May 24, 1932. J. A. ELLIOTT 1,859,659

SWINGING BUCKET LINE EXCAVATOR

Filed April 21, 1930 4 Sheets-Sheet 1

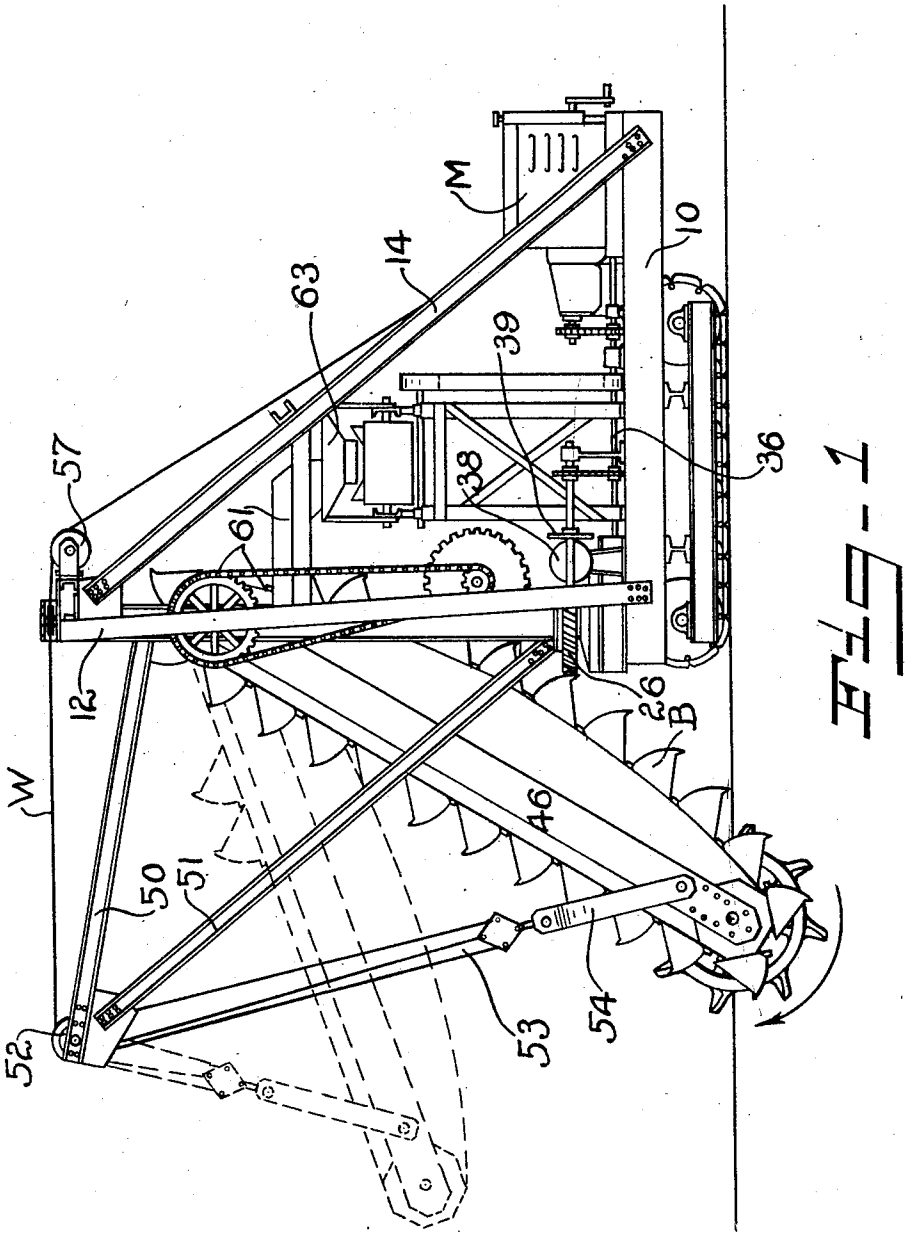


Fig. 1

