No. 699,122. Patented Apr. 29, 1902.

D. WARNER.

DRILLING MACHINE.

(Application filed Feb. 25, 1901.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

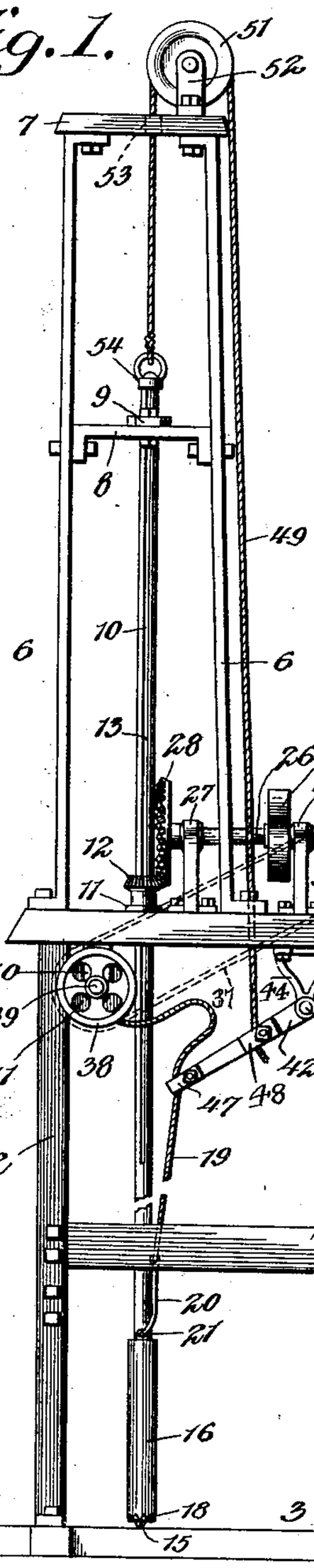


Fig. 2.

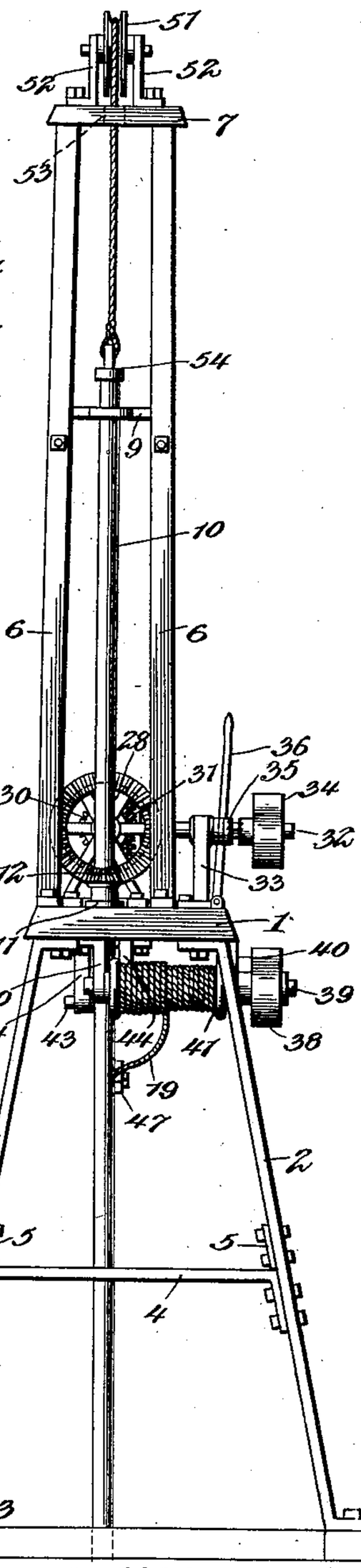
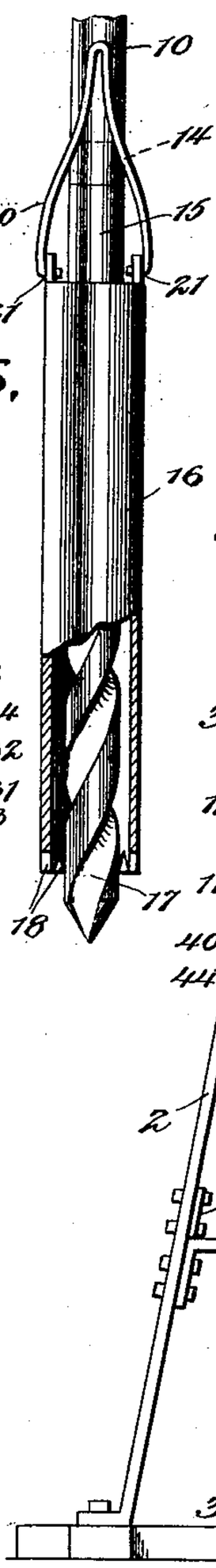


