Feb. 27, 1945. J. L. CLARKSON ET AL 2,370,147

LOADING MACHINE

Original Filed Aug. 2, 1940 3 Sheets-Sheet 1

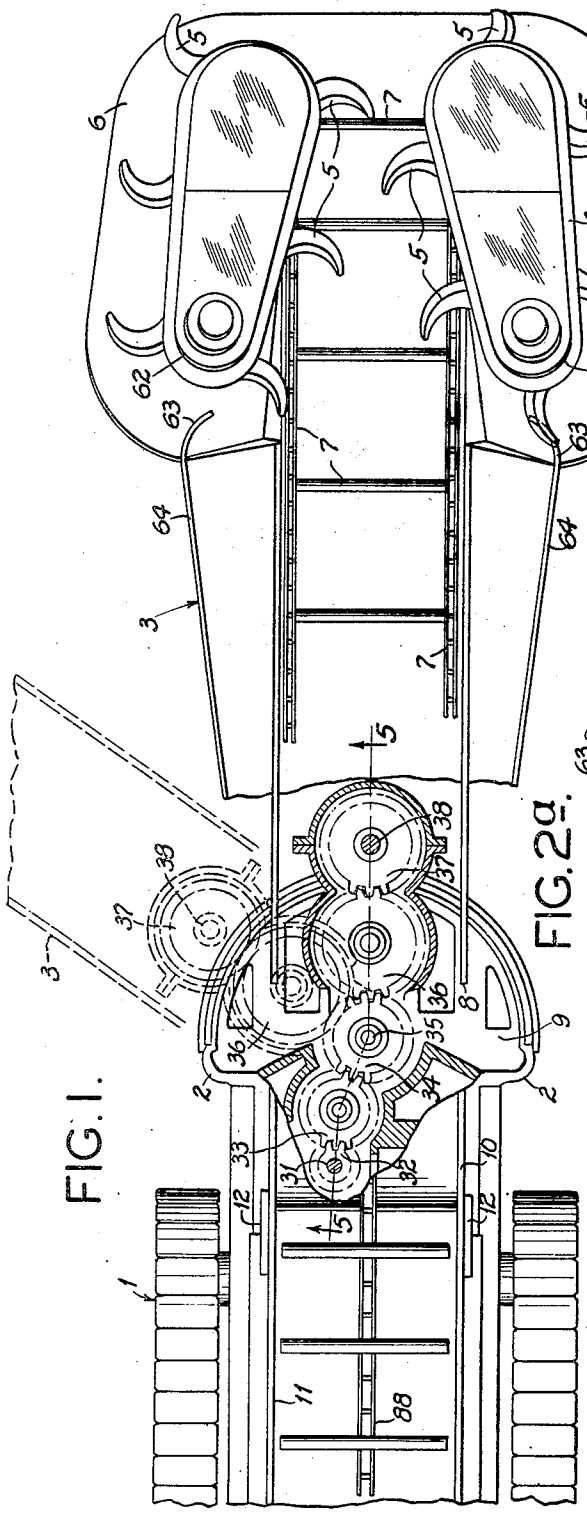

FIG. 1.

FIG. 2a.

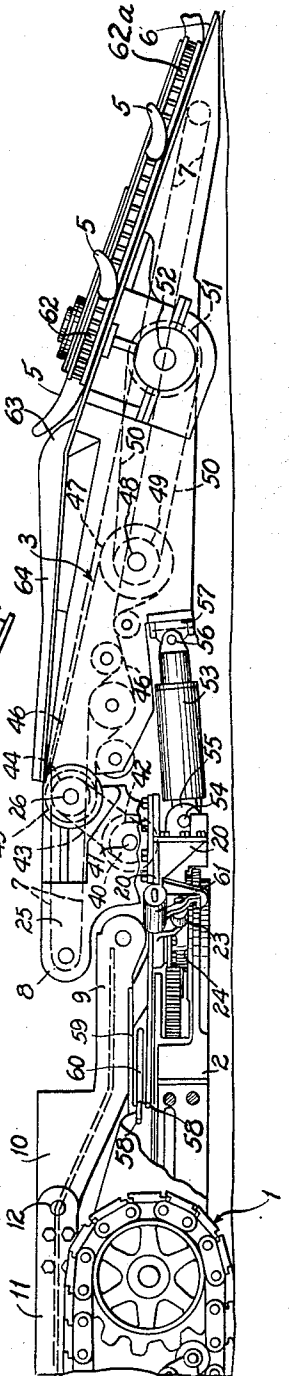

FIG. 2.

