Aug. 11. 1925. 1,549,700

W. J. WILSON

MINING MACHINE

Filed Dec. 19, 1921 2 Sheets-Sheet 1

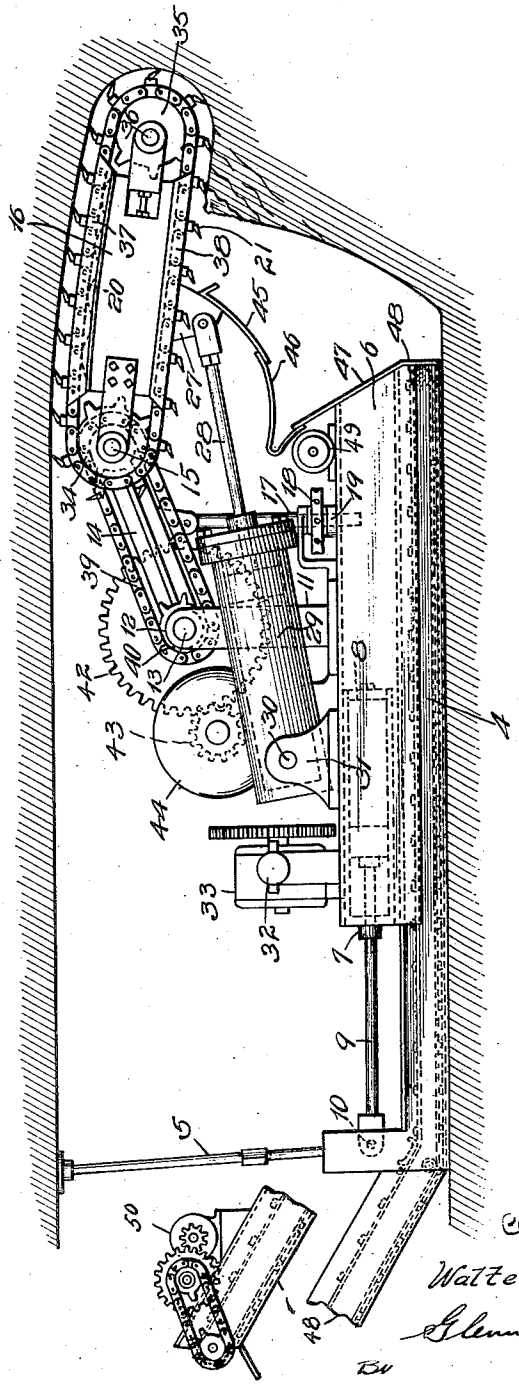


Fig. 1.

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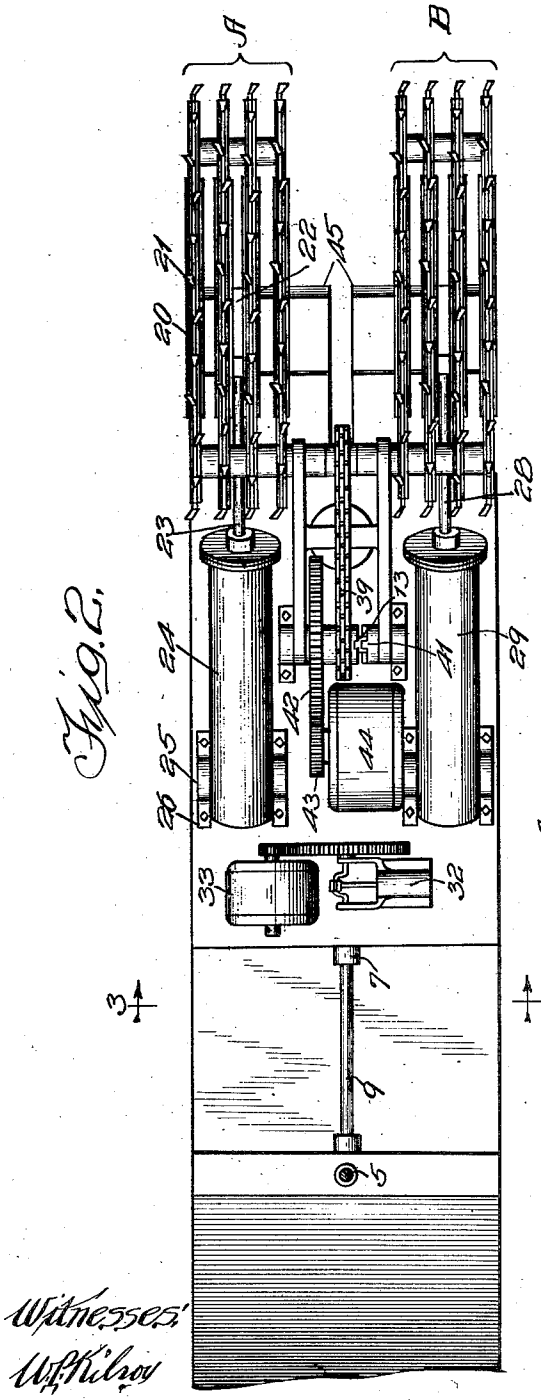


Fig. 2.

