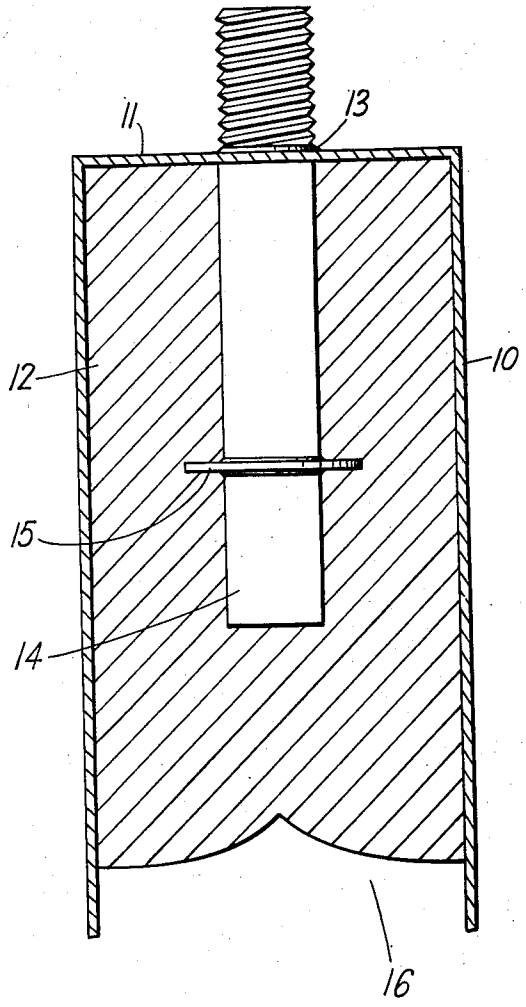
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DEVICE FOR USE IN MAKING NODULAR CAST IRON

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DEVICE FOR USE IN MAKING NODULAR CAST IRON

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This invention relates to the introduction of a volatilisable metal into molten iron or steel especially for the purpose of producing nodular cast iron.

The production of nodular cast iron, has until fairly recently, been mainly carried out by treatment with magnesium in the form of a nickel-magnesium alloy. This is added to the normal ladles, the dilution with nickel being required to enable the magnesium to sink to the bottom of the ladle where it volatilises and passes through the iron. This process is expensive since the nickel content of the hardener is usually 70–80% and the magnesium efficiency (i. e. the portion of the magnesium which is used effectively) may be only about 30%, the balance being mainly lost by oxidation of magnesium vapour which is ejected from the molten iron.

Recently a number of devices have been developed to permit the use of pure magnesium and one of these is known as a pressure ladle apparatus. In this device the magnesium is plunged below the surface of the molten iron which is held in a sealed ladle, thus preventing the loss of magnesium to the atmosphere. Magnesium recoveries are about 40–50%, the major saving in cost being avoidance of nickel consumption. In its original form the device includes a specially shaped ladle above which is suspended a refractory coated plunger incorporating a sealing plate and a heavy weight to maintain the pressure generated by the vapourised magnesium. At the bottom of the plunger is attached a steel canister into which is packed loose pieces of pure magnesium. In operation the ladle is filled with molten iron and the plunger lowered into this until the sealing plate closes the top of the ladle. For each operation the joint between sealing plate and ladle has to be specially prepared using some form of sealing compound, and some little time, say up to 30 seconds, may be required to accomplish this. It is therefore essential that the magnesium should not commence to volatilise before this joint is completed.

As a further development, a solid magnesium billet containing a projecting steel rod has been used. This billet is first coated with refractory to provide the necessary delay before volatilisation and the billet is then attached to the plunger by threading the steel rod into a screw at the end of the plunger.

According to the present invention a method of producing nodular cast iron comprises introducing a readily volatilisable metal into molten iron by means of a plunger comprising a billet of metal consisting of or containing the volatilisable metal having its top and sides sheathed in iron or steel, the plunger being mounted on a holder. The base of the billet may be coated with refractory. The billet may be pure magnesium or an alloy e. g. a magnesium alloy containing aluminium or rare earth metals, or may be rare earth metals alone. Additional means may be provided to hold the billet in position within the steel sheath, to prevent solid metal from leaving the sheath during the period in which this is immersed in the iron.

A plunger made in accordance with the invention is illustrated by way of example in the accompanying diagrammatic drawing wherein 10 shows a mild steel tube having one end closed by a plate 11 welded thereon. The plate 11 has a stud 13 welded to it. A threaded bolt 14 passes through the stud 13 and is disposed in the tube and carries a washer 15 in the tube. The volatilisable metal 12 is cast into the tube around the bolt 14 and washer 15. The metal 12 is thus in the form of a billet and is sheathed at its sides by the tube 10 and at its top by the plate 11. The unsheathed lower end 16 of the billet may be coated with a refractory material.

The washer 15 serves as a means of anchoring the magnesium and other anchorage means may be provided attached to the stud and/or to the sheathing.

The end 16 can if desired be also covered by a welded on steel plate.

The upper end of the stud 16 is threaded for attachment to a rod or handle.

The invention offers the following advantages:

(1) The magnesium or the like tends to volatilise from the open end only whereby the magnesium vapour travels by the longest path through the cast iron, thereby giving the greatest possibility of satisfactory reaction.

(2) The exposed area of magnesium, which may be coated with refractory, is minimised, whereby the device is safer in operation than the use of a billet in which the whole surface is so coated.

(3) In the event of premature volatilisation any explosion which might result is directed downwards thus minimising the risk of accident.

The refractory may be applied for example by coating the exposed magnesium with a synthetic resin and dipping it in sand.

I claim:

1. A device for use in making nodular cast iron, comprising a plunger in the form of a tube of ferrous metal having its lower end open and its upper end enclosed, said tube containing a billet of solid metal readily volatilizable in molten iron and suitable for treatment of iron, the tube having a rod extending through said closed upper end, the upper end of said rod being attached to a holder, the lower portion of said rod having means, rigidly attached thereto, embedded in said billet of solid metal to anchor the same within said tube.

2. A device as set forth in claim 1, wherein said solid metal is magnesium.

3. A device as set forth in claim 1 wherein the solid metal adjacent the lower end of the tube is coated with a refractory material.

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