L. F. HESS.

MINING MACHINE.

APPLICATION FILED APR. 11, 1910.

1,006,213.

Patented Oct. 17, 1911.

2 SHEETS—SHEET 1.

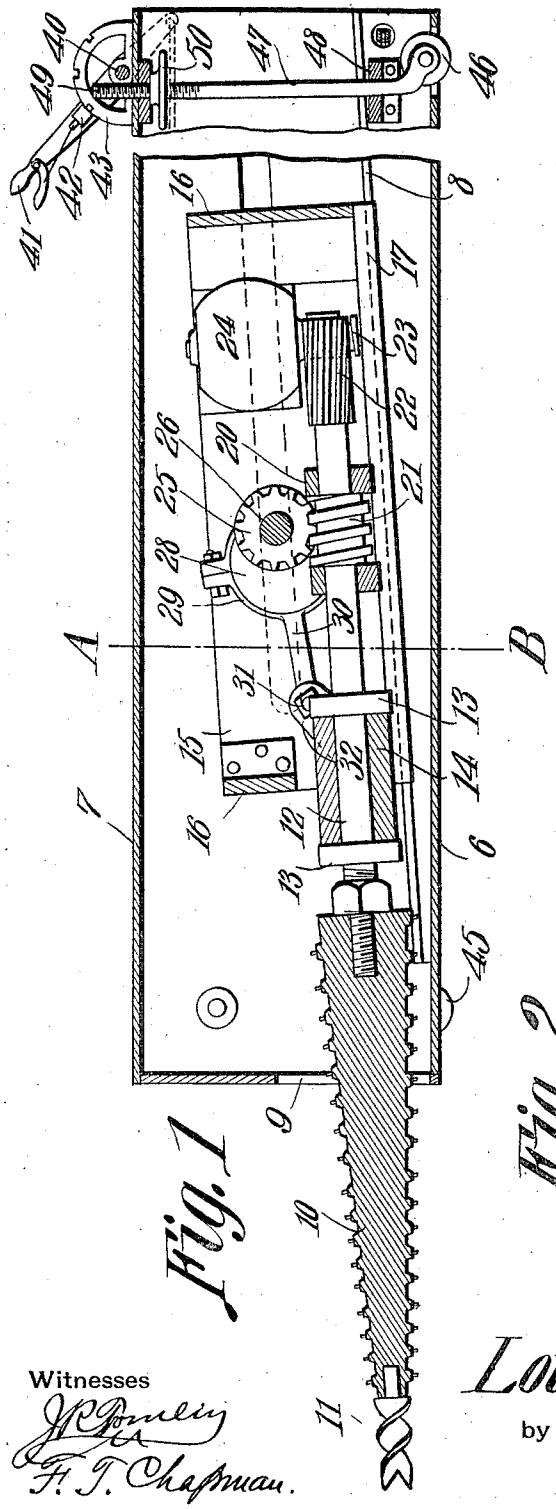

Fig. 1

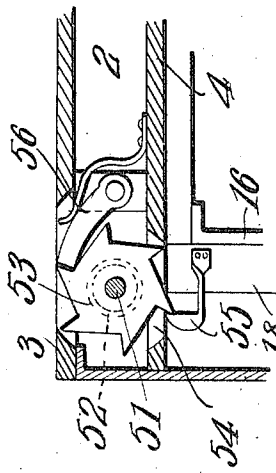

Fig. 3.

