April 10, 1928.

1,665,378

E. E. PETERSON

POWER SHOVEL

Filed Oct. 17, 1924

3 Sheets-Sheet 1

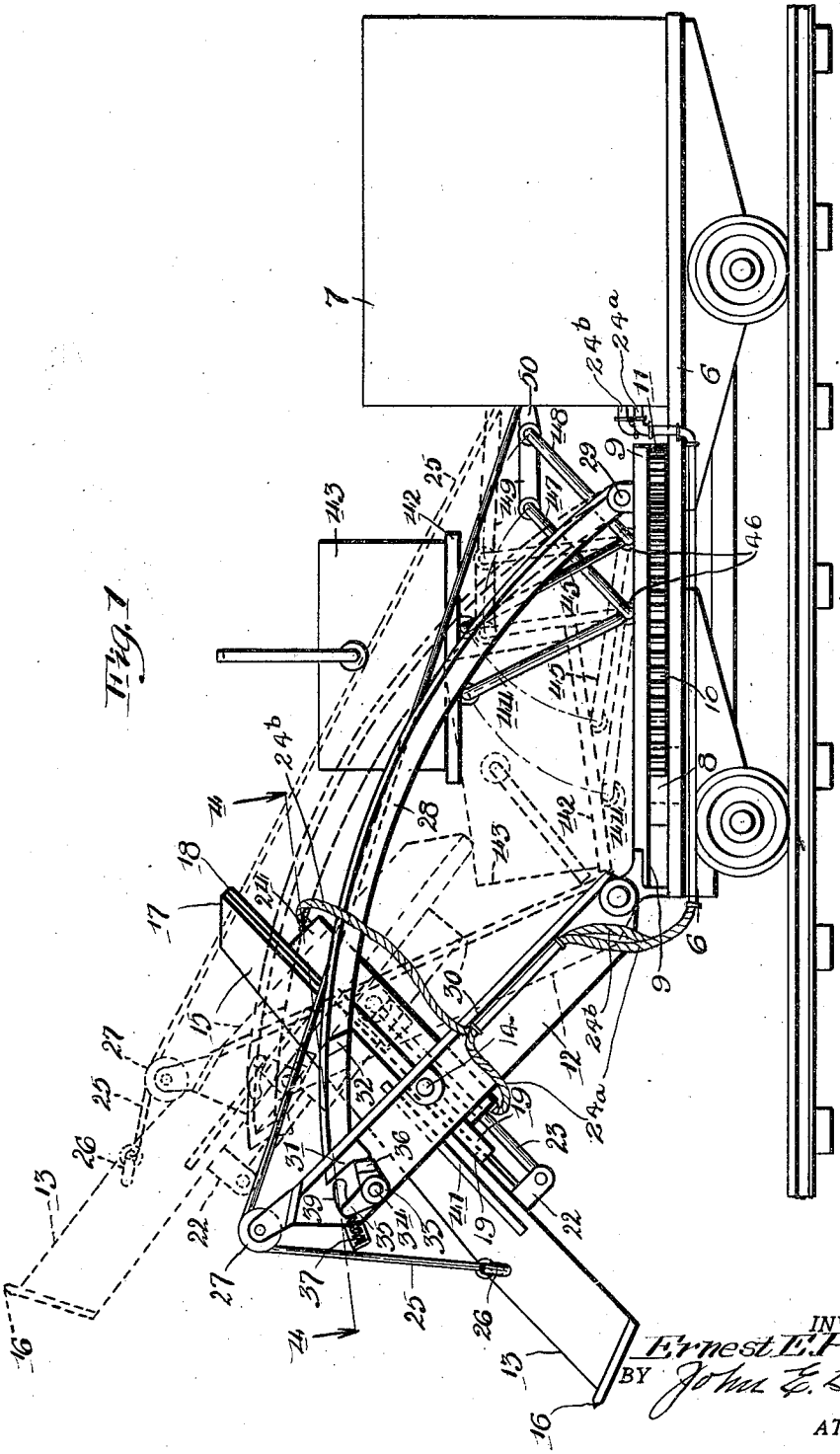


