

May 5, 1931.

W. M. CHARMAN ET AL

1,804,206

HOT TOP

Filed Dec. 30, 1929

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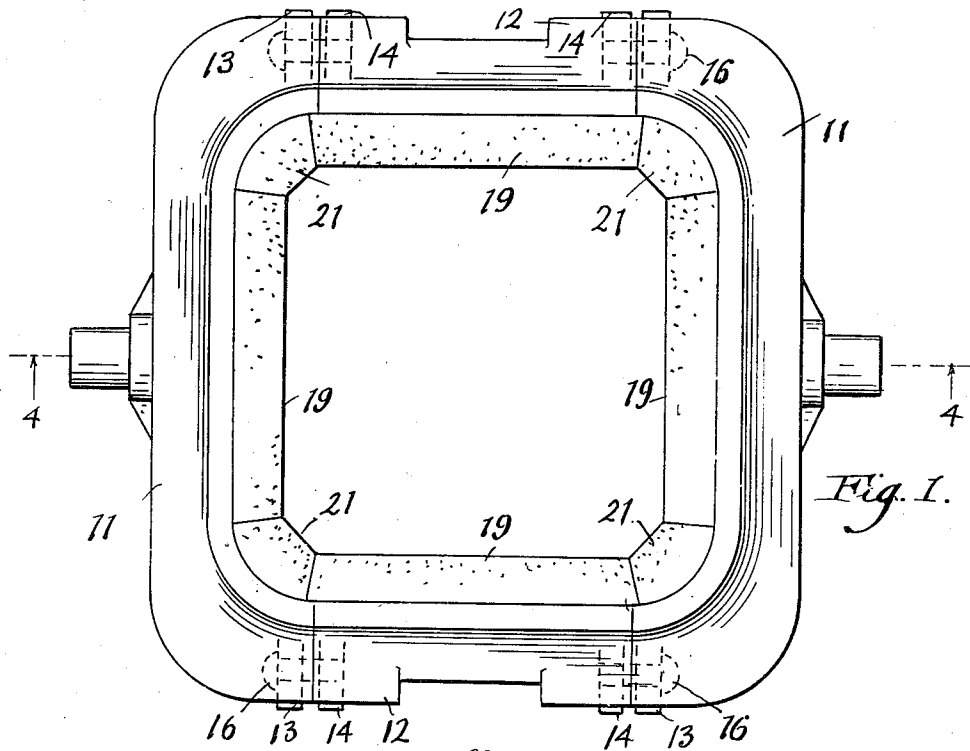


Fig. 1.

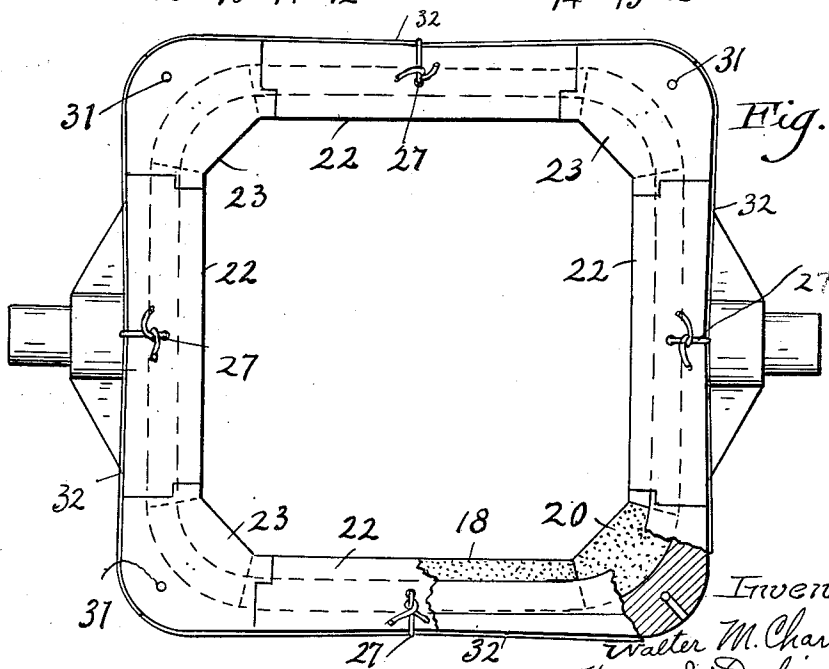


Fig. 2.

