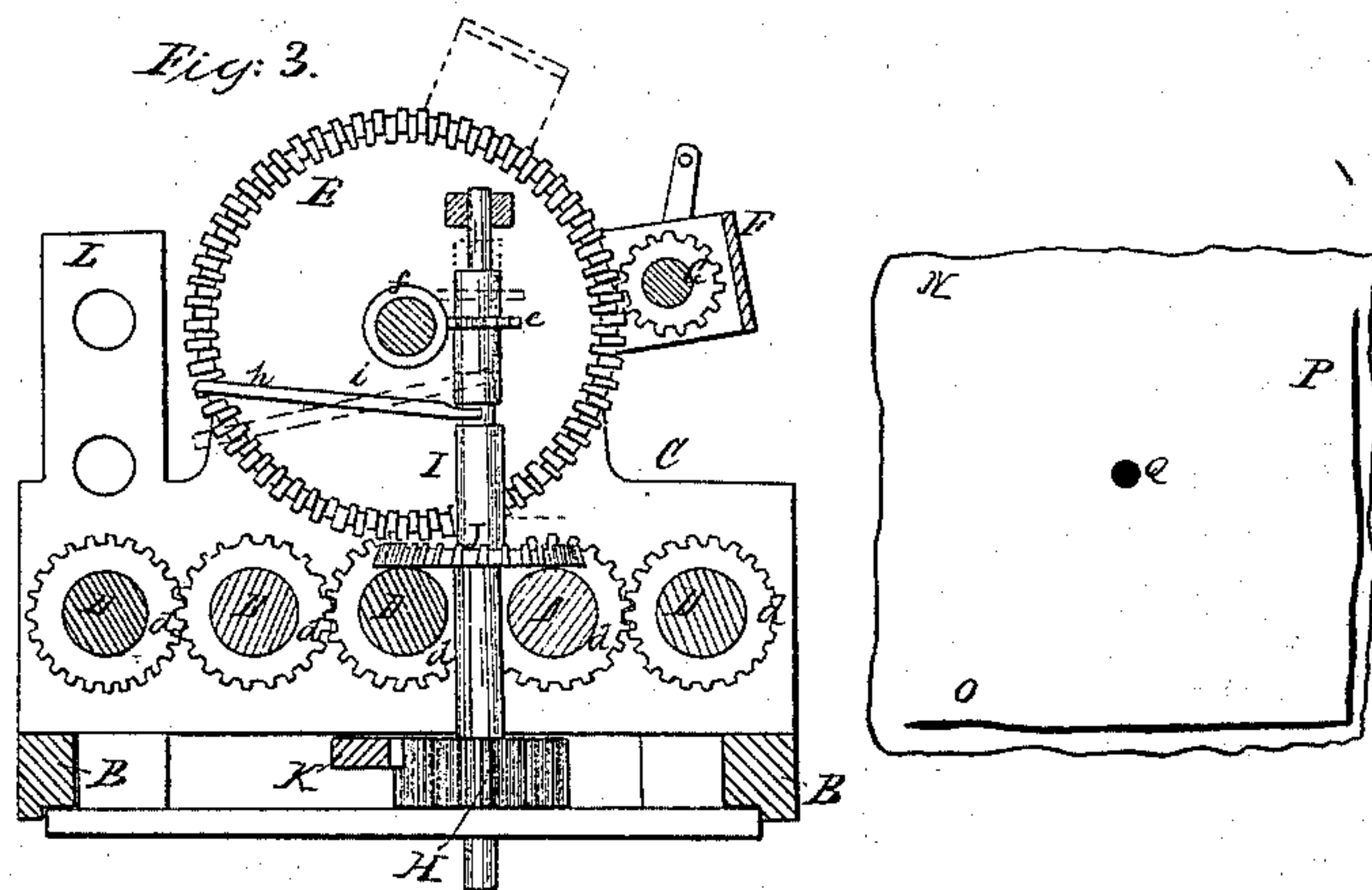
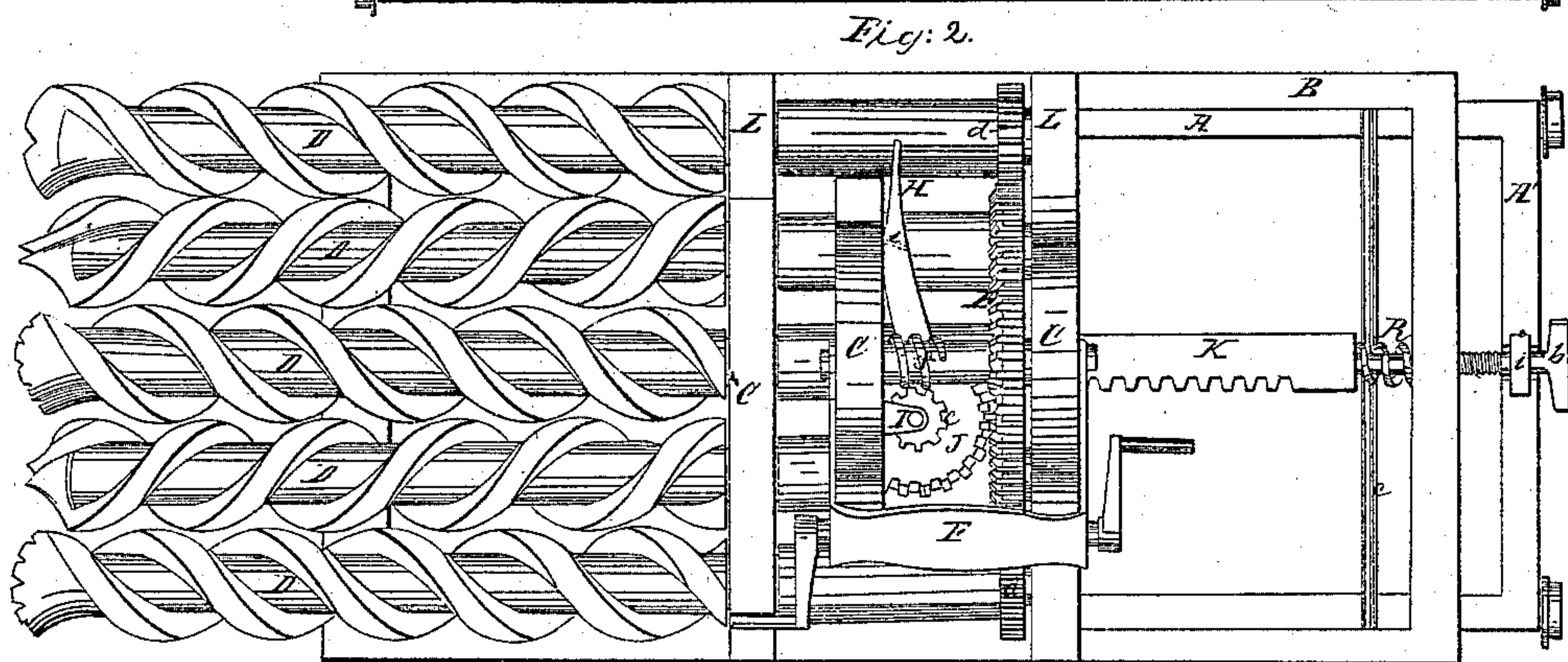
