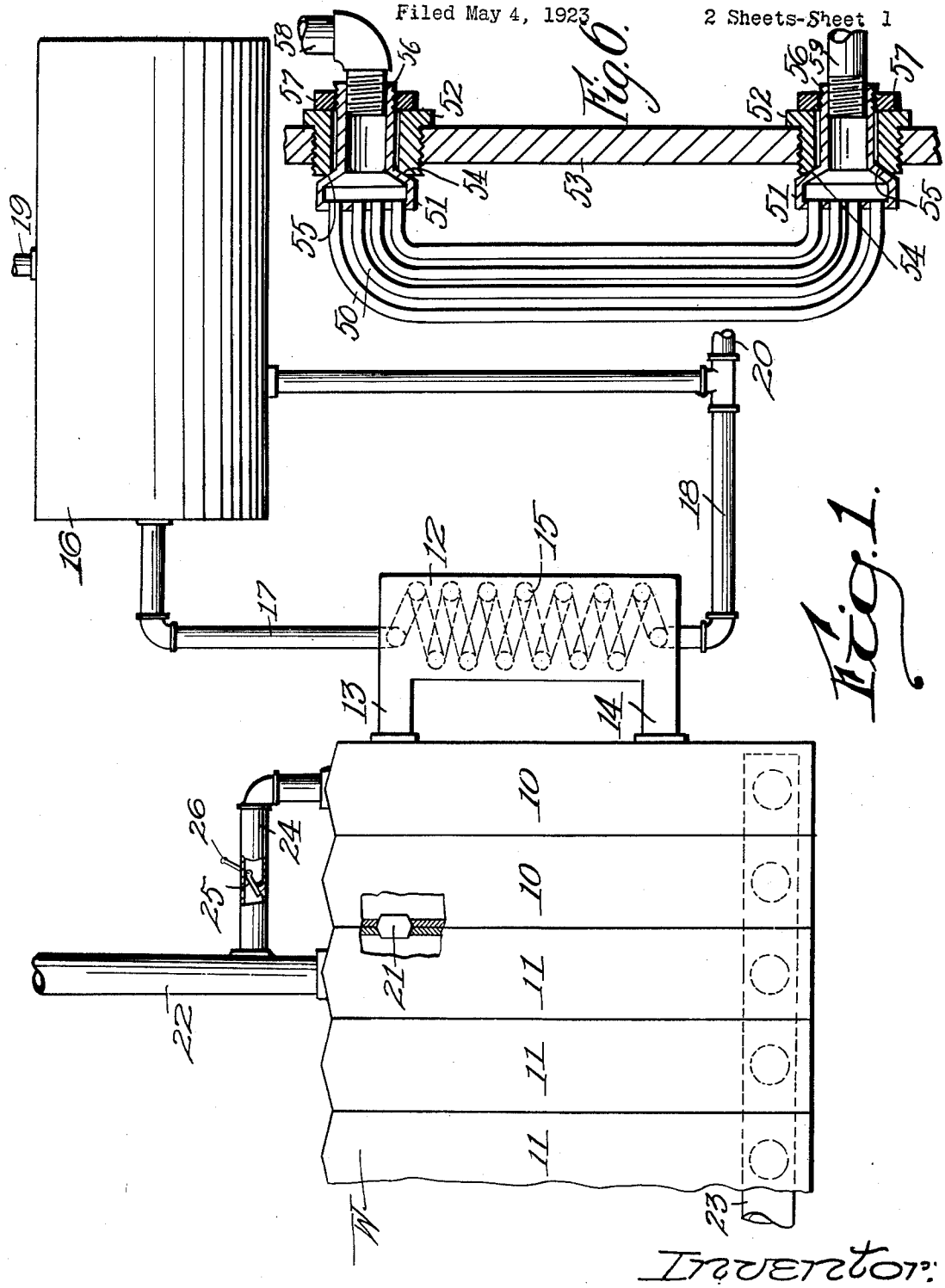
Jan. 17, 1928. 1,656,574

C. SMITH

INDIRECT WATER HEATING APPARATUS

Filed May 4, 1923 2 Sheets-Sheet 1



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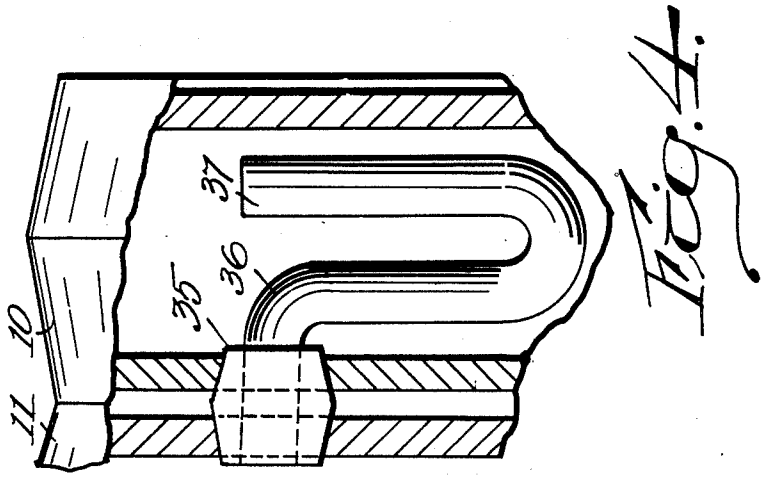


Fig. 4.

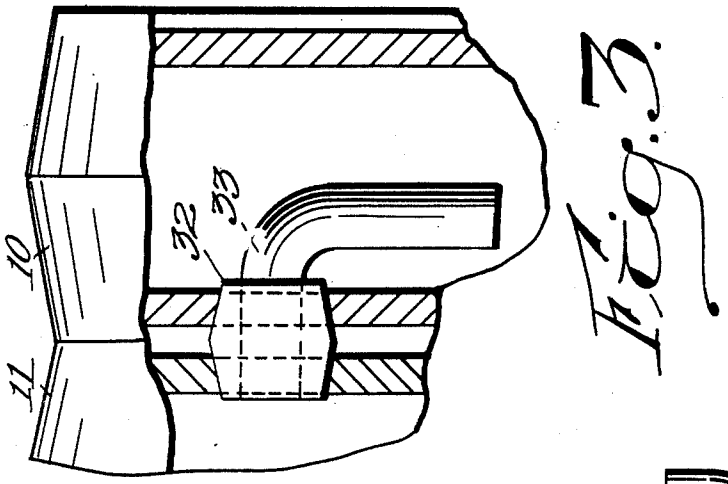


Fig. 3.

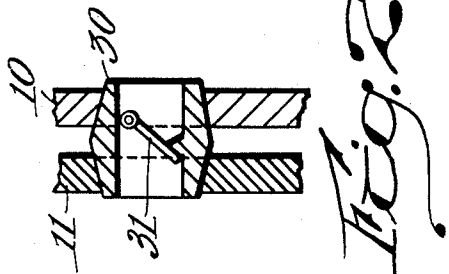


Fig. 2.

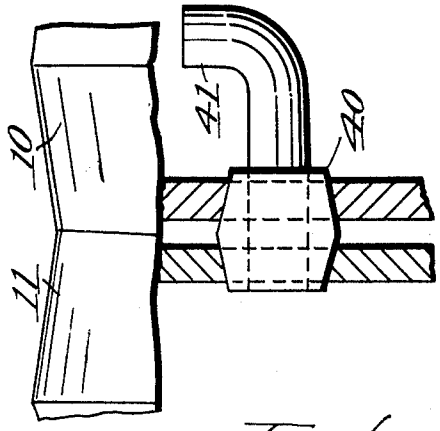


Fig. 5.

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UNITED STATES PATENT OFFICE.

CHETWOOD SMITH, OF WORCESTER, MASSACHUSETTS.

INDIRECT WATER-HEATING APPARATUS.

Application filed May 4, 1923. Serial No. 636,693.

This invention relates to apparatus for heating water indirectly for storage for domestic and other purposes.

It is the general object of my invention to provide an improved construction by which a selected portion of a sectional water heater forming part of a main water heating system may be utilized for heating water indirectly, and by which exchange of heat between the water in the selected portion of the heater and the water in the main heating system is retarded so that the water in the indirect storage system may be heated substantially higher than the water in the main heating system.

To the attainment of this object, I provide means for retarding the circulation of water between the selected portion of the water heater and the main heating system, so that a substantial difference in temperature or pressure is necessary in order to overcome this retarding effect and permit circulation. Several different constructions are shown in the drawings, all of which are well adapted to accomplish this desired result.

A further object of my invention is to provide an improved construction of indirect water heater and improved connections for supporting the indirect heater inside of a sectional water heater.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

Several forms of my invention are shown in the drawings in which

Fig. 1 is a side elevation of a sectional water heater, with my improvements applied thereto;

Figs. 2, 3, 4 and 5 show different forms of retarding connections which may be used between the selected portions of the water heater; and

Fig. 6 is a sectional elevation showing a special form of indirect heater particularly adapted for use in a sectional water heater.

