Jan. 16, 1923. 1,442,204.

W. G. WILSON.

SLIDE VALVE.

FILED FEB. 15, 1919. 5 SHEETS—SHEET 1.

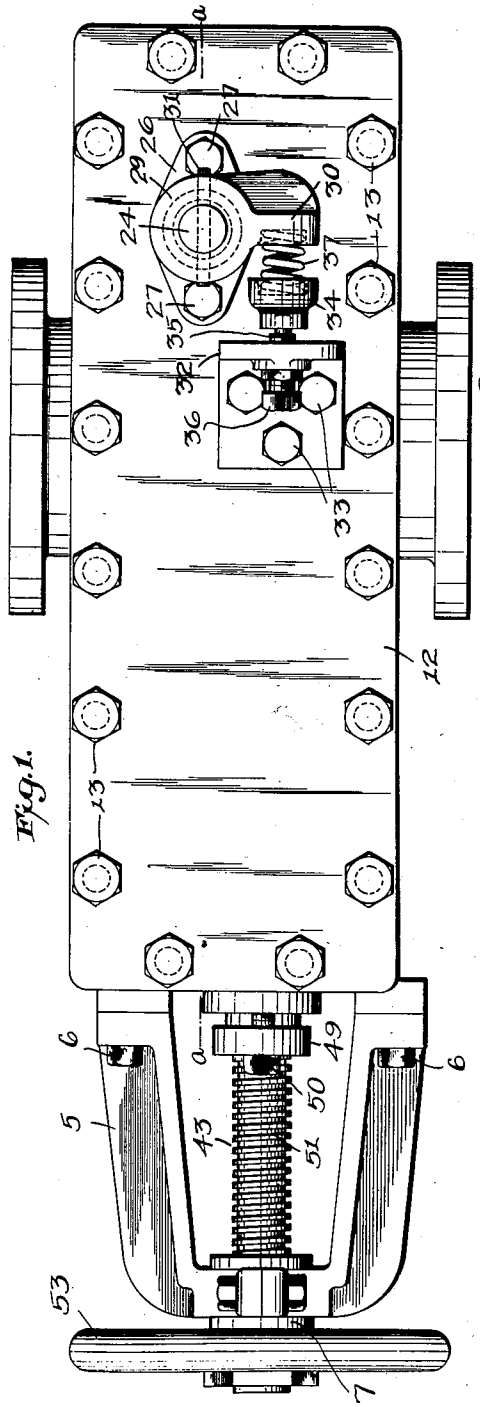


Fig. 1.

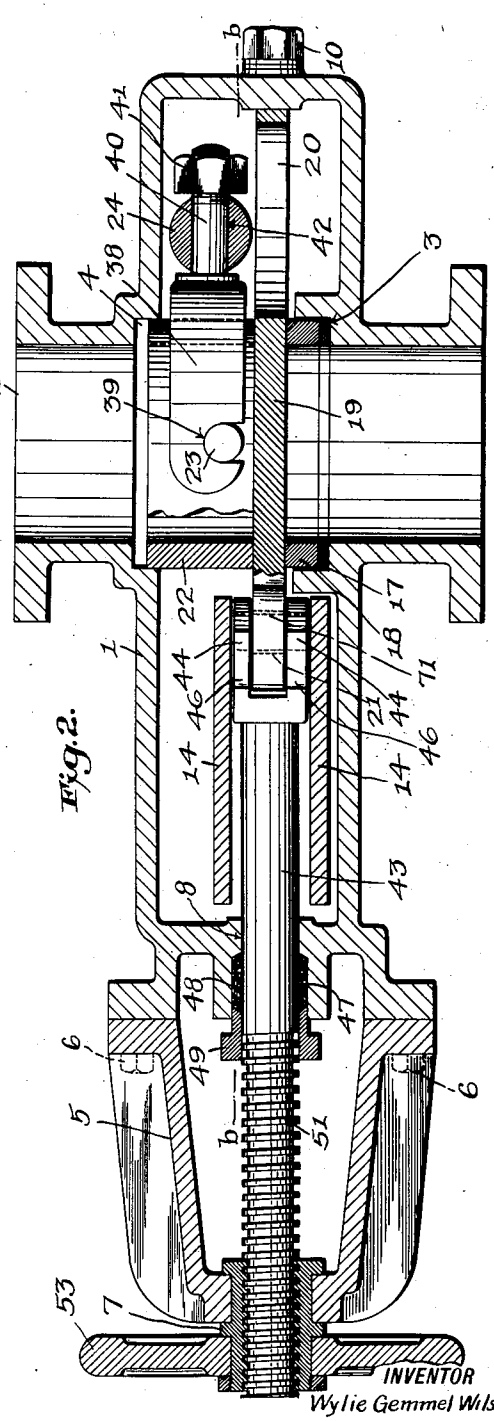


Fig. 2.

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5 SHEETS—SHEET 2.

