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W. S. CLARK.

MACHINE FOR FORMING TUBES OF SOFT METAL.

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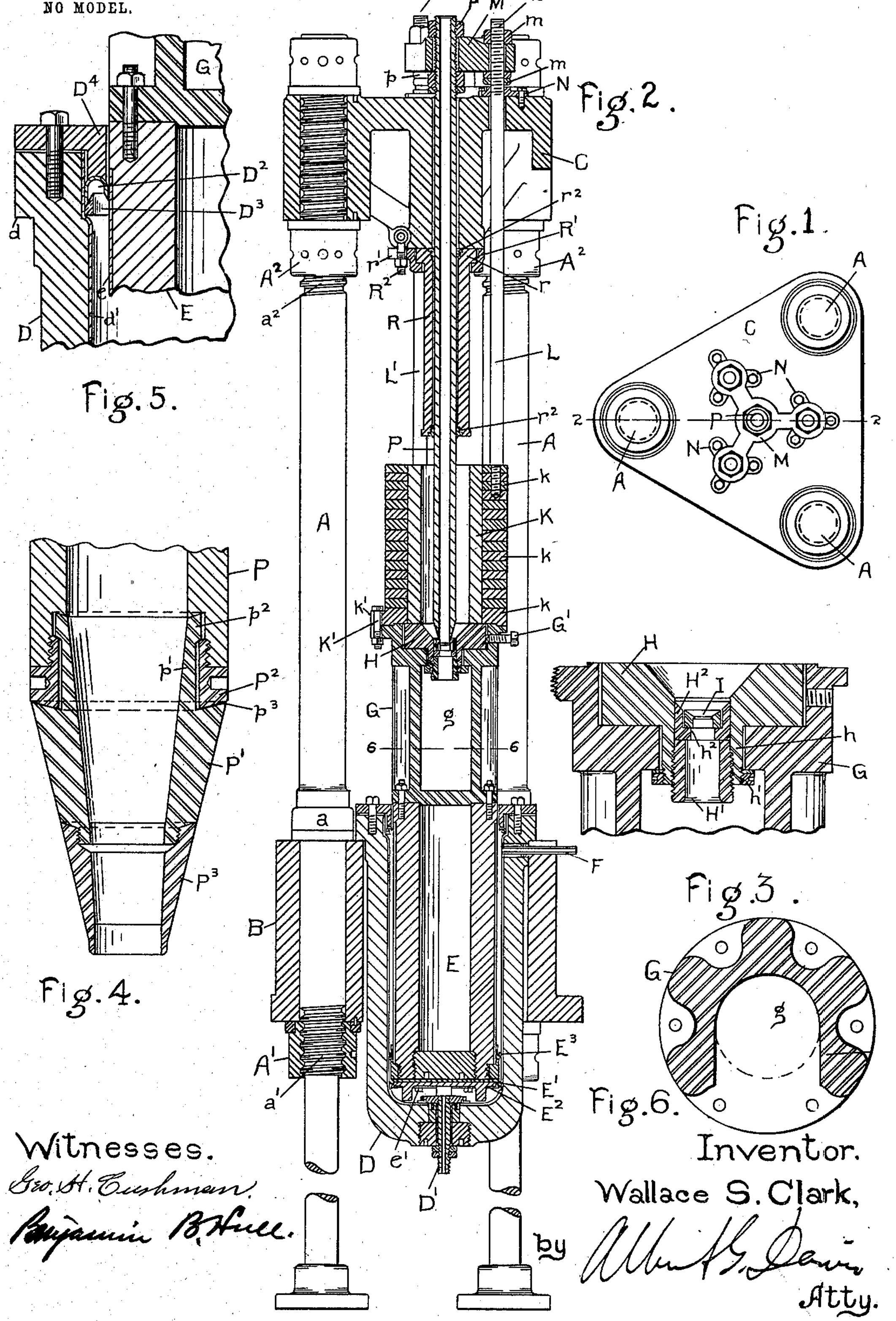
NO MODEL.



Witnesses.

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No. 732,829. Patented July 7, 1903.

UNITED STATES PATENT OFFICE.

WALLACE S. CLARK, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

MACHINE FOR FORMING TUBES OF SOFT METAL.

SPECIFICATION forming part of Letters Patent No. 732,829, dated July 7, 1903.

Application filed February 8, 1901. Serial No. 46,500. (No model.)

To all whom it may concern:

Be it known that I, WALLACE S. CLARK, a citizen of the United States, residing at Schenectady, county of Schenectady, State of New York, have invented certain new and useful Improvements in Machines for Forming Tubes of Soft Metal, of which the following is a specification.

