March 19, 1929. N. A. NEWDICK 1,706,313

LOADING MACHINE

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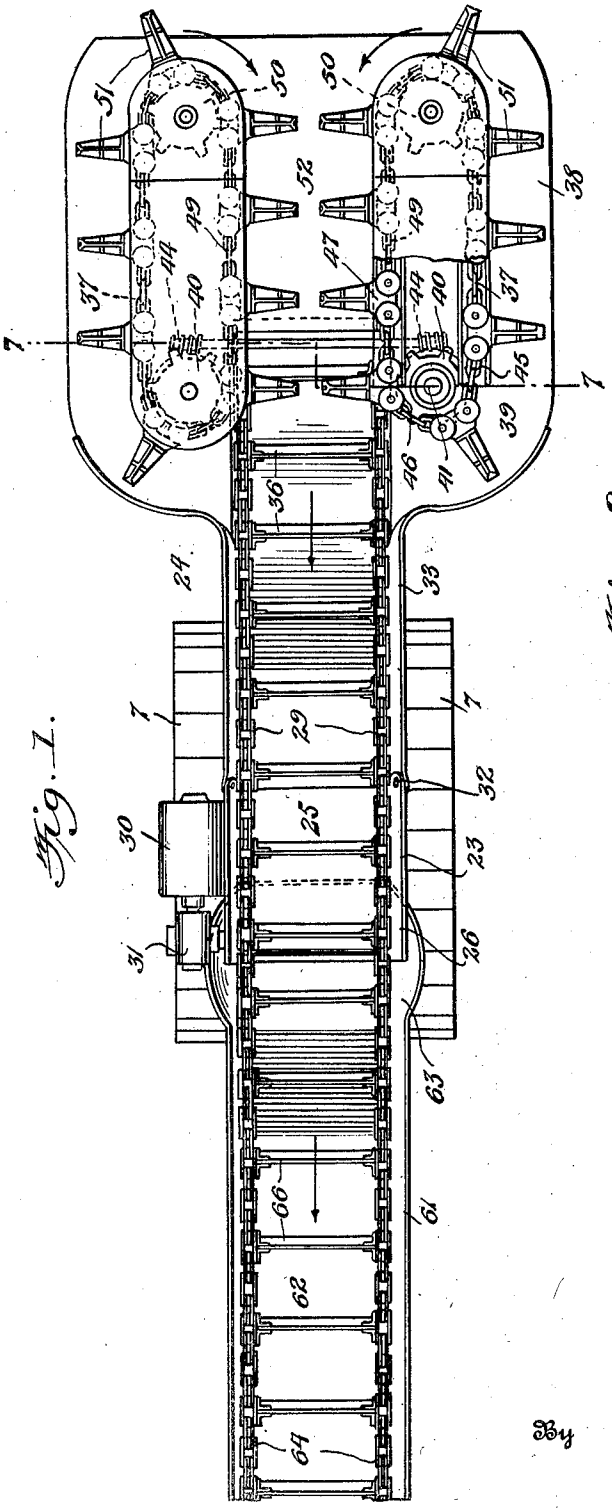


Fig. 1.

