

July 6, 1937.

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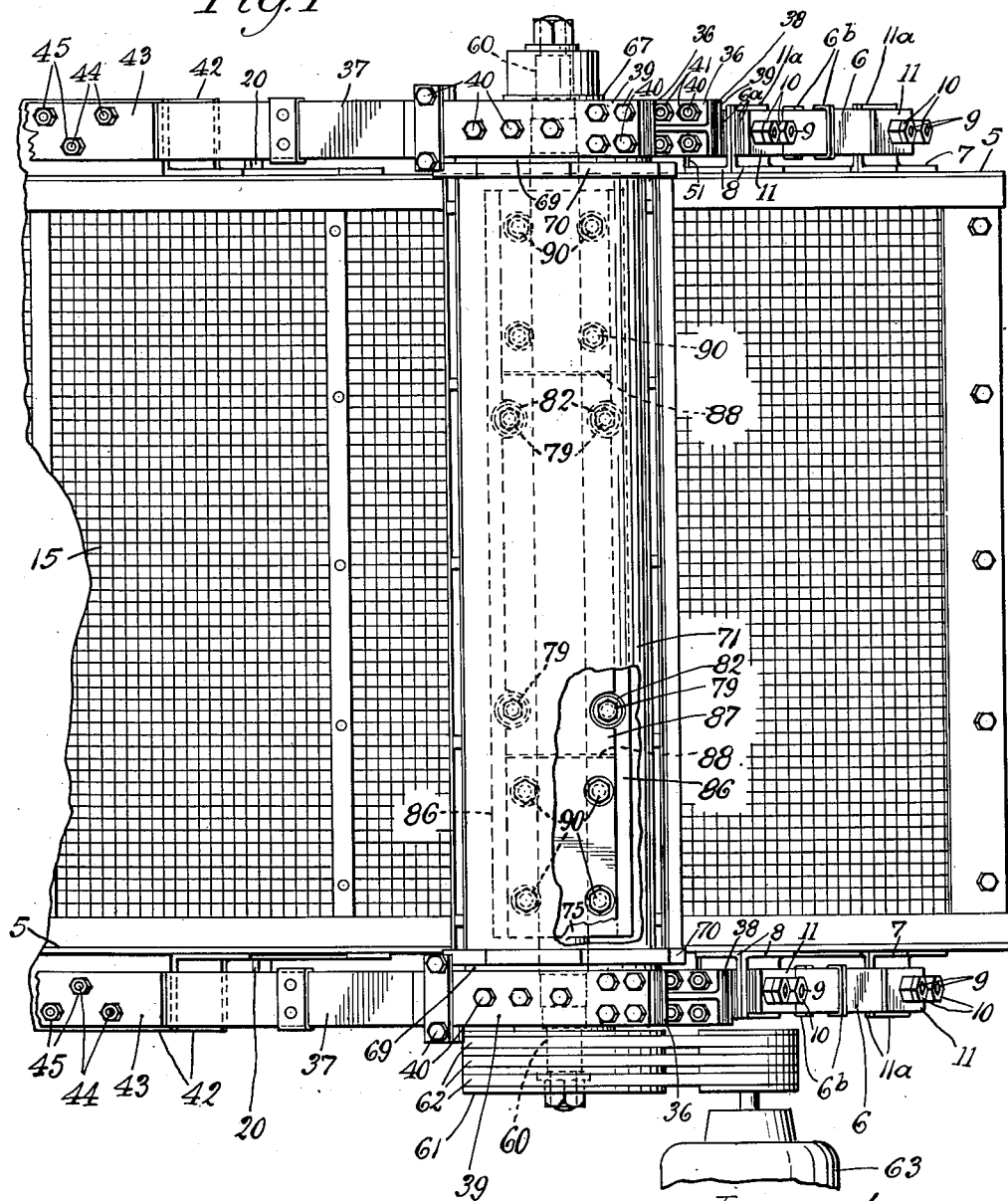
2,085,774