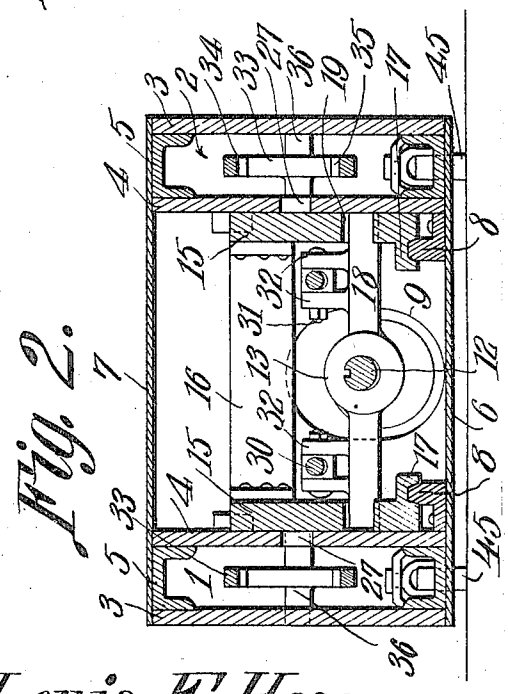

Fig. 2.

Witnesses

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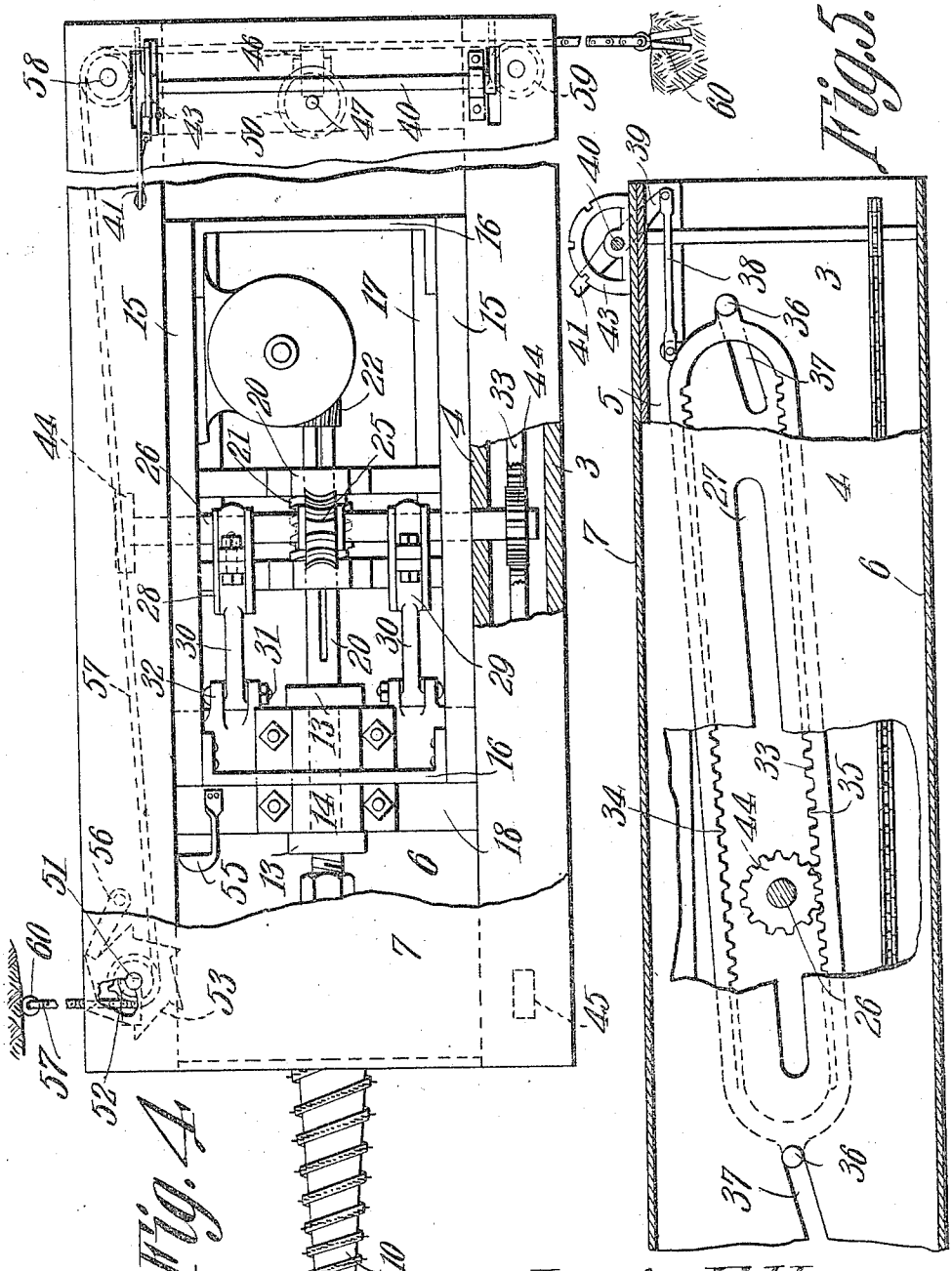

