Dec. 6, 1938. P. G. GATES 2,139,075

BAILER

Filed July 14, 1936

Fig. 1.

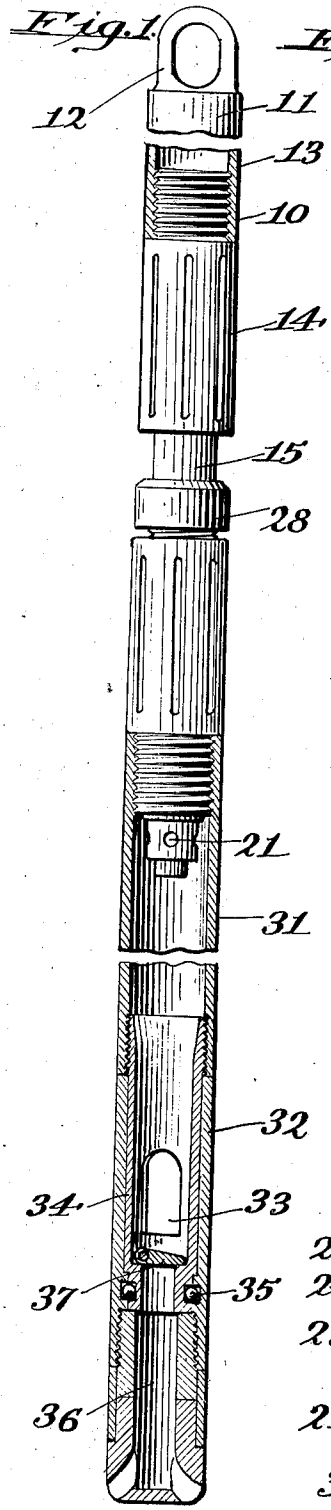


Fig. 2.

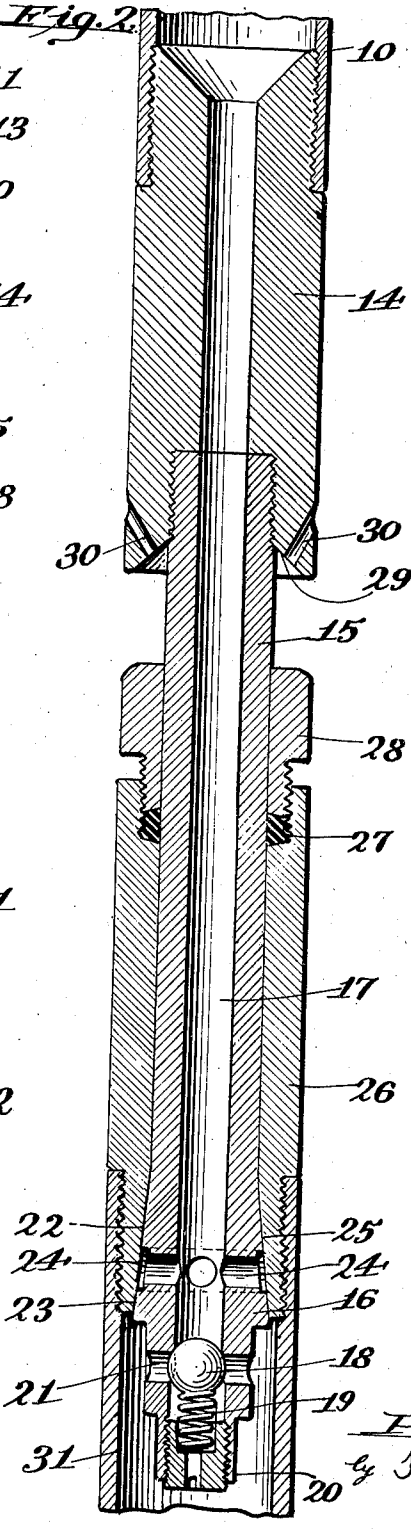
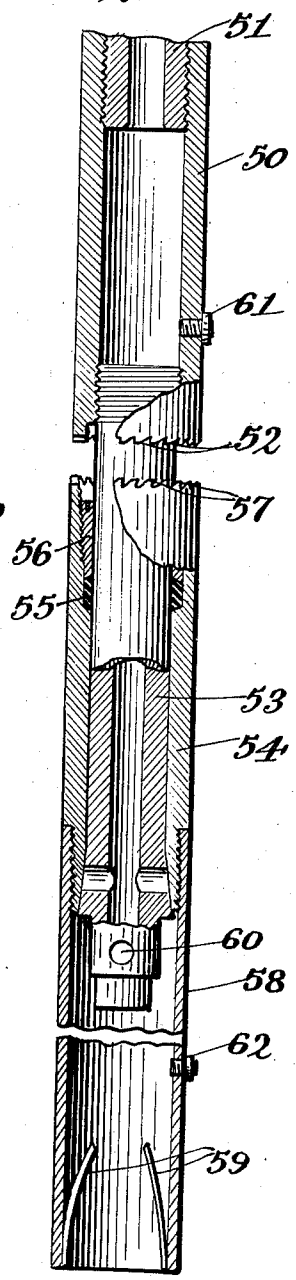


Fig. 3.



