H. A. KUHN & W. W. MACFARREN.

MINING MACHINE.

APPLICATION FILED APR. 24, 1909.

1,148,976.

Patented Aug. 3, 1915.

2 SHEETS—SHEET 1.

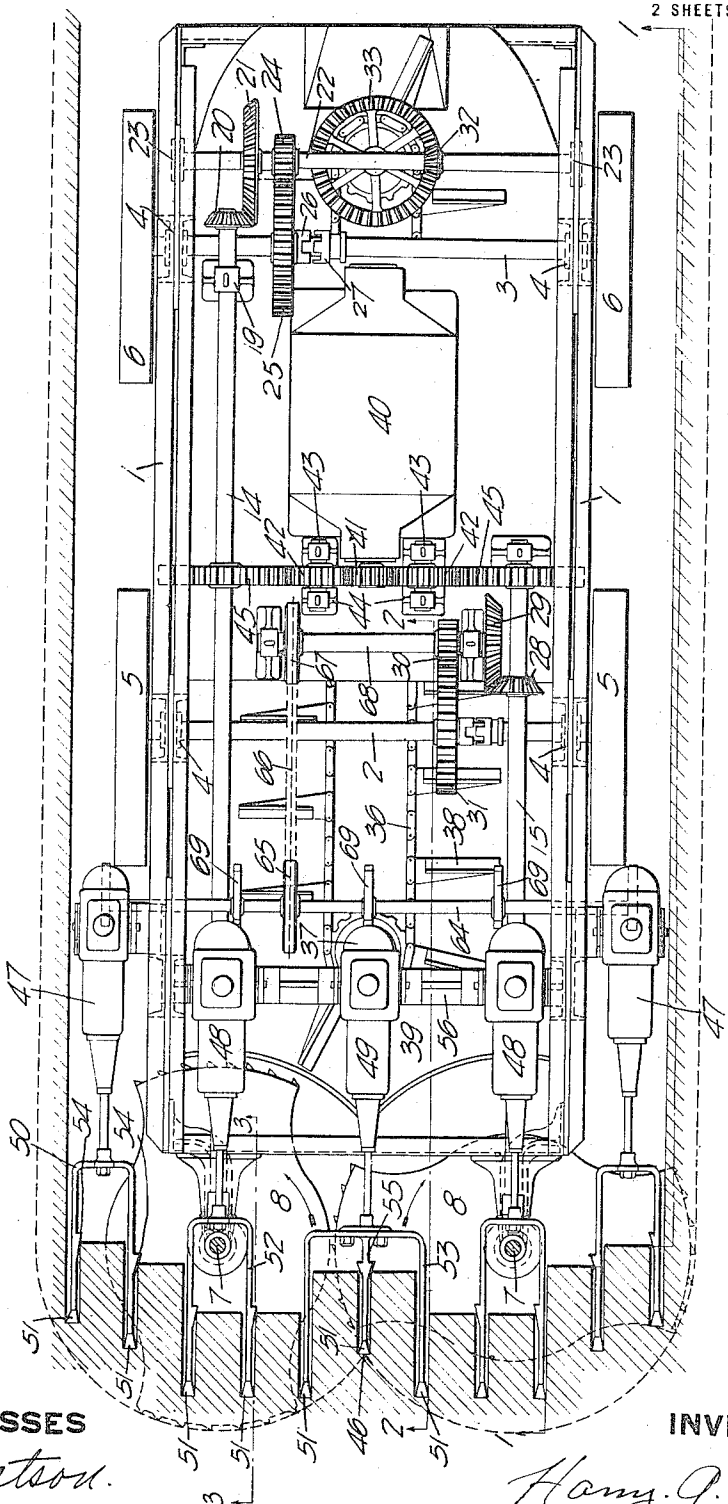


FIG. 1.

WITNESSES

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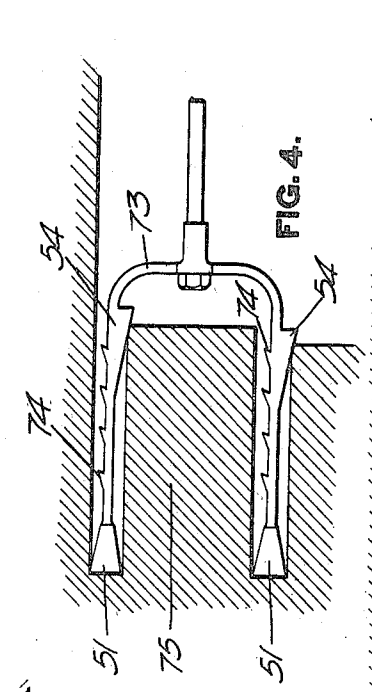


FIG. 4.

