

L. M. SHERIDAN.
SCREENING APPARATUS.
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1,085,997.

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2 SHEETS-SHEET 1.

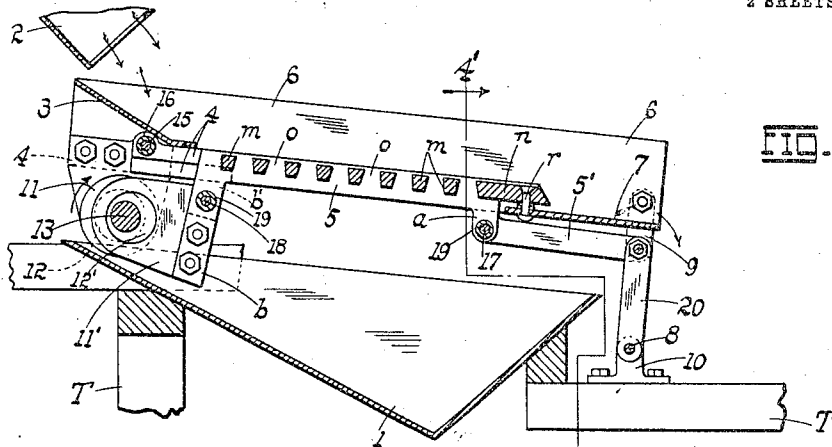


FIG. 1.

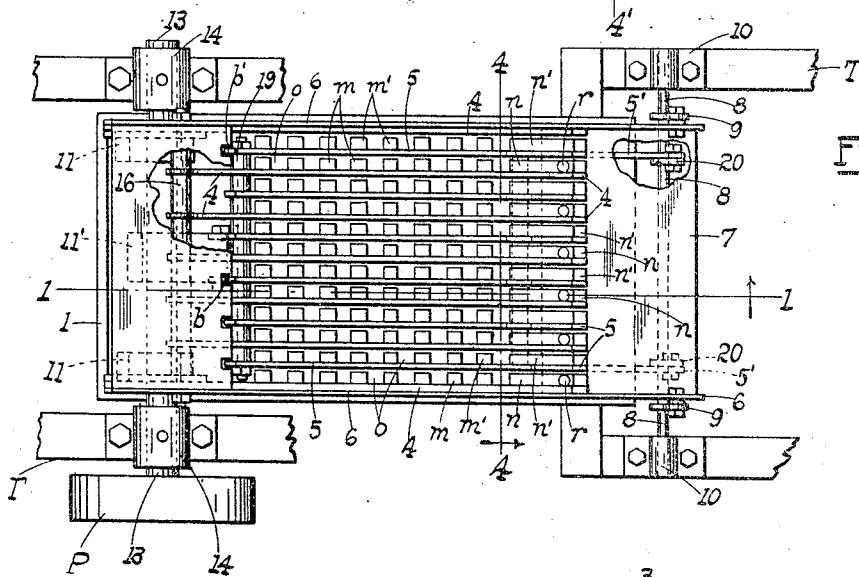
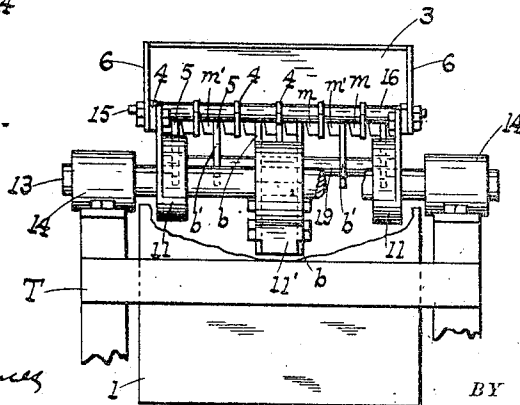


FIG. 2.

FIG. 3.



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SCREENING APPARATUS.

