No. 721,421. PATENTED FEB. 24, 1903.

J. W. CARNOCHAN.

BEAN SEPARATOR.

APPLICATION FILED JAN. 6, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

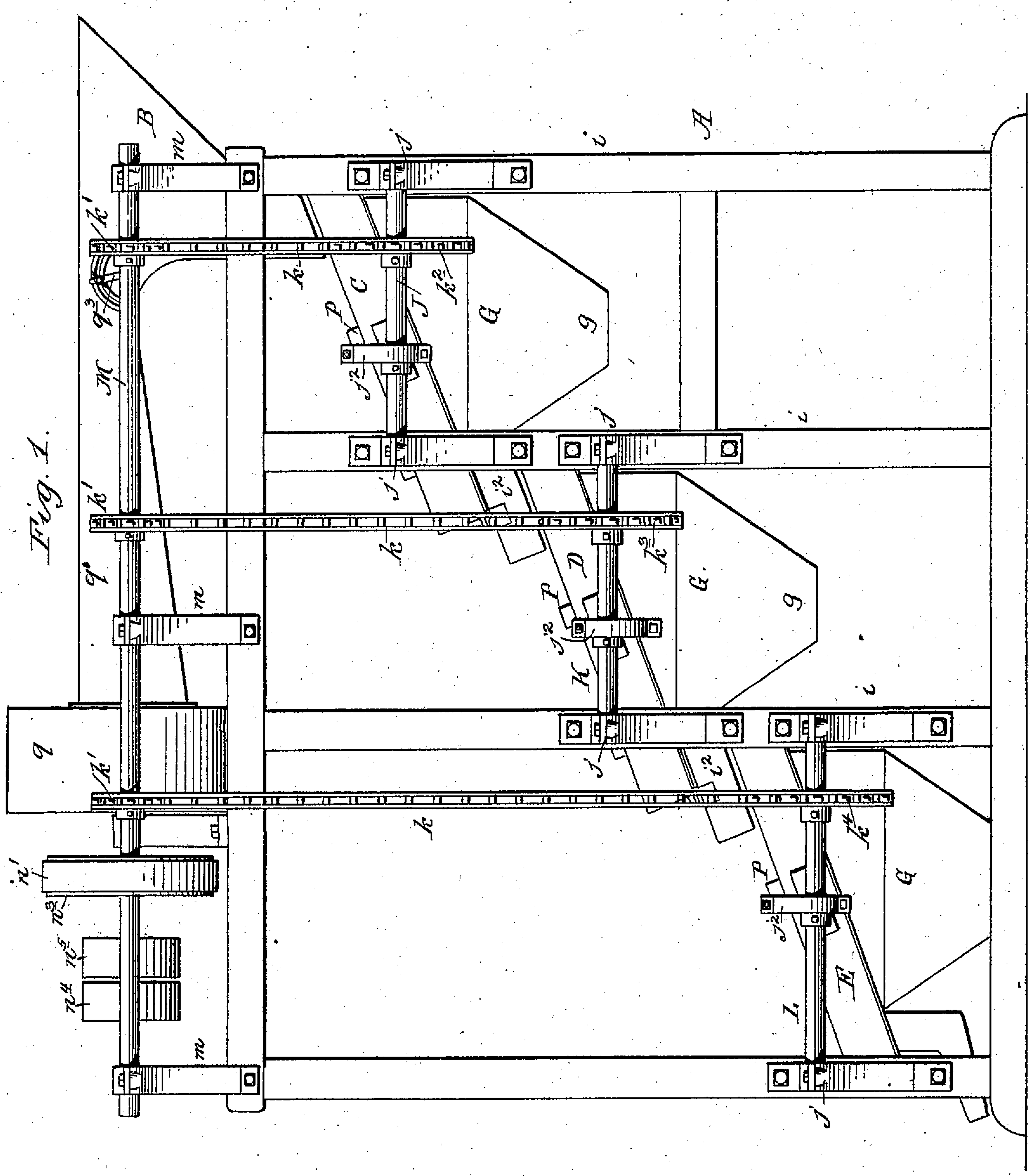

Fig. 1.

