

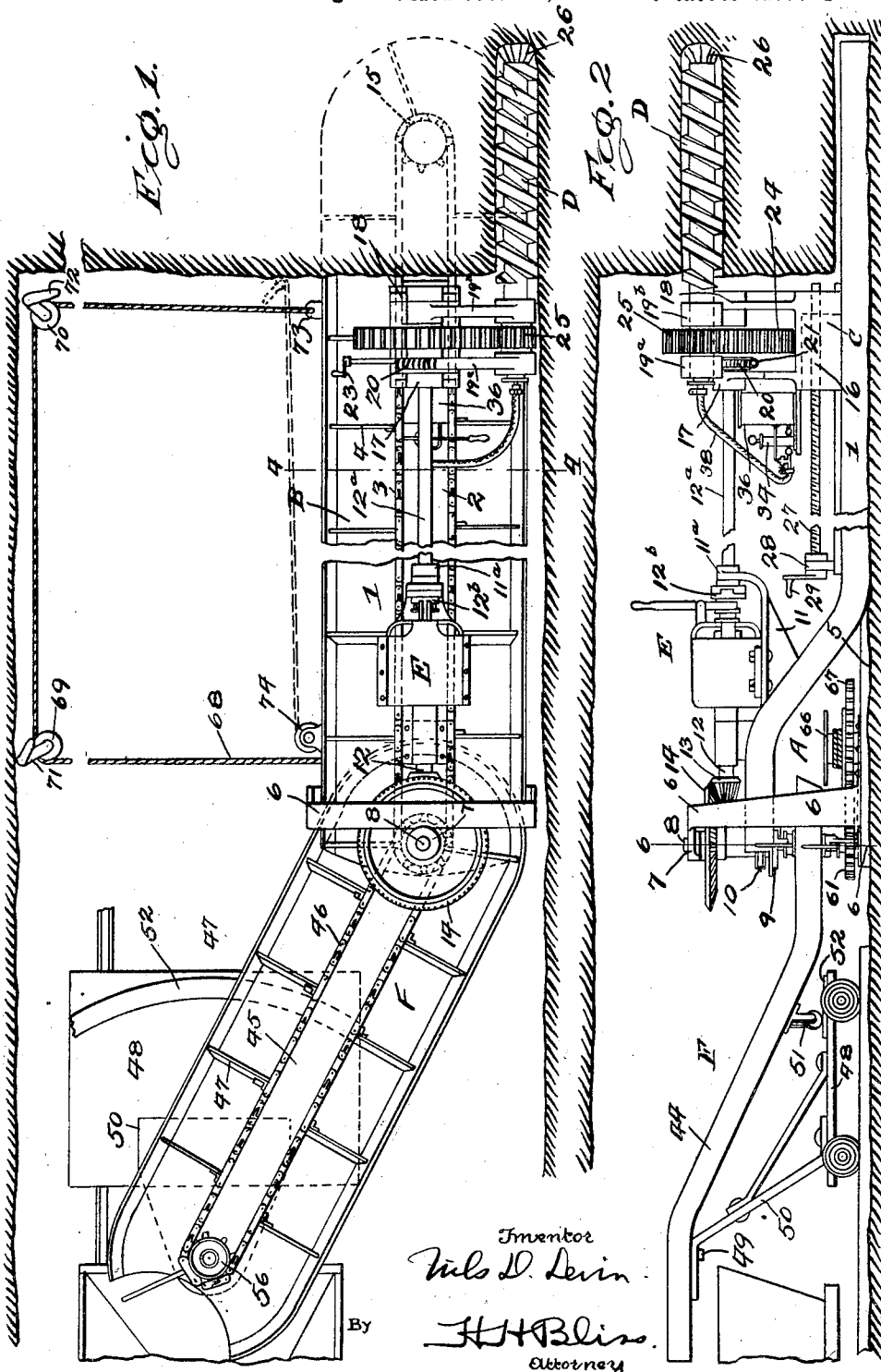
Dec. 16, 1924.

