

May 14, 1935.

H. E. SATRE

2,001,502

EXCAVATING, HOISTING, DUMPING, AND CONVEYING APPARATUS

Filed May 5, 1934 5 Sheets-Sheet 1

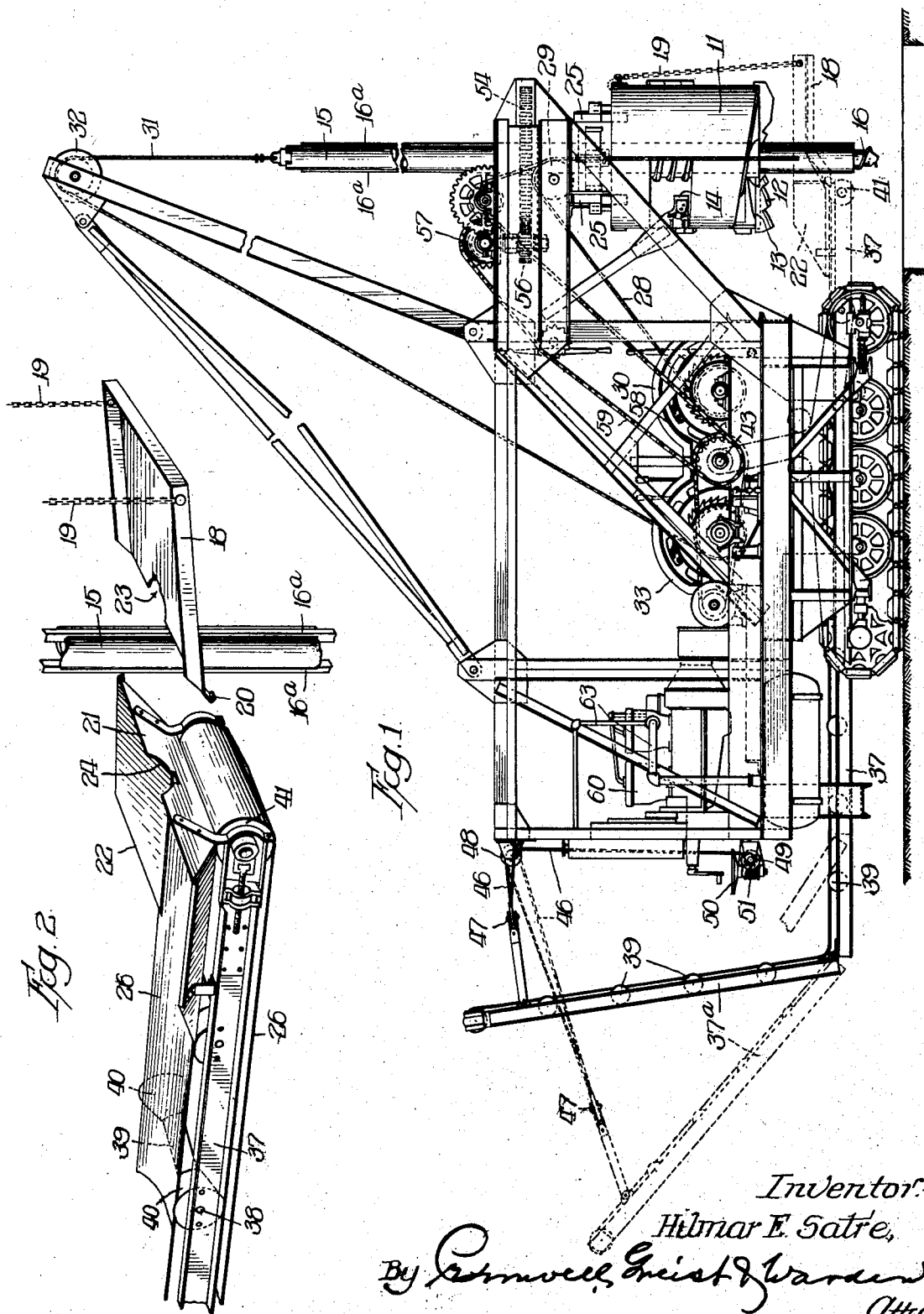


Fig. 1

Fig. 2

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