June 15, 1926. 1,588,441

H. L. BROWNE

DRILLING MACHINE

Filed May 18, 1920

Fig. 1.

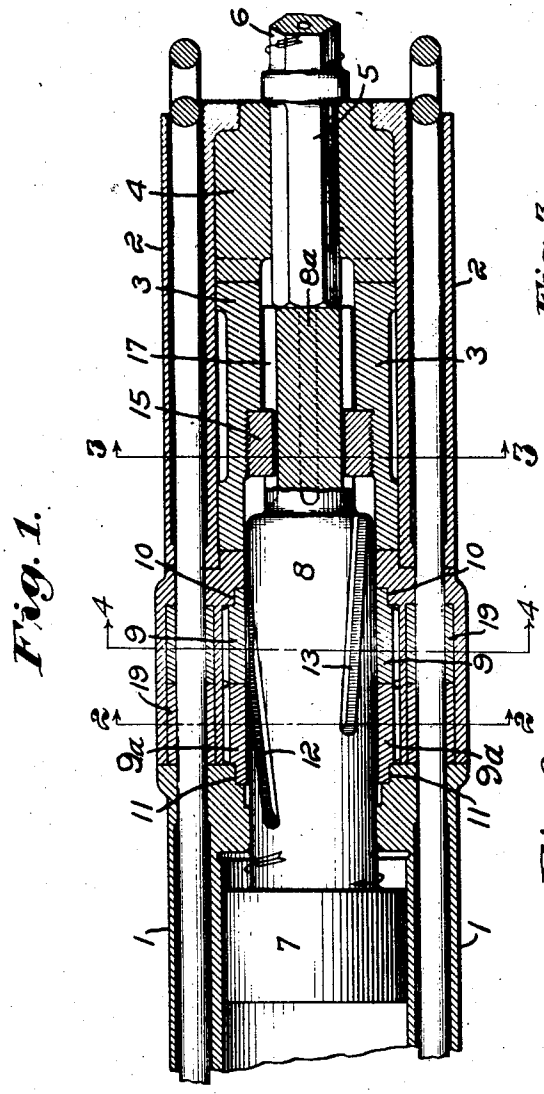


Fig. 3.

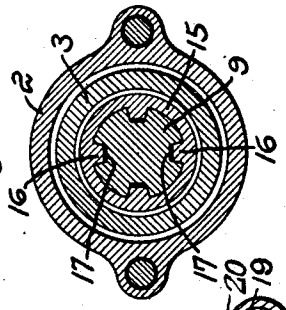


Fig. 4.

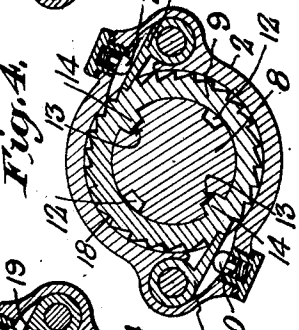
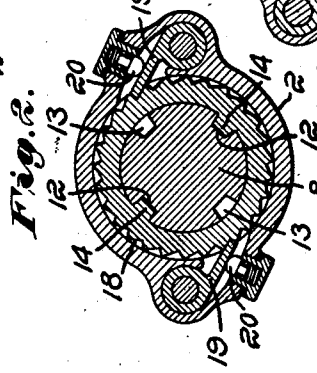


Fig. 2.



Inventor:
Harold L. Browne,
by Emery, Booth, Jamney & Farney
Attys.

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UNITED STATES PATENT OFFICE.

HAROLD L. BROWNE, OF HOUGHTON, MICHIGAN, ASSIGNOR TO GEORGE H. GILMAN, OF BOSTON, MASSACHUSETTS.

DRILLING MACHINE.

Application filed May 18, 1920. Serial No. 382,243.

The invention relates to drilling machines and particularly, but not exclusively to those of the percussive type and in this respect concerns means for rotating the drill steel of a hammer rock drill.