SCREEN

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3 Sheets-Sheet 1

Fig. 1



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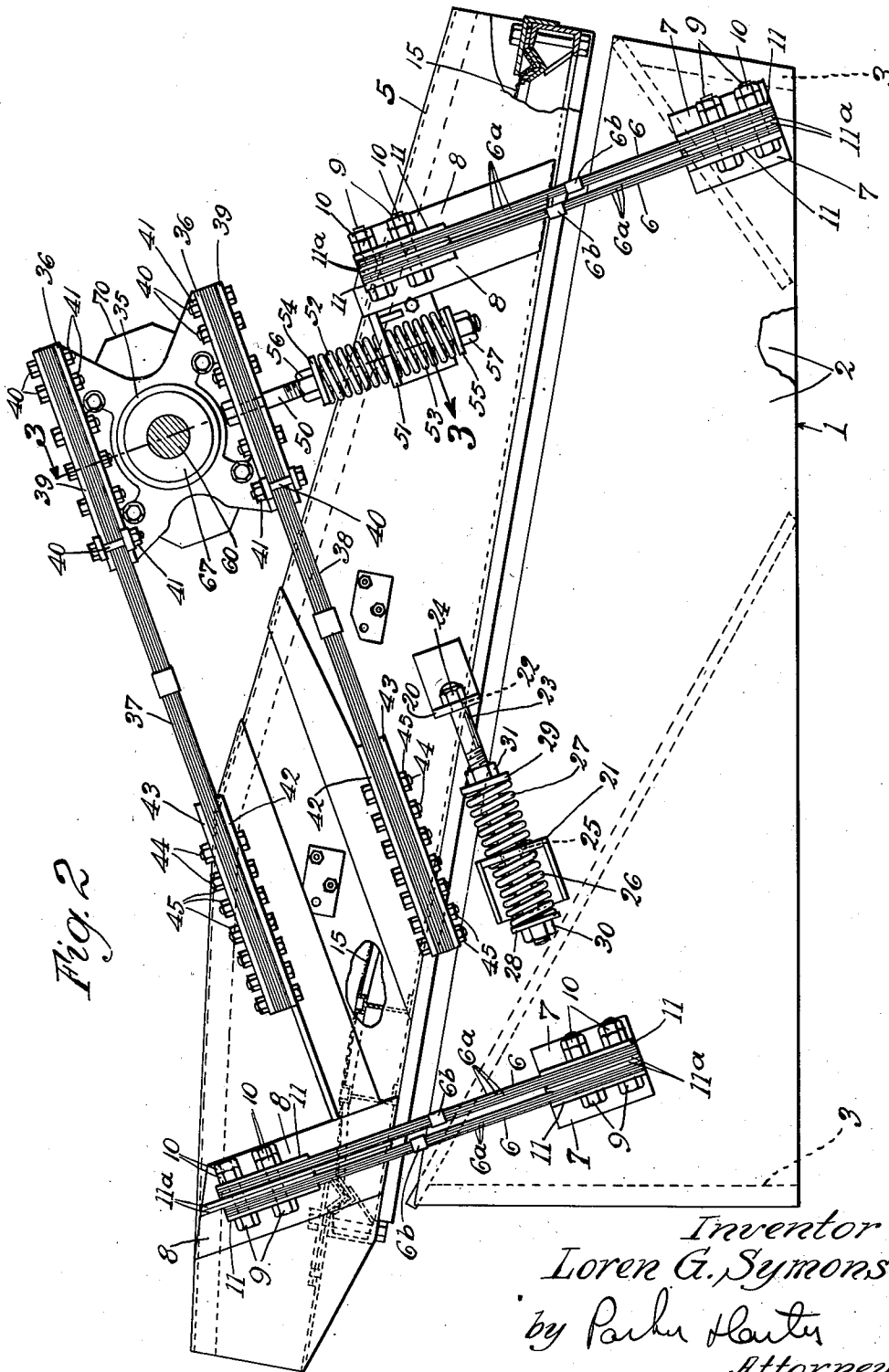
