J. C. FRENCH.

TRENCHING MACHINE.

APPLICATION FILED JULY 15, 1914.

1,210,453.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 1.

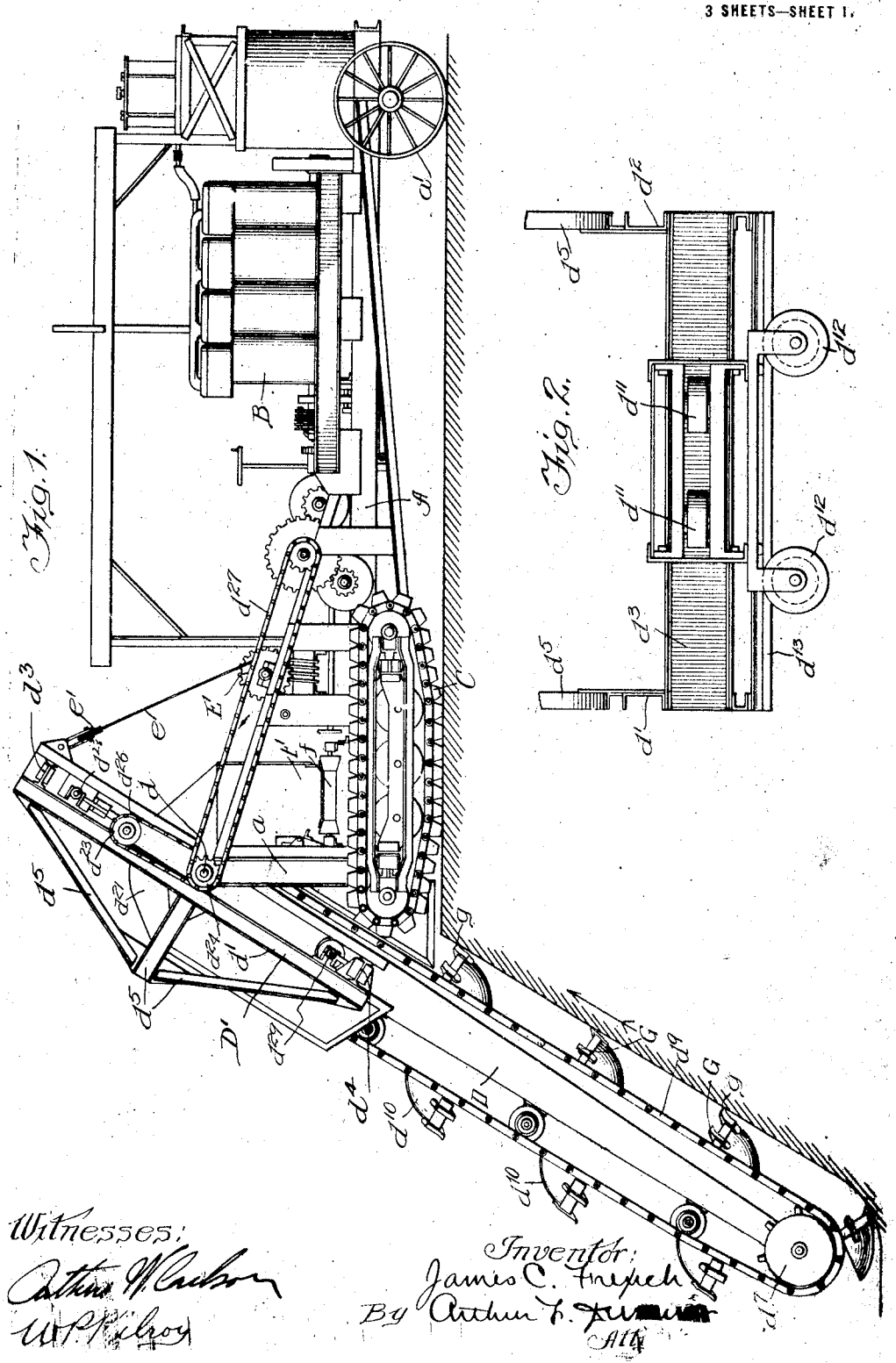


Fig. 1.

