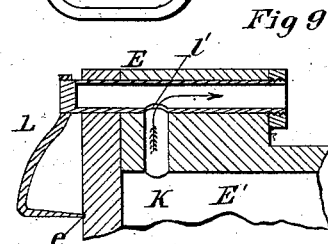
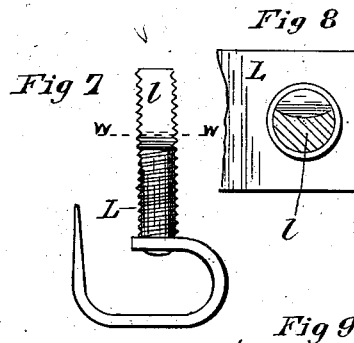
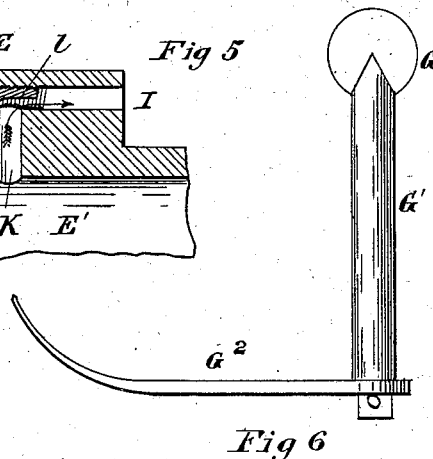
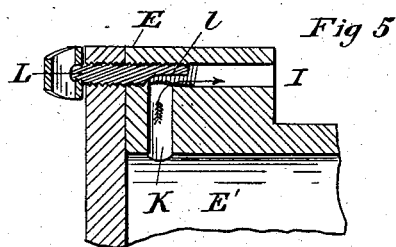
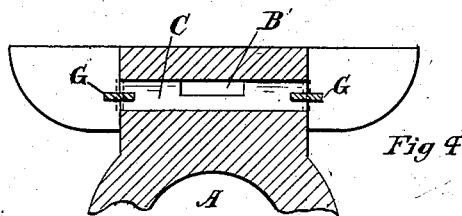
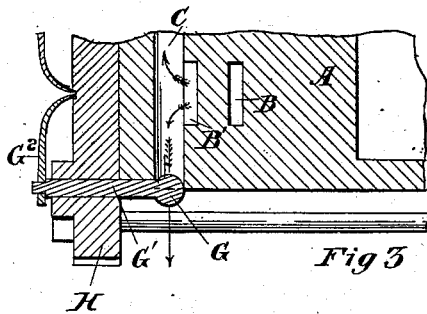
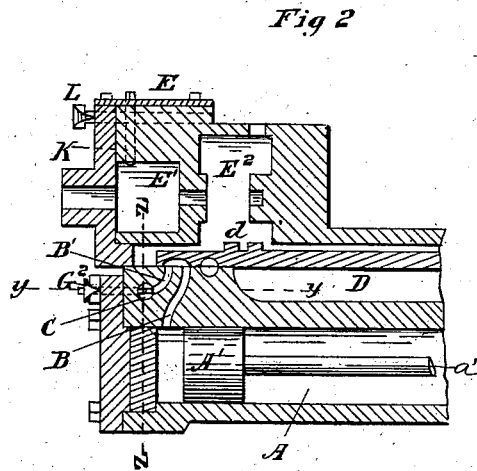
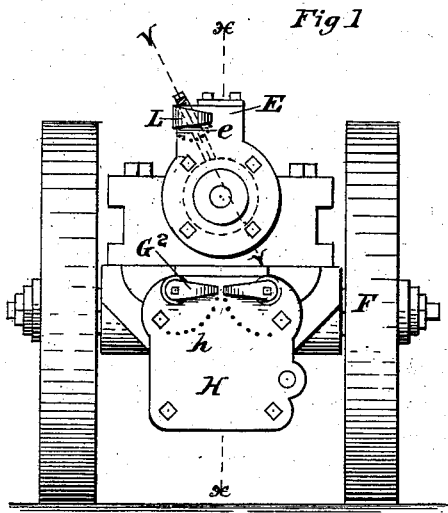


(No Model.)

G. D. WHITCOMB.  
COAL MINING MACHINE.

No. 259,956.

Patented June 20, 1882.



Witnesses

*H. C. Collier*  
*Jno. C. MacGregor*

Fig 6

Inventor  
George D. Whitcomb  
By *Edburn Thacher*  
Attorneys

# UNITED STATES PATENT OFFICE.

GEORGE D. WHITCOMB, OF CHICAGO, ILLINOIS.

## COAL-MINING MACHINE.

SPECIFICATION forming part of Letters Patent No. 259,956, dated June 20, 1882.

Application filed November 14, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, GEORGE D. WHITCOMB, a citizen of the United States, residing at the city of Chicago, in the county of Cook, in the State of Illinois, have invented certain new and useful Improvements in Coal-Mining Machines, which are fully set forth in the following specification, reference being had to the accompanying drawings, in which—

Figure 1 is a rear elevation of a mining-machine provided with my improvements. Fig. 2 is a section on the line *xx* in Fig. 1, the wheels being removed and the forward part of the machine being broken away. The eccentric cam and spiral wheel by which the sliding valve is operated are also absent. Fig. 3 is a detailed and enlarged plan-section on the line *yy* in Fig. 2, but extending somewhat beyond the section-plane of that figure. Fig. 4 is a detailed section on the line *zz*, Fig. 2, showing the upper part of the main cylinder. Fig. 5 is a section on the line *vv* in Fig. 1, looking to the left, and showing only the upper part of the auxiliary cylinder. Fig. 6 is an enlarged view of the valve regulating the escape of exhaust steam or air from the main cylinder, with its spring-handle. Fig. 7 is a similar view of the valve regulating the escape of steam or air from the auxiliary cylinder. Fig. 8 is a section on the line *ww* in Fig. 7. Fig. 9 is a section similar to Fig. 5, but showing a modified form of valve.

