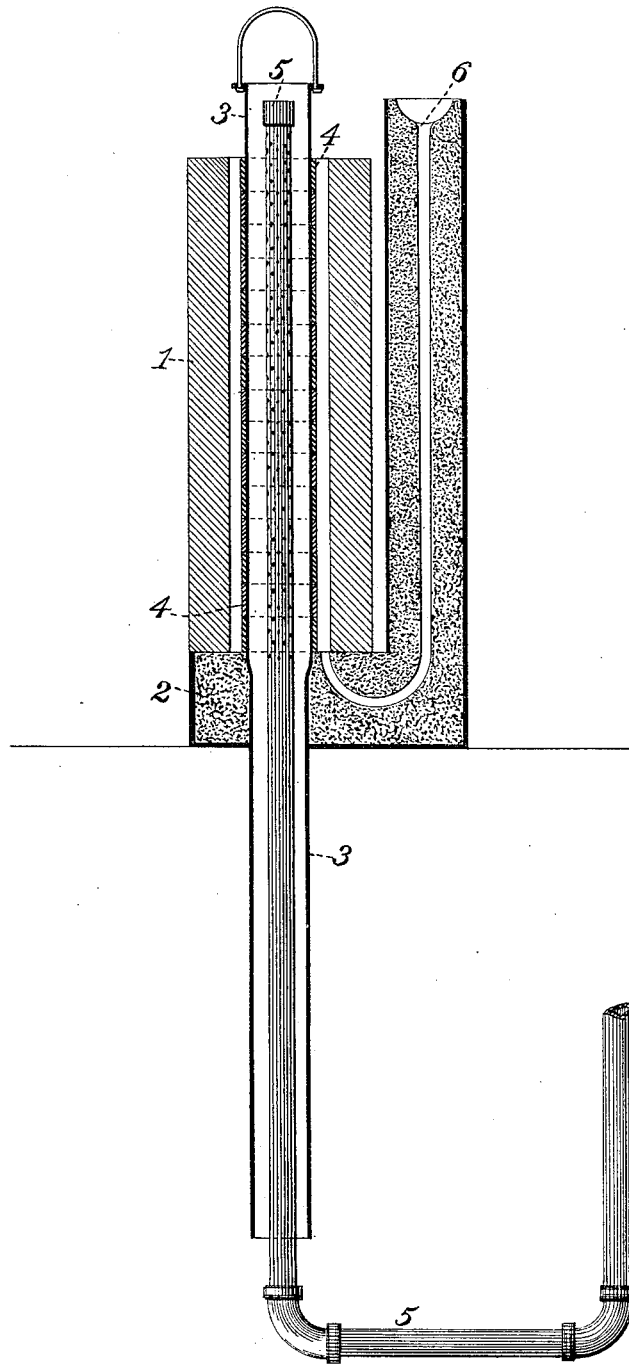


(No Model.)

W. HAINSWORTH.  
MOLD FOR HOLLOW ARTICLES.

No. 386,067.

Patented July 10, 1888.



WITNESSES:

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Att'y.

# UNITED STATES PATENT OFFICE.

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## MOLD FOR HOLLOW ARTICLES.

SPECIFICATION forming part of Letters Patent No. 336,067, dated July 10, 1888.

Application filed May 22, 1888. Serial No. 274,737. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM HAINSWORTH, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered certain new and useful Improvements in Molds for Hollow Articles, of which improvements the following is a specification.

The invention described herein relates to certain improvements in molds for casting pipes, hollow ingots, and other tubular articles formed of steel.

While comparatively little trouble and labor are required in removing sand cores from articles formed of cast-iron, great difficulty is encountered in such removal when the article is formed of cast-steel, on account of the permeation of the steel, which is very fluid when molten, into the sand of the core, thereby forming an exceedingly refractory material firmly united to the walls of the article. It has been attempted to overcome this difficulty by using a hollow metallic core, through which a cooling fluid is caused to circulate; but such a core is liable to become fastened in the article by the contraction of the steel. Metallic bars, either solid or tubular, provided with a cover formed of straw ropes and coated with loam or other suitable material, have also been employed. Cores so constructed cannot, however, be withdrawn from the article until after the straw has been burned out.

The object of the invention described herein is to provide a core so constructed as to permit of the easy escape of the gases and of the quick and ready removal of the core from the mold; and to these ends the invention consists in the construction and combination of mechanical devices or elements, all as more fully hereinafter described and claimed.