Fig. 5.

Fig. 4.

Witnesses

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LOUIS F. HESS, OF HAWKS NEST, WEST VIRGINIA, ASSIGNOR OF ONE-HALF TO DANIEL BOONE, OF HAWKS NEST, WEST VIRGINIA.

MINING-MACHINE.

1,006,213. Specification of Letters Patent. Patented Oct. 17, 1911.

Application filed April 11, 1910. Serial No. 554,781.

To all whom it may concern:

Be it known that I, LOUIS F. HESS, a citizen of the United States, residing at Hawks Nest, in the county of Fayette and State of West Virginia, have invented a new and useful Mining-Machine, of which the following is a specification.

This invention has reference to improvements in mining machines designed particularly for mining coal.

The object of the present invention is to provide a machine capable of cutting an elongated groove or pocket in the coal vein preparatory to blasting the coal, which machine is characterized by its simplicity of structure and lightness in weigth while at the same time being very efficient in operation.

The machine is capable of cutting a groove or elongated pocket in the coal close to the floor of the tunnel whether in the side wall of the tunnel or in the breast of the tunnel, the machine being very largely automatic in operation but possessing the capability of being elevated or depressed to avoid any unevenness in the coal vein and furthermore presenting no moving parts which are liable to injure workmen.

Because of the extreme simplicity of the machine the cost of maintenance is reduced to a minimum and the machine requires no attention except in starting and stopping and in transportation from one location to another.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings in which drawings:—

Figure 1 is a longitudinal central section of the machine with parts broken away. Fig. 2 is a cross section on the line A—B of Fig. 1. Fig. 3 is a detail section of a portion of the means for feeding the machine. Fig. 4 is a plan view of the machine with parts broken away and in section. Fig. 5 is a side elevation with parts in section and broken away to show the means for controlling the feed of the machine to the work and the withdrawal of the cutting end of the machine from the work.

Referring to the drawings there is shown a main frame-work comprising two hollow side members 1, 2 each made up of an outside plate 3 and an inside plate 4 connected top and bottom by a channel beams 5 or other suitable means, while the side members 1 and 2 are joined together in spaced relation by a bottom plate 6 and a top plate 7 so that the whole structure is substantially box-like. This box-like member is capable of housing all the working parts so that all moving parts are protected in such manner that workmen cannot come in contact therewith and be injured thereby.

Access to the interior of the casing is had, in practice, through suitable small openings normally covered by doors or the like whereby lubricant may be supplied to the moving parts.

Within the casing adjacent to the inner plates 4 of the side members and located near the bottom of the casing are tracks 8 extended longitudinally of the casing and higher at the rear end than at the front end.

The front end of the casing, that is the end presented to the work, is provided with an opening or passage-way 9 for a cutter head 10 which is shown as of an elongated conical or taper form with a spiral web or ledge carrying a continuous series of cutters and terminating at the front end in an auger like cutter 11. This cutter head is carried by a shaft 12 attached to the cutter head at the wider or near end thereof in the axis of the cutter head so that when the shaft is rotated the cutter head 10 will participate in such rotation, the direction of rotation being about the longitudinal axis of the shaft and the cutter head.

