

L. H. E. BÉGOT.
 CASCADE EXTRUSION DIE FOR COLD OR HOT SPINNING OF METALS.
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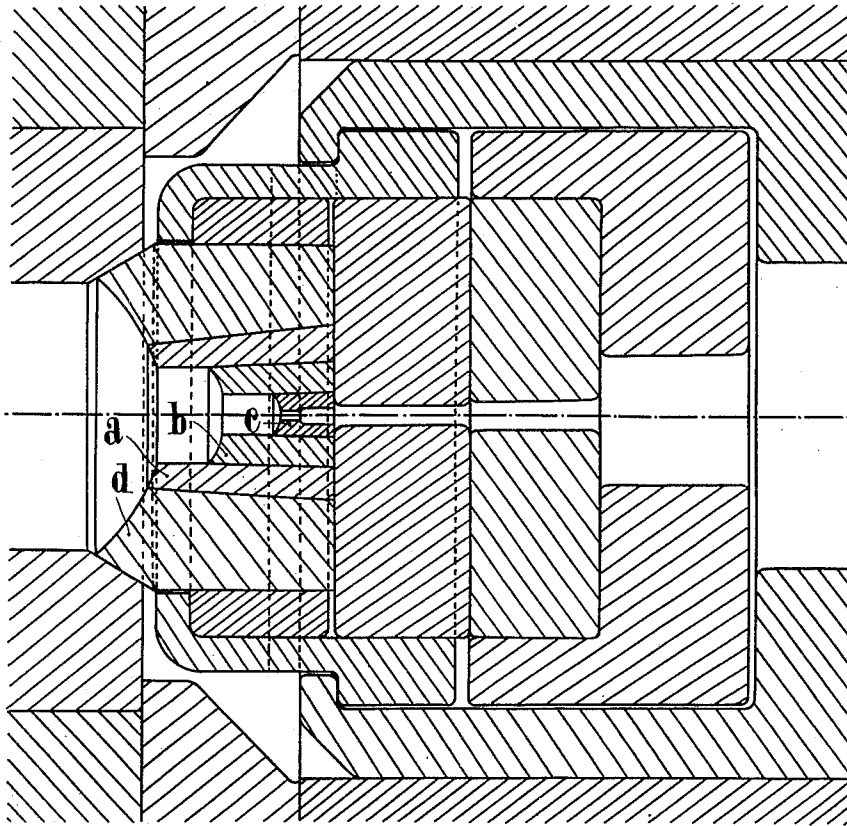


Fig. 2.

Fig. 1.

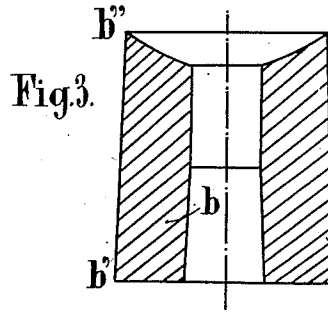
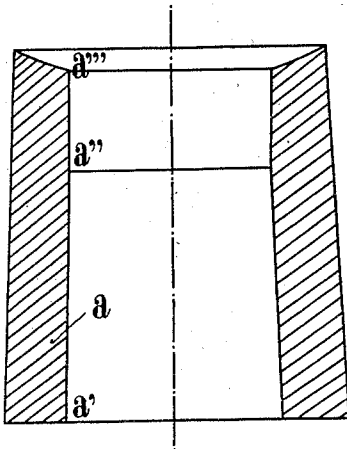


Fig. 3.

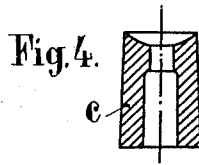


Fig. 4.

INVENTOR
 Louis H. E. Bégot
 BY *Louis Bégot*
 ATTORNEY

UNITED STATES PATENT OFFICE.

LOUIS HIPPOLYTE EDMOND BÉGOT, OF PARIS, FRANCE.

CASCADE EXTRUSION-DIE FOR COLD OR HOT SPINNING OF METALS.

1,395,217.

Specification of Letters Patent.

Patented Oct. 25, 1921.

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To all whom it may concern:

Be it known that I, LOUIS HIPPOLYTE EDMOND BÉGOT, citizen of the Republic of France, and resident of Paris, France, (post-office address 5 Place de Valois,) have invented a new and useful Cascade Extrusion-Die for Cold or Hot Spinning of Metals, which improvements are fully set forth in the following specification.

10 In extruding metals by means of an extrusion press, it has been found that each metal or alloy has a critical point of flow which is limited to a fixed temperature and pressure, beyond which any increase of pressure or of temperature is liable to alter its properties and its mechanical constants. If it is desired, starting from an ingot of a comparatively large diameter, to extrude a tube or any desired shape of a comparatively very small diameter, the operation is limited by the critical point just mentioned. It follows that with an ingot of a given diameter, it is possible to extrude only tubes or shapes above a certain diameter.

