

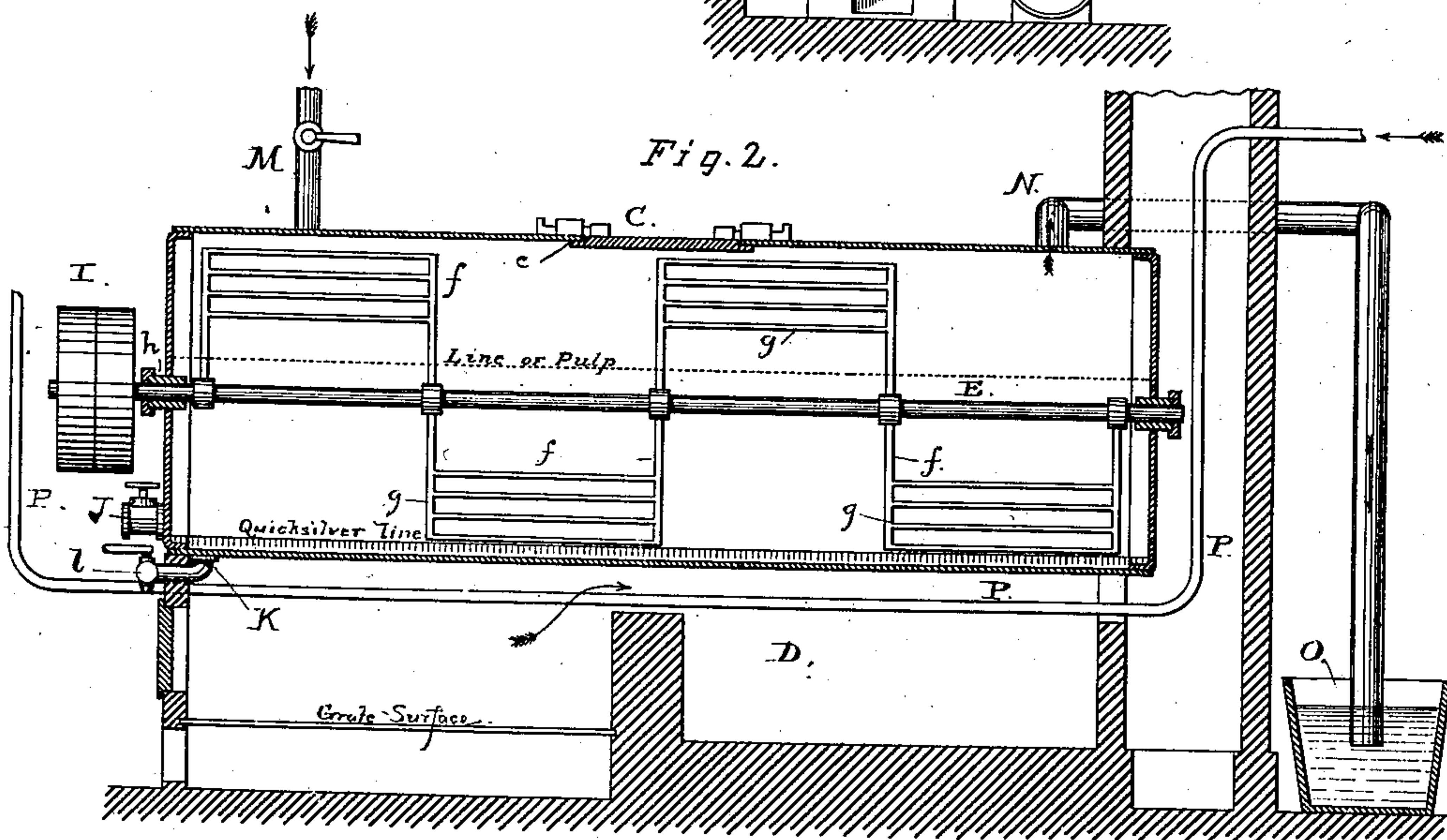
