

June 21, 1938.

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2,120,982

LEAD SEAL

Filed Dec. 9, 1935

2 Sheets-Sheet 1

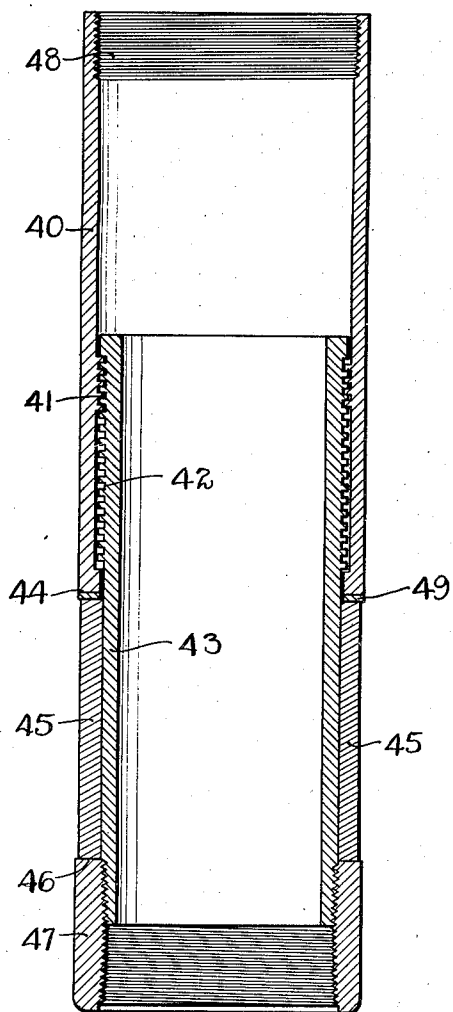


Fig. 1.

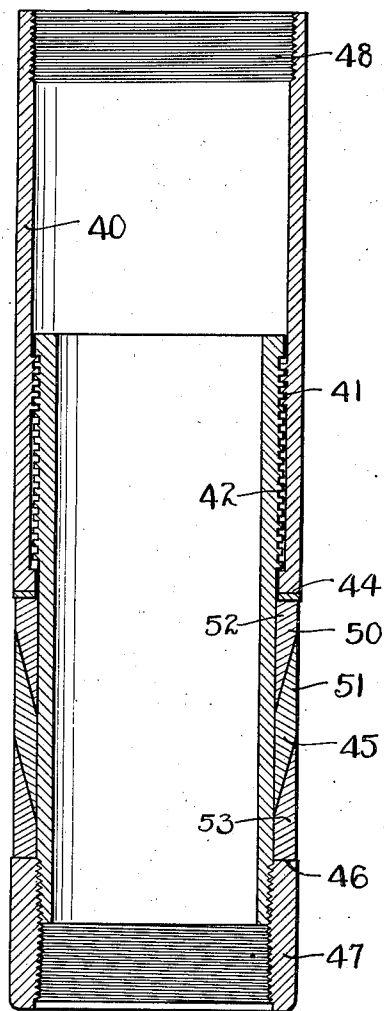


Fig. 2.

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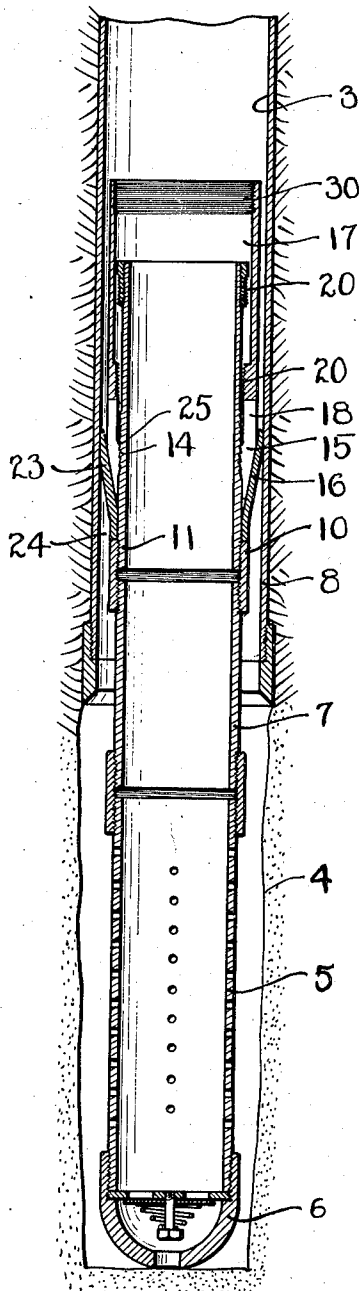


