No. 814,952. PATENTED MAR. 13, 1906.

N. V. FITTS.

VIBRATING SCREEN.

APPLICATION FILED DEC. 5, 1904.

4 SHEETS—SHEET 1.

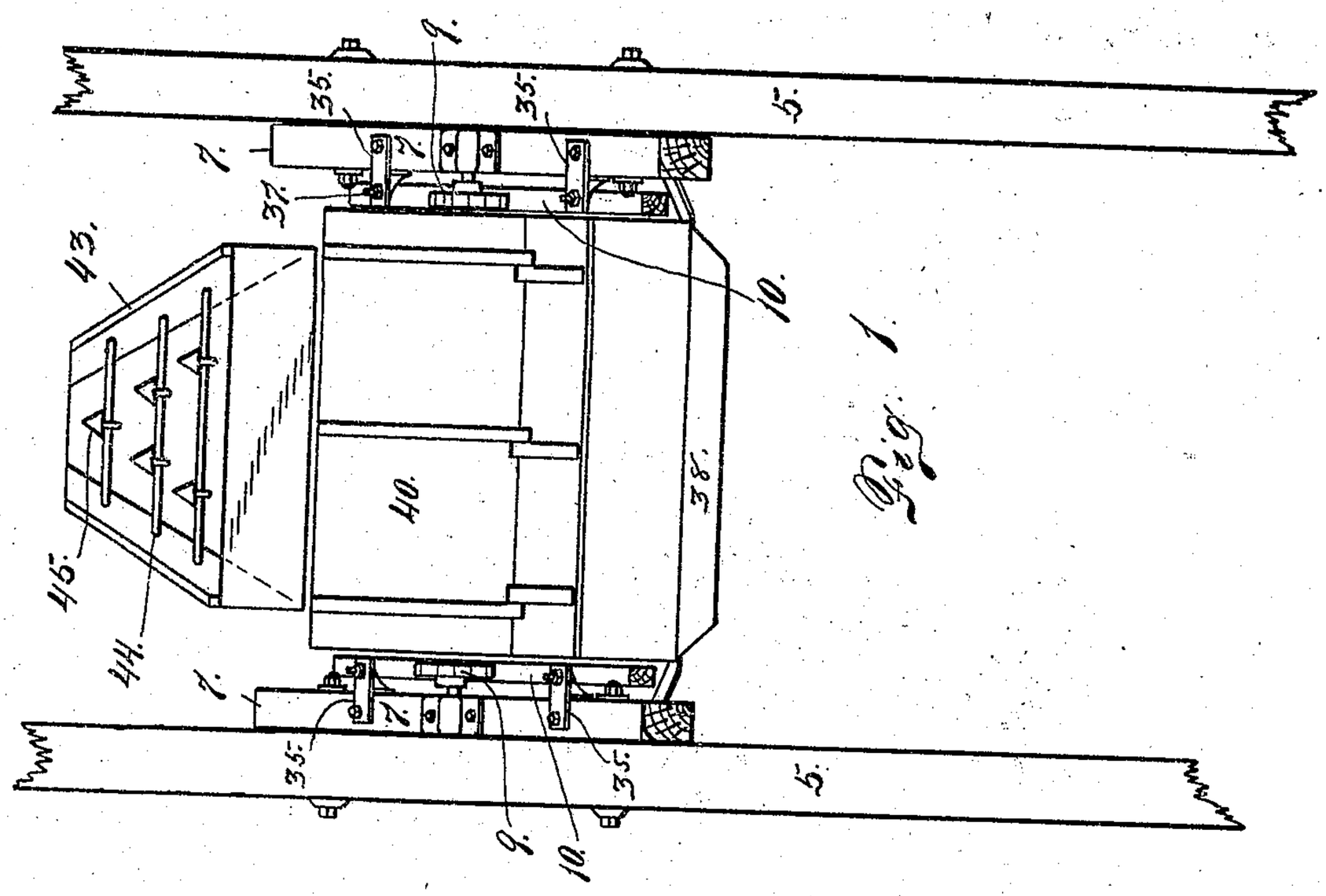

Fig. 1.

