

April 11, 1950

J. E. LINN

2,503,878

ACID WATER NEUTRALIZER

Filed July 22, 1946

2 Sheets-Sheet 1

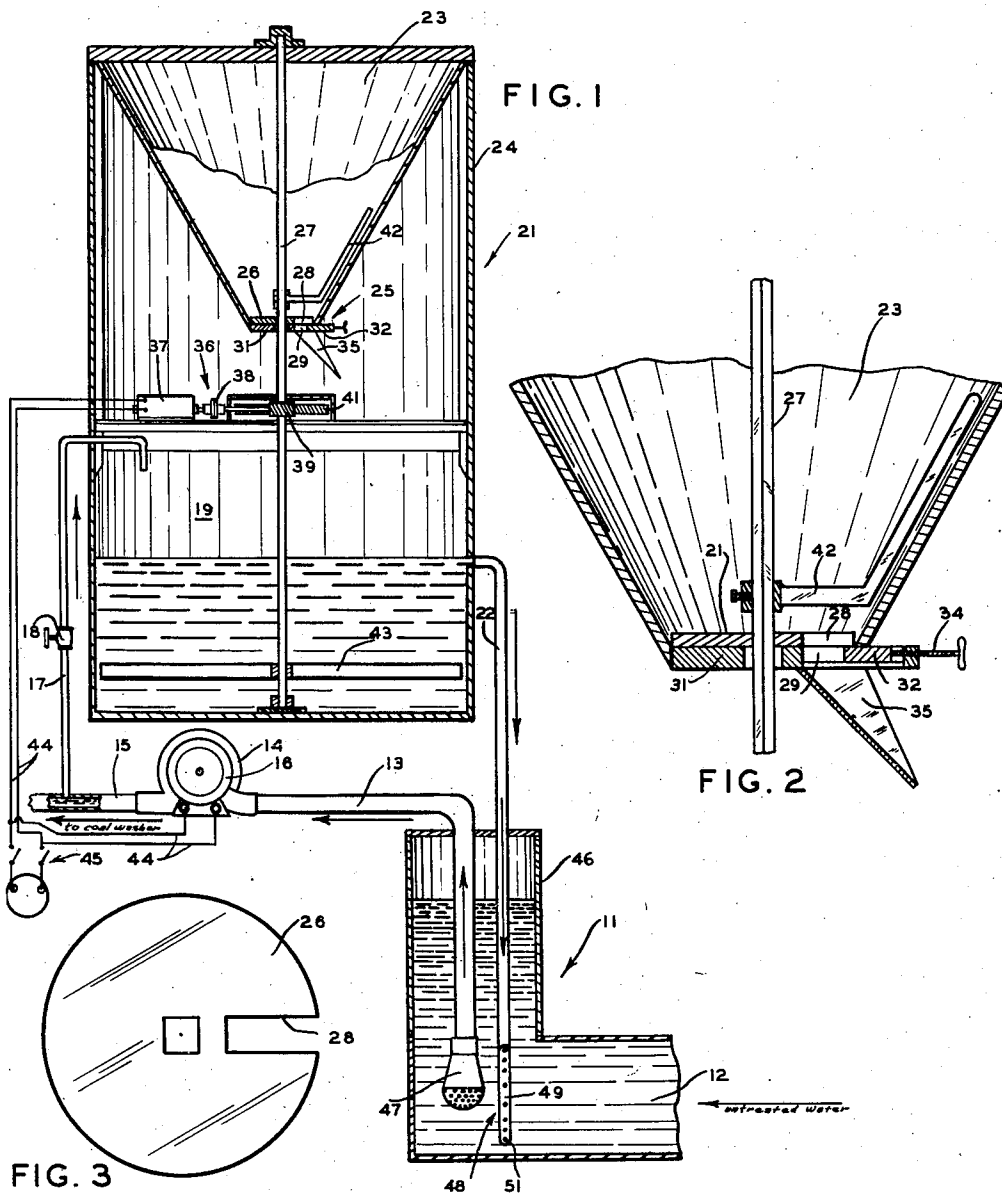


FIG. 3

FIG. 4

INVENTOR
JAMES E. LINN

BY *John H. Cassidy*
ATTORNEY

April 11, 1950

J. E. LINN

2,503,878

ACID WATER NEUTRALIZER

Filed July 22, 1946

2 Sheets-Sheet 2

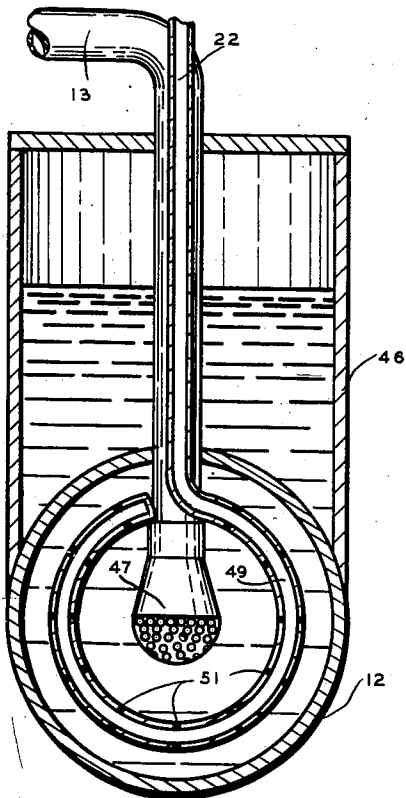


FIG. 6

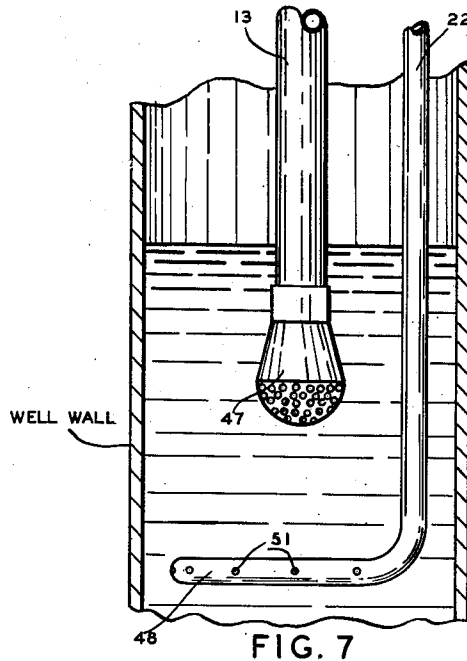


FIG. 7

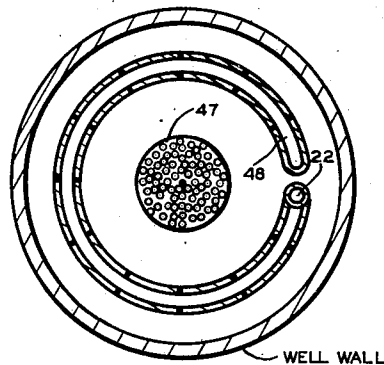


FIG. 8

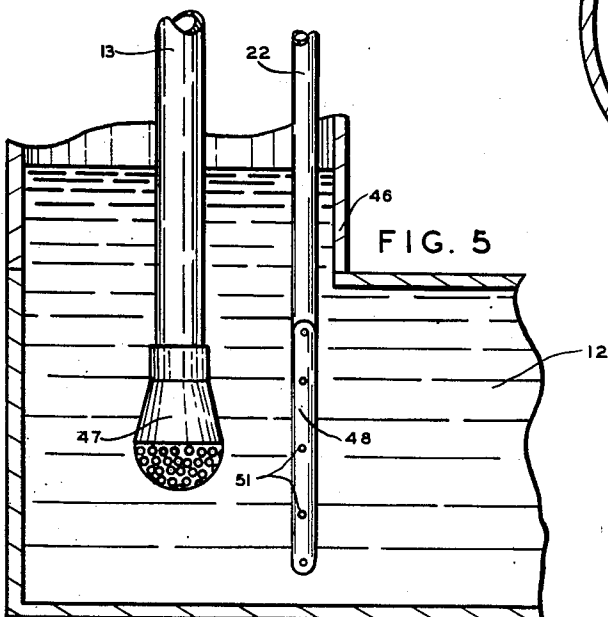


FIG. 5

INVENTOR
JAMES E. LINN

BY *John H. Cassidy*

ATTORNEY

UNITED STATES PATENT OFFICE

2,503,878

ACID WATER NEUTRALIZER

James E. Linn, Stephens, Mo., assignor of one-half to Walter E. Marriott, Columbia, Mo.

Application July 22, 1946, Serial No. 685,295

2 Claims. (Cl. 210-18)

1

This invention relates to apparatus and method for treating water.

A troublesome problem has confronted the coal industry in many sections of the country in connection with the water which is used for washing and processing the coal. In many cases the available source of water is contaminated by sulphur compounds which are, or form, acids, and the water is highly corrosive to the pumping system as well as to washing and processing equipment. The damage extends even to customers storage bins and coal feeding equipment. So far as applicant is aware, this problem has not been solved heretofore, nor has any solution been proposed that completely protects the entire system from the corrosion, or one whose installation and use is economically sound.

The direct and primary object of the invention is to solve this problem by providing means for neutralizing acid water prior to its entry into a water system for preventing corrosive damage in the entire system, which will be simple in construction, easy to maintain and use, and economical in operation.

