March 2, 1937. C. M. BROWNER 2,072,495

TUNNEL MUCKING MACHINE

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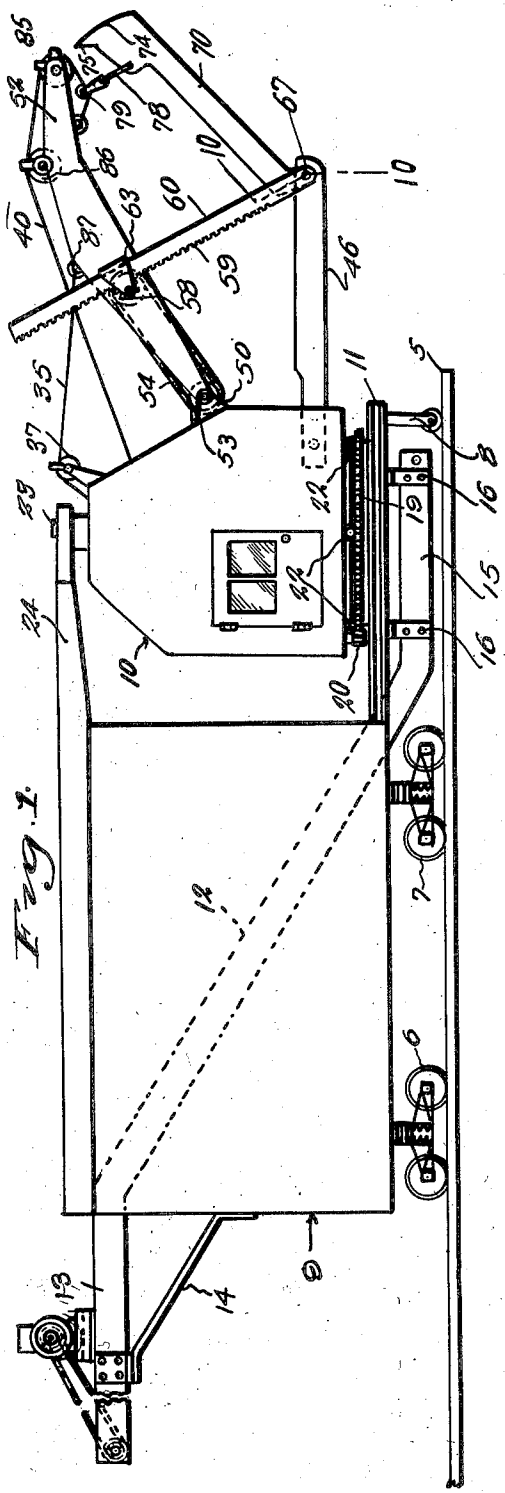


Fig. 1.

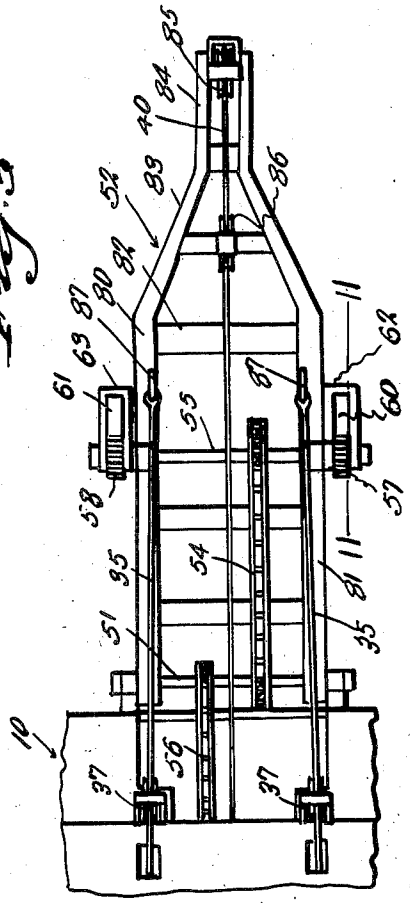


Fig. 5

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Fig. 6.