The invention will be best understood from the following description when read in connection with the accompanying drawings of an example of the invention, while the scope of the invention will be particularly pointed out in the appended claims.

In the drawings:

Fig. 1 shows a longitudinal section through a hammer rock drill;

Fig. 2 shows a section on the line 2—2 of Fig. 1; and

Figs. 3 and 4 show sections on the lines 3—3 and 4—4 of Fig. 1.

Referring to the drawings, the embodiment of the invention submitted includes a casing comprising a cylinder member 1 and a front head structure 2. In the front head structure is rotatably mounted a chuck having a rearward portion 3 and connected thereto a forward portion 4 provided with a polygonal recess for receiving the polygonal end 5 of the drill steel 6. In the cylinder member is mounted a piston 7 to which is integrally secured a hammer bar 8 extending into the front head structure, the hammer bar being provided with an extension 8^a of reduced diameter surrounded by the chuck. The piston is preferably reciprocated by means of compressed air or other motive fluid in any suitable manner as will be readily understood by those skilled in the art.

With the present construction the chuck is rotated during each stroke of the piston and in the same direction. For this purpose the present construction provides therein rings 9^a and 9 which surround the hammer bar, these rings being mounted in the front head structure and having reduced portions 10 and 11 providing exterior bearings for the rings in the front head structure and cylinder member respectively. These rings are connected to the hammer bar by grooves 12 and 13 formed in the latter and which cooperate with followers in the form of lugs 14 formed interiorly of the rings and extending longitudinally throughout their length. The rearward portion 3 of the chuck is herein provided with a nut 15 on which is formed follower lugs 16 cooperating with grooves 17 formed in the hammer bar, these lugs and grooves being similar to the lugs 14 and grooves 12 and 13 just described. Preferably, the grooves 12 and 13 are formed at opposite equal angles to the groove 17 and the latter formed parallel to the axis of the hammer bar. It will be noticed that the grooves 12, 13 and 17 and the lugs 14 and 16 provide a connection for the hammer bar with the chuck which comprises cam surfaces and cooperating followers, one of which surfaces is parallel to the axis of the bar and two of which are oppositely oblique to such axis while each of said surfaces is oblique to each of the other surfaces.

For intermittently clutching the rings to the casing are shown clutch or intermittent grip mechanism in the form of teeth 18 formed on the exterior surface of the rings and cooperating pawls 19 carried by the casing. Cooperating with the pawls are spring pressed plungers 20 for holding the same in contact with the teeth.

When the piston is reciprocated, the grooves 12 and 13 tend to rotate the rings 9^a and 9 in opposite directions and as the teeth 18 on the rings are formed to permit rotation of said rings in only one direction which is the same direction for each, the piston is rotated on each stroke in the same direction by one or the other of the rings through their lugs and cooperating grooves. When the piston rotates, it rotates the chuck by means of the grooves 17 and follower lugs 16. By reason of the fact that the grooves 12 and 13 are herein at equal opposite angles to the groove 17, it follows with this construction that on each stroke of the piston, the chuck is rotated through the same angle and in the same direction.

For purposes of illustration I have disclosed one specific embodiment of my invention. It is to be understood, however, that my invention is not limited to this embodiment and that extensive deviations from the same may be made without departing from the spirit of my invention.

Claims—

1. In a hammer rock drill, a casing having a forward chamber and a rearward chamber separated from said forward chamber by an axially perforated wall, a chuck mounted for rotation in said forward chamber, a hammer piston having a head mounted for re-

ciprocation and rotation in said rearward chamber, said piston having a bar extending through the axial perforation of said wall, said chuck having a rearward socket into which said bar extends, a pair of rings in said wall and surrounding said bar, separate intermittent grip devices for said rings permitting them to rotate in one and the same direction only, a pair of helical grooves on said bar, the grooves of said pair having the same pitch but in opposite directions, a lug on one ring entering one helical groove and a lug on the other ring entering the other helical groove, a straight groove on the portion of said bar entering said rearward socket of said chuck, and a lug on said chuck entering said straight groove.

