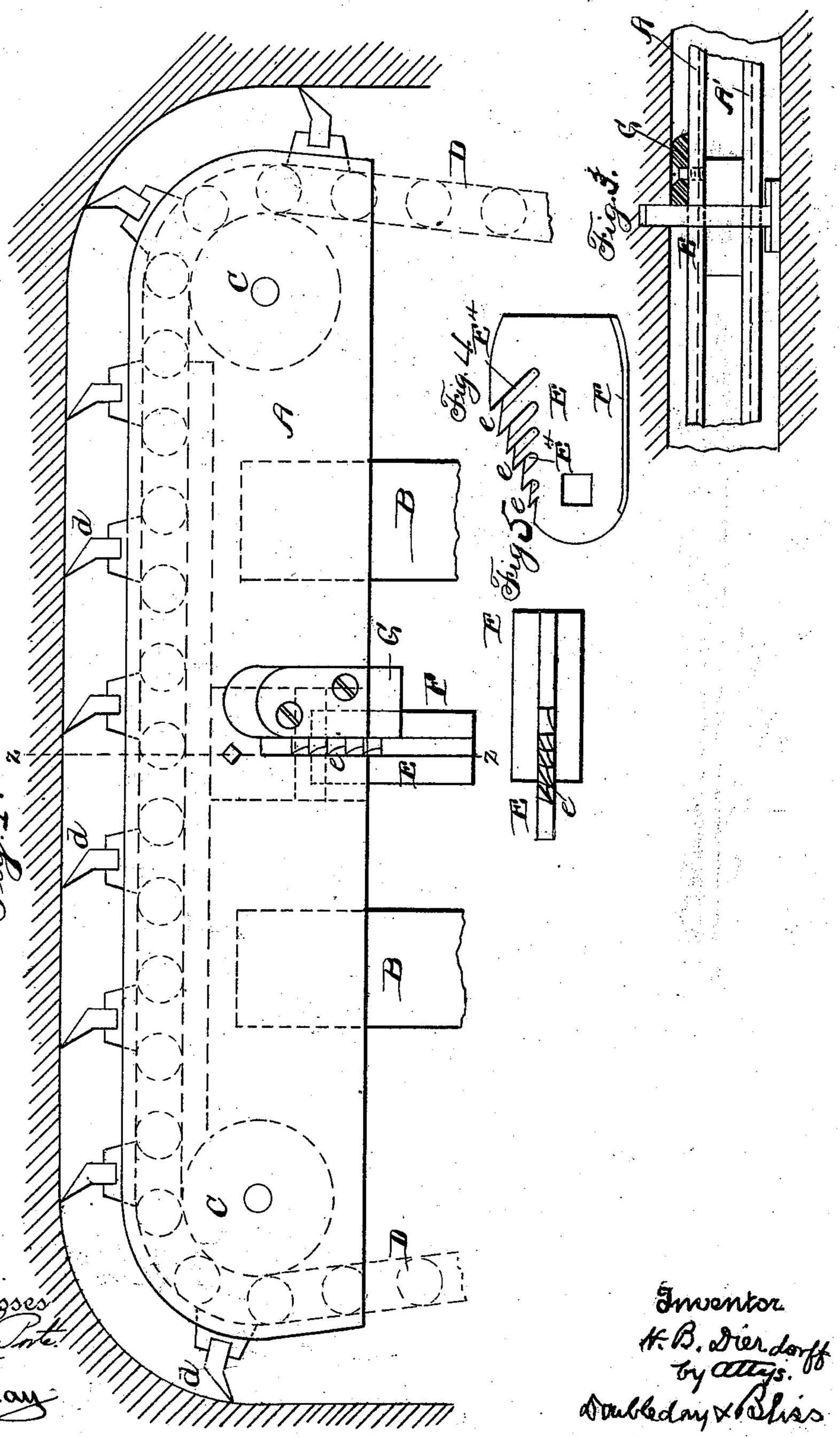
(No Model.) 2 Sheets—Sheet 1.

H. B. DIERDORFF.

MINING MACHINE.

No. 548,970. Patented Oct. 29, 1895.



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(No Model.) 2 Sheets—Sheet 2.

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Fig. 6.

