May 2, 1933. L. E. DAUER ET AL 1,906,547

TRENCH ROLLER

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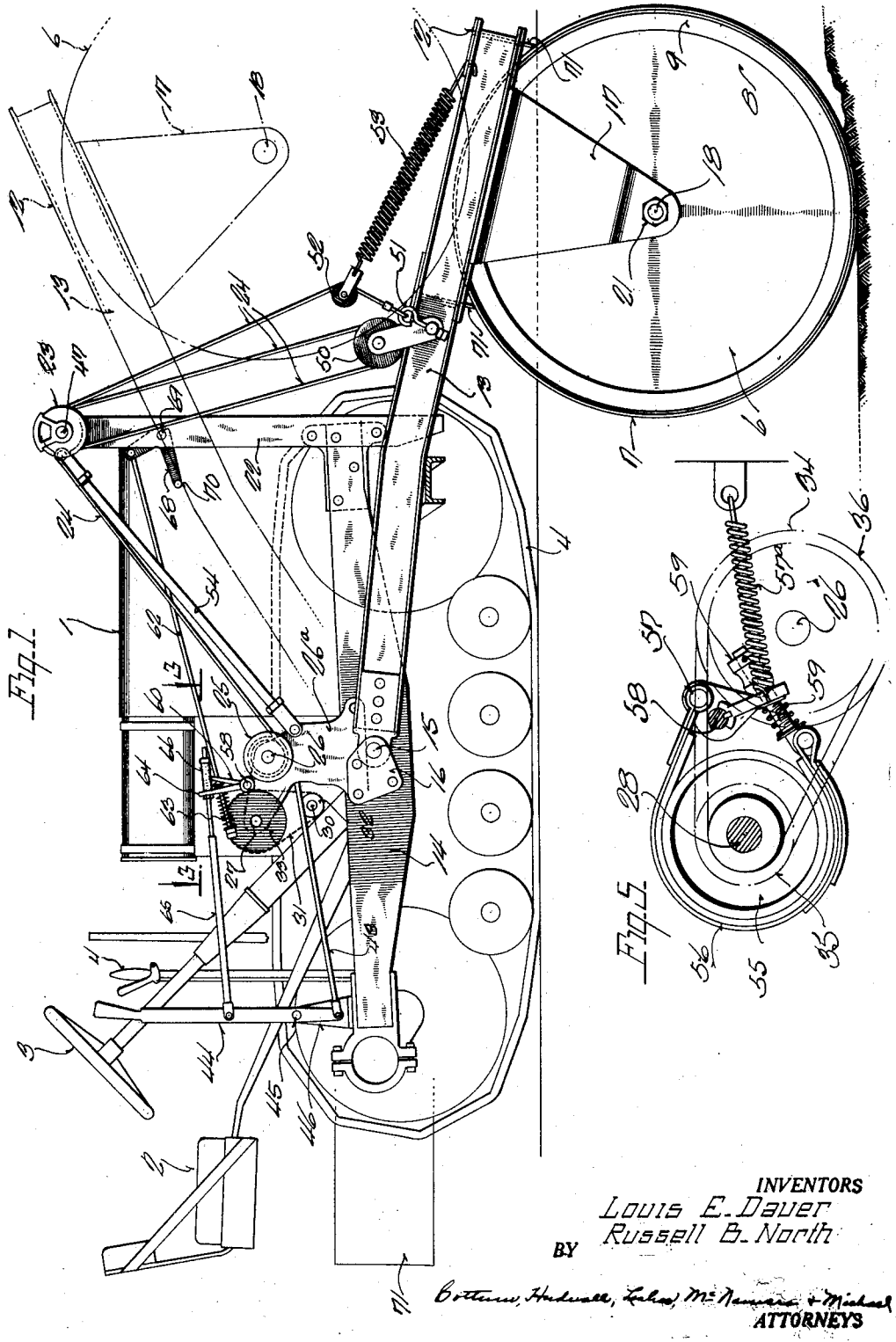


Fig. 1

Fig. 5

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TRENCH ROLLER

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Fig. 2.