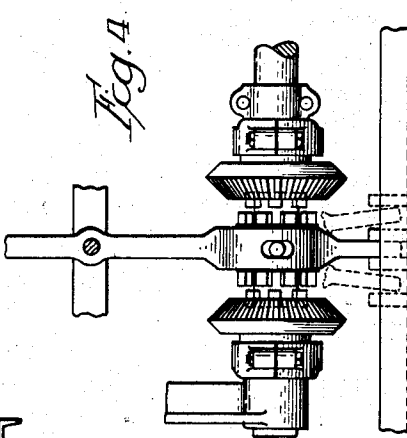
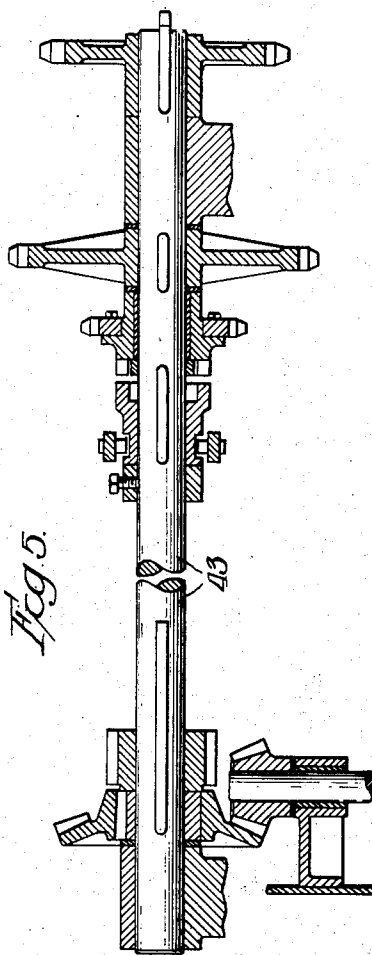
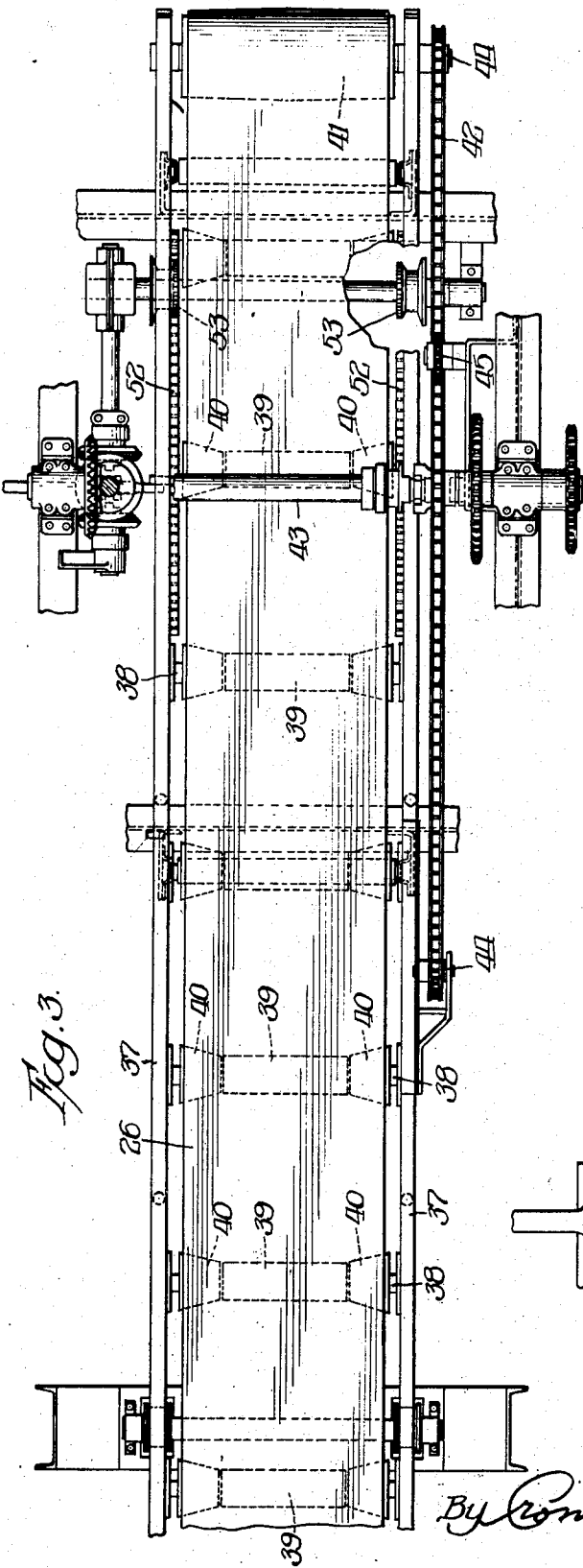
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EXCAVATING, HOISTING, DUMPING, AND CONVEYING APPARATUS

