No. 743,574. PATENTED NOV. 10, 1903.

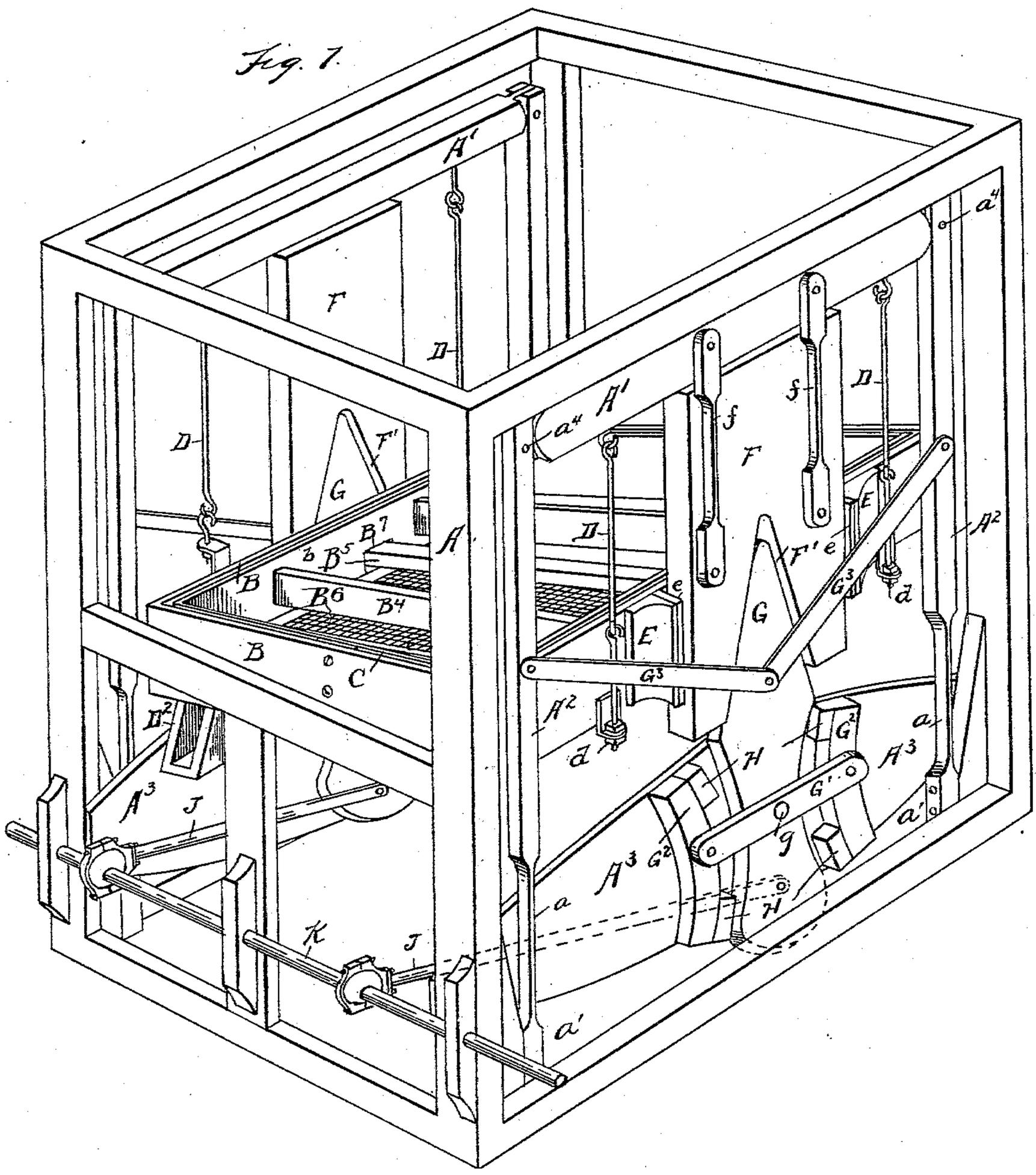
D. SEWELL.

SEPARATING AND GRADING MACHINE.

APPLICATION FILED NOV. 14, 1899.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



