Feb. 18, 1958 A. L. BARRETT ET AL 2,823,791

MATERIAL MOVING APPARATUS

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FIG. 1.

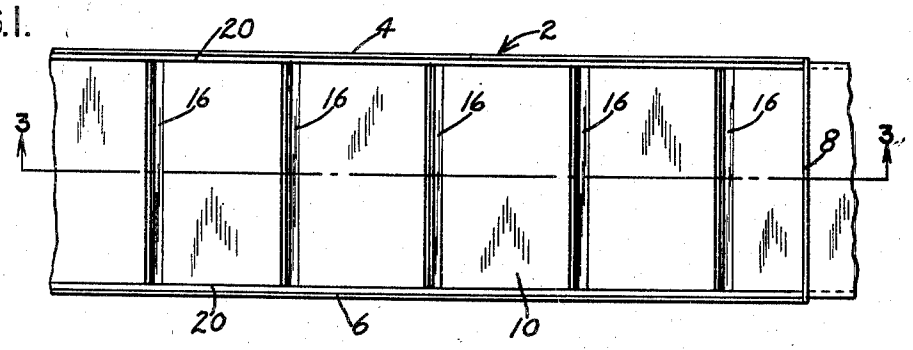


FIG. 2.

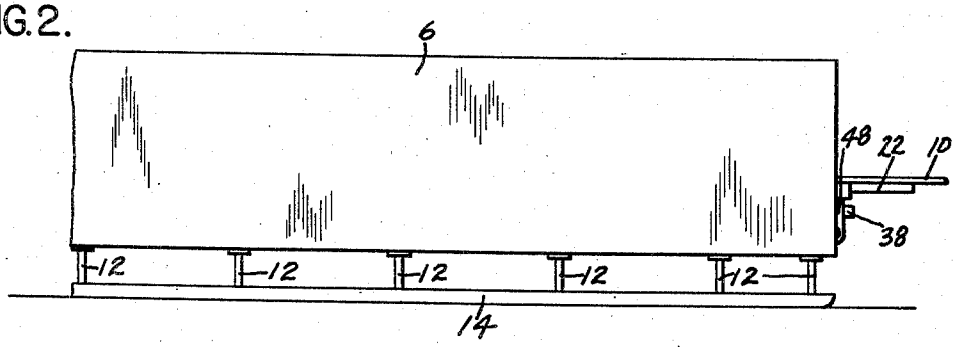


FIG. 3.

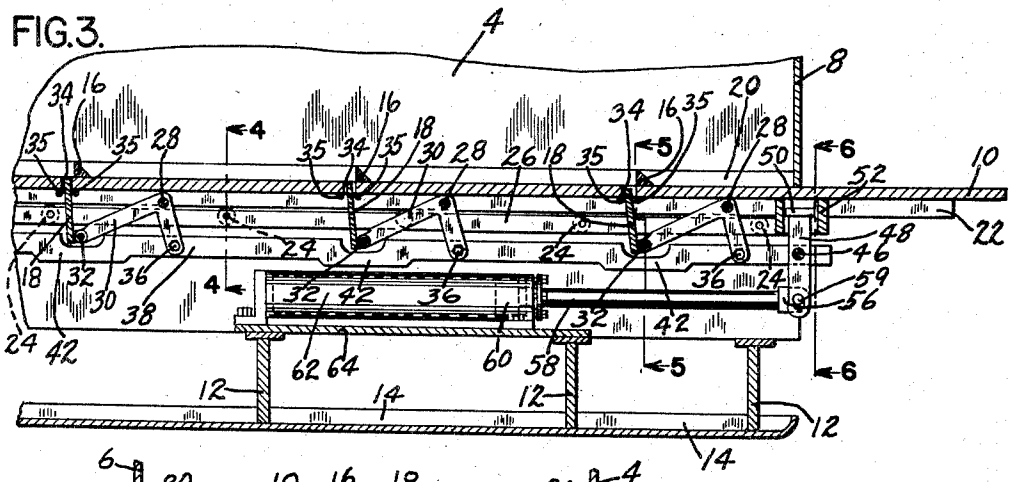
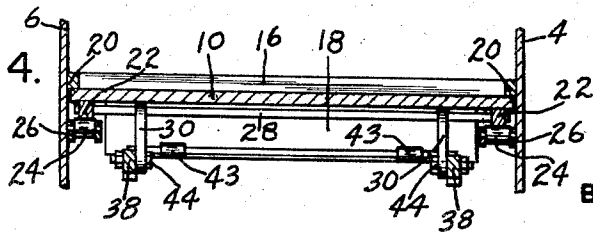


FIG. 4.



