

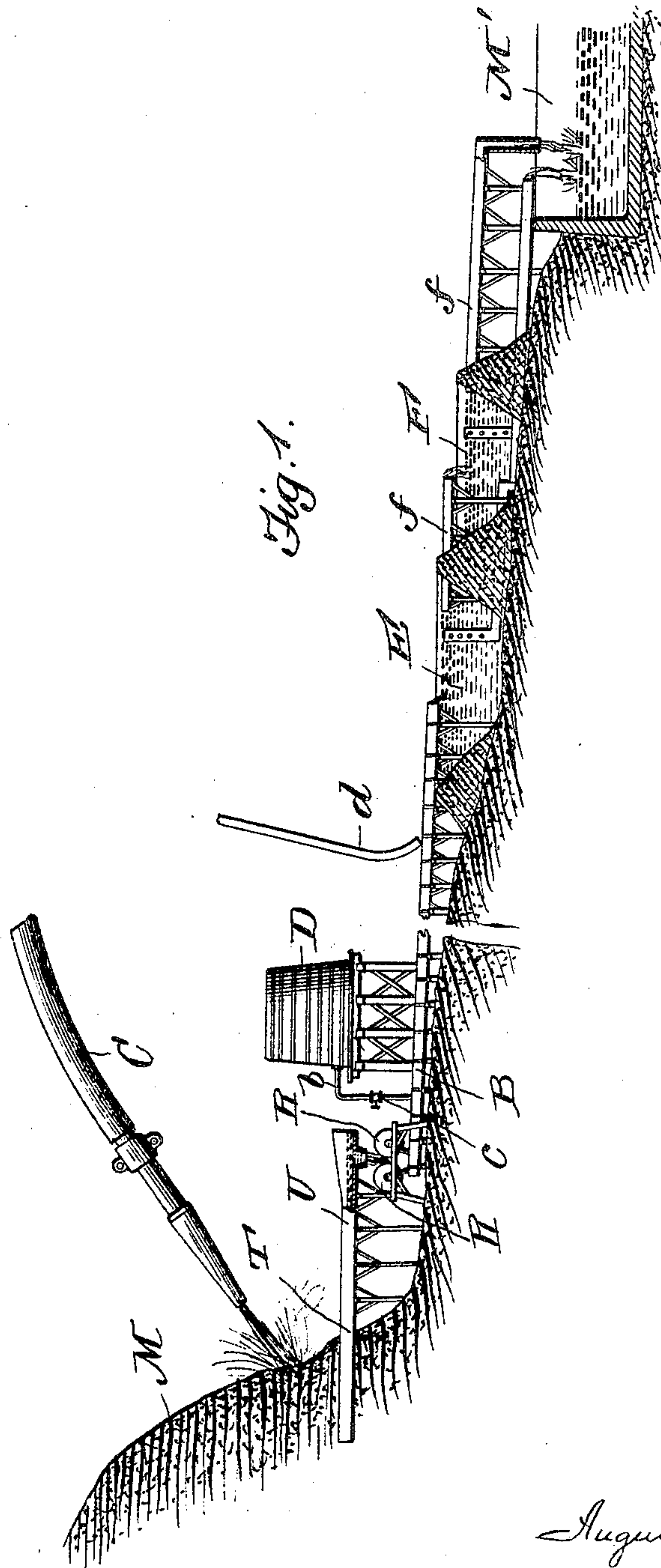
No. 822,398.

PATENTED JUNE 5, 1906.

A. SODERLING.
APPARATUS FOR TREATMENT OF ORES AND TAILINGS.

APPLICATION FILED JULY 13, 1905.

