May 27, 1924. 1,495,704

J. M. MAHLSTADT

DITCH DIGGING MACHINE

Filed April 12, 1922 3 Sheets-Sheet 1

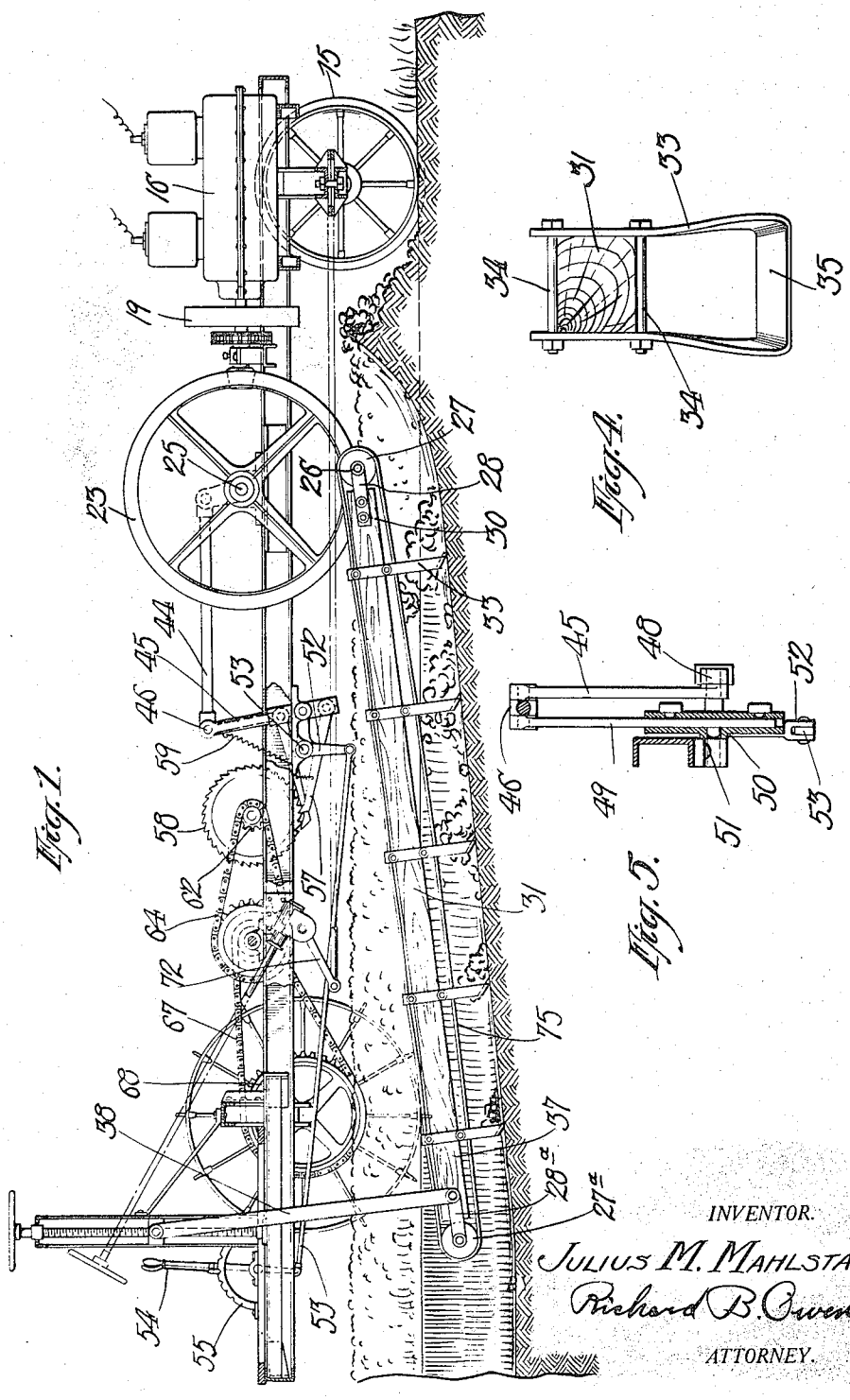


Fig. 1.



