Feb. 16, 1932. F. I. GETTY 1,845,265

WELL SCREEN

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Fig. 1.

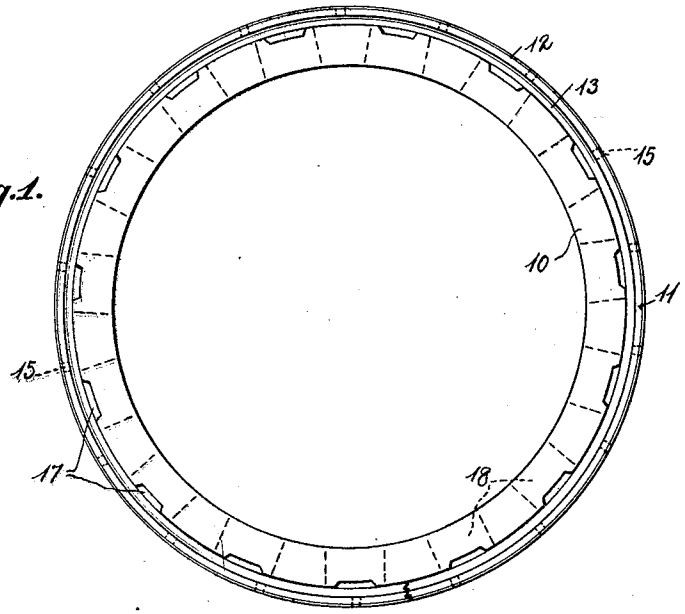


Fig. 2.

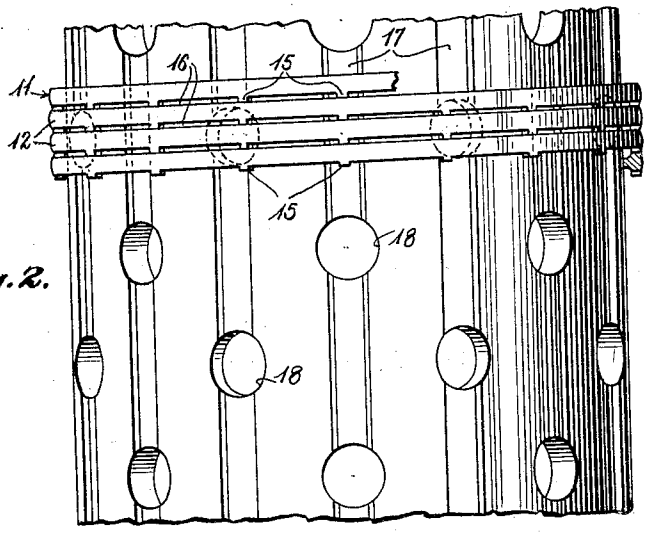


Fig. 3.

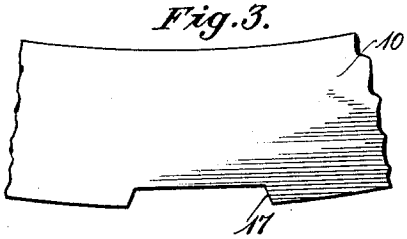
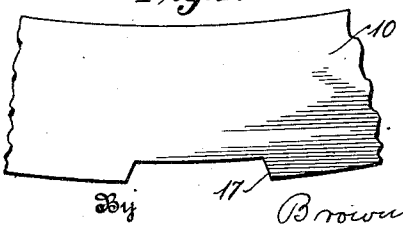


Fig. 4.



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WELL SCREEN

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Fig. 5.

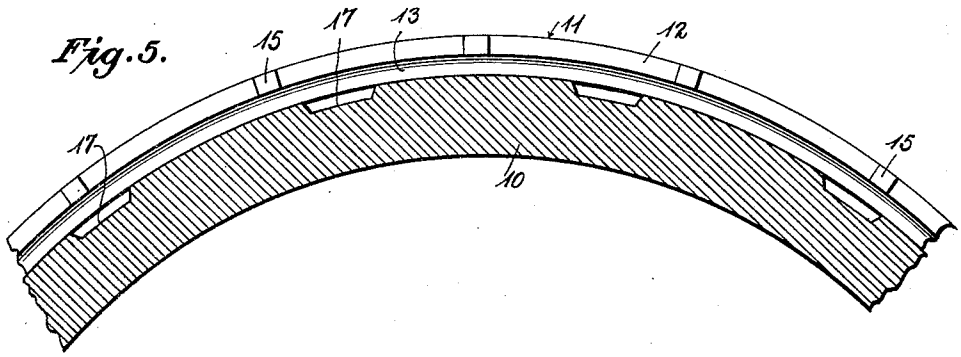


Fig. 6.

