Oct. 8, 1935. E. G. VOELKEL 2,016,564

LOADING MACHINE

Filed May 25, 1933 2 Sheets-Sheet 1

Fig. 1

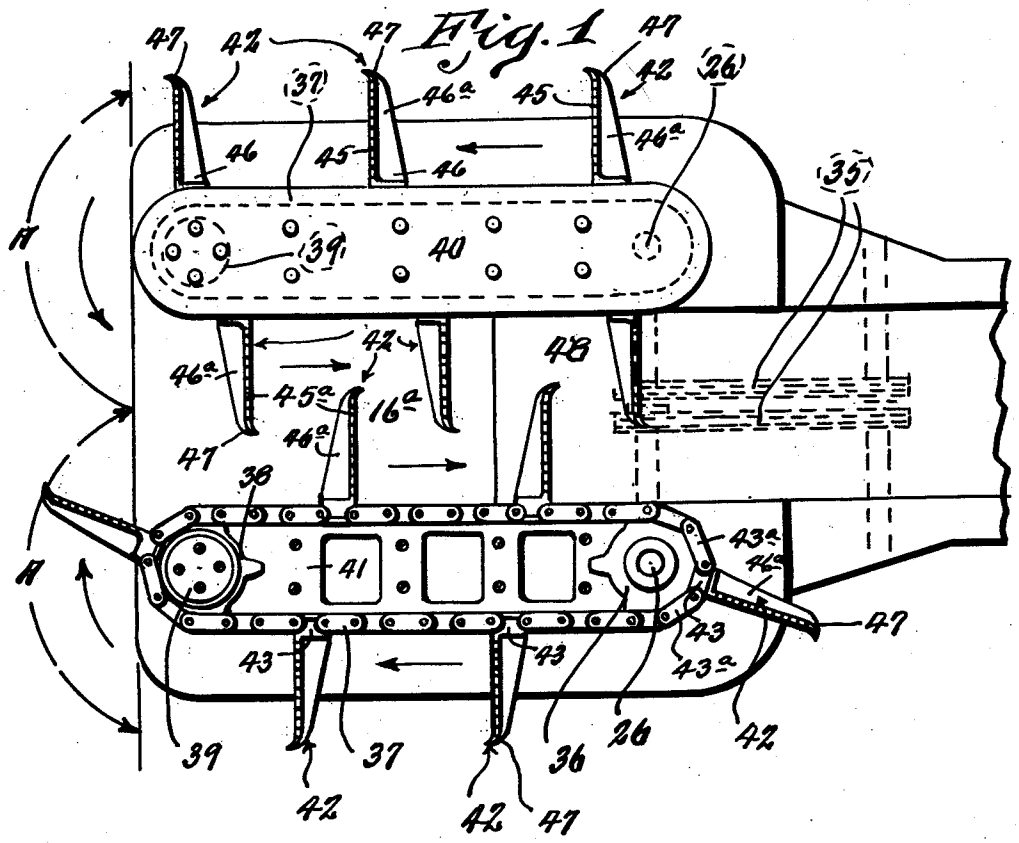
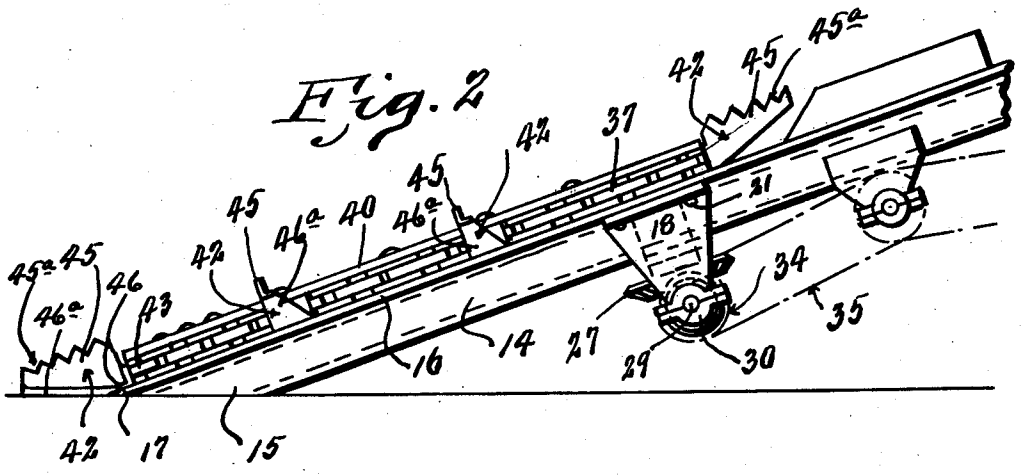


Fig. 2



Inventor
Elmer G. Voelkel
By William James
Atty.

