

Aug. 8, 1939

F. M. GILSTRAP

2,168,735

METHOD OF CEMENTING WELLS

Original Filed Sept. 18, 1931 2 Sheets-Sheet 1

Fig. 1.

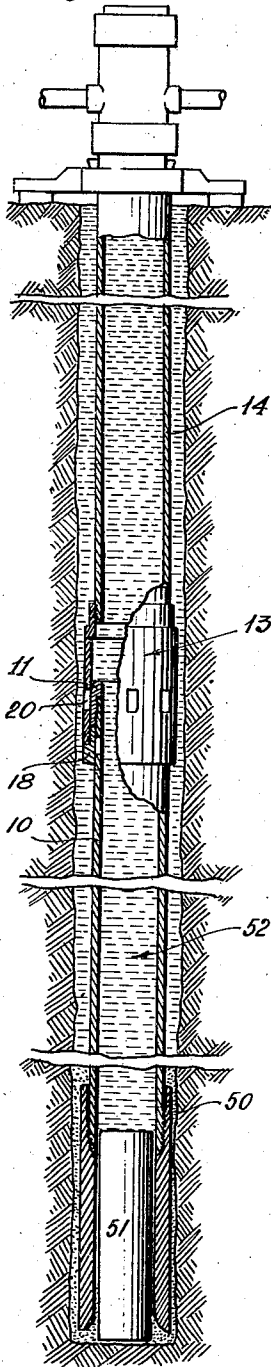


Fig. 2.

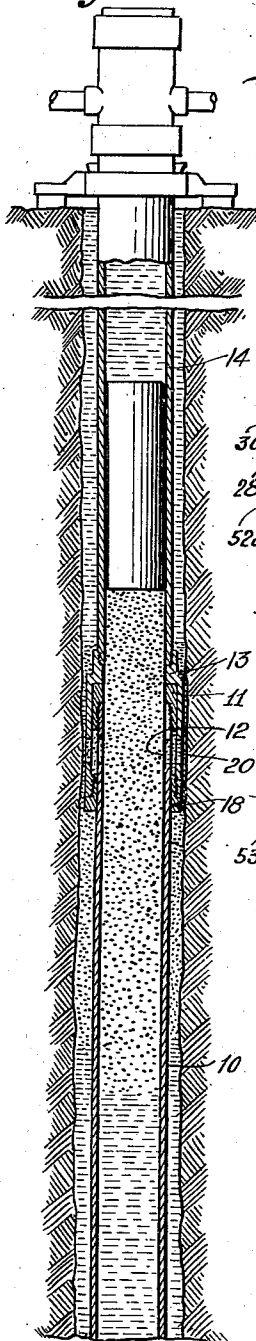


Fig. 3.

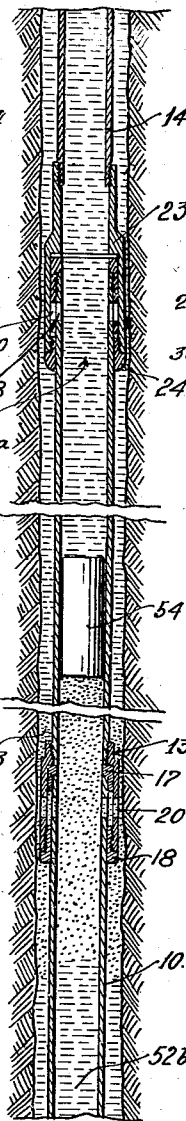
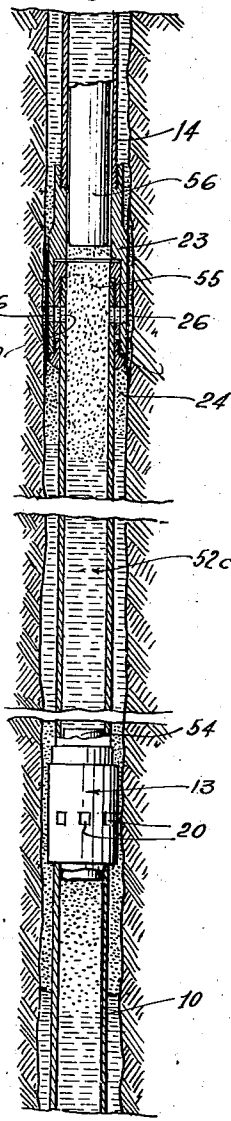


Fig. 4.



