

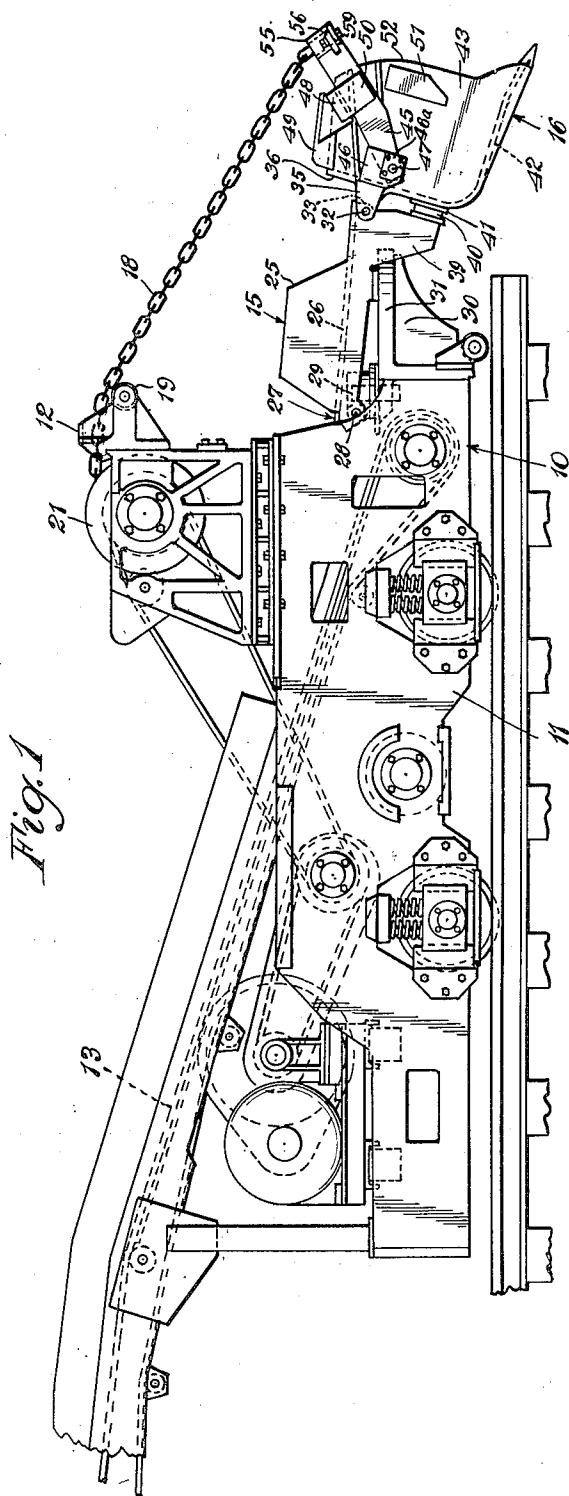
Nov. 25, 1952

A. R. BIEDESS
MUCKING MACHINE

2,619,243

Filed Nov. 27, 1950

3 Sheets-Sheet 1



