Jan. 11, 1944. J. L. CLARKSON ET AL 2,338,704

LOADING MACHINE

Filed Oct. 6, 1941 3 Sheets-Sheet 1

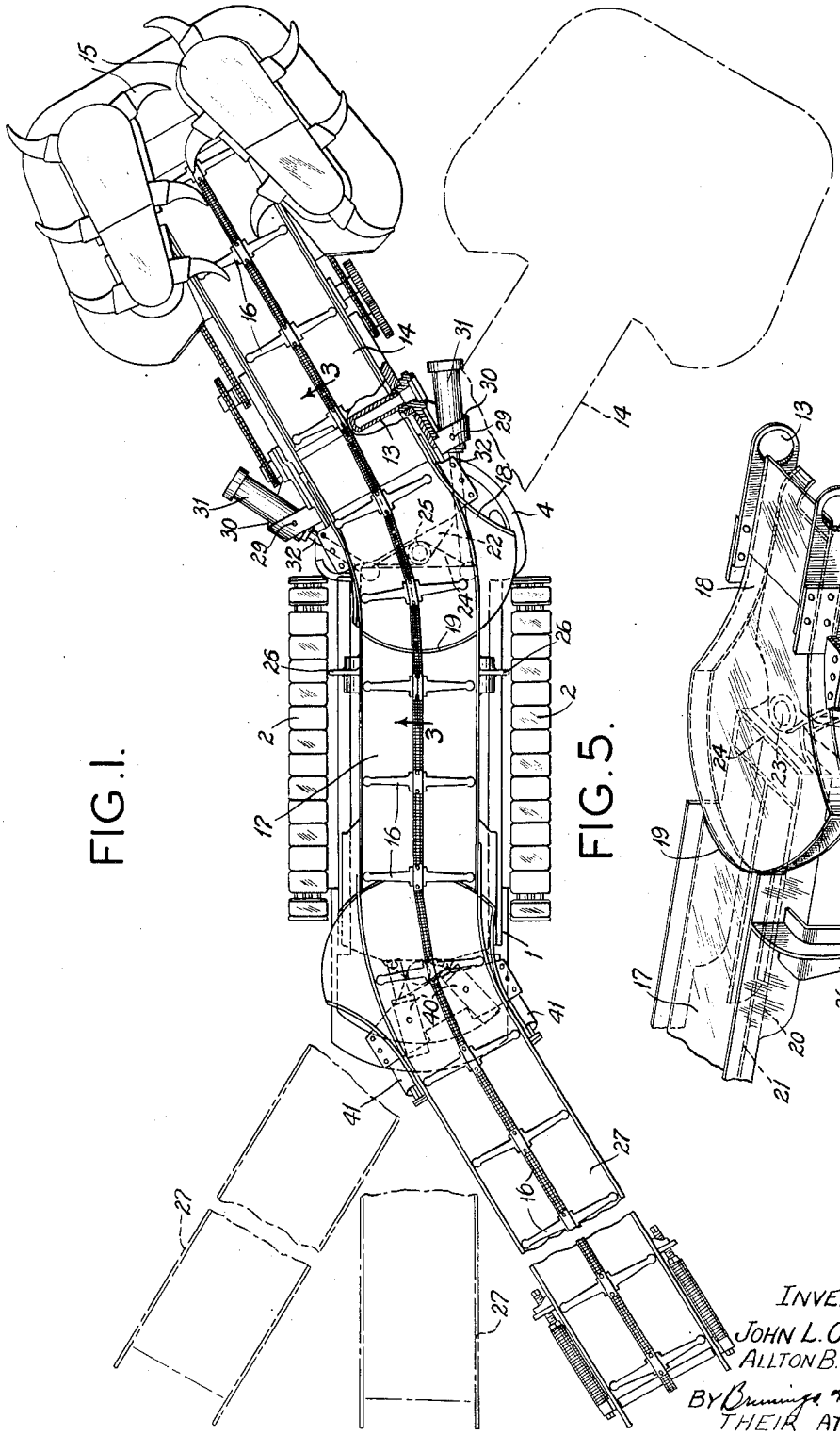


FIG. 1.

FIG. 5.

INVENTOR;
JOHN L. CLARKSON AND
ALLTON B. JACKSON
BY Brumings & Sutherland
THEIR ATTORNEYS

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FIG. 2.