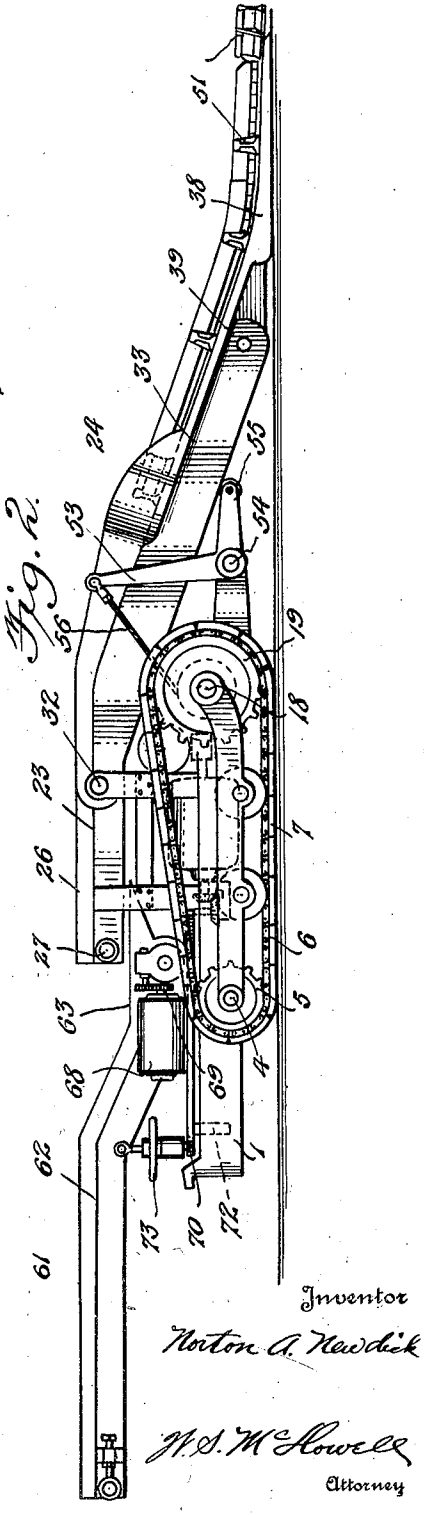


Fig. 2.

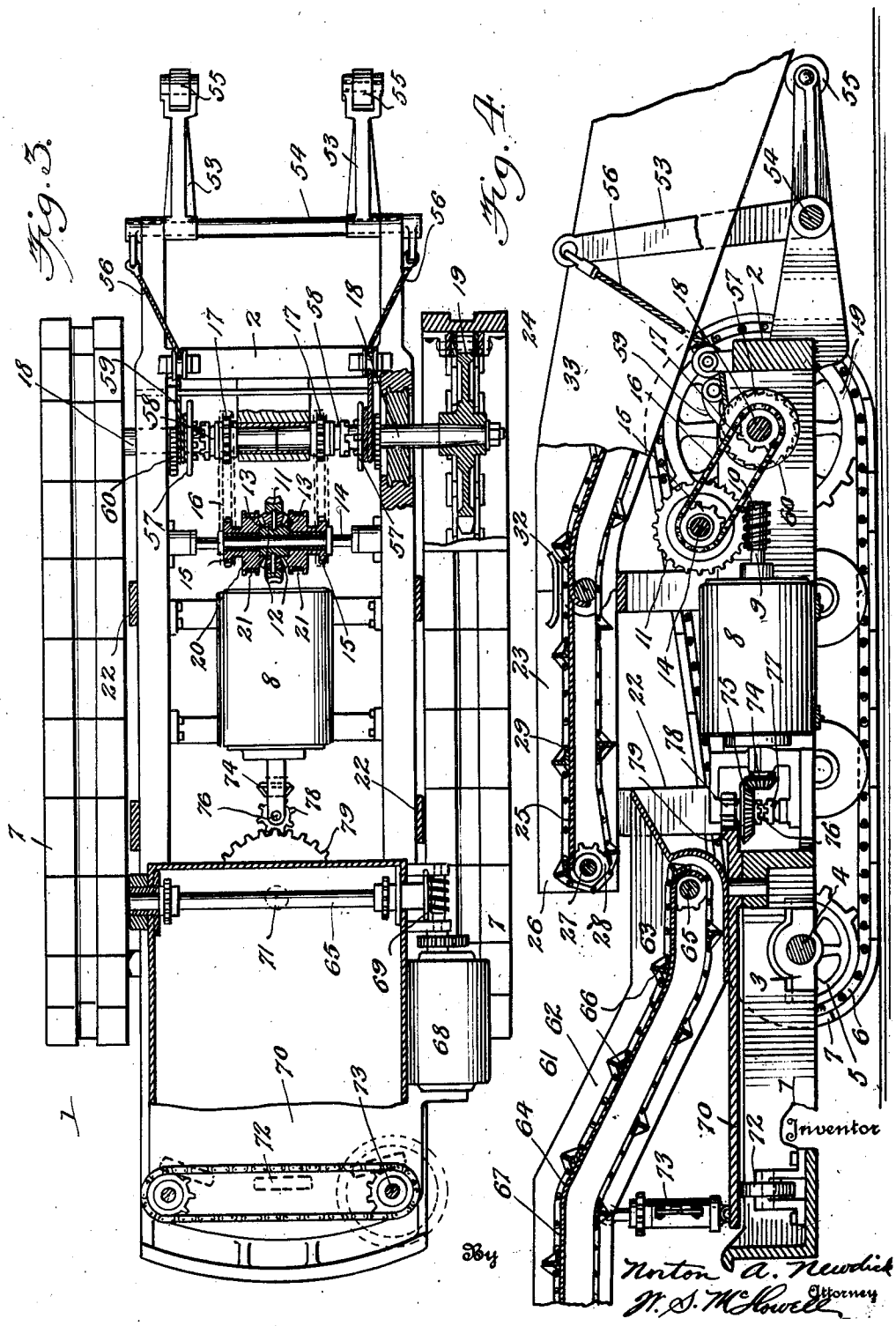
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Fig. 5.

