(No Model.)

H. W. WYMAN & L. F. GORDON.

DIE FOR FORGING CAR COUPLING HOOKS.

No. 524,880. Patented Aug. 21, 1894.

Fig. 3.

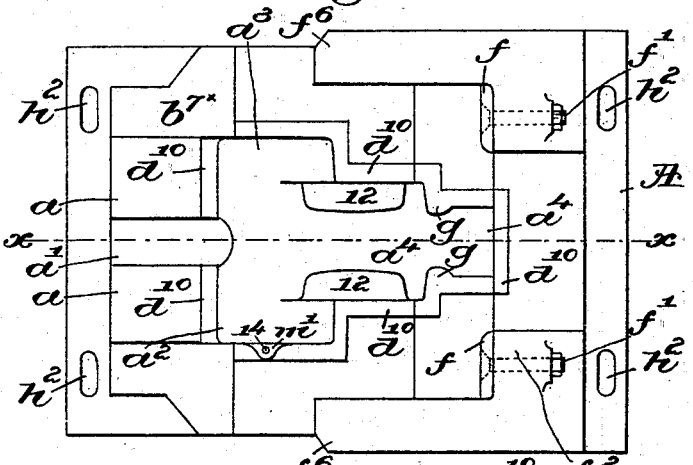


Fig. 1.

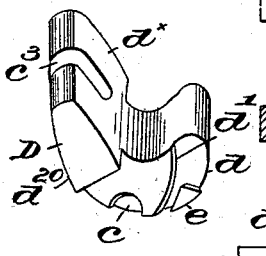


Fig. 2.

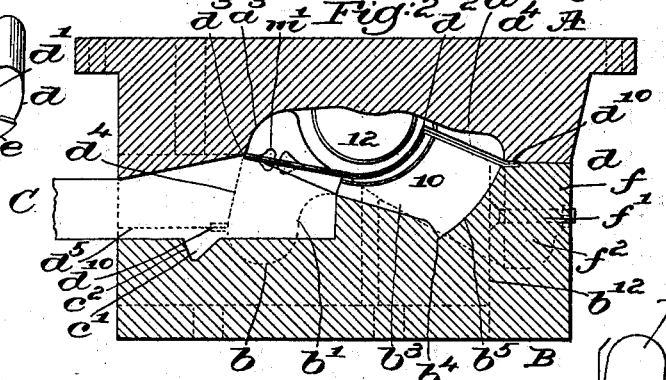


Fig. 5.

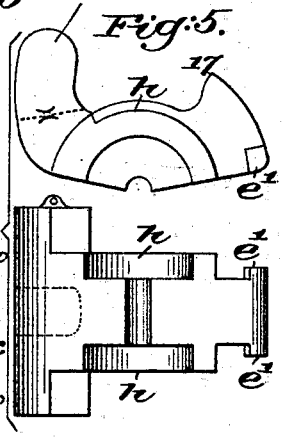
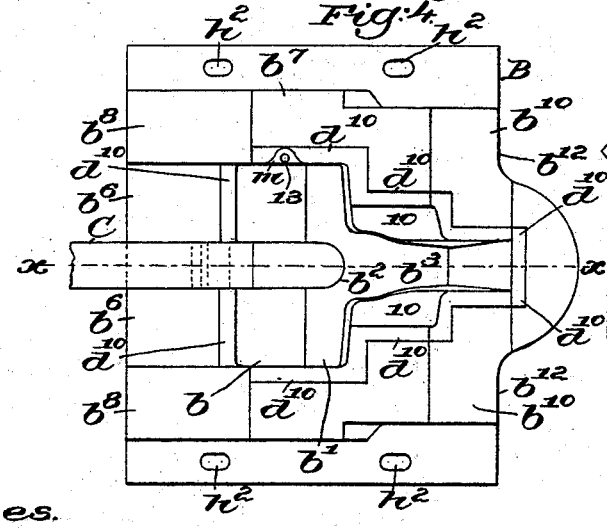


Fig. 4.



