

(No Model.)

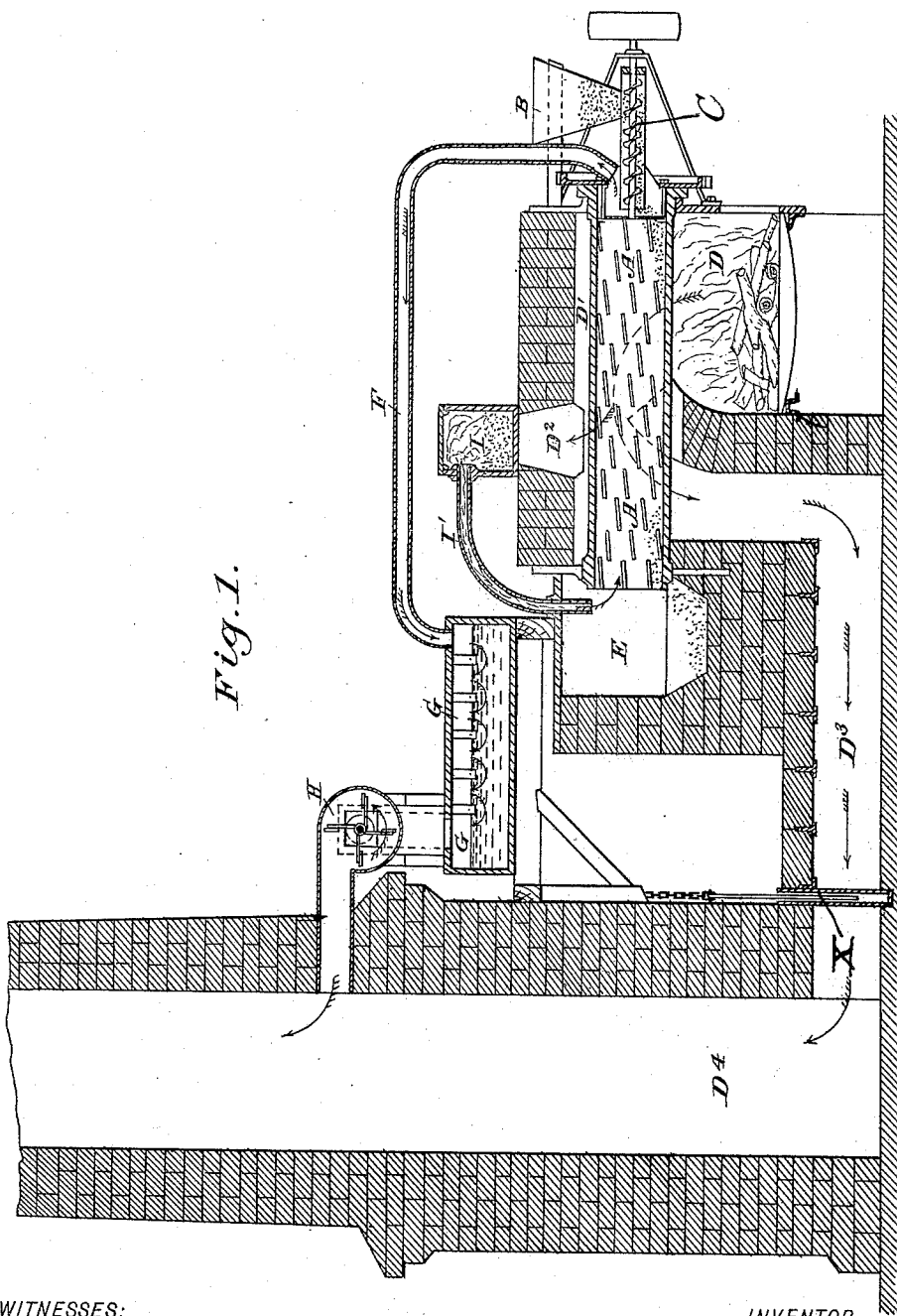
2 Sheets—Sheet 1.

F. H. MOLESWORTH.
PROCESS OF TREATING METALLIFEROUS ORES.

No. 465,872.

Patented Dec. 29, 1891.

Fig. 1.



WITNESSES:

E. R. Bolton
G. L. Richards

INVENTOR

Francis Hylton Molesworth.

BY

Richardson & R.

ATTORNEYS

(No Model.)

