

(No Model.)

C. L. STROBEL.

MANUFACTURE OF EYE BARS AND SIMILAR ARTICLES.

No. 329,501.

Patented Nov. 3, 1885.

Fig 1.

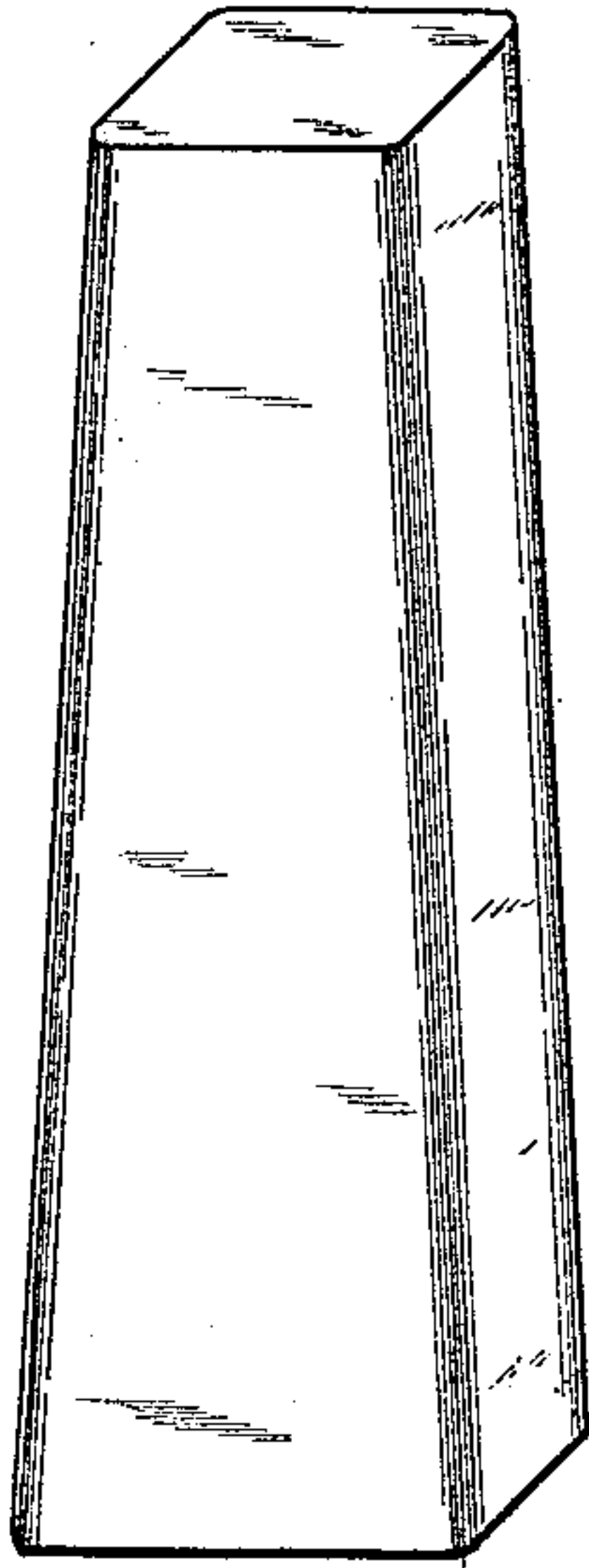


Fig 2.

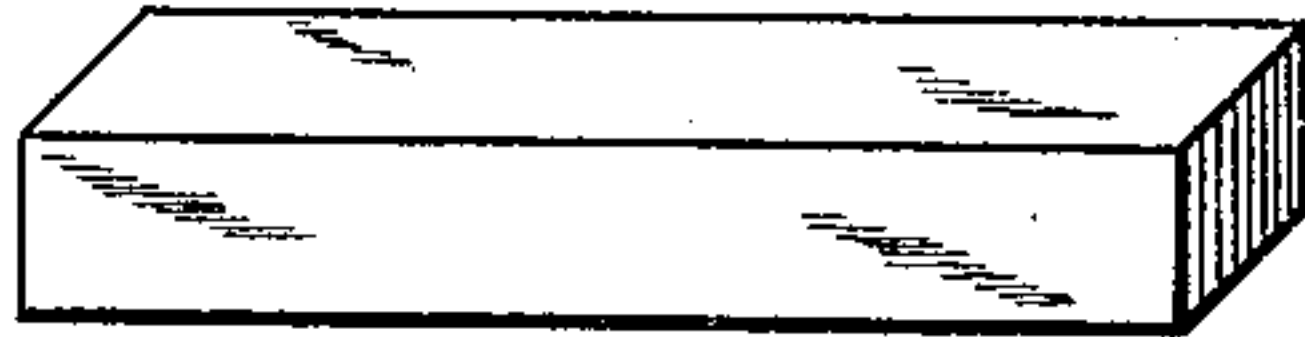


Fig 3.

