

Feb. 10, 1931.

M. EULE

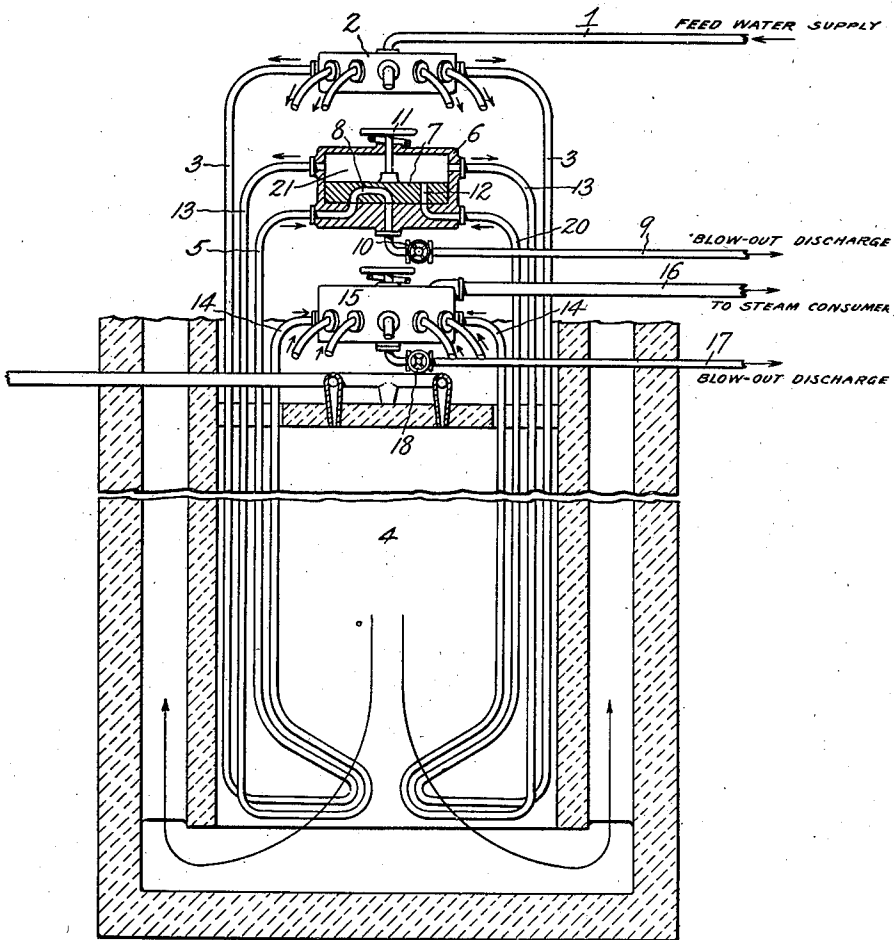
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MULTIWAY SLUDGE VALVE

Filed Sept. 30, 1929

4 Sheets-Sheet 1

*Fig. 1.*



WITNESS

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Fig. 2.

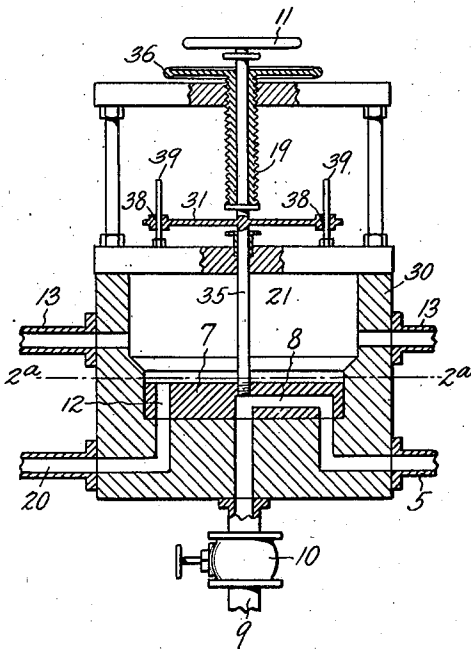


Fig. 3.