25 For the purpose of obtaining shapes of a diameter smaller than the said minimum limit, the difficulty has been avoided by using multiple extrusion dies, so as to offer to the flow of the metal a total cross-section of passage coming within the normal conditions of the operation, while at the same time each extrusion die can be given a diameter smaller than the minimum diameter. This method of working has however the drawback that only comparatively short bars can be obtained, the length of each bar extruded being a fraction of the total length that the bar would have obtained in the same conditions with a single die, this fraction being equal to the said total length divided by the number of dies.

This invention relates to an extrusion die in cascade, by means of which can be obtained in a single operation a single shape or tube in one piece, containing the whole of the metal of the ingot and the diameter of which can be as small as may be desired compared to the original ingot, without the critical point being able to come into action, that is to say without any change taking place in the mechanical properties and constants of the metal.

The cascade die as indicated by its name, is characterized by a series of containers or extrusion dies arranged one behind another

or in cascade, of a gradually decreasing diameter, communicating with each other, the container of the largest diameter receiving the ingot to be treated, and the container of the smallest diameter playing the part of the final die for the discharge of the metal. The proportion between the diameters of two successive containers being considerably greater than the limit ratio beginning with which is attained the critical point of flow, it will be possible, as will be understood, to convert in one single operation the whole of the metal of the initial ingot into a single shape or tube, escaping from the last container or without the mechanical properties and constants of the metal being modified.

In order to make the following explanation as clear as possible, the accompanying drawing shows by way of example a cascade extrusion die according to the present invention.

In the said drawing,

Figure 1 is a central longitudinal section of the die, and

Figs. 2-4 are detail views of the dies.

The cascade die is constituted by a certain number of dies *a, b, c*, etc., of suitable dimensions fitted into each other so as to "hoop" each other for the purpose of resisting lateral pressures produced during the passage of the metal treated.

It will be seen that the first orifice is constituted by a tube *d* mounted in the body of the initial die. This precaution has been adopted in order to enable the lip of the said first die to be replaced. This improvement could be moreover applied to single dies, as will be readily understood.

Finally, it must be pointed out that though each of the dies is mounted conically in one which receives it, this conical adjustment is limited to the surface of contact of the cup of each die. The free portions above the said cups are cylindrical so as to enable the breech end block or head to be easily disengaged at the end of the operation. Thus the die *a* (Fig. 2) is made to taper inside from *a'* to *a''* and is cylindrical from *a''* to *a'''*; the die *b* which engages with or fits into the die *a*, is made to taper outside from *b'* to *b''*, the said portion engaging with the portions *a'-a''* of the die *a*, and so on.

The cascade die constitutes in fact a new departure in the art of extruding metals in the sense that it makes possible gradual re-

110

duction of the cross-section of the ingot treated otherwise than by means of a funnel-shaped orifice.

In fact, the orifice of each of the dies is preceded by a chamber formed by the continuation of the orifice of the preceding die. This is done in such a manner that each of the zones of activity should be preceded by a zone of rest; the whole constituting not only a cascade of dies with decreasing cross-sections, but also a cascade of containers of also decreasing cross-sections.

I claim as my invention—

1. A cascade extrusion die for the extrusion under pressure of a solid metal ingot at one operation into a single one-piece bar containing substantially all of the metal of the ingot, said extrusion die comprising a series of interfitting dies having coaxial bores of progressively-decreasing diameters, the ratio of the diameters of the bores of any two successive dies being appreciably greater than the critical point of flow of the metal of the ingot.

2. A cascade extrusion die, as claimed in claim 1, having combined therewith a container to initially receive the metal ingot and support the same in line with the axis of the extrusion die.

3. A cascade extrusion die, as claimed in claim 1, in which the bore of each die is made with a cylindrical forward portion and a tapered rear portion.

4. A cascade extrusion die for the extrusion under pressure of a solid metal ingot at one operation into a single one-piece bar containing substantially all of the metal of the ingot, said extrusion die comprising a series of interfitting dies having coaxial bores of progressively-decreasing diameters, the ratio of the diameters of the bores of any two successive dies being appreciably greater than the critical point of flow of the metal of the ingot; and a tube encircling the outermost die and having its front end shaped to form the initial orifice of the extrusion die.

5. A cascade extrusion die for the extrusion under pressure of a solid metal ingot at one operation into a single one-piece bar containing substantially all of the metal of the ingot, said extrusion die comprising a series of interfitting dies having coaxial bores of progressively-decreasing diameters, the ratio of the diameters of the bores of any two successive dies being appreciably greater than the critical point of flow of the metal of the ingot, and a tube encircling the outermost die and having its front end shaped to form the initial orifice of the extrusion die; in combination with a container to initially receive the ingot and support the same, with the forward end of the ingot directly opposite said initial orifice.

In testimony whereof I have signed this specification.

LOUIS HIPPOLYTE EDMOND BÉGOT.