Nov. 4, 1930. M. F. KETTLER 1,780,882

WELL SCREEN

Filed July 18, 1929

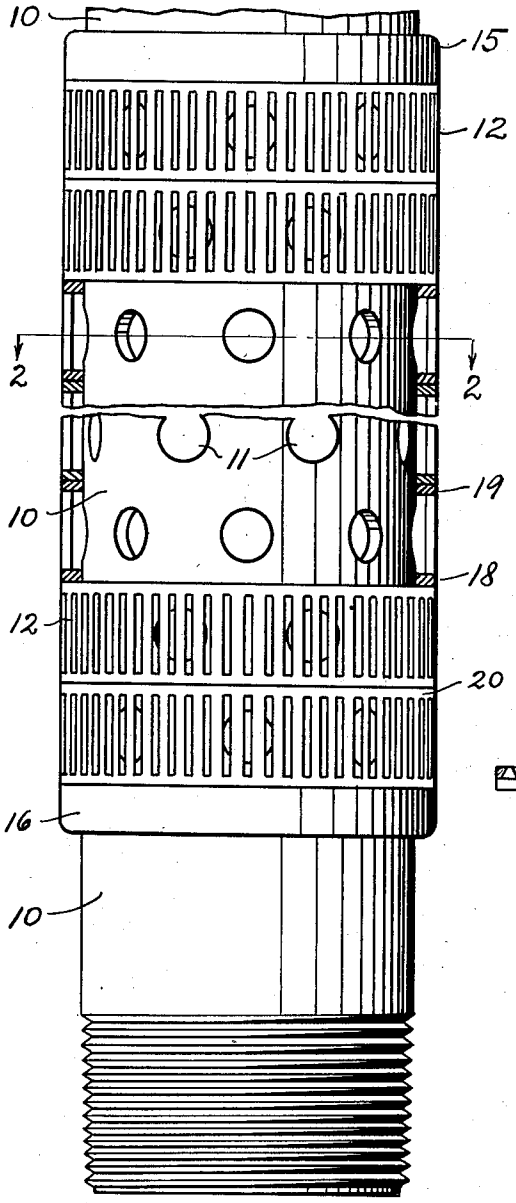


Fig. 1.

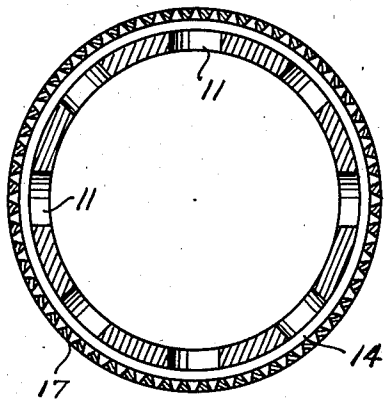


Fig. 2.

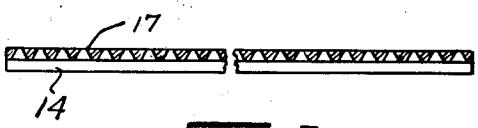


Fig. 3.

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UNITED STATES PATENT OFFICE

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WELL SCREEN

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The present invention relates to oil or water well equipment and in particular to a screen pipe or casing, sometimes called a strainer.

An object of the invention is to provide a device of the character described which will have a large screening or straining surface with a strong construction capable of effectively resisting the hard usages and wear and tear to which apparatus of this character is ordinarily subjected.

Another object is to provide a device of the character described in which the parts are held together as a unit by shrinking them together, whereby play between the parts is eliminated and bracing of the parts secured.

Further objects and advantages will appear evident or be pointed out in the following part of the specification and in the accompanying drawing in which

Fig. 1 is a side elevation, partly in section of a well screen embodying the invention,

Fig. 2 is a cross section on the line 2—2 of Fig. 1, looking in the direction of the arrows, and

Fig. 3 is a longitudinal cross section of one of the straight slotted channel members from which rings utilized in the screen may be formed.

Referring specifically to the drawings, in which similar reference characters refer to similar parts in each of the views, the numeral 10 indicates a tubular supporting member or body provided with a plurality of spaced openings or perforations 11, shown in the drawings as circular openings. These openings may be of any suitable size and shape, for example of the order of one-half inch to five-eighths inch in diameter when they are circular. The openings 11 are preferably arranged in circles about the body 10 and the openings in one circle staggered with relation to the openings of an adjacent circle of openings. Fig. 1 shows the staggered relation of the openings 11. In the structure shown in the drawings, eight openings are provided in each circular row of openings, but I do not limit myself to this number, as the number of the openings 11 may be varied as will be understood by the person skilled in the art, depending upon the diameter of the body 10 and the use for which the strainer is intended.

A plurality of adjacent or superimposed slotted and channelled narrow rings 12 are shrunk about the perforated body 10 and cover the perforations or openings 11 in the body 10. Each ring 12 is provided internally with a channel or groove 14, and the width or height of each ring member 12 and its channel 14 are preferably so proportioned that when the ring members 12 are assembled and shrunk upon the body portion 10 each circular row of openings 11 will be disposed opposite a channel 14, and substantially equidistant from the walls or shoulders 18 and 19 thereof, as shown in Fig. 1. The end walls 18 and 19 pass completely around each end of the rings and when shrunk into position make fluid tight connections with the body 10. The rings are narrow in width, for example 1 to 2 inches, therefore requiring 6 to 12 to make one linear foot of strainer surface. The depth of the channel 14 may be an eighth of an inch or thereabouts. The dimension of other parts will be understood by persons skilled in the art upon consideration of the whole disclosure.

