G. E. WARREN.

METHOD OF MAKING EYELETS.

APPLICATION FILED OCT. 29, 1906. RENEWED MAY 10, 1909.

942,988. Patented Dec. 14, 1909.

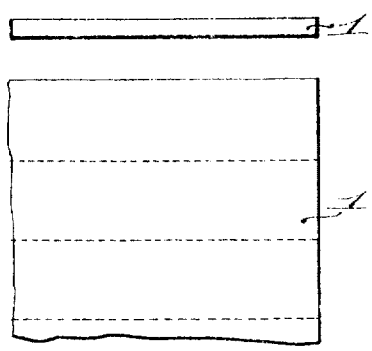

Fig. 1.

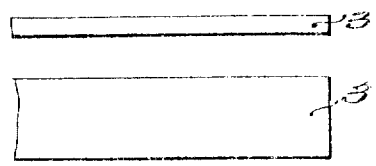

Fig. 2.

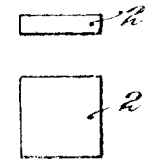

Fig. 3.

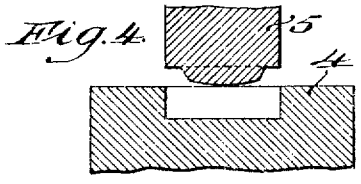

Fig. 4.

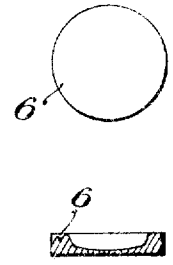

Fig. 5.

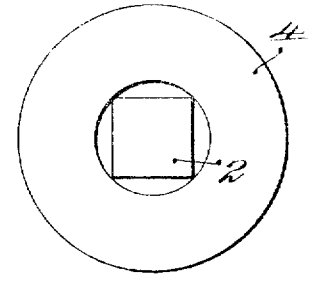

Fig. 6.

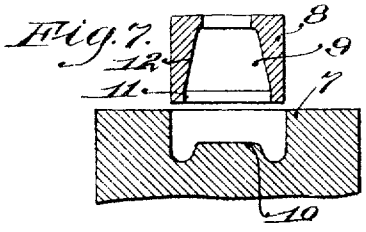

Fig. 7.

Fig. 8.

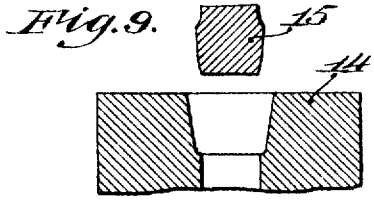

Fig. 9.

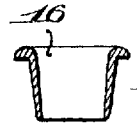

Fig. 10.

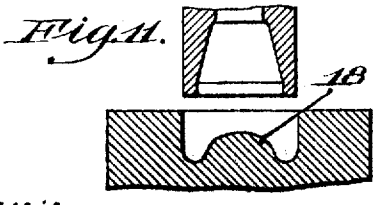

Fig. 11.

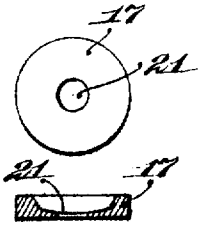

Fig. 12.

Fig. 13.

Witnesses
Edward S. Day
E. C. Wunderman

Inventor
George E. Warren
by his Attorneys
Phillips Van Orsdel & Kirby

UNITED STATES PATENT OFFICE.

GEORGE E. WARREN, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO UNITED SHOE MACHINERY COMPANY, OF PATERSON, NEW JERSEY, A CORPORATION OF NEW JERSEY.

METHOD OF MAKING EYELETS.

942,988. Specification of Letters Patent. Patented Dec. 14, 1909.

Application filed October 29, 1906, Serial No. 340,935. Renewed May 10, 1909. Serial No. 495,174.

To all whom it may concern:

Be it known that I, GEORGE E. WARREN, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Methods of Making Eyelets; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

The method now commonly used in making eyelets consists in cutting circular blanks from a sheet of metal, usually brass, subjecting the circular blanks to the successive action of a number of dies to form the flange of the eyelet and gradually draw out and bend the metal of the blank to form the barrel of the eyelet, and finally finishing the eyelet by punching out the disk of metal left at the lower end of the barrel during the drawing action of the dies. By this method a large amount of scrap or waste is produced varying from 25% to 33% of the material composing the sheet from which the circular blanks are cut out. This method also involves the use of a large number of dies, as the metal of the blanks can only be drawn out to a slight extent at a single operation and to produce satisfactory results the formation of the barrel must be accomplished by the successive action of dies differing but slightly in shape from one another.