Fig. 4.



Fig. 5.

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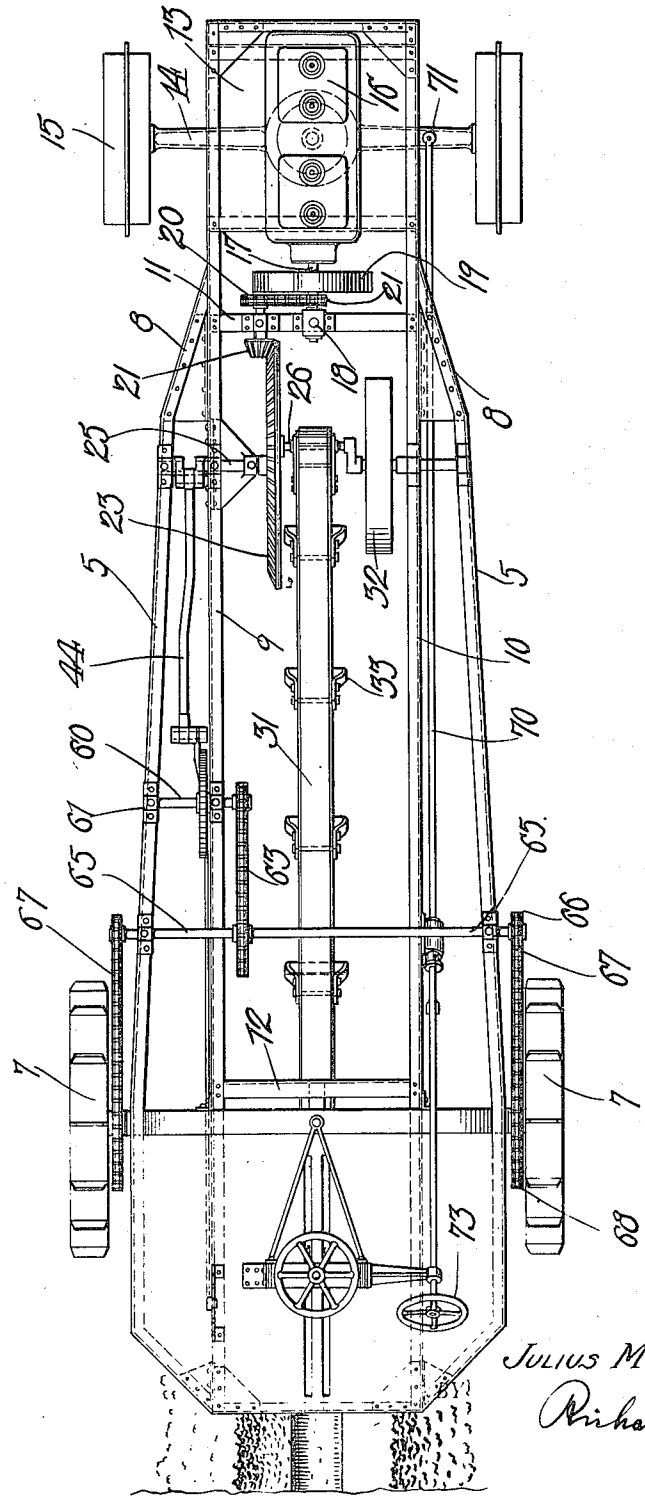
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Fig. 2.




