This invention relates to water treating apparatus and more particularly to a cold process water softener or coagulator, and an object of the present invention is to provide such an apparatus designed and constructed to provide fixed and predetermined flow of water and pre- cipitate through the device and to prevent short circuiting of such fluid flow.

With these and other objects in view, as may appear from the accompanying specification, the invention consists of various features of construction and combination of parts, which will be first described in connection with the accompanying drawings, showing a cold process water softener or coagulator of a preferred form embodying the invention, and the features forming the invention will be specifically pointed out in the claims.

In the drawings:

Figure 1 is a top plan of the cold process water softener or coagulator.

Figure 2 is a vertical section taken on the line 2—2 of Figure 1.

Figure 3 is a horizontal section taken on the line 3—3 of Figure 2.

Figure 4 is a top plan of a modified form of the cold process water softener or coagulator.

Figure 5 is a vertical section taken on the line 5—5 of Figure 4.

Referencing more particularly to the drawings, 1 indicates the receptacle or housing of the cold process water softener or coagulator. In the drawings, this receptacle 1 is shown as being of poured concrete construction as is frequently resorted to in large installations, although it is to be understood that the invention is not limited to this type of construction of receptacle.

The receptacle 1 includes therein which is vertical for a portion of its depth and from the lower end of the vertical portion 3 it inclines inwardly and downwardly as shown at 4, cooperating with the inclined portion 5 of the receptacle 1 to provide a chamber 6 which tapers inwardly and downwardly from both sides, as clearly shown in the drawings. A second partition 7 extends vertically through the length of the receptacle 1 in spaced relation and parallel to the vertical portion of the partition 2 and a third vertical partition 8 is placed in the receptacle 1 parallel and in spaced relation to the partition 7. An inclined partition 9 extends downwardly and inwardly from the partition 7 a predetermined distance below its upper edge and to the bottom of the receptacle 1 forming a mixing chamber 10 which is substantially triangular shaped in cross section and extends throughout the entire length of the receptacle 1. Partitions 11 and 12 extend across the mixing chamber forming an inlet chamber 13 at the upper portion of the mixing chamber 10 and a recirculation collection chamber 14 at the bottom inner corner of the mixing chamber 10. Raw water to be treated enters the mixing chamber 10 through the inlet pipe 15 and the quantity of raw water admitted to the inlet chamber 13 through the pipe 15 is controlled by a pressure actuated valve 16 of any suitable type which may be purchased upon the open market. The quantity of raw water admitted through the pressure actuated valve 16 is controlled by the level of treated water in the treated water outlet chamber 17 through the medium of a float controlled pressure creating mechanism 18 of the usual type which may be purchased upon the open market.

The raw water which enters the raw water inlet chamber 13 passes through a plurality of openings 19 in the partition 11 into the mixing chamber 10 where it mixes with a suitable chemical or coagulant delivered to the mixing chamber through the inlet pipe 20. A plurality of rotary impellers 21 are mounted on a common shaft 22 in the mixing chamber 10 and are spaced across the mixing chamber as clearly shown in Figure 3 of the drawings. The shaft 22 is rotated by any suitable type of prime mover such as an electric motor and gear train indicated at 23 in Figure 1 of the drawings. The raw water and coagulant are thoroughly mixed in the mixing chamber 10 and passed therefrom across the lower end of the partition 7 into the space 24 between the partitions 8 and 7. An adjustable plate 25 is carried by the bottom of the partition 7 to regulate the size of the communicating opening between the mixing chamber 10 and the upflow passage 24. The upper edge of the partition 7 is notched as indicated at 26 to form a weir and the mixed water and coagulant flows upwardly through the passage 24 over the top of the partition 7 and downwardly into the passage 26 formed between the vertical portions of the partitions 2 and 7 and the inclined portion 4 of the partition 2 and the inclined partition 9. This space 26 together with the upflow passage 24 forms the precipitation chambers and from the precipitation effluent passes upwardly into the settling chamber 6 wherein the precipitate or floe settles out of the water and passes into the floe collection chambers or spaces 28 formed along each side of the settling chamber 6 by partitions 29. The settled floe is drawn off from the floe settling chambers 28 through suitable sludge removal pipes 30.