The shaft 12 is provided with spaced collars 13 engaging opposite ends of a suitable bearing 14 mounted on a carriage made up of side members 15 and cross members 16, the side members being provided at their lower edges with grooved foot members 17 adapted to the tracks 8 so that the carriage may slide along the tracks for a purpose which will hereinafter appear.

The bearing 14 is mounted in centralized relation to a cross piece 18 sliding in grooves 19 formed in the side pieces 15.

Mounted in bearing blocks 20 on the carriage 15, 16 is a worm 21 carried by the

shaft 12 but secured to said shaft for rotation therewith only, the shaft being capable of a limited longitudinal movement through said worm 21, the latter being held from movement with the shaft by the bearing blocks 20 which also form journal bearings for the end of the shaft where traversing the worm 21. Beyond this worm the shaft carries another pinion 22 engaged by a worm pinion 23 on the armature shaft of an electric motor 24, the purpose of the motor being to give rotary movement to the shaft 12 and the pinion 22 is elongated so that the shaft may have a limited longitudinal movement without disengagement from the pinion 23.

The worm 21 engages a worm pinion 25 on a shaft 26 traversing the carriage 15, 16 and having bearings in the side members 15 through which the shaft 26 extends at both ends and enters the interiors of the members 1 and 2 through elongated slots 27 in the plates 4, these slots being sufficiently long to permit a movement of the carriage 15, 16 sufficient to completely house the cutter head 10 in the casing or to project the same to the full extent designed.

The shaft 26 carries cams or eccentrics 28 to each of which is applied an eccentric strap 29 having an arm 30 the free end of which is pivoted to a pin 31 between ears 32 erected on the cross piece 18 carrying the bearing 14. Rotative movement of the shaft 26 causes a like movement of the cams 28 and a reciprocatory movement of the bearing 14 agreeable to the degree of eccentricity of the eccentrics 28 In practice a few inches reciprocation is found ample, but the invention is not limited to any particular amount of reciprocatory movement. The carriage 15, 16 is fed forward in a manner to be described until the cutter head 10 has entered the desired distance into the wall of the tunnel, the motor 24 being at the time energized so as to cause the rotation of the shaft 12. This rotary movement of the shaft 12 is communicated to the worm 21 and the shaft 26 is driven at a slower speed through the intermediary of the worm gear 25 so that the eccentrics 28 are rotated at a comparatively slow speed and a like slow speed reciprocation is imparted to the bearing 14 and consequently to the shaft 12.

Lodged within each side member 1, 2 is a rack frame 33 having rack teeth 34, 35 on the inner facing edges. Each frame 33 is supported at the ends by studs 36 entering inclined slots 37 in the plate 4.

At the rear end each frame 33 is connected by a link 38 to a corresponding rock arm 39 on a rock shaft 40 mounted in journal bearings on the rear end of the casing or frame of the machine and extending across the same so that the one rock shaft carries the rock arms for both frames 33. This rock shaft is under the control of a lever 41 carrying a latch 42 in operative relation to a segment 43 provided with notches for engaging the latch 42 so that the lever 41 may be adjusted to different positions and there locked.

The arrangement is such that when the lever 41 is in one position the rack frames 33 will be moved forward toward the active end of the machine and because of the inclination of the slots 37 each frame will be directed toward the bottom of the corresponding side 1 or 2 as the case may be and when the lever 41 is moved in the opposite direction the frames 33 will be caused to move upwardly.

At the ends of the shaft 26 within the side members 1 and 2 the shaft carries pinions 44 adapted to engage the racks 34 and 35 of the frames 33.

When the lever 41 is in one position, the rack 34 is moved into engagement with the pinion 44 of each side of the machine and when the lever is in the other position opposite to that first assumed the rack 35 is in engagement with the pinion 44 on the opposite sides of the machine while when the lever 41 is in an intermediate position then neither racks 34 nor 35 of the two frames 33 are in engagement with the pinions 44.

