Nov. 12, 1957 E. F. MAY 2,812,573

INGOT

Filed March 15, 1954

Fig-1

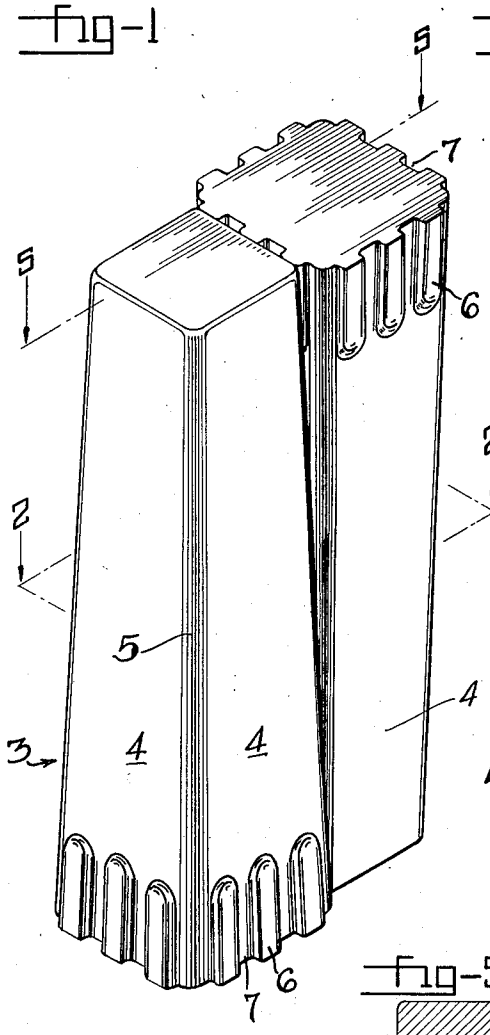


Fig-3

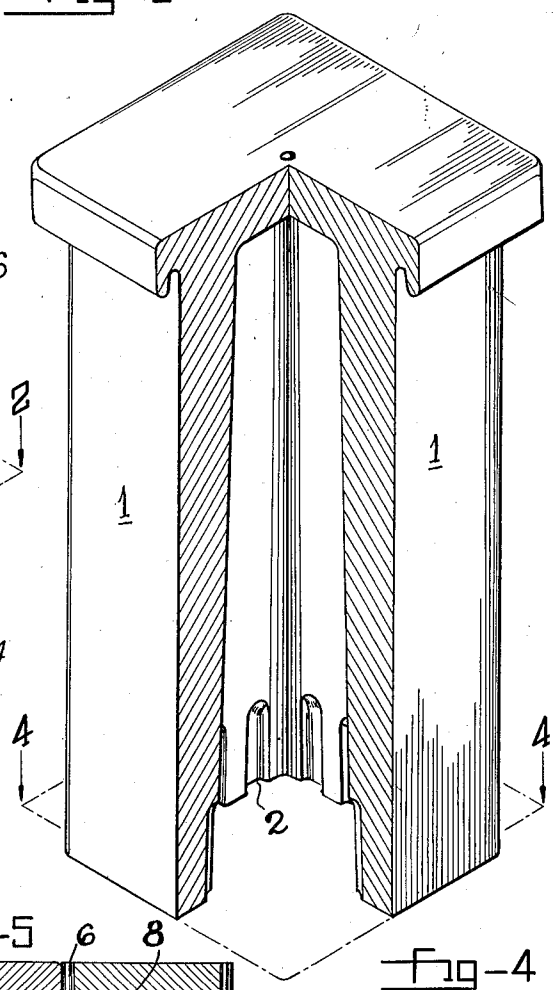


Fig-5

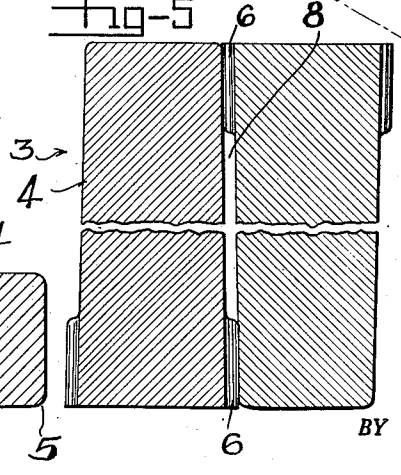


Fig-4

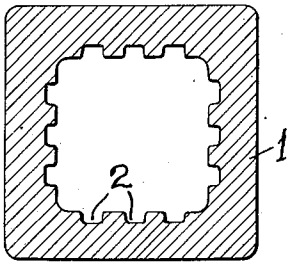
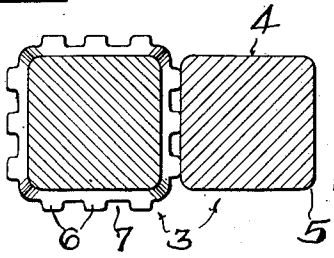


Fig 2



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United States Patent Office 2,812,573 Patented Nov. 12, 1957

2,812,573

INGOT

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Application March 15, 1954, Serial No. 416,166

2 Claims. (Cl. 29—187)

This invention relates to the production of ingots and more particularly to an ingot having a novel configuration.

In accordance with present methods ingots are usually furnace heated preparatory to their being converted into billets or other forms. In this operation the ingots are usually pushed through a furnace while in side-by-side contacting relationship one with another, and while the heated gases in the furnace freely contact the exposed surfaces of the ingots, such gases do not contact those sides of the ingots which engage with each other. Since a considerable surface area of each ingot is not directly contacted by the heated furnace gases, the heating period required to suitably heat condition the ingots for further processing is longer than it would otherwise be with the heated gas directly contacting each side of the ingots. It is therefore far more desirable from an efficiency and economy standpoint to bring the furnace gases into direct contact with each side of the ingots, for not only would the time required to properly heat the ingots be lessened, but the fuel expense also would be accordingly reduced.

