(No Model.) 4 Sheets—Sheet 1.

F. M. LECHNER.

Mining Machine.

No. 232,280. Patented Sept. 14, 1880.

Fig. 1.

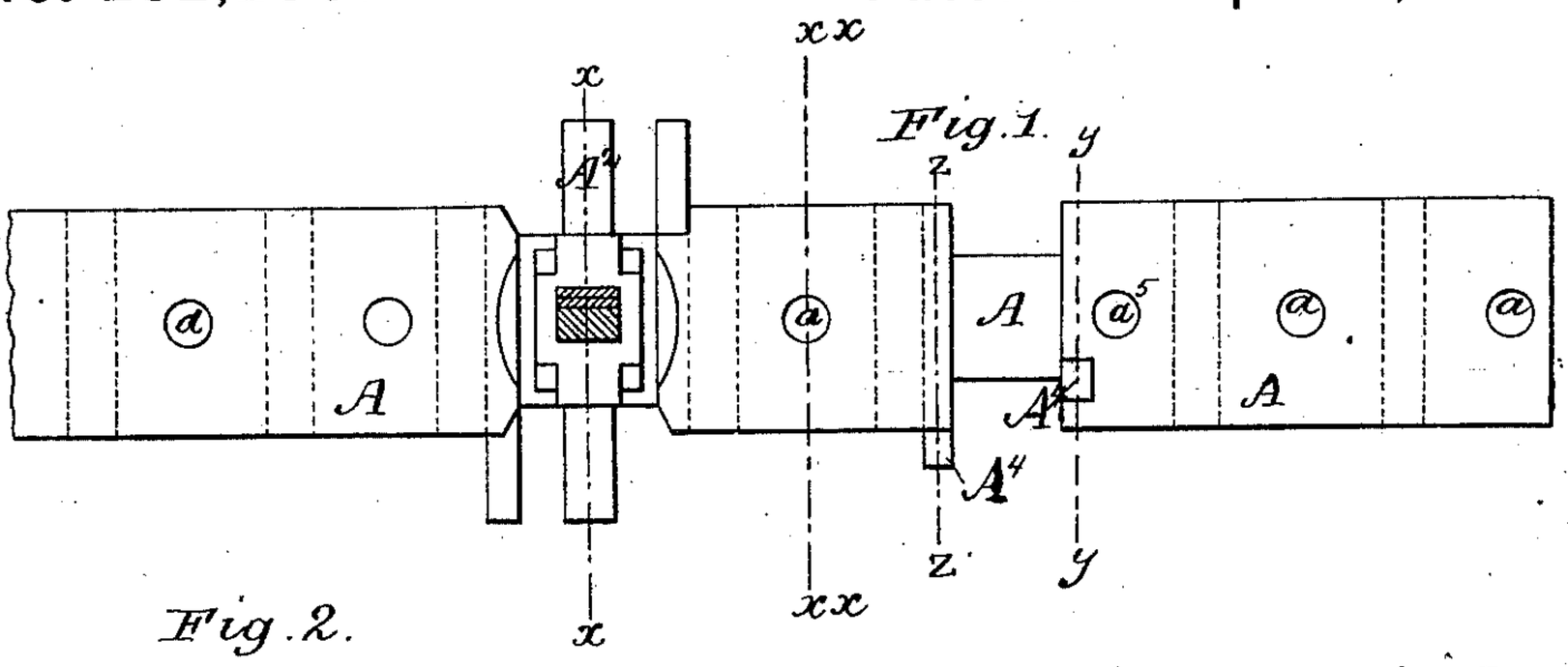


Fig. 2.

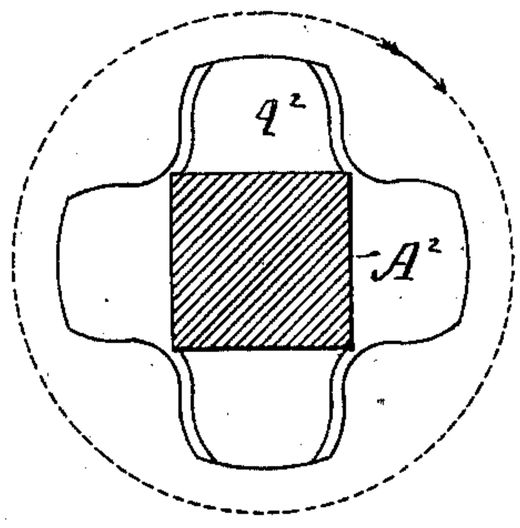


Fig. 3.

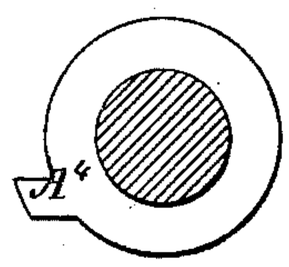


Fig. 4.

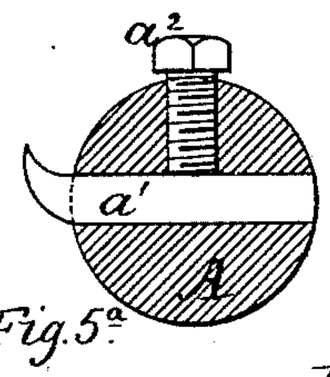


Fig. 5.

