(No Model.)

3 Sheets—Sheet 1.

F. W. SYLER.

MINING MACHINE.

No. 480,418. Patented Aug. 9, 1892.

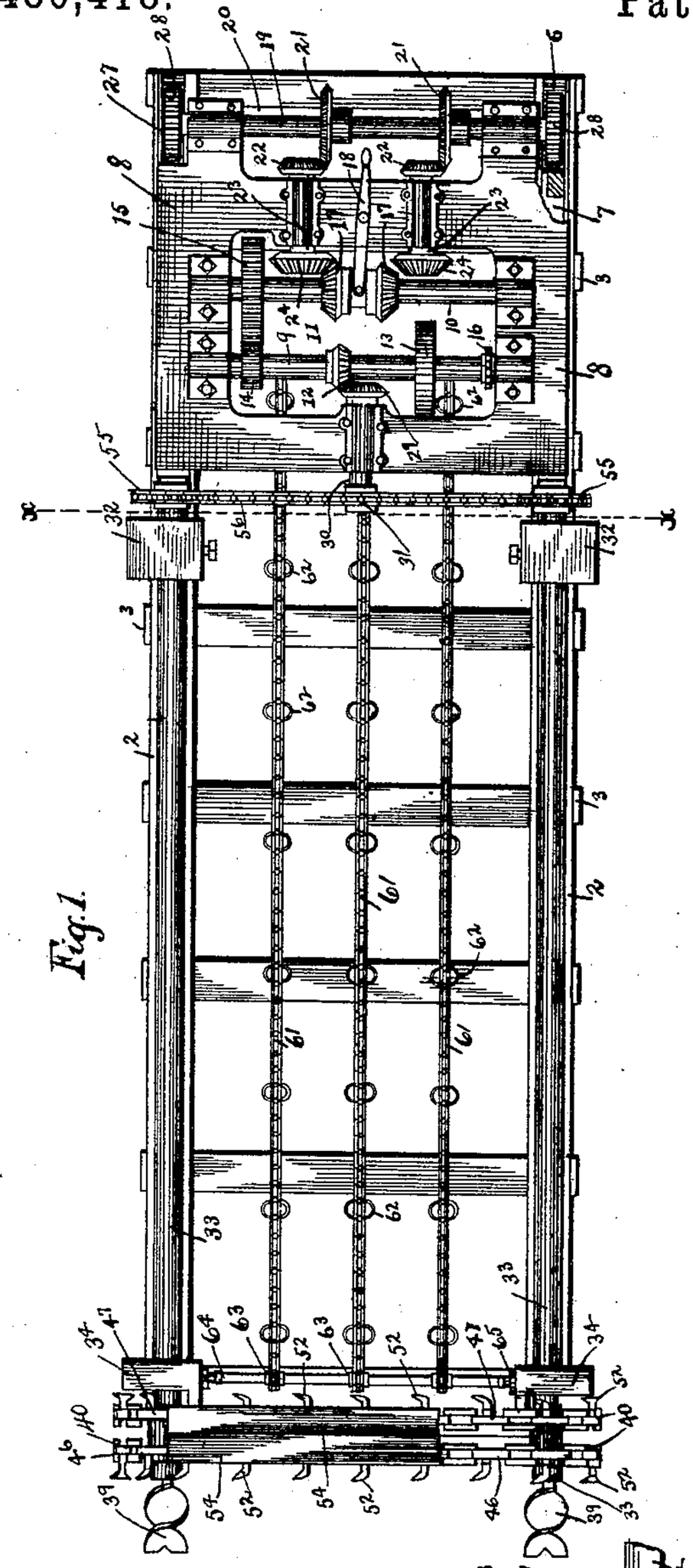

Fig. 1.

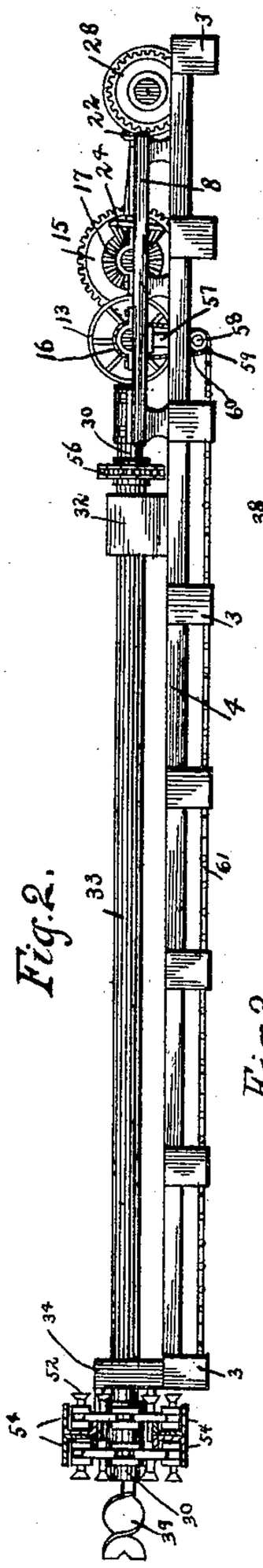

Fig. 2.

