(No Model.) 4 Sheets—Sheet 1.

B. A. LEGG.

MINING MACHINE.

No. 342,614. Patented May 25, 1886.

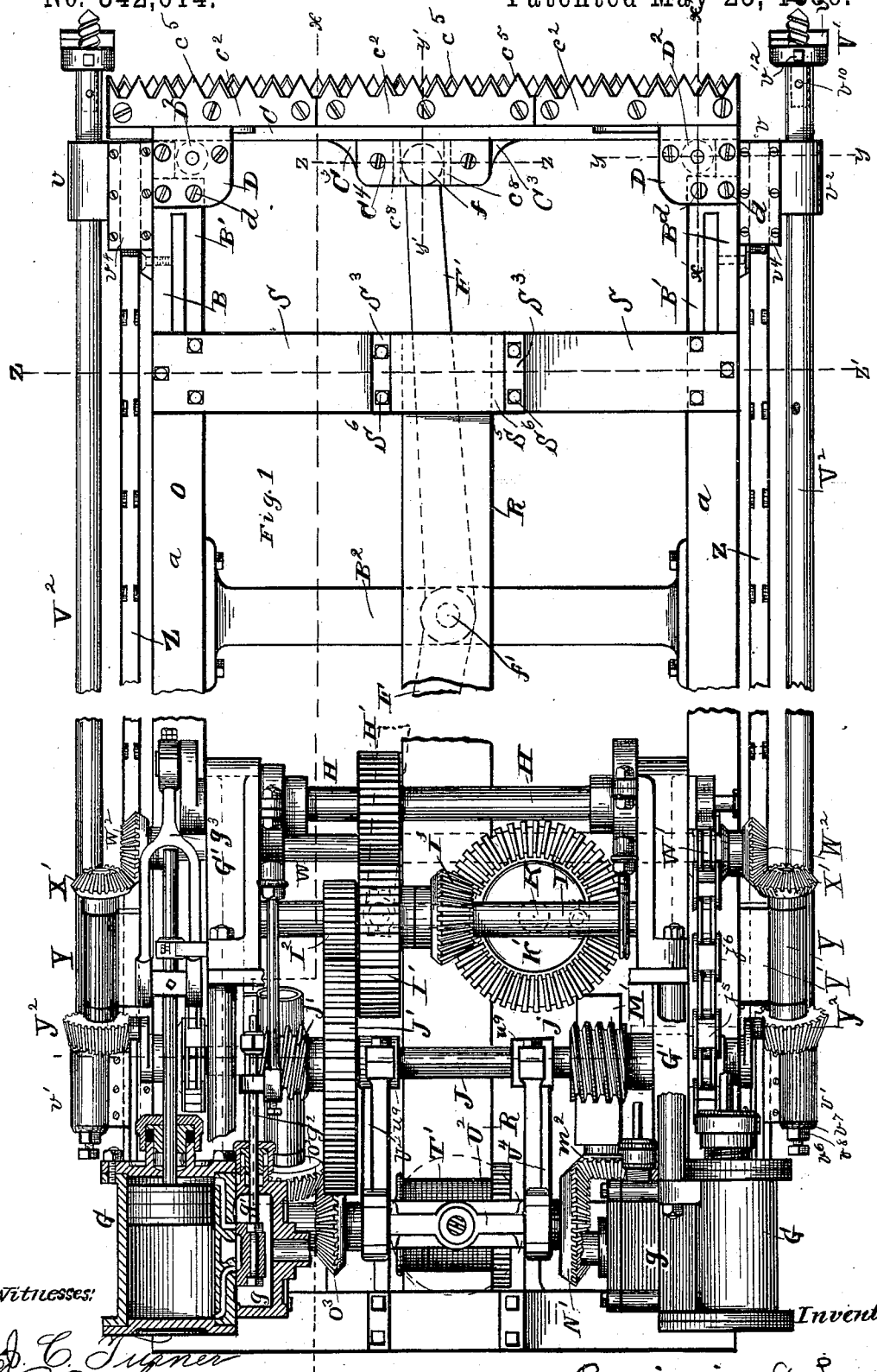


Fig. 1.

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(No Model.) 4 Sheets—Sheet 2.

B. A. LEGG.

MINING MACHINE.

No. 342,614. Patented May 25, 1886.

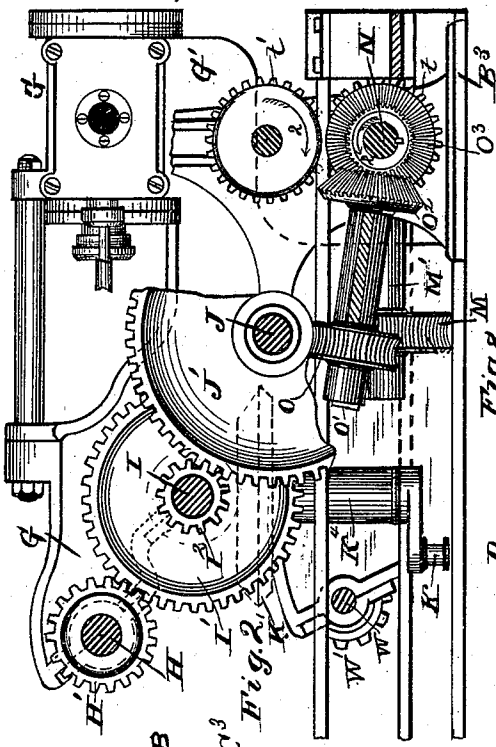


Fig. 2.

