A. R. HOUSTON.

SCREENING CONVEYER.

APPLICATION FILED FEB. 6, 1914.

**1,136,674.**

Patented Apr. 20, 1915.

2 SHEETS—SHEET 1.

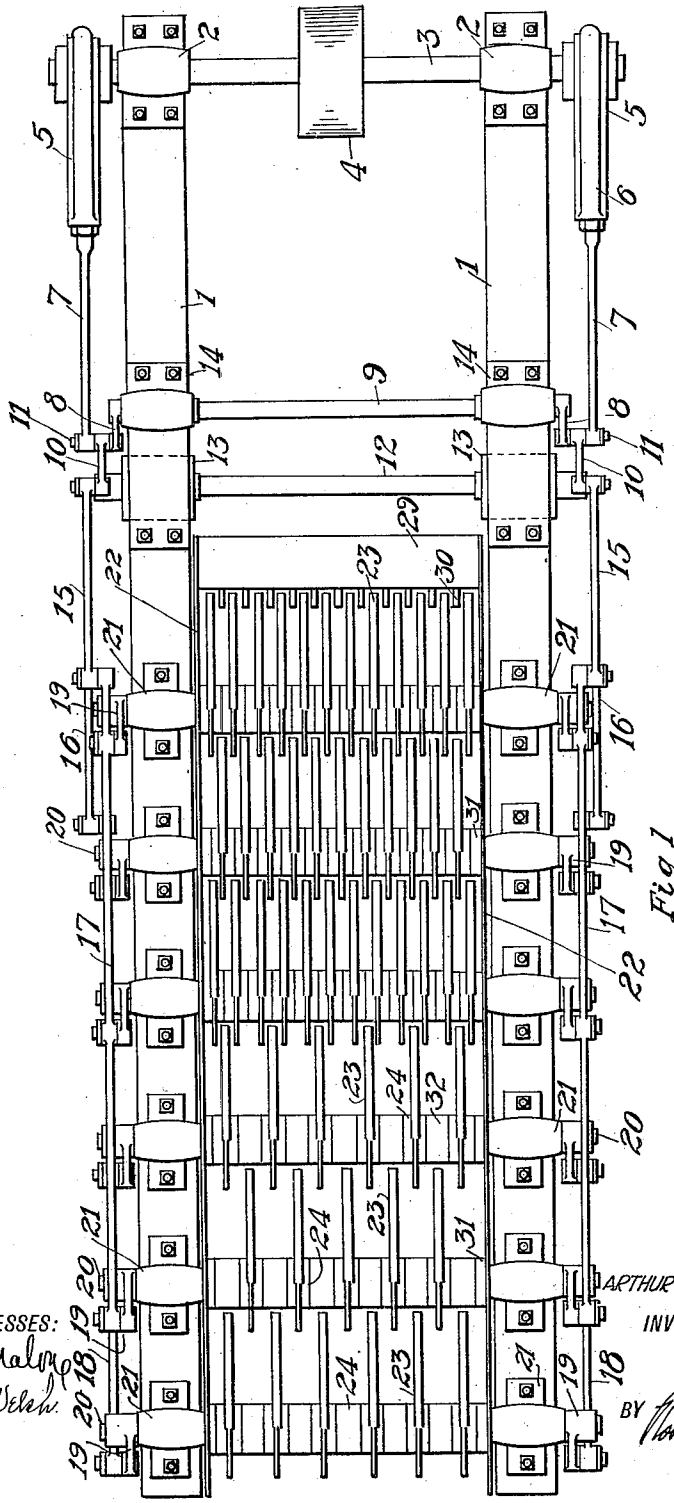

Fig 1

WITNESSES:

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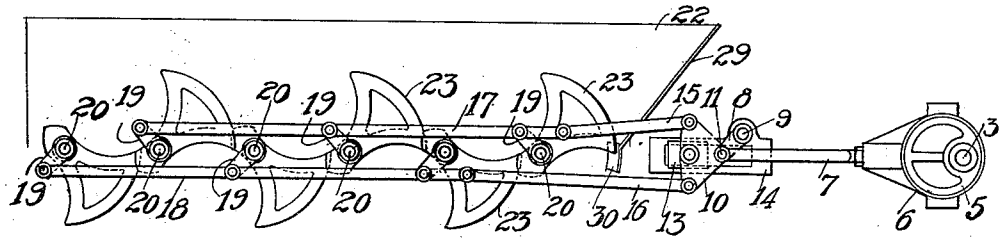


