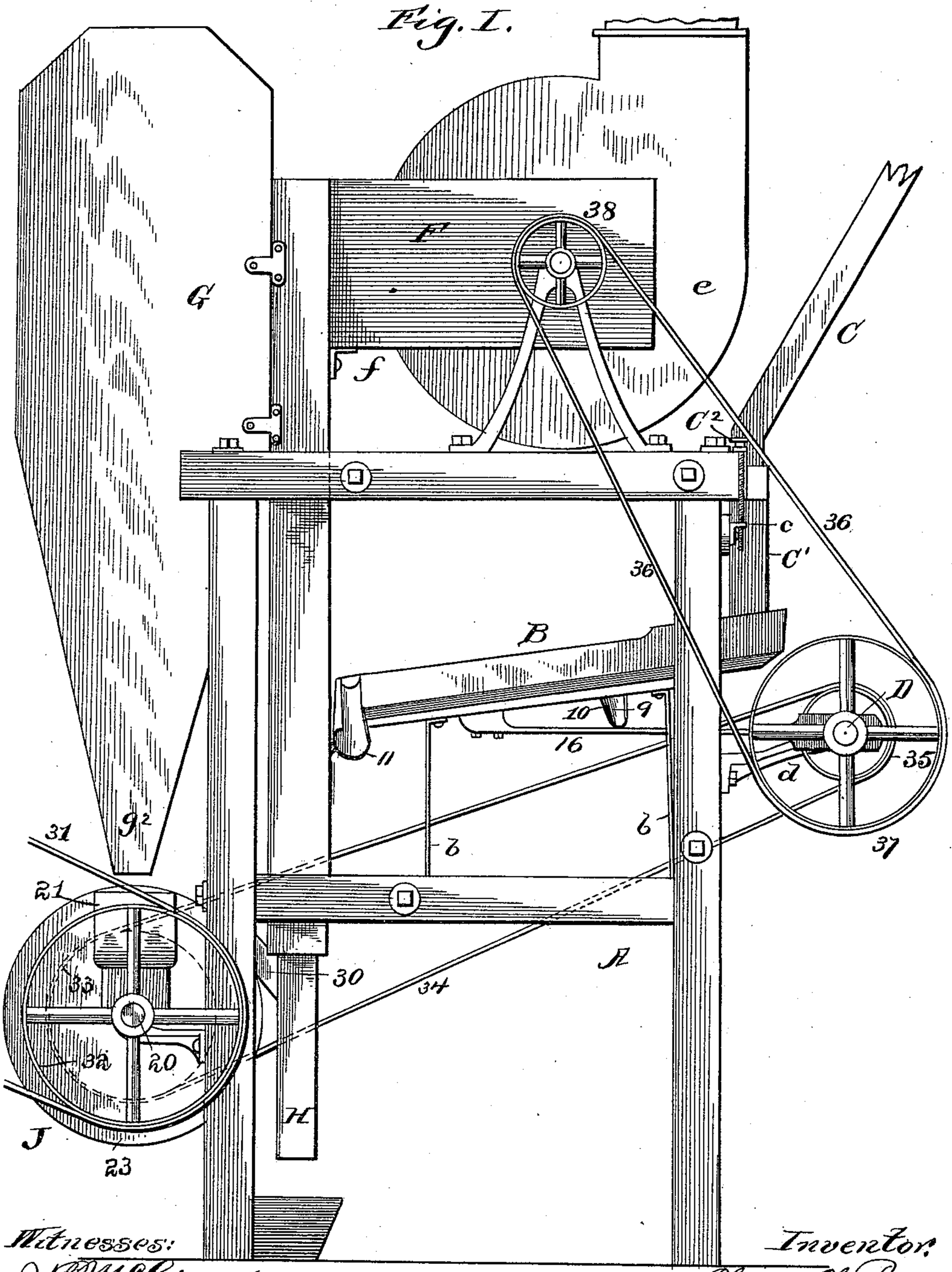
(No Model.) 4 Sheets—Sheet 1.

H. H. RING.

GRAIN SEPARATOR AND CLEANER.

No. 459,552. Patented Sept. 15, 1891.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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GRAIN SEPARATOR AND CLEANER.