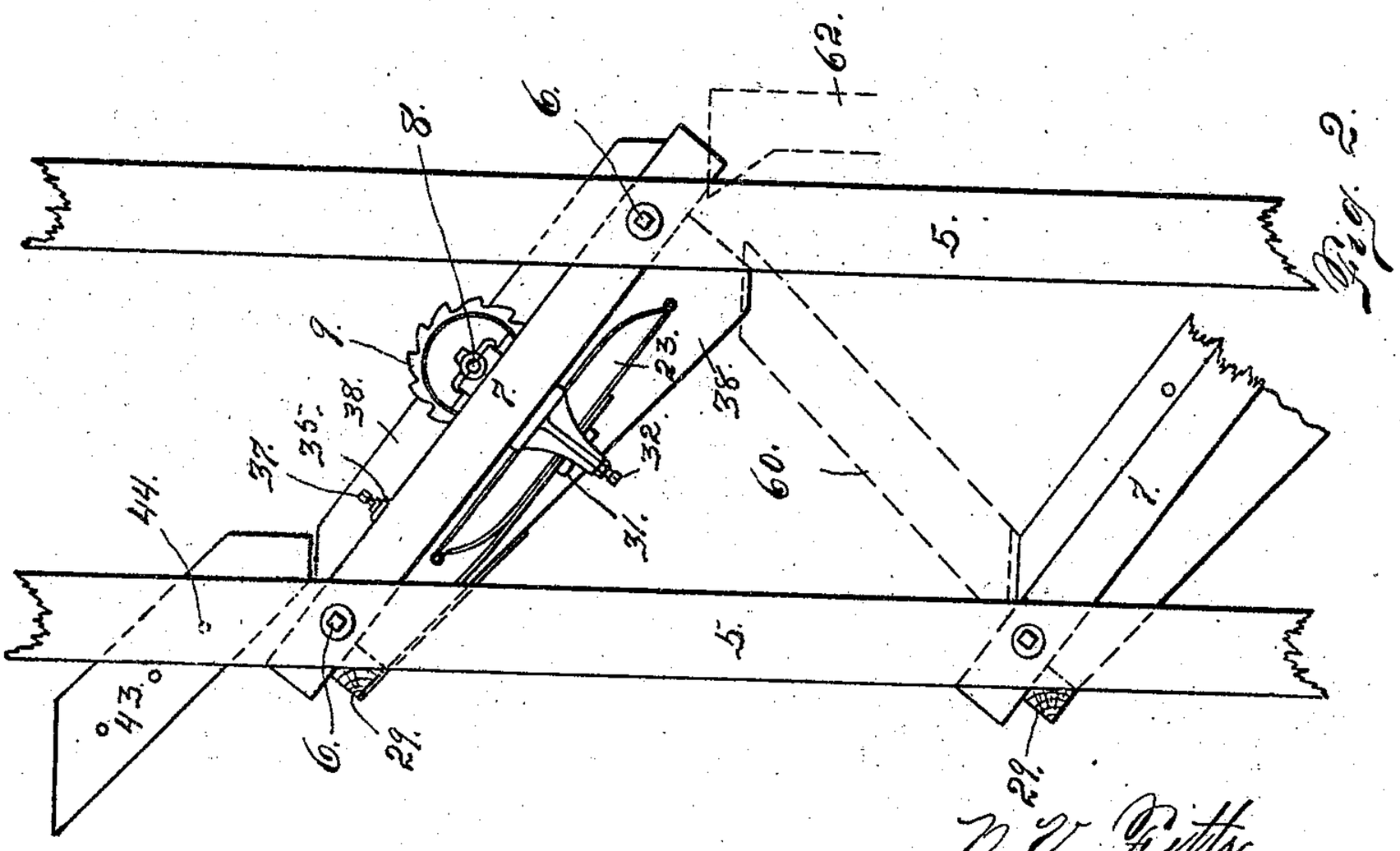

Fig. 2.

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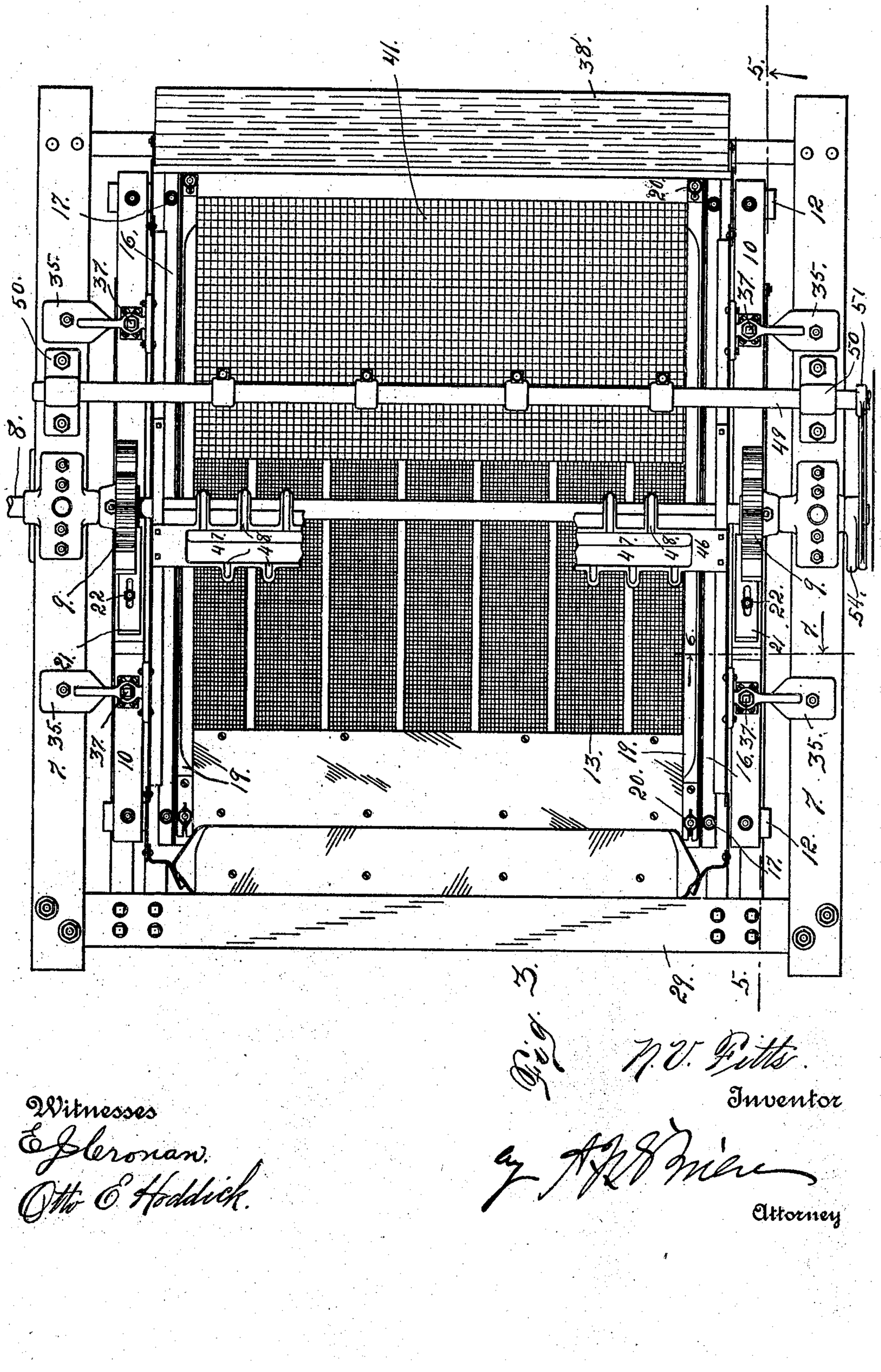

