June 26, 1923. 1,460,076

C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 1

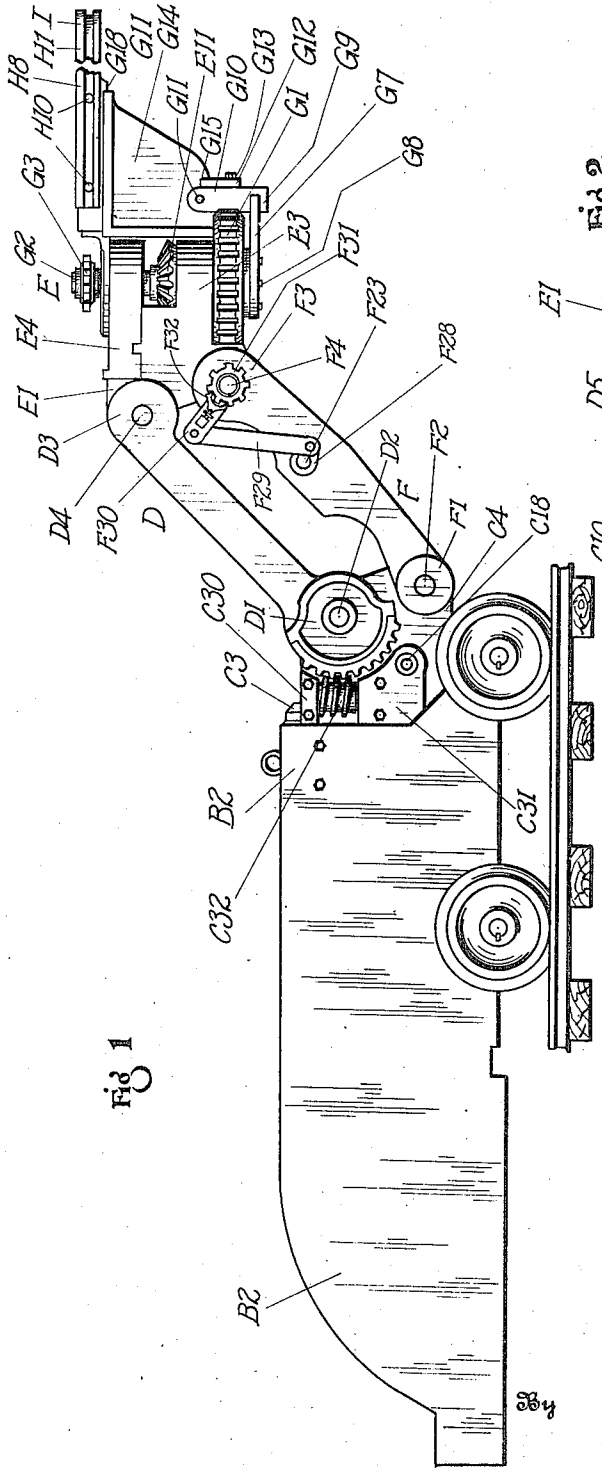


Fig 1

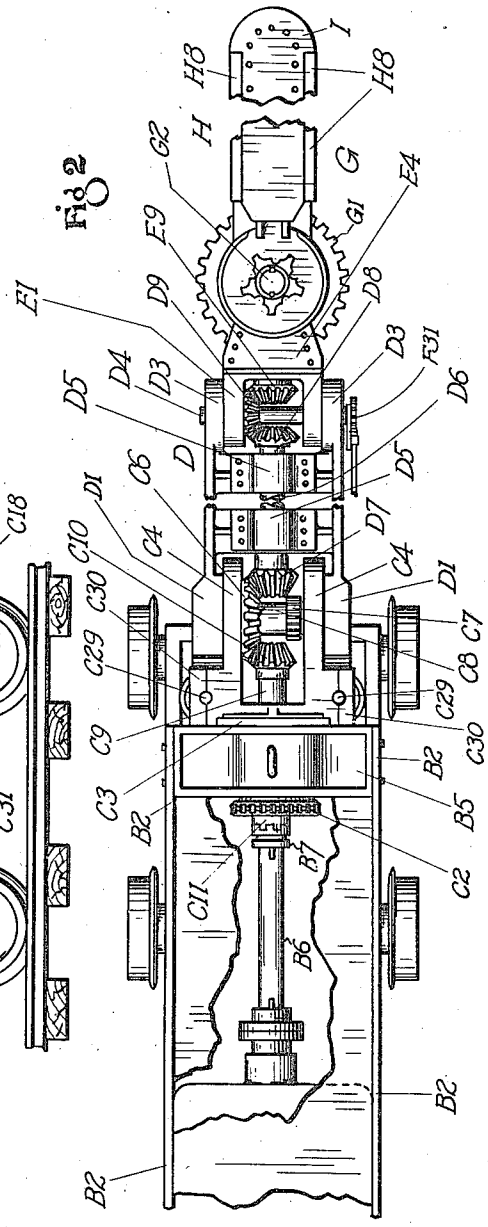


Fig 2

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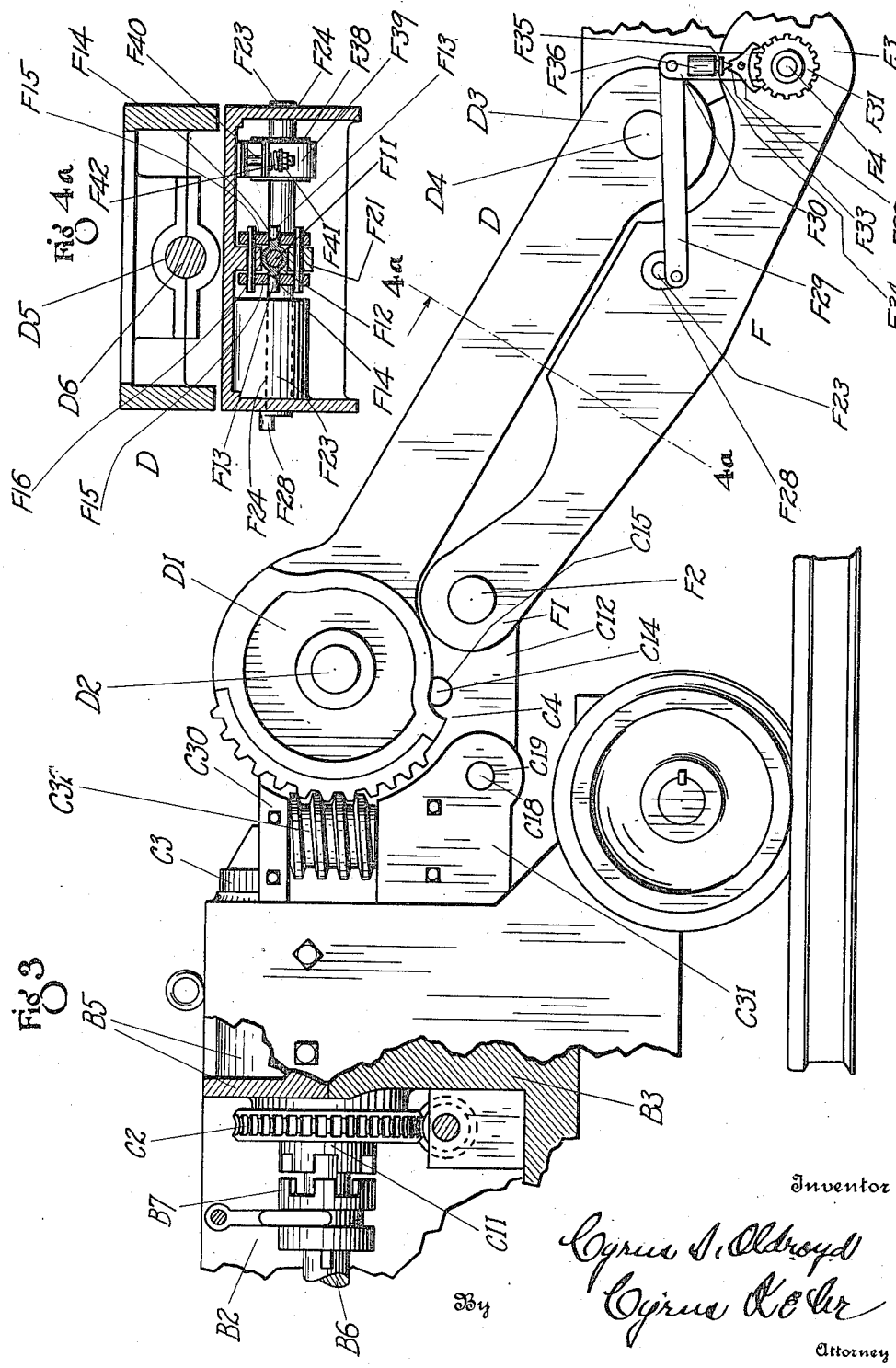
Attorney

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C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 2



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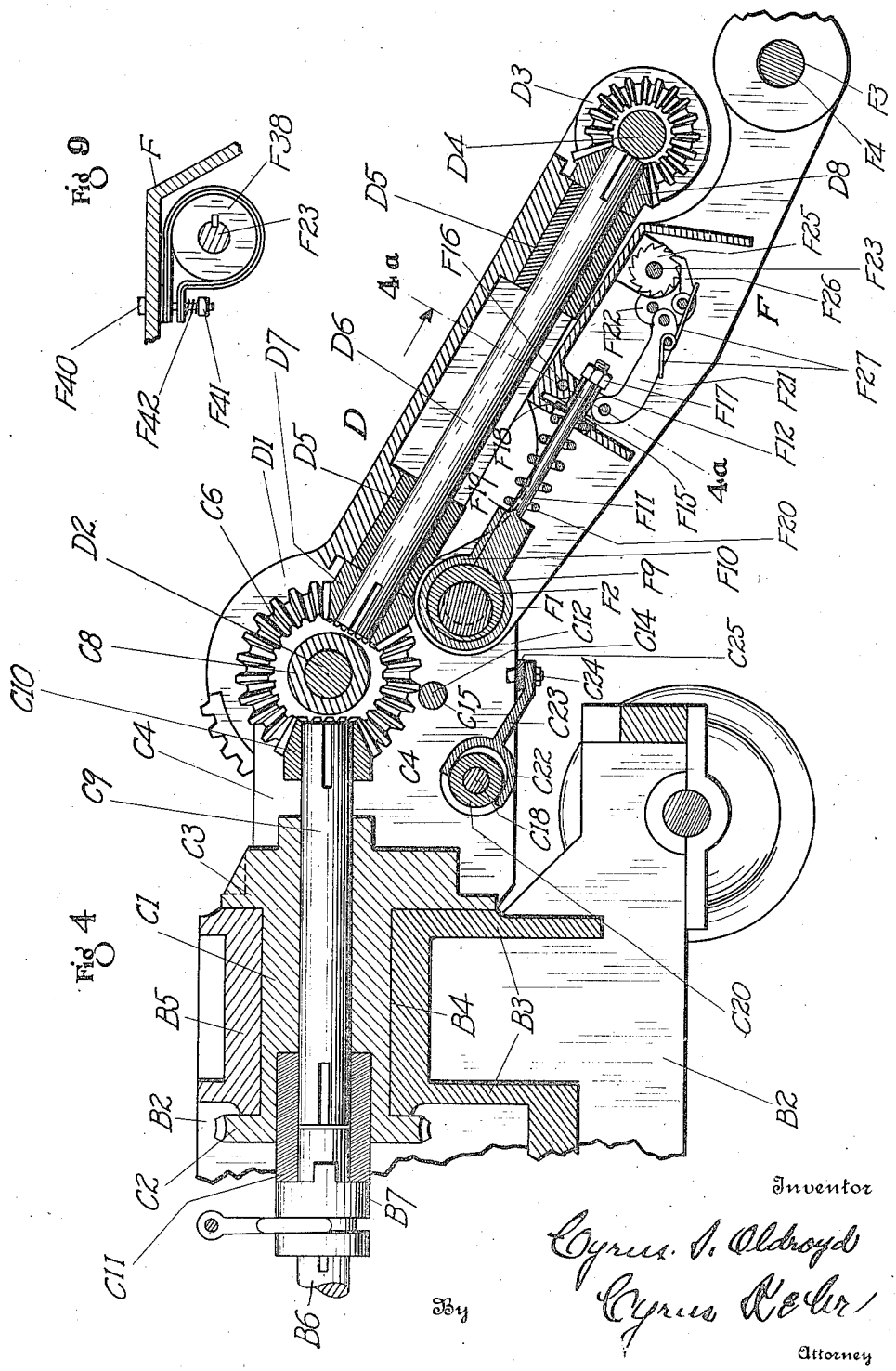
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June 26, 1923. 1,460,076