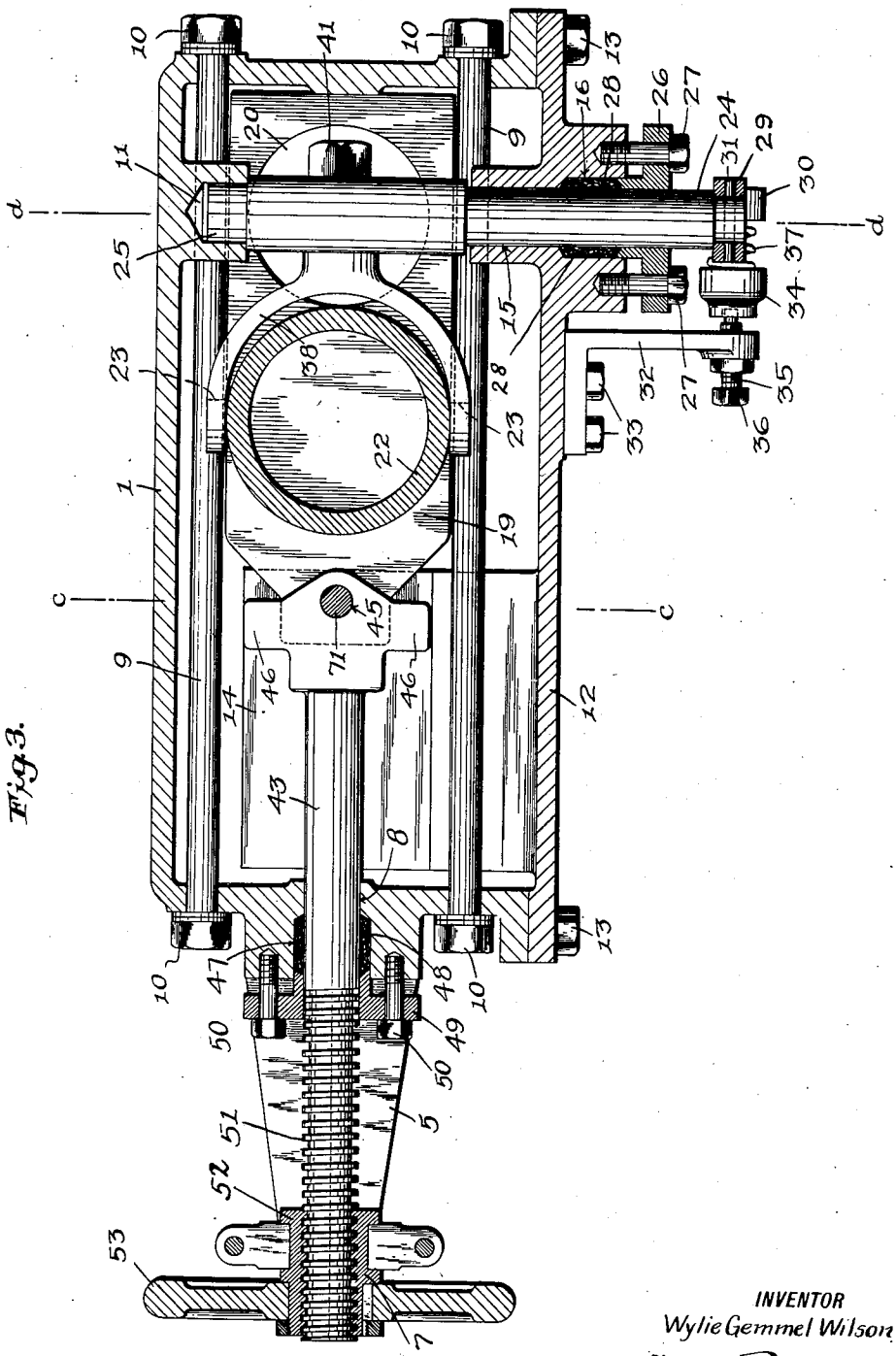



Fig. 3.

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W. G. WILSON.

SLIDE VALVE.

FILED FEB. 15, 1919.

5 SHEETS—SHEET 3.

Fig. 5.

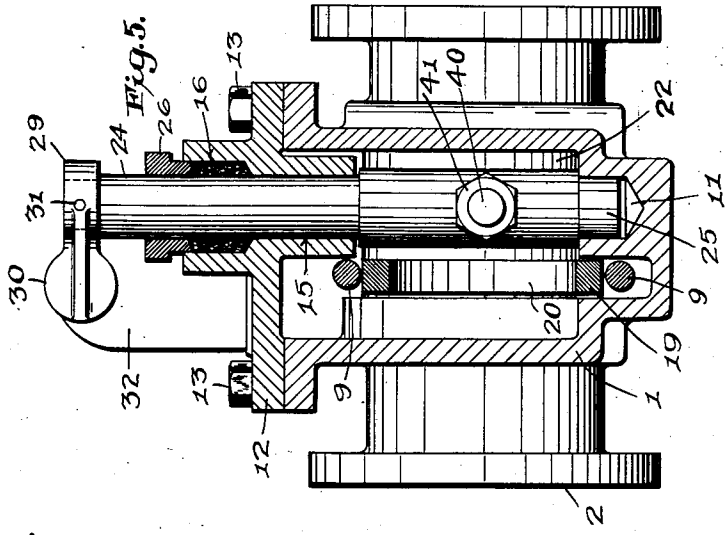



Fig. 6.

