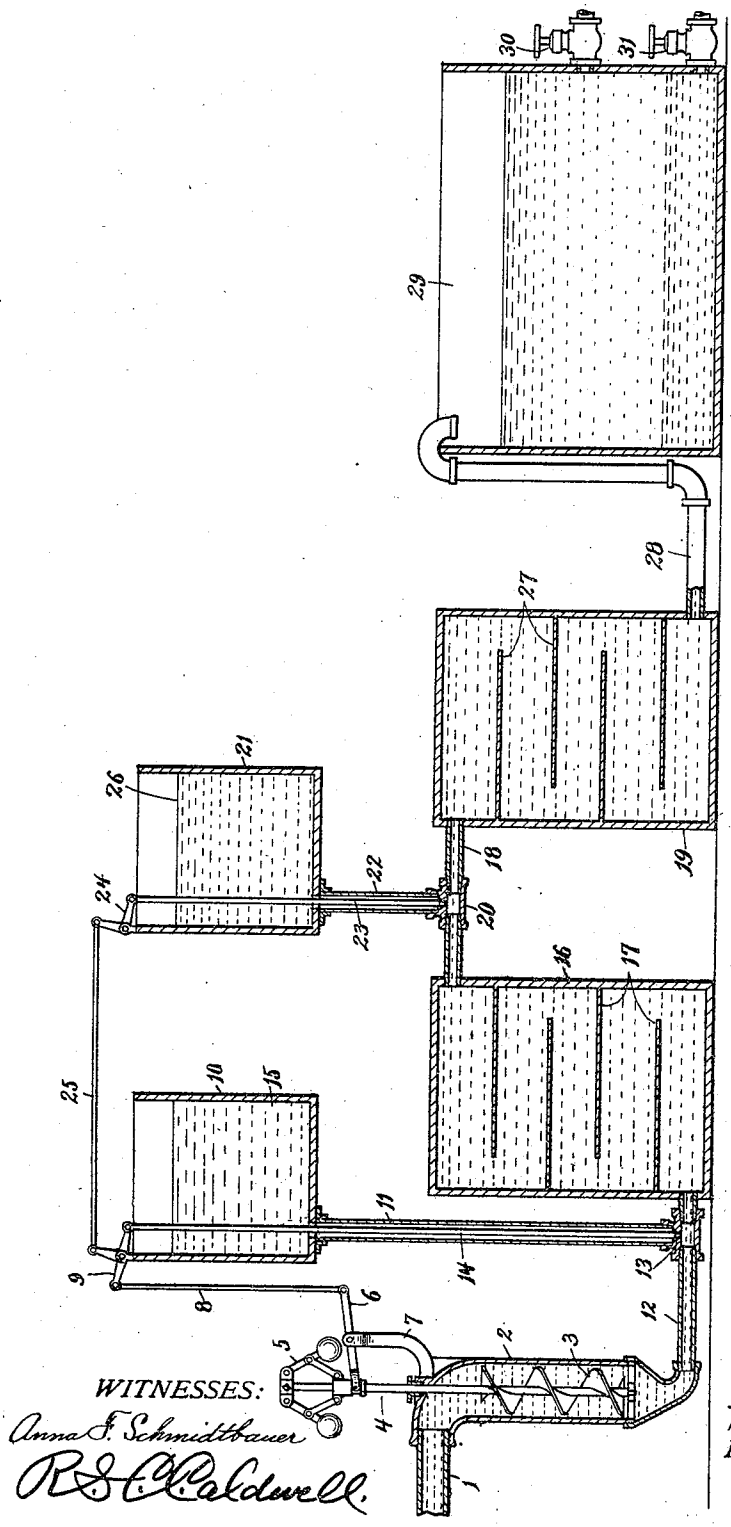
No. 793,727. PATENTED JULY 4, 1905.

B. KNIFFLER.

APPARATUS FOR CLARIFYING WATER OR THE LIKE.

APPLICATION FILED MAR. 25, 1904.



WITNESSES:

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PHOTO-LITHOGRAPHED BY SACKETT & WILHELMS LITHO & PTG. CO. NEW YORK

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UNITED STATES PATENT OFFICE.

BRUNO KNIFFLER, OF MILWAUKEE, WISCONSIN.

APPARATUS FOR CLARIFYING WATER OR THE LIKE.

SPECIFICATION forming part of Letters Patent No. 793,727, dated July 4, 1905.

Application filed March 25, 1904. Serial No. 199,961.

To all whom it may concern:

Be it known that I, BRUNO KNIFFLER, residing in Milwaukee, in the county of Milwaukee and State of Wisconsin, have invented new and useful Improvements in Apparatus for Clarifying Water or the Like, of which the following is a description, reference being had to the accompanying drawing, which is a part of this specification.

This invention relates to certain new and useful improvements in apparatus for clarifying water and the like, and has for its object to provide means for introducing an emulsion to a system of flowing water or other liquid and means for thoroughly mixing such emulsion with the liquid and then means for introducing an acid or an acid-acting chemical to such mixture and means for thoroughly mixing it therewith, so as to cause coagulation of the emulsion to abstract from the liquid the impurities contained therein, and, finally, providing means for separating the clarified liquid from the coagulation containing the impurities.