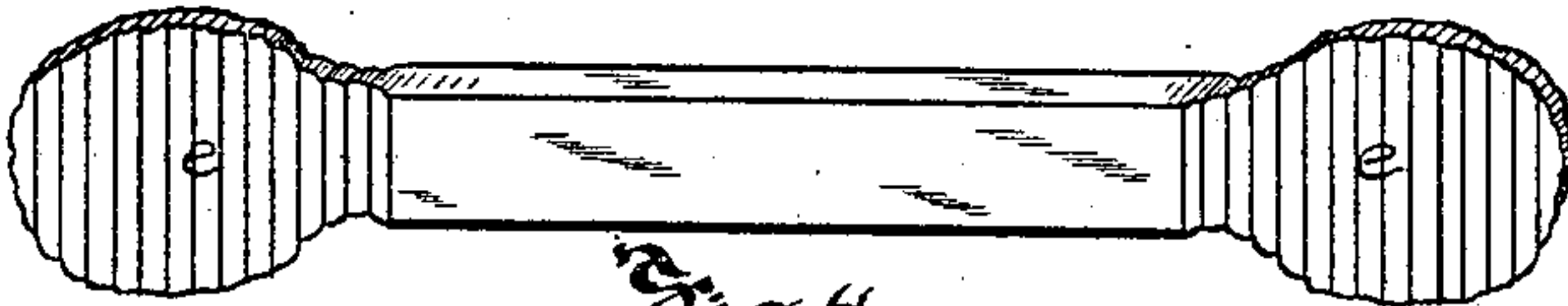
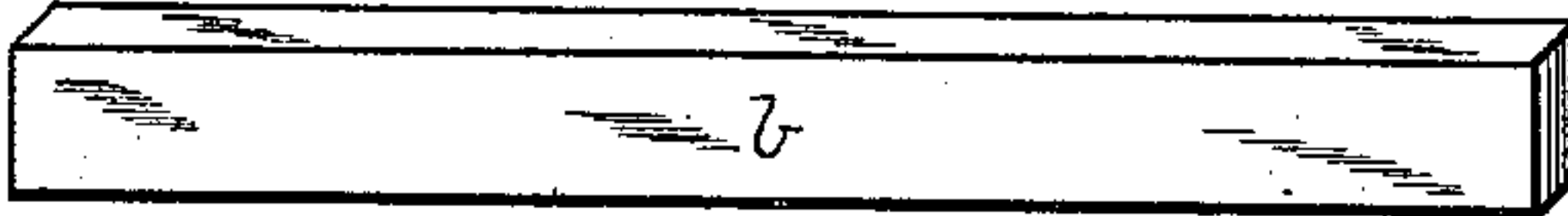


Fig 4.

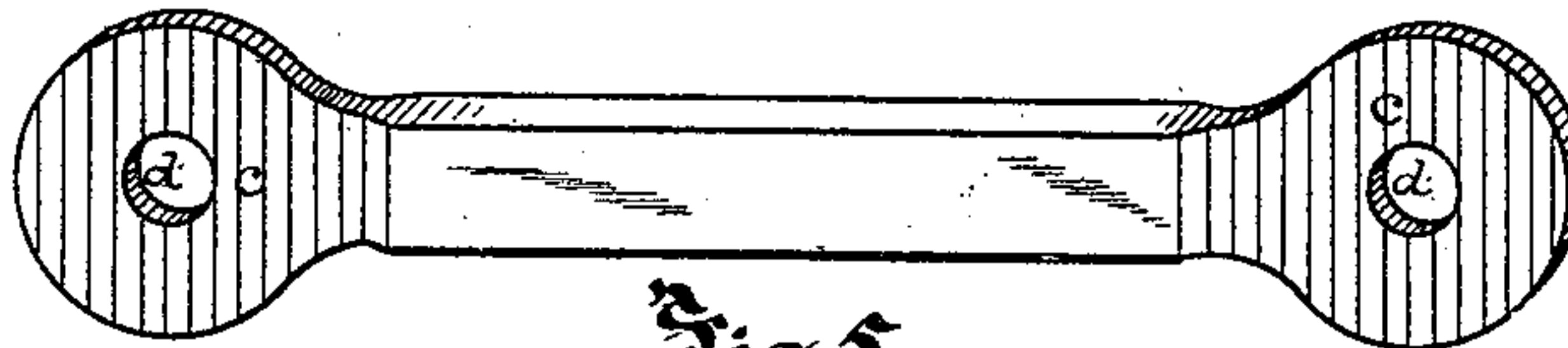


Fig 5.

