May 23, 1961 C. W. HANSLIP 2,985,241

WELL SCREEN DEVICE

Filed Feb. 21, 1958 2 Sheets-Sheet 1

Fig. 1

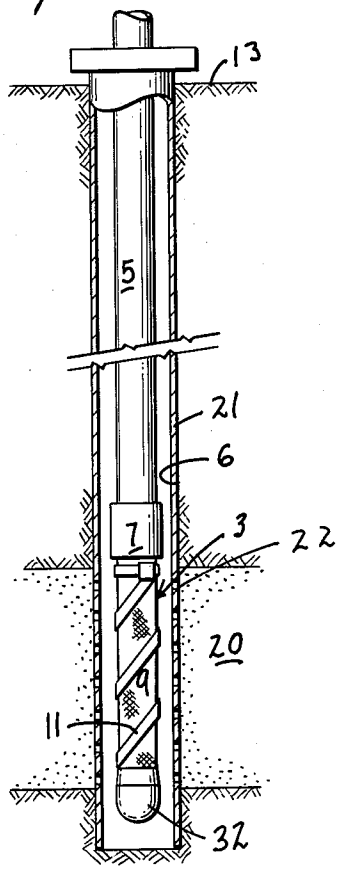


Fig. 2

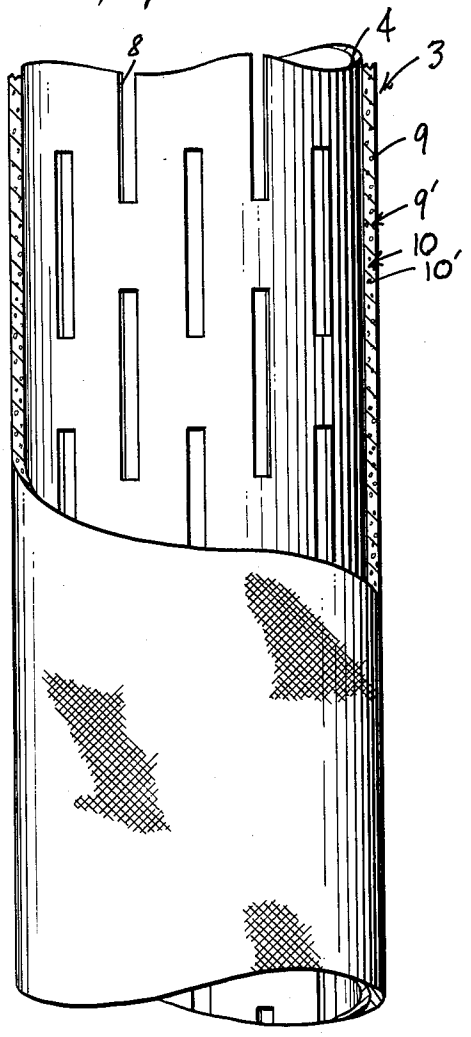
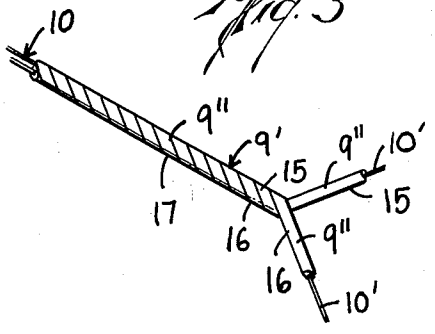


Fig. 3



Charles W. Hanslip
INVENTOR.