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Original Filed Aug. 2, 1940 3 Sheets-Sheet 2

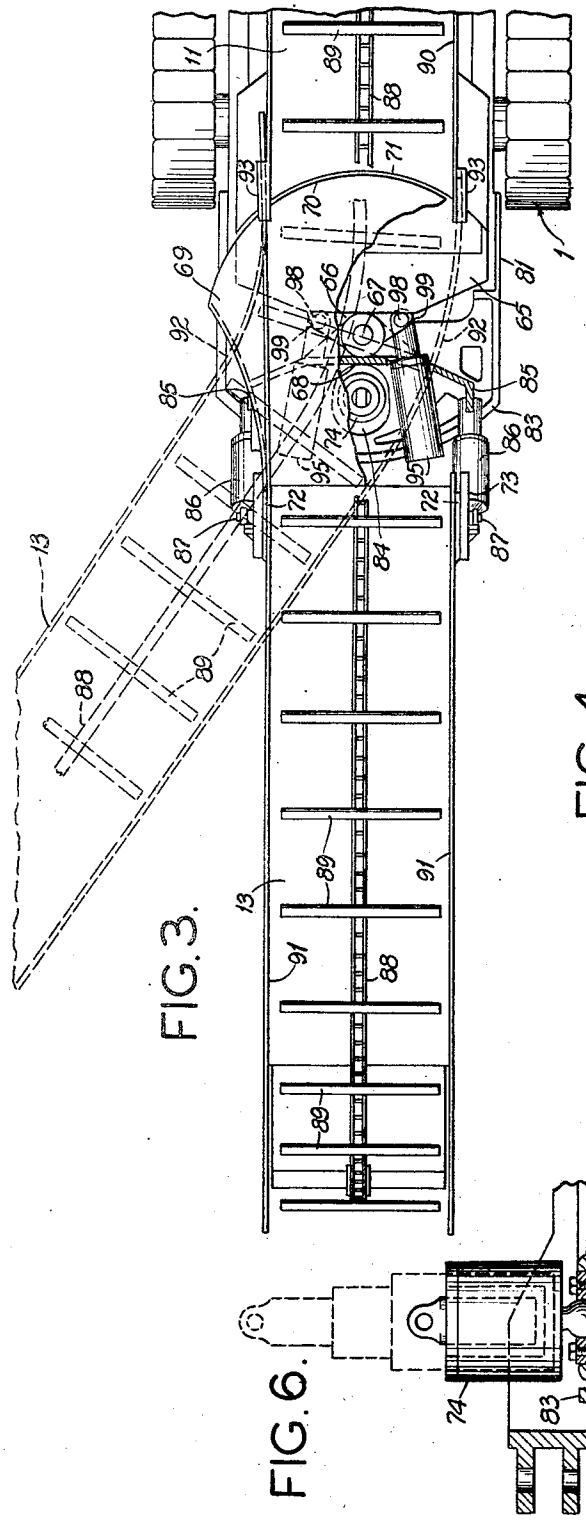

FIG. 3.