Fig. 6.



Witnesses
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(No Model.) 2 Sheets—Sheet 2.

Fig. 3.

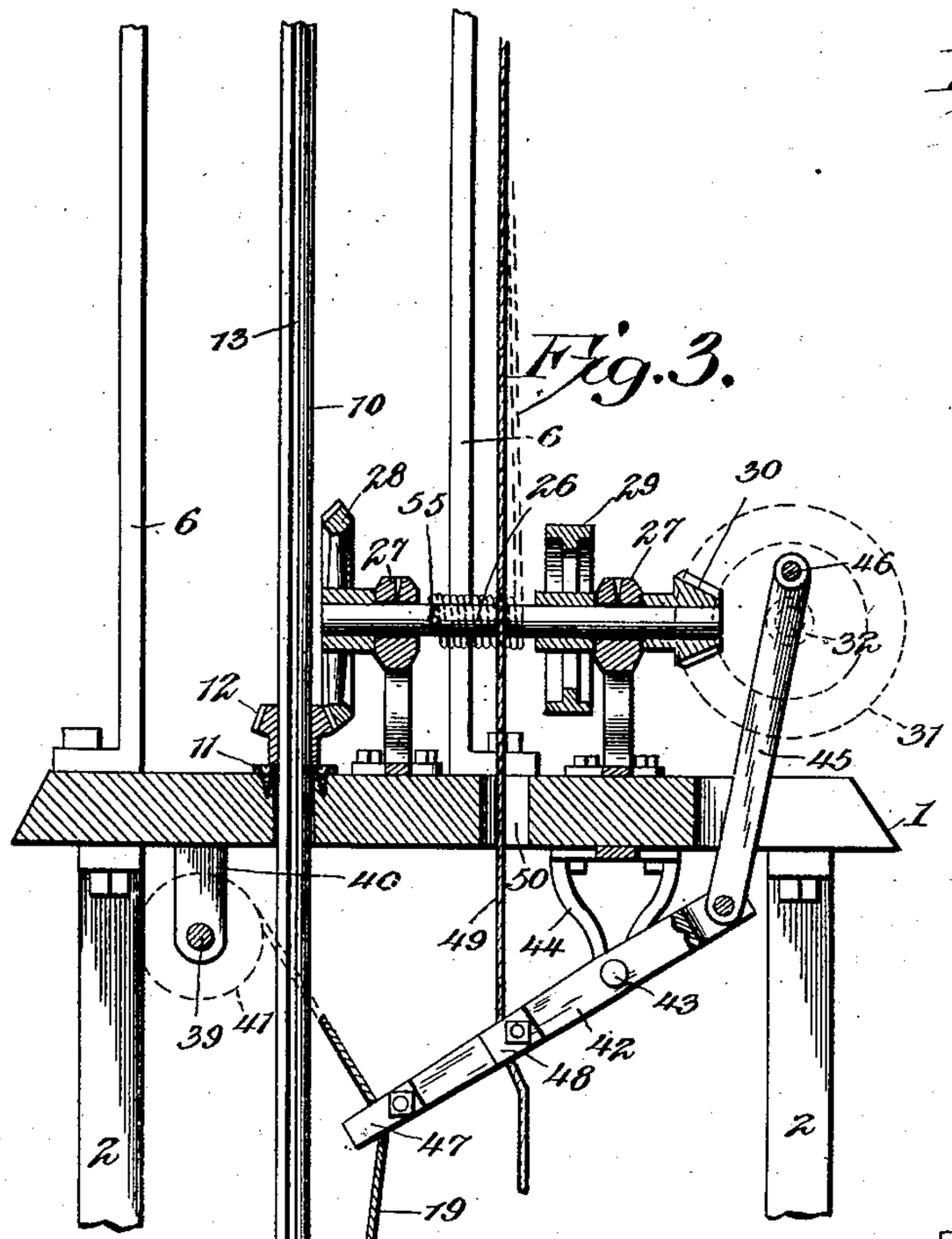


Fig. 5.