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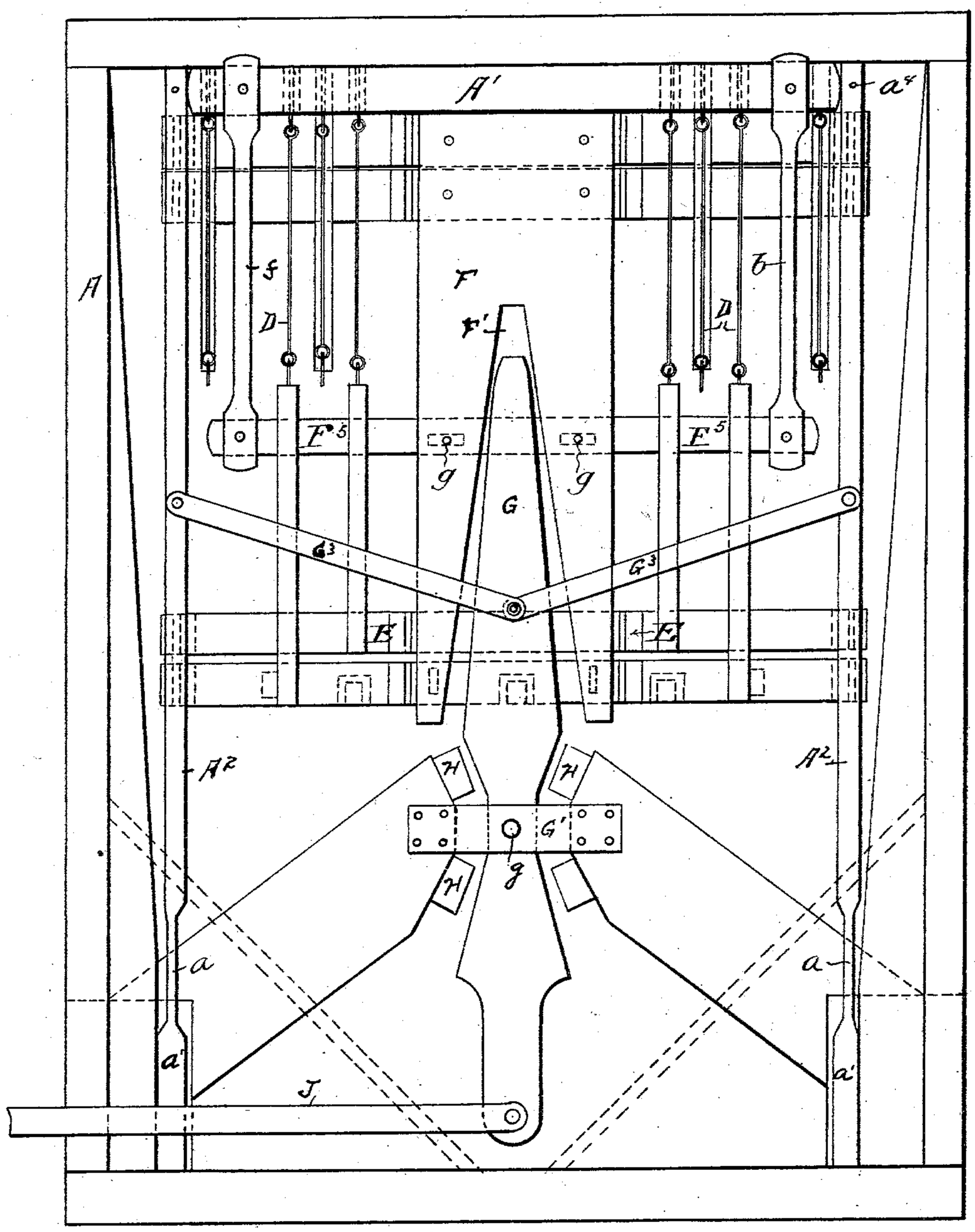

Fig. 2.

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NO MODEL. 5 SHEETS—SHEET 3.

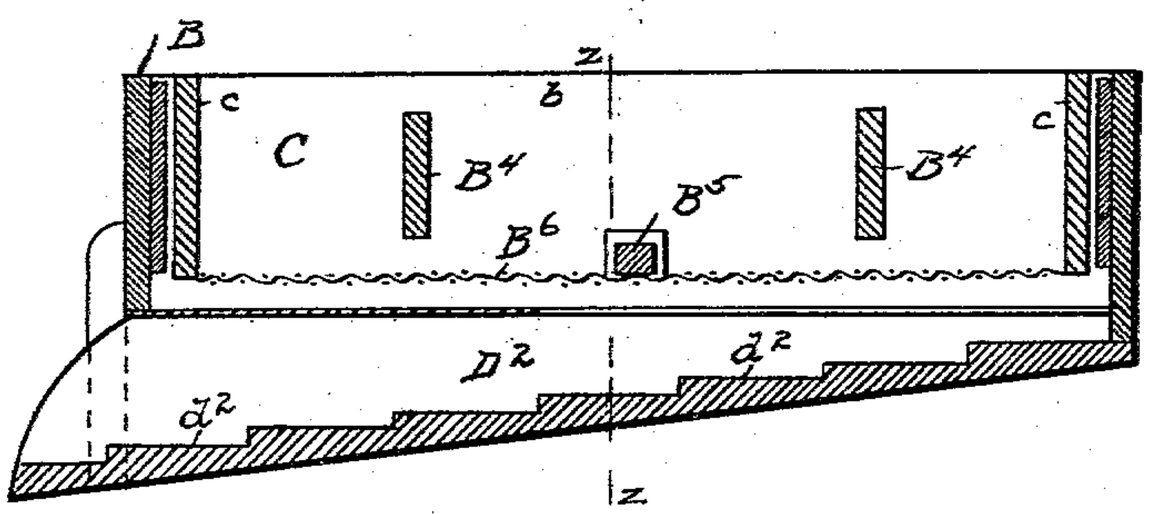


Fig. 4.