1,519,147

N. D. LEVIN

MINING AND LOADING MACHINE

Original Filed Oct. 22, 1910 3 Sheets-Sheet 1



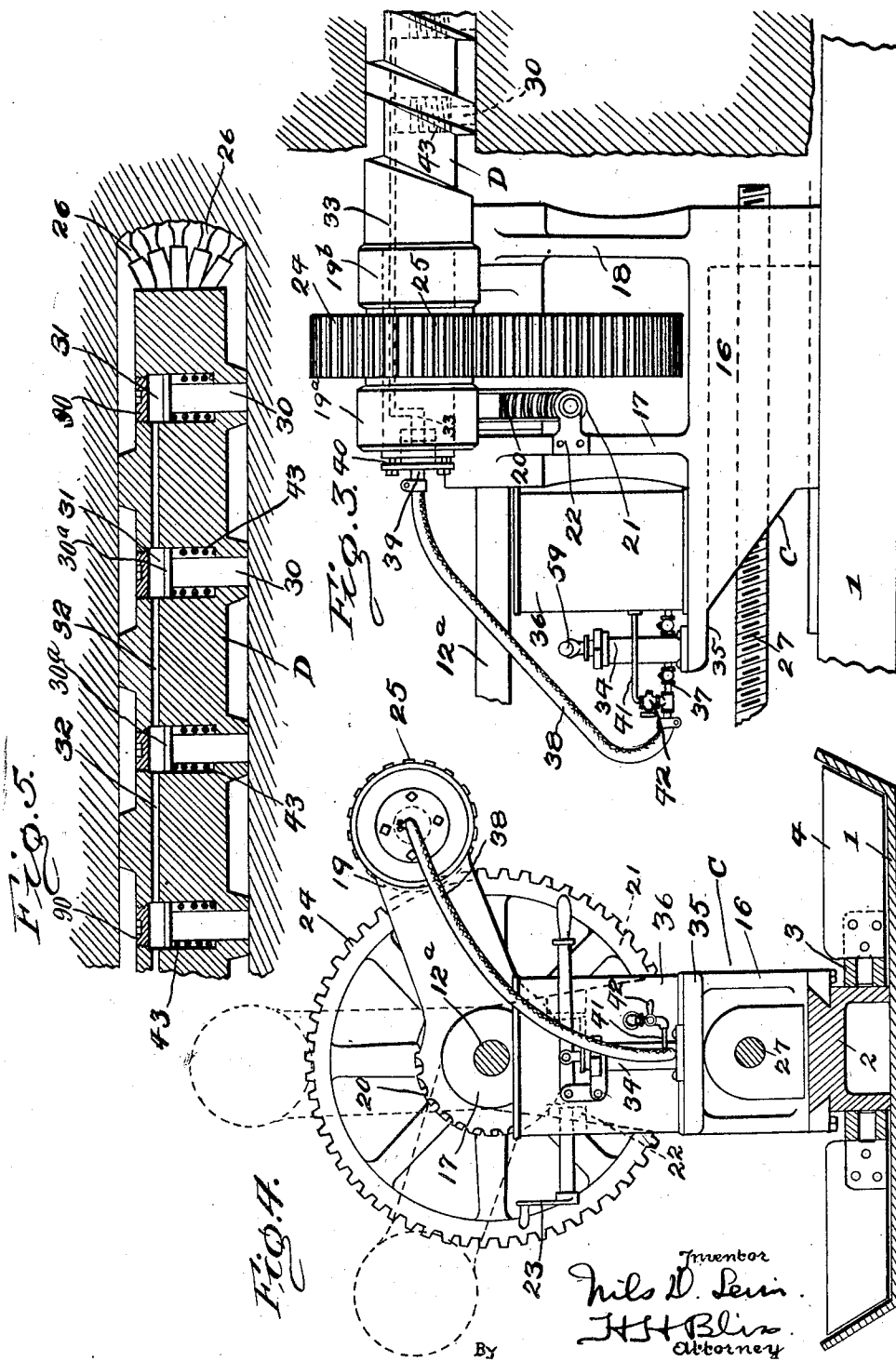
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