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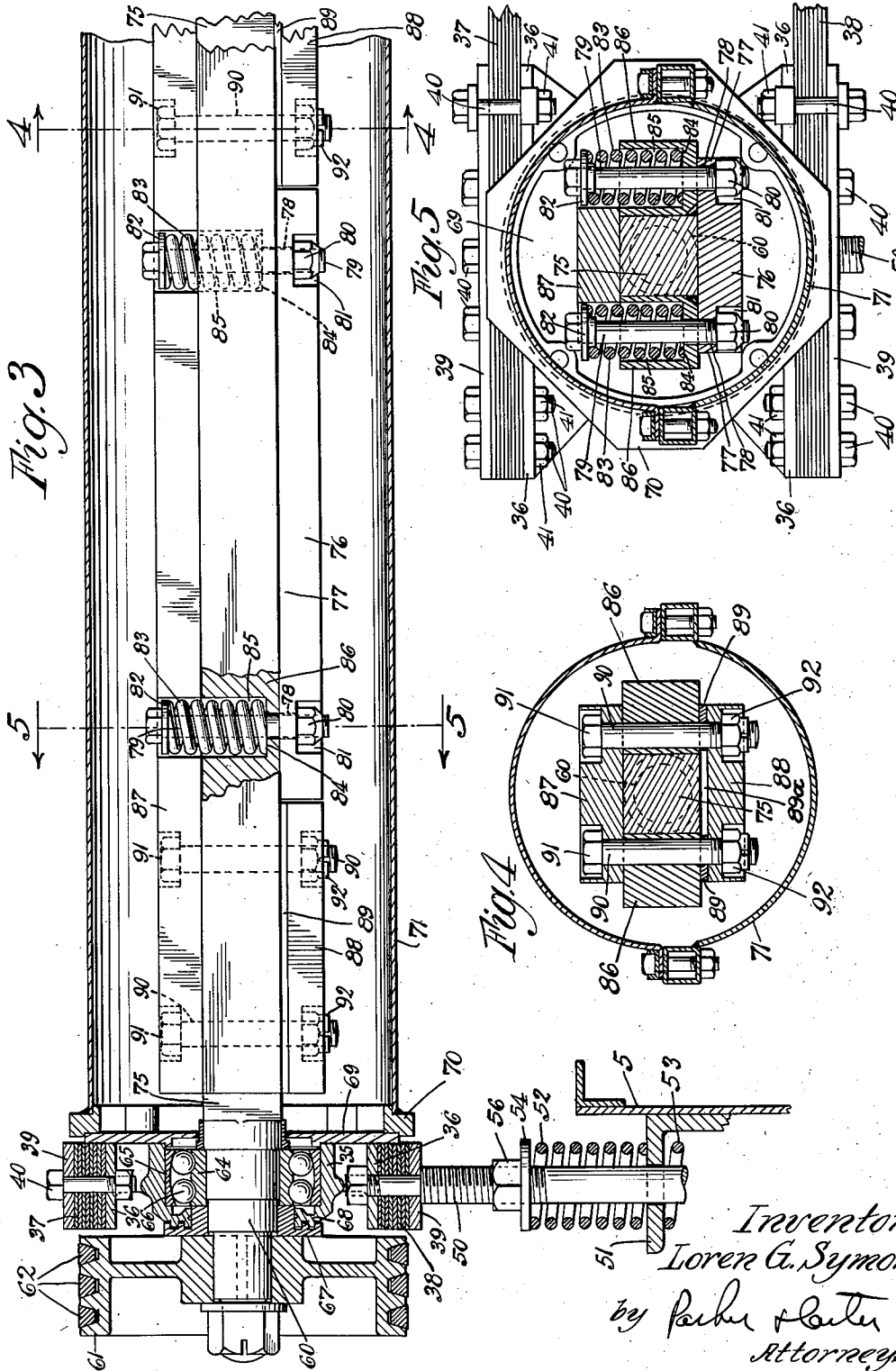
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UNITED STATES PATENT OFFICE