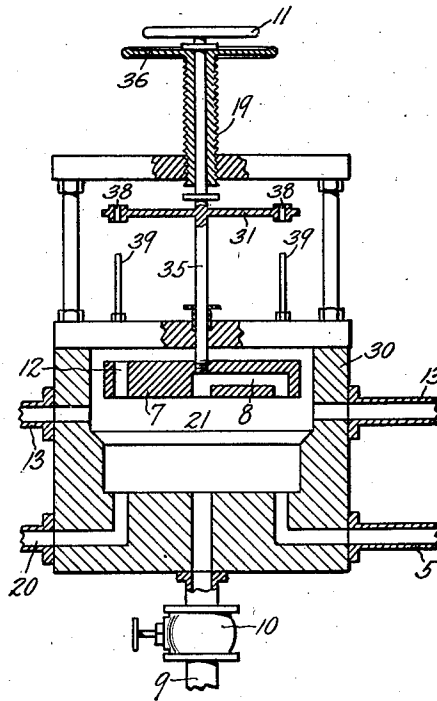
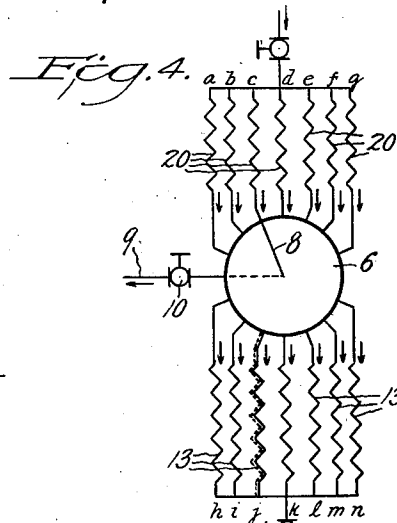
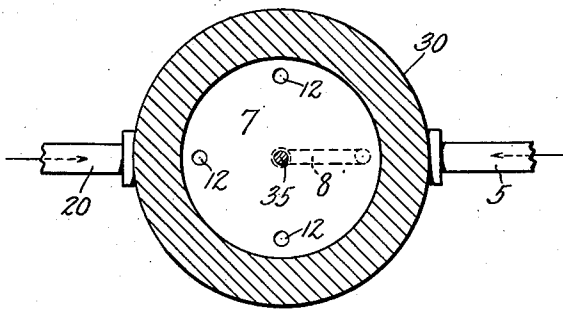


Fig. 2a



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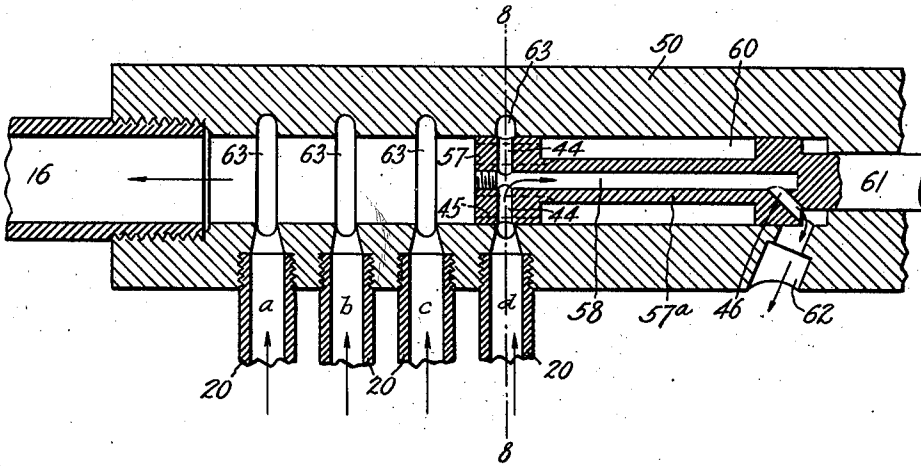
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MULTIWAY SLUDGE VALVE

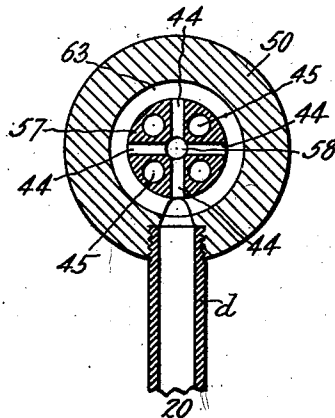
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*Fig. 7.*



*Fig. 8.*



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# UNITED STATES PATENT OFFICE

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## MULTIWAY SLUDGE VALVE

Application filed September 30, 1929, Serial No. 396,177, and in Germany June 16, 1928.