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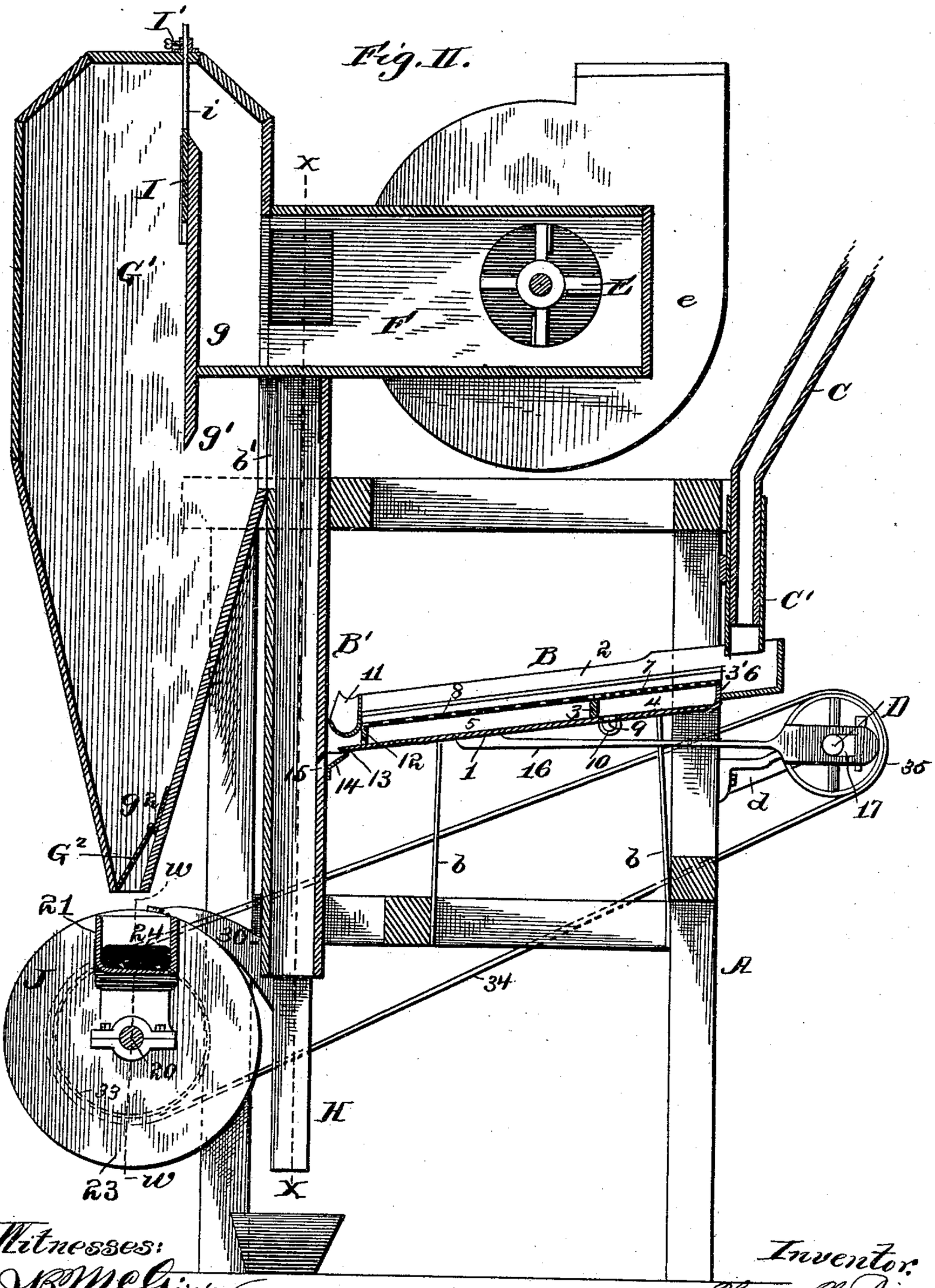
Fig. II.



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(No Model.) 4 Sheets—Sheet 3.

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GRAIN SEPARATOR AND CLEANER.