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by Crosby & Gregory Attys.

UNITED STATES PATENT OFFICE.

HORACE W. WYMAN AND LYMAN F. GORDON, OF WORCESTER, MASSACHUSETTS.

DIE FOR FORGING CAR-COUPLING HOOKS.

SPECIFICATION forming part of Letters Patent No. 524,880, dated August 21, 1894.

Application filed May 9, 1893. Serial No. 473,589. (No model.)

To all whom it may concern:

Be it known that we, HORACE W. WYMAN and LYMAN F. GORDON, of Worcester, county of Worcester, State of Massachusetts, have invented an Improvement in Dies for Forging Car-Coupling Hooks, of which the following description, in connection with the accompanying drawings, is a specification, like letters and figures on the drawings representing like parts.

In another application, Serial No. 472,707, filed on the second day of May, 1893, we have shown and described a blank adapted to be forged, by the dies herein to be described, into proper shape to be used for a car coupling of the standard variety. These blanks are quite heavy to handle, and to devise dies to forge such large masses of metal accurately has required very much study and experiment, especially to make the metal fill all the parts of the die, and yet enable the hook and other parts to be thereafter removed from the die, and we have also been obliged to provide means by which to prevent lateral movement of one part of the die on the other part owing to the great strain exerted in forcing the metal into all parts of the die.

In the forging of large masses of metal of irregular shape, it is necessary to work the metal sufficiently to refine it, or render the forging homogeneous, tough and compact in order to stand in use. We have found it impracticable to heat the metal above a comparatively low heat, since otherwise it would not receive the requisite amount of working or kneading to refine it and give it coherence and strength. We have successfully practiced our invention only by heating the blank to a comparatively low heat and working it slowly. But an essential feature in the practice of our invention is the determination of the parting line of the die in order to insure on the one hand the flowing or forcing of the metal accurately into all of the imprints or cavities of the die, and the flashing, and on the other hand the facilitating of the removal of the forging from the die. This parting line between the upper and lower members of the die must be so proportioned and placed as to allow the hot metal to be forced into every cavity of the die, and it must also permit of the metal being subjected to the greatest amount of working or kneading before and while reaching the cavities. An excess of metal must be provided for in the blank to allow and insure a complete filling of the cavities, but this excess must be as small as possible to keep down the percentage of waste. This excess is squeezed out into a flash between the members of the die; and the proper arrangement of this excess in the flash is made by the parting lines. The flash must, at the same time, be so placed that the fin may be removed by trimming dies, or other means, at a later stage. The angles of the parting and of the forging surfaces bear such relation to each other that the side forces made by the diagonal surfaces will balance each other to allow the members of the die to match. Another consideration in the determination of this parting line is that it shall provide for such a location of the flash or fin that when such flash or fin is trimmed off the forging will be left clean and smooth, and will not be mutilated. In general terms, therefore, the flash line is below and at a distance from the top edges of the forging and sufficiently above the bottoms of the deeper cavities to permit the metal to reach the bottoms of such cavities and fill such cavities before any overflow occurs at the parting. As already stated, this parting line is located below and at a distance from the top edges of the forging and it is substantially coincident with an irregular plane described in lines which would pass crosswise of the forging when laid flat upon its face, and located above the bulk of the mass of metal composing the forging, such plane being hereinafter referred to as a one line outline, or an edge line; that is to say, it is represented by a single line which would describe the linear or lineal as opposed to cubic outline of the forging. With the parting line located as thus described, and bearing in mind that the die is designed to act upon an already partly formed blank, it will be seen that the bulk of the metal of the blank must be forced into the cavities before the meeting edges of the members of the die come together, and, therefore, before there can be any

flash, and the result is that the blank is worked or kneaded to such an extent as to refine its metal and insure a tough, homogeneous and compact structure. And it will also be observed that the finished forging may be removed from the die very readily.

