Oct. 7, 1924. **1,510,628**

E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 1

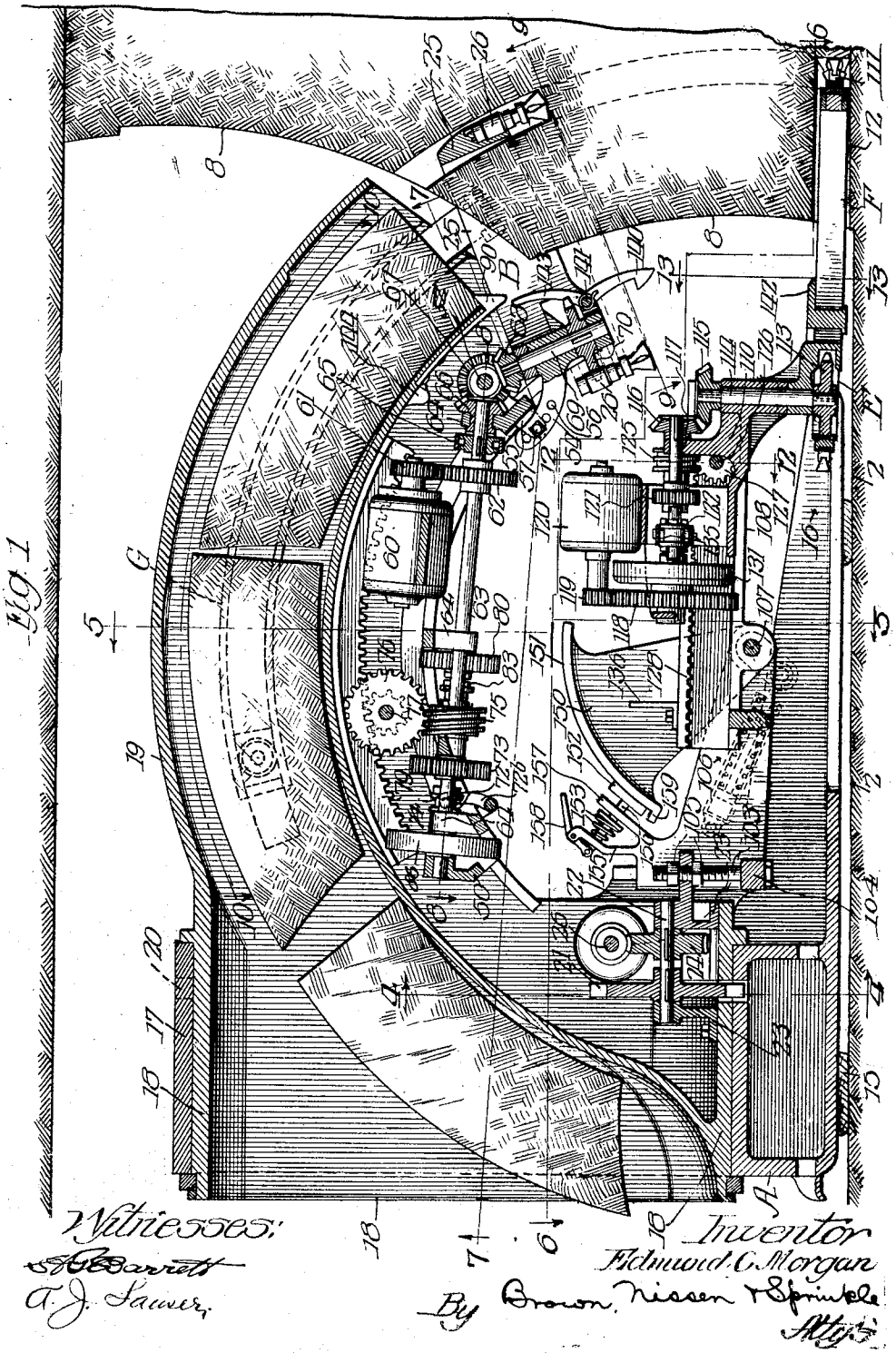

FIG. 1.

Witnesses:
S. B. Barrett
A. J. Sawyer.

Inventor
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys.

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E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 2

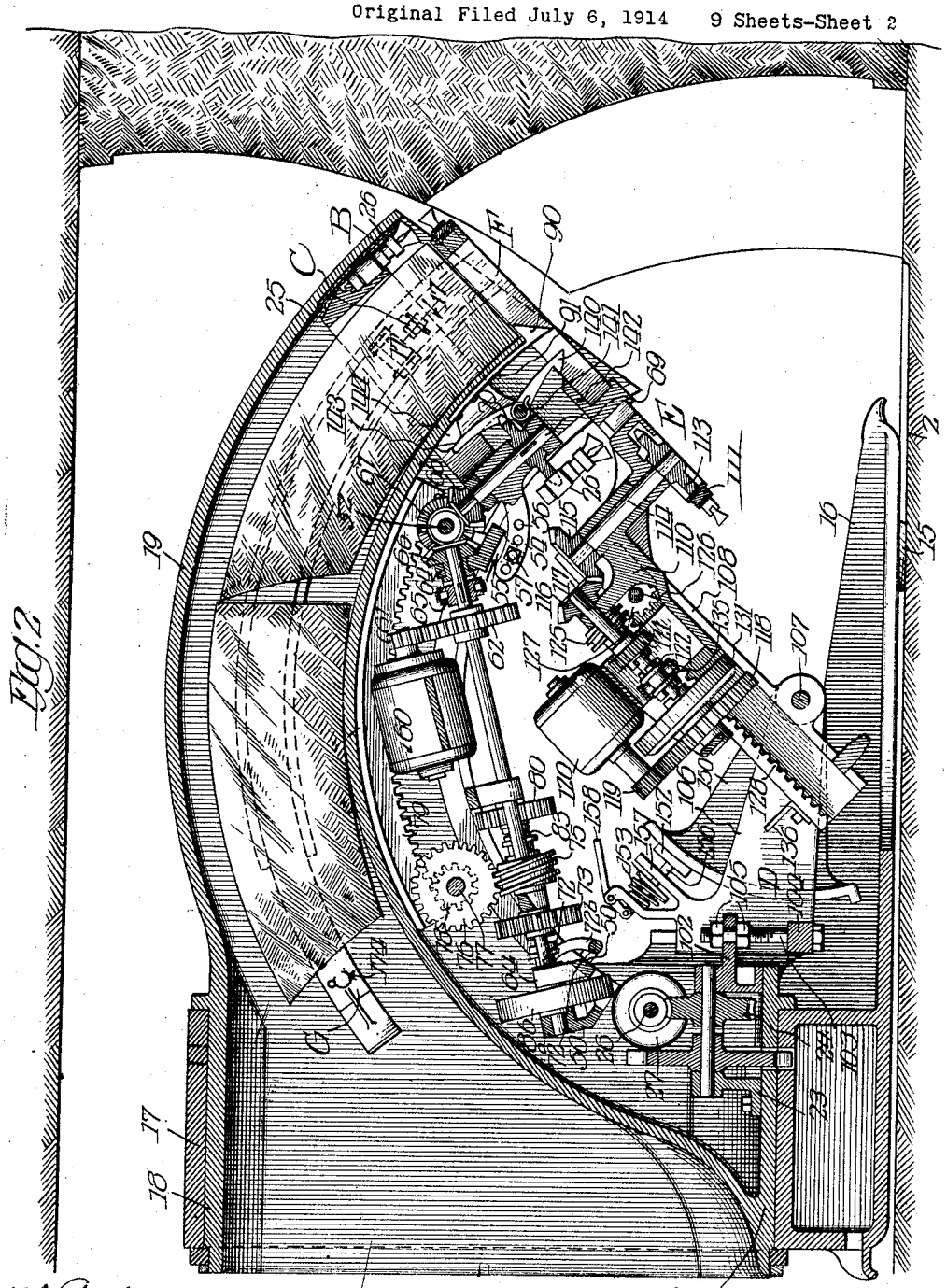

Fig. 12.

Witnesses:
R. C. Barrett
A. J. Sauser.

Inventor
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys.

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E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 3

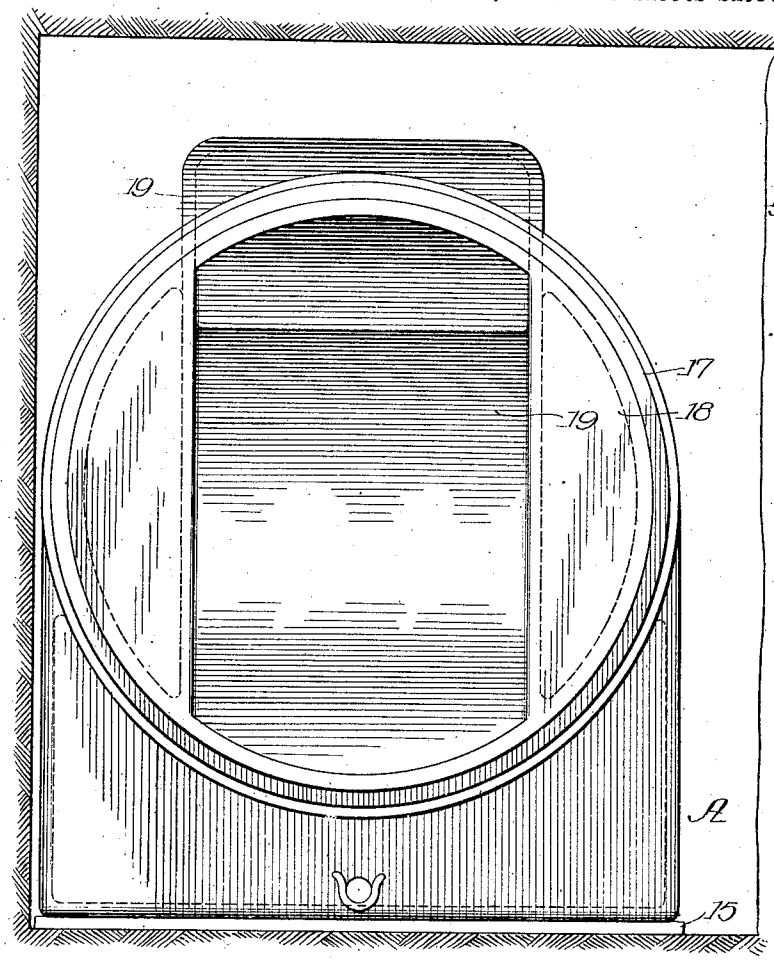

Fig. 3.

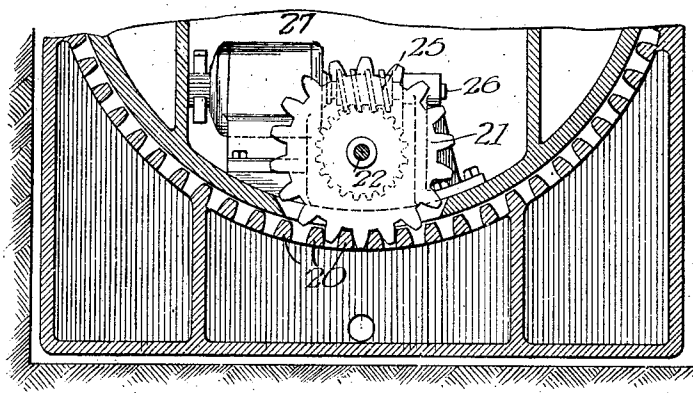

Fig. 4.

Witnesses:
A. G. Barrett
A. J. Sawyer.

Inventor:
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys.

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E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 4

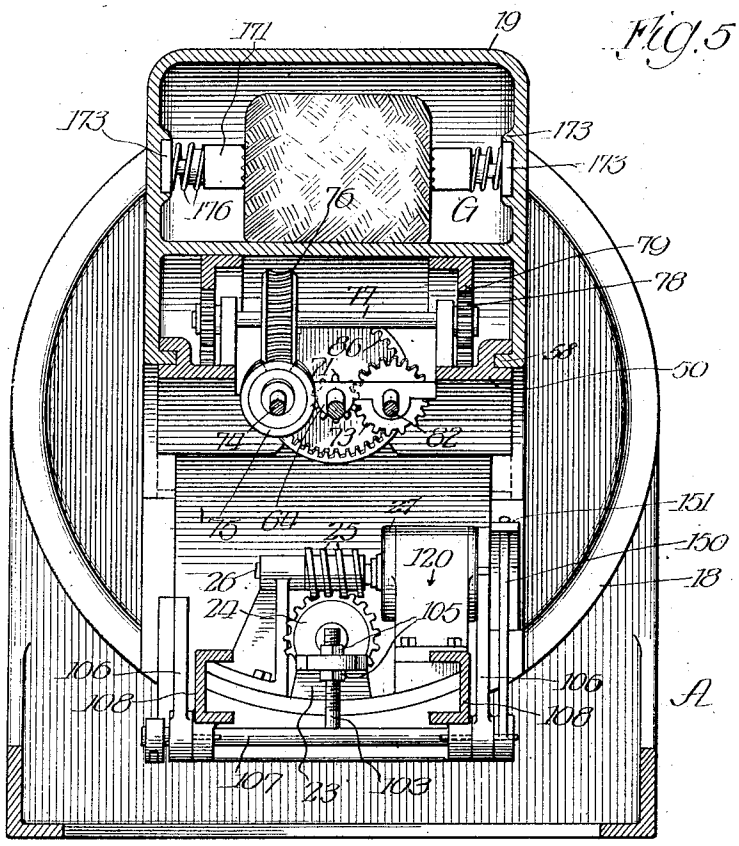


FIG. 5

FIG. 12

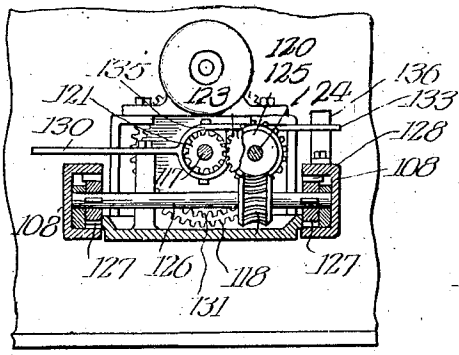
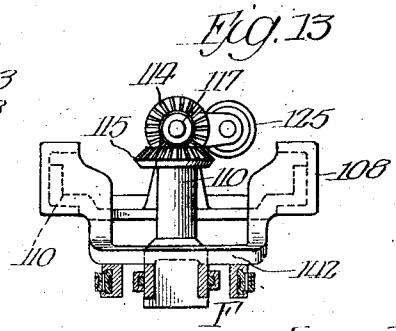


FIG. 13



Witnesses
H. E. Barrett
A. J. Sauer.

Inventor:
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys

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E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 5

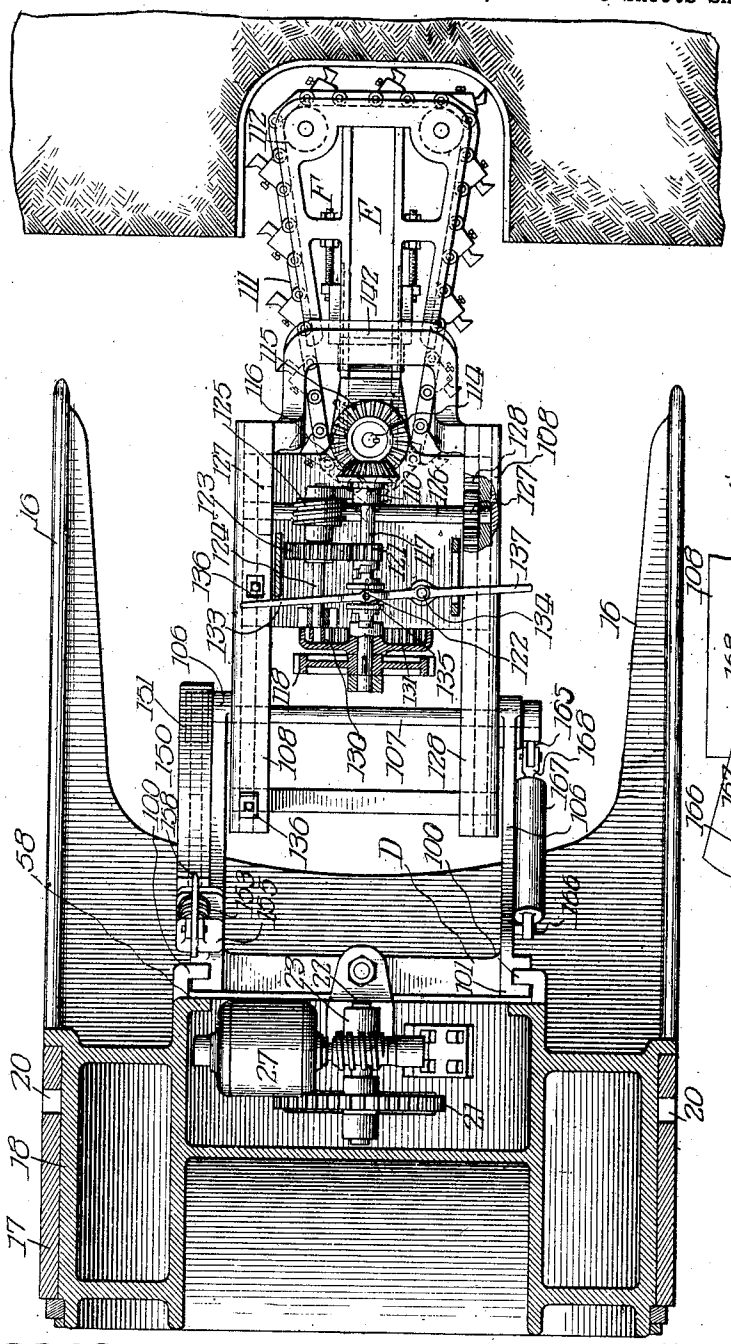


FIG. 6

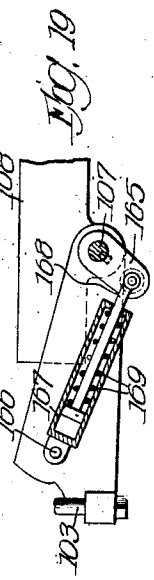


FIG. 19

Witnesses:
H. E. Barrett
A. J. Sauser.

Inventor:
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys.

