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SUPPORT FOR CRUCIBLES AND LADLES

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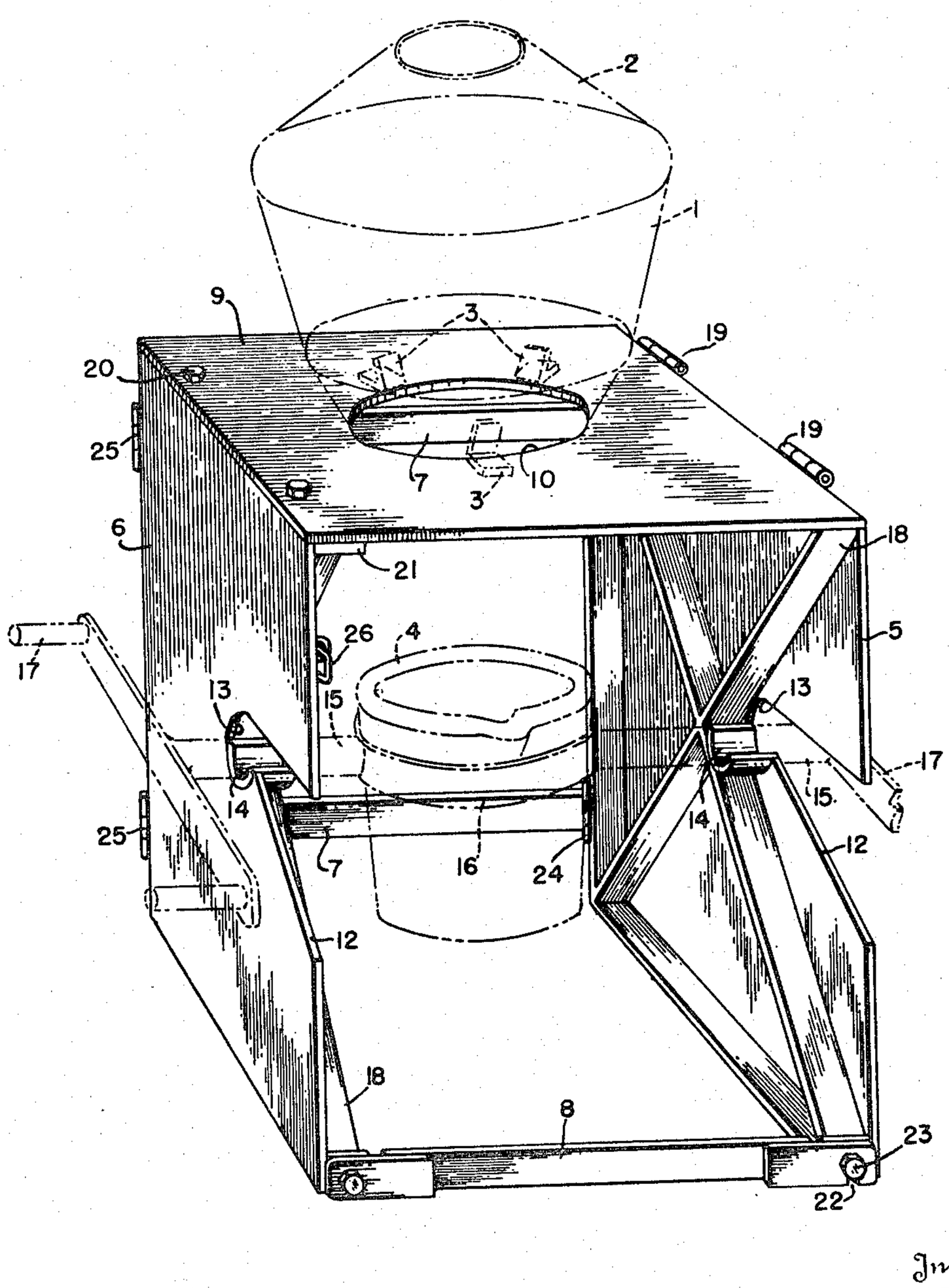

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SUPPORT FOR CRUCIBLES AND LADLES

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This invention relates to metal casting apparatus, and more particularly to a mounting structure for preparing metal for casting utilizing the thermit process.

Ordinarily, in preparing metal for casting, and particularly for steel casting, it is necessary to employ a furnace to melt the metal. Often, however, where repairs must be made in the field, as in many military situations, it is impractical to have a suitable furnace available, thus necessitating return of damaged equipment to a base with consequent delay. It has been found, however, that by employing the thermit process it is quite feasible to produce metal for casting in the field without the use of a furnace. As is well known, the thermit process utilizes the reaction which may be made to occur between aluminum and an oxide of a metal to produce a metal. The temperature of the reaction may be controlled readily by additions of scrap metal and the time required to produce metal is very short. Since the proportions of aluminum and iron oxide are constant and the primary variable is the amount of scrap to be added, the preparation of metal for casting by the thermit process is relatively simple and may be accomplished without the services of a highly skilled melter.

