

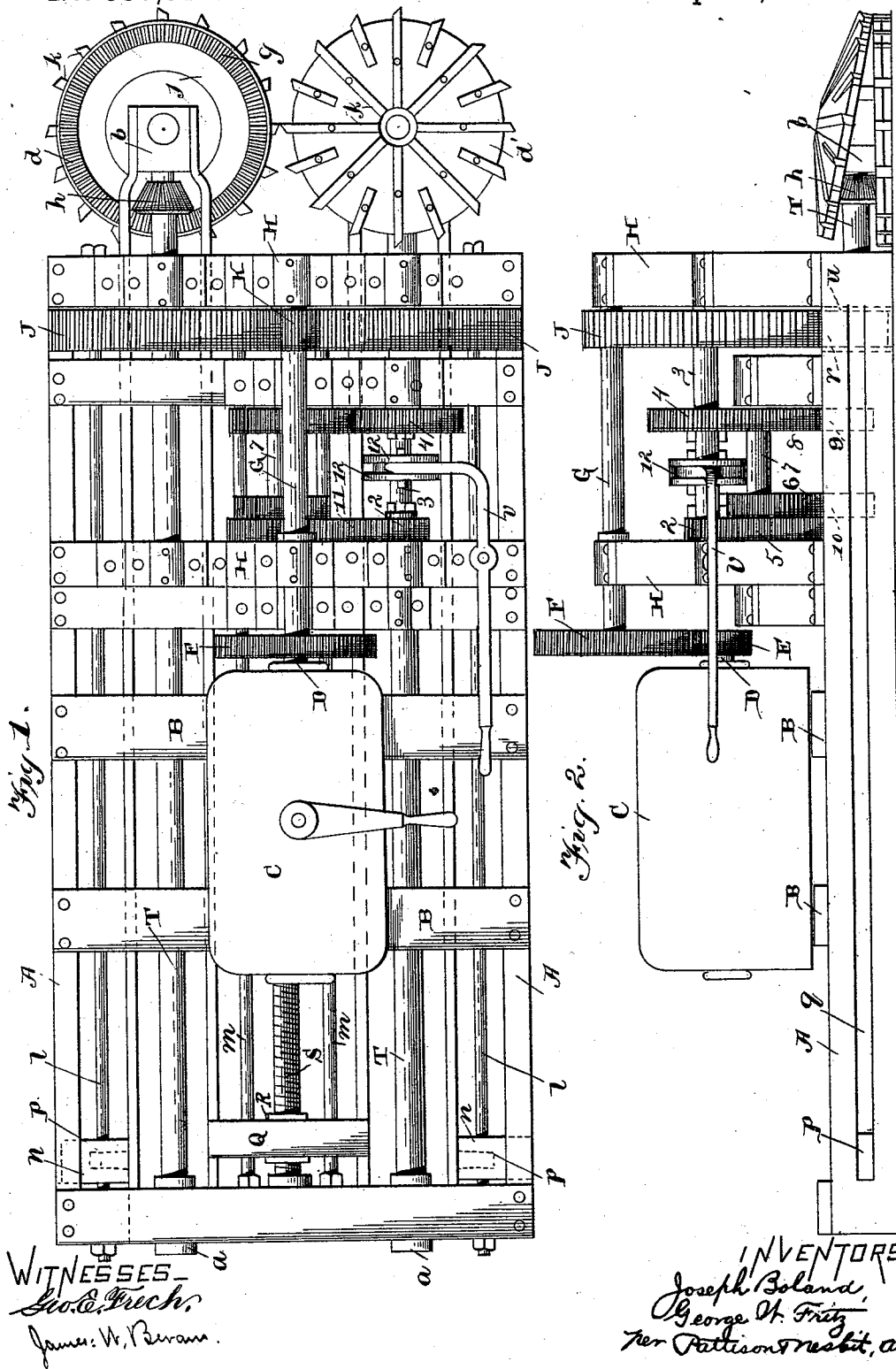
(No Model.)

3 Sheets—Sheet 1.

J. BOLAND & G. W. FRITZ.
MINING MACHINE.

No. 536,912.

Patented Apr. 2, 1895.



