No. 647,282. Patented Apr. 10, 1900.

W. SHANNON.

SEWER EXCAVATING AND FILLING MACHINE.

(No Model.) (Application filed Apr. 11, 1898. Renewed Sept. 18, 1899.)

4 Sheets—Sheet 1.

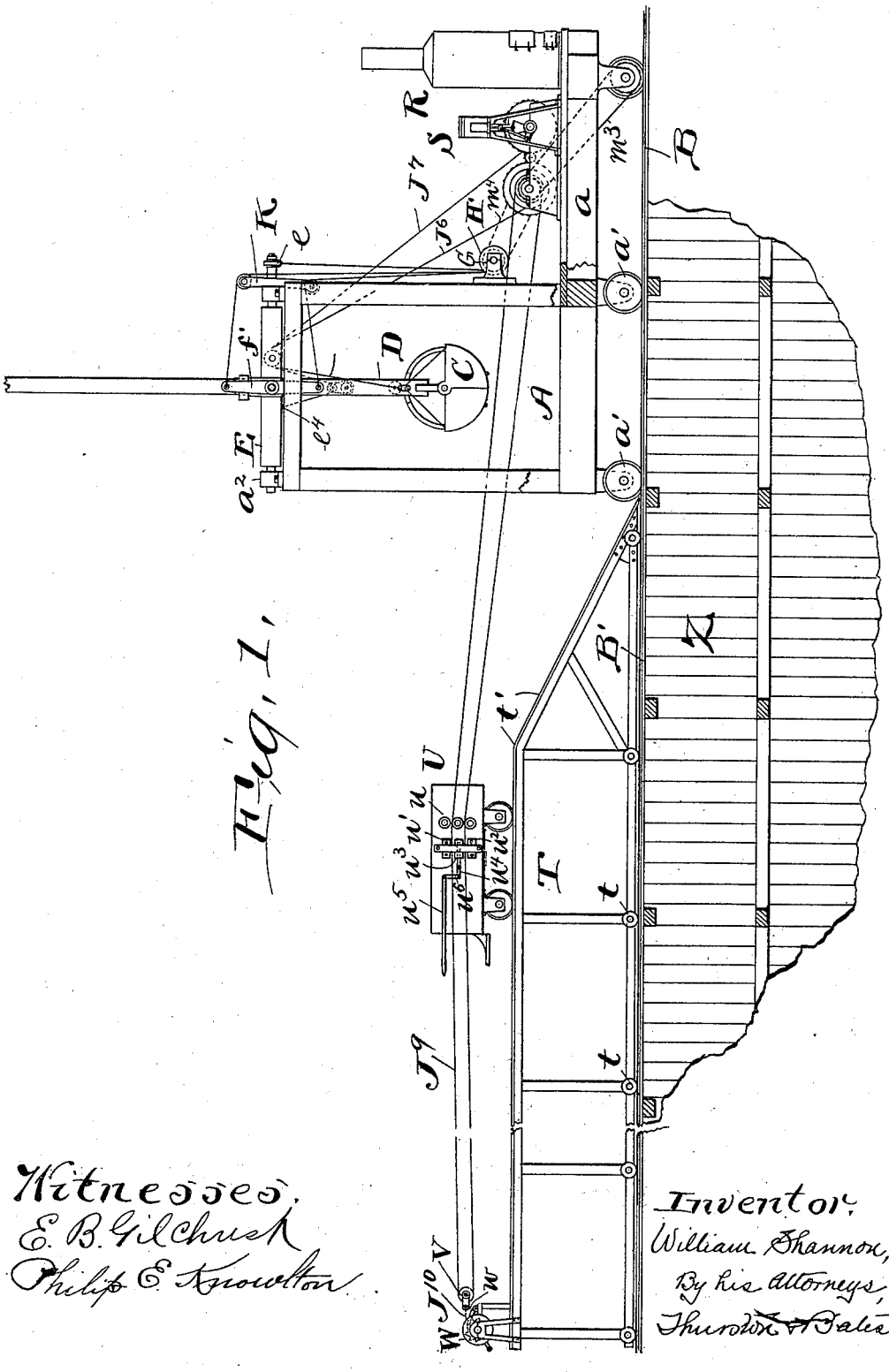

Fig. 1.

Witnesses.
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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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(No Model.) 4 Sheets—Sheet 2.