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Fig 5.

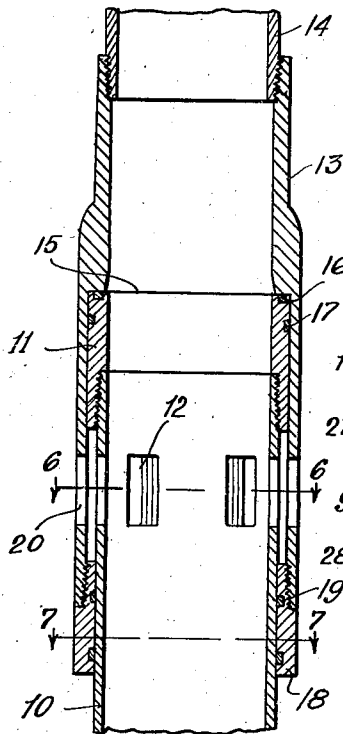


Fig 8

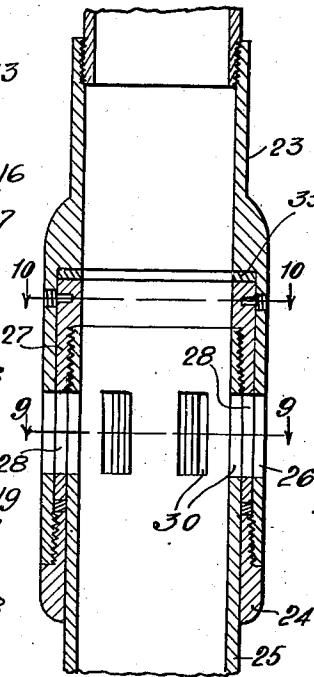


Fig. 11.

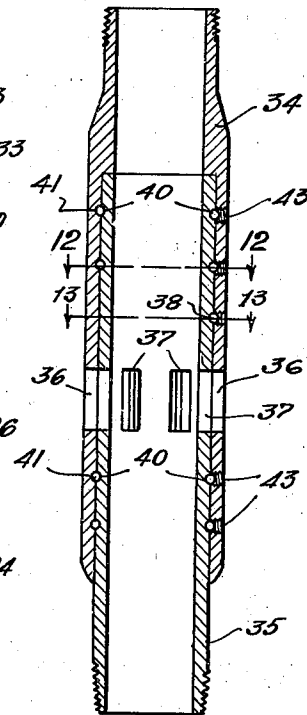


Fig. 6

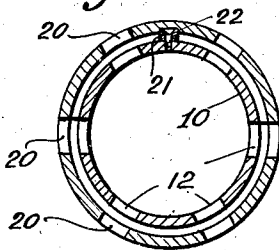


Fig. 9.

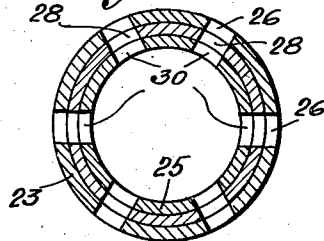


Fig. 12.

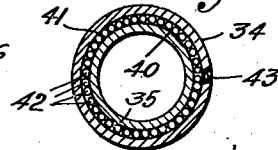


Fig. 7.

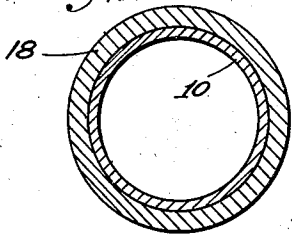


Fig. 10.