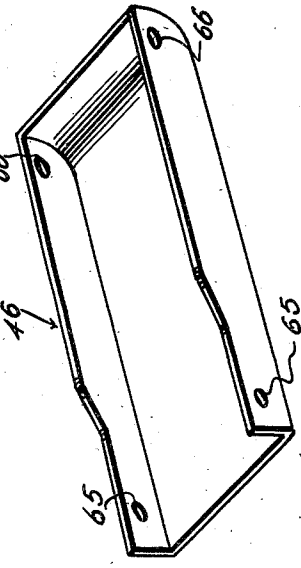


Fig. 3.

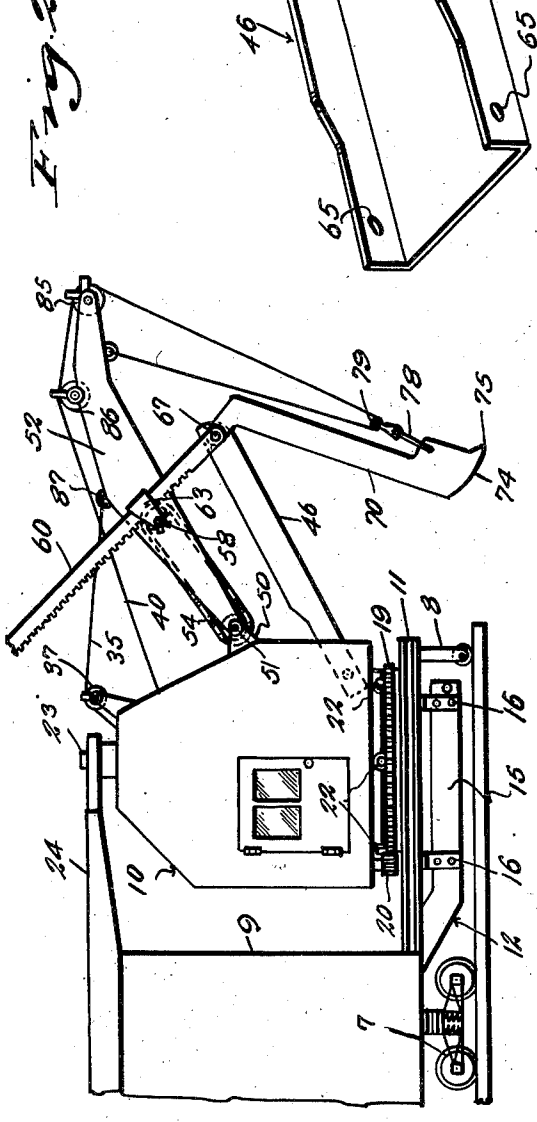
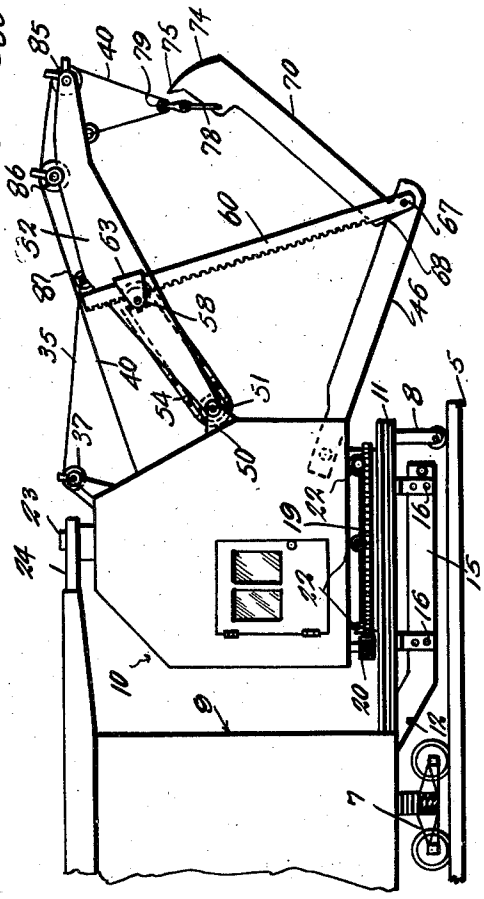


Fig. 2.



