No. 800,693. PATENTED OCT. 3, 1905.

J. A. TRAYLOR.

SHAKING SCREEN.

APPLICATION FILED DEC. 28, 1904.

3 SHEETS—SHEET 1.

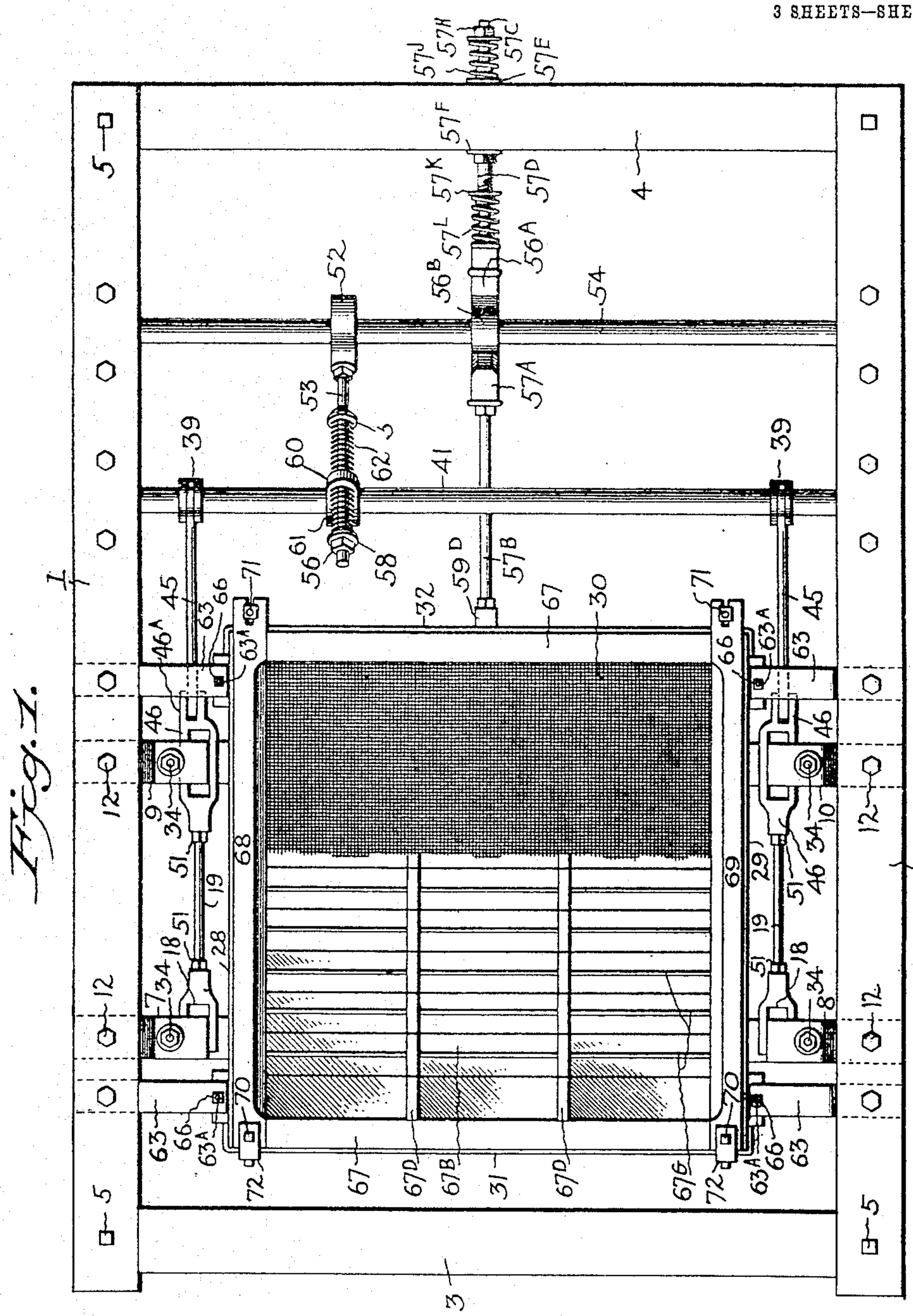

Fig. 1.

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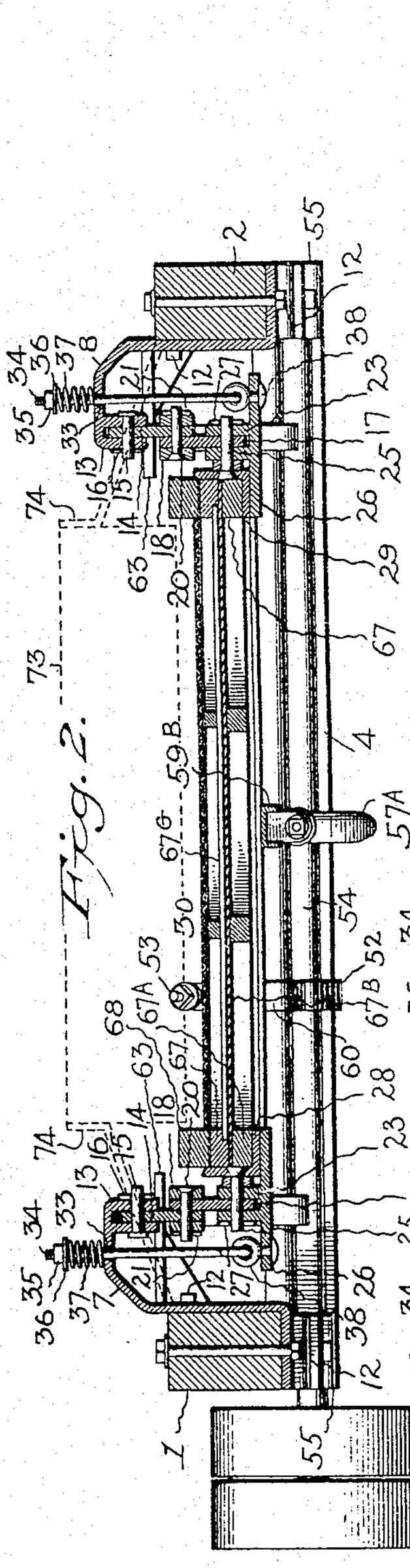

Fig. 2.

