(No Model.) 3 Sheets—Sheet 1.

L. W. LE GRAND & J. KLOTZ.

MINING MACHINE.

No. 464,374. Patented Dec. 1, 1891.

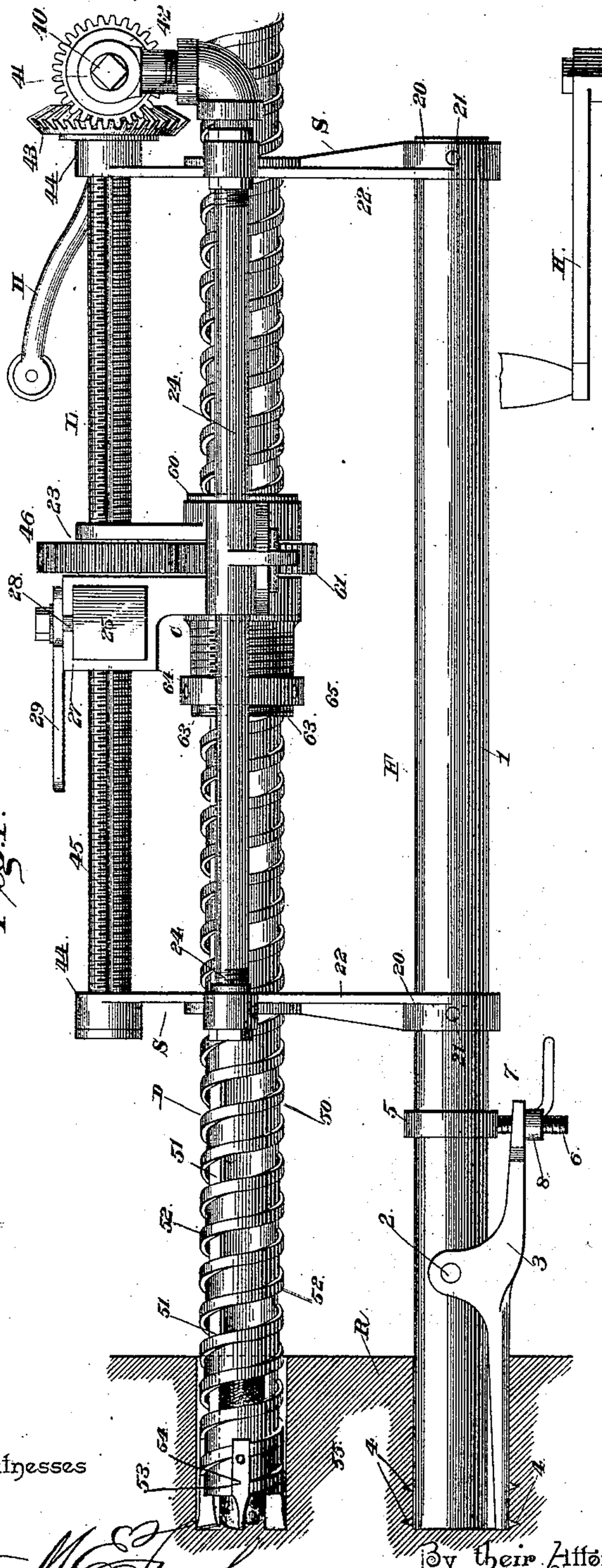

Fig. 1.