Oct. 7, 1924. 1,510,628

E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 6

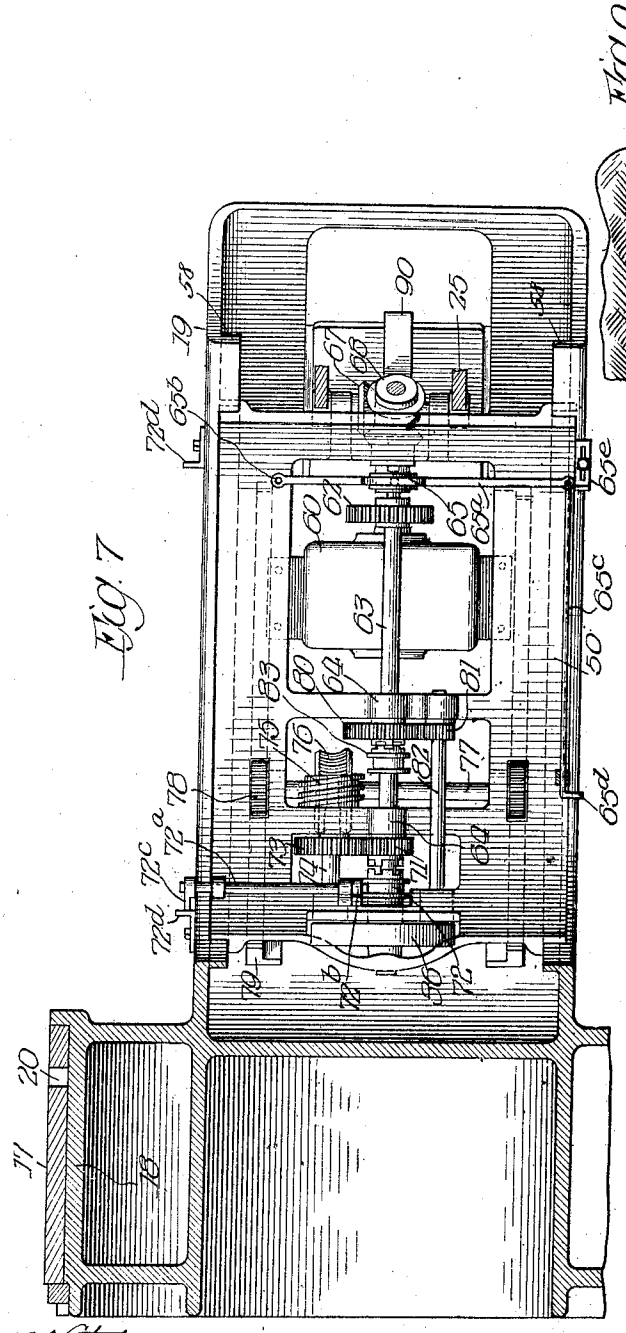


Fig. 7

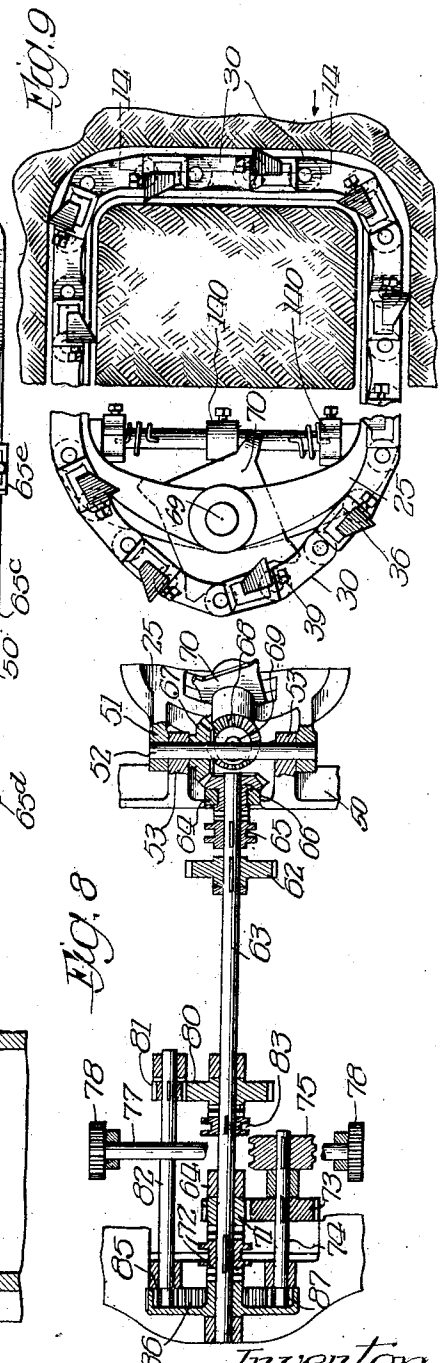


Fig. 9

Fig. 8

Witnesses
A. C. Barrett
A. J. Sawyer.

Inventor
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys

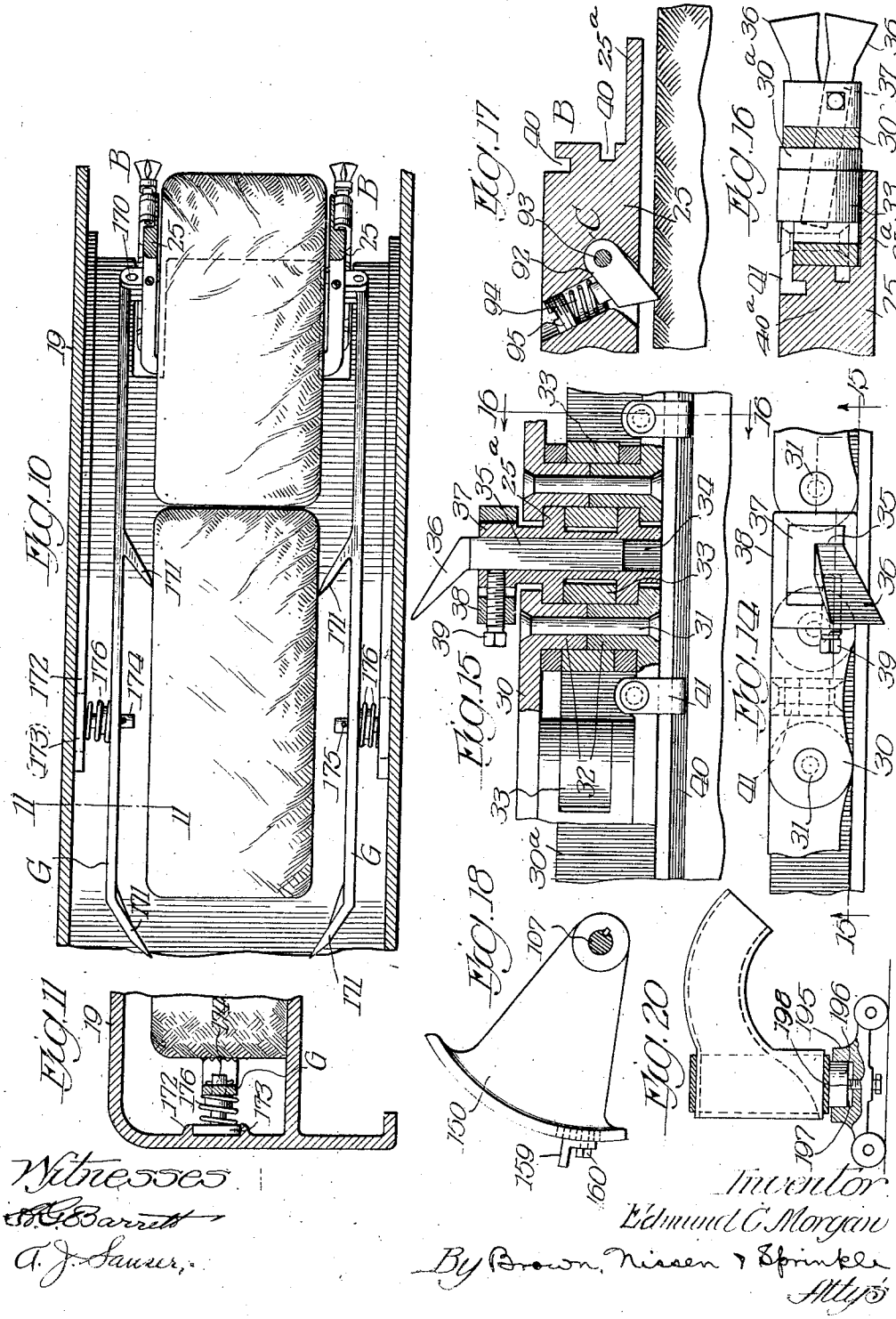
Oct. 7, 1924.

E. C. MORGAN

1,510,628

MINING MACHINE

Original Filed July 6, 1914. 9 Sheets-Sheet 7



Witnesses
B. G. Barrett
A. J. Sauer.

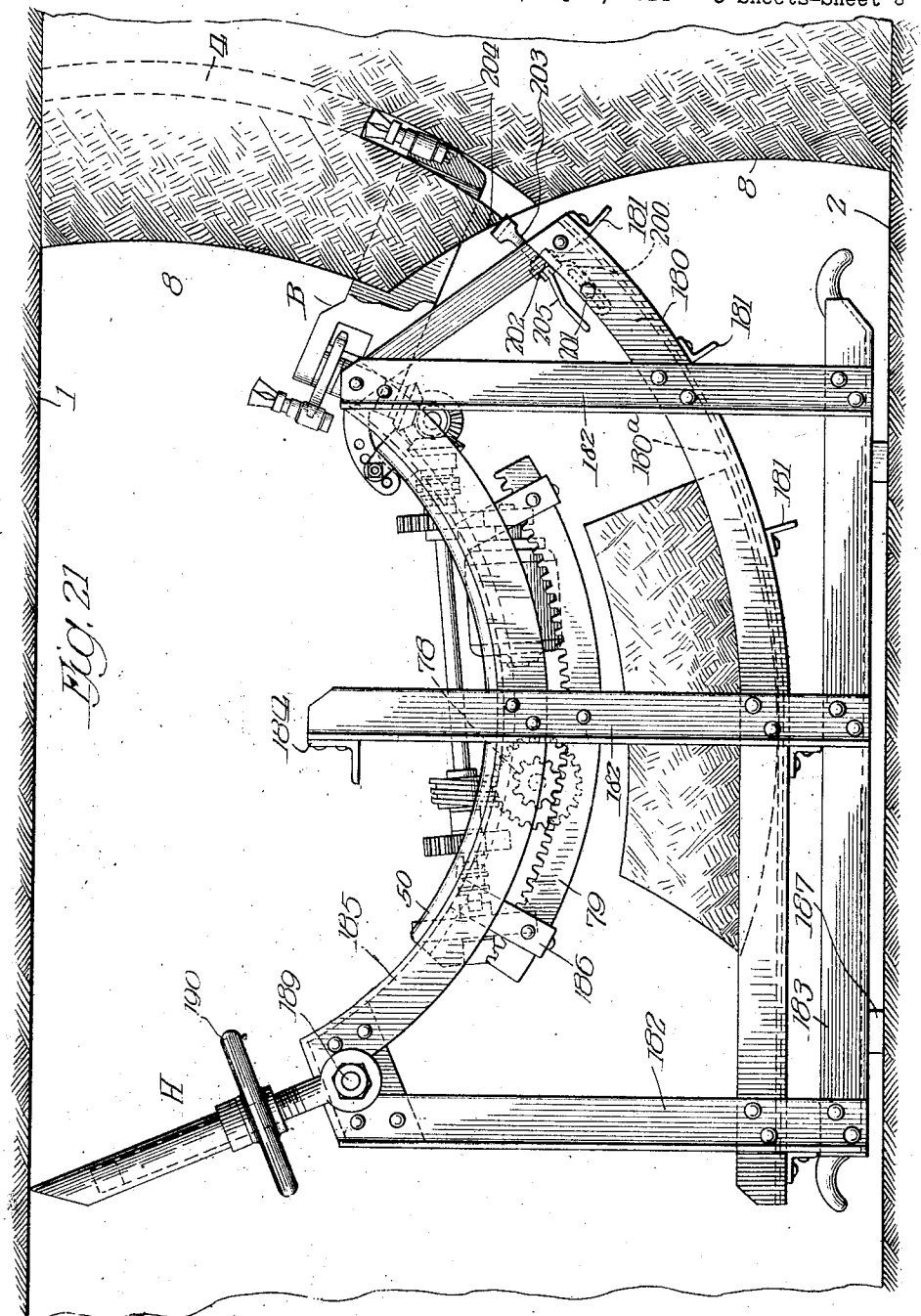
Inventor
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys

Oct. 7, 1924. 1,510,628

E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914 9 Sheets-Sheet 8



Witnesses:
H. G. Barrett
A. J. Sauser,

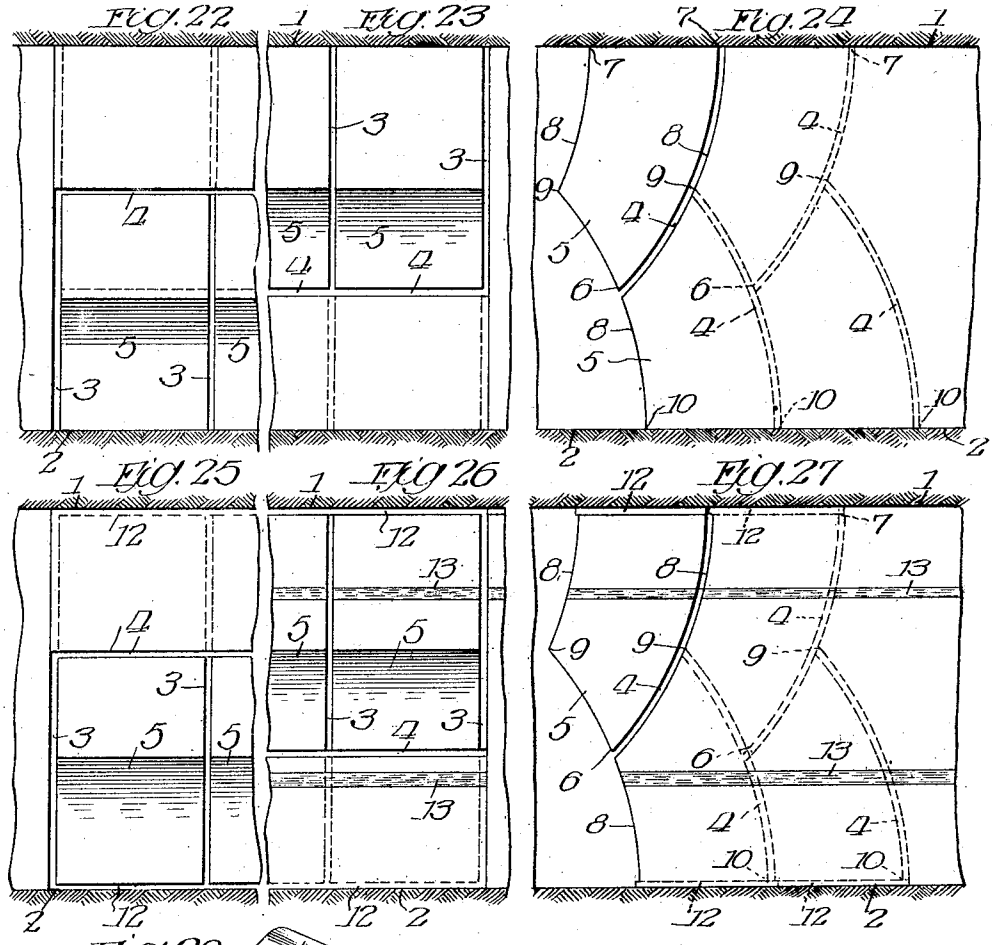
Inventor
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys.

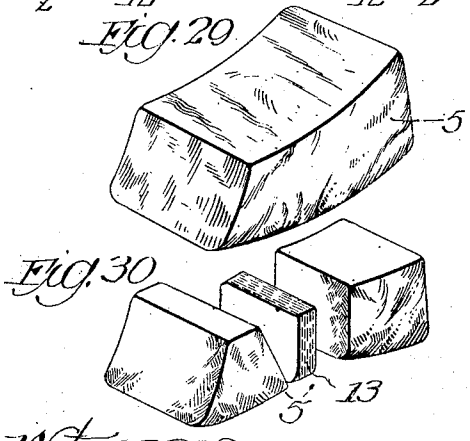
Oct. 7, 1924. 1,510,628

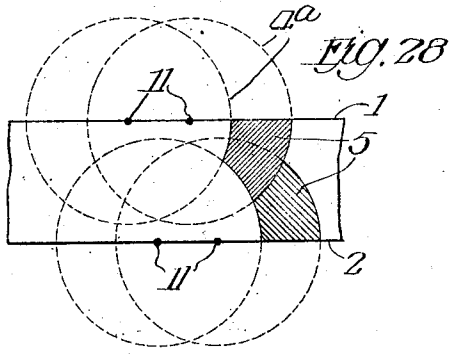
E. C. MORGAN

MINING MACHINE

Original Filed July 6, 1914. 9 Sheets-Sheet 9







Witnesses:
R. C. Barrett
A. J. Sauer.

Inventor
Edmund C. Morgan
By Brown, Nissen & Sprinkle
Attys

Patented Oct. 7, 1924. 1,510,628

UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF NEW YORK, N. Y.; OLIVE EUGENIE MORGAN EXECUTRIX OF SAID EDMUND C. MORGAN, DECEASED.

MINING MACHINE.

Application filed July 6, 1914, Serial No. 849,071. Renewed September 6, 1919. Serial No. 322,162.

To all whom it may concern:

Be it known that I, EDMUND C. MORGAN, a citizen of the United States, residing at New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Mining Machines, of which the following is a specification.

My invention relates to improvements in mining machines and has more particular reference to improvements in mining machines for mining coal and the like.

One of the objects of my invention is to provide an improved machine of this character which will be simple, durable and reliable in construction and effective and efficient in operation.

Other objects of my invention will appear hereinafter.

Referring to the accompanying drawings:

Fig. 1 is a substantially central vertical longitudinal section, some of the parts being shown in elevation, of an improved mining machine embodying my invention, the machine being illustrated in the act of cutting a block of coal from a vein of coal.

Figure 2 is a view similar to Fig. 1 illustrating some of the parts in a different position and in the act of removing and discharging the blocks of coal which it has cut.

Fig. 3 is a rear end elevation of the machine shown in Figs. 1 and 2.

Fig. 4 is a transverse sectional view on the line 4—4 of Fig. 1.

Fig. 5 is another transverse vertical section on the line 5—5 of Fig. 1.

Fig. 6 is a substantially horizontal section on the line 6—6 of Fig. 1 looking downwardly.

Fig. 7 is a substantially horizontal section on the line 7—7 of Fig. 1 looking upwardly.

Fig. 8 is a horizontal section on the line 8—8 of Fig. 1 showing the details of the cutter driving and shifting mechanism.

Fig. 9 is an enlarged detail section on the line 9—9 of Fig. 1 looking upwardly and showing the construction and operation of one of the kerf cutting mechanisms.

Fig. 10 is a section on the curved line 10—10 of Fig. 1 looking downwardly.

Fig. 11 is a transverse detail section on the line 11—11 of Fig. 10.

Fig. 12 is a transverse detail section on the line 12—12 of Fig. 1, showing the driving mechanism for the lower cutting mechanism.

Fig. 13 is a detail view partly in section on the line 13—13 of Fig. 1, showing further details of said driving mechanism.

Fig. 14 is an enlarged detail view in elevation of a portion of the kerf cutting chain of the upper kerf cutting mechanism.

Fig. 15 is a longitudinal section of said chain on the line 15—15 of Fig. 14.

Fig. 16 is a detail transverse section on the line 16—16 of Fig. 15.

