Jan. 11, 1966 E. E. BAKER 3,228,473

CEMENTING COLLAR AND MEANS FOR ACTUATING SAME

Filed Nov. 28, 1962 2 Sheets-Sheet 1

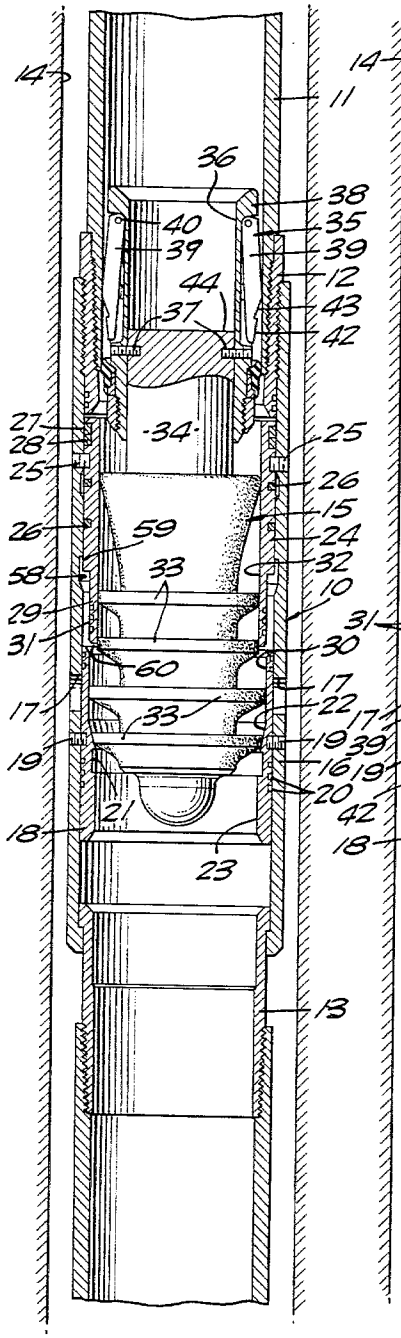


Fig. 1.

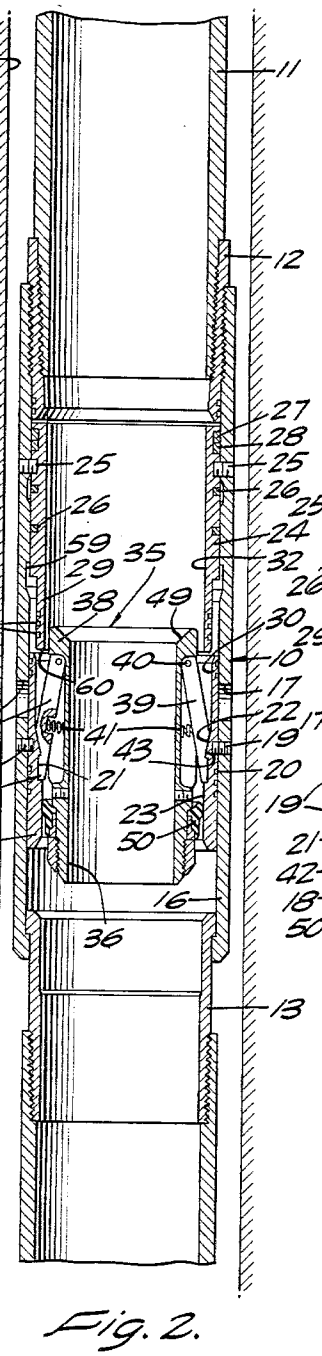


Fig. 2.

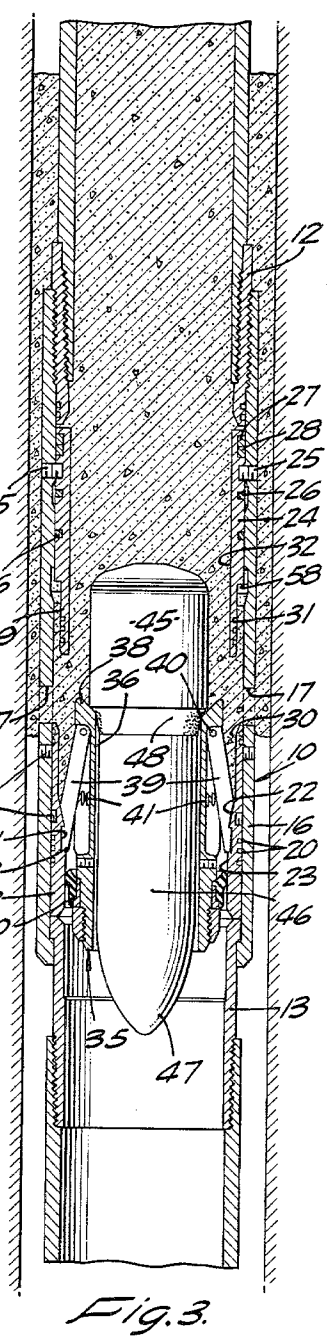


Fig. 3.

