July 18, 1950 A. J. ABRAMS 2,516,041

SHOTHOLE WATER SEAL

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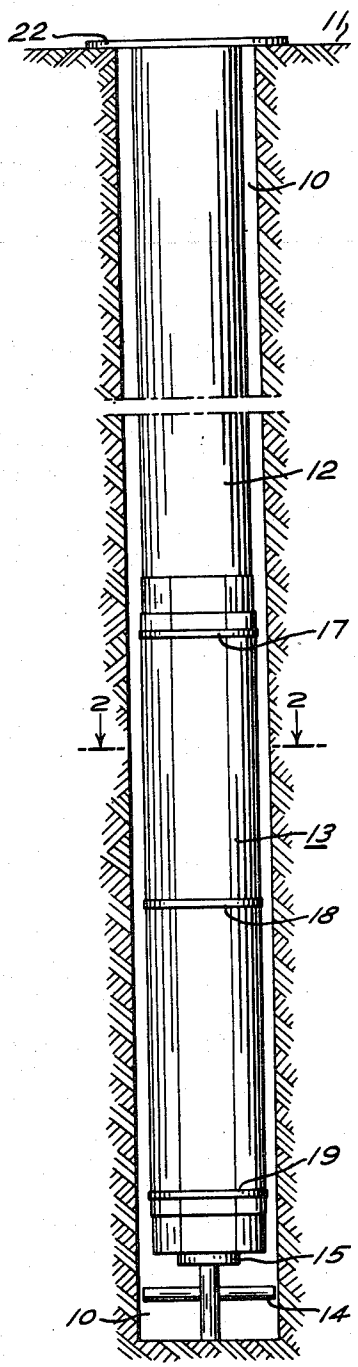


Fig. 1.

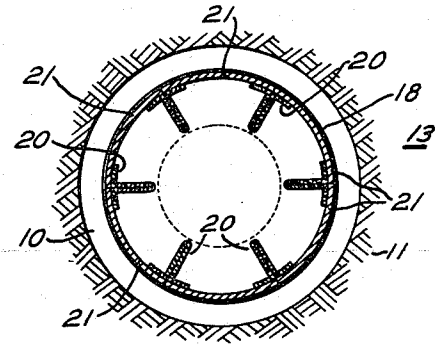


Fig. 2.

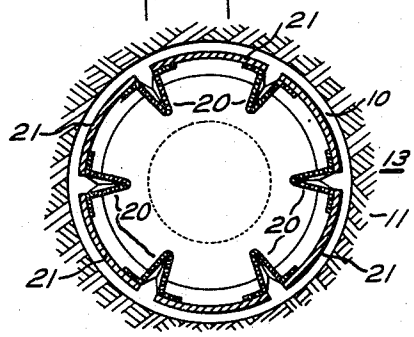


Fig. 3.

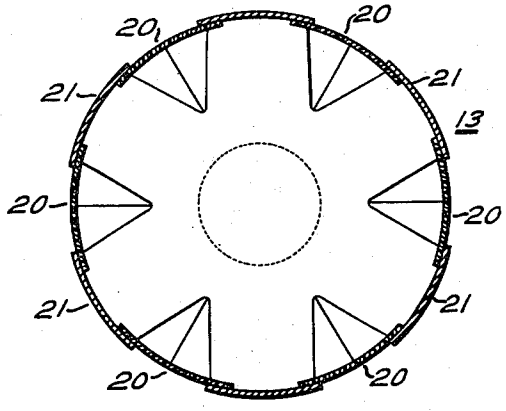


Fig. 4.