Fig. 17, is an enlarged detail on the line 17—17 of Fig. 2 illustrating one of the grippers for gripping the block of coal which has just been cut and which is to be removed by the shifting of the kerf cutting mechanism.

Fig. 18 is an enlarged detail of a slightly modified form of brake mechanism for the lower swinging cutting mechanism.

Fig. 19 is an enlarged detail of a mechanism which yieldingly tends to swing the lower cutting mechanism to its cutting position.

Fig. 20 is a diagrammatic view in elevation and partly in cross-section showing my improved machine mounted upon a supporting truck.

Fig. 21 is a view in side elevation and partly in cross-section of a modified form of mining machine embodying the principles of my invention.

Figs. 22 to 27 are diagrammatic views illustrating my improved method of mining coal, Figs. 25, 26 and 27 illustrating my improved method of mining under such conditions as where several dirty bands exist in the vein.

Fig. 28 is a diagrammatic view illustrating the curves or arcs on which the kerfs are cut to sever the block of coal from the body of the vein.

Fig. 29 is a perspective view of one of the blocks of coal severed from the vein by my improved machine and method, and

Fig. 30 is a view similar to Fig. 29 except that it illustrates a block of coal cut from a vein in which a dirty band existed, such as referred to in connection with Figs. 25 to 27.

It will be obvious, to one skilled in the art after having obtained an understanding of my invention from the disclosures herein

made, that my invention is capable of being embodied in various modified structures without departing from the scope and spirit of the invention, and I wish it to be so understood.

It is well known for various commercial and other reasons that the best results are obtained if coal or similar material is mined in large compact uniform blocks or sections and my present invention contemplates a method of and machinery for mining coal in blocks or sections of this character.

In the drawings I have illustrated my improved method of cutting the body or vein of coal into sections or blocks of a uniform size and shape convenient not only for handling and removal from the mine but also transportation and preservation purposes, and I have also illustrated a machine or apparatus which also embodies my invention and which can be used for carrying out said method. In Figs. 22, 23 and 24 I have illustrated diagrammatically a portion of a mass or vein of coal in which a plurality of kerfs are cut in accordance with my improved method. Here it will be seen that the vein, which is represented by the upper and lower lines 1 and 2 respectively, has a plurality of kerfs 3 cut therein, these kerfs or cuts 3 being disposed vertically, spaced apart and disposed parallel with respect to each other. There are also a plurality of kerfs 4 the axes of which are at right angles to the vertical kerf 3 and which therefore intersect said kerfs 3, in such manner as to divide the vein into uniform blocks or sections 5 of coal. The kerfs 4 are cut on curved lines which begin at the points 6 in the face or outer wall of the vein of coal and which curve toward the upper or lower lines 1 and 2, as the case may be, terminating at 7 in intersecting relation to said lines 1 and 2. These kerfs may be cut in any sequence and in any number desired but I prefer that the curved kerfs 4 be cut alternately, that is to say, for instance as illustrated in Fig. 24, the kerfs 4 be cut one at a time, each kerf being cut after a block of coal formed by the preceding kerf has been cut and removed. To make this clearer assuming, as illustrated in Fig. 24, we start with the upper kerf 4. This kerf is cut on a curved or arc-shaped line which begins at 6 in the outer face or wall of the vein and which terminates at the upper line 1. The block thus formed is then removed exposing a curved face 8. The block of coal 5 thus severed is then removed and the next alternate kerf 4 is cut in the opposite direction, that is, downwardly toward the line 2, beginning at 9 on the exposed face 8 made by the previous kerf and terminating at the point 10 in intersection with the lower line 2, thus the upper and lower blocks may be cut alternately and the mining of the coal will be progressive into the vein. In actual practice I prefer to cut a series of upper blocks and remove them and then cut a series or transverse row of lower blocks and remove them and so on progressively into the vein. Fig. 23 illustrates a transverse row of upper blocks above the kerfs 4 just ready to be removed, while Fig. 22 illustrates a reverse row, that is, a row of lower blocks ready to be removed. As before mentioned, in practice I prefer to cut a plurality of blocks in a transverse upper or lower row as the case may be, but in doing this I cut a single upper block and remove it and then cut the next single block in the transverse row and remove it and then cut a third single block in the transverse row and remove it, and so on until the desired number of blocks in the particular transverse row has been cut and removed. I then proceed to cut the blocks individually in the next transverse row and remove them one by one until that row is complete and so on alternately and progressively for as long a period of time as desired. The vertical series of kerfs 3 may of course be cut in any timed relation to the other kerfs as desired, but in practice I prefer to cut them at the same time as I cut the curved kerfs 4, and I will presently describe a machine by which my improved method can be carried out in this manner. The curvature or arcs upon which the kerfs 4 are cut depend of course upon various conditions, such for instance as the type of machine used for the purpose, the depth or height of the vein and the size and shape of the blocks.

In the particular exemplification of my invention shown in the drawings the curved kerfs 4 for each vertical pair of blocks, so speak, are cut on arcs the centers of which are vertically separated substantially the height or depth of the vein. This is illustrated diagrammatically in Fig. 28. In this view the lines 1 and 2 illustrate the top and bottom of the vein as in the preceding vein and the shaded sections 5 represent the two blocks of a vertical pair, so to speak. The dotted circles 4^a represent the arcs on which the kerfs 4 are cut. The centers of these circles or arcs are indicated at 11. Thus it will be seen that the centers of the kerfs 4 of each vertical pair, so to speak, of blocks are vertically separated substantially the distance between the lines 1 and 2 which correspond to the roof and floor of the mine. The form of block thus severed from the body or vein of coal is illustrated in perspective in Fig. 29. In Figs. 22, 23 and 24 I have described my invention in connection with the mining of coal wherein the line of cleavage between the vein or strata of coal and the dirt or earth above and

below the said vein is comparatively clearly defined. In said views this line of cleavage for the roof and floor of the mine is coincident with the lines 1 and 2. Under such conditions the blocks will readily break loose along the lines of cleavage after the kerfs 3 and 4 have been cut. It happens, however, that the line of cleavage is sometimes indefinite or the thickness of the vein varies materially and under such conditions it is advisable to cut another kerf in order to completely sever the blocks of coal from the mass. In Figs. 25, 26 and 27 I have illustrated such additional kerfs at 12. This kerf is of course coincident with the lines 1 and 2 and determines the height of the mine roof from which the blocks are taken. In other words, the kerfs 12 determine the floor and roof line of the mine. The said kerfs 12 may be cut at any time relatively to the other kerfs but in the machine which I am presently to describe I have made provision for cutting the kerfs 12 simultaneously with the other kerfs 3 and 4. Figs. 25 to 27 illustrate also a vein or body of coal having one or more "dirty bands" strata 13 running through it. This, however, does not interfere with the carrying out of my method. In fact, with my improved method the coal may be very advantageously mined because as the blocks are cut they will in all likelihood sever along said dirty bands leaving a number of smaller blocks and permitting the ready removal of the dirty band. Such a divided block is illustrated in Fig. 30, this being the same as the block illustrated in Fig. 29 except that the dirty band 13 has caused a division of the whole block into two sections.

The machine or apparatus which is illustrated in the remaining drawing has been designed for carrying out my improved method as just described. This machine is constructed so that it will not only cut all of the kerfs simultaneously but it will operate to remove the severed blocks as they are cut and thus maintain its path constantly clear of severed blocks to permit its steady progress into the vein. In Figs. 1, 2 and 6 it will be seen that the operating parts of the machine are all mounted upon and supported by a large frame A which rests upon the floor line 2 of the mine. This frame may be mounted upon suitable skids 15 by which it may be easily shifted along the floor or it may be mounted upon a suitable truck having wheels or rollers, such as illustrated diagrammatically in Fig. 20 and which I will describe later. This frame has two long feet or prongs 16 which project forwardly a considerable distance and serve, in conjunction with the main part of the frame, as a broad solid support for the machine. The rear end of the main frame A is made in the form of a large broad hollow ring 17 which forms a journal or bearing for a sub-frame 18 which is bodily rotatable in said bearing or journal about an axis coincident with the center of said bearing. This sub-frame carries a large curved receiving chute or guide 19 which arches over or around the operating mechanisms and which extends from the rear of the main frame to the forward end of the machine. This chute or receiving member merges at the rear end with the sub-frame 18 which is made hollow and somewhat larger in sectional area than the chute proper so as to form a continuous passage for the blocks of coal from the extreme forward end of the chute to the rear end of the machine.

This chute or guiding member is preferably rectangular in cross section and its forward end, that is, the plane of its forward end, is at an angle to the longitudinal axis of rotation of the sub-frame. It is adapted to be positioned close to the face of the vein or wall of coal and is adapted to receive from the cutting mechanism the blocks of coal which are severed and removed by said cutting mechanism. It is also to be borne in mind that the chute is bodily rotatable with the sub-frame about its horizontal axis so that said chute may be presented to the wall of the vein at any angle desired, and in order that it may be conveniently rotated about its axis I provide mechanism for actuating the sub-frame to accomplish this purpose. Thus the ring bearing or journal boxing 17 of the main frame has an annular series of internal teeth 20 (Fig. 4) which are engaged by a spur gear 21 mounted within the sub-frame on a shaft 22. The shaft 22 is journaled in suitable bearings 23 (Fig. 5) and carries a worm gear 24 which is driven by a worm 25 on the end of an electric motor shaft 26, the motor 27 (Fig. 4) being suitably mounted on said sub-frame and controlled in any desirable manner well known in the art. Thus by running the motor in either direction the sub-frame and the chute 19 carried thereby may be readily rotated in either direction about its axis to position said chute in any relative position desired with respect to the vein of coal. By the provision of a worm driving mechanism such as just described, a locking mechanism, so to speak, is obtained for holding the chute in any position to which it is rotated or adjusted. This chute is curved on a predetermined arc so that it will be in arcuate alignment with the arcuate line of movement of the cutting mechanism, for reasons which will hereinafter appear, and the center of this arc is disposed preferably as close as conveniently possible to the side walls or roof or floor of the mine, as the case may be, depending upon the relative position to which the mechanism is bodily rotated. The cutting mechanism, generally indicated by

the letter B, is shown as operating at the forward end of the chute 19 in an arc which is in alignment with the curve of the chute 19. This cutting mechanism in the structure shown involves a hollow loop-shaped frame 25 around which a cutter chain 26 is disposed and adapted to run (Figs. 1, 2 and 9). This frame is substantially rectangular in shape except that its rear side reach is slightly curved to provide room for the chain driving and other mechanisms. The cutting chain is in the form of a continuous loop which is mounted to travel around the peripheral edge of the frame 25 which is farthest from the end of the chute. The cutter frame 25, as clearly shown in the drawings, is hollow or open and is preferably no thicker than the kerf which the chain cuts so that said frame, while it not only supports the cutting chain, will be capable of passing into the kerf in the rear of the cutting chain, thus permitting the cutting mechanism to embrace or pass over the block as the block is cut, and as will later appear, permitting the block to pass completely through said frame 25. The cutting chain may be of any suitable construction for the purpose. In the construction shown (Figs. 14, 15 and 16) the chain is composed of a plurality of links 30 pivoted or linked together by the bolts or rivets 31. The construction shown in Figs. 14 to 17 inclusive, is covered in my co-pending applications Serial Nos. 848,726 filed July 3, 1914, and 12,760 filed March 8, 1915, and 860,271 filed September 5, 1914. The side members of alternate links have instanding bosses 32 which meet midway of the length of the bolts or rivets 31 and form bearings for the side members of the intermediate links 30^a and the side members of the intermediate links 30^a are spaced by rollers 33, thus forming a solid compact chain which is perfectly flexible and still rigid to withstand the strains of service. The rollers 33 run on a flange 25^a on the frame which thus provides a substantial bearing for said chain. The intermediate links 30^a have central holes 34 preferably square in section to provide suitable sockets for the shanks 35 of the removable cutter blades 36. A portion 37 of the intermediate link projects beyond the confines of the chain laterally and provides a support for a removable collar 38 having a set screw 39 which passes through the portion 37 and binds the shank 35 of the cutter blades firmly in position. The cutter blades and their shanks are disposed angularly, alternate blades being disposed in the same direction so that the chain will cut a kerf wider than the chain. In order to prevent the chain from separating or leaving the frame 25 and at the same time permit it to travel freely on said frame, the frame has two grooves 40, (Fig. 17) one groove of which is engaged by small flanges or projections 40^a on the links and the other of which is engaged by hook members 41 carried by said chain links, thus locking the chain to the frame.

The cutting mechanism B, as before intimated, swings or moves bodily in an arcuate path which is in alignment with the chute 19 and which determines the shape or curve of the kerfs and hence the block. In order, therefore, that the cutting mechanism may be manipulated in this manner its frame is pivotally mounted on another frame 50 which is supported by the chute 19. This pivotal mounting is obtained by providing the cutting mechanism frame 25 with a pair of lugs 51 (Fig. 8) which are mounted upon a shaft 52 supported in similar lugs 53 on the forward end of the frame 50. This arrangement permits the cutting mechanism frame and cutting mechanism to be bodily swung about the pivot shaft 52 for the purpose of adjusting it relatively to the chute and other parts, and in order that it may be held in its adjusted position the frame 25 has a long curved tongue 54 (Fig. 1) which is positioned adjacent the lug 55 outstanding from the frame 50. The tongue 54 has a number of holes 56 through any one of which a bolt 57 carried by the lug 55 may be passed to hold the cutting mechanism in its angularly adjusted position.

The side walls (Figs. 1, 2, 5, 6 and 7) extend below the bottom wall of the chute and have inturned flanges 58 (Fig. 6) at their inner edges. These flanges form suitable guides and supports for the frame 50 (Fig. 5) and are preferably curved on an arc concentric with the arc of the chute so that the frame 50 may slide or shift bodily in a corresponding arcuate line of movement. The mechanism for driving the cutting chain and for bodily moving said cutting mechanism in its arcuate path is carried on this sliding or shifting frame 50. The frame in general consists of a plate positioned between the depending chute walls and curved to conform to the curvature of the chute or guiding structure. The frame 50 carries a suitable source of driving power such as an electric motor 60, which, as seen more clearly in Fig. 7, spans the frame 50. This motor has a pinion 61 (Fig. 1) on its shaft which drives a gear 62 keyed on a main shaft 63. The shaft 63 extends centrally lengthwise of the frame and is journaled in bearings 64 carried on said frame. A clutch member 65 is slidably keyed to the main shaft 63 and cooperates with another clutch member 66 which is loosely mounted on the shaft 63 and which is formed at its end as a bevel gear. This gear meshes with and drives a correspondingly beveled gear 67 on the shaft 52. This beveled gear 67 in turn transmits

power to another bevel gear 68 which is carried on a short shaft 69 journaled in the rear side of the cutting mechanism frame 25 (Figs. 1, 2, 7, and 8). The power for driving the cutting chain is transmitted from this shaft 69 to the chain by means of a sprocket wheel 70 (Fig. 9) carried by said shaft 69 and having teeth which cooperate with the links of the cutting chain. Thus it is seen that the cutting chain is driven in a very simple manner from the motor 60 and the arrangement of the three beveled gears 66, 67 and 68 provides a suitable driving connection for the transmittal of power at any angle to which the cutting mechanism is adjusted about the pivotal shaft 52. The clutch member 65 may be manipulated in any suitable manner for the purpose and provides a simple arrangement for connecting or disconnecting the cutting mechanism from the source of power as well. In the drawings I have shown means for automatically shifting said clutch to stop the cutting chain when the cutting mechanism has reached the end of its forward stroke. A long lever 65^a (Fig. 7) is pivoted at 65^b on the frame 50. This lever extends across to the other side of the frame. It engages the clutch 65 so that when the lever is swinging on its pivot it will throw the clutch one way or the other to connect or disconnect the cutting chain. A long link 65^c is pivotally connected to the free end of the lever 65^a and at one end it has a hook 65^d which is adapted to strike a fixed stop 65^e on the chute wall when the cutting mechanism reaches the lower end of its forward stroke, thus throwing the clutch 65 and disconnecting the cutting chain from the source of power. The stop 65^e may, if desired, be adjusted to properly time the stopping of the chain. To start the cutting chain again the operator simply needs to grab the hooked end 65^a of the link 65^c and operate the clutch 65. The power of shifting or moving the frame 50 and the cutting mechanism in their arcuate line of movement may be and preferably is derived from the main shaft 63.

Loosely mounted on the shaft 63 near its rear end is a driving pinion 71 (Fig. 8) which may be connected with or disconnected from said shaft at will by means of a suitable clutch 72. This gear meshes with a larger gear 73 on a shaft 74 which is parallel with the shaft 63, and when the pinion 71 is connected with the shaft 63 by the clutch 72 it will drive the gear 73 and shaft 74. The latter shaft carries a worm 75 which drives a corresponding worm gear 76 (Fig. 1) on a transverse shaft 77. This shaft 77 is suitably journaled in the frame 50 and carries at its outer ends a pair of pinions 78 (Fig. 7) which mesh with correspondingly toothed racks 79 secured to the under side at the bottom wall of the chute 19 as clearly shown in Figs. 1 and 2 and which is curved to conform to the curvature of the chute and the arc on which the cutting mechanism moves. This construction enables the frame 50 and cutting mechanism B to be bodily shifted or moved in its arcuate path or line of movement in a very simple manner and the clutch 72 enables the power to be connected with or disconnected from this mechanism at will. The provision of the worm and worm wheel 75 and 76 also has the advantage of holding, if desired, the cutting mechanism B and frame 50 in any position to which it may be fed forward or returned. These parts are so proportioned that the cutting mechanism will be fed forward or advanced on the cutting stroke at the proper speed for cutting the kerf. In a machine of this character, however, the speed of operation is, of course, an important desideratum, hence it is desirable, after the block has been cut, to withdraw or return the cutting mechanism at a greater speed than the speed at which it was fed forward on its cutting stroke. For this reason I provide a large internally toothed gear 86 (Fig. 5) on one end of the shaft 63 (Fig. 2) which is adapted to drive a correspondingly smaller gear 87 (Fig. 8) on the shaft 74 for increasing the speed. This large gear 86 is loose on the shaft 63 but it may be connected with or disconnected from said shaft by means of the clutch 72. When connected with the shaft 63 by said clutch 72 the gear 86 will drive the pinion 87 and shaft 74 and hence shift the frame 50 and cutting mechanism quickly on the return stroke (Figs. 1, 2, 7 and 8). The clutch 72 is preferably arranged as a two-way clutch having a neutral position. Thus when the clutch is thrown one way it connects gear 71 with shaft 63 and when thrown the other way it connects the large gear 86 with said shaft. When it occupies a neutral or intermediate position neither gear 71 nor gear 86 will be connected with the shaft 63. In the drawings I have shown mechanism by which the clutch 72 can be automatically thrown to stop the movement of the cutting mechanism at each end of its stroke. On the frame (Figs. 1, 2, 7 and 8) I journal a rock shaft 72^a the inner end of which has an arm or lever 72^b. The end of this arm engages the clutch 72 and when the shaft 72^a is rocked in either direction the clutch will be shifted accordingly. This shaft also has an arm 72^c at its outer end which is adapted to strike either of the two fixed stops 72^d, one of which is positioned on the wall of the chute at points corresponding to each end of the stroke of movement of frame 50 and cutting mechanism. As the arm 72^c strikes either of the stops 72^d it throws the clutch to neutral position and automatically stops the

movement of the cutting mechanism. The operator may then start the mechanism again by operating the arm 72e manually. Later I will describe mechanism by which the chute or receiving structure 19 may be cleared of blocks when it is desired to stop the cutting operation or remove the machine from the mine or shift its position and in connection with this clearing out mechanism it is desirable that a quick forward stroke of the cutting mechanism be possible. This quick forward stroke is accomplished by simply providing another gear 80 on shaft 63, and another clutch 83 for connecting said gear 80 with and disconnecting it from said shaft. This gear 80 when connected with shaft 63, drives a small pinion 81 (Fig. 7) on another shaft 82, which shaft has a pinion 85 (Fig. 8) meshing with the internal gear 86. Thus the power will be transmitted directly from the shaft 63 to the shaft 74 through the internal gear 86 and the pinion 87 and the proportion or ratio of the gears 86 and 87 will be such as to drive the transverse shaft 77 at a greater speed than the other driving connection above described for feeding the cutting mechanism forward. Of course, when the internal gear 86 is connected with the shaft 63 by the clutch 72 the gear 80 must be disconnected from said shaft and the pinion 71 will necessarily be disconnected. In other words, by the proper manipulation of the several clutches the various speeds and direction of operation of the cutting mechanism may be readily obtained.

