No. 633,512. Patented Sept. 19, 1899.

A. D. GROOM.

AUTOMATIC DRILLING MACHINE.

(Application filed Dec. 23, 1898.)

(No Model.) 3 Sheets—Sheet 1.

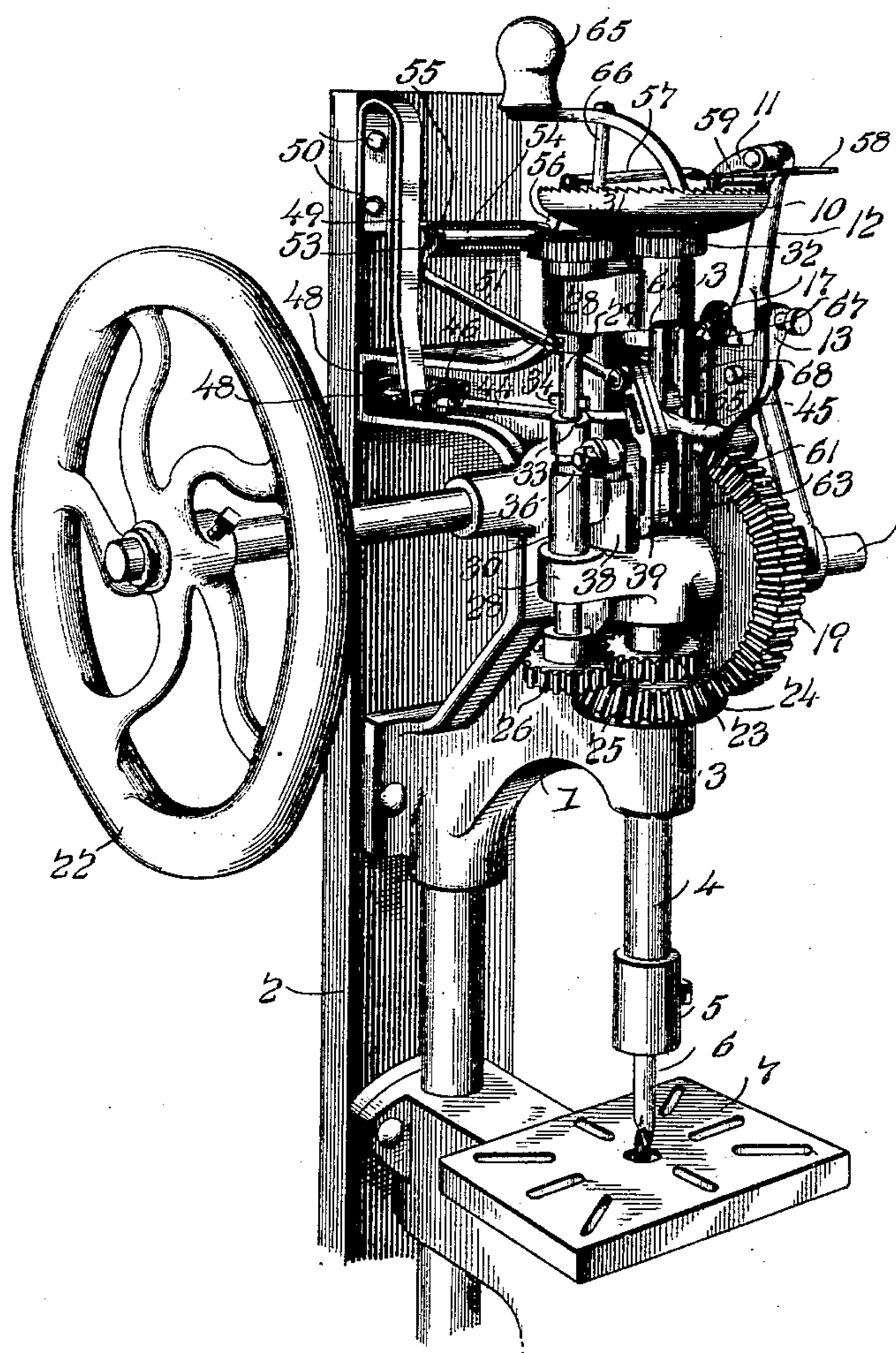

Fig. 1.