Filed May 5, 1934 5 Sheets-Sheet 2



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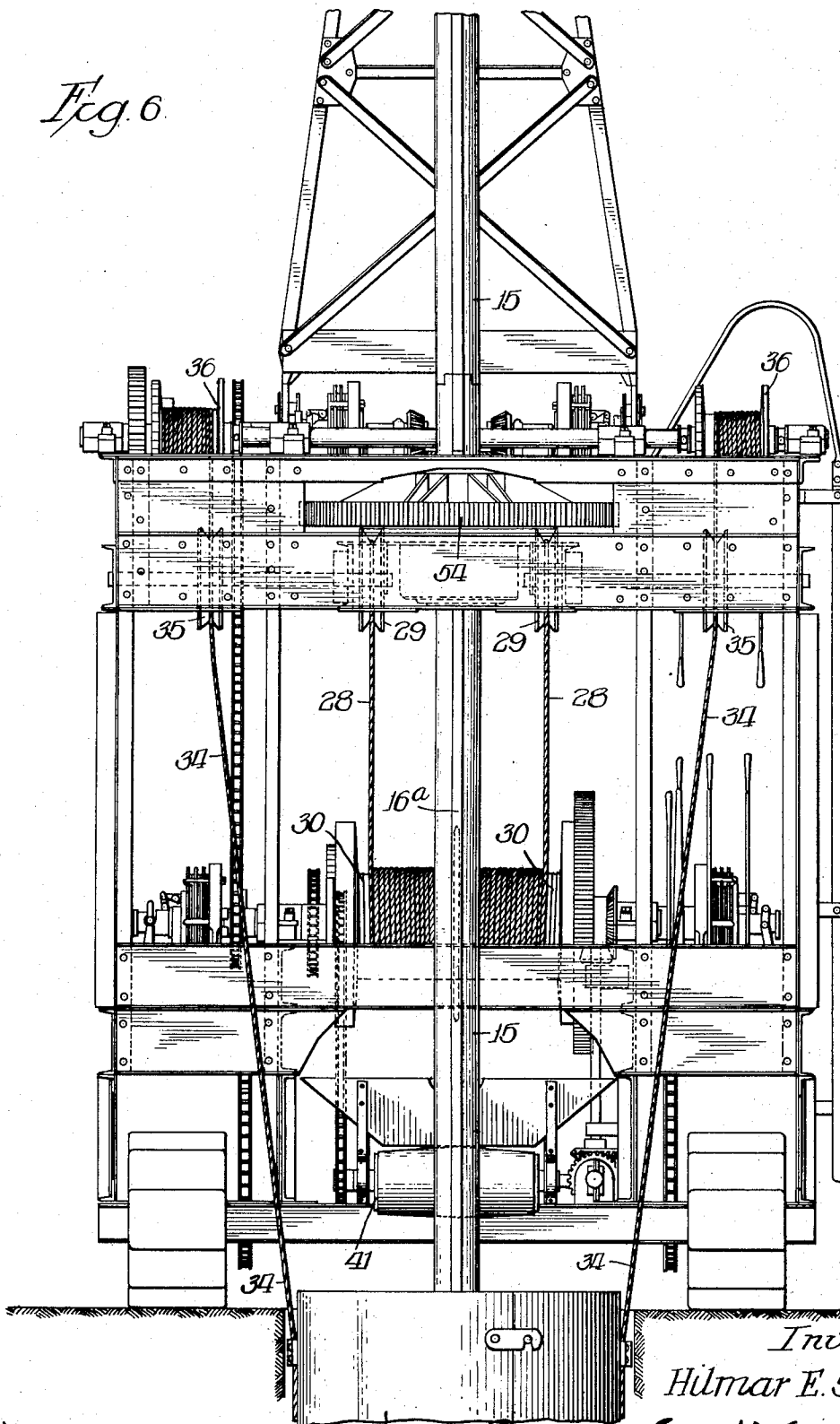
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EXCAVATING, HOISTING, DUMPING, AND CONVEYING APPARATUS

Filed May 5, 1934 5 Sheets-Sheet 3

Fig. 6.



