



# United States Patent Office.

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## IMPROVEMENT IN COAL-DIGGING APPARATUS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern.

Be it known that I, WILLIAM WARD, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Coal-Digging Apparatus; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawing making part of this specification, in which—

Figure 1 is a perspective view of my improved coal-digging apparatus, arranged for "bearing in," and

Figure 2 shows the arrangement for side cutting.

Like letters of reference indicate like parts in each.

In the mining of coal, it is usual to make a "bearing in" or horizontal excavation in the lower part of the stratum, then cut a vertical recess at each side, and then "break down" the mass of coal by wedges driven in at or near the roof.

All this work has heretofore commonly been done by hand. Such mode of mining is both slow and laborious. The use of steam as a motive or digging-power is impracticable in the most of our mines, the roofs generally being low, and the ventilation poor.

By my improved apparatus, hand power can be much more economically applied than in the ordinary way, and applied with less severe labor, and a more abundant yield.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and mode of operation.

A represents the side wall of a chamber in a coal-mine, and B the front wall, or the coal to be mined.

The apparatus I employ consists of posts *a*, beams *b*, and braces or supports *c*, the post, beam, and support on each side being hinged together, or connected by other suitable joint.

To keep such frame-work more firmly in position, I connect the opposite beams or posts, as the case may be, by cross-beams *d*, at as many points as may be desired.

This frame-work is set up, with the posts *a*, in close proximity to or contact with the front wall B, (the posts *a* being about equal in length to the height of the roof above,) and the rear supports *c*, which are preferably made somewhat longer, are then carried forward at their lower ends till their upper ends press against the roof, by which the frame-work is held still more securely.

The beams *b* are made each with a series of ratchet-shaped notches or steps, *e*, in its upper edge.

In any two of the opposite notches *e*, I rest a cross-bearer, *f*, which carries a couple of pulleys, *g*, and from which, by ropes or chains *h*, the coal-digging or cutting devices are suspended.

This apparatus, as shown, consists of side bars, *m*,

having a head-piece, *n*, in which is set a series of chisels, *n*, in any desired number or arrangement.

The side bars *m* are further connected by rods *m'*, and a handle at the rear, *m''*.

This digging-frame is hung to the chain by hooks *o o'*, which engage the side bars *m*, or other part of the frame-work, at pleasure.

It will be observed that each chain, *h*, crosses itself between its pulley and frame, that is, the chain from the rear hook *o* passes over the front of the pulley, and from the rear of the pulley forward, and hooks on, as at *o'*, about as far forward of the center of gravity of the digging-frame swung thereto as the rear hook *o* is back of it.

This feature of my improved construction is an important one.

If the chains were not crossed, the frame *m m' n'* would, unless manipulated with care, move forward and back, describing the arc of a circle, of which the connection to the cross-bearer *f* would be the radius. Consequently, on being thrust forward by power applied at its handle *m''*, it would strike the stratum or wall of coal in front, along about the line *x x*, instead of at the bottom.

But by hanging the frame *m m' n'* so that it shall swing near the floor, and then crossing the chains by which it is hung, I secure this important result, viz: as the frame is swung forward, the forward or *o'* end of the chain is paid out, the other or *o* end shortening up at the same time, so that, instead of describing the arc of a circle, the frame will move horizontally forward; the chisels *n* will strike the front wall B near the floor, which strokes being repeated, the "bearing in" *p* will be made to any desired depth.

As the pulleys *g g* hang loosely on the cross-bearer *f*, they may be shifted from side to side, and the "bearing in" *p* be made across the lower edge of the front wall B. Also, as the depth of the "bearing-in" cut *p* increases, the cross-bearer *f* may be slipped forward from notch *e* to notch *e*, automatically, if the front incline be not too steep.

In order to cut down the corners, it is only necessary to loosen the hooks on one side, and shorten the chain on the other.

The digging-frame will then hang edgewise, and, after being shifted close to the side wall, is operated back and forth, and, as before, cuts a channel, *p'*, in the coal wall B by the force of its consecutive blows.

By the use of a ram, hung by one or more pulleys and cross-chains, as described, (though hung higher, of course,) the wedges may be driven into the upper face of the front wall B, for purposes of breaking down.

The cross-chains enable me to strike a truer and more direct as well as a more effective blow.

The form, shape, and size of the devices described may be varied more or less, the construction and mode of operation remaining the same.

A drum or other like device may take the place of the pulleys.

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

1. Combining the "bearing-in," "knocking-down," or "side-cutting" apparatus with a supporting frame-work, in which it is operated by means of crossing chains and pulleys, substantially as described.

2. A supporting frame-work, consisting of front posts *a*, rear supports *c*, and connecting-beams *b*, the latter having ratchet-shaped notches, and the parts named being hinged together and arranged to carry swinging coal-mine devices, substantially as described.

In testimony whereof I, the said WILLIAM WARD, have hereunto set my hand.

WM. WARD.

Witnesses:

JOHN GLENN,  
THOS. H. KERR.