No. 793,895. PATENTED JULY 4, 1905.

O. MONROE.

MACHINE FOR COATING WIRE OR FORMING TUBING.

APPLICATION FILED APR. 19, 1904.

3 SHEETS—SHEET 1.

FIG. 1.

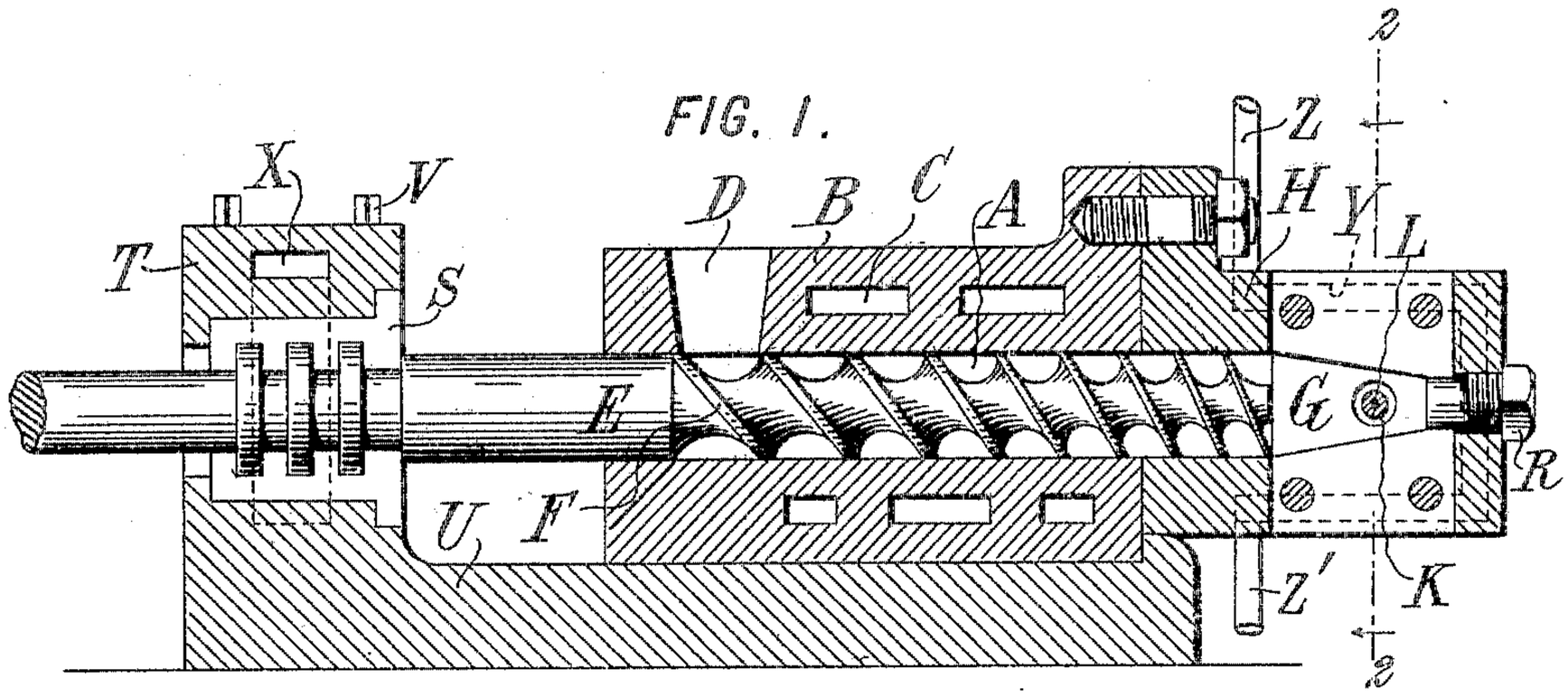
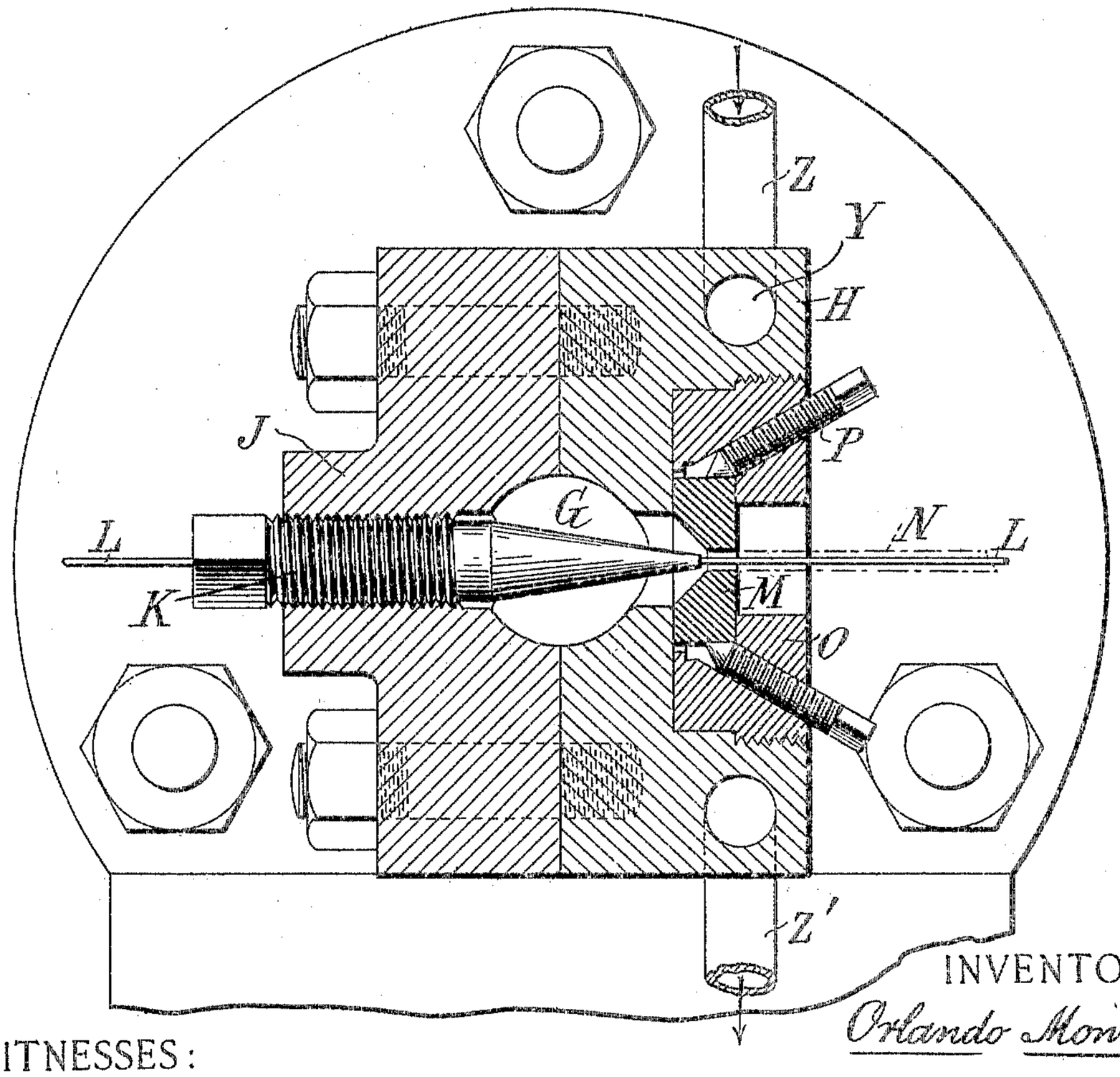


