Oct. 15, 1940. E. L. TUNSEN ET AL 2,218,222

DITCHING MACHINE

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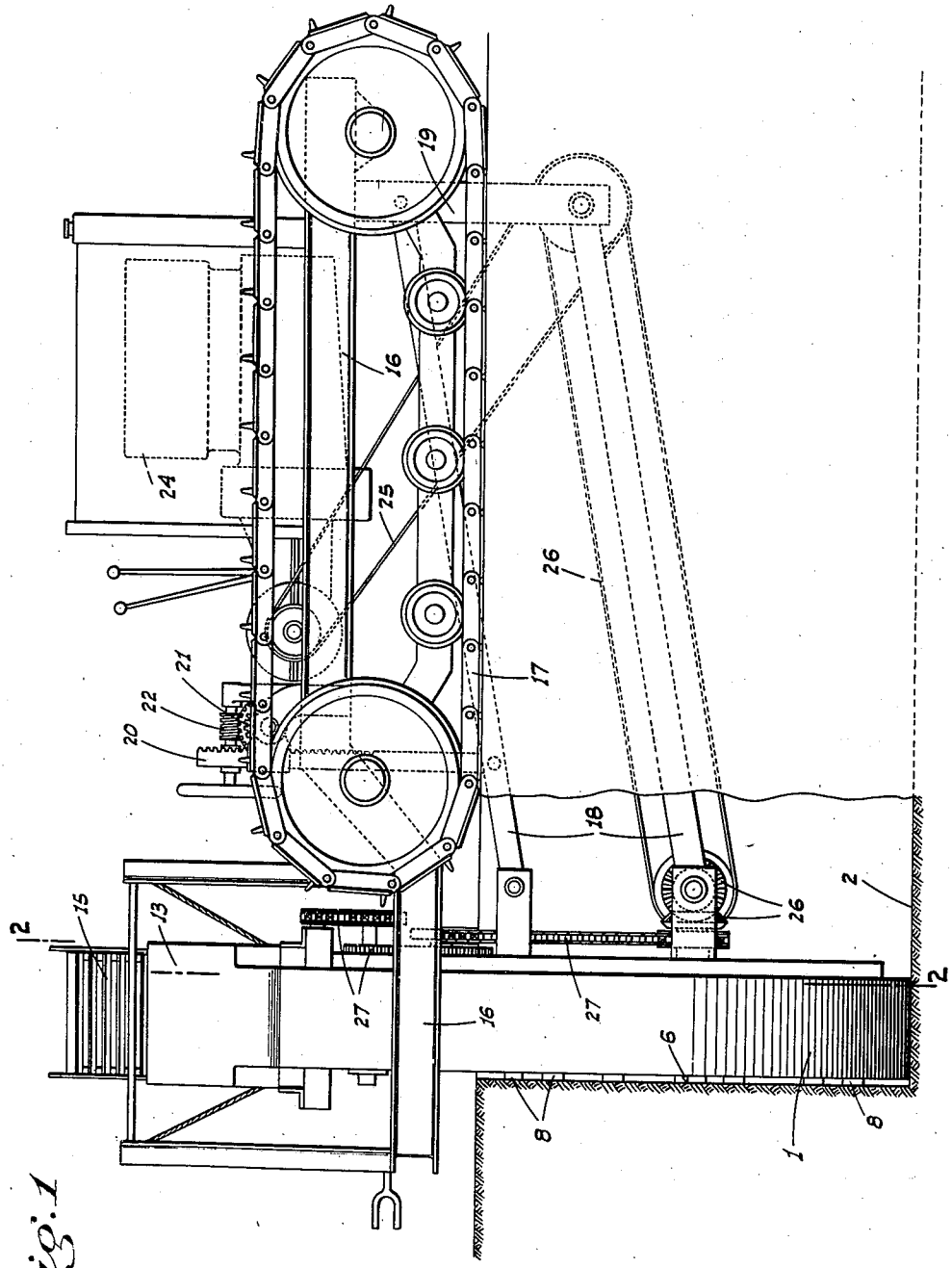


