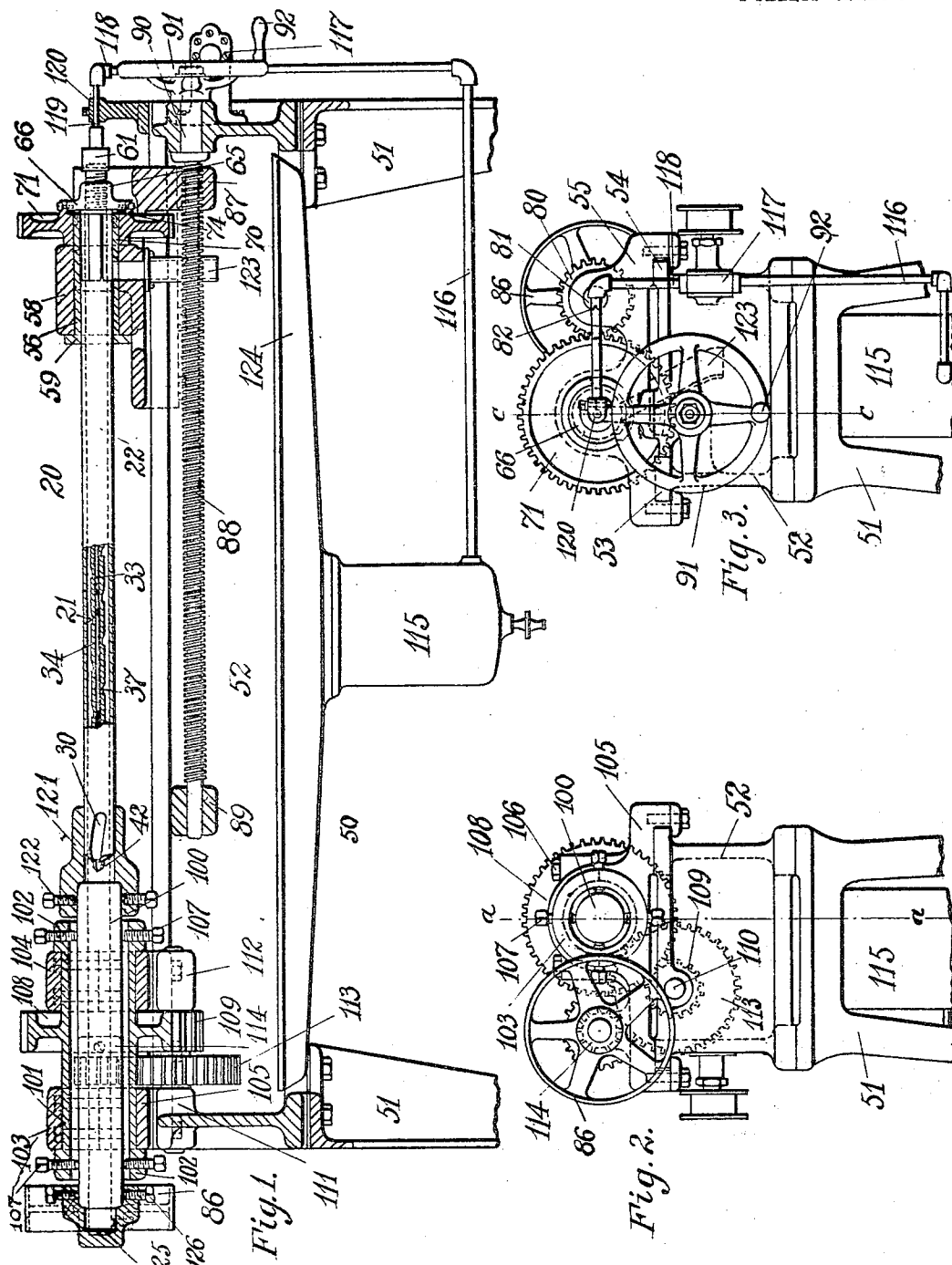


No. 800,894.

PATENTED OCT. 3, 1905.

