Sept. 24, 1963 J. S. POWELL, JR 3,104,456

METHOD OF CONNECTING SERVICE LINES TO MAINS

Filed June 27, 1960 2 Sheets-Sheet 1

FIG. 1.

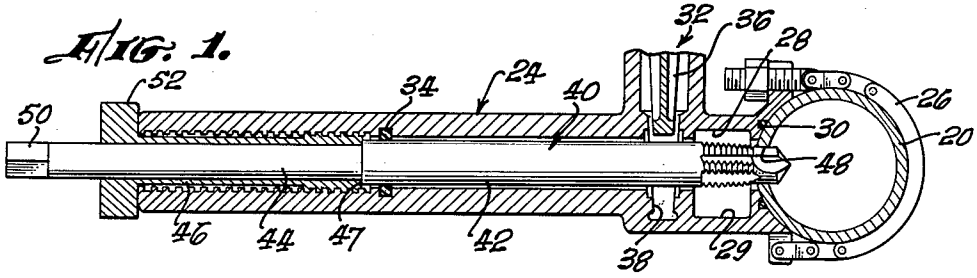


FIG. 2.

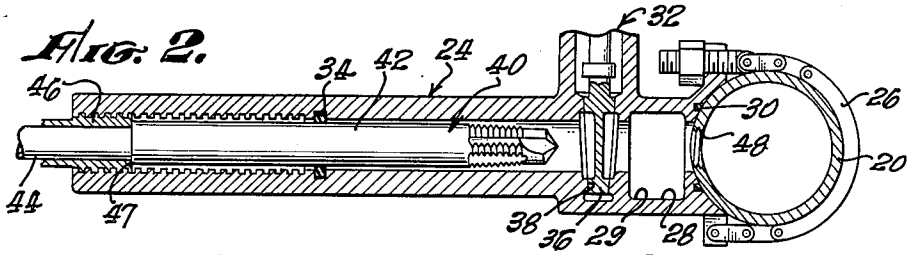


FIG. 3.

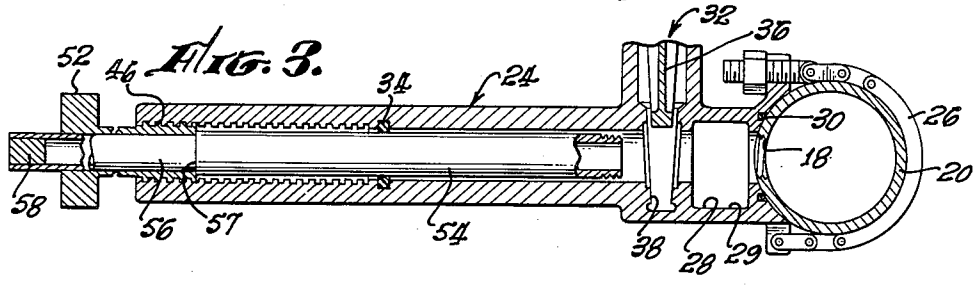


FIG. 4.

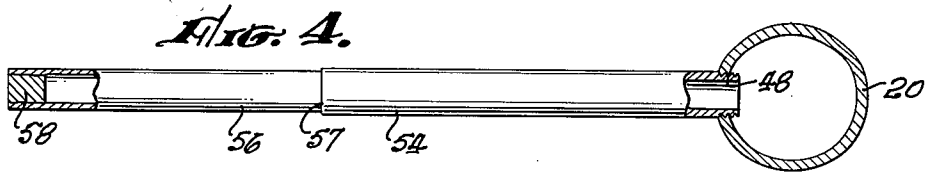
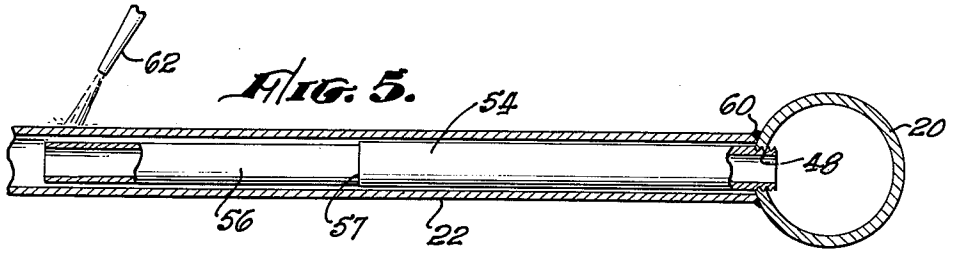


FIG. 5.