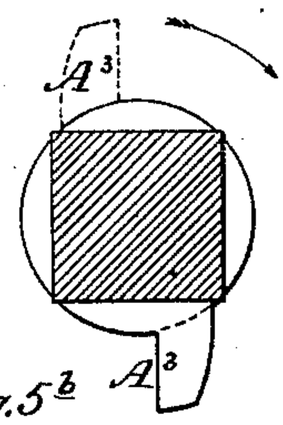


Fig. 5ª.

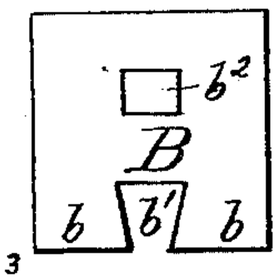


Fig. 5ᵇ.

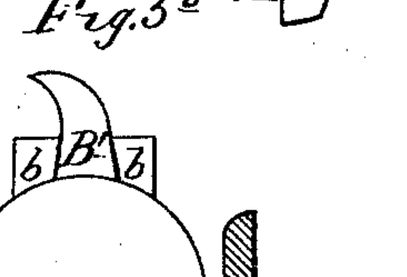


Fig. 8.

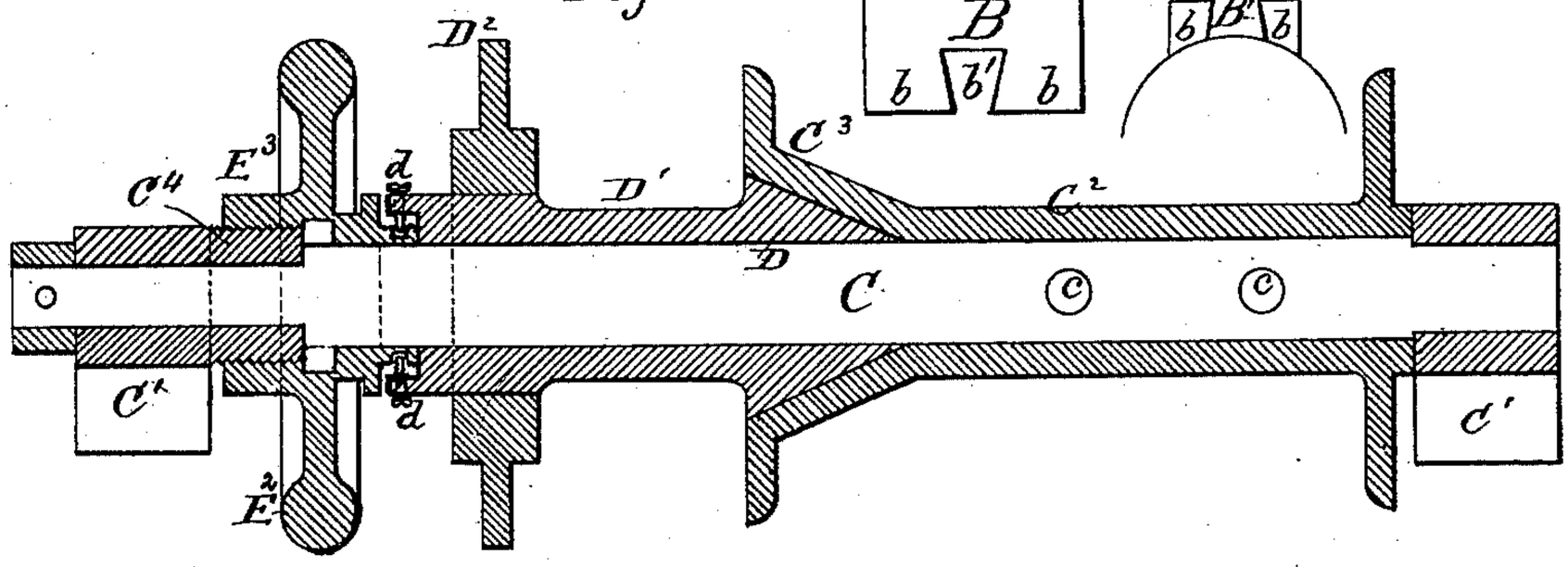


Fig. 6.

