My invention relates to improvements in well bailers of the pressure type for cleanout purposes, operable by any usual suspension means, which are usually constructed with a closed top provided with a relief valve, a casing with the upper part of its annular space converted into a pressure chamber, and a valve below the pressure chamber, and attached next below, a casing having a bailer bottom valve of conventional type, the valve between the chambers operating to prevent fluid in the well bore from entering the empty chamber of the bailer casing containing atmospheric pressure until obstructing matter of a solid or semisolid nature is contacted by the bailer shoe, with consequent opening of said valve; and to load through action of the fluid static pressure within the bore of the well, and to discharge the load at the surface under pressure.

The general object of my invention is to provide an effective means for permitting the bailer to descend through the fluid rapidly under adverse conditions, quick and certain loading of the bailer from the sand, shale, gravel, or similar obstructions; to trap same within the casing; to withdraw same from the well, and to rapidly and effectively discharge the material at the surface by means of pressure trapped in the bailer and brought up from the well bottom.

One other object is to provide a pressure bailer having the facility of bailing wells having a relatively low fluid head pressure, as well as those having a high fluid head pressure. Effectiveness in both types of wells is essential to general utility.

A further object is to provide an efficient bailer having as few adjustments as possible that require the operator’s attention, and to provide a fast operating well tool with a reciprocating sleeve valve between the pressure chamber and the loading chamber, having means of adjusting itself to wells having both high and low fluid levels; a bailer that can be lowered at high speed through the well fluid without danger of opening the valve and communicating the well pressure to the pressure chamber before bottom is encountered, is a primary object. The rapid discharge of the loaded bailer, the closing of the pressure chamber valve and opening the valve for relief of loading chamber alternately for a repeat operation by merely suspending the bailer, are important objects.

A still further object is to provide the necessary parts, viz., a top and relief valve, a sleeve valve for isolating a chamber, and a bailer bottom valve which combined with the usual pump casing sections on hand at the well to be bailed, an efficient cleanout pressure bailer may be quickly assembled; the valves also being adaptable to special bailer casings.

Further objects appear herein.

Fig. I is a longitudinal sectional view of applicant’s bailer. Fig. II is an enlarged longitudinal sectional view of the valve between the upper or low pressure chamber and the lower or load chamber of applicant’s device. Fig. III is a section taken on section III—III of Fig. II. Fig. IV shows a dump key for use in unloading the bailer. Fig. V is a longitudinal sectional view of another embodiment of my invention. Fig. VI shows an enlarged sectional view of the valve between the upper and lower chambers of the embodiment shown in Fig. V. Fig. VII shows a section taken on section VII—VII of Fig. VI.

Fig. I shows the combination having a closed top with a relief valve and swivel for cable connection, numerals 1—11, inclusive, and operable by means of a cable and holt (not shown), the top and swivel being threadedly connected to casing 12. The combined top and swivel is provided with a relief valve comprising a helical spring 6—A, a ball valve 11 under a set screw 7, and disc 8, said set screw threaded for regulating pressure, and a seat for the ball valve 11. The seat is threadedly attached into an opening at 10. The swivel comprises a ball 1 with a head 6 and rod 4, housed in shell 2, said shell being provided with openings 3 and 5 for fluid circulation. The head 6 cooperating with openings 3 and 5, has free longitudinal movement and swiveling effect to compensate for torque in wire cables when connected to especially larger sizes of bailers. The shell 2 is cast in two pieces and welded together. Set screw 7 for adjustment of pressure is accessible by special wrench through opening 5. Pressure outlet for relief is shown at 8. The helical spring 6—A provides for predetermined reserve pressure on valve ball 11 operating to retain well pressure in chamber 12 for purposes shown herein. A reciprocating sleeve valve, Fig. II, having concentric outer and inner cylindrical elements is attached by any usual means (preferably threaded) to the bottom of pressure chamber casing 12 at 13, and to the top of loading casing 21. The detail of construction of the reciprocating sleeve valve is shown in Fig. II and Fig. III, the valve comprising an outer cylindrical element 17 connected to loading casing 27 and an inner cylindrical element 14 connected to...