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SHOTHOLE WATER SEAL

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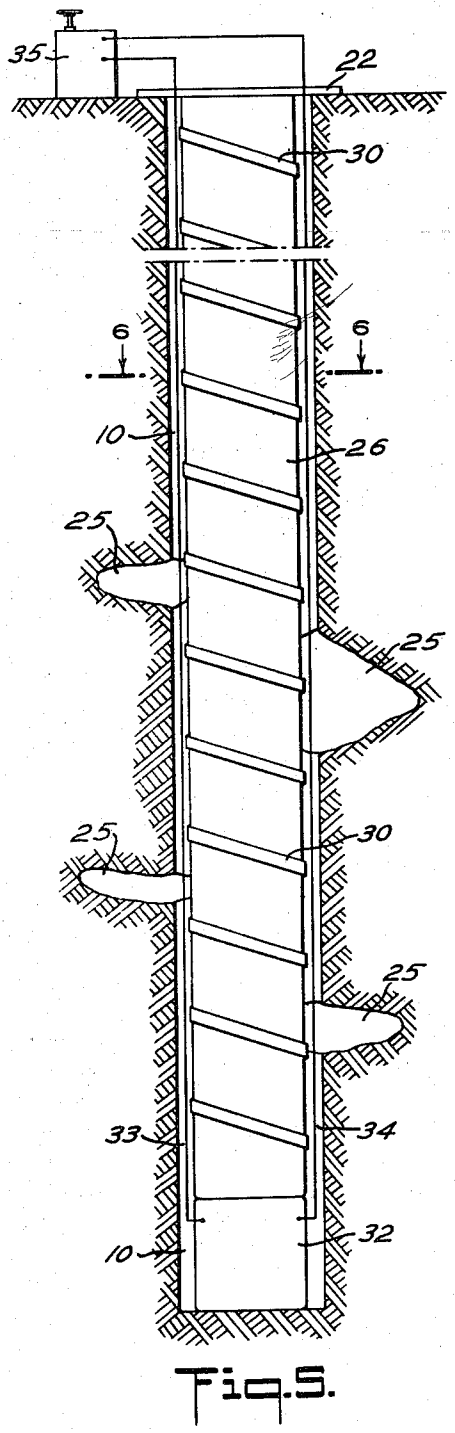


Fig. 5.

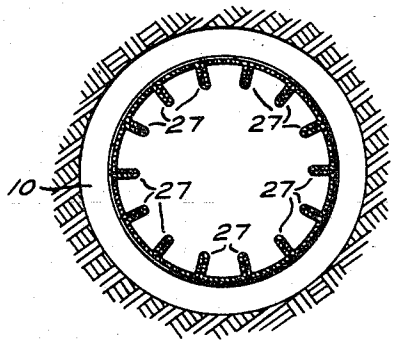


Fig. 6.

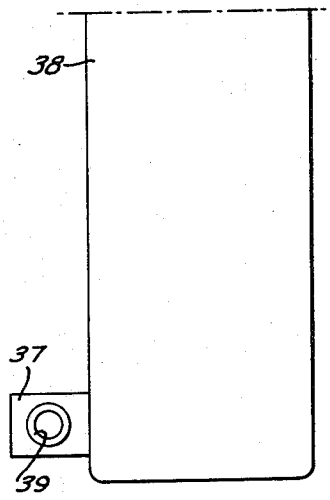


Fig. 7.

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SHOTHOLE WATER SEAL

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4 Claims. (Cl. 102—30)

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This invention relates to seismic prospecting systems of the type in which an explosive charge is disposed in a shothole for generation of seismic waves, which waves and their reflections are thereafter recorded and interpreted to yield valuable information with respect to the character of the subsurface strata.

In conducting seismic surveys in order to determine the probability of oil deposits in various sections of the country, it has often been found that the subsurface strata into which the shotholes penetrate are of such a porous character that it is difficult to hold water in them. It frequently happens that the porous character of such subsurface strata occurs where water is difficult to obtain and which is expensive to haul from the nearest available source. The use of water in each shothole is relatively important since it provides the needed tamp for the explosive charge. If a tamp were not provided, a substantial proportion of the energy generated by the detonation of the charge would be dissipated up the hole and only a small proportion of it directed into the earth.

In carrying out the present invention in one form thereof, there is provided a means for directing and concentrating in any predetermined zone the energy resulting from detonation of the explosive charge in the shothole. This means comprises a liquid container disposed lengthwise of the shothole for holding a predetermined quantity of liquid to form a tamp of the desired weight above the explosive charge. For easy insertion of the container into the shothole, it is preferably folded so that its cross-sectional area is considerably smaller than that of the shothole. It is held in its folded position by means of moisture-absorbing paper or other material distributed along the length and overlapping the folded portions of the container which loses its strength when wet. Accordingly, after insertion of the folded container into the shothole, the addition of water moistens the paper-holding means, which thereupon breaks to permit the unfolding of the container into intimate contact with the walls of the shothole.

