

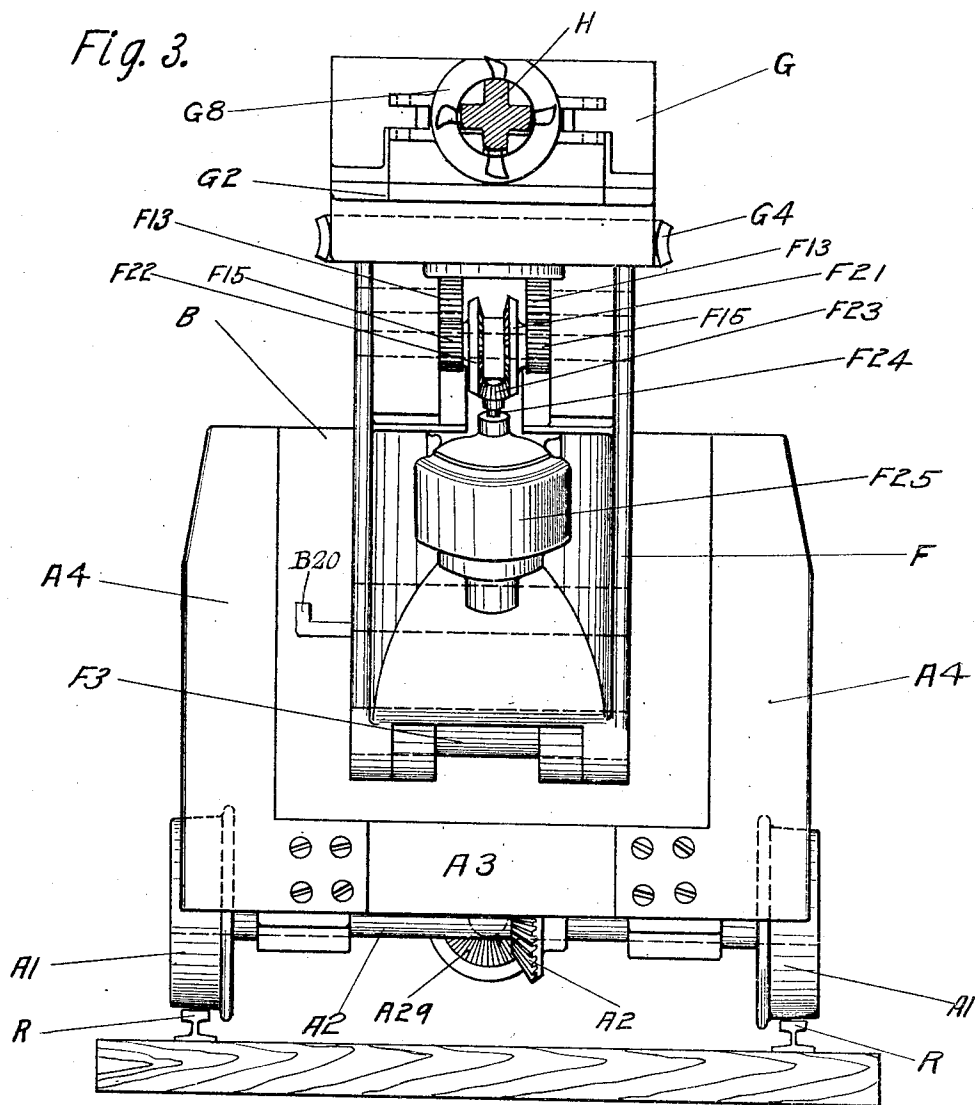
June 26, 1923.

C. S. OLDROYD

1,460,073

MINING AND QUARRYING MACHINE

Original Filed May 3, 1917 15 sheets-sheet 2



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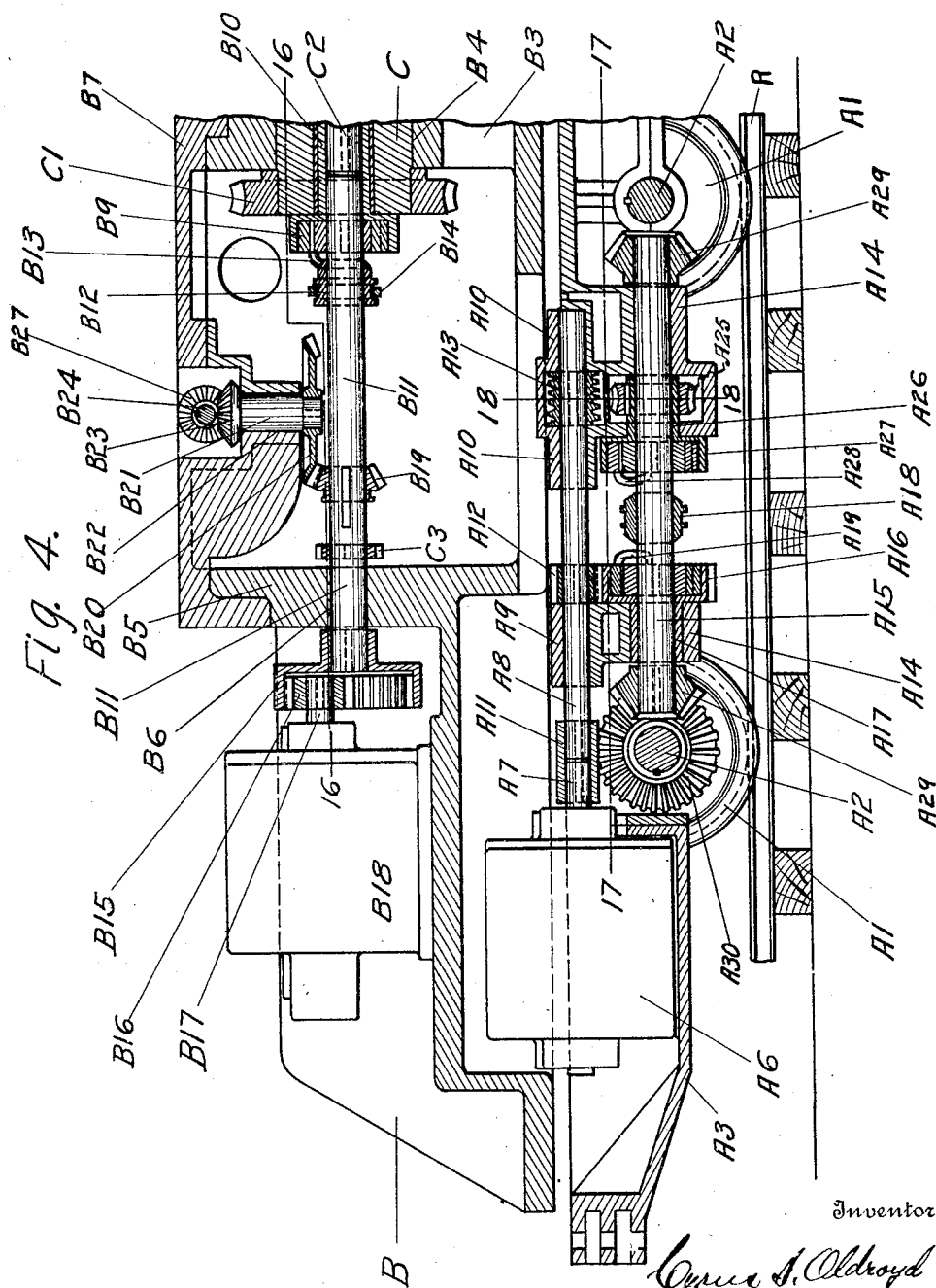
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MINING AND QUARRYING MACHINE

Original Filed May 3, 1917 15 sheets-sheet 3



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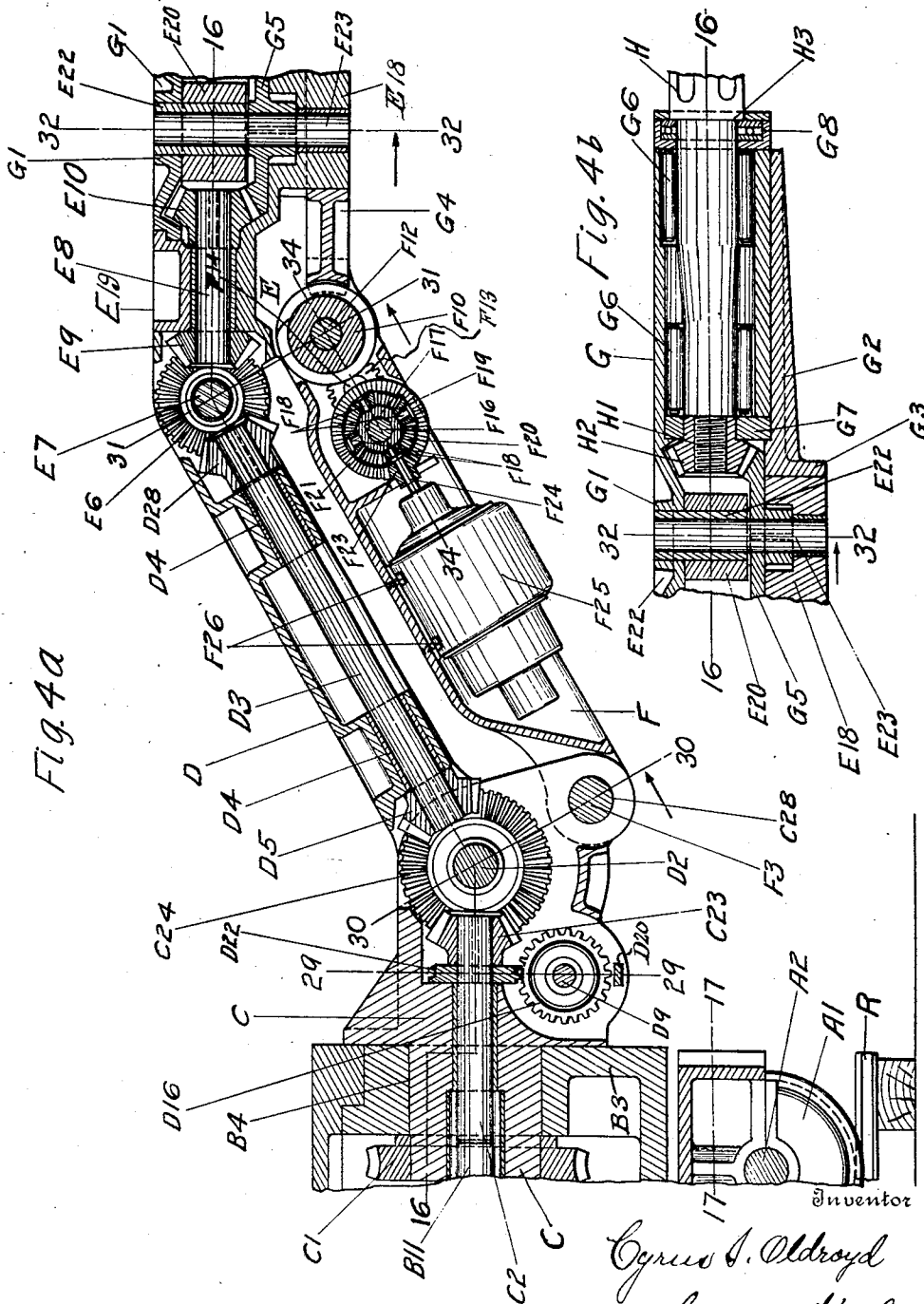
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C. S. OLDROYD

MINING AND QUARRYING MACHINE

Original Filed May 3, 1917

15 sheets-sheet 4



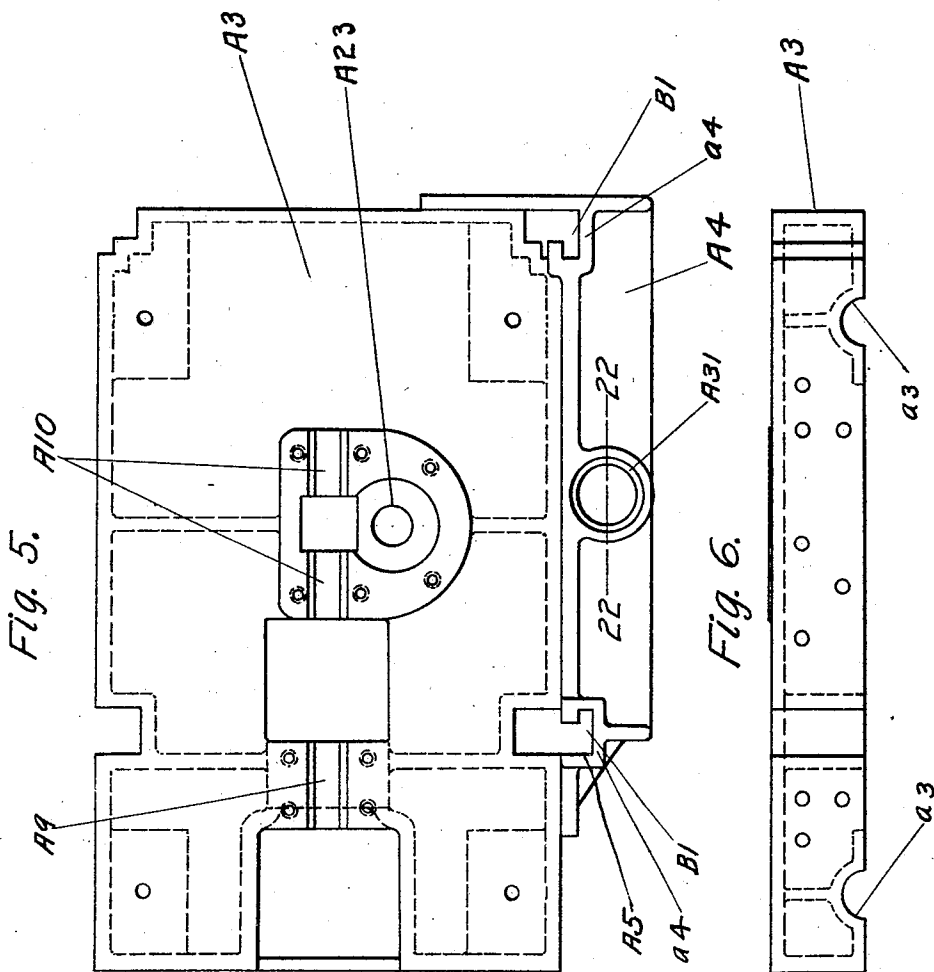
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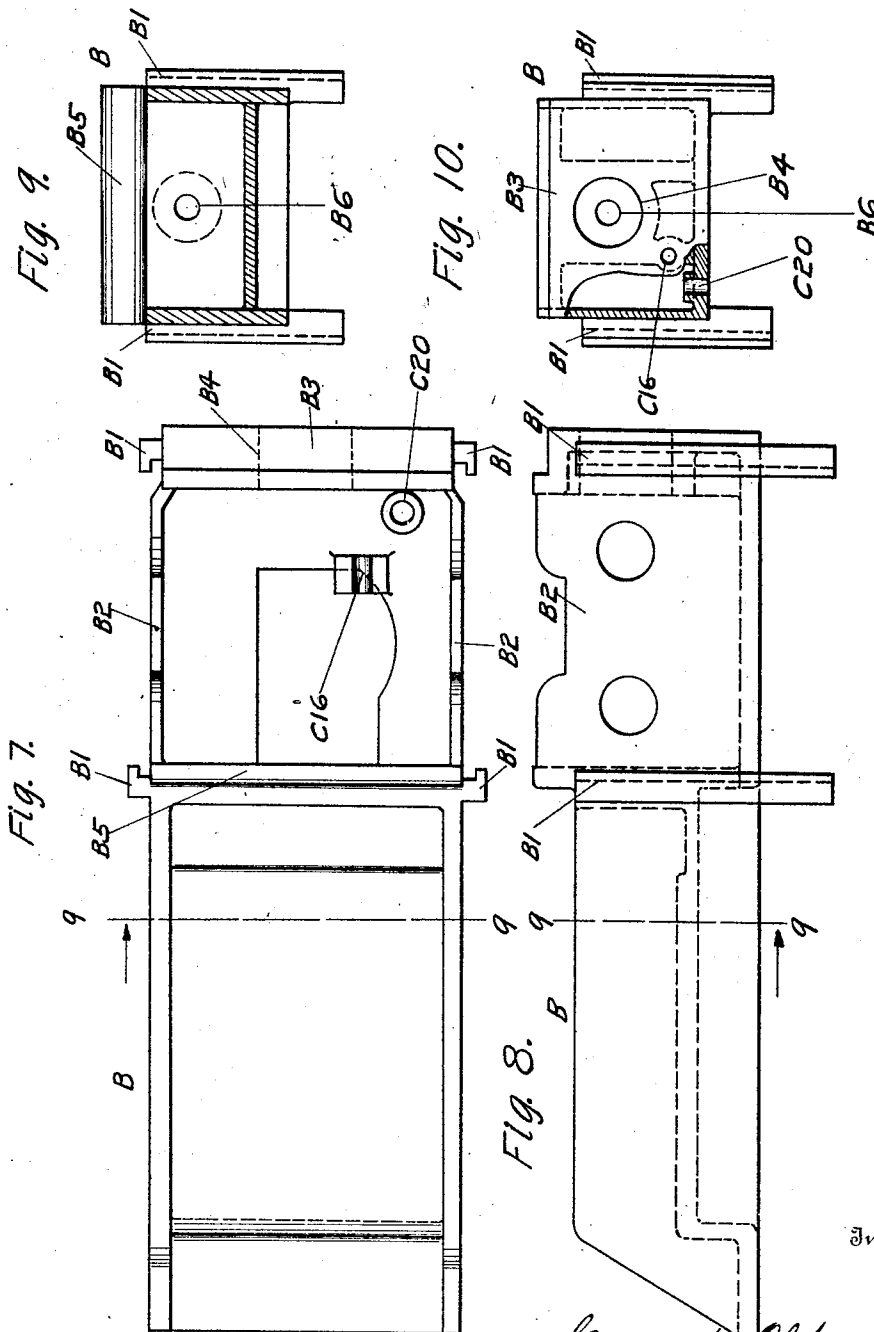
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MINING AND QUARRYING MACHINE