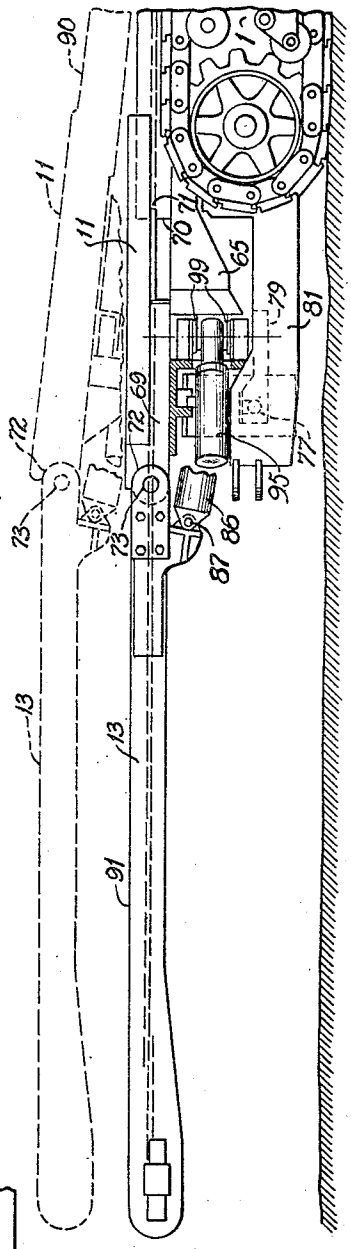

FIG. 4.

FIG. 6.

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Original Filed Aug. 2, 1940 3 Sheets-Sheet 3

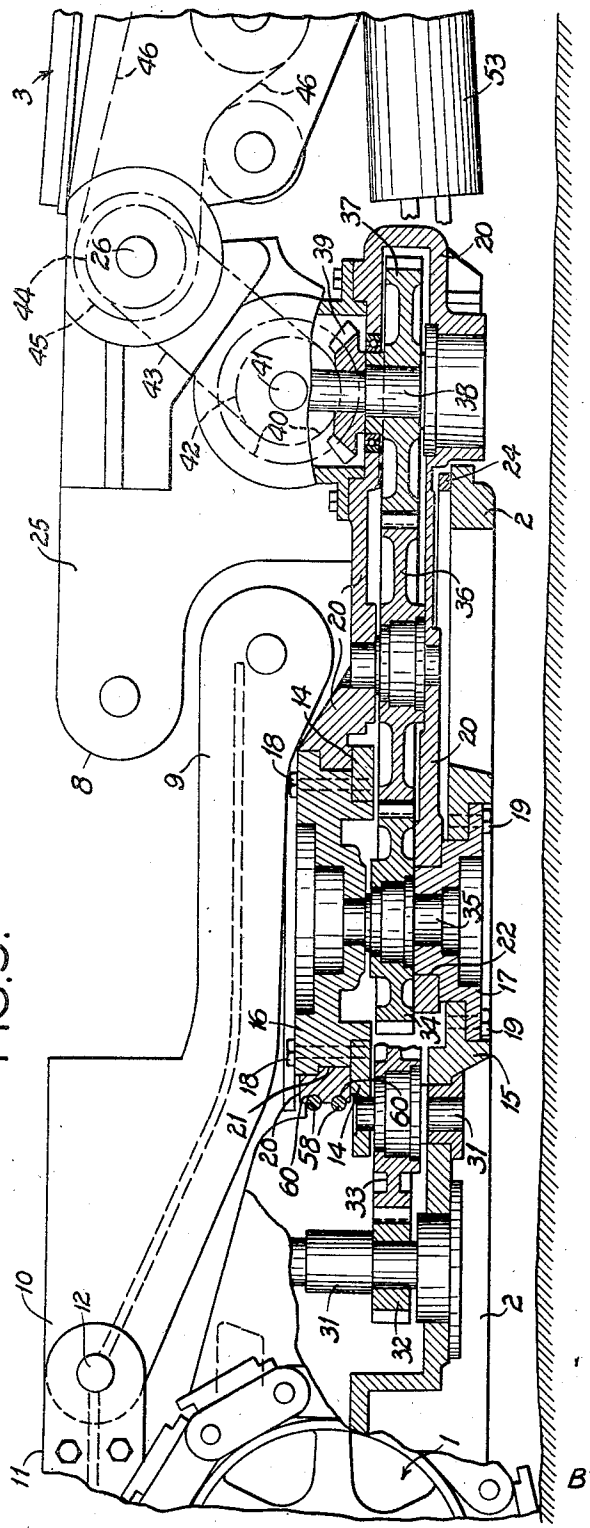

FIG. 5.