3 SHEETS—SHEET 1.



Witnesses

R. A. Boswell,
George M. Anderson.

Inventor

August Soderling

By

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his

Attorney

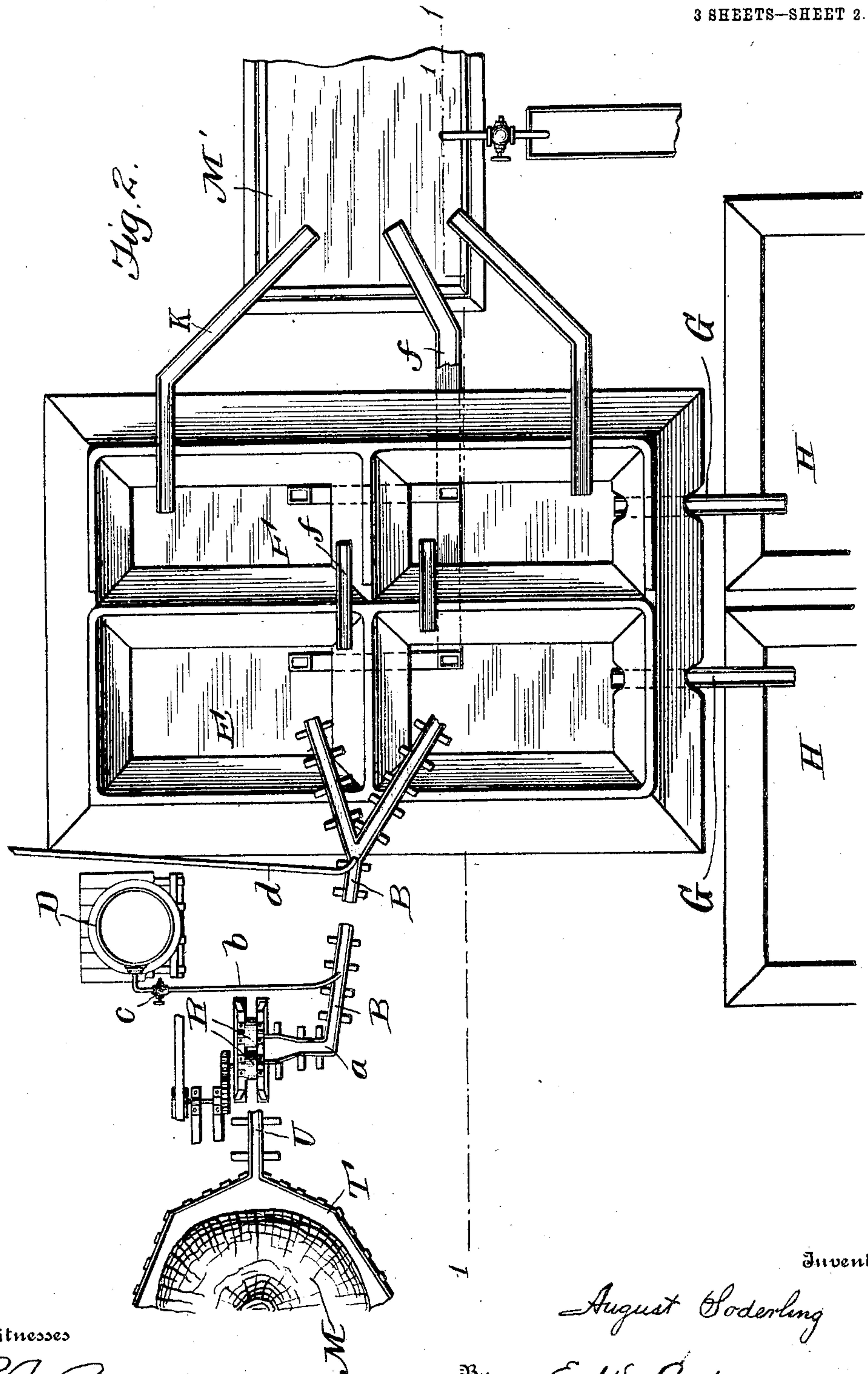
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3 SHEETS—SHEET 3.

