Feb. 2, 1932. N. V. SHUSTER 1,843,497

OIL AND GAS WELL PLUG

Filed Sept. 19, 1930

Fig. 2.

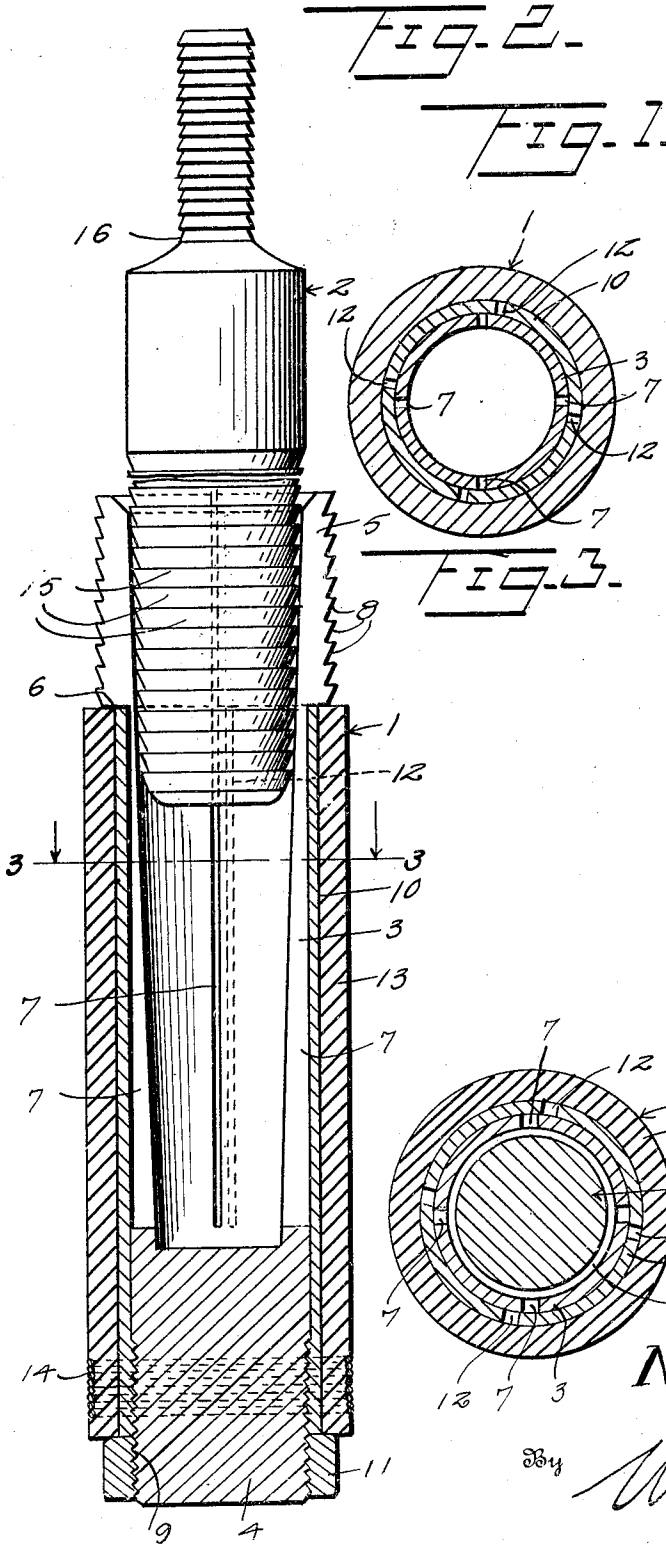


Fig. 1.

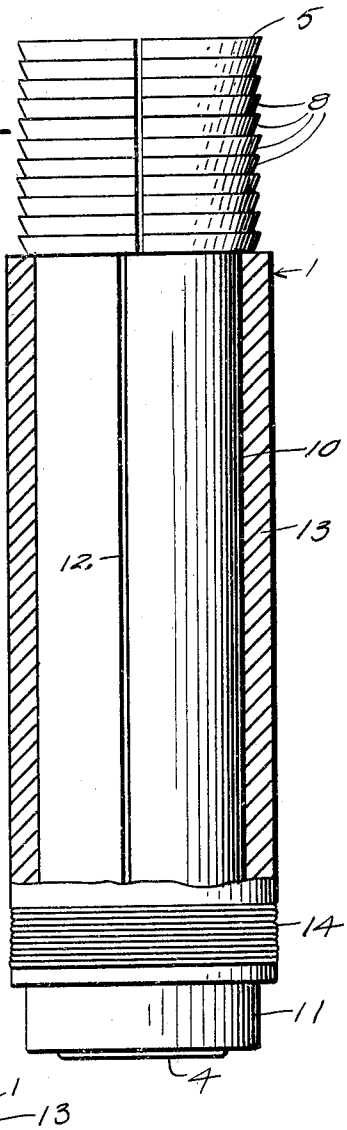


Fig. 3.