Original Filed May 3, 1917 · 15 sheets-sheet 6



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MINING AND QUARRYING MACHINE

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15 sheets-sheet 7

Fig. 11

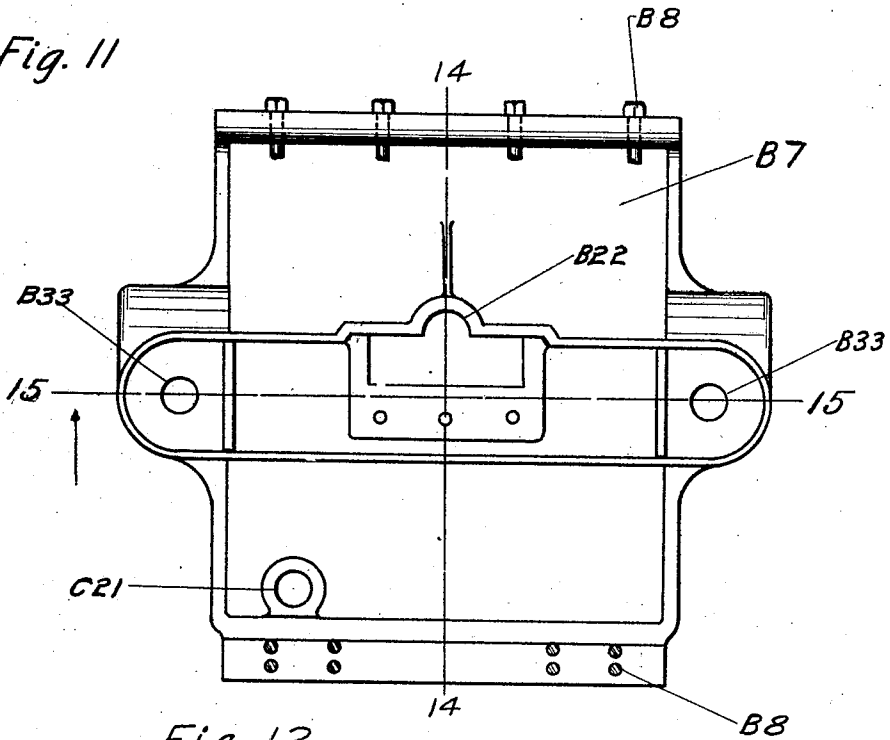


Fig. 12.

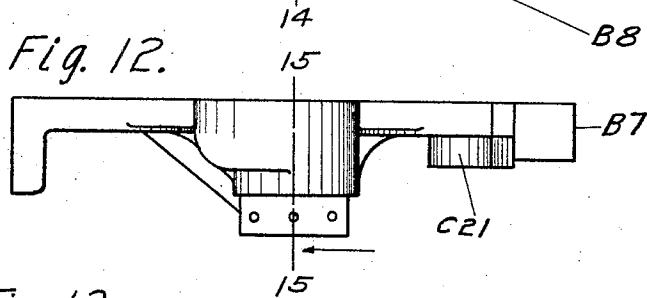
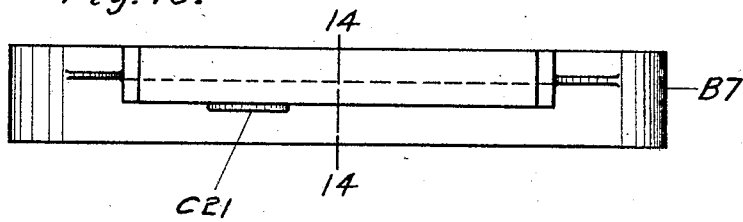


Fig. 13.



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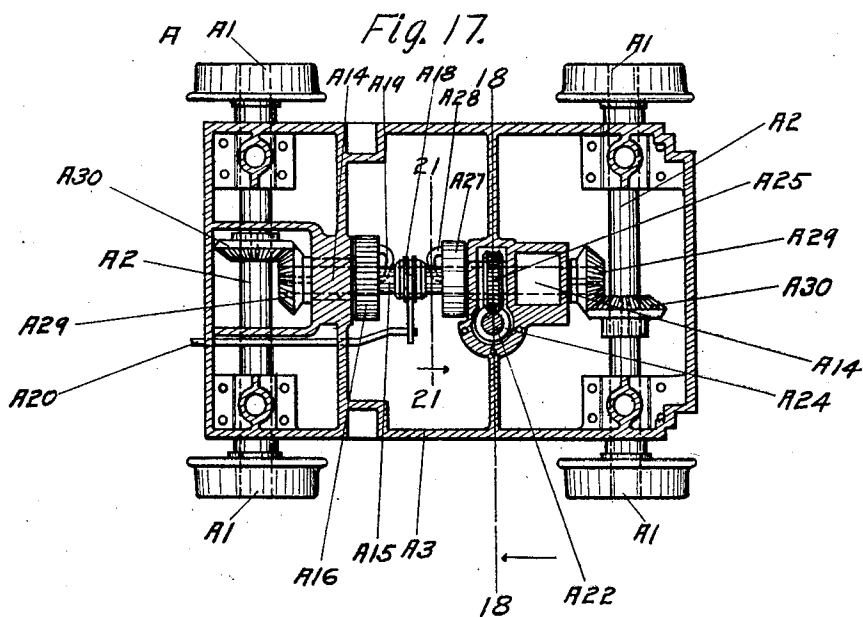
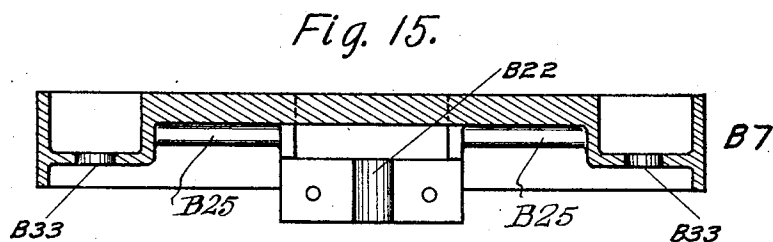
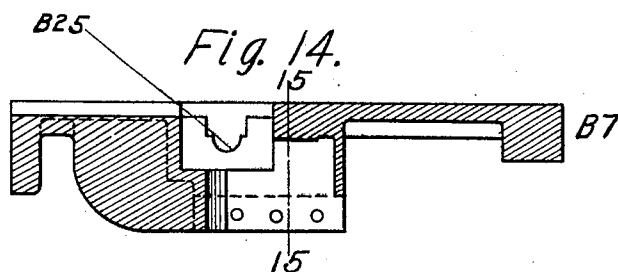
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MINING AND QUARRYING MACHINE

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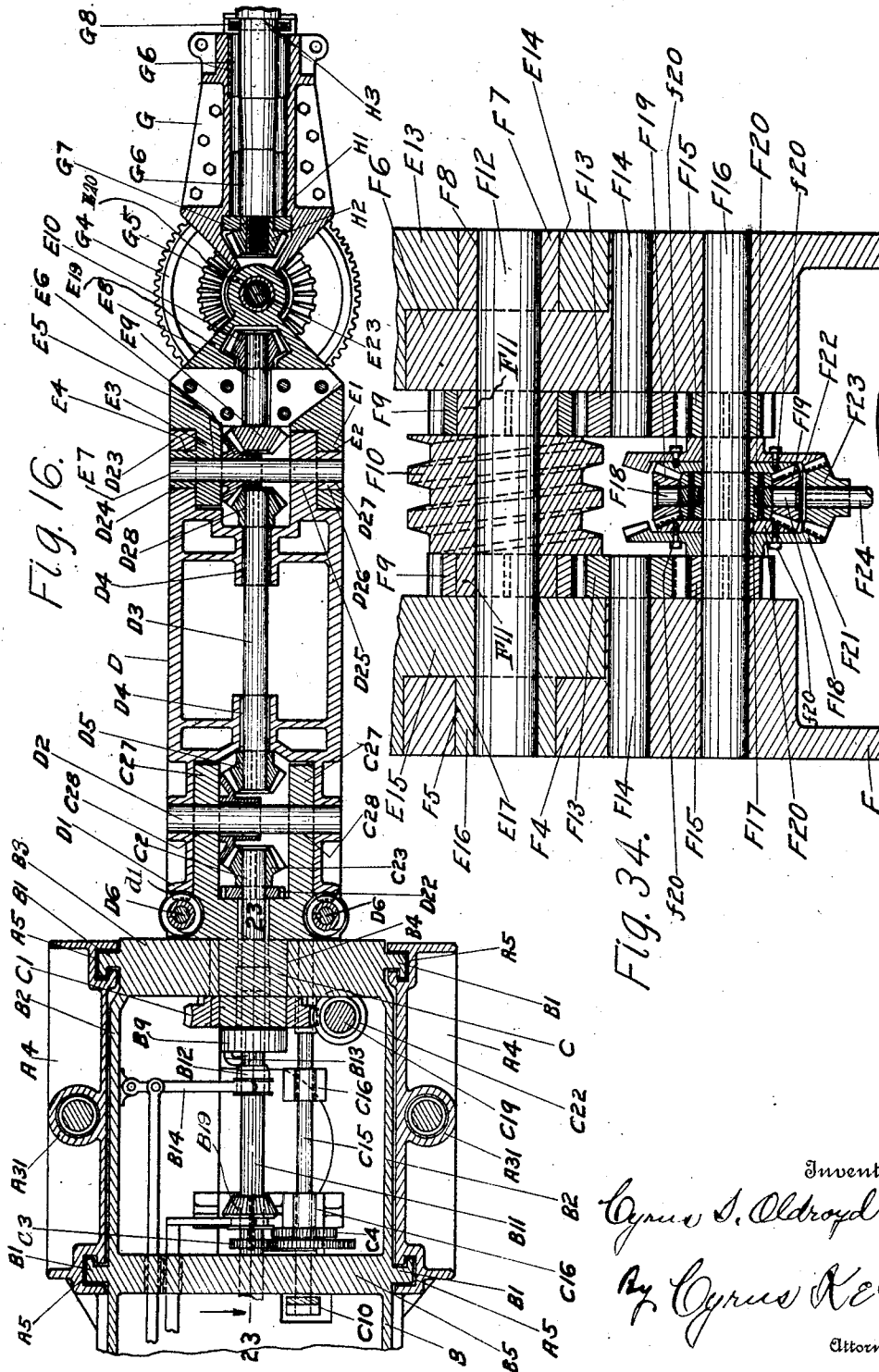
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Original Filed May 3, 1917

15 sheets-sheet 9



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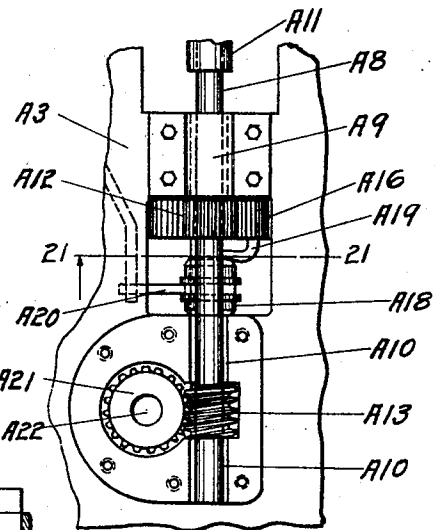
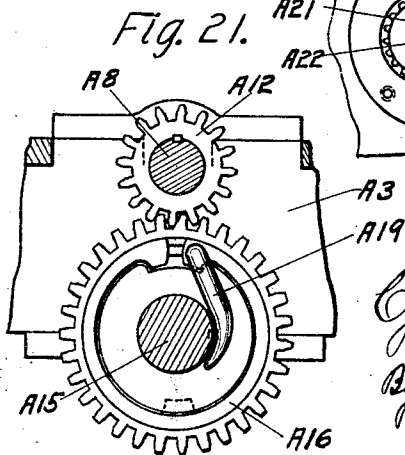
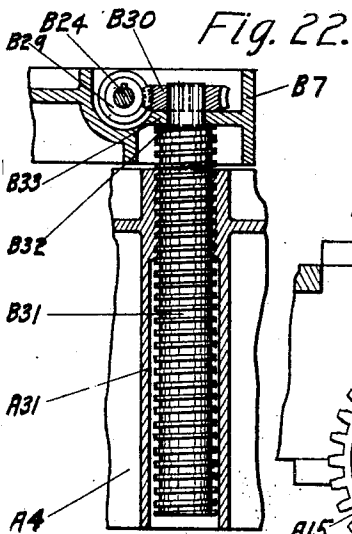
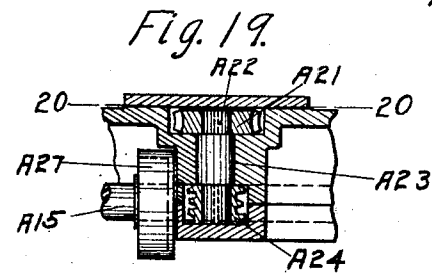
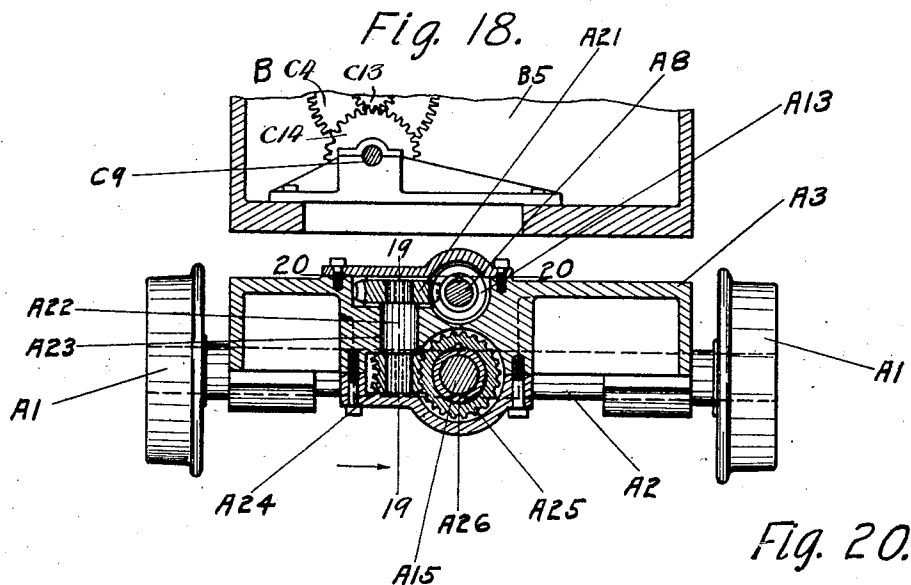
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MINING AND QUARRYING MACHINE

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MINING AND QUARRYING MACHINE

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Fig. 24.

