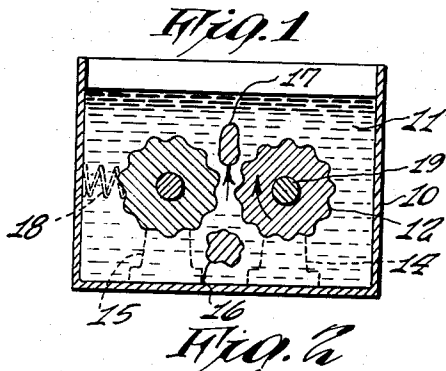
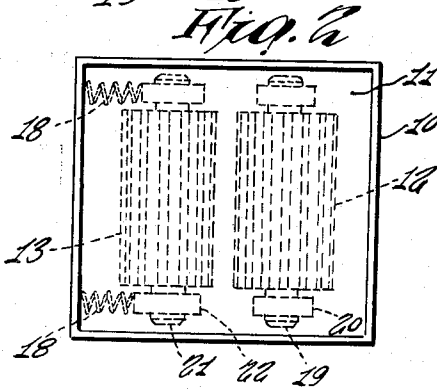
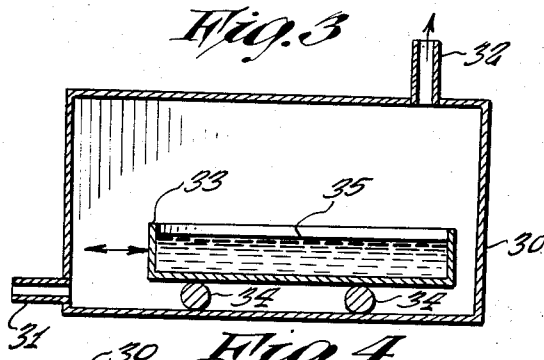
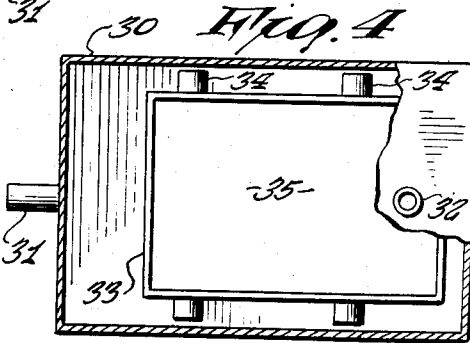
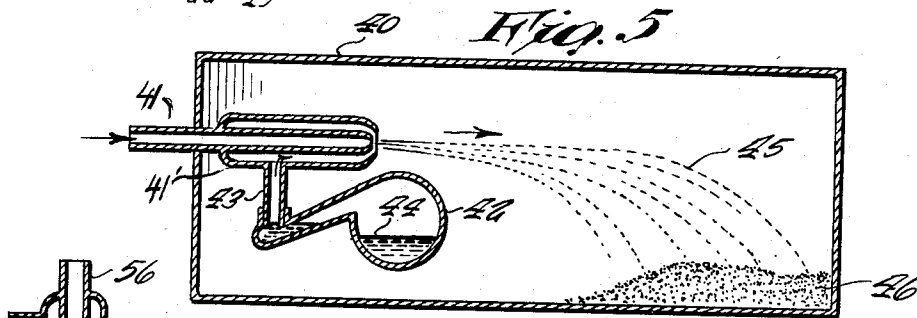
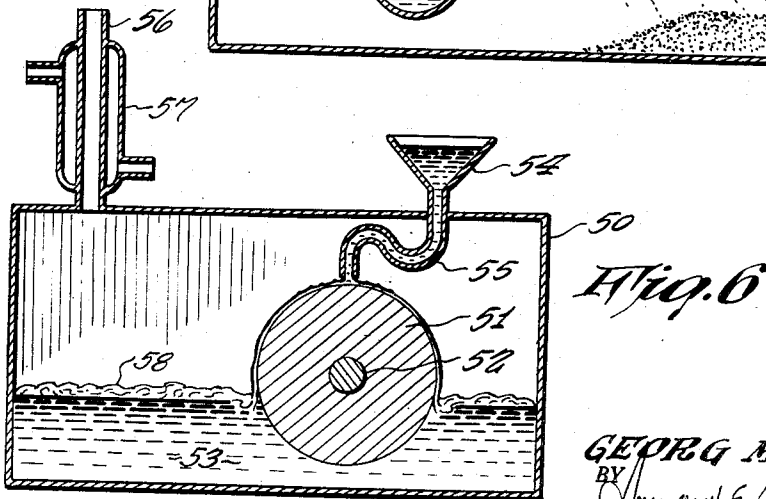