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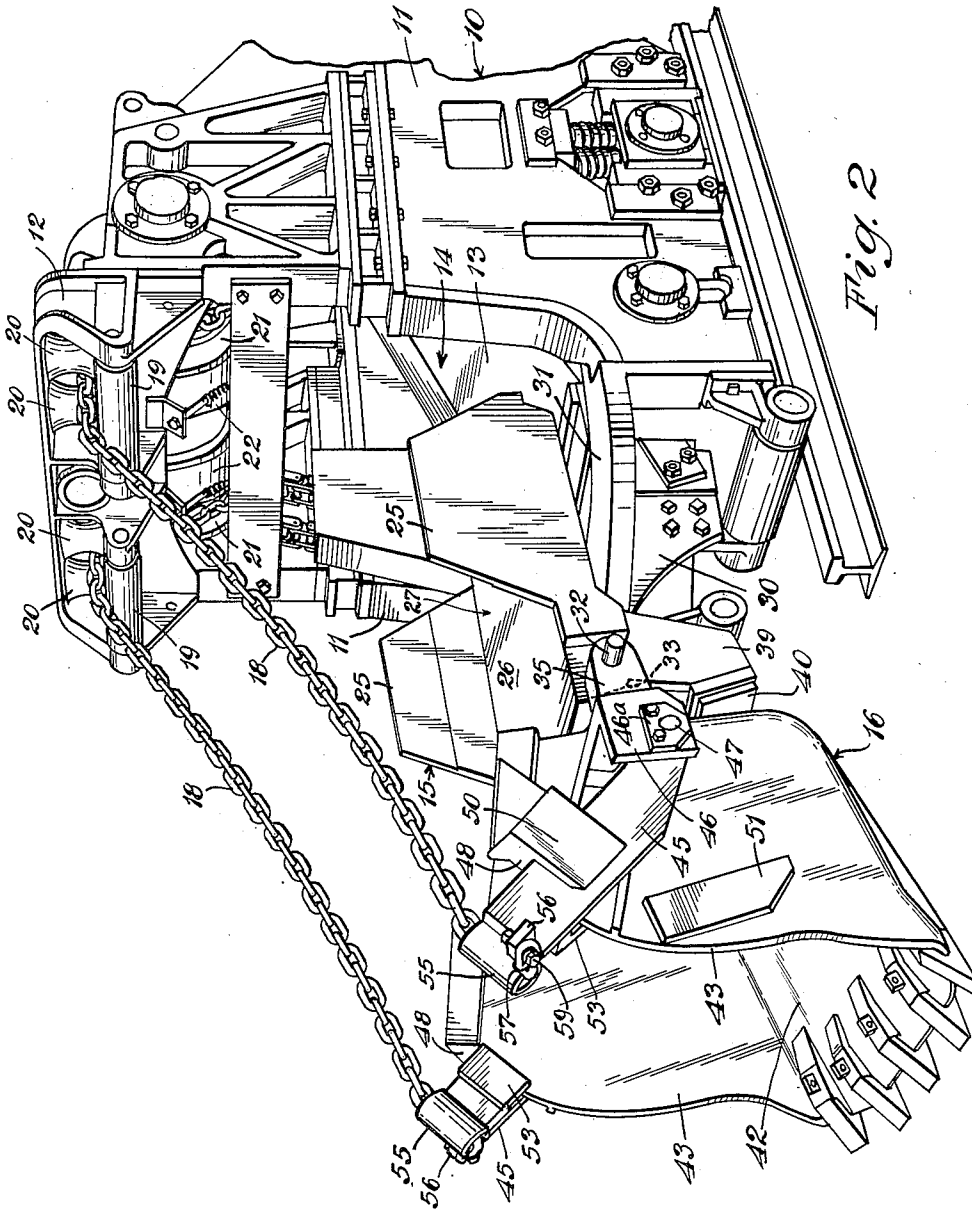
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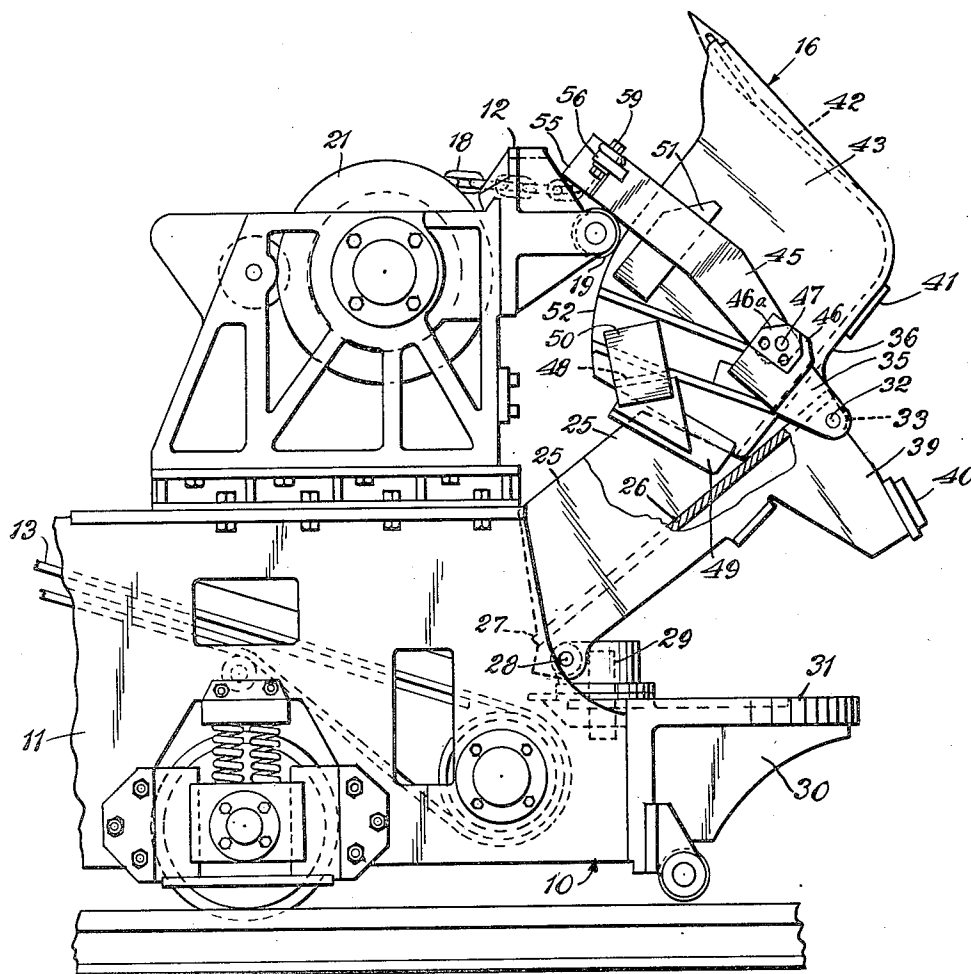