Fig 7.

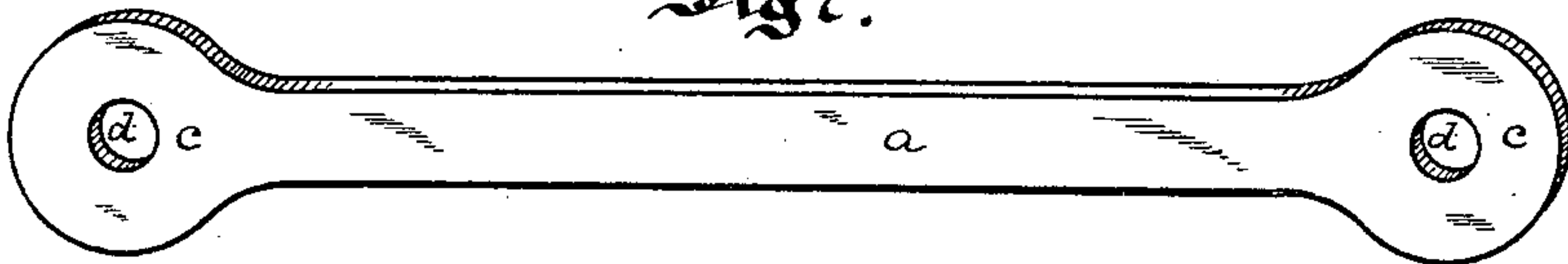


Fig 6.

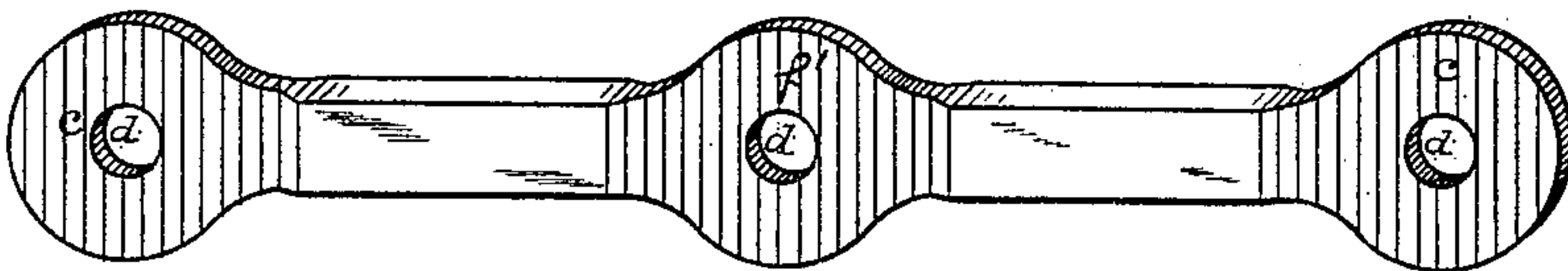
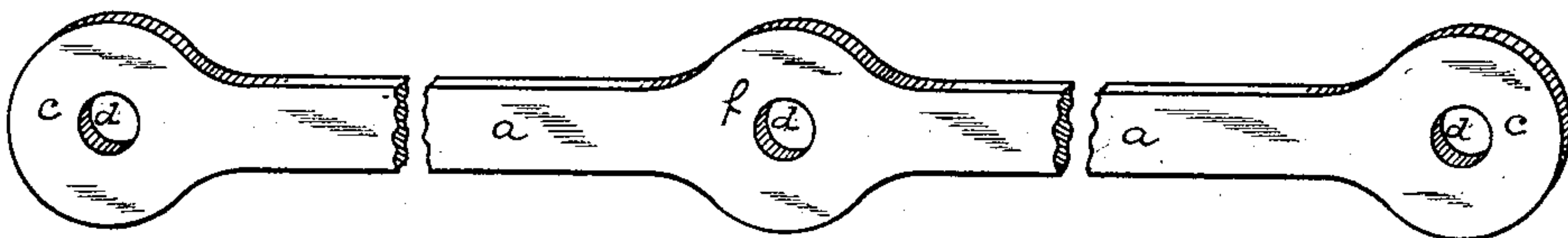


Fig 8.



