Aug. 19, 1924. 1,505,195

C. C. HANSEN

TRENCH DIGGER

Filed March 1, 1924 3 Sheets-Sheet 1

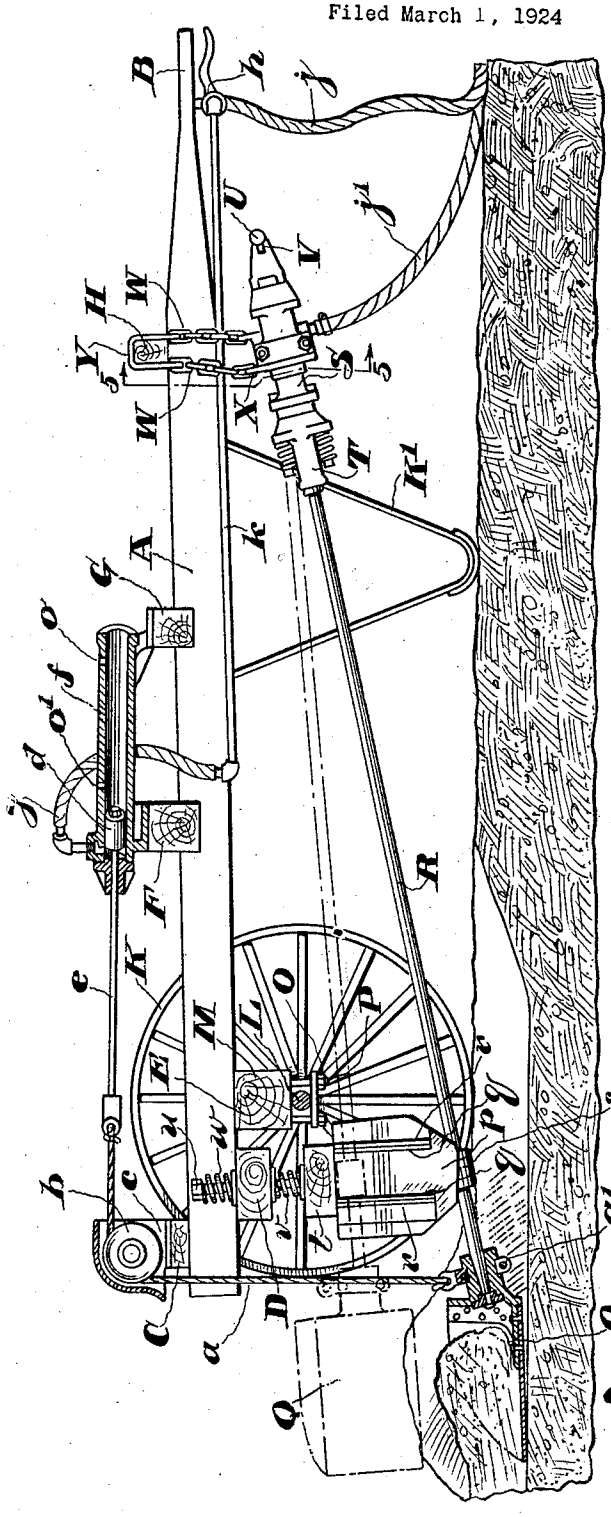


Fig. 1.