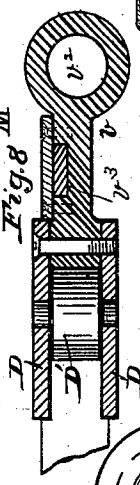


Fig. 8.

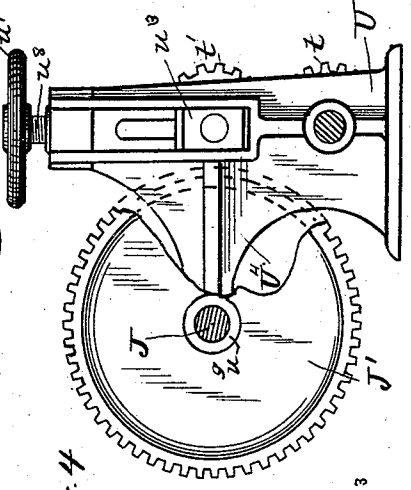


Fig. 4.

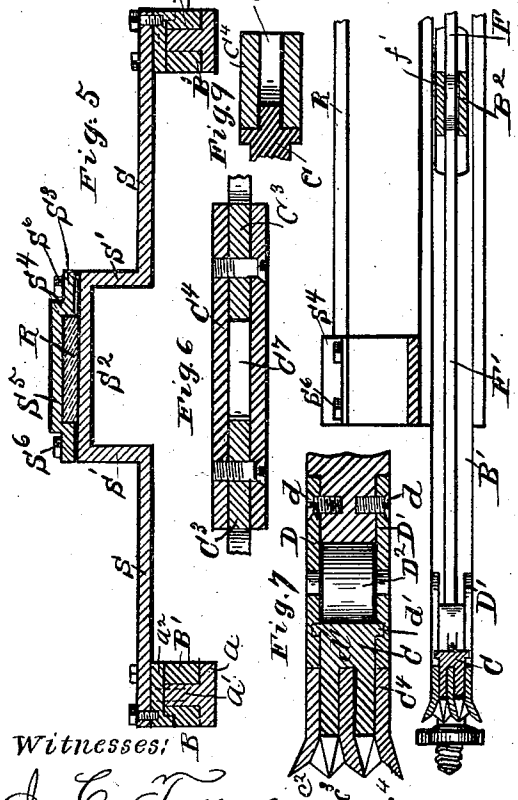


Fig. 5.

Fig. 6.

Fig. 7.

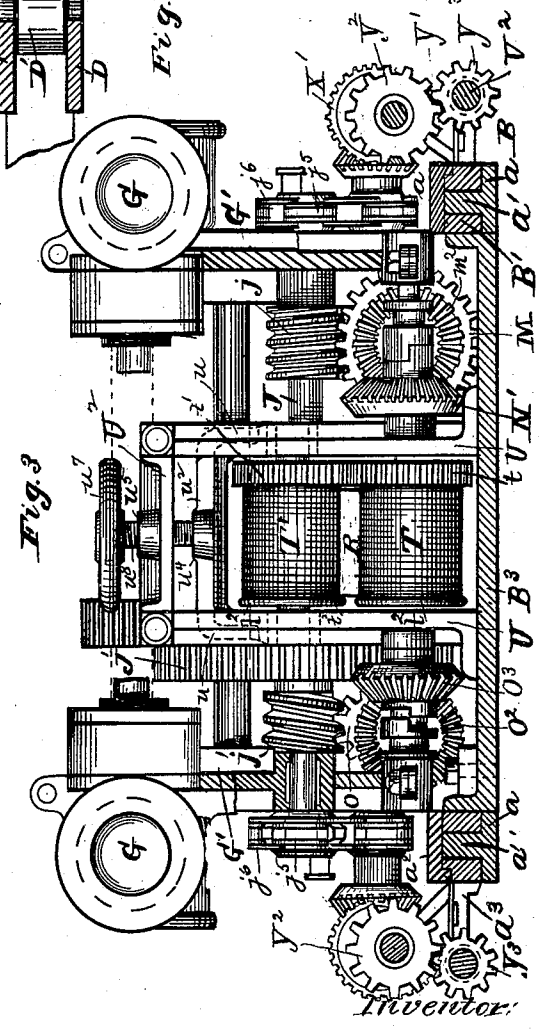


Fig. 3.

