Oct. 9, 1934. A. J. DIEPENBROCK 1,976,217

WELL SCREEN

Filed May 2, 1933

Fig. 1.

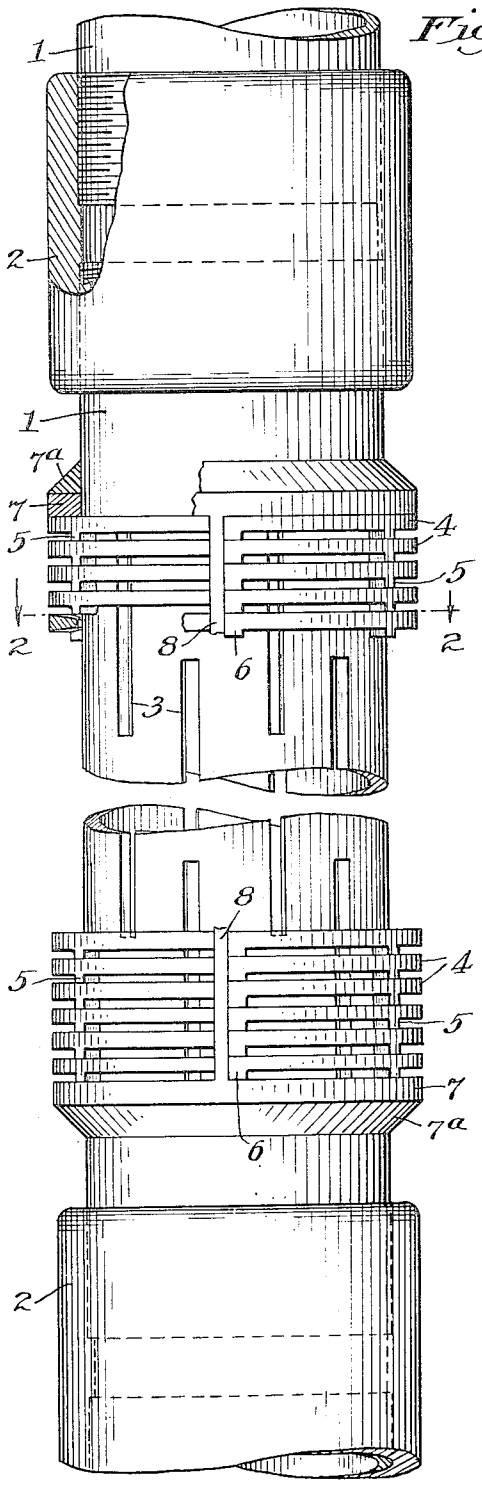


Fig. 2.

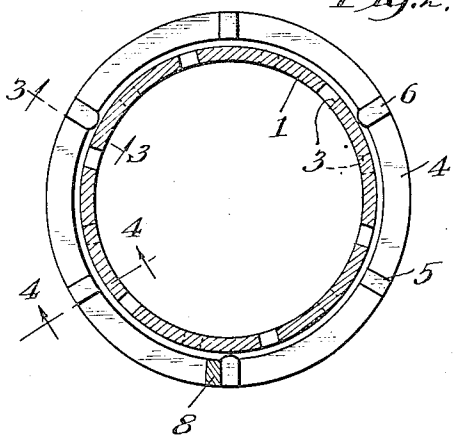


Fig. 3.

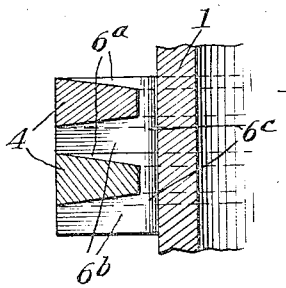
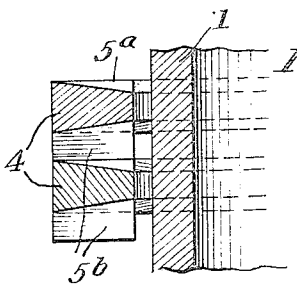


Fig. 4.



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WELL SCREEN

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6 Claims. (Cl. 166—5)

This invention relates to well screen for oil wells and the like, of that type wherein perforated pipe is surrounded by vertically spaced annuli forming a series of narrow apertures therebetween, cooperating with the perforated pipe for excluding sand and other solids while permitting the free flow of oil into the pipe.