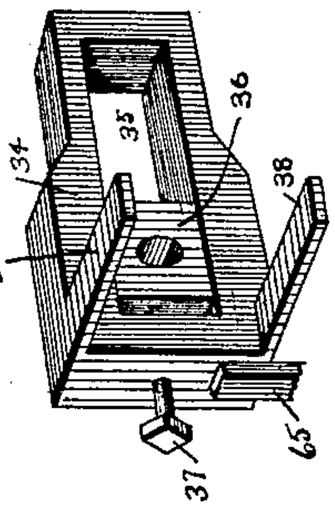

Fig. 4.

Fig. 3.

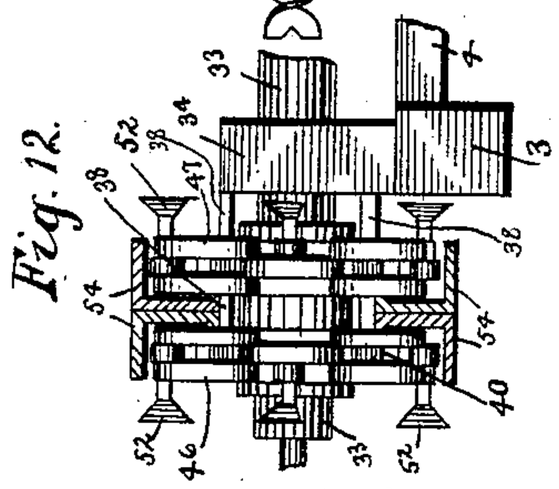

Fig. 12.

Witnesses

H. B. Bradshaw.

J. H. Travers.

Inventor

Frank W. Syler

By his Attorneys

Staley and Shepherd

(No Model.)

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Fig. 5.