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To all whom it may concern:

Be it known that I, LESLIE M. SHERIDAN, citizen of the United States, residing at Anaconda, in the county of Deerlodge and State of Montana, have invented certain new and useful Improvements in Screening Apparatus, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in screening apparatus; and it consists in the novel details of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a vertical longitudinal section of the apparatus on the line 1—1 of Fig. 2; Fig. 2 is a top plan thereof; Fig. 3 is a front end elevation, parts being broken away; Fig. 4 is a vertical cross-section on the line 4—4 of Fig. 2 and on the zig-zag line 4'—4' of Fig. 1; Fig. 5 is a section on the order of Fig. 1 with the eccentrics thrown ninety degrees from their position as illustrated in Fig. 1, the positions of the screening bars being correspondingly shifted; and Fig. 6 is a diagrammatic illustration showing the general character of the path described by a set of screening bars.

The invention herein is particularly directed to apparatus for screening the fines out of ore, coal, minerals, gravel, and the like with a view of maintaining a uniform feed of the oversized material to any point of subsequent treatment, as for example to crushers, rolls, and concentrating machinery, the invention being admirably adapted for handling material which is in a wet, clayey or sticky condition.

A further object is to provide an apparatus which will positively advance the oversize to the discharge end of the machine; one which will allow the fines to work down through the mass to the screening surface; one which will not clog; one in which there will be no binding or crushing, or wedging action tending to crush the ore or stop the machine; one operating with a least amount of resistance; one susceptible of mechanical changes without a departure from the spirit or principle of the invention; and one possessing further and other advantages bet-

ter apparent from a detailed description of the invention which is as follows:

Referring to the drawings, T represents suitable timbers for the support of the apparatus, the same being disposed at a convenient point to carry a receiving hopper 1 as shown, said hopper being directly beneath the screening frames. The material to be screened is discharged from a feed-hopper 2 onto an inclined plate 3 forming the upper boundary of one of the screening frames, the slope of plate being such that the material, assisted by the vibration of the screening frame by which the plate is carried, is advanced rearward and downward onto the screening surface. This screening surface is composed of parallel bars 4, 5, respectively, pitching or inclining downwardly and rearwardly, one set of bars (4) having a movement independent of the adjacent set (5) as presently to be described. To the outer or extreme pair of bars 4, 4, are fastened the sides 6, 6, and to the intermediate bars 4 and between the sides 6, 6, is secured the bottom rear discharge plate 7, the connection to the bars being effected by rivets *r* (or equivalent mechanical manner) passed through the rear and bottom set of terminal lugs or ribs *n* carried by the sides of the bars. The parts 4, 6, 7, thus connected collectively form a rigid screening frame by which the upper front plate 3 is carried. The lower (rear) end of this frame is coupled to a rod 8 through the medium of the side rigid links 9, 9, whose opposite ends are pivotally coupled to the sides 6, 6, and to the rod 8 respectively. The rod (or shaft) 8 is supported in bearings 10, 10, carried by the timbers T. The front and higher end of the said screening frame is provided with suitable bearings or hollow bosses 11, 11, which receive the eccentrics 12, 12, carried by the shaft 13, said shaft being mounted in bearings 14, supported by the timbers T. The front ends of the bars 4 are connected to a tie rod 15 (which thus becomes a part of the screening frame aforesaid, being supported between the sides 6, 6, thereof) the ends of the bars being spaced properly apart by the the thimbles or sleeves 16 disposed about the rod between the bars. It will be seen from the drawings (Figs. 1,

2) that the outside bars 4, 4, are extended forward to embrace the eccentric-bearings or bosses 11, 11, and that the center-bar 4 or that immediately over the central eccentric-bearing 11' (to be presently referred to) is a trifle narrower than the remaining bars, so as not to foul said bearing 11' during the operation of the machine. Such structural features of course, fall within the purview of the skilled mechanic and no claim is made thereto.

