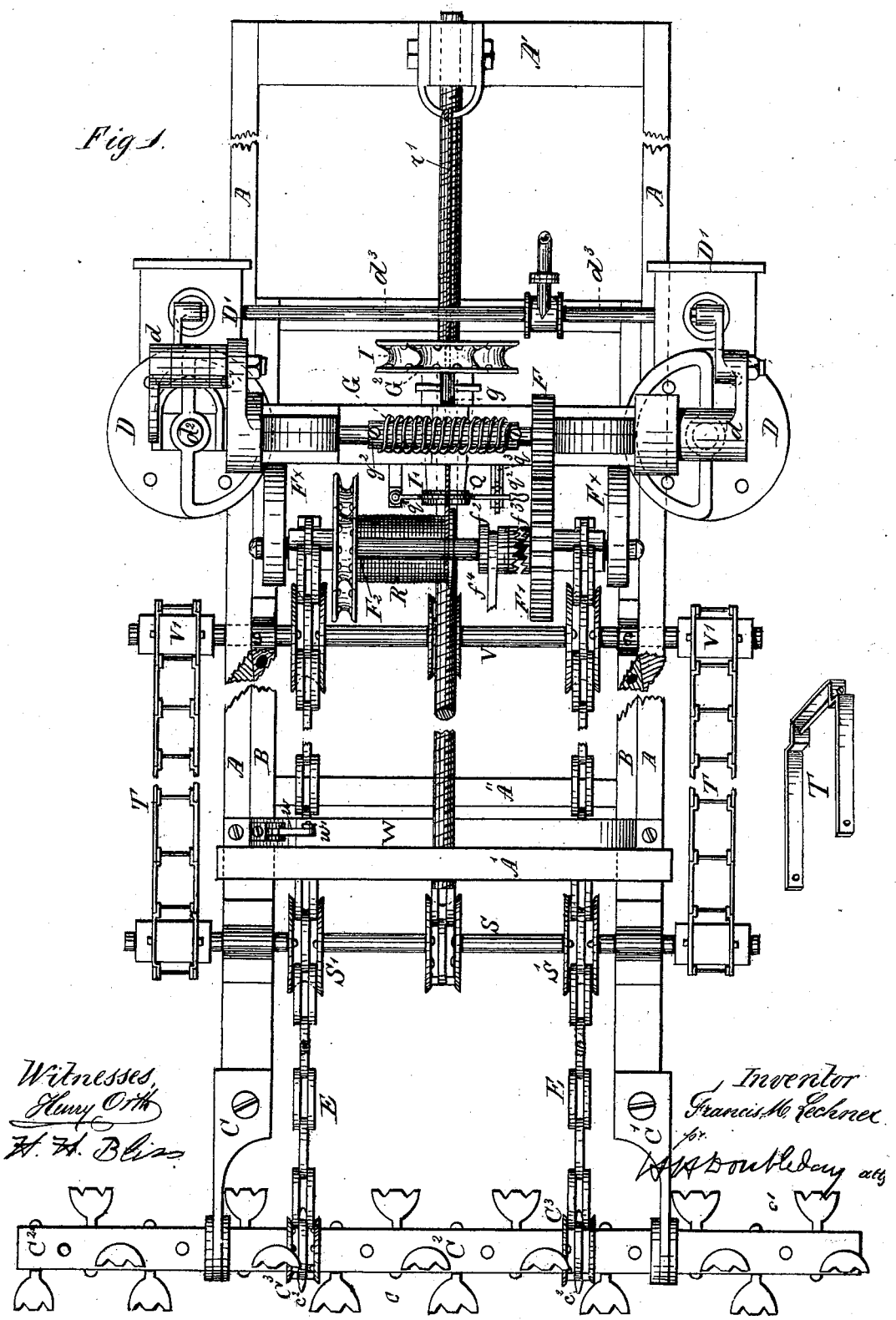
3 Sheets—Sheet 1.

F. M. LECHNER.

Mining-Machine.

No. 197,734. Patented Dec. 4, 1877.

Fig 1.