S. W. BALDWIN.
DRILLING APPARATUS.
APPLICATION FILED OCT. 19, 1904.

2 SHEETS—SHEET 1.



Witnesses:

John H. Lynch.
P. H. Homan

Inventor:

Stephen W. Baldwin.

By his attorney:

F. H. Richards.

S. W. BALDWIN.
DRILLING APPARATUS.
APPLICATION FILED OCT. 19, 1904.

2 SHEETS—SHEET 2.

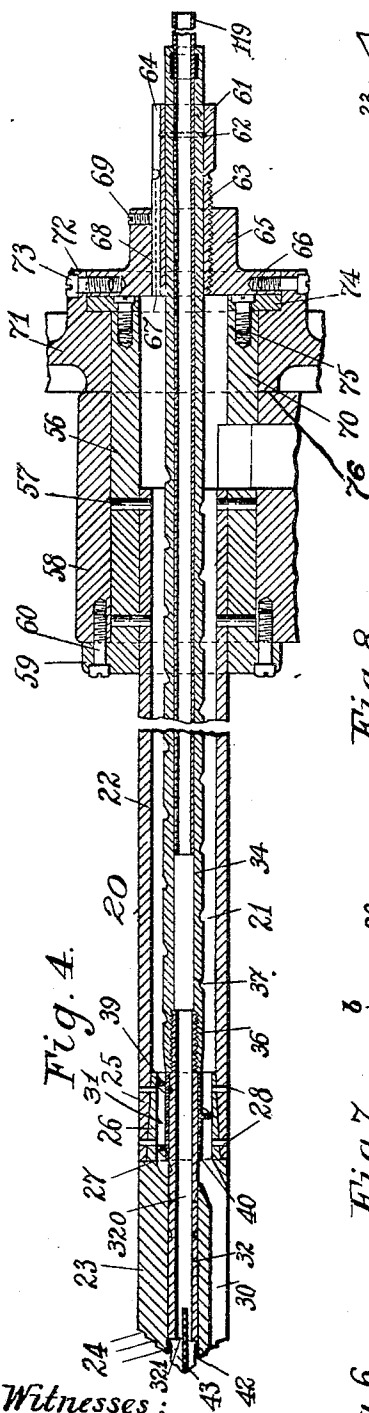


Fig. 4.

Witnesses:

John H. Lynch
P. A. Wittman

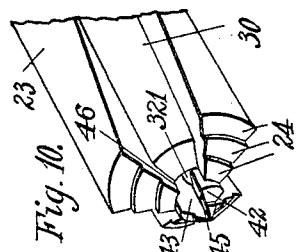


Fig. 10.

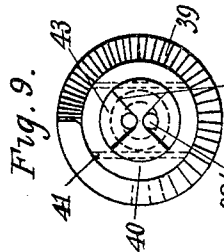


Fig. 9.

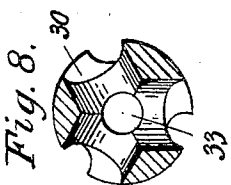


Fig. 8.

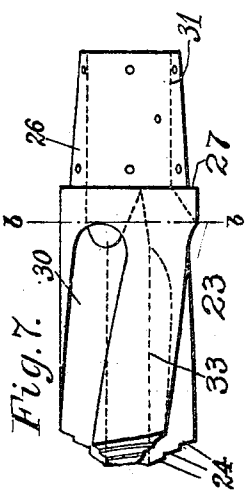


Fig. 7.

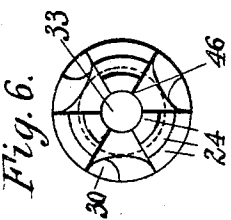


Fig. 6.

