

Nov. 7, 1933.

L. S. HAMER

1,933,903

FLOW BEAN

Filed July 24, 1930

2 Sheets-Sheet 1

Fig. 1.

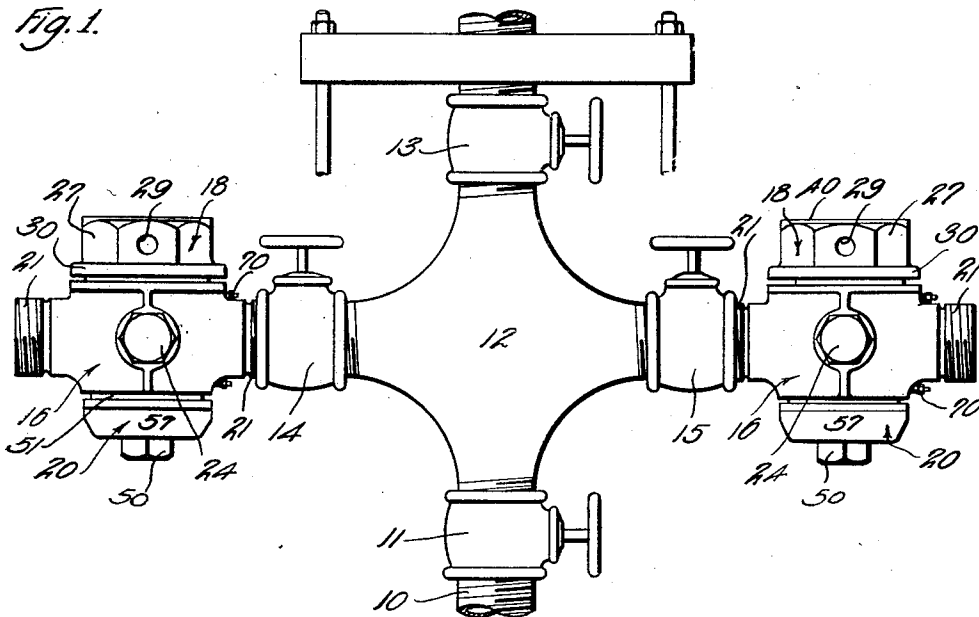


Fig. 2.

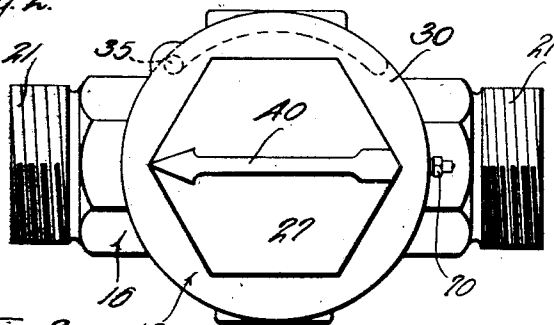


Fig. 3.

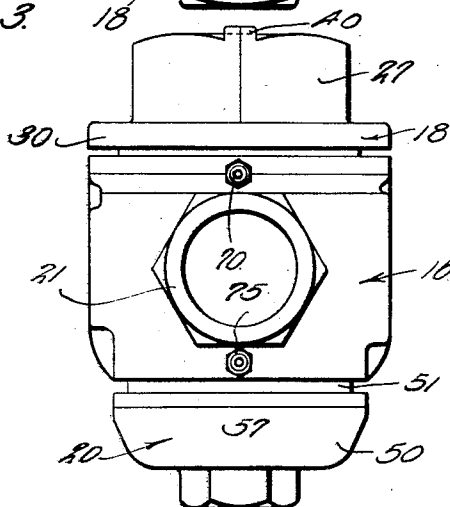
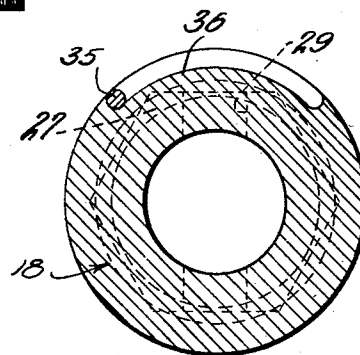


Fig. 6.