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SCREEN

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mesne assignments, to Nordberg Manufactur-
ing Company, Milwaukee, Wis., a corporation
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Application June 12, 1935, Serial No. 26,233

17 Claims. (Cl. 209—329)

My invention relates to an improvement in
screens or material separating devices and has
for one purpose the provision of a screen which
shall be economical to manufacture, easy to op-
erate, durable and highly efficient in operation.
Another object is the provision of improved means
for supporting a vibratory screen deck. Another
object is the provision of improved means for
supporting the vibrating means of a vibrating
screen. Another object is the provision of im-
proved means for limiting and controlling the
vibrating means of a vibrating screen. Other
objects will appear from time to time in the
course of the specification and claims.

I illustrate my invention more or less diagram-
matically in the accompanying drawings, where-
in—

Figure 1 is a partial plan view of my inven-
tion;

Figure 2 is a side elevation with parts broken
away and parts in section;

Figure 3 is an enlarged section taken on the
line 3—3 of Figure 2;

Figure 4 is a section taken on the line 4—4 of
Figure 3; and

Figure 5 is a section taken on the line 5—5 of
Figure 3.

Like parts are indicated by like symbols
throughout the specification and drawings.

Referring to the drawings, I generally indi-
cates any suitable base which may, for example,
be formed by generally parallel side members in-
dicated as 2. Any suitable transverse supports
or connections indicated as 3 may be employed.

I generally indicates any suitable screen deck.
The deck is not indicated in great detail as a
variety of screen decks may be employed. As
means for mounting the screen deck 5 upon the
base or support 1, I provide a plurality of up-
wardly inclined springs generally indicated as 6.
I illustrate each spring 6 as composed of a plu-
rality of laminations 6a, clamped for example by
clamps 6b, intermediate their ends. These lami-
nations are preferably not over $\frac{1}{8}$ " in thickness
and the clamps 6b are indicated illustratively
rather than as limiting me to the particular
spring disposition shown. The springs 6 are
associated with and are bolted to angles 7 and 8
which may be welded or otherwise secured to
the support 1 and the screen deck 5 respectively.
9 indicates any suitable bolts with nuts 10 which
engage suitable spring clamp plates 11. The
flanges 11a of the angles 7 and 8 serve as spacers
between the adjacent pairs of springs 6.

15 indicates any suitable screen cloth but the
attachment of the cloth to the deck 5 is not shown
in detail as it does not of itself form part of the
present invention. It will be understood that I
may employ screen cloth or any other suitable
perforated or apertured screening member or
surface, secured to the deck 5 in any suitable
manner.

In order to hold the springs 6 to a predeter-
mined neutral position I provide additional yield-
ing means at either side intermediate the sup-
port 1 and the screen deck 5. I illustrate, for
example, a bracket 20 on the deck 5 and a corre-
sponding bracket 21 on the support 1. Passing
through the aperture 22 of the bracket 20 is the
reduced end of the pin or guide 23. It is locked
in position in relation to the bracket 20, as by
any suitable nut 24. The opposite end of the pin
23 passes through the aperture 25 of the bracket
21. Positioned about the pin 23 on opposite sides
of the bracket 21 are coil springs 26, 27, which
are compressed between the washers 28, 29, and
the nuts 30, 31. The effect of this yielding con-
nection between the deck 5 and the support 1
is to constrain the deck to a predetermined neu-
tral position, which is preferably the position
shown in Figure 2 with the springs 6 unflexed.
However, the springs 26, 27, have such strength
as to permit vibratory movement of the deck 5
in response to the rotation of the vibrating means
below described. The compression of the springs
may be adjusted, by tightening or loosening the
nuts 30 or 31.

In order to impart vibration to the deck 5 I
may employ an unbalanced member. I illus-
trate, however, a particular type of unbalanced
member which I find highly advantageous and
which is claimed herein. It will be understood
that I do not wish to be limited to the use of this
particular unbalanced member, however, in con-
nection with my screen.

In reference to the particular unbalanced mem-
ber herein shown and claimed, I illustrate a
bearing sleeve generally indicated as 35 which
is provided at opposite sides with flat webs 36 to
which may be bolted springs 37, 38 respectively,
on opposite sides of the axis of rotation of the
rotor. These springs, formed of thin laminae,
may be bolted in position as by the employment
of clamping plates 39, bolts 40 and nuts 41. The
opposite ends are clamped between any suitable
brackets 42, clamp plates 43, bolts 44, and nuts
45. It will be observed from Figure 1 that the
springs 37 and 38 are generally parallel and that

they are both secured in relation to the screen deck itself.

I find it preferable, although not absolutely necessary, to have the springs 37 and 38 generally perpendicular to the deck supporting springs 6. For additional supporting means for the vibratory structure, whereby the springs 37, 38 are held normally in the neutral position in which they are shown in Figure 2, I provide at both bearing sleeves 35 a pin 50 secured to the lower web 36. It passes through the apertured bracket 51 on the screen deck and is provided with coil springs 52, 53, located on opposite sides of said bracket and held under compression as by washers 54, 55, and adjustable nuts 56, 57. The structure just described serves as an additional supporting means for holding the vibrating mechanism in the position in which it is shown in Figure 1, while still permitting its flexure in response to the rotation of the below described unbalanced member.