While no special apparatus is required for the thermit process other than a crucible and a ladle to receive the metal from the crucible, in practice the operation may be greatly facilitated by employing suitably designed apparatus.

An object of the present invention is accordingly to provide a simple and efficient apparatus for preparing metal for casting utilizing the thermit process.

A further object of the present invention is to provide a readily portable mounting structure for supporting the crucible and ladle used in the thermit process.

In accordance with one embodiment of this invention, a mounting structure may be provided comprising a substantially rectangular, parallelepiped structure formed by a pair of spaced, upright, side plates, a top plate mounted between the upper edges of the side plates, and a plurality of cross members extending between the side edges of the side plates to provide a rigid structure. A deep notch is formed in the forward edge of each of the side plates, substantially in the middle thereof, and extends rearwardly approximately to the mid-point of each plate, the notches serving to receive the ladle shank and to permit positioning the ladle directly beneath an aperture formed in the center of the top plate in which is disposed the crucible. The various members described may be rigidly joined to provide a permanent structure, or may be hinged to provide a collapsible, portable structure.

Other objects and advantages of the present

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invention will be apparent from the following detailed description taken in conjunction with the drawing wherein the single figure is a perspective view of a mounting structure constructed in accordance with this invention, a conventional ladle and crucible being shown in conjunction therewith to illustrate the utility of this invention.

As hereinbefore stated, in utilizing the thermit process for preparing metal for casting a reaction crucible is employed and the reaction ingredients, that is the aluminum, the metal oxide, for example magnetic oxide of iron, and such scrap metal as may be required, are placed in the crucible prior to starting the reaction. While the crucible forms no part of the present invention and any suitable crucible may be employed therewith, the following description of a conventional crucible for use in the thermit process may be helpful to an understanding of the present invention. The crucible may have any convenient shape, such as that of the crucible 1 shown in the drawing, and while it is generally made of metal, because of the highly exothermic nature of the thermit reaction, a lining (not shown) of refractory material is usually provided. A tapping aperture (not shown) is formed in the base of the crucible and before the reaction ingredients are placed in the crucible this aperture is sealed. For this purpose a plug is often employed, the plug having a flanged head which seats against the inner side of the crucible while a long stem is provided and extends downwardly through the tapping aperture and beyond the crucible sufficiently so that the tapping aperture may be opened by striking the stem and driving the plug upwardly into the crucible. A lid 2 is provided for the crucible to prevent splattering of the ingredients during the reaction and lugs 3 are mounted about the periphery of the lower portion of the crucible to serve as supports for the crucible. At the completion of the thermit reaction, the crucible is tapped and the molten metal is drained into a ladle 4 positioned immediately beneath the crucible. The molten metal is allowed to drain into the ladle until slag begins to collect on the surface of the metal in the ladle and then the ladle is removed to permit the slag to drain either into a suitable slag pan or into a pit formed in the ground.

In accordance with the present invention, a mounting structure is provided which may be made to be readily portable and yet will provide a rigid and efficient support for the reaction crucible and ladle. Referring to the drawing, it will be seen that this structure includes two, spaced, parallel, side plates 5 and 6, which are substantially rectangular in shape and similar in dimensions. These plates are connected at their rear edges by vertically spaced cross-members 7

and at their front edges by a cross-member 8, located immediately adjacent the bases of the side plates to avoid obstructing the front of the structure, thus facilitating positioning the ladle beneath the reaction crucible and later removing it. A heavy, rectangular, top 9 is supported between the upper edges of these side members and has formed in the center portion thereof a large aperture 10 suitable to receive the lower portion of the reaction crucible. Since the reaction crucible will tend to expand during the reaction, the aperture 10 is made slightly larger than required to admit the lower portion of the reaction crucible when cold. The reaction crucible is supported by the lugs 3 provided adjacent the base of the crucible as hereinbefore described, the lugs resting on the edge of the aperture 10. Where lugs or similar devices are not provided on the reaction crucible, as is the conventional practice, it becomes desirable to provide a flange or a ring which may serve the same purpose, as will be readily apparent.

In order to permit positioning the ladle immediately beneath the reaction crucible, a deep substantially V-shaped notch 12 is formed in the forward edge of each side member and extends from the center portion thereof rearwardly substantially to the middle of the plate. At the apex of each notch a recess 13 is formed, the recess being substantially circular and having fixed thereto the outer end of an inwardly extending, semi-cylindrical trunnion bearing 14, adapted to receive a portion of one of a pair of shank rods 15. The shank rods 15 form a part of a conventional ladle support which includes a shank 16, or ring, to diametrically opposed sides of which are fixed the shank rods 15. In use the ladle is supported in the shank, as shown in the drawing. Handles 17 are mounted on the outer ends of the rods 15 to enable transfer of the ladle and pouring. To prevent buckling of the side plates trusses 18, which may comprise angle irons suitably secured to the side plates, are mounted on the inner sides of each of the side plates.

