(No Model.)

3 Sheets—Sheet 1.

L. E. WHITON.

DRILLING MACHINE.

No. 506,867. Patented Oct. 17, 1893.

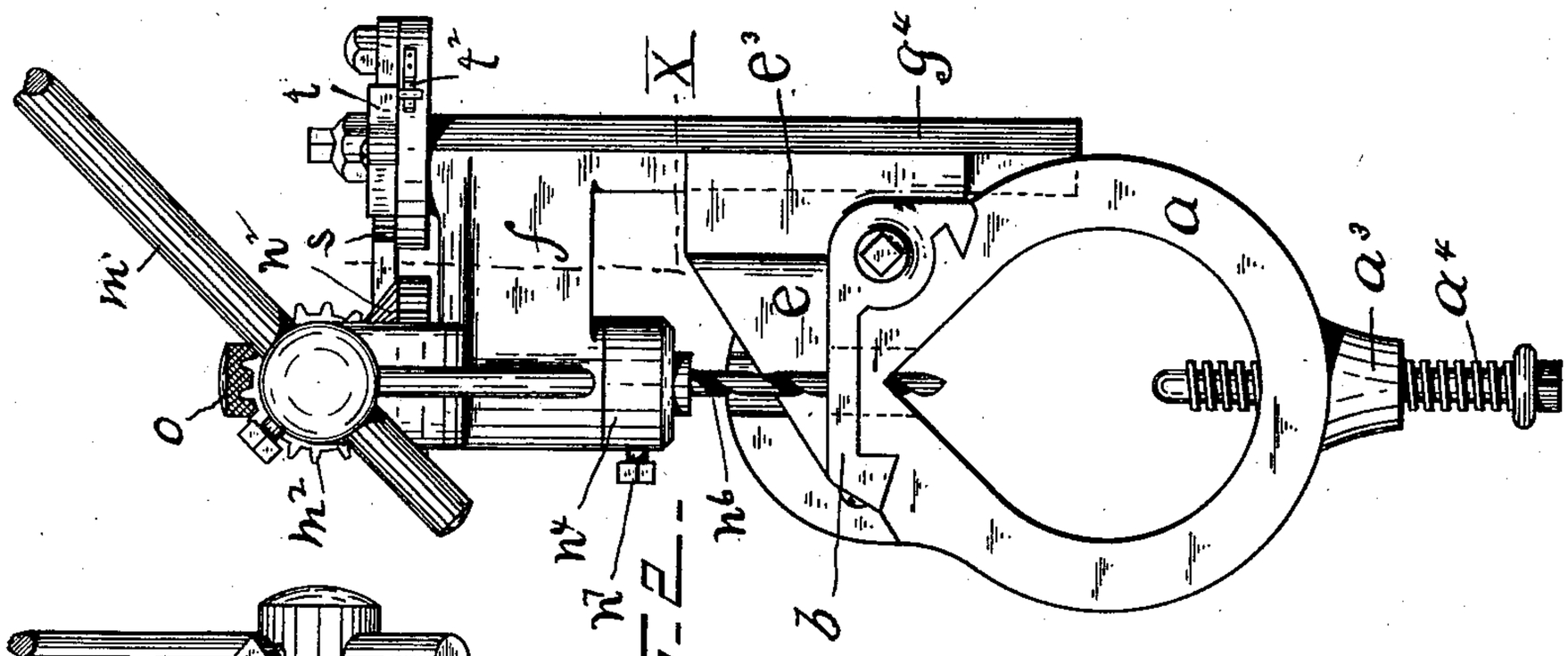

FIG. 2.

