

July 21, 1936.

A. G. ANGELY

2,048,046

METHOD OF TREATING BOILER RETURN WATER AND APPARATUS THEREFOR

Filed Sept. 7, 1933

2 Sheets-Sheet 1

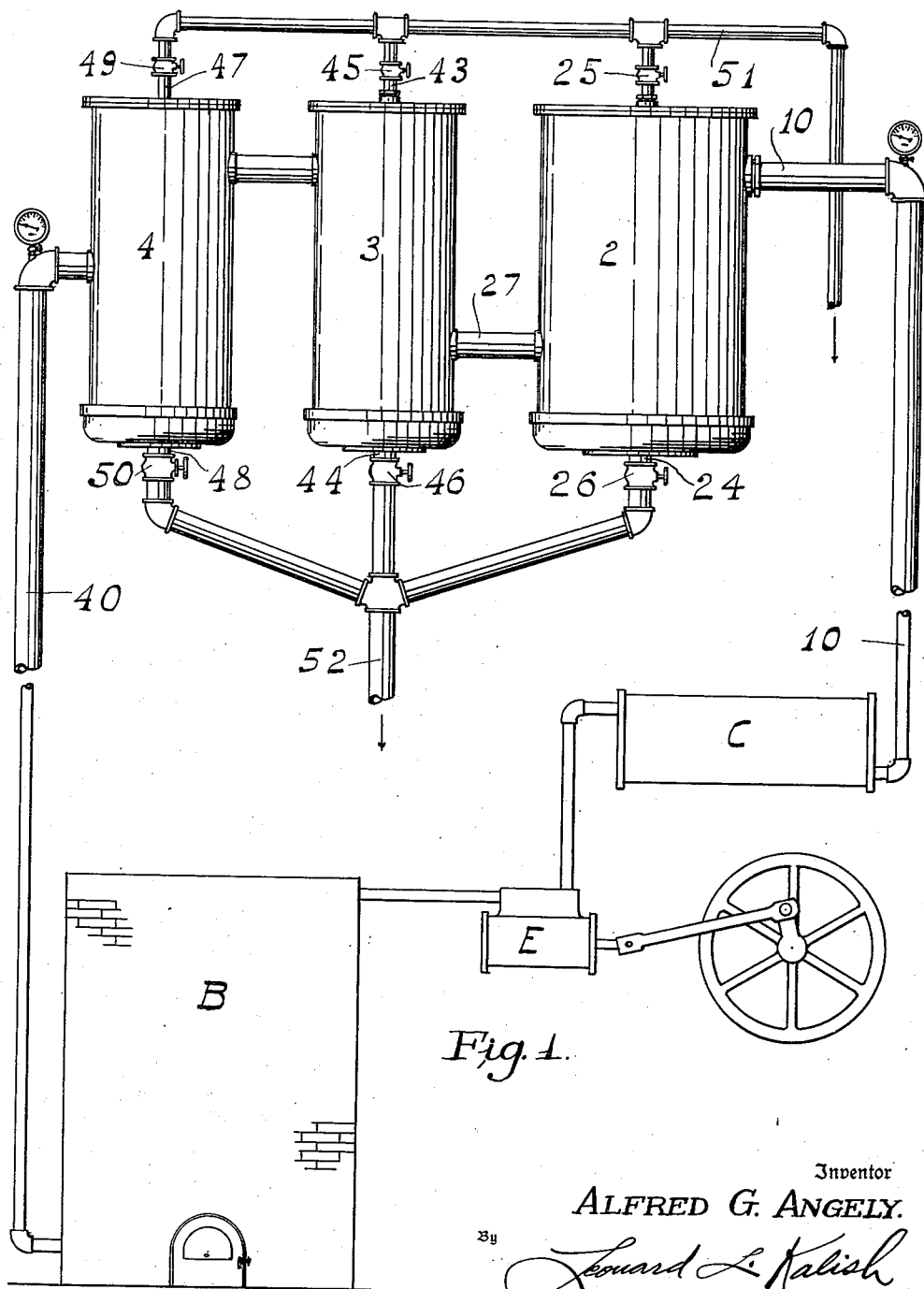


Fig. 1.