Fig 2

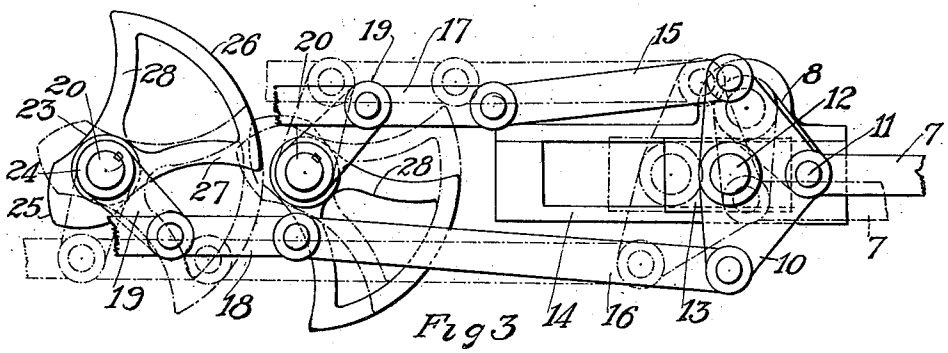


Fig 3

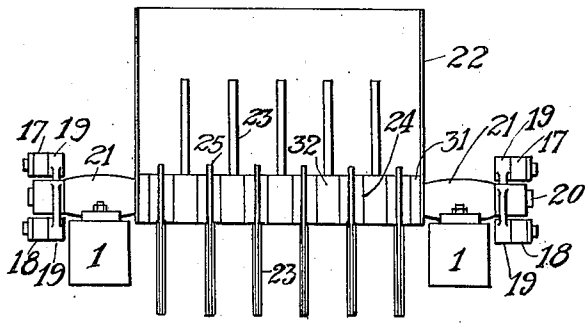


Fig 4

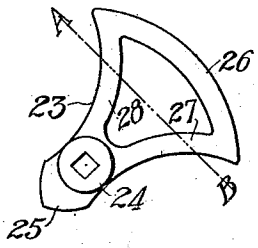


Fig 5


Fig 6

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# UNITED STATES PATENT OFFICE.

ARTHUR RICHARD HOUSTON, OF ENSLEY, ALABAMA.

## SCREENING-CONVEYER.

1,136,674. Specification of Letters Patent. Patented Apr. 20, 1915.

Application filed February 6, 1914. Serial No. 816,931.

*To all whom it may concern:*

Be it known that I, ARTHUR RICHARD HOUSTON, a citizen of the United States of America, residing at Ensley, in the county of Jefferson and State of Alabama, have invented certain new and useful Improvements in Screening-Conveyers, of which the following is a specification.

My invention relates to a screening conveyer and its object is to provide a bed composed of relatively movable spaced members which are designed and actuated so as to continuously advance the material along the bed and to effectively screen it as it is thus moved.

One of the most important objects of my invention is to provide a mechanism for screening coal and like minerals which is free from excessive vibration and therefore does not require special and expensive bed supports and which can be mounted on tipple structures without having a tendency to injure them or shake them down.

A further object of my invention is to design novel and effective driving connections whereby the relatively movable screening and conveying members are so disposed and moved relatively that they avoid crushing the material between them and from binding or interfering one with the movement of the other.

My invention further comprises a novel differential driving transmission by means of which the empty screening members are lowered to receiving position in advance of up travel of the loaded members which causes them to dump the material thereon onto the lowered empties, each member, as it moves in one direction, being loaded, and as it returns in the opposite direction being empty.

My invention further comprises a novel construction of the screening members wherein substantially segment-shaped laterally disposed fingers are used, the upper side faces of which receive the material to be screened and, as the fingers are rocked upwardly, they act to both turn the material over and to advance it, so that the most effective screening thereof results, the curved end faces serving to hold back the material and prevent it slipping under the upper side faces as they are moved.