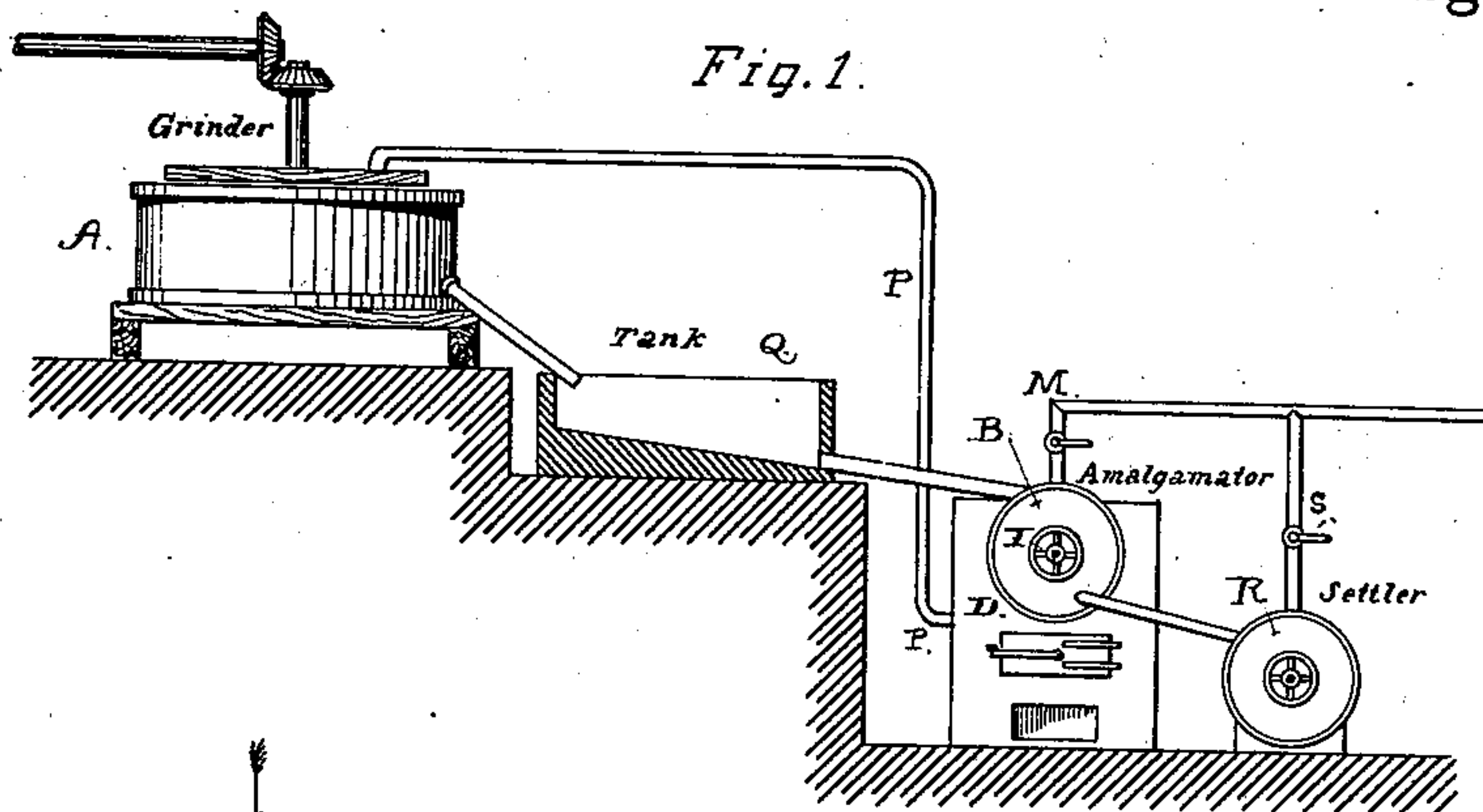
(No Model.)

