Aug. 15, 1933. L. A. MILLER 1,922,972

METHOD AND MEANS FOR HANDLING EXCAVATED MATERIAL

Filed July 28, 1931 3 Sheets-Sheet 1

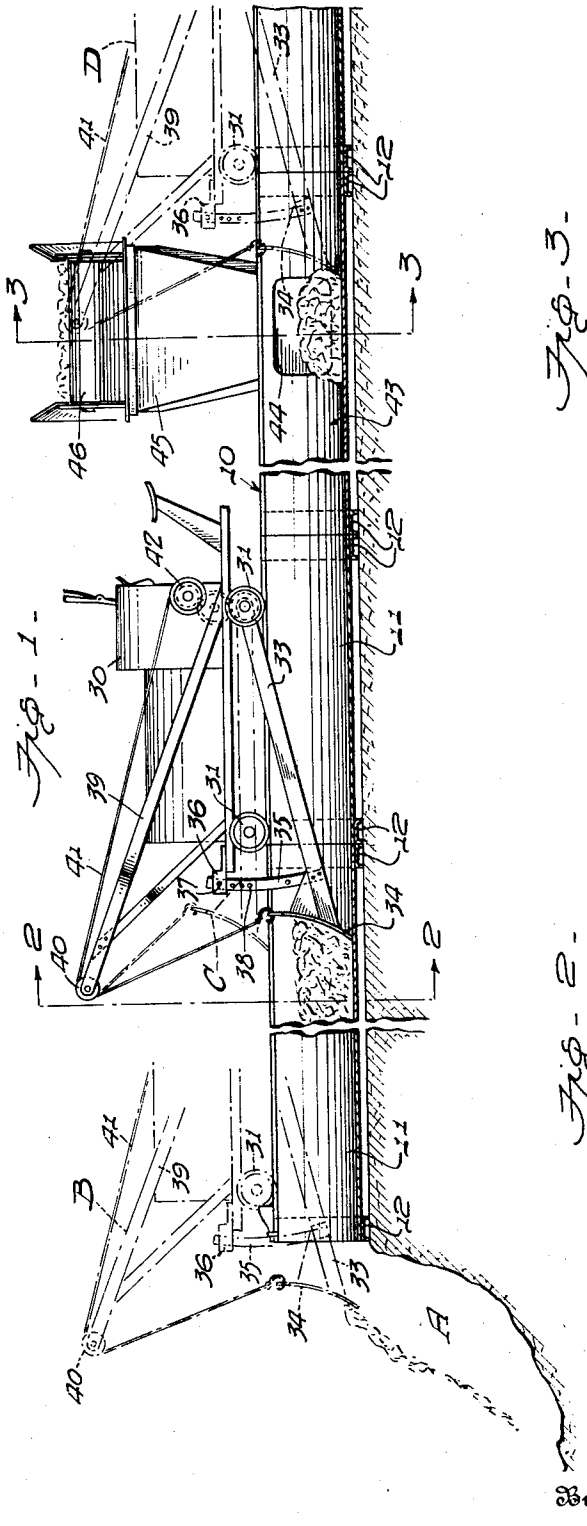


Fig. 1.

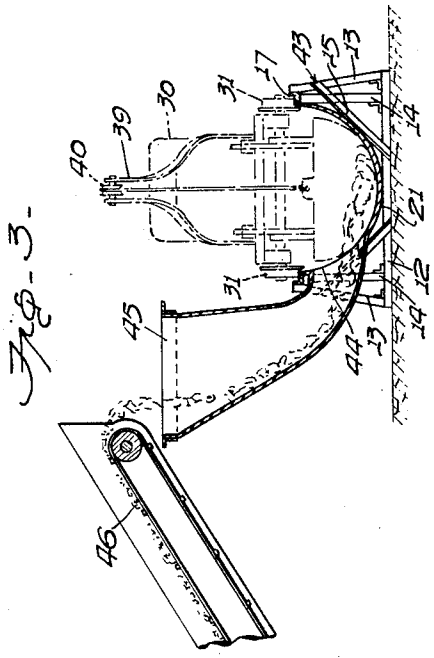


Fig. 3.

