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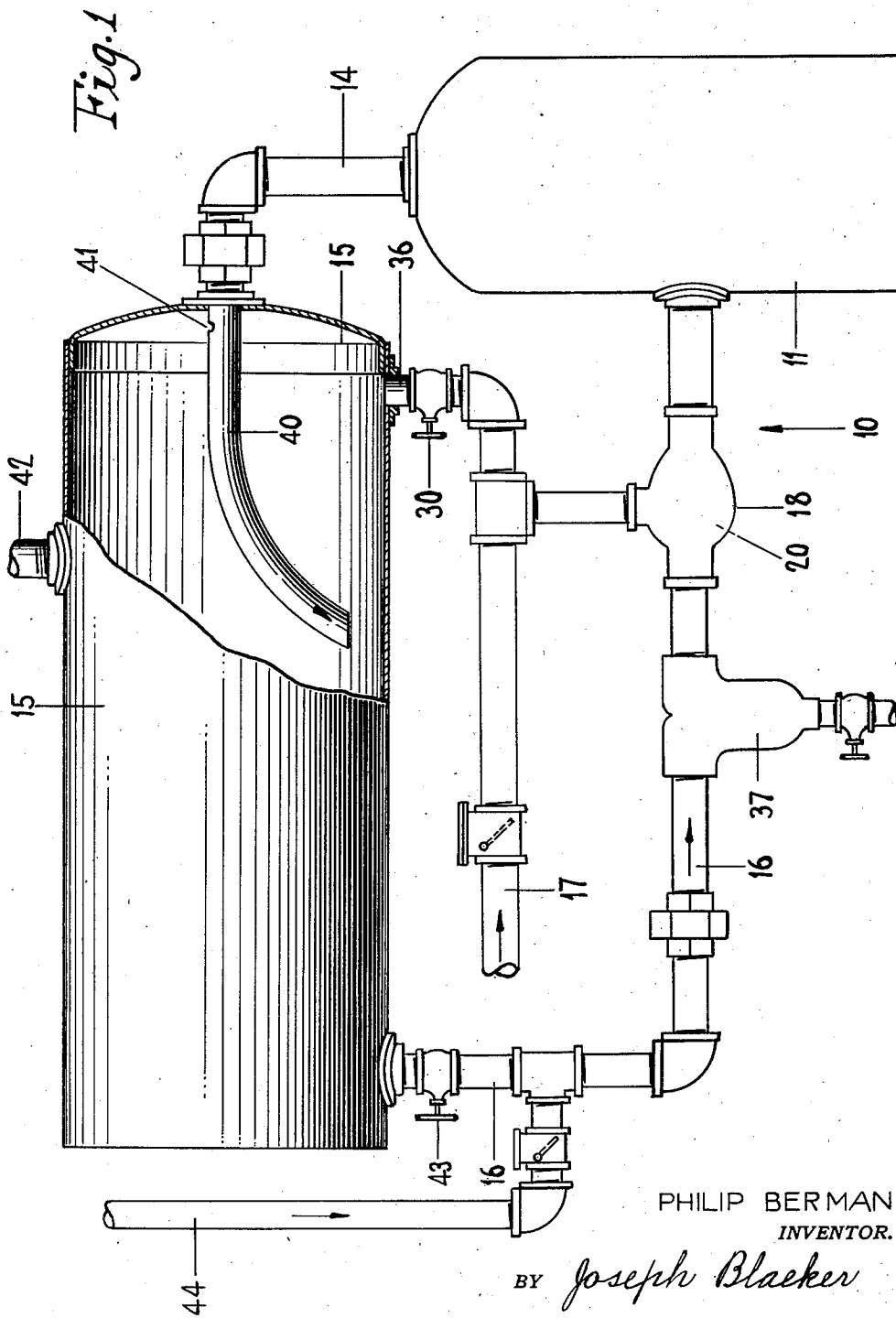
P. BERMAN

