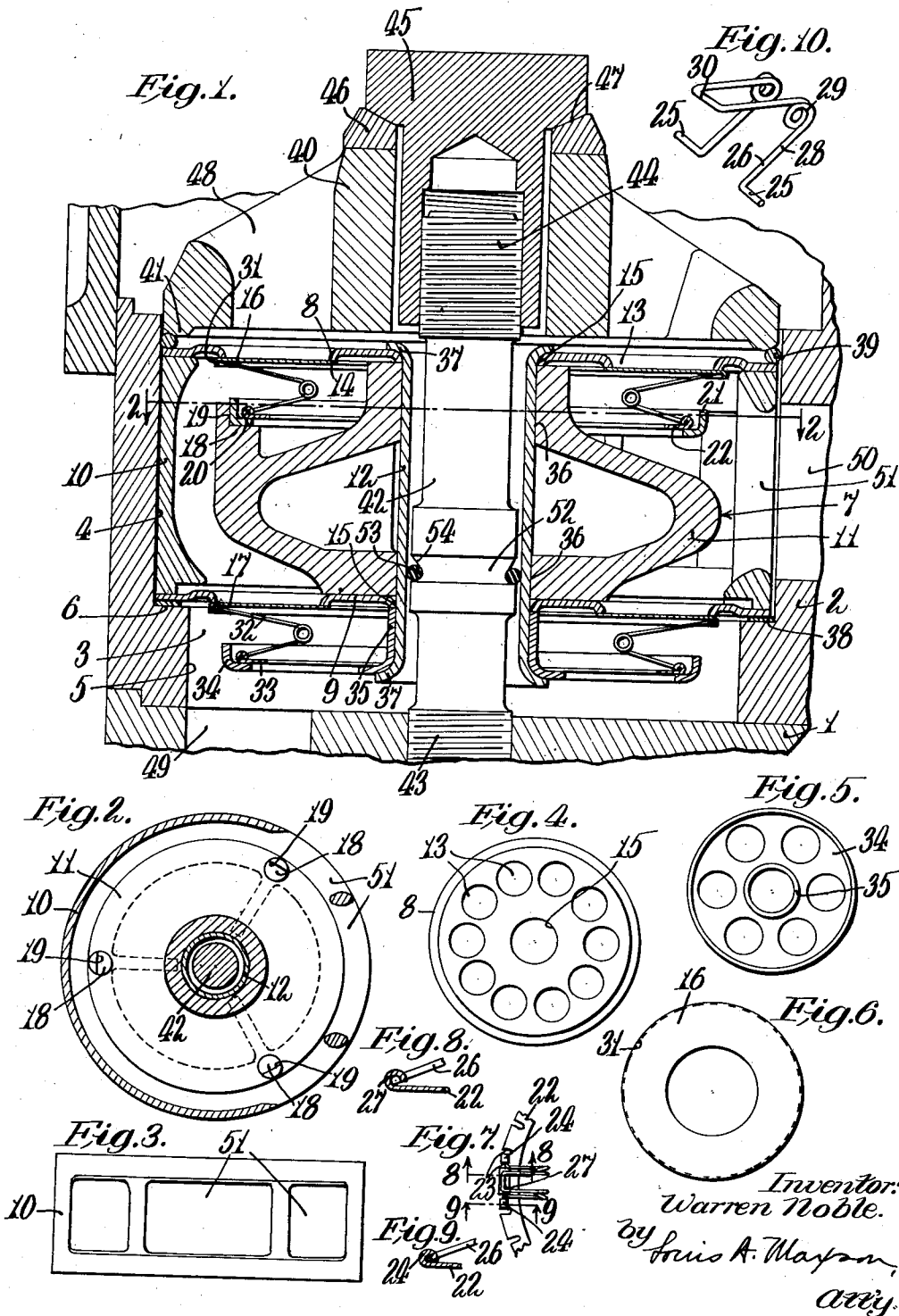


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W. NOBLE  
VALVE MECHANISM

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## UNITED STATES PATENT OFFICE

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## VALVE MECHANISM

Warren Noble, Michigan City, Ind., assignor to  
Sullivan Machinery Company, a corporation  
of Massachusetts

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52 Claims. (Cl. 230—231)

This invention relates to valve mechanisms, and more particularly, but not exclusively, to improvements in valve mechanisms especially adapted to use in fluid compressors or pumps.