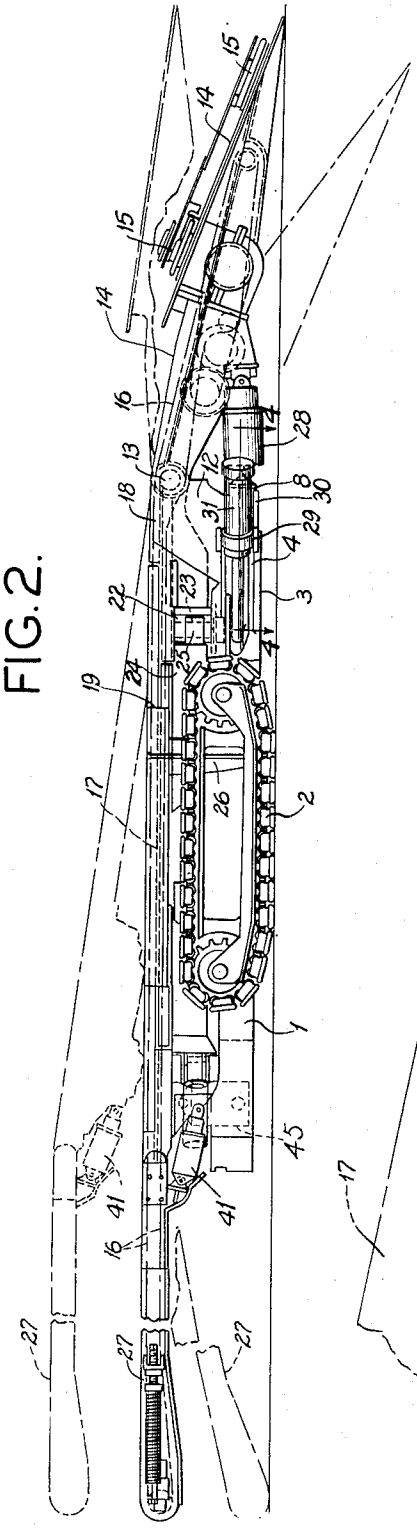
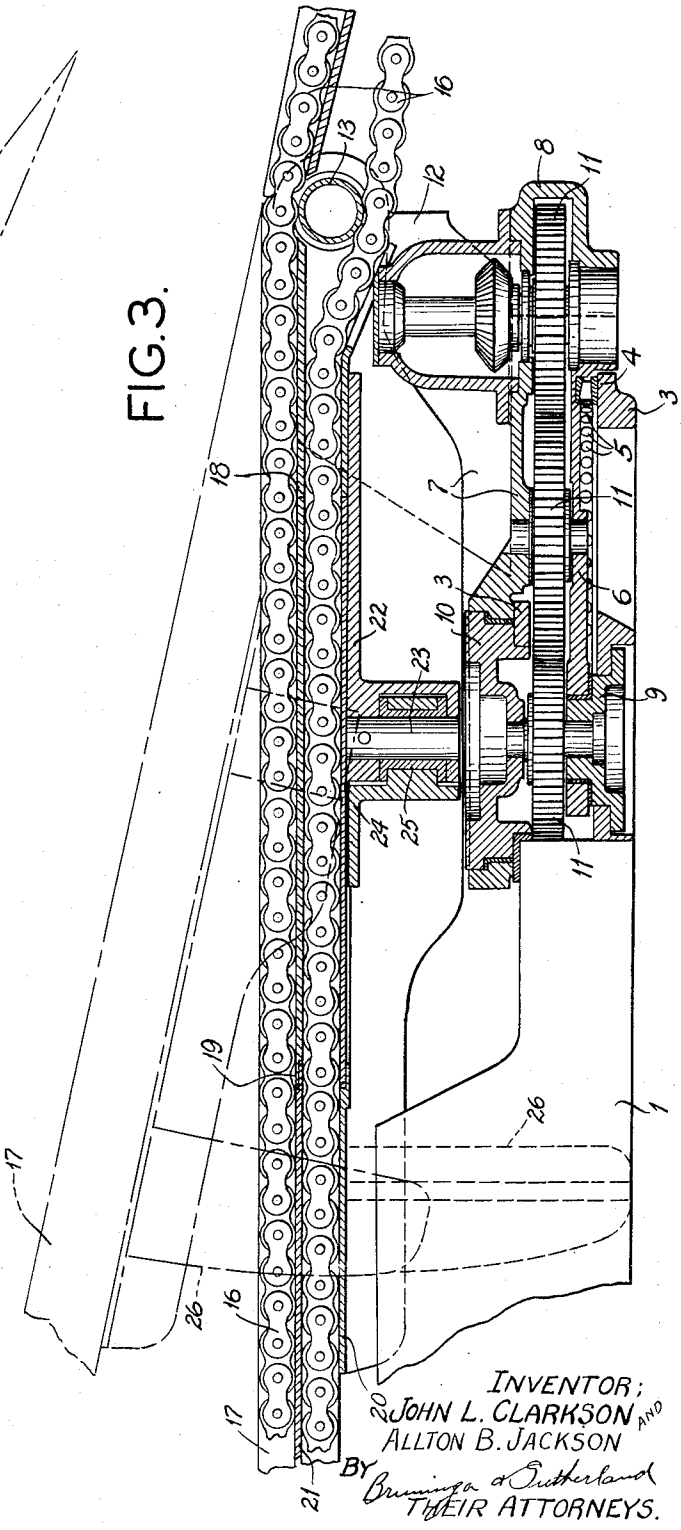