It is the object of the invention to arrange the surrounding annuli so as to form apertures of the desired restricted width, and when the screen is subjected to usual corrosion and wear such as may completely destroy certain of the annuli, to maintain the restricted spacing of the undamaged annuli and thus insure screening action throughout the entire undamaged area.

More particularly it is the object of the invention to construct the surrounding annuli as a series of independent rings adapted for superimposed assembly on the perforated pipe and having means for longitudinally spacing the rings to form the desired restricted apertures therebetween, and also having means for slightly radially spacing the rings from the perforated pipe so that the oil, after passing through the restricted apertures and with sand and solids excluded, may freely enter the perforations in the pipe.

Further objects of the invention will be readily understood from the following description of the accompanying drawing, in which:

Fig. 1 is a side elevation of well screen constructed in accordance with the invention and showing the screening annuli partly broken away.

Fig. 2 is a transverse section on the line 2—2 of Fig. 1.

Figs. 3 and 4 are detailed sections on the lines 3—3 and 4—4 respectively of Fig. 2.

The well screen comprises a usual string of pipe which may include a plurality of pipe lengths 1 connected by usual couplings 2, with the pipe lengths perforated in usual manner. In the present instance the perforations are shown as elongated slots 3. A plurality of annuli surround the pipe 1 and are vertically spaced to form restricted screening apertures therebetween; and the invention provides for mounting the annuli so that they do not depend upon the tension of a continuous wrapping for maintaining their spaced assembly, but comprise independent rings held in place by being supported upon one another in restricted spaced relation. Consequently the rings are not circumferentially tensioned, and therefore there is no possibility of the spacing of the annuli varying responsve to loss of tension as is the case with a continuous wire wrapping, and in the event of corrosion or wear severing one or more of the rings, the undamaged rings maintain the same spaced relation and the screening action is continued throughout their area, rather than loosening the entire screen and destroying the screening action throughout its entire area, as is the case when a continuous wire wrapping is employed.

The rings comprising the screening annuli are shown at 4, and are independent of one another and adapted for reception on pipe 1 in slightly radially spaced relation from the perforated pipe as shown at Fig. 2, with the rings preferably relatively narrow as shown at Fig. 1 and supported one upon another in slightly longitudinally spaced relation so as to form restricted annular apertures between the rings. For this purpose the rings have circumferentially spaced longitudinal lugs 5 adapted for longitudinal abutment for spacing the superimposed rings, and also have circumferentially spaced longitudinally and radially inwardly projecting lugs 6 adapted for longitudinal abutment for maintaining the vertical spacing of the rings, and adapted for radial abutment against the perforated pipe for slightly radially spacing the rings from the pipe. The lugs 6 of each ring are appreciably circumferentially spaced, so that the circumferential spacing of circumferentially next adjacent perforations 3 is less than that of next adjacent lugs of a ring; and more particularly the longitudinally proximate, circumferentially next adjacent perforations, such as the pair of perforations indicated at Figs. 1 and 2 by the pair of lead lines extending to the reference numeral 3, are circumferentially spaced a less distance than that of next adjacent lugs 6 of a ring. As a consequence the oil entering between any pair of vertically next adjacent rings, and which is confined between circumferentially next adjacent lugs 6 of the rings, is not limited to flow through any one perforation 3, but may flow through at least a pair of circumferentially next adjacent perforations of the vertically spaced rows of perforations.

The rings 4, entirely independent of one another, are assembled on pipe 1 in superimposed relation, any number of rings being employed to provide a screening area completely overlying the perforated area of the pipe; and the rings may be secured in assembled relation by retaining collars 7 at the respective ends of the series of rings, which may be fixed to pipe 1 by welding as shown at 7^a. The rings are thus securely held in place, with uniformly restricted apertures maintained between the rings by the longitudinal alinement and abutment of both the lugs 5 and 6. The series

of rings may then be additionally secured in desired assembled relation, by longitudinally welding the series of rings as shown at 8.

