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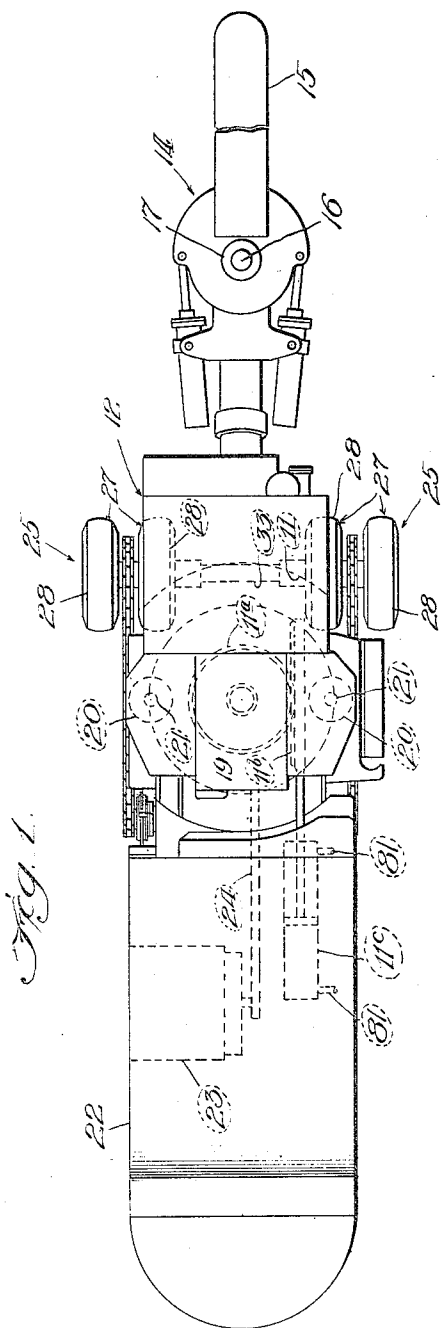
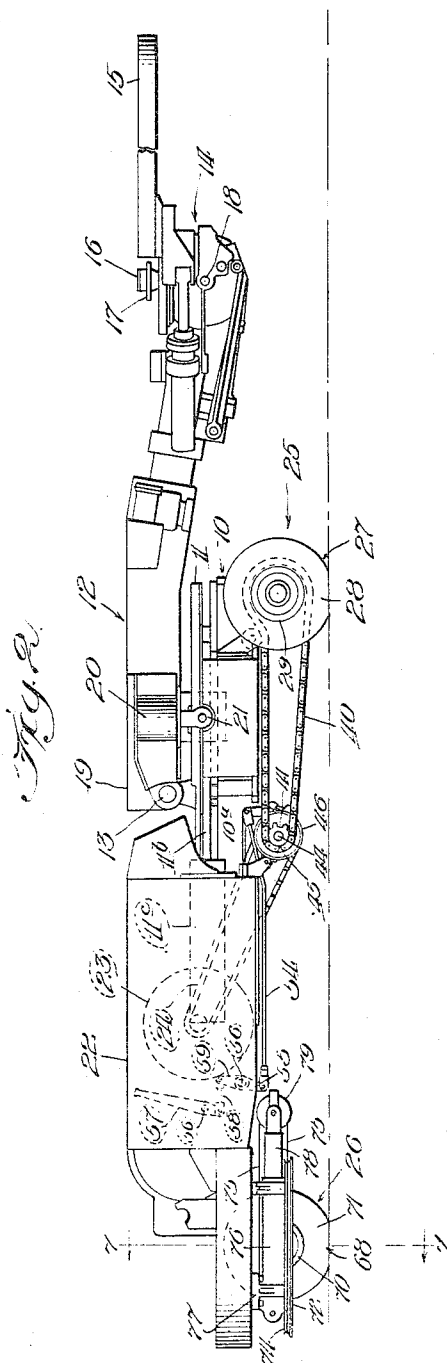
E. M. ARENTZEN

2,332,546

MOUNTED KERF-CUTTING MACHINE

Filed Sept. 23, 1941

7 Sheets-Sheet 1



Inventor:
Einar M. Arentzen
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Oct. 26, 1943.

