J. C. FRENCH.

TRENCHING MACHINE.

APPLICATION FILED OCT. 25, 1915.

1,194,375

Patented Aug. 15, 1916.

5 SHEETS—SHEET 1.

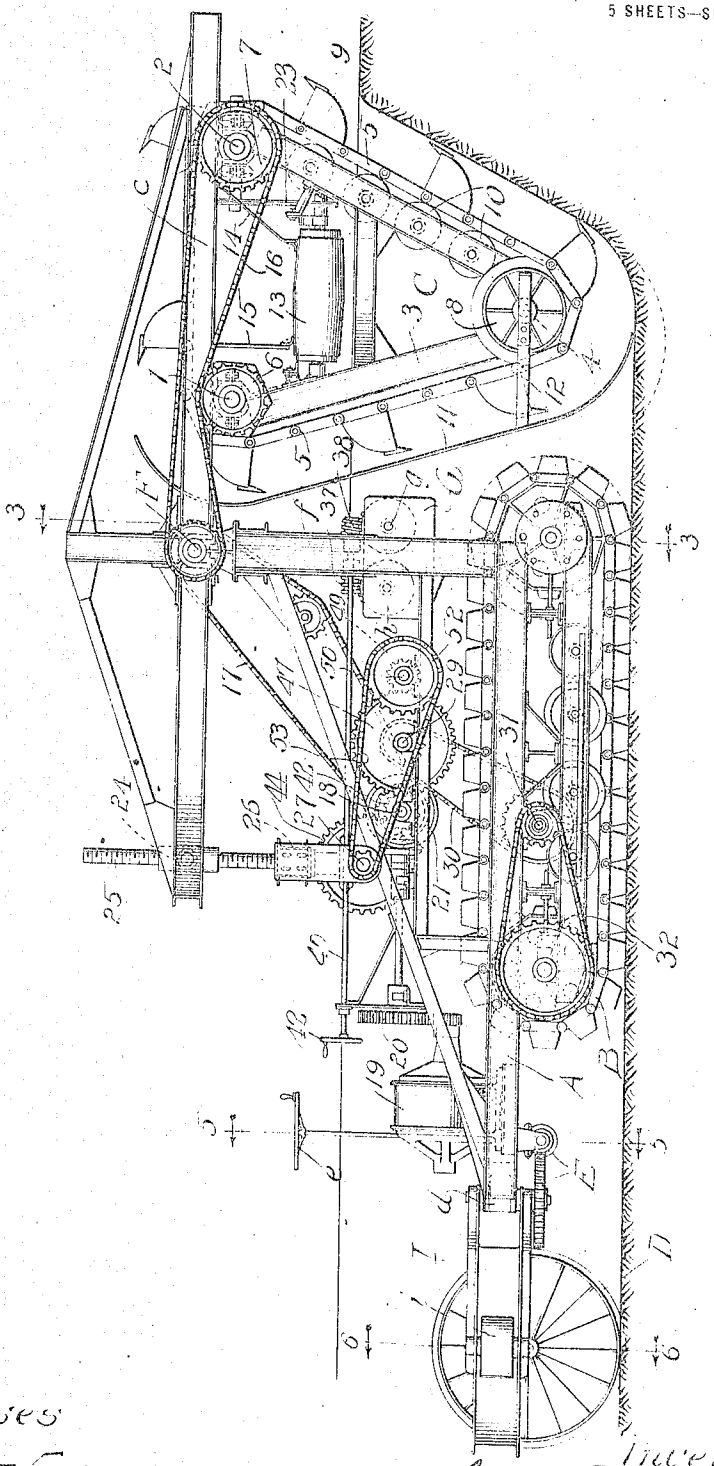


Fig 1

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5 SHEETS—SHEET 2.

