July 3, 1923. 1,460,671

W. HEBSACKER

EXCAVATING MACHINE

Original Filed June 17, 1920 2 Sheets-Sheet 1

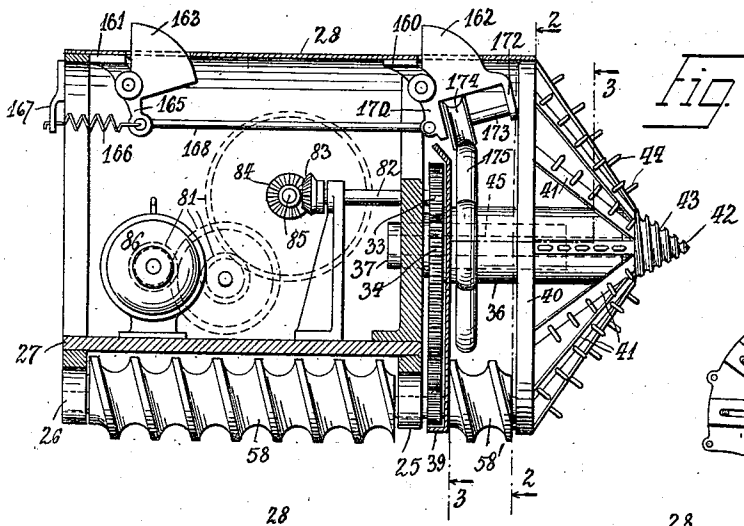

Fig. 1.

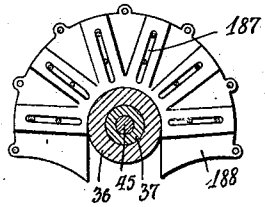

Fig. 6.

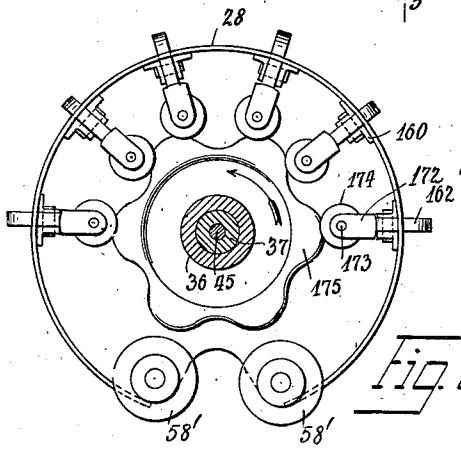

Fig. 2.

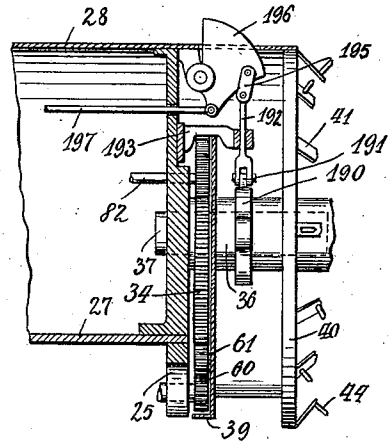

Fig. 7.

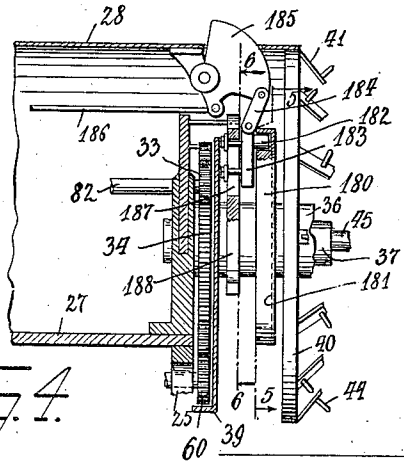

Fig. 4.

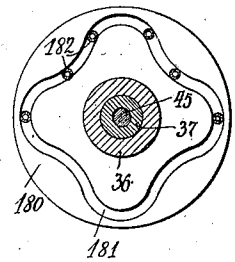

Fig. 5.

INVENTOR.
Wilhelm Hebsacker
BY
ATTORNEY.

