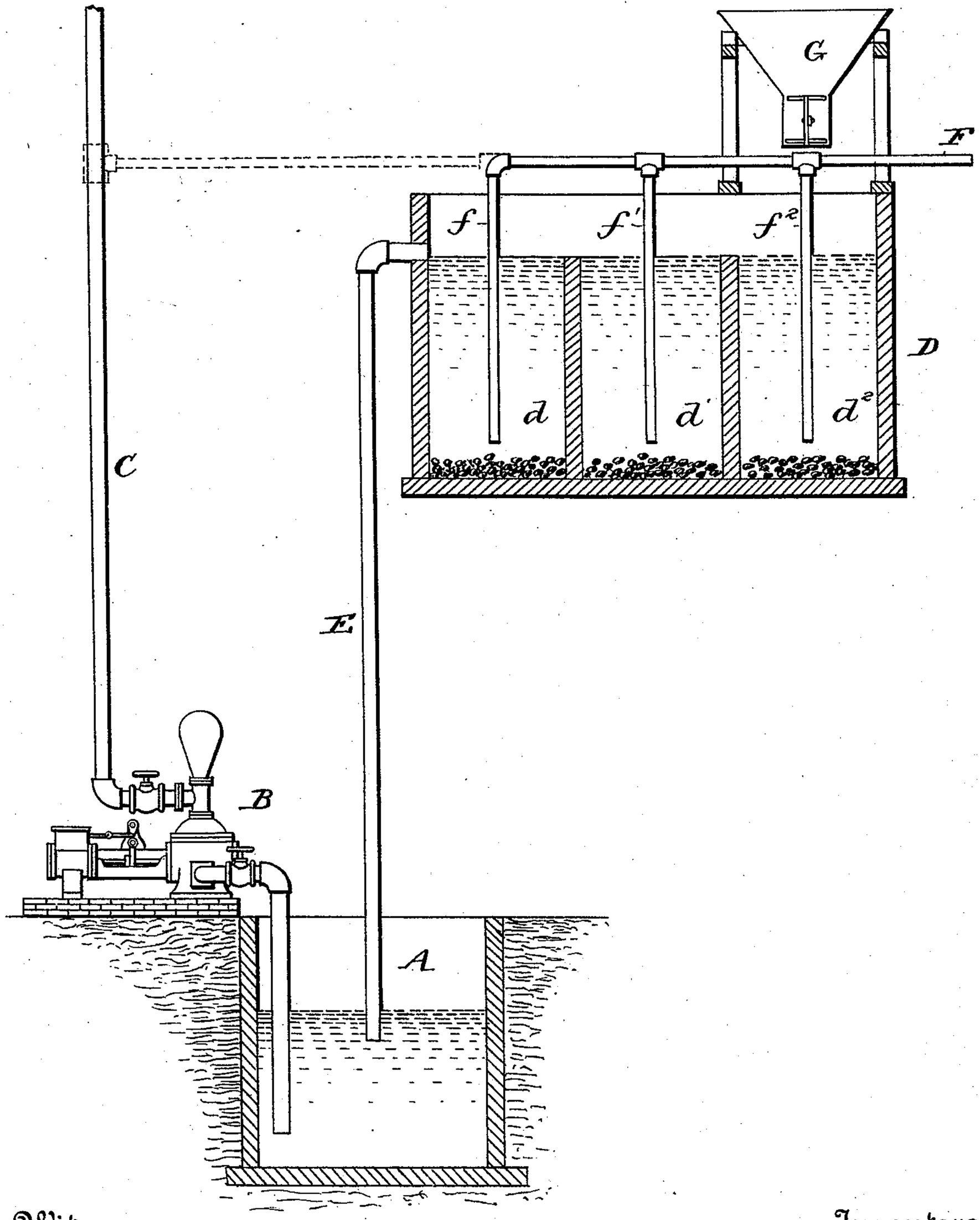
(No Model.)

C. W. GOODALE & H. W. HIXON.

APPARATUS FOR TREATING MINE WATERS.

No. 567,312. Patented Sept. 8, 1896.



Witnesses
J. J. Hinkel
J. A. Fairgrieve

Inventors.
Charles W. Goodale
by Hiram W. Hixon
Foster Freeman
Attorneys

UNITED STATES PATENT OFFICE.

CHARLES WARREN GOODALE, OF BUTTE, AND HIRAM W. HIXON, OF ANACONDA, MONTANA.

APPARATUS FOR TREATING MINE-WATERS.

SPECIFICATION forming part of Letters Patent No. 567,312, dated September 8, 1896.

Application filed December 8, 1894. Serial No. 531,270. (No model.)

To all whom it may concern:

Be it known that we, CHARLES WARREN GOODALE, residing at Butte city, Silverbow county, and HIRAM W. HIXON, residing at Anaconda, Deerlodge county, Montana, citizens of the United States, have invented certain new and useful Improvements in Apparatus for Treating Mine-Waters, of which the following is a specification.