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EXCAVATING, HOISTING, DUMPING, AND CONVEYING APPARATUS

Filed May 5, 1934 5 Sheets-Sheet 4

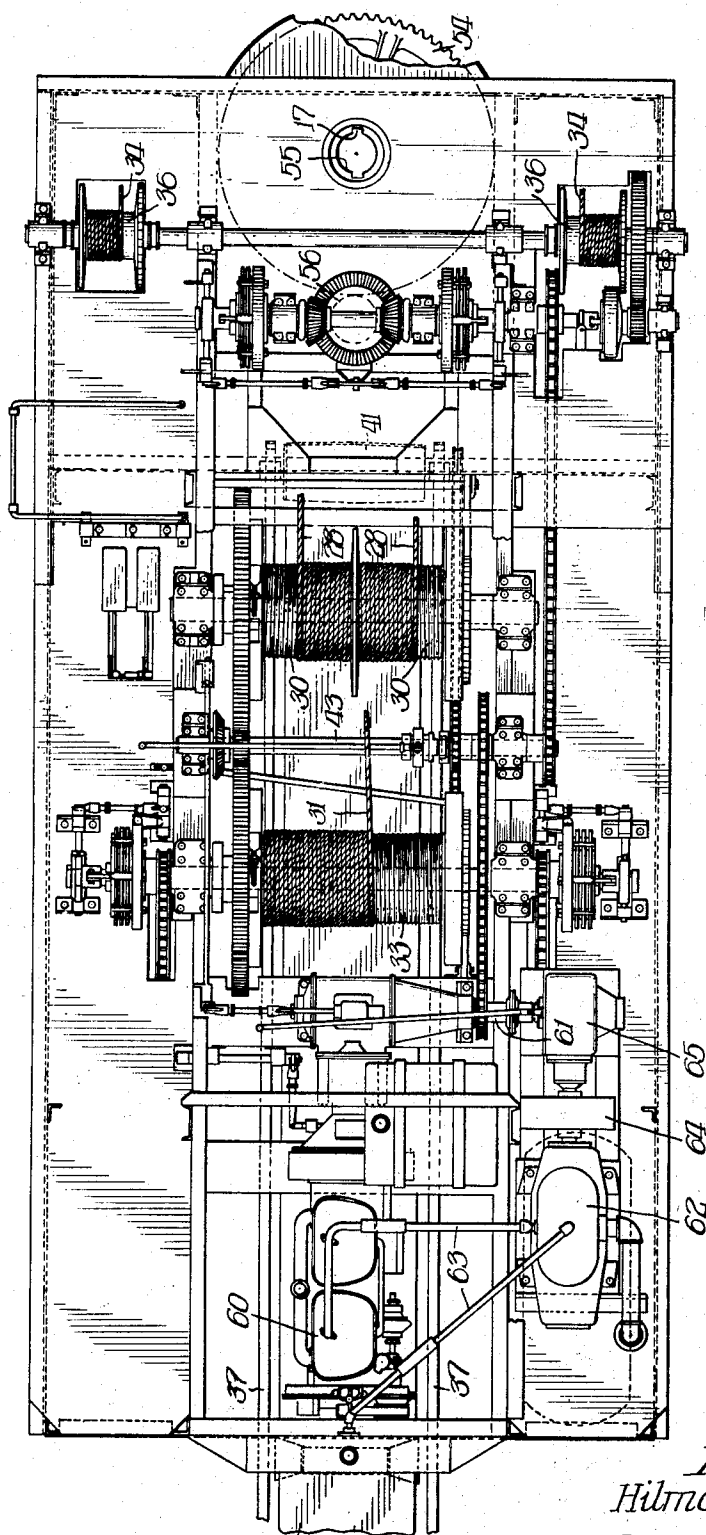


Fig. 7

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