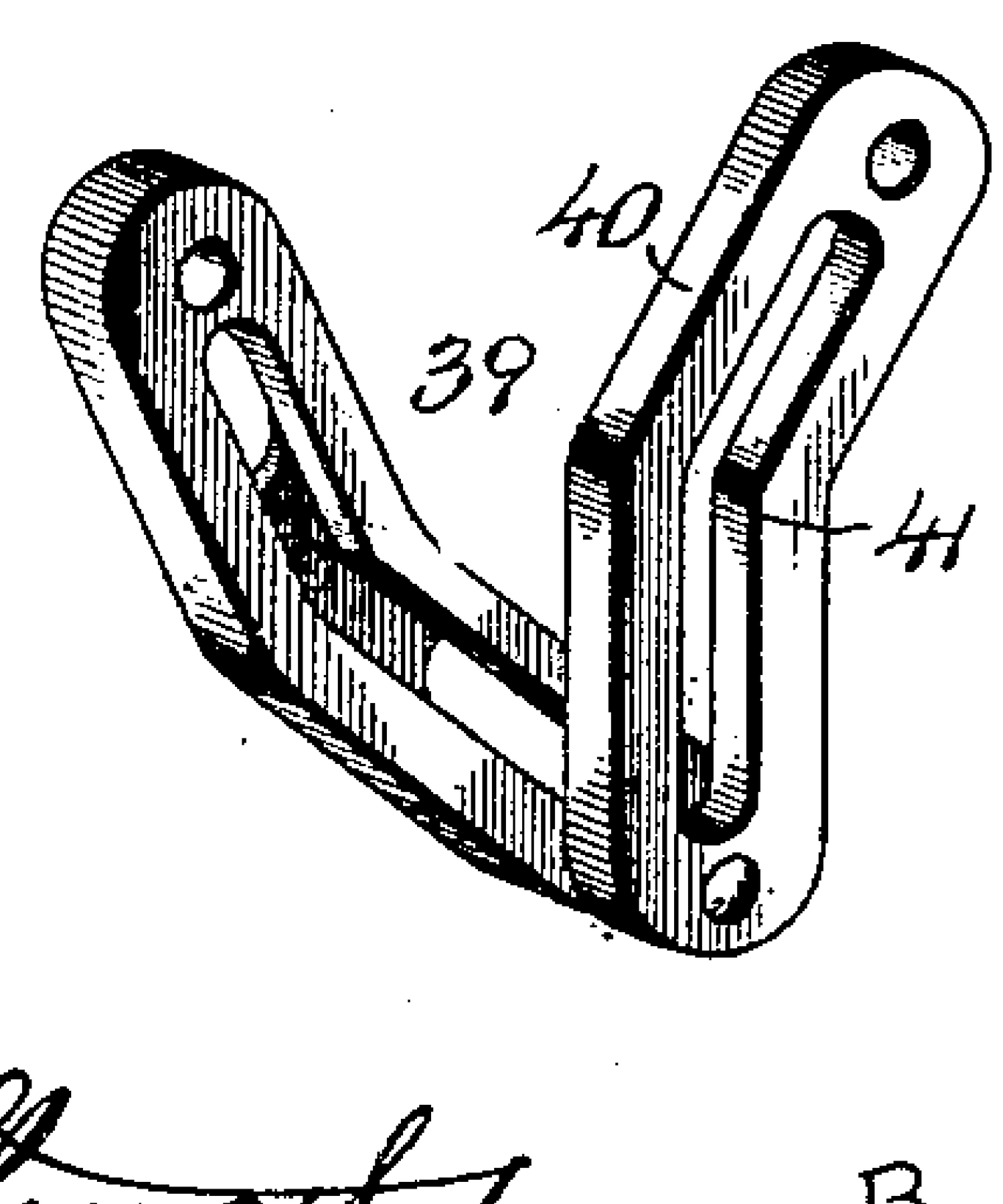

Fig. 6.

Witnesses

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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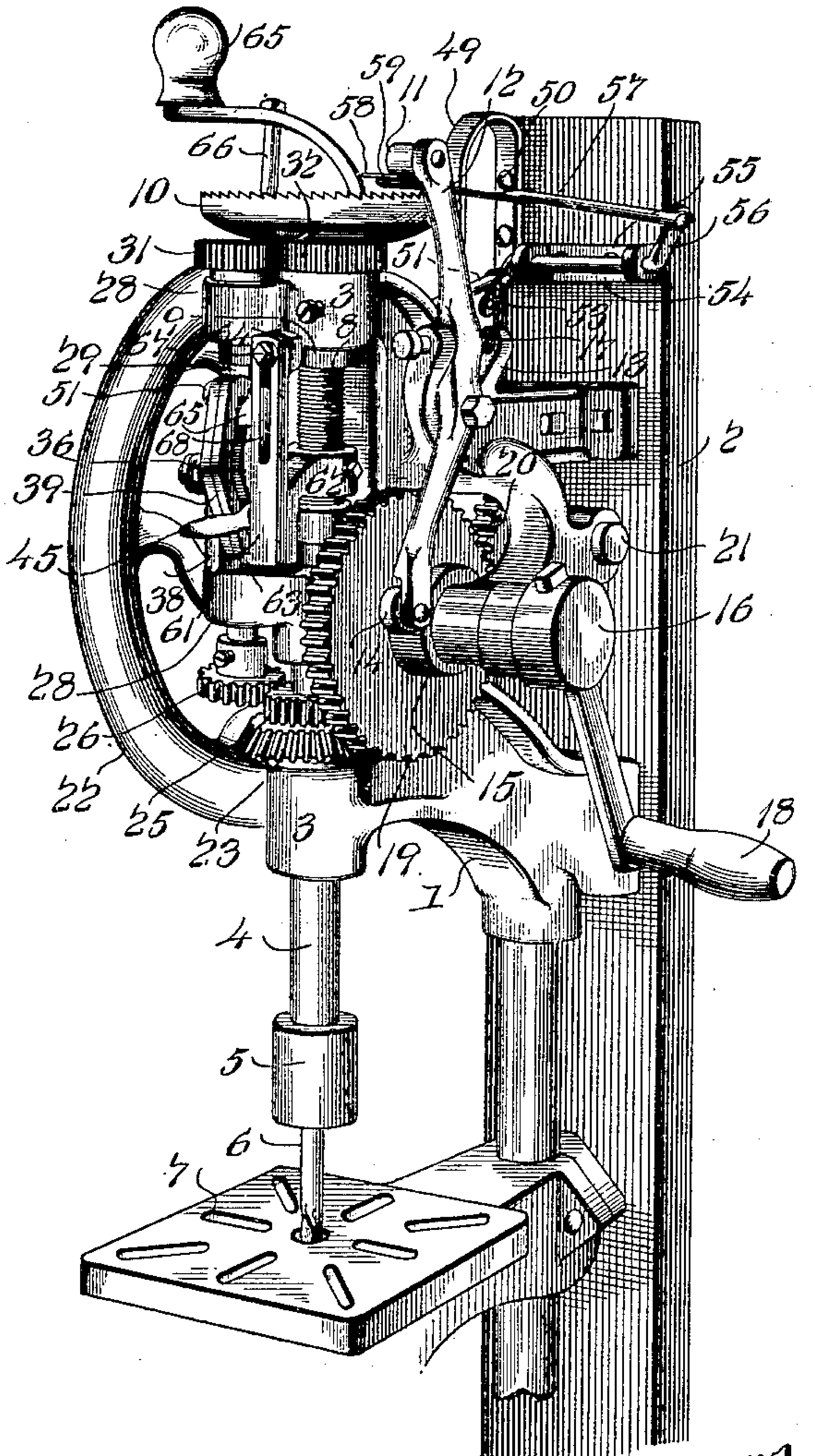
3 Sheets—Sheet 2.