It is thus seen that on the forward stroke of the cutting mechanism B the kerfs 3 and 4 are cut on curves or arcs corresponding to the arcuate line of movement of said cutting mechanism and to the arc of curvature of the chute or receiving structure 19. The cutting mechanism on its return stroke is utilized to remove the block of coal which has thus been severed or cut from the vein. Said cutting mechanism operating on its return stroke to carry the block of coal in the curved line of movement of said cutting mechanism. In this manner, and as clearly shown in the drawings, the block of coal enters the open forward end of the chute or receiving structure 19. By the cutting mechanism it is thus projected or positioned completely within the end of the chute 19 as shown clearly in the drawings. If the chute 19 and cutting mechanism have been rotated to such position that they are operating upwardly, so to speak, that is, so that the cutting mechanism on its cutting stroke moves upwardly toward the roof of the mine, it is readily seen that the moment the block of coal is released from the mass it will drop into the upturned end of the chute 19 by gravity and each succeeding severed block will thus in all probability force the preceding block further along the chute. In the event, however, that the machine is operating in the positions shown in Figs. 1 and 2, that is with the curved end of the chute pointing downwardly, it will easily be seen that the severed block of coal must be tentatively held in the end portion of the chute until the next succeeding block forces it further back into the chute. In the machine shown (Figs. 1 and 2) I provide a simple means of tentatively holding the severed block in the end portion of the chute. This means consists of a beveled hook 90 which is positioned at the lower inner edge of the chute and normally stands in the path of the block entering said chute. The entering block while passing into the chute deflects the hook 90 but the hook 90, being mounted upon a spring arm 91 which is anchored to the wall of the chute, will spring in behind the block of coal after said block has completely entered the chute 19, as clearly shown in Figs. 1 and 2 of the drawings, and thus hold the block of coal tentatively in that position until the next block forces it farther along into the chute. Each block is thus held against dropping out of the chute by gravity and relieves the cutting mechanism of said block while it moves forward, cuts another block and returns.

There are several ways in which the cutting mechanism can be arranged to engage the block of coal after said block is cut for the purpose of lifting or removing said severed block. This depends to a great extent upon conditions. For instance, where the line of cleavage is well defined and a reasonably light force is required to pull or break the block away from the line of cleavage after the kerfs 3 and 4 have been cut I provide a couple of gripping fingers or pawls on the cutting mechanism frame. These devices may occupy the position indicated at C in Figure 2 of the drawings. That is to say, they are mounted on the inner faces of the cutting mechanism frame 25. Fig. 17 illustrates in a large detail one of these grippers. A pawl 92 is pivoted at 93 in a suitable recess in the frame 25 and its free end projects into the path of the coal through the frame. This pawl is yieldingly held in this outstanding position by a spring 94 which spring is removably held in position by a screw-plug 95. The gripping pawl 92 is inclined in such direction that on the forward stroke of the cutting mechanism it will yield and thereby be pushed into its recess by the block of coal. On the return stroke of the cutting mechanism, however, the sharp free end of the pawl will dig into or grip the side of the block of coal and the cutting mechanism will thereby operate to remove the severed blocks. Any number of these grippers may

be provided according to conditions. As before mentioned in the description of my improved method, it sometimes happens that the line of cleavage is more or less irregular and indefinite and under such conditions it is not well to rely upon applying a force to the block of coal to break it away after the kerfs 3 and 4 are cut. It is advisable on the other hand to cut the kerf 12 so as to completely sever the block of coal from the body or mass thereof. Accordingly I provide an undercutting mechanism for this purpose and, as will later appear, not only utilize this mechanism for undercutting or cutting the kerf 12, but I also utilize it to assist the cutting mechanism B in removing the block of coal which has been cut. In accordance with these objects I provide a frame D (Fig. 2) which projects forward from the sub-frame 18.

The sub-frame 18 (Figs. 1, 2, 5 and 6) has inturned vertically disposed flanges 100 on opposite sides which fit within corresponding grooves in the edges 101 of said frame D, so that said frame D may be vertically shifted, for the purpose of adjusting the cutting mechanism which is supported by this frame and which will be later described. A simple means of adjusting this frame and holding it in its adjusted position comprises an outstanding lug 102 (Fig. 2) on said sub-frame 18 through which lug a vertically disposed adjusting bolt 103 passes. This bolt also passes through a cross bar 104 on the frame D and has its head on the under side of said cross bar. A nut 105 is threaded on to the bolt on each side of the lug 102 so that by turning the nuts and bolt relatively the height of the frame D may be determined. The frame D has two spaced arms 106 projecting forwardly and at their outer ends they carry a transverse shaft 107 which serves as a pivot for the swinging cutting mechanism E (Fig. 2). Pivotally mounted on the pivot shaft 107 is a swinging frame which comprises the two parallel side bars 108 (Fig. 6) and the transverse end member 109. The side bars 108 of this frame are grooved on their inner faces and provide guideways for a frame 110 which is slidable or reciprocable in said swinging frame. This frame 110 has at its forward end portion a depending forwardly projecting frame F which constitutes a support for a cutting chain 111. This frame or supporting portion F is comparatively thin so that it will enter the kerf cut by the cutting chain 111. The frame F is substantially a triangle in shape (Fig. 6) and the cutting chain 111 which is in the form of a continuous loop, travels around the periphery or edge of said frame F and the frame has, at its outer corners, a couple of rollers 112 over which the chain passes. The cutting chain may be of any suitable construction and needs no particular description. The inner or rear end of the chain passes around a suitable driving sprocket 113 which is mounted upon the end of a vertically disposed shaft 114 which has a suitable journal in the frame 110. This shaft carries a beveled gear 115 at its upper end which meshes with and is driven by a corresponding gear 116 keyed on the end of a shaft 117 journaled in suitable bearings in the frame 110. At its rear end this shaft carries a large gear 118 which is driven by a pinion 119 on the shaft of a motor 120 which is mounted on the sliding frame 110. In this manner power is supplied from the motor 120 to the cutting chain 111 for the purpose of driving said chain. In order to feed the undercutting mechanism E into the coal so that it will cut the kerf 12 the frame 110 which carries said cutting mechanism is mounted to slide in the swinging frame. I provide means by which this shifting of the cutting mechanism E can be done at different speeds so that said cutting mechanism can be given a slow forward or cutting stroke and a quick return stroke. In Figs. 1, 2 and 6 it will be observed that the shaft 117 has a driving pinion 121 thereon. This pinion is loose on the shaft but is adapted to be connected with or disconnected from said shaft by means of a clutch 122. When connected with the shaft by the clutch this pinion drives a larger gear 123 (Fig. 12) on another shaft 124 which carries a worm 125. This worm meshes with a corresponding worm gear on a transverse shaft 126. The shaft 126 carries a pair of pinions 127 at its outer ends which mesh with toothed racks 128 formed within the grooves or channels of the side bars 108 of the swinging frame so that when the shaft 126 is rotated the frame 110 and cutting mechanism E will be shifted longitudinally of said swinging frame. These driving connections which I have just desribed are intended to feed the cutting mechanism forward at a slow speed. The return stroke of said cutting mechanism is preferably quicker than the forward stroke and this higher speed is obtained by providing an internally toothed large gear 131 loose on the shaft 117 but adapted to be connected with or disconnected from said shaft by the clutch 122. This gear drives a small pinion 130 (Fig. 6) on the shaft 124, hence when the gear 131 is driving the shaft 124 the cutting mechanism will be returned at a relatively higher speed. The clutch 122, as before intimated, is a two-way clutch for connecting either the gear 131 or the gear 121 with said shaft 117, and in order that the operation of this clutch may be automatic to change speeds at the end of each

stroke I provide an operating lever 133 pivoted at 134 on the frame 110 and connected at 135 to the clutch 122 for shifting the clutch in either direction on the shaft 117. The free end of this lever is positioned to engage stops 136 at each end of the stroke or range of movement of said cutting mechanism so that the lever 133 in striking either one of these stops will change the speed and direction of movement automatically. The lever has an outstanding arm 137 by which it may be manually operated, if desired.

In practice I prefer to operate the cutting mechanisms B and E simultaneously; that is to say, while the cutting mechanism B is moving in its arcuate path to cut the kerfs 3 and 4 the other cutting mechanism E will also be cutting the kerf 13, hence when the cutting mechanism B reaches the lower end of its stroke it will practically meet the cutting mechanism E. In this position of the cutting mechanisms I interlock both of them so that on the return stroke of the cutting mechanism B the cutting mechanism E will also be lifted or swung about the pivot shaft 107, as shown in Fig. 2. The interlocking of these two cutting mechanisms may be accomplished in any desired manner. In Figs. 1 and 2 I have shown a simple way by which this may be done. The frame 25 of cutting mechanism B carries a spring-pressed hook 140, which is pivoted at 141 and which engages an undercut shoulder 142 on the frame F of the cutting mechanism E when said cutting mechanisms meet. The cutting mechanism E will therefore be carried with the cutting mechanism B on the return stroke thereof, and since said cutting mechanism is beneath the end of the severed block it will serve as a platform or a support for said severed block and operate to lift the block. As soon as the block has been raised or carried into the end of a receiving chute 19 and caught by the hook 90 as before explained, the cutting mechanism E must be released so that it can return to its normal position. In the structure shown this is simply accomplished by providing an arm 143 on the pivot shaft 141 of said hook 140, which arm 143 will engage a fixed lug 144 on the chute 19 (Figs. 1 and 2), hence when the arm 143 strikes the lug 144 it will unlock the cutting mechanism E and allow it to return. When the machine is operating in the positions shown in Figs. 1 and 2 the cutting mechanism E after being released will swing or drop down to normal position by gravity, but in order that its drop may not be too sudden and hard the mechanism may be balanced or practically balanced, if desired. However, I provide on the end of the pivot shaft 107 a segmental arm 150 which has at its outer end a curved surface 151 formed on an arc the center of which is the pivot shaft 107. A brake shoe 152 is yieldingly pressed against this curved surface 151 by means of a spring 153. This spring is positioned between a fixed arm 155 on the frame D, and a collar on the rod 156 which carries the brake shoe. This rod is journaled in the arm 155 and another arm 157. If desired a hand lever 158 may be connected to the upper end of the rod 156 so that an increased force may be applied manually to the brake shoe. The rear end of the segmental arm 150 is upturned as at 159 so as to provide a stop lug which engages the brake shoe 152 and limits the movement of the cutting mechanism to properly position said cutting mechanism at the end of each return stroke. If desired this stop may be made adjustable, as shown in the modification in Fig. 18. In this form the stop 159 is separable from the segmental arm 150 and may be adjusted along the arc-shaped surface 151 and held in its adjusted position by the bolt 160.

When the machine is operating toward the roof of the mine, that is, when the operating parts are in just the reverse position that they are in Figs. 1 and 2, it might happen that the cutting mechanism E will not swing upwardly toward the roof and return to its cutting position after it is released from the cutting mechanism B, and in order to insure its proper return I provide a crank arm 165 on the end of the pivot shaft 107 and a spring return mechanism is connected to the end of this crank arm 165 and to the frame at 166 (Fig. 6) for the purpose of swinging the cutting mechanism E upwardly. This spring return mechanism may comprise a tubular portion 167 which is pivoted at 166 to the frame D, and a rod 168 which is pivoted to the crank arm 165. The inner end of the rod 168 has an enlarged head which slides in the tube 167 and between this head and the inturned end of the tube 168 is a spiral spring 169 which will be compressed when the cutting mechanism E is swung downwardly by the cutting mechanism B, and this spring acting upon the crank will return said cutting mechanism E when released from the cutting mechanism B. The tubular portion 167, together with the piston therein, constitutes a dash-pot pivoted at 166, the piston being constructed in a well known manner to permit free movement when the kerf cutter F is lifted and retarded movement when the spring 169 restores the plane kerf cutter to initial position. If desired the bottom of the dash-pot may be provided with an opening controlled by a check valve so that the piston may move freely when the kerf cutter F is restored to initial position.

I have previously mentioned that a quick forward and return movement of the cutting mechanism B is desirable when the

chute is to be cleared of coal, and described driving connections by which this quick return speed is accomplished. In the present structure the clearing-out mechanism embodies two long arms G (Figs. 1, 2, 10 and 11) which are pivotally fastened at 170 to the cutting mechanism frame 25 and which extend into the chute 19 for a considerable distance, preferably a distance equal to substantially two lengths of block. These clearing arms are spaced from the sides of the chute and from the blocks of coal within the chute but they have a number of instanding prongs 171 which are inclined in the direction in which the blocks move through the chute. The arms G are curved in conformance with the curvature of the chute and in order that they may properly follow a curved line, that is, move in a curve in alignment with the arc of movement of the cutting mechanism, I provide a couple of guideways 172 on the inner side walls of the chute 19. In these guideways slide the shoes 173. These shoes carry outstanding studs 174 which pass loosely through holes in the arms G and a cross pin 175 is provided to prevent the arms from becoming separated from these studs. Between the shoes and the arms G are spiral springs 176 which not only yieldingly press the prongs 171 against the blocks of coal in the chute but which also hold the shoes within the guideways. By oscillating or bodily moving the cutting mechanism B the arms will be given a reciprocating movement and the prongs carried by said arms will engage the blocks of coal and carry them past the center of the chute so that they will drop through the rear end of the chute by gravity.

In Fig. 21 of the drawings I have illustrated in side elevation a modified structure embodying my invention. This particular form of machine is intended more especially to be used for cutting the upper blocks of coal; that is, it operates to cut the kerfs 3 and 4 which extend upwardly toward the roof of the mine. In this structure instead of building a closed guiding chute or receiving structure, as previously explained, I build up an open chute or receiving structure. This structure comprises a bottom curved guideway or trough made up of spaced parallel angle beams 180 formed to the proper curvature and strengthened by a number of transverse braces 181 distributed at intervals. Resting on the inturned flanges of these beams is a plate 180^a which forms the bottom of the trough. A number of uprights 182 are provided on each side of the guideway and upon which the guideway is supported. These uprights are anchored at their lower ends to a base frame 183. The intermediate pair of uprights are spanned at their upper ends by means of a brace beam 184. Between the upper ends of the end uprights 182 is a pair of curved beams 185 which are firmly secured to the end uprights and which serve as supporting members for the frame 50 and cutting mechanism B. In this construction the racks 79 along which the gears 78 travel are suspended from the curved angle beams 185 by means of the hangers 186. The frame 50, the driving mechanism mounted thereon and the cutting mechanism also carried thereby are identical in construction with those mechanisms previously described and hence need no further description. This construction, as is seen, is comparatively light in weight and occupies comparatively small space. It may be moved along the line in any suitable manner, the frame 183 being mounted upon skids 187 for this purpose. In order to prevent the rear end of the machine from rising, due to the resistance offered to the cutting mechanism while it is cutting upwardly, I provide a suitable jack H which is pivotally anchored at 189 to each of the rear corners of the frame. This jack is of the screw type operated by a hand wheel 190 and is of well known construction, hence it needs no further description except that its upper end is adapted to be jammed against the roof of the mine to prevent the rear end of the structure from rising. It may be desirable to support the block of coal while it is being cut and until it is completely cut and in the drawing (Fig. 21) I have shown a simple means for doing this. On the forward end of the angle beam 180 I provide an adjustable plate 200 which has a long slot through which a bolt 201 passes and is threaded into the beam so that the plate may be secured in its adjusted position. This adjustable plate carries a lever which is pivoted at 202 on said plate. One arm 203 of this lever is enlarged at its end to provide a suitable head and is adapted to be swung around into engagement with the lower corner 204 of the block of coal which is being cut. This device thus serves as a jack or support for holding said block while the cut is being made and is adapted to be swung around out of the way of the block when the block is to be released. This lever may be provided with a handle 205 for conveniently manipulating it. It is pivoted in this manner so that it may be swung around clear of the cutting mechanism so as to allow said cutting mechanism to enter the upper end of the structure.

The structures which I have described are shown as mounted upon skids so that the machines may be jacked along the floor of the mine in the usual way well known in the art. If desired, however, the entire machine may be mounted upon a wheeled or

rollered truck 195, such as illustrated diagrammatically in Fig. 20. By mounting the machine on a truck in this manner it may, if desired, be arranged to swing bodily on a vertical axis, it being simply necessary in such case to provide the frame with a pivotal bearing or journal 197 in the truck. A vertical adjustment of the entire machine may also be secured by means of a bolt or screw 198 adapted to operate against the lower end of the bearing member 196.

What I claim is:

1. In a mining machine, the combination with a supporting frame, of core cutting mechanism mounted thereon in position to cut a core from the face of a mine wall in any direction toward a boundary thereof, means for operating said core cutting mechanism to cut such core in any direction toward a boundary of the coal face, and means for removing the cut core of material.

2. The combination of a cutting mechanism for entirely severing a block of coal from the vein, means for bodily actuating said cutting mechanism to remove the severed block of coal while the latter remains intact, and a curved chute disposed in the line of movement of said cutting mechanism for receiving the block of coal from said cutting mechanism.

3. The combination of a bodily movable cutting mechanism for entirely severing a block of coal from the vein, means for afterward moving said cutting mechanism to remove the whole block intact which it has severed, and a curved chute disposed in the line of movement of said cutting mechanism and into which the cutting mechanism discharges said block.

4. The combination of a bodily movable cutting mechanism comprising a core-cutter and a plane kerf-cutter for entirely severing a block of coal from the vein, means for afterward moving said cutting mechanism to remove the whole block intact which it has severed, a chute disposed in the line of movement of said cutting mechanism and into which the cutting mechanism discharges said block, and means for holding said severed block in position to be moved along the chute by the next set of blocks.