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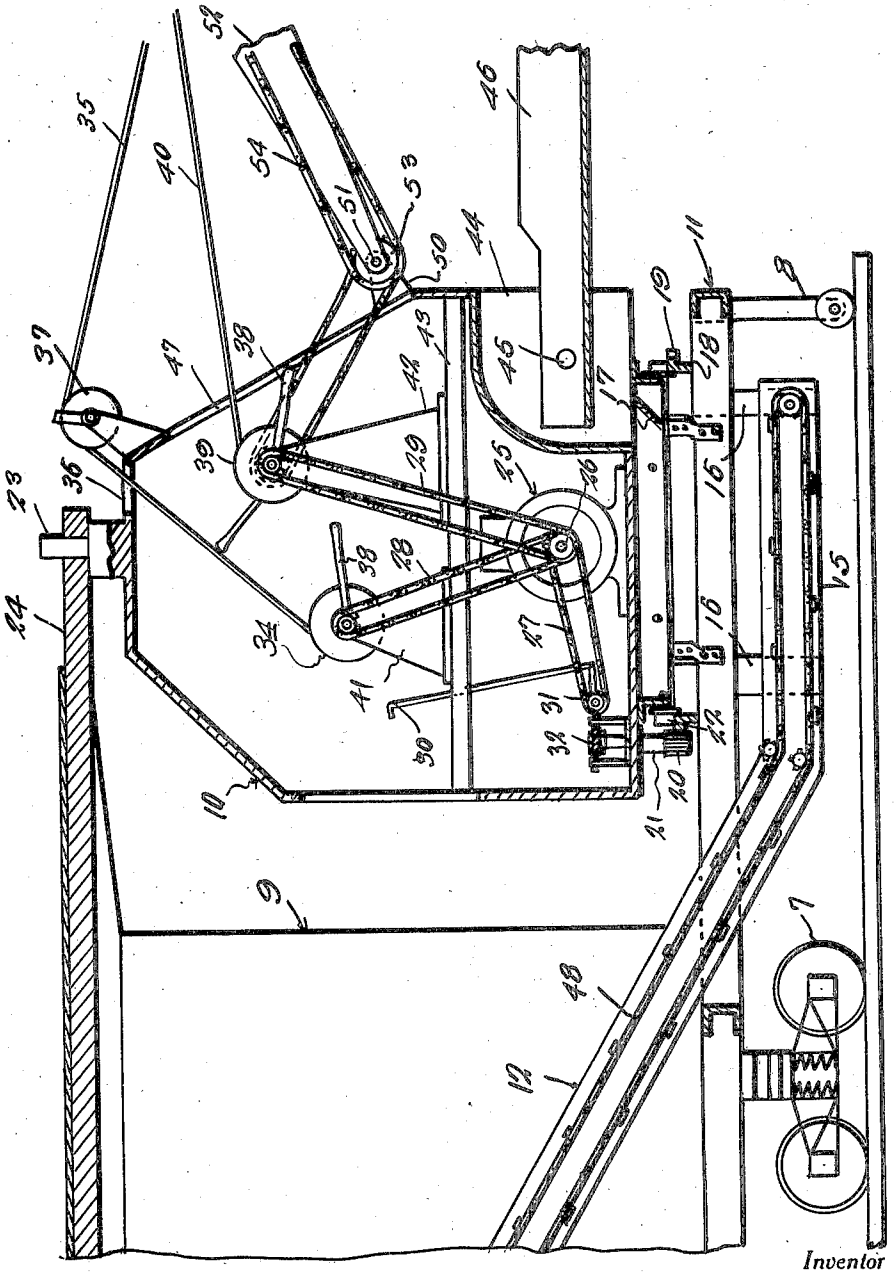
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Fig. 4.



