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LEAD EXTRUSION

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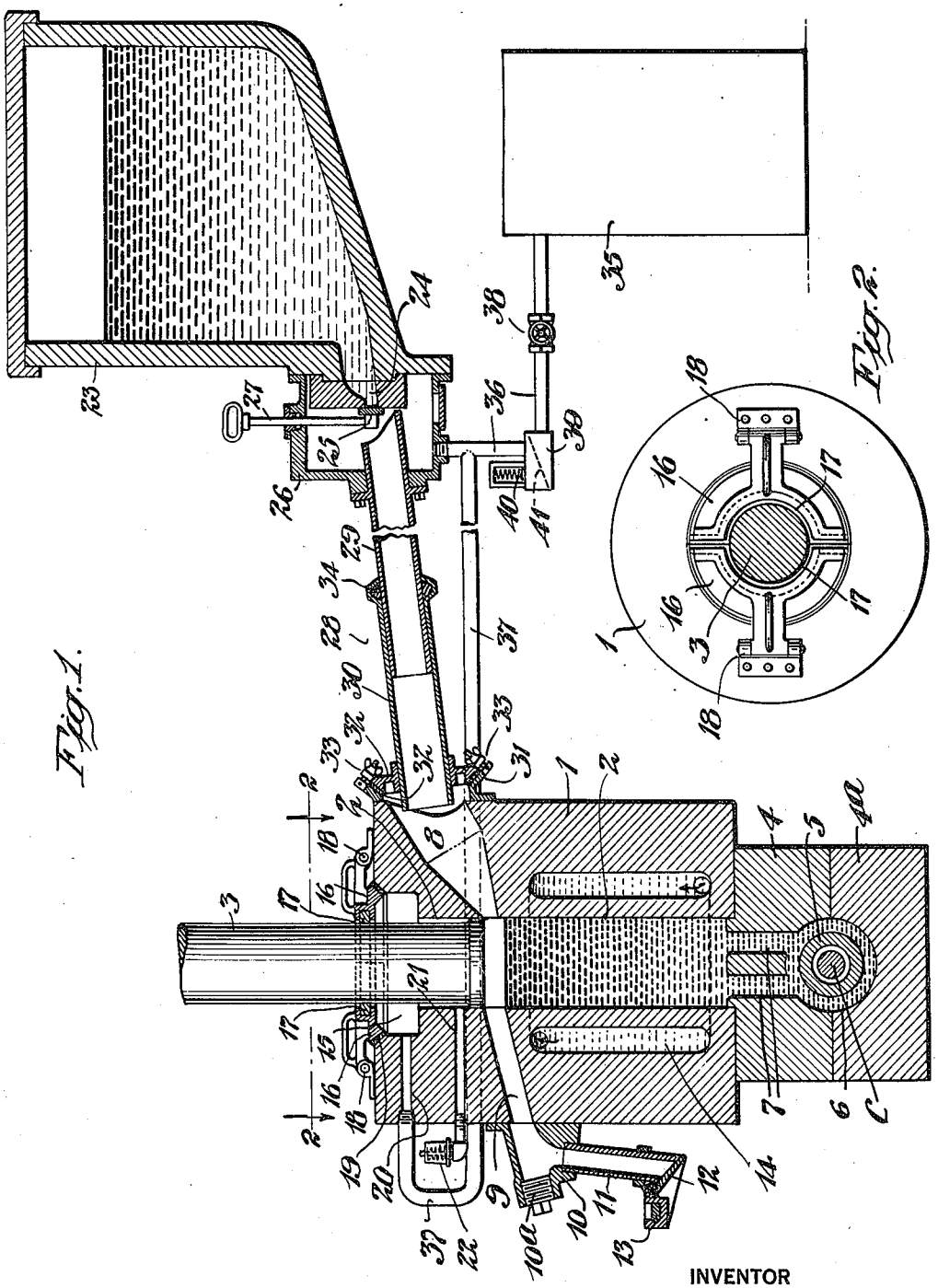


Fig. 1.

Fig. 2.

