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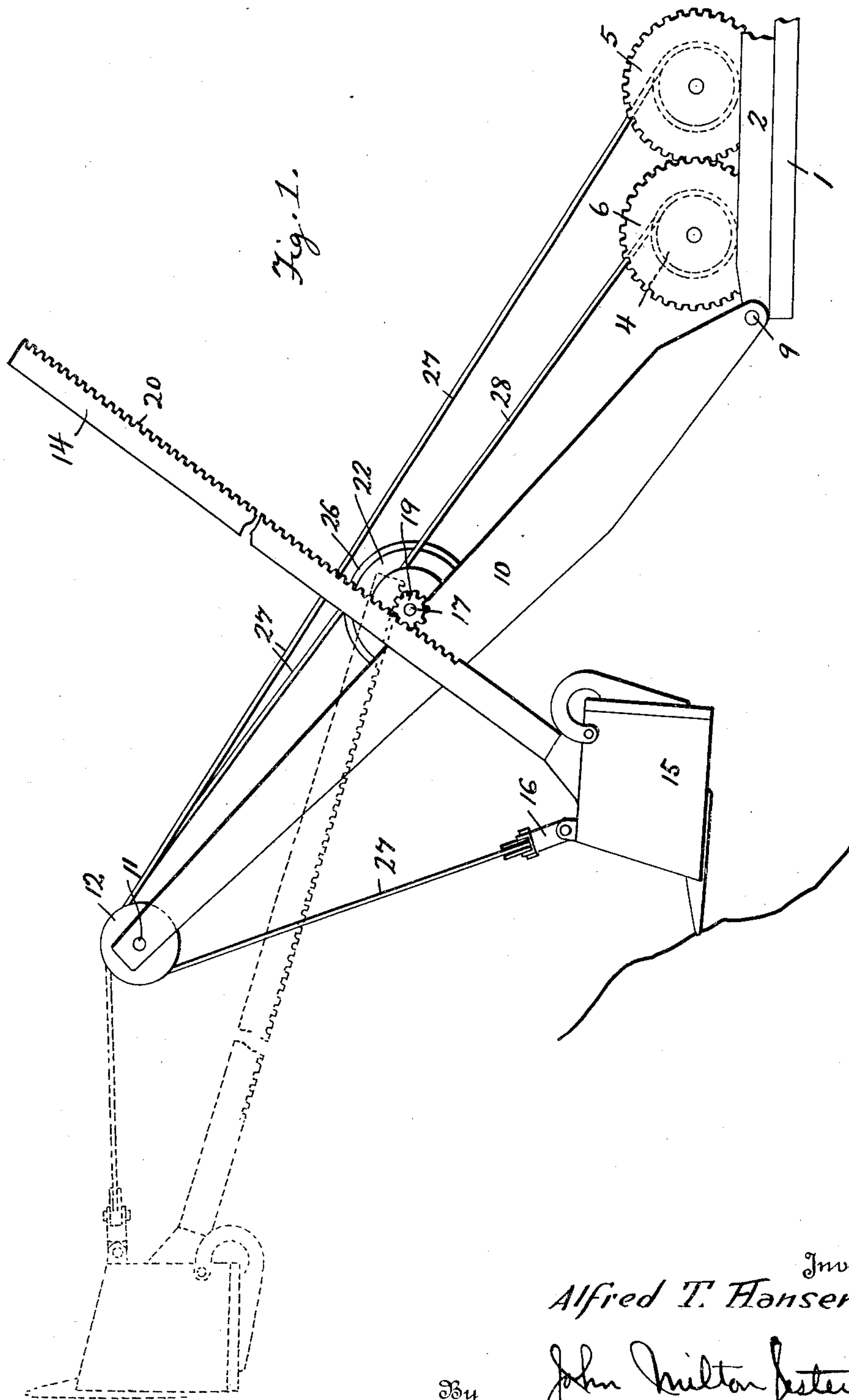
1,658,717

