Jan. 13, 1953 H. J. WAGNER 2,625,039

APPARATUS FOR DETECTING SEEPAGE OF WATER INTO WELLS

Filed Sept. 30, 1948 2 SHEETS—SHEET 1

Fig. 1.

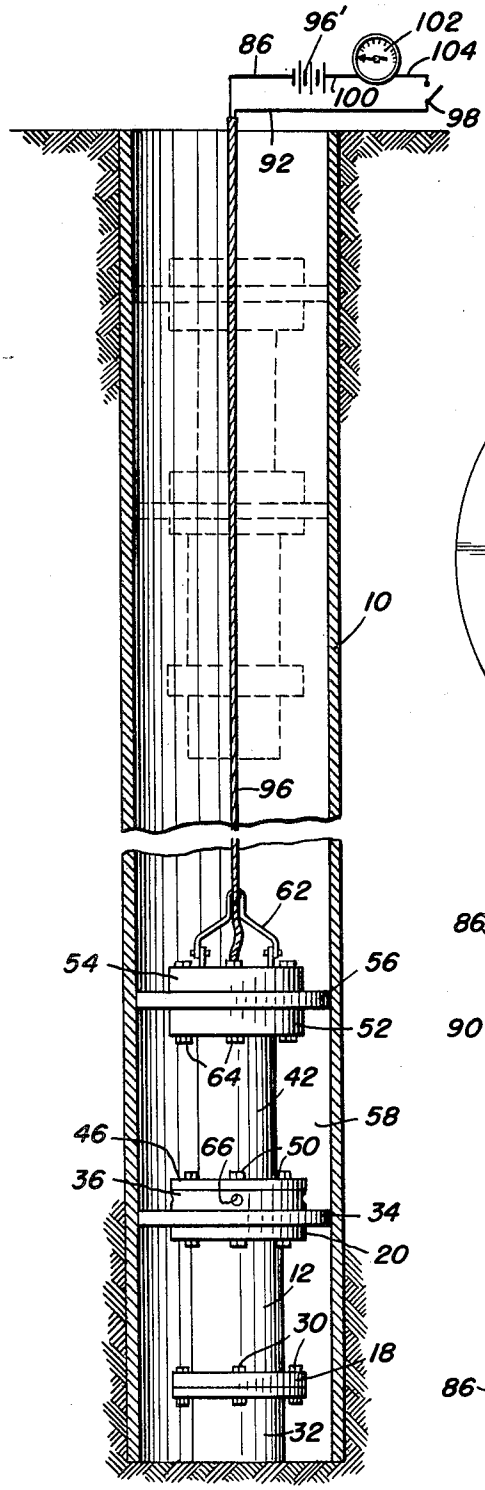



Fig. 3.

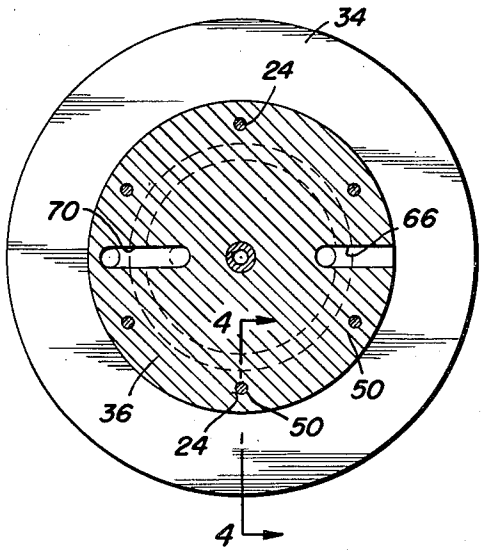



Fig. 5.

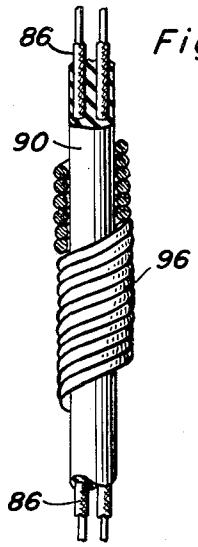
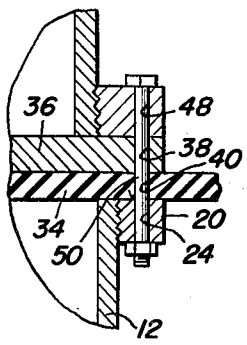



Fig. 4.




