

Dec. 9, 1930.

L. H. WELLENSIEK

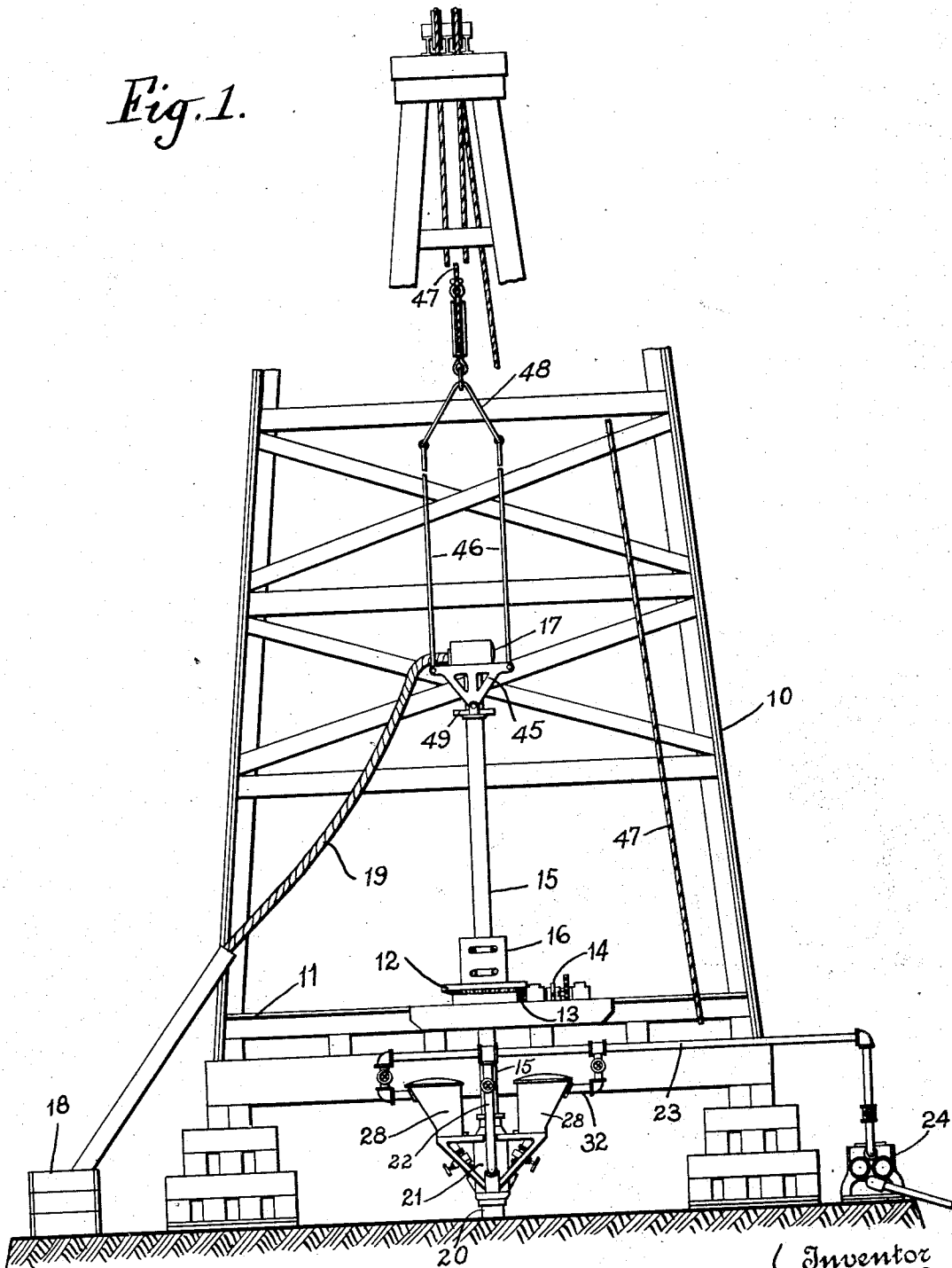
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DRILLING APPARATUS

