United States Patent

Thiel

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[54] CASTING OVEN

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[51] **Int. Cl.**.....**F27b 14/00**

[58] **Field of Search**.....219/406, 420, 421, 424, 425, 219/426, 427, 434, 521, 536; 13/21, 22, 25; 266/33

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[57] **ABSTRACT**

The invention is concerned with an electrically energized casting oven of the crucible type, and one which may be used, for example, for melting precious metals at elevated temperatures of the order of 2,400° F. The oven of the invention includes a coil of resistance steel, or other appropriate resistance material, rather than carbon electrodes, as the heating element.

5 Claims, 2 Drawing Figures

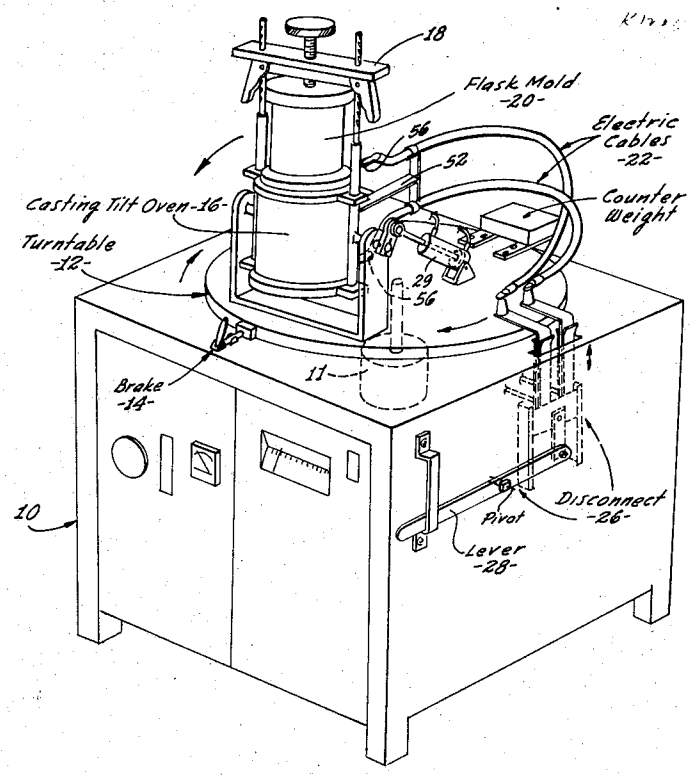


Fig. 1

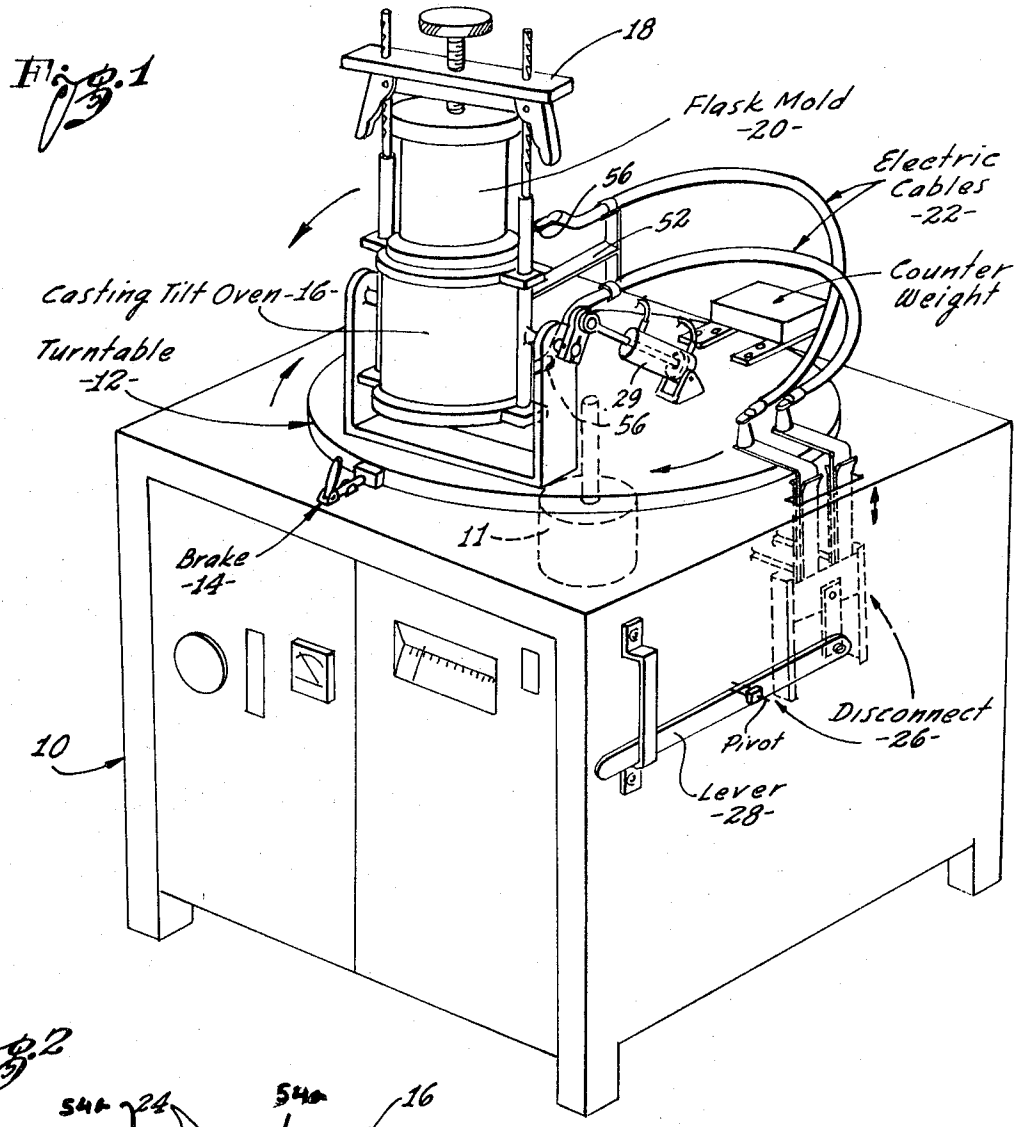
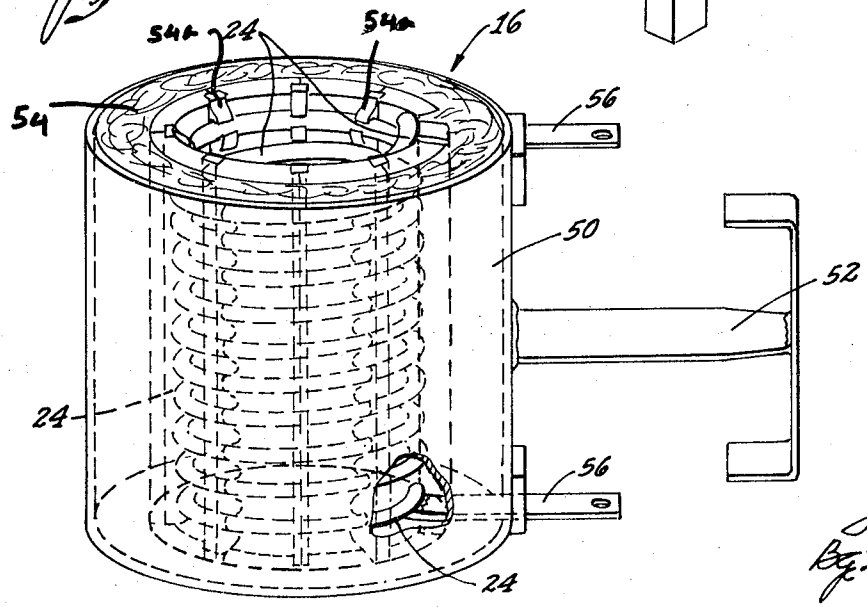


Fig. 2



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CASTING OVEN

BACKGROUND OF THE INVENTION

The invention finds particular utility in the centrifugal casting of precious metals, such as gold, by the tilt method. In practicing such a method, a metal such as gold is placed in a crucible, and a lost wax flask mold is supported over the mouth of the crucible. The crucible is then heated to an elevated temperature to melt the gold, and the crucible and flask are then rotated on a turntable about a vertical axis. The crucible and flask are pivotally mounted on the turntable, and as the turntable is turned, they tilt and the molten gold from the crucible is forced by centrifugal force into the flask.

Because of the high temperatures involved, especially in casting precious metal, the oven normally used in the prior art to heat the crucible generates its heat by passing an electric current between carbon electrodes. However, it is well known that such an oven is not too satisfactory, primarily because of the rapid deterioration of the carbon electrodes which necessitates their frequent replacement.

The oven of the present invention, however, is constructed to incorporate a coil of electrical resistance material, such as resistance steel, ceramic wire or the like. The coil may be formed, for example, of metal wire or ceramic elements such as are presently marketed by the Kanthal Corporation of Bethel, Connecticut. The elements may be formed to the desired helical shape, for example, by passing high current therethrough until the particular element becomes pliable, and by then winding the element about a cylindrical mandrel. In operation, for example, temperatures of the order of 2,400° F. and higher may be achieved by passing a current of the order of 300 amperes through the helical element at a voltage of, for example, 12 volts. Temperatures in excess of 3,000° F. may be achieved by the use of a helix element formed, for example, of Kanthal Super-Ceramic Wire.