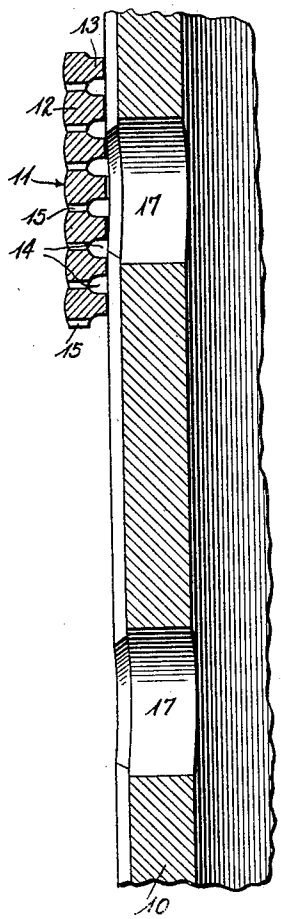


Fig. 7.

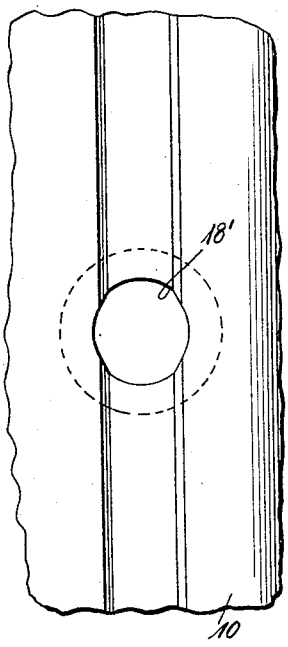
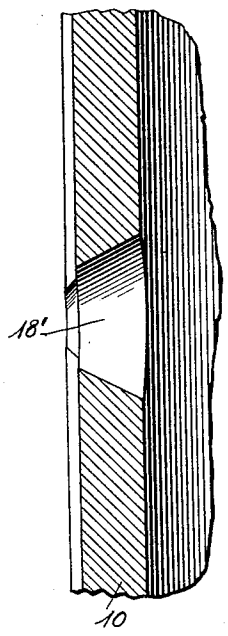


Fig. 8.



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UNITED STATES PATENT OFFICE

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WELL SCREEN

Application filed July 24, 1929. Serial No. 380,710.

The invention relates to screens for use in wells and has as an object the provision of a screen which will not readily become clogged.

It is a further object of the invention to provide a screen in which the cutting by liquid-borne sand will be substantially uniform so that one part will not be cut out while other parts are still fit for use.

It is a further object of the invention to provide a screen having a maximum allowable space in the interior thereof consistent with the strength necessary to withstand the pressures to be expected.

Further objects of the invention will appear from the following description when read in connection with the accompanying drawings showing illustrative embodiments of the invention and wherein:—

Fig. 1 is an end view;

Fig. 2 is a detail side view;

Figs. 3 and 4 are detail sections showing different forms of grooves;

Fig. 5 is a detail transverse section on an enlarged scale;

Fig. 6 is a detail longitudinal section; and

Figs. 7 and 8 are a detail side elevation and a vertical section respectively of a modified form of opening.

While it is the object of a well screen to exclude sand and gravel, yet it is well understood to be impossible to completely exclude sand from entering with the liquid without excluding the liquid also. In order to cause sand entering with the liquid to continue therewith and not be deposited in the passages in the screen, the screen according to the invention herein is made of such dimensions that the liquid will flow at a substantially uniform velocity through the screen in all parts.

In accordance with the invention, a pipe 10 is wound with a wire 11 which is virtually T-shaped in cross section, as indicated in Fig. 6, presenting the head 12 and the reduced base 13, the reduction in the size of the base as compared with the head providing the passages 14 between adjacent turns of the wire.

The wire is wound spirally on the outer surface of the pipe as indicated in Fig. 2 where a limited number of turns only are shown for purposes of illustration.

To space the adjacent turns of the head 12 apart whereby to provide an opening for liquid into the passages 14, there are shown lugs 15 projecting one side of the head, which lugs are placed into contact with the plain side of the head of the previous turn as the wire is wound.

To pass liquid entering through the spaces 16 and passages 14 to the interior of the pipe, there is shown a plurality of longitudinal grooves 17 and perforations 18 through the wall of the pipe opening into the grooves. The grooves 17 obviously tend to weaken the walls of the pipe and to permit the use of a pipe of as thin wall as possible whereby to provide the maximum safe passage within the screen, the grooves are made relatively wide and shallow. For the purpose of maximum strength, in theory the bottoms of the grooves should be made upon the arc of a circle concentric with the surfaces of the pipe, as indicated in Fig. 4, but this structure being more expensive to produce, it is found that grooves with flat bottoms, as indicated in Fig. 3, form a sufficiently close approximation to the ideal.