Filed Aug. 15, 1924

5 Sheets-Sheet 1

*Fig. 1.*



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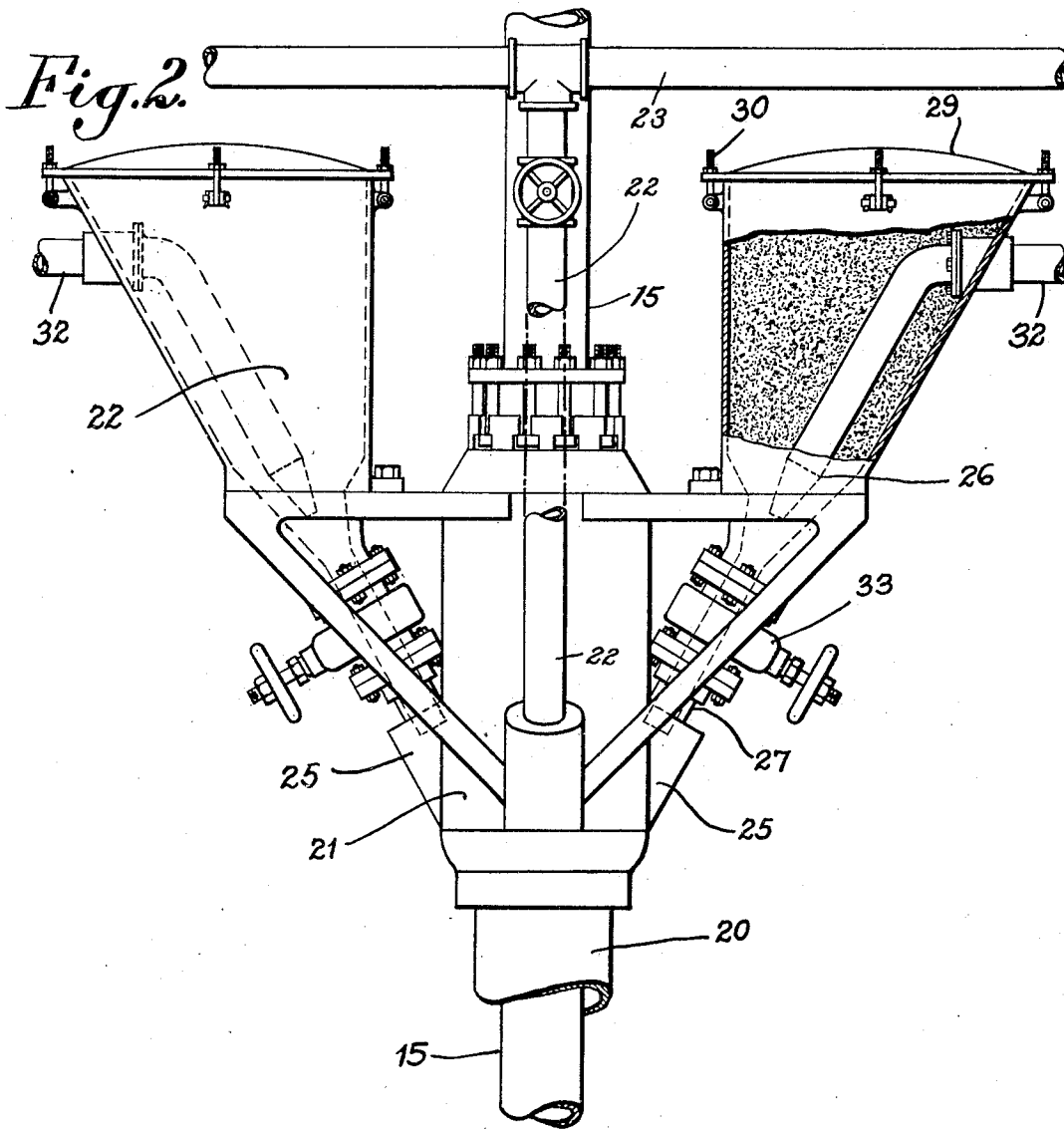
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DRILLING APPARATUS