We believe, as the result of our experiments, that the best results can be obtained by working the blank face down, as described; that is to say, with the hooked portion thereof directed toward the base of the die and in the line of approach of the two members of the die and with the tongued end of the hook blank in nearly horizontal position.

Figure 1 shows a blank, substantially such as we employ in the dies to be described. Fig. 2 is a central longitudinal section of the two parts of the die in the line *x;* Fig. 3 a view of the interior of the upper member or part of the die; Fig. 4, a view of the interior of the lower member or part of the die with the slot defining lifter in place, and Fig. 5 shows the product of the dies in two views.

Referring to the drawings, A represents the upper, and B the lower member of the die, the member A being in practice carried by a suitable plunger or drop, while the part B lies on a rigid body or support, or vice versa, all in usual manner.

C is the slot-defining lifter.

The parting line of the dies commences at *d*, viewing the right Fig. 2, and runs, as shown, horizontally to the flash space d^{10}, and then slants upwardly to the point d^2, and then in a downward curve and upwardly to the left to the point d^3, thence down in the dotted line d^4 to the level d^5, also shown by dotted lines in Fig. 2.

The lower die B has a hook pit *b*, designated by dotted lines Fig. 2, said pit receiving the hook part D of the hook blank, Fig. 1, the innermost wall b' of said pit acting to receive against it and sustain the face $d^{\times}$ of the hook part of the blank, the said wall being slotted at b^2 to receive the inner end of the slot-defining lifter C having, as herein shown, at its under side a dog c' to enter a pocket c^2 formed in the lower die member at a point beyond the hook pit, said dog and pocket preventing any longitudinal movement of the slot defining lifter during the forging operation. The lower die member also has a tongue receiving pit b^3, starting from the upper end of the wall b' of the hook pit *b* and inclining downwardly to near its outer end, where it has, as shown, a beak-forming depression b^4 to constitute the beak 17 of the tongue, see Fig. 5 the outer end of the tongue pit being extended from said beak-forming depression upwardly, as at b^5, to the line of parting of the dies.

All around the imprint of the lower die, composed chiefly of the hook-pit and the tongue pit, there is a flash space d^{10} into which the surplus metal not needed to fill the imprint of the dies enters, forming more or less of a fin, said flash space following the line of parting of the dies, except only along the dotted line d^4.

For sake of simplicity and to avoid confusion we have lettered the flash-space d^{10}, and have used the same letter to indicate said space on both parts of the die, as the flash-space is made by spaces carried by both parts of the die.

In the drawings Fig. 2, the central dividing line drawn through the flash-space d^{10} indicates the line of parting of the dies.

The lower member of the die, between the deepest part of the tongue and the flash space from the point d^4 where the parting line of the die curves downwardly, has a concavity, as 10, the surface of which acts against the wall d' of the hook-blank.

The slot defining lifter C will be used only when the hook-blank has a slot, as c^3, and when the said lifter is used it receives over it the slotted part of the hook-blank.

The upper die member has a projection or extension *a*, herein represented as slotted at a' to straddle the lifter C when the latter is used, the inner wall, coincident with the dotted line d^4 of parting, Fig. 2, of said projection, it being coincident, acting against the outer side d^{20} of the hook-part of the hook-blank, see Fig. 1, said inner wall forming a continuation of a hook-cover, as we shall denominate the space a^3 in the upper die, the said upper die also having a tongue space a^4, and in the tongue space a^4 we have located convexed segmental or semicircular lobes 12, they filling in the upper member of the die between the tongue space and the flash space. The imprints *b*, b^3, a^3, a^4, have substantially vertical side walls and concaved end walls.