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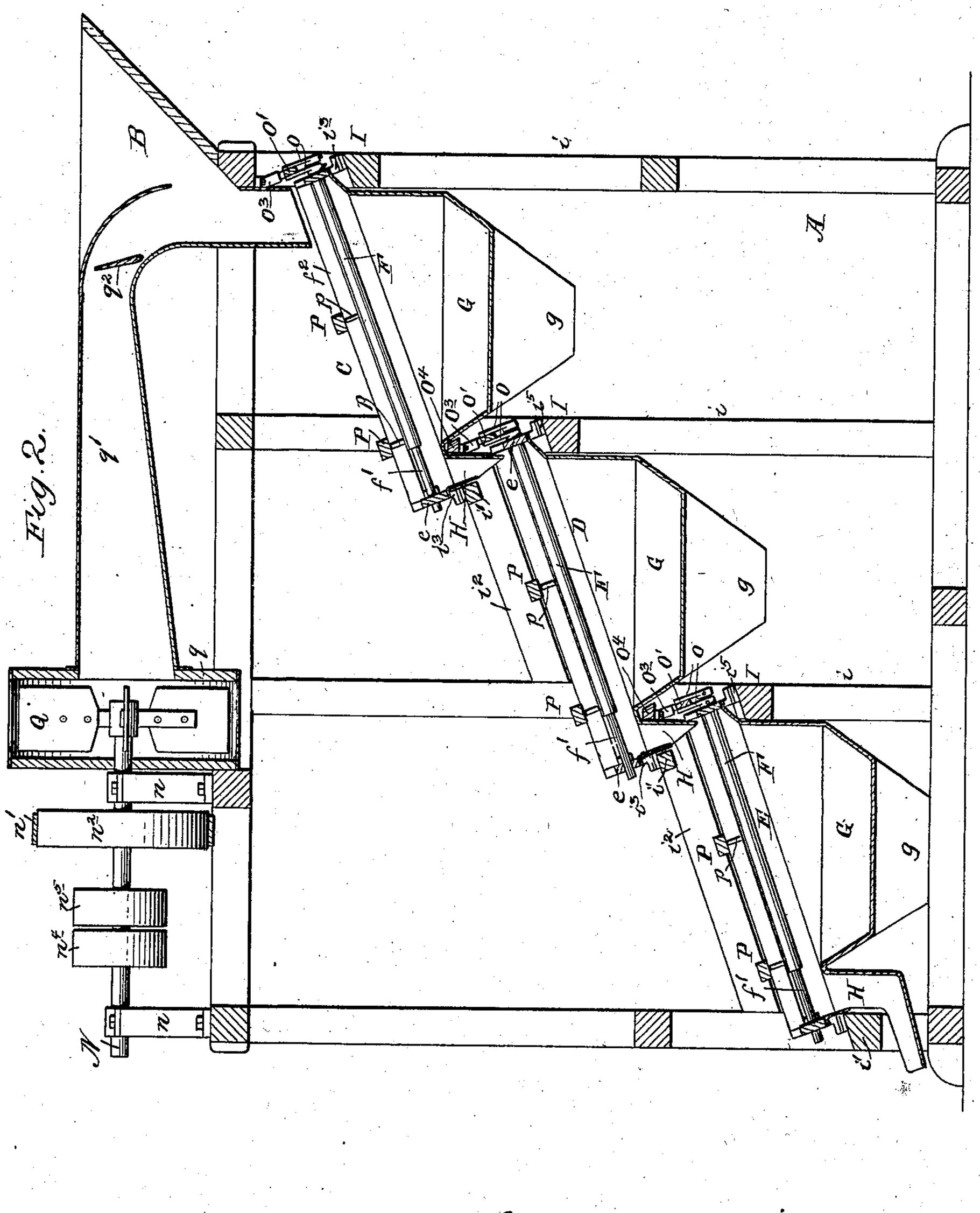
NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



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NO MODEL. 4 SHEETS—SHEET 3.

Fig. 3.