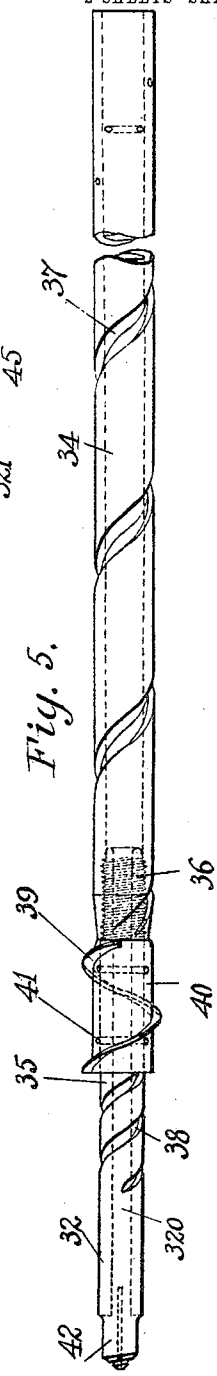


Fig. 5.

Inventor:
Stephen W. Baldwin.
By his attorney:
F. A. Richards.

UNITED STATES PATENT OFFICE.

STEPHEN W. BALDWIN, OF NEW YORK, N. Y.

DRILLING APPARATUS.

No. 800,894.

Specification of Letters Patent.

Patented Oct. 3, 1905.

Application filed October 19, 1904. Serial No. 229,062.

To all whom it may concern:

Be it known that I, STEPHEN W. BALDWIN, a citizen of the United States, residing in Manhattan borough, New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Drilling Apparatus, of which the following is a specification.

This invention relates to and has for an object to provide an improvement in drilling apparatus.

In the drawings accompanying and forming a part of this specification, Figure 1 is a longitudinal section of a machine employing the present improvement. Fig. 2 is an elevation of the left-hand end of the machine shown in Fig. 1, and the line *a a* indicates the line in which the section of Fig. 1 at such end is taken. Fig. 3 is an end view of the right-hand end of the machine illustrated in Fig. 1, and the line *c c* indicates the line in which the section of such end of Fig. 1 is taken. It will be noticed, however, that many of the parts are shown in side view in connection with this longitudinal section for the purpose of better illustrating such parts and their relation to the surrounding parts. Fig. 4 is a longitudinal section of a form of my improved drill and illustrates means for connecting it to an apparatus for use. Fig. 5 is an enlarged side view of the inner member of the drill. Fig. 6 is an end view of the outer drill member. Fig. 7 is the end portion or drill-head of such outer member detached. Fig. 8 is a cross-section thereof in the line *b b* of Fig. 7. Fig. 9 is an end view of the inner member of the drill, it being shown somewhat more enlarged than the corresponding parts shown in other views; and Fig. 10 is a perspective view of the end of the drill-head.

In drilling large holes with a "twist-drill" it has been found that the torsion upon the drill is greater than the same will stand for practical purposes when the "twisting" of the drill is sufficiently deep to carry away the chip from the working face. It has also been found that the best results can be had by drilling different portions of the face or bottom of the drilled hole at different stages of advance.

The present improvement is, among other things, designed to afford a drill wherein the member for producing the large diameter of hole will be free from weakening grooves and channels and wherein the drilling may be done at several stages—that is, an outer drill member will drill behind the plane of an inner

drill member, and the inner drill member may be provided with means for carrying the chip not only from its own cutting edge or lip, but from that of the outer member, and carry the same to a point where it may be ejected by causing it to traverse the inside of the outer drill member. Thus by reference to Fig. 4 it will be seen that there is an outer drill member (designated in a general way by 20) and which is chambered out, as at 21, it being therefore hollow. The shaft portion 22 of the drill may be made out of a different quality of steel than the cutting portion or drill-head 23, this not only for economy in manufacture, but in some instances the quality of steel required for the cutting-face will be inadequate to withstand the torsional strain in the shaft portion, and when the edge-carrying portion has been worn away by use and resharpening a new one may be applied when the shaft and drill-head portions are made separable. The cutting end or drill-head 23 is shown as provided with a stepped cutting-face 24, although other forms may be used in practice, if desired. The union between the cutting end 23 and the shaft portion is, by means of a pair of tapered overlapping portions 25 26, carried, respectively, by the shaft and the drill-head, the portion 25 of the shaft member abutting a shoulder 27 upon the drill-head or edge-carrying portion. The two parts may when assembled then be fastened together in some convenient manner—as, for instance, by pins 28. The edge-carrying end or drill-head is shown as having a number of chambers 30 cut into its end face and sides and converging into a centrally-disposed chamber portion 31, which is in communication with the chamber portion 21 of the drill-shank. The juncture of the walls of the chambers 30 with the end face of the drill produces the shear edge or lips for the cutting-faces 24, and the chambers also afford means of escape for the chip, which will pass into the chamber 31. The inner drill member is shown as having a portion 32 bearing in a chamber or bearing portion 33 of the outer drill member and as having a shank or tang portion 35, to which the shaft portion 34 of the drill may be attached in some convenient manner, here shown as by a screw 36. The shaft portion 34 is shown provided with a spirally-disposed channel 37, and the shank portion 35 is also shown as provided with a spirally-disposed channel 38. The portion of the inner member which is adjacent to the point where the chambers 30 converge into the cham-

