No. 869,609. PATENTED OCT. 29, 1907.

W. YEATTS.

COAL MINING MACHINE.

APPLICATION FILED DEC. 15, 1906

6 SHEETS—SHEET 1.

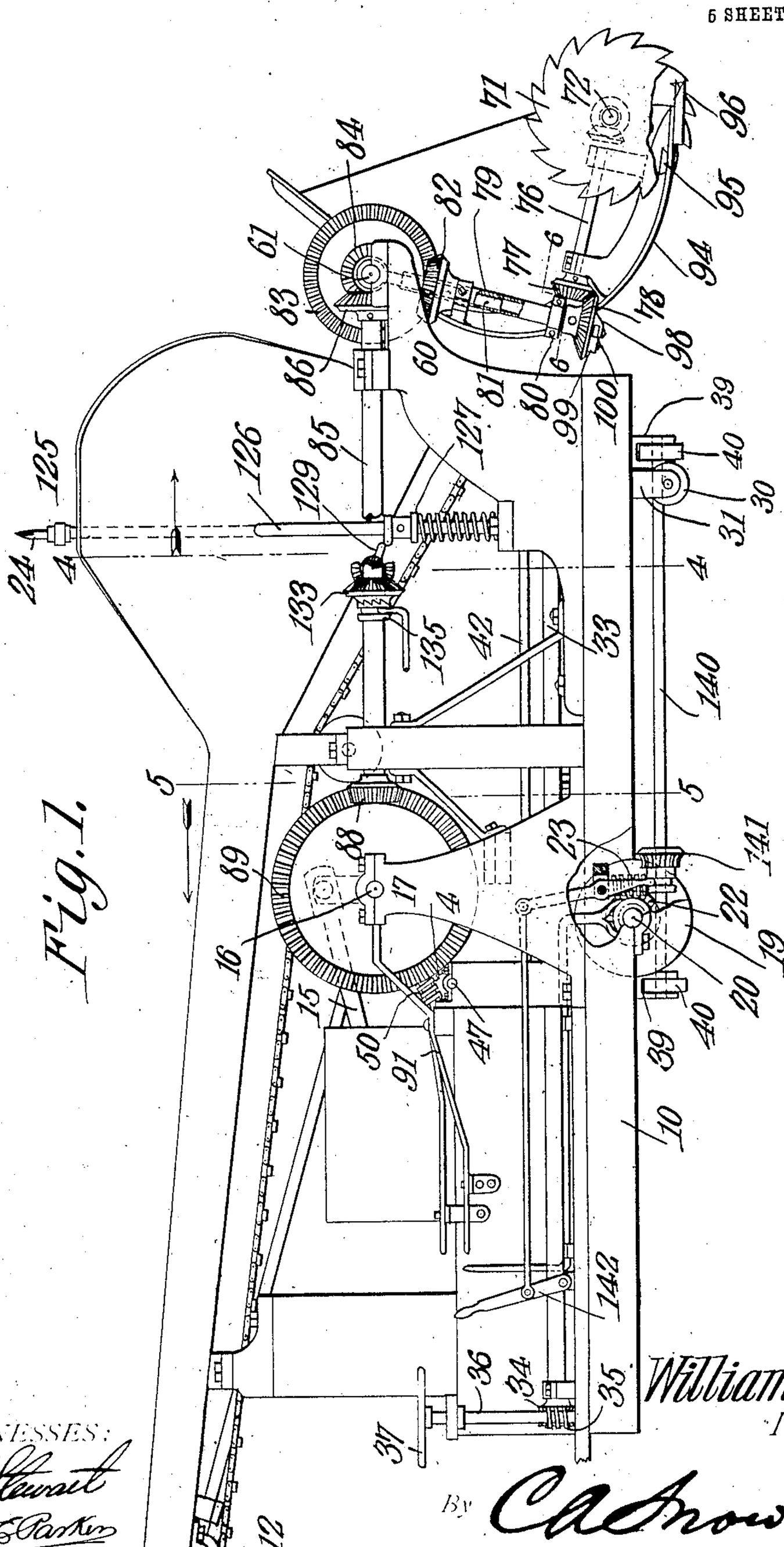

Fig. 1.

