L. WEHNER.

TRENCH DIGGING MACHINE.

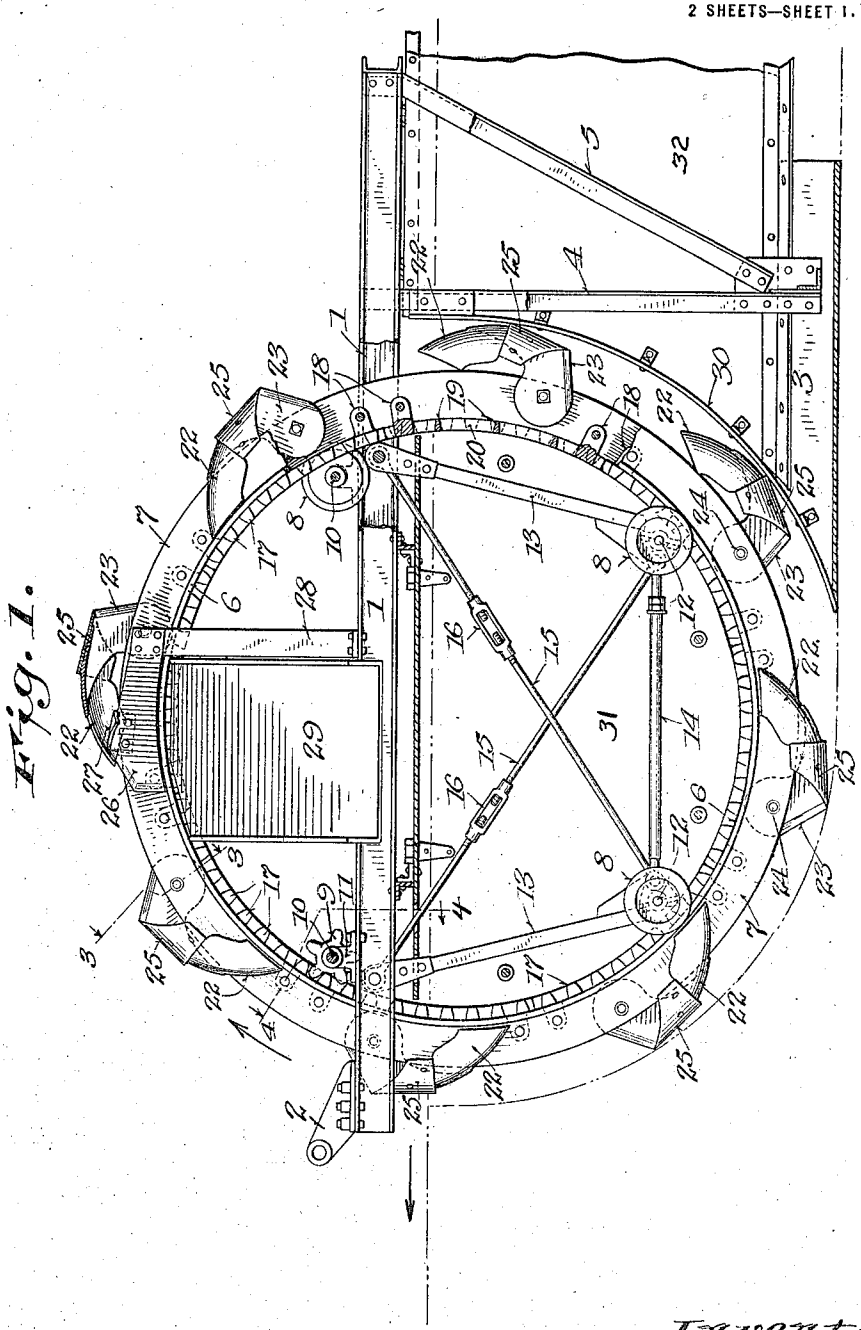
APPLICATION FILED APR. 16, 1917.

1,301,344.

Patented Apr. 22, 1919.

2 SHEETS—SHEET 1.

Fig. 1.



Inventor.
Lewis Wehner,
By Flanders Bottum Lamsett & Bottum
Attorneys.

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

L. WEHNER.

TRENCH DIGGING MACHINE.

APPLICATION FILED APR. 16, 1917.

1,301,344.

