

Feb. 7, 1939.

F. W. WEBER

2,146,101

TRENCH TAMPER

Filed Feb. 24, 1937

3 Sheets-Sheet 1

Fig. 1.

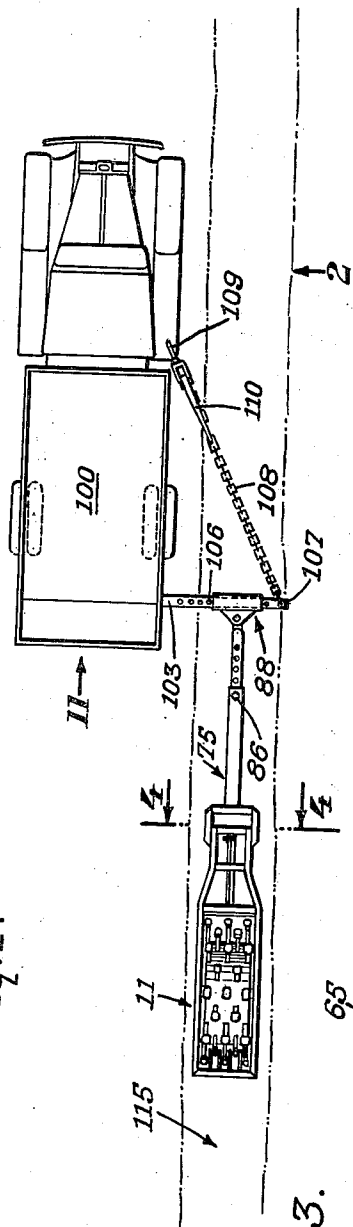


Fig. 2.

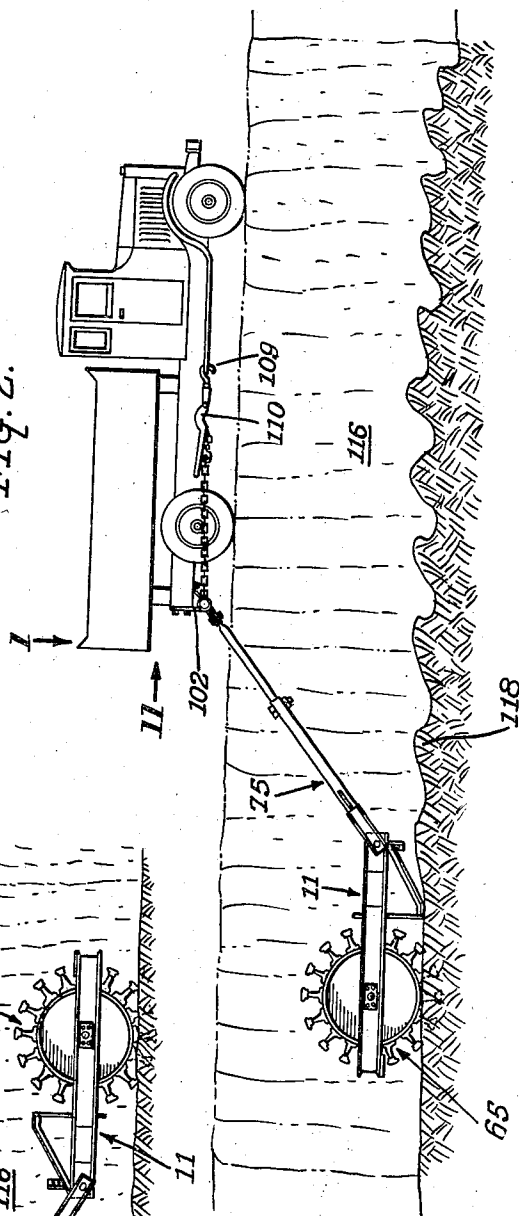
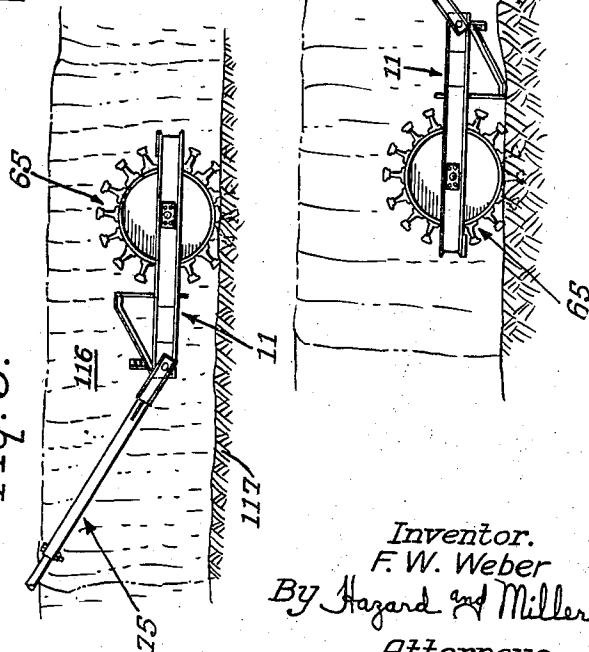