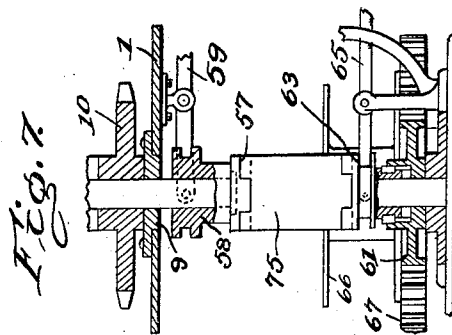
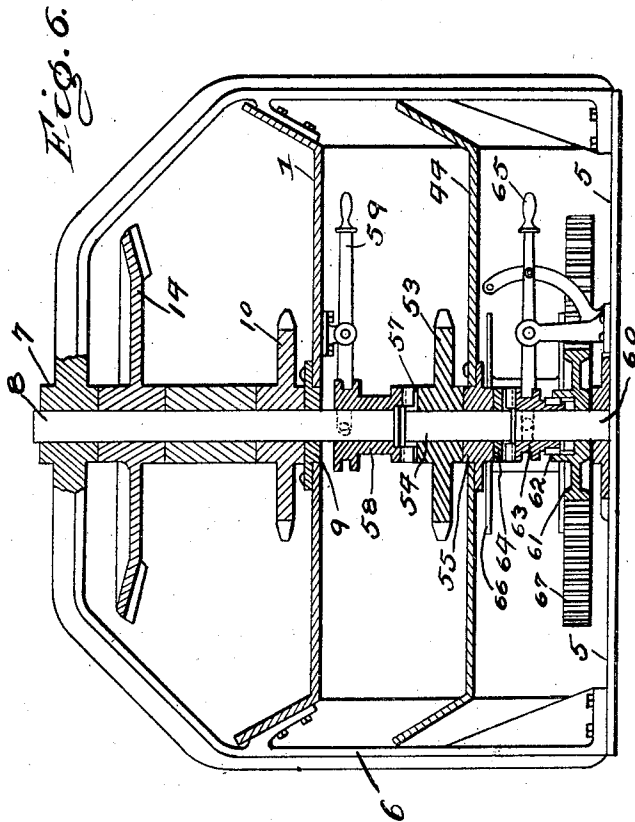
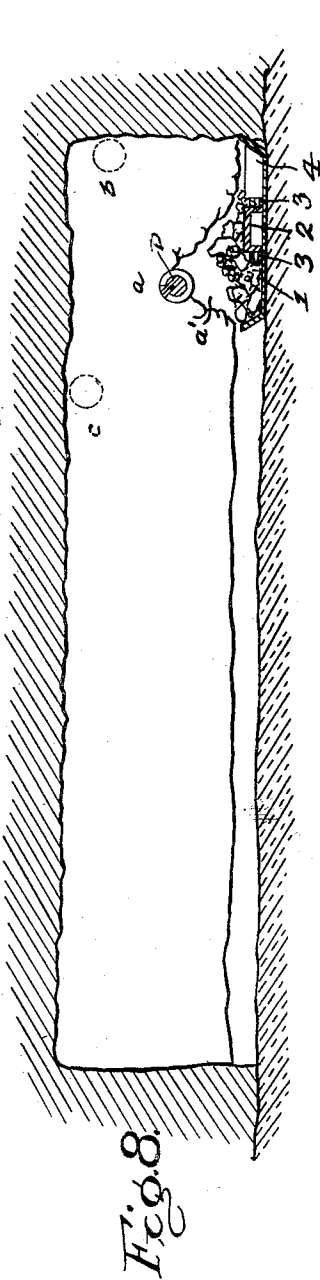
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MINING AND LOADING MACHINE