July 3, 1923. 1,460,671

W. HEBSACKER

EXCAVATING MACHINE

Original Filed June 17, 1920 2 Sheets-Sheet 2

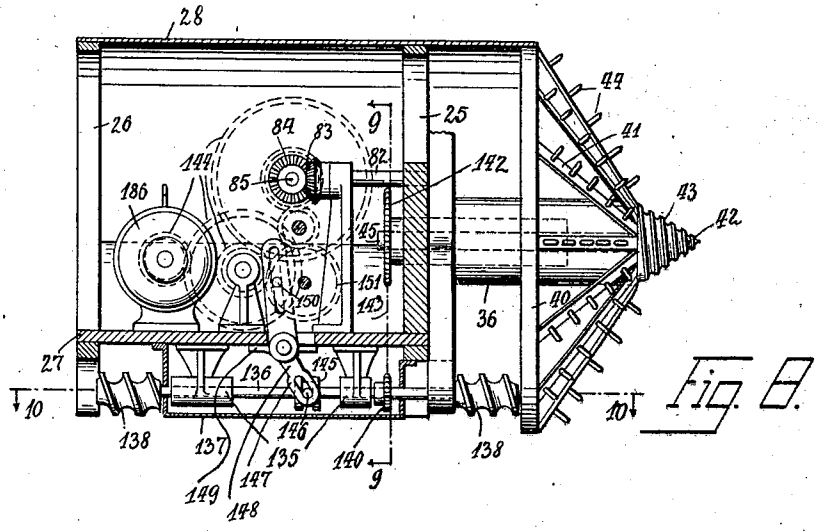

Fig. 8.

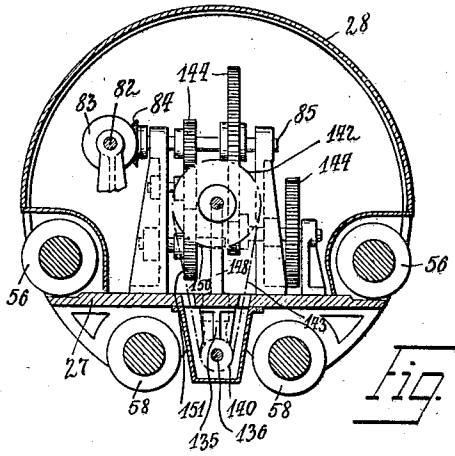

Fig. 9.

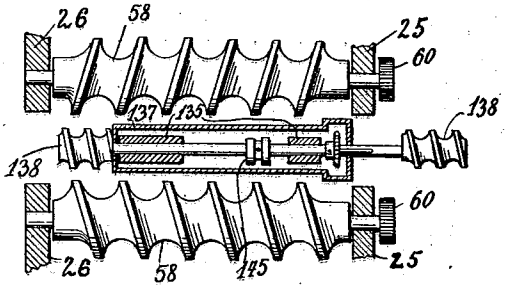

Fig. 10.

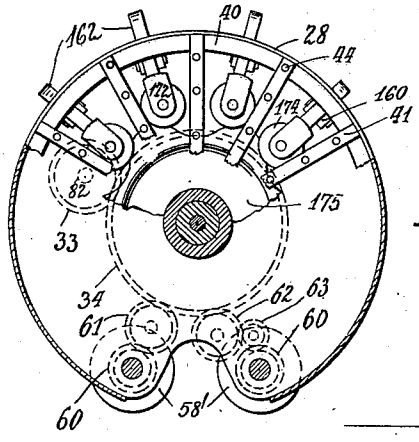

Fig. 5.

INVENTOR.
Wilhelm Hebsacker

BY

ATTORNEY.

Patented July 3, 1923. 1,460,671

UNITED STATES PATENT OFFICE.

WILHELM HEBSACKER, OF HEILBRONN, GERMANY.

EXCAVATING MACHINE.

Original application filed June 17, 1920, Serial No. 389,780. Divided and this application filed May 17, 1921. Serial No. 470,313.

To all whom it may concern:

Be it known that I, WILHELM HEBSACKER, a citizen of Germany, residing at Heilbronn, Wurttemberg, Germany, have invented certain new and useful Improvements in Excavating Machines, of which the following is a specification.

This invention relates to a digging or excavating machine to be used in the construction of tunnels, canals, ditches, etc., or for any other work requiring the removal or turning of soil. The present machine includes improved means for causing its forward movement, and this application is a division of my earlier application filed in the United States Patent Office on June 17, 1920, Serial No. 389,780.

The embodiments of my invention shown in the present case comprise a non-rotary casing, a rotary head at the front end of the casing, and certain novel propelling devices which are caused to move first in one direction and then in the opposite direction, as will be set forth hereinafter. The invention also consists in a novel screw conveyor and in certain other features and arrangements of parts which will be described below, and particularly pointed out in the appended claims.

