

Dec. 15, 1925.

1,565,766

G. WEBER
PROCESS FOR THE PREPARATION OF EXPLOSIVE CHARGES BY MEANS OF
LIQUID OXYGEN OR AIR
Filed Oct. 11, 1923

2 Sheets-Sheet 1

Fig. 1

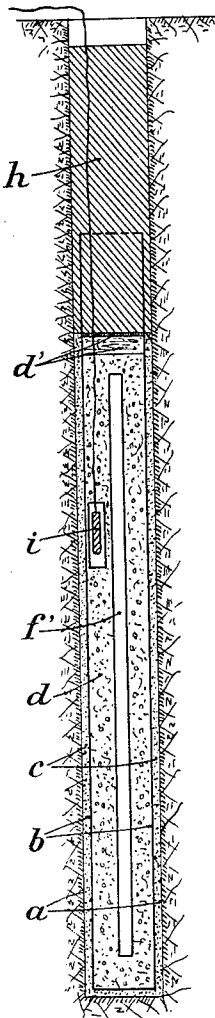


Fig. 2

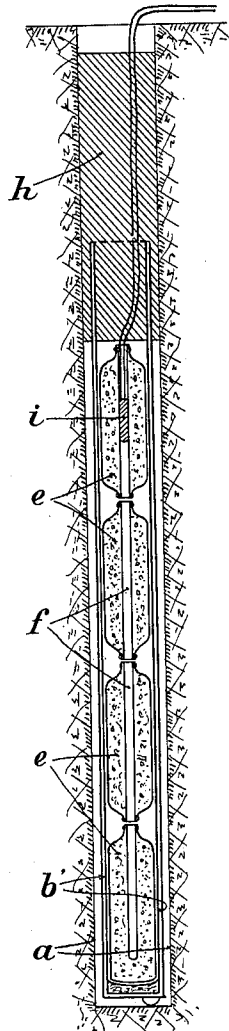
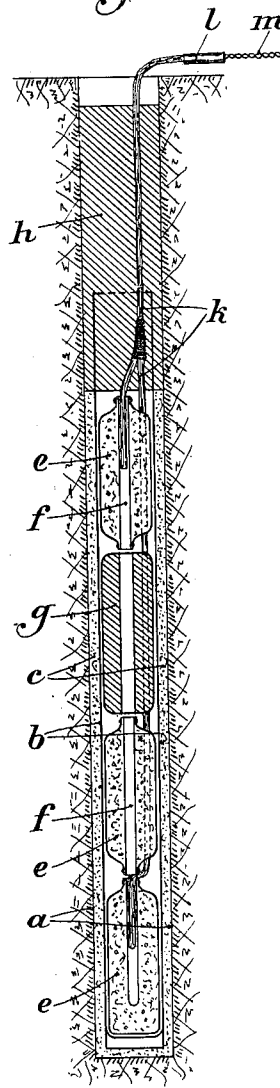


Fig. 3



INVENTOR:
GUILLAUME WEBER
BY: Francis E. Boyce
ATTORNEY.

Dec. 15, 1925.