2,265,108

CONTROLLED CIRCULATION WATER HEATING SYSTEM

Filed June 5, 1940

2 Sheets-Sheet 1



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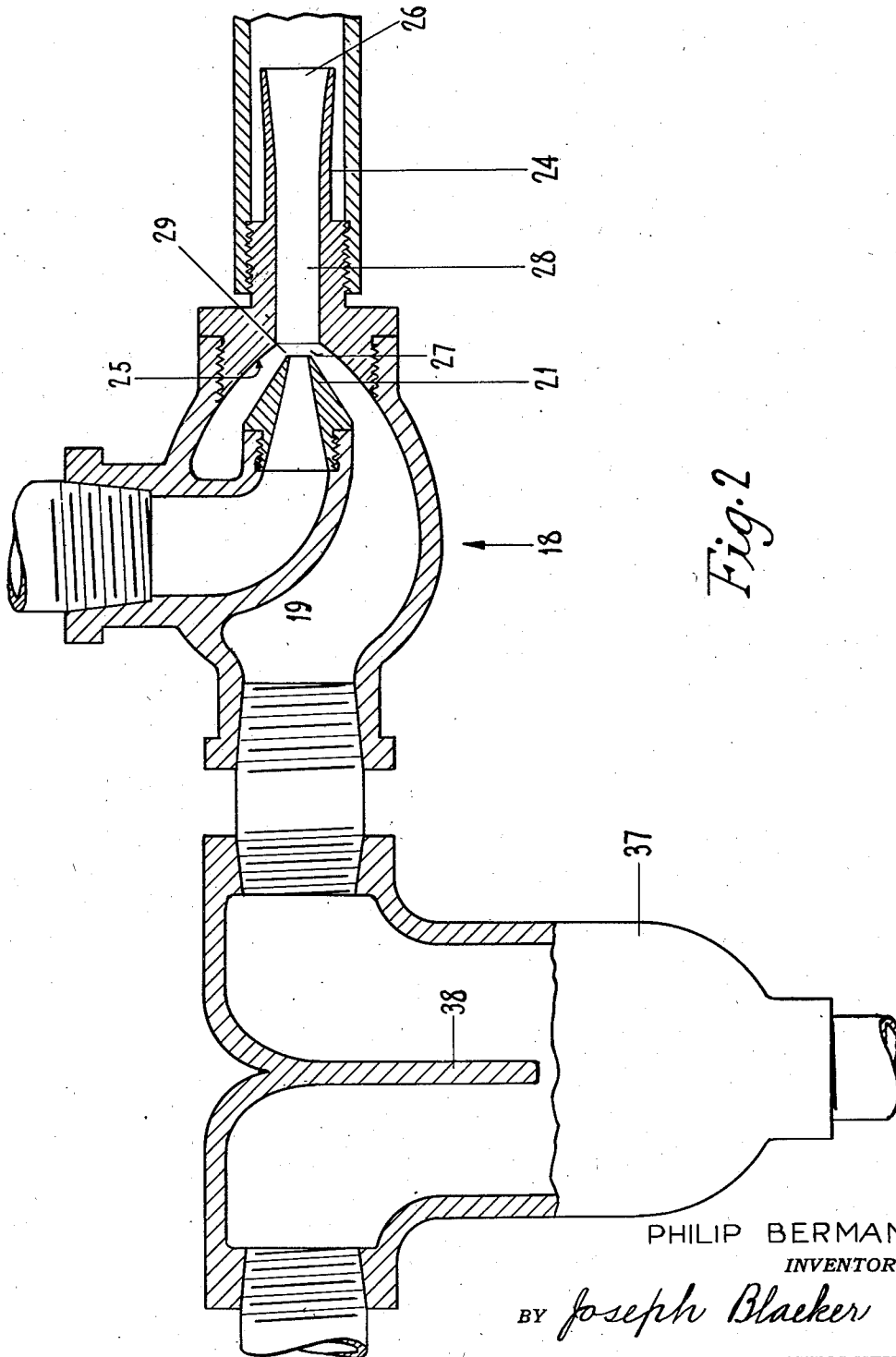
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CONTROLLED CIRCULATION WATER
HEATING SYSTEMPhilip Berman, New York, N. Y., assignor to
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Application June 5, 1940, Serial No. 333,829

5 Claims. (Cl. 122-13)

This invention relates to means for the efficient operation of hot water heating systems in which water is heated in connection with or independent of the heating of the building.

