

(No Model.)

5 Sheets—Sheet 1.

H. A. BARNARD, J. B. CORNWALL & J. S. LEAS.

GRAIN SEPARATOR.

No. 256,097.

Patented Apr. 4, 1882.

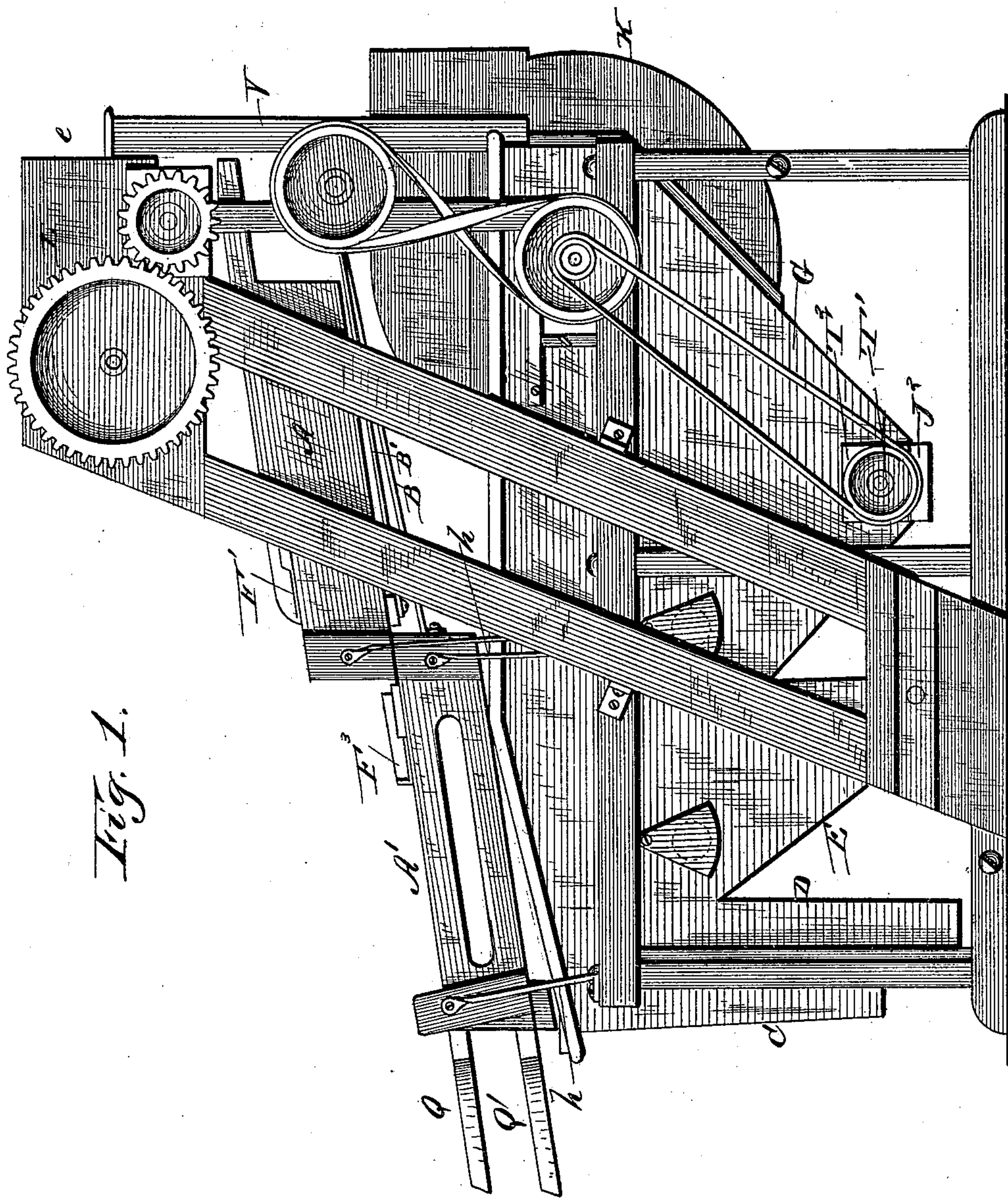


Fig. 1.

Witnesses:  
A. C. McArthur,  
W. R. Keyworth.

Inventors:  
H. A. Barnard,  
J. B. Cornwall,  
J. S. Leas

Per J. A. Alexander  
Attorney.



(No Model.)