For a more detailed understanding of the invention, and for further objects and advantages thereof, reference is to be had to the following description taken in conjunction with the accompanying drawings, in which:

Fig. 1 is an elevation of one embodiment of the invention shown in a shothole;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

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Fig. 3 is a sectional view with the lower part of the container partly expanded or unfolded;

Fig. 4 illustrates the lower portion of the container fully expanded or unfolded;

Fig. 5 is an elevation similar to Fig. 1 of another modification of the invention;

Fig. 6 is a sectional view taken on the line 6—6 of Fig. 5; and

Fig. 7 illustrates a further modification of the invention which may be utilized with either of the modifications of Fig. 1 or 5.

Referring to the drawings, the invention has been shown as applied to a shothole 10 which extends from the surface 11 of the earth to a suitable depth therebelow; for example, 60 to 100 feet or more, or less. Where the walls of the shothole 10 are porous or where the material forming the walls is of a character which rapidly absorbs water, it will be understood that it will be very difficult to produce and maintain a level of water within the shothole 10 high enough to provide adequate tamping for an explosive charge disposed at the bottom of the hole. In accordance with the present invention, not only is there provided the minimum amount of water needed for a tamp, but the weight of the tamp is controlled uniformly for successive shots.

After drilling of the shothole 10, there is inserted therein a container illustrated as having an upper section 12 and a lower section 13. To provide weight at the bottom of the container and to assist in guiding it into the shothole 10, spacing spokes 14 attached to a head plate 15 are provided. The spokes 14 may be omitted, if desired, and the head plate 15 made of considerable weight to insure the lowering of the container in the shothole. The upper section 12 of the container is preferably somewhat smaller in diameter than the shothole 10, and, as shown, the lower section 13 is folded, Fig. 2, so that its cross-sectional area is also smaller than that of the shothole 10. The lower section 13 is restrained in its folded position by means of paper bands 17, 18, and 19. The container as a whole may be made of canvas, preferably waterproofed to minimize leakage of water. In general, the explosive charge will be placed in the bottom of the container 13 before it is lowered into the shothole. However, after the container is in the position illustrated in Fig. 1, a charge of dynamite or other explosive may be lowered to the bottom of the container. Water is then added to fill the container to the desired level and to provide a tamp of adequate weight to insure the localization and concentration of the released

energy adjacent the bottom of the shothole and to minimize its loss in the upward direction.

The addition of the water to the container, either by slow seepage or external flow over the surface, produces a wetting or moistening of the paper bands 17—19 and so reduces their strength that the weight of the water in the lower section 13 causes them to break. As shown in Fig. 2, the lower section may be provided with a series of folds 20. Moreover, instead of the lower section 13 being constructed entirely of canvas, it may be made out of fibre sections 21 to which the folds 20 of canvas or other material may be suitably secured as by sewing and/or cementing. While it has been suggested that the bands require moistening, it is to be understood that need not be the case since the only requirement is that the weight of the water in the section 13 shall produce a force on the bands 17—19 great enough to break them. Since the lower end of the drill hole is nearly always wet due to the use of water in drilling it and also due to subsurface water, in some cases, the paper bands will soon absorb water for reduction in their strength. When this occurs, the weight of the water moves the sections 21 outwardly, as shown in Fig. 3, unfolding the folds 20 until the sections 21 are in contact with the inner wall of the shothole 10. The shothole is then effectively plugged or blocked. The fully expanded position of the lower section 13 is shown in Fig. 4.

Since the container is provided with a closure at its lower end, the tamp may be made effective with the explosive charge supported at points above the bottom of the container 13. When the container is supported by a ring 22, or otherwise, with its lower end above the bottom of the shothole 10, the tamp of water disposed therein will be effective to localize the energy of the explosive charge at the desired point.