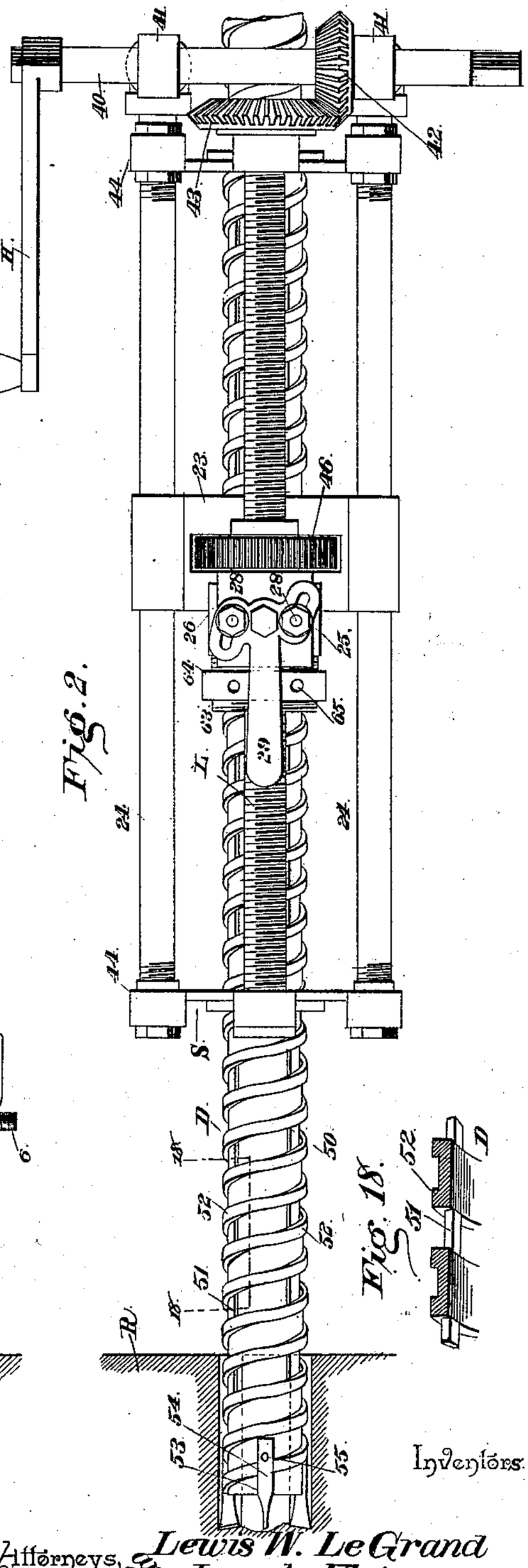

Fig. 2.

Fig. 1a.

Witnesses

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 3.