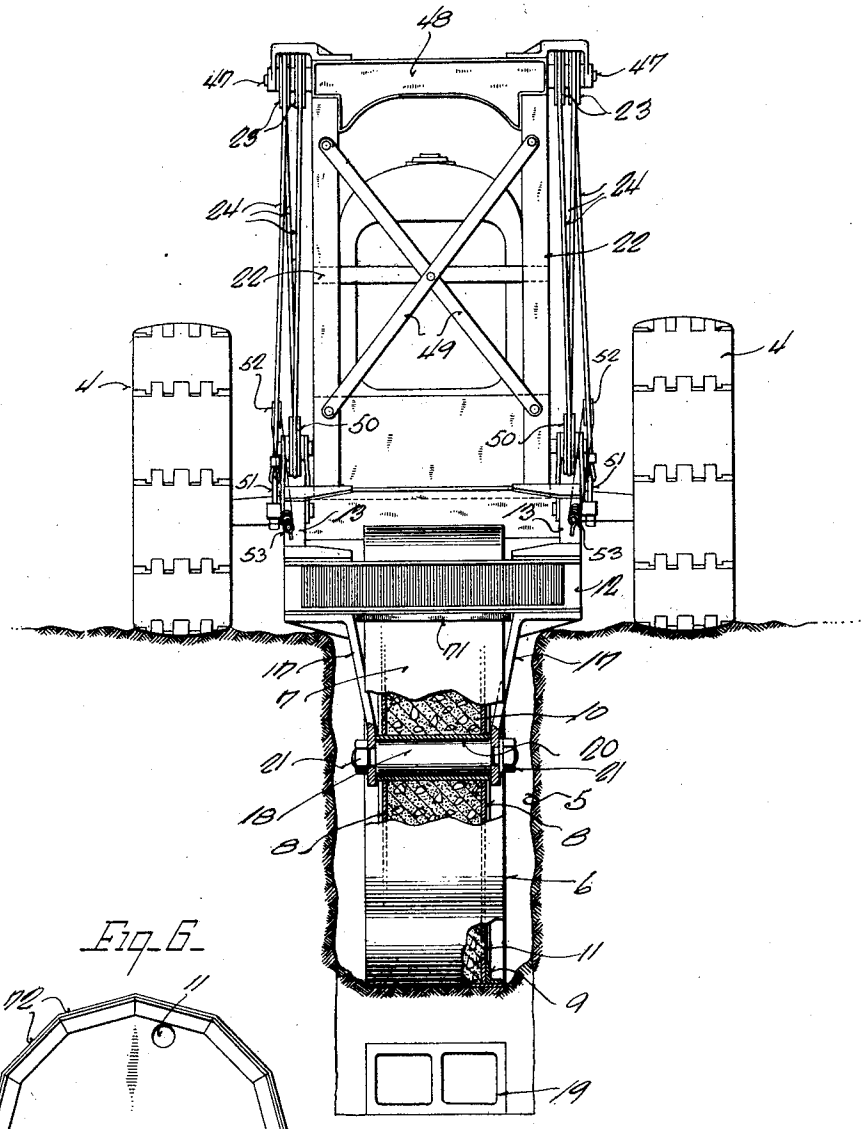
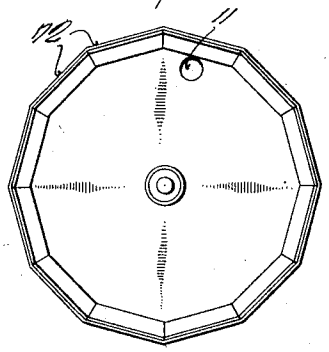


Fig. 6.



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TRENCH ROLLER

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Fig. 3.