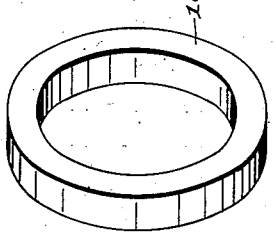
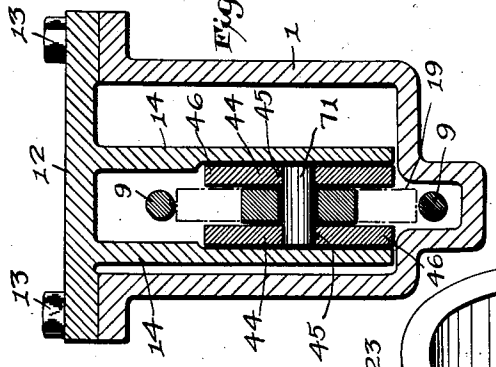



Fig. 4.



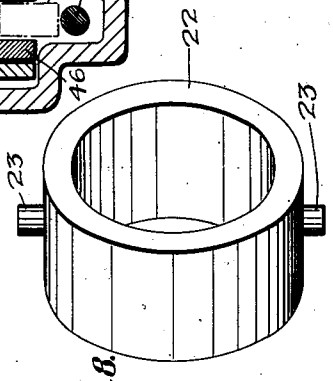
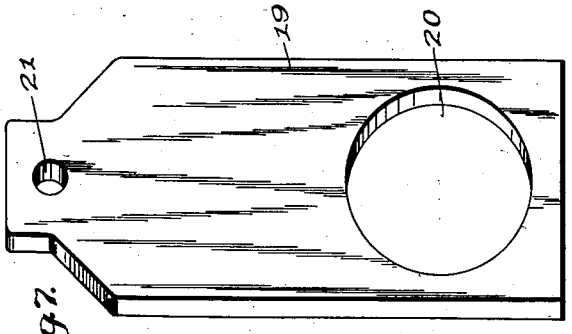




Fig. 8.

Fig. 7.




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1,442,204.

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SLIDE VALVE.

FILED FEB. 15, 1919.

5 SHEETS—SHEET 4.

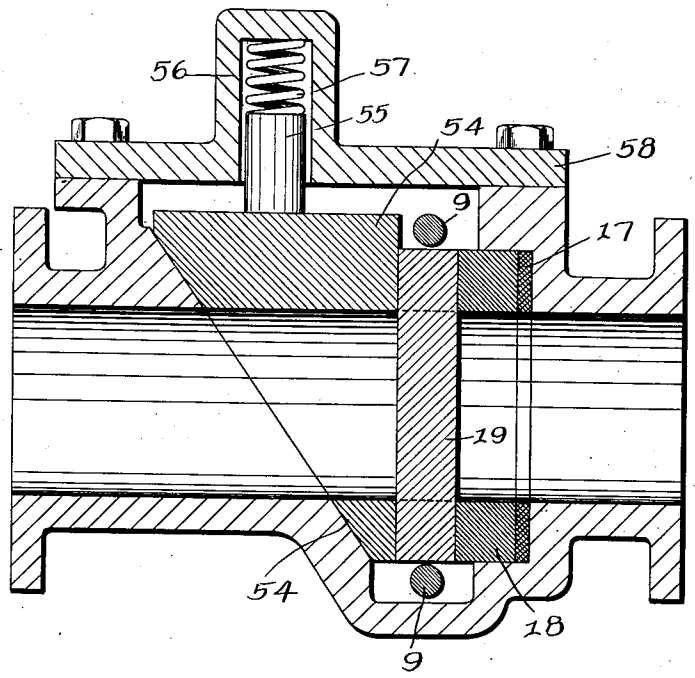



Fig. 9.

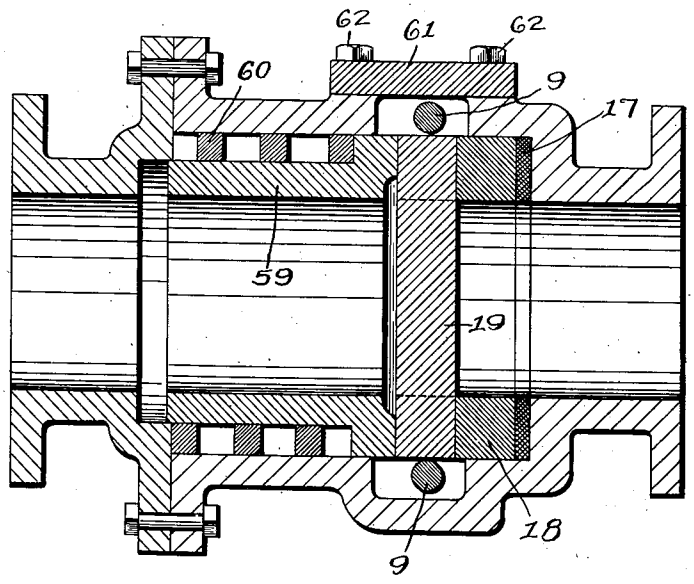



Fig. 10.

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Jan. 16, 1923. 1,442,204.

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SLIDE VALVE.

FILED FEB. 15, 1919. 5 SHEETS—SHEET 5.