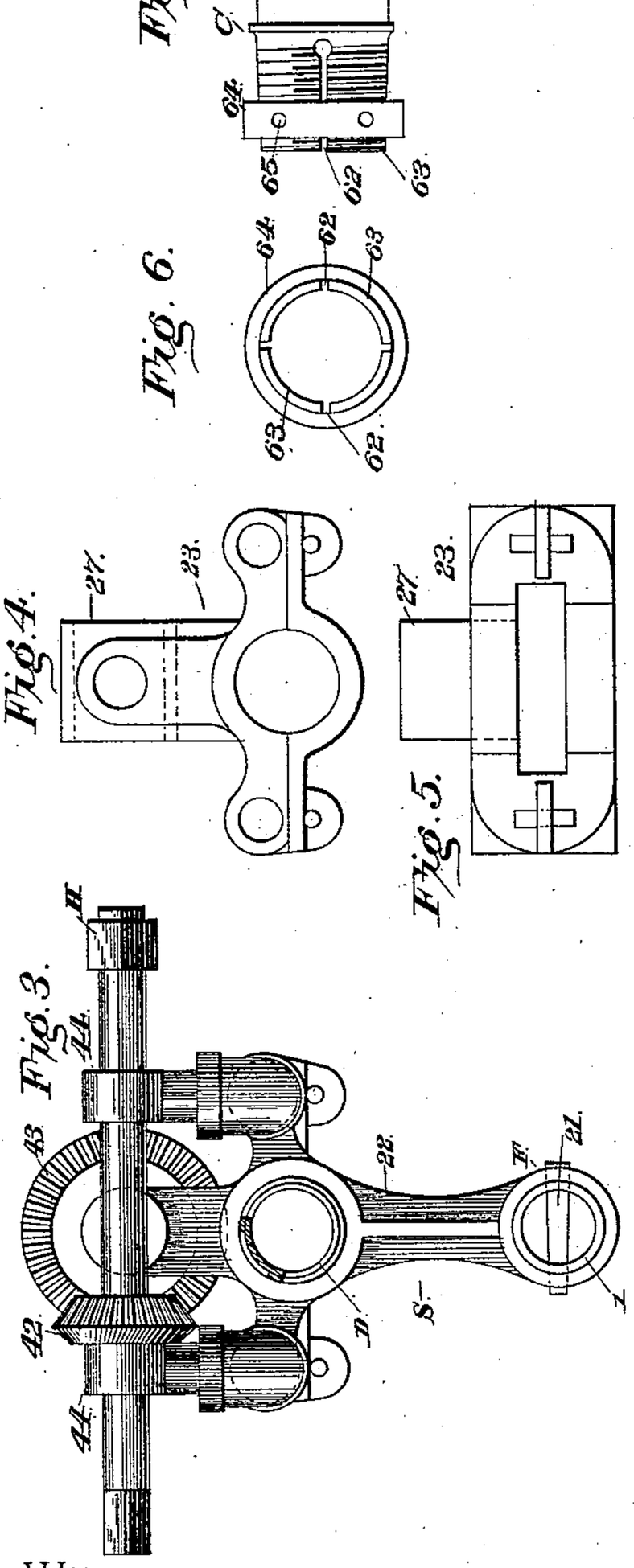


Fig. 4.

Fig. 5.

Fig. 6.

Fig. 7.

Fig. 8.

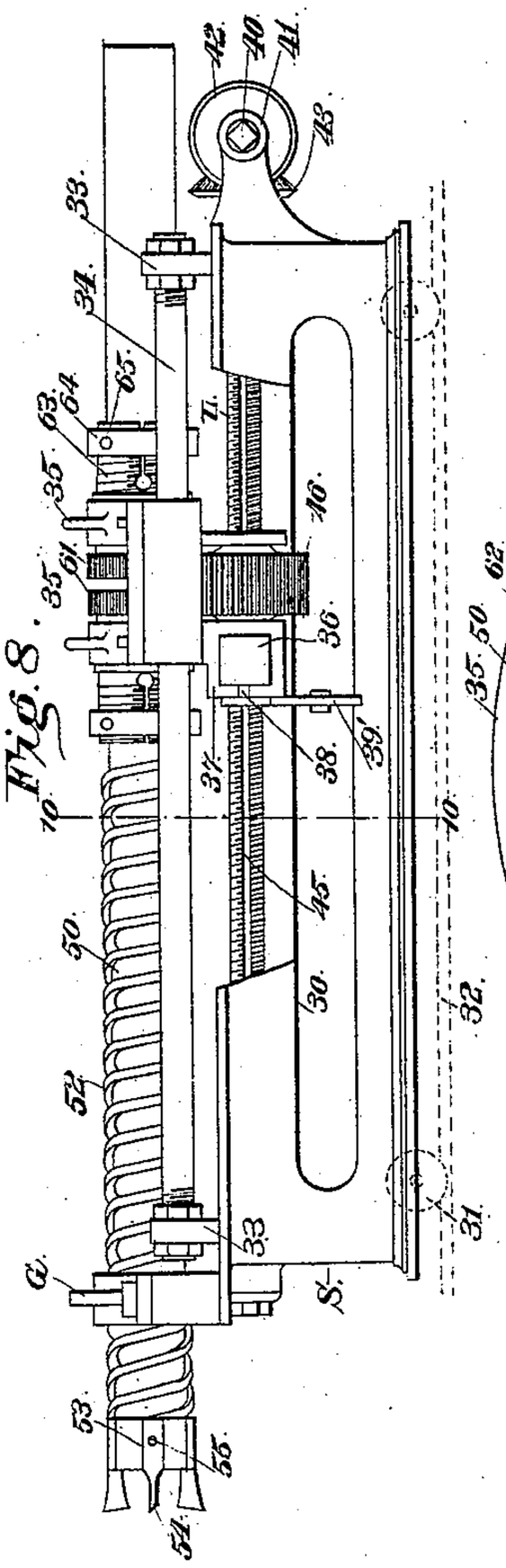
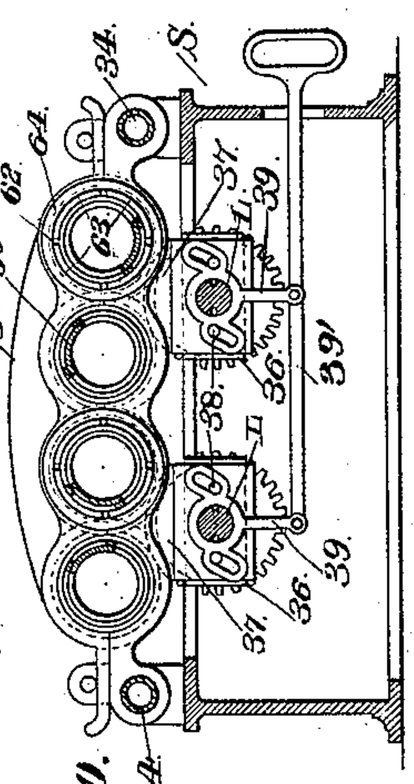


