June 16, 1925. 1,542,047

L. FERRARI

MANUFACTURE OF DIES, MATRICES, PUNCHES, AND LIKE OBJECTS MOLDED IN THE HOT STATE

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Fig. 1

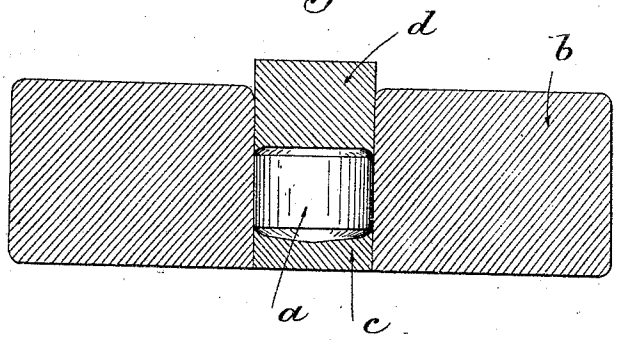
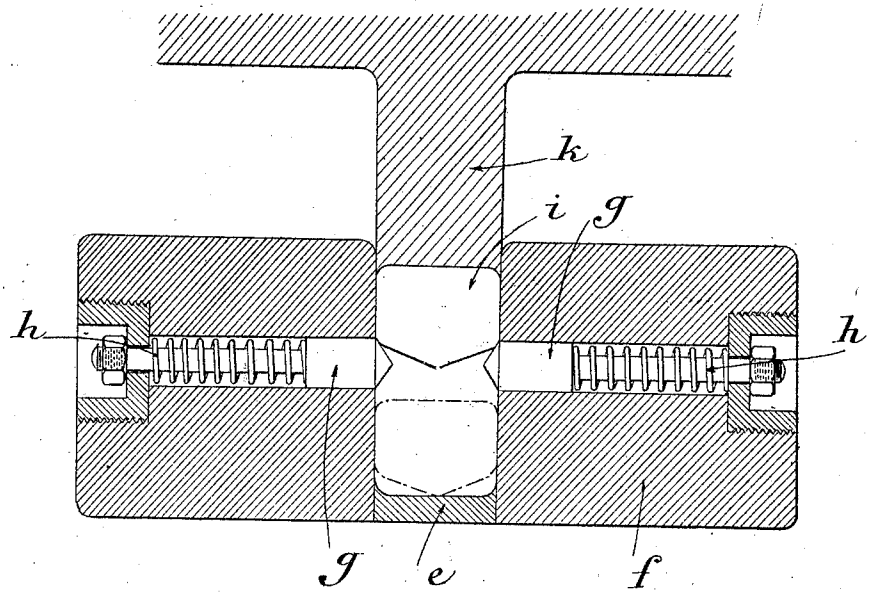