INVENTOR.
EUGENE E. BAKER
BY Lyon & Lyon
ATTORNEYS

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CEMENTING COLLAR AND MEANS FOR ACTUATING SAME

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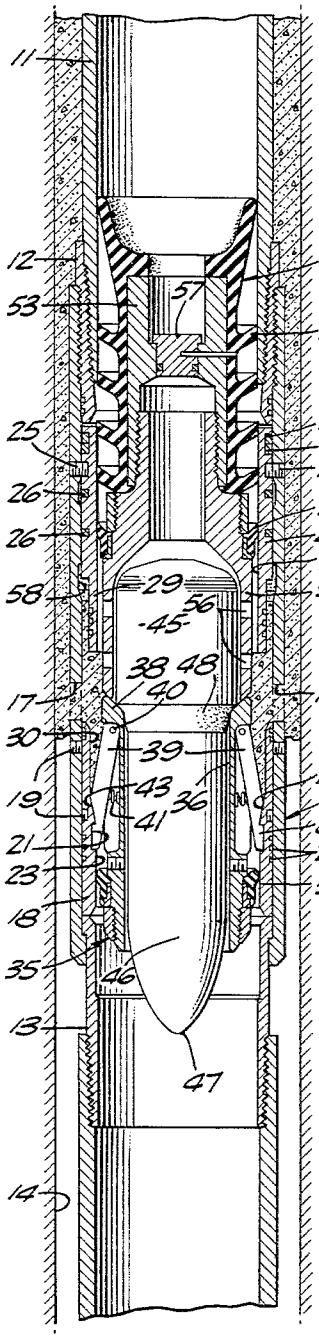


Fig. 4.

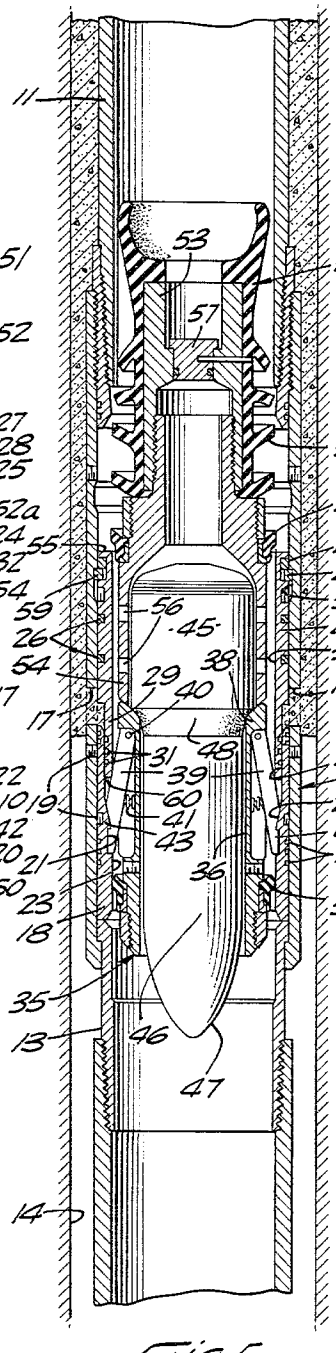


Fig. 5.

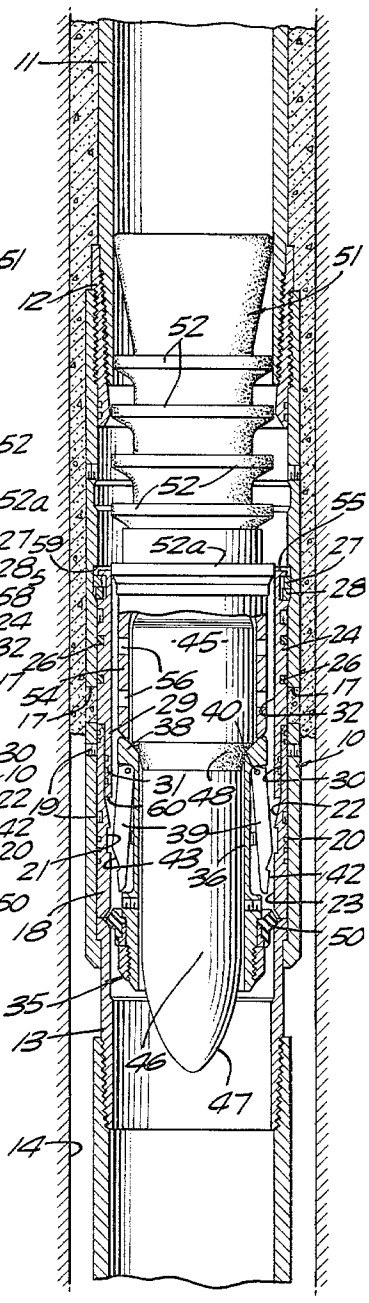


Fig. 6.