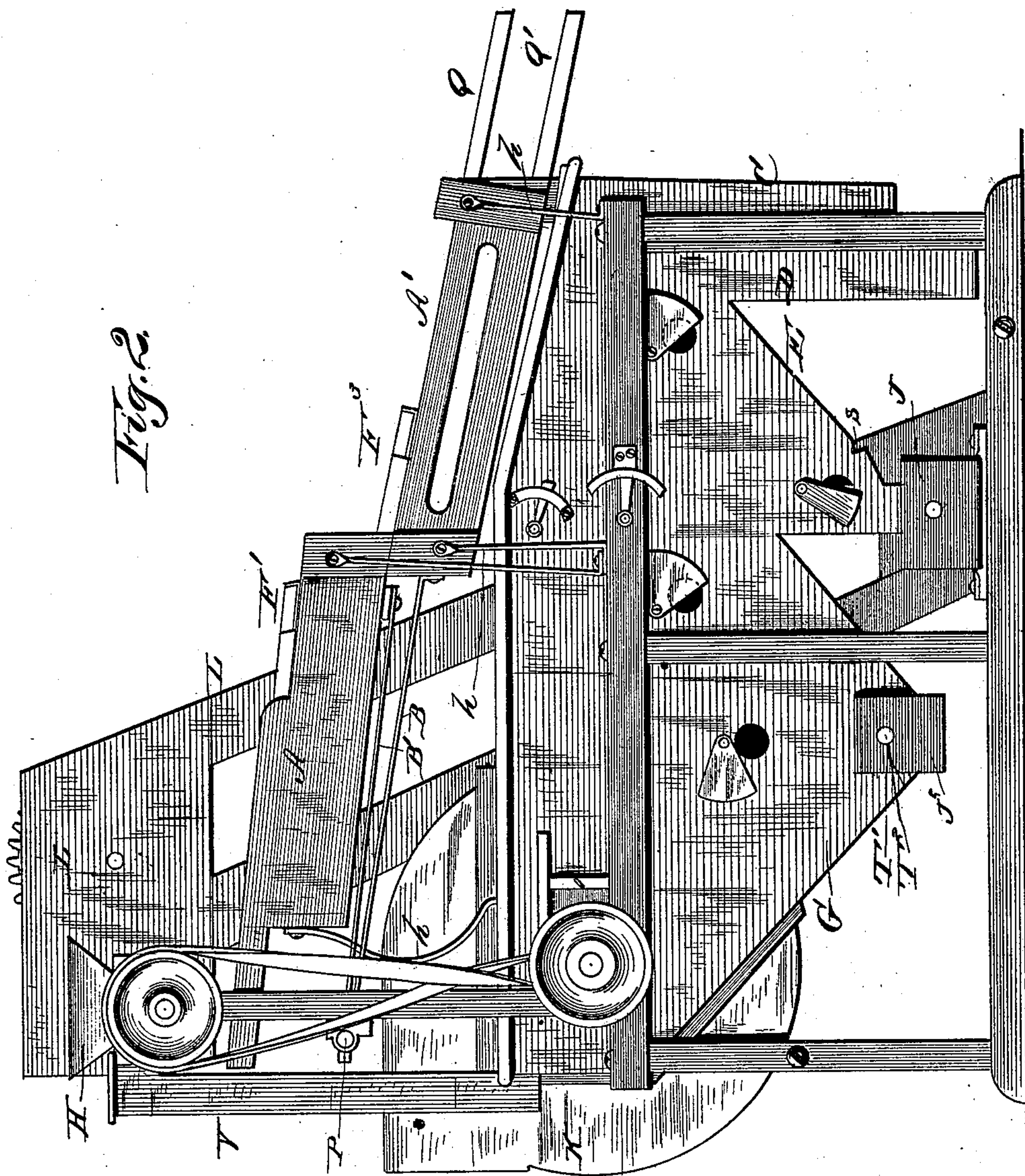
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Witnesses:

M. C. W. Arthur,  
W. R. Keyworth.

Inventors:

A. A. Barnard  
J. B. Cornwall  
J. S. Leas,

Per.

W. Alexander  
Attorney



(No Model.)

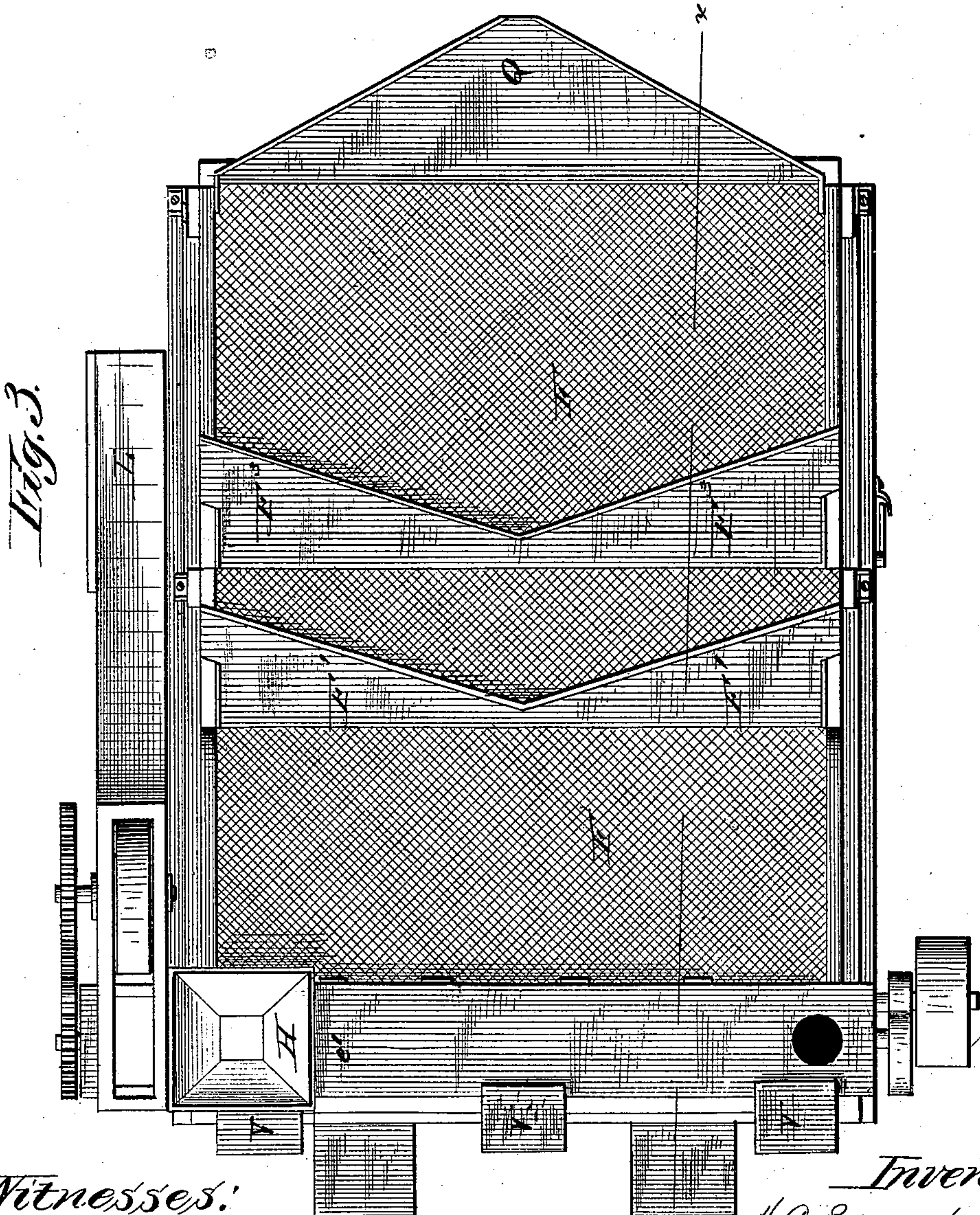
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*H. C. McArthur.*  
*W. R. Keyworth.*