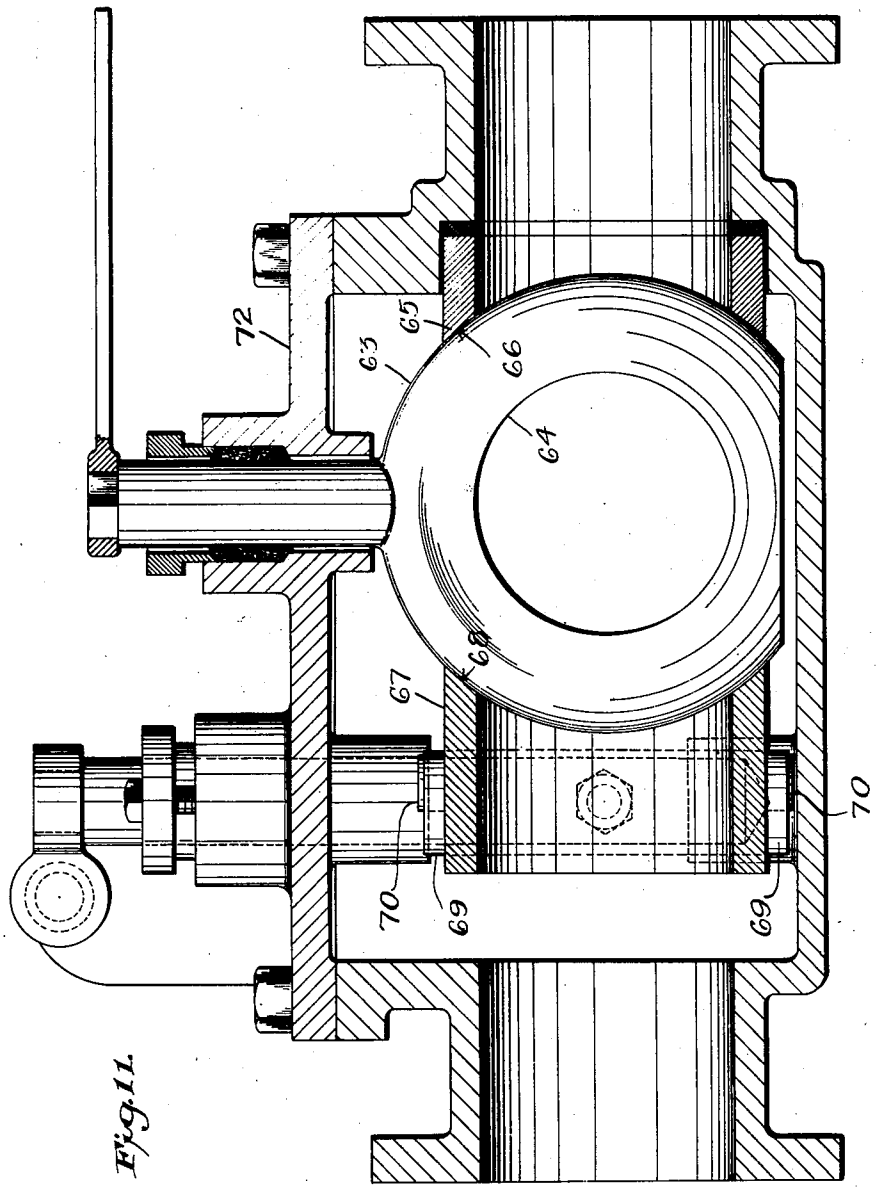



Fig. 11.

INVENTOR
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Patented Jan. 16, 1923. 1,442,204

# UNITED STATES PATENT OFFICE.

WYLIE GEMMEL WILSON, OF NEW YORK, N. Y., ASSIGNOR TO SLIDING VALVES INCORPORATED, A CORPORATION OF DELAWARE.

## SLIDE VALVE.

Application filed February 15, 1919. Serial No. 277,129.

*To all whom it may concern:*

Be it known that I, WYLIE GEMMEL WILSON, a subject of the King of Great Britain, and a resident of New York city, in the county of New York and State of New York, have invented certain new and useful Improvements in Slide Valves, of which the following is a specification.

This invention relates to an improvement in that type of valve known as slide valves, wherein a port is closed by the operation of a plate bisecting the path of the fluid passing through a port and cooperating with a valve seat surrounding said port.

It has been customary in such structures to form the valve seat homogeneous with the valve casing or to construct a separate member as a valve seat and secure the same rigidly to the casing in position to surround the port. It has also been customary to so mount the slide valve as to permit its reciprocation within more or less prescribed limitations.

This invention departs from those conventional constructions in that the valve seat is loosely mounted so that it may expand and contract under changes of temperature and yet perform all of the functions of a valve seat, In like manner the slide valve is loosely mounted allowing for a certain play in its operation, all for the purpose of overcoming difficulties which have been encountered in the operation of earlier constructions.

It is obvious that it is desirable to form said active valve elements of refractory material. Metals of all kinds have been employed and certain composite metals have been made to serve the purpose fairly well under normal conditions, but there are certain abnormal conditions which have developed in modern manufacture which present new problems and under which existing valves have been found to be inadequate for the purpose.

These difficult conditions are particularly manifest in the manipulation of acids or corrosive liquids which have a tendency to disintegrate, oxidize or corrode metals employed for the active elements in valves. Even steam at high temperatures has a disintegrating effect.

It is also found that where a valve seat is formed of suitable metal and screwed or otherwise secured into relation with a valve casing, that under high temperatures the difference in the expansive quality of the seat and its mounting results in fractures in one or the other which is disastrous to the mechanism.

