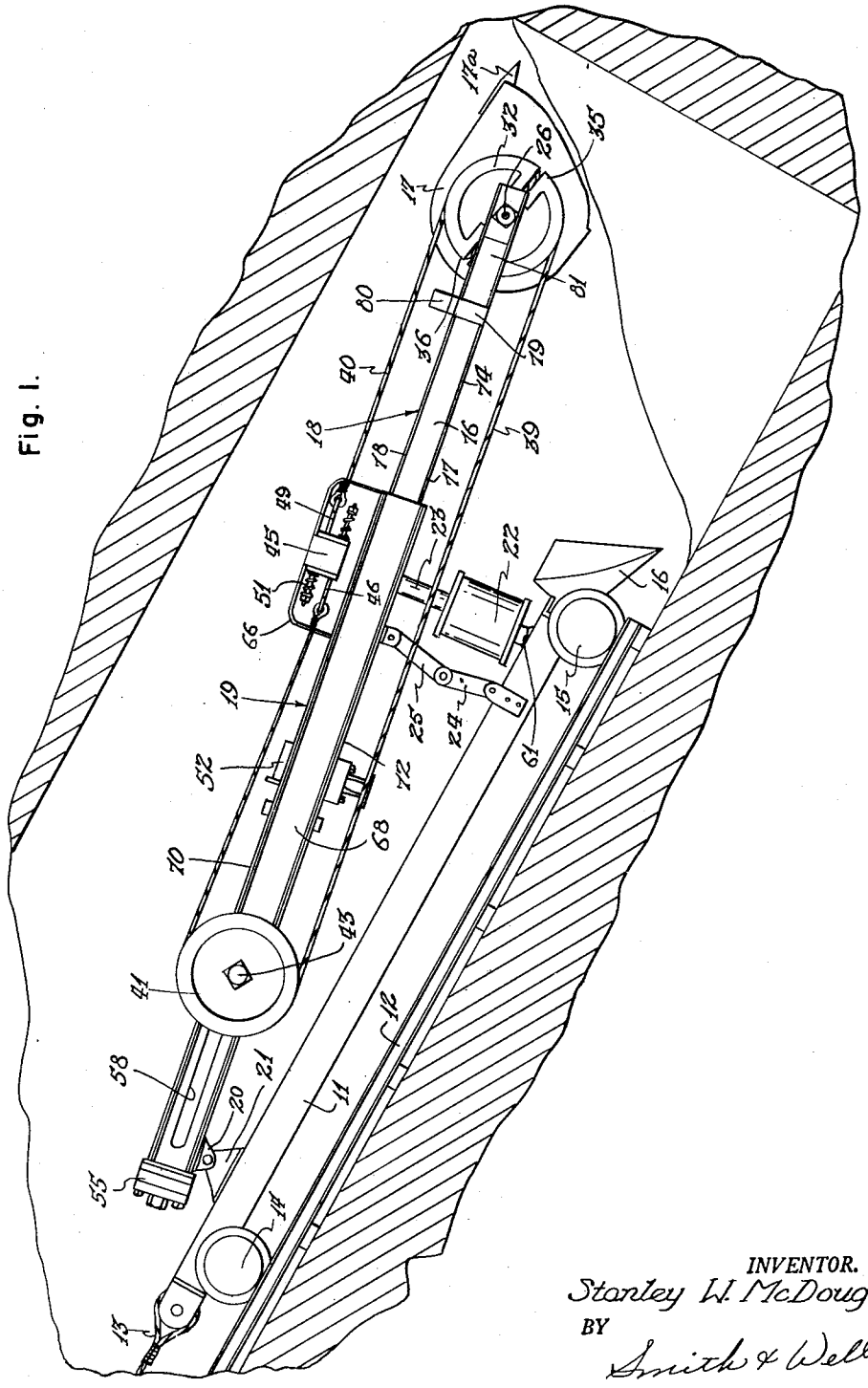
Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 1

Fig. 1.