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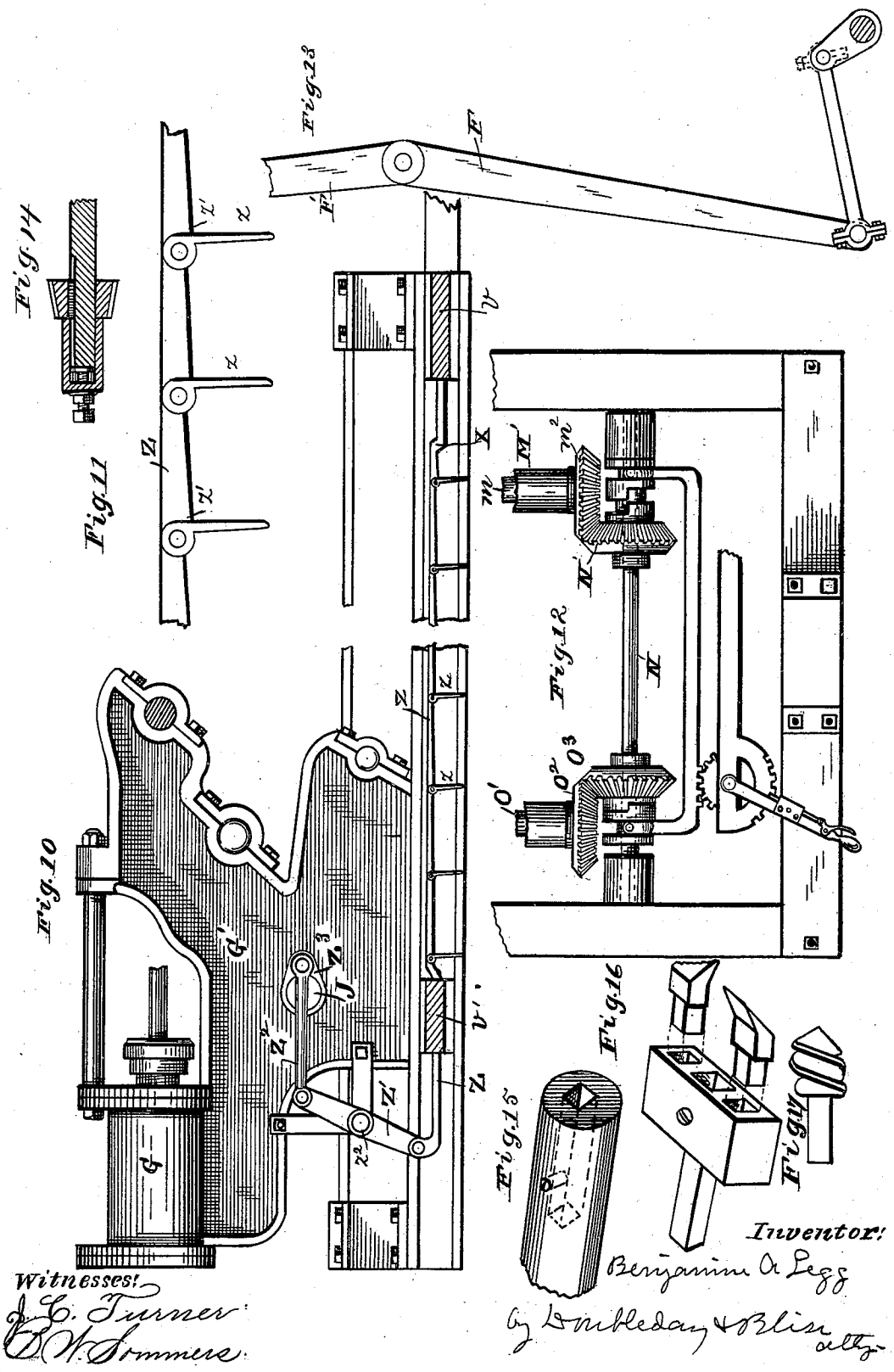
N. PETERS, Photo-Lithographer, Washington, D. C.

(No Model.) 4 Sheets—Sheet 3.

B. A. LEGG.

MINING MACHINE.

No. 342,614. Patented May 25, 1886.



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(No Model.) 4 Sheets—Sheet 4.

B. A. LEGG.

MINING MACHINE.

No. 342,614. Patented May 25, 1886.

Fig. 18

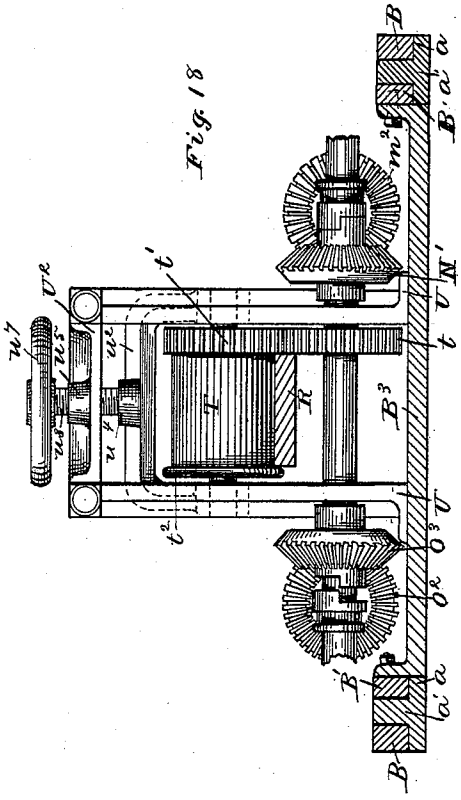
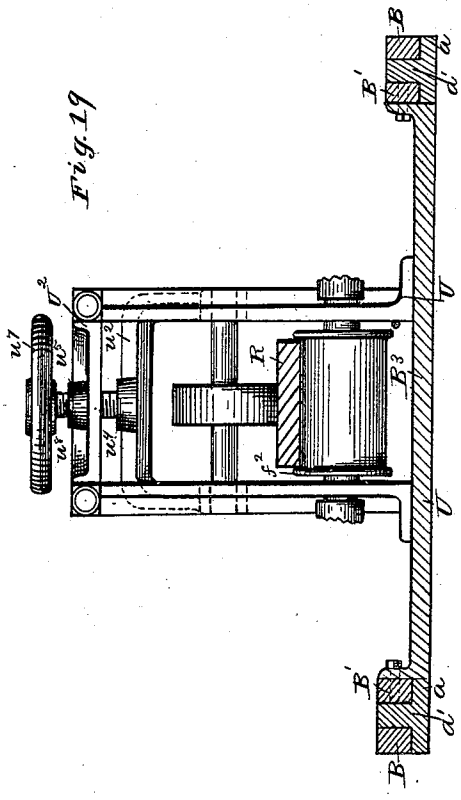