FIG. 2.



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3 SHEETS—SHEET 2.

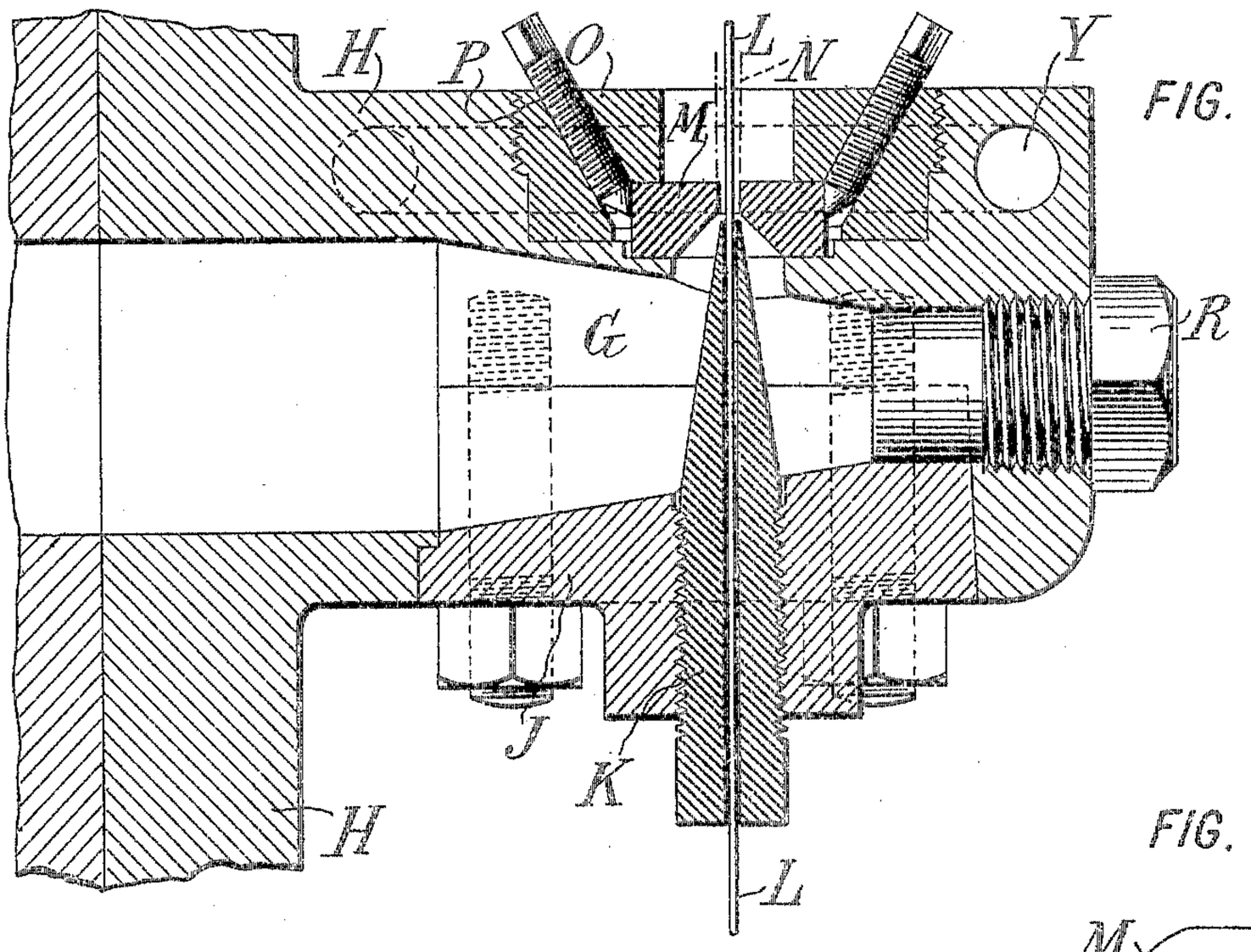

FIG. 3.

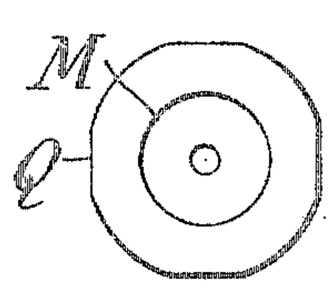

FIG. 5.