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4 SHEETS—SHEET 3.

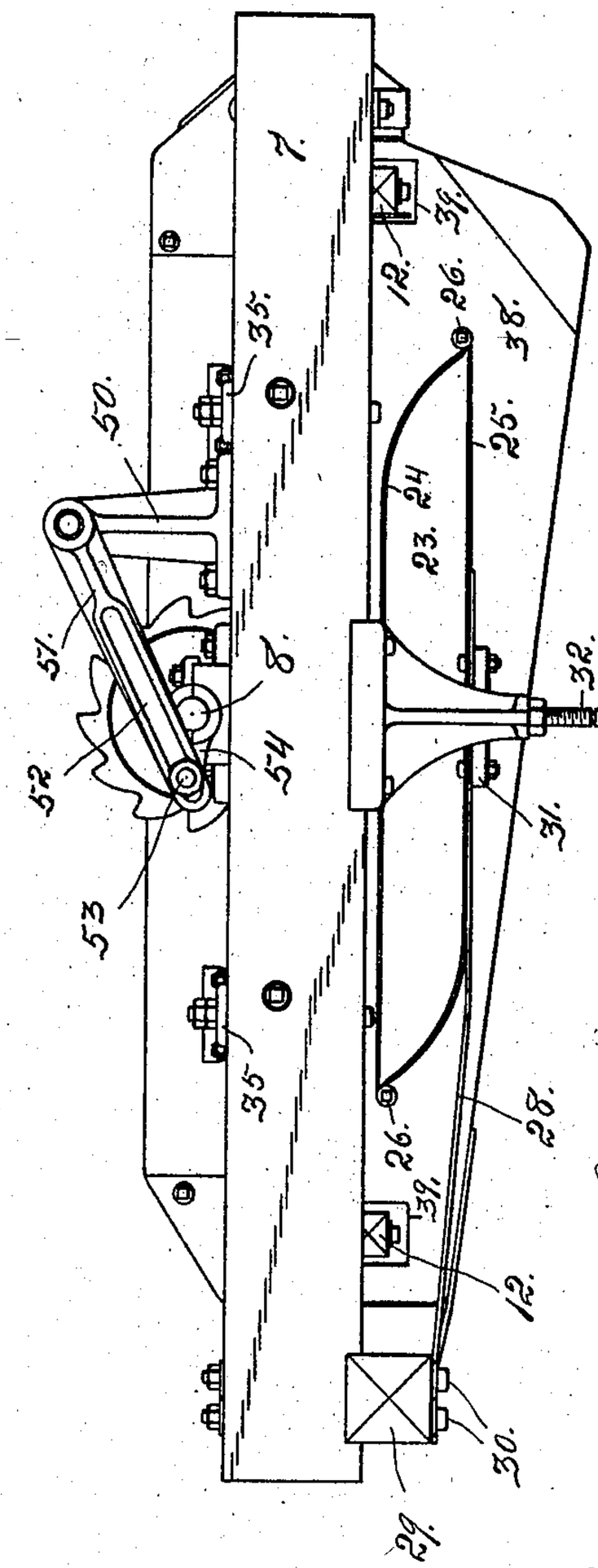

Fig. 4.