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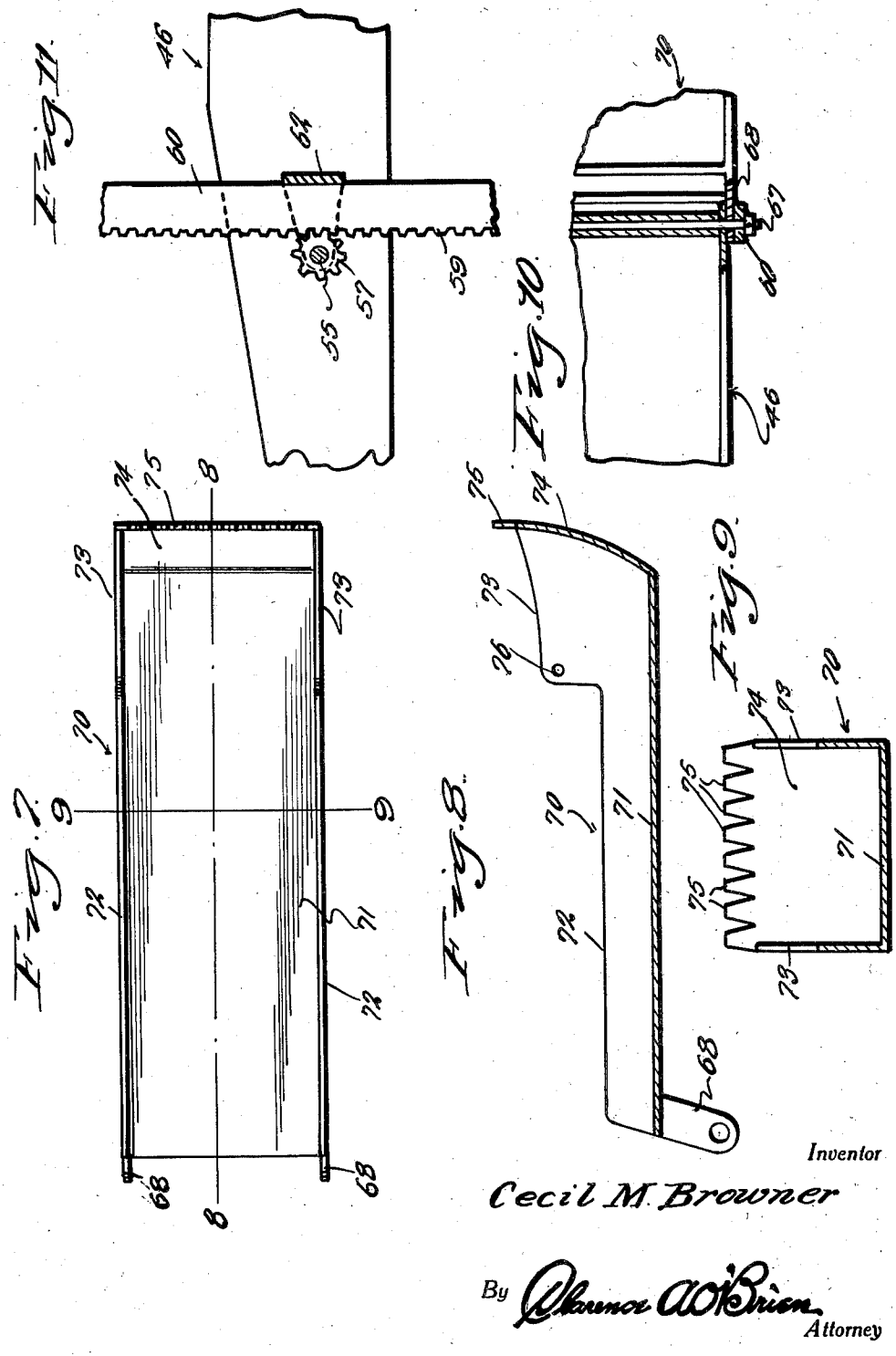
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TUNNEL MUCKING MACHINE

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UNITED STATES PATENT OFFICE

2,072,495

TUNNEL MUCKING MACHINE

Cecil M. Browner, Beaumont, Calif.

Application August 19, 1935, Serial No. 36,908

8 Claims. (Cl. 214—90)

My invention relates generally to power excavating and transporting apparatus, and particularly to a tunnel mucking machine particularly adapted for railway use, by means of which the muck in the tunnel may be removed from its place, conveyed away from the shovel or dipper removing the muck, and transferred to a receiving car, in a continuous and uninterrupted performance, and an important object of the invention is to provide a simplified and efficient arrangement of this character which is relatively inexpensive to manufacture and maintain.

