

The Design of Complicated Castings

Special Designs Required for Certain Castings to Prevent Trouble in the Foundry. Special Methods of Handling Difficult Work in the Foundry. Abstract of Paper Read Before American Society of Mechanical Engineers.

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Castings are often designed with a useless multiplicity of ribs, walls, gussets, brackets, etc., which by their synchronous cooling and their inharmonious shrinkage and contraction, may entirely defeat the intention of the designer. He may find some of his walls, ribs or brackets cracked before the casting is cleaned. It is sometimes possible to remove such superfluous walls, ribs and brackets, and thereby obtain not only a lighter but a stronger and more dependable casting. It is highly essential that the designer keep in mind, as nearly as he can imagine, the cooling processes through which the casting must pass, and the effect which will be produced upon any given wall or member of the casting if it is cooled faster or slower than the other parts of the same casting.

The outer walls of a casting, that is to say,

a much longer period. As a consequence the outer members of certain castings may cool and take on their ultimate dimensions while the inner members are still very hot. The latter will, of course, ultimately cool off by conduction, but they will also continue to contract until at normal temperature, and their freedom of contraction may be prevented by the already determined dimensions of the outer walls. As a result there is likely to be violent tension strains in the interior walls of such castings. Sometimes these strains are sufficient to cause rupture while the casting is still in the mould. Sometimes the casting does not rupture until it is out in service; and even if it breaks in service the rupture may not be produced by stresses of engineering design, but may be due to the original synchronous cooling of the various parts of the casting.

means be beneficially affected. In the case of a flywheel with heavy rim but comparatively light arms and hub, it may be beneficial to remove the flask and expose the rim to the air so as to hasten its natural rate of cooling, while the arms and hub are still kept muffled up in the sand of the mould and their cooling retarded as much as possible. Or in the case of a flywheel with an ordinary weight of rim and arm but with a heavy hub, the hub may be exposed and compelled to cool more readily than it naturally would, while the arms and rim are kept muffled in sand, and the synchronous cooling above referred to is at least approximated.

It is often thought that large fillets are fine features of design in work of this sort, but many times they are highly detrimental to good results. Where two walls meet and intersect, as in the shape of a T, if a large fillet

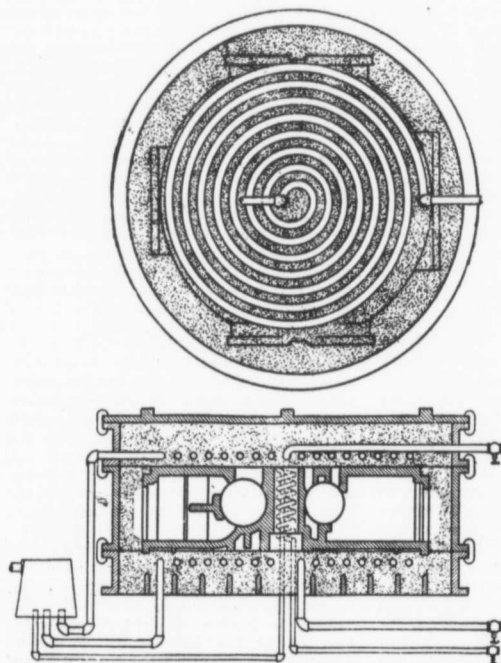


Fig. 2—A Cylinder Head Mold Requiring Special Provision for Cooling.

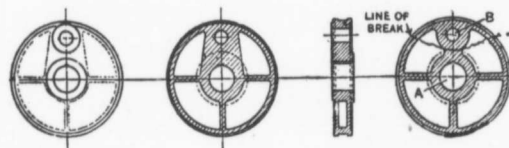


Fig. 1—Crank Disk Calling for Special Foundry Treatment.

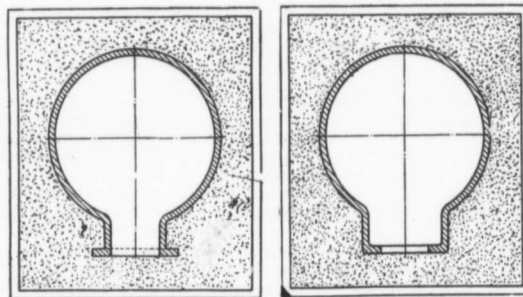


Fig. 3—Mold for a Nozzle with Fig. 4—Suggested Design for the Flange. Nozzle in Fig. 3.

those which are more nearly adjacent to the sides and radiating surfaces of the flask, are naturally the first parts to lose heat, to begin to contract and decrease all their linear dimensions. The inner walls of the same casting, being more isolated from the conducting surfaces of the flask, may remain hot for

EQUALIZING THE RATE OF COOLING.

There are some castings, which, by virtue of their shapes, can be specially treated by the foundryman, and artificial cooling of certain critical parts may be effected in order to compel such parts to cool more rapidly. The strength of the casting may by such

is swept at the juncture, there will be a pool of liquid metal at this point which will remain liquid for a longer time than either wall because of its lessened facilities for quick cooling; and this pool of liquid metal is bound to act as a feeder, supplying metal for other parts lower in the mould that may shrink