2 Sheets—Sheet 2.

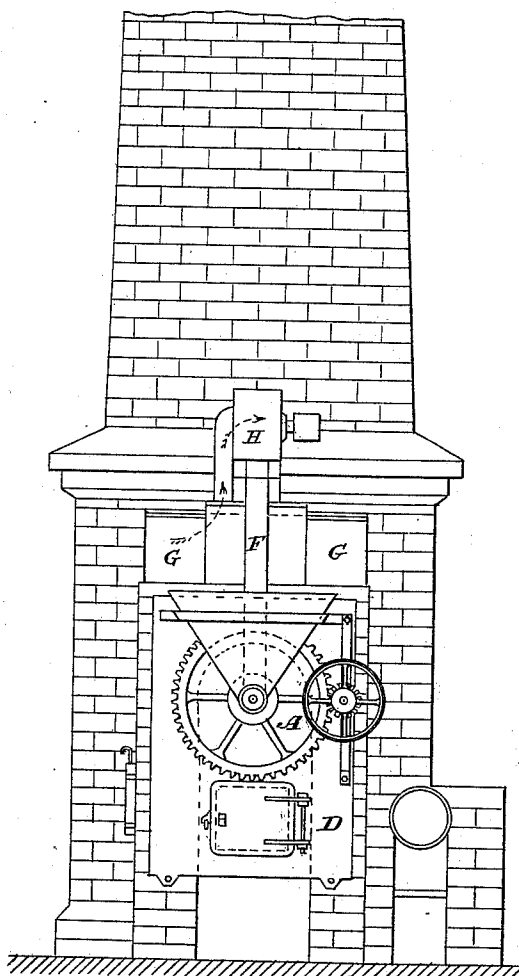
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Fig. 2.



WITNESSES:

E. R. Bolton
E. L. Richards

INVENTOR

Francis Hylton Molesworth

BY

Richardson

ATTORNEYS

UNITED STATES PATENT OFFICE.

FRANCIS HYLTON MOLESWORTH, OF ADELAIDE, SOUTH AUSTRALIA, ASSIGNOR
TO GEORGE SPELLER WRIGHT, CHARLES BALLARD, AND GEORGE MAR-
SHALL, OF SAME PLACE.

PROCESS OF TREATING METALLIFEROUS ORES.

SPECIFICATION forming part of Letters Patent No. 465,872, dated December 29, 1891.

Application filed October 13, 1890. Serial No. 367,900. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS HYLTON MOLESWORTH, analytical chemist, a subject of the Queen of Great Britain, and residing at Adelaide, in the Province of South Australia, have invented new and useful Improvements in the Process of Treating Metalliferous Ores, of which the following is a full, clear, and exact description.

My invention relates to certain improvements in the treatment of metalliferous ores, and more particularly gold and silver bearing or other ores containing sulphides or arsenides. In the following description the process is, for convenience, described with reference to gold-bearing ores, slight modifications of detail being only necessary to render it applicable to silver-bearing and other ores.

The special object of my invention is to provide a means for the more expeditious removal during the process of calcination of the sulphur, arsenic, or other substances which render difficult the extraction of the metals contained in the ores.

The special features of my invention consist in the application of a peroxide to the ores during their calcination, and in the utilization, for the purpose of extracting the gold contained therein, of the resultant fluid obtained by the condensation of the oxidized gases given off during the process. By the use of my invention more rapid decomposition of the sulphides is effected during the calcination than by any method at present in use. As a further advantage, the pyrites or other ores can be roasted at a low temperature, and by this means the formation of the respective salts of the base metals prevented.

While claiming as my invention the application of all peroxides which will answer the purpose, I prefer in use the nitrogen peroxide resulting from the decomposition of crude nitrate of soda by the application of sulphuric or hydrochloric acid and heat. Either of these acids may be used, but, being cheaper, sulphuric acid is preferred. The peroxide thus obtained is introduced into a calciner in which the pyrites or other ores are being roasted by external heat, and is preferably

caused to enter at the outlet from which the ore escapes at the conclusion of the operation. The gases formed in the calciner by the combustion of the oxidized sulphides are carried into a condensing-chamber. The nitro-sulpho-hydrochloric acid therein obtained is used later as a solvent for the separation of the gold from the gangue and the peroxide given off in the operation utilized by being conducted to the calciner.