The downflow precipitation passage or chamber 26 is divided into a plurality of longitudinally spaced individual chambers or passages 32 by a plurality of spaced vertical partitions 33 which causes longitudinally separated downflow precipitation passages to the settling chamber thus providing equally distributed flow of the effluent over the entire width of the receptacle 1 and it also prevents short circuiting of the flow of effluent to the settling chamber 6 which might be caused by the turbulence in the water flowing through this space.

The partitions 33 provide pro-rated flow of water which prevents the outlets of the passages formed by the partitions 33 becoming clogged by floe. Should an obstruction occur in any one of the passages the hydrostatic head will build up at the discharge of the weir 25 independently of flow sufficiently to overcome resistance of flow in the passage caused by uneven distribution of floe in the chamber 6.

The recirculating compartment 14 is connected to the treated water compartment 17 through suitable piping 34 in which piping is located a recirculating pump 35. A pressure actuated valve 36 controls the flow of recirculating water from the treated water collection chamber 17 back into the recirculating chamber 14. This valve is of any approved type of pressure actuated valve which may be purchased upon the open market and it is under control of the float actuated mechanism 18 so that when the level of treated water in the chamber 17 reaches a predetermined height the valve 36 will be open and treated water will be delivered to the recirculating chamber 14. The treated water will pass from the recirculating chamber 14 through a plurality of openings 37.
3

in the partition 12 into the mixing chamber 10 where it
will be mixed with the incoming raw water, the quan-
tity of which will be reduced proportionately to the
quantity of treated water recirculated.

Treated water is drawn off from the treated water
storage or collection chamber 17 through a suitable out-
let 38 and the treated water storage or collection cham-
ber 17 is formed by a part of the vertical portion 3 of
the partition 2 and by a partition 39. The upper edges
of both the partition 2 and 39 are serrated as indicated
at 40 to break up the flow of the clarified treated water
from the settling chamber 6 into the chamber 17.

In the construction shown in Figures 1 and 2 of the
drawings a wash water compartment 41 is shown formed
in the receptacle 1 between the partition 8 and the outer
adjacent wall of the receptacle. The wash water com-
artment 41 is open at the bottom to the upflow precipi-
tation passage 24 so that water may flow from the mix-
ing chamber into the wash water compartment 41 where
the precipitations or floe will settle out of the water
and pass out of the bottom of the wash water
compartment into the upflow passage 24 and be carried
over with the water and floe or precipitation passing
upwardly therethrough. The wash water compartment
41 has outlet and return pipes 43 and 44 respectively
therein, flow through which is controlled by suitable
valves 45.

In the construction or form of the invention shown in
Figures 4 and 5 of the drawings the cold process water
softener or coagulator shown is identical in construction
with that shown in Figure 1 of the drawings excepting
only that the wash water compartment 41 is eliminated
and thus the upflow precipitation upflow passage 24' is
formed between the partition 7 and the adjacent wall 46 of
the receptacle 1'. In all other respects the construction
and operation of the invention shown in Figures
4 and 5 are the same as that shown in Figures 1 to 3.

It will be understood that the invention is not to be
limited to the specific construction or arrangement of
parts shown, but that they may be widely modified within
the invention defined by the claims.

What is claimed is:

1. In a cold process water softener or coagulator, a
receptacle embodying a mixing chamber, means for
delivering raw water to said mixing chamber, means
for delivering chemicals to said mixing chamber, a settling
chamber in said receptacle, a precipitation space in said
receptacle leading upwardly from said mixing chamber
and downwardly to the lower portion of said settling
chamber and a plurality of partitions in the downwardly
leading portion of said precipitation space dividing it
into a plurality of individual passages extending through-
out the depth of the downwardly leading portion of the
precipitation space, said receptacle including a
collection space for treated water, and an outlet for
treated water, a partition extending across said mixing
chamber and forming a raw water inlet space independ-
ent of and separated from said mixing chamber, said
partition provided with a plurality of spaced openings
therein to permit flow of raw water from said raw water
inlet space into said mixing chamber, and means for
delivering raw water to said mixing chamber and
means for delivering chemicals to said mixing chamber,
settling chamber in said receptacle, a precipitation space in said
receptacle leading upwardly from said mixing chamber
and downwardly to the lower portion of said settling
chamber, and a plurality of partitions in the downwardly
leading portion of said precipitation space dividing it
into a plurality of individual passages extending through-
out the entire depth of the downwardly leading portion
of the precipitation space, said receptacle including a
collection space for treated water, and an outlet for
treated water, a partition extending across said mixing
chamber and forming a raw water inlet space independ-
ent of and separated from said mixing chamber, said
partition provided with a plurality of spaced openings
therein to permit flow of raw water from said raw water
inlet space into said mixing chamber, and means for
delivering raw water to said mixing chamber and
means for delivering chemicals to said mixing chamber,
settling chamber in said receptacle, a precipitation space in said
receptacle leading upwardly from said mixing chamber
and downwardly to the lower portion of said settling
chamber, and a plurality of partitions in the downwardly
leading portion of said precipitation space dividing it
into a plurality of individual passages extending through-
out the entire depth of the downwardly leading portion
of the precipitation space, said receptacle including a
collection space for treated water, and an outlet for
treated water, a partition extending across said mixing
chamber and forming a raw water inlet space independ-
ent of and separated from said mixing chamber, said
partition provided with a plurality of spaced openings
therein to permit flow of raw water from said raw water
inlet space into said mixing chamber, and means for
delivering raw water to said mixing chamber and
means for delivering chemicals to said mixing chamber,
settling chamber in said receptacle, a precipitation space in said
receptacle leading upwardly from said mixing chamber
and downwardly to the lower portion of said settling
chamber, and a plurality of partitions in the downwardly
leading portion of said precipitation space dividing it
into a plurality of individual passages extending through-
out the entire depth of the downwardly leading portion
of the precipitation space, said receptacle including a
collection space for treated water, and an outlet for
treated water, a partition extending across said mixing
chamber and forming a raw water inlet space independ-
ent of and separated from said mixing chamber, said
partition provided with a plurality of spaced openings
therein to permit flow of raw water from said raw water
inlet space into said mixing chamber, and means for
delivering raw water to said mixing chamber and
means for delivering chemicals to said mixing chamber,
settling chamber in said receptacle, a precipitation space in said
receptacle leading upwardly from said mixing chamber
and downwardly to the lower portion of said settling
chamber, and a plurality of partitions in the downwardly
leading portion of said precipitation space dividing it
into a plurality of individual passages extending through-
out the entire depth of the downwardly leading portion
of the precipitation space, said receptacle including a
collection space for treated water, and an outlet for
spaced relation across said downflow precipitation space and extending the full depth of the space to divide effluent flowing therethrough in isolated individual streams from their entrance into the downflow space to their exit into the settling chamber, and an outlet for treated water having communication with said settling chamber.

6. A cold process water softener or coagulator as claimed in claim 5 including a partition extending across said mixing chamber and forming a raw inlet space independent of and separated from the mixing chamber, said partition provided with a plurality of spaced openings therein to permit flow of raw water from said raw water inlet space into said mixing chamber, and means for delivering raw water to said raw water inlet space.

7. A cold process water softener or coagulator as claimed in claim 5 including a partition extending across said mixing chamber and forming a recirculation water inlet space independent of and separated from said mixing chamber, said partition provided with a plurality of spaced openings therein to permit recirculated treated water to pass from said recirculated water inlet space into said mixing chamber, and means for delivering treated water from said treated water collection space to said treated water inlet space.

8. A cold process water softener or coagulator as claimed in claim 5 including a partition extending across said mixing chamber and forming a raw inlet space independent of and separated from the mixing chamber, said partition provided with a plurality of spaced openings therein to permit flow of raw water from said raw water inlet space into said mixing chamber, and means for delivering raw water to said raw water inlet space, a second partition extending across said mixing chamber and forming a recirculation water inlet space independent of and separated from said mixing chamber, said partition provided with a plurality of openings therein to permit recirculated treated water to pass from said recirculated water inlet space into said mixing chamber, and means controlled by level of water in said treated water collection space for delivering treated water to said treated water inlet space.

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