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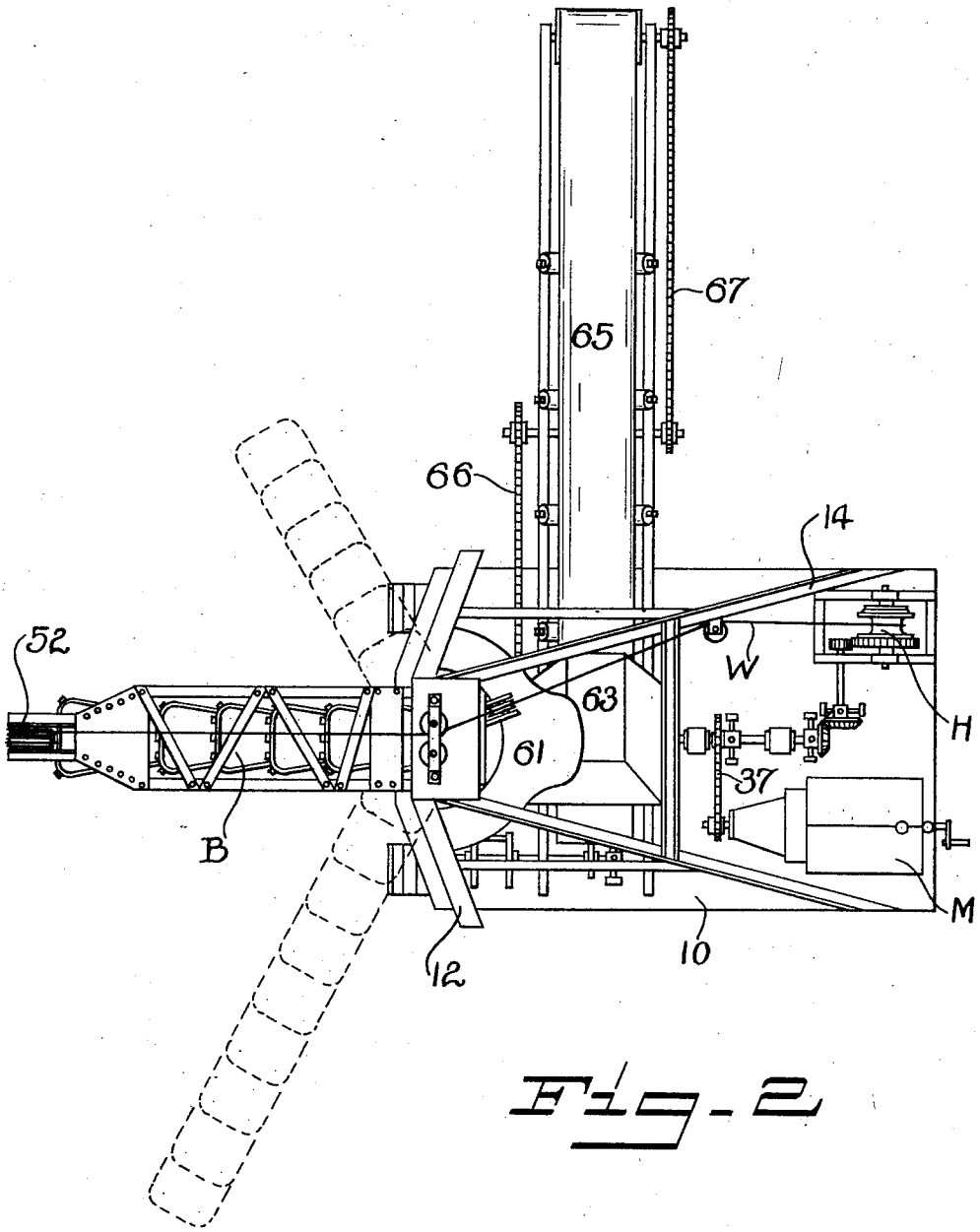


Fig. 2

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SWINGING BUCKET LINE EXCAVATOR