Fig. 3

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UNITED STATES PATENT OFFICE

2,619,243

MUCKING MACHINE

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Application November 27, 1950, Serial No. 197,709

2 Claims. (Cl. 214—90)

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This invention relates to improvements in excavating machines of the kind commonly referred to as mucking machines.

More particularly, the present invention relates to improvements in the type of machine shown in Patent No. 2,239,076 wherein a dipper or scoop is pivotally mounted for vertical swinging movement on the front end of a combination boom and material chute and said boom is mounted near its rear end for vertical and horizontal swinging movement with respect to a mobile base frame having a rearwardly extending elevating conveyor in position to receive material from the boom chute when the dipper and boom are elevated to an upwardly inclined, rearwardly dumping position. The dipper and boom are elevated by a pair of flexible draft devices, usually chains, said draft devices being connected to the outer sides of the dipper and extending upwardly to a bridge on the main frame, where they are wound on power-actuated drums suitably controlled either in unison or independently of each other, so as to effect elevation and lateral swinging of the dipper and boom as desired by the operator.

Mucking machines of the general character above described are particularly adapted for use in tunnelling operations wherein the dipper is forced forwardly into loose material by tramping the base frame of the machine forwardly. The dipper is then raised into dumping position relative to the elevating conveyor by the chains. Under many working conditions where limited overhead clearance is available, the dipper cannot be elevated to a sufficient height and dumping angle relative to the boom and conveyor for satisfactory operation.

The principal object of the present invention is to provide a novel and simple linkage arrangement between the dipper and the flexible draft devices to permit the dipper to be automatically elevated and positioned at a more effective dumping position than heretofore while requiring less overhead clearance for the dipper.

A further object of the machine is to permit the dipper to assume a greater dumping angle and operate within less head room for a given length of boom.

Further objects of the invention will appear from time to time as the following description proceeds.

The invention may best be understood by reference to the accompanying drawings, in which:

Figure 1 is a side view of a mucking machine of the conventional design to which the novel features of my invention have been applied, and

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with a portion of the delivery end of the conveyor mechanism of the machine broken away;

Figure 2 is an enlarged perspective view showing the front end of the machine of Figure 1;

Figure 3 is an enlarged fragmentary side view of the front end of the machine shown in Figure 1, but with the dipper in fully elevated position and with parts broken away to show the relationship between the dipper and the boom in such elevated position.

Referring now to details of the embodiment of my invention illustrated in the drawings, it is shown as applied to a mobile base frame 10 having side plates 11, 11 on which is mounted a bridge 12 spaced above the front end of an elevating conveyor 13 so as to form an open throat 14 through which the loose material passes from a boom 15, on the front end of which a dipper or scoop 16 is pivotally mounted for limited vertical swinging movement. A pair of elevating chains 18, 18 are trained over horizontal rollers 19, 19 near opposite sides of the bridge 12 and, from thence, between pairs of upright guide rollers 20, 20 to winding drums 21, 21 rotatably supported on the bridge to the rear of said upright guide rollers. Suitable power drive connections and manual control means for rotating the winding drums either in unison or independently of each other are provided, as for instance, through a pair of planetary gear devices indicated generally at 22.

The boom 15 is provided as usual with upright side walls 25, 25 and a floor 26 which together form a discharge chute 27 extending the length of said boom. The rear end of the boom is pivotally connected by a transverse pivot pin 28 to an upright stud 29 which, in turn, is pivotally mounted on the forwardly extending platform 30 at the front end of the base frame 10 to permit limited lateral swinging movement of the boom and dipper with respect to the machine base. The front platform 30 has a semi-circular bearing plate 31 disposed in a generally horizontal plane, on which the front end of the boom is adapted to rest in various positions of horizontal swinging movement of the boom and dipper.