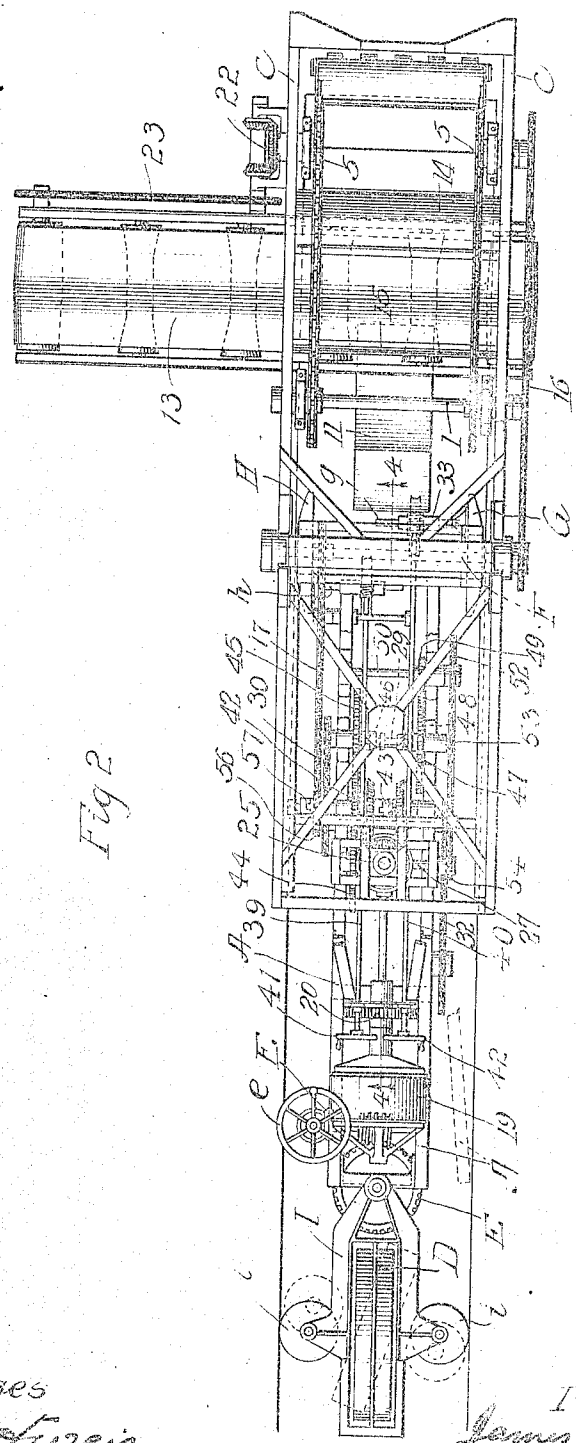


Fig 2

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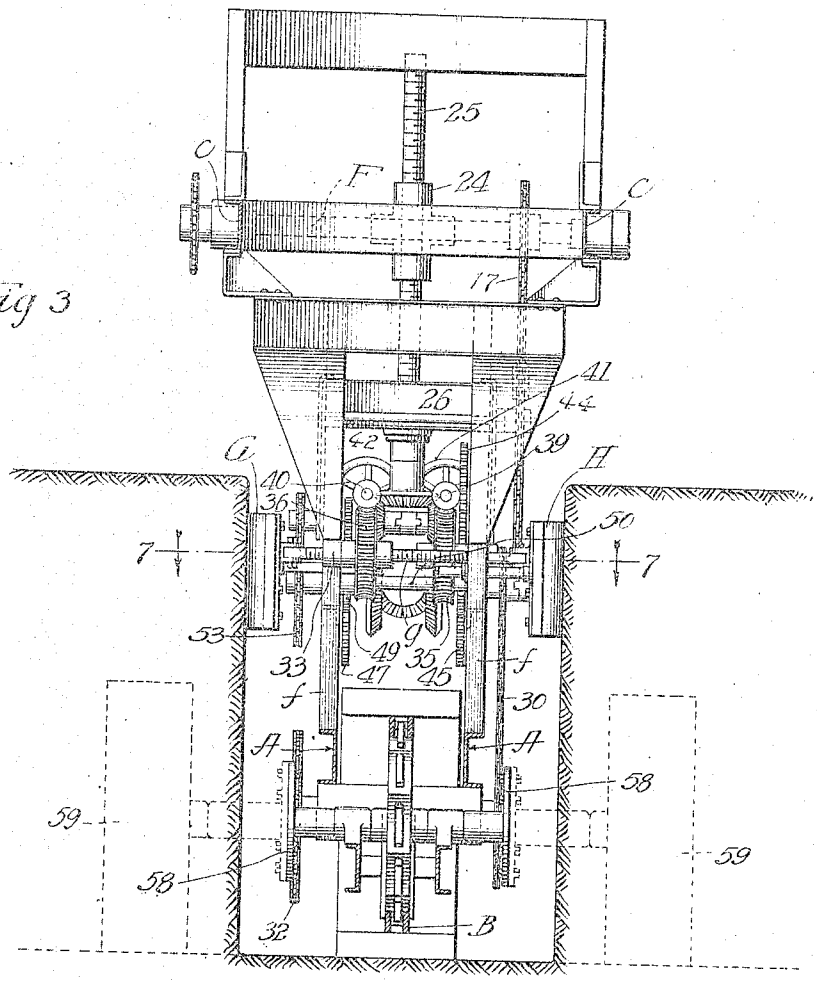
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5 SHEETS—SHEET 3.

