

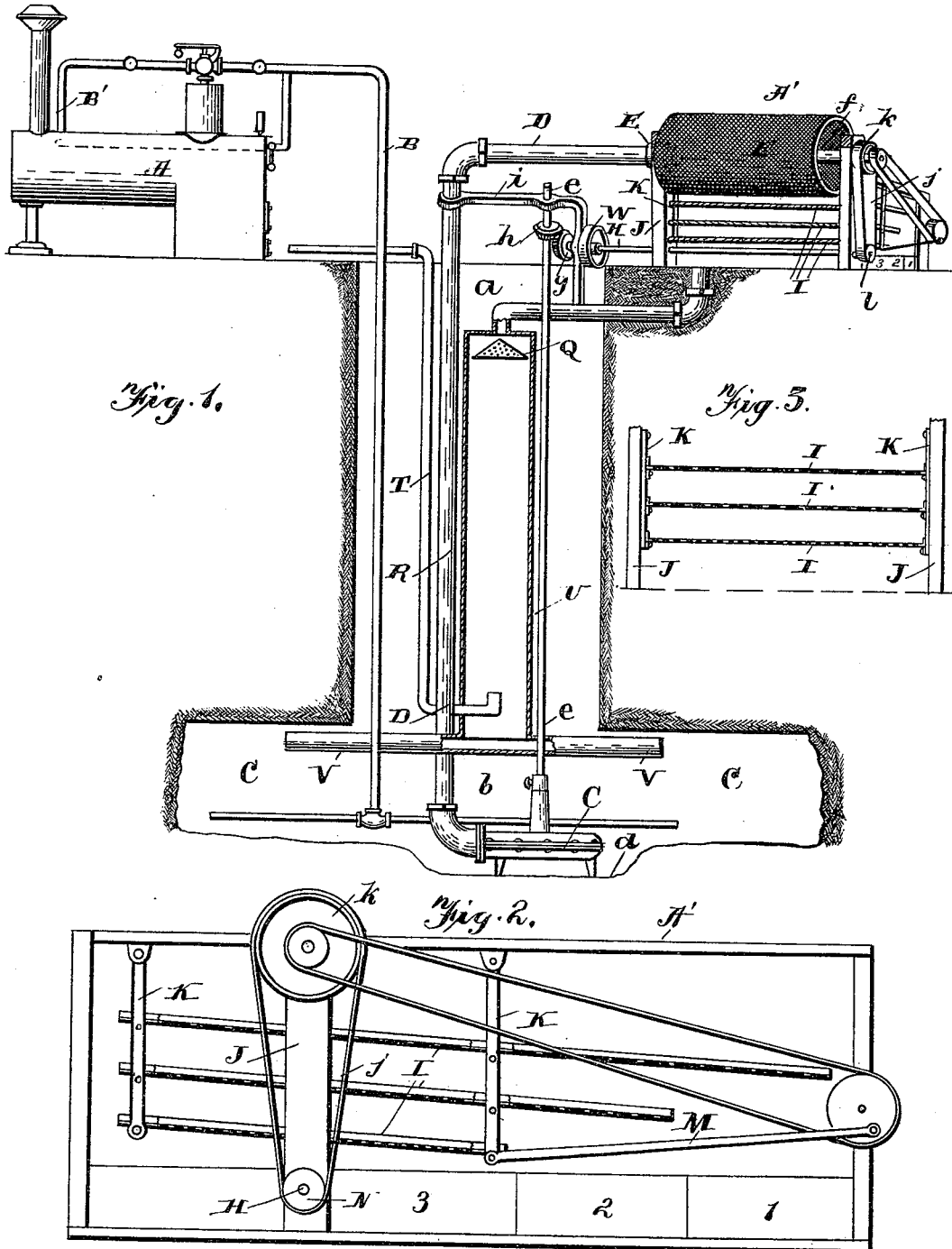
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Patented Mar. 20, 1900.

J. A. LAYCOCK.  
MINING APPARATUS.

(Application filed Mar. 18, 1898.)

