March 21, 1944. H. O. WILLIAMS ET AL 2,344,909

DEEP WELL SCREEN

Original Filed April 15, 1940

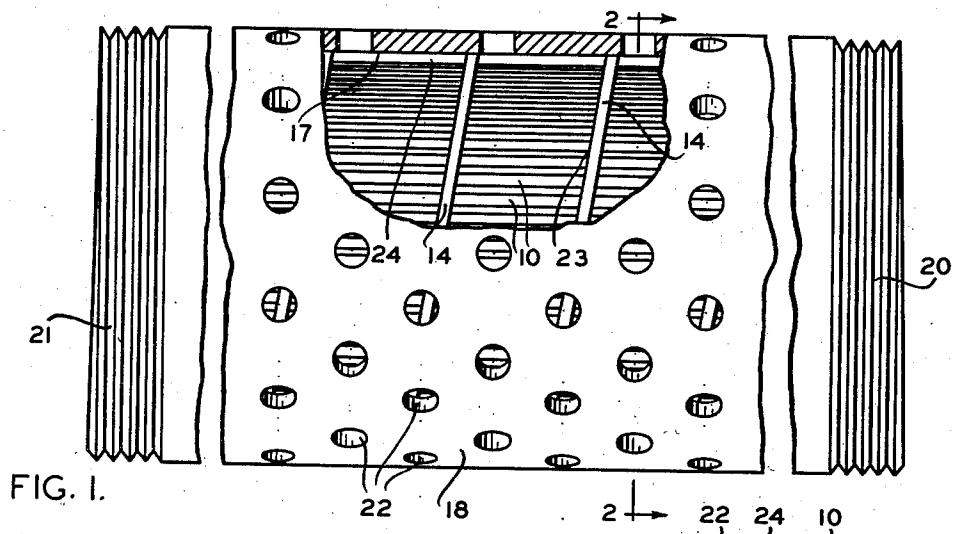

FIG. 1.

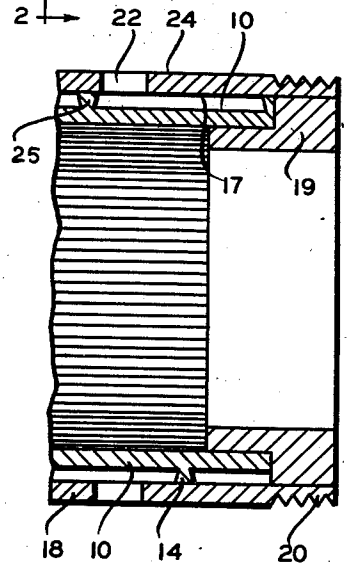

FIG. 3.

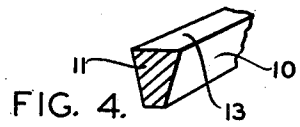

FIG. 4.

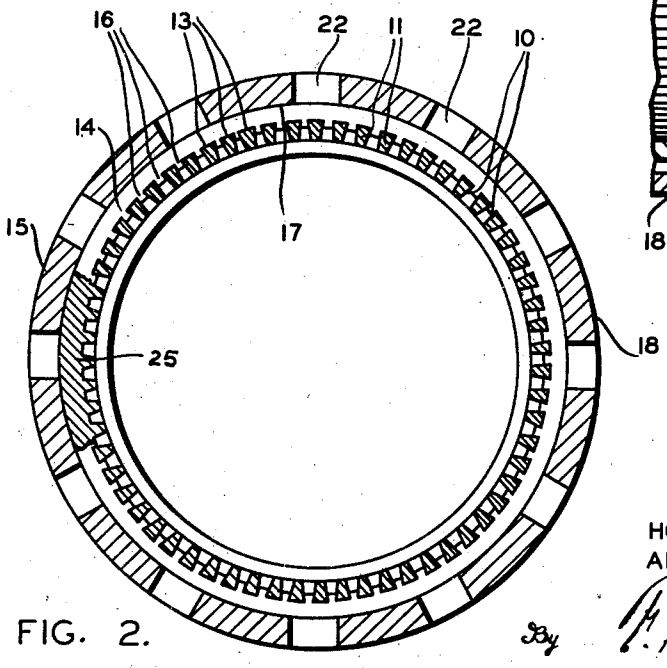

FIG. 2.