5 An object of this invention is to provide an improved valve mechanism. Another object is to provide an improved valve mechanism particularly adapted to use in fluid compressors or pumps whereby flow of fluid is controlled in an improved manner. A further object is to provide an improved valve mechanism of the combined suction and discharge type. Yet another object is to provide an improved valve mechanism wherein certain elements of the valve guard and supporting structure are formed from metallic sheets by pressing, stamping, or otherwise. Still another object is to provide an improved valve means for such a mechanism whereby the valve element of the latter is rendered more efficient, lighter and less costly and also more reliable against breakage and leakage. A still further object is to provide in a valve mechanism of the above character improved valve elements which are formed of relatively thin material and relatively light in weight and having associated therewith improved springs whereby movement of the valve is controlled in an improved manner. A still further object is to provide an improved valve spring whereby the valve element engaged thereby is held against its seat in an improved manner, thereby resulting in an improved valve action. Still another object is to provide an improved spring arrangement in which very fine springs may be used with each held in a manner to require a double breakage before any parts can escape, and in which low fibre stress may be availed of to avoid breakage. Yet another object is to provide an improved valve mechanism of the combined suction and discharge type having improved means for holding the elements thereof together as a unit, thereby permitting unitary removal of the valve mechanism from its associated parts. These and other objects and advantages of the invention, will, however, hereinafter more fully appear.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In this drawing,—

Fig. 1 is a central vertical sectional view through the illustrative embodiment of the improved valve mechanism and its associated elements.

Fig. 2 is a cross sectional view taken substan-

tially on line 2—2 of Fig. 1, with parts omitted to facilitate illustration.

Fig. 3 is a side elevational view of the valve seat distance piece.

Fig. 4 is a plan view of the seat element for the inlet valve.

Fig. 5 is a plan view of the spring retainer for the discharge valve.

Fig. 6 is a plan view of one of the valve elements.

Fig. 7 is a fragmentary plan view showing the spring ring with a spring in operative position thereon.

Fig. 8 is a detail sectional view taken on line 8—8 of Fig. 7.

Fig. 9 is a detail sectional view taken on line 9—9 of Fig. 7.

Fig. 10 is a perspective view of one of the spring elements.

In this illustrative form of the invention there is shown a valve mechanism herein of the combined suction and discharge type particularly designed for use in fluid compressors or pumps. The compressor or pump cylinder is indicated at 1 and the cylinder head at 2. Formed in the cylinder head is a chamber 3 for receiving the valve mechanism and formed by alined bores 4 and 5 of different diameters, providing an intermediate shoulder 6. The improved valve mechanism generally designated 7 is arranged in the chamber 3 and is maintained in seated position on the shoulder 6 in an improved manner as hereinafter described.

Now referring to the improved valve mechanism per se, it will be noted that the same herein comprises an inlet valve seat 8, a discharge valve seat 9, an intermediate distance piece 10 arranged between the valve seats, a filler ring 11, the elements 8, 9, 10 and 11 being held in assembled relation as a unit by means of a central retainer tube 12. As shown, the valve seats 8 and 9 are identical and are each stamped into form from sheet metal and provided with a series of circular flow openings 13 surrounded by annular valve seating surfaces 14 and a central opening 15 for receiving the retainer tube 12. Seated on the seating surfaces surrounding the openings 13 in the valve seat members are plate valves 16 and 17 herein in the form of annular discs of relatively thin sheet metal, and in the present instance these are preferably composed of aluminum. If desired the valve seat members and valves may be faced as by plating with a harder metal, e. g. chromium, to increase their wearing qualities.