(No Model.)



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# UNITED STATES PATENT OFFICE.

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## MINING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 645,861, dated March 20, 1900.

Application filed March 18, 1898. Serial No. 674,368. (No model.)

*To all whom it may concern:*

Be it known that I, JOSEPHUS AMIEL LAYCOCK, of Litchfield, in the county of Montgomery and State of Illinois, have invented certain new and useful Improvements in Mining Apparatus; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification.

My invention relates to improvements in mining apparatus, all of which will be fully shown and described hereinafter and particularly pointed out in the claims.

The object of my present invention is to provide an apparatus constructed to furnish a supply of water to the mine, remove it therefrom for the purpose of separating the metals therefrom, and to supply heat within the mine directly to the water for heating it, and thus thawing the frozen strata containing the metal it is desired to extract.

In the accompanying drawings, Figure 1 is a view representing my invention, part being shown in side elevation, part in perspective, and part in vertical section. Fig. 2 is a side elevation of a portion of the separator. Fig. 3 is a sectional view of one of the screws I.

Referring now to the drawings, *a* represents an opening formed in and through the non-aeriferous strata to the portion *b* of the earth, which is the metal-bearing strata of gravel, clay, or other earthy substance.

*A* is a steam-boiler situated at any desired or convenient point in relation to the opening *b*, and *B* is a pipe extending down into the mine *c* at the lower end of the opening *a*, the ends of the pipe *B* extending laterally for the purpose of delivering steam adjacent the walls of the mine *c*. This pipe *B* is provided with a branch *B'*, passing through the fire-box of the combustion-chamber of the boiler *A* for the purpose of furnishing superheated steam to the pipe *B*, as will be readily understood. The pipe *B* at its lower end will be extended laterally and constructed in any desired and convenient manner to afford such lateral extension. Also situated in any desired relation to the boiler *A* at the opening *a* to the mine is a separator *A'*, constructed

in a manner which will be fully described presently. This separator is shown in the drawings here referred to as in a line with the boiler *A*; but in practical use it is preferably situated at right angles to the boiler *A*, whereby the belt from the engine of the boiler will run directly to the pulley *W*. However, the engine may be separated at any desired distance from the boiler *A* and adjacent to the separation, or any of the parts situated in any desired relation to each other, without departing from the spirit or scope of my invention.

The mine *c* is preferably provided with a pit or cavity *d*, in which is situated a centrifugal or other pump *C*. The operating-shaft *e* of this pump extends upward above the surface of the ground and is connected in a manner which will be presently described. The discharge pipe or tube *D* of this pump *C* has one end passing through an enlarged journal *E* of a cylindrical screen, either composed of coarse wire, as here shown, or of perforated metal, as may be desired, which will let the finer gravel and water pass therethrough, while the large gravel will pass out the open end *f* thereof, as will be readily understood. Situated beneath this cylinder *F* are any desired number of screens *I*, formed of wire or other material, the screens being of different lengths, the upper one being longer and each succeeding one being shorter, as illustrated, and the upper one having the largest mesh and the succeeding one smaller, and so on throughout the series of screens. These screens are suspended by means of links *K* from the frame *J* of the separator and are connected through the medium of a pitman *M* with a pulley *m*, which is driven by a belt *n*, passing around the said pulley and a pulley *r* upon the cylinder-shaft *e*. Below the screens *I* are the pits or receptacles 1 2 3, receptacle 1 receiving the discharge from the upper screen, the receptacle 2 from the succeeding screen, and the receptacle 3 from the lowest screen. The water falls through into the pit 3 and is conveyed out through the pipe *s* again into the mine in a manner which will be particularly described hereinafter.

The drive-shaft *H* is provided with a pulley *W*, which will receive a belt from the engine, and also with a bevel-gear *g*, meshing

with a bevel-gear *h* upon the operating-shaft *e* of the centrifugal pump. An L-shaped supporting-bracket *i* has its lower end rigidly connected in any desired manner to the pipe *s*, the upper end of this bracket embracing and supporting the upper end of the tube *R*, as shown at *b*, and through which the upper end of the shaft *e* passes and is supported and through which also one end of the driving-shaft *H* passes and is supported.

