(No Model.)

J. K. ROBINSON & D. A. STRONG.

Packing for Oil and other Wells.

No. 232,209. **Patented Sept. 14, 1880.**

Fig. 2.

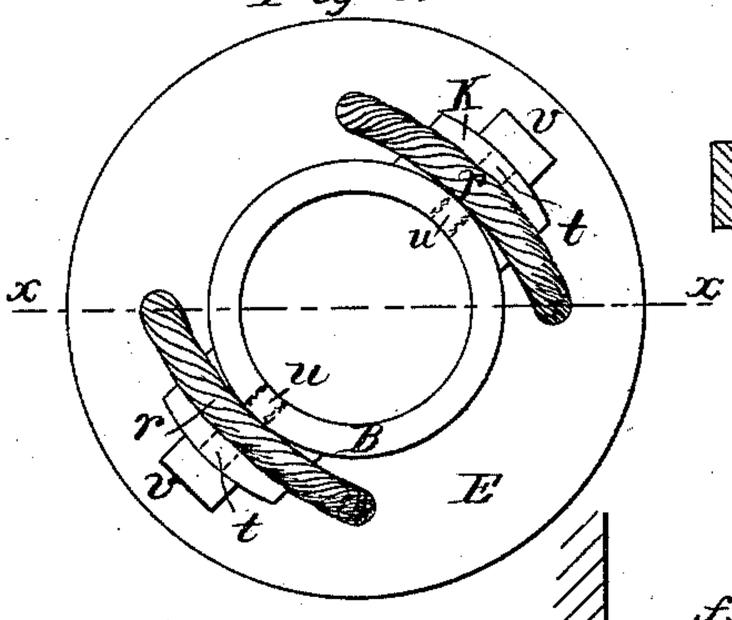


Fig. 1.

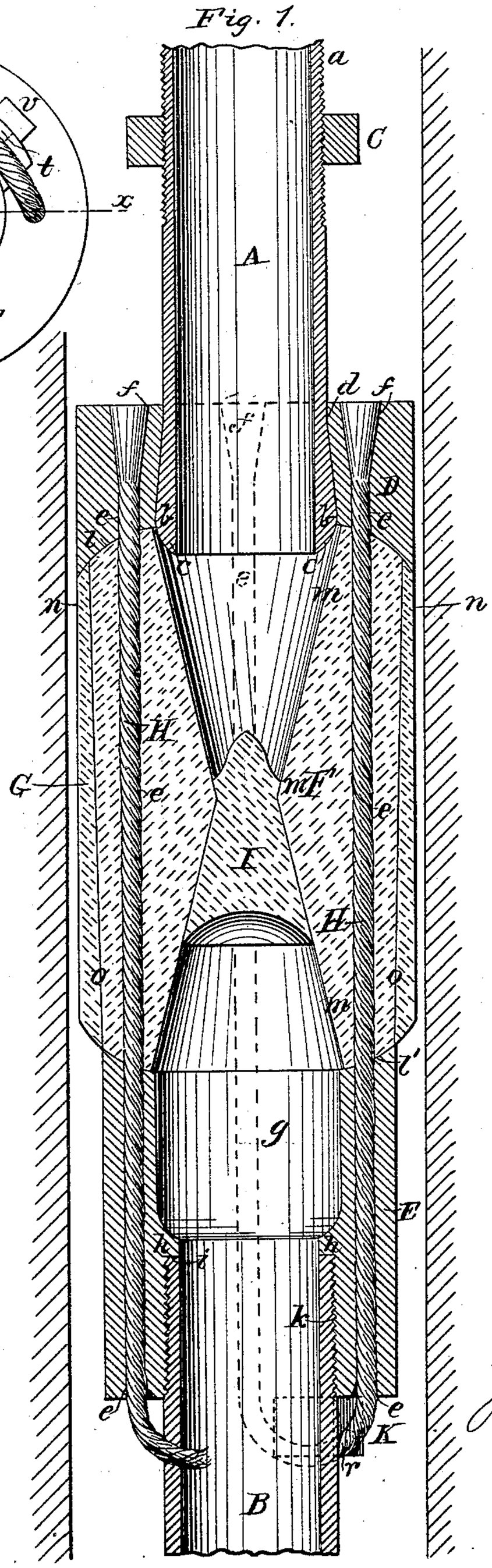
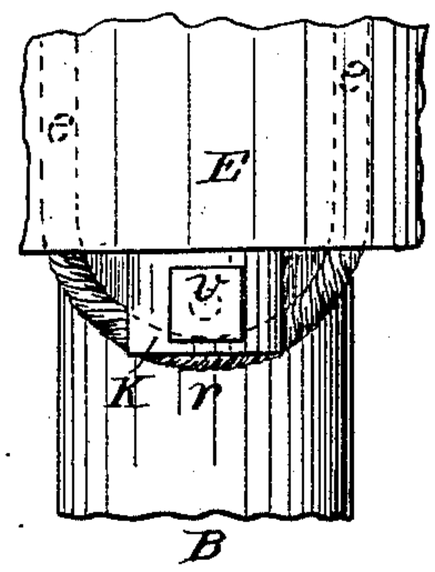