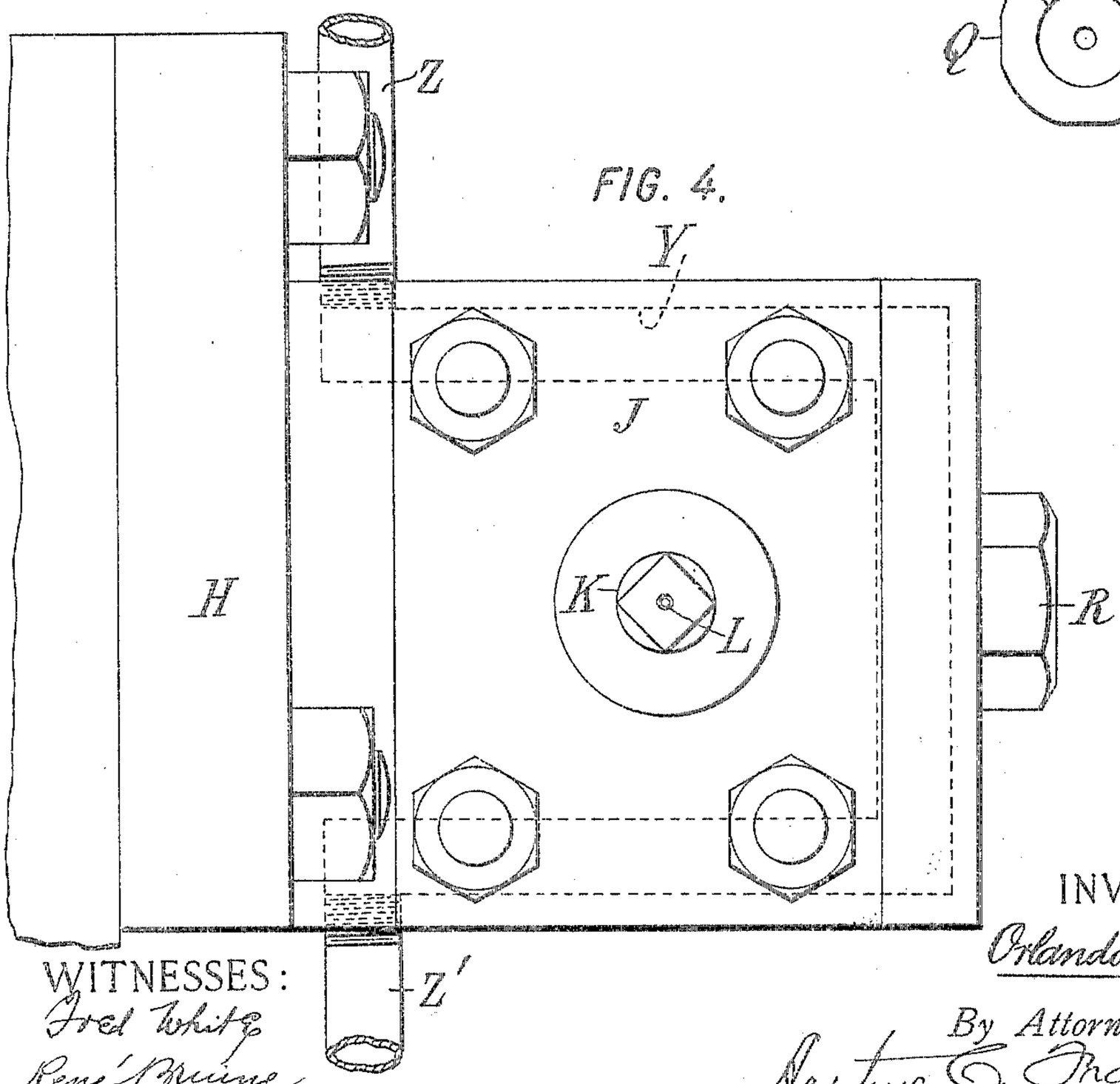

FIG. 4.

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3 SHEETS—SHEET 3.

FIG. 6.