BRIEF DESCRIPTION OF THE DRAWING

FIG. **1** is a perspective representation of casting apparatus which incorporates a tilt oven which, in turn, may be constructed in accordance with the invention; and

FIG. **2** is a representation, partly in section, of the tilt oven, so as to reveal its components.

DETAILED DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

The apparatus of FIG. **1** includes, for example, a cabinet **10**. Appropriate transformers, drive motors, and other operating components of the apparatus may be mounted within the cabinet. For example, a power transformer for the apparatus may be housed within the cabinet, the transformer being capable, in a particular embodiment, for example, of converting 220 volts AC into 12–24 volts at secondary currents of the order of 300 amperes.

A turntable **12** is rotatably mounted on the top of the cabinet **10**, and the turntable may be driven by an electric motor **11** supported within the cabinet. When the motor is deenergized, the turntable **12** may be held at a particular angular position by means, for example, of a brake **14**. A cylindrical casting oven **16**, constructed in accordance with the concepts of the invention, is pivotally mounted on the turntable **12**. A clamp **18** is mounted on top of the oven, and the clamp serves to hold a flask mold **20** in position over the mouth of a crucible supported within the oven.

Electric energy for the oven **16** is supplied by electric cables **22** which connect the helical heating element **24** (FIG. **2**) of

the oven to the secondary of the transformer in the cabinet **10**. A disconnect mechanism **26** is mounted on top of the cabinet, and this mechanism is operated by a disconnect lever **28**.

When the turntable **12** is stationary, the disconnect **26** serves to connect the cables **22** to the transformer in the cabinet **10** so that current may pass through the heating element **24** to melt the metal in the crucible within the oven **16**. When the metal is melted, the lever **28** is operated to cause the disconnect **26** to disconnect the cables **22** so that the turntable **12** is free to rotate. The turntable **12** is then rotated rapidly by the motor **11**, and the oven **16** and flask **20** are tilted, as a unit, so as to assume a horizontal position. The oven and flask may be tilted, for example, by a hydraulic actuator **29**. The gold in the crucible in the center of the oven **16** is then forced into the flask mold **20** by centrifugal action, so that it may be cast into any desired form. A counterweight **31** may be provided at the edge of the turntable **12**, as shown.

The oven **16**, as shown in FIG. **2** includes a thin tubular metallic outer wall **50**. A cable support **52** may be attached to the outer wall. The heating element **24** is wound as a helical coil which is supported by a tubular member **54** within the tubular outer wall **50**. The tubular member **54** may be composed of pieces of appropriate electrical insulating, refractory material. The refractory pieces included members **54*a*** which serve to support the helical heating element, and which project radially inwardly to insulate the crucible (not shown) from the element when it is supported in the oven. The annular space between the tubular member **54** and the tubular outer wall **50** may be filled, for example, with asbestos, or the like. The heating element may be composed of resistance wires or electrically conductive ceramic material, such as described above, so that temperatures in excess of 2,000° F. may be achieved when an electric current of the order, for example, of 300 amperes is passed through the element. Electrodes **56** connect the cables **22** to the heating element.

The invention provides, therefore, an improved casting oven which incorporates a rugged heating element, and one which is not subject to wear, and need not be replaced during the normal life of the equipment.

While a particular embodiment of the invention has been shown and described, modifications may be made. It is intended in the following claims to cover all modifications which fall within the scope of the invention.

What is claimed is:

1. Apparatus for casting precious metal, and the like, including a cylindrical oven member forming a crucible for the metal; a helically wound coil of electrically resistance material surrounding the crucible and responding to electric current to produce elevated temperatures in excess of 2,000° F. in the crucible, thermally insulating material surrounding said heating coil and said crucible, and said oven member being pivotally mounted on a turntable to be tilted about a horizontal axis as the turntable is turned about a vertical axis.

2. The apparatus defined in claim **1**, in which the coil is formed of resistance steel.

3. The apparatus defined in claim **1**, in which the coil is formed of a ceramic material.

4. The apparatus defined in claim **1**, and which includes a clamp affixed to the top of the aforesaid oven to mount a flask mold over the crucible.

5. The apparatus defined in claim **1**, and which includes electric tables extending from an energizing source to the aforesaid coil to energize the coil when the turntable is stationary, and disconnect means for disconnecting the aforesaid tables from the energizing source when the turntable is turned about the aforesaid vertical axis.

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