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UNITED STATES PATENT OFFICE

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DEEP WELL SCREEN

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Original application April 15, 1940, Serial No. 329,752, which is a division of Serial No. 222,410, August 1, 1938. Divided and this application September 13, 1942, Serial No. 459,064

1 Claim. (Cl. 166—5)

Our invention relates to deep well screens and has for its object to provide a well screen for use in very deep wells which is strong and sturdy enough to resist very great strains and pressures encountered in setting the well screen, and also to successfully resist high pressures of the liquid being screened, such as are frequently found in deep oil wells.

It is well known that in putting down oil wells, particularly those extending to great depths, not only are very severe strains and stresses encountered in putting the well screen in position, but also oil pressures at such great depths are sometimes so great as to rupture and destroy the straining means of known types of deep well screens. To meet this condition we have discovered that a strong integrated outer pipe base with holes therein positioned in staggered relation rigidly united with an inner cellular fabricated screen member wherein the elements are welded together at every crossing point and with outer supporting members engaging the inner walls of the pipe base to form broad drainage channels, effectively overcomes the difficulties encountered by well screens set at great depths where pressures are very high.

It is a principal object of our invention therefore to provide a well screen wherein the screening means proper is supported wholly within a perforated pipe base and is so constructed that broad helical channels conduct liquid passing through the perforations of the pipe base to longitudinal drainage slots extending across said helical channels, the members forming the helical coils contacting and being substantially integral with the inner surface of the pipe base and being welded to the members which form the drainage slots at all crossing points thereof.

It is a further object of our invention to provide a well screen of the type above-mentioned wherein a multiplicity of longitudinal elements are held in the form of a cylinder and are closely spaced to form drainage slots between all adjacent pairs thereof, and a helically wound wire with widely spaced helical coils is welded to the outside limits of said longitudinal elements at every crossing point to form an integrally united screen member, to which a perforated pipe base is applied so as to be immovably united to the spaced helical coils.

It is a further object of our invention to provide a well screen embodying longitudinal elements with flat outwardly disposed tops and converging sides positioned so the flat tops outline a cylinder with parallel inwardly diverging drainage slots between adjacent pairs of longitudinal elements, and with helical coils of a supporting wire welded to said flat tops at every crossing point of the wire and said tops, together with a perforated pipe base surrounding said screen member and immovably united to the flat outer surfaces of the helical coils to form helical drainage channels of a width several times the diameter of the perforations or holes in the pipe base, said channel or channels leading to the inwardly diverging drainage slots between pairs of longitudinal elements.

This application is directly a division of application Serial No. 329,752, filed April 15, 1940, which has matured into Patent No. 2,312,459, dated March 2, 1943, and said application Serial No. 329,752 is a division of application Serial No. 222,410, filed August 1, 1938.

The full objects and advantages of our invention will be made clear in connection with the detailed description thereof given in the appended specification, and the features of novelty of the invention which produce the valuable and advantageous results above-noted are particularly pointed out in the claim.

In the drawing illustrating an application of our invention in one of its forms:

Fig. 1 is a plan view partly broken away and in section of a well screen embodying the features of our invention.

Fig. 2 is a transverse sectional view taken on line 2—2 of Fig. 1, viewed in the direction of the arrows.

Fig. 3 is a longitudinal sectional view taken through the end of the well screen.

Fig. 4 is a sectional semi-perspective view of a portion of the longitudinal screen forming elements.

