Aug. 14, 1928. 1,680,555

R. LAIR

EXCAVATOR

Filed June 15, 1926 3 Sheets-Sheet 1

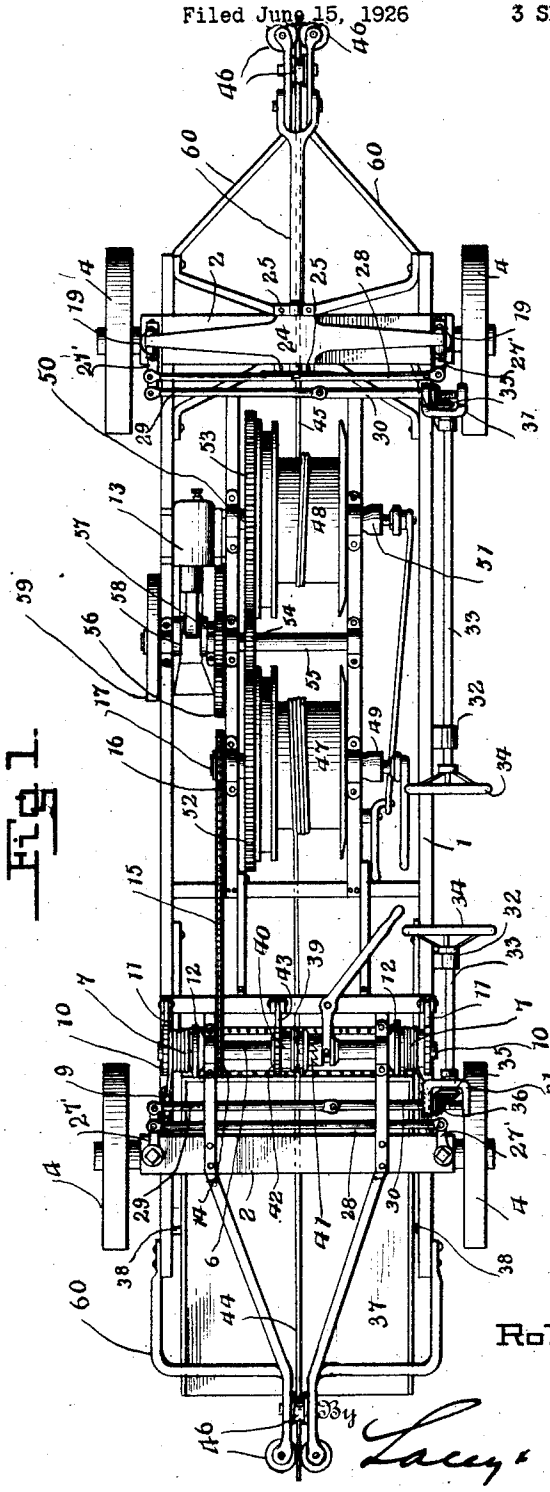


Fig 1.

