March 31, 1925. 1,531,755

J. C. RADOVICH

TRENCH DIGGER

Original Filed Nov. 15, 1920 2 Sheets-Sheet 1

Fig. 1.

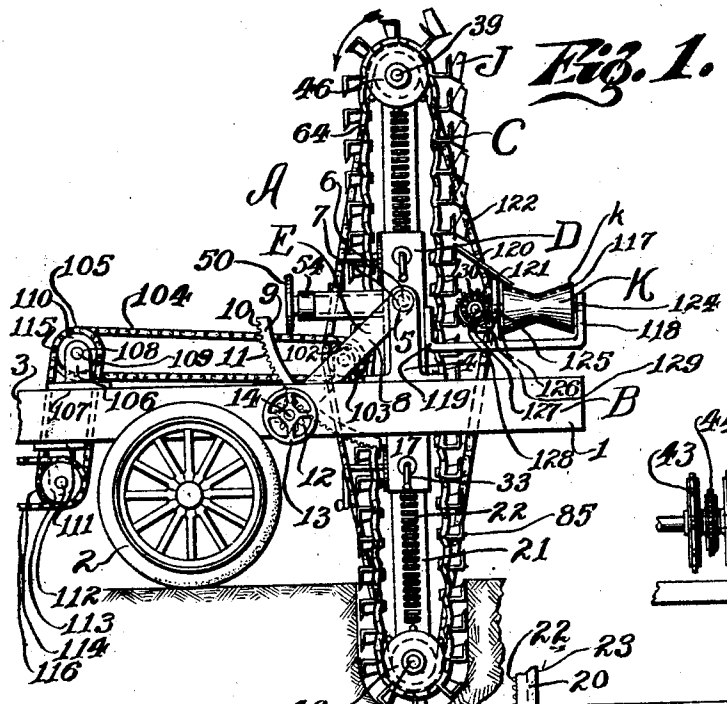


Fig. 2.

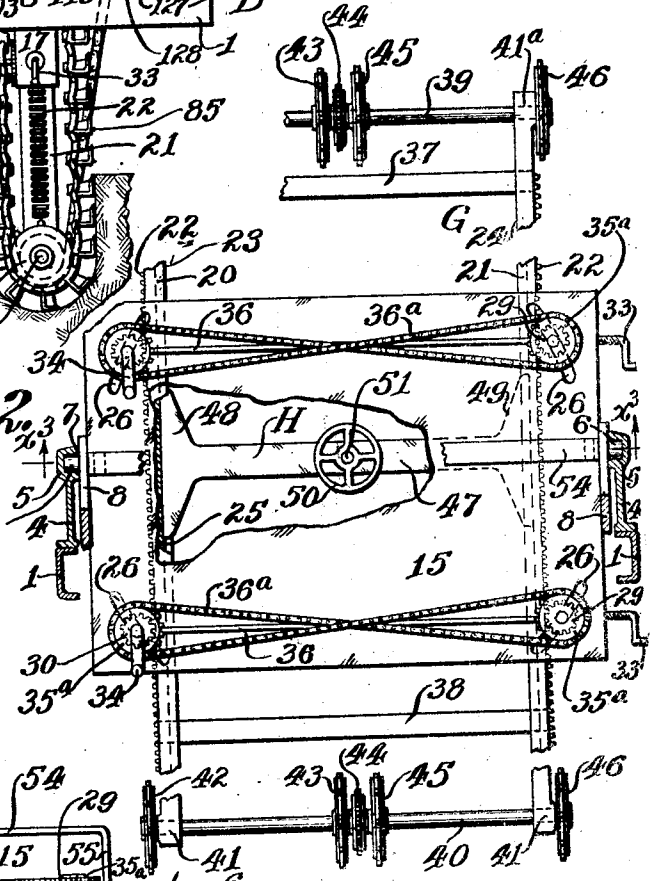
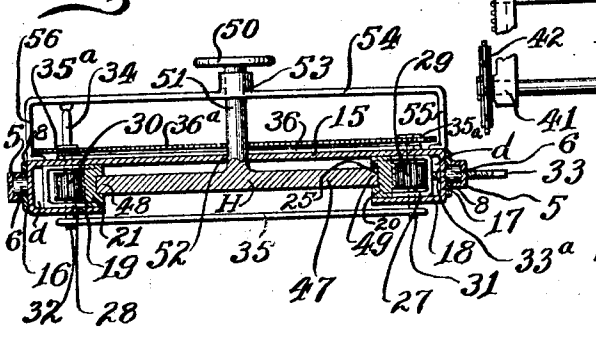


Fig. 3.



