

April 4, 1944.

M. L. HART

2,345,873

BRIDGING PLUG

Filed Jan. 10, 1941

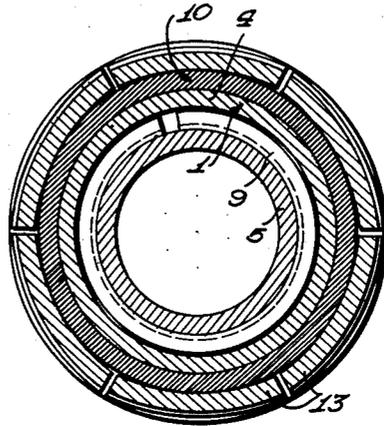
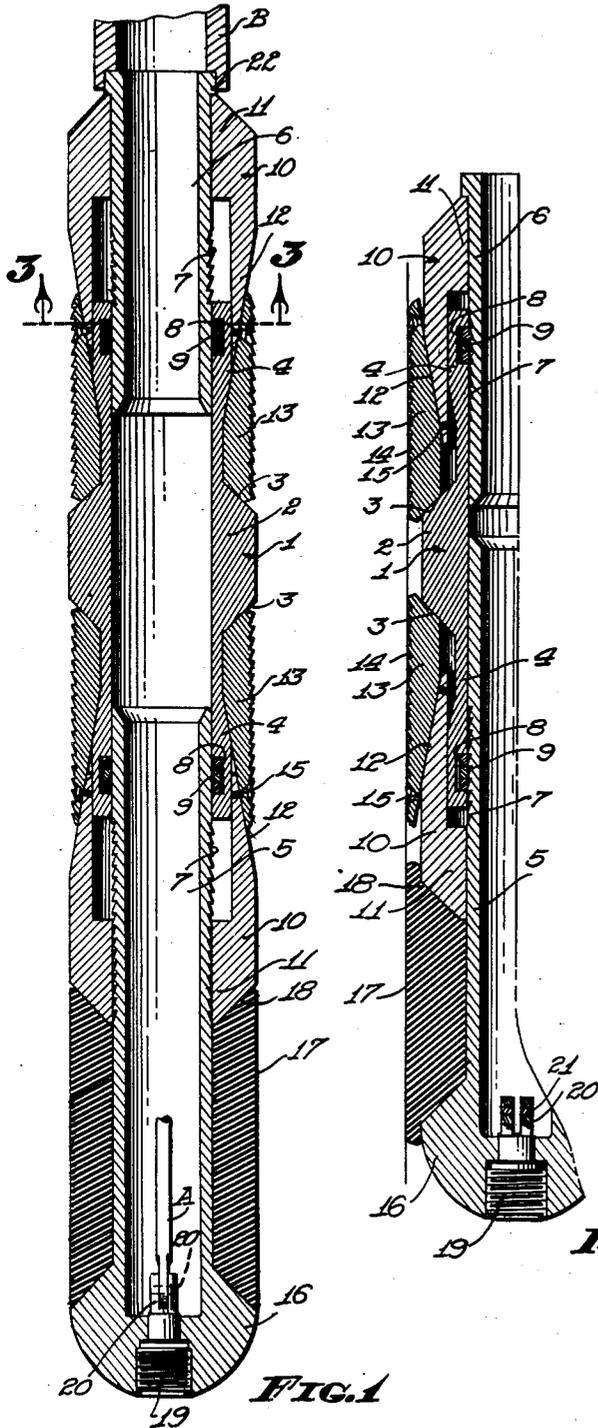


FIG. 3

FIG. 2

FIG. 1

INVENTOR
MERIDA L. HART
BY *Spencer*
ATTORNEY

UNITED STATES PATENT OFFICE

2,345,873

BRIDGING PLUG

Merida L. Hart, Chickasha, Okla., assignor to
Lane-Wells Company, Los Angeles, Calif., a
corporation of Delaware

Application January 10, 1941, Serial No. 373,903

7 Claims. (Cl. 166—13)

My invention relates to bridging plugs, more particularly to devices adapted to be set within well tubing or casing for the purpose of forming a false bottom therein. Among the objects of my invention are:

First, to provide a bridging plug which is readily drillable in that all metal parts may be made of friable or easily drillable material, such as cast iron or aluminum alloy;

Second, to provide a bridging plug which automatically locks against mechanical or hydraulic pressure from either below or above the bridging plug, such pressure only tending to set the bridging plug tighter;

Third, to provide a bridging plug wherein the parts are few in number and easily constructed, thereby providing a bridging plug which is particularly economical of manufacture; and

