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T. V. HUGHES.

APPARATUS FOR THE HEAT TREATMENT OF METALS.

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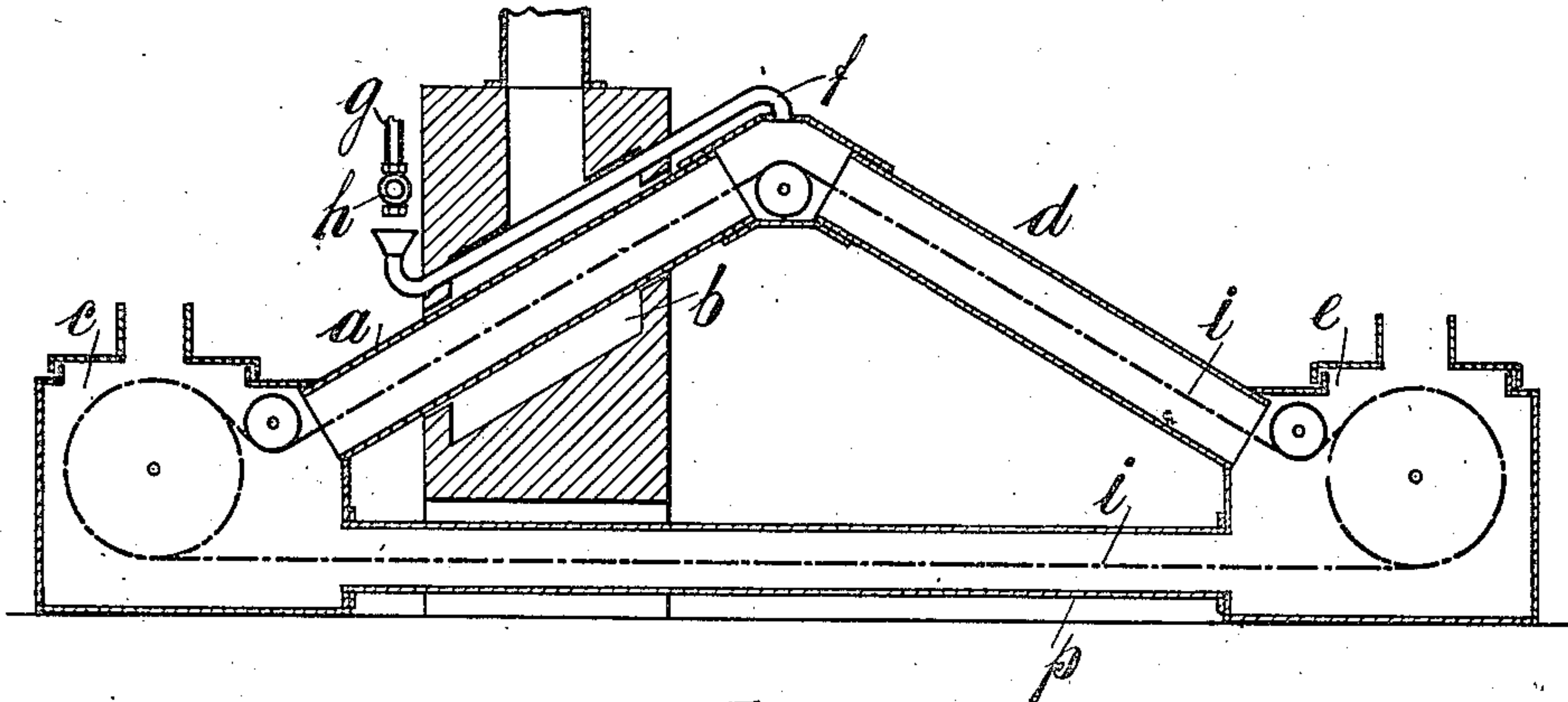