C. H. DOW & W. H. CHANDLER.

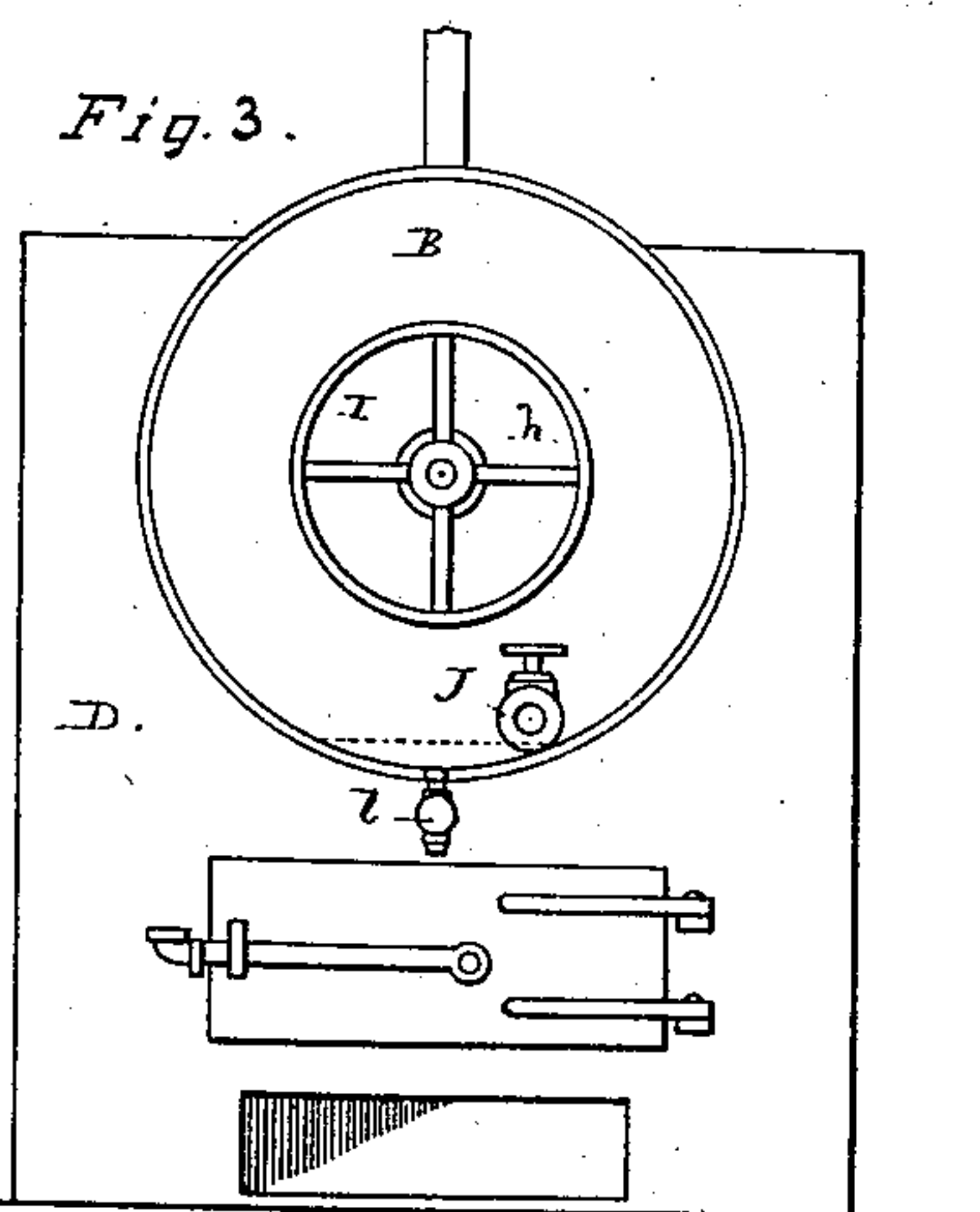
PROCESS OF GRINDING AND APPARATUS FOR AMALGAMATING ORES.

No. 282,863.