Another important object of my invention is to provide an arrangement of the character indicated above which includes power means in a self-contained arrangement, whereby the device is operative independent of outside power sources, although it may employ such outside power sources if desirable.

Other important objects of my invention will be apparent from a reading of the following description in connection with the drawings, wherein for purposes of illustration I have shown a preferred embodiment of my invention.

In the drawings:—

Figure 1 is a general side elevational view of the embodiment showing the dipper boom in the position which it occupies after it has dipped up muck.

Figure 2 is a side elevational view similar to Figure 1 but showing the dipper boom in position to dip up the muck.

Figure 3 is a view similar to Figure 2 but showing the dipper boom in the position which it occupies when running the muck from the dipper boom onto the receiving boom.

Figure 4 is a longitudinal vertical sectional view taken through Figure 1 and showing the operating controls, the muck receiving boom section and the muck conveyor.

Figure 5 is a top plan view.

Figure 6 is a perspective view of the receiving boom section.

Figure 7 is a top plan view of the dipper boom.

Figure 8 is a longitudinal vertical sectional view taken through Figure 7 approximately on the line 8—8.

Figure 9 is a transverse vertical sectional view taken through Figure 7 approximately on the line 9—9.

Figure 10 is a transverse vertical sectional view taken through Figure 1 approximately on the line 10—10.

Figure 11 is a longitudinal sectional view taken along one side of the main boom and showing one of the sticks in its bracket and engaged with its operating pinion.

Referring in detail to the drawings, the numeral 5 generally designates rails on which the trucks 6 and 7 and the wheel equipped bracket 8 roll to support the device of the invention which comprises the conveyor chamber or housing which is generally designated 9 and which rests on the trucks 6 and 7 and the revoluble housing which is generally 10 and which rests revolubly on the frame 11 which is supported jointly by the conveyor housing 9 and the wheeled bracket 8.

An inclined conveyor trough which is generally designated 12 passes diagonally through the conveyor housing 9 and has its horizontal rear portion 13 extending from the rear of the housing 9 and supported by a bracket 14. The depressed front end of the conveyor trough 12 has the horizontal portion 15 which is supported under the frame 11 by means of brackets 16 in position to receive muck from the receiving hopper 17 on the housing 10.

The frame 11 may be conveniently of channel iron or steel and have mounted on the top thereof the turntable annulus or track 18 which has a radial flange 19 which is toothed and meshed with the pinion 20 which is fastened to the jack shaft 21 which extends downwardly from the floor of the housing 10.

The hopper 19 is of annular form or of any other convenient shape and has on its exterior flanged wheels 22 which ride on the top of the annulus 13, and the annulus 17 has further flanges which are attached to the bottom of the housing 10; by means of which arrangement the housing 10 may be rotated into the desired position by proper power application to the jack shaft 21.

The housing 10 may be suitably of generally rectangular form and have a boss 23 on its top which turns in the front end of a longitudinal reinforcing member 24 which extends along and across the top of the housing 9 whereby the housing 10 is revolubly supported securely on the annulus 18 and the frame 11, the member 24 acting to hold the housing down in place.

Mounted on the floor of the housing is a suitable motor which is generally diagrammatically designated and indicated by the numeral 25 and may be an electric motor or a gasoline or other suitable self-contained power unit having the drive shaft 26 on which various sprocket wheels are fastened to operate the housing rotating sprocket chain 27 the main boom operating sprocket chain 28 and the dipper boom elevating sprocket chain 29.

A manual lever 30 controls the clutch mechanism 31 which is operatively engaged with drive means 32 for the jack shaft 21.

The main boom elevating sprocket chain 28 is connected by manual clutch means 33 with a cable drum 34 which has thereon a cable 35 which passes through the opening 36 in the top of the housing and over a pulley 37 to the dipper boom.

