

(No Model.)

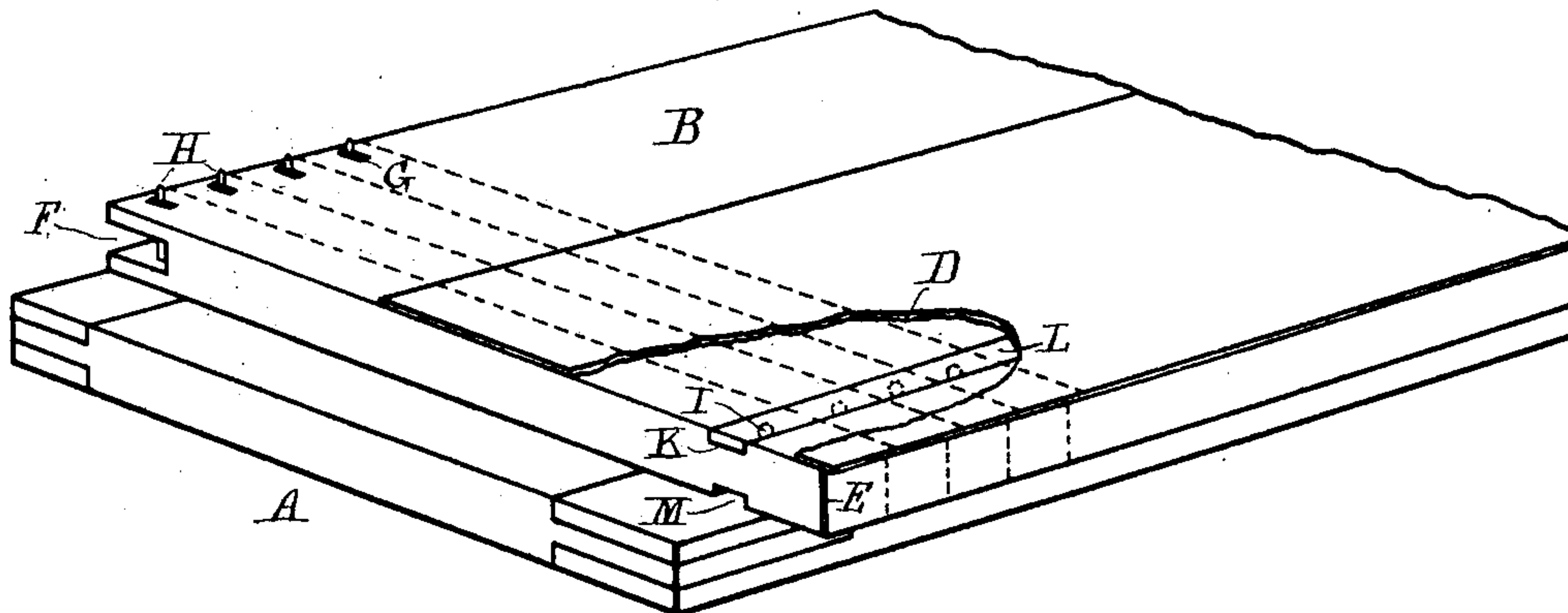
3 Sheets—Sheet 1.

L. K. FULLER.  
KEY FOR MUSICAL INSTRUMENTS.

