

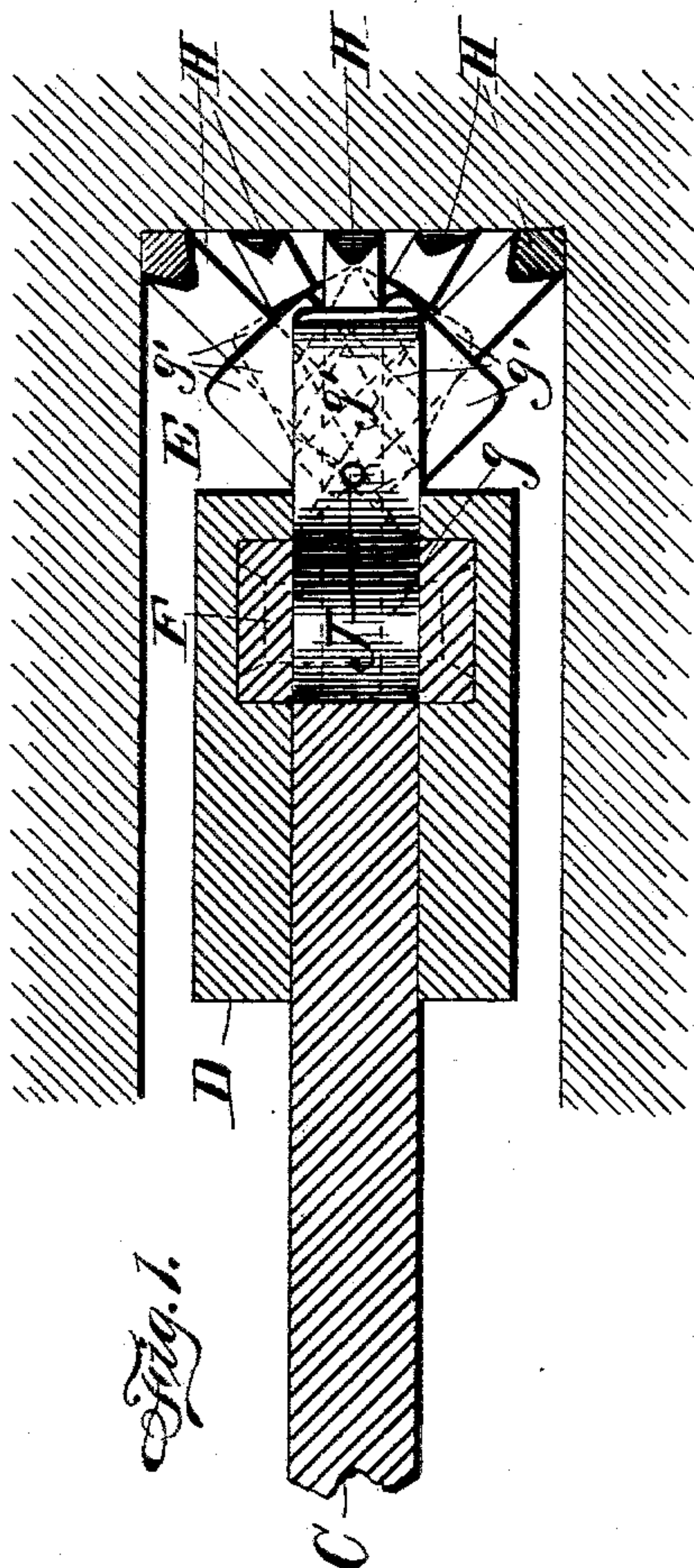
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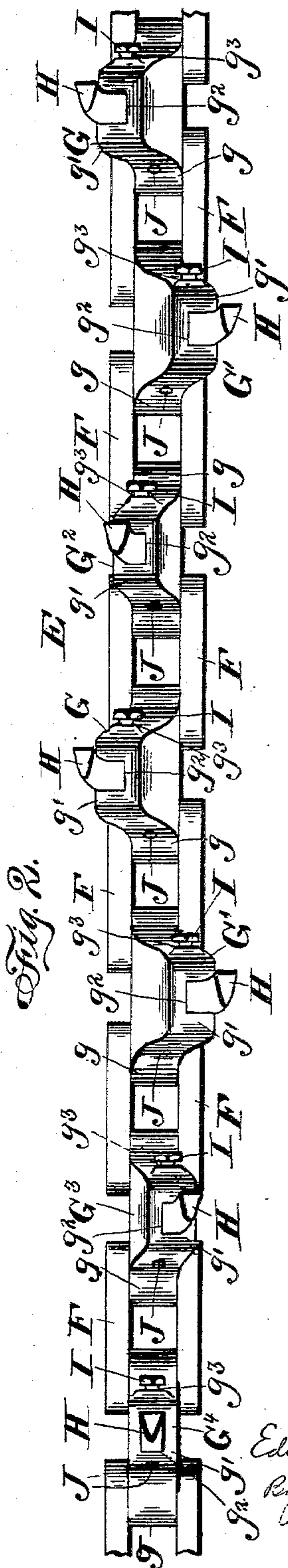
E. L. HOPKINS.  
MINING MACHINE.