As illustrated, a multiplicity of longitudinal elements 10 are provided, each being roughly triangular in cross-section as indicated at 11 in Figs. 2 and 4, and each being provided with a flat top portion 13. These longitudinal elements are held positioned so that the flat faces 13 fall substantially in a cylindrical plane by means of a wire or supporting member 14 which is wound in the form of a helix upon said flat faces 13 and is welded thereto at every crossing point as best indicated at 15 on Fig. 2. There is thus formed a prefabricated screen member of substantially cylindrical form and of integrated cellular construction provided with a multiplicity of longitudinal slots 16 of a suitable width to prevent the ingress of sand or other material with the inflow of liquid where the well screen may be set.

It will be obvious that the width of slots shown in Fig. 2 is merely illustrative and that those slots may be made narrower or larger as conditions of use of a particular screen may require.

The flat outwardly turned faces of rods or screen forming members 15 contact the inner wall 17 of a tubular pipe member 18. This contact secures the pipe member upon the successive helical coils of supporting member 14 in a substantially integral manner by shrinking the pipe base upon the outer faces 13 of longitudinal elements 15 in a known way. This is accomplished by having the inner diameter of the pipe base slightly less than the diameter of the cylinder passing through the outer limits of the helical coils of the wire 14, expanding the pipe base by heating until it will pass over said coils and then permitting it to contract by cooling, whereby the rigid attachment thereof is effected. Header members 19 secured to the ends of rods 15 will also have the pipe base shrunk thereon as clearly indicated in Fig. 3. The ends of the pipe base are threaded as indicated at 20 and 21 of Figs. 1 and 3, which enables the completely fabricated well screen to be attached in series or to other sections of well screen as conditions of use require.

The pipe base 18 is provided with a multiplicity of apertures or holes 22 which are of substantial diameter as shown and which are somewhat widely spaced and are staggered in adjacent rows circumferentially and longitudinally. The helical coils of wire are spaced apart a substantial distance as indicated at 23 in Fig. 1, this distance being several times the diameter of the holes 22.

The advantages of our invention will clearly appear from the foregoing description. The primary advantage is that an unusually strong and stress-resisting screening device is provided wherein the screening elements making up the drainage slots are entirely within the limits of a strong perforated pipe base and are held against stresses of different sorts by the body of the pipe base.

A further advantage resides in the fact that the helical coils of the supporting member welded to the outside of the longitudinal screen elements are spaced apart distances equal to several times the diameter of the holes 22 through the pipe base and thus form broad channels 24 through which liquid which passes through the holes 22 may be distributed to the whole drainage surface formed by the longitudinal members of the integrated inner screen member.

A further advantage of our invention resides in the fact that the longitudinal screen-forming members have flat faces turned outwardly and converging side walls, so that the screen slots begin at adjacent pairs of edges of flat faces and diverge inwardly, thus assuring that material such as sand which is large enough to pass between the said edges will be discharged and not tend to clog the slots and any particles too large to pass between the edges will be effectively held back. The showing of the slots 16 is of course merely for illustrative purposes and their relative widths may be changed to any extent desired from the smallest possible width up to any desirable greater width.

It is a further advantage of our invention that the helically wound supporting wire such as wire 14 is triangular in shape with the narrowed edge contacting the flat top surfaces of the longitudinal screen-forming members and this narrowed edge is sunk an appreciable distance into the tops of the longitudinal members, giving a very firm union, as clearly shown at 25 in Figs. 2 and 3.

We claim:

A well screen comprising longitudinal elements with flat outwardly disposed tops and converging side portions positioned so that said tops outline a cylinder and being closely spaced to provide inwardly expanding longitudinal screening slots, a helically wound wire with widely spaced helical coils on the outside of said longitudinal rods and welded to the flat faces thereof at every crossing point to form an integrally united screen member, and a pipe base surrounding said screen member and immovably united to the outer limits of the aforesaid helical coils, said pipe base having a multiplicity of holes of considerable diameter, the distances between coils being several times the diameter of said holes, whereby said spaced coils provide a continuous helical drainage channel about the screen member inside the inner walls of the pipe base leading from the holes through the surrounding pipe base to the inwardly expanding screening slots.

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