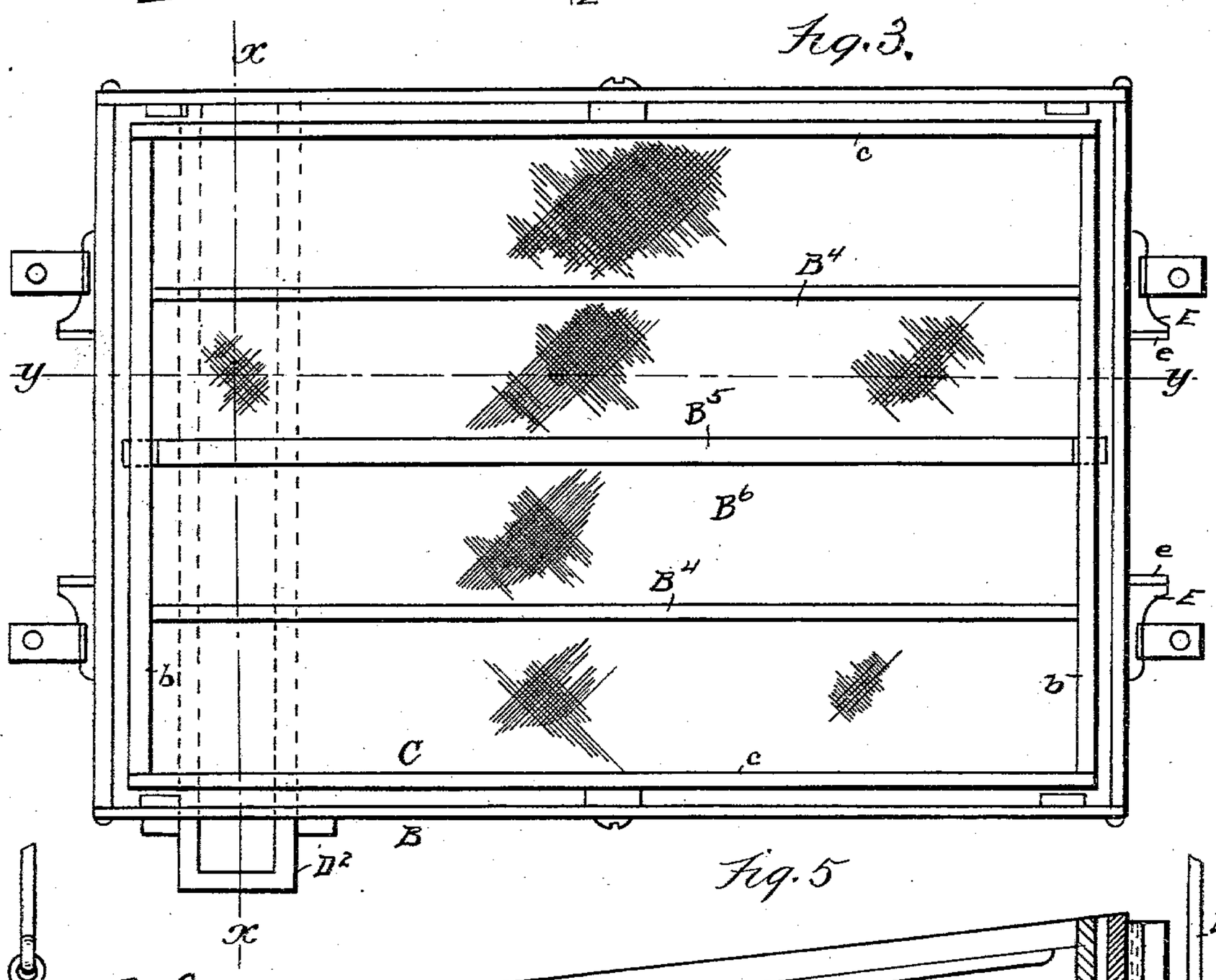


Fig. 3.