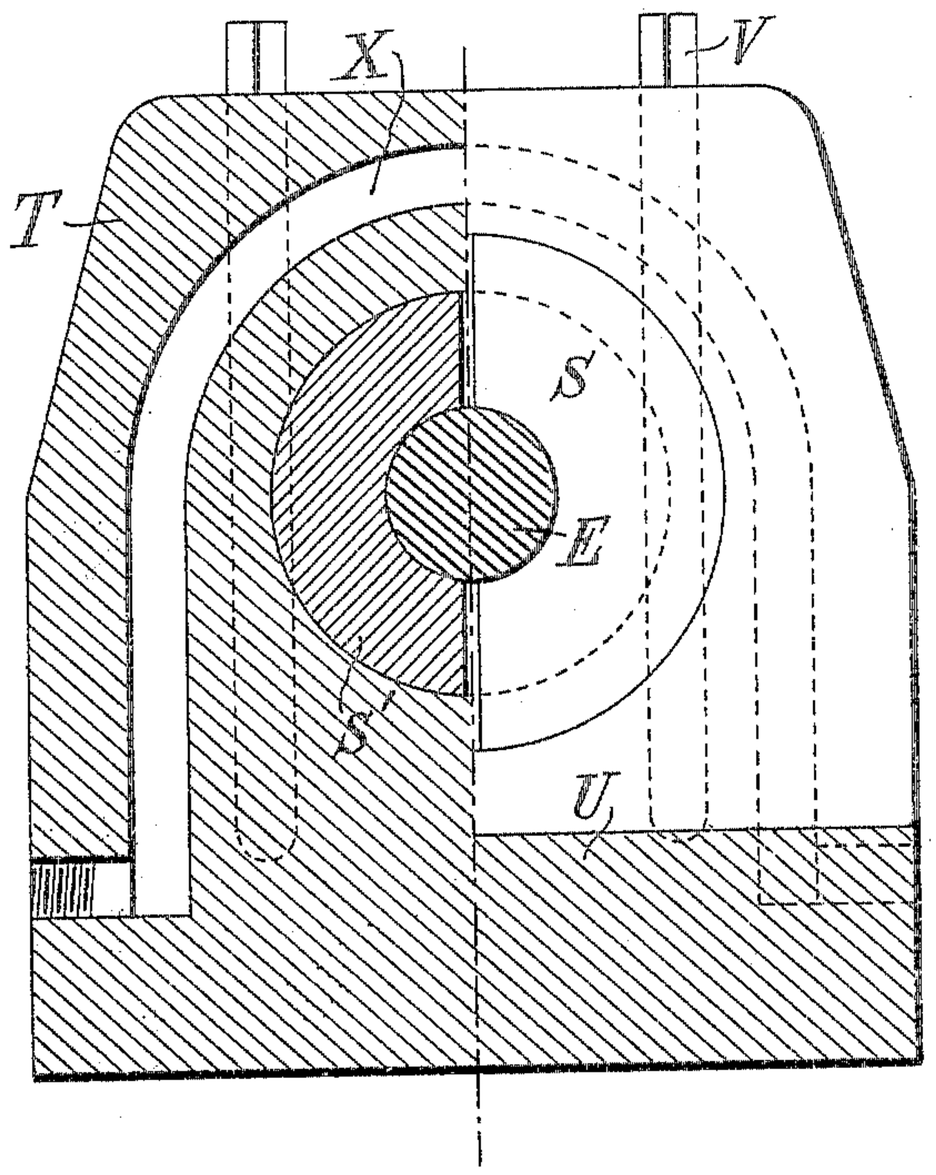


FIG. 7.

