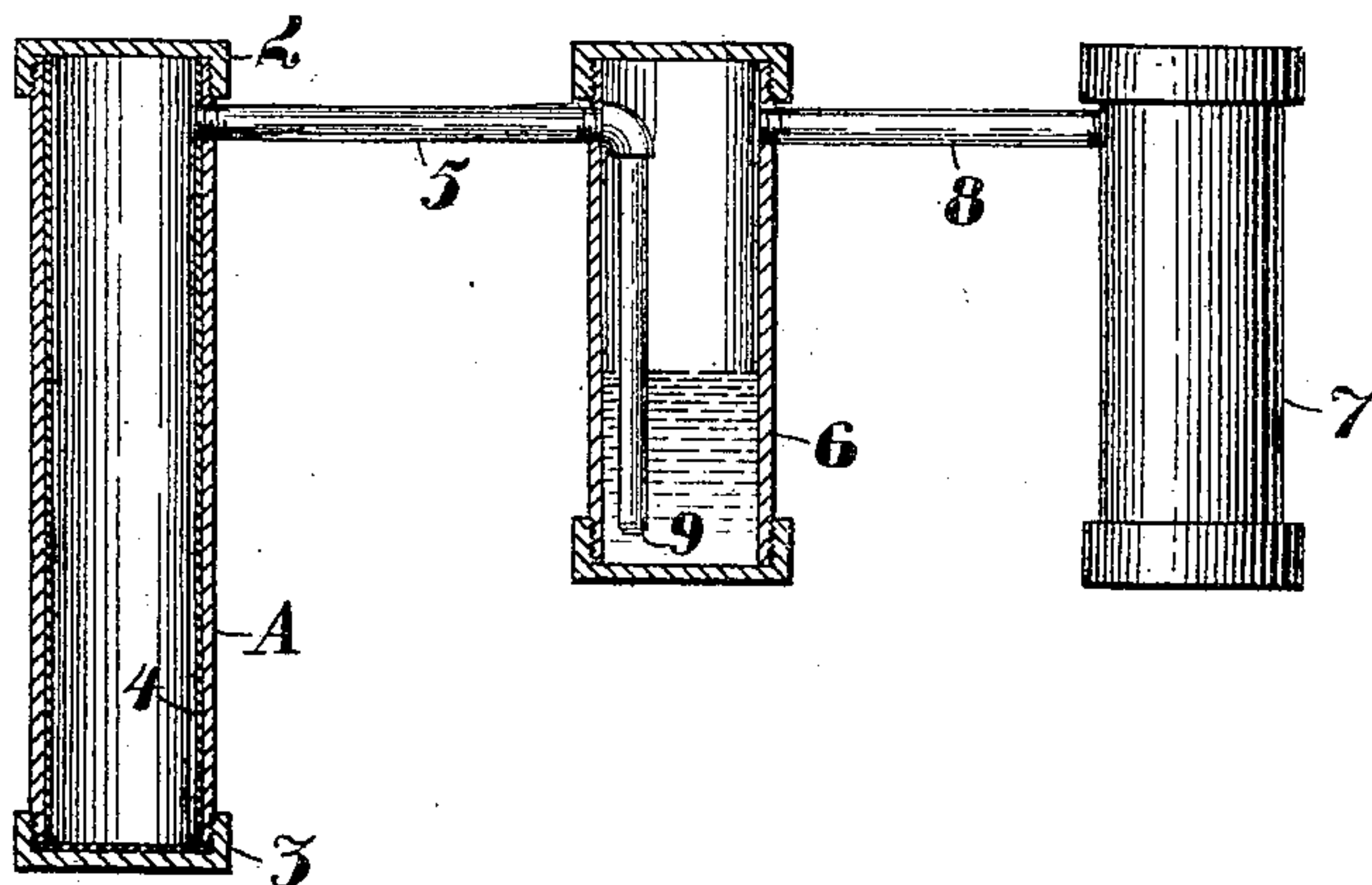


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