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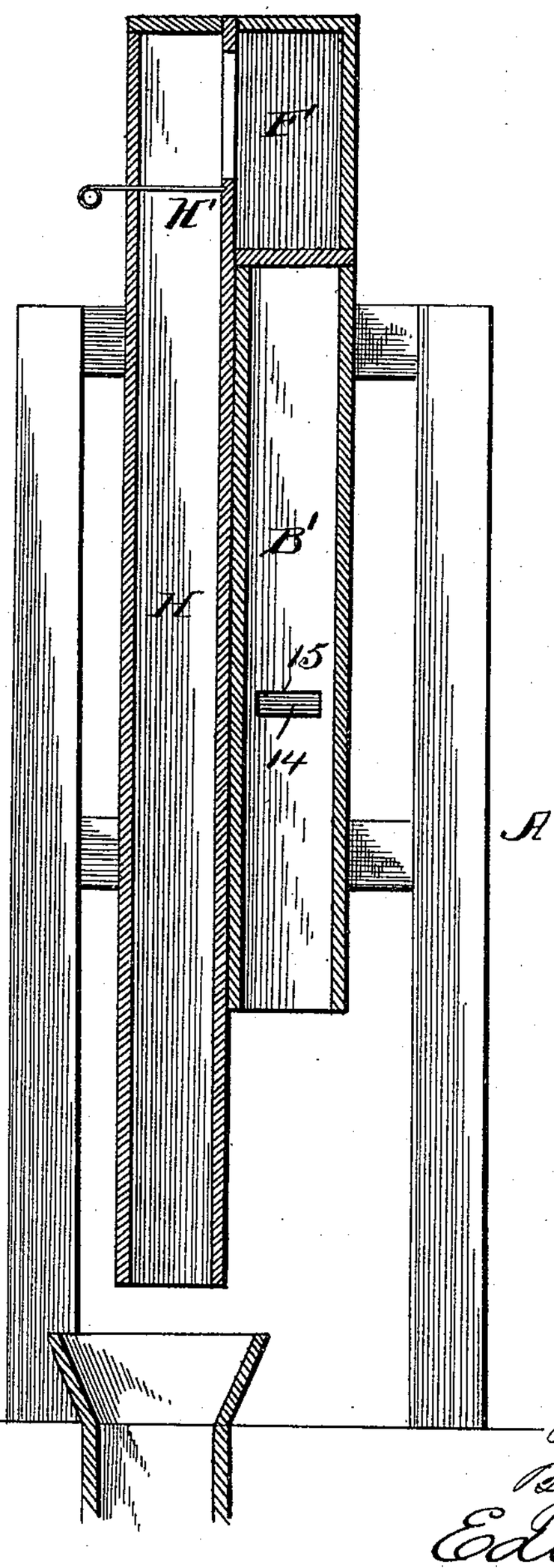
Fig. III.



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(No Model.) 4 Sheets—Sheet 4.

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GRAIN SEPARATOR AND CLEANER.

No. 459,552. Patented Sept. 15, 1891.

Fig. IV.

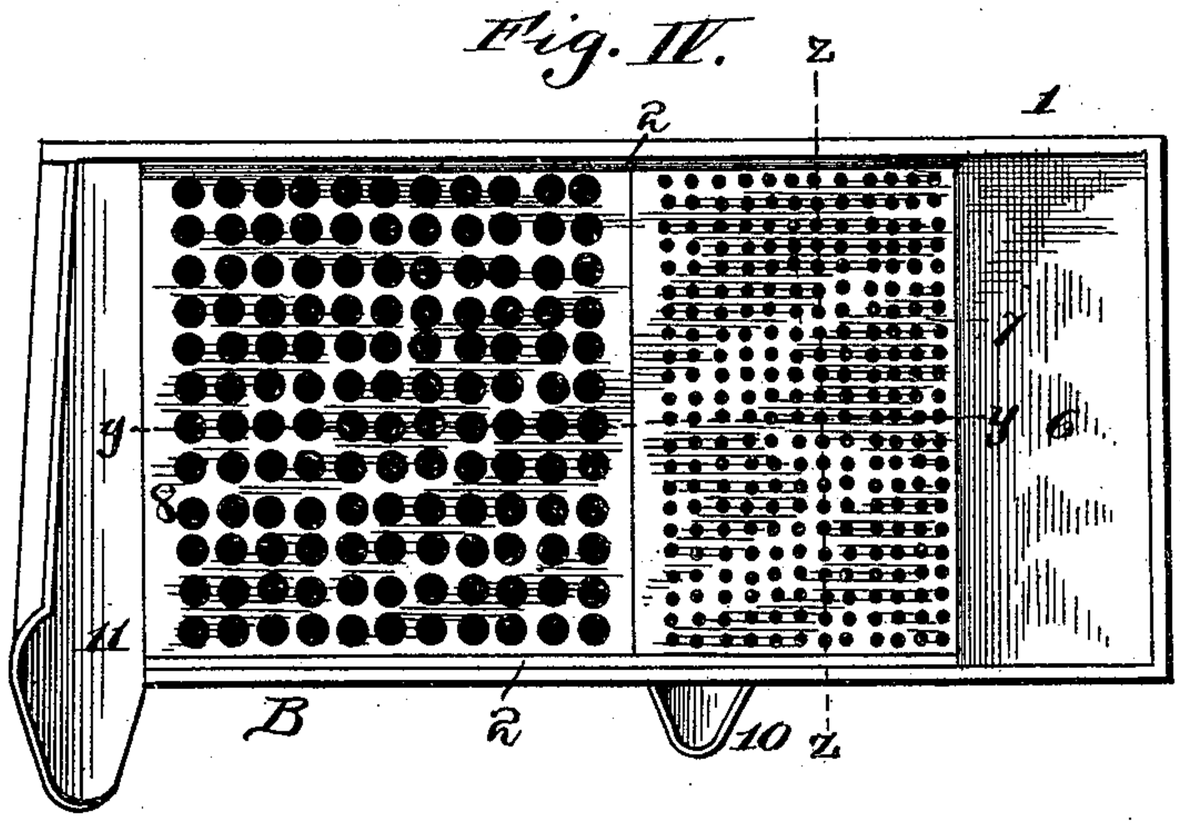


Fig. V.

