No. 696,701. Patented Apr. 1, 1902.

W. WAKELY.

FURNACE.

(Application filed Dec. 7, 1901.)

(No Model.) 3 Sheets—Sheet 1.

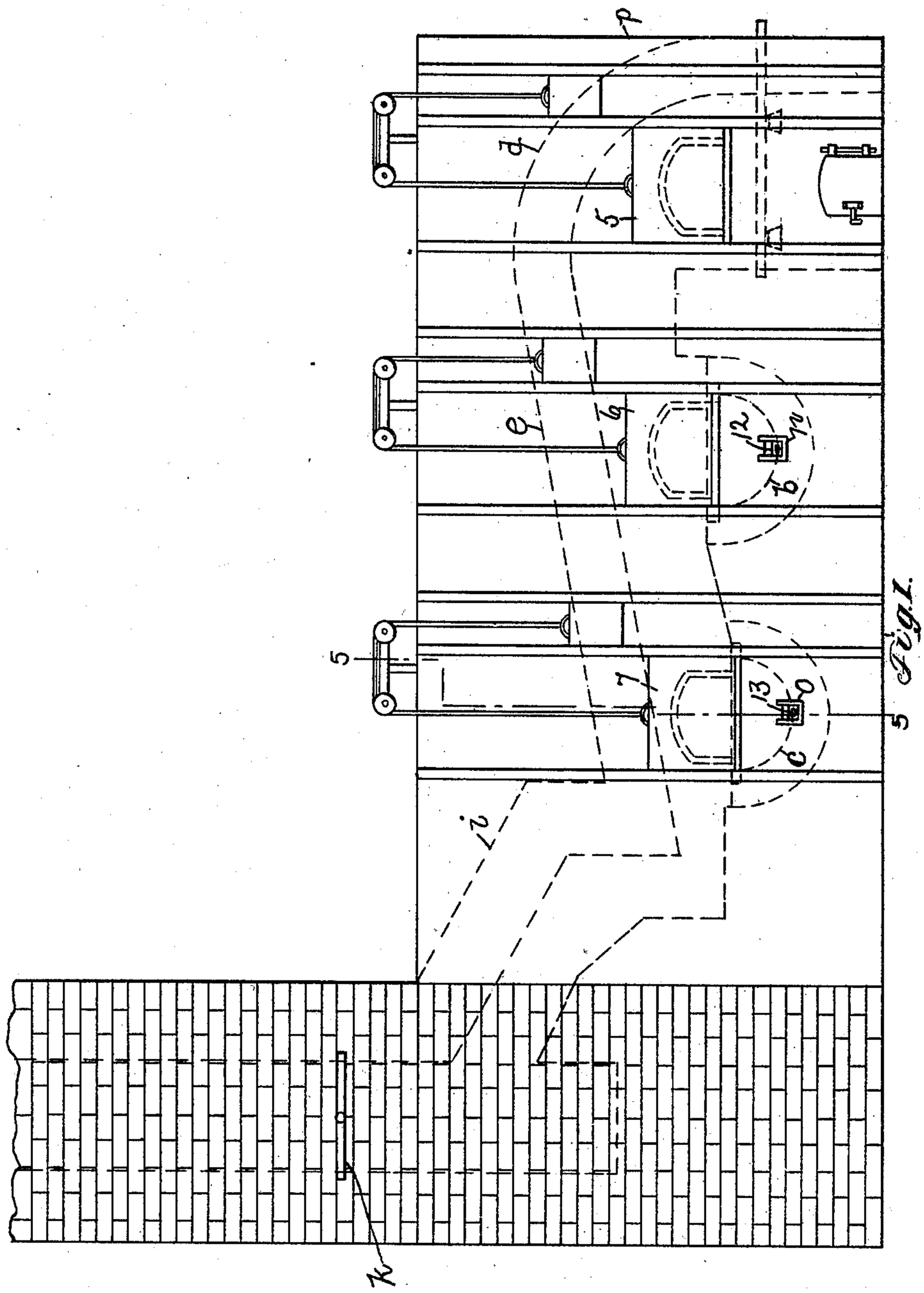

Fig. 1.