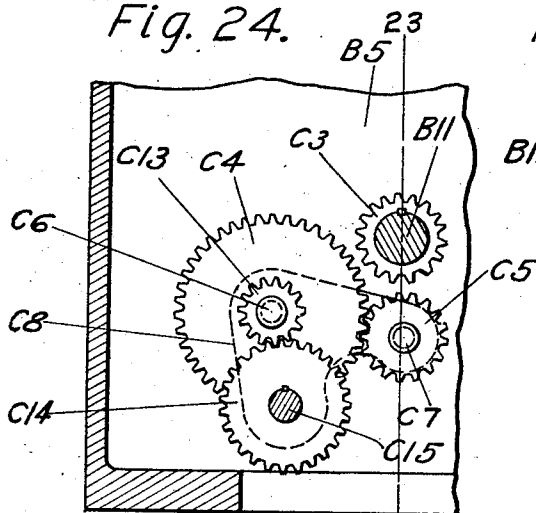


Fig. 25.

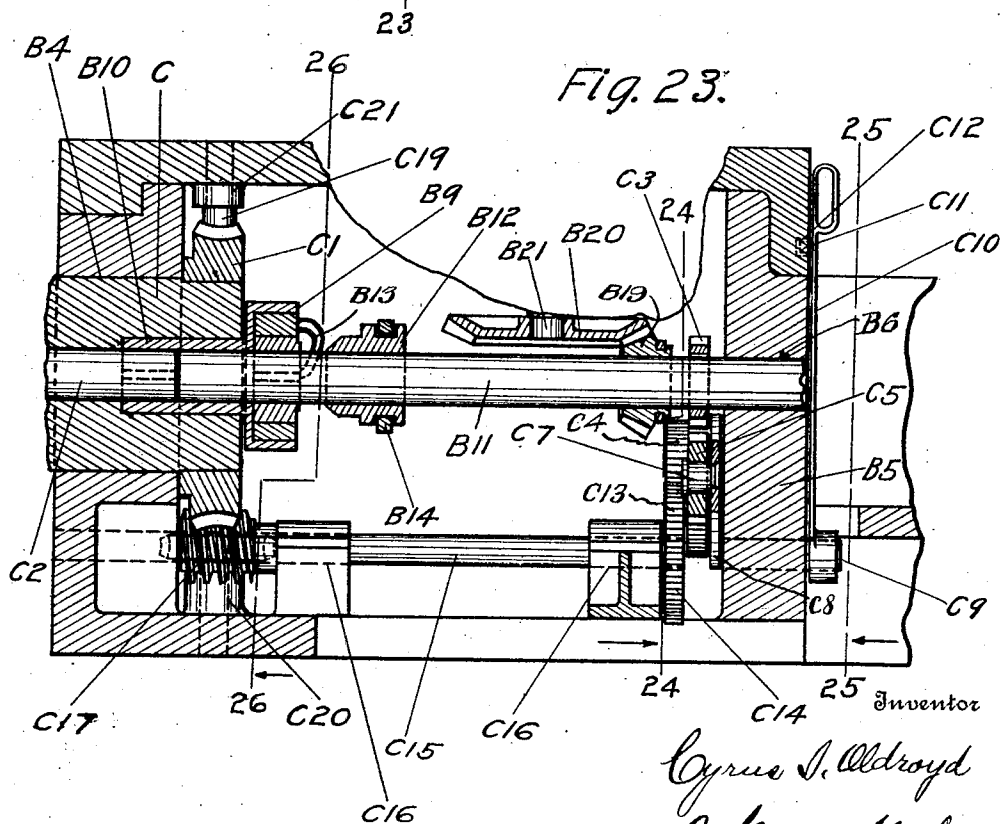
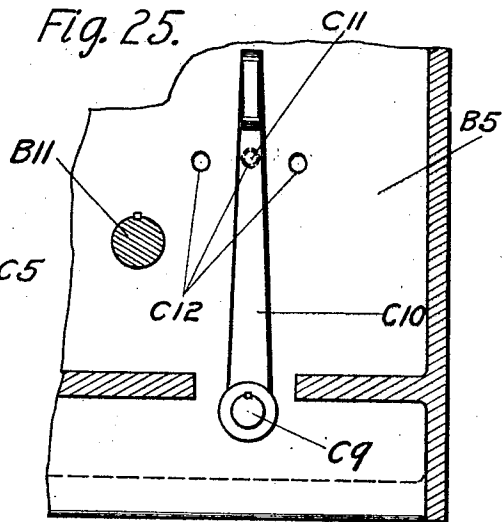


Fig. 23.

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Fig. 26.

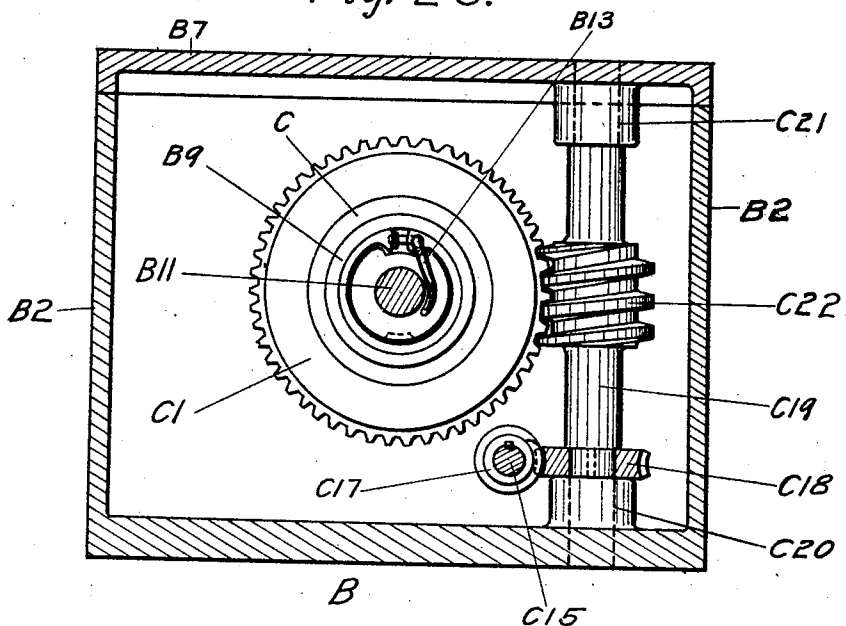
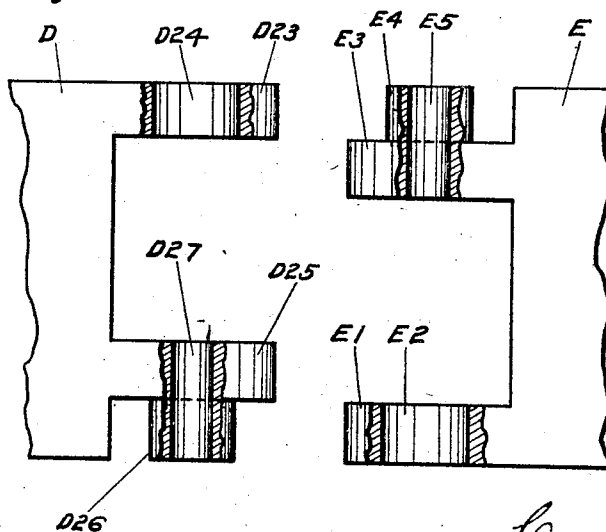


Fig. 35.



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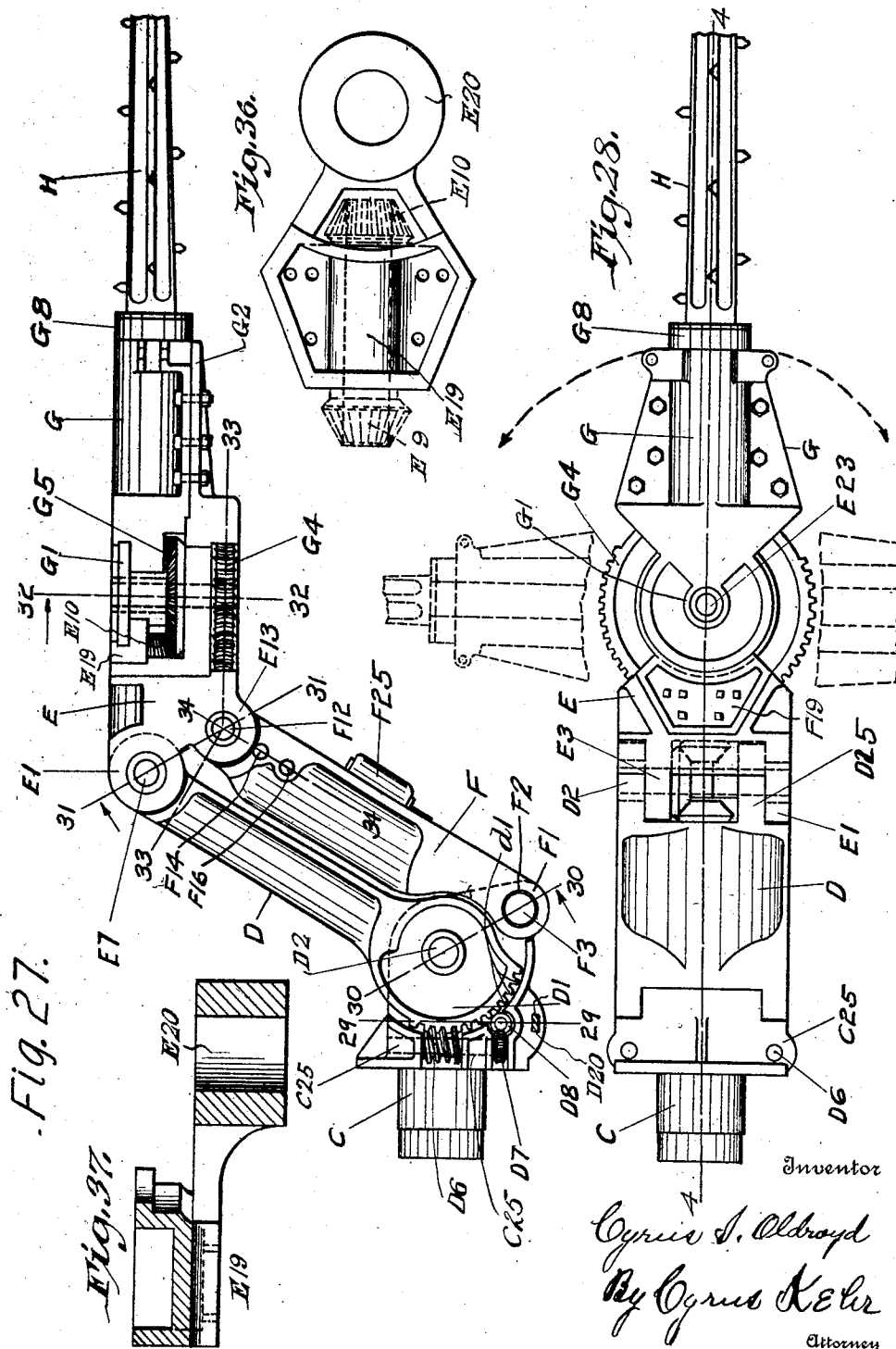
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C. S. OLDROYD

MINING AND QUARRYING MACHINE

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June 26, 1923.

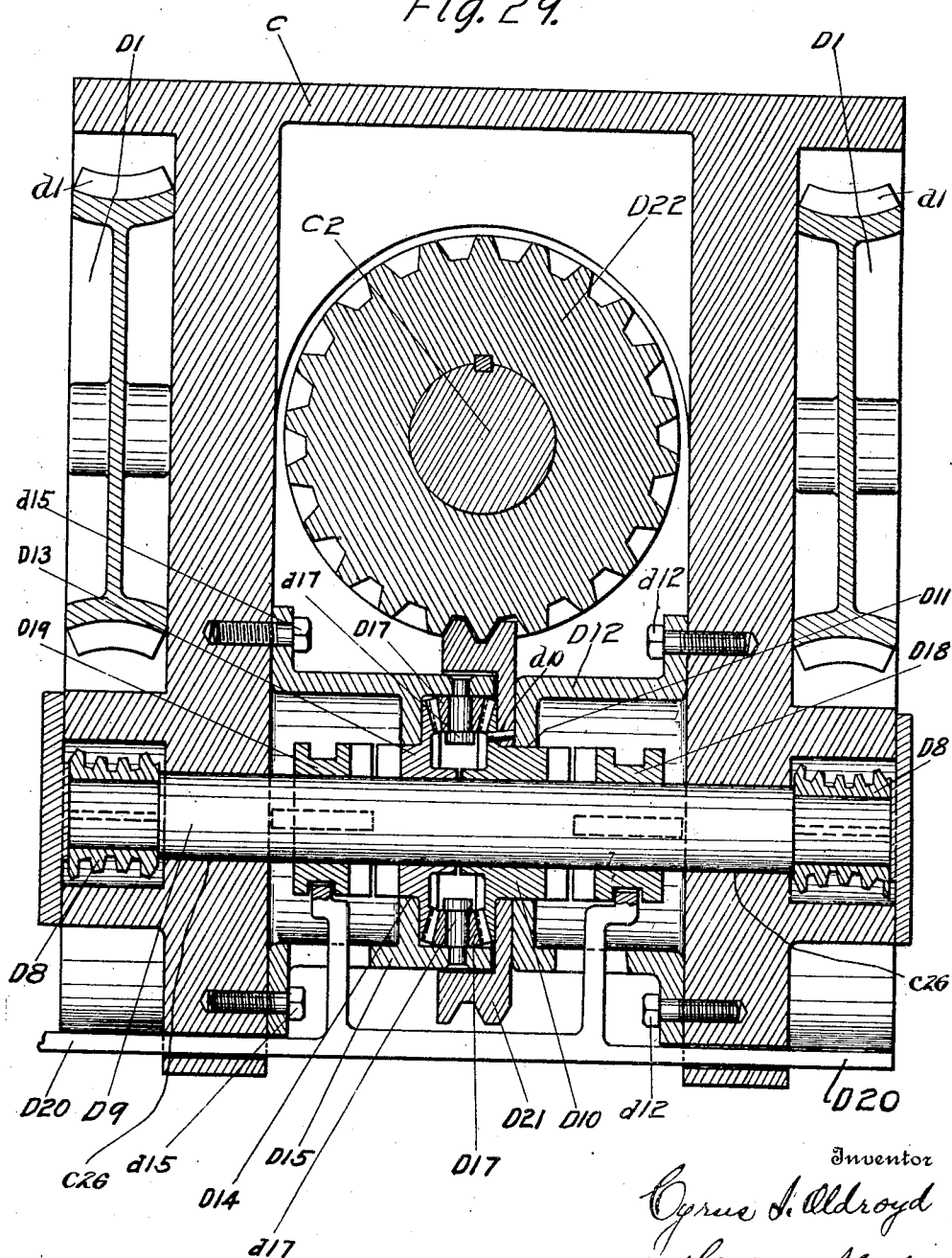
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MINING AND QUARRYING MACHINE

Original Filed May 3, 1917 15 sheets-sheet 14

Fig. 29.