INVENTOR
FRANK L. DAVIS JR.
BY Davis & Davis
ATTORNEYS

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LEAD EXTRUSION

Frank L. Davis, Jr., Kenilworth, N. J., assignor to The Watson-Stillman Co., Roselle, N. J., a corporation of New Jersey

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6 Claims. (Cl. 207—10)

This invention relates more particularly to the extrusion of lead to form a sheathing for an electric cable. In the extrusion process commonly employed for sheathing cables charges of lead in a molten state are poured through a delivery spout and into an extrusion chamber of a press for extrusion by a ram. During its travel along the spout and while it is in the extrusion chamber the lead is exposed to the atmosphere. Consequently the exposed surfaces of the hot lead become oxidized and cause flaws in the sheathing. Particularly at the point where one extruded charge of the lead joins another in the sheathing the oxidation causes a weak spot which often permits leakage of the electric current.

An important object of the present invention is to provide a method of and means for effectually preventing oxidation of the lead in the extrusion apparatus and ensuring the extrusion of a sheathing of uniform texture and strength. Other objects of the invention will appear hereinafter.

In the drawing,

Fig. 1 is a vertical sectional view of an improved extrusion apparatus designed to prevent exposure of the lead to the atmosphere; and

Fig. 2 a section on the line 2—2 of Fig. 1.

The apparatus shown pertains to an extrusion press whose structure includes a main casing section or body 1 having a vertical bore 2 which forms the extrusion chamber and has a ram 3 fitted to reciprocate vertically therein. Mounted at the under side of the body 1 are abutting casing sections 4 and 4a which contain a tubular extrusion point holder 5 disposed horizontally and defining a passage for the cable C shown in cross section. Said casing sections 4 and 4a define an annular lead-receiving space 6 surrounding the point holder, and two ports 7 lead downward from the extrusion chamber to said annular space. When the ram is depressed a charge of lead in the extrusion chamber is forced through said ports into the receiving space and along the point holder to the extrusion point and a cooperating die which form the cable sheathing and apply it to the cable. The extrusion point and die form no part of the present invention and illustration of them is therefore omitted.

Near its upper end the press body 1 has a charging passage 8 which leads obliquely downward from an outer side of the body and opens into the extrusion chamber. Said passage is large enough at its outer end to afford ready access for cleaning and it tapers toward the extrusion chamber to a restricted outlet. At the opposite side of the extrusion chamber the body has an overflow passage 9 which leads obliquely downward from the extrusion chamber to the adjacent outer side of the press body. Here it opens into an elbow fitting 10 fixed to the casing body and provided with a depending discharge spout 11. The latter has a hinged trap door 12 provided with a weight 13 which normally holds it against the lower end of the spout. The lower side of the overflow passage is slightly spaced below the lower side of the charging passage and both passages are suitably spaced above the bottom of the extrusion chamber for accommodation of a charge of a required depth in the chamber. The spacing of the overflow passage below the charging passage fixes the level of the charge of lead below the charging passage so that the ram on its extrusion stroke will not displace lead into the charging passage and clog it. The ram is retractable to a point where it uncovers both passages. Surrounding the chamber is a space 14 formed in the casing body and adapted to receive steam for suitably heating the chamber and to later receive water for cooling the charge of hot lead to the proper degree.

At its upper side the press body 1 has a recess 15 forming an annular sealing space surrounding the ram. Two semi-circular closures 16 cooperate to close the upper side of said space and have gaskets 17 to snugly fit around the ram, and extend radially outward at opposite sides of the ram in abutting relation, as shown in Fig. 2. They are mounted in grooves formed in the closures. At opposite sides of the ram the closures are hinged as at 18 to the top of the press body and have handles for swinging them upward to open position. The casing body has a beveled seat for the closures and the latter have correspondingly beveled edges which bear against a gasket 19 mounted on said seat to seal the recess 15 airtight. A charging port 20 leads through the press body to the recess 15 for charging the latter with gas, as will be described hereinafter. The bore 2 forming the extrusion chamber opens directly into the bottom of chamber 15 and as the shank of the ram is of less diameter than its head there is a space in the upper end of said bore surrounding the shank. In the normal, retracted position of the ram its head is disposed directly above the passage 8, and a blow-off passage 21 leads through the press body from said bore space at a point directly above the ram head. Said passage has a spring seated blow-off valve 22.

