June 5, 1934. O. H. PRICE 1,962,096

WATER TREATING APPARATUS

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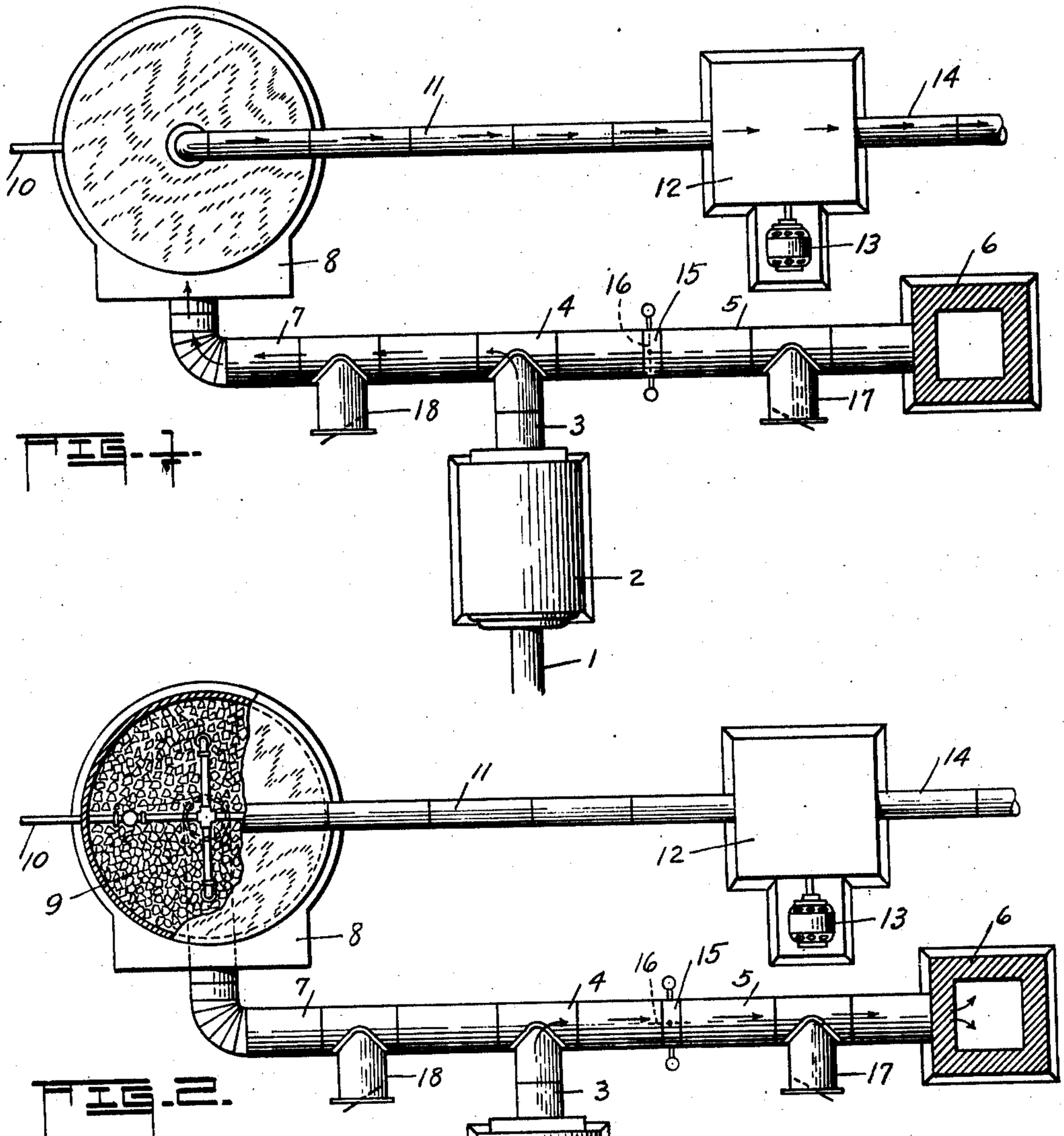