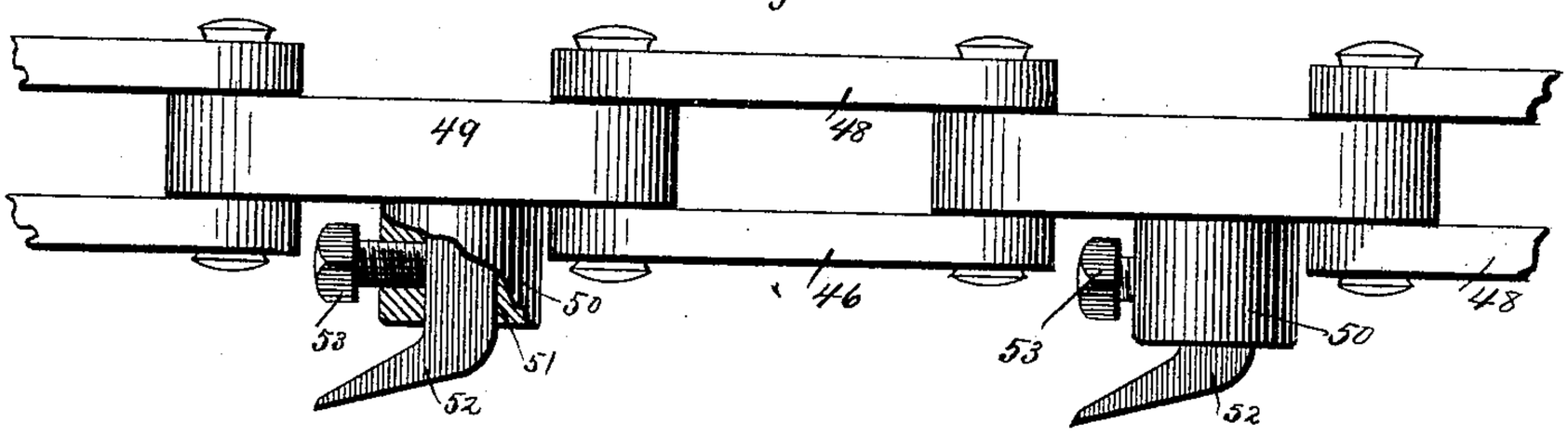


Fig 6

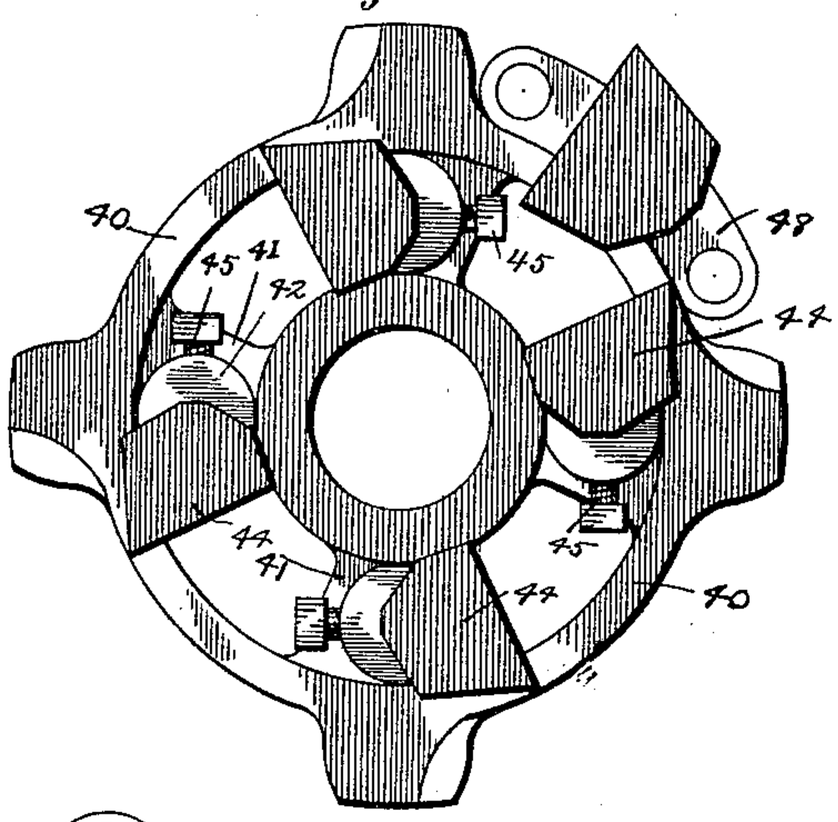


Fig. 7.

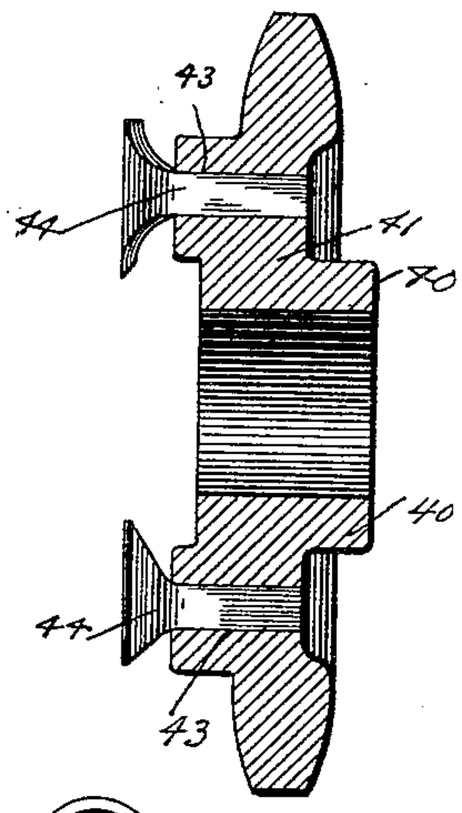
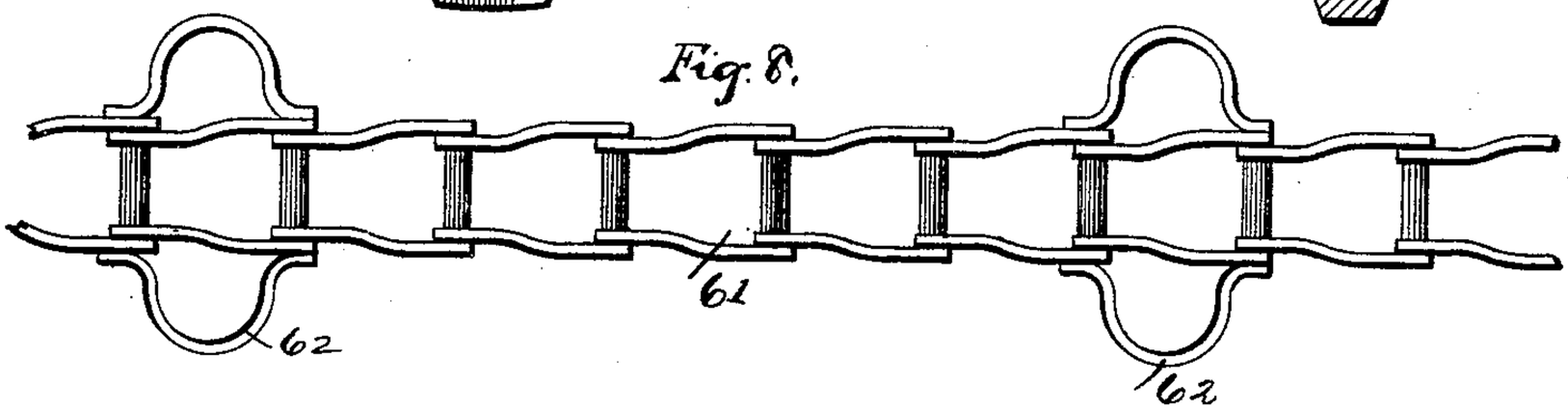