Fig. 5

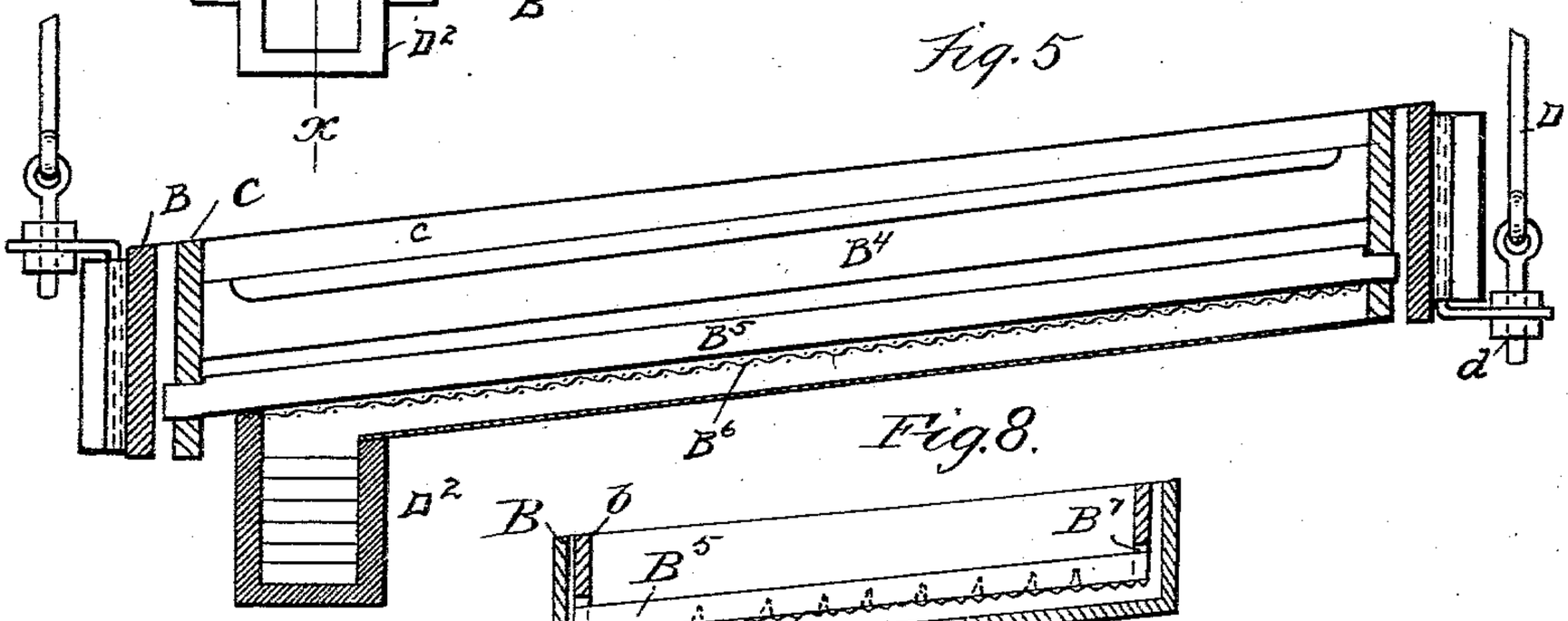
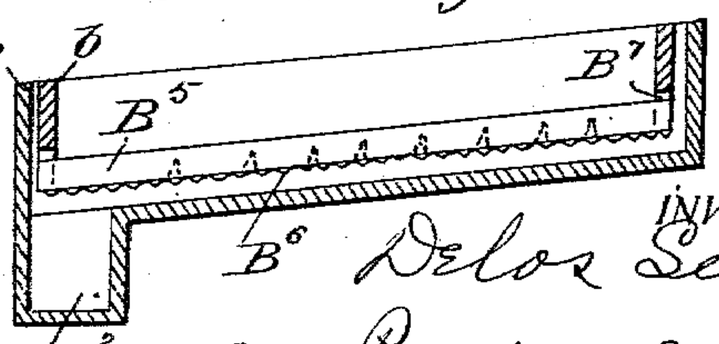


Fig. 8.



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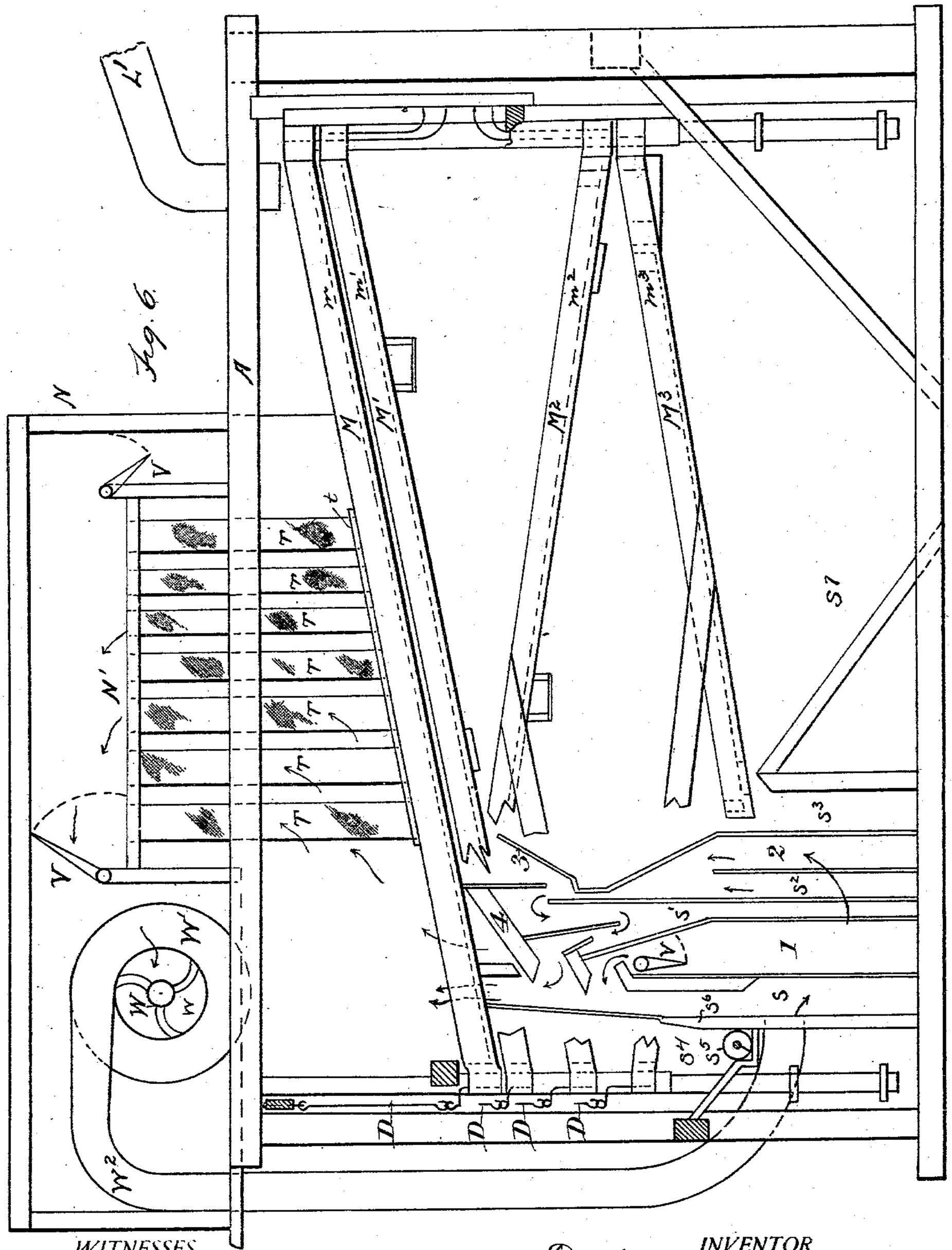
NO MODEL. 5 SHEETS—SHEET 4.