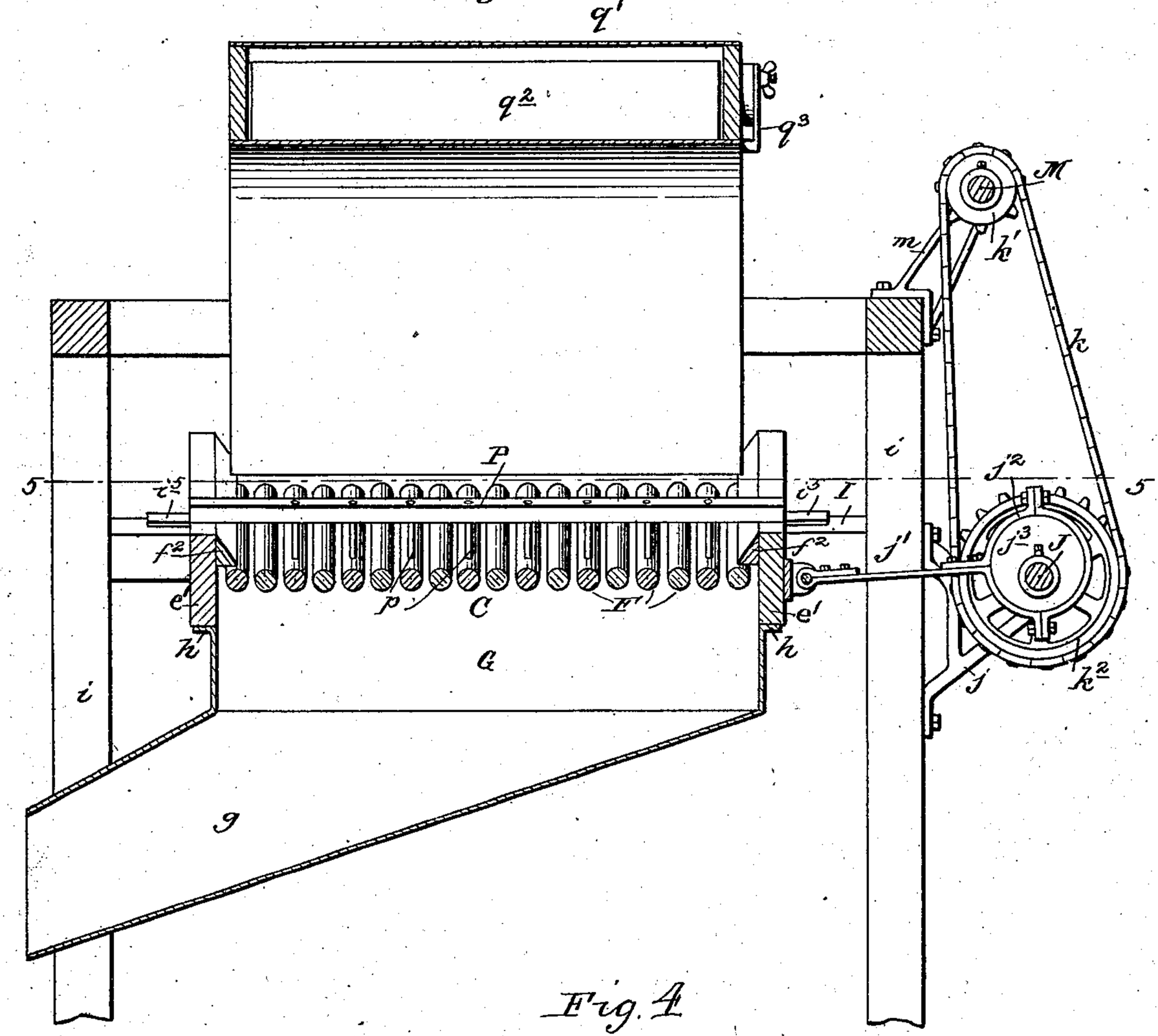
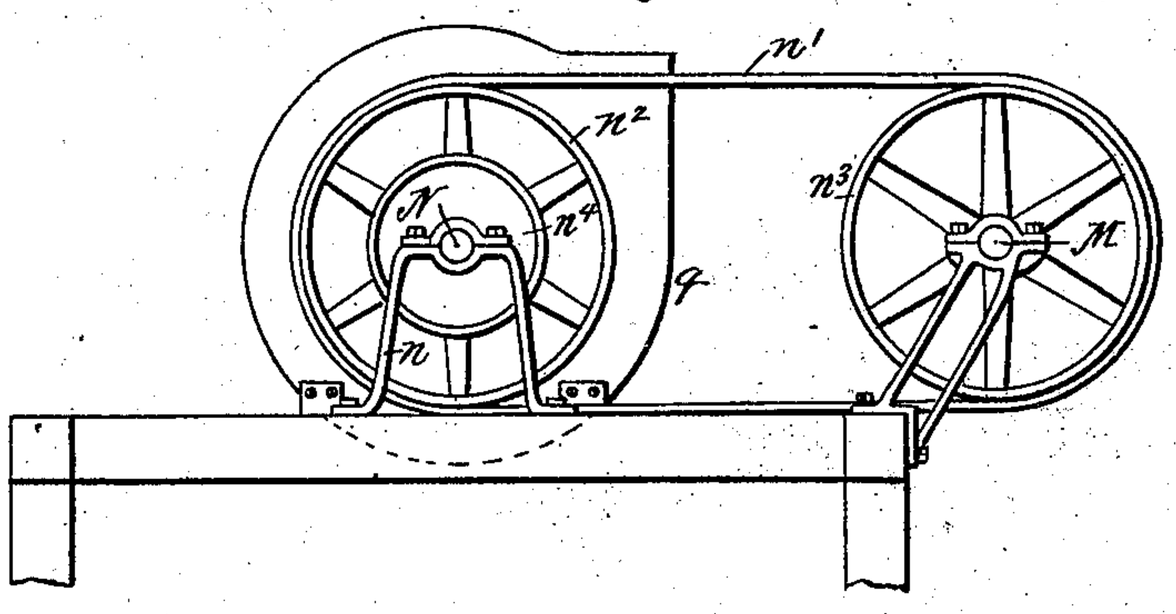


Fig. 4.



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NO MODEL. 4 SHEETS—SHEET 4.

Fig. 5.