A covered hopper 23 serves as a container for a supply of molten lead. If required, the hopper

may be heated by any suitable means. At its lower end the hopper has a discharge port 24 which may be opened and closed by a slide valve 25. A casing 26 fixed to the hopper forms a chest enclosing said valve. An operating stem 27 extends from the valve outward through a stuffing box on the chest and serves for manually operating the valve. A delivery spout 28 leads from the port 24 to the charging passage 8 of the extrusion chamber. This spout comprises tubular telescoping sections 29 and 30. The section 29 projects into the valve chest to the port 24 and has a closely sealed juncture with the chest to exclude air. The end of the tube section 29 at the opposite end of the spout has a tight-sealing juncture with the press body 1. This juncture includes a ring 31 fixed to the press body and surrounding the entrance to the charging passage 8. It has an inwardly tapering seat faced with a gasket 31'. A ring 32 fixed on the tubular section 30 has a similarly tapering surface fitting against said gasket. Suitable releasable clamping devices 33 serve to hold the ring 32 pressed against said gasket. The spout section 30 bears a packing ring 34 fitting closely around the spout section 29 to exclude air.

When the discharge ports 7 of the extrusion chamber are closed and sealed by lead, the extrusion chamber, the delivery conduit formed by the charging port 8, and the spout 28, and the chest 26 all form a continuous, air-tight space. This space is charged with a non-oxidizing gas from a suitable supply source diagrammatically represented in the drawing as a tank 35. I prefer to employ pure or approximately pure nitrogen gas which is non-oxidizing and non-combustible and will not be injurious to the workmen if it escapes. From the tank a supply pipe 36 leads to the chest 26 and from said pipe a branch pipe 37 leads to the charging port of the recess 15 around the ram. A manually operable valve 38 in the pipe 36 serves for controlling the gas delivery. The pipe 36 is formed in two sections which are joined by a chest 39. The latter has a spring seated blow-off valve 40 and a screen 41 separating the sections in the chest. If combustible impurities are introduced by the gas and become ignited by the heat in the apparatus the screen 41 will serve to prevent the combustion from reaching the supply tank.

In the operation of the apparatus the air is first evacuated from the apparatus by opening the valve 38 and admitting the gas, at a materially higher pressure than the atmosphere, to the chest 26. Thence it flows through the lead delivery conduit into the extrusion chamber and if there is no lead in the ports 7 or the space 6 it will flow out therethrough expelling the air. If the ports 7 are sealed by lead the air will be expelled through the overflow port 9 and the spout 11, the gas pressure being sufficient to open the weighted trap door 12. At the same time, the gas will flow through the branch pipe 37 to the port 20 and the space 15 surrounding the ram. Air in this space will be forced out through the blow-off valve 22. When the apparatus is thus charged with the non-oxidizing gas the valve 25 is opened to admit a charge of molten lead from the hopper to the delivery conduit to charge the extrusion chamber. When the chamber is overcharged the excess lead flows out through the overflow passage 9 and spout 11 and its weight opens the trap door 12 to discharge. When this discharge occurs the valve 25 is closed. In the extrusion chamber the lead is cooled by the water in the jacket space 14 until the lead is reduced to a proper plastic consistency for extrusion. Then the ram is depressed by hydraulic pressure or other means to extrude the charge.

After each extrusion pressure the bottom of the extrusion chamber will remain sealed by lead and the gas charge will be retained in the apparatus. The gas filled space 15 assists in preventing leakage past the ram, the weight of the hinged closures 16 being sufficient to hold them closed against the gas pressure. The valve 38 is kept open and the gas charge is kept at a pressure exceeding that of the atmosphere to prevent leakage of air into the apparatus.

From the time each charge of lead leaves the hopper until it is extruded, air is effectually excluded from it by the airtight construction and by the gas under pressure, and oxidation is prevented. The gas charge is retained in the apparatus both during and between successive recharging and extruding operations. The exclusion of air during the interval between successive extrusion operations prevents oxidation of the lead which is left at the bottom of the extrusion chamber after each operation, and keeps it in proper condition to receive the next charge thereon. The invention provides for the production of a strong, uniform homogeneous sheathing free from the flaws of oxidation. While the invention is particularly useful in cable-covering it may be employed to great advantage in other extrusion processes.