Fig. 3.



Inventor.
F. W. Weber
By Hazard and Miller
Attorneys.

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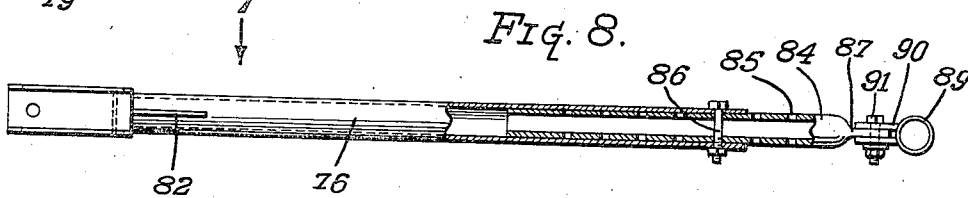
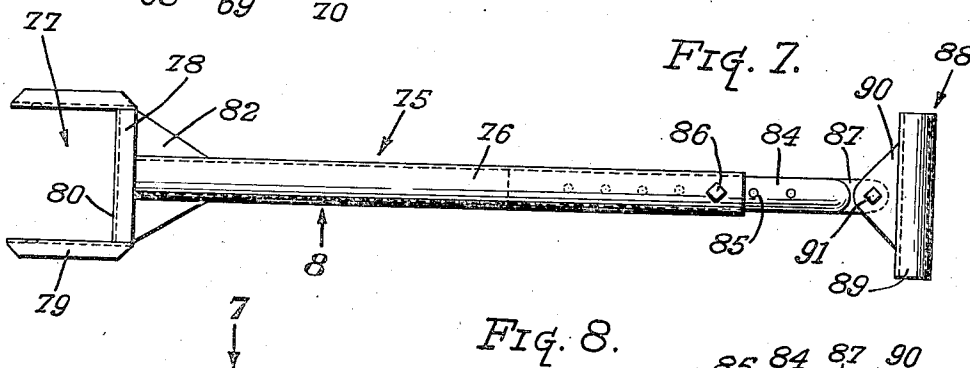
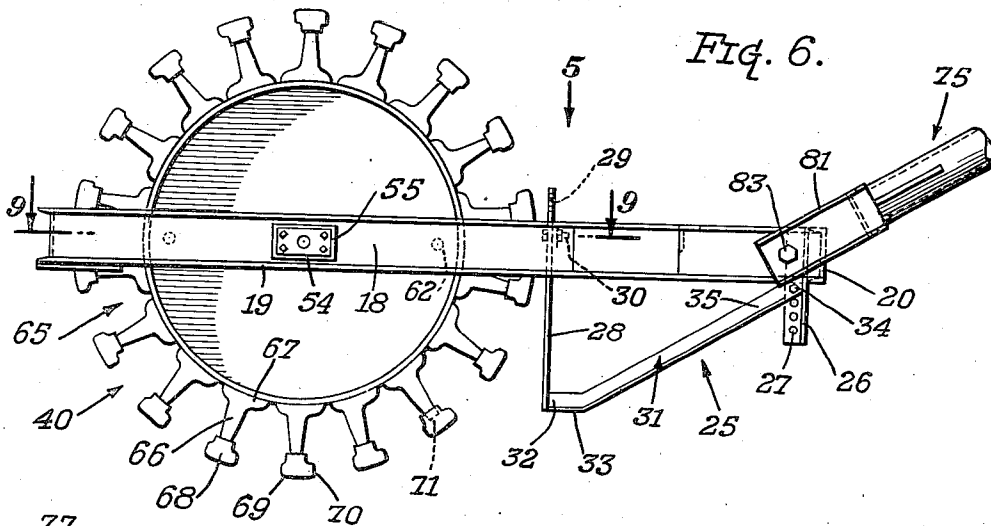
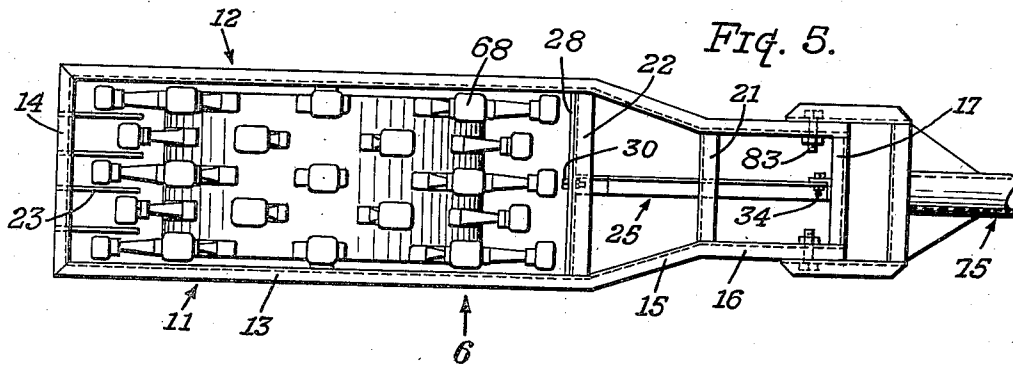
F. W. WEBER