Each ring 12 is provided with a series of closely disposed straining slots 17, preferably of keystone or wedge shape to provide relief for the entering face of the slot to minimize the danger of clogging. The slots 17 are shown cut completely across the channels 14, each end of the slots ending substantially at the inner surface of the side walls or shoulders 18 and 19 of the channels 14, thereby leaving an unslotted portion 20 at each end of the rings. If desired the slots 17 may be shorter. Instead of being disposed vertically, the slots 17 may be inclined, or even arranged horizontally in spaced groups. The slots may also be arranged vertically or inclined in spaced groups. As shown in the drawings the ends of the rings are preferably arranged to meet in substantially fluid tight engagement by means of abutting faces on the side walls 18 and 19 of the channels 14. Similar engaging faces are provided for the collars 15 and 16 and their adjacent rings.

The collars 15 and 16 are shrunk on the body 10 and are provided primarily to protect the ends of the two end rings 12 and not especially for securing the rings in position upon the body 10, as the rings 12 being shrunk upon the body 10 hold themselves in position.

The ring members 12 are separately formed and are preferably prepared from a straight soft steel or iron channel member which has been slotted prior to formation into a ring. A longitudinal cross section of such a straight channel member is shown in Figure 3. In forming the ring member 12, the straight slotted channel member is bent into the form of a circle with the channel portion 14 within the interior and the ends butt-welded or connected in any suitable manner to form the rings shown in the drawings and described herein. By butt-welding the rings, the channel 14 remains unrestricted throughout its circumference as shown in Fig. 2. The slots 17 may be milled, stamped or pressed into the straight channel member in any suitable manner before forming the ring therefrom. After the rings have been formed, they are preferably case hardened to present a better wearing exterior surface.

The body portion 10 of the strainer upon which the rings 12 are assembled may be of the usual steel or metal employed as well casing.

The various portions of the screen either before or after assembly, or both, may be protected by a metal more resistant to the corrosive action occurring in wells than iron or steel. This coating of non-corroding metal may be applied in any well known manner.

In action the fluids in the oil or water well in which the screen or strainer is employed enter the narrow outside portions of the slots 17 first, then they proceed into the wider portions of this slot and then into the channels 14. The fluids then flow in these channels 14 around the perforated body 10 until they meet an opening 11 through which they pass into the interior of the body portion 10.

It is to be understood that the width of the slots 17 may be proportioned according to the character of the formation or sand in which the screen or strainer is to be employed, fine sand requiring as understood a narrower slot than coarse sand. The shape of the channel 14 may also be varied without departing from the invention, for example the channel may be arcuate in cross section or otherwise suitably shaped to provide a path for fluid between the rings 12 and the body 10.

The ring members 12 surrounding the perforated body portion 10 provide a great number of screening slots 17 which, under practical conditions of operation, could not be made directly in the body 10, as they would weaken it to too great an extent. Although rows of openings 11 do weaken the body 10, the rings 12 which completely bridge these weakened portions and tightly grip the body 10 on each side of a weakened portion, together with the collars 15 and 16 which go beyond the perforated portion at each end of the strainer, strengthen and impart rigidity to the whole structure to such an extent that it is substantially as strong or stronger than the body portion 10 before placing the perforations 11 therein. The walls 18 and 19 defining the sides of the channels 14 act as braces for the body portion 10.

Having described my invention, I claim:

1. A well screen having in combination a perforated tube, a series of individual reenforcing and straining rings each of channel shape in cross section having spaced inwardly directed annular flanges to engage directly on the wall of the perforated tube, said rings butting one against the other on said tube and being shrunk on said perforated tube with their webs in spaced relation to the tube and covering certain of the perforations therein, said webs having straining openings therein, the perforations in said tube being arranged to provide a plurality of circumferential perforated portions and imperforate circumferential portions extending completely around said tube and between perforated portions thereof, said rings being arranged with their flanges between each pair of perforated portions whereby to reenforce the perforated portions of the tube.

2. In a well screen, the combination of a series of individual reenforcing and straining rings disposed around a perforated tube having imperforate circumferential portions extending completely around said tube between perforations, each ring of the series acting as an abutment for a succeeding or preceding ring and having a pair of inwardly directed annular flanges defining between them a channel within the ring, the straining portions of said rings opening into said channels, said rings and perforations in said tube being so disposed in relation to each other that fluid may pass from the channels of the rings through perforations in said tube, said annular flanges each gripping said perforated tube on the said imperforate circumferential portions.

3. In a well screen, the combination of a perforated tube having its perforations arranged to define a series of perforated portions and imperforate portions alternating longitudinally of the tube, the said imperforate portions extending completely around said tube, a series of individual straining rings abutting one against the other disposed around said perforated portions and having channels adapted to conduct fluid to said perforations from the straining portions of said rings, the said rings being separated from each other by annular walls engaging said imperforate portions of said tube in fluid tight relationship.

4. In a well screen, the combination of a perforated tube having its perforations arranged to define a series of perforated portions and imperforate portions alternating longitudinally of the tube, the said imperforate portions extending completely around said tube, a series of individual straining rings abutting one against the other disposed around said perforated portions and having channels adapted to conduct fluid to said perforations from the straining portions of said rings, the said rings being shrunk on said tube and being separated from each other by an annular wall engaging said imperforate portions in fluid tight relationship.

In testimony whereof I affix my signature.

MARTIN F. KETTLER.