Fig. 2,

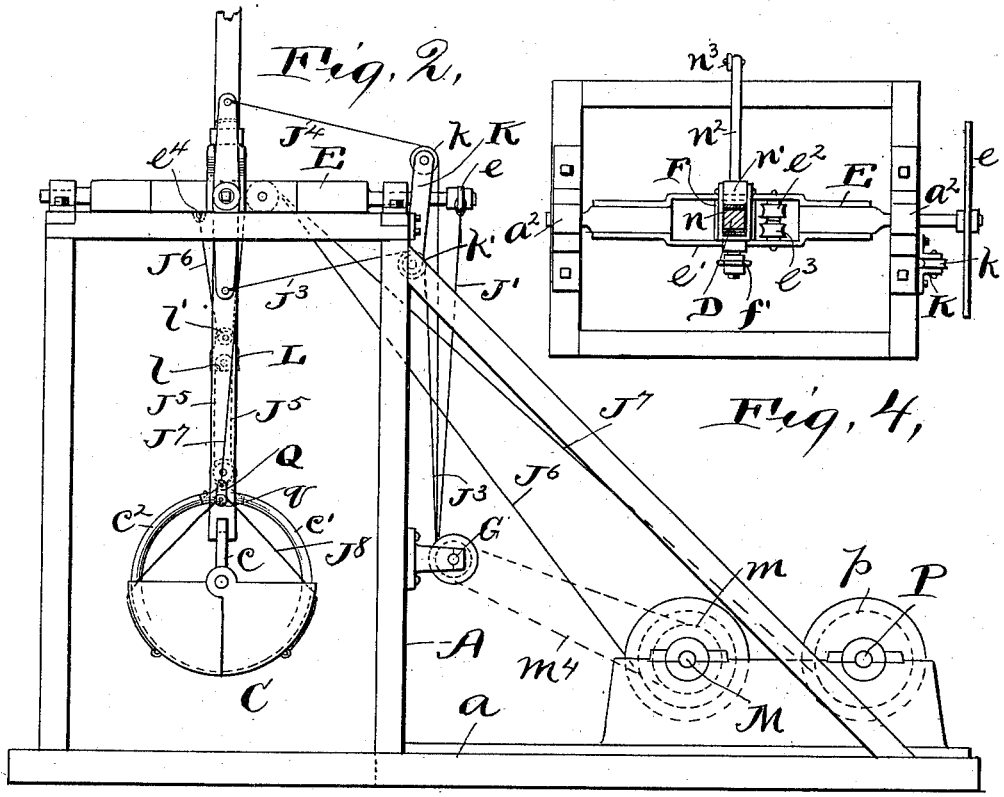

Fig. 4,

Fig. 3,

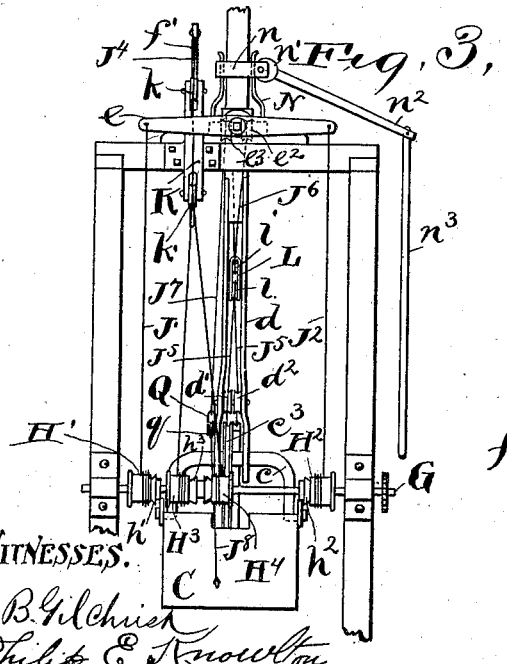

Fig. 5,

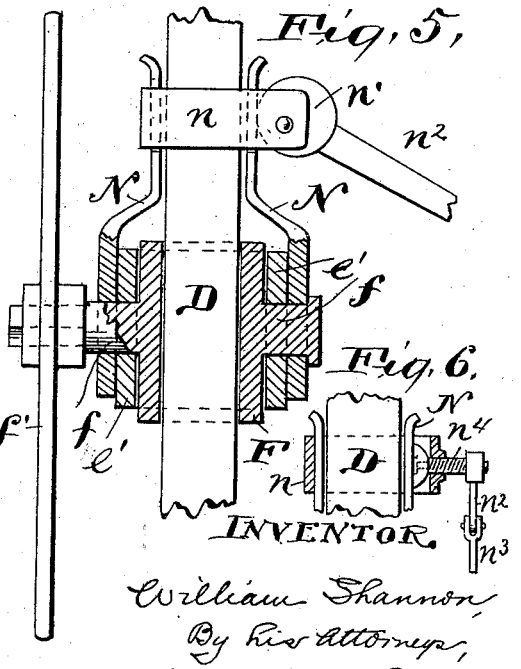

Fig. 6.