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TRENCH TAMPER

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3 Sheets-Sheet 2



Inventor.
F. W. Weber
By *Hazard and Miller*
Attorneys.

Feb. 7, 1939.

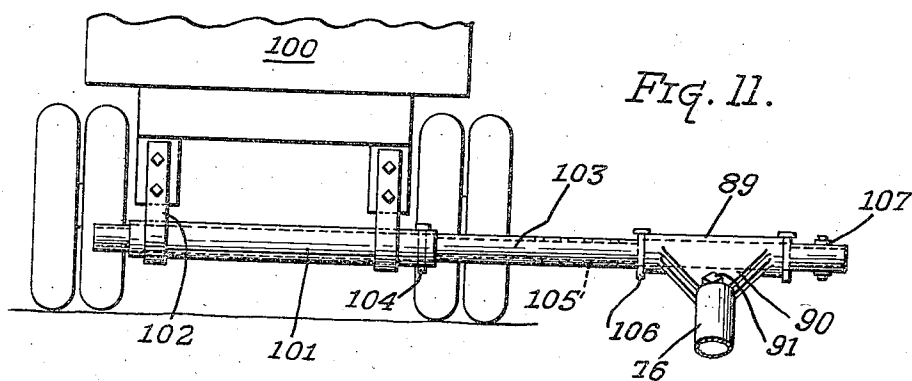
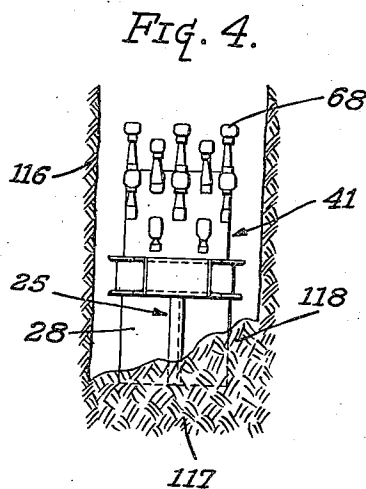
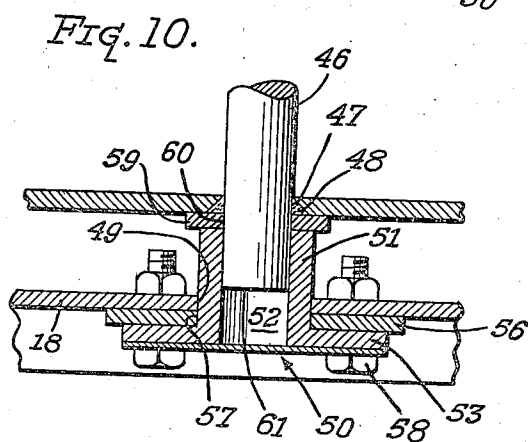
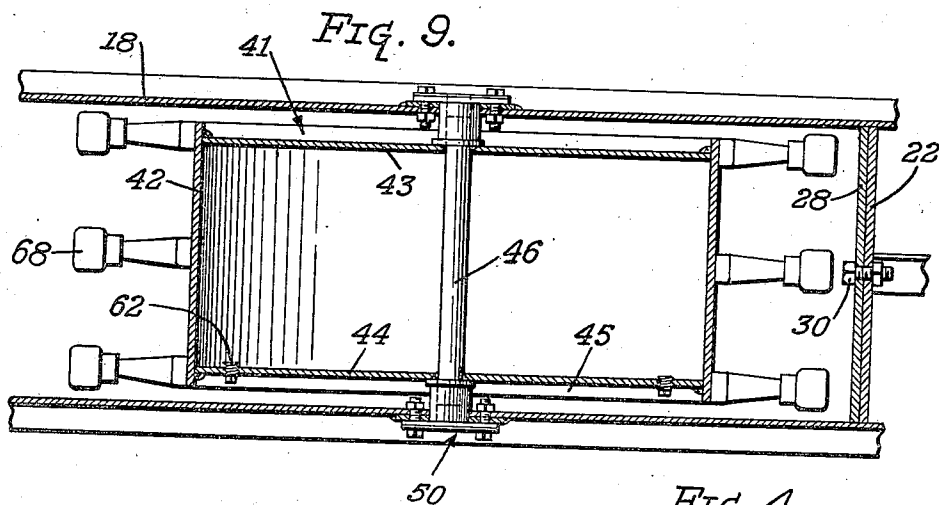
F. W. WEBER