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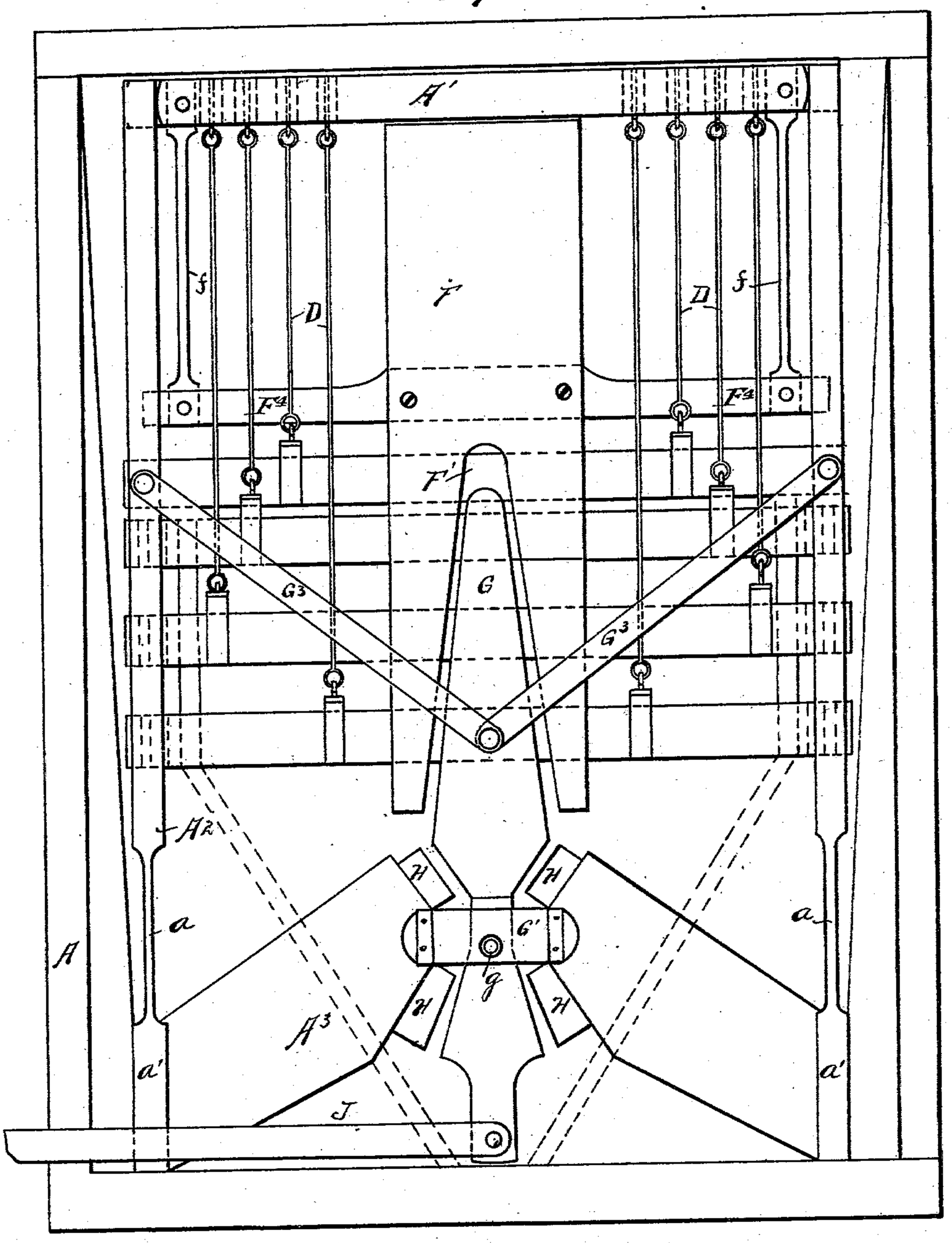
NO MODEL. 5 SHEETS—SHEET 5.