The dipper 16 is pivotally supported on a transverse pivot pin 32 mounted in suitable journals 33, 33 at the front end of the boom and below the upper surface of the chute bottom 26. The pivot pin 32 passes through a plurality of depending side brackets 35, 35, each formed integrally with and projecting from the adjacent wall 36 of the dipper, which wall for convenience may be considered the bottom wall of the dipper.

A pair of depending legs 39, 39 may be formed integrally with the boom at its outer end adapted to overhang the semi-circular bearing plate 31, when the boom is in its lowermost position, as shown in Figure 1. These depending legs have abutment pads 40, 40 on their forward faces adapted to be engaged by pads 41, 41 adjacent the forward end of the bottom wall 36 of the dipper when the latter is in its lowermost, forwardly facing position as shown in Figure 1.

The dipper 16 also includes a front wall 42 and side walls 43, 43 formed integrally therewith but, as usual with this general type of mucking machine, said dipper has no rear wall but instead is arranged so that material will be deposited from the bottom wall 36 onto the chute 27 of the boom when the dipper and boom are in an elevated position as shown in Figure 3.

The general arrangement of the parts previously mentioned, including the means for actuating and controlling the winding drums 21 may be substantially the same as heretofore employed in mucking machines and exemplified in Patent No. 2,239,076, so further details thereof need not be described herein, excepting as to the novel arrangement of parts to which the present invention is particularly directed.

Referring now more particularly to details of the elevating linkage for the dipper which forms the principal feature of the present invention, it will be observed that, instead of connecting the free ends of the elevating chains 18, 18 directly to the side walls 43, 43 of the dipper as in previous machines, said chains are each connected to links 45, 45, the opposite ends of which are pivotally connected to the outer sides of the dipper adjacent the bottom wall thereof. In the form shown herein, the brackets 35, 35 at opposite sides of the dipper which, as previously mentioned, have pivotal connection with the boom 15 through pivot pin 32, each extend upwardly a short distance above the bottom wall of the dipper with an integral bearing plate 46 spaced from a bearing on the adjacent side wall 43 of the dipper. Said bearing plate 46 and boss 46a form end supports for the pivot pin 47 on which the lower end of each link 45 is connected.

Stop means are provided on each side wall 43 of the dipper for limiting the rearward swinging movement of the links 45 with respect thereto, so as to hold said links in a forwardly inclined position when the dipper is in lowered digging position, as shown in Figure 1. In the form shown herein, the stop means consists of a pair of laterally extending abutment members 48, 48 fixed to the side walls 43 adjacent their rearwardly open edges. Said abutment members also have forwardly projecting plates 50, 50 forming guide slots for receiving the links 45 as they approach engaging position with respect to the abutment members 48.

Suitable abutment means are provided to limit the upward and rearward vertical swinging movement of the dipper relative to the boom. In the form shown herein, the abutment members 48, 48 on the side walls 43 adjacent their rearwardly opened edges also have rearwardly extending wings 49 which are adapted to engage the front faces of the side walls 25 of the boom 15 when the dipper is swung to its extreme rearmost position relative to the boom, as shown in Figure 3.

Wear plates 51, 51 may be formed in the outer faces of side walls 43 of the dipper along the upper edges thereof for bearing engagement with

the inner faces of the links 45 when the latter may be swung to forward positions with respect to the dipper.

As will be seen from Figures 1 and 3, the upper edges 52 of the side walls 43 adjacent the rear or open end of the dipper are formed along arcs substantially concentric with the point of pivotal connection of the links 45 with the dipper, and a pair of guide plates 53, 53 are fixed adjacent the outer ends of each of the links, which guide plates overlap the inner faces of the side walls 43 to aid in supporting said links against lateral outward displacement relative to the side walls during the operation of the machine.

In the preferred form of chain attachment means shown herein, each link 45 is provided at its outer end with an integral member 55 disposed tangentially to the arc of swinging movement thereof. Each of the chains 18 passes through the rear ends of its respective tubular member 55 and the free end of the chain is brought outwardly through the front end of said tubular member and fixed to a lug 56 projecting outwardly from the adjacent side of the link. Where, as here, a heavy linked chain is used for the flexible elevating means, each tubular member 55 is provided with a recess 57 along its outer forward end for receiving the next to the last chain link, while the last chain link at the free end of the chain is connected to the lug 56 as by a bolt 59.