One object of the invention is to provide in tubular systems, which consist of a number of tube sections through which a fluid is forced in parallel streams, a junction and collecting device into which all the individual tube sections discharge and in which the discharge of all the sections is properly mixed.

Another object is to provide in a tubular system of the above character a device which equally and effectively distributes the fluid into the individual tube sections.

Another object is to make provisions by which each individual tube section of a tubular system, through which a fluid is forced in a number of parallel streams, can be connected with a chamber in which a much lower pressure exists than in the particular tube sections with which the connection is made.

A further object is to provide a device which combines the action of a collector and mixer with means for selectively connecting individual tube sections with a chamber of lower pressure.

Lastly, an object is to combine into one single apparatus the collection of a fluid discharged from various tube sections, the distribution of this same fluid into various other tube sections and a device for connecting each of the tube sections, into which the fluid is distributed or from which the fluid is collected, with a chamber of lower pressure.

The purpose of temporarily connecting a tube section, through which a fluid is forced under pressure with a chamber of lower pressure, is to discharge the content of such a tube section at high velocity and to thereby wash all sludge, sediment or other scale forming matters out of this section and to remove it into another chamber.

In the accompanying drawings I have illustrated several forms in which my invention may be reduced to practice, and in which

Fig. 1 shows a diagrammatic lay-out of an application of such a device to a steam generator through the tubular heating elements of which water and steam are forced.

Fig. 2 shows a detail design of such a device in longitudinal vertical section in the position which allows washing out of one tube section.

Fig. 2<sup>a</sup> shows a horizontal section on line 2<sup>a</sup>-2<sup>a</sup> in Fig. 2.

Fig. 3 shows the same device as Fig. 2 in the normal position where it acts as collector and distributor.

Fig. 4 shows diagrammatically the layout of the tube lines connected to the apparatus shown in Figs. 2 and 3.

Figs. 5 and 6 show an improved construction of the device, respectively in longitudinal vertical section on line C-D, Fig. 6, and one half of the horizontal section on line A-B in Fig. 5.

Fig. 7 shows in longitudinal vertical section a different design of a multi-way sludge valve which would answer the same purpose as the valves shown in Figs. 2-6, and

Fig. 8 shows a transverse section on line 8-8 of Fig. 7.

Referring now more particularly to Fig. 1 this figure shows a diagrammatical arrangement of heating tubes of a steam generator located against the walls of a combustion chamber 4. The feed water enters through tube 1 into a distributor 2. This distributor divides the water stream coming from 1 into a number of parallel water streams which pass through the tube sections 3. These sections are connected at their other ends to a combined collector and multi-way sludge valve and distributor 6, the entrance connections to this valve being indicated by two tube connections 5 and 20. The multi-way valve 6 contains a distributor disc 7 which can be rotated from the outside by hand wheel 11. The tubes of the individual boiler sections, as represented by tubes 5 and 20 all enter the valve body through the side and emerge at the inside through the bottom, as shown, the passages being spaced so that they register with the vertical passages 12 of disc 7 of which one passage is shown in Fig. 1. One passage 8 in disc 7 is arranged so that one of its ends can be brought into registry with any of the entering tubes (for instance 5 as shown), and the other end terminates at the bottom center of disc 7, where it registers with a central passage provided in the bottom of valve casing 6. This latter passage may be connected by

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way of discharge tube 9 to any suitable sludge-collecting tank (not shown) or tube 9 may discharge directly into the atmosphere. On the way between valve 6 and conduit 9 a shut-down valve 10 of ordinary design is interposed. In the position of the disc 7 shown, all tube lines, except line 5, are connected through the respective vertical disc passages 12 to the chamber 21 of valve 6, whereas tube 5 is connected to discharge pipe 9, through which sludge and sediment present in tube 5 may be blown out. By turning disc 7 the other tubes may be blown out successively.