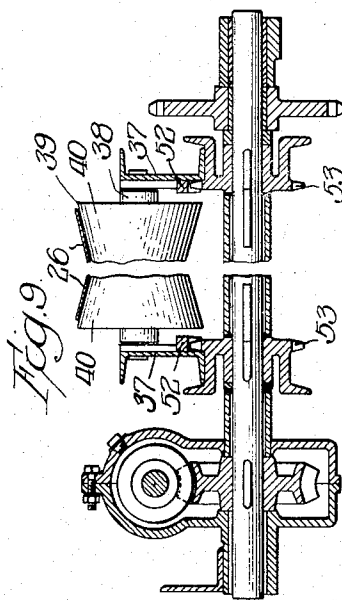
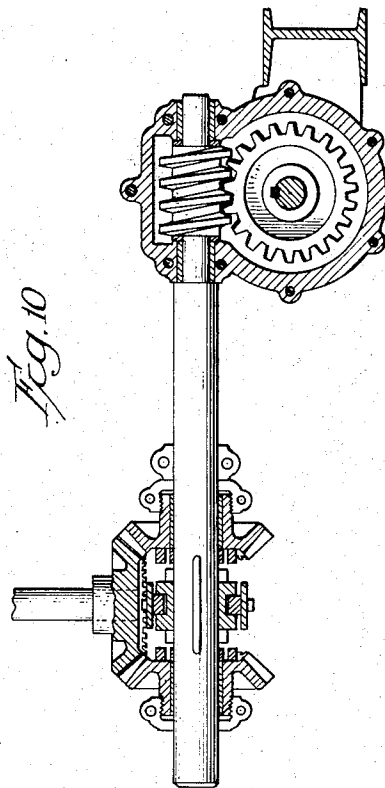
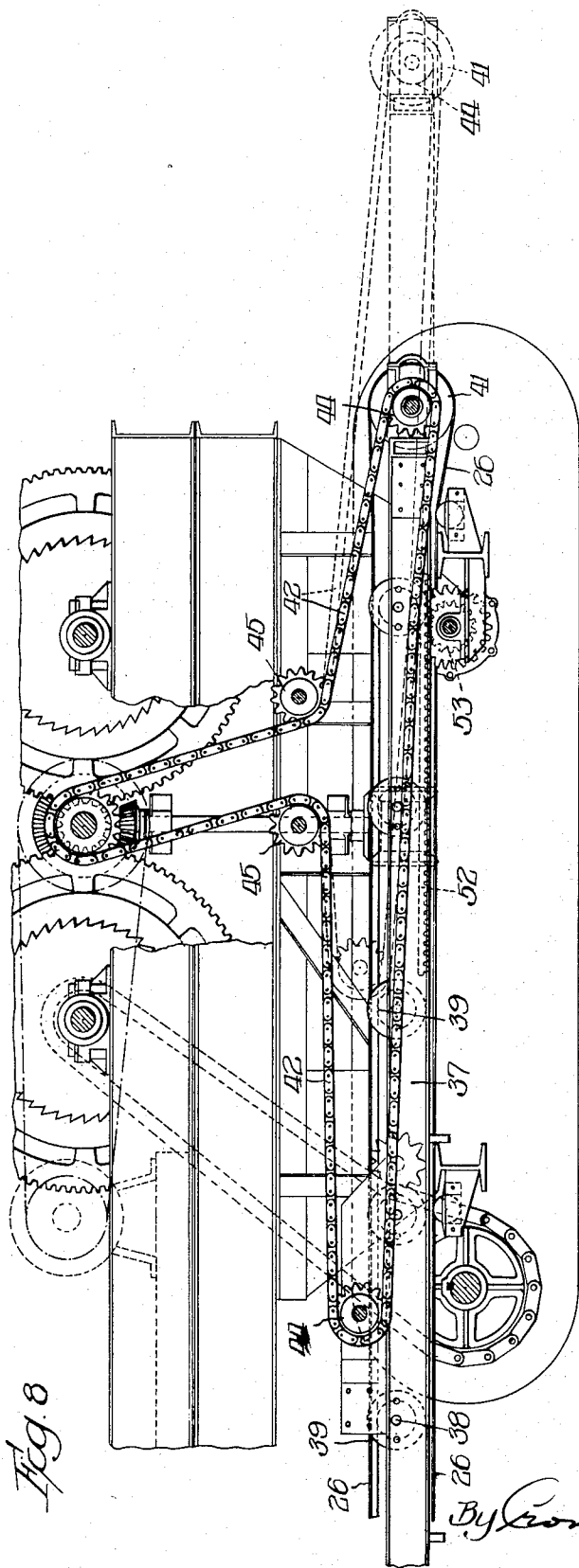
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EXCAVATING, HOISTING, DUMPING, AND CONVEYING APPARATUS

