

H. A. KUHN.
METHOD OF MINING COAL.

APPLICATION FILED APR. 6, 1908. RENEWED JUNE 3, 1910.

981,201.

Patented Jan. 10, 1911.

4 SHEETS—SHEET 1.

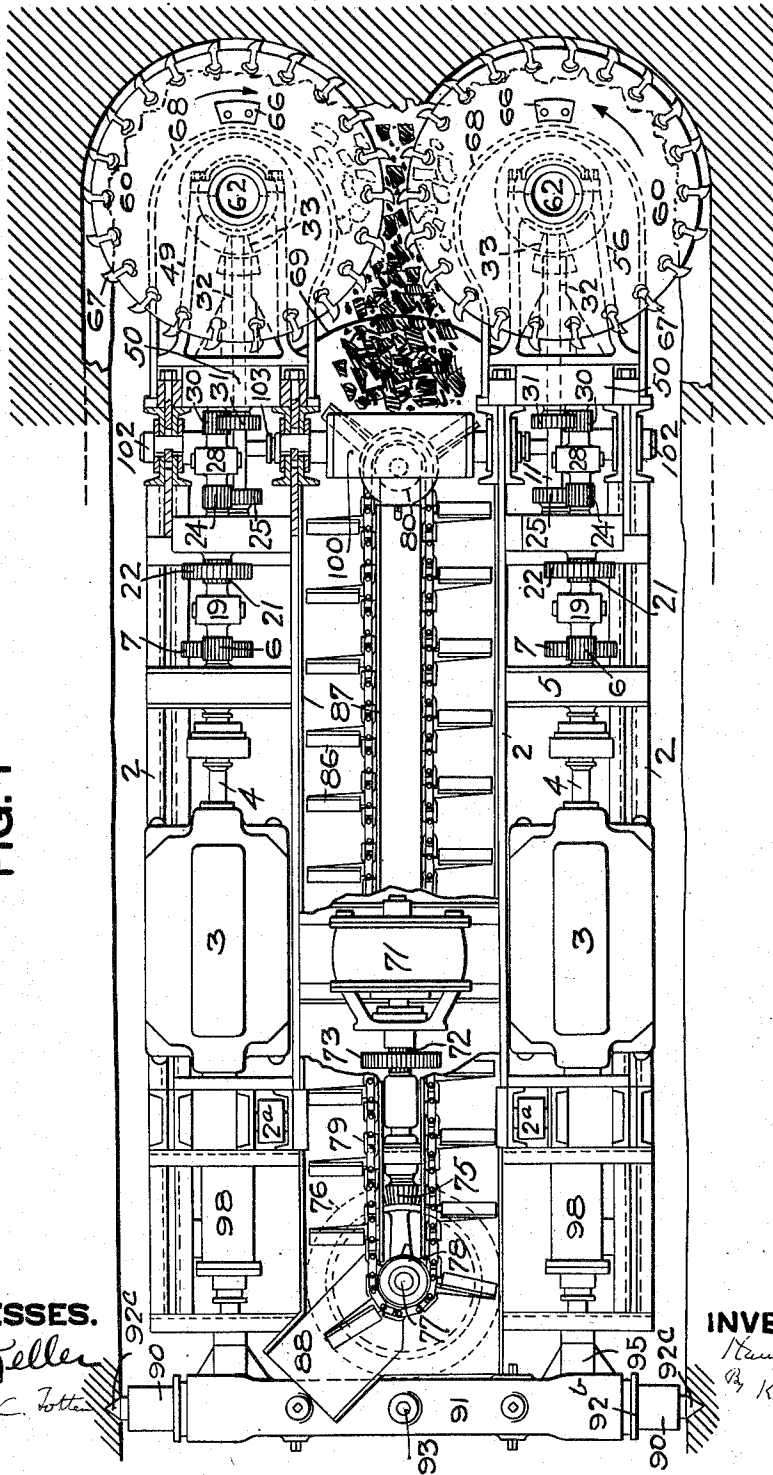
FIG. 1

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4 SHEETS—SHEET 2.