FIG. 3.



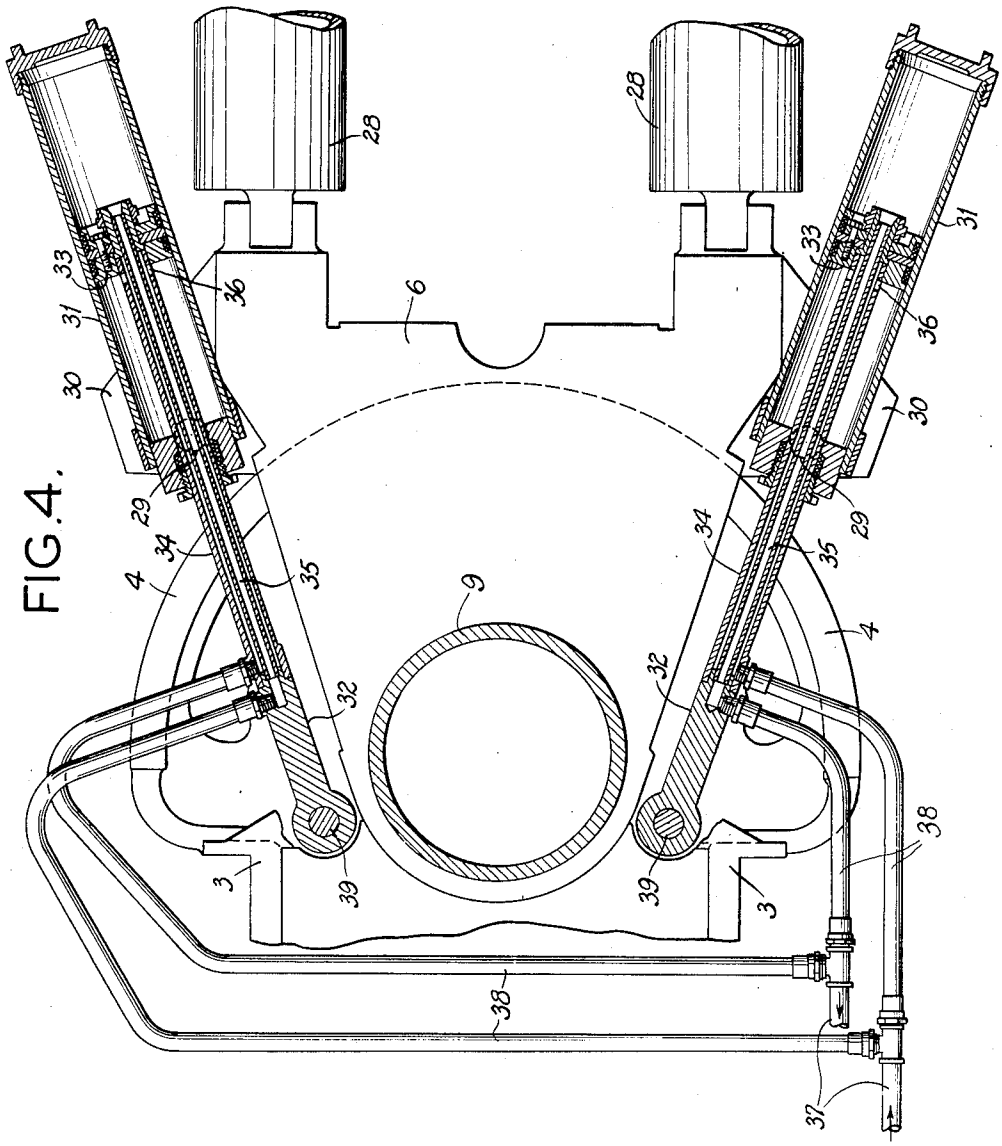
INVENTOR;
JOHN L. CLARKSON AND
ALLTON B. JACKSON
BY Brumbaugh & Sutherland
THEIR ATTORNEYS.

