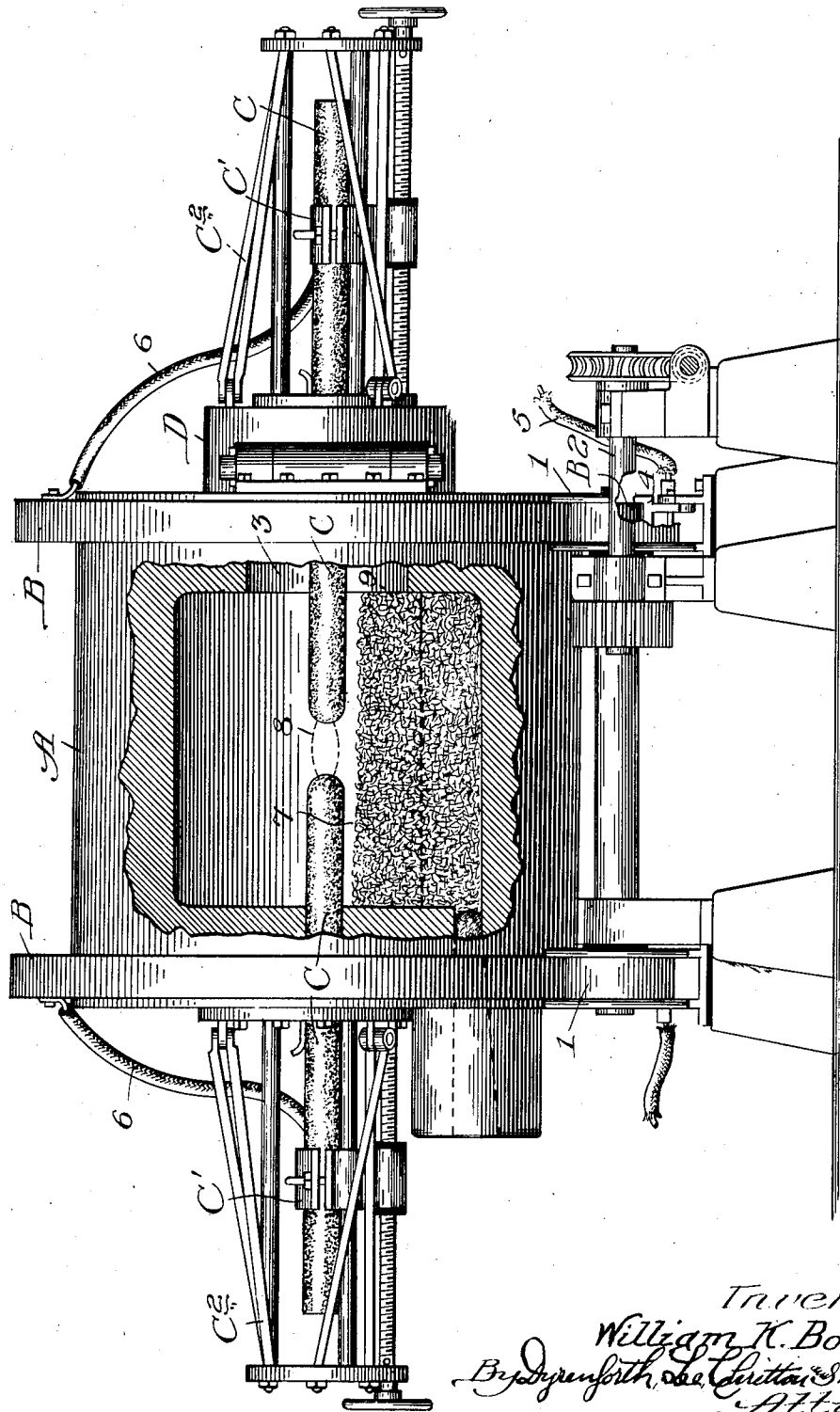


W. K. BOOTH.
 PROCESS FOR MELTING METAL TURNINGS, BORINGS, &c.
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1,380,767.

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UNITED STATES PATENT OFFICE.

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PROCESS FOR MELTING METAL TURNINGS, BORINGS, &c.

1,380,767.

Specification of Letters Patent.

Patented June 7, 1921.

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To all whom it may concern:

Be it known that I, WILLIAM K. BOOTH, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Processes for Melting Metal Turnings, Borings, &c., of which the following is a specification.

The present invention is in the nature of an improved method for melting metal turnings or borings, or other small pieces of metal, such as screenings, or concentrates, from floor sweepings and foundry dirt.

The process is especially valuable for melting brass turnings and borings. It may be used, however, for melting borings and turnings of various metals and various metal concentrates, including copper, aluminum, gray iron, steel, etc. The process is especially valuable in the treatment of metals, which, while in comparatively small size, nevertheless occupy a considerable space when introduced as a charge into a furnace.

In accordance with the improved method, a charge of turnings, borings, or the like, is subjected to a tumbling action and to a high degree of heat until the charge is reduced to a very finely divided or substantially pulverulent condition, and the application of heat is continued until the charge is melted.

The process may best be effected by means of an electric furnace which is adapted to be oscillated or turned while the heating operation proceeds. The process will be described with reference to the accompanying drawing, which shows a broken elevational view of an electric furnace adapted to the practice of the process.