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Fig. 3

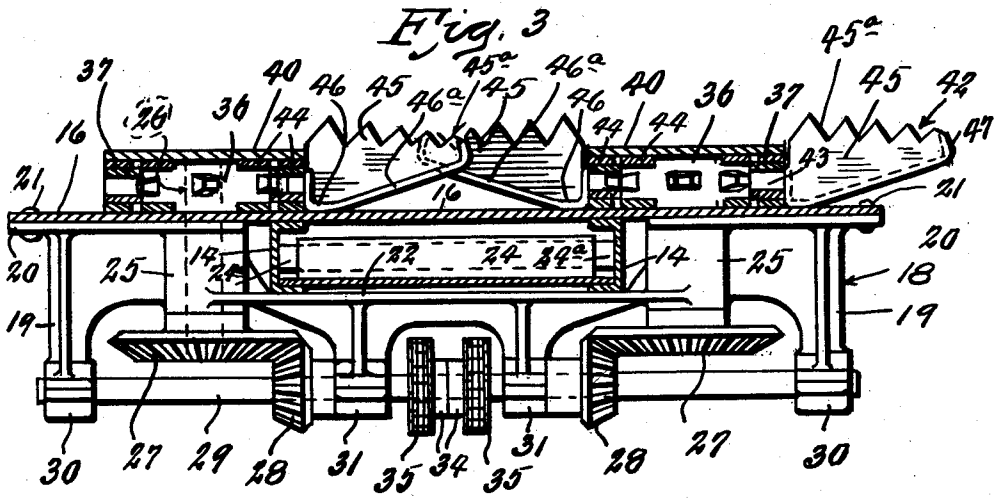


Fig. 4

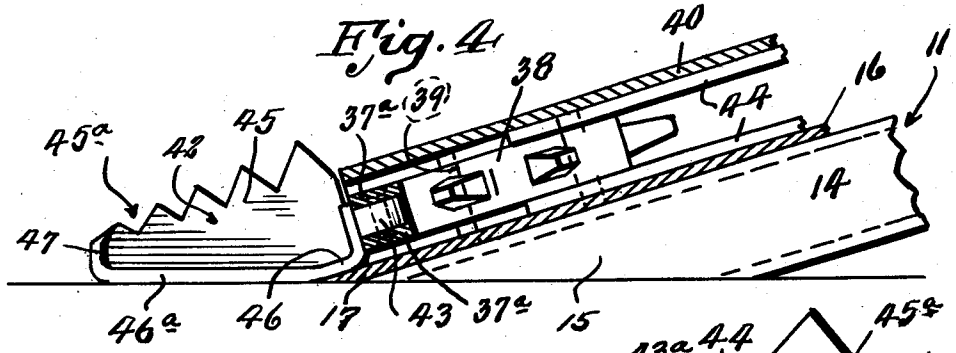


Fig. 5

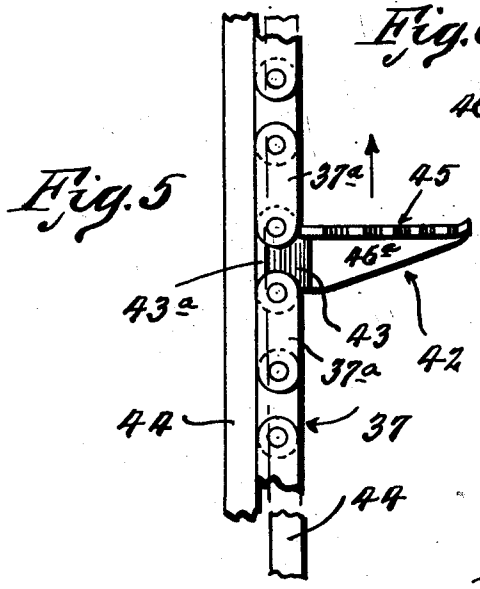
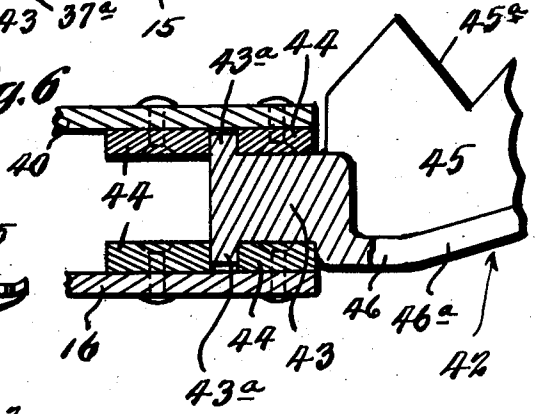


Fig. 6



Inventor
Elmer G. Voelkel
By William James Atty.

Patented Oct. 8, 1935 2,016,564

UNITED STATES PATENT OFFICE

2,016,564

LOADING MACHINE

Elmer G. Voelkel, Pine Lawn, Mo., assignor, by direct and mesne assignments, of one-half to Joseph Pavelka, St. Louis, Mo., and one-half to John L. Clarkson, Nashville, Ill.

Application May 25, 1933, Serial No. 672,841

12 Claims. (Cl. 198—8)

This invention relates to new and useful improvements in loading machines, such as are used in coal mines.

In machines of this type, the coal is generally loaded on to a movable conveyor by means of a plurality of flights or gathering arms carried by a chain and operable over an inclined platform, the lower end of which is disposed against the floor of the mine while the upper end terminates above one end of a conveyor. The arms operate in a plane parallel with the plane of said platform and on their upward movement carry the coal upwardly and discharge it on to the conveyor. These arms are so constructed that their bottoms rest on said inclined platform and are parallel therewith and consequently said arms are disposed angularly relatively to the level of the mine floor. This angular arrangement of the arms to the floor of the mine requires the lower or front end of the platform to be extended forwardly a suitable distance so that only a very small portion of the arms can extend past said platform and operate over the floor since the arms, on account of their angular arrangement, have a tendency to dig into the floor of the mine. Thus the actual travel or sweep of the arms over the floor of the mine is practically nil, and the loading action of said arms is considerably reduced due to this arrangement. Also a large amount of power is required to drive the arms where the tips of said arms extend beyond the platform since these tips or forward ends of the arms are caused to dig into the floor.

One of the objects of the present invention is to provide a loading machine wherein the gathering or loading arms operating over the inclined platform are angularly disposed relatively to the plane of said platform and are disposed substantially parallel with the floor of the mine over which they operate, thereby assuring maximum efficiency of the arms and preventing the load from digging into the floor.

Another object of the invention is the provision of a loading machine having an inclined loading platform or gathering shoe and having a plurality of gathering arms or picks operating thereover, said arms or picks being angularly disposed relatively to the plane of said platform or gathering shoe and operating substantially parallel with the mine floor so that said arms can extend their full length beyond the loading platform over said floor so as to obtain the maximum effect of the gathering action of said arms.

Further objects of the invention are to provide a loading machine having an inclined loading platform and having a plurality of gathering arms operating upwardly thereover and flexible means for supporting said arms, said arms being so arranged that they are inclined relatively to the plane of said loading platform and to said flexible means, the angle of inclination of said arms being substantially equivalent to the angle of said platform whereby said arms are disposed substantially parallel with the floor of the mine when operating thereover, the forward end of said loading platform terminating substantially flush with said arm supporting means so that the full length of said arms is utilized in operating over the mine floor.