Patented Apr. 22, 1919.

2 SHEETS—SHEET 2.

Fig. 2.

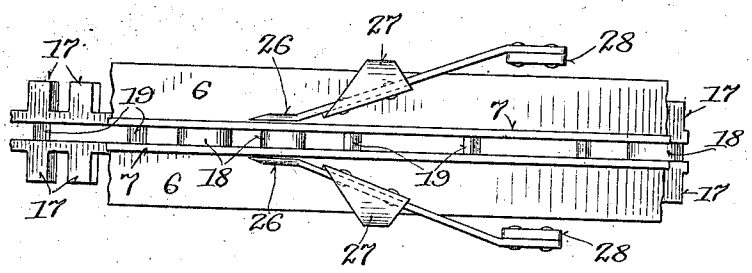



Fig. 3.

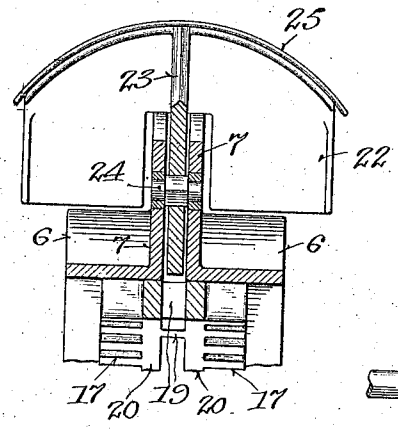
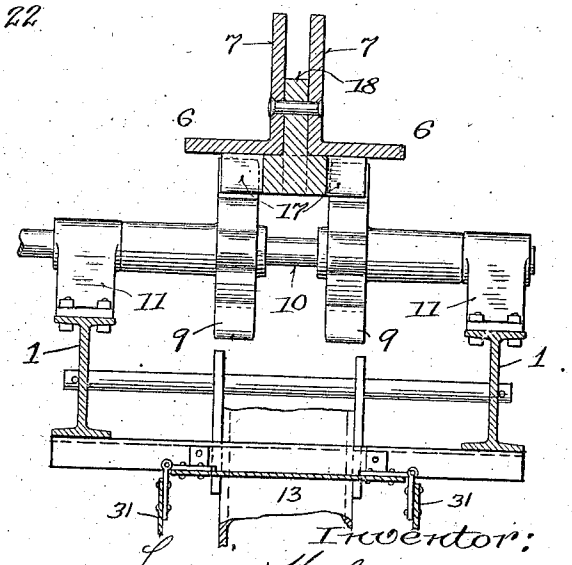



Fig. 4.




Inventor:

Lewis Wehner,

By Flanders Bottum Fawsett & Bottum

Attorneys.

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

# UNITED STATES PATENT OFFICE.

LEWIS WEHNER, OF MILWAUKEE, WISCONSIN, ASSIGNOR TO PAWLING AND HARNISCHFEGER COMPANY, OF WEST MILWAUKEE, WISCONSIN, A CORPORATION OF WISCONSIN.

## TRENCH-DIGGING MACHINE.

1,301,344. Specification of Letters Patent. Patented Apr. 22, 1919.

Application filed April 16, 1917. Serial No. 162,363.

*To all whom it may concern:*

Be it known that I, LEWIS WEHNER, a citizen of the State of Wisconsin, residing at Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented certain new and useful Improvements in Trench-Digging Machines, of which the following is a specification, reference being had to the accompanying drawing, forming a part thereof.

This invention relates to trench digging machines having spokeless digging wheels rotatably supported and guided on rollers and provided at intervals around its periphery with pivoted buckets.

The main objects of the present invention are to effect the complete discharge of the buckets particularly when digging heavy, sticky dirt, such as clay; to thrust stones and other obstructions out of the path of the buckets without breaking or injuring the machine; to prevent dirt from clogging and interfering with the free and proper operation of the gearing inside the wheel and of the pivot connections between the buckets and the wheel; to firmly support and truly guide the wheel and buckets in their movements; and generally to improve the construction and operation of machines of this class.

It consists in the peculiar construction, arrangement and combination of parts as hereinafter particularly described and pointed out in the claims.

In the accompanying drawing like characters designate the same parts in the several figures.