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EXCAVATING MACHINE

Filed March 13, 1926

2 Sheets-Sheet 1



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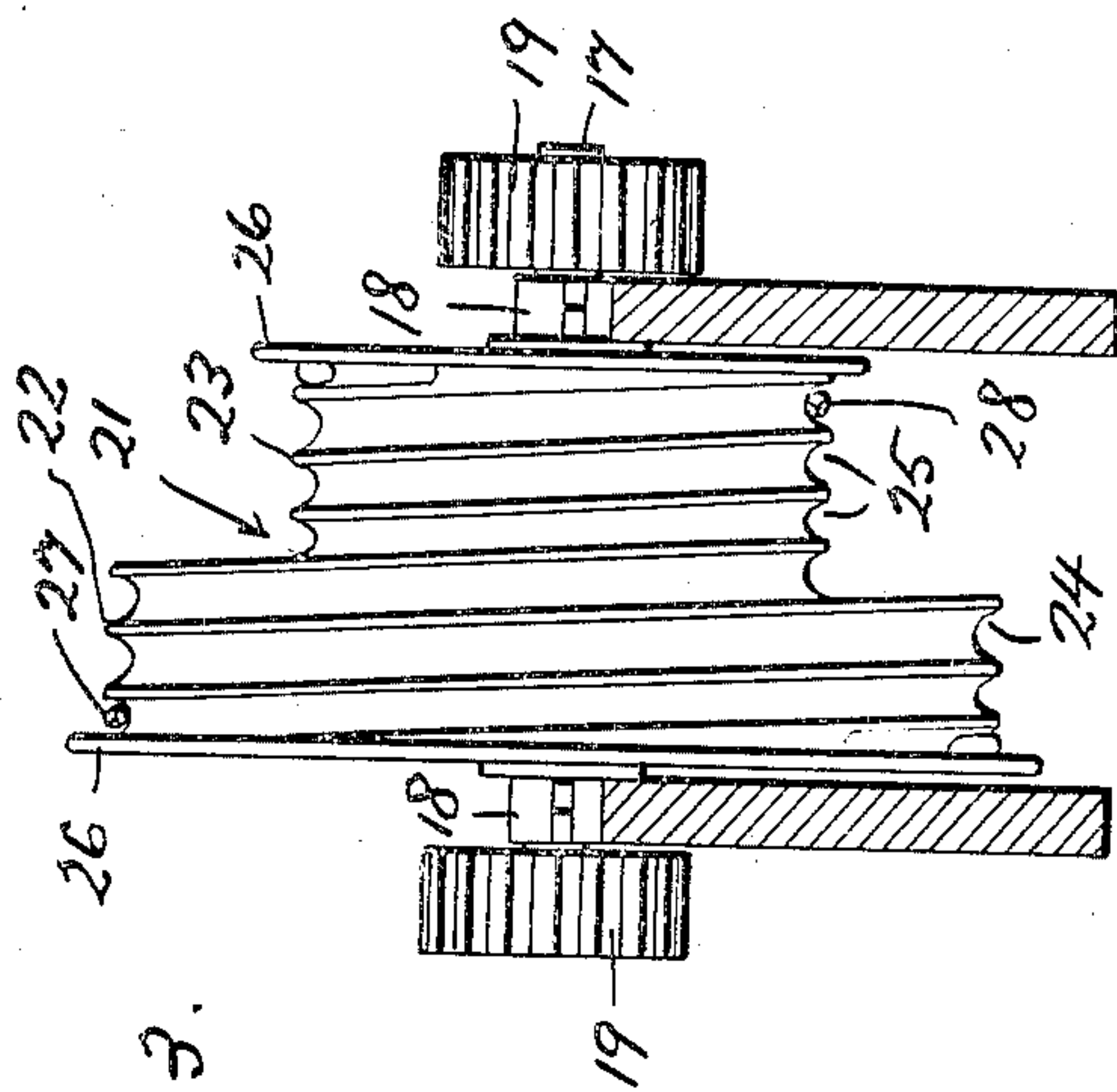
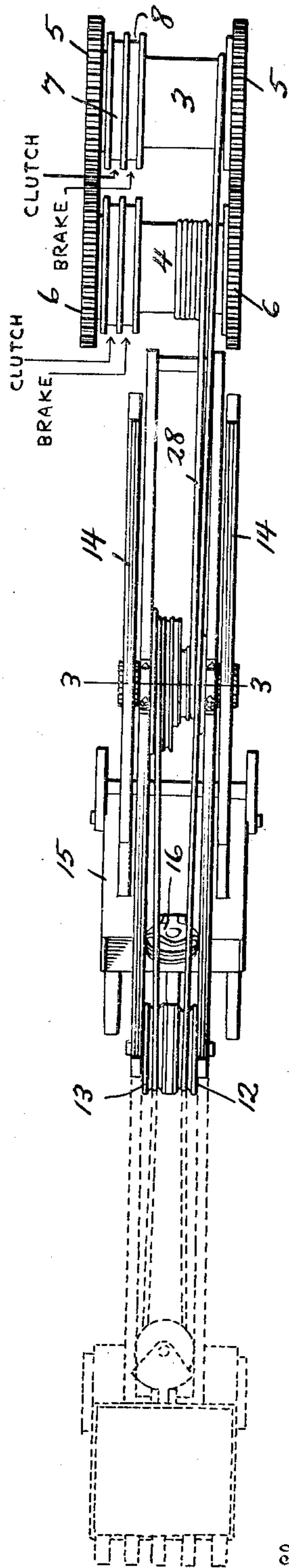
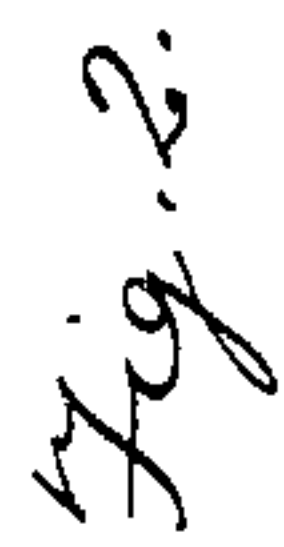
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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE.