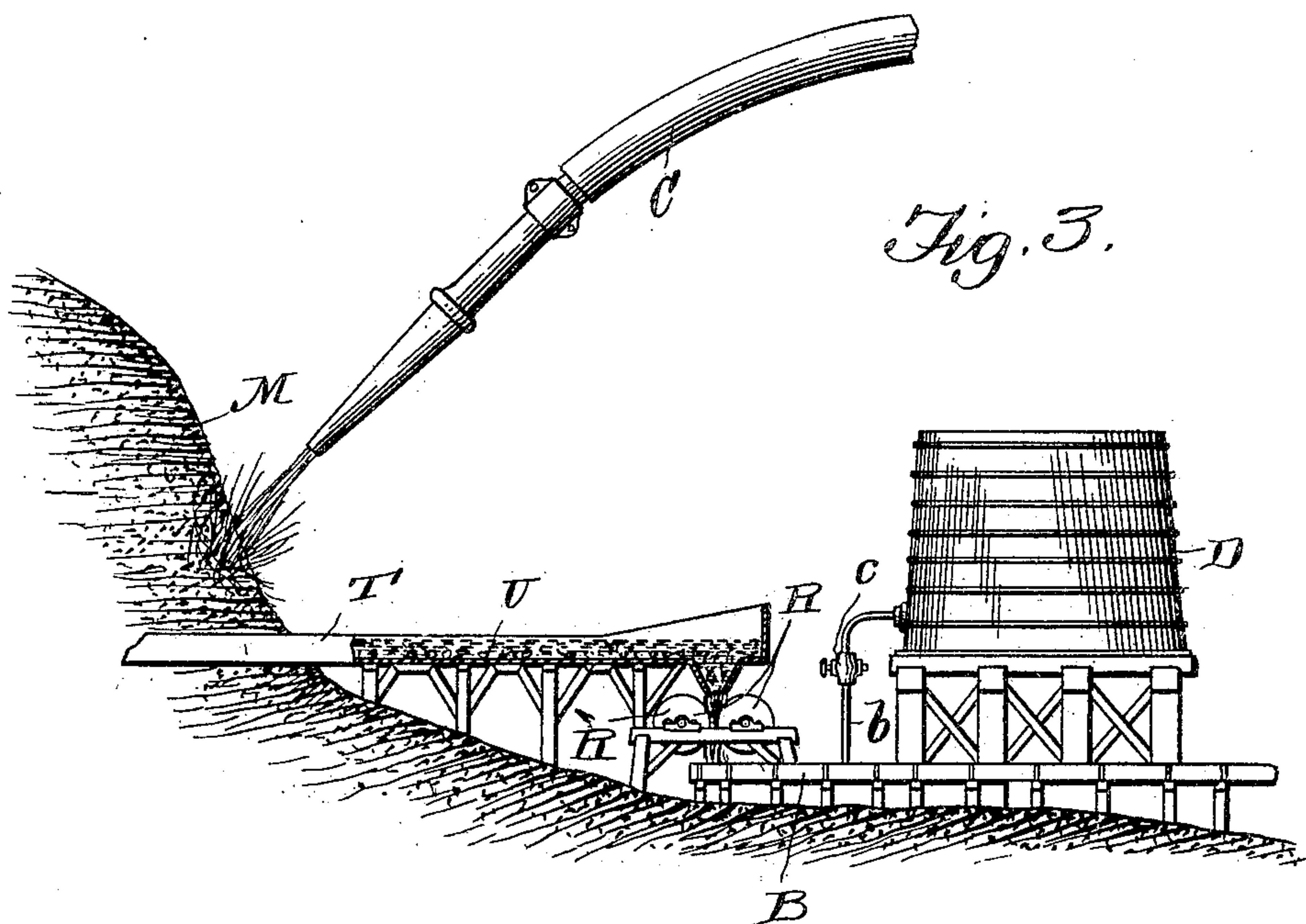


Fig. 4.