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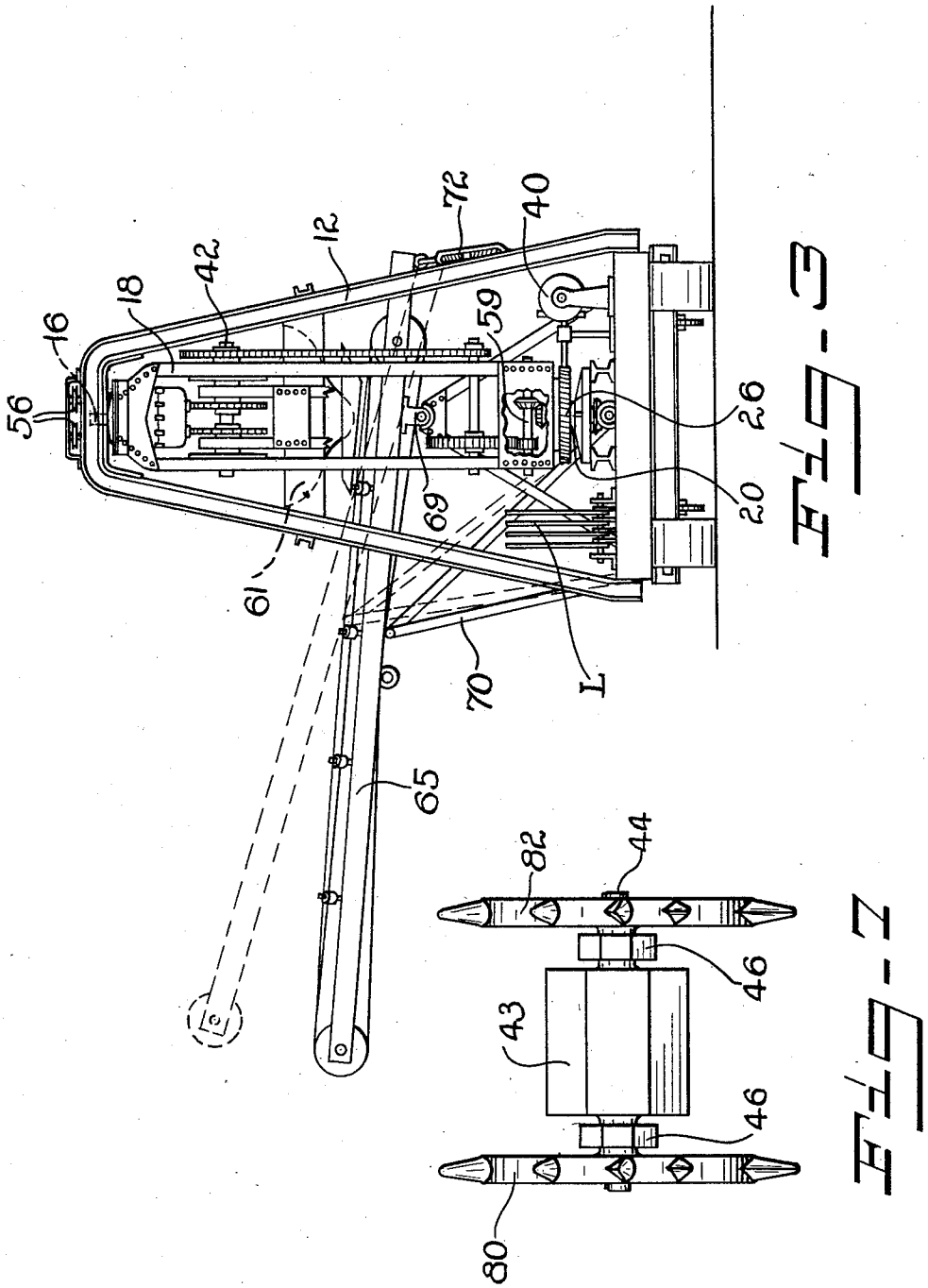


FIG. 3.