Referring to Fig. 1, I have shown a water heater W which may be of any commercial type and which is formed of a plurality of sections 10 and 11. An indirect water heater 12 is connected by upper and lower pipes 13 and 14 to one of the sections 10. This indirect heater contains a heating coil 15 or its equivalent and is connected to a storage tank 16 by supply and return pipes 17 and 18. Water is drawn from the tank 16 through the delivery pipe 19 for any desired purposes and the water thus withdrawn from the tank 16 is replaced through a feed pipe 20, the indirect heater and storage system shown in Fig. 1 being of the usual commercial form.

The sections 10 of the heater W are divided off from the remaining sections 11 of the heater by inserting a solid connection 21 to close the upper passage commonly connecting adjacent sections. It will be understood that the heater W may be arranged with any desired number of sections 10 connected to the indirect heater 12 and with any desired number of sections 11 connected to the main feed pipe 22 of a house heating or other water system. The return pipe 23 of the main heating system is connected to the lower portions of the sections 10 and 11 as is the usual practice. I also provide a pipe 24 connecting one of the sections 10 to the outlet or feed pipe 22 and I provide a check valve 25 in the pipe 24.

With this construction, the sections 11 will be used to heat the water in the main heating system and to deliver the heated water to the feed pipe 22 in the usual manner, the cooler water returning to the heater through the return pipe 23. At the same time, the water in the section or sections 10 will also be heated, but the plug 21 and check valve 25 will prevent or retard the transfer of heat to the main heating system, while at the same time the water in these separated sections will circulate freely through the indirect heater 12. Consequently, the water in the sections 10 will be heated to a higher temperature than the water in the sections 11 and will raise the temperature of the water stored in the tank 16 to any desired point. The common connection between the sections 10 and 11 through the return pipe 23 takes care of any uneven expansion of the water in the sections and prevents any disastrous results from the higher temperature in the sections 10.

If the increase in temperature is sufficiently great, however, the difference in temperature between the water in the pipe 24 and the water in the main feed pipe 22 will cause the water of higher temperature to open the check valve 25 and flow into the pipe 22. A

similar result will also obtain in the event that steam should be generated in the sections 10.

With this construction and arrangement of parts, it is possible to maintain a satisfactory high temperature of the water in the storage tank 16, while at the same time the water heater W may be operated at a relatively low temperature, such as would be desirable in mild weather. Moreover, the full capacity of the heater W is available for extreme weather conditions, as the heater may be caused to operate precisely in the usual manner by opening the check valve 25, for which purpose a handle 26 may be provided.

In Figs. 2, 3, 4 and 5 I have shown different arrangements by which the same results may be accomplished. In each of these cases, the pipe 24 and check valve 25 are omitted and a special connection is substituted for the solid plug 21. In Fig. 2, the connection between the adjacent sections 10 and 11 is formed by a sleeve 30 in which a check wave 31 is mounted. In Fig. 3, a sleeve 32 is provided between the sections 10 and 11 and an open tube 33 is mounted in the sleeve 32 and projects a short distance downward into the section 10. In Fig. 4, a similar sleeve 35 is provided with a tube 36 having a return bend 37 with its open upper end substantially at the level of the sleeve 35. In Fig. 5, a sleeve 40 is provided with a tube 41 having an upwardly extended open end.

In each of these constructions, the direct flow of water between the sections 10 and 11 is retarded and such flow only takes place when a substantial difference in temperature or pressure occurs. In Fig. 2, the difference in temperature must be sufficient to overcome the check valve 31. In Fig. 3, the more highly heated water in the section 10 must extend downward below the open lower end of the tube 32 before it can flow into the section 11. The operation in Fig. 4 is substantially similar, as the highly heated water must be forced downward around the bend of the tube 36 before it can pass through the sleeve 35. In Fig. 5, a similar downward flow must occur from the open upper end of the tube 41 to the level of the sleeve 40.

In each case this movement of the heated water is more or less directly opposed to the normal path of movement of the water and only occurs upon the occurrence of a substantial difference in temperature or pressure.