1,565,766

G. WEBER
PROCESS FOR THE PREPARATION OF EXPLOSIVE CHARGES BY MEANS OF
LIQUID OXYGEN OR AIR
Filed Oct. 11, 1923

2 Sheets-Sheet 2

Fig. 4

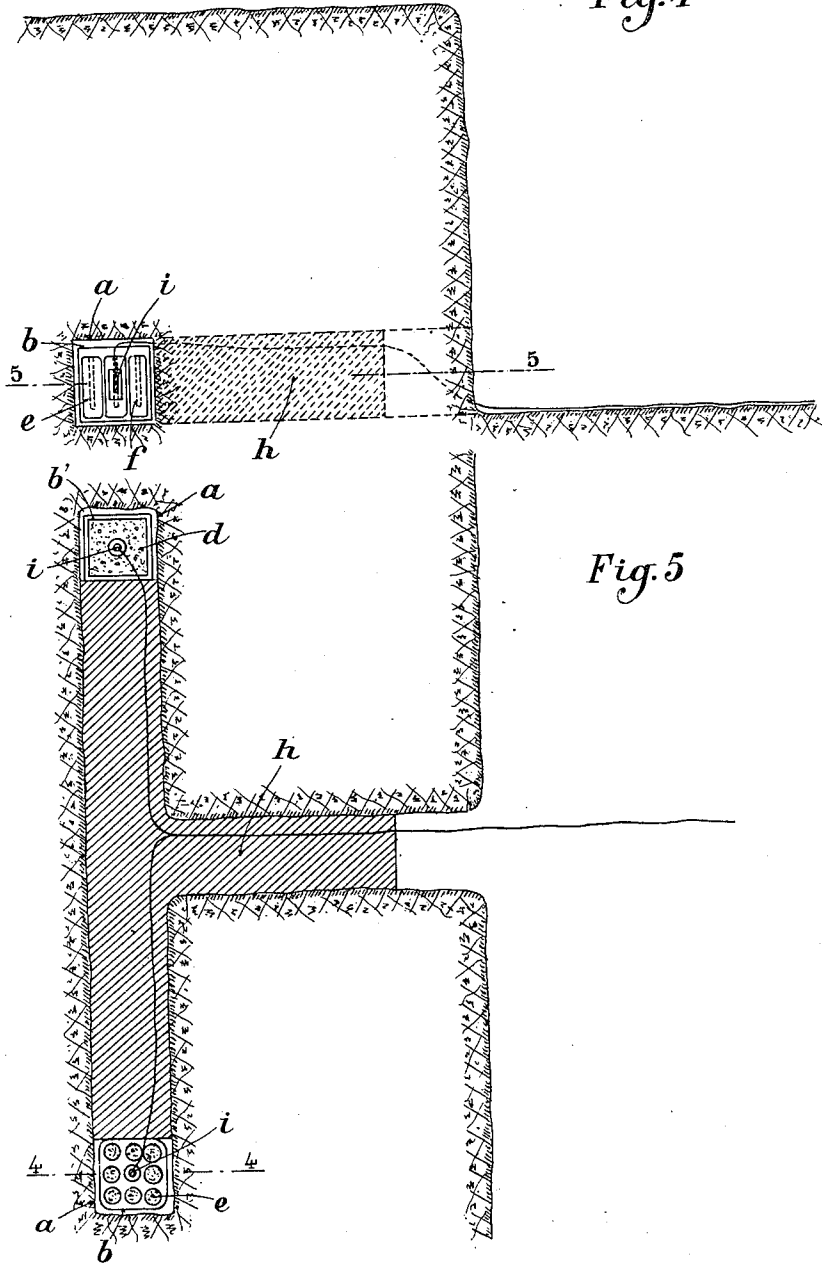


Fig. 5

INVENTOR:
GUILLAUME WEBER
BY
Francis E. Boyce
ATTORNEY.

UNITED STATES PATENT OFFICE.

GUILLAUME WEBER, OF HAYANGE, FRANCE, ASSIGNOR TO THE SOCIÉTÉ: LES PETITS FILS DE FRANÇOIS DE WENDEL & CIE., OF HAYANGE, MOSELLE, FRANCE.

PROCESS FOR THE PREPARATION OF EXPLOSIVE CHARGES BY MEANS OF LIQUID OXYGEN OR AIR.

Application filed October 11, 1923. Serial No. 667,894.

To all whom it may concern:

Be it known that I, GUILLAUME WEBER, citizen of the French Republic, residing at Hayange, Moselle, in the French Republic, have invented new and useful Improvements in Processes for the Preparation of Explosive Charges by Means of Liquid Oxygen or Air, of which the following is a specification.