Fourth, to provide a bridging plug which requires a minimum of effort to set within a well casing and is therefore particularly adapted to be set by cable-suspended setting tools such as those disclosed in my copending applications, Serial Nos. 373,902 and 373,904, filed January 10, 1941, now Patents 2,279,676 and 2,308,004, respectively.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawing, in which:

Figure 1 is a longitudinal sectional view of my bridging plug with the parts shown in their initial positions assumed when the bridging plug is being lowered into the well bore, and showing fragmentarily adjacent portions of the setting tool;

Figure 2 is a longitudinal half sectional view of my bridging plug with the parts shown in the positions assumed when the bridging plug is set within a well casing; and

Figure 3 is an enlarged transverse sectional view through 3—3 of Figure 1.

The bridging plug includes a central tubular body member 1 having a central enlargement 2 which provides upper and lower beveled shoulders 3. Extending upwardly and downwardly from the enlargement 2 are sleeve portions 4 which have inwardly tapering frusto-conical surfaces intermediate their ends. The bore extending through the body member 1, and its sleeve portions 4 is uniform and is adapted to receive telescopically in its two ends two tubular members, one a mandrel 5 and the other a stem 6. The stem 6 is in the form of a hollow tube open at both ends and the mandrel 5 is hollow

and open at its upper end but closed at its lower end.

The telescoping ends of the stem and the mandrel are provided with annular teeth 7. Within the telescoping sleeve portions 4 of the body member there are provided annular channels 8 in which are fitted locking rings 9 adapted to coact with the annular teeth 7 so as to permit telescoping of the sleeve and mandrel, but preventing withdrawal thereof.

Fitted over the end of each sleeve portion 4 is a slip spreading collar or member 10 which is provided with an internal flange or collar portion 11 of smaller diameter than the rest of the collar and which rides on the stem 6 or the mandrel 5, respectively. The portions of the slip spreading member 10 which fit over the ends of the sleeve portions 4 are frusto-conical, as indicated by 12, and are slip camming surfaces. They may in initial position lie in the same conical surface as the frusto-conical surfaces of the sleeve portions 4 as they enlarge in diameter to provide space for the internal channels 8.

Segmental slips 13 are adapted to fit around the slip spreading members and sleeve portions. The slips have complementary inner surfaces corresponding to the slope of the frusto-conical portions 12 and are provided with beveled abutment ends conforming to the beveled shoulders or abutments 3 of the body member. The slips are initially held in place on their respective slip spreading members by means of shear screws 15. The outer surfaces of the slips 13 are provided with teeth 14 for engagement with a surrounding casing, as shown in Figure 2.

The lower end of the mandrel 5 is provided with a head 16 having substantially the same diameter as slip spreading members 10. Between the head 16 and the collar 11 of the lowermost slip spreading member there is positioned a packing sleeve 17 formed of rubber or, preferably, of synthetic material having rubber-like properties, but which is substantially unaffected by oil. The head member 16 is preferably beveled, as is also the corresponding collar portion of the lowermost slip spreading member and the extremities of the packing sleeve 17 are provided with complementary pressure lips 18 adapted to facilitate a sealing connection with the surrounding casing.

The head portion 16 of the mandrel may be provided with a central threaded bore of small diameter which receives an anchor member 19 adapted to be sealed therein. The inner end of the anchor member 19 is bifurcated, as indicated by 20, and is adapted to be attached by a shear

pin 21 to a setting rod A forming a part of the setting tool more fully disclosed in my copending application hereinbefore identified. The setting rod A extends upwardly through the mandrel 5 and stem 6 to the setting tool. The setting tool also includes a setting collar B which is adapted to bear downwardly on the upper end of the stem 6. This end of the stem 6 is provided with flange 22 which overlaps the upper end of the upper slip spreading member so that the upper slip spreading member is forced downwardly upon downward movement of the stem.

My bridging plug is set as follows: The parts of the bridging plug are in the position shown in Figure 1 when it is lowered into the well bore. Upon reaching the desired location, the setting tool is operated in such a manner that the setting collar B is forced downwardly and the rod A is pulled upwardly; this causes the packing sleeve 17 to expand, as shown in Figure 2, and causes the slips 13 to shear the screws 15 and slide along their respective slip spreading members to the position shown in Figure 2, in which the slips engage the surrounding casing. The relative sliding movement of the slips and slip spreading members is caused by the axial movement of the slip spreading members downwardly and upwardly, respectively, as the sleeve and mandrel are moved toward each other. The locking rings 9 engage the annular teeth 7 so that once the stem and mandrel have moved toward each other they cannot again separate.