INVENTOR.
JONATHAN S. POWELL, JR.,
By His Attorneys.
HARRIS, KIECH, RUSSELL & KERN.

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FIG. 6.

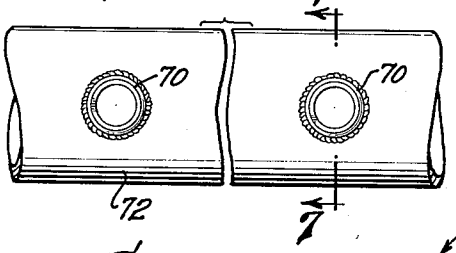


FIG. 7.

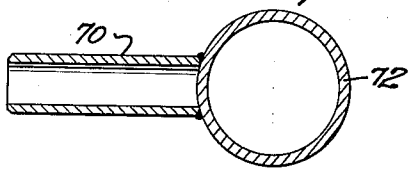


FIG. 8.

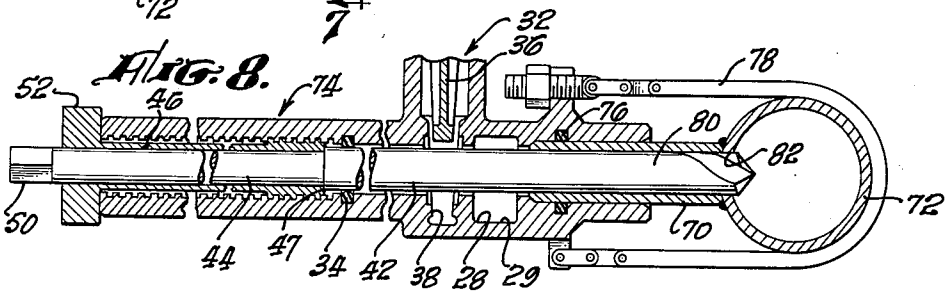


FIG. 9.

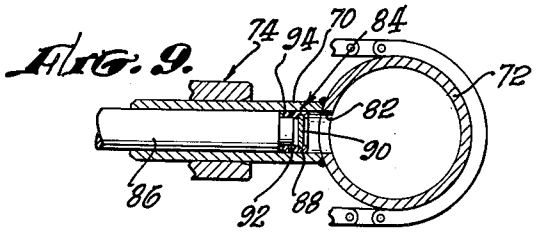


FIG. 11.

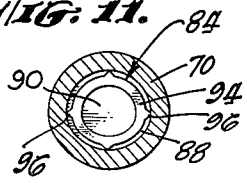


FIG. 10.

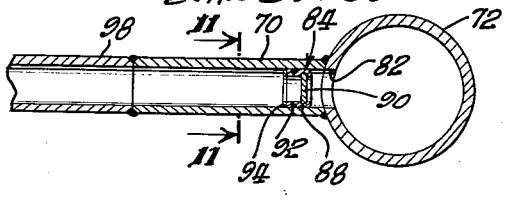


FIG. 13.

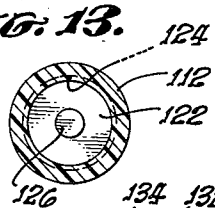


FIG. 12.

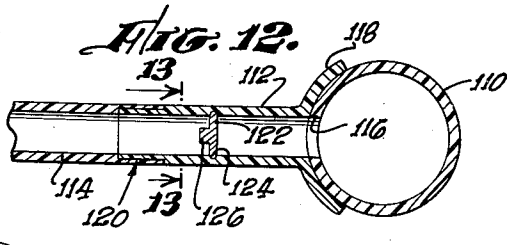
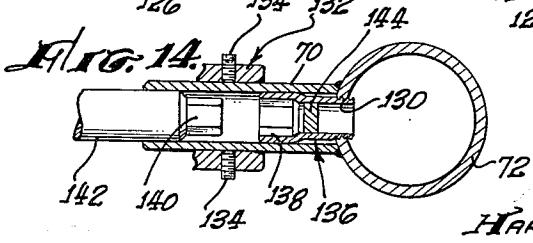


FIG. 14.