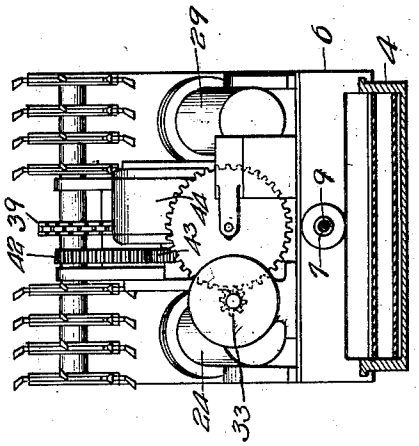


Fig. 3.

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UNITED STATES PATENT OFFICE.

WALTER J. WILSON, OF SEWICKLEY, PENNSYLVANIA.

MINING MACHINE.

Application filed December 19, 1921. Serial No. 523,452.

To all whom it may concern:

Be it known that I, WALTER J. WILSON, a citizen of the United States, residing at Sewickley, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Mining Machines, of which the following is a specification.

The present invention relates to a machine which is adapted to mine or dig out all of the coal or other material being acted upon as distinguished from machines which merely cut kerfs to facilitate the shooting down of the coal. In the usual forms of mining machines, the cutting tools are carried on chains and act on the coal in substantially the same way as a planer tool acts on material in a planer. When an experienced miner mines coal with a pick, he makes a slight cut or breaks out a small portion of coal in one position and then another portion in an adjacent position and then breaks out the projecting piece between the different cuts and in this general manner takes advantage of the formation of the coal in order to mine the same with the least amount of work. One of the objects of the present invention is to provide a mining machine which will attack the coal in a manner similar to the method pursued by a miner when excavating with a pick. Another object is to provide a mining machine having cutting apparatus which will start cutting at the top of the face and cut downwardly and at the same time carry the material out so that it can be deposited on a conveyer for loading the same; and other objects will appear more fully from the following description taken in connection with the accompanying drawings in which

Figure 1 is a side view of a machine embodying this invention;

Figure 2 is a plan view; and

Figure 3 is a sectional end view taken on the line 3—3 of Figure 2.

The machine is provided with a main frame 4 which may rest directly on the floor of the mine or which may be provided with any suitable track. This frame is held in cutting position by means of jacks 5. A reciprocating support or carriage 6 is slidably mounted on the frame 4 and is actuated by any suitable means such as a hydraulic jack 7. In the arrangement shown, the cylinder 8 of this jack is mounted in the carriage 6 and the piston rod 9 is connected at 10 to the base or frame 4, the arrangement being such that the carriage 6 may be moved back and forth by means of this mechanism.

The carriage 6 is provided with posts or uprights 11 having bearings 12 for a shaft 13. An arm 14 is pivoted at the top of the posts 11 and has a shaft 15 at its outer end for supporting the cutter bars 16. The arm 14 is raised and lowered by any suitable means such as a jack comprising a threaded shaft 17 which coacts with a nut 18 which engages with a bearing 19 on the carriage 6.

Any suitable number of cutter bars 16 may be utilized, but I prefer to arrange these bars in two groups A, B with a space between them of substantially the same width as the respective groups of cutters. These cutter bars are provided with cutter chains 20 having cutter bits 21, the chain guides and chains being arranged so that the groups of cutters A and B are adapted to cut or remove all of the material in the paths of the respective groups. The cutter bars of the group A are connected together and have a downwardly projecting arm 22 which is engaged by a piston rod 23 of a hydraulic jack 24, the cylinder of which is pivoted at 25 to brackets 26 carried by the carriage 6. The cutter bars of the group B have a similar arm 27 which is engaged by a piston rod 28 of a hydraulic jack 29 which is pivoted at 30 to brackets 31 on the carriage 6. The respective hydraulic jacks 8, 24 and 29 may be supplied with fluid from any suitable source as from a pump 32 which is driven by means of motor 33, the connections from the pump being omitted for convenience in illustration as any ordinary or preferred arrangement may be used.

