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METHOD FOR CASTING PISTONS

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Fig. 1.

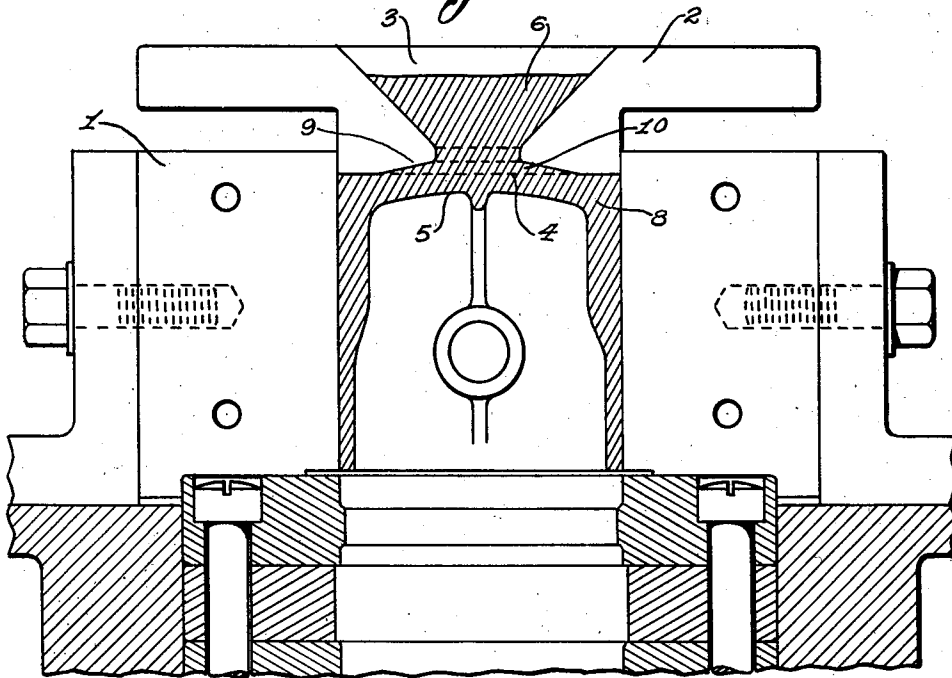


Fig. 2.

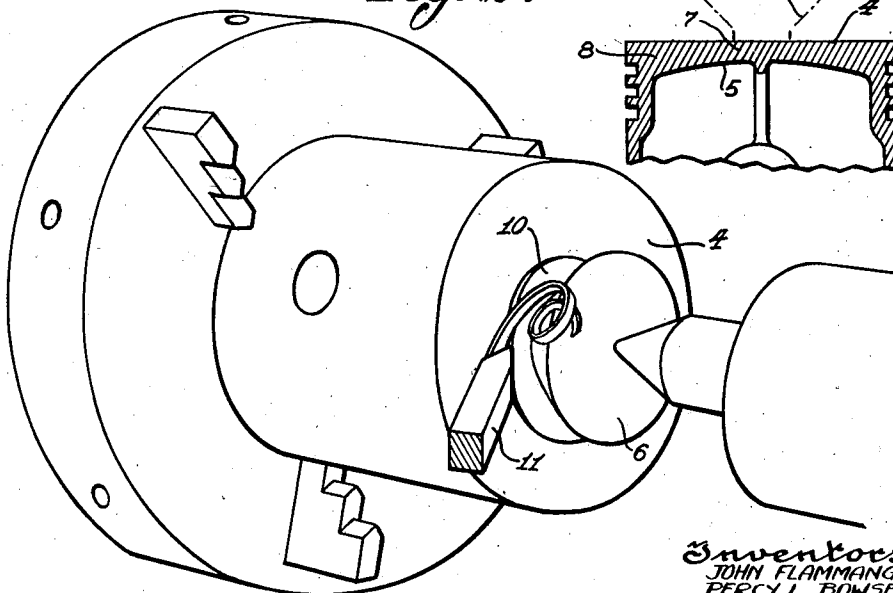
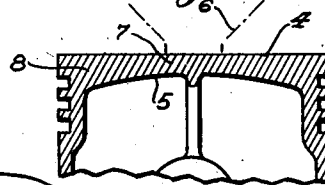


Fig. 3.



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METHOD FOR CASTING PISTONS

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3 Claims. (Cl. 29—156.5)

This invention pertains to a method for casting, and more particularly to casting articles of a particular type, such as trunk pistons.

Trunk pistons have a generally cup shape providing a head and a skirt. Many types of trunk pistons are formed with a flat head, that is, the head is flat or plane on its exterior surface. Furthermore, such pistons are usually formed with the head thinner at its central portion than at its rim. These structural features are designed to meet definite operating conditions.

In casting such pistons it has been found convenient to arrange the mold so that the piston is cast with its head uppermost. Furthermore the ingate is usually placed at the center of the piston head so as to provide, as far as possible, a uniform radial flow for the metal to the different parts of the piston. With this arrangement the ingate enters the matrix at a point where the head of the piston is relatively thin, thinner in fact than it is at the rim of the head. Accordingly a considerable amount of metal flowing in at the ingate must pass through this thin section. Where the section is thin, cooling is more rapid than at points heavier and a definite tendency for the metal to cool and set is found at such points. As the amount of metal in the rim of the head is greater than at this thin section there is a definite tendency for the metal at the thin section to set before the metal at the rim becomes sufficiently cool to solidify. As the supply of metal to the heavier section at the rim must pass through the thin section, there is danger of an insufficient supply of molten metal to take care of crystallization shrinkage at this thin section, and between this point and the rim. In fact difficulty has been encountered in making such castings on account of the fact that such setting actually does take place and there is a liability of the metal being porous at this point.