Fig. 1

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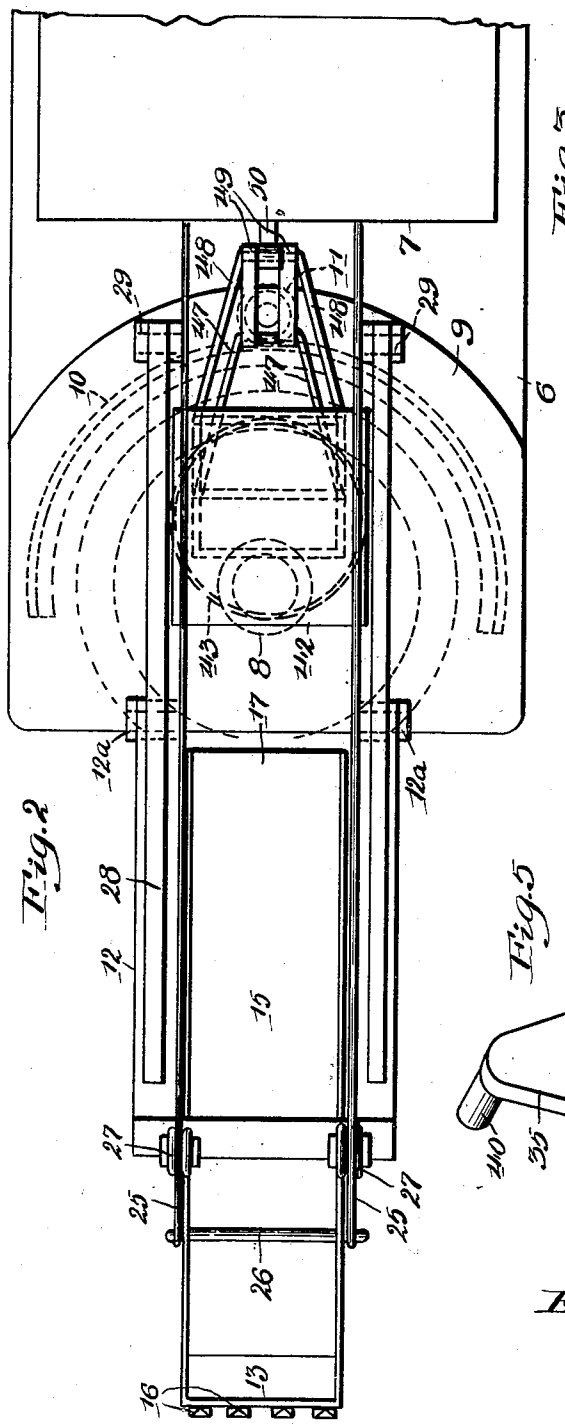