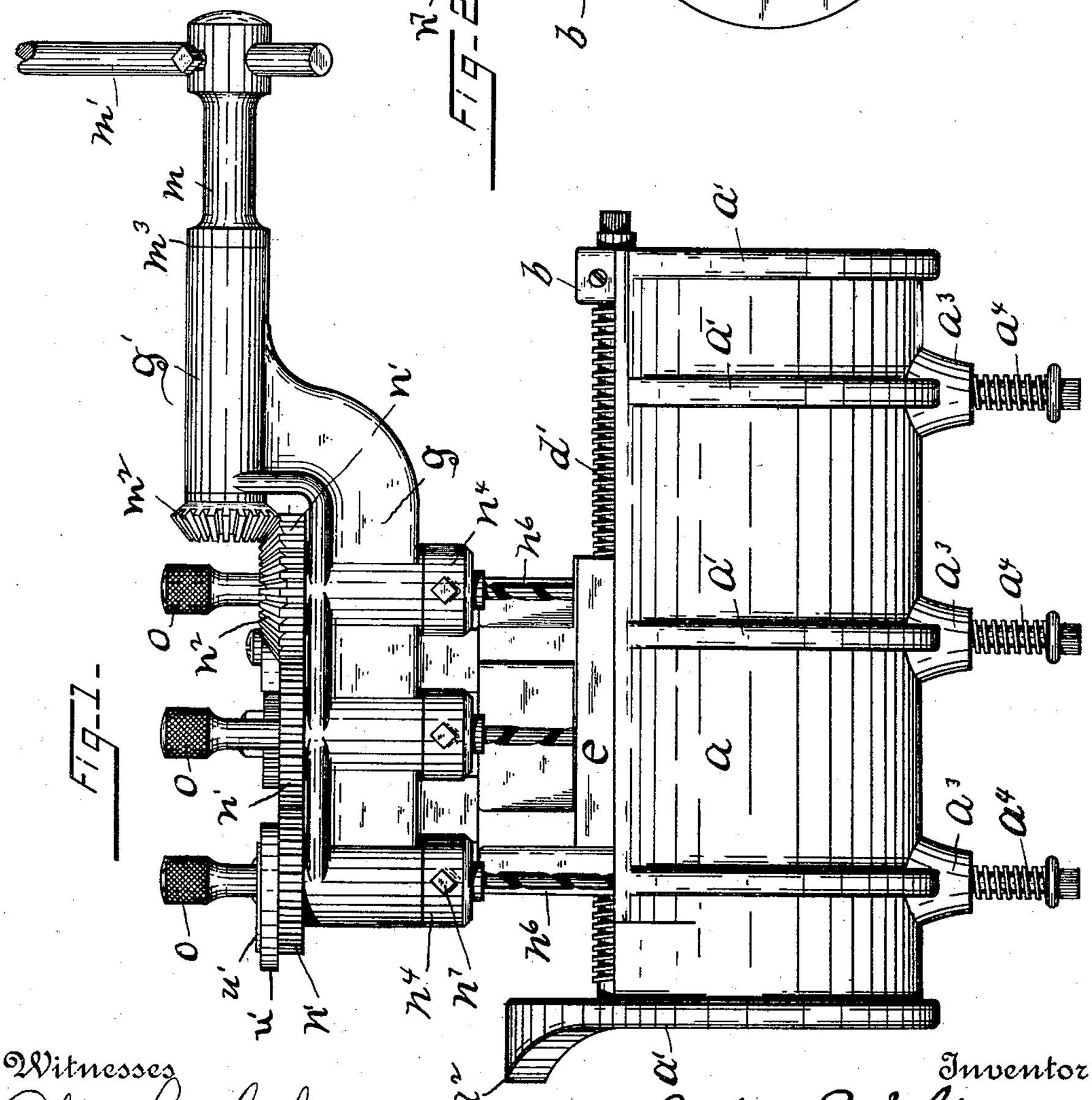

FIG. 1.

