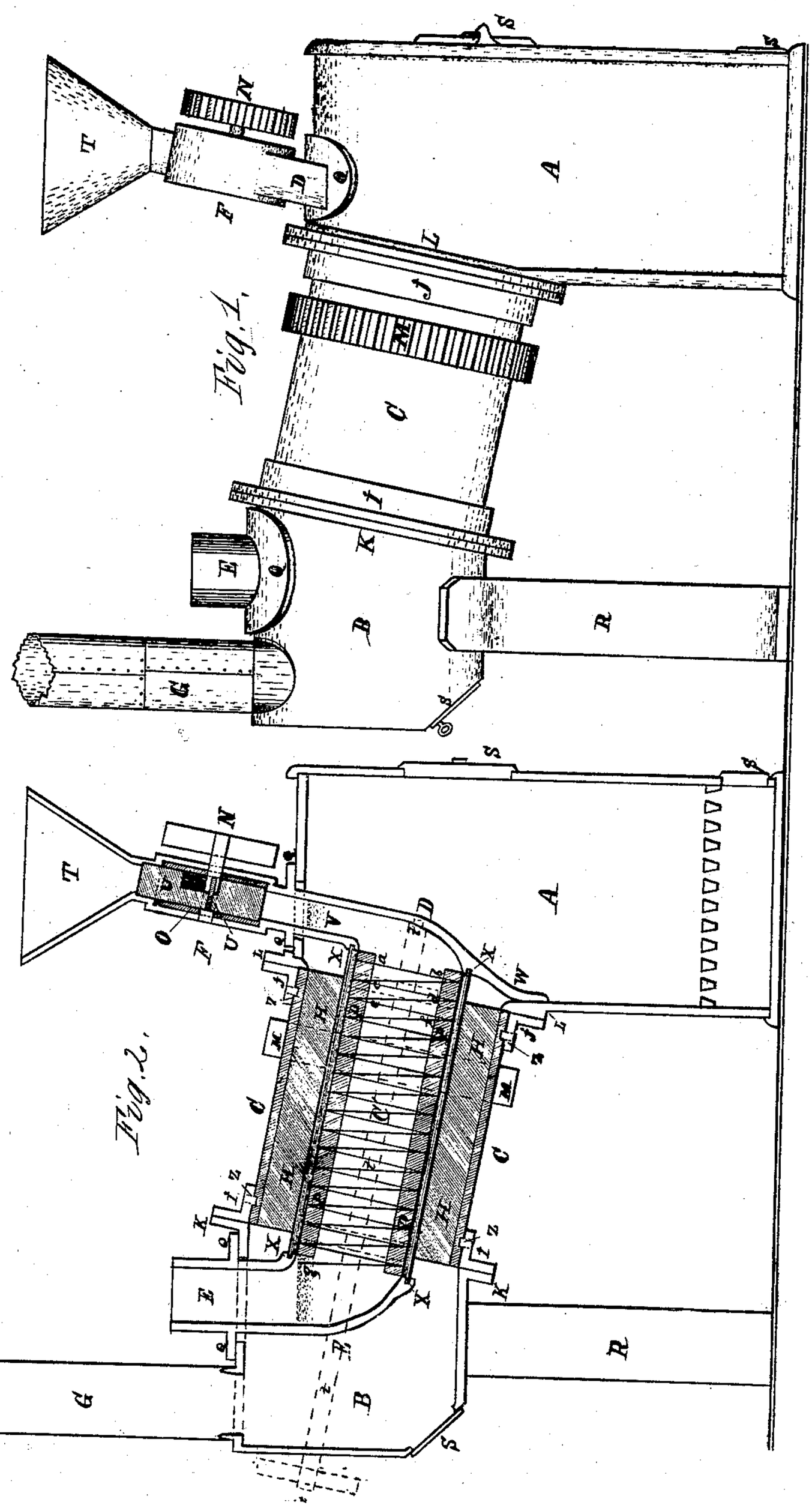
2. Sheets. Sheet 1.

E. A. Hyde,

Amalgamator.

No. 99,571. Patented Feb. 8. 1870.



William J. Erdman
Edward R. Slawson. } Witnesses.

Edward A. Hyde.
Inventor.

E. A. Hyde,

2 Sheets, Sheet 2.

Amalgamator.

No. 99571. Patented Feb. 8. 1870.

Fig. 5.

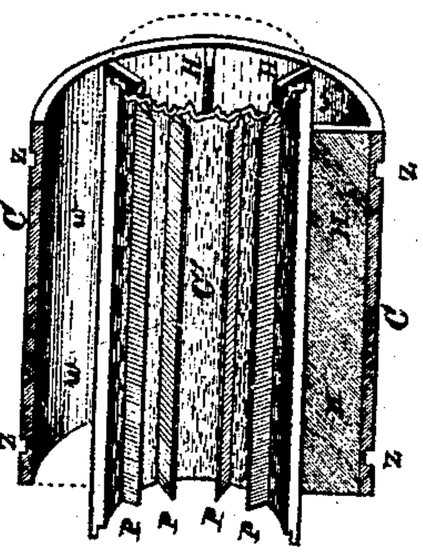


Fig. 7.