Filed May 5, 1934 5 Sheets-Sheet 5



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UNITED STATES PATENT OFFICE

2,001,502

EXCAVATING, HOISTING, DUMPING, AND
CONVEYING APPARATUS

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Application May 5, 1934, Serial No. 724,129

12 Claims. (Cl. 255—21)

The present invention pertains to excavating, hoisting, dumping and conveying apparatus, the several parts adapted for cooperative operation, particularly in the digging of deep holes of varying diameter extending from the surface down to bed rock in constructing caissons or pillars.

By my invention efficiency of such apparatus is greatly enhanced from the standpoints of speed of operation, saving of manual labor, economy of time consumed in the several operations, the utilization of a single power unit for motivating the several operations, and avoidance of necessity for suspending one while performing another.

A further advantage is attained in that all the several operations of digging, hoisting the excavated materials, dumping and conveying to a remote point of disposal, and lining the hole is accomplished without laborers entering the excavation and being subjected to danger of personal injury from cave-in, gas, falling objects or otherwise.

In order that the invention may be readily understood a typical embodiment of apparatus involving the invention is hereinafter described with reference to the accompanying drawings; it being understood that the invention may be embodied in other varied structural forms without departure from the essence thereof, wherefore the invention is not to be restricted other than as required by the prior art.

In the drawings,

Fig. 1 is a side elevation of the machine in operative position;

Fig. 2 is an enlarged view in perspective illustrating the hopper end of the conveyor and the cooperating loading apron;

Fig. 3 is a top plan view of the conveyor and its driving mechanism;

Fig. 4 is a fragmentary detail of the clutch mechanism operatively connecting the rack and pinion drive of the conveyor;

Fig. 5 is a detail plan of the main countershaft partially in section;

Fig. 6 is a front end elevation of the machine illustrating the lowering of the temporary caisson liner;

Fig. 7 is a top plan illustrating the various mechanical devices comprising the machine;

Fig. 8 is an enlarged side elevation of the conveyor and tractor operating mechanism;

Fig. 9 is a vertical transverse section through the conveyor; and

Fig. 10 is a vertical section illustrating the clutch and worm gear drive for the conveyor.

The characteristic features entering into the

machine assembly are the boring auger or bucket 11 provided with bottom cutters 12 carried by hinged lower doors 13 and with side cutters or reamers 14. The construction in detail of the boring auger 11 forms no essential part of the present invention, being set forth and claimed in a copending application directed thereto. Suffice it to say that the loosened soil enters the interior of the bucket through bottom and side openings and is periodically hoisted when filled in order that the excavated material may be dumped and the auger returned for further boring and removal of material.

Rotary movement is imparted to the auger and it is guided in its progress by a lead shaft 15 having a bit 16 formed at the lower end thereof and upon diametrically opposite sides with keys 16a which engage corresponding keyways 17 in the auger whereby to permit of relative axial movement of the two while preventing relative angular movement and thus forcing the auger to rotate with the lead shaft. This shaft forms no essential part of the present invention, being set forth and claimed in a copending application.

It will be understood that the lead shaft 15 is not removed from the hole until the digging operation is completed, the same advancing downwardly by reason of rotary motion imparted thereto supplemented by its own weight and built up in sections at its upper end as the digging progresses, but that the auger is periodically elevated along the lead shaft to empty its load of excavated material.

When the auger reaches a position above the surface of the ground the apron 18 is suspended at its rear end by means of chains 19 hooked over the edge of the auger while the forward end of the apron is engaged by means of the hooks 20 over the upper edge of the adjacent rear wall 21 of the hopper 22. The forward edge of the apron is notched at 23 and the rear wall of the hopper is also notched at 24 so that by these two notches the rear of the conveyor hopper and the forward portion of the apron embrace the lead shaft 15. Thereupon a slight additional upward movement of the auger causes the hinged doors to be tripped by contact of the latching mechanism with the abutment posts 25 causing the doors to open and the load of excavated material to be deposited in the apron 18. A manual tilting of the apron slides the material into the hopper 22 and this may be assisted by means of a scraper or other suitable means; whereupon the chains 19

are released from the auger and the apron removed.