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EXCAVATING MACHINE.

Application filed March 13, 1926. Serial No. 94,488.

This invention relates to excavating machines, particularly those of the type commonly known as power shovels, and has for its object the provision of means whereby a dipper may be given an outward thrust during upward movement without detracting from the hoisting power.

It is well known that the ordinary type of power shovel includes a rotatable platform carrying a pivoted boom which, in turn, carries longitudinally movable members to which the dipper or digger is connected, drum and cable means being provided for raising the dipper, the dipper sticks of course swinging in a corresponding manner. In devices of this class it has been customary to provide some means for moving the dipper sticks outwardly during the upward swing of the dipper in order to take a deeper bite in a bank, or the like, being dug away. However, such expedients have heretofore possessed an objectionable feature inasmuch as the utilization of power for projecting the dipper sticks has involved a decrease in the hoisting power so that the action has not been as efficient as desired.

It is with the above facts in view that I have designed the present invention which has for an important object the provision of a novel drum structure mounted in the boom and having both the hoisting and pull-back cables engaged therewith.

A more specific object is to provide an excavating machine in which the boom is equipped with a drum structure having portions of different diameters, the hoisting cable and pull-back cable being wrapped upon these respective portions, these cables being dead-ended on this drum and being adapted to travel back and forth in suitable guide grooves, the operation of this drum being of course controlled by actuation of the main drums which supply the hoisting and pull-back power.

Still another object is to provide an excavating machine in which the peculiarly constructed drum is sunk within the boom, its shaft carrying gears or pinions meshing with rack teeth on the dipper sticks, the difference in the size of the end portions of the drum providing an increase in leverage so that a more powerful outward thrust on the dipper may be had than is possible under ordinary circumstances where the usual type of uniform diameter drum is employed.

An additional object is to provide a drum

structure and arrangement of this character which may be built into any ordinary type of power shovel, it being unnecessary to provide a special construction throughout, the invention being simple and inexpensive to manufacture and easy to install in addition to possessing the qualities of efficiency and durability, and being an improvement in the art.

To the attainment of the foregoing and other objects and advantages, the invention consists in the combination and arrangement of parts and details of construction to be hereinafter more fully described and claimed, and illustrated in the accompanying drawings in which:

Figure 1 is a side elevation of a power shovel equipped with the invention, the lowered position of the dipper being shown by full lines and the elevated and forwardly pushed position being indicated by dotted lines,

Figure 2 is a top plan view, and

Figure 3 is a cross section through the boom taken on the line 3—3 of Figure 2, the specially constructed boom being shown in elevation.

Referring more particularly to the drawings I have illustrated, in general, an excavating machine or power shovel of a rather conventional type, certain details being, however, omitted as not essential to an understanding of the invention. It is well known that devices of this character embody a base 1 which is ordinarily mounted upon wheels or a caterpillar tread device and which carries a rotatable platform 2 on which are mounted a hoisting drum 3 and pull-back drum 4, the drums being geared together by the intermeshing gears 5 and 6. In devices of this type it is customary to provide each drum with a clutch and brake mechanism and these are indicated diagrammatically at 7 and 8.