An object of this invention is to produce a hot water heating system in which the water in the system is under pressure and wherein heat transference is not entirely dependent upon convection current circulation but to water pressure which produces a high suction in a Venturi effect flow-accelerating means placed in the return pipe from the tank to the heater and which augments the convection current circulation.

Another object of this invention is to provide acceleration of circulation of the hot water in the heating system by utilizing the city water supply pressure and without the use of a pump.

Another object of this invention is to provide an inlet tube positioned within the storage tank, the said inlet tube entering the tank below the service outlet and sloping downwardly toward the bottom of the tank and terminating at a distance from the inlet and serving to prevent short-circuiting of hot water into the service outlet of the storage tank.

Another object of this invention is to provide a regulating valve to control the relative quantities of water circulated from the tank and from the return circulation line to permit partial closing of the tank return pipe whereby the circulation is increased in the return circulation line.

Another object of this invention is to provide an auxiliary inlet for supply water connected to the lower portion of the tank and including a manually controlled valve for by-passing a portion of the supply water directly to the bottom of the storage tank, whereby a controlled circulation is provided in the hot water system to permit the heater to operate at its maximum heating capacity.

With the above and other objects in view, the invention will be hereinafter more particularly described, and the combination and arrangement of parts will be shown in the accompanying drawings and pointed out in the claims which form part of this specification.

Reference will now be had to the drawings, wherein like numerals of reference will designate corresponding parts throughout the several views, in which:

Figure 1 shows a hot water storage heating system having my invention applied thereto.

Figure 2 is a longitudinal cross-sectional view of the circulator and a sediment remover.

In the illustrated embodiment of the invention

the numeral 10 indicates a domestic hot water heating system comprising a hot water heater or heat exchanger 11 of any conventional construction. The water is heated directly in the heater. The water may be heated in an indirect heater or in a submerged heater or in a self-contained type of heater.

Hot water is supplied from the upper elevation of the heater 11 through a pipe 14 connected to a hot water storage tank 15. Water is returned from the lower elevation of the storage tank 15 through a return pipe 16 entering the lower portion of the heater 11.

In the usual practice, the main 17 from the city water supply system is connected to the lower portion of the hot water storage tank 15 and the water pressure serves only to fill the tank. I have found that by connecting the city pressure water supply line 17 direct to the circulating line 16 and by installing a water circulator 18 comprising a Venturi effect flow-circulating means so as to form part of the said circulating line, that when the city water supply under pressure passes through the circulator 18, the pressure causes a suction at the exit from the circulator which augments the usual convection current circulation of the fluid in the said circulation line. The pressure of the city water supply is thus utilized to accelerate the usually sluggish circulation of the hot water.

The water circulator 18 comprises a tubular central portion or body 19. A nozzle 21 has been positioned axially of the said tubular body 19.

A Venturi or compound tube 24 has been threadably secured at the outlet end of the tubular body 19 and in axial alinement therewith. The Venturi tube has a converging lower portion 25, a diverging upper portion 26, a throat 27 and a cylindrical tubular portion 28.

The outlet of the nozzle 21 terminates in close relation to the throat 27 of the Venturi tube 24, leaving an annular gap 29. The nozzle 21 is of conical form so as to increase the velocity of water passing therethrough.