Fig. 19



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UNITED STATES PATENT OFFICE.

BENJAMIN A. LEGG, OF COLUMBUS, OHIO, ASSIGNOR TO JOSEPH ANDREW JEFFREY, OF SAME PLACE.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 342,614, dated May 25, 1886.

Application filed August 27, 1885. Serial No. 175,490. (No model.)

To all whom it may concern:

Be it known that I, BENJAMIN A. LEGG, 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, of which the following is a specification, reference being had therein to the accompanying drawings.

Figure 1 is a top plan of a machine embodying my improvements. Fig. 2 is a longitudinal section on the line *x x*, Fig. 1. Fig. 3 is a rear view, the frames being in section. Fig. 4 is a side view of the frame for the friction-drums detached. Fig. 5 is a section of the standards for the friction-bar, taken on line *z z*, Fig. 1. Fig. 6 is a section on line *z' z'*, Fig. 1. Fig. 7 is a section on line *x' x'*, Fig. 1. Fig. 8 is a section on line *y y*, Fig. 1. Fig. 9 is a cross-section of Fig. 6. Fig. 10 is a side view of the scrapers and the parts related thereto. Fig. 11 shows the scrapers on a larger scale. Fig. 12 is a plan view of the shipping devices for the clutch. Fig. 13 shows detached the lever which drives the cutter-bar. Fig. 14 is a section of the rear end of a drill. Figs. 15, 16, and 17 are details of the rotary drill. Figs. 18 and 19 show modifications of the devices which advance and withdraw the sliding frame.

This invention relates to improvements in mining-machines, it pertaining particularly to machines having a reciprocating bar by which the kerf is formed.

In the drawings I have shown a stationary frame composed of two side portions connected together by cross-bars of any suitable number and shape. As shown, the side parts of the main frame are each formed of a T-bar, *a a'*, (see Fig. 3,) and a top plate or bar, a^2, bolted upon the top of the part *a'*. At a^3 there is a depending flange, for a purpose to be described. This main frame can be made stationary in the mine or wherever the machine is to be used. The other parts of the apparatus, however, are not necessarily dependent upon all the details of this main frame. With this is connected the sliding frame, which, as shown, is composed of two side parts connected by cross-bars at various points. The side parts are each represented as being constructed with two parallel bars, B B', of such dimensions and at such distance apart as to be adapted to fit in the spaces between the parts *a* and a^2 of the side portions of the stationary frame. (See Figs. 3 and 5.) These two bars, B B', may be made integral, or they may be made of separate pieces bolted together, if desired. They are so fitted to the side parts of the stationary frame that they (the sliding bars) can move easily in and out while being held and guided by the stationary parts. The inner bars, B' B', of the sliding frame are joined together by a cross-bar at B^2, comparatively well forward of the machine as a whole, and by one or more cross bars or plates, B^3, at the rear end of the sliding frame. This sliding frame carries the cutting apparatus and also the power devices by which said apparatus is operated, by which they (together with the sliding frame) can be advanced and withdrawn.

The cutting apparatus in this particular machine consists of a series of knives or cutters secured to a reciprocating bar, C, use being made, also, for some purposes, of rotary drills, to be hereinafter fully referred to. The reciprocating bar C is connected with the side bars of the sliding frame by means of top plates, D D, and bottom plates, D' D'. These, at their rear ends or edges, are bolted to the sliding frame, as shown at *d d*, and at the front edges have grooves wherein fit ribs or guide pieces *d'* on the cutter-bar. (See Figs. 2 and 7.) The cutter-bar C is then held firmly, so far as displacement vertically is concerned, and displacement forward; but at the same time it is allowed to reciprocate to a limited distance on lines transverse to the path of advance of the sliding frame.

In order to avoid the friction which would be experienced by the bar in its bearing, I combine therewith anti-friction abutments in the form of rollers D^2, or their equivalents, so arranged as to have the rear edge of the bar C bear against them. These have their bearings in the plates D D', and, as each of said plates is removable independently of the other parts, a roller can at any time be withdrawn for any purpose.