Fig. 8.



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J. H. Travers

H. B. Bradshaw

Inventor

Frank W. Syler

By his Attorneys

Staley and Shepherd

(No Model.)

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MINING MACHINE.

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Fig. 9.

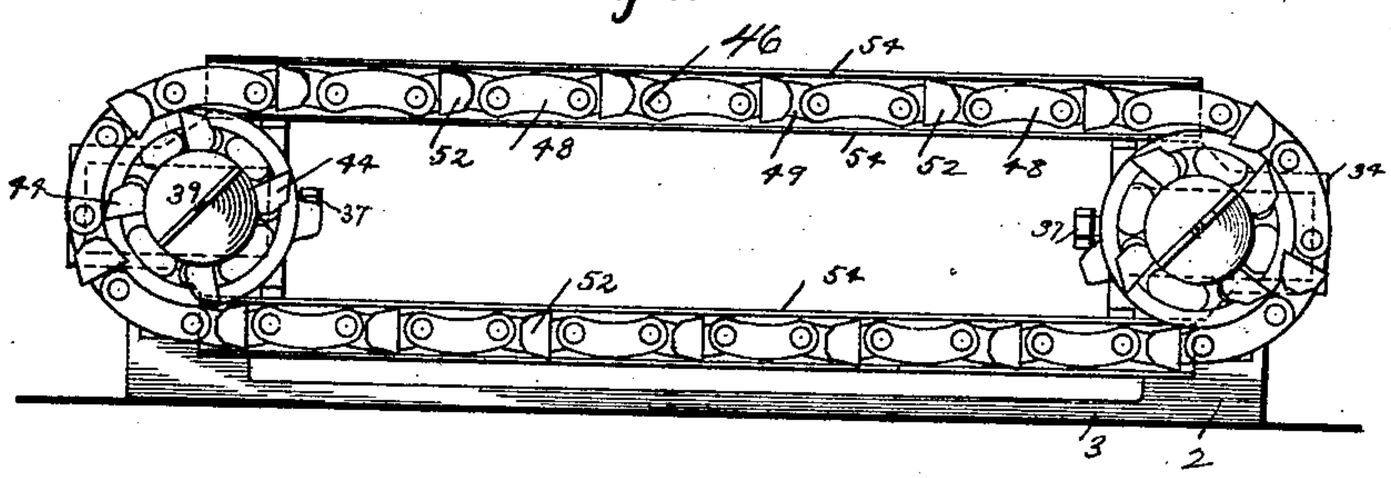


Fig. 10.

