(No Model.) 2 Sheets—Sheet 1.

G. W. LUTES.

UNDERCUT MINING MACHINE.

No. 553,248. Patented Jan. 21, 1896.

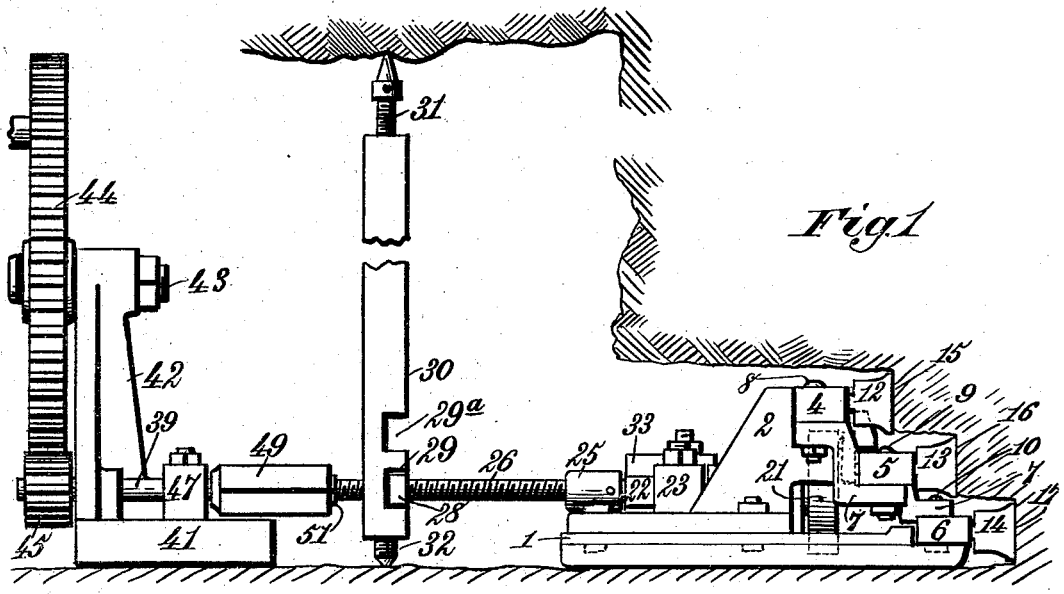

Fig. 1

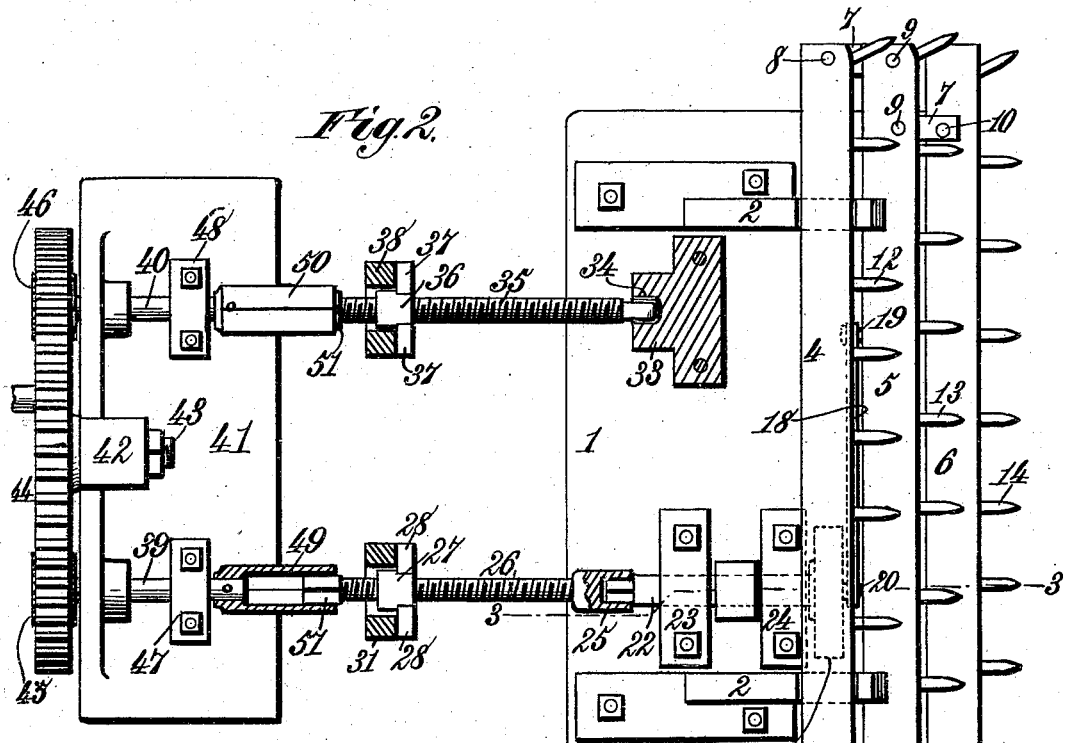

Fig. 2.

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 3.

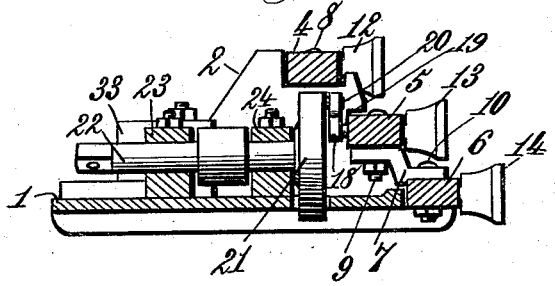


Fig. 4.

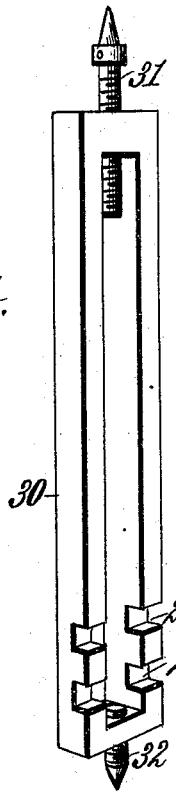


Fig. 5.

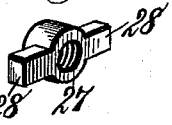
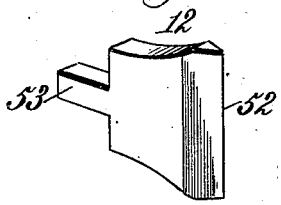


Fig. 6.



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UNITED STATES PATENT OFFICE.

GEORGE W. LUTES, OF LISBON, OHIO, ASSIGNOR OF ONE-FOURTH TO AMOS B. CASSELMAN, OF WASHINGTON, DISTRICT OF COLUMBIA.

UNDERCUT MINING MACHINE.

SPECIFICATION forming part of Letters Patent No. 553,248, dated January 21, 1896.

Application filed September 26, 1895. Serial No. 563,767. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. LUTES, a citizen of the United States, residing at Lisbon, in the county of Columbiana and State of Ohio, have invented new and useful Improvements in Undercut Mining Machines, of which the following is a specification.

This invention relates to that class of mining-machines having a gang of reciprocating cutting-tools designed for undercutting or undermining to form horizontal and narrow cuttings, and thus facilitate the subsequent detachment or removal of the coal.