In the illustration given, A represents a cylindrical furnace-body, which is mounted, in a well-known manner, upon rollers 1, and which is adapted to be turned, or oscillated, by mechanism 2; B, B, a pair of annular metal tracks insulatively mounted on the furnace-body and supported by the rollers 1, thus supporting the furnace-body; and C, C, a pair of electrodes extending axially through the ends of the furnace-body, said electrodes being carried by clamps C' which are adjustably mounted on frames C² at the ends of the furnace-body. One of the frames C² is carried by a door D, which can be opened, for the purpose of charging the furnace through an opening 3 in the end wall.

The annular tracks, or contact members, B, are engaged by stationary contact members, or shoes, 4, equipped with conductors 5 which are in circuit with a suitable source of electricity. Thus, the annular contact members which encircle the furnace-body are energized through the medium of the shoes, or brushes, 4. The members B are connected, by flexible conductors 6, with the clamps C' of the electrodes.

In practising the process, the brass borings, or turnings, for illustration, are charged into the furnace, filling the lower portion thereof to a plane nearly level with the electrodes, as indicated at 7. The furnace is then turned, or oscillated, as desired, through the medium of mechanism 1, 2, the current being at the same time admitted. The furnace is heated by an arc 8 between the inner ends of the electrodes. As the movement of the furnace continues, the charge is subjected to a tumbling action, which has the effect, as the furnace becomes quite highly heated, of causing the turnings, or borings, to disintegrate and to become very finely divided, or powdered. As this action takes place, the charge settles down into a compact mass of pulverulent or finely granular material, occupying perhaps one-half or less than one-half of the original space; and as the application of heat continues the material finally melts, the melting action of all the material occurring at about the same time. The effect of the tumbling action, in connection with heat, not only serves to disintegrate the charge and put it into a compact body of independent articles, but also causes these articles to be raised uniformly to the melting temperature, so that the melting occurs throughout the whole charge, without unduly heating portions of the charge. This is a particularly important feature in dealing with metals which are readily volatile at a high temperature of the furnace, such as zinc, or with compounds, or alloys, containing volatile metals, such as brass. In the drawing, the dotted line 9 may indicate the level of the charge after it has become compacted and is about to melt.

It is an advantage of the process, when carried out in a furnace of the type illustrated, that the material can be charged into the furnace to about the level of the electrodes; and in the operation of the furnace,

the material will quickly settle down so that only at the start will there be any tendency toward short-circuiting, with resulting low-power factor. It will be understood, therefore, that during by far the largest part of the time required for granulating and melting the charge, the furnace will operate under proper conditions of economy, even though the charge originally is at a high enough level to cause some short-circuiting with respect to the electrodes.

It is found in practice that brass, for instance, when heated to about 700° C. or 800° C., concurrently with the tumbling action, will disintegrate and become reduced to a finely granular condition. Further application of heat to the point necessary for melting the brass will cause all of the charge to become molten practically at the same time. It is preferred to continue the rotating, or oscillating, movement of the furnace until the material is entirely fused, the result being that the material is uniformly heated and volatilization avoided.

A further advantage of the improved method is that by reason of the fact that the charge becomes disintegrated and assumes a finely granular or pulverulent form, no large masses will form, which might tend to be thrown against or injure the electrodes. The improved process enables borings, turnings, and shavings of brass or other metals to be economically treated and reduced to a molten condition. Any suitable method of effecting the tumbling action may be employed.

It may be added that in case of some metals, notably aluminum, the turnings, borings and grindings produced in machining and polishing aluminum parts become strongly oxidized and coated with a film of aluminum oxid, and heretofore this has seriously interfered with the recovery of these materials by a melting process, due to the fact that the melted particles do not properly coalesce on account of the films of oxid on the particles. Efforts to overcome this result by a puddling process have not proven satisfactory, doubtless because of the fact that more and more of the material is oxidized. Whether or not this be the correct explanation, the percentage of recovery of such material by known processes has been so small as to make these materials of very little worth; and any effort to increase the percentage of saving, as by careful puddling in

a small vessel, results in excessive labor costs. In accordance with the present process, it is possible to effect a very high saving at a very slight expense. Tests thus far made indicate that a saving ranging from 90 to 95% may be very readily effected without any special precaution. In the improved process, it is unnecessary to use fluxes in effecting the recovery. What is true of aluminum is true, to quite an extent, of zinc and brass, and to some extent of other metals.

The foregoing detailed description has been given for clearness of understanding only, and no unnecessary limitation should be understood therefrom, but the appended claims should be construed as broadly as permissible, in view of the prior art.

What I regard as new, and desire to secure by Letters Patent, is:

1. The method of treating metallic turnings, etc., which comprises subjecting a charge of such materials to a disintegrating tumbling action while simultaneously applying a high degree of heat.

2. The method of melting metallic turnings, etc., which comprises subjecting a charge of such material to a disintegrating tumbling action while applying heat until the charge is reduced to pulverulent condition, and continuing the application of heat until the charge is melted.

3. The method of melting metallic turnings, etc., which comprises subjecting a charge of such material to a disintegrating tumbling action while applying heat until the charge is reduced to pulverulent condition, and continuing the tumbling action and application of heat until the charge is melted.

4. The method of disintegrating and melting metallic turnings, etc., which comprises subjecting a charge of such material to a tumbling action in a closed receptacle while applying heat until the charge is melted, such tumbling action being begun before any substantial melting action occurs.

5. The method of melting metallic turnings, etc., which comprises subjecting a charge of such material to a rotary disintegrating tumbling action in a closed receptacle while applying heat until the charge is reduced to pulverulent condition, and continuing the tumbling action and application of heat until the charge is melted.

WILLIAM K. BOOTH.