J. C. FRENCH.

EXCAVATING MACHINE.

APPLICATION FILED MAR. 4, 1914.

1,199,366.

Patented Sept. 26, 1916.

4 SHEETS—SHEET 1.

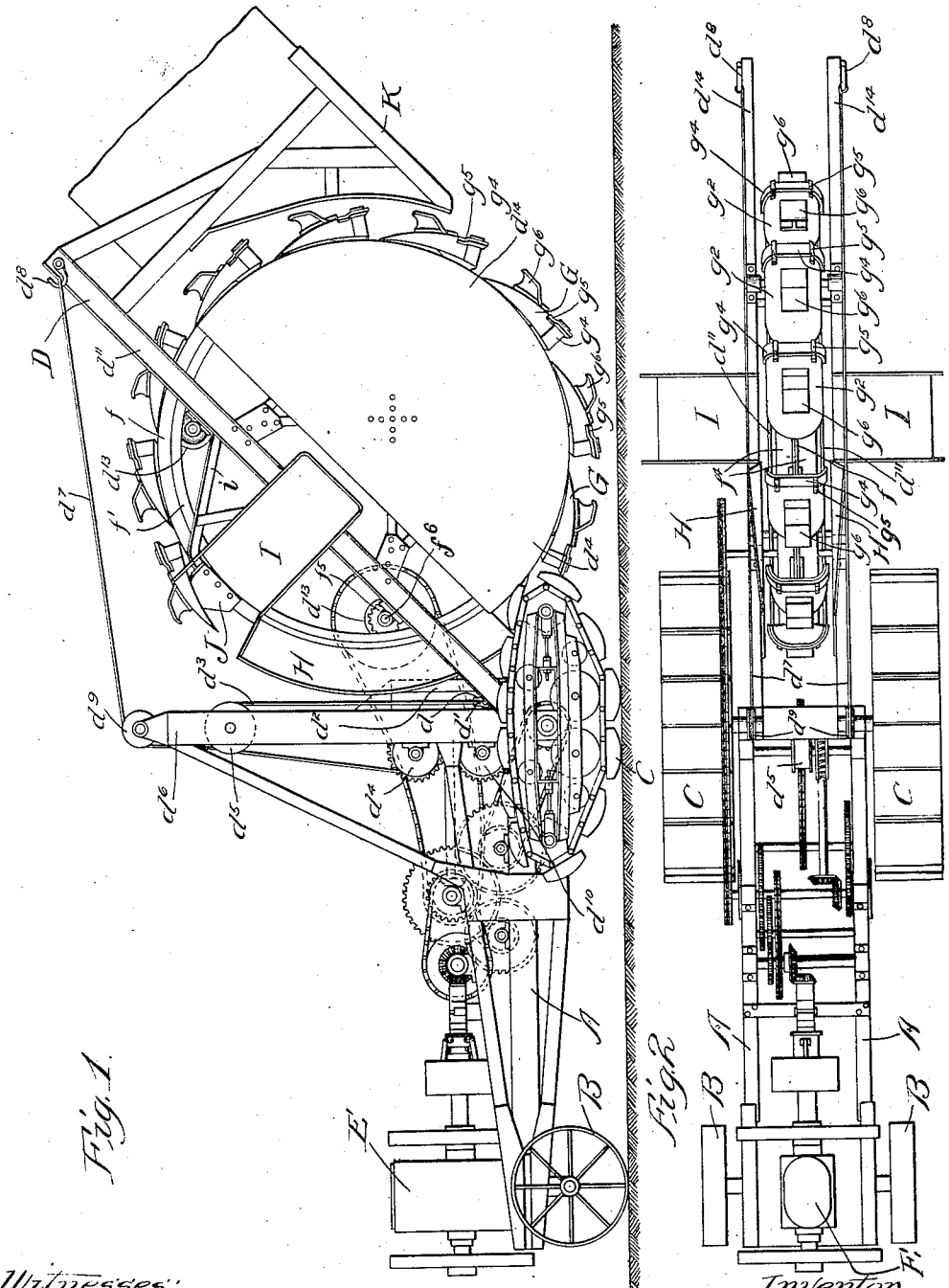


Fig. 1.

