W. E. TRENT.

MUCKING APPARATUS.

APPLICATION FILED MAR. 2, 1912.

1,073,184.

Patented Sept. 16, 1913.

2 SHEETS—SHEET 1.

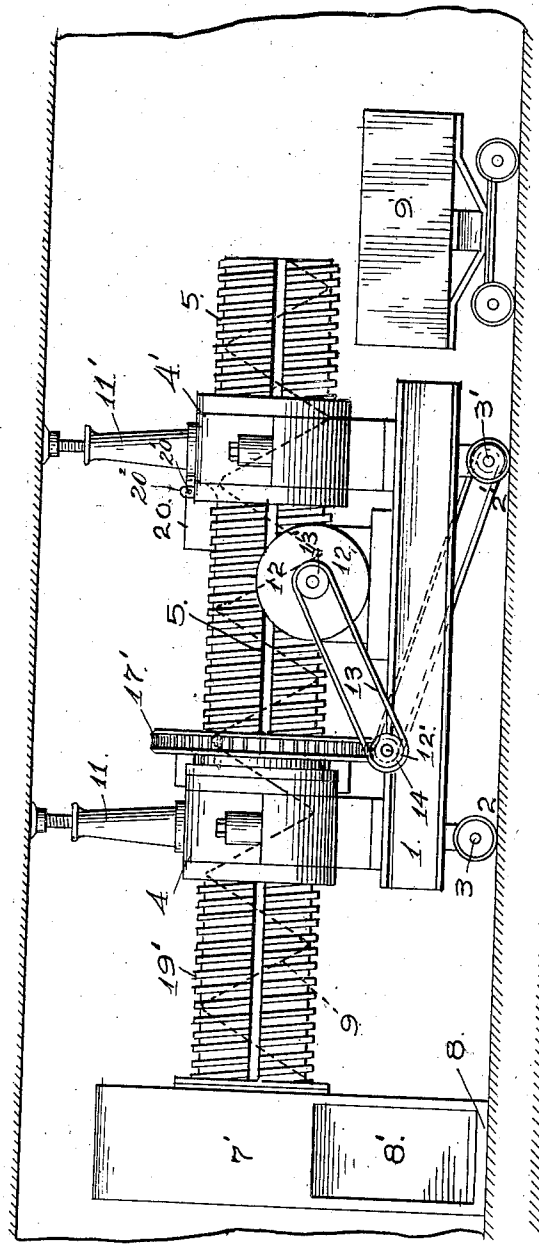


Fig. 1

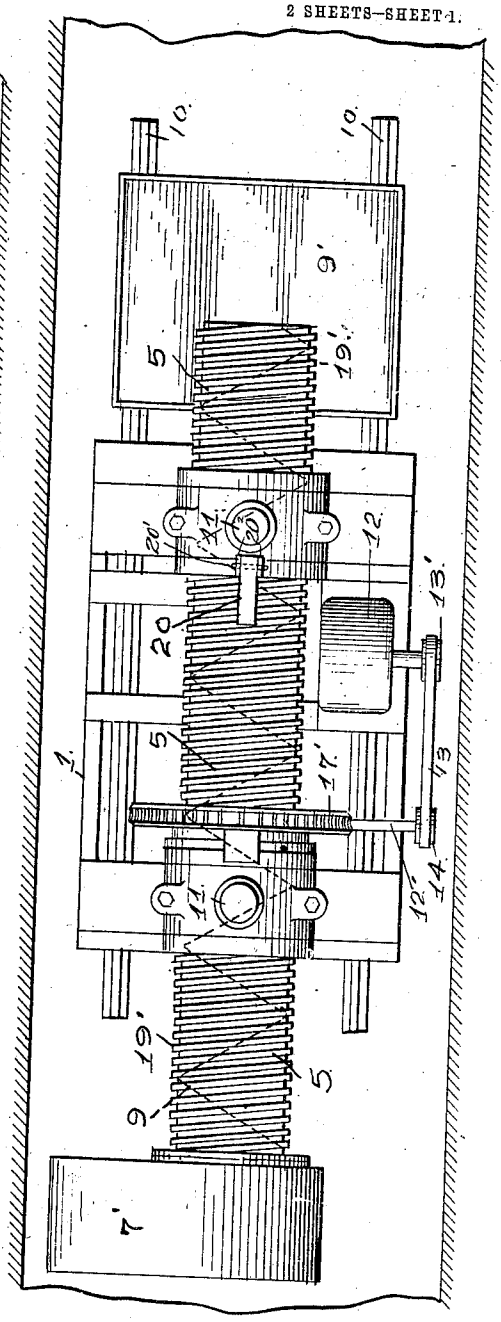