Fig. 2

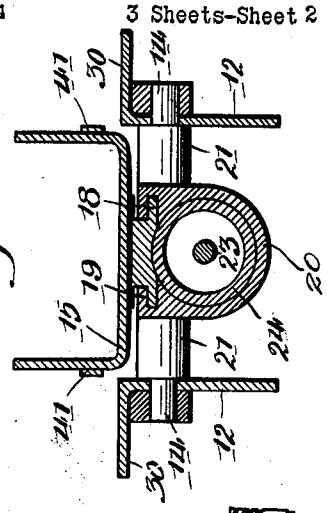


Fig. 3

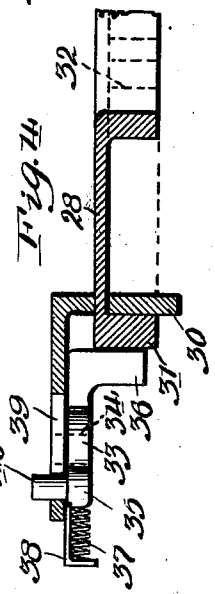


Fig. 4

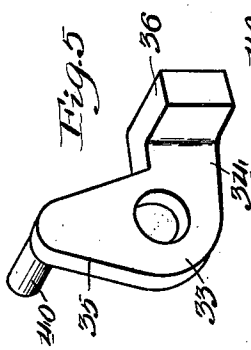


Fig. 5

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3 Sheets-Sheet 3

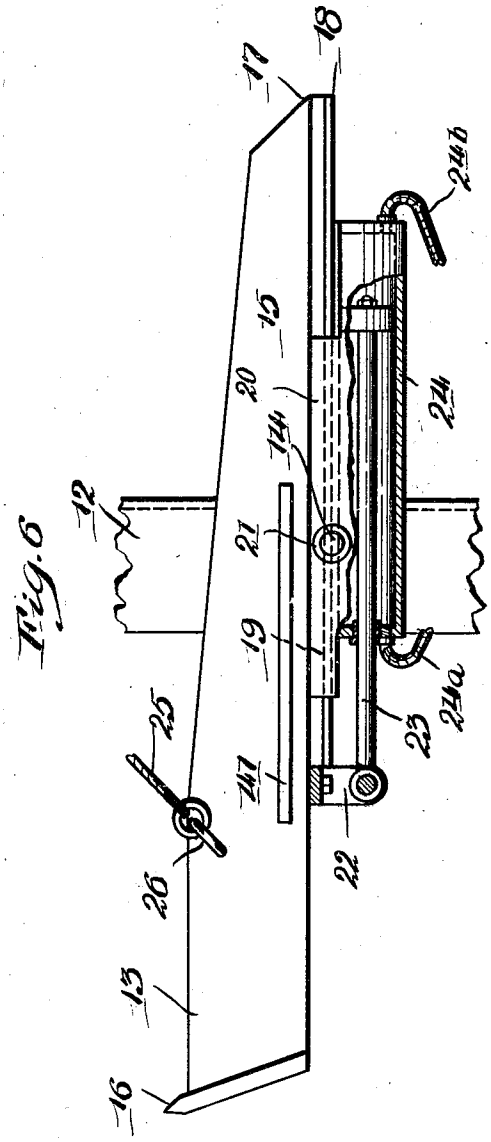


Fig. 6

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UNITED STATES PATENT OFFICE.

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POWER SHOVEL.

Application filed October 17, 1924. Serial No. 744,146.

This invention relates to power shovels, particularly, although not exclusively, adapted for use in underground mining to excavate a drift or other tunnel.

Heretofore the power shovels used in restricted passages, such as in tunnels, have required too much space in which to operate and consequently a large amount of hand work has been necessary. Thus, as far as applicant is aware, none of the old types of machines can be operated to properly clean up the roof of a tunnel, and hand work upon the roof is extremely dangerous, especially where explosives are employed to loosen the earth or drift. Old forms of shovels have the further disadvantage of being slow in operation because of the time required to turn the boom upon its horizontally revolving support in emptying a load from the bucket.

It is my object to provide a novel power shovel which can be operated in an unusually small space to rapidly excavate and deposit excavated material in a suitable conveyor.

Another object is to simplify and render the operation of a shovel of this kind more positive by providing a chute, integral or connected with the bucket proper, so arranged that by merely tilting the chute and bucket the load may be hoisted and deposited in a conveyance receptacle.

A further object is to provide a novel and efficient shovel adapted to operate upon the roof as well as upon the front or end and sides of a restricted underground passageway.

This invention also includes certain other novel features of construction which will be more fully pointed out in the following specification and claims.