Fig. 2.

Witnesses:

Arthur W. Carlson

Robert G. Nelson.

Inventor

James C. French

By Arthur L. Durand

Attorney.

J. C. FRENCH.

EXCAVATING MACHINE.

APPLICATION FILED MAR. 4, 1914.

1,199,366.

Patented Sept. 26, 1916.

4 SHEETS—SHEET 2.

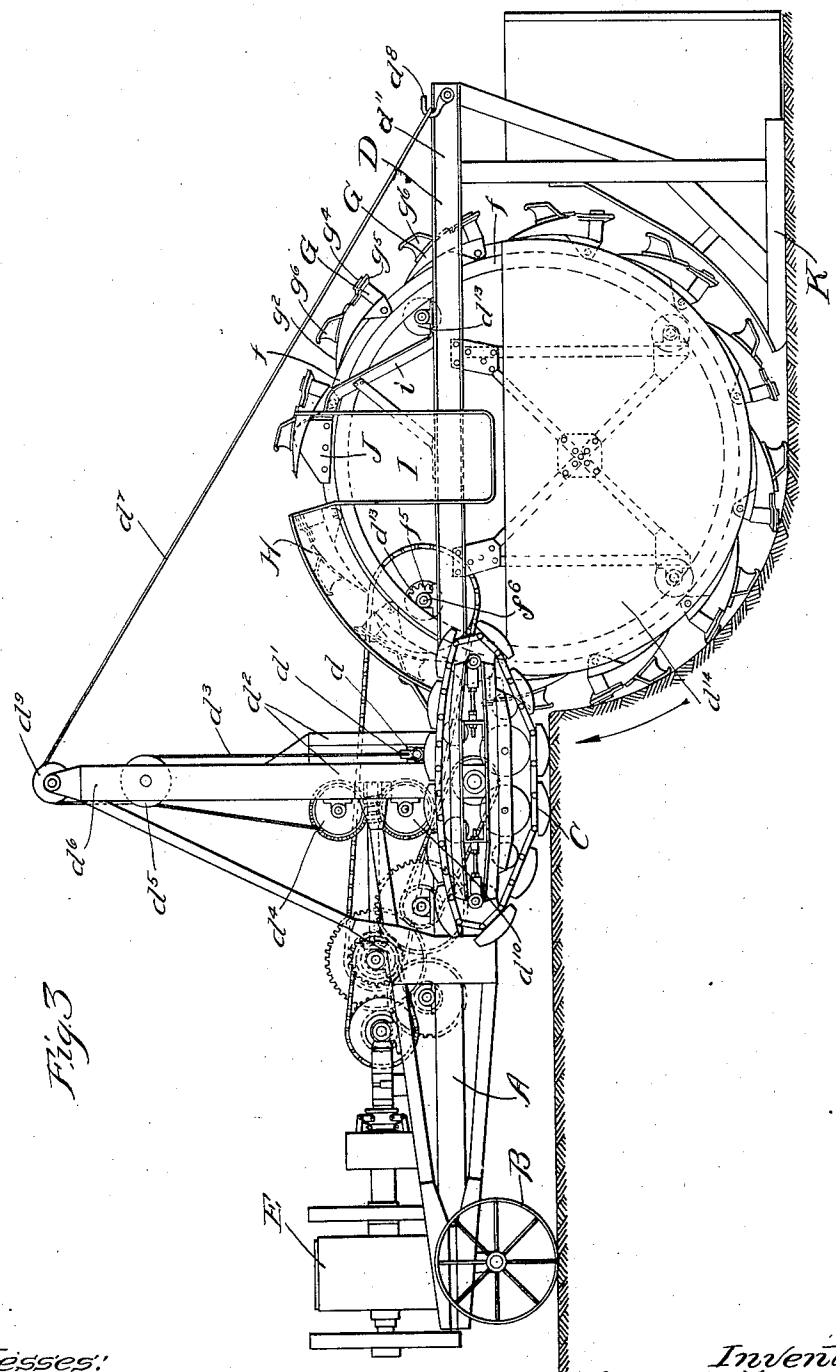


Fig. 3

Witnesses:

Arthur W. Carlson

Robert A. Walsh

Inventor

James C. French

By Arthur N. Durand

Attorney.