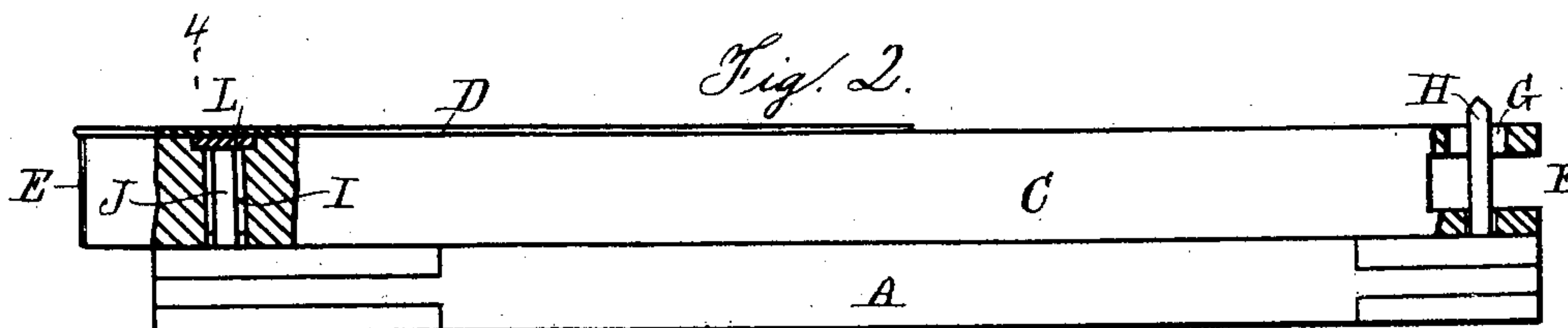
No. 483,378.

Patented Sept. 27, 1892.