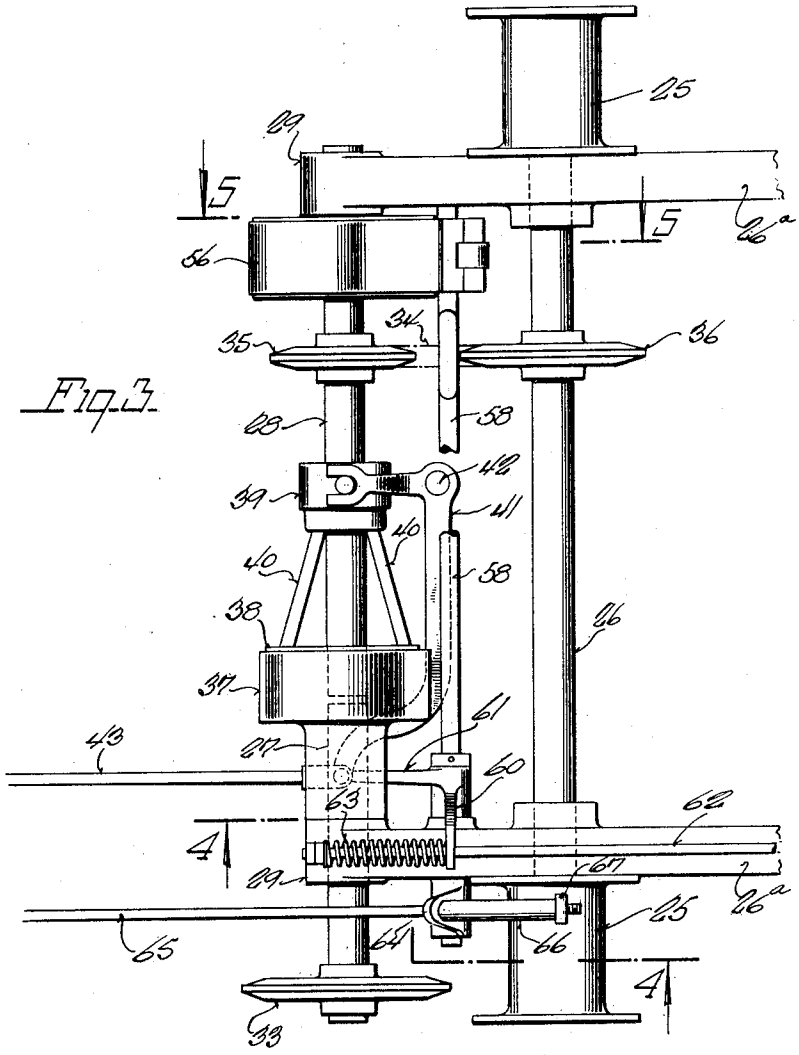
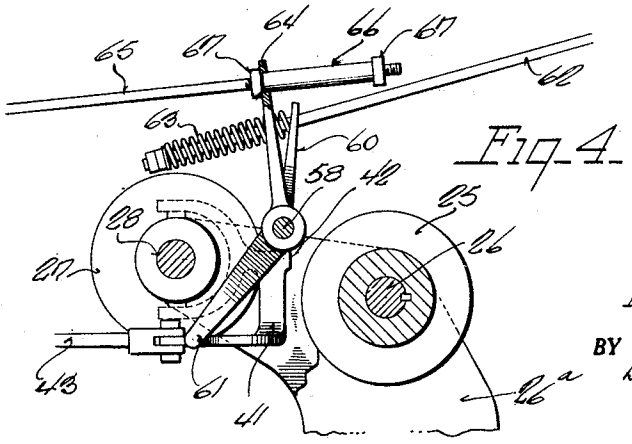


Fig. 4.



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UNITED STATES PATENT OFFICE

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TRENCH ROLLER

Application filed August 13, 1931. Serial No. 556,742.

This invention relates to trench rollers and more particularly to trench rollers for use with power driven tractors.

One object of our invention is to so mount the roller with respect to the tractor that the roller may be readily and easily raised and lowered by the power of the tractor for accommodating the roller to the varying depth of the trench as the roller packs or tamps the fill in successive layers in the trench and also to be raised completely out of the trench and above the level of the ground for moving the machine from place to place without interference or hinderance by the roller.

Another object of our invention is to so mount the roller that it is disposed between the treads of the tractor so that the tractor may straddle the trench and when of the crawler or endless tread type will distribute its weight along the sides of the trench and avoid caving in the side walls of the same.

Another object of our invention is to mount the roller in front or ahead of the tractor so that the operator on the tractor may guide or steer the same to much better advantage than should the roller be at the rear end of the tractor to be towed.

A further object of our invention is to so make the roller that it will have the weight required for efficiently packing or tamping a trench and be usable with a tractor, particularly of the crawler type as an added fixture or attachment.