JONATHAN S. POWELL, JR.,
INVENTOR.

By His Attorneys.

HARRIS, KIECH, RUSSELL & KERN.

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3,104,456
METHOD OF CONNECTING SERVICE LINES TO MAINS

Jonathan S. Powell, Jr., 1231 Brookmere Road, Pasadena 2, Calif.

Filed June 27, 1960, Ser. No. 38,922
2 Claims. (Cl. 29—157)

The present invention relates in general to a method of and apparatus for making service line connections to gas mains, water mains, and the like, without service interruptions to existing service line connections.

It will be understood that the term "main" is used herein to designate any fluid-conveying conduit, and the expression "service line," as used herein, means any branch fluid-conveying conduit connected to such "main."

A general object of the invention is to provide an apparatus for and a method of making service line connections which are respectively much simpler and much less time consuming, and thus far less expensive, than prior apparatuses and methods. Other general objects are to provide service line connections which avoid exposed underground threaded connections, which are easily protectible from corrosion, which avoid the necessity for initially providing the mains with projecting fittings when the mains are laid, thereby avoiding the possibility of having such projecting fittings broken off by digging equipment, and the like.

More specifically, a primary object of the invention is to provide a service line connection and method which involve connecting a lateral stub conduit or nipple to the main or main conduit, and forming a hole through the main to establish communication between the main and the nipple and, at the same time, preventing the escape of fluid from the main by isolating the portion of the main being worked on from the atmosphere and by plugging the nipple with a fusible plug. Subsequently, the service connection is completed by connecting the service line to either the main or the nipple. As a final step, the fusible plug in the nipple is heated, by the external application of heat, to melt out the fusible plug, thereby establishing communication between the main and the service line after the service connection has been completed, which is an important object of the invention.

Another object is to provide a service connection wherein the service line is either connected directly to the main around the nipple, or is connected to the nipple itself.

A further object is to make all exposed connections between the service line and the main, or between the service line and the nipple and between the nipple and the main, bonded connections so that there are no exposed threaded connections. Such bonded connections may be welded connections in the event that the various components are made of weldable metals, or they may be cemented connections in the case of plastic components. Also, the bonded connections in question may be heat sealed connections with heat sealable plastic materials.

The foregoing objects, advantages, features and results of the present invention, together with various other objects, advantages, features and results thereof which will be evident to those skilled in the art to which the invention relates, may be achieved with the exemplary embodiments of the invention described in detail hereinafter and illustrated in the accompanying drawings, in which:

FIGS. 1 to 5 are semidiagrammatic, transverse sectional views, with certain components in elevation, illustrating successive steps of one embodiment of a method of connecting a service line to a main in accordance with the invention;

FIG. 6 is an elevational view of a main having partially completed service connections thereon;

FIG. 7 is a transverse sectional view taken along the arrowed line 7—7 of FIG. 6;

FIGS. 8 to 10 are semidiagrammatic, transverse sectional views, with certain components in elevation, which are similar to FIG. 7, but which illustrate successive steps of another embodiment of the method of the invention for completing the partially completed service line connection shown in FIG. 7;

FIG. 11 is an enlarged sectional view taken along the arrowed line 11—11 of FIG. 10;

FIG. 12 is a view similar to FIG. 10, but illustrating still another method of making a service line connection in accordance with the invention;

FIG. 13 is an enlarged sectional view taken along the arrowed line 13—13 of FIG. 12; and

FIG. 14 is a view similar to FIG. 9, but illustrating yet another apparatus and method of making a service line connection in accordance with the invention.

Referring first to FIGS. 1 to 5 of the drawings, the numeral 20 designates a main, such as an underground gas main, water main, or the like, to which a service line 22 is to be connected. The steps required to connect the service line 22 to the main 20 will now be considered sequentially.