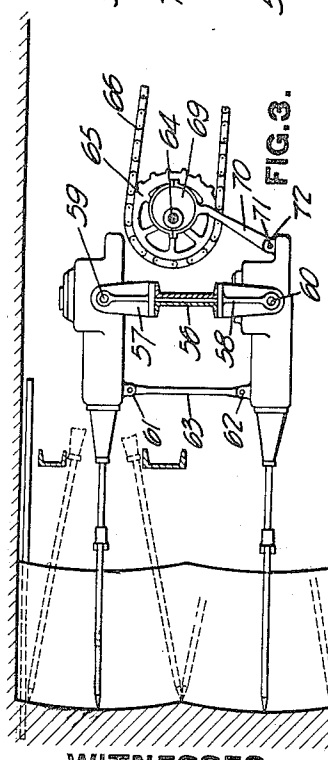


FIG. 3.

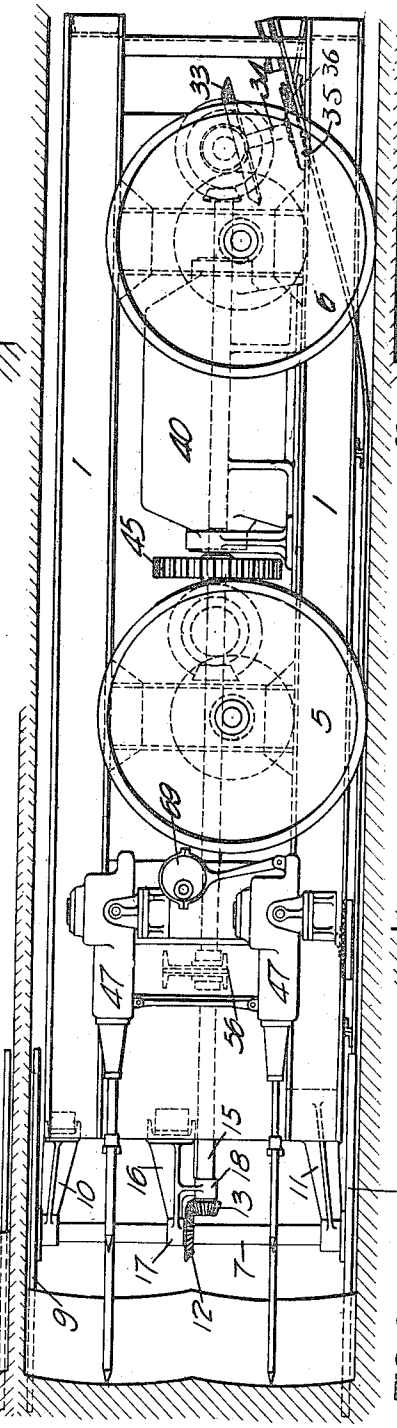


FIG. 2

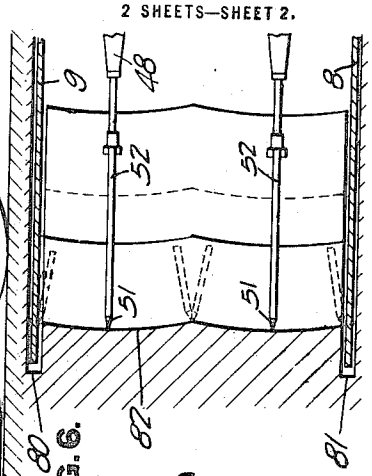


FIG. 6.

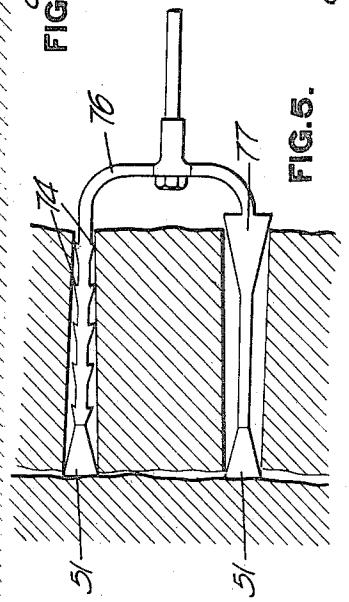


FIG. 5.

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MINING-MACHINE.