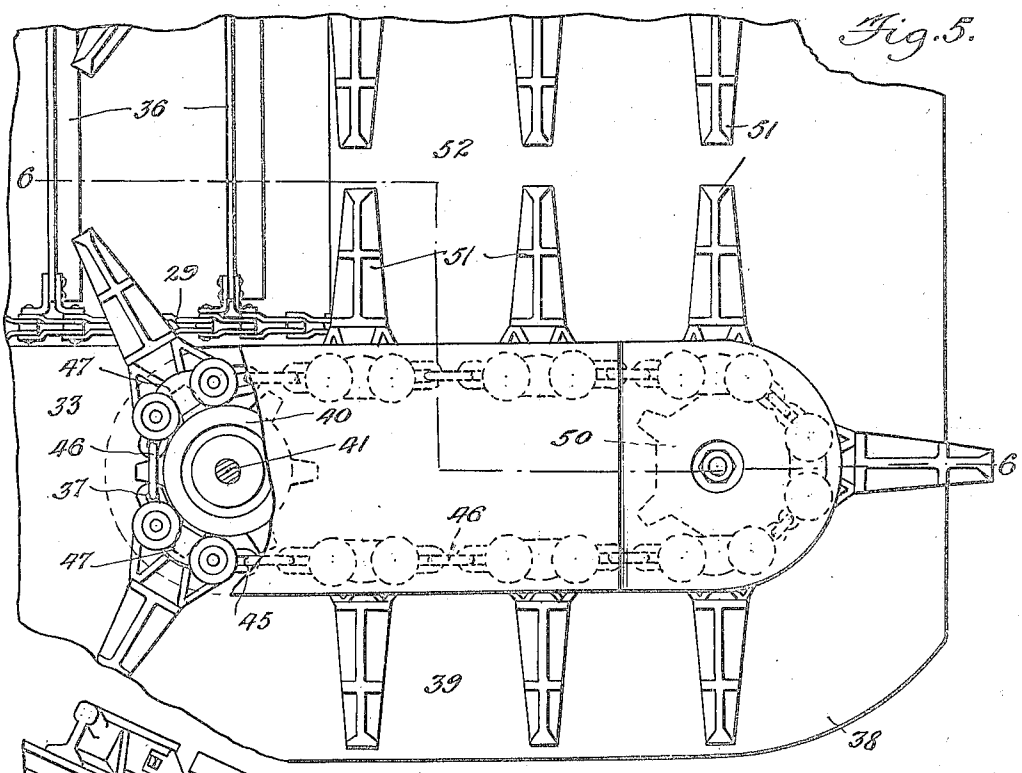


Fig. 6.