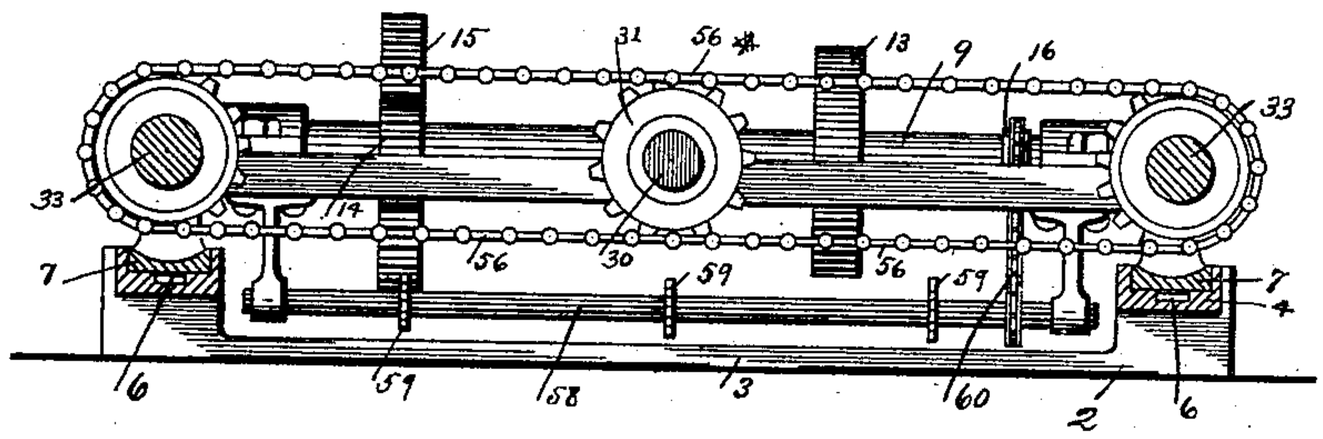
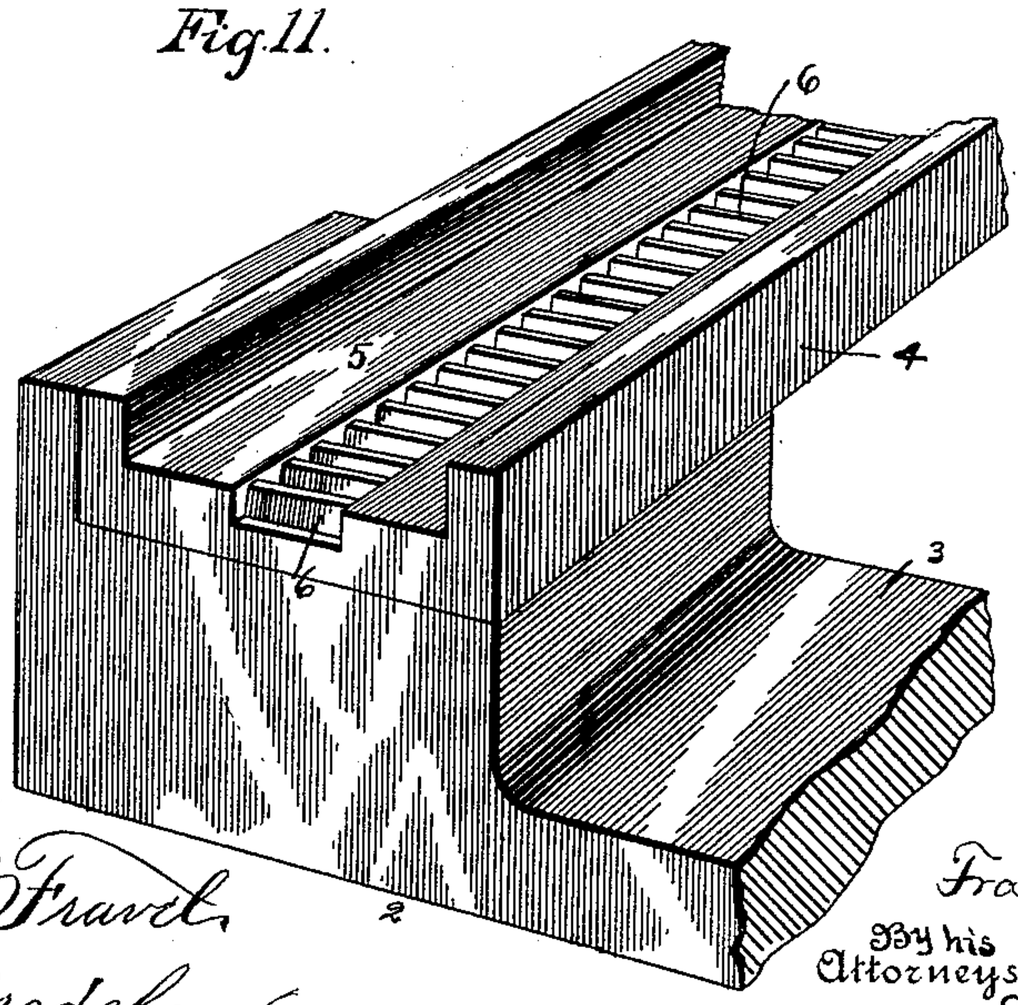


Fig. 11.