A further object of our invention is to provide a boom, pivoted on the tractor and extending beyond one end of the same as a support for the roller, whereby the latter may be raised or lowered by raising or lowering the boom about its pivotal support.

A further object of our invention is to provide a curved or cambered boom to increase the depth to which the roller may extend into a trench with a given length of boom and distance of the supports for the boom from the front of the tractor.

A further object of our invention is to provide a brake device for holding the boom with its roller in any of its elevated or raised positions.

A further object of our invention is to provide means for automatically applying the brake device and disconnecting the boom from the raising power as soon as the boom reaches a predetermined elevated position, as the limit to which the boom may be raised to prevent breakage of the parts.

The invention consists further in the matters hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a broken away side view of a crawler tractor equipped with a trench roller in accordance with our invention;

Fig. 2 is a front view of the tractor, showing the roller in a trench;

Fig. 3 is a top plan view taken on line 3—3 of Fig. 1;

Fig. 4 is a vertical sectional view taken on line 4—4 of Fig. 3;

Fig. 5 is a similar sectional view taken on line 5—5 of Fig. 3; and

Fig. 6 shows a modified form of roller.

The tractor illustrated in the drawings is of the crawler type, having a suitable power plant 1 at the front end of the tractor, driver's seat 2 at the rear end with the steering wheel 3 and control levers, to be hereinafter referred to, in between. The tractor treads 4, 4 in endless form, are arranged at the sides of the device and are suitably connected to the power plant so that the tractor may be moved about under its own power as in devices of this general character. With the treads so disposed they are spaced apart and the tractor may straddle the ditch or trench 5 (Fig. 2) to be tamped or packed with the filling material by the roller 6 to be now described.

As shown in the drawings, the roller 6 is arranged in front of the tractor and has a tread surface 7 of a width to extend nearly the full width of the trench to be tamped. The roller has side plates 8, 8, which are suitably secured to the tread member 7, as by angle strips 9, as shown in Fig. 2. The roller is made hollow, and to give it the necessary weight for trench tamping, we make it solid by filling it with a suitable weight producing material 10. In practice, we fill the roller with a mixture of concrete and metal particles, such as punchings, the mixture being in-

troduced into the roller through one or more holes 11 in one of the side plates 8 as shown in Figs. 2 and 6. The concrete is allowed to dry, the hole being closed either by a cap or by the concrete filling the entrance opening as shown in Fig. 2.

The mounting for the roller 6 comprises a boom 12, which as shown in the drawings, consists of a generally U-shape frame extending a substantial distance beyond the front end of the tractor and having side members 13, 13, which extend back along the sides of the tractor between the treads 4, 4 and frame members 14, 14 included in frame construction. Said frame members 14 extend lengthwise of the tractor on opposite sides thereof and are suitably secured to fixed parts of the tractor structure to be stationary and rigid to form a support for the boom, as well as a support for upright standards at the front of the tractor for the cables for raising and lowering the boom. The rear ends of the side members 13 of the boom are pivotally connected to the frame members 14 to the rear of the roller by trunnions 15, the inner ends of which are secured to the frame members 14 and the outer ends of which are supported by brackets 16 bolted on the frame members 14.

The greater portion of the roller 6 is located below the boom 12 and is connected thereto by brackets 17, 17, in the form of plates bolted or otherwise rigidly secured to the side members 13 of the boom and extending below the same in front of the tractor, as shown. These plates are on the outer sides of the roller 6 and enter the trench with the roller, the boom being wider than the trench, as shown. The brackets carry adjacent their lower ends a shaft 18 which extends through the roller to provide a support and axis member therefor so that the roller when in contact with the ground or other underlying surface will turn about said shaft in the movement of the tractor. The roller 6 is preferably large in diameter and being supported by the brackets well below the boom may enter the trench to substantially the entire diameter of the roller. Thus the roller may reach well into the trench for tamping the initial fill about the pipe or tile 19 laid therein, shown in Fig. 2. A sleeve 20 surrounds the shaft 18 to protect it from the filling material in the roller. Nuts 21, 21 are provided on the opposite ends of the shaft beyond the plates 17 to clamp the parts in the assembled relation shown, and also to permit removal of the roller for repair or any other purpose desired.

