

Sept. 18, 1923.

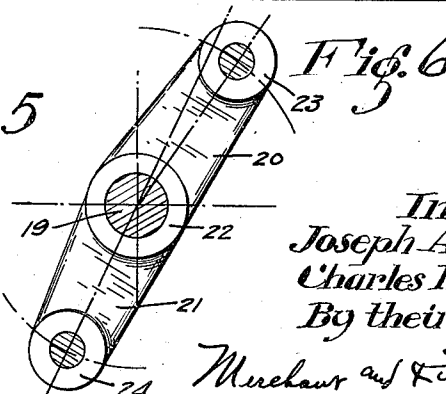
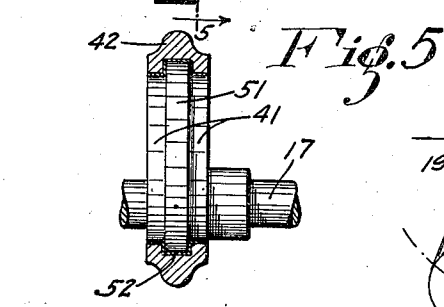
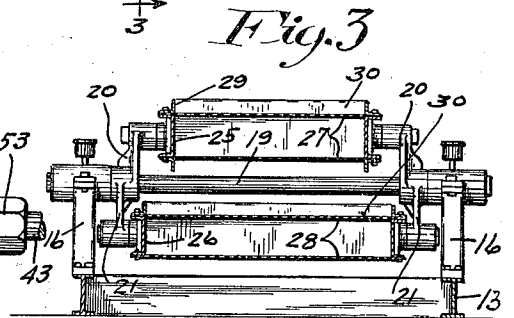
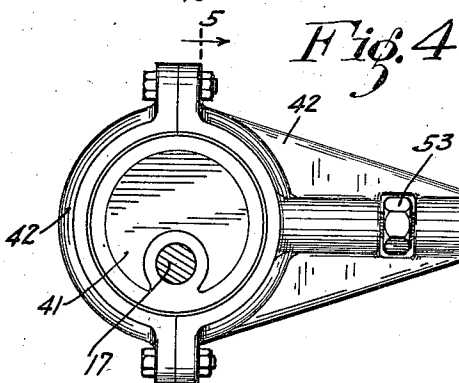
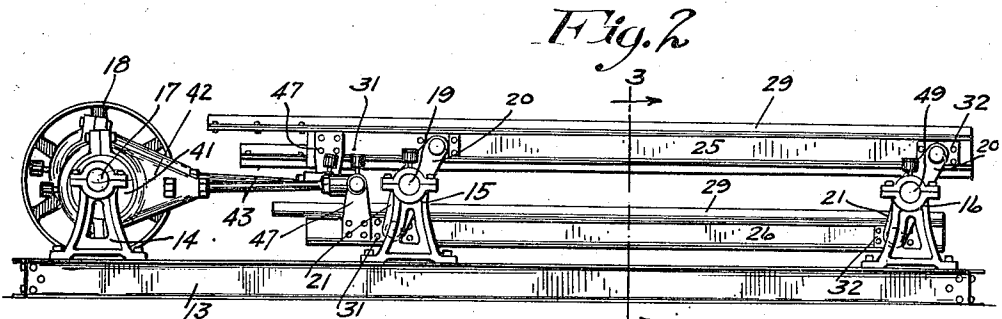
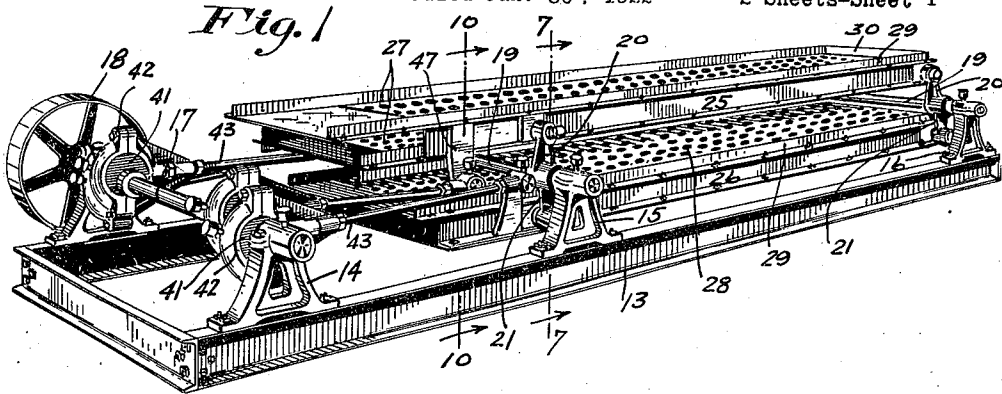
1,468,005