J. C. FRENCH.

EXCAVATING MACHINE.

APPLICATION FILED MAR. 4, 1914.

1,199,366.

Patented Sept. 26, 1916.

4 SHEETS—SHEET 3.

Fig. 4.

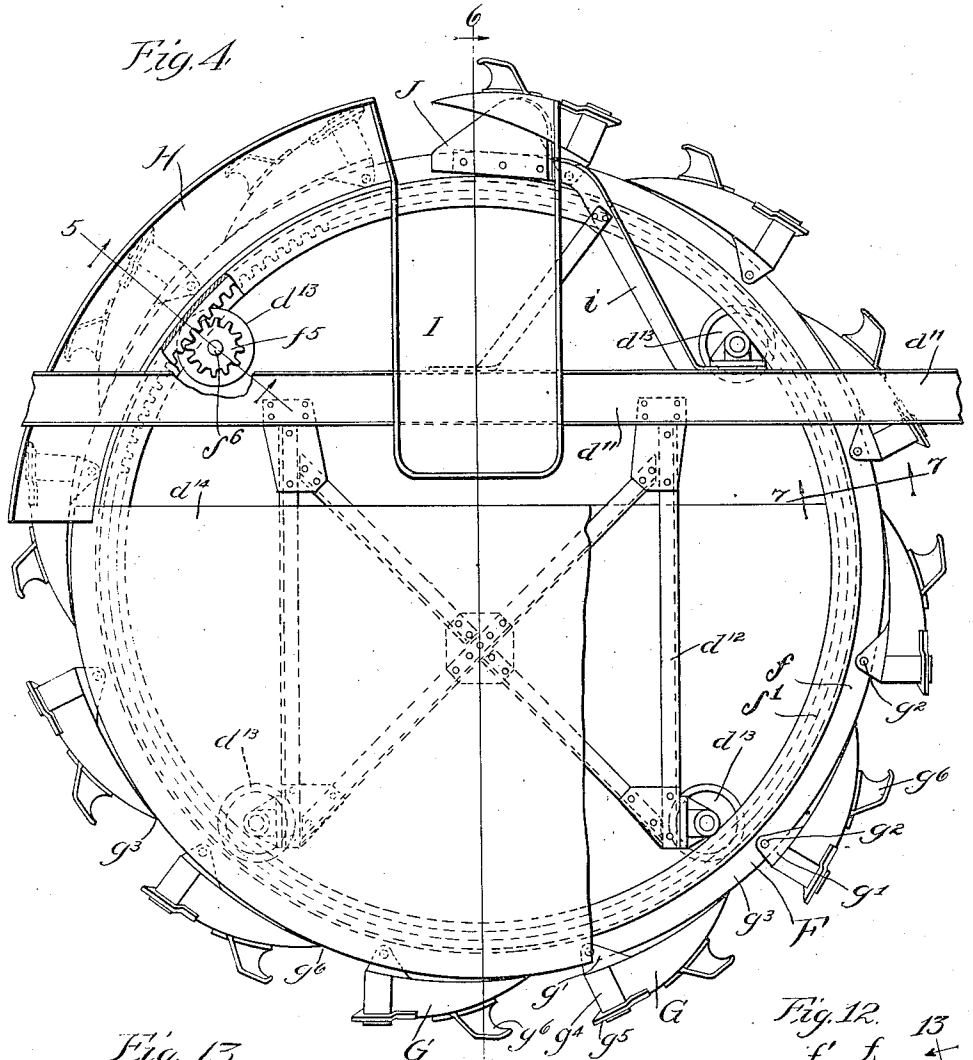


Fig. 13.