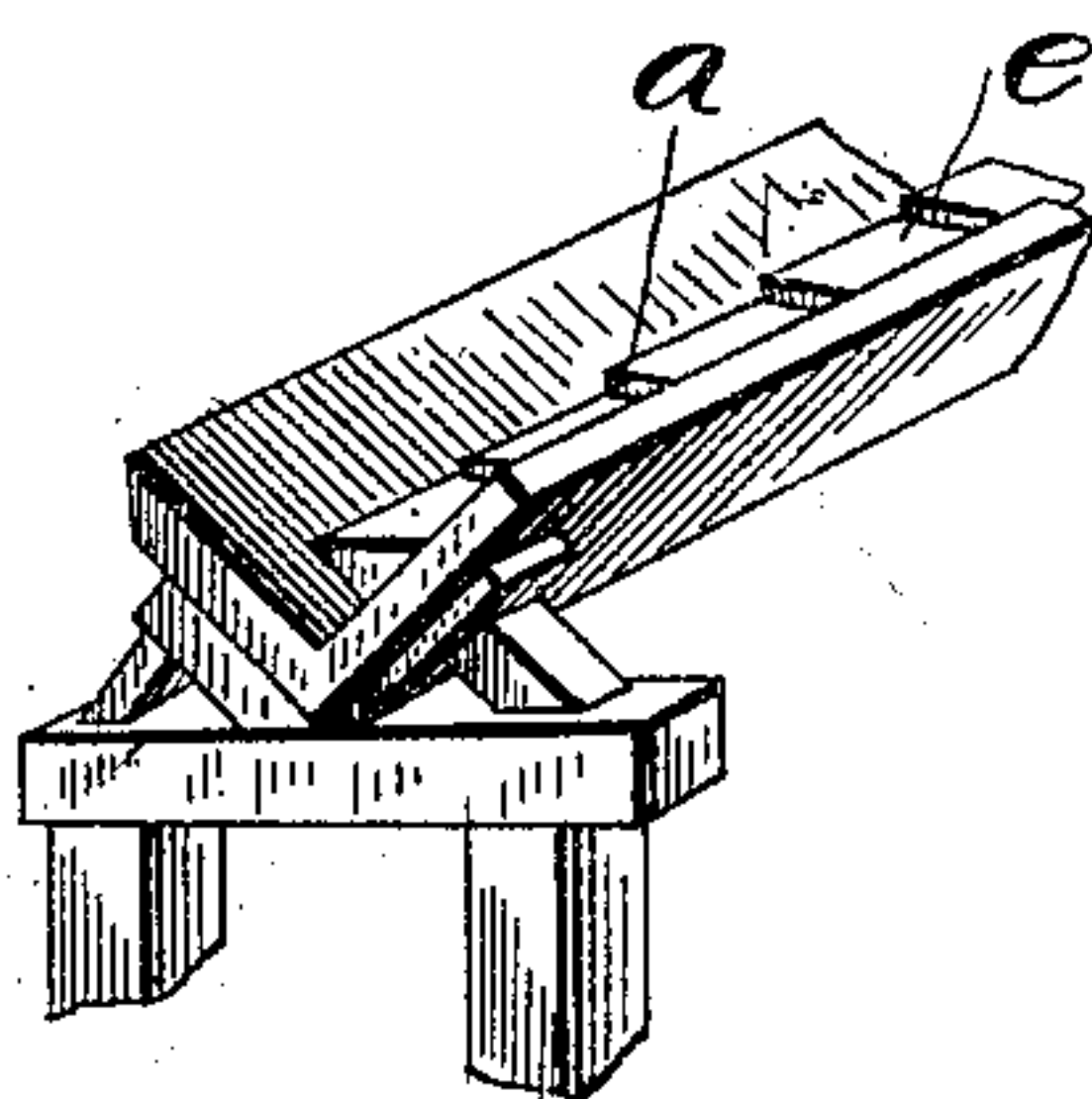
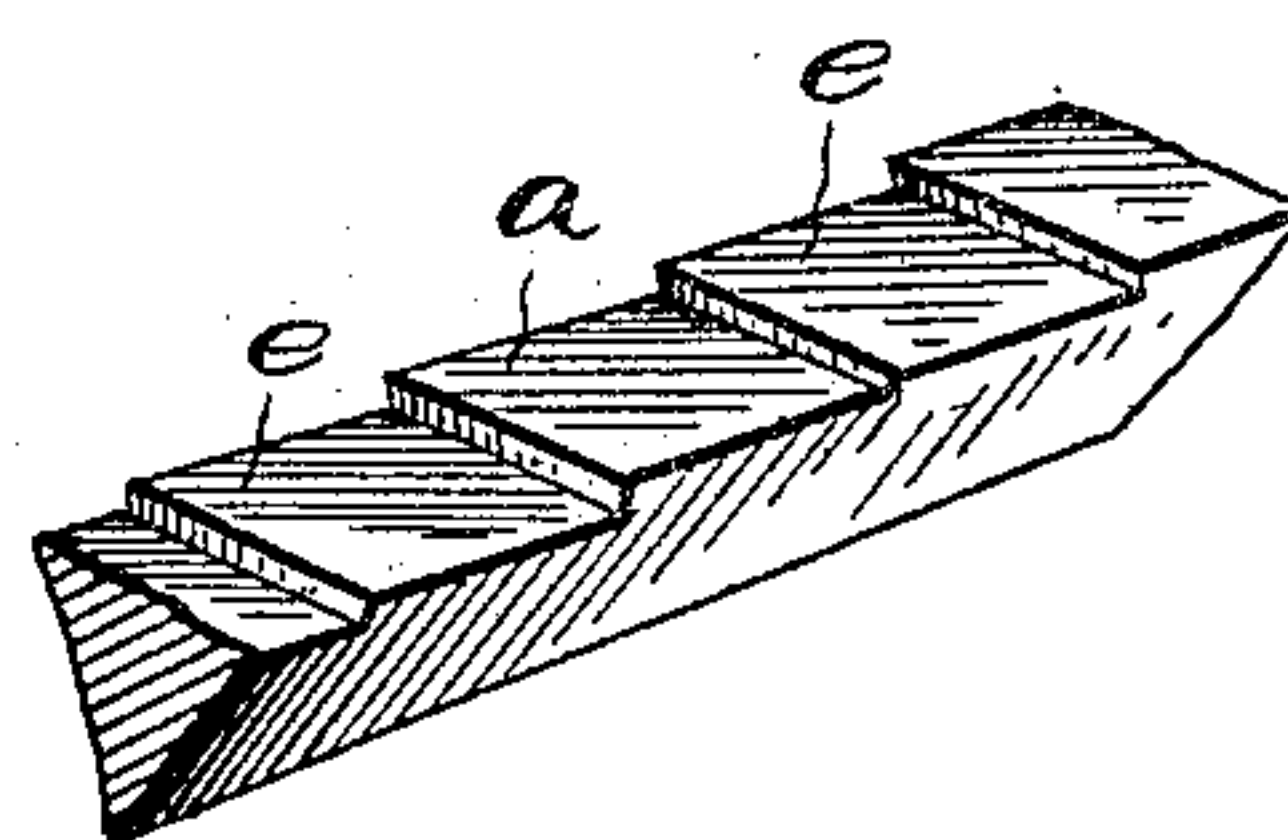