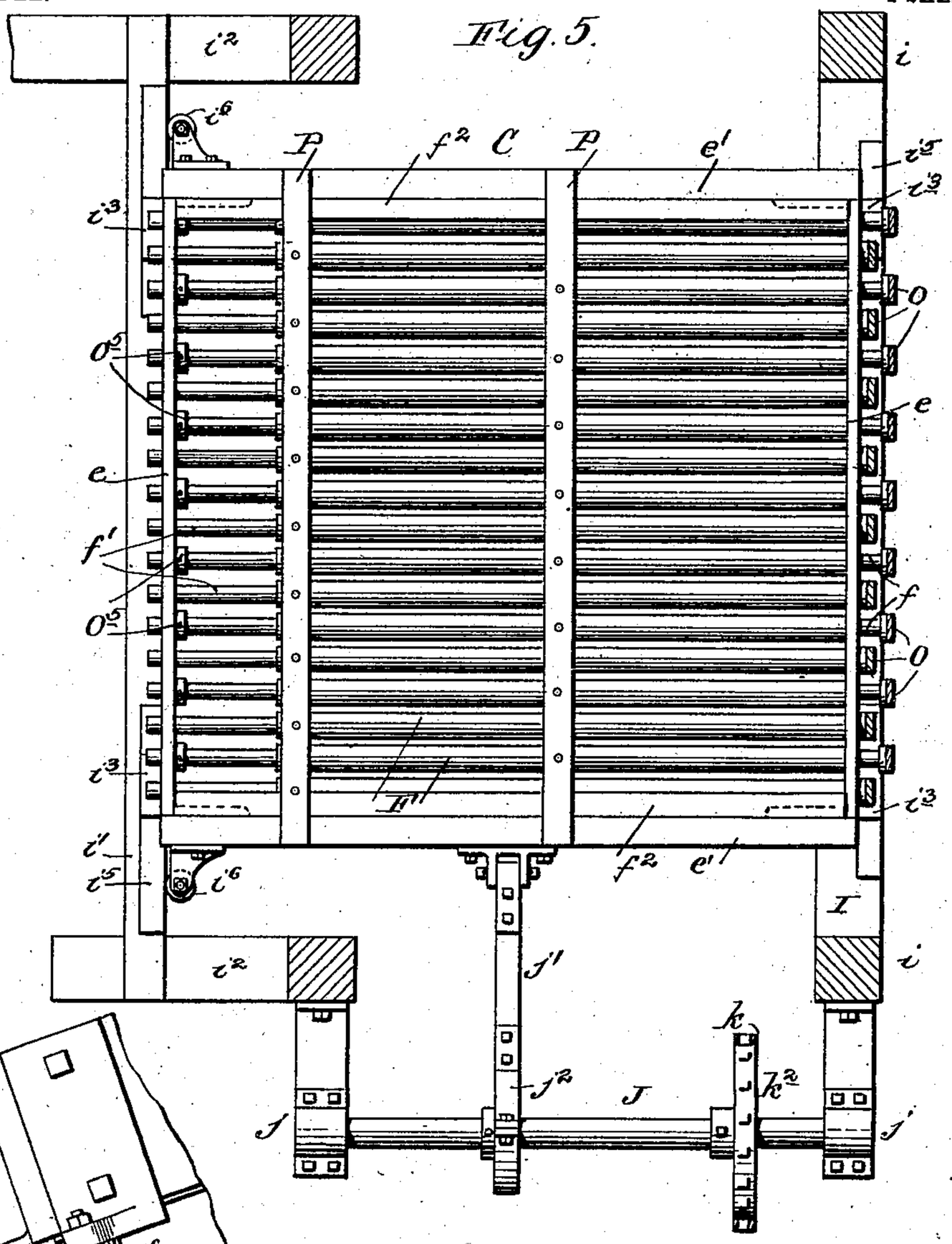


Fig. 7.

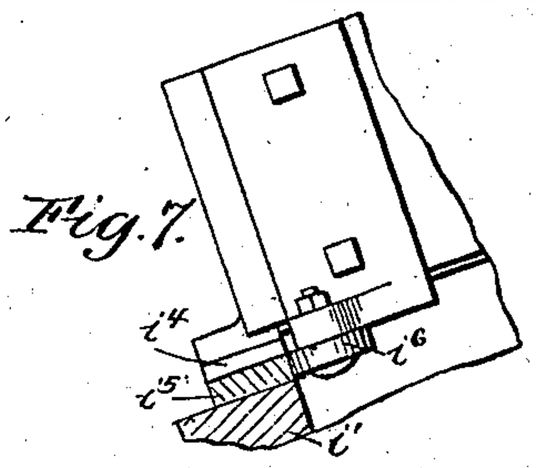


Fig. 6.