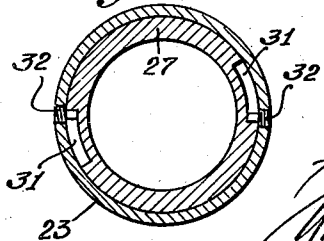
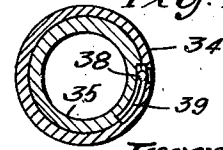


Fig. 13.



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UNITED STATES PATENT OFFICE

2,168,735

METHOD OF CEMENTING WELLS

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Continuation of application Serial No. 563,568,
September 18, 1931. This application August
27, 1935, Serial No. 38,038

23 Claims. (Cl. 166—21)

Our invention relates generally to the art of cementing oil well holes and more particularly to an intermediate cementing sleeve for oil well casing and the principal object of our invention is, to provide a relatively simple, practical and inexpensive sleeve including a valve structure and which may be utilized in a string of oil well casing for accomplishing a cementing job at any desired intermediate point or points in the well hole and which cementing job may be accomplished with an expenditure of comparatively little time, labor and consequent expense. The present application is a continuation of our application, Ser. No. 563,568, filed Sept. 18, 1931, on Intermediate cementing sleeve for oil well casing.

In oil producing fields or territory it frequently occurs that there are two or more strata of oil bearing formation, with hundreds or thousands of feet of non oil bearing formation between them and in many instances the non oil bearing strata contain water which, if not taken care of or counteracted, materially interferes with the production of oil from the oil bearing strata.

It is the purpose of our invention to provide a sleeve, one or more of which may be arranged in the string of casing that is positioned in the well hole and which sleeve or sleeves may be manipulated as the casing is run into the well hole so as to open ports to permit cement to flow outwardly into the well hole at intermediate points therein and above or below the oil bearing strata so as to effectually prevent water from passing into the oil bearing strata and thence into the casing with the oil that is pumped there-through.

A further object of our invention is, to provide a cementing sleeve that includes a valve structure that may be opened by either a vertical movement of the casing in which the sleeve is located or by a rotary movement of said casing or a part thereof.

The methods heretofore used in carrying out cementing jobs in oil wells involves much time, labor and consequent expense, due to the fact that much extra drilling is required to enlarge the hole and further, the required use of two or more strings of casing of different diameters.

Our improved method and apparatus requires only a single string of casing of the same diameter throughout its length and the well hole does not need to be enlarged or redrilled for larger sized casing.

With the foregoing and other objects in view, our invention consists in certain novel features of construction and arrangement of parts that

will hereinafter be more fully described and claimed and illustrated in the accompanying drawings in which:

Fig. 1 is a vertical section taken lengthwise through a well hole with a string of casing therein and showing a cementing sleeve of our improved construction located in said casing with the valve structure of said sleeve closed.

Fig. 2 is a vertical section similar to Fig. 1 and showing the valve structure of the sleeve open to permit the discharge of cement from the casing into the well hole.

Figs. 3 and 4 are vertical sections of well holes with casings therein and with each casing including two of our improved cementing sleeves.

Fig. 5 is a vertical section taken lengthwise through the center of the type of sleeve that is telescopic in action while being shifted into open or closed position.

Fig. 6 is a horizontal section taken on the line 6—6 of Fig. 5.

Fig. 7 is a horizontal section taken on the line 7—7 of Fig. 5.

Fig. 8 is a vertical section taken through the center of the form of sleeve wherein one part rotates for a limited distance in order to open or close the ports in said sleeve.

Fig. 9 is a horizontal section taken on the line 9—9 of Fig. 8.

Fig. 10 is a horizontal section taken on the line 10—10 of Fig. 8.

Fig. 11 is a vertical section taken through the center of a modified form of the type of sleeve wherein one part rotates in relation to the other part to open or close the cement outlet ports.

