G. E. BAILEY & B. A. HATCH.

METHOD OF SOFTENING WATER.

APPLICATION FILED JUNE 15, 1912.

1,108,544. Patented Aug. 25, 1914.

Fig. 1.

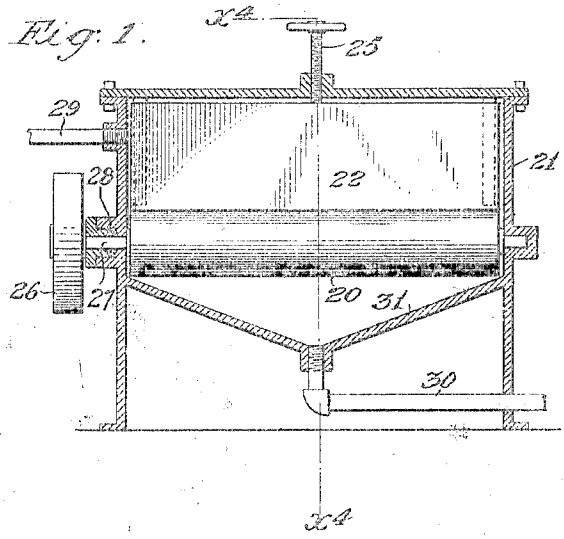
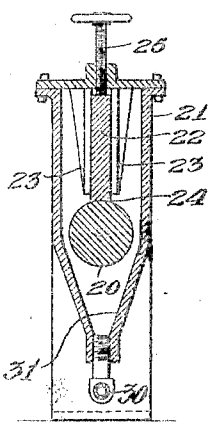


Fig. 2



Witnesses,
Louis W. Gratz.
C. N. Shelton.

Inventors
Gilbert E. Bailey
Bert Arthur Hatch
by Reynolds Graham
their Attorneys.

UNITED STATES PATENT OFFICE.

GILBERT E. BAILEY AND BERT ARTHUR HATCH, OF LOS ANGELES, CALIFORNIA, ASSIGNORS TO THE FERROCHEM COMPANY, OF LOS ANGELES, CALIFORNIA, A CORPORATION OF CALIFORNIA.

METHOD OF SOFTENING WATER.

1,108,544. Specification of Letters Patent. Patented Aug. 25, 1914.

Application filed June 15, 1912. Serial No. 703,885.

To all whom it may concern:

Be it known that we, GILBERT E. BAILEY and BERT ARTHUR HATCH, both citizens of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented a new and useful Method of Softening Water, of which the following is a specification.

Our method is especially designed for softening boiler feed water which contains minerals, alkalis or acids in combination therewith, and has for its purpose the positive and intimate mixing of metallic particles therewith which have an affinity for the minerals, alkalis or acids contained in solution in the water.

Our method particularly relates to the manner of positively mixing such metals with the water in order that the minerals, acids or alkalis may all be neutralized by combining with the metals.

Our method consists in feeding to and mixing finely divided metals with the water which have an affinity for the several minerals, alkalis or acids carried in solution therein, and is carried out by liberating such metallic particles, as may be required for that purpose, in regular amounts in the presence of the water carrying the minerals, alkalis or acids, preferably, as the same is being fed to the boiler.

The accompanying drawings illustrate apparatus by means of which our method may be carried out.

Figure 1 is a longitudinal section of an apparatus adapted to supply fine particles of metal to the water by grinding action. Fig. 2 is a cross section of the same taken on line x^1—x^1 Fig. 1.

In Figs. 1 and 2, we have shown a grinding roller 20, preferably made of composite metal, mounted within a water-tight casing 21 adapted to sustain water pressure. A leaf of composition metal 22 is mounted within slides 23 within the casing 21. These slides guide the leaf 22 and hold the lower edge 24 of the leaf in contact with the top of the roller 20. A feed, such as screw 25, is arranged to exert pressure on the top of the metallic leaf to keep the same in contact with the roller 20. A pulley wheel 26 is arranged outside of the casing mounted upon the end of an axle 27, and by rotating such pulley the roller 20 is caused to grind away the metal from the leaf 22 and the roller 20. A suitable stuffing box 28 is provided to prevent leakage around the axle. A water inlet pipe 29 is provided at a point near the top of the casing, while an outlet pipe 30 is provided to take the water from the bottom 31. Such bottom 31 is preferably arranged to slope from both ends toward the center of the casing, whereby all of the particles of metal ground from the leaf 22 and the roller 20 will be brought into the current of water flowing to the boiler and thereby intimately mixed therewith.