In the accompanying drawings which illustrate the best form of my device at present known to me, Figure 1 is a side elevation of my improved power shovel; Fig. 2 is a plan view of the same; Fig. 3 is a transverse section through the boom members and chute, showing the swivel joint between said members and chute and the cylinder for imparting longitudinal movement to the scoop and chute; Fig. 4 is a section through one of the boom members and brace therefor taken on the line 4—4 of Fig. 1; Fig. 5 is a detail, perspective view of one of the brace catches and Fig. 6 is a detail, side elevation, of the scoop, chute and operating mechanism, partially in section.

Referring to the drawings, I have used the numeral 6 to indicate a suitable car for carrying my device and 7 is a housing adapted to enclose the power plant which may be of anyone of a number of well known types. Pivoted in a large bearing 8 near one end of the car 6 is a turn table 9 provided on its base with a large arcuate rack 10 which may be operated by a pinion 11 to turn the table 9. Upon the forward edge of the table 9, pivoted in bearings 12^a, is a pair of boom members 12, between which, a scoop 13 and an integral chute 15 are mounted upon laterally projecting studs 14. The scoop 13 is closed at its normally forward end and provided with the usual teeth 16 adapted to facilitate driving said end into material to be excavated.

As clearly shown in Figs. 1 and 2, the chute 15 extends backward in continuation of a scoop 13 and is open at its rearward end 17 to allow excavated material to readily slide out of the chute when the chute and scoop are tilted, as hereinafter described. Extending along the bottom of the chute 15 is a pair of laterally projecting parallel flanges 18 adapted to slidably engage guide flanges 19 formed on a bucket support 20 (Fig. 3). This support 20 is provided with laterally projecting hubs 21, which maintain the chute 15 in proper spaced relation between the boom members 12. To operate the chute upon the guide flanges 19, a bracket 22 (Fig. 1) is rigidly secured to the bottom of the chute and is joined by a rod 23 with a piston within a cylinder 24, said cylinder being rigidly held in the support 20. The piston within this cylinder 24 is adapted to be given reciprocating movement in the usual manner by a suitable fluid under pressure which may be delivered to opposite ends of the cylinder through pipes 24^a and 24^b, respectively.

To tilt the scoop and chute upon the boom, a pair of cables 25 are secured at their forward ends to a transverse bar 26. These cables are passed over a pair of sheaves 27 on the upper ends of the boom members 12 and extend backward into the housing 7 where they may be simultaneously wound upon or unwound from a suitable windlass or other power-driven mechanism. Rigid braces 28

for the boom members 12 are pivotally connected to the turn table 9 at their normally rearward extremities, and the forward ends of these braces are slidable in slots in laterally projecting flanges 30 on the members 12. A head 31 on each of the braces 28 is adapted to engage the flange 30 to limit forward tilting of the boom members 12, while backward movement of said members is limited by a stop lug 32 on each of the braces 28.

To prevent the pull upon the cables 25 during the hoisting operation from drawing the boom members 12 back against the stop lugs 32, I provide a catch 33 opposite each of the heads 31. Each of the catches 33 is swiveled upon a pin 34^a in one of the members 12 and has crank arms 34 and 35. A lug 36 on the arm 34 is normally held in engagement with the head 13 by a spring 37 secured at one end to the arm 35 and fixed at its other end upon a small bracket 38 on the member 12. Projecting through an arcuate slot 39 in the member 12 is a pin 40 on the arm 35, which is adapted to be struck to actuate the catch by a rigid projection 41 on the side of the chute 15.

A support 42 for a receptacle 43 is mounted upon the table 9. This receptacle 43 is open at its top to receive excavated material from the chute 15. To facilitate use of the receptacle 43 with an overhead conveyor of the type employed in under ground mines, I provide means for raising said receptacle and its support 42 from its position where it is filled by the chute 15 (the dotted line position, Fig. 1) to an elevated position (shown in full lines in Fig. 1) where it may be conveniently attached to a hook or other member of such a conveyor. Thus, the support 42 is carried upon pairs of arms 44 and 45 which are pivoted in suitable bearings 46 on the table 9 and severally adapted to be actuated by cranks 47 and 48. These cranks 47 and 48 are joined by links 49 and adapted to be swung in arcs by a power-driven member 50 extending into the housing 7.