Fig. 12 is a horizontal section taken on line 12—12 of Fig. 11.

Fig. 13 is a horizontal section taken on the line 13—13 of Fig. 11.

Referring by numerals to the accompanying drawings and particularly to the construction illustrated in Figs. 1, 5, 6 and 7, which form of device is adapted to be opened and closed by vertical movement of the casing, 10 designates a casing section, the upper end of which is externally threaded in order to receive a collar 11 and the wall of the casing immediately below this collar is provided with openings 12 of suitable size which permit cement to flow outwardly while the apparatus is in use.

Enclosing collar 11 and fitting downwardly over the adjacent portion of the casing 10, is a tubular sleeve 13, the upper end of which is internally threaded for the reception of one of the casing members or sections 14.

A shoulder 15 is formed within the sleeve 13 and the upper end of the collar 11, which is adapted to engage against this shoulder when the sleeve 13 is lowered to its limit of movement with respect to said collar 11, is provided with a suitable packing ring 16.

A packing ring 17 is seated in a groove in the external face of collar 11 and engages the inner face of sleeve 13.

Encircling the casing member 10 is a relatively short collar 18 provided on its inner face with packing rings 19 that engage against the outer face of casing member 10 and the upper portion of this collar 18 is screw-seated at the lower end of sleeve 13.

When the casing sleeve is extended, the upper end of collar 18 engages directly against the lower end of collar 11, as illustrated in Fig. 1, thereby preventing the parts of the casing that are connected by the sleeve from pulling apart.

Formed through the wall of sleeve 13 a short distance above the upper end of collar 18, is a series of openings 20 that are adapted to register with the openings 12 in casing member 10 when the sleeve 13 is moved to its downward limit of movement relative to collar 18 and casing section 10, as illustrated in Fig. 5 and when the parts are so positioned cement is free to flow outwardly through the registering openings 12 and 20.

Sleeve 13 is retained against rotary movement relative to casing member 10 in any suitable manner, preferably by means of a pin or key 21 that projects from casing member 10 and which is arranged for sliding movement in a vertically disposed groove or channel 22 that is formed in the inner face of sleeve 13. Thus the parts are held against rotary movement during their telescopic movement and the registration of openings 12 and 20 is assured.

In the use of the device just described for performing an intermediate cementing operation just below an oil bearing sand or formation that lies between the surface of the earth and the lower oil bearing sand or formation, a well hole of uniform size is drilled to the top of the lower sand and a string of casing is then run into the hole with the cementing sleeve located in said string so that when the lower end of the string reaches the bottom of the well hole, said sleeve will be positioned a short distance below the upper oil bearing sand or formation.

Under normal conditions or while there is a strain on the casing, the collar 11 secured to the upper end of casing member 10, will rest on the upper end of collar 18 that is seated in the lower end of the sleeve and under such conditions the parts occupy the positions as illustrated in Fig. 1, with openings 12 and 20 out of registration. A sufficient quantity of cement is now pumped downwardly through the casing to the bottom of the well hole to cement off the lower sand, after which the casing is then lowered a short distance until its lower end rests on the bottom of the hole and the upper portion of the casing is relieved of strains so that the portion of the casing above the sleeve will move downward a short distance or until the shoulder 15 within sleeve 13 rests on top of collar 11.

Such operation brings the ports 12 and 20 into registration with each other and a sufficient amount of cement is now pumped downwardly through the casing and this cement will discharge through the registering openings 12 and 20, thereby cementing off the upper sand, it being understood that during this intermediate cementing

job the sleeve is positioned a short distance below the upper sand.

After this intermediate cementing job has been accomplished a strain is taken on the casing and such strain is maintained the usual length of time for proper setting of the cement.

Fig. 1 shows the sleeve and casing in position while cement is being pumped to the bottom of the well hole to cement off the lower sand and in Fig. 2 the parts are shown in the positions they occupy while the cement is being pumped through the sleeve to accomplish the intermediate cementing job just below the upper sand.