INVENTOR,
John C. Radovich;
BY Raymond Lee Blakeslee,
ATTORNEY

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TRENCH DIGGER

Original Filed Nov. 15, 1920 2 Sheets-Sheet 2

Fig. 4.

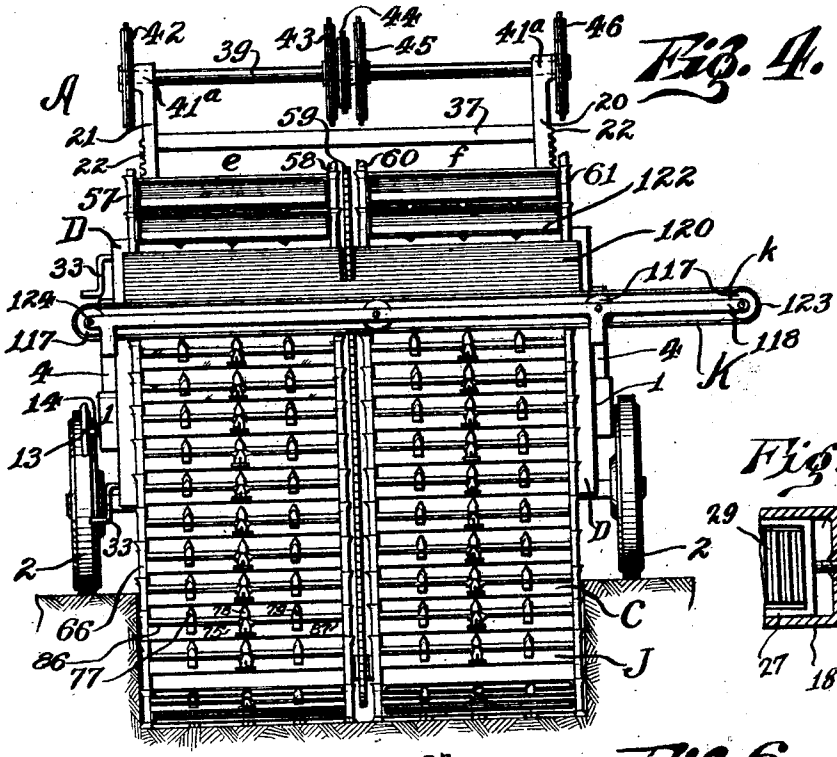


Fig. 9.

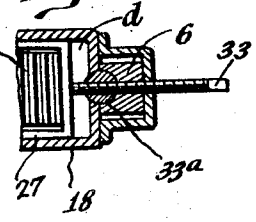


Fig. 5.

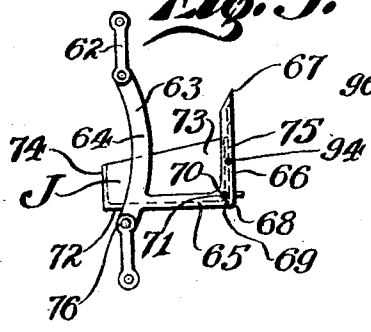


Fig. 6.

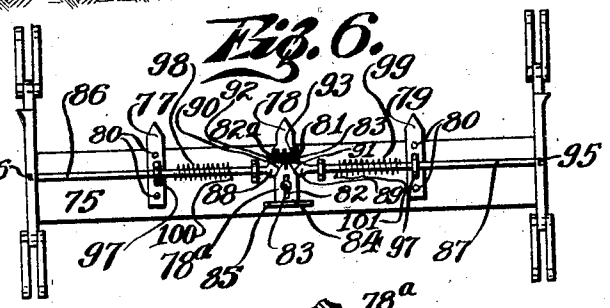


Fig. 7.