FIG. 2

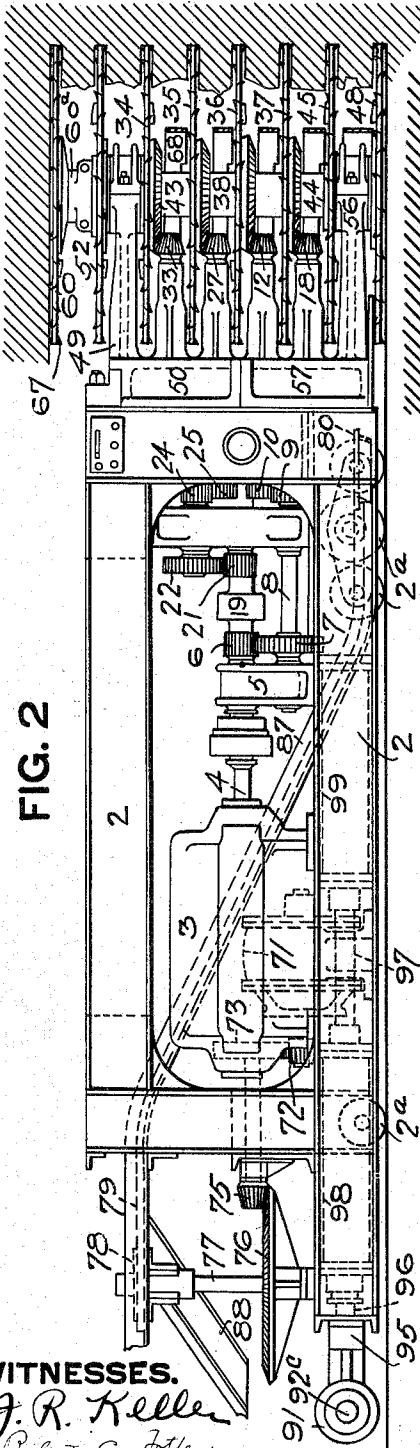
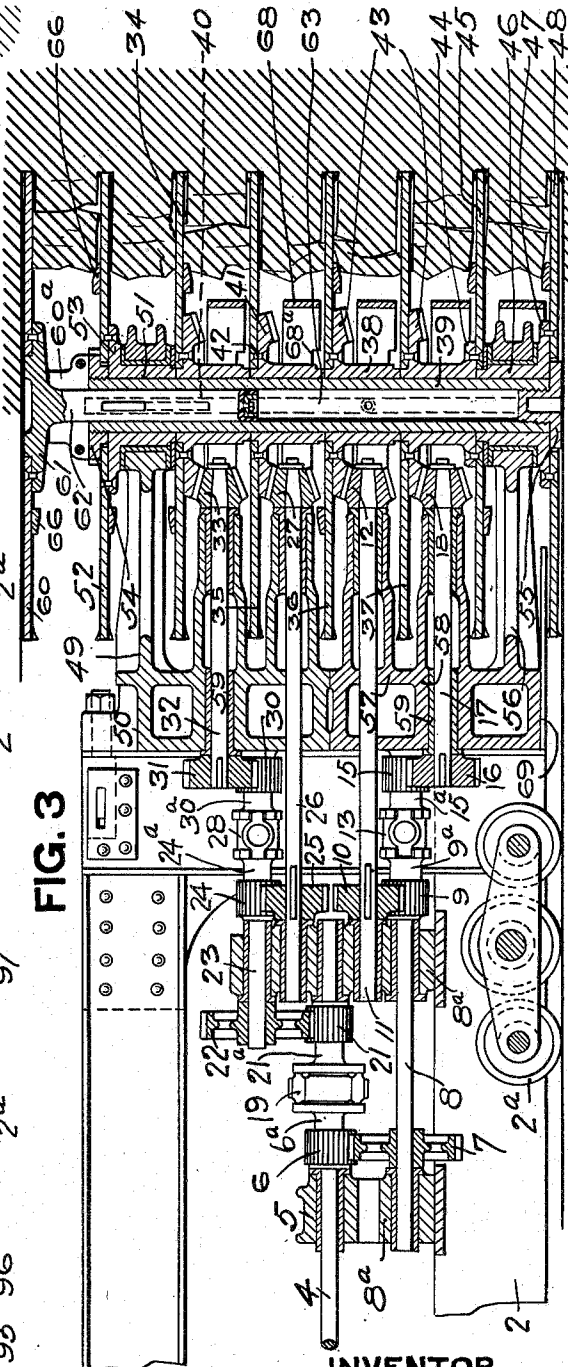