J. A. COYLE ET AL

SCREENING MACHINE

Filed Jan. 30, 1922

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

Fig. 7

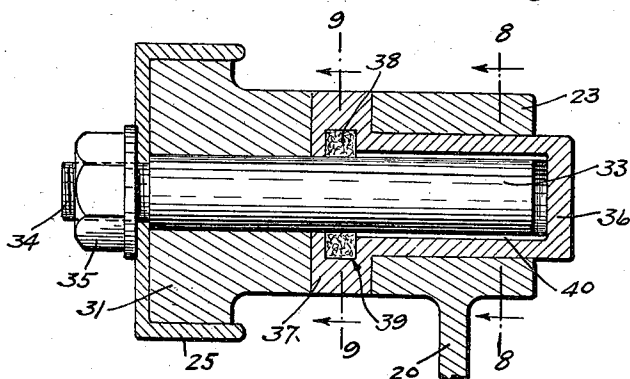


Fig. 8

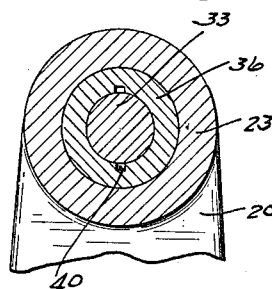


Fig. 9

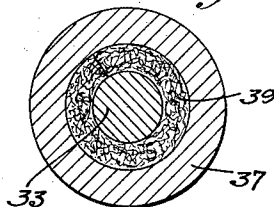


Fig. 11

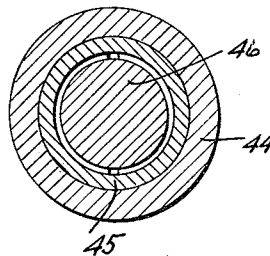


Fig. 10

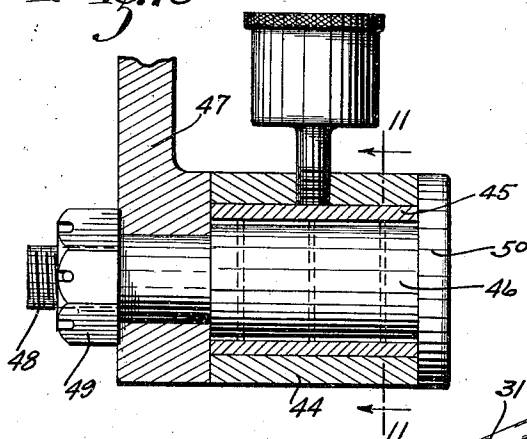
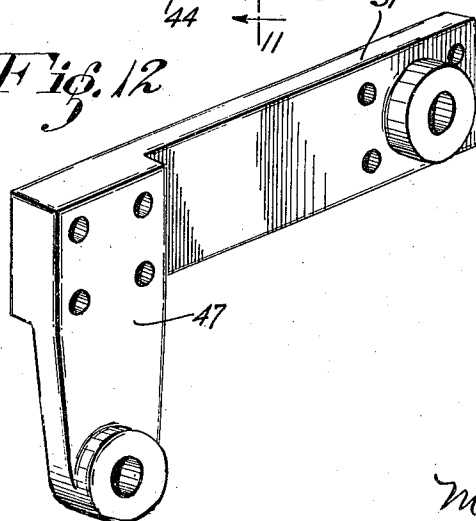


Fig. 12



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UNITED STATES PATENT OFFICE.

JOSEPH A. COYLE AND CHARLES H. ROTH, OF MINNEAPOLIS, MINNESOTA.

SCREENING MACHINE.

Application filed January 30, 1922. Serial No. 532,824.