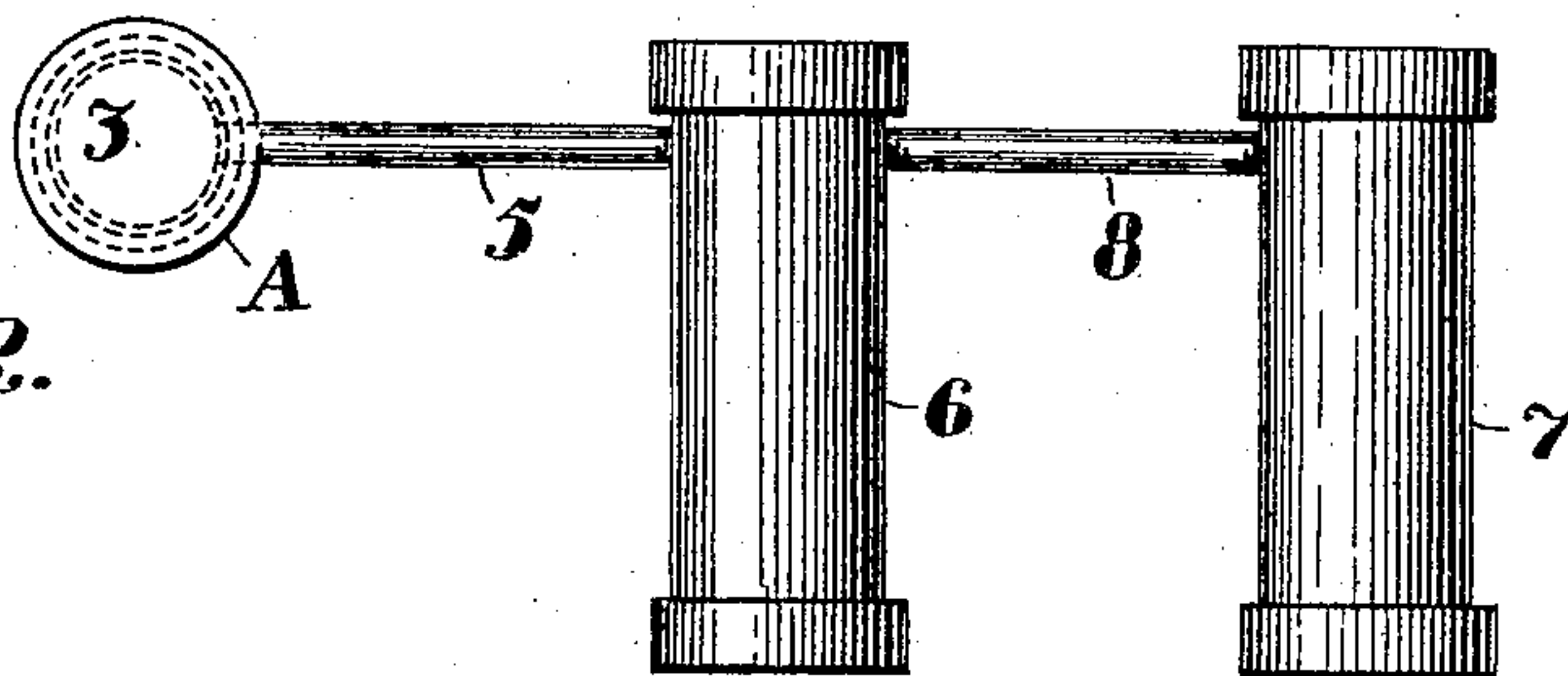
PATENTED JULY 25, 1905.

