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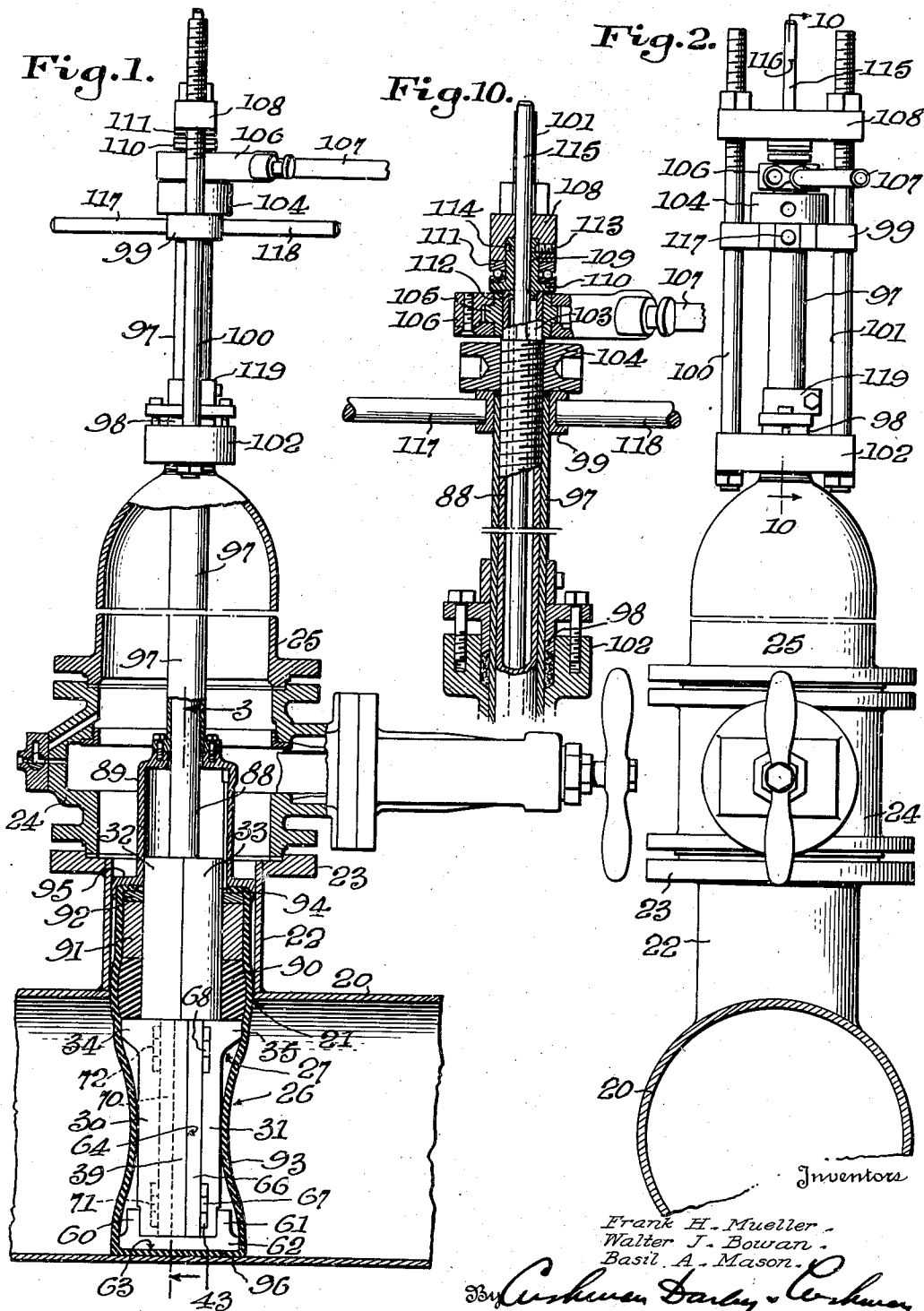
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2,285,779