OIL WELL BAILER
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pressure chamber casing 12. Longitudinal movement of element 14 within element 17 is limited by circumferential abutments on element 14 and an external circumferential flange 14-A on element 16 intermediate the ends of element 14. On the lowermost end portion of element 14 an inner valve member 19 with valve ports 22 therein is formed. The limited reciprocal movement of element 16 within element 17 is adapted to reciprocally alternately open and close ports 16 in element 17 see Fig. II, as flange 14-A fits snugly yet slidably within element 17 to act as a closure for ports 16. An intermediate sleeve valve member 46 is mounted within outer cylindrical element 17 below port 16 and inner cylindrical element 14 is slidably mounted within the intermediate sleeve valve member. Ports 23 in the inner valve member on the lowermost end portion of element 14 are adapted to register with ports 26 in the intermediate sleeve valve member when inner-cylindrical element 14 is telescoped within outer cylinder member 17 and when the valve ports 16 and 17 are in extended position valve ports 23 are closed being moved into the upper imperforated portion of intermediate valve member 46. There are four ports 23 in valve member 19 and four ports 26-28 in intermediate sleeve valve member 46.

The valve parts 14 and 17 are telescoped together under the weight of the pressure casing and top attached by any usual means to the valve element 14 to register ports 23 and 26, the inner-valve element 14 being attached to move downwardly within the intermediate sleeve valve member 45 when the shoe 28 on the bottom of ball valve engages sand or other material of solid nature while lowering the ball. Ports 23 and 25 are held in alignment by means of a key 20 and cooperating key-way 18 on the elements 14 and 17, respectively. A set screw 37 engages through element 17 into port 26 in sleeve 45 to hold the sleeve against rotation. Intermediate valve member 45 engages packing gasket 21 and the downwardly facing abutment formed in element 17 at one end thereof. The lower end of member 45 rests on the upper end of casing 21. Casing 21 is threaded into element 17 and threaded upwardly to firmly engage and hold the sleeve 45 within element 17. The intermediate inner valve member 45 is constructed of bronze or stainless steel to prevent corrosion and to permit renewal, and is provided with four longitudinal conduits one being 31-A to permit passage of fluid from load chamber. Intermediate member 45 has a vertical fluid passage 22-A communicating its lower end with port 26 and opening outwardly at the upper end 28 through a shallow channel in the upper face of the intermediate valve member.

To communicate with port 16 in the outer cylinder element 17, the upper portion of fluid passage 22-A is enlarged and in this enlarged portion is a ball valve seat at the lower end thereof. Ball valve 43 is adapted to rest on the valve seat and the helical spring 44 above the ball valve urges the ball valve into closed position preventing downward flow of fluid through passage 22-A. When the main valve 14-17 is closed fluid may pass upwardly through passage 22-A and out downwardly through port 16 to take care of excessive pressure within the loading chamber. When valve member 14 is moved downwardly to open the valve 14-17 flange 14-A closes port 16 to prevent any fluid flow through passage 22-A.

Downward movement of flange 14-A formed on element 14 closes the passage while ball is lowering. The lower end of element 14 is closed by side inner valve member 19, is provided with solid type packing rings 29 and 22. Packing ring 30 is followed by close fitting metal sleeve 23-A, having four ports adapted to align with the four ports formed in the inside inner valve member 19 so that pin 40-A, a packing ring 22 follows 23-A, and a close fitting metal sleeve 40 follows packing ring 22. The metal sleeve 40 extends slightly past the lowermost part of 10 to permit adjustment. A metal disc 40 with opening for stud, following 24 and a stud with retaining nut 24, screwed into lowermost part of 19 cooperating with slot and pin 40-A, provide an adjustment for the packings. When the valve in operation contacts fluid while descending in a well, the action of the fluid pressure against the disc 43, urges both metal sleeves and two packing rings upwardly, operating to tighten both packing rings automatically against the inside wall of intermediate valve member 45 and the outer surface of the inside inner valve member 18, insuring no slippage of fluid into the sleeve 45 casing, while submergence is taking place. As the baller emerges from the fluid, the confined high pressure in the pressure chamber acts to distend the packings 22 and 23 from the four ports one being numbered 23, reserving the pressure in the pressure chamber, the urged packing rings having the same packing effect between the members 45 and 19 as in submergence.