Witnesses.

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# UNITED STATES PATENT OFFICE.

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## MANUFACTURE OF EYE-BARS AND SIMILAR ARTICLES.

SPECIFICATION forming part of Letters Patent No. 329,501, dated November 3, 1885.

Application filed February 16, 1885. Serial No. 156,019. (No model.)

*To all whom it may concern:*

Be it known that I, CHARLES L. STROBEL, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Manufacture of Eye-Bars and Similar Articles; and I do hereby declare the following to be a full, clear, and exact description thereof.

My invention relates to the manufacture of eye-bars and similar bars or articles having enlargements at the ends or intermediate between the ends, with a smaller shank or body between such enlargements. Heretofore these bars have been made by die-forging, by upsetting, and by what is known as the "Kloman" method of rolling.

In die-forging as heretofore practiced an iron bar of proper section for the shank or body is employed, the end of the bar, with piling-pieces added, being heated to a welding-heat and forged to the shape of the head or enlargement within a die, the metal being spread and welded within the die. This is only applicable to iron bars, as steel cannot be so treated. In this die-forging the metal is weakened and its fiber disturbed, and dependence must be put upon the welding of the parts, which may be imperfect. In upsetting, the metal, at the end of a bar of proper section for the body, is heated and driven back to form the head. This is found to be injurious to the metal, as it practically destroys the fiber when iron is so treated, and the repeated heating necessary causes a partial decarbonization and consequent weakening when the steel is so treated. In the Kloman method the billet or pile is reduced in thickness in suitable reversing-rolls, which operate only upon the central portion thereof, the rolls being reversed and forced nearer while the billet is within the rolls. The shank or body is thus rolled to the proper section and length, and thickened portions are left at the ends of the bars for the formation of the enlargements, the thickened ends being subsequently reheated and forged to the shape of the head under a hammer. The rolling by this method is difficult, as the rolls must be reversed suddenly and exactly at the proper point on the bar, both the machinery and the bar rolled being thereby exposed to violent shocks and strains, and the operation requiring very heavy rolls, which must press together on reversing with considerable power, and permitting but a slow

motion thereof. Iron eye-bars of short length have also been formed by cross-rolling the metal at the ends of the slab, reducing these parts in thickness and spreading them to the breadth necessary for the heads, this being done between rolls having collars or enlargements at their ends, the slab being passed bodily through the rolls with side edge foremost and both ends reduced simultaneously. The slab was then elongated by rolling lengthwise in the ordinary manner, and the heads were completed by the ordinary means, such as forging or shearing. This manufacture more nearly approaches my invention than those above referred to; but it is objectionable, because, in the first place, the cross-rolling of the ends destroys the fiber and weakens the metal to such an extent that the head on an eye-bar so made will always be weaker than the body or shank, especially in iron, and because, in the second place, different parts of the slab are rolled at such different times as to cause uneven cooling, thereby creating injurious internal strains in the metal, and this condition is made worse by the heating of the enlargements at the ends subsequent to the rolling of the bars to form the heads to finished shape, all of which is particularly injurious in steel. The process is also only applicable to short bars.

In all the methods of manufacture above referred to it is found that where the ends of the bar are heated and worked while the body is cold this causes a weakening of the neck where this heating and working end, especially in steel, for which material internal strains are set up, so injurious to the strength of the finished bar that it is necessary to anneal the entire bar to restore it to its normal condition, this annealing operation being necessarily a slow process, and requiring long and expensive furnaces.

The object of my invention is to overcome these difficulties in the manufacture of these bars, and this I accomplish by forging on a billet or slab enlargements of approximately the finished shape of head, and then reheating the blank so formed and rolling it to the required length and finished form of bar without subsequent reheating, the metal of the bar being thus brought to its final shape while the entire bar is in a uniformly heated condition, and consequently the formation of these injurious strains is entirely avoided.

In the accompanying drawings, illustrating



the bar in the different steps of manufacture, Figure 1 is a view of an ingot, and Fig. 2 a view of a bloom or pile, the billet or slab being rolled from the ingot or bloom if of steel, and from the pile if of iron. Fig. 3 is a view of the billet or slab. Figs. 4, 5, and 6 illustrate the blank having the enlargements formed thereon, and Figs. 7 and 8 illustrate the finished bar.