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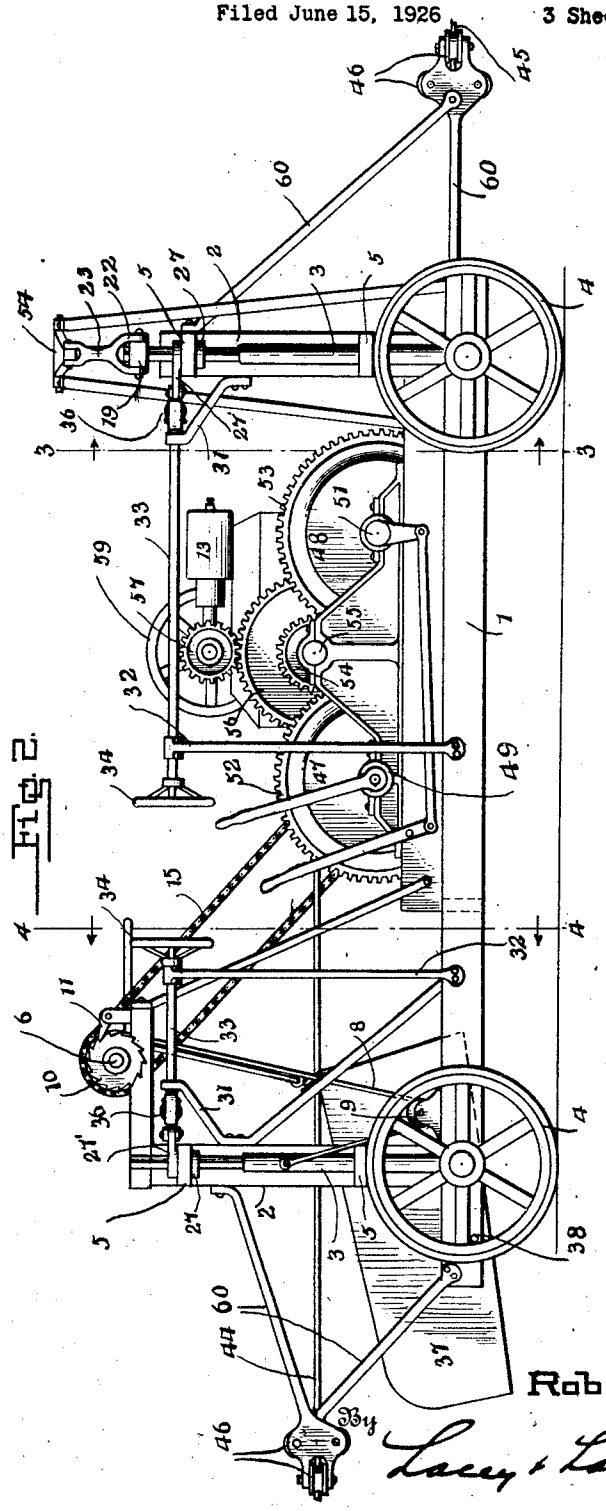


Fig. 2.

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Fig. 3.

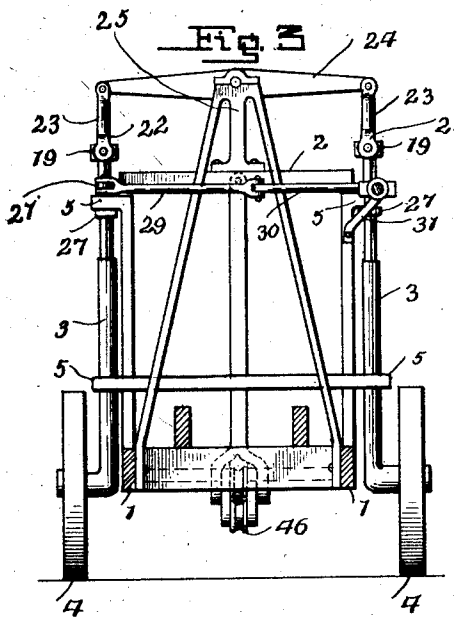


Fig. 4.

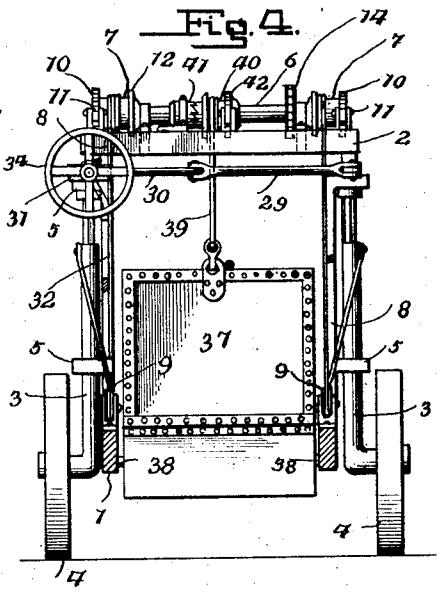


Fig. 5.

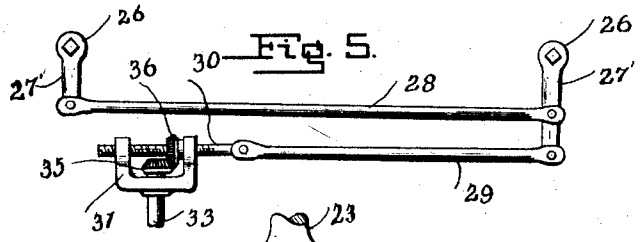
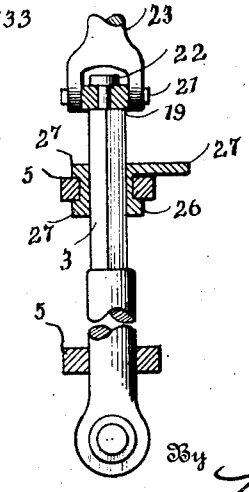


Fig. 6.