W. T. ARMSTRONG.  
ORE REDUCING APPARATUS.  
APPLICATION FILED FEB. 23, 1904.

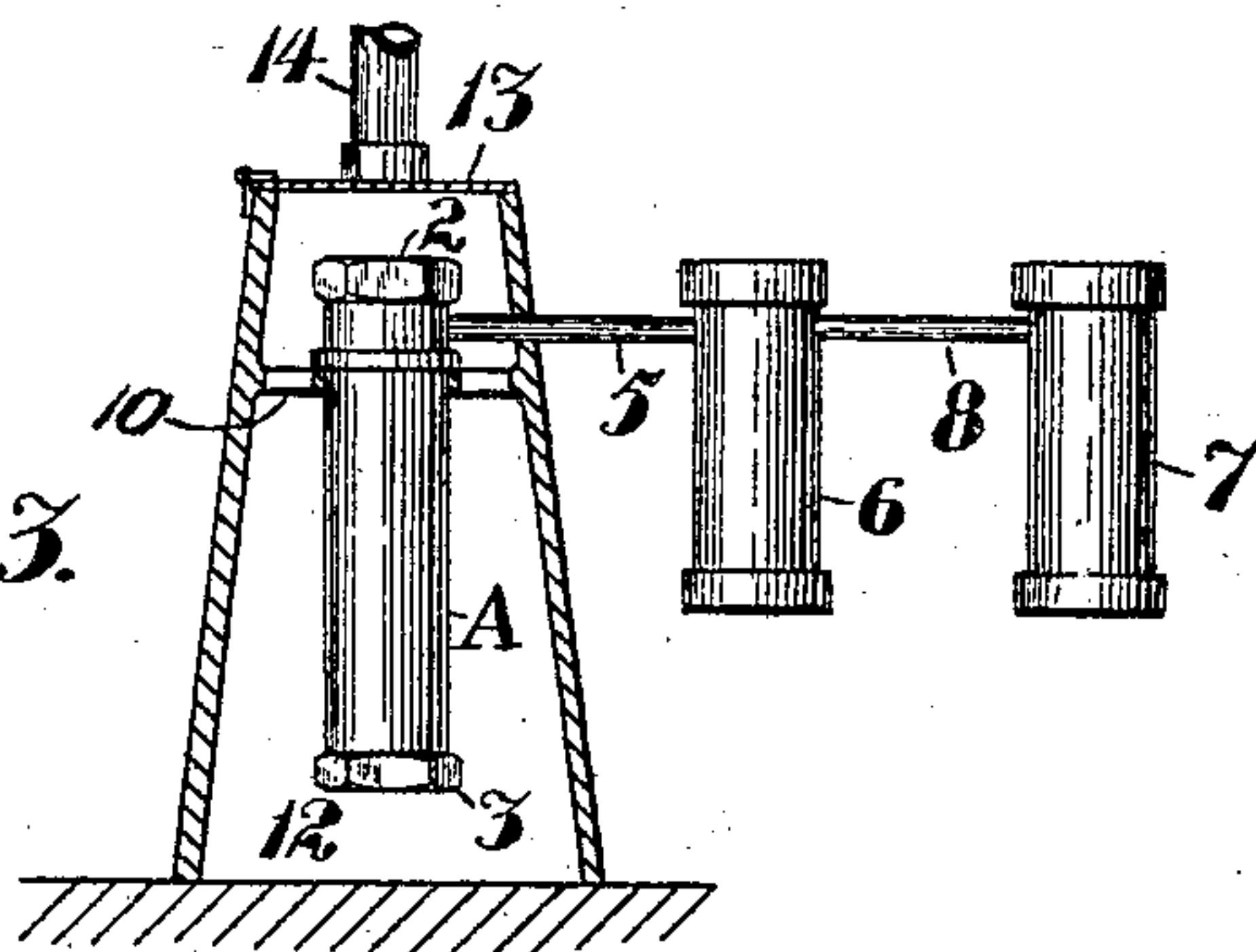
*Fig. 1.*



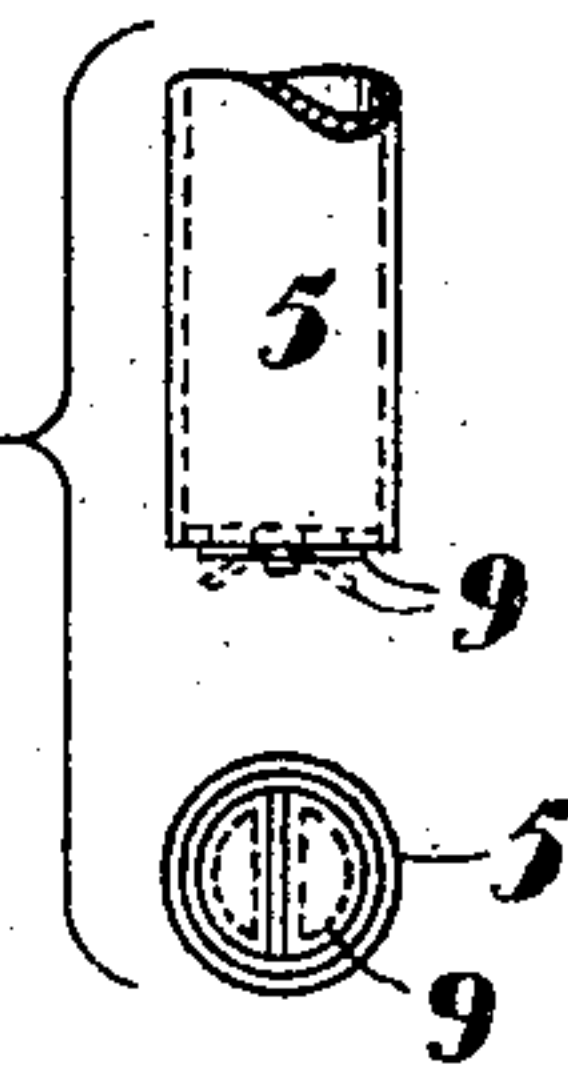
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



Witnesses:  
F. C. Fiedner  
J. H. Source

Inventor,  
William T. Armstrong  
By Geo. H. Strong. atty



# UNITED STATES PATENT OFFICE.

WILLIAM T. ARMSTRONG, OF SAN JOSE, CALIFORNIA.

## ORE-REDUCING APPARATUS.

No. 795,471.

Specification of Letters Patent.

Patented July 25, 1905.

Application filed February 23, 1904. Serial No. 194,786.

*To all whom it may concern:*

Be it known that I, WILLIAM T. ARMSTRONG, a citizen of the United States, residing at San Jose, in the county of Santa Clara and State of California, have invented new and useful Improvements in Ore-Reducing Apparatus, of which the following is a specification.

My invention relates to an apparatus for reducing ores and separating and recovering therefrom the valuable metallic and other ingredients. Its object is to provide a simple portable roasting-furnace for use of prospectors and others.

It consists of the parts and the construction and combination of parts, as hereinafter more fully described, having reference to the accompanying drawings, in which—

Figure 1 is a view in partial section of my invention. Fig. 2 is an end view of the retort with condensers shown in elevation. Fig. 3 is a modification. Fig. 4 is a detail of the valve.

My present invention is designed as an improvement upon an apparatus patented to me April 15, 1902, No. 697,774.

In my present apparatus I employ a receptacle or retort A, which may be made tubular, as being the most convenient form, and may have a cap or cover 2, adapted to screw or otherwise fit upon the upper end. If the apparatus be intended for charges of large size, as in Fig. 1, there may also be a similar cover or removable door 3 at the bottom, so that charges may be introduced from above and after being subjected to a light heat, (preferably that of a light fire,) as will be hereinafter described, the reduction being completed, the material can be discharged from the lower opening. The apparatus may also be so mounted as to be tiltable, in which case the receptacle will be permanently closed at the bottom, and the discharge may take place by inverting the apparatus.