BY Hayden & Prasel

ATTORNEYS

May 23, 1961 C. W. HANSLIP 2,985,241

WELL SCREEN DEVICE

Filed Feb. 21, 1958 2 Sheets-Sheet 2

Fig. 4

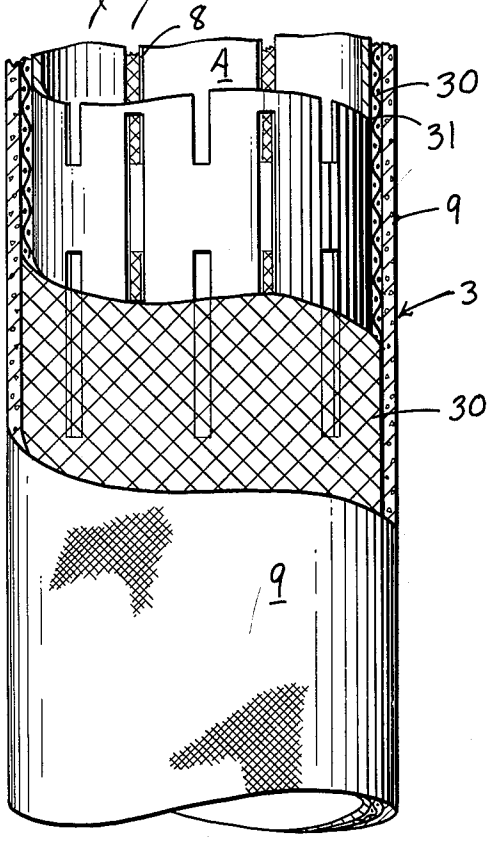


Fig. 6

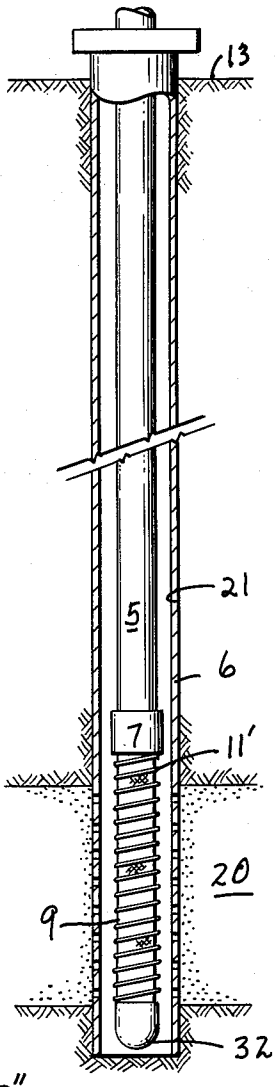
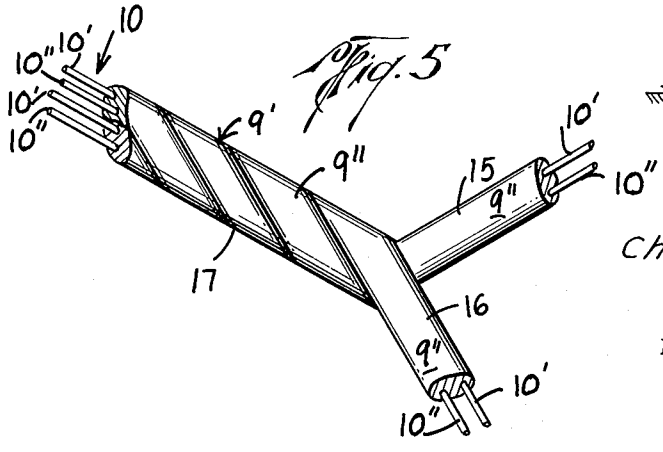


Fig. 5



Charles W. Hanslip
INVENTOR.

BY Hayden & Prasel

ATTORNEYS

United States Patent Office 2,985,241 Patented May 23, 1961

2,985,241

WELL SCREEN DEVICE

Charles W. Hanslip, 10 Westlane, Houston, Tex.

Filed Feb. 21, 1958, Ser. No. 716,718

4 Claims. (Cl. 166—230)

The present invention relates to a well screen device.

At the present time, well screens are secured in the production pipe of a well bore so that fluids may be received from the well bore and conducted through the production string of pipe to the earth's surface. At the present time the well screens in use are formed of tubular members having openings therein of various sizes and configurations, depending upon the characteristics of the formation of the well bore in which the well screen is to be used.