At the same time the conveyor-supporting frame is moved slightly away from the excavation sufficiently to allow the auger again to descend into the hole and the material deposited in the hopper 22 upon the traveling conveyor belt 26 is transported to a point of deposit remote from the hole.

Forming of excavations for which the present apparatus is particularly adapted contemplates the temporary lining of the hole by a metallic casing or liner 27 of substantially the same exterior diameter as the hole being dug and of sufficient interior diameter to permit the raising and lowering of the auger within the liner when the side cutters or reamers are retracted. This liner preferably comprises multiple units each superposed upon the one immediately beneath and they gradually sink as the digging progresses so that the lower edge of the liner lies in the zone of the digging operation. This liner progressively built up from above is removed after the completion of the boring and as the hole is filled from the bottom upwardly by concrete deposited therein through the liner. The lowermost unit of the liner is connected by means of cables to the power mechanism above the surface whereby the liner is lifted and the upper units removed individually as they reach the surface. The structural details of the liner form no essential part of the present invention and are set forth and claimed in a copending application.

From the above general description it will be seen that the work proceeds with practically no interruption. After the dumping of the auger contents into the hopper 22, the auger again descends and renews the boring operation which continues while the dumped material is carried away by the conveyor so that the two operations are concurrent and the dumping of the auger contents and the movements of the conveyor are in timed relation and the whole apparatus requires a minimum of supervision and attention.

By reference to Figs. 1, 6 and 7 of the drawings it will be seen that the auger 11 is suspended by cables 28 traversing pulleys 29 and wound upon drums 30 whereby the said auger may be elevated and lowered, the attachment of the two cables to the auger being at diametric points whereby to prevent tilting under unequal load which might cause binding upon the lead shaft 15.

Likewise it will be observed that the lead shaft 15 is suspended by a cable 31 traversing the pulley 32 and wound upon the drum 33 whereby the lead shaft may be fed into the excavation as the digging progresses and removed therefrom when the work is complete, ready for depositing the concrete.

The casing 27 is suspended by cables 34 attached to opposite sides thereof as particularly shown in Fig. 6 and these cables, traversing the pulleys 35, are wound upon the drums 36, whereby the liner may be withdrawn from the hole after the digging is completed and as the concrete deposited through the liner builds up from the bottom of the hole.

The conveyor, best understood by reference to Figs. 1, 2, 3 and 8, comprises in general a frame formed of side members 37 having journaled therein and transversely thereof shafts 38 carrying rollers 39 coned at their ends as indicated at 40. These rollers are arranged in spaced relation longitudinally of the conveyor and serve to support the traveling belt 26.

At the receiving end of the conveyor the belt 26 traverses the roller 41 driven by the sprocket chain 42 and interposed gearing by the countershaft 43. The sprocket chain 42 traverses the sprockets 44 and the sprockets 45, which latter serve to take up slack as the position of the conveyor is changed bodily to position the same relative to the hole as will be hereafter described. The opposite end of the conveyor frame 37 has a hinged section 37a connected by means of cables 46 traversing sheaves 47 and 48 to a take-up roller 49 operated by a hand wheel 50 through a worm gear 51, whereby the hinged section of the conveyor frame may be raised a greater or less distance for the deposit of the material upon a heap or lifted to approximately a vertical position as shown in Fig. 1, when moving the machine from one job to another.

In order to position the conveyor relative to the hole and beneath the elevated auger to receive the excavated material therefrom into the hopper 22 and again to move the hopper from beneath the auger in order that the auger may be lowered into the hole for a new load, the conveyor frame is arranged to be bodily advanced and retracted as shown in full and dotted lines in Fig. 8 by means of the racks 52 and pinions 53, the latter also driven from the countershaft 43 by interposed gearing.

It will be observed that the bodily movement of the conveyor towards and from a point above the open end of the hole is effected from time to time as required without affecting the conveying of the material upon the conveyor belt.

Rotary motion is transmitted to the lead shaft 15 by a bull gear 54 slidably keyed provided with a central keyed aperture 55 for accommodating said lead shaft. This bull gear is driven by means of a pinion 56 and the sprockets 57 and 58 and the sprocket chain 59 from the countershaft 43.