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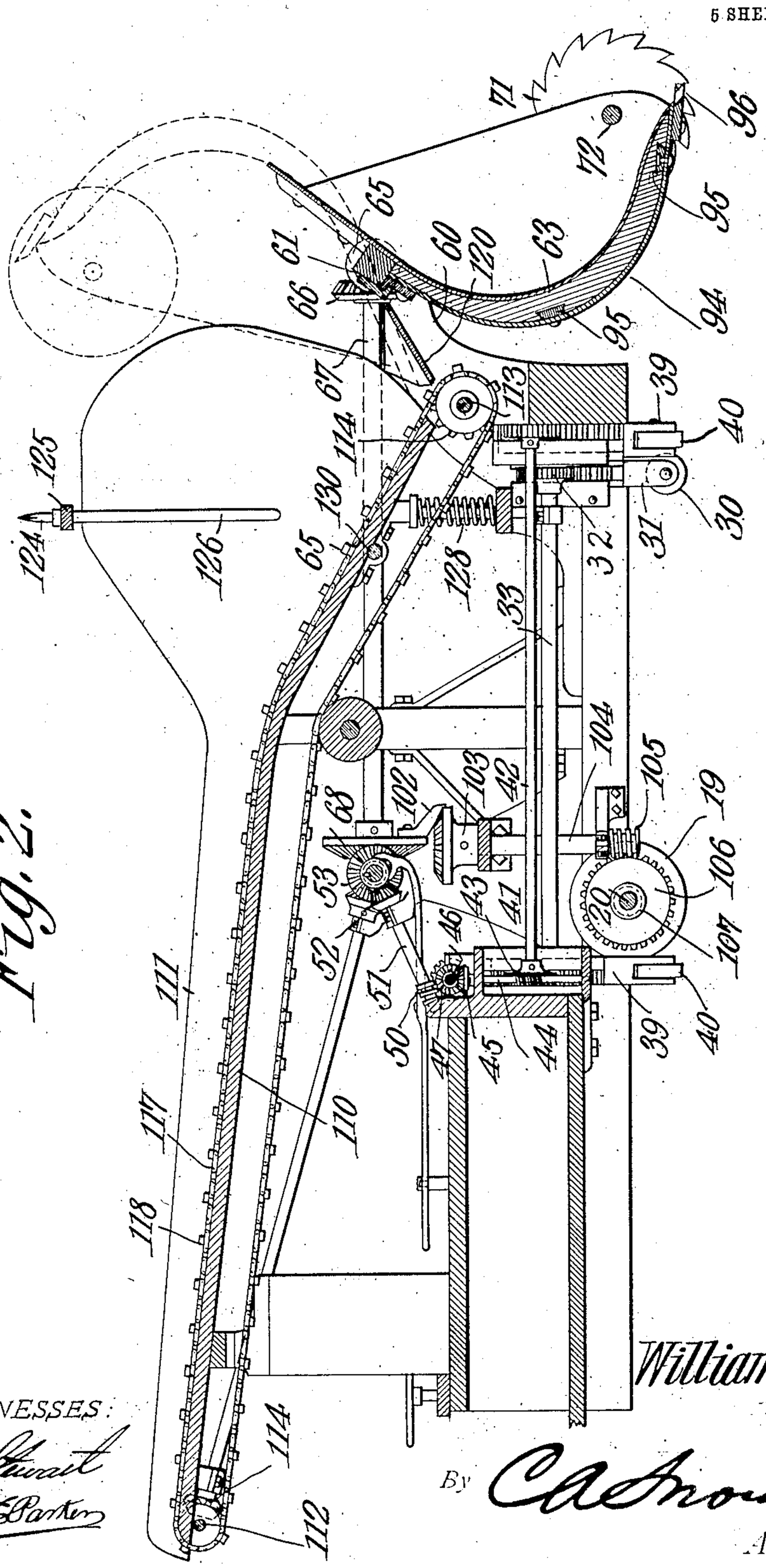
5 SHEETS—SHEET 2.

Fig. 2.



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5 SHEETS—SHEET 3.