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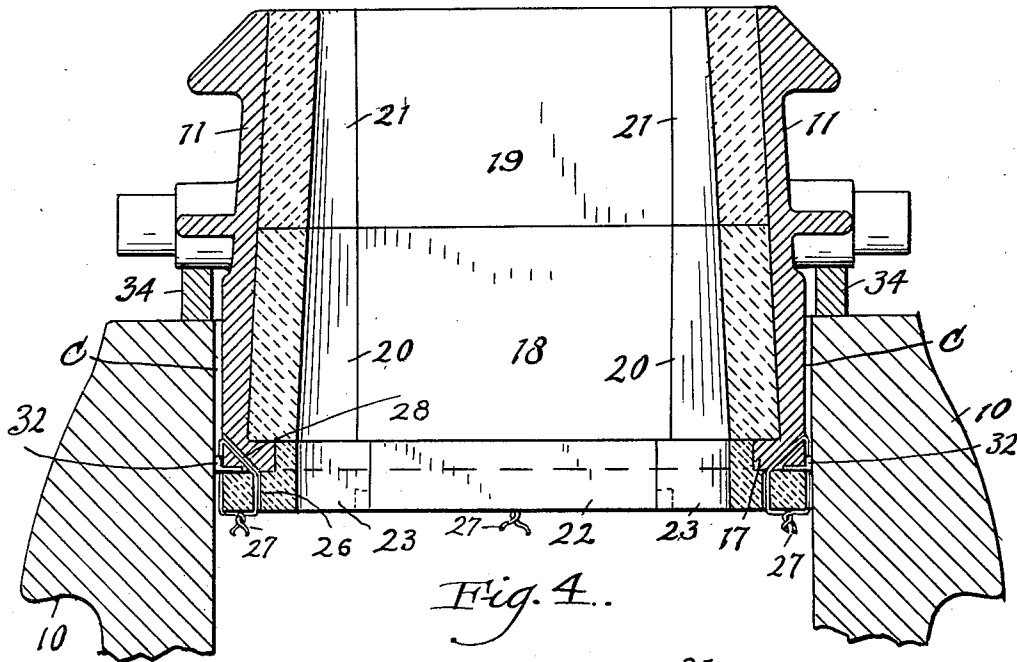
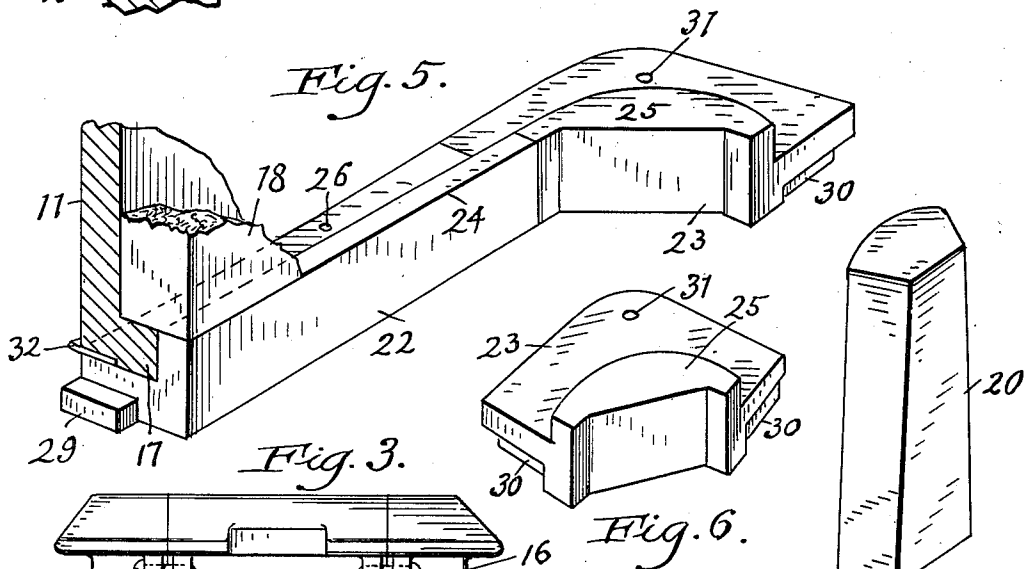
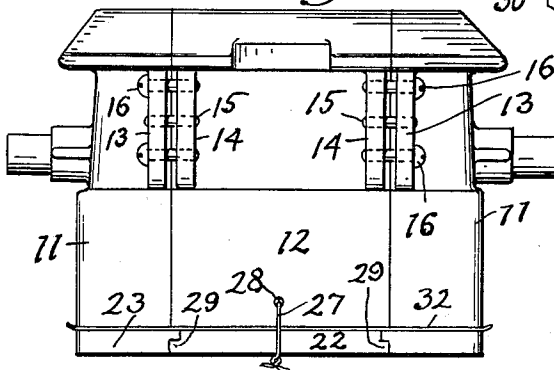