Coöperating with the screening frame aforesaid (that is to say with the frame comprising the members 4, 6, 7, 8 and 15) is the complementary screening frame composed of the bars 5 (previously referred to) and tie rods 17 and 18, the rod 17 passing through lugs *a* at the rear lower terminals of the bars, and the bar 18 passing through the front terminal legs *b* of the bars disposed immediately on opposite sides of the center eccentric-bearing or boss 11', and through the corresponding but shorter legs *b'* of the remaining bars, both rods 17, 18, carrying spacing thimbles or sleeves 19 between the bars. The extension legs *b*, *b'*, directly support the center hollow boss or eccentric-bearing 11' in which operates the center eccentric 12' disposed on the shaft 13, said eccentric thus serving as a support for the front upper end of the complementary screening frame. The lower ends of the extreme or outer pair of bars 5 are provided with rearward extensions 5' whose ends are pivotally coupled to the upper ends of the intermediate links 20 freely oscillatable about the axis of the rod or shaft 8 and being shorter than the links 9. The eccentrics 12, 12', are set angularly apart, having substantially opposite throws so that as one eccentric is down the other is up, and vice versa.

As seen from the drawings, the bars 4, 5, of the respective complementary screening frames, are parallel and spaced suitably apart, the sides of the bars 4 being provided with downwardly cross-sectionally tapering lugs or equivalent formations *m*, the corresponding sides or faces of the bars 5 being provided with corresponding lugs or formations *m'*, the lugs (or their equivalents) being in transverse alinement and disposed in parallel rows (Fig. 2), there being sufficient clearance between the free sides of the lugs and the face of the adjacent bar to prevent binding and to allow perfect freedom of movement between the parts. The lower ends of the bars 4, 5, are provided with elongated terminally beveled lugs or ribs *n*, *n'*, respectively, these also tapering cross-sectionally downward (Fig. 4) so as to produce a downwardly flaring clearance between the lugs and bars, an arrangement similar to that prevailing in grate-bar con-

structions, to allow perfect freedom for the fine material to fall through between the bars. The presence of the lugs *m*, *m'*, *n*, *n'*, leaves suitable polygonal (square) openings *o* between the bars and lugs for the fines to pass through and be received by the hopper 1. The shaft 13 is provided with a belt-pulley P whereby rotation may be imparted thereto from any suitable source of power (not shown).

In the present illustration the ore-supporting faces of the lugs *m*, *m'*, are shown quadrilateral and preferably square (Fig. 2) but it is to be understood that I do not wish to be limited to any particular configuration of either lug or discharge opening. By changing the shape of the lug a corresponding shape in the opening *o* will necessarily result; that is obvious without actual illustration. The object sought of course, is to so proportion and space the lugs as to leave openings just large enough to allow the desired size of screened material or fines to pass through into the hopper 1. Again, the links 9, 20, might be coupled to a shaft or rod overhead, in lieu of a bottom rod 8 as shown. In fact, many mechanical changes might be resorted to without in any wise departing from the principle or spirit of the invention.

The operation will be readily understood from the foregoing, but is substantially as follows: It will be seen from the connections described that the main screening frame, or that carrying the feed-plate 3 is free to reciprocate longitudinally by reason of the connection of its lower end to the transverse shaft 8 through the links 9, 9, the latter being free to oscillate about the axis of said shaft. So too is the complementary screening frame free to reciprocate by reason of its connection to the same shaft through the oscillating links 20, 20. The front, and relatively elevated ends of the respective screens are free to rise and fall and describe what is more or less a circular motion imparted to them by the eccentrics 12, 12', which, as stated, are set with approximately opposite throws. When therefore, rotation is imparted to the shaft 13 (in the direction of the arrow Fig. 1) it follows that the screening frames will have imparted to them a bodily movement not materially unlike that of the connecting rod of a locomotive engine, the forward ends partaking in the present case, of a movement akin to an elongated ellipse *e* (see diagrammatic illustration Fig. 6) whose terminals conform substantially to the arc of a circle, the screening frame assuming extreme positions *h*, *h'*, and a mean position *h'*, as shown in Fig. 6. Since, however, the eccentrics are set to substantially opposite throws, it follows that as one frame (with its screening bars)

moves forward and upward, the complementary frame will move rearward and downward ("upward" and "downward" having special reference of course, to the front ends coupled to the eccentrics), the rear lower ends of the frames having imparted to them in the main a longitudinal reciprocating movement attended with very little rise and fall, such rise and fall being determined by the character of arcs described by the upper ends of the links 9 and 20 respectively.