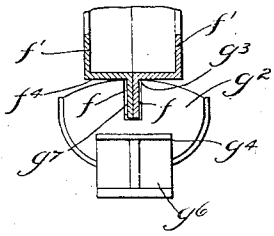


Fig. 5.

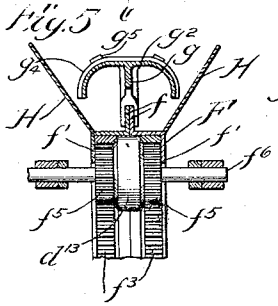
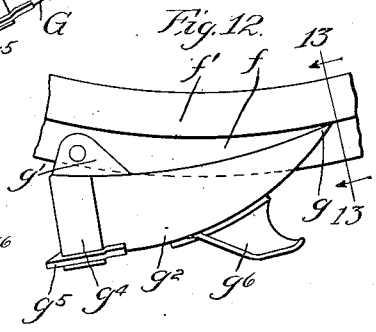


Fig. 12.



Witnesses:

Arthur H. Carlson.

Robert A. Kelly.

Inventor:

James C. French

By Arthur H. Durand

Attorney.

J. C. FRENCH.

EXCAVATING MACHINE.

APPLICATION FILED MAR. 4, 1914.

1,199,366.

Patented Sept. 26, 1916.

4 SHEETS—SHEET 4.

Fig. 6.

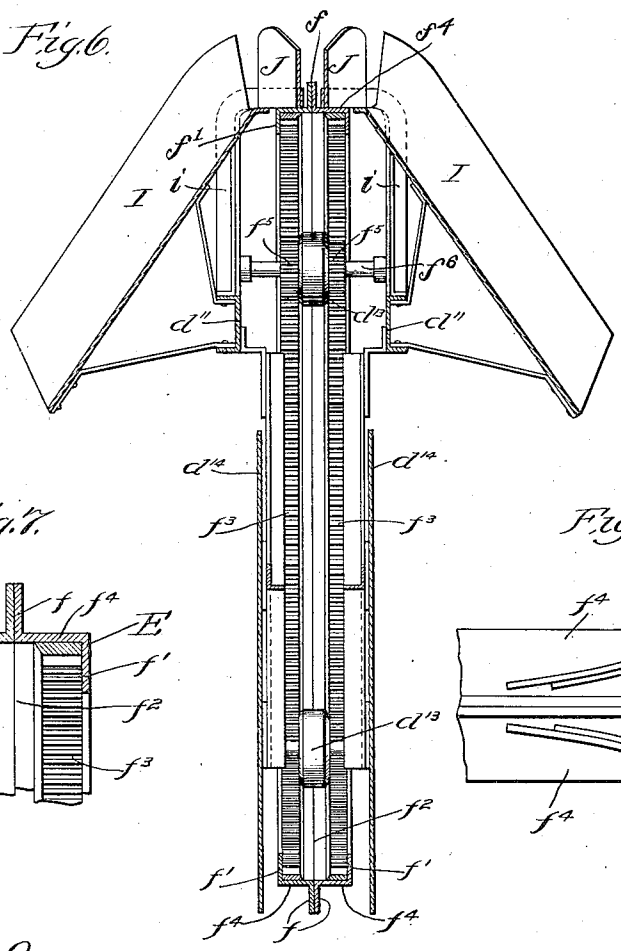


Fig. 7.

Fig. 8.

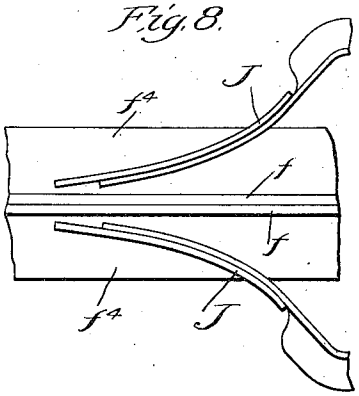


Fig. 9.