1,148,976. Specification of Letters Patent. Patented Aug. 3, 1915.

Application filed April 24, 1909. Serial No. 491,964.

To all whom it may concern:

Be it known that we, HARRY A. KUHN and WALTER W. MACFARREN, citizens of the United States, residing at Pittsburgh, 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 objects of our invention are to provide a machine which will mine the full vertical height of the coal seam without the use of explosives; one adapted to move forward continuously and to cut a narrow entry or room; one adapted to mine the greater proportion of the coal by breaking or dislodging it after the same has been serrated by a number of parallel slots of suitable form and dimension to admit of the easy action of the dislodging devices; and further, to provide a machine having a large capacity, and of simple and powerful form well able to withstand the severe service to which such machines are necessarily subjected.

To these ends, our invention comprises a strong frame work mounted on four ground bearing wheels and provided with a number of picks or punchers at the forward end thereof adapted to attack the coal, together with a number of saws for making smooth cuts at the top and bottom of the entry. In combination with the above, we provide a conveyer for removing the coal as cut, and a propelling gear for advancing the machine.

Referring to the drawings, Figure 1 is a sectional plan through an entry or working place in a mine, showing a plan view of our improved machine. Fig. 2 is a vertical section through the coal seam, showing a side elevation of our improved machine, taken on the line 1—1 of Fig. 1. Fig. 3 is a similar sectional elevation through the coal seam, taken on the line 2—2 of Fig. 1; and Figs. 4 and 5 show modified forms of dislodging devices. Fig. 6 is a sectional elevation through the coal seam, showing slots made by the saws and punchers 48.

The frame 1, preferably formed of structural steel, is mounted upon the axles 2 and 3, these latter turning in suitable bearings 4, secured to the frame 1. The axle 2 has secured to each end thereof a truck wheel 5; and the axle 3 has secured to each end thereof the truck wheel 6.

At the forward end of the machine, a pair of vertical shafts 7 carry the lower saws 8 and the upper saws 9. The shafts 7 are supported in the upper bearings 10 and the lower bearings 11, the same being secured to the frame 1. Upon each of the shafts 7 there is mounted a bevel gear 12, which meshes with and is driven by a bevel pinion 13. One bevel pinion 13 is mounted upon the shaft 14, and the other bevel pinion 13 is mounted upon a similar but shorter shaft 15.

The brackets 16, having the bearings 17 engaging the shafts 7, and the bearings 18 engaging the shafts 14 and 15, are secured to the frame 1. The shaft 14 is extended to the rear of the machine, where it is supported by the bearing 19. On the end of the shaft 14, there is mounted a bevel pinion 20, which meshes with and drives the bevel gear 21 upon a cross shaft 22 supported in the bearings 23, secured to the frame 1. The cross shaft 22 also carries a spur pinion 24 which meshes with and drives the spur gear 25, the same being loosely mounted upon the axle 3. The spur gear 25 has a clutch face 26 engaging with a movable jaw clutch 27, which is adapted to rotatively connect the gear 25 to the axle 3. Similar gears 28, 29, 30, and 31 connect the shaft 15 with the axle 2. By the above connections, both axles are simultaneously driven to advance or retract the machine. The shaft 22 also carries the bevel pinion 32, which meshes with and drives the bevel gear 33 mounted upon the inclined shaft 34, which may be supported in suitable bearings secured to the frame 1.

At the lower end of the shaft 34, there is secured a sprocket 35 which drives the conveyer chain 36. Conveyer chain 36 also passes around an idler sprocket 37 at the front end of the machine. The conveyer chain 36 is provided with flights 38, which slide upon a conveyer plate 39. The idler sprocket 37 may be conveniently mounted upon a pin (not shown), the same being secured to the conveyer plate 39, as will be readily understood. The front end of the conveyer plate 39 is very close to the ground, merely having sufficient clearance to avoid scraping. As the conveyer flights 38 slide

upon the plate 39, they are consequently at a height above the ground of merely the thickness of the conveyer plate 39 plus the clearance between the same and the ground, which in actual practice need not be over 1" all told. The cuttings made by the undercutting saws 8 are swept to the front edge of the conveyer plate 39 by the saws themselves and as the machine advances these cuttings work up over the front edge of the conveyer plate 39 and are, therefore, readily engaged by the flights 38. It will be seen also that the conveyer flights 38 are equally well adapted to remove the cuttings from the saws 9, the cuttings made by the punchers, and the blocks of coal dislodged from between the cuts made by the punchers.