Figure 1 is a side elevation of a trench digging machine embodying the invention, parts being broken away and shown in section, and the front shield or guard plate being removed; Fig. 2 is an enlarged plan view of a portion of the digging wheel showing scrapers for removing dirt from the buckets on the upper side of the wheel; Fig. 3 is a cross section on a still larger scale on the line 3—3, Fig. 1, showing the front or leading end of one of the buckets; and Fig. 4 is a similar section on the line 4—4, Fig. 1, showing the wheel driving and supporting pinions.

The machine comprises a vertically adjustable and swinging main frame composed of two parallel metal I-bars 1, spaced apart and rigidly connected with each other at or adjacent to the ends by cross pieces, and provided at their front ends with brackets 2, by which pivotal and vertically adjustable connections are made with a tractor (not shown) in the usual or any suitable manner, for the purpose of raising and lowering the digging wheel and digging trenches of different depths.

At its rear or trailing end, the main frame is provided with a shoe or runner 3, adapted to bear on the bottom of a trench to support the rear end of said frame and the digging wheel in proper working position when the machine is in operation. The shoe or runner 3, which is located below and parallel with the frame bars 1, is rigidly connected therewith by standards 4 and braces 5.

The digging wheel comprises a pair of angle rings 6, having radially and outwardly projecting flanges 7 on their proximate sides spaced apart as shown in Figs. 2, 3 and 4, to form through the rim of the wheel a vertical slot in open communication with the interior of the wheel, so that dirt will not lodge and become packed in the slot and interfere with the pivotal action of the buckets, as hereinafter explained.

The digging wheel is rotatably supported and guided between the frame bars 1, as shown in Figs. 1 and 4, by flanged rollers 8 and driving pinions 9, mounted in pairs on said bars and in an adjustable auxiliary frame suspended therefrom, said rollers engaging the inside faces and outer edges of the rings 6. The pinions and upper pair of rollers are mounted on transverse horizontal shafts 10, which are supported in bracket bearings 11, attached to the upper sides of the bars 1. The two lower pairs of rollers are mounted on shafts 12, supported by the adjustable auxiliary frame consisting of bars 13, pivotally connected at their upper ends with the bars 1, an adjustable horizontal bar 14 connecting the lower ends of the bars 13 and adjustable brace rods 15, provided with turnbuckles 16 and diagonally connecting the lower end of each bar 13 with the upper end of the other bar 13. By the adjustment of the bar 14 and braces 15, the two lower pairs of rollers may be shifted relatively to the upper pair

of rollers 8 and pinions 9 toward and from the center of the digging wheel, to take up play and wear and to firmly and properly support and guide said wheel.

A pair of internal gears or racks 17, spaced apart to form a slot or opening between them corresponding and registering with the slot or opening between the rings 6, are fitted inside of said rings and are formed with and connected at intervals by outwardly projecting lugs 18, which are inserted between and secured by rivets or bolts to the flanges 7 of the rings, as shown in Figs. 1, 2 and 4.

For convenience in making and assembling these gears or racks, they are preferably cast in segments or sections, as shown in Fig. 1, corresponding segments or sections of the gears being cast or formed integrally with the intervening connecting and spacing lugs 18 and at intervals between said lugs with cross connections 19, to stiffen and strengthen the segments or sections, and firmly hold them in the proper relation to each other. The spaces between the gear teeth preferably extend radially clear through the segments or sections, and are open at their outer ends to permit dirt to readily escape therefrom and thus prevent its lodging therein and interfering with the free and proper operation of the wheel and buckets. At their inner ends the teeth of each segment or section are connected, and the spaces between them closed, by bonds 20, forming the walls of the inner portion of the vertical slot or opening through the rim of the wheel. As shown in Figs. 1 and 4, the digging wheel is rotated in a clockwise direction, indicated by an arrow on Fig. 1, by the pinions 9, fixed on one of the shafts 10 and meshing with the internal gears 17, said shaft 10 having a driving connection (not shown) with the tractor motor.