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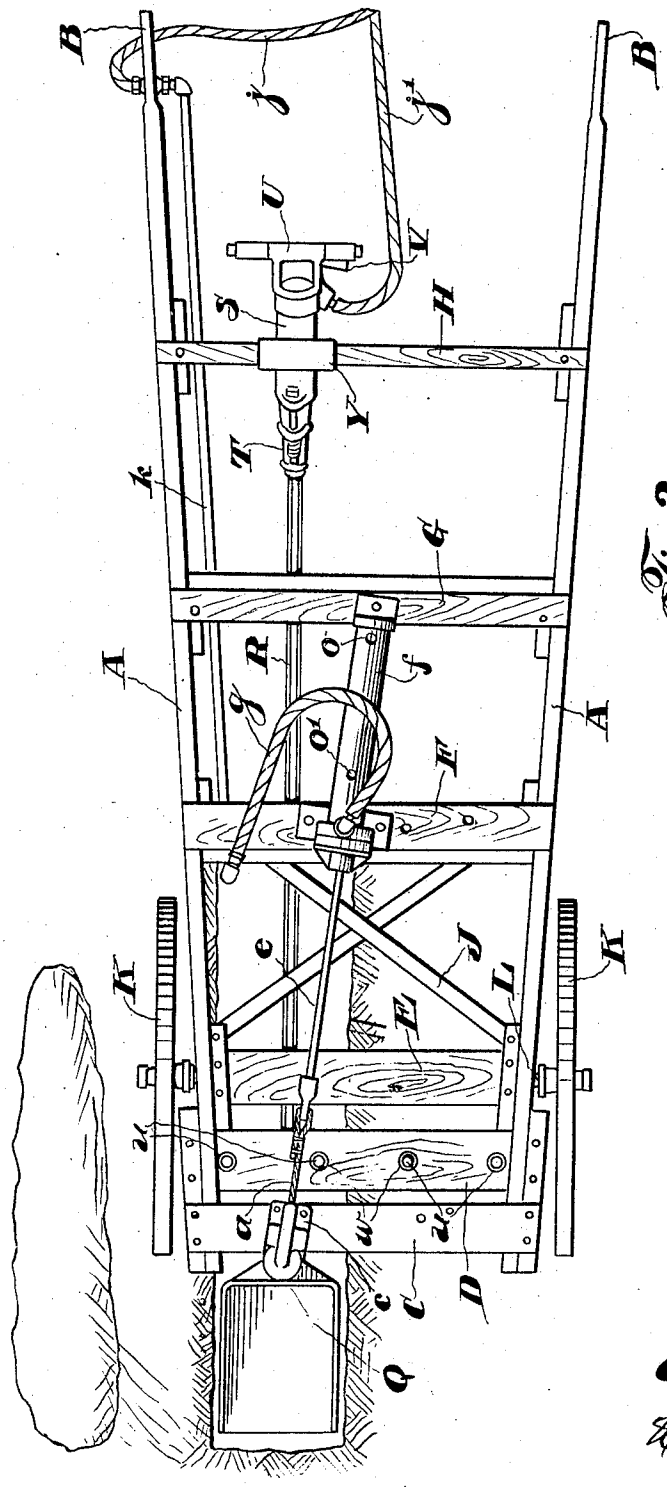


Fig. 2.

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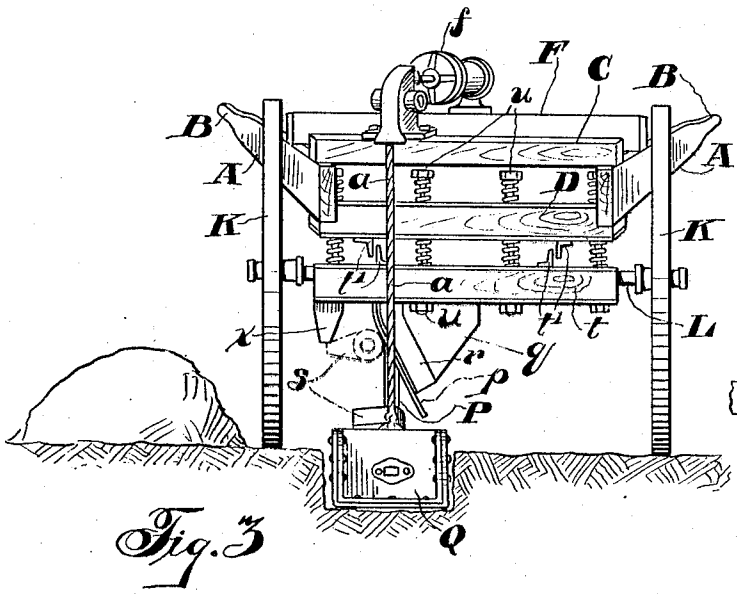


Fig. 3

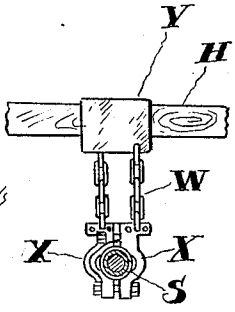


Fig. 5.