I have found by forming ingots with fluted end portions and gradually tapered sides, that a number of such ingots can be arranged in side-by-side engaging relationship while at the same time providing an intervening space extending along the greater part of the length of such ingots, thereby permitting the furnace gases to contact the adjacent opposed surfaces of such ingots as well as their other sides. Over the furnace heating methods now in use, the present invention will permit a reduction of the customary heating period in the furnace, a lower consumption of fuel, an increased rate of operation and a correspondingly less maintenance expense with respect to the furnace and other equipment being used.

The primary object of my invention is to provide an improved ingot having a novel form and construction which makes it possible for a number of such ingots to be arranged in side-by-side contacting relationship while at the same time providing an intervening air space between the opposed adjacent sides of the ingots, whereby heated currents of air or gases may contact substantially the entire surface area of a number of such ingots as they are being projected through a furnace.

Other and further objects of my invention will be pointed out hereinafter, or will be indicated in the appended claims or will be obvious to one skilled in the art upon an understanding of the present disclosure. For the purpose of this application, I have elected to show herein certain forms and details of an ingot which is representative of my invention; it is to be understood, however, that the embodiment of my invention herein shown and described is for purposes of illustration only, and that therefore it is not to be regarded as exhaustive of the variations of the invention in the art.

In the accompanying drawings:

Fig. 1 is a perspective view of two of the ingots embodying my invention, showing the normal relative position of such ingots while they are being projected through a furnace during the heating thereof;

Fig. 2 is a sectional view taken on the line 2—2 of Fig. 1;

Fig. 3 is a perspective view of a mold used in producing the ingots, showing parts broken away and in section;

Fig. 4 is a sectional view on a reduced scale, taken on the line 4—4 of Fig. 3; and

Fig. 5 is a longitudinal sectional view on a reduced scale, taken on the line 5—5 of Fig. 1.

The mold employed in the manufacture of my improved ingot is of the general type used in the art and a detailed description is not considered necessary to an understanding of this invention. Suffice it to say that the mold may be made from any suitable material such as cast iron, that its four sides 1 have interior surfaces which are arranged in converging relationship and that the larger or wider end of the mold is formed interiorly with a series of grooves or depressions 2.

An ingot embodying the principles of my invention comprises an elongated tapered body 3 having a substantially square cross sectional shape throughout the greater part of its length. The ingot body is formed with four converging sides 4, and it preferably has rounded corners as at 5.

The larger end portion of the ingot, at each of its sides, is formed with a plurality of spaced short protuberances 6 which are uniformly spaced or separated one from another by channels or flutes 7. The protuberances are appreciably shorter in length than the ingot body, and they extend longitudinally from the largest end of such body toward its shortest end for a short distance. The protuberances 6 are substantially the same size and shape, and preferably their outer sides are arranged in converging relationship. The protuberances 6 are preferably raised sufficiently from their respective sides 4 that when two of such ingots are positioned alongside one another with the protuberances of one positioned alongside the smaller end of the other, as shown in Figs. 1 and 5, the outer sides 4 of such ingots will be positioned in parallel relationship.

When a number of ingots 3 are positioned alongside one another as shown in Figs. 1, 2 and 5, with certain protuberances 6 of one contacting the smaller end of another, there is provided an intervening space 8 extending lengthwise between the adjacent sides of such ingots and along the greater portion of the length of such ingots. During a heat conditioning operation when several ingots are moved through a furnace while in the relative positions shown on the drawings, heated furnace gases circulate around and between the ingots and through the channels 7 between the protuberances 6, thereby applying heat uniformly to each of the sides of all of the ingots. Since the heated furnace gases come into direct contact with the inner adjacent sides as well as the outer sides of the ingots along the greater portion of the length thereof, the ingots are suitably heat conditioned to a desired temperature for further processing or rolling into billets or sheets in a comparatively short time. While the protuberances 6 are shown on the drawing as extending along approximately one-sixth (⅙) of the length of an ingot, it is to be noted that the lengths of such protuberances may be even shorter, thus increasing the intervening space between two contacting ingots and thereby making it possible for the heated furnace gases to contact and circulate between the ingots along a greater portion of their lengths. It is to be noted that a number of advantages can be claimed over other methods now in use by utilizing the principles of the present invention, among which are increased production with the same furnace facilities, less fuel consumption, savings in the time and labor, less maintenance costs for furnaces and other

equipment, and the consequent reduction of other overhead costs.

What I claim is:

1. An ingot comprising an elongated tapered body having converging sides and also having a substantially rectangular cross-sectional shape throughout the greater portion of its length, a plurality of laterally spaced longitudinal protuberances of substantially the same height on each of the sides of the body adjacent the larger end thereof, the length of the protuberances being substantially shorter than one-half the length of the body, and the longitudinal sides of each protuberance being arranged in converging relationship.

2. An ingot comprising an elongated tapered body having converging sides and also having a substantially rectangular cross-sectional shape throughout its length, a plurality of laterally spaced elongated parallel protuberances of substantially the same height on each side of the body adjacent the larger end thereof, the protuberances being substantially shorter than one-half the length of the body, and the longitudinal sides of each protuberance being arranged in converging relationship, the taper of the body and the height of the protuberances being so related that when two of said bodies are in side-by-side relationship with the protuberances on one side of one of such bodies in contacting relationship with the smaller end portion of the other body the said bodies will be disposed in parallel relationship with an intervening space extending the greater portion of the length of the bodies.

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