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3 Sheets-Sheet 3



Inventor.
F. W. Weber
By Hazard & Miller
Attorneys.

UNITED STATES PATENT OFFICE

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TRENCH TAMPER

Frederick W. Weber, Southgate, Calif., assignor
of one-half to John Trimble Doty, Bellflower,
Calif.

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7 Claims. (Cl. 94—48)

My invention relates to a machine for tamping earth in back fills in trenches or the like. In a great deal of pipe conduit and similar installation work it is necessary to excavate extensive and sometimes lengthy trenches and then back fill the earth into the trench. Where the trench is in a roadway or similar ground surface used extensively, it is necessary that the back fill have the same density of consolidation as the neighboring portion of the ground so that when for instance a road is re-paved that there will be no cracking or settlement at the trench. Also in trench excavation through open countries such as fields, it is also advisable to compact the earth when refilled in the trench in order that it will be unnecessary to leave an elongated pile on top of the trench to take care of natural settlement or that there will be no settlement below the ground surface. Frequently in trench construction and installation particularly of large pipes after the back fill it is necessary to remove the surplus earth. Before doing this it is necessary for the contractor or builder of the installation to be assured that the trench is adequately refilled and tamped. Otherwise after removing the surplus earth a settlement may develop along the length of the trench requiring a back haul of earth to fill in the settlement in the trench to bring the level up with that of the adjacent ground or road-bed.

A common practice in trench refilling to assure the proper density and settlement of the back fill is by hand tamping, which is an inefficient and expensive procedure. Sometimes this is done by flooding the trench with water and allowing settlement by the water seeping downwardly in the soil. This latter however is objectionable in that it does not give a uniform settlement and consolidation of the soil in the trench and frequently where the ground adjacent a trench lacks sufficient porosity the water does not settle out of the material in the trench in a sufficiently short length of time. The hand tamping is also frequently combined with wetting of the material refilled into the trench to consolidate this both by the hand tamping and partial water settlement but this likewise is inefficient and expensive.

An object of my invention is the development of a machine which will efficiently tamp the earth refilled in a trench and assure a density of the soil refilled at least equal to that of the adjacent soil. For this purpose I have made an adaptation of a machine known in the trade as a "sheep's foot" which type of machines are frequently used on grading work, extensive earth

fills for dams and the like. The typical sheep's foot machine employs a drum from which a number of legs extend radially, these terminating at their end in feet or shoes. Therefore when the drum is towed over ground surface to be compacted, the feet or shoes penetrate the soil, each foot thrusting a small section of the soil downwardly. The drums have such a large number of these legs with feet or shoes and such are arranged in such a staggered manner on the drum that the whole mass of the soil over which the sheep's foot is operated is compacted. In this operation it is usual to dampen the soil.

