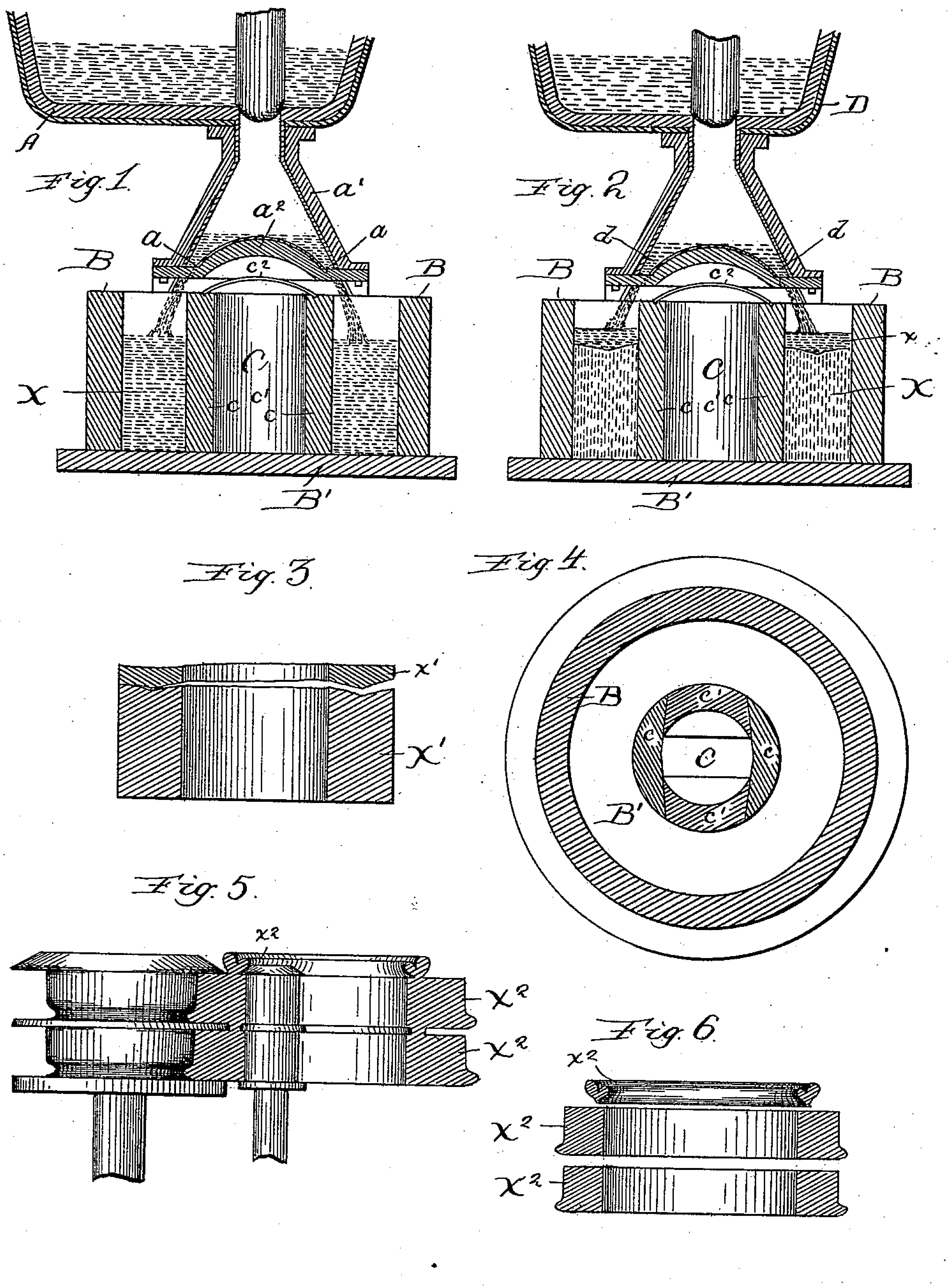
(No Model.)

J. MUNTON.

MANUFACTURE OF BLOOMS FOR ROLLED STEEL TIRES.

No. 464,077. Patented Dec. 1, 1891.



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UNITED STATES PATENT OFFICE.

JAMES MUNTON, OF MAYWOOD, ILLINOIS.

MANUFACTURE OF BLOOMS FOR ROLLED-STEEL TIRES.

SPECIFICATION forming part of Letters Patent No. 464,077, dated December 1, 1891.

Application filed March 24, 1891. Serial No. 386,226. (No model.)

To all whom it may concern:

Be it known that I, JAMES MUNTON, a citizen of the United States, residing in Maywood, in the county of Cook and State of Illinois, have invented a new and useful Improvement in the Manufacture of Blooms for Rolled-Steel Tires, of which the following is a specification.