ber 31 when the parts are assembled may carry a spiral blade 39, mounted in the present instance upon a sleeve 40, which may be fastened in some suitable manner—as, for instance, by means of pins 41—to the shank portion 35. The working end or drill-head proper, 42, of the inner member has channels or chambers 43 cut into its end face and sides, making means to clear the chip away, as well as to produce the shear edge for the cutting-lips. Assuming that the inner and outer drill members are driven at different rates of speed and the inner member driven the faster, the chip cut by the inner member will be discharged into the chambers 30, and the action of the edge 45 of the chambers 43 of the inner drill with the edges 46 of the chambers 30 of the outer drill running at different speeds will be to shear the chips from the inner drill and mingle them in a finely-chopped condition with the chips of the outer drill. These mingled chips will be advanced to the blade portion 39 and chopped up and passed on within the chamber 21, when the spiral 37 will carry them on out to a suitable discharge. Cutting the chips into short pieces prevents any clogging of the chips in the various chambers and passage-ways. The spirals 38 will assist in bringing the chips to the blade 39; but in some cases they may be omitted. There is a chamber 320 within the inner drill member—that is, it extends throughout the shank portion, and at the working end of the head portion it separates into two channels 321, which open into the respective chambers 43. This organization is to permit a flow of oil to be presented to the working lips or face of the inner drill for the purpose of maintaining the proper working condition and to remove the chips and wash the same into the channels or chambers 30 in the head of the outer drill member and also to maintain the proper working conditions of such outer drill. The oil will then pass on into the chamber 31 and up the chamber 21, assisting in the carrying of the chips back to the point of discharge.

In Figs. 1, 2, and 3 a form of practical employment of the improved drill is illustrated, such machine embodying a framework (designated in a general way by 50) supported in the present instance by legs 51 and bearing uprights 52, upon which are carried ways 53 54 for a carriage 55, which supports the drill and its operating mechanism. In the mechanism illustrated herein for using the drill the outer drill is held from rotation and is mounted in a bushing 56 in the present illustration, held thereto by means of pins 57, which bushing is seated in a portion 58 of the carriage 55 and has a flange 59 secured to the end of the portion 58 in the present illustration by means of bolts 60 passing through the flange and entering suitable holes in the carriage. By this means the outer drill is held from rotation, but may be caused to move with the carriage. The ways for the car-

