July 11, 1933. M. A. EVANS 1,917,514

MACHINE FOR HANDLING COAL AND OTHER LOOSE MATERIAL IN MINES

Filed Aug. 26, 1931 3 Sheets-Sheet 1

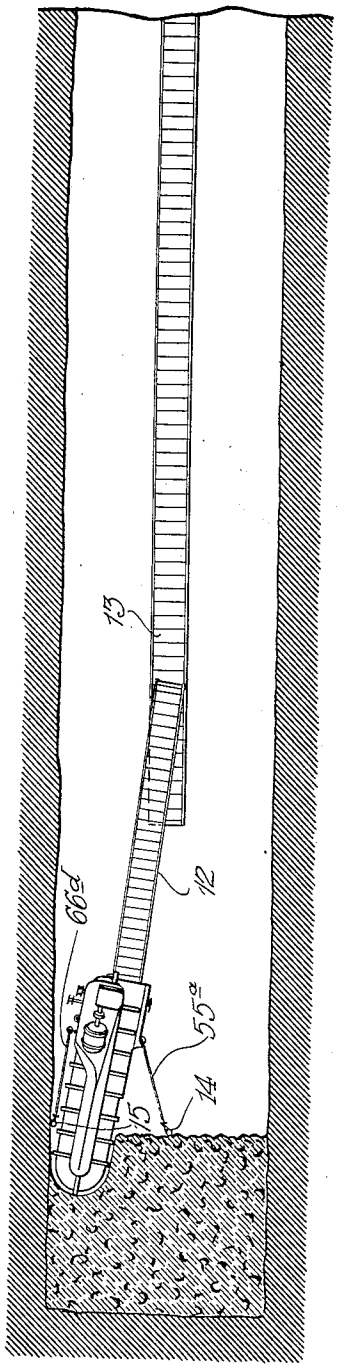


Fig. 1.

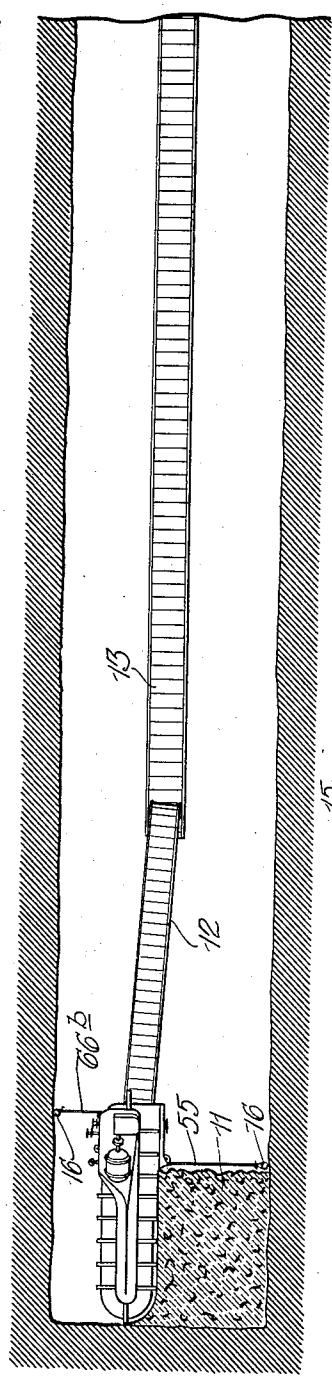


Fig. 2.

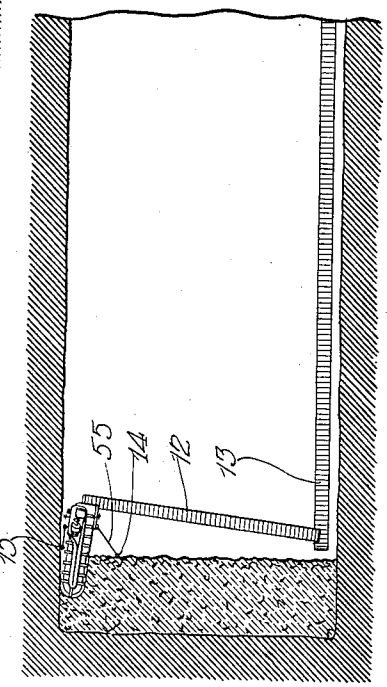


Fig. 3.