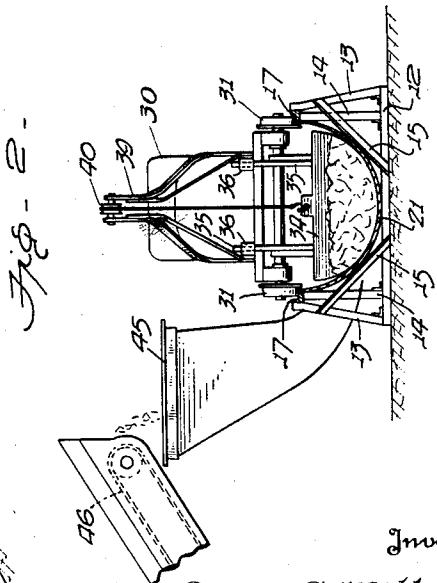


Fig. 2.

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METHOD AND MEANS FOR HANDLING EXCAVATED MATERIAL

Filed July 28, 1931 3 Sheets-Sheet 2

Fig. 4.

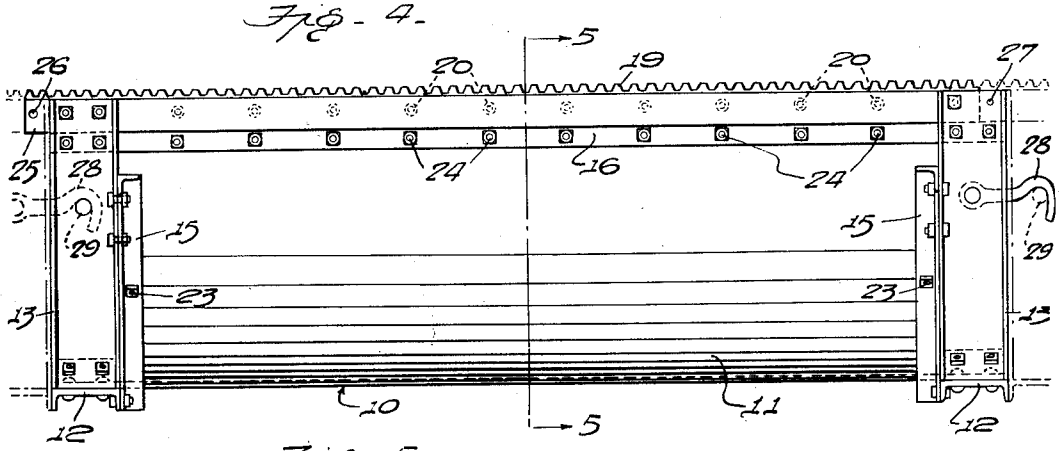


Fig. 5.

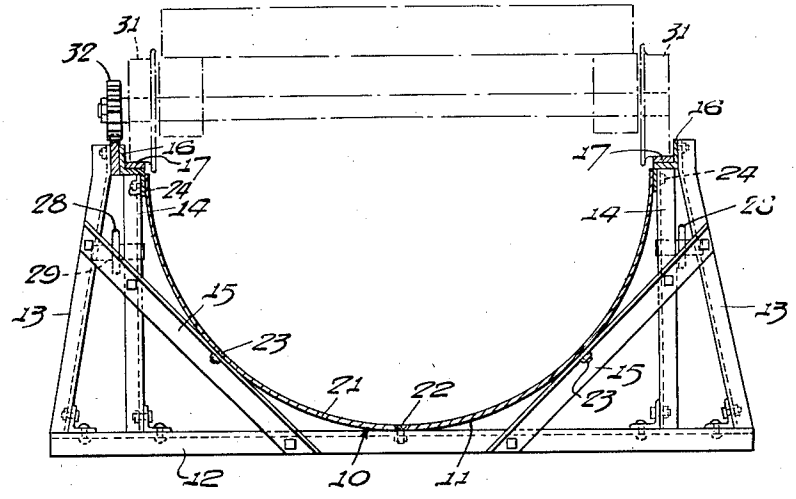


Fig. 6.