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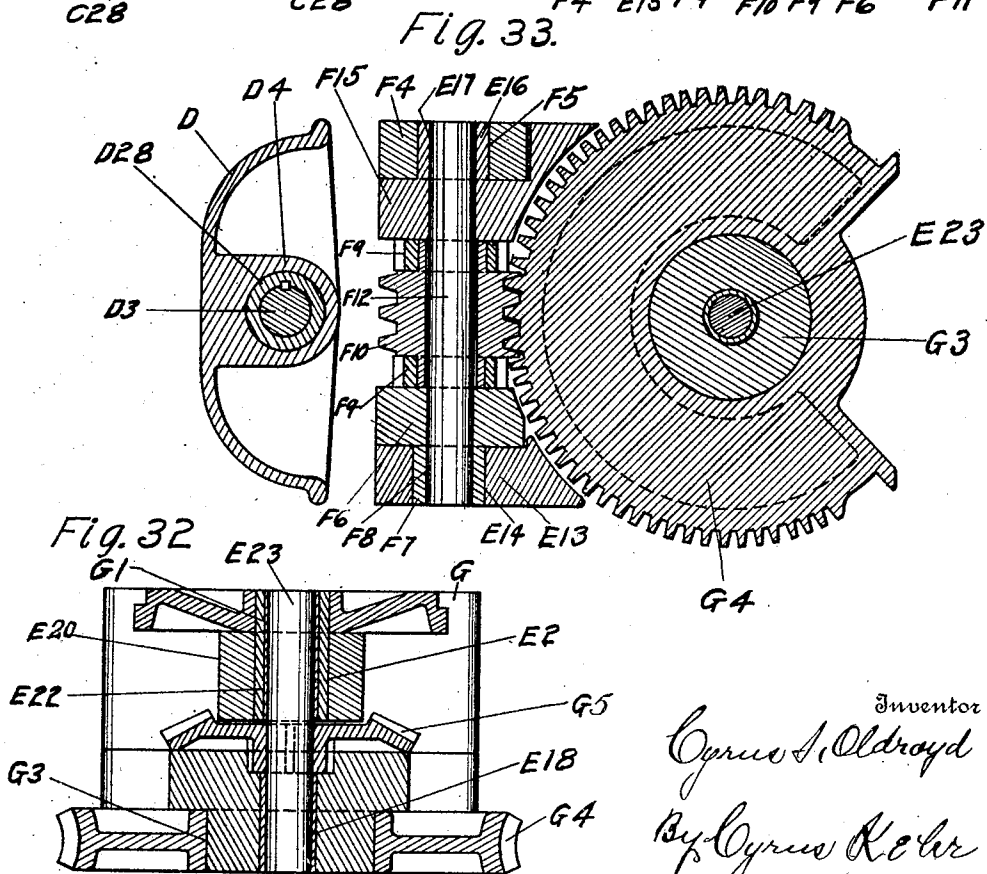
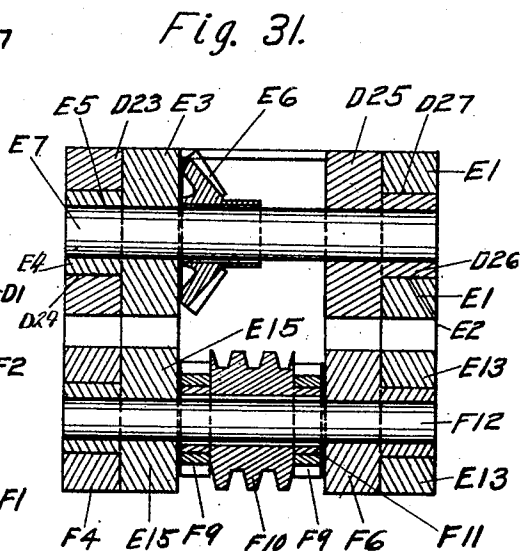
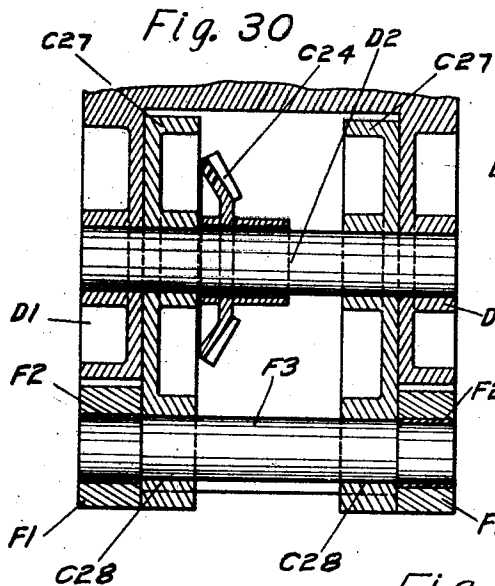
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MINING AND QUARRYING MACHINE

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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 May 3, 1917, Serial No. 166,172. 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 304 Walnut St., 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 machine being, however, adapted to cut in a variety of other ways.

The object of my improvement is to produce a machine by which the cutting means may be made to cut kerfs into the 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 general 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; (5) in a variety of curves, and (6) upright and transverse to the length of the machine.

Another object of the invention is to provide mechanism comprising cutting means which may be lowered below and raised above the level of the track supporting the machine and operated for cutting in such low position, in order that the under-cutting may be at the level of the floor upon which the track rests.

By way of general statement, it may be said that the machine consists of (1) a truck having a rigid frame or body and having supporting or traction wheels adapted to rest on an ordinary rail track or on a floor; (2) a longitudinal body supported by the truck and movable up and down thereon; (3) 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 rails; (4) an inner arm hinged to said neck; (5) a head

hinged to the forward part of said arm; (6) a forward arm hinged to said head; and (7) a cutting mechanism supported by said forward arm, the members supported by said neck being adapted to change position relative to the axis of said neck and thereby change the position of the cutting mechanism relative to said axis, and the rotation of said neck on its axis further changing the position of said cutting mechanism.

The truck, body, neck, inner arm, head, forward arm, and the cutting means being thus related to each other, the cutting means may be put into a variety of positions and through a variety of movements while cutting, as will be hereinafter described.

In the accompanying drawings,

Fig. 1 is an elevation of the right-hand side of a machine embodying my improvement;

Fig. 2 is a plan of the same machine on a smaller scale;

Fig. 3 is a front elevation, the cutting tool being broken away;

Fig. 4, Fig. 4^a, and Fig. 4^b show an enlarged upright section on the line, 4—4, of Fig. 2, looking in the direction of the arrow, Fig. 4 representing the rear portion, Fig. 4^a the intermediate portion, and Fig. 4^b the forward portion of the machine; Fig. 4^a and Fig. 4^b are also taken on the line, 4—4, of Fig. 28;

Fig. 5 is a plan of the truck platform, one of the upright side members being attached to the platform;

Fig. 6 is an elevation of the right-hand side of said platform;

Fig. 7 is a plan of the body of the machine, separated from the truck and other parts;

Fig. 8 is an elevation of the right-hand side of said body;

Fig. 9 is an upright, transverse section on the line, 9—9, of Figs. 7 and 8, looking toward the right;

Fig. 10 is a front elevation of the body shown in Figs. 7 and 8, portions being broken away;

Fig. 11 is a bottom view of the top plate of the body of the machine;

Fig. 12 is an elevation of the right hand edge of said plate;

Fig. 13 is an elevation of the front end of said plate;

Fig. 14 is a longitudinal, upright section on the line, 14—14, of Figs. 11 and 13;

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Fig. 15 is an upright, transverse section on the line, 15—15, of Figs. 11, 12 and 14, looking in the direction of the arrow;

Fig. 16 is a horizontal section on the line, 16—16, of Fig. 4, Fig. 4^a and Fig. 4^b;

Fig. 17 is a horizontal section on the line, 17—17, of Fig. 4 and Fig. 4^a;

Fig. 18 is an upright, transverse section on the line, 18—18, of Fig. 17, looking in the direction of the arrow, a portion of the superposed structure being added;

Fig. 19 is an upright section on the line, 19—19, of Fig. 18, looking in the direction of the arrow;

Fig. 20 is a horizontal section on the line, 20—20, of Figs. 18 and 19, looking downward, more parts being shown than appear in Fig. 19;

Fig. 21 is an upright section on the line, 21—21, of Figs. 17 and 20, looking in the direction of the arrow, the parts being shown to a larger scale;

Fig. 22 is an upright, longitudinal detail section on the line, 22—22, of Figs. 2 and 5, showing a screw and worm gear mechanism for raising the body of the machine on the truck;

Fig. 23 is a section on the line, 23—23, of Fig. 16, looking in the direction of the arrow, the scale being larger;

Fig. 24 is a section on the line, 24—24, of Fig. 23, looking in the direction of the arrow;

Fig. 25 is a section on the line, 25—25, of Fig. 23, looking in the direction of the arrow;

Fig. 26 is a section on the line, 26—26, of Fig. 23, looking in the direction of the arrow;

Fig. 27 is a side elevation of the forward portion of the machine, detached from the body;

Fig. 28 is a plan of the same mechanism;

Fig. 29 is a section on the line, 29—29, of Fig. 4^a and Fig. 27, looking toward the right;

Fig. 30 is a section on the line, 30—30, of Fig. 4^a and Fig. 27, looking in the direction of the arrow;

Fig. 31 is a section on the line, 31—31, of Fig. 4^a and Fig. 27, looking in the direction of the arrow;

Fig. 32 is a section on the line, 32—32, of Fig. 4^a and Fig. 27, looking in the direction of the arrow;

Fig. 33 is a section on the line, 33—33, of Fig. 27;

Fig. 34 is a section on the line, 34—34, of Fig. 4^a and Fig. 27;

Fig. 35 is a detail plan of the meeting ends of the inner arm and the head;

Fig. 36 is a plan and Fig. 37 is a longitudinal section of a cap forming part of the cutting tool supporting mechanism.

Referring to said drawings, A designates the truck; B designates the longitudinal

body which is movable up and down on the truck; C designates the neck which is supported on the forward end of said body and rotatable on an axis which is horizontal and parallel to the body, B, and the track rails, R; D is the inner arm hinged to said neck; E is the head hinged to the inner arm; F is a parallel link co-operating with the inner arm in supporting the head; G is the forward arm, and H is the cutting tool.

The truck comprises supporting or traction wheels, A¹, which are in the form of ordinary mine car wheels and mounted on axles, A². A³ is a horizontal truck platform supported on said axles upon which is supported the body, B. The platform is shown in the form of a rectangle with downward directed flanges along its four edges. To each side flange of the platform is bolted the lower portion of an upright cast metal side member, A⁴, comprising two guide standards, a⁴, and an upright socket or barrel, A³¹. Each of said guide standards is provided with an upright channel, A⁵, directed toward the corresponding standard at the opposite side of the truck platform. The body, B, rests between said side members and has upright tongues, B¹, extending into the channels, A⁵, of said guide standards so as to permit up and down movement of said tongues in said channels. Said channels and said tongues are shown L-shape in cross-section, in order that said tongues and said standards may engage each other to resist relative lateral movement. The tongues, B¹, are supported upon upright sidewalls, B², of the body, B, as shown in Figs. 8, 9 and 10.

At the forward end of the body is a front cross wall, B³. At its middle said wall has a bearing, B⁴. Approximately midway between its front and rear ends, the body has a rear cross wall, B⁵, which has a bearing, B⁶, in horizontal axial alignment with the bearing, B⁴, in the cross wall, B³.

A top plate, B⁷, rests upon the cross walls, B³, and B⁵. Said top plate is secured in position on the body by bolts, B⁸.

An electric motor, A⁶, furnishes power for propelling the truck. The motor is seated on the rear portion of the truck platform and has an axle, A⁷, extending forward horizontally and transversely to the truck axles, A². In line with and abutting endwise against the end of the motor shaft is the motor shaft extension, A⁸, which rests in bearings, A⁹ and A¹⁰. A sleeve coupling, A¹¹, joins the meeting ends of said shafts. On the extension shaft, A⁸, immediately at the front of the bearing, A⁹, is a spur gear pinion, A¹²; and between the two bearings, A¹⁰, is a worm, A¹³.

Between the truck axles, A², the truck platform has bearings, A¹⁴, extending downward and surrounding the shaft, A¹⁵, which extends from one of said axles to the other.

On said shaft is a spur gear wheel, A¹⁶, which meshes with the spur gear pinion, A¹², on the shaft, A⁸. Said wheel, A¹⁶, is loose on the shaft, A¹⁵, and has a sleeve, A¹⁷, extending into the bearing, A¹⁴. Said wheel, A¹⁶, forms the external member of an expansion friction clutch. Forward of said wheel is a sliding cam member, A¹⁸, adapted to turn the arm, A¹⁹, of the clutch for expanding the expansion member of the clutch (Figs. 4, 17, and 21).

A shift lever, A²⁰, is coupled to the sliding cam member, A¹⁸, for shifting the latter endwise on the shaft, A¹⁵ (Fig. 17). When the clutch in the spur gear wheel, A¹⁶, is closed, said wheel transmits motion to the shaft, A¹⁵.

The worm, A¹³, meshes with a horizontal worm wheel, A²¹, which is on an upright shaft, A²², which rests in a bearing, A²³. On the lower end of the shaft, A²², is a worm, A²⁴, which meshes with the worm wheel, A²⁵, which surrounds a clutch sleeve, A²⁶, and which is rigid on the outer member of an expansion friction clutch, A²⁷. Said worm wheel is keyed to said sleeve, and said sleeve is loose on the shaft, A¹⁵. The inner member of the expansion friction clutch is keyed to said shaft. Said clutch is closed by the forward movement of the sliding cam member, A¹⁸, said member engaging the arm, A²⁸, of the clutch A²⁷. When said clutch is closed, motion is transmitted from the shaft, A⁸, through the worm, A¹³, the worm wheel, A²¹, the shaft, A²², the worm, A²⁴, the worm wheel, A²⁵, and the clutch, A²⁷, to the shaft A¹⁵.

When the sliding cam member, A¹⁸, is in its middle position, the clutch, A¹⁶, and the clutch, A²⁷, are both open and no motion is transmitted to the shaft, A¹⁵.

The shaft, A¹⁵, transmits motion to the axles, A², through bevel gears, A²⁹, fixed on the shaft, A¹⁵, and bevel gears, A³⁰, located on the axles, A², and meshing with the gears, A²⁹ (see Figs. 4 and 17).

The transmission through the gears, A¹², and A¹⁶, is for ordinary propulsion of the machine when it is not cutting. The transmission through the worms and worm gears is used when the machine is to be propelled slowly while the cutting mechanism is cutting. The direction of propulsion is changed by reversing the motor, A⁶. This motor, A⁶, is used only for the propulsion of the machine. When the machine is at rest, this motor is cut out.

The neck, C, rests in the bearing, B¹, and extends rearward through said bearing and is there surrounded by a worm gear wheel, C¹, which bears against the rear face of the front cross wall, B³. By this means the forward movement of said neck is prevented. Immediately at the rear of the worm wheel, C¹, is an expansion friction clutch, B⁹, which

has a sleeve, B¹⁰, extending forward into the neck, C. A shaft, C², lying within the neck, C, extends rearward into the forward portion of said sleeve and is keyed to said sleeve, so that the outer member of said clutch and said sleeve and said shaft must rotate in unison. At the rear of the neck shaft, C², the sleeve, B¹⁰, receives and forms a bearing for the forward end of a transmission shaft, B¹¹. The rear portion of said shaft rests in the bearing, B⁶, in the rear cross wall, B⁵, already described.

At the rear of the clutch, B⁹, the shaft, B¹¹, is surrounded by a sliding cam member, B¹², which is to be moved forward for turning the arm, B¹³, of said clutch for closing the latter. A shift lever, B¹⁴, is applied to said cam member for moving said cam member toward or from said clutch (see Figs. 4 and 16). When said clutch is closed, motion is transmitted from the transmission shaft, B¹¹, through said clutch and its sleeve, B¹⁰, to the neck shaft, C².

The rear end of the shaft, B¹¹, projects through the bearing, B⁶, and is there surrounded by the hub of an internal spur gear wheel, B¹⁵, which meshes with a pinion, B¹⁶, which is located within the gear, B¹⁵, and surrounds and is keyed to the axle, B¹⁷, of the electric motor, B¹⁸, which is supported on the body, B. When said motor is running, it drives the transmission shaft, B¹¹, at a speed lower than the speed of the motor axle.

The shaft, C², transmits motion to the cutting mechanism, as will be described later on.

The mechanism employed for raising and lowering the body, B, on the truck is as follows:

On the transmission shaft, B¹¹, is a bevel gear wheel, B¹⁹, which meshes with a horizontal bevel gear wheel, B²⁰, which surrounds and is keyed to the lower end of an upright shaft, B²¹, which rests in a bearing, B²², in the top plate, B⁷. The upper end of said shaft is surrounded by a bevel gear wheel, B²³. Above said wheel, B²³, is a horizontal cross shaft, B²⁴, resting in bearings, B²⁵, in the top plate. At the right of the bevel gear wheel, B²³, a bevel gear wheel B²⁶ surrounds the shaft, B²⁴, and at the left of the wheel, B²³, a bevel gear wheel, B²⁷, surrounds said shaft. The wheels, B²⁶ and B²⁷, are feathered on said cross shaft and are joined to a shift lever, B²⁸, whereby said wheels are so spaced from each other as to permit placing them into a middle position, neither engaging the wheel, B²³, and so as to permit movement toward the right out of the middle position to bring the bevel wheel, B²⁷, into engagement with the wheel, B²³, and to permit movement to the left to bring the bevel wheel, B²⁶, into engagement with the bevel

wheel, B²³. The wheel, B²³, takes constant motion from the shaft, B¹¹, through the bevel wheels, B¹⁹ and B²⁰. When the cross shaft, B²⁴, is to be at rest, the shift lever, B²⁸, is put into its middle position. When said cross shaft is to be rotated, said shift lever is moved in the proper direction to bring the appropriate one of the bevel wheels, B²⁶ and B²⁷ into engagement with the bevel wheel, B²³.