INVENTOR.
EUGENE E. BAKER
BY Lyon & Lyon
ATTORNEYS

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3,228,473

CEMENTING COLLAR AND MEANS FOR ACTUATING SAME

Eugene E. Baker, Duncan, Okla., assignor to Halliburton Company, Duncan, Okla., a corporation of Delaware

Filed Nov. 28, 1962, Ser. No. 240,485
11 Claims. (Cl. 166—154)

This invention relates to a cementing collar for use in a string of well casing and actuating means for opening and closing ports in the collar. In particular, this invention is directed to such a collar for use in multiple stage cementing operations of oil wells with the actuating means adapted to be moved down the well casing after performing the actuating functions, thereby eliminating the need for subsequently drilling or milling through these means.

In the drilling and completion of oil or gas wells, it is often desirable to cement a well pipe or casing into the well bore and this is conventionally accomplished by pumping cement slurry down through the casing and out into the annular space between the well bore and the casing. The cement slurry is introduced into the annulus at or near the bottom of the casing, but if the casing is extremely long or the annulus is small the cement bond and fill at the upper or medium portions of the casing may not be entirely satisfactory. Moreover, occasionally it is highly desirable to obtain a particularly good cement fill and bond in the annulus at a selected upper or medium portion of the casing as well as near the bottom of the casing. Thus, it has become customary under these conditions and requirements to perform multiple stage cementing where cement slurry is introduced into the annulus between the casing and the well bore in successive stages at more than one location along the length of the casing.

There are a number of device known as "cementers" or "cementing collars" which may be used for introducing the cement slurry into the annulus from within the well casing at a particular intermediate location along a well casing. These cementing collars are interposed in the string of well casing and have normally closed ports which may be opened for permitting the discharge of cement slurry into the annulus and then permanently closed. These opening and closing steps are generally accomplished by dropping or pumping a pair of plugs, bombs, go-devils or other devices down the well casing to actuate components of the cementing collar. The first device engages a portion of the cementing collar and opens the ports and the second device engages another portion of the cementing collar and closes the ports. These devices are retained in conventional cementing collars and if it is subsequently desired to gain access to the casing below the cementing collar it is first necessary to drill through these retained devices. Since the particular operation which is to be performed below the cementing collar does not always permit the provision of a drill on the end of the string of pipe being lowered into the casing to perform such operation, this drilling must be conducted as a separate preliminary operation requiring a time-consuming round trip with a drill and string of pipe.

When pumping cement slurry down the casing for these cementing operations it is conventional and practical to drop a plug into the casing below the cement slurry and drop a second plug into the casing on top of the cement slurry; these plugs are commonly referred to as "bottom" and "top" plugs, respectively. When multiple stage cementing is carried on the cementing collar must have a large enough minimum internal diameter to permit the top and bottom plugs used in cementing stages carried on below that collar to pass through the collar without actuating the collar. It is highly desirable that the cementing collar have a minimum internal diameter approximately equal to the internal diameter of the casing both before and after the cementing stage is carried on through that collar so that other tools and devices may be lowered through the collar without the collar presenting any greater obstruction than the casing itself.

Accordingly, it is a principal object of this invention to provide a novel form of cementing collar and means for opening and closing same wherein the collar forms no internal obstruction to the string of casing and the actuating means may be released from the collar after completion of that stage of cementing.

Another object of this invention is to provide novel actuating means for use with a cementing collar wherein the actuating means may be released from the cementing collar by the mere application of fluid pressure for the actuating means to be urged through the cementing collar without requiring drilling.

A further object of this invention is to provide novel actuating means adapted to be carried down through a casing on a conventional top plug and be latched in a cementing collar to provide a seat for engaging subsequently used actuating means.

Still another object is to provide a cementing collar for use in a string of well casing wherein the minimum internal diameter of the collar is equal to or greater than the internal diameter of the casing and novel actuating devices are provided for appropriately latching in the cementing collar to accomplish the opening and closing of the ports, and those actuating devices are released from the cementing collar after the ports have been closed.

Other and more detailed objects and advantages of this invention will appear from the following description in the accompanying drawings.