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Patented Feb. 27, 1945

2,370,147

UNITED STATES PATENT OFFICE

2,370,147

LOADING MACHINE

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Original application August 2, 1940, Serial No. 349,488. Divided and this application April 27, 1942, Serial No. 440,568

6 Claims. (Cl. 198—8)

This invention pertains to loading machines and more particularly to the type of machine ordinarily used in coal mines for gathering coal from the face being worked and loading the same on the mine cars. A particular feature of this invention is the structure of such a machine adapted to operate in low veins, many of which are not over thirty-six inches in height. This application is a division of application Serial No. 349,488, filed August 2, 1940, in which application the novel features of the main structure and the delivery conveyor are claimed.

One of the objects of this invention is to provide a loader structure which will operate in such a low vein, but which will have ample power and gathering ability to handle a large tonnage.

Another object of this invention is to provide such a loader structure which will be flexible so as to be able to gather material from any point over a wide space and deliver the same to cars positioned in practically any way with reference to the loading machine.

Another object is to provide such a loading machine having improved driving means for its front conveyor and gathering devices.

Another object is to provide means to prevent lumps of material from being thrown by the machine in such a manner as to endanger the operator.

Further objects will appear from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a plan view partly in section of the forward end of a loading machine embodying this invention;

Figure 2 is a side elevation of Figure 1;

Figure 2a is a detail illustrating the operation of the lump-breaking device;

Figure 3 is a plan view partly in section of the rear end of the machine;

Figure 4 is a side elevation of Figure 3;

Figure 5 is an enlarged side view partly in section showing the driving connections for the forward conveyor; and

Figure 6 is a sectional detail of a part of Figure 4 illustrating another embodiment of the invention.

Referring now to the drawings, the machine selected for illustration in the drawings comprises a carriage, indicated generally at 1. Extending forwardly from the carriage 1 at a low level near the ground is a long supporting bracket 2, which carries the forward conveyor indicated generally at 3. The conveyor 3 carries at its forward end gathering means, including a pair of gathering chains 4, equipped with gathering arms or picks 5. The gathering devices are adapted to gather material from in front of the machine, and, after passing the same over the shoe 6, to deliver it to an elevating conveyor 7.

The conveyor 7 terminates at its rear end at 8 over the forward end 9 of a delivery conveyor, indicated generally at 10. The conveyor 10 extends rearwardly over the carriage 1. This delivery conveyor is sectionalized. The front end portion 9 is fixed upon the bracket 2, and is therefore stationary. An intermediate section 11 is pivoted at its front end at 12 for vertical swinging motion with respect to the stationary part. An after section 13 is joined to the section 11 for both vertical and horizontal swinging movements.

The forward conveyor 3 is mounted on the bracket 2 for both vertical and horizontal swinging movements in order that its front end may be moved in any position, relative to the carriage 1, so that material may be gathered from any point. In order to provide for such vertical and horizontal movement, and, at the same time, to keep the machine low enough to operate in such a low vein as above mentioned, the following structure is provided:

The bracket 2 may be in the form of a casting and is provided with an upper portion 14 and a lower portion 15. These two portions are spaced apart so as to receive upper and lower bearing members 16 and 17, respectively. These members may be secured to the bracket 2 in any suitable manner as by bolts 18 and 19, shown in Figure 5. The bearing members 16 and 17 provide respectively upper and lower swivel bearings for a swinging bracket 20. This bracket has a swivel bearing on the member 16 at 21 and on the member 17 at 22. The swinging bracket 20 may be provided with rollers 23, arranged to roll upon a rail 24 extending circularly around the forward end of the bracket 2. The swinging bracket 20 has the duty of carrying the weight of the front conveyor 3 and of providing a swinging pivot therefor. It thus provides vertically-spaced swivel bearing portions 21 and 22, together with the supporting rail 24 upon which the bracket may roll from one angular position to another. A head bracket 25 for the conveyor 3 is fixed upon the swinging bracket 20. The front conveyor boom is pivoted upon the bracket 25 at 26 for vertical swinging movement.

In order to drive the front conveyor, the driving connections illustrated in section in Figure 5

are provided. A driving motor, not shown in the drawings, is mounted upon the carriage 1 and connected, as will now be described, to drive the conveyor 7. The same motor may also, if desired, be connected to propel the carriage 1.