Suitably pivoted at 9 upon the platform or other equivalent support is a boom 10 of trussed steel beam construction involving any preferred or necessary details so as to have the proper strength and rigidity, though it will be noted that the central portion of this boom is open for a reason to be explained. Any desired cables might be provided for raising and lowering the boom or, if preferred, any suitable anchor or guide means may be provided for holding it rigid with respect to the face of the

machine, these details being immaterial and not being illustrated. At the forward end of the boom is a shaft 11 carrying a pair of guide pulleys or sheaves 12 and 13 arranged for independent rotation. The numeral 14 designates a pair of dipper sticks located at opposite sides of and in straddling relation to the boom, these sticks carrying the dipper or shovel device 15 which may be of any preferred construction and which carries a padlock sheave 16.

In carrying out the invention I provide a skipper shaft 17 journaled in suitable bearings 18 on the opposite sides of the boom and carrying, at its ends, pinions 19 which mesh with racks 20 on the lower edges of the dipper sticks 14. The shaft 17 also carries a peculiarly constructed drum 21 which is sunk within the boom and which includes or is formed with two portions 22 and 23 of different diameters, the ratio of the former to the latter being preferably substantially 2:1. These respective portions are grooved as indicated at 24 and 25 so as to guide the cables, to be described, during their movement in the operation of the machine. At the ends of the drum are outstanding guard flanges 26 provided for the purpose of preventing the cables from running off.

An important feature in the construction of the skipper drum is the fact that the grooves 24 at the large end thereof constitute a continuation of or communicate with the grooves 25 at the smaller end so that both cables to be described, may be capable of being wound upon the entire length of the drum at different times. In other words there must be a transitional groove between those on the large and small ends for guiding the cables from the small end onto the large end and vice versa. The reason for this unusual and novel construction will of course be explained.

Dead-ended to and wrapped about the hoisting drum 3 is a cable 27 which is trained over the guide pulley 12, under the padlock sheave 16, over the guide pulley 13 and then wrapped and dead-ended to the large portion 22 of the skipper drum 21. Secured to and wrapped about the drum 4 is a pull-back cable 28 which is also wrapped about and dead-ended on the smaller portion 23 of the skipper drum.

In the operation, when the machine has been placed or "spotted" for the purpose of excavating, the hoisting lever, not shown, is thrown in, as is customary, and the dipper which is initially on the ground or near the place to be excavated starts to rise, the movement being in the arc of a circle. Of course the dipper is so positioned that upon its upward movement it will dig or bite into the ground. While the dipper is moving in this manner, the operator may desire to thrust it

outwardly so as to increase the bite. This may be done by releasing the brake provided on the pull-back drum. As the hoist cable 27 is dead-ended on the skipper drum 22, the tension of the hoist cable will cause the drum to revolve in an anti-clockwise manner, (considering the machine as viewed from the left as in Figure 1) owing to the direction or pitch of the grooves on the drum. The rotation of the drum of course causes corresponding movement of the pinions 19 and as these are in mesh with the racks 21 on the dipper sticks 14 the dipper sticks will be thrust outwardly. If the operator sets the brake on the pull-back drum the crowding out or thrusting motion is prevented or stopped and the dipper moves only approximately in the arc of a circle of which the skipper shaft is the center. The dipper and sticks can be moved inwardly or retracted by releasing the brake and throwing in the clutch on the pull-back drum. Thus the thrusting out and retraction can be accomplished while the dipper is being hoisted. It will be seen that the hoist cable 27 is wound clockwise on the large end of the drum (considering the machine as viewed from the left as in Fig. 1) and it will move onto the small end of the drum when the dipper sticks are retracted. The pull-back cable 28 is wound anti-clockwise upon the small end of the drum. When the cables are properly wrapped and the drum properly grooved, while the skipper drum is revolving, one cable is always unwinding and the other one is winding. When the dipper sticks are thrust outwardly the hoist cable unwinds from the small end of the drum onto the large end, followed by the pull-back cable winding from the small end of the drum to the large end thereof.

From the foregoing it will be seen that when the dipper is thrust to a point about level with the free end of the boom, the hoist cable starts to unwrap from the large end of the skipper drum, thereby giving the extra amount of thrusting out power necessary to project the dipper outwardly of and above the pivot of the dipper sticks, namely the shaft 17. I have discovered that the extra power caused by unwrapping from the large end of the drum gives about twice the power for crowding out or thrusting as there is developed in hoisting. The unwrapping above mentioned of course starts at the small end of the drum but the increase in power is not produced until the unwrapping reaches a point on the large end of the drum. It is believed that the construction, operation and advantages will be readily apparent to one skilled in the art without further explanation.