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FIG. 4.



INVENTOR;
JOHN L. CLARKSON, AND
ALLTON B. JACKSON,
BY Brumbaugh & Sutherland
THEIR ATTORNEYS

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UNITED STATES PATENT OFFICE

2,338,704

LOADING MACHINE

John L. Clarkson and Allton B. Jackson, Nashville, Ill., assignors to Clarkson Manufacturing Company, Nashville, Ill., a corporation of Illinois

Application October 6, 1941, Serial No. 413,799

10 Claims. (Cl. 198—8)

This invention pertains to loading machines for loading materials, such as coal, broken stone, and the like, by gathering the material from the ground and depositing it in a suitable conveyance. The invention will be described as applied to a mine loading machine as it has particular application to such machines, although it may be applied to other types of machines.

One of the objects of this invention is to provide a loading machine of this type, particularly a mine loading machine which may operate under a great variety of conditions encountered in mining operations.

Another object is to provide a mine loading machine, which may be used in low veins, providing a minimum of head room and which may operate effectively to gather the coal which has been shot down and load it onto mine cars.

Another object is to provide such a machine which may operate effectively both in low veins and in veins of normal height and which may be adjusted to operate effectively at any elevation so as to be adaptable most effectively to the head room available.

Another object is to provide such a machine in which a single conveyor transfers the material from the gathering point clear to the point of delivery.

Another object is to provide such a machine having such a single continuous conveyor in which the conveyor is flexible, horizontally and vertically, both at its forward gathering portion and at its rear delivery portion.

Another object is to provide an improved structure for such a flexible machine for swinging the swiveled portions.

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

Figure 1 is a plan view of a mining machine embodying this invention.

Figure 2 is a side elevation of the same.

Figure 3 is an enlarged vertical section taken about on line 3—3 of Figure 1.

Figure 4 is an enlarged horizontal section taken about on line 4—4 of Figure 2, and

Figure 5 is a detail showing the joint construction for the horizontal and vertical swinging movements of the gathering boom.

In accordance with this invention, a loading machine is provided having a traveling carriage provided at its front end with a flexible gathering boom, arranged for both horizontal and vertical swinging movement on the carriage, and at its rear end a similarly swingable loading boom by which the material may be delivered to mine cars or other receiving units.

Referring to the drawings, 1 designates the traveling carriage which, in the embodiment illustrated, is arranged to travel on caterpillar treads, indicated at 2. The forward end of the carriage 1 has a forwardly extending bracket 3 provided with an arcuate rail 4 upon which a series of rollers 5 may run. These rollers support the gathering boom, as will be described later, and permit lateral swing by said boom by rolling on the rail 4. Swiveled in the bracket 3 is a structure including a lower swivel bracket 6, an upper swivel bracket 7, and an end bracket 8 which connects the brackets 6 and 7 together. The lower bracket 6 is swiveled on a lower pivot member 9, while the upper bracket 7 is similarly swiveled on an upper pivot member 10, both said pivot members being secured in the bracket 3 as is shown in Figure 3. This structure, including the brackets 6, 7, and 8, provides a lateral swingable structure which carries the gathering boom. This structure also carries a train of horizontal gears 11, by means of which power is transmitted from a motor on the carriage 1 to gathering mechanism on the gathering arm. As this mechanism is not a part of the present invention, it is not described in detail.

