

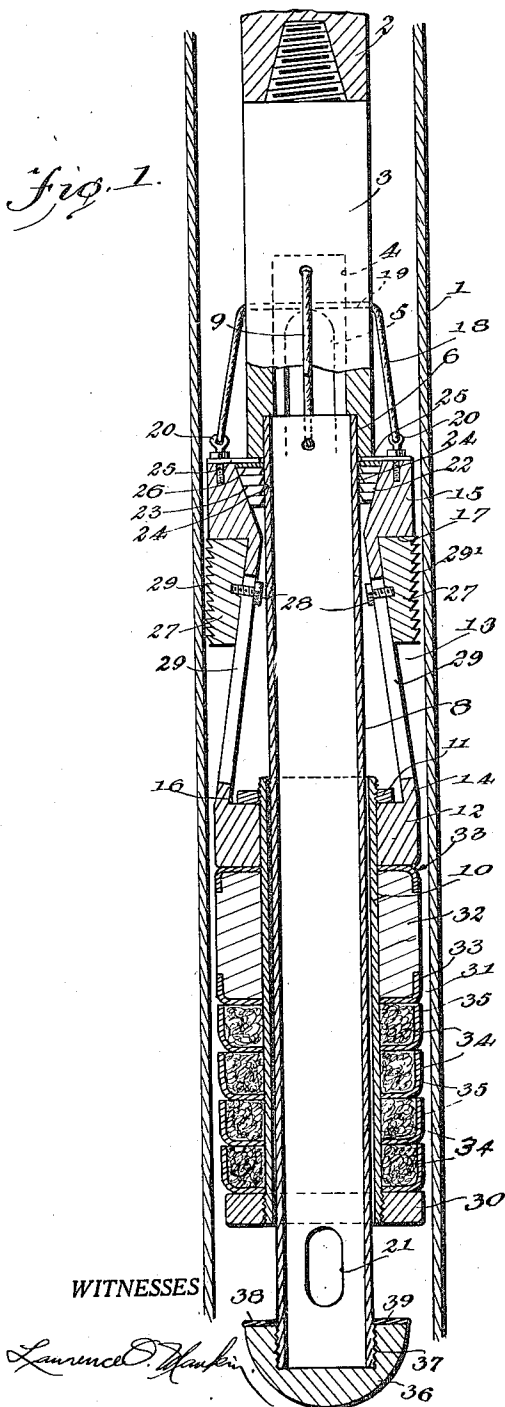
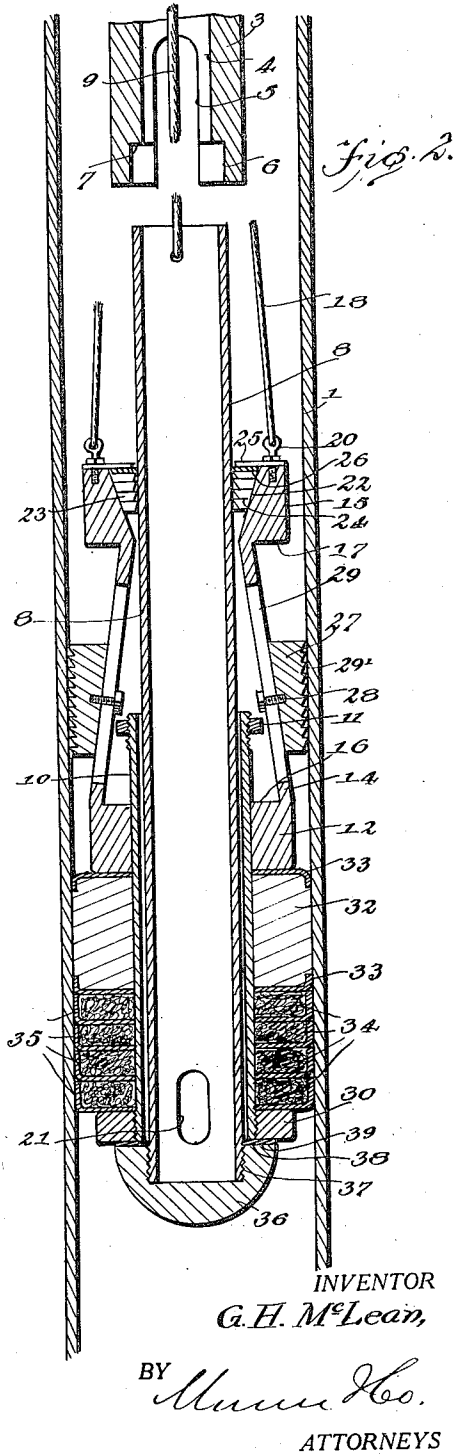
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WELL STOPPER