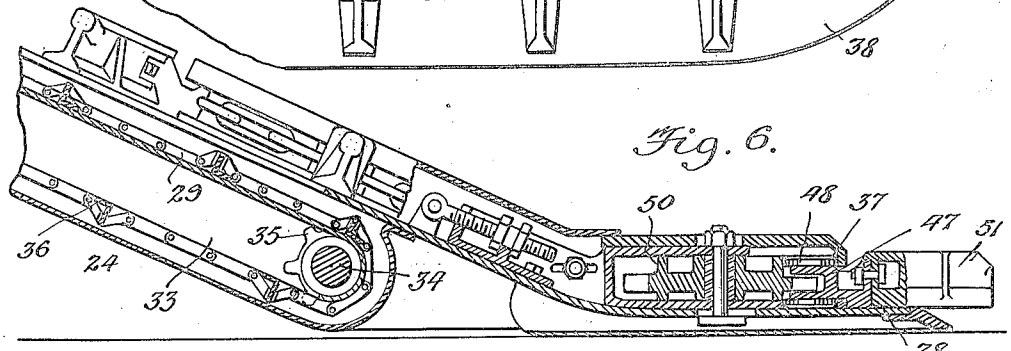
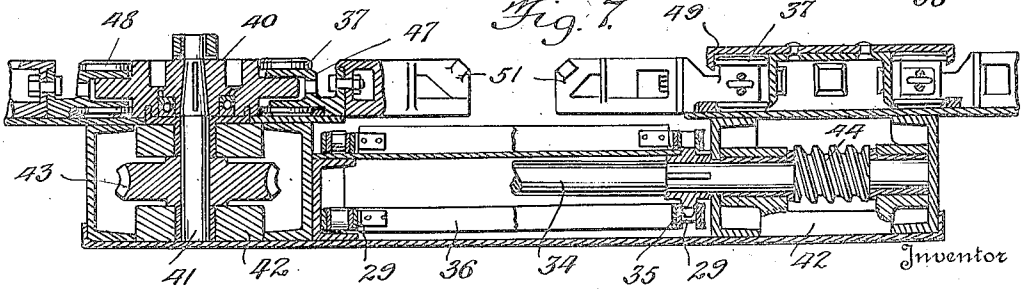


Fig. 7.



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UNITED STATES PATENT OFFICE.

NORTON A. NEWDICK, OF COLUMBUS, OHIO.

LOADING MACHINE.

Application filed August 11, 1924. Serial No. 731,294.

This invention relates to an improved loading machine adapted for use in coal mines, and constructed to transfer coal from the working face of a mine, following its disruption from its native bed, into suitable cars or carriers by which the coal is transported from the mine. The object of the invention is to provide a machine designed for this service which will possess a large capacity for handling the coal rapidly and economically; so designed as to handle the coal in the condition in which it falls on the mine floor following the operation of blasting or shooting the coal, from its original solid state, and further constructed so that its various elements will be readily controllable and the machine manipulated to gather the coal to the best advantage irrespective of the physical limitations which exist in the winding passages and sharp turns of an underground coal mine.

One of the foremost objects of the invention resides in the provision of improved gathering means for transferring the coal from the floor of a mine upon an elevating conveyor and wherein this operation takes place continuously during the operation of the machine, and the coal deposited upon the elevator conveyor in a continuous uninterrupted stream regardless of the relative size of the coal lumps handled thereby.

The invention further consists in the provision of a loading machine which includes an inclined elevating conveyor mounted upon a portable base and in the provision of a pair of endless gathering belts or chains at the forward lower end of the conveyor, which belts or chains are provided with laterally extending flights or arms, disposed to circulate in corresponding horizontal planes, and wherein the arrangement is such that the arms or flights are forced into engagement with the coal to be gathered by their continuous circulating action, remove the coal from the floor and deposit the same upon the receiving end of the elevating conveyor by which the coal is conveyed to a suitable point of discharge.

For a complete understanding of the invention, reference is to be had to the following description and the accompanying drawings, wherein:

Figure 1 is a plan view of a loading machine constructed in accordance with the present invention.

Figure 2 is a side elevation thereof.

Figure 3 is a plan view, partly in section, of the portable base upon which the conveyors of the machine are mounted.

Figure 4 is a vertical sectional view taken through the portable base and the conveyors arranged thereon.

Figure 5 is a plan view of one of the gathering chains.

Figure 6 is a vertical section on the plane indicated by the line 6—6 of Figure 5, and

Figure 7 is a transverse sectional view on the line 7—7 of Figure 1.

Referring more particularly to the details of the invention, as such details are set forth in the specific embodiment of the invention illustrated in the accompanying drawings. The numeral 1 designates a portable base upon which the loading machine is mounted for transportation. In the present instance the base is of the endless belt type, although the base may be mounted, if desired, upon wheels for transportation over a track way. In the present instance the base consists of a rectangular frame 2, disclosed more particularly in Figures 3 and 4. The sides of the frame 2 are provided with recesses for the retention of spring supported journal boxes 3, in which is mounted a transverse axle 4, carrying at its outer ends sprockets 5, disposed to engage with the chains 6 of a pair of endless traction belts 7.