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MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 3



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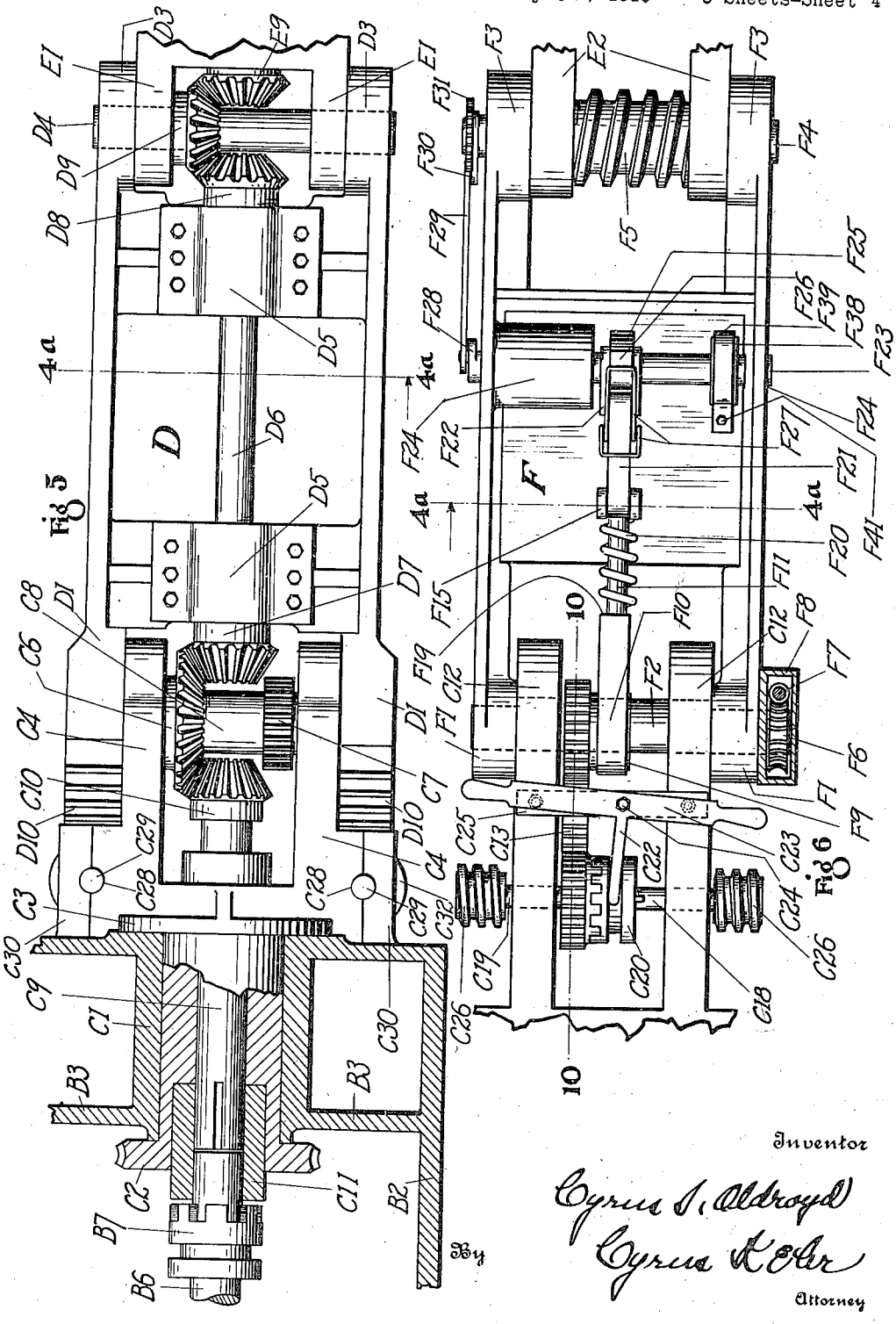
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MINING AND QUARRYING MACHINE

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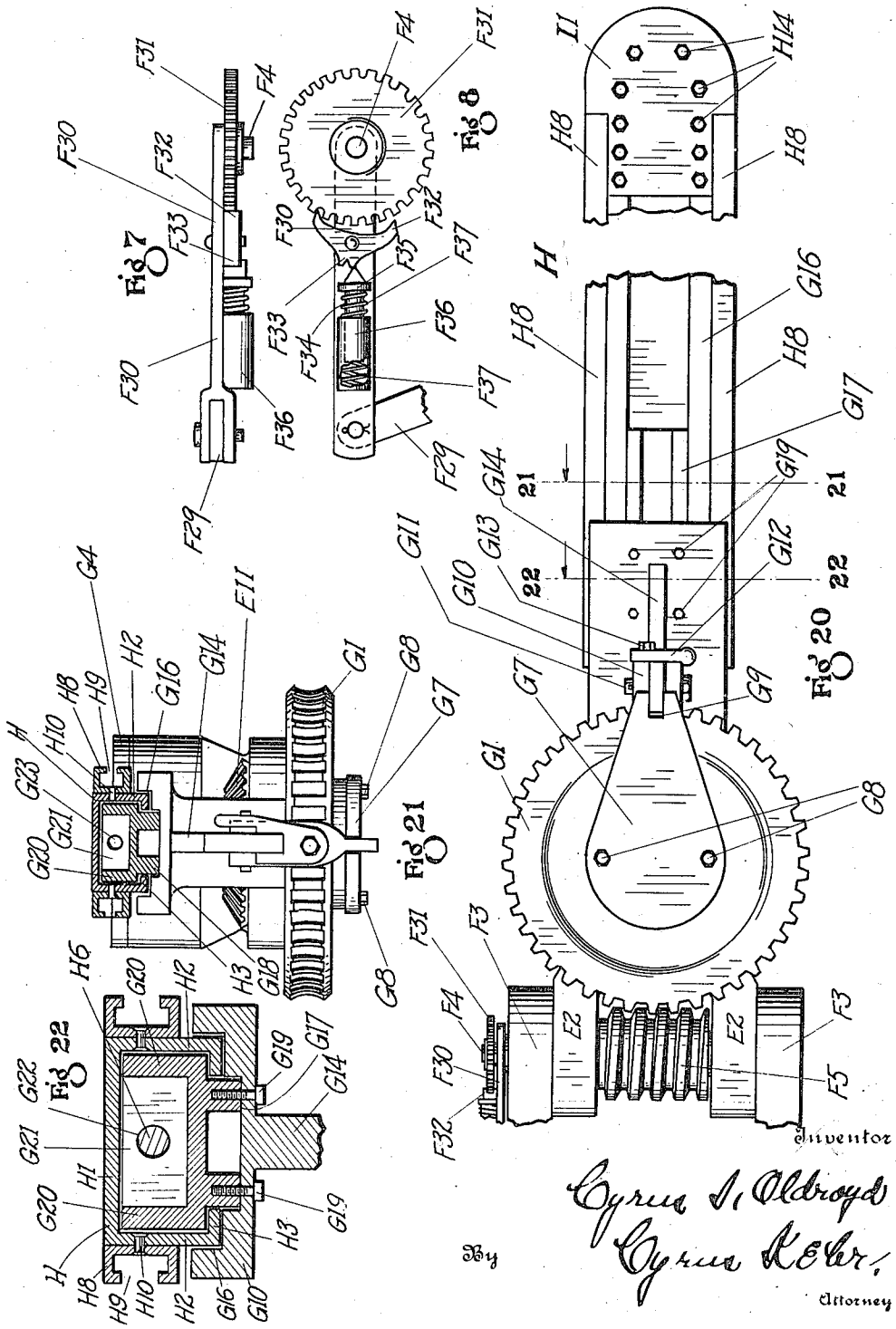
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C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 5