Witnesses.
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(No Model.) 3 Sheets—Sheet 2.

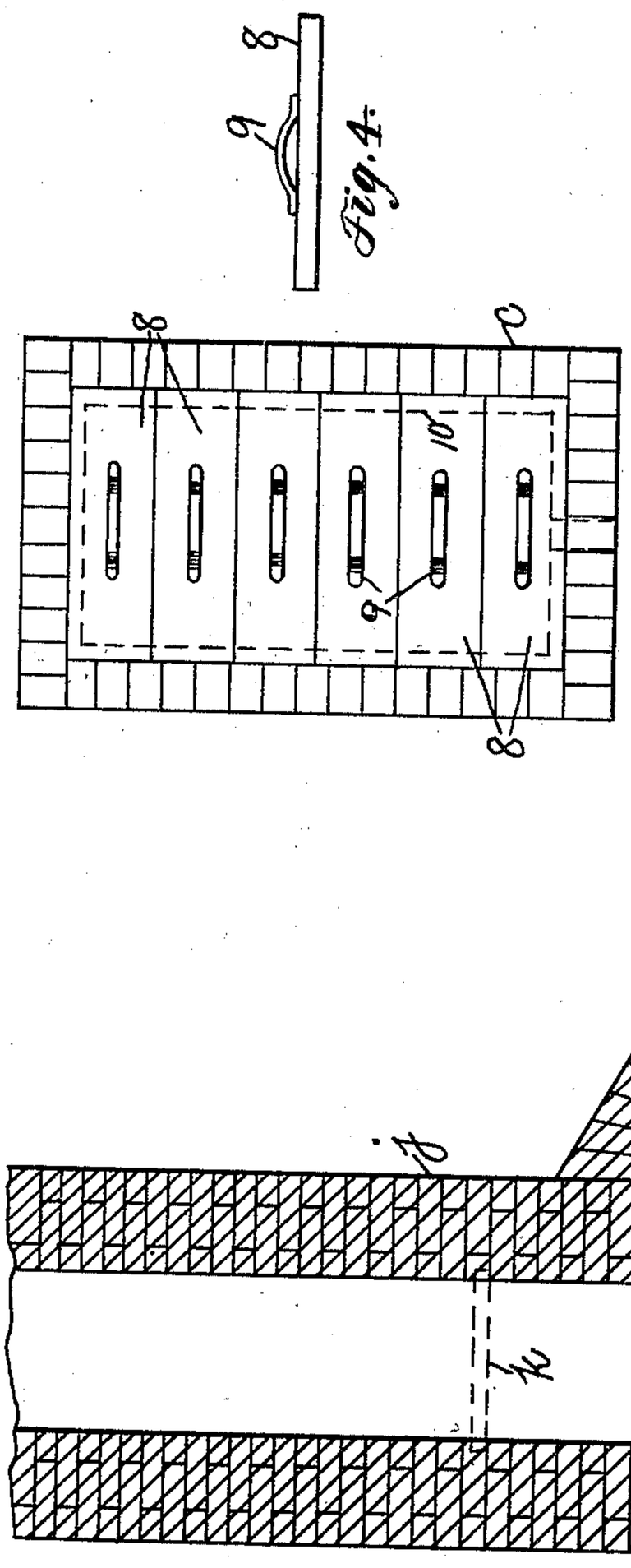

Fig. 3.

Fig. 4.