Fig. 2.



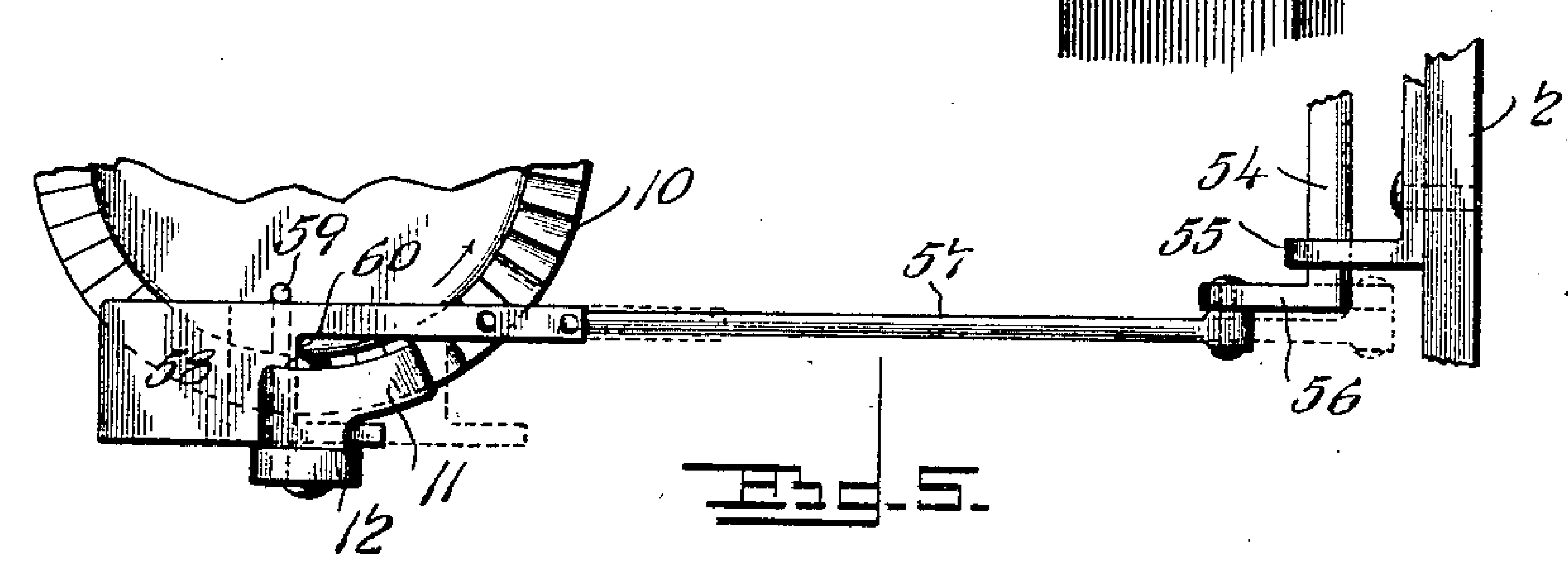


Fig. 5.

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Fig. 3.