PIPE LINE STOPPER

Filed July 15, 1940

4 Sheets-Sheet 1



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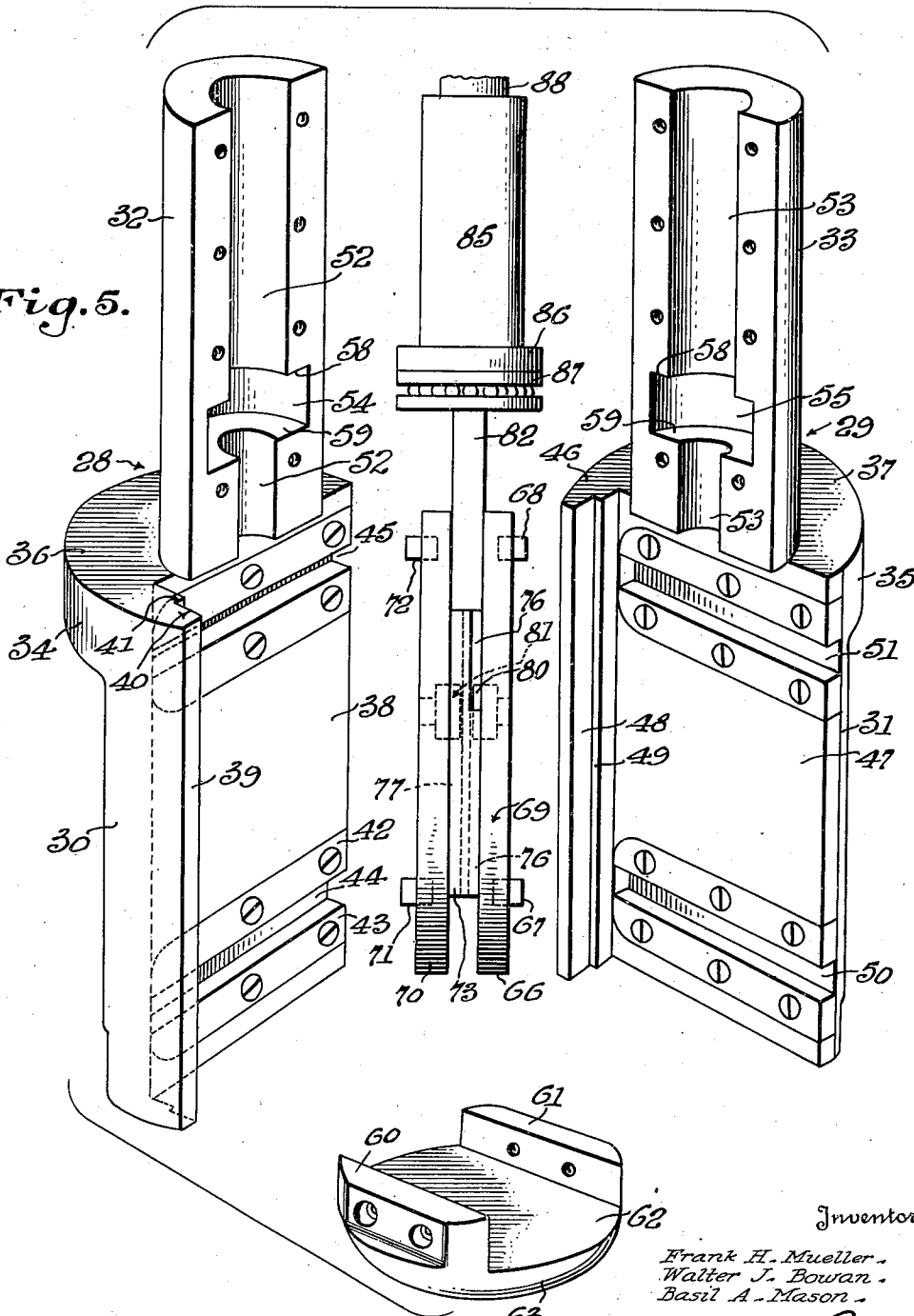
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Fig. 5.



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Fig. 6.