However the ordinary sheep's foot machine is not suitable for trench work. Therefore my invention includes a special construction and mounting for the sheeps' foot drum so that this may be towed longitudinally for instance in a deep trench gradually approaching the surface after the refill is completed and the towing is done by a truck or the like driven on the ground surface parallel to the edge of the trench. In this construction it is necessary therefore to provide an elongated frame having side beams, the frame being of substantially the width of the trench and the side beams being constructed quite thin as to horizontal section so that the sheep's foot drum may be as large as possible to effect the tamping the full width of the trench. It is also necessary to have a forward guide structure formed integral with the frame to prevent the drum skewing anglewise to the trench and therefore tending to bind against one side of the trench wall. My invention provides for this in the frame by having the forward portion contracted in a gradual manner and by providing a sliding shoe extending rearwardly from the forward portion of the frame. This also has a spreader plate which distributes the material dumped in the trench evenly across the bottom of the trench so that the drum with the penetrating legs and feet may have an even bed of loose soil on which to operate.

My invention also includes a tow bar construction. This is made telescopic to accommodate trenches of different depths and to be shortened if desired as the trench becomes filled. The forward end of the tow bar is connected by a swivel moving on a vertical pivot for connection to a towing truck and the rear end of the tow bar has a pivoting connection to the forward contracted end of the frame, this pivot being horizontal. Another detailed feature involves the connection of the tow bar and frame to a truck in which the swivel at the forward end of the tow bar is preferably made with a transverse tube which

may be slipped over a pipe secured to the truck and extending laterally from one side of the truck across the trench. In addition a guiding cable or chain is connected from the frame to the forward portion of the truck and forms a diagonal tension member. This aids in operating the truck parallel to the edge of the trench and also by being connected to the rear end of the frame on the side next the truck counteracts any side pull on the tow bar tending to skew the tamping drum towards the side wall of the trench adjacent the path of travel of the truck.

My invention is illustrated in connection with the accompanying drawings, in which:

Fig. 1 is a plan taken in the direction of the arrow 1 of Fig. 2 illustrating the assembly of a towing truck with my trench tamper indicated as proceeding in a trench in one direction.

Fig. 2 is a side elevation taken in the direction of the arrow 2 of Fig. 1 showing the side of the trench adjacent the truck and operating over material loosely dumped in the trench.

Fig. 3 is a partial elevation showing the trench tamper on a return run in the trench.

Fig. 4 is a vertical transverse section on the line 4—4 of Fig. 1 in the direction of the arrows showing the manner of the spreader blade and sheep's foot drum operating on material dumped into the trench.

Fig. 5 is a plan of the tamper taken in the direction of the arrow 5 of Fig. 6, a portion of the tow bar being omitted.

Fig. 6 is a side elevation taken in the direction of the arrow 6 of Fig. 5, also showing a portion of the tow bar omitted.

Fig. 7 is a plan of the tow bar taken in the direction of the arrow 7 of Fig. 8.

Fig. 8 is a side elevation partly broken away of the tow bar taken in the direction of the arrow 8 of Fig. 7.

Fig. 9 is a horizontal section on the line 9—9 of Fig. 6 through a portion of the tamper to illustrate mainly the drum and the mounting for the axle, and axle and journals being illustrated in plan.

Fig. 10 is a detail section similar to Fig. 9 through the axle journals.

Fig. 11 is a rear elevation of the truck connection taken in the direction of the arrow 11 of Fig. 1 or 2, the tow bar being broken away.

Considering first the details of the tamper machine properly, such being designated by the assembly numeral 11 in which I employ a machine or carriage frame 12. The frame is illustrated as having side beams 13, a rear end transverse beam 14, converging forward ends 15 of the side beams and parallel terminating ends 16, also of the side beams. A front transverse beam 17 connects the forward ends of the side beams 16. Side beams 13 with the converging portions 15 and the extension 16 may conveniently be formed of channels with the webs 18 innermost and the flanges 19 projecting outwardly. The rear transverse beam 14 is also a channel connected by welding or the like to the channels of the side beams with the web innermost. The forward transverse beam 17 is also preferably formed of a channel with the web 20 outermost and the flanges extending inwardly. A transverse brace bar 21 in the form of an angle joins the side beams at the angle formed by the converging portions 15 and the parallel portions 16. There is also a transverse brace bar 22, also preferably formed of an angle adjacent the forward end of the parallel side beams 13 at the converging angle

of the forward extensions 15. Cleaning or scraping fingers 23 are in the form of bars and are secured preferably to the under flange of the transverse rear end beam 14. These are parallel and parallel to the side beams 13.