The front end of the frame of the machine is mounted upon wheels 45 capable of movement about a vertical axis as well as upon a horizontal axis, and at the rear there is provided a caster wheel 46 mounted upon an elongated stem 47 extending through bearings 48 in the frame of the machine and at the upper end this stem is threaded as shown at 49 to receive a nut 50 which may be turned at will to elevate or depress the wheel 46 with relation to the frame.

The vertical adjustment of the stem 47 permits the raising or lowering of the rear end of the machine and consequently the tipping of the cutter head 10 so that it may be raised or lowered as may be found necessary.

Mounted in the side member 2 near the front end thereof is an upright shaft 51 carrying a sprocket wheel 52. This shaft also carries a toothed wheel or ratchet 53 having its teeth movable through a slot 54 in the plate 4 into the path of a spring pawl or finger 55 on the cross-piece 18. A back step pawl 56 is provided for the toothed wheel 53.

Extending around the sprocket wheel 52 is a sprocket chain 57 leading to idler sprocket wheels 58, 59 at the rear ends of the side members 1 and 2 the sprocket chain extending across the rear end of the casing from the idler 58 to the idler 59. The ends of the sprocket chain may be made fast to expansion bolts 60 to be secured in the walls

of the tunnel temporarily and to be readily removed therefrom when it is desired to transport the machine from place to place.

Let it be assumed that the machine is in position to act on the coal with the bolts 60 fastened in the walls of the tunnel and the machine close to one wall of the tunnel, this being the left hand wall to a person at the rear end of the machine and looking toward the front end. During transportation the carriage 15, 16 is retracted so that both this carriage and the cutter head 10 are completely housed within the casing, so now the motor 24 is started while the lever 41 is in the intermediate position holding the rack frames 33 so that neither the racks 34 nor 35 are in engagement with the pinions 44. The action of the motor 24 is to drive the shaft 26 in the desired direction and then by moving the lever 41 in the proper direction one of the sets of rack teeth 34, or 35, say the rack teeth 35, is brought into engagement with pinions 44 and if it be assumed that the shaft 26 is rotating counter-clockwise as viewed in Figs. 1 and 4 then the carriage 15, 16 will be moved toward the front of the machine and the cutter head 10 will be projected, the terminal cutter 11 engaging the coal and boring there into, this cutter being followed by the cutters on the cutter head 10 thus causing a hole to be formed in the coal, the carriage progressing forwardly in the meantime. While this cutting is proceeding the cutter head is given a forward and backward movement by the eccentrics 28 so that the cutters do not engage the coal continuously there being a succession of intervals of rest during which the cutters have time to cool. Ultimately the carriage is moved forwardly until the desired depth of cut has been produced, the finger 55 having in the meantime passed by the teeth of the wheel 53 without actuating this wheel, the pawl 56 preventing movement of the wheel under the action of the finger in the direction considered. At the next rearward reciprocatory movement of the shaft 12 and parts carried thereby the finger 55 is brought into engagement with a tooth of the wheel 53 and the latter is given a partial rotation, this movement being imparted to the shaft 51 and the chain 57 is drawn toward the machine to a commensurate extent. This results in a side movement of the frame of the machine perpendicular to the longitudinal axis of the cutter head, and this side movement of the machine takes place while the cutter head is withdrawing from the cut just produced so that the cutters are at this time idle. Now on the next forward movement of the cutter head the cutters are brought into side engagement with the coal and the cut first produced is elongated horizontally. This operation continues uninterruptedly so long as the machine is in the position assumed and the motor 24 is running, the machine moving laterally until ultimately it approaches close enough to the wall toward which it is moving. Now the lever 41 is moved from the central position to a position opposite that to which it was first moved so that the other racks of the frames 33, say the racks 34 are brought into engagement with the pinions 44, this occurring in both side members 1 and 2, and then the carriage 15, 16, together with the cutter head is moved rearwardly until the cutter head is entirely housed in the machine frame. Now the lever 41 is moved again to the central position and current to the motor is cut off, after which the bolts 60 may be removed from the walls of the tunnel and the machine may be moved to another position, for operating on the coal in the manner already described.