A further object of this invention is to provide such a system with an automatic means for controlling the supply of the emulsion and the acid-acting chemical by the flow of the liquid to be purified, so that the quantity of these purifying chemicals will vary directly with the quantity of liquid to be purified.

It is a well-known fact that in many factories in which great quantities of water are employed weather conditions frequently render the only available supply so contaminated with mud and other impurities as to be unsuitable for the purpose intended. This is especially true with paper-mills; and it is a particular object of this invention to provide for clarifying water in great quantities from these objectionable impurities in such cases.

With the above and other objects in view the invention consists in the devices and parts or their equivalents, as hereinafter set forth.

In the accompanying drawing the figure represents a vertical section of an apparatus for accomplishing the above objects and exemplifying this invention.

In the drawing, 1 represents a water-feed pipe capable of supplying the system with a large quantity of water under pressure which may contain a great amount of impurities in the nature of solid matter held in suspension and which might be unsuitable for use in its natural condition by reason of such impurities. A motor-casing 2 is fed by the water-pipe 1 and is preferably of enlarged diameter and arranged vertically, as shown in the drawing, and within it is suitably journaled a means for receiving motion from the water passing through said casing, which in this particular instance is in the form of a screw-motor 3, mounted on a shaft 4.

A controlling means 5, similar to an ordinary ball-governor, with the usual centrifugal weights and sliding grooved sleeve having link connection therewith, is mounted on the upwardly-projecting end of shaft 4, and the yoked end of a lever 6 embraces the sliding sleeve of the controlling means, so as to be raised and lowered with said sleeve, and this lever 6 is fulcrumed in the upper end of a bracket 7, projecting from the casing 2. A link 8 connects the other end of lever 6 to one arm of a bell-crank lever 9, pivoted to an emulsion-supply tank 10, whose outlet-pipe 11 connects with a pipe 12, leading from the casing 2, by a valve-seat connection 13, and a valve-stem 14 is pivoted to another arm of the bell-crank lever 9 and extends down the outlet-pipe 11 and forms a pin-valve by its tapering end fitting with the valve-seat of connection 13, so as to control the flow of emulsion 15 from the vessel 8 to the water passing through the pipe 12.

By means of the connection above described between the valve-rod 14 and the controller 5 the said valve-rod is raised more or less from its valve-seat to permit more or less of the emulsion to pass to the water by the operation of the controlling means due to the different speeds of rotation of the shaft 4 as the water flows through pipe 1 at different speeds, and this control of the admission of emulsion to the water is so arranged that the quantity of emulsion permitted to pass through the valve varies directly with the quantity of water flowing through the system.

A mixing-chamber 16 connects with the water-pipe 12 and has a series of interfitting

baffle-plates 17 on opposite sides to require the liquid passing therethrough to take a sinuous course, and thereby effect a thorough mixing of the emulsion with the water. At its upper end the mixing-chamber 16 connects by a pipe 18 with a similar mixing-chamber 19, and forming part of pipe 18 is a valve connection 20, having a valve-seat similar to the valve connection 13. An acid vessel 21 has its discharge-pipe 22 connected with the valve connection 20, and a valve-rod 23 similar to valve-rod 14 passes down through the acid vessel 21 and discharge-pipe 22 and by its tapering end forms a pin-valve with the valve-seat of the connection 20. The valve-rod 23 is connected at its upper end to a bell-crank lever 24, pivoted to the acid vessel 21, and the other arm of said bell-crank lever 24 is connected by a link 25 with a third arm of the bell-crank lever 9, so that the movements imparted to said bell-crank lever 9 by the controller 5 are transmitted to the valve-rod 23, and consequently the acid 26 of the acid vessel 21 is admitted by the valve 23 to the mixture of water and emulsion passing through pipe 18 in direct proportion to the quantity of water passing through the system.

The mixing-chamber 19 is provided with interfitting baffle-plates 27 on its opposite sides similar to those contained in mixing-chamber 16 and requiring the liquids to pass downwardly in a sinuous course to effectively mix the acid with the mixture of water and emulsion. This produces a coagulation of the emulsion, which attracts the particles of impurities from the water, and the water with the dirt-contained coagulation is conveyed from the mixing-chamber 19 by means of a pipe 28 and is discharged into a large settling-tank 29, where the dirt-containing coagulation is permitted to settle and separate from the clarified water by the difference of their specific gravities, when the clarified water may be drawn off by means of a valve 30 and the dirt-containing coagulation may be discharged through a valve 31.

From the foregoing it will be seen that with an apparatus such as described an emulsion is added to the flowing water in quantities dependent upon the flow of the water, the emulsion is thoroughly mixed with the water, and to this mixture is added a quantity of acid, also dependent upon the flow of the water, and a thorough mixing of the acid with the mixture of water and emulsion is caused to produce a coagulation of the emulsion, which naturally attracts from the water the impurities held thereby, and when permitted to settle the coagulation with the impurities naturally separate from the clarified water, so that the clarified water may be drawn off free from the impurities. While any emulsion may be used for this purpose which will coagulate on being mixed with an acid and any acid may be used which will produce such coagulation, I have found as suitable for the purposes of this invention that an emulsion of rosin and an acid-acting chemical, such as an alum solution, are admirably suited for this purpose.