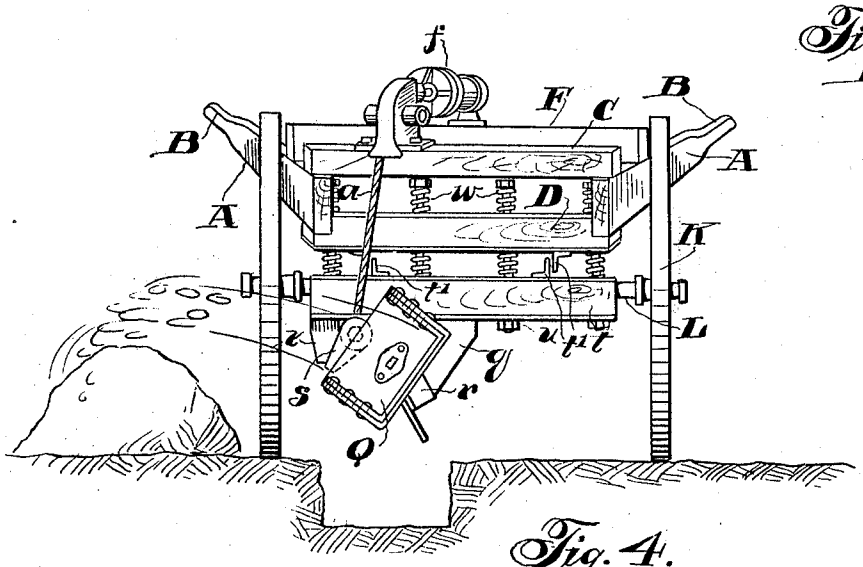


Fig. 4.

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UNITED STATES PATENT OFFICE.

CHARLES C. HANSEN, OF EASTON, PENNSYLVANIA, ASSIGNOR TO INGERSOLL-RAND COMPANY, OF JERSEY CITY, NEW JERSEY, A CORPORATION OF NEW JERSEY.

TRENCH DIGGER.

Application filed March 1, 1924. Serial No. 696,115.

To all whom it may concern:

Be it known that I, CHARLES C. HANSEN, a citizen of the United States, and a resident of Easton, county of Northampton, and State of Pennsylvania, have invented a certain Trench Digger, of which the following is a specification, accompanied by drawings.

This invention relates to excavating machines and includes features which are of general application though having special adaptability for use in devices for digging trenches, ditches and the like.

It is an object of this invention to facilitate the digging of trenches or other excavation work automatically and preferably by pneumatic or pressure fluid means lessening the manual labor usually employed for such operations.

This and other objects are accomplished by providing a wheeled machine capable of being pushed forward by a single operator and completely operated by him from his normal position at the rear of the machine. By a very slight effort on the part of the operator comparatively large quantities of material may be removed at each operation, the shoveling portion of the machine being forced into the material to be removed by pneumatic percussive means and removed as well by pneumatic devices. The material thus loaded on the shovel and raised is automatically swung laterally and dumped or thrown to the side by means which cooperates with the lifting devices.

The invention will be more clearly understood by referring to the drawings which illustrates an improved form which the invention may assume in practice.

In the drawings, Figure 1 is the side elevation in section of an excavating machine constructed in accordance with the practice of the invention and indicates the manner in which the shovel is automatically operated.

Figure 2 is a plan view of the machine showing more particularly the arrangement which the parts bear with respect to the trench in process of being excavated.

Figure 3 is a front view of the machine with the shovel in its normal position,

Figure 4 is a front view of the machine with the shovel raised and tilted to automatically throw the excavated material beyond the side of the frame or carriage, and

Figure 5 is a sectional view taken along the line 5—5 looking in the direction of the arrows, and showing the means for supporting from the frame the pneumatic percussive means for driving the shovel forwardly.

Referring to the drawings, the frame of the machine consists of a pair of laterally extending side bars A terminating at the rear in a pair of handles B adapted to be grasped by the operator for the purpose of propelling the machine. The side bars A are connected by a plurality of cross pieces C, D, E, F, G, and H, and diagonals J forming a rigid frame to withstand the shocks of the apparatus suspended therefrom. Toward the forward end a pair of wheels K mounted on an axle L supports the frame A as by means of a block M and a clamp consisting of a plate O and bolts P. Rearwardly of the wheels K there are provided rests K′ in the form of rods bent to a V-shape and attached to the under side of the side bars A.

