

Sept. 12, 1961

W. D. MYERS

2,999,542

LOCATOR FOR WELL CASING COLLAR SPACES AND SIMILAR RECESSES

Filed June 24, 1957

3 Sheets-Sheet 1

FIG. 1.

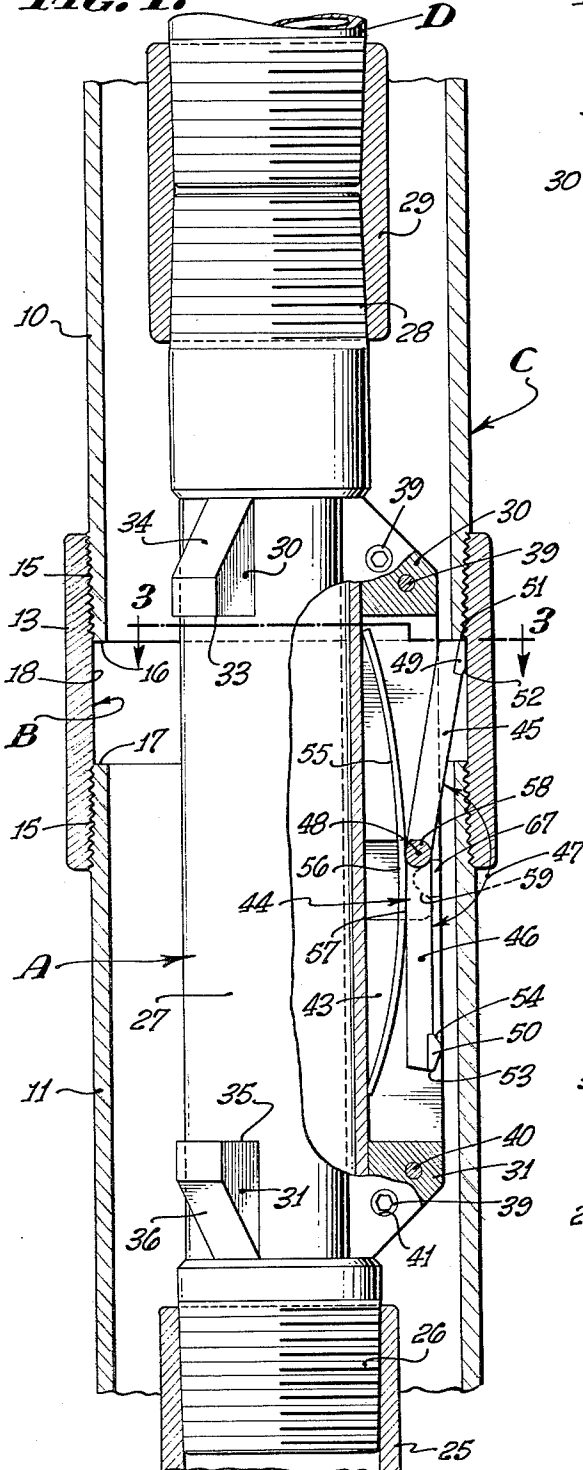


FIG. 2.

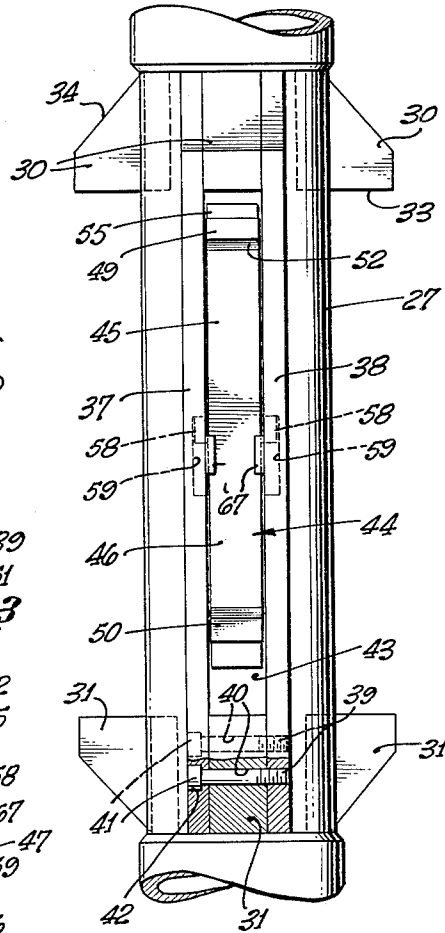
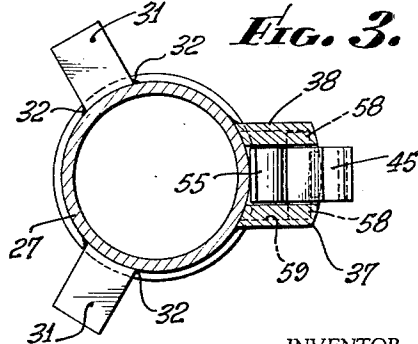


FIG. 3.