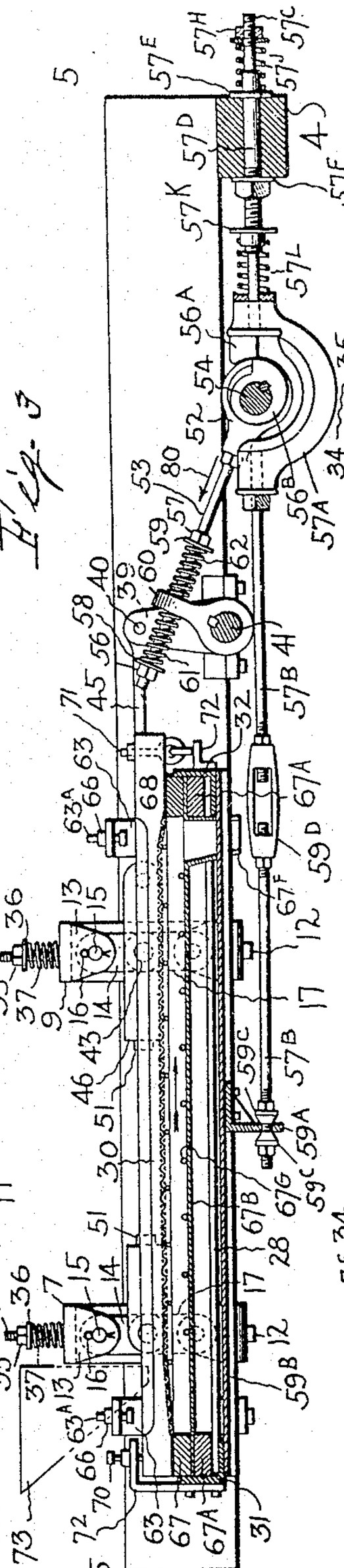

Fig. 3.

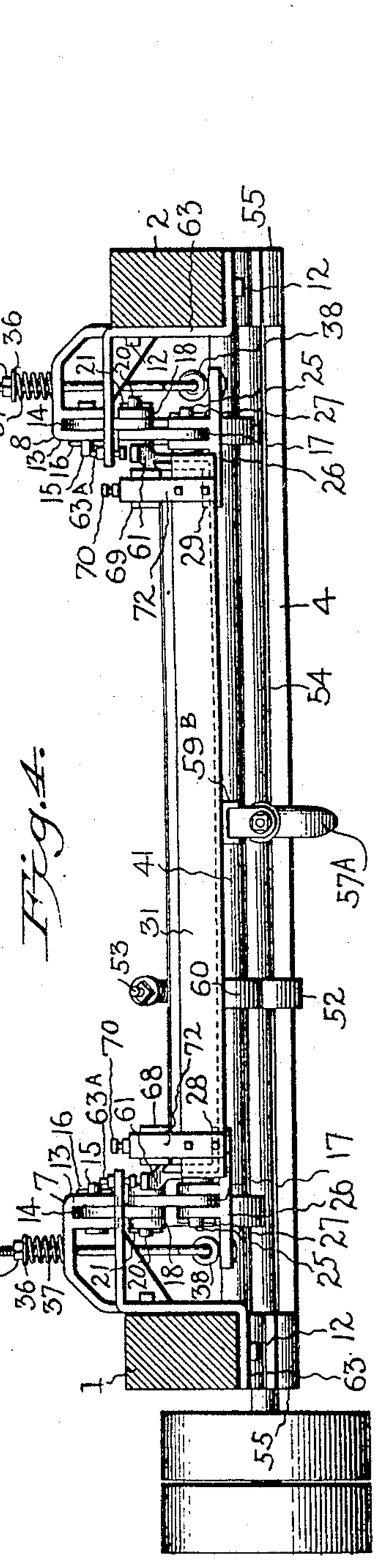

Fig. 4.

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3 SHEETS—SHEET 3.

Fig. 5.

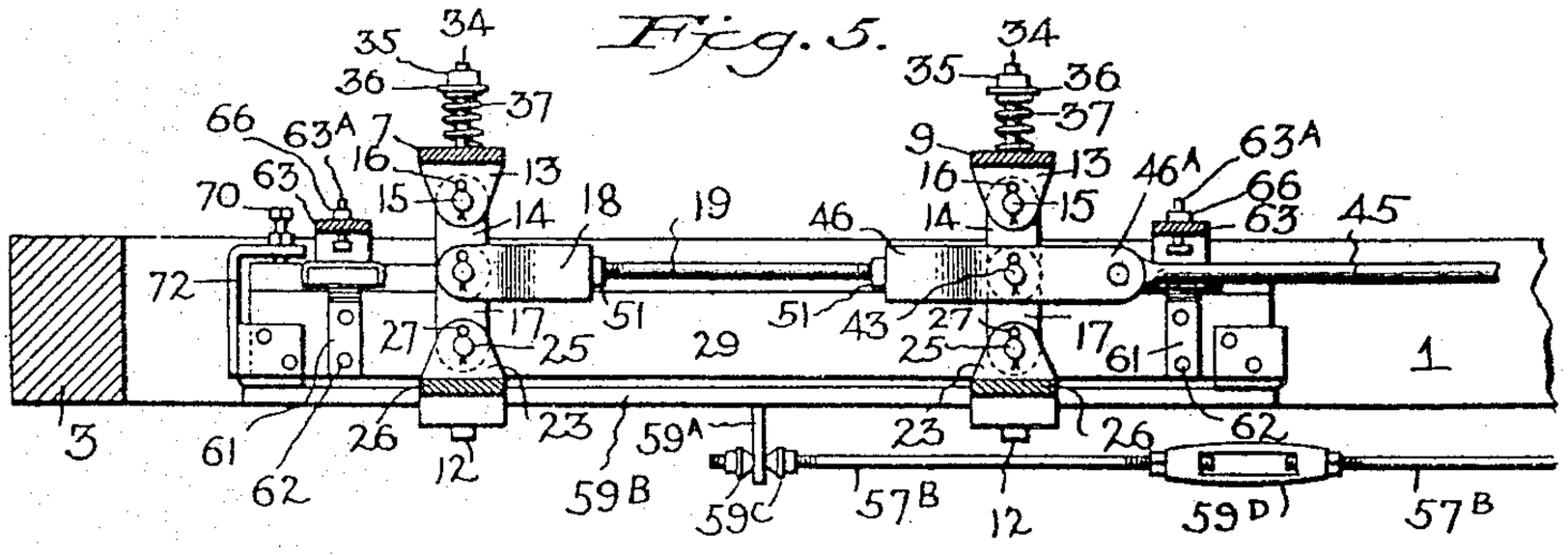


Fig. 6.