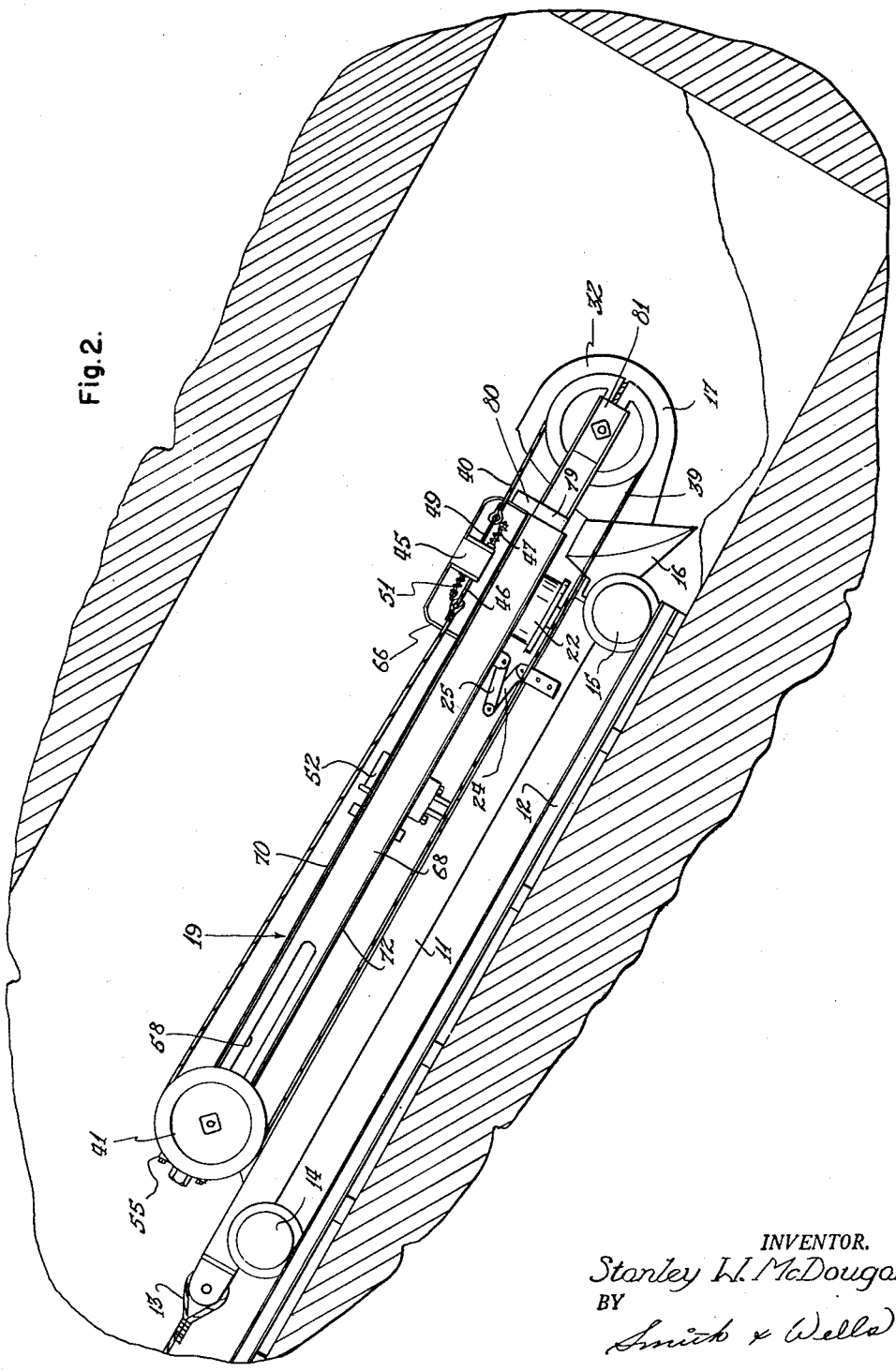
INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 2

Fig. 2.



INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 3

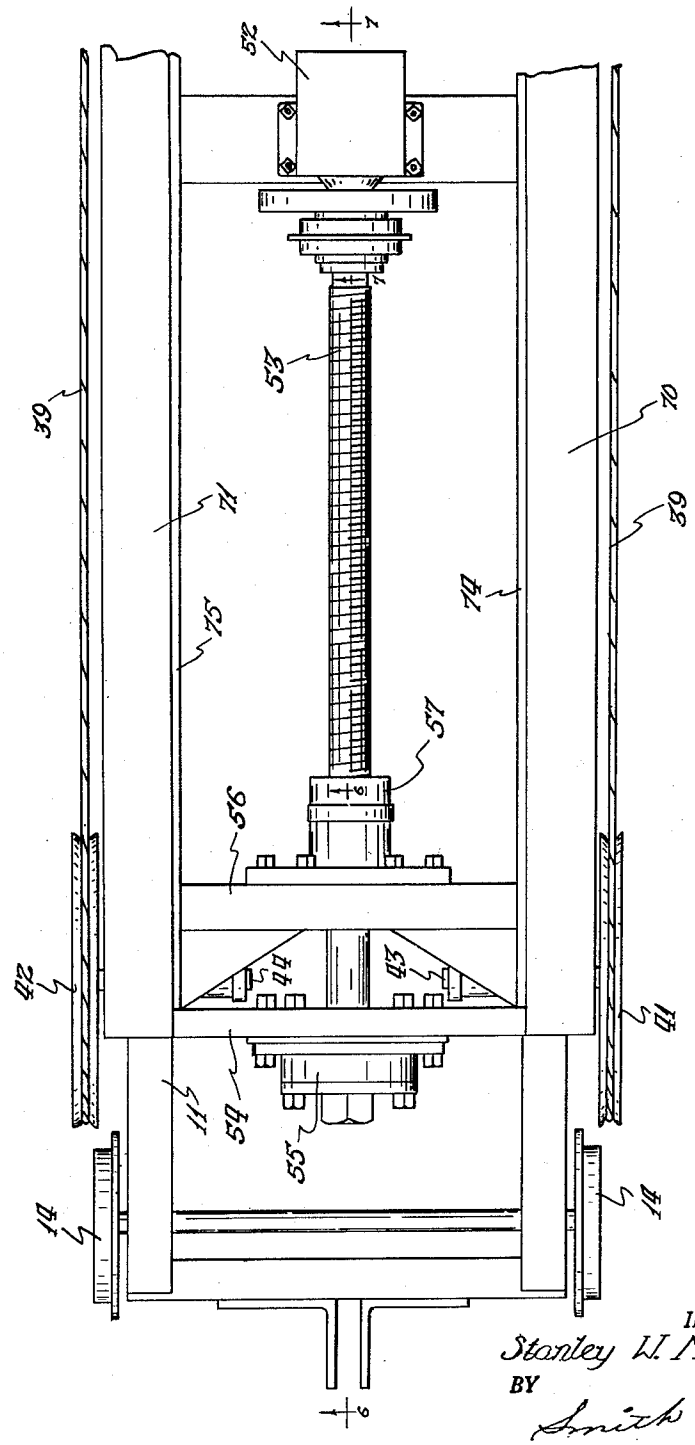


Fig. 3.

INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 4

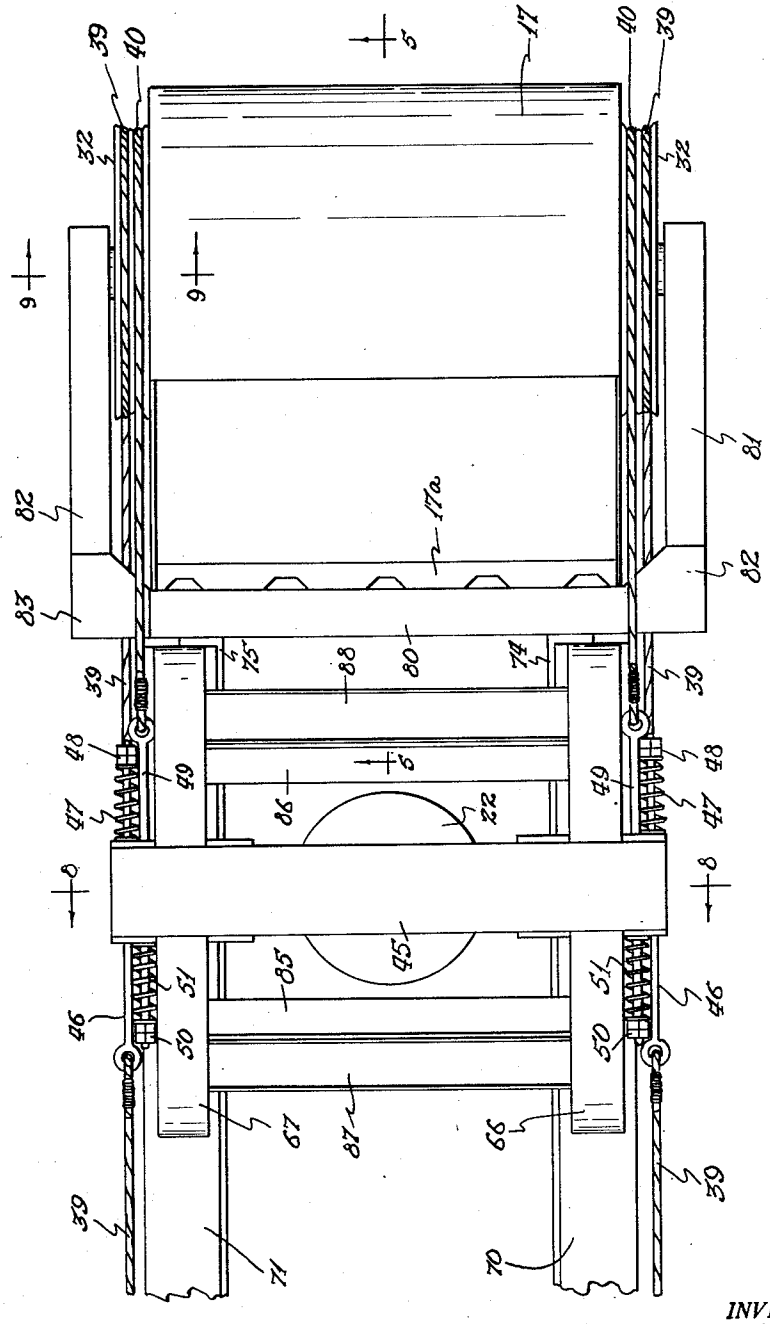


Fig. 4.