In the accompanying drawing, forming a part of this specification, is shown a sectional elevation of a mold embodying my invention.

In the practice of my invention the mold 1 is preferably formed of metal, although molds formed of sand or suitable material may be employed. This mold is arranged upon a bed, 2, through which is formed a central opening for the passage of the tubular core-bar 3. This core-bar is made of a length a little greater

than twice the length of the mold-matrix, and for about half its length its external diameter is considerably reduced, as shown. That portion of the core-bar having the greater diameter is arranged within the mold, its upper end projecting a little beyond the mold, and that portion having the reduced diameter being wholly outside of the mold, as shown in Fig. 1.

The core-bar having been arranged in the mold as above described, a series of thin bands or rings, 4, formed of sand or other suitable molding material, are slipped over the core-bar, entirely covering the portion of the core-bar within the mold-matrix. These rings or bands are made of an external diameter equal to that required in the finished article and of an internal diameter only slightly greater than the external diameter of the core-bar; or, rather, the core-bar and the bands or rings are so proportioned as regards the external and internal diameters of the bands or rings and the external diameter of the core-bar that the rings or bands can be made comparatively thin. The spaces between the adjacent edges of the rings or bands and between the latter and the core-bar afford ample opportunity for the escape of gases.

Within the core-bar I arrange a perforated pipe, 5, connected with a suitable water or other cooling-medium supply. The mold is filled, preferably, through the runner 6, although the metal may be poured in at the top of the mold. As the molten steel comes in contact with the surface of the bands or rings it sets, forming a thin shell, and as the metal, in cooling, contracts, the bands or rings are pressed inwardly toward the core-bar, which is simultaneously expanded by the heat of the molten metal as to bear against and form an internal support for the bands as against the inwardly-acting pressure of the cooling metal. As soon as the surfaces of the ingot have solidified sufficiently to permit of the withdrawal of the core-bar, the water or other cooling medium is applied to the interior of the core-bar, thereby causing the same to contract sufficiently to permit of its withdrawal from the bands or rings. The application of the cooling medium is continued until that portion of the core-bar having the greater diameter is

entirely withdrawn from the mold, thus preventing a re-expansion of the core-bar. As soon as the part of the core-bar having the greater diameter is withdrawn, and while the part having the less diameter is still within the mold, the cooling medium is turned off, as the diameter of said part is made sufficiently small to prevent its being clamped by expansion within the mold. As it is necessary to continue the application of the cooling medium to the core-bar until the part having the greater diameter is entirely withdrawn, this reduced extension will prevent the cooling medium from coming into contact with the hot metal of the ingot, which would be liable to cause a violent explosion. As soon as the metal has cooled sufficiently, the core-bar being entirely withdrawn, water under a considerable pressure is again admitted into the perforated pipe for the purpose of washing away the bands, which, as above stated, are formed of sand or other suitable molding material, and can be easily washed away by the water jets.

While preferring to use a series of bands or rings for the purpose of ventilating the mold, as above described, I may employ a band sufficiently long to entirely inclose the portion of the core-bar within the mold; and in lieu of water jets I may arrange a series of pipes within the core-bar for the circulation of a freezing-mixture, in which case the reduced extension may be omitted, as there would be no liability of an explosion due to the contact of the cooling medium with the hot metal. Where the rings or bands are made sufficiently

thick to resist to a considerable degree the inward pressure of the cooling metal and the transmission of heat to the core-bar, it may be withdrawn without the preliminary cooling above described.

I claim as my invention—

1. The combination of a mold, a hollow core-bar, and one or more bands or rings formed of molding material fitting loosely around said core-bar, substantially as set forth. 45

2. The combination of a mold, a hollow core-bar of a length a little more than twice the length of the mold, a portion thereof being reduced in diameter, and one or more bands or rings formed of molding material fitting loosely around said core-bar, substantially as set forth. 50

3. The combination of a mold, a hollow core, one or more bands or rings formed of molding material and fitting loosely around said core-bar, and means for applying a cooling medium to the interior of the core-bar, substantially as set forth. 55

4. The combination of a mold, a hollow core-bar of a length a little more than twice the length of the mold, one or more bands or rings formed of molding material and fitting loosely around the core-bar, and a perforated pipe connected with a water-supply arranged within the core-bar, substantially as set forth. 60

In testimony whereof I have hereunto set my hand. 65

WILLIAM HAINSWORTH.

Witnesses:

D. C. O'BRIEN,  
JOHN IRWIN, Jr.