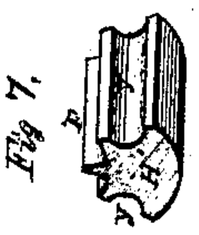


Fig. 3.

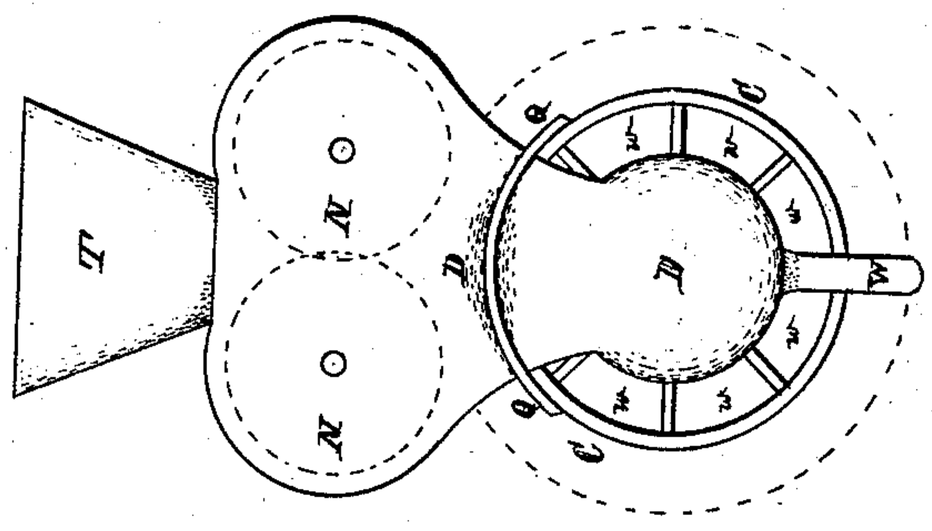


Fig. 4.

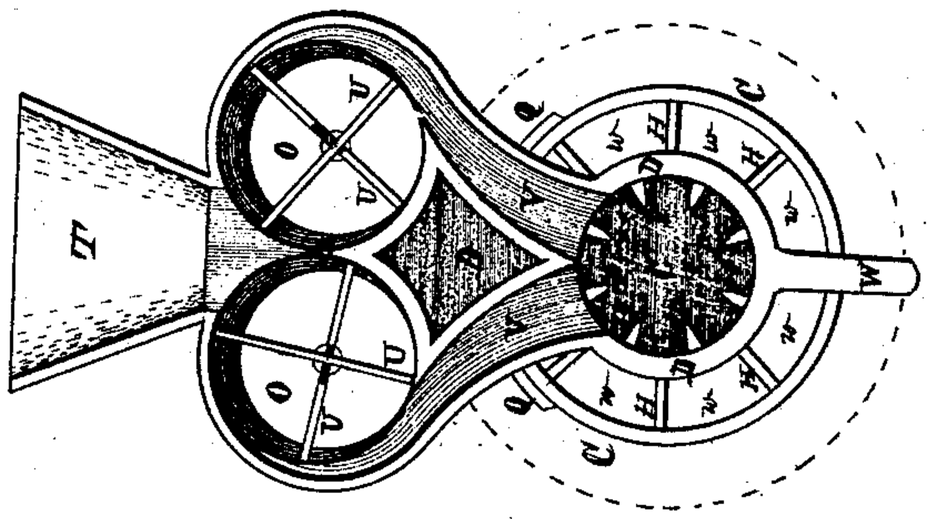


Fig. 8.

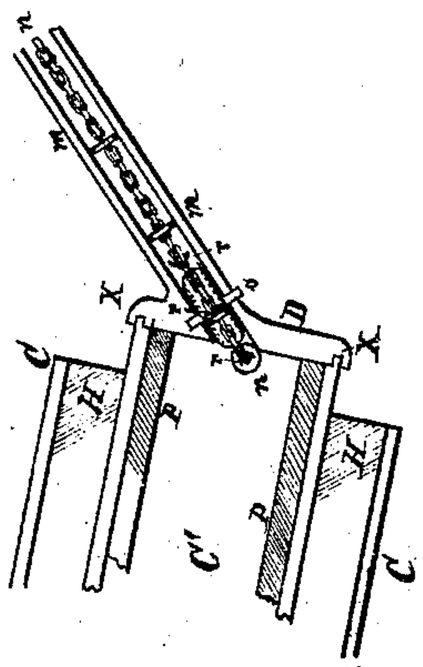
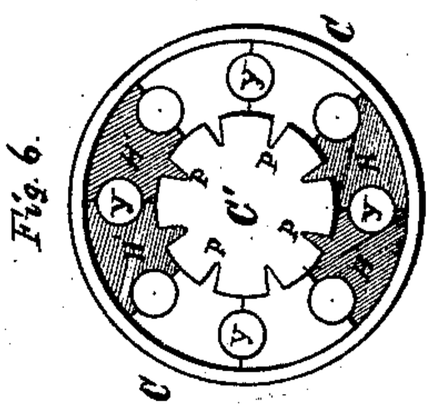


Fig. 6.