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UNITED STATES PATENT OFFICE.

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WELL STOPPER.

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To all whom it may concern:

Be it known that I, GEORGE H. McLEAN, a citizen of the United States, and resident of Tampico, Province of Tamp's, Mexico, have invented certain new and useful Improvements in Well Stoppers, of which the following is a specification.

My invention relates to improvements in well stoppers, and consists in the combinations, constructions and arrangements hereinafter described and claimed.

An object of the present invention is to provide a well stopper or plug which is adapted to be lowered in a well bore to a desirable position and which includes means adapted to be first manipulated by a connection extending to the upper end of the well bore to cause the stopper to engage with the well bore in such manner as to be releasably held against movement along the well bore without preventing the passage of fluid therethrough and to be further manipulated at any desired time to engage with the well bore in such a manner as to completely close the well bore and be permanently held against movement along the latter.

A further object of the invention is to provide a well stopper of the character described which comprises relatively few parts and which is thoroughly effective for the purpose intended.

Other objects and advantages will be apparent from the following description, considered in conjunction with the accompanying drawings, in which—

Figure 1 is a vertical section through a well bore having a well stopper embodying the invention disposed therein with the closure body in non-closing position in respect to the well bore, and

Figure 2 is a view similar to Figure 1, showing the closure body in fully expanded or bore-closing position.

Referring now to the drawings, 1 designates a well bore and 2 is an elongated stem or suspension element which is adapted to be lowered into the well bore. The stem or suspension element has its lower portion or section 3 provided with an axial socket 4 in its lower end, the space within the socket being in open communication with the space surrounding the stem portion 3 through vertically elongated ports 5 at the

lower end of the stem section 3. The socket 4 is counterbored at 6 at the lower end of the stem, thereby defining an annular shoulder 7 which is intersected by the ports 5 and is located below the level of the upper end of the latter.

A tubular body or barrel 8 is adapted at its upper end to interfit the counterbore 6 and is held in abutting relation to the shoulder 7 by a frangible suspension cable 9 by means of which the barrel 8 is suspended from the stem 2. A sleeve 10 which slidably overfits the barrel 8 and is considerably shorter than the latter is threadedly engaged adjacent to its upper end by a nut 11 resting upon an annular lower head portion 12 of a suspension frame 13 which surrounds the upper portion of the barrel 8, whereby the sleeve 10 will be supported in position to depend through the annular lower head 12. The suspension frame 13 includes in addition to the annular lower head 12 a substantially frusto-conical intermediate portion 14 which is integral at its lower end with the outer edge portion of the lower head 12 and is integral at its upper end with the inner edge portion of an annular upper head 15 which encircles the barrel 8. With the organization just described, the annular internal shoulder 16 upon which the nut 11 rests as hereinbefore described is defined at the juncture of the lower head 12 and the intermediate portion 14 and an annular external shoulder 17 is defined at the juncture of the intermediate portion 14 and the upper head 15. The suspension frame 13 is suspended from the stem 2 through the agency of a frangible suspension element 18 which extends through a transverse bore 19 in the lower end portion 3 of the stem and is attached at its ends to screw eyes 20 which are threadedly engaged with sockets in the upper face of the upper head 15. The length of the frangible suspension element 18 is such that the suspension frame 13 will be supported with the upper end thereof lying in a horizontal plane substantially coincident with the plane of the lower end of the stem 2 and the lower end of the sleeve 10 will be positioned above a lateral port 21 in the barrel 8 adjacent to the lower end of the latter.