Fig. 2



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Fig. 3

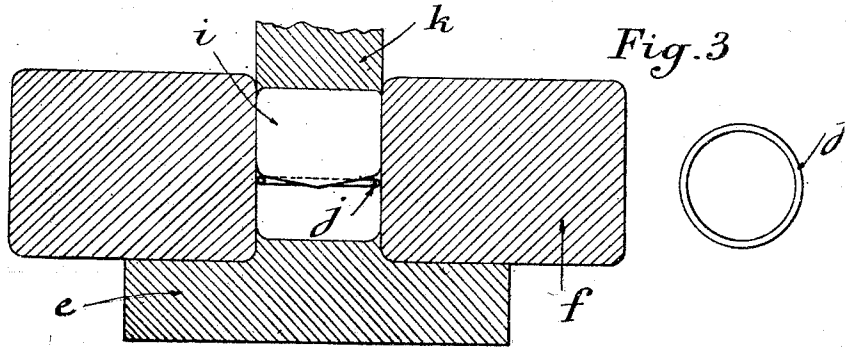


Fig. 4

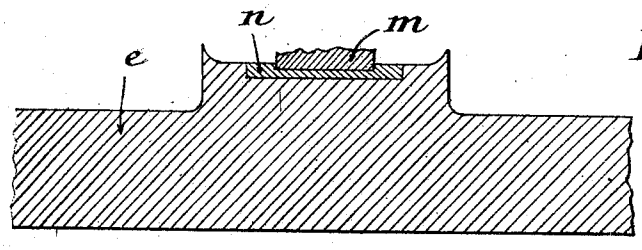


Fig. 5

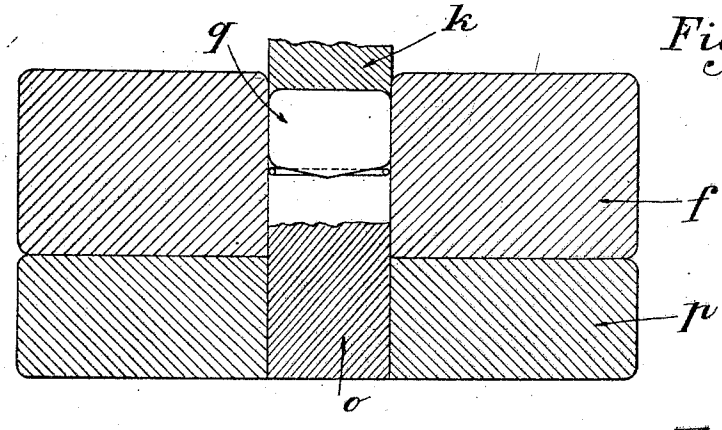
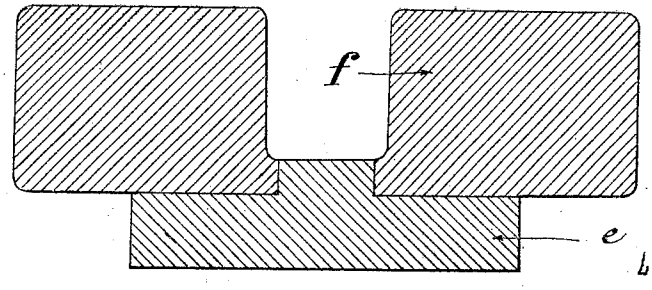


Fig. 6



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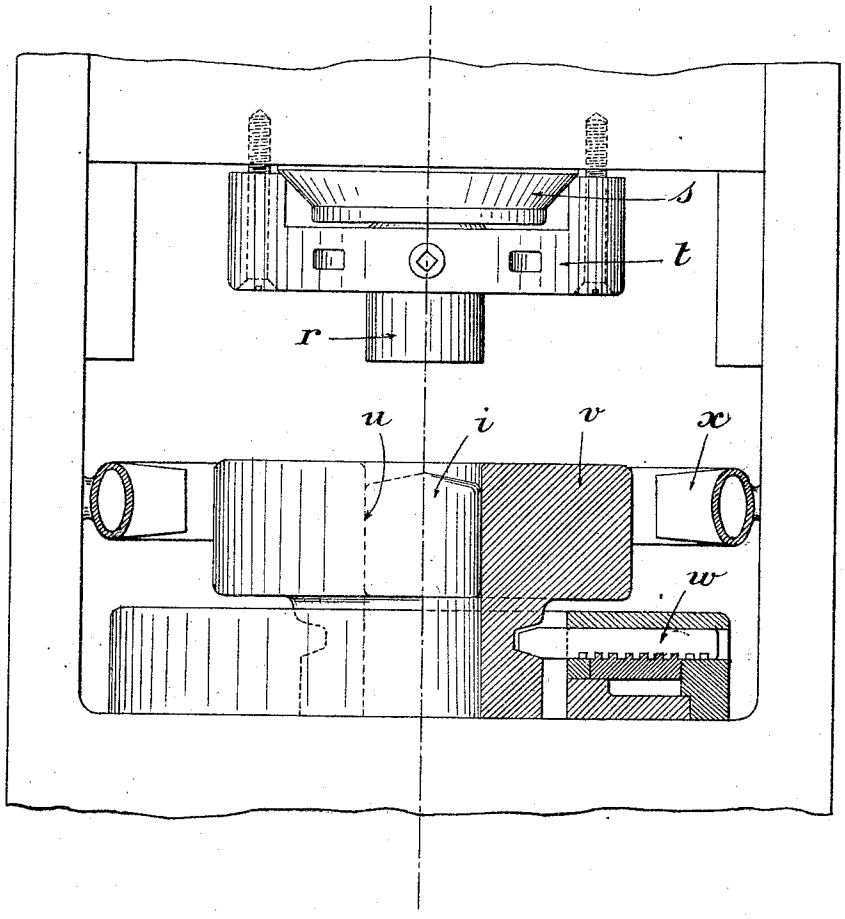
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Fig. 7