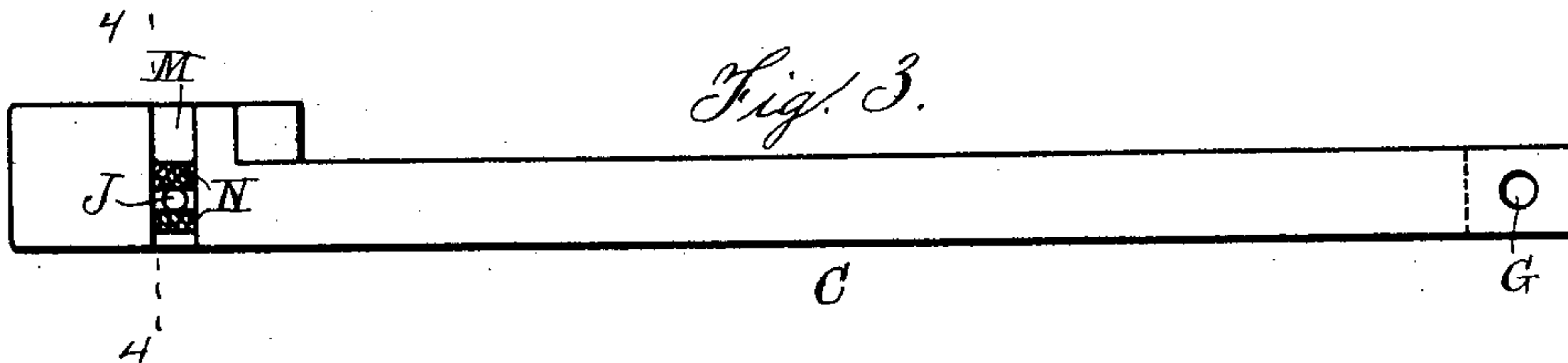
*Fig. 1.*