Witnesses,
Henry Orth
H. H. Bliss

Inventor
Francis M. Lechner
for
Doubleday atty

3 Sheets—Sheet 2.

F. M. LECHNER.

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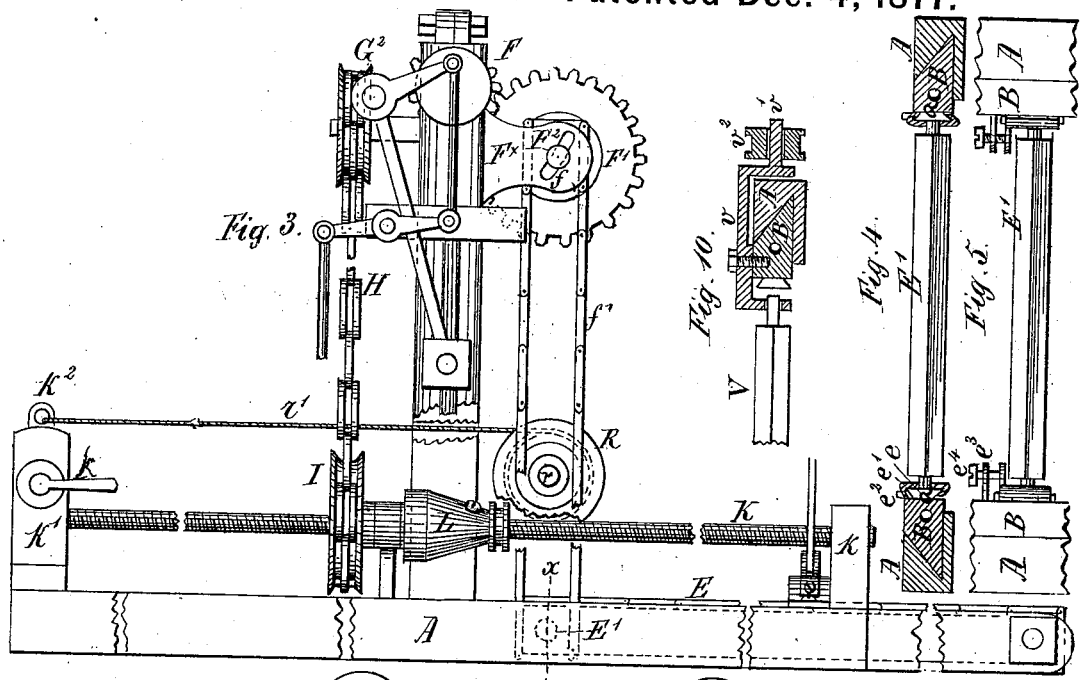