*Inventors.*

*H. A. Barnard.*  
*J. B. Cornwall*  
*J. S. Leas*

*Per* *M. Alexander*  
*Attorney.*



(No Model.)

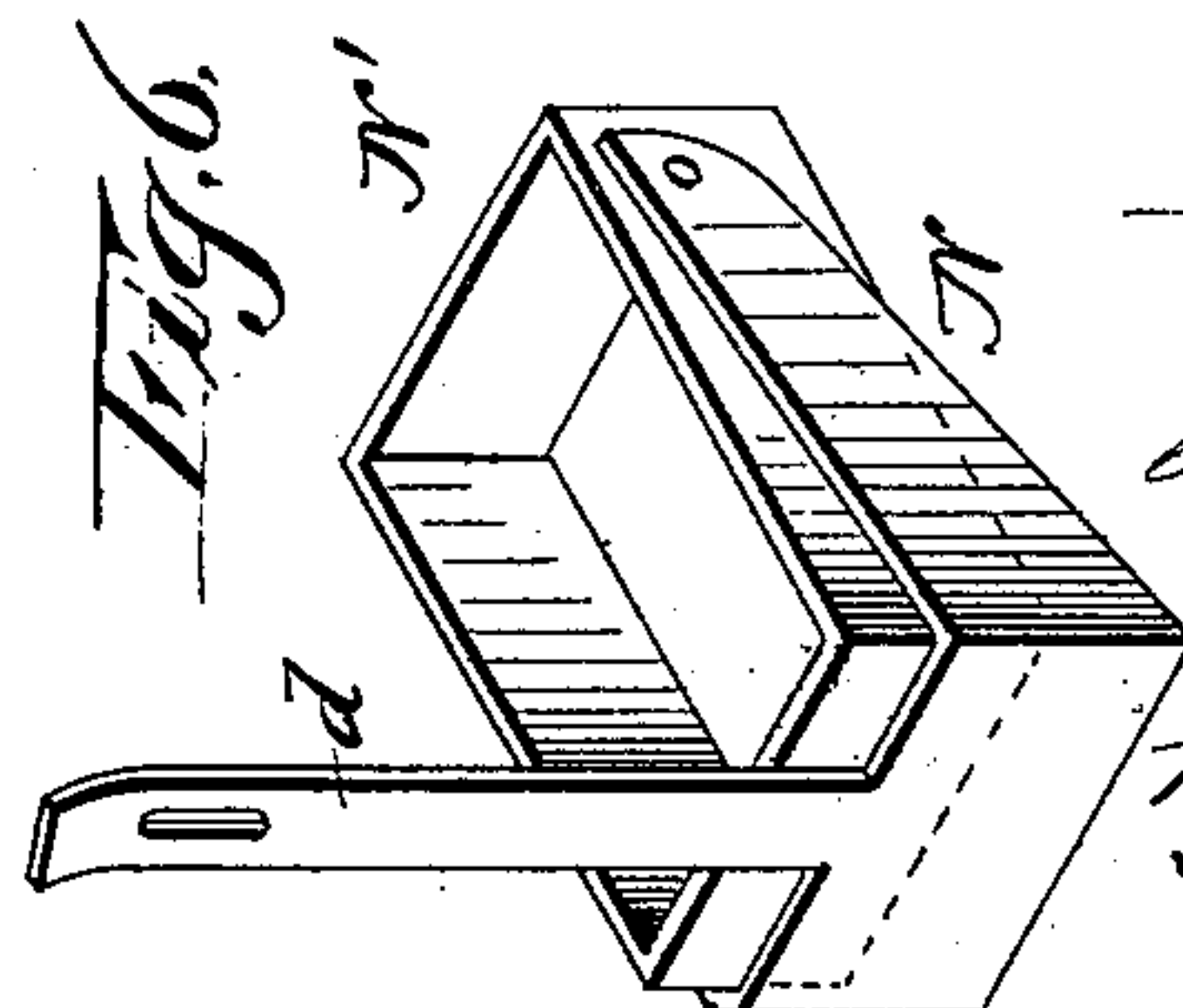