Inventor

ALFRED G. ANGELY.

By

Leonard L. Kalish

Attorney

July 21, 1936.

A. G. ANGELY

2,048,046

METHOD OF TREATING BOILER RETURN WATER AND APPARATUS THEREFOR

Filed Sept. 7, 1933

2 Sheets-Sheet 2

Fig. 2.

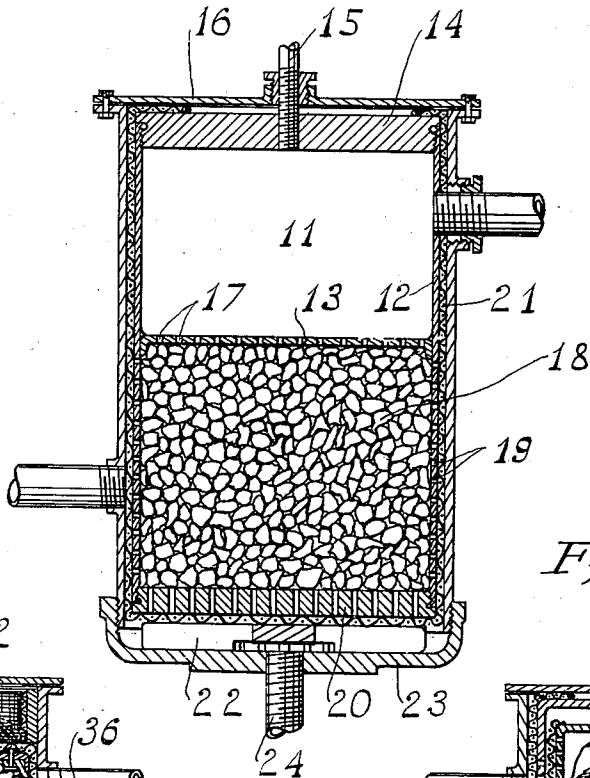


Fig. 3.

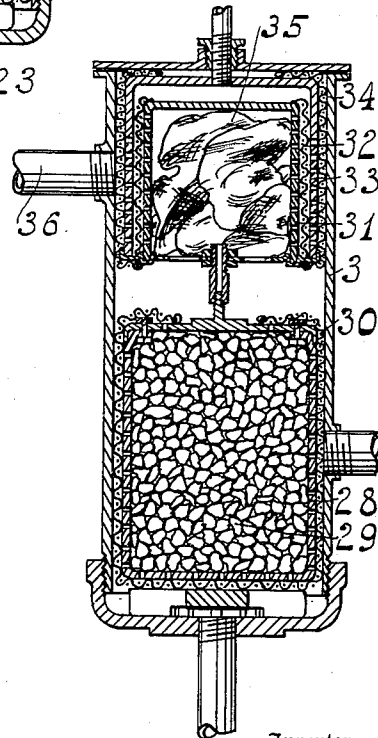
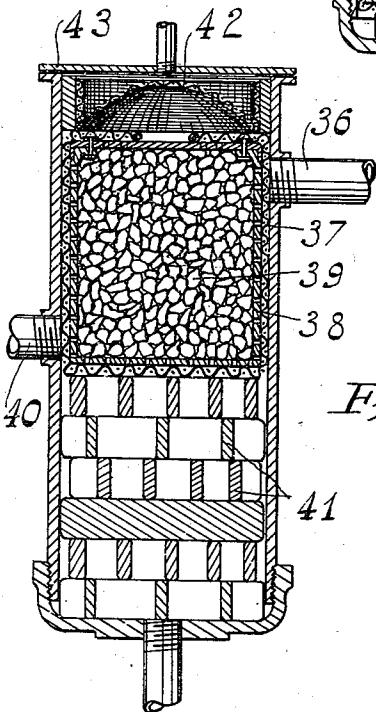


Fig. 4.



Inventor

ALFRED G. ANGELY.