FIG. 1

FIG. 2

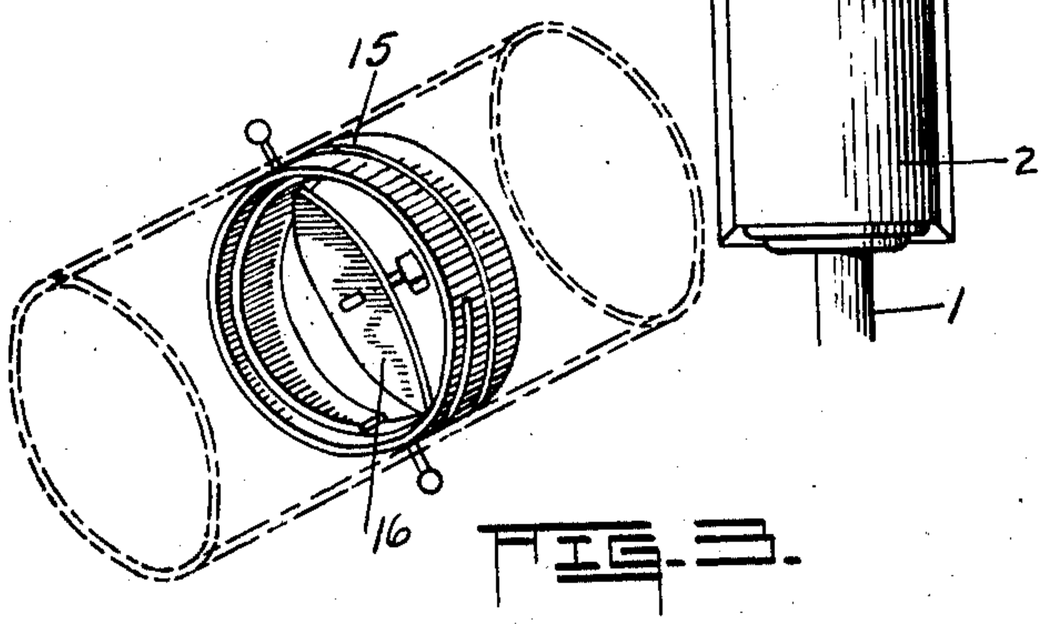

FIG. 3

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WATER TREATING APPARATUS

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2 Claims. (Cl. 210—16)

This invention relates to improvements in water treatment processes and more particularly to means for providing the carbon dioxide employed therein.

It is customary in the treatment of hard water containing lime to allow the water to stand in a settling tank wherein a certain amount of the suspended lime settles out and is removed. However, a certain proportion of the lime passes over in solution from the settling tank to the usual sand filter and it is customary to treat the water leaving the settling tank with carbon dioxide before delivering to the sand filter whereby the lime carried over from the settling tank is precipitated and will be removed by the sand filter.

It has been found that the burning of oil in a combustion chamber when properly regulated will produce the carbon dioxide so employed for precipitating the lime and this invention relates particularly to the installation of an oil burner for this purpose in such a water softening device and further relates to the proper control of the products of combustion from the oil burner whereby when the water treatment system is in operation, communication from the combustion chamber to the chimney will be automatically cut off and when the system ceases to operate, communication between the combustion chamber and the chimney will automatically be opened so that the products of combustion will pass off as long as the oil burner is operated.

With these and other objects in view reference is made to the accompanying sheet of drawing which illustrates a preferred form of this invention with the understanding that minor detail changes may be made without departing from the scope thereof.

Figure 1 is a plan view of the application of an oil burner for the purpose specified illustrating the chimney in transverse section and showing the connections from the chimney to the combustion chamber and from the combustion chamber to a scrubber and from the scrubber to a pump for delivering the carbon dioxide for the precipitation of the lime, indicating by the arrows the path followed by the products of combustion during the operation of the system.

Figure 2 is a similar view with a part of the top of the scrubber removed and indicating by the arrows the path followed by the products of combustion while the oil burner is operating and the water treatment system has ceased to operate.

Figure 3 is a view in perspective of the automatic damper installed in the pipe leading from the combustion chamber to the chimney.

In the embodiment illustrated, an oil burner 1 of any desired commercial type is shown installed in connection with a commercial furnace 2 which may include a steam boiler to supply steam power if desired or may merely be a bricked up combustion chamber. The pipe 3 which leads the products of combustion from the furnace 2 is joined to a T 4, one end of which is connected by pipe 5 to the chimney or smoke stack 6 and the other end connected by the pipe 7 to the scrubber 8. The scrubber 8 is the usual commercial type in which the products of combustion enter at the bottom and pass up through a bed of coke 9 over the top of which water is preferably sprayed from the pipe 10. The products of combustion pass off the top of the scrubber through the pipe 11 to an air compressor 12 operated by the electric motor 13 and from thence through pipe 14 to be employed in the water treatment plant. The air compressor 12 is preferably of the type which may be termed a vacuum and pressure pump in that it creates a definite suction through the pipe 11 and expels the products of combustion under pressure through the pipe 14.