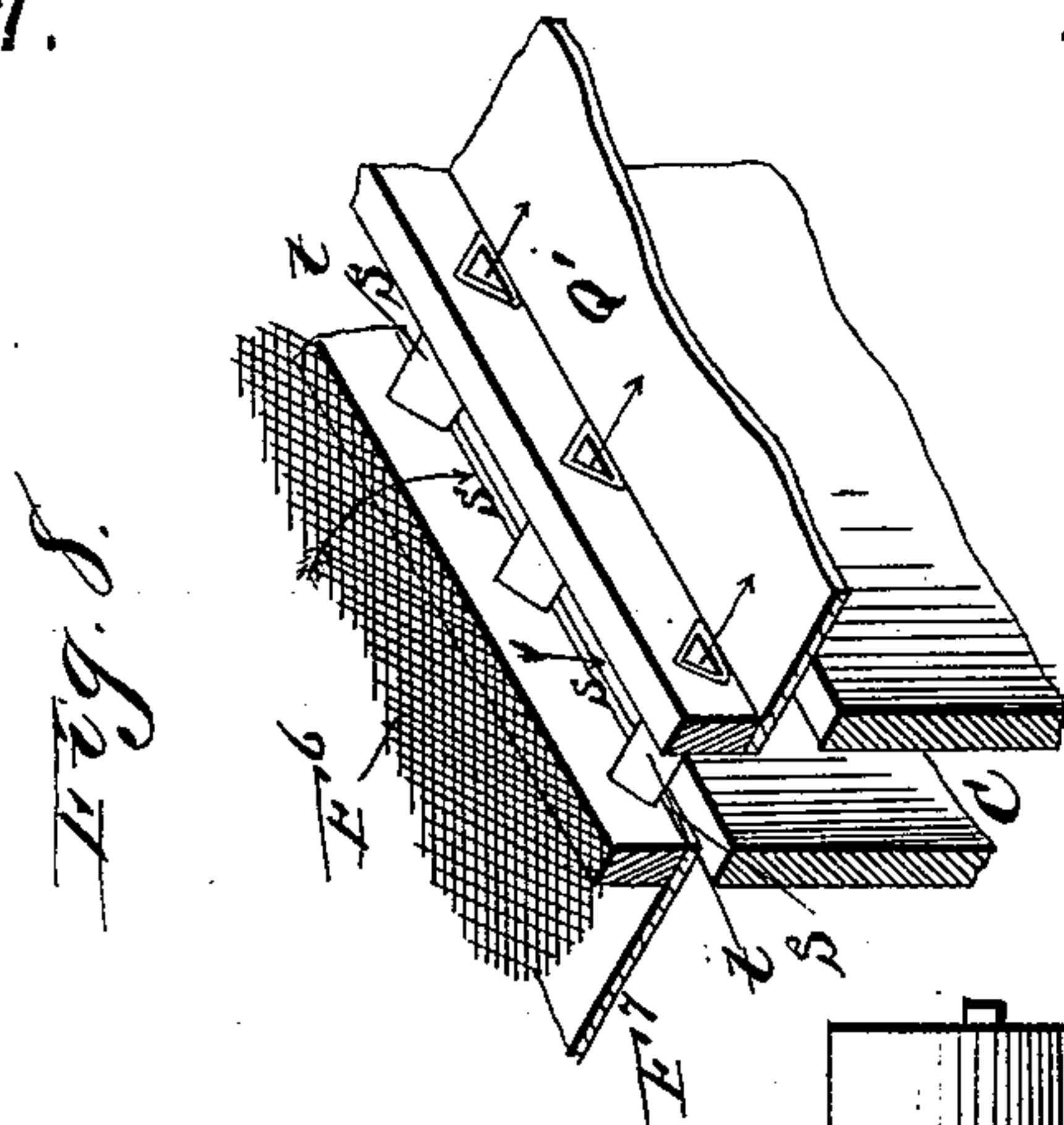
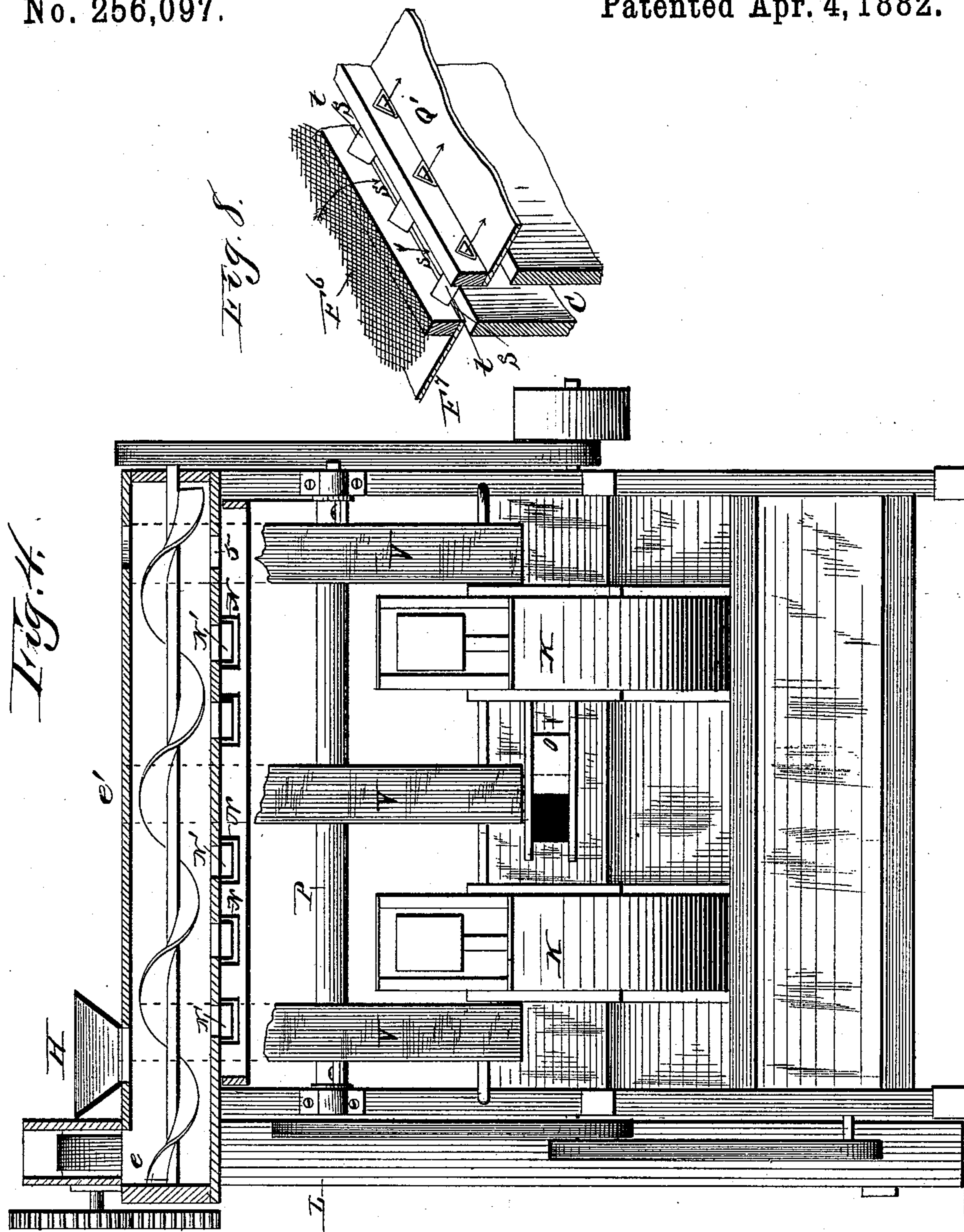
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H. C. McArthur,  
W. R. Keyworth.