5. The combination of a bodily movable cutting mechanism for entirely severing a block of coal from the vein, means for moving said cutting mechanism to remove the whole block intact which it has severed, an arcuate chute disposed in the line of movement of said cutting mechanism and into which the cutting mechanism discharges said block, means for holding said severed block in position to be moved along the chute by the next set of blocks, and means operated by said bodily movable cutting mechanism for clearing the chute of severed blocks.

6. The combination of an oscillating cutting mechanism adapted on its forward stroke to entirely sever a block of coal from the vein, means operable on the return stroke of said cutting mechanism for removing the severed block in its entirety, an arcuate receiving structure disposed coincident with the line of movement of said cutting mechanism for directing the blocks of coal beyond said cutting mechanism, and means for tentatively holding the last block severed by said cutting mechanism in position to be moved along said receiving structure by the next severed block.

7. The combination of a frame structure, a guiding structure disposed on an arc and extending substantially from the forward to the rear end of said frame structure, a cutting mechanism operable adjacent the forward end of said guiding structure and bodily movable on an arc, the center of which is coincident with the center of the arc on which the guiding structure is disposed, said cutting mechanism operating on its forward stroke to sever a block of coal from the mass thereof, and means operable on the return stroke of said cutting mechanism for removing the severed block and placing the severed block on said guiding structure in position to be shoved along said guiding structure by the next severed block.

8. The combination of cutting mechanism movable in an arc for entirely severing a block of material from the mass thereof, means for bodily moving said cutting mechanism to remove the severed block, and a receiving structure disposed on an arc the center of which is at the center of the arc of movement of said cutting mechanism for receiving the blocks as they are removed by the cutting mechanism to direct said blocks beyond the cutting mechanism.

9. The combination of cutting mechanism for entirely severing a block of material from the mass thereof, means for bodily moving said cutting mechanism to remove the severed block, a receiving structure disposed on an arc the center of which is at the center of the arc of movement of said cutting mechanism for receiving the blocks as they are removed by the cutting mechanism to direct said blocks beyond the cutting mechanism, and means for bodily rotating said receiving structure and cutting mechanism about a common axis.

10. The combination of a main supporting frame, a sub-frame rotatably mounted on said main frame, a cutting mechanism pivotally mounted on said sub-frame on an axis transverse to the axis of rotation of said sub-frame and adapted on its forward stroke to sever a block of material from the mass thereof, means operable upon the return stroke of said cutting mechanism for removing the severed block, and an arc-shaped chute disposed in arcuate alignment with the

arc of movement of said cutting mechanism and having its end in position to receive the removed block from said cutting mechanism.

11. In mining apparatus, the combination with kerf cutting mechanism for cutting blocks of material from a mine wall beginning intermediate the floor and roof of a mine chamber, of means for operating said cutting mechanism including the feed thereof either horizontally or upwardly toward a boundary of the mine wall, and means for removing the block of material along the line of movement of said cutting mechanism.

12. In mining apparatus, the combination with core cutting mechanism, of means for operating the same including arcuate feed thereof to cut a core in a mine wall toward the floor, roof or one of the opposite walls of a mine chamber, means for adjusting the position of the cutting mechanism on an approximately horizontal axis to adjust the direction of feed of said cutting mechanism, and means for removing the core of material in arcuate alinement with the direction of feed of said cutting mechanism irrespective of its adjusted position.

13. The combination of kerf cutting mechanism having an unobstructed core-opening therethrough and bodily movable on a curved line for cutting out a block of coal from the vein, means for removing said block of coal along said curved line, and means comprising a curved chute for tentatively holding the block in the path of the next succeeding block.

14. The combination of a curved receiving structure, means for entirely severing a block of coal from the vein thereof, and means for tentatively holding said block in said receiving structure in position to be pushed along said receiving structure by the next succeeding block.

15. The combination of bodily movable cutting mechanism adapted on its forward stroke to entirely cut a block of coal from the vein, means operable on the return stroke of said cutting mechanism for removing the block which has been cut, means for directing the blocks from said cutting mechanism as they are cut, and mechanism for supporting the aforesaid parts to enable cutting horizontally or vertically.

16. The combination of bodily movable cutting mechanism adapted on its forward stroke to cut out a block of coal from the vein, means adapted to occupy a stationary position during the feed of said cutting mechanism but operable on the return stroke of said cutting mechanism for removing the block which has been cut, and a stationary guiding structure aligned with said cutting mechanism for directing the blocks of coal away from the cutting mechanism.

17. The combination of bodily movable cutting mechanism adapted on its forward stroke to cut a block of coal from the vein, means operable on the return stroke of said cutting mechanism for removing the block which has been cut, a relatively stationary structure having an elevated receiving end for directing the blocks of coal from said cutting mechanism, and means for tentatively holding said block of coal in said receiving structure at substantially the end of the return stroke of said cutting mechanism and in position to be shoved along said receiving structure by the succeeding block.

18. In a mining machine, the combination with a supporting frame, of an enclosure having a receiving opening, an open cutting component mounted directly on and movable around a portion of the enclosure for cutting coal and other material from columns directly from a mine vein, the cut columns of coal or other material being injected into said open end of said enclosure, and means for operating said cutting component to cut the coal as aforesaid.

19. The combination of a loop-shaped cutting mechanism arranged to simultaneously cut a plurality of kerfs at an angle to each other to entirely sever a block of coal from the vein, means for bodily moving said cutting mechanism to remove the block of coal from its original relative position, and means, embodying a receiving chute, positioned in alignment with the line of movement of said cutting mechanism for directing the block of coal away from said cutting mechanism.

20. The combination of bodily movable cutting mechanism embodying cutting means for cutting a plurality of kerfs angularly disposed with respect to each other, and adapted to embrace the block of coal as it is cut; additional kerf-cutting mechanism to entirely sever the blocks of the cut material, means for bodily reciprocating both of said kerf-cutting mechanisms, means operable on the return stroke of said cutting mechanisms for removing the block from its original position along the line of movement of the first-named cutting mechanism, and a receiving structure aligned with said first-named cutting mechanism for directing the block of coal away from the cutting mechanism.

21. In mining apparatus, the combination of bodily rotatable core cutting mechanism adapted to be positioned in various angular positions with respect to the wall of material to be cut, and means for operating said cutting mechanism including the feed thereof in any radial directions from the center of adjustment of said angular relation.

22. In mining apparatus, the combination with a supporting frame, of cutting mechanism bodily rotatable on a horizontal longitudinal axis and mounted on said supporting frame in position to occupy various angular relations with respect to the mate-

rial to be cut, means for operating said cutting mechanism including the feed thereof in various directions horizontally and vertically, means mounted on said supporting frame in position to cooperate with said cutting mechanism to sever the cut material, and mechanism mounted on said frame in position for removing the severed block of material from its cut position at the mine wall.

23. In mining apparatus, the combination with a supporting frame, of a supplemental frame rotatable on a horizontal longitudinal axis substantially perpendicular to the base of the mine wall, kerf-cutting mechanism mounted for a bodily arcuate path of travel on said supplemental frame, means for driving said kerf-cutting mechanism, mechanism for bodily moving said cutting mechanism from any position about a complete circle of rotation of said supplemental frame from such perpendicular axis, and means for adjusting the rotary position of said supplemental frame together with said kerf-cutting mechanism.

24. In a mining machine, the combination with a supporting frame, of a plane kerf-cutter, a supplemental frame carrying said kerf-cutter for bodily rotary adjustment on said supporting frame in position spaced radially from the axis of rotation of said supplemental frame including a position of cutting at the base of the mine wall, and means for operating said kerf-cutter in various planes including a plane approximately at the floor level about the axis of rotation of said supplemental frame including rectilinear feed of said kerf-cutter relatively to said supporting frame and in parallelism with said axis of rotation while said supporting frame remains stationary.

25. A mining machine comprising a bodily rotatable kerf cutting mechanism capable of cutting a core in a mine wall in a single feeding movement, means for operating said cutting mechanism including the feed thereof on curved lines radially about the complete circle of rotation of said cutting mechanism to cut a core in a single operation, and means for positioning said cutting mechanism so that said curved lines on which the cutting mechanism operates will intersect.

26. In mining apparatus, the combination with cutting mechanism, of means for operating the same to sever a block of material from the mass thereof, means for bodily rotating said cutting mechanism, means for bodily reciprocating said cutting mechanism approximately radially between a circumferential position and the center of such rotation, and means for removing the severed block of material along the line of reciprocal movement of said cutting mechanism.

27. The combination of a rotary chute disposed on an arcuate line of curvature, cutting mechanism rotatable about the axis of rotation of said chute, means for bodily feeding said cutting mechanism into the mass of material to be cut, and on an arcuate line having its center coincident with the center of the arc on which the chute is disposed, and means for dislodging the cut material and for carrying the same on the arcuate line of movement of said cutting mechanism.

28. The combination of a rotary chute disposed on an arcuate line of curvature, cutting mechanism rotatable about the axis of rotation of said chute, means for bodily feeding said cutting mechanism into the mass of material to be cut, and on an arcuate line having its center coincident with the center of the arc on which the chute is disposed, means for returning said cutting mechanism, additional cutting mechanism for entirely severing the block of material, means operable on the return stroke of said cutting mechanism for carrying said severed block on the arcuate line of movement of said cutting mechanism, and means for tentatively holding said block in position to be pushed along the chute by the succeeding block.

29. In mining apparatus, the combination with a chute disposed on an arcuate line of curvature and rotatably mounted, of cutting mechanism rotatable about the axis of rotation of said chute, means for feeding said cutting mechanism into the mass of material to be mined and on an arcuate line having its center coincident with the center of the arc of curvature of said chute, additional mechanism for entirely severing the cut material from the mine wall, means for returning the first named cutting mechanism, mechanism operable upon the return stroke of said first named cutting mechanism for moving said severed block of material along the arcuate line of movement of said first named cutting mechanism, means for tentatively holding said block in position to be pushed along the chute by a succeeding block, and additional mechanism operable during the return movement of said first named cutting mechanism for progressively moving the blocks along said chute.

30. In mining apparatus, the combination with a curved receiving structure, of cutting mechanism operable at the receiving end of said structure, means for operating said cutting mechanism including feed thereof from said receiving end of said structure and along the line of curvature thereof, means for adjusting the position of said cutting mechanism to enable the same to cut a plurality of intersecting kerfs to form a block in the mass of material to be mined, means operable to remove said block and inserting it in the receiving end of said structure,

and means for holding said block in position to be pushed along the receiving structure by a succeeding block.

31. The combination of a curved receiving structure, cutting mechanism bodily operating near the forward end of said receiving structure on the line of curvature thereof, and embodying means for cutting a plurality of intersecting kerfs to form a distinct block from the mass or vein thereof, means operable to remove said block after it has been formed and for inserting it in said receiving structure, means for holding said block in position to be pushed along the receiving structure by the succeeding block, and means for automatically stopping said cutting mechanism at the end of its cutting stroke.

32. The combination of a cutting mechanism embodying a cutting chain traveling in a loop and adapted to surround a block of coal which it cuts, means for bodily reciprocating said cutting mechanism, a second cutting mechanism adapted to cut a kerf at the end of the cutting stroke of said first cutting mechanism and movable therewith, and means for locking said second cutting mechanism to said first cutting mechanism to remove a block of coal on the return stroke of said first cutting mechanism.

33. The combination of a cutting mechanism embodying a cutting chain traveling in a loop and adapted to surround a block of coal which it cuts, means for bodily reciprocating said cutting mechanism, a second cutting mechanism adapted to cut a kerf at the end of the cutting stroke of said first cutting mechanism and movable therewith, means for locking said second cutting mechanism to said first cutting mechanism to remove a block of coal on the return stroke of said first cutting mechanism, and automatic means for regulating the length of stroke of said first cutting mechanism.

34. The combination of a cutting mechanism embodying a cutting chain traveling in a loop and adapted to surround a block of coal which it cuts, means for bodily reciprocating said cutting mechanism, a second cutting mechanism adapted to cut a kerf at the end of the cutting stroke of said first cutting mechanism and movable therewith, means for locking said second cutting mechanism to said first cutting mechanism to remove a block of coal on the return stroke of said first cutting mechanism, automatic means for regulating the length of stroke of said first cutting mechanism, and a chute disposed in alignment with the line of movement of said first cutting mechanism for receiving the severed block.

35. The combination of a cutting mechanism embodying a cutting chain traveling in a loop and adapted to surround a block of coal which it cuts, means for bodily oscillating said cutting mechanism, a second cutting mechanism adapted to cut a kerf at the end of the cutting stroke of said first cutting mechanism and movable therewith, means for locking said second cutting mechanism to said first cutting mechanism to remove a block of coal on the return stroke of said first cutting mechanism, automatic means for regulating the length of stroke of said first cutting mechanism, a chute disposed in alignment with the line of movement of said first cutting mechanism for receiving the severed block, and means for temporarily holding the block of coal in the end portion of said chute in position to be moved along the chute by the succeeding block.

36. The combination of an arcuate receiving chute, cutting mechanism operable near the end of said chute to entirely sever large blocks of material from the mine wall, means for inserting the blocks successively in said chute as they are cut, and means for moving the blocks along the chute to clear the chute.

37. The combination of an arc shaped receiving chute, a block cutting mechanism bodily oscillatable at the end of the chute on the arcuate line on which the chute is disposed, means operable on the return stroke of the cutting mechanism for depositing the block in said chute, and means carried by said cutting mechanism for moving the blocks along the chute.

38. The combination of an arc shaped receiving chute, a block cutting mechanism bodily oscillatable at the end of the chute on the arcuate line on which the chute is disposed, means operable on the return stroke of the cutting mechanism for depositing the block in said chute, means carried by said cutting mechanism for moving the blocks along the chute, and a pair of curved arms carried by said cutting mechanism and adapted to engage the blocks of coal in the chute and move them along the chute as said cutting mechanism oscillates.

39. The combination of a bodily oscillated kerf-cutting mechanism, an additional bodily oscillated cutting mechanism operating to cut a kerf in intersecting relation to the kerfs cut by the first-named oscillated cutting mechanism and at the end of the stroke of said first-named oscillated cutting mechanism, and means for locking the two cutting mechanisms together to remove the severed block of coal on the return stroke of said first-named oscillated cutting mechanism.

40. The combination of a bodily oscillated kerf-cutting mechanism, an additional oscillated cutting mechanism operating to cut a kerf in intersecting relation to the kerfs cut by the first-named oscillated cutting mechanism, means for locking the two cutting mechanisms together to remove the severed block of coal on the return stroke

of the first-named oscillated cutting mechanism, and a chute disposed in the line of movement of said first-named oscillating cutting mechanism for receiving the blocks therefrom.

41. The combination of a bodily oscillatable kerf cutting mechanism, an additional bodily oscillatable cutting mechanism operating to cut a kerf in intersecting relation to the kerfs cut by the first-named oscillatable cutting mechanism, means for locking the two cutting mechanisms together to remove the severed block of coal on the return stroke of said first-named oscillatable cutting mechanism, means for releasing said additional cutting mechanism, and means for restoring the latter to its original position.

42. The combination of a bodily oscillated kerf cutting mechanism, an additional bodily oscillatable cutting mechanism operating to cut a kerf in intersecting relation to the kerfs cut by the first-named oscillatable cutting mechanism and at the end of the stroke of said oscillatable cutting mechanism, means for locking the two cutting mechanisms together to remove the severed block of coal on the return stroke of said first-named oscillatable cutting mechanism, a chute disposed in the line of movement of said first-named oscillatable cutting mechanism for receiving the blocks therefrom, and means for tentatively holding each severed block in said chute in position to be moved along the chute by the succeeding block.

43. The combination of means for cutting a block of coal from the vein including oscillatable cutting mechanism for cutting the end kerf of said block, means for oscillating said cutting mechanism to remove the severed block, and a brake for governing the return of said cutting mechanism to its original position.

44. In a mining machine, the combination with a supporting frame, of cutting mechanism mounted on said frame, means for operating said cutting mechanism including bodily upward movement thereof to sever a block of coal from a mine vein, and a device on said frame for positively supporting the block of coal in its original position in its native bed while it is being cut.

45. In a mining machine, the combination with a supporting frame, of cutting mechanism mounted thereon, means for operating said cutting mechanism including bodily movement thereof relative to said frame to sever a block of coal from a mine vein, and a flat device mounted on said frame in position to be moved relatively thereto under the block of coal to support the same in its original position in the mine wall while it is being cut.

46. In a mining machine, the combination with a main supporting frame, of a supplemental frame guided on said main frame for circumferential adjustment on a generally horizontal axis extending longitudinally, said supplemental frame being confined to such circumferential movement relative to said supporting frame, an additional frame pivotally connected to said supplemental frame on a transverse axis and movable bodily with said supplemental frame on said longitudinal horizontal axis, cutting mechanism, means for operating said cutting mechanism, and means for supporting said cutting mechanism and its operating means on said supplemental frame for movement bodily with said supplemental frame on said transverse axis toward and away from said horizontal axis.

47. In a mining machine, the combination with cutting mechanism, of operating means therefor, a frame for supporting said cutting mechanism and said operating means, means for pivotally supporting said frame to permit movement of said cutting mechanism transversely of its plane, and a spring connected between said supporting means and said frame in position tending to hold said cutting mechanism in initial position.

48. In a mining machine, the combination with supporting frame-work, of a movable frame pivoted to said supporting frame-work, kerf cutting mechanism and operating means therefor mounted on said movable frame for bodily movement with the latter transversely of the plane of said kerf cutting mechanism, yielding mechanism tending to force said movable frame in a predetermined direction, and means for limiting the movement of said movable frame and said kerf cutting mechanism transversely of its plane to a predetermined position.

49. In a mining machine, the combination with a main frame, of a supplemental frame pivoted thereto, cutting mechanism and operating means therefor mounted on said supplemental frame and movable bodily therewith transversely of the cutting mechanism, a spring tending to pull said supplemental frame including said cutting mechanism to cutting position, a stop for limiting the movement of said supplemental frame to said cutting position, and means for moving said supplemental frame together with said cutting mechanism transversely of the latter against the action of said spring in the opposite direction.

50. In a mining machine, the combination with a supporting frame-work, of a supplemental frame pivotally connected thereto, a resilient buffer between said supplemental frame and said supporting frame-work, kerf cutting mechanism mounted on said supplemental frame, and means for operating said kerf cutting mechanism including rectilinear feed thereof along its own plane by movement relatively to said supplemental

frame in its adjusted position relatively to said supporting frame-work.

51. In a mining machine, the combination with supporting frame-work, of a supplemental frame connected to said supporting frame-work for movement relatively thereto, kerf cutting mechanism and operating means therefor mounted on said supplemental frame and movable bodily therewith, a sector brake surface connected to move with said supplemental frame, and brake mechanism engaging said sector brake surface to retard pivotal movement of said supplemental frame on said supporting frame-work, said operating means for said cutting mechanism including means for feeding said cutting mechanism rectilinearly along its own plane in any of its angular positions on the pivotal connection of said supplemental frame with said supporting frame-work.