The spreader assembly 25 employs an upright bar 26, preferably formed of an angle welded or otherwise secured to the flanges of the forward transverse beam 17 and this has a series of bolt holes 27. A vertical and rectangular spreader plate 28 has a series of central bolt holes 29 adjacent the top and is bolted to the transverse beam 22 by bolts 30 or the like. An angle brace bar 31, also preferably formed from an angle has its lower end 32 with a flattened section 33, this flattened section being parallel to the side beams 13 and is intended to ride parallel to the bottom of the trench. The lower and rear end 32 is secured by welding or the like to the spreader blade 28 adjacent its center. A bolt 34 secures the upper end 35 sloping section of the brace bar to the depending angle 26. In this manner the spreader blade may be adjusted up and down by shifting the bolts 30 and 34 to different bolt holes.

The sheep's foot assembly 40 employs a drum designated by the assembly numeral 41. This has an outer cylindrical drum section 42 and two opposite circular heads 43 and 44 (note Fig. 9). These heads are inset from the edge of the drum forming a space 45 outside of the circular plates 43 and 44 and the side edges of the cylindrical drum portion 42. An axle 46 is preferably cylindrical and extends through openings 47 in the ends 43 and 44 of the drum and is welded thereto by a filler weld 48 (note Fig. 10). The web 18 of each of the side beams 13 preferably has a circular opening 49 to accommodate a bearing block 50. This has a journal sleeve 51 cylindrical on the inside surface 52 and shaped on its outside surface to conform to the opening 49, it preferably being cylindrical on its outside surface. It is provided with a flange plate 53 on the outside, this being preferably rectangular having a lower horizontal edge 54 and vertical edges 55. A rectangular spacing plate 56 is fitted inside of the flange plate against the webs 18 of the side beams 13 and this has an opening 57 to accommodate the sleeve 51. The assembly is attached to the webs 18 by bolts 58. There is also a washerlike wear plate 59 which may be circular and is preferably welded to the sides 44 of the drum and has a circular opening 60 to accommodate the axle 46. It is to be noted that the axle terminates as indicated at 61 (Fig. 10) slightly inside of the side beams 13, that is, inside of the webs of said beams. This is to facilitate the assembly as the drum and axle may be aligned with the openings 49 in the webs of the side beams 13 and the bearing blocks 50 then assembled. The ends of the axle rotate in this bearing block, the ends of which may be kept plugged with grease, one of the circular heads of the drum is provided with removable filler plugs 62 by which the interior of the drum may be filled with water to vary the weight of the drum.

The sheep's foot leg assembly 65 employs a series of individual legs 66, each having an inner head or shoulder 67 shaped on the inside surface with a cylindrical curve to correspond with the drum 42 to which said head is welded. On the ends of each leg there is a foot 68 which may be removable by either threading in place or by welding to the leg. Each foot may be considered as having a heel 69 and forwardly pro-

jecting toe 70. The feet at the bottom are substantially rectangular. These are arranged preferably in rows longitudinally of the drum and also are aligned in a circular manner on the periphery of the drum, such being indicated in Figs. 1, 2, 4, 5, and 6. If desired the legs including the shoulder 67 and the feet 63 may be cast as a single unit but if the feet work in material subject to considerable wear, they may be provided with a shallow socket 71 in which the ends of the legs 66 extend and then they can have a light weld connecting each shoe to its leg, such weld being readily melted for replacement of the worn feet.

The tow bar assembly 75 employs a rear tube or pipe 76 (note particularly Figs. 6 and 7). This has a yoke 77 connected thereto, the yoke having a cross bar 78 and side arms 79, these being illustrated as formed of channels with the webs 80 innermost and the flanges 81 projecting outwardly. Gusset plates 82 connect the cross bar 78 to the sides of the tube 76. A pair of pintle bolts 83 connect the side arms and the forward extension 16 of the side beams 13. It will be noted by reference to Fig. 5 that the side arms fit outside of the extension 16. Telescopically mounted in the tube 76 there is a forward tube or pipe 84, this having a series of diametrically opposite bolt openings 85 through which is connected an attaching bolt 86, this bolt extending through the pipe 76 at its forward end. The forward pipe 84 has a flattened tongue 87, such tongue being horizontal and a swivel towing cross member 88 is attached to this tongue. This swivel is illustrated as having a tube 89 with ears 90 welded thereto and the ears being connected by a vertical pivot bolt 91 to a tongue 87.