FIG. 2.

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SWINGING BUCKET LINE EXCAVATOR

Filed April 21, 1930 4 Sheets-Sheet 4

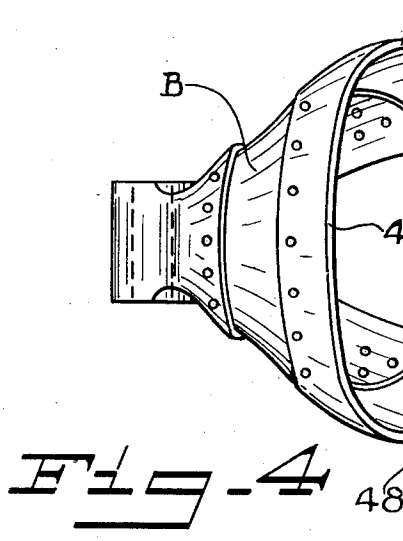


Fig-4

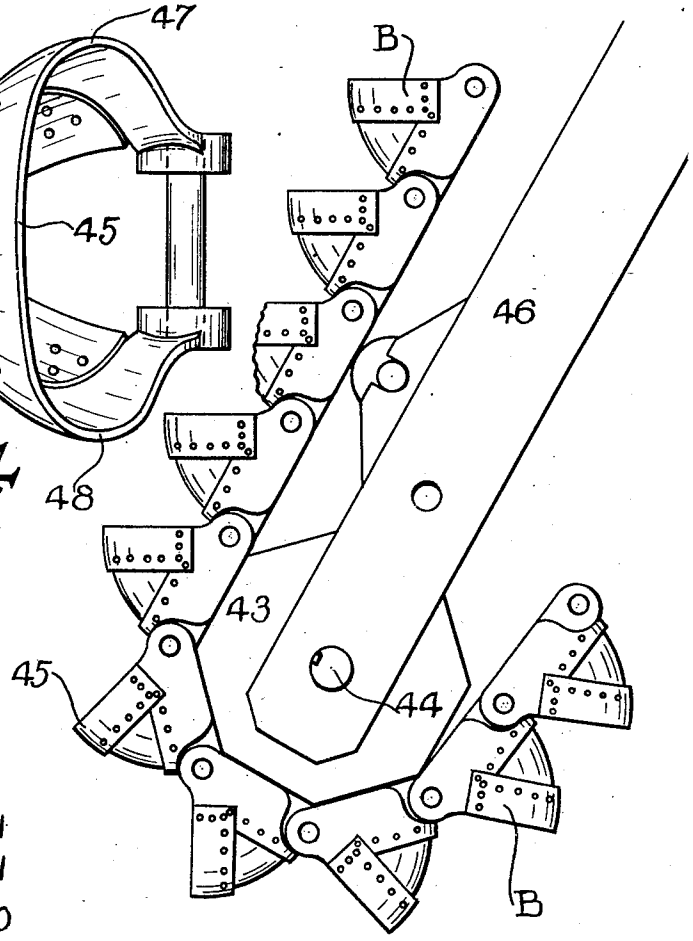


Fig-5

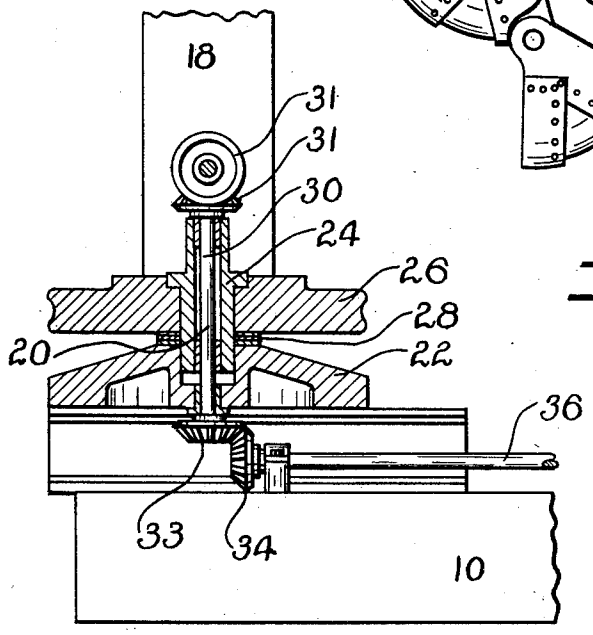


Fig-6

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UNITED STATES PATENT OFFICE

JAMES A. ELLIOTT, OF SEATTLE, WASHINGTON, ASSIGNOR OF ONE-THIRD TO FRANCIS T. HILLMAN, AND ONE-THIRD TO LEE A. DOLAN, BOTH OF SEATTLE, WASHINGTON

SWINGING BUCKET LINE EXCAVATOR

Application filed April 21, 1930. Serial No. 445,866.

My present invention relates to the art of excavating machinery, more particularly to that type of excavator known as a bucket excavator, or which may be more specifically designated as a swinging bucket line excavator.

My machine is primarily intended to do that general class of work that cannot now be successfully accomplished by the various types of power driven shovels or the bucket ditchers or dredgers now in use. There is a wide variety of this type of work, outstanding among which are such uses as digging ditches that are too wide for the ordinary type of trench digger and which are too narrow or too deep to permit the satisfactory operation of the conventional power shovel. Another particular use is that of shallow cutting such as creating a street or sub-grade. Quite often it is necessary to remove only a few inches of ground to get down to the proper grade. A power shovel cannot be used satisfactorily under these conditions, and, of course, the trench diggers are of no use whatever. With my type of machine it is quite easy to produce accurate grades under these conditions.

A further use for my machine is cleaning out the loosened materials in tunnel work particularly. This is usually termed mucking. My machine, by being designed for this purpose can be used very successfully this way. The objects of my invention are therefore:

First: To provide an excavating machine which is more easily handled and maneuvered than the usual power shovels and which will do the work more economically.