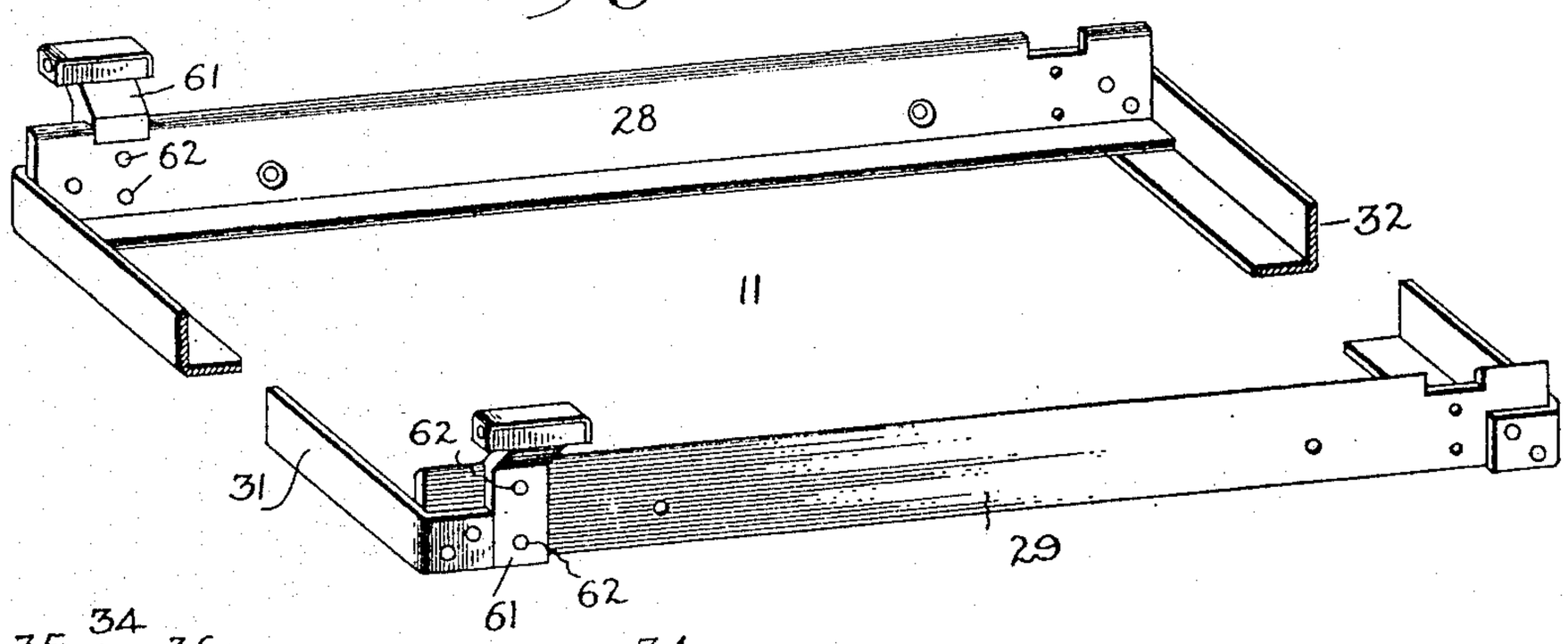


Fig. 7.