Also, it is common practice to "gravel pack" a well adjacent the well screen to further aid in proper flow of the well fluids from the formation through the well screen and into the production string of pipe. The "gravel pack" is formed of clean material having a particle size somewhat larger than the size of particles in the formation from which the oil, or other fluids, is being produced. It is not unusual for the flow of fluid from wells to include fine particles of sand and dirt and the gravel or sand pack in the well bore adjacent the formation from which the flow occurs aids in inhibiting the smaller particle size sand from packing around the well screen, which would, over a period of time, close off the screen and prevent fluid flow therethrough.

The well screen in turn is provided to aid in separating any sand or dirt from the fluid flow so that when the fluid is conducted to the earth's surface it may be passed through various mechanical equipment such as pumps and the like without the fear of damaging the equipment by the presence of the foreign substances in the fluid.

As previously mentioned, well screens heretofore in use are provided with suitable openings of various configurations and sizes, depending upon the formation characteristics in which the well screen is to be used. Also, the well screens may be wrapped with stainless steel or other type of metallic wire which is suitably shaped to further aid in separating the sand and dirt from the fluid flow and also to inhibit packing of fine particle size sand against the well screen as above described which would gradually close off flow through the well screen.

It can be appreciated that gravel pack processes presently in use are costly to initially install, and the well screen constructions are also costly not only to install but to maintain in proper operating condition over an extended period of time. Fine sand and dirt in well fluids tend to close off the openings in the well screen so that after a period of time it is necessary to replace the well screen to maintain proper flow of fluids from the well.

Most fluids from oil and gas wells at the present time may also include salt water in varying amounts and therefore the fluid flow through the well pipe acts as an electrolyte so that over a period of time, the well pipe through which the fluid flow occurs, as well as the equipment at the earth's surface which receives the flow is subjected to corrosive and electrolytic action which tends to greatly lessen its life. Various means have been suggested to overcome such corrosive and electrolytic action

by providing suitable electrodes within the flow system to inhibit electrolysis and corrosion of the well pipe and its equipment. However, such procedure has not been found entirely satisfactory, in that the construction and arrangement of the electrodes in the flow system does not satisfactorily eliminate the problem of electrolysis, and furthermore, frequent replacement and renewal of the electrodes is required.

The present invention provides a device which overcomes the problems heretofore attendant with well screen constructions and gravel pack arrangements used therewith, and also provides a device for combatting corrosion and electrolysis in well fluids.

An object of the present invention is to provide a well screen arrangement including a body, a covering for the body formed of inert fabric, including strands of an inert material for supporting the fabric on the body.

Yet a further object of the present invention is to provide a sleeve for covering a well screen formed of woven or braided asbestos, or other inert fiber in which is woven metallic strands to act as a support framework for the woven or braided inert fibers.

Yet a further object of the present invention is to provide a filter medium for a well screen which eliminates the necessity of providing gravel packs, which filter is formed of a woven, knit, or braided inert fabric of suitable porosity whereby fluid may flow therethrough, the fabric including strands of material which are inert chemically and electrolytically to the fluid passing through the filter so as to provide a support framework for the fabric.

Yet a further object of the present invention is to provide a filter medium for a well screen which eliminates the necessity of providing gravel packs, which filter is formed of a woven, knit, or braided inert fabric of suitable porosity whereby fluid may flow therethrough, the fabric including strands of suitable metal to form electrodes whereby fluid flowing through the medium comes into intimate contact with the strands so that electrolysis of the well pipe and equipment associated with the well is inhibited, and the fabric also including strands of material which are inert chemically and electrolytically to the fluid passing through the filter so as to provide a support framework for the fabric.

Still a further object of the present invention is to provide a device adapted to be secured to a well string including a tubular body having a plurality of openings for receiving a flow from the well bore, a covering for the body including a woven, knit or braided fabric of suitable inert material such as asbestos, synthetic fibers, spun glass, plastic or the like of suitable porosity whereby fluid flow may occur therethrough and into the openings of the body, and said fabric also including a supporting framework of metal strands woven therein whereby fluid flowing through the filter comes into intimate contact with the strands so that electrolysis of the well pipe and equipment associated with the well is inhibited.

