April 25, 1950 J. C. WOHLFARTH 2,505,375

DUPLEX FLUID STRAINER

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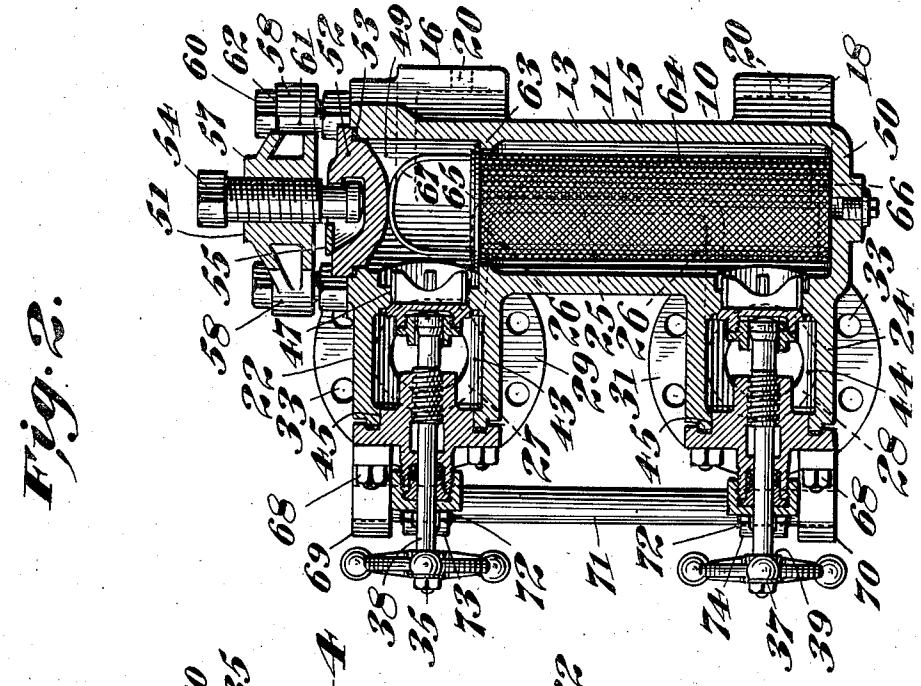

Fig. 2.

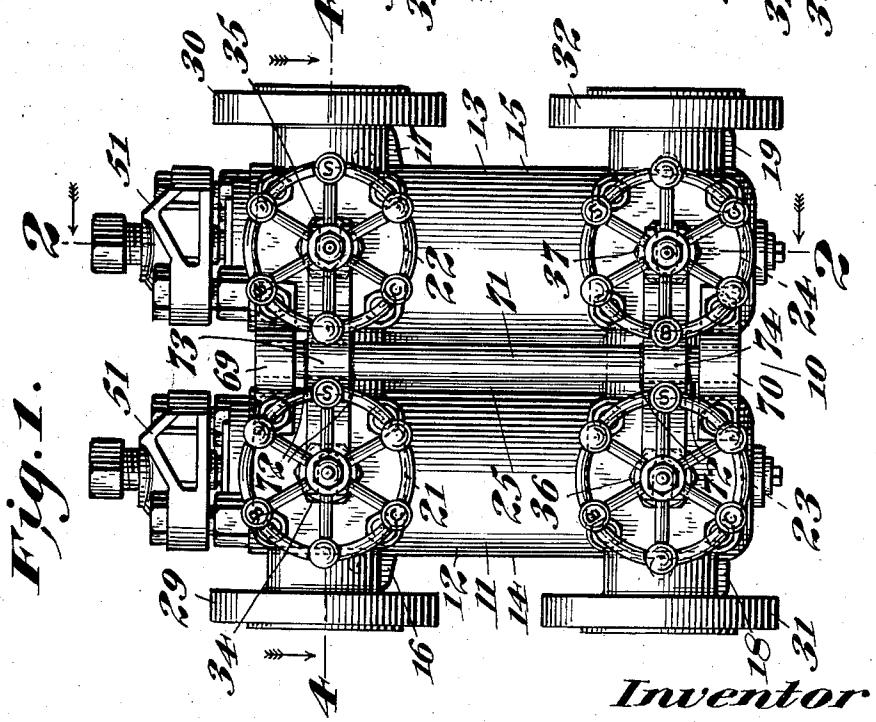

Fig. 1.

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Fig. 4.