The form of sleeve illustrated in Figs. 8, 9 and 10 and which is opened and closed by rotary movement imparted to the upper part of the casing, comprises a sleeve 23 that is connected at its upper end to a casing member and screw-seated in the lower end of this sleeve is a collar 24 that encircles a casing member 25.

Formed through the lower portion of the wall of sleeve 23 is a series of openings 26.

Positioned within the sleeve 23 above the collar 24 is a collar 27 that is screw-seated on the upper end of the casing member 25 and formed through the wall of said collar 27 are openings 28 that are adapted to register with openings 26 in sleeve 23.

Openings 30 are formed in casing member 25 and which openings register with the openings 28.

Formed in the upper portion of the periphery of the collar 27 are one or more short horizontally disposed slots 31 into which project pins 32 that are seated in the wall or sleeve 23. These pin and slot connections permit sleeve 23 and collar 27 to rotate relative to each other for a limited distance in order to bring the openings 26 into and out of registration with the openings 28 and 30.

Arranged between the upper end of collar 27 and a shoulder within sleeve 23 and between the lower end of collar 27 and the upper end of collar 27 and the upper end of collar 29 are combined packing and bearing rings 33, preferably of frictionless material. When this form of sleeve is run into the well hole with the casing and before cement is pumped to the bottom of the hole to cement off the bottom sand, the upper part of the casing is rotated so as to move the openings 26 and 30 out of registration and after the bottom cementing job has been completed and it is desired to perform the intermediate cementing job to protect the upper sand, the upper portion of the casing is rotated to bring the openings 26 and 30 into registration as illustrated in Fig. 8 and under such conditions the cement may be pumped out through said openings at the desired point to protect the upper sand.

In the event that there are two intermediate oil bearing formations or sands between the surface of the earth and the lower sand, two intermediate cementing jobs may be accomplished by arranging in the string of casing one of the sleeves of the telescopic type, as illustrated in Figs. 1, 5, 6 and 7, and which sleeve is located in the string so as to occupy a position just below the lower one of the two intermediate sands or oil bearing formations and a sleeve of the rotary type, as illustrated in Figs. 8, 9 and 10 is located in the string so as to occupy a position just below the upper sand or formation when the casing is positioned in the well hole.

Under such conditions the bottom sand is first cemented off in the usual manner after which the telescopic sleeve is opened, as hereinbefore

described, to permit cement to be pumped into the well hole just below the lower one of the intermediate sands or formations and after this intermediate cementing job has been accomplished, the upper portion of the casing is rotated so as to open the ports in the rotary sleeve and permit cement to be pumped into the well hole just below the upper oil bearing formation or sand.

The drawings clearly illustrate the series of operations to which we have just referred. In cementing off the bottom sand, the volume of cement indicated at 50, after having been forced downwardly through the casing past the normally closed cement valve ports 26 and 20, is discharged from the lower end of the casing into the well by pressure transmitted to plug 51 by way of fluid column 52 extending to the top of the casing. The casing is then lowered to bring ports 12 and 20 into registration and, as is shown in Fig. 3, a second volume of cement, indicated at 53, is introduced followed by plug 54, and is forced down the casing and out through ports 12 and 20 into the well by pressure applied to the following fluid column 52a. The lower portion 52b of the fluid column of course remains trapped within the bottom section of the casing below the ports, and sets up a fluid barrier causing the cement to discharge through the ports. The discharge of cement through ports 12 and 20 will continue until plug 54 is forced down to substantially the position illustrated in Fig. 4, wherein the plug is shown to have closed ports 12 and 20 from the inside of the casing, except for whatever small clearance there may be between the plug and casing. The effect of the port closure by the plug will of course be to impose a resistance to further fluid discharge through the ports.