Fig 3



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5 SHEETS—SHEET 4.

Fig 4

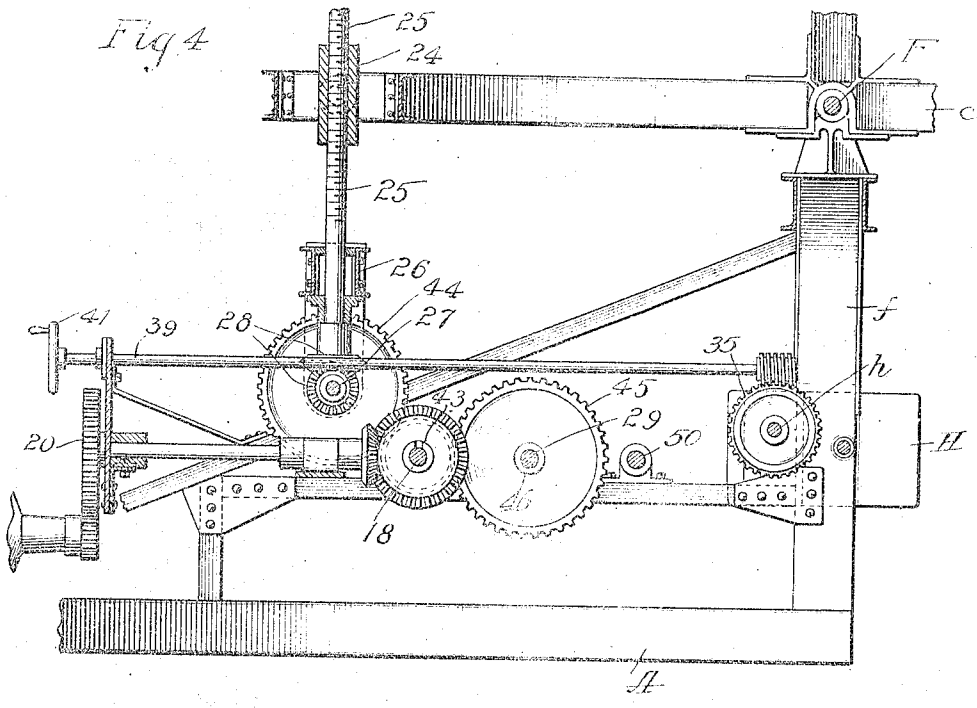
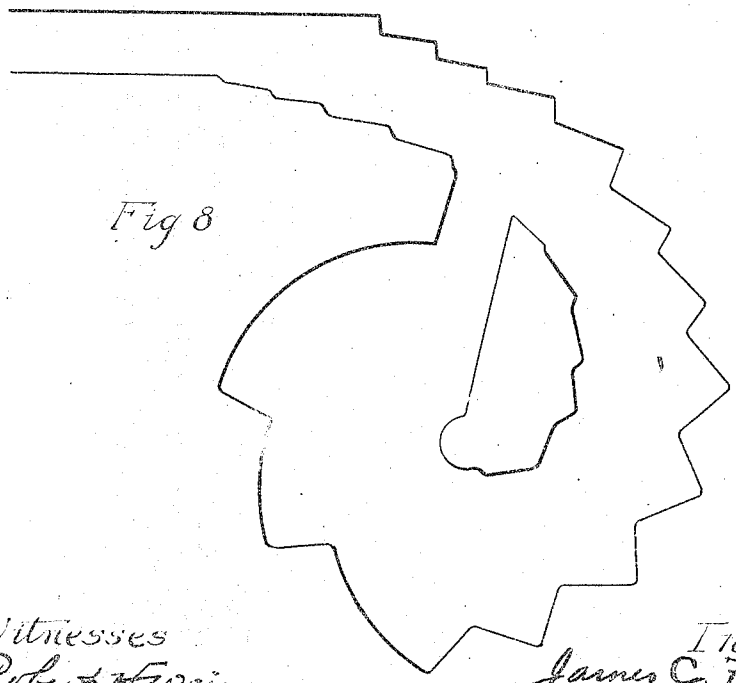