Inventors:  
H. A. Barnard  
J. B. Cornwall  
J. S. Leas.

per  
H. Alexander  
Attorney.

(No Model.)

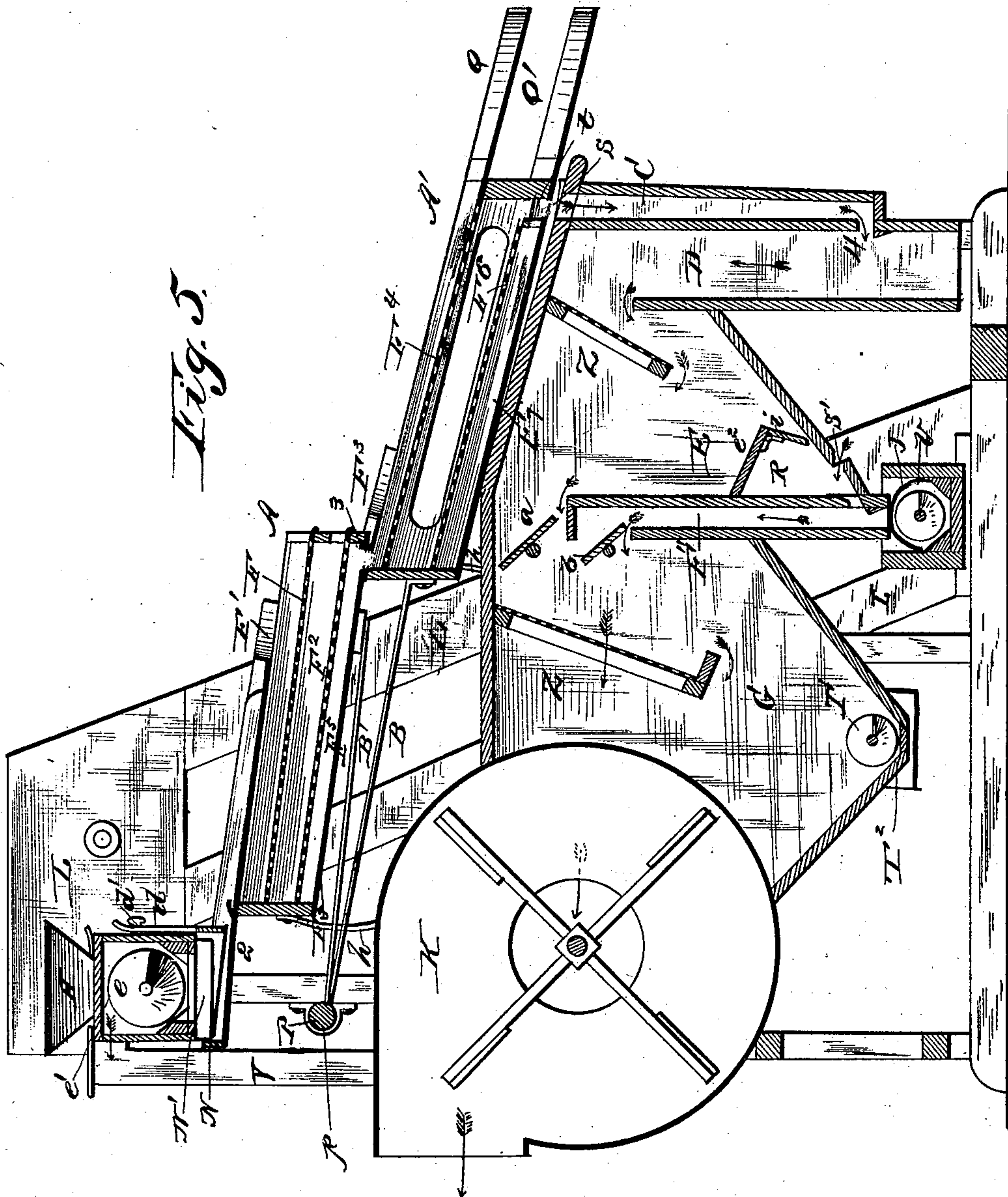
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H. A. BARNARD, J. B. CORNWALL & J. S. LEAS.

