

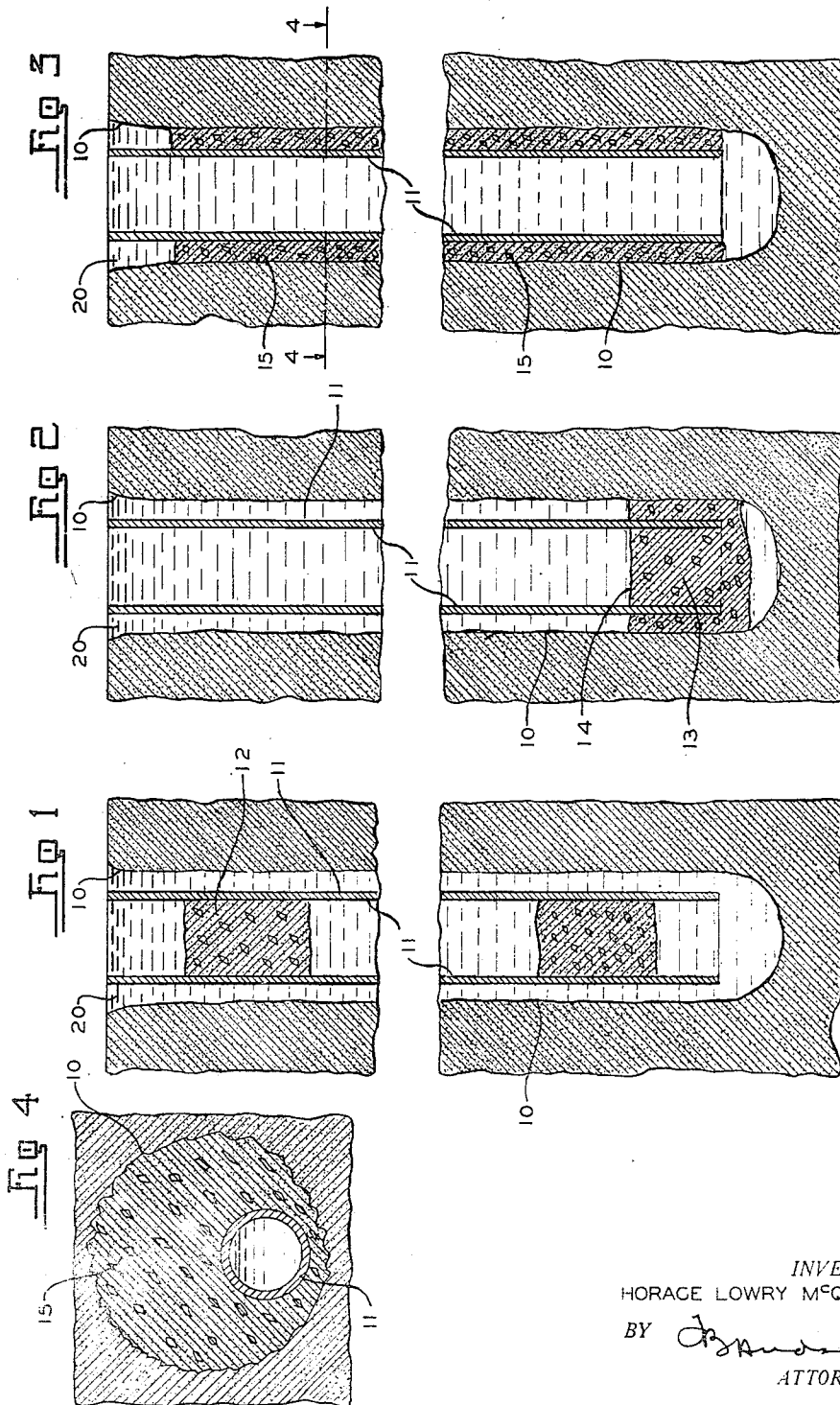
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METHOD OF SUPPORTING PIPE IN WELL HOLES

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METHOD OF SUPPORTING PIPE IN WELL HOLES

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This application is a continuation in part of my application Serial No. 743,485, filed in the U. S. Patent Office September 10, 1934, entitled, Method of sealing porous formations in drilling wells to prevent loss of circulation fluid.

This invention relates to a method of supporting pipe in well holes, and in particular relates to an improved method of suspending pipe in well holes by cement.

In drilling well holes it is necessary during certain phases of the operation to insert pipes, such as casing pipes, and support the same within the well hole. It has been the common practice to support such pipes in place by means of ordinary cement. The cement is placed between the pipe and the well hole wall and packed in place by means of pressure.

The method of cementing pipes in place as heretofore practiced has not been satisfactory for the reason that ordinary cement, due to its weight, cannot readily be positioned to effectively secure the pipe, and moreover the usual present practices result in the pipe being very susceptible to collapsing even when under normal conditions and especially so if the well is shot.