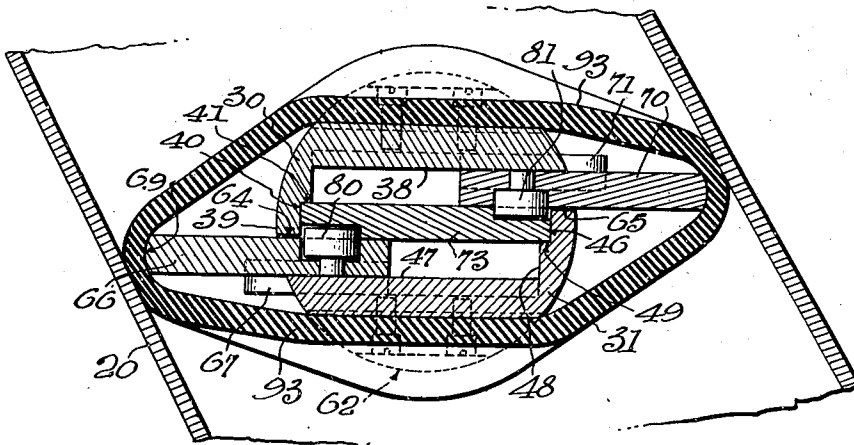


Fig. 7.

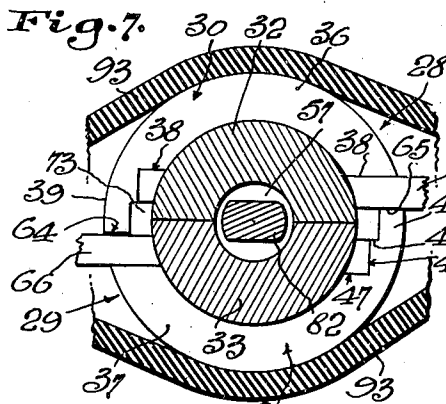


Fig. 8.

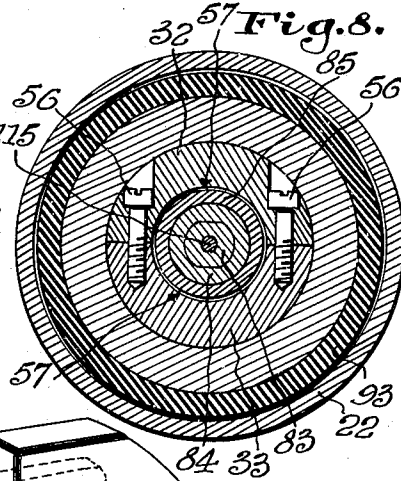
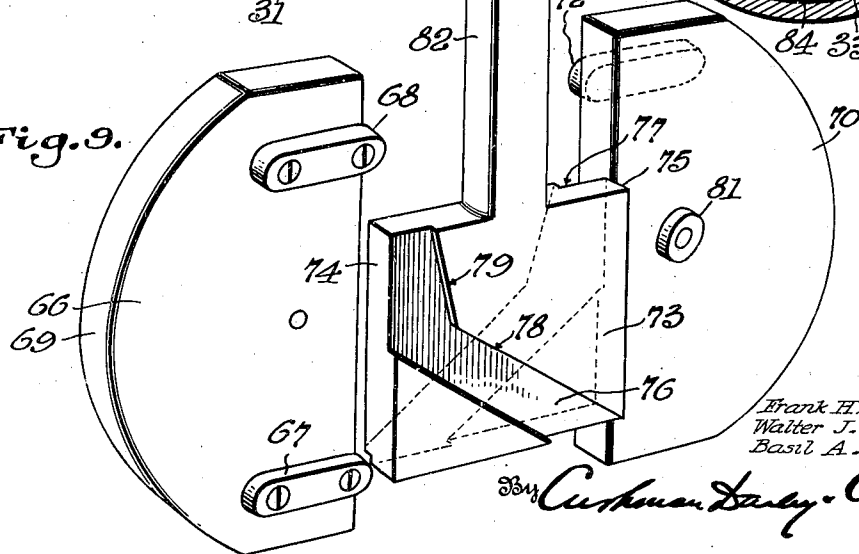


Fig. 9.



