Feb. 13, 1951 E. B. WHITE 2,541,799

METHOD OF FEEDING CHEMICALS

Filed May 22, 1947

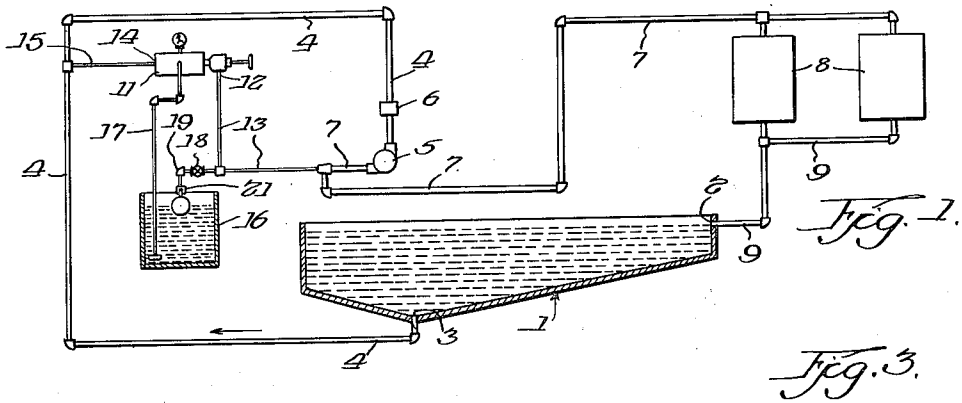


Fig. 1.

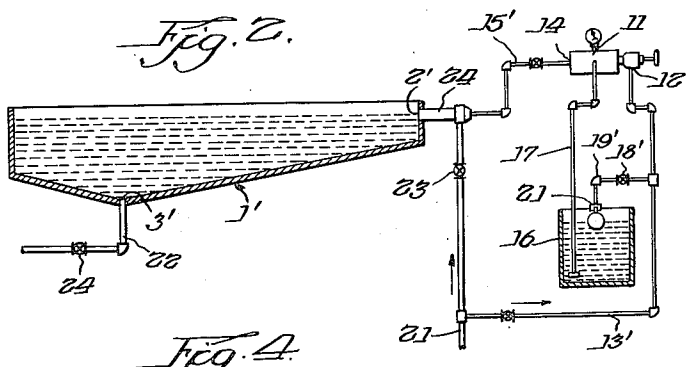


Fig. 2.

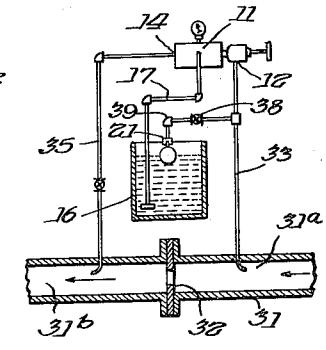


Fig. 3.

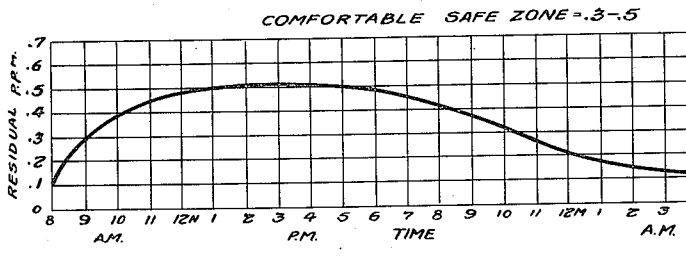


Fig. 4.

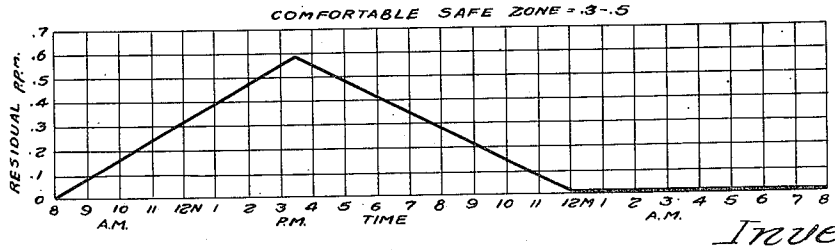


Fig. 5.

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METHOD OF FEEDING CHEMICALS

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Application May 22, 1947, Serial No. 749,692

8 Claims. (Cl. 210—11)

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The invention relates generally to a method of feeding chemicals or the like, and more particularly to such a method which may be readily adapted for use in feeding or injecting sterilizing or antisepticizing chemicals into a water supply line or system.

