My invention relates to permanent molds, and more particularly to a water jacket construction for such permanent molds.

Permanent molds are often made of hard metal of low ductility. Such metal, upon being repeatedly heated and cooled, is subject to cracks and to fractures which permit the water from the water jacket to come in contact with the hot metal in the mold. Thus there is grave danger of serious explosions and injury to plant and workmen.

My invention comprises the lining of the water jackets of permanent molds with a ductile lining such as bronze, which is attached to the interior surface of the water jacket in such a manner as to permit ready conduct of heat from the mold surface to the water in the jacket.

An object of my invention is to provide a water jacket for a permanent mold which will overcome the dangers inherent in using hard metal of low ductility for the permanent molds.

Another object of my invention is to provide a mold construction in which the water jacket may be cheaply made, easy of repair and replacements, but which will overcome the danger of water jacketed permanent molds.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements comprising my invention may be varied in construction, proportions and arrangement, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawing means for carrying the same into practical effect without limiting the improvements in their useful applications to the particular constructions, which, for the purpose of explanation have been made the subject of illustration.

In the drawing,

Figure 1 is a sectional view taken through the mold embodying my water jacket construction;

Figure 2 is a perspective view of a block of material with the ductile metal welded in place, showing how the water jackets are constructed;

Figure 3 is a sectional view showing the operation of my construction to prevent the dangers inherent in using hard metallic permanent water cooled molds.

Referring to the drawing, in Figure 1 I have shown two mold parts 1 and 2 which are adapted to be held in place adjacent each other to form a mold cavity 3 for making, for instance, a plow point or some other desired cast article. The upper mold part is provided with a movable mold section 4 of frusto-conical shape which fits in an aperture in the cast iron of the mold part 1. The mold section 4 is adapted to be spring pressed by means of a spring 5 to push it in towards the interior of the mold. A screw threaded cap 6 holds the spring 5 under tension.

The screw threaded cap 6 fits into an annular member 7 which is welded as indicated at 8 to the upper surface 9 of a water jacket construction 10. The water jacket has side walls which are lined as indicated at 11 and its wall opposite the mold cavity is also lined as indicated at 12 with a tough ductile metal.

In actual practice the mold part 1 is generally of cast iron and the lining at 11 and 12 is usually of bronze. This bronze can be readily welded to the interior of the water jacket and will give practically a molecular contact between the cast iron of the mold part 1 and the liner itself. This is necessary because any air space prevents the fluid in the water jacket 10 from cooling the molds sufficiently for efficient operation.

The mold part 1 is provided with ports 13 and 14 for passing water or some other cooling fluid through the water jacket 10. It is to be noted that I have provided the mold at its portion within the water jacket 10 with an annular surface 15 into which fits the lower end of annular member 7. Welding metal, as indicated at 16, holds the annular member 7 firmly in place. The purpose of the movable mold section 4 is to permit movement of the section 4 which is adapted to form a protuberance on the casting. If it were not for a construction of this kind, the casting in cooling would be subjected to undue strains because of contraction, and fractures and cracks would be generated. This is all more fully set forth and claimed in a pending application filed by me.

The lower mold part 2 is similar in construction to the mold part 1. One exception is that instead of a movable mold section 4, I show a movable core. The lower mold part 2 is provided with the movable core 17 which is spring pressed by means of spring 18 held in place by a screw cap 19 which fits in an annular member 20 which passes through the top plate 21 of the water jacket 22. The top plate 21 is held in place on the water jacket 22 by means of weld 23 which may be made of bronze or similar ductile metal. The interior of the jacket at its sides is provided
with a welded lining 24 and also a welded lining 25 on its surface opposite the mold cavity.

The annular member 20 is held in place at one end by welding 26 which holds the annular member 20 in its place in its seat in annular member 27 formed on the interior surface of the water jacket 22. At its other end annular member 20 is held in place by welding 27 which joins the top plate 21 to the annular member. The function of the movable core to prevent injury to the casting is more fully set forth in a copending application filed by me.

The cover 9 of the water jacket 10 is likewise held in place by a welding as indicated at 28 which corresponds to the welding indicated at 23 for the mold part 2.

Diagrammatically I have illustrated some means, such as bolts 29, for holding mold parts 1 and 2 together. It is to be understood that this showing is entirely diagrammatic and that in actual practice there is usually some quick opening and closing means to permit the mold parts to be separated and then closed and held in place. The lower water jacket 22 is provided with ports 30 which permit cooling fluid to be circulated through the water jacket.

In the construction of my water jackets I employ preferably bronze alloys rough welded as indicated at 31 to a cast iron base indicated generally at 32. This rough welded mass 31 can be smoothed as indicated at 33 or can be left rough. The welding of the ductile metal to the hard base gives close contact between the two which is necessary for rapid heat transferance.

In Figure 3 I have shown a cross section to illustrate the utility of the water jacket construction. I have diagrammatically illustrated a cast iron section of the mold 34 which may be adjacent the cast article. This cast iron section 34 may have a blow hole 35 and may have formed in it a crack 36. The blow hole 35 is a source of weakness which may result in a crack, and the crack 36 may be large enough to permit water or other cooling fluid to seep through the mold walls and come in contact with the molten metal. If such should occur, there is grave danger of serious explosion and injury to the operatives and to the plant.

From the drawing, however, it will be apparent that the cast iron mold 34, because covered with a ductile layer 37 which is welded in place, will not be dangerous in use even where water is in contact with the surface of the ductile layer 37. The ductile layer 37 can give without rupture and water will not enter the cracks or faults in the cast iron and pour into the interior of the mold.

An alternate form of my invention is one in which I may employ a water jacket for a mold part, which mold part is to be of ductile material. In such a case, the lining which I weld on the inside of the ductile mold part still will perform its function of preventing leakage of cooling fluid into the interior of the mold. In this aspect of the invention, it should be pointed out that mold parts made of metal of high ductility are still subject to cracking and that, even though the lining is of the same or lower ductility than the mold part itself, it will perform a very useful function.

From this aspect of the invention, therefore, the difference between the ductility of the mold part proper and the lining though important is not controlling in all instances. The consideration that the lining is, in effect, a different unity from the mold part and, therefore, not subject to all of the strains of the mold part proper is of great importance. It is necessary to have a sufficiently close union between the mold part proper and the lining to permit ready heat transference. Welding the lining to the mold part has effectually solved this question of a sufficiently intimate contact to provide the ready heat transference. However, welding does not give a sufficient homogeneity between the lining and the mold part to make the lining subject to all of the accidents due to strain which may be set up in the mold part proper. It is this preserving of a distinct entity between the mold part proper and the lining in combination with sufficiently close union between the two to provide efficient heat transference that is the very essence of my invention. Other unions than welding are contemplated within the scope of this invention.

While I have shown and described the preferred embodiment of my invention, I wish it to be understood that I do not confine myself to the precise details of construction herein set forth by way of illustration, as it is apparent that many changes and variations may be made therein, by those skilled in the art, without departing from the spirit of the invention, or exceeding the scope of the appended claims.

I claim:

1. In a permanent mold, mold parts having mold surfaces of hard metal of low ductility, a water jacket for each mold part made of the same metal as the mold surface, and a lining welded to the inner walls of the water jacket of ductile metal.

2. In a permanent mold, mold parts having mold surfaces of cast iron, a water jacket for each mold part made of cast iron, and a lining of ductile metal welded to the inner walls of the water jacket.

3. A water jacket for a permanent mold part comprising metallic walls integrally formed with the mold part proper, and a lining on the interior of said walls of the jacket which is welded in place.

HENRY E. McWANE.