After the volume 53 of cement has been discharged into the well, the top of the casing is rotated to bring ports 26 and 30 of the upper cementing valve into registration, and a third volume 55 of cement, followed by plug 56, is introduced and forced down and out into the well by pressure applied through the fluid column introduced above that plug. During this operation the lower portion 52c (see Fig. 4) of the previous fluid column 52a will remain trapped in the casing between the plug 54 and ports 26 and 30, setting up, as in the case of lower portion 52b of the fluid column, a fluid barrier causing the cement 55 to discharge through the ports. The discharge of cement through the latter will of course continue until plug 56 is forced down within sleeve 23 to a position corresponding to the illustrated position of plug 54 within sleeve 13. It will be noted that throughout each of the intermediate cementing operations, the pressure of the entire fluid column in the casing is maintained on the previously deposited cement at the bottom of the well, the pressure being transmitted from one section of the fluid column to the next via the plugs.

We have previously referred to the advantage afforded by the invention of enabling wells to be cemented at any predetermined points using only a single string of casing in a single diameter bore, without having to use two or more strings of casing of different diameters in as many bores of corresponding diameters. As shown in Figs. 3 and 4, the casing is the same diameter throughout, and the successive cementing operations occur in the same bore, i. e., sections of the bore having the same diameter.

The modified form of sleeve illustrated in Fig. 11, 12 and 13 and which is of the rotary type, comprises an upper sleeve member 34 and a lower sleeve member 35, which latter is enclosed by the lower portion of the upper member 34. These two members are provided respectively with openings 36 and 37 that are adapted to move into and out of registration with each other as the members 34 and 35 are relatively rotated and the rotary movement of the members relative to each other is limited by a hardened metal ball 38 that occupies short horizontally disposed grooves 39 that are formed in the contacting faces of the sleeve members (see Fig. 13).

To retain the sleeve members in assembled relation and at the same time permit the same to rotate freely, coinciding grooves 40 and 41 are formed in the contacting faces of the sleeve members and occupying these grooves are hardened metal balls 42 that are introduced into the grooves through openings formed in the sleeve member 34 and which openings are normally closed by plugs 43.

Thus it will be seen that we have provided an intermediate cementing sleeve for oil well holes that is relatively simple in construction, inexpensive of manufacture and very effective in performing the functions for which it is intended.

The sleeve may be conveniently combined with a string of well casing and the use of the sleeve effects a saving of much time, labor and consequent expense in accomplishing cementing jobs for the protection of the oil bearing formation on sands through which the well hole is drilled.

It will be understood that minor changes in the size, form and construction of the various parts of our improved intermediate cementing sleeve for oil well casing may be made and substituted for those herein shown and described without departing from the spirit of our invention, the scope of which is set forth in the appended claims.

We claim:

1. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by the pressure of the fluid column above it, then opening the port, introducing a second and separate volume of cement above the fluid column, and pumping said column and second cement volume down through and from the casing through said port at the top of a portion of said fluid column remaining in the casing below the port, and into the same bore that said first volume of cement is discharged into.

2. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by the pressure of the fluid column extending above the port, then opening the port, introducing a second and separate volume of cement above said fluid column and pumping an upper portion of said column and the second cement volume down through the casing and out through

said port at the top of a lower portion of the fluid column remaining in the casing below the port, and into the same bore that said first volume of cement is discharged into.

3. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said port, discharging said cement from the lower end of the casing into the well bore by the pressure of the fluid column above it, then opening the port, introducing a second and separate volume of cement into the casing, pumping said second volume downwardly through the casing and out through said port at the top of the fluid column remaining in the casing below the port, and into the same bore that the first mentioned volume of cement is discharged into.

4. The method of cementing casing in a well that includes, lowering into the well a string of casing having a pair of normally closed and vertically spaced discharge ports intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column downwardly within the casing past said ports, discharging said cement from the casing into the well at a substantial distance below the lower port by the pressure of the fluid column above it, then opening the lower port, introducing a second separate volume of cement and a following second fluid column into the casing, pumping said second volume downwardly through the casing and out through the open lower port at the top of the fluid column remaining in the casing below said lower port, then closing the lower port and opening the upper port, introducing a third separate volume of cement into the casing, pumping said third volume downwardly through the casing and out through said upper port at the top of the fluid column remaining in the casing between said ports.

