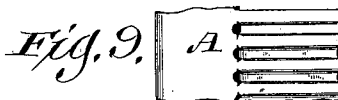
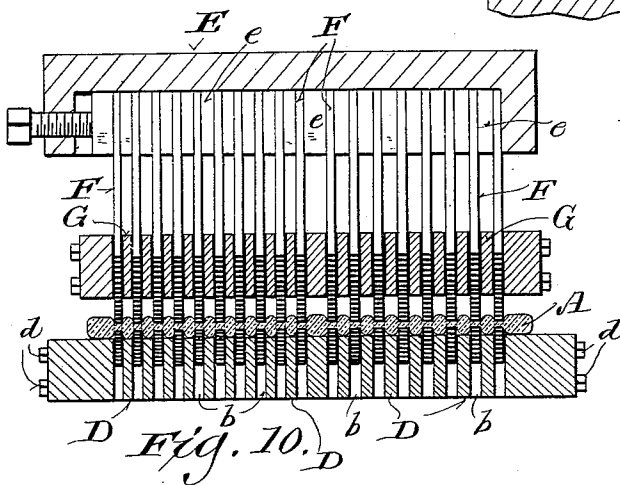
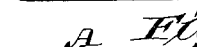
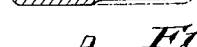
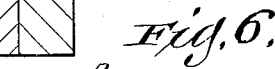
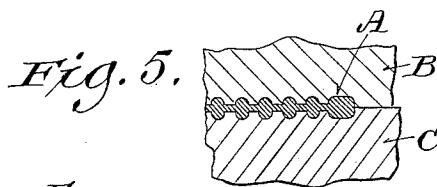
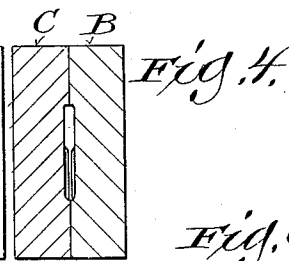
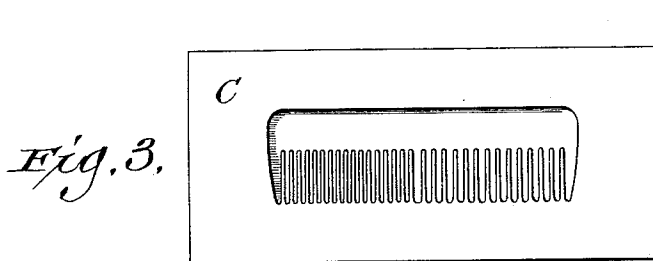
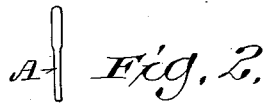
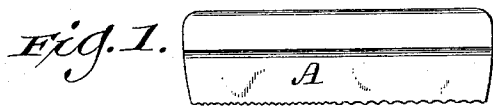


No. 633,721.

Patented Sept. 26, 1899.

J. KOENIG.
MAKING METAL COMBS.
 (Application filed Dec. 13, 1898.)

(No Model.)



Witnesses:
 Geo. W. Young.
 W. E. Oliphant

Inventor:
 Joseph Koenig.
 By H. G. Underwood.
 Attorney

UNITED STATES PATENT OFFICE.

JOSEPH KOENIG, OF TWO RIVERS, WISCONSIN.

MAKING METAL COMBS.

SPECIFICATION forming part of Letters Patent No. 633,721, dated September 26, 1899.

Application filed December 13, 1898. Serial No. 699,125. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH KOENIG, a citizen of the United States, and a resident of Two Rivers, in the county of Manitowoc and State of Wisconsin, have invented certain new and useful Improvements in Making Combs; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention has for its object to simplify and cheapen the production of combs from aluminium or other ductile metal; and it consists in the various operations upon a comb-blank hereinafter particularly set forth with reference to the accompanying drawings and subsequently claimed.