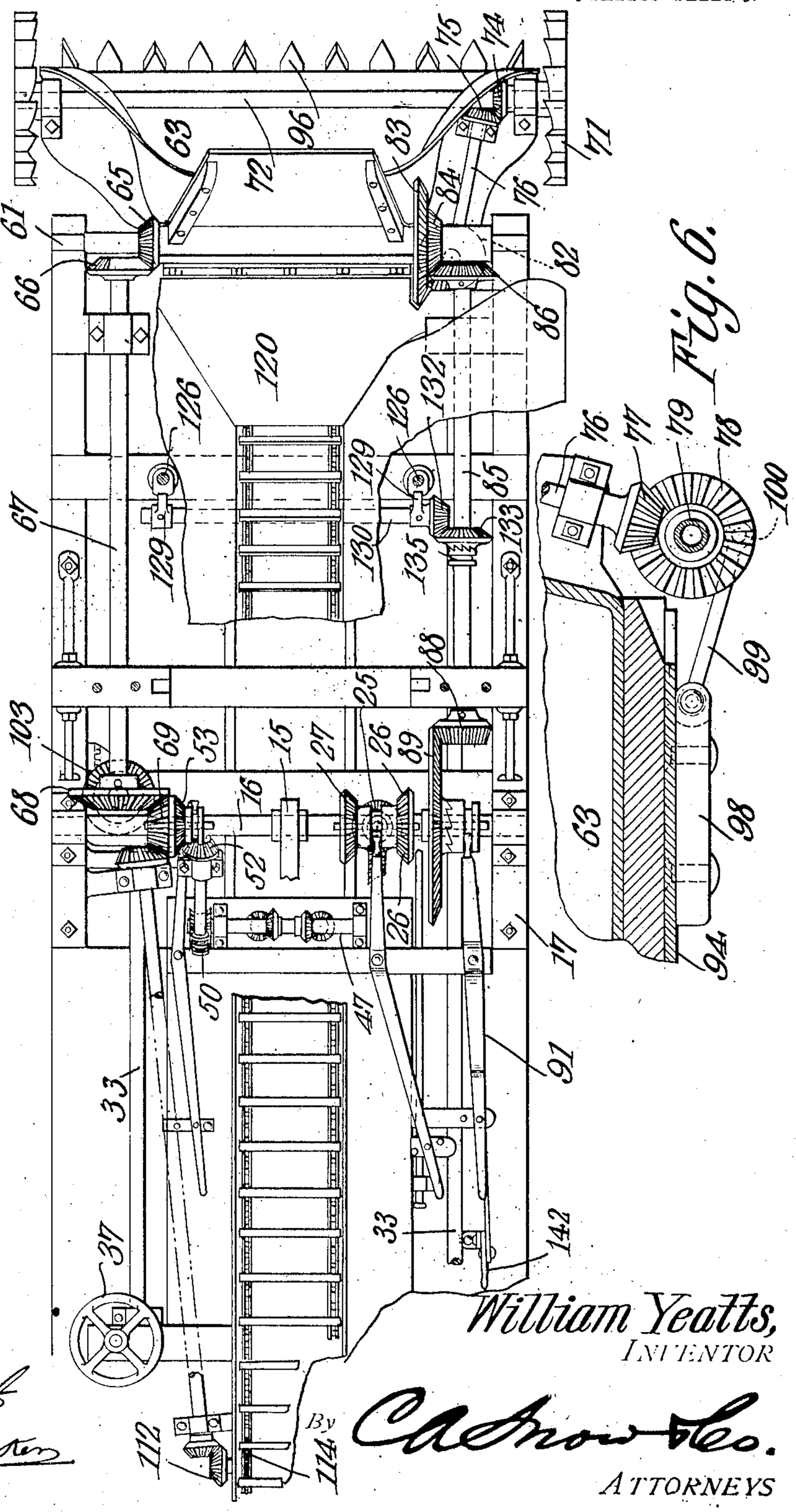

Fig. 3.

Fig. 6.