FIG. 3



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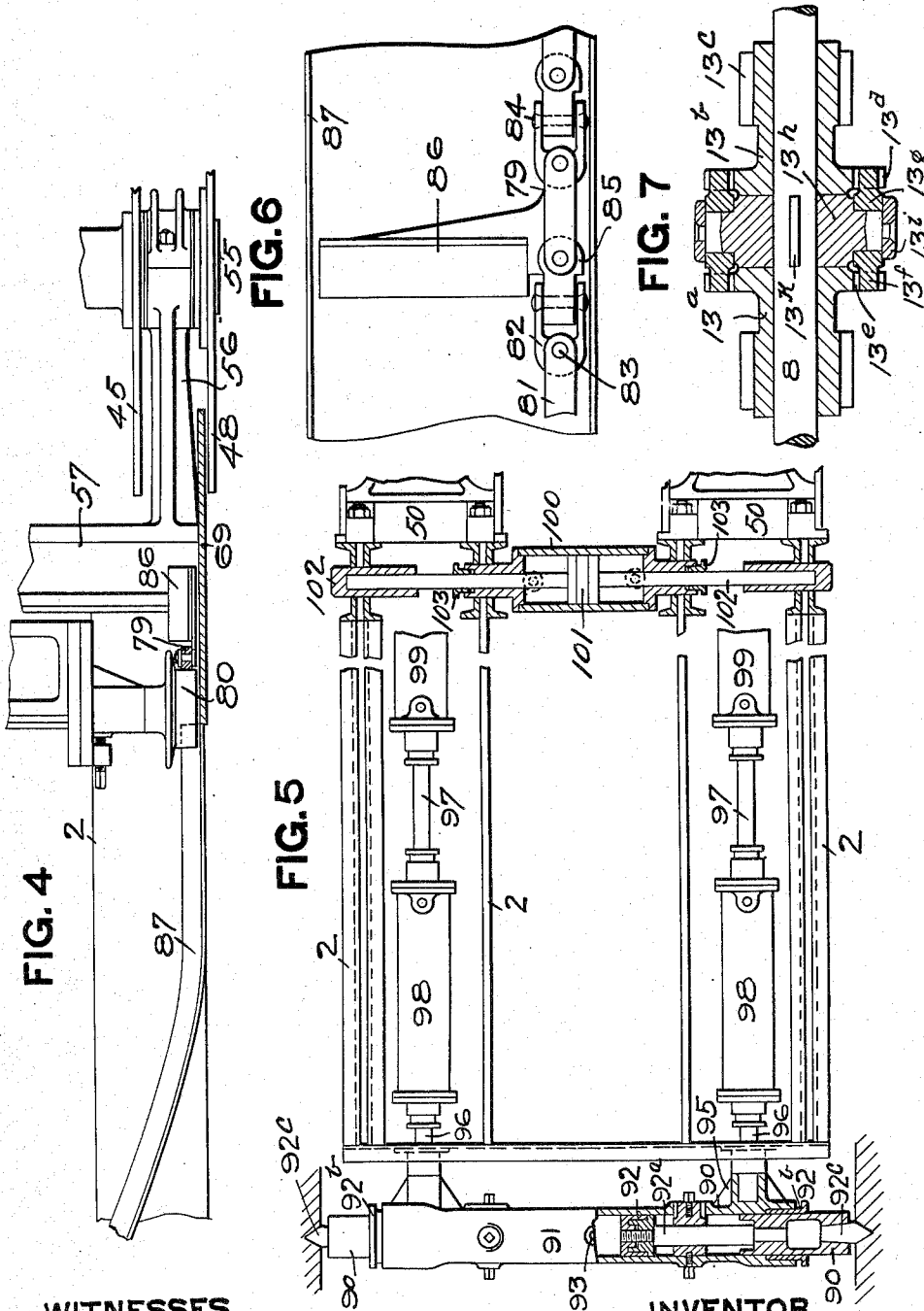
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4 SHEETS—SHEET 4.