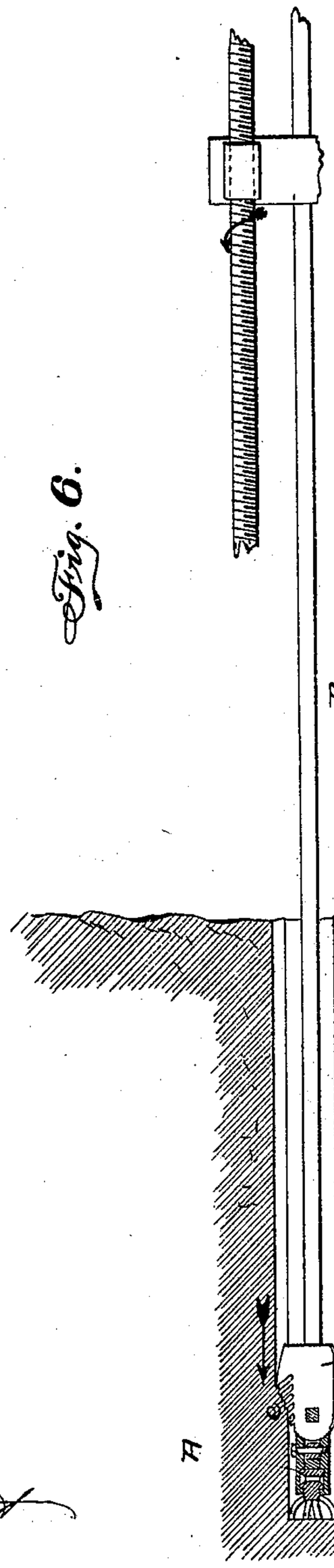
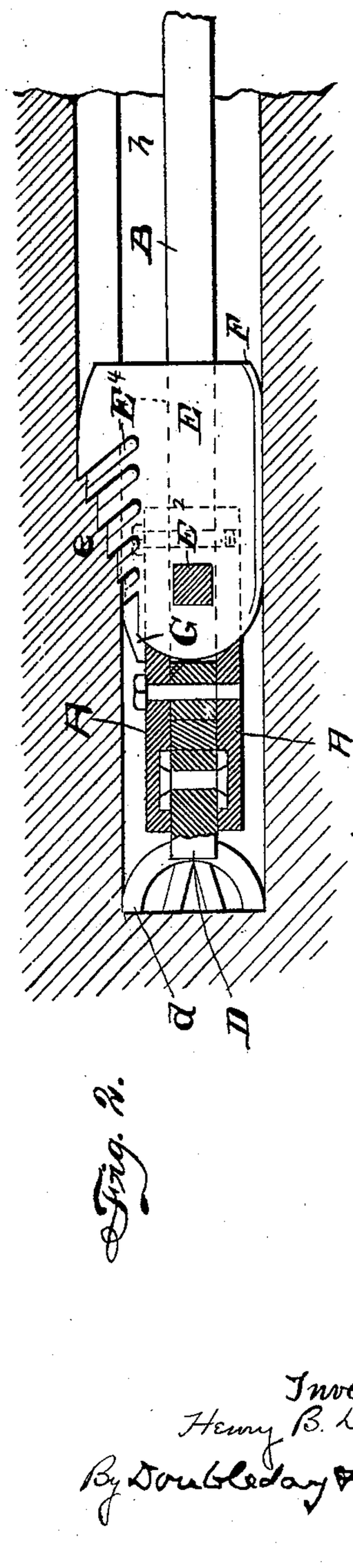


Fig. 7.



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UNITED STATES PATENT OFFICE.

HENRY B. DIERDORFF, OF COLUMBUS, OHIO, ASSIGNOR TO JOSEPH A. JEFFREY, OF SAME PLACE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 548,970, dated October 29, 1895.

Application filed November 28, 1893. Serial No. 492,309. (No model.)

To all whom it may concern:

Be it known that I, HENRY B. DIERDORFF, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mining-Machines; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The present invention relates to improvements in mechanisms for mining or cutting coal and other materials, it relating more particularly to improvements upon the devices shown in the patent to B. A. Legg, No. 342,614, dated May 25, 1886, and the German patent, No. 6,846, dated January 31, 1879; and the features of improvement will be readily understood from the description below, taken in connection with the drawings.

Figure 1 is a plan of a part of a mining-machine having my improved stay or cutter-holder applied thereto. Fig. 2 is a section on line *z z* of Fig. 1. Fig. 3 is a partial rear view. Fig. 4 is a side view, and Fig. 5 is an edge view, of the stay or holder detached. Fig. 6 shows the cutter-carriage extended.

In the drawings I have shown a portion of the cutter-carriage or sliding frame of a mining-machine, it being adapted to be combined with a bed frame or support which can be made temporarily stationary, the carriage sliding forward and back on the bed.

