No. 704,770. Patented July 15, 1902.

M. WILLIAMS.

WELL DRILLING MACHINE.

(Application filed Nov. 26, 1901.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 2.

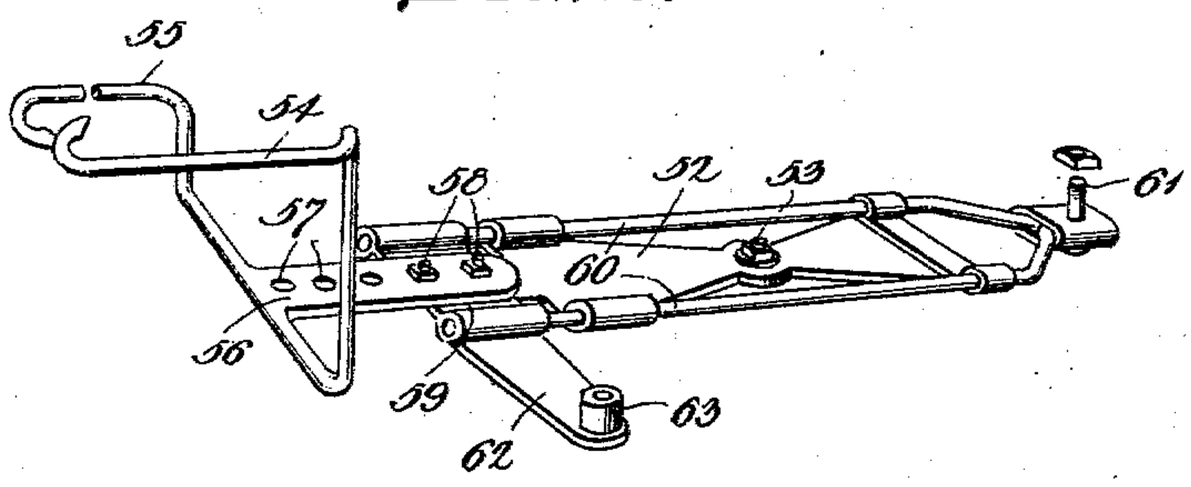

FIG. 1.