A suitable set up for towing the trench tamper may utilize a truck indicated by the numeral 100 (note Figs. 1, 2 and 11). This truck has a tube 101 connected thereto at the rear ends as by suspension straps 102 (note Fig. 11). A projection tube 103 fits in the tube 101 extending completely therethrough and being secured in place by a pin 104 through both the tube 101 and 103. This tube 103 also extends through the tube 89. There are a series of diametrically opposite perforations 105 in the tube 103 for insertion of centering pins 106, which when inserted through these perforations engage the opposite ends of the tube 89. In addition a chain swivel 107 is secured to the outer projecting end of the tube 103 and a chain 108 leads diagonally from this to a securing point 109 on the truck. There is preferably employed a toggle lever assembly 110 or the equivalent for adjusting the length of the chain. This is for the purpose of readily detaching the chain which may be regulated in length by taking up on the links or extending the links either at the swivel or at the toggle lever connection.

In the illustrations a trench is indicated by the numeral 115. This has opposite sides 116 and the bottom 117. It is presumed that at one side of the trench on which the truck travels that there is a clear driveway for the truck. The dirt excavated from the trench is usually piled at the opposite side. In the procedure of filling the trench, a bull-dozer or the like works along the side of the trench having the excavated material thereon and dumps this material into the trench, such dumped material being indicated by the irregular contour 118 (Fig. 2). The tamper machine proper is lowered into the

trench at one end in any suitable manner or if desired the trench may have a grade or ramp at one end so that the tamper part of the machine may be towed into the bottom of the trench. The tow bar is adjusted to the proper length and leads upwardly at an angle as indicated in Figs. 2 and 6. The forward end of the carriage frame 12 is quite heavy so that the spreader plate 28 contacts the irregularly dumped material 118 indicated in Figs. 2 and 4 and spreads such material somewhat evenly over the bottom of the trench. If desired the forward end of the machine may be weighted so that the spread plate and the flattened section 33 of the angle brace 31 runs approximately on the top of the spread material. As such material is evenly spread the sheep's foot drum assembly rolls on this spread material, the legs and feet penetrating such material as indicated in Figs. 2 and 3. It will be noted that in the construction of the frame that this is approximately the width of the trench, the towing connection to the truck restricts to a certain extent the lateral swivelling of the tow bar and when the truck is driven parallel to the side of the trench there is a straight and central longitudinal pull on the tamper machine assembly 11. The forward projecting end having the side beams 15 and 16 together with the yoke 79 restrict any sidewise skewing of the machine frame and drum and thus assure that the frame will not dig into the side walls of the trench.

When the sheep's foot assembly has been operated from one end of the trench to another or the desired length thereof, for instance in the direction indicated in Fig. 2 over the freshly dumped material, the frame is inserted. This is done by tilting the forward end upwardly after unhitching the truck and reversing the truck. Such action causes the rear transverse beam 14 to contact the bottom of the trench, that is, at the portion which has already been tamped and the machine is completely turned over to the position shown in Fig. 3. The truck may then be again connected and driven in a reverse direction back to the starting point. In this reverse travel usually no fresh material is dumped in the trench but the material already dumped is thus given two workings or tappings. In such return movement the spreader plate 28 does not operate being in an elevated position, however should it be desired to again spread the material in the bottom of the trench or to dump fresh material therein, there may be two spreader assemblies such as 25, one extending below and the other above the frame of the machine, but as it is usually satisfactory to have only one assembly in the usual practice of filling trenches, only one is illustrated. After the return trip of the tamper to its original position it is again reversed by being turned over on the rear transverse beam 14 and again assumes the position shown in Fig. 2. As the tamper moves from the end of its first travel in the trench to its starting point, a bull-dozer or the like may be back filling into the trench an additional amount of loose material. In this manner the trench is gradually filled in and the material tamped in the periodical travel of the sheep's foot assembly from one end of a trench to the other or between designated portions of the long trench.