The inner wall of the annular upper head

15 increases in diameter from its lower to its upper end as indicated at 22, thus producing an inclined seat or guide surface on which wedge-shaped locking dogs or slide blocks 23 may slide downwardly and inwardly into engagement with the outer wall of the barrel 8. The locking dogs or slide blocks 23 have the inner faces thereof provided with upwardly inclined teeth 24 and are pressed downwardly continuously by spring fingers 25 secured on the upper end of the head 15 by the screw eyes 20 and having inwardly extending end portions resting upon a washer 26 which in turn is supported upon the upper ends of the locking dogs or slide blocks 23 and to which pressure is transmitted from the spring members 25 to the locking dogs. The latter thus are held continuously in engagement with the barrel 8 for a purpose to be hereinafter described.

Wedge-shaped slide blocks or locking dogs 27 are held against the outer wall of the frusto-conical intermediate portion 14 by headed pins or screws 28 which extend through vertical guide slots 29 in the intermediate portion 14. The pins or screws 28 are adapted to slide along the guide slots 29 so that the slide blocks 27 may move upwardly and inwardly into abutting relation to the shoulder 17 as illustrated in Figure 1 or downwardly and outwardly into engagement with the inner wall of the well bore, as illustrated in Figure 2. The slide blocks 27 have upwardly directed teeth 29 on their outer faces.

A stop 30 which may be a nut threadedly engaged with the sleeve 10 adjacent to the lower end of the latter supports a laterally expansible closure body designated generally at 31 which is annular in form and is adapted to be disposed on the sleeve 10 between the lower head 12 and the nut 30. The laterally expansible closure body 31 preferably comprises an upper ring section 32 made of a compressible elastic material such as rubber, reinforced and confined at and adjacent to its upper and lower ends by thin caps 33 made of a soft readily bendable material, such as lead. The expansible closure 31 also includes a plurality of superposed ring sections 34 arranged between the section 32 and the nut 30 and each comprising an annular body made of a compressible and preferably cementitious mixture, such as oakum, cotton or lead wool mixed with cement. Each section 34 is reinforced and confined at its lower end and at its outer wall by a lead cap 35.

A lifter head 36 is carried at the lower end of the barrel 8 and closes the latter, the lifter head preferably being hemispherical in shape and being provided with a central socket 37 in the flat face thereof threadedly engaged with the barrel 8 so that an

annular shoulder extending outwardly from the barrel is defined at 38 and upon this annular shoulder is disposed a gasket 39.

From the foregoing description of the various parts of the device, the operation thereof may be readily understood. The stem 2 with the well stopper attached thereto in the manner described is lowered into the well bore to a desired position in the latter. The curved face of the lifter head 36 is lowermost and therefore very little resistance is interposed to the passage of oil, water or other fluid upwardly about the lifter head through the port 21 into the barrel 8. Thence, the fluid passes through the port 5 into the space between the stem 2 and the well bore and is free to pass upwardly in the latter. When the stopper has been lowered to a desired position in the well bore, an upward pull on the stem will result in the locking dogs 27 being cammed downwardly and outwardly in respect to the suspension frame 13 until the teeth 29 bite into the wall of the well bore. The suspension frame 13 will then be held against upward movement in the bore and continuation of the pull will result in the breaking of the frangible suspension element 9. Continuation of the upward pull then will result in the barrel 8 moving upwardly in the bore relatively to the suspension frame. The portion of the barrel 8 provided with the port 21 will be received within the sleeve 10 and the gasket 39 will be compressed between the lifter head 36 and the nut 30, thereby preventing the passage of fluid from the space below the lifter head into the barrel 8. Further upward movement of the stem after the lifter head 36 is in engagement with the nut 30 will cause the sleeve 10 to be lifted bodily in the direction of its length, thereby compressing the sections of the expansible closure body 31 and expanding such closure body radially until the closure tightly interfits the bore as illustrated in Figure 2. The teeth 24 of the slide blocks 23 will engage with the barrel 8 to prevent downward movement of the latter relatively to the suspension frame 13 and the frangible suspension element 9 will break when the resistance offered by the expanded closure is sufficient to overcome the strength of such suspension element. The stem 2 may then be withdrawn bodily from the well bore and the latter will be closed against the passage of fluid therethrough from the space below the stopper to the space above the stopper. The cementitious material entering into the composition of the closure section 34 will set when the latter are in expanded position and the stopper thus will be permanently secured in position within the well bore.