Filed Aug. 15, 1924

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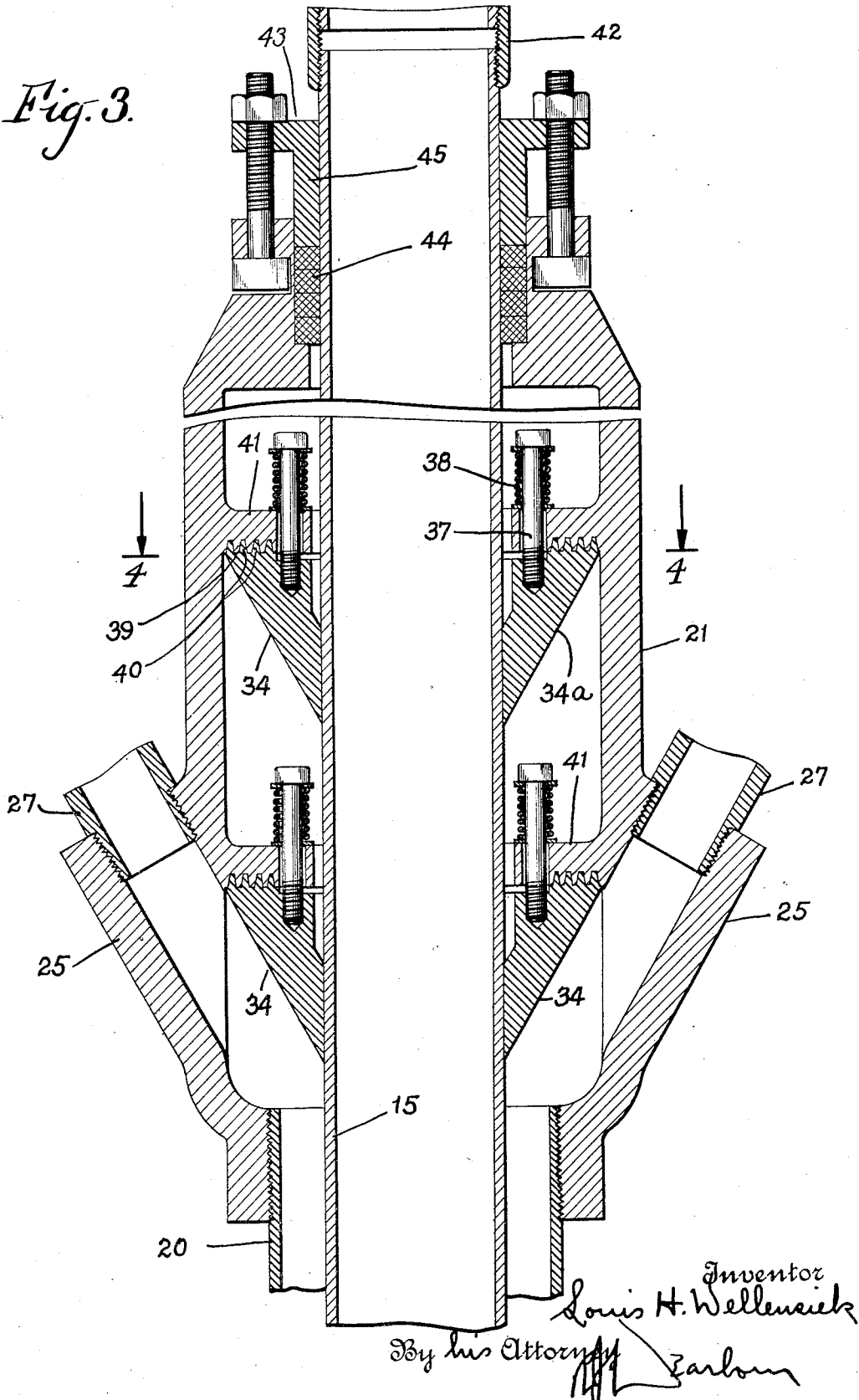
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DRILLING APPARATUS