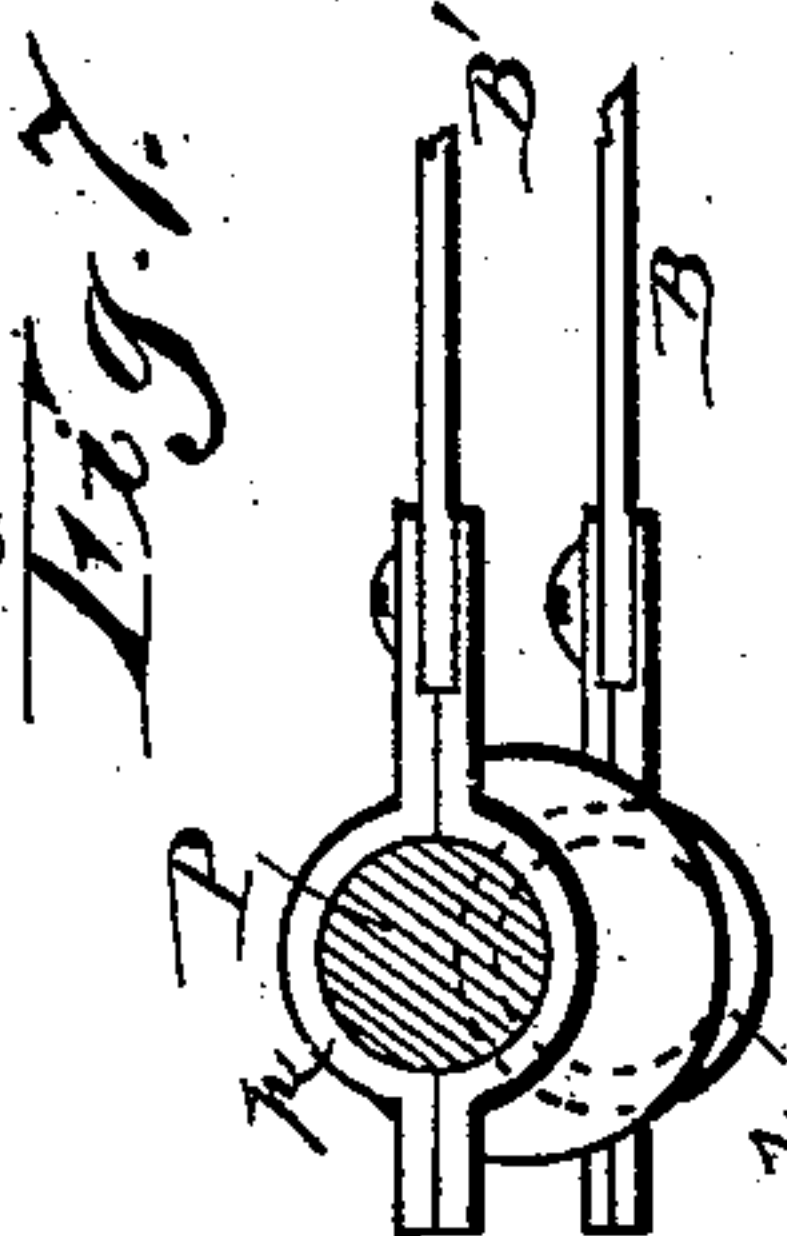
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*H. C. McArthur*  
*W. R. Keyworth*



*Per*

*Inventors.*  
*H. A. Barnard*  
*J. B. Cornwall*  
*J. S. Leas*  
*W. Alexander*  
*Attorney.*



# UNITED STATES PATENT OFFICE.

HEMAN A. BARNARD AND JOHN B. CORNWALL, OF MOLINE, AND J. SILAS LEAS, OF ROCK ISLAND, ASSIGNORS TO THE BARNARD & LEAS MANUFACTURING COMPANY, OF MOLINE, ILLINOIS.

## GRAIN-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 256,097, dated April 4, 1882.

Application filed November 21, 1881. (No model.)

*To all whom it may concern:*

Be it known that we, HEMAN A. BARNARD and JOHN B. CORNWALL, of Moline, Rock Island county, State of Illinois, and J. SILAS LEAS, of Rock Island, in the county of Rock Island and State of Illinois, have invented certain new and useful Improvements in Grain-Separators; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon, which form part of this specification.

The objects of our invention are to provide certain novel improvements in machinery for separating, grading, and cleaning wheat, barley, and other cereals, whereby the same can be separated from the screenings and different grades of grain can be obtained in a more effective manner than heretofore, which objects we attain by means of shakers provided with sieves and operating in opposite directions, in connection with air-blasts at the top and bottom of the machine; also by means of a novel arrangement of air-passages, trunks, separating and return conveyers, and regulating-valves, arranged and operating as will be hereinafter specified.

In the annexed drawings, Figure 1 is an elevation of one end of the separator. Fig. 2 is an elevation of the opposite end of the separator. Fig. 3 is a top view. Fig. 4 is an elevation of the feed end of the machine, showing portions of the air-trunks broken away, and a vertical section through the conveyer-box *e'*. Fig. 5 is a section taken vertically and longitudinally through the machine in the plane indicated by dotted line *x x* on Fig. 3. Fig. 6 is a perspective view of one of the adjustable feeders of the conveyer-box *e*. Fig. 7 is a cross-section through the shaft *P*, showing two of the cranks or eccentrics which actuate the shakers or screen-boxes, also portions of the connecting-rods. Fig. 8 is a view in detail, showing the tubes *t* for conveying off the cockle, trash, &c., from the lower end of the screen-box *A'*.