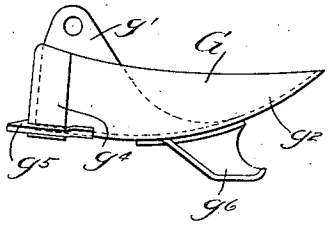


Fig. 10

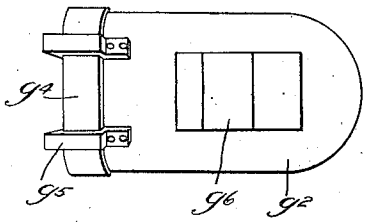
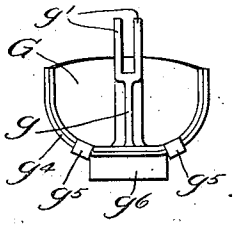


Fig. 11



Witnesses:

Arthur W. Carlson

Nabal G. Nelson.

Inventor:

James C. French

By Arthur F. Durand

Attorney.

UNITED STATES PATENT OFFICE.

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

EXCAVATING-MACHINE.

1,199,366. Specification of Letters Patent. Patented Sept. 26, 1916.

Application filed March 4, 1914. Serial No. 822,257.

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 Excavating-Machines, of which the following is a specification.

My invention relates to trenching machines of that kind in which an annular or ring-like element is supported for rotation in the ground, upon an axis extending transversely of the trench, and in which excavating buckets are secured in position around the periphery of the said annular element, each bucket discharging its contents when it reaches the highest point in its circular path of travel.

Generally stated, the object of my invention is to provide a novel and highly efficient trenching machine of the foregoing general character.

A special object is to provide a novel construction and arrangement whereby the buckets which are secured to the said rotary element, sometimes called a spokeless wheel, are adapted to tilt about a horizontal axis for the purpose of discharging their contents, and whereby stationary cleaners can be used for forcibly ejecting the contents from the buckets, notwithstanding the fact that each bucket is formed in a manner to prevent the contents from falling out of the rear end thereof when it travels upward.

It is also an object to provide a novel construction and arrangement of the annular rotary member, tending to insure greater strength and stability therefor, thus adapting it for use in situations where the work is very heavy and the strain on the machine is more than usual.

It is also an object to provide certain details of construction and combinations tending to increase the general efficiency and serviceability of a spokeless wheel 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, showing the spokeless wheel or ring and buckets raised to a position above the ground. Fig. 2 is a plan of said machine. Fig. 3 is a view similar to Fig. 1, showing the excavating apparatus down in the ditch. Fig. 4 is an enlarged side elevation of the said spokeless wheel and buckets, partly in section, and with a portion of the guard plate broken away to bring the supporting frame into view. Fig. 5 is a detail section on line 5—5 in Fig. 4. Fig. 6 is a vertical section on line 6—6 in Fig. 4. Fig. 7 is an enlarged detail section on line 7—7 in Fig. 4. Fig. 8 is an enlarged plan of the cleaners. Fig. 9 is an enlarged side elevation of one of the buckets. Fig. 10 is a bottom view of said bucket. Fig. 11 is a front end view of said bucket. Fig. 12 is a side elevation of a bucket and a portion of the wheel, showing another form of my invention. Fig. 13 is a cross-section on line 13—13 in Fig. 12.

As thus illustrated, my invention comprises a body A supported upon wheels B and caterpillar traction devices C of any suitable character. The beam D is disposed at the rear of the body, having its end pivoted at d to the vertically adjustable support d^1, which latter slides up and down in the guides d^2 on the body. A cable d^3, running over a drum d^4, is attached to the support d^1, said cable being supported by the sheave d^5 on the frame d^6, or in any suitable manner. A cable d^7 is attached to the outer end of the beam D at d^8, and is supported on a sheave d^9 on the top of the frame d^6, the lower portion of this cable being wound on the drum d^{10}, which latter is of any suitable character. The drums d^4 and d^{10} can be operated from the engine E by any suitable means. With this arrangement, the beam D can be raised and lowered and held at different angles. Said engine E is also suitably connected with the caterpillars C to drive the machine forward.

