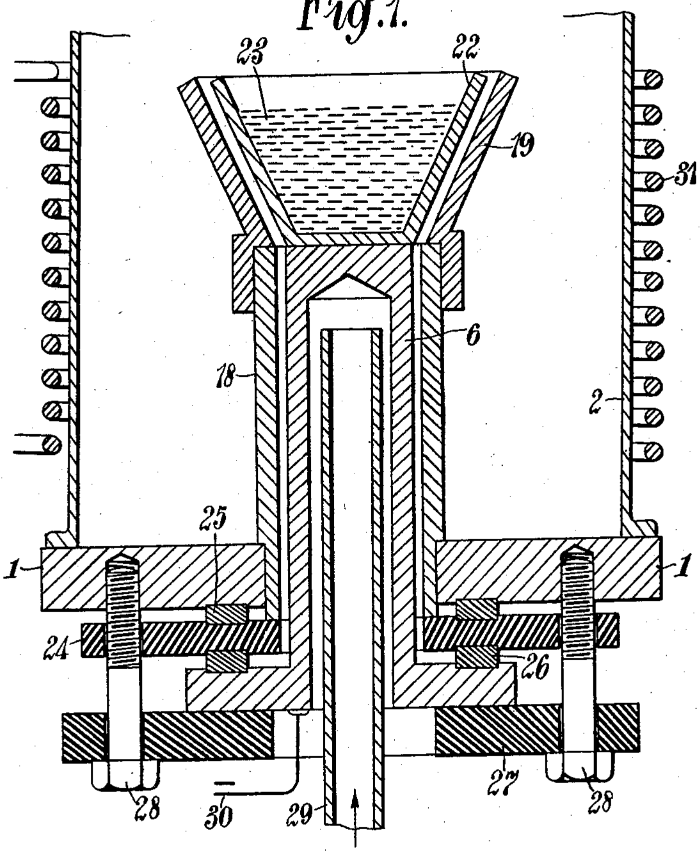
July 2, 1940. B. BERGHAUS ET AL 2,206,020

APPARATUS FOR CATHODE DISINTEGRATION

Filed March 28, 1938

Fig. 1.



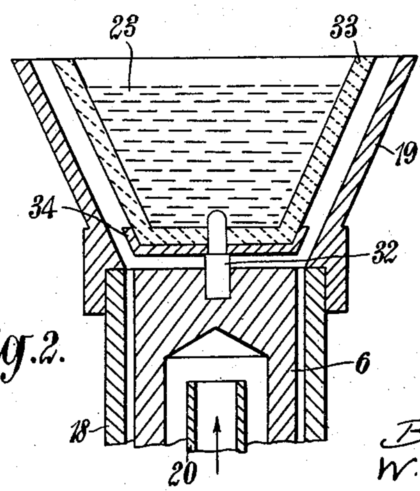


Fig. 2.

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APPARATUS FOR CATHODE DISINTEGRATION

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1 Claim. (Cl. 250—27.5)

It is known in cathode disintegration to disintegrate the cathodes in a solid state, for instance, in the form of discs—wire or tape. Owing to the small disintegration speeds thereby obtained cathode disintegration has hitherto received only a limited application. The present invention substantially increases the speed of disintegration.

The invention relates to a method of cathode disintegration and it mainly consists in that the cathode material is disintegrated in a liquid state. The cathode material is fused in a metallic or non-metallic crucible, which is preferably arranged on a metallic cathode carrier. The cathode carrier is surrounded at a small distance by a metallic covering which protects it and the insulation against disintegration. In order to protect the outer walls of the crucible placed thereon against disintegration, the crucible is also surrounded at a short distance by a metallic covering. The distance of the screen for the cathode carrier and the crucible must be smaller than the distance of the glow fringe formed around the cathode. A distance of the order of 1.5 to 3 mm. has been found suitable in practical operation. This arrangement allows of a very large power being applied to the path of discharge, so that the coating material can be fused solely by the glow current. Preferably a magnetic field may be provided for the orientation of the particles disintegrated from the cathode onwards.

It is known from the literature that an increase in temperature of the solid cathode material has no substantial influence on the amount disintegrated. However, it has been determined by experiments that, from the melting point of the cathode material onwards, the amount disintegrated per unit of time increases surprisingly.