Still a further object of the present invention is to provide a sleeve of woven, knit or braided inert fabric such as asbestos, synthetic fibers, spun glass, plastic or the like which may be supported on a well screen on a framework of inert material.

Another object of the invention is to provide an inert fabric including a filtering medium and support therefor in the form of yarn, twine or cord which may be wrapped circumferentially around a well screen.

Other objects and advantages of the present invention will become more readily apparent from a consideration of the following description and drawings, wherein:

Fig. 1 is a vertical elevation of a well bore illustrating in elevation a form of the present invention positioned on a well string adjacent a producing formation;

Fig. 2 is a sectional view of a form of the present

invention, partly in elevation, to better illustrate the structural details thereof;

Fig. 3 is an enlarged view of a strand of the woven fabric used in connection with the present invention and comprising two support strands and two filtering medium strands;

Fig. 4 is a sectional view, partly in elevation, illustrating another modification of the invention;

Fig. 5 is a view somewhat similar to Fig. 3, of a strand but showing the strand as including two filtering medium strands and four support strands; and

Fig. 6 is a view showing an alternate means for holding the fabric in position over the slotted tubular member.

As previously mentioned it is customary with well screen constructions presently in use to provide openings of suitable configuration and arrangement, as well as of suitable size for receiving flow from the producing formation in the well bore. Also, the well screens are wrapped with wire, generally stainless steel, to further aid in the filtering action of the screen and try to separate the fine particles of sand and dirt from the fluid flow before it is conducted to the earth's surface. Such constructions require a particular form of gravel or sand pack to aid in protecting the screen, and these prior constructions require frequent maintenance operations. Workover operations on the well screens are undesirable in oil wells, because during such period the flow of oil from the well must be inhibited or shut in and in some situations, great expense and delay is encountered in bringing a well back to its original productive capacity after workover operations.

In Fig. 2 the form of the present invention is there illustrated generally by the numeral **3** and is shown as including a body **4** which may be tubular in configuration so that it will conform to the remainder of the well string **5** in which it is supported. The well string **5** extends longitudinally of the well bore **6** to position the screen **3** at the proper location to receive flow from the producing formation **20**. The tubular body **4** is provided with a suitable threaded connection as illustrated at **7** at one end thereof, whereby it may be connected to the string of pipe **5** so that it will be supported at the desired level within the well bore **6**.

As shown in the drawings, the tubular body **4** is provided with openings as illustrated at **8**, such openings being of any suitable size and configuration as desired. In some situations, it may be desirable to provide openings **8** which extend circumferentially around the body in staggered relationship instead of in a longitudinally staggered relationship as illustrated in Fig. 2 of the drawings. In other situations it may be desired to provide openings of generally a circular configuration through the tubular body **4**. The openings are provided so that fluid flow can be conducted interiorly of the tubular body **4**. Heretofore, these openings have been covered with a wrapping of wire which extend around the body of the well screen to act as a filter to inhibit the passage of sand and fine dirt into the body **4**. However, the particles in the fluid tend to stick in wire wrap so that flow through the device is restricted and gradually closed off. When flow is restricted too much, the screen must be replaced.

The disadvantages of such prior constructions are overcome by the present invention and to this end, I provide a covering for the body **4** which acts as a filter for the flow from the well bore into the well screen body **4**. As shown in the drawings, such covering consists of a sleeve **9** formed of a fabric as illustrated generally at **9'** which is positioned on the tubular body **4** and covers the openings **8** therein. The fabric **9'** is preferably formed of woven, braided, knit or wrapped inert material such as asbestos, synthetic fibers, spun glass, plastic or the like so that it will not deteriorate in the presence of fluid flow and contaminants therein from the producing formation, but will be of a suitable porosity so that flow may occur therethrough.