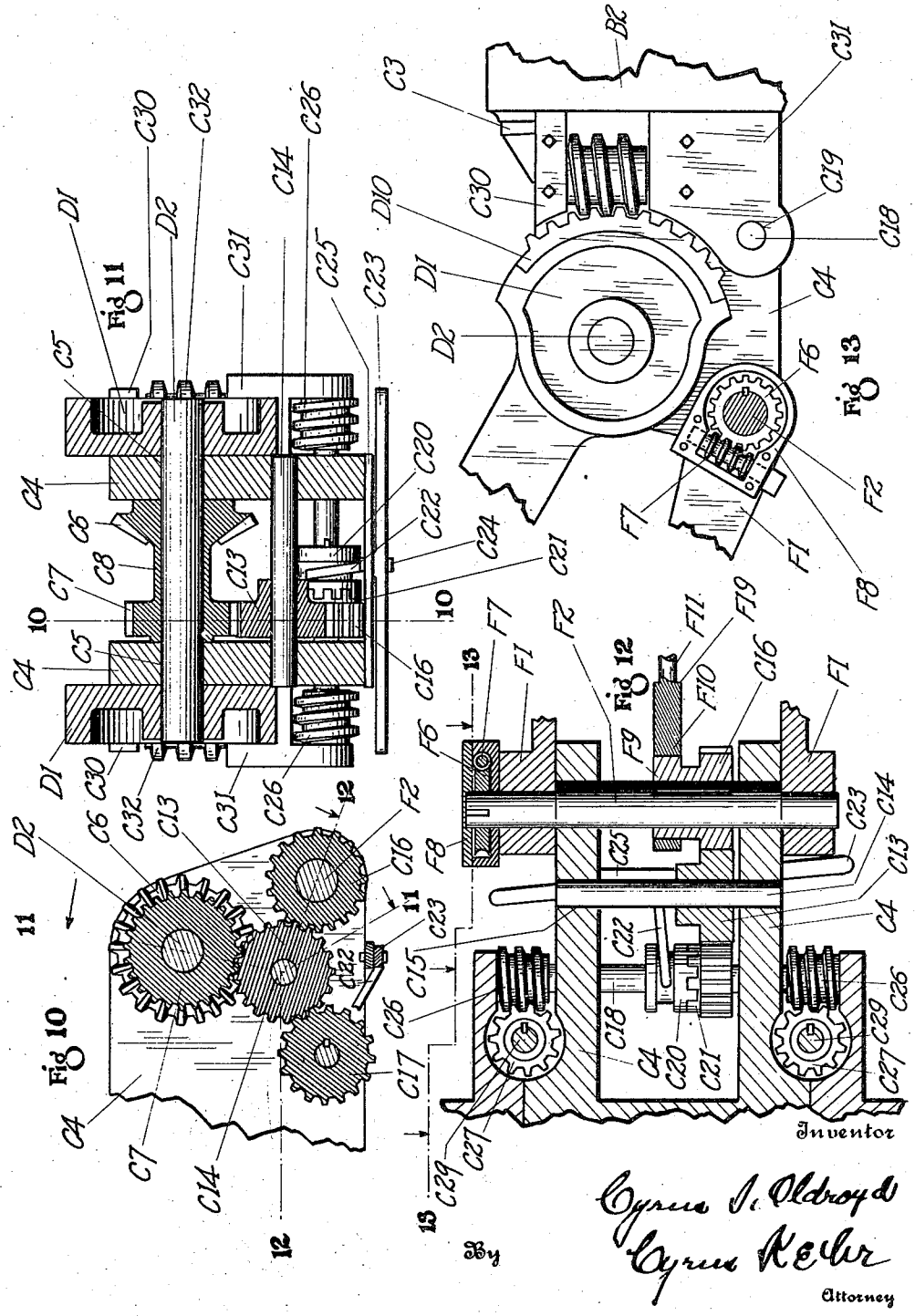


June 26, 1923. 1,460,076

C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 6

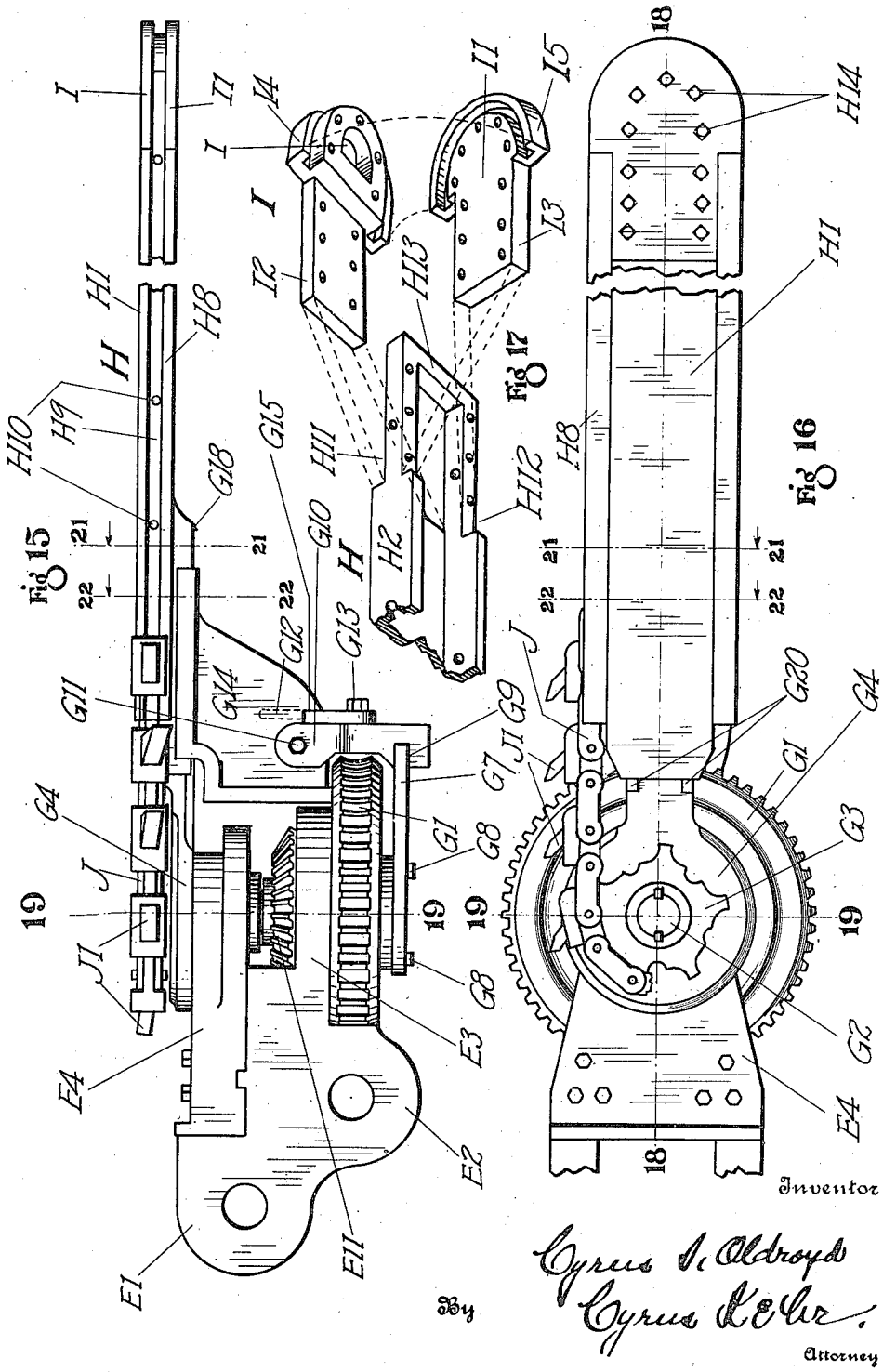


June 26, 1923. 1,460,076

C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 7



June 26, 1923. 1,460,076

C. S. OLDROYD

MINING AND QUARRYING MACHINE

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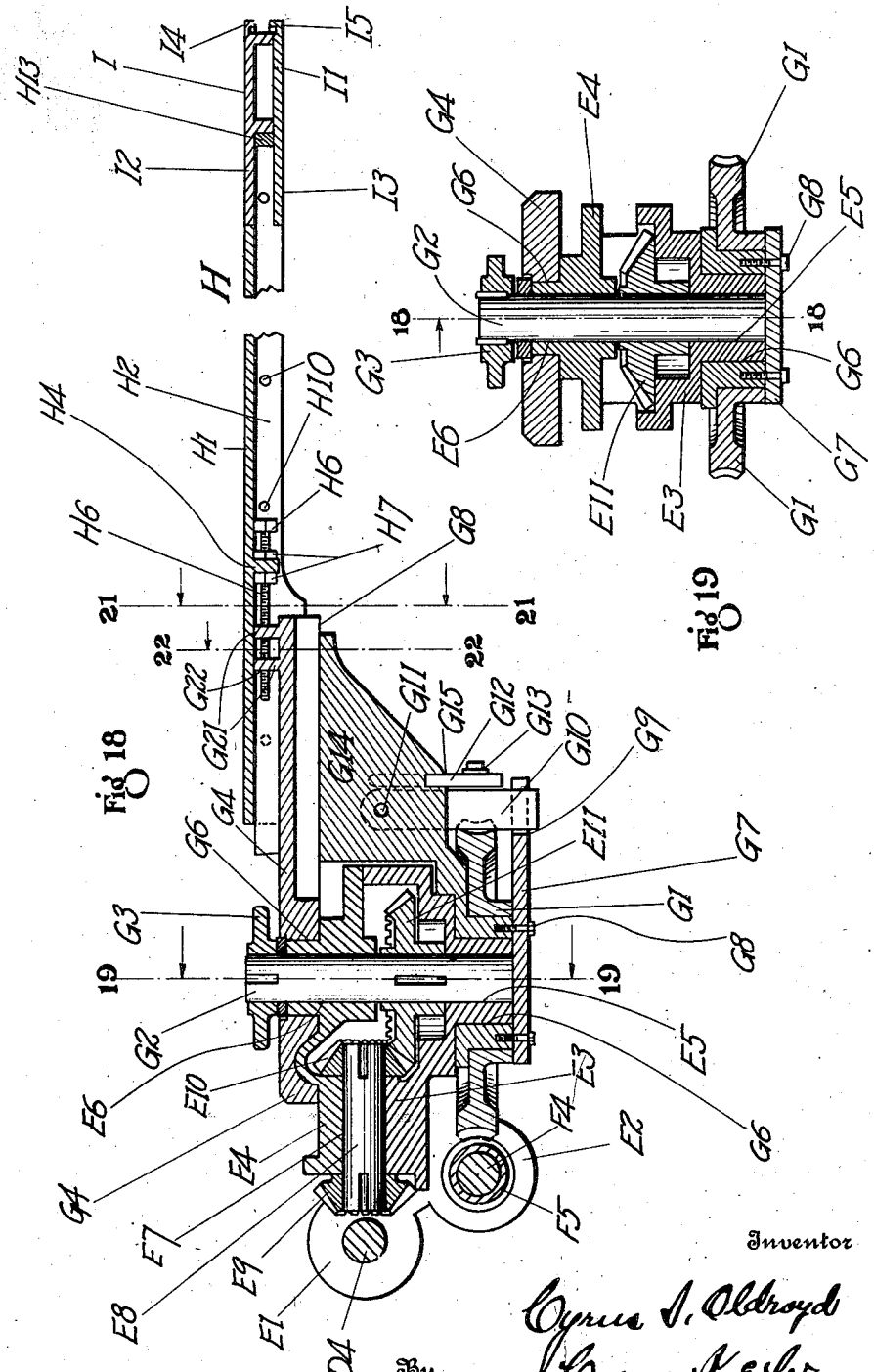


Fig 18

Fig 19

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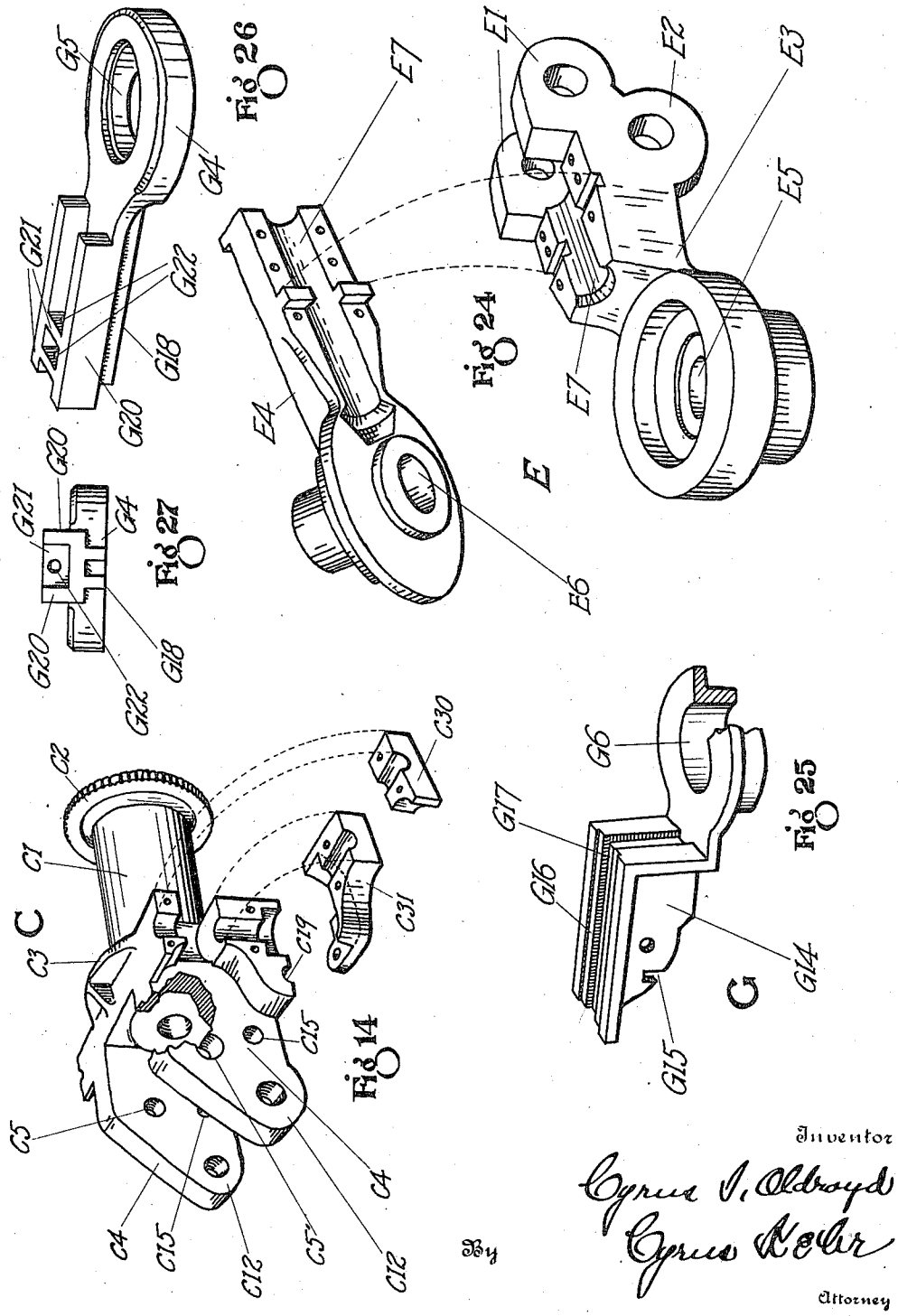
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1,460,076

C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed July 14, 1919 9 Sheets-Sheet 9



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Patented June 26, 1923. 1,460,076

UNITED STATES PATENT OFFICE.