My invention relates to improvements in the manufacture of ingots for rolled-steel tires, and more particularly to improvements upon the process of manufacturing annular steel ingots or blooms heretofore patented to me in Letters Patent of the United States No. 381,505, of April 17, 1888. According to my previously-patented process the molten steel is poured into an annular mold and then the top portion of the annular ingot thus formed containing the dross or imperfections is sheared or cut off.

The object of my present improvement is to improve the quality of the annular steel ingot and render its structure more completely homogeneous and dense throughout, and at the same time diminish the percentage or amount of steel required to be sheared off from the top portion of the annular ingot, and thus effect a saving in material. I have discovered that this result may be accomplished, and herein my invention consists, by pouring into the annular mold immediately after the steel has been poured and on top of the steel while it is yet in a molten condition a quantity of molten slag from the furnace, thus covering the steel over with a layer of slag an inch or two in thickness. The molten slag thus poured on top of the molten steel renders the steel casting below dense and homogeneous and free from pipes or blow-holes. The reason why the molten slag poured on top of the molten steel in the mold serves to so greatly improve the quality of the steel casting produced, I think, may be due in part to the weight or hydrostatic pressure of the slag upon the steel and in part to the fact that the molten slag serves to keep the surface of the steel longer in a molten or liquid condition, and thus allows greater time and freedom for the escape of gases from the steel below and greater time for the dross or imperfections or impurities in the steel to rise to the top thereof; but whatever may be the cause there is no doubt about the fact which I have discovered that by this simple means the quality of the cast-steel annular ingot produced is very greatly improved in character, density, and homogeneity, and that by this means I am enabled to reduce by a large percentage the quantity of steel necessary to be cut or sheared off from the top of the annular ingot. In practicing my process I pour the molten steel into the annular mold in a substantially annular stream, so that the steel will flow into the mold all around its circumference, and thereby cause the flowing steel itself to keep the surface of the steel in the mold in a molten condition during the pouring operation and prevent the formation of a skin of set metal on the surface of the steel in the mold, which would tend to collect the gases in the casting and prevent their escape. The moment a sufficient quantity of steel has thus been poured into the mold to form the annular ingot I immediately, and while the steel in the mold is yet in a molten condition, pour into the mold on top of the steel a quantity of molten slag from the furnace. The molten slag should be poured in to the depth of an inch or two on top of the steel in the mold. As the molten slag is very much lighter and of much less specific gravity than the molten steel, it will not tend to mix with the steel, but will form a separate layer on top. The molten slag may be poured in on top of the steel at one point of the mold; but I prefer to pour it also in an annular stream all around the circumference of the mold in substantially the same way as the steel itself is first poured into the mold. After the steel cools or sets the layer of slag may be readily lifted off or separated from the steel ingot, as it forms a separate layer and does not tend to unite or amalgamate with the steel. After the annular steel has thus been cast the next step in order to produce the bloom ready for rolling into rolled-steel tires or rings is to cut or shear off from the top portion of the annular steel ingot the top portion thereof, containing the dross or imperfections. The amount required to be sheared off, however, is very much less than that required where the annular ingot is cast without pouring the molten slag on top of the molten steel in the mold during the casting operation. The mold employed has a freely-collapsible metallic core, and the mold itself is made of cast iron or metal, so that the contact of the molten steel with the mold will not tend to generate gases or affect injuriously the character of the steel in any way. The absolutely free collapsibility of the core of the mold is necessary in order to prevent the casting from being subjected to strains, producing flaws or cracks therein while it is yet in a setting or rotten condition.

In practicing the invention two ladles are employed, one for pouring the molten steel into the mold and the other, which may be a much smaller one, for pouring the molten slag into the mold on top of the steel immediately after the steel has been poured.

In the accompanying drawings, which form a part of this specification, and in which similar letters of reference indicate like parts, I have shown at Figure 1 a sectional view of a mold and ladle suitable for use for pouring the steel into the mold in practicing my invention; at Fig. 2, a similar view showing the act of pouring the molten slag on top of the molten steel in the mold; at Fig. 3, a similar sectional view showing the annular steel ingot with the layer of slag on top thereof, the latter on one side being shown as lifted or separated from the ingot; at Fig. 4, a horizontal sectional view showing the metal mold with its collapsible metal core. Fig. 5 illustrates the step or operation of shearing off the top portion of the ingot, and Fig. 6 shows the finished steel bloom, ready for rolling into a tire.