Initially, a suitable tool 24 is attached to the main 20, as by means of a clamp 26. The tool 24 provides a space 28 which is isolated from the atmosphere and one end or side of which is bounded by the main 20. More particularly, the tool 24 provides an annular packing means 30, shown as a simple O-ring for convenience, which engages the main 20 on one side thereof to form one end of the isolated space 28. The other end of the isolated space 28 is formed either by a closure means 32, or by an annular packing means 34, shown as a simple O-ring for convenience, engageable with components to be described. The closure means 32 is shown, for purposes of illustration, as comprising simply a gate valve 36 engageable with a valve seat 38.

The next step is to insert into the tool 24 a combined drilling and tapping means 40 having a shank 42 engageable with the annular packing means 34 in a fluid-tight manner to form the outer end of the isolated space 28. Under these conditions, the gate valve 36 is out of engagement with its seat 38. The shank 42 of the drilling and tapping means 40 terminates in a stem 44 which projects from the outer end of the tool 24 through a feed screw 46 engageable with an annular shoulder 47 on the drilling and tapping means. As will be clear from FIG. 1 of the drawings, by simultaneously rotating the drilling and tapping means 40 and the feed screw 46, a hole 48 is drilled in the main 20 and is subsequently tapped. The drilling and tapping means 40 and the feed screw 46 may be rotated in any suitable manner, as by applying wrenches, not shown, to the outer ends 50 and 52 of the stem 44 and the feed screw 46, respectively. Once the hole 48 is drilled and tapped, it establishes fluid communication between the main 20 and the inner end of the isolated space 28. The isolated space 28 is provided adjacent its inner end with a well 29 which receives cuttings produced by the combined drilling and tapping means 40 so that such cuttings are prevented from entering the closure means 32 and the packing means 34 to damage same.

Next, as shown in FIG. 2 of the drawings, the drilling and tapping means 40 is partially withdrawn from the isolated space 28, whereupon the gate valve 36 is re-engaged with the valve seat 38 to close the outer end of the isolated space to prevent the loss of fluid from the main 20. Next, the drilling and tapping means 40 is completely withdrawn from the tool 24 by completely unscrewing the feed screw 46.

Then, as shown in FIG. 3 of the drawings, a nipple 54

is inserted into the tool 24 and into fluid-tight engagement with the packing means 34, whereupon the gate valve 36 may be disengaged from its seat 38 to permit threading of the inner end of the nipple into the tapped hole 48. The nipple 54 is provided at its outer end with a reduced-diameter stem 56 providing an annular shoulder 57 corresponding to the annular shoulder 47 on the drilling and tapping means 40 and engageable by the feed screw 46. As will be apparent, the feed screw 46 may be rotated to advance the nipple 54 until the inner end thereof engages the main 20, whereupon the nipple may be rotated to thread the inner end thereof into the tapped hole 48. Since the feed screw 46 is utilized to guide both the drilling and tapping means 40 and the nipple 54, the inner end of the nipple is brought into accurate register with the tapped hole 48.

The nipple 54 is provided at or adjacent its outer end with a fusible plug 58 of a metal, or metal alloy, having a relatively low melting point. The fusible plug 58 must be capable of withstanding the pressure in the main 20 and in many instances this may be achieved merely by pressing the plug into the nipple 54. In the event that very high main pressures must be sustained, the interior of the nipple 54 may be roughened, grooved, or the like, and the plug 58 cast in place so that it is keyed to the nipple.

After the nipple 54 has been threaded into the tapped hole 48, the tool 24 is detached from the main 20, thereby arriving at the condition shown in FIG. 4 of the drawings. Under these conditions, the fusible plug 58 prevents loss of fluid from the main 20 while the service line 22 is being connected thereto, as will now be described.

Referring to FIG. 5 of the drawings, the next step is to slip the service line 22 over the nipple 54, whereupon the inner end of the service line may be welded to the main 20, as indicated at 60. The necessary hookup of the service line 22 is then completed. For example, the service line 22 may be connected to a gas meter associated with a residence.

Finally, after completing the entire service line installation, the fusible plug 58 is melted out, as by playing the flame of a torch 62 on the service line 22 opposite the fusible plug. The heat generated in this fashion melts the surface of the fusible plug 58, whereupon the pressure in the main 20 blows the plug out of the nipple 54. The resulting remnant of the fusible plug 58 remains in the service line 22 and is small enough that it produces no significant obstruction.