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FIG. 5.

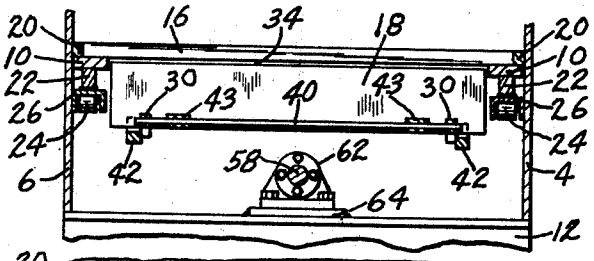


FIG. 6.

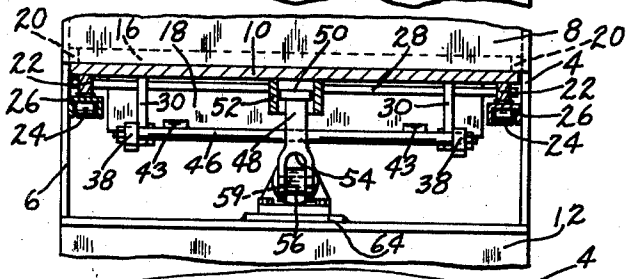


FIG. 7.

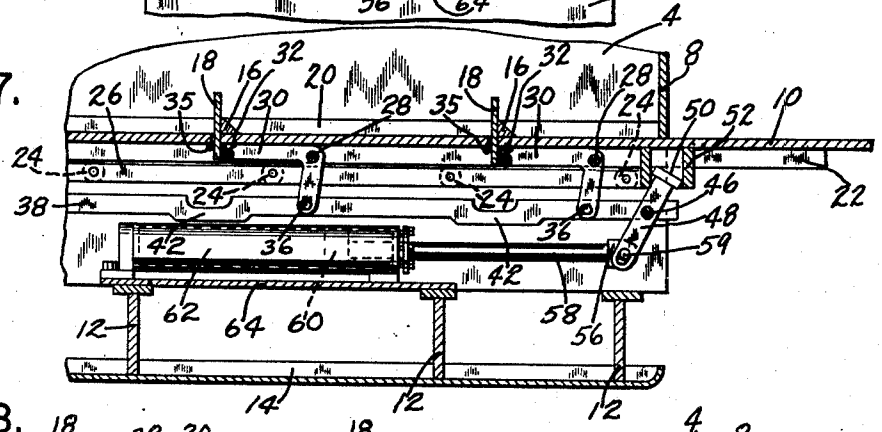
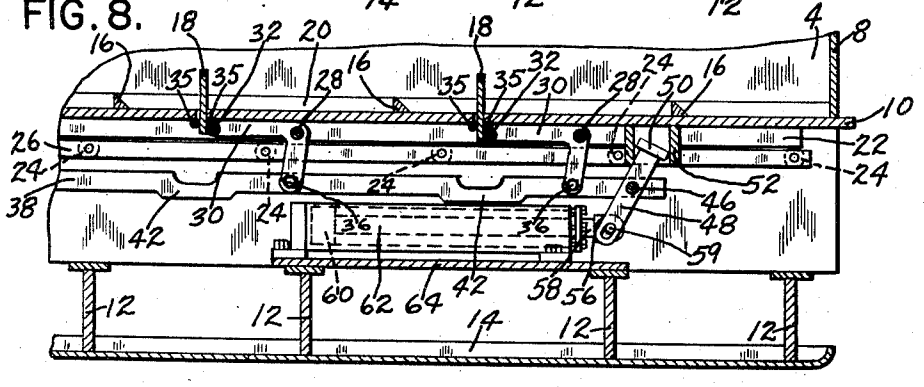


FIG. 8.