Fig. 4.

Inventor

N. V. Shuster

By Watson E. Coleman

Attorney

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UNITED STATES PATENT OFFICE

NOLAND V. SHUSTER, OF RUTLAND, OHIO, ASSIGNOR OF ONE-HALF TO JOSEPH H. KIGGINS, OF MARIETTA, OHIO

OIL AND GAS WELL PLUG

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This invention relates to improvements in plugs for oil and gas wells and pertains particularly to an expansion plug designed to have the circumference thereof increased after being placed in position in the well hole so as to tightly engage the wall of the same.

The primary object of the present invention is to provide an improved expansion plug formed in two separable sections, one constituting the plug body and the other an expansion mandrel, wherein the body of the plug may be set in the desired position before the mandrel is inserted thereinto so that the proper placement of the plug in the well hole is assured.

Another object of the invention is to provide a plug having slips or teeth about the upper end thereof designed to engage the wall of the hole or casing in which the plug is placed to prevent it from coming up the hole or otherwise moving from set position.

Still another object of the invention is to provide an expansion plug wherein the mandrel which is employed for expanding the body of the plug is provided with slips or teeth which prevent it from loosening after being placed in position in the plug body.

The invention will be best understood from a consideration of the following detailed description taken in connection with the accompanying drawings forming part of this specification, with the understanding, however, that the invention is not confined to any strict conformity with the showing of the drawings but may be changed or modified so long as such changes or modifications mark no material departure from the salient features of the invention as expressed in the appended claims.

In the drawings:

Figure 1 is a view partly in side elevation and partly in section of the plug embodying the present invention minus the mandrel therefor.

Figure 2 is a longitudinal sectional view of the plug showing the mandrel in position.

Figure 3 is a sectional view taken on the line 3—3 of Figure 2 showing the plug before expansion.

Figure 4 is a sectional view similar to Figure 3 showing in section therein the mandrel and showing the plug expanded.

Referring more particularly to the drawings wherein like numerals of reference indicate corresponding parts throughout the several views, the numeral 1 indicates generally the body of the present improved plug while the mandrel which is employed for expanding the body is indicated generally by the numeral 2.

As shown the body 1 comprises a tubular core 3 which is closed at its lower end as indicated at 4 and has a portion of its upper end of increased thickness as indicated at 5, thus forming inwardly of the upper end a shoulder 6. The tubular core 3 has formed therein from the upper end a series of longitudinally extending slits, each of which is indicated by the numeral 7, each of these slits extending to a point adjacent the lower or closed end thereof. The outer surface of the enlarged portion 5 at the upper end of the core is provided throughout with circumferential teeth or slips 8 which, when the plug is in position in a well hole and after the plug has been expanded, engage the wall of the hole to prevent the plug moving from position.

The lower end of the core 3 is provided with screw threads 9 and surrounding the core is a sleeve 10, one end of which abuts the shoulder 6 while the other end is in threaded connection with the core through the medium of the threads 9 as shown. When the sleeve 10 is in the position shown the threaded end of the core projects from the lower end thereof to receive a locking ring 11 which holds the sleeve in position on the core. The sleeve 10, like the core 3, is provided with a series of longitudinally extending slits 12 formed from

the upper end thereof and terminating adjacent the lower end.

Surrounding the sleeve 10 and having one end abutting the shoulder 6 is a relatively thick rubber sleeve 13. The end of the rubber sleeve remote from the shoulder 6 is securely bound to the sleeve 10 by wire wrapping 14. As shown the sleeve retaining ring 11 also covers a portion of the end of the rubber sleeve 13 and thus serves to prevent any movement of the rubber sleeve from position.

The mandrel 2 as shown consists of an elongated slightly tapered solid body of metal, the major portion of which is provided with the circumferential teeth or slips 15 extending from the lower reduced end upwardly. At its upper end the mandrel is provided with the stem 16 which also is provided with circumferential teeth to facilitate the engagement of a combination socket therewith when the mandrel is to be lowered to or removed from position. The inner wall of the core 3 is also tapered slightly so that at its inner or lower end the core is of slightly less interior diameter than at its outer end.

In operation the main body portion 1 of the plug is first lowered into the hole by a sand line and placed in the desired position therein. After the body 1 has been located in the proper position in the hole the mandrel is then lowered and inserted into the open upper end of the core 3 and forced thereinto by a bumper on the sand line or by any other suitable means. This causes an opening of the upper end of the core and consequently an expansion of the sleeve 10 and the rubber sleeve 13 forcing the latter into firm contact with the wall of the hole. At the same time the teeth 8 bite into the wall and thus secure the packer against movement. If the packer is to be removed the mandrel can be engaged by a combination socket and jarred from position after which a bell socket may be run in to take a hold upon the packer or the body 1 so that it may be lifted from position.