We prefer to use, as the metals to be mixed with the water, a composition of chemically pure iron, aluminum, lead and zinc, and we have discovered that when a mixture of such metals is finely abraded or ground, and the finely divided metals thus obtained are regularly mixed with the waters containing minerals, alkalis or acids in solution, that such minerals, alkalis or acids are neutralized by their combining with the metals and, instead of forming scale within the boiler, are deposited in a slick mud form and that all of their scale forming characteristics are thereby neutralized.

We have also discovered that a positive, continuous and predetermined quantity of such abraded or finely divided metals must be combined with the water in order to secure perfect results in preventing the formation of scale.

The amount of metal fed to the water is regulated by the speed at which the roller 20 is turned, a slow revolution thereof wearing away a less amount of the leaf 22 and the roller 20. When a higher percentage of the metals is required, the speed of rotation of the roller 20 is increased and a larger supply of metal is given to the water.

We are aware that it has heretofore been proposed to expose certain metals to the action of waters carrying impurities therein in solution to cause such impurities to become innocuous, and we are also aware that it has heretofore been proposed to mix certain chemicals with the water in order to prevent scale forming, but we are not aware that heretofore a constant and positive supply of finely divided metals has been fed

to water to neutralize minerals, acids or alkalis contained therein and prevent them from forming scale.

Our invention is especially adapted to be used in treating feed water to boilers or in treating water fed to water heaters, the metals being fed to and mixed with the water before such water is admitted to the boiler or heater.

In practice, the amount of minerals, acids or alkalis contained in the water to be treated is determined by suitably testing the water, and the amount of metal necessary to combine with such mineral, acid or alkalis to neutralize the same is then ascertained.

The roller 20 is rotated through the medium of the pulley 26 and the speed at which such roller 20 is rotated regulates the amount of finely divided metals fed to the water.

By feeding to the water metals which are liberated from the mass of metals in the presence of such water, by either abrasive or grinding action, we are enabled to supply such metals in their most active form, they being bright and clean and in a condition for immediately combining with the minerals, alkalis or acids contained in the water.

The metals employed in effecting the purification are preferably amalgamated nto a combination and molded into the parts to be abraded or worn away, and this is usually accomplished by heating and mixing the required proportions, for instance, of iron, aluminum, zinc and lead, and then molding them into any shape required for the work performed.

What we claim is:—

1. A process of purifying water consisting of providing a continuous abrasion between two solid bodies of a material suited to correct the impurities in the water, said solid bodies being submerged in the water and maintained in contact by external pressure.

2. A process of purifying water consisting of maintaining high pressures between moving bodies submerged in said water of a material suited to purify water, the particles thereby abraded being released in the water to be purified.

3. A process of purifying water consisting of maintaining high pressures between two bodies of a material suited to purify water, and maintaining a mutual movement between said bodies, the particles thereby abraded being released into the water to be purified.

4. A process of purifying water consisting of providing an abrasion between solid bodies of a material suited to correct the impurities in the water, and maintaining high pressure between said solid bodies, the particles abraded being released into the water to be purified.

5. A process of purifying water consisting of providing an abrasion between solid bodies of a material suited to purify water, said bodies being maintained in contact by external pressure and the particles abraded being released into the water to be purified.

6. A process of purifying water consisting of providing an abrasion between bodies of purifying material, said bodies being maintained in contact by high pressure and being submerged in the water to be purified.

7. A process of purifying water, consisting of providing an abrasion between bodies of purifying material held in contact by high pressures and releasing the product of said abrasion into the water to be purified, said bodies all being of a material suited to correct the impurities in the water.

In testimony whereof, we have hereunto set our hands at Los Angeles, California, this 8th day of June, 1912.

GILBERT E. BAILEY.
BERT ARTHUR HATCH.

In presence of—
FRANK L. A. GRAHAM,
P. H. SHELTON.