Inventor

Robert Lair

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Patented Aug. 14, 1928. 1,680,555

UNITED STATES PATENT OFFICE.

ROBERT LAIR, OF KINGSTON, WASHINGTON.

EXCAVATOR.

Application filed June 15, 1926. Serial No. 116,178.

This invention relates to excavating or grading mechanism and seeks primarily to provide a machine which may be readily manipulated to cause an excavating scoop to travel over a surface which is to be reduced and then caused to carry the load to a place of deposit so that a fill may be made. Another object of the invention is to provide means whereby the machine may be maintained in a level condition notwithstanding that it may be working upon a hillside or upon a surface which is not level. The invention also seeks to provide novel means for manipulating the scoop and also novel means for effecting travel of the machine from the cut to the fill and vice versa. The invention is illustrated in the accompanying drawings and will be hereinafter fully set forth.

In the drawings:

Figure 1 is a plan view of a machine embodying my present invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a transverse section on the line 3—3 of Fig. 2;

Fig. 4 is a transverse section on the line 4—4 of Fig. 2;

Fig. 5 is an enlarged detail of a part of the steering mechanism;

Fig. 6 is an enlarged sectional elevation of another portion of the steering mechanism.

In carrying out the invention, there is provided a main frame 1 which may be formed of channel bars to provide sills and cross beams in such number and arrangement as will attain the necessary strength and rigidity and provide supports for the parts of the working mechanism. At or near the opposite ends of the frame 1 are secured the upright frames 2 which will generally be of arched construction, as shown most clearly in Figs. 3 and 4. Upon the sides of the vertical end frames 2 are mounted spindles 3 which carry ground wheels 4 at their lower ends so that the machine will be supported upon the ground and may readily travel thereover. The spindles 3 are vertically slidable in guides, indicated at 5, upon the outer sides of the respective end frames, and this slidable mounting of the spindles permits the wheels to assume any desired position vertically with respect to the main frame so that the frame will be supported at any desired height above the surface of the ground, and also permits the wheels to assume different vertical positions so that notwithstanding an inclination of the ground surface the frame will remain level. To adjust the front wheels, I provide a shaft 6 which is mounted in suitable bearings upon the upper end of the front arched frame 2 and upon the said shaft are loosely mounted drums 7 about each of which is wound a cable 8 which passes downwardly from the drum to and under a guide pulley 9 secured upon the main frame adjacent the front end thereof, as shown clearly in Fig. 2, and then upwardly, the end of the cable being secured to the respectively adjacent spindle 3, as also shown in Fig. 2. At the outer end of each drum 7 is a ratchet disk 10, and a pawl 11 pivoted upon the frame 2 in any convenient or preferred manner cooperates with this ratchet to prevent reverse rotation of the drum so that after the cable has been wound to bring the frame into the desired position the withdrawal of the moving force will not result in a dropping of the frame but the frame will remain supported in the position in which it has been set. A clutch 12 which may be of any well-known type and is illustrated conventionally is arranged to cooperate with each drum so that, when the cable is to be wound, the drum may be locked to the shaft 6 and, consequently, rotate with the shaft. If it be desired to lower the frame, all that needs to be done is to release the dog or pawl 11, whereupon the weight of the frame will cause the cable to unwind and permit descent of the frame. It will be understood that, if the surface of the ground be uneven, the wheel 4 at one side of the machine may be permitted to assume a lower position relative to the frame than the wheel at the opposite side so that the wheels will be accommodated to the inclination of the ground. The shaft 6 is rotated by the power of a motor, indicated conventionally at 13, and to effect the rotation of the shaft 6 a sprocket is secured thereon, as indicated at 14, and a chain 15 is trained around the said sprocket and around a sprocket 16 secured upon a shaft 17 upon the main frame which will be presently more particularly mentioned. Of course, when the front end of the machine is adjusted to a level position in the manner described, it will be necessary to adjust the rear end of the frame likewise in order to overcome torsional strain and