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by

his Attorney

Patented June 16, 1925. 1,542,047

UNITED STATES PATENT OFFICE.

LAURENT FERRARI, OF BEAUSOLEIL, FRANCE, ASSIGNOR TO THE SOCIETE FRANCAISE POUR L'EXPLOITATION DES PROCEDES CANAVAL-FERRARI, OF BEZIERS, HERAULT, FRANCE.

MANUFACTURE OF DIES, MATRICES, PUNCHES, AND LIKE OBJECTS MOLDED IN THE HOT STATE.

Application filed August 16, 1922. Serial No. 582,173.

To all whom it may concern:

Be it known that I, LAURENT FERRARI, a subject of the King of Italy, residing at Beausoleil, Alpes Maritimes, in the Republic of France, have invented new and useful Improvements in the Manufacture of Dies, Matrices, Punches, and like Objects Molded in the Hot State, of which the following is a specification.

This invention relates to a process of manufacture and reproduction of dies, matrices, punches, and like objects which are pressed, molded, or stamped, which comprises the following operations:

1. In the first place, a malleable alloy, which is composed for example of about 775 parts copper and 225 parts tin, is prepared by melting and the same is then poured into a mold, preferably of a conical shape.

2. Secondly, the mass of alloy thus obtained is brushed carefully and heated to a sufficient temperature; and it is again brushed and strongly compressed in a suitable ring so as to render the alloy homogeneous and also to give a conical shape to the piece.

3. Lastly, the brushed and polished piece is heated to the proper temperature to render the alloy malleable and is introduced, after brushing, into a ring placed upon a block supporting the patrix, said ring being provided with an elastic device preventing the piece from coming into contact with the patrix before applying the pressure, the latter bringing the piece strongly against the patrix and thus making the impression in an effective manner.

In a modified method, which is used where the patrix contains parts in very low relief making two or several successive impression strokes necessary, the piece is disposed in a ring which is heated by suitable means, the patrix being secured to a block which is mounted upon the press.

The said process is very advantageous, since the alloy is perfectly homogeneous after having been compressed, and it will thus afford impressions of an absolute fineness, while on the other hand, the mass of alloy being placed in contact with the patrix only at the time when the pressure is exerted, this will obviate all imperfections in the impressions and all deteriorations of the patrix, as the surface of the piece has a uniform temperature; since all parts of the piece will come into contact with the patrix at the same time, the cooling will take place in a uniform manner upon the whole surface.

Various embodiments of the invention are set forth in the following description, reference being had to the accompanying drawings given by way of example and in which:

Fig. 1 shows the device used for preliminary compression.

Fig. 2 represents the devices for impression purposes, comprising the arrangement for preventing contact between the heated piece and the patrix before applying the pressure.

Fig. 3 is a modified form of Fig. 2, wherein the device holding the piece is constituted simply by an elastic ring.

Fig. 4 shows the device for holding the patrix on a larger scale.

Fig. 5 indicates the device used for making an impression upon a matrice of suitable material or upon a punch for producing the matrice upon a steel block.

Fig. 6 is a modified form of the ring used for impression purposes.

Fig. 7 is a view, half in section and half in elevation, of the apparatus used in cases where a number of pressure strokes are required for the impression, and said apparatus comprises a heating device for maintaining the piece at an adequate temperature.