By rigidly connecting the side plates, top plate, and cross-members, as by bolting or welding, a permanent, rigid structure of simple and efficient design is afforded which is well-adapted for use with the thermit process. Ordinarily, however, it will be desirable to make the structure portable and for this purpose it is more convenient to assemble the several elements hereinbefore described so that the structure will be collapsible or foldable. In accordance with this invention this may be readily accomplished by connecting the top plate 9 to one of the side plates, as for example the side plate 5, by hinges 19 which will permit the top plate to be pivoted upwardly and then down against the outer side of the associated side plate. The opposite edge of the top plate may be secured to the other side plate 6 by bolts 20, which are preferably made captive to prevent loss when the structure is folded, a narrow bar 21 being mounted along the upper edge of the side plate 6 and adapted to have the bolts 20 secured thereto.

Similarly, the front cross-member 8 is pivotally mounted on one of the side plates, as for example the side plate 6, and a notch 22 is formed in the underside of the right end of the cross-member so that when the cross-member 8 is pivoted into locking position the sides of the notch 22 will engage a suitable stud 23, mounted on the side plate 5. The rear cross-members 7 are connected to the side plate 5 by hinges 24 which are mounted on

the rear edge of this plate so that the cross-members may be pivoted forwardly, or in a counterclockwise direction, as viewed in this drawing. The opposite ends of the cross-members 7 are secured to the side plate 6, on the other hand, by hinges 25 so mounted on the rear edge of the side plate 6 as to permit the side plate 6 to be pivoted rearwardly in a clockwise direction, as viewed in this drawing, until the plate lies against the cross-members 7.

When it is desired to disassemble the mounting structure, the bolts 20 are disengaged from the side member 6, or more particularly the bar 21 fixed to the side member 6, and the stud 23 is loosened to permit the cross-member 8 to be pivoted upwardly to lie against the forward edge of the side plate 6 the cross-member being conveniently retained in this position by a latch 26 mounted on the side plate 6. Regarding the side plate 5 as being fixed, the top plate 9 is now pivoted upwardly and in a clockwise direction until it lies in a plane parallel with the side plate 5. The side plate 6 is pivoted rearwardly in a clockwise direction until it lies against the cross-members 7. Then the cross-members 7 and slide plate 6 are pivoted together about the axis of the hinges 24 in a counterclockwise direction until the cross-members and side plate 6 lie against the inner side of the side plate 5, thus providing a relatively compact and readily portable structure.

While but one embodiment of the present invention has been shown and described, it will be understood that many changes and modifications may be made therein without departing from the spirit or scope of the present invention.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

What is claimed is:

1. In a collapsible mounting structure for supporting a reaction crucible over a ladle, a pair of spaced substantially parallel, side plates, each of said side plates having a notch formed in the forward edge and extending substantially to the middle thereof to receive a ladle support, a top plate pivotally mounted on the upper edge of one of said side plates and extending to the other of said side plates, means for securing said top plate to the latter side plate, said top plate having an aperture formed therethrough to receive the lower portion of the reaction crucible, and cross members pivotally fixed to and extending between the rear and front edges of said side plate.

2. In a collapsible mounting structure for supporting a reaction crucible over a ladle, a pair of spaced, substantially parallel side plates, each of said side plates having a notch formed in the forward edge and extending substantially to the middle thereof to receive a ladle support, a top plate pivotally mounted on the upper edge of one of said side plates and extending to the other of said side plates, means for securing said top plate to the latter side plate, said top plate having an aperture formed therethrough to receive the lower portion of the reaction crucible, at least one cross member pivotally fixed to and extending between the rear edges of said side plates, a front cross member pivotally fixed at one end to one of said side plates, and means for securing the other end of said front cross member to the other of said side plates.

3. In a collapsible mounting structure for supporting a reaction crucible over a ladle, a pair of

spaced substantially parallel, side plates, each of said side plates having a notch formed in the forward edge and extending substantially through the middle thereof to receive a ladle support, trunnion bearings mounted in each of said notches to serve as supports for said ladle support, a top plate pivotally mounted along one edge on the upper edge of one of said side plates and extending to the other of said side plates, means for securing the other edge of said top plate to the latter side plate, said top plate having an aperture formed therethrough to receive the lower portion of the reaction crucible, and cross members pivotally fixed to and extending between the rear and front edges of said side plate.

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