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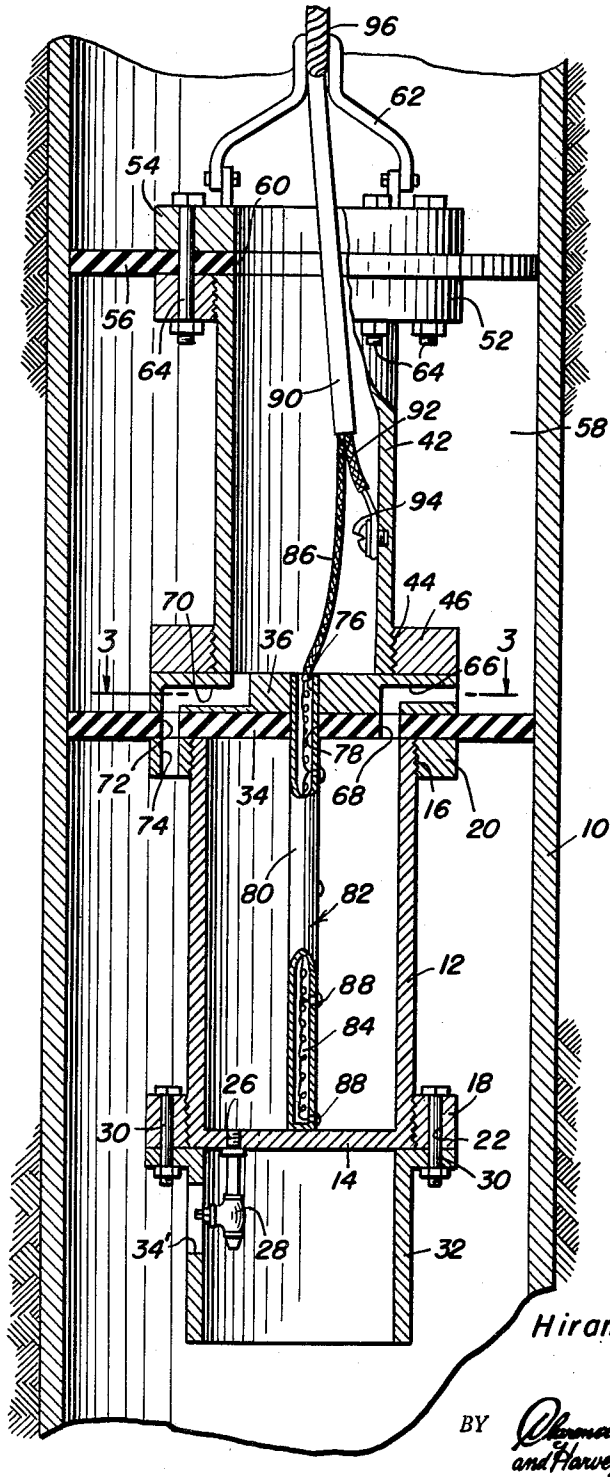
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Jan. 13, 1953 H. J. WAGNER 2,625,039

APPARATUS FOR DETECTING SEEPAGE OF WATER INTO WELLS

Filed Sept. 30, 1948 2 SHEETS—SHEET 2

Fig. 2.




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# UNITED STATES PATENT OFFICE

2,625,039

## APPARATUS FOR DETECTING SEEPAGE OF WATER INTO WELLS

Hiram J. Wagner, Charleston, W. Va.

Application September 30, 1948, Serial No. 52,063

9 Claims. (Cl. 73—155)

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This invention relates to apparatus for detecting the seepage of water into a well and has for its primary object to enable the user to determine the point or points at which such leakage occurs and the rapidity with which seepage of water through a well casing takes place.

Another object is to successively isolate restricted portions of a well, and to determine the amount of seepage occurring in the isolated portion.

A further object is to avoid interrupting the flow of fluid from a well while the water seepage into the well is being determined.