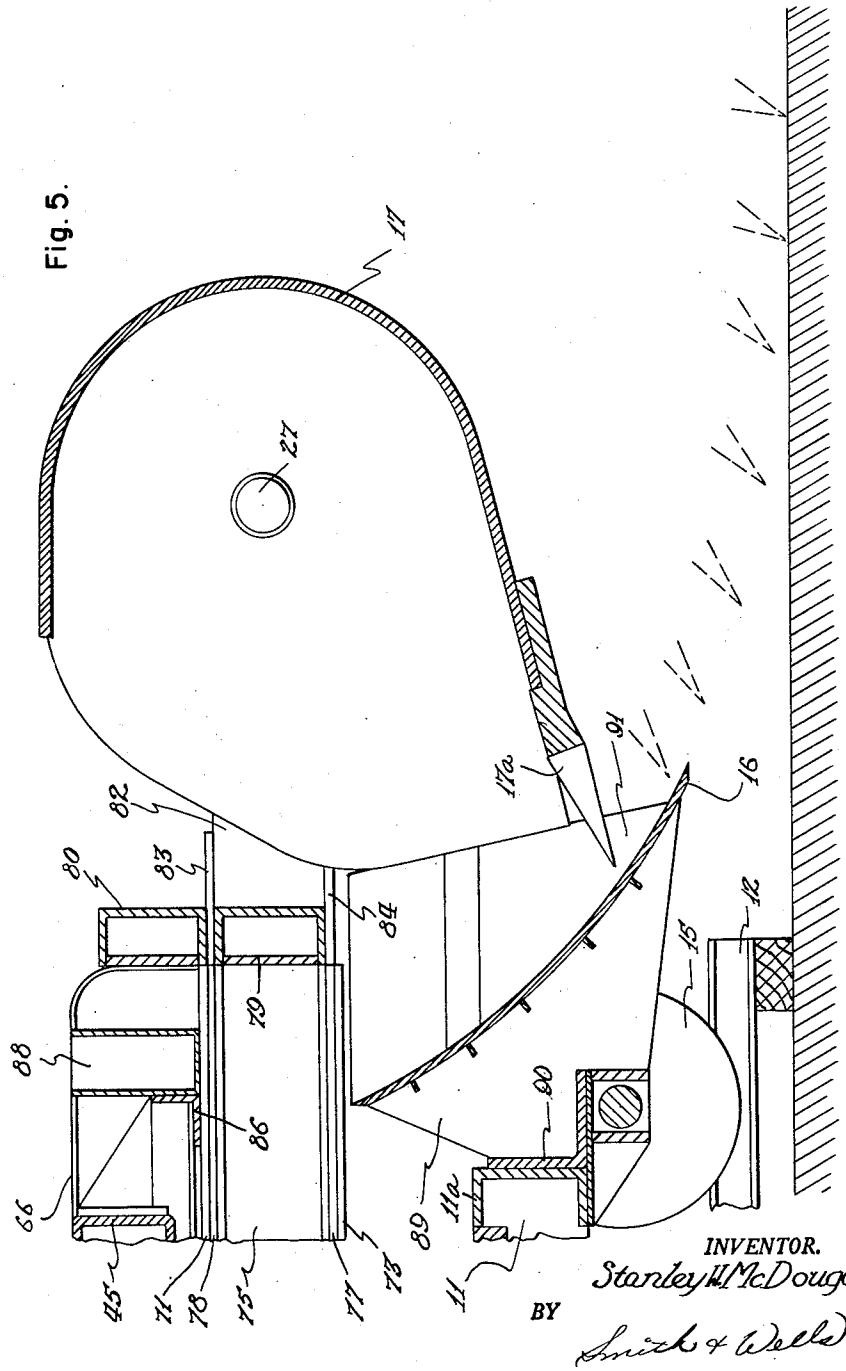
INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 5

Fig. 5.



INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 6

Fig. 6.

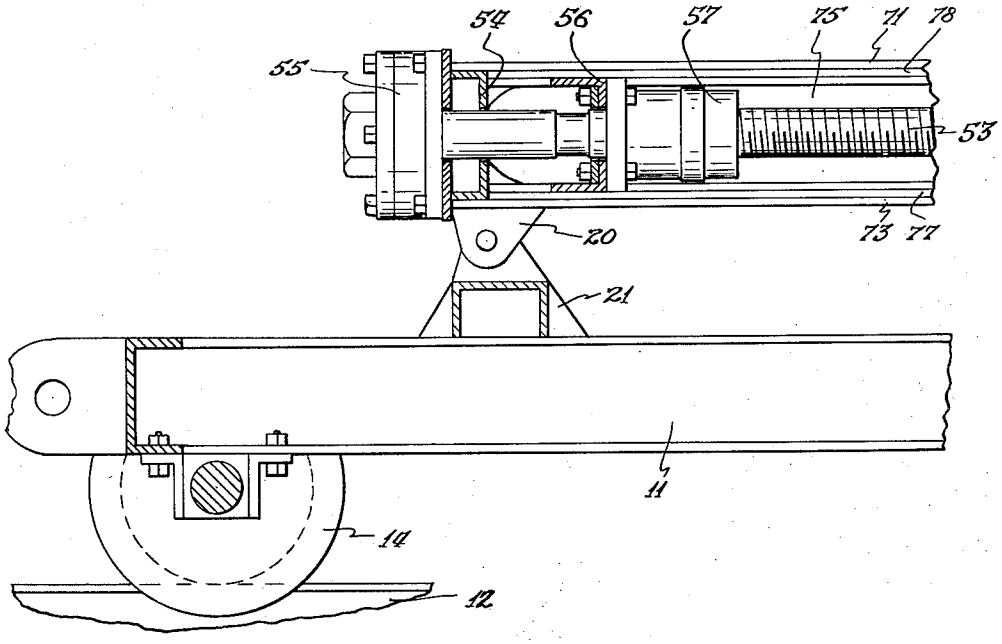
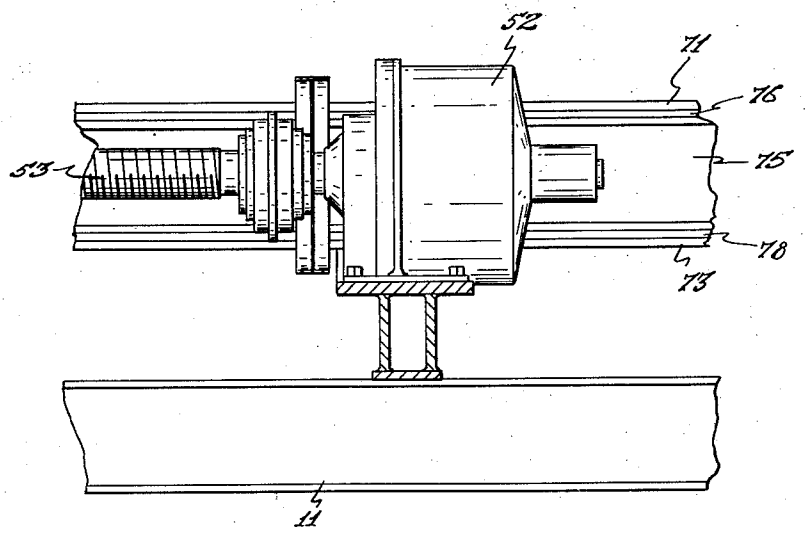


Fig. 7.