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BAILER

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Application July 14, 1936, Serial No. 90,520

16 Claims. (Cl. 166—19)

This invention relates to improvements in bailers and similar devices and may be considered as an improvement over the construction disclosed in my prior Patent No. 2,000,750, issued May 7, 1935, and as an improvement over the construction disclosed in my co-pending application Serial No. 39,131, filed September 4, 1935.

An object of the present invention is to provide a superior "explosion" type bailer and particularly to provide an improved form of valve construction which establishes communication between the lower or entrapping chamber and the top of the bailer when the bailer is landed. The improved form of valve construction is intended to be of very simple yet durable manufacture and of very easy operation. When closed it forms or provides seating surfaces arranged above and below the inlet ports or ingress passages of the valve.

Another object of the invention is to provide an improved "explosion" type bailer consisting of means forming two telescopically connected chambers with the upper chamber-forming means equipped with a structure to act as a drag thereon when the bailer is lowered through circulation fluid in a well or other liquid. By this means the upper chamber-forming means tends to have its downward movement retarded during lowering so that during lowering no telescopic movement between the two chambers takes place which would cause premature explosions.

Another object of the invention is to provide a device for cleaning wells of solid material wherein a drill pipe may be lowered having the essentials of the improved bailer construction attached thereto with the top of the drill pipe being open so that when the valve is opened ingress of fluid may take place directly into the drill pipe, thus causing a prolonged period of inrush of fluid and solids into the entrapping chamber. In this connection a more detailed object of the invention is to provide means in the drill pipe for choking back the rate of inflow so that there will not be too great a disturbance of well conditions when the valve is open.

Another object of the invention is to provide a type of fishing tool which is of such design that the tool may be lowered over a fish in a well and even rotated thereabout, after which the "explosion" is caused to take place which is effective to loosen the fish and insure its being caught by the fishing tool, thus enabling its recovery.

With the foregoing and other objects in view, which will be made manifest in the following detailed description, and specifically pointed out in the appended claims, reference is had to the accompanying drawing for an illustrative embodiment of the invention, wherein:

Fig. 1 is a sectional view through the improved bailer embodying the present improvements.

Fig. 2 is an enlarged vertical section illustrating the valve employed, the valve being shown in its closed or seated position.

Fig. 3 is a partial view in vertical section illustrating the invention as having been embodied in a fishing tool.

Referring to the accompanying drawing, wherein similar reference characters designate similar parts throughout, and particularly to Figs. 1 and 2, the improved bailer comprises an upper chamber-forming means which may be provided by one or more sections of pipe indicated at **10**. The upper end is closed by a suitable closure indicated at **11** which may provide a bail **12** by which the bailer may be lowered into a well through the circulation fluid therein. It will be appreciated, however, that the improved tool is not necessarily restricted in its use to bailing wells but may be used under any analogous conditions, such as for example, obtaining test samples from ocean bottoms.

The bottom of the upper chamber, indicated at **13**, is formed by a tubular member **14** into which is screwed a hollow stem **15**. The hollow stem **15** is provided at its lower end with an upwardly tapering head **16**. The bore **17** through the stem has its lower end normally closed by a ball check valve **18** urged into uppermost and closed position by a spring **19** seated within a plug **20**. When the ball check valve **18** is opened, egress from bore **17** is afforded thereby through laterally extending ports **21**. The tapered head **16** forms or provides upper and lower seating surfaces **22** and **23** arranged above and below the laterally directed ports **24**. In other words, the ports **24** which provide for ingress to bore **17** terminate intermediate the top and bottom of the tapered seating surface of head **16**. This head forms a type of valve adapted to seat upon the tapered interior seating surface **25** of a tubular member **26**. Packing **27**, which is compressed by a gland or nut **28** around stem **15**, serves to prevent leakage between stem **15** and tubular member **26**. The tubular member **14** has a coned bottom **29** and upwardly and outwardly extending passages **30**. The tubular member **26** forms a part of a lower chamber defining means, the balance of which is formed by one or more sections of pipe **31**, to which is con-