The extrusion pressure often forces shavings of lead past the head of the ram. Provision is therefore made for the removal of these lead shavings. The charging passage 8 may be readily opened for cleaning by releasing the clamping devices 33 and sliding the spout section 30 and its closure ring 32 away from the entrance to said passage. The telescoping spout provides for this. Access is had to the space 15 around the ram by merely raising the hinged closures 16. The over-flow elbow fitting 10 has a screw plug 10a in alinement with the over-flow passage 9 and by removal of the plug access is afforded to said passage for cleaning it. Thus all of the spaces which would receive the lead shavings are readily accessible for cleaning.

What I claim is:

1. The method of lead extrusion in a cable covering process, comprising pouring the lead in a molten state through a delivery conduit and into an extrusion chamber, expelling air from said delivery conduit and chamber prior to introduction of the lead by admission of a non-oxidizing gas at a pressure exceeding that of the atmosphere, cooling the lead in the extrusion chamber, and maintaining said gas at said pressure in the said conduit and chamber during the charging, cooling and extrusion operations and during the periods between successive performances of said operations to prevent oxidation of the lead from the time it is introduced into the conduit in a molten state until it is extruded from the chamber in solid state.

2. A metal extrusion apparatus comprising means forming an extrusion chamber; an extruding ram fitted to reciprocate in said chamber; a delivery conduit leading to one side of the extrusion chamber to deliver metal in a molten state thereto; means to charge the conduit and chamber with a non-oxidizing gas, to exclude air from the conduit and chamber; blow-off valve means communicating with the extrusion chamber at the opposite side thereof from the conduit and permitting expulsion of air from the conduit and chamber by admission of said gas; a sealing

chamber surrounding the ram; and means to charge said sealing chamber with said gas.

3. A metal extrusion apparatus comprising means forming an extrusion chamber; an extruding ram fitted to reciprocate in said chamber; a delivery conduit leading to said extrusion chamber to deliver metal in a molten state thereto, said chamber having an overflow passage; and means to exclude air from said conduit and chamber and including a trap closure for said overflow passage adapted to permit discharge of excess metal and adapted to close to prevent admission of air.

4. A lead extrusion apparatus comprising a casing forming an upright extrusion chamber having a charging passage opening laterally into it for charging the chamber with molten extrusion metal, and an overflow passage opening laterally from the chamber at a point spaced below the level of the point at which said charging passage opens into the chamber; and an extrusion ram fitted to reciprocate in the extrusion chamber and retractable to uncover said charging and overflow passages, the spacing of the overflow passage below the level of the charging passage preventing engagement of the ram with a charge of metal in the chamber until the lower end of the ram has been depressed below the charging passage.

5. A metal extrusion apparatus comprising means forming a substantially air-tight extrusion chamber having an extrusion ram fitted to reciprocate therein, said chamber having an outlet for discharge of air from the chamber and a charging inlet for molten metal, a supply container for molten metal having a discharge port at a low point for discharge of the molten metal from a point beneath the surface of the metal in the container, a substantially air-tight delivery conduit formed of telescoped tubular sections in substantially air-tight receiving connection at one end with said port and having a substantially air-tight releasable delivery connection with the charging inlet of the extrusion chamber at its opposite end for delivery of the molten metal from the said container to the extrusion chamber, the chamber and conduit forming a continuous and substantially air-tight space and one section of the conduit being shiftable longitudinally on the other away from the charging inlet of the extrusion chamber when said delivery connection is released, for the purpose set forth, and means to charge said space with a non-oxidizing gas to expel air from the conduit and chamber through said chamber outlet.

6. An extrusion apparatus comprising means forming a substantially air-tight extrusion chamber, said means including a casing and a ram fitted to reciprocate therein to force against an extrusion charge in the chamber, the casing and ram together also forming an annular chamber spaced outward along the ram from the extrusion chamber, a plurality of hinged segmental closure members together surrounding the ram to close said annular chamber against admission of air at the side thereof remote from the extrusion chamber and being adapted to be swung outward for access to the annular chamber to remove slivers of the extrusion charge which may be forced along the ram and into the annular chamber, and means to charge the extrusion chamber and the annular chamber with a non-oxidizing gas, for the purpose set forth.

FRANK L. DAVIS, JR.