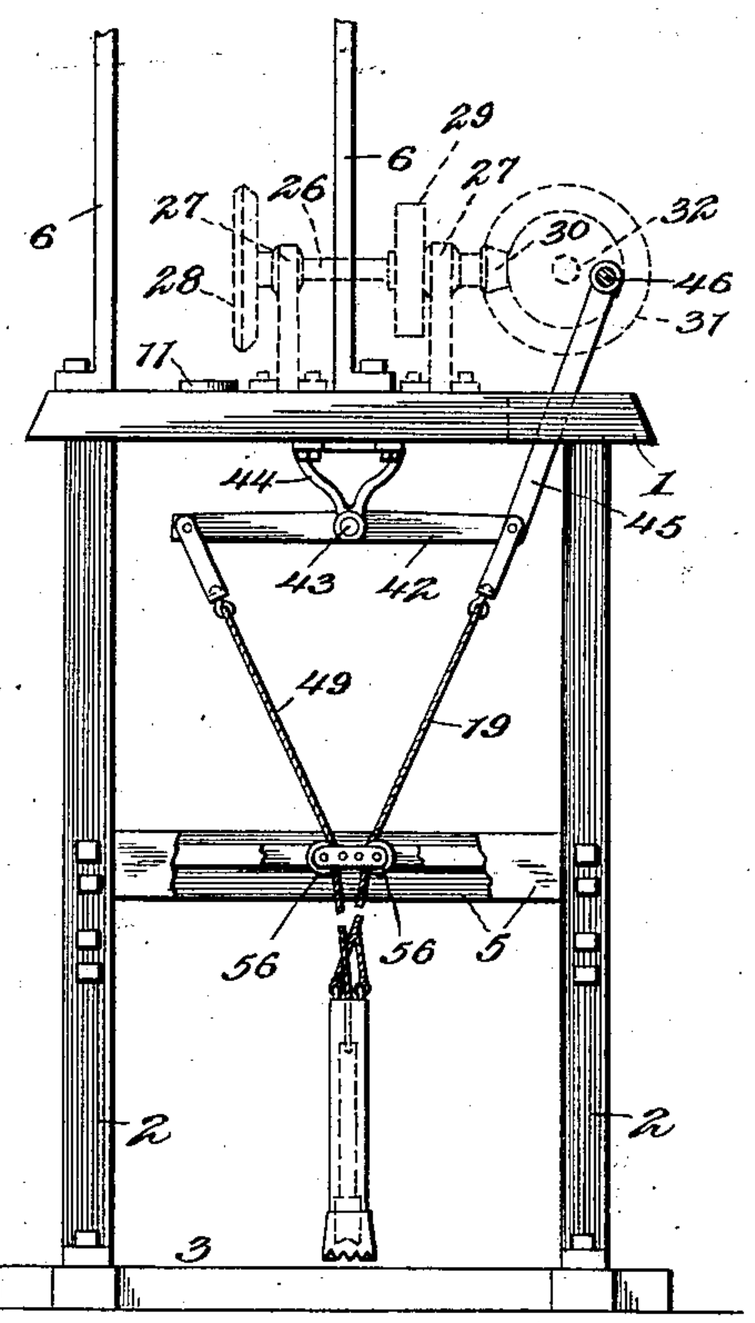


Fig. 4.