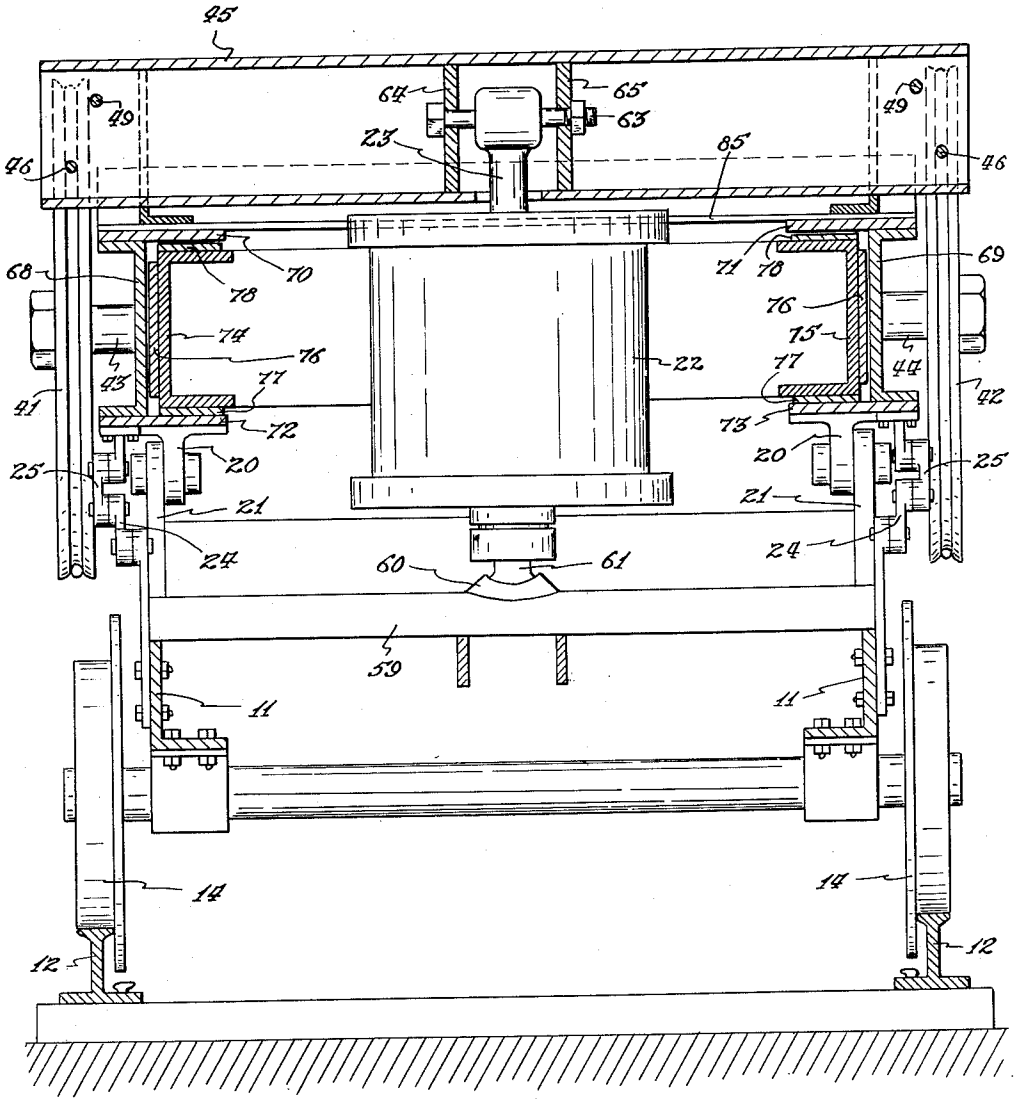
INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 7

Fig. 8.



INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Nov. 21, 1950 S. W. McDOUGALL 2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Filed March 21, 1949 8 Sheets-Sheet 8

Fig. 9.