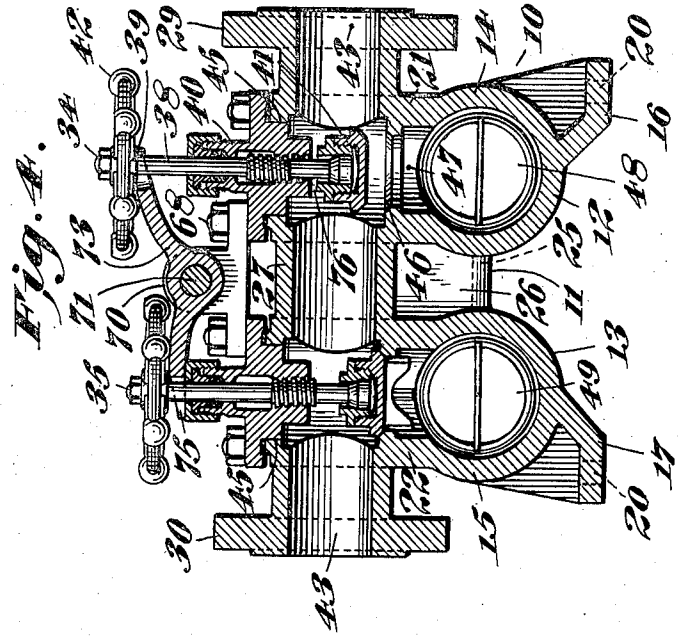
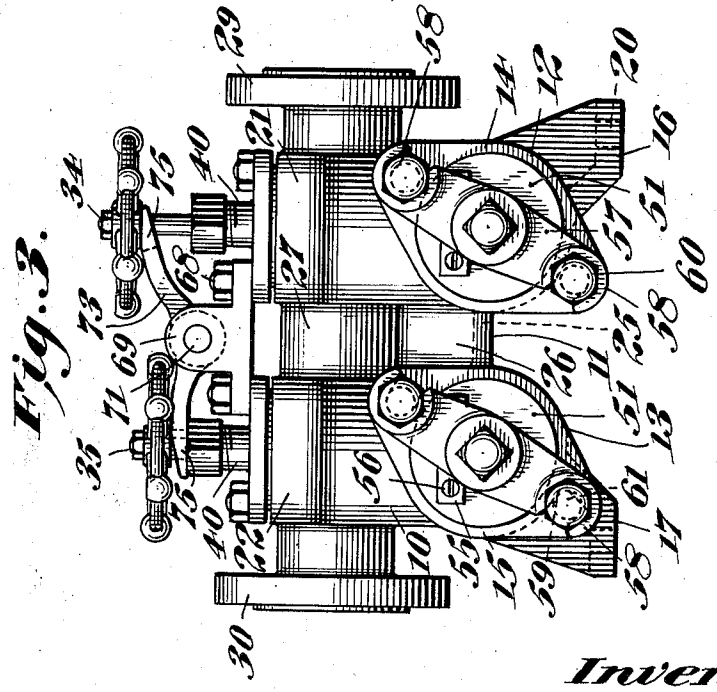


Fig. 3.



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2,505,375

DUPLEX FLUID STRAINER

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4 Claims. (Cl. 210—168)

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This invention relates to strainers for use in removing suspended matter from fluids, and is particularly directed to an improvement in fuel oil strainer units of the duplex type comprising duplicate strainer elements such as are known to be used in oil burning systems where it is a matter of especial importance that there shall be no inadvertent interruption of the normal flow of the strained fuel oil to its point of use or consumption.

Known fuel oil strainers of the duplex type usually comprise within their design the inherent ability to shut off one of the two strainer elements when under normal operating conditions for the purpose of inspection of and repair to the element shut off without interrupting the normal flow of fuel oil through the other of its strainer elements to its point of use or consumption. In some strainers this desirable feature is accomplished automatically by having a single rotatable gate type of valve that serves both strainer elements as to flow and to cut off means. An example of this type of strainer unit is disclosed in the Patent 1,042,203 to Dahl, of October 22, 1912. Other strainers of the automatic preventative type have double faced disc type valves serving opposed valve ports of the two strainer elements, and here again the arrangement is such that it is impossible to shut off both strainer elements at the same time. An example of this type of strainer unit is disclosed in the Patent 1,758,565 to Elliot, of May 13, 1930. There is still another design of strainer unit in which each strainer element has its own individual inlet and discharge valves at opposite ends thereof whereby the inlet and discharge ends of each strainer element may be individually opened up or shut off, as to flow therethrough, selectively by the operator of the strainer unit. An example of this type of strainer unit is disclosed in the Patent 1,627,186 to Lalor, of May 3, 1927. The Lalor strainer unit is well adapted for high liquid pressure fuel oil burners, but this design has the disadvantage that it depends upon the operator thereof for proper operation thereof, and it can be inadvertently shut off entirely during operation. My invention lies in an improvement for the Lalor type of duplex fuel oil strainer units to prevent inadvertent maloperation thereof.