Fig. 3

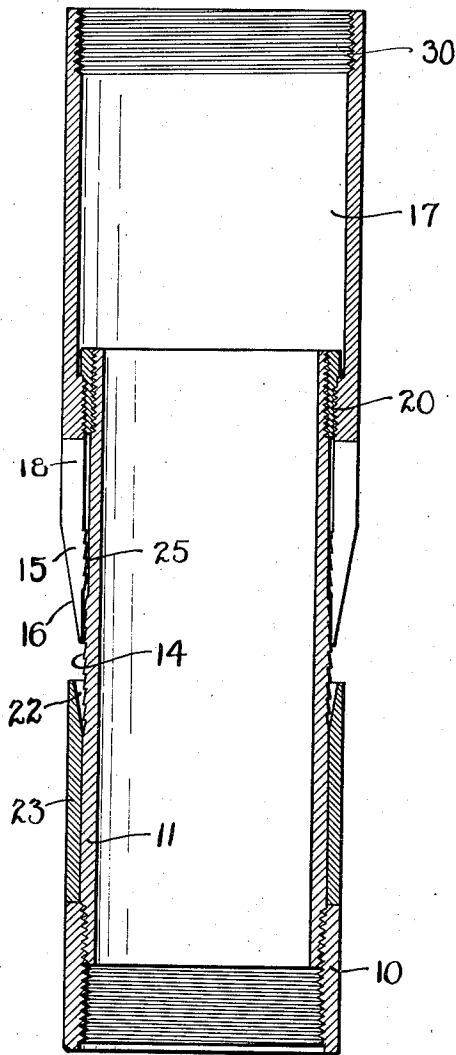


Fig. 4.

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UNITED STATES PATENT OFFICE

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LEAD SEAL

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6 Claims. (Cl. 166—10)

The invention relates to an improvement in lead seal packers of the type which are applied in order to form a seal between the liner and casing in wells.

It is the usual practice in low pressure wells to set the casing and to thereafter run in through the casing with a screen and liner which project below the casing into the production formation. This screen and liner are, as a general rule, of lesser diameter than the casing and it is necessary to form a seal between the liner and the casing to prevent the inflow of foreign material.

Various types of packers have been employed to form a seal about the liner, but the usual practice is to arrange a lead seal adjacent the top of the liner and go into the well with a sealing iron which is in the form of a rounded member to engage against the lead seal and expand it against the liner wall. The sealing iron is then removed and the operation is in this manner completed. The objection to this practice, however, is the fact that the lead seal is not permanently maintained in the expanded position, and any vibration or movement of the parts will upset it. Also, in event of excessive pressure from below, the lead seal may be moved inwardly and the seal destroyed. The present invention directs itself to a lead seal which can be expanded and retained permanently in this expanded position so that the seal is insured.

It is one of the objects of the invention to provide a lead seal which is expanded to sealing position and locked in this sealing position by an expander member.

Another object of the invention is to provide a combination screen, liner, and lead seal which can be set and locked into such position.

Still another object of the invention is to provide in combination with the setting tool a left-hand thread so that the lead seal packer may be expanded and the setting tool or setting string released from the member.

Another object of the invention is to provide a setting device for lead seals which is locked against the setting operation, except after rotation thereof.

Still another object of the invention is to provide an expander for lead seals which will be locked in position and maintain the lead seal in expanded position.

Another object of the invention is to provide an expander for lead seals which is capable of rotation so that it will remain in the rotated position to lock the seal in proper position.

Other and further objects of the invention will be readily apparent when the following description is considered in connection with the accompanying drawings, wherein:

Fig. 1 is a vertical sectional view of one form of lead seal packer wherein the seal is set by rotation of the setting member.

Fig. 2 is vertical section view of the packer similar to Fig. 1, but wherein the lead seal is arranged in the form of nested rings, in order to control the expansible movement thereof.

Fig. 3 shows the side elevation of another form of the invention being applied to a casing and liner with the lead seal in an expanded position and the setting string removed.

Fig. 4 is a view of Fig. 3, showing a modification before the expansion of the lead seal.

Fig. 3 shows a general combination of the arrangement wherein a casing at 3 is positioned in the well directly above a producing formation 4. A screen is indicated at 5 and carries a guide shoe 6 on the lower end thereof. Above the screen 5 is a liner 7, which extends up into the lower end 8 of the casing 3. It is in the lower end of the casing that the seal is to be formed. The liner 7 carries the coupling 10 which is to connect a support sleeve 11 to the liner.

In the Fig. 3 form of the invention this support sleeve 11 is provided on its outer periphery with a plurality of ratchet threads 14. These right-hand ratchet threads are arranged to receive the expander head or fingers 15. These fingers have a lower tapered face at 16 and are arranged on the lower end of the setting sleeve 17 with a plurality of slots 18 defining the fingers so that they may have sufficient radial movement to pass over the ratchet 14. This setting sleeve 17 is threaded and engaged to the upper end of the support pipe or mandrel 11 so that this setting sleeve 17 is incapable of downward movement until such time as the thread 20 has been unscrewed. This is a right-hand thread so that the setting string may be rotated in a right-hand direction in order to release this setting sleeve.