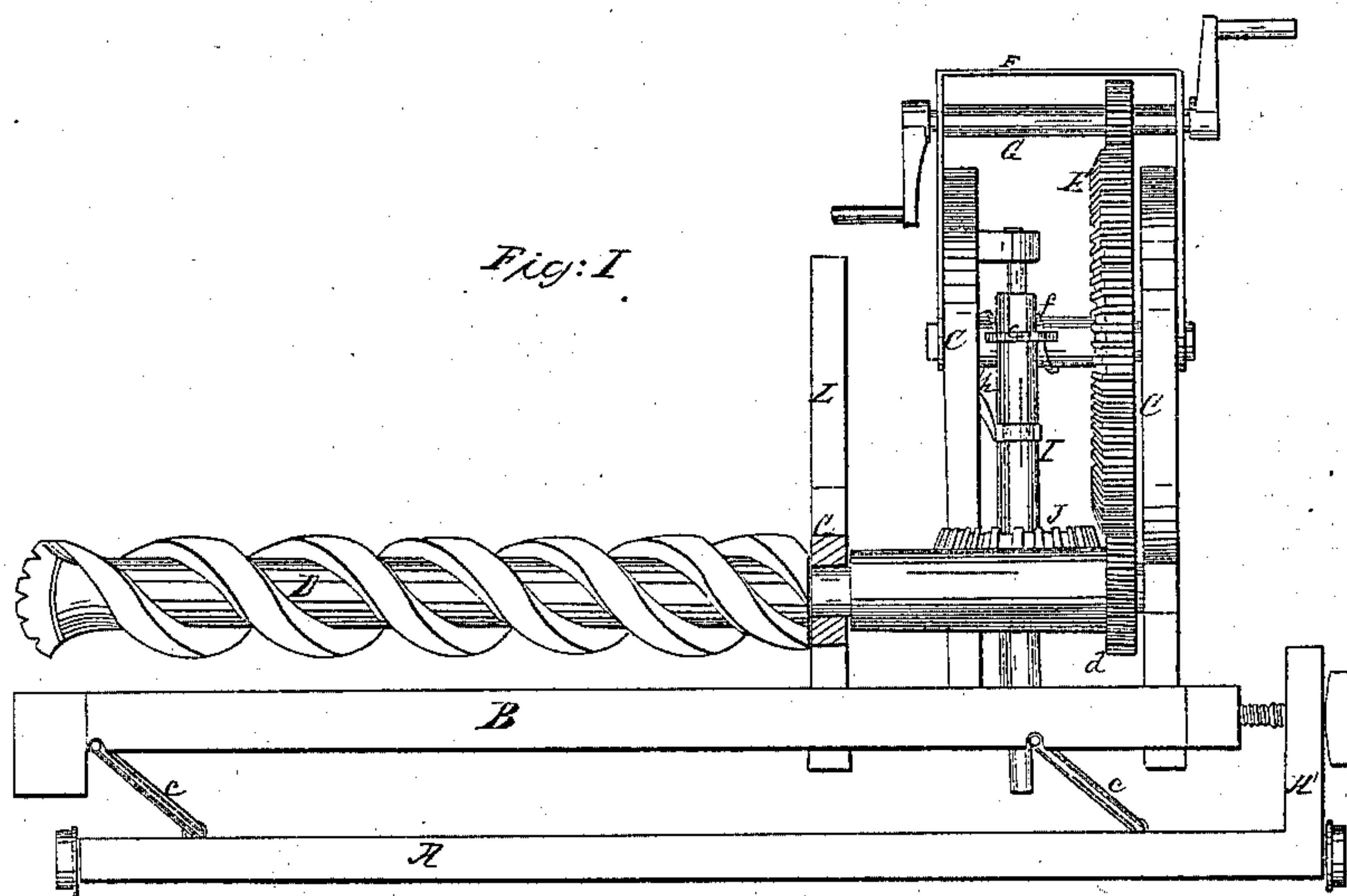