To all whom it may concern:

Be it known that we, JOSEPH A. COYLE and CHARLES H. ROTH, citizens of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have
5 invented certain new and useful Improvements in Screening Machines; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the
10 art to which it appertains to make and use the same.

Our present invention relates to improvements in screening machines of the type disclosed in our U. S. Letters Patent #1,219,925,
15 issued October 28, 1919, and has for its object to improve the same in the several particulars hereinafter noted.

To the above end, the invention consists
20 of the novel devices and combinations of devices hereinafter described and defined in the claims.

In the accompanying drawings, which illustrate the invention, like characters indicate like parts throughout the several
25 views.

Referring to the drawings:—

Fig. 1 is a perspective view of the improved screening machine;

30 Fig. 2 is a side elevation of the same;

Fig. 3 is a transverse section taken on the line 3—3 of Fig. 2;

Fig. 4 is a side elevation of one of the eccentrics and applied connecting rods;

35 Fig. 5 is a detail view with some parts sectioned on the line 5—5 of Fig. 4;

Fig. 6 is a side elevation of one of the upper and lower rocker arms;

40 Fig. 7 is a detail view partly in section, taken on the line 7—7 of Fig. 1, on an enlarged scale;

Figs. 8 and 9 are detail views in section, taken on the lines 8—8 and 9—9, respectively, of Fig. 7;

45 Fig. 10 is a detail view, partly in elevation and partly in section, taken on the line 10—10 of Fig. 1;

Fig. 11 is a detail view in section, taken on the line 11—11 of Fig. 10 on an enlarged
50 scale; and

Fig. 12 is a perspective view of one of the front bearing brackets.

The numeral 13 indicates a rectangular base built up of commercial I and channel
55 bars rigidly connected. Front, intermediate and rear bearing brackets 14, 15 and 16, re-

spectively, are supported on the side members of the base 13 and rigidly bolted thereto.

Journalled in the front bearings 14 is a driving shaft 17, to one end of which is
60 keyed, outward of the respective bearing 14, a combined driving pulley and fly-wheel over which runs a belt, not shown. Rock shafts 19 are journalled in the pairs of bearings 15 and 16, respectively, and have rigidly
65 secured thereto, inward of said bearings, upper and lower pairs of rocker arms 20 and 21, respectively.

Each pair of upper and lower rocker arms 20 and 21 is integrally formed with a com-
70 mon hub 22, keyed or otherwise rigidly secured to the respective rock shaft 19. Bearings 23 and 24 are formed in the outer ends of the arms 20 and 21, respectively. Referring to Fig. 6, it is important to note that
75 the operative length of the upper rocker arms 20 is slightly greater than that of the lower rocker arms 21 and that said upper rocker arms are rearwardly inclined, or in
80 other words, the axes of the bearings 23 are set back of projected lines which extend through the axes of the rock shafts 19 and bearings 24. It is also important to note
85 that the upper rocker arms 20 and their bearings 23 are inset in respect to the lower rocker arms 21 and the hubs 22.

An upper sieve frame 25 is carried by the upper rocker arms 20, and a lower sieve frame is carried by the lower rocker
90 arms 21. Each sieve frame 25 and 26 includes a pair of channel side bars, the flanges of which are turned outward and have rigidly secured thereto, sieves 27 and 28, respectively, and which sieves are vertically
95 spaced, the one above the other, and have a progressively finer mesh from the top sieve down.

Retaining flanges 29 in the form of angle bars, the horizontal members of which are
100 turned outward, are secured to the upper sieve of each sieve frame 27—28, directly over the channel side bars thereof. The sieve frames 25 and 26 are closed at their rear ends by members 30, and which members extend to the upper edges of the retaining
105 flanges 29 to prevent materials on the upper sieves 27 and 28 from working over the rear ends thereof. As best shown in Fig. 3, the sieves 27 are considerably narrower than the sieves 28 and materials screened there-
110 through are deposited on the upper sieve 28 considerably inward of the longitudinal

edges thereof to prevent washing over the sides thereof.

To support the sieve frames 25 and 26 from the rocker arms 20 and 21, there is rigidly secured to the channel side members of said frames between the flanges thereof, front and rear bearing blocks 31 and 32, respectively. These bearing blocks 31 and 32 have bossed bores in which are mounted, wrist pins 33 rigidly secured to the webs of the channels of the side members of the screen frames 25 and 26, by forming thereon, reduced screw-threaded studs 34 which extend through bores in said webs and have nuts 35 applied thereto.