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MACHINE FOR HANDLING COAL AND OTHER LOOSE MATERIAL IN MINES

Filed Aug. 26, 1931 3 Sheets-Sheet 2

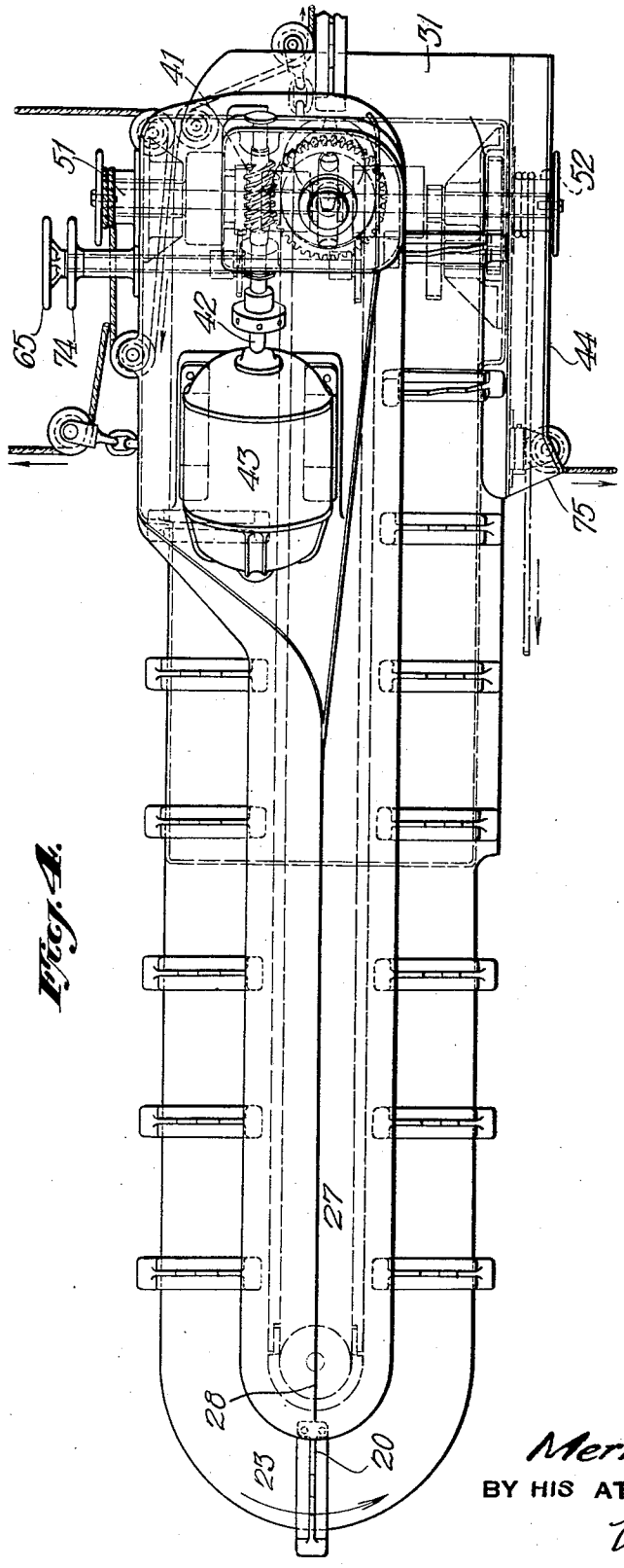


Fig. 4.