*Grier & Boyd,
Mining Coal.*

N^o 43,493.

Patented July 12, 1864.



UNITED STATES PATENT OFFICE.

WILLIAM W. GRIER AND ROBERT H. BOYD, OF HULTON, PENNSYLVANIA.

IMPROVED MACHINE FOR MINING COAL.

Specification forming part of Letters Patent No. 43,493, dated July 12, 1864.

To all whom it may concern:

Be it known that we, WILLIAM W. GRIER and ROBERT H. BOYD, of Hulton, Allegheny county, State of Pennsylvania, have invented a new and useful Machine for Mining Coal; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, making part of this specification, and to the letters of reference marked thereon, in which—

Figure 1 is a side elevation; Fig. 2, a top plan view, and Fig. 3, a transverse vertical section

Like letters refer to like parts in the various figures.

The nature of our invention consists in drilling, boring, or cutting coal in the mine by means of a series of augers mounted in a suitable frame and operated by machinery.

To enable others skilled in the art to make and use our invention, we will proceed to describe it.

A in the several figures represents the main frame, which may be of any suitable size and form. Upon this frame A is mounted an adjustable frame, B, secured to the former by the hinged rods *c*, operating in the manner of a parallel rule, by which means the frame B and its attachments may be raised or lowered as desired in the manner hereinafter explained.

In the upright portion A' of the frame A is placed a sliding collar, *a*, which works up and down in suitable grooves cut in said piece A'. Through this collar *a* passes a bolt, *b*, having a screw-thread on its inner end extending back to the collar, and being provided at its outer end with a suitable handle for operating it. The screw-bolt *b* engages in the rear portion of the adjustable frame B, so that when said screw-bolt is turned the frame B is drawn back toward the upright part A', thus operating the hinged rods *c*, whereby the frame B will be elevated, the sliding collar *a* being raised with it in its grooves, the screw-bolt *b* passing through and working vertically in a slot provided for it in the upright portion A' of the frame A, by which means the adjustable frame B, with the mechanism attached thereto, can be adjusted vertically as desired.

Upon the adjustable frame B is mounted a sliding frame, C, which supports a series of drilling or boring augers, D, placed horizon-

tally and parallel with frame B. These augers have their bearings in the frame C, as shown in Fig. 1, a pinion, *d*, being secured to the rear portion of each, and so placed that each of said pinions shall gear into the one next adjoining it, whereby any motion imparted to any one of the series will be simultaneously transmitted to all the others.