I have discovered that asbestos serves the purpose quite well in that it is inert and does not react with the flow from oil or gas wells, and also forms a fine filtering medium to inhibit the passage of sand or dirt into the well screen body **4**. However, other suitable materials, as above mentioned, which are inert and will withstand the temperature and the pressure conditions in an oil well may be used to accomplish the same purpose. Also, I have determined that in order to aid in initially positioning the inert material on the body **4**, and to increase its period of use in the well bore **6**, a suitable support framework **10** should be incorporated into the fabric **9'** prior to the time that it is woven, braided, knit, or formed into felt-like inert fabric. The last named fabric could be formed, for example, by mixing asbestos and spun glass fibers and bonding them together with an inert resin to form a porous sheet or tube.

The support frame work is illustrated generally at **10** and is shown as being in the form of strands of material of suitable tensile strength so that the asbestos or other filter covering material which is supported thereon may be retained in position on the body **4** over an extended period of time even under extremely high well pressure and temperature conditions.

The sleeve **9** may be initially woven, braided, or knit in tubular form and slipped over the body **4** or the fabric **9'** may be provided in the form of yarn, twine or cord which is then wrapped circumferentially about the tubular body **4** to form the sleeve **9** on the body. In either event, it may be secured in position on the body **4** by any suitable means and if the sleeve **9** is woven in tubular form and then slipped over the body it may be retained in position by means of bands **11** wound helically thereabout. Also, the sleeve **9** can be retained in position on the tubular body **4** by wrapping wire, such as copper, or other relatively inert wires about the fabric **9'**. This is shown clearly in Fig. 6 of the drawings, wherein the sleeve **9** is held in position by means of the wrapping **11'** thereon. If the filtering medium or fabric **9'** is formed in the form of yarn, twine or cord and then wrapped circumferentially around the tubular body **4** it may be also retained in position by suitable bands **11** or wrapping **11'** which are wrapped therearound and then clamped in position by any common and well known tie buckle.

The framework **10** which is interwoven with the filtering fabric **9'** may be formed of metal strand or wire **10'** such as Monel, bronze, stainless steel or other suitable metal which has a tensile strength sufficient to support the fabric **9'** and withstand the treatment to which it is subjected by the fluid flow within the well bore.

In some situations, well conditions may be such that serious corrosion and electrolysis of the well pipe **5** and well equipment at the earth's surface **13** is encountered. In such situations, a wire or strand **10''** may be included in the supporting framework **10**, which is formed of zinc or other electro-positive metal and which so forms an electrode when positioned in the well to inhibit corrosion and electrolysis of the iron and steel well pipe **5** and equipment at the earth's surface **13**.

It is obvious, of course, that a construction incorporating an electro-positive metal strand which will act as an electrode in the fluid flow will not be necessary in all situations. Since the strand **10''** is interwoven in the filtering fabric **9'**, the fluid flow intimately mixes therewith prior to its entry into the well pipe **5**, thus greatly reducing, if not altogether eliminating electrolysis and corrosion problems in the well pipe **5** and in the well equipment at the earth's surface **13**.

The strand **10'**, as shown in Fig. 5 may be used along with the strand **10''**, the strand **10'** being of relatively inert material such as stainless steel, Monel, bronze or other material so that it will support the sleeve **9** in posi-

tion on the body 4 even though the strand 10'' gradually is dissipated by electrolysis.

It will be noted that Figs. 3 and 5 are similar, in that each represents in enlarged detail, a strand 9'' of the filtering fabric 9' with the supporting strand or wire 10' therein, as shown in Fig. 3, and with the additional strand 10'' therein as shown in Fig. 5. It will be noted in Fig. 3 that the strand 10' is provided with a strand 9'' of wrapping of the filtering fabric 9', which as previously described, may be asbestos, spun glass, synthetic fibers or other suitable material which is inert on the one hand, and which will provide suitable filtering action on the other hand. In Fig. 5, the strands 10' and 10'' are provided with a strand 9'' of wrapping of the filtering fabric 9' thereon. As shown in Figs. 3 and 5, two strands 15 and 16 are twisted together to form a single strand 17, which strand 17 comprises in the Fig. 3 showing, two support strands 10' and two filtering medium strands 9'', and which strand 17 in the Fig. 5 showing comprises two strands 10' and two strands 10''. The strands 17 may then be woven, braided or knitted to form the covering 9 for the tubular body 4. When thus formed, the sleeve or covering 9 will be of a single thickness of strand 17, but in some situations it may be desirable to provide a multiple fabric of two or three thicknesses and the present invention contempltaes the provision of such construction, if necessary.