It is the primary object of my invention to construct a duplex fuel oil strainer unit comprising internally thereof a duplication of strainer elements, each of said elements comprising inlet and outlet valve fluid openings adapted for

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manual closure thereof by means of axially movable screw stemmed disc valves having external operating handles attached to the outer end of said valve stems, the said external ends of said valve stems cooperating as a group with interlocking monitor means whereby either one of said strainer elements may be shut off singly for inspection or repair, but a condition of simultaneous shut off of both strainer elements during normal operation of the strainer unit is automatically prevented, and inadvertent maloperation thereof is precluded.

It is a further object of my invention that the shut off condition of a selected strainer element may be accomplished by the closing of either one or both of the inlet and outlet valve openings of the selected strainer element, and that when so shut off neither one of the valves of the other strainer element may be closed without first opening said first mentioned valve or valves, whereby the uninterrupted flow of strainer fuel oil through said strainer unit is assured.

It is a further object of my invention that at any time during normal operation of the strainer unit all four valves thereof may be fully opened, and thus have both strainer elements in operation if deemed desirable.

It is another object of my invention that selective closing of any single valve may be accomplished only when all four valves are fully open, and that successive closing of the valves is so monitored as to permit only of normal uninterrupted operation of the strainer unit.

Further objects and advantages will be apparent from the following description wherein details of design and operation will be given in full with reference to the accompanying drawings illustrating the preferred embodiment of my invention, and wherein similar reference numerals designate similar parts throughout the several views.

Fig. 1 is a plan view of a strainer unit incorporating the preferred form of my invention,

Fig. 2 is a vertical sectional view taken along the line 2—2 of Fig. 1 as seen in the direction of the arrows 2—2,

Fig. 3 is a full rear view as seen in the direction of arrows 4—4 of Fig. 1, and

Fig. 4 is a vertical sectional view taken along the line 4—4 of Fig. 1 as seen in the direction of the arrows 4—4.

Referring now to the drawings, and more particularly to Figs. 1 and 2, the numeral 10 designates the complete ensemble of a duplex strainer

unit embodying the preferred form of my invention.

The duplex strainer unit 10 comprises a main housing 11 divided into two parallel substantially cylindrical body portions 12 and 13 which serve to house the substantially identical strainer elements 14 and 15. The main housing 11 has downwardly extending rear foot supports 16 and 17, and front supports 18 and 19, each adapted with apertures 20 for foundation attachments (not shown). Extending integrally upward from the body portions 12 and 13 at the rear thereof are the inlet valve housings 21 and 22, respectively; and, at the front thereof are the outlet valve housings 23 and 24, respectively. Transversely and jointly uniting the body portions 12 and 13 and their respective valve housings 21 to 24, inclusive, are the integral web portions 25 and 26, and the cylindrical portions 27 and 28 (see Figs. 2 and 3). Extending integrally outwardly from the inlet valve housings 21 and 22 are the dual flanged inlets 29 and 30, and extending integrally outwardly from the outlet valve housings 23 and 24 are the dual flanged outlets 31 and 32. The dual flanged inlets and outlets are adapted to be connected to the oil conduit between the oil supply tank and the burners in any desirable or conventional manner. As indicated in the drawings the dual flanged inlets and outlets are adapted with apertures 33 for conventional bolted flanges (see Fig. 2).