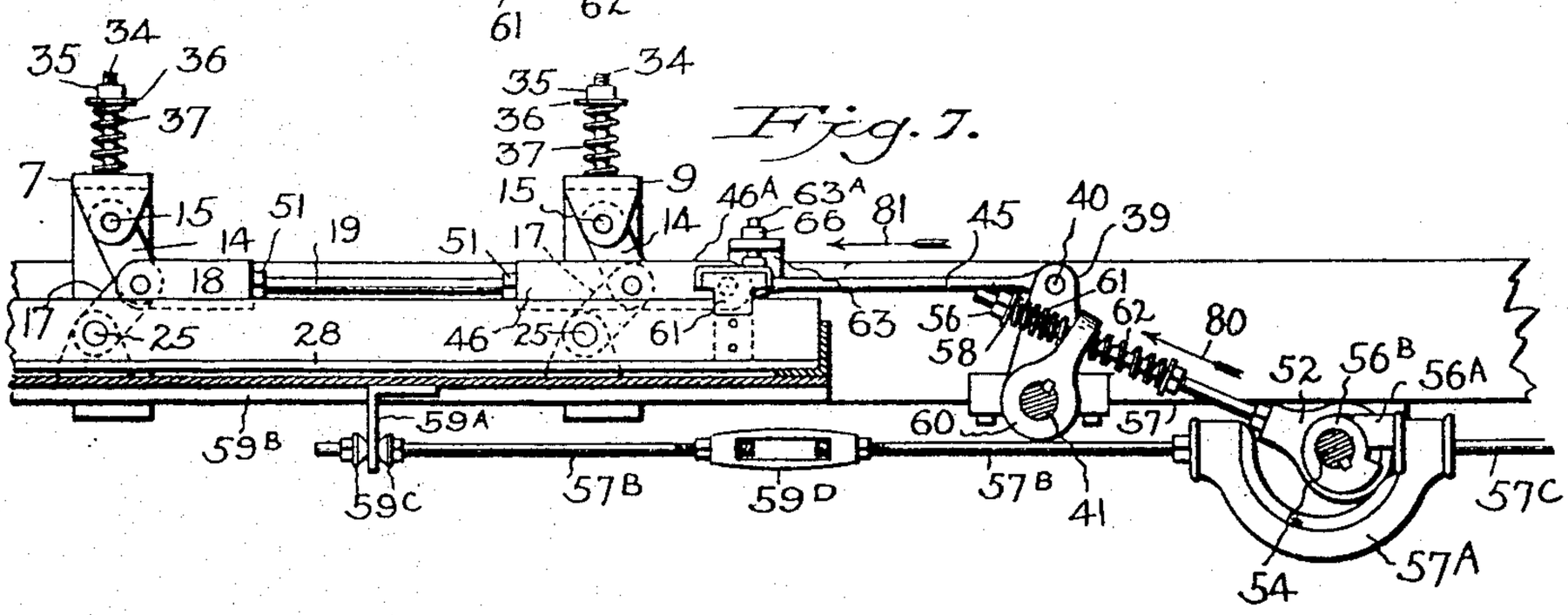
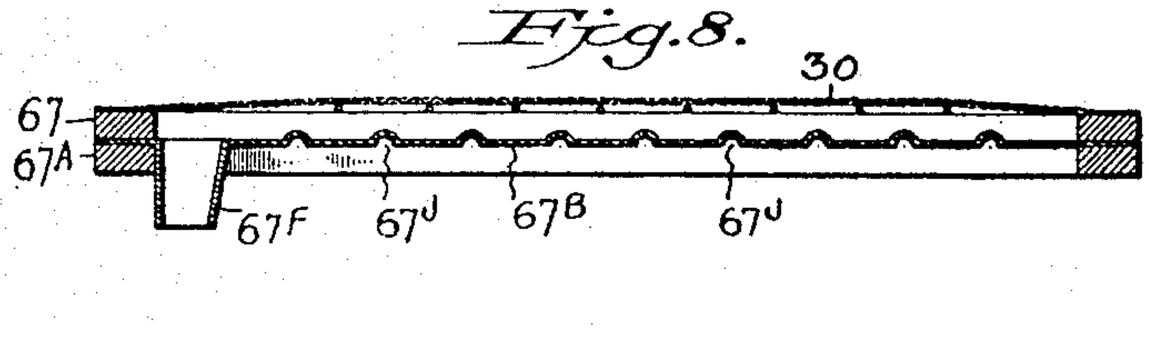


Fig. 8.



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UNITED STATES PATENT OFFICE.

JOHN A. TRAYLOR, OF DENVER, COLORADO.

SHAKING-SCREEN.

No. 800,693. Specification of Letters Patent. Patented Oct. 3, 1905.

Application filed December 28 1904. Serial No. 238,613.

To all whom it may concern:

Be it known that I, JOHN A. TRAYLOR, a citizen of the United States of America, residing in the city and county of Denver and State of Colorado, have invented certain new and useful Improvements in Shaking-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 screens; and the objects of my invention are, first, to provide a screen for ore-pulp and other material having an underwash adapted to prevent its clogging and to facilitate the feed; second, to provide a combined screen and pan arranged to screen ores and other materials and to retoss the screened water and ore-pulp up against the under side of the screen and through its meshes to wash clean and facilitate its screening capacity; third, to provide a screen for screening ore and other material that operates with a differential vertical reciprocal resilient impingement against an abutment at the end of its upward vertical stroke and that has a vertical rocking horizontal reciprocal movement that moves the screen in alternately opposite directions to the alternate vertical rocking movements of said screen and with a differential horizontal movement; fourth, to provide a screen having a bodily-adjustable resilient vertical reciprocal bumping movement and a horizontal reciprocal movement arranged to coöperate with the said vertical bumping movement to toss the ore-pulp ahead on the screen and run in the direction of its feed; fifth, to provide a resiliently-suspended screen and a coöperating screenings-catching pan provided with a vertically-impinging bumper cradle movement, combined with a coöperating horizontally-differential movement that washes, cleans, dissolves, disseminates, and facilitates the perfect screening of ore-pulp and other material. I attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a plan view of my improved screen and attachments, showing the same mounted upon a suitable supporting-frame. Fig. 2 is a transverse sectional view through the screen and supporting-frame, taken on the line 2 2 of Fig. 1. Fig. 3 is a longitudinal vertical sectional view on the line 3 3 of Fig. 1. Fig. 4 is an end view of the feed end of the screen. Fig. 5 is a longitudinal vertical sectional view on line 5 5 of Fig. 1. Fig. 6 is a contracted perspective view of the metal frame which supports the screen-frame. Fig. 7 is a view illustrating the operation of the bumping mechanism which actuates the screen-holding casing and the screen and pan, and Fig. 8 is a longitudinal sectional view illustrating a modified form of screen-pan.

Similar numerals of reference refer to similar parts throughout the several views.

Referring to the drawings, the numerals 1 and 2 and 3 and 4 designate a rectangular frame which I term the "supporting-frame" of my machine, the numerals 1 and 2 designating suitable-sized side rails, which are preferably made of wood, and the numerals 3 and 4 the cross end pieces, which are also preferably made of wood and are secured to the side rails by bolts 5 or by other suitable means. To the side rails 1 and 2 of the supporting-frame I secure four brackets 7, 8, 9, and 10. The brackets 7 and 8 are placed opposite each other, as are also the brackets 9 and 10, and at a distance apart to support between them at predetermined points adjacent to its ends a screen-supporting frame 11. These brackets are bolted to the side rails of the supporting-frame by bolts 12. I preferably make these brackets in substantially the form of a Z and secure the vertical and the lower horizontal arms to the side rails. The top arm of these Z-shaped brackets terminates at its end in a pair of depending semicircular lugs that are spaced at a short distance apart and form a depending yoke 13 on each bracket. I pivotally secure to the yoke 13 of each bracket one end of four links 14, preferably by four pins 15, which are secured in the yokes by split pins 16. Each of these four links depends normally vertically downward from its yoke at the end of the bracket, and at their lower ends they are pivotally secured to one end of four other links 17 and to two yokes 18, formed in the end of two connecting-rods 19. The yokes 18 straddle both of the links of the brackets 7 and 8, and the ends of these two links and the yokes are pivotally connected together, preferably by pins 20, which are provided with heads that are countersunk into one side of the yokes, while the opposite ends of the pins are provided with split pins 21. The opposite ends of the four links 17 are pivotally secured between