Fig. 7.



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No. 743,574. Patented November 10, 1903.

UNITED STATES PATENT OFFICE.

DELOS SEWELL, OF HILLSDALE, MICHIGAN.

SEPARATING AND GRADING MACHINE.

SPECIFICATION forming part of Letters Patent No. 743,574, dated November 10, 1903.

Application filed November 14, 1899. Serial No. 736,937. (No model.)

To all whom it may concern:

Be it known that I, DELOS SEWELL, a citizen of the United States, residing at Hillsdale, county of Hillsdale, State of Michigan, have invented a certain new and useful Improvement in Separating and Grading Machines; and I 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 pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to separating devices for extracting or separating particles of ground grain; and it consists in the various novel features of the construction and combinations hereinafter pointed out and claimed.

In the drawings, Figure 1 is a perspective view of my separating device with the casing removed and with only one sieve shown. Fig. 2 is a right-hand end view of the machine with the same interior construction, but with slight modifications in the mode of hanging or supporting the sieves, also showing the hopper, which is omitted from Fig. 1 in dotted outlines. Fig. 3 is a plan view of a sieve-shoe with the sieve therein. Fig. 4 is a cross-section view of Fig. 3 on the line *x x*. Fig. 5 is a longitudinal sectional view on the lines *y y* of Fig. 3. Fig. 6 is an elevation of the operative parts of the complete apparatus with the casing removed, indicating certain modifications, together with a multiplicity of sieve-shoes and sieves in the construction of the vibratory frame, also indicating an exhaust or air-circulating apparatus and also a dust-collecting device. Fig. 7 is a left-hand view of a modification of the apparatus, showing a multiplicity of sieves and sieve-shoes. Fig. 8 is a cross-sectional view along the lines Z Z of Fig. 4.

Similar characters refer to similar parts.

It will be understood that the modifications hereinabove indicated in no wise show a departure of the apparatus, but are indicative of variations in details which may be employed.

In the drawings, A represents the frame which carries the structure, and it will be understood that this frame is inclosed usually by removable panels in the ordinary manner, thereby making a dust-tight box to which external access may be had and into which material may be delivered by a spout, as at L′, Fig. 6, and out of which material may be delivered by suitable conveyers, as hereinafter described. There is nothing particularly novel in the framework and its inclosures, and as they are common to all classes of separating devices and as they form no part of my invention it will be unnecessary to describe them in detail.

B is a sieve-shoe inclosing a sieve-frame C, to which is attached a sieve B^6. The shoe B is hung to a subframe A′ by hangers D, permitting a reciprocating or swinging motion of sieve C in shoe B, caused as hereinafter described. Upon each end of the shoe B is attached cheek-pieces E E, which are adjacent to peculiarly-shaped blocks F F, attached to the frame A′ by elastic hangers *f f*, as shown in Fig. 1, or they may be attached to a cross-piece F^4, which is in turn attached to the block F. This form of construction is an alternative one from that of attaching the hangers directly to the block F and possesses certain slight advantages, inasmuch as the elastic hangers *f f* are more widely separated and given a longer base of suspensional support. A modification of this form of construction is shown in Fig. 2, wherein the block F is attached rigidly to the upper portion of the sieve-frame.

Pins *g g* are rigidly held in the block F and pass through slots (shown in dotted lines) in the cross-bar F^5, whereby a slight horizontal movement is permitted between the cross-bar F^5 and the block F. The lower portion of each block F has a triangular opening F′, within which is actuated a triangular rocking beam G. An exactly similar rocking beam operates in a similar triangular opening in a corresponding block at the opposite side of the apparatus, as shown in Fig. 7.

The subframes A′ A′ are sustained by posts A^2 A^2, which are so thinned down or cut away at *a a* that they are rendered elastic, the lower ends *a′ a′* being rigidly fastened to the general framework A.

The lower portion of the frame A carries on either side wide beams A^3 A^3, and the rocking beams G are each pivotally attached thereto by means of a pin *g*, supported on its outer extremity by the bar G′, which is in turn rig-

idly supported at its ends by the curved blocks G^2 G^2, secured to the beams A^3.

Appropriately supported at the ends of the curved blocks G^2 G^2 are elastic buffers H H, against which the rocking beam G impinges as it swings or rocks.