Fig. 2.

Witnesses:

Arthur W. Cochran

W. P. Gilroy

Inventor:

James C. French

By Arthur L. [illegible]

Atty.

J. C. FRENCH.

TRENCHING MACHINE.

APPLICATION FILED JULY 15, 1914.

1,210,453.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 2.

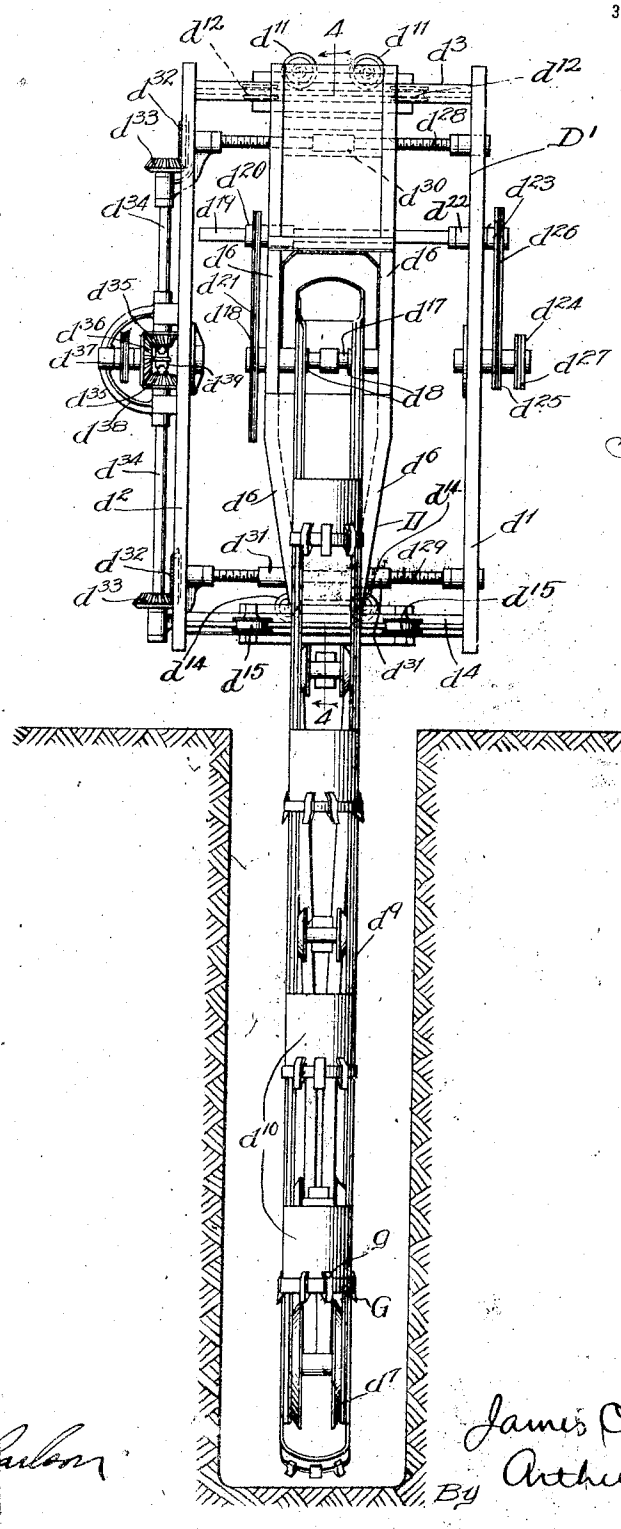


Fig. 3.

Witnesses:

Inventor:
James C. French
By Arthur F. Duraud
Atty.

J. C. FRENCH.

TRENCHING MACHINE.