upwardly-projecting lugs 23 by pins 25. These lugs are formed on top of four bed-plates 26, which support the screen-supporting frame. These lugs project upward from the central portion of the bed-plates, which extend a sufficient distance on each side of the lugs to form shelf portions on each side of them. Upon the inner shelf of each pair of these bed-plates I place angled irons 28 and 29, that have arms of unequal width, placing them on the plates with their widest arms standing vertically and against the adjacent lugs, to which I secure them by the pins 25, which pass through the angle-irons and are countersunk flush with the side of the angle-irons. The pins are secured to the lugs by split pins 27, which are placed through the ends of the pins, which project beyond the lugs. By reference to the cross-sections, Figs. 2 and 4, it will be seen that these bed-plates 26 are suspended by the links (eight links) from the end of the four brackets 7, 8, 9, and 10, that are fastened to the opposite side rails 1 and 2, and on these bed-plates the angle-irons 28 and 29 are placed opposite each other, these bed-plates and the angle-irons forming a casing in which the screen 30 is placed. The ends of these angle-irons 28 and 29 are connected together by smaller angle-irons 31 and 32, one arm of each of which extends under the horizontal arms of the angle-irons 28 and 29, and other arms are bent around against the outer sides of the vertical arms of the side angles and are riveted to them, as shown in Fig. 6. These side and end angle-irons form coöperatively a square casing for the screen 30, which casing is suspended by the eight links from the four brackets of the side timbers. One of the important features of my invention is, however, that this screen-supporting casing shall be under a constant upward pressure against the links and the brackets instead of hanging of their weight from them. I accomplish this feature of my invention in the following manner: Through the top arm of each bracket I form apertures 33, through each of which a rod 34 hangs loosely and vertically. These rods are supported by nuts 35, that are threaded to the ends of the rods, and washers 36 surround the rods below the nuts and rest on springs 37, one end of which rests on the tops of the brackets, and the washers rest on the opposite ends. In the lower end of these rods eyes are formed that are connected to eyebolts 38, that are secured to the bed-plates. The nuts at the tops of the rods are screwed down to compress the springs enough to continuously hold the entire screen-supporting casing under an upward expansive spring-pressure sufficient to cause them to assist or act in conjunction with the links to raise the screen against its bumpers, as will be explained more fully hereinafter. Each pair of links that connect the screen-supporting frame to the brackets forms a toggle-joint, and I connect the center of each toggle on each side of the screen-frame to connecting-rods 19, which on one end are pivotally secured to the pins 20 and to the links 14 and 17, as above described. The opposite end of these connecting-rods are pivotally connected, respectively, to the upper ends of two rock-arms 39 by pins 40. The upper ends of these arms are secured to a rock-shaft 41, that is mounted in boxes 42, which are secured on the side timbers 1 and 2. The links of the brackets 9 and 10 are pivotally connected by pins 43 in slots that are formed centrally through the connecting-rods. These connecting-rods are made of three pieces each 45, 46, and 18. The pieces 45 are links that form one end of the connecting-rods, and they are pivotally connected at one end to the rock-arms 39. The opposite ends of these links are pivotally connected to yokes 46^{A}, formed on the ends of the pieces 46 of the connecting-rods. The two pieces of the connecting-rods 46 and 18 are connected together by longitudinally-adjustable couplings which comprise the threaded rods 19, the rear ends of which screw into threaded holes that are formed in the free ends of the pieces 46, and their opposite ends thread into threaded holes that are formed in the ends of the free ends of the pieces 18. The rods 19 are each provided with two nuts 51, which screw up against the ends of the pieces 46 and 18 and lock them to the threaded rods in adjusted positions. These adjustable connections permit the relative distances between the links to be adjusted to permit both sets of links to depend vertically should the distances between the brackets vary in the construction of a number of these screens, while the links make jointed connections between the connecting-rods and the arms that permit independent movement of each. The rock-arms 39 receive their oscillating motion from an eccentric 52 and an eccentric-rod 53, the eccentric being secured to a shaft 54, that is journaled in boxes 55, that are secured to the under side of the side timbers 1 and 2. The free end of the rod 53 is provided with a thread and with nuts 56 and 57 at opposite ends of the thread. Collars 58 and 59 are placed against the nuts. The free end of the eccentric-rod extends loosely through an arm 60, that is secured to the rock-shaft 41 and is held normally centrally between the nuts and collars by two coiled springs 61 and 62, which are placed on the rod between the collars and the opposite sides of the arm, against which they are held under an equal and suitable expansive pressure to operate the links as desired, as will be explained hereinafter.

To the shaft 54 I secure a cam 56^{B}. This cam is adapted as it is rotated with the shaft to engage the end of a buffer-block 56^{A}, that forms a part of a yoke 57^{A}, one end of which is connected to the rear end of a connecting-