The cutters in this machine are provided in the following way: c^2 c^3 c^4 represent plates or sections, each section being provided with serrations or forward-projecting teeth at its front edge, and adapted to be placed in line with one or more similar sections, and then secured to the bar C. The plates or cutter-sections c^2 are fastened to the upper surface of the bar C, the sections c^4 are secured to the under surface of said bar, and the sections c^3 are situated in a groove or recess extending from the front face of the bar C inward. Each of the cutting-teeth, c^5, proper is V-shaped in face view, although they are differently arranged alternately—that is to say, those of one half of each series across the machine project upward somewhat, and those of the other half of the same series project downward, the deflection from the horizontal line being illustrated in Figs. 2 and 7, where it will be seen that the cutting-edges are so related with respect to each other and with respect to the other parts that a clean wall is cut at the back, top, and bottom of the kerf, and that the latter is of sufficient width to permit the passage thereinto of all the parts necessary to properly carry the cutters. The operating edges of the cutter c^5 are beveled, as shown, those of one half of each series being beveled upward and those of the other half downward. In many respects, however, this part of the apparatus can be modified. Thus, for instance, each one of the cutters c^5 may be made separately and secured to the bar; or the bar may be made in sections, each section carrying cutters formed integral therewith; or the whole bar may be formed with the cutters.

I will now describe the devices by means of which the cutter-bar is reciprocated, and by which it and the frame supporting it are advanced into the material which is being operated upon, and again withdrawn.

At the back of the cutter-bar there is a projection, C^3, formed with a socket, C', (see Figs. 1 and 6;) and C^4 is a plate adapted to be bolted in place above the socket.

F F′ represent a lever, the end F′ of which is connected loosely with the cutter-bar, preferably by means of a ball or cylinder, f, fitted into the aforesaid socket C', and as the lever is thrown one way or the other the cutter-bar is correspondingly moved. At c^8 c^8 there are washers or wearing-plates, of steel or other suitable material, fastened in place so as to receive the wear from the lever, and, when worn, they may be withdrawn and others substituted. Other means of connecting the levers with the cutters can be employed, if desired. The lever F F′ is mounted at f' on the cross-bar B^2. The lever is moved to and fro by means of an engine, which is also attached to the sliding frame and moves therewith, it, as shown, having the following parts.

G G represent the cylinders, secured to upward-rising plates or standards G′ G′, which are bolted to the sliding frame. These cylinders have chests g, valve mechanism g', pistons g^2, crank-rods g^3, and other attachments, which may be of any of the forms now in use or any preferred.

H is the main engine-shaft, also mounted in the upward-rising standards G′. It carries a toothed pinion, H′, meshing with a spur-wheel, I′, on a second shaft, I, parallel to the engine-shaft, and also mounted on the engine-frame.

I^2 is a spur-pinion engaging with a spur-wheel, J′, on a third shaft, and I^3 is a bevel-pinion engaging with a bevel-wheel, K′, mounted on a shaft, K, (dotted lines, Fig. 1,) situated at right angles to the shaft I. This shaft K is mounted in a sleeve-bearing, K^4, carried by the engine-frame, and at the lower end it has a crank, k, which is connected with the above-described lever F F′ by means of a link, L. (See Fig. 13.)

When the engine is in motion, power is transmitted from shaft H, through wheels H′, I′, I^5, and K′, and shaft K and link L, to the lever in such way that the latter is reciprocated in the horizontal plane of the sliding frame, and therefore acts to throw the cutter-bar in the way above described. Any of many ways can be employed for adjusting the throw of the lever F F′ and of the cutters.

Returning to the wheels I^2 and J′ and the shaft J, it will be seen that the latter carries two worms, j and j'.

M, Fig. 3, represents a worm-wheel below the worm j on a shaft mounted in the sleeve M′, and carrying a bevel-pinion, m^2, at its forward end. This wheel engages with another bevel-wheel, N′, upon shaft N, and from this shaft all the power is taken for advancing the sliding frame and for withdrawing it.

The devices by means of which the advancing and withdrawing are effected are constructed and arranged as follows: R represents a bar or board situated longitudinally relatively to the machine as a whole, and somewhat above the stationary and the sliding frames. It is rigidly fastened to the stationary frame, there being at the front end of the latter a support having the horizontal parts S, Figs. 1 and 5, bolted to the frame, the upward-rising parts S′ connected by the horizontal part S^2. Above this there is a clamp having the feet S^3, the vertical parts S^4, and the horizontal plate S^5, this clamp being adapted to be forced toward the part S S′ S^2 by bolts S^6. The bar or board R is placed between the clamp and the horizontal part S^2, and by the bolts at S^6 a firm grip can be obtained. At the rear end of the machine there is a similar standard, whereby the rear end of the bar or board can be gripped. Now, the above-mentioned shaft N causes a frictional engagement with the said bar or board R by means of the following devices: T T′ represent drums mounted upon the main frame, one above and the other below said board R. They engage with each other by means of gear-wheels t t', and at the ends opposite thereto they preferably have flanges t^2, which fit against the edge of the bar or board R. The lower drum, T, is connected rigidly with the shaft N, and if

it be pressed against the bar or board R it will tend to advance or withdraw the sliding frame, and if the upper drum, T', having an opposite rotation through the spur-wheels $t t'$, be pressed against the other side of the bar or board R, a powerful grip can be exerted thereon, and as the drum is revolved the longitudinal motion of the sliding frame will be effected, as will be readily understood.

When the lower drum alone is depended on for moving the frame, it and the bar R may be pressed together in the way shown in Fig. 19, the drum or wheel T' here being used merely as a presser-wheel, and in this respect not requiring the application of power from the drum T.

