

No. 761,111.

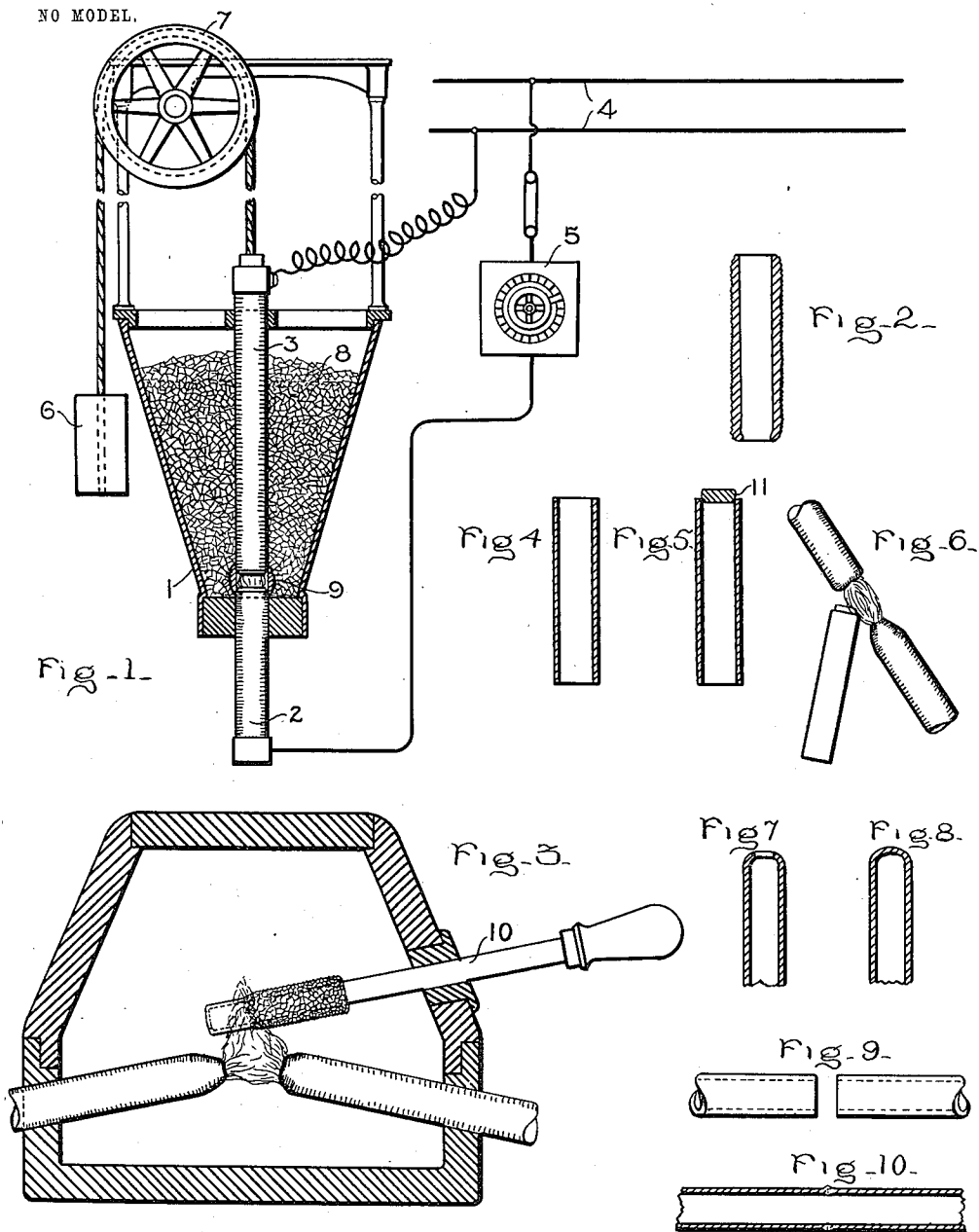
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E. THOMSON.

PRODUCTION OF TUBES FROM REFRACTORY MATERIAL.

APPLICATION FILED AUG. 28, 1902.

NO MODEL.



WITNESSES.

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UNITED STATES PATENT OFFICE.

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PRODUCTION OF TUBES FROM REFRACTORY MATERIAL.

SPECIFICATION forming part of Letters Patent No. 761,111, dated May 31, 1904.

Application filed August 23, 1902. Serial No. 121,321. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Swampscott, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in the Production of Tubes from Refractory Material, of which the following is a specification.