A further object of my invention is to design the movable screening elements with adjustable fingers which can be arranged so as to present gradually increasing screening spaces toward the discharge end of the bed whereby I obtain a screening of the material to different grades.

My invention further comprises the details of construction and arrangements of parts which are hereinafter more particularly described and claimed, reference being had to the accompanying drawings, wherein:—

Figure 1 is a plan view of my invention. Fig. 2 is a side elevation of the screening members and their driving connections with the bearings and supports omitted. Fig. 3 is an enlarged detail view showing the action of the driving mechanism for differentially moving the screening and conveying elements. Fig. 4 is an end elevation of Fig. 1. Fig. 5 is a detail side view of one of the detachable screen fingers. Fig. 6 is a section on the line A—B of Fig. 5.

Similar reference numerals refer to similar parts throughout the drawings.

My conveying screen is mounted on suitable supports 1 which are shown as parallel beams provided at one end with bearings 2 in which the main drive shaft 3 is mounted and driven by a pulley 4. I mount an eccentric 5 on each end of the shaft 3 and their sleeves 6 are connected by rods 7 with the crank arms 8 of a crank shaft 9. A triangular rocking plate 10 is pivoted at its apex to each crank arm 8, being journaled on the crank pin 11 on each crank to which its respective rod 7 is connected. These rocking plates 10 are journaled at the center of their vertically disposed bases to a cross shaft 12, which shaft is mounted in slide blocks 13 which work in guideways 14 that are mounted on the supports 1 and carry the bearings for the crank shaft 9. A pair of links 15 and 16 are respectively connected to pins at the upper and lower corners of each rocking plate 10, the upper link being pivotally connected by a pin to the upper driving rod 17 and the lower link being similarly connected to the lower driving rod 18. The upper driving rod is connected to the cranks 19 of the first and third and each other alternate rocker shaft 20, the several cranks of this set of rocker shafts being disposed upwardly and each pivoted to the drive rod. The lower drive rod 16 is similarly connected to the down turned

cranks 19 on the second and each alternate rocker shaft 20 thereafter constituting the other set of rocker shafts. The rocker shafts are mounted in suitable bearings 21 on the supports 1, and each rocker shaft is provided at its ends with similarly disposed cranks 19 which are connected to the driving rods 16 or 17 on each side of the machine.

The rocker shafts pass through the side walls 22 of the screen and between such walls I mount upon each shaft a series of spaced screen fingers 23 (see Fig. 5). The shafts 20 are preferably squared throughout the portion thereof on which the fingers are mounted. Each finger is provided with a hub portion 24 having a squared opening to fit a rocker shaft 20 and having at one side of its hub a rear tapering extension 25 and on the other side a convex end member 26 struck on a curve from the shaft center and connected with the hub by webs 27 and 28 which preferably have outer concave faces struck on curves extending from the side edges of the extension 25 to the edges of the convex member 26. The upper member 28 which receives and supports the material to be screened is made tapering in vertical cross section so that its widest face is uppermost and the end member 26 is likewise tapering with its wider face outermost. The web 27 and extension 25 are made narrower than the other parts.