On each end of the cross shaft, B²⁴, is a worm, B²⁹, which meshes with a worm gear wheel, B³⁰, on the upper end of the screw shaft, B³¹, rising through the upright socket, A³¹, in the side members, A⁴, of the truck. The upper portion of said socket is threaded to engage the threads of said shaft; and said shaft has at its upper end a shoulder, B³², upon which rests a horizontal web, B³³, formed on the top plate, B⁷ (see Figs. 2 and 22). Said screw shafts form a means for supporting the body, B, while the tongues, B¹, and the channels, A⁵, form a means for guiding said body in its up and down movements. When said screw shafts are turned to make them rise, they lift the body, B; and when said screws are turned to make them descend, they allow said body to descend by gravity to the extent of the descent of said screws. When it is desired to raise said body, the shift lever, B²⁸, is shifted out of the middle position to bring the appropriate bevel gear on the shaft, B²⁴, into engagement with the bevel wheel, B²³, which is upon the upright shaft, B²¹. When the body is to be lowered, said shift lever is shifted out of the middle position in the opposite direction to engage the other bevel wheel on the shaft, B²⁴.

The mechanism for rotating the neck, C, is as follows:

In front of the rear cross wall, B⁵, a small spur gear wheel, C³, surrounds the transmission shaft, B¹¹, and is keyed thereto. Adjacent said wheel, C³, are a spur gear wheel, C⁴, and a spur gear wheel, C⁵, both of which are normally out of mesh with the wheel, C³, but either of which may, at the will of the operator, be put into mesh with the wheel, C³.

A rocker, C⁸, stands in a plane which is upright and transverse to the length of the machine and has a journal, C⁹, extending through the rear cross wall, B⁵. The rear end of said journal projects beyond the rear face of said cross wall and receives a lever, C¹⁰, which is rigidly secured to said journal. On the forward face of the upper end of said lever is a pin, C¹¹, which is adapted to enter any one of the three sockets, C¹², formed in the rear face of the cross wall, B⁵ (see Figs. 16, 18, 23, 24, and 25). Said lever is resilient and bears toward said cross wall, so that when said pin is brought opposite one of said sockets and the lever is then

released, the lever will drive said pin into said socket and hold it there. By means of this lever, the rocker, C⁸, may be set in any one of three positions. On the rocker, C⁸, is a journal, C⁶, which is loosely surrounded by the relatively large spur gear wheel, C⁴. Forward of the wheel, C⁴, is a smaller spur gear wheel, C¹³, also loosely surrounding said journal and immovably joined to the wheel, C⁴, to compel said wheels to rotate in unison. At one side of the spur gear wheel, C⁴, and below the spur gear wheel, C³, said rocker bears a horizontal journal, C⁷, which is loosely surrounded by a spur gear wheel, C⁵, which at all times meshes with the wheel, C⁴. When said rocker is turned toward the right, the spur gear wheel, C⁴, meshes with the spur gear wheel, C³, and is rotated by the latter. When the rocker is turned in the opposite direction and beyond the middle position, the spur gear wheel, C⁵, will make engagement with the spur gear wheel, C³, and receive motion from the latter. The motion thus received by the wheel, C⁵, is transmitted to the wheel, C¹³. By thus setting the rocker in its extreme positions, the wheel, C¹³, will receive motion in either direction; and when the rocker is set in its middle position, the wheel, C⁴, and also the wheel, C⁵, will be out of engagement with the wheel, C³, and no motion will be transmitted from the wheel, C³, to the wheel, C¹³.

In alignment with the journal, C⁹, the axis of which forms the axis of said rocker, is a shaft, C¹⁵, resting in bearings, C¹⁶, rising from the floor of the body, B. The rear end of said shaft extends through the bearing, C¹⁶, and is surrounded by and keyed to a spur gear wheel, C¹⁴, which meshes with the spur gear wheel, C¹³. Whenever either the wheel, C⁴, or the wheel, C⁵, is put into mesh with the wheel, C³, on the transmission shaft, B¹¹, the shaft, C¹⁵, is rotated, the direction of such rotation depending upon which of the wheels, C⁴ or C⁵, is at the time in mesh with the wheel, C³.

The forward end of the shaft, C¹⁵, is surrounded by a worm, C¹⁷, which meshes with a worm gear wheel, C¹⁸, which surrounds an upright shaft, C¹⁹, the lower end of which rests in a bearing, C²⁰, in the bottom of the body, B, and the upper end of which rests in a bearing, C²¹, formed in the top plate, B⁷ (Fig. 26). On said shaft, above the worm wheel, C¹⁸, is a worm, C²², which meshes with the worm wheel, C¹, which has already been described as surrounding the neck, C, at the rear face of the front cross wall, B³. At the will of the operator, this train of mechanism may be set to turn the neck, C, in either direction, or said train of mechanism may be disconnected by placing the lever, C¹⁰, into its middle position. It will be observed that the gearing used for

this transmission from the shaft, B¹¹, to said neck calls for a large reduction of speed. It is also to be observed that the worm gears which constitute parts of this train of mechanism serve to lock the neck, C, in the position which it occupies whenever the rocker, C⁸, is placed into its middle or longitudinal position. In the form shown by the drawings, the speed ratio between the transmission shaft, B¹¹, and the neck, C, is approximately 500 to 1. On account of this difference in velocity, the strength of the members in this train may be varied approximately inversely to the velocity ratio.

The purpose of the rotation of the neck, C, is to vary the position of the cutting mechanism, as will be hereinafter described.

To the forward portion of the neck, C, is hinged the rear end of the inner arm, D.

The rear end of said arm is divided to form segmental ears, D¹. A shaft, D², extends transversely through said ears and the forward part of said neck on the axial line of the transmission shaft, B¹¹, and the neck shaft, C², the rear end of which abuts against the forward end of said transmission shaft. On the forward end of the shaft, C², is a bevel gear wheel, C²³. At one side of said wheel, C²³, a bevel gear wheel, C²⁴, loosely surrounds the shaft, D², and meshes with the bevel gear wheel, C²³, and receives motion from the latter. A shaft, D³, lies parallel to the inner arm, D, and rests in bearings, D⁴. The axis of said shaft and the axis of the neck shaft cut the axis of the shaft, D², at a common point. The rear end of the shaft, D³, projects through its rear bearing and is surrounded with a bevel gear wheel, D⁵, which is located beside the bevel gear wheel, C²⁴, and meshes with the latter, so that motion received by the shaft, C², from the transmission shaft, B¹¹, is transmitted through the gears, C²³, C²⁴, and D⁵ to the shaft D³.

Because of the intersection of the axis of the shafts C², D², and D³, as above described, the arm, D, may be turned on the shaft, D², without disturbing the mesh of the gears which are located between the shafts, C², and D³. Hence the shaft, D³, will receive rotation from the shaft, C², regardless of the degree of inclination of the axis of the shaft, D³, to the axis of the shaft, D².

The mechanism for turning the inner arm, D, on the shaft, D², so as to change the angle of the axial line of the shaft, D³, to the axial line of the neck shaft, C², will next be described (see Figs. 1, 4^a, 16, 27, and 29).

The rear faces of the segmental ears, D¹, are provided with worm gear teeth, d¹. Immediately at the rear of each of said ears is an upright worm shaft, D⁶, engaging the teeth of said ears and resting in bearings,

C²⁵, on the neck, C. On the lower end of each of the shafts, D⁶, is a worm wheel, D⁷, which meshes with a worm, D⁸, on a shaft, D⁹, which rests in bearings, C²⁶, in the neck, C (Fig. 29). Between said bearings, the neck is chambered to make room for the gearing next described.

The shaft, D⁹, is located below and transverse to the neck shaft, C², and below a spiral gear wheel, D²², surrounding the neck shaft and keyed thereto at the rear of the bevel gear wheel, C²³. (See Fig. 4^a and Fig. 29.)

A bevel gear wheel, D¹⁰, loosely surrounds the shaft, D⁹, at one side of the upright plane in which the axis of the neck shaft, C², lies. The hub of said bevel gear rests in a bearing, D¹¹, formed in a barrel, D¹², surrounding and larger than the shaft, D⁹, and secured to the adjacent face of the neck, C, by bolts, d¹².

At the opposite side of said plane is a similar bevel gear wheel, D¹³, which loosely surrounds the shaft, D⁹, and has its working face directed toward the bevel gear wheel, D¹⁰, and which has its hub resting in a bearing, D¹⁴, in a barrel, D¹⁵, which is secured to the adjacent face of the neck by bolts, d¹⁵.

The barrel, D¹⁵, extends toward the barrel, D¹², far enough to cover the space between the bevels, D¹⁰ and D¹³. In the interior of the barrel, D¹⁵, and between the bevel wheels, D¹⁰ and D¹³, and meshing therewith, are small bevel gear wheels, D¹⁷, supported loosely on axles, d¹⁷, fixed on the barrel, D¹⁵, so that said wheels, D¹⁷, can have only a rotary motion received from the bevel gear wheel, D¹⁰. The hubs of the wheels, D¹⁰ and D¹³, are clutch members.

At the right of the bevel wheel, D¹⁰, and within the barrel, D¹², is a clutch member, D¹⁸, which surrounds and is feathered to the shaft, D⁹. At the left of the bevel gear wheel, D¹³, is a similar clutch member, D¹⁹, similarly applied to the shaft, D⁹. A shift bar, D²⁰, engages said clutch members so as to space them to permit placing said bar into a middle position with both of said clutch members out of engagement and to permit shifting into the left hand position to cause the clutch member, D¹⁸, to engage the bevel gear wheel, D¹⁰, and to permit shifting said shift bar to the right to bring the clutch member, D¹⁹, into engagement with the bevel gear wheel, D¹³.

Surrounding the hub of the bevel gear wheel, D¹⁰, and resting against the right hand face of said wheel is a spiral gear wheel, D²¹, said wheels being secured to each other by a cross pin, d¹⁰, or other suitable means to compel them to turn in unison. Said spiral gear wheel meshes with the spiral gear wheel, D²², which, as already described surrounds and is keyed to the neck

shaft, C^2 , and receives motion from the latter. The spiral wheel, D^{22} , transmits motion to the spiral gear wheel, D^{21} , and the bevel gear wheel, D^{10} . The small bevel wheels, D^{17} , are rotated by the bevel, D^{10} , and said small bevels, D^{17} , rotate the bevel gear wheel, D^{13} . All of these are in motion when the neck shaft, C^2 , is in motion; but, as already stated, the bevel gear wheels, D^{10} and D^{13} , are loose on the shaft, D^9 , and the motion thus transmitted from the shaft, C^2 , proceeds no further until one of the clutch members, D^{18} or D^{19} , is shifted into engagement with the adjacent bevel gear wheel, D^{10} or D^{13} . When that is done, the shaft, D^9 , rotates, the direction of its rotation depending upon which of the clutch members has been put into engagement.

When the shaft, D^9 , has thus been put into motion, it transmits motion through the worms, D^8 , the worm wheels, D^7 , and the worms, D^6 , which latter as already described, are in engagement with the teeth of the segmental ears, D^1 . Hence the rotation of said worms turns said ears, whereby the inner arm, D , is turned on the transverse shaft, D^2 .

It is to be observed that these gears intervening between the neck shaft, C^2 , and the segmental ears, D^1 , are designed for reduction of speed, in order that the rotation of the arm, D , on the shaft, D^2 , may be at a relatively low speed.

The shift bar, D^{20} , is under the control of the operator. Said bar is normally set to hold both of the clutch members, D^{18} and D^{19} , out of engagement so that no motion is transmitted from the shaft, C^2 , to the arm, D .

It is also to be noted that the worm gears intervening between the shaft, C^2 , and the segmental ears, D^1 , serve to lock the arm, D , in the position which it occupies when the rotation of the arm, D , on the shaft, C^2 , is stopped by disengaging the clutch member which is at the time engaged and transmitting motion to the shaft, D^9 .

In the form of the mechanism shown by the drawings, the arm, D , is designed to turn on the shaft, D^2 , through approximately sixty degrees.

A head, E , is hinged to the upper end of the inner arm, D , on an axial line which is parallel to the shaft, D^2 , by which the arm, D , is hinged to the neck, C . To form said upper hinge, the arm, D , has at its upper left hand side an ear, D^{23} , in which is a bearing, D^{24} (see Fig. 35). In the right of said arm is another ear, D^{25} . On the right of said ear is a hub, D^{26} . In said ear and hub is a bearing, D^{27} , which is in axial alignment with the bearing, D^{24} , in the ear, D^{23} . On the right hand side of the rear end of the head, E , is an ear, E^1 , corresponding in reverse to the ear, D^{23} , on the

arm, D . In the ear, E^1 , is a bearing, E^2 , which is of proper diameter to receive the hub, D^{26} . At the left of the ear, E^1 , is an ear, E^3 , corresponding in reverse to the ear, D^{25} , on the arm, D . On the left hand side of said ear is a hub, E^4 , which is of proper diameter to fit into the bearing, D^{24} , on the arm, D . A bearing, E^5 , extends through the hub, E^4 , and the ear, E^3 , in axial alignment with the bearing, E^2 .

The upper end of the shaft, D^3 , in the arm, D , extends through the upper bearing, D^4 . A bevel gear wheel, D^{28} , surrounds the upper end of said shaft and meshes with a bevel gear wheel, E^6 , which loosely surrounds a shaft, E^7 , which has its end resting in the bearing, D^{27} , of the ear, D^{25} , and in the bearing, E^5 , of the ear, E^3 . For assembling these parts, the head, E , is so placed as to bring the ear, E^3 , between the ears, D^{23} , and D^{25} , the ear, E^1 , being at the right of the ear, D^{25} , (looking from the rear of the machine). Then the head is moved leftward to bring the hub, E^4 , into the bearing, D^{24} , and to bring the hub, D^{26} , into the bearing, E^2 . Thus the head, E , and the arm, D , are hinged to each other and so remain if relative movement of the head toward the right is prevented. The bevel gear wheel, E^6 , is now put into position immediately at the right of the ear, E^3 , and in engagement with the bevel gear wheel, D^{28} . Then the shaft, E^7 , is inserted endwise into either the bearing, E^5 , or D^{27} , and thence through the bevel gear wheel, E^6 , into the other of said bearings. Then said shaft is secured in any suitable manner against endwise movement, as by close fitting or keying.

In the head, E , is a shaft, E^8 , which is in the longitudinal upright middle plane of the machine when the neck has been turned to bring the parts into position as shown in Figs. 1, 2, 3, and 4^a, and cuts the axis of the shaft, E^7 , at the point at which said axis is cut by the axis of the shaft, D^3 . On the rear end of the shaft, E^8 , is a bevel gear wheel, E^9 , which meshes with the bevel gear wheel, E^6 . Thus the shaft, E^8 , receives motion from the shaft, D^3 . On the forward end of the shaft, E^8 , is a bevel gear wheel, E^{10} , which transmits motion to wheels on the forward arm, G .

The head, E , is to be kept substantially parallel to the axial line of the neck, C . For this purpose a parallel link, F , is placed beside the inner arm, D , and hinged by its rear end to the neck, C , and by its forward end to the head, E .

The neck, C , has ears, C^{27} , in each of which is a bearing, C^{28} , parallel to the shaft, D^2 , and on a plane which is perpendicular to the axial line of the shaft, D^3 . The adjacent end of the parallel link, F , has a pair of ears, F^1 , between which extend the

ears, C²⁷. In each of said ears F¹, is a bearing, F², on an axial line which is perpendicular to the length of said link. A shaft, F³, extends through the bearings, F² and C²⁸.

The lower, rear portion of the head, E, has upright ears, F⁴, in each of which is a bearing, F⁵, which is parallel to the shaft, E⁷.

On the left hand side of the forward end of the link, F, is an ear, F⁴, in which is a horizontal bearing, F⁵. At the right of said ear is an ear, F⁶, on the right of which is a hub, F⁷. A bearing, F⁸, extends through said ear and hub in axial alignment with the bearing, F⁵, in the ear, F⁴.

On the lower, rear portion of the head, E, is an ear, E¹³, having a bearing, E¹⁴, to receive the hub, F⁷, of the ear, F⁶. At the left of the ear, E¹³, and between the ears, F⁴, and F⁶, said head has an ear, E¹⁵, similar to the ear, E¹³, on which is a hub, E¹⁶. On the ear, E¹⁵, is a bearing, E¹⁷, in axial alignment with the bearing, E¹⁴.