Mounted within the frame 2 is an operating motor 8, preferably of a reversible electric type, whose armature shaft 9 at one end is equipped with a worm 10, disposed to mesh with a worm gear 11 of a differential mechanism. This mechanism is of the usual type and provides a plurality of pinions 12 which rotate with the gear 11, and mesh with gears 13 loosely mounted for rotation around a fixed axial support 14, whereby upon rotation of the gear 11 rotary movement will be imparted to the gears 13.

Formed with each of the gears 13 is a sprocket 15 over which pass endless chains 16 leading to sprockets 17 fixed upon axles 18. These axles are journaled for rotation in the forward part of the frame 2 and carry upon their outer ends driven sprockets 19, which engage with the chain 6 to impart motion to the belt 7. Formed with the gears 13 are brake drums 20, around which pass brake bands 21. Obviously, by any suitable manipulating devices, not

shown, these bands may be tightened around the drums 20 to hold their respective gears 13 against rotation, and by this conventional means, power may be selectively applied at the will of the operator to either or both of the axles 18, thus controlling the forward movement of the machine as well as its turning movement to right or left.

Arising from the frame 2 and rigidly associated therewith is a stationary supplemental framework 22, upon which is mounted the upper stationary section 23 and an elevating conveyor structure 24. This structure comprises a frame or trough of structural sheet metal and includes a bottom 25 and trough forming sides 26, a drive shaft 27 being located at the rear end of the section 23. This drive shaft is formed with a pair of sprockets 28 around which pass spaced endless chains 29 of a drag conveyor. A motor 30 is mounted upon one of the sides 26 and through suitable speed reduction gearing, located in the casing 31, power is imparted at proper conveying speeds to the chains 29.

Pivoted to the forward end of the stationary section and the conveyor structure, as indicated by the numeral 32, is a vertically movable inclined adjustable section 33, of the elevating conveyor. This section extends angularly and downwardly and has its forward receiving end located in advance of the base 1. At the extreme forward end of the adjustable section 33 there is provided a foot shaft 34 upon which sprockets 35 are mounted, and around which the drive chains 29 are trained. The chains 29 are connected by transverse flights 36, which are adapted to pass over the bottoms 25 of the conveyor structure 24, so that coal deposited thereon will be advanced in the line of draft of the machine. When the motor 30 is running movement is imparted through the chains 29 to this shaft 34, and the power thus applied to this shaft is employed in operating the gathering mechanism of the machine.

My improved gathering mechanism consists in the provision of a pair of rigidly mounted parallel conveying belts 37, which are mounted upon the forward depressed end 38 of the conveyor structure 34 and so disposed that the belts will be situated to extend parallel and longitudinal with and some distance in advance of the conveying chains 29 and flights 36 and to each side thereof, as shown more particularly in Figure 1. These belts are located on a wide flaring apron 39 formed with the adjustable section 33 of the elevator conveyor. Specifically the gathering mechanism comprises a pair of drive sprockets 40, keyed upon the shafts 41, which extend perpendicularly to the elevator conveyor. These shafts are mounted for rotation within stationary bearings 42, and have fixed thereon worm gears 43, which mesh with right and left hand worms 44 provided upon the ends of the driven foot shaft 34. This power arrangement results in causing the gathering belts to move as indicated by the arrows in Figure 1, so that coal lying in the path of the machine will be directed inwardly and centrally upon the machine and discharged upon the elevator. Further, the worm gearing enables the gathering belts to be driven at a lower rate of speed than the elevator conveyor, for reasons hereinafter specified.

Passing around the sprockets 40 is a strongly constructed chain 45, capable of standing high tensile strains and maintaining its pitch relation to the teeth of the drive sprocket 40. These belts or chains 45 include a plurality of link sections 46, which flexibly unite a plurality of anchor members 47, which carry rollers 48 and circulate in continuous guides 49 fixed upon the apron 39. The link sections 46 permit the gathering belts to flex in both horizontal and vertical planes, thus adapting the belts to passage around the drive sprockets 40, the forwardly located guide sprockets 50 and to adapt the belts to the vertical curvature or formation of the apron 39. To the anchor members 47 there is connected a plurality of flights 51, which project laterally from the gathering belts and are so disposed that the going and return runs thereof move in corresponding horizontal planes. The guide sprockets 50 are mounted in longitudinally adjustable bearings 51, which may be adjusted from time to time to compensate for strain or wear in the gathering belts.