The excavating apparatus is as follows:—The beam D is composed of two parallel side members d^{11} suitably spaced apart and rigidly connected together. Depending from said members is a frame d^{12} provided with four rollers d^{13}, and a spokeless wheel F is supported upon said rollers. This ring or wheel is composed of two Z-bars bent into circular form and having their outer flanges f secured flatwise together. See Fig. 7. The inner flanges f^1 form a channel between them for the central track f^2 and the two rows of gear teeth f^3, the rollers d^{13} engaging said track. The webs f^4 are at right angles to said flanges, in cross sec-

tion, and the teeth f^3 are engaged by the driving pinions f^5 on the shaft f^6 of one of said rollers, said shaft being supported in suitable bearings on the beam. Buckets G are mounted on said ring or wheel F, each bucket being of the shape and character shown in Figs. 9, 10 and 11. Said bucket has a leg or shank g which is forked at its end to provide portions g^1 that embrace the flanges f of the wheel, these portions being held by a pivot g^2 extending through said flanges. Thus the shank g divides the bucket into two compartments, and the back g^2 of each bucket slopes gradually to the rear edge g^3 thereof, this rear edge resting on the wheel while the bucket is filling. Each bucket has a cutting edge g^4 and teeth g^5 of steel. The back of each bucket has a heel g^6 that rides on the ground to hold the bucket against the wheel or rim. Flaring guard plates H are riveted on the beam at opposite sides of the wheel, to keep the dirt from falling at each side while the buckets are moving upward to the dumping position. The spouts I receive the dirt from the buckets, the discharge being facilitated by the cleaners J disposed at said position. Said cleaners are curved plates disposed obliquely to the direction of the motion of the buckets, thereby deflecting the dirt from the webs f^4, and also scraping the inner surface of each bucket. Owing to the curved formation of the buckets, each bucket lifts or rises as it passes over the cleaners. Thus each bucket automatically discharges its load into one of said laterally projecting spouts I, or on to any suitable means. These cleaners are secured to arms i which are mounted on the beam. With this arrangement the buckets are practically closed at their ends while filling and carrying the dirt upward to dumping position, as the exit at the rear end of each bucket is restricted to an extent to keep the wedge of dirt from passing out. The guard plates d^{14} are secured to the frame d^{12} to cover the wheel, having curved edges conforming to the curve of the wheel or ring, and straight upper edges disposed a little below the beam. Said plates d^{14} preferably bear against the sides of the wheel to keep out the dirt. They also assist in preventing the dirt from escaping laterally from the buckets while filling.

In Figs. 12 and 13, the bucket G has its rear end provided with a notch g^7 for the flanges f, whereby the rear edge of the bucket engages the surface of the webs f^4, thus more fully closing the rear end of the bucket while in loading and carrying position. It will be seen that other changes can be made without departing from the spirit of my invention.

When the wheel or ring F is in the ground, as shown in Fig. 3, and when it is rotated in the direction of the arrow, (see Fig. 3) the buckets take up the dirt and cut a straight trench. Thus the machine is a trench cutter and adapted for use in laying tile. For this purpose a shoe K is disposed in rear of the wheel to smooth the bottom of the ditch. This shoe is of any suitable character.

The cutting edge g^4 of each bucket extends vertically at the sides thereof, as well as around the lip of the bucket, while the latter is in loading position. These side cutters are provided for each bucket, whereby the roots, etc., are cut by the forward progress of the machine through the ground. Also, as stated, and inasmuch as each load of dirt is wedge shaped, the heels g^6 ride on the ground to keep the buckets in loading position. Otherwise, the hard wedges of clay or other hard soil might be pressed backward through the buckets after they are loaded, and while still in the ground. With this construction a clean cut is made through any kind of soil.