The object of this invention is to provide an improved method of supporting a pipe within a well hole.

Another object is to provide an improved method of supporting a pipe within a well hole in such a manner as to render the support elastic and to negative conditions tending to collapse the pipe.

A still further object of this invention is to provide a method of supporting a pipe within a well by means of a medium which is elastic and relatively light in weight.

A still further object of this invention is to provide a method of securing or supporting a pipe within a well hole in such a manner that the supporting medium will not be lost by dissipation into the side walls of the well hole and porous formations which have been penetrated.

It is a further object of this invention to provide a method of supporting pipe in a well hole in such a manner as to prevent the escape of fluids therefrom and otherwise obviate dangerous gas pressure conditions which may result in blow outs.

Additional objects and advantages of this present invention will be appreciated from a consideration of the following specification and attached drawing forming a part thereof, wherein:

Fig. 1 is a vertical cross-sectional view of a well hole having a pipe positioned therein, and dis-

closes a first step in the present method of supporting the pipe.

Fig. 2 is a similar or identical view to that shown in Fig. 1 and discloses a further step in the method of supporting the pipe.

Fig. 3 is a similar or identical view of the well hole as shown in Fig. 1 and shows the final step in the method of supporting the pipe, and;

Fig. 4 is a horizontal cross-sectional view taken on line 4—4 of Fig. 3, and shows the pipe in supported condition and its relation to the side walls of the well hole.

It is necessary during certain stages of well drilling to insert into the hole various types of pipes. In the drilling of well holes the same are frequently lined with a pipe casing for various advantageous reasons such as to prevent the side walls of the hole from caving and otherwise maintain the hole in a good condition. In the drawing 10 represents a well hole in which it is desired to position and secure the pipe 11. In Figs. 1 and 2 the pipe is being suspended within the hole by any suitable temporary means pending the provision of the final supporting method which will later be described.

For the purpose of supporting pipes in well holes it has been found that cement alone will not suffice for the reason that it is heavy and hard to force into position, it is brittle and disintegrates, it is rigid and has a tendency to cause the pipe to collapse and furthermore it escapes into the crevices of the well hole during application and is lost. However, I have found that such substances as ground, shredded, or comminuted paper, paper pulp, and rags, or admixtures thereof when added to the cement greatly decrease the weight thereof and render it more suitable for cementing and pipe supporting uses within a well hole. In addition to the above substances used with cement it has been proven advantageous under certain circumstances to use certain vegetable, mineral and animal fibers, examples of such fibrous materials being hemp, manila, amphibole, serpentine, asbestos and hair. I have found that such binders as cement, glue, gelatinous substances and the like, when mixed with proper amounts of pulp, paper, or other fibers as described serve as an excellent medium for sealing and supporting pipes in a well hole. Furthermore, the addition of these and other analogous substances to the cement obviates all the objectional features incident to cement when used alone as a pipe supporting medium.

It has been found that various types of pulps, such as those used in the manufacture of build-

ing boards and newspapers serve admirably in assisting cement to retain the pipe in well holes. Other substances such as vegetable fibers may be used in the cement or added for use with the paper and analogous materials mentioned. If some of the material added be of the nature of pulp and other of it be fibrous, there is then less tendency for the cement to escape through the well wall crevices, and moreover the cement is otherwise improved for the purpose of supporting the pipe. Other materials which may be added to the cement include old newspapers, ground corn stalks, ground sugar cane, and various other analogous substances. Cement has been found to serve as a suitable agent but other binding mediums such as glue, gelatinous substances, and the like, may also be used with the cement or separately.

The proportions of the mixture of cement and the substances to be admixed therewith will vary with the conditions within the well hole. When it is necessary to provide a very light cement in order that it may be pumped into the well hole more readily, and raised therein to a higher level, it will be found advantageous to mix with the cement a light substance such as paper, or paper pulp. Again if the crevices to be sealed to prevent the loss of cement are small, then paper or various pulps thereof may again be employed. If, however, the crevices are large it is well to use a fibrous substance together with the cement as the fibers have a tendency to mat up and thus close off relatively large crevices. Under certain conditions it will be found best to use a mixture with the cement which includes both pulp and fiber. The exact proportions of the mix are not given as the composition will vary with the different well holes and furthermore it is not desired to fix the limit of the mixture as such constitutes no major part of this advancement. It is necessary however that the mixture of cement and matter used therewith, such as paper and fiber, be mixed in such a manner and in such proportions that it can readily be mixed with water and similar liquids, and pumped into the well hole and handled by the pumps which are ordinarily employed with circulation fluids.

For the sake of convenience the cement plus the substances above described will hereinafter be referred to as a cement batch. The batch may be of any desired consistency so long as it can be handled with the usual well pump and introduced into the well and forced into position thereby.