Referring now particularly to Fig. 4 we have here a vertical cross sectional view through the strainer unit 10 along the line 4—4 of Fig. 1. This view is taken through the inlet valve ends of the strainer elements 14 and 15 as seen from the rear thereof and except for respective designating numerals it is typical of that prevailing at the outlet ends of the strainer elements 14 and 15, and therefore a description of Fig. 4 showing the inlet valve end structure will suffice for an understanding of the outlet valve end structure, and need not be repeated for the latter except for certain features inclusively stated in the description for the inlet valve end structure. The inlet valves 34 and 35 together with the outlet valves 36 and 37 (Fig. 1) are preferably uniform in design and may be of any suitable internal structure that comprises an external axially movable screw type valve stem 38 having an abutment 39 thereon. As shown in the drawings the stem 38 is mounted in a packed bonnet 40 suitably attached to the housing 11, and is provided with a suitable disc valve 41 and an external manually operable means such as handwheel 42. As will be noted in Fig. 4 an inlet valve chamber 43 extends successively through the flanged inlet 29, the inlet valve housing 21, the cylindrical portion 27, the inlet valve housing 22, and the flanged inlet 30. A similar outlet valve chamber 44 (Fig. 2) extends successively through the flanged outlet 31, the outlet valve housing 23, the cylindrical portion 28, the outlet valve housing 24, and the flanged outlet 32. The inlet and outlet valve chambers 43 and 44 are each adapted with openings 45 for mounting the bonnets 40 of the valves 34, 35, 36, and 37; and are each further adapted with suitable valve seats 46 for disc valves 41, and communicating valve openings 47 which communicate the inlet and outlet valve chambers 43 and 44 with the strainer chambers (48 and 49) below to be further described hereinafter. The inlet valve chamber 43 receives the flow of fuel oil from the fuel supply tank conduit (not shown) and passes it on to and through the outlet valve chamber 44 to the conduit for the burners (not shown), as will now be described.

Referring now particularly to Fig. 2 we have here a vertical cross sectional view taken through the strainer unit 10 along the line 2—2 of Fig. 1. This view is taken longitudinally through the strainer element 15 and includes its control means—the inlet valve 35 and the outlet valve 37. A similar view if taken through the strainer element 14 would be substantially identical to that of the strainer element 15 except for designating numerals, and therefore a description of the one will suffice for a full understanding of the other, and need not be repeated except for certain features inclusively stated in the description now to be given for the strainer element 15. The main housing 11 comprises the two strainer chambers 48 and 49 extending lengthwise in parallel relationship within the body portions 12 and 13 respectively thereof, and communicating with the inlet and outlet valve chambers 43 and 44 directly above at each end thereof through the valve openings 47 of the valve housings 21, 22, 23, and 24 in their respective locations as has been described hereinabove. The strainer chambers 48 and 49 are each closed at the front end thereof by wall portions 50 of the main housing 11, and are open at the rear end thereof. Each rear end of the chambers 48 and 49 is adapted with readily removable closure means 51. As shown in the drawings the closure means 51 comprise a closure head 52 with sealing gasket 53, a clamp screw 54 having a rotatable tongue-and-groove engagement at its inner end with the closure head 52, and held in engagement therewith by retainer strip 55 and fastening means 56 (Fig. 3), and a latch bar 57 adapted centrally for threaded engagement with the clamp screw 54, and having oppositely extending side slotted ends 58—the sides 59 of the slots being concentric with the axis of the clamp screw 54 for the purpose of rotational engagement and disengagement with the shouldered latch studs 60 mounted in the rear face of the housing 11 adjacent each strainer chamber opening. Each of the latch studs 60 is provided with shouldered extensions 61 having abutments 62 adapted to provide clamping resistance when engaged with the slotted ends 58 of the latch bar 57. When the latch bar 57 is in engagement with the extension abutments 62 the clamp screw 54 may be adjusted inwardly or outwardly as desired to seal or to release the closure head 62 with relation to its respective strainer chamber.

The strainer chambers 48 and 49 each comprise an internal annular abutment flange 63 slightly to the front of the inlet valve opening 47. Each strainer chamber 48 and 49 is provided with a foraminated strainer cage 64 having an open rimmed rear end 65 adapted to seat on the abutment 63, and a closed front end 66. The rimmed rear end 65 is adapted with a bail 67 whereby when the closure head 52 is clamped in place its inner surface engages the bail 67 and forces the rimmed rear end 65 of the strainer cage 64 to seat against the annular abutment 63.

In operation the strainer unit 10 as hereinabove set forth will receive oil from the oil supply tank through either one or both of its inlets 29 and 30 as desired (the unused inlet, if any, being shut off in any conventional manner), and flowing through the unit 10 the oil will be strained, and will be delivered to the burner conduit through either one or both of its outlets 31 and 32 as desired (the unused outlet, if

any, being shut off as in the case of the inlets 29 and 30).

It is to be understood that it is a condition of proper operation of my invention when in use that the strainer unit 10 shall be adapted to have both of its inlet valves in communication with a source of oil supply, and to have both of its outlet valves in communication with a conduit to the burners in operation thereunder. I have herein shown the preferred form of my apparatus, but it is obvious that the inlet valve chamber 43 and the outlet valve chamber 44 could each be divided into individual chambers for each valve, and that each such chamber could be properly serviced within the herein disclosure without departing from the spirit or scope of this invention, or sacrificing any of its advantages.