FIG. 8

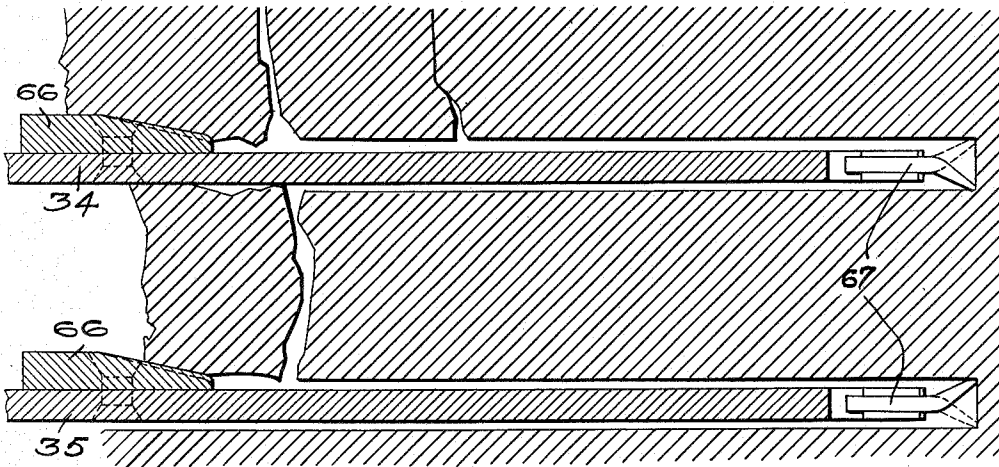


FIG. 9

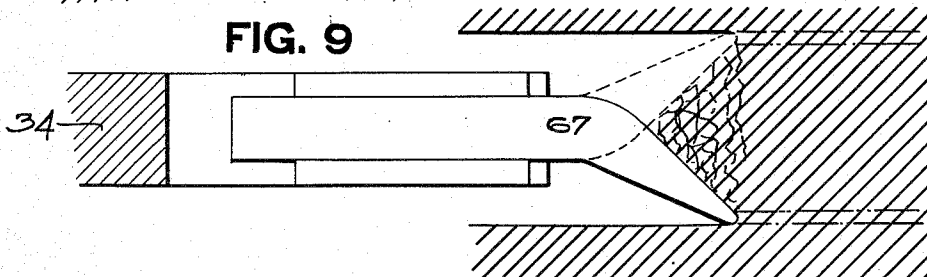
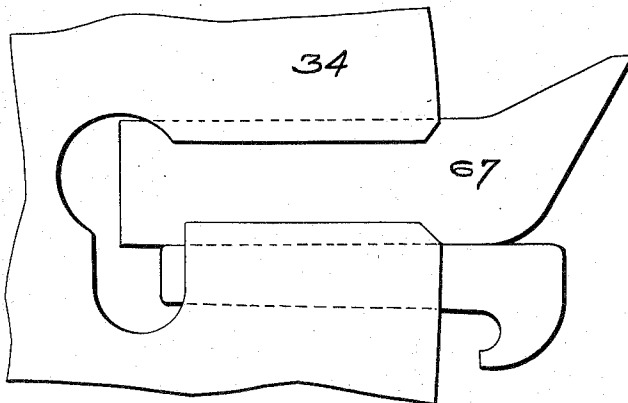


FIG. 10



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UNITED STATES PATENT OFFICE.

HARRY A. KUHN, OF PITTSBURG, PENNSYLVANIA.

