

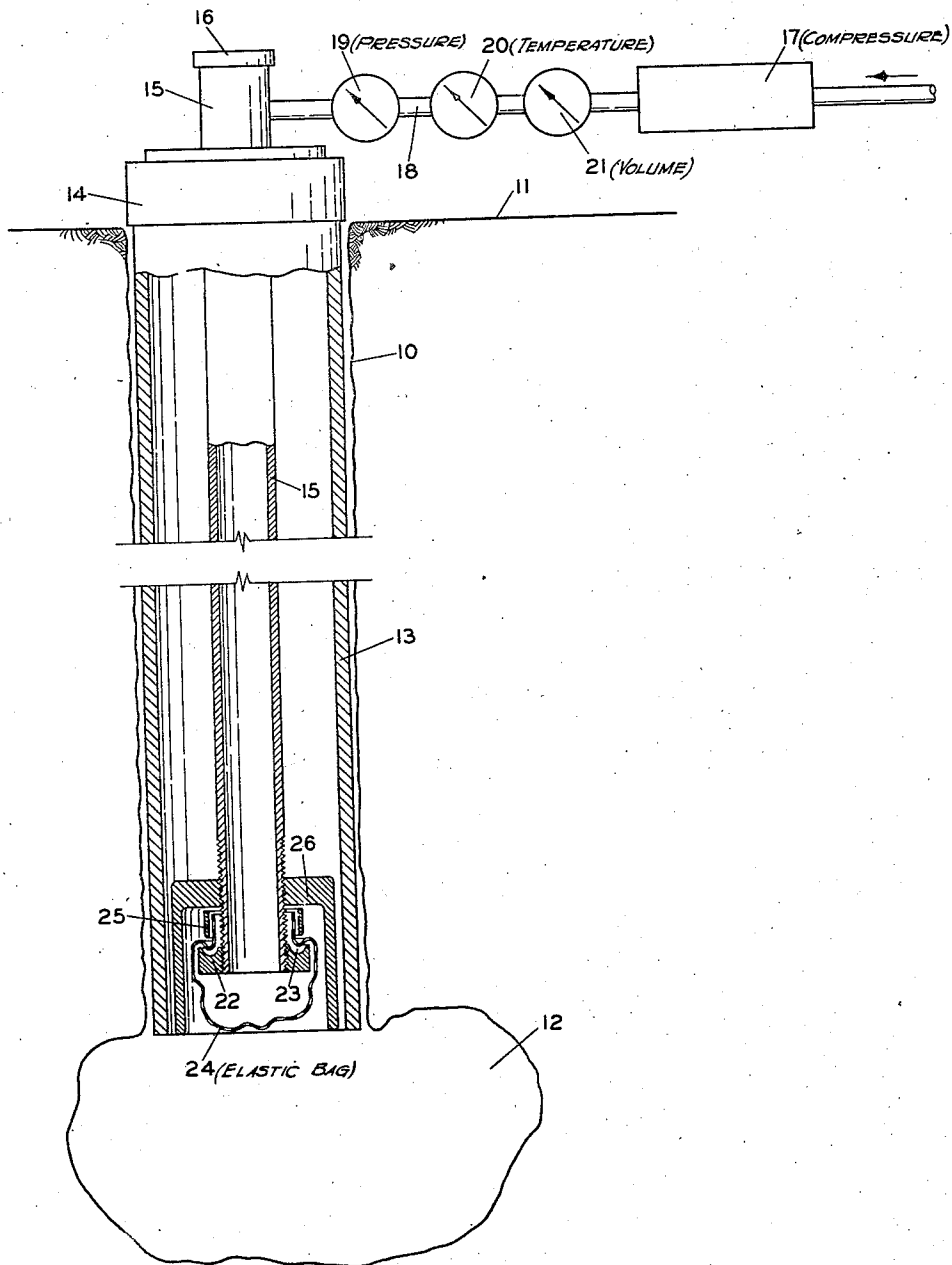
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APPARATUS FOR MEASURING VOLUME OF BOTTOM HOLE PORTION OF WELL BORES

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APPARATUS FOR MEASURING VOLUME OF  
BOTTOM HOLE PORTION OF WELL BORES

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2 Claims. (Cl. 73—51)

This invention relates to the exploration of wells and more particularly to apparatus for determining the size of various cavities, including bottom hole cavities of well bores.