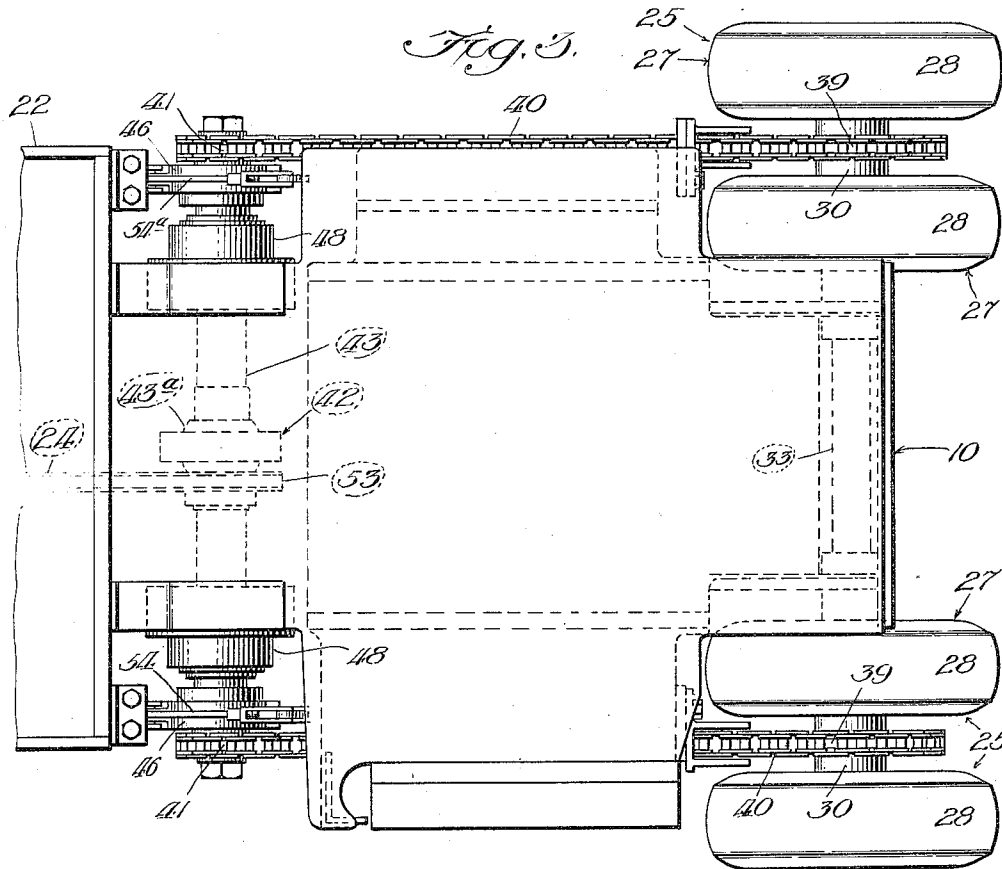
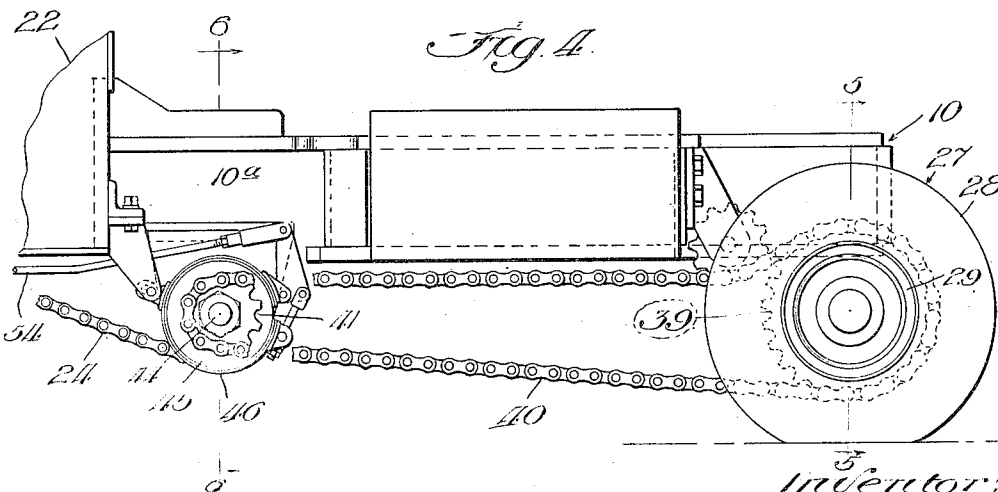
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MOUNTED KERF-CUTTING MACHINE