Fig. 2

Witnesses

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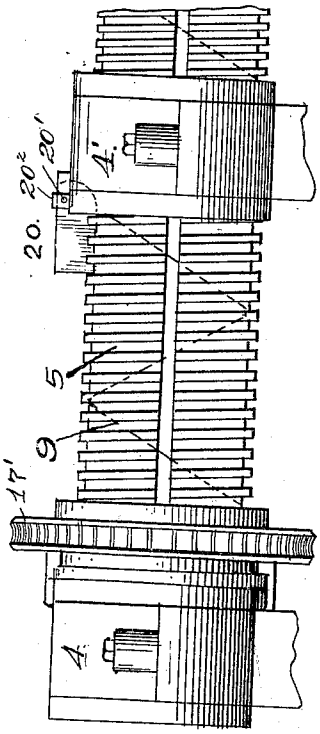


Fig. 5.

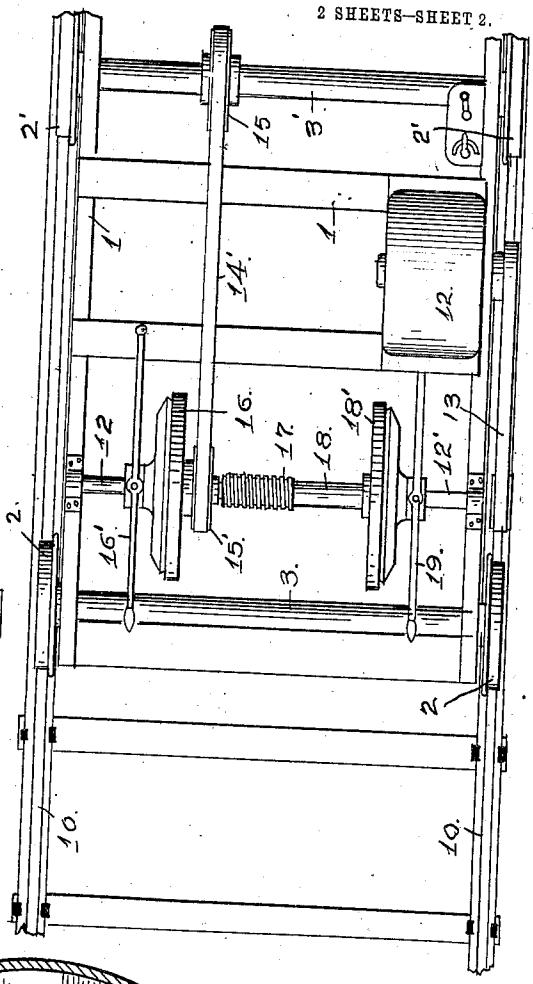


Fig. 4.