52. In a mining machine, the combination with a main frame, of a supplemental frame pivoted thereto, a brake sector movable with said supplemental frame, kerf cutting mechanism, means for driving said kerf cutting mechanism, means for feeding said kerf cutting mechanism rectilinearly along its own plane and along said supplemental frame in the various angular positions to which said supplemental frame is adjustable, and brake mechanism associated with said brake sector for holding said supplemental frame in adjusted position during the operation of said kerf cutting mechanism.

53. In a mining machine, the combination with a main frame, of a supplemental frame pivoted therto, a brake sector connected to move with said supplemental frame, a brake shoe applied to said brake sector, a stop on said brake sector engaged by said brake shoe to limit the movement of said supplemental frame in one direction, a spring between said main frame and said supplemental frame tending to move the latter to its limiting position, kerf cutting mechanism mounted on said supplemental frame, and means for operating said kerf cutting mechanism including rectilinear feed thereof in its own plane by rectilinear movement along said supplemental frame.

54. In a mining machine, the combination with a main frame, of a supplemental frame pivoted thereto for bodily movement relatively to said main frame, kerf cutting mechanism mounted on said supplemental frame and having an initial position extending longitudinally of said main frame, means for operating said kerf cutting mechanism, means for effecting movement of said kerf cutting mechanism away from its initial position and transversely of its plane, means between said main and supplemental frames for effecting the restoration of said kerf cutting mechanism to initial position, and brake mechanism associated with said supplemental frame for controlling such restoration.

55. In a mining machine, the combination with a supporting frame, of a rotatable frame mounted on said supporting frame, cutting mechanism and operating means therefor, a supplemental frame carrying said cutting mechanism and operating means and pivotally connected to the said rotatable frame, means for rotating said rotatable frame together with said cutting mechanism and operating means, and a spring connected between said rotatable frame and said supplemental frame for moving said cutting mechanism to its initial cutting position for all rotatable positions of said rotatable frame.

56. In a mining machine, the combination with a main frame, of a supplemental frame rotatably mounted on said main frame, a chain cutter for producing a plane kerf in a mine wall, said chain cutter being mounted on said supplemental frame distant from the axis of rotation in position to cut a kerf at the base of the mine wall, and means for feeding said chain cutter relatively to said main frame in directions parallel to said axis of rotation and rectilinearly.

57. In a mining machine, the combination with a main frame, of a supplemental frame, means for supporting said supplemental frame on said main frame for rotation relatively to the latter on a horizontal central axis on said main frame, a chain kerf-cutter mounted in position to cut a plane kerf, and self-acting power-operated means for feeding said kerf-cutter rectilinearly and relatively to said main frame for producing a plane kerf parallel to said horizontal axis irrespective of the position of said supplemental frame relative to said main frame and while said main frame remains stationary.

58. In a mining machine, the combination with a main frame having a cylindrical bearing, of a supplemental frame comprising a cylinder fitting said cylindrical bearing, plane kerf cutting mechanism connected to the periphery of said supplemental frame distant from the axis of rotation of said cylinder, and bodily movable therewith in various peripheral positions at the floor, roof and walls of a mine chamber, and means for operating said cutting mechanism including the feeding thereof in directions parallel to the axis of rotation of said supplemental frame and for all such peripheral positions of said cutting mechanism.

59. In a mining machine, the combination with a receiving chute, of devices at the sides of said chute permitting free movement of the blocks of material in said chute in delivery direction but gripping such material when the latter tends to move in the opposite direction, and means for ef-

fecting the delivery of blocks of material into said chute.

60. In a mining machine, the combination with a receiving chute, of means outside of said chute for pushing blocks of material into the receiving end of said chute, and gripping devices connected to said pushing means and extending along said chute in position to engage and move previously loaded blocks along said chute.

61. In a mining machine, the combination of a curved receiving chute, means for delivering blocks of material into said chute, and spring-pressed pawls for gripping blocks of material in said chute and preventing reverse movement thereof.

62. In a mining machine, the combination with a main frame, of a supplemental frame pivoted thereto and adapted to engage the lower end of a solid block of material, a chute mounted on said main frame in a position separated from said supplemental frame but having a receiving opening facing said supplemental frame, and means for moving said supplemental frame toward the receiving opening of said chute to force said block of material into said chute while maintaining said block intact.

63. In a mining machine, the combination with a main frame, of a supplemental frame movable relatively thereto and adapted to engage the lower end of a large arcuate shaped block of material, of a curved chute in arcuate alinement with said block of material, and means for moving said supplemental frame in an arc to cause said block of material to enter the receiving end of said chute.

64. In a mining machine, the combination with a main frame of a supplemental frame movable relatively thereto and adapted to engage the lower end of a block of material, a chute separate from said supplemental frame and mounted with its receiving end approximately midway between the floor and roof of a mine chamber, means for moving said supplemental frame to force said block of material into the receiving end of said chute, and means for adjusting the position of said supplemental frame in an arc to enable blocks of material to be moved into said chute from various elevations.

65. In a mining machine, the combination with a main frame, of a supplemental frame rotatably mounted on said main frame on an axis extending in a general horizontal direction, and a curved receiving chute on said supplemental frame and movable bodily therewith about said axis, the latter being longitudinal relatively to said chute.

66. In a mining machine, the combination with a main frame having a large cylindrical bearing, of a supplemental frame fitting in said bearing, means for rotating said supplemental frame, and a receiving chute having a receiving opening and passageway of less cross-sectional area than the delivery opening thereof adjacent said large cylindrical bearing, said receiving chute being mounted on said supplemental frame and rotatable bodily with the latter.

67. In a mining machine, the combination with a main frame, of a supplemental frame and a tubular chute having a much larger delivery opening than receiving opening, and mounted on said supplemental frame for bodily rotation therewith.

68. In a mining machine, the combination with a main supporting frame, of a tubular chute mounted thereon for rotary adjustment on a horizontal axis, and means for delivering material into one end of said chute and moving such material along said chute while the latter remains stationary in its adjusted position.

69. In a mining machine, the combination with a frame, of a chute mounted thereon, means for adjusting the position of said chute adjacent the mine wall with its receiving end substantially above the base of the mine wall, and means for taking a large block of solid material from its position in the mine wall and delivering it intact directly therefrom into the elevated receiving end of said chute.

70. In a mining machine, the combination with a supporting frame, of an arcuate chute mounted thereon in stationary position for receiving large solid blocks of material directly from their positions in the mine wall, and means for delivering said blocks of material intact into said chute substantially above the base of the mine wall for movement along the latter over a direct path to the delivery end thereof while said chute remains stationary.

71. In a mining machine, the combination with a supporting frame, of an arcuate chute mounted thereon for rotary movement, and means for adjusting said chute over a path of travel extending transversely of said chute and approximating a path extending along a spheroid of revolution.

72. In a mining machine, the combination with a supporting frame, of a curved tubular chute extending from a receiving opening adjacent an upright mine wall along a curved path directly from and toward a longitudinal generally horizontal axis extending transversely of the mine wall, and means for adjusting the position of said tubular chute on such axis through a range of 360° in position to receive material from the mine wall.

73. In a mining machine, the combination with a main frame, of a supplemental frame rotatively mounted on said main frame, a chute on said supplemental frame offset from the center of rotation thereof and extending directly from the receiving end at

a mine wall to the delivery end, means for rotating said supplemental frame on an axis extending in a general horizontal direction to vary the position of said chute, and means for effecting the delivery of material to said chute and movement thereof along said chute while the latter remains stationary in its adjusted position.

74. In a mining machine, the combination with a main frame having a cylindrical bearing, of a supplemental frame guided in said bearing and supported by said main frame on an axis extending in a general horizontal direction, an arcuate chute having a large delivery opening extending through said supplemental frame at said cylindrical bearing and having the forwardly extending portion of less cross-sectional area than that of the delivery portion, and means for rotating said supplemental frame together with said chute in said bearing on said main frame to adjust the position of the receiving end of said chute.

75. In a mining machine, the combination with a main frame having an open enlarged cylindrical bearing, of a cylindrical supplemental frame fitting in said bearing, a curved cross partition in said supplemental frame, and a curved tubular chute extending from said partition and from a peripheral portion of said supplemental frame forwardly to receiving position.

76. In a mining machine, the combination with a frame, of a chute mounted thereon, means for delivering material into the receiving end of said chute, and gripping devices connected to and moving with said delivering means freely in one direction but gripping the material to move the same toward the delivery end of said chute when additional material is being delivered into the receiving end of said chute.

77. In a mining machine, the combination with a supporting frame, of a chute mounted thereon in elevated position for receiving material directly from an upright mine wall substantially above the floor of the mine chamber, means for delivering material from the mine wall into the receiving end of said chute, and a yielding device permitting free movement of the solid material into said chute but holding the same from movement except toward the delivery end of said chute.

78. In a mining machine, a chute, a spring-pressed pawl having a forwardly inclined surface at the entry to said chute to permit free movement of the material into said chute but catching the same and preventing it from moving back out of said chute, and means for delivering material into the receiving end of said chute.

79. In a mining machine, the combination with an arcuate chute, of a yielding catch for preventing blocks of material from slipping back out of the receiving end of said chute, means for delivering blocks of material into the receiving end of said chute, and gripping devices connected to said delivery means to engage the lateral surfaces of the previously loaded blocks to move the same along the said chute toward the delivery opening therein when a block is being moved by said delivery means into the receiving end of said chute.

80. In a mining machine, the combination with a chute, of means for delivering material into said chute, devices guided along the interior walls of said chute to engage the lateral surfaces of blocks of material in said chute and assist said delivery means in moving said blocks toward the delivery opening, and means for effecting the operation of said engaging devices.

81. In a mining machine, the combination with a chute, of means for delivering material into said chute, a plurality of yielding gripping devices pivotally connected to said delivery means and movable therewith in position to grip the lateral surfaces of said material.

82. In a mining machine, the combination with an arcuate chute, of means for delivering blocks of material into the receiving end of said chute, arcuate members pivotally connected to said delivery means and movable therewith, a plurality of gripping devices extending diagonally in the direction of movement of the material in said chute, means for yieldingly holding said arcuate members and said gripping devices toward the lateral surfaces of said blocks of material, and arcuate guiding devices in said chute for said yielding means.

83. In a mining machine, the combination with an arcuate chute, of means for delivering blocks of material into the receiving end of said chute, a yielding catch with an inclined forward face connected to the receiving end of said chute and permitting free movement of blocks of material into said chute but preventing said blocks of material from moving back out of said chute, arcuate members each having a plurality of gripping devices for engaging the lateral surfaces of said blocks of material, said arcuate members being pivotally connected to said delivery means for arcuate movement therewith and lateral movement relatively to the path of travel of said blocks, means for yielding said gripping devices against said blocks, and arcuate guiding grooves on the interior walls of said chute for guiding the arcuate movement of said peripheral members.

84. In a mining machine, the combination with a main frame having a cylindrical bearing on a substantially horizontal axis, of a cylindrical supplemental frame fitting

in said bearing, an arcuate chute extending from a peripheral portion of said supplemetal frame forwardly therefrom toward receiving position and also through said supplemental frame to delivery position, means for delivering blocks of material into the receiving end of said chute, means for holding said blocks of material against backward movement out of the receiving end of said chute, and gripping devices connected to said delivery means and guided along the interior walls of said arcuate chute to assist the delivery means to move said blocks of material along said chute to delivery position.

85. In a mining machine, the combination with a main frame, of a supplemental frame movable relatively thereto and adapted to engage one end of a block of material, a chute, means comprising a latch for effecting hooking engagement with said supplemental frame, apparatus for moving said hooking means together with said supplemental frame to force said block of material into the receiving end of said chute, means for automatically releasing said latch upon the said block of material reaching a predetermined position, and a spring for automatically returning said supplemental frame to initial position after being released.

86. In a mining machine, the combination with a main frame, of a rotatable frame, a supplemental frame pivoted to said rotatable frame and adapted to engage one end of a block of material, a chute, means comprising a latch for hooking on to said supplemental frame and moving the same to cause said block of material to be delivered into the receiving end of said chute, automatic mechanism for releasing said latch to permit the return of said supplemental frame, and a spring for returning said supplemental frame to initial position irrespective of its position as determined by said rotatable frame.

87. In a mining machine, the combination with a main frame, of a supplemental frame movable relative thereto and adapted to engage one end of a block of material, a chute, and means for hooking on to said supplemental frame and move the same to cause said block of material to be delivered into said chute.

88. In a mining machine, the combination with a main frame, of a supplemental frame rotatably mounted on said main frame, a plane kerf cutter on said supplemental frame offset substantially half the height of said main frame from the center of rotation thereof on said main frame in position to cut plane kerfs at the floor, roof and spaced-apart side walls of the mine chamber, and means for operating said kerf cutter including the feed thereof in directions parallel to the axis of rotation of said supplemental frame irrespective of the rotary position thereof.

89. In a mining machine, the combination with a main frame, of a supplemental frame, a loop chain core cutter having an unobstructed core opening therethrough, means for adjusting the position of said supplemental frame on said main frame to adjust the position of said core cutter to cut either vertically or horizontally relatively to said main frame, and means for operating said core cutter including the feed thereof along an arcuate path.

90. In a mining machine, the combination with a main frame, of a supplemental frame, core-cutting mechanism mounted on said supplemental frame, means for adjusting the supplemental frame on said main frame together with said core-cutting mechanism on a longitudinal axis extending in a general horizontal direction to adjust the position of the latter to cut either horizontally or at an inclination from the horizontal, and means for operating said core-cutting mechanism including feed thereof over an arcuate path of travel.

91. In a mining machine, the combination with a main frame, of a supplemental frame, core cutting mechanism mounted on said supplemental frame, means for feeding said supplemental frame with said core-cutting mechanism downwardly and means for holding said core cutting mechanism in swinging adjustment relative to said supplemental frame.

92. In a mining machine, the combination with a frame, of core-cutting mechanism pivoted thereto on a longitudinal axis extending forwardly in a general horizontal direction for adjustment to cut either upwardly or downwardly relatively to said frame, means for holding said core-cutting mechanism in pivotal adjustment to said frame, and mechanism for operating said core-cutting mechanism including the feed thereof.

93. In a mining machine, the combination with a supporting frame, of core cutting mechanism pivoted thereto on a horizontal axis extending longitudinally, means for securing said core cutting mechanism to said frame in adjusted position, and means mounted on said frame for operating said core cutting mechanism in any of its adjustable positions relatively to said frame including feed in various directions approximately radial relatively to said axis.

94. In a mining machine, the combination with a main frame of a supplemental frame guided in an arc on said main frame toward the base of said frame and in the opposite direction away from the mine wall, kerf cutting mechanism mounted on said supplemental frame for an initial position at the face of the mine wall above the base there-

of, and means for moving said supplemental frame on said main frame over an arcuate path of travel to feed said cutting mechanism from such initial position thereof to the base of the mine wall.

95. In a mining machine, the combination with kerf cutting mechanism, of means for actuating the same, supporting frame-work, a supplemental frame for carrying both said cutting mechanism and its actuating means, means for guiding said supplemental frame arcuately on said supporting frame-work, and apparatus for bodily moving said supplemental frame and the kerf cutting mechanism and actuating means carried thereby, over an arcuate path of travel toward one of the limiting surfaces of a mine chamber from an initial position a substantial distance therefrom.

96. In a mining machine, the combination with supporting frame-work, of a supplemental frame guided along an arcuate path of travel on said supporting frame-work and spaced from the center of such arcuate path, loop chain core cutting mechanism having an unobstructed core opening therethrough and mounted on said supplemental frame to move bodily therewith over the arcuate path of travel of said supplemental frame, means for driving said loop chain core cutting mechanism such cutting mechanism being also spaced from the center of such arcuate path, said driving means being mounted on said supplemental frame to partake of the arcuate movement thereof relative to said supporting frame, and means for arcuately moving said supplemental frame to secure arcuate feeding travel of said cutting mechanism while the latter is being driven to effect the cutting of a core in a mine wall.

97. In a mining machine, the combination with a main frame, of a supplemental frame guided for arcuate movement on said main frame, a chute mounted on said main frame, means for engaging one end of a block of material, a device on said supplemental frame for connection with said engaging means, and mechanism for retracting said supplemental frame while said device is connected with said engaging means to effect the movement of said block of material in alinement with said chute and into the same toward loading position.

98. In a mining machine, the combination with a main frame, of a supplemental frame, a chute on said main frame, means for engaging one end of a block of material remote from the receiving end of said chute, a hook carried by said supplemental frame in position for connection with said engaging means when said supplemental frame is moved to said engaging means, and means for retracting said supplemental frame while said hook is connected with said engaging means to cause the latter to move the block of material into the receiving end of said chute and along the latter toward loading position.

99. In a mining machine, the combination with supporting frame-work, of a curved chute mounted thereon, a supplemental frame guided along an arcuate path of travel on said supporting frame-work, a hook carried by said supplemental frame, a device for engaging one end of a block of material remote from the receiving end of said chute, and means for operating said supplemental frame to cause said hook to be automatically connected to said engaging device and move said block of material over an arcuate path into said chute and along the latter toward loading position.

100. In a mining machine, the combination with a main frame, of a pivotal support for said main frame, loop chain core cutting mechanism having an unobstructed core opening therethrough, a supplemental frame mounted on said main frame and carrying said cutting mechanism, means for operating said cutting mechanism including means for feeding said supplemental frame in an arc on said main frame, and means for rotating said main frame to position said cutting mechanism to cut cores in arcs and in radial planes from the center of the mine chamber in any direction toward the roof, floor or side walls of said chamber.

101. In a mining machine, the combination with core cutting mechanism having an unobstructed core opening therethrough, of means for operating said core cutting mechanism including feed thereof from substantially the center of the mine chamber toward the roof, floor or side walls approximately radially and in arcs to cut cores extending from the roof, floor or side walls toward such center, and means for adjusting the position of said core cutting mechanism on a general horizontal axis to effect cutting of cores in any such directions.

102. In a mining machine, the combination with a frame, of a receiving chute disposed on an arc and extending substantially from the forward to the rear end of said frame, core cutting mechanism operable adjacent the forward end of said chute and bodily movable in an arc the center of which is coincident with the center of the arc of said chute, means for operating said core cutting mechanism to cut a core on its forward stroke in the mass of material being mined beginning such stroke a substantial distance above the base of the mine wall, and means for delivering the dislodged core into said chute.

103. In a mining machine, the combination with a rotatable receiving structure, of a frame for supporting said receiving structure for rotation relative to said frame on a

longitudinal horizontal axis, cutting mechanism embodying means for cutting a plurality of intersecting kerfs to form a block of material from the mass being mined and in alinement with said receiving structure, and means for delivering said block of material to said receiving structure in its various adjusted positions.

104. In a mining machine, the combination with a main frame, of a supplemental frame rotatably mounted on said main frame, plane kerf cutting mechanism mounted on said supplemental frame and spaced from the axis of rotation thereof, means for operating said plane kerf cutting mechanism including the feed thereof relatively to said main frame in a direction substantially parallel to said axis of rotation, and means for swinging said kerf cutting mechanism bodily and transversely to its plane toward said axis.