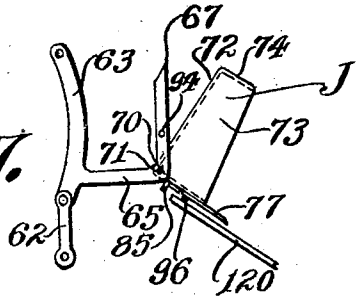
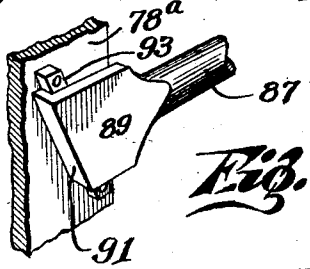


Fig. 8.



INVENTOR,
John C. Radovich;
BY
Raymond Lucas Blakesley,
ATTORNEY.

Patented Mar. 31, 1925. 1,531,755

UNITED STATES PATENT OFFICE.

JOHN C. RADOVICH, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO SEYMOUR J. THURBER, OF LOS ANGELES, CALIFORNIA.

TRENCH DIGGER.

Application filed November 15, 1920, Serial No. 424,109. Renewed August 27, 1924.

To all whom it may concern:

Be it known that I, JOHN C. RADOVICH, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Trench Diggers, of which the following is a specification.

This invention relates to digging apparatus, and in particular to trench diggers, digging machines, etc., and has for its object to provide a device of this character which may be adjusted so as to dig a vertical trench regardless of the slope of the ground upon which it is operating. Another object is to provide a device of this character which will dig a trench to any desired depth and width in a short period of time. In practicing the invention I provide a device which may be attached to the rear of an automobile chassis and which likewise has a driving connection with the motive element of the automobile. Said device includes a continuous conveyor provided with scoops or buckets and spades mounted on each side of the buckets and upon the buckets; said scoops and spades being mounted on continuous chains passing over sprocket wheels mounted upon a suitable frame member. Means are provided for verticalizing the frame member on which the chains carrying the scoops are mounted. It is thus possible to rotate the endless conveyor with its scoops and at the same time, in case the device is on a hill-side, to verticalize the apparatus so that the trench or ditch which the scoops may dig is vertical. Means are likewise provided for feeding the scoops downwardly so that a ditch or trench of certain depths may be provided.

A device of this character is particularly applicable for digging graves. At the present time much time is spent by laborers who must be skilled in the art of digging graves, but with this machine it is possible to dig a first-class grave within a very short period of time, say, from five to ten minutes.

The invention provides for many novel features of construction which will be more particularly pointed out in detail when the drawings are discussed.

The invention has for further objects the provision of an improved trench digger which will be superior in point of relative simplicity and inexpensiveness, taken in conjunction with utility, durability and general efficiency and serviceability.

With the above and other objects in view, the invention consists in the novel and useful provision, formation, construction, combination, association and inter-relation of parts, members and features, all as disclosed in the accompanying drawings, described in the following statement and finally pointed out in claims.

In the drawings:

Figure 1 is a fragmentary side elevation of the improved trench digger;

Figure 2 is a rear elevation of certain details of construction of the said device;

Figure 3 is a fragmentary cross sectional view of the device shown in Figure 2, and taken on the line x^3—x^3 Figure 2, and looking in the direction of the appended arrows;

Figure 4 is a front elevation of the device shown in Figure 1;

Figure 5 is a side elevation of one of the scoops and spade members;

Figure 6 is a front elevation of the scoop and spade member shown in Figure 5;

Figure 7 is a side elevation of the scoop member, but showing the scoop in position for dumping any substance contained within the same;

Figure 8 is a fragmentary perspective view of a lock member used for maintaining the scoop in position.

Corresponding parts in all the figures are designated by the same reference characters.

Referring with particularity to the drawings, A designates an improved trench digger, of which B is the chassis, C an endless conveyer, and D and E means for verticalizing the conveyer C, all of which elements are used in practicing one embodiment of the invention. The chassis B may comprise a suitable frame 1 mounted upon wheels 2. It is intended that the frame 1 be attached to the rear of another vehicle and the chassis of same. For clearness of illustration, the frame 1 is broken away as at 3, but the portion which would normally be extended from 3 would be the part that would be attached to the chassis of any vehicle to which B is attached. Mounted upon the frame member 1, it being understood that