To raise and lower the roller into and out of the trench, as well as when in the same to tamp or pack the fill as it is laid in layers in the trench, we provide a suitable hoisting mechanism which as shown in the drawings includes a pair of upright standards 22, 22 on opposite sides of the tractor at the front of the same and rigidly secured at their lower ends as by bolts or rivets to the frame members 14, as shown. The standards 22 extend above the members 14 to the height desired and provide a support for a set of grooved pulleys or sheaves 23 over and about which are trained cables 24, 24, one at each side of the machine. In the lifting and lowering arrangement shown in Figs. 1 and 2, one end of each cable is attached to a winch or winding drum 25 on the associated side of the tractor and at the opposite end to the boom forward of the tractor as shown. Drums 25 are fixed to the opposite ends of a shaft 26 journaled in brackets or supports 26*a* secured to the frame members 14 and extending upward therefrom at or adjacent the brackets 16, as shown in Figs. 1 and 3. Arranged substantially parallel to shaft 26 is a clutch shaft having normally disconnected alined sections 27, 28, supported in arms 29 extending rearward from brackets 26*a*. Shaft section 27 is connected to a power take-off shaft 30 by a chain 31, the latter engaging over suitable sprocket or chain wheels 32, 33, on the respective shafts. Shaft section 28 is connected to the drum shaft 26 by a chain 34 which engages sprocket or chain wheels 35, 36 on the respective shafts as shown in Fig. 3.

A clutch device is provided for connecting shaft section 28 to and disconnecting it from shaft section 27 which is continuously rotated by the motor of the tractor when the motor is in operation. One member 37 of the clutch is fixed to shaft section 27, while the other member 38 of the clutch is fixed to shaft section 28. For engaging and disengaging member 38 with member 37, we provide a manually operable mechanism, comprising a collar 39 with one end tapered, slidably mounted on shaft section 28 and operating fingers 40 which press a series of plates against clutch member 38. Collar 39 is shifted by a bell-crank lever 41 fulcrumed at 42 on a fixed part of the hoisting structure. A shift rod 43 connects the outer end of the long arm of the lever 41 with a hand lever 44 fulcrumed between its ends at 45 on an upright 46 and extending up near the steering wheel 3 to be within reach of the operator of the machine. Rod 43 is connected to the lower end of the lever 44, as shown in Fig. 1. Moving the upper end of lever 44 forward disengages the clutch 37–38 and releases the drum shaft 26 from the drive of the motor. Moving the lever 44 backward engages the clutch to connect shaft 26 with the motor for rotating the drums 25 to raise the boom and its roller. Lowering the boom is controlled through a brake device to be presently described.

Sheaves 23 are journaled on the opposite ends of a shaft 47 associated with a cross-member 48 extending between and connecting the upper ends of the standards 22. The lat-

ter are braced and connected together below the cross-member by tie rods or bars 49, as shown in Fig. 2. Each cable 24 on leaving its drum 25 is trained over the innermost sheave 23 of the associate set at the upper end of the standards, then about a sheave 50 carried by the boom, then over the outermost sheave at the top of the standards, and then down to the boom, where it is connected thereto by a suitable hook-like fixture 51. A spring drawn tension sheave 52 is engaged with the last mentioned strand of the cable to tighten the same. The spring 53 for the cable tightener is connected at one end to the boom and at the other end to the block for the sheave 52. The standards 22 are further braced by tie rods 54 extending between the brackets 26*a* and the upper ends of the standards as shown in Fig. 1.