No. 597,358.

Patented Jan. 11, 1898.



Witnesses  
W<sup>m</sup> H. Edwards  
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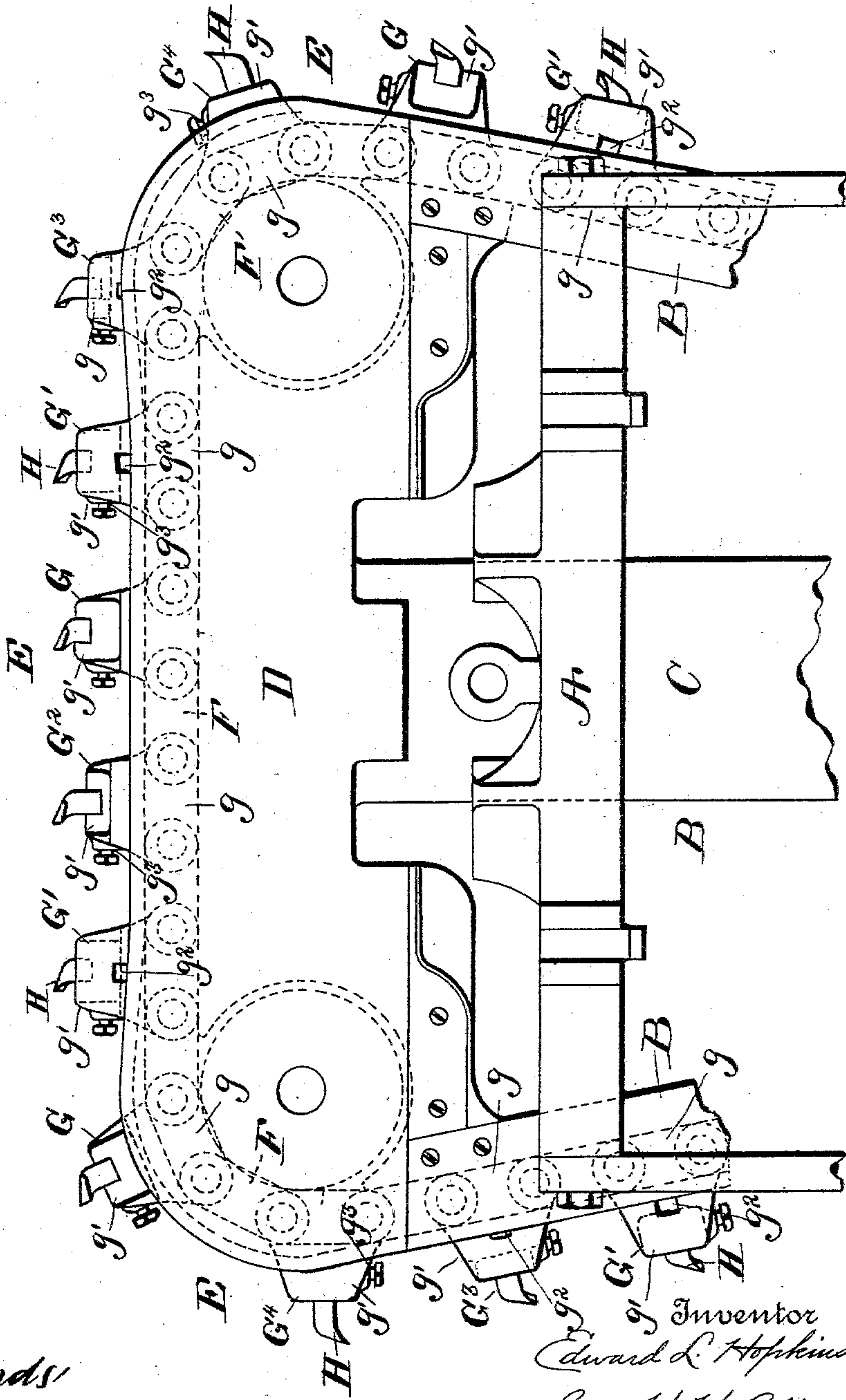
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Fig. 3.