In present-day practice in the petroleum industry, a knowledge of the size of cavities in well bores is desirable in order that an operator's procedure for producing hydrocarbon oil and gas may be simplified and made less expensive. A few of the instances wherein the size of the cavity in a well bore should be known by an operator are during the gravel packing of a well bore and during the tamping of an explosive charge in a bore hole preliminary to discharging the same. Ordinarily in carrying out various well operations, such as gravel packing, it is customary that supplies of materials in excess of the amount estimated to be essential be kept on hand. By knowing the volume of a particular well cavity, the operator can secure exact quantities of supplies that will be needed, and thereby avoid the hauling cost and investment in excess materials. Further, by ascertaining the size of a bore hole prior to "shooting" a well and after the "cleaningout" process, an operator is able to determine the effectiveness of the shot.

By the practice of my instant invention, I am able to more accurately determine the size of a well cavity than with present-day apparatus, and moreover, I may do this readily and economically.

It is therefore the primary object of my invention to provide apparatus for effectively determining the size of various cavities, including bottom hole cavities of well bores.

Other important objects and advantages obtainable by practice of my present invention will be apparent to persons skilled in the art by reference to the following description and annexed drawing which is an elevation view of a preferred embodiment of the apparatus of my invention partly in cross-section.

Referring to the drawing, I have denoted therein a well bore by reference numeral 10. Well bore 10 extends downwardly from the surface of the ground 11 to a well cavity or bottom hole 12, which is formed at the lower end of the well bore. Contained within the well bore is a casing 13, having a closure 14, which is adapted to support a string of oil well tubing 15 concentrically within the casing. A cap 16 is provided on the upper end of tubing 15 which communicates with a compressor 17 through a conduit 18. A pressure indicator 19, a temperature indicator 20, and a volume indicator 21 are preferably pro-

vided on conduit 18 intermediate the compressor and closure 14. A ring 22, which is threadedly connected to the lower end of the tubing, is provided with an annular groove 23 on its upper face. A bag 24, which is preferably composed of an elastic, resilient, inflatable, distortable, oil-resistant material, such as synthetic rubber, covers the lower end of the string of tubing and extends upwardly around ring 22 and over groove 23. Positioned above the portion of the bag covering groove 23 is a sleeve 25, the upper end of which abuts a protector member 26 which is threadedly connected to the lower end of the tubing in a manner whereby sleeve 25 causes the bag to make sealing contact with groove 23. Protector 26 extends downwardly beyond the lower end of the tubing, protecting the bag while it is being lowered through the casing, at which time the bag is in a deflated position.

Referring to the drawing, let us assume that my instant invention is assembled and positioned in the bore hole, as shown therein. A gas is compressed by compressor 17 and conveyed through conduit 18 and tubing 15 to the interior of bag 24 where the gas distends the bag until its outline conforms with the walls of cavity 12. The volume of gas within the bag will then substantially equal the volume of the cavity. It will be noted that by observing the pressure of the injected gas on pressure indicator 19 that the pressure of gas will rise comparatively slowly until the bag is fully expanded, at which time the pressure will rise sharply. By knowing the volume, pressure, and temperature of the gas at the surface of the ground, as indicated on the pressure, temperature, and volume indicators, the volume of gas in bag 24 can be determined and hence the volume of cavity 12 can likewise be determined. In determining the volume of bag 24 corrections for temperature and pressure in well cavity 12 must be considered. By knowing the pressure and temperature of the gas in bag 24 and the volume of gas passing through volume indicator 21, the volume of the gas in the bag can be ascertained and the volume of the well cavity computed.

From the foregoing, it is believed that the apparatus for practicing my instant invention will be readily comprehended by persons skilled in the art. It is to be clearly understood, however, that various changes in the apparatus herewith shown and described and in the method of practicing the invention, outlined above, may be resorted to without departing from the spirit of

the invention, as defined by the appended claims.

I claim:

1. In apparatus for determining the volume of an underground cavity that communicates with the surface of the ground through a bore hole, the combination comprising a conduit positioned in the bore hole and extending to the cavity, the lowermost end of said conduit including a downwardly flanged protective member, a flexible inflatable member disposed in fluid tight relation with the lower portion of the conduit and communicating therewith, said inflatable member being retractable beneath the protective member when deflated and means for transmitting a measured quantity of fluid under pressure through the conduit and into the member to inflate the same until it substantially conforms with the configuration of the surface of the cavity.

2. In apparatus for determining the volume

of the bottom hole portion of a well bore, the combination comprising a string of tubing in the well bore and extending to the lower portion thereof, an inflatable container disposed below the lower end of the tubing, means for hermetically securing the container to the lower end of the tubing, said means including a grooved ring threaded to the end of the tubing, a sleeve urging the mouth of the container into said groove, and a downwardly flanged protective member threaded to the tubing and bearing against said sleeve, the inflatable member being retractable beneath the protective member when deflated and means for transmitting a measured quantity of gas downwardly through the tubing and into the container under sufficient pressure to inflate the container until it contacts substantially the entire surface of the bottom hole.

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