The term "nitro-sulpho-hydrochloric acid" is a name used by me to express the mechanical mixtures of these acids.

For the purpose of carrying my invention into effect the calciner may either be rotary or of the stationary bed type; but I prefer the rotary form, and more particularly one to which the heat is applied from the outside, and the atmosphere by a forced draft caused to enter at the escape-outlet of the ore. In this form of furnace the oxidizing properties of the atmosphere are utilized to the fullest extent without being neutralized by the gases arising from the combustion of the fuel. By an arrangement of the apparatus I make use also of the heat of the furnace in order to obtain the peroxide given off by the nitrate of soda or other chemical in the presence of the sulphuric or other acid.

In order that my invention may be the better understood, I will now proceed to describe the same in conjunction with an apparatus for carrying it into effect, and by reference to the accompanying drawings, in which—

Figure I is a sectional elevation of the furnace and apparatus complete; Fig. II, a front elevation of the same.

Similar letters refer to similar parts in both figures.

A is a calciner of any description, but preferably rotary, with internal ledges for the purpose of distributing the ore; B, external hopper into which the raw crushed ore is fed in the ordinary way; C, feed-screw or other mechanical device for delivering the ore in regular quantities from the hopper B into the entrance of the calciner A; D, furnace; D', furnace-chamber in which the calciner A revolves; D², opening in the wall of the furnace-

chamber for the purpose hereinafter described; D³, furnace-flues; D⁴, chimney or stack; E, discharging chute or hopper into which the oxidized ore from the calciner A is automatically delivered; F, exhaust-pipe leading from the entrance of the calciner A; G, condensing-chamber connected with the exhaust-pipe F; H, rotary fan or other mechanical exhaust connected with the condensing-chamber G and having an outlet into the chimney or stack D⁴; I, retort, the base of which is placed over the opening D²; I', connecting-pipe leading from the retort I and having its outlet opposite to the outlet of the calciner A; and X is a valve for closing the flue D³ when desired.

The method of carrying my process into effect by means of the before-described mechanical apparatus is as follows: The ore to be treated, having been reduced to suitable fineness by any known means, is fed into the hopper B and introduced in regular quantities by means of the feed-screw C into the entrance of the calciner A. The furnace D being placed underneath the charging end of the calciner A, the ore receives its greatest heat immediately upon entrance. The sulphur and arsenic contained therein readily take fire and are converted into sulphur dioxide and arsenious trioxide, the vapors of which escape through the exhaust-pipe F into the condensing-chamber G, the draft being assisted by the rotary fan or other exhaust H. The flames from the furnace D, filling the chamber D' and enveloping the calciner A, keep its contents at a dull-red heat, the smoke and other products of the combustion of the fuel escaping through the flue D³ into the chimney or stack D⁴. The retort I being placed over the opening D², the heat of the furnace causes the nitrate of soda and sulphuric or other acid with which it is charged to give off nitrogen peroxide. This vapor, escaping from the connecting-pipe I', placed

preferably opposite the outlet of the calciner A, mixes with the atmospheric air, and being drawn therein speedily oxidizes any remaining traces of sulphur or arsenic contained in the ore under treatment. The speed at which the calciner is driven and the temperature of the charge as well as the quantity of peroxide supplied should be regulated according to the class of ore under treatment. The roasted pyrites when escaping into the discharge chute or hopper E will then be perfectly sweet and free from odor or fumes.

The nitrogen peroxide obtained from crude nitrate of soda containing a large percentage of chlorine forms, in combination with the sulphur dioxide in the condensing-chamber G, nitro-sulpho-hydrochloric acid. This liquid I propose to use as a solvent for the separation of the gold from the gangue obtained from the calciner by immersing the heated ore therein until the gold is dissolved.

I also wish it to be distinctly understood that I do not claim any portion of the within-described apparatus as part of my invention; but,

Having now particularly described and explained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

The herein-described process, which consists in calcining ores of precious metals containing sulphides and arsenides, subjecting the roasting ore to the action of nitrogen peroxide, and subsequently passing the resultant gases through water, substantially as set forth.

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

FRANCIS HYLTON MOLESWORTH.

Witnesses:

E. B. COLTON,

Solicitor, Adelaide, S. A.

FRANCIS H. CROW,

Licensed Patent Agent, Adelaide.