M. SCHWERIN.

METHOD OF MINING.

APPLICATION FILED JULY 11, 1908.

904,021. Patented Nov. 17, 1908.

Fig. 1

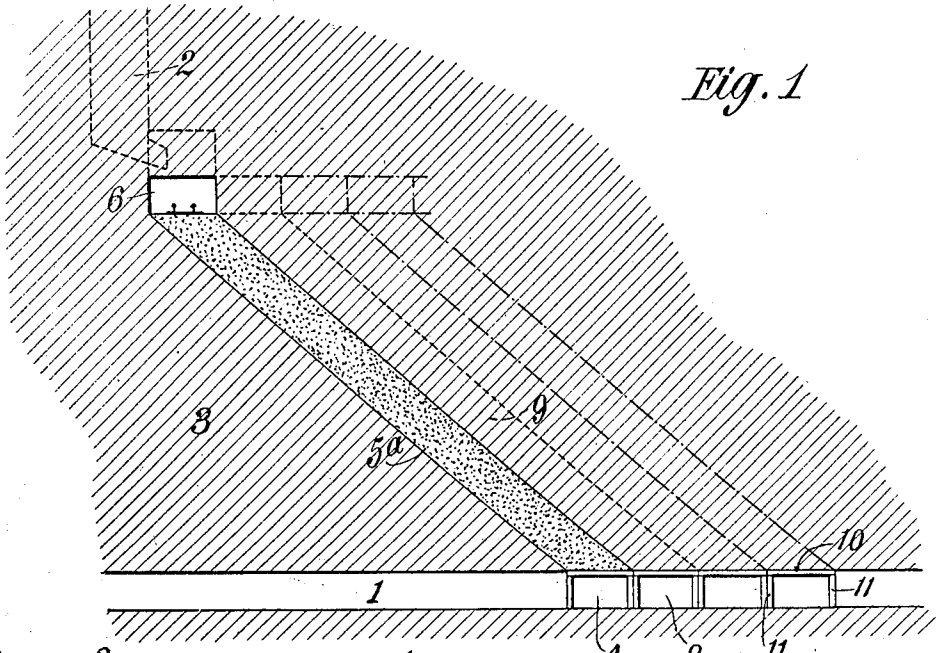
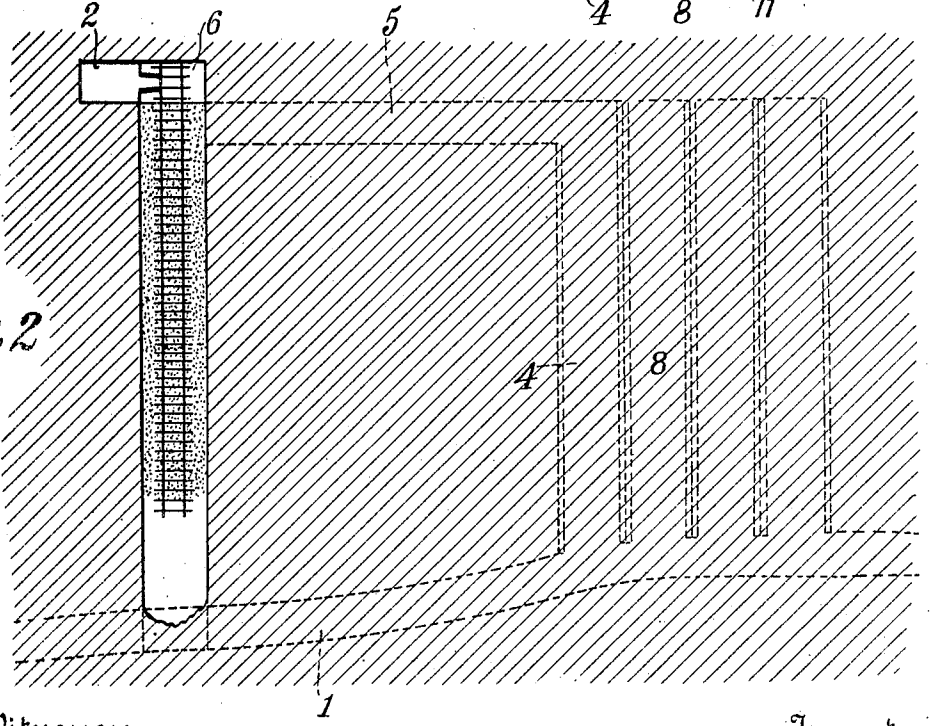