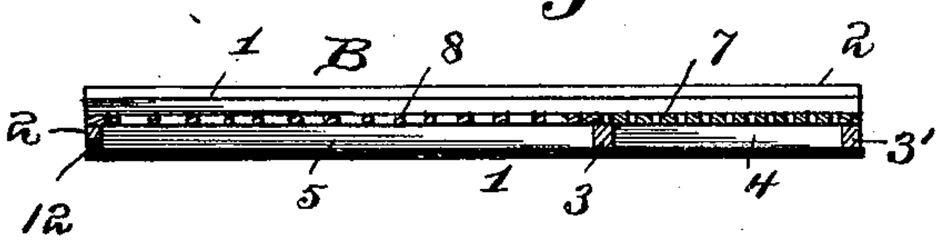


Fig. VI.

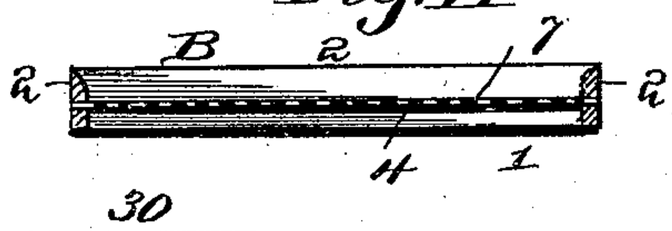
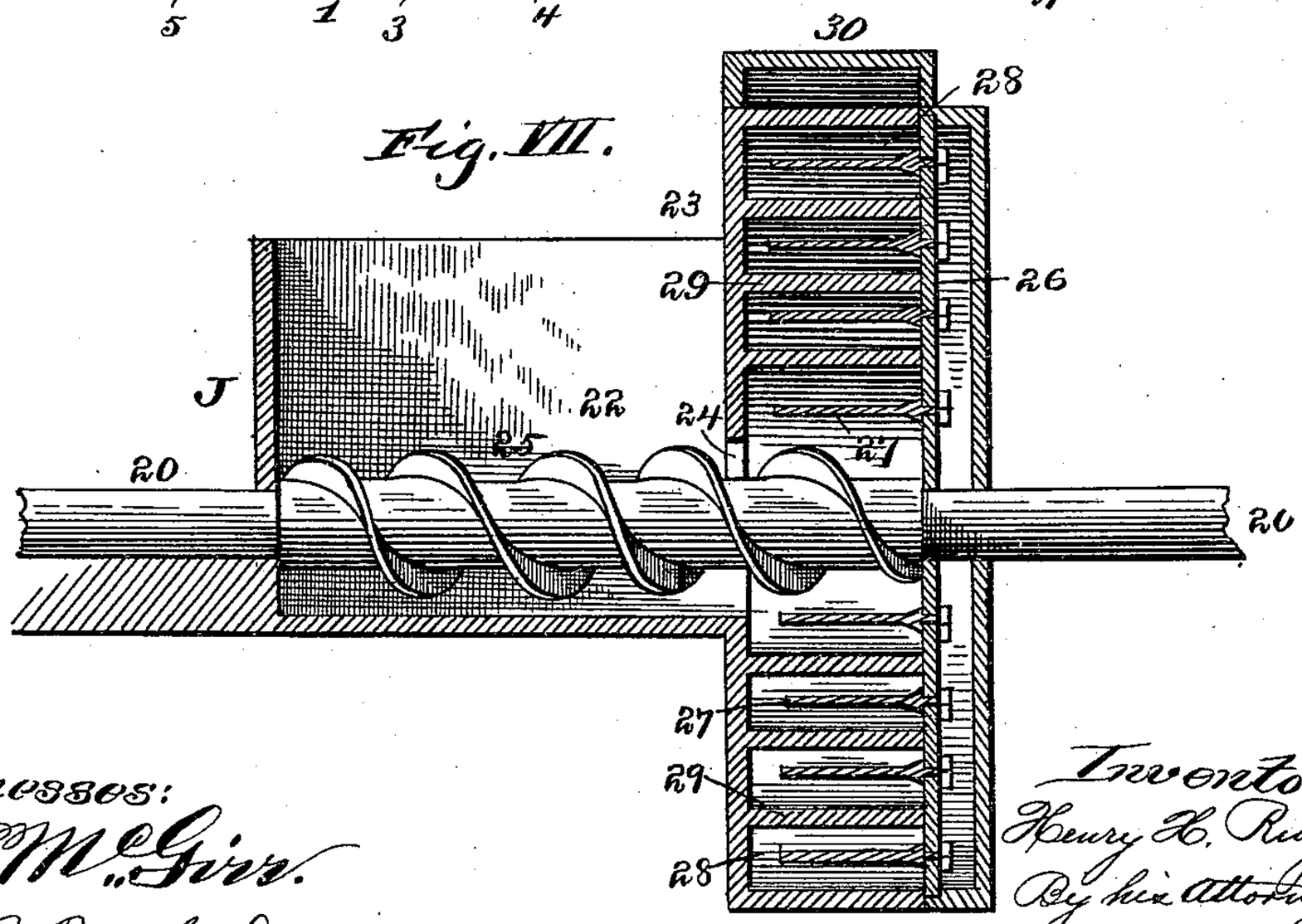