The engagement of the wheel N' with the drum T can be broken by means of any suitable shipping mechanism, so that said wheel shall no longer act to advance the sliding frame. When it is desired to withdraw said frame—that is, move it in the direction opposite to that in which it is moved by the aforesaid devices—and pull it back from the coal or other material upon which it has been operating, the following devices are brought to bear: O is a worm-wheel driven by the worm j', it being on a shaft, O', Fig. 2, which at the front end carries a bevel-pinion, C^2. This pinion engages with a wheel, O^3, which is also mounted upon the shaft N and adapted, by means of suitable shipping devices, to be brought into engagement with the drum T. These parts last above described are so arranged as to turn the shaft N in the direction opposite to that in which it is turned by the wheel N', although the engine be not reversed. Therefore, when the wheel O^3 is in operation, the drums T and T' will be rotated in the directions of the arrows 2, and therefore a backward pull will be exerted upon the sliding frame.

The shifting devices which throw wheel N' into or out of engagement with the drum T and the shifting devices which similarly throw the wheel O^3 can be connected together so as to be simultaneously operated.

The drums T and T' are so supported and mounted that the pressure which they exert upon the bar or board R can be increased or diminished as occasion demands. I have shown one of the mechanisms adapted to permit this regulating of the pressure. It comprises stationary uprights U U, adapted to be bolted to the sliding frame, these being connected at the top by a cross-bar, U^2. In this stationary frame there is mounted a sliding frame having vertical arms u and u, (dotted lines, Fig. 3,) connected by a cross-bar, u^2. At the lower end of the vertical arms there are boxes or bearing-pieces u^3, in which are journaled the ends of the shaft of the drum T'. At u^4 there is a socket in the cross-bar u^2, and at u^5 there is an aperture through the cross-bar U^2 of the stationary part of the drum-frame. This aperture is threaded, and with the threads there engages a screw, w^8, having a hand-wheel, w^7, secured thereto. By means of said screw and wheel the drum T' can be forced down or drawn up as desired. Other equivalent ways of mounting the drums and of having them adjustable (one or both) can be substituted for that employed without departing from the invention in this respect.

By referring to Fig. 19 it will be seen that if power be applied to the vertical screw-shaft w^8 by means of the hand-wheel w^7 said screw-shaft and the sliding frame $u u^2$ cause the part T^4 to bear down on the top of bar R, and consequently the drum T will be pressed against the under side of said bar and have a strong grip thereon. Of course, if a wooden or flexible bar, R, be used, there will be some tendency for it to be forced down; but there will none the less be a tendency to press the drum T against it, as aforesaid.

The standards U U have forward-projecting arms U^4 U^4, provided with boxes or bearings at w^9, wherein the shaft J can have bearings at the central parts, so as to prevent twisting or straining thereof.

The mechanism which I have herein shown and above described for advancing and withdrawing the cutters is, under many circumstances, much superior to any of those which have been heretofore in use. The cutters can be advanced with sufficient rigidity, and at the same time there will be a capability in the advancing mechanism of yielding, if necessary, the engagement between the drums and the bar or board R being frictional and not positive, as is the case with a rack and pinion, or when a rope is wound upon a drum, or when employment is made of a screw and nut. If a wooden beam or board be employed at R, it will be sufficiently flexible and elastic to conform to any deviations in the movement of the engaging parts; secondly, it will permit of a strong bite upon its surface, and, thirdly, it can be easily withdrawn when impaired or worn and another substituted; but in place of this a device to be gripped by the drums can be made of any suitable material, either rigid or flexible.

The drums T T', while being preferably made of metal, can nevertheless be formed of any suitable material. They may be smooth upon their surfaces or corrugated, or they may be wrapped with wire or surrounded with any other material suitable for increasing their frictional capacity and their durability. I prefer to mount them on horizontal axes, as I I can thereby diminish the vertical space required for the machine as a whole; but, under favorable circumstances, they can be arranged on vertical or inclined axes and preserve many of the advantageous features of those shown.

Of course it will be seen that, if properly arranged, one friction-drum, can be made to perform the work to greater or less advantage of moving the sliding frame, and also that the drum or drums can be mounted upon the stationary frame, and the opposing friction surface or surfaces with which they engage can be carried by the sliding frame. This, how-

ever, is not the better construction when the engine and the power-transmitting devices are carried by the sliding frame; but it can be employed where a power-transmitter can be connected with the stationary frame. In respect to this part of the machine, and in view of what has been heretofore done, the invention consists in having the rotary friction device on one of the frames and a friction-surface carried by the other—as, for instance, the surface of such a bar as that shown, with which surface the rotary part can engage.

In Fig. 18 the lower drum is dispensed with, the other parts being substantially the same. If desired, with such an arrangement a detachable top plate, a^2, of the stationary frame can be dispensed with if there should be a tendency to cramping.

The wheels $t\,t'$ constitute a simple connection between the drums; but they may be joined in any other suitable way by crossed belt, chains, idlers, &c.