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7 Sheets-Sheet 2



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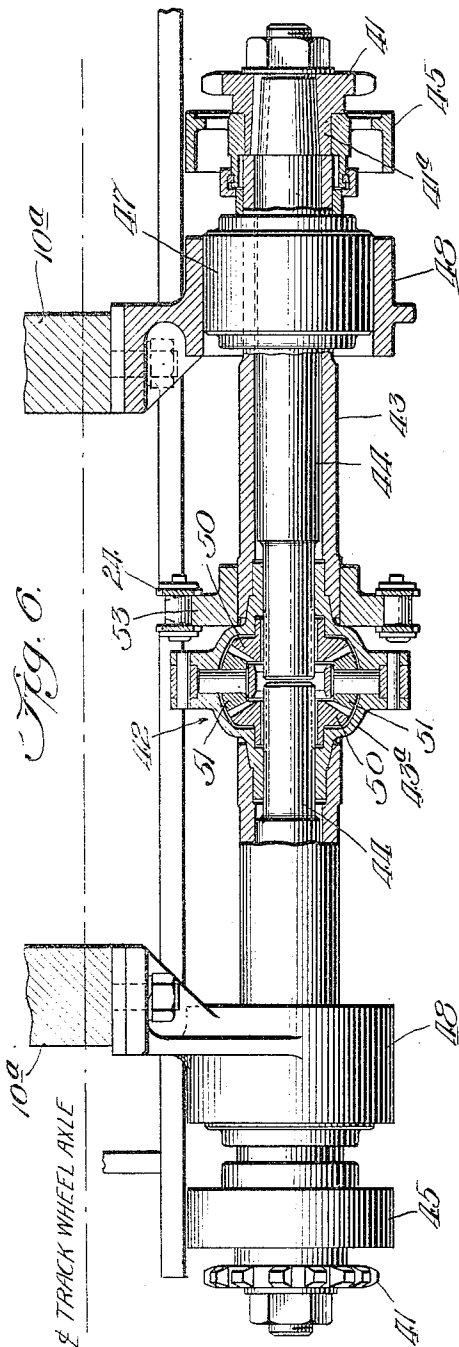
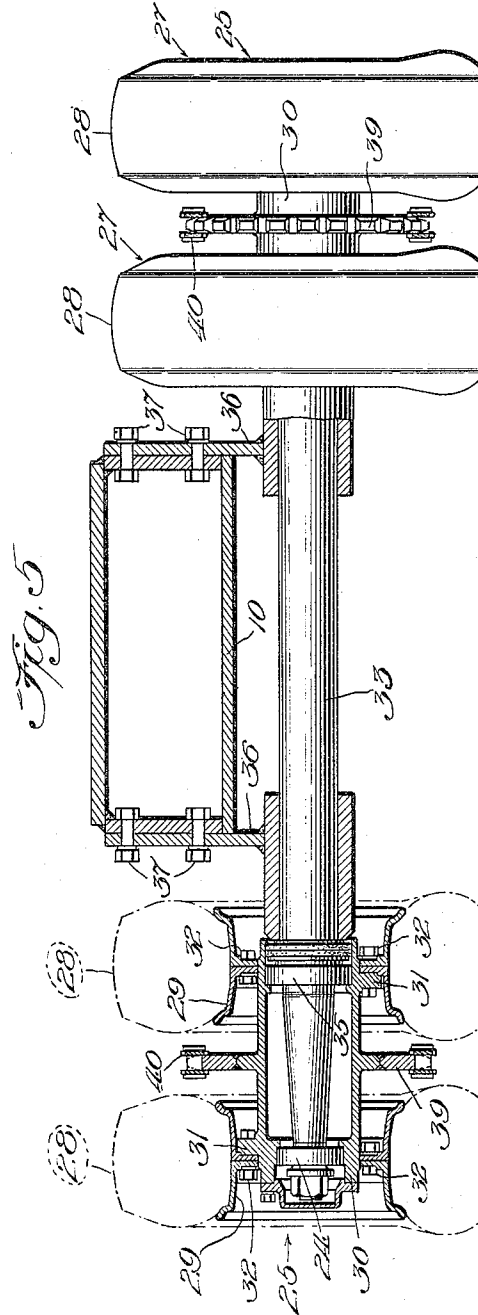
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MOUNTED KERF-CUTTING MACHINE