METHOD OF MINING COAL.

981,201.

Specification of Letters Patent. Patented Jan. 10, 1911.

Application filed April 6, 1908, Serial No. 425,416. Renewed June 3, 1910. Serial No. 564,869.

To all whom it may concern:

Be it known that I, HARRY A. KUHN, a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Methods of Mining Coal; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to a method of mining coal or like substances.

In the method heretofore generally employed in the mining of coal, it has been customary to make a cut in the wall of coal adjacent to the bottom of the mine and then holes were drilled in the body of coal above the under-cut into which the blasts of powder or dynamite were inserted. The effect of the blast is to break down the coal and great quantities of it were often reduced to a very fine state so as to be practically useless for certain purposes, thereby greatly reducing the value of the output of the mine. It is very difficult for the miner to judge the effect that a certain charge of powder will have on the coal in all cases, as the effect may vary according to the seam in which the work is being done so that the blasting has always been done in a more or less haphazard way.

The object of my invention is to provide a method of mining which will dispense with the blasting and which will produce the coal in large lumps, thereby doing away with the fine slack which has to be disposed of at a very low price.

To these ends, my invention comprises, generally stated, the method of mining coal consisting in making a plurality of parallel cuts at the same time in the wall or solid of the coal and simultaneously bringing a force to bear on the partially severed blocks of coal between the cuts at an angle to the direction of the cuts, first on one side of each partially severed block of coal and then applying a like force on the opposite side of the partially severed block of coal, whereby the coal is dislodged by intermittent forces applied alternately above and below at angles to the direction of the cuts.

In the drawings of the apparatus for carrying out my method, Figure 1 is a plan view of the machine; Fig. 2 is a side elevation partly in section; Fig. 3 is an enlarged side view in section of the forward part of the machine; Fig. 4 is a detail of the front end of the conveyer and receiving plate;

Fig. 5 is a plan view of the mechanism for feeding the machine to the coal; Fig. 6 is a detail of the conveyer chain; Fig. 7 is an enlarged detail of the differential; and Figs. 8, 9 and 10 are enlarged details of the cutting bits showing how they cut into the coal.

The machine illustrated in the accompanying drawings is one which forms the subject matter of an application for Letters Patent of the United States, filed by me on February 12, 1908, Serial No. 415,551, and is adapted for carrying out the method of the present application.

Referring to the drawings the numeral 2 designates a suitable frame formed of channel and angle beams so riveted and secured together as to form a rigid and durable structure able to withstand the severe strains and uses to which such a machine is subjected. This frame is mounted upon suitable wheels or rollers 2^a. Motors 3 are mounted upon the frame 2 at opposite sides of the machine and as the parts driven by said motors are in duplicate, such duplicate parts will be designated by the same reference numerals. The motor or armature shaft 4 is journaled in suitable bearings 5 and a pinion 6 on said shaft 4 meshes with the gear wheel 7 on the shaft 8 arranged in suitable bearings 8^a. On the shaft 8 is the pinion 9 on the sleeve 9^a which meshes with the gear wheel 10 on the shaft 11. At the outer end of the shaft 11 is the beveled pinion 12. Interposed between the sleeve 9^a and the sleeve 15^a is the differential 13. A pinion 15 on the sleeve 15^a meshes with the gear wheel 16 on the shaft 17. At the outer end of the shaft 17 is the beveled pinion 18.

Interposed between the sleeve 6^a and the sleeve 21^a is the differential 19. A pinion 21 on the sleeve 21^a meshes with the gear wheel 22 on the shaft 23. A pinion 24 on shaft 23 meshes with the gear wheel 25 on the shaft 26. On the outer end of the shaft 26 is the beveled gear 27. A differential 28 is interposed between the sleeve 24^a and the sleeve 30^a. A pinion 30 on the sleeve 30^a meshes with the gear wheel 31 on the shaft 32. At the outer end of the shaft 32 is the beveled gear 33.