The following experimental results show the differences in the amounts of the disintegration as between solid and liquid cathode material.

	Time of test in minutes	Watts	Disintegrated amount in mg.
Solid cadmium	5	17	183
Liquid cadmium	5	154	16,500
Solid silver	3	38.5	2.4
Liquid silver	3	77	160

In this comparison the surface areas of the solid and liquid material were equal. As compared with the increase in output it is found that the disintegrated amount increases, not only in proportion with the output but greatly beyond it. It has been ascertained that with further increase in output, that is to say, with increased temperature of the melt, the yield is increased. The material to be disintegrated may be fused in the crucible additionally by other known heating methods, for instance, by means of resistance heating or high frequency heating etc. Additional heating is an advantage when it is desired to fuse large amounts of cathode material at the same time. However, heating by the glow current alone is the simplest method and consumes least.

When the cathode material is disintegrated in a metallic crucible care must be taken that the material to be disintegrated does not form a compound with the material of the crucible. Inter alia, cadmium, silver and copper have, for instance, been fused and disintegrated in a molybdenum or tungsten crucible. Other metals with a higher melting point, such as nickel, cobalt, chromium, vanadium, platinum, titanium, rhodium etc., which form very easily an alloy with other metals, more especially with those which come into question as crucible material, are disintegrated in non-metallic crucibles, for instance, sintered alumina, beryllium oxide, magnesium oxide, aluminium oxide, zirconium oxide, etc. In that case the bottom of the crucible is provided with a hole and is placed on a tungsten rod, which effects the contact with the melt or with the material in a solid state.

Two forms of construction according to the invention are illustrated by way of example in the drawing in which:

Figure 1 is a section through a portion of a cathode disintegrating apparatus, taken more particularly through the cathode and crucible, and

Figure 2 is a cross-section through the cathode with a special method of fixing of a non-metallic crucible.

Referring to Figure 1, 1 is the bottom plate and 2 the side wall of the cathode disintegration vessel which is shown only in part. 22 is the hollow cathode, preferably made of crucible shape, for instance a metallic crucible of molybdenum which is carried by the supporting member 6. 18 is the metal covering and 19 is the cap which is adapted to the form of the crucible. These two parts are arranged at a small distance from the supporting member 6 and from the metal crucible 22 respectively. 23 is the metal to be disintegrated which is placed in the crucible, 24 is an insulating disc, 25 and 26 are sealing rings, for instance, of lead, and 27 is an insulating ring, which is pressed on by screws 28. 29 is the leading-in pipe for compressed air cooling and 30 is the current incoming lead for the cathode. 31 is a coil for the production of a magnetic field intended to direct the particles disintegrated from the surface of the liquid metal 23.

The construction shown in Figure 2 differs from the one shown in Figure 1 merely in this, that a metal pin 32 is provided on the cathode support 6, which metal pin is inserted through a hole in the bottom of the non-metallic crucible 33, and supports the crucible 33 by means of a saucer-like member 34. The metal saucer 34 is arranged to lie at a distance from the surface of the cathode support 6, so that the transmission of heat to the cathode support shall be as small as possible. The covering 18 and the cap 19 serve as an insulation in the same manner as in the arrangement first above described. 20 is an inlet pipe for the water cooling.

Disintegration crucibles according to the invention as above described may also be mounted in a large number in the bottom of a disintegrated chamber, in order to provide articles having large surfaces, such as, for instance, metal sheets, with a protecting or improved cover. The shape of the crucible or crucibles may be adapted to conform to the article to be covered, so that a uniform cover is obtained.

What we claim is:

Apparatus for cathode disintegration of cathode material in the molten state comprising, a crucible containing said cathode material, a metallic cathode carrier supporting the crucible and metallically connected with said cathode material, a metal covering surrounding said carrier and spaced therefrom at a distance of a few millimeters whereby the metallic cathode carrier is protected against disintegration, a metallic covering surrounding the outer wall of the crucible at a distance of a few millimeters whereby the crucible is also protected against disintegration, and a coil surrounding said cathode carrier and the crucible and its metal covering to produce a magnetic field for directing the particles disintegrated from the cathode onwards.

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