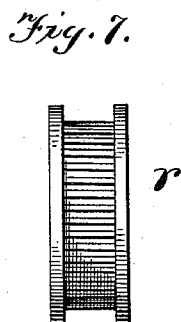
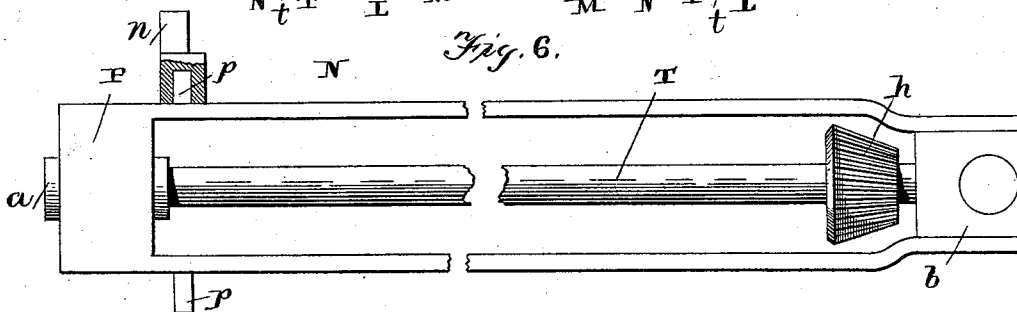
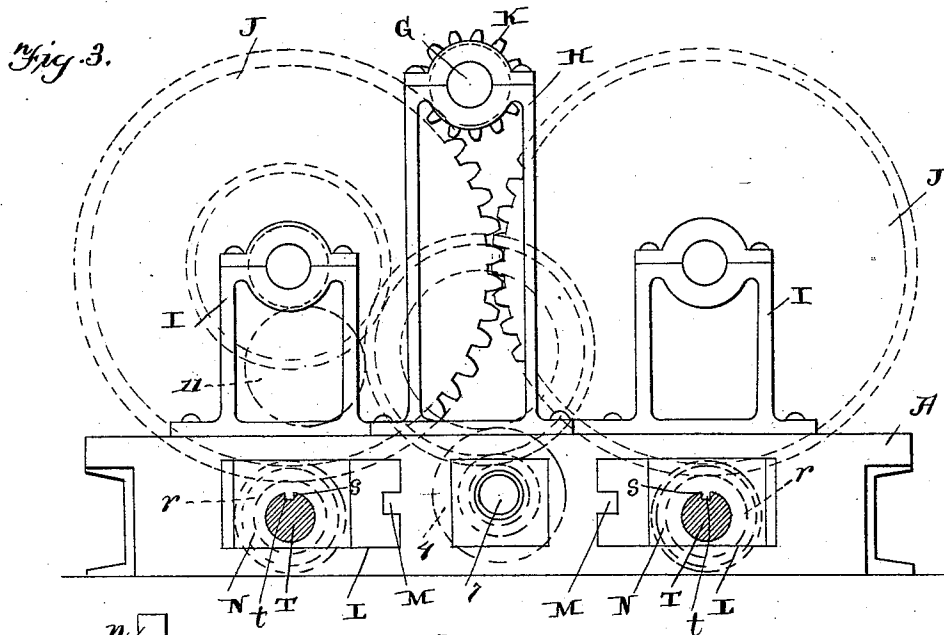
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WITNESSES.
Geo. C. Frick,
James W. Berans.

INVENTORS.
Joseph Boland
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(No Model.)

3 Sheets—Sheet 3.

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Fig. 4.