In operation the water passes through the nozzle 21 and causes the liquid discharged there-through to be under increased high velocity. The nozzle 21 projects directly into the entrained stream so that the direction of the entrained stream is not changed. The entrained liquid is given an impulse by the circulator jet in the same direction exactly in which it is flowing.

The liquid circulator imparts an impulse effect to the liquid and functions to increase the velocity of the liquid and to create a high suction

at the throat of the Venturi tube 24, which suction can entrain and accelerate the circulation.

The outflow from the circulator is in submerged relation centrally of the circulation line. Due to the stream-lined construction of the circulator, the energy in the pressure water supply is fully converted into suction in the circulator.

I have provided a valve 30 in a by-pass line 36 in communication with the circulator 18 and with the hot water storage tank 15, for by-passing a portion of the supply water directly to the bottom of the storage tank, in the event the heater is not of sufficient capacity or more hot water is used than the nozzle permits passage. This makes possible a controlled circulation in the hot water system which permits the heater to operate at its maximum heating capacity.

The circulator 18 has been designed to efficiently utilize the energy of the incoming stream of water which is supplied under pressure to cause a rapid circulation of water within the piping.

Circulators have heretofore been provided with a water supply nozzle which projected into a mixing chamber having an irregular contour. This arrangement of the operating mechanism interfered with the flow and produced turbulence and otherwise interfered with the efficient operation of the device.

This improved circulator avoids the objectionable construction features of the prior art and comprises a mixing chamber which is streamlined in the direction of flow, so that sharp angles or indentations which would cause turbulence are avoided and which permits flow therethrough with the least possible resistance.

The circulator device herein disclosed forms the subject matter of a separate patent application Ser. No. 390,258, filed Apr. 25, 1941.

A sediment remover 37 has been placed in the return pipe 16 from the storage tank 15. The sediment remover 37 has a baffle plate 38 which changes the direction of the liquid. The cross-sectional area inside the sediment remover has been made much larger than the inlet area to considerably decrease the velocity and thus permitting the particles heavier than water to settle to the bottom wherefrom it is discharged at will, and it has been found to actually remove sediment from the entire system.

An inlet tube 40 has been positioned within the tank 15 and is connected to the outlet from the water heater 11. The inlet tube has a vent hole 41 at its upper elevation to prevent air binding. The inlet tube 40 slopes downwardly toward the bottom of the tank and terminates at a distance from the service outlet 42 at the upper elevation of the tank. The tube 40 serves to prevent short-circuiting of heater water into the service outlet 42.

The effect of the circulator is noticeable by a full tank of hot water of even temperature, instead of building up a high temperature at the top of the tank while the lower half of the tank is cold.

The hot water heating system herein described operates automatically without auxiliary mechanical devices having moving parts.

As shown in Figure 1, the return pipe 16 has a manually controlled valve 43 communicating with the lower portion of the tank. The valve 43 permits partial closing of the return pipe from the tank, whereby the circulation is increased in the return circulation line 44.

In accordance with the patent statutes I have described and illustrated the preferred embodiment of my invention, but it will be understood

that various changes and modifications can be made therein without departing from the spirit of the invention as defined by the appended claims.

I claim:

1. In combination with a hot water heating system having a water heater, a hot water storage tank, a hot water delivery line from said heater to said tank and a return pipe line from the tank to the heater, a water circulator in said return pipe line and comprising a Venturi effect flow-accelerating means, said circulator having an inlet for supply water, said Venturi means having its outlet facing in the direction of said water heater and causing a constantly directed pressure to cause augmentation of motion of said water towards said water heater, said tank having a service outlet at its upper elevation, an inlet tube positioned within said tank and being connected to the outlet from said water heater, said inlet tube entering said tank below said outlet and sloping downwardly toward the bottom of said tank and terminating at a distance from said outlet, said inlet tube serving to prevent short circuiting of heater water into said service outlet, whereby said heating system causes consumption of the water in said tank prior to consumption of said heater water.