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*Fig. 3.*



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*Fig. 4.*

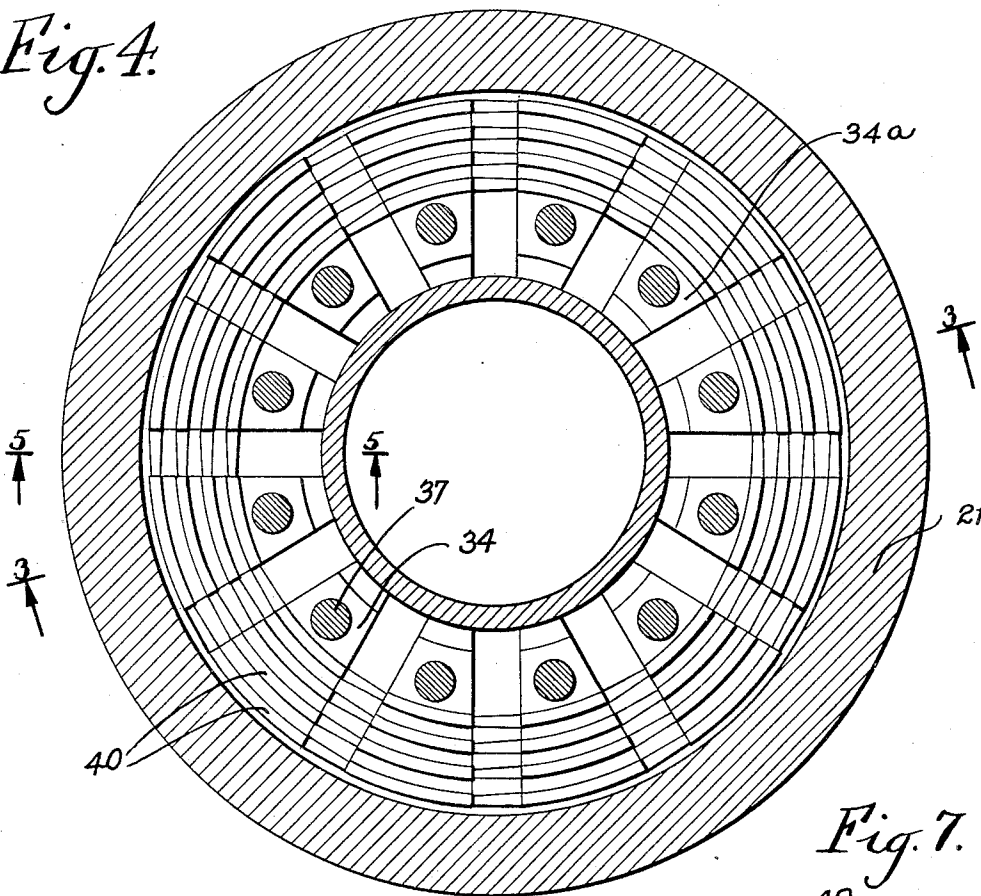


*Fig. 5.*

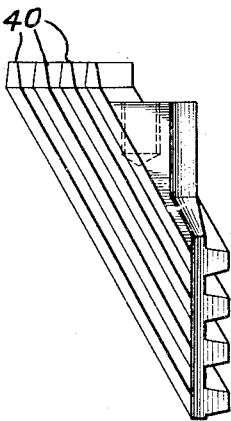


*Fig. 6.*

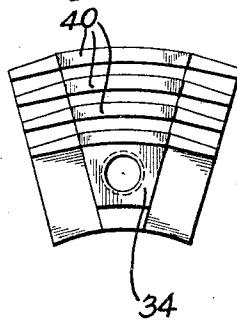
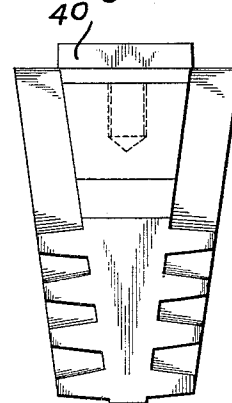