39

Leonard L. Kalish

Attorney

UNITED STATES PATENT OFFICE

2,048,046

METHOD OF TREATING BOILER RETURN
WATER AND APPARATUS THEREFOR

Alfred G. Angely, Horsham, Pa.

Application September 7, 1933, Serial No. 688,429

2 Claims. (Cl. 210—132)

My invention relates to a new and useful method of treating boiler return water, and apparatus therefor, whereby the water of condensation derived from the condensers of steam or steam turbines or other steam-powered machinery, may be more readily and more efficiently used again in the boiler, without the harmful transmission to the boiler of oil and solid matter which return-water generally contains.

It is an object of my present invention to so treat the condensed water, prior to its return to the boiler, as to free it entirely of all oil, as well as from all solid matter.

With the above and other objects in view, my invention consists in subjecting the condensed water to the successive influence of gravity, change in velocity and absorption, thereby to separate, on one hand, the oil content thereof, and to separate, on the other hand, the solid content thereof. My invention further consists of other novel features of method and apparatus, all of which will appear more fully from the following detailed description.

For the purpose of illustrating my invention, I have shown in the accompanying drawings, one form thereof which is at present preferred by me, since the same has been found in practice to give satisfactory and reliable results, although it is to be understood that the various instrumentalities of which my invention consists can be variously arranged and organized and that my invention is not limited to the precise arrangement and organization of the instrumentalities as herein shown and described.

Referring to the drawings in which like reference characters indicate like parts:

Figure 1 represents a somewhat diagrammatic or vertical elevational view of the method and apparatus of my present invention applied to any conventional steam power plant, including boiler, steam power unit, and condenser.

Figure 2 represents a vertical sectional view of chamber numbered "2" in Figure 1.

Figure 3 represents a vertical sectional view of chamber numbered "3" in Figure 1.

Figure 4 represents a vertical sectional view of chamber numbered "4" in Figure 1.

In the lower portion of Figure 1, I have illustrated in a diagrammatic manner, a conventional steam power plant, including boiler "B", engine "E", and condenser "C". The boiler, engine and condenser may be of any conventional type and construction, and are shown merely for purpose of illustration.

The condensed water, resulting in the con-

denser "C" is conveyed through the pipe 10, to the chamber number 2, which is preferably a generally cylindrical metallic shell, as shown particularly in Figure 2. The water is admitted into an upper compartment 11 within an inner cylindrical member 12, which is separated by the horizontal perforated plate 13, and the upper end of which is closed by the upper plate 14 having an outlet pipe 15 extending through the detachable cover 16 of the chamber 2.

The water entering the chamber 10 first undergoes a sudden decrease in velocity, owing to the enlargement of the cross-sectional area of the flow, as it enters the chamber 11. In addition to this reduction in the velocity of flow, the direction of flow is changed to a downward direction through the perforations 17 in the plate 13. The water then flows downwardly at the much reduced velocity through a more or less loose mass of broken soapstone or pumice-stone 18, in the lower portion of the cylinder 12. The lower portion of the cylinder 12 is perforated as at 19, and also contains a similar perforated bottom 20. The inner cylinder 12 is surrounded by a canvas bag 21. Beneath the cylinder 12 is a grating 22, intermediate said cylinder and the bottom terminal member or cover 23 of the chamber 2. A lower outlet 24 is provided in the terminal cap member 23. The upper outlet 15 is provided with a suitable control valve 25, while the lower outlet 24 is provided with another suitable control valve 26.

The water then passes from the lower portion of the cylinder 12, through the pipe 27, into the lower portion of the second chamber or cylinder 3, shown particularly in Figure 3, where it partly enters the perforated metallic inner shell 28 filled with pumice-stone 29 and surrounded by the canvas bag 30. The water again undergoes a sudden reduction in velocity. Part of the water, either through the inner perforated shell 28, or around the same, enters an upper perforated metallic shell 31, surrounded first by the wire basket or wire cylinder 32, and surrounded by the outer perforated metallic shell 33, and canvas bag 34. Here the water, still traveling upwardly with a relatively low velocity, comes in contact with a mass of more or less loose rags or other absorbent material 35, and then passes out through the pipe 36 at an increased velocity, into chamber number 4, where it enters the upper portion thereof, and passes through the canvas bag 37 into the inner perforated metallic shell 38. Here it is again subjected to the action of the more or less loose mass of pumice-stone or soap-stone

39, at a reduced velocity and traveling in a downward direction towards the outlet 40.