Original Filed Oct. 22, 1910 3 Sheets-Sheet 3



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Patented Dec. 16, 1924.

1,519,147

UNITED STATES PATENT OFFICE.

NILS D. LEVIN, OF COLUMBUS, OHIO, ASSIGNOR TO THE JEFFREY MANUFACTURING COMPANY, A CORPORATION OF OHIO.

MINING AND LOADING MACHINE.

Original application filed October 22, 1910, Serial No. 588,471. Divided and this application filed August 1, 1919, Serial No. 314,740. Renewed May 15, 1924.

To all whom it may concern:

Be it known that I, NILS D. LEVIN, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented certain new and useful Improvements in Mining and Loading Machines, of which the following is a specification, reference being had therein to the accompanying drawing.

10 This invention relates to a mechanism for getting coal from its native beds in mines adapted to dislodge the greater proportion of the coal by mechanical breakage resulting from the application of pressure.

15 The mechanism comprises devices for the forming of openings or chambers in the solid coal suitable to provide easement or clearance for large circumjacent coal masses which can be moved, more or less, toward such openings or chambers when breakage strains are exerted upon said masses. It relates also to an arrangement of hydrostatically actuated devices by which pressure and breakage stresses can be applied to such masses at points along the walls of one of said openings or chambers and on lines extending therefrom to another correlated opening or incision; also to the providing of hydrostatically actuated breaking devices which can be advanced into an opening or incision while it is being made in the coal bed, and which will lie within the outlines of the path of the cutter or incision-forming means; also to properly correlating a hystrostatic or fluid pressure device a breakage device, an incision-forming device and a frame supporting them so that hydraulic power can be applied whenever desired to the breakage device; and also to the providing of means at the rear of the breakage or pressure exerting means which will receive the broken down coal and take it away.

As concerns the detail parts of the apparatus use can be made of any of the well known devices for the several purposes.

There are numerous forms of cutters for making or forming incisions in native or solid coal, such as rotary augers, saw-like cutters, reciprocating picks and the like. Similarly, as to the means for taking away the broken coal, reciprocating conveyers, endless carrier belts and others have been used.

And in other applications filed by me, namely, Serial No. 588,471, filed October 22, 1910 (renewed as Serial No. 142,324) and Serial No. 220,818, filed March 6, 1918, respectively, I have presented claims for the patentable features incident to the auger as a specific form of cutter or incision maker, and claims for the patentable features of the conveying apparatus.

The present application relates to the broader features of the forming of correlated incisions or openings and exerting pressure at points in one of them on the coal masses lying between it and a related incision and breaking the coal in the direction of the latter, without intending to limit myself to any particular form of cutter or incision device.

And while I have herein retained illustrations in the drawings similar to those in the said earlier application Serial No. 588,471 (renewed as Serial No. 142,324) which present an auger as such cutter or incision maker, and give below description thereof in detail, it is to be understood that I here regard such cutter as merely typical of any that were well known.

In the drawings—

Figure 1 is a plan view of a machine of one of the forms which embody my improvements.

Figure 2 is a side elevation of the machine.

Figure 3 is a partial side view.

Figure 4 is a vertical section on the line 4—4 of Fig. 1.

Figure 5 is a partial longitudinal section of the cutter or auger and showing the hydraulic breaking plungers.

Figure 6 is a section on line 6—6 of Fig. 2.

Figure 7 is a side view of a removable shaft section.

Figure 8 is a diagrammatic view of a coal face showing the manner of breaking down the coal.

Referring in detail to the construction, A is the main frame of the machine; B is an endless conveyor mounted thereon; C is a carriage slidably mounted on the frame A; D is an auger adjustably mounted on the carriage C; E is a motor adapted to drive the auger and the conveyor B, and F is an auxiliary conveyor adapted to receive

coal from the conveyor B and discharge it into the cars.

The main frame A consists of a horizontally extending pan-like structure 1 having a central longitudinally extending rib member 2 which divides the pan into two parallel troughs. In these troughs are disposed the moving parts of the conveyor B which latter consists of a chain 3 carrying suitably spaced vanes or flights 4. The rib part 2 serves as a guide for the conveyor chain. This chain preferably has its pivot joints alternately at right angles to each other, as indicated in Figure 1, so that the chain is universally flexible. This is necessary, because the rear part of the main frame A is inclined upward and rearward as shown in Figure 2.

The main frame A has a plate-like extension 5 which underlies the upwardly inclined portion of the frame. A yoke 6 which is mounted on the plate or base 5 extends upward and over the main part of the frame 1 to which it is rigidly attached. On the upper end of the yoke is formed a bearing 7 for the vertical shaft 8, and the lower part of this shaft has a bearing 9 carried by the frame part 1. 10 is a sprocket wheel fast on the shaft 8 which drives the conveyor chain 3, the shaft being driven by the motor E. This motor is mounted upon a bracket 11 carried by the inclined part of the main frame A, the shaft 12 of said motor having a bevel pinion 13 which meshes with the bevel gear 14 on the shaft 8. The endless conveyor at its front end passes over a sprocket wheel 15 which is suitably mounted on the frame A.

