(No Model.)

T. ARCHER, Jr.

APPARATUS FOR WINNING COAL, &c.

No. 385,655. Patented July 3, 1888.

FIG. I.

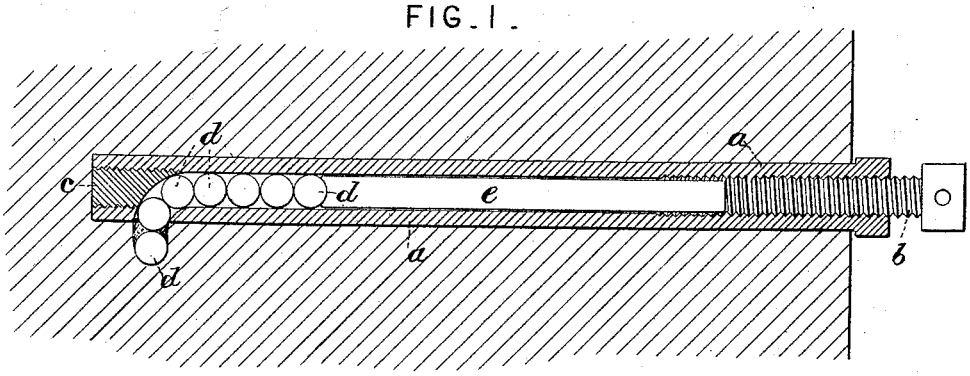


FIG. III.

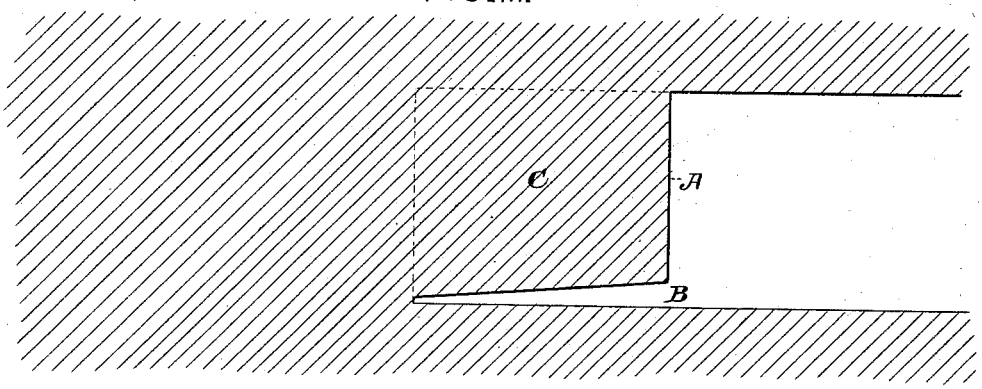
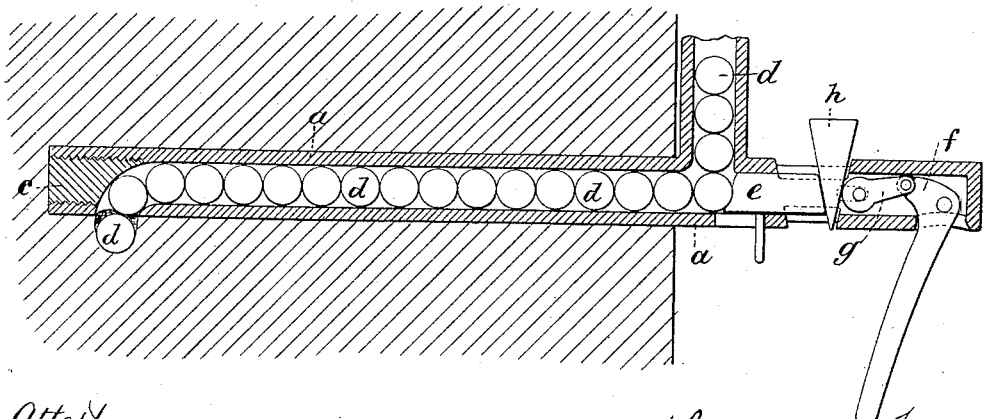


FIG. II.



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UNITED STATES PATENT OFFICE.

THOMAS ARCHER, JR., OF NEWCASTLE-UPON-TYNE, ENGLAND.

APPARATUS FOR WINNING COAL, &c.

SPECIFICATION forming part of Letters Patent No. 385,655, dated July 3, 1888.

Application filed May 9, 1888. Serial No. 273,273. (No model.) Patented in England October 3, 1887, No. 13,346.

To all whom it may concern:

Be it known that I, THOMAS ARCHER, Jr., of Newcastle-upon-Tyne, England, have invented a new and useful Improvement in Apparatus for Winning Coal or Minerals and for Like Purposes, (for which I have obtained Letters Patent in Great Britain, No. 13,346, dated October 3, 1887,) and which invention is fully set forth in the following specification.

The usual method of working coal is to corve out a space at or near the bottom of a seam of coal, then to bore a hole or series of holes at or near the top of the seam, and then to blast or force down by wedges, lime cartridges, or other appliances the mass between.

My improved apparatus is designed to replace the means now commonly employed for forcing down the mass of coal between the upper bore-holes and the corve.