Figs. 1 and 5 show the relation of the screening frames for a rotation of ninety degrees of the eccentrics, and what their relation is for the balance of the three hundred and sixty degrees may be readily imagined without the assistance of further illustration. In these opposite, simultaneous, but independent reciprocations of the screening frames, their respective bars 4, 5, will play longitudinally in opposite directions of the frames, and during these reciprocations the fines are agitated and readily work down through the mass resting on the screening surface into the openings *o* whence they drop into the hopper 1. At the same time the oversize, or the material too large to pass through the holes *o* of the screen is automatically lifted out of the holes and advanced rearward and downward by the lugs *m*, *m'*, carried by the bars. Thus the holes *o* are kept open and free for the passage of the fines, the oversize advancing until it slides off the beveled ends of the lugs or ribs *n*, *n'*, onto the plate or pan 7. Owing to the change of the form of the motion imparted to the pan 7 (its movement being substantially a reciprocating one as compared to the rotary or elliptical movement of the front ends of the screening frames directly actuated by the eccentrics 12, 12'), the material tends to pile up on said pan, but is forced off from the rear end of the screen (the "screen" contemplating the complementary screening frames wherever the term is used in the present description) by the push of the material behind it, the vibratory motion of the pan causing a uniform flow of the oversize off the end of the screen, such uniform flow being eminently desirable in feeding crushers, rolls and concentrating machinery generally. The disposition and shape of the lugs *m*, *m'*, *n*, *n'*, is such as to eliminate all binding, wedging or crushing of the ore (or other material) between the moving parts of the machine, and hence the danger of the machine coming to a stop does not arise.

Generically stated, the screen may be said to have a screening surface composed of distinct sets or series of parallelly disposed coating bars or units suitably spaced apart,

the units of one set alternating with the units of the coating set, and the continuity of the spaces between adjacent units being broken by the side lugs or equivalent formations (*m*, *m'*, *n*, *n'*, or their equivalents) extending across the spaces and dividing the same into a series of openings for the discharge of the fines, said lugs serving as means for lifting the oversize out of the openings, and advancing it toward the discharge end of the screen.

Having described my invention what I claim is:—

1. In a screening apparatus, a screen having a screening surface composed of independent sets of parallel inclined bars, the bars of one set alternating with those of the coating set and spaced apart, means at the elevated ends of the bars for imparting to the bars at said ends a substantially circular movement, the movements of one set being opposite to that of the coating set, links of unequal lengths at the opposite ends for pivotally connecting said ends to a common fixed axis of oscillation, suitable formations on the bars extending across the spaces between the bars, and dividing the spaces into a series of openings, and means for delivering the material to be screened to the upper end of the screening surface.

2. In a screening apparatus, a screen having a screening surface composed of independent sets of parallel inclined bars, the bars of one set alternating with those of the coating set and spaced apart, eccentrics at the elevated ends of the bars, set to throw disposed angularly apart for simultaneously and independently actuating the respective sets of bars in opposed directions, a transversely disposed rod or shaft, links of unequal lengths pivotally connecting the lower ends of the bars of the respective sets to said rod, formations on the sides of the respective bars disposed in transverse alignment across the screening surface and extending across the spaces between the bars whereby said spaces are divided into a series of discharge openings for the fines, and means for delivering the material to be screened onto the elevated end of the screening surface.

3. A screening apparatus comprising a frame composed of a series of inclined bars spaced apart, side members secured to the outer bars of the series, a discharge plate secured to the bars at the lower end of the frame, means at the upper end for receiving the material to be screened, means for securing the upper ends of the bars, a second frame comprising a series of coating bars connected at opposite ends and alternating with the bars of the first frame and spaced therefrom, extensions leading from the lower ends of a pair of bars of the second frame

beneath the discharge plate of the first frame, a fixed, transversely disposed rod contiguous to the discharge end of the first frame, independent links of unequal lengths
5 pivotally connecting the rear extensions of the second frame and the discharge end of the first frame to said rod, means for simultaneously actuating in opposite directions the elevated ends of the frames, and means

for subdividing the spaces between the bars 10 into suitable discharge openings for the fines.

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

LESLIE M. SHERIDAN.

Witnesses:

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Mrs. F. N. HECKMAN.