E. C. MORGAN.

MINING MACHINE.

APPLICATION FILED AUG. 15, 1910.

1,276,249.

Patented Aug. 20, 1918.

3 SHEETS—SHEET 1.

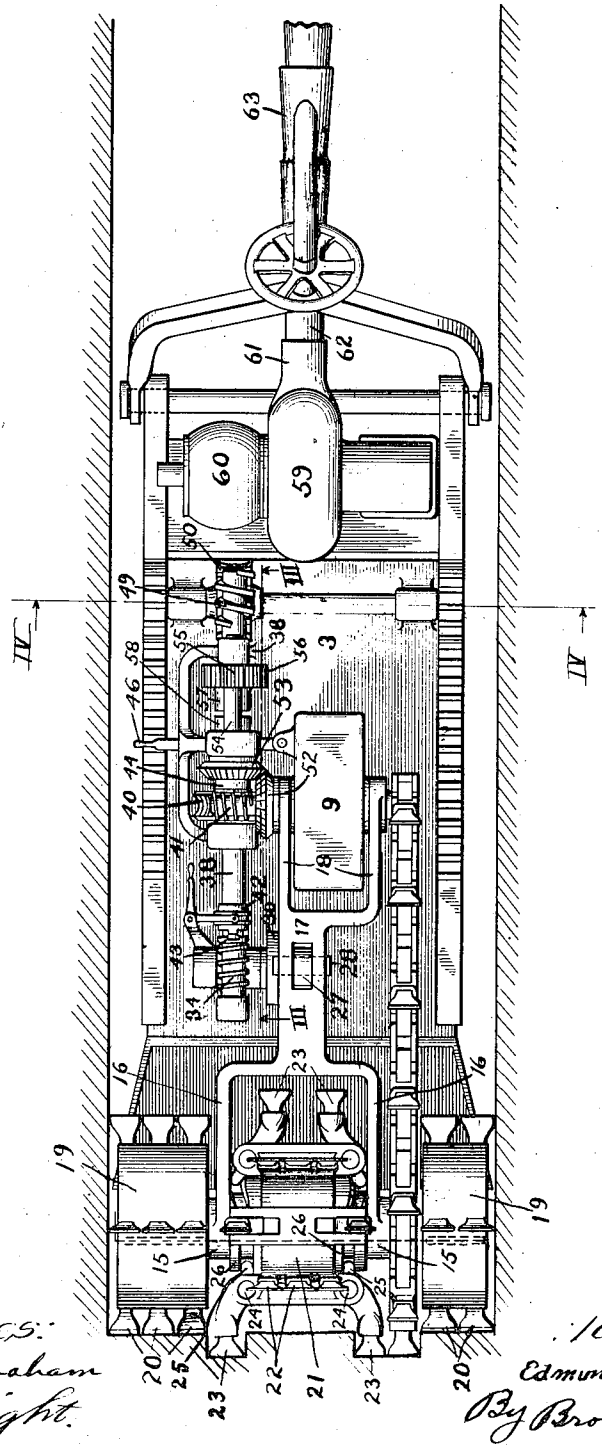

Fig. 1

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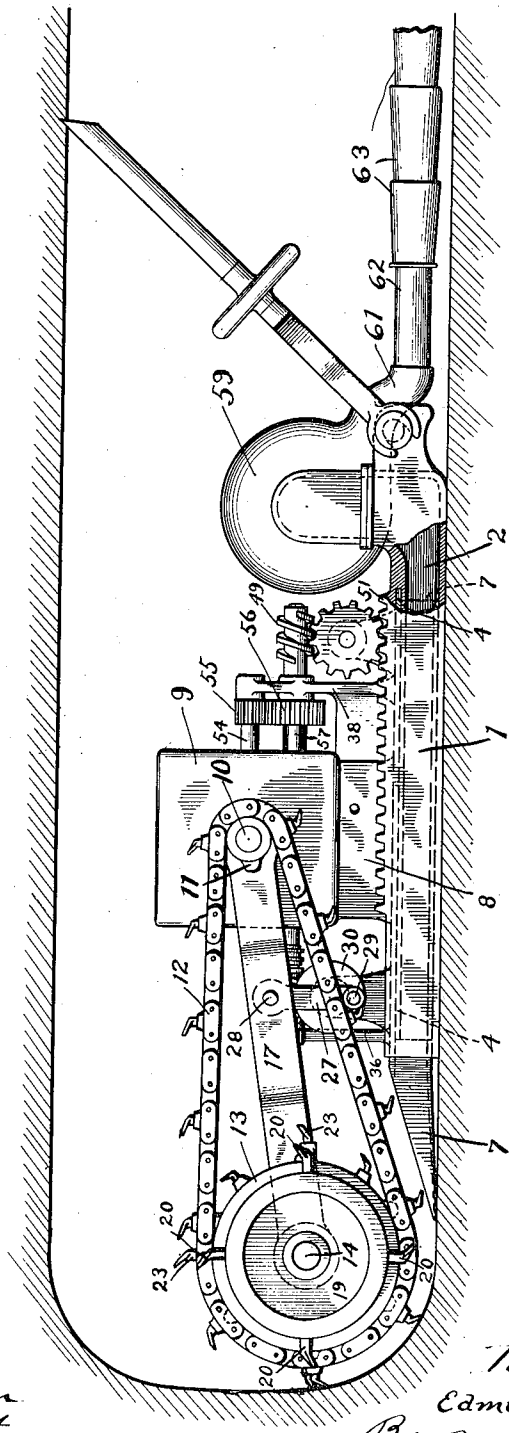
3 SHEETS—SHEET 2.