The cutter chains 20 are mounted on driving sprockets 34 and guide sprockets 35, the former being mounted on the shaft 15 and the latter on shafts 36 at the ends of the cutter bars. These sprockets may be of the usual type but I prefer to make them somewhat eccentric and assemble the sprockets and chains so that the eccentricity of the one sprocket will correspond to the eccentricity

of the other sprocket in order that the chain will run freely or without binding. This eccentricity will give a variable speed to the chain and at the same time will cause parts of the chain to move toward and away from the face of the coal. This action will be pronounced around the forward sprocket 35 where the bits engage with the coal in the arc around the sprocket. As these bits are forced inwardly and outwardly, they will give a picking or striking action against the coal instead of merely planing or grinding it off. The chain guides 37 at the top of the cutter bars are preferably curved outwardly to assist in the feeding movement of the cutter chains. These guides and the guide 38 at the bottom of the bars may have smooth surfaces for the backs of the chains or may have waved or irregular surfaces so that the bits may move outwardly or inwardly as they travel along the guides.

The shaft 15 may be driven in any suitable manner as by means of a chain 39 which is driven by a sprocket 40 on the shaft 13 and controlled by means of a clutch 41 on said shaft, the shaft being driven from a motor 44 by gears 42 and 43.

Guide plates 45 are secured to the cutter bars 16 and are connected by flexible connections 46 with plates 47 on the end of the carriage 6. These plates prevent the coal from being thrown back into the machine and guide it down to the forward end of a conveyer 48 which extends along the bottom of the frame 4 and is then carried upwardly to discharge the coal into cars or the like, this conveyer being driven by a motor 50 and suitable gearing.

When the machine is brought into position at the face of the coal the outer ends of the cutter arms are raised by means of the hydraulic jacks so as to commence the cut adjacent to the roof of the mine. The arm 14 is adjusted to bring the rear end of the cutter bars to any desired position as for instance so that the entire upper reaches of the chains may cut as shown in Figure 1. The bars are fed forwardly by the movement of the carriage 6 until their forward ends have cut well into the coal and then the forward ends are swung downwardly to complete the cut. It will be seen that as soon as the forward ends are well into the coal, the outgoing portions of the chains on the lower sides of the bars will be cutting outwardly against the unsupported coal at the face so that large chunks of the coal may be broken off at the face. This production of large pieces of coal is further enhanced by the variable action of the chains and the spacing of the chains so that they will cut at different distances from the centers of the sprockets. This arrangement whereby the cutters are first forced into the coal or other material and then permitted to cut outwardly so as to tear off the loosened chunks forms one of the important features in the operation of this machine. As the coal is mined, it falls down onto the conveyer 48 and is carried back and up into the coal cars or to such point as desired. After one cut has been made, the forward end of the machine is swung sidewise by means of a jack 49 or other suitable device so as to bring one of the groups of chains into the space left by the two groups and the other group will be in its corresponding position so as to complete the cut for a space equal to twice the width of the cutter groups.

While the above describes one method of operating the machine, a still more desirable method is to bring the cutter arms in position at the roof of the mine and then make a comparatively shallow sumping cut by holding the cutter arms up and feeding the carriage forwardly. As this cut progresses more of the bits on the top of the cutter arms begin to cut and then to force the cutter arms downwardly. This downward movement is then permitted by gradually relieving the pressure in the jack which in this operation only acts as a steady rest or control to keep the cutter arms from feeding downwardly too fast. At the same time the carriage moves forwardly so that the forward ends of the cutter arms first move inwardly into the coal and then down and outwardly to complete the cut. In other words, the cutter arms are so shaped that the feeding action will be more or less automatic and the feeding devices mainly act as guides and safety devices for guiding the cutter arms during the cutting operation.

It will also be noted that after the cutter arms have made a sumping cut, the pressure on the piston for moving the carriage may be reversed and this jack will serve for drawing the main frame 4 forwardly toward the face of the coal preparatory for completing the cut.

Of course the construction of the machine may be greatly varied for carrying out the principles of operation described herein and the parts will necessarily be changed for different working conditions and therefore I do not wish to be limited to the exact construction or arrangement herein shown and described, except as specified in the following claims:

1. A mining machine having a plurality of groups of cutter bars and chains arranged on a common support, the groups being separated by a space substantially as wide as the width of one group, means for actuating the cutter chains and means for swinging the cutter bars of the respective groups.