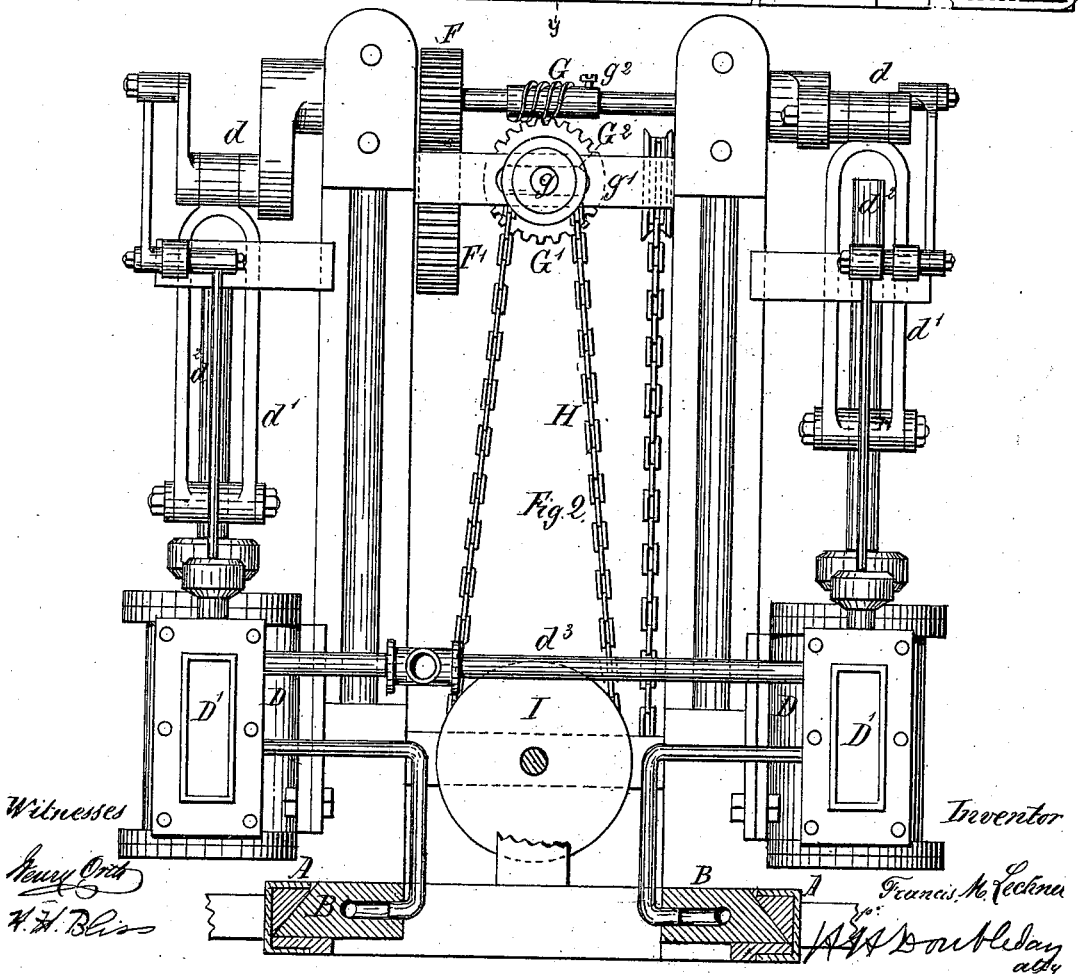

Witnesses
Henry Orth
W. H. Bliss

Inventor
Francis M. Lechner
by
A. A. Doubleday
atty

3 Sheets—Sheet 3.

F. M. LECHNER.

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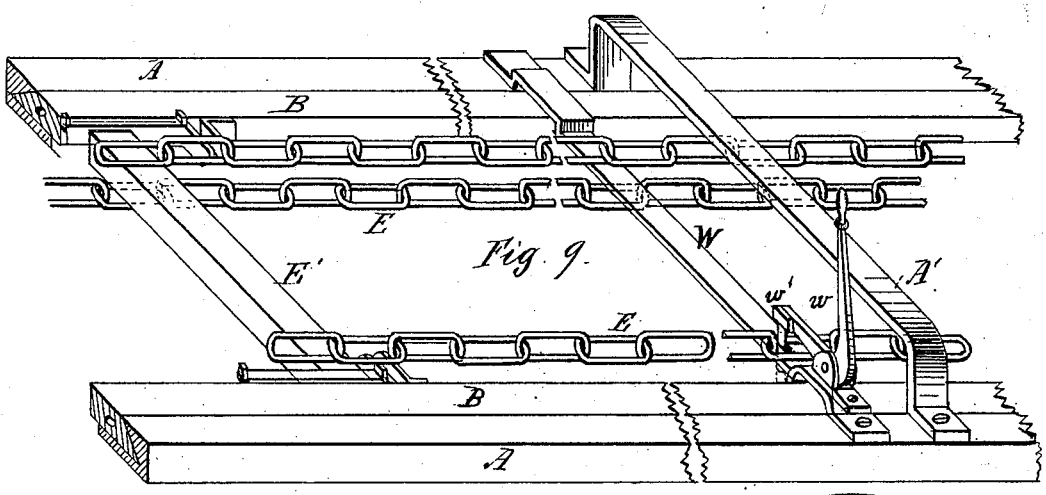

Fig. 9.

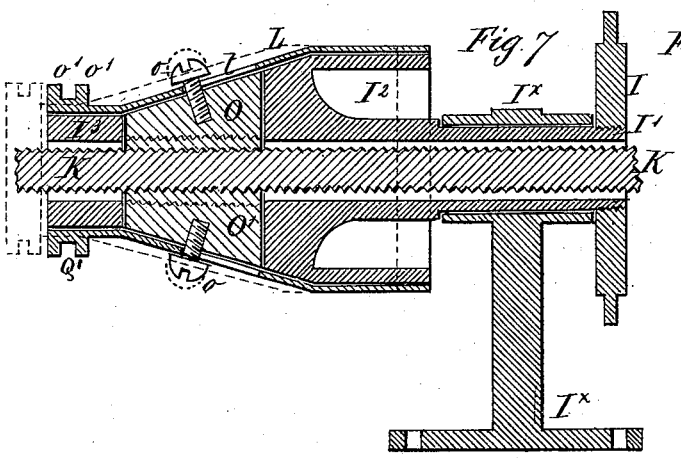

Fig. 7

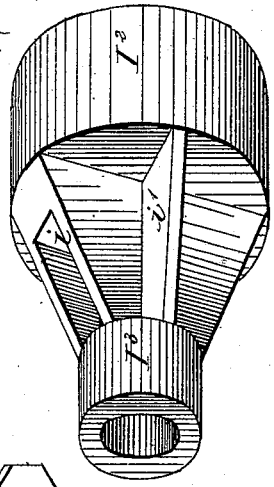

Fig. 8.