APPLICATION FILED JULY 15, 1914.

1,210,453.

Patented Jan. 2, 1917.

3 SHEETS—SHEET 3.

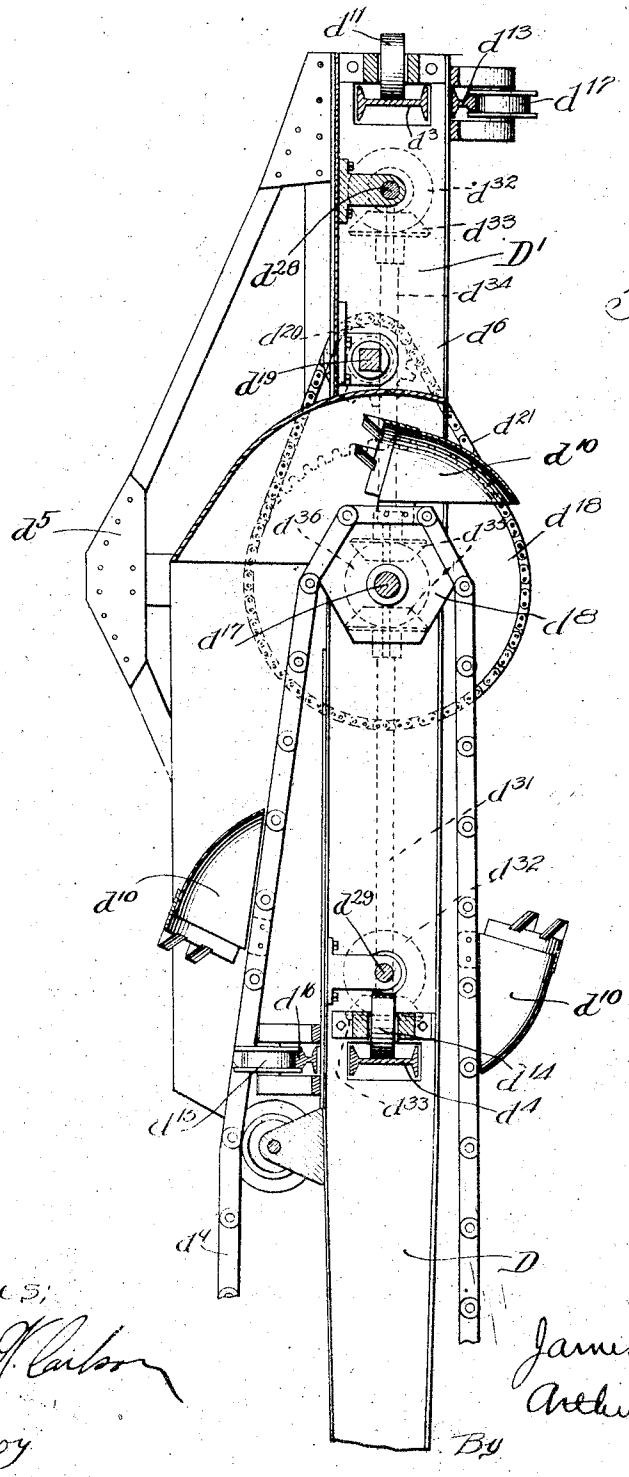


Fig. 4.

Witnesses;
Arthur H. Carlson
W. T. Kilroy

Inventor;
James C. French
Arthur H. Durand
By
Atty.

BEST AVAILABLE COP

UNITED STATES PATENT OFFICE.

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

TRENCHING-MACHINE.

1,210,453. Specification of Letters Patent. Patented Jan. 2, 1917.

Application filed July 15, 1914. Serial No. 851,052.

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, Kenosha county, Wisconsin, have invented a certain new and useful Improvement in Trenching-Machines, of which the following is a specification.

My invention relates to excavators in general, but more particularly to those for making ditches or trenches, and more especially to those excavators for trenching purposes in which an endless series of buckets is arranged upon a tilting beam at the rear of the machine.