105. In a mining machine, the combination with a main frame, of a supplemental frame rotatably mounted on said main frame, plane kerf cutting mechanism for producing a plane kerf in a mine wall spaced from the axis of rotation of said supplemental frame, means for operating said plane kerf cutting mechanism relatively to said main frame in directions parallel to said axis of rotation, and means for swinging said plane kerf cutting mechanism from its cutting position toward said axis of rotation.

106. In a mining machine, the combination with supporting frame-work, of a supplemental frame rotatably mounted on said frame-work on a substantially horizontal axis, said supplemental frame extending forwardly in a general horizontal direction, a chute on said supplemental frame having opposite receiving surfaces adapted to be located adjacent the upright face of a mine wall approximately midway between the floor and roof thereof, and means for rotating said supplemental frame on said horizontal axis to vary the position of said chute to receive material directly from the mine wall above its receiving end on one side of said surfaces or to receive material below said receiving end onto the opposite surface in said chute.

107. In a mining machine, the combination with a main frame, of a supplemental frame rotatably mounted on said main frame on a general horizontal axis, a tubular chute extending from said supplemental frame in a general horizontal direction toward the upright face of the mine wall, said tubular chute being mounted on said supplemental frame in position offset from the said axis of rotation but having a receiving end at or near such axis of rotation, and means for rotarily adjusting the position of said supplemental frame to dispose the receiving end of said chute at an intermediate position at a mine wall intermediate the floor and roof thereof for receiving material from the upright mine wall in any direction extending toward the floor, roof or side walls of the mine chamber.

108. In a mining machine, the combination with a main frame, of a supplemental frame, core cutting mechanism mounted on said supplemental frame, means for operating said core cutting mechanism including the feed thereof to cut an upright core in a mine wall, and means for adjusting the position of said supplemental frame on said main frame for the cutting of the core either vertically or at an inclination from such vertical position.

109. In a mining machine, the combination with a supporting frame, of core cutting mechanism mounted thereon for adjustment to positions for the cutting of cores extending from the floor, roof or a side wall of a mine chamber toward the center thereof, means for operating said core cutting mechanism to effect the cutting of such cores, and means in position on said supporting frame for removing the cut material.

110. In a mining machine, the combination with a main frame, of a supplemental frame mounted for adjustment in an arc on said main frame on a general horizontal axis, core cutting mechanism carried by said supplemental frame and movable therewith in an arc to positions for cutting cores in radial planes as to such axis, and means for operating said core cutting mechanism including the feed thereof in any of such adjusted positions.

111. In a mining machine, the combination of an elevated arcuate chute mounted in position for receiving blocks of material directly from their positions in the mine wall, and means for cutting an arcuate core of material in the mine wall in arcuate alinement with said chute.

112. In a mining machine, the combination with a receiving chute, of kerf cutting mechanism at the open receiving end of said chute, a main frame for supporting said chute, a supplemental frame, means for feeding said supplemental frame along said main frame, an auxiliary frame carrying a curved path on said kerf cutting mechanism and mounted on said supplemental frame, means for adjusting the position of said auxiliary frame relatively to said supplemental frame to effect an adjustment of said kerf cutting mechanism in substantial alinement with said chute, and means mounted on said supplemental frame and said auxiliary frame for operating said kerf cutting mechanism.

113. In a mining machine, the combination with a receiving chute, of kerf cut-

ting mechanism adjacent the open end of said chute, a main frame for carrying said chute, a supplemental frame, means for feeding said supplemental frame along an arcuate path on said main frame, an auxiliary frame for carrying said kerf cutting mechanism, said kerf cutting mechanism being rotarily adjustable on said supplemental frame, means for holding said kerf cutting mechanism in adjusted position on said supplemental frame, and means mounted on said supplemental and auxiliary frames for operating said kerf cutting mechanism.

114. In a mining machine, the combination with a main frame, of a single plane kerf-cutter, a supplemental frame for carrying said single plane kerf-cutter spaced from the longitudinal horizontal axis of said main and supplemental frames in position to cut kerfs both at the floor and at the roof as well as in upright spaced-apart positions, means for adjusting said supplemental frame about such longitudinal axis to place said kerf-cutter in angular positions relative to the material to be cut but in planes substantially at right angles to the upright mine wall either at the floor of the mine chamber or at the roof thereof or in upright positions spaced apart from each other, and means for effecting rectilinear feed of said single kerf-cutter in any of the planes in which it is positioned including the floor plane, and in directions parallel to said axis by moving said kerf-cutter relatively to said main and supplemental frames and while said frames remain stationary.

115. In a mining machine, the combination with a main frame, of a plane kerf-cutter, a supplemental frame for supporting said kerf-cutter spaced from the longitudinal axis of said supplemental frame in position to cut a plane kerf at the base of the mine wall, means for rotating said supplemental frame to adjust the position of said plane kerf-cutter to cut at the base of the mine wall and in various other positions in planes intersecting the plane of the floor of the mine chamber, and means for operating said plane kerf-cutter including feed thereof relatively to said frames while the latter remain stationary and in planes parallel to said longitudinal axis and at right angles to the mine wall but otherwise at any angle relative thereto.

116. In a mining machine, the combination with a supporting frame, of core cutting mechanism having a unobstructed core opening therethrough, means for supporting said core cutting mechanism on said framework for bodily movement along an arcuate path of travel, means for driving said core cutting mechanism, and mechanism between said frame-work and said core cutting mechanism for feeding the latter and its driving means in its entirety and bodily along such arcuate path of travel.

117. In a mining machine, the combination with supporting framework, of an arcuate guideway thereon, an arcuate rack, a supplemental frame supported entirely by said framework along said arcuate guideway, kerf-cutting mechanism mounted on said supplemental framework and movable bodily in an arc with said supplemental frame in position to cut an arcuate kerf in extended parallelism with said arcuate guideway, means for driving said cutting mechanism, said driving means being mounted on said supplemental frame and having all of its parts movable in an arc along said arcuate guideway, and mechanism connected to said arcuate rack for moving said supplemental frame, said cutting mechanism and said driving means along said arcuate guideway to secure arcuate feed of said kerf-cutting mechanism to produce such kerfs.

118. In a mining machine, the combination with supporting framework comprising spaced-apart arcuate rails, of a supplemental frame comprising spaced-apart arcuate grooves fitting on said rails and slidable arcuately along the same, a pair of spaced-apart arcuate racks mounted on said supporting framework, kerf-cutting mechanism mounted on said supplemental frame and movable arcuately therewith in position to cut an arcuate kerf along extended lines in parallelism with said arcuate rack, means mounted on said supplemental frame for driving said kerf-cutting mechanism, and means mounted on said supplemental frame and connected to said racks for moving said supplemental frame along said rails to secure arcuate feed of said kerf-cutting mechanism while moving said driving means bodily with said supplemental frame.

119. In a mining machine, the combination with a supporting frame, of a second frame rotatably adjustable on said supporting frame on a substantially horizontal longitudinal axis transverse of the mine wall, a third frame, loop chain core-cutting mechanism having an unobstructed core-opening therethrough and carried by said third frame, means mounted on said third frame for driving said loop chain core-cutting mechanism, and means for moving said third frame arcuately from said axis to secure arcuate feed of said core-cutting mechanism in the various positions of said second frame in its adjustment on said supporting frame.

120. In a mining machine, the combination with a supporting frame, of a chute mounted on said frame and having a narrow receiving opening and an enlarged delivery opening, and mechanism for delivering material directly from an upright mine wall

into the receiving end of said chute and transferring such material to said delivery opening.

121. In a mining machine, the combination with a supporting frame, of a chute having an enlarged delivery opening approximately circular in cross-section, a cylindrical bearing adjacent the delivery end of said chute to permit rotary adjustment of said chute, and mechanism for delivering material into and along such chute to the enlarged delivery end thereof.

122. In a mining machine, the combination with a main frame having a cylindrical bearing, a supplemental frame having a cylinder fitting such bearing, an arcuate chute having one of its walls extending from a peripheral portion of the cylinder of said supplemental frame and an opposite wall extending from the diametrically opposite peripheral portion of said cylinder, said supplemental frame having an enlarged delivery opening for said chute, and mechanism for delivering material into the receiving end of said chute for passage along the same to said delivery opening for the various positions of said chute as adjusted on the horizontal axis of said supplemental frame in the cylindrical bearing of said main frame.

123. In a mining machine, the combination with plane kerf-cutting mechanism, of a main supporting frame having a free and unobstructed space at the forward portion thereof for feeding movement of said kerf-cutting mechanism relatively to said supporting frame, a supplemental frame mounted for rotary movement on said frame on a longitudinal horizontal axis, means for supporting said kerf-cutting mechanism on said supplemental frame for operation at the floor of a mine chamber and in spaced-apart upright positions as well as upper horizontal positions to produce kerfs in planes substantially perpendicular to the upright mine wall and parallel to such longitudinal axis, and means for operating said plane kerf-cutting mechanism including the feed thereof relatively to said frames and in such planes.

124. In a mining machine, the combination with a main frame, of a supplemental frame pivoted thereto on a transverse axis, a plane kerf cutter, driving means therefor, means for feeding said kerf cutter along said supplemental frame to effect the cutting of a plane kerf spaced from a parallel plane extending through said transverse axis, and means for holding said supplemental frame in adjusted angular position on said transverse axis and relatively to said main frame to permit the cutting of kerfs substantially at right angles to the mine wall or in various other angular positions in accordance with the adjustment of said supplemental frame on said transverse axis.

125. In a mining machine, the combination with supporting framework, of a supplemental frame pivoted thereto on a transverse axis, plane kerf-cutting mechanism mounted on said supplemental frame and tiltable with the latter on said transverse axis to various angular adjusting positions, and means for operating said kerf-cutting mechanism including rectilinear feed thereof in the plane of the kerf-cutting mechanism in such various adjusted positions to cut kerfs intersecting the arcuate path of adjusting travel of said kerf-cutting mechanism on said transverse axis of the pivotal connection between said supplemental frame and said supporting framework.

126. In a mining machine, the combination with a main frame, of a supplemental frame pivoted thereto, an arcuate chute having its center of curvature substantially at said pivoted connection between said main and supplemental frames, plane kerf cutting mechanism mounted on said supplemental frame, means for operating said kerf cutting mechanism, and means for moving said kerf cutting mechanism transversely of its plane along an arc on said pivoted connection to transfer a block of material into said arcuate chute.

127. In a mining machine, the combination with a supporting frame, of self-contained power-operated loop chain core-cutting mechanism mounted for bodily arcuate movement along said supporting frame, means for feeding said loop chain core-cutter arcuately along said supporting frame, and means mounted on said supporting frame for moving a core of material in its entirety back from the mine wall in a direction opposite to the direction of feeding travel of said self-contained power-operated loop chain core-cutter.

128. The combination with framework, of a kerf-cutting device mounted thereon, means for moving forwardly said kerf-cutting device on a horizontal axis and operating the same to produce a kerf in a mine wall, means for returning said kerf-cutting device to initial position, and automatic gripping means co-acting with said returning means to move back from the mine wall the material dislodged.

129. In a mining and loading machine, the combination with a supporting frame comprising a chute open at its forward end, of a reciprocable carrier movable back and forth from a position at the forward portion of said chute, self-contained power-operated core-cutting mechanism mounted on said supporting frame for feeding movement relatively thereto, and means for op-

erating said carrier for receiving the dislodged material directly from its position in the mine wall and transferring such material into the forward open end of said chute.

130. In a mining and loading machine, the combination with a frame having an arcuate chute open at its forward end and at its rear end, of a self-contained power-operated core-cutter mounted on said frame for feeding movement arcuately along said chute to cut a core in arcuate alinement with the forward open end of said chute, and reciprocable mechanism mounted on said frame in position to transfer material along said chute toward loading position.

131. In a mining machine, the combination with a supporting frame, of self-contained power-operated core-cutting mechanism mounted thereon for bodily arcuate feeding movement relatively thereto, an ejector pivoted at the center of arcuate movement of said core-cutting mechanism, and means for operating said ejector to move the cut material from the position assumed thereby immediately after being entirely cut from the mine wall.

132. In a mining machine, the combination with a supporting frame, of self-acting power-operated cutting mechanism mounted thereon for bodily arcuate feeding movement relatively thereto, and an ejector mounted on said frame for movement relatively thereto on the center coinciding with the center of arcuate movement of said core-cutting mechanism to cause said ejector to have a path of movement substantially parallel to the path of movement of said core-cutting mechanism in position to act on the cut material to move the same from its position at the mine wall.

133. In a mining machine, the combination with a supporting frame, of loop chain core-cutting mechanism having an unobstructed core-opening therethrough, self-contained power-operated mechanism for operating said loop chain core-cutting mechanism and movable bodily therewith along arcuate lines relatively to said supporting frame, an ejector pivoted on said frame at the center of arcuate movement of said core-cutting mechanism for movement relatively to said frame in position to act on the core material to move the same from the mine wall, and means for operating said ejector by moving the same relatively to said supporting frame against the core of material to move the latter from its position at the mine wall relatively to said supporting frame.

134. In a mining and loading machine, the combination with a supporting frame, of core cutting mechanism having an unobstructed core-opening therethrough and mounted on said supporting frame for feeding movement relatively thereto, a flat device connected to said frame and adapted to occupy a stationary position during the operation of said core-cutting mechanism, and means for actuating said flat device to push the dislodged material toward loading position.

135. In a mining machine, the combination with means for cutting a core of mineral from the mine vein by cutting spaced-apart kerfs and a kerf at the back of the core, a plane device adapted to occupy a position under the core and in engagement therewith, and means for operating said plane device to lift the severed core from its native position to a position for transfer back from the mine wall in a general horizontal direction.

136. In a mining machine, the combination with core-cutting mechanism, of means for operating said core-cutting mechanism to cut a core of coal from a mine vein toward the plane of cleavage with foreign material, mechanism adapted to extend along a plane parallel to such plane of cleavage in position to engage the dislodged end of the core, and means for operating said mechanism to move the core from its native position toward loading position.

137. In a mining and loading machine, the combination with core-cutting mechanism having an unobstructed core-opening therethrough, of conveying mechanism, plane lifting mechanism adapted to enter a kerf below the lower end of the core, and means for operating said plane lifting mechanism to move the core from the position originally occupied thereby in its native bed and discharging said core in large blocks into said conveying mechanism.

138. In a mining machine, the combination with a supporting frame, of a chute in position on said frame to receive a solid block of material directly from its position in the mine wall, and cutting mechanism mounted on said frame in position for cutting a core of material in the mine wall spaced from the open receiving end of said chute but in alinement with said chute and directly in front of such receiving end of said chute.

139. In a mining machine, the combination with a supporting frame, of a receiving structure mounted thereon, core-cutting mechanism mounted at one end of said receiving structure in position to cut a core beginning substantially above the base of the mine wall, means for guiding said core-cutting mechanism along a path of travel enclosing a space in alinement with said chute, and means for operating said core-cutting mechanism including the feed thereof along such path of travel to cut a core of material in one feeding operation in a mine wall in alinement with said chute.

140. In a mining machine, the combination with a supporting frame, of a receiving structure mounted thereon, core-cutting mechanism, means for guiding said core-cutting mechanism back and forth in approximate alinement with said receiving structure, means for operating said core-cutting mechanism to cut in one operation a core of material in a mine wall in alinement with said chute and beginning substantially above the base of the mine wall, and means for bodily moving said core-cutting mechanism relatively to said receiving structure in a direction opposite to the feeding direction.

141. In a mining machine, the combination with a main frame, of a supplemental frame mounted on said main frame for arcuate feed thereon while deriving its sole support from said main frame while all its parts are moved along arcuate paths of travel spaced from the center of curvature of such paths of travel, kerf-cutting mechanism comprising a traveling chain cutter and mounted for rotary adjustment on said supplemental frame, means for holding said kerf-cutting mechanism in adjusted position on said supplemental frame, and means for operating said cutting mechanism, including the feed of said supplemental frame along such arcuate path of travel while separated entirely from the center of curvature of such path of travel, to cut a plane kerf in a mine wall.

142. In a mining machine, the combination with a chute, of a frame supported entirely by said chute and movable relatively thereto, means for reciprocating said frame along said chute, cutting mechanism supported by said frame in position to cut a body of material in alinement with said chute, and means for operating said cutting mechanism including the feed thereof by movement of said frame along said chute while said frame and said cutting mechanism are supported wholly by said chute.

143. In a mining machine, the combination with an arcuate chute, of a main frame for supporting said chute, a supplemental frame supported entirely by said chute and movable arcuately along the same, cutting mechanism supported by said supplemental frame in position to cut a body of material in alinement with said chute, and means for operating said cutting mechanism including arcuate feed thereof by arcuate movement of said supplemental frame along said chute while said supplemental frame and said cutting mechanism are supported wholly by said chute.

144. In a mining machine, the combination of an arcuate chute mounted in position for receiving blocks of material directly from their positions in the mine wall, and means for cutting an arcuate core of material in the mine wall in arcuate alinement with said chute beginning the core cut substantially above the base of the mine wall.

145. In a mining machine, the combination with a receiving chute, of kerf-cutting mechanism at the open receiving end of said chute, a main frame for supporting said chute, a supplemental frame, means for feeding said supplemental frame along said main frame, an auxiliary frame carrying said kerf-cutting mechanism and mounted on said supplemental frame, means for adjusting the position of said auxiliary frame relatively to said supplemental frame to effect an adjustment of said kerf-cutting mechanism in substantial alinement with said chute, and means mounted on said supplemental frame and said auxiliary frame for operating said kerf-cutting mechanism.

146. In a mining machine, the combination with a receiving chute, of kerf-cutting mechanism adjacent the open end of said chute, a main frame for carrying said chute, a supplemental frame, means for feeding said supplemental frame along said main frame, an auxiliary frame for carrying said kerf-cutting mechanism, said kerf-cutting mechanism being rotarily adjustable on said supplemental frame, means for holding said kerf-cutting mechanism in adjusted position on said supplemental frame, and means mounted on said supplemental and auxiliary frames for operating said kerf-cutting mechanism.

147. In a mining machine the combination with a main frame, of a supplemental frame mounted for arcuate feeding movement on said main frame, elongated chain cutting mechanism mounted on said supplemental frame and extending approximately radially relatively to the center of the arcuate feeding movement of said supplemental frame, means for operating said cutting mechanism including arcuate feeding movement thereof on said main frame along an arcuate path of travel transversely of itself to cut a plane kerf in a mine wall, and means for adjusting the inclination of said chain kerf-cutting mechanism relatively to said supplemental frame to vary the angle of operation of said cutting mechanism.

148. In a mining machine, the combination with an elongated endless chain cutter comprising an elongated cutter bar, of a main supporting frame, of a supplemental frame supported wholly by said main frame for an arcuate path of travel along said main frame spaced from the center of curvature and disconnected therefrom, means for supporting said chain cutter on

said supplemental frame for arcuate adjustment relatively to said supplemental frame, means for operating said chain cutter comprising a sprocket wheel on the axis of adjustment of said cutter relatively to said supplemental frame, and means for holding said chain cutter in adjusted position without interfering with said operating means.