2. A mining machine having two or more groups of cutter chains arranged so that the chains of each group will excavate all

of the material within the path of the group, said groups being spaced apart, bars for supporting the chains of the different groups, pivotal supports for the rear ends of the bars, means for swinging the bars on the pivots in vertical direction, means for driving the chains and means for feeding the bars with the chains thereon into the material to be mined.

3. A mining machine having a vertically adjustable horizontal support, a plurality of groups of cutter bars mounted on said support with the groups separated by spaces substantially equal to the width of one of the groups, means for swinging the outer ends of the bars in a vertical plane, cutter chains carried by said bars with their bits arranged to cut downwardly, and means for driving said chains, the arrangement being such that the cutter chains may be started to cut at the top and swung downwardly to complete the cut and the chains of each group will excavate all of the material within the path of the group.

4. In a mining machine, the combination of a support, an arm pivotally mounted on said support, means for swinging the arm in a vertical plane, a shaft at the outer end of the arm, means for turning said shaft, a plurality of sprockets mounted on said shaft, a plurality of cutter bars pivoted on said shaft, sprockets at the outer ends of said bars, cutter chains for cutting coal carried by the sprockets and means for swinging said bars said cutter bars and chains being arranged in two or more groups with the bars in each group adjacent to each other and the groups separated by spaces, substantially as described.

5. In a mining machine, the combination of a support which is adjustable in a vertical plane, a shaft carried by said support, a plurality of eccentric sprockets mounted on said shaft, cutter bars pivotally mounted on said shaft, eccentric sprockets at the outer ends of said bars, cutter chains carried by the sprockets and means for swinging said bars.

6. In a mining machine, the combination of a frame, a conveyer at the bottom of the frame, a slidable carriage mounted on said frame, means for sliding said carriage, posts on said carriage, an arm pivotally mounted on said posts, means for swinging the outer end of the arm up and down, a shaft at the outer end of said arm, a plurality of cutter bars mounted on said shaft, cutter chains carried by said cutter bars, means for swinging said bars in a vertical direction and means for driving said chains whereby they will cut downwardly, the arrangement being such that the material excavated will be carried away by the conveyer.

7. A mining machine, comprising a movable frame, a conveyer at the bottom of the said frame adapted to convey material backwardly from the machine, a carriage on said frame, means for reciprocating said carriage and cutter bars having cutting chains adapted for cutting coal mounted on the carriage and adapted to discharge the material excavated onto the conveyer.

8. In a mining and loading machine, the combination of a frame, a conveyer in said frame, adapted to receive the excavated material and to carry it to cars or the like, and a group of cutter bars with cutter chains mounted thereon, arranged adjacent to each other and pivotally mounted on said frame to swing in a vertical plane, a second group of cutter bars arranged adjacent to each other and pivotally mounted on the frame, said second group being spaced from the first named group by space substantially equal to the width of each group, means for swinging the cutter bars of each group independently of each other, said cutter chains being adapted to cut downwardly and deposit the excavated material in position to be carried away by the conveyer.

9. In a mining machine, a combination of a frame or base, a carriage mounted on said frame, a hydraulic jack for reciprocating said carriage, posts on said carriage, an arm pivotally mounted on said posts, means for swinging the forward end of the arm, cutter bars carried by said arm and hydraulic jacks for swinging said cutter bars.

10. In a mining machine, the combination of a movable frame, a carriage mounted on said frame, means for reciprocating said carriage, posts on said carriage, an arm pivotally mounted on said posts, means for swinging the outer end of the arm, a shaft carried by said arm, a plurality of cutter bars carried by said shaft, means for swinging said cutter bars, cutter chains carried by said bars, means for driving said chains whereby they will cut downwardly, a conveyer for removing the excavated material and guards between the conveyer and cutter bars for guiding the material into the conveyer.

11. A mining machine having a plurality of cutter bars with guides having irregular surfaces whereby the chains may move toward and away from the centers of the bars, eccentric sprockets at the ends of the bars, cutter chains carried by said sprockets and means for guiding and actuating the bars and chains whereby the cut may be commenced at the roof of the mine and the bars will be swung downwardly to complete the cut, substantially as described.

12. A mining machine having cutting apparatus comprising two or more groups of cutter chains arranged with a space between the groups, the chains of each group being arranged adjacent to each other and adapted to cut all of the material within the path

of the group, guides for said chains having longitudinal irregularities and eccentric sprockets for said chains, some of said sprockets being larger than the others and means for supporting and actuating said chains.

13. A mining machine having two or more groups of cutter chains adapted to cut downwardly said groups being spaced apart with spaces of substantially the same width as the width of one of the groups, and means for receiving and conveying the cuttings to the rear of the machine.

WALTER J. WILSON.