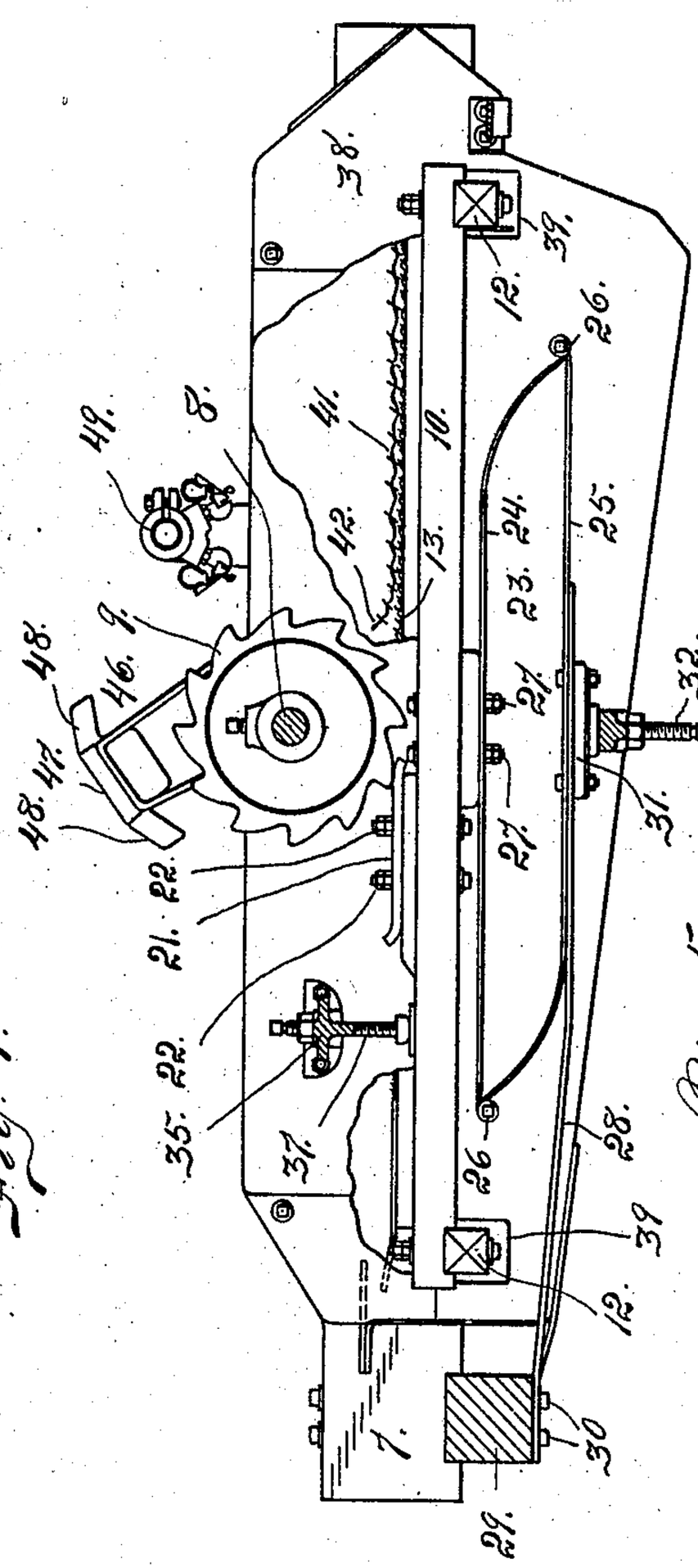

Fig. 5.