Forwardly and below the frame there is suspended a shovel Q, the heel of which is provided with a handle in the form of a long bar R extending rearwardly from the shovel and having a shank suitably formed to fit into and cooperate with means preferably fluid actuated, for thrusting the shovel forwardly into the ground or other material to be excavated. To this end this means comprises a pneumatic percussive tool S having a front head T to receive the shank of the handle R and a grip U against which the operator exerts a pressure to steady and direct the shovel Q as well as the tool S. If desired, the tool S may be of the type ordinarily known as a hammer drill which is provided with a hammer piston (not shown) for striking rapidly against the shank of a steel fitting into the chuck (not shown) in the front head T. The shank of the handle R is fitted into the chuck of the front head T in the same manner as a drill steel ordinarily would be, and, upon operating the throttle V controlling the supply of air to the tool S, rapid blows are struck on the end of the handle R. The tool S forces the edge of the shovel Q into the ground until the shovel is full of dirt or other material to be excavated. In order to place the grip U of the tool S within easy reach of the operator, the tool is suspended from the

cross bar H as by means of a pair of chains W attached to lugs X on opposite sides of the tool and connected in a suitable manner with the U-shaped plate Y fitting over the cross piece H. The chains W attached to opposite ends of the U-shaped plate Y and on opposite sides of the tool S tend to allow the tool S to swing when pushed forwardly by the operator due to the suspension of the chains W and the rope *a*. The chains W being attached to opposite sides of the tool S (Figure 5), there is no tendency of the tool to rotate. This assists in keeping the shovel Q horizontal while driving it forward.

The shovel Q is suspended from the frame by a flexible cable, chain or rope *a* attached to a loose collar *a'* at the heel of the shovels and passes over a pulley *b* mounted by means of a bracket *c* on the cross piece C. The other end of the cable *a* is connected with a fluid operative means for raising the shovel which consists of a piston *d* on the end of a piston rod *e* working within a cylinder *f* into which motive fluid such as, for instance, compressed air is introduced through a hose *g*. A suitable throttle lever *h* controls the flow of compressed air from the supply pipe *j* into a pipe *k* connected with the hose *g*, and being located near one of the handles B, the operator may control the operation of the raising means without reaching unduly. As shown in Figure 1 the cylinder *f* is provided with a plurality of small escape ports *o* which limit the travel of the piston *d* since air admitted into the front end of the cylinder may escape through these ports, if the piston *d* travels back sufficiently far to uncover them. A leak port *o'* is provided to allow the motive fluid to escape from the cylinder *f* when the throttle *h* is closed and is located in such a position in the cylinder *f* that the downward movement of the shovel Q will be cushioned by the fluid entrapped in the cylinder *f*. Thus when the shovel Q is raised by admitting air into the cylinder *f* the danger of breaking the cable *a* is diminished.

Upon raising the shovel Q it is desirable to provide means for swinging the load laterally so as to remove it from above the trench and to tilt and dump the shovel. To this end there is provided a guide which in this instance consists of a curved plate *p* extending downwardly in the path of the handle R of the shovel Q the plate *p* being reinforced by a web *q* attached thereto by means of the angles *r*. On the handle R there is attached a cam *s* which is adapted to ride on its circular face on the plate *p*. As the shovel Q is elevated, the handle R is swung laterally so that the material in the shovel may be dumped off to one side and not back into the trench. The guide plate *p* and its stiffening web *q* are mounted in a suitable manner upon a beam *t* spring suspended from the cross piece C as by means of the bolts *u* passing through beams *t* and the cross piece D, and having the encircling springs *v* for absorbing the shock as the cam *s* strikes the under face of the beam *t*. Other springs *w* on the bolts *u*, held thereon by the bolt heads, prevent the bolt head from injuring the beam D when the shovel Q is released and allowed to drop, and to provide a spring suspension in both directions for the beam *t*. The angles *t'* prevent end motion of the beam *t* due to the side thrust on the plate *p*. To tilt the shovel there is preferably provided a cam *s* which strikes an abutment *x* mounted on the beam *t* and causes the shovel Q to tilt its open face toward one side as shown in Figure 4. Preferably, the air pressure is admitted to the cylinder *f* by opening wide the throttle *h*, whereupon the shovel rises rapidly, is swung over to the side and tilted. The force and momentum resulting from these movements causes the material in the shovel Q to be projected with considerable force sidewise beyond the path of the wheels K.

The operation of the excavating machine is clear from the above description, it being noted that the operator stands at the rear of the machine where he can propel the device forward or to the rear and operate the throttle *h* of the raising cylinder *f*, and without reaching unduly operate the percussive tool S by grasping the grip U swinging it forwardly and rearwardly on the chains W and the rope *a* and pressing the throttle V.