It is well known that glass is well suited to resist the action of acids, and is less susceptible to corrosion or the consequences incident to changes in temperature than possibly any other material. When I name glass I intend to include substances of a similar nature. But the difficulty in employing glass as a material from which to construct the active elements of a valve lies in the fragility of such material. Any sudden shock or blow will fracture the glass and render the valve inoperative, also if the glass is subject to strain due to the expansion or contraction of metals it will crush or crack. These are the obvious difficulties which have been encountered in the use of glass or other fragile material for this purpose.

One of the objects of this invention is to provide means by which glass may be employed for one or both of the active elements of a valve, and wherein the shocks and strains which are fatal to its use may be avoided and the inherent qualities of glass for the purpose stated may be utilized.

Another object is to construct a valve wherein the valve seat is mounted as free elements within the casing, and disconnected from all parts of the casing so as to eliminate any danger of fracture or distortion by reason of the expansion or contraction of the seat or the casing, the valve seat simply resting on a suitable sealing element as a gasket. This structure is desirable for the further reason that it is possible to remove and replace the valve seat with ease and celerity. In like manner, the slide valve is so mounted as to be free to move without the possibility of jamming or crushing strains and with sufficient clearance to allow for expansion and contraction. It may also be readily removed and replaced.

The valve and its seat are held together by an elastic pressure which may be regulated to accomplish co-action between the active elements and the same time make effective the seal.

The term "floating" is used in the claims as describing a valve seat herein disclosed as this term appears to be appropriate to express the idea of an element that is free from attachment to its mounting, as dis-

tinguished from those forms of valve seat that are homogeneous with or fixed to the casing, and as an appropriate term to define a valve seat that is so related to its mounting that it is free to expand and contract in any direction without restriction under all conditions of temperature to which it may be exposed. It is also an appropriate term as applied to a valve element that is loosely mounted as compared to a similar element that is rigidly mounted, the free or loose mounting in like manner permitting a certain latitude of movement to compensate for expansion and contraction due to changes of temperature as well as an automatic adjustment between the active elements of the valve. The same conditions of mounting lend themselves to an easy dismemberment and replacement of the valve elements without disconnecting the valve from its position in the conduit which it controls by simply removing part of the casing as described.

I have illustrated one embodiment of my invention in the accompanying drawings, referring to the several parts by numerals, designating like parts by like numerals.

Fig. 1 is a plan view.

Fig. 2 is a horizontal and longitudinal section taken on the line *a*—*a*, Fig. 1, the same showing certain parts in elevation.

Fig. 3 is a vertical longitudinal section, taken on the line *b*—*b* of Fig. 2.

Fig. 4 is a transverse vertical section on the line *c*—*c* in Fig. 3.

Fig. 5 is a transverse vertical section taken on the line *d*—*d* of Fig. 3.

Fig. 6 is a perspective view of the valve seat.

Fig. 7 is a perspective view of the slide valve plate.

Fig. 8 is a perspective view of the pressure cylinder.

Fig. 9 is a transverse vertical section of a second form of construction, by which pressure may be applied to the valve and its seat.

Fig. 10 in like manner is a third form of construction, by which an elastic tension may be exercised upon the slide valve, its seat and gasket.

Fig. 11 is a transverse vertical section partly in elevation, illustrating another form of construction but embodying the same general principles, wherein instead of a slide valve a rotary spherical valve is employed, but the valve seat, pressure cylinder and other elements are substantially the same only in a form suitable to meet the changed structure.

Referring to Fig. 2, 1 is a valve casing intersected by a port, as 2. In this casing is formed an annular recess, as 3, surrounding the port. This recess is adapted to receive and support an annular valve seat, hereinafter to be described. A further annular recess is also provided within said casing, as 4, to receive a cylindrical member numbered on said drawing 22, and hereafter to be described. 5 is a bracket secured to one end of the casing 1 by the screws 6. This bracket is adapted to support and guide a screw shaft numbered 43, and hereafter more fully described. 7 is a screw head of usual construction, mounted within the arms 5, the same being internally screw-threaded to receive the screw shaft 43. 8 is an aperture in the casing 1, through which the shaft 43 passes, the same also forming a stuffing box around said shaft. 9, 9 are two rods, longitudinally mounted within the casing 1 and secured by the bolts 10. These rods serve to guide the slide valve plate, hereafter designated as 19. 11 is an aperture in the casing 1, adapted to serve as a bearing for one end of the shaft 24. 12 is a lid for the valve casing, the same being secured to said casing by the bolts 13. Dependent from said lid 12 are two plates perpendicular thereto, indicated as 14, 14. These plates serve as ways, between which the reciprocating elements controlling the valve are mounted to move. 15 is an aperture in the valve lid 12, through which the shaft 24 is adapted to pass. 16 is an aperture forming a stuffing box surrounding the shaft 24. 17 is an annular gasket, preferably made of resilient material, and adapted to fit within the annular aperture 3 surrounding the port 2. 18 is a cylindrical valve seat, adapted to rest within the aperture 3 on the gasket 17. This cylindrical valve seat 18 is made slightly smaller than the interior circumference of the aperture 3, so that it is free to move within the prescribed limitations of the aperture 3, and yet sufficient space is allowed so that the expansion and contraction of the material composing the valve casing, or of the material of which said valve seat 18 may be formed, will not be such as to hinder the movement of the said valve seat within said aperture. This valve seat is one of the elements that I characterize as a floating element, for the reason that it is free to move within the aperture adapted to receive the same, as opposed to any strains arising from change of temperature, and is also not in any way secured to the casing but rests loosely on its supporting gasket so that with the dismemberment of the mechanism, as will be hereafter more fully stated, said valve seat may be lifted off of its seat and out of said aperture without employing any of the disengaging instruments that are usually necessary in removing a valve seat from its position. I have illustrated said valve seat in perspective in Fig. 6. 19 is a valve plate adapted to reciprocate in cooperation with said valve