It will be observed that the joint thus formed is the same as the joint formed between the head, E, and the inner arm, D. With the arm, D, and the parallel link, F, secured at their rear ends and brought parallel to each other, the head, E, may be brought into engagement with the forward ends of the arm, D, and the parallel link, F, by bringing said head in front of said arm and link and far enough to the right to bring the axial line of the upper bearings of the head into alignment with the bearings of the inner arm and to bring the axial line of the lower bearings of the head into alignment with the forward bearings of the parallel link, and then moving the head toward the left and causing the four hubs to enter the corresponding bearings.

When these parts have been thus brought into engagement, a hinge is formed between the head and the parallel link. Subsequent sidewise movement of the head relative to the forward end of the parallel link is prevented by two spur gear wheels, F⁹, and a worm, F¹⁰, placed between the ears, E¹⁵ and F⁶. At each end, said worm has a sleeve, F¹¹, extending into the adjacent spur gear wheel, F⁹, and each of said wheels is keyed to the adjacent sleeve, in order that said wheels and said worm may be compelled to rotate in unison. A shaft, F¹², extends through the bearings, F⁸ and E¹⁷, fitting closely in said bearings and extending loosely through the worm, F¹⁰.

To the forward portion of the head, E, is hinged the forward arm, G (Figs. 1, 2, 4^a, 4^b, 16, 27, 28, 32, and 33), the hinge being on a line which is perpendicular to and cuts the axial line of the head shaft, E⁸.

The lower portion of the head is extended forward to make an upright hub-journal,

E¹³. On the upper portion of the head is a cap, E¹⁹, which has at its forward end a bearing, E²⁰, which is in axial alignment with the hub-journal, E¹⁸, and spaced from the latter sufficiently to receive between said bearing and said hub-journal a bevel gear wheel, G⁵, meshing with the bevel gear wheel, E¹⁹, on the forward end of the head shaft, E⁸. Above the wheel, G⁵, a sleeve, E²², extends through the bearing, E²⁰, and projects above said bearing. A shaft, E²³, extends through the hub-journal, E¹⁸, the bevel gear wheel, G⁵, and the sleeve, E²², and is keyed to said bevel gear wheel.

The rear end of the arm, G, has a bearing, G¹, extending around the upper end of the sleeve, E²². A bearing section, G², is secured to the lower portion of said arm and has a bearing, G³, surrounding the hub-journal, E¹⁸. This completes the joint by which said arm and the head, E, are secured to each other.

On the rear portion of the bearing, G³, is a segment, G⁴, of a worm gear wheel which is engaged by the worm, F¹⁰, already described as surrounding the shaft, F¹², on which the joint between the head, E, and the parallel link, F, is formed. When said worm, F¹⁰, is rotated, the worm segment, G⁴, is turned.

The worm, F¹⁰, is driven by the electric motor, F²⁵, which is mounted in the middle portion of the parallel link, F, with its axial line parallel to the length of said link and cutting the axis of the shaft, F¹². The base of said motor rests against the wall of said link and bolts, F²⁶, secure said base to said wall. On the forward end of the shaft, F²⁴, of the motor, is a small bevel gear wheel, F²³, keyed to said shaft. At the left of said wheel and meshing therewith is a larger bevel gear wheel, F²¹, loosely surrounding the shaft, F¹⁶, which has its ends seated in the side walls of the link, F. At the right of the wheel, F²³, and meshing therewith is a larger bevel gear wheel, F²², also loosely surrounding the shaft, F¹⁶. The wheels, F²¹ and F²², are duplicates excepting that the wheel, F²², has more teeth than the wheel, F²¹, has. In practice, the wheel, F²², has been given forty-three teeth while the wheel, F²¹, has been given forty-two teeth.

A bevel gear wheel, F²⁰, of smaller diameter than the wheel, F²¹, lies against the inner face of the latter wheel and is secured immovably thereto as by means of bolts, F²⁰. Another wheel, F²⁰, which is a duplicate of the wheel, F²⁰, already described is similarly applied to the inner face of the wheel, F²².

Between the wheels, F²⁰, the shaft, F¹⁶, is surrounded by a spider hub, F¹⁷, said hub and said shaft being keyed to each other. On said hub are four equally spaced radial journals, F¹⁸. Each of said journals is loosely surrounded by a small bevel gear wheel, F¹⁹, meshing with both wheels, F²⁰.

At the left of the bevel wheel, F^{21} , and at the right of the bevel wheel, F^{22} , a small spur gear wheel, F^{15} , surrounds and is keyed to the shaft, F^{10} . Forward of each of said spur gear wheels, F^{15} , is a similar spur gear wheel, F^{13} , meshing with the adjacent wheel, F^{15} , and loosely surrounding a journal, F^{14} , extending inward from the adjacent wall of the link, F . Said spur gear wheels, F^{13} , also mesh with the spur gear wheels, F^9 , already described as surrounding and being keyed to the sleeves of the worm, F^{10} . When the motor, F^{25} , is in motion, the small bevel gear wheel, F^{23} , turns the larger bevel gear wheels, F^{21} , and F^{22} , in opposite directions without turning the shaft, F^{10} , both of said wheels being, as above stated, loose on said shaft. On account of the difference in movement of teeth on said wheels, said wheels rotate at slightly different velocities, the wheel, F^{22} , being the slower. The left hand wheel, F^{20} , is carried in unison with the wheel, F^{21} , and the right hand wheel, F^{20} , is carried in unison with the wheel, F^{22} . Hence the two wheels, F^{20} , rotate in opposite directions and with the same variation in velocity as applies to the wheels, F^{21} and F^{22} . One of the wheels, F^{20} , turns the small bevel wheels, F^{19} , in one direction while the other wheel, F^{20} , turns the wheels, F^{19} , in the opposite direction and at a slightly different velocity. If this velocity were the same at each side, the wheels, F^{20} , would rotate on the journals, F^{18} , without moving the latter in an orbit around the axis of the shaft, F^{10} . But, the wheel, F^{20} , which has the higher velocity, forces each of the four wheels, F^{19} , forward in the direction of movement of said wheel, F^{20} , the fulcrum of such movement being on the line of mesh of the wheel, F^{19} , with the slower wheel, F^{20} . Thus a slow rotation of the hub, F^{17} , on which the journals, F^{18} , are mounted is effected. Since the hub, F^{17} , is keyed to the shaft, F^{10} , said same slow velocity is imparted to said shaft. Since the spur gear wheels, F^{15} , are keyed to said shaft, said wheels receive the same slow rotation. Said wheels transmit their motion, in reverse direction to the idle spur gear wheels, F^{13} , and the latter transmit, in reverse direction, to the spur gear wheels, F^9 , which, as already described, are keyed to the sleeves of the worm, F^{10} . Accordingly, the worm takes the same motion from the wheels, F^9 .

When it is desired to turn the worm segment in one direction, the motor, F^{25} , is turned in the appropriate direction. If it is desired to turn said worm segment in the opposite direction, the motor is turned in the opposite direction. In practice it is desirable to thus turn the cutting mechanism through one half of the circle. My

mechanism makes provision for that range. The dotted lines at each side of Fig. 28 show the position into which the arm, G , may be turned in either direction from the middle upright longitudinal plane of the machine—90 degrees from said plane, the position suitable for making a cut in a plane which is upright and perpendicular to the track upon which the machine stands. Said position is also suited to making a horizontal side wall cut at the floor level or the roof level or any intermediate elevation while the machine is slowly moving on the track, either forward or backward.

By means of this mechanism intervening between the motor and the worm segment, the high velocity of the electric motor is reduced to the desired extent, the transmission mechanism being compact. It is also to be noted that this transmission gearing locks the worm segment when said gearing is at rest. It is also to be noted that high efficiency attaches to the portion of this transmission mechanism which extends from the motor shaft to the worm, F^{10} , the frictional loss being much less than would be the case if a corresponding reduction were attained through the use of worm gearing.

The rear end of the rotary cutting tool, H , extends endwise into the forward portion of the forward arm, G , and is surrounded by bearing rollers, G^6 . The rear end of said tool has a screw threaded shank, H^1 , which is threaded into the bevel gear wheel, H^2 , which meshes with the larger bevel gear wheel, G^5 , already described as surrounding and being keyed to the shaft, E^{23} , and receiving motion from the head shaft, E^8 , through the smaller bevel gear, E^{10} . The hub of the bevel gear wheel, H^2 , is surrounded by a thrust bearing, G^7 . At the front of the arm, G , a thrust bearing, G^8 , surrounds the shank of the cutting tool and receives a shoulder, H^3 , to resist pressure from the front.

The cutting tool is of any ordinary form and tapers slightly from the rear toward the front; and the axis of said tool is slightly raised at the front for the purpose of bringing the upper face of the tool approximately parallel to the axial line of the head, E , and the forward arm.

I claim as my invention,

1. 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 axial line, and transmission means extending through said neck for actuating said cutting mechanism, substantially as described.

2. 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 axial line, 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.

3. 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, means for rotating said neck, and transmission means extending through said neck for actuating said cutting mechanism, substantially as described.

4. 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, and transmission means extending through said neck for actuating said cutting mechanism, substantially as described.

5. 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, 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.

6. 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, means for rotating said neck, and transmission means extending through said neck for actuating said cutting mechanism, substantially as described.

7. 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, 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.

8. In a machine of the nature described, the combination of a rotary neck resting in a bearing, a rotary neck shaft located in said neck on the axis of the latter, cutting mechanism plurally articulated to said neck and arranged in operative relation with said neck shaft, and operator-controlled means for rotating said neck shaft, substantially as described.

9. In a machine of the nature described, the combination of a rotary neck resting in a bearing, a rotary neck shaft located in said neck on the axis of the latter, cutting mechanism plurally articulated to said neck and arranged in operative relation with said neck shaft, a motor-driven transmission shaft, and clutch mechanism connecting said transmission shaft and said neck shaft whereby the operator may at will cause the neck shaft to receive rotary motion from the transmission shaft, substantially as described.

10. In a machine of the nature described, a rotary neck resting in a horizontal bearing, a rotary neck shaft in said neck on the axis of the latter, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and in operative relation with a source of power, a motor-driven transmission shaft, and operator-controlled reversible gearing connecting said transmission shaft and said neck, whereby the operator may at will cause the neck to receive motion from the transmission shaft in either direction, substantially as described.

11. In a machine of the nature described, a rotary neck resting in a horizontal bearing, a rotary neck shaft in said neck on the axis of the latter, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and in operative relation with said neck shaft, a motor-driven transmission shaft, clutch mechanism connecting said transmission shaft and said neck shaft whereby the operator may at will cause the neck shaft to receive rotary motion from the transmission shaft, and operator-controlled gearing connecting said transmission shaft and said neck whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, substantially as described.

12. In a machine of the nature described, an axially-apertured rotary neck resting in a horizontal bearing which is fixed relative

to the machine body, a rotary neck-shaft in said neck on the axial line of the latter, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of
 5 directions and in operative relation with said neck-shaft, a motor-driven transmission shaft in alignment with said neck-shaft, and clutch mechanism connecting said transmission shaft and said neck-shaft whereby
 10 the operator may at will cause the neck-shaft to receive rotary motion from the transmission shaft, substantially as described.

13. In a machine of the nature described,
 15 a rotary neck resting in a horizontal bearing which is fixed relative to the machine body, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and in operative relation
 20 with a source of power, a motor-driven transmission shaft in alignment with said neck shaft, and operator-controlled gearing connecting said transmission shaft and said neck, whereby the operator may at will cause
 25 the neck to receive rotary motion from the transmission shaft, substantially as described.

14. In a machine of the nature described, a rotary neck resting in a horizontal bearing
 30 which is fixed relative to the machine body, a rotary neck shaft in said neck parallel to the axis of the latter, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and
 35 in operative relation with a source of power, a motor-driven transmission shaft in alignment with said neck shaft, and operator-controlled reversible gearing connecting said transmission shaft and said neck, whereby
 40 the operator may at will cause the neck to receive motion from the transmission shaft in either direction, substantially as described.

15. In a machine of the nature described,
 45 a rotary neck resting in a horizontal bearing which is fixed relative to the machine body, a rotary neck shaft in said neck on the axis of the latter, cutting mechanism articulated to said neck on hinge lines for movement in
 50 a plurality of directions and in operative relation with said neck shaft, a motor-driven transmission shaft in alignment with said neck-shaft, clutch mechanism connecting said transmission shaft and said neck shaft
 55 whereby the operator may at will cause the neck shaft to receive rotary motion from the transmission shaft, substantially as described.

16. In a machine of the nature described,
 60 a rotary neck resting in a horizontal bearing, a rotary neck shaft in said neck parallel to the axis of the latter, cutting mechanism supported by said neck and in operative relation with said neck shaft, a motor-driven
 65 transmission shaft having one end support-

ed in said neck in alignment with said neck, and clutch mechanism connecting said transmission shaft and said neck shaft whereby the operator may at will cause the neck shaft to receive rotary motion from the
 70 transmission shaft, substantially as described.

17. In a machine of the nature described, a rotary neck resting in a horizontal bearing, cutting mechanism supported by said
 75 neck and in operative relation with a source of power, a motor-driven transmission shaft having one end supported in said neck in alignment with said neck, and operator-controlled gearing connecting said transmission
 80 shaft and said neck, whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, substantially as described.

18. In a machine of the nature described,
 85 a rotary neck resting in a horizontal bearing, a rotary neck shaft in said neck parallel to the axis of the latter, cutting mechanism supported by said neck and in operative relation with a source of power, a motor-
 90 driven transmission shaft having one end supported in said neck in alignment with said neck, and operator-controlled reversible gearing connecting said transmission shaft and said neck, whereby the oper-
 95 ator may at will cause the neck to receive motion from the transmission shaft in either direction, substantially as described.

19. In a machine of the nature described, an axially-apertured rotary neck resting in
 100 a horizontal bearing, a rotary neck-shaft in said neck on the axial line of the latter, a sleeve surrounding the rear end of said neck-shaft and rotatable therewith, a motor-driven transmission shaft, and clutch mechanism
 105 connecting said transmission shaft and said sleeve whereby the operator may at will cause the neck-shaft to receive rotary motion from the transmission shaft, substantially as described.

20. In a machine of the nature described, an axially-apertured rotary neck resting in
 110 a horizontal bearing, a rotary neck-shaft in said neck on the axial line of the latter, a sleeve surrounding the rear end of said
 115 neck-shaft and rotatable therewith, a motor-driven transmission shaft having its forward end extending loosely into said sleeve, and clutch mechanism connecting said transmission shaft and said sleeve whereby the
 120 operator may at will cause the neck-shaft to receive rotary motion from the transmission shaft, substantially as described.

21. In a machine of the nature described, a rotary neck resting in a horizontal bearing
 125 which is fixed relative to the machine body, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and in operative relation with means controlled by the operator for
 130

actuating the cutting mechanism, a gear wheel on said neck, a transmission shaft, and means controlled by the operator and in operative relation with said wheel whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, substantially as described.

22. In a machine of the nature described, a rotary neck resting in a horizontal bearing which is fixed relative to the machine body, cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and in operative relation with means extending through said neck and controlled by the operator for actuating the cutting mechanism, a gear wheel on said neck, a transmission shaft, and operator-controlled gearing connecting the transmission shaft and said gear wheel whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, substantially as described.

23. In a machine of the nature described, a rotary neck resting in and extending rearward of a horizontal bearing which is fixed relative to the machine body, a rotary neck shaft in said neck in the axial line of the latter, a transmission shaft, clutch mechanism for connecting the transmission shaft and the neck shaft, operator-controlled gearing connecting said transmission shaft and said neck for imparting rotation to said neck, and cutting mechanism articulated to said neck on hinge lines for movement in a plurality of directions and in operative relation with said neck shaft to be driven by said shaft, substantially as described.

24. In a machine of the nature described, a rotary neck resting in a horizontal bearing, cutting mechanism supported by said neck and in operative relation with means controlled by the operator for actuating the cutting mechanism, a gear wheel on said neck, a transmission shaft in axial alignment with said neck and having its front end supported by said neck, and means controlled by the operator and in operative relation with said wheel whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, substantially as described.

25. In a machine of the nature described, a rotary neck resting in and extending rearward of a horizontal bearing, a rotary neck shaft in said neck in the axial line of the latter, a transmission shaft in axial alignment with said neck and having one end supported by said neck, means controlled by the operator for transmitting motion to said neck, and means controlled by the operator for transmitting motion from said transmission shaft to said neck shaft, and cutting mechanism supported by said neck in operative relation with said neck shaft, substantially as described.