The posts A^2 A^2 are pivotally connected to the upper end of the rocking beam G by connecting-arms G^3 G^3, so that the rocking or swinging of the rocking beam G is communicated to the posts A^2 A^2 and the frame A'. It will be noted, therefore, that the shoe B is hung from the vibrating frame A' and loosely held by means of the cheek-pieces E E in connection therewith and that as the block F is vibrated on the springs *f f* and as the frames A' vibrate the shoe is caused to oscillate through the range of motion permitted, which is measured by the greater width between the cheek-pieces E E and the width of the block F. Preferably I face the inside of these cheek-pieces on the side which comes in contact with the block F with elastic material, as shown at *e e*.

The sieve C is supported entirely by fastening the side pieces *c c* to the side piece of the shoe B in their centers. The sides *c c* of the sieve C are made quite thin and of elastic material, as some elastic wood, and as the end pieces *b b* are comparatively much heavier the rapid side vibration of the sieve tends to produce a tremulous motion, owing to the elasticity of its sides *c c*.

The vibrating beams G G are caused to vibrate or rock by the pitmen J J, which are eccentrically pivoted to the shaft K, which shaft is rotated rapidly in any convenient manner, the means of rotation not being shown.

The inclination and height of the shoe are made adjustable by set-nuts *d d* on the lower end of the hangers D D.

The supporting-posts A^2 A^2 are pivotally attached at a^4 to the frames A' A', so as to permit the vibration.

The construction of the sieve-shoe is shown more clearly in Figs. 3, 4, 5, and 8. In the construction of the sieves I employ rigid stays B^4 B^4 to stay the framework, but which do not touch the cloth, as shown in Fig. 1. I employ, however, as a supporting member for the center of the cloth one or more loose stays B^5. These are so constructed that the bolting-cloth B^6 (partially illustrated in Fig. 4) is attached to the lower side of these loose stays B^5, while the ends of the stays are loosely held in mortises in the end pieces *b b* of the sieve-frame, one of the mortises being shown in Fig. 1 at B^7. The vibration of the sieve therefore induces the loose stays B^5 to vibrate with a rolling motion upon their axes. This in connection with the elasticity of the parts described gives the bolting-cloth such a variety and amplitude of quick, vibratory, or tremulous movements that the vibration of stock traveling over the cloth is sufficient to keep the cloth clean. It is now a common expedient to place small substances on the cloth—like shot, balls, or even small chains—the vibratory movements of which being communicated to the cloth jar the stock from between its meshes, and thus keep the cloth clean. The size and weight of these foreign substances depend very largely upon the quality or the rapidity of vibration given to the cloth, and I have found that by means of the apparatus hereinbefore described I can give sufficient variety and rapidity of vibrations to the cloth so that the stock itself will suffice to keep the meshes of the cloth free from adherent material, thus doing away with the necessity of employing foreign material for that purpose.

It will be noted that the vibrations are transverse to the inclination of the sieve. At the foot of the sieve, as shown in Fig. 4, I have illustrated a conveyer D^2 in a form which I prefer to employ. The mouth of this conveyer appears in Fig. 1.

In Fig. 4 I have exaggerated the angle of inclination of the conveyer for the purpose of bringing out clearly its structure. It will be noted that the interior surface upon which the stock falls is a step-by-step surface, as shown at d^2. The steps themselves are preferably horizontal, the only inclination of the conveyer being due to the dropping of each succeeding step below that of the preceding one. As the sieve vibrates in the longitudinal direction of the conveyer its action is to continually force the stock downward and outward until it is delivered into any convenient receptacle.

It is obvious that I may employ more than one sieve and combine them in various ways with corresponding conveyers and chutes for the delivery of the grades into which the stock is separated, and in Fig. 6 I have shown a structure employing more than one sieve and conveyers in combination with a dust-collector and aspirating apparatus, the structure and mode of operation of which will be readily apprehended by those who are skilled in the art.

It will be understood that the framework A (shown in Fig. 6) is inclosed, preferably, by removable panels in the usual manner and that it is substantially air-tight, with the exception of the inlet for material at L and the discharges. Fig. 6 therefore represents a grader with the side removed, showing the internal construction, and also with certain parts broken away, so as to more clearly illustrate the varied chutes in which the falling material is aspirated by the closed current of air, as hereinbefore described.

M M' M^2 M^3 represent grading-sieves, the material to be graded being delivered at the head of the sieve M through the spout L or any of the approved means for the gradual and regular delivery of material thereto. These graders M M' M^2 M^3 are all constructed with frames *m m' m² m³*, which are set into the apparatus and are caused to oscillate transversely by mechanism constructed upon the

principles and having the mode of operation of that described herein and illustrated in Fig. 1, the grading-sieves being also constructed and having the mode of operation of that illustrated in Figs. 3 and 4. Each grading-sieve is mounted upon an internal concentric frame like that described and illustrated in connection with Figs. 3 and 4, the grading-cloths also being attached to loose ribs, as therein set forth.

It will be understood that the arrangement of sieves M M′ M^2 M^3 is an amplification in general of the manner of mounting the single sieve shown in Fig. 1.