At intervals around its periphery the digging wheel is provided with buckets 22, having central longitudinal webs 23, freely fitting between the flanges 7 of the wheel rim and pivotally connected therewith by trunnions or pivot pins 24, as shown in Figs. 1 and 3. The trunnions or pivot pins 24, which have steel or hard metal bushed bearings in the flanges 7, are formed with squared central portions fitted in correspondingly shaped holes in the webs 23, as shown in Fig. 3. The inner front ends of the webs 23 are made of circular or segmental shape concentric with the trunnions or pivot pins 24, as shown in Fig. 1, to provide broad bearing faces next to the flanges 7 and to avoid straight or flat-faced edges, which would tend, with the oscillation of the buckets, to compress and pack dirt in the slot or opening through the wheel rim and thus interfere with the free movement and proper operation of the buckets. The front or leading ends of the webs 23 outside of the flanges 7, are formed with sharp outwardly and rearwardly inclined cutting edges, and the front or leading ends of the buckets are provided with sharp cutting edges which diverge laterally and rearwardly from the central webs and are formed on hardened steel plates or sections 25 riveted to the outer sides of the bucket bodies and gradually curving inward toward their sides which extend somewhat beyond the sides of the wheel rim or rings 6, as shown in Fig. 3.

The buckets 22 are curved or inclined inwardly toward their rear ends and at the sides so as to close against the laterally projecting parts of the wheel rim or rings 6 on the ascending side of the wheel and each form therewith two forwardly opening pockets or compartments on the outer sides of the flanges 7, the rear ends of the buckets being slotted, as shown in Fig. 3, to close over the flanges 7. The provision of the buckets 22 and their central webs 23 at their front or leading ends with rearwardly inclined cutting edges, causes them to thrust stones and other hard obstructions, which can be dislodged, to one side or the other out of their path and to sever roots or the like with a shearing cut, thereby facilitating the operation of the machine and preventing breaking the buckets and otherwise injuring the machine.

To effectively remove dirt from the buckets, the machine is provided on the upper side of the digging wheel with scrapers, consisting of rearwardly diverging plates 26, provided with outwardly projecting wings 27, and supported at their rear ends by arms or standards 28, fastened to and extending upwardly from the frame bars 1 at the sides of the wheel. The front ends of the scraper plates 26, which are located close to the outer sides of the flanges 7, are sharpened or beveled, and have upwardly and rearwardly inclined sharpened or beveled edges extending above said flanges to the wings 27, which have rearwardly inclined front edges and are curved to correspond with the shape of the buckets. The lower edges of the plates 26 conform and work close to the horizontal or laterally projecting parts of the wheel rim or rings 6, so as to effectively scrape and remove the dirt therefrom when the buckets are opened.

The formation of the wheel rim and buckets and the manner of pivotally connecting the buckets with the wheel rim, as shown and described, enable the scrapers to work close to the outer surfaces of the rim and inner surfaces of the buckets and completely and effectively remove dirt therefrom besides firmly holding and guiding the buckets in proper working relation to the wheel rim and permitting them to open and close freely.

The machine is provided on each side be-

low the scrapers with laterally and downwardly inclined chutes 29, supported from the frame bars 1, for receiving the dirt discharged from the buckets and delivering it upon the ground at the sides of the trench. A curved guide 30, attached to the shoe or runner 3, and standards 4, concentric with the wheel rim or rings 6, supports the buckets 22 and limits their opening on the rear descending side of the wheel.

The space inside of the digging wheel below the frame bars 1 and the space behind the guide 30 and between it and the standards 4 and braces 5, are closed by plates 31 and 32, as shown in Figs. 1 and 4 which prevent the dirt from caving in at the sides of a trench and interfering with the operation of the digging wheel and with laying tile, when desired, behind said guide.

In the operation of the machine, the digging wheel is turned and advanced with the tractor in the directions indicated by arrows on Fig. 1, and the buckets 22 on the lower and the ascending and advancing sides of the wheel, gradually cut the dirt below, ahead of and above them, and are filled in their advance and ascent while they are held firmly closed at their rear or trailing ends against the wheel rim by the pressure against the rearwardly inclined cutting edges at their front or leading ends. At first, as the machine advances, the digging wheel descends into the ground with the shoe 3, gradually deepening the trench, until the vertically swinging frame bars 1, assume a substantially horizontal position which is afterward maintained, the depth of the trench being determined by the vertical adjustment of the pivot connections at the front ends of the said frame bars with the tractor. After they pass above and out of the trench, the buckets are held closed by gravity until they are drawn over and turned upwardly at their trailing ends by the scrapers 26 and 27, which completely eject the dirt therefrom into the chutes 29, by which it is delivered upon the ground at opposite sides of the machine.