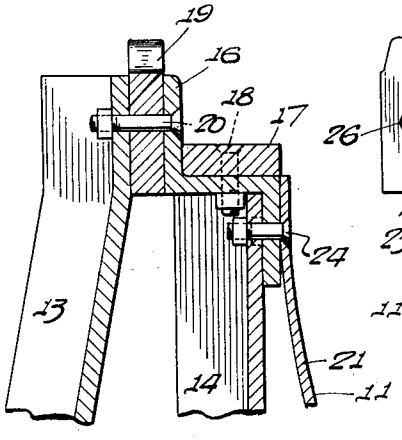
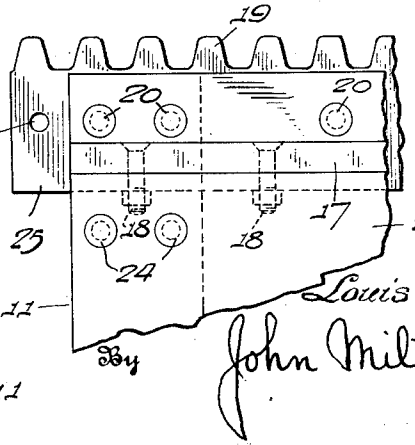


Fig. 7.



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METHOD AND MEANS FOR HANDLING EXCAVATED MATERIAL

Filed July 28, 1931 3 Sheets-Sheet 3

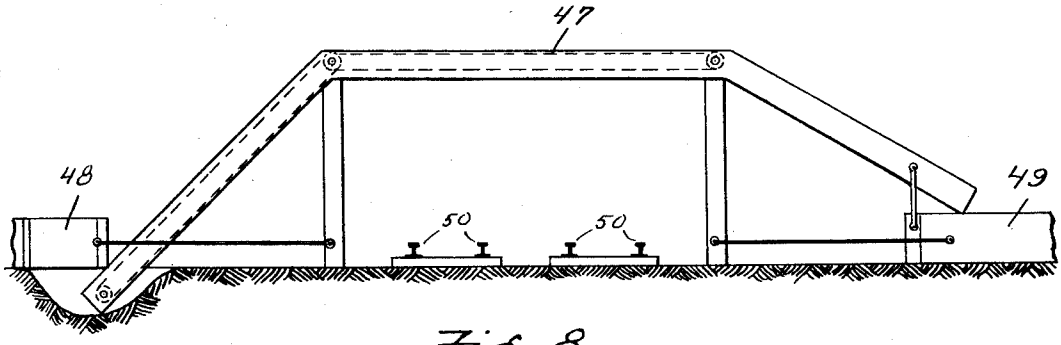


Fig. 8.

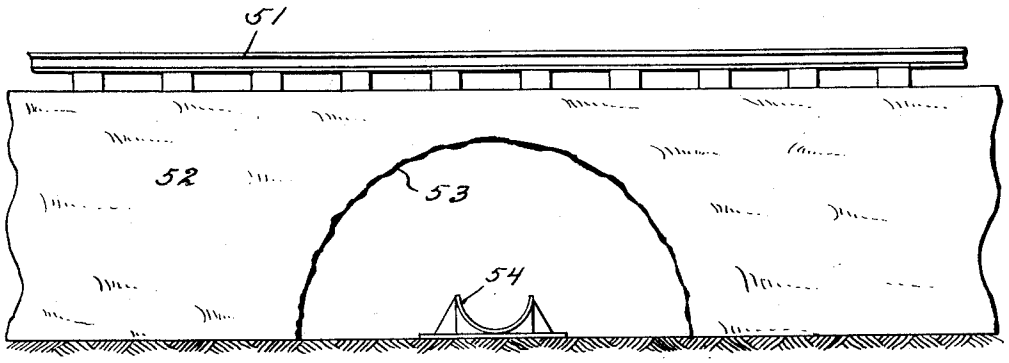


Fig. 9.