*Fig. 7.*



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DRILLING APPARATUS

Filed Aug. 15, 1924

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*Fig. 8.*

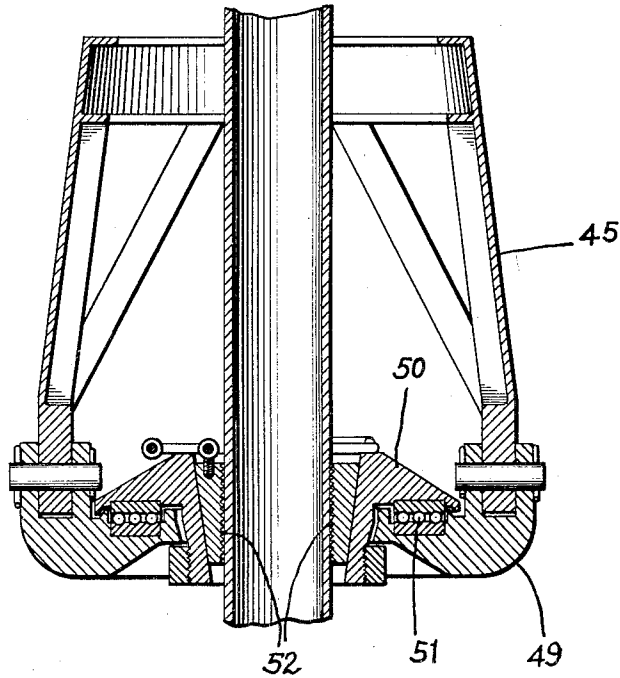
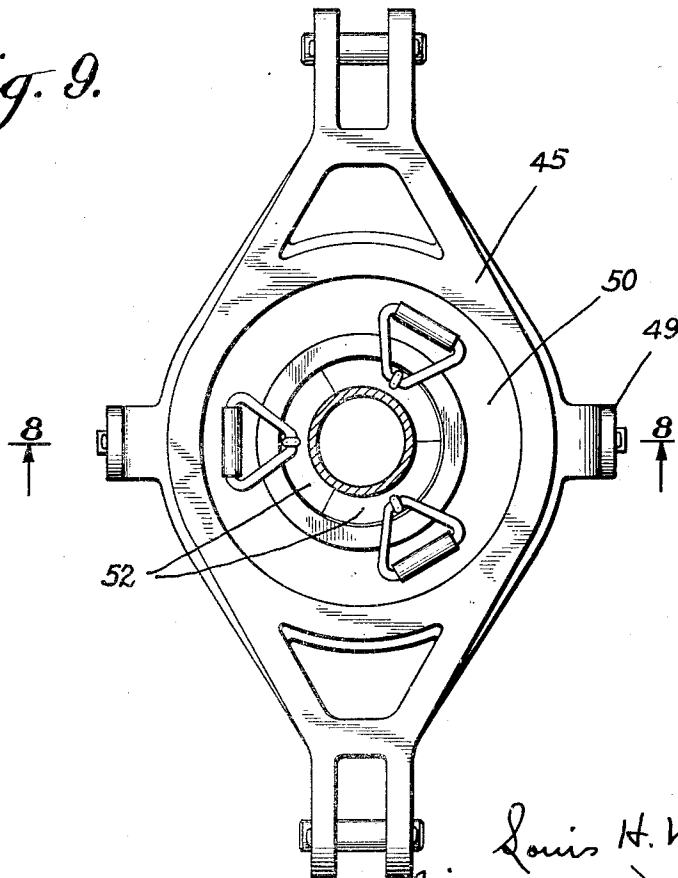


*Fig. 9.*



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## UNITED STATES PATENT OFFICE

LOUIS H. WELLENSIEK, OF HOUSTON, TEXAS

## DRILLING APPARATUS

Application filed August 15, 1924. Serial No. 732,254.

This invention relates to drilling apparatus and more particularly to apparatus for use in drilling through heaving shale or other shifting strata.

5 The invention contemplates the building up of a wall or screen of granular or porous material around the drill stem or depth casing whenever a stratum of heaving or shifting shale or other material is encountered during  
10 the drilling of a well so that if, for any reason, drilling has to be temporarily suspended, the heaving or shifting shale will not jam around the drill stem so tightly that drilling cannot be resumed.

15 Accordingly, one of the objects of the present invention is to form a porous screen about the well casing during the drilling operation whereby the shifting shale is held back so as not to interfere with the drilling.