The principal object of the present invention is to provide a method whereby eyelets can be made from a sheet of metal with the production of only a comparatively small per cent. of scrap or waste.

Other objects of the invention are to provide an improved method whereby a blank of metal can be converted into an eyelet without subjecting it to the number of operations which have heretofore been required and in general to provide a method whereby an eyelet can be produced from a metal blank in an improved and simplified manner.

With the above objects in view a feature of the present invention contemplates cutting up a sheet of metal into polygonal blanks, converting these blanks into curvilinear blanks by subjecting them to pressure between dies, and then converting these curvilinear blanks into eyelets by operating upon them in any suitable manner. By cutting up the sheet of metal into polygonal blanks instead of cutting circular blanks therefrom the amount of scrap is greatly reduced, and if the polygonal blanks are given the proper shape the entire sheet can be cut up without the production of any waste whatever. It is desirable, if not absolutely necessary, that a metal blank which is to be formed into an eyelet by means of dies should have an outline substantially similar to that of the flange of the completed eyelet and for this reason the polygonal blanks severed from the sheet of metal are converted into circular or other curvilinear blanks, similar in shape to the flanges of the eyelets which are to be produced. The present invention contemplates the use of any form of polygonal blanks, but preferably the blanks will be rectangular, as such blanks can be readily severed from a sheet without waste and can be converted into curvilinear blanks by one operation of suitably shaped dies. When the flange of the eyelet to be produced is circular the polygonal blank will preferably be in the form of a square. The polygonal blanks can be converted into curvilinear blanks by subjecting them to pressure between dies in any desired manner. A simple and efficient method, however, and the one which is preferred, consists in placing a blank in a curvilinear die and applying pressure to the opposite sides of the blank to cause the metal to flow outwardly against the side wall of the die.

In operating upon a flat metal blank to convert it into an eyelet the central portion is depressed and is finally punched out after the barrel of the eyelet has been formed. To still further decrease the amount of scrap or waste produced in the manufacture of the eyelet a central depression is preferably formed in the curvilinear blank by displacing the metal of the blank outwardly so that the central portion of the blank is thin and a comparatively small amount of metal is removed in trimming the lower end of the barrel of the eyelet.

Broadly considered the features of invention above referred to contemplate subjecting the curvilinear blank to any operation or series of operations which will convert it into an eyelet. It is preferred, however, to subject the blank to pressure between flange

shaping dies provided respectively with a recess and with a former concentric with but of less diameter than said recess, whereby the metal in excess of that required for the flange is forced into said recess to form the barrel of the eyelet, and this method of treating a blank constitutes a feature of the present invention.

The applicant is aware that both open and closed ended tubes have been produced by forcing metal between the wall of a recess and a concentric former. He is not aware, however, that it has ever been proposed to form an eyelet or any similar article by compressing a blank between flange forming dies and forcing the excess of material from between the dies so as to form a barrel or tubular shank.

It is desirable that the barrel of an eyelet be given a tapering form and a feature of the present invention consists in exerting an inward pressure on the metal which is forced from between the dies to form the barrel of the eyelet so that the barrel is reduced to tapering form. This inward pressure may be produced in any desired manner but in the preferred form of the invention is conveniently produced by forming the recess in one of the dies with a tapering wall.

When a blank is subjected to pressure between flange forming dies so as to force the excess of metal from between the dies to form the barrel of the eyelet, the lower end of the barrel must be trimmed and the barrel reshaped more or less to produce a perfect eyelet, and a feature of the present invention consists in completing the barrel of an eyelet formed by the action of dies as above described by forcing a plunger through the barrel while the barrel is held in a suitably shaped die.

As has been stated above a feature of the present invention consists in displacing the metal of the blank from which the eyelet is to be made so as to form a central depressed portion and thereby decrease the amount of scrap or waste produced in completing the eyelet. To still further decrease the waste a feature of the present invention contemplates providing said depressed central portion with a perforation, and then forming the barrel of the eyelet both by bending and drawing the depressed portion surrounding the perforation and by forcing the excess of metal from between flange shaping dies.