Various changes may be made in the details of the construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. In a trench tamper, a carriage frame, a drum having an axle, means rotatably connecting the axle to the carriage frame, said drum
5 having tamping legs and feet, said frame having a forward extension beyond the periphery of the drum and unbalancing the frame, a tow bar pivotally connected to said extension by a horizontal
10 pivot whereby the tow bar may form an upwardly inclined angle to the general plane of the carriage, the weight of the forward extension being adapted to counteract the upwardly inclined
15 pull on the tow bar, a spreader plate adjustably connected to the forward extension on one side thereof and adapted to engage the soil for spreading in one direction of movement of
20 the carriage and drum and on a reversed direction with the carriage turned upside down to be positioned above the bottom of the trench.
2. In a trench tamper, a carriage frame having a pair of opposite side beams, a rear end beam
25 connecting said beams and a forward extension of less width than that between the side beams to clear the walls of a trench and forming a connecting means at the forward end of the carriage
30 frame, an axle, means forming a journal for the axle at the side beams, a drum having tamping legs and feet on the axle, a tow bar pivoted to the forward extension by a horizontal pivot to
35 permit a forward inclination of the tow bar in reference to the side beams and forward extension, a spreader assembly including a spreader plate adjustably mounted on the forward extension
40 and depending therebelow in one direction of travel of the carriage and drum, the said forward extension and the spreader assembly being adapted to counteract an upward pull on the tow
45 bar to maintain the spreader plate in operative engagement with soil at the bottom of the trench, the said rear end beam forming a support for the drum when reversing the direction of the
50 carriage, the said carriage when reversed having the spreader plate assembly projecting upwardly.
3. In a trench tamper as claimed in claim 2,
55 the rear end beam having a plurality of scraping fingers firmly attached thereto and extending towards the drum and positioned to pass between successive tamping legs and feet during the rotation of the drum in the longitudinal movement of the carriage.
4. In a method of trench tamping in which a carriage frame is provided with a drum having
60 tamping legs and feet and positioned in a trench adjacent one end, moving the carriage with its top side upwardly longitudinally of the trench to develop a first tamping action on the soil at the bottom of the trench, secondly at the end of the first direction of travel reversing the carriage to turn the same upside down while retaining the axis of the drum transverse to the trench, then moving the carriage and drum in reverse direction to develop a second tamping action on the soil at the bottom of the trench.

5. In a method of trench tamping in which a carriage frame having a drum with tamping legs and feet is positioned at the bottom of the trench at one end thereof with the axis of the drum transverse to the trench, dumping filling material loosely in the trench, moving the carriage and drum longitudinally of the trench and at the same time spreading the loosely dumped material in front of the drum whereby such loosely dumped material is tamped into the bottom of the trench, then while retaining the axis of the drum transverse to the trench, reversing the position of the carriage to turn the same upside down, then moving the carriage with the drum in reverse direction over the previously tamped section of the trench to develop a further tamping action to additionally consolidate the soil at the bottom of the trench.

6. In a trench tamper, a carriage frame having a drum rotatably mounted therein, said drum having tamping legs with feet extending substantially radially from the periphery of the drum, said frame having a forward extension, a tow bar pivotally connected to said extension by a horizontal pivot whereby the tow bar may form an upwardly inclined angle to the general plane of the carriage for towing the drum in a trench from a towing means on the ground level, the forward extension having an adjustable spreader plate positioned forwardly of the place of contact of the legs and feet with the bottom of the trench to spread earth dumped in the trench, said forward extension and spreader plate being positioned relative to the axis of the drum to unbalance the carriage frame and counteract the upwardly inclined pull of the tow bar.

7. In a trench tamper, a carriage frame having side beams, an axle journaled therein, a drum secured to the axle and having tamping legs and feet extending substantially radially therefrom, the side beams having a narrowed forward extension, a tow bar having a yoke pivotally connected by a horizontal pivot to said extension, the said side beams being adapted to occupy a horizontal position and the tow bar an upwardly inclined position whereby the carriage may be towed lengthwise in a trench by a towing means travelling on the ground level and having a connection to the upper end of the tow bar, the said forward extension having a spreader assembly including a transverse spreader plate and an upwardly inclined brace bar extending from adjacent the spreader plate to a connecting means at the forward end of the said extension, the spreader plate being adapted to spread earth dumped in the trench for tamping action by the legs and feet, said forward extension and spreader plate being positioned relative to the axle of the drum to unbalance the carriage frame and counteract the upwardly inclined pull of the tow bar.

FREDERICK W. WEBER.