Fig. 10.



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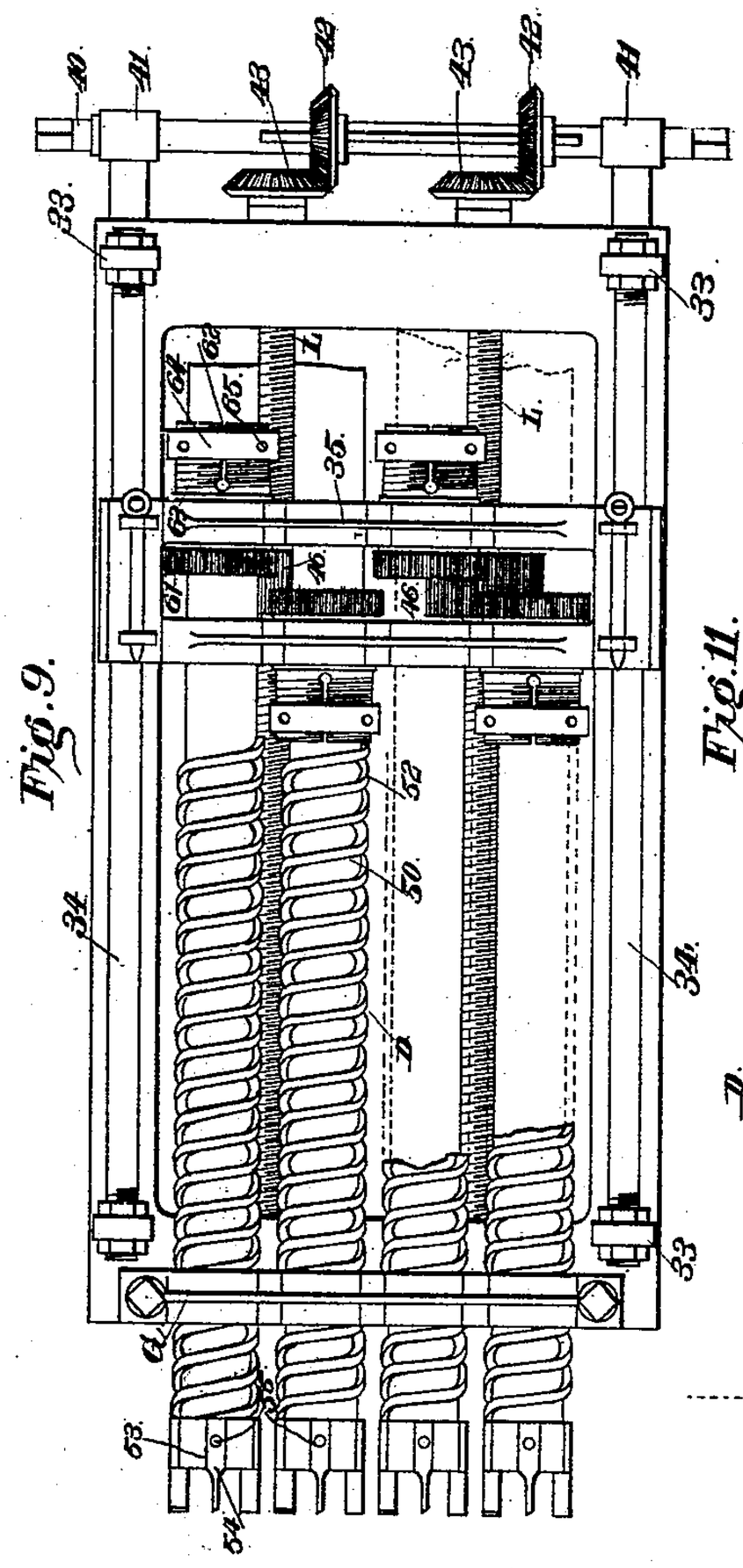

Fig. 9.