Witnesses
J. Frank Culverwell.
J. C. Garner

Inventor.
Michael Williams,
by C. A. Snow & Co.
Attorneys

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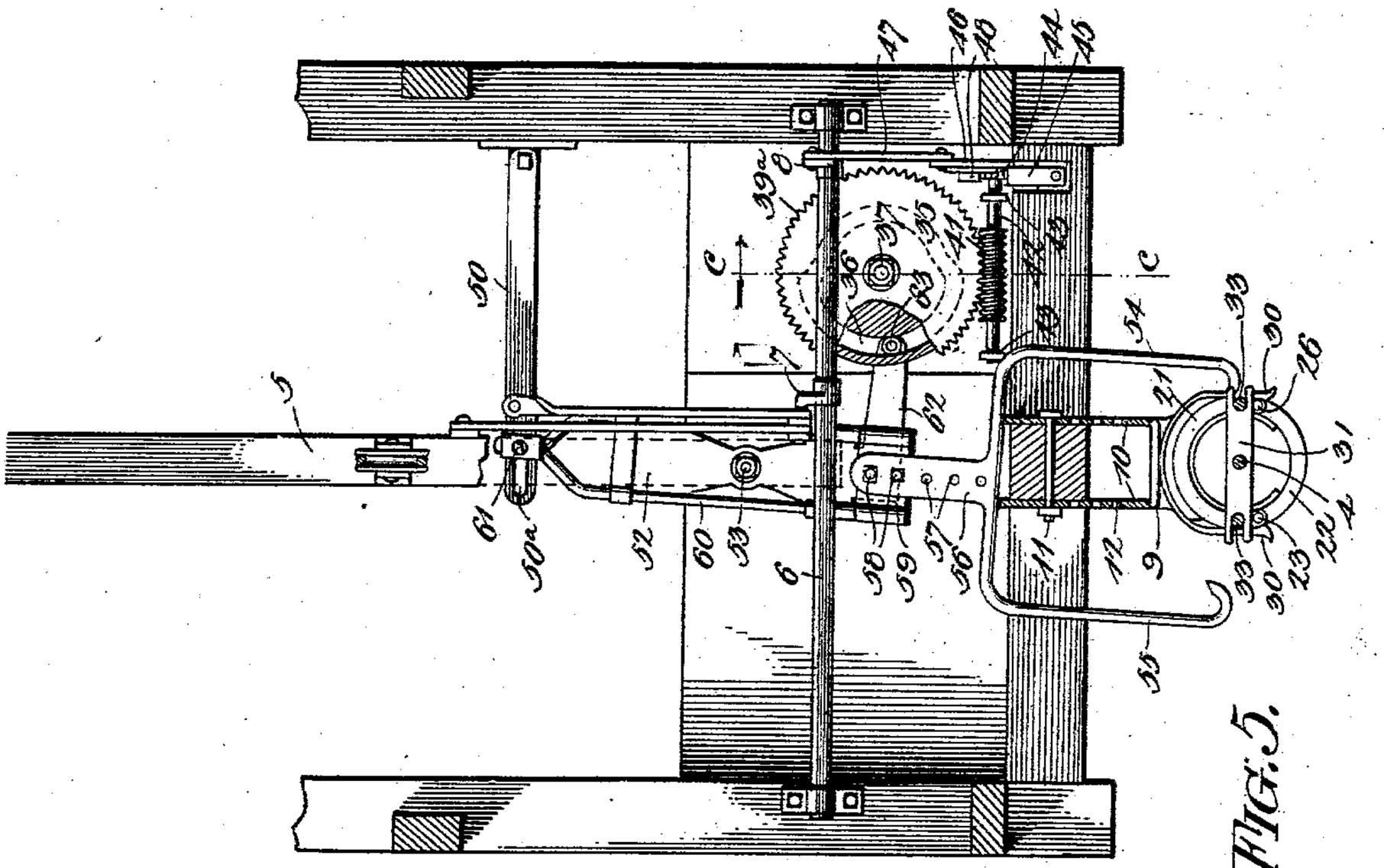

FIG. 2.