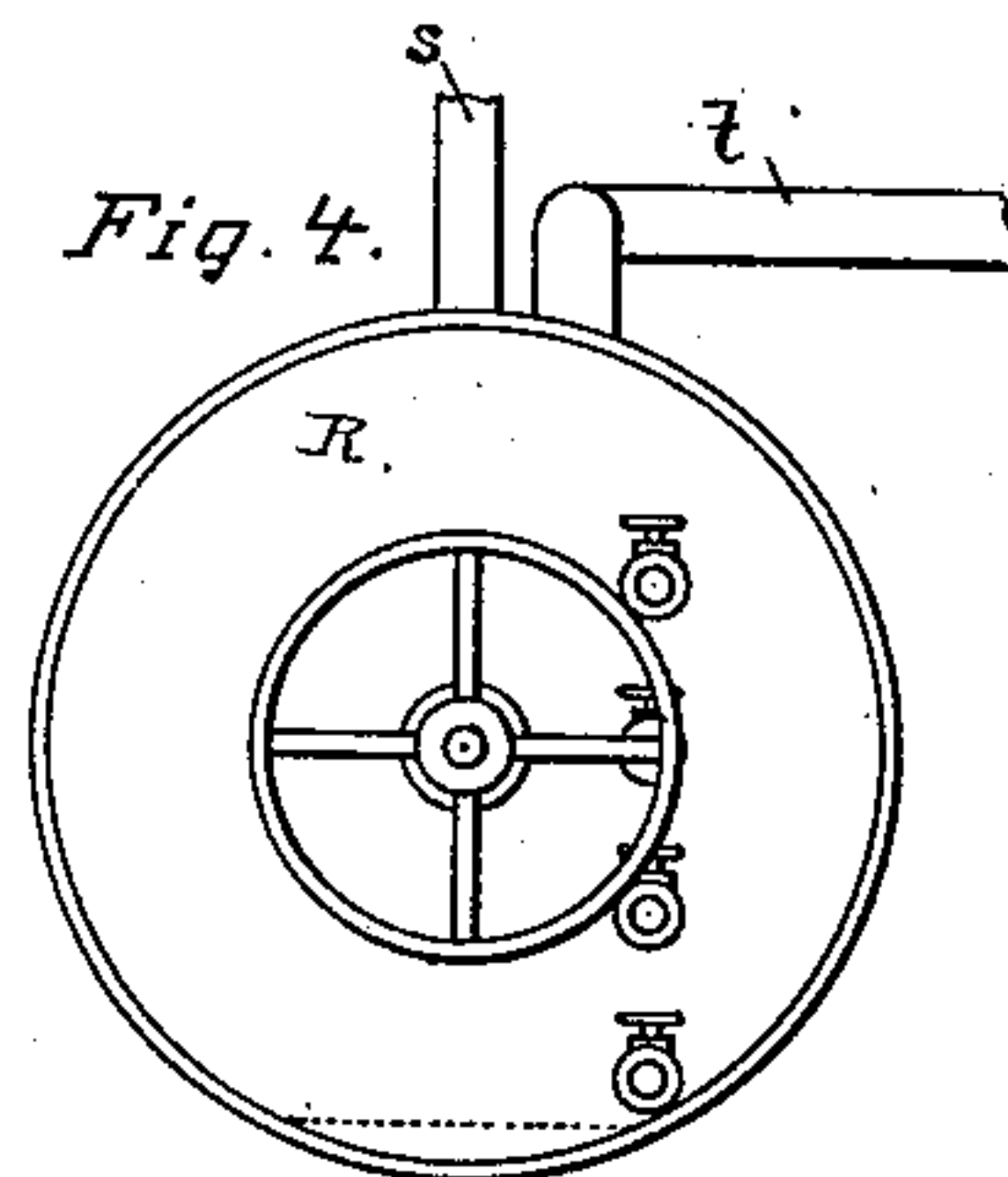
Patented Aug. 7, 1883.



*Fig. 3.*



*Fig. 4.*



Witnesses:  
J. S. Sells  
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Inventors:  
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# UNITED STATES PATENT OFFICE.

CHARLES H. DOW AND WILLIAM H. CHANDLER, OF VIRGINIA CITY, NEVADA,  
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## PROCESS OF GRINDING AND APPARATUS FOR AMALGAMATING ORES-

SPECIFICATION forming part of Letters Patent No. 282,863, dated August 7, 1883.