In the drawings, A represents the ladle containing the molten steel, and from which, through its annular orifice or pouring-nozzle a, the molten steel is poured into the annular metallic mold B.

B′ is the metal base-plate of the mold, and C its metallic freely-collapsible core. The annular pouring orifice or nozzle a of the ladle A is formed by the inverted funnel or bell-shaped shell a', to which is secured the dome-shaped deflector a^2, leaving the annular orifice a of substantially the diameter of the metal mold between the bell a' and the dome a^2.

The collapsible metal core C is preferably composed of four segments c c c' c', the segments having inclined or wedging ends or faces fitting against each other to form tight joints between the segments and at the same time to permit all the segments to freely collapse or move radially toward each other when the steel casting begins to contract. A cap-plate c^2 fits in a V-shaped groove on top of the core and serves to prevent any of the molten metal flowing inside the core during the pouring operation, and also to loosely hold the several segments of the core in place while the core is being set up or during the pouring operation, while it at the same time offers little or no obstruction to the free collapsing of the core. D represents a ladle having a similar annular orifice or pouring-nozzle d for containing the molten slag and pouring it on top of the molten steel in the mold immediately after the step or operation of pouring the steel into the mold has been completed. X represents the molten steel in the mold, and x the molten slag which is poured on top of the steel in the mold. After the steel becomes set, at which time the slag will also be in a solid state, the set or solid slag x' may be easily removed from the annular steel casting X′ by simply prying or lifting it off with a bar or other suitable instrument. The slag, being of less specific gravity than the steel, floats on top of the molten steel and has no tendency to mix therewith when poured thereon. After the annular ingot has thus been cast the next step is to shear or cut from the top portion of the annular ingot a small portion x^2 thereof, containing the dross or imperfections which have collected at the top, and thus produce the finished bloom X^2, ready for rolling into tires or other rings. The quanity or proportion x^2 required to be sheared off from the top of the annular ingot when the same is produced according to my improved process is much less than that which is required to be removed where the annular ingots are cast without pouring on top of the molten steel the molten slag. The saving in metal by my present improvement is ordinarily from one-half to one-third of the total amount previously required to be cut off. The molten slag on top of the molten steel in the mold serves to keep the steel much longer in a fluid condition, and thus gives better opportunity for the dross, gas bubbles, and imperfections to collect near the top surface of the annular ingot and to escape, and the weight or pressure of the molten slag in the steel seems also to tend to compact it and render it much more dense and homogeneous and of a finer texture and improved quality throughout.

The molten slag which I have customarily used in practicing my invention has been the ordinary slag from the steel furnace; but it will be obvious to those skilled in the art that any equivalent molten material may be used to pour on top of the molten steel, provided, of course, that the particular molten material employed is of less specific gravity than the steel and of such nature that it will not unite therewith or have an injurious effect upon the steel, and which will at the same time serve to keep the steel in the mold from too quickly setting, and especially at the top surface thereof. Slag, however, seems to be peculiarly adapted for the purpose, as it tends to a greater or less extent to continue to burn or flame up after it is poured upon the top of the steel in the mold, and thus perhaps has some affinity for the occluded gases in the steel, and this tends to better free the steel therefrom.

My process of producing steel castings by first pouring the molten steel into the mold and then pouring on top of the molten steel a quantity of molten material—such, for example, as slag—to keep the top surface of the steel in the mold longer in a fluid condition, and by its weight or hydrostatic pressure to expel or drive out occluded gases from the molten steel. While it is particularly adapted for forming the large annular steel ingots for tire-blooms, it may also be used in making other steel castings, and my claims herein, or some of them, are not of course limited to its use in making such annular steel castings.

I claim—

1. The process of producing annular steel blooms for rolled-steel tires or rings, consisting in first pouring the molten steel in a substantially annular stream into an annular metallic mold having a freely-collapsible metallic core; second, while the steel in the mold is yet molten pouring molten slag on top of the molten steel, and finally shearing or cutting off the imperfect top portion of the annular ingot thus produced, substantially as specified.

2. The process herein described of producing annular steel blooms for rolled-steel tires or rings, consisting in pouring the molten steel in a substantially annular stream into an annular metallic mold having a freely-collapsible metallic core, and then, before the steel in the mold becomes set, pouring molten material of less specific gravity than the steel on top of the molten steel in the mold, substantially as specified.

3. The process of making steel castings, consisting in first pouring molten steel into the mold, and then, while the steel in the mold is yet in a molten condition, pouring molten slag or equivalent material on top of the steel in the mold, substantially as specified.

4. The process of making annular steel ingots, consisting in first pouring molten steel into an annular mold, and then pouring molten slag on top of the molten steel in the mold, substantially as specified.

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