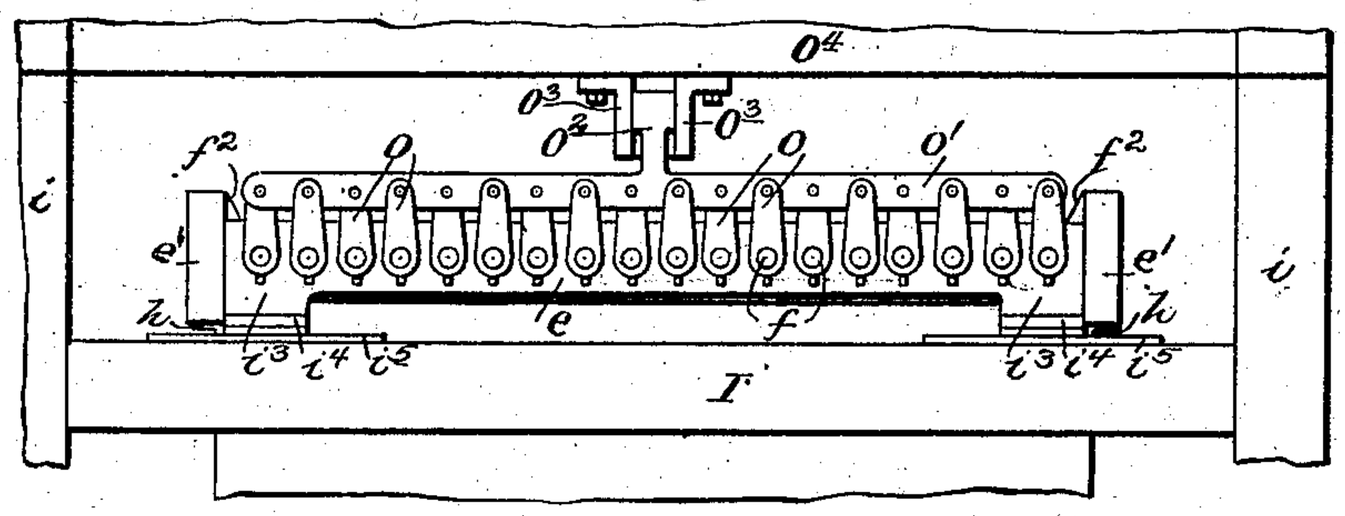
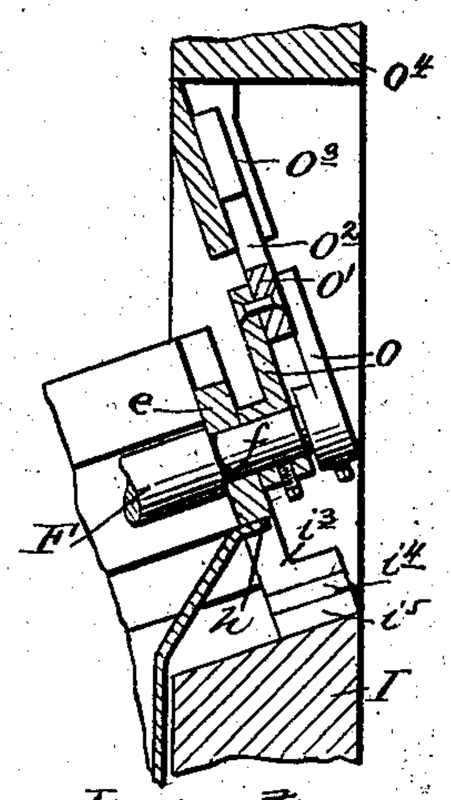


Fig. 8.



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UNITED STATES PATENT OFFICE.

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BEAN-SEPARATOR.

SPECIFICATION forming part of Letters Patent No. 721,421, dated February 24, 1903.

Application filed January 6, 1902. Serial No. 88,515. (No model.)

To all whom it may concern:

Be it known that I, JOHN W. CARNOCHAN, a citizen of the United States, residing at Silvercreek, in the county of Chautauqua and State of New York, have invented new and useful Improvements in Bean-Separators, of which the following is a specification.

This invention relates to a machine for separating or grading materials of different sizes, wherein the material to be separated is fed upon a screen, which is composed of separated smooth-faced rock-bars arranged longitudinally of the screen parallel with each other and preferably in an inclined plane, and means are provided for shaking or reciprocating the screen bodily in a direction transverse to the direction of the length of the rock-bars and for rocking the several rock-bars axially in the same direction simultaneously with the reciprocation of the screen.

The machine herein described is especially useful for separating or grading green string beans and other material of an analogous character—that is, wherein the individual particles of the material are of a length which considerably exceeds their breadth or thickness.

The object of the invention is to provide a separating or grading machine of this nature which is of a simple and desirable construction, which will insure a thorough, complete, and rapid separation or grading of the beans or other material, and which will be of large capacity relative to the size of the machine.

In the accompanying drawings, consisting of four sheets, Figure 1 is a side elevation of a machine embodying the invention. Fig. 2 is a longitudinal vertical sectional elevation through the center of the machine. Fig. 3 is an enlarged transverse vertical sectional elevation taken through the upper screen. Fig. 4 is a rear end elevation showing the upper part of the machine. Fig. 5 is an enlarged horizontal section on the line 5 5, Fig. 3, showing the top screen in plan. Fig. 6 is an enlarged front end elevation of one of the screens, showing the rocking mechanism for the rock-bars. Fig. 7 is a detail side elevation of one of the thrust-rollers for the screens. Fig. 8 is a detail sectional view through the front cross-rail of one of the screens, showing the rock-arms and associated parts for rocking the rock-bars.

Like letters of reference refer to like parts in the several figures.