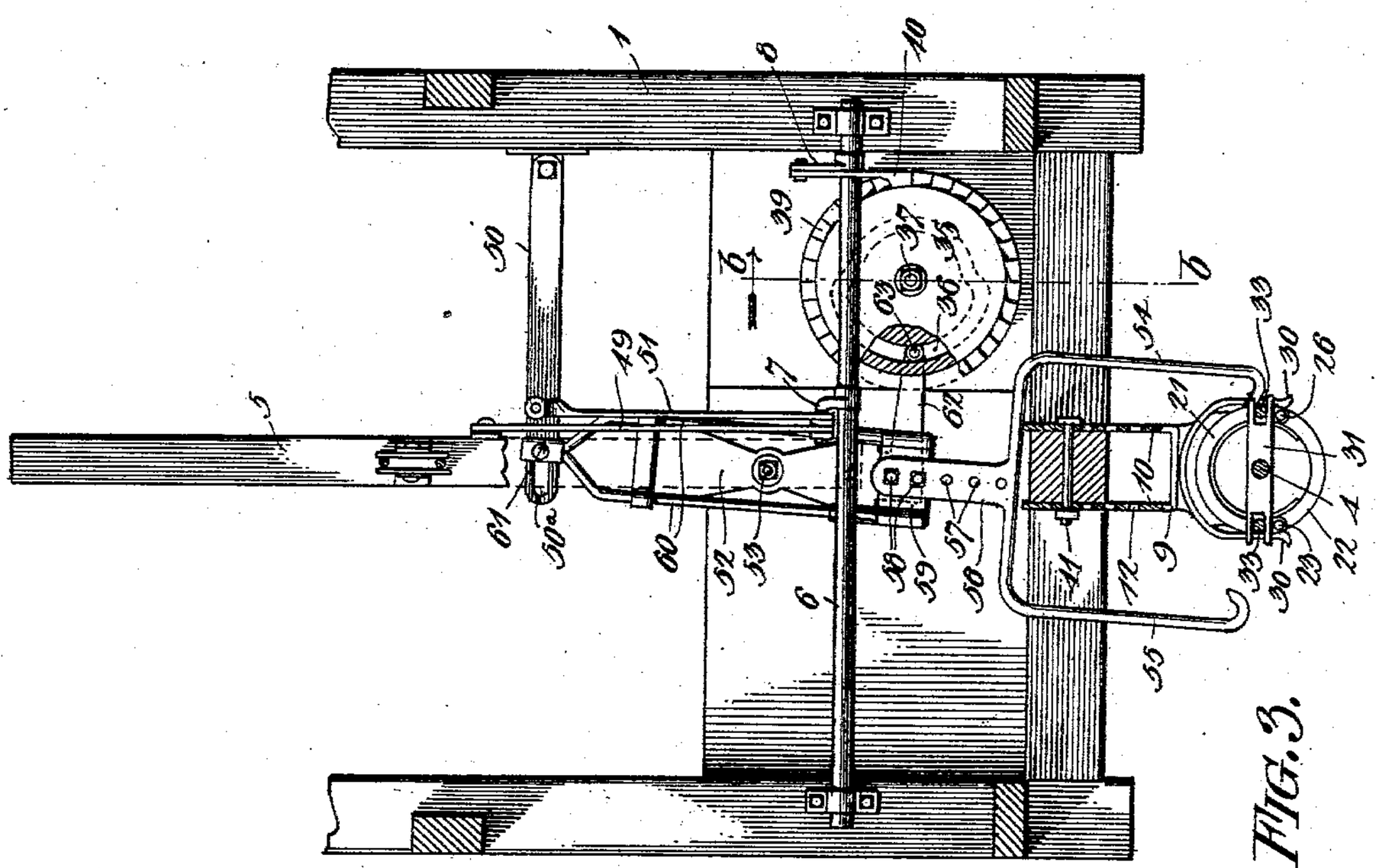

FIG. 3.

Witnesses
J. Frank Calvert.
J. C. Garner

Inventor,
Michael Williams,
by C. A. Snow & Co.
Attorneys

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M. WILLIAMS.

WELL DRILLING MACHINE.

(Application filed Nov. 26, 1901.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 9.