The motor is connected by any suitable driving connections, not shown, to drive a vertical shaft 31, suitably journaled in the bracket 2. A gear 32 on the shaft 31 drives an idler gear 33, which in turn drives a gear 34 on a shaft 35. The shaft 35 is journaled in the bearing members 16 and 17. Accordingly, the gear 34 rotates on the same axis on which the swinging bracket 20 pivots. By this arrangement the drive is carried through the gear 34 to the conveyor 7 and the gathering devices in any position of the bracket 20. Meshing with the gear 34 is another idler gear 36, which drives a gear 37 on a vertical shaft 38 journaled in the forward end of the bracket 20. The shaft 38 carries a bevel gear 39 meshing with a corresponding gear 40 carried by a horizontal shaft 41 journaled in the bracket 25. The shaft 41 carries a sprocket 42, connected by a chain 43 to a similar sprocket 44 on the pivot shaft 26, which drives the conveyor 7. This drive may be carried out by means of a sprocket 45 on the shaft 26 and a chain 46, passing over suitable guide sprockets to a sprocket 47 on a cross-shaft 48 extending across the conveyor boom 3. The shaft 48 carries at each end thereof a sprocket 49, and these sprockets are connected by chains 50 to sprockets 51 on shafts 52 which drive the gathering devices 4, 5. This drive for the gathering devices may be similar to that described in Patent No. 1,904,355, issued to John L. Clarkson on April 18, 1933.

In order to elevate the boom 3 of the front conveyor, a pair of hydraulic jacks 53 is provided, one on each side of the boom 3. Each of these jacks is pivoted at 54 to an ear 55 on the bracket 20. At its forward end the jack is pivoted at 56 to a member 57 pivoted on the boom 3. A suitable hydraulic pump, circulating a pressure fluid such as oil, may be connected to supply the jacks 53. As these hydraulic connections may be of any suitable type well known in the art, they are not illustrated in the drawings. In order to swing the boom 3 laterally in its swivel bearings 21 and 22, cables 58 are provided, passing in opposite directions around a curved flange 59 on the bracket 20 and lying in grooves 60 in said flange, and anchored in ears 61 on said bracket 20. The other ends of these cables, after passing over suitable guide pulleys, are connected to hydraulic jacks operable to haul in on one cable while paying out the other so as to swing the boom. As this mechanism is not a part of the present invention, it is not shown in complete detail in the drawings.

The gathering mechanism, illustrated at 4 and 5, may be similar to that described in the above-mentioned patent. This comprises a pair of chains 4 passing over upper and lower sprockets 62 and 62*a*, respectively, so that the gathering arms or picks 5 move in orbital paths. This movement is inward toward the middle of the conveyor at the lower end of such path, then upward along the conveyor, and then around the upper sprocket 62 to the return path. As the picks 5 move outwardly away from the conveyor 7 in turning about the upper sprocket 62, their points may undergo a sudden increase in velocity; that is, as the picks move upwardly along the inner straight portion of their paths along the conveyor, they travel at a speed preferably a little slower than that of the conveyor 7. As they turn outwardly around the sprocket 62, the chain continues to travel at the same linear velocity. However, the picks extend outwardly from the chain and their tips may move at a radius equal to double that of the sprocket, or more. Accordingly, during this portion of their movement the tips of the picks whip around this sprocket at a high velocity. If a pick happens to have a lump of material lodged thereagainst during its upward travel, it sometimes happens that the lump does not fall back on the conveyor 7 but is retained in the embrace of the pick until the latter moves around the sprocket 62. When this happens, there is a likelihood that the sudden increase in speed will cause the pick to throw the lump of material off the conveyor, sometimes with great force. This is often dangerous to the operator. In order to avoid this action, there is provided adjacent the path of the pick where it passes around the sprocket 62 a deflecting or breaking element 63. This may be in the form of a rib or fin, as shown in Figures 1, 2, and 2*a*. In the arrangement illustrated in Figures 1 and 2 it is formed as a continuation of the upper rim flange 64 of the conveyor. It is preferably shaped so as to tend to deflect material carried around by the pick 5 back onto the conveyor. As shown in Figure 2*a*, it is shaped so that the pick 5 may just clear the edge of the element 63 so that when a lump of material, indicated by dotted lines in Figure 2*a*, is carried around to this point by the pick, such lump will engage the element 63 and will either be deflected so as to fall back on the conveyor, or will be crushed or broken by the mutual action of the elements 5 and 63. This tends to avoid throwing large lumps of material off the conveyor.