prevent twisting of the frame and this leveling or adjustment of the rear end of the frame is accomplished automatically. The spindles 3 at the rear end of the machine are similar to the spindles 3 at the front end thereof and are mounted in guides 5 in the same manner. The upper extremities of the rear spindles, however, are equipped with pins or studs 18 which are disposed vertically axially of the respective spindles and are fitted loosely through collars 19, the extremities of the pins or pintles being upset, as indicated at 20, whereby endwise movement of the spindles relative to the collars will be prevented but the spindles may move pivotally in the collars. Each collar 19 is provided with trunnions 21 at diametrically opposite points of its outer circumference and upon these trunnions is pivotally engaged a fork or yoke 22 at the lower end of a link 23, the upper end of each link being pivoted to the end of a walking beam 24 which is fulcrumed midway its ends in or upon a pedestal 25 erected upon the adjacent end frame 2 at the top thereof, as will be understood.

The lower portion of each spindle 3 is circular in cross section, as shown most clearly in Fig. 6, so that it may not only slide vertically through the corresponding guide 5 but may also turn therein while the upper portion of the spindle is flat-sided in cross section to engage a flat-sided bore in the collar 26 which is fitted through the upper guide 5 and is provided with flanges 27 to engage the upper and lower sides of the said guide whereby the collar will be prevented from moving vertically through the guide but may rotate therein. Of course, the rotation of the collar will be imparted vertically to the spindle and the spindles may be thus turned so as to set the ground wheels in any desired angular position to effect steering of the machine. Extending radially from the upper side of each collar 26 is a crank 27', the cranks at either end of the machine being connected for synchronous movement by a connecting rod 28. One of the cranks is extended beyond the end of the connecting rod 28 and a link 29 is pivoted thereto. The link 29 is disposed transversely of the main frame parallel with the connecting rod 28 and the end of the link remote from the crank is pivoted to the inner end of a threaded rod or worm 30. This threaded rod or worm is supported in a suitable bracket 31 secured to the side of the adjacent end frame 2, and supported in the said bracket and in a standard 32 rising from the main frame is a shaft 33 which is equipped with a hand wheel 34 at its free end. At the opposite end of each shaft 33 is secured a beveled pinion 35 meshing with a similar pinion 36 arranged upon the threaded rod or worm 30 between the pinion 35 and the adjacent side of the bracket 31, as clearly shown in Fig. 5. The pinion 36 meshes with the pinion 35 so as to be rotated by the latter and, in turn, has an internally threaded bore or hub which engages the threaded rod 30 in such manner that, when the pinion is rotated, the rod will be caused to move axially or endwise and this movement will be transmitted through the link 29 so that the spindles will be turned and the wheels 4 set in the desired position. By this simple arrangement, I am enabled to steer the machine from either end and may effect the steering operations at both ends simultaneously so that, notwithstanding the length of the machine, a short turn may be made under some circumstances. It will also be understood that the steering operation is not affected by the vertical adjustment of the main frame.

While I have illustrated the machine as equipped with an excavating scoop or scraper 37, it is to be understood that it may be equipped with a plow or a scarifier or any other implement which will most advantageously break up and aid in removing the ground surface under any given conditions. The scoop 37 is shown as being pivotally supported, as at 38, between the sides of the main frame at the front end of the same so that it may be set at any desired inclination to take up a load or discharge a load and may be easily tilted into a horizontal position so as to transport a load. To effect adjustment of the scoop, a cable 39 is secured to the rear end of the scoop and extends upwardly to a drum 40 which is loosely mounted upon the shaft 6 and is adapted to be connected to said shaft by a clutch 41 of any approved type, the drum being provided with a ratchet 42 to be engaged by a dog 43 whereby it may be held in a set position. When the scoop is to take up a load, the cable 39 is wound upon the drum 40 by locking the drum to the shaft, whereupon the rear end of the scoop will be lifted and the forward end, of course, tilted downward so that the edge of the scoop will dig into the ground surface. When the scoop is filled, release of the pawl 43 will permit the rear end of the scoop to swing downwardly under its own weight and the weight of the load, and this downward movement may be arrested at any time by throwing the pawl into engagement with the ratchet. After the filled scoop has been brought into a level position or into such a position that will support the load, the machine is propelled to the fill and the scoop then tilted in the reverse direction to dump the load by effecting rotation of the drum in the described manner.