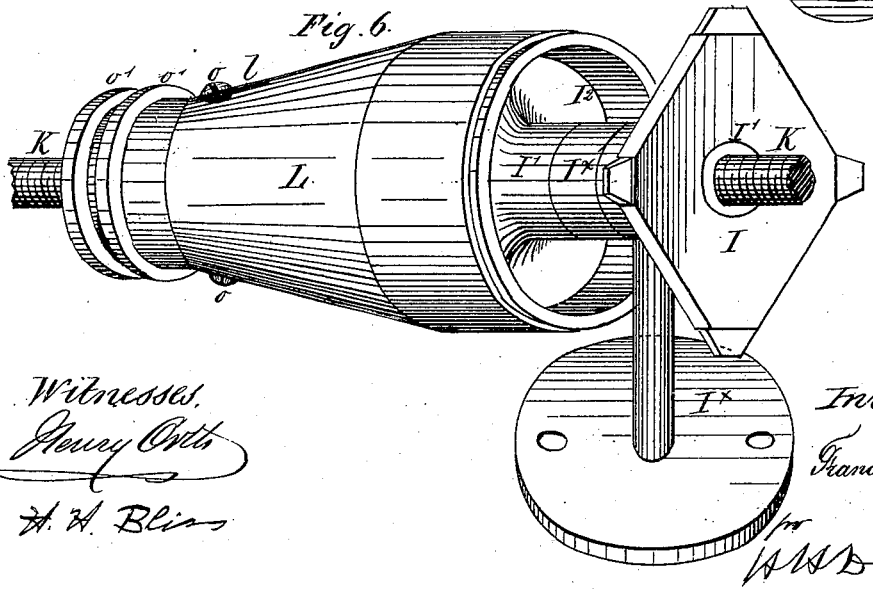

Fig. 6.

Witnesses.
Henry Otto
H. H. Bliss

Inventor
Francis M. Lechner
per
W. S. Doubleday
atty.

UNITED STATES PATENT OFFICE.

FRANCIS M. LECHNER, OF WAYNESBURG, OHIO.

IMPROVEMENT IN MINING-MACHINES.

Specification forming part of Letters Patent No. **197,734**, dated December 4, 1877; application filed September 17, 1877.

To all whom it may concern:

Be it known that I, FRANCIS M. LECHNER, of Waynesburg, in the county of Stark and State of Ohio, have invented certain new and useful Improvements in Mining-Machines; and I do hereby declare that the following is a full, clear, and exact description thereof, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a plan view of my improved machine. Fig. 2 is a rear elevation. Fig. 3 is a side elevation, one engine and a portion of the frame having been removed. Fig. 4 is a vertical section of the sills, sliding carriers, and boxes or hangers. which support and adjust the cutter driving-shaft, taken on line *x y*, Fig. 3. Fig. 5 is a plan view of the same parts. Fig. 6 shows the rotating feeding-nut and its carrier. Fig. 7 is a longitudinal section of the nut. Fig. 8 is a detached view of one part of the nut-carrier. Fig. 9 is a detached view of a device for withdrawing the cutter-bar from the coal. Fig. 10 is a vertical section of devices employed for supporting the rear ends of the scrape-chains.

In the drawings, A A are the sills, and A′ A″ the cross-girts of the main supporting-frame. B B are the sliding carriers of the cutter-frame, supported in the sills by a tongue and groove, or equivalent construction. C C^1 are shoes attached to and projecting forward from the carriers. C^2 is the cutter-head, by preference square in cross-section, except where it is rounded to fit the bearings in the shoes. C^3 C^3 are sprocket-wheels keyed to the cutter-head. *c* c^1 c^2 are the cutter-teeth, similar in their construction and arrangement to those shown in my Patent No. 186,854, except that teeth c^2 are attached to the sprocket-wheel at such distances apart that they will pass between the plates of which the alternate links of the driving-chain is made. D represents the cylinder, D′ the valve-chest, *d* the crank, d^1 the pitman, and d^2 the piston-rod, of an engine to be driven by compressed air, which may be supplied through pipes d^3 from any desired compressor in the usual manner.