It can be appreciated that the invention has been described as including a tubular body 4, and the sleeve 9 thereon. In some situations, the tubular body 4 will have provided thereon wire wrappings such as presently used, and it should be appreciated that the sleeve 9 can be positioned over the wire wrappings if they are present on the body 4.

The wire wrappings presently employed are, as previously mentioned, formed of a particular configuration and so constructed and arranged on the tubular body 4 so that a predetermined opening between each wire is formed on the body. This opening may vary from well screen to well screen, depending upon the characteristics of the formation of the well in which the well screen is to be used.

It is sometimes found advantageous to incorporate a layer of screen wire cloth which may be braided or woven between the tubular body 4 and the sleeve 9. In this regard, attention is directed to Fig. 4 of the drawings wherein the tubular body 4 is illustrated and is shown as being provided with a braided or woven wire cloth 30, which acts as a separator medium to space the sleeve 9 relative to the tubular body 4. The screen wire cloth 30 in Fig. 4 is on the outer periphery 31 of the tubular member 4. The sleeve 9 is positioned upon the wire screen cloth 30 and the screen wire cloth 30 prevents or inhibits intimate contact between the sleeve 9 and the tubular body 4 and thereby promotes the flow of liquids through the sleeve 9 and into the holes 8 of the body 4.

The sleeve 9 in the Fig. 4 modification may be retained in position either by the bands 11 as shown in Fig. 1, or the wire wrap as shown in Fig. 6 of the drawings.

While it is believed that the construction and operation of the invention is apparent by reason of the foregoing description, to further amplify and describe, it will be assumed that the present invention is to be secured on a well pipe 5 and lowered into a well bore 6 adjacent a producing formation 20 for receiving fluid flow therefrom. The tubular body 4 with the openings 8 is covered by a sleeve 9 and the bands 11 wrapped thereabout to hold it in place, or if desired, the sleeve covering 9 is in the form of yarn or strands 17, and then wrapped around the body 4 to cover the openings 8 therein and then the bands 11 wrapped therearound to hold the covering 9 on the body 4.

The body 4 is then secured in the well string 5 and lowered into the well bore 6 to be positioned at the proper level therein to receive flow from the formation 20. The well bore 6 is normally provided with a casing 21 which is perforated as illustrated at 22 so that flow may occur from the formation 20 into the casing 21 to the well bore 6, then through the device 3 and the well pipe 5 to the surface 13 of the earth. If the well is a type which has a minimum of electrolysis and corrosion problems, the supporting framework 10 may be formed of material of suitable strength which is relatively inert and adapted to withstand the well temperature and pressures over an extended period of time.

As flow occurs from the formation 20, the fabric 9', including the filtering strands 9'' of the fabric 9' and the supporting strands 10' of the framework 10 receive the flow and the fabric 9' filters the flow prior to passing it into the openings 8 of the well screen. The filtering fabric 9' is of suitable porosity so that flow may occur therethrough, but has suitable filtering action so that sand or other fine dirt will be separated from the oil.

In situations where corrosion or electrolytic conditions are present in the well, the framework 10 will include the supporting strands 10', and strands 10'', the latter being of suitable electro-positive metal to form an electrode so that corrosion of the iron or steel pipe 5 and the equipment at the earth's surface 13 will be greatly inhibited.

As the strands 10'' deteriorate due to the electrolytic action thereon, the sleeve 9 will remain in position since the strands 10' are of relatively inert material.

It should be noted that the present invention eliminates the necessity of providing a gravel pack which has been customary heretofore. Also, the present invention eliminates the necessity of providing the expensive stainless steel wire wrap which is costly to install initially and which is subject to clogging, even after a short period of time in some wells.