Application filed January 19, 1882. (No model.)

*To all whom it may concern:*

Be it known that we, CHARLES H. DOW and WILLIAM H. CHANDLER, of Virginia City, in the county of Storey and State of Nevada, have invented an Improved Process of Grinding and Apparatus for Amalgamating Ores; and we do hereby declare that the following is a full, clear, and exact description of our said process and of the machinery or apparatus which we have devised for successfully practicing or carrying our invention into effect, reference being had to the accompanying drawings.

Our invention relates to an improved amalgamator and process of grinding ores of the precious metals after they have been crushed and are in condition to be ground and mixed with water.

It is designed more especially for operating upon "tailings"—ore matter that has been previously worked.

Our invention is equally adapted for the treatment of ores taken directly from the mill and not previously worked by any amalgamating and separating processes.

Referring to the accompanying drawings, Figure 1 shows the general arrangement of the apparatus which we employ for treating ores by our improved process in a continuous manner and on a large scale. Fig. 2 is a vertical longitudinal section through the center of the amalgamating-vessel, showing the general construction of this part of our apparatus. Fig. 3 is an end elevation of Fig. 2, taken from the front. Fig. 4 is an end elevation of the settling-vessel.

The grinder A may be any suitable mill or grinding-pan of the kinds now in use.

The amalgamating-vessel B we construct preferably of cylindrical shape, and of sheet metal, very similar in form and structure to the shell of a steam-boiler. In its top we provide an inlet, *c*, closed with a removable cover, C, and beneath its bottom we arrange a grate-surface, fire-box, and combustion-chamber. We place the vessel B in a brick-work chamber, D, connected with a chimney, and provided with the usual doors and draft-openings. This is a practical, convenient, and well-known construction, requiring no particular skill to set up and manage. Within this vessel we

place a horizontal shaft, E, having a number of radial arms, *f*, carrying blades or paddles *g*. The blades *g g* are arranged at the outer ends of the arms *f*, and leave an open space between them and the shaft, through which the particles carried up by the paddles or blades can fall without being carried over. One end of this shaft is supported in a bearing inside the vessel against one head, while the other end projects through the opposite head and turns in a stuffing-box, *h*, at that point. A rotary motion is imparted to this shaft by means of the pulley I.

At one end of the vessel we provide a discharge-opening controlled by a suitable shut-off cock, J, and located just above the line reached by the body of quicksilver placed on the bottom. This outlet is for the discharge of the pulp from above the quicksilver. A second discharge, K, having a cock, L, is placed lower down and in position to run off the body of quicksilver when the same is sufficiently charged with metal and required to be renewed. This vessel is therefore a close air and water tight cylindrical chamber, having a fire-box beneath it and a stirring and agitating device within it capable of being operated from the outside.

When in operation, a stratum or body of quicksilver is placed on the bottom to a certain depth, which is governed by the size and capacity of the vessel, and then after being supplied with a charge of the pulp from the grinding-mill it is tightly closed at the inlets and heat is applied by the fire beneath it.

For regulating the temperature of the mass of pulp being treated in such a vessel, and also for condensing the gases and vapors therein at the end of each operation, so as to permit the cover C to be taken off with safety to admit a fresh supply of pulp, we provide a means for supplying a flow and circulation of cold water into and through the vessel in contact with the pulp, the quantity and velocity of which is under control. This means consists of the cold-water-inlet pipe M, connecting with a suitable head to give the required pressure and the discharge-pipe N at the opposite end of the vessel to lead off the overflow. We prefer to carry the end of this dis-



charge-pipe down into and beneath a body of water in a tank or vessel, O, as by this means the escape of fumes and vapors is prevented, and the condition and temperature of the contents of the vessel can be readily determined at any time from the water in this vessel.

Beneath the vessel B, and through the fire and combustion chamber, we carry a water pipe or heater, P, by which we supply hot water for the grinding operation in the mill. This pipe is placed substantially as shown in Figs. 1 and 2, and the same fire employed for the amalgamator serves to supply hot water for grinding purposes.