Referring again to the lower member of the die, the surface b^7 of the die outside the imprints is inclined upwardly, see Figs. 2 and 4, to the left, to meet the substantially horizontal surface b^8. The portion b^{10} of the lower die inclines upwardly to the left, as best represented in Fig. 2, and the outer walls b^{12} of said inclined portions are preferably substantially vertical to be engaged by preferably steel shoes *f*, held in place by bolts f' in depending ears f^2 of the upper die member, the shape of said ears being indicated by dotted lines in Fig. 2, the vertical wall b^{12} being also represented in said figure by dotted line, the shoes of said ears by sliding down along and over the said vertical walls during the operation of closing the dies and forcing the metal into all the parts of the imprint, preventing the possibility of the upper die member being strained or moved laterally, in this instance to the left viewing Fig. 2, by reason of the action of the inclined wall or face of the hook-pit cover and projection *a*, before referred to, there being great strain upon the die during its closing movements by the action of this part of the upper die on the outer face d^{20} of the hook-portion of the blank.

To greatly strengthen the upper die mem-

ber we have connected the surfaces f^2, which carry the shoes f, to the main body of the die, by a sort of light web f^6, the same not being absolutely essential but very desirable in practice.

The lobes 12 referred to co-operate with and enter the concavities or spaces c of the hook blank, see Fig. 1, the concavities 10 and lobes 12 acting to shape the metal between the shoulder lines d' and the walls of the recesses c of the hook blank, to form the circular segments of tracks or wings h', seen at opposite sides of the tongue of the coupling hook represented in Fig. 5, said tracks or wings serving as the surfaces which insure the turning of each hook blank about a center coincident with the curve of the said tracks or wings, said tracks or wings entering suitable grooves made in the carrying draw-bars or heads of the coupling, not herein shown, in which the said forged hooks are placed.

Referring to Fig. 1 it will be seen that the hook-blank has ears or projections e, which ears or projections in the die herein described, are to be forged to constitute a stop e' to limit the extent of vibration or rocking movement of the coupling hook in operation. We have provided for this step of the forging operation by adding to the upper member of the die the inward projections g, they entering the space d' of the hook-blank, see Fig. 1, at one side of the lugs e and forging said lugs, thus defining the stops referred to. The inclined surfaces b^7 of the lower die member, as well as the inclined surfaces b^{10} are met by oppositely inclined surfaces of the upper die member, but outside the flash-lines, to further aid in preventing longitudinal movement of the upper die with relation to the lower die.

In the drawings the letters h^2 indicate suitable holes in the outer flanges of the die members to receive suitable bolts by which to connect or fix the die members in operative position.

Referring again to the lower die, the flush space d^{10} is represented as having a portion of it sunk or cut away to leave a depression m, with a central pin 13 extending substantially to the level of the flash space. This space m enables the material in the flash space to be molded to constitute a small lug or ear through which a hole may be made by the pin and afford means for attaching a chain or other connection by which to aid if desired in moving the hook during the coupling operation. The upper die member has a corresponding space m' with a pin 14.

In the dies herein described it will be noticed that the walls and acting surfaces of the imprint portions are all so shaped and related one to the other that when the dies are separated the upper die may be freely lifted from the forged mass leaving it in place in the lower die, and that thereafter the forged mass in the lower die may be readily lifted therefrom without any obstruction or impediment due to the surfaces of the imprint, and thereafter we may lift out the forging by means of the slot defining lifter.

Having described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. A two-part separable die for forging car coupling hooks, provided with appropriate cavities for the formation of the various members of the coupling hook, the cavities in one part of the die being deeper than the cavities in the other part of the die to insure a large amount of working or kneading of the metal to force it into these cavities before the parts of the die meet, and having the parting line of the die arranged in a plane below and at a distance from the top edges of the forging and substantially coincident with a lineal delineation of the hook from end to end, substantially as described.