Fig. 1

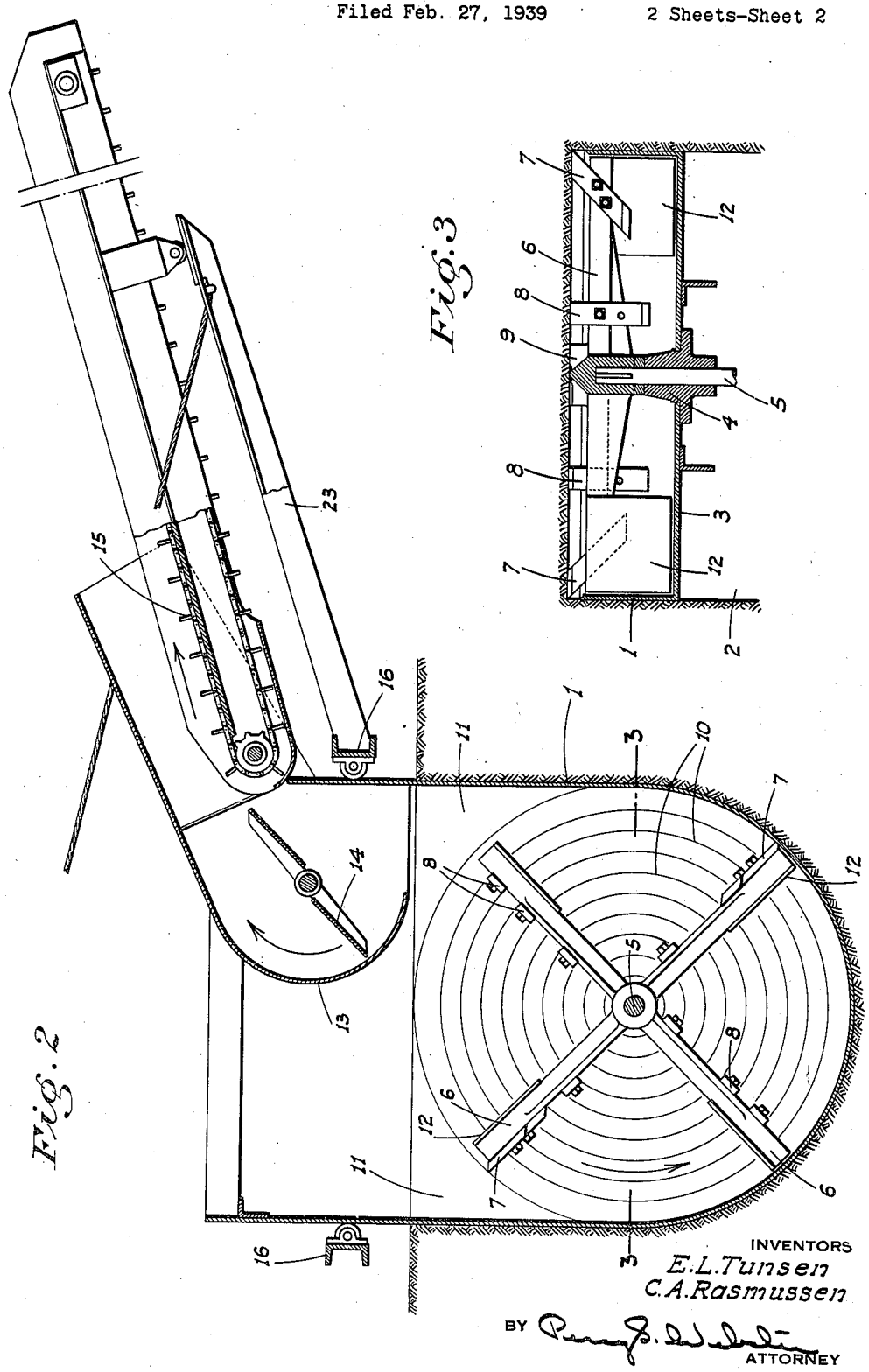
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DITCHING MACHINE

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6 Claims. (Cl. 37—93)

This invention relates to ditching machines and particularly to one intended for use in digging a ditch the lower portion of which serves as the form for the bottom half of a concrete pipe, which is formed by pouring the concrete directly into the ditch.

Such a pipe is intended to be round, and one object of our invention is to provide a digger which will form the lower half of the ditch to a true semicircular shape.

In laying such a poured pipe line, it is requisite that the bore of the pipe shall be maintained at a certain dimension and that the thickness of the pipe shall also be maintained at a certain definite dimension.

Another object of our invention therefore is to provide a digger for the purpose which will maintain the desired accuracy as to width, depth and the circular bottom form of the ditch at all times, and without any checking up ever being necessary. It is also an object to provide for the continuous removal of the dirt as it is dug or excavated, and the depositing of such dirt well to one side of the machine and ditch.

Also, the digger is rapid in operation, and will work effectively in any type of soil.

A further object of the invention is to produce a simple and inexpensive device and yet one which will be exceedingly effective for the purpose for which it is designed.

Thes objects we accomplish by means of such structure and relative arrangement of parts as will fully appear by a perusal of the following specification and claims.