the showing in Figure 1 represents one-half of the frame member, are pedestal members 4. (See Fig. 4.) Said pedestal members 4 are provided with bearings as at 5. Gudgeons 6 are confined within the bearing member 5, as at 7, and said gudgeons are connected with a member D which is used for verticalizing the endless conveyer C. Rigidly attached to one or both of said gudgeons is means E which is also used for verticalizing the endless conveyer C. The means E comprises an arm 8 joined with the gudgeon 6 and the opposite end of each arm 8 is provided with a curved T-head 9, the outer periphery of which as at 10, is provided with teeth 11. The means E is really a segment gear provided with an extended arm member 8, the teeth 11 of said gear meshing with teeth on a member 12. Thus by rotating the member 12, which really comprises a wheel 13 mounted on the shaft 14, said gear carrying the teeth, the segment is caused to move upwardly or downwardly and as the arm 8 is rigidly fixed to the gudgeon 6 the member D is caused to revolve backwardly or forwardly as the case may be. It may be easier to describe the motion given to the member D through the medium of the member E, by saying that the member D is caused to rotate either clockwise or anti-clockwise. Referring to Figures 2 and 3 it will be observed that the member D is box-like in section with one of the sides interrupted. The member D therefore comprises an extended side member 15, end members 16 and 17 and interrupted side portions 18 and 19, said side portions being in spaced relation to the side 15 and parallel therewith. Thus portions of the member D as *d* included between the sides 18 and 15 and the end 17, and the side portions 19 and 15 and the end 16, serve to house and act as guides for certain members used in verticalizing the scoop members C, as well as lowering the scoop members according to the depth of the trench desired. Referring to Figure 2 a frame member G has two of its sides as 20 and 21 operating within a portion of the space *d*. The sides 20 and 21 are in the form of a grooved rack bar, that is to say, an outer edge of each of the members 20 and 21 is provided with spaced teeth 22 and the opposite edges as at 23 and 24 of the said members 20 and 21 are internally recessed or grooved as at 25. The sides 18, 19 and 15 are provided with curved slots 26, and within the spaces *d* of the member D are confined the U-shaped members 27 and 28 and which members are attached to 20 and 21, said members 27 and 28 in turn embrace a spur gear 29 and a spur gear 30. Shafts 31 and 32 pass through the slotted portions 26 and maintain the spur gears 29 and 30 in position. Joined with the U-shaped member 27 is a threaded handle member 33 passing through a threaded perforation in a spherical unit (not shown) confined within the end 17 as shown at 33a. Link members 35 and 36 join with the shafts 31 and 32 so that by turning the handle 33 the shafts are caused to traverse the slotted portions 26 either forwardly or backwardly. The spur gears 29 and 30 have their teeth meshing with the teeth 22 of the members 20 and 21 respectively. Thus, as the handle 33 is rotated the members 20 and 21 are caused to move. It will be observed that the lower half of the member D is likewise provided with handle means 33, and in order to verticalize the members 20 and 21 it is necessary that both the upper and lower handles 33 be rotated.

Referring to Figure 2 in speaking of rotation, the movement would be either clockwise or anti-clockwise, assuming the figure is in the plane of the paper. As shown in Figures 2 and 3 additional crank means 34 are provided, which crank means join with the shafts 32. The shaft 31 and the shaft 32 are each provided with a sprocket wheel 35a, which is detachably joined with their respective shafts. Playing over the teeth of said sprocket wheels is an endless chain 36a. As the teeth of the gears 29 and 30 mesh with the teeth 22 of the members 20 and 21, a rotation of the handle members 34 will cause the members 20 and 21 to move upwardly or downwardly. This upward or downward movement will allow the endless conveyer C to be raised or lowered, thus regulating the depth to which the cutting elements or scooping elements associated with the conveyer C may be moved. It would appear on first sight that a movement of the frame member clockwise or anti-clockwise would cause a twist in the same. However, this is not the case, and the frame member G is provided with bracing means 37 and 38. Additional bracing means is provided at the extremities of the frame member G, the latter bracing means comprising shafts 39 and 40 mounted in suitable journals 41 and 41a in the members 20 and 21. Upon said shafts are placed sprocket wheels 42, 43, 44, 45, and 46. It is to be understood that the sprocket wheels 43, 44 and 45, on the shafts 39 and 40 are midway between the members 20 and 21, while the sprocket wheels 42 and 46 are located at the extremities of the shafts 39 and 40, and on the outside edge of the members 20 and 21. In order to aid in the verticalizing of the frame member G additional means H is provided. Said means is in the form of a double T. That is to say, the means H has an extended length 47 provided with angularly disposed extremities 48 and 49 at each end of the member 47. Said extremi-