riage are longitudinally disposed upon the machine, and consequently the drill will have a longitudinal movement upon the machine—that is, toward and from the work. Means for causing such movement will presently be described. The shaft of the inner drill at its back end is shown as carrying a sleeve 61, fastened to it in some suitable manner, in the present illustration by means of pins 62, and which sleeve has a screw-threaded portion 63, through which is a longitudinal keyway 64, a member having a hub 65 and a flange 66 has mating screw-threads and is screwed thereon and has a keyway 67 adapted to receive a key 68, mounted in said keyway and held in place by some suitable means, in the present illustration by a set-screw 69, so that the points of the drills may be adjusted one relative to the other by loosening the set-screw, sliding the key clear of the hub, and turning the sleeve 61 in either direction, as the case may require, and then securing the same in its adjusted position by sliding the key back in its ways and tightening the set-screw. The bushing 56 projects beyond the portion 58 of the carriage, as at 70, and forms a bearing for a gear-wheel 71, which has a flange 72, forming a chamber, as it were, for receiving the flange 66, and which flanges are fastened together by means of screws 73, the gear-wheel being held from backward movement by means of an annular plate 74, fastened to the bushing 56 by means of screws 75 and being held from forward movement by an abutting shoulder 76 upon the carriage portion 58. The gear-wheel 71 is shown meshing with a pinion 80, splined upon a shaft 81 by means of a feather 82, which pinion may be compelled to travel with the carriage. The spline-shaft has fast upon it a belt-pulley 86, which may be driven from some suitable source of power. (Not shown.) The carriage 55 has dependent from it a nut portion 87, engaging a screw-shaft 88, mounted at its front end in a bearing 89, dependent from the ways of the carriage, and at its rear end having a bearing 90 in the machine-frame. This carriage feed-screw may be driven in some convenient manner. In the present illustration a hand-wheel 91, having a handle 92, is illustrated for such purpose. It will thus be seen that the drill may be moved longitudinally of the machine and that during such movement the inner drill may be rotated.

In organizations wherein the outer drill is held stationary it will be necessary to produce a relative movement between such outer drill and the work, to which end the work may be rotated upon the axis of the inner drill. The work (designated in a general way by 100) is shown carried by a shell 101, having flanges 102 at each end, which flanges, by means of suitable shoulders, prevent the longitudinal movement of such shell by engaging shoulders upon bearings 103 104, fast to the machine-

frame and which may be supported by a stand-
ard 105. The bearings 103 104 are shown as
split bearings held together by means of suit-
able set-screws 106. The work is positioned
5 and held within the shell by means of suitable
set-screws 107, which in the present instance
are shown as engaging the work at each end
at four different points, although other num-
bers of set-screws and differently located may
10 be employed as practice demands. The shell
is shown as having fast thereon a gear-wheel
108, meshing with a pinion 109, fast upon a
shaft 110, supported by bearings 111 112,
which are fast to the machine-frame in some
15 suitable manner. Upon the shaft 110 is a
gear-wheel 113, meshing with a pinion 114,
fast upon the spline-shaft. In the present
illustration the work and the inner drill are
driven at a ratio of about three to one.

20 To assist in the cutting action of the drills
and to carry the chip away from the working
point, it is found desirable to employ a flow
of oil under heavy pressure, or other lubri-
cant, at and away from the working point of
25 such drills. In the present instance a tank
115 is shown having piping 116 running to a
pump 117 of some suitable construction, which
communicates by a pipe 118 with a tube 119,
telescoping with the inside of the inner drill-
30 shaft. This tube 119 is held in a standard
120 of the machine-frame, so that upon the
reciprocation of the drill the tube will remain
stationary and will at all times deliver its
charge of oil into the inner chamber of the
35 inner drill, and from such chamber the oil
will be discharged at or near the point where
the chips from the inner drill originate, and
thus the conditions are most favorable to force
all the chips out through the channels pro-
40 vided as fast as the chips are made. The
copious and efficient lubrication enables a
drill of a given quality of tool-steel to be
driven at a greater drilling speed than would
be possible but for the efficient lubrication at
45 the cutting-point, and the immediate removal
of chip. The oil in practice may be fed into
the drill under heavy pressure, and, owing to
the course it is constrained to traverse in its
discharge with the chip, it will have sufficient
50 force of flow to actively carry the chip on to
the point of discharge. The oil flowing back
through a conduit and not finding escape ad-
jacent to the walls of the drilled hole, the
force or pressure of the oil will be maintained.