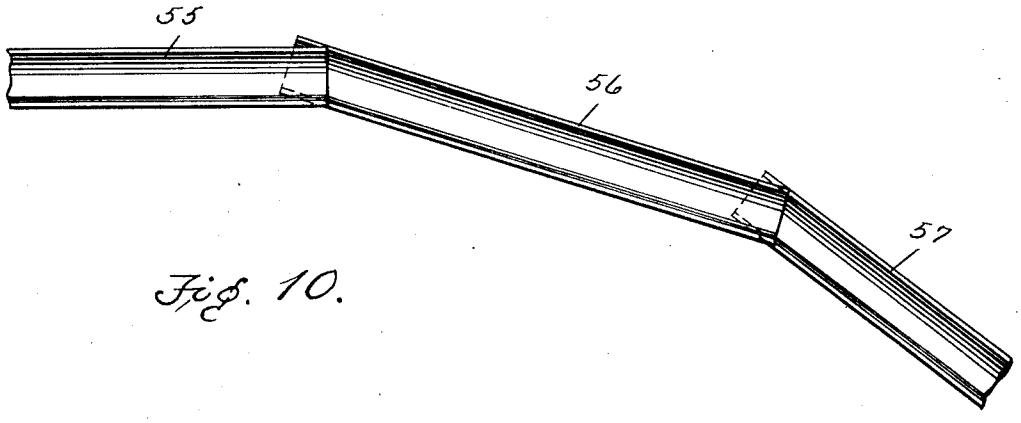


Fig. 10.

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UNITED STATES PATENT OFFICE

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METHOD AND MEANS FOR HANDLING EXCAVATED MATERIAL

Louis A. Miller, Kansas City, Mo.

Application July 28, 1931. Serial No. 553,615

9 Claims. (Cl. 198—224)

The invention relates to the handling of excavated material and has for its general object the provision of a novel method together with a combination of means for the purpose whereby the cost of making fills, etc., etc. will be greatly reduced.

It is well known that at present the system of handling excavated material in connection with construction work, where power shovels and other digging apparatus are employed, involves the laying of a track upon which dump or other cars are run. Wagons, trucks, and in fact hauling apparatus of many kinds are also employed to convey excavated material from the point of loading to where it is to be discharged, that is to say placed in an embankment or wasted, and where cuts have to be made through a hill and the material taken therefrom to make an embankment, or what is commonly called a "fill" the custom is to build a trestle and run the cars thereonto and keep discharging the material therefrom until the fill or embankment attains the proper height or level. All of this involves great expense, particularly the building of the trestle which is usually left in the embankment. The pressure of the trestle in the embankment is frequently very undersirable but it is not feasible to remove it after it has become embedded in the material discharged. It is also known that it frequently occurs that where a road, fill or embankment is to be created between two points, material to make the fill is not available from either side or end and it therefore becomes necessary to establish what is commonly called a "borrow pit" from which the necessary material is procured. In some instances this may mean that the material would have to be hauled from a low point to the top of the fill or embankment. This last mentioned contingency may or may not involve the use of a trestle but in any event the problems to be met are difficult to solve and great expense is unavoidable when the material is handled by ordinary methods.

It is with the above facts in view that I have devised the present invention which contemplates providing a method of handling excavated material involving the employment of a sectional chute which may be laid simply upon the surface of the ground as needed and which extends from the point of loading to the point of discharge without any need for a trestle, the chute itself serving as a track upon which may be operated an appropriate locomotive or the like equipped with means for dragging or bulldozing the material along the chute.

An important object of the invention is to provide an apparatus for this purpose in which the chute may be equipped with racks cooperating with gears on the locomotive so as to insure traction and overcome the frictional resistance to movement of the load along the chute.

Another object is to provide an apparatus of this type in which the locomotive may be equipped with crane means not only for raising and lowering the scrapers or bulldozers but also for handling the chute sections necessary to be placed in position as the distance between the points of loading and discharge increases or when the chute is to be disassembled.