Fig. 3.



Witnesses:

N. W. Low

Jas D. Robinson

Inventor:

John K. Robinson

David A. Strong

UNITED STATES PATENT OFFICE.

JOHN K. ROBINSON, OF WASHINGTON, DISTRICT OF COLUMBIA, AND DAVID A. STRONG, OF CHICAGO, ILLINOIS.

PACKING FOR OIL AND OTHER WELLS.

SPECIFICATION forming part of Letters Patent No. 232,209, dated September 14, 1880.

Application filed June 12, 1880. (No model.)

To all whom it may concern:

Be it known that we, JOHN K. ROBINSON, of Washington city, District of Columbia, and DAVID A. STRONG, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement for Packing the Discharging-Tubes of Oil or other Deep-Bored Wells; and we do hereby declare the following to be a clear and exact description thereof, reference being had to the accompanying drawings, and the letters of reference marked thereon, which form a part of this specification.

In oil or other deep wells it is found necessary to pack the well in such manner as to prevent the surface or overflow water, or water from the veins or crevices in the well above the location of the packer, from passing down below the packer to mingle with the product or fluids at the bottom of the well, or at such point in the well as it may be found necessary to draw or force the fluid from, and also to preclude the gas and oil or other products below the packer from escaping past it, and to effectually confine the gas, when in a flowing well, within such space as will utilize the pressure of the gas in forcing the oil with which it is mingled to pass up and through the eduction-tube.

Our invention relates to the construction, application, and mode of operating such a packing device, and is an improvement on the packer for deep wells described in Letters Patent of the United States granted to us, dated February 6, 1866, No. 52,448, and reissued Letters Patent dated July 1, 1879; and it consists, in this instance, first, in constructing and applying the device in such manner as to enable the operator to insert and easily withdraw all of the tubing and packer from an oil or other deep well; second, in constructing the device in such manner as to enable the operator to withdraw all the tubing from the well without removing the outer elastic casing of said packing; third, in the peculiar construction of suitable connections and manner of uniting the packing to said connections, together with the upper and lower tube-sections of an oil or other deep well; fourth, in the peculiar form and arrangement of the packing material, together with the movement of the several devices, as will insure a more perfect packing for a well; fifth, in the introduction of a suitable check within the interior of the packing material in such manner as to preclude the flow of oil through the tubing during the operation of placing the tubing in the well.

In order that our invention may be fully understood, we will proceed to describe it with reference to the accompanying drawings, in which—

Figure 1 is a central vertical section taken on line *x x*, Fig. 2, with partial sections of those portions of the well-tube to which it is applied. Fig. 2 is a transverse section. Fig. 3 is an elevation of the wire rope held in place by the gibs and set-screws.

Similar letters of reference indicate corresponding parts.

In the drawings, A and B are two sections of well-tubing. A short section of the lower part of the upper tube-section, A, is provided with an external screw-thread, *a*, on which is screwed an adjustable nut or collar, C, which is designed to adjust the downward movement (within the packing) of the upper tube-section, A. On the lower end of this short section of tubing an external enlargement, *b*, decreasing slightly in the direction of the nut or collar C, is arranged for the purpose of suspending couplings D and E with packing F and G and lower tube-section, B.

A short portion of the extreme end of the tube A, as at *c*, is externally reduced or chamfered for the purpose of securing an easy passage of the said tube through the elastic rubber packing, as shown.

D is a metal coupling, the external diameter of which is made somewhat smaller than the bore of the well. The form of the coupling being concavous on its lower surface, receives the end bearings of the elastic packings in such manner that when being compressed will materially assist in forcing the packing in a lateral direction to the eduction-tubes, whereby the external ends or edges of the packing are not liable to adhere or stick to the wall of the well.