149. In a mining machine, a loop-shaped core-cutter, means for feeding said cutter in different directions either toward the roof or toward the floor or toward either side wall of the mine chamber, means carried by said cutter, and operable for severing material in either direction of movement of said cutter, and means for adjusting said cutter as a whole into different cutting positions.

150. In a mining machine, a cutter-head, a loop core-cutter carried on said cutter-head, means for adjusting said cutter-head together with the entire core-cutter to different cutting positions, means for moving said cutter in opposite directions, and mechanism carried by said cutter for severing material during movement of said cutter in either of said opposite directions.

151. In a mining machine, the combination with supporting framework, of a loop chain core-cutter having an unobstructed core-opening extending therethrough, means for supporting said core-cutter on said framework in position to cut a core toward the plane of cleavage between the mine vein and foreign material where the travel of the core-cutting chain will be in a plane approximately parallel to such plane of cleavage, and means for operating said core-cutter including feed thereof toward such plane of cleavage to cut a core adapted to be dislodged approximately at such plane of cleavage.

152. In a mining machine, the combination with a supporting frame, of a loop chain core-cutter, a cutter frame having an unobstructed core-opening therethrough for supporting and guiding said loop chain core-cutter and of such narrow dimensions as to enter the kerf produced by said chain cutter, means for driving said chain cutter relatively to said cutter frame, and self-contained power-operated mechanism for slowly feeding said chain cutter forward along said supporting frame while the latter remains stationary to cut a core in the mine wall in front of said supporting frame.

153. In a mining and loading machine the combination with a supporting frame having a chute mounted thereon, of core-cutting mechanism mounted at the forward portion of said frame for operating in advance thereof and in advance of said chute to cut a core to a position where the cutting path is in a plane approximately parallel to the length of the machine, and mechanism adapted to receive the cut material and transfer it along the chute to the rear portion thereof.

154. In a mining machine, the combination with a supporting frame, of an arcuate guideway thereon, self-contained power-operated core-cutting mechanism mounted on said supporting frame for arcuate feeding movement along said arcuate guideway, and means for moving said core-cutting mechanism along said arcuate guideway to effect arcuate feeding movement of said core-cutting mechanism while said supporting frame remains stationary.

155. A mining machine comprising a supporting frame, core-cutting mechanism mounted thereon for feeding movement relatively thereto, means for operating said core-cutting mechanism while said supporting frame remains stationary, and elongated pawl mechanism extending rearwardly from said core-cutting mechanism in position to engage the cut material when said cutting mechanism moves or tends to move in reverse direction.

156. A mining machine comprising a supporting frame, a kerf cutter mounted thereon to have an arcuate path of travel from the longitudinal axis of the machine to a position in a plane approximately parallel to such axis, and means comprising a pawl mounted in position to be freely movable with said kerf cutter into the kerf produced thereby and operating to automatically grip the cut material when the kerf cutter is moved in reverse direction.

157. In a mining machine, the combination with core-cutting mechanism having an unobstructed core-opening therethrough, of means for supporting said core-cutting mechanism for arcuate feeding movement on an upright axis, means for operating said core-cutting mechanism to cut a core in a mine wall, and apparatus adapted to enter plane kerf in the mine wall and movable on an upright axis for engaging the severed material and moving it in a general horizontal direction from its severed position.

158. In a mining machine, the combination with core-cutting mechanism having an unobstructed core-opening therethrough, of means for supporting said core-cutting mechanism for arcuate feeding movement on an upright axis, means for operating said core-cutting mechanism to cut a core in a mine wall, and apparatus adapted to enter a kerf in the wall and movable on an upright axis for engaging the severed material and moving it in a general horizontal direction from its severed position.

159. In a mining machine, the combination with a frame having a platform, of a cutter mounted on said platform for arcuate movement about an upright axis, and means mov-

able into a plane kerf and in an arc about said axis of said cutter for moving the material severed by said cutter from the position it occupied in its native bed.

160. In a mining machine, the combination with a supporting frame, of cutting mechanism mounted on said frame for arcuate movement about an upright axis, means mounted on said frame for arcuate movement about an upright axis and in position for engaging cut material to move the same from its cut position in the mine wall, and a stop on said frame acting as an abutment for limiting the movement of said engaging means in one direction.

161. In a mining machine, the combination with a supporting frame having a platform in a position to receive dislodged material from an upright mine wall, of core-cutting mechanism having an unobstructed core-opening therethrough and mounted on said platform for arcuate movement relatively thereto about an upright axis, a contact member mounted for movement into a plane kerf and in an arc about said axis of said cutter, and means for operating said contact member to move the core of material from the position it occupied in its native bed onto said platform.

162. In a mining machine, the combination with a supporting frame, of a loop chain core-cutter mounted thereon for movement relatively thereto, of means for operating said loop chain core-cutter, a contact member movable relatively to said loop chain core-cutter and relatively to said frame in position to enter a kerf in the mine wall, means for moving said contact member to force the core of material away from its native position, and means for confining the bottom and opposite sides of said core to direct the core toward a predetermined position when moved by said contact member relatively to said frame.

163. A mining machine comprising supporting framework, means mounted on said framework for cutting a single core section in a mine vein, and means separate from said first-named cutting means but in position on said framework for transversely severing said section into separate parts.

164. A mining machine comprising supporting framework, of a loop core-cutter having an unobstructed core-opening therethrough and mounted on said framework in a position to cut a horizontal core of material in a mine vein, and additional cutting means mounted on said framework in position to cut an upright kerf to transversely sever the cut core into separate parts.

165. In a mining machine, the combination with a supporting frame, of core-cutting mechanism mounted thereon and having an unobstructed core-opening therethrough, and a plane kerf-cutter mounted on said frame in position to act on the core transversely to sever the core from the unmined mass.

166. In a mining machine, the combination with a supporting frame, of core-cutting mechanism mounted thereon and having an unobstructed core-opening therethrough, and a plane kerf-cutter mounted on said frame in position to extend across the path of feeding travel of said core-cutting mechanism to completely sever from the mine wall the core cut by said core-cutting mechanism.

167. In a mining machine, the combination with a supporting frame, of core-cutting mechanism having an unobstructed core-opening therethrough and pivotally mounted on said frame for swinging movement relatively thereto, means for operating said core-cutting mechanism to cut an arcuate core, and a plane kerf-cutter mounted on said frame and movable relatively thereto adjacent said core-cutting mechanism to cut the core transversely and sever the same completely from the unmined mass.

168. In a mining machine, the combination with cutting mechanism, of means for actuating said cutting mechanism, mechanism for slowly feeding said cutting mechanism forward and downwardly during its actuation from an intermediate position at the mine wall, a device for receiving the material cut from the mine wall by said cutting mechanism, and apparatus for effecting the quick return of said cutting mechanism to initial position and at the same time returning said receiving device to move the material thereon back from the mine wall.

169. In a mining machine, the combination with a supporting frame having a platform, of core-cutting mechanism mounted on said frame for arcuate feeding movement on an upright axis, means independently of said core-cutting mechanism, and mounted on said frame for transferring dislodged material away from its cut position over said platform toward the rear portion of said supporting frame, and means for preventing movement of the transferred material back toward the mine wall during movement of said transferring means back to receiving position.

170. In a mining and loading machine, the combination with a supporting frame movable in any direction at will from a given position in a mine chamber, of a mining machine comprising a kerf-cutting mechanism operable to sever material in advance of said supporting frame in any direction in which said supporting frame may be moved, said mining machine comprising means for operating said kerf-cutting mechanism including arcuate feed thereof

through any angle relatively to said supporting frame, and loading mechanism also carried by said supporting frame for movement independently of said kerf-cutting mechanism and in position for receiving the severed material directly from its original position in the mine wall and transferring such material toward loading position.

171. A mining and loading machine comprising a supporting frame, core-cutting mechanism mounted thereon, means for operating said core-cutting mechanism including arcuate feeding movement thereof relatively to said supporting frame, and a flat device mounted on said frame in position to extend under the core cut by said cutting mechanism to receive the core and move it from the mine wall.

172. In a mining machine, the combination with a supporting frame, of core-cutting mechanism mounted thereon and having an unobstructed core-opening therethrough for the passage of material cut thereby and mounted on said frame for feeding movement relatively thereto along arcuate lines from a position between the floor and roof of a mine chamber toward the base of a mine wall, and means for operating said core-cutting mechanism to cut a core extending from the upright face of the mine wall toward the base thereof.

173. The combination with supporting framework, of a loop chain core-cutter having an unobstructed core-opening therethrough and supported by said framework for arcuate movement into the upright face of the mine wall and toward the base thereof, and means for operating said loop chain core-cutter including the feed thereof to cut a downwardly extending core extending from the upright face of the mine wall toward the base thereof.

174. In a mining machine, the combination with a supporting frame, of a core-cutter mounted thereon for arcuate feeding movement relatively thereto in position to enter the upright face of the mine wall intermediate the floor and roof of a mine chamber, and means for operating said core-cutter to cut a core from the upright face of the mine wall beginning at a position intermediate the floor and roof of the mine chamber.

175. A mining machine comprising kerf-cutting mechanism, means for operating the same, and an elongated lever pivoted to said kerf-cutting mechanism and having a pawl for automatically engaging the cut material to remove the same from the mine wall upon reverse movement of said kerf-cutting mechanism.

176. A mining machine comprising a supporting frame, core-cutting mechanism having an unobstructed core-opening therethrough, means for operating said core-cutting mechanism, and spaced-apart means on opposite sides of said unobstructed core-opening in position to engage the cut material when said cutting mechanism moves or tends to move in reverse direction.

177. In a mining and loading machine, the combination with a supporting frame having a chute mounted thereon, of core-cutting mechanism, guideways on said frame in position to extend parallel to said chute, and means for operating said core-cutting mechanism including the feed thereof along said guideways to effect the cutting of a core in a mine wall in advance of said chute.

178. A machine of the class specified comprising a tubular receiver into which cut material is passed from a position substantially above the floor, the said receiver having an inlet opening at one end through which the cut material passes, and a movable cutter at the inlet opening and forming a part of said receiver through which the cut material also passes, the successive charges of material entering the receiver forcing out the preceding charges therefrom.

179. A machine of the class specified comprising a tubular receiver having an inlet at one end substantially above the level and a movable cutter at the inlet end thereof through which the cut material also passes into the receiver, the material being passed in charges into the cutter and receiver and the successive charges of material entering the receiver forcing out the preceding charges therefrom, and means for conveying the material away from the receiver.

180. A coal cutting machine compising an enclosing receiver having a cutting component movably associated therewith to cut coal in columns from the face of a vein and cause the coal as it is cut to be passed directly into and carried clear of the vein by the receiver and said component.

181. A coal cutting machine comprising a swinging enclosure having a conveying means movable therewith, and an open cutting component mounted directly on and movable around a portion of the enclosure for cutting coal or other material in columns directly from a vein, the cut columns of coal or other material being injected into and carried by the receiver during the cutting operation.

182. In a mining machine, the combination with core-cutting mechanism having an unobstructed core opening therethrough, of means for supporting said core-cutting mechanism for arcuate feeding movement on an upright axis, means for operating said core-cutting mechanism to cut a core in a mine wall, and apparatus movable on an upright axis independently of the feeding movement of said core-cutting mechanism

for engaging the severed material and moving it in a general horizontal direction from its severed position.

183. In a mining machine, the combination with a frame having a platform, of a cutter mounted on said platform for arcuate movement about an upright axis, and means movable in an arc independently of the movement of said cutter and about said axis of said cutter for moving the material severed by said cutter from the position it occupied in its native bed.

184. In a mining machine, the combination with a supporting frame comprising a platform, of core-cutting mechanism mounted on said frame for feeding movement in a general horizontal direction about an upright axis, means for operating said core-cutting mechanism to effect the dislodgment of a core of material from a mine wall, and core-removing mechanism rotatable about such upright axis in a general horizontal direction for forcing the material severed by said cutting mechanism from its position in its native bed onto said platform.

185. In a mining machine, the combination with a supporting frame, of cutting mechanism mounted on said frame for arcuate movement about an upright axis, means mounted on said frame for arcuate movement about an upright axis and in position for engaging cut material to move the same from its cut position in the mine wall, and a stop on said frame acting as an abutment for limiting the movement of said engaging means in one direction.

186. In a mining machine, the combination with a supporting frame, of cutting apparatus mounted thereon, a material-moving frame mounted on said supporting frame and confined to an arcuate path of movement in close proximity to the path of movement of said cutting apparatus, said material-moving frame extending radially from its axis of arcuate movement at all times, and means for operating said material-moving frame to move the cut material from the mine wall.

187. In a mining machine, the combination with a supporting frame having a platform in a position to receive dislodged material from an upright mine wall, of core-cutting mechanism having an unobstructed core-opening therethrough and mounted on said platform for arcuate movement relatively thereto about an upright axis, a contact member mounted for movement in an arc about said axis of said cutter, means for moving said contact member into a plane kerf and means for operating said contact member to move the core of material from the position it occupied in its native bed onto said platform.

188. In a mining machine, the combination with a supporting frame, of two relatively movable supplemental frames concentrically mounted on said supporting frame, severing mechanism carried by one of said supplemental frames, material moving means adapted to enter a plane kerf in the mine wall and carried by the other of said supplemental frames, and means within the confine of said supplemental frames for operating both the material moving means and the severing mechanism.

189. In a mining and loading machine, the combination with a supporting frame, of dislodging mechanism mounted thereon, a tubular chute at the rear portion of said frame, means for transferring dislodged material from the mine wall to said chute, and an automatic device connected to said frame at a position having a fixed relation thereto to confine said device for back and forth movements over substantially the same path of travel relatively to said frame for permitting free movement of the dislodged material toward said chute but preventing movement of the material from said chute back toward the mine wall.

190. In a mining machine, the combination with a supporting frame, of a core-cutting mechanism having an unobstructed core opening therethrough and mounted on said frame for arcuate feeding movement on an upright axis, an arcuate tubular chute on said supporting frame, means for transferring dislodged material from its cut position toward said chute, and mechanism for preventing movement of the dislodged material from said chute back toward the mine wall.

191. In a mining machine, the combination with a supporting frame, of core-cutting mechanism mounted thereon for arcuate feeding movement on an upright axis, a tubular chute extending to the rear portion of said frame, means for transferring dislodged material from the mine wall to said chute, and an automatic device for permitting free movement of the dislodged material toward said chute but preventing movement of the material from said chute back toward the mine wall.

192. In a mining machine, the combination with a plane kerf-cutter comprising a flat cutter frame and an endless cutter chain adapted to travel thereon, of a supporting frame, means for supporting said kerf-cutter on said frame for bodily arcuate adjustment relatively thereto on a longitudinal horizontal axis parallel to the length of the machine and perpendicular to an upright mine wall in advance of the machine and for also supporting said kerf-cutter for rectilinear feeding movement relatively to said support and in position to cut a kerf in a direction parallel to such

longitudinal horizontal axis and spaced therefrom to cut such a kerf either at the base of the mine wall or in an upright plane in advance of one side of the machine, and means for operating said kerf-cutter including rectilinear feed thereof relatively to said frame while the latter remains stationary to cut such kerfs in directions parallel to such axis and in planes parallel thereto.

193. In a mining machine, the combination with a receiver having a curved upright wall at its forward or outer end, and means for cutting in the mine wall a curved column of material having its center of curvature coincident with the center of curvature of said curved receiver wall.

194. In a mining machine, the combination with a curved receiver having a curved upright wall at its forward or outer end, of an endless core cutter having an unobstructed core opening therethrough for the passage of an arcuate core directly from the mine vein into said receiver, and means for supporting said core cutter to cut an upright kerf in arcuate alinement with such upright receiver wall and spaced back from the face of the mine wall, and to cut also spaced-apart kerfs connecting the upright kerf.

195. A coal cutting machine comprising an enclosing receiver, a core cutter having an unobstructed core opening therethrough and associated with said reeciver for registry with the inlet opening thereof, and means for operating said core cutter to cut a core or column of coal for passage directly from the coal vein into said receiver to be carried by the latter clear of the vein and said core cutter.

196. In a mining machine, the combination with a frame, of a chute mounted thereon, means for adjusting the position of said chute adjacent the mine wall, and means comprising an endless cutter with an unobstructed core opening extending therethrough for effecting the delivery of material from its position in the mine wall directly into said chute.

197. In a mining and loading machine, the combination with a supporting frame, of a curved open-ended receiver adapted to be located adjacent the mine wall in position to receive material dislodged therefrom, an endless cutter having a free and unobstructed core opening therethrough for the passage of material directly from the mine wall into said receiver, means mounted on said frame for driving said endless cutter, and means for feeding said cutter along a curved path having a center coincident with the center of curvature of the outer forward upright wall of said receiver.

198. In a mining and loading machine, the combination with a supporting frame, of an arcuate receiver adjustably mounted thereon, an endless core cutter, means for mounting said core cutter for an arcuate path of travel to cut an arcuate core for passage through said core cutter into said receiver directly from the face of the mine vein, said receiver having an inner wall at its outer end conforming in curvature to the arcuate path of travel of said core cutter, and means for operating said core cutter including feed thereof along such arcuate path of travel to cut a core in position to extend into said receiver directly from the mine vein.

199. In a mining machine, the combination with a receiver having an inlet opening formed by a bottom, spaced-apart upright walls and an upper connecting portion, of a core cutter associated with said inlet opening for the passage of cut material directly from the mine vein through said core cutter and into said inlet opening, means for supporting said core cutter for an arcuate path of cutting travel, the outer forward upright wall of said receiver being in arcuate alinement with said arcuate path of travel, and means for operating said core cutter including bodily arcuate feed thereof.

200. A mining machine comprising supporting framework, a loop chain core cutter having an unobstructed core opening therethrough and mounted on said framework in position for feeding movement relatively thereto, means for operating said core cutter including such feeding movement, and additional cutting means mounted on said framework in position to cut a kerf to sever the core from the unmined mass.

201. In a mining machine, the combination with a supporting frame mounted thereon in position for cutting a core section in a mine vein, a plane kerf cutter for cutting a kerf to separate the core section from the unmined mass, and means mounted on said frame for moving the separated core section toward loading position.

202. In a mining machine, the combination with a supporting frame, of means mounted thereon in position to cut a core section in a mine vein adjacent said frame with one end of said core section integral with the unmined mass, means mounted on said frame in position to act transversely of said core section adjacent such integral end thereof, and means mounted on said frame in position to take the severed core section from the position assumed thereby after being completely cut out from the mine vein and moving such severed section toward loading position.

203. A mining machine comprising supporting framework, core-cutting mechanism mounted thereon for actuate feeding move-

ment relatively thereto, said core-cutting mechanism having an unobstructed core-opening therethrough, means for operating said core-cutting mechanism including arcuate feeding movement thereof relatively to said supporting framework, and additional cutting mechanism for cutting a kerf to sever the cut core from the unmined mass.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this third day of July, A. D. 1914.

EDMUND C. MORGAN.

Witnesses:

CHARLES H. SEEM,

EDGAR FRANCIS BEAUBIEN.