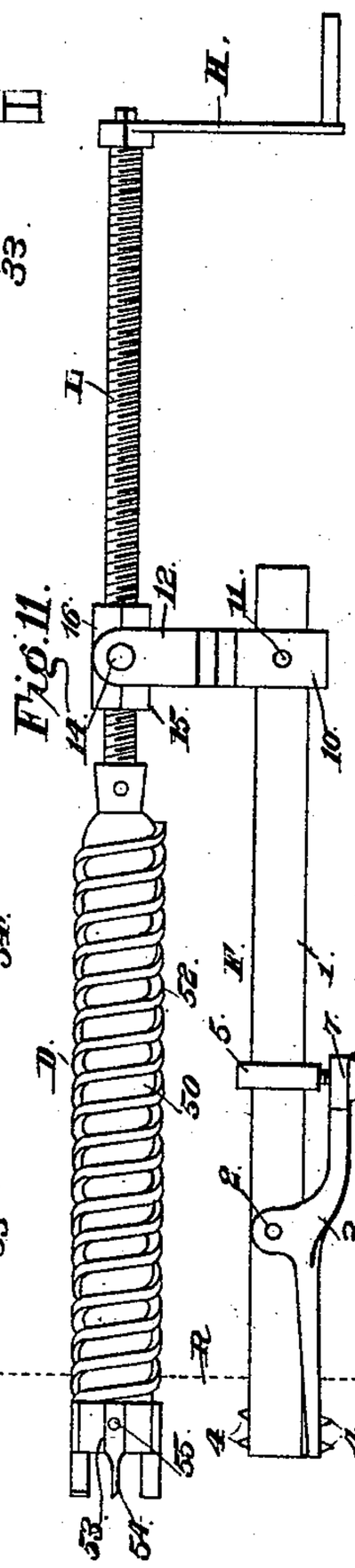

Fig. 11.

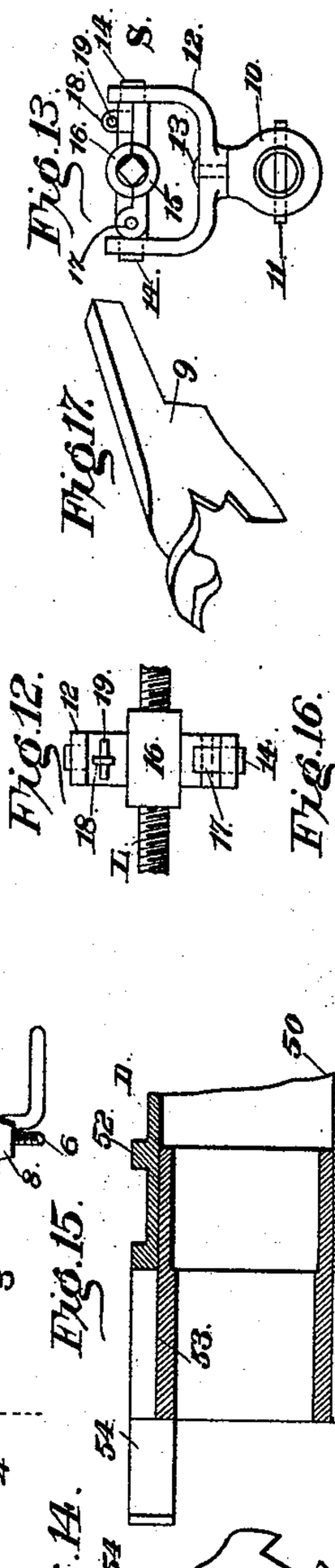

Fig. 12.

Fig. 17.

Fig. 16.

Fig. 15.