5. The method of cementing casing in a well that includes, lowering into the well a string of casing having a pair of normally closed and vertically spaced discharge ports intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column downwardly within the casing past said ports, discharging said cement from the lower end of the casing into the well at a substantial distance below the lower port by the pressure of the fluid column above it, then opening the lower port by movement of the casing, introducing a second and separate volume of cement and a following second fluid column into the casing, pumping said second volume downwardly through the casing and out through the open lower port at the top of the fluid column remaining in the casing below said lower port, then closing the lower port and opening the upper port by movement of the casing, introducing a third separate volume of cement into the casing, pumping said third volume downwardly through the casing and out through said upper port at the top of the fluid column remaining in the casing between said ports.

6. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a volume of cement, followed by a plug, directly into and downwardly

within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by applying to said plug the pressure of a fluid column above it, opening the port, introducing into and pumping downwardly within the casing a second volume of cement followed by a second plug, discharging said second volume of cement through said port at the top of the fluid column remaining in the casing below the port, and forcing said second plug downward to the depth of said port.

7. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a volume of cement, followed by a plug, directly into and downwardly within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by applying to said plug the pressure of a fluid column above it, opening the port, introducing into and pumping downwardly within the casing a second volume of cement followed by a second plug, discharging said second volume of cement through said port at the top of the fluid column remaining in the casing below the port, and forcing said second plug downward to the depth of said port, the pressure of the entire fluid column in the casing then being transmitted through said plugs to the first discharged volume of cement.

8. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a volume of cement, followed by a plug, directly into and downwardly within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by applying to said plug the pressure of a fluid column above it, opening the port, introducing into and pumping downwardly within the casing a second volume of cement followed by a second plug, discharging said second volume of cement through said port at the top of the fluid column remaining in the casing below the port, and forcing said second plug downward to the point at which it covers said port and thereby imposes a resistance to further fluid discharge therethrough.

9. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing into and pumping directly down through the casing a first volume of cement and a following column of liquid, discharging said cement from the casing into the well bore at a distance below the port, closing the casing below said port and opening said port, introducing a second volume of cement on top the liquid column, and pumping said second cement volume directly down through the casing and out through said open port at the top of the fluid column remaining in the casing below the port, and into the same well bore.

10. The method of cementing well casing in a well that includes, lowering into the well a string of casing having a pair of normally closed and vertically spaced discharge ports intermediate its upper and lower ends, opening the lower one of said ports, introducing and pumping directly down through the casing a volume of cement and a following column of liquid, discharging said ce-

ment from the casing into the well bore through said open port, closing said lower port and opening the upper port, introducing a second volume of cement on top the liquid column, and pumping said second cement volume directly down through the casing and out through said open upper port at the top of the fluid column remaining in the casing below said port, and into the same well bore.

11. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by the pressure of the fluid column above it, then opening the port, introducing a second and separate volume of cement into the casing, pumping said second volume downwardly through the casing and out through said port at the top of the fluid column remaining in the casing below the port, and into the same bore that said first volume of cement is discharged into.

12. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed cement discharge port intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said port, discharging said cement from the casing into the well bore at a substantial distance below said port by the pressure of the fluid column above it, then opening the port, introducing a second and separate volume of cement into the casing, pumping said second volume downwardly through the casing and out through said port at the top of the fluid column remaining in the casing below the port, and into the same bore that said first volume of cement is discharged into, while at the same time maintaining the pressure of the entire fluid column in the casing on the first discharge volume of cement.

13. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed portion intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said normally closed portion, discharging said cement from the casing into the well bore at a substantial distance below said normally closed portion of the casing by the pressure of the fluid column above it, then opening said normally closed portion of the casing, introducing a second and separate volume of cement into the casing, pumping said second volume downwardly through the casing and out through said opened portion at the top of the fluid column in the casing below said portion of the casing and into the same bore that said first volume of cement is discharged into.

14. The method of cementing casing in a well that includes, lowering into the well a string of casing having a normally closed portion intermediate its upper and lower ends, introducing and pumping a first volume of cement and a following fluid column directly into and downwardly within the casing past said normally closed portion, discharging said cement from the casing into the well bore at a substantial distance below said normally closed portion of the casing by the

pressure of the fluid column above it, then opening said normally closed portion of the casing, introducing a second and separate volume of cement above the fluid column, and pumping said column and second volume down through and from the casing through said opened portion at the top of the fluid column in the casing below said portion of the casing and into the same bore that said first volume is discharged into.

15. The method of cementing casing in a well bore, which includes circulating hydraulic fluid through the casing, and while retaining the hydraulic fluid in the casing to a level above that of normally closed ports in the side wall of the casing, opening said ports and closing the bore of the casing below said ports, discharging through the open ports the hydraulic fluid standing in the casing above said ports, and then ejecting cement from the casing through the open ports.

16. The method of cementing casing in a well bore, which includes circulating hydraulic fluid through a string of casing having an open bore which is unrestricted throughout its length, and while retaining the hydraulic fluid in the casing to a level above that of normally closed ports in the side wall of the casing, opening said ports and closing the bore of the casing below said ports, discharging through the open ports the hydraulic fluid standing in the casing above said ports, and then ejecting cement from the casing through the open ports.

17. The method of cementing casing in a well bore, which includes discharging cement at the lower end of the casing by a column of hydraulic fluid retained in the casing in back of the cement and extending above a predetermined higher level at which additional cement is to be subsequently ejected, discharging from the casing at said higher level the hydraulic fluid standing in the casing above said level, and then ejecting cement from the casing at said higher level.

18. The method of cementing casing in a well bore, which includes discharging cement from the casing by a column of hydraulic fluid retained in the casing in back of the cement and extending above a predetermined higher level at which additional cement is to be subsequently ejected, discharging from the casing at said higher level the hydraulic fluid standing in the casing above said level, and then ejecting cement from the casing at said higher level.

19. The method of cementing casing in a well bore, which includes circulating hydraulic fluid through the casing and retaining said hydraulic fluid in the casing to a point above a predetermined level at which cement is to be ejected, discharging from the casing at said level the hydraulic fluid standing in the casing above said level, ejecting cement from the casing at said level by a column of hydraulic fluid retained in the casing in back of said cement and extending above a predetermined higher level at which additional cement is to be subsequently ejected, and then establishing circulation downwardly through the casing and outwardly therethrough at said higher level.

20. The method of cementing casing in a well bore, which includes circulating hydraulic fluid through the casing, and while retaining the hydraulic fluid in the casing to a level above that of normally closed ports in the side wall of the casing, opening said ports and closing the bore of the casing below said ports, and then establishing hydraulic circulation downwardly through

the casing and outwardly through said open ports.

21. The method of cementing casing in a well bore, which includes discharging cement at the lower end of the casing by a column of hydraulic fluid retained in the casing in back of the cement and extending above a predetermined higher level at which additional cement is to be subsequently ejected, and then establishing hydraulic circulation downwardly through the casing and outwardly therethrough at said higher level.
22. In a method of cementing wells, the steps of: lowering a well casing into a well, introducing a volume of cement into the casing, effecting the

cement from the casing into the surrounding well bore, and selectively opening ports in the casing above said point of cement ejection while maintaining the disposition of fluid therebelow.

23. The method of excluding water from a well comprising the steps of: lowering a casing having a pair of normally closed ports into a well bore, and as successive integral operations at each of said ports, selectively opening a port in the casing, introducing cement into the casing, and ejecting the cement from the casing through said opened port.

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