

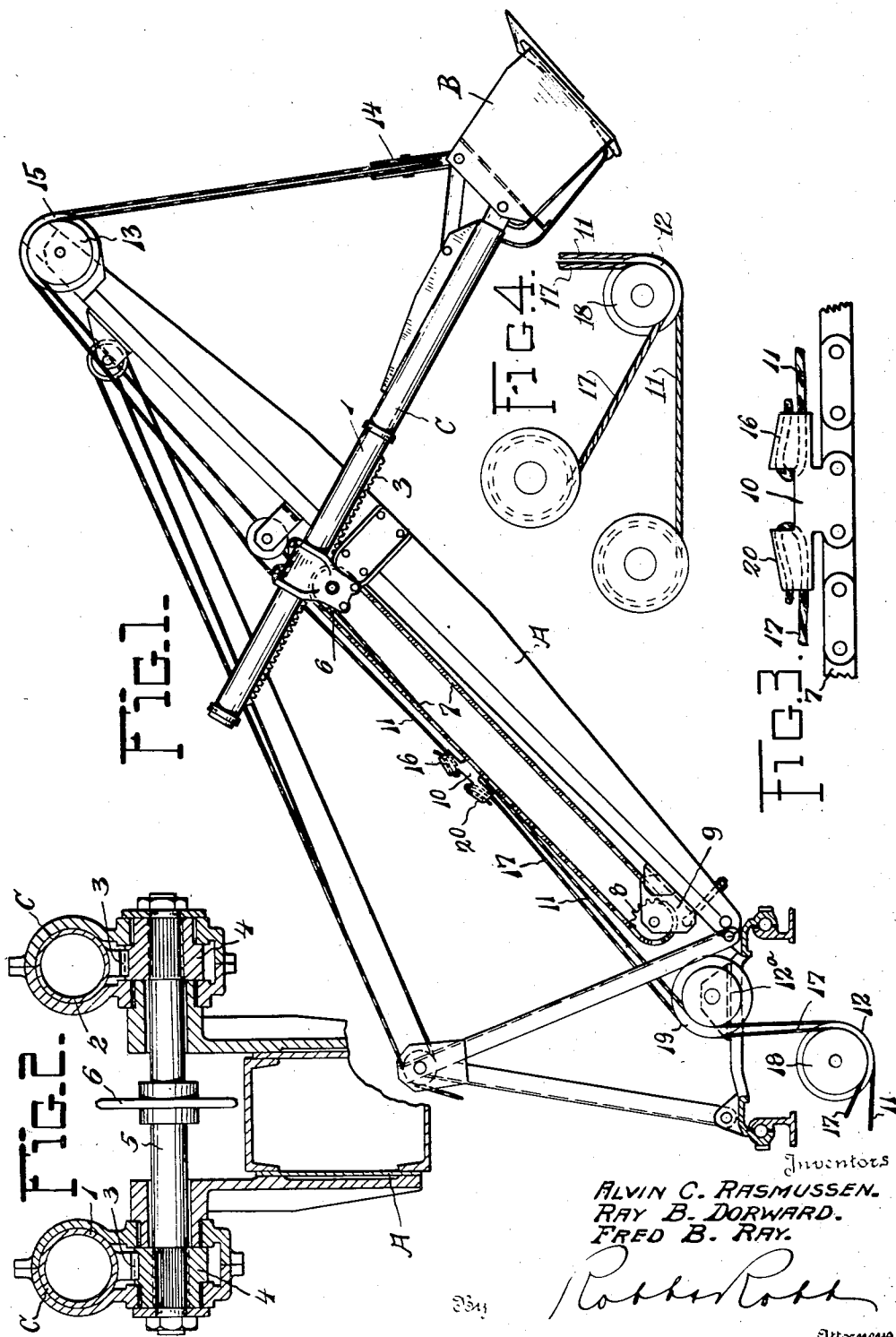
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ROPE THRUST SHOVEL

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ROPE THRUST SHOVEL

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As applied to power excavators, such, for instance, as power shovels, the present invention provides novel instrumentalities for effecting and controlling the shifting or thrusting action of the dipper stick.

It has been already proposed to provide a dipper thrusting device in which a single cable associated with the power unit may be employed for effecting a shifting of the dipper stick independently of the hoisting action of the hoist gear, this previous proposal including the provision of a dipper thrusting device that may be operated and controlled from the hoisting and dragline drums, such as are ordinarily provided in certain types of power excavators.