26. In a machine of the nature described, a rotary neck resting in a horizontal bearing, cutting mechanism supported by said neck and in operative relation with means controlled by the operator for actuating the cutting mechanism, a gear wheel on said neck, a transmission shaft in alignment with and having one end supported by said neck, and clutch mechanism connecting the transmission shaft and said gear wheel whereby the operator may at will cause the neck shaft to receive motion from the transmission shaft, substantially as described.

27. In a machine of the nature described, a rotary neck resting in and extending rearward of a horizontal bearing, a rotary neck shaft in said neck in the axial line of the latter, a transmission shaft in axial alignment with and having one end supported by said neck, clutch mechanism, for connecting the transmission shaft and the neck shaft, operator-controlled gearing connecting said transmission shaft and said neck for imparting rotation to said neck, and cutting mechanism supported by said neck and in operative relation with said neck shaft, substantially as described.

28. In a machine of the nature described, a truck, a body on said truck, the body and the truck being related to each other for guiding the body for up-and-down movement on the truck, a rotary neck resting in a horizontal bearing in said body, a rotary neck shaft in said neck on the axial line of the latter, cutting mechanism supported by said neck and in operative relation with said neck shaft, a motor-driven transmission shaft located on said body, clutch mechanism connecting said transmission shaft and said neck shaft whereby the operator may at will cause the neck shaft to receive rotary motion from the transmission shaft, lifting-and-lowering mechanism in operative relation with said body and said truck, and operator-controlled gearing connecting said transmission shaft and said lifting and lowering mechanism whereby the operator may at will cause said lifting-and-lowering mechanism to receive motion from said transmission shaft, substantially as described.

29. In a machine of the nature described, a truck, a body on said truck, the body and the truck being related to each other for guiding the body for up-and-down movement on the truck, a rotary neck resting in a horizontal bearing in said body, a rotary neck shaft in said neck on the axial line of the latter, cutting mechanism supported by said neck and in operative relation with said neck shaft, means controlled by the operator for rotating said neck shaft, a motor-driven transmission shaft located on said body, operator-controlled gearing connecting said transmission shaft and said neck, whereby the operator may at will cause the neck to

receive rotary motion from the transmission shaft, lifting-and-lowering mechanism in operative relation with said body and said truck, and operator-controlled gearing connecting said transmission shaft and said lifting-and-lowering mechanism whereby the operator may at will cause said lifting-and-lowering mechanism to receive motion from said transmission shaft, substantially as described.

30. In a machine of the nature described, a truck, a body on said truck, the body and the truck being related to each other for guiding the body for up-and-down movement on the truck, a rotary neck resting in a horizontal bearing in said body, cutting mechanism supported by said neck and in operative relation with operator-controlled means for actuating said cutting mechanism, a motor-driven transmission shaft located on said body, operator-controlled gearing connecting said transmission shaft and said neck whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, lifting-and-lowering mechanism in operative relation with said body and said truck, and operator-controlled gearing connecting said transmission shaft and said lifting-and-lowering mechanism whereby the operator may at will cause said lifting-and-lowering mechanism to receive motion from said transmission shaft, substantially as described.

31. In a machine of the nature described, a truck, a body on said truck, the body and the truck being related to each other for guiding the body for up-and-down movement in the truck, a rotary neck resting in a horizontal bearing in said body, a neck-shaft, operator-controlled gearing connecting the transmission shaft and the neck-shaft, cutting mechanism supported by said neck and in operative relation with said neck-shaft, a motor-driven transmission shaft located on said body, operator-controlled gearing connecting said transmission shaft and said neck whereby the operator may at will cause the neck to receive rotary motion from the transmission shaft, lifting-and-lowering mechanism in operative relation with said body and said truck, and operator-controlled gearing connecting said transmission shaft and said lifting and lowering mechanism whereby the operator may at will cause said lifting-and-lowering mechanism to receive motion from said transmission shaft, substantially as described.

32. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a hinge line which is transverse to the axis of said neck, cutting mechanism supporting means hinged to the other end of said arm, means carried by said neck and associated with said neck and said cutting

mechanism supporting means for keeping the latter parallel to the axis of said neck during movements of said inner arm on the axis of the hinge between said arm and said neck, operator-controlled means carried by said neck for turning said inner arm on its hinge line, cutting mechanism located on said supporting means, and means for actuating said cutting mechanism, substantially as described.

33. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a line which is transverse to and cuts the axis of said neck, cutting mechanism supporting means hinged to the other end of said arm, means carried by said neck and associated with said neck and said cutting mechanism supporting means for keeping the latter parallel to the axis of said neck during movements of said inner arm, on the axis of the hinge between said arm and said neck, operator-controlled means carried by said neck for turning said inner arm on its hinge line, cutting mechanism located on said supporting means, and means for actuating said cutting mechanism, substantially as described.

34. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a line which is transverse to the axis of said neck, means carried by said neck for turning said arm on said hinge line, a head hinged to the outer end of said inner arm on an axis which is transverse to the axis of said neck, means carried by said neck and associated with said neck and said head for keeping the latter parallel to the axis of said neck during movements of said inner arm on the axis of the hinge between said arm and said neck, a forward arm hinged to said head on a line which is transverse to the axis of the neck and to the axial line on which the inner arm is joined to said neck, cutting mechanism supported by said forward arm, and means for actuating said cutting mechanism, substantially as described.

35. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a line which is transverse to and cuts the axis of said neck, cutting mechanism supporting means hinged to the other end of said arm, means carried by said neck and associated with said neck and said cutting mechanism supporting means for keeping the latter parallel to the axis of said neck during movements of said inner arm on the axis of the hinge between said arm and said neck, operator-controlled means carried by said neck for turning said inner arm on its hinge line, cutting mechanism located on said supporting means, and means extend-

ing through said neck, inner arm and supporting means for actuating said cutting mechanism, substantially as described.

36. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a line which is transverse to the axis of said neck, means carried by said neck for turning said arm on said hinge line, a head hinged to the outer end of said inner arm on an axis which is transverse to the axis of said neck, means carried by said neck and associated with said neck and said head for keeping the latter parallel to the axis of said neck during movements of said inner arm on the axis of the hinge between said arm and said neck, a forward arm hinged to said head on a line which is transverse to the axis of the neck and to the axial line on which the inner arm is joined to said neck, cutting mechanism supported by said forward arm, and means extending through said neck, said inner arm, and said head for actuating said cutting mechanism, substantially as described.

37. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a line which is transverse to the axis of said neck, means carried by said neck for turning said arm on said hinge line, a head hinged to the outer end of said inner arm on an axis which is transverse to the axis of said neck, means carried by said neck and associated with said neck and said head for keeping the latter parallel to the axis of said neck during movements of said inner arm on the axis of the hinge between said arm and said neck, a forward arm hinged to said head on a line which is transverse to the axis of the neck and to the axial line on which the inner arm is joined to said neck, a motor in operative relation with the forward arm for turning the latter, cutting mechanism supported by said forward arm, and means for actuating said cutting mechanism, substantially as described.

38. In a machine of the nature described, a rotary neck resting in a horizontal bearing, an inner arm hinged by one end to said neck on a line which is transverse to the axis of said neck, means for turning said arm on said hinge line, a head hinged to the outer end of said inner arm on an axis which is transverse to the axis of said neck, a parallel member associated with said neck and said head for keeping the latter parallel to the axis of said neck during movement of said inner arm on the axis of the hinge between said arm and said neck, a forward arm hinged to said head on a line which is transverse to the axis of the neck and to the axial line on which the inner arm is joined to said neck, a motor located on said parallel member in operative relation with the forward

arm for turning the latter, cutting mechanism supported by said forward arm, and means for actuating said cutting mechanism, substantially as described.

39. In a machine of the nature described, 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 two lines which are between said tool and the attachment of said group of supporting members to the machine, and are parallel to each other and perpendicular to said axial line, whereby, by the folding and unfolding of said member on said hinge lines said tool is carried toward and from said axial line and repositioned parallel to said axial line, operator-controlled means carried by said group to effect folding and unfolding on said hinge lines, and means for actuating said cutting tool, substantially as described.

40. In a machine of the nature described, 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 of said group of supporting members to the machine, two of said lines being parallel to each other and transverse to said axial line and the other of said hinge lines being transverse to said hinge 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 means to effect folding on said third hinge line, and means for actuating said cutting tool, substantially as described.

41. In a machine of the nature described, 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 two lines which are between said tool and the attachment of said group of supporting members to the machine and are parallel to each other and perpendicular to said axial line, whereby, by the folding and unfolding of said members on said hinge lines said tool is carried bodily by parallel movement toward and from said axial line, operator-controlled means carried by said group to effect folding and unfolding on said hinge lines, and means extending along said axial line for actuating said cutting tool, substantially as described.

42. In a machine of the nature described,

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 of said group of attaching members to the machine, two of said lines being parallel to each other and transverse to said axial line and the other of said hinge lines being transverse to said 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 means to effect folding on said third hinge line, and means extending along said axial line for actuating said cutting tool, substantially as described.

43. In a machine of the nature described, the combination of a rotatable neck, a cutting tool, a cutting tool support supporting the cutting tool in a plane which is approximately parallel to the axial line of said neck, means intermediate the neck and the cutting tool support and hinged to said neck and said support on lines which are parallel to each other and transverse to the axial line of said neck and constituting a means for holding said tool support at various distances from the axial line of the neck and parallel to said axial line, operator-controlled means for actuating said intervening means to shift said tool support bodily by parallel movement toward and from said axial line, and means for actuating said cutting tool, substantially as described.

44. In a machine of the nature described, 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 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 means to effect

folding on said third hinge line, and means for actuating said cutting tool, substantially as described.

45. In a machine of the nature described, the combination of a rotatable neck, a cutting tool, a cutting tool support supporting the cutting tool in a plane which is approximately parallel to the axial line of said neck, means intermediate the neck and the cutting tool support and hinged to said neck and said support on lines which are parallel to each other and transverse to the axial line of said neck and constituting a means for holding said tool support at various distances from the axial line of the neck and parallel to said axial line, operator-controlled means for actuating said intervening means to shift said tool support bodily by parallel movement toward and from said axial line, and means extending through said neck 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 rotating 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 means extending through said neck for actuating said cutting tool, 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, members supporting said tool on said neck for bodily movement obliquely toward and from the axial line of the neck, and means extending through said neck for actuating said cutting tool for cutting and for imparting said bodily movement, 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, operator-controlled, power-driven means for actuating said neck, a cutting tool, members supporting said tool on said neck for bodily movement on the neck obliquely toward and from the axial line of the neck, and means extending through said neck for actuating said cutting tool for cutting and for imparting said bodily movement, substantially as described.

49. 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 and stationary relative

to the machine body, operator-controlled, power-driven 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 while the tool passes successively through planes which are substantially parallel to said axial line, and means extending through said neck for actuating said cutting tool, substantially as described.

50. In a machine of the nature described, the combination of a rotatable neck which rests 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 turning said neck in said bearing, a cutting tool, a plurality of members located intermediate said neck and said tool and hinged to the neck and the tool on lines permitting a bodily parallel movement of the tool toward and from the axial line of said neck and also permitting a bodily swinging movement of the tool on an axial line which is perpendicular to the axial line of said neck, and means for actuating said cutting tool for cutting, substantially as described.

51. 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, members supporting said tool on said neck parallel to the neck axis and for bodily 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, and means for actuating said cutting tool, substantially as described.

52. 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, and means for actuating said tool, substantially as described.

53. 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, 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.

54. 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, articulated members supported on said neck and having hinge lines extending in diverse directions and said members supporting the cutting tool parallel to and at varying distances from the axial line of the neck, 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 means for actuating said cutting tool, substantially as described.

55. 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 supporting 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 axial line, whereby the cutting tool may be carried through an orbital path by turning said supporting members to the rotation of said neck and the radius of said orbital path may at the will of the operator be varied by varying the distance at which said members support said tool from the axial line of the neck and whereby said tool may be held in a line which is parallel to or transverse to the neck axis, 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 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, 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 vary-

ing 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.

57. 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, members articulated on said neck on a plurality of hinge lines for carrying said cutting tool in an orbital path which is concentric to the axial line of the neck and supporting said tool in a line varying in angularity relative 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 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, members articulated on said neck on a plurality of hinge lines for carrying said cutting tool in an orbital path which is concentric to the axial line of the neck and supporting said tool in a line varying in angularity relative to said axial line, a neck shaft in said neck, and means operatively connecting said neck shaft and said cutting tool for actuating the latter for cutting, substantially as described.

59. 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, articulated members supporting said tool on said neck on a plurality of hinge lines for movement on the neck toward and from the axial line of the neck, operator-controlled, power-driven mechanism for effecting said movement, and means for actuating said cutting tool, substantially as described.

60. 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, members supporting said tool on said neck for movement obliquely toward and from the axial line of the neck, operator-controlled, power-driven mechanism for effecting said movement, and means extending along the axial line of the neck for actuating said cutting tool, substantially as described.

61. 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, articulated members supporting said tool on said neck for movement on the neck toward and from the axial line of the neck, operator-controlled, power-driven mechanism for effecting said movement, and means extending along the axial line of the neck extending through said neck for actuating said cutting tool, substantially as described.

62. 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, members supporting said tool on said neck for movement obliquely toward and from the axial line of the neck, operator-controlled, power-driven mechanism for effecting said movement, and means extending through said neck and along its axis for actuating said cutting tool, substantially as described.

63. 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 which is forward of the neck and perpendicular to the neck axis, operator-controlled, power-driven mechanism for effecting said movements, and means for actuating said cutting tool, substantially as described.

64. 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 mechanisms for effecting said movements, and means for actuating said cutting tool, substantially as described.

65. 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 mechanisms for effecting said movements, and means for actuating said tool for cutting, substantially as described.

66. 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-driven mechanisms for effecting said movements, and a neck shaft in said neck, and means for operatively connecting said neck shaft and said cutting tool for actuating the latter, substantially as described.

67. 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, a neck shaft in said neck, and means operatively connecting said neck shaft and said cutting tool for actuating the latter, substantially as described.

68. 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 supported on said neck and adapted to support the cutting tool at varying distances from the axial line of the neck, 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 link-form members support said tool from the axial line of the neck, operator-controlled, power-driven means for varying said distance, and means extending along the axis of the neck for actuating said cutting tool, substantially as described.

69. 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 supported on said neck and supporting the cutting tool at varying distances from the axial line of the neck and to swing in a plane which is parallel to said axis, 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 axial line of the neck, power mechanisms controlled by the operator for varying said distance and for holding the tool parallel to or transverse to the axial line of the neck, and means for actuating said cutting tool, substantially as described.

70. In a machine of the nature described, the combination of a cutting tool, rotatable means supported on the machine and supporting said cutting tool for movement in an orbital path having a horizontal axis and

also for movement into positions of varying angularity to said axial line and into said axial line, operator-controlled, power-driven means for effecting said movements, and means for actuating said cutting mechanism, substantially as described.

71. 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 plurality 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, and means for actuating said cutting tool, substantially as described.

72. 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, link-form members supporting said tool on said support for movement toward and from the axial line of said support, and means extending through said support for actuating said cutting tool, substantially as described.

73. 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, and means extending through and along the axis of said support for actuating said cutting tool, substantially as described.

74. 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, means for actuating said neck, a cutting tool, articulated members supporting said tool on said neck for movement on the neck obliquely toward and from the axial line of the neck, and means for actuating said cutting tool, substantially as described.

75. 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, 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 means extending through and along the axis of said neck for actuating said cutting tool, substantially as described.

76. 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, and means for actuating said cutting tool, substantially as described.

77. 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, and means for actuating said cutting tool, substantially as described.

78. 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, and link-form members supported by said neck and supporting said cutting tool for movement toward and from the axial line of the neck and for swinging the tool in a plane which is parallel to said axis, and means for actuating said tool, substantially as described.

79. 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, and 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, 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.

80. 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, means for actuating said neck, a cutting tool, link-form members supported on said neck and supporting the cutting tool at varying distances from the axial line of the neck, 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 link-form members support said tool from the axial line of the neck, and means for actuating said cutting tool, substantially as described.

81. 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 supported on said neck and supporting 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, 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 at the will of the operator be varied by varying the distance at which said link-form 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, and means for actuating said cutting tool, substantially as described.