Fig. VII.



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UNITED STATES PATENT OFFICE.

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GRAIN SEPARATOR AND CLEANER.

SPECIFICATION forming part of Letters Patent No. 459,552, dated September 15, 1891.

Application filed April 2, 1891. Serial No. 387,398. (No model.)

To all whom it may concern:

Be it known that I, HENRY H. RING, a citizen of the United States, and a resident of Lairdsville, in the county of Lycoming and State of Pennsylvania, have invented certain new and useful Improvements in Grain Separators and Cleaners; 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.

This invention relates to an improved grain separator and cleaner; and the object is to effect the separation of refuse matter and the scouring of the grain in a single continuous operation, thus placing the grain in condition for use after it is delivered from the machine.

The invention consists in the combination of a movable screen or sieve for separating and cleaning the grain from the chaff, &c., a primary air-conduit into which the grain and small gravel is deposited, an enlarged air-chute of greater cross-sectional area than the primary conduit, which is in communication with the primary air-conduit and is provided with an automatic valve adapted to be opened by weight of the grain, a suction-fan, scouring mechanism arranged to receive the kernels of grain from the enlarged air-chute, and a secondary air-conduit in communication with the suction-fan and receiving the scoured clean grain and the light particles of dust from the scouring mechanism, the several mechanisms being all combined and arranged for operation substantially as will hereinafter be fully explained.

The invention further consists in the novel construction of parts in some of the several mechanisms, and also in the combination of devices, which will be fully described and claimed.

To enable others to fully understand my invention, I have illustrated the same in the accompanying drawings, in which—

Figure I is a side elevation of my separator and cleaner. Fig. II is a vertical longitudinal sectional view thereof, taken centrally through the shoe, the primary air-conduit and air-chute, and the frame. Fig. III is a vertical transverse sectional view on the line X X of Fig. II through the recovery and discharge air-conduit. Fig. IV is a detail plan of the vibrating shoe. Figs. V and VI are longitudinal and transverse sections, respectively, through the vibrating shoe on the lines *z z* and *y y*, respectively, of Fig. IV; and Fig. VII is an enlarged sectional view through the scouring mechanism on the plane indicated by the dotted line *w w* of Fig. II.

Like letters and numerals of reference denote corresponding parts in all the figures of the drawings.

The present machine is designed to prepare the unclean grain, mixed with grass, dirt, gravel, and other refuse, just as it comes to the hand of the miller, in condition for immediate use, if desired, and to this end the dirt and sand, twigs, straw, chaff, large and small gravel, and other refuse matter must first be separated from the grain. The latter must then be scoured and cleansed free from the thin skin or "whiskers" adhering to the kernels of grain, and the light particles of dust, &c., from the scouring mechanism must be carried away from the grain as it leaves said scouring mechanism. All of the operations are consecutively performed in a machine embodying my invention, in which as many different mechanisms as there are operations to be performed are combined in a novel and compact manner.

The several operating parts of the machine are supported on a main frame A of suitable construction and proportions. In this frame A, I arrange a cleaning-shoe B, which is arranged to vibrate or reciprocate back and forth in the frame, and said shoe is suspended by vertical arms or links *b b*, which are suitably attached to the shoe and to the main frame. This primary cleaning-shoe operates to separate the kernels of grain from the dust and sand, twigs, large gravel, and small stones, chaff, and all other refuse that may get mixed with the grain, except the small gravel, which are about the size of the kernels of grain, and the separation of the small gravel from the grain is effected in the primary air-chute B′, into which the grain and small gravel from the cleaning-shoe are deposited.