Among its features this invention embodies means entering a well for isolating any area of said well from the balance thereof, a receptacle communicating with the isolated portion of the well for receiving water seeping into said isolated portion, a vertically disposed electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit and means in said electrical circuit for registering the decrease of resistance in said circuit as water rises in the receptacle.

Other features include means for maintaining a flow of fluid through the well during the isolation of a portion of the wall thereof from the balance of the well, a drain valve in the bottom of the receptacle, and a skirt depending from the bottom of the receptacle and encircling the drain valve to protect said valve from injury.

In the drawings:

Figure 1 is a sectional view through a well casing illustrating this improved detecting device in use therein;

Figure 2 is a fragmentary enlarged sectional view through the well casing and that portion of the detecting device which enters the well;

Figure 3 is a transverse sectional view taken substantially along the line 3—3 of Figure 2;

Figure 4 is a fragmentary enlarged sectional view taken substantially along the line 4—4 of Figure 3; and

Figure 5 is a fragmentary side view partially in section of a type of suspending cable and conductor carrier suitable for use in connection with this invention.

Referring to the drawings in detail, a well is drilled to any desired depth below the surface of the earth and is conventionally equipped with a well casing 10. It frequently happens that through corrosion and for other reasons the well casing will leak, thus permitting water to enter the well and this water may rise to a depth within

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the well where it seriously impairs the productivity of the well.

My invention embodies a seepage receiving receptacle 12 of substantially tubular form and having a closed bottom 14. Opposite ends of the receptacle are provided with external screw threads 16 on which attaching collars 18 and 20 are threaded, and these collars are provided at spaced intervals with bolt-receiving openings 22 and 24 respectively. The bottom 14 of the receptacle 12 is provided with an internally screw-threaded drain opening 26 in which is received the threaded nipple of a drain valve 28 which projects downwardly below the bottom of the receptacle 12 as will be readily understood upon reference to Figure 2. Bolted as by bolts 30 which extend through the openings 22 in the flange 18 to the underside of the receptacle 12 is a valve protecting skirt 32 which, as illustrated in Figure 2, encircles the valve and is provided with a window 34' through which access to the valve may be had for opening and closing it.

Seated on the upper open end of the receptacle 12, and overlying the flange 20 is a sealing gasket 34, the outer edge of which projects well beyond the outer periphery of the flange 20 and contacts the casing 10, not only to effect a water-tight junction therewith, but also to hold the receptacle in spaced relation to the casing. Seated on the gasket 34 in closing relation to the upper end of the receptacle 12 is a head 36 which is provided with spaced openings 38 adjacent its periphery which are adapted to align with the openings 24 in the flange 20, and with spaced openings 40 formed in the gasket 34. A tubular duct 42 rests on the top of the head 36 and extends upwardly therefrom in substantial axial alignment with the chamber 12, and secured as by screw-threads 44 to the lower end of the duct 42 is a flange 46 which is provided adjacent its periphery with spaced openings 48 which are adapted to align with the openings 24, 38 and 40 to receive clamping bolts 50 by which the head and duct are held in proper position on the receptacle 12. A flange 52 is carried by the duct 42 adjacent the end remote from the flange 46, and clamped against the end of the duct carrying the flange 52, between the flange and a clamping ring 54 is a sealing gasket 56 which is of a diameter substantially equal to that of the sealing gasket 34 so as to cooperate with the sealing gasket 34 in contacting the casing 10 and forming around the exterior of the duct an annular chamber 58. The gasket 56 is provided with a central opening 60 of a diameter substantially equal to the internal di-

ameter of the duct 42, and carried by the clamping ring 54 is a suspension bail 62 to which is attached the suspension cable, to be more fully hereinafter described. Clamping bolts 64 pass through the flange 52, the gasket 56 and the clamping ring 54 in order to securely hold the parts together.