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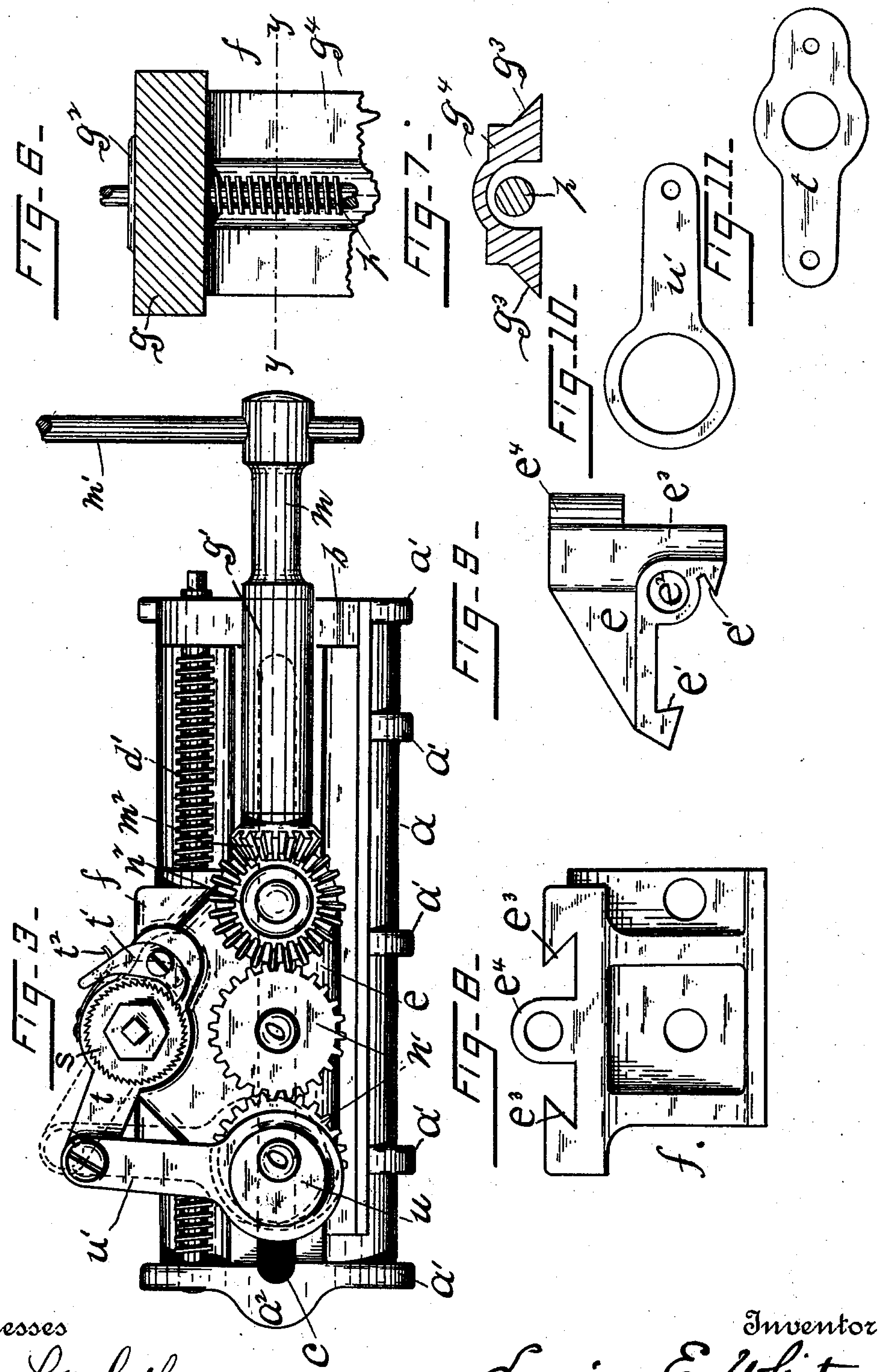

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(No Model.)

3 Sheets—Sheet 3.

L. E. WHITON.

DRILLING MACHINE.