Fig. 2



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3 SHEETS—SHEET 3.

Fig. 3

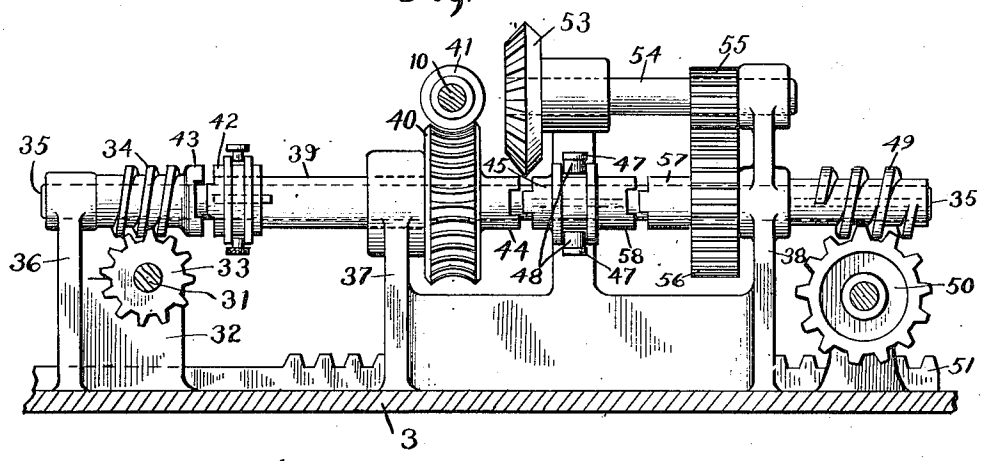
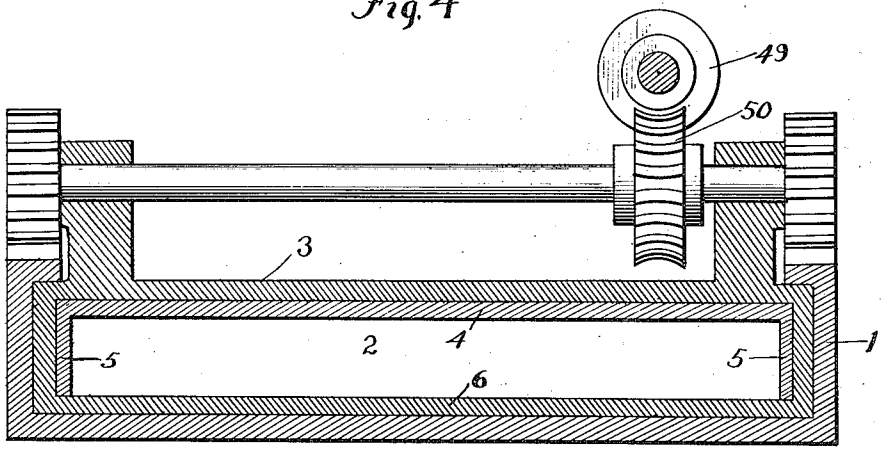


Fig. 4



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UNITED STATES PATENT OFFICE.