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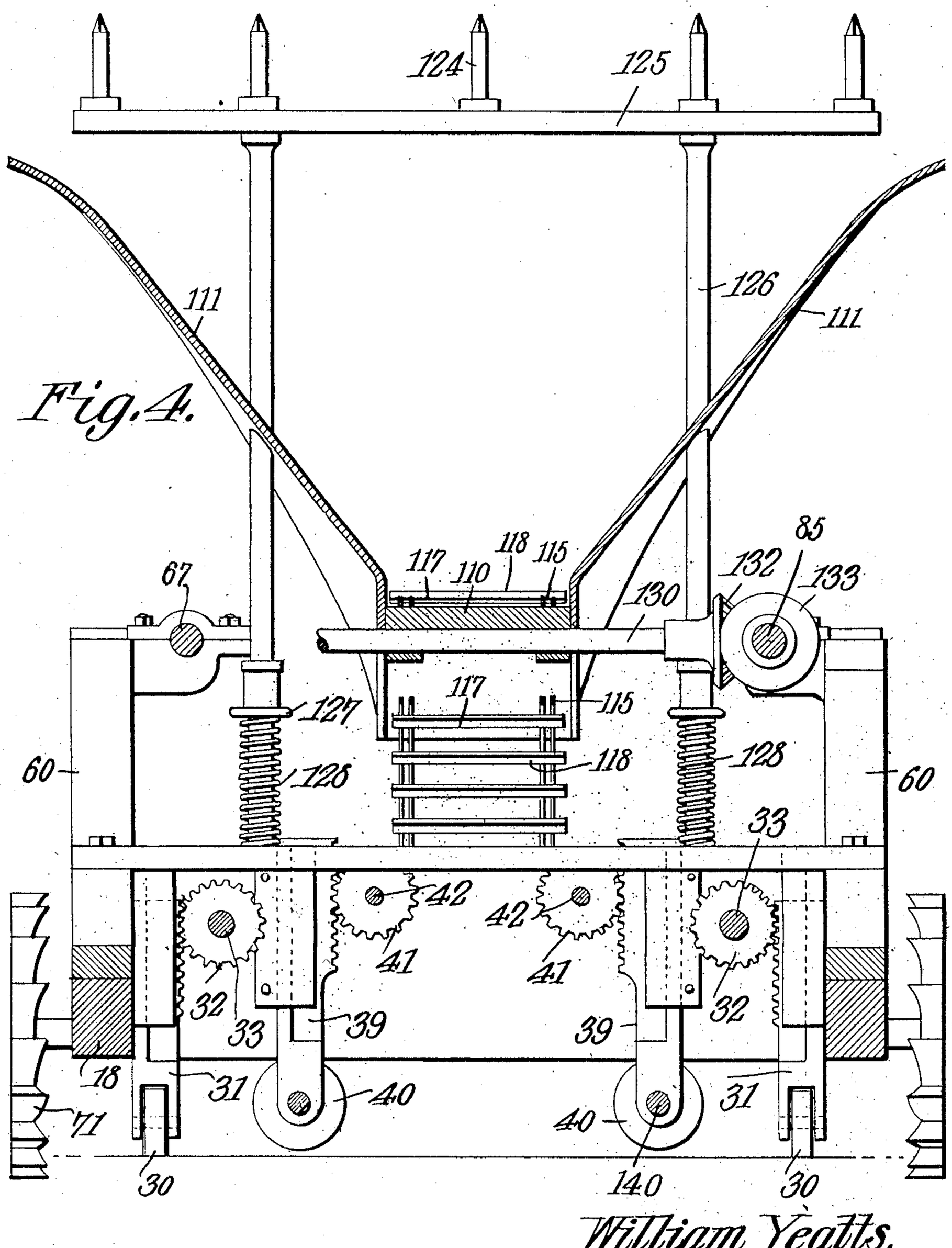
5 SHEETS—SHEET 4.

Fig. 4.



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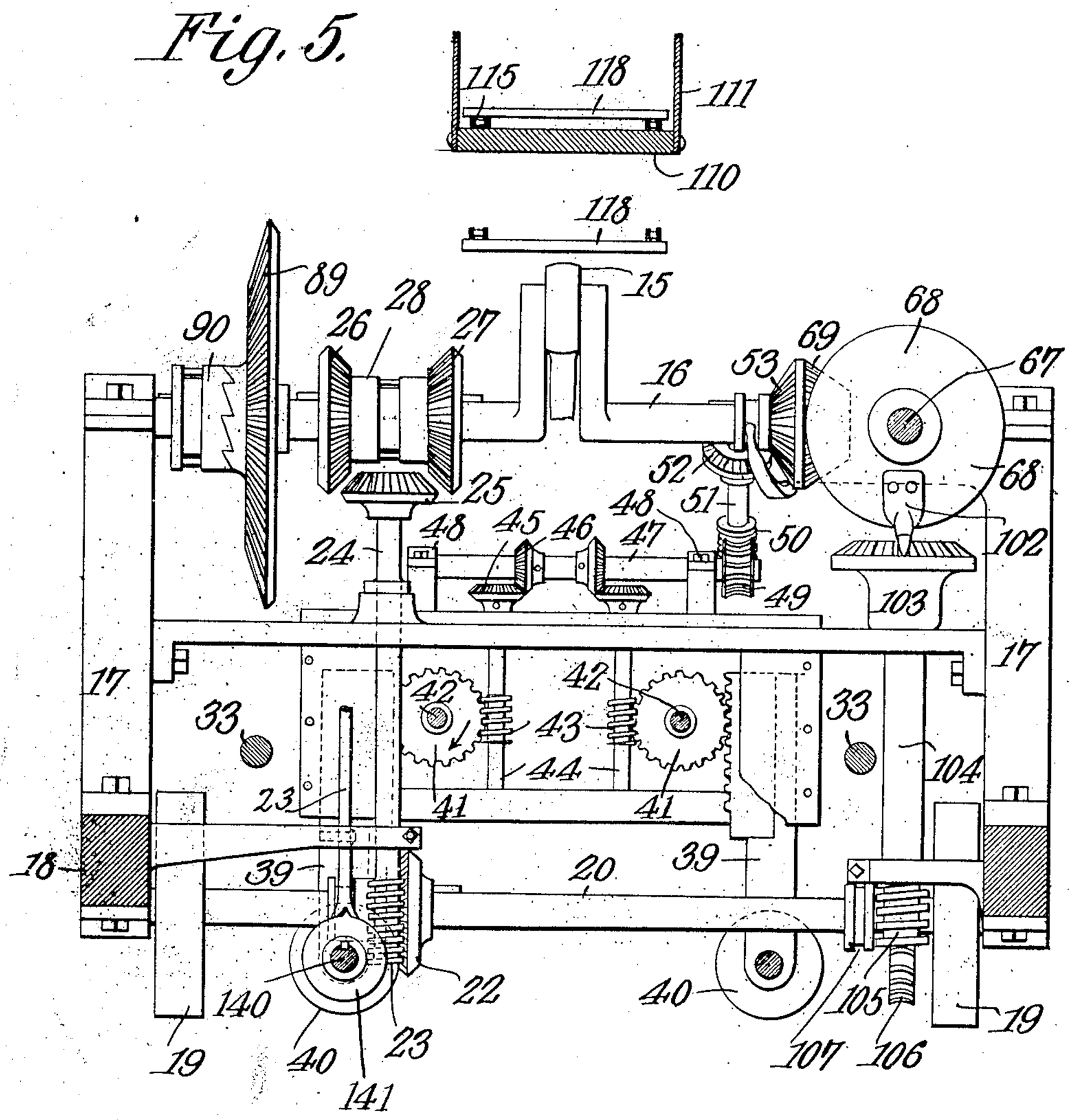
5 SHEETS—SHEET 5.