The fluid passes from space 21 into other tube sections 13 connected to the upper portion of valve body 6 and which again lead to boiler portions where they may absorb further heat. These several tube lines discharge finally into a combined collector and multi-way valve 15. The individual tube lines 14 terminating at this collector 15, which may have a construction similar to valve 6, can be each connected via a shut-down valve 18 to a blow-out conduit 17 which is here shown leading to the atmosphere. In the course of normal operation valve 18 is closed and the entire discharge of tubes 14 is mixed together in the collector 15 and passes therefrom into the service steam conduit 16.

Figs. 2 and 3 show the design of a combined collector, multi-way sludge valve and distributor in detail. The valve consists in this case of a valve body 30 into which a disc 7, similar to disc 7 in Fig. 1, is inserted. This disc has a vertical passage 12 for each pipe but one, which latter registers with a U-shaped passage 8 described with reference to Fig. 1. Passages 12 connect the several tubes 20 directly with the mixing chamber 21 and therefrom with the several tubes 13 of additional boiler sections which terminate in the upper part of casing 30. The passage 8 of disc 7 connects the tube with which it registers (in this case tube 5) and from which the sludge is to be removed, with the sludge discharge tube 9. Between discharge tube 9 and the valve body a shut-off valve 10 is provided. Fig. 4 shows diagrammatically the tubes 20 (*a, b, c, d, e, f, g*) and the tubes 13 (*h, i, j, k, l, m, n*) connected to the valve 6. In the position shown on Fig. 4, the tube line *c* is to be cleaned and is therefore is connected to the sludge discharge conduit 9. After the cleaning out of tube line is finished, the disc 7 can be turned so that passage 8, for instance, will be connected with tube *d* and then to tube *l, m, n*, successively.

Fig. 3 shows the valve in normal operating position as a fluid collector and distributor, that is to say, the fluid discharged by all tubes is collected and mixed in the chamber 21 and from there distributed into the tubes 13, and

no sludge is to be blown out. For this purpose the disc spindle 35 is rotatably disposed in a threaded spindle 19 which can be operated by hand wheel 36 so that the disc can be raised from its seated position shown in Fig. 2 into the position shown in Fig. 3, in which all lower supply pipes 20 freely discharge the fluid into valve body 30, where the fluid is collected and whence it is distributed through pipes 13. In order to seat disc 7 properly so that its several passages properly register when some of the pipes are to be cleared of sludge, spindle 35 has fixed to it a guide disc 31 provided with holes 38 at its periphery which register with diametrically opposite pins 39 mounted on top of the valve casing and which are arranged in number and circumferential spacing to correspond with the angular spacing of the pipes 20 at their point of entry into the bottom of valve body 30. Thus, when disc 7 is lowered from the position shown in Fig. 3 onto its seat, guide disc 31 should be placed into the proper position before it is lowered (which can be done by turning spindle 35 through hand wheel 11) so that when disc 7 is seated its passages 12 will register with all tubes not to be cleared and passage 8 will register with the tube (5 in Fig. 2) to be cleared of sludge.

During normal operation (disc 7 in position shown in Fig. 3) the valve 10 is closed. When disc 7 is in the position, as indicated in Fig. 2, the valve 10 is open. Thus leakage losses during normal operation are prevented. When a tube line is to be washed out, only a negligible amount of fluid would leak from the other tubes 20 into the conduit 9.

A further improved design of the combination valve is shown in Figs. 5 and 6. The fluid enters the valve from conduits 20 through borings 40 and leaves the valve through main 16. For the sake of simplicity this modification is designed as a valve which acts only as collector and sludge remover, but not as a re-distributor, and it may for instance be employed in Fig. 1 at the point where valve 15 is located. The connection to the conduit 9 is shown in Fig. 6 and numbered as 31. Between 31 and conduit 9, a shut-down valve should be located as shown in Fig. 1, which is omitted in Figs. 5 and 6 but implied. During normal operation the pressure in sludge conduit 31 is therefore as high as in conduits 20 and the valve member 7 is held by means of spring 32 in an elevated position, as indicated by the dotted line *a* and there is free connection between all conduits 20 and main discharge conduit 16. If the discharge valve closing duct 31 is opened, a low pressure will be created underneath the valve member 7, so that the latter is depressed against spring 32 by the pressure existing in chamber 21 above valve 7. Thus a connection is provided from the steam conduit

over whose opening the valve is placed (in this case 5), via boring 40<sup>a</sup>, opening 8 into conduit 31 and these conduits (5, 8 and 31) are thereby tightly sealed against the chamber 21. As soon as the blowing out process is finished, the discharge valve is closed, the pressure in 31 builds up through the steam supply from conduit 5 and spring 32 will lift the valve member 7 upward, thus connecting the tube section 5, which was washed out, again with chamber 21 and discharge conduit 16.

