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G. J. FIRMIN & T. A. D. FORSTER.

Amalgamator.

No. 202,804. Patented April 23, 1878.

Fig. 1

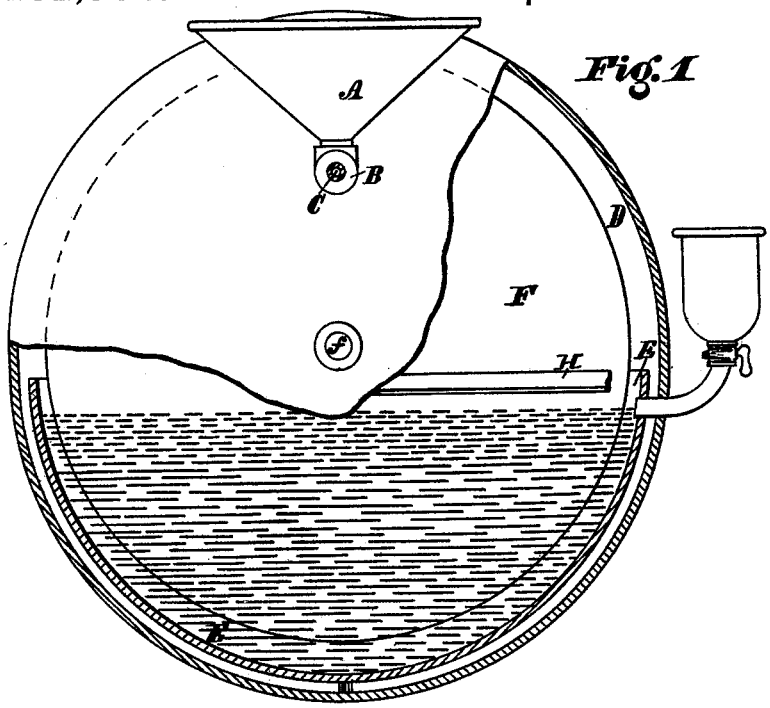
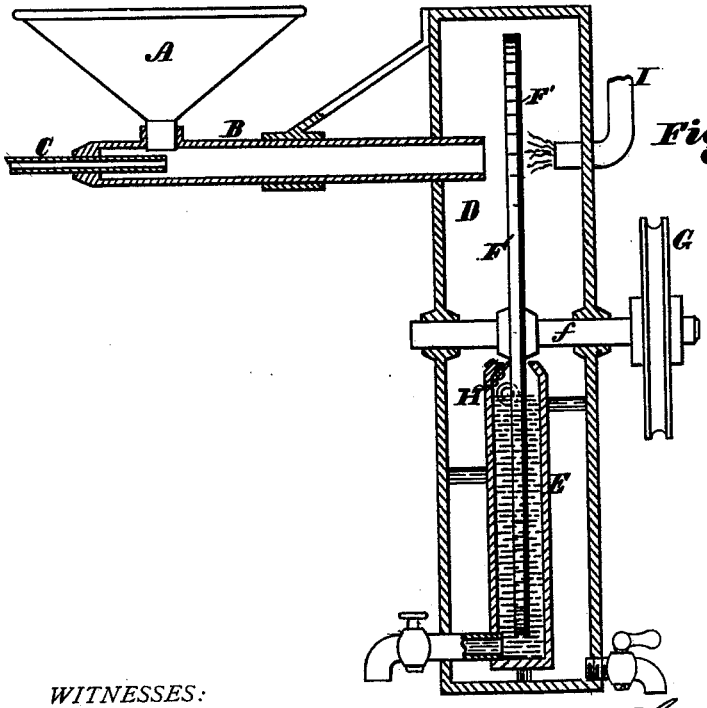