The valve 16 is the suction valve, while the 55

valve 17 is the discharge valve, and these valves are yieldably maintained in their seated position by means of springs of improved design. Formed on the filler ring 11 on the upper side thereof are upstanding projections 18, herein three in number, as shown in Fig. 2, and each arcuately cut away at 19 on a radius struck from the axial center of the ring, and these projections support and position an annular spring retainer 20 having an upstanding flange 21 for positioning a spring ring 22. This spring ring is slotted at 23 to provide bent-up hinge portions 24, 24 formed at a plurality of points about the periphery of the spring ring, and these hinge portions receive the outwardly bent ends 25 of springs 26. The ends 25 of these springs are inserted within the hinge portions 24 and are retained therein by a bent up portion 27 lying between the side arms 28 of the spring; the portion 27 preventing inward release, even in case of breakage of the intermediate part of the spring, of the ends 25 from the hinge portions 24 when the spring is in assembled position on the spring ring 22. The side arms 28 of each spring are connected by coiled spring portions 29 to a generally U-shaped valve engaging portion 30 which engages the outer face of the valve 16, the latter having a depending peripheral flange 31 so that the U-shaped portions of the springs maintain the valve in its proper centered position with respect to its seats. As illustrated, the discharge valve 17 is held in seated position by similar springs 32 mounted on a spring ring 33 supported by a spring retainer 34, the latter having a hub-like sleeve portion 35 through which the retainer tube extends, and formed with flow openings similar to the openings in the valve seat members. The inner surface of the hub portion 35 of the spring retainer engages an annular portion of the valve seat member 9 surrounding the central opening 15 thereof, and the filler ring 11 is provided with aligned openings 36 through which the retainer tube extends, and the parts 8, 9 and 34 are maintained in assembled relation with respect to the filler ring 11 by the bending, spinning or peening outwardly at 37 of the ends of the retainer tube, thereby to maintain the parts of the valve mechanism in unitary relation.

It will be noted that a plurality of springs are provided mounted at spaced points about the periphery of the spring rings, there being herein preferably at least a dozen of these springs for each valve, and the U-shaped valve engaging portions of these springs engage the valves at spaced points adjacent to their outer peripheries so that the valves are unseated by the flow of fluid about their inner peripheries with an initial rolling action, and as a result there will be a comparatively gentle opening and closing of valves and consequent elimination of valve hammering. Moreover, it will be noted that the springs are generally V-shaped in side elevation.

In this instance, the valve unit comprising the elements 8, 9, 11, 34 and 12 is placed in position within the chamber 3 in the cylinder head 2 in a manner shown in Fig. 1 with the outer flanged portion of the bottom valve seat member 9 engaging a ring-like gasket 38 supported by the shoulder 6, while engaging the flange-like portion of the upper valve seat member 8 is a sealing ring 39. The valve unit is maintained in position within the valve chamber by means of a member 40 having an annular flange 41 on its inner face engaging the sealing ring 39; and this member 40 is held in holding posi-

tion by means of a central stud 42 extending centrally through the retainer tube 12 and threadedly engaged at 43 with the adjacent wall of the cylinder 1. Threadedly engaged at 44 with the outer end of the stud 42 is a holding nut 45, while interposed between the head of this nut and the upper surface of the central hub portion of the member 40 is a washer 46. This washer is provided with a conical surface 47 engaging a corresponding surface on the nut head, thereby to insure proper centering of the parts and to impart uniform holding pressure to the member 40. The holding member 40 is provided with flow ports 48, while formed in the adjacent wall of the cylinder are flow ports 49. The inner wall of the cylinder head 2 is provided with a flow opening 50 and the distance piece 10 of the valve unit is provided with flow openings 51 communicating with the opening 50.

To effect a fluid tight sealing engagement between the holding stud 42 and the inner wall of the retainer tube 12 there is formed on the stud 42 an annular groove 52 receiving a sealing ring 53 preferably composed of rubber, and this ring tightly engages a conical surface 54 of the groove 52 and the inner wall of the retainer tube with a wedging action so that leakage through the tube past the bolt is prevented.