Fig. 14.

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UNITED STATES PATENT OFFICE.

LEWIS W. LE GRAND AND JOSEPH KLOTZ, OF WEST PITTSTON, PENNSYLVANIA.

MINING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 464,374, dated December 1, 1891.

Application filed November 15, 1890. Serial No. 371,519. (No model.)

To all whom it may concern:

Be it known that we, LEWIS W. LE GRAND and JOSEPH KLOTZ, citizens of the United States, residing at West Pittston, in the county of Luzerne and State of Pennsylvania, have invented a new and useful Mining-Machine, of which the following is a specification.

This invention relates to mining-machines; and the object of the same is to effect improvements upon devices of this character heretofore constructed.

To this end the invention consists of the details of construction hereinafter more fully described and claimed, and as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, Fig. 2 a plan, and Fig. 3 an end elevation, of our improved machine having a single drill. Fig. 4 is an elevation, and Fig. 5 a plan, of the cross-head used in this machine. Fig. 6 is an end view, and Fig. 7 a side elevation, of the clutch used in this machine. Figs. 8, 9, and 10 are respectively a side elevation, plan, and section on the line 10 10 of our improved machine embodying a gang of drills. Fig. 11 is a side elevation, and Fig. 12 a plan view, of a simpler form of machine with a single drill. Fig. 13 is an elevation of the yoke used therein. Figs. 14 and 15 are enlarged details, respectively, in end elevation and longitudinal section of the manner of holding the bits in the drill. Fig. 16 is an elevation of an extension bar as used in this simple form of machine. Fig. 17 is an enlarged perspective detail of the bit for drilling the fastening-hole. Fig. 18 is a sectional detail of a portion of one of the tubular drills.

Referring to the said drawings, the letter F designates a fastener for holding our improved machine to its work. This fastener comprises a tube 1, to which at 2 is pivoted a lever 3, the lever and the tube having teeth 4 on the outer sides of their ends.

5 is a collar surrounding the tube 1 and having a threaded shank 6, which is embraced by the forked inner end 7 of the lever 3, and 8 is a hand-nut turning on said shank to press the inner arm of the lever toward the tube and distend its outer arm. A hole being first drilled into the rock or coal R by the use of the bit 9 illustrated in Fig. 17, the fastener is inserted in this hole and the hand-nut 8 turned in the proper direction to engage the teeth 4 in the hole at its extreme depth, and thereby hold the fastener in place.

The letter S designates a supporting frame-work for the machine, which latter will be hereinafter described. In the simpler forms of our machine this frame-work S is made in the shape of a yoke, Fig. 13, whose lower end 10 embraces the tube 1 and is held thereon by a pin 11. Upon this ring-shaped lower end 10 is mounted the yoke 12, which is pivotally secured thereto by the pin 13, and upon trunnions 14 in the arms of the yoke is pivoted the lower half 15 of a split nut. The upper half 16 of this nut is pivoted at 17 to the lower half, and its free end passes over an eye 18 on the lower half and is retained in position to complete the nut by a pin 19.

In the single-drill form of our machine the supporting frame-work S comprises two yokes 22, whose lower ends 20 are secured upon the tube 1 by cross-pins 21 in the same manner as above described. In the upper ends of the arms of these yokes 22 are secured side bars 24, upon which slides a cross-head 23.

25 and 26 are the two members of a split nut which move through a box 27 in cross-head 23 and each of which members has a pin 28 in its upper face.

29 is a lever pivoted upon the cross-head 23 and having cam-shaped slots engaging the pins 28, whereby when the lever is moved in the proper direction the two halves of the split nut will be slid outwardly in the box 27 of the cross-head; but when the lever 29 is moved in the opposite direction these halves will be brought together and retained in position to complete the nut.

In the undermining-machine employing a gang of drills, as shown in Figs. 8, 9, and 10, the supporting frame-work S is simply a bed or base 30, which may be mounted upon wheels 31 and moved upon a track 32, if desired. Rising from the bed 30 at each end and at each side thereof is a pair of eyes 33, connected along the sides of the base by side bars 34, upon which slides a large cross-head 35. Depending from this cross-head are two boxes 37, in which are mounted split nuts 36, the same as above described, except that

there are two of such nuts in the present instance, and there may be a greater number, if desired.