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4 SHEETS—SHEET 4

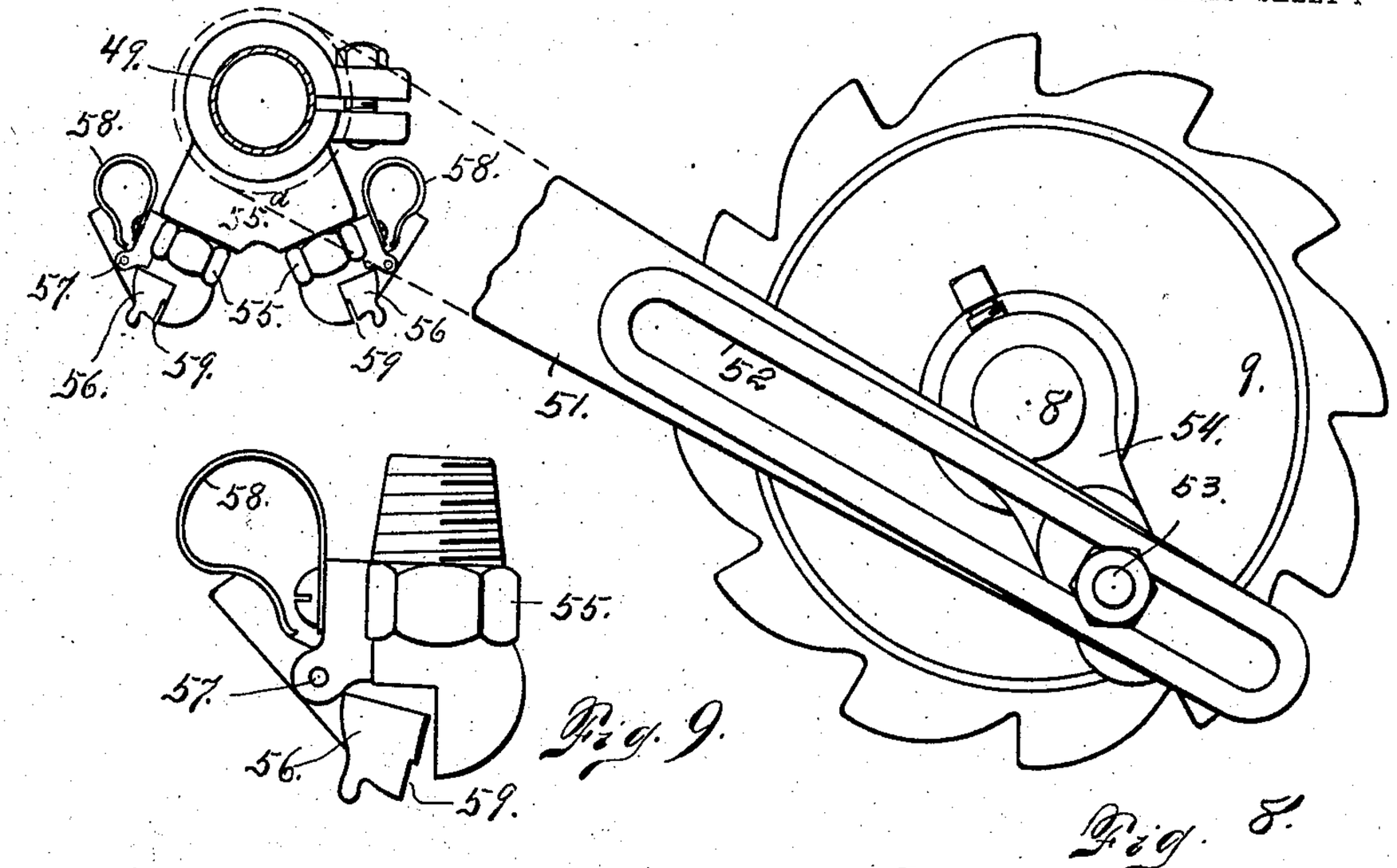

Fig. 5.

Fig. 9.