The operation of the improved valve mechanism will be clearly apparent from the description given. The inlet pressure, that is, fluid at atmospheric pressure, flows through the intake flow passages 48 in the holding member 40 upon the suction stroke of the compressor piston and pressure fluid flows in through the openings 13 in the inner valve seat member 8, unseating the valve 16 against the pressure of the springs 26 and this atmospheric pressure flows through the annular space between the filler ring 11 and the outer distance piece 10 through the flow openings 51 in the distance piece and thence through the flow opening 50 in the cylinder head to the compressor cylinder, the discharge valve 17 at that time being maintained closed by the other springs 32. Upon the compression stroke of the compressor piston, the fluid within the cylinder is compressed, and this compressed fluid flows through the flow opening 50, the flow openings 51, the annular space between the filler ring 11 and the distance piece 10 and through the openings 13 in the discharge valve seat member 9, moving the discharge valve 17 away from its seat against the pressure of the springs 32 and past the spring retainer 35 and through the flow passages 49 of the cylinder discharge, this high pressure maintaining the suction valve 16 closed at that time. When it is desired to remove the valve mechanism from its chamber within the cylinder head, the nut 45 is released from the stud 42, the member 40 removed from its holding position and the entire valve mechanism withdrawn from the valve chamber as a unit. Also the valve mechanism may be inserted within the valve chamber as a unit and maintained in position therein simply by proper positioning and adjustment of the parts 40, 46 and 45.

As a result of this invention, it will be noted that an improved valve mechanism is provided wherein the valve elements thereof are maintained in seated position by spring means of an improved design and which open and close with a gentle rolling action, thereby eliminating valve hammering. It will further be noted that the improved valve mechanism is of improved design composed of a relatively few component parts

and maintained in assembled relation as a unit in a comparatively simple manner. These and other advantages of the improved valve mechanism will be clearly apparent to those skilled in the art.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration, and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

I claim:

1. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a spacing element interposed between said members, said members and said element having central openings and a retainer tube extending through said openings and maintaining said members and elements in assembled relation as a detached unit securable in and removable from a pump as a whole.

2. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a spacing element disposed between said members and contacting the same adjacent their outer peripheries, and means extending through said members and element for maintaining them in assembled relation as a detached unit securable in and removable from a pump as a whole.

3. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a spacing element disposed between said members and contacting the same adjacent their outer peripheries, and means extending between said members and through said element for maintaining them in assembled relation as a detached unit securable in and removable from a pump as a whole.

4. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a plurality of spacing elements respectively contacting said members adjacent the inner and outer peripheries of the latter, and means extending between said members and through said elements for maintaining them in assembled relation as a detached unit securable in and removable from a pump as a whole.

5. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a spacing element interposed between said members, a spring retainer member engaging one of said seat members, valves engageable with said seat members, springs for yieldably holding said valves in seated engagement with said seat members including springs supported and positioned by said spring retainer member, said members and element having central openings, and a retainer tube extending through said openings and engaging the inlet valve seat member and said spring retainer member and maintaining said members and element in assembled relation as a detached unit securable in and removable from a pump as an entity.

6. In a pump valve mechanism, an inlet valve seat member, a discharge valve seat member, an annular distance piece interposed between said members for maintaining the latter in spaced relation, a filler ring interposed between said seat members and arranged centrally within said distance piece, said seat members and filler ring having central openings, and a retainer tube extending through said openings and maintaining

said elements in an assembled unit when removed from their assembly in a pump.

7. In a valve mechanism, an inlet valve seat member, a discharge valve seat member, an annular distance piece interposed between said members for maintaining the latter in spaced relation, a filler ring interposed between said seat members and arranged centrally within said distance piece, a spring retainer member engaging the discharge valve seat member, valves engageable with said valve seat members, springs for yieldably holding said valves in seated engagement with said seat members including springs supported and positioned by said spring retainer member, said members and said filler ring having central openings, and a retainer tube extending through said openings and having portions engaging the inlet valve seat member and said spring retainer member for maintaining said elements in assembled relation.