EDMUND C. MORGAN, OF MORGAN PARK, ILLINOIS.

MINING-MACHINE.

1,276,249. Specification of Letters Patent. Patented Aug. 20, 1918.

Application filed August 15, 1910. Serial No. 577,134.

To all whom it may concern:

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

This invention relates to mining machines and has for its main general object to provide an improved construction, combination and arrangement of parts in a mining machine.

More especially one of the objects is to provide an improved combination and arrangement of parts for that class of mining machines in which the material to be mined is finely subdivided, and according to which the mining machine can be simply and economically constructed and made durable and efficient in operation.

Another object is to provide improved means for breaking down the material to be mined.

Other and further objects will appear in the specification and be specifically pointed out in the appended claims, reference being had to the accompanying drawings, exemplifying the invention and in which—

Figure 1 is a top plan view of a mining machine constructed in accordance with the principles of this invention;

Fig. 2 is a side elevation of the same;

Fig. 3 is a section on the line III—III of Fig. 1;

Fig. 4 is a section on the line IV—IV, Fig. 1.

Referring more specifically to the drawings, and first of all to Figs. 1, 2, 3 and 4, the embodiment of the invention shown therein comprises a base member 1 provided with a tubular passage or pneumatic conveyer 2 passing lengthwise therethrough. Reciprocably mounted on the base member 1 is a carriage 3 which is adapted to be moved forwardly and rearwardly in suitable guide ways on the base member 1, as shown most clearly in Fig. 4. Integrally formed with the base member 1 is a tongue or sheet 4 provided with lateral flanges 5, (see Fig. 4) adapted to slidably engage the bottom sheet 6 of the carriage 3, thus forming a tubular portion of said carriage which telescopes with the tubular passage 2 in the base member when the carriage is moved relatively to said base member. The forward end of the carriage 3 is provided with a scoop or shovel 7 whereby it is adapted to scoop up the finely divided material which is cut down by the cutters presently to be described. Upon the upper end of a pedestal or support 8, and rigid on the carriage 3 is mounted a motor 9 which is provided with a power shaft 10, one end of said power shaft having a sprocket 11 rigidly secured thereto for driving an endless chain belt 12, said chain belt being carried adjacent the forward end of the machine by a sprocket wheel 13 rigidly mounted on a cutter shaft 14, said cutter shaft being journaled in a pair of bearing bosses 15 provided on the outer ends of the forked arms 16 of a bifurcated cutter head carrying member 17. The rear end of the member 17 is also bifurcated, the arms 18 of which are journaled upon the power shaft 10, thus adapting the member 17 to be swung about the axis of said power shaft 10. Keyed to the outer ends of the cutter shaft 14, which projects laterally beyond the prongs 16 of the forked lever 17, are a pair of drums 19, upon which are rigidly mounted at suitable intervals a plurality of radially projecting cutters 20. Between the prongs 16 and upon the shaft 14 is keyed another drum 21 having a plurality of cutters 22 rigidly mounted thereon at intervals. Said cutters 20 and 21 are adapted when the shaft 14 is rotated, to cut down in finely divided particles the coal across the entire width of the machine, as shown in Fig. 1, with the exception of those portions directly in front of the forward ends of the prongs 16. In order to provide means for cutting a clearance way for the bosses 15 and the prongs 16, a pair of movable cutters 23 are provided which when they are passing through the bank of coal are disposed directly in front of the bearing bosses 15, as shown in Fig. 1. In order, however, to remove the cutters 23 out of their position so as to avoid interference with the prongs 16 when the cutter head is rotated, said members are pivotally mounted at 24, and provided with cam arms 25 which cam arms are slidably engaged by cams 26 rigidly secured to the forked lever 17.