Generally stated, the object of my invention is to provide a novel and highly efficient construction of excavator of that particular kind in which the endless series of buckets is movable back and forth across the trench, during the continuous travel of the buckets up and down in the ditch, for the purpose of cutting a trench which is wider than the buckets, and thereby obviating the necessity of using very wide buckets, or of employing two or more series of buckets arranged side by side, as was often done when a trench of unusual width was desired.

A special object is to provide a simpler and more satisfactory form of beam than was heretofore employed in machines of this kind for supporting the excavating buckets, having novel and efficient means for causing the beam to automatically reciprocate back and forth across the trench, and so constructed and arranged that it will be capable of operating at a greater angle from the horizontal than was heretofore possible with machines of this kind.

It is also an object to provide certain details and features of construction and combinations tending to increase the general efficiency and serviceability of a trenching machine having a reciprocating digging beam 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 a trenching machine embodying the principles of my invention. Fig. 2 is an enlarged view looking down on the upper end of the digging beam. Fig. 3 is an enlarged rear elevation of the digging beam and endless series of buckets shown in Fig. 1, looking in a direction at right angles to said beam. Fig. 4 is an enlarged section of the upper portion of said digging beam and series of buckets, taken on line 4—4 in Fig. 3.

As thus illustrated, my invention comprises a body or platform A provided with a rear frame or super structure a, and with an engine B of any suitable character. The front portion of said body is supported by suitable wheels a^1, and the rear end of said body is supported by suitable caterpillars C which are operated by said engine to slowly propel the machine forward during the excavating operation, and also while the machine is traveling from one place to another. It will be understood, of course, that the transmission from the engine to said caterpillars may be of any suitable character, and that any suitable devices can be employed for controlling this transmission of power. I do not, however, limit myself to any particular means for propelling the machine along the surface of the ground.

The tilting and sidewise reciprocating digging beam D is supported in position to enter the ground in rear of the body or platform A, being mounted to swing about a horizontal axis located at d, which axis extends transversely of the direction of travel of the machine, whereby the said beam tilts up and down in a vertical plane at its rear or lower end. The mechanism for providing the sidewise motion of this beam comprises an upper rectangular frame D^1 composed of parallel side members d^1 and d^2, and upper and lower cross members d^3 and d^4 these members being secured together in any suitable manner. This frame is preferably strengthened by the truss members d^5 which are applied to the outer sides of the frame members d^1 and d^2, whereby said frame is prevented from buckling or bending when subjected to the strain of digging or excavating, as will hereinafter more fully appear. The sidewise reciprocating portion of the beam D comprises the parallel members d^6 which are suitably connected together to form a sort of ladder frame, this frame being provided at its lower end with a pair of sprocket wheels d^7, the lower end of the beam being disposed between these two wheels. The upper end portions of the structural members d^6 are, however, spread apart to

provide room between them for the upper sprocket wheels d^8, as shown more clearly in Fig. 3; and these upper and lower sprocket wheels are connected by parallel sprocket chains or link belts d^9 of any suitable known or approved character. The ladder frame and sprockets and link belts, together with the buckets d^{10} on said link belts are supported for reciprocating movement from one side of the rectangular frame to the other—that is to say, they are supported for bodily sidewise movement between the frame members d^1 and d^2, these two members being suitably spaced apart to provide room and clearance for this reciprocating movement. For this purpose the upper end of the said ladder frame is provided with supporting wheels d^{11} which travel in a suitable track formed on the top of the cross member d^3 (see Fig. 4), and with grooved wheels d^{12} which engage the track d^{13} disposed at the rear of the member d^3; and down below the said ladder frame is provided with supporting wheels d^{14} which travel on the track provided on the upper surface of the cross member d^4, and with other wheels d^{15} which travel on the track d^{16} disposed in front of said cross member; and with this construction it will be seen that the axes of the wheels d^{11} and d^{14} extend transversely of the digging beam—that is to say, at right angles to the length of said beam, and also at right angles to the axis of the sprocket wheels d^8; but the axes of the wheels d^{12} and d^{15} extend up and down the beam D, as these wheels do not sustain the weight of the beam, but simply keep the ladder frame or digging beam parallel with the rectangular upper frame. In this way the said ladder frame and endless series of buckets are movable bodily from one side to the other.