While I have shown and described a preferred embodiment of the invention, it should be understood that this is merely il-

illustrative as it is conceivable that the skipper drum may be constructed in a somewhat different manner and that the relative proportions of the parts may be varied if found 5 advisable for any reason. I reserve the right to make any such modifications and in fact all changes or variations which will not constitute any departure from the spirit of the invention or the scope of the sub- 10 joined claims.

Having thus described the invention, I claim:

1. In an excavating machine, coacting hoisting and pull-back drums, a boom carrying guide sheaves, a shaft journaled at the intermediate portion of the boom and carrying gears, dipper sticks slidably mounted with respect to the boom and carrying a dipper, the dipper sticks including racks 15 meshing with said gears, a skipper drum on said shaft, a cable dead-ended and wrapped upon the hoisting drum, trained over the guide sheaves, connected with the dipper and dead-ended and wrapped upon 25 one end of said skipper drum, and a cable dead-ended and wrapped upon the pull-back drum and dead-ended and wrapped upon the other end of the skipper drum, said skipper drum having portions of different 30 diameters and being formed throughout its length with a continuous cable guiding groove.

2. In an excavating machine, coacting hoisting and pull-back drums, a boom carrying guide sheaves, a shaft journaled at the intermediate portion of the boom and carrying gears, dipper sticks slidably mounted with respect to the boom and carrying a dipper, the dipper sticks including racks 40 meshing with said gears, a skipper drum on said shaft, a cable dead-ended and wrapped upon the hoisting drum, trained over the guide sheaves, connected with the dipper and dead-ended and wrapped upon one end 45 of said skipper drum, and a cable dead-ended and wrapped upon the pull-back drum and dead-ended and wrapped upon the other end of the skipper drum, the skipper drum having one end of considerably greater diameter than the other, and being grooved 50 throughout its length, said cables being initially wound upon the respective end portions and being capable of traversing the length of the drum.

3. In an excavating machine, coacting hoisting and pull-back drums, a boom carrying guide sheaves, a shaft journaled at the intermediate portion of the boom and carrying gears, dipper sticks slidably 60 mounted with respect to the boom and carrying a dipper, the dipper sticks including racks meshing with said gears, a skipper

drum on said shaft, a cable dead-ended and wrapped upon the hoisting drum, trained over the guide sheaves, connected with the 65 dipper and dead-ended and wrapped upon one end of said skipper drum, and a cable dead-ended and wrapped upon the pull-back drum and dead-ended and wrapped upon the other end of the skipper drum, the 70 drum having its opposite ends of widely different diameters and being formed with a continuous guide groove, the cables being initially wound upon the respective end portions and one being wound in the opposite 75 direction to the other, both cables being capable of traversing the entire length of the drum and acting to control the thrust or retraction of the dipper sticks.

4. In an excavating machine including a 80 boom, dipper sticks, a dipper, a hoisting drum and a pull-back drum, a skipper drum sunk within the boom and operatively connected with the dipper sticks for moving the same longitudinally, a hoisting cable 85 moved by the hoisting drum, connected with the dipper and secured to and wrapped about the skipper drum in one direction, and a pull-back cable connected with the pull-back drum and secured to and wrapped 90 about the skipper drum in the opposite direction to the winding of the hoisting cable, and means on the drum permitting both cables to traverse substantially the full 95 length thereof and to increase the outward thrust of the dipper sticks at certain times.

5. In an excavating machine, the combination of a boom carrying guide sheaves, a shaft journaled at the intermediate portion of the boom, dipper sticks slidably 100 mounted along the boom and operatively driven by said shaft, a hoisting drum, a pull-back drum, and a skipper drum on said shaft, the skipper drum having its opposite end portions of widely different diameter 105 and being formed throughout its length with a continuous groove extending about both end portions, a dipper, a cable dead-ended and wrapped upon the hoisting drum, trained over the guide sheaves, connected 110 with the dipper and dead-ended and wrapped upon the smaller end of the skipper drum, and a cable dead-ended and wrapped upon the pull-back drum and dead-ended and wrapped upon the larger end of 115 the skipper drum, both cables being capable of traversing the entire length of the skipper drum and each being adapted to pass from the larger to the smaller end thereof, and vice versa, whereby to increase the 120 crowding-out power.

In testimony whereof I affix my signature.

ALFRED T. HANSEN.