Inventor
LELAND S. HAMER
By *Ni. Hildwell*
This Attorney

Nov. 7, 1933.

L. S. HAMER

1,933,903

FLOW BEAN

Filed July 24, 1930

2 Sheets-Sheet 2

Fig. 4.

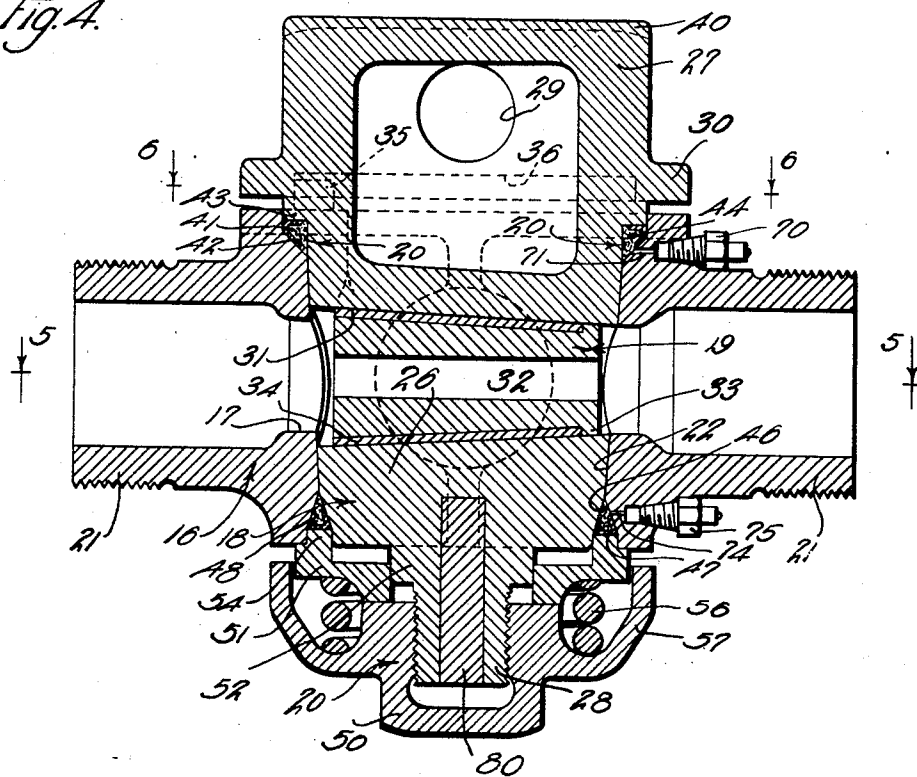
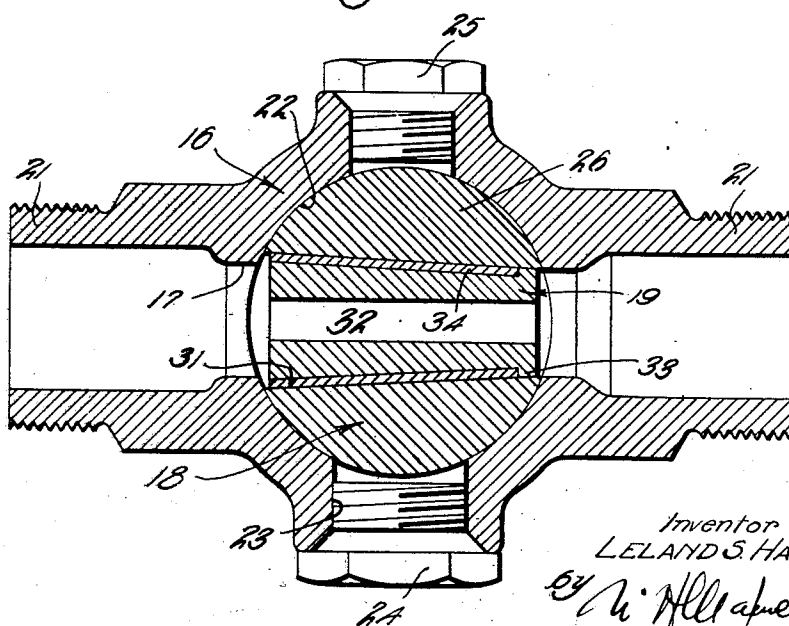


Fig. 5.