Obviously, my invention is susceptible of embodiment in forms other than that illus-

trated in the accompanying drawings, and I therefore consider as my own all modifications and adaptations of the form of the device herein disclosed which fairly fall within the scope of the appended claims.

Having thus described the invention, what is claimed is: —

1. A well stopper comprising an annular suspension frame adapted to be lowered in a well bore, locking means carried by the suspension frame for engaging the wall of the bore to hold the frame against upward movement in the bore, an elongated radially expandible closure carried at the lower end of the suspension frame, means extending vertically through the closure and the suspension frame whereby the closure may be expanded radially, and frangible means connecting said suspension frame with said closure expanding means and normally preventing operation of the latter.

2. A well stopper comprising an annular suspension frame adapted to be lowered in a well bore, locking means carried by the suspension frame for engaging the wall of the bore to hold the frame against upward movement in the bore, an elongated radially expandible closure carried at the lower end of the suspension frame, means extending vertically through the closure and the suspension frame whereby the closure may be expanded radially, a frangible element for suspending the suspension frame from a stem depending in the well bore, a second frangible element having greater strength than the first frangible element for suspending said closure expanding means from said stem, and locking means arranged between said suspension frame and said closure expanding means for holding the latter against downward movement relatively to the suspension frame while permitting upward movement of the closure expanding means relatively to the suspension frame.

3. In a well stopper, an annular suspension frame, a barrel depending through said suspension frame, a vertically compressible radially expandible closure body carried by the suspension frame in encircling relation to the barrel adjacent to the lower end of the latter, said barrel having a lateral port in the portion thereof depending below said closure body, a lifter head at the lower end of the barrel, and frangible suspension elements for respectively connecting said suspension frame and said barrel with a source of lifting power and being adapted to break under stress in the order named, means carried by the suspension frame for engaging with the wall of the well bore to hold the suspension frame

against upward movement in the well bore, and means arranged between the suspension frame and the barrel for holding the latter against downward movement relatively to the suspension element and for permitting upward movement of the barrel relatively to the suspension frame.

4. In a well stopper, an annular suspension frame, a barrel depending through said suspension frame, a vertically compressible radially expandible closure body carried by the suspension frame in encircling relation to the barrel adjacent to the lower end of the latter, said barrel having a lateral port in the portion thereof depending below said closure body, a lifter head at the lower end of the barrel, frangible suspension elements for respectively connecting said suspension frame and said barrel with a source of lifting power and being adapted to break under stress in the order named, means carried by the suspension frame for engaging with the wall of the well bore to hold the suspension frame against upward movement in the well bore, means arranged between the suspension frame and the barrel for holding the latter against downward movement relatively to the suspension element and for permitting upward movement of the barrel relatively to the suspension frame, and means carried by the lifter head on the barrel for sealing the joint between the lower end of the barrel and the closure when the barrel is in lifted position.

5. In a well stopper, an annular suspension element adapted to be lowered in a well bore and to be held against upward movement in the well bore, a sleeve supported upon the suspension frame to depend below the lower end of the latter, said sleeve being movable upward, a stop at the lower end of the sleeve, a vertically compressible radially expandible annular body encircling the sleeve and extending between the stop and the lower end of the suspension frame, a barrel depending through the suspension frame, and through the sleeve, said barrel being mounted to slide in the direction of its length independently of the suspension frame, said barrel having a lateral port in the depending end portion thereof, means for preventing downward movement of the barrel relatively to the suspension frame, and a head at the lower end of the barrel closing the lower end of the barrel and for engaging with the lower end of the sleeve upon a determined upward movement of the barrel to close the lower end of the sleeve and to cause upward compression and radial expansion of the closure.

GEORGE HENRY McLEAN.