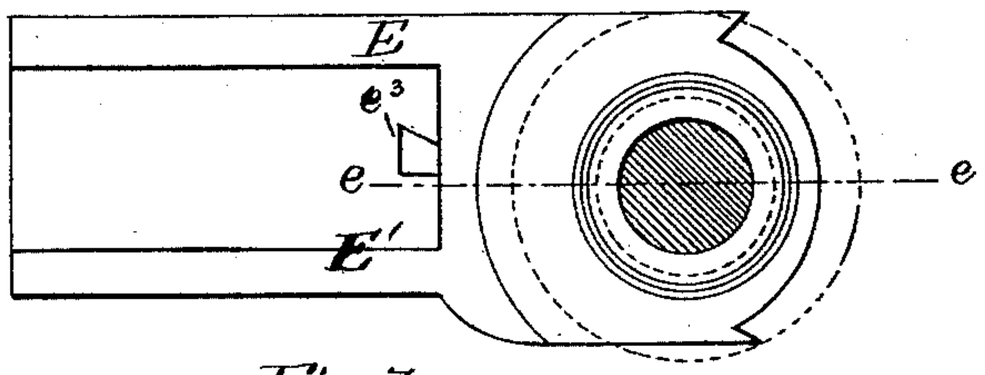
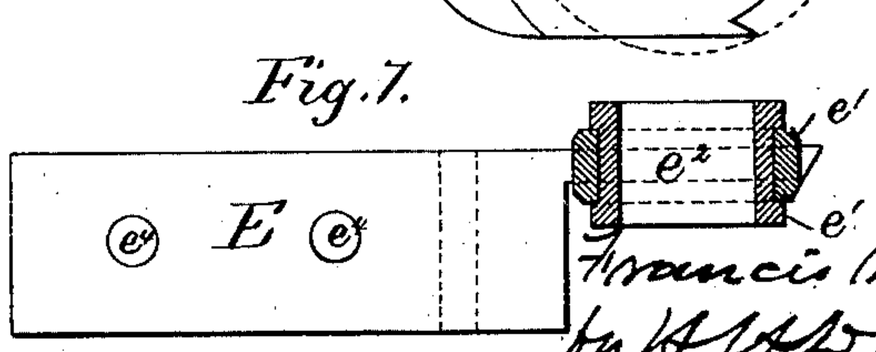


Fig. 7.



Witnesses:
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J. S. Barker

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(No Model.)

4 Sheets—Sheet 2.

F. M. LECHNER.

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No. 232,280.

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Fig. 9.

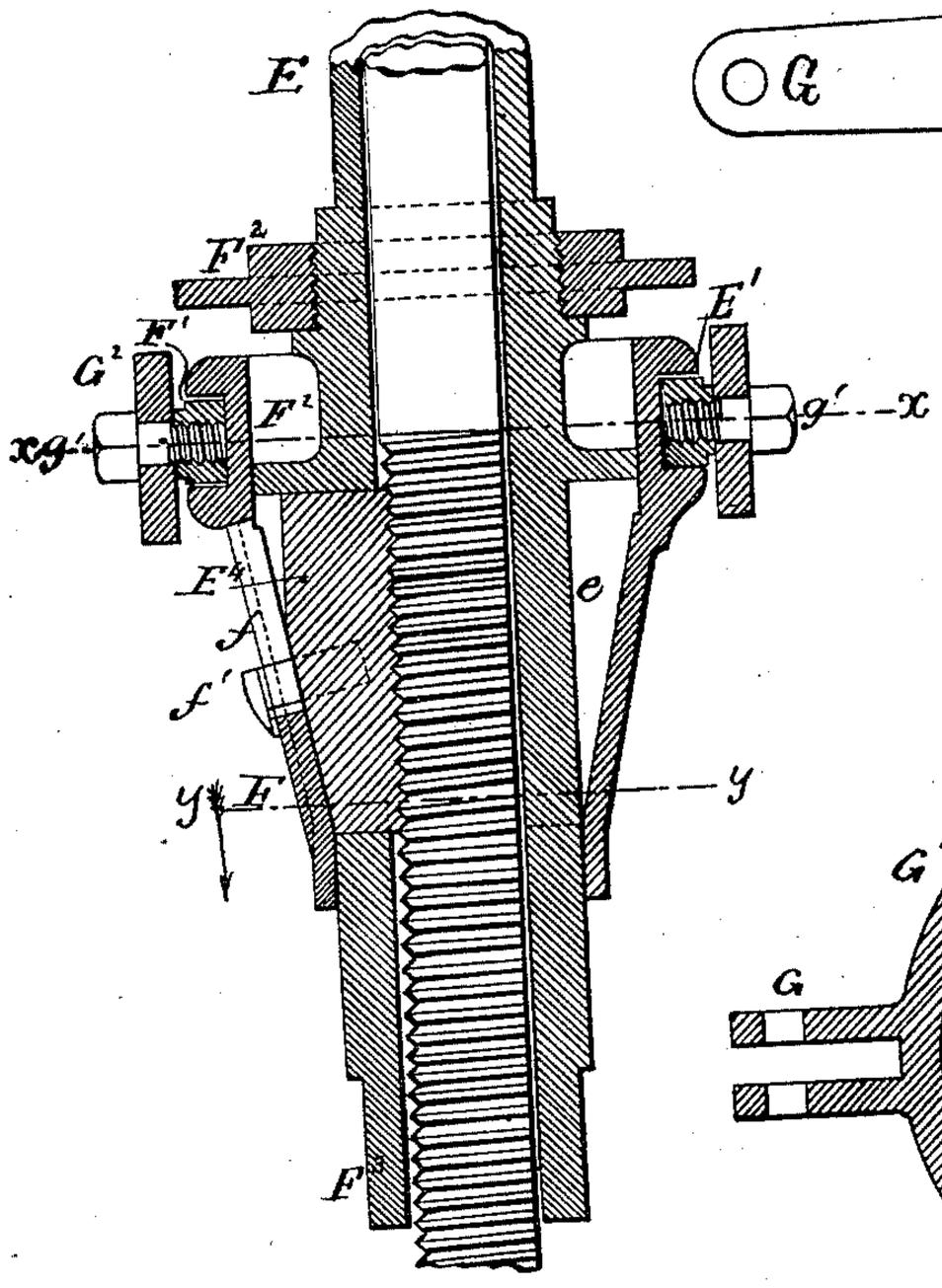


Fig. 12.