The restricted apertures between the rings preferably flare inwardly for free passage of oil and exclusion of solids such as sand; and for this purpose the rings may be trapezoids in cross-section as shown at Figs. 3 and 4, forming upper and lower beveled surfaces on the rings. Each lug 6 preferably projects upwardly from the upper beveled surface of its ring as shown at 6^a, so as to form a horizontal abutment surface in the plane of the uper edge of the outer periphery of the ring, and as shown at 6^b each lug depends from its ring such distance as to provide the desired restricted apertures between the superimposed rings, and forms a horizontal abutment surface at its lower end adapted to engage the horizontal abutment surface of the projection 6^a of the next lower ring. The lug also projects radially inwardly from ring 4 as shown at 6^c, so as to form an abutment surface adapted to engage pipe 1 for slightly radially spacing the rings from the perforated pipe, so as to provide for free flow of oil to the perforations 3 after passing through the restricted flaring apertures between the rings. The lugs 5 have upper and lower projections 5^a—5^b similar to the projections 6^a—6^b and forming horizontal abutment surfaces adapted for engagement of the lower abutment surface of projection 5^b with the upper abutment surface of the projecton 5^a of the next lower ring when the screen is operatively assembled; but the lugs 5 terminate at the inner peripheries of rings 4 as shown at Fig. 4, so that the annular space between the rings and the perforated pipe is circumferentially obstructed at only the lugs 6.

The invention thus provides for surrounding perforated pipe with a plurality of annuli which are securely held in restricted longitudinally spaced relation, slightly radially spaced from the perforated pipe; with the annuli comprising independent rings held in place by their support upon one another and without relying upon the tension of a wire wrapping. It will thus be seen that the restricted longitudinal spacing of the annuli is not affected by loss of tension nor by the complete wearing away of one or more of the annuli, since even in this latter contingency the undamaged rings are maintained in the same longitudinally spaced relation so as to continue the same screening action throughout their area.

I claim:

1. In well screen for a perforated pipe, a series of rings adapted for mounting on the perforated pipe, circumferentially spaced lugs on the rings for radially spacing the rings from the pipe, the circumferential spacing of next adjacent lugs of each ring being greater than that of circumferentially next adjacent perforations of the pipe, and means for supporting the rings in superimposed restricted spaced relation.

2. In well screen for a perforated pipe, a series of rings adapted for separate mounting on the perforated pipe, and circumferentially spaced lugs projecting from an end of each ring and adapted to engage a next adjacent ring for supporting the rings in superimposed restricted spaced relation, certain of the lugs of each ring projecting radially inwardly and adapted to engage the perforated pipe for radially spacing the rings from the pipe.

3. In a well screen for a perforated pipe, a series of annuli adapted to encircle the perforated pipe, circumferentially spaced lugs on the annuli for radially spacing said annuli from the pipe, the circumferential spacing of next adjacent lugs of each annuli being greater than that of circumferentially next adjacent perforations of the pipe, and means for supporting the annuli in superimposed restricted spaced relation.

4. In a well screen for a perforated pipe, a series of annuli adapted to encircle the perforated pipe, circumferentially spaced lugs on the annuli for radially spacing said annuli from the pipe, the circumferential spacing of next adjacent lugs of each annuli being greater than that of longitudinally proximate, circumferentially next adjacent perforations of the pipe, and means for supporting the annuli in superimposed restricted spaced relation.

5. In a well screen for a perforated pipe, a series of rings adapted for separate mounting on the perforated pipe, and circumferentially spaced lugs projecting longitudinally from each ring and adapted to engage a next adjacent ring for supporting the rings in superimposed restricted spaced relation, said lugs also projecting radially inwardly and adapted to engage the perforated pipe for radially spacing the rings from the pipe.

6. In a well screen for a perforated pipe, a series of rings adapted for separate mounting on the perforated pipe, and circumferentially spaced lugs projecting longitudinally from each ring and adapted to engage a next adjacent ring for supporting the rings in superimposed restricted spaced relation, said lugs also projecting radially inwardly and adapted to engage the perforated pipe for radially spacing the rings from the pipe, the circumferential spacing of next adjacent lugs of each ring being greater than that of circumferentially next adjacent perforations of the pipe.

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