Fig. 2



Witnesses:
Raphael Netter
J. Blake

Inventor
Martin Schwerin
By his Attorney
Peter W. Pierson

UNITED STATES PATENT OFFICE.

MARTIN SCHWERIN, OF ELIZABETH, NEW JERSEY.

METHOD OF MINING.

No. 904,021. Specification of Letters Patent. Patented Nov. 17, 1908.

Application filed July 11, 1908. Serial No. 443,135.

To all whom it may concern:

Be it known that I, MARTIN SCHWERIN, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Methods of Mining, of which the following is a specification.

My invention consists in a method of mining devised by me to minimize the cost of timbering workings, and to reduce the cost of mucking, that is removing broken ore to the levels.

My new method involves stopping by successive inclined slices and filling-in of the spaces formed by the slicing operation, as the stoping of each slice progresses. Where the ore is weak, it may be necessary to support the roof by posts and head-boards near the advancing face, but such slight timbering is merely incidental to my invention and is not required where the ore is strong; even where such posts and head-boards are required, they may be withdrawn if desired. In any case the filling is effected by dumping-in waste from the top of the slice when the face has advanced far enough to make room for the filling operation.

My new method will be best understood by reference to the accompanying diagrams in which

Figure 1 is a vertical projection of a minable body, and Fig. 2 a horizontal projection thereof.

Referring to these diagrams, 1 is a drift in minable material or alongside of a vein, and leads to a shaft or chute not shown.

2 is a waste-chute and 3 is a body of minable material lying between the drift and the waste-chute.

4 is a cross-cut first formed and starting from the drift. As the material is removed from this cross-cut, it is advanced towards the far side of the minable body or vein and then the first raise 5 is started on a slant upwardly to the foot 6 of the waste-chute. The upper end portions of the spaces formed by removal of the successive slices constitute a series of cross-cuts in which a track from the waste-chute may be shifted successively from one to the other to fill the various slice spaces. When the first slice 5^a (which is laterally of raise 5) has been removed, a slice space (corresponding to the slice of material removed) is formed into which waste material or filling is dumped, the dumping being begun before all the minable material is removed from the first slice. The filling is dumped into the slice space as soon as practicable behind an advancing face in order to diminish the width of roof left unsupported.

When the slice space formed by removal of the first slice has been filled up, the track will be shifted and laid from the foot of the waste-chute on top of the filling in the first slice space. The main functions of the filling are to support the overlying minable material and to prevent a caving of the ground above.

In practice, I begin the second cross-cut 8 before the first cross-cut is completed and then, on reaching the far end of the second cross-cut, begin work on the second inclined raise 9; and so on until the minable body is worked out between the levels of the drift and the tops of the slice-spaces.

The slices are carried on the angle of repose of the filling so that the waste finds its final resting place without any handling other than tramming in mine cars and dumping. The ore as it is broken requires no handling to convey it to ore-gates in the roof of the cross-cut below each slice, on the level below, since it falls by gravity down the incline in which the slice is stoped.

The position of each cross-cut is such that the slice connecting it and the top cross-cut will have an inclination equal to the natural slope or angle of repose of the filling. When the first bottom cross-cut reaches the opposite wall of the vein (the same side of the vein as that on which the waste-chute is situated in the level above) an inclined raise is started on the angle of repose so that it will hole into the foot portion of the waste-chute. Each raise and slice is removed to a height above the floor of this foot portion of the waste-chute sufficient to enable the work therein to be carried on.