Still other objects of the invention are to provide a loading machine of the class described having the forward end of the loading platform terminating flush with the forward end of the operating means which carry the gathering arms whereby the latter in traversing the front end of said machine extend forwardly the full length past the forward end of said loading platform, thereby obtaining the maximum benefit of said arms in gathering the material on to said platform, said arms being disposed upwardly and angularly relatively to the plane of said loading platform whereby said arms are in contact with the mine floor when traversing thereover.

Additional objects of the invention are to provide a gathering arm of the class described having one end adapted to be attached to an operating means, said arm being disposed angularly relatively to said attaching end whereby the lower edge of said arm is disposed parallel with the mine floor when said arms are actuated in a plane inclined from horizontal.

With these and other objects in view, my invention consists in certain novel features of construction and arrangement of parts, hereinafter more fully described and claimed, and illustrated in the accompanying drawings, in which—

Figure 1 is a top plan view of my improved machine showing parts thereof broken away.

Figure 2 is a side elevational view of same.

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

Figure 4 is an enlarged cross section taken on line 4—4 of Figure 1.

Figure 5 is a fragmental detail view of the chain and the guides therefor.

Figure 6 is a cross section taken on line 6—6 of Figure 1.

The loading machines to which the present invention appertains generally have an inclined loading platform having its forward end bearing

on the mine floor and having a plurality of gathering arms operatively mounted for movement over said platform for the purpose of gathering the material, such as coal, and moving it over said platform on to an endless conveyor which extends from said platform and carries the material away.

Heretofore the gathering arms have been made to have a contact throughout their entire lengths with the surface of the platform or with the lower edge disposed in parallelism with the plane of said platform. As the latter is disposed in a plane which is inclined from horizontal or from the floor of the mine, it is obvious that the arms cannot extend beyond the forward end of said platform to any great extent since they would dig into the floor. Thus the gathering action of the arms is limited practically to the material which falls or is deposited on said platform. Where the arms project slightly beyond the forward end of the platform a considerable power is required to operate such arms since said arms have a tendency to dig into the floor. Furthermore, the arms being in contact with the inclined platform have a tendency on their return movement to sweep some of the material from the platform into the mine, thereby causing injury to the operators.

In the present invention, these objectionable features are eliminated and the efficiency of the machine is greatly increased while the power required to operate the machine is reduced. Briefly stated, the invention consists in disposing the gathering arms or picks at an angle to the plane of the loading platform or gathering shoe, the angle being substantially equivalent to the angle occupied by said platform with regard to the plane of the floor of the mine. Thus when the arms pass over the forward end of the machine they do not form the continuation of the inclined plane of the platform but occupy planes substantially horizontal or parallel with the floor. This permits the shortening of the forward end of the loading platform so that the arms throughout their entire lengths can be in contact with the floor and can be utilized to gather the material. This arrangement greatly increases the efficiency of the machine and also results in the reduction of power necessary to drive the arms as the latter do not dig into the ground.

Referring by numerals to the accompanying drawings, **10** indicates the forward or loading end of the loading machine **11**. This machine includes a support or frame **12** disposed angularly to the floor of the mine so that the forward end rests thereon while the other end (not shown) of the machine is disposed a suitable distance above the ground whereby the coal or other material can be discharged into a coal car or other suitable container. The support **12** includes a pair of channeled members **14** disposed longitudinally of the machine and having their forward ends cut obliquely as indicated at **15**.

Members **14** are suitably spaced from each other and support a loading platform or gathering shoe **16** which is disposed in an inclined plane and has its forward end terminating or resting upon the floor of the mine, as indicated at **17**. A casting **18** is arranged against the underside of the loading platform **16** near the rear end thereof. This casting is provided adjacent to its ends **19** with lateral flanges **20** which fit against the underside of platform **16** and are secured thereto in any suitable manner, such as by rivets **21**. The central portion of casting **18** is depressed, as indicated at **22**, to provide clearance for channel members **14** and for an endless belt conveyor **24**, the latter being hereinafter more fully described.

A bearing **25** is formed near each end of casting **18** at right angle to the plane of the platform **16** and journaled in each bearing is a shaft **26**. The lower end of each shaft has fixed thereon a beveled gear **27** which meshes with a beveled pinion **28**. These pinions are fixed to a horizontally and transversely disposed shaft **29** which is journaled in bearings **30** and **31** formed in casting **18**. A pair of sprocket wheels **34** is fixed on shaft **29** intermediate bearings **32** and operating over said wheels are chains **35** which extend rearwardly and are operated in any suitable manner to drive shaft **29**, and, through gears **27** and **28**, respective shafts **26**.