Witnesses

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Inventor

Frank W. Syler

By his Attorneys

Staley and Shepherd.

UNITED STATES PATENT OFFICE.

FRANK W. SYLER, OF COLUMBUS, OHIO.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 480,418, dated August 9, 1892.

Application filed June 6, 1891. Serial No. 395,398. (No model.)

To all whom it may concern:

Be it known that I, FRANK W. SYLER, a citizen of the United States, residing at Columbus, in the county of Franklin and State of Ohio, have invented a certain new and useful Improvement in Mining-Machines, of which the following is a specification.

My invention relates to the improvement of mining-machines; and the objects of my invention are to provide an improved machine of this class of such construction as to facilitate the mining of coal or other mine products, to so construct and operate said machine as to admit of the production of a narrow continuous kerf in the coal and obviate the necessity of utilizing the machine-cutters for removing the coal bounded by said kerf, to decrease the frictional or cutting area between the coal and the cutting-tools, to produce a desired cutting result at the expense of comparatively slight power, and to produce other improvements in construction and operation, which will be more fully pointed out hereinafter.

In the accompanying drawings, Figure 1 is a plan view of my improved machine. Fig. 2 is a side elevation of the same. Fig. 3 is a detail view of a portion of one of the drill-shafts, showing a modified form thereof. Fig. 4 is a detail view in perspective of one of the boxings in which said shaft is supported. Fig. 5 is a plan view of a portion of the cutting-chain. Fig. 6 is a face view of one of the sprocket and cutting wheels. Fig. 7 is a central sectional view of the wheel shown in Fig. 6. Fig. 8 is a plan view in detail of one of the cleaning-chains. Fig. 9 is a front end view which omits for the sake of clearness parts of the machine which would appear between the cutting-chains. Fig. 10 is a sectional view on line *x x* of Fig. 1. Fig. 11 is a detail view in perspective of portions of one of the channel-bars and one of the supporting-bars therefor, and Fig. 12 is an end view of the cutting-head enlarged from Fig. 2.

Like parts are indicated by similar figures of reference throughout the several views.

2 represents a stationary oblong frame, which consists, as shown, of a number of parallel cross-bars 3, the upwardly-projecting end portions of which are connected by parallel channel-bars 4, which extend at right angles with said cross-bars 3, with which they are rigidly connected throughout the length of the machine. The channels 5 of the bars 4 are formed, as shown, by flanging upward the longer sides of said bars 4. Within the center of each of the channels 5 and extending throughout the length thereof is a rack 6, which consists, as shown, of a series of transverse cog-teeth, the upper sides of which are on the same horizontal plane, said plane being slightly below the upper surface of the channels 5. Within these channels 5 fit and slide the slide frame-bars 7 of the sliding frame of the machine. These sliding frame-bars are of such length as to extend from the forward ends of the channel-bars 4 to a point a short distance in front of the rear ends of said channel-bars, as shown in Fig. 1 of the drawings. Supported upon and bridging the rear portions of the sliding frame-bars 7 is a frame-plate or platform 8.

9 and 10 represent, respectively, transverse shafts, the ends of which bear in boxings upon the plate 8 on opposite sides of an opening 11 in said plate 8. Upon the center of the forward shaft 9 is mounted a bevel gear-wheel 12 and on one side of said bevel-wheel a belt-wheel 13. Upon and near one end of the shaft 9 is mounted a pinion-wheel 14, which gears, as shown, with a gear-wheel 15 on the corresponding end of the shaft 10. The end of the shaft 9 opposite that on which is carried the pinion 14 carries a small sprocket-wheel 16. Upon the central portion of the shaft 10 are loosely mounted in the usual manner two connected and sliding bevel gear-wheels 17, which are provided with an intervening sleeve, and which is keyed upon the shaft 10 in the usual manner. The connecting-sleeve of the wheels 17 has pivotally connected therewith a suitable lever 18, which is fulcrumed near the center of its length to the plate 8.

19 represents a transverse shaft, which is parallel with the shafts 9 and 10 and the ends of which are journaled on opposite sides of and adjacent to an opening 20 in the rear portion of the plate 8. Upon this shaft 19 are mounted two bevel gear-wheels 21, which gear, respectively, with bevel-wheels 22, mounted upon the ends of short shafts 23, which are journaled at right angles with the

shaft 19 upon the plate 8 between the openings 20 and 11. The forward ends of these shafts 23 carry bevel gear-wheels 24, one of which is adapted to gear, as hereinafter described, with one of the wheels 17. The outer ends of the shaft 19 extend above corner recesses 27, formed in the rear portion of the plate 8, and carry, as shown, gear or cog wheels 28, the teeth of which mesh with the teeth of the rack 6 of the channel-bars 4. The bevel-wheel 12 of the shaft 9 gears with a bevel-wheel 29 upon the rear end of a shaft 30, which is journaled upon and projects slightly in front of the plate 8. The forward end of this shaft 30 carries a sprocket-wheel 31.