The first slice is taken by stoping from the first inclined raise. When the stope has advanced far enough away from the raise, the timbers, if any, behind are drawn and filling-in the raise is commenced. Each one of the bottom cross-cuts is timbered, the caps 10 resting on separate pairs of posts 11 in these cross-cuts which are side by side. Separate posts must be used so that when the timbers are drawn at the end of a cross-cut in which filling is going on, the timbers in the adjacent cross-cut will stand independ-

ently. The drift along the wall in the bottom level may also be timbered and kept open for tramming ore to the chute or shaft, as long as any stoping is going on in the slices opened up from this drift. Filling in each slice space will stand right up to the level of the floor of the top cross-cut or foot portion of the waste-chute. Track laid on this filling, and moved from slice to slice will serve to convey the waste from the waste-chute down which it comes to the slice space in process of filling. Filling may be stowed for the support of the roof in the top portion of each slice space as soon as such top spaces are no longer needed to lay track on for tramming waste, but there will be left open a passage-way along the wall on the same side as the waste-chute. This passage-way thus grows into a top drift and furnishes a means for cars of waste passing from the waste-chute to the slice spaces. When the distance that waste is trammed becomes so great that it is more economical to construct a new waste-chute, then this top drift is abandoned after the timbers, if any, in it are recovered, and it is filled with waste or left open for ventilation until the new waste-chute is finished.

In operation it is advisable to start the second bottom cross-cut before the first is finished, and the third cross-cut before the second is finished, so as to have a number of slices in various stages of partial completion, the underlying ones being more advanced than those successively overlying. Likewise it is advisable to keep the lower part of a stope in advance of the upper part so as to facilitate keeping separate the filling and ore.

A feature of operation in several slices simultaneously is that an underlying slice space must be filled in that portion of it which directly underlies any work in progress on the slice above. After the first inclined raise breaks into the foot portion of the waste-chute, there is always an open course for air to circulate between the bottom drift and the waste-chute (or a manway alongside of it) by way of some portion of a slice in course of stoping.

Whether the bottom drift follows a wall, in ore or in waste, or whether it be in reality a cross-cut through the ore-body and the course of the cross-cuts be thereby changed so that they are technically not cross-cuts, but drifts, does not in any case alter my method since it is here contemplated that under certain conditions the passages may be laid out in any direction through an ore or other minable body, or certain passages even omitted entirely. Likewise whether the cross-cuts are parallel and the raises at their ends at right-angles to them or at some other angle (in the horizontal projection), and whether the shape of the slices be rectangular, trapezoidal, rhomboidal, quadrilateral, or irregular, does not change my method since it is here contemplated, under certain conditions, to make the shape of the slices conform to the shape of the minable body in any manner demanded by the economic necessities of the physical conditions. Likewise the order of progress of the slices, or the progress of the stopes in either direction between the walls or from the inclined raises, or the placing of the inclined raises in the middle or at either end, or elsewhere, is here contemplated. Likewise it is here contemplated that the angle of inclination of the slices will be varied to suit conditions imposed by various ores and minerals and varying degrees of strength of the ore or mineral.

I claim:—

1. The herein-described method of mining minable bodies by removal of successive inclined slices or stopes, and the filling, after removal, of the slice spaces.

2. The herein-described method of mining consisting in successively slicing a minable body on an incline and filling the space formed by the slicing operation.

3. The herein-described method of mining consisting in connecting a drift and an open-ended waste-chute by successively slicing on an incline a minable body which is between the drift and chute, and in filling the space formed by the slicing operation whereby the minable material above said space is supported by the filling.

4. The herein-described method of mining consisting in cross-cutting a minable body lying between a drift and a waste-chute; in slicing said body on an incline from the cross-cut to the waste-chute, and in filling the space formed by the slicing operation to support the minable material overlying said space.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses, this 7th day of July, 1908.

MARTIN SCHWERIN.

Witnesses:
G. BLAKE,
EDWARD E. BLACK.