It will be observed that the machine is compact, and since it may be made largely of structural material the machine is of such light weight as to be readily moved by hand from point to point.

In operation no moving parts are in position to come in contact with the workmen and consequently danger of injury is practically eliminated.

The bottom of the cutter-head 10 being substantially horizontal and movable close to the floor of the tunnel, the cut produced in the coal is very close to the floor of the tunnel and nearly coincident therewith. This cut is of less height within the coal than at the outer wall, thus facilitating the blasting out of the coal with less explosives than is necessary when the cut is of equal height from front to back. Also the amount of coal removed by the cutters is small since the cutter head is of small size comparatively.

The relative proportions of the parts shown in the drawings may be varied as desired, it being understood that the showing of the drawings is in the most part susceptible of change without in any manner departing from the salient features of the invention.

The speed of movement of the parts may of course vary as desired and consequently no particular speed of movement can be given. It may be stated however that with a cutter head of about three feet in length, the cutter head may rotate at about 250 revolutions per minute and have a reciprocatory movement of about 6 inches extent at the rate of about six per minute. Of course these amounts are merely indicative and may be changed as desired.

What is claimed is:—

1. In a mining machine, a supporting casing, tracks therein at an angle to the bottom of the casing, said tracks being more elevated at the rear of the casing than at the

front thereof, a carriage mounted on the tracks, and a taper or conical cutter head supported by the carriage and movable therewith in the direction of the length of the tracks.

2. In a mining machine, a carriage; a cutter shaft mounted for longitudinal reciprocation in the carriage; a worm in which the shaft reciprocates longitudinally, the worm being fixed to the shaft for rotation therewith; a transverse shaft journaled in the carriage; a pinion upon the transverse shaft meshing into the worm; mechanism operatively connecting the transverse shaft and the cutter shaft, to secure a longitudinal reciprocation of the latter; a motor upon the carriage provided with a worm disposed transversely of the cutter shaft; and an elongated pinion fixed upon the cutter shaft and meshing slidably into the worm.

3. In a mining machine, a casing; a carriage mounted for reciprocation therein; a cutter disposed upon the carriage; means for advancing and retracting the carriage; a shaft journaled for rotation in the casing; a ratchet wheel secured to the shaft; a flexible element engaged with the shaft and extended through the casing transversely of the line of reciprocation of the carriage, the flexible element being terminally adapted for connection with fixed supports; and means upon the carriage to engage the ratchet wheel when the carriage is retracted.

4. In a mining machine, a casing; a frame slidable in the casing and provided with spaced racks; a carriage slidable in the casing; a cutter movable upon the carriage; a shaft journaled in the carriage and operatively connected with the cutter; a pinion upon the shaft, disposed between the racks; means for moving the frame longitudinally; and inter-engaging elements upon the frame and the casing to impart transverse movement to the frame and to fix the frame, when the frame is moved longitudinally, whereby either rack may be brought into mesh with the pinion.

5. In a mining machine, a casing; a carriage mounted for reciprocation therein; a cutter disposed upon the carriage; means for advancing and retracting the carriage; a shaft journaled for rotation in the casing; a flexible element engaged with the shaft and extended through the casing transversely of the line of reciprocation of the carriage, the flexible element being terminally adapted for connection with fixed supports; and interengaging elements upon the carriage and upon said shaft, to secure a rotation of the shaft when the carriage is retracted.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

LOUIS F. HESS.

Witnesses:
W. A. SPENCER,
MOLLYE A. MICHAEL.