The perforated metallic shell 38 is also provided with a perforated bottom, and beneath it a series of suitable gratings 41 are disposed.

Above the perforated metallic shell 38, a wire gauze basket 42 is positioned beneath the detachable cover plate 43 of the cylinder or chamber 4.

The cylinder or chamber 3 is provided with an upper outlet 43, and lower outlet 44, each controlled by corresponding valves 45 and 46, respectively, while the chamber or cylinder 4 is provided with a similar upper outlet 47 and lower outlet 48, controlled by valves 49 and 50, respectively.

The upper control valves 25, 45, and 49, are preferably connected to a common take-off pipe 51, while the lower control valves 26, 44 and 50 are preferably connected to a common take-off pipe 52.

The final water outlet pipe 40 is then connected, either directly or through any suitable pump or injector (not shown in the drawings) to the inlet of the boiler "B".

In operation, the water entering the successive chambers 2, 3, and 4, is thus subjected to the repeated changes in magnitude and direction of velocity or motion, while simultaneously subjected to the separating and absorptive action of the canvas walls and broken-stone masses. It will be observed also that at the upper end of each of the chambers 2, 3, and 4, is a dead liquid space wherein the separated oil can float on top of the body of water which fills the chamber, without being disturbed by the general flow of water through the chamber. Thus, while the flow of water takes place generally between the inlet and outlet or between the level of the inlet and the level of the outlet of each chamber (the control valves being all normally closed), the upper portion of the chamber is undisturbed. The lower portion of each chamber is similarly undisturbed, being below the level of either the inlet or the outlet. In this manner, the separated oil floats and gathers at the top of each chamber, and is periodically drawn off by temporarily opening the respective control valves 25, 45, and 49, for a time just sufficiently long enough to draw off the collected oil, (plus a small amount of water). The solid sediment, on the other hand, settles in the lower part of each chamber, and is periodically drawn off, (and washed out with some water) through the valves 26, 46 and

50, which are also periodically opened for a short space of time.

It has been found in practice that a single charge of stone and canvas in a system of this character, will operate efficiently for a relatively long period of time, requiring renewal only at wide intervals (depending naturally, somewhat on the amount of oil and sediment carried by the return water). It has been also found in practice, however, that this system will efficiently and continuously remove oil and sediment from the return water to such an extent as to render the operation of the boiler, as a whole, more efficient.

I am aware that my invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof, and I therefore desire the present embodiment to be considered in all respects as illustrative and not restrictive, reference being had to the appended claims rather than to the foregoing description to indicate the scope of the invention.

Having thus described my invention, what I hereby claim as new and desire to secure by Letters Patent, is:

1. In apparatus for separating impurities including oil and solid matter from boiler return-water, a casing having a quiescent dead-liquid space in its upper portion, an inlet for contaminated water in said space below the top thereof, an outlet for oil and other floating impurities in the top of said space, filter material filling the casing below said space, a lower quiescent dead-liquid space below said filter material and in the bottom of the casing for receiving non-floating impurities, a drain in the bottom of the last named space, and an outlet for purified water opening into the casing at the level of the filter material.

2. In apparatus for separating impurities including oil and solid matter from boiler return-water, a casing having a quiescent dead-liquid space, an inlet for contaminated water in said space below the top thereof, an outlet for oil and other floating impurities in the top of said space, a second quiescent dead-liquid space for non-floating impurities, a drain in the bottom of said space, an outlet for purified water above said second space, filter material covering the mouth of said outlet, and an element interposed between said outlet and said second space having an opening through which non-floating impurities may pass into said second space.

ALFRED G. ANGELY.