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

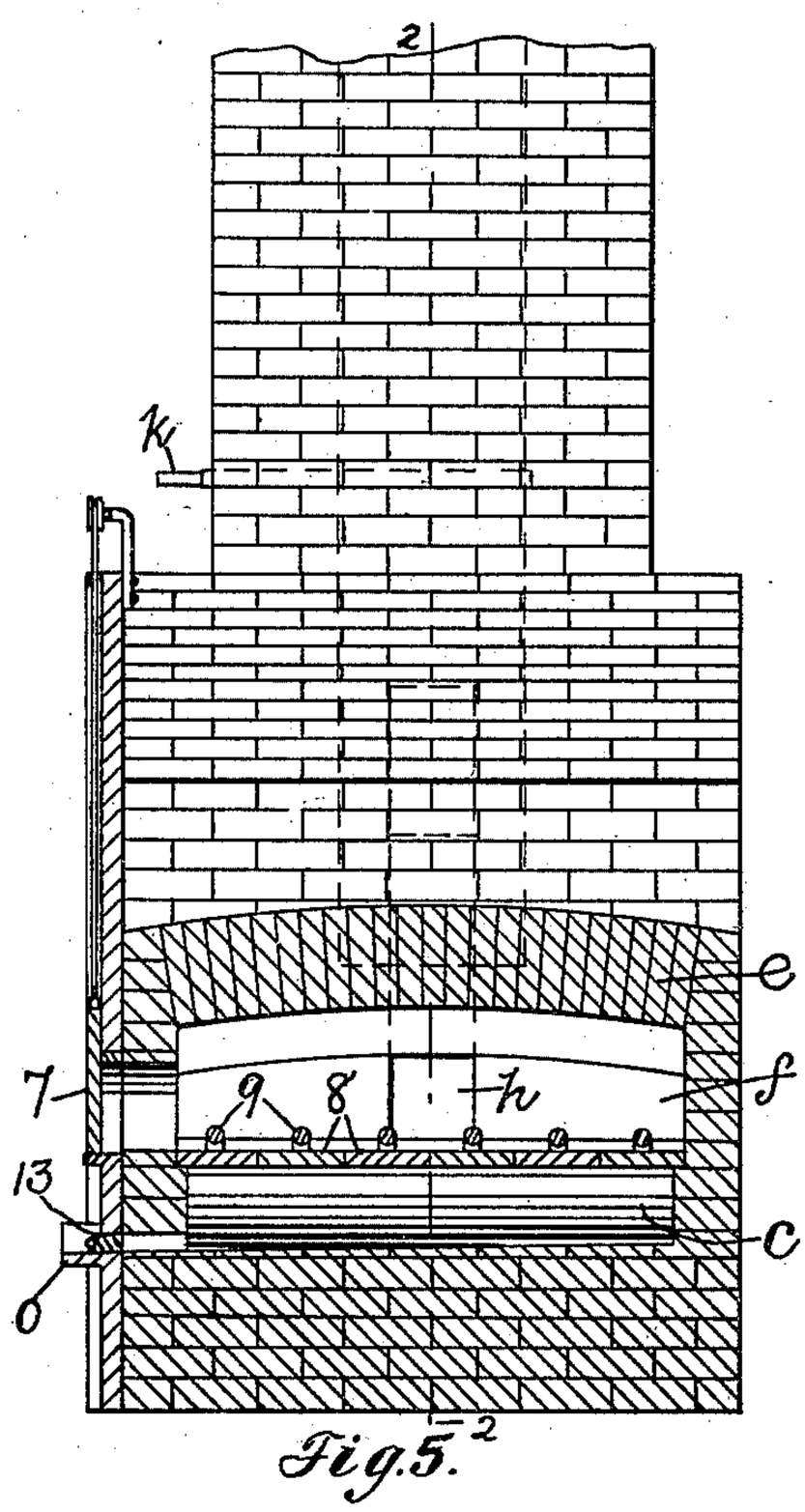

Fig. 5.

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UNITED STATES PATENT OFFICE.

WILLIAM WAKELY, OF TAUNTON, MASSACHUSETTS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 696,701, dated April 1, 1902.

Application filed December 7, 1901. Serial No. 85,054. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM WAKELY, a citizen of the United States, residing in Taunton, in the county of Bristol and State of Massachusetts, have invented an Improvement in Furnaces, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to a metallurgical furnace, and has for its object to provide a furnace of the character specified in which metals or alloys of metals having different melting-points may be simultaneously treated at a minimum expense.

Figure 1 is a front elevation of one form of furnace embodying this invention; Fig. 2, a vertical longitudinal section of the furnace shown in Fig. 1, the section being taken on the line 2 2, Fig. 5; Fig. 3, a plan view of one of the basins shown in Fig. 2; Fig. 4, a detail to be referred to; and Fig. 5 a transverse section on the line 5 5, Fig. 2, looking toward the left.