One of the objects of this invention, therefore, is to provide a method for casting such a flat head piston arranged so as to overcome this tendency to produce porous metal between the ingate and the rim of the piston head.

Another object is to provide a casting method by which any tendency to produce porous metal may take place in such a portion of the piston blank that the defective metal will be removed during subsequent finishing operations.

Further objects will appear from the following description taken in connection with the accompanying drawing, in which:

Figure 1 is a vertical sectional view of a mold employed in performing this invention and illus-

trating the manner in which the casting is carried out.

Figure 2 is a perspective view illustrating the subsequent finishing of the piston; and

Figure 3 is a fractional section of the head of the finished piston.

Referring now to the drawing, 1 designates a mold of any suitable type provided with a suitable core, not shown, for forming the interior surface of the piston blank. In Figure 1 the piston blank is shown within the mold, the core having been removed. The mold 1 may be provided with a cover or top 2 provided with an ingate 3 entering the piston matrix at the center of the piston head. The finished piston has a flat head indicated at 4 on its exterior. The interior surface of the piston head is tapered toward the center as indicated at 5. It will be seen from Figure 3 that the interior surface 5 approaches the flat surface 4 at the center of the head. The ordinary ingate, indicated in dotted lines at 6, would provide a thin section at 7 through which the metal must flow to the heavier section 8 at the rim of the piston head.

In accordance with the present invention the mold is provided with an enlargement of the matrix as indicated at 9. This is an upward slope of the top surface of the matrix from a point of the piston head near the rim thereof, upwardly toward the center. This slope is preferably such as to provide a vertical depth of the matrix between this portion and the top of the core, at least equal to the vertical depth of the rim portion 8. In this way the restriction indicated at 7 is eliminated and this portion of the matrix is provided with increased flow capacity for molten metal so that the metal will flow more rapidly to the various parts of the piston blank and particularly to the rim portions of the head at which portions a considerable volume of metal is required. This arrangement not only provides such increased flow capacity so that easy access of an ample supply of a molten metal is provided, but the section of the piston head is increased throughout the central portion thereof. As the tendency to produce porous metal is greatest at the point adjacent the mold top and just inside the ingate, such porous metal, if produced at all, will be found in the bulge 10 produced at the center of the piston head by the enlarged portion 9 of the matrix.

After the piston blank has been cast and removed from the mold, the bulge 10 is removed in finishing the piston. This step is illustrated in Figure 2 in which the piston blank is shown

mounted in a suitable machine, while a cutting tool 11 is shown removing the excess metal of the bulge 10 so as to produce the flat head 4.

It will be seen that in accordance with this invention the difficulty encountered in casting flat head pistons due to the tendency to produce porous metal at the point 7 is overcome. This is accomplished by providing ample flow capacity for the molten metal and by providing a portion of the piston blank so located that any porous metal will be produced in this portion, which portion is subsequently removed during the finishing operations on the piston.

This application is a continuation in part of application Serial No. 683,431 filed August 3, 1933, the common subject matter relating to forming a piston head of solid metal without flaws by casting an external bulge on the head and later removing the excess metal by machining the head to a flat form.

It will be seen, therefore, that while this invention has been described as applied to a unitary device, it will be understood that individual features, or subcombinations thereof, may be useful by themselves without reference to the other features. It is understood that the employment of such individual features or subcombinations is contemplated by this invention and within the scope of the appended claims. It is further obvious that various changes may be made, within the scope of the appended claims, in the details of practicing my method without departing from the spirit of this invention; it is to be understood, therefore, that this invention is not limited to the specific details shown and/or described.

Having thus described the invention what is claimed is:

1. The method of making a trunk piston having a flat head which is thinner at its center than at its rim, comprising, forming a mold with a shape to form the piston head with an external

bulge at its center portion, pouring the metal through an ingate opposite the center of the piston head so as to provide an increased flow from the ingate through said bulge in all directions toward the rim of the piston head, and thereafter removing the metal of the bulge in order to form the flat head.

2. The method of making a trunk piston having a flat head which is thinner at its center than at its rim, comprising, casting a piston blank to a form having an external bulge at the center of its head by pouring the metal to the casting through an ingate at the center of the head so that the metal flows through said bulged portion whereby freedom of flow is provided in all directions along the head and an ample supply of metal to the head is provided to insure soundness of the casting, and thereafter machining the head to flat form, thereby removing the excess metal at said bulge.

3. In the art of casting trunk pistons having heads thinner at their centers than at their rims in a metal mold which may chill the casting metal, the method comprising, forming the metal mold matrix with a cavity to form an external bulge at the center of the piston head, providing in such metal mold matrix a flared ingate decreasing in size toward its inner end, directly interconnecting the inner ingate end with such cavity by a throat having a length a small fraction of its width, pouring the metal through such ingate at said bulge so as to provide an increased flow from the ingate through said bulge in all directions toward the rim of the piston head, and maintaining a large mass of molten metal in the ingate so as to promote ready transfer of heat and metal from said mass to the piston head in order to compensate for shrinkage.

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