In the drawings:

FIGURE 1 is a sectional elevation of the cementing collar of this invention connected in a string of casing with the ports of the cementing collar closed and a top cementing plug passing into the cementing collar;

FIGURE 2 is a sectional elevation similar to FIGURE 1 with the opening seat of the actuating means latched in the cementing collar and released from the top plug illustrated in FIGURE 1;

FIGURE 3 is a sectional elevation similar to FIGURE 2 with an actuating device having served to open the ports of the cementing collar;

FIGURE 4 is a sectional elevation similar to FIGURE 3 with the other actuating device positioned in the cementing collar prior to closing of the ports;

FIGURE 5 is a sectional elevation view similar to FIGURE 4 with the ports of the cementing collar closed and all of the actuating means of this invention still supported in the cementing collar;

FIGURE 6 is a sectional elevation view similar to FIGURE 5 showing the actuating means of this invention immediately after release from the cementing collar and in the appropriate position for being urged down through the well casing.

Referring now to the drawings the cementing collar, generally designated **10**, of this invention is threaded into a string of casing **11** in a conventional manner through upper and lower threaded connecting subs **12** and **13**, respectively. The string of casing with the cementing collar **10** is lowered into the well bore **14** and positioned at the desired location. One or more cementing stages may be conducted below cementing collar **10** in a conventional manner wherein the cement slurry is pumped down through casing **11**, past collar **10**, and out through a cementing shoe or cementing collar therebelow. In each of

these cementing stages carried on below cementing collar **10**, conventional top and bottom plugs may be used above and below the stages of cement slurry and such plugs are adapted to pass through cementing collar without actuating any of the components thereof. However, the top plug used in the last cementing stage carried on below cementing collar **10**, i.e., the last plug to pass through collar **10** before the cementing stage using collar **10** is started, is of a special type and is generally designated **15** as shown in FIGURE 1. It is to be understood and will readily be apparent to those skilled in the art that a plurality of cementing stages can be carried out below cementing collar **10** by using various types of conventional cementing collars and devices, and cementing collar **10** will remain unactuated in the condition shown in FIGURE 1 until a top plug similar to plug **15** is employed. This is at least in part due to the fact that cementing collar **10** does not have any component of a smaller internal diameter than the internal diameter of casing **11** and therefore conventional plugs or even actuating plugs for conventional types of cementing collars will pass through cementing collar **10** without engaging and actuating same.

The cementing collar **10** is provided with a cylindrical housing **16** having the connecting sub **12** connected to the upper end and the connecting sub **13** connected to the lower end. Housing **16** is provided with a plurality of ports **17** through which the cement slurry will be discharged into the annular space between the wall of the well bore **14** and the well casing **11** to accomplish this stage of cementing. An opening sleeve **18** is positioned inside and in the lower portion of housing **16** but spaced from connecting sub **13**. Opening sleeve **18** is adapted to move longitudinally within housing **16** but is maintained in the position shown by threaded shear pins **19** connecting the opening sleeve **18** to the housing **16**. When opening sleeve **18** is positioned with shear pins **19** in place the ports **17** are covered and annular grooves and O-rings **20** on the exterior of sleeve **18** completely seal ports **17** from the passage of fluid therethrough. Opening sleeve **18** has an annular internal groove **21** with a frustoconical internal surface **22** above groove **21**. The smallest internal diameter of opening sleeve **18** is at surface **23** which is equal to or slightly larger than the internal diameter of casing **11**.

The cementing collar **10** is also provided with a closing sleeve **24** positioned in the upper portion and inside of housing **16**. Closing sleeve **24** is adapted to slide longitudinally within housing **16** and is maintained in the position shown by means of threaded shear pins **25** connecting the sleeve to the housing **16**. Closing sleeve **24** is provided with external annular grooves and O-rings **26** adapted to seal with the internal surface of housing **16**. The upper portion of closing sleeve **24** is provided with a wide external annular groove in which are positioned upper and lower lock rings **27** and **28**, respectively, the function of which will be hereinafter described. Lock rings **27** and **28** are split rings that have been preformed to tend to expand to a diameter larger than the internal diameter of housing **16** and are confined in the positions shown by the internal surface of housing **16**. The lower end of closing sleeve **24** is provided with a reduced diameter external cylindrical portion **29** adapted to closely fit within the upper internal cylindrical surface **30** of opening sleeve **18** for the purposes hereinafter described. Cylindrical portion **29** is provided with annular grooves and O-ring seals **31** for sealing with internal surface **30**. Closing sleeve **24** has an internal cylindrical surface **32** having a diameter equal to or larger than the internal diameter of casing **11**. Thus, it may be seen that the minimum internal diameter of any portion or component of cementing collar **10** is represented by cylindrical surfaces **23** and **32** both of which have equal or larger diameters than the internal diameter of casing **11**.