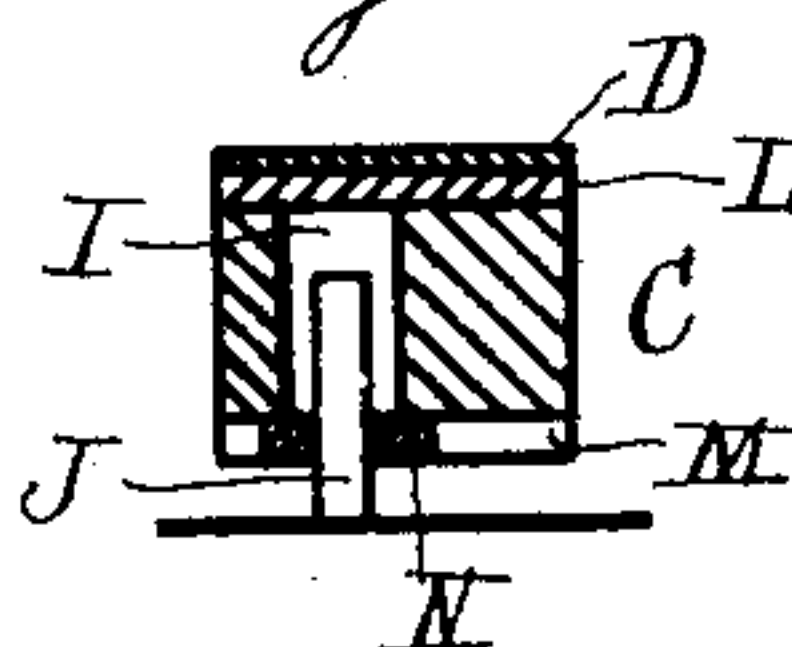
*Fig. 2.*



*Fig. 3.*



*Fig. 4.*