A A′ respectively indicate the top plate and bottom plate of the front cross part of the carriage-frame. These are connected to the parts in the rear by means of one or more longitudinally-arranged frame-bars B B.

It will be understood that so far as the details of the above-described parts are concerned they may be of any usual or preferred form and may have applied any preferred engine or motor. Thus in Fig. 6 there is illustrated, more or less conventionally, a sufficient part of well-known devices for advancing the carriage.

C C indicate the guide-wheels, which support and guide the cutter-chain D. At this date there are numerous forms of these chains and wheels, and the present invention is adapted for use in connection with any of them.

The chain D is provided with cutters *d* and is driven from a suitable sprocket-wheel or equivalent device at or near the rear end of the carriage in the now common way, the chain being adapted to travel continually in the direction of the arrow.

When the machine is at work and the cutters *d* are engaging with the material, they will meet powerful resistance, and there is a reactionary thrust laterally in the direction opposite to that indicated by the arrow. Successful work demands that this reactionary thrust should be overcome, and heretofore numerous devices have been used or proposed for accomplishing this purpose. To each of the devices with which I am acquainted there are incident numerous objections and disadvantages which I have overcome.

E indicates a relatively stationary plate—that is, one secured stationarily to the carriage. It is formed or provided with a series of points *e e*, which preferably rise one above another and lie on an inclined line, the first one at the bottom rising but little above the plane of the roof of the main kerf. The plate E can be secured to the carriage in any suitable way. As shown, it is extended downward and is seated in a recess formed in the carriage cross-head and is fastened by a bar or pin at E^2, the latter engaging with the carriage or with a plate secured thereto. The plate E is thin (three-eighths of an inch) in cross dimensions, and the uppermost tooth or cutting-point rises only five-eighths to three-fourths of an inch.

The mode of action of this device will be readily understood. As the points *e* are pushed forward with the carriage under the constant pressure exerted by the ordinary feed devices (nut and screw, pinion and rack, or the like) commonly used, they are held powerfully in continuous engagement with the coal. In order to have the second point free to advance while maintaining its hold on the coal, the first or lowest one removes a shallow layer of the coal in front of it, and so throughout the series, and each point provides a "free face" of coal below the next

one, so that the latter readily removes the coal in front of it, and an insignificant amount of power is required to advance the whole series. By having a series of several cutting-points I insure that one or more shall maintain a constant hold, even though one or more others should for an instant lose their hold by the shaling down of coal particles. E^4 indicates a groove or grooves for the escape of detached coal particles.

The cutter-points, it will be seen, are each shaped so as to incline forward and upward, and when they are being constantly pressed against the coal their tendency is to rise somewhat and assist more or less in holding up the front end of the carriage.

As said above, I am aware of the fact that it is not broadly new to employ in a coal-mining machine the combination of a series of laterally-operating cutters arranged to move and to cut at the front of a machine and a driven vertical cutter arranged at the front of the machine to move and cut a kerf transversely to the kerf of the laterally-operating cutters for the purpose of preventing lateral displacement of the machine, as the aforesaid patent, No. 342,614, to B. A. Legg, illustrates how a driven vertical cutter of the nature of a drill has been combined with reciprocating saw-like cutters and adapted to accomplish several purposes, including this overcoming of the reactionary thrust of the laterally-acting cutters by forming a kerf transverse to the main kerf, the sides of the drill bearing against the sides of the smaller vertical kerf, and the aforesaid German patent, No. 6,846, illustrating how a continuously-moving laterally-operating chain-cutter can have combined with it a driven vertical cutter, which forms a kerf transverse to the main kerf and acts to center and govern the movements of the cutter-frame; but it will be seen that I do not employ a driven cutter, those herein shown being entirely stationary relatively to the carriage or the frame to which they are secured. I obviate the necessity of the driving or power-transmitting and power-consuming devices which are required when use is made of a driven cutter, whether the latter be arranged to reciprocate relatively to the carriage or to rotate in vertical planes or to rotate in horizontal planes. Comparatively numerous parts, by way of wheels and shafting or chains, &c., are necessary when use is made of driven cutters for this purpose.

It is well known that in all mining-machines comprising, mainly, a stationary bed and a carriage adapted to slide forward from five to seven feet when the carriage approximates the forward limit of its movement the sagging or a tendency to drop down of the front end increases very objectionably. This is particularly true where laterally-operating cutters are used, (such as the reciprocating saw in the said Legg patent, or the chain-cutters of the present or of the said German and other earlier constructions,) for normally the upward and downward tendencies, as concerns the cutters, are neutralized, and therefore the gradually-increasing leverage of gravity is experienced, with the result of a serious binding and cramping between the opposing surfaces of the carriage and the bed.