Fig 8



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5 SHEETS—SHEET 5.

Fig 5

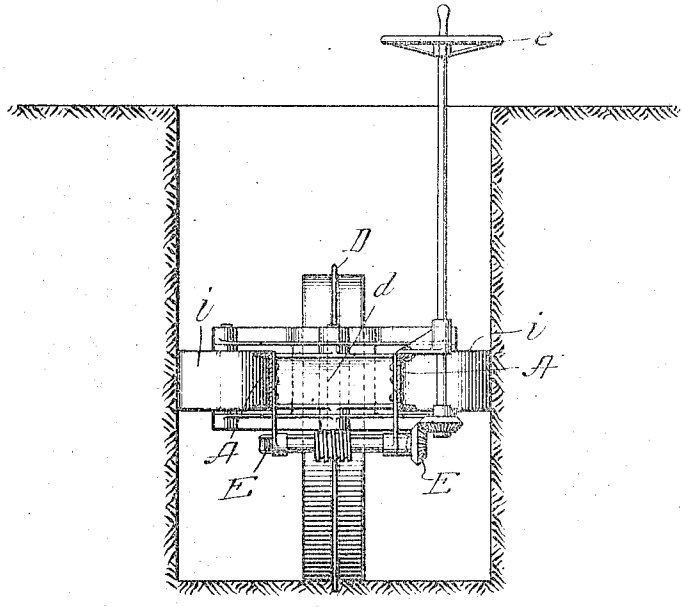


Fig 6

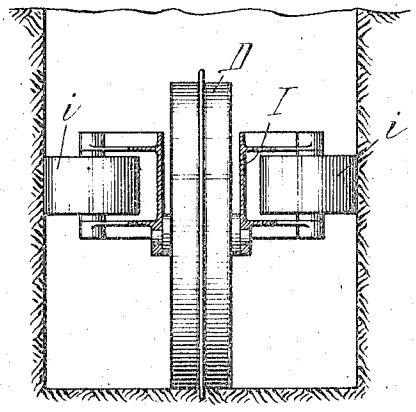
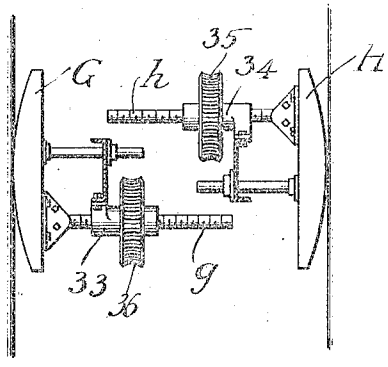


Fig 7



Witnesses

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UNITED STATES PATENT OFFICE.

JAMES C. FRENCH, OF KENOSHA, WISCONSIN, ASSIGNOR TO FREDERICK C. AUSTIN, OF CHICAGO, ILLINOIS.

TRENCHING-MACHINE.

1,194,375. Specification of Letters Patent. Patented Aug. 15, 1916.

Application filed October 25, 1915. Serial No. 57,370.

To all whom it may concern:

Be it known that I, JAMES C. FRENCH, a citizen of the United States of America, and resident of Kenosha, Wisconsin, have invented a certain new and useful Improvement in Trenching-Machines, of which the following is a specification.