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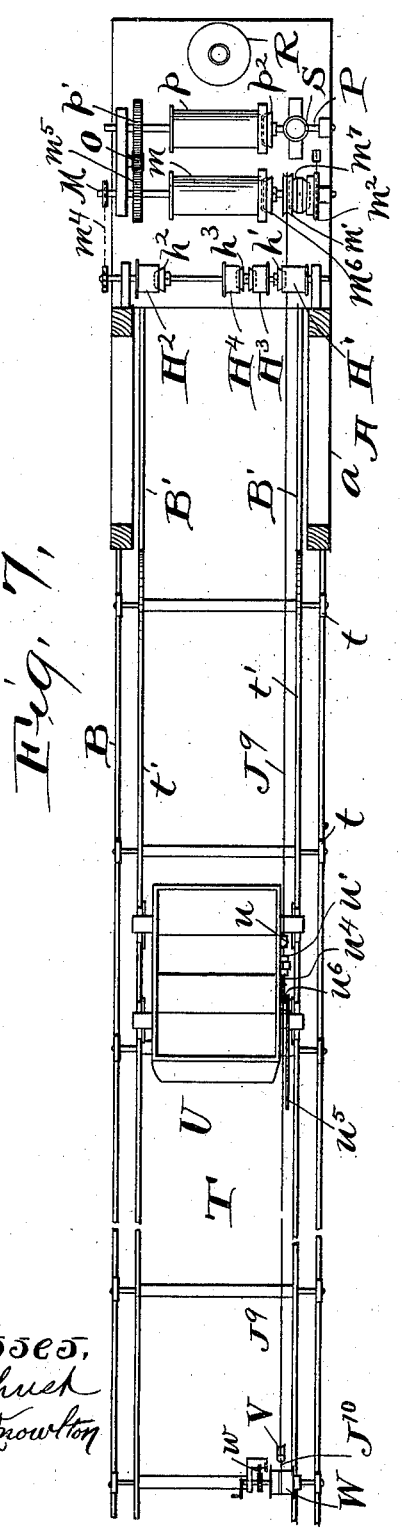

Fig. 7.

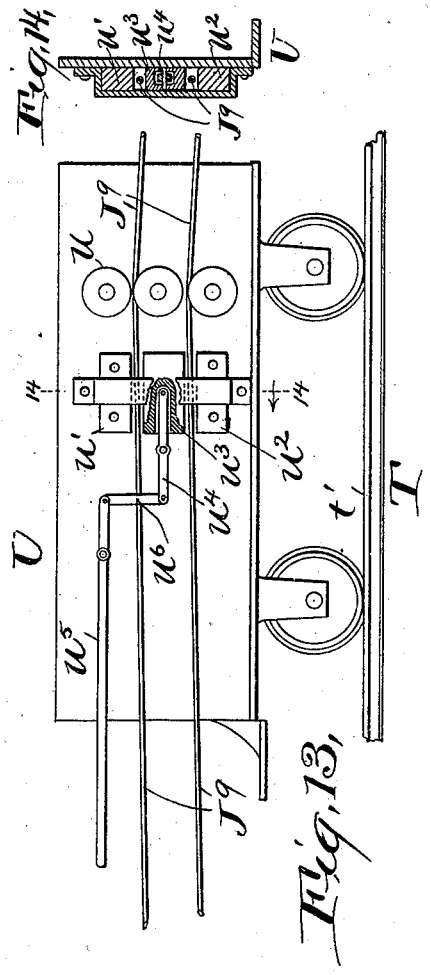

Fig. 13.

Fig. 14.

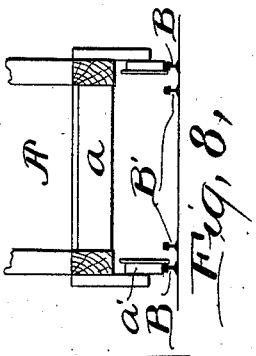

Fig. 8.

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(Application filed Apr. 11, 1898. Renewed Sept. 18, 1899.)

(No Model.) 4 Sheets—Sheet 4.

Fig. 9.

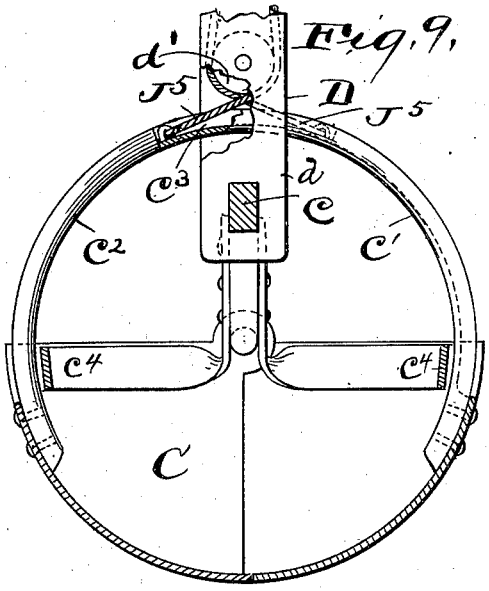


Fig. 10.

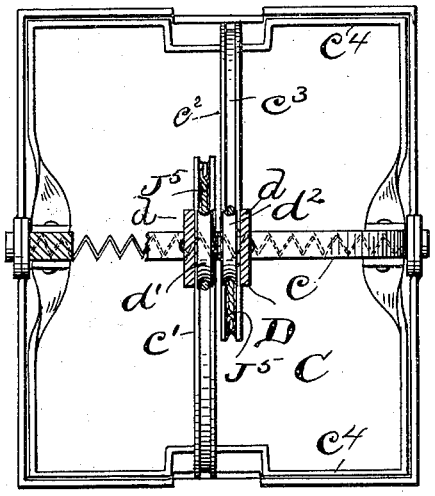


Fig. 11.

