

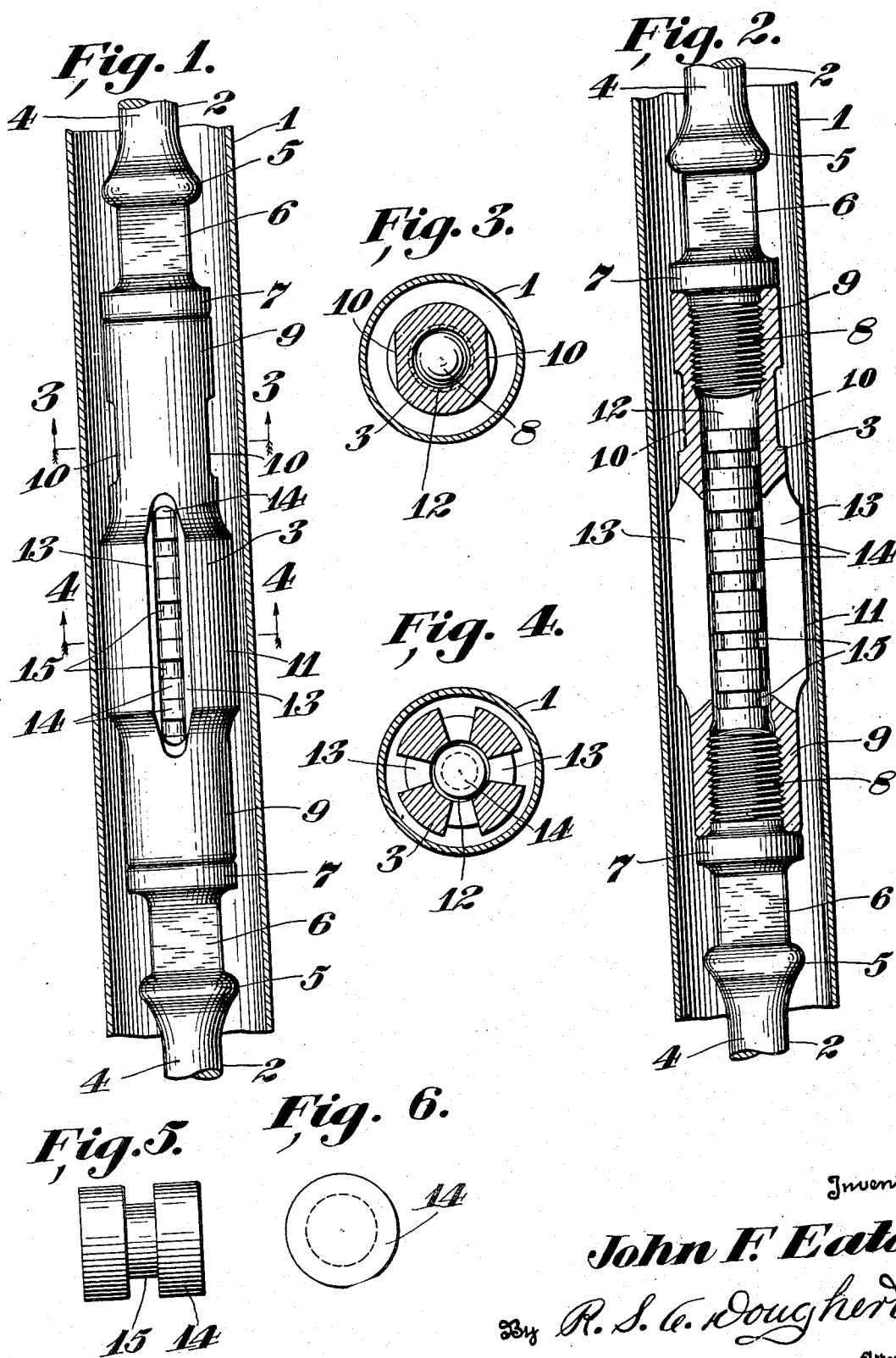
Jan. 1, 1946.

J. F. EATON

2,392,033

SUCKER ROD COUPLING WITH ZINC INSERTS

Filed Nov. 1, 1941



Inventor

John F. Eaton.

By R. S. C. Dougherty.