2. In a rock drill, a hammer piston, a chuck, a drill steel carried by said chuck, said drill steel being operated by percussion imparted by said hammer piston, means forming a slidable interlocking connection between said piston and chuck causing one to rotate when the other rotates, and a plurality of intermittent grip devices cooperating with said hammer piston and having slidable interlocking oppositely pitched cam connections therewith for continuously rotating said piston in the same direction in response to reciprocation of said piston.

3. In a drilling machine, a cylinder, a piston therein mounted for rotation and having a hammer bar, a pair of ratchet rings surrounding said hammer bar, means permitting said rings to rotate in but one and the same direction, a chuck, a drill steel carried by said chuck and to which percussion is imparted by said piston and hammer bar, separate means connecting said hammer bar to said chuck and to each of said rings, at least two of said separate means providing an oblique cam and a cooperating follower, and means for reciprocating said piston whereby said chuck and said piston are rotated in the same direction through said connecting means during each direction of reciprocation of the piston.

4. In a drilling machine, a cylinder, a piston therein mounted for rotation and having a hammer bar, a pair of ratchet rings surrounding said hammer bar, means permitting said rings to rotate in but one and the same direction, a chuck, a drill steel carried by said chuck and to which percussion is imparted by said piston and hammer bar, separate means connecting said hammer bar to said chuck and to each of said rings, each of said separate means providing a surface and a cooperating follower and each of said surfaces being angularly disposed relatively to each of the other surfaces, and means for reciprocating said piston whereby said chuck and said piston are rotated in the same direction through the connecting means during each direction of reciprocation of the piston.

5. In a drilling machine, a cylinder, a piston therein mounted for rotation and having a hammer bar, a pair of ratchet rings surrounding said bar, a chuck, a drill steel carried by said chuck and to which percussion is imparted by said piston and hammer bar, oppositely oblique grooves and followers connecting the respective rings to said bar, a groove parallel to the axis of the bar and a cooperating follower connecting said chuck to said bar, and means for intermittently preventing rotation of said rings, but allowing them to rotate in the same direction whereby both said piston and said chuck are rotated in the same direction during each direction of reciprocation of said piston.

6. In a drilling machine, a cylinder, a piston therein mounted for rotation and having a hammer bar, a pair of ratchet rings surrounding said hammer bar, means permitting said rings to rotate in but one and the same direction, a chuck, a drill steel carried by said chuck and to which percussion is imparted by said piston and hammer bar, separate means connecting said hammer bar to said chuck and to each of said rings, at least two of said separate means providing oppositely oblique cams of the same pitch and a cooperating follower, and means for reciprocating said piston whereby said chuck and said piston are rotated at the same speed in the same direction through said connecting means during each direction of reciprocation of the piston.

7. In a drilling machine, a cylinder, a piston therein mounted for rotation and having a hammer bar, a pair of ratchet rings surrounding said hammer bar, means permitting said rings to rotate in but one and the same direction, a chuck, a drill steel carried by said chuck and to which percussion is imparted by said piston and hammer bar, separate means connecting said hammer bar to said chuck and to each of said rings, each of said separate means providing a surface and a cooperating follower and each of said surfaces being angularly disposed relatively to each of the other surfaces, and means for reciprocating said piston whereby said chuck and said piston are rotated at the same speed in the same direction through the connecting means during each direction of reciprocation of the piston.

8. In a drilling machine, a cylinder, a piston therein mounted for rotation and having a hammer bar, a pair of rotatable ratchet rings surrounding said bar, a chuck, a drill steel carried by said chuck and to which percussion is imparted by said piston and hammer bar, oppositely oblique grooves of the same pitch and followers connecting

the respective rings to said bar, a groove parallel to the axis of the bar and a cooperating follower connecting said chuck to said bar, and means for intermittently preventing rotation of said rings, but allowing them to rotate in the same direction whereby both said piston and said chuck are rotated at the same speed in the same direction during each direction of reciprocation of said piston.