Inventor
LELAND S. HAMER
By *W. H. H. H. H.*
His Attorney

UNITED STATES PATENT OFFICE

1,933,903

FLOW BEAN

Leland S. Hamer, Long Beach, Calif.

Application July 24, 1930. Serial No. 470,405

12 Claims. (Cl. 251-91)

This invention relates to a device for controlling the flow of fluid, and relates more particularly to a flow bean for controlling the flow of a well.

5 The oil flowing from wells producing from natural causes is usually under comparatively high pressures, making it necessary to control or regulate the flow. Devices commonly known as "flow beans" are employed to control or restrict the rate of flow of wells. The oil flowing from wells under high pressures usually carries with it sand which rapidly cuts out and enlarges the bores or passages of the usual types of flow beans, making it necessary to replace them after short periods of use.

It is a general object of the present invention to provide a simple, practical, and effective flow bean or flow nipple for controlling the flow of fluid from an oil well, or the like.

20 Another object of the invention is to provide a flow bean in which the nipple for reducing the rate of flow of the fluid may be quickly and easily removed for replacement.

It is another object of the invention to provide a flow bean in which the nipple for controlling or reducing the rate of flow may be quickly and easily replaced without removing the device from the line and without disconnecting or disturbing other equipment on the well.

30 It is another object of the invention to provide a flow bean of the character mentioned that is adapted to handle extremely high pressures without leaking.

35 A further object of the invention is to provide a flow bean in which the flow controlling nipple directly subjected to the abrasive action of the fluid and the sand in the fluid is of simple formation and is inexpensive of manufacture.

40 It is another object of the invention to provide a flow bean that may be simultaneously operated to cut off the flow of fluid and to operate the flow controlling nipple to a position for removal in a single operation.

45 Another object of the invention is to provide a flow bean that embodies a carrier for the flow nipple that is rotatably carried in a body, so that the nipple is shiftable to a position for replacement and to provide a means for effectively sealing around the carrier.

50 It is a further object of the invention to provide a flow bean that is dependable in operation and that is inexpensive of manufacture.

Other objects and features of my invention will be best and more fully understood from the following detailed description of a typical form and

application of the invention, throughout which description reference is had to the accompanying drawings, in which:

Fig. 1 is a side elevation of a typical arrangement of fittings or valves at the upper end of a well casing illustrating two of the flow beans provided by the present invention in connection therewith. Fig. 2 is a top or plan view of the flow bean provided by this invention. Fig. 3 is an end view of the device. Fig. 4 is an enlarged vertical detailed sectional view of the flow bean illustrating it in the open position. Fig. 5 is a transverse or horizontal detailed sectional view taken as indicated by line 5-5 on Fig. 4, and Fig. 6 is a reduced horizontal detailed sectional view taken as indicated by line 6-6 on Fig. 4.

In Fig. 1 of the drawings I have illustrated an arrangement of conduits, valves, and other fittings for mounting at the upper end of a well casing, which arrangement may be considered typical of constructions provided on producing oil wells. Devices or arrangements of the general character illustrated in Fig. 1 of the drawings are generally termed "Christmas trees". The Christmas tree shown in the drawings includes the upper end portion of a well cap or head 10, a gate valve 11 connected with the upper end of the head 10, a cross fitting 12 above the gate valve 11, a valve 13 on the upper arm of the fitting 12, a valve 14 on one of the side or horizontal arms of the fitting 12, a valve 15 on the other horizontal arm of the fitting, and various other parts common to arrangements of this character.