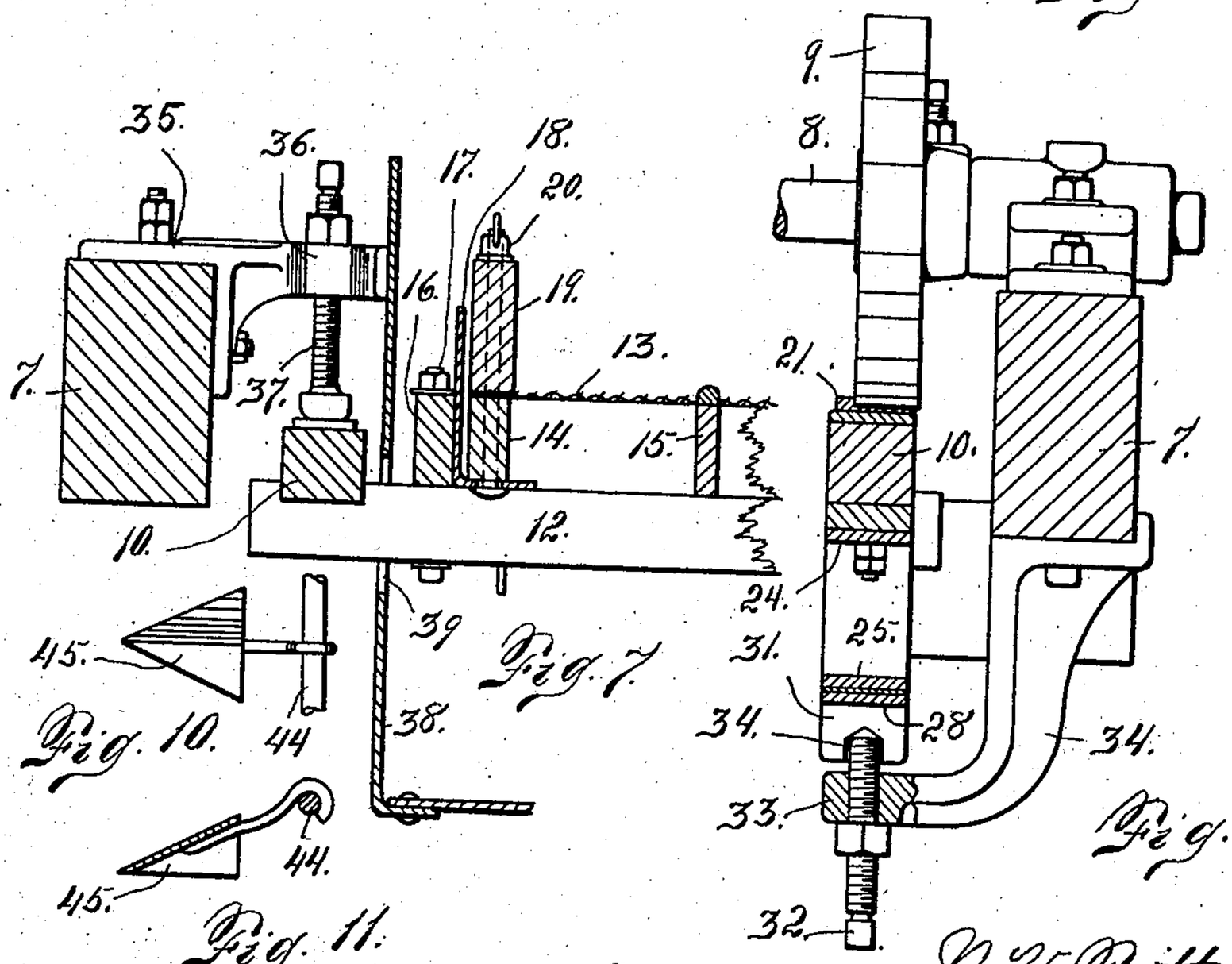

Fig. 10.

Fig. 11.

Fig. 7.

Fig. 6.

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UNITED STATES PATENT OFFICE.

NORMAN V. FITTS, OF DENVER, COLORADO, ASSIGNOR TO THE COLORADO IRON WORKS COMPANY, OF DENVER, COLORADO.

VIBRATING SCREEN.

No. 814,952. Specification of Letters Patent. Patented March 13, 1906.

Application filed December 5, 1904. Serial No. 235,465.

To all whom it may concern:

Be it known that I, NORMAN V. FITTS, a citizen of the United States, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Vibrating Screens; and I do 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, reference being had to the accompanying drawings, and to the figures of reference marked thereon, which form a part of this specification.

My invention relates to improvements in vibrating-screen mechanism adapted for use in sizing and classifying pulverized ore and other material where the necessity for a classifying, grading, or screening function exists. It is well known that a thorough classification of pulverized ore is exceedingly desirable, inasmuch as it greatly facilitates the subsequent treatment of the ore for the purpose of recovering its metallic values.

My present invention relates to the class of devices set forth in Patent No. 738,485, dated September 8, 1903, and includes certain novel features of construction and function whereby results are obtained superior to those possible in the construction covered by the aforesaid patent, all of which will be fully understood by reference to the accompanying drawings, in which is illustrated an embodiment thereof.

In the drawings, Figure 1 is a front elevation of my improved construction. Fig. 2 is a side elevation of the same illustrating the arrangement of a number of the screening mechanisms one above another, whereby the material which passes through the mesh of one screen is passed to another screen of different mesh, and so on, according to the number of grades, sizes, or classifications into which it is necessary or desirable to divide or separate the material under treatment. Fig. 3 is a top plan view of the screen mechanism shown on a larger scale than in Figs. 1 and 2. Fig. 4 is a side elevation of the constuction shown in Fig. 3. Fig. 5 is a section taken approximately on the line 5 5, Fig. 3, viewed in the direction of the arrow. Fig. 6 is a section taken on the line 6 7, Fig. 3, looking toward the right. Fig. 7 is a section taken on the same line looking toward the left. Fig. 8 is an enlarged detail view illustrating the manner of manipulating the rocking water-supply pipe from the shaft of the multiple cam-wheel. Fig. 9 is an enlarged detail view of one of the nozzles connected with said pipe. Figs. 10 and 11 are a top view and a sectional elevation, respectively, of the distributing devices located in the feed-chute.

The same reference characters indicate the same parts in all the views.

Let the numeral 5 designate a suitable upright framework, to which is secured by bolts 6 a stationary frame 7, on which is journaled a shaft 8, to which is secured a pair of multiple cam-wheels 9, arranged to act on parallel bars 10, connected by transverse bars 12, forming the body of the screen-frame. The mesh material 13 of the screen is secured to suitable bars 14 and 15. These parts 13, 14, and 15, taken collectively, will be termed the "screen" as distinguished from the screen-frame. The screen-frame is further provided with side bars 16, secured to the cross-pieces 12 by bolts 17. To the bars 12 are also secured upwardly-projecting plates 18, mounted on opposite sides of the screen and in contact with the side bars 17. Mounted above the mesh material and engaging the same on opposite sides are bars 19, which are removable by loosening thumb-nuts 20, whereby the screen proper may be removed and another substituted when desired.

To the upper surface of the frame-bars 10 are attached wearing-plates 21, which are held in place by bolts 22, passing through slots formed in the plates, whereby the latter are adjustable for the purpose of varying the action of the multiple cam-wheels which engage the said plates.