Rising from each of the sliding frame-bars 7 at a point a short distance in front of the frame-plate 8 is a bearing-block or boxing-piece 32, in each of which is journaled the rear end portion of a horizontal drill-shaft 33. These shafts 33 extend forwardly a short distance above the sides of the machine-frame and bear at the forward end of said frame in bearing-boxes 34, which also project upwardly from the upper sides of the sliding frame-bars 7. As shown in Fig. 4 of the drawings, each of these forward journal-boxes 34 is provided with a horizontal mortise 35, within which is supported a sliding or adjustable block 36, the central opening of which forms the journal-bearing for the shaft. This block 36 is adapted to be forced outward in its guideway by a set-screw 37, which passes through the inner end of the bearing-box. Each of these boxes 34 has projecting forwardly from the inner end thereof and adjoining the upper and lower sides thereof arms 38. The forwardly-extending end of each of the shafts 33 carries, as shown, an auger or suitable drilling-tool 39. Upon each of the shafts 33, between said auger and the boxing 34, are mounted, as shown, two separated sprocket-wheels 40. Projecting forwardly from each of the spokes 41 to each of these sprocket-wheels 40 is a boss 42, and in each of said bosses and in the spoke of the wheel is formed a socket 43, which, as shown, receives the stem of a cutting-tool 44, the enlarged sharpened and cutting head of which extends to a point opposite the periphery of the wheel-rim. This tool is held in place within said socket by a suitable set-screw 45. The cutting-tools 44 of the forward sprocket-wheels project from the forward faces of the latter, while the cutter-tools of the rear wheels project rearwardly therefrom.

The forward and rear pairs of sprocket-wheels 40 serve to drive separate sprocket cutting-chains 46 47. Each of these sprocket-chains consists of the usual open links 48, which are jointedly connected by intervening alternate links 49, the latter being solid, and the solid links of the forward chain have projecting forwardly therefrom bosses 50. The bosses of the rear chain project rearwardly from the solid links thereof, as shown. In each of these bosses and extending within the body of the solid link is formed a socket 51, into which is inserted the shank of a cutting-tool 52, the outer sharpened and bent end of which is adapted, as hereinafter described, to come into contact with and cut away the coal or other material to be mined. The shanks of these cutting-tools 52 are supported in their positions in the link-sockets by set-screws 53, which pass through screw-holes in the bosses 50. The upper and lower or horizontal portions of each of the chains 46 are provided with guideways formed by uniting the central portions of the horizontal channel-pieces, as indicated at 54, the joint of said channel-pieces being between the two chains. The forwardly and rearwardly extending flanges of these channel-pieces extend, as shown, above and below the sprocket-chains, said channel-pieces being supported in the position described by the outer end portions of the arms 38 of the boxing-pieces 34, which are rigidly secured thereto. From this construction it will be seen that the upper sides of the guide-pieces 54 will serve to form covers for the bodies of said chains.

Upon the rear ends of the shafts 33, between the boxings 32 and the frame-plate 8, are mounted sprocket-wheels 55, which are connected by a transverse sprocket chain-belt 56, which also engages at the center of its length with the teeth of the sprocket 31.

Journaled in the lower ends of the arms 57, which depend from the under side of the frame-plate 8, and extending beneath the shaft 9 is a transverse shaft 58, which carries a number of sprocket-wheels 59. One of these sprocket-wheels 59 is connected with the sprocket-wheel 16 of the shaft 9 by a chain belt 60. About the remaining sprocket-wheels of said shaft 58 pass chain belts 61, which, as shown in Fig. 8 of the drawings, are preferably formed of jointed open links, and which are provided at intervals with lateral projections 62. At the forward end of the frame these chains 61 pass about sprocket-wheels 63, which are mounted upon a transverse shaft 64, the ends of which are journaled in arms 65, which extend downwardly from the inner ends of the forward boxing-pieces 34.