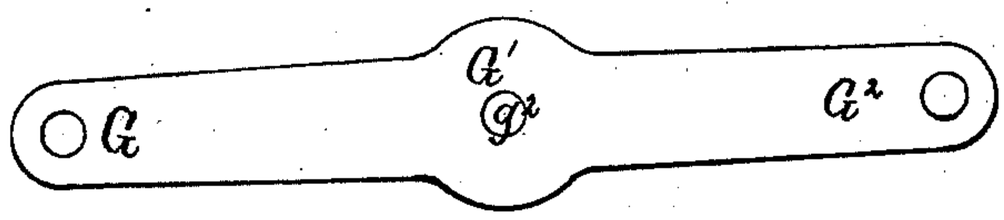


Fig. 10.

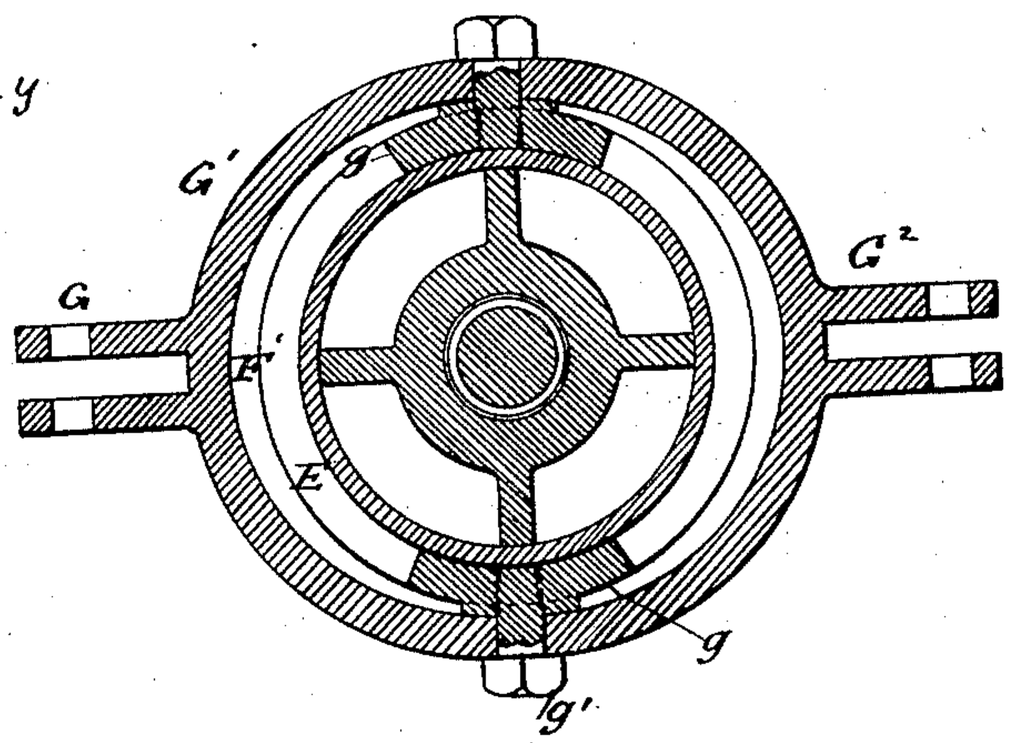
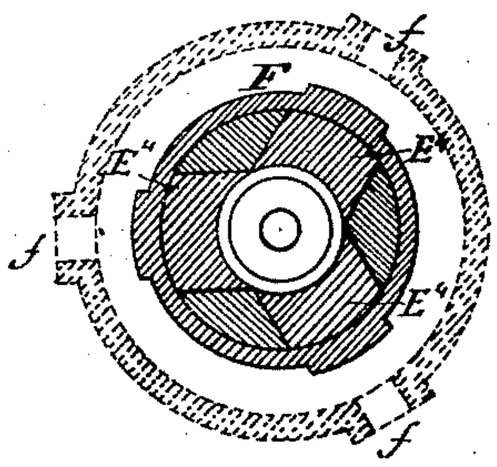


Fig. 11.



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(No Model.)

4 Sheets—Sheet 3.

F. M. LECHNER.

Mining Machine.

No. 232,280.

Patented Sept. 14, 1880.

Fig. 14.

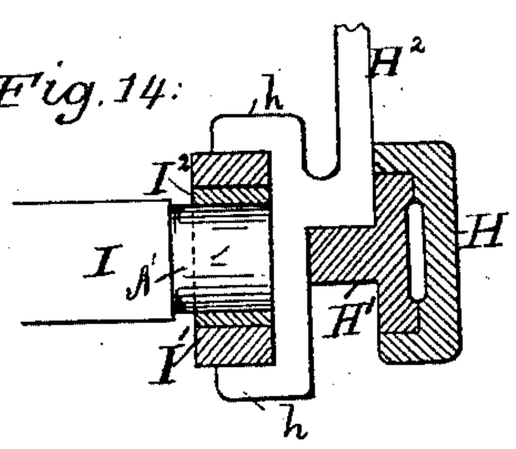


Fig. 15.