According to the plan now commonly followed when wedges are used it is usual to employ wedge-pieces opening the up-and down way with a roller or wedge between them, which roller or wedge is drawn or forced into such position that the wedges at the ends of the bar open and exert a pressure in the desired direction.

In order that such an apparatus may work with considerable force and with the desired range, it is necessary that it be strongly made, and that the bore-hole be of considerable size, whereby the cost of boring is increased, and it is also necessary that the whole apparatus be of considerable weight, by which the facility of working it is diminished.

By means of my invention, however, I am enabled to obtain considerable range of powerful action with a very light and slender rod. I employ a hollow rod closed at what is intended to be the inner end with reference to the coal to which it is to be applied in action, except for an opening at one side at a very short distance from the end. The opening at the side stands in such a way that a ball placed within the rod can come in contact with no dead-stop if forced through the hollow rod, but must be gradually diverted from the straight path of the axis of the rod by the slope at the end. At the other end of the rod is placed a strong screw fitting the rod internally. In the space between the screw and the slant of the rod is placed a series of hard steel or chilled iron, or other hard balls, rollers, or blocks.

In use the rod so charged is inserted in a bore-hole, which it nearly fits, and the strong screw is forced into it. By this means first one of the balls, rollers, or blocks is forced out at the other end, and then another and another, so as to exert a constantly-increasing pressure until the mass of coal gives way.

It is not of course necessary to employ a screw for imparting pressure to the series of balls, as any other suitable device may be employed instead. For example, a lever arrangement at the end of the hollow rod may be used, and a new ball, roller, or block put in at each movement of the lever. It will thus be seen that in soft tenacious coal I can accumulate a nest of balls of indefinite extent until the pressure becomes such as to break down the mass, and as the strain on the apparatus is entirely upon the solid end of the rod, with a tension strain only on the rod itself, a very, very light rod with a small bore-hole can be used.

The apparatus can be used for winning coal without corving by applying a sufficient number of rods at the top and bottom of the seam at intervals, whereby a pressure is exerted at any desired distance from the face of the coal.

The apparatus is also available for other purposes, such as sinking or quarrying, or for winning other kinds of minerals.

In the accompanying drawings, which form part of this specification, Figure I is a longitudinal section of one form of my invention; Fig. II, a partial longitudinal section of an apparatus employing a lever in place of a screw, and Fig. III a diagram illustrating the method of working coal.

In Fig. III, A represents the face of the coal that is being worked; B, the corve or kerf, and C the "jud" or mass above the corve. The kerf is usually made about three feet deep and from seven to ten feet along the face A. One plan of working is to cut three feet in on each side of the jud, and then force the latter down. Another plan, known as "shooting fast," is to make no cutting at all at the sides, but to blast down the coal while it is fast at the sides. Both of these methods, particu-

larly the former, produce large quantities of small coal, which, by the use of my invention, is avoided.

My apparatus, as shown in Fig. I, comprises a light tubular rod, *a*, with an internal screw-thread near its outer end, in which is mounted a strong screw, *b*. Its other or inner end is closed by a screw-plug, *c*, and just above the plug *c* is an opening in the side of the rod. In the hollow of the rod *a* are placed a series of hard steel or chilled-iron balls, rollers, or blocks, *d*, and between the last ball *d* and screw *b* is interposed a push-rod, *e*, though obviously the entire space within the rod may be filled with balls *d*.

In operation the rod so charged is inserted in a bore-hole and the screw *b* turned in the proper direction to force the balls *d* one by one out of the aperture, the curve or slope of plug *c* being such as to divert them gradually toward said aperture until the accumulating pressure of the balls causes the mass of coal to break down. In this way the operation of shooting fast can be performed with the minimum production of small coal.

Instead of a screw for applying pressure to the series of balls *d*, I may employ a lever, as shown in Fig. II, in which a toggle-jointed lever, *f g*, is represented. In this form of apparatus an additional ball must be introduced after each movement of the lever; or if the throw of the lever be insufficient to admit a ball, then a wedge, *h*, is used and allowed to slip down between the end of push-rod *e* and arm *g* of the lever as the latter is withdrawn, so as to keep the movement gained at each stroke until it is sufficient to admit another ball, and then the wedge *h* is withdrawn.

It will be seen that in the use of this apparatus the pressure is limited only by the tensile strength of the rod or bar, and that in forcing the balls out laterally there is no reaction tending to expel the rod from the hole in which it is placed.

It is obvious that other modifications could be made in details of construction without departing from the spirit of the invention, and that the apparatus is susceptible of a variety of applications, as in sinking shafts, tunneling, quarrying, &c.

I claim—

1. An apparatus for winning coal and other purposes, consisting of a tubular rod having on one side near its inner end an aperture, a series of balls, blocks, or rollers of approximately the inner diameter of said rod, and means for imparting pressure through the series of balls, blocks, or rollers from one to the other, so as to force them one by one through said aperture into the mass of the coal or other mineral, substantially as described.

2. The combination of the hollow rod having a lateral aperture near one end, the series of balls, blocks, or rollers therein, and means for applying pressure to said balls, blocks, or rollers, so as to force them one by one through said aperture, substantially as described.

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

THOMAS ARCHER, JR.

Witnesses:
JOHN KIRTLEY,
M. FAWCETT.