Fig. 5.



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UNITED STATES PATENT OFFICE.

AUGUST SODERLING, OF BODIE, CALIFORNIA.

APPARATUS FOR TREATMENT OF ORES AND TAILINGS.

No. 822,398.

Specification of Letters Patent.

Patented June 5, 1906.

Application filed July 13, 1905. Serial No. 269,459.

To all whom it may concern:

Be it known that I, AUGUST SODERLING, a citizen of the United States, and a resident of Bodie, in the county of Mono and State of California, have made a certain new and useful Invention in the Treatment of Ores and Tailings; and I declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it appertains to make and use the invention, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

Figure 1 is a section on the line 1 1, Fig. 2. Fig. 2 is a plan view, partly diagrammatic and partly broken away, of my apparatus. Fig. 3 is a view, on a larger scale, of a section of the apparatus. Figs. 4 and 5 are detail perspective views of the sluice-trough and its riffles.

The invention relates to the treatment of tailings or slimes of the precious metals in connection with the cyaniding process; and it consists in certain improvements upon the invention described in Letters Patent No. 636,114, dated October 31, 1899, as herein-after set forth.

In cases where tailings are very slimy or contain copper or other base metals in various combinations which it is desirable to remove a weak solution of nitric, sulfuric, hydrochloric, or other mineral acid may be employed, as described in the Letters Patent referred to, or weak solution of certain salts, such as potassic chromate or any nitrate or chlorite or crude salts from alkaline plains, which would act as solvents in the separation of the base metals referred to; or dilute solutions of organic acids, particularly oxalic acid, tartaric acid, or acetic acid, or of their salts, may be used to act as solvents for the rebellious slimes or slimy tailings which otherwise would prove refractory in the subsequent cyaniding process. In this leaching process in order to effect an intimate mixture of the particles of the tailings and the chemical solution necessary to proper economic results agitation of the mixture is required, which is provided for by means of steps or riffles in the bottom of the trough or conveyor whereby the mixture is conducted to the settling-reservoirs. The agitation occasioned by the falling of the mixture from one step or riffle of the trough to another during a course of a mile or several miles has been

found sufficient for the purpose when the riffles or steps are each about eighteen inches in length. This plan of agitation by gravity is particularly adapted to this preliminary treatment because of its economic character. After agitation with the dilute solution and before cyaniding an alkaline wash or leaching may be used when required.

In the accompanying drawings, illustrating a plant for carrying out this preliminary treatment upon a large scale, the letter M indicates the pile of tailings to be reduced. Around the base of the pile is constructed a ledge trough T, the inner edge of which is in contact with the pile and the outer portion of which is walled and communicates with a trough U, leading to a set of crushing or pulverizing rolls R.

A stream of water conveyed through a pipe C or otherwise is caused to play upon the pile of tailings, which are thereby washed down into the circumscribing trough T and through the trough U to the crushing-rolls, whereby the tailings are pulverized and discharged into the inclined sluice-trough B, which is designed to extend for a long distance, according to the character of the work. This distance may vary from a fraction of a mile to several miles. This trough is provided with a riffle-bottom *a* and is designed to effect an agitation by gravity of the mixture flowing along its bottom.