The melting temperature of the fusible plug 58 and the length of the nipple 54 are such that the heat generated in welding the service line 22 to the main 20 does not heat the nipple at the plug sufficiently to loosen the plug. For example, assuming that the main 20, the service line 22 and the nipple 54 are all made of ordinary pipe, it has been found that, with a nipple length of approximately eight inches, the plug temperature reaches only about 220° F. during the course of welding the service line 22 to the main 20. Thus, making the fusible plug 58 out of a metal or metal alloy that melts at 275° F. provides an ample margin of safety.

While the nipple 54 is shown as smaller than and spaced radially inwardly from the service line 22, this is not absolutely essential, although the radial spacing does reduce transmission of the welding heat to the fusible plug 58, which is desirable. Also, the nipple 54 has, as a matter of convenience, been shown somewhat longer, in relation to its diameter, than would be the case in actual practice. Further, in actual practice, the shoulder 57 engageable by the feed screw 46 is preferably closer to the outer end of the nipple 54, i.e., closer to the end thereof containing the fusible plug 58.

It will be noted from the foregoing that the present invention provides a very simple method of connecting the service line 22 to the main 20 and one which can be made rapidly with simple and inexpensive components, thereby minimizing the cost of making the connection. Further, since the service line is welded to the main 20 there are no exposed threaded connections so that corrosion problems are minimized. Further, with the simple structure of the connection which the invention provides, it may be protected against corrosion readily, may be wrapped readily, or the like. Still another advantage is that there is no necessity of initially providing the main 20 with fittings which can corrode, be broken off, or the like, prior to use.

Turning now to FIGS. 6 to 11 of the drawings, the embodiment of the invention illustrated therein employs the same basic concepts as that hereinbefore described, but utilizes somewhat different components and somewhat different steps.

Referring first to FIG. 7 of the drawings, the first step with this embodiment is to weld a nipple 70 to a main 72. The nipple 70, in this instance, ultimately forms a part of the service line.

The next step is to slip over the nipple 72 a tool 74 which is similar to the tool 24 and corresponding components of which are identified by the same reference numerals. The tool 74 differs from the tool 24 in that, instead of being seated against the main 72, it is seated against the outer end of the nipple 70 and is provided with an annular packing means 76, shown as a simple O-ring, engageable with the exterior of the nipple 70 and sealing the inner end of the isolated space 28. The tool 74 is held in place by a main-encompassing clamp 78 similar to the clamp 26.

With the tool 74 in place as shown in FIG. 8 of the drawings, a drill 80 is inserted through the tool 74 and the nipple 70 in much the same manner as the drilling and tapping means 40 is inserted through the tool 24. The drill 80 is similar to the drilling and tapping means 40 and identical reference numerals are employed to designate corresponding components.

Elaborating on the foregoing paragraph, the drill 80 is inserted into the tool 74 until the shank 42 thereof engages the packing means 34 in a fluid-tight manner. Thereupon, the valve 36 is disengaged from its seat 38 and, by means of the feed screw 46, the drill 80 is brought into engagement with the main 72. Subsequently, by simultaneously rotating the drill 80 and the feed screw 46, a hole 82 is drilled in the main 72 at the inner end of the nipple 70. Subsequently, the drill 80 is withdrawn, the gate valve 36 being seated prior to disengaging the shank 42 of the drill from the packing means 34.

Referring to FIG. 9, the next step is to insert a plug means 84 through the tool 74 into the nipple 70. This insertion is effected with a rod 86 which carries the plug means 84, the rod 86 first engaging the packing means 34 in a fluid-tight manner, whereupon the gate valve 36 may be unseated to permit insertion of the plug means 84 into the nipple 70. The feed screw 46 may act on the rod 86 during the course of inserting the plug means 84 in the same manner that it acts on the drill 80, the rod 86 being rovided with an annular shoulder, not shown, corresponding to the annular shoulder 47. Subsequently, the rod 86 is withdrawn from the nipple 70 and the tool 74, and the tool is then detached.