The device or flow bean provided by the present invention is intended primarily to be mounted in or connected with a conduit for passing oil from a producing well. For the purpose of facilitating an understanding of the invention the flow bean will be described as connected with the valve 14. In Fig. 1 of the drawings I have illustrated two flow beans provided by this invention, one being connected with the valve 14 and the other being connected with the valve 15. The device provided by this invention is adapted to be employed wherever it is desirable to control the flow of fluid under high pressures. It is to be understood that the invention is not to be taken as limited to the particular form or application about to be described, but that it is to be taken as including any features that may fall within the scope of the claims.

The flow bean provided by the present invention includes, generally, a body 16 having a fluid passage 17, a core or plug 18 carried by the body 16, a flow nipple 19 removably carried by the

plug 18 and adapted to restrict the flow of fluid through the passage 17, and means 20 for sealing around the plug 18 to prevent the leakage of fluid from between the body 16 and the plug 18.

5 The body 16 is adapted to be mounted in or connected with a conduit at the upper end of a well. For example, it is adapted to be connected with the valve 14 on the fitting 12. The body 16 may be similar, generally, to the body of a typical stop cock and may be varied considerably in construction without departing from the broader principles of the invention. The fluid passage 17 extends diametrically through the body 16 and suitable means is provided at the opposite ends of the passage for connecting the body 16 in a fluid conduit. In the particular case illustrated externally screw threaded tubular extensions 21 are provided on the body 16 at the opposite ends of the passage 17. A longitudinally tapered opening 22 is provided in the body 16 for carrying the plug 18. The opening 22 preferably extends completely through the body and intersects the fluid passage 17. The central longitudinal axis of the opening 22 is preferably normal to the longitudinal axis of the passage 17. The opening 22 is round in cross section and is longitudinally tapered throughout its length.

In accordance with the invention a second opening 23 is provided in the body 16. The opening 23 intersects the opening 22 and its central longitudinal axis is in the same plane as the longitudinal axis of the fluid passage 17. The opening 23 extends completely through the body 16 and may be of greater diameter at one side of the opening 22 than it is at the opposite side of the opening 22. The opening 23 may be normally closed at its largest end by a removable plug 24 and at its smaller end by a removable plug 25.

40 The core or plug 18 is rotatably carried in the opening 22 and is in the nature of a carrier for the flow nipple 19. The plug 18 is operable to a position where it prevents the flow of fluid through the passage 17. In accordance with the preferred form of the invention the plug 18 is an integral member and includes a longitudinally tapered central portion 26 fitting the opening 22, an enlarged polygonal portion 27 at the large end of the central part 26, and a reduced portion or stem 28 at the small end of the portion 26. The central portion of the plug is of round cross sectional configuration and preferably has a ground fit with the opening 22 so that it tightly fits the opening.

55 The polygonal portion 27 of the plug 18 projects from the body 16 and is adapted to be engaged by a wrench or suitable tool for operating or turning the plug. The portion 27 may be made hollow to lighten the construction. A transverse opening 29 may be provided through the portion 27 to receive a suitable tool for operating the plug. In the preferred form of the invention the end of the body 16 at the base of the portion 27 is made flat and an annular flange 30 is provided at the base of the portion 27 to extend over the end of the body. In practice the flange 30 is normally spaced from the body.

70 The flow nipple 19 is removably carried in a transverse opening 31 in the plug 18. The opening 31 is diametrically disposed in the central portion 26 of the plug and is provided at a point where it is adapted to be brought into register with the fluid passage 17. The opening 31 extends completely through the plug 18 and is longitudinally tapered throughout its length. The

nipple 19 is in the form of a liner or tube having a central longitudinal opening 32. The opening 32 of the nipple may be of a diameter to provide for the desired restriction of the flow of fluid through the passage 17. The nipple 19 is carried completely within the opening 31 and is longitudinally tapered. In the preferred form of the invention an annular radial flange 33 is provided at the small end of the nipple to fit the opening 31. An annular body 34 of packing surrounds the nipple between the flange 33 and the large end of the nipple. The packing 34 may be formed of a suitable soft metal or rubber and is provided to seal with the walls of the opening 31. The packing 34 prevents the nipple 19 from becoming set or jammed in the opening 31.