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Fig-3-

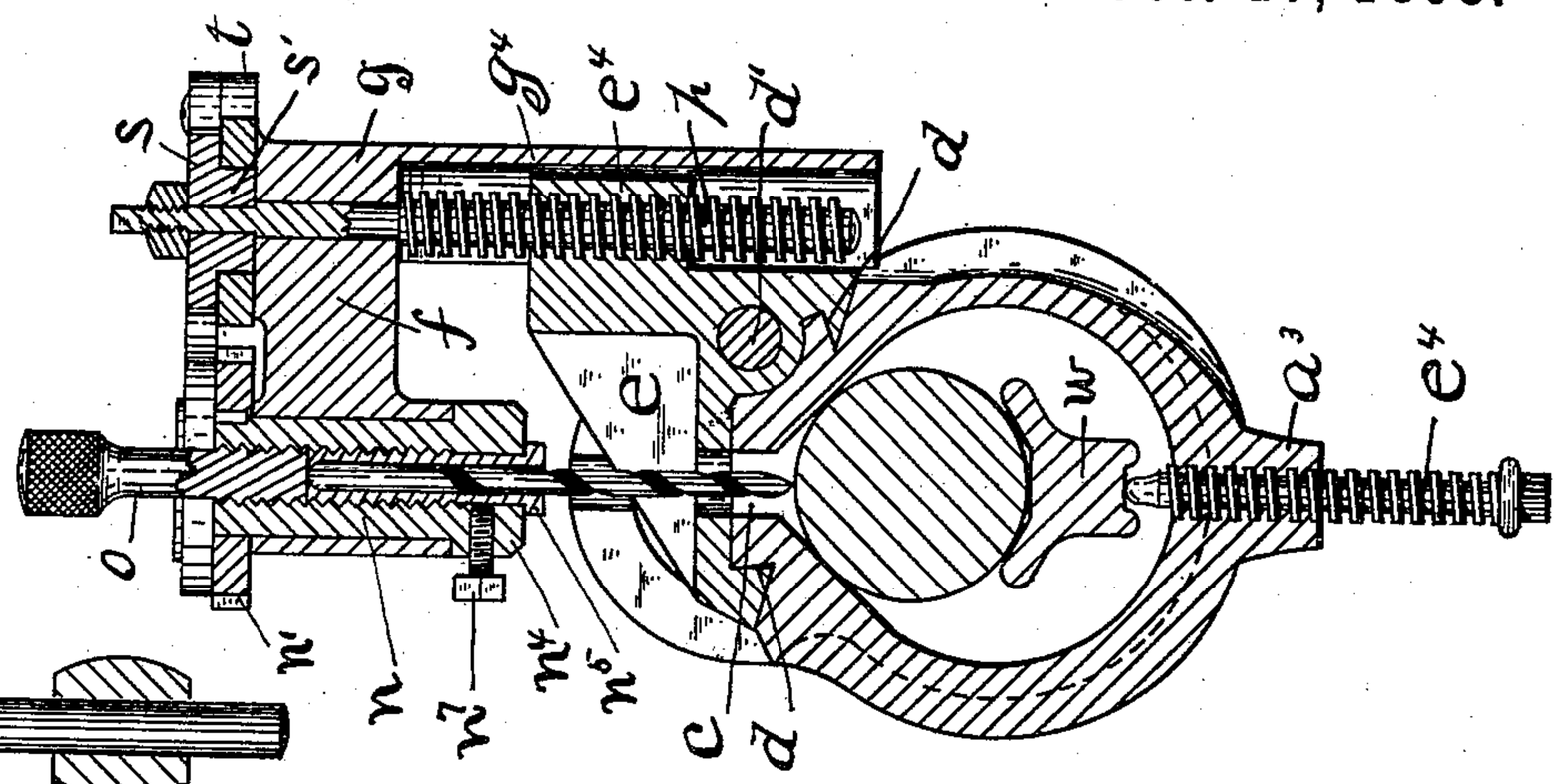
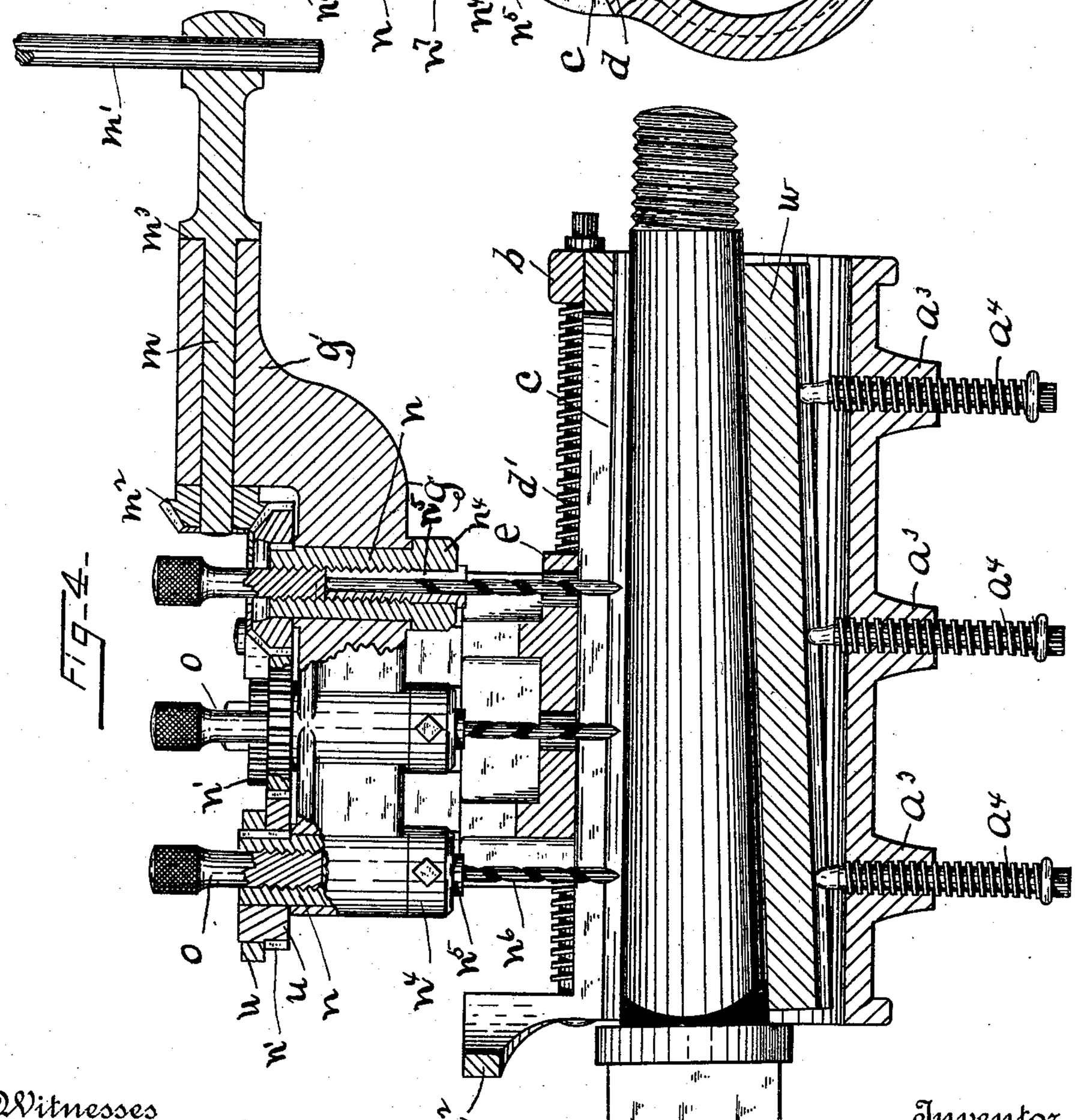