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MATERIAL MOVING APPARATUS

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Application April 19, 1954, Serial No. 423,908

3 Claims. (Cl. 198—224)

This invention relates generally to material moving apparatus especially to material such as coal, ore, and the like. In a specific embodiment, the invention is applicable in the same manner as the invention in Patent 2,673,638—Barrett et al., March 30, 1954, although the invention is not limited in its application to such uses.

The above-identified patent sets forth some of the problems encountered by mining engineers in the utilization of modern machines, and that discussion need not be repeated here. It will suffice here to point out that it is an object of this invention to provide improved material moving apparatus of a type which finds ready application to modern mining methods. This and other objects are realized in apparatus of the general type disclosed herein, which may if desired be used broadly for the conveying of mineral, or which can be used in material receiving, storing, and discharging apparatus such as is disclosed in the above-identified patent.

In the drawings:

Fig. 1 is a top plan view of such a portion of the apparatus as will suffice to illustrate the invention.

Fig. 2 is a side elevation view.

Fig. 3 is a view in section substantially on line 3—3 of Fig. 1, but on a larger scale than Figs. 1 and 2.

Fig. 4 is a view in section substantially on line 4—4 of Fig. 3.

Fig. 5 is a view in section substantially on line 5—5 of Fig. 3.

Fig. 6 is a view in section substantially on line 6—6 of Fig. 3; and

Figs. 7 and 8 are operational views, being somewhat similar to the sectional view shown in Fig. 3 but showing the apparatus in different operating positions.

Referring now to the drawings in detail, a storage bin is indicated generally at 2, the bin 2 consisting of sides 4 and 6, endwalls one of which is shown at 8, and a bottom consisting principally of a movable deck 10. The bin 2 is mounted by means of legs 12 on a skid 14; it will of course be apparent to those skilled in the art that any other suitable means of making the bin mobile may be employed.

A plurality of conveyor flights or cross blades 16 are arranged across the deck 10; the conveyor flights and the deck are relatively movable through a half cycle during which the flights move material relative to the deck and another half cycle during which the deck moves material relative to the flights. More specifically, flights 16 are so shaped and oriented as to make the flow of material over them in one direction relatively easy, but relatively difficult in the opposite direction, so that, with the bin filled or partly filled with mineral, relative movement between the flights and the deck in one direction causes mineral to flow over the flights, and this is the half cycle in which the deck moves material relative to the flights; while relative movement between the flights and the deck in the opposite direction from that just indicated effects a scraping action of the flights on the deck, and

this is the half cycle during which the flights move material relative to the deck.

It will of course be perfectly evident to those skilled in the art that either the flights may be made to move along the deck with the latter being stationary relative to the mine bottom, or the flights may be made stationary while the deck is made movable. In the embodiment shown, the flights are fixed relative to the mine bottom and the deck is movable relative thereto. Accordingly, referring now specifically to Figs. 3, 7 and 8, when the deck 10 moves leftward, material flows readily over the flights 16 and it may accurately be said that the deck moves material relative to the flights. On the other hand, for deck movement to the right, flights 16 exert a scraping action and it may accurately be said that, during this half cycle, the flights move material relative to the deck.

Material engaging means or retractable blades 18 cooperate with the deck and are movable into a material engaging position (as shown in Figs. 7 and 8) and into an inactive position (Fig. 3). Means are provided sequentially to move the engaging means 18 into engaging position and then to provide the aforesaid relative movement through the half cycle during which the deck moves material relative to the flights, and to move the engaging means 18 into inactive position and then to provide the aforesaid relative movement during which the flights move material relative to the deck.