The large end of the opening 23 in the body is adapted to readily pass the nipple 19 when it is desired to insert or remove the nipple. It will be obvious how the plug 18 may be operated from a position such as is shown in Figs. 4 and 5 of the drawings to a position where the opening 31 is in register with the opening 23 and how the plugs 24 and 25 may be removed to permit removal of the nipple 19. When the plug 18 is in a position where the nipple may be removed, that is, when the opening 31 is in register with the opening 23, the flow of fluid through the passage 17 is fully stopped by the plug.

The present invention provides means for limiting rotation of the plug 18 in the opening 22 so that it may be positioned where the nipple 19 is in proper register with the passage 17. The means for limiting the movement of the plug 18 in the opening 22 includes a lug 35 projecting from the body 16 and extending into a groove 36 in the base of the polygonal portion 27 of the plug. The groove 36 may extend for approximately 90° about the axis of rotation of the plug 18, and the lug 35 is adapted to engage an end of the groove when the plug is in a position where the nipple 19 is in direct register with the fluid passage 17. The lug 35 is adapted to engage the opposite end of the groove 36 to position the plug relative to the body so that the opening 31 is in register with the opening 23.

Means may be provided on the plug to indicate the direction in which the flow is intended to pass through the device. In the particular form of the invention illustrated in the drawings an arrow 40 is provided on the end of the polygonal portion 27 to indicate the direction of flow through the plug 18.

The means 20 is provided to pack or seal between the body 16 and the plug 18 and to maintain the plug in a position where it is tightly seated in the opening 22. The means 20 includes packing 41 arranged in an enlargement or groove 42 in the large end portion of the opening 22 in the body. The packing is preferably in the nature of a cup-leather. The lower side of the enlargement or groove 22 is beveled inwardly toward the center of the body 16 and the packing 41 seats against the beveled walls of the enlargement. An annular shoulder 43 is provided at the base of the portion 27 of the plug to extend into the enlargement 42. The shoulder 43 is adapted to engage or compress the packing so that it effectively seals with the walls of the enlargement 42 and the shoulder.

In the preferred form of the invention an annular groove 44 is provided in the inner wall of the packing 41 to receive fluid supplied to the groove 22 from the exterior of the body. Means

is provided for supplying fluid under pressure to the groove 22 for actuating the packing 41 into effective sealing engagement with the walls of the groove and the flange or shoulder 43. A suitable valved fitting 70 is arranged in a port or passage 71 communicating with the groove 22. A suitable fluid, say grease, may be delivered to the groove 22 through the fitting 70 to actuate the packing 41 and to retain the packing compressed against the shoulder 43 and the walls of the groove.

Means is provided for sealing or packing between the reduced end portion of the plug 18 and the body 16. Registering annular grooves are provided in the plug 18 and the opening 22 to form an annular groove 46 for carrying a packing or cup-leather 47. The walls of the groove 46 diverge downwardly or outwardly and the packing 27 is provided with flanges 48 to seat against the divergent walls of the groove. The inner portion of the groove 46 is adapted to hold or contain fluid supplied to the groove 46 under pressure to effectively expand the flanges 48 against the walls of the groove. A passage 74 extends from the exterior of the body 16 to the groove 46 and a suitable valved fitting 75 is provided at the outer end of the passage, through which grease or the like, may be supplied to the groove for actuating the packing.

In the preferred form of the invention means is provided for normally yieldingly urging the plug 18 into the opening 22 so that it tightly seats in the opening and for effectively compressing the packing 41 and 47. A nut 50 is screw threaded onto the reduced stem 28 of the plug 18. A compression sleeve 51 is arranged between the nut 50 and the body 16. The sleeve 51 may be slidable on a cylindrical enlargement 52 at the base of the stem 28. The sleeve 51 is provided with an annular flange 54 extending into the groove 46 and engaging the packing 47. The flange 54 completely closes the end of the groove 46. A radial shoulder is provided on the sleeve 51 to engage an end of the body 16 to limit movement of the flange 54 into the groove 46.