The features of invention above referred to, and other features hereinafter described and defined in the claims, will be clearly apparent to those skilled in the art from the following description taken in connection with the accompanying drawing, in which—

Figure 1 shows in plan and side elevation a portion of a sheet of metal suitable for forming eyelets. Fig. 2 shows in plan and side elevation one of the strips into which the sheet illustrated in Fig. 1 is divided, and Fig. 3 shows in plan and side elevation one of the blanks into which the strip illustrated in Fig. 2 is divided. Fig. 4 is a sectional view of the dies by which the blank illustrated in Fig. 3 is converted into a curvilinear blank provided with a central depression. Fig. 5 illustrates, in plan and sectional elevation the curvilinear blank produced by the action of the dies illustrated in Fig. 4. Fig. 6 is a plan view of the lower die illustrated in Fig. 4 with the blank illustrated in Fig. 3 placed therein. Fig. 7 is a sectional view illustrating the dies which act upon the blank illustrated in Fig. 5 to form the flange and barrel of the eyelet. Fig. 8 is a sectional view of the blank after it has been acted upon by the dies illustrated in Fig. 7. Fig. 9 is a view in sectional elevation of the die and plunger by which the barrel of the eyelet is shaped and trimmed. Fig. 10 is a sectional view of the completed eyelet. Fig. 11 is a view, in sectional elevation, of dies adapted to act on a blank provided with a depressed and perforated central portion. Fig. 12 shows in plan and sectional elevation the form of blank used in connection with the dies illustrated in Fig. 11, and Fig. 13 shows in sectional elevation the blank after it has been acted upon by the dies illustrated in Fig. 11.

The present invention is particularly adapted for use with metals which will flow under pressure such for instance as aluminum or zinc. The dies illustrated in the drawings are adapted to form a circular eyelet and accordingly the blanks which are cut from the sheet of material illustrated at 1 in Fig. 1 are preferably in the form of regular polygons. The simplest form of blank to produce, and the form which can be most readily severed from a sheet or strip without any waste, is a square, and this form of blank is illustrated at 2 in Fig. 3. The sheets from which these blanks are severed may be supplied either in the form of strips as indicated at 3 in Fig. 2 or in the form of sheets as illustrated at 1 in Fig. 1, which sheet is cut into strips as indicated by the dotted lines.

The dies which operate upon the square blank 2 are indicated at 4 and 5 in Fig. 4, the die 4 being circular in form and preferably having a diameter equal to the diagonal of the blank. The blank 2 is placed in the die 4 as illustrated in Fig. 6 and while held in the die is subjected to pressure between the die 4 and the die 5. This pressure is exerted upon the opposite sides of the blank so that the metal of the blank is forced outwardly against the wall of the die 4 and assumes a circular form. As illustrated the die 5 is provided with a central projection so that the central portion of the blank is first operated upon and the metal is dis-

placed outwardly so as to leave a central recess in the blank. At the end of the compressing operation the die 5 is within the die 4 so that all portions of the blank are subjected to pressure and the annular portion of the blank is reduced to the same thickness throughout.

The blank produced by the action of the dies 4 and 5 is indicated at 6. The flange and barrel of an eyelet are produced from this blank, in accordance with a feature of the present invention, by means of the dies illustrated in Fig. 7, in which 7 indicates a die for shaping the upper surface of the flange and 8 a die for shaping the under surface of the flange. To form the barrel of the eyelet the die 8 is provided with a central recess 9 and the die 7 is provided with a projecting former 10 concentric with but of less diameter than the recess 9. The blank 6 is inverted and placed in the die 7 and then the dies are brought together to exert a sufficient pressure on the annular portion of the blank to shape the flange of the eyelet and force the excess of metal from between the dies into the recess 9, the metal flowing between the former 10 and the lower portion of the wall of the recess 9. To prevent the wall of the barrel being thicker at its lower end, that is, the end remote from the flange, the wall of the recess 9 is preferably cylindrical for a short distance as indicated at 11. Above the cylindrical portion 11 the wall of the recess 9 preferably tapers as indicated at 12 so that an inward pressure is exerted upon the metal forming the barrel of the eyelet and the barrel is reduced to tapering form.

The blank after it is acted upon by the dies illustrated in Fig. 7 is indicated at 13. To complete the eyelet the blank 13 is placed in the die 14 illustrated in Fig. 9 which die has the shape which the exterior of the barrel of the eyelet is to have. While the blank 13 is in the die 14 a plunger indicated at 15 is forced through the barrel, thereby shaping the barrel to the die and at the same time trimming the inside and lower end of the barrel, so that the wall of the barrel tapers from its upper to its lower end. The finished eyelet produced by the action of the plunger 15 and die 14 on the blank 13 is indicated at 16.