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FIG. 4.

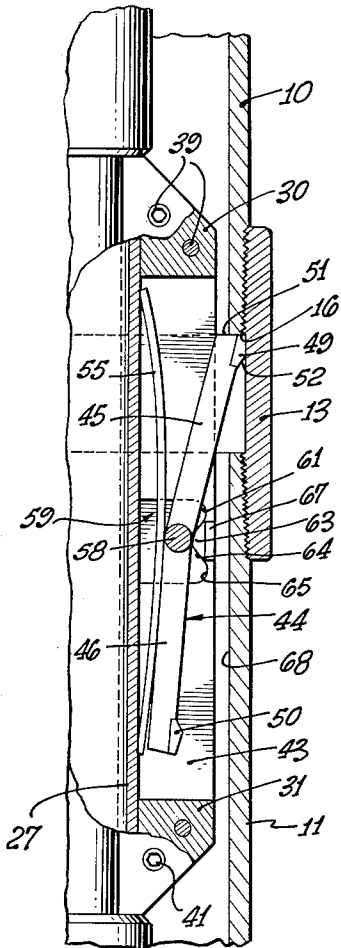


FIG. 5.

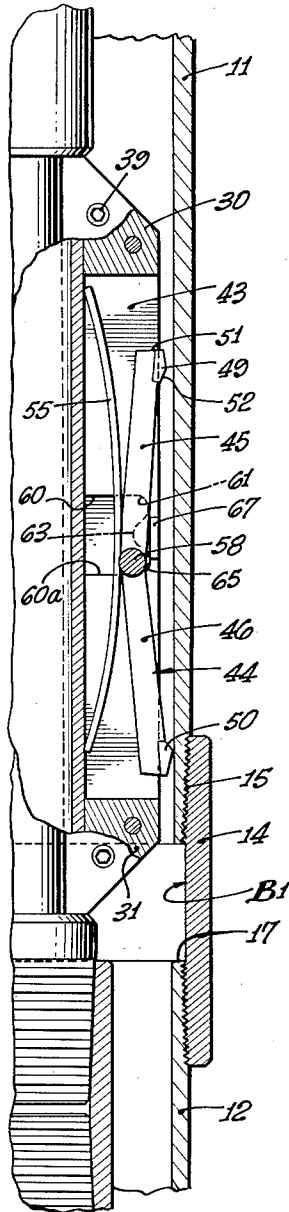


FIG. 6.

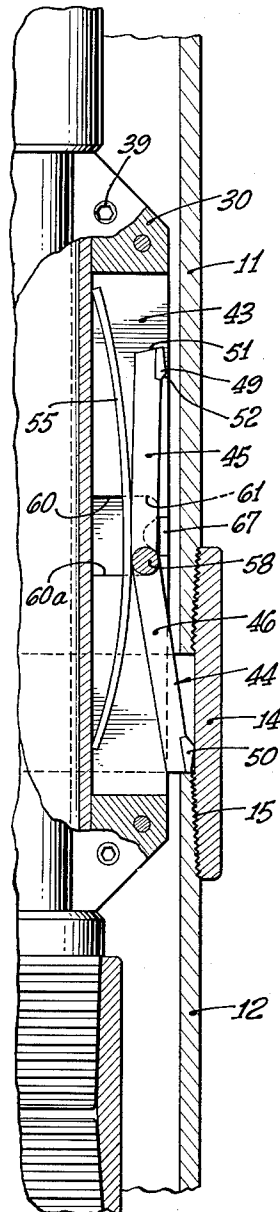
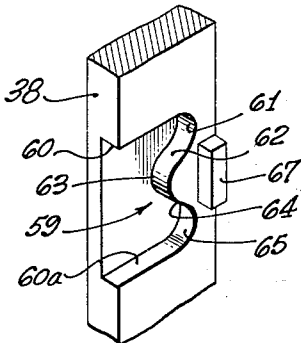


FIG. 7.