In the drawings similar characters of reference indicate corresponding parts in the several views:

Figure 1 is a side elevation of our improved ditch digger shown as in operation in a ditch and as mounted in connection with a driving mechanism and a supporting vehicle.

Figure 2 is an enlarged transverse section of the digger on line 2—2 of Fig. 1.

Figure 3 is a sectional plane on line 3—3 of Fig. 2, but showing the opposed digger arms in horizontal position.

Referring now more particularly to the characters of reference on the drawings, the essential features of our invention comprise a rigid, relatively short shaped shield or casing 1 whose width is that of the ditch 2 to be dug, and whose lower portion is truly semicircular. The upstanding sides of the casing, above the axis of the curved portion, are vertical and parallel and are of a height to extend above the top of the ditch, which is substantially as deep as it is wide, as plainly indicated in Fig. 2.

The front of the casing is entirely open, while the back is closed by a plate 3. Projecting through this plate from behind and journaled in a fixed bearing 4 is a driven shaft 5, disposed coaxial with the curvature of the casing. This shaft extends to adjacent the front of the casing, and is there provided with a plurality of radial arms 6, preferably four in number.

Fixed on the opposed ones of said arms adjacent their outer end are reversible cutting or scraping blades 7, disposed flat on said arms so that their width is radial with the shaft. The blades are set at an outward angle to the axis of the shaft in such a position that the outermost end of their cutting edge lies ahead of and outwardly of the inner periphery of the casing, or so as to excavate the dirt through a circular path whose outer periphery at the bottom, substantially conforms to the outer peripheral line of the casing.

Also fixed on all said arms radially inward of the cutters 7 are other non-angularly disposed reversible blades 8, adapted at their forward end to engage the vertical face of the dirt at the head of the ditch and excavate the dirt in circular paths with a scraping action.

Each cutter is relatively narrow, so as to cut a corresponding narrow circular swath, but all the cutters are arranged in such relatively staggered relation on the various arms that the face of dirt will be excavated in the form of a number of such narrow swaths, as indicated by the various circular lines 10 in Fig. 2, and without a radial break from the outermost cutters 7 to adjacent the central shaft. If desired, the hub of the arms may be provided with a central cutter as indicated at 9.

The circular path of cutting of the outer cutters 8 will practically reach ground level at the top and center, leaving of course substantially triangular masses of dirt on each side at the top and untouched by the cutters, as indicated at 11. However, as will be obvious, the straight sides of the casing, with the forward movement of the latter, shear through these triangular portions of dirt at the sides thereof, and due to their unsupported overhang, they then drop off of themselves.

The casing, besides serving to shear and true the walls of the ditch, also serves as a receptacle for the excavated dirt, preventing the same from falling into the finished ditch, and thus keeping the ditch perfectly clean.

In order to continuously remove the dirt from the casing, the arms 6, rearwardly of the cutters, are provided with radial paddles 12 which extend radially inward a certain distance from the inner periphery of the casing.

These paddles sweep up and throw the dirt up the side of the casing toward which the paddles are turning and into the bottom of a housing 13 mounted as a unit with the casing just above ground level. A rotary paddle unit 14 is turnably mounted on this housing on a horizontal axis, and engages the dirt as it is thrown upwardly by the paddles 12 and delivers such dirt onto an endless conveyor 15 of conventional form. This conveyor is also mounted as a unit with the casing and housing and extends laterally a suitable distance, so as to discharge onto the ground well clear of the ditch.

The shaft 5, paddle unit and conveyor are all driven at a relatively high speed. By reason of this, the dirt is practically pulverized as it is excavated and it is thrown up by paddles 12 with sufficient velocity to cause it to enter housing 13 and be acted on by paddle unit 14.

In operation, besides the various shafts being driven in the proper direction, the digger as a whole must be moved along the ground, while maintaining shaft 5 as near to parallelism with the ground surface as is possible. In connection with the supporting of the digger necessary to obtain the above results, it may also be desirable to set the digger at various adjustable levels.

The support and adjustment of the digger may be accomplished in various ways, that shown here being illustrative. In this showing, the casing above ground is vertically slidable between the side beams 16 of a chassis frame, which is supported from the ground outwardly of the beams by endless track units 17 of conventional form and which may or may not be self-propelled.

The digger casing 1 is mounted in connection with the frame for vertical adjustment and so as to maintain the shaft 5 parallel to the ground level at all times by means of parallel and vertically spaced compression arms 18 pivoted in connection with the casing at the back and extending rearwardly to pivotal connection with a depending frame member 19. An upstanding rack bar 20 is pivoted on each upper arm 18, and is engaged by a pinion 21 mounted in connection with an irreversible worm control device 22.