My invention relates to excavators for cutting trenches, and more particularly to those having traction devices which support the machine in the trench, whereby the excavator travels in the trench behind the trench-cutter which is located at the forward end thereof.

Generally stated, the object of my invention is to provide a novel and efficient excavator of the foregoing general character, adapted for cutting trenches for any desired purpose.

A special object is to provide an excavator of this kind in which the traction devices are quite narrow, being of less width than the trench cutter, and having means for engaging the sides of the trench to hold the machine upright during the operation thereof, whereby the weight of the machine is materially reduced, and whereby the handling of the machine is facilitated during the operation thereof in the trench, as will hereinafter more fully appear.

It is also an object to provide certain details and features of construction and combinations tending to increase the general efficiency and desirability of a trenching machine of this particular character.

To the foregoing and other useful ends my invention consists in matters hereinafter set forth and claimed.

In the accompanying drawings, Figure 1 is a side elevation of an excavator embodying the principles of my invention. Fig. 2 is a plan of said excavating machine. Fig. 3 is an enlarged vertical section on line 3—3 in Fig. 1. Fig. 4 is an enlarged longitudinal section on line 4—4 in Fig. 2. Fig. 5 is an enlarged vertical transverse section on line 5—5 in Fig. 1. Fig. 6 is a similar section on line 6—6 in Fig. 1. Fig. 7 is a horizontal section on line 7—7 in Fig. 3. Fig. 8 is a diagrammatic plan view illustrating the method of cutting a trench and then turning the machine around while still in the ground at the end of said trench.

As thus illustrated, my invention comprises a body A mounted upon a caterpillar B which is narrower than the said body, and which is considerably narrower than the trench cut by the trench-cutter C at the forward end of said body. A steering wheel D has a swivel *d* at the rear end of said body, whereby this wheel can be swung laterally about a vertical axis to change the course or direction of travel of the machine. This steering wheel is controlled by worm gearing E, of any suitable character, operated by a hand-wheel *e* disposed conveniently at the rear end of the platform of said body. The said trench-cutter C comprises a pair of horizontal beams *c* which are pivoted at F to tilt about a horizontal axis, this axis being in the form of a transverse shaft supported by the upright frame *f* at the forward end of the body. Transverse shafts 1 and 2 are mounted in bearings on the underside of the beams *c*, and a frame 3 is hung on the said shafts, this frame being provided with a transverse shaft 4 at the lower end thereof, it being observed that said frame is V shaped when viewed from the side. The endless sprocket chains 5 travel over the sprockets 6, 7 and 8, on said shafts 1, 2 and 4, and are provided with buckets 9 in any suitable known or approved form, each bucket being adapted to discharge its load while traveling horizontally from the sprockets 7 to the sprockets 6, and being adapted to cut the ground and take up a load of dirt while traveling upward at the forward side of said frame. Rolls 10 are mounted on said frame 3 to bear against the sprocket chain 5 at the forward side of said frame, thereby forming a backing for the sprocket chains and buckets while the latter are being forced forward into the ground at the end of the trench. A shield 11 is disposed immediately back of this trench-cutter, being supported by side bars 12 at its lower end portion, which bars are suitably mounted on the bearings of the shaft 4 at the lower end of the frame. This shield 11 is as wide as the trench, is curved forward at its upper and lower ends, and carries loose dirt forward until taken up by the buckets, whereby the bottom or floor of the trench is left clean and free from loose dirt. A transverse conveyer 13 is disposed immediately under the horizontal path of the buckets, and in position to catch the discharge therefrom, whereby the dirt is discharged at one side of the trench and left in a ridge or embankment,

sometimes called a spoil-bank, thus increasing the height of the trench at one side thereof. The shields 14 and 15 are disposed at opposite sides of the conveyer 13 and form a sort of hopper for receiving the discharge from the buckets and preventing the same from falling off of the upper surface of the conveyer.