Like letters of reference indicate like parts in each.

The bar is formed from iron or from steel of proper carbon, the ingot or bloom, if steel, or pile, if iron, such as shown in Figs. 1 and 2, being reduced to the slab or billet *b* (shown in Fig. 3) in suitable grooved rolls. The billet formed should be of proper weight, so as to produce a bar of proper width, thickness, and length when finished, as hereinafter set forth, and this can be easily attained in the practical manufacture thereof. The billet *b* is of substantially the same width desired for the body or shank *a* of the finished bar, its thickness being so chosen that the enlargements can readily be made, and being generally a little more than twice the thickness of the finished bar. The ends of this billet are heated and the eye bar heads *c* are forged thereon between suitable dies for producing the shape of head desired, thus forming the blanks illustrated in Figs. 5 and 6. Where the material is iron I prefer to form the enlargements by die-forging direct from the billet; but where steel is employed I consider it preferable to spread the metal and shape the enlargements, as shown at *e*, Fig. 4, on the anvil under a steam-hammer preliminary to finishing them by die forging, as this gives an opportunity for chipping should cracks show along the edges of the enlargements, and but a low heat is required for finishing the enlargements within the die. By the term "die-forging" I of course include shaping the heads in any suitable manner under a hammer or press with the employment of dies. The pin-holes *d* may be rough punched during the forging of the heads. The same manipulation will also be found advantageous in working large iron billets or in forming blanks having large heads. The blank formed from the billet is placed in a furnace and heated as a whole to a proper rolling-heat, and then reduced and elongated between horizontal rolls until brought to the proper length for the finished bar, when, if the weight of the slab were correct, it will also be reduced to the proper thickness. Where the heads or enlargements of the blank are left thicker than the finished bar, they are also reduced in the last passes in the rolling of the blank, and so are also surface-finished, compacted, and worked during the rolling, so that the metal of the entire bar receives substantially the same amount of work, be it under the hammer or press in forming the blank from the billet, or in the rolls after the blank is heated. In rolling the blank to

bar it will gain slightly in width, and the edges will be a trifle rounded; but this is not objectionable, and, if desired, the edges can be rolled square by suitable edge rolling between the heads or enlargements, the rolls employed being preferably arranged to reverse, and the bar being made to pass to and fro between the heads for one or more passes. The pin-holes *d* in the finished bar can be drilled and bored by suitable tools in the ordinary manner. Where an intermediate head or enlargement is to be formed on a bar, as at *f*, Fig. 8, it may be accomplished in the manner above set forth, the metal of the billet between the ends thereof being spread and die-forged, thus forming the enlargement *f'* in the blank, Fig. 6, and the blank subsequently reheated and rolled to the proper length.

My improved method of making these bars can be carried out with the ordinary rolls, steam-hammer, or press and forging-dies heretofore in common use, and for this reason I have considered it unnecessary to illustrate the means employed.

The finished bars (shown in Figs. 7 and 8) are formed substantially free from strain, as the entire bar is heated previous to finishing in the rolls, and any internal strains caused in the metal by heating the portions spread in forging the enlargements are thus removed, avoiding the necessity for any annealing of the finished bar, and forming a bar of equal strength throughout, the material in the necks and heads or enlargements, so often found weak and imperfect when made by the methods heretofore practiced, being equally strong with the body or shank. An ordinary heating-furnace less than one-half the length of the annealing-furnace heretofore employed is sufficient for the purpose. The entire surface of the bars will also be rolled in finishing, and consequently a bar of even thickness and finished surface be obtained. I am also enabled to provide a bar made from a single slab, and having one or more heads or enlargements at or near the center thereof, such bars with intermediate heads being exceedingly desirable for bridge construction or other structural work. Such bars have not been produced from a single slab or piece of metal previous to my invention.

What I claim as my invention, and desire to secure by Letters Patent, is—

The herein-described method of making bars having eyes or similar enlargements thereon, consisting in die-forging on a billet or slab enlargements of approximately the finished shape of head, reheating the blank so formed, and rolling it to the desired length and finished form of bar.

In testimony whereof I, the said CHARLES L. STROBEL, have hereunto set my hand.

CHARLES L. STROBEL.

Witnesses:

JAMES I. KAY,  
J. N. COOKE.