If the frame of the machine is level, the scoop may be brought to a level position. Then, by permitting the front end of the

machine to be lowered, the scoop will be inclined and assume a position in which it will take up a load, so that by merely raising or lowering the front end of the machine the desired operation of the scoop will be effected.

To effect travel of the machine, I provide cables 44 and 45 which extend longitudinally of the machine and are to be anchored at points remote from the machine in any well known manner. From their anchors these cables extend between a plurality of guide pulleys 46 disposed at the ends of the frame and are wound upon drums 47 and 48 respectively. The drum 47 is mounted loosely upon the shaft 17 which has been heretofore mentioned and is adapted to be locked to said shaft by a clutch, indicated at 49, and which may be of any well known or preferred type. The drum 48 is carried loosely upon a shaft 50 which is similar to the shaft 17 and carries a clutch 51 which may also be of any approved form whereby the drum 48 may be locked to the shaft. The clutches 49 and 51 are controlled through hand levers arranged adjacent the hand steering wheels 34, as shown in the drawings. Secured upon the shafts 17 and 50 are gear wheels 52 and 53, respectively, which mesh with an idler gear 54 carried by a shaft 55 mounted in suitable bearings upon the frame and disposed between the drums 47 and 48. The shaft 55 carries a gear 56 at one end, and this gear 56 meshes with a pinion 57 upon the end of the engine crank shaft 58 which is driven by the engine 13 and is equipped with a fly wheel 59. It will be understood that the gear 57 is rotated as long as the motor 13 is running and this motor may be of any convenient type. The rotation of the gear 37 will be transmitted through the described train of gears to the gears 52 and 53 and, consequently, the drum 47 or 48 may be caused to rotate whenever desired by manipulation of the respective clutches. Likewise the shaft 6 will be continuously driven and either drum 7 or the drum 40 may be operated by properly manipulating the respective clutches. The guide pulleys 46 at the ends of the machine are shown as carried by bracing arms 60 extending from the end frames. These bracing and supporting arms may be of any preferred form and any other form of support which will aid in imparting rigidity to the structure of the machine may be employed.

To impart travel to the machine, the drum 47 or the drum 48 is locked to its respective actuating shaft accordingly as the machine is to proceed in one or the other direction. With the drum 47 locked to its shaft and the drum 48 free, the cable 44 will be caused to wind while the cable 45 will unwind, although the tension on both cables will be maintained through the coaction of the machine and the respective anchors. As the cable 44 winds upon the drum 47, the machine will, of course, be caused to travel to the left in Figs. 1 and 2 and when traveling in this direction the scoop, if tilted, will obviously be caused to cut off the surface soil and take up the same. If the place of fill is forward with respect to the machine, the scoop may be adjusted to a level or load-carrying position and the travel of the machine continue without interruption, the scoop being dumped at the fill in the manner previously described. To return the machine to the place of cut or to carry the scoop rearwardly from the cut to a fill located rearwardly with respect to the machine, the drum 47 is released from its respective shaft and the drum 48 locked to its shaft, whereupon the cable 45 will be caused to wind and the cable 48 will, of course, unwind, the result being that the machine will travel toward the right in Figs. 1 and 2.

From the foregoing description, taken in connection with the accompanying drawings, it will be seen that I have provided a compact, simply arranged and easily manipulated machine whereby excavating may be efficiently accomplished and the material excavated easily moved to a desired fill and unloaded into the same. While, of course, the machine will, in a general way, be held to a single path approximately alined with the cables 44 and 45, said cables do not have to be in exact alinement but may be disposed at an angle to each other as may be most convenient under the conditions of operation, and the machine may be caused to travel in a desired direction more or less at variance with the line of the cables by manipulation of the steering gear in an obvious manner.

Having thus described the invention, I claim:

An excavating machine comprising a wheel-supported frame, means on the frame for effecting travel of the same, a scoop pivotally mounted between its ends adjacent its bottom upon the frame at one end thereof, a shaft mounted on the frame over the scoop, power means on the frame to rotate the shaft, a drum loose on the said shaft, means for locking the drum to the shaft, means to prevent reverse movement of the drum when unlocked from the shaft, and a cable secured to the drum and attached to the rear end of the scoop and arranged to unwind from the drum when the drum is unlocked from the shaft.

In testimony whereof I affix my signature.

ROBERT LAIR. [L. S.]