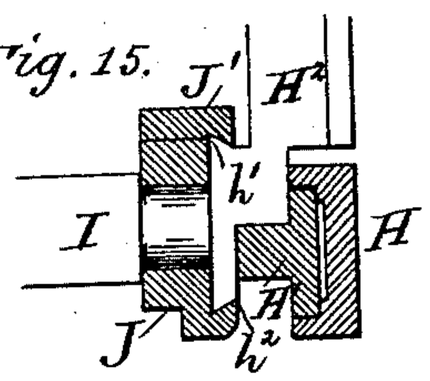
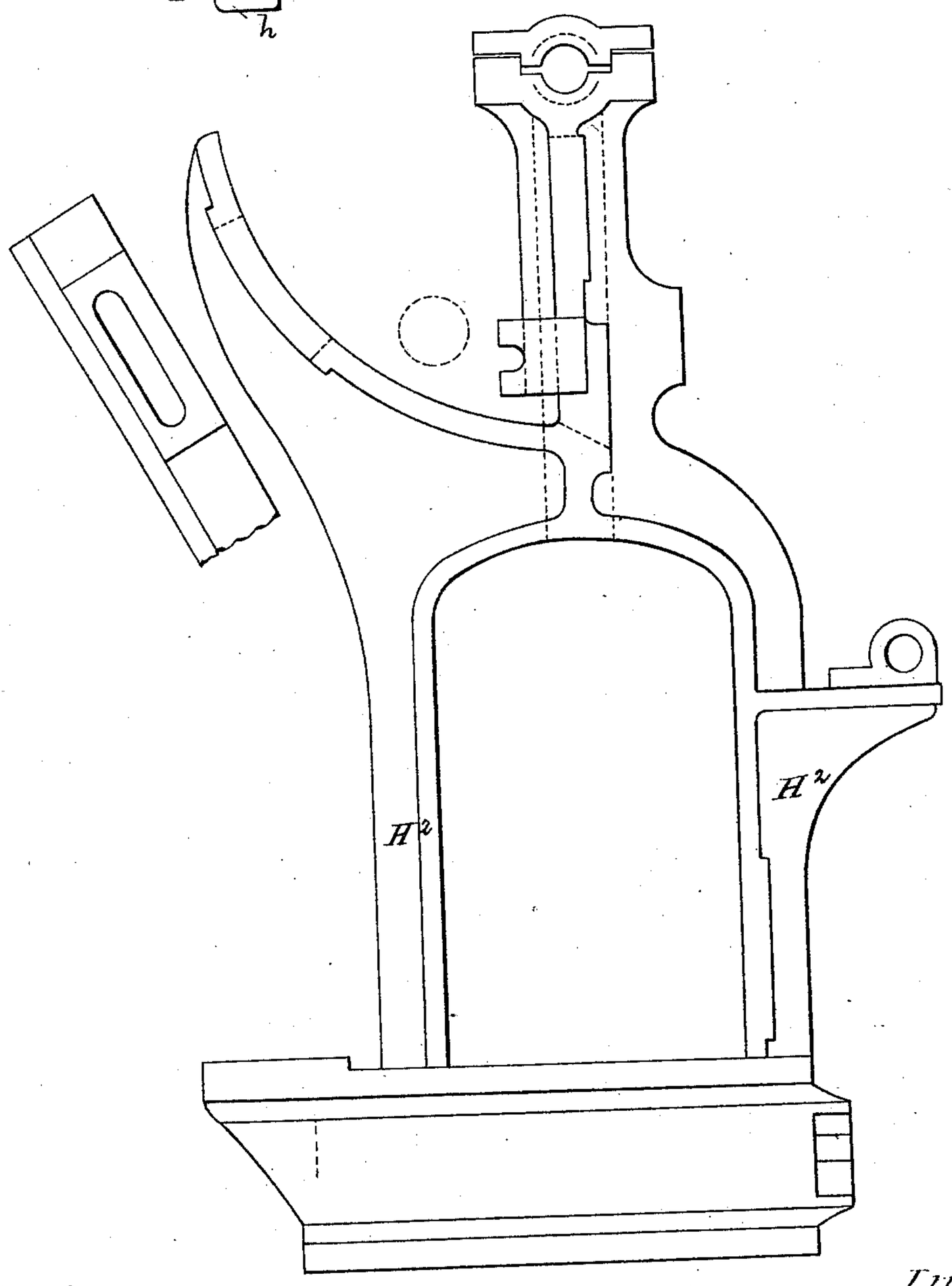


Fig. 13.



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(No Model.)

4 Sheets—Sheet 4.

F. M. LECHNER.

Mining Machine.