39 is a lever pivoted to each box 37 and having cam-shaped slots engaging pins 38 upon the members of each split nut, and 39′ is a hand-rod connecting all these levers and extending through one side of the base, which when operated opens or closes all the split nuts simultaneously.

The letter H designates an operating-handle or other source of power and the means and devices for connecting it with the long screw L, hereinafter described. In the simpler form of machine the handle H is connected directly to the screw, as seen in Fig. 11. In the other forms of the machine a transverse shaft 40 turns in bearings 41 across the rear end of the supporting frame-work and is driven by the handle shown or by power applied in any preferred manner from any suitable source so long as a steady rotary motion is imparted to the shaft 40. Said shaft carries a bevel gear or gears 42, which meshes with another 43 upon the rear end of each screw L, above mentioned. Such screw turns in a bearing 44 in the supporting frame-work and at each end thereof passes intermediately through the split nut and is provided with a longitudinal groove 45. Upon the screw is splined a gear-wheel 46, which turns within an opening in the cross-head, and the screw L passes through the split nut carried by the cross-head, whereby the latter is caused to progress slowly when the nut engages the screw, but can be moved at will when the halves of the nut are separated, and the gear-wheel 46 will continue to revolve with the screw in whatever position throughout the length thereof the cross-head is placed. In the simple construction illustrated on Sheet 3 the long screw L is connected directly with the rear end of the drill D, to be hereinafter described, and when the drill is embedded in the coal and the screw is set back in the split nut for another movement an extension-bar 47 is inserted between the drill and the screw, these members being provided with tenons 48 and sockets 49 at their opposite ends, whereby they may be connected with each other in a manner well known in this art.

The letter D designates the drill with which our improved machine is provided. This drill consists of a tube 50, which is formed of a spirally-wound strap of strong metal, and occasional blocks 51 are preferably interposed between the adjacent edges of the strap to give the tube sufficient rigidity. Along the outer face of the strap at each edge thereof is formed a raised rib 52, thereby creating a spiral delivery-channel extending with considerable pitch from one end of the drill to the other. In the end of the drill are formed dovetailed recesses 53, preferably three in number, arranged equidistant upon the exterior of the tube, and in these recesses are removably seated the bits 54, which may be additionally maintained in place by locking screws or pins 55, if desired.

The letter C designates a clutch, the preferred form of which is as follows: 60 is a tubular sleeve completely surrounding the drill D and carrying upon its body a gear 61, which meshes with the gear 46 upon the screw. One end of this sleeve is split, as at 62, forming four fingers 63, which embrace the drill and are slightly resilient, their outer faces being inclined and screw-threaded. Over these fingers screws a nut 64, preferably having openings 65 for a spanner, although its outer face may be angular to receive a wrench or other operating-tool, as will be readily understood.

With a machine of any of the above-described constructions the operation will be as follows: A hole having been bored in the rock or coal R with the bit 9, the fastener F is inserted therein and locked in place in an obvious manner, or if the undermining-machine is used it is moved into position and held there by any suitable means. Rotary power having been supplied through the handle H, the long screw L is turned in its bearings and as it turns the split nut moves forwardly thereon, or in the simple construction illustrated on Sheet 3 the screw moves through the nut. The driving-gear, which is connected to the screw by spline and groove, is caused to rotate therewith, and the gear on the collar which embraces the drill is driven by this driving-gear, so that when the clutch is tightened upon the drill the latter is caused to rotate in unison with and oppositely from the screw. In the simple construction, the screw being connected directly with the drill, the latter is of course caused to rotate and to progress coincidently therewith. As the screw turns, the split nut in the cross-head causes the latter to travel slowly forward on the side bars, carrying the driving-gear, the driven gear, the clutch, and hence the drill, with it. As the bits 54 are arranged in a circle in which they revolve, they make a ring-shaped hole in the rock or coal, the coal-dust produced being delivered from such hole in the spiral delivery-channel between the exterior ribs 52. In this manner a clogging of the machine is prevented, and hence less power will be required to drive the machine than in tubular drills heretofore constructed, wherein the coal-dust was delivered from the hole inside the drill and alongside the core. The core in the present case passes inside the drill, as will be understood, and in the simple construction illustrated on Sheet 3 must be broken off and removed from time to time when the extensions 47 are put in, as described above. In the better forms of our machine, however, the drill is at least six feet long, and in the undermining-machine illustrated on Sheet 2 the drill passes through a guide G at the front end of the supporting frame-work S for the obvious purpose of steadying it in its work. When the cross-head has progressed the length of the screw and the drill has been