Explosive charges have been prepared hitherto by placing in the mine holes or chambers, cartridges of suitable composition, preliminarily impregnated with liquid air or oxygen by immersion in a suitable vessel. The explosives, containing liquid air or oxygen, thus prepared, give very appreciable results when they are used in normal firing conditions, that is to say when the time elapsing between the removal of the cartridge from the immersion vessel and the moment of the explosion does not exceed a certain limit, which is a maximum of 15 to 20 minutes.

But as soon as it is necessary, to fire a great number of mines at a time or to remove masses with more or less considerable charges requiring a long preparation, the liquid air or oxygen may not be sufficiently retained by the cartridges, so that in these new conditions the explosives containing liquid air or oxygen can no longer be used with the same chances of success.

The object of the present invention is a process for the preparation of explosive charges containing liquid air or oxygen, one feature whereof resides in the use of tight tubes or receptacles which are placed into the mine holes or chambers; the materials composing the charge are placed in said tight tubes or receptacles and are impregnated with liquid air or oxygen, either at the exterior or only after having been placed in position, or partly at the exterior and partly at the interior.

In this manner the use of dipping vessels is wholly or partially suppressed and loss of liquid air or oxygen, by evaporation in contact with the wall of the mine hole, or chamber and by leakage through holes or fissures in the rock, is obviated; all danger during the preparation of the charge, when the latter is impregnated with liquid air or

oxygen exclusively within the mine hole or chamber, is also suppressed.

In the appended drawings which are given by way of example:

Figs. 1, 2 and 3 show respectively in vertical section three mine holes, which are charged according to the process forming the object of the invention.

Fig. 4 is a vertical section along 4-4 (Fig. 5) and Fig. 5 is a horizontal section along 5-5 (Fig. 4) of the whole of two mine chambers charged in accordance with said process.

In the mine hole *a* (Figs. 1, 2 and 3) is placed a tight tube of suitable strength made of a combustible or metallic substance; this tube has a single wall such as the tube *b* (Figs. 1 and 3), or comprises several envelopes such as the tube *b'* (Fig. 2), vacuum being made between the envelopes, or any other means of protection being used against the entrance of outer heat.

The empty space between the tube *b* (or *b'*) and the wall of the mine hole *a* is preferably filled with an insulating, combustible or inert substance *c* such as sawdust, or wood or cork flour, peat, infusorial earth etc.

The combustible or inert substances *d* used to prepare the explosive, such as carbon, soot, sawdust, wood or cork flour, peat, metallic powders, hydrocarbons, oils, sulphur, infusorial earth etc. may be placed into the tube or receptacle in their original state and without any other protection than a small amount of cotton, wool etc. or wire gauze, at the upper part at *d'*, according to the diagram of Fig. 1. According to Figs. 2 and 3 such substances may also be contained in cartridges *e*; these are preferably provided with a central duct *f* to facilitate the subsequent impregnation with liquid air or oxygen. A like duct is also provided in the mass of the charge illustrated in Fig. 1.

The combustible or inert substances entering into the composition of the charge may be distributed in the proper manner along the tube, so as to obtain the maximum effect at the desired point. Fig. 3 shows diagrammatically an arrangement of this kind comprising a plug of inert substance *g*

placed between the cartridges *e*. The cartridges having the most explosive effect are usually placed at the bottom of the tube.

In Figs. 4 and 5 the same reference letters indicate parts corresponding to those of Fig. 3; at the upper part of Fig. 5, the receptacle *b'* is provided with a number of envelopes containing, unchanged, the substances *d* forming the charge, whilst at the lower part of this same Fig. 5, the receptacle *b*, with a single wall, contains several cartridges *e*.

In all cases, it is easy to add a hydrocarbon, preferably in the liquid state, at the time of preparing the charge, when this is considered as necessary to increase the explosive effect or the rupture.