8. In a compressor or pump, the combination with a cylinder member having a chamber, of a valve mechanism receivable in said chamber including a plurality of valve parts, and a central tubular holding element for maintaining said parts in assembled relation when removed from said chamber, a holding stud secured to the compressor cylinder and extending centrally through said tubular element, and a holding member engageable with said stud and engaging the outermost part of said valve mechanism for maintaining said valve mechanism in position within said chamber.

9. A compressor valve spring assembly for a valve mechanism having a guard or cover, comprising a spring retainer ring, and a plurality of spring elements carried by said spring retainer ring and having portions movable relative to said ring.

10. A compressor valve spring assembly for a valve mechanism having a guard or cover comprising a spring retainer ring, and a plurality of spring elements pivotally mounted on said spring retainer ring.

11. A compressor valve spring comprising a spring supporting ring, a plurality of spring elements pivotally mounted on said ring, and clip means on said spring supporting ring for maintaining the spring elements in their pivotal mountings on said ring.

12. A compressor valve comprising a circular valve element bent to provide an external peripheral flange projecting from the back thereof.

13. A compressor valve of the spring-seated type comprising a circular valve element bent to provide an external peripheral flange projecting from the back thereof and adapted to cooperate with a spring in the positioning of said valve, said valve also having a central opening to permit flow both externally and internally thereof.

14. A compressor valve structure comprising a circular valve, a seat with which the same cooperates, and means for effecting a cooperative relation between the valve and seat including a plurality of spring fingers engaging the valve near its outer edge and locating said valve in planes parallel to its seat.

15. A compressor valve structure comprising a circular valve, a seat with which the same cooperates, and means for effecting a cooperative relation between the valve and seat including a plurality of spring fingers engaging the valve near its outer edge at points spaced circumfer-

entially about the valve and locating said valve in planes parallel to its seat.

16. A compressor valve structure comprising a circular valve having a peripheral flange projecting from one valve face, and a plurality of spring fingers engaging the valve adjacent said flange, said flange and spring fingers cooperating in maintaining said valve centered with respect to its seat.

17. A compressor valve structure comprising a circular valve having a peripheral flange projecting from one valve face, and a plurality of spring fingers engaging the valve adjacent said flange at points spaced circumferentially about said valve, said flange and spring fingers cooperating in maintaining said valve centered with respect to its seat.

18. A spring supporting ring having slots cut in its body and extending outwardly through the outer edge of the ring and forming narrow portions adapted to be bent into a shape to form a pivotal mounting for a spring element.

19. A spring supporting ring having slots cut in its body and extending outwardly through the outer edge of the ring and forming thereon narrow portions adapted to be bent into a shape to form a pivotal mounting for a spring element and other portions adapted to be bent into shape to maintain the spring elements in their pivotal mountings.

20. In combination, in a compressor, a circular valve, and a plurality of compressor valve springs each comprising arm portions terminating in coiled springs and a connecting U-shaped valve engaging portion, said springs each disposed within a space of less length than the radius of said valve.

21. A compressor valve spring comprising arm portions terminating in coiled springs and a connecting U-shaped valve engaging portion extending substantially parallel to the axes of said coiled springs and said arms having laterally bent portions forming pivotal mountings for the spring.

22. A compressor valve structure comprising a circular valve, and a plurality of coiled springs engaging said valve near its outer edge and guiding the movements thereof.

23. A compressor valve structure comprising a circular valve, a spring supporting ring, and a plurality of U-shaped coiled valve springs pivotally mounted on said spring ring and engaging said valve near its outer edge.

24. A compressor valve structure comprising a circular valve, a spring supporting ring, and a plurality of generally U-shaped coiled valve springs pivotally mounted on said spring ring on axes extending chordally of the latter and engaging said valve near its outer edge.

25. In a valve mechanism, in combination, a valve seat, a valve co-operating therewith, and spring means for positioning said valve, including spring elements, each having ends extending in the same general direction, and an intermediate portion providing flexibility, means for holding one of said ends of each spring, and means co-operating with the other end to preclude displacement of the valve in planes parallel to its seat.

26. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a spacing element interposed between said members and disposed inwardly of the outer peripheries thereof, a separate casing member

disposed substantially coaxial with said spacing element and adjacent to and contacted by the peripheral portions of adjacent surfaces of said seat members, and means for holding said parts together as a unit when disassembled from a pump.

27. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, a spacing element interposed between said members and disposed inwardly of the outer peripheries thereof, a separate casing member having a lateral flow port through the wall thereof and disposed substantially coaxial with said spacing element and adjacent to and contacted by the peripheral portions of adjacent surfaces of said seat members, and means for holding said parts together as a unit when disassembled from a pump.

28. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, and a central member connecting said members, for detachment from the pump with which they are usable, as an assembled unit.

29. In a valve mechanism for a pump, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, and a central member contacting with less than all of said members and connecting said members, for detachment from the pump with which they are usable, as an assembled unit.

30. In a valve mechanism, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, and a central member contacting with all of said members except said casing member and connecting said members, for detachment from the pump with which they are usable, as an assembled unit.

31. In a valve mechanism, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, a central member connecting said members, for detachment from the pump with which they are usable, as an assembled unit, said spacing member providing a mounting for an inlet valve guard, and an inlet valve guard disposed upon said mounting.

32. In a valve mechanism, an inlet valve seat

member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, a central member contacting with less than all of said members and connecting said members, for detachment from the pump with which they are usable, as an assembled unit, said spacing member providing a mounting for an inlet valve guard, and an inlet valve guard disposed upon said mounting.

33. In a valve mechanism, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, a central member contacting with all of said members except said casing member and connecting said members, for detachment from the pump with which they are usable, as an assembled unit, said spacing member providing a mounting for an inlet valve guard, and an inlet valve guard disposed upon said mounting.

34. In a valve mechanism, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, a central member connecting said members, for detachment from the pump with which they are usable, as an assembled unit, said spacing member providing a mounting for an inlet valve guard, an inlet valve guard disposed upon said mounting, inlet and discharge valves cooperating with their respective seat members, and spring means cooperating with said inlet valve member maintaining said inlet valve guard in position upon its mounting.

35. In a valve mechanism, an inlet valve seat member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, a central member contacting with less than all of said members and connecting said members, for detachment from the pump with which they are usable, as an assembled unit, said spacing member providing a mounting for an inlet valve guard, an inlet valve guard disposed upon said mounting, inlet and discharge valves cooperating with their respective seat members, and spring means cooperating with said valve members, the spring means associated with said inlet valve member maintaining said inlet valve guard in position upon its mounting.

36. In a valve mechanism, an inlet valve seat

member, a discharge valve seat member, said members disposed in spaced, parallel, coaxial relation, a spacing member interposed between said members and lying inwardly of the peripheries of the latter, a casing member surrounding said spacing member and engaged by the outer portions of the adjacent sides of said seat members, a discharge valve guard coaxial with said discharge valve seat member, a central member contacting with all of said members except said casing member and connecting said members, for detachment from the pump with which they are usable, as an assembled unit, said spacing member providing a mounting for an inlet valve guard, an inlet valve guard disposed upon said mounting, inlet and discharge valves cooperating with their respective seat members, and spring means cooperating with said valve members, the spring means associated with said inlet valve member maintaining said inlet valve guard in position upon its mounting.

37. A compressor valve spring mechanism comprising a ring having only a spring retainer function and having secured thereto a plurality of spring elements each extending substantially wholly in radial directions.

38. A pump valve spring mechanism comprising a plurality of springs each having portions in the sides of a dihedral angle, and a ring supporting said springs at the periphery thereof with the edges of said dihedral angles extending chordally of said ring.

39. A compressor valve spring comprising a ring having at its periphery a plurality of bent portions arranged in series completely around its periphery and providing substantially tangential spring mountings, and springs generally V-shaped in side elevation and having an extremity of one portion of the V thereof engaged in said mountings and the other portion thereof extending freely outwardly.

40. A compressor valve spring mechanism comprising a ring having only a spring retainer function and having secured thereto a plurality of spring elements generally V-shaped in side elevation but with one leg of the V longer than the other, said spring elements having their shorter legs connected at their extremities to said ring adjacent the periphery of the latter.