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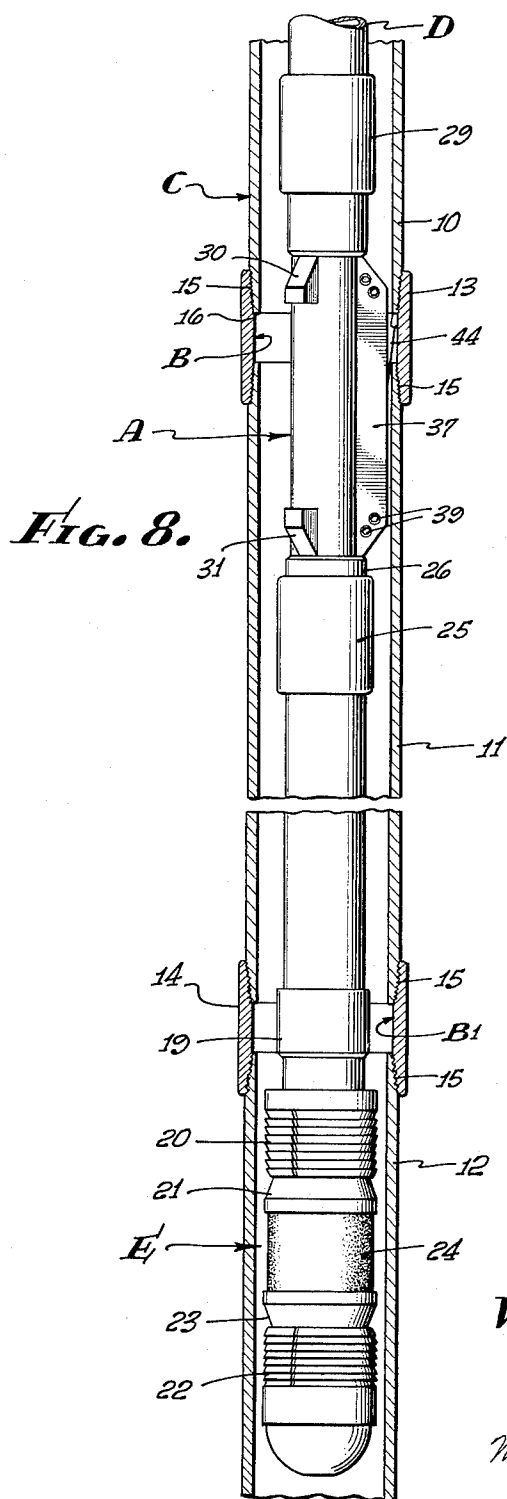
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LOCATOR FOR WELL CASING COLLAR SPACES AND SIMILAR RECESSES

Filed June 24, 1957

3 Sheets-Sheet 3



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LOCATOR FOR WELL CASING COLLAR SPACES AND SIMILAR RECESSES

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Filed June 24, 1957, Ser. No. 667,443
14 Claims. (Cl. 166-64)

The present invention relates to subsurface well appa-
ratus, and more particularly to apparatus for positively
locating specific region in well casings, liners and simi-
lar conduit strings disposed in well bores.

Casing strings and similar well bore conduits ordi-
narily consist of tubular sections secured together by
intervening coupling collars. A space exists between the
ends of adjacent tubular sections at each coupling col-
lar, which can serve as a reference point for accurately
positioning tools in the conduit string. As an example,
exact knowledge of the location of a casing collar space
can serve to check the depth measurements of a gun
perforator lowered in the conduit string. Such knowl-
edge can also prevent the setting of a retrievable or
permanently installed well packer across the coupling
space, which might result in fluid leakage around the
packer, or possible damage to it. Packers should be set
either above or below the coupling space.

An object of the present invention is to provide an
improved apparatus for definitely locating a coupling
space or recess in a conduit string disposed in a well
bore.

Another object of the invention is to provide an appa-
ratus to be secured to a running-in string for use in a
conduit string disposed in a well bore, in which the appa-
ratus is capable of positively locating a coupling space
or recess when moved upwardly in the conduit string
by the running-in string, as well as when moved down-
wardly therewithin by the running-in string.

A further object of the invention is to provide an
apparatus for definitely locating a coupling space or re-
cess in a conduit string disposed in a well bore, which
apparatus can be reset repeatedly while in the well bore,
to locate the same space or recess a plurality of times,
or to locate a plurality of different spaces or recesses
in the conduit string. In a more limited sense, a locat-
ing apparatus is provided capable of being reset for
plural operations in locating one or more coupling spaces
or recesses in response to both upward and downward
movement of the running-in string within the well con-
duit.

Yet another object of the invention is to provide an
apparatus for definitely locating a coupling space or re-
cess in a conduit string disposed in a well bore, which
is comparatively economical to manufacture and easy
to use.

This invention possesses many other advantages, and
has other objects which may be made more clearly appa-
rent from a consideration of a form in which it may be
embodied. This form is shown in the drawings accom-
panying and forming part of the present specification.
It will now be described in detail, for the purpose of
illustrating the general principles of the invention; but
it is to be understood that such detailed description is
not to be taken in a limiting sense, since the scope of
the invention is best defined by the appended claims.

Referring to the drawings:

FIGURE 1 is a part side elevation and part longi-
tudinal section of a locating tool disposed in a well casing
and locating a coupling space therewithin;

FIG. 2 is a side elevation of the locating tool, parts
being shown in section;

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FIG. 3 is a cross-section through the locating tool
taken along the line 3-3 of FIG. 1;

FIG. 4 is a quarter longitudinal section of the tool
disclosed in FIG. 1 with the locating member being re-
leased from the coupling space;

FIG. 5 is a view similar to FIG. 4 of the locating
member fully released from the coupling space;

FIG. 6 is a view similar to FIG. 5, disclosing the
locating member in a lower casing coupling space;

FIG. 7 is an isometric projection of the cam and guide
plate portion of the apparatus;

FIG. 8 is a side elevation of the locating tool and a
well packer disposed in a well casing.