rod 57^B, the opposite end of which rod is connected loosely by means of a yielding connection to a clip 59^A, that is bolted in any convenient manner to the middle portion of a channel-bar 59^B, that is secured to the under side of the screen-holder. This channel-bar is located centrally of the width of the screen and is bolted at one end to the angle-bar 31 and at its opposite end to the angle-bar 32. The yielding connection of the connecting-rod 57^B with the clip 59^A is formed by passing the forward end of the connecting-rod through a hole in the depending end of the clip, rubber blocks 59^C being placed upon the rod, one on each side of the depending end of the clip, which blocks are held against the clip by nuts, as shown. The connecting-rod is provided with a turnbuckle 59^D, by which the length of the rod may be adjusted to meet conditions. The opposite end of the yoke is connected to one end of a rod 57^C, which passes loosely through a tube 57^D, that extends through the end piece 4 of the supporting-frame. This tube has an integral collar 57^E adjacent to one end, which abuts against the timber 4, and its opposite end is threaded and a washer 57^F is slipped thereon against the timber. A nut is then secured against the washer, thus securely holding the tube. The opposite or outer end of the rod 57^C is threaded, and a nut 57^H is secured thereon, and a coiled spring 57^J is placed on the rod between the nut and the end timber 4. A collar 57^K is screwed upon the forward end of the tube 57^D, and a coiled spring 57^L is placed on the rod between the collar 57^K and the yoke. Thus as the cam 56^B rotates against the buffer-block 56^A the yoke 57^A is moved rearward, carrying with it the connecting-rod 57^B and the screen, the spring 57^L being compressed thereby between the collar 57^K and the end of the yoke, and when the cam passes the buffer-block the yoke and the connecting-rod and screen are thrown violently forward, causing the water and ore-pulp which has been tossed into the air by the vertical impact of the screen against its buffers to fall back onto the screen a little nearer its discharge end than the point from which it was tossed, as will be explained more fully hereinafter. The spring 57^J at the rear end of the connecting-rod 57^B will cushion the impact of the screen at the limit of its forward throw. Upon one end of the shaft 54 a power-receiving pulley is secured, an idle pulley being mounted adjacent thereto.

Adjacent to each corner of the screen-supporting casing and to the outside of the angle-irons 28 and 29 I secure four short vertical arms or buffer-standards 61 by bolts 62, the top of each of which extends over and is set into a notch formed in the top of the angle-irons. The tops of these I cover with one or more thicknesses of leather, which is suitably secured to opposite sides of the standards, and to the side rails opposite each of these four standards I secure four Z-shaped angle-irons 63, the top of each of which extends directly over the top of the buffer-standard adjacent to it. Through the top of each bracket I insert adjustable screws 63^A, which I term "adjustable buffer-screws." I place these screws in position to stand directly over the buffer-blocks. The lower ends of these adjustable buffer-screws are provided with heads, and their upper ends are provided with check-nuts 66, which are threaded to the screws on top of the brackets to lock the screws in adjusted positions. These buffer-blocks are made wider than the heads of the screws transversely of the longitudinal movement of the screen-frame, and they are made enough longer than the length of the adjustable bumper-screws in order that the buffer-blocks may strike them at the opposite ends of the horizontal reciprocating stroke of the screen-casing and screen.

The screen 30 comprises a screen-supporting sash which fits loosely into and rests on the lower arms of the angle-irons 28, 29, 31, and 32 of the screen-supporting casing. The sash consists of double or two-part sash, which comprises the upper sash 67 and the lower sash 67^A. The screen 30 is supported by the upper sash 67, and the lower sash 67^A supports a pan 67^B. The top sash is adapted to support wire screen-cloth of any size mesh from the coarsest to the finest mesh practical for screening material.

In screening ores for subsequent treatment to recover their values by the several processes in use screens varying from twenty to eighty mesh are most generally employed. Screens of this fineness when supported by open framework invariably sag under the continual weight of ore under rapid agitation, or when the fine screens are supported by a coarse-mesh screen the bends in the wire of the coarse-mesh screen will cut out or wear away the finer screen-covering, and I have found in practice that it is necessary to more evenly support the entire body of the screen to avoid its breaking and enable it to wear evenly until worn out by the ore. I carry out this feature of my invention in the following manner: The top sash is provided with cross-braces 67^D, and transversely across the braces and the top surface of the top sash I place a plurality of small wires, preferably spacing them several inches apart across the frame and drawing them tight, securing them by any suitable means to the sash. Over these wires and the cross-braces I place a screen of wires or of slotted sheet metal, preferably securing the screen to the sash by tacks, nails, or screws. The screen then rests directly on the wires and cross-braces and is supported by them substantially evenly throughout its entire surface and is effectually prevented from sagging enough to crack and break it. The lower or bottom sash 67^A is of exactly

the same size as the upper sash and is placed directly below it. This bottom sash supports the pan 67^B just below the screen, that extends entirely across the top surface of the lower sash and is secured to it at its edges by nails or screws. This pan also extends directly under the entire surface of the screen and rests on cross-braces which form a part of the sash. At the discharge end of the pan, along the side of the rear end of the sash, I form discharge-spouts 67^F, which extend across the breadth of the screen. I form across the surface of the pan a series of water or ore-pulp baffle-bars 67^G, arranging them at right angles to the flow of the water on the pan below the screen-surface and also to form abutments on the surface of the pan, which through the medium of the reciprocating and vertically-swinging movement of the screen will toss the water as it flows against the baffle-bars up through the screen for the purpose of washing, cleaning, and disintegrating any talcy material or sand or ore sticking in the meshes of the screen-cloth and also to assist in disintegrating any lumps of material passing over the screen and to irrigate, wash, and disseminate the ore passing over said screen. In obtaining this result I may employ the baffle-bars as described above, or I may form in the body of the pan a series of upwardly-extending corrugations 67^J at suitable intervals apart in the length of the pan. These corrugations preferably extend at right angles to the flow of the ore-pulp across the pan. My invention contemplates the arrangement of these baffle corrugations or bars at any desired angle and extending either partially or wholly across the pan or arranged in any predetermined zigzag or stepped order on the surface of the pan. These corrugations may also be of any desired shape—such as concaved or square, irregular, or X-shaped—and they are made to project high enough above the level surface of the pan to cause the water that is flowing through the screen to be tossed up against and through the meshes of the screen.

I secure the screen and its sash in the casing by means of two removable side strips 68 and 69, which are preferably made of wood. These strips are clamped down on top of the screen and sash at its opposite sides by the adjustable screws 70 at one of their ends and the swinging bolts 71 at their opposite ends. The adjustable screws 70 are threadedly secured in the top of angle-irons 72, that are secured to the side of the end angle-iron 31. The tops of these screws are adapted to receive a wrench, and the screws are turned against the ends of the strips, which are simply slipped under them, and they are clamped down against the screen and sash. The opposite ends of the screen-clamping strips are bifurcated to form a yoke, and the swinging bolts 71 are pivotally connected to a clip 72, that is secured to the end angle-iron 32. These bolts swing up into the slots of the yokes, and their nuts are turned to clamp the strips and the screen and sash to the casing.