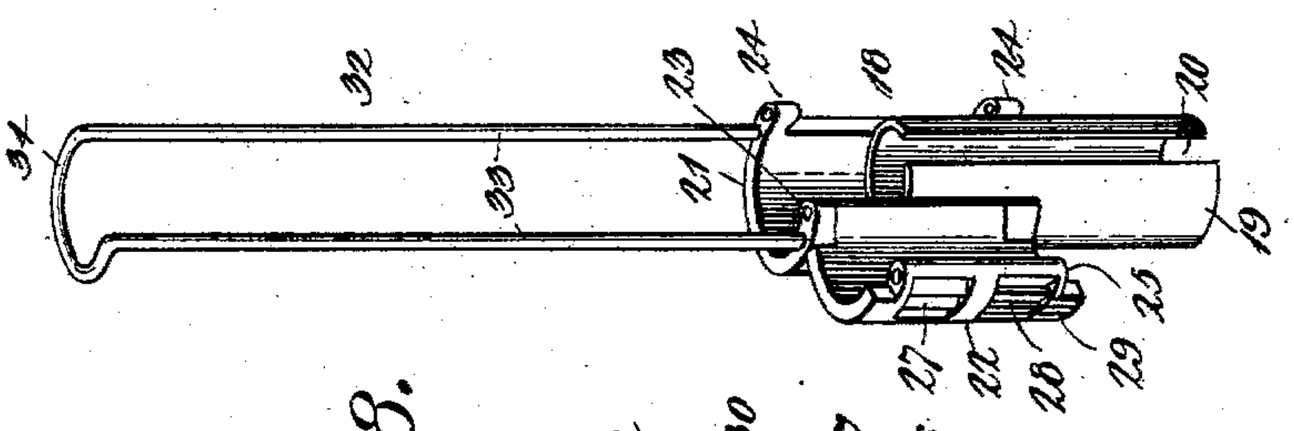
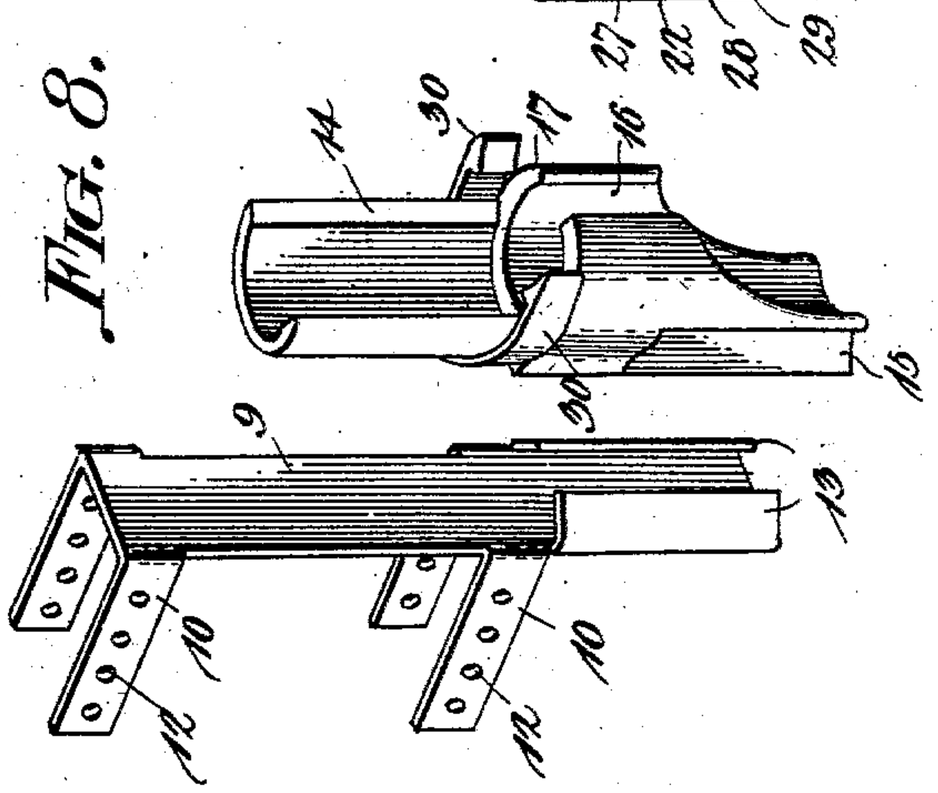


FIG. 10.

FIG. 7.