Above the main frame A there is located a housing N, which is also inclosed with an air-tight inclosure. In it is located a fan W, inclosed in a fan-case W′, the fan-case having an opening or eye *w* in the usual manner and a tangential discharge-tube w^2. This discharge-tube is extended until it enters the lower portion of the casing inclosing the frame A, connecting with an air-space in and around the hoppers S S′ S^2 S^3. These hoppers are triangular in shape with apex downward, as shown in dotted lines in Fig. 2. The sieve M is preferably clothed with two or more grades of bolting-cloth, the first at the head of the sieve being the finest and delivering into the upper end of the sieve M′, in which a cut-off may be placed, if desired. The second grade extends through the central portion of the sieve M and delivers its stock into the lower half of the shorter grader M′. The lower and coarser portion, if more than two grades are used, is at the tail of sieve M and over the aspirating-chamber, the final discharge being delivered into chute S^4 and conveyed away by a conveyer S^5.

The aspirating-chamber includes all the space from the wall S^6 around the hoppers S S^2 in which the coarser material is delivered, in which it is drawn through by the rising currents of air passing through the falling material, which air-currents are modified by the construction shown, and thence passing through the coarser section at the foot of sieve M, carrying with it the fine dust derived from the coarse stock into the dust-collector above the sieve M, through the cloth-tubes T T of this dust-collector, into the housing N, and from thence to the eye of a fan at *w*.

A suitable valve V is provided by which the air-currents can be regulated and rendered stronger or weaker in the various sections operating upon the various grades of material, as may be desired. It will be observed that the sieve M deposits its sifted material upon the sieve M′, as has already been stated. The tailings from this sieve go over into an aspirating-chamber and hopper S. The graded material from sieve M′ is deposited on sieve M^2, its tailings going into hopper S^2, and the fine material from this sieve is in turn deposited in sieve M^3. The material passing through this is delivered into a hopper S^7.

It will be observed that the tailings from the sieve M are deposited on a chute 4 and are subjected to the air-currents which arise through the passage 1, modified by the valve V, and also to the air-currents which arise from passage 2 after much of the coarser dust arising from the tailings from the sieve M′ has already been deposited therefrom in the hoppers S^2 and S′. Thus the air-currents are permitted to produce their whole effect upon the tailings of the sieve M, which are coarser than those of the other sieves and are divided as between M and M′, so that only a portion of the air-current is allowed to operate upon the tailings of the sieve M′.

I do not need to particularize as to the gradings of the cloth nor the special grades into which the material is divided, as such matters are all familiar to millers, as it is obvious that the gradings can be adjusted at will and that the special gradings or manner of dividing the stock into any particular grades does not form any part of my invention.

In Fig. 6 I have indicated a separating and grading machine with a closed circuit of air circulation; but aside from the features already described the further features necessary to such a machine do not form any part of my present invention and are therefore only indicated in general terms, except as they might be varied very largely or even radically departed from without departing from the invention claimed herein. It is not deemed necessary to describe anything more than salient features thereof, it being understood that in consequence of its illustrating a closed air-circuit the ouside casing is substantially air-tight, including the supplemental housing N′, which only communicates with the main body through perforations in the top thereof, from which depend cloth-tubes R R. These may be attached to or rest upon a short covering *t* over the upper sieve, the aspirated air passing from the interior of the sieve-chamber through the meshes of the cloth-tubes and out through the openings of the housing N′ into the interior of the housing N and from thence to the fan. The dust that collects upon the outside of the tubes T is jarred from the covering *t* downwardly and upon the lower end of the sieve M.

What I claim is—

1. In combination with the rigid casing of a separating device, an oscillating frame located therein on spring-supports, a sieve-shoe suspended from the top of said oscillating frame and adapted to have a to-and-fro vibratory movement, a sieve carried by said shoe, means for oscillating said frame, which means consists of rocking arms having triangular upwardly-directed apexes, operating in angular recesses in blocks elastically attached to said oscillating frame, buffers operating in conjunction with said rocking arms, spring-bar connecting the upper portion of said rocking arms with the oscillating frame, and means for giving said rocking

arms an oscillating motion, substantially as described.

2. In a separating device, the combination of a main frame A, oscillating frames A′, supported upon elastic uprights A^2, A^2, said uprights being connected to the bottom portion of the frame A, a sieve-frame carrying a sieve and having elastic members by which it is supported in a shoe B, said shoe being supported by hangers D, D, over the frame A′, and carrying cheek-pieces E, E, and means substantially as described for engaging the cheek-pieces and giving said shoe B a vibratory movement by percussive action, whereby said movement is transmitted to the sieve-frame and sieve carried thereby, substantially as described.

3. The combination of a sieve-shoe, means for transversely vibrating said shoe, a sieve-frame having elastic side pieces secured about midway between their ends to the inner side of the shoe and a sieve-cloth attached to said sieve-frame and also to one or more supporting-ribs, said supporting rib or ribs being loosely held at their ends in mortises in the ends of said sieve-frame in such manner that they have a slight oscillatory rocking motion, due to the vibrations of the sieve, substantially as described.

4. As a cloth-cleaning device, the combination of partially-rotating bars loosely held in the sieve-frame, and a sieve-cloth attached to the frame and to the bars, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

DELOS SEWELL.

Witnesses:

FREDERICK W. STOEK,

STEPHEN A. CRANE.