A typical operating routine for the strainer unit 10 may be traced on the drawings as follows:

Referring to Fig. 1 assume that oil is being delivered to and discharged from the strainer unit 10 in accordance with the preceding paragraph, and that the strainer element 14 is in normal operating condition, and that the strainer element 15 is shut off and may be opened for the purpose of cleaning the strainer cage 64. Referring now to Fig. 4 the implied condition of internal operation is shown wherein the inlet valve 34 of the strainer element 14 is in full open position with its disc valve 41 raised above its valve seat 46 so as to allow oil flowing into the inlet chamber 43 from the connected tank conduit (not shown) to flow through the communicating valve opening 47 into the strainer chamber 48 below, while at the same time the inlet valve 35 of the strainer element 15 is in its closed position with its disc valve seated upon its valve seat thus preventing oil within the inlet chamber 43 from flowing into the strainer chamber 49 below. By referring now to Fig. 2 we note that this view shows the implied condition of shut off existing in the strainer element 15 wherein both the inlet valve 35 and the outlet valve 37 are closed whereby oil cannot flow from either the inlet chamber 43 or the outlet chamber into the strainer chamber 49 below, and the chamber 49 may therefore be safely opened for examination, or repair and cleaning of the strainer cage 64. With a little imagination Fig. 2 may also be used to illustrate the flow of oil through the strainer element 14 as is occurring at the same time as is the shut off condition of strainer element 15. By temporarily ignoring the indicating numerals and assuming that Fig. 2 discloses the strainer element 14 with its inlet valve and its outlet valve open, then the oil flows from the inlet valve chamber above through its communicating inlet valve opening to the rear of the strainer chamber below, and flowing forwardly through the strainer cage leaves the strainer chamber at the front end thereof through the communicating outlet valve opening into the outlet valve chamber above, and thence to the burner conduit (not shown), thus completing its cycle through the strainer unit 10.

We now come to that feature of the strainer unit 10 which constitutes my invention per se when used in cooperation with the strainer unit 10. Mounted upon the longitudinal axis of the unit 10 and suitably attached to the upper surfaces of the valve bonnets 40 thereof by certain fastening devices 68 thereof are the rocker shaft support brackets 69 and 70. The support brackets

69 and 70 provide bearing means for the rocker shaft 71 rotatable therein. Attached to the rocker shaft 71 by any suitable means such as welding 72 are the dual twin-armed monitor levers 73 and 74. Lever 73 serving the inlet valves 34 and 35, and lever 74 serving the outlet valves 36 and 37. The monitor levers 73 and 74 are identical in structure, are in alignment upon the rocker shaft 71, and have the ends 75 of their outwardly extending arms each adapted for facial engagement with the valve stem abutment 39 of its respective valve (Fig. 4). The angular relationship of the twin arms in each of the levers 73 and 74 are identical and are such that when all the valves of both strainer elements 14 and 15 are at full open position any one valve stem 38 may be adjusted downward to its full closed position and in so doing the abutment 39 of this valve stem will engage the outer end 75 of its respective monitor lever pushing it downward, and will thereby rotate the rocker shaft 71 and both levers 73 and 74 thereon about its axis, whereby the lever ends 75 on both of the levers 73 and 74 on the opposite side of the rocker shaft 71 to that of the depressed ends 75 will rise and engage the abutments 39 of both the valve stems on that side in their full open position, thus preventing any downward movement of either of these valves in a closing direction until the first closed valve (or valves) is or are again opened. It will be understood that the shut off condition of a strainer element with respect to the flow of oil therethrough may be brought about by the closing of either one or both of the valves controlling that specific strainer element. For the examination of the strainer cage both valves of its strainer element must be closed to prevent the escape of oil therefrom when opened. When both valves of a strainer element have been closed then both of these valves must be opened before either one or both valves of the other strainer element may be closed. In order to avoid unnecessary exactitude in timing, an overtravel clearance is allowed for in the open position of each valve as is indicated at 76 between the top of each disc valve 41 and the inner face of its bonnet 40. These clearances in no way affect adversely the automatic safety functioning of the strainer unit 10.