The power is transmitted from the engine D to the endless series of buckets in any suitable manner, but preferably as follows:—The frame a comprises upright portions which are disposed at opposite sides of the machine, and which embrace the digging beam D and its tilting frame D^1 being provided at their upper ends with suitable bearings for the axis d of the beam. This pivotal point or supporting axis of the beam D can be provided in any suitable manner, but by reason of the arrangement shown and described it is not necessary to employ a long driving shaft at this point, as it is desirable to obviate the necessity of sliding sprockets d^8 on a shaft when the beam moves from side to side. The construction preferably includes, therefore, a short shaft d^{17} supported in suitable bearings on the frame members d^6, upon which the sprockets d^8 are suitably fixed, and which is provided at its outer end with a large sprocket wheel d^{18}; and this driving shaft d^{17} is then driven from a jack shaft d^{19} through the medium of a sprocket d^{20} which is swiveled on the adjacent frame member d^6, being connected with the jack shaft by a spline or feather and through the medium of a sprocket chain d^{21} which connects this comparatively small sprocket wheel with the said relatively large sprocket wheel. The said shaft d^{19} is supported for rotation in suitable bearings on the frame members d^4 and d^6, and is suitably held against endwise movement by the collars d^{22} and d^{23} secured thereon at opposite sides of the bearing on the adjacent frame member. Sprockets d^{24} and d^{25} are arranged side by side immediately outside of the frame member d^1, being rigidly connected together, and rotate about an axis coincident with the axis d about which the digging beam D tilts or swings in the manner previously described. The collar d^{23} may have a sprocket wheel, either integral therewith or separate therefrom, and this sprocket wheel is connected by a sprocket chain e^{26} with the said sprocket d^{25}; and finally the sprocket d^{24} is suitably connected with the engine B through the medium of a sprocket chain d^{27} and other suitable means, whereby the said engine is capable of operating the said buckets d^{10} in the direction indicated by the arrow in Fig. 1 during the time the beam D and everything carried thereby is moving from side to side.

The mechanism for reciprocating the beam and buckets back and forth across the trench is preferably as follows:—Upper and lower transverse screws d^{28} and d^{29} are mounted in suitable bearings on the upper and lower end portions of the frame members d^1 and d^2, and are suitably held against endwise movement in said bearings. The screw d^{28} extends through a screw threaded sleeve d^{30}, and the screw d^{29} extends through a similar screw threaded sleeve d^{31}, all of said sleeves being suitably fixed on the ladder frame which carries the buckets. The outer ends of these screws which are adjacent to the frame member d^2 are provided with bevel gears d^{32} which are engaged by bevel pinions d^{33} mounted on the ends of the shafts d^{34}, which latter are mounted in suitable bearings on the side of the frame member d^2, being parallel therewith. The adjacent ends of the shafts d^{34} are provided with bevel gears d^{35} which engage a bevel pinion d^{36} the latter being driven by a sprocket connection including a sprocket wheel d^{37} suitably supported by a bracket d^{38} on the frame member. The two shafts d^{34} are preferably joined together or integral, so that they form one long shaft in effect, and the bevel gears d^{35} are loosely mounted on this shaft, a bevel jaw clutch d^{39} being slidably mounted on the shaft between the said bevel gears. This clutch may be of any suitable known or approved character,