ties 48 and 49 fit within the grooved portion 25 of the members 20 and 21. A wheel member 50 is rigidly attached to a projection 51 integrally formed with the member 47. Thus by turning the member 50 and at the same time revolving the handle means 33, either in one direction or the other, it is possible to aid in the verticalizing of the frame member G. In order to maintain rigidity in the means H the projection 51 extends through a hole 52 in the side 15, and likewise through a hole 53 in a U-shaped bracing member 54, said bracing member being provided with angularly disposed end members 55 and 56 rigidly attached to the side member 15. The endless conveyor C includes endless chain members 57, 58, 59, 60 and 61 playing over the sprocket wheels, both upper and lower, 42, 43, 44, 45 and 46. The members 57, 58, 60 and 61 are constructed in a particular manner, best illustrated in Figures 5, 6 and 7, said chain members including short link members 62 joined with a slightly curved member 63, and said member 63 including a curved part 64 and a diamond shaped integral extension 65 formed with an upward projection 66. The end of the projection 66 is sharpened as at 67. The extension 65 and projection 66 comprise a spade member. It is noted that the lengths 62 are pivotally joined to the member 63. A plurality of the members just described are provided. At the elbow portion as 68 between the members 65 and 66 is a perforation 69. A bucket member J provided with gudgeons 70 located on said bucket member as at 71, plays within the perforations 69. We have been speaking in a singular sense; however, it is to be understood that the chain members 57, 58, 60 and 61 are all identically formed and correspond to the showing in Figures 5, 6 and 7. Thus the bucket members extend in one set as at *e* between the chain members 57 and 58, while another set as at *f* extends between the chain members 60 and 61. By providing the perforations 69, the bucket members J are pivotally supported between their respective chain members, whether they be in the *e* section or the *f* section. Obviously there might be other sections, depending upon the size of the trench digger. The buckets J include a bottom wall 72, side walls 73 and end walls 74 and 75. It is to be noted that the end wall 75 is much higher than the end wall 74. It is necessary to so make the walls, due to the curvature of the member 63. The bucket member J is of course open at the top and is supported at two points, one at the pivot point, as has been described, and the other at a link point 62, as shown at 76, the links 62 being in reality shackle members, in order that the teeth of the sprocket wheels may be confined within the members 62 to cause rotation of the conveyer C. Each of the bucket members J has mounted upon an end 75 upwardly extending and pointed spade members 77, 78 and 79. The members 77 and 79 are fixedly joined to the end 75 by means of bolts 80. It is also to be noted that the spade members 77, 78 and 79 are so placed on the end 75 of the bucket member J that they are in spaced relation to each other. The spade member 78 is divided as at 81, and for a purpose about to be set forth. The lower portion of the spade members 78 as at 78^a may move upwardly or downwardly. To accomplish the upward or downward movement the member 78^a is slotted as at 82 and 82^a and bolt members 83 joined to the end 75 are confined in said slotted portions 82 and 82^a. The lower portion of the member 78^a as at 84 is provided with an angularly disposed projection 85. To lock each of the bucket members J in position similar to that shown in Figures 5 and 6, it is necessary to provide a lock of some form for so holding the bucket members. Said lock may include slidable rods 86 and 87 which are provided with enlarged heads 88 and 89, said enlarged heads being provided with staggered and angularly disposed end portions 90 and 91. Mounted upon the member 78^a are members 92 and 93 which members co-act with the members 90 and 91, as shown in Figure 8. The opposite ends of the members 86 and 87 are beveled and play normally within holes 94 located in the members 66 as at 95 and 96. (See Fig. 6.) To retain the members 86 and 87 in position straps 97 are provided, which straps are joined with the spade members 77 and 78, and also with the ends 75. Surrounding the members 86 and 87 are compression springs 98 and 99. One end of each spring as 100 and 101 fastened into the end member 75, while the other end is fastened to the members 86 and 87 respectively. Thus the members 86 and 87 are normally urged outwardly in opposite directions in order that their ends as 95 and 96 may engage the perforations 94 and securely lock the bucket members J in a position similar to that shown in Figures 5 and 6. Now, if the projection 85 were to be pushed downwardly the member 78^a would move a corresponding distance, and the projections 92 and 93 coming into contact with the staggered inner wall of the member 90 would tend to pull the members 86 and 87 together and release the end portions 95 and 96 from the perforations 94 and allow the bucket to be swung into the position shown in Figure 7. Of course the tension means 98 and 99 tend to resist all movement of the projection 85 downwardly, and when the bucket member is thrown into the position as shown in Figure 5, the beveled ends of the members 86 and 87 quickly pass into the perforations 94 to