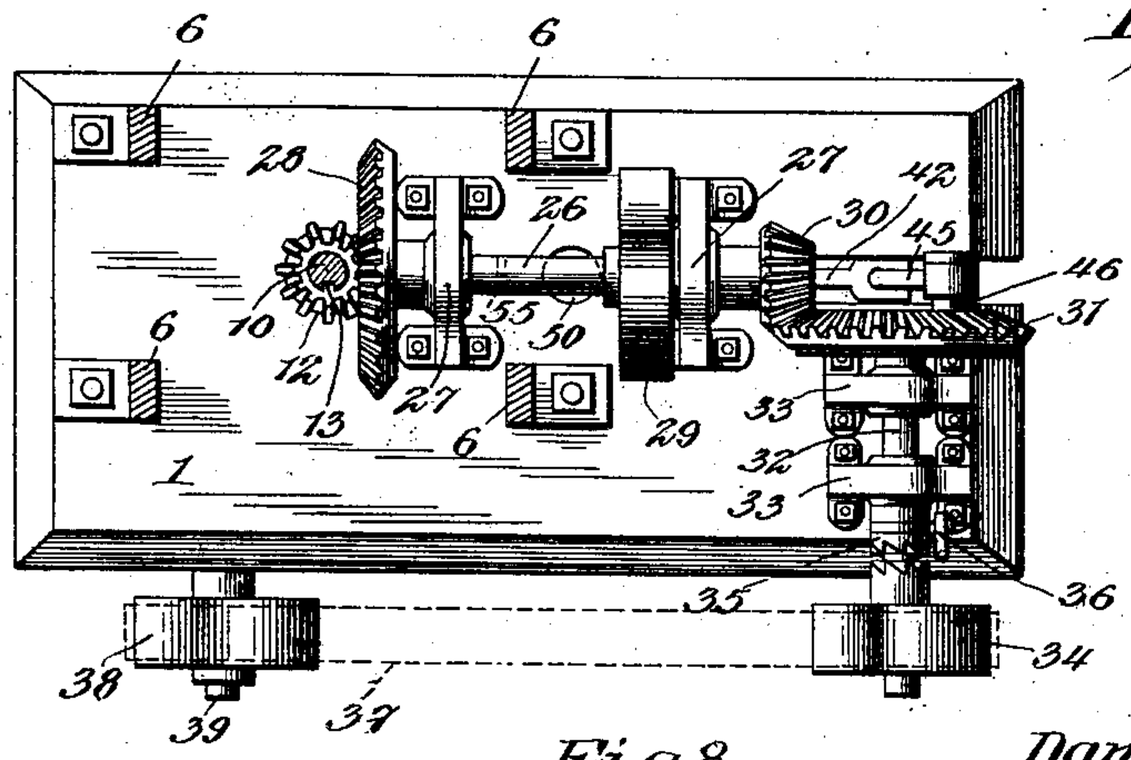


Fig. 7.

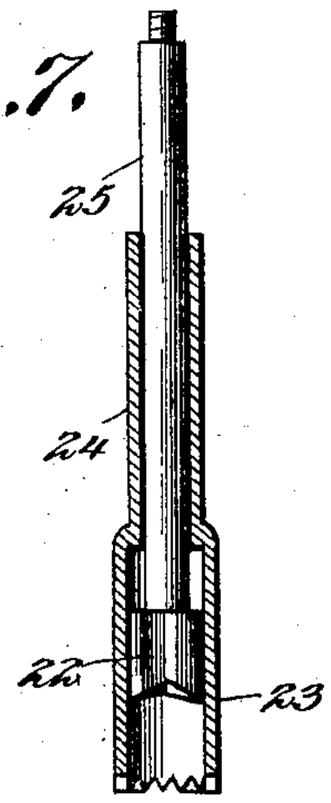
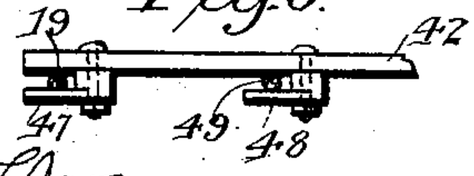


Fig. 8.



Witnesses
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UNITED STATES PATENT OFFICE.

DANIEL WARNER, OF BRONSON, MICHIGAN, ASSIGNOR OF ONE-HALF TO JANE W. STONE, OF BROOKLYN, NEW YORK.

DRILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 699,122, dated April 29, 1902.

Application filed February 25, 1901. Serial No. 48,818. (No model.)

To all whom it may concern:

Be it known that I, DANIEL WARNER, a citizen of the United States, residing at Bronson, in the county of Branch and State of Michigan, have invented a new and useful Drilling-Machine, of which the following is a specification.

This invention relates to well-drilling machines embodying a drill of the duplex type, consisting of inner and outer concentric drill members.

The object of the invention is to equip the machine with simple and effective mechanism for effecting the simultaneous reciprocation of the drill members in opposite directions and to impart a rotary movement to the inner drill member during the reciprocation thereof in order that said inner drill member may be constituted by a twist-drill.

A further object of the invention is to utilize a single walking-beam for the simultaneous opposite reciprocation of the drill members through the medium of a pair of independent cables, the walking-beam being oscillated by the mechanism employed to rotate the inner drill member.

To the accomplishment of the foregoing objects and others subordinate thereto the invention consists in a drilling-machine embodying certain novel features and details of construction and arrangement of parts, as hereinafter fully described, illustrated in the drawings, and incorporated in the claims.

In the accompanying drawings, Figure 1 is a side elevation of a drilling-machine complete constructed in accordance with the present invention, showing both cables connected to the walking-beam. Fig. 2 is an elevation taken at right angles to Fig. 1. Fig. 3 is an enlarged section taken longitudinally of the main driving-shaft and extending through the main platform, one of the cables being wound upon the main shaft in dotted lines. Fig. 4 is a sectional plan view of the parts shown in Fig. 3. Fig. 5 is a side elevation of the lower portion of the stand, showing a modification in the driving mechanism for the inner and outer members. Fig. 6 is an enlarged detail elevation of the inner and outer drill members, showing the lifting-bail for the outer drill member and the inner member constructed in the form of a twist-drill. Fig. 7 is an enlarged detail vertical section showing other forms of inner and outer drill members. Fig. 8 is a detail view of one end of the walking-beam.

Similar numerals of reference designate corresponding parts in all the figures of the drawings.

The drilling-machine contemplated in this invention is especially designed with reference to the drilling of gas and oil wells, and comprises a portable stand, which may be carried from place to place and mounted at the point where the well is to be drilled. The stand, which is best illustrated in Figs. 1 and 2, comprises a main platform 1, which is supported at a suitable elevation above the ground by means of corner-posts 2, connected at their lower ends to a suitable base-frame 3 and braced at intermediate points in their height by means of cross-bars 4 and 5. Extending upward from the platform 1 are other posts 6, connected at their top to a second smaller platform 7, which is bolted to the upper ends of the posts and supported solely thereby. The posts 6 are braced at points intermediate of their length by means of suitable cross-bars 8, and these cross-bars are also arranged to support a central cross-bar 9, which is provided with an opening to form a guide for the shaft 10 of the drill. Another bearing 11 is provided for said shaft, which last-named bearing is connected with the lower main platform 1, while resting upon the bearing 11 is a bevel-pinion 12, having an internal feather or spline to engage a groove 13, extending longitudinally of the drill-shaft 10, so as to permit the shaft to be raised and lowered through the bevel-pinion 12, while at the same time the said shaft and bevel-pinion are caused to rotate together. The drill-shaft 10 will in practice be composed of a number of sections having a screw-threaded engagement with each other, so that they may be connected and disconnected according to the depth of the well and so that additional sections may be added from time to time as the depth of the well increases. This feature is so well understood in the art that no illustration thereof is deemed necessary, although by reference to Fig. 6 it will be seen that I have illustrated the shaft

10 as provided in its lower end with a socket to receive a threaded shank 14 on the contiguous end of the next lower section 15, which in said figure constitutes the inner member of the drill. By unscrewing the drill 15 an additional shaft-section may be applied to the shaft 10 and the drill subsequently attached to the added section in a manner that will be readily understood.

The drill is of a duplex character, comprising an inner drill member 15 and an outer drill member 16. These drill members are arranged concentrically with relation to each other and are adapted to have independent movement, the outer member 16 being in the nature of a sleeve or jacket which surrounds the inner member 15 and allows the inner member to reciprocate and revolve without affecting the outer member and while the latter is itself being reciprocated by the operating devices hereinafter described.