Fig:1

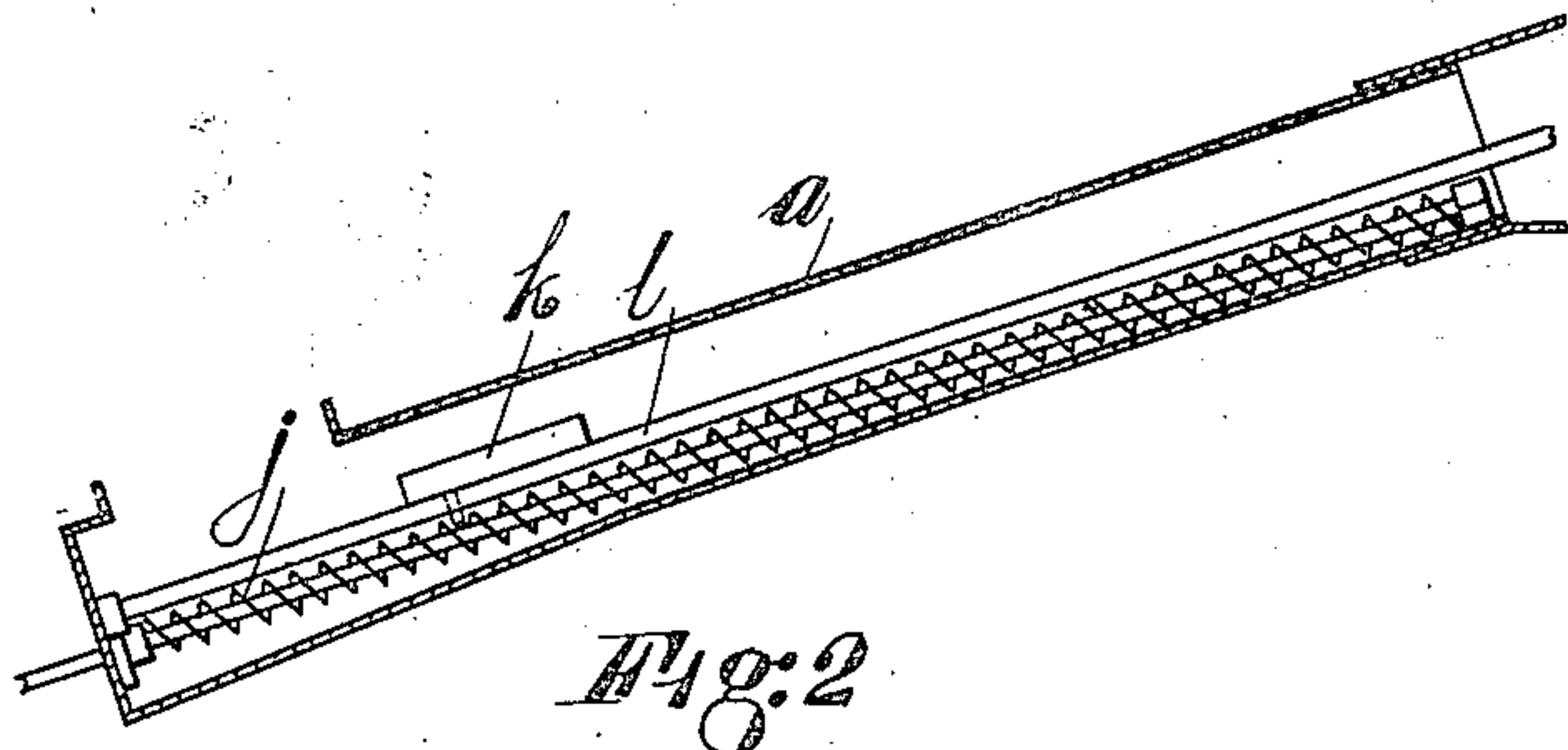


Fig:2

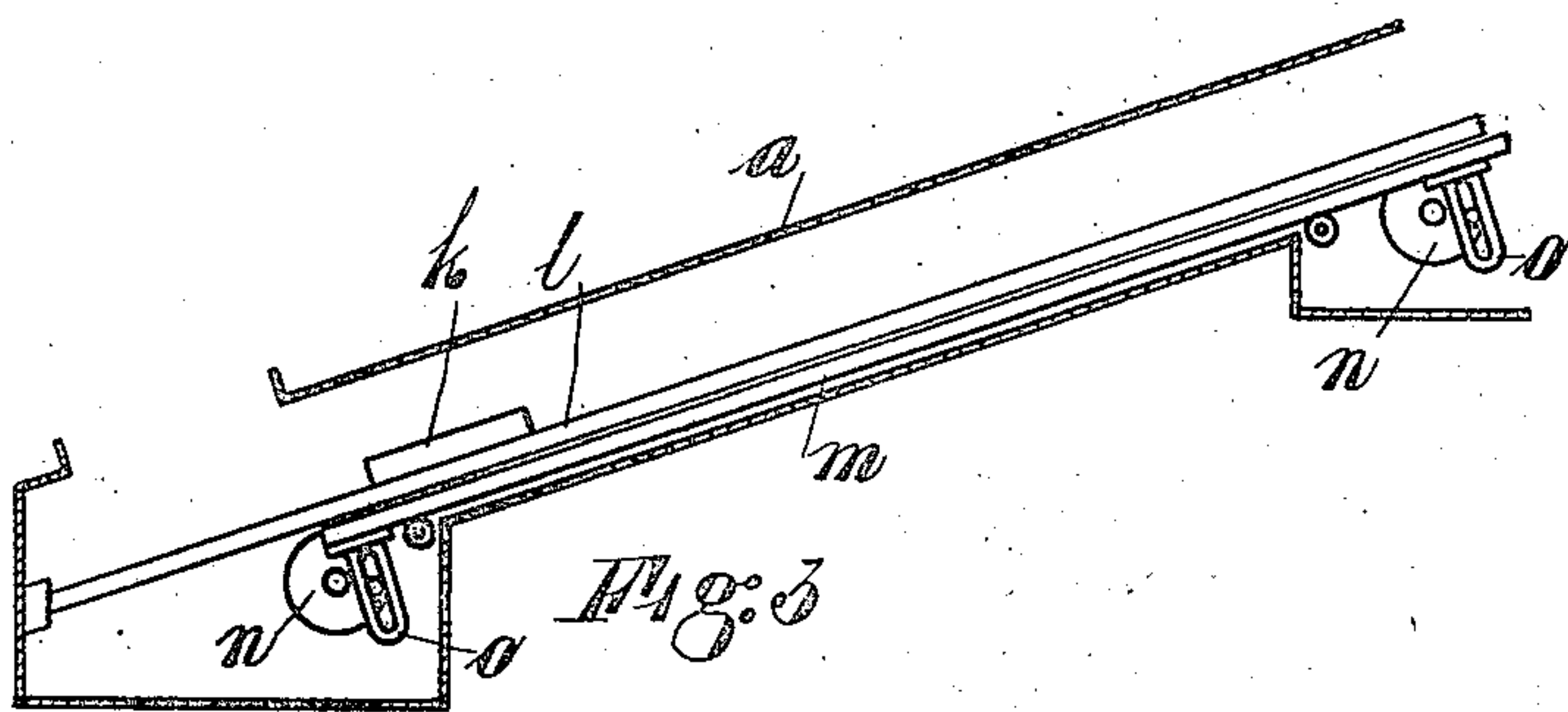


Fig:3

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# UNITED STATES PATENT OFFICE.

THEOPHILUS VAUGHAN HUGHES, OF BIRMINGHAM, ENGLAND.

## APPARATUS FOR THE HEAT TREATMENT OF METALS.

No. 868,185.

Specification of Letters Patent.

Patented Oct. 15, 1907.

Application filed March 19, 1907. Serial No. 363,303.

*To all whom it may concern:*

Be it known that I, THEOPHILUS VAUGHAN HUGHES, a subject of the King of Great Britain, residing at 130 Edmund street, in the city of Birmingham, England, have invented new and useful Improvements in Apparatus for the Heat Treatment of Metals, of which the following is a specification.

This invention relates to apparatus for the heat treatment of metals or alloys during or in connection with manufacturing processes, and consists in the combination of parts hereinafter described whereby I am enabled to submit metallic articles to the action of heat in an atmosphere of non-oxidizing or other gas or gases without passing the articles through liquid seals or quenching tanks, and also to effect a pre-heating of the gas supply whereby the said atmosphere is maintained.

Referring to the accompanying sheet of explanatory drawings:—Figure 1 is a sectional diagram of heat treatment apparatus constructed in accordance with this invention. Figs. 2 and 3 are respectively sectional views of modified forms of heating or conveying appliances employed in conjunction with my heat treatment chamber.

The same reference letters in the different views indicate the same parts.