CYRUS S. OLDROYD, OF CINCINNATI, OHIO, ASSIGNOR TO OLDROYD MANUFACTURING COMPANY, OF KNOXVILLE, TENNESSEE, A CORPORATION OF TENNESSEE.

MINING AND QUARRYING MACHINE.

Application filed July 14, 1919, Serial No. 310,817. Renewed December 11, 1922.

To all whom it may concern:

Be it known that I, CYRUS S. OLDROYD, a citizen of the United States, residing at Cincinnati, in the county of Hamilton and State of Ohio, have invented a new and useful Improvement in Mining and Quarrying Machines, of which the following is a specification, reference being had to the accompanying drawing.

My improvement relates particularly to machines used for cutting into upright walls of coal, rock, or similar material, the machine comprising cutting means actuated by the machine and projected endwise into the wall of coal, or other material, and then moved sidewise to make a sweeping cut.

The object of my improvement is to provide a machine by which the cutting means may be made to cut kerfs into a wall as follows: (1) horizontally along the floor level and horizontally at other levels as high as the machine can reach; (2) vertically and parallel to the forward course of the machine within a certain range and diagonally to said course within a more extended range; (3) obliquely toward the right or toward the left within a certain range; (4) annularly around a horizontal axis which is parallel to the forward course of the machine; and (5) in a variety of curves.

By way of general statement, it may be said that the machine comprises (1) a body and supporting or traction wheels supporting the body and adapted to rest on an ordinary rail track or on a floor; (2) a neck located at the front of said movable body and rotatable on a horizontal axis extending lengthwise of the machine and approximately in an upright plane cutting midway between the track wheels; (3) cutting mechanism; (4) adjustable means supported by said neck and supporting means to permit adjustment of said cutting mechanism toward and from the axial line of said neck and also on an axial line which is perpendicular to the axial line of said neck.

The present invention relates particularly to said neck and the parts supported thereby and means for actuating said parts.

For a machine of this general type reference is made to my application, Serial Number 166,172, filed May 3, 1917, for Letters Patent of the United States, for an improvement in mining and quarrying machines.

In the accompanying drawings,

Fig. 1 is a right hand side elevation of a machine embodying my invention, a portion being broken away and the cutter chain being omitted;

Fig. 2 is a plan of the same machine, portions being broken away;

Fig. 3 is a larger right hand elevation of a portion of the mechanism shown by Fig. 1, some parts being broken away;

Fig. 4 is an upright section along a portion of the upright middle, longitudinal plane of Fig. 2;

Fig. 4^a is a transverse section on the line, 4^a—4^a, of Figs. 4 and 6;

Fig. 5 is a plan of the mechanism shown in Figs. 3 and 4;

Fig. 6 is a bottom view of a portion of the mechanism shown by Figs. 3, 4 and 5;

Fig. 7 and Fig. 8 are details of a ratchet mechanism located on the lower parallel link bar;

Fig. 9 is a detail of a frictional retarding device applied to the shaft of said ratchet mechanism;

Fig. 10 is an upright longitudinal section on the line, 10—10, of Figs. 6 and 11;

Fig. 11 is a section on the line, 11—11, of Fig. 10;

Fig. 12 is a section on the line, 12—12, of Fig. 10;

Fig. 13 is an upright section on the line, 13—13, of Fig. 12;

Fig. 14 is a perspective view of the neck casting and parts applied thereto;

Fig. 15 is a side elevation of the head and parts supported thereby;

Fig. 16 is a plan of the mechanism shown in Fig. 15, portions being broken away at the left;

Fig. 17 is a perspective of parts of the forward end of the chain support, said parts being separated from each other;

Fig. 18 is a longitudinal, upright section on the line, 18—18, of Fig. 16;

Fig. 19 is an upright, transverse section on the line, 19—19, of Figs. 15 and 18;

Fig. 20 is a bottom view of the mechanism shown by Figs. 15, 16 and 18;

Fig. 21 is a transverse upright section on the line, 21—21, of Figs. 15 and 20;

Fig. 22 is an enlargement of the upper part of Fig. 21;

Fig. 23 is a perspective view of the head casting;

Fig. 24 is a perspective of a cap plate which is applied upon the head casting;

Fig. 25 is a perspective of the tool support, a part being broken away;

Fig. 26 is a perspective of a cap plate which is to be placed upon the tool support;

Fig. 27 is an elevation looking at the cap plate of Fig. 26 from the rear.

Referring to said drawings, C is the neck structure. That is secured to the front part of the body of the machine to rotate on an axis which is horizontal and parallel to the length of the machine. Said neck structure has a cylindrical neck, C^1, which rests in a horizontal, longitudinal bearing, B^4, formed by notching the upper edge of the front, upright wall, B^3, and notching the lower part of the bearing block, B^5, which rests upon the cross wall between the side walls, B^2, of the body of the machine. At the rear of said cross wall and bearing block, a worm wheel, C^2, surrounds and is fixed to the neck. Thus the neck is held against forward movement in the bearing. At the front of the bearing, said neck structure has a shoulder, C^3, which abuts against said cross wall and bearing block to hold the neck against rearward movement.

By rotating the worm wheel, C^2, the entire neck structure is rotated. For means for rotating said worm wheel, reference is made to my above-mentioned application for Letter Patent.

For convenience in description, it is assumed that the parts of the neck structure and the parts supported thereby which are uppermost in the elevations and upright sections of the drawings are upper parts.

The neck structure has two walls, C^4, which are parallel to each other and parallel to and equi-distant from the axial line of the neck. In each of said walls is a bearing, C^5, in alignment with the other of said bearings on a line which is perpendicular to and intersects the axial line of the neck, C^1. In said bearings rests a hinge shaft, D^2. Between said walls, said shaft is loosely surrounded by a bevel gear wheel, C^6, and a spur gear wheel, C^7. Said wheels are joined to each other by a sleeve, C^8. A neck shaft, C^9, is located in the neck on the axial line of the neck and extends forward nearly to the transverse hinge shaft, D^2. On the forward end of the neck shaft and keyed thereto is a bevel gear wheel, C^{10}, which meshes with the bevel gear wheel, C^6. In this manner motion is transmitted from the neck shaft to the wheels, C^6 and C^7. The rear end of the neck shaft is surrounded by a sleeve, C^{11}, and said sleeve is keyed to said shaft and extends rearward of the latter and receives the forward end of a transmission shaft, B^6. The rear end of said sleeve is notched to form one member of a jaw clutch. The other member, B^7, of the clutch is feathered on the transmission shaft, B^6. By bringing said clutch member, B^7, into engagement with the sleeve, C^{11}, motion is transmitted from the transmission shaft through the sleeve, C^{11}, to the neck shaft. For means for thus transmitting motion, reference is made to my above-mentioned application for Letters Patent.

Forward of the neck structure, the upper parallel link member, D, has a lower companion parallel link member, F. The link member, D, has at its rear end two ears, D^1, each of which overlaps the outer face of one of the walls, C^4, of the neck structure. The transverse hinge shaft, D^2, already described, is extended at each end to reach through the adjacent ear, D^1, to form journals for the link member, D, said journals being on an axial line which is perpendicular to and cuts the axial line of the neck, C^1. At its forward end the link, D, has a pair of ears, D^3, each of which is in approximately the plane of the corresponding ear, D^1. Each of the ears, D^3, overlaps the outer face of one of an upper pair of ears, E^1, on the head, E. A shaft, D^4, rests in the ears, D^3 and E^1, parallel to the shaft, D^2.

On the link member, D, are two bearings, D^5, which are on an axial line which cuts the axial line of the shafts, D^2 and D^4, and the axial line of the neck, C^1. In said bearings is a shaft, D^6, each end of which projects through the adjacent bearing, D^5. The rear end of said shaft is surrounded by a bevel gear wheel, D^7, said wheel being keyed to said shaft and meshing with the bevel gear wheel, C^6, whereby the shaft, D^6, receives motion through the bevel wheel, C^6, when the neck shaft, C^9, is rotated. The forward end of the shaft, C^6, is surrounded by a bevel gear wheel, D^8, said wheel being keyed to said shaft and meshing with the bevel gear wheel, D^9, which loosely surrounds the shaft, D^4, and receives rotation from the bevel wheel, D^8.

The lower parallel link member, F, has at its rear end a pair of ears, F^1, each of which overlaps the outer face of an ear, C^{12}, on the forward part of one of the walls, C^4. A hinge shaft, F^2, extends through the ears, C^{12}, and F^1, parallel to the shaft, D^2.

On the forward end of the parallel link member, F, are a pair of ears, F^3, which are parallel to the ears, F^1, and each of which overlaps the outer face of a lower pair of ears, E^2, formed on the head, E. A hinge shaft, F^4, extends through the ears, F^3 and E^2, parallel to the shafts, F^2, D^4, and D^2. The shafts, D^2 and D^4, lie in a plane which is parallel to the plane in which lie the shafts, F^2 and F^4.

In this manner a parallel link mechanism is formed whereby the head, E, is supported for movement toward and from the axial line of the neck, C^1, while the parallel rela-

tion between said head and said axial line is maintained.

The parallel link mechanism is actuated by operator-controlled power mechanism which will now be described.

The spur gear wheel, C^7, meshes with an idle spur gear wheel, C^{13}, which is mounted on a shaft, C^{14}, which is parallel to the shaft, D^2, and has its ends resting in bearings, C^{15}. The idle spur gear wheel, C^{13}, meshes with a spur gear wheel, C^{17}, which loosely surrounds a shaft, C^{18}, which is parallel to the shaft, C^{14}. The shaft, C^{18}, rests in bearings, C^{19}, formed in the walls, C^4. Adjacent said spur gear wheel, C^{17}, said shaft is surrounded by a clutch member, C^{20}, which is feathered on said shaft and is adapted to engage a clutch member, C^{21}, combined with the wheel, C^{17}. A clutch arm, C^{22}, engages the clutch member, C^{20}, and is rigid on a horizontal lever, C^{23}, which is pivoted at C^{24} to a cross bar, C^{25}, which is bolted to the side walls, C^4. By means of said lever, clutch engagement can be made with the spur gear wheel, C^{17}, so as to compel the shaft, C^{18}, to take motion from said spur gear wheel. Each end of the shaft, C^{18}, projects outward through the adjacent wall, C^4, and supports a worm, C^{26}, which meshes with the adjacent worm wheel, C^{27}, which is fixed on the lower end of the adjacent upright shaft, C^{29}, which rests in bearings, C^{28}, formed on the side walls, C^4, by the aid of upright cap plates, C^{30}, and C^{31}. On each shaft, C^{29}, is a worm, C^{32}, which engages the worm segment, D^{10}, on the adjacent ear, D^1, which ears, as above described, are supported on the rear end of the upper parallel link member, D.