The invention is represented in the drawings by a lo-
cating tool A for determining the position of a collar
space B, or corresponding recess, in a conduit string C,
such as a well casing disposed in a well bore. The locat-
ing tool A is secured to, and may actually form part of
a running-in string D, such as a string of drill pipe or
tubing extending to the top of the hole. Secured to the
lower end of such running-in string is another tool or
device E to be operated within the conduit string. A
well packer E is illustrated in the drawings by way of
example only. It is to be understood however, that the
locating tool A can be used in conjunction with other
specific devices or tools that are to be placed accurately
at a predetermined location within the conduit string C.

The well casing or similar conduit string shown in the
drawings is made up of a plurality of casing sections
10, 11, 12 secured together by coupling collars 13, 14.
As shown, a coupling collar 13 connects the lower end
of one casing section 10 and the upper end of an adja-
cent casing section 11 together by being threadedly at-
tached to the threaded pins 15 of such sections. When
the threaded connections between the casing sections and
collars are tightened, a longitudinal space B exists be-
tween the lower end 16 of the upper casing section 10
and the upper end 17 of the lower casing section 11.
Since the inner surface 18 of the coupling collar has a
much greater diameter than the inner diameter of the
casing sections 10, 11, a substantial circumferential cou-
pling space B exists within the coupling collar.

As stated above, the well packer E can be of any par-
ticular design. As illustrated, it includes a body 19,
around which is disposed a set of segmental upper slips
20 cooperable with an upper expander 21 for anchoring
the well packer to the well casing against upward move-
ment; a set of lower segmental slips 22 surrounding the
body cooperable with a lower expander 23 for anchoring
the well packer to the well casing against downward
movement therewithin; and an intervening packing sleeve
24 of rubber or rubber-like material adapted to effect
a seal with the wall of the well casing C. The well
packer E is to be set in the well casing at a predeter-
mined location therewithin. Assurance is desired that
the setting point of the packer is longitudinally com-
pletely to one side of a coupling space B, in order that
the packer will not be set inadvertently across the cou-
pling space. Such setting might be conducive to leakage
or other failure of the well packer.

The upper end of the packer body 19 is secured to
the tubular string D, usually through the aid of a left
hand threaded connection (not shown), in order that
the tubing string can be detached from the packer after
the operation in the well bore has been completed. The
portion of the tubing string between the packer and
locator tool is connected to the lower end of locator
tool A, as by threading an upper box 25 of the tubing
string to the lower threaded pin 26 of the tubular body
27 of the locating tool. The upper end of the tubular
body 27 may be constituted as a threaded pin 28 thread-
edly secured within a companion box 29 on the lower

end of the tubular string D, which tubular string extends to the top of the well bore.

The tubular body 27 has a substantial length, to receive upper and lower sets 30, 31 of circumferentially spaced centering wings or ribs, which are secured to the exterior of the body as by the aid of welding material 32. As disclosed, three wings are provided at the upper portion of the body 27 and also at the lower portion of the body, which are spaced substantially 120 degrees from one another. The upper set 30 of wings have inner ends 33 substantially normal to the axis of the body, whereas upper guide surfaces 34 are provided tapering in an upward and inward direction to prevent the wings from inadvertently catching in a coupling space B during elevation of the tool in the well casing. Similarly, the upper or inner surfaces 35 of the lower set 31 of wings are substantially normal to the axis of the tubular body, these wings having lower tapering surfaces 36 inclined in a downward and inward direction to prevent such lower wings from inadvertently hanging up or catching in coupling spaces B and similar recesses in the well casing C during lowering of the apparatus there-within.

The upper and lower wings 30, 31 are longitudinally aligned with one another. An upper wing 30 and aligned lower wing 31 have longitudinally extending and transversely spaced guide plates 37, 38 engaging their side surfaces, these guide plates being secured to the upper and lower wings in any suitable manner, as by means of screws 39 extending through the end portions of one guide plate 37, through holes 40 in the wings, and being threadedly attached to companion threaded holes in the other plate 38. The heads 41 of the screws are received within counterbores 42 in the adjacent plate 37 to minimize the extent of projection of the screws outwardly from this plate.

The inner ends of the plates engage the exterior of the tubular body 27, and their outer ends project outwardly to substantially the same extent as the wings 30, 31, and possibly to a slightly greater extent. These plates 37, 38 are spaced apart by the aligned wings 30, 31 and define a longitudinally extending groove 43 therebetween in which a collar space locating member 44 is received. This locating member has substantially the same width as the distance between the guide plates 37, 38, so as to be slidable along such plates, and it has a length that is substantially less than the distance between the aligned upper and lower wings 30, 31. The locating member 44 has a radial thickness substantially less than the depth of the groove 43, to permit substantial lateral movement of the locating member within the groove.