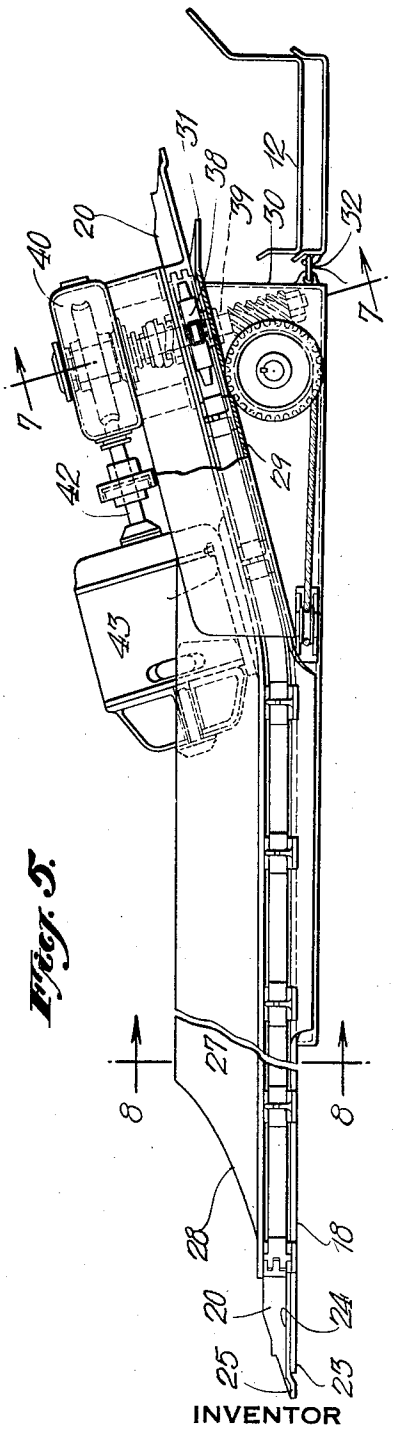


Fig. 5.

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MACHINE FOR HANDLING COAL AND OTHER LOOSE MATERIAL IN MINES

Filed Aug. 26, 1931 3 Sheets-Sheet 3

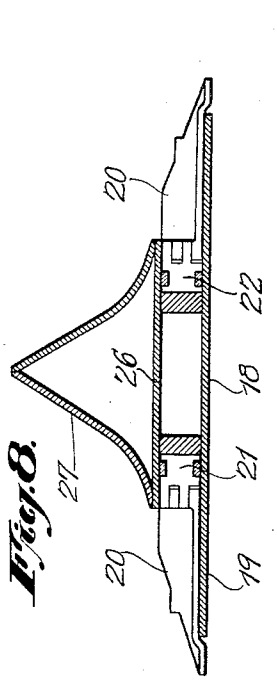


Fig. 8.

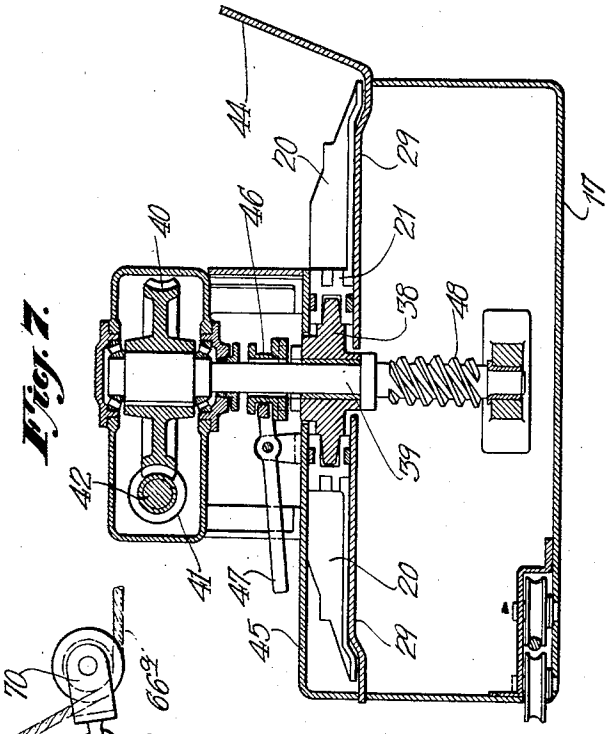


Fig. 7.