Bushings 36 are secured in the bearings 23 and 24, mounted on the wrist pins 33 and have on their inner ends, external annular flanges 37 which are interposed between the bearings 23 and 24 and the bosses on the bearing blocks 31 and 32. To exclude dust from the wrist pins 33, the outer ends of the bushings 36 are closed and packings 38 are mounted in annular channels 39 in the flanges 37 and bear directly against said wrist pins. Circumferentially spaced oil grooves 40 formed in the bushings 36 extend to the packings 38.

To reciprocate with said frames 25 and 26, there is mounted in the driving shaft 17 and secured for rotation therewith, inner and outer pairs of eccentrics 41, set, each pair, 180 degrees apart. Eccentric straps 42 are mounted on the eccentrics 41 and have secured thereto, connecting rods 43 which are attached to the sieve frames 25 and 26. These connecting rods 43 have on their opposite ends, from the eccentric straps 42, bearing heads 44 provided with bushings 45 mounted on the wrist pins 46 and provided with circumferentially spaced oil grooves. The wrist pins 46 are secured to arms 47, integral with the forward ends of the bearing blocks 31, and it is important to note that the wrist pins 46 are all located in the same plane. The wrist pins 46 are secured to the arms 47 by forming thereon, studs 48 which extend through bores in the arms 47 and to which, nuts 49 are applied.

The bearing heads 44 and their bushings 45 are held on wrist pins 46 between the arms 47 and heads 50 on the outer ends of said wrist pins, and which arms and heads prevent dust from getting to the wrist pins 46. To prevent lateral movement of the eccentric straps 42 on the eccentrics 41, said eccentric straps and eccentrics are provided the latter with external annular tongues 51 which work in annular channels 52 in the former. The sides of the eccentrics 41 and their straps 42 are thus left flush so that there is no chance for dust, dirt and the like to lodge thereon and finally work between the moving parts.

It will be noted that the sieves 27 and 28, at their front ends, are made progressively shorter from the uppermost down, so that materials not precipitated through said screens may be discharged thereover; independently, the one from the other.

The connecting rods 43 are secured to the eccentric straps 42 by opposing nuts 53 whereby the operative length of said rods may be varied, at will. It will be noted that the major travel of the rocker arms 20 is rearward of vertical lines which extend through the axes of the rock shafts 19, and that the major travel of the lower rocker arms 21 is forward of said lines. This travel may be varied, at will, by changing the operative length of the connecting rods 43 to the upper sieve frame 25 in respect to the operative length of the connecting rods 43 to the lower sieve frames 26.

The operation of the improved screening machine may be briefly described as follows:

Materials to be separated or graded, are deposited on the upper screen 27 by any suitable means. All materials that will not pass through the screens and be deposited on the next underlying screen, are precipitated over the front ends thereof. To cause the materials in the screens to travel toward the forward or delivery ends of the screens, the same is jumped or bounced by the upward and forward movement of the screens.

By rearwardly inclining the upper rocker arms 20 in respect to lines extended through the axes of the rock shaft 19 and the bearings 24 and stopping their forward movement at substantially the highest point, a greater jump or bounce is imparted to the materials on the upper sieves 27, and, hence, said materials are moved faster over said sieve to the delivery end thereof, than the materials on the lower sieve 28. This greater lifting movement of the upper sieves also dislodges large pieces of materials held in said sieves and prevents the same from clogging, and, hence, slowing up the action of the machine. The movement of the materials on the lower sieves is more of a sifting action, which is highly desirable in the successful operation of the machine. To cause all of the sieves to have the same length of horizontal travel, it is necessary to increase the operative lengths of the upper rocker arms over that of the lower rocker arms to offset the decreased horizontal movement of said upper rocker arms produced by rearwardly inclining the same, in respect to the lower rocker arms.