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## UNITED STATES PATENT OFFICE

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## PIPE LINE STOPPER

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Application July 15, 1940, Serial No. 345,648

12 Claims. (Cl. 138—94)

This invention relates to pipe line stoppers and has as its object to provide a stopper which may be inserted through a side wall opening in a main and then expanded to completely seal off the main and the main opening. The invention also includes mechanism whereby the expansion and release of the stopper is effectively accomplished. The invention is illustrated in typical embodiment in the accompanying drawings with reference to which description will be made.

In the drawings:

Figure 1 is an axial section of the new apparatus shown in association with a section of a main also in axial section.

Figure 2 is an elevation of the apparatus of Figure 1 as seen from the right of the latter figure.

Figure 3 is a section substantially on line 3—3 of Figure 1.

Figure 4 is a section substantially on line 4—4 of Figure 3.

Figure 5 is an exploded view of a core constituting a part of the stopper.

Figure 6 is a section substantially on line 6—6 of Figure 3.

Figure 7 is a section substantially on line 7—7 of Figure 3.

Figure 8 is a section substantially on line 8—8 of Figure 3.

Figure 9 is an exploded view of stopper expanding mechanism, and

Figure 10 is a section substantially on line 10—10 of Figure 2.

Referring to the drawings, reference numeral 20 designates a main provided in its top wall with a circular opening 21 which as here shown is upwardly rimmed by a cylindrical fitting or adapter 22 which is welded to the main in fluid-tight relation. The fitting 22 has an outer annular flange 23 at its upper end to which the lower portion of a gate valve housing 24 is adapted to be secured. Securable on top of the housing 24 is a barrel or canopy 25 which is sufficiently long to completely receive the stopper generally designated by the reference numeral 26.

The stopper 26 comprises a core 27 which is longitudinally split and comprises the two portions 28 and 29, most clearly seen in Figure 5, these consisting of the lower body portions 30 and 31 and upper semi-cylindrical neck portions 32 and 33. At the base of the neck portions the body portions have arcuate flanges 34 and 35 coaxial with the neck portions, and providing top shoulders 36 and 37.

Body portion 30 has a flat inner face 38 at one

side of which is a longitudinally extending flange 39 whose inner margin is rabbeted to provide rectangularly related longitudinal surfaces 40 and 41. Set in a transversely extending recess in the lower portion of body 30, flush with the face 38, is a pair of bars 42 and 43 which define a rectilinear guideway 44, and similar bars similarly disposed in the upper portion of the body 30 define a rectilinear guideway 45 which is parallel to the guideway 44, both guideways being normal to an axial plane of the core.

Body portion 31 has a longitudinally extending flange 46 at one side of the flat face 47, the flange having a rabbeted margin providing rectangularly related longitudinal surfaces 48 and 49. Transverse guideways 50 and 51 are provided by inset bars in the same manner as described in connection with body portion 30, the guideways 50 and 51 being respectively directly opposite guideways 44 and 45 when the parts are assembled and as particularly shown in Figure 4.

The neck portions 32 and 33 are provided with semi-cylindrical channels 52 and 53 and, intermediate the ends of the latter, with arcuate recesses 54 and 55, Figure 5, and when the parts are joined together by screws as at 56, Figure 8, the channels 52 and 53 define a cylindrical axial passage 57, Figure 7, while the recesses 54 and 55 define a cylindrical enlargement having top and bottom annular thrust surfaces 58 and 59, Figures 3 and 4. From the latter figures it will be noted that the axial passage 57 is of greater diameter above shoulder 58 than below shoulder 59. Below flanges 34 and 35 the body portions 30 and 31 are flattened and the lower ends are secured by screws to upstanding flanges 60 and 61 of a circular cap piece 62 whose bottom surface 63, Figure 3, is curved substantially as the walls of the main 20, the direction of curvature being parallel to the faces 38 and 47 of the body portions.

With the core parts secured together, there are provided diagonally opposite longitudinal slots 64 and 65, these being defined respectively between the edge of flange 39 and the opposed margin of face 47, and between the edge of flange 46 and the opposed margin of face 38.