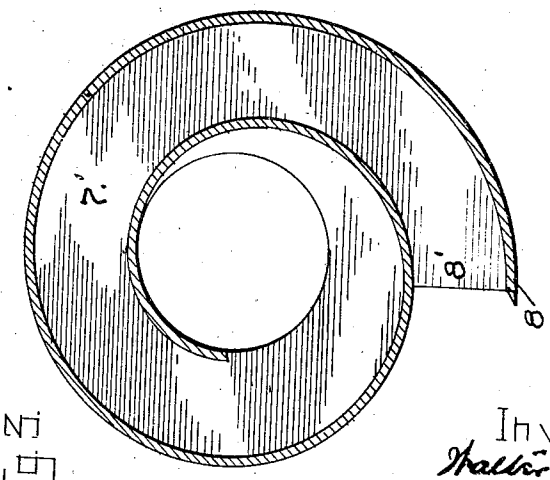


Fig. 6.

Witnesses

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UNITED STATES PATENT OFFICE.

WALTER E. TRENT, OF RENO, NEVADA.

MUCKING APPARATUS.

1,073,184. Specification of Letters Patent. Patented Sept. 16, 1913.

Application filed March 2, 1912. Serial No. 681,152.

To all whom it may concern:

Be it known that I, WALTER E. TRENT, a citizen of the United States, residing at Reno, in the county of Washoe and State of Nevada, have invented certain new and useful Improvements in Mucking Apparatus, of which the following is a specification.

The present invention relates to an apparatus for following the drilling or blasting operation in the driving of a mine or railway tunnel, the purpose thereof being to remove the debris or loose soil broken down within the tunnel by the operators in advance thereof; the object of the invention being the production of a simple, efficient, and durable machine for successfully removing the soil and rock displaced by the drilling and blasting operation, a machine which will handle a large tonnage per day, and one which will dispense with the employment of a large force or working crew of men as at present required for removing such material from within the tunnel as the work therein progresses, the machine being of such a character as not only to remove the loose or falling material, but at the same time leave the interior wall surface of the tunnel in a substantially finished condition.

In general, the apparatus comprises a suitable supporting structure, a rotatable delivery cylinder or tube mounted thereon, a spiral scoop for elevating the loosened material and discharging the same into the delivery cylinder, mechanism for propelling the supporting structure and imparting rotation to the delivery cylinder or tube, and means for controlling the longitudinal feed of the said cylinder or tube.

To comprehend the invention, reference should be had to the accompanying sheets of drawings, wherein—

Figure 1 is a side elevation of the improved apparatus illustrated as positioned within a tunnel under course of construction, the tunnel being broken away for purpose of illustration. Fig. 2 is a top plan view of the apparatus. Fig. 3 is a front elevation of the rotatable cylinder or tube with the spiral scoop applied thereto. Fig. 4 is a plan view of the supporting structure with the rotatable cylinder or tube and parts supported thereby removed, said view disclosing the general arrangement of the mechanism for imparting rotation to the rotatable cylinder or tube and feed movement to the supporting structure. Fig. 5 is an enlarged detail view of the lock nut for engaging with the threads of the rotatable cylinder or tube for causing longitudinal travel thereof relative to the supporting structure, said nut being illustrated in engagement with the outer threads of the cylinder or tube, which is partly broken away.

In the drawings, the numeral 1 is used to designate any suitable form of a supporting frame capable of sustaining the working parts of the apparatus, the same being supported by the forward wheels 2 and the rear wheels 2′, mounted respectively on the forward axle 3 and rear axle 3′. From the supporting frame or bed 1 upwardly springs the spaced bearing pillar blocks 4 and 4′, within and through which works the longitudinally disposed rotatable cylinder or tube 5. At its forward end portion the rotatable cylinder or tube 5 carries a spiral scoop 7′, the outer end of which is provided with a shovel extension 8, and said scoop discharges the material elevated thereby into the cylinder or tube 5 through the inlet or feed opening 8′. The scoop 7′ which is fastened to the forward end of the cylinder or tube serves as a laterally projected auger for cutting, elevating and discharging the material to be removed from within the tunnel into the cylinder or tube 5, the size of the scoop from the axis of the said cylinder or tube 5 to its extreme cutting or shovel edge of its shovel extension 8 being approximately one-half the diameter of the tunnel to be formed, so that with each revolution of the cylinder or tube 5 the scoop 7′ will travel approximately the circumference of the tunnel, the cutting or shovel edge of its shovel extension acting close to the complete wall of the tunnel. As rotation is imparted to the cylinder or tube 5, the spiral scoop or shovel 7′ picks up the loosened material in advance thereof and discharges the same into the cylinder or tube 5, where the material is acted on by the spiral rib 9 therein which serves as a worm for forcing the received material through the cylinder or tube and discharging the same at the rear end thereof, which delivers the material into a car 9′ situated at the rear end of the apparatus to receive the same.