The shapes or relations of the edges or faces of the parts E can be varied to correspond to different classes of material. When the coal is of the harder sorts, the points *e* should be so arranged as to be adapted to perform this lifting function and yet overcome the more severe resistance presented, and vice versa with respect to the softer varieties of material.

When the material which is being cut is friable or liable to break down easily, I employ a plate adapted to move under and support the horizontal wall immediately adjacent to the lines of action of the cutter E. Such a plate is shown at G, it being supported on the carriage close to the cutter, as aforesaid; but the other features of the invention are not dependent on it, and it can be often dispensed with.

Owing to the possibility of the cutters becoming dulled, and therefore not removing the material in advance of them, (which would result in a downward pushing of the front end of the carriage,) I prefer to combine with the devices above described means of the nature of an abutment on the opposite side or bottom of the kerf to receive the pressure without imparting it to the carriage. In such case I employ a runner or shoe-like plate F at the bottom of the part E. This shoe or runner also serves to take the weight of the front part of the carriage as it moves forward and to hold it up against its tendency to sink or sag downward, it being remembered that in these chain-cutter machines the cutters in the chain are the lowermost bodies and have to take the down thrust ordinarily.

The shoe F is preferably rounded at both the front end and the rear end, so as to readily pass over particles, ridges, &c. As shown, the shoe and the stay are applied and removed together, in fact are integral; but that is entirely a matter of convenience, and in their actions they may be independent under many circumstances.

I herein refer to the fact that in the present machine the device at E is not "driven"—that is to say, there are no special power-transmitting devices for imparting motion from the engine, motor, or driving mechanism to it in the ordinary way, as in patents above mentioned. In my case the cutters are non-driven or stationary relative to the carriage, and as a consequence I provide for the desirable results above described.

Driven cutters of other forms have been used or proposed, including reciprocating picks, rotary augers, and horizontally-acting cutter-wheels; but in each of such cases use has to be made of supplemental power-transmitting devices in order to drive the cutter,

and, moreover, they have had combined with them projections extending up from the carriage and formed separately from the cutters, which projections were intended to take the lateral thrust. When use was made of reciprocating picks or rotary augers, these projections consisted of the bearings in which the drills or augers were mounted. With the horizontal rotary cutter-wheels the projections used were bars extending back from the wheels and adapted to enter their kerf.

By employing a device of the character of mine I obviate entirely the necessity not only of the parts to drive the cutter, but of the projections or bearings to follow behind the cutter to act as a stay.

There can be modification in some of the parts without departing from the essential features of the mechanism. The cutting points or edges can be varied in shape, size, and number to meet the varying conditions presented, and they can be secured to the carriage in other ways and still preserve the important matter of being adapted to be pressed constantly against the coal under the continuous pressure of the carriage.

I am further aware of the fact that it has been heretofore proposed to employ a long keel-like rib on the outside of a cylindrical casing of a tunneling-machine, and do not claim such matter as of my invention; but in the proposed machines of that sort within my knowledge there was no provision for allowing the coal particles loosened by the keels to escape backward between the wall of the frame and the wall of the kerf. Such loosened coal would have a tendency to cramp and bind the moving parts; but in the present construction there is a free space or open chamber between the chain-supporting frame and the horizontal wall of the kerf at points within the area inclosed by the chain-cutters, so that coal particles loosened by the stay device will not clog or cramp any of the parts either above or below the chain-supporting frame. Such escape is facilitated by the clearance-passages, as at E^4, between one cutting-point and the next when a multiple cutter is used.

I am further aware of the fact that it has been proposed to combine with a chain-cutter mining-machine a holding device, consisting of a plate of metal secured to the side of the carriage and lying in about the central horizontal planes and arranged to bear laterally against the vertical side wall of the kerf; but in the machine to which I refer this abutment or holding-plate was so arranged as to necessitate the use of two chains, one moving above the plate and one below it. It will be seen that it is necessary to have the bearing-edge of the holding-plate at least as far out from the side of the carriage as the outermost vertical plane, in which move the points of the cutters. The cutters, or many of them, must project downward and upward beyond the horizontal plane of the chain-links in order to cut a path and provide clearance for the carriage and the chain. Hence it is practically impossible to project a holding-plate of the sort last referred to out laterally unless it is placed below the horizontal plane of the lowermost cutter-points. When so placed, there is no path for it. To provide a path for this plate, a second lower cutter-chain had to be applied, which moved below the plate. Thus two kerfs were made, leaving a horizontal web of coal between them. To remove this web, a cutter had to be employed at the front of the holding-plate. Such a web or line of material could not be removed from ordinary refractory coal without first forming a kerf both above and below it. All of this is obviated by arranging the cutter-holder in the way I have shown and described—that is to say, so that the cutting-points engage with the coal forming a horizontal wall, as with the roof; and I desire to be understood as limiting myself to a cutter-holder of the sort described, having its points projected vertically from the carriage and engaging with the horizontal wall of the chain-kerf, and specifically exclude holders or cutters which engage with the coal along the vertical wall at the side of the main kerf on lines between the top and bottom horizontal planes of the cutter-points.