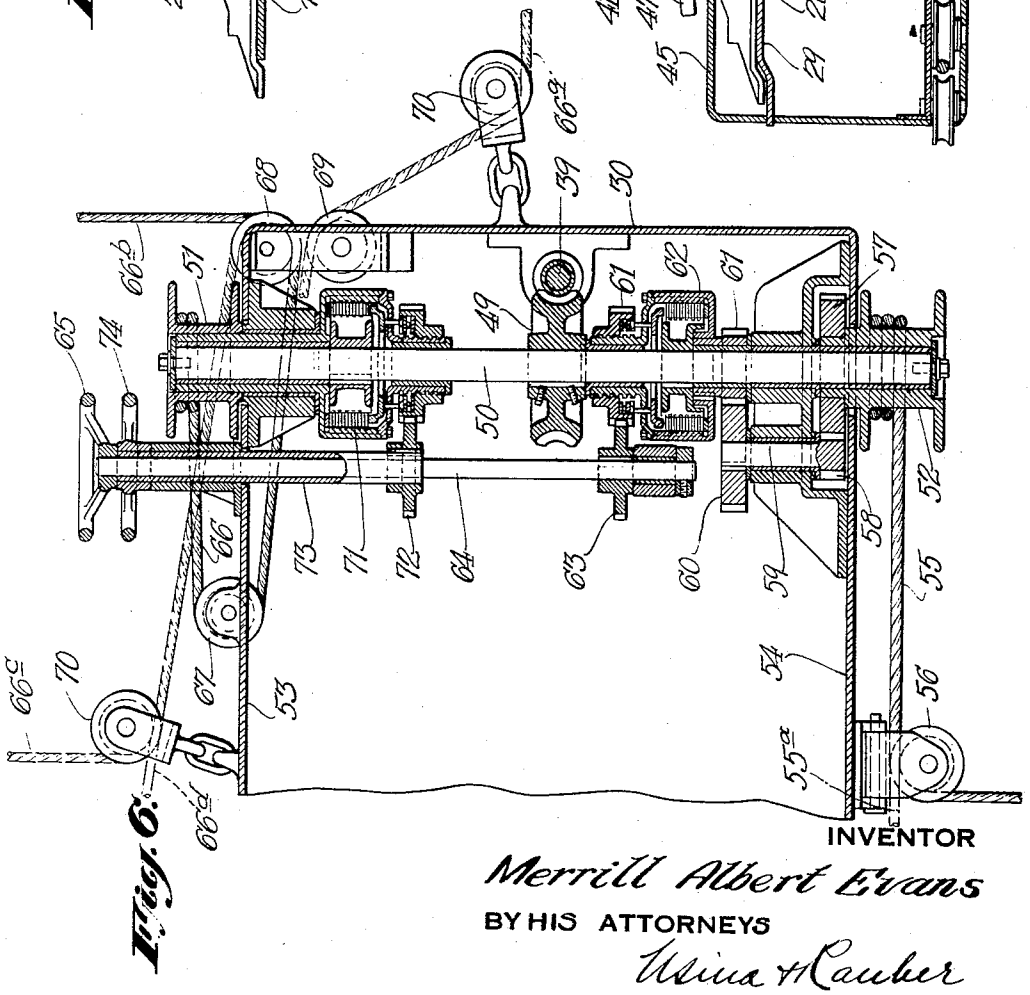


Fig. 6.

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UNITED STATES PATENT OFFICE

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MACHINE FOR HANDLING COAL AND OTHER LOOSE MATERIAL IN MINES

Application filed August 26, 1931. Serial No. 559,405.

The invention aims to provide a machine of simple construction which is highly efficient, is easily moved and directed under its own power, and which can be used to disintegrate the material and to convey it to a second conveying unit of any usual or suitable type.

The accompanying drawings illustrate an embodiment of the invention.

Fig. 1 is a diagrammatic plan view showing the beginning of the attack on the wall of loosened coal.

Fig. 2 is a similar view showing the progress of removal of the coal.

Fig. 3 is a similar view showing an alternative arrangement of the standard conveyers.

Fig. 4 is a plan view and Fig. 5 a side elevation of the handling machine.

Fig. 6 is a horizontal section through the main shaft which controls the movements of the apparatus.

Fig. 7 is a section on line 7—7 of Fig. 5.