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7 Sheets-Sheet 3



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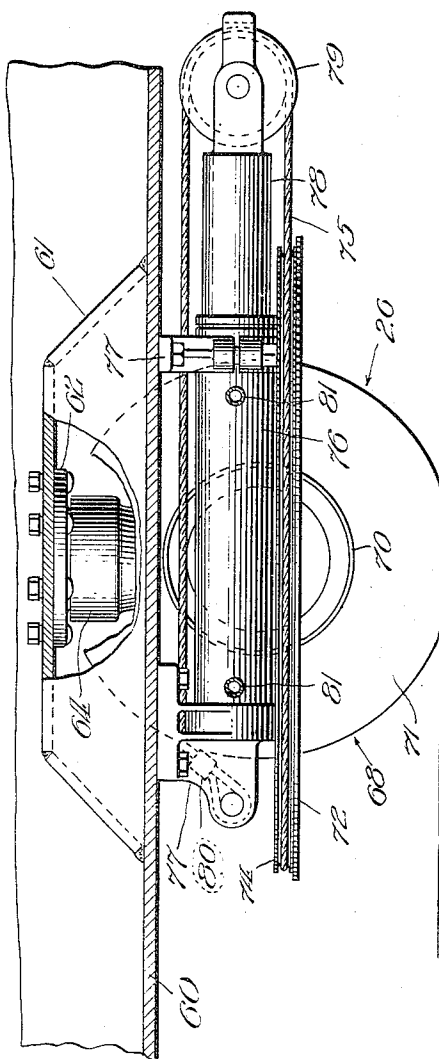
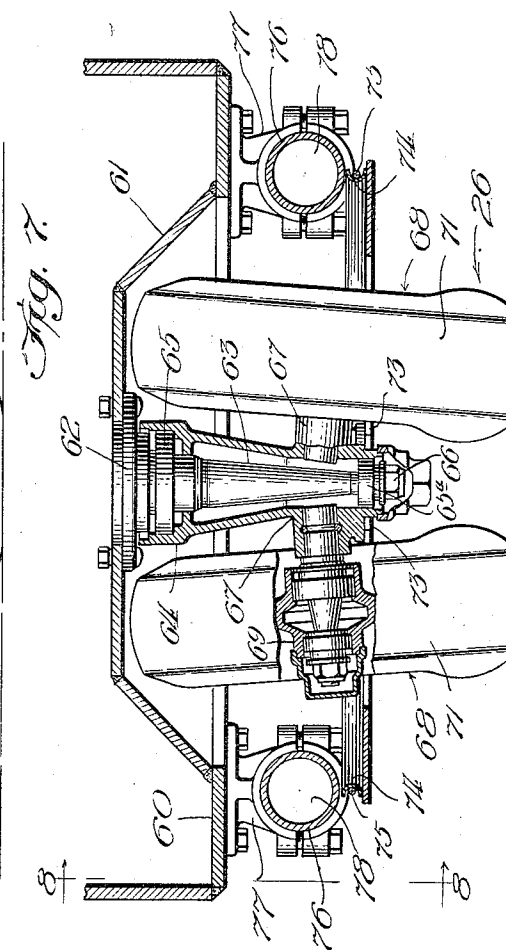
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MOUNTED KERF-CUTTING MACHINE

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7 Sheets-Sheet 4



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MOUNTED KERF-CUTTING MACHINE

Filed Sept. 23, 1941

7 Sheets-Sheet 5

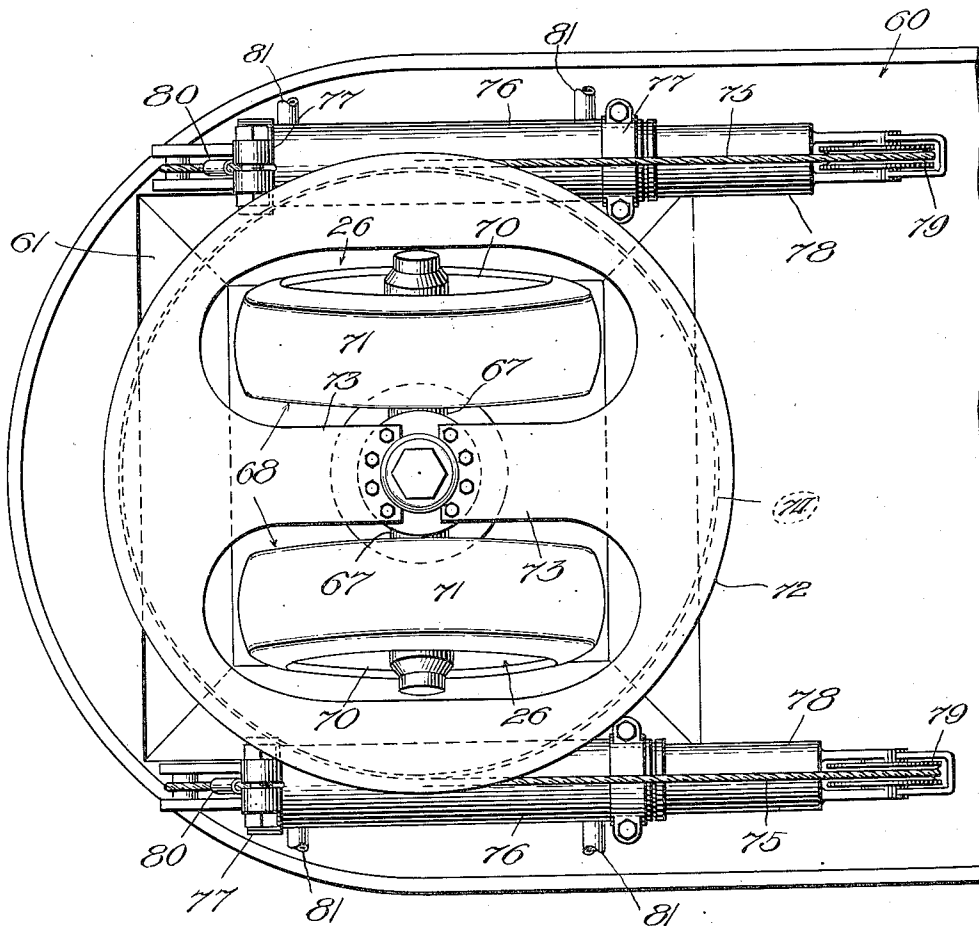


Fig. 9.