Reference is to be had to the accompanying drawings, in which four different forms of my invention are illustrated, and in which Fig. 1 is, substantially, a longitudinal vertical section of the first form of this invention; Fig. 2 is a front elevation with parts in section on line 2—2 of Fig. 1; Fig. 3 is front elevation with parts broken away and parts in section on line 3—3 of Fig. 1; Fig. 4 is a fragmentary vertical section showing a modification of the advancing means; Fig. 5 is a transverse section on line 5—5 of Fig. 4; Fig. 6 is a similar view taken on line 6—6 of Fig. 4; Fig. 7 is a fragmentary vertical section showing a further modification of the advancing means; Fig. 8 is a vertical section showing still another form of my improved excavator; Fig. 9 is a cross section on line 9—9 of Fig. 8; and Fig. 10 is a horizontal section on line 10—10 of Fig. 8.

Referring to Figs. 1, 2 and 3, the non-rotary casing of the machine consists of a front member or plate 25 of approximately circular shape, a rear member or band 26, a horizontal platform 27 extending from one of said members to the other, and a shell 28 of cylindrical curvature, but open at the bottom lengthwise. Within the casing an electromotor or other suitable engine 86 is supported on the platform 27, and through suitable gearing 81 this motor operates a transverse shaft 85 actuating, by means of bevel gearing 84, 83, a longitudinal shaft 82 carrying a pinion 33. This pinion meshes with a gear wheel 34 secured rigidly to a sleeve 36 mounted to rotate about a stub axle 37 secured to the front member 25 of the casing and projecting therefrom axially forward. This sleeve 36 carries the rotary excavating head, which is here shown of a general conical shape, with a ring 40 located at the rear end or base of said head, spaced from said front member 25, and obliquely disposed bars 41 converging forwardly toward the point 42 having a helical thread 43 adapted to worm itself into the soil when rotated under pressure. Fixed on the outer sides of the bars 41 are a plurality of rigid abraders or cutters 44, preferably disposed in several concentric rows (see Fig. 3) and acting, when the head is rotated, to loosen the soil after the manner of picks, bars, or chisels, the soil passing between the bars of the head as the latter advances.

The machine rests on two longitudinal screw conveyors located at its bottom and journaled in the members 25, 26 below the platform 27. Each of these conveyors comprises a relatively long rear portion 58, located between the members 25, 26, and a relatively short front portion 58′ located between the front member 25 and the ring 40 of the rotary head. These two portions are held to turn in unison, as by being secured rigidly to the same shaft. The two conveyors are rotated in opposite directions, as by having a pinion 60 on the shaft of one conveyor in direct mesh with a pinion 61 engaging the gear wheel 34, while the pinion 60 of the other conveyor 58, 58′ meshes with a pinion 63 which also engages a pinion 62 in mesh with the gear wheel 34.

The rotating head may be provided with an axial rod or spindle 45 rigid with the point 42 and journaled within the hollow axle 37, so as to steady said head. The gears 33, 34, 60, 61, 62 and 63 may be protected by a cover 39 located in front of them, and in the rear of the conveyor portions 58′.

The soil loosened by the slowly-revolving screw point 42 and by the cutters 44 is

moved rearwardly by the auxiliary or front portions 58′ of the screw conveyors and by their main portions 58. The machine is fed forward in part by the action of the screw point 42, in part by the screw conveyors 58, 58′, and in part by additional mechanism to be described presently. The two screw conveyors rotate in opposite directions, thereby avoiding any tendency to tip the machine sideways.

The additional advancing mechanism or propelling device, moving alternately in opposite directions, is constructed as follows: Secured at suitable intervals within the casing, at the upper half thereof, are front and rear brackets 160 and 161 respectively on which sector-shaped plate levers 162 and 163 respectively are mounted pivotally to swing in planes passing through the axis of the machine, that is to say, said levers will move lengthwise of the machine. The shell 28 has suitable longitudinal slots through which the said levers are adapted to project. Each of the rear levers 163 has an arm 165 to which is connected a tension spring 166 secured at its outer end to a bracket 167 fixed on the rear member 26 of the casing. A longitudinal rod 168 is connected pivotally with said arm 165 and with a similar arm 170 on the corresponding front lever 162, thereby causing the two connected levers to swing in unison. Another arm 172 extends from the front edge of each lever 162, parallel to the respective arm 170, and these parallel arms carry a spindle 173 and a freely movable concave-faced roller 174. The springs 166 keep the several rollers 174 against the wavy edge of a cam 175 secured to the sleeve 36 carrying the rotary cutter head.