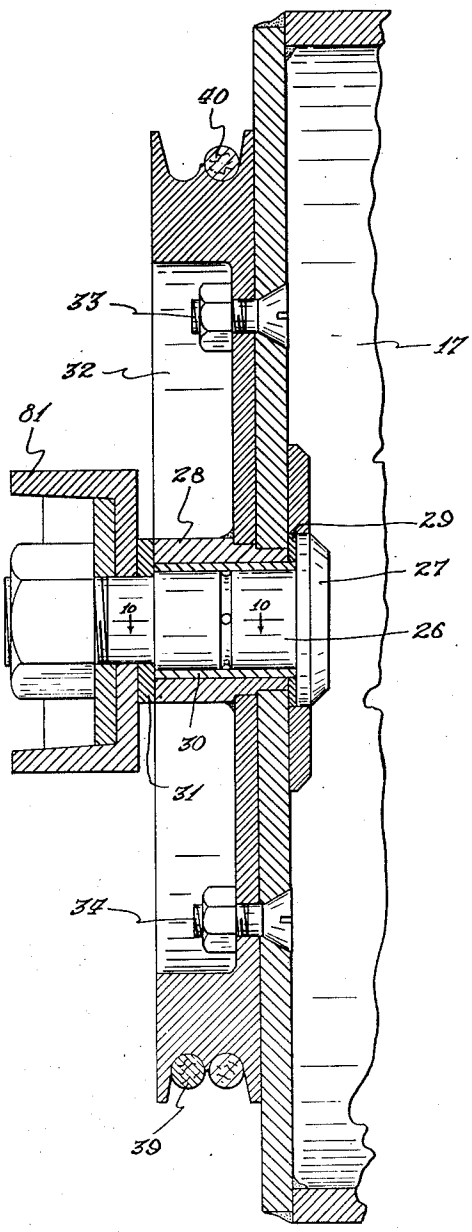
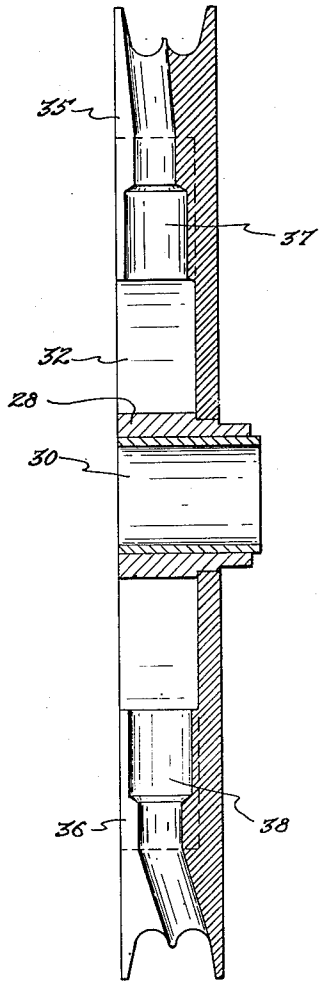


Fig. 10.



INVENTOR.
Stanley W. McDougall
BY
Smith & Wells

Patented Nov. 21, 1950 2,530,714

UNITED STATES PATENT OFFICE

2,530,714

MUCKING MACHINE FOR INCLINED MINE SHAFTS

Stanley W. McDougall, Kellogg, Idaho

Application March 21, 1949, Serial No. 82,614

7 Claims. (Cl. 214—103)

1

The present invention relates to improvements in a mucking machine for inclined mine shafts.

It is the particular purpose of my invention to provide a device for clearing away the loosened rock at the face of sloping tunnels. In mining it is often the practice to sink the shaft at an angle to the vertical instead of straight down. The sloping shaft may be at various angles to the vertical and rails are laid in the shaft to lower a car to the face of the shaft for drilling and blasting and removing the loosened rock. In drilling and blasting at the face, the rock is broken up to a stubstantial depth. Upon explosion this broken up rock will level out in front of the face of the shaft. Removal of this loosened rock is difficult. Scoops such as could be used in a horizontal tunnel do not work satisfactorily because they cannot be shoved down into the rock. Clam shell buckets such as are used in a vertical shaft do not work well since there is not room to maneuver the bucket.

It is the purpose of the present invention to provide a novel machine which carries a bucket that can be lowered over the pile of loose rock to the face of the tunnel and then turned downward into the loose rock and pulled back up the shaft until the bucket inverts itself and faces upwardly. The bucket acts as a clawing device reaching down into the loose rock from the top thereof at the shaft face to effect its loading.

It is also a purpose of my invention to provide a novel mechanism whereby the bucket is carried upon an extensible pivoted frame that operates to turn the bucket so that its open side is down while the frame is being extended. The frame is pivoted at its rear end and is held in raised position as it is extended and is then allowed to settle onto the loose rock so that the weight of the frame causes the bucket to dig in as the frame is again drawn together to effect a reversal of the position of the bucket.

The nature and advantages of my invention will appear more fully from the following description and the accompanying drawings wherein a preferred form of the invention is shown. It should be understood however, that the description and the drawings are illustrative only and are not intended to limit the invention except insofar as it is limited by the claims.

In the drawings:

Figure 1 is a view in side elevation of my improved mucking device showing it in position to start the digging operation in a sloping shaft;

Figure 2 is a view like Figure 1 but showing the end of the digging operation with the bucket in position to carry its load out of the shaft;

2

Figure 3 and Figure 4 together comprise a plan view of the machine;

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 4;

Figure 6 is a sectional view taken on the line 6—6 of Figure 3;

Figure 7 is a sectional view taken on the line 7—7 of Figure 3;

Figure 8 is a sectional view on an enlarged scale taken on the line 8—8 of Figure 4;

Figure 9 is an enlarged fragmentary sectional view taken on the line 9—9 of Figure 4; and

Figure 10 is a detailed sectional view of the cable attaching device shown in Figure 9, the section being taken on the line 10—10 of Figure 9.

As illustrated best in Figures 1 and 2, the present invention is embodied in a machine which has a carriage 11 that is adapted to be lowered on rails 12 down a sloping shaft. A cable 13 is used to pull the carriage back up the shaft. The carriage has rear wheels 14 and front wheels 15 and on the front end of the frame it carries a plow 16 which is adapted to cooperate with a bucket 17 to carry a load of loose rock.

The bucket 17 is carried by an extensible frame which includes a front part 18 that slides in a rear part 19. The frame composed of parts 18 and 19 is pivoted by mounting brackets 20 and 21 near the rear end of the carriage 11. In order to raise and lower the extensible frame, I mount a hydraulic jack 22 at the front end of the carriage 11 and couple its piston 23 to the part 19 of the extensible frame. Interconnecting links 24 and 25 are provided between the part 19 and the carriage 11 so as to limit the upward travel of the extensible frame and to give stability to the frame in its raising and lowering operations.