20 Another object of the invention is to provide a method whereby the shifting of such shale or other material, as it may be necessary to drill through, will not interfere with the operation of the drill stem.

25 Another object of the invention is to provide means for introducing granular material into the well to provide a porous screen around the drill stem or depth casing.

30 Still another object of the invention is to provide a special type of casing head so constructed and arranged that a section of pipe may be passed downwardly therethrough without any leakage of fluid around the pipe.

35 A still further object is to provide a porous or granular screen around the drill stem in the vicinity of such shale or other material as the stem may pass through during the drilling operation.

40 A still further object is to provide such a screen which, while effectively holding back the shale or other material, will not check the flow of oil when a paying stratum is reached.

45 One of the features of the invention has particular reference to the method whereby

a porous screen is constructed in the well around the depth casing to hold back the heaving shale while permitting the free flow of oil without discontinuing the regular operation or rotation of the drill stem.

Referring to the several figures of the drawings:

Fig. 1 is a view in elevation of a portion of a derrick, somewhat conventional in form, and provided with the drilling apparatus  
55 constituting a part of my invention.

Fig. 2 is an enlarged view in elevation of the drilling apparatus shown in Fig. 1.

Fig. 3 is a sectional view in elevation of a portion of the drilling apparatus shown in Figs. 1 and 2, and as taken on the line 3—3  
60 of Fig. 4.

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

Figs. 5, 6 and 7 are views of one of the arcuate sections or members disassociated  
65 from the other sections with which they cooperate to form collectively a packing ring, Figures 5 and 7 being views in elevation and Figure 6 a plan view of the same member or  
70 section.

Fig. 8 is an enlarged sectional view of the two point swivel taken on line 8—8 of Fig. 9.

Fig. 9 is a plan view of Fig. 8.

Having thus briefly set forth some of the objects and advantages of my invention I  
75 will now proceed to describe the same, reference being had to the accompanying drawings, and will then point out the novel features of the invention in the appended  
80 claims.

Considering the invention in detail and referring now more particularly to Fig. 1 it will be seen that the invention comprises a derrick 10 of conventional design with a  
85 raised floor 11 upon which a rotary 12 is mounted, the rotary being operated by a pinion 13 mounted on the end of a pinion shaft 14 which is operated by means of belts or chains connected with a motor (not shown). 90

A casing 15 which constitutes both depth casing and drill stem is secured to the rotary 12 and is rotated therewith, it being understood that one or more strings of surface casing 20 of different diameters may be used in addition to those shown. The casing 15 is secured to the rotary 12 by any suitable means such, for example, as a double deck grip ring 16.

This system relates more particularly to the reverse return method of drilling wherein mud laden fluid passes down the outside of the drill stem and returns to the surface through the drill stem. Accordingly, the casing 15 is provided at its upper end with a box or hopper 17 into which the fluid from the well is discharged, the fluid being removed from the hopper 17 to a slush-pit 18 through a flexible hose 19.

The casing or drill stem 15 is supported by a two-point support swivel structure 45 which is supported by two rods 46, 46 attached to a cable 47 by means of a bale 48, the rods 46, 46 being of a length somewhat greater than that of an ordinary pipe so as to enable the attachment of new joints. The swivel structure 45 (Fig. 8) is formed with a pair of bearing plates 49 and 50 and suitable bearing members 51 are interposed between the bearing plates to provide for the easy rotation of the plate 50 on the plate 49. The casing 15 is held in contact with the swivel members by means of wedge slips 52.

Beneath the raised floor 11 of the derrick 10 and secured on the upper end of the surface casing 20 is a casing head 21 formed with a short connecting member 22 which connects to a pipe 23 which in turn leads to a source of fluid supply (not shown), the fluid being pumped from the source of supply to the casing head 21 by a pump 24, and from the casing head it is forced down the bore of the well and about the drill stem or depth casing 15.