Fig. 5.



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UNITED STATES PATENT OFFICE.

WILLIAM YEATTS, OF RICEVILLE, VIRGINIA.

COAL-MINING MACHINE.

No. 869,609. Specification of Letters Patent. Patented Oct. 29, 1907.

Application filed December 15, 1906. Serial No. 348,046.

To all whom it may concern:

Be it known that I, WILLIAM YEATTS, a citizen of the United States, residing at Riceville, in the county of Pittsylvania and State of Virginia, have invented a new and useful Coal-Mining Machine, of which the following is a specification.

This invention relates to coal mining and tunneling machinery, and has for its principal object to provide a device whereby coal may be mined in large quantities at comparatively small cost, or tunnels, drifts or ditches cut through material of any character.

A further object of the invention is to provide a device of this character in which a lifting scoop or shovel is provided with cutters which are moved for the purpose of loosening the material which is collected into the scoop or shovel, and from thence conveyed away by any suitable mechanism.

A still further object of the invention is to employ means for moving such cutting devices either with or without the scoop for the purpose of loosening the material which the scoop is to receive.

A still further object of the invention is to provide a laterally movable scoop having cutters projecting from its lip.

A still further object of the invention is to provide a scoop or shovel with cutters arranged to cut both vertically and horizontally, and in which provision is made for gradually raising the scoop toward dumping position as the material is gradually cut away and received into the scoop.

A still further object of the invention is to provide a scoop having a pair of revoluble cutters arranged one at each side of the scoop for cutting away the material.

A still further object of the invention is to provide a device of this class in which a scoop is associated with an endless conveyer, the scoop being gradually raised during the reception of the load until it reaches a position where the contents are dumped on to the conveyer and then be automatically returned to initial position.

A still further object of the invention is to provide a mining machine with automatically actuated picks for removing the material from the roof of the tunnel or drift, the material dropping to an endless conveyer and being carried away to the mine cars or other suitable point of discharge.

With these and other objects in view, as will more fully hereinafter appear, the invention consists in certain novel features of construction and arrangement of parts, hereinafter fully described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the form, proportions, size and minor details of the structure may be made without departing from the spirit or sacrificing any of the advantages of the invention.