The alloy which serves to take the impression of the mold is made, preferably by fusion, of 775 parts of pure copper and 225 parts tin; the operation being preferably performed with a moderate fire, the copper is melted in the first place, and when the fusion is completed, the tin is added stirring vigorously in order to make the mixture quite homogeneous, and the alloy is then ready for casting. Obviously, use might be made of any other metal or alloy having the same qualities as the preceding, viz, a high degree of malleability at a relatively low temperature, absolutely non-rusting qualities at all temperatures, perfect homogeneity, stability even after various forgings or meltings, strength as regards die impressions by the cold process for dies and mat-

rices which is at least equal to that of a good quality of cast and tempered steel, facility for machine work and polishing, and a normal melting point.

The alloy thus prepared is poured into a mold which may be a mold of ordinary sand or a heated metal mold, having the desired size and shape, preferably a conical shape on the contact surface. Casting may also be made in the form of ingots, these being subsequently re-melted at low temperature and molded. The piece of allow thus obtained is carefully brushed with a wire brush to remove even the smallest grains of sand from the surface, and is then heated to a sufficiently high temperature, or between a dull red and a red heat. After another brushing, it is then placed in a device wherein it is subjected to a considerable pressure in order to render the alloy more homogeneous than when in the cast state, as well as to eliminate blowholes or like defects due to the casting process. On the other hand, were the alloy not compressed so as to provide a sufficient strength for the piece after the impression is made with the patrix, and especially where the patrix has a large diameter or possesses parts in very low relief, it would be necessary to employ a much higher pressure than would be required when a preliminary compression of the alloy is effected. But such high pressures would tend to deteriorate the patrix, and on the other hand, even should all the details of the patrix be reproduced upon the piece, the latter would be rapidly deteriorated during the process by reason of its lack of homogeneity, as the projecting portions will not be sufficiently compressed to give them any great strength.

For these reasons it becomes necessary to give a preliminary compression to the mass of alloy *a*, this being effected within a ring *b*, Fig. 1. The lower part of the cavity of the ring is closed by a strong block *c* whereof the top is preferably given a concave or hollow conical shape. The piece of alloy *a* is compressed by a block *d* which may be secured to the hammer of the compression device or can be acted upon by the pressure of said device. Obviously, the ring *b* should have a sufficient strength to withstand the pressure. Its internal cavity is preferably given a slight taper for the ready removal of the piece *a* when cold, and on the other hand it will have adequate dimensions so as to enable the piece thus prepared to be used directly for impression purposes without requiring a mechanical treatment for bringing it to suitable proportions.

In this manner, the piece when leaving the above-described compression apparatus will be ready for taking the impression. The piece of alloy, having the convex or conical shape which was conferred upon it during the compression process, is carefully brushed and polished so as to remove even the slightest impurities from the surface; it is heated to a point near redness in order to render the alloy malleable, then brushed, and placed in the impression apparatus containing the patrix. The piece is so disposed that the convex side is adjacent the patrix. The apparatus is provided with suitable means for preventing all contact between the piece and the patrix when placing the former in the apparatus, as the contact is only to take place when pressure is exerted. The amount of pressure to be applied will depend upon the diameter of the patrix and the depth of the low relief parts. The impression is carried out in a single operation.

Should the piece of alloy be placed in the apparatus without the proper precautions, it would come into contact with the patrix before the pressure is applied, and the action of the temperature would cause the softening of the high relief parts of the patrix which are the most easily affected, and when pressure is applied the said parts when softened would be damaged and would afford a very defective impression. Furthermore, the parts of the piece in contact with the salient portions would become cooled and thus thereby hardened, and this would be an additional source of deterioration of the patrix when the pressure is applied.

Fig. 2 shows the apparatus which is employed for impression purposes. It comprises the block *e* upon which the patrix is disposed, said block being mounted at the lower or small diameter part of the internal cavity, which is also slightly conical, of a ring of great strength *f*, the latter being traversed by a plurality of rods *g* whereof the ends extend within said cavity of the ring under the action of springs *h*, the ends of said rods being suitably inclined. Upon inserting the piece *i*, the latter will be held by the rods, and it is only upon applying the pressure that the same will overcome the effect of the springs *h* and will cause the said rods to disappear, thus making contact between the piece and the patrix for purposes of impression (position shown in full and dotted lines). Pressure acts upon the piece through the medium of a block *k* whereof the bottom surface has preferably a concave form; said block can be separated from or attached to the hammer of the press.