Formed in the head 36 is an L-shaped passage 66, one end of which communicates with the chamber 58 while the opposite end opens into a passage 68 formed in the gasket 34 and opening into the interior of the receptacle 12. It will thus be seen that communication is established between the receptacle 12 and the chamber 58. Formed in the head 36 in circumferentially spaced relation to the passage 66 is a second passage 70 one end of which communicates with the interior of the duct 42 while the opposite end opens into a passage 72 formed in the gasket 34, and this passage 72 communicates through a passage 74 formed in the ring 20 with that portion of the well below the sealing gasket 34. Since the upper end of the duct 42 is wholly open, it will be understood that communication is established between the portion of the well below the receptacle and chamber 58 with that portion of the well above the chamber 58, so that while a seepage measurement is being taken no interruption of the flow of gas from the well will be experienced. Such passage also serves to bypass water seeping into the well above the upper sealing gasket 56 around the chamber 58 and into the portion of the well below the lower sealing gasket 34.

Formed in the head 36 substantially centrally thereof is an opening 76 which aligns with an opening 78 through the gasket 34, and receives the tubular casing 80 of an electrical resistance unit designated generally 82. The casing 80 is preferably formed of a non-conducting material and contains therein a resistance wire 84 which extends upwardly to the upper end of the tubular casing 80 and is connected at that point to a suitable insulated conductor 86. Secured at spaced intervals in the tubular casing 80 are contact elements 88 which extend through the wall of the tubular casing and are connected at vertically spaced points to the resistance wire 84 as will be readily understood upon reference to Figure 2. The conductor 86 is housed within a suitable sheath 90 along with a second insulated conductor 92 which has electrical connection with the duct 42 as at 94. The sheath 90 is contained within a stranded suspension cable 96 which is looped around the bail 62 and thence leads upwardly to the open upper end of the well to provide a suspension means for the receptacle 12 and the accompanying equipment. The upper ends of the conductors 86 and 92 lead respectively to one terminal of a power source 96' and to one terminal of a switch 98. The opposite terminal of the power source is coupled through the medium of a conductor 100 to one terminal of a resistance measuring instrument 102, the opposite terminal of which is coupled through the medium of a conductor 104 with the terminal of the switch 98 opposite that to which the conductor 92 is coupled. It will thus be seen that with the switch 98 closed, and water rising in the receptacle 12, the instrument 102 will be energized.

In use, the receptacle is lowered as suggested in Figure 1 into a well casing so that the gaskets 34 and 56 will effectively seal that portion of the casing extending the length of the duct 42. Any leakage of water that takes place through the casing between the gaskets 34 and 56 will flow through the passages 66 and 68 into the receptacle 12, and water rising in the receptacle will first contact the lowermost contact element 88, thus establishing the electrical circuit through the instrument 102 and giving a reading thereon. As the water rises it will contact the second contact element 88 and owing to the fact that a portion of the resistor 84 has been cut out, it will be evident that the reading on the instrument 102 will vary from the initial reading. As the water rises and contacts successive contacts 88 it will be evident that the reading on the instrument will change, and by noting the interval of time between the first and last readings, and knowing the capacity of the receptacle 12, the user may readily determine the rate at which seepage into the length of well casing extending between the gaskets 34 and 56 takes place.

While in the foregoing there has been shown and described the preferred embodiment of this invention, it is to be understood that minor changes in the details of construction and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

Having described the invention, what is claimed as new is:

1. Apparatus for detecting seepage of water into a well, said apparatus comprising means for isolating any area of the well from the balance thereof, a receptacle communicating with the isolated portion of the well for receiving water seeping into said isolated portion of the well, a vertically disposed electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit and means in said circuit for registering the decrease of resistance in said circuit as water rises in the receptacle.

2. Apparatus for detecting seepage of water into a well, said apparatus comprising means receivable in a well for isolating any area of the well from the balance thereof, a receptacle, means for communicating between the receptacle and an isolated portion of the well and directing water seepage from an isolated portion of the well into the receptacle, a vertically disposed electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit, means in said circuit for registering the decrease of resistance in said circuit as water rises in the receptacle, a drain valve in the bottom of said receptacle and a skirt depending from the receptacle and surrounding the drain valve to protect said valve from damage.

3. Apparatus for determining the rapidity with which a fluid seeps into a well from different portions thereof and for collecting specimens of the same, said apparatus comprising a means slidably received in a well for isolating any portion of the well from the balance of the well, a receptacle carried by the isolating means and communicating with the isolated portion of the well for receiving water seeping into the well from the isolated portion thereof, a vertically disposed electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit and means in said circuit and responsive to increasing and decreasing resistance therein to register the decrease of resistance in said circuit as water rises in said receptacle.