The upper ends of shafts **26** project above platform **16** and have fixed thereto sprocket wheels **36**. Operating over each sprocket wheel is an endless chain **37**. These chains extend forwardly parallel with the plane of the inclined platform and engage sprocket wheels **38**, which latter are loosely arranged on stud shafts **39** suitably supported on said platform. A pair of cover plates **40** is supported on platform **16** in spaced relation therewith, preferably by castings **41**. These cover plates are coextensive with the chains and cover the latter as well as the sprocket wheels so that no material can enter therebetween.

The operating mechanism including chains **37** is driven by driving means **34** and **35** in such a manner that the inner or opposed sides of chains **37** move upwardly of the central portions **16***a* of the platform **16**.

A plurality of gathering arms or picks **42** is attached to each chain and extend transversely therefrom. As shown, each arm is formed with an integral lug **43**, the longitudinal axis of which is disposed at right angles to said arm. Each lug is apertured at its ends and is adapted to be interposed in the chain and form one of the connecting lugs for the links **37***a*. Each lug **43** is formed on its top and bottom faces with outwardly projecting and longitudinally disposed shoulders **43***a*, preferably flush with the inner side of the lug. These shoulders are engaged by guides **44** secured in place, respectively, to the underside of each cover plate **40** and to the platform **16**. Each pair of guides is spaced from each other to receive therebetween the corresponding shoulder **43***a* of lugs **43**. There are two pairs of guides on each cover plate and two pairs of guides on platform **16** below each chain. The guides extend between the centers of the sprocket wheels and the lugs are in engagement with the guides when traveling between the sprocket wheels. These guides take up the strains to which the arms are subjected, as when moving the material upwardly over the inclined platform **16**, and they hold said arms against displacement from their proper positions.

The gathering arms of the two chains move upwardly on the inclined central portion **16***a* in opposed relation with each other. They are so spaced apart and relatively to each other that each arm of one chain is interposed equidistant from the corresponding pairs of arms of the other chain, as shown in Figure 1. The length of each arm is greater than the distance between the chain and the center of the portion **16***a* so that said arms overlap each other.

Each arm is angle-shaped in cross section having a vertically and forwardly presented flange **45** and a horizontally and rearwardly extending flange **46**. The vertical flange **45** extends a suit-

able distance above lug **43** and the edge is serrated, as indicated at **45***a*. The horizontal flange **46** tapers from lug **43** toward the outer end of the arm. This end is slightly curved forwardly, as indicated at **47**.

As stated before, heretofore these arms have been formed with their bottom or lower flange parallel with the plane of the inclined platform, and consequently such arms were angularly disposed relatively to the floor of the mine. In the present invention the bottom flange **46** or the bottom of the arm is inclined toward the outer end of said arm (see Fig. 3) so that the portion **46***a* is not in contact with the platform but is spaced therefrom and when the arm traverses the front end of the machine said portion **46***a* comes in contact with the floor of the mine and is disposed substantially parallel therewith (see Figs. 2 and 4).

The angle of inclination of portion **46***a* of the gathering arms or picks **42** with respect to the plane of the loading platform and the plane of the orbital travel of said picks is substantially the same as that of the loading platform or gathering shoe **16** with respect to the mine floor.

Since the arms are not disposed angularly relatively to the mine floor, they cannot dig but merely sweep thereover and consequently the forward edge **17** of the platform **16** can be terminated substantially flush with the chain or the portion **46** of the arm so that the maximum degree of the gathering or sweeping action of the arms over the mine floor can be obtained as indicated by lines A in Figure 1. This arrangement not only reduces the amount of power required to operate the chains and arms but also considerably increases the efficiency of the machine. Guides **44** take up the weight of the arms and serve to hold said arms in proper position, while said arms travel between the centers of the sprocket wheels on said platform and while the sprocket wheels act as guides and supports for the chains and arms as the latter pass thereover.