To the lower surface of the bars 10 of the screen-frame are attached springs 23, located on opposite sides and composed of upper and lower members 24 and 25, connected at their extremities, as shown at 26. The upper members of these springs are secured to the bars 10 by bolts 27, while their lower members are secured to tie-bars 28. One extremity of each of these tie-bars is secured to a cross-bar 29 of the stationary frame by means of bolts 30. The tie-bars 28 engage the lower members 25 of the springs 23 and afford such a support to the said springs as to prevent

any longitudinal rocking movement of the springs 23 during the action of the multiple cam-wheels on the wearing-plates of the bars 10. Attention is called to the fact that these multiple cam-wheels are centrally located with reference to the bars 10 of the screen-frame, and the object of the mechanism is to cause all parts of the screen-frame to have a uniform vibrating movement. My improved construction makes this practicable. The lower members 25 of the springs 23, together with their engaging tie-bars 28, are provided with blocks 31, which are engaged by the upper extremities of bolts 32, threaded in the lower inwardly-projecting ends 33 of brackets 34, whose upper extremities are secured to the side bars of the stationary frame 7. The tension of the springs 23 may be regulated by adjusting the set-bolts 32. The upper extremities of these set-bolts engage recesses 34, formed in the blocks 31. By adjusting the bolts 32 the springs 23 may be kept at a uniform tension, whereby the two springs 23 on opposite sides of the machine may be made to yield equally to the action of the multiple cam-wheels, thus preventing any lateral rocking motion of the screen during the operation of the mechanism.

Centrally secured to the side bars of the stationary frame 7 are brackets 35, which are provided with inwardly-projecting arms 36, occupying positions directly above the bars 10 of the screen-frame. There are two of these brackets 35 on each side of the screen-frame. In these brackets are threaded set-bolts 37, whose lower extremities are engaged by the bars 10 of the screen-frame and form stops to limit the upward movement of the screen-frame when the latter is released by the cam-faces of the multiple cam-wheels 9. As the upward or reverse movement of the screen-frame is suddenly checked by the stop-bolts 37, which are four in number, as heretofore explained, the resulting sudden impact performs an important function in the screening of the material under treatment, as will be readily understood.

Mounted on the stationary frame is a housing 38, preferably composed of sheet metal and completely inclosing the screen at the top, sides, and bottom. The cross-bars 12 of the screen-frame pass through slots 39, cut in the sides of the housing, the said slots being of sufficient length to permit the necessary vibration of the screen-frame, whose bars 10 are located outside of said housing, being supported by the extremities of the cross-bars 12, which protrude through the slots 39 of the housing. In the treatment of dry material the top 40 of this housing, which is removable, is a very important feature, since it prevents the escape of a considerable portion of the very fine material in the shape of dust. When wet material is under treatment, the cover need not be employed. It must be understood that my improved screen mechanism is adapted equally well for handling both dry and wet material.

In order to better break up and distribute the material over the screen 13, a coarser screen 41 is mounted above the lower part of the screen 13 and a short distance therefrom, whereby any material in the form of bunches or balls is broken up and separated, whereby it may be advantageously acted on by my improved device. In order to better perform its function, its upper edge is slightly turned outwardly, as shown at 42.

Attention is called to the fact that my improved screen mechanism when in use is suitably inclined, as is illustrated in Fig. 2 of the drawings. When thus arranged, the material is fed to the screen from an inclined chute 43, which, as shown in the drawings, is provided with transverse rods 44, upon which are hung distributing devices 45, which engage the bottom of the chute and have a tendency to spread the material evenly over the bottom of the chute, whereby as it is delivered to the screen it is spread thereon at a uniform depth approximately. When it is stated that the screen member 41 is mounted above the lower portion of the screen 13, it must be understood that the term "lower" is used with reference to the inclined position of the screen mechanism, as just described.

When the material is treated in a wet state, suitable means must be employed for delivering water thereto in such quantities as will best facilitate the progress of the work. For this purpose a trough 46 is mounted on the stationary frame and extends transversely across and above the screen. As shown in the drawings, this trough consists of a main central part 47 and nozzles 48, extending both forwardly and rearwardly from the body of the trough. The body of the trough should occupy a horizontal or approximately horizontal position when the screen mechanism is in the inclined position for operating purposes. Hence in Fig. 5 the trough 47 is shown inclined to the plane of the screen, so that when the screen is inclined to the horizontal the trough will occupy a horizontal position. Water is continually supplied to this trough and delivered to the screen in both directions from the body of the trough, which occupies a central position extending transversely across the screen at any suitable height therefrom. I have also made further provision for supplying the material with water, consisting of a transversely-arranged water-pipe 49, journaled in stationary brackets 50 and provided with an arm 51, provided with slots 52, through which pass a wrist 53 of a crank-arm 54, made fast to the rotary cam-wheel shaft 8. As the shaft 8 rotates it is evident that partial rotary movements in reverse directions will be imparted to the water-pipe 49. This pipe is provided