seat 18. It is preferably provided with an aperture 20, corresponding in dimensions with the port bisecting the valve. It is also provided with the aperture 21 adapted to receive a bolt, hereafter to be described. I have illustrated the same in perspective in Fig. 7. 22 is a cylindrical member of substantially the same size as the cylindrical valve seat 18, and is provided with oppositely disposed lugs 23, and is illustrated in perspective in Fig. 8. 24 is a shaft, one end of which as at 25, is journalled at the aperture 11 of the casing 1. This shaft passes through the aperture 15 of the lid 12, and the stuffing box 16 of the same lid. 26 is a sealing member for the stuffing box 16, supported thereon by the bolts 27. 28 is packing contained within the said stuffing box 16. 29 is a ring provided with a dependent member 30. This ring is mounted at the other end of the shaft 24 and keyed thereto as at 31. 32 is a bracket secured to the lid 12 by suitable bolts, as 33. This bracket carries a cup-shaped head 34 supported by a threaded bolt, as 35, said bolt having a head, as 36, by which it may be rotated. Interposed between said cup-shaped member 34 and the dependent member 30 is a helical spring 37, adapted to bear upon the dependent member 30, and in so doing rotate the shaft 24. 38 is a bifurcated member, the arms of which are provided with the slots 39. 40 is a bolt secured to the rear of the said bifurcated member 38, and provided with a nut 41. 42 is a hole in the shaft 24, adapted to receive the bolt 40, the nut 41 serving to lock said bolt and bifurcated member in connection with the shaft 24. 43 is a shaft adapted for reciprocation in the aperture 8 of the casing 1. This shaft is at one end bifurcated, as at 44—44. These bifurcated members are pierced by holes, as 45—45, see Fig. 4. Said shaft is also provided with the wings 46, 46. 47 is a packing box in the casing 1, and 48 packing contained within said packing box. 49 is a lid for the same, secured thereto by the bolts 50. 51 is the screw threaded section of the shaft 43, and 52 is an internally screw-threaded box mounted to rotate within one end of the bracket 5. 53 is a hand wheel secured to said screw box 52.

Referring to Fig. 9, the second form of construction is illustrated, wherein the elastic means for exerting pressure upon the valve plate is varied by substituting a wedge formation. This drawing is a transverse section of the structure as previously described. All the elements are the same with the exception of the fact that I make the cylindrical member 54 in this case, (22 in the former case), of wedge shape, that is to say, cut to form one face diagonally to its axis, at approximately 40 degrees or more, the other face being perpendicular to its axis. This cylindrical wedge member is provided with a shaft 55, adapted to work freely within the aperture 56 against the tension of the spring 57 contained within said aperture. It will be understood that the casing is cut to conform with the wedge shaped disk, and the pressure of the spring 57 causes the said disk to be driven downwardly to impinge upon the valve plate 19 and cause the same to bear upon the valve seat 18 and gasket 17. In this construction I have provided a lid 58 which can be readily removed for access to the working parts.

In Fig. 10 I have illustrated a third form of construction, wherein the cylindrical member designated in the first construction as 22, and the second as 54, here is designated as 59. I surround this cylinder with the helical spring 60, and in the way obvious from the drawings reproduce the same pressure upon the valve plate seat and gasket as heretofore stated. In this construction I provide the lid 61, the removal of which permits access to the operative parts for the purposes of repair, etc. This lid is held in position by the bolts 62.

In Fig. 11 I have illustrated a further form of construction, wherein a spherical valve is employed instead of a slide valve. This valve is indicated by 63. This sphere is pierced by a port 64, which is adapted to cooperate with the valve seat 65 and the surface of the sphere 66 and with the pressure disk 67 and the surface of the sphere 68. The disk 67 is caused to be elastically pressed against the sphere by the bifurcated arm 69—69 operating on lugs 70—70 heretofore illustrated in previous constructions. Access to the valve is found by removing the plate 72.

This valve is assembled and operated as follows: The casing is formed of two parts, a body 1 and a lid 12. The lid having been removed the lower bar 9 is first introduced and secured by the nuts 10. The shaft 43 can then be run from the interior of the casing into the aperture 8 and through its stuffing box 47 by which a fluid tight joint is accomplished. Reciprocal movement is imparted to the shaft 43 by the rotation of the hand wheel 53 which is secured to the screw box 52 which in turn operates on the screw 51. The end 25 of the shaft 24 is then introduced into the bearing 11. This shaft 24 carries the bifurcated member 38. The cylindrical member 22 is then run into the aperture 4 so that the apertures 39—39 embrace the lugs 23—23. The gasket 17 is then placed in the aperture 3 and the valve seat 18 placed on the gasket and the slide valve 19 is introduced between the valve seat 18 and the cylindrical member 22. One end of the slide valve 19 is brought between the bifurcated arms 44 so that the hole 21 registers with the holes 45. The pin 71

which is of a diameter slightly less than that of the holes 44 and 21 is then introduced into said holes as shown in Figure 4. The upper rod 9 is now placed in position and secured by the nuts 10.