With the form of chain connection just described, it will be observed that the chains 18, 18 assume a substantially straight line position when the dipper and boom are being initially elevated from their lowermost position, at which time the maximum digging strain is usually exerted upon the chains.

The use and operation of the machine above described is as follows:

The machine is mounted as usual for movement along track rails and for digging at the extreme end of the track where loose material is deposited on the floor of the tunnel by blasting or other digging operations. The entire machine is bodily moved at low speed under traction toward the end of the track, with the dipper and boom in their lowermost positions, as shown in Figures 1 and 2, wherein the digging lip of the dipper is projected forwardly at a downward angle below the level of the track and substantially at the floor level of the tunnel, the boom resting on the platform 30. The dipper is filled by moving the machine forwardly to gather a suitable load, and then lifting the dipper and boom by means of the elevating chains 18, 18.

When the dipper is in its lowermost digging position as in Figures 1 and 2, it will be understood that the initial pull on the elevating chains will tend to swing the dipper upwardly with respect to the boom, while the boom remains stationary in its lowered position, until the abutment members 49 on the dipper engage the side walls 25 of the boom. Thereafter, further upward pull on the chains results in an upward movement of both the dipper and the boom until the dipper and boom assume a discharged position substantially as shown in Figure 3.

It will be particularly noted that, owing to the novel form and arrangement of the pivoted links 45 at opposite sides of the dipper, the initial upward pull of the chains is exerted on the

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dipper, with said links swung rearwardly into engagement with the abutment members 43, 43. This presents a most efficient angle of pull for the initial elevation of the dipper with respect to the boom. As the elevation of the dipper proceeds to the point where the links 45 come into substantial alignment with the chains, further pull on the links tends to rock the dipper rearwardly with respect to the boom, during which rocking movement, the links 45 continue to be swung forwardly and away from abutment members 43. As a result, the dipper will be tilted at a substantial angle to the boom when the dipper and boom reach their dumping position. When moved to the uppermost permissible position, the upper ends of the links 45, 45 pass over the rollers 19, 19 on the bridge 12, and the side walls 43, 43 of the dipper come into engagement with said rollers, as shown in Figure 3.

As will be noted especially from Figure 3, the pivot pins which connect the links 45, 45 to the dipper are disposed forwardly of the direct line of pull between the upper ends of the links and the axis of vertical swinging movement of the dipper relative to the boom, when the dipper and boom are swung to their uppermost limit of movement. This arrangement insures the rearward tilting movement of the dipper relative to the boom in all permissible positions of the dipper and boom and, as a result, the dipper will be inclined at a greater dumping angle than the boom in the dumping position.

It will now be understood that the links 45 and elevating chains 18 assume a most efficient angle for initial elevation of the dipper from its lowermost digging position, but that the links automatically readjust themselves with respect to the dipper and boom so that the dipper requires less overhead clearance than is possible with prior mucking machine constructions, where the chains have been connected to a fixed point on the sides of the dipper.

It will be observed further that the novel form of linkage above described involves no other substantial change in the usual conventional control or manipulation of the machine. The operator can also control the lateral swinging movement of the dipper as before, by causing more tension on one chain than the other, for swinging the boom and dipper toward one side or the other of the machine when desired.

Although I have shown and described certain embodiments of my invention, it will be

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understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. In a mucking machine including a mobile base frame with a material conveyor extending longitudinally therealong, a boom pivotally mounted for vertical and lateral swinging movement at the front end of said base frame, a dipper pivotally mounted for limited vertical swinging movement at the front end of said boom, and a bridge spanning the front of said conveyor having a pair of power-actuated flexible draft devices trained thereover for elevating said boom and dipper in unison into rearwardly inclined discharging relation to said conveyor, the combination of a pair of links pivotally connected at opposite sides of said dipper and having their free ends connected to said draft members, stop means limiting rearward swinging movement of said links relative to said dipper to dispose said links at a forwardly and upwardly inclined angle to said draft devices when the boom and dipper are in a lowered digging position, and said links being swingable forwardly relative to said dipper when said dipper and boom are elevated by said draft devices.

2. A mucking machine structure in accordance with claim 1, wherein the axis of the links on the dipper is disposed forwardly of the line of pull between the draft devices on the bridge, and the axis of the dipper on the boom, in all permissible positions of the dipper, but said axes approach a substantially straight-line relation with said draft devices at the upper discharge position of said dipper and boom.

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