In carrying the invention into effect I employ a tube *a* serving as a heat treatment chamber which is supported in an inclined position within a furnace *b* surrounding the greater part of the tube. At its lower extremity the tube *a* dips into a closed box or chamber *c* and at its upper extremity is secured to an oppositely inclined delivery or cooling tube *d* which likewise terminates in a chamber *e*. Both chambers *c* and *e* are fitted with suitable lids or covers to provide ready access to their interiors.

At the upper extremity of the tube *a*, or at the junction of the tubes *a* and *d*, connection is made with a gas supply pipe *f* which also passes through the furnace for the purpose of pre-heating the gas or gases employed. When the gas or gases consist entirely or in part of steam the said tube is utilized for the generation of such steam, and the supply of water thereto is maintained by a water pipe *g* fitted with tap *h*.

By the arrangement of tubes *a* and *d* as aforesaid and the buoyancy of the heated gases passed into the same through the pipe *f*, a non oxidizing atmosphere can readily be maintained in the said tubes, the only escape to the boxes *c* and *e* and thence to the atmosphere being that due to a slow diffusion which takes place at the outer ends of the tubes. By the provision for heating the gas supply tube *f* the disturbing effects of a cold gas supply on the heated tubes and articles are avoided. Boxes *c* and *e* are connected by a tube *p*.

For feeding or conveying the articles through the

heat treatment chamber *a* and cooling chamber *d*, I may employ an endless conveyer chain *i* fitted with suitable trays, or boxes as shown at Fig. 1 or a screw *j* adapted to slide a box or boxes as *k* along a pair of parallel guide rails *l* in the tube *a*, as shown at Fig. 2. The chain or screw may be continuously or intermittently operated as desired. In the arrangement shown at Fig. 3 provision is made for an intermittent movement, the boxes *k* being supported by rails *l* and propelled in a step by step manner by a reciprocating rail *m* (arranged between the guide rails) which during each forward stroke raises the boxes off the rails *l* and advances them towards the outlet end of the tube *a*, and on the return stroke lowers the boxes on to the rails *l* where they remain until again raised with the next forward movement of the reciprocating rail *m*. Any convenient means may be employed for operating the rail *m*, such as a pair of cranks *n* geared to rotate simultaneously and arranged to respectively engage a pair of slotted projections *o* attached to the rails.

Instead of employing a pair of inclined tubes as hereinbefore described, I sometimes dispense with the tube *d* and employ only the tube *a* the upper end of the latter then being closed. In this case the screw form of feeding apparatus is preferred and the required forward and return movements of the screw are obtained by reversing its direction of rotation. The lower portion of the tube extending beyond the furnace is also made somewhat longer than otherwise in order to obtain the required cooling of the articles before they are withdrawn.

Having thus described my invention what I claim and desire to secure by Letters Patent is:—

1. In the heat treatment of metals, the combination consisting of an inclined thermal treatment chamber charged with non-oxidizing gas, a furnace for heating such chamber and its inclosed gas, and a gas supply tube connected to the upper end of the chamber and arranged in part within the said furnace, substantially as described.

2. In the heat treatment of metals, the combination consisting of an inclined thermal treatment chamber charged with non-oxidizing gas, a furnace for heating such chamber and its inclosed gas, a gas supply tube connected to the upper end of the chamber and arranged in part within the said furnace, and means for conveying articles to be treated along the said thermal treatment chamber, substantially as described.

3. In the heat treatment of metals, the combination consisting of an inclined thermal treatment chamber charged with non-oxidizing gas, a furnace for heating such chamber and its contained gas, a closed chamber at the outer end of the said thermal treatment chamber, a gas supply tube connected to the upper end of the thermal treatment chamber and arranged in part within the said furnace, and means for conveying articles to be treated along the said thermal treatment chamber, substantially as described.

4. In the heat treatment of metals, the combination consisting of an inclined thermal treatment chamber, an oppositely inclined cooling chamber secured to the said thermal treatment chamber, both chambers being charged with  
5 nonoxidizing gas, a furnace for heating said thermal treatment chamber and its contained gas, closed chambers at the respective outer ends of the thermal treatment and cooling chambers, a connecting tube between the said closed chambers, means for conveying articles to be  
10 treated through all the chambers and a gas supply tube

connected to the upper end of the thermal treatment chamber and arranged in part within the furnace, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses. 15

THEOPHILUS VAUGHAN HUGHES.

Witnesses:

JOHN MORGAN,  
HARRY DAVIS.