The sprocket chain 29 is operatively connected by means of manually controlled clutch means 38 with a cable drum 39 which has wound thereon the cable 40 which operates the main boom. The respective drums are supported on brackets 41 and 42 mounted on a support 43 located at level above the floor of the housing. In the front end of the housing is a recess 44 between the side walls of which is supported an axle or pivot 45 on which is pivoted the inward end of the receiving section 46 of the dipper boom. The cable 40 passes through an opening 47 in the slanting front of the casing 10 as clearly shown in Figure 4. The conveyor trough 12 contains a suitable conveyor 48 which is driven by any suitable means and at an appropriate rate to carry out the muck deposited thereon from the hopper 17 to a following railway car (not shown) into which the muck is emptied by the rear end of the conveyor trough.

On a bracket 50 fixed to the front of the housing 10 above the recess 44 is a shaft 51 on which the inward end of the main boom 52 is pivoted, and the shaft 51 has a sprocket wheel 53 over which is trained the sprocket chain 54 which is also trained over a sprocket wheel on a shaft 55 which is journaled through and in an intermediate portion of the main boom 52. A drive sprocket chain 56 is operatively connected to the shaft 51 and to suitable power connection with the engine or motor 25. The ends of the shaft 51 outwardly of the sides of the main boom 52 are equipped with pinions 57 and 58 which mesh with the teeth 59 on the "sticks" 60 and 61 which have their teeth held in engagement with the pinions 57 and 58 by brackets 62 and 63 which are mounted on the ends of the shaft 55.

The receiving section of the dipper boom which generally designated 46 is clearly shown in Figure 6 to be of trough-shape and as having holes 65 in its reduced left hand sides and other holes 66 adjacent its closed right hand end. Through the latter holes extends the shaft 67 on whose ends outward of the side of the section 46 are pivoted the lower ends of the "sticks" 60 and 61 and the lugs 68 which depend from the dipper section 70 of the dipper boom, whereby the "sticks", the dipper boom section 46, and the dipper section 70 are pivoted on the same axis.

As shown in Figures 7, 8 and 9 the dipper section 70 is composed of a bottom 71, side walls 72 each having an enlarged portion 73, and the curved end portion 74 which has on its upper edge the digging teeth 75; the side wall portions 73, the curved end 74 and the bottom forming the dipper bucket. The portions 73 are provided with side holes 76 which accommodate the tongs 78 which have a pulley 79 under which is trained the cable 40.

The main boom 52 comprises the side members 80 and 81 which are braced by various cross members 82, and the side members converge as indicated by the numeral 33 to the head 84 which contains at its extremity the pulley 85 over which the dipper boom raising cable 40 is trained. Inwardly of the pulley 85 is another pulley 86 over which the cable 40 is also trained. The dual cables 35 are provided for raising and lowering the main boom and are attached to the intermediate portion of the main boom as generally indicated by the numerals 87 and these cables pass over the pulleys 37 on the front upper part of the housing 10. The angularly depressed outer portions of the main boom are clearly shown in Figures 1, 2 and 3.

The housing 10 having been rotated in proper position for the operation of the dipper boom, the manual controls are operated to place the dipper section 70 in the extreme depressed position shown in Figure 2, wherein the receiving section 46 is in a forwardly inclined position. The cable 40 is then operated so as to bring the dipper section forwardly and upwardly into the position shown in Figure 1, wherein the muck present in the dipper section 70 moves gravitationally into the then horizontally positioned receiving section 46. The "sticks" 60 and 61 are then operated into the position shown in Figure 3 so as to give a greater inclination to the dipper section 70 and ensure gravitational movement of the muck onto the receiving section 46. The receiving section 46 then having thereon the muck from the dipper section, the "sticks" are operated to give an upward inclination to the receiving section shown in Figure 2, whereby to cause the muck on the receiving section to gravitationally move to the hopper 17 and be deposited through the agency of the hopper onto the portion 15 of the conveyor 12 and to be then conveyed by the conveyor 48 to the receiving car attached behind the housing 9. As the "sticks" reach the position shown in Figure 2 wherein the acute angulation is given to the receiving section 46, the cable 40 is operated so as to permit the dipper section 70 to fall to the digging or dipping position shown in Figure 2.