*A A'* designate two shakers mounted on flexible supports *h*, and arranged in different inclined planes in close relation to each other.

Each shaker is provided with one or more screens, which are preferably removable. It will be seen that the wheat, &c., pass directly from the lower end of one shaker upon the upper end of the lower shaker, the oats, sticks, straws, &c., passing off laterally by means of guides. (Shown in Fig. 3.) The two shakers *A A'* are moved in opposite directions by means of rods *B B'*, which connect them to eccentric-straps applied around cranks or eccentrics *p* on a horizontal transverse shaft, *P*, said cranks or eccentrics being so arranged upon their shaft that while those which control the motions of one shaker are moving it forward those which control the motions of the other shaker will be moving it backward.

It will be seen that instead of using a single shaker of a given screening capacity we employ two shakers, counterbalanced as described, to which a high rate of speed can be given, for the reason that the momentum or jar of one shaker will be neutralized by the other shaker. Hence there will be no liability of breakage from concussion, and the shakers operate to a better advantage for removing oats from spring wheat. It enables us to increase the area of the sieve-surface and enlarge the discharge-spout without detriment to the smooth and fast motion so essential in removing oats from spring wheat. It also enables us to use a finer or smaller hole in the sieves in a machine of any given capacity than we could use in the non-balancing shakers, and also to discharge the grain in a wider stream, thus making the shakers contribute to the efficiency of the air-separation. The jar or concussion incident to reversing the motion of a shaker vibrating five hundred to five hundred and fifty times per minute causes the grain, oats, and short pieces of bitter or rosin weed to jump or bound on the sieves, and thus pass through the holes with the grain. By using the counterbalancing-sieves this is avoided and the efficiency and usefulness of the machine much increased, also its durability, and power is saved in operating it. The wheat, mixed with impurities, enters the hopper *H* at that end of the feed-conveyer box *e'* which is next to an endless elevator, *L*, and is moved across the machine by the screw-conveyer *e*, and drops out of the



box  $e'$  at intervals through chutes  $N'$ , so that it will be delivered evenly on the shaker A.

The conveyer-box  $e'$  is covered and made tight, except the openings for the admission of air and for the admission and discharge of the grain, so as to form an air-chamber. Openings are made in the side thereof, connecting by means of the air-ducts  $V V V$  with the chamber G. The action of the fan causes air-currents to descend from the conveyer-box  $e'$  through these air-ducts  $V V V$  to the chamber G, carrying with them the dust and other light particles from the grain and depositing them in said chamber G, while the dust is drawn into the fan and blown outdoors through a dust-spout, or into a dust-room, as may be desired; or, without departing in the least from the spirit of our invention, a hopper may be used for spreading the grain, instead of the conveyer, which will discharge the grain therefrom into an air separating trunk, where it will be acted on by the air, and from which it is discharged direct onto the first shaker, A.

The discharge of the wheat and impurities from the box  $e'$  is regulated by vertically-adjustable feeders N, hereinafter described.

The wheat sifts through the receiving coarse screen F of the upper shaker, and the straw, weeds, &c., pass off laterally from the chutes  $F'$  thereof. The material which falls on a wheat-screen,  $F^2$ , in this upper shaker is again cleaned and falls on an imperforated plate,  $F^5$ , from which it is discharged through an opening, 3, upon the top screen of the second shaker. This lower or second shaker,  $A'$ , is provided at its upper end with lateral chutes  $F^3$ , which catch and carry off the oats and other foreign matter that fall from the tails of the two screens of the upper shaker.

The lower or second shaker,  $A'$ , is provided with a top screen,  $F^4$ , which discharges its oats, trash, &c., on a tail-chute, Q, and a bottom cockle-screen,  $F^6$ , which discharges the cockle on a board,  $F^7$ , the wheat passing from the lower end of this screen  $F^6$  and falling through openings  $s$  between tubes  $t$  into the vertical box C, as indicated by the arrows in Figs. 5 and 8. The cockle which escapes through the screen  $F^6$  and falls on the board or plate  $F^7$  escapes therefrom through the tubes  $t$  onto a chute,  $Q'$ .

The wheat passes into the vertical bottomless trunk D through an opening, 4, and is subjected in this trunk to a strong upward current of air induced by fans in fan-cases K, and controlled by a valve,  $a$ , which can be opened sufficiently to admit a current of air strong enough to lift out all of the impurities lighter than the wheat remaining in the wheat, which impurities will pass into the screenings-box E, the lighter materials passing over into the screenings-box G and the dust passing into and through the fan-cases K. There are openings in the centers of these cases opening into the box G, which allow the dust to be carried off, as above stated.

If any good wheat is drawn out of the trunk

D with the impurities, it will pass into the screenings-box E with the heavier screenings, so that it can be recleaned at the bottom of the separating-trunk  $F''$  by an upward current of air controlled by a valve,  $b$ , arranged below valve  $a$ , from the lower end of which trunk the wheat will fall into the conveyer-trough J. The screw-conveyer in this trough will deliver the wheat, with some impurities, into an elevator, L, through an opening,  $v$ , which by means of the well-known endless carrier therein will carry the wheat, &c., into the feed-conveyer box  $e'$ , to be re-treated.