Fig. 2



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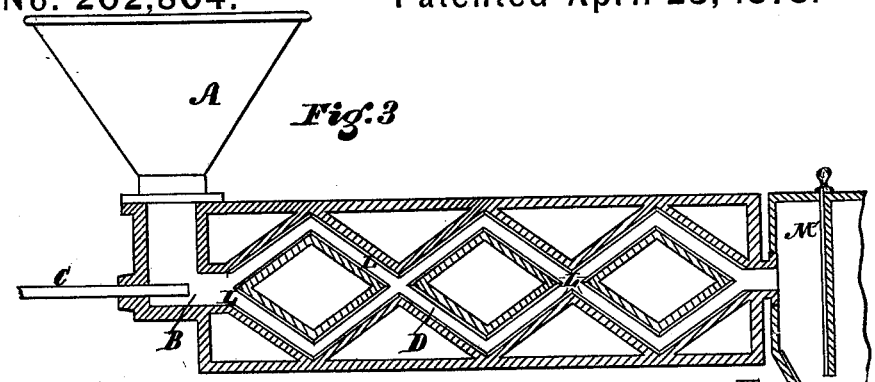

Fig. 3

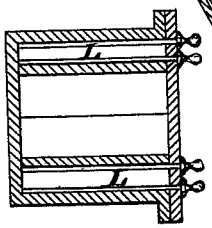

Fig. 4

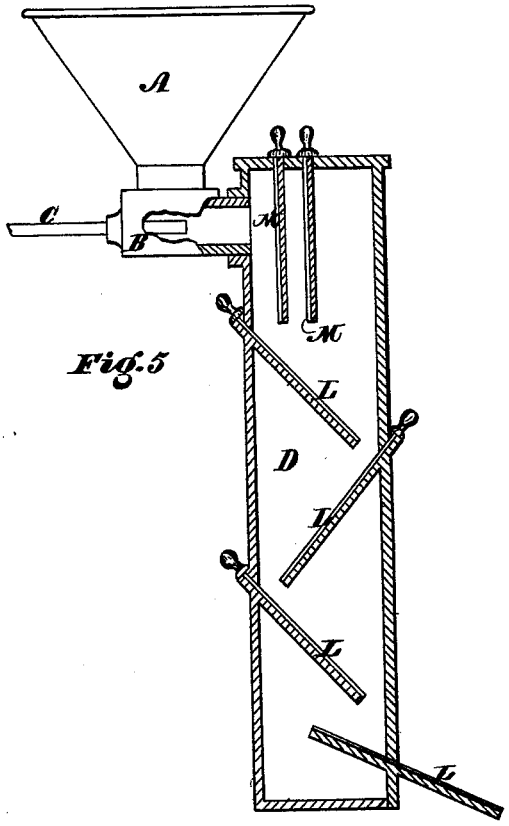

Fig. 5

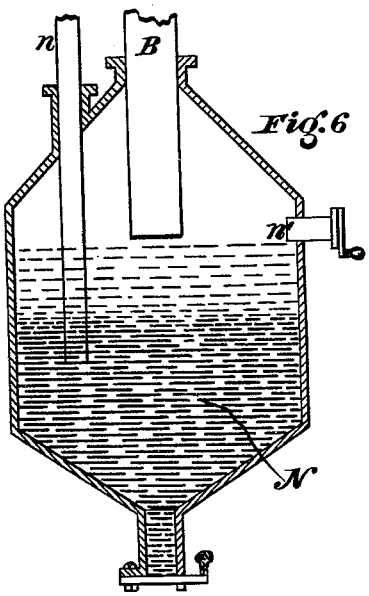

Fig. 6

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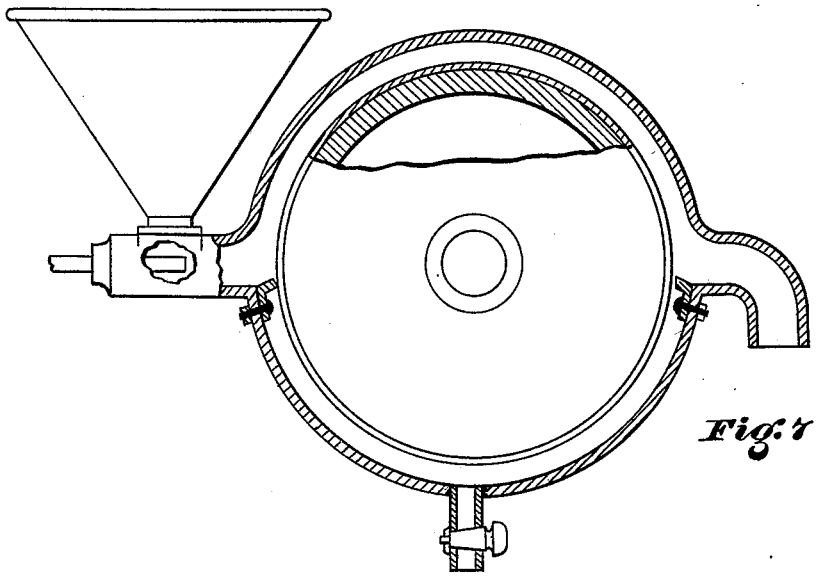
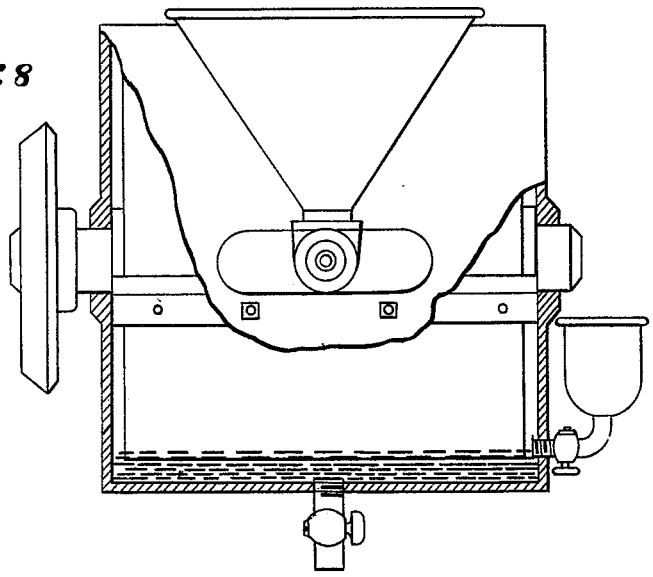


Fig. 7

Fig. 8



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UNITED STATES PATENT OFFICE.

GEORGE J. FIRMIN AND THOMAS A. D. FORSTER, OF NORRISTOWN, PA.

IMPROVEMENT IN AMALGAMATORS.

Specification forming part of Letters Patent No. **202,804**, dated April 23, 1878; application filed January 14, 1878.

To all whom it may concern:

Be it known that we, GEORGE JORDAN FIRMIN and THOS. A. D. FORSTER, of Norristown, in the county of Montgomery and State of Pennsylvania, have invented certain new and useful Improvements in Processes and Apparatus for Amalgamating Ores; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use it, reference being had to the accompanying drawings, which form part of this specification, in which—

Figure 1 is a longitudinal vertical section of our improved apparatus. Fig. 2 is a transverse vertical section; Fig. 3, longitudinal vertical section of modification; Fig. 4, transverse section of Fig. 3. Figs. 5 and 6 are vertical sections of modifications; and Figs. 7 and 8 are, respectively, a vertical section and an end view, partly broken away, of another modification.

Our invention consists in the process of amalgamating metals by forcibly projecting the ore containing said metals against amalgamated plates, or into a vessel of mercury, and in the peculiar construction and combination of parts constituting the apparatus whereby said process is carried into effect.

In practicing our invention, pulverized or finely-ground ore is fed in proper quantities, and in the form of a stream, into a tube or cylindrical chamber, wherein a strong forward or longitudinal current is produced by a jet of steam, air-blast, or other equivalent medium. Within this tube or cylinder, or in a chamber beyond and communicating with it, is placed a series of amalgamated plates, or a revolving amalgamated disk, or a trough of mercury. The ore, falling into the tube or cylinder from the hopper, is carried swiftly along in the form of a sand-blast by the steam, air, or other motor, and projected against the amalgamated plates or disk or into the trough of mercury. Where the plates or disk are employed, the precious metals adhere thereto, and are duly removed by scraping. Where the ore is blown into or against the mercury-bath, the metals amalgamate with such mercury, while the refuse material rises to the surface, and is carried off by a water-supply provided for that purpose.