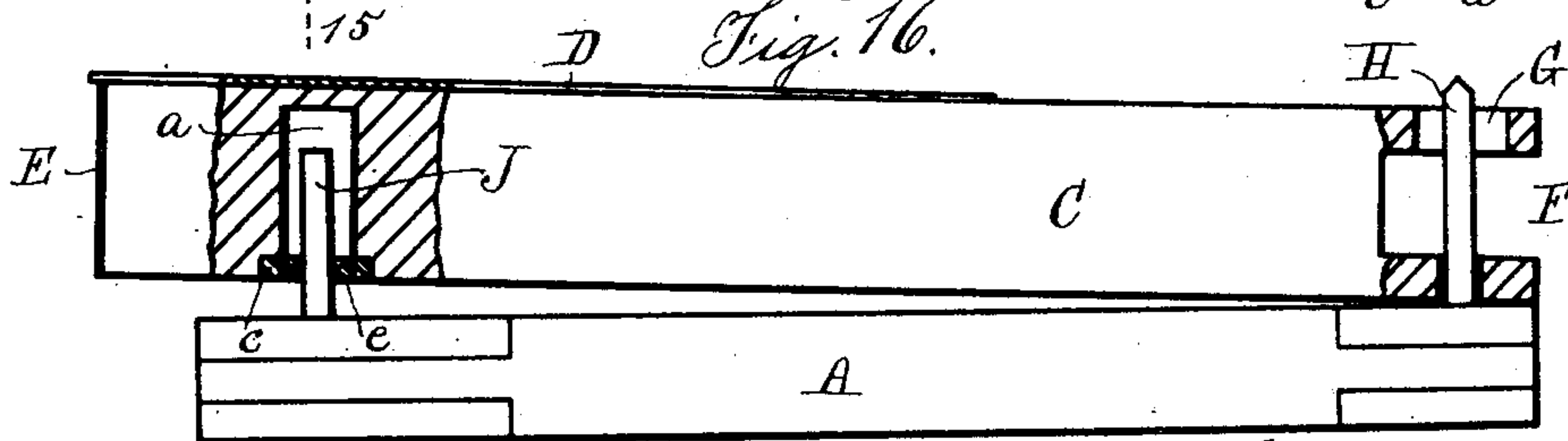
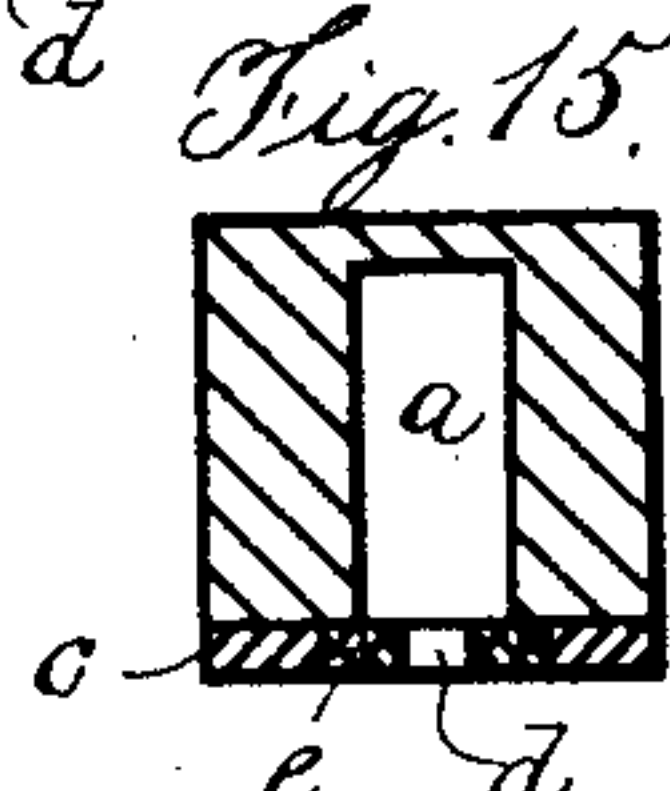