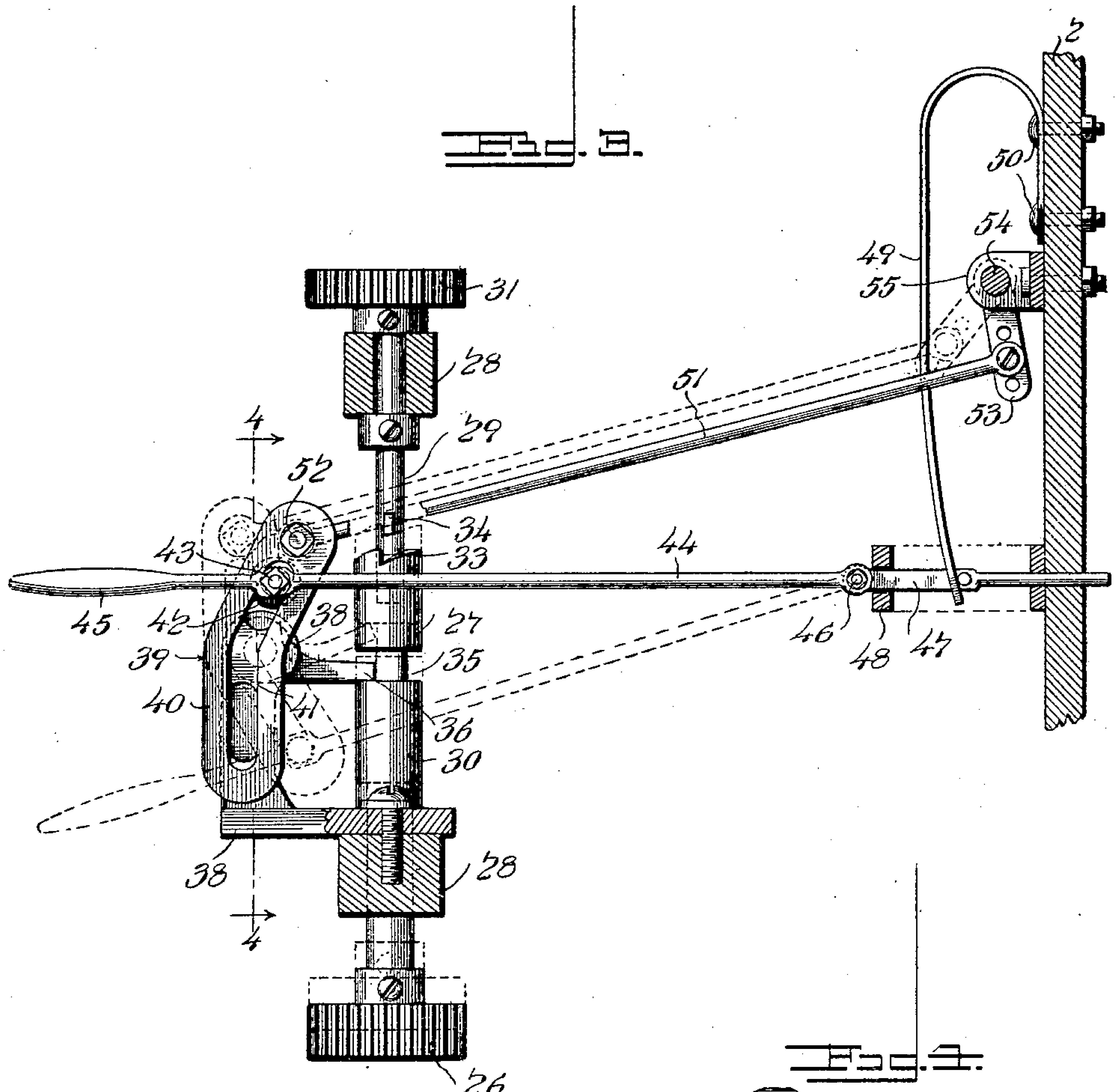


Fig. 7.