Fig. 8 is a section on line 8—8 of Fig. 5.

Referring first to Figs. 1, 2 and 3, the machine is indicated with its front end entering a pile 11 of loosened coal. The front end removes the coal by digging under it at the floor and feeding the coal backward to a portable conveyer 12 which in turn carries the coal to a sectional conveyer 13 which conveys it to mine cars. As the coal is thus removed from the wall, the machine is fed forward by means of cables attached to jacks 14, 15, or other fixed points, and taken up by motor operated drums on the machine. When the machine has thus been advanced to the end of the wall of loosened coal, it is pulled sidewise, as in Fig. 2, by fastening one of the cables to a jack 16 in a line transverse to the length of the machine. As the operation continues the machine progresses sidewise and continues to feed the coal to the portable conveyer 12, which is hooked to the rear end of the machine and moves laterally with it.

The operation is similar in the arrangement of Fig. 3, except that the portable conveyer 12 extends along the face of the wall from the excavating machine to the sectional conveyer 13, the end of the conveyer 12 being adjustable along the sectional conveyer 13 to allow for the movement of the machine along the wall of material.

The machine is carried on a flat base 17 resting on the floor and supporting the operating mechanism. Beyond the operating mechanism is an extension comprising a flat horizontal plate 18 which is positioned parallel with the base of the main frame and slightly above the floor plate 17. The smooth, broad, sliding surface of the base 17 distributes the weight of the motive apparatus and connected parts so as to minimize the digging into or breaking of the floor of the mine. On the sides 19 of the extension travel the series of blades 20 which are connected at their inner ends to an endless chain 21 traveling around upright guides 22 carried on the plate 18. The forward end 23 of the extension plate is rounded or pointed (Fig. 4). The blades 20 have flanges 24 resting on the plate 18. The ends of the blades project beyond the outer edges of the plate and are of reduced height, tapering to a point 25 (Fig. 5) which is substantially at the floor line at the front end of the machine. This shape and arrangement of the blades and the front end of the plate permit them to enter the wall of material easily and to remove the material clear to the floor.

On the center of the plate 18 there is a cover plate 26 with upwardly converging sides 27 forming a wall along the back of the feed side of the conveyer which deflects onto the conveyer any falling material. The plates 27 at the front end of the machine are tapered off to substantially a plow point 28, Fig. 5, to facilitate the entrance of the machine into the material. The sides 27 of the central portion of the conveyer extend to the back of the machine and form part of the casing around the motor and mechanism.

At the rear, the plate 18 has an upwardly inclined portion 29 which extends over the rear end plate 30 of the casing and has a lip 31 adapted to overhang the portable conveyer 12 so as to drop the coal into the conveyer as it is swept over the end of the plate by the blades 20. The conveyer may be loosely hooked to the rear end of the machine by

means of a link 32 when sumping or working in a narrow place.

The chain carrying the blades 20 is driven by a sprocket wheel 38 on a shaft 39 at the upper end of which is a worm gear 40 driven by a worm 41 on the shaft 42 of an electric motor 43. The lower side of Fig. 4 is the feed side of the apparatus along which the coal is carried from the wall to the portable conveyer. In the ascending part of the plate on which the coal is carried, at the rear of the machine this plate 29 is provided with an upward flange 44, Fig. 7, which prevents the pushing of the coal off the edge and guides it to the end where it drops onto the portable conveyer.

At the return side (Fig. 7) the chain and blades run under a plate 45 which supports parts of the mechanism at this end of the machine.

The shaft 39 is in continuous rotation. The sprocket wheel 38 is loose thereon and is clutched or unclutched by means of a clutch sleeve 46 on the shaft actuated by a hand lever 47.

The shaft 39 has at its lower end a worm 48 which drives a worm gear 49, Fig. 6, which is fixed on a shaft 50 extending across the rear end of the machine. This shaft drives the automotive device by which the machine can be forced into the wall, or across the face of it, or can be retracted. Rope drums 51 and 52 are mounted loosely on the ends of the shaft at points beyond the side walls 53 and 54.