Fig. 3 shows another device for maintaining the piece *i* at a distance from the patrix as long as the pressure is not exerted, consisting simply in an elastic split ring *j* which acts solely by lateral friction in order to prevent the descent of the piece.

Fig. 4 represents the method of securing

the patrix *m* to the block *e*, this being effected without any liability to side movement, by means of a member *n* having constant external dimensions for each size of matrice to be obtained.

Fig. 5 shows the device used for impression purposes upon a matrix in suitable material or upon a die for producing the matrice upon a steel block. For this it is simply necessary to place the matrice or the die *o*, after turning the same to adequate dimensions, in the ring *f* while at the same time supporting the matrice or die throughout the entire height by means of an additional ring *p*. The steel piece *q* is inserted in exactly the same manner as the piece of alloy *i*, after having been heated to a bright cherry red in a deoxidizing atmosphere, unless it is preferred to treat the matrice by a known process using leather charcoal or a like powdered carbon.

Fig. 6 represents the form which may be given preliminary to the ring *f*, so as to facilitate the construction of the patrix-holder *e*, Fig. 4, whereby projecting part of the periphery may be eliminated and the fragility diminished in consequence.

Fig. 7 shows a modified form of the impression device wherein the patrix is mounted on a block *r* which is secured to the hammer of the lever or press *s* through the intermediary of a mandrel *t*. The piece of alloy is disposed in the cavity *u* which is formed, in order to receive the piece, in a metal member *v* secured in the fixed position but adjustable by suitable means *w*. The member *v* may be heated by the gas burner *x* or by like means whereby the piece of alloy *i* shall be maintained at an adequate temperature, should a single pressure be insufficient to produce the impression by reason of the size of the patrix or the low relief of the same. One may operate by two or more successive pressures, this being feasible since the member *v* being in a well-fixed position the patrix will always be brought upon the same point of the piece *i*, the latter remaining at a sufficient temperature by reason of the gas burner *x* which serves to prevent it from becoming cooled.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A process of manufacture of dies, matrices, punches, and like pressed or molded objects, consisting in preparing by fusion an alloy which is malleable at a relatively low temperature, said alloy being subsequently cast in molds so as to constitute a piece which is then suitably brushed, and strongly compressed in the hot state whereby it shall be rendered perfectly homogeneous and shall be given a conical form, said piece of alloy being then polished, brushed and heated in order to render it malleable, and is then placed in the apparatus serving to press strongly together the said piece and a patrix used for making the impression, said apparatus being so disposed that the piece of alloy shall come into contact with the patrix at the time when the pressure is applied.

2. A process of manufacture of dies, matrices, punches, and like pressed or molded objects, consisting in preparing by fusion an alloy which is malleable at a relatively low temperature, said alloy being subsequently cast in molds so as to constitute a piece which is then suitably brushed and strongly compressed in the hot state whereby it shall be rendered perfectly homogeneous and shall be given a conical form, said piece of alloy being then polished, brushed and heated in order to render it malleable and is then placed in the apparatus serving to press strongly together the said piece and a patrix used for making the impression, said apparatus comprising a strong ring whose internal cavity is closed at one end by a block supporting the patrix, an elastic device preventing the piece of alloy when disposed within said ring from coming into contact with the patrix, said device admitting this contact when the pressure is exerted upon the piece of alloy.

3. A process of manufacture of dies, matrices, punches, and like pressed or molded objects, consisting in preparing by fusion an alloy which is malleable at a relatively low temperature, said alloy being subsequently cast in molds so as to constitute a piece which is then suitably brushed and strongly compressed in the hot state whereby it shall be rendered perfectly homogeneous and shall be given a conical form, said piece of alloy being then polished, brushed and heated in order to render it malleable, and is then placed in the apparatus serving to press strongly together the said piece and a patrix used for making the impression, said apparatus containing a cavity wherein the piece of alloy is placed, heating means surrounding said cavity, and means whereby the piece of alloy shall come into contact with the patrix at the time when the pressure is applied.

In testimony whereof I have signed my name to this specification.

LAURENT FERRARI.