The casing head 21 is provided with a pair of oppositely disposed outlet connections 25, 25 to each of which is secured an upwardly inclined valved tubular member or passageway 27 on the outer end of which is secured a hopper 28 having a cover 29 removably secured thereon by any suitable means as, for example, bolts 30 and nuts 31. A pair of branch pipes 32, 32 each of which is connected at one end to the supply pipe 23 and connected at their other ends to one of the hoppers 28 and each may be provided within the hopper with a nozzle 26 which projects into the tubular member or passageway 27. Thus, in addition to supplying fluid to the casing head 21, the pipe 23 also supplies fluid to the hoppers 28, 28 in such a manner as to provide a means for maintaining the passageways between the hoppers and the casing head clear of any obstruction by reason of the injector action of the nozzles. In

the place of the nozzles 26, 26 mechanical means may be substituted for maintaining the passageways clear of any obstruction, and the nozzles are illustrated for the purpose of describing one way in which the desired result may be advantageously obtained.

The pipes 32, 32 may be of any size to furnish the desired quantity of fluid to the hoppers or they may be provided with means such as a valve for regulating the passage of fluid therethrough. The tubular members or passageways 27, 27 are each provided with a valve 33, 33 for controlling the discharge of the contents of the hoppers into the casing head 21.

The casing head 21 is also provided with a packing device for preventing the fluid therein from escaping therefrom, as illustrated in Fig. 3. The packing consists of one or more packing rings 34, 34 disposed within the casing head. Each packing ring 34 comprises a plurality of arcuate sections 34a (see Fig. 4) and each section is secured to a bolt 37 which is supported on resilient means such as a coil spring 38. The several sections or members 34a are formed with grooves 39 and tongues 40 which cooperate with grooves and tongues formed in annular flanges 41, 41 in the wall of the casing head to form a groove and tongue or labyrinth joint. Groove and tongue joints are likewise provided between each of the adjacent or contiguous members 34a. The grooves and tongues are preferably of tapered formation.

The operation of the device is apparent. When a collar 42 connecting adjoining sections of the drill stem or depth casing 15 is moved downward and comes in contact with one of the packing rings 34, the several members 34a are pushed downwardly and also rocked backward somewhat by reason of the tapered character of the groove and tongue joints. At the same time the members are spread apart from each other. The multiplicity of passages through which the fluid must pass reduces the extent of leakage through the packing members while the collar 42 is going through. At the upper end of the casing head 21 a stuffing box 43 of conventional design may be provided, if desired, to prevent leakage about the casing 15 in case there should by any chance be any seepage through the labyrinth packing members. The stuffing box consists of suitable packing material 44, packing gland 45, and suitable means such as bolts and nuts for maintaining the gland in position. It is, of course, necessary to remove the stuffing box to permit the collar 42 to descend.

The drill stem is rotated in the usual manner until such time as it may become necessary to change the bit. In the event that such change must be made when the bit is cutting through a body of heaving or shifting shale there would under ordinary drilling meth-

ods, be danger of the shale settling so tightly around the drill stem while its rotation is stopped for the exchange of bits that rotation could only be resumed with difficulty.

5 The present invention, however, contem-  
plates the exchange of bits without stopping  
the rotating of the drill stem and also the  
building up of a granular or porous screen  
about the drill stem in the vicinity of the  
10 strata of heaving shale so that the shale can-  
not settle around or interfere with the con-  
tinuous operation of the drill stem. There-  
fore, whenever a stratum of heating or  
shifting shale is encountered the hoppers  
15 28 are filled with a granular material (as  
indicated in Fig. 2) such for example,  
as gravel. To introduce the gravel into  
the casing head 21 the valves 33 are opened  
so that the discharge of water or mud  
20 laden fluid from the nozzles 26 will force  
the granular material into the casing head  
21 from which it is forced down around the  
casing 15 by the pressure exerted by the mud  
laden or other fluid being forced into the  
25 casing head from the pipe 22 by the pump  
24. The two hoppers 28, 28 can be operated  
simultaneously or one can charge gravel into  
the casing head while the other is being re-  
filled. The fluid is discharged from the noz-  
30 zles 26, 26 with sufficient force to keep the  
tubular members or passageways 27, 27 free  
from obstructions.