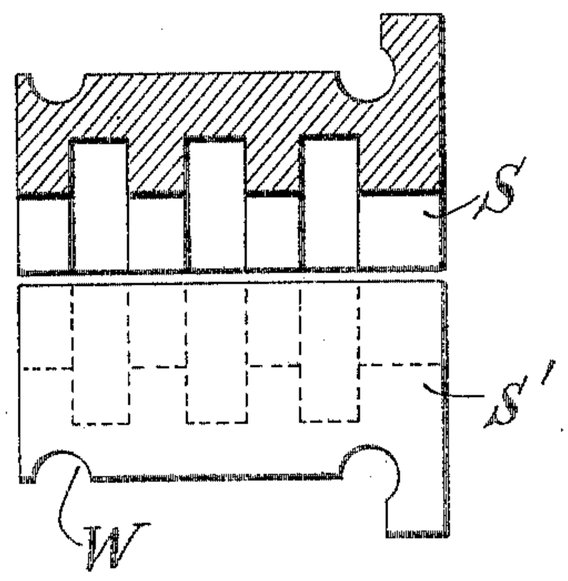
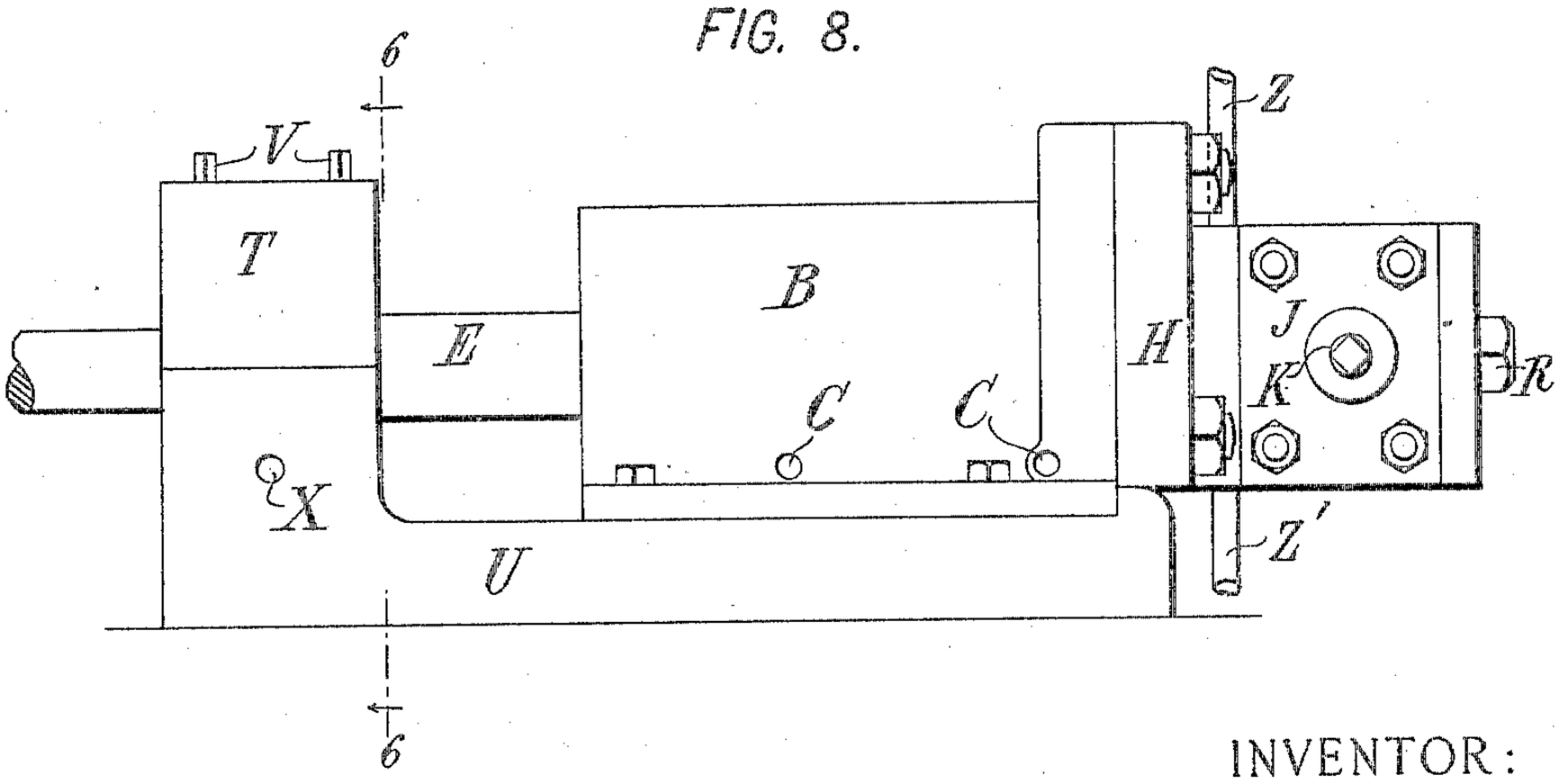


