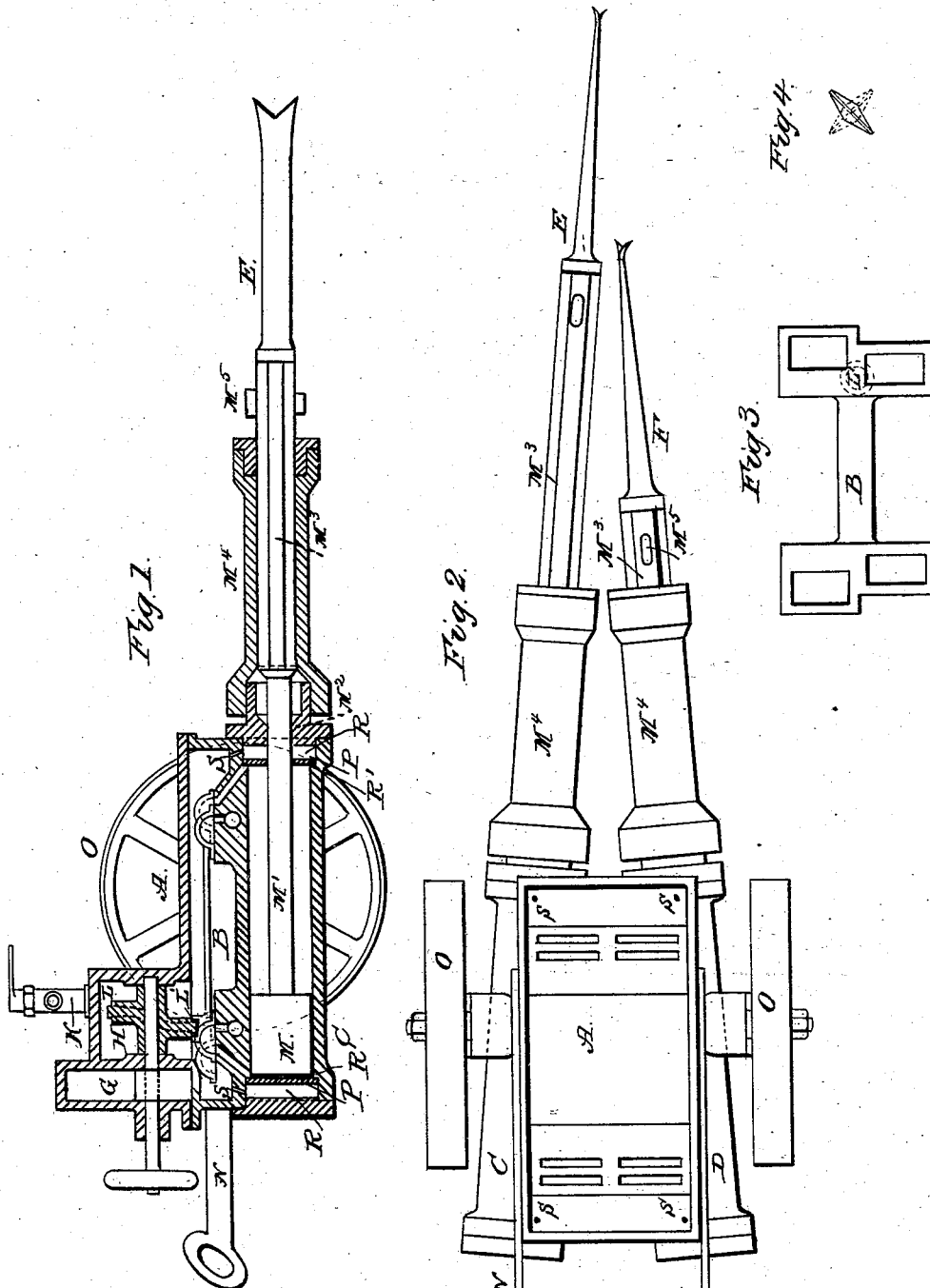


(No Model.)

E. HILL.
MINING MACHINE.

No. 261,608.

Patented July 25, 1882



WITNESSES:
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UNITED STATES PATENT OFFICE.

EBENEZER HILL, OF SOUTH NORWALK, CONNECTICUT.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 261,608, dated July 25, 1882.

Application filed February 17, 1882. (No model.)

To all whom it may concern:

Be it known that I, EBENEZER HILL, of South Norwalk, in the county of Fairfield and State of Connecticut, have invented new and useful Improvements in a Mining-Machine, of which the following is a specification.

This invention is based upon the well-known mining-machines of one Harrison, for which several patents have been granted since 1876, which pertains to a machine having a single-piston engine supported on a pair of wheels and guided by an operator seated behind the machine and controlling its movements by his hands and feet. In these machines a projecting end of the piston-rod is armed with a pick or chisel that is driven forward into the coal by compressed air, used after the manner of steam acting upon the piston and controlled by valves, as in the ordinary steam-engine. In such mining-machines, when the piston is driven forward by the air-pressure an equal amount of force is expended in the opposite direction, which must be counterbalanced by the weight of the machine and the opposing resistance of the operator who is holding and guiding it, and the recoil is similar to that of a gun, which must be sustained by the marksman, with addition, also, that as the piston vibrates rapidly in opposite directions the recoil is constantly pushing and pulling, and hence the force of the blow and the speed of running the engine are limited by the power and endurance of the workman, and under any circumstances are exceedingly severe and very injurious to him.