In this prior construction the means for effecting and controlling the shifting or thrusting action of the dipper handle embraces unique cable connections between the dipper handle or stick and the main power unit. These connections are such that by drawing in on one line of the cable, the dipper stick is shifted in one direction, means being provided for opposing this action of this line of cable, to shift the dipper handle in another direction as the operating action may require. The arrangement is such that the dipper stick may be shifted in either direction, either during the hoisting or lowering of the dipper. This shifting or thrusting of the dipper handle is effected through the shipper shaft which is provided with a drum fixed thereto. This drum on the shipper shaft is connected with an auxiliary drum by means of a cable, one end of which is wrapped about and anchored upon the auxiliary drum and the other end is wrapped about and anchored upon the drum on the shipper shaft; so that when the cable is drawn in by action of the auxiliary drum, the shipper shaft and shipper shaft drum are rotated so that the dipper stick is thrust in one direction, say for example, an inward thrust on the dipper stick when the cable is drawn in.

Instrumentalities are provided whereby this action of the cable is opposed in order that, when the cable is payed out, the dipper stick is shifted in the other direction. For this purpose there is provided a dipper hoisting cable, the tension in which is utilized for the purpose of opposing the aforesaid action. This hoisting cable is connected with the hoisting drum at one end, the other end being secured to and wrapped around the drum on the shipper shaft, and forms in effect a continuation of the first mentioned cable. The hoisting cable extends from the hoisting drum over a sheave mounted adjacent the outer

end of the boom, through a padlock sheave mounted on, or connected with, the dipper, and thence back over a suitable sheave to the shipper shaft drum. The hoisting cable thus supports the weight of the dipper and the resulting tension in the cable is made to oppose the tension of the first mentioned cable. Therefore, the hoist cable performs its functions of raising and lowering the dipper and swinging the dipper stick about the shipper shaft. Additionally, however, the tension in the hoist cable opposes the tension in the first mentioned cable, so that, upon rotation of the auxiliary drum for paying out the latter cable, the dipper handle is forced in a direction opposite to that in which it is moved when the latterly-mentioned cable is drawn in. The dipper stick is therefore always under the control of the auxiliary drum, and the dipper stick may be forced in either direction without requiring rotation of the hoisting drum. The dipper may be raised or lowered at will by the hoist drum in the usual manner.

The present invention provides an improvement over these aforementioned instrumentalities, by providing mechanism which will eliminate the use of the drum on the shipper shaft. This drum, as employed in the prior construction referred to, is cumbersome, and difficulty is sometimes encountered due to the rope getting out of place and becoming entangled. Furthermore, the use of a large rope on a small drum results in rapid deterioration of the rope.

In the present construction there is substituted for the drum on the shipper shaft of the above construction, a chain for actuating the shipper shaft, this chain being actuated in turn by two lines causing opposite action. These lines are interconnected with a cable clamp mounted on the chain and constitute a hoist line and a retracting line. The chain is mounted over a pair of sprockets, one of which is mounted on the shipper shaft, and the other is anchored on the boom adjacent the foot thereof.

The hoist line extends from the hoist or digging drum of the machine out to the boom point, around a sheave located at the boom point, down to the bale block on the dipper, around the sheave on this bale block, thence back to the boom point and around a second sheave, thence back to a cable clamp mounted on the chain.

The retracting line starts at the second hoist drum, passes over guide sheaves on the turntable of the machine, thence to the cable clamp on the chain. Tension on the hoist cable, together with a release of the retracting cable, pulls the chain

toward the boom point. The opposite action is accomplished by pulling in on the retracting line, causing the cable clamp connection to move in the opposite direction.

5 The invention will be more readily understood by reference to the accompanying drawing, in which—

Figure 1 represents a side view of a boom with a dipper mounted thereon, which dipper is adapted to be crowded in and out by the improved instrumentalities of this invention.

Figure 2 is a sectional view through the dipper stick and mountings, and illustrates the sprocket mounted on the shipper shaft over which the crowding chain is passed.

Figure 3 is a fragmentary side elevation of a portion of the crowding chain embracing the cable clamp, and illustrating the general construction of this clamp.

Figure 4 is a detail showing the usual winding drum and cable arrangement.

Referring more particularly to the drawing, the boom is designated generally at A, the dipper being indicated at B and the dipper stick at C. It may be mentioned in this connection that the dipper stick is made up of a pair of pipe-like members, one on each side of the solid boom.