It will now be readily apparent to those skilled in the art to which this invention appertains that I have made an improvement in the specific type of duplex oil strainer unit herein described (wherein individual inlet and outlet valves are provided for each of the strainer elements) whereby either one of two strainer elements may be cut off singly for inspection or repair, but a condition of simultaneous shut off of both strainer elements during normal operation of the strainer unit is automatically prevented, and inadvertent maloperation of the strainer unit is precluded. In the Lalor device the operator could either intentionally or inadvertently shut off a second strainer element when a first one was already shut off. In my improvement a second strainer element can not be shut off when a first strainer element is shut off, but the second strainer element may be shut off successively by first opening up the first shut off strainer element—this constitutes the safety feature that prevents and precludes maloperation.

I claim:

1. A duplex fluid strainer unit comprising internally thereof a duplication of strainer elements, each of said elements comprising inlet and outlet

flow control means in spaced relation along the axis thereof, each of said control means being adapted for manual closure thereof by means of external operating handles, a rocker shaft operably mounted upon said unit axially midway between the respective axes of the said strainer elements and between their external operating handles, rocker arms fixed upon said shaft in line with each of said operating handles, the outer end of each said rocker arm being adapted to engage the under side of its respective adjacent operating handle when the control means of one of said strainer elements are both closed and the control means of the other of said strainer elements are both open, whereby in subsequent normal operation of the strainer unit either one or both of the control means of either strainer element may be operably closable only when both of the control means of the other strainer element are open.

2. A duplex fluid strainer unit comprising internally thereof a duplication of strainer elements, each of said elements comprising inlet and outlet valve fluid openings at opposite ends thereof, conduit means for supplying fluid to each of said inlet openings, conduit means for discharging fluid from each of said outlet openings, axially movable screw-stemmed valve means for each of said openings, the said valve means each comprising external manually operable means having an inwardly facing abutment thereon, a rocker shaft operably mounted on said unit substantially midway between the said strainer elements and between the said external operable means, two double-armed rocking levers fixed upon said shaft in spaced relation in line with said inlet valves and said outlet valves respectively, the outer end of each said rocking lever being adapted to facially engage their respective adjacent valve stem abutment when the valves of one of said strainer elements are both closed and the valves of the other of said strainer elements are both open, whereby in subsequent normal operation of the strainer unit either one or both of the valves of either of said strainer elements may be operably closable only when both of the valves of the other of said strainer elements are open.

3. A duplex fluid strainer unit comprising internally thereof a duplication of strainer elements having their axes spatially parallel in a common plane, each of said elements comprising inlet and outlet valve fluid openings at opposite ends thereof, the said inlet openings and the said outlet openings having their axes each lying in common planes respectively spatially parallel to each other, conduit means for supplying fluid to each of said inlet valve openings, conduit means for discharging fluid from each of said outlet valve openings, axially movable screw-stemmed valve means for each of said valve openings, the said valve means each comprising external manually operable means having an inwardly facing abutment, a rocker shaft operably mounted on said unit substantially midway between said strainer elements, two double-armed rocking levers fixed transversely upon said shaft in spaced relation proximate the planes of the said inlet and outlet valve openings respectively, the outer ends of the said levers being each adapted to facially engage their respective adjacent valve stem abutment when the valves of one strainer element are both closed and the valves of the other strainer element are both open, whereby in subsequent normal operation of the strainer unit either one or both of the valves of either strainer element may be operably closable only when both of the valves of the other strainer element are open.

4. A duplex fluid strainer unit comprising internally thereof a duplication of strainer elements having their axes spatially parallel in a common plane, each of said elements comprising inlet and outlet valve fluid openings having their axes spatially parallel in a common plane, said latter planes being spatially parallel one to the other and normal to the first mentioned plane, and having the axes of the inlet openings and of the outlet openings respectively in spatially parallel common planes that are transverse to the first mentioned axes and thereby normal to all three first mentioned planes, conduit means for supplying fluid to each of said inlet valve openings, conduit means for discharging fluid from each of said outlet valve openings, axially movable screw-stemmed valve means for each of said valve openings, the said valve means each comprising external manually operable means having an inwardly facing abutment, a rocking shaft operably mounted upon said unit parallel to the axes of said strainer elements and substantially midway between the second and third mentioned planes, two double-armed rocking levers fixed transversely upon said shaft in spaced relation proximate the planes of the said inlet and of the said outlet valve openings respectively, the outer ends of the said levers being each adapted to facially engage their respective adjacent valve stem abutment when the valves of one strainer element are both closed and the valves of the other strainer element are both open, whereby in subsequent normal operation of the strainer unit either one or both of the valves of either strainer element may be operably closable only when both valves of the other strainer element are open.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
218,351	Weed	Aug. 5, 1879
1,627,186	Lalor	May 3, 1927