At the upper level, where the pile of tailings is located and near the crushing-rolls, is placed a tank D, which contains a solution of acid or of acid salts, as hereinbefore mentioned. From this tank a pipe *b* conveys the weak acid solution to the head of the trough B, where it enters the mixture of particles of tailings and water from the crushing-rolls and is conveyed with such mixture, with which it becomes intimately mixed, to the settling-reservoirs at the lower level. The pipe *b* is provided with a valve *c* to regulate the flow of the acid solution. In order still further to dilute this solution, near the end of the sluice-trough or at a point of branching there is provided a water-supply pipe *d*, which conveys water to the mixture in the trough.

The sluice-trough B is preferably made V form in cross-section and is designed to be without joint or crevice between its walls. To that end the sections are cut entire from a log in such wise that several sections can be cut from the same log. In the sections are

placed the movable angular bottom pieces *a*, having a stepped or riffle surface *e*. The length of each step of the riffle-surface is designed to be usually about eighteen inches and the rise from step to step about two inches, more or less.

The sluice-trough B may be caused to branch at points where the diluting-water pipes discharge in order to carry the mixture easily. These troughs finally discharge into the first reservoir or reservoirs E, which are designed for the purpose of settling the "sands" or particles of the tailings from the slimes or lighter mixture which is conveyed over by the overflow troughs or pipes *f* to the settling reservoir or reservoirs for such slimes, (indicated at F.)

All the water, acid slimes, tailings, and other matter brought down by the sluice-trough are collected in the reservoirs E and F, where the copper and other base-metal salts dissolved in the water being by this time, through the agitation effected in the sluice-troughs, fully separated and in solution are decanted off through the overflow-conductors *f* into a tank or reservoir M, in which the last traces of the slimes are settled from the base liquids, which are decanted and run through a series of wooden troughs K, containing iron-scrap, on which the metallic copper will be deposited and saved as a precipitate, and other chemical compounds of value may also be saved by proper appliances.

The sands and slimes settled in reservoirs E and F are sluiced by the hydraulic stream through the bottom conductors or sluices G into final reservoirs H, wherein the preliminary treatment is concluded, and the sands and slimes are dried and cultivated and made ready for cyanid treatment. In this manner it will be seen that the tailings and slimes are first pulverized and thoroughly mixed by rolls, then mixed with a solution of acids or acid salts in proper amount to provide for solution of the base contents of the same, then agitating the mixture by running it through sluices or conductors for a considerable distance into settling-reservoirs and freeing the same from base solutions, whereby they are left in condition to be successfully treated by the cyanid process. Large bodies of tailings and slimes can thus be treated and prepared in an economical manner on an extended scale, so that gold and silver can be extracted by the cyanid process cheaply and effectively.

The preliminary treatment described is designed to be effected at about one-eighth or one-tenth the cost of a preliminary treatment in a closed plant. The sands and slimes being settled for the main part in separate reservoirs facilitate special separate cyanid treatments, especially for the slimes. As the slimes and tailings are thoroughly oxidized in the preliminary treatment, the extraction of the precious metals by subsequent cyaniding is designed to reach a higher percentage than heretofore practicable. The riffles in the sluicing-troughs being removable they can be easily and conveniently cleaned of amalgam by lifting them out of the troughs and sweeping such amalgam material into quicksilver-troughs placed at intervals along the line of troughs. Through this preliminary treatment the zinc slime resulting from cyaniding is designed to yield about half the cost of consumption of potassium cyanid per ton of tailings worked in mercury by retorting the same before melting into reguluses and bullion bars.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. Apparatus for preliminary treatment of tailings and slimes, consisting of an inclined riffled trough or conductor having at its upper end a water-supply, and pulverizing-rolls, and a tank holding a weak solution of solvent acids or acid salts, a dilution-water conductor near the lower end of said trough, and at its lower end settling-reservoirs for sands and for slimes, final reservoirs for base-metal solutions and separate terminal reservoirs for the sands and for the slimes, substantially as specified.

2. Apparatus for the treatment of tailings and slimes preliminary to cyaniding consisting of an inclined riffle-bottom trough or conductor, at the upper end thereof a water-supply, pulverizing-rolls and a tank for a weak solution of solvent acids or acid salts, at the lower end thereof settling-reservoirs for sands and slimes, and an intermediate water-discharge near the settling-reservoirs, substantially as specified.

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

AUGUST SODERLING.

Witnesses:

N. H. GREGORY,
M. Y. S. KIRKWOOD.