These individual members are indicated generally at 1 and 2 and are provided with teeth 3 adapted to engage with the pinions 4 mounted on the shipper shaft 5. On this shipper shaft is mounted a sprocket 6. Over this sprocket 6 passes the chain 7, the chain being also passed over a sprocket 8 anchored through the bracket 9 to the boom A adjacent the foot thereof. On the chain is mounted a cable clamp 10. This cable clamp is a double connection providing for the connection of the hoist and retracting lines. The hoist line is indicated at 11 and extends from a hoisting drum M of the machine, thence over guide surfaces 12 and 12a, out to the end of the boom A around the guide sheave 13 on the end of the boom, around the sheave 14 mounted on the bale block of the dipper B, back to the boom point around a second sheave 15 thereon and then has its end secured to one of the cable connections 16 of the cable clamp 10.

The retracting line 17 starts at the second hoist drum on the machine N, passes over guide sheaves 18 and 19 at the turntable center of the machine, and thence to the other cable connection 20 on the cable clamp 10.

It will be seen from this arrangement of the cable that the weight of the dipper is sustained by the hoist cable 11 and it is therefore placed under a tension which acts in opposition to the tension in the retracting cable 17.

This results, therefore, upon release of the retracting line 17, in the chain 7 being pulled toward the boom point, thereby effecting the racking out of the dipper stick.

The converse action takes place when the retracted line 17 is pulled inwardly. This operates the chain 7 in opposite direction so as to crowd in the dipper stick in a manner which will be obvious. When the hoisting cable is drawn in, the dipper is raised and the dipper stick swung about the shipper shaft in the usual manner. If it is desired to force the dipper more firmly against the bank or to the point of excavation, this is accomplished by releasing the retracting cable, allowing the cable 17 to pay out, which enables the shipper shaft to rotate under the influence of the tension of the cable 11, and the dipper stick is forced outwardly.

If, however, it is desired to reduce the bite by withdrawing the dipper, the retracting cable 17 is drawn in, which effects a rotation of the shipper shaft against the influence of the cable 11 so as to shift the dipper handle inwardly, as has been previously explained.

It may be mentioned, incidentally, that the use of the two round dipper stick members, one on each side of the solid boom, substantially reduces the side rubbing of one stick or the other against the boom side, and results in a rigid positioning laterally of the attachment. The circular section of the dipper sticks also produces a uniform resistance to bending in all directions.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent of the United States, is—

1. In a machine of the character described, a boom, a dipper stick mounted on the boom, racking instrumentalities for the dipper stick, a chain mounted on the boom and interconnected with the dipper stick, a cable clamp mounted on the chain, and oppositely acting tension cables interconnected with the cable clamp and cable winding instrumentalities for operating the said chain selectively in opposite directions for racking the dipper stick relative to the boom.

2. In a machine of the character described, the combination of a boom, a dipper stick for the boom, instrumentalities for racking the dipper stick relative to the boom and including a shipper shaft, a flexible chain mounted on the boom and connected to the shipper shaft for actuating the latter to effect crowding operation of the dipper stick, oppositely acting tension cables interconnected with the chain and cable winding instrumentalities associated with each cable for operating the said chain selectively in opposite directions for racking the dipper stick relative to the boom.

3. In a machine of the character described, the combination of a boom, a dipper stick mounted on the boom, racking instrumentalities on the dipper stick including a shipper shaft, a sprocket on the shipper shaft, a second sprocket anchored to the boom, a chain interconnecting the sprockets, a cable clamp mounted on the chain, oppositely acting tension cables interconnected with the chain and cable winding instrumentalities associated with each cable for operating the said chain selectively in opposite directions for racking the dipper stick relatively to the boom.

4. In a machine of the character described, a boom, a dipper assembly mounted on the boom including a dipper and dipper stick, racking instrumentalities for the dipper stick, a chain mounted on the boom and interconnected with the dipper stick, a hoist cable interconnecting the said chain and hoist devices on the machine and arranged to sustain the weight of the dipper, and a retracting cable interconnecting the chain and other hoist devices on the machine, whereby pulling in movement on the retracting cable actuates the said chain to rack in the dipper stick, and release of the retracting cable enables the tension of the hoisting cable to cause reverse movement of the chain to crowd out the dipper stick relative to the boom, the digging operations of the machine being thereby controlled by the tension on the cables.