The bucket 17 is pivotally mounted at the forward end of the frame part 18 by means of stub shafts 26 at each side of the frame 18. Figure 9 shows the details of one of the stub shafts 26 and the mounting of the bucket 17 thereon. The stub shaft has a head 27 thereon and the bucket 17 has a bearing 28 that fits around the stub shaft. Bushings 29 and 31 are provided between the stub shaft 26 and the bearing sleeve 28. The bucket 17 carries a cable mounting sheave 32 at each side thereof, the sheave being bolted to the bucket by screw bolts indicated at 33 and 34 in Figure 9. Each sheave is slotted at two diametrically opposed points 35 and 36 and provided with cable holding sockets 37 and 38 for securing the ends of the cables which are used to rotate the bucket 17 as the extensible frame part

18 is advanced and retracted. The cables are indicated by the numerals 39 and 40 at each side of the bucket 17.

Referring now to Figures 3 and 4 in particular, it will be noted that the cables 39 and 40 are trained around the sheaves 32 on the bucket 17 and are extended rearwardly. Two sheaves 41 and 42 are journalled on shafts 43 and 44 carried by the rear end of the extensible frame part 18. The cables 39 are trained around the sheaves 41 and 42 and have their free ends connected to a mounting block 45 which is fixed on the stationary part 19 of the extensible frame. Each cable 39 has a rod 46 secured to the end thereof. This rod 46 passes through the block 45 and a spring 47 is interposed between the block 45 and take-up nuts 48 on the end of the rod 46 to tension the cable 39.

The cables 40 are connected to the block 45 in a similar fashion by rods 49 having nuts 50 thereon to mount the springs 51.

It is believed to be clear from the Figures 1 to 5 inclusive that as the part 18 is extended and retracted with respect to the part 19 of the frame, the cables 39 and 40 will cause the bucket 17 to swing between the positions shown in Figures 1 and 2. As the frame is extended, the bucket 17 is moved in a counterclockwise direction as shown in Figures 1 and 2 to bring the open side down and point the digging members 17*a* of the bucket toward the face of the shaft as indicated in Figure 1. When the frame 18 is retracted, the cables cause the bucket 17 to rotate in a clockwise direction bringing the digging member 17*a* down into the loose rock. During this digging operation the hydraulic jack 22 is released so that the weight of the frame parts 18 and 19 and the weight of the bucket 17 combine to force the bucket down into the loose rock.

Figures 3, 6 and 7 illustrate the mechanism for extending and retracting the frame part 18 with respect to the frame part 19. The frame part 19 carries a motor 52 which is coupled to a screw 53. The other end of the screw 53 is mounted on a cross head 54 at the rear end of the frame part 19 by a thrust bearing 55. A cross head 56 is secured on the rear end of the frame part 18 and carries an internally threaded member 57 for engagement with the screw 53. The motor 52 is reversible so that by operating the screw 53, the cross head 54 and its corresponding frame part 18 can be moved to and fro on the frame part 19. The side members of the frame part 19 are slotted as indicated at 58 in Figure 1, for passage of the shafts 43 and 44.

Referring now to Figure 8, the details of the mounting of the jack 22 and the block 45 are shown in this figure. This figure also illustrates the construction of the frame members 18 and 19. The carriage 11 has a cross bar 59 at its forward end. This cross bar has a socket 60 which pivotally mounts a rounded head 61 that is provided on the bottom of the jack cylinder 22. The piston 23 of the jack extends up through the block 45 and is pivoted by a cross pin 63 which extends between two bars 64 and 65 that are welded in place in the block 45. The block 45 is secured on top of the frame member 19 by a pair of I-beams 66 and 67 (see Figure 4). The frame part 19 is composed of two channel irons 68 and 69 that have guide plates 70 and 71 at the top thereof and similar guide plates 72 and 73 at the bottom thereof. The frame part 18 has inwardly facing channel irons 74 and 75 fitted between the guide plates 70—72 and 71—73. Wear plates 76, 77, and 78 are provided on each of the channel irons 74 and 75.

The channel irons 74 and 75 are connected together at the forward end of the machine by a cross beam 79 (see Figures 4 and 5). The beam 79 and a stop beam 80 are welded together and the beam 79 extends outwardly at both ends beyond the beam 80 to mount the rear ends of two channel irons 81 and 82 that carry the bucket 17. Gusset plates 83 and 84 are utilized above and below the cross beam 79 to strengthen the joint between the cross beam 79 and the channel irons 81 and 82.

The forward end of the frame part 19 is reenforced by two angle irons 85 and 86 which tie the top plates 70 and 71 together. It is desirable at times to add weight to the framework composed of the part 18 and 19 so I provide two troughs 87 and 88 between the I-beams 66 and 67 which may be filled with any suitable heavy material for adding weight to the framework to force the bucket 17 down into the muck at the face of the shaft.