The coupling D has perforated through the center an opening, *d*, the size and shape of which conforms with the taper enlargement

on the lower end of the upper tube-section, A, so that said section can move up and down within the coupling D in such manner as to prevent it being pulled out or through the coupling when it may be required to lower the tubing into or withdraw it from the well.

Holes *e*, with conical enlargements *f f* on the upper surface of the coupling D, are perforated lengthwise through its solid portion for the purpose of passing through and making fast a flexible wire rope, as shown.

E is a lower metal coupling, the external diameter of which is made to pass through the internal portion of the outer elastic rubber packing or casing when pulled through it, the upper surface of said coupling being concaved correspondingly to the lower surface of the upper coupling, D.

A suitable portion of the coupling is provided lengthwise through its center with an opening or enlargement, *g*, thereby permitting the lower part of the upper tube-section, A, to pass freely therein on its downward movement, if desired. An intermediate space, *h*, below may be provided with a shoulder or seat, *i*, which may abut or form a joint upon the upper end of the lower tube-section, B, which is screwed into the extreme lower end of said coupling, a suitable screw-thread, *k*, having been prepared therefor. Holes of corresponding size and number are perforated lengthwise, as in coupling D, for the passage of the flexible wire rope.

F is an elastic rubber packing, reduced at its lower external diameter and increased at its upper external diameter, forming a tapered circumferential surface from end to end, the convex ends of which are formed to fit within the concavous portion *l l'* of the upper and lower couplings. Holes are also provided through it lengthwise, corresponding in size and location to the holes in couplings D and E for the passage of the flexible wire rope.

The form of the internal surface of the elastic packing F is shown in Fig. 1, *m m m*, being contracted diametrically at the middle and increased at the respective ends in such manner as to permit the enlarged portion of the lower end of the upper tube-section, A, to pass downward some distance before expansion takes place in the packing.

G represents an outer elastic rubber casing or packing, the length of which corresponds with the length of the elastic packing F, the external diameter, *n n*, being cylindrical and somewhat less than the bore of the well. The internal diameter, *o o*, is made to correspond with the external size of the packing F, over which it is drawn in such manner as will prevent it slipping off when being lowered into or withdrawn from the well.

H represents a flexible wire rope of steel, iron, or copper, of suitable dimensions, for the purpose of connecting the upper and lower metal couplings, D and E, securely together, between which the elastic rubber packings are confined, and also for the purpose of sustaining the lower tube-section, B, with the packings and couplings, while being lowered into and withdrawn from the well. The respective ends of each piece of the flexible wire rope may be drawn upward through the holes *e e* nearest each other in the lower coupling, E, elastic packing F, and upper coupling, D, then secured within the conical enlargements *f f* of the holes *e e* in the upper surface of the coupling D, in the manner usually adopted for securing the strain ends of wire rope.

Below the under surface of the coupling E the wire rope may form a loop, *r*, to avoid an abrupt turn in the rope, upon which a suitable metal stud or gib is seated, the upper end of the stud or gib thus forming a rest or bearing for the under surface of the coupling E, thereby enabling any slack of the loop to be tightened, all of which insures a rigid connection with the packings and couplings. The gib or stud K being perforated with a lateral hole, *t*, and a corresponding one, *u*, provided with a screw-thread in the lower tube-section, B, is held in place by the screw-bolt *v*, to prevent it dropping into the well.

I represents a check of any suitable material inserted within the interior of the packing F in such manner as to prevent its displacement until the downward movement of the upper tube-section, A, relieves it from its position in the packing, when the pressure of the ascending oil and gas will force it to the top of the well.

K represents a metallic gib or stud inserted between the upper part of the loop formed by the flexible wire and the under surface of the lower coupling, to take up the slack formed in said loop. That portion of the gib next the tube is shaped to fit the tube. The portion resting upon the loop of the flexible wire rope may be grooved out to fit the rope, while the part upon which the coupling rests may be flat and held in place by the screw-bolt *v*.

Having described the drawings and illustrations, we will further proceed to state how the invention may be put together, applied, and operated.