The present invention also is particularly adapted for app'ication to the treatment of swimming pool water in pools of the fill and draw type, as well as pools of the circulating type. With respect to such swimming pools, it is customary to employ mechanical means for injecting the antisepticizing materials into the pool water, this being accomplished by making a concentrated solution of the antisepticizing chemica's and injecting the solution by some form of mechanical means or the like into the water entering the pool. It is customary in such pools to endeavor to maintain a residual of from three-tenths to five-tenths parts per million of the antisepticizing material, which is generally chlorine, in the pool at all times. However, as the method employed at present is to feed the so'ution at a substantially uniform rate into the pool water already containing such material, it will be apparent that the maintenance of the residual within the desired limits involves more or less constant attention of the operator.

The present invention has among its objects the utilization of a novel method of feeding chemicals or the like, whereby the concentration of the solution injected may be automatically varied over a period of time to achieve the desired results. For example, in the case of swimming pools the residual of chlorine in the pool water may be automatically controlled to maintain the residual within predetermined limits substantially throughout the normal period of pool use.

Another object of the invention is the utilization of such a method which requires a minimum amount of attention from the operator to achieve the desired results and which may be readily utilized with pools of either the fill and draw type or of the recirculating type.

A further object of the invention is the utilization of such a method which is very simple and at the same time very efficient for the purposes intended.

Many other objects and advantages of the invention herein shown and described wi'l be obvious to those skilled in the art from the disclosure herein given.

For the purposes of illustration, the present invention is illustrated in connection with water

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supply systems, particularly those utilized in swimming pool water systems. However, it will be apparent to those skilled in the art that the present invention may be readily adapted for use in feeding chemicals of various types wherein similar feeding characteristics are desirable.

In the drawings, wherein like reference characters indicate like or corresponding parts:

Fig. 1 is a diagrammatic view of a swimming pool system of the recirculating type, utilizing the present invention;

Fig. 2 is a diagrammatic view similar to Fig. 1 of the application of the present invention to a swimming pool system of the fill and draw type;

Fig. 3 is a diagrammatic view showing the ap-p'ication of the present invention to a water or other fluid supply line;

Fig. 4 is a graph showing the results obtained by use of the present method in the sterilization of swimming pool water; and

Fig. 5 is a graph similar to that illustrated in Fig. 4 with the results obtained in the sterilization of swimming pool water, utilizing present methods of feeding the sterilizing material.

Referring to Fig. 1, 1 indicates generally a swimming pool having an inlet 2 for water entering the pool and an outlet 3. The outlet 3 is connected by piping 4, to the low pressure side of a suitable circulating pump 5, a suitable strainer 6 being interposed in the line if desired. The high pressure side of the pump 5 is connected by piping 7 to suitable filters 8, the outlets of which are in turn connected by piping 9 to the inlet 2 of the pool. Thus, the pool water is constantly being withdrawn through the outlet 3 to the pump 5 through the line 7, filters and piping 9 back to the pool. The construction thus described is typical of systems now in use and in the absence of the use of the present invention, the sterilizing material might be added directly to the pool water or, if in solution form, fed by mechanical means, such as a pump, into the return line, it being common in such cases to introduce it in the line between the filter and the pool inlet, or in other words, in the piping 9.

The present method is illustrated in connection with, and preferably contemplates, the use of a hydraulic injector indicated generally by the numeral 11, having its inlet 12 connected to the high pressure side of the pump 5 by piping 13 communicating with the piping 7, and the outlet 14 of the injector connected by piping 15 to the piping 4 and the low pressure side of the pump 5. The injecting means may be of any suitable design as for example, the injector mechanism

illustrated in my co-pending application, Chemical Feeder, Serial No. 749,691, filed May 22, 1947. The sterilizing chemicals are prepared in the form of a solution and placed in a suitable tank 16 and adapted to be withdrawn into the injector 11 through a tube or piping 17. Water from the high pressure side of the pump 5 may also be admitted into the tank 16 through valve 18, piping 19 and valve 21, the latter being diagrammatically illustrated in the present instance as being of a float actuated type and adapted to be opened and closed by the fall and rise of the liquid level in the tank 16.

In practicing the present invention, the operator will determine the residual of sterilizing material in the pool water before initiating the sterilizing operation, and knowing the pool capacity and period of use desired, can calculate the amount of chemicals required in accordance with common practice. The chemicals are then added to and mixed with the water in the tank 16 after which the system is placed in operation, the rate of feed being so determined as to produce the desired results.

When the system is in operation, the pump 5 will draw water from the pool through the piping 4 and back to the pool through piping 7, filters 8 and piping 9, a portion of the water circulated being by-passed from the high pressure side to the low pressure side of the system through piping 13, injector 11 and piping 15, the by-passed volume of water being relatively small compared with that being recirculated through the pool. As the water flows through the injector 11, the antisepticizing solution will be drawn from the tank 16 through the piping 17 into the injector and ultimately into the low pressure piping 4 of the system to the pool 1.