Referring to the accompanying drawings, A designates the ore-hopper, and B a tube or cylindrical vessel, into which it feeds its contents. C is a pipe for conveying steam, compressed air, or other equivalent medium for creating a current in the tube B, and carrying the ore fed thereinto along in the form of a blast. D is a chamber, communicating with or forming a continuation of the cylinder or tube B; and E, a vessel for containing mercury, located therein. F is a wheel or disk, mounted on a shaft, *f*, and arranged relatively to the tube or cylinder B, in such manner that the ore projected from or through the latter will strike upon that part of said disk above a line drawn horizontally through its center. Said disk is also so arranged that one-half, or about one-half, of its surface will be constantly submerged in the mercury contained in the vessel E. G is a pulley or gear-wheel on the shaft *f*, by means of which a slow revolving motion is communicated to the disk F. Said disk F is composed of copper, provided, by preference, with an iron backing, F′. H represents a scraper or brush, for removing the amalgamated metals from the disk F.

The operation is substantially as follows: The disk F, revolving in the mercury-bath, becomes amalgamated or obtains an amalgamating surface. When the ore is projected from the tube or cylinder B, the precious metals therein adhere to such surface and are carried down into the bath, the refuse matter, or ore deprived of the precious metals, falling away from said disk into any convenient receptacle. The metal so adhering to or amalgamating with the disk or surface of the disk F will be removed by the action of the mercury in the bath in the passage of said disk through the latter. Any metal not so taken off from said disk will be removed by the brush or scraper H, and thrown back into the mercury-bath.

When steam or other heated motor is employed as the medium for creating the ore-blast, to counteract its heating effect upon the disk F a current of water may be admitted through a pipe, I. This water-current will also serve as a washer to separate the mercury from the refuse part of the ore which may happen to drop into the mercury-bath, and, through its discharge, will carry off such refuse matter.

In lieu of, or in connection with, the revolving disk F, obliquely arranged, amalgamated plates L may be employed; and in connection with such oblique plates, vertical plates M M, amalgamated, may be substituted for the disk F. Said plates L and M collect upon their surfaces the precious metals contained in the ore projected upon or against them, the refuse or earthy matter of such ore falling away. To detach the precious metals from such plates, the latter are made removable by any appropriate means, as by sliding out through openings in the tube B or chamber D.

The object of providing two of the plates M is to have one always in position when the other is removed for scraping, as it is obvious that, owing to the position of said plates, the ore can be projected against but one of them at a time.

In Fig. 6 is shown another modification, wherein the ore projected by the steam or motive blast is conducted into a vessel containing a bath of mercury. (Shown at N.) The tube through which the ore is carried terminates sufficiently close to the surface of the bath to dash its contents into said bath, the metals sinking into and amalgamating with the mercury, while the waste ore or refuse matter rises to the top of the latter, and is carried off by the water admitted at *n* and flowing away at *n'*. Such waste ore or refuse matter may pass into a washer, to recover any mercury which may have been mechanically carried along with it by the water.

The principle of our invention having been thus disclosed, we beg to say that we do not confine ourselves to the specific mechanism described for carrying it into effect, as this may be greatly varied—for example, by projecting the ore through amalgamated coils or cylinders, or upon a traveling plate in place of the revolving disk, or upon a revolving drum, as shown in Figs. 7 and 8.

We claim as our invention—

1. The process herein described for amalgamating metals, consisting in forcibly projecting the pulverized ore containing them, by means of a blast, upon or against an amalgamated disk or plates, or upon the surface of a body of mercury, substantially as described.

2. In combination with the ore-conveyer tube or cylinder B, the revolving disk or plate F and mercury-bath E, arranged and operating substantially as shown and described.

3. The combination of tube or cylinder B, mercury-bath E, revolving disk or plate F, and brush or scraper H, substantially as shown and described.

4. The combination of hopper A, tube or cylinder B, steam, air, or motor pipe C, mercury-bath E, and revolving disk F, substantially as shown and described.

5. In combination with the mercury-bath E and revolving disk F, the water-inlet I and discharge, substantially as shown and described.

In testimony that we claim the foregoing we have hereunto set our hands this 7th day of January, 1878.

GEO. J. FIRMIN.
THOS. A. D. FORSTER.

Witnesses:
JOHN RODGERS,
M. D. CONNOLLY.