The locating member 44 consists of an upper arm 45 and a lower arm 46 which diverge to a substantial extent with respect to one another and make a large obtuse angle 47 relative to one another about the point 48 where such arms merge into one another. Actually, the upper and lower arms 45, 46 are integral with one another, the obtuse angle 47 being somewhat less than a straight angle. For example, the obtuse angle may be about 160 to 170 degrees. The arms themselves may be of substantially equal length, the upper arm 45 terminating in an upper finger or dog 49, and the lower arm 46 terminating in a lower finger or dog 50, each dog projecting outwardly of its arm to a substantially greater distance than the thickness of the arm itself.

The upper end 51 of the upper finger or dog 49 is adapted to engage the lower end 16 of a casing section 10 when disposed in a coupling space B, and when so engaged is substantially normal to the axis of the tool body 27 and of the well casing C. However, the lower outer portion 52 of the upper finger or dog 49 is tapered in a downward and inward direction, so as to slide past the ends 17 of coupling sections as the locating tool is being lowered in the well casing. Similarly, the lower end 53 of the lower dog is adapted to engage the upper

end 17 of a casing section when disposed in the coupling space B, such end then being substantially normal to the axis of the tubular body. The upper portion 54 of this dog also is tapered in an upward and inward direction, to ride freely past the lower ends 16 of casing sections and similar sharp edges or projections in the casing string.

The locating member 44 is urged in a direction outwardly of the groove 43 by a spring member 55, in the form of a bowed leaf spring, the end portions of which are adapted to engage the base of the groove 43 constituted by the outer surface of the tubular body 27, the intermediate portion 56 of the bowed spring being adapted to engage the inner surface 57 of the locating member. Actually, such medial portion 56 of bowed spring will engage the inner surface of either the lower arm 46 or the inner surface of the upper arm 45 of the locating member, depending upon the operating condition of the locator apparatus.

The extent of outward movement of the locating member 44 under the influence of the spring 55 is dependent upon the engagement of trunnions or follower members 58, which are suitably secured to the locating member, as by welding, to the side portions of the locating member at the junction point 48 between the upper and lower arms 45, 46. Such trunnions or follower members 58 have a diameter substantially equal to the radial thickness of the arms and project in opposite directions from the sides of the locating member into cam grooves 59 formed in the inner side walls of the guide plates 37, 38. These cam grooves are opposed to one another. Each cam groove 59 includes longitudinally spaced upper and lower sides 60, 60a, the upper side 60 merging into an outer pocket 61 in which a trunnion or follower 58 may be received. The periphery of such follower member is also slidable along a cam face 62 which extends in a downward and inward direction, this cam face ending at a corner 63 in the side plate that is displaced laterally outward from the tubular body 27 to a substantial extent. From this corner, the cam groove is provided with a lower cam face 64 inclined in a downward and outward direction, this face merging into a lower pocket 65 at the outer portion of a guide plate, into which a follower member or trunnion 58 can be received. The lower pocket 65 merges into the lower groove side 60a, which may be substantially parallel to the upper side 60 and which is substantially perpendicular to the axis of the body 27 of the tool. The trunnions 58 are either located between the upper side 60 and upper cam face 62, or between the lower cam face 64 and lower side 60a. When the trunnions 58 are disposed in or adjacent to the upper pocket 61, the intermediate portion 56 of the outwardly bowed spring 55 engages the lower arm 46 and urges the entire locating member 44 in an outward direction. However, the lower arm 46 cannot move outwardly to any substantial extent, since its outer surface adjacent the trunnions will come into contact with stops 67, in the form of lugs, which are welded, or otherwise secured, to the guide plates 37, 38 and which extend inwardly over the outer surface of the member 44 substantially in alignment with the cam faces 62, 64 and the inner corner 63 where such cam faces merge into one another.

When the follower members or trunnions 58 are disposed in the upper pockets 61, the bowed spring 55 will engage the lower arm 46 with the stop lugs 67 and will tend to urge the trunnions fully within the pockets 61, the upper arm 45 then extending outwardly of the guide plate groove 43. When the upper dog 49 is engaged with the inner wall 68 of the casing section, the trunnions 58 are not disposed fully in an outward position in engagement with the outer ends of the upper pockets 61. Accordingly, upon the upper dog 49 coming opposite a coupling space B, the spring 55 will then force the upper arm 45 outwardly to a further extent, in which the upper dog 49 shifts into the coupling space. When such entering

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into the coupling space occurs, during upward movement of the running-in string D and locating tool A, the upper end 51 of the dog will engage the lower end 16 of the casing section 10 to prevent further upward movement of the upper arm 45. Upward movement of the body 27 of the locator tool is then resisted by engagement of the followers of trunnions 58 with the upper cam faces 62, which cam faces attempt to shift the trunnions inwardly, forcing the locator member 44 with greater force against the intermediate portion 56 of the outwardly bowed leaf spring 55 (FIG. 4). When a sufficient upward force is taken on the body 27 of the tool, such upward force is transmitted through the guide plates 37, 38 to the upper cam faces 62, which tend to urge the trunnions 58 and locator member 44 inwardly. Eventually, such force will be sufficient to shift or cam the trunnions 58 and the upper arm 45 inwardly to the extent at which the corners 63 of the guide members will be moved over the trunnions 58 and the latter will then be located within the lower pockets 65. When this occurs, the stop lugs 67 will be engaging the outer surface of the upper arm 45 to hold it and its upper dog 49 inwardly of the guide plates 37, 38. The spring 55 will then cause the lower arm 46 and its dog 50 to project outwardly of the guide plates and the intervening groove 43 into engagement with the wall 68 of the well casing. When such engagement occurs, the trunnions 58 will be disposed inwardly of the outer ends of the pockets 65, the spring 55 maintaining the lower dog 50 in engagement with the wall of the well casing (FIG. 5).