Second: To provide a machine of this character which is readily portable as the various units comprising the same are small, light in weight and can be easily removed and reassembled, to facilitate transportation.

Third: To provide a machine for the type of work indicated wherein only the bucket line swings thus enabling me to produce a lighter and simpler machine.

Fourth: To provide a machine which, for a given weight and cost, will handle larger quantities of suitable material more economically than the conventional equipment.

Fifth: To provide a machine capable of tunnel mucking.

Other and more specific objects will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Figure 1 is a side elevation of my device the bucket line being shown approximately in its extreme position.

Figure 2 is a top-plan view showing the maximum swings of my bucket line in dotted lines.

Figure 3 is an end elevation with the bucket line removed to better illustrate the pivoting arrangement.

Figure 4 is an enlarged view showing a single bucket of the type I prefer to use.

Figure 5 is an enlarged view of the end of my bucket conveyor, to more clearly bring out certain types of construction.

Figure 6 is a fragmentary cross-sectional view through the lower pivot of my machine, certain parts being shown in section to better illustrate the drive means.

Figure 7 is an end elevation of my bucket support means and showing particularly my ground breaking members.

Referring to the drawings throughout which like reference numerals indicate like parts, numeral 10 designates the main frame or base of my machine. This is supported upon and is adapted to be moved about by preferably a belt track often referred to as a caterpillar type. This may be driven through suitable drive means by any source of power as by the internal combustion motor "M". This is connected to the belt tracks by means that are well known, and as they form no part of my present invention no further description is deemed necessary.