nected a bailer bottom **32** having ports **33** which can be opened or closed by means of a sleeve **34** having similar ports that can be moved into or out of registration with ports **33** upon rotation of the sleeve. The sleeve is retained on the bailer bottom in such a manner as to be rotatable by means of a series of balls **35**. Races for the balls are formed of the interior of the sleeve and on the exterior of the bailer bottom. The balls are inserted through a small aperture, not shown, which is formed in the sleeve and which is subsequently plugged up to prevent the escape of the balls. The body of the bailer bottom has a vertical central passage **36** formed therein which is normally closed by a downwardly closing entrapping valve **37**.

The operation and advantages of the improved bailer are as follows:

When the bailer is lowered into a well the lower chamber-forming means assumes the lowermost telescoping position so as to be suspended by stem **15** with the seating surfaces on head **16** and tubular member **26** in seating engagement. In this position, as shown in Fig. 2, the entrances to the ports **24** are closed and are effectively sealed by virtue of the seating surfaces arranged above and below ports **24**. With this valve construction closed air in the upper chamber is confined therein at approximately atmospheric pressure. When the bailer lands at the bottom of the well so that the lower chamber-forming means has its downward movement arrested and therefore moves upwardly with relation to stem **15** and the upper chamber-forming means, head **16** is unseated, with the result that the external or hydrostatic pressure of the liquid into which the bailer is lowered causes the liquid to suddenly enter the bailer bottom past the entrapping valve and into the upper chamber through ports **24**. The air in the upper chamber which prevents the opening of the valve when at approximately atmospheric pressure compresses highly, allowing this inrush to take place. The sudden inrush of the liquid into the bailer causes debris and other matter to be effectively sucked into the lower entrapping chamber past the entrapping valve and thus become entrapped therein. The bailer may then be withdrawn from the well and upon lifting the bailer the valve provided by head **16** again closes. When it has been recovered, upon rotating sleeve **34** to align its ports with ports **33**, the contents of the entrapping chamber may be discharged. Valve **18** permits the upper chamber to be emptied thereon without requiring the bailer to be set down on the derrick floor. In other words, while the bailer remains suspended, sleeve **34** may be rotated to open the lower chamber on which an emptying or reduction of pressure in the upper chamber takes place by the escape of pressure past check valve **18**.

The purpose of passages **30** is to prevent the upper chamber from dropping with respect to the lower chamber while the bailer is being lowered into a well. The coned bottom surface **29** and passages **30** enable the fluid through which the bailer is being lowered to pass through these passages and the friction developed in so doing acts somewhat as a drag on the upper chamber with the result that the upper chamber has its downward movement retarded. It will therefore not telescope relatively to the lower chamber during the lowering nor cause the bailer to be prematurely set off before it is actually landed.

On Fig. 3 I have illustrated the invention as having been incorporated in a type of fishing tool. In the preferred form of construction **50** designates the drill pipe by which the construction is lowered into the well. Incorporated in the drill pipe at a suitable distance above the tool there is a balance sub **51** through which is formed a relatively small opening, such as for example, ½ or ¾ inch in diameter. This sub may be located in the drill pipe as much as a thousand feet or more above the tool proper. The bottom of the drill pipe is toothed as indicated at **52**, the teeth preferably having flat points. The hollow stem **53** corresponds in its construction to stem **15** and its upper end is threaded into the bottom of the drill pipe. Tubular member **54** corresponds to tubular member **26** and has a packing **55** compressed by nut **56** around stem **53**. The top of tubular member **54** is toothed as at **57** to mesh with teeth **52**. A string of drill pipe **58** is attached to tubular member **54** and this string may be of any suitable or preferred length. The top of drill pipe **50** is open so that prior to the opening of the valve afforded by the head on the hollow stem **53** the pressure within the drill pipe above the valve may be substantially atmospheric pressure. Incorporated in the lower string of drill pipe **58** there may be any conventional form of fishing tool and I have illustrated, for example, inwardly extending springs **59** adapted to be caused to engage beneath the collar or tool joint on a lost string of drill pipe. In this form of construction the device is lowered into the well by drill pipe **50** and the drill pipe and tubular member are held spaced from each other by the insertion of a small wooden wedge, not shown, between teeth **52** and **57**. The string of drill pipe **58** may be lowered over a lost string or fish and rotated, if desired.