4. Apparatus for detecting seepage of water

into a well, said apparatus comprising means slidably received in a well for isolating any area of said well from the balance thereof, means for selectively raising and lowering said last means, a receptacle communicating with the isolated portion of the well for receiving water seeping into said isolated portion of the well, a vertically disposed electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit, means in said circuit for registering the decrease of resistance in said circuit as water rises in the receptacle and means carried by the isolating means to maintain communication between the portions of the well on opposite sides thereof.

5. Apparatus for determining the rapidity with which water seeps into a well from different portions thereof, said apparatus comprising means slidably received in a well for isolating any portion of the well from the balance of the well, a receptacle carried by the isolating means and communicating with the isolated portion of the well for receiving water seeping into the well from the isolated portion thereof, a vertically disposed electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit, means in said circuit and responsive to increasing and decreasing resistance therein to register the decrease of resistance in said circuit as water rises in said receptacle and means carried by the well portion isolating means to maintain communication between the portions of the well on opposite sides thereof.

6. Apparatus for detecting seepage of water into a well comprising a receptacle having an open upper end, a head closing the upper end of the receptacle, an annular packing ring carried by the receptacle adjacent its upper end for sealing engagement with the wall of the well, a duct carried by the head and projecting upwardly therefrom in spaced relation to the wall of the well, an annular packing ring carried by the duct in spaced relation to the packing ring carried by the receptacle to form an annular chamber around the duct which is isolated from the well, the head having a passage therethrough establishing communication between the chamber and the receptacle and a second passage therethrough establishing communication between the portion of the well below the receptacle and the duct, a vertical electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit, means in said electrical circuit for registering the decrease of resistance in said circuit as water entering the receptacle from the chamber rises in said receptacle and a drain valve in the bottom of said receptacle.

7. Apparatus for detecting seepage of water into a well comprising a receptacle having an open upper end, a head closing the upper end of the receptacle, an annular packing ring carried by the receptacle adjacent its upper end for sealing engagement with the wall of the well, a duct carried by the head and projecting upwardly therefrom in spaced relation to the wall of the well, an annular packing ring carried by the duct in spaced relation to the packing ring carried by the receptacle to form an annular chamber around the duct which is isolated from the well, the head having a passage therethrough establishing communication between the chamber and the receptacle and a second passage therethrough establishing communication between the portion of the well below the receptacle and the duct, a vertical electrical resistance unit in but electrically isolated from the receptacle, an electrical circuit including the receptacle and the resistance unit, means in said electrical circuit for registering the decrease of resistance in said circuit as water entering the receptacle from the chamber rises in said receptacle, a drain valve in the bottom of said receptacle and a skirt depending from the receptacle and surrounding the drain valve to protect said valve from damage.



8. Apparatus for collecting a specimen of well seepage while determining the rate of such seepage comprising means for isolating a selected portion of a well from the balance thereof, passage means through said last means for the vertical movement of a fluid therethrough, a receptacle, means for communication between the isolated portion of the well and the receptacle, electrical means including a member in the receptacle for indicating at a position remote from the receptacle the height of seepage accumulated in the receptacle.

9. Apparatus for detecting seepage of water into a well comprising a receptacle having an open upper end, a head closing the upper end of the receptacle, an annular packing ring carried by the receptacle adjacent its upper end for sealing engagement with the wall of the well, a duct carried by the head and projecting upwardly therefrom in spaced relation to the wall of the well, a second annular packing ring carried by the duct in spaced relation to the first mentioned packing ring carried by the receptacle for sealing engagement with the wall of the well to define an annular space around the duct, the head having a passage therethrough establishing communication between the annular space and the receptacle and a second passage therethrough establishing communication between the portion of the well below the receptacle and the duct, a vertical electrical resistance unit in but electrically isolated from the receptacle, an electric circuit including the receptacle and the resistance unit and means in said electrical circuit for registering the decrease of resistance in said circuit as water entering the receptacle from the space rises in said receptacle.

HIRAM J. WAGNER.


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