The bracket 7 has an upward and forward extension 12 which carries at its upper portion a horizontal hinge bearing 13. Hinged in the bearing 13 is a forwardly extending boom 14, providing a gathering boom and carrying at its forward end gathering mechanism, indicated generally at 15. This gathering mechanism may be of any suitable type, well known in the art and is not described in detail herein. It will be seen that the boom 14 may swing vertically on the hinge 13 and horizontally on the swivel formed by the members 9 and 10.

The boom 14 has a channel form, providing a runway for a single continuous conveyor 16 which extends continuously from the gathering mechanism 15 clear to the rear end of the loading boom. An intermediate section of the conveyor 16 passes over the carriage 1 along a channel structure, indicated generally at 17. This intermediate section is also arranged with a swivel on the same axis as the gathering boom and to hinge vertically on the hinge 13.

For this purpose a short channel section 18 is hinged at its forward end on the hinge 13 and terminates at its rear end in an arcuate edge 19. It will be noted that both the channel section 17 and the short section 18 have a double channel

construction, providing a lower floor plate 20 and an upper floor plate 21. The plate 21 carries the upper run of the conveyor 16, while the lower plate 20 carries the lower or return run of that conveyor. Both these plates on the section 18 terminate in arcuate edges 19, engaging matching concave edges on the corresponding plates of the section 17. The section 18 is equipped on its underside with a swivel bracket 22 carrying a swivel pin 23. The section 17 also carries on its underside a complementary swivel bracket 24 equipped with a bearing 25 for the pin 23. This pin therefore connects the sections 17 and 18 so that they may swivel laterally to permit the side swing of the boom 14. At the same time the entire structure, including sections 17 and 18, is hinged at 13 so as to be able to swing vertically, as indicated in broken lines in Figure 3. The section 17 is equipped with downwardly extending guides 26, engaging the side plates of the carriage 1 so as to maintain the section 17 in alignment with the carriage during such vertical movement.

At the rear end of the section 17 a loading boom 27 is mounted for both lateral and vertical swinging movement on the section 17, in the same manner as described for the connections between the section 17 and the gathering boom 14. The boom 27 is similar in construction to the section 17, and the conveyor 16 is arranged to travel along the boom 27 to its rear end.

In order to move the gathering boom vertically and horizontally on the hinge 13 and the swivel 9 and 10 and to control such movement accurately, a fluid pressure system is provided and fluid pressure jacks are mounted so as to accomplish these movements. The fluid pressure system may be of any suitable type. A hydraulic system is contemplated in the embodiment illustrated, using oil as a circulating medium, suitable oil pump equipment, not shown, being mounted on the carriage 1 and operated by suitable power devices.

In order to raise and lower the boom 14 on the hinge 13, a pair of hydraulic jacks 28, only one of which is seen in Figure 2, are connected to the pressure system and controlled in any suitable well-known manner so as to control the vertical swing of the gathering boom, as indicated in broken lines in Figure 2.

In order to swing the boom 14 laterally, the arrangement shown in Figure 4 is provided. Pivoted at 29 on a side wing 30 of the bracket 12, on each side of the boom 14, is a jack 31. These jacks are of the telescopic type, the outer member of which is in the form of a cylinder and the inner member a piston rod, indicated generally at 32, having a piston 33 at its end within the cylinder. In accordance with this invention, the piston rod is tubular in form, having an outer tube 34 and an inner tube 35. The tube 34 is connected to the piston 33 and communicates by means of ports 36 with the interior of the cylinder above the piston 33. The inner tube 35 passes through the piston 33 and is open at its end so as to communicate with the interior of the cylinder below the piston 33. It will be seen that these two tubes provide means for passing pressure fluid into the cylinder on either side of the piston. The pressure fluid is conveyed to the jack from the pressure system of the machine, indicated generally at 37, by means of flexible tubes 38. As may be seen from Figure 4, the tubes 38 are so arranged that the outer tube 34 of one of the jacks 31 is connected with the inner tube of the other jack, and this pair is connected to one side of the pressure system. In the same manner the inner tube of the first jack is connected with the outer tube of the second, and this pair is connected to the other side of the pressure system. Accordingly, as indicated by the arrows in Figure 4, when pressure is admitted to one side of the system and exhausted from the other side by suitable valve arrangements, not shown, the fluid pressure is exerted upon the upper face of the piston 33 of one of the jacks and on the lower face of the piston of the other jack, while, at the same time, the opposite face of each piston is open to the exhaust. By this arrangement, one of these jacks exerts a thrust while the other exerts a pull. The rods 32 are pivoted at 39 to the bracket 3 on the carriage. It will be seen, therefore, that by exerting a thrust on one of these jacks and a pull on the other, the bracket 12, and therefore the gathering boom 14, will be swung horizontally on the swivel at 9 and 10.