In Fig. 6 the inner member is shown as consisting of an ordinary twist-drill having the spiral cutting portion 17, the said drill being adapted to operate both as a thrust and rotary drill. In the same figure the outer drill member is shown to consist of a sleeve of uniform diameter, having its lower end provided with cutting-teeth 18, which operate outside of and around the inner drill member. The inner drill member is connected directly to the main drill-shaft 10, while the outer drill member is connected to an operating-cable 19, which is moved upward and downward by mechanism hereinafter referred to, thereby imparting a corresponding upward and downward reciprocating movement to the drill member 16. In order to connect the cable 19 to the outer drill member, the latter is provided with a bail-shaped loop 20, pivotally connected at 21 to the upper end of the outer drill member, as shown in Figs. 1, 5, and 6, the said loop being arranged to slide along the shaft of the inner drill member.

In Fig. 7 I have shown an inner drill member adapted especially for a reciprocatory or driving movement, the said drill member having a cutting head or bit 22, which is received in an enlarged jacket 23, forming the lower end of the outer drill member, the latter being also provided with a guide-sleeve 24, through which the shank 25 of the inner drill member passes.

The mechanism for imparting independent movements to the inner and outer drill members comprises, essentially, a main driving-shaft 26, mounted in suitable bearings 27 on the platform 1 and having fast thereon at one end a bevel gear-wheel 28, which meshes with the bevel-pinion 12 to impart a rotary movement to the drill-shaft 10. Intermediate its ends the shaft 26 is provided with a belt-pulley 29 to receive a driving-belt from any suitable motor, and at its opposite end said shaft is provided with a bevel-pinion 30, which meshes with a bevel gear-wheel 31 on the end of a counter-shaft 32, mounted in bearings 33 on the platform 1 and extending at right angles to the main driving-shaft 26, as shown in Fig. 4. Mounted loosely upon the shaft 32 is a belt-pulley 34, adapted to be thrown into and out of engagement with the shaft 32 by means of a shiftable clutch-collar 35, splined to the shaft 32 and adapted to be moved by a shift-lever 36. The pulley 34 receives a belt 37, which passes around another pulley 38 on a shaft 39, mounted in suitable brackets 40 and arranged beneath the platform 1, said shaft having fast thereon a drum 41, upon which is wound the cable 19, which connects with and serves to operate as well as raise and lower the outer drill member 16.

Located beneath the platform 1 is a walking-beam 42, fulcrumed intermediate its ends at 43 in brackets 44, the said walking-beam having pivotally connected thereto at one end an operating-link or pitman 45, which connects with a wrist-pin 46 on the bevel gear-wheel 31, whereby in the rotation of said gear-wheel an oscillatory movement is imparted to the walking-beam 42. Said walking-beam is provided at or near its other end with a clamp or cable-grip 47, (see Fig. 8,) by means of which the cable 19, connected to the outer drill member, may be securely and adjustably attached to the walking-beam at any point in the length of the cable. The said walking-beam is also provided with an additional cable-grip 48 for receiving and holding another independent cable 49, which extends upward through an opening 50 in the platform 1 and passes over a guiding-sheave 51, mounted in bearing-brackets 52 on the upper platform 7, the said cable passing downward through an opening 53 in the platform 7 and connecting with a swivel-head 54, connected to the upper extremity of the drill-shaft 10. In view of the fact that both of the cables 19 and 49 of the drill members are connected to the same end of the walking-beam 42 and that the cable 49 is doubled around the sheave 51 it will be seen that the inner and outer drill members will be simultaneously reciprocated in opposite directions, the inner drill member descending as the outer drill member ascends, and vice versa. At the same time that the inner drill member is reciprocated it is also rotated within the outer drill member, thus facilitating the cutting operation, and by reason of the outer drill member operating independently of the inner drill member it serves to cut around the inner drill member and also to clean the inner drill member and free it from adhering material. Thus it will appear that the inner drill member is simultaneously reciprocated and rotated and that the outer drill member is simultaneously reciprocated. The special utility of this arrangement is that the rotation of the inner drill member effects the boring of a hole, and as the drill proceeds the reciprocation of the outer drill member breaks away the edges of the hole thus formed, but does so after the inner drill member is elevated out of the hole and at a time when

the edges or walls of the hole are not supported by the inner drill members—that is to say, while the rotary inner drill member is boring a cavity the outer drill member is in an elevated position, but as the inner drill member is retracted from the cavity the outer drill member is thrust forward to break down the unsupported cavity-walls.