If the speed of flow of liquid in any portion of passages 14 or 17 is checked, the liquid-borne sand will tend to be deposited at this point, and to avoid such action the cubical contents of passages 14 and of the grooves 17 receiving liquid from said passages are made substantially equal. The perforations 18 are made of ample size that there may be no resistance to flow of liquid to the interior of the pipe out of grooves 17.

In order to provide sufficient flow space in the grooves 17 for the purpose above described without unduly weakening the walls of the pipe, it is desirable to provide a relatively large number of such grooves and it is at present preferred to space these grooves at about 24 degrees of the arc from center to center as illustrated in the drawings.

A modified form of opening is shown at 18′ in Figs. 7 and 8 in which the walls of the opening flare inwardly to enable the resist-

ance to flow to be reduced as the liquid passes into the pipe.

Since the velocity of flow of the liquid is substantially uniform in all parts of the screen, it follows that the cutting of the materials of the screen by the sand carried along with the liquid will be substantially uniform throughout and therefore that parts will not be cut away whereby to render the screen useless until the same is substantially completely worn out.

Minor changes may be made in the physical embodiment of the invention within the scope of the appended claims without departing from the spirit thereof.

I claim:

1. A well screen comprising, in combination, a cylinder having longitudinal grooves in its outer surface and perforations through its walls opening into said grooves, a covering of wire applied circumferentially to said cylinder, said wire having a reduced portion in contact with the cylinder to provide passages communicating with said grooves and means to space the adjacent outer portions of said wire apart to provide screen openings into said passages.

2. A well screen comprising, in combination, a cylinder having grooves in its outer surface and perforations in its walls opening into said grooves, a covering of T-shaped elements carried by said outer surface at an angle to said grooves with the reduced portion in contact with said surface to provide passages communicating with said grooves, the heads of the T's spaced apart to provide screen openings therebetween, the combined cubical capacity of the passages being substantially equal to that of the grooves to provide for flow of liquid to the interior of the cylinder at a substantially uniform speed at all points.

3. A well screen comprising, in combination, a cylinder having grooves in its outer surface substantially parallel with its axis and perforations in its walls opening into said grooves, a substantially circumferential winding of T-shaped wire covering said cylinder with the reduced portion of the wire in contact with the surface of the cylinder to provide substantially circumferential passages crossing and communicating with said grooves and means for spacing the head in each turn of said winding from the heads of the adjacent turns to provide screen openings into said passages, the combined cubical capacity of said passages being substantially equal to that of said grooves whereby to provide a substantially uniform rate of flow of liquid through all parts of the screen.

4. A well screen comprising, in combination, a relatively thin walled cylinder having relatively shallow grooves in its surface substantially parallel with its axis and openings through its wall into said grooves, the openings into each groove staggered relative to the openings into adjacent grooves, a covering of substantially T-shaped wire wound spirally upon said cylinder with the reduced base of the wire in contact with the surface of the cylinder to provide passages in communication with said grooves, the head of said wire bearing lugs to space the heads of successive turns from adjacent turns thereof to provide screen openings to said passages, the width of said grooves and passages being such that the combined cubical capacity of the grooves and of the passages is substantially equal whereby to provide a substantially uniform rate of flow through all parts of the passages and grooves to prevent accumulation of sand caused by lessening of speed of flow of sand bearing liquid in any part of said screen.

5. A well screen comprising, in combination, a cylinder having grooves cut in its outer surface, said grooves spaced apart a distance in excess of their width and perforations through its walls whose diameters exceed the width of the grooves and opening thereinto, a covering of wire applied substantially circumferentially to said cylinder, said wire having a reduced portion in contact with the cylinder to provide passages communicating with said grooves, and means to space the adjacent outer portions of the wire apart to provide screen openings into said passages.

6. A well screen comprising, in combination, a cylinder having longitudinal grooves in its outer surface and perforations through its walls opening into said grooves, a covering of wire applied circumferentially to said cylinder, said wire having a reduced portion in contact with the cylinder to provide passages communicating with said grooves and means to space the adjacent outer portions of said wire apart to provide screen openings into said passages, the combined cubical capacity of said passages being substantially equal to that of the grooves to provide substantially uniform speed of flow of liquid through said passages and grooves at all points.

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