It will be seen that after the mandrel, which as previously stated is tapered, has been driven into the materially tapered core the teeth 15 will prevent it from slipping from position so that a firm contact will be maintained at all times between the rubber sleeve 13 and the wall of the hole and the passage of water past the plug will thus be effectively cut off.

Having thus described my invention, what I claim is:—

1. A well plug of the character described, comprising a tubular metal core closed at one end and having a plurality of longitudinally extending slits through the wall thereof from the other end and terminating adjacent the closed end, a sleeve of resilient material encasing the major portion of said core, and an elongated mandrel insertable into the open end of the core for expanding the same and said sleeve.

2. A well plug of the character described, comprising a tubular metal core closed at one end and having a plurality of longitudinally extending slits through the wall thereof from the other end and terminating adjacent the closed end, a sleeve of resilient material surrounding said core, an elongated mandrel insertable into the open end of the core for expanding the same and said sleeve, and means about the upper end of the core for gripping the wall of a well hole to prevent movement of the core therein.

3. A well plug of the character described, comprising a tubular metal core closed at one end and having a plurality of longitudinally extending slits through the wall thereof from the other end and terminating adjacent the closed end, a sleeve of resilient material surrounding said core, an elongated mandrel insertable into the open end of the core for expanding the same and said sleeve, means about the upper end of the core for gripping the wall of a well hole to prevent movement of the core therein, said mandrel and the interior of said core being slightly tapered, and said mandrel having teeth formed thereabout for engaging the inner wall of the core to prevent relative movement between the latter and the mandrel.

4. A well plug of the character described, comprising a core in the form of a tubular body closed at one end, said core at the other end having a surrounding thickened portion forming a shoulder inwardly of the said other end, teeth formed about the outer surface of said thickened portion, said core having a series of longitudinally extending slits from the open end to a point adjacent the closed end thereof, a sleeve surrounding the core and having one end abutting said shoulder, said sleeve being in threaded engagement with the core and further having a series of longitudinally extending slits therein, said last slits opening through the end of the sleeve adjacent the shoulder, a resilient sleeve surrounding the first mentioned sleeve, a retaining ring engaging the closed end of the core and maintaining said sleeves in position thereon, and a mandrel insertable into the open end of the core for expanding the same and the sleeves thereabout.

5. A well plug of the character described comprising a pair of tubular bodies disposed one within the other and closed at one end, said bodies each having longitudinally extending slits formed therein from the open end to a point adjacent the closed end, said slits of the bodies being out of register with one another, a sleeve of compressible material encasing the major portion of the bodies and extending beyond the inner or closed ends of the slits, and an expanding element adapted

to be inserted into the open end of the inner one of the bodies.

6. A well plug of the character described comprising a pair of tubular bodies disposed one within the other and closed at one end, said bodies each having longitudinally extending slits formed therein from the open end to a point adjacent the closed end, said slits of the bodies being out of register with one another, a sleeve of compressible material encasing the major portion of the bodies and extending beyond the inner or closed ends of the slits, an expanding element adapted to be inserted into the open end of the inner one of the bodies, the inner one of said bodies having its open end extended beyond the open end of the other body, and teeth formed about the outer face of the extended end of the inner body for engagement with the wall of the well into which the plug is inserted.

7. A well plug of the character described comprising an inner cylindrical body closed at one end and having threads formed about the closed end thereof, an outer cylindrical body encasing the inner body and having threaded connection with the threads of the closed end thereof, said inner and outer bodies being longitudinally split from their open ends to points adjacent the closed end of the inner body, a sleeve of compressible material encasing the outer body, means surrounding the sleeve in the area of the closed end of the inner body, to secure the sleeve in position, and an expanding element insertable into the open end of the inner body.

8. A well plug of the character described comprising an inner cylindrical body closed at one end and having threads formed about the closed end thereof, an outer cylindrical body encasing the inner body and having threaded connection with the threads of the closed end thereof, said inner and outer bodies being longitudinally split from their open ends to points adjacent the closed end of the inner body, a sleeve of compressible material encasing the outer body, means surrounding the sleeve in the area of the closed end of the inner body, to secure the sleeve in position, an expanding element insertable into the open end of the inner body, and means forming a part of the inner body at the open end thereof and extending beyond the outer body and the sleeve, for engaging the wall of a well hole to prevent movement of the plug in one direction therein.

9. A well plug of the character described comprising an inner cylindrical body having one end closed, an outer cylindrical body surrounding the inner body and having threaded connection therewith at the closed end, the outer body terminating short of the open end of the inner body, said inner and outer bodies having longitudinal slits in the walls thereof formed from the open ends to permit of their being expanded, said slits being out of register with one another, an elongated sleeve of compressible material completely encasing the outer body, securing means about the sleeve adjacent the end remote from the open ends of the bodies, teeth formed about the exterior surface of the inner body adjacent the open end thereof, and means for effecting the expansion of the bodies and the sleeve.

In testimony whereof I hereunto affix my signature.

NOLAND V. SHUSTER.