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MOUNTED KERF-CUTTING MACHINE

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A perspective view of a mechanical assembly. A curved member 57 is connected via a linkage system (58, 59) to a horizontal rod 56. This rod is part of a larger mechanism (55) mounted on a base 11. A vertical support 12 is also shown.

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MOUNTED KERF-CUTTING MACHINE

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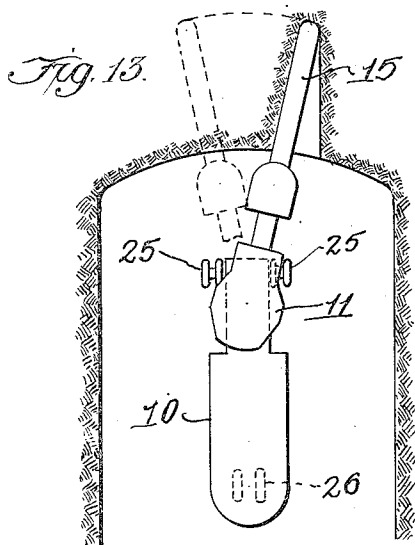
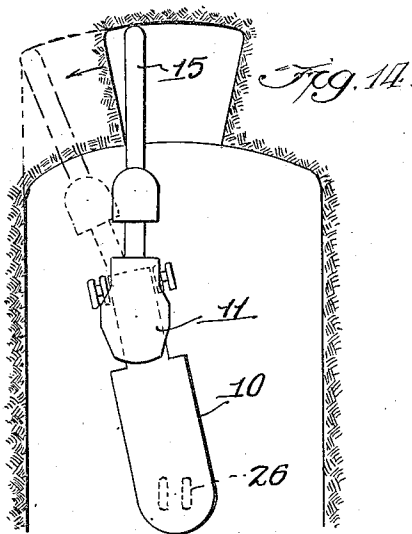


Fig. 15.

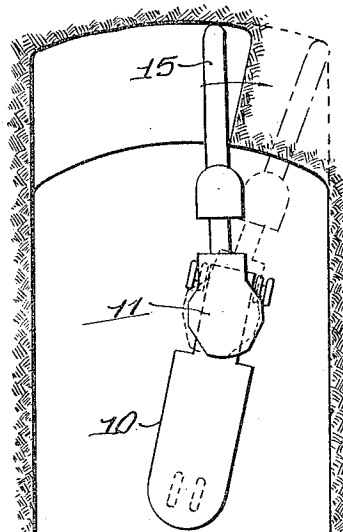
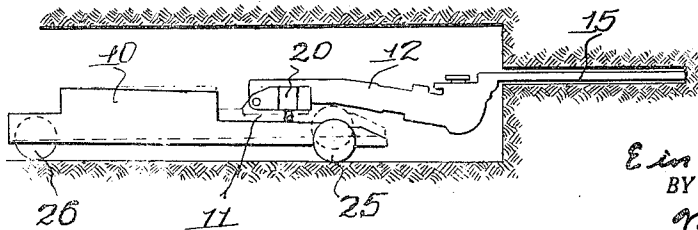


Fig. 16.



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UNITED STATES PATENT OFFICE

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MOUNTED KERF-CUTTING MACHINE

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Company, Chicago, Ill., a corporation of
Illinois

Application September 23, 1941, Serial No. 411,985

3 Claims. (Cl. 180—79.2)

This invention relates to improvements in kerf-cutting machines of the mounted type, wherein a kerf-cutting element is mounted on a mobile base frame for various vertical and lateral adjustments.

Machines of the above type have heretofore been commonly supported by and guided along mine tracks by means of flanged track wheels, so that the use of such machines has been limited to mines wherein it is practical to extend the track system to the various working faces. Even in such cases the scope of movement of such machines is restricted by the mine tracks on which they are guided.

The principal object of my invention is to provide such mounted cutting machines with a novel form of traction and steering mechanism including rubber tired wheels, whereby the machine may be readily maneuvered from place to place in the mine without limitations as to a track system, and whereby the cutting operations can be performed in an improved, more facile manner.

For illustrative purposes, my invention is shown herein as applied to a mounted kerf-cutting machine of the "Universal" type wherein the cutter bar is capable of adjustment for cutting in horizontal and vertical planes in front of the base frame, and at various tilted angles relative to such planes. It will be understood, however, that the invention may also be applied to various other types of mounted kerf-cutting machines, having various forms of bar elevating, swinging or tilting devices.

The invention may best be understood by reference to the accompanying drawings, in which

Figure 1 is a plan view of a kerf-cutting machine to which my invention has been applied.

Figure 2 is a side view of the machine shown in Figure 1.

Figure 3 is an enlarged fragmentary plan view showing the front part of the main frame or chassis of the machine shown in the preceding figures, illustrating the arrangement of the front wheels and the drive connections thereto.