No. 232,280. **Patented Sept. 14, 1880.**

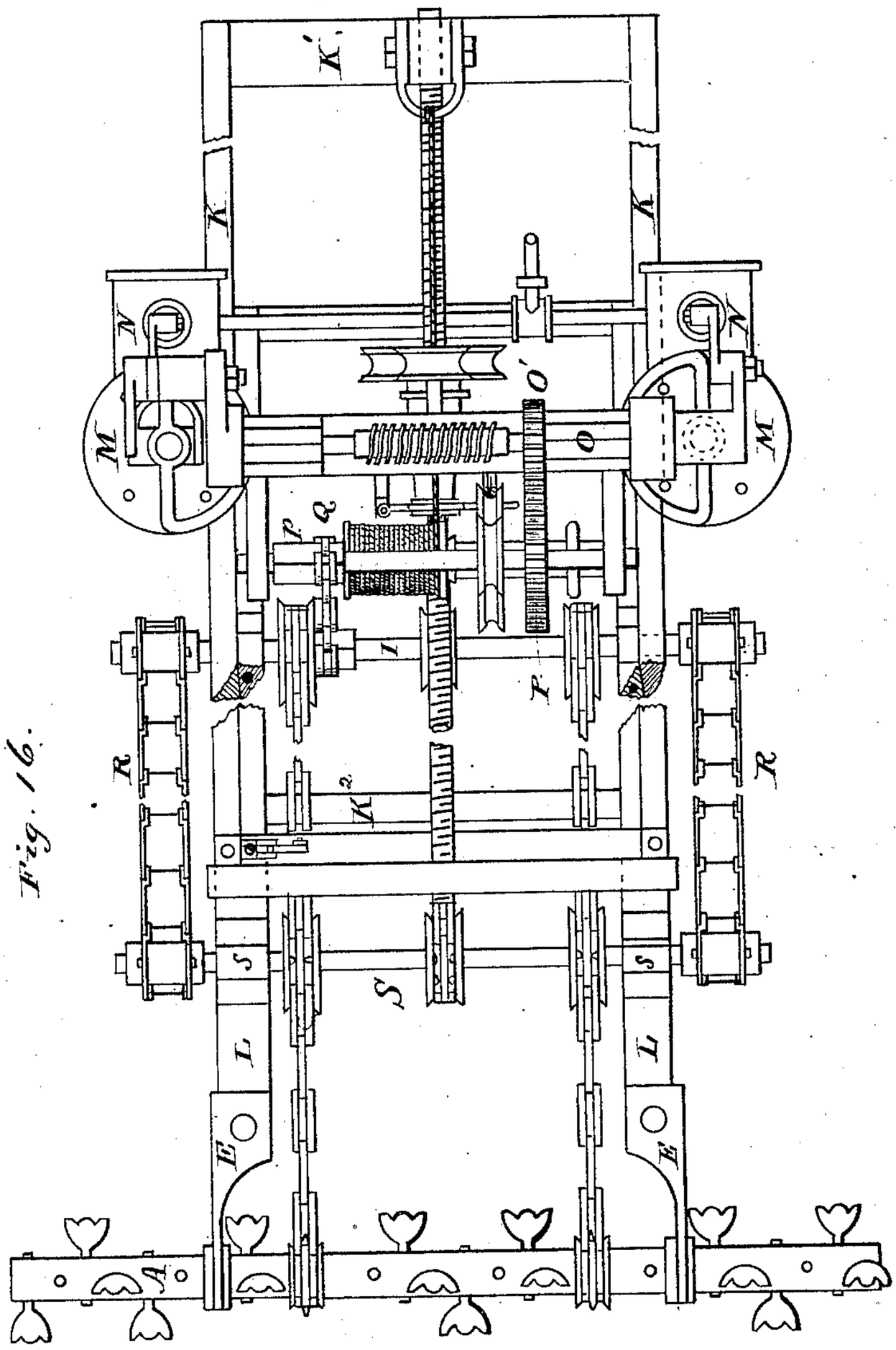

Fig. 16.

Witnesses:

H. N. Low

J. S. Barker

Inventor:

Francis M Lechner

by H A Doubleday and

W W Bliss attys

UNITED STATES PATENT OFFICE.

FRANCEIS M. LECHNER, OF WAYNESBURG, ASSIGNOR TO LECHNER MINING MACHINE COMPANY, OF COLUMBUS, OHIO.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 232,280, dated September 14, 1880.

Application filed May 31, 1880. (No model.)

To all whom it may concern:

Be it known that I, FRANCEIS 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 the following to be a full, clear, and exact description of the invention, such as 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 side view of my improved cutter-bar. Fig. 2 is a transverse section taken on line *x x*, Fig. 1. Fig. 3 is a transverse section taken on line *z z*, Fig. 1. Fig. 4 is a transverse section on line *x x x x*, Fig. 1. Fig. 5 is a transverse section on line *y y*, Fig. 1. Figs. 5^a and 5^b show a clamp. Fig. 6 is a side view of one of the supporting-shoes at the end of the cutter-bar carrier. Fig. 7 is a top or plan view of the same. Fig. 8 is a longitudinal section of the shaft, the sleeve, and the friction-clutch and the devices employed for withdrawing the cutters from the coal. Fig. 9 is a longitudinal section of the screw and nut-carrier, which thrusts the cutters forward into the coal. Fig. 10 is a plan view of the yoke which connects the shipping-lever with the nut-carrier. Fig. 11 is a vertical section taken on line *x x*, Fig. 9. Fig. 12 is a vertical section taken on line *y y*, Fig. 9. Fig. 13 is a side elevation of the engine-frame. Fig. 14 is a vertical section of one end of one of the driving-shafts and its supports. Fig. 15 is a similar section of another construction of shaft-bearing. Fig. 16 is a plan view of a machine embodying my invention, which in its general organization is like the machine shown in my Patent No. 197,734, dated December 4, 1877, and of which, therefore, I need only give a brief description.