In the accompanying drawings:—Figure 1 is a side elevation of a mining machine constructed in accordance with the invention. Fig. 2 is a longitudinal sectional elevation of the same. Fig. 3 is a plan view of the machine, parts being broken away in order to more clearly illustrate the construction. Fig. 4 is a transverse sectional view of the machine on the line 4—4 of Fig. 1, the view being on an enlarged scale. Fig. 5 is a similar view on the line 5—5 of Fig. 1. Fig. 6 is a sectional plan view of a portion of the mechanism on the line 6—6 of Fig. 1.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The mechanism forming the subject of the present invention is designed for the mining of coal or other material and for the cutting of drifts, tunnels, and the like through earth or rock. The machine as a whole is mounted on a suitable frame 10 mounted on supporting wheels and provided with an internal combustion or other type of engine by which the machine may be propelled in any direction, and which, also, serves for the purpose of operating the moving parts. The piston of the engine is connected by a rod 15 to a main crank shaft 16 that is mounted in bearings at the top of standards 17 carried by the longitudinal sills 18 of the frame and from this shaft all of the remaining parts of the mechanism receive motion. The main weight is supported by a pair of wheels 19 that are rigidly secured to an axle 20 having bearings at the lower edges of the sills 18, and feathered on the axle is a worm gear 22 which may be moved into or from engagement with a worm 23 that is carried by a vertically disposed shaft 24 adapted to bearings in the frame. The upper end of the shaft 24 is provided with a bevel gear 25 which may mesh with either of a pair of bevel gears 26—27 that are carried by a sleeve 28 feathered on the main shaft. The sleeve may be moved in the direction of the length of the shaft in order that either gear 26—27 may engage the gear 25 and thus impart motion through the worm gear to the axle 20 for the purpose of propelling the machine in either direction. At the forward end of the machine the weight may be supported by a pair of small wheels 30 that are carried by vertically guided rack bars 31, said rack bars being engaged by pinions 32 that are carried by horizontally disposed parallel shafts 33, the latter being mounted in bearings slightly above the level of the sills and extending toward the rear end of the machine, at which point each shaft carries a worm gear 34 in mesh with a worm 35. The

worms 35 are carried by vertically disposed shafts 36 having hand wheels 37 which may be turned for the purpose of raising or lowering the rack bars and moving the wheels 30 into or from contact with the ground. During the forward or backward travel of the machine, and under normal conditions of working, the wheels 30 rest on the ground and serve not only as a means for supporting the frame, but by reason of their adjustability, permit the raising and lowering of the front end of the frame to a limited extent.

It is necessary at times to move the machine to the right or to the left, and for this purpose the frame is provided with four vertically disposed guideways for the reception of four rack bars 39, said rack bars carrying wheels 40, the axes of which are at a right angle to the axes of the wheels 30. The rack bars 39 are engaged by pinions 41 that are carried by a pair of shafts 42, mounted in suitable bearings in the lower portion of the frame and extended rearward to a point somewhat beyond the vertical plane of the main crank shaft. The two rear pinions 41 intermesh with worms 43 carried by vertically disposed shafts 44 at the upper ends of which are bevel gears 45 in mesh with bevel gears 46 that are carried by a transversely disposed shaft 47 having bearings 48 on the frame.

At one end of the shaft 47 is arranged a worm gear 49 in mesh with a worm 50 on an obliquely disposed shaft 51. The shaft 51 carries a bevel gear 52 which may be brought into mesh with a bevel gear 53 that is feathered on the main shaft 16 and which may be moved into and from engagement with the bevel gear 52. When the gears are in mesh, motion is transmitted from the main crank shaft through the gearing connections described to the several rack bars 39, and the latter are moved vertically for the purpose of raising or lowering the wheels 40. When the wheels are moved down, the frame as a whole will be elevated and the main wheels and the front wheels 30 will be moved from the ground, the transverse wheels 40 then forming the sole support of the machine, so that the latter may be shifted laterally as occasion may require.

At the front end of the machine is a pair of vertically and forwardly extending standards 60 carrying bearings for the support of a transversely disposed shaft 61, the latter having rounded end portions, and being provided with a square or polygonal body, as shown in Fig. 2, and to the square portion of the shaft is secured the scoop 63, said scoop being movable between the positions shown in full lines and dotted lines in Fig. 2, and serving during this upward movement to gather a load of coal or other material, and when the elevated position is reached, to dump the accumulated load on to an endless conveyer 65, in which the material may be carried to a dumping point or to the mine cars or other vehicles. The scoop shaft 61 is provided at one end with a bevel gear 65 which intermeshes with a mutilated bevel gear 66 carried by a horizontally disposed shaft 67, and the rear end of the shaft 67 carries a bevel gear 68 which may mesh with a bevel gear 69 that is formed integral with the bevel gear 53, and is movable with the latter in the direction of the length of the main shaft 16. When the gears 68 and 69 are in mesh during the working of the engine, the scoop shaft will be turned and the scoop will be gradually moved from the lowest to the highest position, gathering in the coal or other material from the face of the tunnel or drift, and after the dumping position has been reached, the teeth of the mutilated gear will pass from engagement with the gear 65, and the scoop will fall by gravity to the initial position, and then as the shaft 67 continues to turn, the teeth of the mutilated gear will again engage the bevel gear 65 and the operation will be repeated, provision being made for advancing the machine step by step as the material is gradually excavated.