Figure 4 is a side view of the parts shown in Figure 3.

Figure 5 is an enlarged detail transverse section through the front drive axle, taken on line 5—5 of Figure 4.

Figure 6 is a detailed transverse section through the power shaft, taken on line 6—6 of Figure 4.

Figure 7 is a transverse detail section through the steering structure at the rear of the machine,

taken on line 7—7 of Figure 2, but showing the supporting wheels in elevation.

Figure 8 is a section taken generally on line 8—8 of Figure 7.

Figure 9 is a bottom view of the steering structure.

Figure 10 is an enlarged detail side view, in part section, showing the manual brake control mechanism.

Figure 11 is a section taken on line 11—11 of Figure 10.

Figure 12 is a section taken on line 12—12 of Figure 10.

Figures 13 to 15 are diagrammatic plan views illustrating a novel method of operation of the machine of my invention in a mine.

Figure 16 is a side view of the machine in outline, illustrating one of the steps in the method of cutting illustrated in Figures 13 to 15.

Referring now to details of the embodiment of my invention illustrated in the drawings, the same is shown as applied to a mounted kerf-cutting machine of the "Universal" type, which, as previously mentioned, has heretofore been used in mines, but usually has been mounted on track wheels for propulsion and guiding along mine tracks. Such machines are well known, so detailed description thereof need not be made herein, excepting to point out the principal elements, and particularly those parts which are involved in the application of my invention thereto.

The machine shown in the drawings includes a main frame 10, having a turntable 11 mounted at its forward end, and a supporting frame 12 pivotally mounted for vertical swinging adjustment on a transverse pivot 13 at the rear of said turntable. A cutter head 14 is rotatably mounted on the front end of said supporting frame for rolling adjustment about a generally longitudinal axis, and has a cutter bar 15 swivelled thereon for lateral swinging movement in its own plane about the axis 16 of a cutter chain drive sprocket 17. The cutter head 14 also has means for tilting the plane of the cutter bar at various angles relative thereto about a transverse pivot 18. The cutter chain sprocket 17 may be driven through the usual drive connections (not shown) by a motor 19 carried on the supporting frame 12. The various tilting and swinging adjustments may be performed as usual, by various power devices not shown herein, excepting as to the lateral swinging mechanism for the turntable 11, and the elevating mechanism for the supporting frame 12.

The turntable 11 has a depending toothed hub 11^a engaged by a rack 11^b. Said rack is reciprocally operated by a fluid cylinder device 11^c mounted beneath the main frame 10, so that said turntable can be swivelled reversely by power.

The elevating means for the supporting frame 12 consists of a pair of fluid cylinder devices or jacks 28, 20 at opposite sides of said supporting frame, having their piston rods 21, 21 pivotally connected to opposite sides of the turntable 11. The above mentioned fluid cylinder devices may be operated as usual by pressure supplied thereto under manual control of suitable valves, not shown.

The main frame 10 also includes a rear frame portion 22 on which is mounted a motor 23, connected through the usual gear reduction mechanism to a drive chain 24, which heretofore has been operatively engaged with a sprocket on the rear track wheel axle for propelling the machine along the tracks. It will further be understood that as heretofore constructed a rear track-wheel axle was journaled in suitable supports disposed beneath and about midway of the main frame 10, and a front track wheel axle was journaled in supports at the front end of said main frame. As will presently appear, I employ the same motor and chain drive as a part of the propelling and steering mechanism for the rubber-tired wheel mounting.

Referring now to the novel means for mounting the machine for propulsion and steering on rubber-tired wheels, said means consists essentially of two wheel structures 25, 25 disposed at opposite sides of the main frame at the extreme front end thereof, and a swivel wheel structure 26 arranged for swivelling on a vertical axis at the extreme rear end of the main frame. The general wheel arrangement thus described provides in effect a three-point support for the machine, and the swivelled rear wheel structure affords other novel advantages in the operation of the cutting machine as will presently appear.

Each of the front wheel structures 25 shown herein consist of a pair of wheels 27, 27 having pneumatic tires 28, 28 thereon, arranged side by side with their tire rims 29, 29 mounted on an elongated sleeve 30 forming in effect a common hub member for both wheels. For convenience in mounting the tires and their rims, each of said tire rims 29 may be split on a median vertical plane as shown in Figure 5, and the two halves of each rim are detachably connected to each other and to suitable lugs 31, 31 projecting from the hub 30, by bolts 32.

The sleeves or wheel hubs 30 are rotatably mounted on opposite ends of a through axle 33 by means of suitable anti-friction bearings 34, 35. The axle 33 extends through a pair of depending brackets 36, 36 rigidly connected at opposite sides of the main frame 10 as by bolts 37, 37. It will be understood that the axle 33 is disposed in approximately the same position relative to the main frame as the track wheel axle for which it is substituted.