It will be noted that the pivots 29 for the outer members or cylinders of the jacks 31 are placed at the open end of the cylinder, that is, the end from which the piston rod emerges. Accordingly, the pivots 29 and 39 are located at the adjacent ends of the inner and outer telescopic members of the jack. It will be noted, also, that the pivots 39 are placed as close as possible to the swivel 9 and somewhat behind the center-line of that swivel. Also, the pivots 29 are laterally outside of the pivots 39. These arrangements are of particular importance in a machine of this type which must operate in a cramped space. The relative location of the pivots 29 and 39 positions the jacks 31 to extend outwardly at an angle to the axis of the gathering boom. In this position the placing of the pivots 39 in rear of the axis of the swivel 9 provides for a maximum turning moment for the force exerted by the jacks for turning the boom 14 on the swivel 9. It will be noted, further, that as this turning movement progresses, one of the jacks swings so as to increase its angle with respect to the center-line of the boom 14, while the other jack moves in the opposite direction so as to decrease that angle somewhat. The arrangement is such, however, that the decrease in angle of the second jack is never such as to pass the position of parallel relation between the jack and the boom. This is a great advantage because it leaves the space between the jacks 31 unobstructed at all times, while permitting free movement of the jacks, so that there is no interference between them and the jacks 28, which are located at the same level and between the jacks 31.

At the rear end of the machine the structure of the swivel joint, between the loading boom 27 and the section 17, is similar to that described for the joint between the section 18 and the section 17. At this end a pair of jacks 40 provides for swinging the boom 17 laterally, and a pair of jacks 41 provides for swinging the same vertically. Another jack 45, supported on the carriage 1, operates to raise and lower the rear end of the section 17, causing the same to swing on the hinge 13.

A suitable source of power, such as a motor, not shown, is mounted on the carriage 1 and connected to drive the tractor treads 2, the conveyor 16, and the oil pump mentioned above for the fluid-pressure system. The latter system is connected to supply pressure fluid to the various jacks and suitable control valves, included in the system, are mounted on the carriage at a con-

venient location for the operator. These details are not illustrated nor described as they may be arranged in any suitable manner.

It will be seen that this invention provides a loading machine which comprises in effect a single conveyor having gathering means at one end and arrangements for depositing its load at the other end, the same being carried by a traveling carriage so that it may be moved by its own power to any desired location. The structure is greatly simplified as the material is not passed from one conveyor to another, but is handled in a single run from the gathering point to the loading point. The conveyor, while mounted on and controlled as to its general direction and position by the traveling carriage, is flexible at each end in both directions. Accordingly, the machine may be presented to a pile of material in any desired manner, and may be positioned and adjusted so that its loading boom may be passed over a mine car or other receiving device so that the material may be deposited therein. The arrangement whereby the intermediate section is hinged at its front end and carries a flexible loading boom at its rear end is particularly useful where the head room is limited, or where projections or other obstacles in the ceiling of the mine entry may tend to obstruct the movement of material on the conveyor. In such cases the intermediate section may be adjusted to the desired level and the loading boom may be adjusted to any other angular position. It will be noted that by elevating the intermediate section, the front end of the loading boom can be positioned to any elevation while the rear end can be adjusted to any other desired elevation. In this way by manipulating the carriage and the two flexible ends of the conveyor, the machine can be adjusted to operate in almost any situation.

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

It is further obvious that various changes may be made in the details of construction or operation, 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 or described.

The invention having thus been described, what is claimed is:

1. A loading machine of the character described, comprising, a traveling carriage, a gathering boom on the front of said carriage, gathering mechanism at the end of said boom, a single continuous conveyor on said carriage and said boom arranged to receive material from said gathering mechanism, said conveyor having a section hinged to the forward part of said carriage for vertical swinging movement and a rear section mounted for vertical and horizontal swinging movements at the rear end of said first section, and power-driven means for swinging said conveyor sections.