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# UNITED STATES PATENT OFFICE.

EDWARD L. HOPKINS, OF COLUMBUS, OHIO.

## MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 597,358, dated January 11, 1898.

Application filed November 4, 1895. Serial No. 567,935. (No model.)

*To all whom it may concern:*

Be it known that I, EDWARD L. HOPKINS, a citizen of the United States, residing in Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mining-Machines, of which the following is a specification.

Figure 1 is a cross-section of a cutter-head having my improved chain applied thereto. Fig. 2 is a face or edge view of the chain. Fig. 3 is a plan view of a sufficient portion of a mining-machine to illustrate the manner of applying my improvements thereto.

In the drawings, A indicates a portion of the bed-frame, and B indicates generally a portion of the carriage or frame on the bed which moves forward and back and supports the cutter-chain. In the construction shown this has a centrally-arranged thrust-bar C, with a cross cutter-head D at the front, which supports the chain along the operating-line. This cross cutter-head, it will be seen, is formed with a guideway which is stationary relatively to the chain and having parts which prevent the chain from moving unduly upward, downward, or forward when the cutters are at work and are traveling across the front. It is desirable to have the chains as small as possible within the necessary limits of strength, and this necessitates the forming of the cutter-links with the bosses or projections in front of and outside of the stationary guideway and arranged to project vertically (either up or down) into the horizontal planes of the vertical stop plates, ribs, or flanges, which form part of the guideway, and with which stop plates, ribs, or flanges the body portion of each cutter-link engages. In the construction of guideway and chain shown the guide has a relatively narrow or reduced throat, through which project these extensions, bosses, or lugs on the cutter-links and outside of which throat the lugs are bent or inclined to project upward or downward, as above described; but there are now known numerous forms of these chain-cutter mining-machines with modified styles of bed-frames, carriages, engines, or motors, and other details, and the present improvements can be applied to any of those having stationary guideways for the cutter-chain along the front and chains having cutter-holding pro-

jections in front of said stationary guideways.

The chain itself is indicated as a whole by E, it being arranged to travel around the chain-supporting part of the carriage. As shown, it is constructed of strap-links F, arranged in pairs, and intermediate cutter links or blocks G G' G<sup>2</sup> G<sup>3</sup> G<sup>4</sup>. The detachable and adjustable bits H are secured to the latter.

One of the objects of the present invention is to provide bit-carriers which shall not only be sufficiently strong, but also have the metal disposed in such way that the bits can be directed or held in lines such that their edges shall attack the coal in a desirable manner.

Heretofore it has generally been customary to employ bent or crooked bits in the cutter-chains of mining-machines; but serious disadvantages are incident to these bits owing to the difficulty and expense incident to their manufacture and to keeping them properly adjusted and in repair.

Another object of the present invention is to so construct and arrange the bit-carrying parts that the bits themselves can be formed from straight bars of steel and require nothing except to be cut in proper lengths from the bar, suitably sharpened at one end, and then fastened in the bit-sockets.