5. In a machine of the character described, a boom, a dipper stick mounted on the boom, racking instrumentalities for the dipper stick, a chain mounted on the boom and interconnected with the dipper stick, a hoisting cable, a retracting

cable interconnected with the chain for moving the said chain in opposite directions responsive to actuation of one of the said cables, thereby operating the chain selectively in opposite directions for racking the dipper stick relative to the boom.

6. In a power shovel, the combination of two independently rotatable drums, a boom, a dipper, a dipper handle carried by the boom, a chain mounted on the boom and associated with the dipper handle, a cable connected with one of said first named drums and with the chain, and a dipper hoisting cable connecting the other of said drums with the chain on the boom.

7. In a power shovel, the combination of two independently rotatable drums, a boom, a dipper and dipper handle carried by the boom, a sprocket mounted on the boom and associated with the dipper handle, a cable connected with one of said last named drums for rotating said sprocket in one direction, and a cable connected with the other of said drums for controlling the rotation of the sprocket and for rotating said sprocket in another direction.

8. In a power shovel, the combination of two independently rotatable drums, a boom, a dipper and dipper handle carried by said boom, a sprocket mounted on said boom adjacent the midpoint and associated with the dipper handle, a second sprocket mounted on said boom at a point spaced from said first sprocket, a chain connecting said sprockets, a cable connected with one of said first named drums and with the chain intermediate the sprockets for controlling the rotation of the sprockets, and a second cable connected with the other of the drums and with the dipper and attached to the chain for rotating the sprocket in another direction.

9. In a power shovel, the combination of a pair of drums, a boom, a dipper and dipper handle carried by said boom, a sprocket mounted on said boom and associated with said dipper handle, a chain associated with the sprocket for rotating the same, and a cable connected to one of said drums and to said chain for controlling the rotation of the sprocket, and a second cable connected to the other of said drums and to said chain for rotating said sprocket.

10. In an excavator shovel, the combination of a boom, a dipper stick mounted on the boom for thrusting and racking-in movements, a dipper carried by said dipper stick, shipper mechanism for thrusting and racking-in said dipper stick and mounted on the boom and comprising a shipper shaft, hoisting cable means for raising and lowering the dipper, a flexible shipper shaft ac-

tuating part distinct from and operatively connected therewith, carried by the boom and movable longitudinally thereof for causing racking-in and thrusting operations of the dipper stick, means for moving said hoisting cable means in opposite directions, and attachment means between the hoisting cable means and said flexible part whereby as the hoisting cable means is operated for raising and lowering the dipper, the said flexible part is moved longitudinally of the boom and caused to actuate the shipper shaft.

11. In a power shovel, the combination of a boom, a dipper stick mounted on the boom, a dipper carried by the dipper stick, a shipper shaft for operating the stick, a flexible actuating member for the shipper shaft, a pair of oppositely acting tension cables distinct from and connected to said flexible actuating member, said construction being of such a nature that movement of the flexible actuating part in one direction by one of the cables is resisted and controlled by the other of the cables.

12. In a machine of the character described, the combination of a boom, a dipper, a dipper stick mounted on the boom, a rack on the dipper stick, a gear meshing with the rack, a gear shaft, a sprocket mounted on said gear shaft, a chain for driving said sprocket, means for operating said chain comprising a pair of oppositely acting cables attached to said chain at spaced points, a pair of winding drums for operating said cables, said construction being of such a nature that one of said cables is effective to operate said chain and sprocket for dipper stick movement whilst the other cable controls such movement.

13. In an excavator shovel, the combination with a boom, a dipper stick and dipper mounted on said boom, of a shipper mechanism unit mounted on said boom and operatively connected to the dipper stick, including a shipper shaft and a shaft actuating part connected to the boom to move along the same and operable to cause racking in and thrusting operations of the dipper stick, cable means distinct from and connected to said shaft actuating part and arranged to raise and lower the dipper, and means for shifting said cable means in opposite directions to effect raising and lowering movements of the dipper and actuation of the shipper shaft actuating part along the boom whereby said racking in and thrusting operations are produced.

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CERTIFICATE OF CORRECTION.

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It is hereby certified that the residence of the assignee in the above numbered patent was erroneously described and specified as "Marion, Indiana" whereas said residence should have been described and specified as Indianapolis, Indiana, as shown by the records of assignments in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 8th day of October, A. D. 1935.

Leslie Frazer

Acting Commissioner of Patents.

(Seal)