To all whom it may concern:

Be it known that I, Carl F. Dieckmann, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Processes of Fastening Non-Metallic Elements to Metal, of which the following is a specification.

My invention relates to processes of fastening non-metallic elements such as wood, celluloid, and the like to metal, especially sheet metal, without the aid of rivets, screws, or similar mechanical contrivances. Attempts have been made to do this by the aid of glue or other adhesives, but an adhesive cannot sink into metal and hence releases it too readily, especially if the non-metallic element shrinks or expands. My process while applicable in a variety of cases, is very useful in the manufacture of slide rules and similar instruments used by draftsmen, estimators, and others. The object of the invention is to provide a process by which metallic and non-metallic elements may be readily and securely fastened together without separate fastening devices.

It will be understood by those familiar with the manufacture of devices composed in whole or in part of wood or celluloid that no matter how great care is exercised in seasoning or otherwise preparing the material it nevertheless shrinks and warps when in the manufactured article. In celluloid articles, including scales, it is extremely important that they shall not shrink nor warp, and as a result of my invention the wood or celluloid is so securely fastened to the metallic element that the latter acts as a reinforcement for the former and effectually prevents either shrinking or warping. In fact, articles constructed according to my process become practically unitary and maintain both their length and shape indefinitely. The purpose of my invention is to provide a process capable of obtaining these desirable features.

I obtain this object in the manner illustrated in the accompanying drawings in which—

Figure 1 is a face view, partly in section, of the frame or body of a slide rule the center of which is of metal and the graduated marginal strips are nonmetallic—usually celluloid. The parts are secured together according to my improved method.

Fig. 2 is a sectional view taken on the line 2—2, Fig. 1. Fig. 3 is a sectional view similar to Fig. 2, but shows in addition, the central slide, which in this case is also composed of metal and nonmetallic elements.

Fig. 4 is a face view of the slide shown in Fig. 3. Like numerals denote like parts throughout the several views.

For illustrative purposes I have chosen to show the invention as applied to slide rules and in this particular case the invention is applied both for forming the body of the rule and the slide itself. With reference to the body, a plate or strip 1 is formed, ten inches in length, or whatever the length of the rule is to be. It may be made of aluminum or other metal, or alloy and may be polished to any extent desired. Rows of holes 2 are punched along the marginal edges and filled with adhesive substance. These marginal edges are then inserted in rabbits 3 formed in the inner faces of the side strips 4 of the rule with the result that when the adhesive has solidified it forms a solid connection from one surface of the non-metallic element to the other through the holes in the metal. This results in a most rigid and reliable fastening of the parts together.

With respect to the slide, a plate or flat strip 5 is provided which may, as before, be polished and of desired composition. Holes 6 are punched in it and filled with adhesive. Two flat strips of non-metallic substance are then pressed against the surfaces of the metal strip, so as to cover the holes and place the non-metallic strips in contact with the adhesive. The adhesive is then permitted to solidify, whereupon the parts will be found to be securely and permanently fastened together.

For slide rule purposes, the strips 8 are not as wide as strip 6, thus in effect forming marginal tongues adapted to slide in grooves 10 formed on the inner sides of the strips 4. The surfaces of the non-metallic elements are duly graduated in the manner familiar to those who understand the principle of the slide rule.

While wood or fiber may be employed as the non-metallic material, a particularly good article is produced by employing celluloid and employing a fluid celluloid as the
adhesive. In such case, the fluid celluloid apparently becomes integral with the other and hence when the device is finished, it is as if there were integral pins or cores passing through the holes in the metal and the result is a most durable and permanent assemblage. I have found that a rule made by my process can safely be guaranteed to be accurate in calculations within extremely small limits.

It will be understood, of course, that the method may be applied to the production of articles other than slide rules.

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

1. The process of fastening metal to a non-metallic rigid, non-plastic element, consisting in forming holes in the metal, filling them with adhesive and placing the metal between contiguous surfaces of the non-metallic element, whereby the adhesive forms a connection from one side to the other, passing through the holes.

2. The process of fastening a metal plate to a non-metallic element consisting in rabbeting the non-metallic, rigid non-plastic element so as to fit closely over the edge of the plate, forming apertures in that portion of the plate adapted to enter the rabbet, filling the apertures with an adhesive, and inserting the edge of the plate with its filled apertures into said rabbet.

3. The process of fastening a smooth metal plate to non-plastic celluloid consisting in rabbeting the celluloid so as to fit closely over the edge portion of the plate, forming apertures in that portion of the plate adapted to enter the rabbet, filling the apertures with liquid celluloid and inserting the edge of the plate with its filled apertures into said rabbet and permitting the liquid celluloid to harden and thereby render the portions of celluloid on the two sides of the plate virtually integral.

4. The process of fastening celluloid to a smooth flat strip of metal consisting in forming apertures in the strip, filling them with fluid celluloid, forming flat surfaces on the celluloid which is to be fastened, placing the solid celluloid, surface to surface against the metal strip in position to cover the holes, and permitting the fluid celluloid to harden.

In witness whereof, I have hereunto subscribed my name.

CARL F. DIECKMANN.