41. A compressor valve spring mechanism comprising a ring having only a spring retainer function and having secured thereto a plurality of spring elements generally V-shaped in side elevation but with one leg of the V longer than the other, said spring elements having their shorter legs connected at their extremities to said ring adjacent the periphery of the latter and arranged with their longer legs extending outside a cylindrical surface in which the periphery of said ring lies, and flexing in substantially axial planes with respect to said ring.

42. In a valve mechanism, in combination, a valve seat, a guard, a valve disposed between said seat and guard, and a spring assembly between said seat and guard including a ring having connected thereto a plurality of torsion springs each having relatively yieldable ends connected by coils.

43. In a valve mechanism, in combination, a valve seat, a guard, a valve disposed between said seat and guard, and a spring assembly between said seat and guard including a ring having connected thereto at its periphery a plurality of torsion springs each having relatively yieldable ends connected by coils.

44. In a valve mechanism, in combination, a valve seat, a guard, a valve disposed between said seat and guard, and a spring assembly between said seat and guard including a ring having connected thereto at its periphery and in each case by one of their ends a plurality of torsion springs each having relatively yieldable ends connected by coils.
45. In a valve mechanism, in combination, a valve seat, a guard, a valve disposed between said seat and guard, and a spring assembly between said seat and guard including a ring perforated to permit fluid flow therethrough and having connected thereto a plurality of torsion springs each having relatively yieldable ends connected by coils.
46. A compressor valve structure comprising an annular valve, a valve seat comprising circular seat portions respectively engaged by portions adjacent the inner and outer peripheries of said valve, and means for yieldingly seating said valve including at least three spring fingers engaging the valve adjacent the circumferential zone thereof which cooperates with the outer seat portion.
47. A compressor valve structure comprising a valve having an external peripheral circular flange projecting from the back thereof, a ring coaxial with the desired position of said valve, supporting means for said ring, and a plurality of springs each providing spring fingers and having portions respectively engaging the valve adjacent the flange and secured to said ring adjacent the periphery of the latter.
48. A compressor valve structure comprising a valve having a circular external peripheral flange projecting from the back thereof, a ring coaxial with the desired position of said valve, supporting means for said ring, and a plurality of springs each providing spring fingers and having portions respectively engaging the valve adjacent the flange and secured to said ring adjacent the periphery of the latter.
49. A compressor valve structure comprising an annular valve imperforate between its peripheries and valve positioning means including a plurality of coiled springs engaging said valve near its outer edge at a plurality of points spaced circumferentially with respect to said valve to provide a balanced seating pressure.
50. A compressor valve structure comprising an annular valve imperforate between its peripheries and valve positioning means including a plurality of coiled springs engaging said valve near its outer edge at a plurality of points spaced circumferentially with respect to said valve to provide a balanced seating pressure, said springs cooperating with said valve in centering the same.
51. A compressor valve structure comprising a circular valve, a spring ring, supporting means for said ring, and a plurality of generally U-shaped coiled valve springs pivotally mounted on said spring ring and engaging said valve near its outer edge and having the coils thereof nearer the axis of the valve than the points of engagement thereof with said valve.
52. In a valve mechanism, in combination, a circular valve seat, a valve cooperating therewith, and spring means for positioning said valve including spring elements each having ends extending in directions generally radial of the valve seat and each having an intermediate portion providing flexibility, means for holding one of the ends of each spring, and means cooperating with the other ends of said springs to preclude displacement of the valve in planes parallel to its seat.

WARREN NOBLE. 40

CERTIFICATE OF CORRECTION.

Patent No. 2,063,047.

December 8, 1936.

WARREN NOBLE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 3, second column, line 41, claim 10, after the word "cover" insert a comma; page 4, first column, line 40, claim 21, after "portion" insert a comma; lines 40 to 42 inclusive, same claim 21, strike out "extending substantially parallel to the axes of said coiled springs and" and insert the same after "portions", line 43, same claim; and that the said Letters Patent should be read with these corrections therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 16th day of November, A. D. 1937.

(Seal)

Henry Van Arsdale,  
Acting Commissioner of Patents.