It being my purpose to design my apparatus for both conveying and screening the coal or other material, I arrange the several fingers 23 on the first shaft closely together with their hubs abutting and the material is delivered onto the concave upper faces of the fingers on the first screening member in any suitable manner, an end inclined wall 29 being provided down which the material will pass onto such member. At the bottom of this wall I provide a series of fixed stripping lugs or fingers 30 that are interposed between the convex end members 26 of the fingers 23. The fingers are similarly spaced on the second and third shafts 20 but are arranged in staggered relation, the fingers of the second shaft being so disposed by the use of washers 31. The shafts are spaced so that the convex end members 26 of the fingers move always in close proximity to the next adjacent shaft toward the intake end of the machine and the rear extensions 25 of the fingers on each shaft project substantially between the convex members 26 of the fingers on the next adjacent shaft toward the discharge end of the machine. As many shafts as desired may be arranged with the fingers thus closely spaced. As shown, the fingers on the last three shafts are given twice the spacing of those on the first three shafts by the interposition of washers 32 equal in width to the hub portions 24 of the fingers, but it will be understood that the manner of spacing can be widely varied. These widely spaced fingers are staggered by means of the washers 31 arranged on the intermediate shaft in the manner shown. The rocker shafts and their fingers which form screening members are grouped in two sets, the members of the respective sets being alternately arranged and mounted in the same plane. One set is driven by the rod 17 and the other set by the rod 16. These screening members are so connected to their respective driving rods that when the slide 13 is at the inner end of its travel, the concave faces of one set are raised to discharging position and the other set are lowered to receiving position, and when the slide is at the outer end of its travel, the set that stood in lowered or receiving position are raised to discharge their contents onto the members of the other set that were raised and have been lowered into their receiving positions. As a screening member is rocked upwardly the upper faces 28 of its fingers 23 on which the material rests are gradually tilted until the material falls or rolls over them toward, and falls onto, the next adjacent screening member at the left which at the time is being lowered into its receiving position. The convex end members 26 being struck on a curve from the shaft center, move up and down without disturbing the material that may fall or rest against them, and they serve the important function of preventing the material on the screen bed from slipping under or in any way interfering with the rocking of the members 28. The members 26 permit material to be screened between them so that the material is wholly supported by screening members while it is on the screen bed. The alternate rise and fall of the rocking screen members causes each member to successively lift a load of the material and dump it onto the next adjacent screening member, after which it is lowered as an empty to receive another load of material, etc. The alternate rise and fall of the members thus effects a conveying or feeding of the material toward the discharge end of the machine during which it it is being constantly turned over and over and therefore it is brought into contact with the successive screening members in the best possible manner for effective screening. By making the under or inner edges of the screen finger members 26 and 28 narrower than the upper or outer edges thereof, I provide for the material to fall freely between the fingers.

I have found it desirable to drive the screening members differentially so that the raised or empty members are caused to drop back more quickly into receiving position than the loaded members are raised to dump. This action prevents any crushing of the material between the relatively moving

members and it positions the empty members to receive the material by the time the loaded members are tilted sufficiently to throw it off. This differential driving action may be obtained in various ways but that which I have found most suitable for my purposes is shown more clearly in Fig. 3, wherein the rocking plate 10 is shown in full line position at the extreme of its travel to the right, in which position it has lowered the first screen member, which is typical of one set of members, to receiving position and raised the second screen member, also typical of another set of members, to its full discharged or empty position. Of course the bed of material may be so thick that the members will all be more or less loaded, so that the terms "loaded" and "empty" are used relatively to distinguish the members onto which material is being forced from those that are forcing the material forward. As the eccentrics drive the slides 13 to the left to the position shown in dotted lines, it will be evident that the weight on the set of "loaded" members, which in the case shown, will be the first, third, etc., will cause them to present a greater resistance to being raised with the burden of material thereon, than the "empty" members, namely, the second, fourth, etc., will present to being lowered. It will also be noted that as the eccentric rods 7 are moved to the left the crank arms 8, to which they connect, are first swung down through an arc as the slides move, and this initial swing acts directly to increase the travel given to the lower end of the rocking plate 10 and hence to lower link 16 relatively to that imparted to the upper link 15. This combined action of the cranks 8 and the different resistances offered by the loaded and the empty members causes the rocking plate 10 to assume its dotted line position in Fig. 3, and in doing so it will be noted that the empties have dropped down until the outer edge of their upper receiving faces 28 stands approximately level with the hubs of the loaded members which have been rocked upwardly to their dotted line position representing but a small fraction of their up travel. After the parts have assumed this position the continued movement of the eccentric rods 7 swings the cranks 8 upwardly, thereby causing them to tend to advance the upper ends of the rocking plates 10 more rapidly than the lower ends. The result of these combined motions is to slowly complete the lowering of the empties and to rapidly swing the loaded members to the position shown in Fig. 2, when the rocker plates 10 will be seen to have resumed their vertical position. As the eccentrics start the slide toward the right, the cranks 8 act on the rocker plates in the reverse manner to that described so that the upper links 15 are first moved more rapidly and then more slowly than the lower links 16 and this gives the desired differential travel to the loaded and empty sets of screening members. The extensions 25 of the screen fingers project between the curved members 26 of the adjacent teeth and serve to positively clean and prevent the clogging of material between the screen fingers.

