H. F. BROWN.

Coal and Rock-Cutting Machines.

No. 142,896. Patented September 16, 1873.

FIG. 1.

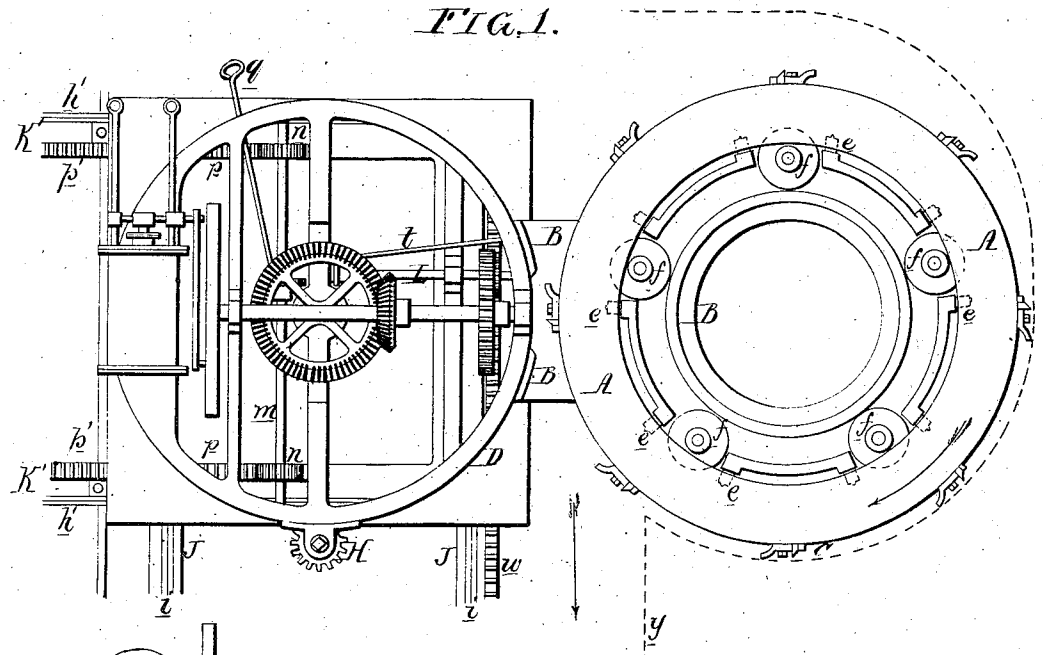


FIG. 2.

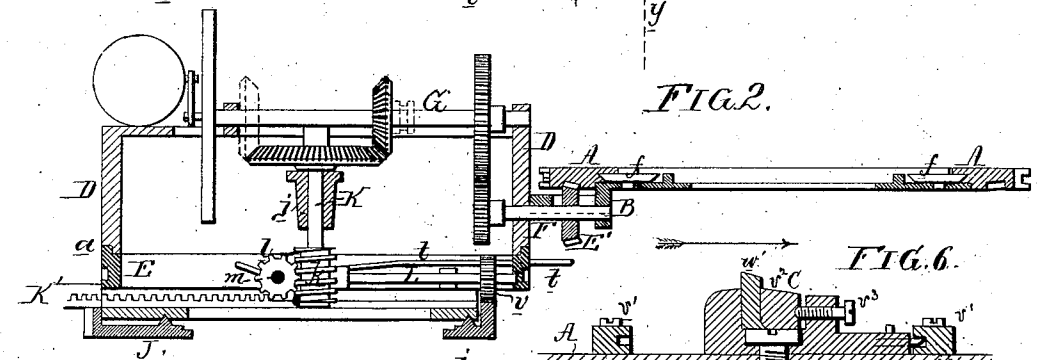


FIG. 6.

FIG. 3.

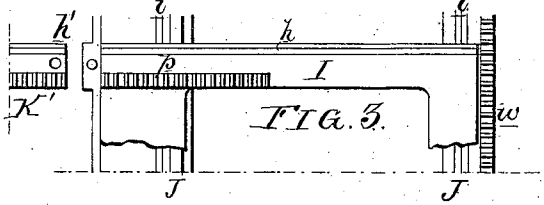


FIG. 5.