In my improved method of suspending pipe into wells, the pipe 11 is supported by any temporary means in the hole 10 as shown in Fig. 1. Circulation is first established between the pipe and the well hole. To effect this, water or a circulation fluid is pumped under pressure down the pipe 11 and is caused to circulate back up between the well hole walls and the pipe. If at all possible this circulation is first established before attempting to finally support the pipe in place by cementing the same.

A batch 12 of cement and other matter is then introduced into the top of the pipe and by pressure is forced downwardly in the pipe. Several batches of cement and paper mix are successively introduced into the pipe until the well hole bottom is partly filled with the mix as shown at 13 in Fig. 2. The cement and the matter added thereto will not extend to the very bottom of the well hole due to the presence of mud and pres-

sure therein, but will assume the position shown in Fig. 2. After the introduction of each batch of cement and other matter, pressure is applied and when the condition shown in Fig. 2 with the cement batch in the bottom of the hole is accomplished the further introduction of cement and matter is discontinued and pressure applied in the pipe at the top thereof as before so as to exert a force upon the portion 14 of the sealing batch 13. The continued application of pressure in the above described manner will cause the cement and mix to travel upwardly between the outside of the pipe casing and the well walls. As the cement and mix is relatively light in weight it will rise as described by reason of the pressure applied thereto. Moreover, the presence of the paper and other substances will prevent the cement from leaking into the crevices of the well side walls and escaping as the paper or other matter mixed with the cement will lodge in such crevices and seal them. When the cement batch has been forced into substantially the position shown at 15 Fig. 3 it will be found that the pipe 11 is then securely supported within the hole against displacement.

It is not entirely essential that the cement batch be positioned in the above described manner, but the same may under certain circumstances be deposited directly into the annular space 20 in the well hole between the side walls thereof and the pipe. If such a method of positioning the cement and paper is employed it may be forced into the position shown in Fig. 3 by pressure or some other suitable means.

It has been found that one of the most efficient manners of introducing the cement batch consists in continuously pumping the same into the top of the pipe 11 under considerable pressure, and maintaining the pressure and continuing the introduction of the batch until it has assumed the position shown at 15 in Fig. 3, in which position the pipe will ultimately be positively held in place when the cement sets.

There are various other methods of inserting or positioning the cement batch in position which include forcing the same into place with charges of mud or circulation fluid, but the scope of my invention is not to be limited to any specific method or means of positioning the cement.

In Fig. 4 there is shown a horizontal cross-sectional view of the well hole 10 and pipe 11 after the cement batch 15 has been positioned to secure the pipe in a supported position. Theoretically the cement batch would be uniformly spaced about the pipe, but in practice the batch flows into position substantially in the manner shown in Fig. 4 with the pipe resting against one side of the well and with a majority of the cement batch grouped about one side of the pipe. The presence of the various substances such as paper in the cement render the same highly elastic and prevent the pipe from collapsing due to pressures of various origins, and especially when the well is shot, or treated with explosives.

Should the well pipe be run through porous formations containing oil or gas and it is desired to shoot the well or perforate the pipe adjacent such formations in order to obtain a flow of such oil and gas, it has been found advantageous to use a mixture of cement and paper to support and seal the pipe. Later if necessary acid or caustic solutions may be employed to dissolve the seal and so permit the oil or gas to more readily flow into the well hole through the fissures made by the explosion. In all instances of shooting wells

with explosives the improved sealing and supporting medium of cement and paper should be used for reasons of their elastic nature which prevents collapsing of the pipe.

I claim:

1. The method of supporting a pipe within a well hole and of preventing the loss of the supporting medium into porous formations while said medium is in the fluid state, which comprises placing a pipe in the well hole, introducing a supporting medium of a setting cement slurry and ground paper into the top of the pipe, applying pressure to the medium to force it upwardly between the pipe and the wall of the well hole, and allowing the medium to set to form an elastic support for the pipe.

2. The method of supporting a pipe within a well hole and of preventing the loss of the supporting medium into porous formations while said medium is in the fluid state, which comprises placing a pipe in the well hole, introducing a sup-

porting medium of a setting cement slurry, ground paper and fibres into the top of the pipe, applying pressure to the medium to force it upwardly between the pipe and the wall of the well hole, and allowing the medium to set to form an elastic support for the pipe.

3. The method of forming a support for a pipe within a well hole and of preventing the loss of the supporting medium into porous formations while said medium is in the fluid state, which comprises introducing the pipe into the well hole, introducing a supporting medium of a setting cement slurry and ground paper into the pipe, continuing the introduction of said sealing medium under pressure sufficient to force the same up between the pipe and well hole walls to form a seal against loss of the supporting medium into porous formations, and allowing the sealing medium to set to form an elastic support for the pipe.

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