Attorney

UNITED STATES PATENT OFFICE

2,392,033

SUCKER ROD COUPLING WITH ZINC INSERTS

John F. Eaton, Tulsa, Okla., assignor to Bethlehem Steel Company, a corporation of Pennsylvania

Application November 1, 1941, Serial No. 417,422

4 Claims. (Cl. 204—197)

This invention relates to an improvement in sucker rod joints, and more particularly to a protective coupling guide for use under electrolytic conditions in oil wells.

Four methods of producing oil from wells are today in use: natural flow, artificial flow induced by oil or gas lift, swabbing and pumping. But pumping is certainly the method most widely utilized, and the pumps are usually actuated by a string of sucker rods. The success of deep oil well pumping, in particular, is largely dependent upon the length of service received from sucker rods, for rod breaks are costly in labor, down time, and replacements.

Standard sucker rods, made according to American Petroleum Institute specifications, are high-grade steel rods from $\frac{5}{8}$ inch to $1\frac{1}{8}$ inch in nominal diameter and 25 to 30 feet in length overall, including the coupling if any. Pony rods are similar, but shorter. Both sucker and pony rods are characterized by an enlarged or upset portion at each end, which at one end at least terminates in an externally threaded pin.

The box and pin type of sucker rod has an interiorly threaded end or box at the opposite end from the pin, which dispenses with the use of couplings to make connections, but the double pin type, exteriorly threaded at both ends, employs couplings and subcouplings to make up a string of sucker rods. These last are short internally threaded members screwed onto the pins, being called couplings if both ends are threaded alike and subcouplings if the ends are threaded differently, as in joining rods of different sizes for the tapered strings of deep wells.

The advantage of using the double pin type of rod is that all abrasion against the side of the tubing is taken on the coupling, so that the coupling rather than the much more expensive sucker rod receives the wear. Couplings can thus be removed and are usually renewed several times during the life of the rods, for the failure of a coupling would obviously entail the same considerable expense as the breakage of a sucker rod.

Electrolysis is provably the main cause of sucker rod and coupling failure in some fields, as in certain West Texas wells where about 75 per cent of the rod breaks are due to electrolytic action. Brines impregnated with hydrogen sulphide gas, shown by the familiar test for discoloration or blackening of lead acetate paper and found in many oil bearing horizons, have a highly destructive electrolytic pitting effect upon sucker rods or the like of ordinary steels.

Special corrosion resistant alloy steels have

heretofore been used in such wells, but these steels are not only rather high-priced, even in normal times, but are now practically unobtainable due to shortages. Since iron and zinc form a galvanic couple, zinc dissolving, and iron remaining unaffected, galvanizing is a good protectant against electrolysis, but galvanized rods and couplings are fairly expensive also, and in dynamic tests the soft zinc coating has been found to resist abrasive wear very poorly and to facilitate the formation of surface nicks or notches which concentrate operating stresses and produce progressive cracks and breaks ending in costly fishing jobs. Moreover, detached flakes of the zinc coating which have dropped to the bottom of the well will tend to hang between the ball and seat of the traveling or standing valves of the pump, thereby breaking the fluid seal, if adequate provision is not made for prevention. And for long life of the couplings and well tubing, the couplings should be extremely hard and highly polished on their outer surface, which is impossible with galvanizing.

To utilize this principle of the selective corrosion of zinc in contact with iron, without permitting undue abrasive weakening of the couplings or rods, is one object of my invention.

Another object is a sucker rod coupling of high resistance to attack by electrolysis.

A further object is a guide or coupling which will protect the adjacent sucker rods from electrolytic action.

Still another object is a coupling which is provided with inexpensive, self-cleaning and readily renewable zinc inserts.

Other objects, advantages and purposes of my invention will hereinafter appear in the following pages of the specification and claims.

Having thus given a general description of the advantages of my invention, I shall now in order to make the same more clear refer to the annexed sheet of drawings forming a part of this specification and in which like characters of reference indicate like parts.

Figure 1 is a side elevation of the coupling shown connecting two sucker rods within the well tubing;

Fig. 2 is a longitudinal section of the coupling which more clearly shows the zinc inserts and sucker rod pins;

Fig. 3 is a transverse sectional view taken substantially on the line 3—3 of Fig. 1, showing the wrench flats on the coupling and the top sucker rod pin;

Fig. 4 is a transverse sectional view taken

on the line 4—4 of Fig. 1 showing the fluid passage perforations in the body of the coupling;

Fig. 5 is a side view of one of the zinc inserts; and

Fig. 6 is a top plan view of the insert shown in Fig. 5.

