

(No Model.)

2 Sheets—Sheet 1.

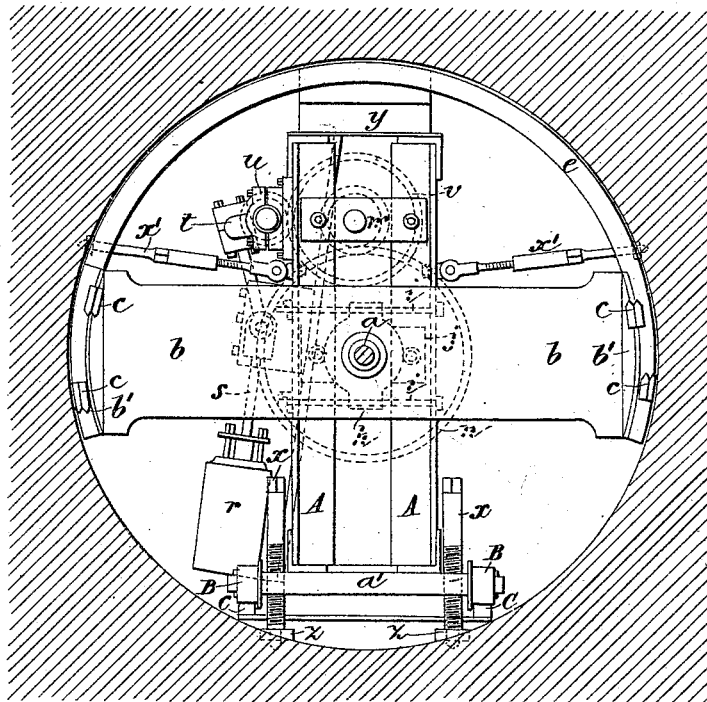
R. STANLEY.

BORING MACHINE FOR MINING COAL, &c.

No. 345,551.

Patented July 13, 1886.

Fig. 1.



Witnesses.
Will F. Norton
H. B. Washington

Inventor.
Reginald Stanley.
by John J. Halsted & Son
his attys.

(No Model.)

2 Sheets—Sheet 2.

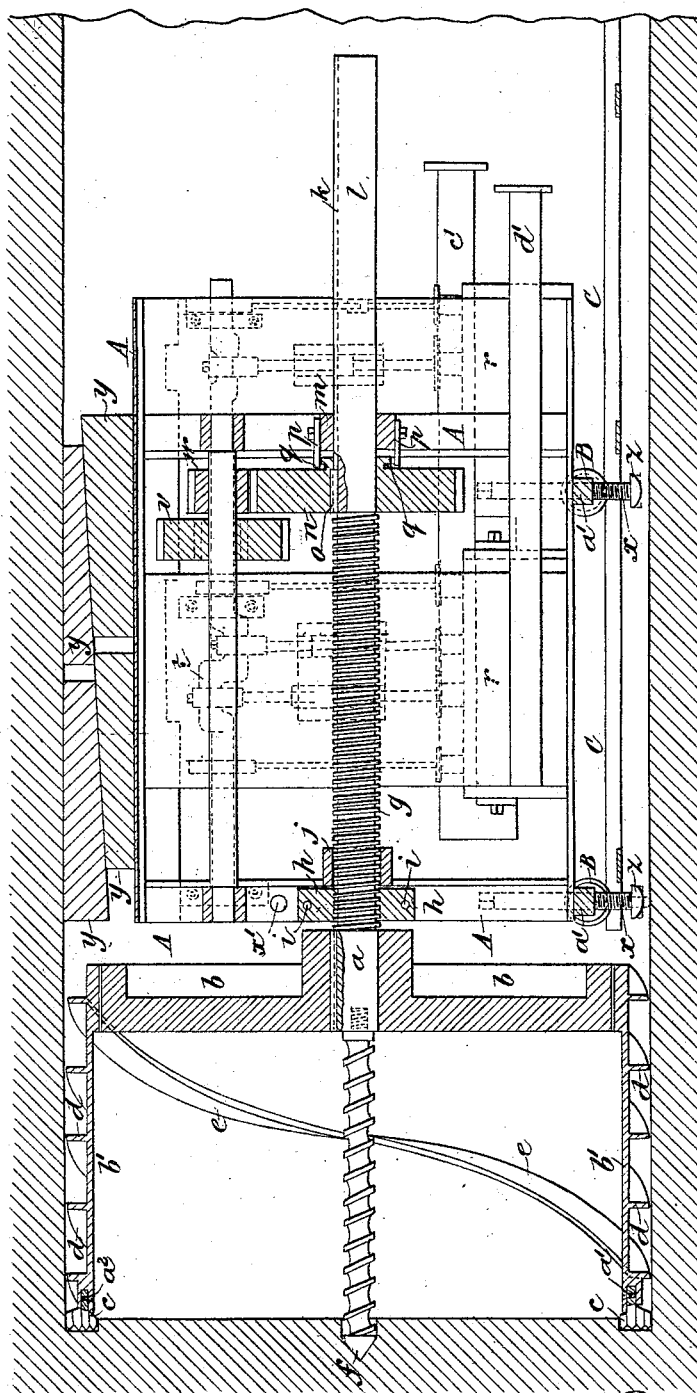
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Fig. 2.