again lock the bucket member J. The continuous chain member 59 which passes over the sprocket wheels 44, both upper and lower, acts as a prime mover for all the bucket members J. Said chain member 59 passes over a sprocket wheel 102, which sprocket wheel is suitably mounted upon a shaft journaled to the chassis B. Another sprocket member 103 is mounted upon the shaft and has a continuous chain member 104 playing over the same. Said chain member 104 likewise passes over a sprocket wheel not shown in the drawing, located upon the chassis B as at 105. A standard 106 is mounted upon the chassis as at 107, said standard being provided with a journaled bearing 108. A shaft 109 is confined within said bearing and upon said shaft is mounted a sprocket wheel 110. It is upon the shaft 109 that the sprocket wheel mentioned above, as not being shown, is likewise mounted. Beneath the frame member 1 of the chassis B is an additional standard 111 provided with a journaled bearing which confines a shaft 112. Upon this shaft two sprocket wheels 113 and 114 are mounted. A continuous chain member 115 plays over the sprocket wheels 114 and 110, and a chain member 116 plays over the sprocket wheel 113. The chain 116 likewise connects with the motive elements for moving said chains. Thus, if we assume the motive elements are operating, the chain 116 will tend to move all chains movably joined therewith, the consequence being that the endless conveyer C will commence its movement in an anti-clockwise direction, looking in the plane of the paper and at Figure 1. As the endless conveyer with its associated spades and bucket members commence its downward movement the spades come into contact with the earth and dig into the same and scoop up the dirt into the buckets, and the buckets then move upwardly. It then becomes necessary to in some manner trip the buckets so that the earth confined within the same may be passed to some point away from the trench. In order to do this I have provided a form of traveling conveyor K. Said conveyer K includes convex roller members 117 suitably journaled in a frame member 118, which is fixedly joined to a side of the member D as shown at 119. The endless conveyer K is of extended length as shown in Figure 4, and over the roller members 117 plays an endless belt *k*. An inclined slide 120 is mounted in connection with the member 118 as at 121, said inclined slide extending so that it may come into contact with the projection 85 on the scoop or bucket members J, thus tripping the bucket member J as shown in Figure 1 at 122 and allowing the contents of said bucket member to slide downwardly upon said inclined plane 120 and thence on to the endless belt *k* for delivery to a dump wagon located preferably beneath a point as shown at 123. It is necessary of course to use some propulsive means to cause the endless belt *k* to move. In order to do this one or more of the roller members 117 are mounted upon shafts 124, one end of which shaft as at 125 is provided with a beveled gear 126. The teeth of said beveled gear mesh with the teeth of another beveled gear 127 mounted upon a shaft 128 at right angles to the shaft 124, the shaft 128 being suitably supported by means of a journaled bracket member 129 attached to the member 118. The opposite end of the shaft 128 is provided with a sprocket wheel 130, and over the teeth of said sprocket wheel the chain 59 plays. Thus when the chain 59 moves the sprocket wheel 130 is rotated and in turn the roller 117 will likewise be rotated and tend to move the endless belt *k*.

It is presumed that the description as given explains to a certain extent the operation of the device. However, the following additional remarks may be of aid.