A helical spring 56 is arranged under compression between the sleeve 51 and the nut 50. In the preferred form of the invention an annular apron or lip 57 is provided on the nut 50 to inclose the spring 56. The lip 57 may freely engage over the sleeve 51. The spring 56 acts to urge the sleeve 51 inwardly to retain the flange 54 in effective engagement with the packing 47 and acts to urge the plug 18 downwardly or inwardly in the opening 22. In practice the nut 50 may be adjusted on the stem 28 to provide for the desired or necessary action of the spring 56. In the drawings the nut 50 is shown in engagement with the sleeve 51.

In the preferred construction the plug is reinforced so that the stem 28 is particularly strong and is not apt to fail upon turning of the plug or tightening of the nut 50. The plug is preferably in the nature of a casting and a bar 80 of soft steel is arranged in the stem 28 to strengthen the stem. The bar 80 may be arranged in the mould when the plug is poured, so that it is effectively bonded in the plug. The bar 80 may extend completely through the stem 28 and extend into the portion 48.

It is believed that the operation of the flow bean provided by this invention will be readily apparent from the foregoing detailed description. During normal operation of the device the plug 18 is positioned as illustrated throughout the

drawings where the nipple 18 is in direct register with the fluid passage 17. The nut 50 may be adjusted on the stem 28 to provide for the proper urging of the plug 18 into the opening 22 and for the proper compression of the packing 41 and 47. When it is desired to remove the nipple 19 for replacement the plug 18 is rotated to a position where the opening 31 is in register with the opening 23. The lug 35 acts to limit turning of the plug in either direction so that it may be operated to the position where the opening 31 is in register with the opening 23. The plugs 24 and 25 may be removed and the nipple 19 driven out through the opening 23 by means of a suitable tool. When the plug 18 is in the position for removing the nipple 19 the passage of fluid through the device is positively prevented. Grease or other suitable fluid may be supplied to the grooves 42 and 46 under pressure to actuate the packing. The flange 30 on the plug prevents fluid that may leak from the device from squirting or flying onto the operator. The lip 57 prevents fluid that may leak past the sleeve 51 from discharging directly outward.

Having described only a typical preferred form of my invention, I do not wish to limit myself to the specific details set forth, but wish to reserve to myself any changes or variations that may appear to those skilled in the art or fall within the scope of the following claims:

Having described my invention, I claim:

1. A flow bean including, a body having a fluid passage, a plug carried by the body and intersecting the passage, there being a transverse tapered opening in the plug adapted to register with the passage, a tapered flow nipple removably but tightly fitted in the opening in the plug and extending substantially the entire length of said opening, the plug being rotatable in the body, and means limiting movement of the plug in one direction in a position where the flow nipple is in register with the passage.

2. A flow bean including, a body having a fluid passage, a plug carried by the body and intersecting the passage, there being a transverse tapered opening in the plug adapted to register with the passage, an elongated tapered flow nipple removably mounted in the opening in the plug and extending substantially the entire length of said opening, the plug being rotatable in the body, and means limiting movement of the plug in one direction in a position where the flow nipple is in register with the passage, including a lug on the body extending into a groove in the plug.

3. A flow bean including, a body having a fluid passage and a tapered opening intersecting the fluid passage, there being a second opening in the body intersecting the tapered opening, a tapered plug rotatable in the tapered opening having a transverse opening, the plug being operable between a position where the transverse opening is in register with the fluid passage and a position where the transverse opening is in register with the said second opening, a removable flow nipple in the transverse opening, and means for sealing between the plug and the body, including packing arranged between the small end portion of the plug and the body, a sleeve engaging the packing, and spring means urging the sleeve into the tapered opening against the packing and urging the plug toward the small end of the tapered opening.