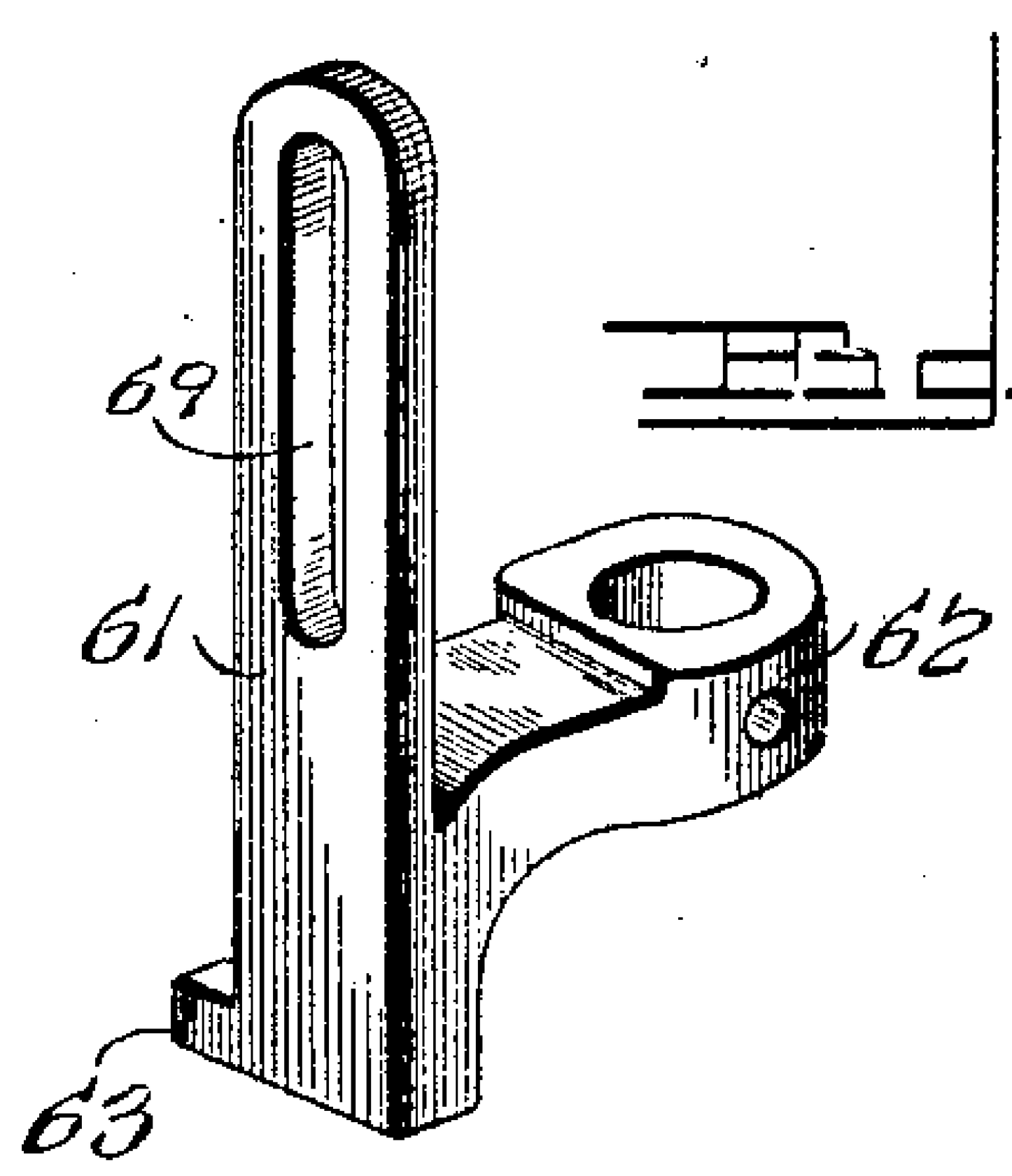
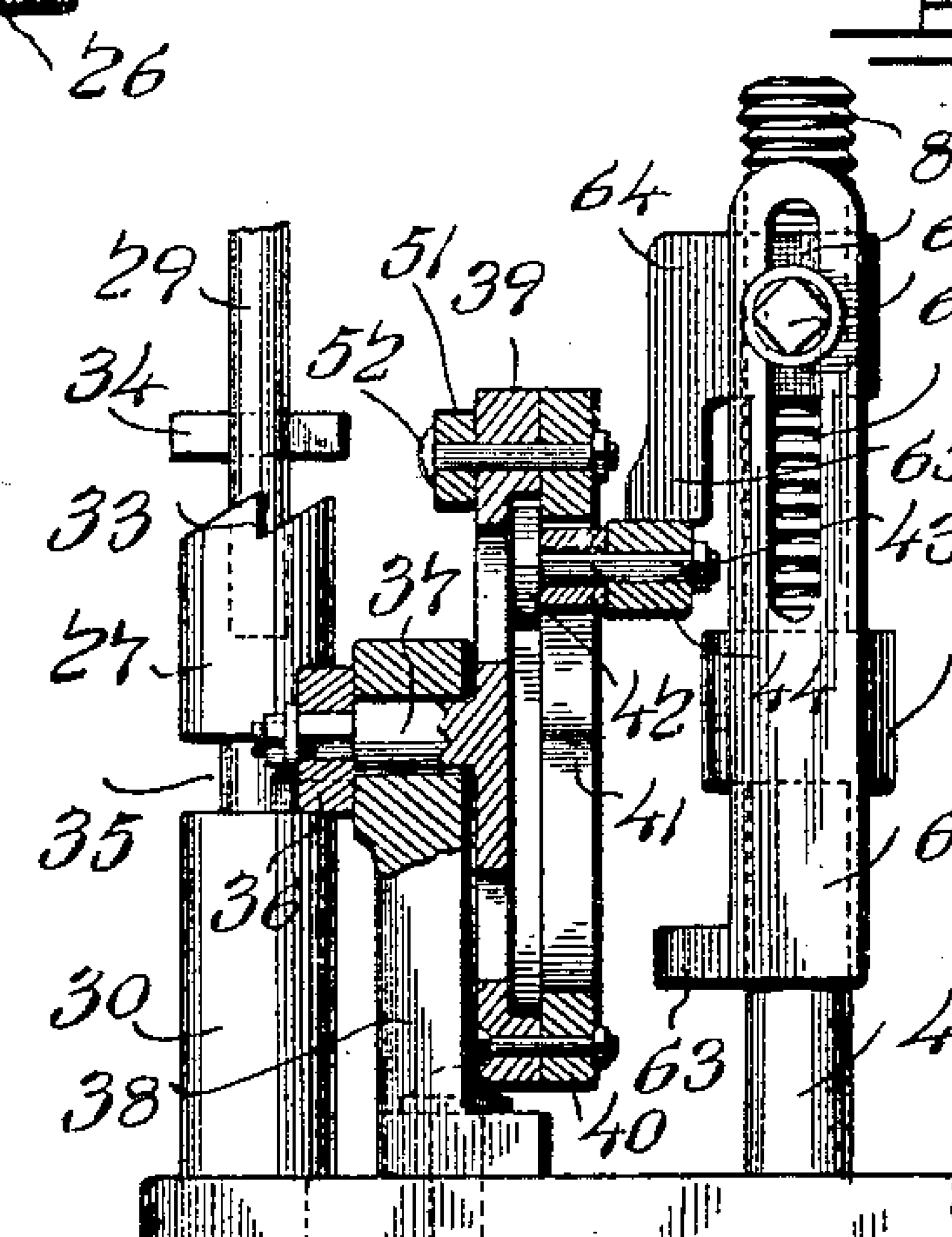


Fig. 4.