To place the lid 12 in position the pin 31 securing the collar 29 to the shaft 24 is withdrawn and the collar removed. The shaft 24 is then run into the aperture 15 in the lid and through its stuffing box. As the lid finds its place the plates 14 dependent therefrom embrace the bifurcated arms 44 of the shaft 43 and operate to hold the pin 71 in position within the apertures 45 and 21. The lid is then secured by the nuts 13. The collar 29 and pin 31 are restored with the spring 37 interposed between the cup 34 and the radial arm 30. The tension of the spring 37 is regulated by the screw 36, and as its bearing is on the radial arm 30 it operates to rotate the shaft 24 and hence to cause the arms 38 to bear on the lugs 23 and cylindrical member 22 on the slide valve 19 and the valve 19 on the valve seat 18 and the valve seat 18 on the gasket 17. This spring tension can be regulated at will. The relation between the bars 9—9 and the slide valve 19 is such that the latter may move freely between the former, yet the bars definitely limit the lateral movement of the valve. The dependent plates 14—14 serve as guides for the wings 46—46 and operate to limit the movement of the shaft 43 to a reciprocal movement.

The operation is as follows: The hand wheel 52 is rotated thus imparting a reciprocal movement to the shaft 43 and slide valve 19. When the port 2 is in register with the hole 20 in the valve 19 the valve is open and when otherwise it is closed. By reason of the pressure of the spring tension 37 the cylindrical member 22 bears on the valve 19 and it in turn on the valve seat 18 and the latter on the gasket 17 thus accomplishing a seal.

One of the advantages of the structure is that it may be assembled or dismembered without difficulty, and the active elements such as the valve seat and valve which are subject to wear or breakage may be removed and replaced with a minimum of labor.

Referring to Fig. 9 the structure shown in that drawing is assembled substantially in the same manner as that last described. The lid 58 is first removed, the gasket cylindrical valve seat, and valve plate are introduced, and then the cylindrical member 54, cut with a wedge surface, is introduced into the corresponding wedge aperture, and through the medium of the spring 57 is caused to bear upon the valve and valve seat.

Referring to Fig. 10 the variation in the structure is obvious. The cylindrical pressure disk, in this case numbered 59, and in the first instance designated as 22, is provided with a shoulder adapted to cooperate with a helical spring 60, and causes the cylinder to bear upon the valve, valve seat and gasket in like manner. Access to this valve is found by removing the lid 61 and bar 9 which when removed exposes the operative parts to easy removal and repair. It may be mounted on a gasket which may be elastic or non-elastic or which may be omitted entirely, the spring pressure operating on the valve and valve seat being sufficient to form a seal.

I do not intend to confine myself in the construction of this device to the materials named. Any material suitable for the purpose may be employed.

I find it desirable to provide a valve seat that is disconnected from the casing in the manner described and so supported as to be free from surrounding influences. Such a seat readily adjusts itself to changes of temperature and cooperates well with a slide valve accommodating itself to any surface irregularities of the valve plate. It can also be readily removed and replaced.

The valve plate 19 may also be formed of glass to meet the conditions incident to the manipulation of corrosive fluids, but I do not intend to limit the construction of this valve to glass. It may be made of any suitable material. I may form the seat of glass and the valve of metal, or vice versa, or I may form both of glass. I have observed under such conditions as I have described that glass and glass cooperate to make a perfect seal.

Reciprocating movement is imparted to the valve 19 by the rotation of the hand wheel 53 in the usual manner. The cylindrical member 22 is caused to rest on the valve 19 in approximate alignment with the cylindrical valve seat 18, and is caused to bear upon the valve and its seat by the tension of the spring 37, as heretofore described. This tension need not be more than sufficient to keep the valve and its seat in continuous relation. The valve described being a one-way valve, the pressure of the fluid is usually sufficient to retain the valve seated under normal conditions, but it is desirable to employ said elastic means to normally hold the valve and its seat in relation.

What has been said in reference to the removal for repair or replacement of the valve seat is equally true with reference to the valve. The whole structure may be dismembered by removing the caps or covers, and one of the bars 9, whereupon the active elements are all exposed and may be readily removed.

While I have described several forms in which my invention may be embodied, I

do not intend to be limited to such constructions, for the invention is susceptible of embodiment in various forms.

What I claim is:—

1. A valve comprising a valve seat free to float in all directions, in combination with a suitable valve element.

2. A valve comprising a valve seat and a mounting for the same, the seat and its mounting being so related that expansion or contraction of either one or both will not affect either, a valve for said seat.

3. A valve comprising a casing with a port through the same a valve seat mounted to surround said port and free to expand and contract without hindrance by reason of said mounting and a valve element to co-operate with said valve seat.

4. A valve comprising a casing with a port through the same a valve seat adapted to co-operate with said port to form a continuous passageway and means to support said seat in said co-operative relation without restricting the freedom of said valve seat to expand and contract and a valve element to co-operate with said valve seat.

5. A valve comprising a valve seat free to float in all directions in combination with a valve element and elastic means to hold the same in cooperative relation.