The operation of my device is as follows: The machine being in position for use, rotary motion is applied to the belt-wheel 13 and shaft 9 through a belt from a suitable motor, and from said shaft 9 motion is imparted to the shaft 10 through the wheels 14 and 15 and to the shaft 30 through the gearing of the wheels 29 and 12. The double bevel-wheel 17 having been moved by pressure on the lever 18 to such point on the shaft 10 to cause an engagement of one of the wheels 17 with one of the wheels 24, motion is transmitted through the shaft 23 and wheel 22 to the wheel 21 and shaft 19. The rotation of the shaft 19 will result in a rotation of the gear-wheels 28 and a consequent forward movement of said wheels upon the rack 6, with the

teeth of which it engages. This forward movement, as will readily be seen, will, through the connection of the parts thereof, be transmitted to the sliding frame and the shafts 33, which are supported thereon. These shafts in addition to their forward motion will, through the rotation of the sprocket-wheel 31 and the belt connection therewith of the sprocket-wheels 55, have imparted thereto a rotary motion, which will result in a rapid rotation of the drill-augers 39 and the sprocket-wheels 40. The rotation of said sprocket-wheels will result in the continuous movement of the cutting-chains 46, which are carried thereby, and in the forward cutting-tools of the forward chain engaging with and cutting a continuous channel in the wall of coal which may be adjacent thereto about a given space in said wall. As the forward faces of the forward sprocket-wheels 40 are thus driven into contact with the coal wall it is obvious that the cutter-tools 44 of said wheels will serve to produce an approximately circular kerf or recess in the coal wall about the auger-hole previously formed therein. In case the core or neck of coal which is thus left uncut within the continuous kerf produced by the chain cutters is not broken off through the action of the various cutting devices it is obvious that such core may be readily broken away by the use of a hammer or other means. When it is desired to withdraw the augers and cutting-chains from connection with the coal wall, the rotating direction of the cog-wheels 28 is reversed and the movement of the sliding frame and its connected parts changed toward the rear by moving the sliding bevel-wheels upon the shaft 10 until that one of said wheels 17 which during the feeding movement was in engagement with one of the wheels 24 is freed therefrom and the remaining wheel 17 is in engagement with the remaining wheel 24. During the forward movement of the machine rotary motion is imparted to the chains 61 through the connection of the shaft 58 and shaft 9 by the sprocket-chain 60. The continuous movement of these chains 61 from front to rear of the machine will result in the broken coal chipped from the wall by the various cutters being carried backward and out of the way of the head of the machine partly by contact therewith of the lateral projections 62 and of the chain-links. In case the coal above the kerf or at other points in the wall should cave or fall upon the forward portion of the machine it is obvious that the machine may be reversed and that the rear cutting-tools of the rear chain 47 and the rear sprocket-wheels 40 will serve to cut a way for the movement of the sliding frame through any material which may have accumulated upon said machine.

From the construction and operation herein described it will be seen that the kerf is cut from the flat sides of the chain-links and that the kerf thus produced is endless or continuous. From this result it is obvious that the area of contact between the cutting-tools and the wall of coal is exceedingly small and that the narrow kerf thus produced results in the production of a central core of coal, which is easily broken away or destroyed. It will thus be seen that the necessity of applying the cutting-tools to the entire coal surface removed is thus obviated and that a much less degree of power is necessary for the narrow cut produced than would be found necessary in removing the same quantity of coal where the entire surface removed is cut away by the machine-cutters.

As shown in Fig. 3 of the drawings, I may provide the shafts 33 with a screw conveyer, (indicated at 66,) which will serve during the rotation of said shaft to carry back the coal and dust from the head of the machine.

Having now fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a mining-machine, the combination, with a moving frame and rotating shafts carried thereby, of sprocket-wheels on the forward portions of said shafts and a series of projecting cutters on the front faces of said sprocket-wheels, substantially as specified.

2. In a mining-machine, the combination, with a movable frame and rotating shafts carried thereby, of sprocket-wheels on said shafts, cutters 44, supported from the forward faces of said sprocket-wheels, cutting-chain 46, connecting said sprocket-wheels, as described, and cutters 44, supported and projecting from the forward faces of the links of said chain, substantially as specified.

3. In a mining-machine, the combination, with a movable frame and rotating shafts carried thereby, of sprocket-wheels on said shafts, cutting-tools 44, projecting from the forward faces of said wheels, drilling-tools supported in the forward ends of said shafts in front of said sprocket-wheels, and an endless chain connecting said wheels, as described, and having cutting-tools projecting forwardly from the forward face thereof, substantially as specified.

FRANK W. SYLER.

In presence of—
C. C. SHEPHERD,
THOS. B. PRITCHARD.