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UNITED STATES PATENT OFFICE.

REGINALD STANLEY, OF NUNEATON, COUNTY OF WARWICK, ENGLAND.

BORING-MACHINE FOR MINING COAL, &c.

SPECIFICATION forming part of Letters Patent No. 345,551, dated July 13, 1886.

Application filed October 31, 1885. Serial No. 181,530. (No model.)

To all whom it may concern:

Be it known that I, REGINALD STANLEY, a subject of the Queen of Great Britain, residing at Nuneaton, in the county of Warwick, England, have invented a new and useful Improved Boring-Machine, of which the following is a specification.

This invention relates to the construction of an improved machine or apparatus adapted for boring or assisting to make passages, headings, or roadways in coal, clay, marl, sandstone, and other substances.

The improved machine is constructed of a central horizontal shaft, carrying at one end rectangular or bent iron arms, consisting of two or more arms arranged radially on the shaft, and carrying arms extending forward horizontally, in a direction parallel with the central shaft. On the end of each arm are attached cutters. A number of ribs or projections forming sweepers or scrapers, and arranged at a suitable angle, are provided on the surface of the horizontal arms, and a long strip or long strips of metal, also forming a sweeper or sweepers, extends or extend in a circular direction from the front end of one of the said horizontal arms to some distance from the front of one of the other horizontal arms, and can, if required, consist of more than one sweeper, and extend partly or completely around the circle of which the arms form radii. On the cutting-end of the central shaft is attached a drill, fitted with a spiral worm, working in the hole which the drill is intended to make, and assisting in steadying the end of the central shaft. The central part of the shaft is screw-threaded and works through a block or nut attached to the frame of the machine, the said block or nut being removable from the frame, for the purpose hereinafter described. The frame is made as narrow as possible, so as to leave a space or passage on one or both sides thereof, in the heading or way, and it is fixed by set-screws or pins, or by wedges and set-screws or pins to the top and bottom (and sides, if required) of the passage, heading, or airway being made, the said set-screws or pins being provided with collars, and serving also when operated to raise or alter the direction of the machine. The central shaft is made to advance or retire, according to the direction in

which it is turned, and any suitable motive power is employed for driving the shaft.

In order to enable my invention to be fully understood, I will describe the same by reference to the accompanying drawings, in which—

Figure 1 represents a transverse section, and Fig. 2 a sectional elevation, of my improved machine, showing the same at work.

Similar letters in both figures represent similar parts.

a represents the central horizontal shaft of the machine, and *b b* are the radial arms at the end of the same.

b' b' are the horizontal arms, extending forward from the ends of the arms *b b* in a direction parallel with the shaft *a*.

c c are the cutters, fixed in sockets on the ends of the arms *b'* by means of set-screws *a'*, and which, when the arms are rotated, as hereinafter described, cut an annular groove in the heading or way. The arms *b'* are made of a width suitable to the number of cutters which are to be used.

d d are the sweepers or scrapers, placed at an angle on the surface of the arms *b'*, as shown in Fig. 2; but the sweepers or scrapers *d* can, if required, be extended beyond the width of the arms *b'*.

e is the strip of metal, also forming a sweeper, and extending in a circular direction from the front of one of the arms *b'* to a point at a distance back from the front of the other arm *b'*. Two or more of the sweepers *e* can be used in the machine and more than one between any two arms.