The drum 52 has attached to it one end of a feed rope 55 by which the machine can be fed sidewise in the manner of Fig. 2. The rope passes over a pulley 56 and thence in a lateral direction to an anchor 16, as in Fig. 2, or it may be to an anchor 14 as in Fig. 1, when feeding the machine endwise into the wall. The drum carries a gear 57 driven by a pinion 58 on a shaft 59 carrying a gear 60 which is driven by a pinion 61 loose on the shaft 50. A clutch 62 serves to clutch the pinion 61 to the shaft so as to drive the drum. The clutch is actuated by a pinion 63 on a shaft 64 actuated by a hand wheel 65 at the rear side of the machine. The gearing for the drum 52 is a speed reduced train so as to advance the machine slowly sidewise against the material at a rate corresponding roughly with the rate of removal of the material. The movement of the machine can be exactly co-ordinated by the operation of the hand wheel 65.

The drum 51 is primarily for handling the machine during its initial endwise entrance into the wall of material or during its retraction. Fastened to the drum is the end of a cable 66 which passes forward over a guide pulley 67, thence rearward over a guide pulley 68. From this point the cable may extend in several different directions. It may pass toward the center of the machine over a guide pulley 69 and thence over a detachable pulley 70 and out toward the rear, as indicated at 66*a*, so that when it is taken up on the drum the machine will be pulled to the rear out of operating position; or it may pass from the pulley 68 in a lateral direction, as indicated at 66*b*, so as to swing the rear end of the machine around or to hold it steady, as in Fig. 2; or it may pass forward from the pulley 68 over a detachable pulley 70 and transversely away from the machine, as at 66*c*, so as to balance the pull of the cable 55 at the opposite side and steady the machine; or it may extend forward, as at 66*d*, the cable being at the same time extended forward, as at 55*a*, so as to advance the machine endwise into the wall. (See Fig. 1.)

The drum 51 is connected to the shaft 50 through a clutch 71 operated by a pinion 72 on a hollow shaft 73 which surrounds the shaft 64 and which is manipulated by a hand wheel 74 at the rear side of the machine adjacent to the hand wheel 65. Thus the operator standing behind the rear end of the machine can easily regulate the direction and rate of movement of the machine as it enters the wall endwise or progresses sidewise along the material and can also control the withdrawal of the machine when the work is done at one location.

The machine is extremely compact permitting it to operate in a small space and particularly where headroom is limited. The entering end of the machine is very flat. The rear end is of comparatively little height. The width of the space occupied by the operating mechanism lies within the outside lines of the paths of the blades. The movement of the machine and the disintegrating and removal of the material take place at one time, although these movements may be dis-simultaneous. The very flat or low feeding extremities of the blades work under the loosened material and disintegrate it so that it continually falls down on the floor of the machine and is carried back to the portable conveyer. It is particularly adapted to mining coal and ore where the conditions require simplicity, compactness, durability and facility of operation in crowded places, and where we are apt to encounter bad roof, soft bottom, necessary cleaning at the face and thinness of seams,—conditions which make mechanical loading difficult. The compactness of the machine in length and width allows the timbering to follow up very closely the face of the wall, as is necessary where roof conditions are poor. The continuous but relatively slow speed with which the machine advances and loads allows the coal to be cleaned from the wall under normal conditions. Visibility, which is a big factor in cleaning coal by hand, is well maintained be-

cause the action of the machine raises very little dust.

The coal is deposited only on a narrow portion of the portable conveyer which is connected at its rear end, so that it affords a good picking table for removing foreign matter.

The machine is particularly adapted to thin seams, since the limiting factor for the working height of seams is the height of the machine and this is reduced to a minimum by the compact arrangement of the driving mechanism.

The flange plate 44 referred to above extends outward from the forward side of the machine so as to provide an offset or shoulder 75, Fig. 4, which by engaging the wall of material as in Fig. 2, facilitates the entrance of the base plate into the material. This endwise, forward movement of the machine or sumping operation is also facilitated by the shape of the blades with downward offsets at their ends which overlie the edge of the supporting plate which serve to break the material apart before it falls upon the conveyer. At their inner ends each of the blades has a sufficient height to make a strong attachment to the chain.