William J. Erdman
Edward R. Slawson } Witnesses.

Edward A. Hyde,
Inventor.

United States Patent Office.

EDWARD A. HYDE, OF ANN ARBOR, MICHIGAN.

Letters Patent No. 99,571, *dated February* 8, 1870.

IMPROVEMENT IN APPARATUS FOR SEPARATING GOLD AND SILVER FROM PULVERIZED QUARTZ.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, EDWARD A. HYDE, of Ann Arbor, in the county of Washtenaw, and State of Michigan, have invented a new and improved Mode of Separating Gold and Silver from Pulverized Quartz; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, making a part of this specification, in which—

Figure 1 is a perspective view of the entire apparatus, except the machinery for running it.

Figure 2 is a sectional view of the same.

Figure 3 is a perspective end view of the feeding-apparatus, showing how the same sits over the end of the cylinder which contains the lead, making one of its heads.

Figure 4 is a sectional view of the same.

Figure 5 is a perspective inside view of the cylinder C′ when made of iron.

Figure 6 is a perspective view, showing my method of lining the cylinder C with fire-bricks of such a pattern as that an inner cylinder, C′, is made for the lead, and also a series of flues, Y Y Y, through the bricks, between the lead and the outer cylinder.

Figure 7 is a perspective view of one of the above-mentioned fire-bricks.

Figure 8 shows the method by which an endless chain is used as a feeding-apparatus, instead of the device shown in figs. 1, 2, 3, and 4.

A is the furnace.

B, the cinder-box.

C, the outer cylinder.

C′, the cylinder which contains the lead.

D, the feeding-head.

E, the waste-head.

F, the feeding-apparatus.

G, the smoke-stack.

H, partitions between the outer and inner cylinder, dividing the space between them into flues leading from A to B.

w w w w are these flues.

I J are sockets, bolted to the heads K L, and serve as supports for the cylinder C.

M, the cog-wheel, by which the cylinder is rotated.

N, cog-wheels, (in fig. 3 by dotted lines,) which rotate the feeders O.

P, parallel vanes, running along the inner surface of C′, attached to it, or separate.

Q, flanges, by which the heads D and E are bolted to A and B.

R, a support for the cinder-box.

S, doors.

T, the hopper.

U, sliding eccentric arms, which force the pulverized quartz down the channels V into the lead, which rises as high in the heads E and D, as indicated by the dotted shading near the letters V and *g* in fig. 2.

W, a brace, running down from D, and bolted to L.

X, grooves, in the heads D and E, into which the ends of the cylinder C′ set.

Z, grooves around the cylinder C, into which screws are set, fastening A and B to the cylinder.

a b c d e f g, and the zigzag line from *a* to *g*, represent the course of the pulverized quartz in passing through the lead as the cylinder revolves.

Y, flues through the fire-bricks.

H′, the fire-bricks, of the pattern shown in fig. 7.

m m represent one of the two spouts in which the endless chain *n n* runs, passing over the wheel *o*.

This chain has floats or pistons at regular intervals, which carry the quartz down into the lead in C′.

The spout, in which the chain returns, (not shown in fig. 8,) has a larger bore than the other, so as to allow the lead to flow off from the pistons, and not be carried up to the hopper.

The wheel *o* has the prongs or forks *r r r* to hold the chain in place.

In fig. 2, the dotted lines *t t t*, through the centre of C′, represent the shaft by which the vanes P are rotated, when the inclined cylinder is made to be stationary.

The cylinder lined with fire-brick, as in figs. 6 and 7, is intended for use when the quartz or ores contain chemical elements which would be destructive to the inner iron cylinder C′.

The operation of my invention is as follows:

Blocks of lead having been introduced into C′, through E, a fire is built in A. When the cylinder C′ and heads D and E have become as full of melted lead as indicated in fig. 2, the cylinder C is made to revolve by means of gearing connected with the wheel M. At the same time the wheels N are rotated by the same power that rotates M.