The delivery conveyor is arranged in three sections. The front section 9 is fixed on the bracket 2, as already pointed out, and has hinged thereto at 12 an intermediate section 11. In order to provide for both horizontal and vertical swinging movement of the after section 13, the structure shown in Figures 3, 4, and 6 is provided. The intermediate section 11 carries a bracket 65, having a pivot bearing 66 adapted to receive a pivot pin 67. Swiveled on the pin 67 is a bracket 68, which has secured thereto a member 69 which extends forwardly of the pin 67 and terminates at its forward end in an arcuate edge 70 which lies flush with the floor of the section 11 adjacent a concave arcuate edge 71 on said floor. The arcs of the edges 70 and 71 are concentric with the pin 67, so that as the member 69 swivels on said pin it provides a substantially continuous floor for the conveyor. The member 69 is provided with pivot bearings 72, to which the after section 13 is pivoted by means of short pivot pins 73. Thus, the pin 67 provides a swivel connection for swinging the after section 13 horizontally, while the pivots 73 provide a hinged joint for swinging said after section vertically.

The rear end of the section 11 is supported by a hoisting device, shown in the form of a hydraulic cylinder 74. The extensible upper end of this device is pivoted to the lower portion of the bracket 68. The lower part of the cylinder 74 has trunnions 77 resting in a movable bracket 79 which is swiveled on a rearwardly-extending supporting bracket 81 on the carriage 1. The bracket 79, in addition to being swiveled, may be provided with rollers adapted to run on a circular track 83 on the bracket 81. The latter bracket is provided

with an arcuate opening 84, through which the lower end of the cylinder 74 extends in order to permit the swinging movement of said cylinder.

In order to take care of the vertical swinging movement of the section 13, the bracket 68 is provided with ears 85 upon which are pivoted hydraulic cylinders 86, whose other ends are similarly pivoted at 87 to the section 13.

The lateral swinging movement of the after section is accomplished by means of a pair of hydraulic jacks 95, one on each side of the pivot pin 67. Each of these jacks is mounted by means of trunnions, engaging sockets in the bracket 68 of the swiveled member. The other end of each of these jacks is pivoted at 98 to suitable ears 99 on the bracket 65. These jacks are operated in opposite directions, i. e., one is retracted while the other is extended, in order to swing the after section to one side or the other.

A suitable hydraulic pump and a suitable system of piping for the pressure fluid, together with suitable control valves for operating the several jacks in the desired manner, are provided. These have not been illustrated, however, as they may be of any suitable construction, well-known in the art.

The conveyor chain which forms the moving element of the delivery conveyor, comprising the sections 9, 11, and 13, may be of the single chain type, comprising a chain 88, which is flexible in two directions and which has mounted thereon a series of transverse flights 89, said flights being mounted at their middle points on the chain 88. In order that this movable chain may move easily around lateral curves when the section 13 is swung horizontally, the sections 11 and 13 are provided with side flanges 90 and 91, respectively. Arranged to span the swiveled member are two flexible flange sections 92, which are secured to the flanges 91 and extend forwardly so as to pass just outside of the flanges 90, as will be seen in Figure 3. Guides 93, secured to the flanges 90, hold the ends of the flexible sections 92 in place at the ends of the flanges 90 during the lateral swinging movement of the section 13. The sections 92 may be constructed of spring steel or similar resilient material, so that they will form themselves into smooth curves, as indicated in dotted lines in Figure 3 when the section 13 is swung to one side. Thus, the section 92, which is on the inside of the curve, provides a guide over which the flights 89 may slide in making the turn.

In place of the mounting of the hoisting device as described, the cylinder 74 may be mounted for uniform movement on a ball-and-socket joint, as indicated at 94 in Figure 6.