FIG. 8.



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UNITED STATES PATENT OFFICE.

ORLANDO MONROE, OF BAYONNE, NEW JERSEY.

MACHINE FOR COATING WIRE OR FORMING TUBING.

SPECIFICATION forming part of Letters Patent No. 793,895, dated July 4, 1905.

Application filed April 19, 1904. Serial No. 203,967.

To all whom it may concern:

Be it known that I, ORLANDO MONROE, a citizen of the United States, residing in Bayonne, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Machines for Coating Wire or Forming Tubing, of which the following is a specification.

Wires for electrical purposes are insulated by means of a coating of rubber or other insulating composition. Ordinarily this composition is applied by passing the wire through the center of a die and simultaneously forcing through the die the plastic material which coats the wire and hardens thereon.

My invention aims to provide a machine of this sort which is adapted also to express the plastic material through the die about a stationary central core, so as to form it into a tubing.

In insulated wire it has been found very difficult to secure uniform results. For example, it has often been found that of two lengths of wire insulated and tested under the same conditions one will show a resistance even twice as great as the other. Among the causes which probably contribute to these differences are air-holes or pin-holes in the insulating composition and irregularities in the density of the composition. The plastic material is expressed from the die in an entremely stiff condition, and in order to secure an even and dense coating the pressure required is very great. To prevent the material from squeezing back through the forcing-screw, it is generally kept cold and stiff in the neighborhood of the screw, and in order to permit it to pass uniformly through the die this part of the apparatus is heated. If the material as it is fed to the machine is of irregular density or if it is fed irregularly, it will in machines of the old style reach the chamber immediately in the rear of the die in the same irregularly-packed condition.

This invention aims to insure as far as possible an extreme and regular density of the material by exerting a greater pressure upon it while in the chamber immediately in the rear of the die than that which is necessary in merely forcing it from the hopper to said chamber, at the same time securing a rapid movement of the material from the hopper to the chamber, so that irregularly-fed material will be quickly advanced to the chamber and there subjected to the extreme pressure necessary to insure a homogeneous and dense mass. Supposing the usual screw-shaft to be employed, the end of the threads are given a small pitch, so that they will exert the necessary strong pressure on the material in the chamber, while the beginning of the threads is given a much greater pitch, so as to feed the material forward rapidly. This greater pitch also facilitates the escape of air backward along the convolutions of the screw as the air is expressed out of the material.