Laterally slidable against face 47 is a plate or wing 66 which has fixed thereto keys 67 and 68, Figures 4 and 9, slidable in the guideways 50 and 51, this plate having a thickness slightly less than the width of slot 64 and having an outer edge 69 curved as the inner walls of the main 20, the plate being of symmetrical form and being

substantially entirely receivable in the longitudinal core recess. A similar plate or wing 70 is slidable against face 38 and has keys 71 and 72 slidable in guideways 44 and 45. Slidable between the opposed faces of plates 69 and 70 is a block 73 of rectangular cross section, the opposite faces or edges 74 and 75 of the block being guided in the rabbets of flanges 39 and 46. On its other faces block 73 has formed therein oppositely extending cam grooves 76 and 77, the latter being most clearly shown in Figure 9. Referring to this figure, it will be seen that the groove 76 comprises two merging angularly related portions 78 and 79, the latter being much more steeply inclined than the former. Groove 77 is of identical form as indicated in dotted lines in Figure 9. These grooves respectively receive followers in the form of rollers 80 and 81 journaled on plates 66 and 70 in the manner most clearly shown in Figure 6.

When the block 73 occupies an upper position the rollers are in the lower portions of the grooves and the plates 66 and 70 are substantially completely within the core body. When block 73 is depressed, the plates are cammed outwardly relatively rapidly while the rollers are in the groove portions as at 78 and then more powerfully as the groove portions as at 79 come against the rollers.

Block 73 has a stem 82, extending upwardly in bore 57, whose extremity 83 is externally threaded. Threaded on the extremity 83 and brazed thereto is an internally and externally threaded sleeve 84. The external threads of sleeve 84 are engaged with the threads of an elongated nut 85 which has a bottom external annular flange 86 underlying shoulder 58. Interposed between the flange 86 and the shoulder 59 is a ball bearing assembly 87. Welded to the upper end of nut 85 in coaxial relation is a tubular member 88 which extends upwardly through an opening in a hollow cap 89. It will be obvious that the block or operator element 73 can be moved upwardly or downwardly by suitably rotating nut 85 through tubular member 88.

Supported on top of shoulders 36 and 37 flush with the circular outline of the latter, is an elongated rubber ring 90 surrounding the core neck portion, and slidable on the latter above the ring 90 is an annular metal spacer 91 in turn surmounted by a slidable metal ring 92. All of these elements are of the same diameter, as is also the bottom cap 62. A normally cylindrical rubber bag 93 receives the core and has an upper flange 94 clamped between ring 92 and a bottom flange 95 of the cap 89. The bag 93 includes a bottom wall 96, integral with its sleeve portion, which is conformed to the bottom surface 63 of the bottom cap 62. Ordinarily the end wall 96 will be molded in this form, but in any event will be caused to assume proper external curvature due to the mandrel effect of the end cap. The upper portion of the core neck is slidably receivable in the cap 89 but relative rotation is prevented by a key 33' and groove 89', Figure 4.

A tubular member 97 has a lower flanged end secured to the top of cap 89 and receives tubular member 88 with a sliding fit. Member 97 passes upwardly through a gland 98 in the top of barrel 25 and has its upper end rigidly secured in an opening in a cross head 99 which is slidable on rods 100 and 101 rising from a cross bar 102 here shown as integral with the upper portion of barrel 25. Tubular member 88 projects upwardly beyond member 97 and has a squared end

103 beneath which it is threaded for a distance and is engaged by a nut 104 above the cross head 99. The squared end of member 88 is received in a ratchet wheel 105 which is adapted to be reversibly driven by pawls carried by a ring 106 swivelled on the ratchet wheel and operable by means of a handle 107.

Immediately above the upper extremity of member 88 a cross bar 108 is strung on rods 100 and 101 and held against upward movement by nuts threaded on the upper extremities of the latter. Cross bar 108 has centrally journaled therein, on a vertical axis, a thimble 109 having a flange 110 between which and the lower surface of the cross bar is disposed a ball bearing assembly 111. Beneath flange 110 the thimble 109 has a pilot flange 112 received in the upper extremity of member 88. The thimble is retained in association with bar 108 by means of a screw 113 whose inner end is received in an annular groove 114 of the thimble.