Now, let a stream of the pulverized quartz into the hopper T, and the quartz will be forced down the channels V by the arms U. As the quartz collects at the bottom of V, it will be taken by the vanes P, and carried by them around to the bottom of the cylinder, *i. e.*, from *a* to *b*. When arrived at *b*, the specific gravity of the quartz being less than that of the lead, it will rise perpendicularly, or to the point *c*, because my cylinder is inclined at an angle of about twelve degrees. From *c* it will pass around again to *d*, and then up again to *e*, and so on to *g*, and finally out of the lead through E.

It will be seen that by this means, with a cylinder of lead only one foot in diameter, and three feet in length, the quartz is made to pass through a distance of about seventeen feet of melted lead. By regulating the rate at which my cylinder revolves, the quartz will remain in the lead a longer or shorter time, as may be desired. The quantity of quartz introduced is also regulated at pleasure.

The atmosphere is excluded from the lead, because the surface in D and E is covered with the quartz. If necessary, a stream of water may be directed upon the outside of the cylinder C, so as to keep the temperature reduced, and prevent the same from sagging or bending by reason of the great weight within.

The inclination of the cylinder is that which causes the quartz to pass through it, and the speed with which it runs through will be governed by the degree of inclination. The quartz is held between the vanes P until it arrives at or near the bottom, when it will rise perpendicularly. The quantity forced through will be governed by the speed of the feeders O, or the chain *n n*.

When the device shown in fig. 8 is used for a feeder, the quartz is carried down through the spout by the floats or pistons, and liberated as soon as the lowest point of the curve is reached. The wheel *o* has its outer edge rounded, so as to allow the quartz to rise freely. The chain is carried by a forked wheel above the hopper.

Still another method of making the quartz pass through the lead in the inclined cylinder, is to rotate the vanes P by means of a shaft running through the centre of C′, leaving the cylinder stationary. This shaft has bearings in the heads D and E, and passes out through the cinder-box B, as shown by the dotted lines *t t t t* in fig. 2.

Again, the cylinder may be used inclined or horizontally, with a rotating spiral vane or screw, instead of the vanes P, the cylinder being stationary. An inclined rotating cylinder will work without either vanes or screw.

Again, the cylinder may be inclined or horizontal, and rotated, having attached to its inner surface the threads of a screw, or a spiral vane.

All reference to a screw or spiral vane in this specification is intended to describe simply the thread of a screw without the body, or a vane like one of those marked P in figs. 2, 4, 5, and 6, but longer, and wound spirally, making a thread about two inches high, and from three to six inches apart. When the spiral is rotated separately, it is attached to the shaft *t t t*. When not, it is fastened to the inner surface of C′, and the shaft is dispensed with.

The operation results in the formation of an amalgam, constantly growing richer and richer by the intimate commingling and actual contact of the lead with every added particle of quartz.

When the process has been carried on long enough, the lead is drawn off through an opening in the head D, by the introduction of a spout or tube through the furnace-door. The separation of the gold or silver from the lead is now an easy matter.

The great advantages of this method are, that the quartz is both kept a long time in the hot lead, and is also being constantly stirred, and divided, and commingled from first to last.

Other advantages are, that this machine is able to keep the lead at a higher heat, without injury to itself, than any method yet discovered, and will run through tons of quartz, where other processes would fall short of a half ton.

My castings are made heavy, and are annealed. Wrought-iron can also be used in the manufacture of every part.

If necessary, the heads D and E may be surrounded with a jacket, with water between the head and jacket to prevent sagging by overheating.

The different modes of constructing and operating the cylinder C C C′, are as follows:

Inclined and rotating, with vanes attached.

Inclined or horizontal and rotating, with screw attached

Inclined and rotating, without vanes or screw.

Inclined and stationary, with vanes rotating.

Inclined and stationary, with screw rotating.

Horizontal and stationary, with screw rotating.

All the foregoing modes are practicable, both when the cylinder is made entirely of metal, and also when an outer cylinder of metal, lined with fire-brick, is used.

This same apparatus may be used with hot mercury instead of lead, by tightly connecting the waste-head E with a large iron tank, in such a manner as that the waste quartz will readily flow into the tank. This tank must be tight, so that there will be no waste of mercury by vaporizing.

There must also be a condensing-pipe running from the head E, and terminating in a coil immersed in cold water, to conduct off the vapor, and prevent explosion.

What I claim, and desire to secure by Letters Patent, is—

1. The cylinder C C C′, constructed as described, in combination with the heads D and E, substantially as set forth.

2. In combination with the cylinder C C C′, the feeding-apparatus, containing the wheels O O, with eccentric sliding arms U U, substantially as and for the purpose described.

3. In combination with the cylinder C C C′, the feeding-apparatus, containing the endless chain with floats or pistons, substantially as and for the purpose described.

4. In combination with the cylinder C C, the fire-brick H′, substantially as set forth.

EDWARD A. HYDE.

Witnesses:

W. J. ERDMAN,

GEO. L. WEED, Jr.