The impregnation of the charge *d* or of the cartridges *e* by liquid air or oxygen, after putting said charge or cartridges in place in the tube or receptacle *b* (or *b'*) is carried out by simply pouring, and if necessary, by means of a funnel, this liquid air or oxygen upon the mass or the cartridges. If the impregnation is effected at the outside, the addition of the liquid air or oxygen to maintain the charge in a good state of saturation, is carried out preferably in a gradual manner according as it is absorbed by the mass. In this manner one can charge at one time a great number of holes of large or small diameter, and having a length which may be of several tens of metres.

The stopping up is done usually in the last place, by the use of plugs of wadding, loose earth, or sand *h*, or even with water. If the wadding forms a very compact mass, a conduit may be provided through the same for the evacuation of vapours given off within the tight tube and which cannot escape through the fissures in the rock.

The firing is performed at will by electricity, by fuse or by detonating cord; in Figs. 1, 2, 4 and 5 is shown a device for firing by electricity, a protected detonator *i* being disposed in contact with the mass *d* (Figs. 1 and 5) or in a cartridge *e* (Figs. 2, 4 and 5). In case of use of a fuse, the latter is lighted in the same manner; Fig. 3 shows a device for effecting the explosion by means of a detonating cord *k*; *l* is the detonator and *m* the usual igniting fuse; this ignition may be also effected by means of electricity.

Having now described my invention what I claim as new and desire to secure by Letters Patent is:

1. The process for preparing explosive charges containing liquid oxygen or air according to which tight receptacles are first inserted into the mine holes and the materials constituting the charge are then placed in said receptacles, said materials being saturated with liquid oxygen or air.

2. The process for preparing explosive

charges containing liquid oxygen or air according to which tight tubes made of an insulating substance are first inserted into the mine holes and the materials constituting the charge are then placed in said tubes, said materials being saturated with liquid oxygen or air.

3. The process for preparing explosive charges containing liquid oxygen or air according to which tight tubes are first inserted into the mine holes, each of said tubes being composed of several envelopes insulated from each other, the materials constituting the charge being then placed in said tube, said materials being saturated with liquid oxygen or air.

4. The process for preparing explosive charges containing liquid oxygen or air according to which tight tubes are first inserted into the mine holes, each of said tubes being composed of several envelopes between which vacuum is made, the materials constituting the charge being then placed in said tube, said materials being saturated with liquid oxygen or air.

5. The process for preparing explosive charges containing liquid oxygen or air according to which tight receptacles are first inserted into the mine holes and the materials constituting the charge are then placed in said receptacles, said materials being saturated with liquid oxygen or air, and the space between said receptacles and the wall of the mine holes being filled with an insulating material.

6. The process for preparing explosive charges containing liquid oxygen or air according to which tight receptacles are inserted into the mine holes and the materials constituting the charge are contained in a plurality of separate cartridges which are placed in said receptacles, said materials being saturated with liquid oxygen or air.

7. The process for preparing explosive charges containing liquid oxygen or air according to which tight receptacles are inserted into the mine holes and the materials constituting the charge are contained in a plurality of separate cartridges which are placed in said receptacles, plugs of inert substance being interposed between said cartridges, said materials being saturated with liquid oxygen or air.

8. The process for preparing explosive charges containing liquid oxygen or air according to which tight receptacles are first inserted into the mine holes and the materials constituting the charge are then placed in said receptacles, a central duct being provided in each mine hole through the charge, and liquid oxygen or air being poured through said duct for impregnating said materials.

9. The process for preparing explosive

charges containing liquid oxygen or air according to which tight receptacles are first inserted into the mine holes and the materials constituting the charge are then placed
5 in said receptacles, a central duct being provided in each mine hole through the charge, liquid oxygen or air being poured through said duct for impregnating said materials, the mine holes being then filled up with a plug of suitable material and an upper duct 10 extending through said plug and opening into the exterior.

In testimony whereof I have signed my name to this specification.

GUILLAUME WEBER.