It will be noted in Fig. 2 that the upper concave faces 28 of the screening fingers are so positioned on the rocker shafts and are curved so that they present in side elevation practically a continuous concave curve from the outer end of the raised face 28 to the inner end of the adjacent lowered face 28. This arrangement makes possible the conveying or advancing of the material with a minimum frictional resistance and it increases the tendency of the material to roll or turn over as it is advanced, but I desire it to be understood that the concave receiving face is preferable only, for advantageous results will be obtained without the curve in such faces.

I consider the design and arrangement of the screening fingers of considerable importance but they may be varied without departing from my invention. The same is true with reference to the differential drive for the screening members which may be widely varied without departing from my invention.

The operation of the screening members will be attended by but little vibration and hence the supports 1 may be mounted on the tipple or on an inexpensive foundation as compared with the foundations now required for the bodily movable screens.

The principles of construction and operation underlying my invention are adapted for use with various forms of conveyers, mechanical stokers and like devices, and I desire my claims to be so understood.

What I claim as new and desire to secure by Letters Patent, is:—

1. In an apparatus of the character described, rocking screen members having concave material receiving faces pivoted at one side, and means to swing their said faces approximately from horizontal to vertical position, said differential driving means acting to move adjacent faces in opposite directions at different speeds, and guards carried by the free ends of said faces.

2. In an apparatus of the character described, transverse rocking screening members each having upper curved concave material supporting faces and outer curved edges, and differential driving means to alternately raise and lower said members, said means acting to effect the lowering movement of members in advance of the lifting movement of adjacent members, and the upper curved faces of adjacent pairs of members when they stand at opposite extremes

of their travel forming a substantially continuous curved surface in the direction of the discharge end of the apparatus.

3. A screening mechanism comprising a series of horizontal rocker shafts, screening members connected at one side to each shaft and comprising an upper inclined top face and a convex vertical end face, and differential operating connections to rock one member upwardly as the adjacent member toward the discharge end of the machine is rocked downwardly, and vice versa, the down movements taking place more rapidly than the up movements, the material handled being supported principally on said inclined upper faces and fed by each onto the next to move it, substantially as described.

4. In an apparatus of the character described, rocking screening members, alternate members being connected to form two groups, means to swing one group upwardly as the other is swung down, said means comprising a rocking reciprocatory element connected to both groups of screening members, substantially as described.

5. In an apparatus of the character described, rocking screening members, the alternate members being connected in groups, means to raise one group as the other is lowered, said means comprising a rocking element connected to both groups of screening members, and a reciprocatory cross head to which said element is pivotally connected midway between its connections to said screening members, substantially as described.

6. In a screening and conveying mechanism, rocking screen members connected alternately in groups, and driving mechanism to rock said members and raise the member of one group as it lowers the intervening members composing the other group, said driving mechanism comprising a crank, a rocking element connected at an intermediate point to the crank, a driving connection from the upper end of said member to one group of the screen members and a driving connection from the lower end of said member to the other group of screen members, means to oscillate the crank, and a guide in which the rocking member reciprocates, substantially as described.

7. In a screening conveyer, a series of rocker members, an operating mechanism connected to said rocker shafts to rock the first, third, etc., upwardly as it rocks the second, fourth, etc., downwardly, and vice versa, said operating mechanism comprising a driving connection to each group of rocker members, a reciprocatory rocking member connected at opposite ends to the driving connections of said groups of rocker shafts, a slide block, a guide means for said block as it reciprocates, an oscillatory crank shaft having a crank, said rocking member being pivotally connected medially and in line to said crank and slide block, and means to oscillate said crank shaft and reciprocate said rocking member, substantially as described.

8. In an apparatus of the character described, in combination, a reciprocating slide block, a slideway therefor, a crank, a rocking member pivoted medially to said crank and slide block, driving rods pivotally connected to the ends of said rocking member, and groups of alternating rocking screen members which are operated by said driving rods, substantially as described.

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

ARTHUR RICHARD HOUSTON.

Witnesses:
NOMIE WELSH,
R. D. JOHNSTON.