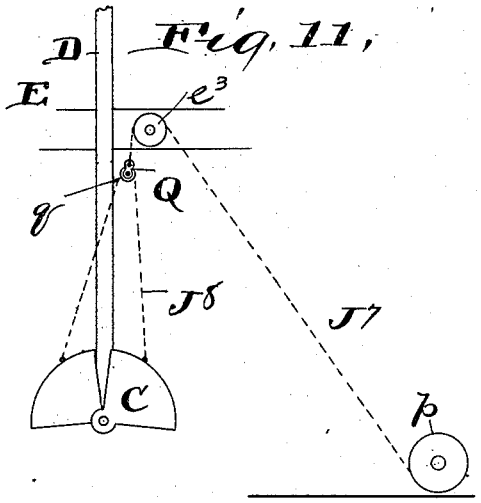
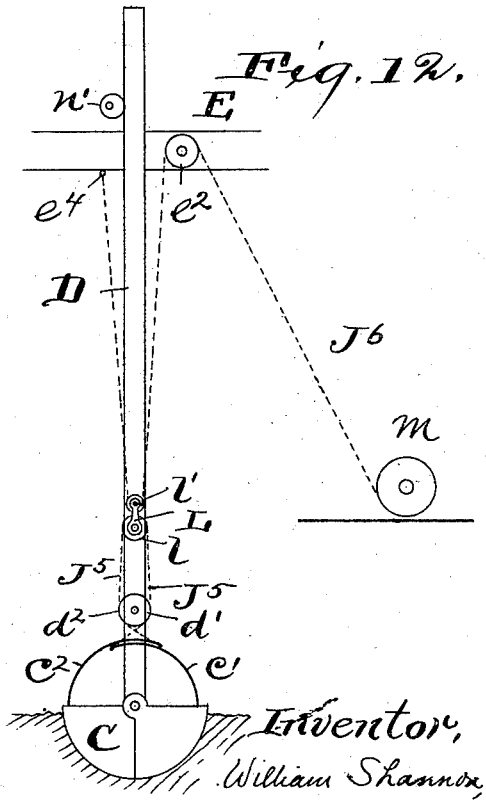


Fig. 12.



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UNITED STATES PATENT OFFICE.

WILLIAM SHANNON, OF CLEVELAND, OHIO, ASSIGNOR OF FORTY-NINE ONE-HUNDREDTHS TO JOHN McMYLER AND EDMUND F. ATHERTON, OF SAME PLACE.

SEWER EXCAVATING AND FILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 647,282, dated April 10, 1900.

Application filed April 11, 1898. Renewed September 18, 1899. Serial No. 730,952. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM SHANNON, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented a certain new and useful Improvement in Sewer Excavating and Filling Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings.

My invention is of that class of sewer digging and filling machines where a scoop or bucket carried by a traveling carriage is adapted to dig the earth in front of a sewer to be built and transfer it to a car which carries it backward and dumps it over the sewer which has been built.

The object of the invention is to provide a machine having this capacity which may be of simple and cheap construction and shall be very efficient in operation.

The invention consists of the means I employ for attaining the objects specified, or a portion thereof, as hereinafter described, and definitely enumerated in the claims. Prominent among these means are the mechanism for directing the scoop to the proper point for digging, the means for closing the bucket and for scraping the dirt from it when it is open, the means for operating the transfer-car, and the arrangement by which the transfer-car may be brought under the bucket and may be elevated over the sewer which is being built, so as to be out of the way of the workmen.

Various minor points of the invention and combinations of parts which compose part of the invention will be pointed out as the description proceeds.

The drawings clearly disclose the invention.

Figure 1 is a side elevation of the digging and elevating mechanism, the transfer-car, the trestle for the latter, and the track on which they travel. Fig. 2 is a side elevation of the digging and elevating mechanism above its supporting-wheels. Fig. 3 is a front elevation of the trestle-tower portion of that mechanism, and Fig. 4 is a plan of the trestle-tower. Fig. 5 is an enlarged detail view of the clamp for the bucket-rod. Fig. 6 is a detail view of the upper portion of a modified form of such clamp. Fig. 7 is a plan, partly sectional, of the parts shown in Fig. 1. Fig. 8 is a rear view of the lower portion of the trestle-tower, showing the rails of the tracks beneath the same. Fig. 9 is a vertical central section through the scoop or bucket, and Fig. 10 is a plan of the same. Figs. 11 and 12 are diagrammatic views illustrating the opening of the bucket at its elevated position and closing of it at the ground. Fig. 13 is a side elevation of the car shown in Fig. 1, but on a larger scale than that figure; and Fig. 14 is a vertical transverse section through the gripping-shoes of the car, being taken on the line 14 14 of Fig. 13.

The same letters of reference designate the same parts in each of the figures.

The machine as a whole consists of an excavating and elevating mechanism, a transfer-car coöperating therewith, suitable tracks, and suitable machinery of transmission for operating the car and the mechanism. The frame for the excavating mechanism consists of a suitable trestle-tower A, mounted on a platform *a*, which is supported by means of wheels *a'* on a track B. This track is laid along the course in which the sewer-trench is to be dug and is open between its rails, so that the digging-bucket may descend between the rails. Fig. 1 shows at Z such trench, with the usual side-boarding and cross-bracing.