82. 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 supported on said neck and supporting 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, 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 link-form 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, and a neck shaft and means operatively connecting said shaft and the cutting tool for actuating said tool, substantially as described.

83. 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 supported on said neck for supporting and carrying said cutting tool in an orbital path which is concentric to the axial line of the neck and supporting said tool in a line varying in angularity relative to said axial line, and means for actuating said cutting tool, substantially as described.

84. 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 supported on said neck for supporting and carrying said cutting tool in an orbital path which is concentric to the axial line of the neck and supporting said tool in a line varying in angularity relative to said axial line, a neck shaft in said neck and means operatively connecting said neck shaft and said cutting tool for actuating the latter, substantially as described.

85. 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, mechanism for effecting said swinging movement, and means for actuating said tool, substantially as described.

86. 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, mechanism for effecting said swinging movement, a neck shaft in said neck, and means operatively connecting said shaft and said cutting tool for actuating the latter, substantially as described.

87. 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 on said neck and supporting 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, whereby the cutting tool may be carried through an orbital path by the rotation of said neck and the radius of said said orbital path may be varied by varying the distance at which said link-form 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 axial line of the neck, power mechanisms controlled by the operator for holding the tool parallel to or transverse to the axial line of the neck, and means for actuating said cutting tool, substantially as described.

88. In a machine of the nature described, the combination of a horizontal, rotatable neck, operator-controlled, power-driven mechanism for turning said neck, members hinged to said neck on a hinge line which is transverse to the axial line of said neck, a cutting tool supported by said members approximately at right angles to said hinge line and for movement diagonally to said hinge line, and means extending along the axis of the neck for actuating said cutting tool, substantially as described.

89. 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 and 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 for yieldingly swinging the tool in a plane parallel to said axial line, and means for actuating said cutting tool, substantially as described.

90. 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, means acting through said rotary support for actuating said supporting members for moving the tool toward and from the axial line of the rotary support, and means extending through and along the axis of said support for actuating said cutting tool, substantially as described.

91. 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 rotary support for swinging the tool in a plane parallel to the axial line of said rotatable support, and a motor carried by said rotatable support for effecting said swinging of the cutting tool, and means for actuating the cutting tool, substantially as described.

92. 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 rotary support for swinging the tool in a plane parallel to the axial line of said rotatable support, and a motor carried by said rotatable support for effecting said swinging of the cutting tool, and means extending through said rotatable support for actuating the cutting tool, substantially as described.

93. In a machine of the nature described, the combination of a rotary neck resting in a bearing, an elongated cutting tool, parallel links interposed between said neck and said tool for supporting said tool in planes substantially parallel to the axial line of said neck, and mechanism for actuating said tool for cutting, substantially as described.

94. In a machine of the nature described, the combination of a rotary neck resting in a bearing, an elongated cutting tool, parallel links interposed between said neck and said tool for supporting said tool in planes substantially parallel to the axial line of said neck, mechanism for turning said neck, and mechanism for actuating said tool for cutting, substantially as described.

95. In a machine of the nature described, the combination of a rotary neck resting in a bearing, an elongated cutting tool, parallel links interposed between said neck and said

tool for supporting said tool in planes substantially parallel to the axial line of said neck, and a rotary neck shaft in operative relation with said tool for actuating said tool for cutting, substantially as described.

96. In a machine of the nature described, the combination of a rotary neck resting in a bearing, an elongated cutting tool, parallel links interposed between said neck and said tool for supporting said tool in planes substantially parallel to the axial line of said neck, and a rotary neck shaft in said neck and in operative relation with said tool for actuating the tool for cutting, substantially as described.

97. In a machine of the nature described, the combination of a rotary neck resting in a horizontal bearing, an elongated cutting tool, parallel links interposed between said neck and said tool, and gearing on said neck in operative relation with said cutting tool for actuating said tool for cutting, substantially as described.

98. In a machine of the nature described, the combination of a rotary neck resting in a horizontal bearing, an elongated cutting tool, parallel links interposed between said neck and said tool, and means for turning said neck and means for actuating said cutting tool for cutting, substantially as described.

99. In a machine of the nature described, the combination of a rotary neck resting in a horizontal bearing, an elongated cutting tool, parallel links interposed between said neck and said tool, and a neck shaft in operative relation with said tool to actuate said tool for cutting, substantially as described.

100. In a machine of the nature described, the combination of a rotary neck resting in a horizontal bearing, an elongated cutting tool, parallel links interposed between said neck and said tool, a neck shaft in said neck in operative relation with said tool for actuating the tool for cutting, and means for turning said neck, substantially as described.

101. 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, and means for actuating said cutting tool for cutting, substantially as described.

102. 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, and means for actuating said cutting tool for cutting, substantially as described.

103. 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, and means for actuating said cutting tool for cutting, substantially as described.

104. 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, means for turning said tool on said perpendicular hinge, and means for actuating said cutting tool for cutting, substantially as described.

105. In a machine of the nature described, the combination of a rotary support resting in a horizontal bearing, parallel links supported by said support, 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 support, and a motor located on one of said links in operative relation with said tool for turning the latter on said perpendicular axial line, substantially as described.

106. In a machine of the nature described, the combination of a rotary support resting in a horizontal bearing, parallel links supported by said support, 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 support, a motor located on one of said links in operative relation with said head block for turning the latter on said perpendicular axial line, and a transmission shaft extending lengthwise through the other of said links and arranged in operative relation with said cutting tool to actuate said cutting tool for cutting, substantially as described.

107. In a machine of the nature described, the combination of a rotary support resting in a horizontal bearing, an elongated cutting tool, parallel links intermediate the cutting tool and the rotary support, a neck shaft in said rotary support, gearing intervening said shaft and the cutting tool for actuating the latter for cutting, and gear-

ing intervening the neck shaft and the adjacent ends of one of the parallel links for turning said link, substantially as described.

108. In a machine of the nature described, the combination of a rotary support, a neck shaft in the rotary support, an elongated cutting tool to be held in planes parallel to the axis of the rotary support, parallel links and a head block intermediate the cutting tool and the rotary support, a longitudinal transmission shaft in one of the links, a longitudinal transmission shaft in the head block and arranged in operative relation with the cutting tool for actuating the latter for cutting, a transverse shaft forming a hinge between the rotary body and said link, gearing on said transverse shaft for transmitting motion from the neck shaft to the longitudinal shaft of said link, a transverse shaft forming a hinge between the outer end of said link and the adjacent end of said head block, gearing supported on said transverse shaft for transmitting motion from the transmission shaft of the link to the transmission shaft of the head block, substantially as described.

109. In a machine of the nature described, the combination of a rotatable supporting member, operator-controlled, power-driven means for turning said supporting member, an elongated cutting tool, members articulated on said supporting member on a plurality of hinge lines for carrying said cutting tool parallel to the axial line of the supporting member and in an orbital path which is concentric to the axial line of said supporting member, a rotary shaft on said axial line, and means operatively connecting said shaft and one of said articulated members for turning the latter on its adjacent hinge, substantially as described.

110. In a machine of the nature described, the combination of a rotatable supporting body, an elongated cutting tool, articulated members interposed between said cutting tool and said supporting member, means for actuating said cutting tool for cutting, and means extending through said supporting body for actuating said articulated members to bodily shift said cutting tool, substantially as described.

111. In a machine of the nature described, the combination of a rotatable supporting member, operator-controlled, power-driven means for actuating said supporting member, an elongated cutting tool, articulated members interposed between said cutting tool and said supporting member, means for actuating said cutting tool for cutting, and operator-controlled power-driven means associated with said supporting member for actuating said articulated members for bodily shifting the cutting tool, substantially as described.

112. 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.

113. 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.

114. In a machine of the nature described, the combination of a rotary supporting body, an elongated cutting tool, link-form members intervening said supporting body and the cutting tool for carrying the cutting tool parallel to the axial line of the rotary supporting body into said axial line and from said line far enough to permit movement in an orbit larger than the transverse diameter of the machine, whereby said tool, intervening means, and supporting body are adapted to co-operate for cutting along said larger orbit and at all points within said larger orbit for the forming of a tunnel or entry of sufficient cross-section to receive said machine, substantially as described.

115. 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.

116. 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, an elongated cutting tool, means supporting said tool on said rotatable support parallel to the axial line of said support for movement from and toward and into the axial line of said support, and means extending through said support for actuating said cutting tool for cutting, substantially as described.

117. 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, an elongated cutting tool, means supporting said tool on said rotatable support parallel to the axis of said

support for movement from and toward and into the axial line of said rotatable support and for swinging the tool in a plane parallel to said axial line, and means extending
5 through said rotatable support for actuating said cutting tool for cutting, substantially as described.

118. In a machine of the nature described, the combination of a rotatable support
10 which is horizontal and parallel to the machine path, means for turning said support, an elongated cutting tool, means supporting said tool on said rotatable support parallel to the axial line of said rotatable support
15 and for movement on the rotary support obliquely from and toward and into said axial line, and means for actuating said cutting tool for cutting, substantially as described.

119. In a machine of the nature described, the combination of a rotatable support which is horizontal and parallel to the machine path, means for turning said support,
20 an elongated cutting tool, members supporting said tool on said support parallel to the axial line of said neck and for movement from and toward and into said axial line, and means extending through said support for actuating said cutting tool for cutting,
25 substantially as described.

120. 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
30 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, yielding means for effecting said swinging movement, and means for actuating said tool for cutting, substantially as described.

121. 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
40 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.

122. In a machine of the nature described, the combination of a horizontal rotary neck, a head, means intervening said neck and
50 said head and hinged to said members on lines which are parallel to each other and transverse to the axis of said neck, a tool support hinged to said head, a longitudinal shaft resting in said head, gearing intervening said shaft and said cutting tool for ac-

tuating the latter for cutting, a segment gear wheel on the tool support, and gearing in operative relation with said segment gear for actuating the latter for slowly bodily swinging the cutting tool, substantially as
70 described.

123. In a machine of the nature described, the combination of a rotary support, a head carried on said support parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, cutting mechanism supported by
80 said forward arm, and transmission mechanism extending horizontally along said head and across said perpendicular hinge line to said cutting mechanism to actuate said mechanism for cutting, and means for swinging said forward arm on said hinge line, substantially as described.

124. In a machine of the nature described, the combination of a rotary support, a head carried on said support parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, a rotary cutting tool supported by said forward arm, and transmission mechanism extending horizontally along said head and across said perpendicular hinge line to said cutting tool to rotate said tool for cutting,
90 and means for swinging said forward arm on said hinge line, substantially as described.

125. In a machine of the nature described, the combination of a rotatable support, a head, means intervening the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, cutting mechanism supported by said forward arm, and transmission mechanism extending from said horizontal transmission shaft across said
105 perpendicular hinge line to said cutting mechanism to actuate said mechanism for cutting, and mechanism for swinging said forward arm on said hinge line, substantially as described.

126. In a machine of the nature described, the combination of a rotatable support, a head, means intervening the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, said head and said
120 125 130

forward arm being approximately in a common plane which is parallel to the axial line of said rotary support, cutting mechanism supported by said forward arm, and transmission mechanism extending from said horizontal transmission shaft across said perpendicular hinge line to said cutting mechanism to actuate said mechanism for cutting, and mechanism for swinging said forward arm on said hinge line, substantially as described.

127. In a machine of the nature described, the combination of a rotatable support, a head, means intervening the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, a perpendicular transmission shaft on said hinge line, cutting mechanism supported by said forward arm, and transmission mechanism operatively connecting said horizontal transmission shaft and said perpendicular transmission shaft and said cutting mechanism to actuate said mechanism for cutting, and mechanism for swinging said forward arm on said hinge line, substantially as described.

128. In a machine of the nature described, the combination of a rotatable support, a head, means intervening the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, a perpendicular transmission shaft on said hinge line, said head and said forward arm being approximately in a common plane which is parallel to the axial line of said rotary support, cutting mechanism supported by said forward arm, and transmission mechanism operatively connecting said horizontal transmission shaft and said perpendicular transmission shaft and said cutting mechanism to actuate said mechanism for cutting, and mechanism for swinging said forward arm on said hinge line, substantially as described.

129. In a machine of the nature described, the combination of a horizontal rotatable support, a head comprising two bearings on a hinge line which is perpendicular to the axial line of said support, means intervening said rotatable support and said head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on the hinge line of said two bearings, cutting mechanism supported by said forward arm, transmission mechanism extending

from said horizontal transmission shaft through the axial line of said two bearings to said cutting mechanism to actuate said mechanism for cutting, and mechanism for swinging said forward arm on the axial line of said two bearings, substantially as described.

130. In a machine of the nature described, the combination of a horizontal rotatable support, a head comprising two bearings on a hinge line which is perpendicular to the axial line of said support, means intervening said rotatable support and said head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a shaft on said perpendicular hinge line, a forward arm hinged to said head on said perpendicular hinge line, cutting mechanism supported by said forward arm, transmission mechanism extending from said horizontal transmission shaft through said hinge line to said cutting mechanism to actuate said mechanism for cutting, and mechanism for swinging said forward arm on said hinge line, substantially as described.

131. In a machine of the nature described, the combination of a horizontal rotatable support, a head comprising two horizontal sections each having a bearing on a common hinge line which is perpendicular to the axial line of said rotatable support, a horizontal longitudinal transmission shaft in said head, means intermediate the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a forward arm hinged to said head on said hinge line, cutting mechanism supported on said arm, transmission mechanism extending from said horizontal transmission shaft through said hinge line to said cutting mechanism for actuating said cutting mechanism for cutting, and mechanism for swinging said arm on said hinge line, substantially as described.

132. In a machine of the nature described, the combination of a horizontal rotatable support, a head comprising two horizontal sections each having a bearing on a common hinge line which is perpendicular to the axial line of said rotatable support, a horizontal longitudinal transmission shaft in said head, means intervening the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a forward arm comprising two bearings on said hinge line, cutting mechanism supported on said arm, transmission mechanism extending from said horizontal transmission shaft through said hinge line to said cutting mechanism for actuating said cutting mechanism for cutting, and mechanism for swinging said arm on said hinge line, substantially as described.

133. In a machine of the nature described, the combination of a horizontal rotatable support, a head comprising two horizontal sections each having a bearing on a common hinge line which is perpendicular to the axial line of said rotatable support, a horizontal longitudinal transmission shaft in said head, means intermediate the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a forward arm comprising two sections and hinged to said head on said hinge line, cutting mechanism supported on said arm, transmission mechanism extending from said horizontal transmission shaft through said hinge line to said cutting mechanism for actuating said cutting mechanism for cutting, and mechanism for swinging said arm on said hinge line, substantially as described.

134. In a machine of the nature described, the combination of a horizontal rotatable support, a head comprising two horizontal sections each having a bearing on a common hinge line which is perpendicular to the axial line of said rotatable support, a horizontal longitudinal transmission shaft in said head, means intermediate the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a forward arm comprising two sections each having a bearing on said axial line, cutting mechanism supported on said arm, transmission mechanism extending from said horizontal transmission shaft through said hinge line to said cutting mechanism for actuating said cutting mechanism for cutting, and mechanism for swinging said arm on said hinge line, substantially as described.

135. In a machine of the nature described, the combination of a rotatable support, a head, means intervening the rotatable support and the head for carrying the latter parallel to and toward and from the axial line of said support, a horizontal longitudinal transmission shaft in said head, a forward arm hinged to said head on a hinge line which is perpendicular to the axial line of said rotatable support, an elongated rotary cutting tool supported on said arm approximately in alignment with said horizontal transmission shaft, and transmission mechanism extending from said shaft through said hinge line and to said rotary tool for rotating the latter, substantially as described.

136. In a machine of the nature described, the combination with a neck structure comprising a neck seated in a horizontal bearing,

ing, 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 for transmitting motion from the neck shaft to said parallel shaft, two upright shafts adjacent the parallel shaft, gearing joining said parallel shaft and said upright shafts, a gear on each of said upright shafts, and two gear segments fixed on one of the parallel link members concentric with the adjacent hinge of one of said members and each of said gear segments engaging one of the gears on said upright shafts, substantially as described.

137. 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 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 gear worm on each of said upright shafts, and two segments fixed on one of the parallel link members concentric with the adjacent hinge of one of said members and each of said worm segments engaging one of said worm gears, substantially as described.

138. 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, means for rotating said neck, and a neck shaft extending through said neck and arranged in operative relation with the cutting mechanism for rotating said cutting mechanism, substantially as described.

In testimony whereof I have signed my name, this 2nd day of May, in the year one thousand nine hundred and seventeen.

CYRUS S. OLDROYD.