A baller bottom valve is threadedly attached to casing 21. The valve comprises a shoe 26 with sleeve 28 threaded therein and having an opening 31-A in one side. Shoe 26 has an opening 31 adapted to register with opening 31-A in the sleeve 26. Removable combined partition and seat 32 is seated within shoe 25 and carries flap valve 33 for retaining the load in the loading chamber. Openings are adapted to register by manually operated means by rotating the sleeve 28 relative to the baller shoe 26 until opening 31-A is in alignment with opening 31 which is shown in a peripheral view at Fig. 1. When the shoe is attached to Fig. 1 into an oil well having fluid head with, the pressure chamber casing section of the baller closed to exclude fluid by means of its closed top with relief valve, and the reciprocating sleeve valve in its closed position, the baller has a buoyancy whereby it is buoyant in the well fluid. The loading chamber section of the casing attached to the lowermost end of the reciprocating sleeve valve has provision for free passage of fluid upwardly through the one-way bottom baller valve, 25-44, inclusive, through casing 21, through 27, 22-A and into the well, as the baller passes downwardly, thereby retaining the reciprocating sleeve valve elements relatively extended with inner valve member ports closed, to prevent fluid from entering the pressure chamber. The arrested downward movement of loading casing 27 under weight of pressure chamber casing 12 results in a sudden telescopic movement downward of element 14 with consequent registry of ports 23 with 26, in the intermediate valve member and closing of opening 40-A, thereby communicating the well pressure through the registered valve ports into the pressure chamber casing 12, causing a dynamic influx of sand, shale, and fluid through the one-way bottom baller valve and into the section of the loading casing to be trapped by the bottom baller valve.
A major portion of the air compressed in the uppermost of casing 12 if fluid pressure is sufficient for loading at one impact will be discharged into the well through relief valve 11, permitting increased influx of the bailed material into the loading chamber. When the baller is elevated for a repeat impact should the fluid pressure be low or for withdrawal from the well, the telescopic elements in the reciprocating sleeve valve are relatively extended by means of the suspended weight of loading casing casing 27 and either the well pressure is trapped within the pressure chamber casing 12 or the low pressure is retained for successive impacts by means of the closed ports in the inner valve members of the reciprocating sleeve valve. After loading, if an excessive well pressure be trapped in the loading chamber casing 27 the pressure is permitted to escape while emerging from the well fluid through open long 22—a and 16. The baller, with the desired retained ejecting pressure or equalized pressure in the pressure chamber 12, and the material in the loading chamber casing 27 trapped by the baller valve, is withdrawn from the well for discharge in the usual manner. The bottom baller valve withdrawn from the well mouth is opened by manual rotation on a dump key and the retained pressure in the casing 12 becomes effective through the opened valve ports of the supported baller in the loading chamber below with consequent ejection of the baller material.