The carriage C consists of a base part 16 which is slidably mounted upon the rib 2 of the frame (see Figure 4), and upstanding bearing arms or pedestals 17, 18. The motor shaft 12 has a forward extending section 12^a. The rear end of the shaft section 12^a is supported by a bearing bracket 11^a and is connected by a disengageable clutch device 12^b to the motor shaft 12. The front end of the shaft 12^a is disposed in the bearings of the pedestals 17, 18. Disposed between the pedestals 17 and 18 and mounted upon the shaft 12^a is a swinging yoke or radius arm 19. The rear branch or arm 19^a of this yoke is formed at its inner end with a segmental worm wheel 20. 21 is a worm which is mounted in a bearing bracket 22 secured to the rear pedestal 17 of the carriage. This worm meshes with the segmental worm wheel 20 and can be turned by means of a crank 23 to cause the yoke 19 to swing about its axis, it being understood that the shaft 12^a turns freely in the yoke.

The auger D is rotatably mounted in the free ends of the yoke arms 19^a, 19^b, and is driven by the large spur gear 24 which is slidably keyed on the shaft 12^a and which

meshes with a spur pinion 25 secured to the shaft of the auger D. The auger in its preferred form carries cutting tools 26, 26 at its front end. It will be seen that with the auger mounted in the manner shown and described, it is possible to drive it from the motor in any one of a variety of positions in which it may be placed by swinging the yoke 19 through something over 180°. The carriage C upon which the auger is mounted is, as it was stated, slidably mounted upon the main frame, and a screw 27 which is mounted at its rear end in a bearing 28 and which at its forward end is threaded through the base of the carriage, serves to move the carriage backward and forward on the main frame, a hand crank 29 being provided to turn the screw.

The auger D is provided with means for breaking the coal down after the auger has been driven into the coal. A preferred form of the breaking means is shown in the drawing. A series of hydraulic plungers 30, 30 are mounted in cylindrical cavities 31, 31 formed in the auger, the cylinders and plungers being disposed transversely of the auger and in one axial plane thereof. The cylindrical cavities 31, 31 communicate with each other through passages 32, 32, and the rearmost cavity of the auger is in communication with the passage 33 which leads to the rear end of the auger shaft where it issues axially. 34 is a hand force pump which is mounted upon a bracket 35 of the carriage C. This pump has its suction passage in communication with a reservoir 36 which contains a supply of water or other suitable liquid. The discharge pipe 37 of the pump is connected to a hose 38 which in turn is connected to the passage 33 of the auger, the hose being provided at its discharge end with a nozzle 39 which extends through a suitable stuffing box 40. 41 is a by-pass pipe leading from the discharge pipe 37 of the pump into the reservoir 36. The by-pass is controlled by a hand actuated control valve 42.

When the pump is actuated, the by-pass 41 being closed, the liquid is forced through the hose 38 and passages 33, 32 into the cylinders 31 and causes the plungers 30 to be forced outward. A spring 43 is mounted under the head of each of the plungers 30 and serves to retract the plunger when the liquid pressure is withdrawn, which is done by opening the valve 42 in the by-pass 41 so that the liquid can flow freely back into the reservoir 36.

It will be seen that after the auger has been driven forward into the coal, as shown in Figures 1 and 2, the hydraulic pressure can be applied to the plungers mounted in the auger to break down the underlying coal upon the endless conveyor which extends into the bottom kerf, it being understood

that said bottom kerf is previously cut by any of the well known undercutting devices. The coal thus broken down is carried rearward by the endless conveyor B, and in order that it may be discharged into cars without manual labor, I provide the auxiliary conveyor F.

The conveyor F comprises a main frame part 44 in the form of an elongated pan which is divided by a central longitudinal rib part 45 into two parallel troughs to receive the moving parts of the conveyor which, as shown, comprises a chain 46 and flights 47. The conveyor frame 44 has its front and rear end parts horizontal with an intermediate inclined part. It is supported upon a truck 48, the rear end of the conveyor frame 44 being provided with a depending pivot pin 49 which extends loosely through an aperture in the upper end of a bracket 50 on the truck, the frame 44 carries on its under side a wheel 51 which is designed to run upon an arcuate plate 52 on the truck platform. Thus mounted on the truck, the frame can be swung through a considerable range about the pivot 49.