The apparatus as a whole moves within the tunnel on supporting tracks 10 placed therein to receive the same, which tracks or rails are extended within the tunnel as

the work therein advances, and the apparatus is held securely in place within the tunnel during the longitudinal or feed movement of the rotating cylinder or tube 5 by means of the jacks 11 and 11′ which are supported by the pillar blocks 4 and 4′ and adjusted to bear against the roof of the tunnel being formed. It may be desirable at times to throw the nut 20 out of engagement with the spiral screw threads, and rotate the cylinder or tube 5 independently of any longitudinal movement thereof relative to the frame, and as the material is removed to advance the entire machine as far as the tracks extend and when this point is reached to throw the nut into engagement with the spiral screw threads and advance the tube simultaneously with the rotation thereof. When it is desired to forwardly advance the supporting frame or structure after the rotatable cylinder or tube 5 has moved forwardly its full distance in advance thereof, and then screwed back to its normal starting position, in order to position the spiral shovel for a new section of work, the jacks 11 and 11′ are screwed down and the entire apparatus moved forwardly within the tunnel a distance equal to the projection of the rotatable cylinder or tube beyond the same, the jacks being then screwed up to hold the apparatus locked in said position.

The apparatus is operated by any suitable type of a reversible motor or engine 12, in the present case an electric motor being employed, the power of which is transmitted to a drive shaft 12′ by a chain 13 working over a sprocket wheel 13′ on the motor shaft and a sprocket wheel 14 on the drive shaft 12′. The rotation of the drive shaft is transmitted to the rear axle 3′ of the supporting structure in any suitable manner, as, for instance, by a drive chain 14′ working over a sprocket wheel 15 of the rear axle 3′ and a sprocket wheel 15′ loose on the drive shaft 12′, the said sprocket wheel 15′ being thrown into and out of locked engagement with the drive shaft 12′ by means of the actuating friction clutch 16, thrown into engagement with the hub thereof by a hand controlled lever 16′ extended to a point within convenient reach of the operator of the machine.

In addition to the sprocket 15′ loose on the drive shaft 12′, there is loosely mounted thereon a worm 17, in mesh with the worm gear ring 17′ through which the rotatable cylinder or tube 5 extends, being feathered thereto. The hub 18 of the worm 17 is engaged by a friction clutch 18′ secured to the drive shaft for imparting motion or rotation thereto for driving the cylinder or tube 5, the said clutch being controlled by a hand actuated lever 19 extended to within convenient reach of the operator of the machine. In this manner the power of the actuating motor is transmitted for imparting rotation to the cylinder or tube 5, the direction of its rotation depending upon the rotary motion transmitted to the drive shaft.