The plug means 84 includes a collar 88 carrying a fusible plug 90 in the form of a disc set in an internal annular groove in the collar. The collar 88 carries externally thereof an O-ring 92 which makes a fluid-tight seal with the interior wall of the nipple 70. The collar 88 is held in place within the nipple 70 against the pressure within the main 72 by a washer 94 against which the outer end of the collar 88 is seated and which is provided with prongs 96 adapted to bite into the interior wall of the nipple 70. Such a washer 94 is capable of holding the plugged collar 88 in place against substantial main pressures.

The next step is to weld a service line 98 to the outer end of the nipple 70, the nipple in this instance forming

a part of the service line. Then, the hookup of the service line 98 is completed.

The final step is to heat the nipple 70 opposite the plug means 84 sufficiently to melt out the fusible plug 90 in the same manner as the fusible plug 58, the collar 88 and the washer 94 remaining within the nipple 70.

As in the case of the embodiment of FIGS. 1 to 5 of the drawings, the location of the plug means 84 relative to the weld between the nipple 70 and the service line 98 and the melting temperature of the fusible plug 90 are such that the heat generated in welding the service line 98 to the nipple 70 will not melt out the fusible plug 90. Also, the fusible plug 90 may be protected from the welding heat at the connection between the service line 98 and the nipple 70 by making the collar 88 of a heat insulating material. Doing this, however, requires the application of more heat to the plug means 84 in the course of melting out the plug 90.

Referring to FIGS. 12 and 13 of the drawings, illustrated therein is a service connection to a main 110 comprising a nipple 112 and a service line 114, communication between the main 110 and the nipple 112 being established through a hole 116 in the main. In this case, the main 110, the nipple 112 and the service line 114 are all formed of suitable plastic materials bonded together by cementing, heat sealing, or the like, instead of by welding. To provide stronger connections, the nipple 112 terminates at its inner end in a saddle 118 complementary to the main 110, and, for the same reason, a telescoping connection 120 is provided between the nipple 112 and the service line 114.

In making the service connection of FIGS. 12 and 13, the nipple 112 is first bonded to the main 110. The hole 116 is then drilled in substantially the same manner as and with substantially the same equipment as the hole 82 in the main 72. Then, a fusible plug 122 is inserted into the nipple 112 in substantially the same manner as and with substantially the same equipment as the plug means 84. The fusible plug 122 is preferably snapped into an annular groove 124 in the nipple 112, the plastic material of which the nipple is formed being sufficiently flexible to permit this. The fusible plug 122 is provided thereon with a central boss 126 receivable in a hole in a rod, not shown, similar to the rod 86 for inserting the plug means 84. The boss 126 thus serves as a means for connecting the fusible plug 122 to such a rod during the insertion process.

Next, the service line 114 is bonded to the nipple 112 at the telescoping connection 120, either by cementing, heat sealing, or the like.

After the service line 114 has been completely hooked up, the fusible plug 122 is melted out by applying heat to the nipple 112 opposite the fusible plug. In this instance, the fusible plug 122 may be made of a metal or metal alloy having a rather low melting point so that it can be melted out without overheating the plastic nipple 112. Preferably, Wood's metal is used since, under such circumstances, the fusible plug 122 can be melted out merely by pouring hot water over the nipple 112 opposite the fusible plug. However, it will be understood that the fusible plug 122 may be melted out in other ways.

Referring to FIG. 14 of the drawings, illustrated therein is an alternative method of establishing communication between the nipple 70 and the main 72 and of preventing the escape of fluid from the main until the service line 98 is connected to the outer end of the nipple. Instead of drilling the hole 82 of FIGS. 8 to 10 in the main 72, a somewhat smaller hole 130 is drilled and tapped therein through the use of a tool 132 similar to the tool 74 and through the use of a drilling and tapping means, not shown, similar to the drilling and tapping means 40. In this case, the tool 132 is anchored in place by set screws 134 engageable with the nipple 70, instead of by a main-encircling clamp.

After the hole 130 has been drilled and tapped and the drilling and tapping means withdrawn from the tool 132, a plug means in the form of a second nipple 136 is inserted into the nipple 70 and is threaded into the tapped hole 130. The nipple 136 is provided at its outer end with a non-circular, preferably hexagonal, socket 138 adapted to receive a complementary plug 140 on the inner end of an inserting tool 142 capable of engaging an annular packing means of the tool 132 corresponding to the annular packing means 34. The nipple 136 is inserted and threaded into the tapped hole 130 with the inserting tool 142 in much the same manner as the plug means 84 is inserted with the inserting tool or rod 86.