In operation the conveyor F has its receiving end disposed beneath the rear end of the conveyor B, and preferably the conveyor F is driven from the motor E which drives the conveyor B. 53 is the driving sprocket wheel on the conveyor F, it being mounted on a short shaft 54 which is mounted in a suitable bearing 55 carried by the pan 44 of the conveyor. (See Figure 6.) An idle sprocket wheel 56 for the conveyor chain 46 is mounted in a similar manner at the rear end of the conveyor F. The upper face of the sprocket wheel 53 is formed with clutch teeth 57 which are adapted to be engaged by the teeth of a sliding clutch 58 which is slidably connected upon the lower end of the shaft 8 and which can be raised and lowered by a hand lever 59. When the receiving end of the conveyor F has been moved under the discharge end of the conveyor B, the driving sprocket 53 of the former conveyor can be operatively connected to the shaft 8 of the conveyor B by simply lowering the clutch 58. In this way too the two conveyors are pivotally or flexibly connected to each other, and as the truck 48 is free to move on the track, it will be seen that the conveyor F will be automatically maintained in working relation with the main frame A of the machine when the latter is moved laterally along the face of the coal.

To effect the lateral movement of the machine along the face, I provide suitable power devices as follows:

On the base part 5 of the main frame A is mounted a stud shaft 60 upon which is rotatably mounted a spur gear 61. This gear has on its upper side clutch teeth 62 which are at all times in engagement with the teeth

of a sliding clutch 63. 64 is a toothed clutch disc fast on the lower end of the shaft 54 of conveyor F, and by sliding the clutch 63 upward into engagement with the disc 64, the latter is connected to the gear 61. 65 is a suitably mounted hand lever designed to shift the clutch 63. 66 is a winding drum arranged to turn about a vertical axis, and 67 is a large spur gear connected to said drum and mounted in mesh with the gear 61. One end of the cable 68 is secured to the winding drum 66 and thence extends to the left parallel to the face, passes over pulleys 69 and 70 which are anchored in any suitable manner by jacks or props 71, 72, and thence passes along the face of the coal to the machine, being made fast at 73 to the main frame A. It will be seen that when the clutch 63 is thrown to operative position, the winding drum 66 is turned causing the cable to be wound up and the machine to be drawn laterally along the face of the coal. Furthermore the construction and arrangement of these devices is such that they are adapted to move the main frame laterally in parallelism so that it is maintained at the same angle to the coal face.

74 is a pulley mounted on the base 5 at the left side of the machine, and is adapted to have the cable 68 passed over it and extended forward to a point adjacent the face of the coal and there made fast when it is desired to move the machine endwise into the bottom kerf.

It is at times desirable to drive the winding drum 66 when the conveyor F is not in operative position. To make this possible, I provide a short shaft section 75 which is shown in Figure 7. This shaft is designed to be inserted between the movable clutch members 58 and 63 and is formed at its ends with teeth to engage the teeth of said clutch members. By inserting the shaft section 75, the gear 61 can be connected to the shaft 8 and driven from the motor E.

One way in which the machine can be used will be readily understood from the foregoing description. Let it be assumed that it is to be used in mining on the room and pillar plan; the procedure is as follows:

A bottom kerf in the coal is formed by any desired means. A machine such as above described is placed where it can be used to form clearance opening or chambers, as at *a'* in the lower regions of the solid vein and also form chambers above the lower ones, the latter providing easement for the upper coal when pressure is exerted upon it. After the carriage C has been fully retracted, the cable 68 is passed over the pulley 74 and carried forward along the side of the machine, as indicated by dotted

lines in Figure 1, and made fast at a point adjacent the face. The movable shaft section 75 having been placed in position between the clutches 58 and 63, the motor is now started so as to turn the winding drum 66 and draw the machine endwise toward the face of the coal. When the front end of the main frame A and the conveyer B have been projected fully into the bottom kerf of the coal, the motor is stopped, the shaft section 75 removed, and the conveyer F is run into operative position and connected by means of the clutch 58 with the shaft 8 of the conveyer B.