Referring to Fig. 16, K K are the sills; K′ K^2, the cross-girts; L L, the carriers; M M, the engine-cylinders; N N, the steam-chests; O, the crank-shaft; O′, the spur-pinion on the crank-shaft; P, a spur-gear on the main driving-shaft, which is squared, as at *p*, to receive the driving-chain Q, which communicates motion to second shaft, I, from which the cutter-shaft is driven. R R are scraper-chains, the front ends of which are mounted on shaft S, which revolves in bearings *s s*, formed for its support in or upon the sliding carriers L. As the parts embodying the invention for which protection is sought in this patent are shown in detail and enlarged, I have not thought it necessary to refer to them particularly when describing this Fig. 16, but will now proceed to do so.

Referring to Figs. 1, 2, 3, 4, 5, A is the body of the cutter-bar, preferably round in cross-section and of substantially uniform diameter from end to end, except that it is reduced in size at A′ to receive its bearing-boxes, and is provided with ears or lugs A^2 to receive the links of a driving-chain; but as the construction of these lugs and the driving-chain is fully explained in a prior patent of mine, they need not be specifically described here. This cutter-bar is provided at suitable distances apart with sockets *a*, to receive the shanks *a′* of the cutting-teeth, which are adjustably secured within the sockets by means of set-screws a^2, so that they may be made to cut a kerf of any desired thickness in the coal.

A^3 A^4 are supporting-lugs projecting from the face of the bar and cast in one piece therewith. The bar is rotated in the direction indicated by the arrow in Fig. 5, and the front faces of the lugs are employed to support cutting-teeth against backward thrust by means which I will now explain, these faces being arranged on lines not radial to the axis of the cutter-bar, but on lines parallel to radial lines.

In Figs. 5^a and 5^b B and *b′ b′* constitute a clamp, of which B is the body and *b′ b′* are inclosing-arms, between which latter is an opening or throat dovetailed in plan, (see Fig. 5^a,) and tapering from the bottom toward the top, as shown in the vertical section Fig. 5^b.

B′ is a cutting-tooth, the shank of which is secured in the throat *b*.

b^2 represents a set-screw which passes through the clamp and into a screw-threaded hole, a^5, in the cutter-bar, the relation of parts being such that when the clamp is screwed to its place upon the cutter-bar the rear side of one of the jaws *b′* abuts against the front face of the lug A^4, and is supported thereby when the cutter-bar is rotated in the direction indicated by the arrow, Fig. 5.

The under face of the clamp B and the cor-

responding end of the shank of the cutter B′ are rounded to fit closely the cutter-bar; or, when preferred, the cutter-bar may be flattened at this point, in which case the corresponding parts of the clamp and cutter-shank should be made flat.

It will be readily understood that these devices will hold the cutter B′ firmly in position, and that when the cutting-bit wears away the tapering shank can be reduced a little upon two sides by grinding, and thrust farther through the clamp B, a suitable backing being interposed between the lower end of the shank and the cutter-bar.

Referring to Figs. 6 and 7, E is the upper, and E′ the lower, member of the shoe, divided centrally on the line *e e*.

The projecting shank end of the shoe is narrow, and is constructed with the rim or boss *e′* upon each side, the inner walls of this boss being coincident with the central opening, and thereby forming a broad support for the boxing e^2, in which the cutter-shaft is mounted, it being understood that there is one shoe upon the forward end of each of the sliding cutter-carriers of the machine.

When preferred the upper member, E, may be provided with a dovetailed rib, e^3, projecting inwardly from the inner vertical face and adapted to enter a correspondingly-shaped seat formed in the front end of the carrier, whereby this rib assists in supporting the upper member, E, against the upward thrust which is produced by the cutting action of the bits upon the coal, and thereby relieving materially the bolts or set-screws which pass through the holes e^4 for the purpose of securing the shoe to the sliding carrier.

Referring to Fig. 8, C is a shaft provided at each end with bearings, which are mounted in the boxes C′ $C^\times$.

C^2 C^3 is a sleeve or thimble mounted upon the shaft, and firmly secured thereto by means of pins which pass through both the sleeve and the shaft at *c c*.

The end C^3 of the thimble is made flaring, as indicated, for a purpose which will soon be explained.

D D′ is a friction-driver mounted loosely upon the shaft C, the end D of the driver being in the form of a hollow conical wedge, and adapted to fit closely within the conical portion C^3 of the thimble.

D^2 represents a sprocket-wheel formed upon or attached to the driver, and in practice driven by means of a suitable chain from one of the driving-shafts of the machine.

The bearing $C^\times$ is provided with a tubular extension, C^4, which is screw-threaded externally.

E^2 is a hand-wheel mounted loosely on shaft C. One end, E^3, of the hub of this hand-wheel is expanded and screw-threaded internally to fit the screw-threaded extension C^4. The opposite end or side of the hub of the hand-wheel is reduced in external diameter, so as to enter a recess formed for its reception in the adjacent end of the friction-driver, and is provided with an external groove to receive the inner ends of set-screws *d*, which pass through the end of the driver.