It will not be necessary to describe in detail the engine, nor the frame which supports it upon the carriers B B.

F is a spur-pinion upon the crank-shaft of the engine, meshing with spur-gear F^1, which is mounted loosely upon shaft F^2, this shaft being mounted in slots *f* in brackets $F^\times$, projecting from the posts of the frame, which slots form segments of circles, the center of the circles being the center of the crank-shaft. Thus shaft F^2 may be raised or lowered in the slots without disturbing the mesh of the gears F F^1.

The driving-chains f^1 (preferably one upon each side of the machine) pass around squared portions of the shaft F^2 E′, and other chains pass around the cutter-shaft C^2 and shaft E′, which is mounted in bearings upon the carriers or upon the posts, as under some circumstances I propose to adjust the shaft E′ toward or from the cutter-head C^2, in order to tighten the driving-chain E, and chain f^1 can be tightened by raising shaft F^2 in slots *f* by set-screws or otherwise. f^2 is a clutch-faced coupling sliding on shaft F^2, but prevented from rotating thereon by means of a spline or feather, and engaging with the clutch-faced hub f^3 of spur-gear F^1. f^4 represents the end of a shifting-lever used to shift the coupling f^2. G is a worm, secured to the crank-shaft by a key or set-screws, g^2, and is adjustable longitudinally upon said shaft.

G^1 is a worm-wheel, which takes into the under side of the worm G. The shaft *g* of the worm-wheel is mounted in bracket-arms or yokes g^1, secured to the posts of the machine, and can be adjusted transversely of the machine, in order that the worm-wheel may be kept in proper working relation to the worm G whenever said worm is moved upon the crank-shaft, for a purpose which will be hereinafter explained.

G^2 is a sprocket-wheel, keyed to the opposite end of shaft *g*. H is a chain, connecting sprocket-wheel G^2 with a sprocket-wheel, I, attached to the tubular nut-carrier, which I will now proceed to describe, especial reference being made to Figs. 6, 7, and 8.

The inner portion of the nut-carrier consists of a cylindrical end, I^2, provided with a tubular bearing, I^1, a smaller cylindrical part, I^3,

and an intermediate conical portion, provided upon opposite sides with recesses or throats *i*. (See Fig. 8.) The tubular bearing I^1 is supported on the frame or on a standard, I^x, rising from the frame. i^1 are wings or webs, extending from the cylindrical portion I^2 to the part I^3. L is a shell or sleeve fitting over the inner part, and provided with slots *l l*, corresponding in location to the recesses *i*. The nut is made in two sections, O O′, as shown in Fig. 7, whose outer faces fit closely the inner surface of the shell L when the parts are in the position shown in same figure. *o o* are set-screws passing through slots *l l* into the nut-sections. Q is a ring, seated in the groove Q′, which is formed by two ribs, *o*′, on the outside of the front smaller end of the shell L. The ring Q is provided with projecting arms q^1-q^2, the arm q^1 being pivoted to the frame, while arm q^2 is connected with a hand-lever, or with a notched arm, q^3, projecting from the frame.

When preferred, a forked shifting-lever may be employed in place of the ring and arms, the inwardly-projecting spurs of the fork taking into the groove between the ribs *o*′.

It will be readily seen that when the parts of the nut-carrier are in the position shown in full lines in Fig. 7, the nut-sections are held firmly in contact with the screw; and that if the nut-carrier and nut be rotated by means of the chain H the carriers B B, the cutting apparatus, and its operating mechanism will be fed forward into the coal or rock; and it will also be seen that if the shell L be shifted forward into the position shown in dotted lines in Fig. 7 the nut-section will be withdrawn from the screw.

Should it be found desirable to tighten chain H, this can be done by moving the worm-wheel G^1 toward one end of the crank-shaft, when the worm G should also be moved.

The screw-shaft K is rigidly supported in standards *k* k^1, rising from the cross-girts of the main frame, so that when the nut is griped upon this shaft, and is rotated by means of chain H, the cutting apparatus and engine are advanced upon the sills at the desired speed.

R, Fig. 1, is a drum, mounted on a shaft, *r*, and driven by a belt or chain from shaft F^2.