The sweepers or scrapers *d* and *e* serve to scrape out or expel from the annular groove made by the cutters *c*, and in which the arms *b'* are working, any accumulation of fine material or cuttings produced in the operation, thereby allowing the cutters to penetrate to a greater depth than would otherwise be the case.

The cutters *c* are of a number and size, and set in a manner that will cut the annular groove wide enough to allow the sweepers or scrapers *d* and *e* to work freely therein, and to allow for altering the direction of the cut.

f is the drill, fixed in the cutting end of the central shaft, *a*, and having a spiral worm, as shown in Fig. 2, which fits the central hole

made in the heading by the drill, when the machine is operated. In this hole a charge of powder can be subsequently introduced to assist in removing the core. The drill *f* further
 5 serves to steady the end of the central shaft *a*, and the cutters *c*, when the machine is at work, and the spiral worm thereon carries back the loose material or cuttings out of the hole.

g is the screw-thread on the central part of the shaft *a*, the said screw-thread being of a length corresponding, or nearly so, with that of the arms *b'*.

h is the screw-threaded block or nut in which the screw-threaded part *g* of the shaft *a* works, the pitch of the thread being made to suit the rate at which it is required to feed forward the cutters *c'*. The block or nut therefore not only serves as a bearing to the shaft *a*, but allows it to be propelled forward at the required rate of speed. The block or nut *h* is
 20 attached to the frame A of the machine, and prevented from turning when in operation by means of pins or bolts *i* passing through one side of the frame and through the block or nut *h* and into the other side of the frame, so that
 25 by withdrawing the said pins or bolts the block or nut *h* will be free of the frame A, and can be rotated upon the thread *g* of the shaft *a* for the purpose of allowing the machine to be run forward when the cutters have entered the heading to the depth required, as will be hereinafter more fully described.

j shows a smooth bearing fixed to the back of the front legs of the frame A. This bearing is for the purpose of carrying the threaded end of the shaft when the machine is being run forward, as well as when the machine is at work.

k is a longitudinal slot which is cut in the plain part *l* of the central shaft for about the same distance as the length of the arms *b'* and cutters *c*. The said part *l* of the central shaft rotates and slides in a bearing, *m*, on the frame A of the machine.

n is a spur-wheel on the plain part *l* of the central shaft, in which spur-wheel is fixed a feather or key, *o*, fitting in the slot *k*, and over which the slot *k* slides as the shaft is moved backward or forward. The spur-wheel *n* is
 50 kept from moving along the shaft by means of a sleeve or pins, *p*, fixed to the bearing *m*, and having a flange or projections, *q*, fitting in a corresponding groove on the boss of the spur-wheel; or other suitable means can be employed for keeping the spur-wheel *n* in position in the frame A, and at the same time allow it to revolve with the central shaft *a*, and the central shaft to slide in the spur-wheel.

Motion is communicated to the spur-wheel *n* from two or more cylinders, *r*, attached to the side of the frame A, and driven by compressed air, water, or steam power, the piston-rods *s* of the said cylinders operating, cranks *t*, and intermediate spur-wheels, *u v w*, acting upon the spur-wheel *n*. *c'* represents the feed, and *d'* the exhaust-pipe of the en-

gine. The frame A is made of wrought-iron or steel of a rectangular form, extending perpendicularly from near the floor to near the roof of the heading in which the machine is at work, and its width is such as to allow of a passage on both sides, as shown, (or a passage may be left on one side only.) The whole machine is carried upon four wheels, B, that run upon rails C, laid on the floor of the heading.
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x x are the set-screws or pins (which are drill-pointed) for fixing the machine to the bottom of the passage being made, and for raising the machine, the said set-screws or pins being adapted to enter the material of which the passage is formed.

y y are the wedges for fixing the top of the machine to the passage, and which are driven between the top of the passage and the top of the frame A, made flat for this purpose.

z z are the collars on the set-screws or pins *x*, which collars, when the set-screws have entered the bottom of the passage to the required depth, will rest on the latter. The set-screws work through the axles *a'* of the carrying-wheels B of the machine in such a manner that when it is desired to raise the machine, in order to alter its direction of cut and to shift the rails C, it is only necessary to continue to screw down the set-screws, (the wedges *y* being removed,) and the collars, bearing upon the bottom of the passage, the set-screws *x*, will raise the machine.
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x' are screw-pins hinged on each side of the frame A, and, when required, are used to steady the cutters and to alter the direction of the cut. They are drill-pointed and fitted with collars like the screw-pins *x*. When they are used, they are screwed out into the sides of the heading, and when not required, are allowed to hang down beside the frame.