The material gathered by the arms is moved upwardly over the central portion **16***a* of the platform. It will be observed that the central portion **16***a* terminates a short distance below the upper ends of the chains, there being a discharge opening **48** formed through which the material is dropped on to the endless conveyor **24**. The lower end of this conveyor operates over a roller **24***a* disposed between channel members **24** underneath the central portion **16***a*. The conveyor extends upwardly and rearwardly and the upper end thereof (not shown) discharges the coal or other material at a point suitable for loading into cars and the like. This conveyor operates at a greater rate of speed than the chains and arms and consequently the material discharged on to said conveyor is moved faster, thereby preventing choking at the point of discharge from the central portion **16***a* on to the conveyor.

The angular arrangement of the bottoms of the arms relatively to the platform **16***a* does not affect the loading or gathering action of said arms since the material is gathered in a mass and the arms are embedded therein and moving upwardly over the platform. The serrated upper edge of each arm assists in enabling the arm to pass through the mass of material disposed on the floor of the mine. By inclining the bottoms of the arms the distance between the material discharged on to the conveyor and the bottom of said arms is increased so as to reduce to minimum the danger of sweeping some of the material over the platform on the return movement of said arms.

Furthermore, the clearance between the material on the conveyor and the arms is increased so that the material can be moved by said conveyor without interference from said arms. In machines having arms in contact with the loading platform, the material remains in contact with said arms even when deposited onto the conveyor. As the latter operates at greater speed than said arms, the latter produces a drag on said material so that a large amount of power is required to operate the conveyor to overcome the resistance offered by said arms. With the use of my gathering arms this objectionable feature is eliminated and a saving in power is thus effected.

Thus by the use of my novel gathering arms, the power required to operate the conveyor, as well as the arms, is considerably reduced, while the gathering action of the arms over the mine floor is greatly increased.

I claim:

1. In a loading machine, the combination of an inclined loading platform, a pair of endless chains arranged parallel with said platform with their inner sides adjacent to the sides of said platform, means for driving said chains whereby the inner sides thereof travel upwardly, a plurality of spaced-apart gathering arms fixed to each chain, each arm extending laterally from the chain and having its bottom edge inclined transversely of the plane of said loading platform, the angle of inclination of each arm relatively to said platform being substantially the same as that of the platform to the mine floor, the lower forward end of said platform terminating flush with the forward ends of said chains, whereby the arms during their gathering movement extend beyond the forward end of said platform and operate over the mine floor.

2. In a loading machine of the class described, the combination of a support, an inclined loading platform fixed thereon and having a straight forward edge disposed on the floor of the mine, an endless chain operatively mounted on said support adjacent to each side of said platform, the forward end of each chain being substantially flush with the forward end of said platform, means for actuating said chains whereby the inner sides thereof operate upwardly, and a plurality of gathering arms fixed at spaced intervals to each chain and extending transversely therefrom, each arm having its bottom inclined outwardly of said chain and the plane of said platform whereby when said arms traverse the forward end of the loading machine their bottoms are in contact throughout their entire lengths with the floor of the mine.

3. In a loading machine of the class described, the combination of a support, a loading platform fixed thereon and disposed in a plane inclined from horizontal, the forward end of said platform being disposed adjacent to the floor of the mine, a pair of endless chains mounted on said support adjacent to the sides of said platform, a plurality of gathering arms fixed to each chain in spaced-apart relationship and extending transversely, the bottom of each arm being inclined outwardly from the plane of said chain and of said platform, the angle of inclination of said bottom with respect to said platform being substantially the same as that of the platform to the floor of the mine whereby said arms in traversing the front

end of the machine operate over the floor of the mine, and means for actuating said chains to move the opposed arms of said chains upwardly upon said platform.