Operation.

In operation, the scoop 13 may be extended forward by paying out the cables 25 and simultaneously admitting fluid pressure behind the piston in the cylinder 24. The cables 25 may be retracted to tilt the scoop and chute upon the studs 14. During the operation of picking up a load and hoisting it, the lugs 36 hold the heads 31 adjacent to the forward surfaces of the flanges 30, so that the braces 28 maintain the boom members 12 in the full line position shown in Fig. 1. To empty a load, the cables 25 are retracted within the housing 7 to swing the scoop upward and backward upon the studs 14. As the chute 15 approaches its dotted line position shown in Fig. 1, the projections 41 on the sides of said chute, strike the pins 40 to throw the lugs 36 out of engagement with the head 31, thus allowing the boom members 12 to swing backward against the stop lugs 32. This, as will be readily understood, causes excavated material in the scoop 13 to pass backward by gravity through the chute 15 and out at the open end 17 thereof. The receptacle 43, which has been previously lowered to its dotted line position (Fig. 1) by extending the member 50 from the housing 7, now catches the excavated material as it falls from the chute 17. By repeating the above described operation, loads may be delivered from the scoop 13 to the receptacle 43 until the latter is filled. The member 50 is finally retracted into the housing 7 to raise the support 42 and receptacle 43 to the full line position shown in Fig. 1, where said receptacle may be conveniently attached to an overhead conveyor for disposal of the excavated material.

By means of the pinion 11 and rack 10, the turn table 9 may be swung horizontally in the bearing 8 to reach with the scoop 13 all desired parts of the ends, sides and roof of the tunnel. It will be noted that when the receptacle 43 is lowered, it is located directly above the axis of rotation of the table 9, so that said receptacle is maintained in position to receive excavated material from the end 17 of the chute 15 irrespective of the angular position of the table 9. Obviously, the scoop 13 may be extended upward, as indicated in dotted lines of Fig. 1, to reach the roof of the tunnel when material removed therefrom will immediately pass by gravity down the chute 15 into the receptacle 43.

Having described my invention what I claim as new and desire to protect by Letters Patent is:

1. In a power shovel adapted for tunneling in restricted space, a turn table, a boom extending obliquely from said table and pivoted upon a horizontal axis thereon, a scoop and a chute communicating with said scoop, pivoted on said boom, a substantial distance above said table, said scoop being adapted to project upward above the upper end of said boom to operate upon the roof of a tunnel, means for extending and retracting said scoop and chute on said boom, means for tilting said chute on said boom and a receptacle arranged to receive excavated material directly from said chute, when said scoop is elevated.

2. In a power shovel adapted for tunneling, a carriage, a boom pivoted upon a horizontal axis on said carriage, a scoop and chute communicating with said scoop, pivoted upon said boom upon a horizontal axis located a substantial distance above said carrige, said scoop being adapted to be projected upward above the upper end of said boom to remove material from the roof of a

tunnel, means for extending and retracting said scoop and chute on said boom, means for tilting said chute to raise said scoop on said boom, means for permitting backward pivoting of said boom on said carriage to empty material from said scoop and a receptacle arranged on said carriage to receive excavated material from said chute when said scoop is elevated.

3. In a power shovel adapted for tunneling in restricted space, a carriage, a pair of boom members tiltably supported on said carriage and projecting obliquely forward therefrom, a scoop and an integral chute swiveled between said boom members, said scoop being adapted to extend upward above the upper end of said boom members to operate upon the roof of a tunnel, means for rigidly holding said boom members in predetermined, forwardly extended, position during the operation of said scoop, means for allowing rearward swinging of said boom members when said scoop is elevated to discharge its contents through said chute and means for extending and retracting said chute between said boom members comprising a cylinder and piston mounted on the bottom of said chute and adapted to be operated by fluid under pressure.