For imparting forward and rearward longitudinal movement to the rotatable cylinder or tube 5, depending upon the direction of rotation imparted to the drive shaft 12′, the said cylinder or tube is provided with the external screw-threads 19′, for its full length, which are engaged by the internally threaded segmental nut 20, pivotally mounted as at 20′ between suitable ears 20^2 extending upwardly from one of the pillar blocks, say 4′. When the said nut is in mesh with the external threads of the cylinder or tube 5, a longitudinal feed movement is imparted to said cylinder or tube during the rotary movement thereof, which longitudinal movement ceases the moment the feed nut 20 is thrown out of engagement with the external threads of the cylinder or tube 5. The forward movement of the said cylinder or tube is regulated in accordance with the work of removing the loose soil or debris within the tunnel in advance thereof, the same being held against forward feed until the spiral scoop has taken up the dirt to the extent of its full width and formed a clean inner wall to the tunnel during the rotary movement thereof, the cylinder or tube being then advanced forward another step by throwing the feed nut into engagement therewith, such step feed continuing until the cylinder or tube 5 has moved outwardly its full distance, and the tunnel cleaned to such a point. By then reversing the drive motor, an inward longitudinal feed will be transmitted to the cylinder or tube 5, provided the feed nut be thrown into engagement with the external threads thereof, to force the same its full inward distance, at which time the feed nut is moved out of locked engagement therewith and the clutch 18′ disconnected from the hub 18 of the worm 17. The reversing controller for the motor is then thrown to impart forward travel to the structure, the lever 16′ being operated to place the clutch 16 into engagement with the hub of the sprocket wheel 15′, thus forwardly advancing the structure the desired distance, when the clutch 16 is thrown out of engagement with the sprocket wheel 15′ and the clutch 18′ thrown to connect the worm 17 to the drive shaft 12′ for imparting rotation to the cylinder or tube 5 and the spiral shovel 7′ carried thereby.

By the use of the described apparatus the work of removing the loose material from within the tunnel is in keeping with the advance work of drilling and blasting, leav-

ing the same in a finished condition. As the car 9′ located at the rear end of cylinder 5 becomes filled with material, the same is removed and an empty car placed beneath the discharge end of the cylinder 5.

I am aware that various changes may be made in the construction of the various working parts of the described apparatus without creating a departure from the invention, and I do not therefore wish to be understood as restricting myself to the details of construction of the working parts shown and described.

Having thus described the invention what is claimed as new and desired to be protected by Letters Patent is—

1. In an apparatus for the described purpose, the combination with a supporting structure, of drive mechanism for imparting longitudinal travel thereto, a rotatable tube mounted within bearings on the supporting structure, an elevating scoop secured to the forward end portion of said tube for raising material and discharging the same therein, devices actuated by the drive mechanism for imparting rotation to the rotatable tube and the scoop carried thereby, and independently operated means for imparting longitudinal movement to the said tube during the rotary motion thereof.

2. In an apparatus for the described purpose, the combination with a longitudinally disposed rotatable tube, provided for its full length with external screw threads, of a scoop carried at the forward end thereof and rotatable therewith, of mechanism for imparting longitudinal movement to the rotatable tube, means for receiving and removing the material discharged from the said tube, and a feed nut for engaging with the external threads of the tube for controlling the longitudinal movement of the said tube during the rotation thereof.

3. In an apparatus for the described purpose, the combination with a supporting structure provided with bearing pillars, of drive mechanism for imparting longitudinal movement thereto, a longitudinally disposed rotatable tube working within the said bearing blocks, said tube being provided with an internal helical rib and being externally screw-threaded, a worm ring feathered to said tube, a scoop carried at the outer end portion of said tube for receiving material and discharging the same into the tube, a worm for engaging the worm ring of the tube, devices for locking said worm to the drive mechanism for actuating the worm ring for imparting rotation to the tube, and a feed nut for engaging the external threads of the tube for imparting longitudinal movement to the said tube during the rotary movement thereof.

4. In an apparatus for the described purpose, the combination with a supporting structure, of drive mechanism for imparting longitudinal travel thereto, a longitudinally movable and rotatable tube mounted in bearings of the supporting structure, said tube being provided with an internal helical rib extended throughout the length thereof, of means actuated from the drive mechanism for imparting rotation to the tube, a spiral scoop carried at the outer end portion of the tube and rotatable therewith for elevating material to be removed and discharging the same into the said tube, of devices controlling the longitudinal movement of the tube, and means for receiving the material discharged from the said tube.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WALTER E. TRENT.

Witnesses:
N. A. ACKER,
D. B. RICHARDS.