The chief objects of my invention are to improve the prior apparatus or machines of the class referred to, and to provide a novel arrangement of cutters, whereby stepped under-cuts will be produced in the operation of the machine, thus rendering it possible to produce at one operation an under-cut or groove of considerably greater width than is possible with prior machines of a similar character for the purpose of materially facilitating the detachment or removal of the coal.

The invention also has for its object to provide novel means for simultaneously advancing or feeding and reciprocating the cutters in such manner that they are maintained in engagement with the coal during their reciprocating movements to produce the stepped under-cut.

To accomplish these objects my invention involves the features of construction and the combination or arrangement of parts hereinafter described and claimed, reference being made to the accompanying drawings, in which—

Figure 1 is a side elevation of my improved mining-machine applied in operative position in a mine and showing the stepped under-cuts produced by the cutting-tools. Fig. 2 is a plan view of the machine, showing some of the parts in section. Fig. 3 is a detail sectional view taken on the line 3 3, Fig. 2. Fig. 4 is a detail view of one of the brace-standards for engaging the top and bottom of the mine for the purpose of enabling feed mechanism to advance the cutting-tools as they are reciprocated. Fig. 5 is a detail perspective view of one of the nuts used in connection with the screw-shafts which advance the cutting-tools and reciprocate the same, and Fig. 6 is a detail perspective view showing a form of cutting-tool which may be used.