with outlet-nozzles 55, screwed into threaded openings formed in the pipe, which is suitably reinforced, as shown at 55ª, for the purpose. These nozzles are arranged in pairs at suitable intervals. The individual nozzles of each pair are arranged one in front of the other, and they are provided with openings of considerable size, which are controlled by valves 56, pivoted at 57 and normally held in the closed position by springs 58. These valves when closed allow a suitable quantity of water to escape from the pipe. If, however, the escape-opening, which is designated 59 in Fig. 8, should become clogged, it is only necessary to pull outwardly on the valve 56, when the latter may be thrown to the position shown in Fig. 9, whereby any dirt or foreign matter tending to stop the nozzle-opening may be removed, after which the valve may be allowed to assume its normal position. It will be observed that as the oscillating or partial rotary movement in reverse directions is imparted to the water-pipe 9 the nozzles will distribute the water forwardly and rearwardly over the screen in an advantageous manner.

When it is desired to re-treat the material which passes through one screen, as that shown uppermost in Fig. 2, this material may be carried downwardly by a chute 60, indicated by dotted lines in Fig. 2, and delivered to another screen of exactly the same construction located below, except that the mesh of the screen will of course be finer than that through which this grade of the material formerly passed. Thus it must be understood that the material may be subjected to any desired number of screening actions or operations according to the number of grades, classifications, or sizes desired.

Attention is called to the fact that the wearing-plates 21 are raised somewhat from the upper surface of the bars 10 of the screen-frame, also that the cam-surfaces of the multiple cam-wheels engage the extremities of these wearing-plates, whereby when any cam-face is released from the wearing-plate the engaged extremity of the latter snaps upwardly into the interdental spaces between the cam-faces of the cam-wheels in response to the recoil of the springs 23, this upward movement continuing until the screen-frame is engaged by the adjustable stop-bolts 37.

From the foregoing description the use and operation of my improved devices will be readily understood. The material to be treated is first discharged into the chute 43, in which it is separated or spread over the bottom of the chute in an approximately even layer through the instrumentality of the spreading devices 45. From this chute it passes to the upper portion of the screen, referring to Fig. 2, where it is acted on by the vibration imparted by the coöperating action of the multiple cam-wheels 9, the springs 23, and the stops 37. During the rotation of the shaft 8, upon which the cam-wheels are mounted, if the material is treated in a wet state water is constantly supplied to the screen through the instrumentality of the trough 47 or the oscillating supply-pipe 49, or both, as may be desired. The material rejected by the screen passes over the lower extremity of the same and thence into a chute 62, whence it may be delivered to any suitable receptacle. The material that passes through the screen 13 may be discharged from the lower extremity of the housing into the chute 60, whence it is delivered to another screen of finer mesh. In this manner the material may be subjected to any desired number of screening actions, as heretofore explained.

Having thus described my invention, what I claim is—

1. In a vibrating screen, the combination with a stationary frame, of a screen provided with a frame relatively movable with reference to the stationary frame, springs centrally connected with the screen-frame and suitably supported, said springs being composed of members connected at their extremities and supported intermediate their extremities, tie-bars connected with the said springs at one extremity and with the stationary frame at the opposite extremity, multiple cam-wheels engaging the central portions of the screen-frame on opposite sides whereby the said frame is alternately depressed and released, and suitable means for limiting the reverse movement of the screen-frame.

2. The combination with a relatively stationary frame, of a screen, springs centrally connected with the screen and supported from the frame, tie-bars secured to the springs, the said bars being stationary at one extremity, multiple cam-wheels acting on the central portions of the screen on opposite sides, and means centrally acting on the screen-frame in direct opposition to the springs, whereby the latter are placed under tension.

3. The combination with a stationary frame, of a screen, springs secured to the central portions of the frame of the screen, tie-bars having one extremity connected with the stationary frame and their opposite extremity secured to the springs, adjustable means engaging the central portion of the springs for regulating their tension, and cams acting centrally on the screen in direct opposition to the tension-regulating means for imparting a vibratory action to the screen, substantially as described.

4. The combination with a stationary frame, of a screen, springs centrally connected with the screen on opposite sides, the said springs being composed of upper and lower separated members, tie-bars connected at one extremity with the springs and at their

opposite extremities with the stationary frame, adjustable means centrally engaging the lower members of the springs, and cams acting centrally on the screen in opposition to the upper members of the springs which are placed under tension by the cams whereby a vibratory movement is imparted to the screen.

5. The combination of a screen provided with a suitable frame, a housing surrounding the screen proper, the framework of the screen being provided with side bars located outside of the housing, and end bars which protrude through openings with which the housing is provided, springs engaging the screen-frame outside of the housing and on opposite sides of the latter, the springs being composed of upper and lower separated members, tension-regulating means for supporting the said springs, and centrally engaging the same, tie-bars having one extremity of each attached to the said springs, the opposite extremities of the tie-bars being secured to a stationary support.

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

NORMAN V. FITTS.

Witnesses:
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IDA J. O'BRIEN.