As the gravel is forced downwardly in the  
well it builds up a porous screen about the  
35 casing 15 so that the heaving shale is kept  
from falling in around the casing or drill  
stem and preventing or rendering it difficult  
to exchange bits. Inasmuch as the screen  
is composed of granular material it will suf-  
40 fice to hold back the shifting or heaving  
shale without interfering with the free flow  
of oil or other liquid encountered.

Apparatus of preferred form and con-  
struction has been illustrated and described  
45 for the purpose of showing one way in which  
this invention may be practiced, but the in-  
ventive thought upon which my invention  
is based is broader than its illustrative em-  
bodiment thereof and no limitations are  
50 therefore intended other than those imposed  
by the appended claims.

What I claim is:

1. Well drilling apparatus comprising a  
casing-head for the surface casing, a cham-  
55 bered member or hopper connected to said cas-  
ing-head and adapted to contain granular ma-  
terial, and a fluid nozzle within the hopper  
for discharging said granular material under  
pressure from said hopper into the well  
60 around the outside of the depth casing.

2. In well drilling apparatus, a casing head  
having an internal annular flange provided  
with annular grooves and tongues on one face  
thereof, a plurality of arcuate members hav-  
65 ing grooves and tongues adapted to cooperate

with the grooves and tongues of said annular  
flange to form a seal, and grooves and tongues  
on their contiguous sides cooperating with one  
another to form a seal, and means for adjust-  
ably securing said arcuate sections to said  
70 flange.

3. In drilling apparatus, a casing head hav-  
ing an internal annular flange having a por-  
tion thereof provided with grooves and  
75 tongues, a plurality of arcuate members hav-  
ing grooves and tongues adapted to cooperate  
with the grooves and tongues of said annular  
flange to form a seal, the contiguous sides of  
said members being provided with a plurality  
of grooves and tongues cooperating to form  
80 seals and means for resiliently securing said  
arcuate sections to said flange, the several  
arcuate sections collectively constituting a  
packing ring.

4. In drilling apparatus, a casing head hav-  
85 ing an internal annular flange having a por-  
tion thereof provided with grooves and  
tongues, a plurality of arcuate members hav-  
ing grooves and tongues adapted to cooperate  
with the grooves and tongues of said annular  
90 flange and means for resiliently securing each  
of said arcuate members to said flange includ-  
ing a bolt secured to the arcuate member and  
extending through the flange and a spring  
surrounding the bolt, one end of which spring  
95 constitutes a seat for the enlarged end of the  
bolt whereby limited movement of the arcuate  
member is permitted.

5. In drilling apparatus, a casing head  
100 through which a tubular member is adapted  
to be passed said casing head having an inter-  
nal annular flange with a portion thereof  
provided with grooves and tongues, a plural-  
ity of arcuate members having grooves and  
105 tongues adapted to cooperate with the grooves  
and tongues of said annular flange, the con-  
tiguous sides of said members being provided  
with a plurality of grooves and tongues co-  
operating to form seals, and a portion of each  
of said arcuate members being adapted to abut  
110 against the tubular member within the casing  
head, and means for resiliently securing said  
arcuate sections to said flange and against said  
tubular member.

6. The reverse return method of drilling a  
115 well through shifting or heaving strata which  
comprises continuously rotating a drill stem  
to thereby penetrate the strata, and prevent-  
ing shifting or heaving formation from  
packing about the drill stem so as to interfere  
120 with its rotation by simultaneously forcing  
granular material downwardly around the  
outside of the drill stem during the rotation  
thereof to build up a porous screen between  
the drill stem and the well in the vicinity of  
125 the shifting or heaving formations.

7. The reverse return method of drilling a  
well through shifting or heaving strata which  
comprises continuously rotating a drill stem  
to thereby penetrate the strata, and prevent-  
130

ing shifting or heaving formation from pack-  
ing about the drill stem so as to interfere with  
its rotation by simultaneously forcing granu-  
lar material downwardly around the outside  
5 of the drill stem under fluid pressure during  
the rotation thereof to build up a porous  
screen between the drill stem and the well in  
the vicinity of the shifting or heaving forma-  
tions.

10 In witness whereof I have hereunto set my  
hand this 16th day of July, 1924.

LOUIS H. WELLENSIEK.

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