The digging-bucket or scoop C (to be hereinafter more specifically described) is of the well-known clam-shell form and is secured by its bail *c* to a long vertical bar D. Journaled in suitable bearings a^2 at the top of the trestle-tower is a frame E, having secured to its shaft the lever *e*, by which it may be oscillated. The intermediate portion of this frame consists of two parallel and separated side plates *e' e'*. Between these side plates, at the center thereof, is the vertical sleeve F, which has trunnions *f* extending through and bearing in the side plates *e'*. A lever *f'*, secured to an extension of one of these trunnions *f*, furnishes means for oscillating the sleeve. The vertical bar D stands within this sleeve F, wherefore it follows that if the lever *f'* is turned on its pivot in one direction or the other the bar D, and hence the scoop, will be swung backward or forward accord-

ingly, while if the frame E is oscillated by its lever e' the bar D, and hence the scoop, will be swung sidewise. If both levers are turned at the same time, the scoop will move in a direction wnich is the resultant of the longitudinal and lateral tendencies given it.

Journaled at the side of the trestle-tower or in other sutable position is a shaft G. On this shaft near the bearings are a pair of drums H′ H², which are loose upon the shaft, but may be connected with it by friction-clutches h' h^2. A cable J′ runs from the drum H′ to one end of the lever e, and another cable J² from the drum H² to the other end of the lever e. If the drum H′, for example, is clamped to the shaft G and the drum H² loose thereon, rotation of the shaft winds up the cable J′, with the result that the bar D and scoop is tipped to the right of Fig. 3. If the other clutch is thrown into gear, the cable J² is wound up, and the reverse movement of the scoop takes place. Between the drum H′ and H² are other drums H³ H⁴, to which run cables J³ J⁴ from the ends of the lever f' over intermediate guiding-pulleys k, journaled in a suitable bracket K. A double-faced friction-clutch h^3 is shown between these drums and may clamp either to the shaft G. Thus the lever f', and hence the bar D and bucket C, may be swung either forward or backward. Thus by clamping the proper drums to the rotating shaft G for the desired length of time the bucket may be shifted to any point desired.

The lower part of the bar D consists of a pair of plates d, which are separated from each other, as shown, and have their lower ends connected to the bail c of the scoop. The two shells of the scoop are quarter-cylinders, as shown. Secured to the upper edge of each and near its middle is a quadrant-bar c' or c^2. This quadrant-bar is grooved on its upper surface, as shown at c^3. The quadrant-bars extend through the space between the plates d and a little distance beyond the same. Cables J⁵ are secured to the ends of the quadrant-bars and from thence pass backward and upward through the space between the bars d d and lie against suitable guides in the form of sister pulleys d' d^2, which are journaled on a pin rigid with said bars. The cables then pass up to a tackle-block L, which carries them. In the form shown in the drawings the cables J⁵ are in reality one cable, which hangs down on opposite sides of the pulley l, carried by the tackle-block.

From the construction just described it results that if the block L is drawn upward the bucket is forced shut, while if relative movement between the pulley-block and bar D is allowed the bucket may be opened, the cables J⁵, near their ends, lying in the grooves c^3 as the bucket opens. The block L carries another pulley l', which lies in a bight of a cable J⁶, one end of which is secured at e^4 to the frame E, and the other end after passing over the pulley e^2, journaled in that frame, passes around a friction-drum m, which is loosely journaled on a shaft M. If the bucket is open and the cable J⁶ is wound up, the block L will be elevated, and hence the bucket forced shut. After that a continued winding up of the cable J⁶ will elevate the bar D and the bucket.

In order to prevent the elevation of the bar D, I provide a suitable clamp. This clamp consists of a pair of spring-arms N, which are supported by the trunnions of the sleeve F and lie on opposite sides of the bar, and a yoke n, which loosely surrounds these clamping members and carries suitable means for forcing the members into contact with the bar D. These means, as shown in Figs. 3 and 5, consist of a cam n', pivoted to the yoke and having a projecting arm n^2, which is adapted to be elevated by a depending pole n^3. In Fig. 6 instead of the cam n' a screw n^4 is shown, which may be turned by an arm n^3, as before. Thus if the pole n^3 is shoved up the bar D is clamped in place. The pole n^3 is shown as illustrative of any convenient means of operating the arm.

From what has been said it will be apparent that if the bucket is opened and brought down to the level of the ground and the bar D clamped in place and the cable J⁶ wound up the bucket must scoop into the earth and dig up a load, which substantially fills it, as illustrated in Fig. 12.

After the bucket is elevated it may be opened and dumped by a pull on the cable J⁷, which runs from a drum p over a pulley e^5, carried by the frame E, and down to a block Q, which has a pulley q, over which takes a short cable J⁸, which has its ends secured to the under side of the clam-shell. Thus when the drum p is wound up the bucket is dumped. Fig. 11 illustrates this position of the bucket.