Between the separating-trunk  $F''$  and the screenings-box E is a chamber, R, formed by a partition,  $e^2$ , and provided with a self-acting hinged valve,  $i$ . A space,  $s'$ , is left just below the valve  $i$ , as shown in Fig. 5, for the admission of air-currents to carry off any dust and other light particles from the wheat while it flows from chamber R into the lower end of the trunk  $F''$ . This chamber R, with its trap-valve and air-passage, allows the wheat which falls from box E to be partially cleaned by air-currents on its way to the conveyer-trunk J.

In machines of this character heretofore made the fan or fans would draw the air through the screenings-box E into the trunk  $F''$  along with the screenings; but by the above arrangement of parts they will be kept separate, and we are able to control the operation of the same by the valve  $b$ .

The box G, into which the screenings pass from the upper end of the separating-trunk  $F''$  and box E, has a small conveyer-screw,  $T'$ , at its bottom, which delivers the screenings not carried off by the fans out at one side of said box G, where they can be collected in a suitable receptacle. By crossing the belt which rotates this screw  $T'$  the screenings can be discharged from the opposite side of the box G. Both discharge-openings at the ends of screw  $T'$  are provided with chambers  $T^2$  and hinged valves  $J^2$ , the latter being arranged to open by the pressure of the screenings, so that while said valves permit the exit of the screenings, air will be prevented from entering unduly.

The feed-conveyer box  $e'$  is arranged across and far enough above the upper vibrating shaker, A, to allow the feeders  $N'$  to be raised and held up by means of slotted straps  $d$  and set-screws  $d'$ , so as to leave openings which will admit the escape of the wheat, &c., assisted by the vibrations of the imperforated plate 2 of the shaker. The higher the feeders N are raised the more space is afforded for the passage of the grain, &c., from the box  $e'$ , and the faster will be the feed.

It will be seen by reference to Fig. 4 that the hole 5 at the end of box  $e'$  farthest from the hopper H has no feeder. This hole 5 is large enough to allow all of the wheat, oats, straw, &c., not fed out at the other discharge-openings in box  $e'$  to fall upon the upper part of the shaker A, thus preventing choking at this end of the box  $e'$ . The said hole should be large enough to allow the escape of bunches



of straw or other substance too large to pass through the feeders N.

The feeders N are preferably larger in area than the openings through the bottom of the box *e'*, and they are applied to move freely on the chutes N'. To obtain the proper amount of feed the feeders N are only slightly raised above the shaker-plate 2, so that the wheat will flow into these feeders faster than it can pass out, which causes it to fill up the space in the feeders and back up to the conveyer-screw *e*, thus keeping the box *e'* properly filled. This will keep bunches of straw or other large substance from passing down into the feeders, which substances will be moved to and discharged through the opening 5. The feeders N do not vibrate with the shaker A, and their edges are inclined to correspond to the inclined plane of the extension 2 of this shaker. Each feeder N is hinged at one end to a chute, N', and made adjustable by means of the strap *d* and set-screw *d'*, described above.

The operation is briefly as follows: The wheat, with its impurities, is received at the end of the conveyer-box *e'* next to the return-elevator L, and while being conveyed across the machine the dust is removed by the action of the fans by means of the air-passages V. It is then distributed evenly upon the upper part of the shaker A. After the wheat is partially cleaned by passing through the sieves in the two shakers A A' it flows down the passage C into the separating-trunk D, where it is subjected to the action of the air-currents, the force of which is regulated by adjusting the valve *a*. Here nearly all remaining impurities are drawn out, and if it is desired to raise the grade the blast is made strong enough to take out sufficient small grain, &c., to get the clean grain to weigh up to grade. The lightest screenings pass through into the box G, while the heavier fall into the box E and pass into the separating-trunk F'' and are recleaned. The best material falls down into the conveyer-box J, and is returned to the box *e'* again by the elevator L. The lighter material is drawn up into the box G and discharged therefrom by the conveyer-screw T'. It will be seen that we arrange in each one of the screenings-boxes an inclined reticulated deflector, Z, which directs the screenings downward, but allows the dust to pass directly through it, induced by the force of the air-currents.

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

1. The combination of the screenings-box E, the separating-trunk F'', the division *e*<sup>2</sup>, and valve *i*, forming a chamber, R, which communicates with the lower part of said trunk, the air-inlet *s'*, and a conveyer, substantially as described.

2. The combination, with the separating-trunk F'' and the screw-conveyer at the lower end thereof, of the elevator L and the feed-conveyer box *e'* and screw-conveyer therein, substantially as described.

3. The combination of the feed-conveyer, the screenings-box G, the fans, and air-passages V, leading from the said screenings-box to the feed-conveyer box, substantially as described.

4. The combination of the feed-conveyer, the adjustable feeders thereof, the shakers A A', the down-passage C, the trunk D, screenings-box E, trunk F'', conveyer J, and the elevator leading up to the said feed-conveyer, substantially as described.

5. The combination of the feed-conveyer having the chutes N', the adjustable pivoted feeders N, attached thereto, and reciprocating shakers or screen-boxes, substantially as described.

6. The combination of the screenings-boxes E G, the downflow-passage C, the bottomless trunk D, the separating-trunk F'', having a passage near its lower open end, the chamber R, the valves *a b*, and a fan, substantially as described.

7. The combination of a feed-conveyer, two alternately-reciprocating screen-boxes or shakers provided with laterally-discharging chutes and arranged in close relation to each other, an elevator, the means for supplying the material to this elevator, a downflow-passage, a bottomless trunk, two screenings-boxes, a separating-trunk, and one or more fans, substantially as described.

In testimony that we claim the foregoing as our own we affix our signatures in presence of two witnesses.

HEMAN A. BARNARD.  
JOHN B. CORNWALL.  
J. SILAS LEAS.

Witnesses:

J. S. GILLMORE,  
FRANK H. HEAD.