The shoe 3 bearing on the bottom of the trench, supports the digging wheel in proper working position as it advances against the digging action of the buckets, which has a tendency to force it downward.

Various changes in details of construction and arrangement of parts may be made, without departure from the principle and scope of the invention as defined in the following claims.

I claim:

1. In a trench digging machine, a digging wheel comprising a pair of spaced angle rings set with their vertical sides adjacent to each other and forming a vertical slot between them in open communication with the interior of the wheel, and buckets having vertical webs inserted and pivotally secured in said slot at intervals around the periphery of the wheel.

2. In a trench digging machine, a digging wheel comprising a pair of spaced angle rings set with their vertical sides adjacent to each other, spaced internal gears attached to the inner sides of said rings with the space between them coinciding with the space between the rings and forming therewith an open vertical slot through the rim of the wheel, and buckets having vertical webs inserted and pivotally secured in said slot at intervals around the periphery of the wheel.

3. In a trench digging machine, the combination of a frame, a digging wheel rotatably mounted therein and having a rim provided on the outside with spaced peripheral flanges and on the inside with spaced internal gears, the spaces between the flanges and gears coinciding and forming an open slot through the rim, buckets having webs inserted and pivotally secured in said slot at intervals around the periphery of the wheel, and a pair of driving pinions carried by said frame and meshing with said gears.

4. In a trench digging machine, the combination of a frame, a digging wheel rotatably mounted in said frame and having a rim provided medially with spaced flanges forming a slot opening through the rim into the interior of the wheel, buckets having central longitudinal webs pivoted adjacent to their front ends between said flanges, the buckets being inclined inwardly toward their rear ends and longitudinally slotted to close on the ascending side of the wheel toward the rim and form pockets therewith on opposite sides of the flanges, scrapers mounted on the frame adjacent to the upper side of the wheel close to the outer sides of said flanges in the path of the closed buckets which in passing over them are turned upwardly and opened thereby.

5. In a trench digging machine, a digging wheel having a rim provided medially with outwardly projecting spaced flanges, and buckets provided with longitudinal webs pivoted between said flanges and having outwardly and rearwardly inclined front cutting edges, the buckets having front cutting edges diverging outwardly and rearwardly from the outer ends of the cutting edges of the webs.

6. In a trench digging machine, the combination of a frame, a digging wheel rotatably mounted therein and having a rim composed of rings formed on their adjacent sides with outwardly projecting radial flanges which are spaced apart and form a vertical slot between them through the rim, correspondingly spaced internal gears formed at intervals with outwardly projecting connecting and spacing lugs which

are secured between the flanges of the rings, a driving shaft mounted on said frame within said wheel parallel with its axis and provided with pinions meshing with said gears, and buckets having central longitudinal webs freely fitting between the vertical flanges of the rings and pivoted thereto.

7. In a trench digging machine, the combination of a frame, a digging wheel comprising rings formed with vertical flanges on their adjacent sides, which are spaced apart, correspondingly spaced internal gears formed at intervals with connecting lugs which project outwardly between and are secured to the vertical flanges of the rings, flanged rollers mounted on said frame and rotatably supporting and guiding said digging wheel inside thereof, driving pinions mounted on said frame in mesh with the internal gears, and buckets provided with central longitudinal webs freely fitting between and pivoted to the flanges of said rings.

8. In a trench digging machine, the combination of a frame, a digging wheel comprising a pair of angle rings having on their adjacent sides outwardly projecting flanges spaced to form an open slot through the rim, a pair of correspondingly spaced internal gears fitted inside of said rings and formed at intervals with connecting and spacing lugs which project outwardly between and are secured to the flanges of the rings, the spaces between the teeth of said gears extending radially therethrough and being open at their outer ends and closed at their inner ends by bonds, flanged supporting and guiding rollers mounted on said frame in position to engage with the inside faces and outer edges of the rings, and a pair of driving pinions mounted on said frame in mesh with said gears.

In witness whereof I hereto affix my signature.

LEWIS WEHNER.

**Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents. Washington, D. C."**