Fig. V shows a sectional side view of a modified embodiment employing my invention, comprising a closed baller top 48 having means for cable attachment, provided with a usual ball relief valve 53, said top being threadedly connected, substantially air-tight to the uppermost end of pressure chamber casing 55. To the lowest end of casing 55 is attached by any usual means, a modified construction of the reciprocating sleeve valve shown at Fig. VI, to the bottom of which is attached a loading chamber casing 76 with a one-way conventional baller bottom valve connected to the lowest end of said casing, numerals 56—64, inclusive, Fig. V. The reciprocating sleeve valve shown in Fig. VI, comprises concentric tubular members 51 and 63 concentrically located and adapted for limited longitudinal movement. A flanged center—57—A formed on 57, is adapted to move between circumferential abutments at 60 and 65 on the outer telescopic element 63, one being on the lower end of the containing nut 59. The reciprocating sleeve valve is shown in a relatively extended position with inner valve ports closed. The elements are adapted to register ports formed in 57—B, to form an inner valve member 68, 65, and 66, with ports in 65—A of element 65 to form a cooperating intermediate valve member, numerals 71, 72, and 74. The ports are held in alignment by means of a key-way in the flange 57—A formed on element 57, key 61 and co-operating key-way in wall of 63. The cylindrical Inner sleeve valve is concentrically located, the inside sleeve valve member 57—B being integrally attached or formed on the lowest end of element 57, and its cooperating intermediate valve member 53—A with ports 68, 69, and 56, being formed on lowest end portion of element 57—B is closed at its lowest end at 88, by any usual means, or preferably formed solid. The intermediate valve member 63—A is open at its lowest end. The partition formed within element 65 having outer conduits 73, 87, and 75 by attaching the threaded loading casing 18 to the valve is provided with openings 67 and 64. The purpose of said openings are to form a valve to reciprocally open and close, cooperating with inner sleeve valve members having ports as shown. In order to prevent corrosion from saline elements in the well fluid, the outer valve element 63—A formed thereon is constructed of stainless steel, and should have a close sliding fit with inner valve member 57—B, fluid-tight, and said inner valve member provided with bakelite or other composition compression packing rings 86 and 78, to prevent any slippage of fluid into pressure chamber while under pressure.

The modified baller shown in Fig. V, is lowered into the well by means of cable or other means (not shown) until the material to be balled is contacted. When the baller encounters the fluid head in descending into the well bore, passage for fluid is permitted through the one-way bottom baller valve, and the bailing loading casing 18, and through openings 67 and 64, into the well, in which cavity is permitted by hole 59, through fluid head adding momentum and velocity to the empty pressure chamber, preventing the telescopic contraction and opening of the reciprocating sleeve valve portions in the inner sleeve valve members before sand, shale, or other material to be bailed is encountered. The fluid pressure against the closed head 88 acts also to prevent telescoping of the telescopic elements before the arrest of shoe 82. The packing rings 66 and 70 carried on inner valve member 57 by means of fluid pressure, applied to one edge and the inner sleeve valve members before sand, shale, or other material to be bailed is encountered. In emerging, the rings distend by pressure in the pressure chamber through the ports and operate to hold the pressure in the chamber. The momentum of the loading chamber with the free passage of fluid accelerates the momentum of the empty pressure chamber carried above. When the material of obstruction at 60 and 65 is cleared, the telescopic elements of the modified reciprocating sleeve valve are relatively telescoped and the ports 58, 69, and 65, register with ports 71, 72, 57 and 74, closing openings 64 and 66 permitting a dynamic ingress of fluid from the loading chamber into the pressure chamber, with consequent loading under pressure of the loading chamber from the sand, shale, or other obstruction. When the baller is elevated for a second impact should the fluid be low or to be withdrawn from the well, the reciprocating sleeve valve inner ports are closed by the suspended weight of the loading casing, the high or low pressure is reserved in the pressure chamber, but the pressure is released from the loading casing through openings 64 and 67 when the baller is emerging, the ports are essential to loading, the remainder of the empty pressure chamber is reserved, until the pressure breaks under the bottom shoe of the baller to complete the loading operation. The bottom baller valve on reaching the surface is permitted to rest on any suitable holding down 7 usually a rod (not shown) passed through openings 83 and 84 with the ends of the rod held securely, while the sleeve 73 is rotated to register ports with 78—A. The pressure from the pressure chamber casing 85 of the supported baller is
subsequently communicated downwardly through the loading chamber through registered ports in the inner valve members, the downward movement of $3$ reciprocally closing port openings $44$ and $51$ and permitting no escape of the air or gas contained in the baller through said openings. This causes the quick ejection of the matter in the loading chamber of the baller, if pressure is sufficient, in the same manner of operation explained pertaining to Figure I the first embodiment.