6. A valve comprising a valve seat and a mounting for the same, the seat and its mounting being so related that expansion or contraction of either one or both will not affect either, and elastic means to hold the same in co-operative relation.

7. A valve casing with a port through the same, a valve seat co-operating with the port to form a continuous passage, a mounting for the seat which permits the free expansion or contraction of the seat, a valve element mounted to co-operate with the seat and means to operate the valve, elastic means adapted to bear on the valve and hold the same in operative relation with said seat.

8. A valve casing with a port through the same, a valve seat co-operating with the port to form a continuous passage, a mounting for the seat which permits the free expansion or contraction of the seat, a valve element mounted to co-operate with the seat and means to operate the valve element, elastic means adapted to bear on the valve element and hold the same in operative relation with said seat, said valve seat being formed of glass.

9. A valve comprising a casing with a port through the same, an aperture in the casing surrounding the port, a gasket seated in said aperture, a valve seat of a size to freely move within said aperture and resting on said gasket, a slide valve element mounted to co-operate with said seat and means to operate said valve element with means to cause a spring pressure to bear on said valve for the purpose of holding said valve element and seat and gasket in co-operative relation and to accomplish a seal.

10. A valve comprising a casing with a port through the same, an aperture in the casing surrounding the port, a gasket seated in said aperture, a valve seat of a size to freely move within said aperture and resting on said gasket, a slide valve element mounted to co-operate with said seat and means to operate said valve element with means to cause a spring pressure to bear on said valve for the purpose of holding said valve element and seat in co-operative relation and to accomplish a seal between the seat and said gasket, both said valve element and seat elements being formed of glass.

11. A valve comprising a casing with a port through the same, an annular recess surrounding said port and a gasket set therein, a cylindrical valve seat mounted on said gasket, said valve seat being of a size to admit of free expansion and contraction without binding effect due to its mounting, a slide valve element mounted to co-operate with said valve seat and means to operate the same and elastic means to cause said valve element to bear on its seat and the seat on said gasket.

12. A valve comprising a casing with a port through the same, an annular recess surrounding said port and a gasket set therein, a cylindrical valve seat mounted on said gasket, said valve seat being of a size to admit of free expansion and contraction without binding effect due to its mounting, a slide valve element mounted to co-operate with said valve seat and means to operate the same and elastic means to cause said valve element to bear on its seat and the seat on said gasket, both said valve element and seat elements being formed of glass.

13. A valve comprising a casing with a port through the same, an annular recess surrounding said port and a gasket set therein, a cylindrical valve seat mounted on said gasket, said valve seat being of a size to admit of free expansion and contraction without binding effect due to its mounting, a slide valve element mounted to co-operate with said valve seat and means to operate the same and elastic means to cause said valve element to bear on its seat and the seat on said gasket, one of said valve or seat elements being formed of glass.

14. A valve casing with a port therethrough a valve seat mounted to surround said port and a slide valve adapted to co-operate with said seat a screw plunger mounted to pierce the casing and operate the valve, said plunger being bifurcated at its internal end and pierced with oppositely disposed holes, said slide valve also having a hole registering with the holes in said bifur-

cated ends of the plunger, a pin adapted to enter said soles, said bifurcated ends extended to form wings, said casing divided into two parts a body portion and a lid for the same, and said lid having dependent plates adapted when placed in position to span said bifurcated members and wings to hold said pin in position and to confine the shaft to a reciprocating movement.

15. A valve comprising a casing with a port through the same, a valve seat mounted to surround said port, said valve seat being of a size to admit of free expansion and contraction without binding effect due to its mounting, a slide valve mounted to cooperate with said valve seat and means to operate said valve member, a cylindrical member mounted to rest on the valve with elastic means to cause said cylindrical member to bear on said valve to hold the valve and its seat and the casing in cooperative relation.

16. A valve casing with a port therethrough, a valve seat mounted to surround said port and a slide valve adapted to cooperate with said seat and means to operate said valve, a cylindrical member of substantially the size of the seat mounted to rest on the valve with elastic means to cause said cylindrical member to bear on said valve to hold the valve and its seat in cooperative relation, said elastic means comprising a rock shaft carrying a bifurcated member, oppositely disposed lugs on either side of said cylindrical member with which said bifurcated member is adapted to cooperate a radial arms secured to the end of said rock shaft with a spring interposed between said arms and a stationary element to cause said shaft to rock according to a predetermined tension.

17. A valve comprising a casing with a port therethrough, a suitable valve bisecting the path of the fluid and a valve seat surrounding said port, said valve seat interposed between the valve and the casing, the contacting faces of the valve seat, valve member and casing being in planes transverse of the flow of the fluid said valve seat being free to float in all directions.

18. A valve comprising a casing with a port therethrough, a suitable valve bisecting the path of the fluid and a valve seat surrounding said port, said valve seat interposed between the valve and the casing, the contacting faces of the valve seat, valve member and casing being in planes transverse of the flow of the fluid said valves each being free to float in all directions, and elastic means for holding the valve member, the valve seat and the casing in contact one with the other.

Signed by me at New York city, N. Y., this 20th day of December, 1918.

WYLIE GEMMEL WILSON.

Witnesses:
ROY THOMAS STRAHAN,
MARGARET VOGEL.