The short piece of tubing, which is a part of the lower end of the upper tube-section, A, having been properly fitted to the upper coupling, D, and provided with an external screw-thread for the adjustable nut or collar C, is slipped through the coupling, when the adjustable nut or collar may be screwed on as desired. A part of the screw-thread above the collar serves to connect the short tube to the upper tube-section. The lower tube-section may be screwed into the coupling E to the shoulder *i*, care having been taken to locate the screw-holes for the attachment of the gib or stud in the tube with the screw-bolt *v*. The outer elastic rubber casing, G, is then pushed over the packing F until the ends of each are flush, and inserted between the couplings D and E. The wire rope is then drawn through the packing and couplings, and compression-clamps put on, the packing pressed tightly between the couplings,

and ends of the rope fastened. The gibs or studs may then be placed between the loops and coupling and made fast, as described. The compression-clamps may then be relaxed, and the tube-sections attached and lowered into the well.

The tube-sections having been connected together with the packing device and lowered into the well, the lower tube-section resting on the bottom, the downward movement of the upper tube-section through the elastic rubber packing F causes lateral expansion of said packing and the outer casing, G, to the wall of the well. The lateral expansion of the packing carries with it the flexible wire rope, which pulls down the upper coupling, D, causing a vertical compression of the packings, which may be further vertically compressed by the partial weight of the upper tube-section, the nut or collar C being so arranged as to press upon the upper surface of the coupling D in such manner as will insure the passage of the point of the tube through the contracted opening of the packing F, whereby the check inserted therein becomes released and is forced by the pressure of the gas and oil below through the upper tube-section to the top of the well. The downward movement of the tube may continue until the chamfered point reaches the lower end of the enlargement *g* in the coupling E, thereby perfecting the packing of both the well and the tube.

In withdrawing the packer and tubing from the well the upper tube-section, being raised at the top, moves upward until the nut or collar C leaves the upper surface of the coupling D, the vertical compression of the packing is relaxed, and as the upward movement continues the point or lower end of the tube is pulled through the opening in the packing F until it reaches the tapered enlargement in the coupling D.

The elastic strength of the solid packing F, with the flexible wire rope pulled taut, springs the packing to its usual position, which becomes fully released in a lateral direction from the outer rubber casing or the wall of the well, when the tubing and packer can be withdrawn, as described.

When not using the outer rubber casing the lower coupling may be increased in diameter on its external surface, and the packing F made cylindrical from end to end on its external surface, and also enlarged. If the outer rubber casing remain in the well, the tubing and packer F may be again inserted therein and the well packed, as described.

The device may be modified without departing from the spirit of our invention. For instance, the adjustable nut or collar C may be a fixed flange, through which bolts may pass, and be fastened to the upper surface of the coupling D in such manner as to enable the flange to slip down the bolts toward the coupling, through which the tube may pass into the elastic packing and press it out, as herein stated.

The outer elastic packing, G, may be dispensed with, if desired, and the internal packing increased on its external diameter its full length, whereby it is increased in solidity and answers the same purpose.

The upper surface of the top coupling, D, may be increased in thickness, and the holes of the wire rope lengthened upward, so that metal plugs may be screwed therein to prevent the gas from escaping through fine interstices of the wire-rope, if found necessary.

In this application we do not claim connecting the tube-sections to the packing material and compressing the same to the wall of the well by the downward movement of the upper tube-section, as a similar device was described but not claimed in our early application for Letters Patent granted February 6, 1866.

We do not claim connecting the tube-sections to or within each other, wherein they are held together by shoulders or screws to form a slip or telescopic joint.

We do not claim connecting the tube-sections together at any point where the flexible packing surrounds the sliding joint or where the upper tube is connected to the lower tube arranged as a coupling.

We do not claim connecting the respective ends of two sections of oil-well tubing by or with an outer tube or cylinder attached to said tubing.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. An elastic rubber packing, F, provided with convexed ends and double conically-inverted central opening through which to pass the eduction-tube, surrounded with an outer elastic rubber packing or casing, G, of external uniform diameter, as shown and described.

2. The combination of the tube A, having an external enlargement, *b*, and adjustable nut or collar C, with the concaved coupling D, substantially as described.

3. The combination of the tube A, concaved coupling D, and elastic rubber packings F and G with the flexible wire rope H, concaved coupling E, the tube B, and gib or stud K, as shown and described.

4. In combination with the tube A and elastic rubber packing F, the rubber or metal check I, inserted within the interior of the packing during the tubing operation, as shown and described.

In testimony whereof we, the said JOHN K. ROBINSON and DAVID A. STRONG, have hereunto set our hands.

JOHN K. ROBINSON.
DAVID A. STRONG.

Witnesses to signature of John K. Robinson:

JAS. B. ROBINSON,
MARIA E. ROBINSON.

Witnesses to signature of David A. Strong:

H. RUBENS,
GEO. A. MEECH.