A sprocket chain 16 is arranged for suitably connecting the shaft 2 with the shaft F, and the latter is connected by another sprocket chain 17 with the transverse shaft 18 mounted in suitable bearings on the body. This shaft 18 is driven from an electric motor, or other suitable source of power 19 on the body, through the medium of the spur gearing 20 and the beveled gearing 21, which gearing may be of any suitable form or character. In this way the trench-cutter is operated by the source of power carried on the body of the machine. The shaft 2 is suitably connected by gearing 22 and a sprocket belt 23 with the outer end of the conveyer 13, whereby the latter is also driven from the shaft F which serves as an axis about which the trench-cutter is raised and lowered by a tilting motion thereof. For the purpose of thus raising and lowering the trench-cutter, the rear ends of the beams *c* are provided with a swiveled and internally threaded sleeve 24 which engages a vertically disposed screw 25, the latter mounted in a bearing 26 which is swiveled on the shaft 27, and which latter is driven from the shaft 18 through the medium of suitable gearing. Beveled gearing 28 connects the lower end of the screw 25 with the shaft 27, and in this way the beams *c* can be tilted about their axes when it is desired to raise and lower the trench-cutter. It will be understood that any suitable arrangement or means can be employed for enabling the attendant or operator to rotate the screw 25 in either direction at will.

The shaft 18 is gear connected with a transverse shaft 29 and the latter is in turn connected by a sprocket belt 30 with a transverse shaft 31 on the bottom of the body frame. From this shaft 31 a sprocket belt 32 extends to the rear end of the caterpillar, whereby the latter is driven from the source of power located on the body of the machine.

As the caterpillar B is quite narrow, as previously explained, some means must be provided for insuring the stability of the machine, by preventing it from tipping over sidewise, while operating in the trench. For this purpose, a pair of shoes or runners G and H are arranged at opposite sides of the machine and disposed in position to engage the sides of the trench near the top thereof. These shoes or runners are mounted on the ends of the transversely arranged screws *g* and *h*, the latter being mounted in bearings 33 and 34 on the body frame. These screws are provided with threaded sleeves in the form of worm wheels 35 and 36, and these wheels are arranged to engage the worms 37 and 38 on the forward ends of the hand-wheel shafts 39 and 40 which latter extend longitudinally of the body frame and are supported in suitable bearings thereon. The rear ends of these shafts 39 and 40 are provided with hand-wheels 41 and 42 for the rotation thereof, and with this arrangement the shoes or runners G and H can be adjusted toward and away from each other, depending upon the conditions, thereby to maintain the machine upright. Thus the machine travels not only on the bottom or floor of the trench, but also slides along the sides of the trench, being held upright by these runners or other suitable means for engaging the vertical sides of the trench. In this connection it will also be seen that the frame or yoke I of the rear steering wheel D is provided at opposite sides thereof with rollers *i* which also engage and travel upon the sides of the trench. In this way, and when the hand-wheel *e* is rotated, the wheel D is skewed about its steering axis *d*, but the wheel is maintained practically in the center of the trench by the rollers *i*, thus causing the rear end of the body A to be shifted to either side of the trench.

A machine of the foregoing construction and mode of operation may be employed for various purposes. It may be used for making ditches for drainage purposes, or it may be used in the construction of trenches for military purposes. A trench is cut which is as wide as the trench-cutter, but practically the balance of the machine is much narrower than the trench-cutter, thereby reducing the weight and also facilitating the handling of the machine in the trench. This is especially true in changing the direction of travel of the excavator, and with the construction shown a machine can be turned around in the ground at the end of the trench, by a series of operations involving first going ahead and then backing up, as indicated in Fig. 8, in a manner which will be readily understood. Obviously, however, the machine can be handled or manipulated in various ways, depending upon the condition and the results desired, and I do not limit myself to any particular mode of operation or method of use.

As a matter of further and special improvement, the beveled gearing 28 may be provided with a suitable clutch, in the usual and well known manner, for reversing the rotation of the screw 25. Also, and as shown in Fig. 2, the shaft 18 is provided with a clutch 43 for reversing the rotation of this shaft when such is necessary or desirable. This shaft is provided with a pinion 42 which engages the gear wheel 44 on shaft 27, and which engages the gear wheel