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UNITED STATES PATENT OFFICE.

ANDREW D. GROOM, OF GLENORA, PENNSYLVANIA.

AUTOMATIC DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 633,512, dated September 19, 1899.

Application filed December 23, 1898. Serial No. 700,155. (No model.)

To all whom it may concern:

Be it known that I, ANDREW D. GROOM, a citizen of the United States, residing at Glenora, in the county of Butler and State of Pennsylvania, have invented a new and useful Automatic Drilling-Machine, of which the following is a specification.

This invention relates to an improved automatic quick-return mechanism for drilling-machines, drill-presses, or similar machines having an automatic screw-feed for the drill-spindle; and it has for its object to provide an efficient and positive mechanism of this character that will make the machine entirely automatic in both the feed and return movements of the drill-spindle, while at the same time insuring a quick return movement of the spindle when the latter reaches the limit of its movement.

The invention is specially applicable to that class of drilling-machines employed by blacksmiths and carriage-makers and commonly known as "blacksmiths' drills," which type of drills embody as essential features thereof a drill-spindle having a screw portion in combination with a revoluble feed-nut carrying a crown ratchet-wheel rotated automatically by an oscillatory pawl-carrying lever, yet any type of machine having these elements can be equipped with the mechanism contemplated by the invention to provide for an automatic quick return of the spindle.

With these and other objects in view, which will readily appear as the nature of the invention is better understood, the same consists in the novel construction, combination, and arrangement of parts hereinafter more fully described, illustrated, and claimed.

While the essential and characteristic features of the invention are necessarily susceptible of modification, still the preferred embodiment of the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a perspective view of a drilling-machine or blacksmith's drill equipped with the quick-return mechanism contemplated by the present invention. Fig. 2 is a similar view of the machine, exposing the opposite side from that shown in Fig. 1. Fig. 3 is a vertical sectional view, the line of section being at one side of the eccentric link and the pitman and reversing-lever connections therewith. Fig. 4 is a detail vertical sectional view on the line 4 4 of Fig. 3, the line of section including the eccentric link and the adjacent tappet-support carried by the drill-spindle. Fig. 5 is a detail plan view showing the active and inactive positions of the pawl-arresting plate with relation to the feed-pawl of the machine. Fig. 6 is a detail in perspective of the segmental eccentric link. Fig. 7 is a similar view of the tappet-support.

Referring to the accompanying drawings, the numeral 1 designates the supporting-frame of a drilling-machine, which is fastened to an upright support 2 in the usual manner and is provided with a plurality of vertically-alined bearings 3 for the revoluble longitudinally-movable drill-spindle 4, which carries at its lower end the usual chuck or holder 5 for the drilling-bit 6, working over the table 7 of the machine. The said drill-spindle 4 is provided with a threaded portion or member 8, which is engaged by the interior threads of the revoluble feed-nut 9, mounted within the uppermost bearing 3 of the drill-frame and carrying at the upper side thereof the usual crown ratchet-wheel 10, the peripheral teeth of which are engaged by the gravity feed-pawl 11, pivotally mounted on the upper end of an oscillatory pawl-carrying lever 12. The oscillatory pawl-carrying lever 12 is pivotally mounted intermediate its ends on a forked bracket extension 13, projected from one side of the drill-frame, and the lower end of said lever has fitted thereto an antifriction-roller 14, riding on the periphery of an actuating-cam 15, mounted on the short horizontal drive-shaft 16, journaled in a bearing at one side of the drill-frame. The said actuating-cam 15, in combination with a suitable spring 17 at one side of the lever 12, imparts an oscillatory movement to the latter, and thereby provides for automatically and intermittently turning the ratchet-wheel 10, and thereby, through the medium of the feed-nut 9, cause a downward feed movement to be imparted to the drill-spindle. The drive-shaft 16 has fitted to its outer end an operating-crank 18 and to its inner end a combined bevel and spur gear-wheel 19, the spur portion of which meshes with the pinion 20 of the counter-shaft 21, carrying at one end the usual balance or fly wheel 22. The bevel-gear portion

of the wheel 19 meshes with the bevel gear-pinion 23 of a gear-hub 24, splined on the drill-spindle, so as to rotate therewith, while at the same time permitting the spindle to have its necessary reciprocatory movement. These various parts of the drilling-machine are the usual appurtenances thereof and form no part of the present invention, but have been specifically described, as the same directly coöperate with the quick-return mechanism forming the subject-matter of the application and which mechanism will now be described.

The gear-hub 24, which receives its motion from the drive gear-wheel 19, in addition to the usual bevel gear-pinion 23, is provided with a driving-cog 25 for the quick-return mechanism, and this driving-cog meshes with a pinion 26 at the lower end of a vertically-arranged telescopic shaft 27, the separate members of which normally rotate independently of each other. The said telescopic shaft 27 is mounted in the vertically-alined lateral bearing-lugs 28, projected from one side of the drill-frame, and consists, respectively, of the upper shaft-rod 29 and lower shaft-sleeve 30, having a loose telescopic fit, and the lower shaft-sleeve member 30 of the shaft carries at its lower end the pinion 26 referred to, while the upper rod member 29 of the telescopic shaft carries at its upper end the horizontal gear-pinion 31, meshing with a corresponding gear-pinion 32, carried by the feed-nut 9 at the under side of its crown ratchet-wheel 10. To provide for interlocking the members 29 and 30 of the telescopic shaft at the proper time, the lower sleeve-section 30 is provided at its upper end with shoulders 33, adapted to be moved into engagement with a cross-pin 34, fitted in the upper shaft-rod member 29, and when thus interlocked the two members of the shaft rotate together and transmit motion directly from the driving-gear of the machine to the feed-nut.