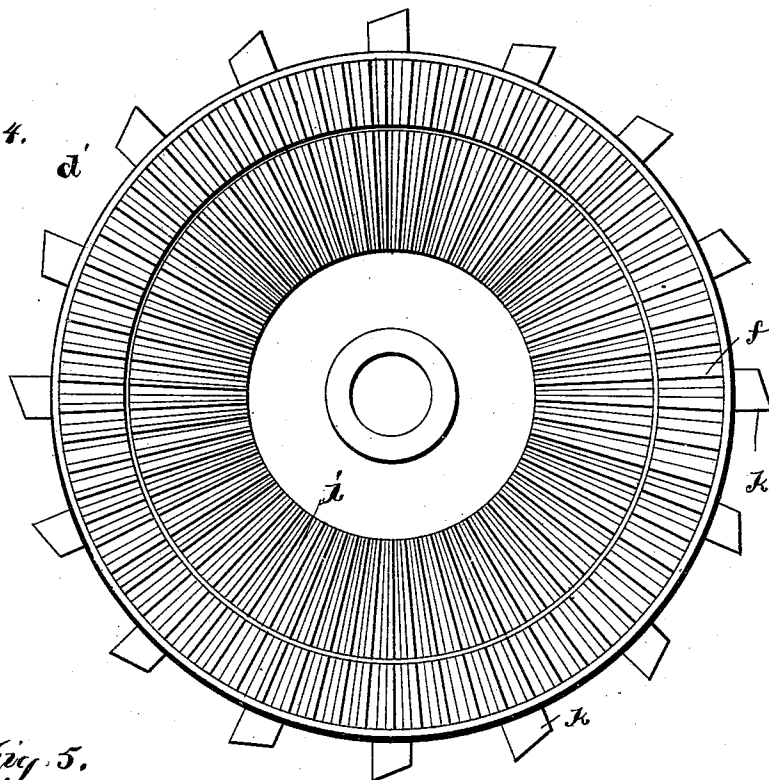
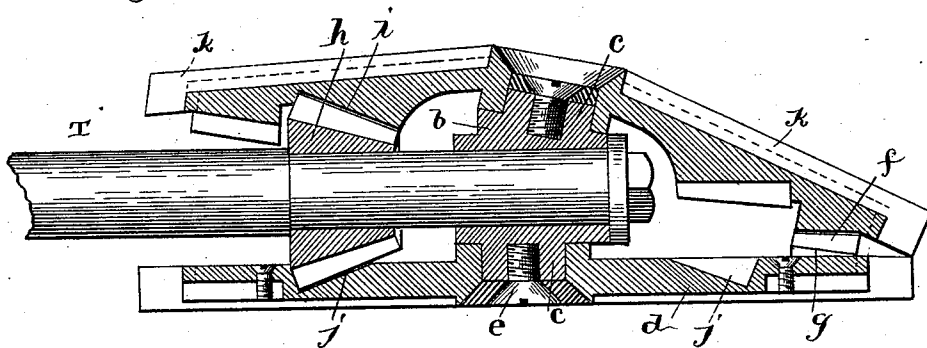


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH BOLAND AND GEORGE W. FRITZ, OF PITTSBURG, PENNSYLVANIA.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 536,912, dated April 2, 1895.

Application filed April 18, 1894. Serial No. 508,043. (No model.)

To all whom it may concern:

Be it known that we, JOSEPH BOLAND and GEORGE W. FRITZ, citizens of the United States, residing at Pittsburg, 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, reference being had therein to the accompanying drawings.

Our invention relates to improvements in mining machines; and it consists in the construction and arrangement of devices which will be fully described hereinafter and particularly referred to in the claims.

This invention relates to that class of mining machines shown and described in our Patent No. 501,402, granted July 11, 1892, which is specially intended for mining coal, and other minerals.

One of the objects of this invention is to provide endwise moving frames in which the cutter shafts are journaled and carried, and to operate this frame or frames by means of a variable speed gearing, whereby the said shaft and cutters are fed forward slowly as they cut, and by the movement of a lever the said gearing is reversed and the speed increased for the purpose of withdrawing the cutters rapidly.

Another object of this invention is to construct the pairs of cutters with a lower cutter having a straight lower cutting face, and the upper cutter of each pair made convex on its upper face and set at an angle to the lower cutter as clearly illustrated, whereby the front cutting face or half of the upper cutter clears the rear cutting face or half of the said upper cutter, which enables the machine to be worked with less power (about one half) thus making a great saving in the operation of the same, and also preventing all liability to choking, which is liable to occur in the construction shown in our former patent where the whole upper face of the upper cutter must be cleared, as will be clearly understood.

The object of this invention also relates to other details of construction, which will be fully described hereinafter and referred to in the claims.

In the accompanying drawings—Figure 1 is a plan view of a mining machine which

embodies our invention complete. Fig. 2 is a side elevation of the same; Fig. 3, a front end elevation of the same, with the cutters removed; Fig. 4, a plan view of the inner face of the upper cutter. Fig. 5 is a sectional view taken longitudinally through the center of the cutters. Fig. 6 is a detached view of one of the endwise movable frames. Fig. 7 is an edge view of one of the pinions *r*.