55 In starting the drill and until the various
chambers and conduits thereof have gotten
past the front face of the work some means
must be employed to dam the oil and hold it
from running out of the channels 30 and 43
60 and away at a point where it is not desirable
it shall escape, its proper course being through
the chamber 31, and to properly direct the
flow of oil a sleeve 121 may be fastened, by
means of set-screws 122, to the end of the work
65 and adjusted and positioned thereon by such

screws, such sleeve having a working fit with
the perimeter of the outer drill for closing the
channels 30 and also for forming a bearing
and support for such drill until the same has
entered the work and thereafter forming a 70
support for the drill. This will completely
dam up the oil and force the same as it is fed
through the chambers in the inner drill to re-
turn through the chambers of the outer drill
into the inner chamber thereof and then be 75
discharged with the chips through the dis-
charge-tube 123, falling upon a tray 124, which
is in communication with the oil-reservoir
115. The chips will there remain, and the
oil will drain off and pass on into the reservoir 80
and be pumped into the drill again as occa-
sion may require.

There may be a cup 125 fastened to the work
by set-screws 126 to retain the oil as the drill
is finishing its cut; otherwise after the first 85
penetration of the drill through the end of the
work the oil would escape and not flow back
through the drill.

Having thus described my invention, I
claim—

1. The combination with an outer drill, of a 90
pilot-drill mounted within said drill for inde-
pendent rotation, and said pilot-drill having
a conduit for leading lubricant to the working
point of the outer drill.

2. The combination with an outer drill hav- 95
ing cutting-lips formed by channels and ar-
ranged to cut on an annulus, of an inner drill
mounted therein for independent rotation and
having cutting-lips disposed to cut within such 100
annulus and in advance of the cutting of the
outer drill, said inner drill having a conduit
to supply a flow of lubricant to its cutting-
lips, and channels adapted to register with the
lip-forming channels of the outer drill to sup- 105
ply the same with lubricant.

3. A drill having a hollow cylindrical forma-
tion, an end face and a number of recesses in
such end face, the juncture of one of the walls
of each of said recesses with the end face form- 110
ing a cutting-lip, and a drill mounted within the
said hollow cylindrical drill for independent
rotation, and having a lubricant-channel lead-
ing to the working point and in communica-
tion with each of the said recesses. 115

4. The combination with a hollow drill hav-
ing a hollow shank, of a drill having a work-
ing fit with the inside of said hollow drill and
having its shank within said hollow shank and
of smaller diameter than the inside diameter 120
thereof leaving an interspace, said inner drill
and its shank having an inclosed lubricant-
conduit leading to its working point, said hol-
low drill having an opening from the region
of its working point to the said interspace, 125
and means in said interspace to carry away the
chip from the drills.

5. The combination with a hollow drill hav-
ing a hollow shank, of a drill having a working
fit with the inside of said hollow drill and hav- 130

ing its shank within said hollow shank and of smaller diameter than the inside diameter thereof leaving an interspace, said hollow drill having an opening from the region of its working point to the said interspace, and means in said interspace to carry away the chip from the drills.

6. The combination with a hollow drill having a hollow shank, of a drill having a working fit with the inside of said hollow drill and having its shank within said hollow shank and of smaller diameter than the inside diameter thereof leaving an interspace, said hollow drill having an opening from the region of its working point to the said interspace, and means in said interspace to break up and carry away the chip from the drills.

7. The combination with a hollow drill having a hollow shank, of a drill having a working fit with the inside of said hollow drill and having its shank within said hollow shank and of smaller diameter than the inside diameter thereof leaving an interspace, said inner drill and its shank having an inclosed lubricant-conduit leading to its working point, said hollow drill having an opening from the region of its working point to the said interspace, means in said interspace to break up and carry away the chip from the drills, and means for forcing a stream of lubricant through said conduit, the opening in the hollow drill and said interspace to lubricate the cutting-points of the drills and expedite the removal of chip.

8. The combination with an inner and an outer drill member having a hollow shank and both of said drill members having chip-channels leading into said hollow shank, the inner drill having a shank within said hollow shank and provided on its perimeter with a spirally-disposed channel for conveying the chip through said hollow shank, and means carried by said inner drill member for supplying a stream of oil to assist in the conveyance of said chip, and means for rotating the drills one relatively to the other.