With the reciprocating cutters I prefer to combine rotary cutters so arranged as to produce apertures at the ends of the throw of the reciprocating cutter-bar. These rotary drills proper are represented at V V′, there being one upon each side of the machine. Each is mounted upon an elongated shank or shaft, V^2, which is mounted in the horizontal planes of the sliding frame, bearings therefor being provided in a bracket, v, at the front end of the machine and a bracket, v', at the rear end of the drill-shaft, and, if necessary, others at intermediate points. The bracket v is secured to the side bar, B, of the sliding frame, it having at the outer end or edge a box or bearing, v^2, Fig. 8. A groove or way, v^3, is formed in the bracket, for a purpose to be hereinafter described, this groove or way being covered by a plate, v^4. The rear bracket, v', is also secured to and projects laterally outward from the side bar of the sliding frame. It has a socket into which the rear end of the drill-shaft is fitted, and is also provided with adjusting devices for regulating the position of the drill-points. These adjusting devices may be of any suitable form. As shown, they consist of a screw, v^6, passing through the end wall, v^7, of the bracket-bearing, and a jam-nut, v^8, adapted to lock the screw in any position to which it is adjusted.

The operative parts of the drill consist of the auger-like portion V, detachably secured to the stock or shaft V^2, the latter being provided with a central socket in its end, into which the shank of the auger part can be seated, and there being a set-screw or other fastening device at v^{10} for fastening the latter in place. The end of the stock or shaft V^2 is squared or made polygonal in section, and upon this squared portion is fitted the chisel part V′ of the drill, it having widened cutters v^{11} and a squared aperture, which fits upon the aforesaid socket end of the stock V^2, and there being a set-screw, key, or other fastening device at v^{12} for clamping it in place.

If either the auger part V or the chisel portion V′ becomes worn or broken, it can be readily replaced for sharpening or permitting the substitution of another. However, the drills may be made in any other suitable way—that is to say, a single auger may be employed, or one having a single rotary chisel-cutter, and in either case the cutting part may be integral with or detachable from the stock or shaft.

Preferably I employ rotary drills the diameter of whose cut is as great as the vertical diameter of the kerf of the reciprocating cutters, and it is better to arrange the latter cutters so that they shall move into the aperture formed by the drill, as they are thereby relieved from shock or resistance at the end of their throw. When the stock or shaft V^2 of the drill is at one or more points of considerably less diameter than that of the cut of said rotary drill, the reciprocating cutter can be carried well in toward the axis of the stock or shaft without striking any of the rotary parts.

I have shown an improved apparatus for revolving the drills. The shaft J carries at its ends sprocket-wheels j^5, wherewith engage chains j^6. These chains engage with sprocket-wheels W′ on a cross-shaft, W. At the outer ends of this shaft there are bevel-wheels W^2, which engage with bevel-wheels X′. Each of the latter is secured to a shaft mounted in a bearing, Y, carried by a bracket, Y′, secured to the side bar of the sliding frame. Y^2 is a toothed wheel, also carried by the shaft, it engaging with the toothed wheel Y^3, secured to the stock or shaft V^2 of the drill. It will now be seen that when the engine is in motion and power is transmitted to the shaft J it will be carried also through the devices last above described to the toothed wheels Y^3 and the drill-stock.

In order to withdraw from the kerf the cuttings and the small particles produced by the cutters while in operation, I employ reciprocating cleaners—that is to say, which move toward and from the cutters—they acting while moving away from the cutters to draw out the cuttings. There is a set of these on each side of the machine shown, each set being carried by a reciprocating bar, Z. This is mounted in bearings, so that it can slide to and fro, and, for convenience and simplicity, the bearings may be provided by means of the brackets which carry the rotating drills. As above described, the front brackets, v, have grooves or apertures v^3, Fig. 8, and the rear brackets, v', are similarly constructed, Fig. 3. The bar Z is mounted in these and carries downward-depending scrapers. As shown, these consist of plates or bars z, hinged to the bars Z. As the bars move forward, the scrapers yield, and therefore ride loosely over the surface on which the machine rests; but when the bar is moving in the opposite direction the scrapers drop into the vertical position, and are held there by suitable

stops, and therefore engage with any material that may lie in their path and push it outward. These should be at such distances apart as that the material shall be carried from one to the other throughout the series and ultimately delivered outside of the kerf.

The bars Z may be reciprocated by any suitable mechanism. I have shown one adapted for this purpose, there being a lever or rocking bar, Z′, pivoted to the sliding frame or to a support secured thereto, pivoted at z^2. It is oscillated by a link, Z^2, driven by a crank, Z^3. This crank can be secured to any rotating part of the machine which is suitably located—as, for instance, to the shaft J—and when said shaft is revolving it will be seen that the cleaner-bar is reciprocated to and fro. By an examination of the drawings it will be found that these bars are at the ends of the throw of the reciprocating cutters, and therefore they can easily reach the material which is loosened by said cutters and carried loosely. The rotary drills are so revolved as to deliver their cuttings on about the same line longitudinally of the machine, and this also makes it advantageous to have the cleaners arranged as they are—that is, on lines between the rotary drills and the cutters, which are placed intermediately between the drills.

What I claim is—

1. In a mining-machine, the combination of a stationary frame, a sliding frame, a friction-drum carried by one of said frames, a friction-surface upon the other frame, adapted, substantially as set forth, to be pressed by the said drum, whereby the movement of the sliding frame is advanced relatively to the stationary frame, and means, substantially as set forth, for advancing the sliding frame.

2. In a mining-machine, the combination of the stationary frame, the sliding frame, two oppositely-revolving friction-drums carried by one of said frames, a friction-bar, R, engaged with by both of the aforesaid drums, and means, substantially as set forth, for operating the said drums.