Referring now to the drawings, A indicates a horizontal rectangular frame-work or bed, upon which the operating parts are supported, and in which some of them move endwise as will hereinafter fully appear. Extending transversely across this frame are the two bars B upon which the electric motor or other power C is placed. The driving shaft D of this motor extends forward and carries a pinion E, which meshes with a cog wheel F, rigidly attached to a longitudinally extending shaft G, supported in suitable bearings upon the standards H.

Journaled between the front standards H, are the two large cog wheels J, which intermesh with each other as shown in the end elevation Fig. 3, and a pinion K upon the forward end of the shaft G, which meshes with one of said cog wheels J, through the medium of which they are revolved.

The ends of the frame work or bed A are provided with the openings L, the walls of which are provided with the lugs M, and at each side of the frame A are the two endwise moving cutter frames N which consist of parallel bars as shown, which are connected by head pieces P, which are provided with grooves to receive the said lugs of the frame, and which form a bearing therefor, saving the necessity for making a perfect fit for the whole surface of the head piece, as would otherwise necessarily be the case. By having these endwise moving frames to move rearward into the frame A, a greater amount of movement is given the said frames than would be the case if such movement therein were not provided thus increasing the endwise moving capacity of the machine. A cross bar Q connects the said endwise moving frames, and this cross bar has attached to its under side a screw nut R through which a screw shaft S passes. This shaft S has its ends journaled in blocks placed in the ends of the

frame A, and is prevented from having any endwise movement whatever, while it is permitted to freely revolve as and for the purpose to be presently described.

5 Shafts T have their rear ends journaled in the rear end pieces of the endwise moving frame and are provided with collars *a*, and the front ends of said shaft are journaled in the cross heads *b*, which are securely attached
10 to the forward extremities of the said endwise moving frames. These heads *b*, are provided with the lower spindles *c*, upon which the lower cutter *d*, is journaled and held in place by means of a screw and washer as
15 clearly illustrated at *e*. The upper spindle *c*, is at an incline for the purpose of supporting the upper cutter at an incline to bring its forward periphery in contact with the periphery of the said lower cutter. The upper cutter is
20 provided on its periphery with a series of cogs *f*, which mesh with the cogs *g*, upon the periphery of the lower cutter, so that the lower cutter is revolved by the upper cutter, the latter being revolved through the medium
25 of a pinion *h*, secured to the shaft, which meshes with the cogs *i* of said upper cutter. The lower cutter is provided with a circular groove *j* in which the said pinion *h*, freely revolves without interfering therewith, the said
30 revolution of the wheels or cutters being substantially the same as that shown in our former patent hereinbefore mentioned. A very marked difference as to the shape and relative arrangement of these cutters in comparison
35 with this former patent however exists. Attention is directed to the fact that the lower cutter is flat or straight on its outer or lower surface, so that it cuts an even floor in the mine, while the upper cutter is convex on its
40 outer surface, so that only its front half cuts, the rear half of said cutter being entirely cleared by the forward half, so the machine is driven by about half the power required to drive our former machine, and all choking is
45 absolutely avoided. The cutters *k*, are attached to the outer sides of the said wheels in any desired manner, and extend beyond the face thereof to make a clearance, and in the upper cutter the knives extend above the
50 screw which holds it in place to make a clearance thereof, all of which is clearly illustrated and will be readily understood.

The two sets of cutters revolve outwardly and therefore in opposite directions, so that
55 all cuttings are thrown to one side of the machine, and out of the way of the working parts which is a very desirable feature. The rear ends of the endwise moving frames are guided by means of the rods *l* and *m*, and by
60 means of the lugs *p* and cross-heads *n*, which extend into the slots *q*.

The large cog wheels J, are revolved by the shaft G, as before stated, and intermesh, and they in turn engage the pinions *r*, which are
65 upon the shafts journaled in the endwise moving frames and which revolve the said cutters. These pinions are provided with

feathers *s*, that engage key ways *t*, of the said shafts, so that the shafts are permitted to
freely pass endwise through them, and the pin- 70
ions are themselves prevented from having any endwise movement by means of flanges
u, which engage opposite sides of the said large cog wheels.