embedded a corresponding distance in the rock or coal, the operating-lever 29 (or 39′) is moved to separate the members of the split nut, and this causes the forward movement of the cross-head to cease. The rotary movement of the driving-shaft is then stopped, the nut 64 of the clutch C is loosened, and the whole cross-head, with the gears connected therewith, is moved to the rear upon the side bars by hand. Here the clutch is again connected with the drill and the split nut with the screw, and when the rotary motion of the driving-shaft recommences the drilling operation will be resumed as before.

The simple construction above referred to is obviously a portable device adapted to bore holes at any angle, as permitted by the pivots 13 and 14 in its yoke, and the whole is preferably driven by hand.

The single-drill machine illustrated on Sheet 1 is a stronger and more powerful machine adapted to bore for blasting purposes and at any desired height in the mine, and this drill may be driven by hand or by other power and may be left to operate automatically for a considerable portion of time.

The undermining-machine illustrated on Sheet 2 is, as its name signifies, for the purpose of undermining or underboring a bulky section of rock or coal which is afterward to be blasted at the top and thereby detached from the vein. This machine generally stands near the floor of the mine and is preferably driven by power rather than by hand. In the drawings we have illustrated this machine as provided with four drills driven by two screws, the driving-gear 46 on each screw being sufficiently broad to engage the driven gears 61 upon two contiguous drills, the latter being preferably located above the screws and the arrangement is generally about as shown. It will be understood, however, that a greater or less number of drills may be employed in the gang by correspondingly increasing or decreasing the breadth of the base and by making such other changes as are necessary and as come within the knowledge of the average mining engineer or machinist.

What is claimed as new is—

1. In a mining-machine, the combination, with a supporting frame-work having side bars, a screw journaled longitudinally in said frame-work, and means for rotating the screw, of a cross-head sliding on said side bars, a clutch journaled therein and having a gear, said clutch having fingers at one end whose exteriors are threaded and a nut screwing thereon, a drill clamped within said clutch, and a driving-gear splined upon the screw, guided in an arm of the cross-head and in constant engagement with the gear on said clutch, the whole operating substantially as described.

2. In a mining-machine, the combination, with a supporting frame-work, a screw journaled longitudinally in said frame-work, and means for rotating the screw, of a cross-head guided on said frame-work and carrying a driving-gear which is splined on said screw, a clutch journaled in said cross-head and having a gear in constant mesh with said driving-gear, a drill clamped within said clutch, a split nut whose members are guided within a box in the cross-head and engage opposite sides of the screw, and means for moving said members, the whole operating substantially as described.

3. In a mining-machine, the combination, with a tubular drill, a sleeve surrounding the same and having fingers at one end whose exteriors are tapered and threaded, and a nut screwing thereon, of means for revolving said sleeve and feeding it forward, as and for the purpose set forth.

4. In a mining-machine, the combination, with a supporting frame-work, a number of screws journaled longitudinally therein, and means for revolving said screws, of driving-gears splined on said screws, a cross-head moving on said frame-work and guiding said driving-gears, clutches journaled in said cross-head and carrying exterior gears, each adjacent pair of which meshes with one driving-gear, split nuts moving in boxes in said cross-head, means for moving the members of said nuts, and tubular drills journaled in guides in the frame-work and passing through said clutches, the whole operating substantially as hereinbefore described.

In testimony that we claim the foregoing as our own we have hereto affixed our signatures in presence of two witnesses.

LEWIS W. LE GRAND.
JOSEPH KLOTZ.

Witnesses:
PATRICK GIBBONS,
F. H. KYTE.