A drive sprocket 39 is mounted on each of the hub members 30, preferably between the two pairs of wheels, as shown in Figure 5. The two sprockets are connected by chains 40, 40 to sprockets 41, 41 at opposite ends of a differential drive structure indicated at 42 and shown in detail in Figure 6.

The differential structure 42 consists of an elongated tubular housing 43 having two aligned

separate shafts 44, 44 rotatably mounted in opposite ends thereof. The drive sprockets 41, 41 have their hubs 41^a, 41^a keyed on the projecting ends of said shafts. A brake drum 45 is also fixed on each of said sprocket hubs, for engagement by brake bands 46, as will presently be described.

The housing 43 is rotatably supported at opposite ends by anti-friction bearing members 47, 47 carried in depending bearing brackets 48, 48, respectively, suitably secured to side frame members 10^a, 10^a of the main frame 10. A differential gear assembly of the usual form is disposed in an enlarged gear casing 43^a forming the central portion of the housing 43. Said gear assembly includes bevel gears 50, 50 fixed on the adjacent ends of shafts 44, 44, and meshed with bevel gears 51, 51 rotatably carried by the gear casing 43^a.

A chain sprocket 53 is fixed on the housing 43 adjacent the gear casing 43^a in position to be engaged by the drive chain 24, which has heretofore been described as constituting part of the drive mechanism for the machine. It will be understood that in the form shown herein, the differential structure 42 is disposed in substantially the same location as the rear track wheel axle which said differential structure replaces. The sprocket 53 thus replaces a similar sprocket on the rear track wheel axle, and is in position to be engaged by the drive chain 24 and be driven by the motor 23. In the particular arrangement shown herein, where the drive chain 24 is disposed centrally of the machine, the tubular housing 43 provides sufficient bearing support for the drive sprocket 53 even though said sprocket must be located at a considerable distance from the bearing brackets 48, 48, in order to be in proper alignment with said drive chain.

With the differential drive above described, the front wheel structures 25, 25 may be driven differentially, and the brake bands 46, 46 engaging the brake drums 45, 45 on the differential drive sprockets 41, 41 are preferably controlled independently of each other, so as to assist in the steering and cutting movements of the machine when desired. In the arrangement shown in detail in Figures 10 to 12, the two brake bands are connected by brake rods 54, 54^a to depending levers 55, 55^a at opposite sides of the main frame adjacent the rear end thereof. The lever is fixed on a transverse rock shaft 56, and is operated by a hand lever 57 connected to the shaft 56 by a link 58 and lever 59, fixed in said shaft. The lever 55^a is rotatably mounted on the shaft 56 and is operated by a hand lever 57^a connected to its extended upper end 59^a by a link 58^a. The two hand levers 57 and 57^a are disposed side by side so that they can be operated simultaneously for applying substantially equal braking effort on the brake drums 45, 45, or can be operated selectively for retarding one of the front drive wheels while speeding up the other through the differential gear. This differential drive control is not only helpful in steering the machine, but is of especial advantage during certain cutting operations, where it may be desired to apply more power on one side of the machine than the other.

The rear steering wheel structure 26 is mounted below a platform 60, herein shown as a rearward extension of the frame portion 22. The platform 60 with its wheel structure may be constructed as a unit and suitably secured to the

rear end of the machine frame. In the form shown, the platform is generally semi-circular at its rear end and has a central elevated recess 61 within which is rigidly secured a base plate 62 having an integral depending bearing pin 63. An upright bearing sleeve 64 is rotatably mounted on said bearing pin as by vertically spaced anti-friction bearings 65, 65^a. The bearing sleeve is held in place by a nut 66 threaded on the lower end of the bearing pin 63.

The bearing sleeve 64 has a pair of relatively short stub axles 67, 67 formed integrally therewith on opposite sides and adjacent its lower end, on which axles are rotatably mounted wheels 68, 68. Said wheels may be of any suitable construction, including hubs 69, and rims 70, with rubber tires 71, 71 mounted thereon. The axes of the stub axles 67, 67 are preferably inclined downwardly so that the wheels 68, 68 are dishd inwardly and approach each other quite closely at their bottom tread surfaces, as shown in Figure 7.

A steering ring 72 is disposed in a generally horizontal plane surrounding the wheels 68, 68 as shown in Figure 9, which ring has two supporting arms 73, 73 extending between said wheels at the front and rear thereof, and secured to the lower end of the bearing sleeve 64. The steering ring has a grooved cable guide 74 formed about its periphery, adapted to receive a steering cable 75 therein associated with steering control mechanism, herein consisting of a pair of fluid-operated cylinder devices 76, 76 supported longitudinally in brackets 77, 77 along the under side of the platform 60 at opposite sides thereof. Each of the cylinder devices 76 has a piston 78 carrying a sheave 79 at its forward end for engaging the steering cable 75. The two ends of said cable are anchored, respectively, by clamps 80, 80 at the front ends of the cylinders 76. From each anchored end, said cable is trained forwardly and downwardly over the adjacent sheave 79, and thence rearwardly around the grooved cable guide 74 on the steering ring 72. Fluid pressure is supplied alternately to the two cylinders through pipes 81, 81 under manual control of valves in any well known manner, so as to extend one of the pistons while pressure on the other piston is relieved, to permit its simultaneous retraction. Thus the two wheels 68, 68 may be swivelled by power in opposite directions for steering the machine from its rear end.