Referring now to the various characters of reference on the drawing, the numeral 1 indicates the well tubing, 2 identical sucker rods, and 3 the coupling joining said sucker rods. Each sucker rod 2 is provided with a slender rod or bar portion 4, a head 5, a wrench engaging square 6, pin shoulder 7, and externally threaded pin 8. At both ends of coupling 3 is an internally threaded box portion 9 adapted to engage the externally threaded pin 8. Milled flats 10 supply means for wrench engagement and the enlarged middle body portion 11 is provided with a longitudinally bored central chamber 12, connecting said box portions 9, and with vertically fluted elongated slots 13. Within said chamber 12 are vertically arranged several spool-shaped zinc inserts 14 each provided with a circumferential groove 15.

The zinc inserts 14 are placed within the chamber 12 at the time of making up the sucker rod string, sufficient open space being left in the chamber 12 above zinc inserts 14 to permit a limited amount of free vertical movement to said inserts. For illustration the coupling has been shown as equipped with five (5) zinc inserts, but it will be readily understood that this number is not critical and may be varied as desired to accord with the size of coupling used and other operating conditions. The number of zinc inserted couplings required will vary also with the concentration of electrolyte in the particular well, but one to every 50 or 60 feet of exposed rod, i. e., at every other joint, will usually be found ample to protect both the rods and the other couplings.

Besides guarding the zinc inserts 14 from abrasion against the tubing 1, the enlarged body portion 11 serves to hold the rods in the center of the tubing during the pumping stroke and lessens the chance of buckling.

If the zinc inserts 14 were permitted to become coated with corrosion products they would lose a great part of their effectiveness in combating corrosion within a short time. But in operation most of the well fluid flowing past the moving coupling passes through the fluid passage slots 13 and is directed against the surface of the zinc inserts 14. The grooves 15 in said inserts increase the surface friction of the fluid passing the inserts, with the effect of lifting and agitating the inserts; and the fact of a plurality of small inserts instead of one large one further adds to the agitation and movement of the inserts in the coupling. The result of the continuous vibration and impact shocks is to

loosen and knock off the corrosion products as soon as they form, maintaining thus the primary efficiency of the zinc for the full period of its useful life. When the zinc inserts have corroded so much as to need replacement, they may be easily and cheaply replaced in the field, by raising and unscrewing the rods and following the method of the original insertion, without needing a whole new coupling.

For illustration, I have described my invention as a sucker rod coupling, but I wish to have it clearly understood that it may be made as a subcoupling or other modified form of coupling, or as a joint for pony rods, equally as well.

In other respects also, although I have shown and described my invention in considerable detail, I do not wish to be limited strictly to the exact and specific details shown and described, but may use such substitutions, modifications or equivalents thereof as are embraced within the scope of the invention or as are pointed out in the claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A coupling for sucker rods pumping corrosive well fluid comprising end box portions and a vertically slotted central chamber containing a plurality of loosely movable spool-shaped zinc inserts having fluid-engaging grooves so placed that the fluid strikes them while moving in the direction of their long axes.

2. A coupling for sucker rods comprising end box portions, an enlarged hollow longitudinally pierced portion perforated to permit the passage of fluid vertically, and within said hollow pierced portion a plurality of vertically disposed superposed movable cylindrical zinc inserts each having in the middle a circumferential groove to frictionally engage said fluid.

3. A coupling for sucker rods for use in corrosive well fluids, comprising a hollow steel shell internally threaded at both ends to engage threaded sucker rod pins, an enlarged central portion longitudinally slotted to admit the well fluid freely, and a plurality of renewable zinc inserts with circumferential grooves occupying a part of said central portion between the threaded pins and adapted to be moved easily by the well fluid engaging in the grooves during operation to shake off corroded portions.

4. A device for protecting iron and steel tubing and sucker rods of the double pin type against electrolytic corrosion, comprising a removable coupling section located intermediate adjacent lengths of sucker rods and consisting of an enlarged perforated outer steel shell with exterior diameter slightly less than the interior diameter of the tubing, and a plurality of movable selectively corrodible metallic spools therein.

JOHN F. EATON.