When it is desired to turn the rear end of the link member, D, on the hinge shaft, D^2, the clutch lever, C^{23}, is moved by the operator to engage the shiftable clutch member, C^{20}, with the clutch member, C^{21}. Then motion is transmitted from the spur gear wheel, C^{13}, through the train of gearing above described to the worm segment, D^{10}. The worm segment and the parts associated therewith are so related and proportioned as to allow movement of the link member, D, through such an arc as will give the cutting mechanism the desired range of movement toward and from the axial line of the neck, C^1.

On the shaft, F^4, is a gear worm, F^5, which engages and transmits motion to the worm wheel, G^1, for the turning of the tool support, G, on the axial line of the shaft, G^2, as will be hereinafter described. This worm gearing is to be used only when it is desired to laterally swing the cutting mechanism supported by the tool support, G. Hence the shaft, F^4, is to be given motion by mechanism which is under the control of the operator. And it is desirable that a slow rotation be imparted to the shaft, F^4, in order that a slow lateral movement may be given to the cutting mechanism when said mechanism is making a sidewise cut. Such operator-controlled mechanism for transmitting motion from the transverse shaft, D^2, already described, to the shaft, F^4, will now be described.

The idle spur gear wheel, C^{13}, which, as above described, is mounted on the shaft, C^{14}, is parallel to the shaft, D^2. Said wheel, C^{13}, meshes with a spur gear wheel, C^{16}, on the shaft, F^2, already described as serving to form the hinge between the rear end of the lower parallel link member and the neck casting, C. The parts of said shaft which extend into the ears, F^3, are excentric relative to the body of said shaft, so that by the turning of said shaft, true relation between said link member and the neck structure may be slightly varied for the purpose of correcting any deviation from direct relation between the four bearings of the parallel link structure, or for the purpose of putting said relation out of true sufficient to intentionally slightly tilt the cutting mechanism out of parallel relation with the axial line of the neck, C^1; that being at times desirable when there is a slant in the upper or lower face of the vein of coal or if there is a slight slant in the track on which the machine stands. The adjustment of said shaft, F^2, is effected manually by the aid of a worm wheel, F^6, mounted on said one end of said shaft and a worm shaft, F^7, said worm wheel being keyed on the shaft, F^2, and the worm shaft being seated in bearings in a housing, F^8, bolted on the outer face of the lower parallel link member. Said worm shaft has a four-sided end which is to be engaged by a wrench for turning said shaft. When said worm shaft is at rest, it serves as a lock for holding the worm wheel and the shaft, F^2, against rotation.

Integral with the spur gear wheel, C^{16}, is an excentric, F^9, also surrounding and fixed to shaft, F^2. To said excentric is applied an excentric strap, F^{10}, which is secured to the rear end of an excentric rod, F^{11}, the forward end of which rests slidably in a sleeve, F^{12}, which has lateral trunnions, F^{13}, which rest in bearings, F^{14}, in an oscillating member, F^{15}, which has its upper end pivoted at F^{16} to the link member, F, on an axis which is horizontal and transverse to the length of the machine. The excentric rod, F^{11}, extends through the sleeve, F^{12}, and said end is screw threaded and surrounded by an adjusting nut, F^{17}. At the rear end of the sleeve, F^{12}, a washer, F^{18}, surrounds the excentric rod. Rearward of said washer said rod has a forward-directed shoulder, F^{19}. Between said shoulder and said washer is an expanding coiled spring, F^{20}, which bears against said shoulder and said washer and tends to push the

excentric rod and the oscillating member, F^{15}, forward. The nut, F^{17}, limits the forward movement of said sleeve and oscillating member. By shifting said nut on the excentric rod, the sleeve, F^{12}, and the oscillating member, F^{15}, are shifted relative to said rod. Such shifting affects the position of the pawl support, F^{22}. To the lower end of the oscillating member, F^{15}, is coupled the rear end of a horizontal link, F^{21}. The forward end of said link is coupled to the lower end of the oscillating pawl support, F^{22}. Said support loosely surrounds and extends downward from the shaft, F^{23}, which is horizontal and transverse to the length of the machine and rests in bearings, F^{24}, formed in the side walls of the link member, F. Adjacent the support, F^{22}, a ratchel wheel, F^{25}, surrounds and is keyed to the shaft, F^{23}. On the forward part of the lower end of the oscillating support, F^{22}, is a hinged pawl, F^{26}, which is adapted to engage the teeth of said ratchet wheel. A spring, F^{27}, is applied to said support in position to engage the pawl and press the latter yieldingly against the periphery of the ratchet wheel. During the reciprocation of the excentric rod, F^{11}, and the link, F^{21}, the pawl, F^{26}, engages and partially turns the ratchet wheel, the extent of such turning depending upon the number of teeth on the ratchet wheel and the length of stroke of the rod, F^{11}, and the link, F^{21}. These limited movements of the ratchet wheel slowly turn the shaft, F^{23}.

It will be observed that during the forward stroke of the excentric rod, F^{11}, said rod is free to move forward through the sleeve, F^{12} and that during such forward stroke pressure is exerted upon the sleeve, F^{12}, only through the spring, F^{20}, which, as above described, bears against the shoulder, F^{19}, and said sleeve. Hence said spring must be of sufficient strength to transmit the degree of power needed under normal conditions to actuate the train of mechanism between the oscillating member, F^{15}, and the worm wheel, G^1. But the limit of strength of the spring must be such as to cause it to yield when the tool support or any part supported thereby meets such resistance to the turning of the tool support on the axial line of the shaft, F, as would result in breakage or in excessive strain.

This mechanism automatically adapts itself to the variable resistance to the turning of the tool support on its axis when lateral cuts are being made. Such variation in resistance may be due to variation in hardness of the coal or other material being cut, or to the occasional presence of an extra hard limited mass of material, such as a stone or sulphur ball in coal. By varying the adjustment of the nut, F^{17}, on the rod, F^{11}, the resistance of the spring may be varied, and thus the pressure with which the cutting mechanism is pressed sidewise against the coal or other material while making a sidewise cut is varied. This adjustment permits forcing the cutting mechanism sidewise to its maximum, the spring yielding and suspending the lateral feed of the cutting mechanism when the maximum of resistance to lateral feed has been reached.

The nut, F^{17}, may also be turned for readjustment of the spring whenever the shaft, F^2, is partially turned to adjust the relation between the neck structure and the head through the parallel link members, as already described.

On the right-hand end of the shaft, F^{23}, at the adjacent outer side of the link member, F, said shaft supports a crank, F^{28}, to which is coupled the lower end of a pitman, F^{29}. The upper end of said pitman is coupled to a rocking member, F^{30}, which is hinged on the horizontal shaft, F^4. On said shaft is fixed a ratchet wheel, F^{31}, and on the rocking member is a reversible pawl, F^{32}, which engages the teeth of the ratchet wheel. This pawl has two rearward extensions, F^{33}. A slide member, F^{34}, extends into the barrel F^{36}, seated on the locking member. Said slide member is adapted to enter the space between the extensions, F^{33}, or to bear against the outer face of either of said extensions. And the slide member has a shoulder, F^{35}, against which bears an expanding coiled spring, F^{37}, which surrounds the body of the slide member and extends to the inner end of the barrel, F^{36}. Thus said spring yieldingly presses the slide member toward the pawl. The operator may set the pawl into any one of three positions—with one of the points bearing against the ratchet wheel, with the other of the points bearing against the ratchet wheel, or with both points standing out of engagement with the ratchet wheel. This latter position is attained by turning the pawl so as to bring the slide member into the space between the extensions, F^{33}. The other positions are attained by so turning the pawl as to bring the slide member into contact with the outer face of the appropriate extension, F^{33}. When the ratchet wheel is to be rotated for turning the gear worm, F^8, to turn the tool support on the axis of the shaft, G^2, in one direction, the pawl, F^{32}, is tilted in the appropriate direction to make engagement with the ratchet wheel. When said tool support is to remain stationary on said axis, the pawl is placed into neutral position by engaging the slide member between the extensions, F^{33}. Thus motion may be transmitted from the shaft, F^{23}, to the shaft F^4, there being a reduction of motion through the ratchet mechanism on the shaft, F^4, and the transmission from the shaft, F^4, through the worm, F^8, to the worm wheel, G^1, is

also a reduction. Hence the velocity received by the worm wheel G^1, from the shaft, D^2, through the train of mechanism intervening between the shaft, D^2, and said worm wheel is much less than the velocity of the shaft, D^2.

To hold the ratchet wheel, F^{25}, against turning backward during the backward movement of the pawl, F^{26}, a friction strap, F^{39}, is applied to the wheel, F^{38}, which surrounds and is keyed to the shaft, F^{23}. A bolt, F^{40}, extends through the wall of the link member, F, and through the ends of the strap. Below the strap a nut, F^{41}, surrounds the bolt, and between the strap and the nut a spring, F^{42}, surrounds the bolt. The strap serves as a yielding brake. The resistance which the strap offers to the rotation of the wheel, F^{38}, and the shaft, F^{23}, may be varied by varying the position of the nut on the bolt.

The head, E, comprises a base member or body, E^3, and an upper cap member, E^4, which is bolted to the base member or body. The two pairs of ears, E^1 and E^2, are on the body or base member. The base member extends forward and has a lower upright bearing, E^5, which receives the lower end of the upright shaft, G^2. The cap member extends forward and has a bearing, E^6, in alignment with the bearing, E^5, and also receives the shaft, G^2. Between said two bearings, the shaft, G^2, is surrounded by and keyed to a bevel gear wheel, E^{11}, which meshes with a bevel gear wheel, E^{10}, which is keyed on the shaft, E^8, which rests in a bearing, E^7, formed between the base member, E^3, and the cap member, E^4. On the rear end of said shaft is fixed a bevel gear wheel, E^9, which meshes with the bevel gear wheel, D^9, on the transverse shaft, D^4. By means of this train of gearing, motion is transmitted from the shaft, D^6, to the shaft, G^2. The upper end of the shaft, G^2, projects above the bearing, E^6, and said end has fixed upon it a sprocket wheel, G^3, which engages the cutter chain described further on.

The tool support has a cap plate, G^4, which has a bearing, G^5, which surrounds the bearing, E^6, of the cap member, E^4; and the tool support has a bearing, G^6, which surrounds the bearing, E^5. Through this engagement of the bearings, G^5 and G^6, the tool support is hinged to turn on the axial line of the shaft, G^2. The worm wheel, G^1, loosely surrounds the bearing, G^6, and rests on the supporting plate, G^7, and bears upward against the horizontal part of the support, G, and is adapted to be engaged to the tool support by a latch mechanism to be described further on. Thus the worm wheel is made concentric with the shaft, G^2. As already described, the worm, F^5, engages the worm wheel, G^1. Hence rotation of said worm will cause the rotation of the worm wheel, and since the worm wheel is secured to the tool support by said latch mechanism, said support must swing on the axial line of the shaft, G^2, when the worm, F^5, is turned. But provision is made for releasing the latch mechanism, in order that the tool support and the mechanism supported thereby may be swung on the axis of the shaft, G^2, by an operator whenever that is desirable for changing the position of said support more rapidly than can be done by the worm gearing or where the machine is being moved along passageways wherein the course deviates from a straight line to such extent as to require the swinging of the tool support and the parts supported thereby out of alignment with the body of the machine.