With a machine constructed as above described, it will now be understood that it may be maneuvered both for transportation from place to place and for cutting, without being dependent upon, or limited by, the track system in the mine. The rubber-tired wheels permit the machine to ride over or along mine tracks wherever they may be encountered in the mine, as for instance, in the main haulage entries.

Among other advantages of a machine made in accordance with my invention is its especial adaptability to cut across the working face of a mine room or entry in the novel manner illustrated in Figures 13 to 15, inclusive. This cutting operation consists in sumping the cutter bar by moving the machine forwardly near the center of the room, as indicated in full lines in Figure 13, then swinging the bar by power to make an arcuate cut about the axis of the turntable 11, to an angular position substantially as shown in dotted lines in the same figure. The elevating cylinders 20, 20, on the supporting

frame 12 are then actuated to decrease the angle between said supporting frame and the main frame of the machine, as shown in Figure 16. Since the cutter bar is inserted in its kerf, it may serve as a temporary support anchored in the working face, with the result that the front end of the machine may be lifted by power relative to the supporting frame 12, until the front supporting wheel structures 25, 25 are entirely free of the ground, as indicated in dotted lines in Figure 16. While the front end of the machine is thus supported by the cutter bar, the turntable 11 may be swung laterally by actuating its cylinder device 11^c, in a direction reverse to its initial cutting movement, as indicated in Figure 14, so as to swing the entire front end of the machine about the axis of the rear wheel structure 26, and position the machine frame, as well as the cutter bar, in an advanced position along the mine face. Power on the elevating cylinders 20, 20 is then released so as to permit the front wheels to resume their normal supporting engagement with the ground. The cutter bar may then be swung laterally in the same direction as its initial cutting movement, so as to continue the kerf toward the left, as indicated in dotted lines in Figure 14.

When the initial or sumping cut is made at the center of the room as shown at Figures 13 and 14, the kerf may be extended to the right rib or wall by "back cutting," that is to say, operating the cutter chain in a reverse direction while swinging the cutter bar from its initial sumping position toward the right rib as indicated in Figure 15. It will be understood, however, that if desired, the cutter bar may be initially sumped along the right rib so that the entire width of the room will be cut by swinging the front end of the machine toward the left in a plurality of successive positions. By repeating this alternate lifting, lateral swinging, and dropping of the front wheels relative to the ground, the machine may be operated to cut a relatively wide room or entry, utilizing the rear steering wheel structure as its effective axis of swinging movement, so as to cut a kerf along a much longer radius and produce a much straighter working face than can be done with the usual track mounted machines, wherein the maximum swinging radius of the cutter bar is centered at the turntable axis.

It will be understood further, of course, that substantially the same method of cutting can be employed by pivoting the cutter bar about its own axis on the cutter head 14 instead of the axis of the turntable 11.

Although I have shown and described one particular embodiment of my invention, it will be understood that I do not wish to be limited to the exact construction shown and described, but that various changes and modifications may be made without departing from the spirit and scope of my invention as defined in the appended claims.

I claim as my invention:

1. In combination with a kerf-cutting machine frame, rubber-tired supporting wheels for said frame including a steering wheel structure pivoted on a vertical axis, and fluid actuating means for swivelling said steering wheel structure including an arcuate steering member extending horizontally around said wheels and connected to said wheel structure, a pair of cylinder and piston devices mounted in said frame, and means connected at opposite ends to said devices and

trained about said steering member for rotating said wheel structure in opposite directions.

2. In combination with a kerf-cutting machine frame, rubber-tired supporting wheels for said frame including a steering wheel structure pivoted on a vertical axis, fluid actuating means for swivelling said steering wheel structure including a pair of cylinder and piston devices disposed horizontally of said frame at opposite sides of said wheel structure, an arcuate steering member extending horizontally about said wheels and connected to said wheel structure, and flexible cable means connected at opposite ends to said cylinder and piston devices and trained about said arcuate steering member for rotating said wheel structure in opposite directions. 15

3. In combination with a kerf-cutting machine frame, rubber-tired supporting means for said frame including a steering wheel structure pivoted on a vertical axis, said steering wheel structure having two wheels arranged side by side in relatively close relation on opposite sides of their steering axis, an annular steering member disposed horizontally about said wheels and connected to said steering structure between said wheels, and means for swivelling said wheel structure for steering including flexible cable means engaging said annular steering member. 5 10

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