When it is desired to elevate or lower the main drill-shaft 10, the cable 49 is disconnected from the walking-beam and the end thereof passed through an opening 55 in the main driving-shaft 26, after which by starting the engine and rotating the shaft 26 the cable 49 will be wound thereon in the manner illustrated in dotted lines in Fig. 3, thus raising the inner drill bodily. Likewise in order to raise and lower the outer drill member 16 the cable 19 is disconnected from the walking-beam, and by shifting the clutch-collar 35 the driving-pulley 34 is caused to actuate the belt 37 and pulley 38, thereby winding or unwinding the drum 41 and operating upon the cable 19, with the effect that the outer drill member 16 will be raised or lowered according to the direction of rotation of the drum. When it is desired to operate the inner drill member with a rotary action only, the cable 49 may be left disconnected from both the walking-beam and the main driving-shaft 26, thereby allowing the drill to remain at the bottom of the well, where it will be rotated by the gearing hereinabove described. In conjunction with such rotary drill the outer drill member may be employed and caused to reciprocate by the means referred to, thus facilitating the drilling action and materially assisting the inner drill member by keeping the latter clean and breaking up the material at the point where the inner drill member is operating.

In Fig. 5 I have illustrated another form of mechanism for imparting reciprocatory movements simultaneously to the outer and inner drill members in different directions without imparting a rotary motion to the inner drill member. Under the arrangement illustrated in Fig. 5 the walking-beam 42 is fulcrumed about centrally, and the operating cables 19 and 49 are connected, respectively, to the opposite ends of the walking-beam, the said cables being guided at intermediate points in their length by means of guiding sheaves or pulleys 56, journaled in any suitable manner upon the machine-frame. As the walking-beam is vibrated by the connecting-rod 45, one of the drill members will be lifted while the other is dropped, and movement will be simultaneously imparted to the two drill members in opposite directions. Any suitable means may be provided for lengthening the cables 19 and 49 according to the depth of the well at the time of operation. The construction previously described is, however, preferred, as the operating-cables are also capable of being used as the means for elevating and lowering the drill members in removing the same from the well or lowering the same into the well.

From the foregoing description it will be seen that the inner rotary drill member may have imparted thereto a reciprocatory movement or not, as may be preferred; also that the inner and outer drill members are simultaneously reciprocated in opposite directions by means of independent cables and operating connections therefor and that the same cables which are used to actuate the drill members are also employed to raise and lower the said drill members at any time during the drilling of a well.

From the foregoing it is thought that the construction, operation, and many advantages of the herein-described invention will be apparent to those skilled in the art without further description, and it will be understood that various changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a drilling-machine, a duplex drill consisting of inner and outer concentric drill members, in combination with mechanism for simultaneously imparting a reciprocatory movement only to one drill member and a combined rotary and reciprocatory motion to the other drill member.

2. In a drilling-machine, a duplex drill consisting of inner and outer concentric drill members, in combination with mechanism for simultaneously imparting a combined reciprocatory and rotary motion to the inner drill member, and a reciprocatory movement only to the outer drill member.

3. In a drilling-machine, outer and inner concentric drill members, in combination with mechanism for simultaneously imparting rotary motion to the inner drill member and reciprocatory motion only to the outer drill member, the outer drill member having a guide-sleeve through which the shaft of the inner drill member passes, and an enlarged jacket in which works the cutting head or bit of the inner drill member.

4. In a drilling-machine, outer and inner concentric drill members, in combination with mechanism for simultaneously imparting motion to the drill members in different directions, said mechanism comprising independent cables connected respectively to the inner and outer drill members, and operating means for said cables.