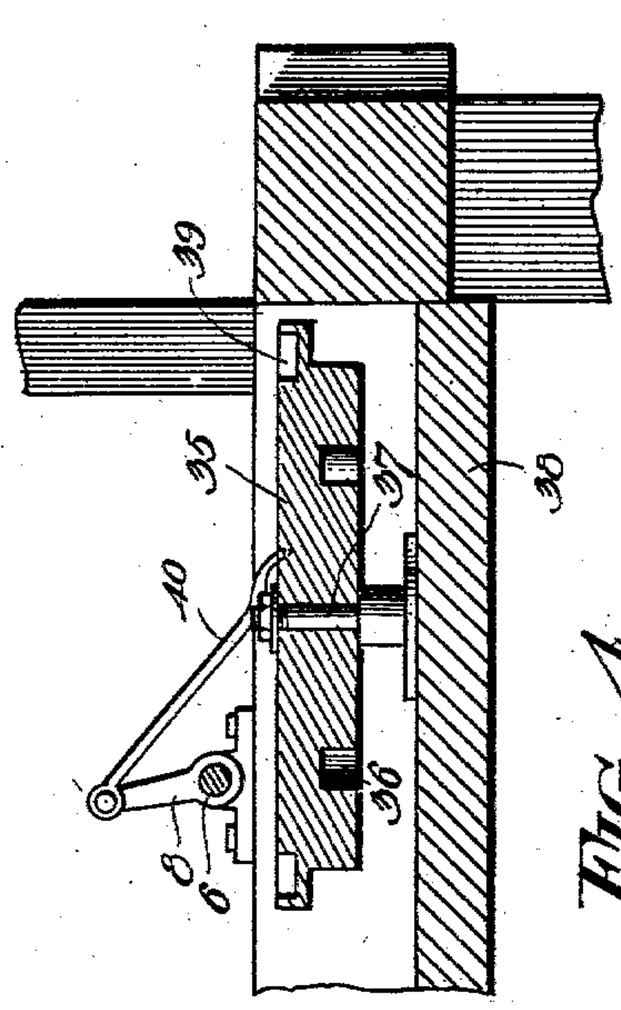


FIG. 4.

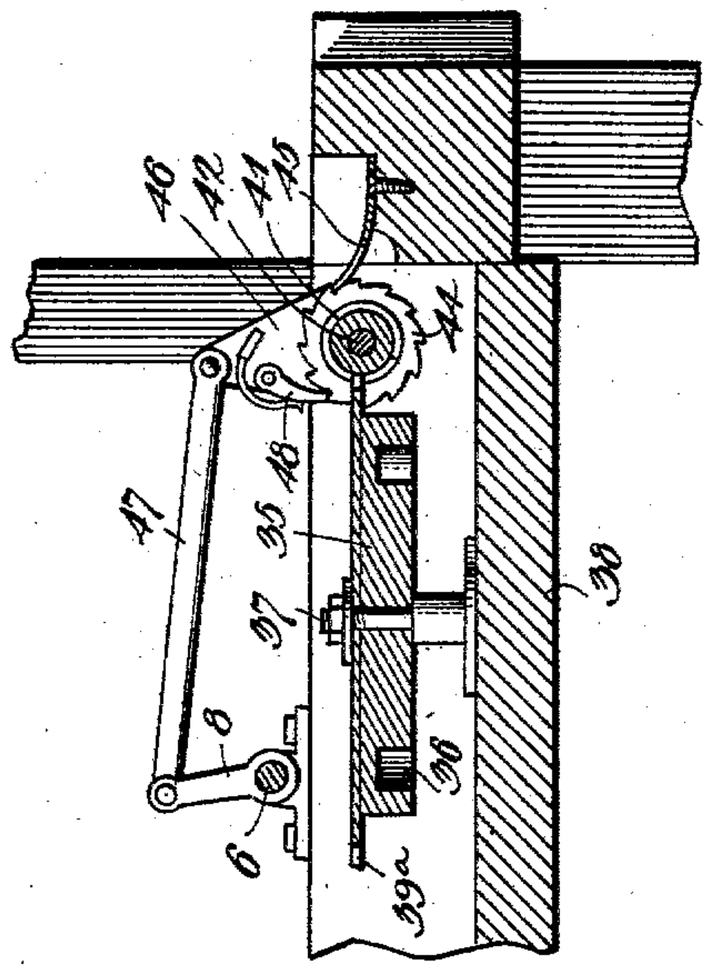


FIG. 6.

Witnesses
J. Frank Cumberwell.
J. W. Garner

Michael Williams, Inventor.
by Cachow & Co.
Attorneys

UNITED STATES PATENT OFFICE.

MICHAEL WILLIAMS, OF MADISON, WISCONSIN, ASSIGNOR OF ONE-THIRD TO WILLIAM J. SCHNEIDER, OF MIDDLETOWN, WISCONSIN.

WELL-DRILLING MACHINE.

SPECIFICATION forming part of Letters Patent No. 704,770, dated July 15, 1902.