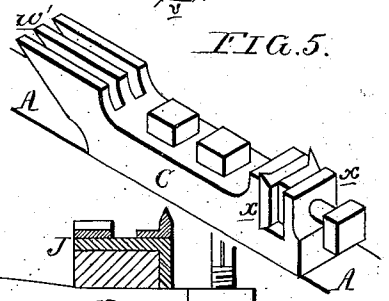
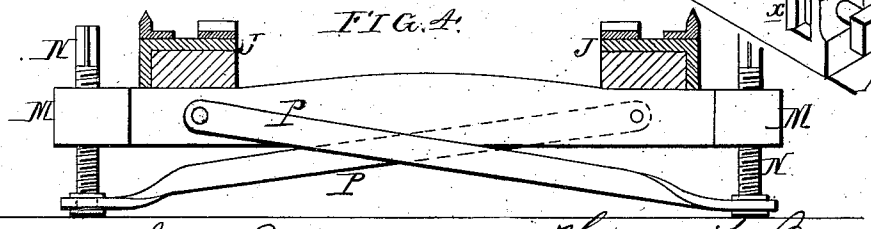


FIG. 4.



Witnesses,
John K. Rupertus.
Thomas McKown

Horace F. Brown
by his attys
Howson and Son

UNITED STATES PATENT OFFICE.

HORACE F. BROWN, OF INDIANAPOLIS, INDIANA.

IMPROVEMENT IN COAL AND ROCK CUTTING MACHINES.

Specification forming part of Letters Patent No. **142,896**, dated September 16, 1873; application filed July 30, 1873.

To all whom it may concern:

Be it known that I, HORACE F. BROWN, of Indianapolis, Marion county, State of Indiana, have invented an Improved Coal and Rock Cutting Machine, of which the following is a specification:

The object of my invention is to facilitate the mining of coal and the quarrying of slate, marble, and other rocks by means of a rotating ring, A, having cutters on its periphery, as shown in the plan view, Figure 1, and vertical section, Fig. 2, of the accompanying drawing, the said ring being carried by frame-work so constructed and so adapted to ways that it can be turned laterally, or turned in two directions, one at right angles to the other, and thus be made to penetrate and cut channels in the rock *y*, (shown by dotted lines in Fig. 1,) all as fully described hereafter.

A is the revolving cutting-ring, to the periphery of which the cutters are secured in the manner described hereafter; and this ring is carried by an arm, B, projecting from and secured to an annular frame, D, which is so fitted at *a* to an annular bed, E, that it can be turned freely on, but can have no other movement independently of, the said bed. The cutting-ring A is supported by small anti-friction rollers *e e*, carried by the arm B, which is contained within the cutter-ring, except where it is connected with the frame, and is guided in its circular course by a number of horizontal anti-friction wheels, *f f*, also carried by the arm B. On the under side of the cutting-ring A is an annular rack, to the teeth of which is adapted a bevel-pinion, E′, on a shaft, F, which has one bearing in the frame D, and the other in a projection on the arm B, as shown in the vertical section, Fig. 2, the said shaft F deriving its motion from a shaft, G, which is driven by a steam or air engine carried by the said frame D. Teeth are formed in the exterior of the annular bed E, and to these teeth are adapted those of a pinion, H, which has its bearings on the frame D, so that on turning the shaft the said frame, and with it the arm B and its cutting-ring, may be turned on the bed E to any angle desired. The annular bed D has parallel grooves, adapted to ways *h h* on a slide, I, part of which is illustrated in the detached plan view, Fig. 3, and this slide has grooves adapted to ways *i i* on the frame J, which is supported in the manner described hereafter. A vertical shaft, K, concentric with the annular frame D and annular bed E, is arranged to turn in a hanger, *j*, suspended from the said frame, and derives its motion through the intersection of bevel-gearing from the driving-shaft G. This vertical shaft is furnished with a worm, *k*, adapted to the teeth of a pinion, *l*, on a shaft, *m*, which has its bearings in the bed E, the shaft being furnished with pinions *n n*, adapted to racks *p* on the slide I, and also to racks *p′* on frames K′, which have ways *h′*, coinciding with the ways *h* on the slide I, under the circumstances described hereafter. The pinions *l* can be moved to and fro on the shaft *m* by means of a rod, *q*, and thus put in and out of gear with the worm *k*. When the pinion is in gear with the worm, the annular bed E, frame D, and cutting-ring A will be traversed in the direction of the arrow, Fig. 2. Another shaft, L, having its bearings in the bed E, is furnished with a pinion, which can be moved in and out of gear with the worm *k* by means of a rod, *t*, the shaft having another pinion, *v*, gearing into a rack, *w*, on one of the frames J, so that, when the shaft L is driven by the worm *k*, the annular bed E, and all the appliances which it supports, will be traversed in the direction of the arrow, Fig. 1, the slide I being necessarily carried in the bed along the ways *i i*. The frames J J and K K are supported on sills M, one of which is shown in the transverse section, Fig. 4, drawn to an enlarged scale, each end of each sill being provided with a screw, N, and the lower end of each screw being connected to the outer end of one of the arms P, the two arms being hinged to the sill, and arranged in the manner too clearly illustrated in Fig. 4 to need explanation.