Another probable cause of poor insulation and lack of uniformity is the existence of fine metal particles in the coating. At the point where the material is fed in there is a strong lateral thrust of the screw-shaft against the wall of the surrounding cylinder, which results in a considerable cutting or wearing away of the chamber or threads at this point. Not only does this necessitate frequent repairs, but the particles of metal are carried forward with the coating composition and injuriously affect the insulation. The edges of the threads in my improved machine are made wide in the vicinity of the feeding-hopper, by which construction an extended bearing of the threads on the cylindrical wall is secured and the cutting or wearing away of the parts is minimized.

The chamber between the die and the end of the screw in which the material is packed is usually formed in a separate end member or head, which is made removable to permit cleaning of the chamber. It is very necessary to have access to this chamber, because the material packs therein and becomes hard, especially in the corners, where there is no continued movement. Where rubber composition is used, the hardening is due to some extent to vulcanization, by reason of the great friction and heat developed. This invention provides for access to the chamber by the removal of a comparatively small part of the head, (carrying also a part of the chamber-wall,) so as to expose the sides and ends of the chamber and make them easily accessible.

The nipple or tube which passes through the chamber and carries the wire to the center of the die is longitudinally adjustable, and this invention provides for a lateral adjustment of the die, by which the wire is centered in the coating very accurately and expeditiously.

Various other improvements are referred to in detail hereinafter.

The accompanying drawings illustrate a complete apparatus embodying all the features of the invention.

Figure 1 is a longitudinal section of a complete apparatus embodying the invention. Fig. 2 is a section on the line 2 2 of Fig. 1 enlarged. Fig. 3 is a horizontal axial section of the end chamber and adjacent parts. Fig. 4 is a side elevation of the mechanism shown in Fig. 3. Fig. 5 is an end view of the die removed from the surrounding members. Fig. 6 is a vertical view, half in section and half in elevation, showing the shaft-bearing. Fig. 7 is a horizontal view, half in section and half in elevation, of the divided bearing. Fig. 8 is a side elevation of the complete apparatus.

Referring to the embodiment of the invention illustrated, a cylindrical chamber A is provided in the member B, the latter being preferably a casting with a spiral passage C formed therein for the passage of a cooling or a heating fluid.

D is a sort of hopper formed in the member B and into which the plastic material is fed. The material is forced forward by means of a screw-threaded shaft E, the thread F of which has a gradually-diminishing pitch from the rear to the forward end. At the same time, preferably, the depth of the thread is gradually increased toward the forward end, the proportions being such, however, that the material fed into the hopper D is forced forward by the thread at a gradually-diminishing rate. Thus even though the material be fed in carelessly and irregularly at D and be not of uniform consistency yet at the forward end of the screw it will be closely and uniformly compacted and all the air expressed out of it, (the air passing backward and out of the hopper D.)

At the rear end of the thread F, where the material is introduced, there is a lateral reaction against the thread, which is always in one direction and which has been found to cut or wear away the wall of the chamber at this point to such an extent as to carry a considerable quantity of metal particles into the insulating composition and to spoil the fit of the shaft in the chamber and necessitate comparatively frequent repairs to the chamber. In order to avoid this, the thread or threads are made with a wide edge, as shown, at the rear end, so as to distribute the reactionary pressure referred to and minimize the cutting away of the wall of the chamber at this point.

An end chamber G, preferably conical, as shown, is arranged beyond the end of the screw-shaft E, being preferably formed in an end member H, bolted or otherwise attached to the body member B. The die is arranged at the side of this end chamber, and the wire passes through a suitable tube transversely across this chamber. In the end chamber G the mass of material is pressed together, so as to compact it uniformly and to press it out equally on all sides of the die. The material, especially rubber compositions, hardens in the corners and other portions of this chamber where they are not in constant movement and frequent cleaning is necessary. Formerly the entire member H has been removed and the hardened material dug out from the exposed end of the chamber G. The material is difficult of access from the end, however, and this invention provides for the removal of a lateral wall of said chamber, preferably the portion carrying the wire tube. By removing the side of the chamber obviously the interior is much more accessible than it would be from the end. Furthermore, this is a very small member, and its removal and replacement are much simpler than the removal and replacement of the entire end member H. Such a construction is most clearly shown in Figs. 3 and 4, the portion J (forming preferably an entire half of the chamber) being formed separately from the substantially fixed member H and being fastened thereto by stud-bolts or otherwise as convenient. A removable plug R is inserted in the end of the machine, which also permits access to the chamber G.