The brake device, heretofore referred to, is shown in Figs. 3 and 5. It comprises a drum 55 fixed on the section 28 of the clutch shaft and engaged by a brake band 56 of suitable friction material. A bell-crank lever 57 is employed for tightening and loosening the band on the drum, said lever being keyed or otherwise fixed to a rock shaft 58 extending between and journaled in the brackets 26*a*. As shown in Fig. 5, the upper end of the band is directly connected to the short arm of the lever 57, while the lower end of the band is connected to the long arm of the lever by a bolt 59. Loose on rock-shaft 58 is a fixture having a pair of arms 60, 61, extending above and below said shaft. Lower arm 61 is in the path of movement of rod 43 where it connects with bell crank lever 41. A rod 62 extends through upper arm 60, as shown in Fig. 4, there being a coil spring 63 on the rod on the rear side of the arm. Fixed on rock shaft 58 is an upwardly extending arm 64, through which extends a rod 65 which is connected to hand lever 44 above its fulcrum 45, as shown in Fig. 1. A tube 66 passes through arm 64 on rod 65 and is held in place at each end by nuts 67. The nut at the rear end of the tube forces arm 64 forward to release the brake when hand lever 44 is pushed forward manually. Rod 62 extends toward the front end of the machine above the boom 12 and is connected to the upper end of a bell-crank lever 68 fulcrumed at 69 on one of the standards 22. The lower end of said lever has an outwardly projecting pin 70 in the path of upward movement of the boom 12.

In operation, the tractor with its attached roller 6 when lifted above the surface of the ground, is run over the ditch or trench to be filled with the tractor straddling the trench. With a crawler type of tractor this can be done without caving in the side walls of a trench because the weight of the tractor is low to the ground and is distributed over a relatively large area along the sides of the trench. After the pipe or tile are laid in the bottom of the trench and connected for service, a layer of the material constituting the fill, which may be the dirt previously dug from the trench, is placed on the tile. The roller 6 is now lowered into the trench until its tread surface 7 rests on the fill. The tractor is now run back and forth along the length of the trench and the roller packs or tamps the fill. Another layer of dirt is placed in the trench and the operation is repeated, the roller each time being raised to the extent required to accommodate the dirt layer. These operations are repeated until the trench is completely filled or filled to the extent desired, the roller serving to pack the trench with sufficient firmness to meet all filling requirements.

With the roller mounted in front of the tractor, the latter may be handled or steered to much better advantage than should the roller be hooked on to the rear of the tractor and towed. The reason for this is, that the driver can easily see the roller because it is always in front of him and thus he can operate the machine without being required to frequently turn around and look rearward or attempt to run the tractor while sitting in an awkward reverse position. The device of our invention is simple in construction and operation and will effectively and efficiently pack a trench in less time, at less expense and produce a firmer fill than by hand tamping or with any other devices heretofore devised for the purpose.

The boom 12 is made strong enough to support the weight of the roller when carrying it, and is cambered or bent downward in its outer end portion to increase the depth to which the roller may extend into a trench. Blades 71, 71 are fixed to the boom over the top surface of the roller to scrape any accumulation of filling or other material likely to adhere thereto in the use of the device.

Whenever the clutch 37–38 is released, the brake 55 is automatically applied to hold the roller from lowering from its elevated position, whereas, when the clutch is applied to raise the boom the brake is automatically released. This is accomplished in the following manner: When the upper end of the hand lever 44 is moved forward, its lower end is moved rearward, thereby pulling rod 43 rearward to release the clutch. Rod 65 is moved forward by the lever, giving arm 64 a like movement and moving rock-shaft 58 to the right to release the brake. Pulling rearward on hand lever 44 engages the clutch before releasing the brake, due to tension of a spring 57*a* attached to lever 57 at one end and to the tractor at the other end, before arm 64 is moved forward manually to release the brake. This overlaps the action of the clutch and the brake and prevents dropping of the boom 12 with its load.

The clutch and the brake are automatically

disengaged and applied respectively, should the operator fail to manually do the work when the boom in being raised reaches its uppermost position. This is accomplished on the boom striking the pin 70 on the bell-crank lever 68. As the boom raises the pin, the upper end of the lever is moved forward. This pulls the rod 62 forward, first compressing spring 63, and thereafter moving upper arm 60 forward. Connected arm 61 will be moved rearward, and engaging the end of rod 43 will move it rearward to disengage the clutch. Hand lever 44 will thus be returned to clutch disengaged position and the brake will be applied and hold the boom with its roller raised. The action is entirely automatic and will function even though the operator may have hold of the lever 44. The brake is of the self wrapping type and will apply rapidly when set in motion.