As the fluid level of the solution in the tank falls as a result of the injection thereof into the system, the float valve 21 will open to admit water into the tank 16, thereby bringing the fluid level up to its original position. Thus, as fluid is withdrawn from the tank 16, the chemical concentration of the solution therein will be undergoing a reduction due to the admission of the diluting water through the valve 21. When the feeding operation is first begun a solution of maximum concentration of antisepticizing material is fed into the pool, thereby building up a residual of such material in the pool water. However, as the concentration of the solution being fed decreases, the residual will tend to level off, and upon further feeding action will then begin to decline.

This action is graphically illustrated in Fig. 4, wherein it is arbitrarily assumed that the period of pool use will run from approximately 9 a. m. to 10 p. m., this being a common operational period. Referring to Fig. 4, it will be noted that when fresh antisepticizing solution is first fed into the pool in the morning at 9 a. m., the residual curve will rise very steeply to bring it within the desired operating limits by 9 a. m., when the pool is first open for use. The curve then starts to level off through the forenoon and early afternoon at the upper limits desired. It will be apparent that the solution will have been diluted to such an extent that it is approximately just making up normal losses in residual content over this period. From about 5 p. m. the residual begins to drop as the dilution of the solution has reached a point where it will not compensate for normal losses. It will be noted that the curve does not drop below the lower

limit set, of three-tenths P. P. M. residual, until 10 p. m., the assumed end of the period during which the pool is in use. The curve then levels off until the residual content is approximately one-tenth P. P. M. at 8 a. m., at which time the cycle is repeated.

Fig. 5 graphically illustrates a residual curve comparable to Fig. 4 but employing present methods of feeding the chemicals. The residual curve illustrated on this graph is typical of feeding methods wherein a solution of substantially uniform concentration is fed into a pool system, and it will be noted that as the sterilizing solution is fed into the pool the residual content rises at a uniform rate. When the residual reaches the maximum desired limit, it is necessary for the operator to stop the feeding action, at which point the residual content begins to decline. It will be apparent that with this method the period of time that the residual content is within the predetermined limits is relatively short compared with the results achieved by the use of the present invention. It will also be apparent that while the residual could be raised by again starting feeding of the solution, the constant attention of the operator would be required, and that if the operator fails to stop the feeding at the proper time, the residual will continue to rise above the desired maximum limit.

While the present invention has been disclosed in conjunction with a swimming pool system of the circulating type, it will be obvious to those skilled in the art that the method is also readily applicable to other types of pool or water systems.

Fig. 2 illustrates the application of the present invention to a pool system of the fill and draw type wherein fresh water under pressure, as for example from a city pressure line, is admitted to the pool and simultaneously therewith water is being lost from the pool through the overflow, etc. Referring to Fig. 2, 1' indicates a swimming pool having an inlet 2' and an outlet 3', the inlet 2' being operatively connected to a source of fresh water under pressure, indicated by the piping 21, the outlet 3' being connected by piping 22 to a drain or other waste disposal means. Valves 23 and 24 in the respective piping control the amount of water admitted to and drained from the pool. The inlet 12 of the injector 11 is connected to the piping 21 by the piping 13', with the outlet 14 of the injector connected by piping 15' to the pool inlet 2'. It will be noted that the inlet 12 of the injector is connected to the piping 21 at the high pressure side of the valve 23 and the piping 15' to the outlet 2' through a pipe 24 of such a diameter that the pressure in such pipe will be less than that in the piping 13', so that there will be a pressure differential between the piping 13' and the piping 15' regardless of the position of the valve 23. The tank 16 and piping 17 are employed in the same manner as has been heretofore described in connection with the system illustrated in Fig. 1, with the float valve 21 connected to the line 13' through the piping 19' and valve 18'. The results achieved with such system will be the same as has been heretofore described with respect to the system illustrated in Fig. 1, solution being fed from the tank 16 into the injector 11, piping 15 and into the pool, the solution being simultaneously diluted with water from the piping 13' through valve 18', piping 19' and float valve 21.

The present method may also be employed in connection with other water supply lines, as for example, in connection with the antisepticizing of potable water supplies and reservoirs thereof. Fig. 3 illustrates the application of the present invention to such a system wherein the sterilizing solution is fed into a supply line. Referring to Fig. 3, 31 indicates generally a supply pipe which, for example, may be carrying water into a reservoir, the water flow being in the direction of the arrows. Interposed in the water line is a restricting orifice indicated generally by the numeral 32 which will create a pressure differential on opposite sides of the orifice, the side 31*a* being the high pressure side and the side 31*b* the relatively low pressure side of the line. In this application the inlet 12 of the injector 11 is connected by piping 33 to the high pressure side 31*a* of the line and the outlet 14 is connected by piping 35 to the low pressure side 31*b* of the line. The tank 16 and piping 17 are as previously described and the float valve 21 is operatively connected to the piping 33 through piping 39 and valve 38. Obviously, the results achieved in this application of the invention will be the same as that previously described for the pool systems illustrated in Figs. 1 and 2, and as graphically illustrated in Fig. 4.