Hold-down strips 20 are secured to the sides 4 and 6 in any suitable manner, being located immediately above the deck 10. Flights 16 extend between and are secured to the hold-down strips. Deck 10 is provided at its under side and near its side edges with support strips 22. Strips 22 ride on rollers 24 which are rotatably supported in members 26 secured as by welding to the sides 4 and 6. As shown, members 26 may conveniently be inverted channel members with a portion of the channel bottom being cut away in order that the rollers may project upward through the openings thus provided.

At spaced intervals, rods 28 are secured adjacent the under surface of deck 10. In the embodiment shown, rods 28 are thus secured by the support strips 22. Each rod 28 carries a pair of bell cranks 30, bell cranks 30 being pivoted at the vertex by rods 28 passing through suitable openings.

One arm of each bell crank is pivotally secured as at 32 to one of the material engaging means 18. Deck 10 is provided with transverse slits or openings 34 through which the material engaging means 18 move. Openings 34 are placed adjacent flights 16. More specifically, each opening 34 is adjacent the vertical face of a flight 16. Deck 10 is reenforced on its under side at the edges of the openings 34 by rods 35.

The remaining arm of bell crank 30 is pivotally secured as at 36 to a reciprocable member 38.

Reference was made above to the pivotal connection 32 of each bell crank 30 with its material engaging means 18. As is probably best seen in Fig. 5, this pivotal connection is accomplished in the embodiment of the invention shown by means of a rod 40 extending across between pairs of bell cranks. Rod 40 extends at its ends somewhat beyond the outer faces of bell cranks 30 so as to be engageable with the reciprocable members 38 which are disposed at the two sides of the apparatus. In the embodiment shown, reciprocable members 38 are offset somewhat, as shown at 42, where the ends of rod 40 come into contact to limit the movement in one direction of rocker arms 30. Each rod 40 passes through a pair of ears 43 secured to its associated material engaging means 18.

Reference was made above to the pivotal connections 36 between the rocker arms 30 and the reciprocable mem-

bers 38. These pivotal connections are provided in the embodiment shown by threaded members 44.

At the right ends as seen in Figs. 3, 7 and 8, reciprocable members 38 are joined by a rod or transverse member 46. Transverse member 46 passes through a lever 48; more specifically, transverse member 46 passes through lever 48 at a point between the ends of the lever. The upper end of lever 48 is provided with a bearing plate 50 which engages a socket 52 provided on the under side of deck 10. The lower end of lever 48 is bifurcated as shown at 54, and the two fingers of the bifurcation receive between them the end 56 of a piston rod 58. A pivot pin 59 is preferably secured in the rod end 56 and engages suitable slots in the fingers of the bifurcated end 54. Piston rod 58 is secured to a piston 60 of a hydraulic motor, piston 60 being reciprocable in a cylinder 62 supported in any suitable manner on a pedestal 64 which in turn is mounted on adjacent legs 12.

The hydraulic motor formed by cylinder 62 and piston 60 is preferably a double-acting jack having the usual conventional controls which need not be described in detail here because they are well known to those skilled in the art. These controls may, and preferably will, include automatic reversing valves which reverse the flow of hydraulic fluid under pressure at the end of each stroke of the piston.

Operation

The start of the operation will be taken with the parts in the position shown in Fig. 3. It will be assumed that the bin is at least partly filled with mineral.

With fluid flowing under pressure into the right end of cylinder 62 as seen in Fig. 3, piston 60 moves toward the left. Leftward movement of piston 60 of course carries with it piston rod 58. Lever 48 is free to pivot clockwise either about the rod 46 or about its end in socket 52. Inasmuch as deck 10 offers considerable resistance to movement, lever 48 pivots clockwise with the end in socket 52 serving as the fulcrum. Accordingly, reciprocable members 38 are carried leftward, rocking the rocker arms 30 clockwise into the position shown in Fig. 7, and in the course of this movement, material engaging means 18 are moved from their inactive position of Fig. 3 to their material engagaing position as shown in Fig. 7.

At this point, rocker arms 30 engage the under side of deck 10 and their clockwise rotation is stopped. Piston 60 continues its leftward movement, and for the rest of its stroke moves deck 10 to the left. During this movement, material engagaing means 18, moved upward through the openings 34 by the rocker arms 30, push the mineral in the bin toward the left over the sloping surfaces of flights 16. This is the half cycle of operation during which deck 10 moves material relative to flights 16.