Referring now to Figure 5 in particular, this figure illustrates the mounting and construction of the plow 16. The plow 16 is mounted on the front end of the carriage 11 by webs 89 and an angle iron 90 that is fastened to the front member 11*a* of the carriage 11. The plow 16 has side flanges 91 which are spaced far enough apart to receive the side walls of the bucket 17 between them. Figure 5 illustrates by dotted lines several positions of the digging fingers 17*a* of the bucket as the bucket advances toward the plow 16. In the final or load carrying position of the bucket shown in Figure 5, the plow 16 and the bucket cooperated to hold the load while the carriage is being pulled up from the face of the shaft to a dumping position. Dumping can be readily accomplished by extending the part 18 of the pivoted frame and raising the pivoted frame slightly so that the bucket 17 will turn its open side down to discharge the material therein. The carriage is then lowered into the shaft again. When the carriage is in loading position the jack 22 is operated by supplying hydraulic fluid thereto to lift the frame 18—19 to the position shown in Figure 1. The motor 52 is then operated to extend the part 18 of the frame. This will cause the bucket to swing downward from its load carrying position and forward to the position shown in Figure 1. In this position the bucket is inverted with its open end facing outward toward the face of the shaft and away from the machine. The pressure is released on the jack 22 allowing the frame 18—19 to drop and bringing the bucket 17 into contact with the muck at the face of the shaft. The frame part 18 is then retracted. As it is retracted, the cables 39 force the bucket 17 to rotate downwardly so that the digging edge 17*a* of the bucket digs into the muck as the bucket is returned to upright or loading position. I have not shown the controls for the motor 52 and the jack 22 since they obviously may be of any suitable type to effect the operation just described. Various other details of the construction have not been described since they are not essential to the operation of the machine.

It is believed that the nature and advantages of my invention will be apparent from the foregoing description. Having thus described my invention, I claim:

1. A mucking machine comprising a carriage, a frame pivotally supported on said carriage, said

frame comprising a supporting part and an extensible part slidably mounted on the supporting part and projecting therefrom, a bucket rotatably mounted on the projecting end of the extensible part, means to extend and retract the extensible part, and mechanism operable by outward movement of the extensible part to turn the bucket on its axis in a direction to cause the open end of the bucket to face away from the carriage, said mechanism being operable to turn the open end of the bucket downward and rearwardly toward the carriage as the extensible part is retracted.

2. A mucking machine comprising in combination a carriage, an extensible frame having one end pivotally supported on the carriage, said frame having a digging bucket pivotally supported on its free end, means to raise said frame, means to extend and retract the frame, and connecting members on the bucket and frame operable by extension of the frame to invert the bucket and face it away from the carriage, said members being operable by retraction of the frame to swing the bucket downwardly and toward the carriage.

3. A mucking machine comprising in combination a carriage, an extensible frame having one end pivotally supported on the carriage, said frame having a digging bucket pivotally supported on its free end, means to raise said frame, means to extend and retract the frame, and connecting members on the bucket and frame operable by extension of the frame to invert the bucket and face it away from the carriage, said members being operable by retraction of the frame to swing the bucket downwardly and toward the carriage and a plow on the carriage receiving the open end of the bucket when the bucket is retracted.

4. A mucking machine comprising in combination a carriage having a plow at one end, a bucket supporting frame mounted on said carriage, said frame comprising two parts, one part having one end pivoted on the carriage, power means supported on the carriage to lift the other end of said pivoted part, the other part of said frame being slidably supported by the first named part so it may be extended and retracted in any position of the first named part, a bucket pivoted centrally of its sides on the free end of the extensible part and held in load carrying position when said part is not extended, means operable by extension of said part to invert the bucket and means operable by retraction of the said part to return the bucket to load carrying position.

5. In a mucking machine a carriage, a bucket supporting frame comprising two parts one movable endwise on the other to project beyond it said frame being pivotally mounted at one end on said carriage, a bucket pivotel centrally of its sides on the free end of the movable part of said frame, cable fastening sheave members on the bucket and cables secured thereto and to the

frame to rotate the bucket downward from an inverted position with the open end of the bucket facing away from the frame to a load carrying upright position with the open end of the bucket toward the frame.

6. A mucking machine comprising in combination a carriage, an extensible frame having one end pivotally supported on the carriage, said frame having a digging bucket pivotally supported on its free end, means to raise said frame, means to extend and retract the frame, and connecting members on the bucket and frame operable by extension of the frame to invert the bucket and face it away from the carriage, said members being operable by retraction of the frame to swing the bucket downwardly and toward the carriage and a plow on the carriage receiving the open end of the bucket when the bucket is retracted, said members comprising a sheave fixed on the bucket, flexible members trained around said sheave, a sheave on the frame movable with the free end of the frame, one flexible member extending from said first named sheave about the second named sheave and secured to a nonextensible part of said frame, and the other flexible member extending from the first named sheave and anchored to a nonextensible part of said frame.

7. A mucking machine comprising a carriage, a frame pivotally supported on said carriage, said frame comprising a supporting part and an extensible part slidably mounted on the supporting part and projecting therefrom, a bucket rotatably mounted on the projecting end of the extensible part, means to extend and retract the extensible part, and mechanism operable by outward movement of the extensible part to turn the bucket on its axis in a direction to cause the open end of the bucket to face away from the carriage, said mechanism being operable to turn the open end of the bucket downward and rearwardly toward the carriage as the extensible part is retracted, said mechanism comprising a sheave fixed on the bucket, a second sheave on the extensible part of the frame, and flexible means fixed to the supporting part of said frame and trained around said sheaves.

STANLEY W. McDOUGALL.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
978,540	Barnett	Dec. 13, 1910
1,300,111	Billings	Apr. 8, 1919
2,346,471	Colovich	Apr. 11, 1944
2,348,796	Ferwerda et al.	May 16, 1944
2,409,752	Goodwin	Oct. 22, 1946
2,441,582	McDade	May 18, 1946
2,489,898	Kluckhohn	Nov. 29, 1949