The rotor itself includes the shaft 60 provided with any suitable pulley 61 about which may pass the belt 62 to any suitable motor or power source 63. 64 indicates an inner ball race about the shaft 60 and 65 an outer ball race within the member 35. 66 indicates any suitable balls or rollers whereby the shaft 60 is permitted to rotate freely with a minimum of friction within the sleeve 35. 67 is one member of any suitable dust excluding labyrinth or seal and 68 the opposite member. It will be understood that the member 67 rotates with the shaft 60, whereas 68 is fixed in relation to or forms part of the member 35. It will be realized that any other suitable means for excluding dust or confining lubricant may be employed. 69 is an inner end plate associated with the end member 70 to which the cylindrical housing portion 71 may be secured in any suitable manner, for example, by welding. The result is a tightly closed housing with no room for access of dust. It will be understood that whereas I have described but one end of the vibrating mechanism, both ends may be identically formed.

Rotating with and as a part of the shaft 60 is the square central portion 75 which extends substantially throughout the length of the housing 71. Secured to it is a shorter fixed member 76, herein shown as spaced centrally of the square central portion and having outwardly extending shoulders 77 which may be apertured as at 78 to permit the passage therethrough of limit bolts 79 the length of which may be adjusted as by nuts 80, fitting in pockets 81 in the outer face of the member 76. The bolts 79 are provided with limit heads 82. 83 indicates compression springs surrounding the bolts 79 and compressed between the heads 82 and the bottom surface 84 of pockets or apertures 85 formed in side members 86. The side members 86, of which two are shown, are connected to the cross members 87 and 88. It will be understood that the members 86, 87 and 88 may be integral or secured together by the pins 90 with heads 91 and adjustable nuts 92 so that they move as a unit. The side members 86 and the cross member 87 extend substantially throughout the length of the housing 71, whereas the smaller cross members 88 may be secured at either end of the members 86, as illustrated in Figures 1 and 3. The cross members 88 are preferably spaced from the members 86 by spacing bars 89 of predetermined thickness, which determine the clearance 89a between the square shaft 75 and

the cross bars 88. It will be understood that the strength of the springs 83 is such that when the rotor is at rest the parts are normally in the position in which they are shown in Figures 4 and 5. When the motor is driving the rotor through the pulleys 61 and when a predetermined speed of rotation is reached, then the centrifugal tendency of the member 87, with its attached members 86, overcomes the force of the springs 83 and moves outwardly from the center of rotation of the shaft 60. The parts are so proportioned that when the springs 83 hold the parts in the position of Figure 5 the rotor is in dynamic balance and will rotate without causing any vibration. When the speed increases sufficiently to cause the members 86, 87, 88 and 89 to move centrifugally outwardly from the axis of rotation of the rotor, the member then becomes unbalanced, and, in response to its rotation, vibrates and causes a vibration of all attached parts including the screen deck 5. The clearance 89a obtained by the spacing members 89, limits the distance the members 86, 87 can move outwardly from the axis of the rotor 75.

The rate of rotation necessary to cause this unbalance may be determined, controlled and adjusted by setting the nuts 80 in order to increase or diminish the compression on the springs 83.

It will be understood that the spacing members 89 may be replaced by similar spacing members of more or less thickness in order to vary the clearance 89a which defines the possible movement of the member 87, away from the center of rotation of the shaft 60 and away from the opposite fixed member 76. Thus I can, by setting the springs 83, limit or control the speed of rotation necessary to cause unbalance, and by varying the thickness of the spacing members 89 I can limit the possible maximum unbalance permitted.

It will be realized that whereas I have described and shown a practical and operative device, nevertheless many changes might be made in the size, shape, number and disposition of parts without departing from the spirit of my invention. I therefore wish my description and showing to be taken as in a broad sense illustrative and diagrammatic rather than as limiting me to my specific showing.

The use and operation of my invention are as follows:

I find it desirable to mount my rotor upon leaf springs as they form a very advantageous connection between the rotor and the screen deck. When the device is out of use, however, it is important to provide additional supporting means, to prevent undesired flexure of the springs 37, 38. I find the pin or pins 50 in connection with the springs 52 and 53 an adequate solution of this problem. It has the further advantage of providing a further limit and control of the amplitude of vibration of the springs 37, 38, in response to rotation of the rotor, particularly at low speeds when the device is being stopped.

I find it preferable to have the springs 37, 38, perpendicular to the springs 6 but this is not absolutely necessary and I wish my claims to be interpreted with sufficient scope to cover a substantial deflection from such perpendicularity. I further find it an efficient solution to have the unbalanced rotor positioned above the screen deck and intermediate the ends of the

screen deck. This again is to some extent a matter of convenience and my screen will operate with the unbalanced rotor positioned beyond the end of the deck.