It will be noted in the examples given above that the material being fed is initially mixed with a relatively small volume of the receiving fluid, by-passed from a main fluid line, and then fed into and mixed with the larger volume of fluid flowing in the main line; and in the case of pools or reservoirs is finally mixed with the much greater volume of fluid in the pool or reservoir. Thus, particularly in the case of swimming pools, the materials fed are mixed and diluted in a series of steps, whereby excessive localized concentrations are eliminated.

It will be noted from the above disclosure that I have produced a novel method of feeding a chemical solution, the utilization of which will automatically vary the concentration of the materials being fed to produce the desired results. It will likewise be apparent that while I have illustrated the application of my invention in connection with swimming pool and water supply systems, my novel method may be readily employed in feeding other types of materials into fluid systems where it is desirable to vary the concentration of the materials being fed. Furthermore, it will be apparent that while I have illustrated the application of my method in connection with a hydraulic feeding mechanism, the invention may be readily utilized in connection with feeding mechanisms of various types other than hydraulic.

Having thus described my invention, it is obvious that various immaterial modifications may be made in the same without departing from the spirit of my invention; hence, I do not wish to be understood as limiting myself to the exact arrangement and method herein shown and described, or uses mentioned.

What I claim as new and desire to secure by Letters Patent is:

1. The method of feeding sterilizing materials into a water supply line, comprising creating a pressure differential in different portions of said line, by-passing water from the high pressure side to the low pressure side of said line, injecting a sterilizing solution into the water so by-passed, and simultaneously continuously reducing the concentration of the sterilizing solution being fed.

2. The method of feeding sterilizing materials into a water supply line, comprising creating a pressure differential in different portions of said line, by-passing water from the high pressure side to the low pressure side of said line, providing a supply of a sterilizing solution of predetermined volume, injecting said solution into the water so by-passed and simultaneously diluting said supply of solution with water from said supply line to continuously reduce the concentration of the sterilizing solution being fed.

3. The method of feeding sterilizing materials into a water supply line, comprising creating a pressure differential in different portions of said line, by-passing water from the high pressure side to the low pressure side of said line, providing a supply of a sterilizing solution of predetermined volume, injecting said solution into the water so by-passed and simultaneously adding water from said supply line to the supply of solution to maintain the volume thereof substantially constant, and to continuously reduce the concentration of said solution.

4. The method of feeding sterilizing materials into a swimming pool water supply or circulation system, comprising providing a supply of sterilizing solution of sufficient volume and strength for providing adequate water sterilization over a desired period of time, injecting said solution into the pool water supply line, in relatively small amounts compared to the initial volume of the injecting solution, and simultaneously reducing the concentration of said supply of solution during the injection of such solution to maintain the residual content of sterilizing material in the pool water substantially within predetermined limits over such period of time.

5. The method of feeding sterilizing materials into a swimming pool water system of the fill and draw type, utilizing a fresh water supply under pressure, comprising providing a supply of sterilizing solution of predetermined volume, feeding said solution in relatively small amounts compared with the initial volume of the solution, into the fresh water supply line to said pool, and simultaneously diluting said supply of solution with water from said fresh water supply to continuously reduce the concentration of the solution being fed.

6. The method of feeding sterilizing materials into a swimming pool water system of the fill and draw type, utilizing a fresh water supply under pressure, comprising providing a supply of sterilizing solution of predetermined volume, feeding said solution in relatively small amounts compared with the initial volume of the solution, into the fresh water supply line to said pool, and simultaneously adding water from said fresh water supply to said supply of solution to maintain the volume of the latter substantially constant, the concentration thereof diminishing as the solution is fed.

7. The method of feeding or injecting a solution into a fluid system, comprising providing a predetermined volume of the solution to be fed, feeding said solution in relatively small amounts, compared with the total initial volume of the solution, into the receiving fluid, and adding a diluting fluid to such supply of the solution during the feeding process, to maintain a substantially constant volume of solution and a corresponding diminution of the strength of the solution.

8. The method of feeding sterilizing materials into a swimming pool water supply or circula-

tion system, comprising providing a supply of a sterilizing solution of predetermined volume, injecting said solution into the pool water supply line in relatively small amounts compared with the initial volume of the injecting solution, and adding water to said supply in a predetermined ratio to the reduction in the volume resulting from injection thereof into the pool water supply line, and thereby substantially continuously reduce the concentration of the solution being fed throughout the period of feeding.

EUGENE B. WHITE.

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