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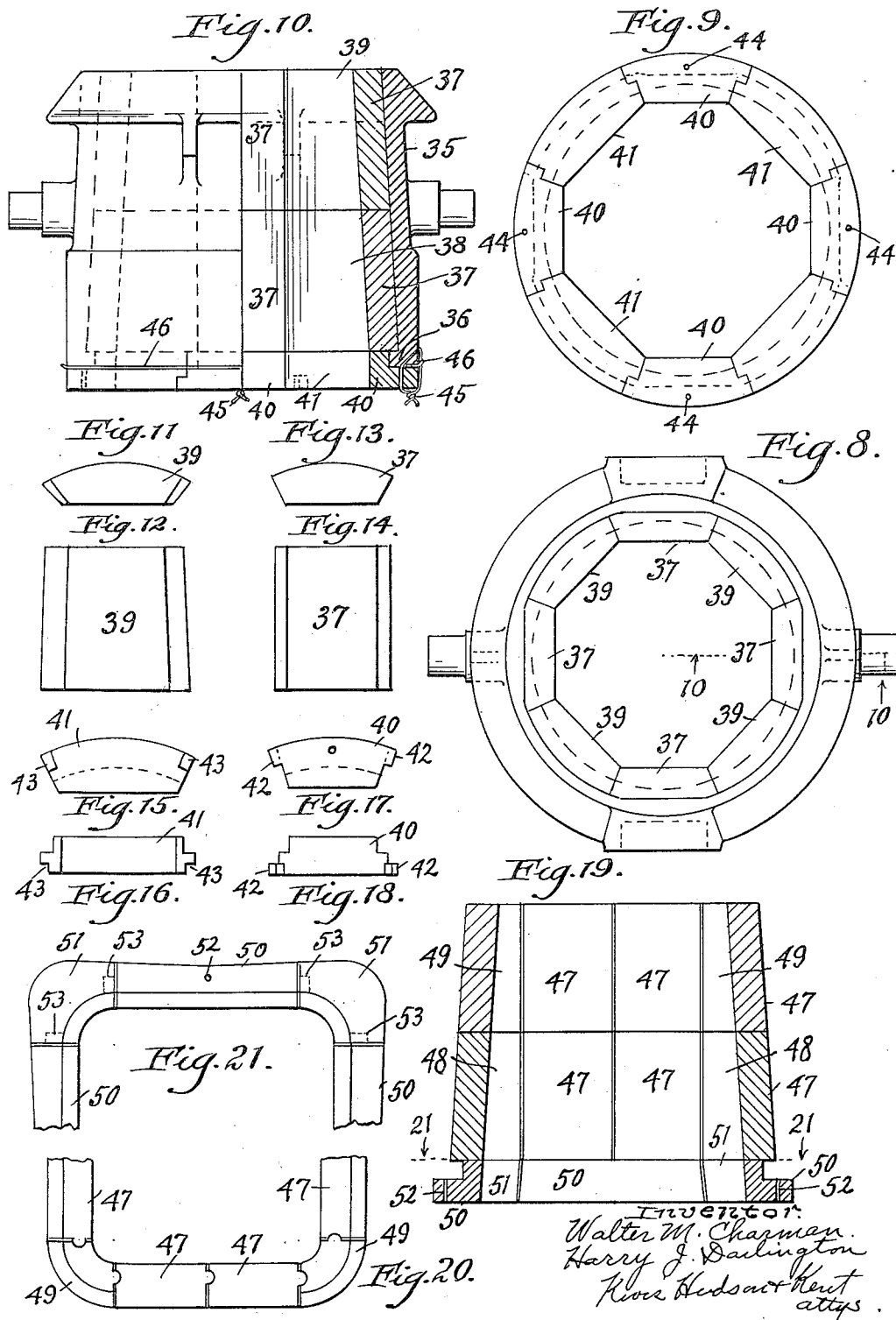
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HOT TOP