In operation the machine, by reason of its tractor base, is driven forwardly into the coal pile to be gathered. The motor 30 is then energized imparting motion simultaneously to the elevator conveyor and to the two gathering belts, causing the driven parts to move in the directions indicated by the arrows in Figure 1. The flights 51 in circulating around the guide sprockets 50 are located immediately adjacent the floor surface of a mine upon which the coal to be gathered is deposited. This enables the flights to sweep the coal from the floor and convey the same longitudinally in a draft direction along the central portion of the apron 39 or the trough 52 formed between the adjacent guides 49 of the belts. It should be noted in this connection that the gathering belts operate continuously together and advance the coal into and along the machine. In many machines of the prior art shovels, scoops and fingers moving in non-circular paths are provided which do not operate continuously upon the coal in carrying out the gathering operation, but operate on the intermittent principle. In the present invention the gathering belts are constantly attacking the coal pile, so that the coal is

moved in a continuous stream by a pair of belts through the trough 56 upon the wide drag conveyor of the elevator which carries the coal away to a suitable point of deposit. Further, the elongated construction of the gathering belts is of importance in that it is desirable in order to effect a proper transference of the coal from the gatherers upon the elevators. For this reason the gathering belts move at a slower rate of speed than the elevator conveyor and the lower end of the elevator conveyor is terminated at a position in advance of the drive sprockets 40, see Figure 1. These features enable the coal passing through the trough 52 to be deposited upon the elevator conveyor before the flights 51 begin their arcuate path of travel around the sprockets 40. This enables the coal to be removed from the influence of the flights while the latter are yet traveling parallel with the elevator conveyor, so that the flights 51, when passing arcuately around the drive sprockets 40 will not push or cause the coal to be removed from the conveying influence of the conveyor elevator.

In transporting the machine around the mine it is necessary to elevate the adjustable section 33 slightly so that the forward depressed end 38 thereof will be located some distance above the floor. A convenient method of accomplishing this consists in providing the machine with a pair of bell crank levers 53 which are pivoted as at 54 upon the forward part of the frame 2. The shorter arms of these levers are provided with rollers 55, which engage with the bottom of the section 33. The longer of the arms are connected with cables 56, which have their inner ends trained around and secured to drums 57, loosely mounted upon the forward axles 18. These drums are provided with clutch jaws designed to be engaged with correspondingly shaped jaws provided upon sliding sleeves 58, which are keyed to the axles 18. By engaging the sleeves 58 with the drums 57 through the clutch jaws, rotary motion may be imparted to the drums 57, causing the cables 56 thereon to be wound or unwound, thereby raising or lowering, at the will of the operator, the adjustable section 33 of the forward conveyor structure. Any suitable appliances may be provided for retaining the conveyor structure in its elevated position. In this connection I have disclosed pivoted pawls 59, which engage with ratchet teeth 60 provided on the drums 57.

In order to deliver coal to a mine car situated behind the machine, there is provided an adjustable delivery conveyor 61. This conveyor consists of a frame 62 shaped at its forward end to provide a bowl or receiver 63 which is located immediately beneath the discharge end of the elevator conveyor, and is adapted to receive coal discharged from such conveyor. Corresponding to the elevator conveyor the delivery conveyor is provided with spaced longitudinally extending chains 64 passing over sprockets provided upon shafts 65 at the forward and rear ends of the frame 62, and the chains 64 connected by transverse flights 66, which move over the floor 67 of the frame 62. The discharge end of the delivery conveyor may be of any desired height to adapt the machine to the height of the mine car used in connection therewith. To impart motion to this conveyor there is provided a motor 68 which, through suitable motion transmitting devices 69, rotates the foot shaft 65. However, it will be understood that power may be applied either to the forward or rearward of the shaft 65.

The delivery conveyor is mounted upon a swinging bed plate 70, which is pivoted as at 71 upon the frame 2 for swinging movement in a horizontal plane. The rear or free end of the bed plate rests upon rollers 72, and the elevated discharge portion of the conveyor 61 is supported by means of a pair of adjustable jacks 73 which, by reason of their telescoping action permit the delivery conveyor as a whole to swing in a vertical plane about the horizontal axis defined by its foot shaft 65.