9. In a rock drill, a casing, a hammer piston, a chuck, a drill steel carried by said chuck, means including a hammer piston for percussively actuating said drill steel, a pair of intermittent grip devices each having a ratchet and pawl connection with said casing permitting said devices to rotate in only one and the same direction, a spiral groove and cooperating lug connecting said piston to one of said devices and an oppositely pitched spiral groove and cooperating lug connecting said piston to the other of said devices, and a sliding interlocking connection between said piston and chuck causing one to rotate when the other rotates.

10. In a hammer drill, a casing having a reciprocatory hammer piston therein, a chuck having a slidable connection with said piston, angularly movable members having a slidable connection with said piston, a plurality of said slidable connections comprising cam surfaces and one of them a feather connection, and means for intermittently gripping said members to said casing to cause the chuck to be rotated in the same direction for each direction of reciprocation of said piston.

11. In a hammer drill, a hammer piston, a chuck, a plurality of angularly movable members, means slidably connecting said piston to said members and chuck, and means for alternately holding said members against movement for enforcing rotation of said chuck through said connections in the same direction for each direction of movement of the piston.

12. In a hammer drill, a hammer piston, a chuck, a plurality of angularly movable members, lug and slot connections between the piston and each of said members and chuck, the effective surfaces of each of said slots being at a different angle to the effective surfaces of each of the others, and means for intermittently preventing rotation of said members for enforcing rotation of the chuck for each reciprocation of said piston.

13. In a hammer drill, a hammer piston, a chuck, a plurality of angularly movable members, lug and slot connections between the piston and each of said members and chuck, the effective surfaces of each of said slots being at a different angle to the effective surfaces of each of the others, and means for intermittently preventing rotation of said members for enforcing rotation of the chuck for each reciprocation of said piston at the same speed.

14. In a hammer drill, a hammer piston, a chuck, a plurality of angularly movable members, lug and slot connections between the piston and each of said members and chuck, the effective surfaces of each of said slots being at a different angle to the effective surfaces of each of the others, and means for intermittently preventing rotation of said members for enforcing rotation of the chuck for each reciprocation of said piston in the same direction.

15. In a hammer drill, a hammer piston, a chuck, a plurality of angularly movable members, lug and slot connections between the piston and each of said members and chuck, the effective surfaces of each of said slots being at a different angle to the effective surfaces of each of the others, and means for intermittently preventing rotation of said members for enforcing rotation of the chuck for each reciprocation of said piston in the same direction and at the same speed.

16. In a drilling machine, a drilling tool, a reciprocatory piston for rotating said tool, means coacting with said piston and tool for enforcing rotation of said tool in the same direction and at the same speed for each direction of movement of said piston, and said means causing said piston to rotate on one of its strokes in the same direction as said tool.

17. In a hammer drill, a piston, a chuck, two angularly movable members, slot and groove connections between the piston and each of said members and the chuck, the effective surfaces of the grooves of two of said connections being oblique to the direction of reciprocation of the piston and that of the third being in the same direction as that of such reciprocation, and means for alternately preventing rotation of said members to cause the piston to rotate the chuck for each direction of reciprocation of the piston.

18. In a hammer drill, a piston, a chuck, two angularly movable members, slot and groove connections between the piston and each of said members and the chuck, the effective surfaces of the grooves of two of said connections being oblique to the direction of reciprocation of the piston and that of the third being in the same direction as that of such reciprocation, and means for alternately preventing rotation of said members to cause the piston to rotate the chuck in the same direction for each direction of reciprocation of the piston.

19. In a hammer drill, a piston, a chuck, two angularly movable members, slot and groove connections between the piston and each of said members and the chuck, the

effective surfaces of the grooves of two of said connections being oblique to the direction of reciprocation of the piston and at different angles to each other and that of the third being in the same direction as that of such reciprocation, and means for alternately preventing rotation of said members to cause the piston to rotate the chuck for each direction of reciprocation of the piston.