A feed-hopper 73, which I illustrate in Figs. 2 and 3 only, is arranged in operative relation to the feed end of the screen. This feed-hopper may be of any suitable form or construction that is adapted to feed the ore evenly and regularly onto the entire width of the end of the screen. This hopper is outlined in dotted lines in Fig. 2 and is shown partially broken away in Fig. 3. It is set between the side clamps of the screen and is supported far enough above it to allow the screen operative movement by rods 74, which extend to and are secured to the side rails 1 and 2. In the practical operation of my improved screen it is set at a downward inclination that will permit the ore to flow from the hopper onto the screen and move over its surface toward its discharge end only as fast as the fines that are in the ore will settle out of the ore and sift through the screen. In general mill practice several screens may be arranged in tandem order, the screens ranging from a coarse to a very fine mesh, the coarsest screen being first in order, so that the second may screen the tailings from the first and the third the tailings from the second, and so on.

The operation of my improved screen is as follows: Power being applied to the shaft 54 the cam imparts a differential horizontal resilient reciprocating movement to the screen-casing and the screen and sash as the casing is suspended by the toggle-links from the brackets 7, 8, 9, and 10. A differential vertical resilient movement is also imparted by the eccentric 52 and its rod 53 to the rock-arm 60, which imparts an oscillating motion to the rock-shaft 41, which in turn imparts, through the medium of the rock-arms 39, a reciprocating motion to the connecting-rods 19, and the connecting-rods, owing to their being connected to the links which lift the screen against the bumpers and impart a vertical reciprocating cradle-like movement to the screen which, taken in connection with the compensating springs 61 and 62 and the rock-arm 60 on the connecting-rod 53 of the eccentric 52, acts as follows: The adjustable bumper-screws are set to give any desired practical vertical movement to the screen, and assuming that a moderately-violent vertical stroke is desired the adjustable bumper-screws are set, so that the bumper-blocks will strike the heads of the screen before the connecting-rods and the toggle-links have made their full stroke; but as the connecting-rod 53 of the eccentric must make its full stroke the difference in the strokes is compensated, and each is allowed to work independent of the other by means of the springs 61 and 62, which are compressed against the opposite sides of the rock-arm 60 by the full strokes of the connecting-rod 53

during its reciprocal movements. These reciprocal-movement-compensating springs also operate in conjunction with the vertical spring-rods 34 to impart a quick vertical throw or toss to the screen against the bumper-screws as they pass their vertical centers, their action in this respect being as follows: Assuming that the connecting-rods 19 and the links 14 and 17 are standing at the end of their backward and upward strokes, as shown in Fig. 7, as the eccentric-rod 53 moves forward in the direction of the arrow 80 the spring 62 pushes against the rock-arm 60 and pushes it ahead of it, and this rock-arm through the medium of the rock-arms 39 and rock-shaft 41 moves the connecting-rods 19 and the links 14 and 17 also in the direction of the arrow 81; but as the links and the crank-arm stand at an angle toward the direction in which the eccentric-rod is pushing they start slower and move slower than the eccentric-rod is moving, which causes the rock-arm 60 to resist the push of the spring 62 and to compress it between itself and the collar 57, while the tension of the spring 61 on the opposite side of the rock-arm 60 is relaxed. The compression of the spring 62 takes place quickly, as the eccentric-rod, rock-arms, and the connecting-rods make from one hundred and fifty to two hundred and fifty reciprocations per minute. Consequently the compression may be said to be practically instantaneous, and this compression continues until the links pass their vertical centers. The links are also assisted to resist the forward push of the compensating springs 62 against the rock-arm 60 by the upward expansive tension of the vertical rods 34, the springs 37 of which exert a constant upward pressure against the downward and forward movement of the links, as the links when moving from the position shown in Fig. 7 move the screen 30 down and compress the spring 37 on the vertical rods; but when the links pass their vertical centers and swing up to the limit of the arc of their swinging movement as defined by their radius from the pivoted connection to the brackets 7, 8, 9, and 10, they resiliently jerk the screen up until its bumper-blocks strike the adjustable bumper-screws. Consequently when the connecting-rods 19 move the links forward the links force the screen downward against the resistance of the resilient pressure of the vertical spring-rods 34, which resistance further tends to compress the compensating spring 61. The resistance consequently increases until the links pass their vertical center, when the resistance is instantly relieved, which causes the compressed compensating spring to violently expand against the rock-arm 60, causing it and the rock-arms 39 and connecting-rods 14 and the links 14 and 17 to jump violently forward in the forward upstroke of the links, which are also thrown up by the upward expansive spring 37 of the vertical rods 34. This quick upward movement of the links as they pass their vertical centers throws the screen bodily upward until the bumper-blocks strike violently against the adjustable bumper-screws. If the bumpers are set so that the bumper-blocks strike the bumper-screws before the links complete their full stroke, the links and the connecting-rods stop also when the bumpers strike, but the eccentric-rod 53 continues to the full limit of its stroke by compressing the spring 61, as above described. Thus these springs 61 and 62 form a compensating yielding cushion for the variable vertical reciprocating strokes of the bumpers and the fixed stroke of the connecting-rod 53 by which the vertical reciprocal movement of the screen is effected. When the compensating rods follow in the same manner and the compensating spring 62 on the opposite side of the rock-arm is compressed as the links move down and backward to their vertical centers, they compress the springs 37 of the vertical rods, and the instant the links pass their centers they and the screen spring up, causing the screen-bumpers to again strike the adjustable bumper-screws. Consequently the screen receives two vertical bumps at each full stroke of the eccentric and the connecting-rods. The motions of the links, connecting-rods, the vertical spring-rods, and the compensating springs, however, do not alone give to the screen its entire operative movement. The resilient reciprocating compensating throw movement of the yoke and its connecting-rod moves the screen with an even movement in the direction of the flow of the ore-pulp across the screen, and then jerks or throws the screen with a sudden resilient movement in the opposite direction to the direction of the flow of the ore-pulp. The slow even movement imparted to the screen by the cam and yoke takes place at the same time the screen is swinging to and fro under the action of the connecting-rods, toggle-links, and rock-shaft; but the quick throw of the screen by the spring 57^{L} takes place at the moment the cam slips off the abutment 56^{A} and at the instant the screen is swung up against its bumpers by the toggles and its vertical lifting-spring 37. The swinging movement of the toggle-links and the vertical impingement of the screen by the springs 37 against the bumpers tosses the ore-pulp flowing over the screen into the air and causes the ore-pulp to fall on the screen ahead of the place where it was tossed into the air, as the screen is thrown back under it while it is in the air. The same action takes place on the pan, and the screened ore-pulp, which is thrown against the baffle-bars by the swinging movement of the screen due to the toggle-links, is tossed into the air when the screen strikes its bumpers, and the screen is jerked or thrown back under the screened ore-pulp, causing it to shoot in short