One end of a rope or chain, *r*′, may be attached to post or standard k^1, or to a clevis or staple, k^2, Fig. 3, the other end of the rope being attached to shaft *r* or drum R, in order that by the revolution of this shaft the rope may be wound up and the engines and cutters withdrawn from the coal, the nut being first released from the screw, as has been explained; or, when preferred, a second screw may be arranged to withdraw the cutting apparatus and engines, and operated by hand.

In order to remove from the drift such cuttings as are not brought out by the driving-chains E, I employ scraper-chains T, each link of which is made of a thin flat bar or strip of metal bent into a U shape, as shown detached in Fig. 1, the scraper-chain being mounted and driven as follows:

S is a shaft, supported in the carriers B B, and provided with spurred or sprocket wheels S′, rotated by chains E E. The outer ends of shaft S have sprocket-wheels attached, or are squared, so as to drive the scraper-chains.

s s are boxes secured to each carrier, and carrying the shaft V, the ends of which have rollers V′ V′, or their equivalent, attached to them, to support the rear ends of the outer scraper-chains.

In Fig. 10, I have shown a construction of devices for operating the rear ends of these scraper-chains, which is in many respects preferable to that shown in Fig. 1.

Referring to Fig. 10, A represents the sill, and B a carrier. V is a short shaft, arranged between the carriers, having its ends journaled in one end of a strap or hanger, *v*, which is secured to and travels with the carrier B. The outer end of this strap or hanger *v* overhangs the sill A, and has a stud or spindle, v^1, projecting therefrom, upon which a loose pulley, v^2, or its equivalent, is mounted. There is one of these loose pulleys upon the outer side of each of the sills, and the rear portion of the scrapers pass over these pulleys, as will be readily understood.

Referring to Figs. 4 and 5, *a* represents a dovetailed rib, formed upon or attached to the inner side of each of the carriers. *e* is a correspondingly-dovetailed bracket or boxing, fitted to slide upon the rib *a*, and provided with a gib, e^1, and set-screw e^2. e^3 is a lug projecting from an inner face of rib *a*. e^4 is a set-screw, working in this lug, and bearing upon the dovetailed bracket or box *e*. By an examination of these figures (4 and 5) it will be seen that the shaft E′ may be thrust from the cutter-shaft C^2 by means of set-screws e^4, for the purpose of tightening chain E, when desired.

In Fig. 1, W is a bar or girt, attached to the sills, and extending over the driving-chains E. *w* is a bell-crank lever, pivoted upon this bar. *w*′ is a locking-dog, pivoted to the horizontal arm of lever *w*, and working through a slot in the bar W, directly in line with the upper leg of one of the driving-chains.

When I wish to withdraw the cutting apparatus from the coal, I thrust the locking-dog *w*′ through the slot in the bar W, and into one of the open links to the chain, thus connecting the chain rigidly with the bar, and through the bar to the sills A of the frame, when a continued revolution of the engine in the same direction as is required for cutting the coal will retract the carriers and cutting apparatus, as will be readily understood upon an examination of the drawings, without further explanation.

In Fig. 9, which is a detached view of a slightly-modified construction of these devices, a bar, W, is arranged below the upper line of the driving-chain E, as under some circumstances this arrangement will be found preferable to that shown in Fig. 1.

When the rope or chain *r*′ and the drum R are

employed for drawing the carriers and cutting apparatus backward, the drum may be connected with its shaft r by means of a clutch or shifting-lever, so that the drum can be thrown out of action while the cutters are being advanced into the coal.

What I claim is—

1. In a mining-machine, the combination, with the carriers, of the driving-shaft E′, adjustably supported between said carriers, substantially as set forth.

2. The combination, with the screw K, of a divided nut, O O′, its conical support, and the inclosing-shell L, substantially as set forth.

3. In a mining-machine, the combination, with the sills, the sliding carriers, and the driving-chain E, of devices for locking the chain to the sills, substantially as set forth.

4. In a mining-machine, scrapers operated in vertical planes to remove the cuttings from the kerf or drift, substantially as set forth.

5. In a mining-machine, a worm adjustable upon the driving-shaft for actuating the feeding devices, substantially as set forth.

6. In a mining-machine, the shaft F^2, made adjustable for tightening the driving-chain f^1, substantially as set forth.

7. In a mining-machine, the overhanging scraper-chain supports, substantially as set forth.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

FRANCIS M. LECHNER.

Witnesses:
JAS. G. BULL,
H. W. NEEREAMER.