Application filed November 26, 1901. Serial No. 83,785. (No model.)

To all whom it may concern:

Be it known that I, MICHAEL WILLIAMS, a citizen of the United States, residing at Madison, in the county of Dane and State of Wisconsin, have invented a new and useful Well-Drilling Machine, of which the following is a specification.

My invention relates to improvements in well-drilling machines, the object of my invention being to provide means for automatically turning the drill-rope alternately in reverse directions to turn the drill-tool attached to the rope in the bore as is required during the progress of the work and to prevent the drill-rope from becoming unduly twisted.

My invention consists in the peculiar construction and combination of devices hereinafter fully set forth and claimed.

In the accompanying drawings, Figure 1 is a vertical longitudinal sectional view of a portion of a well-drilling machine embodying my improvements. Fig. 2 is a detail perspective view of the successively effective pawls which rotate the rope-guide and showing the connections for shifting said pawls. Fig. 3 is a top plan view, partly in section, on a plane indicated by the line *a a* of Fig. 1. Fig. 4 is a detail vertical sectional view taken on a plane indicated by the line *b b* of Fig. 3. Fig. 5 is a view which is similar to Fig. 3 and shows a modification. Fig. 6 is a detail vertical sectional view taken on a plane indicated by the line *c c* of Fig. 5. Fig. 7 is a detail perspective view of the adjustable support for the bearing in which the rope-guide rotates. Fig. 8 is a similar view of the bearing for the rope-guide. Fig. 9 is a similar view of the rope-guide. Fig. 10 is a face view of the cam-wheel.

In the embodiment of my invention here shown the framework 1 of the drill-rope-operating machine is of the usual construction, 2 being the mast, which carries the direction-sheave 3. The drill-rope 4 is operated by the usual lever 5, which is connected to a rock-shaft 6, that is provided with a pair of rock-arms 7 8.

A vertically-disposed support 9, which is preferably of the form shown in Fig. 7, but may be of any preferred form, is provided at its upper end and near its lower end with rearwardly-extending arms 10, which bear on opposite sides of the lower portion of the mast and are secured thereto by bolts 11. The said arms 10 are provided with adjusting-openings for the said bolts, and hence the said support may be adjusted toward and from the mast, as may be required. At the lower end of the support, on the front side thereof, are forwardly extending and converging flanges 13. A bearing 14, which is approximately cylindrical in form, is provided in its rear side, at its lower portion, with vertical grooves 15, which are adapted to receive the flanges 13, and hence the said bearing is adapted to be secured on the front side of the support 9. A vertical opening 16 is in the front portion of the bearing 14, at the intermediate portion thereof, which projects forwardly and forms a flange 17. In the said bearing 14 is journaled a rope-guide 18, which is here shown as consisting of the cylindrical lower portion 19, having the opening 20 in one side, and the approximately semicylindrical members 21 22, which are disposed around the upper portion of the cylinder 19, the latter being secured to or formed with the member 21. The cylindrical portion 19 of the rope-guide fits and is adapted to revolve in the lower portion of the bearing 14, and the lower ends of the members 21 22 when the same are closed together in circular form bear upon the flange 17, which supports the said rope-guide. The members 21 22 are hinged together at one side, as at 23, and are provided with suitable means for fastening them together when closed. The member 21 is here shown as provided with projections 24, which are adapted to overlap a projection 25, with which the member 22 is provided, and a suitable pin 26 may be inserted in alined openings in the said projections to lock the said members when closed. The said members 21 22 of the rope-guide are provided on their outer sides with an upper series of ratchet-teeth 27 and a lower series of ratchet-teeth 28, the said series of ratchet-teeth being reversely disposed. The lower ends of the members 21 22 are provided on their outer sides with an annularly-disposed series of notches 29. The bearing 14 is provided with a pair of spring-pressed dogs 30, which by engagement with the said notches 29 retard the

rotation of the rope-guide and act as a brake. The rope-guide may be readily engaged with the drill-rope by disposing the slot 20 in line with the slot 16 and opening the member 22, as shown, and when the said member 22 is closed against the member 21 and fastened thereto the drill-rope is retained in the said rope-guide, as will be understood. A turning-bar 31 is suitably secured to and adjustable on the drill-rope above the rope-guide and moves vertically with the drill-rope in the operation thereof. A traveler 32, which rises from the upper end of the drill-rope guide and rotates therewith, has a pair of vertical guide members 33, which are engaged by the turning-bar and on which the latter slides, the upper ends of the said vertical members 33 being connected together by a laterally-offset semicircular portion 34, which clears the drill-rope.