A further object is to provide an apparatus in which the chute may have an inlet at its side so that the locomotive, if of the bulldozer type, may be run over the point of loading the chute, such being, however, unnecessary if the locomotive be equipped with hoe-like scrapers instead of bulldozing means.

A more specific object is to provide an apparatus embodying a sectional chute of novel formation whereby it will possess great strength and be capable of sustaining the weight of the locomotive or other traction device travelling along it.

An additional object is to provide a method and apparatus of this character which will be simple to install, inexpensive to operate, rapid and efficient in action, and a general improvement in the art.

To the attainment of the foregoing and other objects and advantages, the invention consists in the method and combination of apparatus for carrying it out to be hereinafter more fully described and claimed, and illustrated in the accompanying drawings in which:

Figure 1 is a sectional view showing a chute with a locomotive operating along it,

Figure 2 is a cross section taken on the line 2—2 of Figure 1 and looking in the direction of the arrows,

Figure 3 is a cross section taken on the line 3—3 of Figure 1 and looking in the same direction,

Figure 4 is a side elevation of one section of a convenient chute,

Figure 5 is a cross section therethrough taken on the line 5—5 of Figure 4,

Figure 6 is an enlarged detail section through the upper edge of the chute.

Figure 7 is a side elevation of what is shown in Figure 6,

Figure 8 is a cross section through a railroad track showing an elevated conveyor arrangement for conducting material across,

Figure 9 is a view showing a method of carrying out the invention if the railroad be on an embankment, and

Figure 10 is a diagrammatic plan view showing a method of avoiding obstructions.

At the very outset it should be distinctly understood that the basic idea of my invention is not dependent upon the use of any specific or definite type of apparatus, except of course in some particulars, as it is readily conceivable that a large number of instrumentalities may be resorted to for accomplishing the desired result. However, I have illustrated and will describe a certain arrangement of parts and devices which will cooperate to carry out my invention with a high degree of success.

Referring more particularly to the drawings I have illustrated a chute designated as a whole by the numeral 10, and this chute is formed of sections 11 one of which is illustrated in considerable detail in Figures 4 to 7. This chute is intended to be laid upon the ground, without any preliminary foundation, and is to serve itself as a trackway along which any suitable haulage devices may be operated. The sections are laid end to end and are detachably connected in such manner that the entire assembly will be more or less flexible so as not to be distorted as the result of irregularities in the contour of the ground.

While, as mentioned above, the construction of the chute might be varied, I have shown each section 11 as comprising horizontal channel bars 12 located at the ends and to which are secured upright channel bars 13 and 14, the latter being located inwardly of the former. The uprights 13 and 14 are provided at each end of each horizontal bar 12 and are braced by diagonally arranged angle bars 15 secured to the bars 13 and 14 and also the bars 12. Secured upon the upper ends of the uprights 14 are Z-bars 16 upon which are preferably provided rail elements 17 secured in place as by bolts 18 which pass through them and through the horizontal portions of the Z-bars. Located between the upper vertical flanges of the Z-bars and the inner faces of the uprights 13 are racks 19 secured in place as by bolts 20. This constitutes the framework. The body of the chute section comprises a preferably substantially semicylindrical shell 21 secured at its bottom to the channel bars 12, as shown at 22, secured at its intermediate portions to the braces 15, as shown at 23, and secured to the uprights 14 and lower vertical flanges of the Z-bars 16, as shown at 24. The rack bar 19 is intended to "break joint" with the remainder of the chute section and is therefore shown as having one end terminating short of the end of the section and its other end provided with an extension 25 formed with a hole 26.

As mentioned above, the chute sections are intended to be laid upon the ground in end to end relation and when this is done bolts are passed through holes 27 in the upper ends of the uprights 13 and Z-bars 16 at one end of each section and through the holes 26 in the adjacent ends of the rack bars of the next section. In order not to rely entirely upon these bolts for holding the sections assembled, I may provide one end of each section with pivoted hooks 28 adapted to engage keepers 29 on the adjacent end of the next section. By virtue of this arrangement it is clear that the successive sections may have limited relative vertical movement so as to avoid damage in the event that the chute is laid upon an uneven or rolling surface.