The same letters denote the same parts in all the figures.

My invention relates to machines for mining coal or ores which are operated by letting steam or compressed air in at the rear end and out at the forward end of a piston-cylinder, and vice versa, alternately. In the operation of these machines it has been found that the piston in its backward movement after each stroke is thrust too violently against the rear head of the cylinder, thereby producing a violent concussion and recoil, which are excessively fatiguing to the operator and unfavorably affect the durability of the machine. The use of a cushion of india-rubber or like material has not been found a sufficient remedy for this evil.

The present invention consists in an air-cushion of adjustable pressure, interposed for this purpose between the piston and the cylinder-head, and in the devices for regulating the

pressure, which will be fully described herein-after, and definitely pointed out in the claim.

The particular machine represented in the accompanying drawings is of the general construction shown in Letters Patent No. 232,792, issued September 28, 1880, to me jointly with Sarah J. Harrison, John J. Harrison, and Orange Butler, for coal-mining machines.

A denotes the main cylinder of the machine; A', the piston, which works back and forth within it, and *a'* the stem affixed to the piston and carrying the pick. The inlet-port B and the exhaust-port B', the latter opening into the exhaust-passage C, which is formed in the enlarged upper wall of the piston-cylinder, are opened and closed by the sliding valve D, which is made to reciprocate by the engagement of the slotted cap *d* on its upper surface with a spiral wheel which turns in the cavity E<sup>2</sup> of the auxiliary or valve-motor cylinder E, being on the same shaft with the eccentric cam, which turns in the cavity E' of the same cylinder. As the conformation of this wheel and cam has nothing to do with the present invention, they are omitted from the drawings.

F represents the wheels on which the frame of the machine rests. All these parts are of a construction already known.

At each end of the exhaust-passage C, I place a disk-valve, G, of area sufficient to close the passage, or nearly so. Its cylindrical stem G' has a bearing partly in a groove cut in the outer surface of the piston-cylinder and partly in the heavy plate H, which is set close against the head of the cylinder. Passing through this plate the stem carries at its outer end a spring bar or handle, G<sup>2</sup>, the outer end of which is bent toward the plate H, so that the elasticity of the spring tends to force this end into one or other of the sockets *h* in the outer surface of the plate, which are arranged in the arc described by the outer end of G<sup>2</sup> when the stem G' is turned in its bearing. By drawing this end of G<sup>2</sup> out of the socket the stem G' may be turned so as to set the disk G at any desired angle to the base of the cylindrical exhaust-passage C, and thus close that passage to a greater or less extent, according to the greater or less angle to the horizon at which the cylinder is set, and the consequently varying momentum of the back-stroke of the piston A'. Of course it is never to be entirely closed.

When the disk has been set at the desired angle the spring-handle  $G^2$  is released and immediately springs into the socket corresponding with its position, and thus holds the disk at the angle to which it has been adjusted, at the same time indicating what that angle is. By this device I provide an elastic cushion of compressed air between the piston and the head of the cylinder, whose resistance to the backward thrust of the piston is regulated by the greater or less degree to which the exhaust-passage C is closed. I can thus readily adapt this resistance to the varying force with which the piston comes back. The appliances by which this is effected are not liable to get out of order, and are obviously readily accessible for renewal in case of need.

In the end of the shell of the cylinder E which contains the auxiliary motor operating the sliding valve D, I bore a tube, I, intersecting the exhaust-outlet K. This tube forms a seat for a cylindrical valve, L. As shown in the drawings, both valve and tube are threaded; but this will ordinarily be found unnecessary. For the inner part,  $l$ , of its length about half the thickness of this valve is cut away, as shown in Figs. 5 and 8, so that by setting this part at the intersection of the exhaust-outlet K and turning the valve the exhaust-outlet can be left wide open or closed to a greater or less degree; or the valve L may be a tube with a perforation,  $l'$ , capable of being turned into or out of registry with the exhaust-outlet, as shown in Fig. 9. The valve is provided with a spring-handle,  $L'$ , substantially similar to

the handle  $G^2$ , by means of which it can be turned, the outer end of the handle springing into one of the sockets  $e$  in the outer-end surface of the auxiliary cylinder E. By thus regulating the degree of rapidity with which the air is exhausted I am enabled to regulate the motion of the cams, and consequently the motion of the sliding valve, much more accurately than by means of a valve applied at the necessarily smaller inlet-port; besides that, a valve in the latter position is liable to become obstructed by condensed water carried in by the air. This control of the rate of reciprocation of the sliding valve is of vital importance, since without it the valve is liable to reciprocate too swiftly, so that the direction of the piston is reversed before it has had time to make nearly a full stroke.

What I claim as my invention, and desire to secure by Letters Patent, is—

In a mining-machine, the main piston-cylinder, provided with an air-space between the piston and the rear cylinder-head, in combination with a sliding valve to regulate the admission and escape of air or steam, an auxiliary engine to operate the said valve, provided with the exhaust-outlet K, and a valve for regulating the escape of air or steam through this outlet, substantially as and for the purposes described.

GEO. D. WHITCOMB.

Witnesses:

THOMAS H. PEASE,  
GEO. R. CUTLER.