Figure II shows a sectional side view of the reciprocating sleeve' valve which is best adapted to the operation of the larger diametrical sizes of the baller illustrated in Figure I in which embodiment I prefer to construct the reciprocating sleeve valve with an interchangeable sleeve valve. In another embodiment shown in Figure VI, the reciprocating sleeve valve is employed above the loading chamber and below the pressure chamber of a pressure baller, same as shown at Figure I. The type of construction of the reciprocating sleeve valve shown at Figure VI has the advantage of more readily loading and unloading through the inner member ports of the reciprocating sleeve valve when constructed in the smaller diametrical sizes, and may be constructed of stainless steel in smaller and more efficient diametrical sizes to correspond to many well bores.

In both constructions of the reciprocating sleeve valve, its performance is similar, whether operated by a cable (not shown) or other means.

The present invention may take other forms of constructions, but the constructions herein presented with the appended claims, are only embodiments, therefore, I do not wish to be restricted in the practice of my invention as applied to well clean-out tools, or limited in the claims thereof.

What I claim is:

1. In a pressure baller for bailing oil wells, an upper or pressure chamber and a lower or loading chamber connected together by a telescopic sleeve valve comprising inner and outer tubular elements slidably connected together for limited longitudinal movement to open or close the valve, a tubular partition fixedly mounted in the outer element at a point intermediate its ends and snugly mounting the side port in the partition opening inwardly thereof at a point intermediate its ends and opening downwardly into the loading chamber, a side port in the outer element above the partition, a flange on the inner element above the partition, an abutment on the upper end of the outer element limiting upward movement of the inner element as the flange engages the abutment, cooperating means on the inner and outer elements permitting relative longitudinal movement but preventing relative rotative movement of the valve elements operable to align the side ports in the partition and the inner element to open the valve when the elements are telescoped, an auxiliary longitudinal passage in the partition and communicating the loading chamber with the outer element above the partition, a spring pressed up wardly opening valve in the auxiliary passage, the flange on the inner element closing the side port in the outer element when the valve is telescoped to communicate between the upper and lower chambers.

2. In a pressure baller for bailing oil wells, an upper or pressure chamber and a lower or loading chamber, connected by a telescopic sleeve valve comprising inner and outer tubular elements slidably connected together for limited longitudinal movement to open or close the valve, said elements having ports in each adapted to register, said inner element connected to and communicating with the pressure chamber above the valve and extending downwardly and snugly fitting within the ported partition in said outer element communicating to the load chamber, said inner element provided with packing means carried on the lowermost end thereof, comprising solid packing rings associated with metal sleeves, said packing rings being mounted above and below the ports and spaced by means of a metal sleeve having corresponding ports and means to prevent relatively rotative movement of said metal sleeve on the inner element and slidably mounted thereon, fixedly held between a flanged shoulder and a cooperating nut and washer, and operating so that when the baller is exposed to well fluid pressure the packing means are pressed upwardly relative to said inner element, and the imperforate cylindrical wall of said outer element to form a seal between the pressure and loading chambers.

3. In a pressure baller for bailing oil wells, an upper or pressure chamber and a lower or loading chamber connected together by a telescopic sleeve valve comprising inner and outer tubular elements slidably connected together for limited longitudinal movement to open or close the valve, a tubular partition fixedly mounted in the outer element at a point intermediate its ends and snugly mounting the side port in the partition opening inwardly thereof at a point intermediate its ends and opening downwardly into the loading chamber, a side port in the outer element above the partition, an abutment on the upper end of the outer element limiting upward movement of the inner element as the flange engages the abutment, cooperating means on the inner and outer elements permitting relative longitudinal movement but preventing relative rotative movement of the valve elements operable to align the side ports in the partition and the inner element to open the valve when the elements are telescoped, an auxiliary longitudinal passage in the partition spaced from the main bore thereof and communicating the load chamber with the outer element above the partition, a downwardly and upwardly opening valve in the auxiliary passage, the flange on the inner element opening and closing the passage in the outer element partition alternately when the valve is reciprocated to establish and break communication between the upper and lower chambers.

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