Inasmuch as the T 4 is connected to both the chimney 6 and pump 12, unless the suction of the pump is always greater than the up draft of the chimney, the products of combustion will not be uniformly delivered to the pump. Therefore, a commercial draft regulator 15, such as the type disclosed by the Breese Patent 1,628,644, May 17, 1927, having a swinging damper plate 16, is interposed between the T 4 and the chimney 6 and is so adjusted that the normal pull of the pump 12 will be sufficient to close the damper so that all the products of combustion pass through the scrubber and are delivered by the pump through the pipe 14. Since the up draft in the chimney varies with atmospheric conditions, a similar automatic draft regulator 17 is interposed between the chimney 6 and the first automatic draft regulator 15. This draft regulator 17 is so adjusted that if the up draft of the chimney 6 is greater than the suction of the pump 12, atmospheric air will enter through the automatic draft regulator 17 in sufficient quantities to allow the suction of the pump to maintain the damper 16 in the pipe 5 closed. In order to obtain the greatest percentage of carbon dioxide from the combustion of oil, a proper draft must be established from the combustion chamber and therefore it is preferable to interpose a third automatic draft regulator 18 in the pipe 7 between the elbow 4 and the scrubber 8 so that if for any reason the suction of the pump 12 is greater than

that required to produce the largest percentage of carbon dioxide, this third automatic regulator 18 will admit atmospheric air into the pipe 7 whenever the suction therethrough is greater than that desired for the combustion chamber of the furnace 2. These automatic draft regulators 15, 17 and 18 are articles of commerce and their construction and operation is fully described in said Breese patent as well as their manner of adjustment and it is therefore thought that no further description is necessary.

If the pipe 3 leading from the combustion chamber was connected only to the pump 12, there would have to be a simultaneous operation and discontinuance of operation of both the pump 12 and oil burner 1, otherwise if the pump ceased operating before the oil burner, there would be no outlet for the products of combustion. If the pipe 3 from the combustion chamber were connected to both the pump 12 and chimney 6, then as long as the pump 12 was operating and creating a greater suction than the up draft of the chimney 6, carbon dioxide would be furnished the water treating system and if the oil burner continued to operate after the pump ceased operating, the products of combustion would be carried off up the chimney, as is usual in oil burning furnaces. However, the up draft of the chimney is a variable quantity depending upon atmospheric conditions and under the most favorable, the apparatus might work satisfactorily, but under other conditions, such as a high wind, the draft up the chimney might be greater than the suction of the pump and either continuously or intermittently carry off all the products of combustion up the chimney.

By the installation of the automatic regulator 15 in connection with the automatic draft regulator 17 in the pipe 5 between the pipe 3 leading from the combustion chamber and the chimney 6, the pump 12 will draw all of the gases from the oil burner through the scrubber and discharge the carbon dioxide to the system and yet the oil burner may continue to operate after the pump has ceased operating which may be very desirable in the case that the oil burner also furnishes heat to a boiler for heating purposes or for supplying power for operating some parts of the system, or in case the pump becomes inoperative.

What I claim is:

1. In a water treating apparatus, the combination with a continuously operating oil burner for continuously producing carbon dioxide for said apparatus, a combustion chamber therefor, an intermittently operating pump, a connection from the combustion chamber to the pump for intermittently delivering carbon dioxide from the combustion chamber to the apparatus, a chimney, a connection from the combustion chamber to the chimney for delivering products of combustion to the atmosphere, an independent automatic damper in the connection between the chimney and the combustion chamber adapted to be closed by the pull of the gases when the pump is in operation, an automatic draft regulator mounted in an intake opening provided in the said connection between the damper and chimney adapted to open upon excess draft in the chimney during the operation of the pump to allow the damper to respond to the pull of gases from the combustion chamber.

2. The construction of claim 1 including an additional automatic draft regulator mounted in an intake provided in the connection between the combustion chamber and pump to automatically control the draft through the combustion chamber during the operation of the pump to most efficiently produce carbon dioxide.

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