4. In a power shovel a carriage, a boom tiltably mounted near one end of said carriage, in oblique, forwardly projecting position, a scoop pivoted on said boom, a chute communicating with said scoop, means for extending and retracting said scoop on said boom, means for elevating said scoop to allow excavated material to pass by gravity backward through said chute, and a brace and catch arranged to maintain said boom in forwardly extended position during hoisting and for allowing said boom to swing backward upon said carriage to empty excavated material through said chute.

5. In a power shovel, a turn table, a boom tiltably mounted near one end of said table in oblique, forwardly projecting position, a scoop and a chute communicating with said scoop pivoted upon said boom, means extending and rotating said scoop and chute on said boom, means for elevating said scoop to allow excavated material to pass by gravity backward through said chute, and a brace and catch arranged to maintain said boom in forwardly extended position during hoisting and for allowing said boom to swing backward upon said carriage to empty excavated material through said chute.

6. In a power shovel, a carriage, a boom tiltably mounted near one end of said carriage, means for maintaining said boom in oblique, forwardly extended position, a scoop pivoted on said boom, a chute communicating with said scoop, means for slidably extending and retracting said scoop on said boom, means for elevating said scoop to allow excavated material to pass by gravity backward through said chute and a catch for allowing said boom to swing backward upon said carriage to empty excavated material through said chute.

7. In a power shovel adapted for tunneling in restricted space, a carriage, a pair of boom members tiltably supported on said carriage and projecting obliquely forward therefrom, a scoop and an integral chute swiveled between said boom members, said scoop being adapted to extend upward above the upper end of said boom members to operate upon the roof of a tunnel, means for positively holding said boom members in predetermined, forwardly extended position during the operation of said scoop, means for allowing rearward swinging of said boom members when said scoop is elevated to discharge its contents through said chute and means for extending and retracting said chute between said boom members.

8. In a power shovel adapted for tunneling in restricted space, a carriage, a pair of boom members tiltably supported on said carriage and projecting obliquely forward therefrom, a scoop and an integral chute swiveled between said boom members, said scoop being adapted too extend upward above the upper end of said boom members to operate upon the roof of a tunnel, means for positively holding said boom members in predetermined, forwardly extended position during the operation of said scoop, said scoop and chute being arranged to be elevated to discharge excavated material through said chute and means for extending and retracting said chute between said boom members comprising a cylinder and piston mounted on the bottom of said chute and adapted to be operated by fluid under pressure.

9. In a power shovel, a turn table, a pair of boom members pivoted to swing vertically upon the normally forward periphery of said table, a pair of rigid braces pivoted upon said table at their normally rearward ends and slidably attached to said boom members at their forward ends, a scoop and chute pivoted to swing vertically between said boom members, a receptacle carried by said table, means for elevating said scoop to allow excavated material to pass by gravity through said chute into said receptacle, and catches for said braces on said boom members disposed to be actuated to allow rearward swinging of said boom when said bucket is elevated.

10. The combination with a power shovel adapted for use in tunnels and an overhead conveyor of a turn table, a boom tiltably carried upon said table, a scoop and chute pivoted upon said boom, means for elevating said scoop too empty excavated material through said chute, a receptacle disposed

above the axis of said table to receive excavated material from said chute and a support for said receptacle arranged to be elevated to bring said receptacle into proximity with said conveyor.

11. The combination with a power shovel adapted for use in tunnels and a conveyor, of a carriage, a boom tiltably mounted upon said carriage, a scoop and chute pivoted upon said boom, means for elevating said scoop to empty excavated material through said chute, a receptacle disposed on said carriage to receive excavated material from said chute, and a support for said receptacle arranged to be actuated to bring said receptacle into proximity with said conveyor.

In testimony whereof, I have hereunto signed my name to this specification.

ERNEST E. PETERSON.