From the foregoing it will be understood that by revolving the rope-guide during the operation of the machine the drill-rope will be turned with the said guide.

I will now describe improved means for automatically revolving the rope-guide by a step-by-step movement first in one direction and then in the reverse direction to prevent the drill-rope from being unduly twisted.

A wheel 35, which is provided with a cam-slot 36, revolves on a vertical spindle 37, which is secured on a platform or other suitable support 38, with which the frame 1 is provided. In the form of my invention shown in Figs. 1, 3, and 4 the said wheel 35 is provided on its upper side with ratchet-teeth 39 and is rotated by a step-by-step movement by a pawl 40, which is carried and operated by the rock-arm 8 of the rock-shaft 6. Hence the said wheel 35 is rotated by a step-by-step movement.

In the form of my invention shown in Figs. 5 and 6 the wheel 35 is provided with spur-teeth 39^a, which are successively engaged by a worm 41, that is carried by a shaft 42, which is journaled in bearings 43. The said shaft has a ratchet-wheel 44, which is fast thereon and is engaged by a spring dog or detent 45 to prevent reverse rotation of the worm. An oscillating arm 46 is mounted on said shaft 42 and is connected by a rod 47 to the rock-arm 8 of the rock-shaft 6. Hence oscillating motion is imparted to the arm 46 when the machine is in operation. Said oscillating arm 46 carries a spring-pressed pawl 48, which engages the ratchet-wheel 44, and hence rotates the worm 41 and the wheel 35 by a step-by-step movement. The lever 5 is connected to the rock-arm 7 by a bar 49. Hence the said rock-shaft 6 is operated by said lever. A horizontally-disposed link-lever 50 is connected to the rock-arm 7 by a pitman 51. Hence the said link-lever 50 is oscillated. A guide 52 is pivotally mounted, as at 53, on the support 38 of the frame 1 at a suitable distance in rear of the lower portion of the mast. A pair of successively effective pawls 54 55, which respectively coact with the ratchets 27 28 to rotate the rope-guide alternately in reverse directions, are here shown as connected to a bracket-arm 56, which is provided with a series of adjusting-openings 57 for bolts 58, that secure the said bracket-arm to a cross-head 59. Parallel rods 60, which are engaged by the pivoted guide 52, are connected to said cross-head, and their rear ends are connected together and are connected to the oscillating link-lever 50 by a bolt, pin, or stud 61, that operates in a slot 50^a, with which said link-lever is provided. Hence the pawls 54 55 are operated longitudinally by said link-lever, and when one of said pawls is engaged with the revoluble drill-rope guide said guide will be rotated by a step-by-step movement in one direction, as will be understood. The parallel rods 60 are in effect members of the said pawls and render the latter extensible in length to compensate for the adjustment of the drill-rope guide, with the support for the bearing thereof, toward and from the mast. An operating-arm 62 projects from one side of the pivoted guide 52 and is provided with a tappet-roller 63, that operates in the cam-slot 36 of the wheel 35. The step-by-step rotation of said wheel is thus effective to successively engage the said pawls with the drill-rope guide, so that the latter will be alternately rotated in reverse directions and prevented from becoming twisted to too great an extent in either direction.

My invention is effective to automatically turn the drill-rope, and hence the tool attached thereto, to turn the drill-tool appropriately in the bore as the work progresses and avoids the necessity of doing this manually.