The machine shown in the drawings, which is intended for separating or grading beans or other like material into several grades or sizes, briefly stated, is constructed as follows: A plurality of shaking-screens are arranged longitudinally of the machine, one below the other and preferably all inclined downwardly from front to rear, with the first or uppermost screen located beneath a feed-hopper, so as to receive the beans therefrom. Each screen is provided with a separating-surface consisting of a number of parallel rock-bars separated by intervening spaces and extending from front to rear or longitudinally of the screen. The rear or tail ends of the rock-bars are reduced in diameter to provide wide spaces at the tail end of the screen, so that the beans which are too large to pass through the spaces between the main portions of the rock-bars can drop through the wider spaces at the tail ends, and each screen is provided with a main chute or conveyer for directing the beans passing through the main portion of the screen to a desired point of discharge, and a tail-chute for directing the unscreened beans tailing off through the wide tail-spaces to the screen next below, or, in the case of the last screen, to a desired point of discharge. The spaces between the rock-bars of the successive screens are of successively greater width, the spaces of the uppermost or first screen being narrowest, so that the material which is fed to the upper screen and cannot pass through the separating-spaces thereof will tail off onto the next screen below, and so on to the several screens. Mechanism is provided for reciprocating the screens transversely and for rocking or oscillating the rock-bars axially. Any desired number of screens may be employed.

A represents the main frame of the machine, which may be of any preferred construction; B, the feed-hopper, which is arranged on the upper part of the frame near the front thereof; C, the top or first screen, which is supported, preferably, in an inclined position beneath the discharge-opening of the

feed-hopper, so as to receive the material passing through the latter; D, a second shaking-screen, similarly arranged in the machine with its forward or head end extending beneath the rear or tail end of the first screen; and E the third screen, arranged with its head end beneath the tail end of the second screen. The screens are all alike and are preferably constructed as follows:

e represents front and rear transverse rails, connected at their ends to the front and rear ends, respectively, of longitudinal side rails *e'* to form an open rectangular screen-frame.

F represents the separated rock-bars, which are arranged longitudinally between the side rails of the screen-frame and parallel therewith and with each other. For the greater part of their length the rock-bars are of uniform diameter and have smooth upper convex surfaces, the bars being preferably cylindrical. The front ends of the rock-bars are reduced to form journals *f*, which pass through bearing-openings provided therefor in the front rail of the screen-frame. The rear ends of the rock-bars are also reduced in diameter at *f'*, so as to increase the width of the spaces between the rock-bars and provide journals which bear in openings provided therefor in the rear rail of the screen-frame. The spaces between the reduced tail portions *f'* of the rock-bars are large enough to permit all of the unscreened beans which do not pass through the spaces between the main body portions of the rock-bars to drop through these large spaces. The longitudinal side rails of the screen-frame are preferably provided with inwardly-projecting beveled strips f^2, (see Fig. 3,) which overhang the outer rock-bars, so as to prevent the beans on the screen from wedging between the said outer rollers and the side rails of the screen-frame. The beveled strips also aid in confining the material on the screen against the tendency of the same to work off in the transverse reciprocation of the screen.

Each screen is provided with a main hopper or chute G, arranged below the main or body portion of the screen, and a tail-chute H, arranged below the wide spaces in the tail end of the screen. The hoppers or chutes G are provided with discharge-legs *g*, which extend to the side of the machine or to any other suitable point where it is desired to discharge the screened beans. The chutes H incline rearwardly and direct the unscreened beans which pass through the wide openings at the tail end of the screen onto the head of the screen next below or in the case of the last screen to any desired point of discharge. The chutes G and H for each screen are preferably made of sheet metal and are secured to the screen-frame in any suitable manner, as by means of securing-flanges *h*, extending beneath and secured to the rails of the screen-frame.

The screens are all mounted to reciprocate transversely of the machine-frame in any suitable manner. In the machine shown in the drawings each screen is supported by a front horizontal transverse frame-bar I, secured at its opposite end to suitable upright frame members *i* and arranged beneath the head end of the screen, and a transverse horizontal frame-bar *i'*, arranged beneath the tail end of the screen. The transverse bars *i'* for the tail ends of the first and second screens are located, respectively, above the head ends of the second and third screens, being supported by suitable longitudinal side frame-pieces i^2. Preferably each screen is provided at its front and rear ends with a pair of depending feet i^3, provided on their bottoms with plates i^4, of vulcanized fiber, which rest and slide on metallic wear-plates i^5, arranged on the upper faces of the transverse screen-supporting bars. This construction renders the screen comparatively light-running and greatly diminishes the noise.

i^6, Fig. 5, represents rollers secured at the opposite sides of the rear end of each screen-frame and bearing on the front face of the rear transverse supporting-bar *i'* for the screen to prevent longitudinal rearward movement of the screen on the supporting-bars.

The screens are reciprocated transversely of the machine-frame by any suitable mechanism. That shown in the drawings is as follows:

J K L represent horizontal shafts, each arranged opposite one end of one of the screens. The shafts are supported in suitable bearings *j*, provided therefor on the upright members of the machine-frame, and each shaft is connected to the adjacent screen-frame to reciprocate the same, as by means of a pitman *j'*, connected at its inner end loosely to the screen-frame and provided at its outer end with an eccentric-strap j^2, surrounding an eccentric j^3, secured to the shaft.