I will now proceed to describe in detail the construction of one form of cleaning-shoe

which may be employed, and which, as will be seen by reference to Figs. I and II, is inclined slightly from its receiving toward its discharge end. The cleaning-shoe is shown in detail in Figs. IV, V, and VI, and it is provided with a casing 1, having a suitable bottom and raised sides 2, and to the bottom are secured battens or strips 3 3′, which divide the casing into two shallow compartments 4 5. At the upper end of the shoe I provide a receiving-compartment 6, which is isolated from the upper compartment 4 by the partition 3′, and this receiving-compartment 6 is nearly or quite the full depth of the shoe to adapt it to receive all the material from the chute C, which is suspended above the shoe, as shown. The shoe is provided with two screens 7 8, which are of different sizes, and said screens 7 and 8 rest on the battens 3 3′ and lie over the compartments 4 5, respectively. The screens may be made of perforated sheet metal or wire-gauze, and the upper screen 7 over the compartment 4 and adjacent to the receiving-compartment 6 has apertures which are much smaller than the interstices or apertures in the lower screen 8 over the compartment 5. In the bottom of the shoe-casing, above the imperforate batten 3, is a slot or opening 9, which serves to discharge the sand and dirt from the compartment 4 into a spout 10, fixed to the bottom of the shoe-casing. The twigs, straw, chaff, large stones, and other refuse too large to pass through the screen 8 are carried over the screens to the lower end of the shoe by the rapid vibration thereof and discharged into a spout 11, (see Figs. II and IV,) which is fixed to the lower discharge end of the shoe transversely thereof, and the matter deposited in the two spouts 10 11 is discharged onto the floor or into suitable receptacles provided for the purpose. In the vertical side 2, at the lower end of the shoe-casing, an outlet opening or slot 12 (shown in Fig. V) is provided for the passage of small gravel and the grain, and the bottom of the shoe is extended, as at 13, to form a ledge below the slot 12, which ledge rests on a mouth-piece 14, (see Fig. II,) fixed to the primary air-conduit B′ below an opening or slot 15 therein, whereby the grain and small gravel are delivered to said primary air-conduit without waste. The shoe is vibrated rapidly by means of a pitman 16, (in Figs. I and II,) fixed to the bottom of the shoe-casing, and having a yoke 17, which embraces an eccentric (not shown) on a rotary shaft D, which is journaled in suitable bearings (not shown) on the main frame A. The chute C receives the grain which is mixed with straw, sand, and other refuse matter, which is deposited into the receiving-compartment 6 at the upper end of the shoe. As the shoe is vibrated very rapidly the sand and dirt from the compartment 6 passes over and through the small screen 7 into the compartment 4, Figs. II and V. The straw, twigs, and other matter too large for the screen 8 pass over the shoe into the spout 11, and the grain and small gravel pass through the open interstices in the large screen 8 into the compartment 5, and thence through the openings 12 and 15, Figs. II and V, into the primary air-conduit B′. The screens 7 and 8 of the shoe rest upon the battens 3 3′ and are held in place between the sides and ends of the shoe-casing, and it is evident that the screens can be easily removed and others used in lieu thereof. The spout C is provided with a sleeve C′, which fits snugly thereon and depends toward the compartment 6 of the shoe, and this sleeve C′ is adapted for vertical adjustment on the spout by means of a regulating-screw C^2, which works in a suitably-fixed bearing on the frame A and in a lug *c*, fixed to the side of the spout. (See Fig. I.) As it may sometimes be desirable to change the inclination of the vibrating shoe, I provide the sleeve C′ with the means for adjusting it vertically; or this sleeve may be adjusted to permit a larger or smaller quantity of matter to pass through to the shoe.

E is the suction-fan inclosed within a suitable casing *e*, which is mounted on the main frame A above the vibrating shoe, and with the chamber of the fan-casing communicates a chamber F, formed by a casing *f*, Fig. 1, which is suitably secured to said frame A.

G is an enlarged air-chute, which is of greater cross-sectional area than the primary air-conduit B′. This air-chute is arranged at one side or in the rear of the primary conduit B′ and also in rear of the secondary air-conduit H, which conduits B′ H are arranged vertically side by side in front of the enlarged chute G, and they are both substantially the same in size. (See Fig. III.) The air-chute G has its upper end enlarged to form a chamber G′, and between this chamber G′ and the chamber F is a vertical partition *g*, which extends below the bottom of the casing *f* for a short distance, as at *g′*, the upper end of the vertical partition *g* terminating below the top of the chute G to leave a passage or opening *i* between the two chambers F G′ for the passage of the air-current from the conduit B′ to the suction-fan. The size of the opening or passage *i* between the chambers G′ F can be varied by means of a blast gate or valve I, which is suspended from the top of the chute G and held in place by means of a set-screw I′, which is readily accessible from the outside of the chute, as shown in Fig. II. The lower portion of the air-chute G is contracted and tapered to form a discharge-spout g^2, and within this contracted end g^2 of the air-chute is an automatic valve G^2, which is hinged to one side of the chute and arranged in a vertically-inclined position to close the lower end of the chute when the suction-fan is in operation, said valve G^2 being automatically operated by the weight of the grain which is precipitated through the chute G on its way to the scouring mechanism, as will be hereinafter more fully described. The upper end of the secondary air-conduit H opens directly