Filed Dec. 30, 1929

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UNITED STATES PATENT OFFICE

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HOT TOP

Application filed December 30, 1929. Serial No. 417,326.

This invention relates to hot tops for ingot molds, particularly reusable hot tops.

One of the objects of the invention is the provision of removable and replaceable lining elements for hot top casings.

Another object is the provision of semi-permanent lining elements of a minimum number of forms adapted to be assembled readily without fastenings, and being of a character to withstand hard usage in shipment and handling with a minimum of breakage or other damage.

A further object is the provision of means for covering anew after each casting operation the lower edge of the casing by a separate course of lining material, embodying novel means of attachment to the casing.

Other objects and features of construction will appear as we proceed with the description of those forms of the invention which, for the purposes of the present application, we have illustrated in the accompanying drawings, in which

Figure 1 is a top plan view of a square hot top embodying the invention.

Fig. 2 is a bottom view of the same, certain parts being broken away in order to more clearly illustrate the invention.

Fig. 3 is a side elevational view of the hot top.

Fig. 4 is a central sectional view taken substantially on the line 4—4 of Fig. 1, illustrating the hot top in pouring position within an ingot mold.

Fig. 5 is a perspective view illustrating a side and corner member of the lower lining course.

Fig. 6 is a similar view of the corner member alone.

Fig. 7 is a perspective view of one of the corner members of an upper lining course.

Figs. 8 and 9 are top and bottom plan views respectively of a round hot top for use in connection with round ingot molds.

Fig. 10 is a side elevation of the same, partly in section upon the line 10—10 of Fig. 8.

Figs. 11 and 12 are top and side views respectively of one of the upper course lining members.

Figs. 13 and 14 are top and side views of another upper course lining member.

Figs. 15 and 16 are bottom and inner side views respectively of one of the lower course lining members.

Figs. 17 and 18 are similar views of the other lower course member.

Fig. 19 is a vertical central sectional view of a modification of the invention, showing the lining elements only.

Fig. 20 is a fragmental plan view of the same.

Fig. 21 is a sectional view taken substantially on the line 21—21 of Fig. 19, illustrating a fragment of the lower course.

Referring first to that form of the invention illustrated in Figs. 1 to 7 inclusive of the drawing, a fragment of an ingot mold is shown at 10 in Fig. 4, this being a mold of generally rectangular cross section, preferably tapered slightly toward the bottom. Our hot top is of the type which is adapted to float with the ingot in the mold during the ingot's solidification, shrinking and cooling, and to this end the hot top is formed of a size and shape to fit within the mold opening, leaving only a small clearance C on all sides.

The hot top itself consists of a metal casing covered on the inner side wall and bottom edges with lining material, preferably refractory elements such as fire brick. The metal casing preferably comprises two pairs of castings 11 and 12. The castings 11 each form a complete side of the casing and extend around the two adjacent corners, while the castings 12 are in the nature of inserts between the castings 11 on either side of the casing. This arrangement presents advantages in machining, as only two castings of each casing have curved machined surfaces. Each of the castings 11 and 12 has two flanges 13 or 14, as the case may be, carrying fastenings by means of which the castings are held together. In assembling the parts, holes are first made in adjacent flanges for the reception of dowel pins 15, and after these pins are set, additional holes are drilled and tapped for fastening screws 16, although obviously bolts may be employed here if preferred. When these screws are drawn up tightly the

parts of the casing are rigidly connected. Of course the casing may be made in a greater or a smaller number of parts, and in fact may be a single casting if desired, but the arrangement illustrated is preferred.

At the base of the casing we provide an inwardly extending ledge 17 running entirely around the casing, this ledge being formed preferably, although not necessarily, as an integral part of the various castings making up the casing. The upper course or courses of the lining material are supported upon this ledge, and are preferably locked in place against inward movement by the shape of the elements and their interengaging relation. In the present case we have illustrated the lining above the ledge 17 as made in two courses, comprising side elements 18 and 19 of identical shape and size having parallel side edges. There is but one element 18 or 19 on a side in each course, but obviously more than one may be employed if desired. At the corners between adjacent elements 18 there are corner elements 20 which are tapered toward the top, as indicated particularly in Fig. 7, and each of which is formed on its side edges to engage the side edges of the adjacent elements 18. These edges in the present instance are beveled in a manner similar to that illustrated in Fig. 1 for the upper course. Hence, when all of the elements of the course are in place it is impossible for any one of them to move inwardly. When the course is to be removed however, one of the elements 18 may be slid upwardly out of the way, whereupon all of the other elements are readily taken out. The top course includes besides the side elements 19 corner elements 21 similar in shape to elements 20 but narrower on account of the inward taper of the casing. It will be observed therefore that in the case of a square hot top the entire lining above the casing is constructed of but three different shapes, and if a single course only is employed two different shapes are sufficient. The joints between the various elements and any surface irregularities at such joints are preferably filled with suitable cement.