With the roller 6 weighted, it is essential to counterbalance this weight and that of the boom by placing a counterweight on the tractor. This is done by providing a counterweight box 71 on the rear of the tractor. In the arrangement shown in the drawings the roller can be lowered in the trench several feet below the top surface of the ground. With this lowering depth, the machine can be used with trenches deeper by several feet as the pipe and the first layer of dirt or earth usually take up a foot or two. The roller can be lifted well above the ground, as shown by dotted lines in Fig. 1, for moving the machine from place to place.

The tread surface of the roller 6 could be flatted, as shown in Fig. 6 to enhance the tamping effect of the roller. These flatted surfaces are indicated by 72 in Fig. 6 and are disposed about the circumference of the roller.

The details of structure and arrangement of parts shown and described may be variously changed and modified without departing from the spirit and scope of our invention. except as pointed out in the appended claims

We claim as our invention:

1. In combination with a tractor having traction elements for supporting the tractor, of a trench tamping roller in front of the tractor, a boom fulcrumed on the tractor to the rear of the roller, said boom extending a substantial distance beyond the front of the tractor, roller supporting means mounted on the boom in front of the tractor and connecting the roller to the boom, said means being disposed to enter the trench with the roller and extending below the boom to provide a mounting for the roller at a sufficient distance below the boom that the roller may be lowered into a trench by the boom for substantially the entire diameter of the roller, and means on the tractor for raising and lowering the roller by the boom.

2. In combination with a tractor having traction elements for supporting the tractor, of a trench tamping roller in front of the tractor, a U-shaped boom straddling the tractor from the front of the same and fulcrumed on the tractor to the rear of the roller, said boom extending a substantial distance beyond the front of the tractor and having a width greater than the width of the trench to be entered by the roller, roller supporting brackets carried by the boom in front of the tractor, said brackets being on opposite sides of the roller and disposed to enter a trench with the roller when lowered into the same, said brackets extending below the boom and providing a mounting for the roller at a sufficient distance below the boom that the roller may be lowered into a trench by the boom substantially the entire diameter of the roller, and means on the tractor for raising and lowering the roller by the boom.

3. In combination with a tractor having traction elements for supporting the tractor, of a trench tamping roller in front of the tractor, a boom fulcrumed on the tractor to the rear of the roller, said boom extending a substantial distance beyond the front of the tractor, roller supporting means mounted on the boom in front of the tractor and connecting the roller to the boom, said means being disposed to enter the trench with the roller when lowered into the same and extending below the boom to provide a mounting for the roller at a sufficient distance below the boom that the roller may be lowered into a trench by the boom for substantially the entire diameter of the roller, and means on the tractor for raising and lowering the roller by the boom, said boom being cambered to increase the depth to which the roller may be lowered below the tractor.

4. In combination with a tractor having traction elements for supporting the tractor and a power unit on the tractor for propelling the same through said elements, of a trench tamping roller in front of the tractor, a boom fulcrumed on the tractor to the rear of the roller, said boom extending a substantial distance beyond the front of the tractor, roller supporting means mounted on the boom in front of the tractor and connecting the roller to the boom, said means being disposed to enter the trench with the roller and extending below the boom to provide a mounting for the roller at a sufficient distance below the boom that the roller may be lowered into a trench by the boom for substantially the entire diameter of the roller, a hoisting mechanism on the tractor for raising and lowering the roller by the boom, and means for connecting the hoisting mechanism with the power unit of the tractor for raising the roller through the power furnished by said unit.

5. In combination with a tractor having traction elements for supporting the tractor

and a power unit on the tractor for propelling the same through said elements, of a trench tamping roller in front of the tractor, a boom fulcrumed on the tractor to the rear of the roller, said boom extending a substantial distance beyond the front of the tractor, roller supporting means mounted on the boom in front of the tractor and connecting the roller to the boom, said means being disposed to enter the trench with the roller and extending below the boom to provide a mounting for the roller at a sufficient distance below the boom that the roller may be lowered into a trench by the boom for substantially the entire diameter of the roller, a hoisting mechanism on the tractor for raising and lowering the roller by the boom, a clutch device for connecting the hoisting mechanism with the power unit of the tractor for raising the roller through the power furnished by said unit, and a brake device for controlling the descent of the boom when disconnected from the power unit.

In testimony whereof we affix our signatures.

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