To turn the delivery conveyor in a horizontal plane, the motor 8 has its armature shaft 9 provided at the end opposite to the worm 10 with a pinion 74, which meshes with a gear 75 loosely provided upon a shaft 76. The hub of the gear 75 is provided with clutch jaws designed to be engaged with similar jaws provided upon a sleeve 77, which is keyed to the shaft 76. By engaging the sleeve 77 with the gear 75 motion may be imparted at will to the shaft 76, the direction of rotation of said shaft is of course governed by controlling the direction of rotation of the armature shaft. The upper end of the shaft 76 is provided with a spur gear 78, which meshes with the teeth of a segment rack 79 provided upon the forward edge of the bed plate 70.

In view of the foregoing description, taken in connection with the accompanying sheets of drawings, it will be seen that there is provided a strongly constructed, easily operated high capacity machine for service in underground coal mines. The construction of the machine is such that it is readily adapted to any recognized method of mining coal, and may be used with equal facility when coal is mined from the so-called "long wall" method as well as the "room and pillar" method. The machine attacks the coal at the base and outer edge of the pile and is forced forwardly by its tractor base as the coal is conveyed away. By the operation of the differential drive mechanism the machine may be moved from right to left

so as to attack the pile from the most advantageous position, and this can be more readily accomplished by reason of the tractor base than when a track mounted machine is employed and adapts the machine more readily to advance workings where track cannot readily be placed. Further, by providing the tractor base the necessity of swinging the gathering conveyor in a horizontal plane is avoided, although it will be understood that the invention is not limited in its scope to a tractor base machine, but may be employed upon an ordinary wheeled truck if such a construction is desired. The latter construction is contemplated because of the rapidity with which a machine may be moved from place to place. This is of importance when the working places within a mine are not closely situated to one another. Further, the gathering conveyor possesses the advantage of employing the side arm gathering conveyors where they operate to the best efficiency and limiting the use of the same as elevating conveyors and where they are not so efficient as the drag type of conveyor. In my Reissue Patent 15,339, April 18, 1922, the side arm type of gathering conveyor is not only employed for removing the coal from the floor but also for elevating and conducting the coal rearwardly and longitudinally of the machine for over half of its length. As an elevator the side arm type does not possess the carrying capacity of the drag conveyor and because of the peculiar construction of its chain or belt, upon which its flights are mounted, the construction is heavy, costly, and requires considerable power to operate. In the present instance I have limited the gathering conveyor of the side arm type solely to its duty as a gathering agent and is not utilized in any essential sense as a conveyor, this work being entirely done by the drag conveyors. Moreover, I have further improved the machine by providing two conveying belts of the side arm type in contrast to the single belt of this type disclosed in my aforesaid patent and by this means have produced a machine by which the capacity of a loading machine over known prior types is materially increased.

What is claimed is:

1. In a loading machine, an elongated inclined frame having its lower forward end broadened out laterally in opposite directions to provide a substantially horizontal surface engaging portion, a pair of gathering belts mounted upon the broadened end, and an elevating conveyor mounted upon said frame with its lower end positioned in line with the space between the gathering belts.

2. In a loading machine, an elongated inclined frame having a bed plate, the forward end of the bed plate extending beyond the lower end of the frame and broadened out laterally in opposite directions with respect to the remaining portion of the plate to provide a substantially horizontal surface engaging portion, an elevating conveyor mounted on the frame over the narrower portion of the bed plate, and gathering means positioned on the broadened portion of the plate to gather the material and force it up the plate in line with the longitudinal axis of the elevating conveyor.

3. In a loading machine, an elongated inclined frame having a bed plate, the forward end of the bed plate extending beyond the lower end of the frame and broadened out laterally in opposite directions with respect to the remaining portion of the plate to provide a substantially horizontal surface engaging portion, an elevating conveyor mounted on the frame over the narrower portion of the bed plate, gathering means positioned on the broadened portion of the plate to gather the material and force it up the plate in line with the longitudinal axis of the elevating conveyor, and raised marginal portions on the broadened portion of the plate to prevent any scattering material being thrown in advance of the gathering region.

In testimony whereof, I have signed my name to this specification.

NORTON A. NEWDICK.