2. A loading machine of the character described, comprising, a dirigible traveling carriage, a single continuous conveyor on said carriage having an intermediate section mounted for vertical swinging movement on said carriage, a forward section swiveled for lateral swinging movement and a rear section swiveled for lateral swinging movement relative to said intermediate section, gathering means at the front end of said forward section, and means for swinging said sections.

3. A loading machine of the character described, comprising, a traveling carriage, a single continuous conveyor on said carriage having an intermediate section mounted for vertical swinging movement on said carriage, a forward section swiveled for lateral and vertical movements and a rear section swiveled for lateral and vertical swinging movements relative to said intermediate section, gathering means at the front end of said forward section, and power-driven means for swinging said sections.

4. A loading machine of the character described, comprising, a traveling carriage, a swingable boom on said carriage, a conveyor extending along said boom, swivel means for mounting said boom on said carriage for lateral swinging movement, a pair of jacks symmetrically positioned at opposite sides of said boom, said jacks having pivotal connections to said carriage beyond the swivel axis of said mounting and to said boom at points laterally outside of said first connections, whereby one of said jacks acts at increasing leverage during the swing of the boom when the other acts at decreasing leverage, and means for energizing said jacks simultaneously in opposite directions.

5. In a loading machine of the character described having a traveling carriage, a gathering boom on the front of said carriage, swivel means for mounting said boom for lateral swinging movement, a pair of telescopic jacks having inner and outer relatively movable members, said jacks being symmetrically positioned with respect to said boom and said relatively movable members of each jack having pivotal connections at their adjacent ends with said carriage and said boom respectively, said connections being located so as to position said jacks to extend divergently along said boom, whereby one of said jacks acts at increasing leverage during the swing of the boom when the other acts at decreasing leverage, and means for elevating said boom positioned between said jacks.

6. In a loading machine of the character described having a traveling carriage, a gathering boom on the front of said carriage, swivel means for mounting said boom for lateral swinging movement, a pair of telescopic jacks having relatively movable external and internal members, said jacks being symmetrically positioned with respect to said boom and said relatively movable members of each jack having pivotal connections at their adjacent ends with said carriage and said boom respectively, said connections of said external members being laterally outside of said connections of said internal members, and means for energizing said jacks simultaneously in opposite directions in order to swing said boom.

7. A loading machine of the character described, comprising, a traveling carriage, a laterally swingable gathering boom on the front of said carriage, a laterally swingable loading boom on the rear of said carriage, and a single continuous conveyor arranged to travel from the front of said gathering boom to the rear of said loading boom, said conveyor having an intermediate section traveling along and substantially parallel to said carriage, said intermediate section being hinged at its forward portion for elevating its

rear end and having guiding means to maintain it in said parallel relation to said carriage.

8. A loading machine of the character described, comprising, a traveling carriage, a swingable boom on said carriage, a conveyor extending along said boom and over said carriage, swivel means for mounting said boom on said carriage for lateral swinging movement, pivotal means spaced from said swivel means for mounting said boom for vertical swinging movement on said carriage, and separate swivel means for said conveyor to enable the forward part of the same to swing laterally with said boom.

9. A loading machine of the character described, comprising, a traveling carriage, a laterally swingable boom on said carriage, a conveyor extending along said boom and over said carriage, swivel means for mounting said boom on said carriage for lateral swinging movement, pivotal means spaced from said swivel means for mounting said boom for vertical swinging movement on said carriage, means for mounting the portion of said conveyor extending over said carriage for vertical movement at its rear end, and guide means cooperating with said carriage to maintain alignment of said conveyor therewith.

10. A loading machine of the character described, comprising, a carriage mounted for travel on caterpillar treads in order to direct and position the same, a single continuous conveyor on said carriage having an intermediate section mounted for vertical elevation at its rear end, a forward section flexibly mounted for lateral and vertical swinging movement and a rear section flexibly mounted on said rear end for lateral and vertical swinging movement, gathering means on said front section, and power-driven means for raising said intermediate section and for swinging said front and rear sections.

JOHN L. CLARKSON.
ALLTON B. JACKSON.