Fig-4-



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UNITED STATES PATENT OFFICE.

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DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 506,867, dated October 17, 1893.

Application filed May 1, 1893. Serial No. 472,510. (No model.)

To all whom it may concern:

Be it known that I, LUCIUS E. WHITON, a citizen of the United States, residing in the city and county of New London and State of Connecticut, have invented certain new and useful Improvements in Drilling-Machines, which improvements are fully set forth and described in the following specification, reference being to the accompanying three sheets of drawings, in which—

Figure 1 is a front elevation of my complete machine ready for use; Fig. 2 an end, and Fig. 3 a plan or top view of the same. Figs. 4 and 5 are views of said machine largely in section, said sections being taken longitudinally and transversely, respectively. Fig. 6 is a view of a portion of the vertically movable carriage which carries one or more drills, as hereinafter explained, this view being taken on line *x*—*x* of Fig. 2. Fig. 7 is a cross sectional view taken on line *y*—*y* of Fig. 6. Fig. 8 is a plan view of a horizontally movable carriage, which supports the vertically movable carriage above referred to and Fig. 9 is an end elevation of said horizontally movable carriage. Figs. 10 and 11 are detached views of an eccentric arm and rocker arm, respectively.

This invention has particular relation to machines for drilling a hole or holes in cylindrical bars and seeks to provide a portable machine of such construction that it may be cheaply manufactured, easily operated and may combine great strength with the least possible weight.

My invention is especially useful in drilling a multiple of holes in vehicle axles (an axle being shown in proper position to be operated upon in Figs. 4 and 5), to provide reservoirs for lubricating material but may as readily be used in drilling any material in bar form.

My machine consists of three distinct principal, or essential, features, viz: a case or shell preferably of considerable length in which the rod or axle to be operated upon rests and which, when in use, is firmly clamped upon said axle and is supported by the same; the shell, when thus properly clamped, serving to support the complete device in position for use, as hereinafter explained; said shell or case has mounted thereon, mechanism, by means of which a carriage, arranged to slide longitudinally on the top of the same, is driven backward and forward in suitable ways. This carriage forms the second principal feature of my invention.

The third feature consists of a vertically movable carriage arranged to slide in ways located on the rear side of the horizontally movable carriage just referred to. This vertically movable carriage supports a number of drills, and mechanism for driving the same, as well as mechanism by means of which the complete carriage is raised and lowered to feed the drills downward during the process of boring, or to draw the same upward when said process has been completed.