The nipple 136 is provided therein with a fusible plug 144 which is retained therein in much the same manner as the fusible plug 58 is retained in the nipple 54.

After a service line, not shown, has been welded to the outer end of the nipple 70, and after the hookup of the service line has been completed, the nipple 70 is heated opposite the fusible plug 144 in the inner nipple 136 to release the fusible plug, thereby establishing communication between the main 72 and the service line.

The embodiments of the invention illustrated in FIGS. 6 to 11, in FIGS. 12 and 13, and in FIG. 14 have substantially the same advantages as the embodiment illustrated in FIGS. 1 to 5 so that a further description is unnecessary.

Although exemplary embodiments of the invention have been disclosed herein for purposes of illustration, it will be understood that various changes, modifications and substitutions may be incorporated in such embodiments without departing from the spirit of the invention as defined by the claims which follow.

I claim:

1. A method of connecting a weldable service line to a weldable main intermediate the ends thereof, including the steps of:

(*a*) welding an inner end of a weldable nipple directly to the peripheral wall of said main with said nipple projecting laterally from said main;

(*b*) isolating a space which is axially aligned with said nipple and which communicates at an inner end thereof with the outer end of said nipple;

(*c*) inserting a drill axially into said space through the outer end thereof and axially into said nipple through the outer end thereof, while simultaneously maintaining the isolation of said space;

(*d*) drilling a hole through said peripheral wall of said main with said drill from the exterior of said space, whereby to connect said main and the inner end of said nipple in fluid communication;

(*e*) withdrawing said drill axially from said nipple and said space while simultaneously maintaining the isolation of said space;

(*f*) inserting a plug having a fusible portion axially into said space through the outer end thereof and axially into said nipple through the outer end thereof, while simultaneously maintaining the isolation of said space;

(*g*) securing said plug within said nipple adjacent the inner end thereof from the exterior of said space;

(*h*) deisolating said space;

(*i*) welding an end of said service line directly to the outer end of said nipple; and

(*j*) heating said plug through said nipple sufficiently to melt said fusible portion thereof, whereby to connect said service line in fluid communication with said main through said nipple.

2. A method of connecting a weldable service line to a weldable main intermediate the ends thereof, including the steps of:

(*a*) welding an inner end of a weldable nipple directly to the peripheral wall of said main with said nipple projecting laterally from said main;

(*b*) isolating a space which is axially aligned with said nipple and which communicates at an inner end thereof with the outer end of said nipple;

(*c*) inserting a hole-forming member axially into said space through the outer end thereof and axially into said nipple through the outer end thereof, while simultaneously maintaining the isolation of said space;

(*d*) forming a hole through said peripheral wall of said main with said hole-forming member from the exterior of said space, whereby to connect said main and the inner end of said nipple in fluid communication;

(*e*) withdrawing said hole-forming member axially from said nipple and said space while simultaneously maintaining the isolation of said space;

(*f*) inserting a plug having a fusible portion axially into said space through the outer end thereof and axially into said nipple through the outer end thereof, while simultaneously maintaining the isolation of said space;

(*g*) securing said plug within said nipple adjacent the inner end thereof from the exterior of said space;

(*h*) deisolating said space;

(*i*) welding an end of said service line directly to the outer end of said nipple; and

(*j*) heating said plug through said nipple sufficiently to melt said fusible portion thereof, whereby to connect said service line in fluid communication with said main through said nipple.

References Cited in the file of this patent

UNITED STATES PATENTS

1,773,401	Lovekin	Aug. 19, 1930
2,121,558	Coe	June 21, 1938
2,171,577	Larry	Sept. 5, 1939
2,782,496	Augustauskas	Feb. 26, 1957
2,828,759	Gerhart	Apr. 1, 1958
2,903,004	Gerteis	Sept. 8, 1959

FOREIGN PATENTS

19,807	Germany	Oct. 26, 1882