An indicator rod 115 is threaded in a bore in the upper end of a stem 82 of block 73 and projects upwardly through tubular member 88 beyond the cross bar 108 and is provided with a mark 116 normally visible above the latter.

After the hole 21 has been cut in the main 20 in accordance with usual procedure, the barrel of the boring machine is removed from the top of the gate valve housing after the gate valve has been closed. The barrel 25 of the present invention may now be secured to the top of the housing 24. At this time the cross bar 108 has been removed from the rods 100 and 101 so that by pulling on handles 117 and 118 projecting oppositely from the cross head 99, the plug 26 has been enabled to be pulled completely into barrel 25 and held in this position by a clamping ring 119 engaging tubular member 97 just above the gland fitting 98. Plates 66 and 70 are in retracted relation, and bag 93 is in cylindrical form, the diameter of the cylinder being suitably less than the diameter of the opening 21 of the main.

With the barrel secured in position on housing 24, the gate valve may be opened and the stopper lowered through opening 21 until the bottom of the bag engages the inner bottom wall of the main, conforming thereto. Barrel 25 having been secured in predetermined relation on the housing 24 the stopper will be lowered in proper relation, since the stopper cannot turn relative to tubular member 97 and the latter itself is prevented from turning by the cross head 99 to which it is fixed. Cross bar 108 may now be secured in position and then upon operating the ratchet drive, tubular member 88 may be turned so as to depress block 73 and thereby project plates 66 and 70 to distend the bag and conform it to the inner side walls of the main as particularly indicated in Figure 3. With the plates fully projected, they complete the major portion of a circle in conjunction with the bottom cap 62 and the main is completely blocked by the conformed rubber bag except for the opening 21. In order to seal off this opening nut 104 is threaded downwardly on member 88, thus depressing member 97, cap 89, ring 92 and spacer 91 so that the rubber ring 90 is peripherally bulged outwardly so as to carry the surrounding bag portion into peripheral sealing engagement with the edges of opening 21 and/or with the interior of adapter 22.

In moving the block 73 downwardly the thrust is taken by the upper ball bearing assembly 111

and it is here assumed that when the mark 116 on rod 115 comes level with the top of bar 108, the plates 66 and 70 will have been fully projected. To retract the plates, member 88 is, of course, reversibly rotated, the thrust in this case being taken by the ball bearing assembly 87.

It will be seen that the rubber bag is utilized not only to form an edge seal between the plates and the main, between the bottom cap 62 and the main, and at the main opening, but also to prevent any leakage through the core which might otherwise occur. The bag is of heavy flexible molded rubber and its distention by the plates or wings is facilitated by the reduced section of the core between the flanges 34 and 35 and the bottom cap, Figure 4, into which it can collapse. The projected wings are steadied by the flanges 39 and 46 and the block 73 is rigidly guided at all times by the rabbets in the flange margins. In Figure 6 it will be seen that the diagonally opposite margins of the block 73 are fully supported by the shoulders 41 and 49 at the receding inner edges of the projected wings. Desirably, the wings are not projected at right angles to the axis of the pipe, since there would thus be a considerable torsion effect. Preferably, the plug is so disposed in the main that, as shown in Figure 6, lateral sealing pressure will be exerted by the wings along substantially opposite arcs of the inner walls of the main. Obviously, different sizes of cores with wings of different size may be used to accommodate the apparatus to mains of different sizes. The same bag can be used within a varied range. The main opening 21 can be of the same diameter through the usual range of main sizes.

The invention is susceptible of variation in embodiment and accordingly we do not limit ourselves except as in the following claims.