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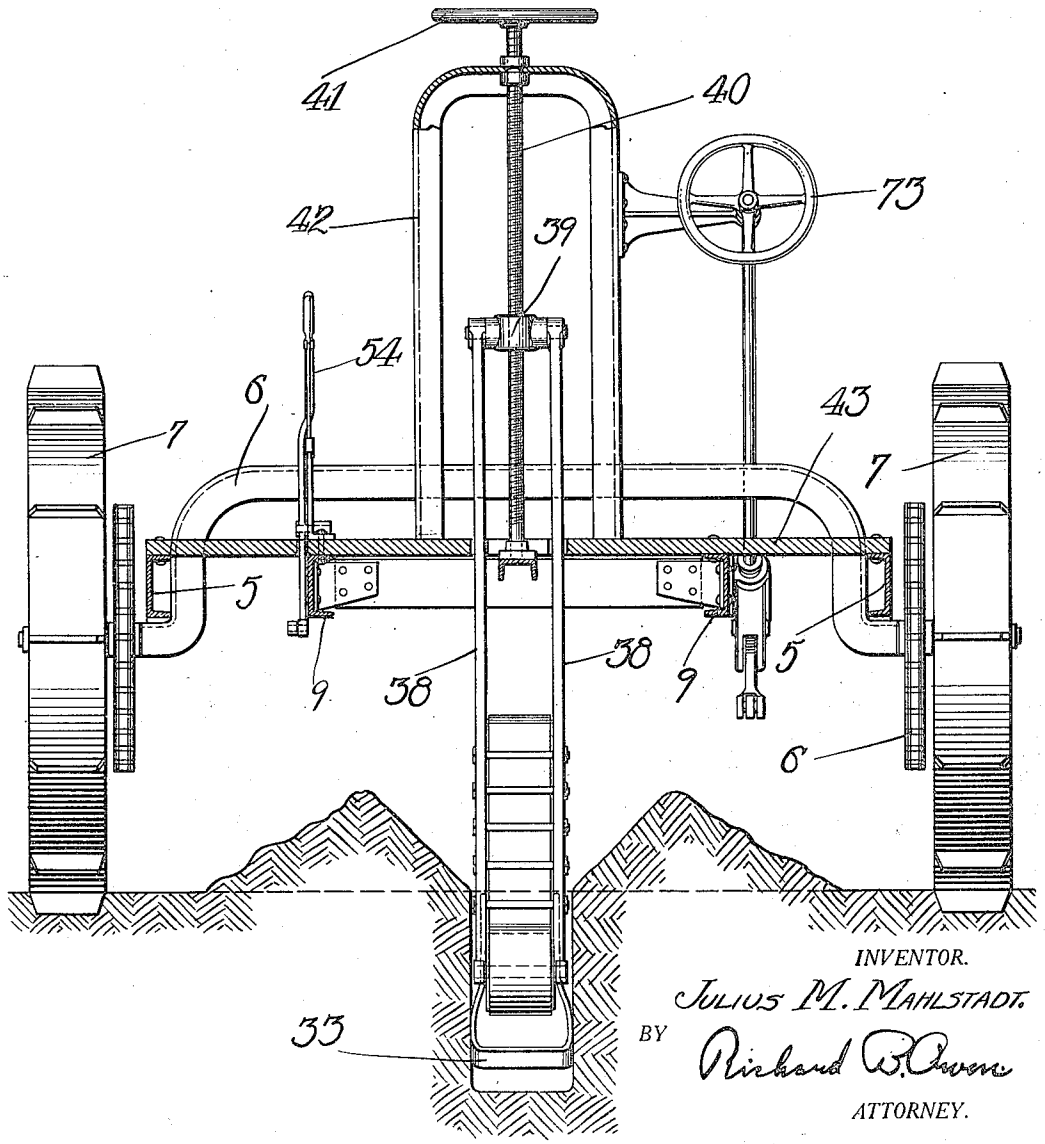
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Fig. 3.




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# UNITED STATES PATENT OFFICE.

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## DITCH-DIGGING MACHINE.

Application filed April 12, 1922. Serial No. 551,888.

*To all whom it may concern:*

Be it known that I, JULIUS M. MAHLSTADT, a citizen of the United States, residing at Sheffield, in the county of Franklin and State of Iowa, have invented certain new and useful Improvements in Ditch-Digging Machines, of which the following is a specification.