Adjacent to its upper shouldered end the lower sleeve-section 30 of the telescopic shaft is provided with an annular groove 35, which is loosely engaged by the point of a rock-arm 36, secured fast on the outer end of a journal-pin 37, mounted in a bearing-bracket or stand 38, fastened to the drill-frame at one side of the drill-spindle. The journal-pin 37 is projected centrally from one side of the segmental oscillatory eccentric link 39, which link is provided at the side opposite the journal-pin with a longitudinally-slotted face-plate 40, the longitudinal slot in which follows the segmental curvature of the link and is provided with an obtuse-angled side 41, with which coöperates the flanged guide-roller 42. The flanged guide-roller 42 has the flange thereof engage at the inner side of the face-plate 40, so that the roller will be held to a proper working movement within the longitudinal slot thereof, and said roller 42 is loosely journaled on a short spindle-bolt 43, projected from or fastened to the reversing-lever 44. The reversing-lever 44 is provided beyond the roller 42 with a handle extension 45, disposed at the front of the machine, and the opposite end of said reversing-lever is pivotally joined, as at 46, to the slide-rod 47, slidably supported by a suitable bracket 48, fastened to one side of the drill-frame and engaged by the lower forked end of a bowed leaf-spring 49, the upper free end of which spring is preferably secured fast, as at 50, to the upright support 2 for the entire machine. The pressure of the free end of the spring 49 is normally exerted in a direction away from the link 39, and consequently pulls upon the reversing-lever 44. The oscillatory movement of the link 39 is imparted to a pitman 51. This pitman is pivotally connected at its front end, as at 52, to the upper end of the link 39 and at its rear end to the rock-arm 53, fitted to one end of a short rock-shaft 54, journaled in a bearing-bracket 55, fastened to the support 2 for the machine. The other end of the rock-shaft 54 carries a second rock-arm 56, to which is pivotally connected one end of an adjusting-arm 57, which carries at its opposite end a flat pawl-arresting plate or blade 58, which is loosely supported beneath the feed-pawl 11 upon a supported arm 59, projected laterally from the pawl-carrying lever 12. At the end next to the arm 57, extended therefrom, the said pawl-arresting plate or blade 58 is provided with a fork or bifurcation 60, in which the pawl freely plays when in action.

To provide for the proper adjustment of the guide-roller in the slot of the eccentric link, the tappet-support 61 is employed. The said support has projected from the same at an intermediate point a collar 62, which is adjustably fastened on the drill-spindle 4 at any desired point according to the limit at which the feed of the drill is to be arrested and reversed, and below the collar 62 the tappet-support is provided with a laterally-projecting tappet-hook 63, adapted to engage beneath the reversing-lever to move the guide-roller into the upper end of the slot of the link above the axis or journal thereof, while a correspondingly-opposite movement is given to the reversing-lever by the upper tappet-arm 64. The tappet-arm 64 is provided at its lower end with a heel 65, adapted to engage at the upper side of the reversing-lever 44, and at its upper end with an attaching-plate 66, carrying the bolt 67, engaging in the longitudinal slot 68 of the tappet-support 61, to provide for varying the distance between the upper and lower tappets 64 and 63, respectively, according to the required longitudinal reciprocation of the drill-spindle.

Normally when the drilling operation is in progress the separate members of the telescopic shaft have no interlocking connection and revolve independently of each other, and the guide-roller carried by the reversing-lever lies within the upper portion of the slot in the eccentric link above the axis or jour-

nal of the latter and is held in such position by the retraction of the spring 49. The eccentric link is thus held in a position which depresses the rock-arm 36 and pushes the pitman 51, which rocks the shaft 54, in a direction which causes the pawl-arresting plate 58 to be slid upon its support 59 to a position whereby the feed-pawl will freely play in the fork or bifurcation of said plate. With this position of the various parts there is no interference with the free downward feed of the drill-spindle; but as such spindle continuously moves downward the upper tappet or tappet-arm 64 moves against the reversing-lever and presses the same downward until the roller 42 passes the axial center of the link-slot, this movement of the roller necessarily drawing out the spring. As the roller 42 passes the axial center of the link the spring 49 will draw upon the reversing-lever and oscillate the eccentric link in a direction which will cause the same to pull outward upon the pitman 51, and thereby draw the pawl-arresting plate beneath the feed-pawl, so as to render the latter inactive. The same movement of the eccentric link elevates the sleeve member 30 of the telescopic shaft the slight distance necessary to interlock the shoulders thereof with the cross-pin of the rod-section 29, thus causing the two shaft members to rotate together and transfer motion from the drive-shaft directly to the feed-nut, so that the rotation of this nut will be reversed and will consequently return or elevate the drill-spindle to its initial position. During the return or reverse movement of the drill-spindle the tappet-hook 63 will lift up the reversing-lever until the roller 42 passes above the axial center of the link, when the spring 49 will again oscillate the latter and cause the various parts of the mechanism to resume their normal positions and permit the downward feed of the drill-spindle to again take place. Should the operator at any time or at any point desire to reverse the movement of the drill-spindle, it is simply necessary to grasp the handle extension 45 of the reversing-lever and move the same up or down, as will be readily understood.