In some locations, the subsurface strata may not only be porous but there may also be encountered relatively large voids, as indicated at 25, Fig. 5. These voids may be relatively small or they may be large. They may connect to fissures and otherwise render it difficult to hold water within the shothole 10. Instead of the container shown in Figs. 1–4, a water-tamp may be provided by a container 26 formed of canvas or of a heavy waterproofed kraft paper provided with a plurality of folds 27 of the pleated or accordion type. The container 26 is held in its folded position by means of a spirally-wound paper strip 30 extending from substantially the top to the bottom of the shothole 10. In this case, the explosive charge 32 is disposed at the bottom of the shothole 10, leadwires 33 and 34 extending therefrom to the firing or detonating apparatus 35. As in the case of Figs. 1–4, the strip 30 may be of paper which loses its strength after absorption of moisture or wetting thereof, or it may be of a material insufficiently strong to withstand the expanding force due to the weight of water within the container 26. In either case, the weight of the water breaks the tape and permits the container 26 to expand outwardly and into engagement with the wall of the shothole 10.

Where the head plate or the weight at the bottom of the container is not adequate to insure easy insertion of the container in the shothole, there may be provided one or more tabs, such as a tab 37 shown in Fig. 7, having a reinforced opening or eyelet 39 into which there may be inserted a long rod for forcibly moving the container 38 downwardly in the shothole. It is to be understood, of course, that the tab 37, together with its reinforced eyelet 39, may be applied to the modifications of Figs. 1 and 5, or in some cases it may be utilized alone and without the need for the folding of the container prior to insertion in the shothole. The eyelet 39 may be formed in the body-portion of the container 13 by closing the lower end, as by sewing or cementing it at a point above the eyelet.

It is to be understood that other modifications may be made within the spirit and scope of the appended claims.

What is claimed is:

1. In a seismic wave generating system, means for directing and concentrating in a predetermined zone the energy resulting from detonation of an explosive charge in a shothole comprising a liquid retaining, moisture permeable container folded to a relatively small size for insertion lengthwise of said shothole and moisture absorbing paper means distributed along the length and overlapping the folded portions of said container for absorbing moisture from said moisture permeable container and for holding said container folded until after absorption of moisture by said paper means which, upon addition of water to said container, automatically wets said paper means to decrease its strength for breakage by the weight of said water to permit unfolding of said container.

2. In a seismic wave generating system, means for directing and concentrating in a predetermined zone the energy resulting from detonation of an explosive charge in a shothole comprising an abrasive resistant, liquid retaining fabric container folded to a relatively small size for insertion lengthwise of said shothole, and moisture absorbing paper means distributed along the length and overlapping the folded portions of said fabric container to absorb moisture therefrom and to hold said fabric container folded, which paper means, upon the addition of water to said container, automatically is weakened for breakage by the weight of said water to permit unfolding of said container.

3. In a seismic wave generating system, means for directing and concentrating in a predetermined zone the energy resulting from detonation of an explosive charge in a shothole comprising a liquid retaining container having a plurality of longitudinal sections of moisture permeable material, said container being folded at said longitudinal sections to a relatively small size for insertion lengthwise of said shothole, and moisture absorbing paper means encircling said folded container a plurality of times, the respective encirclements being at regions spaced along the length of said container and adjacent at a plurality of points to said longitudinal sections of moisture permeable material for absorption of moisture at said plurality of points and for holding said container folded until after absorption of moisture of said paper means which paper means, upon the addition of water to said container, automatically decreases its strength for breakage by the weight of said water to permit unfolding of said container.

4. In a seismic wave generating system, means for directing and concentrating in a predetermined zone the energy resulting from detonation of an explosive charge in a shothole comprising an abrasive resisting, liquid retaining container folded to a relatively small size for insertion lengthwise of said shothole, and moisture

absorbing paper means encircling said folded container a plurality of times, the respective encirclements being at regions spaced along the length of said container with intervening spaces therebetween for holding said container folded until after absorption of moisture by said paper means which upon overflow of water added to said container and the wetting of the exterior thereof automatically wets said encircling paper means to decrease its strength for breakage by the weight of said water in said container to permit unfolding of said container.

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