In order to enable those skilled in the art to make and use my invention, I will now describe the same in detail, referring to the drawings, wherein—

The numeral 1 indicates a base-frame of any construction suitable for the purpose. This base-frame is preferably composed of a rectangular piece of timber arranged in a horizontal position and provided with upright brackets 2, bolted or otherwise attached to the base-frame and constructed to receive the cutter-head, which is composed of horizontal cutter-carrying bars 4, 5 and 6, arranged in a stepped form, so that the bar 5 lies in rear of the bar 6, and the bar 4 lies in rear of the bar 5.

The cutter-carrying bars are rigidly connected by angular brackets 7, bolted to the respective bars through the medium of suitable bolts, as at 8, 9, and 10. The cutter-carrying bars are provided with gangs of cutters or cutting-tools 12, 13, and 14. The gangs of cutters or cutting-tools 12, 13, and 14 are preferably detachably secured respectively to the cutter-carrying bars 4, 5, and 6 in such manner that the tools can be readily removed for the purpose of sharpening them whenever desired, or for substituting a new cutter (one or more) if occasion demands.

It will be observed that by the construction and arrangement of parts described and shown the gangs of cutters are arranged in stepped form, one gang lying in advance of the other gang, so that if the cutter-head, as a whole, is reciprocated and the tools act upon the coal the cutters or cutting-tools will produce stepped cuttings, as indicated by the numerals 15, 16, and 17, Fig. 1, thereby rendering it possible to readily produce a cutting or groove of considerable depth or width, as compared to a single row of cutters acting on the coal in prior machines for undercutting or undermining.

The cutter-head is reciprocated through the medium of a pitman 18, pivoted at one end, as at 19, to the central cutter-carrying bar 5 of the cutter-head, and at its opposite end connected to the crank 20 of a crank-wheel

21, secured to a rotary shaft 22, which is journaled in brackets 23 and 24, bolted or otherwise rigidly secured to the base-frame 1. The rear end of the shaft 22 is provided with an angular head engaging an angular socket 25 in the front end of a screw-shaft 26 which works in a non-rotary nut 27, having lateral arms, as at 28, lying in recesses 29, formed in a brace-standard 30. The brace-standard is provided at its upper and lower ends with adjustable screws 31 and 32 for the purpose of engaging the top and bottom of the mine, and thereby enabling the brace-standard to be rigidly and immovably fixed in a perpendicular position, as represented in Fig. 1.

The base-frame 1 is also provided with a bearing-block 33, having a cavity 34, in which is arranged the front end of a screw-shaft 35, working in a screw-nut 36, having lateral arms 37 engaging recesses in a brace-standard 38, constructed and arranged in all substantial respects the same as the brace-standard 30, so that it can be fixed in a perpendicular position in the mine. The brace-standards resist the rearward pressure of the non-rotary nuts 27 and 36 when the screw-shafts 26 and 35 are rotated, and these brace-standards also engage and prevent rotation of the nuts when the screw-shafts are rotated.

The rotary motion of the screw-shaft 26 imparts a rectilinearly-reciprocating motion to the cutter-head, and the rotary motion of the screw-shaft 35 advances or feeds the base-frame 1, and consequently the gangs of cutters, during the reciprocating motion of said cutters.

The screw-shafts are both rotated in the same direction, and this is accomplished, as here shown, through the medium of rotary drive-shafts 39 and 40, journaled on a frame 41, having a pillow-block 42, in which the shaft 43 of a spur-gear 44 is journaled. The spur-gear meshes into pinions 45 and 46, secured respectively to the shafts 39 and 40. The shafts 39 and 40 are journaled in bearings 47 and 48, and their front ends are constructed with sleeves 49 and 50 engaging over the square heads of the screw-shafts, as indicated at 51, Fig. 2, in such manner that when the shafts 39 and 40 are rotated the screw-shafts 26 and 35 are also rotated, and since these screw-shafts are in operative connection with non-rotary nuts 27 and 36 the screw-shafts will travel longitudinally in a forward direction. In the longitudinal movement of the screw-shafts their angular heads, as 51, traverse the sleeves 49 and 50 of the shafts 39 and 40.