20. In a hammer drill, a piston, a chuck, two angularly movable members, slot and groove connections between the piston and each of said members and the chuck, the effective surfaces of the grooves of two of said connections being oblique to the direction of reciprocation of the piston and at different angles to each other and that of the third being in the same direction as that of such reciprocation, and means for alternately preventing rotation of said members to cause the piston to rotate the chuck in the same direction and at the same speed for each direction of reciprocation of the piston.

21. In a hammer drill, a hammer piston, a chuck, a plurality of angularly movable members, means connecting said piston to said members and to said chuck, means for intermittently preventing rotation of said members whereby said chuck and piston are moved angularly, said means and connections providing that the movements of said piston, chuck and members will be in the same direction.

22. In a drilling machine, means forming a casing having a chamber, a piston in said chamber, a chuck mounted for rotation in said chamber, a plurality of members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a cooperating follower and each of said surfaces being at an angle to each of the other surfaces, and means for preventing rotation of said members alternately on opposite strokes of said piston, the angles between said surfaces being such that said chuck is rotated during each direction of reciprocation of said piston.

23. In a drilling machine, means forming a casing having a chamber, a piston in said chamber, a chuck mounted for rotation in said chamber, two members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a cooperating follower, two of said surfaces being oblique to the axis of said piston and at an angle to each other and the other surface being parallel to said axis, means for preventing rotation of said members alternately on opposite strokes of said piston, the angles between said surfaces being such that said chuck is rotated during each direction of reciprocation of said piston.

24. In a drilling machine, means forming a casing having a chamber, a piston in said chamber, a chuck mounted for rotation in said chamber, two members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a cooperating follower, two of said surfaces being oppositely oblique to the axis of said piston and the other surface being parallel thereto, and means for preventing rotation of said members alternately on opposite strokes of said piston whereby said chuck is rotated during each direction of reciprocation of said piston.

25. In a drilling machine, means forming a casing having a chamber, a piston in said chamber, a chuck mounted for rotation in said chamber, a plurality of members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a cooperating follower and each of said surfaces being at an angle to each of the other surfaces, means for preventing rotation of said members alternately on opposite strokes of said piston, the angles between said surfaces being such that said chuck is rotated in the same direction during each direction of reciprocation of said piston.

26. In a drilling machine, means forming a casing having a chamber, a piston in said chamber, a chuck mounted for rotation in said chamber, a plurality of members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a cooperating follower, two of said surfaces being oblique to the axis of said piston and at an angle to each other, and the other surface being parallel to said axis, means for preventing rotation of said members alternately upon opposite strokes of said piston, the angles between said surfaces being such that said chuck is rotated in the same direction during each direction of reciprocation of said piston.

27. In a drilling machine, means forming a casing having a chamber, a piston in said

chamber, a chuck mounted for rotation in said chamber, a plurality of members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a co-operating follower and each of said surfaces being at an angle to each of the other surfaces, and means for preventing rotation of said members alternately on opposite strokes of said piston, the angles between said surfaces being such that said chuck is rotated at the same speed in the same direction during each direction of reciprocation of said piston.

28. In a drilling machine, means forming a casing having a chamber, a piston in said chamber, a chuck mounted for rotation in said chamber, two members in said chamber having bearings exteriorly of the piston rotatably supporting them against substantial longitudinal movement relative to said casing, means connecting said piston to said members and to said chuck, each of said means providing a surface and a co-operating follower, two of said surfaces being oblique to the axis of said piston and at an angle to each other, and the other surface being parallel to said axis, and means for preventing rotation of said members alternately upon opposite strokes of said piston, the angles between said surfaces being such that said chuck is rotated at the same speed in the same direction during each direction of reciprocation of said piston.

In testimony whereof, I have signed my name to this specification.

H. L. BROWNE.