By turning the set-screws, the frames J J and K K may be raised or lowered at pleasure and adjusted to different inclinations, while the arms P P, the outer ends of which rest on the ground, serve to steady the screws under all circumstances.

Different styles of cutters may be secured to the periphery of the cutting-ring A; but for most purposes I prefer the cutter illus-

trated in the enlarged perspective view, Fig. 5. This consists of a steel block, C, having three cutting-edges, w', the next cutter having but two cutting-edges, so arranged as to remove the material left by the spaces between the three cutting-edges of the cutter C'. In addition to these cutting-edges, each block c is furnished with two side cutters, $x\,x$, secured in a manner clearly explained by the drawing.

Another form of cutter is illustrated in the sectional view, Fig. 6. This consists of a block, c', secured to the ring A by a single screw, v, which serves as a pivot, upon which the tool can be turned so as to cause the cutting-points w' to face either way, according to the direction of the movement of the ring, the block being secured after adjustment by a spring-catch at its rear end, adapted to either of two projections, v^1, on the ring. The cutters w' are retained in position by a block, v^2, forced against the same by a set-screw, v^3. There are three cutting-points, w', the outermost of which are inclined so as to give clearance at the sides.

The cutter illustrated in Fig. 5 may also be made reversible.

In Fig. 1, the dotted line y represents the face of the bed of coal, marble, or other rock into which a channel has to be cut by the above-described apparatus.

In the first instance, the mechanism is so adjusted that the ways of the slide I shall coincide with those of the frames K', the slide I occupying a portion of the ways of the said frames K' K' so far from the face y of the rock that the cutters of the ring A will just touch the same. The cutting-ring is then caused to revolve at the same time. The annular bed, with all its appliances, is caused to traverse in the direction of the arrow until the cutting-ring has penetrated the rock to the extent, or about the extent, shown in Fig. 1, when the movement of the cutting-ring in the direction pointed out is arrested, after which the shaft L is caused to revolve, and consequently the annular bed, its annular frame D, and cutting-ring, together with the slide I, are caused to traverse the ways $i\,i$ of the frames J J in the direction of the arrow, Fig. 1, while the cutting-ring revolves; the result of which operation will be the cutting of a deep channel in the rock, the direction of this channel depending upon the adjustment of the frames J J and K' K'.

It will be occasionally necessary to turn the annular frame on its bed—an operation easily accomplished by operating the shaft of the pinion H. If this be done while the annular bed is stationary, and the cutting-ring is in operation, the result will be the gradual withdrawal of the said cutting-ring from the rock, and the gradual termination of the channel cut therein.

To facilitate the entrance of the cutter into the rock, and its withdrawal from the same, and to enable the cutters to work well into the corners at the ends of the channel, I propose in most cases to so arrange the ring and its driving mechanism, and the cutters, that the apparatus can be operated by a reverse as well as by a forward movement of the said ring. The only material change required in the operating mechanism will be to provide the shaft G with two bevel-pinions at opposite sides of the pinion on the shaft K, so arranged that either of them may be thrown in and out of gear with the latter. (See dotted lines in Fig. 2.)

Inasmuch as the arm B, which carries the cutter-ring, is contained almost entirely within the ring, the latter can be inserted to almost its entire extent in the narrow opening which it cuts, and such opening may therefore be cut much deeper than by ordinary machines, in which narrow cutters cannot penetrate one-half their diameter.

I claim as my invention—

1. A channeling-machine in which a cutter-ring, A, is carried by an arm, B, contained within said ring, except at the point where it joins the frame, as set forth.

2. The cutter-ring A and its carrying-arm B, in combination with an annular frame adjustable upon a bed, E, substantially as set forth.

3. The cutter-head A, in combination with the arm B and its anti-friction rollers e and f.

4. The combination of the cutter-head A and its annular rack with the arm B and pinion E' on the shaft F, adapted to bearings on the said arm and annular bed D.

5. The cutter-block C, having cutting-edges w' and intermediate channels, and attached to the cutter-ring, as set forth.

6. The combination of the annular bed E and its annular frame D, carrying the cutting-ring A, with ways on which the said bed can be traversed in two directions, at right angles to each other, as specified.

7. The combination of the slide I, adapted to ways $i\,i$ on the frames J J, and having ways $h\,h$ for the bed E, with the frames K' K', having ways h', corresponding with those of the slide.

8. The combination of the central shaft K and its worm k, carried by the frame D, the racks on the frames J and K' K', and within-described gearing or its equivalent, which is carried by the bed E for traversing the latter, in the manner described.

9. The sill M, its set-screws N N, and arms P P, the whole being constructed substantially as set forth, for the support and adjustment of the frames J J and K' K'.

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

HORACE F. BROWN.

Witnesses:

D. R. BROWN,

W. H. ZIMMERMAN.