The yoke which carries the auger D is then swung over to the left by actuating the crank 23 until it approaches a horizontal position, as shown by dotted lines in Figure 4. This brings the auger into the position corresponding to the circle *a* in Figure 8. The motor is now started so as to rotate the auger D, and the carriage is gradually fed forward by turning the screw 27.

When the opening made by the auger has been carried as far as desired the pump 34 is put into action to force liquid into the plunger chambers, and the plungers 30 are caused to exert pressure against the wall around the incision made by the auger. This pressure causes the mass of coal which lies between the incision *a* and the clearance chamber provided by the undercut to move downward, deflection of this mass away from its native bed being now permitted. It is broken down in the manner indicated in Fig. 8 of the drawing. It falls upon the conveyer B part of which is to the rear of the cutter and of the breaking down devices, and the conveyer carries it rearward and discharges it into the conveyer F which in turn discharges it into a mine car. The operator, when he desires, can retract the hydraulic plungers by opening the by-pass valve 42.

The coal below the incision *a* having been broken down and a clearance opening or easement chamber *a'* having been formed, the carriage C is retracted by screw 27, and the auger cutter is then swung over to the right to a position properly correlated to that of the incision or chamber at *a, a'*. This is conventionally illustrated by *b* in Fig. 8 and is preferably somewhat above the position of the previous incision at *a*.

The clutch 12^b is then thrown into operative position and the cutter is again fed forward. When it has been carried in far enough the pump 34 and the plungers 30 are again brought into action. The wall of the easement incision and chamber at *a, a'* now permit the deflection thereinto of the coal between them and the incision at *b*. When sufficient pressure in the incision *b* is reached the intervening coal is forced toward the

opening or chamber at *a, a'* and is broken from the solid. It drops down rearward (relative to the line of advance, bodily, of the cutters) onto the conveyer and is carried backward to the car.

Then the carriage having again been retracted, the pulley blocks 69 and 70 are made fast at suitable points to the left of the machine, and the cable 68 is passed around the pulleys 69 and 70 and thence back to the machine to which it is made fast at 73. The winding drum 66 is now started by throwing in the clutch 63, and the cable is thus wound up until the machine is drawn far enough to the left to make additional cuts with the auger. Preferably the machine will be moved far enough so that the auger, when swung to an upright position, will occupy the position indicated by the circle *c* in Fig. 8. With the auger in this position, the carriage is again fed forward and the operation of incision-making, breaking down and loading is repeated. In this case the walls of the earlier incision and clearance chamber at *a, a'* provide easement for the mass of material between the incisions, and when the pressure in the chamber *c* becomes sufficient the coal breaks toward the said opening.

I do not herein claim any of the specific matters of novelty incident to the auger as a particular means of forming the incisions to receive the breaking devices having presented such claims in my said application Serial No. 588,471, renewed as Serial No. 142,324, of which this application is a division.

What I claim is:

1. The combination of the movable main frame, the means thereon and moving therewith for supplying fluid under pressure, the cutter support carried by said frame and having a duct communicating with the pressure fluid supply, the relatively movable breaking devices on said support actuated by the pressure of the fluid in said duct, and the cutters on said support arranged to form an incision or opening through which the support can travel and which will permit the breaking devices to be normally positioned within the outlines of the path formed by the cutters, when traveling.

2. The combination of the movable main frame, the means thereon for supplying fluid under pressure, the cutter support carried by said frame and having a duct extending along the support and communicating with the pressure fluid supply, relatively movable breaking devices on the support actuated by the pressure of the fluid in said duct, and cutting means on said support adapted to form an incision or opening through which the support can travel, said breaking devices normally lying within the outlines of the path formed by the cutters

but adapted to be forced under fluid pressure to points outside of said outlines.

3. The combination of the movable main frame, the means thereon for supplying fluid under pressure, the cutter support carried by said frame and having a duct communicating with the pressure fluid supply, the breaking devices movably mounted on said support and actuated by the pressure of the fluid in said duct, the cutters arranged

to travel in advance of the breaking devices and form an incision or opening through which said support can travel, the breaking devices normally positioned within the outlines of the path formed by the cutters but adapted at option to be forced by the pressure fluid in said duct to points outside of said outlines. 15

In testimony whereof I affix my signature.
NILS D. LEVIN.