The shafts M and P of the drums m and p are journaled in suitable bearings on the platform a in front of the trestle-tower. At this point the platform is preferably floored over and carries a suitable boiler R and engine S. This engine may of course be of any desired type, is preferably reversible, and operates to rotate the shaft P. This shaft P carries a gear p', which meshes with an idle gear O, which latter meshes with a gear m^5 on the shaft M, whereby the latter shaft may be rotated by the engine in the same direction as the shaft P. Suitable friction-clutches p^2 and m^6 serve to connect the drums p and m with their respective shafts. A sprocket-chain m^4 connects the shaft M with the shaft G for swinging the bucket laterally. Another sprocket-chain m^3 leads from a loose sprocket-wheel m^2 on the shaft M to one of the wheels a', whereby when the sprocket-wheel m^2 is clutched to the shaft M (which it may be by the friction-clutch m^7) the whole mechanism may be caused to travel along the track B in the direction desired.

The drums m and p are thrown into gear and revolved for causing the clam-shell to dig into the ground, for elevating it, and dumping it. After it has been dumped these drums are thrown out of gear, and the bucket and the bar D descend by their own weight, suitable brakes (not shown) being applied by the operator to keep the cables on the drums taut.

In order to prevent the material in the bucket from sticking to it, I provide a pair of scrapers c^4, each of which is in the form of a stirrup and is secured to the bail c of the bucket and lies along the two ends and the cylindrical side of the scoop. The scraper may be made of one single piece of flat metal bent into the shape shown.

In order to dispose of the dirt in the bucket and transfer it back over the sewer already built or to a convenient point for removal entirely, I provide a suitable trestle T, which runs on wheels t on the track B and extends up on an incline from the level of that track and then horizontally back above the men in the ditch who are building the sewer and to a point back of the completed sewer, and I provide a car U, adapted to stand under the scoop when it is elevated and receive its contents when dumped and then to travel back over the trestle T to the point where it is desired to deposit the earth and there dump it. This car runs on tracks t' on the top of the trestle and on tracks B' on the level of the ground between the rails B. The trestle T is shown in the drawings as close up to the excavating structure, such being one of its extreme positions; but there may be a considerable space between them.

I operate the car U by a cable J^9, which is continuously driven by a suitable sheave or drum m', loose on the shaft M, but clutched thereto by a suitable friction-clutch, as the inner face of a double clutch m^7. The cable passes from the sheave m' rearward over the trestle T and around a loose pulley V. This pulley is secured to the end of a cable J^{10}, which winds around a suitable windlass W, which is located at the rear of the trestle and has an operating-crank and a ratchet-pawl w for preventing its reverse movement. After the excavating structure has been properly placed the cable J^{10}, which was slackened to allow the forward movement of that structure, is wound up taut.

The cable J^9 passes along the side of the car U between suitable guide-rollers u thereon and between suitable grip-shoes. Two of these shoes u' and u^2 are stationary, while the intermediate shoe u^3 is movable in either direction by means of a lever u^4, which is pivoted to the car and is operated by a suitable hand-lever u^5 through the intervention of a link u^6. One ply of the cable lies between the shoe u' and the shoe u^3 and the other ply between the shoe u^3 and the shoe u^2. As these two plies are of course moving in opposite directions, it follows that if the shoe u^3 is moved to grip the ply of the cable between it and the shoe u^2, for instance, the car will move in one direction, whereas if the other ply of the cable is gripped by the shoes u^3 and u' the car will move in the opposite direction.

In the operation of the device the trestle T is stationed over the sewer being completed and the excavating structure is moved to the desired location by the sprocket-chain m^3. The cable J^{10} is then wound up taut and the sprocket-wheel m^2 is disengaged from its shaft and the sheave m' thrown into engagement. The drums m and p are now disengaged from their shafts and allowed to unwind, being governed therein by the brake. The drum p is not allowed to unwind faster than the drum n, and thus as the weight of the bucket and its bar cause them to descend the bucket is kept open. As the bucket descends it is swung into the proper position by the rotation of the shaft G and the winding up of the drums H', H^2, H^3, or H^4, as desired. When the bucket strikes the ground, it is open and its pivot is substantially at the ground-line. The operator thereupon shoves up the pole n^3, thus clamping the bar D. The drum m is then rotated, winding up the cable J^6 and causing the scoop to dig into the ground a distance substantially equal to its radius. When the scoop has become closed with a load of earth therein, the drums m and p are rotated together until the bucket is near the upper end of its stroke. The operator on the car U then grips the proper ply of the cable and runs his car beneath the bucket, whereupon a continued rotation of the drum p opens the bucket and allows the material to fall into the car. The car operator then grips the other ply of the cable J^9, and the car is drawn up on top of the trestle T and runs back to the desired point and is dumped while the bucket is excavating and raising another load. The car may dump into the sewer-ditch, over the completed sewer, or into a wagon driven under the car near the rear of the trestle, as desired.