M represents a counter-shaft journaled in suitable bearings *m* on the main frame and arranged longitudinally of the machine above the shafts J K L, all of which are driven from the counter-shaft M, as by means of sprocket-chains *k*, passing over sprocket-wheels *k'*, secured to the counter-shaft and sprocket-wheels k^2 k^3 k^4, secured, respectively, to said shafts J, K, and L. The counter-shaft M is driven to drive the several actuating-shafts for the screens from a drive-shaft N, which is journaled in suitable bearings *n* on the upper part of the machine-frame, as by a belt *n'*, running on a pulley n^2 on the drive-shaft and a pulley n^3 on the counter-shaft M. The drive-shaft is provided with the usual tight and loose pulleys n^4 n^5.

Mechanism is provided for rocking or oscillating the rock-bars of the several screens in the same direction and simultaneously with their reciprocating transverse movement. The preferred mechanism for accomplishing this oscillation of the bars is as follows, (see particularly Figs. 2, 5, 6, and 8:)

O represents rock-arms, one rigidly secured to the front end of each of the rock-bars of each screen. The upper ends of all the rock-arms of each screen are pivotally connected to a common longitudinal transverse actuating-rod O′, which is provided with an arm O^2, extending upwardly therefrom and engaging between guide-plates O^3, secured to a transverse frame-bar O^4, arranged above the head end of the screen and secured at its opposite ends to the upright bars of the main frame. The arm O^2 of the actuating-rod is free to slide vertically up and down between the guide-plates, and when the screen is reciprocated transversely the actuating-rod being held from transverse movement with the screen is caused to slide up and down relative to the screen-frame, thus causing all of the rock-bars to oscillate in the same direction. This rocking or oscillation of the rock-bars tends to roll the beans axially on the screen-bars and to turn or twist the same around to a position parallel with the rock-bars and materially aids the movement of the beans longitudinally along or down the screen. As the shafts all oscillate or rock in the same direction, there is no tendency for the rock-bars to grip the beans and force or squeeze the same through between the rock-bars. Inasmuch as the rock-bars in the screens for small-sized beans must be comparatively close together and as the hubs or securing ends of the rock-arms are necessarily comparatively large to prevent weakness it is desirable to arrange the rock-arms as shown in the drawings—that is, with the rock-arms of the alternate rock-bars on the front side of the actuating-rod O′ and the rock-arms of the remaining rock-bars on the rear side of the actuating-bar. This staggered arrangement of the rock-arms enables the use of larger and stronger ones without danger of interference in operation. The hubs of the rock-arms O, which are on the rear side of the actuating-rod, abut against the front end rail of the screen-frame and prevent longitudinal rearward movement of the rock-bars, to which they are secured in the screen-frame. The other rock-bars are shown to be provided with collars O^5, secured on their rear reduced portions inside of or in front of the rear end rail of the screen-frame. By thus utilizing the rock-arms on a portion of the rock-bars and the collars O^5 on the remainder of the rock-bars to prevent longitudinal rearward movement of the latter in the screen-frame larger collars and rock-arms may be employed than if collars O^5 were secured in the described relation on all of the rock-bars and the rock-arms were all in line, which is desirable, as there is considerable wear on these parts. The oscillating mechanisms for the second and third screens are preferably arranged, as shown, in the spaces between the chutes G and H of the first and second screens, respectively.

P represents transverse strips or bars arranged above the rock-bars of each screen and secured at their opposite ends to the side rails of the screen-frame. These strips are provided with depending spaced teeth or fingers *p*, which project toward the rock-bars of the screen and act to straighten or turn the beans, which extend crosswise of the rock-bars in their movement down or longitudinally of the screen into a position parallel with the rock-bars. Thus the beans, which are thrown in a transverse position by the shaking of the screen as they work down the same, are straightened around as they reach each of the bars P. One or more of the strips P, with the straightening-fingers, are provided for each screen, as found necessary for the most complete separation of the materal.

The beans or other materials are fed to the machine through the feed-hooper at the forward end of the machine and pass down from the same onto the head end of the first screen. The transverse reciprocation of the screen agitates or shakes up the beans or other material which is delivered to the screen in bulk and causes the different particles to be presented to the rock-bars. The oscillation or rocking of the rock-bars has a tendency to roll or turn the beans axially and work the same around into a position parallel with the rock-bars, so that the beans, which are smaller than the spaces between the shafts, can pass through the screen and also to cause the larger beans, which do not pass through the screen, to move longitudinally along or down the screen. As the beans pass down the screen on the rock-bars such beans as lie transversely or crosswise of the rock-bars are turned around longitudinally or parallel with the rock-bars by the straightening-fingers *p*. The beans which pass through the first screen drop in the chute G and are discharged at the side of the machine. All of the beans which do not pass through the main body portion of the screen pass through the wide spaces at the tail end thereof and by means of the chute H are directed to the head end of the next screen, the same operation being repeated for each of the screens. The wide spaces at the tail ends of the screens are sufficiently large to permit all of the beans which do not pass through the body of the screen to pass through them, and there can be no clogging or piling up of the beans at the tail end of the screens, as would be the case if the rock-bars were of the same diameter throughout and the beans were obliged to tail off over the rear rail of the screen.