This invention relates to a trench or ditch digging machine and more particularly to a novel and improved power operated mechanism particularly designed to dig a trench as the machine proceeds and traverses the ground.

One of the objects of my invention is the construction of an automatically operated ditch digging machine capable of forming a furrow or trench to the desired depth and adapted particularly for laying tile and also for irrigation and other construction purposes.

Another and very important object of the invention is the provision of power operated and driven trench or ditch digging machine wherein the earth working member is driven from the motor, including provision for raising and lowering the said earth working member to the desired height to dig the ditch or trench to the desired depth.

A further object of the invention resides in the construction of a power operated ditch digging machine having a longitudinal, implement carrying means adapted to be reciprocated and operable in the direction in the travel of the machine including further provision for regulating its speed during the earth working operation.

An additional object of the invention is the provision of a reciprocatory vertically adjustable, power driven, implement supporting means having a plurality of equally spaced shovels or scoops secured thereto so that the loosened earth is continually thrown forward by each successive implement and deposited or thrown in a hill on each side of the furrow as the machine advances over the ground.

With these and other objects in view the invention consists in the construction and novel combination of parts hereinafter fully described, illustrated in the accompanying drawing, and pointed out in the subject matter being claimed, it being understood that various changes in the form, proportion, size and minor details of construction may be resorted to without departing from the spirit and scope of the invention.

In the drawings, Figure 1 is a side view showing the machine in working operation.

Figure 2 is a plan view.

Figure 3 is a rear view partly in section showing the ditch or trench formation.

Figure 4 is a detailed view showing the scoop or shovel mounting.

Figure 5 is a view partly in section of the feed regulating mechanism.

Referring now to the drawings, wherein like reference characters designate corresponding parts throughout the several views, 5 designates the side beams which may be constructed of channel iron and which extend forwardly from the rear bent axle 6 carrying the rear ground supporting wheels 7 of the machine. The side beams 5 are directed inwardly toward the front of the machine and connected by braces 8 which, together with the longitudinal beams 9, 10 and the front and rear transversely extending cross bars 11, 12 constitute a firm and rigid structure for supporting the power operating and driven mechanism now to be described in detail.

The front end of the machine 13 is supported on the front axle 14 and the ground supporting wheels 15, the motor 16 of the machine being preferably placed centrally of the forward end of the frame work so that the weight will be carried directly by the axle 14 to give the proper balance necessary. The driven shaft 17 from the motor is supported in suitable bearing 18 on the front, transversely extending connecting bar 11 and also carries the fly wheel 19 as clearly shown by Figure 2 of the drawing. The sprocket and chain gearing 20, 21 is adapted to operate the shaft and its bevelled gear 22, the same being in mesh with the large, bevelled gear 23 to which the earth working mechanism structure is connected in a manner subsequently to be referred to.

The large bevelled gear 23 is supported and carried by the transversely extending crank axle 25 said axle being supported in suitable bearings on the frame proper. The continuously rotatable bevelled gear 23 is of course driven in the opposite direction to the travel of the machine, that is to say, anti-clockwise and on its inner rim is provided

with a stud or short shaft 26, which shaft carries a pulley or roller 27. A pair of short supporting arms 28 are attached to the shaft 26 on each side of the roller and are rigidly secured to the sides of the forward end 30 of the longitudinal reciprocating beam 31 of the machine. On the opposite side of the longitudinal beam 31, a fly wheel 32 is mounted on the crank wheel and thus assists in giving the proper momentum to the beam during its reciprocating motion as the front end travels upwardly and downwardly during the continuous rotation of the bevelled gear above referred to. The said beam 31 has attached thereto a plurality of earth working elements in the form of scoops or shovels 33 preferably constructed of steel and substantially U-shaped and connected by bolts 34 above and below the said beams. The sloping front edge 35 of each shovel is disposed at an angle to the horizontal or the normal line of draft so that the reciprocating motion of the beam will tend to scrape and throw the dirt forwardly as the respective scoops or shovels pass through the ground, each successive shovel assisting in throwing and depositing the dirt on each side of the trench as the same is made. If so desired, the shovels or scoops may be so mounted as to ride backwardly when the same engage an obstruction that might otherwise tend to break the same. In its normal position the beam 31 is disposed at an angle so that the rear end thereof is considerably below the front end 30 and in order to regulate the depth of operation, the rear end 37 of the beam is supported by a pair of parallel upwardly extending bars 38 attached to the internally threaded sleeve 39. A feed screw 40 and a hand wheel 41 is provided at the rear of the machine and is supported by the yoke frame 42 secured on the transverse cross beam 43 of the said machine. The endless screw 40 of course passes through the internally threaded sleeve 39 so that upon rotation of the hand wheel 41 the said sleeve and the supporting arms 38 attached thereto may be raised and lowered and consequently the rear end 37 may be regulated to the desired height for the depth of operation intended.