The lower edge of the casing and the lower and inner edge of the ledge 17 are covered in our construction with a lower lining course, preferably of refractory material made in sections and applied to the casing by means which will permit the material to be withdrawn downwardly away from the casing, the fastenings being adapted to fail when subjected to tension in excess of that caused by the weight of the material alone. In the present instance this course consists of side elements 22 and corner elements 23. These elements cover the bottom of the casing and ledge 17, and have vertical portions extending over the inner edge of the ledge 17 and meeting the lower edges of the elements 18 and 20, these vertical portions being num-

bered 24 and 25 respectively in the drawings. The portion 25 is curved on its outer surface to conform to the inner contour of the casing 11. Each of the elements 22 has a perforation 26 therethrough for the reception of a flexible fastening, by means of which the element is supported and held snugly against the ledge 17. For this purpose we have illustrated a soft wire tie member 27 which is caused to pass through the opening 26 and through an inclined opening 28 formed in the casting 11 or 12, as the case may be, the outer end of the wire being then bent down around the outer side of the element 22 and the ends twisted together. Other types of fastenings such, for instance, as spring clips may of course be substituted for the tie wires 27, if desired.

The extremities of each of the lining elements 22 are formed to interengage and support the corner elements 23. This may be effected by means of projections 29 integral with the elements 22 which extend into recesses 30 formed in the end walls of the elements 23. In the drawing the elements 23 are shown as also provided with perforations 31 which may be employed if desired for additional fastenings, although as a general rule the fastenings on the side elements will be found to be sufficient. If all of the elements of the lower course are thus fastened the interlocking connections may be dispensed with.

On the under side of each of the castings 11 and 12 there is a shallow recess in which we mount a sheet metal wiper strip 32 that extends outwardly beyond the wall of the casing and is adapted to engage the inner wall of the mold 10 to close off the clearance C and prevent molten metal from flowing out over the top of the mold.

The hot top during the pouring operation may be supported at the desired level within the mold by means of blocks 34, as indicated in Fig. 4, or the blocks may be positioned beneath other projecting parts, such as the flanges 13 and 14. When the level of metal in the mold has risen sufficiently to float the hot top, the blocks 34 are removed.

Referring now to the round hot top construction shown in Figs. 8 to 18 inclusive, the tapered metal casing illustrated at 35 may be made of one or more pieces as desired. It is provided with an inwardly extending ledge 36 similar to the ledge 17, and for the same purpose. On this ledge are supported lining elements 37 and 38 alternately arranged, the elements 37 being of the same width throughout their length, while the elements 38 are wider at the bottom than at the top in order to enable the course of brick as a whole to conform to the tapered wall of the casing. On account of the beveled edges as shown on all of these elements, they are keyed in place when the last element 37 is slid into

position. The lining above the ledge, as in the first described form of the invention, may be in two separate courses. In this event the upper course will comprise in addition to the straight sided elements 37, tapered elements 39 which are similar to the elements 38 except that they are somewhat narrower, that is to say their lower width is the same as the upper width of elements 38, while they taper off to a narrower width at the top.

Below the ledge 36 there are a series of lining elements 40 and 41. Each of the elements 40 is provided with projections 42 which extend into recesses 43 in the elements 41 in a manner similar to the engagement of the projections 29 and recesses 30 of the first described form of the invention. Each of the elements 40 has a perforation 42 there-through for the reception of a flexible fastening element 45 which also passes through an inclined hole in the casing 35, it being understood as before that other fastening means, adapted to part or be broken by strains in excess of those caused by the weight of the material supported, may be substituted for the wires shown. A sheet metal wiper strip 46, similar to the wiper strip 32 and similarly mounted, is also employed.

In Figs. 19, 20 and 21 there is illustrated a further modification of the invention wherein the lining above the ledge is composed of elements 47 having parallel sides, and corner elements 48 and 49 that are tapered. The various elements in each course interengage by means of tongue and groove joints, as shown in Fig. 20. The lining beneath the ledge of the casing is composed of side elements 50 and corner elements 51, the side elements having perforations 52 therein for the reception of supporting fastenings similar to the fastenings 27 and 45, and the corner elements being supported from the side elements by projections 53 extending into sockets in the corner elements.