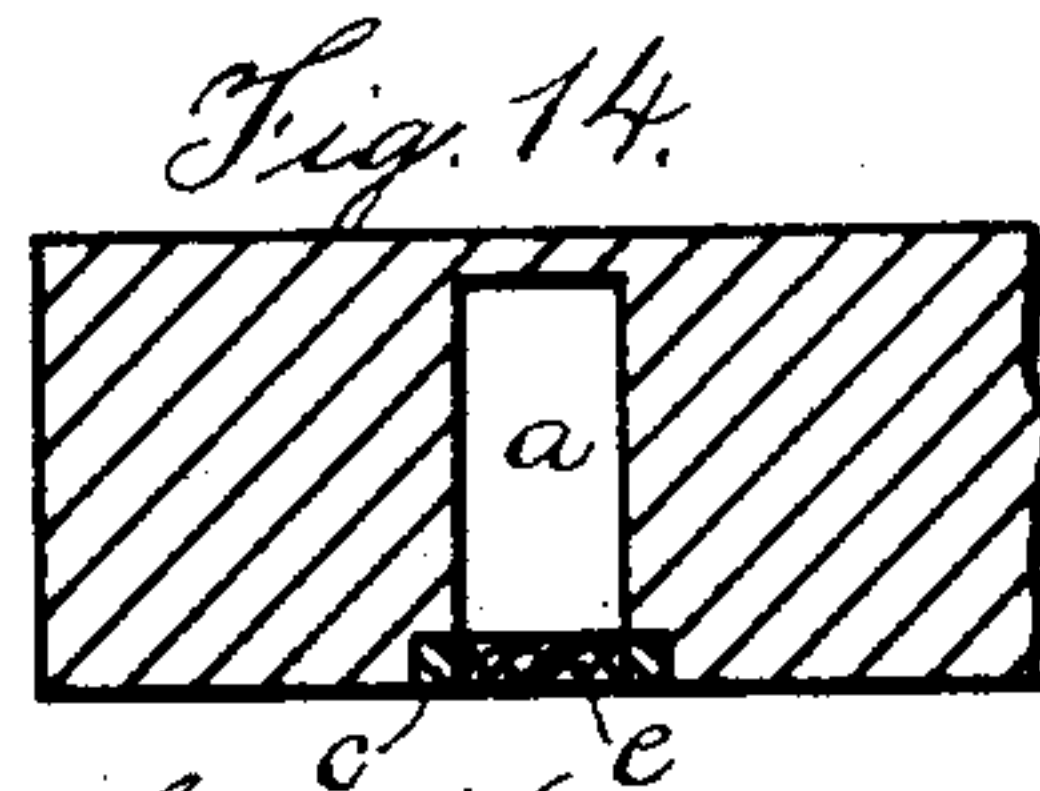
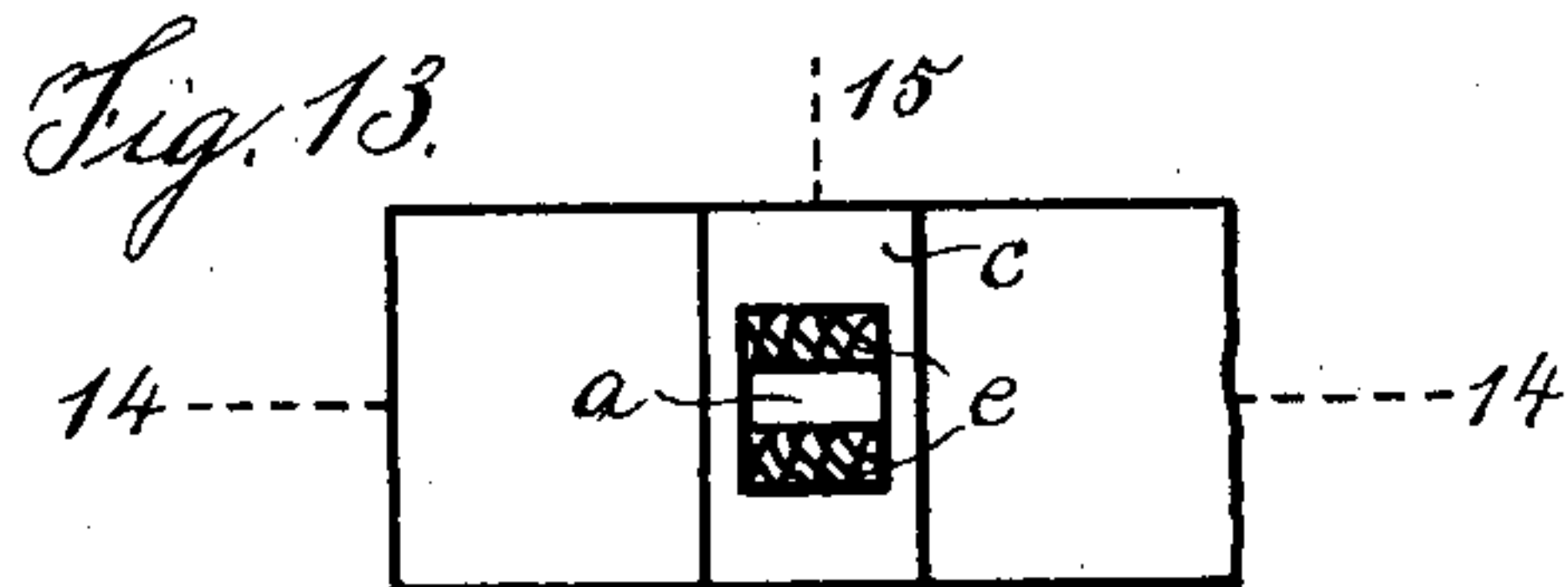