Within the opening *a* to the mine *c* is a chamber or tube *U*, into which the lower end of the discharge-pipe *R* passes. Situated within the upper end of this tube or chamber *U* is a perforated cone-shaped diaphragm *Q*, upon which the water falls, thus spreading it out and causing it to fall in sprays within the chamber. The lower end of this chamber is provided with one or more outlet-pipes *V*, extended in any desired direction, and these pipes will be constructed in any convenient and well-known manner for extending them as the mine is extended, as will be readily understood. These outlet-pipes *V* deliver the water again into the mine. A pipe *T* connects with and has its lower end opening within the lower end of the chamber *U* and delivers steam therein for heating the chamber and the falling sprays from the delivery-pipe *R*. This heating arrangement, together with the pipe *B*, serves to keep the water within the mine at a temperature above freezing-point, whereby the gravel *c* is thawed, and the centrifugal pump being situated in a pit *d* (preferably) the slush in the way of ore, gravel, and water is taken by the pump and delivered to the cylindrical screen *F*, which is revolved through the medium of the belt *j*, passing around a pulley *k* upon the shaft *u* of the cylinder and around a pulley *l* upon the drive-shaft *H*. The larger gravel passes out the end of the cylinder and the smaller gravel through upon the screens, which operate in the manner before described for grading the gravel and permitting the water to pass through, which is again delivered to the delivery-pipe *R*, as before described.

In operation the mine is about filled with water to the upper surface of the gravel or metal-bearing strata, and this water is heated through the medium of the steam from the boiler.

I do not limit myself to any particular form of pump nor do I desire to limit myself to the particular way of heating the water in the mine by the delivery of steam directly in the water, for this may be varied without departing from the spirit of my invention. For instance, instead of delivering the steam directly in the water, a coil of pipes can be provided, through which the steam is forced and circulated, and the heated pipes would heat the water and the water in turn would thaw the gravel.

My invention therefore pertains particularly to the method of supplying the mine with water and then heating the water, where-

by a slush consisting of water and gravel is provided, which is taken up by the pump and then separated or washed in any desired manner. The form here shown is one way in which the slush from the mine can be conveniently treated for the purpose of separation and washing.

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

1. The combination with a mine containing a supply of water, of a steam-generator, a pipe connected at one end with the steam-generator and having its opposite end extending within the mine and delivering steam directly to the water therein, a pump in communication with the water contained within the mine, and a return-pipe receiving the water delivered by the pump and adapted to return it to the mine, substantially as described.

2. The combination with a mine containing a supply of water, of a heating device, a pipe having one end in communication with the heating device and the opposite end extending within the well and provided with an elongated horizontal portion for supplying the heat directly to the water within the mine, a pump in communication with the water, and adapted to deliver it outside of the mine, and a return-pipe in communication with the water delivered from the mine and adapted to return it thereto, substantially as described.

3. A mining apparatus comprising a heating device, a pipe extending therefrom and delivering heat within the mine, a water-supply, a pump situated within the mine and having a discharge-pipe thereabove, a separator, a water-delivery pipe having one end connected with the separator, a vertical chamber within the opening to the mine to which the opposite end of the water-delivery pipe communicates, and a pipe from the heating device delivering heating medium within the said chamber, the lower end of the chamber having exits within the mine, substantially as described.

4. An improved mining apparatus comprising a water-supply and heating device for the mine, a centrifugal pump situated within the mine and having an outlet outside of the mine, a rotating and reciprocating separator, the outlet-pipe being in communication with the rotating element of the separator, a vertical revoluble shaft connected with the centrifugal pump within the well and extending to a point above and outside of the well, and a horizontal shaft having one end operatively connected with the pump-shaft and the opposite end operatively connected with the reciprocating and rotating element of the separator, substantially as described.

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

JOSEPHUS AMIEL LAYCOCK.

Witnesses:

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