2. In combination with a hot water heating system having a water heater, a hot water storage tank, a hot water delivery line from said heater to said tank and a return pipe line from the tank to the heater, a water circulator in said return pipe line and comprising a Venturi effect flow-accelerating means, said circulator having an inlet for supply water, said Venturi means having its outlet facing in the direction of said water heater and causing a constantly directed pressure to cause augmentation of motion of said water towards said water heater, said tank having a service outlet at its upper elevation, an inlet tube positioned within said tank and being connected to the outlet from said water heater, said inlet tube entering said tank below said outlet and sloping downwardly toward the bottom of said tank and terminating at a distance from said outlet, the upper portion of said inlet tube having an air vent to prevent air binding, said inlet tube serving to prevent short circuiting of heater water into said service outlet, whereby said heating system causes consumption of the water in said tank prior to consumption of said heater water.

3. In combination with a hot water heating system having a water heater, a hot water storage tank, a hot water delivery line from said heater to said tank and a return pipe line from the tank to the heater, a water circulator in said return pipe line and comprising a Venturi effect flow-accelerating means, said circulator having an inlet for supply water, said Venturi means having its outlet facing in the direction of said water heater and causing a constantly directed pressure to cause augmentation of motion of said water towards said water heater, said tank having a service outlet at its upper elevation, an inlet tube positioned within said tank and being connected to the outlet from said water heater, said inlet tube entering said tank below said outlet and sloping downwardly toward the bottom of said tank and terminating at a distance from said outlet, the upper portion of said inlet tube having an air vent to prevent air binding, said inlet tube serving to prevent short circuiting of heater water into said service outlet, an auxiliary inlet

for supply water connected to the lower portion of said tank and including a manually controlled valve for adjusting the flow of auxiliary water to said tank, whereby a controlled circulation is provided in said hot water system in proportion to the maximum heating capacity of said heater.

4. In combination with a hot water heating system having a water heater, a hot water storage tank, a hot water delivery line from said heater to said tank and a return pipe line from the tank to the heater, a water circulator in said return pipe line and comprising a Venturi effect flow-accelerating means, said circulator having an inlet for supply water, said Venturi means having its outlet facing in the direction of said water heater and causing a constantly directed pressure to cause augmentation of motion of said water towards said water heater, said tank having a service outlet at its upper elevation, an inlet tube positioned within said tank and being connected to the outlet from said water heater, said inlet tube entering said tank below said outlet and sloping downwardly toward the bottom of said tank and terminating at a distance from said outlet, the upper portion of said inlet tube having an air vent to prevent air binding, said inlet tube serving to prevent short circuiting of heater water into said service outlet, an auxiliary inlet for supply water connected to the lower portion of said tank and including a manually controlled valve for by-passing a portion of the supply water directly to the bottom of said storage tank, whereby a controlled circulation is provided in said hot water system to permit said

heater to operate at its maximum heating capacity.

5. In combination with a hot water heating system having a water heater, a hot water storage tank, a hot water delivery line from said heater to said tank and a return pipe line from the tank to the heater, a water circulator in said return pipe line and comprising a Venturi effect flow-accelerating means, said circulator having an inlet for supply water, said Venturi means having its outlet facing in the direction of said water heater and causing a constantly directed pressure to cause augmentation of motion of said water towards said water heater, said tank having a service outlet at its upper elevation, an inlet tube positioned within said tank and being connected to the outlet from said water heater, said inlet tube entering said tank at the central portion thereof and below said service outlet and sloping downwardly toward the bottom of said tank and terminating at a distance from said service outlet, the upper portion of said inlet tube having an air vent, said inlet tube serving to prevent short circuiting of heater water into said service outlet, an auxiliary inlet for supply water connected to the lower portion of said tank directly at said inlet end, said auxiliary inlet including a manually controlled valve for by-passing a portion of the supply water directly to the bottom of said storage tank, whereby a controlled circulation is provided in said hot water system to permit said heater to operate at its maximum heating capacity.

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