The longitudinally extending reciprocating beam 31 and its elevated mechanism are positioned centrally of the frame work and together with the operating mechanism above described is properly balanced to give stability to the machine as a whole so that the same can operate properly in different soil as well as over irregular ground. The traction mechanism of the machine is also preferably driven from the motor at variable speeds determinable by the particular conditions under which the machine is to operate. I have therefore provided the axle 25 with a throw arm or rod 44 positioned between the outer beam 5 and the longitudinal beam 9 of the frame, the rear end of the said throw arm or rod being connected to the lever arm 45 as at 46 as clearly shown by Figures 1 and 5 of the drawing. The lower end of the said arm 45 is pivotally mounted in the stationary bearing 48 and in order to regulate and vary the throw of the arm 45, the same is connected to the slidable rod 49 operable in the pivotally mounted sleeve 50 mounted on the pivot 51. The bell crank lever 52 pivoted on the stationary bearing 53 is connected at one end to the sleeve 50 and at its opposite end to a shift rod 53, the opposite end of said shift rod being movable by the lever 54 operable on the rack 55. Connected to the sleeve there are provided a pair of dogs 57 which engage the teeth of the ratchet wheel 58 and consequently rotate the same the desired number of teeth at each reciprocation or movement of the throw arm 44. The resilient springs 59 connected to the respective dogs tend to retain the same in engaged position with the teeth at each movement of the lever 45 above referred to.

The shaft 60 on which the ratchet 58 is mounted is supported also in suitable bearings 61 on the frame of the machine and is provided with a pinion 62 for a sprocket chain 63 trained over the larger sprocket 64 of the transversely extending driven shaft 65. The latter shaft is mounted in the bearings 66 on the side beams 5 and also carries sprocket wheels 66 on the ends thereof for the side sprocket chains 67 which sprocket chains are also trained over large sockets 68 to drive the rear traction wheel 7 as clearly understood.

It will of course be recognized that in view of the resistance offered during the digging operation, that the machine must necessarily travel forward at an extremely slow rate of speed and that upon each reciprocation of the beam and the operation of the traction mechanism, the machine advances by inches depending of course, upon the condition of the soil and the resistance encountered. The speed of advance or travel of the machine is of course regulated by varying the throw of the rod 44 thus permitting the ratchet wheel 58 to move forward a distance, that is to say, 3 teeth, 5 teeth, and so forth. By operating the bell crank lever 52 through the medium of the actuating rod 53, the inclination of the sleeve 50 may be varied and consequently the movement of the lever arm 45 and the rod 44 will consequently be limited so that the dogs may move the ratchet wheel 58 forward the desired number of teeth. This, of course necessitates the rod 49 being freely movable in the sleeve to accomplish the result above intended. A conventional type of steering mechanism is also provided for the machine which consists of a longitudinally extending

steering rod 70 connected at 71 to the front axle and at its rear to a rod 72 operable by the steering wheel 73 disposed in proximity to the hand wheel 41 for raising and lowering the earth working beam 31.