As the cutter head is rotated, the cam 175 will turn in unison therewith and the several levers 162, 163 will be oscillated to make contact with the bore produced by the head, and to advance or propel the excavator. It will be noted that the intervals between the cam waves do not coincide with the spacing of the several rollers and levers, thus while all the levers will be rocked practically constantly, their timing will vary, some of the levers being retracted at the time that others are advanced. It will be understood that the propelling action is exerted by the rear edges of the sector-shaped levers, at the time such levers are rocking rearwardly.

Figs. 4, 5 and 6 show a modified form of cam enabling me to dispense with the springs 166, said modified cam 180 having an endless undulating cam groove 181 on one face, suited to receive rollers 182 carried by slides 183 and connected by links 184 with levers 185 of the same character as the levers 162, and at 186 I have indicated the rod which (like the rod 168 of Fig. 1) connects the front lever 185 with the corresponding rear lever (not shown). The slides 183 are guided by radial slots 187 formed in a backing plate 188.

In the modification shown in Fig. 7 a lobed peripheral cam 190, driven like the cams described above, engages rollers 191 journaled in the forked inner ends of slides 192 guided and supported by brackets 193 secured to the front member 25 of the casing. Links 195 connect the outer ends of the slides 192 with the sector-shaped levers 196 arranged in front and rear and operating as described above, the two levers of the same pair being coupled by a rod 197.

It will be noted that the front levers 162, 185, 196 are located in the space between the front members 25 of the casing and the rear end or ring 40 of the rotary cutter head.

Figs. 8, 9 and 10 illustrate a construction in which the general features are substantially the same as in the construction described above, except that there is an additional pair of screw conveyers 56 located at a level slightly above the platform 27, said conveyers being driven in opposite directions, in exactly the same manner as has been described above with reference to the screw conveyers 58. The auxiliary conveyor portions 58′ have been omitted (although they might be used). The main feature distinguishing the construction illustrated by Figs. 8, 9 and 10 from those described above, consists in substituting another type of additional advancing mechanism for the rocking levers 162, 163, 185, 196. Like this last-named mechanism, the one shown in Figs. 8, 9 and 10 comprises front and rear members connected to move in unison, first in one direction and then in the other, and located in advance of the members 25 and 26 respectively of the casing, but in construction details, the mechanism of Figs. 8, 9 and 10 differs considerably from the rocking levers of the kind set forth in the modifications described above.

Secured below the platform 27 are two bearing brackets 135 supporting a revoluble shaft 136, and protected by a housing 137 from which said shaft projects forwardly and rearwardly, the protruding ends carrying rigidly a pair of helical conveyors 138. The shaft 136, which extends parallel with the axis of the machine and directly below said axis, at about the same level as the axes of the conveyors 58 (Fig. 9), is operated by means of a sprocket 140 held against longitudinal motion and having a longitudinal groove for a key 141 on said shaft. The sprocket 140 is driven by means of a chain 143 from a sprocket 142 secured rigidly to the inner end of the rod or spindle 45 which rotates in unison with the sleeve 36.

A collar 145 is mounted on the shaft 136 and is fixed thereto in any suitable way so

as to permit the shaft 136 to turn freely in the collar but to prevent relative movement of the collar longitudinally of the shaft. The collar 145 is provided with pins 146 which project into the slots of a fork 147 at the lower end of a lever 148 fulcrumed on a bracket 149 secured to the platform 27, said lever swinging lengthwise of the shaft 136. An oscillating motion is imparted to said lever by a pin 150 extending through a slot in the upper portion of the lever (Fig. 8) and extending from one side of a gear 151 driven from the motor 86 by suitable gearing 144. It will be understood that the shaft 136 and the conveyors 138 attached thereto will thus be rotated constantly and at the same time given a reciprocating movement lengthwise of the shaft's axis, whereby the loosened soil will be carried to the rear of the excavator, supplementing the action of the main conveyors 56 and 58.

Various modifications may be made without departing from the nature of my invention.