The air supply may be connected to the various pneumatic devices in any suitable manner as for instance to the cylinder *f* by means of the pipe connection *k* and hose connections *g* and *j* and to the percussive tool S by means of the hose connection *j'*.

As shown in the drawing, the shovel is suspended preferably nearer one side of the machine, that is to say nearer one of the wheels K. The object of this arrangement is to throw the material from the shovel Q as little distance as necessary without obstructing the progress of the machine along the trench by unloading in front of the wheels K. If it is desired to throw the material to the opposite side of the trench, the beam *t* carrying the guide plate *p* may be removed and reversed by removing suitable bolts, the cylinder *f* is bolted to the cross piece F on the opposite side, and the bracket *c* is removed to the other side of the cross piece C. The cam *s* is reversed by driving the shovel Q from the tapered end of the handle R and turning the cam *s* and the handle R over to the opposite side. The plate Y is slid over on the cross piece H not bolted thereto.

I claim:

1. An excavating machine comprising a frame, a shovel suspended from said frame, fluid actuated percussive means for driving said shovel forward, means for raising said shovel, and automatic means to tilt and dump said shovel upon elevation thereof to a predetermined height.

2. An excavating machine comprising a frame, a shovel suspended from said frame, fluid actuated percussive means supported by said frame and adapted to thrust said shovel forward, means to raise said shovel, a guide to swing said shovel laterally, and automatic means to tilt and dump said shovel upon elevation thereof to a predetermined height.

3. An excavating machine comprising a frame, a shovel suspended from said frame, fluid actuated percussive means to thrust said shovel forward, means for raising said shovel, a guide to swing said shovel laterally upon raising thereof, and a cam to tilt and dump said shovel upon elevation thereof to a predetermined height.

4. An excavating machine comprising a frame, a shovel suspended from said frame, fluid actuated percussive means suspended from said frame for thrusting said shovel forward, pneumatic means to raise said shovel, a guide to swing said shovel laterally, a cam to tilt and dump said shovel upon elevation thereof to a predetermined height, and a spring bumper for said shovel to strike.

5. An excavating machine comprising a frame having two forward supporting wheels and a rearward rest, a shovel suspended from said frame and forwardly thereof and having a handle extending rearwardly, fluid actuated percussive means cooperative with said handle to thrust said shovel forwardly, means for raising said shovel, a guide to swing said shovel laterally, and means to tilt and dump said shovel.

6. An excavating machine comprising a frame having forward supporting wheels and a rearward rest, a shovel suspended from said frame having a rearwardly extending handle, pneumatic percussive means cooperating with said handle to thrust said shovel forwardly, fluid actuated means for raising said shovel, a guide to swing said shovel laterally, and means to tilt and dump said shovel at a predetermined height.

7. An excavating machine comprising a frame having two forward supporting wheels and a rearward rest, a shovel pivotally suspended below and forwardly of the said frame and having a handle extending rearwardly, pneumatic percussive means suspended from said frame and cooperative with said handle to thrust said shovel forwardly, automatic means to raise said shovel, a guide to swing said shovel laterally, and a cam on said shovel handle to tilt and dump said shovel upon elevation thereof to a predetermined height.

8. An excavating machine comprising a frame having forward supporting wheels and a rearward rest, a shovel suspended below and forwardly of said frame and having a rearwardly extending handle, a pneumatic hammer cooperative with said handle to thrust said shovel forwardly, a cylinder, a pneumatically operated piston therein for raising said shovel, a cam on said shovel handle, a curved guide adapted to bear against said cam to swing said shovel laterally, and an abutment actuating said cam to tilt and dump said shovel upon elevation thereof to a predetermined height.

9. An excavating machine comprising a frame having forward supporting wheels and a rearward rest, a shovel suspended below and forwardly of said frame having a rearwardly extending handle, a pneumatic hammer cooperative with said handle to thrust said shovel forwardly, a cylinder and pneumatically operated piston therein for raising said shovel, a cam on said shovel handle, a curved guide adapted to bear against said cam to swing said shovel laterally, an abutment actuating said cam to tilt and dump said shovel upon elevation thereof to a predetermined height, and a spring suspension for said abutment.

In testimony whereof I have signed this specification.

CHARLES C. HANSEN.