If desired, a fan may be employed for removing dust or light particles of foreign matter from the beans as they pass from the feed-hopper to the first screen. Q represents such a fan, which is secured to the front end of the drive-shaft and is arranged in a fan-casing *q*, the intake of which is connected by a wind-trunk *q′* with the discharge of the feed-hopper.

q^2 represents a pivoted valve in the wind-

trunk for regulating the suction. It is provided with any suitable means for setting the valve at the desired angle, such means being shown to consist of an arm q^3, connected outside of the wind-trunk to one end of the shaft carrying the gate, and a suitable locking device carried by the outer end of the arm.

I claim as my invention—

1. The combination of a screen composed of substantially cylindrical parallel separated rock-bars, means for shaking said screen as a whole, and means for oscillating or rocking said rock-bars, substantially as set forth.

2. The combination of a screen composed of substantially parallel separated rock-bars, means for shaking the screen bodily and oscillating or rocking said bars, and means independent of said bars for supporting the screen, substantially as described.

3. The combination of a screen composed of substantially parallel rock-bars, and means for shaking the screen and rocking said bars while maintaining a substantially fixed separation of the latter, substantially as described.

4. The combination of a separating-surface composed of separated rock-bars arranged lengthwise in the direction of movement of the material to be separated over the separating-surface, means for reciprocating said surface as a whole in a direction transversely of the direction of the length of said rock-bars, and means for oscillating or rocking said rock-bars simultaneously with the reciprocating movement of the screen, substantially as set forth.

5. The combination of a separating-surface composed of separated rock-bars arranged lengthwise in the direction of movement of the material to be separated over the separating-surface, means for supporting said separating-surface in an inclined position, means for reciprocating said separating-surface bodily in a direction transversely of the direction of the length of said rock-bars, and means for oscillating or rocking said rock-bars simultaneously with the reciprocating movement of the screen, substantially as set forth.

6. The combination of a screen-frame, a separating-surface composed of substantially parallel separated rock-bars journaled in said frame in an inclined position, horizontal ways on which said frame is slidably supported, means for reciprocating said frame in a direction transversely of the direction of the length of said rock-bars, and means for oscillating or rocking said rock-bars simultaneously with the reciprocating movement of the screen, substantially as set forth.

7. The combination of a separating-surface composed of longitudinally-arranged separated rock-bars provided with reduced tail-end portions, means for shaking said separating-surface as a whole, and means for rocking or oscillating said rock-bars simultaneously with the shaking movement of said separating-surface, substantially as set forth.

8. The combination of a separating-surface composed of longitudinally-arranged separated rock-bars provided with reduced tail-end portions, means for reciprocating said separating-surface, and means for oscillating said rock-bars axially simultaneously with said reciprocating movement of said separating-surface, substantially as set forth.

9. The combination of a screen having a separating-surface composed of longitudinally-arranged rock-bars, means for supporting said separating-surface in an inclined position, means for reciprocating said screen in a direction transversely of the direction of the length of the rock-bars, means for oscillating said rock-bars axially, and separated straightening-fingers arranged above said rock-bars, substantially as set forth.

10. The combination of a screen-frame, means for supporting said frame, separated rock-bars journaled in said frame and extending longitudinally thereof, means for reciprocating said frame in a direction transversely of the direction of the length of said rock-bars, rock-arms connected to said rock-bars, an actuating-rod loosely connected to said rock-arms, and means for holding said actuating-rod from transverse movement with said screen-frame to oscillate said rock-bars.

11. The combination of a screen-frame, means for supporting the same, separated rock-bars journaled in said frame and extending longitudinally thereof in an inclined plane, means for reciprocating said frame in a direction transversely of the direction of the length of said rock-bars, a transversely-arranged actuating-rod, a part carried by said actuating-bar and engaging in a stationary guide which prevents a transverse movement of the bar and permits the same to slide up and down, and rock-arms connected to said rock-bars and to said actuating-rod, substantially as set forth.

12. The combination of a screen having a separating-surface composed of longitudinally-arranged separated rock-bars, means for reciprocating said screen in a direction transversely of the direction of the length of the rock-bars, a second screen arranged with its head end beneath the tail end of the said first-mentioned screen and having a separating-surface consisting of rock-bars arranged longitudinally of the screen, means for reciprocating said screens in a direction transversely of the direction of the length of the rock-bars, a chute arranged beneath the body portion of said first-mentioned screen, a second chute arranged beneath the tail end of the first-mentioned screen, and means for oscillating the rock-bars on said second screen arranged between said chutes for the first screen, substantially as set forth.

13. The combination of a screen composed of substantially cylindrical parallel rock-bars, and means for shaking the screen and rocking said bars while maintaining a substantially fixed separation of the latter, substantially as described.

14. In a grading machine and in combination, a grading-screen comprising a frame, parallel separated bars mounted therein, means for shaking said screen and rocking said bars, and a guide-rail for said screen, substantially as described.

15. In a grading-machine and in combination, a screen comprising a frame, parallel separated bars journaled therein, guide-rails for said screen, and means for reciprocating the screen bodily and rocking said bars, substantially as described.

Witness my hand this 28th day of December, 1901.

JOHN W. CARNOCHAN.

Witnesses:
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C. B. HORNBECK.