It is important to note that the wrist pins 46 oscillate with the sieve-equipped frames 25 and 26 but maintain positions close in the vicinity of a common plane that intersects the axes of the driving shaft 17 and the rock shafts 19. This oscillation of the

wrist pins 46 while very slight and does not deviate very much from a common plane that intersects the axes of the driving shaft 17 and rock shafts 19, overcomes any tendency of the parts to lock when the centers of the eccentrics 41 are in line with said plane, by thus locating the wrist pins 46 a straight pull and push on the sieve frames 25 and 26 by the connecting rods 43 without any angular pulling or pushing movement, and, hence, a free reciprocatory movement is imparted to the screens without any strains or undue wear in the several parts of the machine. The mounting of the sieve frames is such that when the upper frame is traveling backward, it is driving the lower frame forward by means of the rocker arms, and, hence, the sudden stopping of one screen frame is cushioned by the forward movement of the other sieve, or, in other words, the two screen frames are balanced, the one against the other. This balanced action of the screen frames, eliminates all bumps, jars and vibrations and the parts of the machine are so arranged and constructed by protecting all wearing parts from dust, dirt and grit which is prevalent in materials handled by this class of machines.

The above described machine has been put to extensive commercial use and has proven highly efficient for the purpose had in view.

What we claim is:—

1. The combination with a rock shaft, of upwardly and downwardly extended rocker arms on the rock shaft, upper and lower sieve-equipped frames carried, respectively, by the upwardly and downwardly extended rocker arms, a driving shaft having cranks set one ahead of the other, and connecting rods operated by the cranks and connected by independent pivots, the one to the upper sieve-equipped frame and the other to the lower sieve-equipped frame, said pivots being arranged to oscillate the sieve-equipped frames but to maintain positions closely in the vicinity of a common plane that intersects the axes of the rock shaft and the driving shaft.

2. The combination with rock shafts, of upwardly and downwardly extended rocker arms on the rock shafts, upper and lower sieve-equipped frames carried, respectively, by the upwardly and downwardly extended rocker arms, a driving shaft having cranks set one ahead of the other, and connecting rods operated by the cranks and connected by independent pivots, the one to the upper sieve-equipped frame and the other to the lower sieve-equipped frame, said pivots being arranged to oscillate the sieve-equipped frames but to maintain positions closely in the vicinity of a common plane that intersects the axes of the rock shafts and the driving shaft.

3. The combination with rock shafts, of upwardly and downwardly extended rocker arms on the rock shafts, upper and lower frames carried, respectively, by the upwardly and downwardly extended rocker arms, a driving shaft having cranks set one ahead of the other, each of said frames having a plurality of sieves, which, at their delivery ends, are progressively shorter from the uppermost down, and connecting rods operated by the cranks and connected by independent pivots, the one to the upper frame and the other to the lower frame, said pivots being arranged to oscillate with the frames but to maintain positions closely in the vicinity of a common plane that intersects the axes of the rock shafts and the driving shaft.

4. The combination with rock shafts, of upper and lower rocker arms on the rock shafts, sieve-equipped frames carried by the rocker arms, said upper rocker arms being inclined in respect to lines projected through the axes of the rock shafts and the connections between the lower rocker arms and the lower sieve-equipped frame and in respect to the direction of travel of the material on the sieves, and means for oscillating the rock shafts to cause the rocker arms to impart opposite reciprocatory movement to the sieve-equipped arms.

5. The combination with rock shafts, of upper and lower rocker arms on the rock shafts, sieve-equipped frames carried by the rocker arms, said upper rocker arms being inclined in respect to lines projected through the axes of the rock shafts and the connections between the lower rocker arms and the lower sieve-equipped frame and in respect to the direction of travel of the material on the sieves, the operative length of the upper rocker arms being greater than of the lower rocker arms, and means for oscillating the rock shafts to cause the rocker arms to impart opposite reciprocatory movement to the sieve-equipped arms.

6. The combination with a rock shaft, of upper and lower rocker arms on the rock shaft, sieve-equipped frames mounted on the rocker arms, and means for oscillating the rock shaft to cause the rocker arms to impart opposite reciprocatory movement to the sieve-equipped arms, the major travel of the upper and lower rocker arms being on opposite sides of a vertical line extending through the axis of the rock shaft.