To overcome these objections, and at the same time greatly increase the efficiency of the machine, is the object of this invention; and it consists chiefly in combining two piston-cylinders with the same valve-chamber in such a manner that the exterior ends of the pistons converge slightly toward each other, so that the pick or cutting-tools will tend to the same point in the coal, and by suitable valve-connections will exactly alternate with each other, or so that as one is moving forward the other will, with the approximately same amount of force, be withdrawn or move in the opposite direction, and thereby neutralize the tendency to recoil. Another advantage of such an arrangement is that, as the cylinders are placed nearly as far apart as they are long, the pistons will recip-

rocate on the opposite sides of a plane, which will have a tendency to vibrate on a common center equidistant from the wheels and at a right angle to their axis, so that as each pick or tool is drawn out of the coal a prying action will be produced, similar to the action of the common pick given by the miner when he strikes into the coal and then lifts the handle; hence the coal will, to a greater or less extent, be broken off in lumps, instead of being pulverized or reduced in small chips.

Another feature of the invention consists in providing cushioning-heads in the ends of cylinders to receive the ends of the pistons in case the tool should miss or fail to strike the coal, and thus prevent breaking the cylinder-heads.

The drawings represent, at Figure 1, a vertical section and partial elevation of the machine; and Fig. 2 shows a plan of the same with the covers off the valve-chest to show the parts or openings from the valve-chest. Fig. 3 is a plan of the valve as seen from the under side. Fig. 4 is a diagram to show the position of the ends of the tools.

The valve-chest A and the valve B are of a form similar to those used in the Harrison machine, but of double the width to reach over the two cylinders C and D, which are placed under the valve-chest and at such an angle to each other as to make the tools at E and F converge or tend to the same point.

The valve-operating mechanism is also the same as in the Harrison machine, consisting of a rotary engine, G, on the shaft of which is a disk, H, in the valve-chest and just below the throttle K, and around said disk is a rib, L, inclined to the axis, to work in a slot at L' in the back of the slide-valve B to give it its proper motions; but the valve B is so constructed that when one port is open to drive one of the pistons forward the corresponding diagonally-opposite port of the other cylinder is open to drive the other piston back, and as the valve is formed of the same piece of metal and is operated by the same cam there is no possibility of the pistons being in each other's way.

A piston is shown at M, having a piston-rod at M', extending through a stuffing-box at M², and an extension is shown at M³ in a guiding-support, M⁴, and the tool is attached in the end

of said extension of the piston-rod, and fastened by a key at M⁵, all of which parts are made similar to those in the Harrison machine. The same kind of guiding-handles N are also used, and the cylinders are supported on wheels at O in the same manner; but instead of bumpers or cushions of rubber for the piston to strike against, as in the Harrison machine, I use disks of metal, P, in each of the cylinders, which are larger in diameter than the bore of the cylinders, forming cushion-chambers. The ends of the cylinders are enlarged at R and bored to receive these disks, that work nearly air-tight, or like pistons in the said chambers, and their inner faces abut against shoulders R' at each end of the working-bore of the cylinders, and thereby serve practically as cylinder-heads to the piston-chambers proper.

From the valve-chambers small ports at S are formed, to let the air at full pressure always remain behind said metal disks, so that they are held against the shoulders R'; but in case the tool misses the coal and is driven with full force toward the end of the cylinder the piston will first trap a small quantity of air between it and the disk to prevent actual metallic contact, and the disk will then be driven back toward the cylinder-head; but the port at S, being very small, will not permit a rapid escape of the air behind the disk, and hence it will be checked before it can be driven against the cylinder-head. The pressure of the air between the disk and the head will, however, be greatly increased, and as the exhaust will be wide open the disk and the piston will both be driven back by the reactive force of the air so trapped, and the disk will assume its place against the shoulders at the end of the piston-cylinders proper.

The tools are made of the ordinary fish-tail form, as shown, and are placed to work at a right angle to each other, as in the diagram at Fig. 4. So they practically work as a revolving tool, or at least have the same advantages, and owing to the vibratory motion of the machine, as already explained, have somewhat the property of prying out the chips or lumps of coal.

The two cylinders might be placed close together and parallel to each other to work the tools in holes independent of each other; but in such a case this prying action would be lost, and, furthermore, the tools would not have the advantages of striking into the coal from the opposite sides of the hole, and hence the lumps between the angles of the tools could not be broken off.

I therefore claim—

1. In a mining machine, the combination of two pistons armed with cutting-tools, said pistons working in cylinders whose axes converge toward the cutting-point, as hereinbefore described.

2. A mining-machine having the combination of two cylinders with the same valve-chest and a simultaneously-moving valve covering and opening diagonally-located ports and operating two pistons inclined toward each other, as hereinbefore set forth.

3. A mining-machine having the combination of two pistons slightly inclined toward each other and carrying cutting-tools, mounted substantially as described, to have a vibratory action laterally or a prying action upon the material, as hereinbefore set forth.

4. A mining-machine having the combination of two pistons carrying cutters with fish-tail or similar cutting-edges, arranged to work at a right angle to each other and converging to the same point, as hereinbefore set forth.

5. A mining-machine having, in combination with its working piston or pistons, a cushioning-chamber of larger diameter than the bore of the cylinder, and a disk to work in said chamber, with a small inlet-port behind it, leading from the main valve-chest, as and for the purposes set forth.

In witness whereof I have hereunto set my hand and seal in the presence of two subscribing witnesses.

EBENEZER HILL. [L. S.]

Witnesses:

EUGENE N. ELIOT,
AARON W. WOOD.