A single motor indicated at 60 furnishes power for the driving of all the operating parts of the apparatus from the main drive shaft 61 and suitable transmission gears, sprockets, chains and other transmission media. As here shown there is included an air compressor 62, water cooling system 63, fly wheel 64, speed reducing gear 65, levers for controlling the motor, for the air compressor, for the reducing gear, for changes of speed, for operating clutches provided for engaging and disengaging, etc. The particular details of the power installation and transmission form no essential part of the present invention but may be modified in design as desired to adapt the same to the operation of the several parts.

I claim:

1. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, a conveyor for receiving said charge of earth and delivering it at a remote point of disposal, and a single power unit for operating said auger and conveyor in timed successive and concurrent relation.

2. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, a conveyor for receiving said charge of earth and delivering it at an elevated remote point of disposal, and

power means arranged to operate the digging and conveyor mechanism concurrently.

3. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, a conveyor shiftable lengthwise of the machine into position beneath said earth auger for receiving the charge of earth and delivering it to a remote point for disposal, and power means for effecting the digging and conveying operations concurrently.

4. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, power means for actuating said earth auger, and a conveyor operated by said power means for receiving said charge of earth and delivering it to a remote point for disposal.

5. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, a conveyor operated by said power means for receiving said charge of earth and delivering it to a remote point for disposal, and power means for operating the auger and conveyor concurrently.

6. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, power means for actuating said earth auger, and a conveyor shiftable by said power means into position beneath said earth auger for receiving the charge of earth and delivering it to a remote point for disposal.

7. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, means for lifting said earth auger with a charge of excavated earth to a distance above the surface of the ground, power means for actuating said earth auger, and a conveyor including a traveling belt driven by said power means for receiving said charge of earth and delivering it to a remote point for disposal.

8. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, a lead shaft for directing and assisting the auger, a temporary liner for the hole, means for rotating the lead shaft and with it the auger, means for raising and lowering the auger, a conveyor, means for positioning the conveyor beneath the auger when elevated above the surface, means for automatically dumping the contents of the auger onto the conveyor, means for shifting the conveyor bodily into position beneath the auger and withdrawing the same from said position, and means for operating the conveyor to carry away the material deposited by the auger, and a single power means for motivating the several guiding,

digging, lining, dumping and conveying elements.

9. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth, a lead shaft for directing and assisting the auger, means for rotating the lead shaft and with it the auger, means for raising and lowering the auger, a conveyor, means for positioning the conveyor beneath the auger when elevated above the surface, means for automatically dumping the contents of the auger onto the conveyor, means for shifting the conveyor bodily into position beneath the auger and withdrawing the same from said position, and means for operating the conveyor to carry away the material deposited by the auger, and power means for motivating the several guiding, digging, dumping and conveying elements in such timed relation as to achieve concurrent operation of the digging and conveying mechanisms.

10. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive the excavated earth and to be lifted with a charge of excavated material to a distance above the surface of the ground, a conveyor including a hopper shiftable lengthwise of the machine into position beneath said earth auger and above the hole for receiving the charge of earth and delivering it to a remote point for disposal, and power means to lift and lower and drive the auger and to shift and drive the conveyor concurrently.

11. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive and discharge the excavated earth, a lead shaft for directing and driving the auger, means for lifting said earth auger along the lead shaft with a charge of excavated earth to a distance above the surface of the ground, and a conveyor for receiving said charge of earth and delivering it to a remote point of disposal, said conveyor including a hopper shiftable to a position beneath the auger and above the hole and adapted to partially embrace the lead shaft with its rear edge, and an apron movable towards and from the hopper at the opposite side of the lead shaft, said apron also adapted at its forward edge to partially embrace the lead shaft and together with the hopper to prevent excavated material from falling into the hole when discharged by the hopper.

12. In a machine for digging caisson holes and the like, the combination of an earth auger adapted to dig the hole and receive and discharge the excavated earth, a lead shaft for directing and driving the auger, means for lifting said earth auger along the lead shaft with a charge of excavated earth to a distance above the surface of the ground, and a conveyor for receiving said charge of earth and delivering it to a remote point of disposal, said conveyor including a hopper shiftable to a position beneath the auger and above the hole and notched at its rear edge to receive the lead shaft, and an apron suspended to swing towards and from the hopper at the opposite side of the shaft, said apron also notched at its forward edge to receive the lead shaft and together with the hopper to prevent excavated material from falling into the hole when discharged by the hopper.

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