BEST AVAILABLE COP

such for example as those used on planers and grinding machines, and is shifted automatically from one bevel gear to the other, through the medium of any suitable connection or arrangement, thereby automatically reversing the rotation of the screws d^{28} and d^{29} when the digging beam D reaches the limit of its sidewise travel in either direction. In other words, the said clutch is an automatic reversing device for causing the said screws to alternately rotate in opposite directions, whereby the said digging beam and the excavating buckets are reciprocated back and forth across the path of the trench, thus producing a trench which is much wider than the buckets; but I do not limit myself to any particular form of clutch mechanism for this purpose. Obviously, it may be controlled by hand, in any well-known manner, if so desired. Thus the digging beam D and the buckets d^{10} are reciprocated back and forth in the manner described, but the rectangular frame comprising the members d^1, d^2, d^3 and d^4 does not have any movement during this reciprocation, being held against displacement by its pivotal connection with the frame a on the body. It will be understood, of course, that the said rectangular frame is movable about the horizontal axis provided by said pivotal connection.

For the purpose of raising and lowering the digging beam and buckets, by tilting the same about the horizontal axis d, any suitable means can be employed. As shown in the drawings, a drum E of any suitable character is provided near the rear of the body A and is connected by a cable e with a sheave e^1 on the upper end of the rectangular frame of the digging beam, in any suitable manner, to cause the lower end of the digging beam to rise when the cable is wound on the drum. With this arrangement, the digging beam D and its upper rectangular supporting frame can be tilted to a horizontal position when it is desired to have the machine travel from one place to another.

The buckets d^{10} can be of any suitable character, and as shown are arranged to turn upside down as they pass over the upper sprockets d^8, thereby discharging their contents into the hopper F arranged immediately below on the rear end of the machine body. From this hopper the dirt can be discharged to either or both sides of the machine by a conveyer f or other suitable apparatus for this purpose. This conveyer or discharging apparatus can be operated by any suitable connection with the engine B, it being understood that the latter is preferably employed for operating all of the various devices through the medium of power transmitting connections which are controlled by clutches or other similar means.

With the foregoing construction, the mechanism for reciprocating the digging beam from side to side is of a very simple and practical character, but is at the same time well adapted to withstand the various strains incident to the excavating operation. Said entire mechanism tilts about the axis of tilting motion of the beam, when the beam tilts up and down, and supports the beam and buckets. It will also be seen that the construction permits the digging beam D to be swung downward to a position in which it stands very nearly vertical, if such is desired, the caterpillars C being spaced apart to provide ample clearance between them for the upwardly moving buckets, as well as for the structure of the beam. These buckets move sidewise toward one caterpillar and then move sidewise toward the other caterpillar, thus widening the trench beyond the limits imposed by the mere width of the buckets themselves. In this connection it will also be seen that the buckets have side cutters G which operate on the side of the trench, as well as front cutters g which operate on the inclined end surface of the trench. It will be understood, of course, that during this back and forth sidewise motion of the buckets the caterpillars C are being operated to slowly crowd the machine forward. It is obvious, however, that the method of using a machine of this kind may vary according to the requirements of different cases.

The wheels a^1 can be arranged for steering the machine, if such is necessary or desirable, and any suitable known or approved steering gear can be employed for this purpose. These wheels are preferably arranged some distance ahead of the caterpillars C, and the latter are preferably disposed as far to the rear as possible, or sufficiently so to enable them to carry the weight of the digging beam and buckets in an advantageous manner, thereby insuring a well balanced machine.

I do not limit myself to the exact construction shown and described.

What I claim as my invention is:

1. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, mechanism for supporting and reciprocating the beam and buckets from side to side, said mechanism and beam tilting together about a horizontal axis, and means for operating the buckets during said lateral motion thereof.

2. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, side cutters on said buckets, mechanism for reciprocating the beam and buckets from side to side while the buckets are in the ground, and means for operating the buckets during said lateral motion thereof, said

BEST AVAILABLE COPY
BEST AVAILABLE COPY

mechanism including upper and lower screws having threaded engagement with the beam, a tilting frame to support said screws, means for rotating said screws, and a means for reversing the rotation of the screws.

3. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, mechanism for reciprocating the beam and buckets from side to side, said mechanism and beam tilting together about a horizontal axis, and means for operating the buckets during said lateral motion thereof, said means including a shaft supported on the beam to rotate about said axis, movable endwise with the lateral movement of the beam and buckets, sprockets fixed on said shaft, and link belts attached to said buckets, engaging said sprockets.

4. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, mechanism for reciprocating the beam and buckets from side to side, and means for operating the buckets during said lateral motion thereof, said means including a shaft mounted to rotate about an axis coincident with the axis of tilting motion of the beam, sprockets fixed on said shaft, link belts attached to said buckets, engaging said sprockets, said shaft and sprockets being movable with said beam in the direction of said axis, and a power transmitting connection for driving said shaft, said connection having one axis of rotation coincident with said shaft and involving a counter shaft disposed a distance therefrom, and said mechanism having a frame which tilts about said axis and whereon said counter shaft is mounted.

5. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, tilting mechanism for reciprocating the beam and buckets from side to side, means to tilt said beam and mechanism about a transverse axis to raise and lower the buckets, and means for operating the buckets in the ground during said lateral motion thereof, said means including a driving shaft for said buckets, rotatable about an axis coincident with the axis of tilting motion of said beam, movable endwise with the beam, a counter shaft connected with said driving shaft, and a sliding connection supported on said counter shaft and movable back and forth thereon by the lateral motion of said beam.

6. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, mechanism for reciprocating the beam and buckets from side to side, and means for operating the buckets during said lateral motion thereof, said beam having a tilting frame held against lateral movement, tracks on said frame, and wheels on the beam, engaging said tracks, serving to keep the beam and frame parallel, but facilitating lateral motion of the beam between the sides of said frame.

7. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, mechanism for reciprocating the beam and buckets from side to side, and means for operating the buckets during said lateral motion thereof, said beam having a rectangular supporting frame, tracks at the upper and lower ends of said frame, and wheels on the beam engaging said tracks, said mechanism including screws extending across said frame, means for rotating said screws, threaded sleeves on said screws, secured to said beam, and a clutch for reversing the rotation of said screws.

8. An excavating machine comprising a tilting digging beam, an endless series of excavating buckets carried on said beam, mechanism for moving the beam and buckets from side to side, means for operating the buckets in the ground during said lateral motion thereof, means to propel the machine forward during the operation of said buckets in the ground, and a device to tilt said beam and mechanism about a horizontal and elevated axis extending transversely of the direction of travel of said machine.

9. An excavator comprising a digging device, means to operate said device, mechanism for shifting said device back and forth sidewise during operation thereof, and means to tilt said device and mechanism about a common horizontal and transverse axis of adjustment to raise and lower said device in the ground.

10. An excavator comprising a trench-cutter, means to operate said trench-cutter, mechanism to reciprocate said trench-cutter laterally during operation thereof, and means to tilt said mechanism about a horizontal and transverse axis to change the position of said trench-cutter.

11. An excavator comprising a digging device, a frame having screw-mechanism to shift said device laterally, and means to tilt said frame about a horizontal and transverse axis to change the position of said device.

12. An excavator comprising a tilting trench-cutter and mechanism tilting therewith about a horizontal and transverse axis and adapted to shift the trench-cutter laterally in the direction of said axis and thereby widen the trench.

13. An excavator comprising a trench-

cutter, a track extending transversely of said trench-cu ter, wheels on said trench-cutter to travel on said track, and means to move said trench-cutter and track about a horizontal and transverse axis of adjustment to raise and lower the trench-cutter in the ground.

Signed by me at Chicago, Illinois, this 29th day of June, 1914.

JAMES C. FRENCH.

Witnesses:
RACHEL J. RICHARDSON,
ROSE E. SEHNEM.

BEST AVAILABLE COP