9. An outer drill having a hollow shank cutting-faces and chip-channels leading from said cutting-faces into said hollow shank and adapted to discharge its chip through such hollow shank, an inner drill mounted in the outer drill and having a shank of less diameter than the interior of the said hollow shank, said inner drill being adapted to cut in advance of the outer drill and to discharge its chip back of the cutting-faces of the outer drill and into the chip-channels thereof, and said drills having shear edges to cut the chip from the inner drill into short lengths.

10. An outer drill having a hollow shank cutting-faces and chip-channels leading from said cutting-faces into said hollow shank and adapted to discharge its chip through such hollow shank, an inner drill mounted in the outer drill and having a shank of less diameter than the interior of the said hollow shank,

said inner drill being adapted to cut in advance of the outer drill and to discharge its chip back of the cutting-faces of the outer drill and into the chip-channels thereof, said drills having coacting shear edges for cutting the chip from the inner drill into short lengths, means to supply a draft of oil to the working point of said drills, a cutter within the hollow shank for the chip from the outer drill, and means for effecting rotation of one of the drills relatively to the other.

11. The combination with an outer drill member embodying a drill-head and a shaft carrying the same having a plane cylindrical outer surface and an inner chamber, the head having cutting-lips formed by its end face and the faces of channels in its sides and having channels running from such channels to the inner chamber, of an inner drill member embodying a drill-head and a shaft carrying the same having a spiral groove in its outer surface and an oil-conduit within it the head being removable from the shaft and having cutting edges formed by its end face and the faces of channels in its sides and having channels running from such channels to said oil-conduit, the inner drill-head having a bearing in and passing through the inner chamber of outer drill-head, the shaft of the inner drill being smaller than the inner chamber of the outer drill and leaving an annular space a spiral blade carried by the inner head to carry the chip back through the inner channel of the outer drill, and means for effecting relative rotation of one of the drills relatively to the other.

12. A drill having a concentrically-disposed cylindrical bore, cutting-lips radiating therefrom and formed by the junctures of the end face of the drill and the faces of channels cut into the sides and end of the said head and where cut into the end reaching to said bore, a drill-head having a working fit in said bore and having its cutting-lips beyond those of the outer drill and formed by the juncture of its end face with the faces of channels in its sides, the said channels intermittently registering with the channels in the side of the former drill-head where such channels are cut into the end face of the said former drill-head when the drills rotate one relative to the other, and means for rotating the drills one relative to the other.

13. A drill having a concentrically-disposed cylindrical bore, cutting-lips radiating therefrom and formed by the junctures of the end face of the drill and the faces of channels cut into the sides and end of the said head and at the end reaching to said bore, a shank for carrying said head and having a chamber within it and in communication with said channels, a drill-head having a working fit in said bore and having its cutting-lips beyond the cutting-lips of the outer drill and formed by the juncture of its end face with the faces of channels in

its sides, the said channels intermittently registering with the channels in the side of the former drill-head where such channels communicate with the said inner bore of the outer drill-head, when the drills rotate one relative to the other, means for rotating the drills one relative to the other a shank for the inner drill located in the chamber of the shank of the outer drill and having a conduit within it communicating with the channels in the inner head, and means to supply a flow of oil through said conduit, the channels in the respective drills and the chamber of the outer drill-shank.

14. A drill having a concentrically-disposed cylindrical bore, cutting-lips radiating therefrom and formed by the juncture of the end face of the drill and the faces of channels cut into the sides and end of the said head and at the end reaching to said bore, a shank for carrying said head and having a chamber within it and in communication with said channels, a drill-head having a working fit in said bore and having its cutting-lips beyond the cutting-lips of the outer drill and formed by the juncture of its end face with the faces of channels in its sides, the said channels registering with the channels in the side of the former drill-head where such channels communicate with the said inner bore of the outer drill-head, a shank for the inner drill located in the chamber of the shank of the outer drill and having a conduit within it communicating with the channels in the inner head, and means to supply a flow of oil through said conduit, the channels in the respective drills and the chamber of the outer drill, a carriage for said drills, means to secure the shank of the outer drill to the carriage, a bearing for the inner drill-shank upon the carriage, a gear-wheel to which the same is fastened, means to adjust the said shank through such bearing, means to hold the work, means to rotate such work-holding means, and means adapted to be carried by the end of the work to support the drill and prevent the escape of oil.