45 on shaft 29, the latter gear wheel having a clutch 46 to open and close connection between it and said shaft. The gear wheel 47 on shaft 29 has a clutch 48 to open and close connection between it and said shaft, and this gear wheel engages a pinion 49 on the shaft 50, which latter is also mounted in suitable bearings on the body frame. The shaft 29 has a sprocket wheel 51 for the sprocket chain 30, and the shaft 50 has a sprocket wheel 52 for the sprocket chain 53 which extends around a sprocket 54 on the shaft 27, in the manner shown. With this arrangement the caterpillar B can be operated at high speed while the machine is traveling along the road from one place to another, through clutch 43 to the pinion 42, from the latter to the gear wheel 45, and then through sprocket 51 and chain 30 to shaft 31, and from the latter to the caterpillar. When the machine is in operation, however, a slower speed is required, and in such case clutch 46 is open and clutch 48 is closed, whereby the transmission is then from shaft 18 through pinion 42 to gear wheel 44, then through shaft 27 and pinion 54 and sprocket chain 53 to sprocket wheel 52, then through shaft 50 to pinion 49 to gear wheel 47, thus rotating shaft 29 at a much slower speed than before. During this forward feeding of the machine to produce the excavating operation, the clutch 55, on the shaft 27, is, of course, in middle position, being an ordinary jaw clutch, so that adjusting screw 25 does not rotate. However, and by shifting this clutch 55 one way or the other, the double gearing 28 can be operated, in a manner that will be readily understood to instantly rotate the screw 25 in either direction. Then sprocket chain 17, leads to a sprocket wheel 56 on the shaft 18, which sprocket wheel is controlled by an ordinary jaw clutch 57, whereby the transmission of power to the excavating buckets can be more effectively and conveniently controlled at will.

As previously stated, the transmission of power from the cutter to the various operative elements, and the control of such transmission can be accomplished in any suitable or desired manner, and broadly considered, my invention is not limited to any particular means for so doing. But the arrangement of gears, clutches, etc., last described, or some equivalent arrangement, is thought to be practical and effective for this purpose. But I do not limit myself to the exact construction shown and described.

As shown in Fig. 3 the caterpillar B is provided at its forward end with flange couplings 58 which are mounted on the ends of the forward shaft of said caterpillar, whereby the wheels 59, shown in dotted lines in Fig. 3, can be connected to said shaft in the manner shown. In this way and when the said wheels 59 are in place, the machine is adapted to travel on the surface of the ground and is held by said wheels against tipping over sidewise. Obviously, any suitable means can be employed for this purpose. When the machine is in operation, as shown in the drawings, the wheels 59 are not in use, having been removed before the machine enters the trench.

What I claim as my invention is:

1. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright.

2. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said means including shoes which bear against the sides of the trench and manually operated worm gearing for adjusting said shoes.

3. An excavating machine, comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said devices being narrower than said body, and a steering wheel at the rear end of said body.

4. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said trench-cutter including an endless series of buckets disposed at the forward end of said body, said body and devices being narrower than said buckets, and means for shifting the rear end of said body sidewise to change the direction of travel of said machine in the trench.

5. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said body having a steering mechanism at the rear end thereof, which mechanism includes a wheel to engage the bottom of the trench, means to swing said wheel about a vertical steering axis, and rollers at opposite sides of said wheel to engage the sides of the trench.

6. An excavating machine comprising a trench-cutter, a body for supporting said

trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said trench-cutter being wider than said body said devices being of a width which is insufficient to maintain the stability of said machine, and means for steering the body sidewise to change the direction of travel thereof.

7. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, mechanism to raise and lower said trench-cutter, relative to said body, and a motor and power-transmitting connections to operate said devices and trench-cutter and mechanism, carried on said body.

8. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said means including rearwardly extending shafts having their rear ends provided with a pair of hand-wheels for the operation thereof.

9. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said devices having detachable wheels which keep the machine from falling over sidewise while traveling above ground.

10. An excavating machine comprising a trench-cutter, a body for supporting said trench-cutter in position for operation in the ground, traction devices traveling in the trench to support said body therein, and means for engaging the sides of the trench to hold the machine upright, said devices including a single relatively narrow caterpillar at the front of said body, and said means being disposed directly above the front portion of said caterpillar, which latter is disposed centrally of the trench.

Signed by me at Chicago, Ill., this 11th day of October, 1915.

JAMES C. FRENCH.