Referring to the drawings, the letter *a* denotes a shell or case, preferably of considerable length, the same being shaped in cross section substantially elliptical as illustrated in Fig. 2 and 5. This shell is designed to support the complete machine and is so constucted that it may receive, and be firmly clamped upon the axle with which the machine is being used; the manner of clamping said shell or case thereon being fully explained hereinafter. The case is strengthened by a number of ribs a' located at suitable positions throughout its length. As here illustrated these ribs, with the exception of those on the extreme ends, do not extend around on the rear (right hand) side of said case for the reason that they would be in the path of the movable carriages above referred to. The rib a' on the inner left hand of the case (as seen in Figs. 1, 3 and 4 of the drawings) has an upward projection a^2. This rib projection forms a bridge which, when the machine is used to bore a large axle, allows the shoulder of such axle to lie beneath the bridge thereby making it possible and convenient to drill a hole close up to the shoulder. The rib on the right hand end of the case *a* (as illustrated in Figs. 1, 3 and 4) is flattened on its upper side and has secured thereto a piece *b*, shaped as best seen in Fig. 2. A number of downwardly extending bosses a^3 are provided on the lower part of the case to provide bearings for screws a^4 used in clamping the shell upon the axle. The case is slotted, as at *c*, on its upper

side almost throughout its entire length, in order to provide an opening through which the drills may enter the case when the machine is in use, to reach the axle clamped within said shell. The walls of the shell are thickened somewhat near its upper portion and ways d are cut in this thickened portion in which the horizontally movable carriage, above referred to, is designed to travel. Supported between the projection a^2 and the piece b is a screw d' this screw being arranged to revolve freely in the bearings provided in said parts but being prevented from any lengthwise movement.

e denotes a carriage designed to slide lengthwise on the case a. This carriage has located on its lower side ribs e' designed to travel in the ways d of shell a (Fig. 5). Carriage e has also tapped longitudinally therethrough a hole e^2 to receive the screw d'. It will be obvious that if the carriage is in position on the ways, and the screw passes through the hole e^2, any rotary motion of said screw will cause the carriage to travel thereon and thus be moved forward or backward on the ways d according to the direction of rotation of the screw.

On the rear side of the carriage e are vertical ways e^3 in which the vertically movable carriage, above referred to, is designed to travel and between these ways is a projection e^4. This projection is tapped to receive a screw which is journaled in said carriage and regulates the upward and downward movement of the same.

Having now particularly described the construction of the shell or case a, which supports the complete machine, and also the construction of the longitudinally movable carriage arranged to slide backward and forward on the upper side of the same, and the mechanism by means of which said carriage is driven, I will proceed to describe the vertically movable carriage which carries a number of drills and the mechanism by means of which said drills are operated, as well as the mechanism by means of which said carriage is caused to move upward and downward. This last named carriage, when referred to as a whole throughout the remainder of this specification, is indicated by the letter f; the main frame of the same being indicated by the letter g, the approximate shape of said main frame being illustrated in the drawings. This frame g has an elongated extension g' (seen at the right hand in Figs. 1, 3 and 4) which is bored to provide a suitable bearing for a shaft m, said shaft having at its outer end a crank m' by means of which the same is caused to revolve and on its inner end a bevel gear m^2 which latter, when in operation, drives other gears hereinafter described, which, in turn, set in revolution the drills of the machine. The shaft m is preferably somewhat enlarged and shouldered toward its outer end, as at m^3, so that when the bevel gear m^2 is in position on the inner end of said shaft the latter is prevented from any lengthwise movement in either direction, although it may revolve freely in its bearings. At suitable positions on the frame g a number of bosses g^2 are formed; these bosses being bored to provide bearings for the drill spindles n. The spindles n extend through and somewhat above the frame g and bear upon their upper ends gears n'. The gear on the spindle nearest the extension g' of frame g has also on its upper side bevel gear teeth n^2 which mesh with the teeth of the gear m^2 on shaft m. It should be noted that the gear n', on the upper face of which are the bevel gear teeth n^2, should always be so located in the frame g relative to the gear m^2 that said bevel gears will mesh and also that the drill spindles n should be so located in the frame g relative to each other that their respective gears n' will always be in mesh. It will now be seen that should gear m^2 be rotated its teeth, meshing with the teeth n^2 of gear n', will drive said gear n' which in turn will drive the complete train of gears n' and their connected drill spindles; here shown as three in number. It should also be noted that it is necessary in this machine to use right and left hand drills as only every other drill will be driven in the same direction, as will be readily understood. When it is desired to only drill one hole, only one drill need be used which can be inserted in any one of the spindles, the remaining spindles running idle. The gears n' on the upper end of the spindles n prevent any downward movement of the drill spindles in their bearings and the lower ends of said spindles are formed with heads n^4 which prevent any tendency on the part of said spindles to work upward in their bearings when the drills are at work. The spindles n are tapped vertically throughout their length to receive a split sleeve or chuck n^5 in which the drills n^6 are held. A set screw n^7 in the lower end or head n^4 of the drill spindles n bears against this split sleeve and forces the same together upon the drill and clamps the latter against displacement. To still further guard against any displacement of the drills, a plug o is screwed down from the upper end of the spindle until the end of the same bears against the upper end of the drill, see Figs. 4 and 5, thus positively preventing the drill from working upward. The heads of these plugs o are in the drawings shown as milled, in order to give the same a suitable finish and to enable the operator to obtain a firm grip thereon.