It is to be understood that while I have entitled my invention a "sewer excavating and filling machine" many features of it are adapted for other uses than in the construction of sewers, and I do not intend to limit myself to any particular use of the combinations which constitute my invention. I believe myself to be entitled to those combinations for all purposes and whether they are embodied in a sewer-machine, a steam-shovel, a dredge, or other machine.

Having described my invention, I claim—

1. In a digging-machine, in combination, a suitable support, a frame pivoted thereto on a horizontal pivot, a substantially-vertical sleeve carried by the frame and pivoted to it on a horizontal pivot which is substantially at right angles to the pivot of the frame to its support, a bar slidable through said sleeve,

a bucket carried at the lower end of said bar, and a clamp carried by said sleeve and adapted to oscillate with it and to hold the sliding bar against longitudinal movement, substantially as described.

2. In a digging mechanism, in combination, a pivoted sleeve, a bar slidable within the same, a bucket carried at the lower end of said bar, a lever secured to said sleeve, a cable leading from said lever, and a drum around which said cable is wound, substantially as described.

3. In a digging mechanism, an open frame having a pair of separated side plates, a substantially-vertical sleeve between said side plates and having trunnions journaled in said side plates, a lever rigidly secured to one of said trunnions, in combination with a bar slidable within said sleeve and a bucket carried by said bar, substantially as described.

4. In a digging mechanism, in combination, a suitable support, a frame pivoted thereto on a horizontal pivot, a sleeve pivoted to the frame on a horizontal pivot at an angle to the pivot of the frame to the support, a bar slidable within said sleeve, a bucket carried at the lower end of said bar, a lever secured to the frame, a lever secured to the sleeve, cables leading from said levers, and drums on which said cables are adapted to be wound, whereby the frame and the sleeve may be tipped, substantially as described.

5. In a digging mechanism, in combination, a suitable support, a frame pivoted thereto, said frame being open intermediate of its pivots, a sleeve in such open portion of the frame and pivoted to the frame and thereby adapted to oscillate therein, a bar slidable through said sleeve, an oscillating clamp for the bar, and a bucket carried at the lower end of the bar, substantially as described.

6. The combination of a suitable support, a frame pivoted thereto, a bar extending from said frame, a pulley carried by the frame, a movable pulley, a drum m, a cable J^6 passing from the drum over the pulley on the frame under the movable pulley to a substantially-stationary point, a clam-shell bucket carried at the lower end of said bar, a connecting-cable between the movable pulley and such bucket whereby when the movable pulley is elevated the bucket is closed, and a clamp for holding said bar stationary, substantially as described.

7. In combination a horizontal pivoted frame open intermediate of its pivots, a substantially-vertical sleeve in the open portion of such frame and pivoted thereto, a substantially-vertical bar passing through said sleeve and slidable therein, a clam-shell bucket secured at the lower end of said bar, two pulleys carried by said frame in its open portion, two winding-drums and two cables, each cable leading from one of the winding-drums over one of said pulleys, one of the cables operating to close and the other to open the clam-shell, substantially as described.

8. In a digging mechanism, in combination, a vertically-movable bar, a clam-shell bucket carried at the lower end thereof, quadrant-arms extending inward from the upper edges of said bucket, suitable guides or pulleys d' d^2 carried by said bar, cables J^5 secured to the ends of said quadrant-arms and lying against said guides, and means for drawing up said cables, substantially as described.

9. In a digging mechanism, a bar, a clam-shell bucket carried at the lower end thereof, a pair of stationary pulleys secured to said bar, a movable block, cables which depend from said movable block on opposite sides of the stationary pulleys, and have each end secured to the bucket on the side opposite to that of the pulley over which it passes, means for clamping the bar in a stationary position, and means for elevating the movable block, substantially as described.

10. In a digging mechanism, a bar, a clam-shell bucket carried at the lower end thereof, guiding-pulleys carried by said bar, a movable tackle-block L having a pulley l', a cable J^6, a winding-drum m, said cable passing around the winding-drum and passing beneath said pulley l' in a bight, cables J^5 depending from said block L and passing on opposite sides of the stationary pulleys and having their ends secured to the bucket on the side which is opposite to that of the pulley with which it contacts, substantially as described.

11. In a digging mechanism, in combination, a suitable support, a bar depending therefrom, a clam-shell bucket carried at the lower end of the bar, guiding-pulleys d' d^2 carried by said bar, quadrant-arms extending upward and inward from the upper edges of said clam-shell, a movable tackle-block L having a pulley l', cables J^5 which depend from said tackle-block on opposite sides of the guiding-pulleys d' d^2, each of said cables having its end secured to the end of that quadrant-arm, which, when the bucket is opened, is on the opposite side of the guiding-pulley against which that cable passes, and an elevating-cable J^6 which passes down in a bight beneath the pulley l', substantially as described.

12. In a digging mechanism, a bar, a clam-shell bucket at the lower end thereof, quadrant-arms extending inward and upward from the sides of the bucket, said arms being arranged to move past each other when the bucket opens, grooves in the upper sides of said arms and cables or chains secured to said arms near their free ends and passing in contact with suitable guides held by said bar, whereby when said bucket is opened said cables or chains may lie in the grooves in said arms, substantially as described.