In order to provide means for moving the lever 17 to and fro vertically, a connecting link 27, which is pivoted at one end upon a pin 28 carried by the swinging arm 17, is connected at the other end to a crank pin 29 projecting from a crank disk 30, said

crank disk being keyed to a short transverse shaft 31 journaled in a pedestal 32 rigid with the reciprocating carriage frame 3. Also keyed to the shaft 31 is a worm gear 33 which meshes with a worm 34 freely rotatable about a shaft 35, which shaft is disposed longitudinally of the machine and journaled in a plurality of bearings 36, 37 and 38. Rotatably mounted upon the shaft 35 and capable of rotation relatively thereto, is a sleeve 39, upon one end of which, to the right of the bearing support 37, as shown in Fig. 3, is rigidly mounted a worm wheel 40 meshing with the worm 41. The worm 41 is keyed to one end of the power shaft 10 of the motor 9. Splined to the sleeve 39 is a clutch 42, which is movable axially into and out of clutching engagement with a clutch element 43 on the end of the worm 34, said worm being thereby adapted to receive power from the sleeve 39 when said sleeve is driven in a manner now to be pointed out. The right hand end of the sleeve 39, shown in Fig. 3, is provided with a clutch element 44 to adapt it to coöperate with a clutch 45 which is splined to the shaft 35 and adapted to be moved into and out of clutch by means of a shifting lever 46, (see Fig. 1) which lever is provided with forks 47 with rollers 48 carried thereby (see Fig. 3) for engaging in a circular groove in the clutch 45. It will thus be evident that when the clutch 45 is shifted into engagement with the clutch element 44, the shaft 10 is adapted to transmit power to the shaft 35 through the intermedium of the worm 41, worm wheel 40 and clutch 45. This connection imparts rotary motion to the shaft 35 to obtain a vertical swinging movement to the lever arm 17 by means of the mechanism already described. At the same time, a worm 49 keyed to the rear end of the shaft 35 and meshing with the feed pinion 50 serves to feed the carriage of the machine forwardly to force the cutters into the material to be mined. This feeding movement is accomplished by means of a rack 51 with which the feed pinion 50 meshes.

Keyed to the short shaft 54 is a driving pinion 55 which meshes with a spur gear 56, the hub portion 57 of which is freely rotatable on the shaft 35. This train of gears is provided for the purpose of a quick return travel of the carriage at the completion of the forward cut. For this purpose the clutch 45 is provided adjacent the hub 57 of the gear 56 with a clutch element 58, thereby adapting the several parts to impart a quick return movement through the worm 49 and gear 50.

Referring now more especially to Figs. 1 and 2 of the drawings, a blower 59, preferably driven by a direct connected motor 60_3 is mounted on the rear end of the base member 1, the inlet passage of said blower being directly connected to the pneumatic passage 2 in the base frame of the machine. A discharge outlet 61 of the blower 59 has connected thereto a sleeve 62 of any suitable flexible material such as canvas, which sleeve is slidably connected with a pneumatic tube comprising a plurality of detachably connected sections 63, which, as the machine is moved forwardly into the cut, may be added one by one over the sleeve 62, thus enabling an indefinite elongation of the pneumatic tube without interruption of the excavating process.

What I claim is:

1. The combination with rotary cutting mechanism comprising a plurality of cutters and rotatable in a given plane during the cutting operation, of means for supporting said mechanism, and a cam groove for positively shifting the plane of rotation of said cutters during a predetermined portion of their rotary travel and for positively confining the cutters in a predetermined position during the cutting operation and preventing lateral movement thereof except as determined by said groove.

2. In a mining machine, the combination of a plurality of sets of rotary cutters, each set operating on a mine wall in a plane parallel to the operating plane of the other set, and means for positively moving the cutters of each set into planes closer to each other during a predetermined portion of their rotary travel and strictly confining said cutters to a predetermined path of travel independently of gravity.

3. In a mining machine, the combination of a bearing fork, a rotary cutter head journaled on said fork, means to rotate the cutter head, a plurality of cutters rigidly mounted on said cutter head, and other cutters pivotally mounted on said cutter head to oscillate lengthwise the axle thereof, said oscillating cutters being thereby adapted to provide clearance for the prongs of said bearing fork and to avoid interference therewith when the cutter head is rotated.

4. In a mining machine, the combination of a bearing fork, a rotary cutter head journaled in said fork, means to rotate the cutter head, a plurality of cutters rigidly mounted on said cutter head, other cutters pivotally mounted on the cutter head to cut a clearance way for the forks, said cutters being provided with cam arms, and cams mounted on said fork and engaging said cam arms to oscillate the cutters into the space between said forks to avoid interference with the fork.