circular loops from each baffle-bar up against and through the meshes of the screen above, as the pan is positioned just far enough below the screen to enable the momentum of the screen to accomplish this and causing the ore-pulp to fall back onto the pan ahead of the baffle-bar it was tossed up from. I preferably reciprocate the screen horizontally in the reverse direction to the vertical swinging movement of the links in order to reciprocate the screen in a substantially vertical plane. Thus when the connecting-rods and links are moving in the direction of the arrow, and the screen under the action of the cam which is secured centrally upon the shaft 54 is moving in the direction of the arrow and is pushing against the upward lift of the links after they pass their vertical centers and move upward, the result is that the backward horizontal movement of the screen is pushing against the onward upward straight movement of the screen due to the upward swing of the links, which naturally lifts the screen upward to one side of its vertical alinement. Consequently the result of these counter movements is to lift and reciprocate the screen in a substantially vertical plane. This compound vertical and horizontal movement gives to the screen an intensity of vibrating motion in the directions best adapted to keep every particle of ore in intense live motion, which effectually sifts the finer particles of the granulated ore from the coarser particles and prevents clogging, thus enabling the screen to be worked to its fullest capacity.

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

1. In a shaking-screen, a screen-support comprising a sash, independent supporting-wires secured tightly across said sash, a screen laid on top of said supporting-wires and secured to said sash, a second sash, a pan secured to said second sash beneath said screen, a plurality of projecting baffle-bars formed on the top surface of said pan, and arranged in predetermined order and arrangement, and means including the cam, the yoke, the spring-controlled rods, the abutment and the spring-compensating connection between one end of one of said rods and said screen and pan for imparting a reciprocating jerk or throw movement to said screen and pan that will cause the baffle-bars to throw the water behind them up against and through the meshes of said screen, substantially as described.

2. In a shaking-screen, the combination with a pair of sashes, a pan clamped between said sashes; a screen upon the upper sash above said pan and means for clamping said screen upon said sash; of the cam and spring-operated reciprocating device secured centrally beneath said sashes; buffers adjacent to the corners of said screen; and adjustable stops, above and in the path of said buffers.

3. In a shaking-screen, a pair of sashes; a pan clamped between said sashes; cross-braces extending lengthwise of said upper sash; a plurality of wires extending across said braces; a screen supported on said wires; means for clamping said screen to said upper sash, and a cam and spring-operated device for operating said screen.

4. In a shaking-screen, the combination of a supporting-sash having a bed of wires stretched across it, a screen secured to said sash and resting on said bed of wires, with a sash provided with cross-braces arranged to register with said screen sash, and adapted to fit under it, a pan secured on said sash and braces and having bars or raised projections on its surface at predetermined distances apart, a feed-hopper at one end of said screen and means for discharging material from said screen and pan, substantially as described.

5. In a shaking-screen, a combined screen and a screenings-catching pan, comprising a double supporting-sash separated into two parts, a screen secured to the top part, a pan secured to the lower part, baffle-bars arranged across said pan at right angles to the flow of the screenings material, means for operatively supporting said combined screen and pan, and means including a rod connected at one end to said screen for imparting a spring throw or jerking movement to said combined screen and pan in one direction of their shaking movement, whereby the water flowing through said screen onto said pan is thrown up against the bottom of said screen and through its meshes, substantially as described.

6. In a shaking-screen, the combination with the screen, and its supporting-frame, of means for imparting to said screen a variable-speed reciprocal stroke, comprising a cam rotatably mounted adjacent to said screen, a yoke-shaped casting surrounding said cam, having a bumper-head arranged to be engaged by said cam, a tube secured in the rear of the supporting-frame, an adjustable collar on the forward end of said tube, a rod secured at one end to said yoke and extending loosely through and beyond said tube, a nut on the outer end of said rod, a spring on said rod between said nut and said supporting-frame, a coiled spring on said rod between said adjustable collar and said yoke, a rod connected at one end to the opposite end of said yoke, provided with a turnbuckle connection between its ends and having its opposite end provided with oppositely-arranged adjustable buffers and means for attaching said shaking-screen to said rod between said buffers, substantially as described.

7. In an inclined shaking-screen, the combination of an operatively-supported screen provided with a supporting-bed of parallel-arranged wires for supporting said screen throughout its surface, a screenings-catching pan positioned below said screen, and arranged

to be reciprocated with said screen, a plurality of raised projections on the surface of said pan arranged in any predetermined order and direction, a discharge-spout at the discharge end of said pan with a power-operated reciprocating device arranged and adapted to impart a spring-actuated-impulse throw-stroke in the direction of the flow of material over said screen and pan, and comprising a rod provided with a yoke portion, a cam arranged to move said rod in one direction of its reciprocal movement, an abutment, a spring arranged to throw said rod in the opposite direction of its reciprocal movement, a clip depending from said screen and pan, a threaded end on one end of said rod extending loosely through said clip; a nut on each side of said clip on said rod; a resilient buffer on each side of said clip between each nut and the adjacent side of said clip, whereby a spring compensating connection is made between said reciprocating rod and said screen, and pan, and means for rotating said cam, substantially as described.

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

JOHN A. TRAYLOR.

Witnesses:

G. SARGENT ELLIOTT,

BESSIE THOMPSON.