I claim:

1. An excavating machine comprising a non-rotatable body, a rotary cutter head in front of said body, a propelling device projecting laterally from the body to engage the bore of the excavation and movable forward and rearward relatively to said body, and means for moving said device alternately in opposite direction.

2. An excavating machine comprising a non-rotatable body, a rotary cutter head in front of said body, a propelling device comprising front and rear sections connected to move in unison forward and rearward relatively to said body, and means for moving said device alternatively in opposite directions.

3. An excavating machine comprising a non-rotatable body, a rotary cutter head located in advance of said body and spaced therefrom, a propelling device movable forward and rearward relatively to said body and located between said body and said head, and means for moving said device alternately in opposite directions.

4. An excavating machine comprising a non-rotatable body having connected front and rear members, a rotary cutter head located in advance of said front member and spaced therefrom, a propelling device comprising front and rear sections connected to move in unison forward and rearward and locted respectively in front of the front member and of the rear member of said body, and means for moving said device alternately in opposite directions.

5. An excavating machine comprising a non-rotatable body, a rotary cutter head located in front of said body, rotary screw conveyors journaled on said body about axes extending lengthwise of the body, to convey rearwardly the material loosened by the cutter head, and to propel the machine forward, an additional propelling device movable forward and rearward relatively to said body, and means for moving said device alternately in opposite directions.

6. An excavating machine comprising a non-rotatable body, a rotary head having means to disintegrate soil in advance of said body, a series of oscillating sector-shaped levers mounted on said body to make contact with the bore produced by said head, and means for actuating said levers.

7. An excavating machine comprising a non-rotatable body, a rotary head having means to disintegrate soil in advance of said body, a series of oscillating sector-shaped levers mounted on said body to make contact with the bore produced by said head, and means for actuating said levers, at different intervals so that their operative motions will occur at different times for different levers.

8. An excavating machine comprising a non-rotatable body, a rotary head having means to disintegrate soil in advance of said body, a series of oscillating sector-shaped levers mounted on said body to make contact with the bore produced by said head, said levers being located at the front and at the rear of said body, each front lever being operatively connected with one of the rear levers, and means for actuating said levers.

9. An excavating machine comprising a non-rotatable body, a rotary head having means to disintegrate soil in advance of said body, a series of oscillating sector-shaped levers mounted on said body to make contact with the bore produced by said head, and a cam, rotating in unison with said head, for actuating said levers.

10. An excavating machine comprising a non-rotatable body, a rotatable cutting head adjacent to said body, rotary screw conveyors journaled on said body about axes extending lengthwise of said body, and screw extensions on said conveyors reaching close to said head.

11. An excavating machine comprising a non-rotatable body, a rotatable cutter head adjacent to said body, a double-ended screw conveyor located at the lower part of said body and mounted to rotate about an axis extending lengthwise of the machine and also movable lengthwise of said axis, and means for imparting a longitudinal reciprocating motion to said conveyor while it is rotating.

12. An excavating machine comprising a non-rotatable body, a rotatable cutter head adjacent to said body, screw conveyors extending lengthwise of said body and located on opposite sides thereof, means for imparting rotation in opposite directions to the conveyors which are located on opposite sides of

the body rocking levers pivoted on said body and adapted to engage the bore produced by said rotary head, and means for giving said levers their active rearward movements intermittently to cause an advance of said body.

13. An excavating machine comprising a non rotatable body, a rotatable shaft centrally mounted in said body, a rotatable cutter head on said shaft, a helical screw cutter projecting forwardly from said head and a propelling device projecting laterally from said body and movable forward and rearward relatively to said body whereby said cutter head is held against the material to be excavated and means for moving said propelling device alternately in opposite directions.

14. An excavating machine comprising a non rotatable body, a rotatable shaft centrally mounted in said body, a rotatable cutter head on said shaft, a propelling device projecting laterally from said body to engage the bore of the excavation, movable forward and rearward relatively to said body, and means carried by said shaft for moving said device alternately in opposite directions.

15. An excavating machine comprising a non rotatable body, a rotatable cutter head mounted on said body having a helical screw cutter projecting forwardly from said cutter, a propelling device mounted on said body and projecting laterally therefrom adapted to hold said cutter head and helical screw cutter in contact with the excavating cut.

In testimony whereof I have affixed my signature.

WILHELM HEBSACKER.

Witnesses:
E. SHLEIRHER,
FRIEELÆ KLEU CER.