Referring now more particularly to the construction of special top plug **15**, the plug is broadly comprised of a conventional top plug having a plurality of resilient wiper members **33** mounted on a mandrel **34** with an opening seat assembly, generally designated **35**, mounted on the upper end of mandrel **34** of the plug. The plug **15** may be of numerous conventional designs with the only modification being that opening seat assembly **35** is connected to the upper end of the plug. Opening seat assembly **35** has an internal bore **36** fitting the external surface of mandrel **34** and is connected to mandrel **34** by means of threaded shear pins **37**. The body **38** of assembly **35** is provided with a plurality of longitudinal external recesses in which a plurality of latching keys **39** are pivotally mounted at their upper ends by pins **40**. Latching keys **39** have a substantial length and are biased outwardly by any convenient means such as coil compression springs **41** mounted in recesses within and behind the keys as shown in FIGURE 2.

The profile of the outer surface of latching keys **39** includes a block portion **42** on the lower end with a tapered surface **43** adjacent and above block portion **42**. When the opening seat assembly **35** is positioned within the casing **11** as shown in FIGURE 1, the latching keys **39** are constrained against outward pivoting beyond the position shown due to the internal surface of the casing **11**. With keys **39** constrained to this position the block portion **42** does not engage the internal surface of the casing but rather the outermost portion of tapered surface **43** engages the casing. Thus, as the opening seat assembly **35** passes through a casing collar between two joints of casing, the latching keys **39** may pivot slightly outwardly but the tapered surface **43** will remain in engagement with the internal surface of the casing collar or casing such that the block portion **42** will not latch within the casing collar as might otherwise be possible.

When the top plug **15** reaches collar **10** and the latch keys **39** are adjacent the opening sleeve **18**, the latch keys **39** will expand outwardly due to the compression springs **41**. The configuration of the latch keys **39** and the opening sleeve **18** are such that the block portion **42** of the latch keys mates with and engages the annular groove **21** of the opening sleeve **18**. The frustoconical surface **22** and enlarged internal cylindrical surface **30** permits the latch keys **39** to expand outwardly and the tapered surface **43** to mate with or at least not interfere with surfaces **22** and **30**.

In this manner the opening seat assembly **35** is therefore latched in the position shown in FIGURE 2 against movement in either direction with respect to opening sleeve **18**. The fluid pressure in the casing **11** above cementing collar **10** is then increased and will result in a pressure on the end **44** of the mandrel **34** tending to urge the mandrel of the plug **15** downwardly relative to open seat assembly **35** thereby shearing pins **37** to release mandrel **34** from the opening seat assembly. This permits mandrel **34** and wiper means **33** of the plug **15** to proceed downwardly through the casing **11** and thereby complete the top cementing plug function of plug **15**. The shear pins **19** securing the opening sleeve **18** to the housing **16** have a greater strength than the shear pins **37** securing opening seat assembly **35** to mandrel **34** of the plug **15**. Therefore, pins **37** will shear, as heretofore described, before pins **19** can shear under the imposed fluid pressure and thus opening sleeve **18** remains in its original position closing ports **17** after release of the opening seat assembly **35** from the plug **15**, as shown in FIGURE 2.

When it is desired to conduct the cementing stage through the ports of cementing collar **10**, an actuating device such as bomb **45** is dropped into the casing **11** and is adapted to engage the opening seat assembly **35**. Although a bomb **45** is illustrated and such device drops by gravity through the fluid within casing **11**, it will be readily apparent to those skilled in the art that an ap-

propriately modified conventional bottom plug could be substituted for bomb **45**, spaced an appropriate distance from plug **15**, and pumped down the casing **11** to engage opening seat assembly **35** at the same time that plug **15** reaches the bottommost position of travel within casing **11**. Bomb **45** is provided with a reduced diameter bottom portion **46** and a tapered bottom end **47** to fit into the bore **36** of the opening seat assembly. A resilient sealing means **48** on bomb **45** is adapted to engage a tapered shoulder **49** in the upper end of body **38**. A sealing means **50** is provided on the outside of the lower portion of body **38** for sealing engagement with cylindrical surface **23** of the opening sleeve **18**.

Thus, when bomb **45** engages the opening seat assembly **35** and fluid pressure is applied in the casing **11** thereabove, the fluid pressure will tend to force the bomb **45**, opening seat assembly **35**, and opening sleeve **18** downwardly due to the interengagement of latch keys **39** with the opening sleeve. When sufficient fluid pressure has been applied, the pins **19** will be sheared and the bomb **45**, seat **35**, and sleeve **18** will move downwardly relative to housing **16** to thereby uncover ports **17** as shown in FIGURE 3. This downward movement will be terminated by sleeve **18** engaging connecting sub **13**. It is to be noted that the fluid pressure required to shear pins **19** is greater than the previously applied fluid pressure employed in shearing pins **37**. The cement slurry may then be introduced and discharged through ports **17** into the annular space between well bore **14** and the casing **11**.