An electric or other motor 40 is mounted on the frame 1, from which power may be supplied to drive the shafts 14 and 15 as follows:—The armature pinion 41 of the motor 40 meshes with and drives the idler gears 42 mounted upon the short shafts 43, the same being supported in the bearings 44. The idler gears 42 mesh with and drive the spur gears 45, one of which is secured to the shaft 14, and the other of which is secured to the shaft 15.

By the above described mechanism, power is transmitted from the motor 40 to the saws 8 and 9, the truck wheels 5 and 6, and the conveyer chain 36.

It will be noted that the saws 8 and 9 are of peculiar construction, inasmuch as they interlock with one another. It will be evident that in using a pair of saws so constructed, it will be necessary that they be connected by rigid gearing, so that the proper rotative relation may be preserved at all times. The object of this construction is to make the cutting edges of the saws overlap each other, so that the point of intersection of their cutting circumference 46 may be as far removed from the line joining the centers of the shafts 7 as possible. When circular saws are used in pairs, the cutting edges thereof leave between them, on the advance of the machine, a thin wedge-shaped section of coal which extends back to the line joining the centers of the saw shafts.

By the construction herein shown, the undercut is projected forwardly a much greater distance than if circular saws were used.

Mounted at the forward end of the machine, we provide two horizontal series each containing five punchers or picks. In the design shown, these punchers are electrically driven, each puncher comprising a small electric motor driving a pulsator or air cushioning device, which in turn drives the cutting elements of the puncher.

In the present application, it is desired to drive the machine by electric power, and we have therefore shown an electric motor adapted to drive the conveyer and the propelling gear, and electrically operated punchers for making the slots in the coal.

The two horizontal series of punchers are duplicates of each other; *i. e.*, each puncher is a duplicate of the one above or below it. Referring to the upper horizontal series of punchers, the two outside punchers 47 are duplicates of each other; the intermediate punchers 48 are in duplicate, and are only different from the punchers 47 in the length of the cutting forks. The middle puncher 49 is of special construction, inasmuch as it has a triple cutting device. All of the punchers 47 are provided with the two-pronged cutting forks or yokes 50, each of which carries two chisel-shaped cutting edges 51. The yokes 50 and 52 are detachably secured to the punchers 47 and 48, and are of identical construction, except that the yokes 52 are made of sufficient length to clear the shafts 7. The middle punchers 49 are provided with a special yoke or fork 53, having three prongs as shown, each of which carries a chisel-shaped cutting edge 51. The yokes 50 are provided with two dislodging devices 54, which may be in the form of a wedge as shown. The yokes 52 are provided with two similar devices. The yokes 53 may be also provided with a pair of similar devices, but we have shown as a substitute, a double wedge 55.

From the above description, taken in connection with Figs. 1 and 2, it will be seen that we have provided a machine in which a horizontal undercut and a horizontal overcut, each consisting of a thin slot, are made across the top and bottom of the entry being cut. Between these two slots, the punchers 47, 48, and 49, by their cutting edges 51, produce a number of parallel vertical slots in the coal.

In order that the lumps between the various vertical slots may be free to break under the action of the wedges 54 and 55 for their entire vertical height, it is necessary that they be previously undercut and overcut, and for this reason we have arranged the location of the various vertical cuts as plainly shown in Fig. 1, some of the vertical cuts being in advance of others, as shown, but all of them being within the cutting circumference of the saws.

In Fig. 3 we have shown a method of mounting the punchers and mechanism for operating the same. A pair of channels 56 extends across the machine and is secured to the frame 1. Brackets 57 and 58 are secured respectively above and below the channels 56, there being two of said brackets for each puncher. The upper series of punchers are pivoted by the pins 59 to the brackets 57, and the lower series of punchers are pivoted by the pins 60 to the brackets 58, so that all the punchers may oscillate in vertical planes. Each puncher of the upper

series is provided with a lug 61, and each puncher of the lower series with a corresponding lug 62. The lugs 61 and 62 may be connected by suitable pins with the link 63, which constrains each pair of punchers so connected to oscillate together. To effect the oscillation of the several punchers, a shaft 64 extends across the machine, and is supported in suitable bearings secured to the frame 1. The shaft 64 carries a sprocket 65, the same being driven by a chain 66, which engages a sprocket 67 upon the shaft 68, to which power is supplied as previously described. The shaft 64 carries five eccentrics 69, there being one of these latter for each vertical pair of punchers. The eccentrics 69 operate the eccentric rods 70, which are connected by the pins 71 extending through lugs 72 on the lower series of punchers.