What I claim is—

1. In an undercutting mining machine having laterally operating endless chain cutters the combination with the cutter carriage adapted to advance into the kerf or cut, of a non-driven or relatively stationary holding cutter projecting directly upward from the carriage and having one or more points adapted to be pressed and held continuously against the coal forming the roof of the main kerf under the constant pressure of the advancing carriage, substantially as set forth.

2. In an undercutting mining machine having laterally operating endless chain cutters, and a cutter carriage or frame adapted to enter the kerf or cut, the combination with said carriage of a non-driven holding cutter stationary relatively to the carriage and projecting directly upward therefrom and having one or more upwardly inclined cutting points adapted to be pressed continuously forward and upward against the coal forming the roof of the main kerf under the constant pressure of the carriage, whereby said points tend, by their constant engagement, to prevent downward or lateral swerving of the carriage, substantially as described.

3. In a mining machine of the character described, the combination with the horizontally acting cutter, and the cutter carriage or frame moving into the kerf or cut, of the holding cutter above the carriage and adapted to be pressed against the coal above the kerf, and means secured to the carriage for taking the downward pressure thereof and relieving the carriage therefrom, substantially as set forth.

4. In a mining machine, the combination

with the horizontally acting cutters, and the carriage entering the kerf, of the non-driven or relatively stationary cutter at the front of and supported by the carriage and extending directly upward from the carriage, and adapted to form a groove in the horizontal wall of the kerf and having a vertical plate below the cutting point with a groove or passage way as at E^4, substantially as set forth.

5. The combination, in a mining machine having horizontally acting cutters, and a cutting carriage or frame, with the carriage of a series of holding cutting points in substantially the same vertical plane, said cutter points being stationary relative to the carriage and arranged to have said series inclined backward and upward, whereby they can be advanced under the constant pressure of the carriage and held continuously in engagement with the coal at one or another of the said points, substantially as set forth.

6. In a mining machine having a horizontally acting cutting apparatus and a cutter carriage or frame entering the kerf or cut, the combination with said carriage of a steadying or guiding plate having a series of cutters to form a vertical groove in the horizontal wall, and connected with a shoe or abutment to bear on the opposite horizontal wall said shoe and cutters being adapted to take the pressure one from the other, substantially as set forth.

7. In a mining machine having a horizontally acting cutting apparatus, and a carriage or frame entering the kerf, the combination with said carriage of a shoe or support on the under side of the carriage and resting on the bottom of the cut and situated between the side longitudinal lines of the laterally acting cutters, substantially as set forth.

8. The combination with the carriage, and the chain having cutters and traveling horizontally across the front end of the carriage, of the shoe connected to the front end of the carriage and resting upon the bottom of the chain kerf, substantially as set forth.

9. In a mining machine, the combination of the cutter chain, the cutters therein, the carriage having a chain supporting frame of vertical dimensions less than those of the kerf which is formed by the chain cutters, whereby an open chamber is provided between the carriage and the horizontal wall of said kerf, and a stay or aligning device for the carriage having one or more cutting points or edges secured rigidly to the carriage projecting directly upward from the carriage to points above the horizontal plane of the cutter points, and adapted to be constantly pressed by the carriage against the coal which forms the said horizontal wall of the kerf and to deposit the coal which it loosens from said wall in the aforesaid open chamber, substantially as set forth.

10. The combination with the carriage and the horizontally moving cutter chains of the vertical cutter adapted to form a kerf communicating with the chain kerf, and a horizontal plate bearing upward against the roof of the main kerf at points immediately adjacent to the vertical cutter, both said vertical cutter and horizontal plate being secured to the carriage, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

HENRY B. DIERDORFF.

Witnesses:
R. CHAS. HUTCHINS,
CHARLES W. MILLER.