For supporting the worm gear wheel, G^1, against downward movement, the supporting plate, G^7, extends across the lower ends of the bearings, E^5, and G^6. Cap screws, G^8, extend upward through said plate into the bearing, G^6. Thus said plate is made rigid with the support, G. Said supporting plate is extended forward beyond the periphery of the worm wheel and is there provided with a notch, G^9, which receives the lower end of a latch tongue, G^{10}, and allows said tongue to rest between two teeth of the worm wheel, G^1. The tool support has a downward and forward-directed, longitudinal, median flange, G^{14}, and the latch tongue is forked to receive the flange. A bolt, G^{11}, extends through the two arms of said tongue and through said flange to hinge the tongue. Immediately in front of the upright position of the latch tongue is a notch, G^{15}, in the flange, G^{14}. A handle, G^{12}, is hinged to the forward edge of the tongue by a horizontal bolt, G^{13}. Normally the handle projects into the notch, G^{15}, whereby the latch tongue is held in its upright and engaged position between two teeth of the worm wheel and in the notch, G^9, of the latch plate.

When said latch tongue is in its engaged position, the tool support can turn on its upright axis only when said wheel turns on its axis, and that can occur only when the gear worm, F^5, is turned by the means to be hereinafter described. But when the handle, G^{12}, is moved toward the right out of the notch, G^{15}, and the lower end of the tongue is moved forward until it clears the teeth of the worm wheel, the tool support is free to be swung manually in either direction on the axial line of the shaft, G^2.

The mechanism by means of which the cutter chain is supported will now be described.

The upper face of the tool support, G, has a longitudinal channel, G^{16}, in the middle of which is a still lower channel, G^{17}, In the channel, G^{17}, rests the foot, G^{18}, of a cap, G^4.

Said foot is secured to the supporting member, G, by cap screws, G^{10}, extending upward through the support into said foot. As already described, the cap, G^4, has the bearing, G^5, which surrounds the bearing, E^6, of the cap, E^4, the bearing, E^6, receiving the upright shaft, G^2. Above the foot, G^{18}, the cap plate has two upright longitudinal walls, G^{20}, extending from the forward end of the plate rearward nearly to the bearing, G^5. The foot, G^{18}, is high enough to bring the lower edge of the wall, G^{20}, above the bottom of the channel, G^{16}. Near the forward end of the cap plate are two cross walls, G^{21}, which extend from one wall, G^{20}, to the other and to the horizontal face of the cap plate between said walls. At the middle of each of said walls is a screw threaded aperture, G^{22}. An elongated chain supporting body, H, is supported upon the cap plate, G^4, and the support, G. Said body has a horizontal upper wall, H^1, and upright side walls, H^2, extending downward into the channel, G^{16}. On the lower edge of each wall, H^2, is a flange, H^3, directed toward the foot, G^{18}, and beneath the lower edge of the wall, G^{20}. Thus the body, H, is engaged by the cap plate and the tool support in such manner as to be limited to endwise sliding on said cap plate and tool support. A little way forward of the forward end of the cap plate, the body, H, has a cross wall, H^4, in which is an aperture, H^5. A bolt, H^6, extends loosely forward through said aperture and is threaded through the apertures, G^{22}, of the two cross walls, G^{21}, on the cap plate. Nuts, H^7, surround the bolt at each side of the cross wall, H^4. By turning said bolt and said set nuts, the body, H, may be shifted endwise on the cap plate and tool support for varying the tension of the cutter chain.

To the outer face of each wall, H^2, and immediately above the adjacent upper face of the tool support, G, is applied a channel member, H^8, which is dove-tail in cross section and has a slot, H^9, directed outward. Bolts or rivets, H^{10}, secure said channel members to the walls, H^2. The body of the cutter chain, J, rests in said channel members, the cutters, J^1, supported by said chain reaching out through the slot, H^9. At the forward end of the body, H, said channel registers with a channel formed by two end members, I and I^1. The member, I, has a rearward extended shank, I^2, which overlaps the upper face of the member, H, said member being cut away at H^{11} to make the upper face of said shank lie flush with the upper face of the member, H. The member, 1^1, has a similar shank, I^3, which overlaps the lower side of the member, H, the lower face of said shank being made flush with the lower edges of the side walls, H^2, by cutting said walls away at H^{12}. Said walls have their forward ends connected by a cross wall, H^{13}, against which the body of the member, I^2, abuts, said body being thick enough to extend downward flush with the lower face of the cross wall, H^{13}, and upon the upper face of the member, I^1. Bolts, H^{14}, extend through the shanks of the members, I and I^1, and the walls, H^2, to bind said shanks to the member, H; and bolts, H^{14}, also extend through the bodies of the members, I and I^1, to bind said bodies immovably to each other. The members, I and I^1, are rounded approximately concentric to an upright axis placed at the middle of the cross wall, H^{13}. The member, I^1, has on its body a flange, I^4, which is directed downward toward a corresponding upward directed flange, I^5, formed on the body of the member, I^1. The ends of the flange, I^4, meet the forward ends of the upper lip of the channel members, H^8, while the rear ends of the flange, I^5, similarly meet the forward ends of the lower lip of the channel members, H^8. In this manner the dove-tail channel in which the cutter chain rests is made continuous around the forward end of the member, H, the structure being adapted to allow the chain to slide in said channel. Rearward of the body, H, the cutter chain surrounds the sprocket wheel, G^3, which surrounds and is keyed to the upper end of the upright shaft, G^2, as already described. A cutter chain, J, having cutters, J^1, of any desired type adapted to be applied to the structure described may be used. The desired tension is given to the chain by adjusting the bolt, H^6, whereby the distance between the pair of end members, I and I^1, and the sprocket wheel, G^3, is varied.

The range of movement of the head, E, toward and from the axial line of the neck, C^1, may be varied by varying the arc through which the parallel link members turn and by varying the length of the parallel link members. By lengthening said members, such range of movement of the head, E, may be increased. It is desirable that such range be sufficient to permit bringing the cutter chain to the floor level and also to the ceiling and a suitable lateral distance for making upright cuts parallel to the length of the machine. The tool support, G, is to turn through a half circle on the axis of the shaft, G^2, in order to adapt the cutting mechanism to cut in an upright plane to which the axial line of the neck, C^1, is perpendicular. The worm gear wheel, G^1, permits such range of swinging of the tool support on the axial line of the shaft, G^2. In this connection it is well to revert to the description of the ratchet mechanism by which the worm, G^5, is slowly turned for the turning of the worm wheel, G^1, and the ratchet mechanism at the front of the worm wheel, G^1, by which the tool support may be

released for rapidly swinging the tool support into a new position relative to the worm wheel, and in order that whenever the tool support is to be turned faster than is required when the cutting mechanism is making a cut, such movement is to be made by the operator through the releasing of the latch mechanism and the manual turning of the tool support and the parts supported thereby. For example, if the tool support is directed forward and it is desired to turn the support so as to extend the cutting mechanism sidewise at right angles to the length of the machine, the operator releases the latch mechanism and manually turns the tool support on its axis and then again engages the latch mechanism with the worm wheel, G^1.

I claim as my invention,

1. In a machine of the nature described, the combination with a neck structure comprising a neck seated in a horizontal bearing, a head, and cutting mechanism supported by said head, of a pair of parallel link members joining said neck structure and said head through hinge shafts which are parallel to each other and transverse to the axis of said neck, a driven neck shaft extending through the neck structure, a shaft parallel to and near the hinge shafts which are supported by the neck structure, operator-controlled gearing, in part supported by one of the hinge shafts, for transmitting motion from the neck shaft to said parallel shaft, two upright shafts adjacent the parallel shaft, worm gearing joining said parallel shaft and said upright shafts, a worm on each of said upright shafts, and two worm gear segments fixed on one of the parallel link members concentric with the adjacent hinge of one of said members and each of said worm gear segments engaging one of said worms, substantially as described.

2. In a machine of the nature described, the combination with a neck structure comprising a neck seated in a horizontal bearing, a head, and cutting mechanism supported by said head, of a pair of parallel link members joining said neck structure and said head through hinge shafts which are parallel to each other and transverse to the axis of said neck, a driven neck shaft extending through the neck structure, a gear member on the axial line of one of said hinge shafts and a gear member connecting the first mentioned gear member with said driven neck shaft, a shaft parallel to and near the hinge shafts which are supported by the neck structure, operator-controlled gearing for transmitting motion from the gear member on said hinge shaft to said parallel shaft, two upright shafts adjacent the parallel shaft, worm gearing joining said parallel shaft and said upright shafts, a worm on each of said upright shafts, and two worm gear segments fixed on one of the parallel link members concentric with the adjacent hinge of one of said members and each of said worm gear segments engaging one of said worms, substantially as described.

3. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing and a head and cutting mechanism supported by said head, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, one of said shafts being adjustable for varying the distance between the parts of the neck structure and the parts of the head which are joined to said link member, substantially as described.

4. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing and a head and cutting mechanism supported by said head, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, one of said shafts having parts which are excentric relative to each other whereby the adjacent link member is adapted to adjustment by partially rotating said shaft, substantially as described.

5. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing and a head and cutting mechanism supported by said head, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, one of said shafts having parts which are excentric relative to each other whereby the adjacent link member is adapted to adjustment by partially rotating said shaft, and gearing for partially turning said shaft, substantially as described.

6. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing and a head and cutting mechanism supported by said head, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, one of said shafts having parts which are excentric relative to each other whereby the adjacent link member is adapted to adjustment by partially rotating said shaft, and worm gearing for partially turning and locking said shaft, substantially as described.

7. In a machine of the nature described, the combination of means forming a bearing, a cutting mechanism supporting means having a neck seated rotatably in said bearing, an elongated cutting mechanism hinged

to said supporting means to permit movement of said mechanism toward and from the axial line of said neck parallel to said line and to swing in a plane which is parallel to said line, operator-controlled, power-actuated yielding transmission mechanism for slowly swinging said cutting mechanism in said plane, and transmission means extending through said neck for actuating said cutting mechanism, substantially as described.

8. In a machine of the nature described, the combination with a head and means for supporting the head and a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of operator-controlled power-driven transmission mechanism comprising a pawl and ratchet wheel for slowly turning said tool support on said axial line for moving the cutting mechanism sidewise for sidewise cutting and a spring for driving the pawl bodily forward, substantially as described.

9. In a machine of the nature described, the combination with a head and means for supporting the head and a tool support hinged to said head on an axial line which is transverse to the length of the machine, cutting mechanism on the tool support, a worm gear on said support, a worm fixed on a shaft and engaging said gear, of operator-controlled power-actuated transmission mechanism for driving said shaft for slowly turning said tool support on said axial line for moving the cutting mechanism sidewise for sidewise cutting, a part of said transmission mechanism being a spring adapted to yield and suspend transmission under abnormal resistance by the tool support to turning on its axis, substantially as described.

10. In a machine of the nature described, the combination with a head and means for supporting the head and a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of operator-controlled, power-driven transmission mechanism for slowly turning said tool support on said axial line for moving the cutting machanism sidewise for sidewise cutting, parts of said transmission mechanism being an excentric rod and a spring and pawl and ratchet, the spring being associated with the rod and serving to transmit power for the forward stroke of the pawl and the rod serving for the return stroke of the pawl, substantially as described.

11. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing, a head, a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, a gear member on one of said shafts, power means for rotating said gear member and operator-controlled power transmission mechanism in operative relation with said gear member and the tool support for slowly turning the latter on its axial line for moving the cutting mechanism sidewise for sidewise cutting, substantially as described.

12. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing, a head, a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, a gear member on one of said shafts, power means for rotating said gear member and operator-controlled yielding power transmission mechanism in operative relation with said gear member and the tool support for slowly turning the latter on its axial line for moving the cutting mechanism sidewise for sidewise cutting, substantially as described.

13. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing, a head, a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, a gear member on one of said shafts, power means for rotating said gear member and operator-controlled power transmission mechanism comprising a spring in operative relation with said gear member and the tool support for slowly turning the latter on its axial line for moving the cutting mechanism sidewise for sidewise cutting, substantially as described.

14. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing, a head, a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and are transverse to the axial line of said neck, a gear member on one of said shafts, power means for rotating said gear member and operator-controlled

power transmission mechanism comprising a reciprocatory rod in operative relation with said gear member and a spring associated with said rod for transmission during forward stroke, for slowly turning the latter on its axial line for moving the cutting mechanism sidewise for sidewise cutting, substantially as described.

15. In a machine of the nature described, the combination with a head and means for supporting the head and a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of operator-controlled yielding power transmission mechanism for slowly turning said tool support on said axial line for moving the cutting mechanism sidewise for sidewise cutting, said transmission mechanism including an oscillatory member, a sleeve pivoted in said oscillating member, a reciprocatory rod having one end slidable in said sleeve and a spring applied to said reciprocatory member and to said oscillatory member to bear against the latter during the forward stroke of the reciprocatory member, substantially as described.

16. In a machine of the nature described, the combination with a neck structure having a neck seated in a horizontal bearing, a head tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head on lines which are parallel to each other and transverse to the axial line of said neck, and power transmission means extending along said neck and one of the parallel link members to the tool support for slowly turning the latter on its axial line for moving the cutting mechanism sidewise for sidewise cutting, substantially as described.

17. In a machine of the nature described, the combination with a neck structure comprising a neck seated in a horizontal bearing, a head, a tool support hinged to said head on an axial line which is transverse to the length of the machine, and cutting mechanism on the tool support, of two parallel link members joined to said neck structure and said head by four hinge shafts which are parallel to each other and transverse to the axis of said neck, one of said shafts being adjustable transversely to its length, power transmission mechanism between said shaft and said tool support, said transmission mechanism comprising means for making adjustment to compensate for adjustment of said shaft, substantially as described.

18. In a machine of the nature described, the combination with a neck structure and a head and a tool support hinged to said head on an axis which is transverse to the axis of said neck, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and transverse to the axial line of said neck, gearing on the rear shaft of one of said link members, ratchet mechanism supported by said link member for transmitting motion from said gearing to said forward hinge shaft of said link member, and gearing transmitting motion from said forward hinge shaft to said tool support, substantially as described.

19. In a machine of the nature described, the combination with a neck structure and a head and a tool support hinged to said head on an axis which is transverse to the axis of said neck, and cutting mechanism on the tool support, of a pair of parallel link members hinged to said neck structure and said head by shafts which are parallel to each other and transverse to the axial line of said neck, gearing on the rear shaft of one of said link members, ratchet mechanism supported by said link member for transmitting motion from said shaft to said forward hinge shaft of said link member, and worm gearing for transmitting motion from said forward hinge shaft to said tool support and to lock said support when the worm gearing is at rest, substantially as described.

20. In a machine of the nature described, the combination with a head and a neck structure having a neck resting in a horizontal bearing, of supporting mechanism intermediate said head and said neck structure, a tool support hinged to said head on an axis which is transverse to the axial line of said neck, a gear member concentric with said axis, operator-controlled means for securing said gear member to said tool support, and power means combined with said gear member for actuating the latter, substantially as described.

21. In a machine of the nature described, the combination with a head and a neck structure having a neck resting in a horizontal bearing, of supporting mechanism intermediate said head and said neck structure, a tool support hinged to said head on an axis which is transverse to the axial line of said neck, a worm gear member concentric with said axis, operator-controlled means for securing said worm gear member to said tool support, and power means combined with said worm gear member for actuating the latter, substantially as described.

22. In a machine of the nature described, the combination with a head and a neck structure having a neck resting in a horizontal bearing, and a neck-shaft in said neck, of supporting mechanism intermediate said head and said neck structure, a tool

support hinged to said head on an axis which is transverse to the axial line of said neck, a gear member concentric with said axis, operator-controlled means for securing said gear member to said tool support, and power means combined with said neck shaft and with said gear member for actuating the latter, substantially as described.

23. In a machine of the nature described, the combination with a head and a neck structure having a neck resting in a horizontal bearing, of supporting mechanism intermediate said head and said neck structure, a tool support hinged to said head on an axis which is transverse to the axial line of said neck, a gear member concentric with said axis, operator-controlled means for securing said gear member to said tool support, gearing located on one of the forward parallel link shafts and engaging said gear member, and power means combined with said shaft for actuating the latter, substantially as described.

24. In a machine of the nature described, the combination with a head and a tool support hinged to each other on an axial line which is transverse to the length of the machine, operator-controlled gearing for slowly turning said tool support on said axial line, and detachable means for securing the tool support to a member of said gearing, substantially as described.

25. In a machine of the nature described, the combination with a neck structure having a neck resting in a horizontal bearing, of a head and a tool support and a shaft which is transverse to the axial line of said neck, said head having a bearing surrounding said shaft and having a cap plate on which is a bearing also surrounding said shaft, and said tool support having a bearing surrounding the bearing on said head and said tool support having a cap which has a bearing surrounding the bearing of the cap plate of the head, and operator-controlled means for turning said tool support, substantially as described.

26. In a machine of the nature described, the combination with a neck structure having a neck resting in a horizontal bearing, of a head and a tool support and a shaft which is transverse to the axial line of said neck, said head having a bearing surrounding said shaft and having a cap plate on which is a bearing also surrounding said shaft, and said tool support having a bearing surrounding the bearing on said head and said tool support having a cap which has a bearing surrounding the bearing of the cap plate of the head, a gear member concentric with the axis of the tool support, and operator-controlled means for turning said gear member for turning the tool support, substantially as described.

27. In a machine of the nature described, the combination with a neck structure having a neck resting in a horizontal bearing, of a head and a tool support and a shaft which is transverse to the axial line of said neck, said head having a bearing surrounding said shaft and having a cap plate on which is a bearing also surrounding said shaft, and said tool support having a bearing surrounding the bearing on said head and said tool support having a cap which has a bearing surrounding the bearing of the cap plate of the head, a gear member loosely surrounding the bearing on the tool support, and operator-controlled means for turning said tool support, substantially as described.

28. In a machine of the nature described, the combination with a neck structure having a neck resting in a horizontal bearing, of a head and a tool support and a shaft which is transverse to the axial line of said neck, said head having a bearing surrounding said shaft and having a cap plate on which is a bearing also surrounding said shaft and said tool support having a bearing surrounding the bearing on said head and said tool support having a cap which has a bearing surrounding the bearing of the cap plate of the head, a gear member loosely surrounding the bearing on the tool support, a supporting plate secured to said bearing, operator-controlled means for joining said gear member to said tool support, substantially as described.

29. In a machine of the nature described, the combination with a head and a tool support hinged to said head on a line which is perpendicular to the length of the machine, of a gear member journaled on the axis of said hinge, power means for turning said gear member, and latch mechanism supported by the tool support for temporarily making engagement between the tool support and said gear member, substantially as described.

30. In a machine of the nature described, the combination with a head and a tool support hinged to said head on a line which is perpendicular to the length of the machine, of a gear member journaled on the axis of said hinge, power means for turning said hinge member, and latch mechanism supported by the tool support for temporarily making engagement between the tool support and said gear member, said latch mechanism comprising a tongue and a handle, substantially as described.

31. In a machine of the nature described, the combination with a head and means for supporting the head, said head having bearings on an axial line which is transverse to the length of the machine, of a transverse shaft resting in said bearings, a tool support comprising a cap plate pivotally surrounding one of said bearings and a part

of the body of said support pivotally surrounding the other of said bearings, transmission mechanism support on said head for rotating said shaft, an elongated cutting tool supported on said tool support, and means operatively connecting said transverse shaft and the cutting tool, substantially as described.

32. In a machine of the nature described, the combination with a head, a tool support hinged to the head on an axial line which is transverse to the length of the machine, of a cap secured to said support and forming a part of the hinge, a cutter chain supporting body secured for endwise adjustment on said cap, a driven shaft on said axial line, a wheel on said shaft, and a cutter chain on said wheel and said chain supporting body, substantially as described.

33. In a machine of the nature described, the combination with a head and a tool support hinged to said head on a line which is perpendicular to the length of the machine, of a gear member journaled on the axis of said hinge and having radial faces positioned to be engaged by a latch mechanism, power means for turning said gear member, and latch mechanism supported by the tool support and adapted to make temporary engagement with the radial faces on said gear member, substantially as described.

34. In a machine of the nature described, the combination with a head and a tool support hinged to said head on a line which is perpendicular to the length of the machine, of a toothed gear wheel rotatable on said hinge line, power means for turning said gear wheel, and latch mechanism supported by the tool support for temporarily making engagement between the tool support and the teeth of said gear wheel, substantially as described.

35. In a machine of the nature described, the combination with a head and means for supporting the head, said head having bearings on an axial line which is transverse to the length of the machine, of a transverse shaft resting in said bearings, a tool support comprising a cap plate pivotally surrounding one of said bearings and a part of the body of said support pivotally surrounding the other of said bearings, transmission mechanism supported on said head for rotating said shaft, a cutter chain supporting body seated on the tool support, a sprocket wheel on said shaft in alignment with said chain supporting body, and a cutter chain applied to said chain supporting body and said sprocket wheel, substantially as described.

36. In a machine of the nature described, the combination with a head and means for supporting the head, said head comprising a cap member having a bearing on an axial line which is transverse to the length of the machine and said head having a bearing on said line, of a transverse shaft resting in said bearings, a tool support comprising a cap plate pivotally surrounding one of said bearings and a part of the body of said support pivotally surrounding the other of said bearings, and a longitudinal shaft in a bearing formed between the cap member and the main part of said head, gearing intervening said longitudinal shaft and said transverse shaft, a cutter chain supporting body seated on the tool support, a sprocket wheel on said transverse shaft in alignment with said chain supporting body, and a cutter chain applied to said chain supporting body and said sprocket wheel, substantially as described.

37. In a machine of the nature described, the combination of a head having at each of two opposite sides a bearing on the same transverse axial line, a tool support having a tubular neck surrounding one of said bearings and said support comprising a cap plate surrounding the other of said bearings, a shaft resting in the bearings of said head, transmission mechanism for rotating said shaft, a wheel on one end of said shaft, a chain support supported on said tool support, and a cutter chain supported on said chain support and said wheel, substantially as described.

38. In a machine of the nature described, the combination of a head having two bearings on a transverse axial line, a tool support having a tubular neck surrounding one of said bearings and said support comprising a cap plate surrounding the other of said bearings, a transverse shaft resting in the bearings of said head, transmission mechanism for rotating said shaft, a sprocket wheel on the upper end of said shaft, a cutter chain support on said tool support, a cutter chain supported on said chain support and said sprocket wheel, and a gear wheel loosely surrounding the neck of the tool support bearing which is the farther from the sprocket wheel, means for holding said gear wheel from moving away from the tool support, and means for making engagement between said gear wheel and the tool support to compel said members to move in unison, substantially as described.

39. In a machine of the nature described, the combination of a head having two bearings on the same axial line and one of said bearings being directed upward and the other downward, a tool support having a tubular neck surrounding the lower of said bearings and said support comprising a cap plate surrounding the upper of said bearings, a shaft resting in the bearings of said head, transmission mechanism for rotating said shaft, a sprocket wheel on the upper end of said shaft, a chain support on said tool support, a cutter chain supported on

said chain support and said sprocket wheel, a gear wheel rotatably mounted on the tool support, and latch mechanism supported by the tool support and engaging the teeth of said gear wheel, substantially as described.

40. In a machine of the nature described, the combination of a cutting mechanism supporting means having a neck seated rotatably in a bearing, an elongated cutting mechanism hinged to said support to permit movement of said mechanism toward and from the axial line of said neck parallel to said line and to swing in a plane which is parallel to said line, operator-controlled, power-actuated yielding transmission mechanism for slowly swinging said cutting mechanism in said plane, and a neck shaft extending through said neck and arranged in operative relation with the cutting mechanism for actuating said cutting mechanism, substantially as described.