Although I have shown and described herein a preferred embodiment of my invention, it is to be definitely understood that I do not desire to limit the application of the invention thereto, and any change or changes may be made in the materials, and in the structure and arrangement of the parts, within the spirit of the invention and the scope of the subjoined claims.

What is claimed is:—

1. In an excavator, a vehicle comprising a revoluble housing, a swingable dipper boom, a conveyor having one end located under the inner end of the dipper boom, said dipper boom comprising a dipper section and a material receiving section, said dipper section being pivotally connected to said receiving section, said dipper section being arranged to assume an inclined position in which it passes excavated material gravitationally onto said receiving section while said receiving section is in a relatively uninclined position, and said receiving section being arranged to be operated to assume a position of relatively great inclination while said dipper section is in a depressed digging position in which said receiving section gravitationally passes the received excavated material onto said end of said conveyor.

2. In an excavator, a vehicle comprising a revoluble housing, a swingable dipper boom, a conveyor having one end located under the inner end of the dipper boom, said dipper boom comprising a dipper section and a material receiving section, said dipper section being pivotally connected to said receiving section, said dipper section being arranged to assume a position in which it passes excavated material onto said receiving section, and said receiving section being ar-

ranged to assume a position in which it passes the received excavated material onto said end of said conveyor, said vehicle further comprising a relatively stationary boom overlying said dipper boom, dipper boom operating and supporting means connected between said relatively stationary boom and said dipper boom, said operating means including a rack bar swingably connected to said dipper boom at the pivotal point of the dipper and receiving sections, pinion means on said relatively stationary beam and meshed with said rack bar, and power means for driving said pinion means.

3. In an excavator, a vehicle comprising a revoluble housing, a swingable dipper boom, a conveyor having one end located under the inner end of the dipper boom, said dipper boom comprising a dipper section and a material receiving section, said dipper section being pivotally connected to said receiving section, said dipper section being arranged to assume a position in which it passes excavated material onto said receiving section, and said receiving section being arranged to assume a position in which it passes the received excavated material onto said end of said conveyor, said vehicle further comprising a relatively stationary boom overlying said dipper boom, dipper boom operating and supporting means connected between said relatively stationary boom and said dipper boom, said operating means including a rack bar swingably connected to said dipper boom at the pivotal point of the dipper and receiving sections, pinion means on said relatively stationary beam and meshed with said rack bar, and power means for driving said pinion means, said operating means further comprising lifting and lowering cable means extending operatively between outer end portions of said relatively stationary boom and the dipper section of said dipper boom.

4. In an excavator, a vehicle comprising a revoluble housing, a swingable dipper boom, a conveyor having one end located under the inner end of the dipper boom said dipper boom comprising a dipper section and a material receiving section, said dipper section being pivotally connected to said receiving section, said dipper section being arranged to assume a position in which it passes excavated material onto said receiving section, and said receiving section being arranged to assume a position in which it passes the received excavated material onto said end of said conveyor, said vehicle further comprising a relatively stationary boom overlying said dipper boom, dipper boom operating and supporting means connected between said relatively stationary boom and said dipper boom, said operating means including a rack bar swingably connected to said dipper boom at the pivotal point of the dipper and receiving sections, pinion means on said relatively stationary beam and meshed with said rack bar, and power means for driving said pinion means, said operating means further comprising lifting and lowering cable means extending operatively between outer end portions of said relatively stationary boom and the dipper section of said dipper boom, said cable means also being connected to said power means, said cable means being separately operable by said power means from said pinion means.

5. In an excavator, a vehicle comprising a revoluble housing, a swingable dipper boom, a conveyor having one end located under the inner end of the dipper boom, said dipper boom comprising a dipper section and a material receiving section, said dipper section being pivotally connected to said receiving section, said dipper section being arranged to assume a position in which it passes excavated material onto said receiving section, and said receiving section being arranged to assume a position in which it passes the received excavated material onto said end of said conveyor, said vehicle further comprising a relatively stationary boom overlying said dipper boom, dipper boom operating and supporting means connected between said relatively stationary boom and said dipper boom, said operating means including a rack bar swingably connected to said dipper boom at the pivotal point of the dipper and receiving sections, pinion means on said relatively stationary beam and meshed with said rack bar, and power means for driving said pinion means, said operating means further comprising lifting and lowering cable means extending operatively between outer end portions of said relatively stationary boom and the dipper section of said dipper boom, said cable means also being connected to said power means, said cable means being separately operable by said power means from said pinion means, and adjusting means operatively connected to said power means for adjusting the position of said relatively stationary boom.