In order to loosen the coal or other material, a pair of revoluble cutters 71 are employed, these being arranged at the opposite edges of the scoop and being carried by a transversely disposed shaft 72 having suitable bearings at the lower portion of the scoop frame. At one end of this shaft is a bevel gear 74 which meshes with a bevel gear 75 on a shaft 76, and this latter shaft, also, carries a bevel gear 77 in mesh with a bevel gear 78 on a hollow shaft 79. The shaft 79 is mounted in suitable bearings 80 at one side of the scoop frame, and extending through said shaft or the upper portion thereof is a spindle 81 that is pivoted on the shaft 61 and is free to swing, together with the hollow shaft 79, in following the movement of the scoop. At the upper portion of the hollow shaft is a bevel gear 82 in mesh with a bevel gear 83 that is formed integral with a bevel pinion 84, the gear and pinion 83 and 84 being loosely mounted on the shaft 61 and free to rotate independent thereof. Mounted in bearings at the upper part of the frame is a horizontally disposed shaft 85. At the forward end of this shaft is a bevel pinion 86 which intermeshes with the pinion 84, and at the rear end of said shaft is a pinion 88 in mesh with a bevel gear 89 that is mounted loosely on the main shaft 16. The hub of the gear 89 is provided with clutch teeth arranged to engage with the similar teeth of a clutch sleeve 90 feathered on the shaft 16 and under the control of an operating lever 91 that is arranged within convenient reach of the attendant, so that the gear may be clutched to the shaft or released therefrom, as desired. Mounted at the rear of the scoop 63 is a transversely movable plate 94 that preferably is provided with a number of dove-tailed ribs 95 entering corresponding grooves formed in the rear face of the scoop. The lower forward edge of the plate 94 is provided with cutting teeth or bits 96 which project beyond the forward lip of the scoop, and as the plate is moved transversely of the scoop proper, the bits or cutters will operate on the material being excavated, and will loosen the same, the material being received within the scoop as the latter moves upward from the full line to the dotted line position. The plate 94 carries a block 98 that is connected by a pitman 99 to a wrist pin 100 on the lower face of the bevel gear 78, so that as the bevel gear is turned, the plate is reciprocated.

As the material is gradually excavated, it becomes necessary to advance the machine, and this is accomplished automatically from the shaft 67. The bevel gear 68 of shaft 67 is provided with a single tooth 102 projecting from its flat face, and said tooth is arranged to engage with the teeth of a bevel gear 103 that is carried by a vertically disposed shaft 104, the bevel gear 103 being turned to the extent of a single tooth for each revolution of the shaft 67. The lower end of the shaft 104 carries a worm 105 that intermeshes with a worm

wheel 106 mounted loosely on the axle 20, a clutch 107 being employed for locking the worm wheel to the shaft during the operation of the machine, and each time the scoop is filled and dumped, the machine as a whole will be advanced a distance corresponding to the depth of the cut.

At the upper portion of the main frame is arranged a conveyer frame, including a bottom plate 110 and side walls 111. At the opposite ends of the bottom plate 110 are arranged shafts 112—113 carrying sprocket wheels 114 over which pass link belts 115. The belts serve as a support for an endless conveyer 117 having suitable transverse ribs 118 in order to positively feed the material from the front to the rear end of the machine. The forward ends of the side walls 111 are flared outwardly, as indicated more clearly in Figs. 3 and 4, in order that the material falling in the scoop may be properly directed on to the conveyer, and in order to prevent the falling of any material between the front end of the conveyer and the scoop, a chute plate 120 is arranged immediately to the rear of the scoop, as shown in Fig. 2.

Where the machine is used for mining coal, the limit of upward movement of the scoop is such as to cut within a few inches of an upper layer of slate, and in order to detach the remaining portion of the coal between the roof of the tunnel and the layer of slate, a series of automatic picks 124 are employed. These picks are carried by a transversely disposed bar 125 that is mounted on vertical rods 126 that pass through guiding openings formed in the flaring side walls 111 and all of them are within the space between the side walls 111 of the conveyer, so that any material detached will be directed onto the traveling member of the conveyer, as will be seen on reference to Fig. 4. The lower portions of the rods 126 are provided with collars 127 that rest on top of compression springs 128, and these collars are arranged to be engaged by a pair of cams 129 mounted on a transversely disposed shaft 130 under the upper run of the conveyer. The shaft 130 is provided at one end with a bevel gear 132 which intermeshes with a bevel gear 133 mounted loosely on the shaft 85, the hub of the bevel gear having clutch teeth arranged to be engaged by the clutching teeth of a collar 135 that is slidably mounted on the shaft 85, so that the picks may be operated at will.

For convenience in moving the machine laterally, one set of transverse wheels 40 is mounted on a shaft 140, and said shaft carries a worm wheel 141, and feathered to the shaft and under the control of an adjusting lever 142. By operating this lever, the worm wheel 141 may be moved into engagement with the worm 23 for the purpose of transmitting movement through the transverse wheels and effecting the necessary lateral adjustment.