In order to prevent the earth from clogging and adhering to the bottom of the beam 31, I have provided an endless belt 75 trained over the pulley 27 and a rear pulley $27^a$ attached to the rear end of the beam 31 by a similar pair of arms $28^a$, it being of course understood that the said belt overlies the bolts 34 connecting the shovels or scoops to the beam and is disposed between the side arms thereof and below the lower bolt 34.

While I have illustrated and described my invention with some degree of particularity, I realize that in practice various alterations therein may be made. I therefore reserve the right and privilege of changing the form of the details of construction or otherwise altering the arrangement of the correlated parts without departing from the spirit of the invention or the scope of the appended claims.

Having thus described my invention what I claim as new and desire to secure by United States patent is:—

1. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism supported by the frame, a continuously driven reciprocating beam and combined earth digging and scraping elements supported thereby driven from the power operating mechanism, and means for regulating the depth of operation of the rear end of said beam.

2. A ditch digging mcahine of the class described comprising a wheel supported frame, power operating mechanism supported on the frame, a longitudinal, reciprocating beam having combined earth digging and scraping members secured thereto continuously driven from the power operating mechanism and means for varying the depth of operation of said beam and members and for varying the rate of travel of the machine during the operation of said beam.

3. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism supported on the frame, a longitudinal beam having a series of combined earth digging and scraping elements; said beam being continuously driven from the power operating mechanism and means for varying the angular relation of the rear end of said beam to the frame to vary the depth of operation of the earth working elements.

4. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism mounted on the frame, a longitudinal beam having earth working elements supported below the frame and centrally thereof, means for raising and lowering the rear end of the beam for varying the depth of operation of the elements, and means for increasing and decreasing the distance traversed by the machine without affecting the speed of operation of said beam and the power operating mechanism.

5. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism mounted at the front end of the frame, a continuously driven rotary element driven from the power operating mechanism, a longitudinal beam having a plurality of spaced, earth working elements supported centrally of and below the frame, said beam being connected eccentrically of the continuously driven element for reciprocating the beam during the forward travel of the machine, and means for varying the depth of operation of the earth working elements.

6. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism mounted on the frame, a crank shaft, a rotary element mounted on the crank shaft and driven from the power operating mechanism, an inclined longitudinal beam having a plurality of earth working elements suspended therefrom supported centrally of and below the frame, the front end of the beam being connected eccentrically of the rotary element and continuously reciprocable during the travel of the machine and lever operated means for increasing and decreasing the distance traversed by the machine without affecting the speed of operation of said beam and the power operating mechanism.

7. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism supported on the frame, a continuously driven reciprocating beam having spaced earth working elements secured thereto and suspended below the beam, said beam being driven from the power operating mechanism, supporting bars connected to the rear end of the beam, screw threaded means for raising and lowering the bars and the supported beam for varying the angular relation of the said beam to the frame to regulate the depth of operation of the earth working elements.

8. A ditch digging machine of the class described comprising a wheel supported frame, power operating mechanism supported on the frame, a rotary element driven from the power operating mechanism, a continuously driven reciprocating beam connected to the rotary element and having a plurality of spaced, U-shaped earth working elements secured thereto and suspended below the same, an endless belt connected to the beam for preventing clogging of the

loosened earth during the operation of the earth working elements, and means for regulating the depth of operation of the said elements.

9. A ditch digging machine of the class described, comprising a wheel supported frame, power operating mechanism supported on the frame, a transverse crank shaft, a rotary element supported on the shaft, gearing for driving said rotary element from the power operating mechanism, a longitudinal beam eccentrically connected to the rotary element, combined earth digging and scraping elements secured to the beam, a throw rod connected to the crank axle, lever operated means for varying the throw of said rod and variable speed gearing connected to the rear supporting wheels of the machine whereby the forward rate of travel may be regulated without affecting the speed of operation of the earth working elements.

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

JULIUS M. MAHLSTADT. [L. S.]

Witnesses:

JOHN SOLBERG, Sr.,

JOHN VRACH.