The method of using the hot top herein described is substantially the same as in the case of application Serial No. 329,486, filed by us on December 31, 1928, the present application being in the nature of an improvement. The lining elements above the ledge are a more or less permanent part of the hot top, being usable for a considerable number of heats. The life of these elements may be extended by filling the joints and covering the inner surface with a suitable coating preparatory to each casting operation. When the hot top is withdrawn from the ingot, the lower course of lining material generally adheres to the ingot, this being permitted by the breakage of the fastenings employed to support the lower lining elements, these fastenings being weakened more or less by heat from the cast metal.

Following each casting operation the hot top is reconditioned, that is a new coating is

applied to the lining elements above the ledge and new lining elements below the ledge are applied. For the latter purpose the hot top is supported by its trunnions in a suitable holder and inverted. The corner elements of the lower course are put in position first, after which the side elements are positioned and fastened by the wires shown or other means for a similar purposes.

While in the foregoing description and in the accompanying drawings we have disclosed certain embodiments of our invention more or less in detail, we desire it to be understood that such detail disclosure has been resorted to primarily for the purpose of fully illustrating the invention, and is not to be construed as amounting to a limitation upon the scope thereof.

Having thus described our invention, we claim:

1. In a hot top, a casing, a lining therefor of refractory material, said lining comprising alternate elements having parallel side edges, and intermediate elements tapered toward one end thereof.

2. In a hot top, a generally rectangular casing, a lining therefor of refractory material, said lining comprising side elements having parallel side edges, and corner elements tapered toward one end thereof.

3. In a hot top, a casing, a lining therefor of refractory material, said lining comprising alternate elements having beveled side edges arranged parallel to each other, and intermediate elements having beveled side edges, said intermediate elements being tapered toward one end thereof.

4. In a hot top, a casing having an inner surface tapered upwardly, a lining therefor of refractory material, said lining comprising alternate elements having parallel side edges, and intermediate elements tapered upwardly.

5. In a hot top, a generally rectangular casing having inner walls tapered upwardly, and a lining therefor of refractory material, said lining comprising side elements having parallel side edges and corner elements tapered upwardly.

6. In a hot top, a casing having an inner surface tapered upwardly, a lining therefor of refractory material, said lining comprising alternate elements having beveled side edges arranged parallel to each other, and intermediate elements having beveled side edges, said intermediate elements being tapered upwardly.

7. In a hot top, a generally rectangular casing having walls tapered upwardly, a lining therefor of refractory material, said lining comprising side elements having beveled side edges arranged parallel to each other, and corner elements having beveled side edges, said corner elements being tapered upwardly.

8. In a hot top, a metal casing having an inturned ledge at the bottom thereof, lining elements supported upon said ledge, and additional lining elements covering the inner and bottom sides of said ledge, said last
5 named lining elements being supported from the casing by flexible ties.

9. In a hot top, a metal casing having an inturned ledge at the bottom thereof, lining
10 elements supported upon said ledge, additional lining elements covering the inner and bottom sides of said ledge, said last named lining elements having interengaging ends, and means for securing alternate ones of said
15 last named lining elements to said casing.

10. In a hot top, a metal casing having an inturned ledge at the bottom thereof, lining elements supported upon said ledge, additional lining elements covering the inner and
20 bottom sides of said ledge, alternate ones of said last named lining elements having projections at their ends, the intermediate ones of the last named elements having portions resting upon said projections, and means for
25 securing to the casing said elements having the projections.

11. In a hot top, a metal casing comprising two end members having corner portions integral therewith, two side members adapted
30 to fit between the corner portions of the two end members, and external means for securing together said side and end members.

12. In a hot top, a metal casing having an inturned ledge at the bottom thereof, lining
35 elements supported upon said ledge, additional lining elements covering the inner and bottom sides of said ledge, means for securing every other one of said last named lining members to said casing, and interlocking
40 connections between said last named lining members preventing movement of the unsecured members.

13. In a hot top, a metal casing having an inturned ledge at the bottom thereof, lining elements supported thereupon, additional lining elements covering the lower sides of said ledge, and flexible ties for supporting
said last named lining elements from the casing.

14. In a hot top, a metal casing having an inturned ledge at the bottom thereof, lining elements supported thereupon, additional lining elements covering the lower sides of said ledge, said last named lining elements
55 having interengaging ends, and means for securing alternate ones of said last named lining elements to said casing.

In testimony whereof, we hereunto affix our signatures.

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