In rotation if any resistance is encountered the wooden wedge inserted between teeth **52** and **57** is ground up or mashed up until the teeth engage. This enables the locking of tubular member **54** with drill pipe **50**. Also, when the teeth mesh the downward movement of drill pipe **50** with respect to tubular member **54** opens the valve provided by the tapered head on stem **53**, causing the fluid in the well around the fish to rush up into the drill pipe **58** through the valve and into drill pipe **50**. Drill pipe **50** being dry and having its internal pressure substantially atmospheric allows a prolonged rush of fluid and solids into the fishing tool. This will effectively free the fish so that it may be recovered.

It will be understood that the bottom stem **53** is equipped with a check valve corresponding to check valve **18** and lateral passages indicated at **60** which may correspond to passages **21**. This check valve in this form of construction, as well as in the construction illustrated in Figs. 1 and 2, may serve to partially release the pressure entrapped above the valve while at the bottom of the well when the construction is withdrawn. In the form shown in Fig. 3, as the construction is withdrawn from the well pressure inside of the drill pipe, when it becomes in excess of the external hydrostatic pressure, may be partially equalized by means of this valve. As an additional means for bleeding the drill pipe during withdrawal, or as an alternative form of construction drill pipe **50** may be equipped with an outwardly opening check valve **61**. If desired, the lower drill pipe section **58** may be equipped with a similar outwardly opening check valve **62**. The latter check valve is designed to partially equalize or release pressure during with-

drawal and may come into important use in the event that sand settles around the top of the fish supported within springs **59** closing the bottom of drill pipe **58** in such a manner as to entrap the high pressure at the bottom of the well therein.

The purpose of the blank sub with the small aperture therein is to allow the air in drill pipe **50** to flow quite freely therethrough but when the liquid or mud in the well encounters the sub continued upward flow is materially retarded. In this way by choking back upward flow through the drill pipe, which is prolonged, the well conditions will not be so suddenly and materially disturbed as to cause cave-ins when the valve is open; also the danger of blowouts due to the sudden surge of fluid into the drill pipe will be reduced.

From the above described constructions it will be appreciated that the improved bailer is of very simple design and manufacture and because of its simplicity it is quite durable, having a smooth and highly efficient operation.

Various changes may be made in the details of construction without departing from the spirit or scope of the invention as defined by the appended claims.

I claim:

1. A device of the character described, comprising means providing an upper chamber adapted to be lowered into fluid in a well or other liquid and adapted to confine air or a compressible fluid at approximately atmospheric pressure, said upper chamber-forming means having a downwardly extending hollow stem provided with a tapered head, a lower chamber-forming means telescopically mounted upon said stem carrying means adapted to seat or seal upon said head, said stem and head having passages therethrough terminating on the sides of the head between the top and bottom of the tapered surface thereof whereby seating or sealing surfaces are provided above and below the entrances to the passages.

2. A device of the character described, comprising means providing an upper chamber adapted to be lowered into fluid in a well or other liquid and adapted to confine air or a compressible fluid at approximately atmospheric pressure, a stem secured to the upper chamber-forming means having a head, means providing a lower chamber telescopically mounted upon said stem and presenting seating surfaces adapted to seat upon said head, there being inlet ports formed in the head terminating upon tapered sides thereof and adapted to be closed by said seating surfaces.

3. A device of the character described, comprising means providing an upper chamber adapted to be lowered into fluid in a well or other liquid and adapted to confine air or a compressible fluid at approximately atmospheric pressure, means providing a lower chamber telescopically connected to the upper chamber-forming means, means providing a valve adapted to be opened by upward movement of the lower chamber-forming means relative to the upper chamber-forming means, said upper chamber-forming means having passages through its walls whereby fluid on passing therethrough when the device is lowered may by the friction developed retard downward movement of the upper chamber-forming means.

4. A device of the character described, comprising means providing an upper chamber, a headed stem connected to the upper chamber-forming means, means providing a lower chamber telescopically mounted upon said stem, there being passages through the stem adapted to be closed when the lower chamber-forming means is in its lowermost position with respect to the upper chamber-forming means, and means for locking the upper and lower chamber-forming means against relative rotation when the upper chamber-forming means is in its lowermost position and ingress is afforded to the upper chamber-forming means.

5. A device of the character described, comprising a string of drill pipe having an open top, a stem secured to the bottom of the string of drill pipe, a head on the stem, a lower tubular member telescopically mounted upon the stem above the head, there being passages through the stem adapted to be closed by the tubular member when the tubular member is in its lowermost position, and teeth on the drill pipe and tubular member adapted to engage to lock the tubular member against rotation relatively to the drill pipe.