The wire tube K is screwed through the member J and is tapered at its inner end to provide a wide space for the passage of the plastic material to the die. By reason of the screw-threaded construction it can be adjusted forward or backward. The wire L passes through the center of the tube K, as shown, and thence out through the center of the die M, receiving, as it does so, a coating N.

The die M is held in place by means of a retaining-ring O, which screws in the side of the end member H and which is provided at its inner end with a recess slightly larger than the die M, so as to permit lateral adjustment of the latter. The ring O overhangs the outer face of the die to retain it against the outward pressure. In order to effect this lateral adjustment, screws P are provided, the rear ends of which lie outside of the face of the ring O and the inner ends of which are preferably coned, as shown, and bear against flat side faces Q, Fig. 5, of the die. These flat faces are necessary to permit lateral movement of the die relatively to the ends of the screws P.

The bearing for the rear end of the shaft comprises a longitudinally-split collar S S′, which embraces the shaft in the usual manner and which is carried in a projecting portion

T of the bed U of the machine, the projection T being provided with rabbets as shown, which receive shoulders of the bearing-collar S S′, so as to resist the rearward thrust. The collar is held from rotation in the member T, preferably by means of pins or keys V, which pass through suitable apertures W in the sides of the collar. The projection T may be cooled by circulating water through a passage X, formed therein. The projection T is arranged a sufficient distance at the rear of the chambered member B to permit the withdrawal of the bearing-collar S S′ with the shaft E forwardly entirely out of the projection T. In order to move the shaft forwardly, the member H must of course be first removed. The members of the split collar can be removed from the shaft either for repair or for substituting a new member in case of too great wear or breakage. Fig. 8 shows the manner of connecting the bed and the two-chambered members B and H.

When the machine is started, it is customary to pass steam through the spiral passage C, the ends of which are indicated at Fig. 8, to warm the machine. The great friction developed, however, soon heats the machine to such an extent that water has to be circulalated through the passage C in order to keep the material at the desired consistency. At the die, on the other hand, the material has to be kept quite plastic, and the head H is formed with a passage Y, surrounding the die and through which steam is continually passed during use. Where it it has been necessary to remove the head H in order to have access to the chamber, the passage Y has been extended into the main casting B and the pipes for conducting the steam have been conducted to the latter in order to save frequent disconnections. The extending of the passage Y into the main casting is obviously a difficult and expensive matter, and is avoided in the present machine. Pipes Z and Z′ connect with the ends of the passage Y at points on the head H adjacent to the die. The removal of only the plate J, which is on the opposite side of the head H, does not interfere in any way with the connections of the pipes Z and Z′.

Though I have described with great particularity of detail a complete apparatus embodying the invention, yet it is not to be understood that the invention is limited to the particular apparatus shown. Various modifications thereof in detail and in the arrangement and combination of the parts may be made by those skilled in the art without departure from the invention.

What I claim is—

1. In a machine of the class described, a chamber at the end of the forcing device, a lateral wall of said chamber being removable from the remainder of said chamber to expose the sides thereof.

2. In a machine of the class described, an end member H in which is a chamber beyond the end of the forcing device, said end member H having a side portion J constituting substantially one-half of the chamber and which is removable from the remainder of said member to expose the sides of the chamber.

3. In a machine of the class described, a chamber at the end of the forcing device, a wire tube projecting through a wall of said chamber, the wall of said chamber carrying said wire tube being removable from the remainder of said chamber.

4. In a machine of the class described, an end member in which is a chamber, a die-retaining member carried by a wall of said chamber and separable therefrom, a die, and means for adjusting the die laterally with reference to said member.

5. In a machine of the class described, an end member in which is a chamber, a die-retaining member carried by a wall of said chamber and separable therefrom, a die, and means lying outside of the exposed face of said member for adjusting the die laterally with reference to said member.

6. In a machine of the class described, a die-retaining ring O, a die M, said ring overhanging the outer face of said die, and screws P projecting through said ring and bearing against the sides of said die to adjust the same laterally.

7. In a machine of the class described, a chamber at the end of the forcing device having a die at one side surrounded by a passage for a heating medium, a lateral wall of said chamber opposite the die being removable from the remainder of the chamber.

In witness whereof I have hereunto signed my name in the presence of two subscribing witnesses.

ORLANDO MONROE.

Witnesses:
DOMINGO A. USINA,
THEODORE T. SNELL.