As is conventional in cementing operations, when the proper quantity of cement slurry has been introduced into casing **11** to accomplish the desired cement fill in the annulus, a top plug is dropped into the casing **11** on top of the cement slurry and pumped down the casing until the downward travel of the plug is arrested. Turning now to FIGURE 4, the top plug, generally designated **51**, of this invention serves the normal top plug function but also serves additional functions in cementing collar **10**. Top plug **51** is provided with the conventional wiper means **52** adapted to slidably and sealably engage the inside of the casing **11**. Wiper means **52** are mounted on the body **53** of the plug. The lower end of body **53** is comprised of a cylindrical portion **54** adapted to loosely fit over the upper end of bomb **45** and engage the upper end of the body **38** of the opening seat assembly **35**.

Thus, it may be seen that the top plug **51** is supported on the opening seat assembly **35** which is latched to the opening sleeve **18** which is in turn supported from further downward movement by the connecting sub **13**. The fluid pressure is then increased in the casing **11** above cementing collar **10** and this pressure will bleed past some of the wiper means **52** and be applied to the upper annular end **55** of the closing sleeve **24**. The fluid pressure will be prevented from completely bypassing closing sleeve **24** by the lower of wiper means **52** such as the lowermost wiper means **52***a*. When the fluid pressure on end **55** tending to force closing sleeve **24** downwardly reaches a predetermined level the forces will be sufficient to shear pins **25** thereby permitting sleeve **24** to move downwardly within housing **16**. Upon sufficient downward movement the reduced diameter portion **29** of sleeve **24** will enter the internal surface **30** of opening sleeve **18** and a seal will be established therebetween by O-rings **31** to thereby close ports **17**.

When portions **29** first enters internal surface **30** fluid may become trapped between the closing sleeve **24**, opening seat **35**, bomb **45** and top plug **51**. Ports **56** are provided in body **53** and a releasable plug or check valve **57** is provided in the upper end of body **53** to permit this trapped fluid to pass through the top of plug **51**.

As the closing sleeve **24** moves downwardly in response to the pressure on the upper end **55** the sleeve will reach a location as shown in FIGURE 5 where the lower locking ring **28** on the exterior of the sleeve expands outwardly into an internal groove **58** in the housing **16**. Internal groove **58** has a downwardly facing shoulder **59** to engage the lock ring **28** and prevent upwardly movement thereof and thereby prevent upward movement of closing sleeve **24** with respect to housing **16**. In this position the ports **17** are irreversibly closed since there can no longer be axial separation of the opening sleeve **18** and the closing sleeve **24**. Also, in this position the lower end **60** of closing sleeve **24** has not yet engaged the latch keys **39** nor is the downward travel of closing sleeve **24** terminated. Downward movement of closing sleeve **24** will continue even though wiper means **52** and particularly **52***a* have become disengaged from the internal surface **32** of the sleeve since the area of upper end **55** is greater than the area of lower end **60** thereby causing a hydraulic unbalancing tending to force the sleeve **24** downwardly.

Further, downward movement of sleeve **24** from the position shown in FIGURE 5 results in the lower end **60** engaging latch keys **39** to cam the latch keys inwardly thereby releasing the block portions **42** from the annular groove **21** in the opening sleeve **18**. With the latch keys **39** thus released from the opening sleeve **18** the opening seat assembly **35**, bomb **45**, and top plug **51** are completely released from the cementing collar **10** and are therefore free to be urged downwardly through the cementing collar and casing **11** by the application of fluid pressure thereabove or lowering tubing into the casing **11**. When the closing sleeve **24** has nearly reached the lowermost point in its travel, the uppermost locking ring **27** will also expand into the annular groove **58** to assist in preventing the sleeve from thereafter moving upwardly relative to the housing **16**.

Thus, it may be seen that by this invention there is provided a cementing collar that may be opened and closed by actuating devices and that these devices may be urged through the cement collar after completion of the opening and closing procedures without requiring drilling of the actuating devices. Moreover, it may be seen that the collar can have a minimum internal diameter equal to or greater than the internal diameter of the casing both before and after the cementing stage using this collar so that a collar forms no obstruction to the use of various types of tools and devices on the inside of the casing. Furthermore, although a specific type of cementing collar has been described employing an opening sleeve and a closing sleeve which is generally known as a "differential valve cementer," it is to be understood and will readily appear to those skilled in the art that other types and styles of cementing collars and cementers may be used without departing from this invention by making certain minor modifications.