This invention relates to machines for forming a continuous seamless tube of soft metal, such as lead or an alloy of lead and tin or any other suitable plastic or semiplastic material, such as gutta-percha, india-rubber and its compounds, tar or asphalt compounds, or the like. One use to which such machines are put is covering electric conductors or cables with a sheath of the desired material. The mode of operation consists in leading the conductor or cable through a tubular mandrel which passes into a receptacle for the lead or other material and terminates adjacent to a die, leaving an annular space, through which the plastic material is forced in the shape of a tube closely surrounding the conductor. This process requires that the mandrel shall remain at all times exactly concentric with the die in order that the thickness of the sheath or covering may be uniform.

In the machine embodying my improvements the mandrel and the receptacle for the plastic material are supported on a vertically-movable piston or ram, by means of which they can be raised, so that a stationary annular plunger concentric with the mandrel can enter the receptacle and force the plastic material through the die at the bottom as the receptacle rises. I provide the pedestal on which the receptacle rests with a central chamber open on one side, so that the incased conductor coming down through the die can be led off to one side and reeled up.

In the following description I have for the sake of convenience assumed that the material to be operated on is lead; but it should be clearly understood that I do not thereby intend to limit the use of my machine to any given material.

In the accompanying drawings, Figure 1 is a top plan view of my improved press. Fig. 2 is a vertical section thereof on the line 2 2, Fig. 1. Fig. 3 is an enlargement of that portion of Fig. 2 showing the die at the bottom of the lead-receptacle. Fig. 4 is an enlarged vertical section of the lower end of the mandrel. Fig. 5 is an enlarged detail sectional view of a portion of the ram and its packing. Fig. 6 is a cross-section of Fig. 2 on the line 6 6 on an enlarged scale.

The frame of the machine comprises stout pillars or standards A, preferably three in number and placed at the angles of an equilateral triangle. At a given height above their lower ends the standards support a heavy rigid bed-plate B. This is preferably clamped against collars a on the standards by nuts A' engaging with screw-threads a' cut in the standards. The upper ends of the standards are united by a heavy rigid cap-plate C, which is adjustable vertically by means of nuts A^2 engaging screw-threads a^2 on the standards above and below said cap-plate. The bed-plate has a central opening to receive the cylinder D, which preferably hangs suspended by a flange d, resting on the bed-plate, and has a brass or similar lining d'. In the lower end of the cylinder is a packed pipe connection D', by means of which fluid-pressure can be conveyed to the cylinder and raise a piston-ram E therein, preferably a tubular structure having a jacket e, of brass or the like, and provided at its lower end with a packing-disk E', of leather or the like, cupped to make a fluid-tight joint and clamped in place by a plate E^2, held by screws e'. An annular packing E^3 surrounds the ram just above the packing E'. At the upper end of the cylinder is an annular semicylindrical packing D^2, retained in a countersink in the cylinder by a ring D^3 and an annular gland D^4, secured to the top of the cylinder and closely fitting the ram. A pipe F enters the annular space between the ram and the cylinder just below the packing D^2.

Resting on the top of the ram and firmly attached thereto is a pedestal or space-block G, preferably fluted vertically to give it strength with comparative lightness and containing a central chamber g open on one side, as shown in Fig. 6. The top of the pedestal has a central opening through it, which is counterbored to form a seat for the annular die-block H, having a tubular central neck h passing down through the opening in the pedestal and therein secured, as by a nut h', screwed upon the neck and abutting against the under side of the pedestal top, as shown in Fig. 3. The die-block has some lateral play on its seat and can be adjusted by means of set-screws G', passing transversely through the upper part of the pedestal and abutting against the die-block.

In the tubular neck h is screwed a bushing H', on which rests an annular bolster H^2, having an inwardly-beveled upper edge and an internal flange h^2, on which rests the die I, consisting of a ring having a beveled upper edge in line with the beveled edge of the bolster H^2. The opening through the die is slightly smaller than that through the bolster and bushing to give plenty of clearance for the incased conductor leaving the die.

The die-block H forms the bottom of the lead-receptacle K, which has a cylindrical interior and is strengthened by a series of heavy hoops k, the lower one having ears k' to receive the bolts K', by which it is fastened to the pedestal G. Upright guide-rods L are inserted into the upper hoops and rise through holes in the cap-plate, their upper ends being rigidly connected by a yoke M, adjustably secured to the rods by nuts m. The holes in the cap-plate are preferably a little larger than the rods, which are accurately guided by plates N, secured to the cap-plate and having holes engaging the rods with a sliding fit. A tubular mandrel P is adjustably secured by nuts p in a hole at the center of the yoke and passes centrally through a passage-way in the cap-plate, terminating just above the die I, the axis of the mandrel being coincident with that of the die. The nuts p provide for the adjustment of the annular space between the die and the end of the mandrel.