4. A flow bean including, a body having a fluid passage and a tapered opening intersecting the

fluid passage, there being a second opening in the body intersecting the tapered opening, a tapered plug rotatable in the tapered opening having a transverse opening, the plug being operable between a position where the transverse opening is in register with the fluid passage and a position where the transverse opening is in register with the said second opening, a removable flow nipple in the transverse opening, and means for sealing between the plug and the body, including packing between the small end portions of the plug and the body, a member engaging the packing, and means simultaneously urging the member against the packing and urging the plug toward the small end of the tapered opening.

5. A flow bean including, a body having a fluid passage and a tapered opening intersecting the fluid passage, there being a second opening in the body intersecting the tapered opening, a tapered plug rotatable in the tapered opening having a transverse opening, the plug being operable between a position where the transverse opening is in register with the fluid passage and a position where the transverse opening is in register with the said second opening, a removable flow nipple in the transverse opening, and means for sealing between the plug and the body, including packing compressible against the body and the plug upon urging of the plug toward the small end of the tapered opening, a nut threaded on the plug, and a spring engaging the nut to urge the plug toward the small end of the tapered opening.

6. A flow bean including, a body having a fluid passage and a tapered opening intersecting the fluid passage, there being a second opening in the body intersecting the tapered opening, a tapered plug rotatable in the tapered opening having a transverse opening, the plug being operable between a position where the transverse opening is in register with the fluid passage and a position where the transverse opening is in register with the said second opening, a removable flow nipple in the transverse opening, and means for sealing between the plug and the body, including packing between the body and the plug, a member engaging the packing, a nut threaded on the plug, and a spring between the nut and the member.

7. A flow bean including, a body having a fluid passage and a tapered opening intersecting the fluid passage, a plug rotatable in the tapered opening having a transverse tapered opening adapted to register with the fluid passage, a tapered elongate flow nipple removably mounted in the opening in the plug, and packing between the flow nipple and the walls of the said opening.

8. A flow bean including, a body having a fluid passage and a tapered opening intersecting the fluid passage, there being a second opening in the body intersecting the tapered opening, a tapered plug rotatable in the tapered opening hav-

ing a transverse opening, the plug being operable between a position where the transverse opening is in register with the fluid passage and a position where the transverse opening is in register with the said second opening, a removable flow nipple in the transverse opening, and means for sealing between the plug and the body, including packing between the body and the plug, a member engaging the packing, a nut threaded on the plug, a lip on the nut extending over the member, and a spring between the nut and the member.

9. A flow bean including, a body having a fluid passage and a tapered opening intersecting the fluid passage, there being a second opening in the body intersecting the tapered opening, a tapered plug rotatable in the tapered opening having a transverse opening, the plug being operable between a position where the transverse opening is in register with the fluid passage and a position where the transverse opening is in register with the said second opening, a removable flow nipple in the transverse opening, and means for sealing between the plug and the body including, packing between the plug and the body, a shoulder on the plug to compress the packing upon urging of the plug toward the small end of the tapered opening, packing arranged in a groove to seal with the plug and body, a sleeve for compressing the last-mentioned packing, a nut threaded on the plug, and a spring under compression between the nut and the sleeve to compress the last-mentioned packing and to urge the plug toward the small end of the tapered opening.

10. A flow bean including a body having a fluid passage and an opening intersecting the fluid passage, a plug turnable in the opening and having a transverse tapered opening adapted to register with the fluid passage, a tapered flow nipple in the opening in the plug, and packing surrounding the nipple to seal between the nipple and the walls of the opening in the core.

11. A flow bean including a body having a fluid passage and an opening intersecting the fluid passage, a plug turnable in the opening and having a transverse tapered opening adapted to register with the fluid passage, a tapered flow nipple in the opening in the plug, packing surrounding the nipple to seal between the nipple and the wall of the opening in the plug, and a flange on the small end of the nipple engaging the wall of the opening in the plug.

12. A flow bean including a body having a fluid passage and an opening intersecting the fluid passage, a plug turnable in the opening and having a transverse tapered opening adapted to register with the fluid passage, and an elongate tapered flow nipple in the opening in the plug and extending substantially the entire length of the opening.

LELAND S. HAMER.