



# UNITED STATES PATENT OFFICE.

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## SAVING FINE GOLD AND SULFURETS.

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*To all whom it may concern:*

Be it known that I, FRANCIS M. GRAHAM, a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented certain new and useful Improvements in Saving Free Gold and Sulfurets, of which the following is a specification.

My invention relates to an improved process of treating gold-bearing material containing free gold and sulfurets to extract the latter, the object of my invention being to provide a process by which this can be done more effectively than has heretofore been the case, both as to the saving of gold and as to preventing loss of mercury.

My improved process will best be understood from a description of one form of apparatus by means of which it may be conveniently carried out. Said apparatus is represented in the accompanying drawings, in which—

Figure 1 is a longitudinal vertical section of an apparatus used in connection with my improved process. Fig. 2 is an end view thereof, and Fig. 3 is a cross-section on the line A A of Fig. 1.

Referring to the drawings, 1 represents a long shallow box in the nature of a sluice-box, having bottoms 2, sides 3, and a low end wall 4 at the upper end, the lower end being open. The bottom of said box has a very slight slope from the upper end to the lower end, the slope being just sufficient to cause a flow of mercury from one end to the other, so that the whole of the bottom of the sluice-box is covered with mercury to a substantially uniform depth with the exception of the trough hereinafter described. At the lower end of the box the mercury flows into a trough 6, along which trough it flows in a transverse direction and discharges into a pump-cylinder 7, in which works a pump-plunger 8, by means of which the mercury flowing into said cylinder is raised to a sufficient height to be carried into a pipe 9. Said pipe has a fall sufficient to carry the mercury to the upper end of the sluice-box, where it flows into a pipe 10, extending transversely across said upper end, said pipe 10 being perforated, as shown at 11, to permit the mercury to fall therefrom into the upper end of

the sluice-box. The nature of the means for returning the mercury to the upper end of the sluice-box is immaterial. Instead of a plunger-pump a centrifugal pump, a rotary elevator, or any other suitable means may be used. By this construction there is insured a continual flow of the mercury in the sluice-box in one direction and a return thereof outside the sluice-box in the opposite direction.

The pulverized rock containing the free gold and sulfurets, together with a sufficient quantity of water, is conveyed by means of a pipe 12 to a chute 13, extending the width of the sluice-box, so that it falls upon the surface of the mercury and is brought into intimate contact therewith. In the bottom of the sluice-box is formed a transverse trough 14, into which extends the bottom of a wall 15, secured between the sides of the sluice-box, the bottom of said wall dipping down a considerable depth into the mercury. This construction necessitates that all the mercury shall flow below the bottom of said wall, while water, rock, sulfurets, and any other material lighter than mercury will be held back by said wall. On account of the water being unable to escape in the same direction as the mercury it will flow toward the upper end of the sluice-box over the surface of the mercury and will carry with it to a greater or less extent the particles of rock and sand therewith and also small particles of free gold. The sulfurets being heavy will remain behind and will be carried by the current of mercury against the wall 15, where they will pile up and can be removed by hand or in any convenient manner. When said pile of sulfurets reach a higher level than the sides of the sluice-box, they may conveniently be swept off into a chute 18 and conveyed to any desired point. The particles of free gold will be carried down into contact with the mercury and will be amalgamated therewith. The tailings will be carried along by the water on the top of the mercury and will pass over the upper end of the sluice-box. In order to insure intimate contact of the free gold with the mercury, there are provided at suitable intervals partitions 20, which extend to within a short distance of the surface of the mercury, and thus force the water and the particles of gold carried thereby into contact with the mercury.

The gold amalgamated from the mercury is recovered in the usual manner.

The advantages of this method of treating gold-bearing material are, first, that there is  
5 no loss whatever of the heavier particles of gold-bearing material, as the flow of the mercury always tends to carry the heavier particles back in opposition to the flow of the water, thus preventing them being carried away  
10 by the current of water; also, there is no loss of mercury, for while in other processes for treating gold-bearing material with mercury there is a tendency for the fine particles of mercury to be carried away by the gold-bearing material washed off by the water this is  
15 not the case with the present construction, for the movements of the water, the gold-bearing material, and the mercury tend to shake down the fine particles of mercury long before  
20 they reach the point at which the tailings and water separate from the mercury.

I claim—

1. The process of concentrating precious metals from ores, which consists in causing  
25 the comminuted ores mingled with water to flow over the top of a stream of mercury flowing in the opposite direction, whereby the heavier particles, brought into immediate contact with the stream of mercury, are held  
30 back relatively to the lighter particles and separated therefrom and removing the heavier particles so separated, substantially as described.

2. The process of concentrating precious

metals from ores which consists in adding water thereto and causing the mixture to flow  
35 in a stream, while passing mercury under said stream in the opposite direction thereto to carry off therewith the heavier particles at the  
40 bottom of said stream and in immediate contact with the mercury while permitting the lighter particles to flow off with the water in the opposite direction thereto, intercepting the heavier particles so carried along with the  
45 mercury, and removing the heavier particles so accumulated, substantially as described.

3. The process of treating gold-bearing material containing free gold and sulfurets to separate the latter from the residuum which  
50 consists in causing a stream of mercury to flow in one direction, adding water to the gold-bearing material, causing the water and the gold-bearing material to flow on the surface of the stream of mercury in the opposite direction to the flow of the latter, recovering  
55 the free gold amalgamated with the mercury, intercepting the sulfurets carried on the top of the stream of mercury in the opposite direction of the flow of water, and removing the sulfurets thus accumulated, substantially as  
60 described.

In witness whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRANCIS M. GRAHAM.

Witnesses:

FRANCIS M. WRIGHT,  
CECELIA POWNING.