5 I claim:

1. In a vibrating screen, a support, a screen deck, yielding supporting means intermediate said support and said deck, including a plurality of parallel leaf spring members positioned at a plurality of points along the opposite sides of said screen deck, and means for vibrating said deck, including an unbalanced rotor and means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearing means for said rotor and a flexible supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of said screen deck, said last mentioned spring members being generally perpendicular to the spring supporting members intermediate the deck and the support.

2. In a vibrating screen, a support, a screen deck, yielding supporting means intermediate said support and said deck, including a plurality of parallel leaf spring members positioned at a plurality of points along the opposite sides of said screen deck, and means for vibrating said deck, including an unbalanced rotor and means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearing means for said rotor and a flexible supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of said screen deck, said last mentioned spring members being generally perpendicular to the spring supporting members intermediate the deck and the support, the leaf spring members between the unbalanced rotor and the screen deck being located some on one side and some on the opposite side of the axis of rotation of said rotor.

3. In a vibrating screen, a support, a screen deck, yielding supporting means intermediate said support and said deck, including a plurality of parallel leaf spring members positioned at a plurality of points along the opposite sides of said screen deck, and means for vibrating said deck, including an unbalanced rotor and means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearing means for said rotor and a flexible supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of said screen deck, said last mentioned spring members being generally perpendicular to the spring supporting members intermediate the deck and the support, the leaf spring members between the unbalanced rotor and the screen deck being located some on one side and some on the opposite side of the axis of rotation of said rotor, there being a pair of such members adjacent each side of the screen deck.

4. In a vibrating screen, a support, a screen deck, yielding supporting means intermediate said support and said deck, including a plurality of parallel leaf spring members positioned at a plurality of points along the opposite sides of said screen deck, and means for vibrating said deck, including an unbalanced rotor and means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearing means for said rotor and a flexible

supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of said screen deck, said last mentioned spring members being generally perpendicular to the spring supporting members intermediate the deck and the support, and being inclined upwardly somewhat from the plane of the deck, the unbalanced rotor being located above said deck.

5. In a vibrating screen, a support, a screen deck, yielding supporting means intermediate said support and said deck, including a plurality of parallel leaf spring members positioned at a plurality of points along the opposite sides of said screen deck, and means for vibrating said deck, including an unbalanced rotor and means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearing means for said rotor and a flexible supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of said screen deck, said last mentioned spring members being generally perpendicular to the spring supporting members intermediate the deck and the support, and being inclined upwardly somewhat from the plane of the deck, the unbalanced rotor being located above said deck, and intermediate its ends.

6. In a vibrating screen, a support, a screen deck, supporting leaf springs intermediate said support and said deck, a rotary unbalanced member supported on said screen deck, and supporting leaf springs therefor, intermediate said rotary member and said deck, the leaf springs intermediate the housing and the screen deck being generally perpendicular to the leaf springs intermediate the screen deck and the support, and yielding means between the screen deck and the support and between the screen deck and the rotary unbalanced member respectively, tending respectively to move said screen deck into a predetermined neutral position in relation to the support and to move said rotary unbalanced member into a predetermined position in relation to the screen deck.

7. In a vibrating screen, a support, a screen deck, yielding supporting means intermediate said screen deck and support, a rotary unbalanced member supported on said screen deck, means for rotating it, supporting leaf springs therefor intermediate said rotary member and deck, and additional yielding supporting means between the rotary member and the screen deck, adapted to permit flexure of the leaf springs, but tending to move the rotary unbalanced member and leaf springs into a predetermined position in relation to the screen deck.

8. In combination, a flexibly mounted screen, an unbalanced rotatable member, means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearings therefor, and a supporting connection between said bearings and said screen including a plurality of flexible leaf spring connections, said connections being inclined somewhat in relation to the screen, said unbalanced rotatable member being positioned out of the plane of the screen.

9. In combination, a flexibly mounted screen, an unbalanced rotatable member, means for rotating it about a horizontal axis extending transversely across the line of movement of the screen, bearings therefor, and a supporting connection between said bearings and said screen including

a plurality of flexible leaf spring connections, said connections being inclined somewhat in relation to the screen, said unbalanced rotatable member being positioned out of the plane of the screen, and an additional yielding connection between the bearings of said unbalanced member and the screen, effective to permit flexure of said first mentioned flexible leaf spring supporting connections.