To adapt the machine for use under all conditions and with all kinds of work, the crown ratchet-wheel 10 has preferably mounted rigidly on the upper side thereof a crank-handle 65, held spaced from the wheel by the brace-bolt 66 and providing means whereby the feed mechanism may be operated manually, especially in boring soft metals.

Changes in the form, proportion, and the minor details of construction may be resorted to without departing from the principle or sacrificing any of the advantages of this invention.

Having thus described the invention, what is claimed, and desired to be secured by Letters Patent, is—

1. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut having pawl-and-ratchet operating mechanism, and the drive-gearing, of a normally-inactive gear connection between the drive-gearing and the feed-nut, said gear connection having relatively fixed and movable members, a device for arresting the action of the pawl of said operating mechanism, an oscillatory link having an operative connection with the movable member of the gear connection, and also with the arresting device, a reversing device for shifting the position of the link, and means for setting into action said reversing device by the movement of the tool-spindle, substantially as set forth.

2. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut, and the drive-gearing, of a normally-inactive gear connection between the drive-gearing and the feed-nut, the said gear connection having a movable member, an oscillatory link having a rock-arm connection with said movable member of the gear connection, and means for causing the oscillation of the link by the movement of the tool-spindle, substantially as set forth.

3. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut, and the drive-gear, of a telescoping shaft having the separate members thereof geared respectively with the feed-nut and the drive-gearing, said shaft consisting of an upper rod having a cross-pin, and a lower sleeve loosely receiving the rod and provided with shoulders adapted to be moved into engagement with the pin, an oscillatory link having a rock-arm connection with said sleeve, and means for causing the oscillation of the link by the movement of the tool-spindle, substantially as set forth.

4. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut, and the drive-gearing, of a telescopic shaft geared with said feed-nut and drive-gearing and having interlocking members, normally disengaged, and one of which is longitudinally movable, an oscillatory link having a rock-arm connection with said longitudinally-movable shaft member, and means for causing the oscillation of said link by the movement of the tool-spindle, substantially as set forth.

5. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut, and the drive-gearing, of a normally-inactive gear connection between the drive-gearing and the feed-nut, said gear connection having a longitudinally-movable member, an oscillatory link having a rock-arm connection with said longitudinally-movable member of the gear connection, a device for arresting the action of the operating connections for said revoluble feed-nut, an operative connection between said link and said arresting device, and means for causing the oscillation of said link by the movement of the tool-spindle, substantially as set forth.

6. In a machine of the class described, the

combination with the tool-spindle, the revoluble feed-nut having pawl-and-ratchet operating mechanism, the pawl-carrying lever of which mechanism is provided with a support, and the drive-gearing, of a quick-return mechanism having a normally-inactive gear connection between the drive-gearing and the feed-nut, an independent pawl-arresting plate slidably sustained by the said support of the pawl-carrying lever, and arranged to slide beneath the pawl, and means, controlled by the movement of the tool-spindle, for automatically and simultaneously setting into action said gear connection and sliding the pawl-arresting plate beneath and in contact with the point of the pawl, substantially as set forth.

7. In a machine of the class described, the combination with the tool-spindle, a revoluble feed-nut having a pawl-and-ratchet operating mechanism, and the drive-gearing, of a normally-inactive telescopic shaft geared with the feed-nut and drive-gearing and having a longitudinally-movable member, an oscillatory link having a rock-arm connection with said longitudinally-movable shaft member, a reciprocatory adjusting-arm carrying a forked pawl-arresting plate slidably supported beneath the pawl of said pawl-and-ratchet operating mechanism, a suitably-arranged rock-shaft having a rock-arm connection with said adjusting-arm, a pitman connection between said oscillatory link and said rock-shaft, and means for causing the oscillation of said link by the movement of the tool-spindle, substantially as set forth.

8. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut, and the drive-gearing, of a normally-inactive telescopic shaft geared with the feed-nut and drive-gearing and having a longitudinally-movable member, a segmental longitudinally-slotted oscillatory link pivotally supported at a central point and having a rock-arm connection with the longitudinally-movable shaft member, a spring-retracted reversing-lever carrying a roller engaging in the slot of the link, and a tappet-support fitted to the tool-spindle and having oppositely-located tappet projections engaging respectively above and below the reversing-lever to shift the roller thereof within the link, substantially as set forth.

9. In a machine of the class described, the combination with the tool-spindle, the revoluble feed-nut, and the drive-gearing, of a normally-inactive telescopic shaft geared with the feed-nut and drive-gearing, a segmental longitudinally-slotted oscillatory link having a connection with the telescopic shaft for interlocking the members thereof, a spring-retracted reversing-lever carrying a lateral projection engaging in the slot of the link, a tappet-support adjustably mounted on the tool-spindle and provided at its lower end with a tappet-hook engaging beneath the reversing-lever, and a vertically-arranged tappet-arm mounted for longitudinal adjustment on the tappet-support and lying above the reversing-lever to provide for moving the same in a downward direction, substantially as set forth.

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

ANDREW D. GROOM.

Witnesses:

WM. E. PIPHER,

A. S. MORROW.