The endless chain may be reversed by releasing the automotive clutches and reversing the motor. When the coal has been loaded out the motor is stopped, the three clutches released and the handling rope arranged as at 66*a* and fastened to a jack at a distant point. The motor being started and the handling clutch tightened, the machine will pull itself away from the face of the wall.

Various modifications may be made by those skilled in the art without departing from the invention as defined in the following claims.

What I claim is—

1. In machines of the class described, an enlongated one pieced conveyer plate having a horizontal section and an upwardly inclined section terminating in a downwardly extending lip section, a base frame therefor, said frame comprising a box-like casting with rounded edges having a flat bottomed base plate and side walls adapted to receive the said conveyer plate to support the same with the horizontal section in part extending beyond the base plate at a slightly higher horizontal level, and with the inclined section resting upon one of said walls, an endless chain mechanism centrally disposed on said conveyer plate along its longitudinal axis, a housing therefor forming a runway about the outer face of said plate, a plurality of gathering arms spaced upon said chain and adapted to travel along said runway in substantial contact with the surface thereof, each of said arms comprising a base portion and a vertically extending fin portion, the base portion extending laterally beyond the outer edge of said conveyer plate and the fin portion tapering from its inside edge towards the end of the base portion and terminating with the base portion in a substantial point, the said point being located approximately on the same horizontal level as the under face of said conveyer plate, means disposed above the conveyer plate to energize said endless chain mechanism, and clutch means disposed below the conveyer plate to engage automotive propelling means said first means to position the machine with respect to material to be gathered.

2. In machines of the class described, a gathering apparatus comprising a one piece conveyer plate having an elongated horizontal section terminating in an arcuate end and an upwardly inclined section terminating in a downwardly extending lip section, a flat bottomed supporting frame therefor, the horizontal portion of said conveyer plate being supported therein so as to extend therefrom at a slightly higher horizontal level than the bottom of the said supporting frame, an endless chain mechanism centrally disposed along the longitudinal axis of said conveyer plate, a housing therefor forming a runway about the entire outer face of said plate, a plurality of gathering arms spaced upon said chain and adapted to travel along said runway in substantial contact with the surface thereof, said arms each having a base portion extending laterally from said chain to beyond the edge of said plate, each base portion carrying a tapered vertically extending member thereon, the taper on said member running downwardly from the section adjacent the said housing and terminating at the end of the base portion substantially in a point, the said point being positioned at approximately the horizontal level of the bottom face of the conveyer plate, means disposed above said conveyer plate to operate said endless chain mechanism, and clutch means disposed below said conveyer plate to engage automotive propelling means said first means to position the machine with respect to material to be gathered by the said gathering apparatus.

3. In machines of the class described and claimed in claim 1, a bed frame comprising a one piece box shaped casting having a bottom plate adapted to rest upon a mine floor, the upright side sections thereof being molded to support a conveyer plate positioned thereon, the edges of said bed frame being substantially rounded.

4. In machines of the class described and claimed in claim 1, a one piece conveyer plate, said plate having an elongated horizontal section terminating in an arcuate end and an upwardly inclined rear section terminating in a downwardly disposed lip section.

5. In machines of the class described and claimed in claim 1, a one piece conveyer plate,

said plate having an elongated horizontal section terminating in an arcuate end and an upwardly inclined rear section terminating in a downwardly disposed lip section, said inclined section carrying a vertical extension along one edge thereof.

6. In machines of the class described and claimed in claim 1, a one piece conveyer plate, said plate having an elongated horizontal section terminating in an arcuate end, an upwardly inclined rear section terminating in a downwardly disposed lip section, said inclined section carrying a vertical extension along one edge thereof forming a grooved alley way intermediate said vertical extension and the base of the plate, said alley way communicating with the said downwardly disposed lip section and extending part way about the periphery of the opposite edge of said inclined section and being adapted to receive the downwardly turned point ends of gathering arms of an endless belt conveyer longitudinally positioned on said conveyer plate.

In witness whereof I have hereunto signed my name.

MERRILL ALBERT EVANS.