The link G, it will be seen, is formed with a body part or draft portion g, to which the strap-links F are articulated, and with a forwardly-projecting lug g'. In this link G the part g' is turned upward relative to the draft portion g. g<sup>2</sup> is the cutter-socket, which in this link extends downward and inward from the outer end of the lug g', the socket passing entirely through to the lower side of the link. At g<sup>3</sup> there is a threaded aperture to receive the binding-screw I. The link G<sup>4</sup> is more or less similar to the link G, except that the forwardly-projecting portion g' is inclined outward and downward instead of upward. It also has a cutter-socket, which in this case extends from the upper face of the cutter-link downward, outward, and through the end of the lug. It has a set-screw at I. In all of the links of the present construction these set-screws I are placed outside of and in front of the stationary guide and on the front side of the bit, so that the latter shall be relieved of



all pressure upon its threads and can therefore be brought tightly to place and firmly held.

J J indicate steel pins which are inserted into the sockets, these pins lying transversely of the cutter-socket and being adapted to prevent the bits from sliding backward far enough to engage with any of the stationary parts of the frame. The bit-sockets are carried entirely through the body of the metal and have both ends open in order that shaping and drifting tools can be readily passed through to provide true walls, so that the bits can be tightly fitted in place.

The link  $G^4$  has its lug  $g'$  arranged to project directly and horizontally outward, it being in other respects substantially similar to those at  $G$  and  $G'$ . The links  $G^2$  and  $G^3$  are in principle of structure substantially the same as those at  $G$  and  $G^4$ ; but the lugs  $g'$  are not inclined either upward or downward at as great an angle to the horizontal as are the lugs on the former links.

As above stated, the cutter-bits  $H$  are cut from straight bars of steel. They are sharpened by having the metal at the front end and behind the front face beveled or tapered. They all incline forward slightly from that vertical plane which is transverse to the cutter-head. Those in the links  $G$  and  $G^2$  incline upward from the central horizontal plane of the cutter-link, and those at  $G'$  and  $G^3$  both incline downward, though at different angles, as above stated. By examining Figs. 2 and 3 the preferred arrangement of these cutter-links as to their sequence will be seen. The upper and lower cutters have work to perform which is much more severe than those which have their points or edges in the intermediate horizontal plane. Hence I so distribute the cutter-links that those along the top and the bottom shall be greater in number than the others. The preferred arrangement is shown diagrammatically in Fig. 2, from which it will be understood that the cutters follow each other in what may be

called "sets" or "groups," those of each group comprising, first, a long upward-turned cutter  $G H$  and a long downward-turned cutter  $G' H$ , then a short upward-turned cutter  $G^2 H$ , then another pair of long ones  $G G'$ , then a shorter one extending downward,  $G^3 H$ , then the central one,  $G^4 H$ . The coal at the central part horizontally of the kerf is much more easily attacked and dislodged than that which lies along the top and bottom, and therefore the cutters in the links at  $G^2$ ,  $G^3$ , and  $G^4$  have much less work to perform than those at  $G$  and  $G'$ . Consequently the arrangement of the cutter-links in groups such as described is, it is believed, the most economical and advantageous.

What I claim is—

1. In a mining-machine cutter-chain, the herein-described cutter-links arranged in groups, each group having two pairs of cutters, and each of said pairs comprising one long upper and one long lower cutter, together with one short upper and one short lower cutter, and each cutter lying in vertical planes other than those of the adjacent cutters, substantially as set forth.

2. In a mining-machine cutter-chain, the herein-described cutter heads or links each having an outwardly-projecting and vertically-inclined bit-carrying portion, with a correspondingly-inclined bit-socket therein, the said cutter heads or links being arranged in groups, each group having a pair of long upper and a pair of long lower cutters, together with one short upper, one short lower and one horizontal centrally-arranged cutter, each cutter lying in vertical planes other than those of the adjacent cutters, substantially as set forth.

In testimony whereof I have hereunto set my hand this 25th day of October, 1895.

EDWARD L. HOPKINS.

Witnesses:

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