Supported on base 10 is an inverted U shaped pivot support member 12 which is suitably braced to the base by the diagonally disposed braces 14. At the upper mid-point of member 12 is suitably arranged a vertical pivot axis 16 which forms the upper pivot point for my bucket line support frame 18. Directly below pivot 16 and on the same axis

is the lower pivot member 20. The exact construction that I have found very satisfactory is more completely shown in Figure 6 wherein a frame support member 22 is suitably supported from base 10, and is bored at its center to accommodate a pivot pin 24. Member 24 is secured to the worm gear 26 which in turn is fixedly attached to frame 18. Disposed about pin 24 and positioned between members 22 and 26 may be any suitable type of thrust bearing 28. I have found that alternately placed steel and bronze washers are satisfactory. I prefer to make pin 24 of hollow construction so as to accommodate the driven shaft 30, which, by means of the bevelled gears 31 carry the power upwardly. At the lower extremity of shaft 30 I provide suitable gearing 33 and 34 to operatively connect shaft 30 and the driving shaft 36. The exact manner by which shaft 36 is connected to the motor is relatively unimportant. I have found that in most cases a single shaft as 36 may be either directly connected to the motor or more preferably connected thereto by suitable gearing or by the chain 37. For driving the worm gear 26 I prefer to employ an intermeshing worm which is connected to a friction plate 38. This may be engaged as the operator wills to either friction plate 39 or 40, depending upon which direction it is desired to swing frame 18. The controls are connected to the bank of levers indicated at "L".

Pivotably secured to frame 18 by shaft 42 is a bucket line supporting frame or ladder 46. The exact construction of this member forms no part of this invention as any of the proven types of bucket line supports, such as are used on gold dredges, ditchers and the like, will be satisfactory. I have shown that form which employs buckets linked together and running over a hexagonal drive member attached to shaft 42 and having a hexagonal idler at 43 which is journalled upon the shaft 44. The method of securing the buckets together may follow any of the proven designs.

One feature is essential, however, in this machine. This is illustrated more clearly in Figure 4 and involves having the cutting edge 45 of the buckets extending around each end of the bucket and also having these ends as 47 and 48 extending outwardly sufficiently so that portions 47 or 48 will engage and cut into dirt or soil before the support frame 46 has reached the soil. If the buckets did not overhang I believe it woud be clear that 46 would come to rest against the earth bank and prevent the buckets biting into the same as the bucket line is swung to one side or the other. To facilitate raising my bucket line about its horizontal axis 42 I have provided the overhanging crane members 50 and 51, which are secured to the pivoting frame 18. Journalled at the outer extreme end of the crane member 50 is sheave 52 over which passes the working line "W" of the tackle 53, which in turn is secured to the U shaped member 54, which forms the attachment of the same to member 46. The working line "W" is carried through the guide sheaves 56 to sheave 57. This arrangement is desirable to take care of the swinging of member 18 and the crane which is attached thereto, and finally it is wound about the drum of hoist "H". Hoist "H" in turn is suitably connected as indicated in Figure 2 to the source of power "M".

The bucket line may be driven from shaft 59 by suitable gearing or chains as indicated in Figure 3, the exact arrangement being best determined in accordance with the size and the use of the machine that is being designed. Suitably supported on the fixed frame work is a receiving guide hopper 61, which is so arranged and positioned that the bucket line will discharge into the same. From this hopper the material is fed to a distributing hopper 63 which is intended to distribute a wide stream of soil or sand upon the V belt conveyor 65. This type of conveyor has long been in use and may be driven in any number of ways as by the drive chains 66, 67, which in turn are connected to the source of power. I have shown the conveyor 65 as positioned on one side of my machine. I believe it is so clear that further illustration is unnecessary that this conveyor could be duplicated on the opposite side or might be turned through 90 degrees so it would discharge directly to the rear. This is the form that would be used particularly on the mucking design.

It might be desirable in digging, for instance, an irrigation ditch, to have one conveyor on each side of the machine with a discharge distributed equally between them so as to build up an equal wall on each side of the ditch. In case the discharge was to be wasted it would then be desirable to have a conveyor possibly longer in proportion than that indicated, in any event, I prefer to pivotally support conveyor 65 as at 69 so that it may assume different positions as shown in Figure 3. It would then be desirable to have the bracking 70 adjustable and to have a securing means of an adjustable nature as, for instance the turn buckle 72.