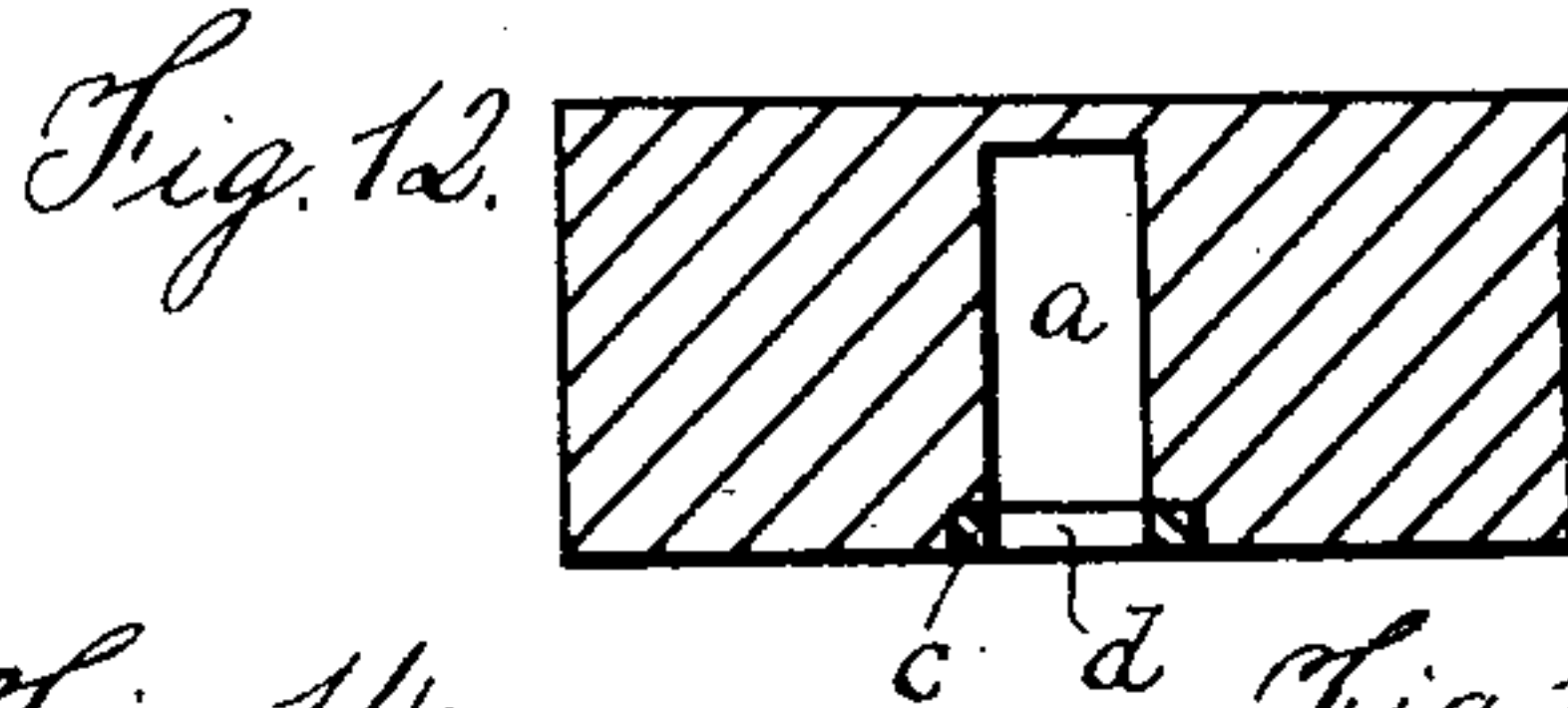
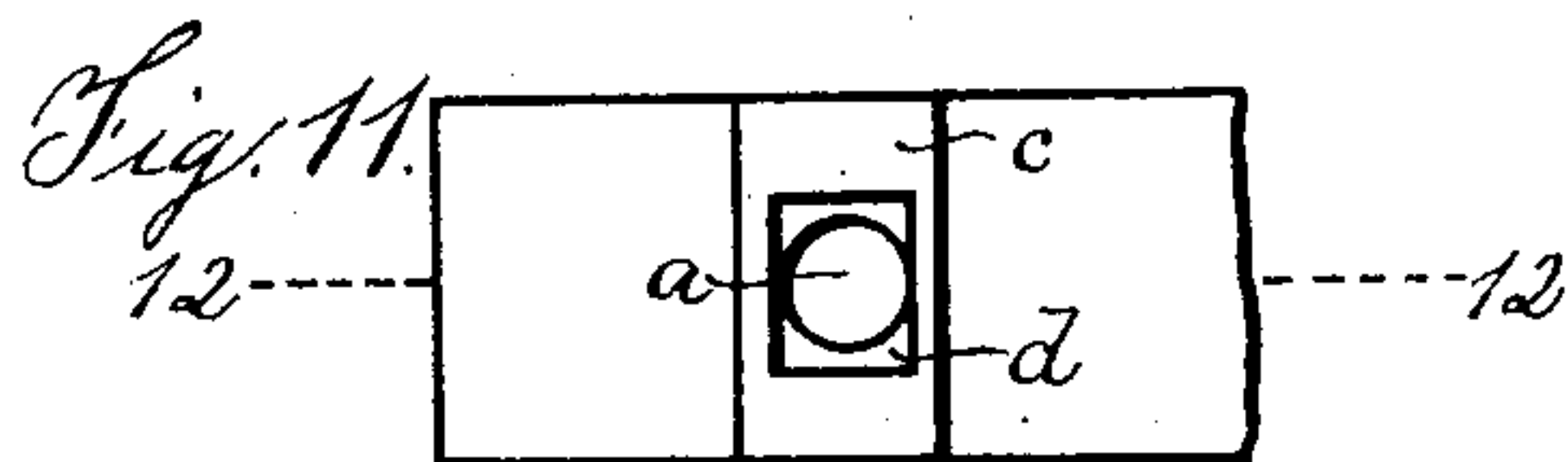