By the above described mechanism, all the punchers are simultaneously oscillated in vertical planes. It is immaterial whether the oscillation of the punchers forming a horizontal series is coincident or whether the eccentrics are so placed on the shaft 64 as to produce a rising action of certain of the punchers coincident with the falling action of the others. It is preferable that the latter arrangement be used to effect a better balanced action of the cutting elements.

In Fig. 4, we have shown a modified form of yoke 73, provided with chisel-shaped cutting edges 51, the previously described dislodging wedges 54, and special teeth 74 for the purpose of engaging and removing the lumps of coal 75 after they are separated from their native bed.

In Fig. 5, we have shown a further modification, in which the yoke 76 is provided with the cutting edges 51, and a double inclining dislodging device 77 upon one fork of the yoke 76, in addition to which there is provided a double set of teeth 74 upon the other prong of the yoke, for the purpose previously described.

In Fig. 6, we have shown the relation between the cuts made by the punchers 48 and the saws 8 and 9. The saw 9 cuts a slot 80; the saw 8 cuts a slot 81. Punchers 48 cut a slot, the bottom of which is indicated by the line 82.

The vertical oscillation of the cutting edges 51 of the punchers 48 is limited by the throw of the eccentrics 69, so that the cutting edges 51 may not strike the saws 8 and 9.

The operation of our improved machine may be readily understood, as it consists merely in supplying power to the various mechanisms and throwing the clutches operating the propelling gear so as to produce forward motion of the machine. The rearward motion of the machine may be obtained by reversing the motor 40.

It is obvious that many changes in the design, construction, and arrangement of parts may be made by those skilled in the several arts pertaining to them, without departing from the spirit of our invention, and we therefore desire to claim and hold as ours all the patentable subject matter covered by the following claims.

We claim—

1. In a mining machine, an undercutting device, an overcutting device, and a plurality of punchers mounted between said undercutting device and said overcutting device.

2. In a mining machine, a plurality of undercutting devices, a plurality of overcutting devices, and a plurality of reciprocating punchers mounted between said undercutting and said overcutting devices.

3. In a mining machine, an undercutting saw, an overcutting saw, and a reciprocating puncher mounted between said saws.

4. In a mining machine, a plurality of undercutting saws, a plurality of overcutting saws, and a plurality of reciprocating punchers mounted between said saws.

5. In a mining machine, an undercutting device making a curved undercut, and a plurality of punchers arranged to cut vertical slots in the coal over said undercutting device, said punchers being provided with cutting points so arranged that the bottom of the slots cut thereby will lie in a curve approximately the curve of the undercut.

6. In a mining machine, an undercutting device and an overcutting device, both making curved cuts of substantially similar outline, one above the other, a series of vertically oscillating punchers arranged to cut vertical slots in the coal between the undercut and the overcut, and so arranged that the bottoms of said slots will lie in a curve approximately parallel to the undercut and overcut and within the same.

7. In a mining machine, a pair of rotary interlocking undercutting saw blades arranged to cut a narrow horizontal slot in the coal and a series of reciprocating punchers mounted for vertical oscillation above said saw blades, and arranged to cut a number of parallel vertical slots in the coal above the slot cut by said blades.

8. In a mining machine, a pair of rotary interlocking undercutting saw blades, teeth on said blades arranged to cut a narrow horizontal slot in the coal, a series of vertically oscillating punchers located at a height of about one-fourth the height of the coal seam from the floor, and a second series of similar punchers mounted above the first series, each puncher in the upper series being in line with a puncher in the lower series, means for driving said saws, and means for oscillating said punchers.

9. In a mining machine, a pair of rotary interlocking undercutting saw blades, teeth

on said blades arranged to cut a narrow slot in the coal, a plurality of vertically oscillating punchers mounted one above the other so as to cut connecting slots in the coal, and a conveyer comprising a chain having projecting flights; the same being arranged to gather and remove the material dislodged by said saws and said punchers.

10. In a mining machine, a frame, power driven wheels in supporting relation thereto, a pair of undercutting saws mounted upon said frame, a plurality of vertically oscillating reciprocating punchers also mounted on said frame, a conveyer mounted on said frame adapted to gather and remove the material cut or dislodged by said saws and said punchers, and means for driving all of the above elements.

11. In a mining machine, a vertically oscillating reciprocating puncher, a conveyer adapted to remove the material cut by said puncher, and undercutting mechanism arranged to deliver to said conveyer the material cut by said puncher.

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