It will be seen that the ring or rotary element F, sometimes called a spokeless wheel, is arranged in a vertical plane, and that the buckets G have their orbit disposed in this same vertical plane, whereby the forward movement of the ring or wheel and its buckets bodily results in the cutting of the trench. The pressure of the ground against the cutting edge of each bucket will tend to hold the latter in loading position, and to keep the rear ends of the buckets pressed tightly against the ring or wheel F, but the thrust of the dirt entering the buckets tends to swing them away from the ring or wheel, as previously explained, and this is especially true when the machine is working in hard clay. To counteract this tendency, therefore, and prevent the load from readily passing out at the rear end of each bucket, while they are working in the ground, the heels g^6 of the buckets are disposed a suitable distance in rear of the pivots by which the buckets are mounted on the peripheral flange of the said ring or wheel. With this provision, and regardless of how forcefully the dirt may enter the bucket, the latter will be held in carrying position by its heel which slides on the ground and thereby resists the thrust and wedging action of the dirt entering the bucket. The axes of motion provided by the pivots g^2 are horizontal and parallel, and each bucket is wider than the ring or wheel, whereby each bucket forms or trims the opposite sides of the trench—that is to say, each bucket is as wide as the trench. Such being the case, and with the buckets arranged to cut entirely across the bottom of the trench, the ring or wheel F is driven by gearing which engages the inner side of the ring, in the manner explained.

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

What I claim as my invention is:

1. A trenching machine comprising a circular or ring shaped rotary element, means for supporting said element in the trench, means for rotating said element about an axis transverse of the trench, a series of tilting digging buckets disposed along the periphery of said element, each pivoted thereon, means engaging the ground in rear of the pivots to hold the buckets in carrying position while loading, and devices for discharging the dirt from said buckets, said element having a cylindric outer surface for engaging the dirt in the buckets, said devices serving to tilt each bucket upward and away from said surface to discharge the load therefrom.

2. A trenching machine comprising a circular or ring shaped rotary element, means for supporting said element in the trench, means for rotating said element about an axis transverse of the trench, a series of tilting digging buckets disposed along the periphery of said element, each pivoted thereon, means engaging the ground in rear of the pivots to hold the buckets in carrying position while loading, and devices for discharging the dirt from said buckets, each bucket having a rearwardly tapering chamber, and said devices comprising a stationary cleaner disposed in position to enter and raise the buckets as the latter pass over upside down.

3. A trenching machine comprising a circular or ring shaped rotary element, means for supporting said element in the trench, means for rotating said element about an axis transverse of the trench, and a series of buckets disposed along the periphery of said element, said supporting means including a frame having rollers, said element having a circular track to engage said rollers, said rotating means including pinions supported on said frame, and said element having teeth for engaging said pinions, disposed at each side of said track, said element being composed of two flanged rings secured together at the center of said track.

4. A trenching machine comprising a circular or ring shaped rotary element, means for supporting said element in the trench, means for rotating said element about an axis transverse of the trench, a series of tilting digging buckets disposed along the periphery of said element, each pivoted thereon, means engaging the ground in rear of the pivots to hold the buckets in carrying position while loading, and devices for discharging the dirt from said buckets, said devices including plates set at angles to the direction of travel of the buckets, and curved to present concave surfaces to the dirt in the buckets, each plate having an upper edge for engaging the buckets.

5. A trenching machine comprising a circular or ring shaped rotary element, means for supporting said element in the trench, means for rotating said element about an axis transverse of the trench, a series of tilting buckets disposed along the periphery of said element, pivoted thereon, and devices for discharging the dirt from said buckets, and curved plates between which the buckets travel upwardly to dumping position, flaring outwardly from the sides of said element.

6. An excavating machine comprising a traveling support, an endless series of buckets pivoted on said support, operating in a vertical plane, and stationary means for successively tilting said buckets outward about their pivots to discharge the contents thereof, each bucket being free to tilt about a horizontal axis relative to said support, except while held in loading position by the ground, each bucket having means for engaging the ground to hold it in said position.

7. An excavator comprising an endless series of digging buckets, pivots for said buckets, whereby each bucket has pivotal motion to discharge its load, means passing through the buckets at the place of discharge to clean each bucket, and a heel on each bucket to engage the ground and hold the bucket in loading position.

Signed by me at Chicago, Illinois, this 14 day of February 1914.

JAMES C. FRENCH.

Witnesses:

RACHEL J. RICHARDSON,

ROSE E. SEHNEM.