It will be noticed that thus a screwing up and down of the stem 35 is not necessary in order to blow out a particular conduit. Valve 7 may be rotated so as to select the desired conduit and the location be fixed from the outside by means similar to those shown and described with reference to Fig. 2, so that the position of opening 8 with regard to the individual tubes 20 can be seen from the outside.

Figs. 7 and 8 show still another form of this combination valve which, as illustrated, answers the purpose of collecting the fluid discharged by a number of conduits to be discharged, into a service main 16 (such as valve 15 in Fig. 1) and provides at the same time for connecting each of the individual incoming conduits with sludge blow-out means. This device consists of a main valve body 50 and a piston shaped selector element 57, provided with a stem portion 57<sup>a</sup>, which leaves an annular space 60 around the restricted portion. This stem is provided with a longitudinal passage 58 which corresponds to the discharge passage 8 of the valves shown in Figs. 2, 3, 5 and 6. The piston 57 is provided with transverse passages 44 which connect the piston periphery with the central longitudinal passage 58. The piston 57 is further provided with a number of longitudinal passages 45 shown in dotted lines (see also Fig. 8) which connect the annular space 60 around the piston neck with the space in front of the piston head. The rear end of piston 57 has an oblique passage 46 connecting the longitudinal passage 58 with the annular space around the piston rod 61 by which the piston is operated. In the extreme right hand piston position shown, and in all positions towards the left, this passage remains in communication with a discharge passage 62 provided in the casing wall. The boiler tubes 20<sup>a-d</sup> each terminate in casing 50 in a peripheral groove 63 so that when piston head 57 registers with one of these grooves for instance that of tube 20<sup>a</sup> as shown, that particular tube becomes connected with piston passage 58 and thus blows its sludge through discharge 62. If the piston 57 is shifted to register with tube 20<sup>c</sup>, that tube will blow out its sludge, but tube 20<sup>a</sup> is now able to resume the normal fluid supply to main 16 through the longitudinal passages 45

in the piston head 57. Thus any of the boiler tubes may be selectively blown out without interfering with the fluid supply of the others. During normal operation of the boiler none of the tubes is blown out and in that case piston head 57 is positioned midway between two grooves 63.

I claim:

1. A multi-way sludge valve, comprising a valve casing having a plurality of inleads disposed at its bottom for connecting a plurality of conduits with said casing, means for conducting the fluid supplied by the conduits away from the casing, a sludge discharge outlet also arranged in the bottom centrally to said inleads, a discharge valve connected to said outlet for closing it when a normal fluid flow through said casing is desired, a selector on the casing bottom for connecting any of said inleads with said outlet, means for operating said selector from the exterior of said casing to select the conduit to be flushed, spring operated means for automatically lifting said selector from said inleads when said discharge valve is closed, to permit free fluid passage from all inleads through said casing, the fluid pressure in said casing pressing said selector against the casing bottom when the discharge valve is opened, thereby directly connecting the desired inlead with said discharge outlet.

2. A multi-way sludge valve, comprising a valve casing having a plurality of inleads disposed at its bottom for connecting a plurality of conduits with said casing, means for conducting the fluid supplied by the conduits away from the casing, a sludge discharge outlet also arranged in the bottom, a discharge valve connected to said outlet for closing it when a normal fluid flow through said casing is desired, a selector on the casing bottom for connecting any of said inleads with said outlet, means for operating said selector from the exterior of said casing to select the conduit to be flushed, and means for lifting said selector from said inleads when said discharge valve is closed.

In testimony whereof I affix my signature.

MARTIN EULE.