41. In a machine of the nature described, the combination of a cutting mechanism supporting means having a neck seated rotatably in a bearing, an elongated cutting mechanism hinged to said support to permit movement of said mechanism toward and from the axial line of said neck parallel to said line and to swing in a plane which is parallel to said line, operator-controlled, power-actuated yielding transmission mechanism for slowly swinging said cutting mechanism in said plane, means for rotating said neck, and transmission means extending through said neck for actuating said cutting mechanism, substantially as described.

42. In a machine of the nature described, the combination of a cutting mechanism supporting means having a neck seated rotatably in a bearing, an elongated cutting mechanism hinged to said support to permit movement of said mechanism toward and from the axial line of said neck parallel to said line and to swing in a plane which is parallel to said line, operator-controlled, power-actuated yielding transmission mechanism for slowly swinging said cutting mechanism in said plane, means for rotating said neck, and a neck shaft extending through said neck and arranged in operative relation with the cutting mechanism for actuating said cutting mechanism, substantially as described.

43. In a machine of the nature described, the combination of a cutting tool, a group of members supporting said tool, said group being supported for rotation on the machine on a horizontal axial line and said group being foldable on three hinge lines which are between said tool and the attachment of said group of supporting members to the machine, two of said hinge lines being parallel to each other and transverse to said axial line and the other of said hinge lines being transverse to said two hinge lines and perpendicular to said axial line, whereby, by the folding and unfolding of said members on the first two hinge lines said tool is carried bodily by a parallel movement toward and from said axial line and whereby, by the folding and unfolding of said members on the third of said hinge lines the cutting tool is swung in a plane which is parallel to said axial line, operator-controlled means carried by said group to effect folding on said two hinge lines, operator-controlled, power-actuated yielding means to effect folding on said third hinge line, and means for actuating said cutting tool, substantially as described.

44. In a machine of the nature described, the combination of a cutting tool, a group of members supporting said tool, said group being supported for rotation on the machine on a horizontal axial line and said group being foldable on three hinge lines which are between said tool and the attachment of said group of supporting members to the machine, two of said hinge lines being parallel to each other and transverse to said axial line and the other of said hinge lines being transverse to said two hinge lines, and perpendicular to said axial line, whereby, by the folding and unfolding of said members on the first two hinge lines said tool is carried bodily by a parallel movement toward and from said axial line, and whereby, by the folding and unfolding of said members on the third of said hinge lines the cutting tool is swung in a plane which is parallel to said axial line, operator-controlled means carried by said group to effect folding on said two hinge lines, operator-controlled power-actuated yielding means to effect folding on said third hinge line, and means extending along said axial line for actuating said cutting tool, substantially as described.

45. In a machine of the nature described, the combination of a cutting tool, a group of members supporting said tool, said group being supported for rotation on the machine on a horizontal axial line and said group being foldable on three lines which are between said tool and the attachment to the machine, two of said lines being transverse to said axial line and the other of said hinge lines being transverse to said two hinge lines and perpendicular to said axial line, whereby, by the folding and unfolding of said members on the first two hinge lines said tool is carried bodily by a parallel movement toward and from said axial line and, whereby, by the folding and unfolding of said members on the third of said hinge lines the cutting tool is swung in a plane which is parallel to said axial line, operator-controlled means carried by said group to effect folding on said two hinge lines and operator-

controlled, power-actuated yielding means to effect folding on said third hinge line, and means for actuating said cutting tool, substantially as described.

46. In a machine of the nature described, the combination of a rotatable neck which is in a bearing which is fixed relative to the machine body and is horizontal and parallel to the machine path, operator-controlled, power-driven means for actuating said neck, an elongated cutting tool, and members supported by said neck and supporting said cutting tool parallel to the neck axis and for bodily movement toward and from the axial line of the neck and for swinging in a plane which is parallel to said axis, operator-controlled, power-actuated yielding mechanism for swinging said cutting tool in said plane, and a neck shaft in said neck, and means operatively connecting said neck shaft and said cutting tool for actuating said cutting tool for cutting, substantially as described.

47. In a machine of the nature described, the combination of a rotatable neck which is in a bearing which is fixed relative to the machine body and is horizontal and parallel to the machine path, operator-controlled, power-driven means for actuating said neck, a cutting tool, articulated members supported on said neck and having hinge lines extending in diverse directions and said members being adapted to support the cutting tool at varying distances from the axial line of the neck and to swing the tool in a plane which is parallel to said axis, operator-controlled, power-actuated yielding mechanism for swinging said tool in said plane whereby the cutting tool may be carried through an orbital path by the rotation of said neck and the radius of said orbital path may be varied by varying the distance at which said members support said tool from the axial line of the neck and said tool may be held in a line which is parallel to or transverse to the neck axis, a neck shaft in said neck, and means operatively connecting said shaft and the cutting tool for actuating said tool, substantially as described.

48. In a machine of the nature described, the combination of a rotatable neck which is in a bearing which is fixed relative to the machine body and is horizontal and parallel to the machine path, a cutting tool, link-form members supporting said tool on said neck for movement on the neck toward and from the axial line of the neck and for swinging the tool on an axis line which is forward of the neck and perpendicular to the neck axis, operator-controlled, power-driven transmission mechanism for effecting said movements, a part of said transmission mechanism being yielding, and means for actuating said cutting tool, substantially as described.

49. In a machine of the nature described, the combination of a rotatable neck which is horizontal and parallel to the machine path, a cutting tool, members supporting said tool on said neck for movement obliquely toward and from the axial line of the neck and for swinging the tool on an axis which is forward of the neck and perpendicular to the neck axis, operator-controlled, power-driven transmission mechanisms for effecting said movements, one of said transmission mechanisms being yielding, and means for actuating said cutting tool, substantially as described.

50. In a machine of the nature described, the combination of a rotatable neck which is horizontal and parallel to the machine path, a cutting tool, members supporting said tool on said neck for movement obliquely toward and from the axial line of the neck and for swinging the tool on an axis which is forward of the neck and perpendicular to the neck axis, operator-controlled, power-driven transmission mechanism for effecting said movements, the transmission mechanism for swinging the tool being yielding, and means for actuating said cutting tool, substantially as described.

51. In a machine of the nature described, the combination of a rotatable neck which is horizontal and parallel to the machine path, a cutting tool, link-form members supported by said neck and supporting said cutting tool for movement on the neck toward and from the axial line of the neck and for swinging the tool in a plane which is parallel to said axis, operator-controlled, power-driven transmission mechanisms for effecting said movements, and the transmission mechanism for swinging the tool being yielding, and means for actuating said tool for cutting, substantially as described.

52. In a machine of the nature described, the combination of a rotatable neck which is horizontal and parallel to the machine path, a cutting tool, link-form members supported by said neck and supporting said cutting tool for movement on the neck toward and from the axial line of the neck and for swinging in a plane which is parallel to said axis, operator-controlled, power-actuated yielding transmission mechanism for swinging the cutting tool in said plane, a neck shaft in said neck, and means operatively connecting said neck shaft and said cutting tool for actuating the latter, substantially as described.

53. In a machine of the nature described, the combination of a tool support rotatable on a horizontal axis, operator-controlled, power-driven mechanism for effecting rotation of said support, a cutting tool, a plu-

rality of articulated members supporting said tool on said support for movement toward and from the axial line of said support and for swinging the tool in a plane parallel to said axial line, operator-controlled, power-actuated yielding transmission mechanism for swinging the cutting tool in said plane, and means for actuating said cutting tool, substantially as described.

54. In a machine of the nature described, the combination of a tool support rotatable on a horizontal axis which is fixed relative to the body of the machine, operator-controlled, power-driven mechanism for effecting rotation of said support, a cutting tool, members supporting said tool on said support for movement toward and from the axial line of said support and for swinging the tool in a plane parallel to said axial line, operator-controlled, power-actuated yielding transmission mechanism for swinging the cutting tool in said plane, and means extending through and along the axis of said support for actuating said cutting tool, substantially as described.

55. In a machine of the nature described, the combination of a rotatable neck which is horizontal and parallel to the machine path, means for actuating said neck, a cutting tool, link-form members supporting said tool on said neck for movement on the neck toward and from the axial line of the neck and for swinging the tool on an axis which is forward of the neck and perpendicular to the neck axis, operator-controlled, power-actuated yielding transmission mechanism for swinging the cutting tool in said plane, and means for actuating said cutting tool, substantially as described.

56. In a machine of the nature described, the combination of a rotatable neck which is horizontal and parallel to the machine path, means for actuating said neck, a cutting tool, members supporting said tool on said neck for movement obliquely toward and from the axial line of the neck and for swinging the tool on an axis which is forward of the neck and perpendicular to the neck axis, operator-controlled, power-actuated yielding transmission mechanism for swinging the cutting tool in said plane, and means for actuating said cutting tool, substantially as described.

57. In a machine of the nature described, the combination of a tool support rotatable on a horizontal axis, mechanism for effecting rotation of said support, a cutting tool, members supporting said tool on said support for movement toward and from the axial line of said support for swinging the tool in a plane parallel to said axial line, mechanisms on said rotatable support for actuating said supporting members for moving said tool toward and from the axial line of the rotary support and operator-controlled, power-driven, yielding transmission mechanism for swinging the tool in a plane parallel to said axial line, and means for actuating said cutting tool, substantially as described.

58. In a machine of the nature described, the combination of a rotary neck resting in a horizontal bearing, parallel links supported by said neck, a head block coupled to the outer ends of said links, an elongated cutting tool hinged to said block on an axial line which is perpendicular to the axial line of said neck, means for turning said neck, means for actuating said parallel links, operator-controlled, power-driven, yielding means for turning said tool on said perpendicular hinge, and means for actuating said cutting tool for cutting, substantially as described.

59. In a machine of the nature described, the combination of a rotary body, an elongated cutting tool, means intervening said supporting body and the cutting tool for carrying the cutting tool parallel to said axial line for orbital movement around said line and from and toward and into said line and for yieldingly swinging the tool in a plane parallel to the axial line of the rotary body, substantially as described.

60. In a machine of the nature described, the combination of a rotary supporting body on an axial line which is approximately co-incident with the longitudinal center line of the machine, an elongated cutting tool carried parallel to said axial line for orbital movement around said line and from and toward and into said line and to yieldingly swing in a plane which is parallel to said axial line, substantially as described.

61. In a machine of the nature described, the combination of a rotary supporting body, an elongated cutting tool, means intervening said supporting body and said cutting tool for carrying the latter for orbital movement around said line and from and toward and into said line and to yieldingly swing in planes parallel to the axial line of said supporting body, substantially as described.

62. In a machine of the nature described, the combination of a rotatable support which is horizontal and parallel to the machine path, an elongated cutting tool, members supported by said support and supporting said cutting tool for movement from and toward and into the axial line of the rotatable support and for swinging the tool in a plane which is parallel to said axis, operator-controlled, power-driven, yielding means for effecting said swinging movement, and means for actuating said tool for cutting, substantially as described.

63. In a machine of the nature described, the combination of an elongated cutting

tool, means for supporting said tool parallel to the machine path and to carry said tool in such parallel relation through orbital paths which are concentric to the middle longitudinal line of the machine and which range in diameter from zero to the largest, which is of larger diameter than the transverse dimensions of the machine, and to yieldingly swing said tool in planes which are parallel to the axial line of the orbital paths, and means for actuating said cutting tool for cutting, substantially as described.

In testimony whereof I have signed my name this 9th day of July, in the year one thousand nine hundred and nineteen.

CYRUS S. OLDROYD.