We claim:

1. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising a rubber bag, a core in said bag, means carried by the core projectible to distend opposite sides of the bag curvilinearly into contact with the inner walls of the main, the closed end of the bag being externally curved so as to conform to and seal against the inner wall of the main opposite the opening, and means for peripherally expanding the bag adjacent its other end to seal off the main opening.
2. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising an elongated body, a block of rectangular section slidable axially of said body in a recess in the latter, a pair of plates in said recess on opposite sides of said block, said plates having outer edges curved as the inside of the main, coacting means between said plates and said block whereby reciprocation of the latter causes simultaneous projection or retraction of the plates transversely of said body, and body walls providing guides for the other sides of said block.
3. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising an elongated body, a block of rectangular section slidable axially of said body in a recess in the latter, a pair of plates in said recess on opposite sides of said block, said plates having outer edges curved as the inside of the main, coacting means between said plates and said block whereby reciprocation of the latter causes simultaneous projection or retraction of the plates transversely of said body, and body walls providing guides for the other sides of said block and also providing back-

ing for diagonally opposite margins of the first mentioned sides of said blocks at the edges of said plates which recede during projection.

4. A pipe line stopper according to claim 2 wherein said body comprises two separable portions on opposite sides of an axial plane of the body, and wherein said body walls are constituted by a longitudinal flange on each of said body portions.

5. A pipe line stopper according to claim 3 wherein said body comprises two separable portions on opposite sides of an axial plane of the body, and wherein said body walls are constituted by a longitudinal flange on each of said body portions.

6. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising an elongated body provided with an axially extending recess having parallel side faces, longitudinal flanges projecting from diagonally opposite margins of said faces short of the opposite faces so that diagonally opposite longitudinal slots are provided, plates respectively slidable against and transversely of said side faces, said plates having outer edges curved as the inner walls of the main and being respectively projectible and retractible through said slots, said flanges having opposed margins provided with rabbets, a block of rectangular section reciprocable longitudinally of said recess and having edges guided in said rabbets and faces guided between said plates, and means whereby reciprocation of said block causes simultaneous projection or retraction of said plates.

7. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising an elongated body, a block of rectangular section slidable axially of said body in a recess in the latter, a pair of plates in said recess on opposite sides of said block, said plates having outer edges curved as the inside of the main, and coacting means between said plates and said block whereby reciprocation of the latter causes simultaneous projection or retraction of the plates transversely of said body, said coacting means comprising cam grooves and followers of which the followers are mounted on said plates substantially midway longitudinally of the latter, said grooves each including two merging angularly related portions so disposed that when said block is uniformly moved to project said plates initial relatively rapid movement of the latter is succeeded by relatively slow and more powerful movement thereof.

8. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising an elongated body, a block of rectangular section slidable axially of said body in a recess in the latter, a pair of plates in said recess on opposite sides of said block, said plates having outer edges curved as the inside of the main, coacting means between said plates and said block whereby reciprocation of the latter causes simultaneous projection or retraction of the plates transversely of said body, said body including a hollow neck portion providing thrust surfaces for a rotary nut, a threaded stem on said block engaged in said nut, and means operable to rotate said nut whereby to reciprocate said block.

9. A pipe line stopper according to claim 8 wherein said body and neck portion are axially split and wherein the parts of the neck portion are arcuately recessed to provide said thrust surfaces.

10. A pipe line stopper insertable through a side

wall opening in a main, said stopper comprising a cylindrical sleeve, a core in said sleeve including upper and lower portions filling the sleeve cross sectionally, and means carried by the core and oppositely projectible between said portions to distend opposite sides only of the bag curvilinearly into contact with the inner walls of the main, said core being cross sectionally reduced between section portions to permit the sides of the sleeve between said opposite sides to collapse inwardly.

11. A pipe line stopper insertable through a side wall opening in a main, said stopper including a body, members movable oppositely transversely of the body and carried thereby, a reciprocable operator element for said members, a rotatable non-rising tubular member having a threaded connection with said operator element for reciprocating the latter, and a rod fixed to said operator element and extending through said

tubular element for indicating the relative position of said operator.

12. A pipe line stopper insertable through a side wall opening in a main, said stopper comprising an elongated body, a block of rectangular section slidable axially of said body in a recess in the latter, a pair of plates in said recess on opposite sides of said block, said plates having outer edges curved as the inside of the main, and coacting means between said plates and said block whereby reciprocation of the latter causes simultaneous projection or retraction of the plates transversely of said body, said coacting means comprising cam grooves and followers, of which the followers are mounted on said plates substantially midway longitudinally of the latter.

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