Method of operation

It is my intention to use my machine for certain types of excavation work that cannot be economically accomplished with existing equipment even though the existing equipment costs considerably more than my machine.

I have found my machine particularly useful for removing shallow-overburdens, preparing sub-grades as for roads, paving basement excavations, irrigation and drainage canals and for mucking in tunnel work.

In general my machine will be employed somewhat after the mode of the power shovel often referred to as a steam shovel, although most of such equipment is now operated by internal combustion engines or electric power. To this end my machine works with the bucket end toward the excavation and moves toward the same, wherein it differs from ditching machines. With this type of equipment a steady flow of excavated material can be maintained which means that lighter and less expensive equipment can displace the more bulky and clumsy equipment formerly used. I normally run my bucket line in the direction indicated by the arrow in Figure 1. This is just the reverse of the ditcher. As the material is engaged by the buckets "B" it is elevated to the receiving hopper 61. This must be of the special shape indicated, in order to properly receive the excavated material as the bucket line is swung about its vertical axis. From this hopper material is fed to the distributing hopper 63 whose purpose it is to prevent a piling up of the material at any one point of the conveyor 65. The conveyor 65, as previously pointed out is constructed so as to discharge the material either to trucks, cars or the like or to form it into embankments. This steady stream of material is much easier on the rolling stock which receives it than is the large masses dropped by the power shovel. It has a still further advantage in that each truck, for instance, can be uniformly loaded, something that it is difficult to accomplish with the shovel type.

My device differs from the steam shovel operation in that only the bucket line and its supporting means is pivotable. This dispenses with any track and gearing as normally used and makes the machine much lighter and cheaper and enables its use in restricted cuts where it would not be possible to swing a steam shovel. As previously pointed out the buckets "B" must have a peculiar side over-hanging construction in order that the side of the bucket line can bite into an embankment. In certain kinds of work I have found it necessary to provide a means to loosen up the compact materials and have provided a pair of toothed wheels 80 and 82 which are secured to shaft 44, and are therefore driven by the bucket line. One of these wheels is shown in Figure 1. This arrangement would be suitable only in case the working was all done against a bank on the right of the machine. Normally I prefer to use two, and merely left the same off Figure 1 so as to make the figure a little more understandable.

Light types of my machine would prove very useful in handling loose materials such as coal, sand or gravel where weight would not be needed to do the cutting as is normally required.

It will be apparent, I believe, that the various operations may be controlled by an operator stationed at levers "L". I have not clearly shown the connecting means in all cases as I feel such mechanism is well known to those skilled in this art, and would unnecessarily complicate the present application.

The foregoing description and the accompanying drawings clearly disclose a preferred embodiment of my invention but it will be understood that this disclosure is merely illustrative and that such changes in the invention may be made as are fairly within the scope and spirit of the following claims:

What I claim is:

1. In a portable swinging bucket-line excavator, the combination with a base and its rigid, inverted U-shaped upright, of a rotary upright frame and a swinging bucket-line pivoted therein, a central tubular pivot pin rigid with the rotary frame and having a bearing on the base, means for rotating the rotary upright frame, a driven shaft journaled in the base and said tubular pin and means for driving the shaft, and transmission mechanism between the driven shaft and the bucket-line excavator.

2. In a portable swinging bucket-line excavator, the combination with a base and its rigid, inverted U-shaped upright, of a rotary frame and a crane rigid therewith, an excavator frame pivoted in the rotary frame and hoisting means for the excavator frame, said rotary frame having a pivot-bearing in the upper end of the U-shaped upright, a tubular pivot pin rigid with the lower end of the rotary frame and journaled in the base, a worm gear rigid with the tubular pin and rotary frame and means for co-action with the worm gear for turning the rotary frame, a driven shaft journaled in the base and said tubular pivot pin, means for revolving said driven shaft, and transmission mechanism from said driven shaft for operating the bucket-line excavator.

In witness whereof, I hereunto subscribe my name this 14th day of April, A. D. 1930.

JAMES A. ELLIOTT.