15. The combination with a pair of drills one working within the other, a carriage for said drills having a bored head, a bushing within the bore of said head and secured thereto and projecting beyond the head to form a bearing, said outer shank being fastened to said bushing, a gear-wheel mounted upon the bearing portion of the said bushing, a member having a hub and a flange, the flange secured to said gear-wheel and the hub having a screw-threaded bore, a mating screw-thread upon the shank of the inner drill, a keyway through said hub and screw-thread portion of the shank, a readily-removable key, and means to hold the key in position.

16. In a boring-machine, the combination with a carriage mounted upon ways, of a pair of drills carried thereby, one of said drills being arranged concentrically within the other, one of which drills is fast upon said carriage,

gearing for driving the other of said drills, means to adjust the working points of the drills one relatively to the other, and means to rotate the work.

17. The combination with a drill having channels cut into its sides at its end for producing cutting-lips, a conduit to carry oil to said channels, an inclosed conduit into which said channels open to draw the oil and chip away from such working point, and means for securingment to the work for inclosing the channels in the drills and leading the flow of oil to the said inclosed conduit until the drill has entered the work sufficiently to carry said channels beyond the face of the work to perform the damming.

18. In a drill the combination with a pair of drills working one within the other, of means to carry the work, and means to drive the drills relatively to the work at variable speed.

19. In a drill the combination with a pair of drills working one within the other, of means to carry the work, means to drive the drills relatively to the work at variable speed, and means to commingle, cut up, and carry away the chip from both drills.

20. In a drill the combination with a pair of drills one of which is hollow and has a hollow shank and the other of which drills is within the hollow drill and having a shank in the shank thereof with an annular space between them, of means to carry the work, means to drive the drills relatively to the work at variable speed, and means to commingle, cut up, and carry away the chip from both drills through said annular space.

21. In a drill the combination with a pair of drills one of which is hollow and has a hollow shank and the other of which drills is within the hollow drill and having a shank in the shank thereof with an annular space between them, of means to carry the work, means to drive the drills relatively to the work at variable speed, means to commingle, cut up, and carry away the chip from both drills through said annular space, the inner drill-shank having an oil-conduit, and means to supply a flow of oil through the said conduit to assist in such removal of chip.

22. The combination with a pair of drills one mounted within the other and the inner drill having its working face in advance of the working face of the outer drill, coöperative shear-faces carried by said drills to cut up the chip of the inner drill, and means to rotate one drill relatively to the other.

23. The combination of a pair of drills one mounted within the other and the inner drill having its working face in advance of the working face of the outer drill, and coöperative means carried by said drills to cut up the chip from both drills.

24. The combination with two drills, concentrically mounted one within the other, a

work-holder, means for driving the drills relative to the work at different speeds, and means for positively feeding oil to the points of the drills.

5 25. In a drilling apparatus the combination with a drill-head having cutting-lips, and a hollow shank and channels running from such cutting-lips to the hollow interior of said shank, and a cutter within said hollow interior
10 for cutting up the chip as it passes into such hollow interior from the cutting-lips through said channels.

26. In drilling apparatus the combination

with a pair of drills mounted one within the other and having an annular space between 15 their shanks, channels running from the cutting-lips of the outer drill to such annular space, a cutter within such annular space for cutting up the chip from the drills, and means for rotating one drill relatively to the other. 20

Signed at Nos. 9 to 15 Murray street, New York, N. Y., this 18th day of October, 1904.

STEPHEN W. BALDWIN.

Witnesses:

CHAS. LYON RUSSELL,

C. A. WEED.