In carrying out my invention I first form a lining for the tube or retort, such as shown at 4. This lining may be made of paper or wood veneer or equivalent flexible fiber, which can be fitted to the interior of the retort and which by the action of heat without the admission of air may be reduced to a carbonaceous form. This envelop forms a lining within which the ore, pulverized to any suitable degree, is placed. In conjunction with this ore I also introduce a certain amount of material which may be also reduced to carbonaceous form, such as ordinary wood, in

pieces of suitable size until the retort or receptacle has been filled. The top is then placed upon the receptacle, and connection is made with the upper part of the receptacle by means of a tube, as at 5, which leads to a condenser, as 6. This condenser may be made of any suitable or desired material which will serve the purpose and contains a body of water, into which the pipe 5 dips sufficiently to deliver any fumes or gases arising from the distillation or action within the retort, so that these fumes may be entirely or partially condensed. The pipe 5 is threaded into the retort or otherwise provided with a swivel connection therewith, so that in a small prospector's outfit the retort may be turned horizontal and laid on a couple of rocks, with the condensers resting on the ground, the fire being built up around the retort. If the action of the first condenser is not sufficient to complete the operation, a second condenser, as 7, may be employed. A pipe 8, leading from the upper part of the first condenser, will convey any uncondensed fumes and deliver them beneath the surface of the water in the second condenser in the same manner as described for the first one. Thus any series or number of condensers may be employed.

In order to prevent backflow of liquid from the condensers to the retort at the conclusion of the roasting operation and incident to the cooling of the retort, I may interpose a suitable thick valve 9 in the end of pipe 5, as shown; otherwise there would be danger of an explosion.

The operation will be as follows: The ore, properly pulverized and mixed with the woody or other carbon-forming material, is introduced into the retort or receptacle, which has first been lined with paper, wood, or equivalent carbonaceous material. The retort is so located that a light fire may be built about it. If found desirable, a proportion of niter in any suitable form may be added to the mass. Heat being applied, the inclosing envelop and the wood or other fiber within the retort will be gradually reduced to a carbon, and oxygen, which will be found in combination with much of the ore, will be released and uniting with the carbon will form carbon dioxide. The ore will by this process be reduced to a friable mass which may, when removed from the retort, be dissolved, and the substances contained in the ore—such as gold, silver, and the like—may be recovered by well-known proc-



esses for the recovering of such metals. It often occurs that portions of the vapors or gases produced by the heat of the ore in this manner are of such character that it is desirable to condense and recover them. This is notably the case in the roasting of ores containing quicksilver. I have therefore employed the condensers and connecting-pipes, as previously described, and such vapors passing from the retort will by successive passages through the condensers, as shown, be reduced to a metallic form or otherwise condensed within the water, so that they can afterward be recovered, if desired. In Fig. 3 I have shown a convenient means of installing a small roasting plant of this description. The retort, which may be of any suitable size and capacity, is suspended vertically by any convenient means, as the support or spider 10, in the space within the furnace 12. This furnace may be made of brick or loose stones roughly plastered over with mud, the crude materials at the hand of the prospector sufficing for the purpose. A suitable space beneath the retort and between the retort and the walls of the furnace is left for the wood charge. The furnace is in the form of a hollow truncated cone with a loose pivoted cover-plate 13 fitting over the otherwise open top. This plate may be perforated and provided with a short section of stovepipe 14 to create a draft within the furnace. When a fire is

built in the furnace, the heat will entirely envelop the retort, soon reducing the contained ore, the vapors passing off through pipe 5 to the condensers. When the ore charge has been reduced and the apparatus allowed to cool sufficiently, the bottom 3 of the retort is opened to effect discharge. The bottom is then screwed on and a fresh charge inserted at the top by removing cover 2.

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

In a portable apparatus of the character described, a tube of uniform diameter threaded at the ends, removable closures for said ends and rendering the tube substantially air-tight, said tube having an inner lining capable of being reduced to a carbonaceous form by heat, a condenser, and a pipe leading from the tube to the condenser said tube adapted to contain a body of carbon-forming material mixed with ore, and said pipe having the end within the condenser provided with a check-valve to prevent backflow into the tube.

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

WILLIAM T. ARMSTRONG.

Witnesses:

J. R. COLE,

A. G. WILKINS.