A stationary plunger R is secured to the under side of the cap-plate, preferably by means of a flanged collar R', engaging a flange r on the plunger and having ears r' to receive the bolts R^2, which are preferably hinged to the cap-plate, as shown in Fig. 2. The plunger is tubular to allow the mandrel to pass through it, having bushings r^2 screwed into its ends and fitting the mandrel snugly, so as to center the mandrel accurately. The plunger fits the cylindrical interior of the lead-receptacle, so that it will enter it and expel the lead when the receptacle is lifted by the ram.

In order to insure a uniform thickness of the tube or sheath, the end of the mandrel is so made as to have a swiveling or universal joint action, so that the pressure of the lead will hold it concentric with the die and will automatically center it if accidentally displaced. The preferred construction is shown in Fig. 4, wherein the nozzle P' has a reduced portion p' provided with a flange p^2 and fitting into a socket in the end of the mandrel, where it is secured by a bushing P^2, screwed into the socket. The shoulder p^2 and the upper end of the nozzle and the corresponding faces of the nut and mandrel are curved on the arcs of concentric spheres, so that the nozzle has a universal ball-joint action. The tip p^3 of the nozzle is removable, in order to allow it to be changed or renewed at pleasure. By properly shaping the outside of the nozzle and tip the downward pull on them, due to the friction of the lead flowing over their surfaces, may be made to balance the upward thrust due to the pressure exerted on all surfaces within the cylinder. As the pressure in the annular space between the nozzle and the die is greatest at the point where the metal is thinnest, the result is to push the nozzle over toward that side of the die where the metal is thickest, thereby equalizing the thickness of the metal and evening up the pressure. The frictional resistance to motion through the die and core tube or mandrel where the space is narrowest produces a greater relative interference with the motion of the metal at that place than where it is wider, causing pressure to be stored or a greater back pressure to be produced at that point than where the space is wider. This results in swinging the movable core-tube laterally and equalizing the space.

The operation of the press when making a tube or applying a sheath to a cable is as follows: The receptacle is filled with molten lead, which is allowed to cool sufficiently to solidify. The ram is then raised by fluid-pressure, carrying the receptacle up over the stationary plunger and forcing the lead to escape between the nozzle and the die in the shape of a seamless tube. If a cable is to be covered, it is fed down through the mandrel at the same rate of speed as the formation of the pipe. The lead will continue to flow out at the bottom of the receptacle until the limit of movement of the ram is reached. This is so adjusted that a residue of lead of suitable thickness—say three inches—remains in the bottom of the receptacle. The fluid-pressure is then cut off from the pipe D' at the bottom of the cylinder and a suitable port or cock opened and pressure admitted through the pipe F, each pipe D' and F acting as a supply and exhaust pipe, forcing the ram downward and with it the pedestal, receptacle, mandrel, guide-rods, and yoke until the top of the receptacle is below the plunger. A fresh charge of molten lead is then run into the receptacle, where it unites with the residue of the former charge, and when it has solidified the press is ready to form a further length of pipe. It is evident that this cycle of steps can be repeated indefinitely, so that a pipe or sheath of any length can be produced. The finished product is guided off laterally through the open side of the chamber g.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination with a ram and a pedestal thereon, of a plunger, a die-block mounted on the pedestal, a bushing screwed into said die-block, a flanged bolster supported

on said bushing, and a die resting on said bolster.

2. The combination of a downwardly-projecting mandrel, a self-adjusting nozzle secured thereto and independently laterally movable in any horizontal direction under irregularities of lead-pressure, and a die beneath the nozzle.

3. In a lead-press, the combination with a receptacle, of a vertically-adjustable die in its bottom, and a vertically-adjustable mandrel terminating just above said die, said mandrel having a self-adjusting laterally-movable nozzle.

4. In a lead-press, the combination with a tubular mandrel, of a nozzle therefor, and a bushing for securing it to the mandrel, the meeting faces of the nozzle and bushing being on the arc of a sphere.

5. In a lead-press, the combination with a tubular mandrel having a socket in its end, of a nozzle provided with a reduced portion to enter said socket, and having a flange at its upper end, and a bushing to screw into the socket and abut against said flange, the meeting faces of the socket, nozzle and bushing, being on arcs of spheres.

6. In a lead-press, the combination with a receptacle, of a die, and a stationary mandrel provided with a self-adjusting laterally-movable nozzle having such a tapered surface that the friction of the lead thereon balances the tendency of the pressure to separate the die and mandrel.

In witness whereof I have hereunto set my hand this 6th day of February, 1901.

WALLACE S. CLARK.

Witnesses:

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MARGARET E. WOOLLEY.