Having fully described my invention it is to be understood that I do not wish to be limited to the details herein set forth nor to the details illustrated in the drawings, but my invention is of the full scope of the appended claims.

I claim:

1. For use with a ported cementing collar in a well pipe, the collar having an opening sleeve provided with an internal groove, the improvement comprising, in combination: an actuator device having a body member for passing through the well pipe to the cementing collar, latch means mounted in said body member, said latch means movable outwardly relative to said body member for engaging the internal groove in the opening sleeve to latch said body member to said opening sleeve, and said latch means having means for preventing latching engagement with the well pipe.

2. For use with a ported cementing collar in a well pipe, the collar having an opening sleeve provided with an internal groove and having a closing sleeve, the improvement comprising, in combination; an actuator device having a body member for passing through the well pipe to the cementing collar, latch means pivotally mounted in said body member, said latch means movable outwardly

relative to said body member for engaging the internal groove in the opening sleeve to latch said body member to said opening sleeve, and said latch means having a cam surface for being engaged by the closing sleeve to move said latch means inwardly for disengaging said body member from the opening sleeve.

3. For use with a ported cementing collar in a well pipe, the collar having an opening sleeve provided with an internal groove and having a closing sleeve, the improvement comprising, in combination: an actuator device having a body member for passing through the well pipe to the cementing collar, latch means pivotally mounted in said body member, said latch means movable outwardly relative to said body member for engaging the internal groove in the opening sleeve to latch said body member to said opening sleeve, said latch means having means for preventing latching engagement with the well pipe, and said latch means having a cam surface for being engaged by the closing sleeve to move said latch means inwardly for disengaging said body member from the opening sleeve.

4. For use with a ported cementing collar in a well pipe, the collar having an opening sleeve provided with an internal groove and having a closing sleeve, the improvement comprising, in combination: an actuator device having a body member for passing through the well pipe, a plurality of longitudinal recesses in the exterior of said body member, a latch key pivotally mounted in each said recess and spring biased outwardly, each said latch key having an outer profile with a portion for engaging the internal groove in the opening sleeve and a separate portion for preventing latching engagement of the key with the well pipe and each said latch key having a cam surface for being engaged by the closing sleeve to pivot said latch keys inwardly out of engagement with the opening sleeve to release said body member from the cementing collar.

5. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having at least one port, an opening sleeve means first positioned for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal groove, a closing sleeve means movable to a position for closing said port after said opening sleeve means has moved to said second position for opening said port, an opening seat means for passing through the well pipe to said collar assembly, said opening seat means having latch means movable outwardly for engaging the said internal groove in said opening sleeve means to latch said opening seat means to said opening sleeve means, means for establishing sealing relation between said opening sleeve means and said opening seat means for applying fluid pressure to move said opening sleeve means to said second position thereof, means for moving said closing sleeve means to the position thereof closing said port, and said closing sleeve means having means for engaging said latch means upon movement to said position for closing said port for moving said latch means inwardly and out of engagement with said internal groove.

6. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having at least one port, an opening sleeve means first positioned for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal grove, a closing sleeve means movable to a final position for closing said port after said opening sleeve means has moved to said second position for opening said port, an opening seat means for passing through the well pipe to said collar assembly, said opening seat means having latch means movable outwardly for engaging the said internal groove in said opening sleeve means to latch said opening seat means to said opening sleeve means, plug means for passing through the well pipe to said collar assembly and engaging said opening seat means to move said opening sleeve means to said second position thereof, means for movable outwardly for engaging the said internal groove thereof, and said closing sleeve means having means for engaging said latch means upon movement to said final position for moving said latch means inwardly and out of engagement with said internal groove.

7. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having at least one port, an opening sleeve means first positioned for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal groove, a closing sleeve means movable to a final position for closing said port after said opening sleeve means has moved to said second position for opening said port, an opening seat means for passing through the well pipe to said collar assembly, said opening seat means having latch means movable outwardly for engaging the said internal groove in said opening sleeve means to latch said opening seat means to said opening sleeve means, plug means for passing through the well pipe to said collar assembly and engaging said opening seat means to move said opening sleeve means to said second position thereof, actuating means for passing through the well pipe to said collar assembly, said actuating means having means for sealing engagement with said closing sleeve means for moving said closing sleeve means to said final position thereof upon application of hydraulic pressure above said actuating means, and said closing sleeve means having means for engaging said latch means upon movement to said final position for moving said latch means inwardly and out of engagement with said internal groove for allowing said opening seat means, plug means and actuating means to pass through the collar assembly.

8. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having at least one port, an opening sleeve means first positioned for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal groove, a closing sleeve means movable to a final position for closing said port after said opening sleeve means has moved to said second position for opening said port, an opening seat means for passing through the well pipe to said collar assembly, said opening seat means having an annular body, latch means pivotally mounted on exterior of said body, said latch means resiliently biased outwardly relative to said body and having means for engaging the said internal groove in said opening sleeve means to latch said opening seat means to said opening sleeve means, plug means for passing through the well pipe to said collar assembly and engaging said opening seat means to move said opening sleeve means to said second position thereof upon the application of hydraulic pressure, actuating means for passing through the well pipe to said collar asesmbly, said actuating means having means for sealing engagement with said closing sleeve means for moving said closing sleeve means to said final position thereof upon application of hydraulic pressure above said actuating means, and said closing sleeve means having means for engaging the exterior of said latch means upon movement to said final position for moving said latch means inwardly relative to said body and out of engagement with said internal groove for allowing said opening means, plug means and actuating means to pass through the collar assembly.

9. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having at least one port, an opening sleeve means first positioned for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal groove, a closing sleeve means movable to a final position for closing said port after said opening sleeve means has moved to said second position for opening said port, an opening seat means for passing through the well pipe to said collar

assembly, said opening seat means having an annular body with external longitudinal recesses, a latch key pivotally mounted in each said recess and spring biased outwardly, each said latch key having an outer profile with a portion for engaging the internal groove in the opening sleeve and a separate portion for preventing latching engagement of the key with the well pipe, the engagement of said latch keys in said internal groove serving to latch said opening seat means to said opening sleeve means, means for establishing sealing relation between said opening sleeve means and said opening seat means to move said opening sleeve means to said second position thereof upon application of fluid pressure thereabove, means for moving said closing sleeve means to said final position thereof upon application of hydraulic pressure thereabove and said closing sleeve means having means for engaging said latch keys upon movement to said final position for moving said latch means inwardly relative to said body and out of engagement with said internal groove.

10. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having a tubular housing with means for attachment to the well pipe, at least one port in said housing, an opening sleeve means first positioned in said housing for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal groove, a closing sleeve means first positioned in said housing and then movable to a second position for closing said port after said opening sleeve means has moved to said second position for opening said port, said opening sleeve means and said closing sleeve means each minimum internal diameters at least as large as the internal diameter of the well pipe, an opening seat means for passing through the well pipe to said collar assembly, said opening seat means having an annular body, latch means mounted in said body, said latch means movable outwardly relative to said body for engaging the said internal groove in said opening sleeve means to latch said opening seat means to said opening sleeve means, plug means for passing through the well pipe to said collar assembly and engaging said opening seat means to move said opening sleeve means to said second position thereof upon the application of hydraulic pressure, actuating means for passing through the well pipe to said collar assembly, said actuating means having means for sealing engagement with said closing sleeve means for moving said closing sleeve means to said second position thereof upon application of hydraulic pressure above said actuating means, and said closing sleeve means having means for engaging said latch means upon movement to said second position for moving said latch means inwardly relative to said body and out of engagement with said internal groove for allowing said opening seat means, plug means and actuating means to pass through the collar assembly.

11. In a cementing collar device for well pipe and means for actuating that device, comprising: a collar assembly having a tubular housing with means for attachment to the well pipe, at least one port in said housing, an opening sleeve means first positioned in said housing for covering said port and movable to a second position for opening said port, said opening sleeve means having an annular internal groove, a closing sleeve means first positioned in said housing and then movable to a second position for closing said port after said opening sleeve means has moved to said second position for opening said port, said opening sleeve means and said closing sleeve means each minimum internal diameters at least as large as the internal diameter of the well pipe, frangile means maintaining said opening sleeve means in said first position, separate frangible means maintaining said closing sleeve means in said first position: an opening seat means for passing through the well pipe to said collar assembly, said opening seat means having an annular body with external longitudinal recesses, a latch key pivotally mounted in each said recess and spring biased outwardly, each said latch key having an outer profile with a portion for engaging the internal groove in the opening sleeve and a separate portion for preventing latching engagement of the key with the well pipe, plug means for passing through the well pipe to said collar assembly and engaging said opening seat means to break said frangible means and move said opening sleeve means to said second position thereof upon the application of hydraulic pressure thereabove, actuating means for passing through the well pipe to said collar assembly, said actuating means having means for sealing engagement with said closing sleeve means for breaking said separate frangible means and moving said closing sleeve means to said second position thereof upon application of hydraulic pressure above said actuating means, and said closing sleeve means having means for engaging said latch means upon movement to said second position for moving said latch means inwardly relative to said body and out of engagement with said internal groove for allowing said opening seat means, plug means and actuating means to pass through the collar assembly.

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CHARLES E. O'CONNELL, *Primary Examiner.*