2. A two-part separable die for forging car coupling hooks, provided with appropriate cavities for the formation of the various members of the coupling hook, the cavities in one part of the die being deeper than the cavities in the other part of the die to insure a large amount of working or kneading of the metal to force it into these cavities before the parts of the die meet, and having the parting line of the die arranged in a plane below and at a distance from the top edges of the forging and substantially coincident with a single line edge outline of the hook from end to end, and a flash space following the said parting line substantially throughout its length, substantially as described.

3. A two-part separable die for forging car coupling hooks, provided with appropriate cavities for the formation of the various members of the coupling hook, the cavities in one part of the die being deeper than the cavities in the other part of the die to insure a large amount of working or kneading of the metal to force it into these cavities before the parts of the die meet, and having the parting line of the die arranged in a plane below and at a distance from the top edges of the forging and substantially coincident with a single line edge outline of the hook from end to end, and a flash space extending longitudinally and transversely of the die in the plane of the parting line and throughout its extent saving only at that portion coincident with the outer edge of the hook-end, substantially as described.

4. A die having a hook pit and a connected tongue pit, combined with a slot-defining lifter loosely mounted in said hook pit, and means to prevent longitudinal movement of said lifter and die, one with relation to the other, during the forging operation, substantially as described.

5. A die having a hook pit and a connected tongue pit, the side walls of the tongue pit being cut away to leave cavities 10 between

the said side walls and the flash space of the die, combined with a co-operating die having a projection a and cavity a^3, the face of said projection and the wall of said cavity being made as a continuous surface to form a side covering and top for the hook pit, and tongue spaces having segmental lobes therein, the parting line of the die being arranged in an irregular plane substantially coincident with a one line outline of the hook when laid face downward, substantially as described.

6. A die having a hook pit and a connected tongue pit, the side walls of the tongue pit being cut away to leave cavities 10 between the said side walls and the flash space of the die, combined with a co-operating die having a slotted projection a and cavity a^3, the face of said projection and the wall of said cavity being made as a continuous surface to form a side covering and top for the hook pit, and tongue spaces having segmental lobes therein, the parting line of the die being arranged in an irregular plane substantially coincident with a one line outline of the hook when laid face downward, and the lifter C adapted to said slotted projection, substantially as described.

7. A die for making car coupling hooks, composed of an upper and a lower member separated by a parting line arranged below and at a distance from the top of the forging and substantially coincident with an edge line outline of the forging when laid face down, and having a flash space substantially coincident with the length of the parting line, one of the die members having a hook pit and a connected tongue pit, the side walls of the tongue pit having cavities 10 between themselves and the flash space of the die and the other die member having a projection a and a cavity a^3, the face of said projection and the said cavity being made as a continuous surface to form a side covering and top for the hook pit, and said member also having a tongue space provided with substantially vertical side walls, segmental lobes on said side walls and the projections g, substantially as and for the purpose described.

8. A two-part separable die having imprints or cavities for the article to be forged, one of the members of said die having its deeper cavity open at one side, as the hook pit, and the other member of the die having a projecting surface, as a, constituting a side wall for said hook pit when the parts of the die are closed, combined with a shoulder on one die and a projection on the other, whereby said shoulder and projection, when the parts of the die are brought together, co-operate in advance of the exertion of the greatest pressure by the surface a on the material to be forced into the hook pit, substantially as described.

9. A die for making car coupling hooks, composed of an upper and a lower member separated by a parting line arranged below and at a distance from the top of the forging and substantially coincident with a side line outline of the forging when laid face down and having a flash space substantially coincident with the length of the parting line, one of the die members having a hook pit and a connected tongue pit, the side walls of the tongue pit having cavities 10 between themselves and the flash space of the die and the other die member having a projection a and a cavity a^3, the face of said projection and the said cavity being made as a continuous surface to form a side covering and top for the hook pit and said member also having a tongue space provided with substantially vertical side walls, segmental lobes on said side walls, and cavities m, m', substantially as and for the purpose described.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

HORACE W. WYMAN.
LYMAN F. GORDON.

Witnesses:
GEO. S. TAFT,
HENRY BACON.