As soon as piston 60 has reached the end of its stroke, the flow of fluid under pressure is reversed by a suitable manual or automatic mechanism, and fluid under pressure is admitted to the left end of cylinder 62. The least resistance to movement is provided by the rocker arms, and they are now pivoted counterclockwise until the ends of rods 40 engage the upper surfaces of offsets 42 in reciprocable members 38. This movement of the rocker arms moves the material engaging members 18 into their inactive position. Continued movement of piston 60 toward the right moves the deck 10 toward the right. It is during this half cycle that flights 16 move material relative to the deck 10. As soon as piston 60 has reached the position shown in Fig. 3, the full cycle is completed and is ready to be repeated.

It will be apparent to those skilled in the art that we have here provided improved and more efficient material moving apparatus for the moving of mineral such as coal, ore, and the like. Other advantages will be apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

We claim:

1. A material moving device comprising, a stationary support, a deck reciprocably mounted on said support, a first material engaging means located adjacent one side of said deck and extending laterally thereacross with reference to the path of movement of said deck, said first material engaging means being rigidly secured to said support to engage said one side of said deck, said first material engaging means being so constructed that forward movement of said deck in one direction relative to said first material engaging means causes material to flow relatively freely over said first material engaging means, a second material engaging means having a material engaging position and an inactive position, said second material engaging means being movably mounted on the other side of said deck to be retractable therethrough and extend outwardly from said side of said deck when in a material engaging position; and sequentially operable means located adjacent the other side of said deck to move said second material engaging means into material engaging position, then to move said deck beneath said first mentioned engaging means so that said second material engaging means approaches said first material engaging means, then to move said second material engaging means to said inactive position, and then to move said deck in the reverse direction to cause said first material engaging means to scrape said one side of said deck.

2. A material moving device comprising, a support, an elongated deck mounted on said support for longitudinal reciprocating movement with respect thereto, spaced elongated openings extending through and laterally across said deck the ends of which terminate inwardly of the sides thereof, a plurality of cross blades rigidly secured to said support adjacent one side of said deck to extend laterally thereacross between said openings, respectively, a plurality of retractable blades pivotally mounted on the other side of said deck with portions thereof being movable through said openings, respectively, to extend beyond said one side of said deck, an elongated rod located adjacent said other side of said deck and extending longitudinally with respect thereto, said elongated rod being pivotally connected to a portion of each of said retractable blades remote from said first mentioned portion, an elongated lever having one end pivotally connected to said deck to extend outwardly from said other side thereof and its other end secured to means for causing oscillatory movement thereof about said one end, and said elongated rod being connected to said lever intermediate the ends thereof and having a portion remote therefrom movably supported by said support.

3. A material moving device comprising, a support, an elongated deck mounted on said support for longitudinal reciprocating movement with respect thereto, spaced elongated openings extending through and laterally across said deck the ends of which terminate inwardly of the sides thereof, a plurality of cross blades rigidly secured to said support adjacent one side of said deck to extend laterally thereacross between said openings, respectively, a plurality of retractable blades pivotally mounted on the other side of said deck with portions thereof being movable through said openings, respectively, to extend beyond said one side of said deck, an elongated rod located adjacent said other side of said deck and extending longitudinally with respect thereto, said elongated rod being pivotally connected to a portion of each of said retractable blades remote

from said first mentioned portion, an elongated lever having one end pivotally connected to said deck to extend outwardly from said other side thereof and its other end secured to means for causing oscillatory movement thereof about said one end, said elongated rod being connected to said lever intermediate its ends thereof and having a portion remote therefrom movably supported by said support, and said retractable blades having a portion intermediate the aforementioned portions thereof engageable with said other side of said deck and said elongated rod to restrict movement thereof in opposite directions.

References Cited in the file of this patent

UNITED STATES PATENTS

2,357,244	Watson	Aug. 29, 1944
2,592,010	Cole et al.	Apr. 8, 1952