into the chamber F at a point in rear of the passage *i* leading from the enlarged chamber G′ to the chamber F; but the primary air-conduit B′ does not communicate directly with the chamber F, although it has indirect communication with said chamber F through the medium or interposition of the enlarged chamber G′, with which chamber G′ the primary air-chute B′ has direct communication by an opening or slot *b′*, (see Fig. II,) located in the upper end of the air-conduit at one side of the depending lower end *g′* of the vertical partition *g*, between the chambers F G′. (See Fig. II.)

In the practical operation of the machine the current of air having the greatest volume and force is produced in the primary conduit B′, as the valve G^2 closes the air-chute G when the fan is in motion and the valve H′ is properly adjusted in the conduit H, and such current in this primary conduit B′ is of sufficient strength to carry upward the kernels of grain deposited in the conduit from the cleaning screen or sieve. The small gravel which is delivered into the primary conduit along with the grain is separated from the kernels of the grain in the primary conduit, owing to the fact that the gravel is of greater specific gravity than the kernels of grain and the air-current in such primary conduit is of sufficient strength to carry the grain up the conduit. Thus the small gravel is discharged from the lower end of the primary conduit B′, while the grain is carried up the primary conduit by the air-current through the opening *b′* and delivered into the enlarged chamber G′ of the chute G. As the chamber in this chute is of greater cross-sectional area than the area of the primary conduit, the strength of the air-current from the primary conduit in passing from the primary conduit through the chamber G′ is weakened or diminished and thus rendered of insufficient strength to sustain and carry with it the kernels of grain and thus fall by gravity toward the tapered end g^2 of the chute and lodge upon the valve G^2 therein until they are deposited into the scouring mechanism J, indicated in Fig. II and shown in detail in Fig. VII. The depending end *g′* of the vertical partition *g* operates in a measure to deflect the grain held in suspension in the air-current, and as the current of air is compelled by the partition *g g′* to take a circuitous course through the enlarged chamber G′ before it reaches the chamber F, the necessary dimunition in the strength of the current is made possible. At the same time the current of air, taking the circuitous or irregular course through the primary conduit, the enlarged chamber G′, and the chamber F, is of sufficient strength to carry off with it the light particles of dust, &c., that are apt to pass with the grain and gravel into the primary conduit B′. The current of air drawn by the fan through the secondary air conduit is regulated by the blast-gate or valve H′ (seen in Fig. III) to such strength or force that the air-current therein will carry up the light matter from the scouring mechanism J, but the air-current in H will not carry up said secondary conduit the cleaned grain conveyed by the delivery-spout 30 (shown in Fig. II) from the scourer into the secondary conduit H. The scourer J is shown in detail in Fig. VII of the drawings, and it comprises a shaft 20, journaled in a long bearing (or two bearings may be used,) a grain-receptacle 21, arranged below the discharge end g^2 of the enlarged air-chute, a stationary case or shell 23, having an axial inlet opening 24, a feed-screw 25, carried by the shaft 20 and operating in the grain-receptacle to positively force the grain into the casing or shell, and a disk 26, fixed to the shaft within the case or shell and carrying the beaters or blades 27, arranged to operate in the compartments 28 formed in the case or shell by a series of concentric partitions 29, fixed to one side of the case or shell.

The construction of the scourer is not claimed, specifically, in this application, as it forms the subject-matter of a separate application (case D) filed by me of even date herewith, and bearing Serial No. 387,399, for improvements in grain scourers, to which application reference is made for a fuller explanation of the scourer.