10 10. In combination, a flexibly mounted screen, an unbalanced rotatable member, means for rotating it, bearings therefor, and a connection between said bearings and said screen including a plurality of flexible leaf spring connections, said connections being inclined somewhat in relation to the screen, said unbalanced rotatable member being positioned out of the plane of the screen, and an additional yielding connection between the bearings of said unbalanced member and the screen, effective to permit flexure of said first mentioned flexible leaf spring connections, and including a stem extending intermediate said bearings and screen, and yielding means associated with said stem, tending to move said unbalanced member to a predetermined position in relation to the screen.

11. In a vibrating screen, a support, a screen deck, yielding leaf springs intermediate said support and said screen deck, a rotary unbalanced member supported on said screen deck, a housing thereabout, and leaf springs, intermediate said housing and said screen deck, the leaf springs intermediate the housing and the screen deck being generally perpendicular to the leaf springs intermediate the screen deck and the support, and means tending to limit the flexure of the leaf springs supporting said housing.

12. In a vibrating screen, a support, a screen deck oscillatably mounted on said support, and means for vibrating said screen, including an unbalanced rotor mounted for rotation about a horizontal axis extending transversely of the path of movement of the screen, bearing means for said rotor, and a flexible supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of the screen deck in pairs, one leaf spring of each pair being secured to said bearing means above the axis of rotation of the unbalanced member, and one below.

13. In a vibrating screen, a support, a screen deck oscillatably mounted on said support, and means for vibrating said screen, including an unbalanced rotor mounted for rotation about a horizontal axis extending transversely of the path of movement of the screen, bearing means for said rotor, and a flexible supporting connection between said bearing means and the screen deck, including a plurality of leaf spring members secured to opposite sides of the screen deck in pairs, one leaf spring of each pair being secured to said bearing means above the axis of rotation of the unbalanced member, and one below, and additional yielding means, interposed between the bearing means for the rotor and the screen deck,

for limiting the flexure of said leaf spring members.

14. In a vibrating screen, a support, a screen deck oscillatably mounted on said support for oscillation in a generally arcuate path, and means for vibrating said screen, including a rotor mounted for rotation about a horizontal axis extending transversely of the path of movement of the screen, and a flexible supporting connection between said rotor and the screen deck whereby said rotor can oscillate, in relation to said deck, in a generally arcuate path, the tangents of the path of oscillation of the deck in relation to its support and of the path of oscillation of the rotor in relation to the deck being substantially perpendicular to each other.

15. In a vibrating screen, a support, a screen deck oscillatably mounted on said support for oscillation in a generally arcuate path, and means for vibrating said screen, including a rotor mounted for rotation about a horizontal axis extending transversely of the path of movement of the screen, and a flexible supporting connection between said rotor and the screen deck whereby said rotor can oscillate, in relation to said deck, in a generally arcuate path, the tangents of the path of oscillation of the deck in relation to its support and of the path of oscillation of the rotor in relation to the deck being at a substantial angle to each other.

16. In a vibrating screen, a support, a screen deck oscillatably mounted on said support for oscillation in a generally arcuate path, and means for vibrating said screen, including a rotor mounted for rotation about a horizontal axis extending transversely of the path of movement of the screen, and a flexible supporting connection between said rotor and the screen deck whereby said rotor can oscillate, in relation to said deck, in a generally arcuate path, the tangents of the path of oscillation of the deck in relation to its support and of the path of oscillation of the rotor in relation to the deck being at a substantial angle to each other, the supporting means for the screen deck, and for the rotor, including leaf springs.

17. In a vibrating screen, a support, a screen deck oscillatably mounted on said support for oscillation in a generally arcuate path, and means for vibrating said screen, including a rotor mounted for rotation about a horizontal axis extending transversely of the path of movement of the screen, and a flexible supporting connection between said rotor and the screen deck whereby said rotor can oscillate, in relation to said deck, in a generally arcuate path, the tangents of the path of oscillation of the deck in relation to its support and of the path of oscillation of the rotor in relation to the deck being at a substantial angle to each other, the supporting means for the screen deck, and for the rotor, including leaf springs, the supporting springs intermediate the rotor and deck being generally perpendicular to the supporting means intermediate deck and support.

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