Assuming that the chassis B has been joined with some truck, the chassis may be with its attendant features transported to any point desired. To do this the wheel 13 is rotated so that the conveyer C will be out of contact with the ground and the chassis B allowed to travel upon the wheels 2. If the trench to be dug were on a hill and it was desired to dig an up-and-down trench perfectly vertical, verticalizing might be accomplished by placing a small carpenter's level upon the member D so that the bubble in said level would register at the center when the conveyer C was level. The verticalizing requires two distinct operations,—one a turning of the hand wheel 13 so as to adjust the frame G, referring to Figure 1, either clockwise or anti-clockwise; and turning the wheel 50, as well as the handle members 33, referring to Figure 4, so as to adjust the frame member G either clockwise or anti-clockwise. After the verticalizing operation has been performed the motive power may be switched on and the conveyer will start its movement in the direction shown by the curved arrow in Figure 1. As the spades come into contact with the ground the dirt will be dug into, picked up by the buckets, deposited on the endless belt *k*, and conveyed to a dump wagon or cart located beneath point 123. The buckets will then in their open position pass upwardly, and as they swing over the upper sprocket wheels 42 and 43, and also 45 and 46, they will tend to close and when so closed the lock members will maintain the same in position ready for another scooping of the earth. As it is necessary to provide means for increasing the depth of the ditch or trench the handle members 34 are rotated and the frame member G is gradu-

ally moved downwardly. After a certain depth of trench has been reached it is only necessary to back the chassis B so that the trench may be of extended length. It is to be noted upon referring to Figure 4, that the wheels 2 straddle the trench.

It is obvious that many changes and variations and modifications may be made in departure from the particular description and showing of the accompanying drawings, in adapting the invention to varying conditions and requirements of use and service, without departing from the true spirit of the invention.

Having thus disclosed my invention, I claim and desire to secure by Letters Patent:

1. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for causing said conveyer to move, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said verticalizing means including means for rotating said conveyer laterally, backwardly and forwardly.

2. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for causing said conveyer to move, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said scoop members being pivotally joined to said spade members, means being provided for maintaining said scoop members in position.

3. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for moving said conveyer, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said scoop members being pivotally joined to the spade members, means being provided for maintaining said scoop members in position; and means including locking elements associated with said spades and with the scoop members.

4. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for moving said conveyer, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the scope of the ground upon which said conveyer is operated; said scoop members being pivotally joined to the spade members, means being provided for maintaining said scoop members in position; said means including locking elements associated with said spades and with the scoop members; means being provided upon said scoop members for releasing the lock so as to allow the scoop member to discharge its contents.

5. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for causing said conveyer to move, and means for verticalizing said conveyor, so that a trench having vertical side and end walls may be dug regardless of the slope of the ground upon which said conveyer is operated; said endless conveyer being provided with a frame member, there being journaled portions at the ends of said frame member, and shafts confined within said journaled portions and sprocket wheels upon said shafts; said endless conveyer also being provided with chain members playing over said sprocket wheels.

6. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for causing said conveyer to move, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said endless conveyer being provided with a frame member, there being journaled portions at the ends of said frame member, and shafts confined within said journaled portions and sprocket wheels upon said shafts; said endless conveyer also being provided with chain members playing over said sprocket wheels; said scoop members being held between pairs of said last named chain members.

7. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for causing said conveyer to move, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said endless conveyer being provided with a frame member, there being journaled portions at the ends of said frame member, and shafts confined within said journaled portions and sprocket wheels upon said shafts; said endless conveyer also being provided with chain members playing over said sprocket wheels; there being bucket members held between pairs of said last named chain members; each of said chain members being provided with outwardly projecting spades and the said bucket members being journaled to said spades.

8. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for moving said conveyer, and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said scoop members being pivot-

ally joined to the spade members, means being provided for maintaining said scoop members in position; said means including locking elements associated with said spades and with the scoop members; means being provided upon said scoop members for releasing the lock so as to allow the scoop member to discharge its contents; means likewise being provided whereby the conveyer may be moved upwardly or downwardly to regulate the depth of trench to be dug.

9. A trench digger, including an endless conveyer, spade members and scoop members associated with said conveyer, means for moving said conveyer and means for verticalizing said conveyer, so that a vertical trench may be dug regardless of the slope of the ground upon which said conveyer is operated; said scoop members being pivotally joined to the spade members, means being provided for maintaing said scoop members in position; said means including locking elements associated with said spades and with the scoop members; mean being provided upon said scoop members for releasing the lock so as to allow the scoop member to discharge its contents; and means for conveying the discharged contents from the scoop members to a definite point at one side of the trench digger for further disposition.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN C. RADOVICH.

Witnesses:

J. CALVIN BROWN,

EDNA TURNER.