It is also an object of the invention to provide apparatus for mixing a water treating substance into solution, the strength of which may be controlled as desired.

A further object of the invention is to provide apparatus for treating water prior to its entry into a given system which apparatus is automatically placed in operation upon initiating the operation of the system's pump, or pumps.

Other objects and advantages will become apparent as the description proceeds and a more comprehensive understanding of the invention will be afforded from the following detailed description when considered in conjunction with the accompanying drawings, in which

Fig. 1 is a diagrammatic view of a water system embodying the instant invention in its preferred form,

Fig. 2 is a fragmentary view showing a mechanism for feeding measured quantities of a water treating substance into the system illustrated in Fig. 1,

Figs. 3 and 4 are plan views of a rotating disk and an adjustable apertured, fixed disk, respectively, employed in a feeding mechanism shown in Fig. 2,

Figs. 5 and 6 are front and side elevational views, respectively, of a sump for the system illustrated in Fig. 1, and

Figs. 7 and 8 are an elevational and a bottom plan view, respectively, of a modified form of the

2

sump illustrated in Figs. 5 and 6, which is adaptable to well sources of untreated water.

In the particular embodiment of the invention illustrated in Fig. 1, a water system comprising a sump generally designated 11 is shown which receives untreated water from a source, such as a pond or the like, through an inlet orifice 12. Connecting with the sump 11 by means of a pipe 13 is a motor driven pump 14 which withdraws water from the source for delivery to an outlet pipe 15. The pump 14 is driven by a motor 16 whose electrical connections are made in a manner later to be described. Connected into the outlet pipe 15, and ahead of the pump 14, is a pipe 17 which transfers water from the pump 14 through a manually operated valve 18 into a reservoir 19 forming a part of a water treating mechanism generally designated 21.

From the reservoir 19 treated water is conveyed by gravity through a pipe 22 to the sump 11. The treated water receives a treating agent which is stored in a hopper 23 supported above the reservoir 19 in a closed housing 24. Measured quantities of a water treating agent are fed through a feeding mechanism 25 located in the bottom of the hopper. This latter mechanism comprises a revolving disk 26 which is keyed to a shaft 27. The disk 26 has a radial slot 28 cut therein which at fixed intervals cooperates with an aperture 29 cut into a fixed disk 31 closing the bottom of the hopper 23. A movable block 32 is arranged to slide in keyways 33 channelled in the face of the aperture 29 and is adjustable therein by means of a thumb screw 34 to vary the effective area of this aperture. A spout 35 is attached to the bottom of the fixed disk 31 in alignment with the aperture 29 and feeds a dry water treating ingredient outwardly over a mechanism 36 for driving the shaft 27, from which point the ingredient falls by gravity into the reservoir 19.

The shaft driving mechanism 36 comprises a motor 37 which is connected by means of a shaft and a coupling 38 to a worm gear 39. The latter engages with a gear 41 which is splined to the shaft 27. Within the hopper 23 an agitating arm 42 is connected with the shaft 27 and is arranged to rotate therewith to prevent the clogging of the feeding mechanism 25. Also attached to the shaft 27 is a paddle 43 which revolves within the reservoir 19 to insure a thorough mixing of the water treating ingredient in solution.

The driving motor 37 and the pump motor 16 are supplied current from a suitable source

3

through the leads 44 and a switch 45, which latter device controls both motors. Operation of the water treating mechanism 21 is thereby automatically effected when operation of the water system is started by placing the motor 16 across

the line. When the untreated water is taken from a source such as a pond, the sump 11 may be constructed with an outer housing 46 of vitrified clay or the like. Within the housing 46 a sump strainer 47 is attached to the pipe 13 and forms the inlet opening for the water entering the system. Extending downwardly in the sump housing 46 is an outlet 48 for the treated water transferred from the reservoir 19. This outlet takes the form of a ring section 49; or extension, of the pipe 22 which is drilled with a series of holes 51 permitting complete diffusion of the treated water within an extension of the inlet orifice 12. With this arrangement of the parts, untreated water is present in the vitrified clay housing only up to a point in proximity with the treated water outlet 48. From this point, all of the water surrounding the submerged portions of the pipes 13 and 22, the sump strainer 47, and the outlet 48 is treated water and the external surfaces of these elements are therefore not subject to the harmful effects of the untreated water coming from the source.

In Figs. 7 and 8 a modified form of the sump 11 is illustrated for use in connection with a system supplied untreated water from a source, such as a well. Here, the pipe 13 and the sump strainer 47 extend into the well in a manner such that the outlet orifice 48 for the treated water from the reservoir 19 is positioned to lie parallel to the surface of the water at a distance below the sump strainer 47. Also, the tile casing is not used, but in all other respects the sump is the same and has the same action as described for that illustrated in Figs. 6 and 7, that is, the untreated water is prevented from coming into contact with any portion of the water pumping system. In most installations this sump will be located below the well casing and accordingly the casing will be protected, too. This will provide an additional saving, since the well casing will not have to be replaced at frequent intervals.