4. In a loading machine of the class described, the combination of a support, a loading platform mounted thereon in a plane inclined from horizontal with the lower forward end disposed adjacent to the floor of the mine, an endless chain operatively mounted on said support adjacent to each side of said platform with the forward end of each chain arranged substantially flush with the forward end of said platform, a plurality of gathering arms fixed in spaced-apart relationship to said chains, each arm comprising a single piece casting having formed integral at one end a chain lug disposed at right angle to the arm and having perforate ends for attaching to the respective chain links, each arm being right-angled in cross section with the vertical flange presented forwardly and the horizontal flange forming the bottom of said arm, said bottom flange being inclined outwardly relatively to the plane of said platform, the arms operating over the forward ends of said chains projecting beyond the forward edge of said platform and operating over the mine floor with their bottoms in contact therewith, the angle of inclination of the bottom of each arm with respect to the plane of the platform being substantially the same as the angle of inclination of said platform with respect to the mine floor, and means for driving said chains to cause the arms to move upwardly over said inclined platform.

5. In a loading machine of the class described, a gathering arm comprising a single piece casting having formed integral at one end a chain lug disposed at right angle to the arm and provided at each end with a vertically disposed opening for pivotally connecting said lug to the links of a chain, each arm being right-angled in cross section with the vertical flange presented forwardly and the horizontal flange forming the bottom of said arm, said bottom flange being inclined outwardly with respect to the plane of said chain lug whereby said arm is adapted to operate over a loading platform at an angle with respect thereto and over the mine floor in contact therewith throughout its entire length.

6. In a loading machine of the class described, a support, an endless chain operatively mounted thereon, and a plurality of gathering arms arranged in spaced-apart relationship on said chain, each arm comprising a single piece casting having formed integral at one end a chain lug disposed at right angle to the arm and pivotally connected at its ends with the respective links of said chain, each arm being right-angled in cross section with the vertical plane presented forwardly and the horizontal flange forming the bottom of said arm, said bottom flange being inclined outwardly relatively to the plane of said chain whereby when said chain is arranged in an inclined plane with respect to the mine floor said arms in operating over said mine floor have their bottom flanges in contact therewith.

7. In a loader of the character described, gathering mechanism, comprising, a gathering shoe mounted at an inclination to the ground, a gathering chain mounted for orbital travel on said shoe, and a pick for said chain having a body portion of substantial length inclined with reference to the plane of the orbit to position said portion above said orbit in order to elevate the same with reference to the material at the upper end of its travel.

8. In a loader of the character described, gathering mechanism comprising a gathering shoe mounted at an inclination to the ground, a gathering chain mounted for orbital travel on said shoe at the inclination thereof, and a pick for said chain having its outer portion for a substantial length thereof extending outwardly at an inclination to the orbit of said chain, said outer portion being thereby positioned to extend along the ground at the lower portion of its travel and to extend upward from the face of said shoe at the upper portion of its travel.

9. In a loader of the character described, gathering mechanism comprising a gathering shoe mounted at an inclination to the ground, a gathering chain mounted for orbital travel on said shoe at the inclination thereof, and a pick for said chain having an outwardly directed body portion adapted to extend angularly to said shoe along the ground beyond said shoe during a portion of its travel, the tip of said pick being projected forwardly of the rest of the pick.

10. In a loader of the character described, gathering mechanism comprising a gathering shoe mounted at an inclination to the ground, a gathering chain mounted for orbital travel on said shoe, and a pick for said chain having a heel portion supported on said shoe and a body portion of substantial length inclined with reference to the plane of the orbit to position said portion above said orbit in order to elevate the same with reference to the material at the upper end of its travel.

11. In a loader of the character described, gathering mechanism comprising a gathering shoe mounted at an inclination to and extending downwardly to the ground, a gathering chain mounted for orbital travel on said shoe at the inclination thereof, and a pick for said chain having an outwardly directed portion thereof of substantial length extending at a corresponding inclination to the orbit of the chain adapted to extend along the ground in advance of said shoe during a portion of its travel.

12. In a loader of the character described, gathering mechanism comprising a gathering shoe mounted at an inclination to and extending downwardly to the ground, a gathering chain mounted for orbital travel on said shoe at the inclination thereof, and a pick for said chain having a portion adapted to bear upon and be supported by said shoe and an outwardly directed portion thereof of substantial length extending at a corresponding inclination to the orbit of the chain adapted to extend along the ground in advance of said shoe during a portion of its travel.

ELMER G. VOELKEL.