6. A device of the character described, comprising a string of drill pipe having an open top, a stem secured to the bottom of the string of drill pipe, a head on the stem, a lower tubular member telescopically mounted upon the stem above the head, there being passages through the stem adapted to be closed by the tubular member when the tubular member is in its lowermost position, and teeth on the drill pipe and tubular member adapted to engage to lock the tubular member against rotation relatively to the drill pipe, and means in the drill pipe above the stem forming a restricted passage for retarding upward flow through the drill pipe when passages in the stem are open.

7. A device of the character described, comprising means forming an upper chamber, means forming a lower chamber telescopically connected thereto, a valve adapted to be opened upon relative telescopic movement of the lower chamber-forming means, and means providing a bleeder valve in the lower chamber-forming means below said valve.

8. In a bailer, means defining an upper air chamber having a hollow stem extending downwardly therefrom, a lower entrapping chamber telescopically mounted upon said stem, a tapered head on the bottom of the stem, there being a complementary tapered seating surface on the entrapping chamber forming means engageable with said head, there being one or more laterally directed ports in the head terminating opposite said seating surface when the head is in engagement therewith.

9. A valve for bailers and the like comprising a hollow stem adapted to form a part of an upper air chamber, a tubular member telescopically mounted thereon adapted to form a part of a lower chamber, there being a tapered head on the stem engageable with a tapered seat on the bottom of the tubular part, there being one or more entrances or ports in the head terminating on its tapered surface between the top and bottom thereof so that when the head is engaging the seat said ports will be disposed opposite said seat between the top and bottom thereof whereby seals are formed above and below said ports.

10. A valve for bailers and the like, comprising a hollow stem having an upward taper near its bottom, there being one or more ports formed in the stem communicating with the hollow interior thereof and terminating upon said taper, a sleeve

slidable upon said stem presenting a seating surface complementary to said taper.

11. In a fishing tool, means defining an upper air chamber having a hollow stem extending downwardly therefrom, a lower entrapping chamber telescopically mounted upon said stem, a tapered head on the bottom of the stem, there being a complementary tapered seating surface on the entrapping chamber-forming means engageable with said head, there being one or more laterally directed ports in the head terminating opposite said seating surface when the head is in engagement therewith.

12. A valve for fishing tools and the like comprising a hollow stem adapted to form a part of an upper air chamber, a tubular member telescopically mounted thereon adapted to form a part of a lower chamber, there being a tapered head on the stem engageable with a tapered seat on the tubular part, there being one or more entrances or ports in the head terminating on its tapered surface between the top and bottom thereof so that when the head is engaging the seat said ports will be disposed opposite said seat between the top and bottom thereof whereby seals are formed above and below said ports.

13. In a bailer or fishing tool, means defining an upper air chamber having a hollow stem extending downwardly therefrom, a lower entrapping chamber telescopically mounted upon said stem, a tapered head on the bottom of the stem, there being a complementary tapered seating surface on the entrapping chamber-forming means engageable with said head, there being one or more laterally directed ports in the head terminating opposite said seating surface when the head is in engagement therewith.

14. A valve for bailers, fishing tools, and the like comprising a hollow stem adapted to form a part of an upper air chamber, a tubular member telescopically mounted thereon adapted to form a part of a lower chamber, there being a tapered head on the stem engageable with a tapered seat on the bottom of the tubular part, there being one or more entrances or ports in the head terminating on its tapered surface between the top and bottom thereof so that when the head is engaging the seat said ports will be disposed opposite said seat between the top and bottom thereof whereby seals are formed above and below said ports.

15. A valve for suction bailers, fishing tools, and the like, having a hollow stem the exterior of which is upwardly and inwardly tapered, there being one or more lateral ports in the stem communicating with the hollow interior thereof and terminating on said taper between the top and bottom thereof.

16. In a device of the character described, a hollow upper member for preserving reduced pressure, a hollow stem extending downwardly therefrom, means defining a lower chamber telescopically mounted thereon, a head on the stem for maintaining the lower chamber-forming means thereon, there being provision made for opening the upper member to the lower chamber through the stem when the lower chamber-forming means is telescoped upwardly on the stem, and means including interengageable teeth formed on the upper member and the lower chamber-forming means for preventing the lower chamber-forming means from telescoping upwardly upon the stem until desired.

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