7. The combination with a rock shaft, of upper and lower rocker arms on the rock shaft, sieve-equipped frames mounted on the rocker arms, the operative length of the upper rocker arms being greater than of the lower rocker arms, and means for oscillating the rock shaft to cause the rocker arms to impart opposite reciprocatory movement to the sieve-equipped arms, the

major travel of the upper and lower rocker arms being on opposite sides of a vertical line extending through the axis of the rock shaft.

8. The combination with a rock shaft, of upper and lower rocker arms on the rock shaft, sieve-equipped frames mounted on the rocker arms, the operative length of the upper rocker arms being greater than of the lower rocker arms, said upper rocker arms being inclined in respect to a line projected through the axes of the rock shaft and the connections between the lower rocker arms and the lower sieve-equipped frame and in respect to the direction of travel of the material on the sieves, and means for oscillating the rock shaft to cause the rocker arms to impart opposite reciprocal movement to the sieve-equipped arms, the major travel of the upper and lower rocker arms being on opposite sides of a vertical line extending through the axis of the rock shaft.

9. The combination with a rock shaft, of upwardly and downwardly extended rocker arms on the rock shaft, sieve-equipped frames carried by the rocker arms, oppositely extended bearing arms on the sieve-equipped frames, and operating connections connected by independent pivots to the bearing arms and arranged to oscillate with the sieve-equipped frames but to maintain positions closely in the vicinity of a common plane that intersects the axes of the rock shaft and the driving shaft.

10. The combination with a rock shaft, of upwardly and downwardly extended rocker arms on the rock shaft, upper and lower sieve-equipped frames carried, respectively, by the upwardly and downwardly extended rocker arms, bearing blocks on the sieve-equipped frames and having wrist pins mounted in the rocker arms, oppositely extended arms on the bearing blocks and having wrist pins, and operating connections attached to the last mentioned wrist pins for oscillating said pins and including a driving shaft, said last noted wrist pins being arranged to oscillate with said sieve-equipped frames but to maintain positions close in the vicinity of a common plane that intersects the axes of the rock shaft and the driving shaft.

11. The combination with a rocker arm-equipped shaft, of a sieve-equipped frame having bearings provided with wrist pins, bushings closed at their outer ends, secured in the rocker arms and applied over the wrist pins, and means for oscillating the sieve-equipped frame.

12. The combination with a rocker arm-

equipped shaft, of a sieve-equipped frame having bearings provided with wrist pins, bushings closed at their outer ends, and having packings at their inner ends, secured in the rocker arms and applied over the wrist pins, and means for oscillating the sieve-equipped frame.

13. The combination with a rocker arm-equipped shaft, of a sieve-equipped frame having bearings provided with wrist pins, bushings closed at their outer ends, secured in the rocker arms and applied over the wrist pins, an annular external flange on the bushings interposed between said bearings and rocker arms, and means for oscillating the sieve-equipped frame.

14. The combination with a rocker arm-equipped shaft, of a sieve-equipped frame having bearings provided with wrist pins, bushings closed at their outer ends, secured in the rocker arms and applied over the wrist pins, an annular external flange on the bushings interposed between said bearings and rocker arms, annular channels in said flanges, packings in the said channels and engaging the wrist pins, and means for oscillating the sieve-equipped frames.

15. The combination with a rocker arm-equipped shaft, of a sieve-equipped frame having bearings provided with wrist pins, bushings closed at their outer ends, secured in the rocker arms and applied over the wrist pins, an annular external flange on the bushings interposed between said bearings and rocker arms, annular channels in said flanges, packings in the said channels and engaging the wrist pins, oil grooves in the bushings leading to said packings, and means for oscillating the sieve-equipped frames.

16. The combination with a rocker arm-equipped shaft, of a sieve-equipped frame having bearing arms provided with wrist pins, said wrist pins having heads on their outer ends, and connecting rods attached to the wrist pins between said bearing arms and the heads on the wrist pins.

17. The combination with a rock shaft, of rocker arms on the rock shaft, upper and lower sieve-equipped frames carried by the rocker arms, a driving shaft having a plurality of eccentrics equipped with eccentric straps, said eccentrics and eccentric straps having tongue and groove interlocking engagement, and connecting rods between the sieve-equipped frames and the eccentric straps.

In testimony whereof we affix our signatures.

JOSEPH A. COYLE.
CHARLES H. ROTH.