From an examination of Fig. 8 it will be readily understood that when the parts are in the position there shown the tubular wedge D of the driver is held in close contact with the flaring end C^3 of the thimble, so that a rotation of the driver will carry with it the thimble and the shaft C; but the hand-wheel E^2 will remain stationary during such rotation by reason of its frictional contact with the tubular extension C^4. When, however, it is desired to withdraw the wedge D from contact with the thimble the hand-wheel is turned in the proper direction, and its engagement with the thread on C^4 will accomplish this result.

The nut-carrier is represented in Figs. 9, 10, 11, 12, in which the inner portion of said carrier consists of a cylindrical end, F^2, provided with a central opening of such size as to receive the screw-threaded shaft, a smaller cylindrical portion, F^3, and an intermediate conical portion provided upon three sides with recesses or throats which are equidistant from each other.

F is a shell or sleeve, tapering in form and of such size at its smaller end as to fit closely the part F^3, and having its larger end cylindrical in form and of such size as to fit closely the enlarged portion F^2 of the inner section of the carrier. The sleeve is provided with three longitudinal slots, *f*, arranged centrally of the recesses in the inner portion. Three nut-sections, E^4, (see Figs. 9 and 12,) are seated in the recesses above referred to, and are provided upon their inner faces with screw-threads corresponding to the thread on the feeding-screw, each of the nut-sections being connected with the sleeve by means of a flat-headed screw, *f′*, which passes through the slot *f*.

From an examination of Fig. 9 it will be readily understood that when the sleeve is moved in the direction indicated by the arrow the nut-sections will be withdrawn from contact with the screw by reason of the engagement of the heads of the bolts *f′* with the outer face of the sleeve.

In order to readily shift the sleeve upon the inner section I employ the following devices: G G′ G^2 is a circular yoke loosely surrounding the sleeve at its greatest diameter and provided with ears, the ear G being pivoted to a suitable support on the frame of the machine, the ear G^2 being connected to a shipping-lever arranged at some convenient point upon the frame-work of the machine, as will be found most convenient.

F′ F′ is a groove extending around the largest portion of the sleeve, and *g g* are curved blocks fitting loosely in this groove and connected with the yoke G G′ G^2 by means of set-screws or bolts *g′*, which pass through holes g^2 in the yoke. These devices furnish a convenient means for shifting the sleeve backward and forward on the inner portion of the

nut-carrier, it being understood, of course, that said inner portion is firmly attached to the frame-work of the machine in such manner that while it is free to rotate when driven by a chain passing around the sprocket-wheel F^2, longitudinal motion of the nut-carrier relative to the sliding frame and carrier is prevented, so that when the nut-sections are in engagement with the screw-shaft the rotation of the nut-carrier will feed the cutter forward into the coal.

H, Fig. 14, represents one of the sills or side bars of the main or bed frame, H′ being one of the sliding carriers, which, in this instance, is constructed of a T-iron. H^2 is a section of the engine-frame, which is firmly bolted to the carrier H′.

I represents one of the driving-shafts by means of which power is transmitted from the engine-shaft or crank-shaft to the cutter-bar. I′ is a sliding box, which carries one end of the shaft I, and is provided with a bearing or bushing, I^2, adapted to be readily replaced when worn. The bearing I′ is supported between two flanges, *h h*, projecting from the base or lower part, H^2, of the engine-frame, and is adjustable thereon for the purpose of tightening the driving-chain which connects shaft I with the cutter-shaft at the forward end of the carrier H′ by any suitable mechanism, preferably one of those shown in an earlier patent of mine.

In Fig. 15 the parts H′ H^2 are substantially the same in structure as those in Fig. 14, except that the lower portion of the part H^2 is formed into a dovetailed rib, h' h^2. I is a shaft corresponding to the shaft marked I in Fig. 14. J J′ is a bearing-block, in which one end of shaft I is mounted. The upper part, J′, of this bearing is detachable from the lower part, J, and is secured thereto by means of set-screws or bolts. (Not shown.)

In practice a rotary motion is imparted to the shaft I by means of a driving-chain, which connects it with a shaft mounted near the upper end of the engine-frame H^2, so that when in operation there is a heavy upward pull upon said shaft, and by an examination of this figure (Fig. 15) it will be readily understood that such upward strain is borne by the lower solid portion, J, of the bearing, by reason of its engagement with the lower edge, h^2, of the dovetailed rib.

What I claim is—

1. In a mining-machine, a cutter-bar provided with projecting spurs or lugs adapted to support the cutting-teeth, substantially as set forth.

2. The combination, with the cutter-bar provided with the projecting spurs, of the clamp B, for attaching the cutting-teeth to the bar, substantially as set forth.

3. The combination, with the shaft C and the sleeve having the conical portion C^3, of the driver D, hand-wheel E^2, and the tubular screw-threaded bearing C′ C^4, substantially as set forth.

4. The combination, with the cutter-bar, of the shoe E E′, provided with the rim or boss *e′*, adapted to support the boxing e^2, substantially as set forth.

5. The combination, with the nut-carrier, of the yoke G G′ G^2 and the blocks *g*, seated in the groove F′, substantially as set forth.

6. The combination, with the dovetailed rib h' h^2 and the shaft I, of the divided bearing-block J J′, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 13th day of May, 1880.

FRANCEIS MARION LECHNER.

Witnesses:

HENRY W. NEEREAMER,

THOMAS C. ORNDORFF.