In the event the apparatus is then lowered within the wall casing C, the lower dog 50 will slide along the wall 68 of one of its sections 11, until the dog is opposite a lower coupling space B1. When this occurs, the spring 55 will shift the lower arm 46 outwardly to a further extent as determined by a full seating of the trunnions 58 within the lower pockets 65. The dog 50 will come to rest upon the upper end 17 of a lower casing section 12. Since it cannot move any further, a downward force imposed on the tubular body 27 and the guide plates 37, 38 will cause the lower cam surfaces 64 to act upon the trunnions or followers 58, urging them and the lower arm 46 in an inward direction against the force of the outwardly bowed leaf spring 55. When the camming force is sufficient to overcome the resisting force of the spring 55, the guide plates 37, 38 will be shifted downwardly along the locator member 44, the followers 58 moving inwardly until the corners 63 ride over the followers and the latter become disposed in the upper pocket portions 61 of the apparatus. When this occurs, the lower arm 46 is retracted from the coupling space B1 and from engagement with the well casing by the engagement of the stop lugs 67 with the outer surface of the lower arm 46 and the upper arm 45 again is projected outwardly of the guide plates 37, 38 and will engage the wall 68 of the well casing C. The locator parts are then again in a position for locating a coupling space B during upward movement of the apparatus in the well casing.

In the use of the apparatus, the locating member 44 will usually be positioned as illustrated in FIG. 1, in which the followers 58 are disposed in the upper pockets 61, with the upper arm 45 and dog 49 projecting outwardly of the guide members 37, 38. The apparatus A, with the other well tool E, such as the well packer, connected to the lower portion of the running-in string D, is then lowered in the well casing C to the desired approximate location at which the packer is to be set. During lowering movement of the apparatus, the upper dog 49 slides along the wall 68 of the well casing and will actually shift into each coupling space B. However, its tapered guide surface 52 will engage the upper ends 17 of the casing sections to cam the upper arm 45 inwardly out of such coupling spaces, whereupon it will slide successively along the wall of each well casing section.

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When it is desired to set the well packer E at its particular location, the running-in string D and the tools connected thereto are elevated slowly until the upper dog 49 enters a coupling space B under the influence of the leaf spring 55. When the dog 49 engages the lower end 16 of a casing section 10, its further upward movement is prevented and the operator at the top of the well bore is apprised of this fact by a substantial increase in resistance to upward movement of the running-in string. Further upward movement cannot occur until the upper cam faces 62 force the trunnions 58 and the upper arm 45 inwardly against the action of the bowed leaf spring 55, to the extent at which the trunnions will shift into the lower pocket 65 (FIG. 5). A substantial force is preferably required to cause such shifting or transfer of the locating member 44 within its groove 43. As an example, an upward pull of from 500 to 1,000 pounds may be required to cause the action of the upper cam faces 62 upon the followers 58 to overcome the force of the bowed spring 55 and effect an inward shifting of the upper arm 45 and of the upper dog 49 from the coupling space B. Such increase in force will clearly advise the operator at the top of the well bore that the dog 49 is in the coupling space. When the followers 58 shift into the lower pocket 65, the resisting force is relieved, which will advise the operator that the dog 49 is no longer in such space. Of course, if the operator does not exert sufficient force to transfer the locating member 44 to a condition in which the followers 58 are in the lower pockets 65, he will, nevertheless, be advised of the fact that the coupling space B has been located. He can then, if he wishes, lower the tubing string D the desired distance and then effect a setting of the well packer E in packed-off condition within the well casing C between coupling spaces, with definite assurance that the packer will be anchored in a casing section at a location removed from the coupling spaces on opposite sides thereof.

After the well packer E has been set in the well casing and the operation with the well packer has been completed, the running-in string D is disconnected from the well packer, as by rotating the running-in string to the right a sufficient number of turns, whereupon the running-in string is moved upwardly. Assuming the locator apparatus to be in its FIG. 1 condition, the upper dog 49 will again enter a coupling space B and upon sufficient force being exerted, the upper cams 62 will shift the upper arm 45 inwardly and remove the upper dog 49 from the coupling space B, the trunnions or followers 58 being transferred into the lower pockets 65 in which the lower dog 50 will project outwardly of the guide plates 37, 38, the upper dog 49 being disposed within the confines of the guide plates (FIG. 5). The running-in string D and locating tool A can now be elevated in the well casing C. The lower dog 50 merely rides into each coupling space B, its guide surface 54 then camming the dog inwardly. The running-in string and the locating tool can be withdrawn completely from the well casing.