The above described apparatus and method is particularly useful in its adaptation to equipment for washing coal wherein a serious problem of suitable water supply has long been present. Since coal washing plants are most economically located at the mines and since the washing operation requires large quantities of water, an adequate supply of treated water is not usually available. Most often the water supply has to be taken from ponds or lakes whose basins are formed naturally or by a mining operation, such as strip mining. Quite frequently, then, the beds of such ponds or lakes are found in land having a high sulphur content and the water contained in them is therefore highly acidic. Although the coal may be washed with this acid water, if it is used untreated the entire water pumping system has to be replaced frequently at large costs. Moreover, the washed coal retains a large quantity of the acid which is destructive to the coal handling equipment at the mine and at its point of use. Even if the water is treated before the coal is washed the pumping system up to the water treating plant has necessarily had to be replaced at frequent intervals in the prior art systems. With the instant invention in use, however, all of these disadvantages are overcome,

4

since the acid water is neutralized before it enters any part of the pumping system.

In this application of the invention, the hopper 23 is charged with hydrated lime and the feeding mechanism 25 is adjusted by means of the thumb screw 34 to discharge a required amount of lime into the reservoir 19. Also the amount of water entering the reservoir is determined primarily by adjusting the valve 18 to deliver the required amount of the treating solution to the outlet 48.

The cost of treating the water with the present apparatus and method is small and constitutes a minute percentage of the amount which is saved.

It is also to be pointed out that in this particular embodiment, as illustrated in Fig. 1, water for the treating solution is taken ahead of the pump 14. Thus, provision is made for feeding the contents of the reservoir 19 to the outlet 48 in direct ratio to the amount of water withdrawn from the source by the pump 14. If, for any reason, the output of this pump is varied, the amount of water flowing into the reservoir through the valve 18 will be altered accordingly and a corresponding change in the head effective on the outlet orifice of the reservoir will result. Such a change in the head will vary the flow of the water treating solution to the outlet 48, which flow will be in direct proportion to the water drawn through the sump strainer 47.

The importance of this feature of the invention is pronounced since variation in the effective head of the source water, changes in the speed of the pump motor, variations in back pressure on the pump, etc., are automatically provided for insofar as the amount of treating solution delivered to the source is concerned.

Various changes, if within the scope of the appended claims, may be made in the details of construction without departing from the spirit of this invention. Parts of the invention may be used without the whole and improvements may be added while retaining some or all of the advantages of the invention.

I. claim:

1. In a water system having a sump from which water is withdrawn, a pump, a suction line between the pump and the sump, and a discharge line from the pump, apparatus for supplying an agent for neutralizing acid water flowing to said sump comprising a reservoir, feeding mechanism for supplying continuously and repeatedly measured quantities of hydrated lime to said reservoir, a water line connected between said discharge line and reservoir whereby a continuous flow of water to the reservoir is maintained in accordance with the operation of the pump, an overflow conduit connected to the reservoir and discharging in the sump, whereby a continuous flow of water and lime from the reservoir to the sump is maintained when the pump is in operation.

2. In a water system having a sump from which water is withdrawn, a pump, a motor for driving the pump, a suction line between the pump and the sump and a discharge line from the pump, apparatus for supplying an agent for neutralizing acid water flowing to said sump comprising a reservoir, feeding mechanism for supplying continuously and repeatedly measured quantities of hydrated lime to said reservoir, an agitator in the reservoir, a motor connected to drive said lime supplying means and said agitator, a water line connected between said discharge line and said reservoir whereby a continuous flow of water

5

is maintained in accordance with the operation of the pump, an overflow conduit connected to the reservoir and discharging in the sump, a circuit arranged and connected to supply electric current to both of said motors, and a switch for opening and closing said circuit, whereby a continuous flow of lime water from the reservoir to the sump is maintained when the pump is in operation.

JAMES E. LINN.

REFERENCES CITED

The following references are of record in the file of this patent:

Number
Re. 18,510
1,716,205
2,081,794
2,099,836
2,296,713

Number
578,035
586,629
658,489

6

UNITED STATES PATENTS

Name	Date
Green -----	July 5, 1932
Bucher -----	June 4, 1929
Echagaray -----	May 25, 1937
Blanchard et al.	Nov. 23, 1937
Hinsch -----	Sept. 22, 1942

FOREIGN PATENTS

Country	Date
France -----	June 20, 1924
France -----	Jan. 9, 1925
France -----	Jan. 25, 1929