

UNITED STATES PATENT OFFICE.

HENRY JOSHUA PHILLIPS, OF LONDON, ENGLAND, ASSIGNOR TO THE
GOLDEN LINK CONSOLIDATED GOLD MINES, LIMITED, OF SAME
PLACE.

EXTRACTION OF PRECIOUS METALS FROM THEIR ORES.

SPECIFICATION forming part of Letters Patent No. 683,325, dated September 24, 1901.

Application filed November 13, 1899. Serial No. 736,872. (No specimens.)

To all whom it may concern:

Be it known that I, HENRY JOSHUA PHIL-
LIPS, Fellow of the Institute of Chemistry, a
subject of the Queen of Great Britain, resid-
ing at 123 Palace Chambers, Westminster,
London, England, have invented certain new
and useful Improvements in or Relating to
the Extraction of Precious Metals from Cer-
tain of Their Ores, of which the following is
a specification.

This invention has for its object improve-
ments in or relating to the extraction of pre-
cious metals from their ores, and relates, pri-
marily, to so treating refractory or rebellious
gold-bearing ores that the gold therein can
then be extracted by means of the well-known
cyaniding or amalgamation or other suitable
processes, and, furthermore, besides effect-
ing the extraction of the gold, other metals—
such as tellurium, arsenic, or antimony—pres-
ent in said ore may be preserved therein and
subsequently also extracted—for instance, in
treating telluride ore according to this inven-
tion the tellurium, arsenic, antimony, &c.,
(or any of them,) as well as the gold, may be
extracted, as hereinafter set forth.

There exists in certain parts of the world,
notably in Hungary, West Australia, and
Colorado, a certain class of gold-bearing min-
erals in which the gold is said to be or ap-
pears to be in actual combination with such
elements as tellurium, arsenic, antimony, &c.,
and hitherto it has been found necessary or
usual to subject such ore to a preliminary
roasting before treatment by the well-known
cyanid or chlorination process. Now accord-
ing to the present invention such preliminary
roasting can be and is dispensed with, and
the elements which are combined with the
gold are dissolved in the manner and by the
means hereinafter described, thus dissociat-
ing the gold from its combinations, and there-
by rendering the gold free to be acted upon
and extracted by any well-known cyanid or
other suitable process for recovering free gold
from the ore.

According to the present invention it has
been found that if ores containing telluride,
arsenide, or antimonide of gold (or such like
gold-bearing ores) be acted upon under heat

and pressure by a weak or dilute solution of
the polysulphids of the alkalies or alkaline
earths—say 0.5 to three per cent. of the poly-
sulphid in solution—the said weak solution will
have a selective action and will dissolve such
elements so combined with the gold without
dissolving the gold or only an inappreciable
amount thereof, (if any,) thus leaving prac-
tically the whole of the gold in a free metal-
lic state, which can then be treated by the
well-known cyanid or other desirable proc-
ess for recovering gold. For instance, the gold
having thus been dissociated from its com-
binations the latter may now be washed out
of the ore, leaving its gold in the free metal-
lic state in the ore, and the whole of the free
gold in the ore can then be treated by cyanid-
ing, &c., as aforesaid.

It is an object of the present invention to
use only sufficient polysulphid, under heat and
pressure, to exercise a selective action upon
and dissolve the elements which are combined
with the gold without dissolving the gold
itself.

This invention may be carried out as fol-
lows: The ore to be treated is first reduced
to powder or a finely-comminuted condition
and placed in any suitable vessel or recepta-
cle capable of being tightly closed and when
closed of withstanding considerable pressure
when the mixture is heated. The ore is mixed
with the weak polysulphid solution—say about
equal weights of the solution and of the ore—
and the vessel or receptacle having been
sealed or tightly closed the ore is now heated
in said vessel by any suitable means to a suit-
able temperature—say about 100° to 200°
centigrade—and maintained under said heat
and the consequential pressure until such
elements which are combined with the gold
have been dissolved. The dissolving of said
combinations is effected very rapidly under
the heat and pressure—say in one to three
hours, depending, however, upon varying
conditions, notably the temperature employed
and the facilities provided for mixing or stir-
ring the ore while same is being acted on.
For instance, if the ore be placed in a revol-
ving drum and heated to, say, 200° centigrade,
or thereabout, the solution of the combina-

tions would be much sooner accomplished than if the mixture were heated to 100° centigrade only without agitation of the mixture.

As a modification of the foregoing process
 5 the ore in the condition hereinbefore described and the aforesaid weak or dilute solution hereinbefore described may be placed together in a suitable vessel or receptacle capable of being sealed or tightly closed (ad-
 10 vantageously a receptacle of very large size) and allowed to remain in said vessel for a prolonged period out of contact with the external air and without applying artificial heat or pressure, (or only very moderate heat or
 15 pressure may be applied—for instance, the closed vessels may be exposed to the heat of the sun with a view to shortening such period,) and ultimately the gold will be dissociated and its combinations dissolved, and
 20 the former can then be recovered by the ordinary cyaniding or other suitable process, as aforesaid.

The amount of the polysulfid employed in the aforesaid weak solution is proportioned
 25 according to the amount of and nature of the constituents of the ore soluble in said solution, this proportion being determined either from the known constitution of said ore or ascertained by chemical analysis of said ore.
 30 For instance, with an ore containing tellurium in other states than as well as telluride of gold, such tellurium, as well as the tellurium combined with the gold, will be dissolved,

and therefore a sufficient amount of polysulfid must be introduced to dissolve all such
 35 tellurium, but always such polysulfid must be introduced in such a weak solution as not to dissolve the gold, and for this purpose any amount of the said weak solution may be in-
 40 troduced until the combined gold has been dissociated. This also applies equally in the case of antimony or arsenic in the ores.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

45 The herein-described method of extracting precious metals from refractory sulfid or telluride ores without roasting; which consists in subjecting the ore without roasting and in the form of a powder—under heat and pres-
 50 sure—to the action of alkaline polysulfids in solution of such weakness that same will have a selective action namely will dissolve the elements which are combined with the gold and for which the polysulfids have a greater
 55 affinity than for gold without dissolving the gold itself which latter is thus dissociated and can then be recovered by any known suitable process for recovering free gold.

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

HENRY JOSHUA PHILLIPS.

Witnesses:

FRANCIS W. FRIGOUT,
 H. D. JAMESON.