3. The combination of the stationary frame, the sliding frame, friction-drum carried by one of said frames, means, substantially as described, for operating the said drum, and a friction-bar carried by the other and removable from its supports, substantially as set forth.

4. In a mining-machine, the combination of the stationary frame, the sliding frame, the two revolving friction-drums carried by one of said frames, a friction-bar carried by the other, means independent of the drums for supporting said bar, and the wheels which transmit motion from one to the other of the drums, substantially as set forth.

5. The combination of the stationary frame, the sliding frame, a friction-drum carried by one of said frames, and a friction-surface upon the other of said frames, adapted, substantially as set forth, to engage with the friction-drum, an adjustable bearing for the said drum, and means, substantially as set forth, for operating said drum.

6. The combination of the sliding frame, the stationary frame, the power devices mounted upon the sliding frame, a rotating friction-drum upon the sliding frame, means, substantially as described, for connecting said drum with the power devices, and a friction-surface upon the stationary frame adapted to be engaged with said friction-drum, substantially as set forth.

7. The combination of the stationary frame, the sliding frame, a friction-drum mounted upon one of said frames, a friction-surface carried by the other frame and adapted to engage with said drum, means, substantially as set forth, for rotating said drum in one direction, and means independent of those aforesaid, substantially as described, for rotating the drum in the opposite direction, as set forth.

8. The combination of the stationary frame, the sliding frame, the rotary drills carried by the sliding frame, the engine or power devices carried by the sliding frame, the shafts Y, respectively interposed between the engine and the drills and each lying substantially in the plane of its drill, substantially as and for the purposes set forth.

9. The combination of the stationary frame, the sliding frame, the engine or power devices mounted upon the sliding frame, the rotary drills upon the sliding frame, the means for advancing the sliding frame, shaft J, which drives said means, shafts Y′, interposed between the shaft W and the drills, and means for imparting power from the shaft J to shaft W, substantially as set forth.

10. The combination of the cutters, the sliding frame, the bracket-bearings v' and v, one at or near the rear end of the sliding frame and the other at or near the front end, the reciprocating cleaner-bar mounted in said rear and front bearings, and the cleaners secured thereto, substantially as set forth.

11. The combination of the cutters, the sliding frame, the rotary drills, the brackets which support the drills upon the sliding frame, and the reciprocating cleaner-bars mounted in said brackets, substantially as set forth.

12. The combination of the rotary drills, the intermediate cutters between the rotary drills, and the cleaner-bars mounted between the drills and the intermediate cutters, substantially as set forth.

13. The combination of the reciprocating cutters, the frame which carries said cutters, and the cleaner-bar mounted transversely to the path of the cutters at the end of their throw, substantially as set forth.

14. In a mining-machine, the combination, with the stationary frame carrying guide-bars, of the sliding frame having at each side two bars, B B′, one inside and the other outside of one of the aforesaid bars carried by the sta-

tionary frame, the cutters carried by the sliding frame, and the power devices on said frame, substantially as described.

15. The combination, with the stationary frame, of the sliding frame having the bars B lying outside of the stationary frame, and adapted, substantially as set forth, to move on the outside of said frame, the cutters carried by the sliding frame, and the power devices on said frame, as described.

16. The combination of the sliding frame having outside bars, B B, means for connecting said bars together, and the stationary frame having a way for the said bars on the outer sides of said stationary frame, the cutters carried by the sliding frame, and the power devices on said frame, as described.

17. The combination of the sliding frame having the outside bars, B B, and the stationary frame inside of the said bars, and provided with the detachable parts a^2, the cutters carried by the sliding frame, and the power devices on said frame, substantially as set forth.

18. The combination, with the stationary frame having the vertical guide-piece a', and the bottom a, of the sliding frame, having the side bars, B B', the cutters carried by the sliding frame, and the power devices on said frame, substantially as set forth.

19. In a mining-machine, the combination of the stationary frame, the sliding frame, the rotating drill carried by the sliding frame, the bearings for said drill, and means, substantially as set forth, for adjusting the end of the drill relatively to the sliding frame, substantially as set forth.

20. The combination of the stationary frame, the sliding frame mounted thereon, the rotating drill carried by the sliding frame, the power-wheel surrounding the axis of the drill, and the adjusting devices engaging with the drill, substantially as set forth.

21. The combination of the main frame, the standards or upright frames secured thereto, the bar R, secured to said standards, the sliding frame, the engine upon and moving with said sliding frame, and the friction-drums on the sliding frame, one above and the other below said bar, substantially as set forth.

22. The combination of the sliding frame, the friction-drums thereon, the stationary frame, the bar R thereon, and uprights or standards for said bar, formed separately from the frame and detachably secured thereto, substantially as set forth.

23. The combination of the stationary frame, the friction-bar R, carried thereby, the sliding frame, the friction-drums thereon, and the frame or standards for said drums, formed separately from and detachably secured to said sliding frame, substantially as set forth.

24. The combination of the stationary frame, the sliding frame, the friction-drums carried by one, the friction-bar carried by the other, of said frames, movable bearings for one of the drums, and the screw which moves said bearings, substantially as set forth.

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

BENJAMIN A. LEGG.

Witnesses:
MATT CRISPIN,
T. M. LIVESAY.