If desired, a small amount of cotton, rayon or synthetic fiber may be incorporated in the sleeve 9 if the fabric 9' is of asbestos to reinforce the asbestos.

The sleeve 9 is relatively inexpensive, compared to present installations of wire wrapping, and the sleeve 9 not only filters better, but has less tendency to become clogged with sand and fine dirt. Of course, if desired, the sleeve 9 can also be used to cover present wire wrap constructions.

Of course, the present invention can be used with any type of well fluids and the reference to oil and gas wells has been purely for purposes of illustration. The bands 11 or wires 11' may be of metal or of a suitable plastic which is inert and does not react with the well fluids in which the device is used.

A closure plug 32 may be secured in the lower end of the body 4 by any suitable means such as threads.

Broadly, the present invention relates to a well screen incorporating a tubular body with fabric thereon wherein the fabric includes strands forming a filtering medium and strands forming a supporting framework for the fabric.

What is claimed is:

1. A combination well screen filter for well fluids and corrosion inhibitor for well pipe through which the well fluids flow including a body of formaminated fabric adapted to be secured in overlying relation on the lower end of a well pipe with openings in the pipe for receiving flow therethrough, said body fabric being formed of woven strands of inert material to withstand deterioration by reaction to the well fluids and forming a filter to separate undesirable solid constituents from the well fluids, metal strands interwoven with said fabric to form a supporting frame for said fabric, and additional strands interwoven with said fabric, said additional strands being formed of metal which occupies a higher positive position in the electromotive series than iron to provide an electrode in the well fluid to inhibit corrosive action on the well pipe in which the fluids flow.

2. A well screen construction adapted to be positioned on a well pipe including a tubular body having openings

therein whereby well fluid may flow thereinto from the well bore, a tubular body of woven asbestos covering said first mentioned body to filter the flow from the well bore as it passes thereinto, said woven tubular body including strands of metal which occupy a higher positive position in the electromotive series than iron whereby fluid flow through said body intimately contacts said metal strands so that corrosive action on the well pipe is inhibited.

3. A combination well screen filter for well fluids and corrosion inhibitor for well pipe through which the well fluids flow including a body of foraminated fabric adapted to be secured in overlying relation on the lower end of a well pipe with openings in the pipe for receiving flow therethrough, said body fabric being formed of strands of inert material to withstand deterioration by reaction to the well fluids and forming a filter to separate undesirable solid constituents from the well fluids, metal strands interwoven with said fabric to form a supporting frame for said fabric and, said strands occupying a higher positive position in the electro-motive series than iron to provide an electrode in the well fluid to inhibit corrosive action on the well pipe in which the fluids flow.

4. A combination well screen filter for well fluids and corrosion inhibitor for well pipe through which the well fluids flow including a body of foraminated fabric adapted to be secured in overlying relation on the lower end of a well pipe with openings in the pipe for receiving flow

therethrough, said body fabric being formed of strands of inert material to withstand deterioration by reaction to the well fluids and forming a filter to separate undesirable solid constituents from the well fluids, metal strands interwoven with said fabric to form a supporting frame therefor and additional metal strands interwoven therein, said additional strands being formed of metal which occupies a higher positive position in the electromotive series than iron whereby fluid flow through said body intimately contacts said electro positive metal strands so that corrosive action on the well pipe is inhibited.

References Cited in the file of this patent

UNITED STATES PATENTS

921,337	Archer	May 11, 1909
934,076	Kneuper	Sept. 14, 1909
997,191	Hogarth	July 4, 1911
1,406,825	Dobson	Feb. 14, 1922
1,608,709	Mills	Nov. 30, 1926
1,811,573	Bacheldor et al.	June 23, 1931
1,918,949	Woods	July 18, 1933
1,936,663	Dennis	Nov. 28, 1933
2,590,094	Egeberg et al.	Mar. 25, 1952
2,760,584	Rohrback	Aug. 28, 1956
2,775,302	Kirkpatrick	Dec. 25, 1956