In the process above described it will be seen that the only waste or scrap produced during the manufacture of an eyelet is the material removed during the operation of the flange 15 in trimming the barrel of the eyelet. This scrap in actual practice has been found to be less than 5%. To still further decrease the amount of scrap a perforation may be formed in the depressed central portion of the blank illustrated in Fig. 5. A blank so perforated is illustrated at 17 in Fig. 12. To form the flange and barrel of an eyelet from this blank, the dies illustrated in Fig. 7 are slightly modified as indicated in Fig. 11. As will be apparent from this figure, the die which shapes the upper surface of the flange is provided with a central former 18 somewhat longer and rounder than the former of the die 7. In the operation of the dies illustrated in Fig. 11 the former 18 acts to bend and draw the depressed portion of the blank surrounding the perforation so that this portion of the blank forms the lower portion of the wall of the barrel. In other respects the dies illustrated in Fig. 11 act in the same manner as the dies illustrated in Fig. 7. The article produced from the blank 17 by the action of the dies illustrated in Fig. 11 is indicated at 19 in Fig. 13 from which it will be seen that the article is of substantially the same shape as the article illustrated in Fig. 8 with the exception that it is provided with a perforation 20 somewhat larger than the perforation 21 in the blank 17. An eyelet is completed from this article by the action of the die 14 and plunger 15, illustrated in Fig. 9, as above described, and it will be seen that the percentage of scrap is diminished by the amount of material forced into the barrel of the eyelet by the bending and drawing action of the former 18.

The nature and scope of the present invention having been indicated and the preferred manner of practicing the invention having been specifically described, what is claimed is:—

1. The process of making eyelets which consists in severing a polygonal blank from a sheet of metal, placing said blank in a curvilinear die, applying pressure to the opposite sides of the blank to cause the metal to flow outwardly against the side wall of the die and form a curvilinear blank, and subjecting the curvilinear blank to such further operations as will convert it into an eyelet.

2. The process of making eyelets which consists in severing a polygonal blank from a sheet of metal, placing said blank in a curvilinear die, applying pressure to the opposite sides of the central portion of the blank to cause the metal to flow outwardly against the side wall of the die and form a curvilinear blank having a central depression, and subjecting said curvilinear blank to such further operations as will convert it into an eyelet.

3. The process of making eyelets which consists in subjecting a blank to pressure between flange shaping dies provided respectively with a recess and with a form concentric with but of less diameter than said recess, whereby the metal in excess of that required for the flange is forced into said recess to form the barrel of the eyelet.

4. The process of making eyelets which

consists in subjecting a blank to pressure between flange shaping dies, forcing the excess of metal from between the dies to form the barrel of the eyelet, and then shaping and trimming the barrel of the eyelet by forcing a plunger therethrough while said barrel is held in a die.

5. The process of making eyelets which consists in subjecting a blank to pressure between flange shaping dies provided respectively with a tapering central recess and with a former concentric with but of less diameter than said recess, whereby the metal in excess of that required for the flange is forced into said recess to form a tapering barrel for the eyelet.

6. The process of making eyelets which consists in subjecting a blank to pressure between flange shaping dies, forcing the excess of metal from between the dies to form the barrel of the eyelet, and exerting an inward pressure on the metal forming the barrel to reduce it to tapering form.

7. The process of making eyelets which consists in forming a blank having a depressed and perforated central portion, bending and drawing the depressed portion surrounding the perforation to form a portion of the barrel of the eyelet, subjecting the blank to pressure between flange shaping dies, and forcing the excess of metal from between the dies to complete the barrel.

8. The process of making eyelets which consists in severing a polygonal blank from a sheet of metal, converting said blank into a curvilinear blank having a central depression by subjecting it to pressure between dies, subjecting said curvilinear blank to pressure between flange shaping dies, and forcing the excess of metal from between the dies to form the barrel of the eyelet.

9. The process of making eyelets which consists in severing a polygonal blank from a sheet of metal, converting said blank into a curvilinear blank having a central depression by subjecting it to pressure between dies, perforating the depressed portion, bending and drawing the depressed portion of the blank surrounding the perforation to form a portion of the barrel of the eyelet, subjecting the blank to pressure between flange shaping dies, and forcing the excess of metal from between the dies to complete the barrel.

In testimony whereof I affix my signature, in presence of two witnesses.

GEORGE E. WARREN.

Witnesses:

FRED O. FISH,

ALFRED H. HILDRETH.