In Fig. 6, I have indicated a construction of indirect heater which may be used to advantage in the combination heretofore described. For this purpose I provide an indirect heater of special form comprising a series of small heating tubes 50 having their ends secured in upper and lower heads 51. Sleeves or bushings 52 are firmly seated in openings provided in an end wall 53 of the heater W and these bushings 52 are provided with conical seats 54 at their ends. The heads 51 are provided with co-operating conical surfaces 55 and with reduced tubular portions 56 which extend outward through the bushings 52 and are provided with clamping nuts 57. Supply and return pipes 58 and 59 are connected to the portions 56 of the heads 51 and correspond in function to the pipes 17 and 18 of Fig. 1.

The particular advantage of this improved heater lies in the convenience with which it can be assembled in a sectional water heater. When assembling the parts, the heads 51 with their connecting tubes 50 are inserted through one of the holes in the end wall 53 before the corresponding bushing 52 is seated therein. Assuming that the heater is inserted through the upper opening, the lower head and its tubular member 56 are first inserted through the upper opening and are then moved downwardly and manipulated to guide the lower head into the lower bushing 52. The upper bushing 52 is then inserted around the upper tubular member 56 and is firmly seated in the wall 53. The clamping nuts 57 are then placed in position and serve to draw the conical surfaces 55 of the heads 51 against the conical seats 54 of the bushing 52, thus sealing the opening and firmly supporting the heater in position. This construction of indirect heater is particularly desirable for use in connection with my improved indirect heating apparatus previously described, in which a portion of a water heater may be operated at a temperature higher than the remaining portion thereof.

Having thus described certain forms of my invention and the advantages thereof, it will be evident that other changes and modifications can be made therein by those skilled in the art within the spirit and scope of my invention as set forth in the claims, and I do not wish to be otherwise limited to the details herein disclosed, but what I claim is:—

1. Indirect water heating apparatus comprising a main sectional water heater, an indirect water heater operably connected to a selected portion of said main heater for heating thereby, and means to retard the circulation of water between said selected portion and the remaining sections of said main water heater.

2. Indirect water heating apparatus comprising a main sectional water heater, an indirect water heater operably connected to a selected portion of said main heater for heating thereby, and means normally causing the water in said selected portion to be heated higher than the water in the remaining sections but preventing excessive rise in temperature in said selected portion by

transfer of heat by circulation to the main body of water in the remaining sections in excess of the requirements for said indirect water heater.

3. Indirect water heating apparatus comprising a main water heater formed in sections, an indirect water heater, a selected portion of said main water heater being exclusively effective to supply the circulating heating water for said indirect water heater, and connections between said selected portion and the remaining sections of said main water heater permitting flow of highly heated water to said remaining sections from said selected portion to transfer heat in excess of the requirements of said indirect water heater.

4. An indirect water heating apparatus comprising a main water heater formed in sections, an indirect water heater receiving its supply of circulating heating water exclusively from a selected portion of said main water heater, and a check valve normally closed to retard transfer of heat between the water in said selected portion and the water in the remaining sections of said heater but permitting flow of highly heated water from said selected portion to the main body of water in said water heater to transfer heat in excess of the requirements of said indirect water heater.

5. Indirect water heating apparatus comprising a main water heater formed in sections, an indirect water heater connected to a selected portion of said main water heater, and means preventing circulation of water between said selected portion and the remaining sections of said water heater until the temperature of the water in said selected portion is substantially higher than the temperature of the water in the remaining sections.

6. Indirect water heating apparatus comprising a main water heater formed in sections, an indirect water heater connected to a selected portion of said main water heater, and means normally preventing flow of water between said selected portion and the remaining sections of said water heater, but permitting such flow when the difference in temperature of the water in said selected portion and said remaining sections exceeds a predetermined temperature range.

7. Indirect water heating apparatus comprising a main water heater formed in sections, an indirect water heater connected to a selected portion of said main water heater, said selected portion having upper and lower connecting passages to the next adjacent section, and a check valve normally closing said upper passage and having an opening movement away from said selected portion.

8. Indirect water heating apparatus comprising a main water heater formed in sections, an indirect water heater connected to a selected portion of said main water heater, said selected portion having upper and lower connecting passages to the next adjacent section, and a check valve normally closing said upper passage and having an opening movement away from said selected portion.

9. Indirect water heating apparatus comprising a main sectional water heater, an indirect water heater operably connected to a selected portion of said main heater for heating thereby, and means to retard the circulation of water between said selected portion and the remaining sections of said main water heater, said means comprising an external connection between said selected portion and said remaining sections of said main heater, and a check valve in said connection opening away from said selected portion.

In testimony whereof I have hereunto affixed my signature.

CHETWOOD SMITH.