It is intended that some suitable sort of locomotive or other traction device, indicated at 30, be operated along and upon this chute for the purpose of dragging material from the point where it is loaded into the chute to the point where it is desired for instance to make a fill as indicated at A in Figure 1. Naturally there is no limitation as to the exact form of traction or haulage device but it is necessarily equipped with wheels 31 which travel along the track bars 17. Though it might not always be necessary it is preferably that the wheel axles, at least the driving axle, be equipped with gears 32 meshing with the rack bars 19. Incidentally it might also be mentioned that the rack bars 19 need not be provided at both sides of the chute as one is probably sufficient to prevent slipping of the wheels with respect to the chute and as a matter of fact Figure 5 shows only one gear 32 and one rack bar 19. It should be understood though that the structure can be duplicated at both sides of the chute if desired. Naturally the intention is that material excavated by cutting down an embankment or procured from a "borrow pit" be deposited by any suitable means within the chute so that the material may be conveyed along it by means of the locomotive. In the present instance the locomotive is represented as of the bulldozer type, that is to say it is equipped with pivoted beams 33 carrying a head 34 of scraper-like form fitting more or less closely within the shell of the chute. These beams are represented as provided with curved arms 35 travelling through guides 36. The beams 33 carrying the head or scraper are of course vertically movable and may be held in elevated or lowered position by the inserting some suitable pin, bolt or the like through holes 37 in the guides 36 and through selected ones of other holes 38 in the arms 35. To effect raising and lowering of the beams and scraper the locomotive is preferably provided with a crane structure including supports 39 carrying a pulley 40 over which is trained a cable 41 connected at one end with the head or scraper 34 and having its other end secured to and wound upon a drum 42 adapted to be rotated by the transmission mechanism of a locomotive. By this means it is very simple to lift the scraper device when the load is discharged into the fill A and it is desired to return the locomotive idly to the point of loading of the chute so that the scraper will not strike against the material dumped into the chute.

Instead of the locomotive being of the bulldozer type as described it is quite evident that it may just as easily be of the scraper type, that is to say instead of pushing the load it may pull it. In such an event beams similar to the beams 33 would be provided carrying a hoe-like scraper, or gang of scrapers, trailing behind the locomotive. The advantage of the bulldozer type is that the load may be pushed directly off the end of the chute into the fill as illustrated in Figure 1 whereas if the scraper type is used such could not be done as the material would be left at a point spaced considerably short of the end of the chute, thus necessitating that it, the material, be shoveled off. Referring to Figure 1 the discharging position of the locomotive is shown in dot and dash lines at B. The normal position of the scraper or bulldozer 34 is shown in full lines while

its elevated or inactive position is illustrated at C by dot and dash lines.

If the locomotive be of the trailing scraper type it is clear that the material where the cut is made may be deposited within the chute by the simple expedient of dumping it in by means of a power shovel, conveyor or anything else for the reason that the locomotive itself does not have to pass over the material, only the trailing scraper passing over, this latter causing no difficulty as it is a simple matter to lift whatever scraper is provided. However, when the bulldozer type is used it is obvious that it could not very well run over the material charged into the chute unless care be taken that the material does not pile up above the top. In view of these circumstances I may resort, if desired, to the use of means for charging the chute from the side instead of the top and at the right of Figure 1 and also in Figures 2 and 3 I have shown a chute section 43 in which the shell is formed with an opening 44 through which material may pass into the chute through an upstanding loading chute or funnel-like device 45 located at the side in position to have material dumped directly into it by any means, for instance the conveyor shown at 46. Material introduced within the chute by this means will not project above the top and will consequently not clog the trackways and racks so that the bulldozer type of locomotive may be used. In actual use, it should be understood that after the locomotive has discharged a load into the fill it is run back along the sectional chute with the scraper member and its beams in elevated position, until the entire traction device passes over the material fed into the chute and reaches the position indicated by dot and dash lines at D, whereupon the beams together with the scraper head are lowered so that upon forward movement of the locomotive the charge of material will be forced along the chute to the discharge end. In the carrying out of the above mentioned operation it will be seen that the work of loading material into the chute may be continuous, there being no lost motion in this respect as is bound to be the case with ordinary handling systems.