The spur-gear 44 may be rotated manually, or it may be driven by any suitable motor, such as an electrical or other engine. The rotation of the spur-gear imparts rotary motion in the same direction to the pinions, and, therefore, by the construction and arrangement of parts heretofore described and shown, the gangs of stepped cutting-tools are simultaneously advanced or fed forward and reciprocated rectilinearly to produce a stepped under-cut, as indicated in Fig. 1, which produces a comparatively deep or wide undercutting to facilitate the subsequent detachment or removal of the coal.

The brace-standards 30 and 38 are preferably constructed with supplemental recesses 29^a, as shown in Fig. 4, for the vertical adjustment of the non-rotary screw-nuts 27 and 36 to accommodate the various parts of the base-frame 1 and frame 41, if they are set higher or lower in the mine to meet conditions that may arise.

A machine constructed in accordance with my invention can be conveniently and readily operated, and will rapidly produce stepped under-cuts for the purpose of undercutting or undermining the coal in a coal-mine to facilitate the subsequent detachment or removal of the coal, thereby entirely avoiding the discomfort and labor incident to the ordinary practice of undercutting, which requires the miners to lie recumbent and use picks.

I have specifically described my improved machine with special reference to operating on coal in a coal-mine; but obviously the machine can be used for any purpose for which it may be found adapted.

The construction of the cutters is best seen by reference to Fig. 6, where one of the cutters is represented in detail. The cutter is formed with a chisel-edge 52 and a shank 53, adapted to be set in a socket in a cutter-carrying bar. The construction of the cutter may, however, be variously modified without affecting the spirit of my invention.

The chief advantage of my machine resides in its simplicity of construction and the possibility of manufacturing it at greatly less expense than machines heretofore constructed and designed for undercutting or undermining.

Although I have illustrated a specific form of cutting-tool, (best seen in Fig. 6,) I do not wish to be understood as confining myself to any particular construction of cutting-tool, as the form, shape, or construction thereof may be variously modified without affecting the spirit of my invention.

Having thus described my invention, what I claim is—

1. In a mining machine, the combination with a base-frame, of a reciprocating cutter-head provided with a plurality of cutter carrying-bars arranged in stepped form, one in advance of another, gangs of independent cutters mounted respectively on the cutter carrying-bars to produce stepped undercuts, and mechanism for reciprocating the cutter-head, substantially as described.

2. In a mining machine, the combination with a base-frame, of a reciprocating cutter-head comprising a plurality of cutter carrying-bars arranged in stepped form, brackets rigidly connecting the cutter-bars together, gangs of independent cutters mounted respectively on the cutter carrying-bars to pro-

duce stepped undercuts, and mechanism for advancing or feeding and reciprocating the cutter-head, substantially as described.

3. In a mining machine, the combination with a base-frame, and a reciprocating cutter-head provided with cutting tools and mounted on the base-frame, of a pair of rotary screw-shafts, one of which connects with and serves to reciprocate the cutter-head, and the other one of which serves to advance or feed the cutter-head, non-rotary screw-nuts with which the screw-shafts engage, and mechanism for imparting rotary motion to the screw-shafts, substantially as described.

4. In a mining machine, the combination with a base-frame, and a reciprocating cutter-head mounted thereupon and provided with cutting tools, of two rotary screw-shafts, one of which connects with and serves to reciprocate the cutter-head, and the other one of which serves to advance or feed the cutter-head, brace-standards adapted to engage the top and bottom of a mine, non-rotary screw-nuts engaged with the brace-standards, rotary-shafts having sleeves engaging and serving to rotate the screw-shafts, and mechanism for rotating the sleeve carrying-shafts, substantially as described.

5. In a mining machine, the combination with a base-frame, and a reciprocating cutter-head mounted thereupon and provided with cutting tools, of a countershaft journaled on the base-frame and having a crank and pitman connection with the cutter-head for reciprocating the same, a rotary-screw-shaft engaging said countershaft, a rotary screw-shaft engaging a part of the base-frame, brace-standards provided with non-rotary screw-nuts with which the screw-shafts are in operative connection, a pair of rotary drive-shafts loosely connected with the screw-shafts for rotating the latter and provided with pinions, and a spur gear engaging the pinions, substantially as described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE W. LUTES.

Witnesses:
JOHN M. DICKINSON,
GEO. T. FARRELL.