The form of differential I employ is illustrated in Fig. 7. The sleeves 13^a and 13^b have the pinions 13^c and the flanges 13^d. In the flanges 13^d are the seats or recesses 13^e to receive the lugs 13^f on the collars 13^g. These collars 13^g are mounted on the pins

13^b and are held in place by the washers 13ⁱ. The pins 13^b are keyed to the shaft by means of the key or feather 13^k. The lugs 13ⁱ have a certain amount of play in the seats 13^e and if there is undue strain on the sleeve 13^b the collars 13^e are free to move to provide for any such strain and the difference in speed of the sleeve is compensated for.

Disk cutters, 34, 35, 36 and 37 are provided with the sleeves 38 and said sleeves are secured to the hollow shaft 39 by means of the spline 40. Formed integral with the sleeves 38 are the plates 41 to which the disks are secured by rivets 42. On the lower face of the plates 41 are formed the beveled gears 43 with which the beveled pinions 18, 12, 27 and 33 are adapted to engage. The lowermost sleeve 38 is provided with the flange 44 to which the disk 45 is riveted. At the bottom of the shaft is secured by means of the spline 40 the sleeve 46 provided with the flange 47 to which the disk 48 is riveted. An arm 49 extending out from the head 50 carries at its outer end the sleeve 51 which is keyed to the shaft 39 by the spline 40 and a disk 52 is riveted to the flange 53 of the sleeve 51. A jam nut 54 engages the upper end of the shaft 39 and this jam nut in connection with the jam nut 55 at the lower end of the shaft 39 acts to confine the disks and their sleeves in place on the shaft 39. The sleeve 46 is carried by the arm 56 of the head 57. There are two of these heads 50 and 57 and said heads provide the bearing 58 for the shafts 11, 17, 26 and 32. Within these bearings 58 are the bushings 59. The uppermost disk 60 is riveted to the plate 61 on the plunger 62 which enters the chamber 63 in the shaft 39. Compressed air may be admitted to the lower end of the shaft 39 to lift the plunger 62 and so elevate the upper disk 60. This disk is then held in its raised position by means of the interposed split collar 60^a.

All the disks, with the exception of the bottom disk 48 and the top disk, are provided with the wedges 66 on their upper and lower faces adapted to break down or loosen the coal as the disks enter the same. These wedges are located on the upper and lower faces of the disks and at opposite sides of the centers of the disks so that when the upper wedge is in contact with the coal the lower one will be outside the cut. Furthermore, the disks are so arranged with reference to each other that the upper wedge of one disk will be in engagement with the coal of one cut while the lower wedge of the adjoining disk will be in contact with the coal of the adjoining cut. The disks may be arranged on the driving shaft in such manner that the wedges of one disk will be arranged on the quarter with reference to the wedges of the adjoining disk so that the breaking-down force of the wedges will be applied in-

termittently on opposite faces of the block of coal between the cut, as fully hereinafter set forth. The cutting disks are also provided with cutters or bits 67 of any suitable form which project out beyond the periphery of the disks and are adapted to cut narrow slits in the coal as said disks are revolved. By projecting the bit 67 at an angle to the disk, the actual cutting is reduced to the working or cutting points of said bits at a few points in the entire wall of the coal seam, the balance of the mining being done by the wedges 66, thereby reducing the power required to a minimum. Bolted to the heads 50 and 59 are the guards 68 which are adapted to prevent the coal from reaching the bearings and direct it to the space between the cutters to be received by the receiving plate 69. This plate 69 is secured to the forward end of the frame. The guards 68 are cut away, as at 68^a, to permit of the passage of the wedges on the disks.