The manner in which the drills are located, supported and driven having been now fully described I will proceed to describe the mechanism by means of which the carriage f is caused to travel upward and downward. The frame g is formed in its rear with a downwardly projecting portion g^4, having ribs g^3 formed thereon, designed to travel in the ways e^3 located on the rear of the carriage e as already referred to. The shape of said downwardly projecting portion on which said

ribs are formed is clearly shown in Figs. 6 and 7. The frame g is bored to provide vertical bearings for the body of a downwardly extending screw p, the same being parallel with the ribs g^3. This screw p enters the tapped hole of the projection e^4 between the ways e^3 and it will be obvious that should the screw p, when in position in said projection e^4, be revolved the carriage f will be caused to move upward or downward according to the direction of the revolution of said screw; the ribs g^3 in the meantime traveling on the ways e^3. The shank of screw p where it passes through frame g, is shouldered down somewhat so that when a ratchet wheel s hereinafter referred to is located upon the upper end of said shank the screw is prevented from any vertical movement within its bearings, although permitted to revolve freely therein.

The screw p is automatically driven by the following described mechanism. On the upper end of the shank of this screw is secured a ratchet wheel s with a downwardly extending hub s', of some length, which bears against the top of the frame g (Fig. 5). This long hub forms the axial bearing for a rocker-arm t (illustrated in Fig. 11) located beneath the ratchet wheel s which latter swings on the hub s' and is thus capable of movement independent of said wheel. This arm bears thereon a pawl t' held in engagement with the teeth of the ratchet wheel by a spring t^2 (Fig. 3). When pawl t' is engaged with said ratchet wheel, and the rocker arm t is in the position indicated in full lines in said Fig. 3, it will be obvious that should such rocker-arm be moved to the position indicated by dotted lines in said figure the pawl t will push before it and revolve for a short distance the ratchet wheel s. When the rocker arm again goes backward the spring t^2 yields and the pawl rides over the ratchet teeth until again in proper position for forward movement. The weight of the carriage f upon the screw p is sufficient to prevent any backward motion of said screw when the pawl returns to its starting point. The movements of the rocker-arm t are controlled by an eccentric u fastened to one of the gears n (shown in Fig. 4 as a solid part of the left hand gear n). This eccentric, and the end of the rocker-arm, are pivotally connected by an arm u' formed as an integral part of the eccentric (shown in detail in Fig. 10). It will be understood that when the eccentric u is in motion, through its rod u', motion will also be imparted to the rocker-arm t and, by means of its pawl t', the screw p caused to revolve by a step by step movement. When the carriage f has traveled downward until it meets the carriage e, or as low as it may be desired to have the same descend, the pawl t' is pressed back away from the ratchet wheel s thereby permitting the screw p to be revolved in the opposite direction, thus causing the carriage f to move upward until any desired height within the limits of the screw p is attained. The upper end of screw shank p is preferably squared so that a suitable wrench may be applied to same when it is desired to revolve the screw independently of the automatic mechanism above described. The heads of the clamping screws a^4, the end of the screw d and the heads of the set screws n^7 are also squared and, preferably, of the same size thereby making it necessary to have but one wrench for adjusting the machine.

The case a is clamped upon the axle in the following manner:—A Y shaped cradle w is first placed on the under side of the axle and the said axle and cradle are inserted within the case a. The lower side of the cradle is grooved to receive the upper ends of the clamping screws a^4. The screws a^4 are screwed upward beneath the cradle w carrying the latter, and the axle resting therein, before them until the axle bears against the upper converging inner sides of the case (see Figs. 4 and 5) and it will be understood that when said screws are forced home the axle will be tightly clamped between the converging walls of said case and the cradle.