It will be seen, therefore, that this invention accomplishes its objects in providing a loading machine of this character, which may be built low enough to operate in low veins of coal, or the like, but which is still flexible and capable of operating in any other situation. The front portion of the machine, including the conveyor 3 and its gathering devices, is strongly supported upon the carriage, while, at the same time, it is low in height. The arrangement of flat gears lying horizontally upon a low bracket provides for driving connections running forwardly a comparatively long distance without occupying the height that upstanding gears or bevel gears would occupy. The front conveyor is swiveled on the carriage by means of the members 16 and 17 in such a way as to be adequately supported by vertically spaced bearings. These are capable of sustaining a great weight suspended in cantilever relation to the carriage, while, at the same time, permitting the side swing of the boom 3.

The delivery conveyor is solidly supported at its front end and arranged for elevation of its intermediate section at the rear end thereof. Accordingly, when operating in entries of normal height, this end may be elevated to reach any type of mine car. The arrangement, by which the after section 13 may swivel as well as swing vertically, provides for loading cars which may of necessity be placed laterally with respect to the carriage and at any relative elevation.

While the invention has been described as embodied in a unitary structure, it will be understood that individual features or sub-combinations thereof may be useful by themselves without reference to other features or the complete combination; and it is understood that the employment of such individual features or sub-combinations is contemplated by this invention when within the scope of the appended claims.

It is further understood that various changes may be made in the details of construction within the scope of the appended claims without departing from the spirit of this invention, and that the invention is not limited to the specific details shown and described.

The invention having been described, what is claimed is:

1. In a loading machine for operation in low entries, a traveling carriage, a long supporting structure extending forwardly from said carriage at a low level, a front conveyor mounted at the forward end of said structure, said conveyor having movable material-handling means, driving means on said carriage, a train of gearing having small vertical height operating on upright axes and lying substantially in a single plane extending along said supporting structure, and driving connections from said driving means to said train and from said train to said material-handling means to drive the latter.

2. In a loading machine for operation in low entries, a traveling carriage, a long supporting structure extending forwardly from said carriage at a low level, a front conveyor mounted at the forward end of said structure, said conveyor having movable material-handling means, driving means on said carriage, said supporting structure having closely spaced upper and lower portions provided with pivot-bearing openings aligned on an upright axis, a supporting member for said conveyor pivoted on said axis and extending in cantilever relation to said structure, pivot bearings engaging said pivoted supporting member and secured to said structure to pivotally mount the former on the latter, and a train of gearing operating substantially in a single plane between said upper and lower portions on upright axes and providing driving connections between said driving means and said material-handling means.

3. In a loading machine for operation in low entries, a traveling carriage, a long supporting bracket extending forwardly from said carriage at a low level, a front conveyor mounted on, and extending forwardly from said bracket, said conveyor having movable material-handling means, driving means on said carriage, a train of flat gears operating on upright axes extending along said bracket from said carriage to said conveyor, and driving connections from said driving means to said train and from said train to said material-handling means to drive the latter.

4. In a loading machine for operation in low

entries, a traveling carriage, a long supporting bracket extending forwardly from said carriage at a low level, a front conveyor pivoted on, and extending forwardly from said bracket, said conveyor having movable material-handling means, driving means on said carriage, a train of flat gears operating on upright axes one of which is the pivot axis of said conveyor, said train extending along said bracket from said carriage to said conveyor, and driving connections from said driving means to said train and from said train to said material-handling means to drive the latter.

5. In a loading machine for operation in low entries, a traveling carriage, a long supporting bracket extending forwardly from said carriage at a low level, said bracket having upper and lower portions providing vertically spaced pivot bearings, a pivoted member having complementary pivot means engaging said pivot bearings and extending forwardly therefrom in cantilever relation to said bracket, and a front conveyor carried by the forward portion of said pivoted member.

6. In a loading machine for operation in low entries, a traveling carriage, a long supporting bracket extending forwardly from said carriage at a low level, said bracket having closely spaced upper and lower portions providing vertically spaced pivot bearings, a pivoted member having complementary pivot means engaging said pivot bearings and extending forwardly therefrom in cantilever relation to said bracket, a front conveyor carried by the forward portion of said pivoted member, said conveyor having movable material-handling means, driving means on said carriage, a train of flat gears operating on upright axes one of which is the axis of said pivot bearings, said train extending along said bracket between said upper and lower portions from said carriage to said conveyor, and driving connections from said driving means to said train and from said train to said material-handling means to drive the latter.

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