The operation of the machine is as follows: The rails C are first placed at a proper distance from the face of the work to allow the arms *b'* to rotate in front of the same, and the machine is then run forward and secured in position by means of the set-screws *x* and wedges *y*, the parts of the machine being in the position shown in Fig. 2. The cylinders *r* will set the piston-rods *s* and gearing *u v w* in motion, and the spur-wheel *n* will be caused to rotate and will carry with it the central shaft, *a*, which, being forced forward by the part *g* thereof working in the threaded block or nut *h*, will advance at a regular speed and will rotate and carry forward the arms *b'*, cutters *c*, and central drill, *f*. The cutters *c* will form the annular groove in the face of the heading to be cut, and the cuttings will be carried backward and expelled by the sweepers or scrapers *d* and *e*, out of the groove, and can then be thrown back by hand past the machine through the spaces or passages at the sides thereof, as required; at the same time the drill *f* will have drilled a central hole. When the cutters have penetrated to the required depth, the machine is stopped, and the core can be either
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removed while the cutters are up to the face of the work or the whole machine can be withdrawn to a suitable distance, while the core is blown down by means of a charge of powder or other explosive introduced into the central hole; or the core can be removed in any other suitable manner. In order to withdraw the machine from the face of the work, it is only necessary to detach the block or nut *h* from the frame *A*, in the manner hereinbefore described, when it can be easily and quickly screwed forward along the threaded part *g* of the shaft to the position it occupies thereon when commencing the operation, the weight of the central shaft being borne by the smooth bearing *j*. The rails *C* are then pushed forward to the back of the arms *b*. The frame of the machine is then lowered onto the rails and run forward along the shaft *a*, and the block or nut *h* being again fixed in position, the whole machine (the parts of which, including the arms *b'* and cutters *c*, are ready for another operation) can be withdrawn to allow of removing the core and cleaning the heading, ready for the machine to commence making another cutting.

Although I have described and shown my improved machine provided with two rectangular or bent arms, *b b'*, it will be obvious that a larger number can be employed, according to requirements, and the rails *C* can, if required, be dispensed with.

In some cases it may be desirable to cut an annular groove in the face of the work without boring a central hole therein, as herein described, in which case the central drill, *f*, is removed from the machine by simply unscrewing the same.

The long sweeper or scraper *e* can extend round a portion of the circle of which the arms *b* form radii, as shown in the drawings, or it can extend completely round the said circle; and in the latter case it can be attached to one or both of the arms *b'*; also, more than one sweeper can be used between either of the arms *b'*, according to the lengths of the arms

b', or the angle or rake it is required to give the said sweeper.

In the drawings I have shown the screw-thread formed on the fore part of the central shaft and the rear part of the shaft formed plain. It will, however, be obvious that this arrangement can, if required, be reversed—that is to say, the fore part of the shaft can be plain and formed with a slot and work in a smooth bearing, and the rear end of the shaft be threaded and the nut or block *h* be attached to the front part of the frame *A*—in which case the smooth bearing *j* would also be fixed to the rear of the rear legs of the frame.

Having now particularly described and ascertained the nature of my said invention, and in what manner the same is to be performed, I declare that what I claim is—

1. In a machine for boring passages, headings, and the like in coal and other substances, the combination, with the central boring-shaft, of arms *b b*, attached at right angles to the front end of the same, the cutting-arms *b' b'*, attached to and projecting forward from the free ends of the arms *b' b'* and parallel with the central boring-shaft, and provided on their outer side with a series of spirally-arranged scraping or cleaning ribs, *d*, all substantially as shown, and for the purposes described.

2. In a boring-machine, the combination of the arms *b b*, attached at right angles to the central boring-shaft, the cutting-arms *b' b'*, attached to and projecting forward from the arms *b*, and parallel with the central shaft, the spirally-arranged ribs *d* on the outer side of arms *b'*, and a strip or strips, *e*, extending from the front end of one of the arms *b'* to a point on, but some distance from, the front end of the other horizontal arm *b'*, as and for the purposes set forth.

REGINALD STANLEY.

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