Figure 1 represents a side elevation of an aluminium or other ductile metal comb-blank reduced in thickness where the teeth are to be formed; Fig. 2, an end view of the blank; Fig. 3, a plan view of the former section of a die in which the comb-blank is swaged; Fig. 4, a transverse section of the die; Fig. 5, a longitudinal section of a portion of said die and comb-blank swaged therein; Fig. 6, a transverse section of the comb-blank before swaging; Figs. 7 and 8, similar views of the swaged comb-blank; Fig. 9, a plan view of a portion of said swaged comb-blank; Fig. 10, a view, partly in longitudinal section, as indicated by line 10 10 in the succeeding figure, illustrating the operation of cutting out spaces between comb-teeth; and Fig. 11, a partly-transverse sectional view of the assemblage shown in the preceding figure.

Referring by letter to the drawings, A indicates a comb-blank cut from aluminium or other ductile metal. Where the comb-teeth are to be formed the blank A is reduced in thickness, and this reduction may be had prior or subsequent to the cutting out of said blank. The blank is now swaged in a flat die having the former and punch sections B C thereof cut to form a mold for the comb, or the operation of swaging said blank may be accomplished by die-rollers. The blank is to be sufficiently thinned where the teeth are to come so that when the swaging operation takes place the material will flow to fill the mold, and thus form the teeth even with the comb-back, or otherwise, as may be predeter-

mined, there being films of the material left between the teeth.

Fig. 6 clearly illustrates the comb-blank before it is swaged; Fig. 7, a transverse section through one of the films between teeth formed by the swaging operation, and Fig. 8 a like section through one of the teeth of said swaged blank.

The swaging operation having been accomplished, the product is laid upon a series of plates D, spaced apart by blocks *b*, the latter and plates being held together by any suitable means, it being practical to clamp them together by bolt-rods *c* and nuts *d*, or said plates and their spacers may be confined in a frame or shoe of suitable dimensions. The comb-teeth rest upon the plates D, and the films between teeth register with the intervals between said plates.

Held by a clamp E or other suitable means are a series of cutters F, separated by spacing-blocks *e*, and these cutters may be guided by another series of plates G, arranged as shown in Figs. 10 and 11, spacing-blocks *f* being arranged to separate the latter plates. The plates G and their spacers *f* may be held together by means similar to those employed for holding the plates D and spacers *b* aforesaid. The cutters have sharp, square-faced, and beveled lower ends, as best illustrated in Fig. 11, and in practice these cutters are caused to exert shearing action on the films between comb-teeth to cut away all of the same at one operation, said cutters moving down between the plates D aforesaid.

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

1. A method of making metal combs that consists in providing comb-blanks of aluminium or other ductile metal reduced in thickness where the teeth are to come, die-swaging each blank to form teeth of comb-back thickness separated by films of the material, and finally cutting away all the films.
2. A method of making metal combs that consists in providing comb-blanks of aluminium or other ductile metal reduced in thickness where the teeth are to come, die-swaging each blank to cause a flow of the ma-

terial in the thin portion of said blank to form teeth of predetermined thickness separated by films of said material, and finally removing said films by means of a corresponding series of cutters at one operation.

5 3. A method of making metal combs that consists in providing comb-blanks of aluminium or other ductile metal reduced in thickness where the teeth are to come, die-
10 swaging each blank to cause a lateral flow of the material to form teeth of predetermined thickness separated by films, arranging the swaged blank on separated supports to have

said films in register with the spaces between said supports, and finally removing all of the 15 aforesaid films at one operation by a series of separated vertically-operating cutters having square beveled lower ends.

In testimony that I claim the foregoing I have hereunto set my hand, at Two Rivers, in 20 the county of Manitowoc and State of Wisconsin, in the presence of two witnesses.

JOSEPH KOENIG.

Witnesses:

W. J. WRIETH,
J. F. MAGEE.