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METHOD FOR THE PREPARATION OF ALUMINUM ALLOYS FOR THE
EXTRACTION OF THE ALUMINUM BY MEANS OF MERCURY
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METHOD FOR THE PREPARATION OF ALUMINUM ALLOYS FOR THE EXTRACTION OF THE ALUMINUM BY MEANS OF MERCURY

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This invention relates to an improved method for the preparation of aluminum alloys for the extraction of the aluminum by means of mercury.

It is a known fact that aluminum may be extracted from aluminum alloys by treating said alloys with hot mercury, thereby dissolving the aluminum in the hot mercury.

It is a matter of course that in carrying out this process it will be necessary to reduce the size of the starting material to small pieces in order to improve the contact possibilities between the aluminum alloy and the mercury solvent.

Despite extensive dressing, however, the extraction of aluminum according to the known methods proceeds very slowly and may not start at all unless the temperature is brought to a certain height.

It is noticeable that at moderate temperature, say 300° C., at which the solubility of aluminum in mercury is appreciable, the mercury mostly shows no dissolving power, even if the material to be extracted has been reduced to small size. In these cases, recourse may be taken to strongly increasing the temperature of the solvent at the beginning until solution begins to take place, whereupon the continuation of the extraction can take place at moderate temperature.

Hereby the mercury must, of necessity, pass through a range of high vapor pressure which makes the construction of the extraction apparatus more difficult.

It is the object of this invention to overcome the disadvantages pointed out heretofore.

The inventor has found that the extraction of aluminum from aluminum alloys by means of mercury can be performed at relatively low temperatures if the preparation and dressing of the starting material is performed not in the presence of air but in the presence of mercury.

Therefore this invention relates to a process in which the starting alloy is surrounded by liquid or gaseous mercury when the physical feature of said alloy is changed in preparation for the extraction process.

In carrying out my invention, a number of different methods may be employed. Some examples will be given, in which several embodiments of the invention will be described and illustrated by the accompanying drawings:

It should, however, be understood that the examples are given by way of illustration and not of limitation and that many modifications in the details may be made without departing from the spirit of the invention.

In the drawings:

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Fig. 1 shows partly in longitudinal section a device for carrying out the method according to the invention as described in Example 1;

Fig. 2 is a plan view of the device shown in Fig. 1;

Fig. 3 illustrates in longitudinal section a device for carrying out the method according to the invention as described in Example 1.

Fig. 4 shows the same device as seen from above, with part of the cover removed;

Fig. 5 is an illustration of another device used in carrying out Example 3, and

Fig. 6 is yet another device to be used in Example 4.

Example 1

Referring to Figs. 1 and 2, a container 10 is shown substantially filled with liquid mercury 11. In the container, there are two rollers 12 and 13, which form a deforming device for the aluminum alloy to be prepared for subsequent extraction. A lump of alloy to be fed through the rollers is designated by 16, another lump emerging from the rollers after deformation, by 17. Roller 12 is supported by a standard 14 and mounted on a shaft 19 in a bearing 20. Roller 13 is mounted on a shaft 21 in a bearing 22 of sufficient width to permit shaft 21 to move toward roller 12 under the action of a spring 18.

In operation, an alloy consisting of 34% silicon, 64% aluminum, 1.2% iron, remainder oxide and carbides, is passed through the rollers 12 and 13 of the above described device, roller 13 being forced by the action of spring 18 toward roller 12, thereby causing a piece of aluminum alloy 16 to be deformed in passing.

The alloy is fed to the container in rough pieces of an average diameter of 30–50 mm.