In the present embodiment of this invention I have shown a furnace especially designed and adapted for recovering an alloy of lead, tin, and antimony from dross or oxids of said metals, and simultaneously recovering lead or tin or an alloy of lead and tin from dross or oxids of the same, the lead or tin or an alloy of the same having a materially-lower melting-point than an alloy of lead and antimony. For this purpose I employ a furnace provided with a combustion-chamber *a*, a basin or pocket *b*, made in the hearth of the furnace adjacent to the said combustion-chamber, and a basin or pocket *c*, also made in the hearth of the furnace at a lower level than the basin *b*. The top or roof of the furnace is preferably made with curved or inclined portions *d e*, the portion *e* extending downwardly and rearwardly until it meets the rear wall *f* of said furnace to form with the hearth of the furnace an inclined passage *g*, which communicates with an outlet-port *h* in the wall *f*, the said port having its lower wall substantially on a level with the upper surface of the basin *c*. The port *h* communicates with a suitable passage *i*, leading to a chimney or stack *j*, which latter may and preferably will be provided with a suitable damper *k*.

The furnace is provided with suitable grate-bars *l* and with an ash-pit *m* below the same, which is accessible from outside the furnace.

The basins *b c*, which are substantially narrow and of considerable depth and open at their upper portions, may be made of refractory material, such as fire-clay or fire-brick, and are situated in the hearth of the furnace at different levels, with the basin *c* at a lower level than the basin *b*, so that the contents of the basin *c* may be removed from the heating zone or path of movement of the heat passing through the passage *g*.

The basins *b c* are separated by a portion of the hearth of substantial thickness to prevent burning out and breaking down of the walls of the basins, and this intermediate portion of the hearth has its upper surface inclined at such an angle that if extended it would intersect the basin *c* substantially at its longitudinal center, with the result that the flame is directed down into the basin *c* and strikes the material therein substantially at the center of the basin, thereby more uniformly heating the contents of the basin.

The basins *b c* are for the best results curved in cross-section, as shown, for the purpose of preventing the metal sticking to the sides of the basins. Furthermore, they are made of substantial depth, so as to enable a substantially large quantity of material to be treated with a minimum exposure of surface area, thereby reducing to a minimum loss by volatilization when the materials are treated with the basins uncovered.

The basins *b c* are provided at one end with discharge spouts or troughs *n o*, which extend through an iron or steel facing *p* for the furnace. The metal facing *p* is provided with suitable openings which register with the combustion-chamber *a* and with the basins *b c* and which openings are normally closed by suitable doors 5 6 7.

The basins *b c* may be open at their top or they may be closed substantially air-tight by suitable covers. In the present instance only one basin, as *c*, is shown closed by a cover, which is composed of a plurality of sections 8, each of which is provided with a suitable han-

dle *g*, by which the whole or a portion of the sections may be lifted off from the basin *c* through the door 7. The cover-sections 8 may and preferably will rest upon suitable ledges 10 in the upper surface of the basin *c*. (See Figs. 2 and 3.)

The furnace herein shown is especially adapted for recovering an alloy of lead, tin, and antimony, such as is used for linotype and stereotype work, and also for simultaneously recovering an alloy of lead and tin, which is useful for soldering purpose, or for recovering lead or tin. For this purpose the oxids of the lead, tin, and antimony, which are found on the market as dross, are suitably fluxed and placed in the upper basin *b*, and the oxids of lead and tin or the oxid of either lead or tin is suitably fluxed and placed in the lower basin *c*.

I will first describe the operation of the furnace with the contents of both basins exposed.