13. In a digging mechanism, a bar, a bail secured at the lower end thereof, a clam-shell bucket pivoted to the ends of said bail, a pair of scrapers carried by said bail and lying along the ends and the sides of the two portions of the bucket, substantially as described.

14. In a machine for excavating and refilling sewers, in combination, a suitable digging and elevating mechanism, a track for the same, a trestle separate from the digging and elevating mechanism and adapted to be moved independently thereof along the track and itself carrying a track, said trestle being inclined downward at its forward end and the track thereon extending down said incline, a car on the trestle adapted to travel on the track thereon and down the incline and beneath the bucket of the elevating mechanism, and means for propelling the car along the trestle, substantially as described.

15. The combination of a track, a trestle movable thereon, an elevated track carried by said trestle and inclining at its forward end substantially to the plane of the track on which the trestle runs, an excavating mechanism movable in front of said trestle, suitable means for operating the excavating mechanism, a cable extending along said trestle and driven at the excavating mechanism, and a car adapted to be propelled along the trestle by said cable and adapted to descend down the incline at the front thereof and pass under the bucket of the excavating mechanism, substantially as described.

16. In a machine for digging and refilling sewers, in combination, mechanism adapted to travel along a track and elevate material from beneath the track above it, a traveling trestle separate from and independent of the elevating mechanism but adapted to travel along over the same, a sheave carried by said trestle, a cable extending from the digging mechanism over said sheave and back, means for varying the position of the sheave with reference to the trestle but maintaining it at substantially the same distance from the digging mechanism whereby the cable is maintained with operative tautness, a suitable connection between the cable and motor of the digging mechanism whereby the latter may operate the cable, and a car on the trestle adapted to be moved by the cable, substantially as described.

17. In combination, two tracks, one within the other, a suitable trestle-tower open at one end and supported on wheels on the outer track, an elevated trestle having an inclined front and a track extending along the trestle and extending down the inclined front and terminating in close proximity to the inner track mentioned, a car supported on wheels which are adapted to travel on the trestle or on the said inner track, a dumping-bucket carried by said trestle-tower, mechanism for causing said bucket to descend and receive a load of material and for elevating the same and dumping it, whereby said car may pass down the incline and under the bucket when the same is elevated and receive the load therefrom and may then pass up the incline onto the trestle, substantially as described.

18. In a mechanism for digging and refilling sewers, in combination, a movable trestle, a track carried thereby, a car adapted to travel along said track, mechanism for digging and elevating material in front of said trestle, a suitable motor for operating said elevating mechanism, a cable adapted to be driven by said motor and extending along said trestle, means on said car for guiding said cable, a suitable gripping device on the car adapted to be moved in one direction and grip one ply of the cable and be moved in the other direction and grip the other ply and thus cause the car to travel in either direction without changing the direction of motion of the cable, substantially as described.

19. In combination, an excavating mechanism, a traveling car, a track for the same, a pulley at the rear of said track, a cable leading from the excavating mechanism over said pulley and back to the excavating mechanism, stationary grip-shoes u' u^2 on said car, a movable grip-shoe u^3 on said car between the shoes u' and u^2, one ply of said cable being between the shoes u' and u^3 and the other ply between the shoes u^2 and u^3, a pivoted lever and a connection between it and the shoe u^3, whereby the shoe may be moved to grip either ply of the cable, substantially as described.

20. In combination, a track, a digging and excavating mechanism supported on said track and movable along the same, a movable trestle adapted to follow after said digging mechanism and stand at various distances therefrom, a windlass at the rear of said trestle, a cable passing over the same, a pulley V at the forward end of said cable and connected thereto, a driving drum or sheave on the excavating mechanism, a cable J^9 passing around said sheave and said pulley V, and a car adapted to travel along said trestle and having means for gripping said cable, substantially as described.

21. In a digging mechanism, in combination, a pivoted sleeve, a bar slidable within the same, a bucket carried at the lower end of said bar, means for elevating the bar and bucket, an oscillatable clamp pivoted on an axis substantially coincident with that of the sleeve and adapted to lock the bar, substantially as described.

22. In combination, a suitably-guided bar D, two separate plates d d constituting the lower portion of said bar, a bail secured to the said plates near their lower ends, a bucket secured to said bail, a pair of pulleys journaled between the bars d d, cables J^5 depending on opposite sides of the pulleys and engaging with the bucket to close the same when the cables are drawn upward, substantially as described.

23. In combination, a bar D, suitable means for guiding the same, said bar having its lower end formed of two separated plates d d, a bail secured to said plates near their lower ends, a clam-shell bucket pivoted to said bail, quadrant-arms secured to the upper edges of

said bucket and extending upward and inward through the space between the plates *d d*, cables secured to said quadrant-arms near their free ends, and suitable guides for said cables whereby the cables when pulled may operate to close the bucket, substantially as described.

In testimony whereof I hereunto affix my signature in the presence of two witnesses.

WILLIAM SHANNON.

Witnesses:
ALBERT H. BATES,
PHILIP E. KNOWLTON.