A motor 71 is located centrally of the machine and a pinion 72 on the motor shaft engages with the gear wheel 73 on the shaft 74, said shaft having the beveled pinion 75 meshing with the miter gear 76 on the vertical shaft 77. At the upper end of the shaft 77 is the sprocket wheel 78 around which the conveyer chain 79 passes. The conveyer chain 79 also passes around the wheel 80 which is journaled in the forward end of the frame 2 at a lower level than the sprocket wheel 78. The sprocket chain 79 is of a peculiar construction in order to provide for this change of level and direction of its travel and in Fig. 6 I have illustrated the links of this chain in detail. One of the links 81 has the clevis 82 pivoted at 83. A bolt 84 connects the clevis 82 with the link 85. By this construction the chain has a universal joint at each link to enable it to conform to the line of travel required in its use in connection with the machine. The conveyer chain is provided with the conveyer arms 86 which are adapted to travel in the guide-ways 87. These conveyer chains in their movement pass over the receiving plate 69 and gather up the coal, convey it through the guide-ways until it is discharged into the chute 68 at the rear end of the machine, whence it may be conveyed by suitable conveyer to the mine cars to be loaded. To provide for the feed of the machine the following mechanism is provided. Jacks 90 are operated by the cylinder 91, said jacks having the pistons 92 adapted to move back and forth in said cylinder 91. The cylinder 91 is provided with inlets 93 for the entrance of the motive fluid. Connected to the pistons 92 are the piston rods 92^a which pass through stuffing boxes 92^b. Secured to said piston rods are the points 92^c. The extensions 95 of the cylinders 91 are secured to the ends of the plungers 96 and 97 working in

cylinders 98 and 99, said cylinder being secured to the frame 2 of the machine.

From the above construction it will be apparent that when the jacks 90 are forced into the side walls and the cylinders 91 held rigidly in position, as the motive fluid is admitted to the cylinders 98 and 99, the plungers of said cylinders being connected to the stationary jacks will, by the resistance offered, act to move the machine forward and withdraw it according to which of the cylinders the motive fluid is admitted.

In order to move the machine from one side to the other or change the direction of mining, I provide the cylinder 100 with the piston 101 and the piston rods 102. The piston rods 102 pass through suitable stuffing boxes 103. The motive fluid may be admitted to opposite sides of the piston 101 according to which side it is desired to move the machine.

In practicing my improved method with the above machine, power is applied to rotate the cutting disks and as said disks enter into the coal they cut narrow slits therein and the wedges carried by the disks entering the cuts act to loosen or break the blocks of coal between the cuts so that the coal is broken off in lumps. Owing to the arrangement of the wedges a force is brought to bear upon the partially severed blocks of coal at angles to the direction of the cuts, first on one side of each partially severed block of coal and then a like force is applied but in the opposite direction and on the opposite side of the partially severed blocks of coal. The latter force follows the first force, thereby dislodging the coal by intermittent forces applied alternately and at right angles to the direction of the cuts simultaneously with the cutting and conveying away of the dislodged coal. By the practice of my improved method I am enabled to make a series of parallel cuts in the full body of the coal seam and at the same time bring forces to bear upon the partially severed

blocks of coal in such a way as to dislodge the coal in lumps simultaneously with the cutting action, whereby it is possible to mine the entire seam of merchantable coal without the use of hand labor or explosives.

What I claim is:

1. The method of mining coal, consisting in making a plurality of parallel cuts at the same time in the seam of coal and at the same time bringing forces to bear on the partially severed block of coal at an angle to the direction of the cuts, first on one side of said partially severed block and then applying a force in the opposite direction on the opposite side of said block, whereby the coal is dislodged by intermittent forces thus applied.

2. The method of mining coal, consisting in making a plurality of parallel cuts at the same time in the seam of coal and at the same time bringing forces to bear on the partially severed block of coal at right angles to the direction of cuts, first on one side of said partially severed block and then applying a force in the opposite direction on the opposite side of said block, whereby the coal is dislodged by intermittent forces thus applied.

3. The method of mining coal, consisting in making a plurality of parallel cuts at the same time in the seam of coal and subdividing intermittently the direct cutting force making each cut and working in each cut into three component forces, one component force working in the plane of the cut and the other two component forces working at angles to the plane of the cuts and in opposite directions, whereby the coal is dislodged by intermittent forces thus applied.

In testimony whereof, I the said HARRY A. KUHN have hereunto set my hand.

HARRY A. KUHN.

Witnesses:

ROBERT C. TOTTEN,
J. R. KELLER.