6. In an excavator comprising a supporting vehicle, a main relatively stationary boom projecting from said vehicle, a dipper boom hingedly mounted on said vehicle, dipper boom operating means on said vehicle, said dipper boom comprisprising a material receiving section and a dipper section, pivot means swingably connecting the inner end of the dipper section to the outer end of the receiving section, said operating means comprising a first lifting and lowering member working between an outer part of said relatively stationary boom and a second lowering and lifting member working between an inner part of said relatively stationary boom and the pivotal connection of the boom sections, and power means driving said first and second members, said power means being selectively connectible to said first member in a manner enabling moving said dipper section from a lowered rearward position to an upward and forward position in a digging action, said material section being in a forwardly inclined position, said power means being selectively connectible to said second member in a manner enabling depressing said material receiving section so as to further tilt said dipper section and cause gravitational flow of the material from the dipper section onto the material receiving section, said first and second members being further operable to raise said material receiving section so as to cause gravitational flow of the material thereon from the inner end thereof while lowering said dipper section into digging position, said second member comprising rigid racks slidably connected to the relatively stationary boom and pivotally connected to said pivot arms.

7. In an excavator comprising a supporting vehicle, a main relatively stationary boom projecting from said vehicle, a dipper boom hingedly mounted on said vehicle, dipper boom operating means on said vehicle, said dipper boom comprising a material receiving section and a dipper section, pivot means swingably connecting the inner end of the dipper section to the outer end of the receiving section, said operating means comprising a first lifting and lowering member working between an outer part of said relatively stationary boom and a second lowering and lift-

ing member working between an inner part of said relatively stationary boom and the pivotal connection of the boom sections, and power means driving said first and second members, said power means being selectively connectible to said first member in a manner enabling moving said dipper section from a lowered rearward position to an upward and forward position in a digging action, said material section being in a forwardly inclined position, said power means being selectively connectible to said second member in a manner enabling depressing said material receiving section so as to further tilt said dipper section and cause gravitational flow of the material from the dipper section onto the material receiving section, said first and second members being further operable to raise said material receiving section so as to cause gravitational flow of the material thereon from the inner end thereof while lowering said dipper section into digging position, said second member comprising rigid racks slidably connected to the relatively stationary boom and pivotally connected to said pivot means, and pinion means driven by said power means and meshed with said racks.

8. A machine of the character described comprising a support, a secondary chute boom section pivoted at one end on a horizontal axis on said support, a primary boom section of chute form having its inner end pivoted to the outer end of the secondary section in muck depositing relation thereto and having a digging element at its outer end, first elevating and downward releasing means connected to said support and depending therefrom and connected to the outer end of said secondary boom section, second means connected to the outer end of said primary boom section, said digging element extending on the upper side of the outer end of said primary boom section and said second means being connected to an upper part of said digging element and the inner end of said primary boom section being downwardly deflected with respect to the remainder of the primary boom section, whereby said primary boom section may be made to hang with its digging element substantially perpendicularly aligned with the pivotal connection of the boom sections and with the length of the primary boom section declining at an angle to the rear of said pivotal connection while said primary boom section is in digging position and to the rear of said support and said secondary boom section is in sharply elevated and rearwardly declined gravity dumping position, said primary section being arranged to be elevated to dumping position wherein the secondary boom is in a relatively depressed muck receiving relation to said primary boom section, said primary section being arranged to be further elevated and inclined so as to cause the muck dug thereby to fall and slide gravitationally therealong and onto said secondary boom section to be discharged gravitationally by said secondary section when the same is elevated as the primary boom section is returned to depressed digging position.

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