5. In a drilling-machine, the combination with inner and outer drill members, of a walking-beam operatively connected to both of said members to reciprocate them simultaneously in opposite directions, and means for operating the walking-beam.

6. In a drilling-machine, outer and inner concentric drill members, in combination with

mechanism for simultaneously imparting motion to the drill members in different directions, the said mechanism comprising a walking-beam, cables connected with said walking-beam, and also with the drill members, and an operating-shaft for actuating the walking-beam.

7. In a drilling-machine, the outer and inner concentric drill members, in combination with mechanism for simultaneously imparting motion to the drill members in different directions, said mechanism comprising a walking-beam, means for driving the walking-beam, and cables connected with the drill members and having an adjustable connection with the walking-beam.

8. In a drilling-machine, outer and inner concentric drill members, in combination with mechanism for simultaneously imparting motion to the drill members in different directions, a walking-beam, a driving-shaft for actuating the walking-beam, a drum, a cable wound thereon and connected to one of the drill members, means actuated by the driving-shaft for rotating said drum, and clutch mechanism for throwing the drum-actuating device into and out of operation.

9. In a drilling-machine, outer and inner concentric drill members, in combination with mechanism for simultaneously imparting motion to the drill members in different directions, said mechanism comprising operating-cables connected to the drill members, and a bail connected with the outer drill member to provide for the attachment of one of the cables thereto.

10. In a drilling-machine, outer and inner concentric drill members, and a swivel-head connected to the shaft of the inner drill member, in combination with mechanism for simultaneously imparting motion to the drill members in different directions, said mechanism comprising cables, one of which is connected to the swivel-head on the shaft of the inner member, and the other to a bail on the outer member.

11. In a drilling-machine, the combination with inner and outer drill members, of operating mechanism common to said members for effecting their simultaneous reciprocation in opposite directions to cause said members to strike alternate thrust blows during the drilling operation.

12. In a drilling-machine, the combination with inner and outer drill members, of operating means common to said members for effecting their simultaneous reciprocation in opposite directions and for rotating the inner drill member.

13. In a drill, the combination with inner and outer drill members, of mechanism for rotating the inner drill member only and for effecting the simultaneous reciprocation of the inner and outer drill members in opposite directions, whereby the unsupported walls of the cavity will be broken down by the outer drill member after the inner drill member has been withdrawn from said cavity.

14. In a drilling-machine, the combination with inner and outer drill members, of a walking-beam, a cable connected to the walking-beam at one side of its fulcrum and extended directly to one of the drill members, a sheave located beyond the end of the other drill member, a second cable connected to the walking-beam and passed around the sheave for connection with the last-named drill member, and means for oscillating the walking-beam to effect the simultaneous reciprocation of the drill members in opposite directions.

15. In a drill, the combination with inner and outer drill members, of a walking-beam operatively connected to said drill members to effect their simultaneous reciprocation in opposite directions, and means for imparting a rotary movement to one only of the drill members during the reciprocation thereof.

16. In a drill, the combination with inner and outer drill members, of a walking-beam operatively connected to said drill members to effect the simultaneous reciprocation thereof in opposite directions, and driving mechanism disposed to effect the rotary movement of one only of the drill members and to oscillate the walking-beam.

17. In a drill, the combination with inner and outer drill members, of a walking-beam operatively connected to said members to effect their simultaneous reciprocation in opposite directions, a beveled pinion mounted on one of said drill members to rotate said member, but having sliding engagement therewith, a driving-shaft geared to said beveled pinion, and mechanism geared to said driving-shaft and operatively connected to the walking-beam to oscillate the latter.

18. In a drill, the combination with inner and outer drill members, of a walking-beam connected to said drill members to effect their simultaneous reciprocation in opposite directions, a driving-shaft, gearing interposed between the driving-shaft and one of the drill members to effect the rotary movement of the latter, a counter-shaft geared to the driving-shaft, and a link eccentrically connected to the counter-shaft and having an operative connection with the walking-beam.

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

DANIEL WARNER.

Witnesses:
R. D. STRANG,
F. N. RUDD.