5. In a mining machine, the combination with a power shaft, means to rotate the shaft of an arm pivoted at one end to said shaft, said arm being bifurcated at its outer swinging end, a cutter shaft journaled in the forks of said bifurcated arm, a plurality of

cutters rigidly mounted on said shaft on each side of and between said forks, and cutters oscillatably mounted on said shaft to cut a clearance way for said forks, said oscillating cutters being thus adapted to avoid interference with said forks while the shaft is being rotated.

6. In a mining machine, the combination with a power shaft, means to rotate the shaft of an arm pivoted at one end to said shaft, said arm being bifurcated at its outer swinging end, a cutter shaft journaled in the forks of said bifurcated arm, a plurality of cutters rigidly mounted on said shaft on each side of and between said forks, cutters oscillatably mounted on said shaft to cut a clearance way for said forks, said oscillating cutters being thus adapted to avoid interference with said forks while the shaft is being rotated, and means for imparting a feed movement to said arm.

7. In a mining machine, the combination with a power shaft, means to rotate the shaft of an arm pivoted at one end to said shaft, said arm being bifurcated at its outer swinging end, a cutter shaft journaled in the forks of said bifurcated arm, a plurality of cutters rigidly mounted on said shaft on each side of and between said forks, cutters oscillatably mounted on said shaft to cut a clearance way for said forks, said oscillating cutters being thus adapted to avoid interference with said forks while the shaft is being rotated, means for imparting a feed movement to said arm, and means for feeding said power shaft forward.

8. In a mining machine, the combination with a rotary cutter head, of a support therefor, a plurality of cutters rigidly connected to said cutter head, additional cutters pivoted to the peripheral portion of said rotary cutter head in planes outside of said fixed cutters, means acting independently of gravity for positively moving said additional cutters toward each other, and means for positively holding said additional cutters in their paths of travel.

9. In a mining machine, the combination with a rotary cutter head, of cutters mounted thereon, bearings for said cutter head, a fork carrying said bearings, additional cutters for cutting the mine wall in the plane of the arms of said fork, means for automatically shifting said additional cutters out of the way of said arms when said cutters approach said arms, and means for rotating said cuter head.

10. In a mining machine, the combination with a plurality of rotary cutter heads, of cutters mounted on each of said cutter heads, a plurality of straight arms for supporting the bearings of said cutter heads, additional cutters for cutting the mine wall in the planes of said arms, automatic mechanism for shifting the additional cutters out of the way of said arms once during each rotation thereof, means for driving said cutter heads, and cutters mounted on said driving means for cutting the mine wall in the planes of said driving means.

11. In a mining machine, the combination with three rotary cutter heads co-axially mounted, of bearing supports for said cutter heads comprising a forked lever with its arms straight and respectively between the intermediate cutter head and outside cutter heads, cutters on each of said cutter heads, additional cutters for cutting the mine wall over the spaces in the planes of the arms of said fork, means for shifting said additional cutters out of the way of said arms when passing the same, and driving mechanism for said cutter heads.

12. In a mining machine, the combination with a rotary shaft, of three drums spaced apart from each other and mounted on said shaft to rotate therewith, a plurality of cutters on each of said drums, bearings for said shaft between the intermediate drum and the drums on the end portions of said shaft, a forked support for said bearings, additional cutters for cutting the mine wall in the planes of the arms of said forked support, means for moving said additional cutters out of the way of said arms when said cutters are passing over the rear portions of their paths of travel, a sprocket connected to said shaft to rotate therewith, a chain cutter mounted on said sprocket between one arm of said forked support and one of the outer drums, and means for operating said chain cutter to transmit power simultaneously to said drums and additional cutters.

13. In a mining machine, the combination with rotary cutting mechanism comprising a multiplicity of cutters operating in juxtaposed planes and extending entirely across a mine wall, of a movable support for said rotary cutting mechanism, a motor, means connected between said motor and said rotary cutting mechanism for operating the latter, and means connected between said motor and said movable support for automatically and continuously oscillating the latter together with said rotary cutting mechanism carried thereby.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this 8th day of August, A. D. 1910.

EDMUND C. MORGAN.

Witnesses:
R. H. JEFFERY,
H. B. ALEXANDER.