The deformation is performed under liquid mercury. Preferably the mercury level is made to stand above the rollers as shown and the pieces of the aluminum alloy are fed between the rollers from underneath automatically, floating upward between the rollers owing to their buoyancy in the mercury, and thus being deformed while submerged.

While a lump of alloy of the type described, when dressed in air, is not appreciably attacked by mercury, a lump deformed by passing through rollers below mercury, when broken up, shows the metal crystals to be penetrated by mercury.

If the thus pre-treated alloy is exposed to the effect of mercury at 350° C., aluminum is immediately dissolved corresponding to the solubility at this temperature.

Example 2

The device used for preparing the aluminum alloy is shown in Figs. 3 and 4. It comprises a closed gas-tight container 30 having an inlet pipe 31 and an outlet pipe 32. The container is filled with mercury vapor supplied through pipe 31 and expelling air through pipe 32.

Arranged within container 30 is a drawer-shaped vessel 33 mounted on wheels 34 and filled with liquid aluminum alloy 35.

In operation an aluminum scrap alloy comprising 4% copper, 94% aluminum, and 2% other alloy components is liquified at about 680° C. and introduced into vessel 33, which is so arranged on the wheels 34 that it can perform a strong shaking motion.

Mercury vapor is introduced without pressure through 31, thus displacing the air at 32.

Under constant shaking, the fluid metal is then permitted to cool off in the mercury vapor atmosphere until the temperature has fallen below the normal boiling point of mercury.

The aluminum alloy has by that time solidified to a granular mass, the individual elements of which are about the size of a pinhead. The particles are completely wetted with mercury on their surface.

Example 3

Fig. 5 shows the device used. A closed container 40 has an injector 41 mounted in one of the side walls, a retort 42 is arranged in the container and has a connection 43 to pipe 41. The retort is filled with liquid aluminum alloy 44; 45 designates vaporized alloy, and 46 the alloy after it has deposited on the bottom of container 40.

In operation an aluminum alloy comprising 30% of silicon, 68% of aluminum and slight amounts of other components is introduced at the start into retort 42. Mercury vapor is introduced under pressure through injection pipe 41; liquid aluminum alloy is sucked from the retort and atomized by the mercury vapor, as shown at 45. The dispersed alloy, wetted with mercury, is immediately attacked by the latter if below its boiling point, even at moderate temperatures, and a higher aluminum extraction ensues when the deposit 46, after cooling-off, is subjected to extraction.

Example 4

Fig. 6 shows the device to be used. The device

comprises again a closed vessel 50. Mounted in the container is a roller 51 rotatably mounted on a shaft 52. About one-third of the roller dips into the mass of boiling mercury 53. Mounted in one of the container walls is a funnel 54 with a pipe 55 for admission of the liquid alloy. 56 designates a vent pipe, and 57 a cooler.

In carrying out the method according to this modified embodiment of the invention, a liquid alloy comprising 30% of silicon, 57% of aluminum, and a remainder of iron, titanium, and so on, is caused to flow through funnel 54 and pipe 55 onto the revolving roller 51 which dips into boiling mercury 53. The alloy is distributed over the roller and enters the mercury in a thin film and is there transformed into a sluggy mass 58 which floats on the surface of the mercury. After cooling, separation can be brought about by simple mechanical means. When extracted with mercury, the alloy is speedily dissolved.

I claim:

1. The process of dressing aluminum alloys in preparation for the extraction of the aluminum by means of mercury, which comprises disintegrating said alloys in liquid state in the presence of fluid mercury and under exclusion of air, thereby causing the formation of new surfaces in the particles obtained by disintegration of said alloys and enabling the mercury to perform an immediate wetting action on said newly formed surfaces.
2. In the process according to claim 1, effecting the disintegration of liquid aluminum alloys in an atmosphere of gaseous mercury.
3. In the process according to claim 1, effecting the disintegration by spraying a liquid aluminum alloy by means of a jet of gaseous mercury.
4. In the process according to claim 1, wherein the disintegration of the aluminum alloy in liquid form occurs in liquid mercury.

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