Assuming now that we have a machine of the construction described and it is desired to use the same, the case is first secured in the manner just described to the axle to be operated upon, the screw d' is rotated until the carriage e, actuated by the same, and which supports the carriage f, reaches a position at which it is desired to drill. The carriage f, having been previously elevated, the handle m is grasped and the drills caused to revolve by means of the mechanism above described while at the same time the carriage is gradually fed downward, actuated by the automatic mechanism provided to lower the same thus forcing the rapidly revolving drills into the axle. When one set of holes has been drilled the carriage f, carrying the drills, is caused to travel upward removing the drills from the axle and the carriage e is then fed along until the position is reached at which it is desired to drill the second set of holes.

A suitable scale may be provided in the ways d, the same serving to indicate the amount of movement of said carriage on the ways and being useful in measuring off the distance between the several sets of holes. (See Fig. 3.) A stop may also be provided to limit the amount of downward movement of the carriage f the same serving to indicate when the desired depth of hole has been bored.

My machine has the advantages of portability and convenience of operation and the construction of the case a is such as to allow axles of widely different diameters to be supported within the same and drilled, without special adjustment.

Having described my invention, I claim—

1. In a drilling machine, in combination, a substantially tubular frame, clamps for securing an article therein, a carriage mounted

upon said frame and provided with drill-carriers, and means for operating the carriers, substantially as set forth.

2. In a drilling machine, in combination, a hollow frame, the upper side of which is slotted, means for securing articles therein, a carriage mounted upon said frame and provided with tool carriers in such a position that the tools carried thereby may project through the slotted portion of the frame, and means for operating the carriers, substantially as set forth.

3. In a drilling machine, in combination, a hollow frame, the upper portion of which is slotted longitudinally and provided with ways, a carriage mounted upon said ways, a vertically movable frame mounted upon said carriage and provided with tool carriers in such a position that the tools carried thereby may project through the slot in the first mentioned frame, and means for moving the frame and operating the carriers, substantially as set forth.

4. In a drilling machine, in combination, a hollow frame, the upper portion of the bore of which is tapered, set screws through the bottom of the frame, a cradle within the frame upon the screws, a carriage upon the frame provided with tool-carriers, and means for rotating the carriers, substantially as set forth.

5. In a drilling machine, in combination, a hollow frame, the upper portion of which is slotted longitudinally and the exterior is provided with ribs, the rib at one end being provided with a projection forming a bridge, a piece secured to the opposite end of the frame, a screw threaded shaft journaled in the projection and in the piece, a carriage movably secured upon the frame in engagement with the shaft, and provided with tool carriers and means for operating the carriers, substantially as set forth.

6. In a drilling machine, in combination, a frame, a longitudinally movable carriage mounted thereon, a vertically movable frame mounted upon the carriage, hollow spindles mounted in the vertically movable frame, provided with intermeshing gear, a split sleeve in each spindle, each sleeve being adapted to receive a drill, a lock above each sleeve for engaging with and retaining each sleeve in the spindle, and a means for operating the sleeves, substantially as set forth.

7. In a drilling machine, in combination, a frame, a longitudinally movable carriage mounted thereon, a vertically movable frame upon the carriage, hollow spindles in the vertically movable frame, a split sleeve in the lower end and a plug in the upper end of each spindle, the upper end of which projects above the end of the spindle and is milled, and means for operating the spindles and sleeves, substantially as set forth.

8. In a drilling machine, in combination, a frame, a longitudinally movable carriage mounted upon the frame, the rear portion of which is provided with ways and a screw threaded projection, a frame mounted upon the ways, a screw threaded shaft in the frame in engagement with the projection of the carriage, the upper end of the shaft being provided with a ratchet, spindles in the frame upon the carriage, the upper ends of which are provided with intermeshing gears, one of them being provided with an eccentric, and a pawl in engagement with the ratchet wheel and adapted to be operated by the eccentric, and means for operating the drills, substantially as set forth.

9. In a drilling machine, in combination, a frame, a longitudinally movable carriage mounted upon the frame the rear portion of which is provided with ways and a screw threaded projection, a vertically movable frame upon the ways, a screw threaded shaft journaled in the frame in engagement with the extension of the carriage, a ratchet wheel upon the shaft provided with a projecting hub, a rocker arm upon the hub, a spring actuated pawl upon the arm, drill spindles journaled in the frame the upper ends of which are provided with intermeshing gears, and one end is provided with an eccentric, a pitman from the eccentric to the rocker arm, and means for operating the drills, substantially as set forth.

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