In the practical carrying out of my invention while I have referred to only one locomotive it should be understood that if desired more may be used, operating in relays, one dragging the load a certain distance and another picking it up and dragging it or bulldozing it the remaining distance or a portion of the remaining distance after which yet another may come into play, the reason for this being that in the event that the distance between the point of loading and discharge is very great the material accumulating at the loading point might become too great while the previous charge is being forced along the chute by the locomotive. In other words it would appear that for rapid action the longer the chute the greater should be the number of traction devices operating along it.

By virtue of the provision of the crane device on the locomotive it becomes a simple matter to build on to the chute as the fill A becomes filled up. As the material discharged from the chute builds up within the fill and the surface becomes level with the surface at the end of the chute an additional chute section must be placed in position and the crane above referred to permits this to be done in a simple and expeditious manner.

In the use of my system and apparatus it is of course to be considered that like with all other systems there is the possibility that it is necessary to carry the load over a road, highway, railroad track or the like, in which event it is easily conceivable that an elevated conveyor 47 might be provided onto which the material might be discharged from the chute 48 and which could be utilized for conducting the material to a similar chute 49 located at the other side of the obstruction. This is illustrated in Figure 8 wherein a railroad track is shown in section at 50. If the railroad 51 be on an embankment 52 as shown in Figure 9, a tunnel 53 may be cut for the passage of the chute 54.

From the foregoing description and a study of the drawings it will be apparent that I have thus provided an extremely simple method and combination of apparatus for the rapid and effective handling of excavated material and the like. It will be observed that there is no necessity whatsoever for building any trestle as the chute is intended to be prolonged from time to time as a fill is made. Consequently this tremendous item of expense is avoided. Furthermore the disadvantage of having an embankment with a trestle embedded in it is eliminated. My system should work out with the greatest degree of economy when it is considered that it provides the shortest path between points of loading and discharge, the importance of this feature becoming more readily apparent when it is ordinarily considered that costs are based upon a minimum haul of five hundred feet beyond which additional distances are charged for on a basis of units of one hundred feet. Clearly the greatest possible reduction in the distance will result in the very least cost per cubic yard of material handled. Another point well worthy of mention is that by the employment of my chute system it might be conceivable, if the terrain so requires, to provide a plurality of sectional chutes arranged at different angles and discharging one into another, as shown diagrammatically at 55, 56 and 57 in Figure 10, each of course having its own locomotive or locomotives. By this means an insurmountable obstruction might be avoided in a simple manner. It is really believed that the carrying out, operation and advantages of my scheme will be apparent to one skilled in the art without further explanation.

While I have shown and described a preferred embodiment of the invention and have made certain definite references to detailed features, it should be understood that the disclosure is merely an exemplification of the principles involved as the right is reserved to make all such changes in the details of construction as will widen the field of utility and increase the adaptability of the device provided such changes constitute no departure from the spirit of the invention or the scope of the claims hereunto appended.

Having thus described the invention, I claim:

1. In a system for handling excavated material, the combination of a sectional chute adapted to be laid upon the ground to extend from a loading point to a point where discharge of material is desired, and a power operated traction device travelling along the chute as a track and equipped with means entering the chute for moving material therealong, the chute having lateral inlet entirely below its top.

2. In a system for handling excavated material, the combination of a chute adapted to be laid upon the surface of the ground and formed of separable sections arranged in end to end relation, and a plurality of traction devices movable along the chute as a track in relays for

selected distances, and means carried by the traction devices and entering the chute for moving material therealong, the chute having a lateral inlet entirely below its upper edge.