It will therefore be seen that by vertical movement of the rack bars, the digger structure, together with the adjacent end of the conveyor 15, will be vertically adjusted. In order to relieve the digger of some of the weight of the conveyor without affecting the unitary association of the conveyor with housing 13 regardless of the level of the latter, the lower end of said conveyor may be pivotally mounted in connection with the housing and supported toward its outer end for movement laterally of the digger on a lateral arm unit 23 mounted rigid with the chassis frame as shown in Fig. 2.

The chassis carries a suitable power plant such as a gas engine indicated at 24. A drive connection 25 extends between the engine and the pivot point of the lower arm 18 with member 19, and another drive connection 26 extends between the lower end of connection 25 and the rear end of shaft 5 at the forward pivot point of said lower arm 18. Auxiliary drives 27 of suitable type connect shaft 5, behind the casing, with the rotary paddle unit 14 and conveyor 15 so that all rotating parts move at predetermined synchronized speeds.

By means of a supporting and drive mechanism such as that above described, the chassis may be propelled or pulled ahead while maintaining the digger unit in the desired upstanding position at all times, and all the rotating members of the digger will be driven without interference regardless of the vertical setting of the digger.

From the foregoing description it will be readily seen that we have produced such a device as substantially fulfills the objects of the invention as set forth herein.

While this specification sets forth in detail the present and preferred construction of the device, still in practice such deviations from such detail may be resorted to as do not form a departure from the spirit of the invention, as defined by the appended claims.

Having thus described our invention, what we claim as new and useful and desire to secure by Letters Patent is:

1. A ditch digger including a rotary excavating unit having its axis horizontal and adapted to extend lengthwise of a ditch for engagement with the head wall thereof and excavate a circular area, means to support the unit for movement along the ground and so that its center is below ground level and means provided with the unit to cut through the head-wall dirt above the horizontal central plane of said area and tangent to the periphery thereof to the level of the top of said circular area and on both sides thereof.

2. A ditch digger comprising a rotary excavator adapted to excavate a circular area, means to mount the excavator for movement along the ground with its axis horizontal and so that it will operate on the head wall of the ditch, a casing mounted in connection with the rotary excavator behind and with its front edge adjacent the dirt engaging elements thereof; said casing including a lower portion concentric with the shaft and substantially the same diameter as that of the excavator and vertical sides upstanding from and tangent to said lower portion.

3. A ditch digger comprising a rotary excavator adapted to excavate a circular area, means to mount the excavator for movement along the ground with its axis horizontal and so that it will operate on the head wall of the ditch, a casing mounted as a unit with and open to the excavator in position to receive the dirt as excavated, means to engage such dirt and throw the same upwardly, a conveyor extending laterally from the digger above ground level and means to engage such upwardly thrown dirt and deliver the same onto the conveyor.

4. A ditch digger comprising a rotary excavator adapted to excavate a circular area, means to mount the excavator for movement along the ground with its axis horizontal and so that it will operate on the head wall of the ditch, a casing mounted as a unit with and open to the excavator in position to receive the dirt as excavated and extending rearwardly from the excavator, the back of the casing being closed and its lower portion being circular and concentric with the excavator, paddles disposed radially in said circular portion of the casing and mounted for rotation with the excavator so as to throw the dirt up one side of the casing from the bottom thereof, a housing in the casing on said side above and clear of the path of rotation of the paddles, said housing having a bottom opening through which said upwardly thrown dirt passes, a conveyor leading laterally from the housing and a rotary paddle unit in the housing to engage the dirt thrown

into the same from below and deliver such dirt onto the conveyor.

5. A ditch digger comprising a vertically disposed U-shaped casing the lower portion of which is semicircular, means supporting the casing for movement along the ground so that said lower portion is below ground level with its axis parallel to the ground surface and a rotary excavator mounted as a unit with the casing at the front end and disposed concentric with the lower portion thereof; said excavator including cutting elements extending radially out to engage the dirt ahead of but adjacent the casing and excavate the dirt along a circular path whose outer diameter is substantially the same as the outer diameter of the lower portion of the casing.

6. A ditch digger comprising a rotary excavator to engage the head wall of the ditch being dug, a casing mounted as a unit with and behind the excavator to receive the dirt as excavated, a housing in the casing above the excavator and open to the casing, means in the casing to engage the dirt in the casing and deliver the same into the housing, and additional means to engage the dirt as delivered into the housing and remove such dirt and deposit the same on the ground to one side of the digger.

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