Centrally of the sliding frame C and directly above the pinions *d* is located a driving gear-wheel, E, the shaft of which has its bearings also in sliding frame C. Pivoted to the shaft of wheel E is a swinging frame, F, in which is mounted a shaft, G, which has a crank at either end and is provided with a pinion, engaging with and operating wheel E. By thus pivoting the swinging frame F the shaft G, with its cranks and pinion, may be shifted from one position to another, as indicated in red in Fig. 3, and the pinion kept constantly in gear with wheel E, by which the machine may be accommodated to the positions the workmen may be compelled to assume when operating it close to a wall, bank, or other obstacle on either side.

The shaft of wheel E is provided with an endless screw, as shown in Figs. 1 and 2, which engages with pinion *e* on the upper portion of shaft I. Near the lower end of shaft I is secured a pinion or gear wheel, H, as clearly shown in Fig. 3, which engages with the teeth of rack-bar K, which is located parallel with and centrally between the side pieces of the adjustable frame B.

Midway of shaft I is located a beveled gear-wheel, J, which, when shaft I is raised, as hereinafter explained, will be brought into gear with the beveled teeth on wheel E, as indicated in red in Fig. 3. Shaft I is provided with a circumferential groove, in which the bifurcated end of a lever, *h*, engages, said lever being pivoted at *i*, Fig. 2. By operating lever *h* the shaft I is raised, whereby the pinion *e* on its upper end is thrown out of gear with the endless screw *f*, and wheel J is thrown into gear with wheel E for the purpose of reversing the movement of sliding frame C and withdrawing the augers D from the holes cut by them in their forward movement in the coal.

The augers D have their bodies made as strong as possible, and are provided with spiral flanges for removing the chips or broken

coal, as shown in Fig. 2. Instead of the usual lips attached to wood-cutting augers, these augers D are provided with points constructed like one or the other of the styles shown in the drawings, and which are found in practice to operate with much greater facility than those constructed in the ordinary style.

To illustrate the operation of our invention, the diagram N, Fig. 4, is used to represent a transverse vertical section of the seam of coal to be mined. The machine is so located as to bring the points of the augers against the face of the coal, and power applied, which forces the augers into the coal to the desired depth, when the motion of shaft I is reversed by means of lever *h*, as before described, which causes the sliding frame C to travel in a reverse direction, thereby withdrawing the augers. The machine is moved laterally a distance equal to the width of the cut made by the augers, when the operation is repeated, and so continued until the channel O, technically termed "bearing in," is completed to the required distance, the frame B being adjusted so as to cut said channel at the desired height. The augers may then be shifted to the post L of the sliding frame; or, if desired, another machine having them permanently located in that position may be used, by which the channel P, technically denominated "cutting," is formed by a similar operation of the machine. A blast, or wedges, is then inserted in the central hole Q, by which the face of the coal vein is broken off in the usual manner. It will thus be perceived that the object of our invention is to perform the bearing in and cutting operations by machinery, the same having heretofore been done by the pick and hand-labor, it, of course, being obvious that the machine may be operated by steam, compressed air, or any other known power, if desired.

The operation of the machine is as follows: Power is applied to the shaft G, from whence it is transmitted through wheel E to the augers D. At the same time a forward motion is imparted to the sliding frame C through the medium of screw *f*, pinion *e*, shaft I, wheel H, and rack K, which moves the augers for-

ward and keeps them up to their work. When it has cut to the proper depth, the end of lever *h* is depressed, which throws wheel J into gear with wheel E, by which the motion of wheel H is reversed, and the sliding frame C, with the augers, is carried back to its original position, ready for another cut.

It will be observed that the rear end of the rack rests against a spring, R, the object of which is to allow the same, with the sliding frame and augers, to yield, in case the latter should come in contact with any unusually hard substance, and thus prevent their being broken.

It is obvious that any well-known device which will accomplish the object may be connected with the lever *h*, for the purpose of operating the latter automatically, so as to reverse the movement of the sliding frame C at either end of the machine without stopping its operation.

Having thus described our invention, its construction and operation, what we claim as new, and desire to secure by Letters Patent, is—

1. One or more series of rotating augers constructed substantially as described, for the purpose of mining coal.

2. Mounting the augers D in the sliding frame C, in combination with the adjustable frame B, substantially as described.

3. Adjusting the frame B by means of the hinged rods *c*, screw-bolt *b*, and sliding collar *a*, or their equivalents, substantially as shown.

4. Having the driving-shaft G in the swinging frame F, substantially as and for the purpose set forth.

5. The combination and arrangement of wheel E, shaft I, provided with its pinion *f*, wheels J and H, and rack K, substantially as described.

6. The combination of the spring R, rack K, and frame B, substantially as and for the purpose set forth.

WILLIAM WATSON GRIER.

ROBERT H. BOYD.

Witnesses:

A. S. NICHOLSON,
ROBERT HAYNE.