Between the grinding apparatus and the amalgamating-vessel we interpose a receiving and supplying tank or trough, Q, for use when the process is to be carried on in a continuous condition, as it permits the operation of grinding to proceed without interruption, while the amalgamating-vessel receives its charges at the proper intervals from the accumulating contents of the tank.

As thus constructed and arranged, this apparatus is operated substantially as follows: The amalgamator B, having the fire under it, is charged with a quantity of pulp from the tank until the contents reach a point or level just above the shaft E. The cover C is then secured on and tightly sealed at the joint and the rotating shaft E is set in motion. The paddles or arms upon this shaft, then being carried down through the pulp, bring the particles into intimate contact with the quicksilver below the pulp, and also loosen and agitate the mass, so as to permit the heavier particles to settle down through it by virtue of their superior gravity. By the action of the heat, also, there is effected an ebullition or a throwing up of the quicksilver in the form of "stringers" from its surface into the lower part of the pulp, and the combined action of these two agencies—the heat and the stirring mechanism—facilitates as well as insures perfect amalgamation. After receiving such treatment in the vessel, the charge of pulp can be settled directly in this vessel, which will render the operations of amalgamating in such vessel intermittent; or by employing a separate vessel, R, as a settler the charges, when properly worked, can be run off each time for subsequent treatment to the settling operation, and the amalgamating-vessel can be immediately recharged from the grinder or its tank, thereby making the operation of the apparatus more nearly continuous.

The supply and circulation of cold water in

the amalgamator permit the settling operation to be rapidly and effectively performed in this vessel by simply shutting off the heat beneath its bottom and turning in the cold water. At such times the speed of the shaft E will be reduced and the flow of cold water under pressure through the vessel will condense the vapors and produce precipitation of the heavier particles, and at the same time carry off from the vessel the light and worthless matter through the pipe N. This operation, however, would be more expensive in working on a large scale, as the interruption in the amalgamating operation would involve a loss of heat and the additional time required at the beginning of each operation to raise the heat within the vessel to the required degree. To overcome this delay and to reduce the expense, we grind the pulp with hot water, and we employ also the separate settling-vessel R. This is a vessel similar in its general construction to the amalgamating-vessel B, excepting that no fire is employed beneath it, and instead of one discharge-outlet in the head we provide several discharges at different levels. This settler is a closed vessel, and has a stream or body of cold water under pressure passed continuously through it, for which purpose the water-inlet *s* and outlet *t* are connected with suitable pipes for the supply and discharge. By the use of this stream of water the operation of settling in an apparatus of this character is performed rapidly and effectively, and it contributes in a considerable degree to the successful and economical application and working of our improved process.

Having thus fully described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The method herein described of grinding ore pulp, the same consisting in subjecting the pulp to the action of hot water during the operation of grinding in a suitable mill, as herein set forth.

2. In an apparatus for treating ore pulp to separate the valuable particles therefrom, the combination of the grinder and amalgamator, connected, as described, with the furnace for heating the amalgamator, and the water-pipe passing through the said furnace and connected to the grinder, substantially as set forth.

Witness our hands and seals.

CHAS. H. DOW. [L. S.]

WM. H. CHANDLER. [L. S.]

In presence of—

EDWARD E. OSBORN,

D. SELLECK.

Correction in Letters Patent No. 282,863.

It is hereby certified that Letters Patent No. 282,863, dated August 7, 1883, for an improvement in the "Process of and Apparatus for Amalgamating Ores," were erroneously granted to Charles H. Dow, William H. Chandler, William A. Shreves, and Myron L. Justin, as owners thereof; that it appears by assignment on record in the Patent Office that said Letters Patent should have been granted to William H. Chandler, William A. Shreves, and Myron L. Justin, as owners of the entire interest; and that the proper corrections have been made in the files and records pertaining to the case in the Patent Office, and should be read in the Letters Patent to make them conform therewith.

Signed, countersigned, and sealed this 14th day of August, A. D. 1883.

[SEAL.]

M. L. JOSLYN,  
*Acting Secretary of the Interior.*

Countersigned:

E. M. MARBLE,  
*Commissioner of Patents.*