All of the metal parts of the bridging plug, including the locking rings, may be formed of friable material such as cast iron or the various aluminum alloys. Cast iron offers certain advantages in the construction of the slips, however, in that the surface may be hardened so that the teeth 14 may dig into the surrounding casing.

Various changes and alternate arrangements may be made within the scope of the appended claims, in which it is my intention to claim all novelty inherent in the invention as broadly as the prior art permits.

I claim:

1. A bridging plug comprising: a body member; tubular members telescoping into the ends of said body member; slip-spreading collars slidable on said tubular members and telescoping over the ends of said body member; each of said slip-spreading collars and said body member having frusto-conical slip camming surfaces, means on said tubular members adapted, when said tubular members are telescoped into said body member, to engage and cause telescoping of said slip-spreading collars; and wedge-shaped segmental slips initially secured in retracted position to said slip camming surfaces of said slip-spreading collars.

2. A bridging plug comprising: a body member; tubular members telescoping into the ends of said body member; slip-spreading members telescoping over the ends of said body member and having external slip camming surfaces, means as said tubular members adapted, when said tubular members are telescoped into said body member, to engage and cause telescoping movement of said slip-spreading members; and slips adapted to fit over and ride upon the external camming surfaces of said slip-spreading members, said body member having abutments restraining said slips against axial movement as said slip-spreading members are telescoped over said body member, whereby said slips are spread by said slip camming surfaces into wedging con-

tact with a surrounding casing, and means initially restraining said slips in radially inner positions on said slip-spreading members.

3. A bridging plug comprising: a body member; tubular members telescoping into the ends of said body member; slip-spreading members telescoping over the ends of said body member, means on said tubular members adapted, when said tubular members are telescoped into said body member, to engage and cause telescoping of said slip-spreading members; slips adapted to fit over and ride on said slip-spreading members upon telescoping movement of said slip-spreading members on said body member, said body member having abutments restraining said slips against axial movement as said slip-spreading members are telescoped over said body member, whereby said slips are spread by said slip spreading members into wedging contact with a surrounding casing; means initially restraining said slips in radially inner positions on said slip-spreading members; and coating locking elements between said tubular members and said body member adapted to permit telescoping of said tubular members into said body member but locking against withdrawal thereof.

4. A bridging plug comprising: a body member; tubular members telescoping into the ends of said body member; slip-spreading collars on said tubular members and telescoping over the ends of said body member; each of said slip-spreading collars and said body member having frusto-conical slip camming surfaces; wedge-shaped segmental slips initially secured in retracted position to said slip camming surfaces of said slip-spreading collars; and coating locking elements between said tubular members and said body member adapted to permit telescoping movement of said tubular members but locking against withdrawal.

5. A bridging plug comprising: a body member; tubular members telescoping into the ends of said body member; slip-spreading collars slidable on said tubular members and telescoping over the ends of said body member; each of said slip-spreading collars and said body member having frusto-conical slip camming surfaces; wedge-shaped segmental slips initially secured in retracted position to said slip camming surfaces of said slip-spreading collars; one of said tubular members having an enlarged end portion and a packing sleeve mounted on said member between said enlarged portion and the slip-spreading collar thereon.

6. A bridging plug comprising: a body member; tubular members telescoping into the ends of said body member; slip-spreading members slidable on said tubular members and telescoping over the ends of said body member; slips adapted to ride upon said slip-spreading members from radially inner positions to radially outer positions, said body member having abutments restraining said slips against axial movement as said slip-spreading members are telescoped over said body member, whereby said slips are spread by said slip spreading members into wedging contact with a surrounding casing; one of said tubular members having an enlarged end portion and a packing sleeve mounted on said tubular member between said enlarged portion and the slip-spreading member thereon; and means initially restraining said slips to the slip spreading members in their radially inner positions.

7. A bridging plug comprising: a body mem-

ber having central abutments; tubular members telescoping into the ends of said body member; slip-spreading members slidable on said tubular members and telescoping over the ends of said body member, said tubular members having enlarged ends adapted, when telescoped into said body member, to engage and cause telescoping movement of said slip-spreading members on said body member; slips bearing against said abutments and adapted to ride upon said slip-spreading members from radially inner to radially outer positions as said slip-spreading mem-

bers telescope on said body member; means initially restraining said slips to their radially inner positions; coacting locking elements between said tubular members and said body member adapted to permit telescoping movement of said tubular members into said body member but locking the tubular members against withdrawal therefrom; and a packing sleeve on one of said tubular members between the enlarged end thereof and the slip-spreading member thereon.

MERIDA L. HART.