3. An apparatus for handling excavated material, comprising in combination, a sectional, self supporting chute adapted to be laid directly upon the open ground from a loading point to a point where discharge of material is desired, a power operated traction device travelling along the chute as a track and equipped with a scraper member entering the chute for moving material therealong, and coacting rack and pinion means on the chute and traction device for preventing slipping of the latter with respect to the former during its travel, the rack means on the successive chute sections being pivotally connected whereby the sections may gravitationally conform to irregularities in the terrain.

4. In a system for handling excavated material, the combination of a chute adapted to be laid upon the ground and formed of sections arranged in end to end relation, means flexibly connecting the sections to permit limited relative movement thereof to conform to inequalities in the surface of the ground, wheeled traction devices power operated and movable along the chute as a track, means movably mounted on the traction devices and disposable within the chute for engaging and moving material therealong, and a laterally arranged inlet chute entering the side of one of the chute sections below the top thereof to avoid interference with the traction devices, and constituting the loading point.

5. In an apparatus for handling excavated material, a chute adapted to be laid upon the ground to extend between a loading point and a point where discharge of material is desired, said chute being formed of sections arranged in end to end relation and flexibly connected, each section comprising a skeleton frame including horizontal Z-bars having upper and lower vertical flanges and a horizontal web connecting the same, a substantially semicylindrical shell mounted therein and secured to the lower vertical flanges, a bar on the web serving as a rail, and a rack secured to the upper vertical flange.

6. In an apparatus for handling excavated material, a chute adapted to be laid upon the ground to extend between a loading point and a point where discharge of material is desired, said chute being formed of sections arranged in end to end relation and flexibly connected, each section comprising a skeleton frame and a substantially semicylindrical shell mounted therein, and a rack bar carried by each section and detachably and pivotally connected with the next adjacent section and adapted to serve as slippage preventing means for a traction device movable along the chute as a track.

7. In an apparatus for handling excavated material, a chute adapted to be laid upon the ground to extend between a loading point and a point where discharge of material is desired, said chute being formed of sections arranged in end to end relation and flexibly connected, each section comprising a skeleton frame and a substantially semicylindrical shell mounted therein, and a rack bar carried by each section and detachably connected with the next adjacent section and adapted to serve as slippage preventing means for a traction device movable along the chute as a track, said rack bars projecting beyond one end of each section and terminating short of the other end whereby to break joint with the end portions of the sections.

8. A chute of the character described comprising a plurality of connected sections each comprising a skeleton frame including horizontal bottom bars, vertical bars rising therefrom, a substantially semicylindrical shell located within the confines of said frame and secured to the bottom bars, Z-bars mounted on the upper ends of the vertical bars and including upper and lower vertical flanges connected by a horizontal web, said lower vertical flanges being secured to the upper ends of the vertical bars and the upper edge portions of the shell, upwardly converging braces secured to said bottom bars, upwardly diverging braces secured to the lower bars, the vertical bars and first named braces and also secured to the shell, a rack bar secured to each upper vertical flange and to the upper ends of the first named braces, one end of each rack bar terminating short of the shell and the other end projecting beyond the other end of the shell whereby a plurality of the sections may be connected in series.

9. A chute of the character described comprising a plurality of connected sections each comprising a skeleton frame including horizontal bottom bars, vertical bars rising therefrom, a substantially semicylindrical shell located within the confines of said frame and secured to the bottom bars, Z-bars mounted on the upper ends of the vertical bars and including upper and lower vertical flanges connected by a horizontal web, said lower vertical flanges being secured to the upper ends of the vertical bars and the upper edge portions of the shell, upwardly converging braces secured to said bottom bars, upwardly diverging braces secured to the lower bars, the vertical bars and first named braces and also secured to the shell, a rack bar secured to each upper vertical flange and to the upper ends of the first named braces, one end of each rack bar terminating short of the shell and the other end projecting beyond the other end of the shell whereby a plurality of the sections may be connected in series, a hook pivoted upon one end of each section, and a keeper on the adjacent end of the next section engageable by the hook whereby a plurality of the sections may be flexibly connected and enabled to conform substantially to the terrain.

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