I do not desire to limit myself to the precise combination and construction of devices herein shown and described, as it is evident that modifications may be made therein without departing from the spirit of my invention.

The cam-wheel 35 may be of any suitable construction; but I prefer to construct the same as shown in Fig. 10. The cam-slot 36 is made in the under side of said wheel, and said slot comprises the oppositely-disposed segmental portions 36^a 36^b, which are concentric with the center of the wheel and of different radii, the portion 36^b having the least radius, and oblique portions 36^c, which connect said segmental portions.

Having thus described my invention, I claim—

1. In a well-drilling machine, the combination of a revoluble drill-rope guide having two series of reversely-disposed ratchet-teeth, one of said series being above the other, with pawls to engage said ratchet-teeth respectively, said pawls being disposed on opposite sides of said guide, means to operate said pawls, a shiftable support for said pawls and means to automatically operate said shiftable support and thereby successively engage the said pawls, to rotate said drill-rope guide

alternately in reverse directions, substantially as described.

2. In a well-drilling machine, the combination of a revoluble drill-rope guide having two series of reversely-disposed ratchet-teeth, with pawls to engage said ratchet-teeth respectively, means to operate said pawls, means to successively shift them into engagement with the respective teeth of said drill-rope guide, and a brake for said drill-rope guide, substantially as described.

3. In a well-drilling machine, the combination of a revoluble drill-rope guide having two series of reversely-disposed ratchet-teeth, with pawls to engage said ratchet-teeth respectively, a pivoted support for said pawls, said pivoted support having a tappet, means to impart longitudinal motion to said pawls, a cam coacting with said tappet to shift said pivoted support and thereby shift the said pawls into engagement alternately with the ratchet-teeth of said drill-rope guide, and means to operate said cam, substantially as described.

4. In a well-drilling machine, the combination of a revoluble drill-rope guide having two series of reversely-disposed ratchet-teeth, pawls to engage said ratchet-teeth respectively, a lever to operate the drill-rope, a connection between said lever and said pawls whereby the latter are operated to rotate said drill-rope guide, a shiftable element connected to said pawls to successively shift them into engagement with the respective teeth of said drill-rope guide and means, including a step-by-step movement, operatively connected to said lever, to shift said shiftable element, substantially as described.

5. In a well-drilling machine, the combination of a revoluble drill-rope guide having two series of reversely-disposed ratchet-teeth with pawls to engage said ratchet-teeth respectively, a lever to operate the drill-rope, a connection between said pawls and said lever whereby said pawls are moved longitudinally, a shiftable element connected to said pawls to successively engage them with the respective teeth of said drill-rope guide, and a connection including a step-by-step mechanism between said shiftable element and said lever, to actuate said shiftable element, substantially as described.

6. In a well-drilling machine, the combination of a revoluble drill-rope guide having two series of reversely-disposed ratchet-teeth, pawls to engage said ratchet-teeth respectively, a drill-rope-operating lever, a rock-shaft, a lever 50 connected to the said pawls to move the latter longitudinally, a connection between said lever 50 and the rock-shaft, an operating connection between the latter and said drill-rope lever, whereby said rock-shaft is operated, a shiftable element connected to the pawls to successively shift them into engagement with the respective teeth of the drill-rope guide and a step-by-step mechanism actuated by said rock-shaft to operate said shiftable element, substantially as described.

7. In a well-drilling machine, the combination of a mast for the direction-sheave of the drill-rope, a support connected to the said mast and adjustable toward and from the same, a bearing carried by said support, a revoluble drill-rope guide journaled in said bearing and adjustable means to rotate the said drill-rope guide alternately in reverse directions, substantially as described.

8. In a well-drilling machine, the combination of a mast, a revoluble drill-rope guide, a bearing therefor, adjustable toward and from the mast, a drill-rope-operating lever and an adjustable element, operatively connected to said lever for rotating said drill-rope guide, substantially as described.

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

MICHAEL WILLIAMS.

Witnesses:

ELSIE MEMHARD,

JOHN C. FEHLANDT.