It will be noticed that by having the end- 75
wise moving frames, and attaching the cross heads which carry the cutters directly to the forward ends of the said endwise moving frames, we have a very convenient and effective manner of preventing the said cutters from
80 assuming anything but a horizontal position, in which position they are firmly held.

As before stated the screw shaft passes through the screw nut of the cross bar Q, and it is through the medium of these parts that
85 the frames are moved endwise, and simultaneously revolved through the medium of the large cog wheels J, and we will now proceed to describe the variable speed gearing for feeding the said frames and cutters in and out of the
90 coal at different speeds. This gearing consists of a pinion 2 which is loosely placed on the inner end of the shaft 3 of one of the large cog wheels J, and held in place by means of suitable collars against lateral movement,
95 and also placed upon this same shaft is another loose cog wheel 4, larger in diameter than the pinion or cog wheel 2. Between these two wheels, is a sliding clutch or collar having lugs, which engage lugs upon the inner
100 sides of the said wheels 2 and 4 when moved in contact therewith, the said clutch having a feather moving in a key-way of the said shaft 3. This clutch arrangement is the usual construction of such arrangements, and need
105 not be more fully described. Inside of this shaft 3 is another shaft 7, upon which a loose wheel 8 is placed at its outer end, the said wheel being held against lateral movement by means of a collar in the usual manner in
110 such constructions, and at the other end of the said shaft 7 are the two wheels 5 and 6 which are made fast to each other. The cog wheel 6 meshes with the pinion 10 secured rigidly to the screw shaft S, and the loose
115 wheel 8 meshes with the pinion 9 which is also fast upon the said screw shaft, and smaller in diameter than the pinion 10. An idler cog wheel 11 meshes with the pinion 2 upon the shaft 3, and this idler in turn meshes with the
120 cog wheel 5.

The operation of this gearing is as follows: The endwise moving frames are moved outward and the cutters carried into the coal to be cut when the clutch is in engagement with
125 the pinion 2 to make it fast to the shaft 3, through the medium of the said pinion meshing with the idler 11, which meshes with the cog wheel 5, made fast to the wheel 6, and the wheel 6 meshes with and drives the pin-
130 ion 10 attached to the screw shaft. This revolves the said shaft in the proper direction to move the endwise frames outward as just stated at the right speed as the cutters cut

away the coal. By moving the clutch in contact with the wheel 4 thus making it fast with the shaft 3 and revolved therewith, the screw shaft is revolved in the opposite direction through the medium of said wheel meshing with the wheel 8 which in turn drives the wheel or pinion 9 attached to the said screw shaft. Owing to the fact that the wheel 4 is so much larger than the wheels 5 and 6, and the pinion 9 smaller than the pinion 10, the screw shaft is revolved very much faster, and the cutters are therefore withdrawn from the coal at a higher speed than they are driven thereinto. The revolution of the screw shaft is reversed owing to the fact that when it is driven forward, the idler 11 forms a part of the train, but when driven backward the train has no idler taking the part of the idler 11, thus making a train of gearing composed of one wheel less than the gearing for driving it forward, which reverses the motion thereof as is readily understood by those versed in the art. The clutch 12 is moved back and forth through the medium of a lever *v*, for the purpose of either throwing out entirely the speed gears, or for the purpose of throwing into operation either the slow or fast train.

Having thus described our invention, what

we claim, and desire to secure by Letters Patent, is—

1. A mining machine comprising a cutter having a straight outer cutting surface, a cutter having a conical outer cutting surface and set obliquely to said straight faced cutter and meshing therewith, and a driving shaft driving one of said cutters, substantially as specified.

2. A mining machine comprising a lower cutter having a straight under cutting surface, an upper cutter having a conical upper cutting surface, said conical cutter set obliquely to the straight cutter and meshing therewith, a carriage or frame for said cutters traveling in a plane parallel with the straight cutting surface of the straight cutter, and a shaft carried by said frame engaging and driving one of said cutters, all combined to operate as and for the purpose described.

In testimony whereof we affix our signatures in presence of two witnesses.

JOSEPH BOLAND.
GEORGE W. FRITZ.

Witnesses:

A. S. PATTISON,
J. M. NESBIT.