The present invention relates to the formation of tubes or similar hollow bodies from refractory granular material—such, for example, as silica—the manipulation of which requires exceedingly high temperature, such as that produced by the electric arc or the oxyhydrogen flame.

One of the objects of my invention is to provide a simple and convenient method for constructing a tube or other similar hollow body of silica, which tube can afterward be worked into other desired forms.

The features of novelty which constitute my invention I have pointed out with particularity in the appended claims. The invention itself will, however, be better understood by reference to the following description, which is to be taken in connection with the accompanying drawings, in which—

Figure 1 is a view of the apparatus employed for fashioning the tube. Fig. 2 is a tube produced in accordance with my invention. Fig. 3 shows the subsequent treatment of the tube; and the remaining views, Figs. 4 to 10, inclusive, represent other details in the manipulation of the product.

At 1 in Fig. 1 is shown a hopper in which is placed a mass of granular quartz free from any large percentage of impurities. A pure-white sand may be used or finely-ground quartz, which, if desired, may be granulated quartz which has been previously fused. It should not, however, be too fine, but should be coarse enough to flow with a fair degree of freedom under its own weight. The lower end of the hopper 1 is provided with an electrode 2, the inner end of which is located at or near the level of the bottom of the hopper. A cooperating electrode 3, formed of carbon and of a diameter which is made great or small in accordance with the desired interior

diameter of the tube to be formed, is mounted within the hopper so that it may be brought into contact with the lower electrode 2.

The electric connections of the electrodes are made so that current of regulable value may be supplied thereto. The source of supply is indicated conventionally by supply-mains 4, from which extend leads connected, respectively, to the electrodes and in one of which is inserted a resistance-box 5 or other suitable current-regulating means. The difference of potential of the current source should be such as to permit the maintenance of a long arc upon the separation of the electrodes.

Upon the establishment of a circuit through the electrodes and the gradual separation of the electrodes, as by slowly lowering a weight 6, serving as a counterbalance for the electrode 3 and put into motion by the slow revolution of the wheel 7, over which passes a flexible connection between the weight and the electrode, an arc of gradually-increasing length is drawn between the electrodes 2 and 3.

The granules of fused quartz 8, which, as has before been mentioned, may be the product of a preliminary fusion of the quartz and subsequent crushing into fine grains, fuse, so as to produce a small ring 9, which as the arc lengthens by the drawing apart of electrodes is gradually built up by the addition of adhering layers of fused quartz until a complete tube is formed, as indicated in Fig. 2. This tube is then mounted upon a carbon rod, such as 10, and inserted in the flame of an arc, as in Fig. 3, and turned until its exterior has been progressively exposed to the heat of the arc, thereby producing a fusion and compacting of the exterior surface of the tube such as to render the same smooth, as indicated in cross-section in Fig. 4.

If it is desired that the tube be closed at its ends, a small block 11 of fused silica may be applied to the end, as in Fig. 5, and exposed to the arc, as in Fig. 6, to unite the two and so close the tube. Instead, however, of thus closing the tube I may secure the result by a gradual fusing and closing in of the end of the

tube by the operation of the arc, as indicated by stages of production represented by Figs. 7 and 8.

5 The tubes made in the practice of my invention by the method above disclosed may be united end to end by heating in the oxyhydrogen flame or in the electric arc, as desired, these steps being indicated in Figs. 9 and 10 of the drawings, in which Fig. 9 shows the
10 ends of the tubes placed in position preparatory to being brought together and Fig. 10 the final result.

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

15 1. The method of producing tubes or similar hollow bodies from refractory material in a divided state, which consists in providing electrodes of suitable cross-section, surrounding the opposing ends of said electrodes by the
20 material to be acted upon, and drawing a gradually-lengthening arc between said electrodes, thereby producing a progressive fusion of the

refractory material which, as the arc lengthens, forms the desired tube or other hollow body.

25 2. The method of making tubes or other hollow bodies from refractory material which consists in drawing a gradually-lengthening electric arc within the mass of such material, and then extinguishing the arc.

30 3. The method of forming tubes or other hollow bodies from a refractory material which consists in drawing an electric arc between electrodes within a mass of the material to be acted upon, discontinuing the arc, removing the body thus formed, and subsequently reheating to smooth the exterior.

35 In witness whereof I have hereunto set my hand this 26th day of August, 1902.

ELIHU THOMSON.

Witnesses:

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JOHN J. WALKER.