While I have shown a settling-tank as a means for separating the clarified water from the coagulation containing impurities, it is obvious that any other suitable means may be employed, and therefore it is not to be understood that my invention is confined to the use of a settling-tank for this purpose. Furthermore, the particular construction of the mixers, the chemical vessels, the valves, the controller, and other parts is not essential to the successful operation of the device; but other means may be substituted for accomplishing their several functions, and this invention is intended to comprehend all such modifications.

What I claim as my invention is—

1. An apparatus for clarifying water comprising a water system, a casing through which the water passes, a screw receiving motion from the passing water, a centrifugal controller operated by the screw, an emulsion vessel having a valve connection with the water system and adapted to admit emulsion to the water under control of the centrifugal controller, a mixer for mixing the emulsion with the water, an acid vessel having a valve connection with the water system to admit acid to the mixture of water and emulsion and controlled by the controller, a mixer for mixing the acid with the mixture of water and emulsion so as to coagulate the emulsion and thereby attract the impurities from the water, and a settling-tank in which the coagulation containing the impurities separates from the clarified water.

2. An apparatus for clarifying water comprising a water system, a casing through which the water passes, a screw within the casing receiving motion from the passing water, a controller connected to the screw and dependent in its operation upon the speed of rotation of the screw, a means for introducing an emulsion to the water, a mixer for mixing the emulsion with the water, and means for introducing an acid to such mixture, a mixer for mixing the acid with the mixture of water and emulsion whereby the emulsion is coagulated and the coagulation attracts the impurities from the water, and means for separating the clarified water from the coagulation containing the impurities, said emulsion-introducing means and said acid-introducing means being controlled by the controller.

3. An apparatus for clarifying water comprising a water system, a casing through which the water passes, a screw contained within the casing and receiving motion from the passing water, a centrifugal controller operated by the screw, means for introducing an emulsion to the water, a mixer for mixing the emulsion

with the water, means for introducing an acid to such mixture, a mixer for mixing the acid with the mixture of water and emulsion whereby the emulsion is coagulated and the coagulation attracts the impurities from the water and means for separating the clarified water from the coagulation containing the impurities, said emulsion-introducing means and said acid-introducing means being controlled by the centrifugal controller.

4. An apparatus for clarifying water comprising a water system, a vertical cylindrical casing through which the water passes, a screw journaled within the casing and receiving motion from the water passing therethrough, a centrifugal controller mounted on the screw, a mixing-chamber having connection at its lower end with the lower end of the cylindrical casing and receiving the water therefrom, an emulsion vessel at a higher level than the mixing-chamber, an outlet-pipe therefor connecting with the connection between the cylindrical casing and the mixing-chamber, a valve-rod passing through said outlet-pipe and forming a valve at the junction of said outlet-pipe with the connection between the cylindrical casing and the mixing-chamber to control the flow of emulsion from the emulsion vessel, a double bell-crank lever on the emulsion vessel having one of its arms connected to the said valve-rod, a link connected to another arm of the bell-crank lever, a suitably-pivoted yoked lever having connection with the centrifugal controller and connected to said link, baffle-plates within the mixing-chamber adapted to form a sinuous upward course therethrough for the water and emulsion to effect a thorough mixing thereof, a second mixing-chamber connected at its upper end to the upper end of the first-mentioned mixing-chamber, an acid vessel at a higher level than the mixing-chambers, an outlet-pipe leading therefrom and connecting with the connection between the mixing-chambers, a valve-rod passing through said outlet-pipe and forming a valve at the junction of said outlet-pipe with the connection between the mixing-chambers, a bell-crank lever on the acid vessel having one arm connected to said valve-rod, a link connecting the other arm of the bell-crank lever on the acid vessel with the third arm of the bell-crank lever on the emulsion vessel, baffle-plates in the second mixing-chamber arranged to form a sinuous downward course for the acid and the mixture of water and emulsion to effect a thorough mixing of the same and thereby cause the coagulation of the emulsion to attract the impurities from the water, a discharge-pipe leading from the lower end of the second mixing-chamber, and a settling-tank into which the discharge-pipe empties.

5. An apparatus for clarifying water, comprising a water-pipe, a motor operated by the flow of water through the water-pipe, a centrifugal controller operated by the motor, and means for introducing a chemical to the water having the passage thereof controlled by the centrifugal controller.

6. An apparatus for clarifying water, comprising a water-pipe, a motor operated by the flow of water therethrough, a centrifugal controller operated by the motor, a valved emulsion-introducing means adapted to supply the water with emulsion and having its valve controlled by the centrifugal controller, and a valved acid-introducing means adapted to supply the mixture of water and emulsion with an acid-acting chemical and having its valve controlled by the centrifugal controller.

In testimony whereof I affix my signature in presence of two witnesses.

BRUNO KNIFFLER.

Witnesses:
R. S. C. CALDWELL,
ANNA F. SCHMIDTBAUER.