The locating tool can also be used to locate a coupling space and corresponding recess in the well casing when moving in a downward direction. Assuming the apparatus has been lowered in the well casing, the upper arm 45 and dog 49 will normally be the parts projecting outwardly from the guide plates 37, 38, the followers 58 being disposed in the upper pockets 61. Upon moving the running-in string D and locating tool A upwardly, the upper dog 49 will enter a coupling space B and engage the lower end 16 of the casing section 10. Taking an upward pull in the body 27 of sufficient extent, which may be by way of example 500 to 1,000 pounds, causes the upper cam surfaces 62 to cam or force the follower members 58 and the upper arm 45 in an inward direction against the force of the bowed spring 55, the followers then being disposed in the lower pockets 65, the spring 55 then forcing the lower arm 46 and lower dog 50 outwardly. The apparatus A may now be lowered in the well

casing to locate a lower coupling space B1. When such space is reached, the lower dog 50 will be forced by the spring 55 into it, coming to rest upon the upper end 17 of a lower casing section 12 (FIG. 6). The imposition of a downward force on the apparatus of sufficient magnitude, of, say, the aforementioned values of 500 to 1,000 pounds, will then cause the lower cam faces 64 to act upon the followers 58 and cam or force the lower arm 46 inwardly against the force of the bowed spring 55, until the trunnions or followers 58 transfer back into the upper pockets 61, at which the spring again urges the upper arm 45 and dog 49 outwardly. The locating tool is then in condition for again locating a higher coupling space B when the running-in string D and the apparatus A are moved in an upward direction.

The foregoing operation can be repeated as often as desired, the upper arm 45 and upper dog 49 being set in position for locating a coupling space when the apparatus is moved in an upward direction, or the lower arm 46 and lower dog 50 may be set in position for locating a coupling space when the apparatus is moved in a downward direction in the well casing or corresponding well conduit. Upward movement of the apparatus will not only locate the next higher coupling space, but will also condition the locating apparatus for locating the next lower coupling space. Downward movement of the apparatus to locate the next lower coupling space will result in a conditioning of the apparatus in which the upper arm and upper dog are again projected outwardly so as to locate the next higher coupling space. Such actions may be alternated and repeated as often as desired to locate coupling spaces in the well casing, without the necessity of removing the apparatus from the well bore.

The inventor claims:

1. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member pivotally mounted on said supporting member and movable laterally of said supporting member and adapted to move into the recess; means engaging said locating member at its pivot region to shift said locating member laterally outward of said supporting member and into the recess; and cam means on and movable with said supporting member and engaging said locating member to shift said locating member laterally inward from said recess in response to longitudinal movement of said supporting member in the well conduit.

2. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member carried by and movable laterally of said supporting member and adapted to move into the recess to be selectively coupled to the well conduit against upward or downward movement; cam means on said supporting member engageable with said locating member to shift said locating member inwardly from the recess in response to upward movement of said supporting member in the well conduit; and cam means on said supporting member engageable with said locating member to shift said locating member inwardly from the recess in response to downward movement of said supporting member in the well conduit.

3. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member pivotally mounted on said supporting member and movable laterally of said supporting member and adapted to move into the recess; spring means engaging said locating member at its pivot region to shift said locating member laterally outwardly of said supporting member into the recess; and cam means on and movable with said supporting member engaging said locating member to shift said locating member laterally inward from said recess against the force of said spring means and in response to longitudinal movement of said supporting member in the well conduit.

4. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member carried by and movable laterally of said supporting member and adapted to move into the recess to be selectively coupled to the well conduit against upward or downward movement; spring means engaging said locating member to shift said locating member laterally outwardly of said supporting member and into the recess; cam means on said supporting member engageable with said locating member to shift said locating member inwardly from the recess against the force of said spring means in response to upward movement of said supporting member in the well conduit; and cam means on said supporting member engageable with said locating member to shift said locating member inwardly from the recess against the force of said spring means in response to downward movement of said supporting member in the well conduit.

5. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member movable laterally of said supporting member and adapted to move into the recess; means engaging said locating member to shift said locating member laterally outward of said supporting member and into the recess; cam means on said supporting member and engaging said locating member to shift said locating member laterally inward from said recess in response to longitudinal movement of said supporting member in the well conduit; means for retaining said locating member in such laterally inward position; and means on said locating member for resetting said locating member in position to be shifted laterally outwardly of said supporting member and into the recess.

6. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member movable laterally of said supporting member and adapted to move into the recess; spring means engaging said locating member to shift said locating member laterally outward of said supporting member into the recess; cam means on said supporting member engaging said locating member to shift said locating member laterally inward from said recess against the force of said spring means and in response to longitudinal movement of said supporting member in the well conduit; means for retaining said locating member in such laterally inward position against the force of such spring means; and means on said locating member for resetting said locating member in position to be shifted by said spring means laterally outwardly of said supporting member and into the recess.

7. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member carried by and movable laterally and longitudinally of said supporting member, said locating member having upper and lower arms; spring means engaging said locating member and tending to urge said arms laterally outwardly of said supporting member and into the recess; stop means on said supporting member engageable with one of said arms, when said locating member occupies one longitudinal position on said supporting member, to prevent outward movement of said one arm into the recess, said stop means engaging the other of said arms, when said locating member occupies another longitudinal position on said supporting member, to prevent outward movement of said other arm into the recess; and cam means on said supporting member engaging said locating member to shift one of said arms from the recess against the force of said spring means in response to longitudinal movement of said supporting member in the well conduit.

8. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted,

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to be moved longitudinally in the well conduit; a locating member carried by and movable laterally and longitudinally of said supporting member, said locating member having upper and lower arms; spring means engaging said locating member and tending to urge said arms laterally outwardly of said supporting member and into the recess; stop means on said supporting member engagable with one of said arms, when said locating member occupies one longitudinal position on said supporting member, to prevent outward movement of said one arm into the recess, said stop means engaging the other of said arms, when said locating member occupies another longitudinal position on said supporting member, to prevent outward movement of said other arm into the recess; and cam means on said supporting member engaging said locating member to shift said upper arm from a well conduit recess against the force of said spring means in response to upward movement of said supporting member in the well conduit and said lower arm from a well conduit recess against the force of said spring means in response to downward movement of said supporting member in the well conduit.

9. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member carried by and movable laterally and longitudinally of said supporting member, said locating member having upper and lower arms; spring means engaging said locating member and tending to urge said arms laterally outwardly of said supporting member and into the recess; stop means on said supporting member engagable with one of said arms, when said locating member occupies one longitudinal position on said supporting member, to prevent outward movement of said one arm into the recess, said stop means engaging the other of said arms, when said locating member occupies another longitudinal position on said supporting member, to prevent outward movement of said other arm into the recess; an upper cam on said supporting member engaging said locating member to shift said upper arm from a well conduit recess against the force of said spring means in response to said upward movement of said supporting member in a well conduit; and a lower cam on said supporting member engaging said locating member to shift said lower arm from a well conduit recess against the force of said spring means in response to downward movement of said supporting member in the well conduit.

10. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit and having a longitudinally extending groove; a locating member disposed in said groove and shiftable laterally and longitudinally of said supporting member, said locating member having upper and lower arms diverging from one another in an outward direction; spring means in said groove engaging said locating member and tending to urge said arms laterally outwardly of said supporting member and into the recess; stop means on said supporting member engagable with said lower arm, when said locating member occupies an upper position on said supporting member, to prevent outward movement of said lower arm into the recess, said stop means engaging said upper arm, when said locating member occupies a lower position on said supporting member, to prevent outward movement of said upper arm into the recess; a follower on said locating member at the juncture of said upper and lower arms with one another; an upper cam on said supporting member engaging said follower to shift said upper arm from a well conduit recess against the force of said spring means in response to upward movement of said supporting member in the well conduit; and a lower cam on said supporting member en-

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gaging said follower to shift said lower arm from the well conduit recess against the force of said spring means in response to downward movement of said supporting member in the well conduit.

11. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member pivotally mounted on said supporting member and movable laterally of said supporting member and adapted to move into the recess; means engaging said locating member to shift said locating member laterally outward of said supporting member and into the recess; and cam means permanently fixed to said supporting member and engaging said locating member to shift said locating member laterally inward from said recess in response to longitudinal movement of said supporting member in the well conduit.

12. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member pivotally mounted on said supporting member and adapted to move into the recess; means engaging said locating member to urge said locating member against the wall of the well conduit during lowering of the apparatus therein and to shift said locating member laterally outward of said supporting member into the recess; and cam means on and movable with said supporting member and engaging said locating member to shift said locating member laterally inward from said recess in response to longitudinal movement of said supporting member in the well conduit.

13. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member pivotally mounted on said supporting member and movable laterally of said supporting member and adapted to move into the recess; means engaging said locating member to urge said locating member against the wall of the well conduit during lowering of the apparatus therein and to shift said locating member laterally outward of said supporting member into the recess; and cam means permanently fixed to said supporting member and engaging said locating member to shift said locating member laterally inward from said recess in response to longitudinal movement of said supporting member in the well conduit.

14. In apparatus adapted to be run in a well conduit having a recess therein: a supporting member adapted to be moved longitudinally in the well conduit; a locating member movable laterally of said supporting member and adapted to move into the recess; means engaging said locating member to shift said locating member laterally outward of said supporting member and into the recess; cam means on said supporting member; and means pivotally mounting said locating member on said cam means for movement laterally of said supporting member and for engagement by said cam means to shift said locating member laterally inward from said recess in response to longitudinal movement of said supporting member in the well conduit.

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