The object of our invention is to neutralize the acids contained in certain mine-waters, thereby preventing such waters acting deleteriously upon metallic vessels, pipes, or pumps through which they pass, and at the same time to precipitate and save the mineral contained in the waters which have acid and cause the deleterious effects on the metal; and our invention consists in the various features substantially as hereinafter more particularly set forth.

In the operation of mines, and especially in copper mines, the mine-waters are more or less impregnated with minerals, which are more or less corrosive in their nature, such, for instance, as the sulfate of copper, and, as is well known, it is common to collect these mine waters in a vat, sump, or other receptacle, and to discharge the waters from the mine through metallic pipes by the aid of pumps, which, of course, are metallic, and these mineral waters have a corrosive and deleterious effect upon the pipes, pumps, and vessels when used, quickly destroying them, which involves great expense in maintenance. Moreover, many of these waters contain a considerable quantity of mineral, as copper, which is usually pumped out of the mine in solution in these waters and thereby lost or wasted.

It is the object of our invention to provide a simple, cheap, and effective means whereby this deleterious action of the mine-waters may be obviated, and at the same time the minerals contained therein may be saved and utilized, and we will now describe our invention as applied in copper mines, especially where the mine-waters are impregnated to a considerable degree with sulfate of copper in solution or other minerals.

Various means of carrying out our invention may be utilized and will be readily understood from what is set forth hereinafter, and the mechanism illustrated in the accompanying drawing is typical only, and may be varied in construction and arrangement to suit the requirements of any particular case, but it will be sufficient to enable those skilled in the art to understand the principles of our invention and utilize the same when desired.

The drawing annexed hereto represents diagrammatically one arrangement of devices which we have found satisfactory.

In the drawing, A represents a vat, reservoir, sump, or similar receptacle, preferably located in the lowest part of the mine, to receive the mine-waters from the different levels, and B represents a pump, connected with the reservoir and feeding into a pipe C, which extends to the mouth of the mine and discharges the mine-waters free therefrom.

Arranged in a convenient position with relation to the reservoir A is a tank D, (shown in the present instance as having three compartments d d' d^2,) and provided with a discharge-pipe E, delivering into the reservoir A.

F is a pipe or similar means for conveying water to the tank, in the present instance having three discharge-orifices f f' f^2, preferably extending at or near the bottom of the tank, as indicated.

G represents the feeding device connected with the tank, and this feeding device may be of any usual and well-known construction, and is adapted to supply the tank with material hereinafter specified at regular intervals or otherwise, and it can be operated manually or mechanically in connection with the operation of the pump, or in any other convenient manner.

The pipe F may receive its water from some particular level in the mine, or from any other source; as, for instance, as indicated in dotted lines, it may be connected with the main delivery-pipe C.

With this general description of one structural embodiment and arrangement of parts, we will now describe how our invention is carried out.

As before stated, the mine-waters are more or less impregnated with sulfate of copper, which corrodes or acts deleteriously upon the pump, pipes, vat, and reservoir, when used,

and in order to neutralize this corrosive action and at the same time save the copper contained in the waters, we make use of what is known as milk or cream of lime, which is mixed with the waters and acts to neutralize the same, precipitating the copper. In order to produce this milk or cream of lime, burnt limestone, or calcined lime, is thrown into the tank D at intervals in sufficient quantities, and in the present instance by operating the hoppers to deliver the requisite quantity at proper intervals, and the water through the pipe F, coming in contact with the calcined lime, produces the milk or cream of lime, which, flowing through the discharge E into the reservoir A, will unite with the sulfuric acid of the sulfate of copper contained in the waters, and will separate and precipitate the copper in the nature of a mixture of cupric hydrate and calcium sulfate having a bright-green color. This not only saves and utilizes the sulfate of copper in solution in the mine-waters, but neutralizes the acid in the waters and renders them harmless in their passage through the pumps and pipes to the mouth of the mine, so that a given plant which is relatively very expensive will last very much longer, not being corroded by the waters, and at the same time the copper contained in solution in the waters is saved for a useful purpose.

From the above description the principles of our invention will be readily understood by those skilled in the art, and the details of construction and arrangement for carrying out the same may be varied to suit the requirements of any particular case without departing from the spirit of our invention.

What we claim is—

The combination with a sump located a suitable depth within a mine and collecting the waters from different levels of the mine, of a tank having a feed-pipe delivering into said sump, a feeder for said tank, a pump connected with the sump and provided with a discharge leading to the top of the mine, and a pipe leading from said discharge and delivering water to the tank, substantially as shown and for the purpose described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

CHARLES WARREN GOODALE.
HIRAM W. HIXON.

Witnesses:
J. B. WELBORNE,
H. L. MAURY.