When the setting sleeve is released from the support 11 it will move downwardly with the beveled face 16 moving into the recess 22 at the upper end of the lead seal 23. The movement of expanding the lead seal 23 is best seen in Fig. 3 where the fingers have moved under the lead seal and caused it to expand outwardly against the inside face 24 of the casing.

Inside faces of the fingers 15 are formed with complementary ratchet teeth 25 to engage the

teeth 14 so that the expander is then locked against upward movement. In this manner the lead seal is locked outwardly in expanded position so that pressure from below cannot unseat the packer, and any movement of the parts will not affect the position of the lead seal. The fingers may be released by backward rotation if the packer is to be thereafter removed.

The upper end of the setting sleeve 17 is provided with a set of left-hand threads 30 by which the setting string is connected. All of the other connections between the sections of the setting string will be right-hand threads so that right-hand rotation may be imparted to the setting sleeve 17 in order to unscrew the threads 20, it being intended that the threads 30 will be made up tightly when the device is assembled at the surface so that the left-hand thread 30 will resist unscrewing to a sufficient extent that the threads 20 may be unscrewed and the lead seal set in position. When the fingers 15 have been moved in under the lead seal and some of the weight of the setting string of pipe applied thereto the lead seal will be expanded and the fingers will be wedged firmly beneath the lead seal and any attempt to rotate these fingers will, therefore, be resisted by the frictional engagement of the parts and the right-hand ratchet threads. This tendency will cause unscrewing of the threads 30 and release the setting string. The string can then be removed and the parts will remain in the position shown in Fig. 3.

Fig. 1 shows a modified form of the invention wherein the setting sleeve is illustrated at 40 and is modified slightly with respect to the sleeve 17 in that it is provided on its inside face with a coarse or acme thread 41 which engages a complementary thread 42 on the support sleeve 43. The lower end of this setting sleeve 40 is formed with a square shoulder 44 and is arranged to engage a slip ring 49 which in turn abuts the lead sleeve 45. The lead member is, in turn, supported on a shoulder 46 on the upper end of the coupling 47, which is similar to the coupling at 10 in the Fig. 3 form of the invention.

When the setting sleeve 40 is rotated it will move downwardly because of the threads 41 and 42 and in this manner the lead seal 45 will be caused to expand against the casing to form a seal between the liner and casing. The left-hand threads 48 are provided on the upper end of this setting sleeve the same as the left-hand threads at 30 in Fig. 3.

Fig. 2 shows another modified form in which the lead seal 50 is constructed of a plurality of interfitting rings 51, 52 and 53 which are tapered and nested to engage each other in order to cause the seal to expand more easily and create an even pressure to obtain a secure seal.

What is claimed is:

1. A lead seal liner packing comprising a support member, a lead ring about said member, a lock expander adapted for movement into said ring, interengaging means on said support and expander to normally prevent the relative movement thereof but releasable to effect setting of said lead ring, and additional inter-engaging means on said support and expander to retain said expander in setting position.

2. A lead seal liner packing comprising a support member, a lead ring thereon, a lock expander adapted for movement into said ring, means on said member and said expander to latch said expander under said ring, interengaging means on said support and expander to normally prevent the relative movement thereof but releasable to effect setting of said lead ring, and a pipe connected to said expander which is operable to release said means.

3. A lead seal liner packing comprising a support member, a lead ring concentrically disposed about said member, a lock expander adapted for movement between said ring and said member, interengaging means on said support and expander to normally prevent the relative movement thereof but releasable to effect setting of said lead ring, a pipe connected to said expander which is operable to release said means, means to latch said expander under said ring, and a left-hand thread connecting said expander and pipe whereby said pipe will release from said expander when the packing is set.

4. A lead seal including a support pipe, a lead seal thereon, a setting sleeve to be moved against said seal, means including a ratchet latch to hold said sleeve in set position, and a threaded connection between said pipe and sleeve to be unscrewed when said seal is to be set.

5. A lead seal including a support pipe, a lead seal thereon, a setting sleeve to be moved against said seal, means to hold said sleeve in set position including ratchet fingers to latch on said support pipe, a threaded connection between said pipe and sleeve to be unscrewed when said seal is to be set, and a setting pipe having a left-hand threaded connection to said sleeve which is releasable when the seal is set.

6. A lead seal including a support pipe, a setting pipe, a short threaded connection between said pipes, a lead seal encircling said support pipe and to be expanded therearound by said setting pipe upon screwing of said threads and sliding of said pipe with respect to said support, said seal comprising a cylindrical ring of lead, and combination expander and latch fingers on said setting pipe to expand said seal and latch said setting pipe.

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