Combustion is started in the chamber *a*, and the products of the same first pass over the open upper basin and then pass downwardly over the open lower basin to the outlet port or opening *h*, which is made substantially small with relation to the area of the lower basin, and consequently the heat is held in the vicinity of the said basin. The contents of the upper basin being nearer to the combustion-chamber *a* and to the heating zone in the passage *g* are exposed to a higher heat than the contents in the lower basin, thus enabling the oxids of an alloy of higher melting-point to be reduced to the metallic state in the upper basin, while at the same time oxids of an alloy or of a metal of lower melting-point are reduced in the lower basin, the products of deoxidation created or generated in the upper basin commingling with the products of combustion, and thus assisting in heating the material in the lower basin, which latter material is removed from the heating zone in the passage *g* a sufficient distance to obtain a substantial difference in degree of heat in the two basins, which difference is sufficient to enable the metal or alloy of metals of materially lower melting-point to be treated without material loss by volatilization. The metals in the basins *b c* may be withdrawn therefrom through the spouts or troughs *n o*, first removing suitable stoppers or plugs 12 13. The molten metal may be run into suitable molds. (Not shown.)

It will thus be seen from the above description and from an inspection of the drawings that the heat contained in the products of combustion is fully utilized in acting on the material in the basin *b* and also in the basin *c*, and the material in the latter is acted upon by the heat created or generated in the basin *b*. The degree of heat can be regulated within limits by the damper *k*.

In practice an alloy of lead, tin, and antimony has been recovered from their oxids or dross in the basin *b*, while an alloy of lead and tin has been simultaneously recovered from their oxids in the basin *c* in a substantially short time and with a very small consumption of fuel. The alloy of lead, tin, and antimony melts at a materially higher temperature than the alloy of tin and lead.

The furnace herein shown is adapted for simultaneously deoxidizing the dross in the basin *b* and for sweating dross in the basin *c*, in which case the latter basin is closed by the covers 8 substantially air-tight, and is used as a retort or sweating basin. By using the lower basin as a retort a material saving may be effected in recovering the more valuable metals of lower melting-points. For instance, when a dross is rich in metals—as, for instance, a dross containing sixty per cent. lead, thirty per cent. tin, and ten per cent. antimony—the tin, which is the more valuable, can be recovered in the sweating-basin without loss by volatilization, and the dross of lead and antimony remaining in the basin could then be put into the upper basin *b* and recovered therein. It will thus be seen that by using the basin *c* as a retort or sweating-basin a maximum amount of the metal of greater value can be recovered by the sweating process simultaneously with the recovery in the basin *b* of an alloy of materially higher melting-point, thus enabling dross or oxids of metals to be economically treated at a profit.

I have herein described the furnace as useful for recovering an alloy of lead, tin, and antimony in one basin and lead or tin or an alloy of lead and tin in the other basin; but I do not desire to limit my invention in this respect, as other metals or alloys of metals having materially different melting-points may be simultaneously treated.

I claim—

1. In a furnace of the character described, the combination with a combustion-chamber, an outlet therefor, and an intermediate passage downwardly inclined from the combustion-chamber to said outlet, of a plurality of substantially narrow deep basins or receptacles formed in the hearth of the furnace with the basin remote from the combustion-chamber at a lower level than the one adjacent to said combustion-chamber, the said basins being extended transversely of the furnace and separated by a portion of the hearth of substantial thickness and having its surface of such inclination as to direct the flame passing over the lower basin to substantially the longitudinal center of the said basin, substantially as described.

2. In a furnace of the character described, the combination with a combustion-chamber, a downwardly-inclined passage communicating therewith, and an outlet port or opening communicating with said passage, of a plurality of basins or pockets curved in cross-sections and extended across said furnace below said inclined passage and having outlet-openings communicating with the exterior of the furnace, said basins or pockets being located at different levels with the basin re-

mote from the combustion-chamber at a lower level than the basin adjacent to the combustion-chamber, substantially as and for the purpose specified.

3. In a furnace of the character described, the combination with a combustion-chamber, an outlet therefor and an intermediate passage connecting the same, of a plurality of basins located in the hearth of the furnace between said combustion-chamber and said outlet, the more remote basin being located at a lower level than the basin adjacent to said combustion-chamber, and a removable cover for said remote basin, substantially as and for the purpose specified.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

WILLIAM WAKELY.

Witnesses:

CLINTON SPROAT,

RICHARD P. COUGHLIN.