The case or shell 23 of the scourer has the discharge-spout 30, (see Fig. II,) which opens into the lower end of the secondary air-conduit H, and the partitions 29 of the said shell or case have openings which are arranged out of line to cause the grain to travel or move around in each compartment before passing into the other compartments successively by the action of the feed-screw and the beaters upon the grain in the receptacle or hopper and the compartments of the case or shell, and the incoming grain crowds upon and pushes the grain in and through the central compartment of the scourer to the discharge-spout 30. The disk 26 moves with the shaft 20, and the beaters act on the grain to remove the thin skin or coating therefrom and effectually clean the grain by the time it is discharged into the secondary air-conduit. The power is applied by a belt 31 to a belt-pulley 32, fixed to the end of the screw-shaft 20, Fig. VII, and the other end of this shaft 20 has a smaller pulley 33, (indicated by dotted lines in Fig. I,) from which a belt 34 runs to a pulley 35 on the shaft D to operate the latter shaft and the vibrating screen, the fan E being driven by a belt 36, which passes around pulleys 37 38, respectively, on the fan-shaft D.

The operation of my invention may be briefly summarized, as follows: The unclean buckwheat or grain is conveyed by the chute C to the vibrating shoe B, which is reciprocated rapidly from the shaft D. The sand and dirt pass through the screen 7 into and through the compartment 4, the grain and small gravel pass into and through the compartment 5, and the twigs and other refuse

too large for the screen 8 pass over the end of the shoe into the spout 11. The sand and dirt are discharged from the spout 10, Fig. IV, the twigs and other large refuse from the spout 11, and the grain and small gravel are deposited into the primary air-conduit B′. The small gravel or other heavy material is separated from the grain in the conduit B′ and gravitate through the open lower end thereof, while the grain is carried by the blasts of air upward through the conduit into the enlarged chamber G′, in which chamber the grain is precipitated into the hopper 21 (see Figs. II and VII) of the scourer, the air-current from the conduit B′ carrying off the light particles of dust through the chamber G′ into the chamber F, thence to the fan. The grain is positively forced or conveyed into the scourer by the screw-conveyer, and then positively forced through the successive compartments therein, in which it is cleaned by the action of the beaters or blades, and, finally, the grain is delivered into the secondary conduit H, and gravitates into a suitable receptacle, while the light particles and dust from the scourer are carried by the air-current through the conduit H into the chamber F, and thence to the fan.

I am aware that modifications in the form and proportion of parts and details of construction can be made in many instances without departing from the spirit or sacrificing the advantages thereof, and I would therefore have it understood that I hold myself at liberty to make such changes and alterations as fairly fall within the scope of my invention.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a grain separator and cleaner, the combination of a primary vertical air-conduit open at its lower end, the cleaning shoe or screen discharging into said conduit, a scourer, a vertical valved secondary air-chute arranged above the scourer to deliver directly thereto and having the enlarged chamber at its upper end, which communicates directly with the primary air-conduit, and the suction-fan communicating with said chamber of the secondary air-conduit, substantially as described.

2. In a grain separator and cleaner, the combination of a cleaning shoe or screen, a primary air-conduit, a scourer, the valved chute arranged to precipitate the cleaned grain into the scourer and receiving directly from the primary air-conduit, a secondary air-conduit receiving from the scourer, and a suction-fan communicating with both the secondary valved chute and the secondary air-conduit to exhaust the dust and light particles from the same, substantially as described.

3. In a grain separator and cleaner, the combination of a cleaning shoe or sieve, a primary air-conduit, a scourer, the valved chute having the enlarged chamber and receiving from the primary conduit and adapted to precipitate the grain into the scourer, the secondary air-conduit receiving from the scourer, a suction-fan, and an air-chamber F intermediate of the fan and the chute and secondary air-conduit, substantially as and for the purpose set forth.

4. In a grain separator and cleaner, the combination of a cleaning shoe or sieve, the valved air-chute having the enlarged chamber at its upper end, the air-chamber F, separated from said enlarged chamber of the chute by a partition, the primary conduit receiving from the sieve or shoe and opening into the chamber of the chute below the chamber F, and the fan, substantially as and for the purpose set forth.

5. In a grain separator and cleaner, the combination of a vibrating cleaning-shoe, the vertical valved chute having the enlarged chamber at its upper end, the primary air-conduit opening into said chamber of the chute, the air-chamber F, separated from the enlarged chamber of said chute by a partition, the deflector situated in front of the opening between the primary conduit and the enlarged chute-chamber, and the fan, substantially as and for the purpose set forth.

6. In a grain separator and cleaner, the combination of a cleaning shoe or sieve, the vertical primary air-conduit, the vertical valved chute having the enlarged chamber and receiving from said conduit, the air-chamber F, separated by a partition from the chute-chamber, a blast-valve for opening or closing the opening between the chute-chamber and the chamber F, the scourer, the secondary air-conduit receiving from the scourer and opening into the chamber F, means for regulating the blast in the secondary conduit, and the fan, substantially as and for the purpose set forth.

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

HENRY H. RING.

Witnesses:
D. B. DYKINS,
JOHN WALDRON.