I claim:—

1. A scoop or bucket, and cutting members carried thereby and movable independently thereof.

2. A scoop or bucket having cutting members at one edge, and means for operating said cutting members independent of the scoop.

3. A scoop or bucket, and a movable cutting member arranged at the edge thereof.

4. A scoop or bucket, and a longitudinally movable cutter arranged at the entrance lip of said scoop or bucket.

5. A scoop or bucket, a cutter supported thereby, and means for reciprocating said cutter in the direction of the length of the edge or lip of said scoop.

6. A scoop or bucket, a movable cutter arranged at the edge thereof, means for moving the scoop, and means for moving the cutter independent of the scoop.

7. A scoop or bucket, means for traveling the same against the material to be excavated, and an independent means carried by the scoop for loosening the material as the scoop is operated.

8. A scoop or bucket, and a plurality of reciprocatory cutting members projecting beyond the receiving edge of said scoop.

9. A scoop or bucket, revoluble cutters at the sides thereof, reciprocatory cutters at the receiving lip of the scoop, and means for operating all of said cutters.

10. In combination, a pivotally mounted scoop, means for swinging the same, a reciprocatory plate at the back of the scoop, cutters carried by said plate and projecting beyond the receiving edge of the scoop, a shaft carried by the scoop, a pair of revoluble cutters on said shaft, a gear having its axis of rotation coincident with the axis of movement of the scoop, means for driving the gear, a shaft supported by the scoop and having a pair of bevel gears receiving motion from the first gear, gearing connections between the bevel gear carrying shaft and the cutter shaft gears, a crank pin carried by one of said bevel gears, and means for connecting said crank pin to said plate.

11. In a device of the class specified, a frame, an endless conveyer, fixed guiding means for said endless conveyer, a scoop or bucket pivoted to the frame at a point intermediate its front and rear edges, the front edge forming a receiving lip, and means for swinging the scoop upward independent of the conveyer to a point where its contents will run by gravity over the rear edge of the scoop on to such conveyer.

12. A pivotally mounted scoop, a rock shaft carrying the same, a gear mounted on said rock shaft, and a mutilated gear for engaging and driving the rock shaft gear to raise said scoop to dumping position, said scoop being arranged to move by gravity to the lowermost position when the teeth of the gears are out of mesh.

13. A pivotally mounted scoop, a rock shaft carrying the same, means for operating said rock shaft, a bevel gear mounted loosely on the rock shaft, means for operating the bevel gear, a plate arranged under the rear of the scoop and having a ribbed and grooved connection therewith, cutter bits carried by the plate and projecting beyond the receiving lip of the scoop, a hollow shaft having bearings at the side of the scoop and provided with upper and lower bevel gears of which the uppermost intermeshes with the rock shaft gear, a crank pin carried by the lower bevel gear and connected to the plate, a shaft arranged near the forward edge of the scoop, a pair of revoluble cutters supported by said shaft, and gearing connections between the cutter carrying shaft and the lower bevel gear.

14. An excavating scoop arranged to swing in a vertical plane, and a pair of sets of cutters carried thereby, one set being arranged to cut vertically and the other set to cut horizontally.

15. In a machine of the class described, a frame propelling wheels supporting the same, a step by step driving mechanism for said wheels, said mechanism including a bevel gear, a scoop, a rock shaft carrying the same, a bevel gear on said rock shaft, a mutilated gear arranged to engage the bevel gear of the rock shaft, a driven shaft carrying said mutilated gear, a driven gear arranged at one end of the mutilated gear shaft, and a single tooth member carried by the driven gear and arranged to engage the bevel gear of the propelling mechanism.

16. In a machine of the class described, a frame, an engine mounted thereon, a pair of sets of wheels for supporting the frame, the axes of the wheels of one set being at an angle to those of the other set, gear and clutch connections between the engine and the wheels, whereby driving movement may be imparted to either set, a scoop, cutting members carried thereby, gearing connections between the engine, the scoop and the cutting members,

an endless conveyer arranged to receive the material from the scoop, and gearing connections between the engine and the endless conveyer.

17. In mechanism of the class described, the traveling excavator means, a conveyer mechanism including flaring side walls for directing the material on to the conveyer proper, a plurality of picks arranged to engage with and remove a portion of the roof of the tunnel or drift being excavated, all of said picks being arranged in a space between such flaring side walls, and an operating means common to the excavating means and the picks.

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

WILLIAM YEATTS.

Witnesses:
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W. L. WALTINGTON.