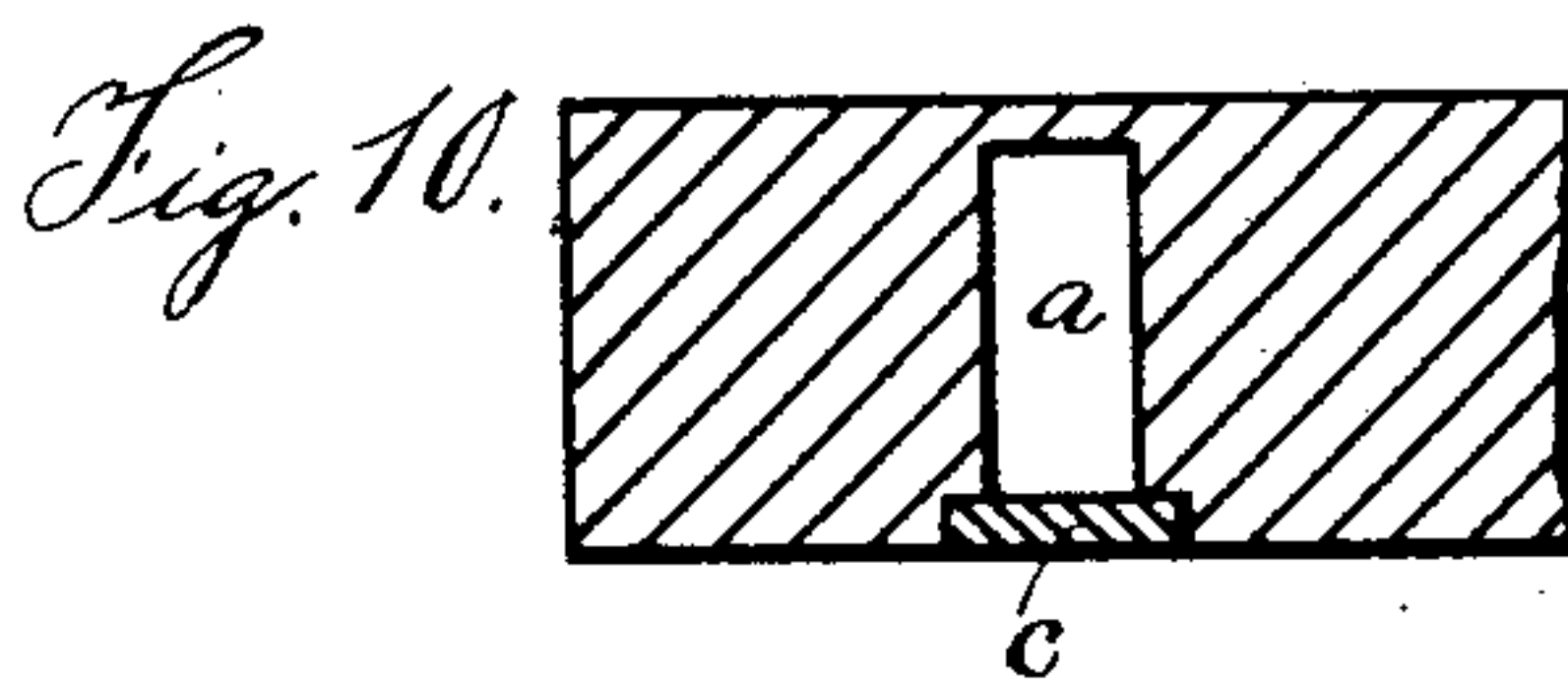
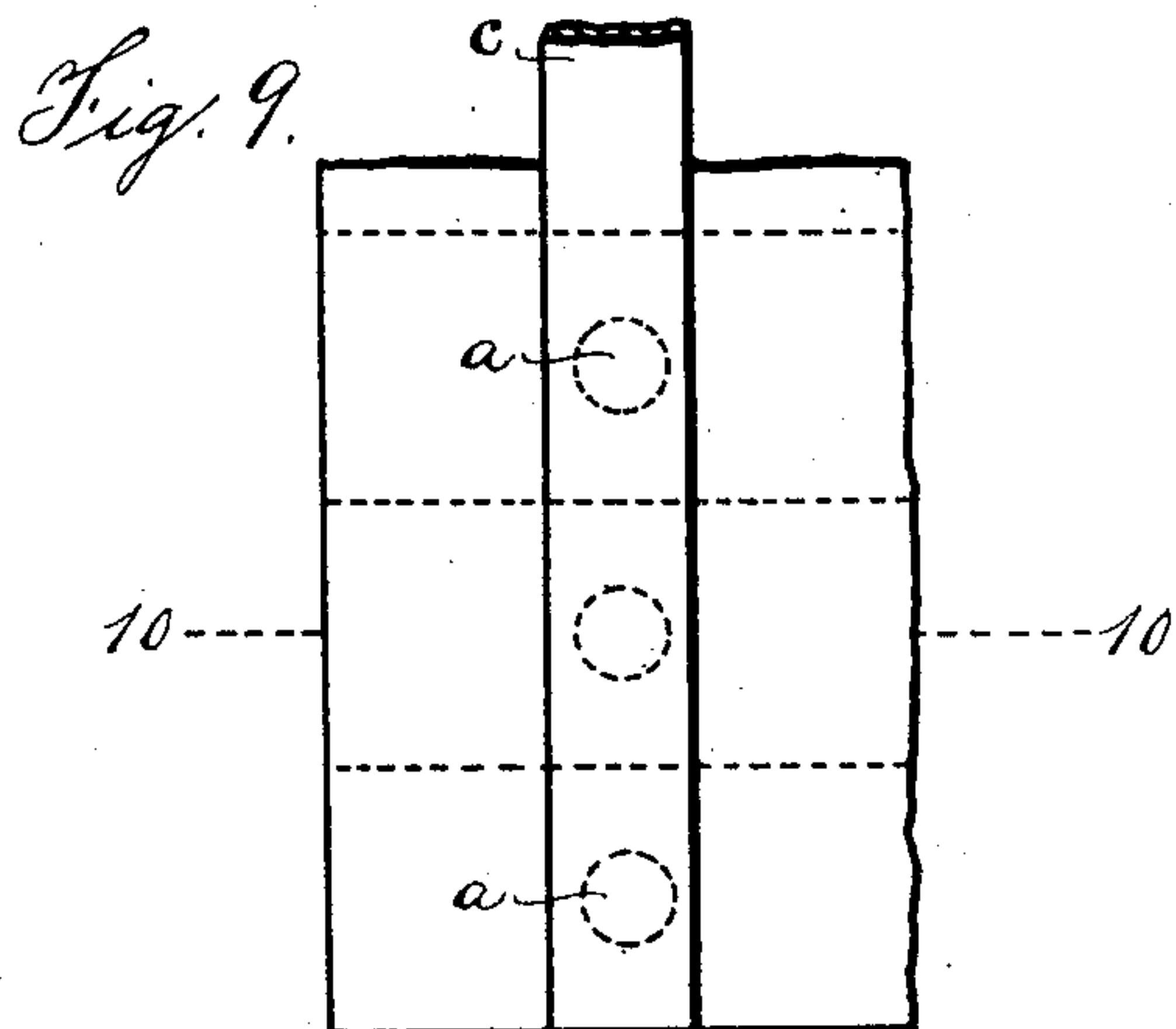
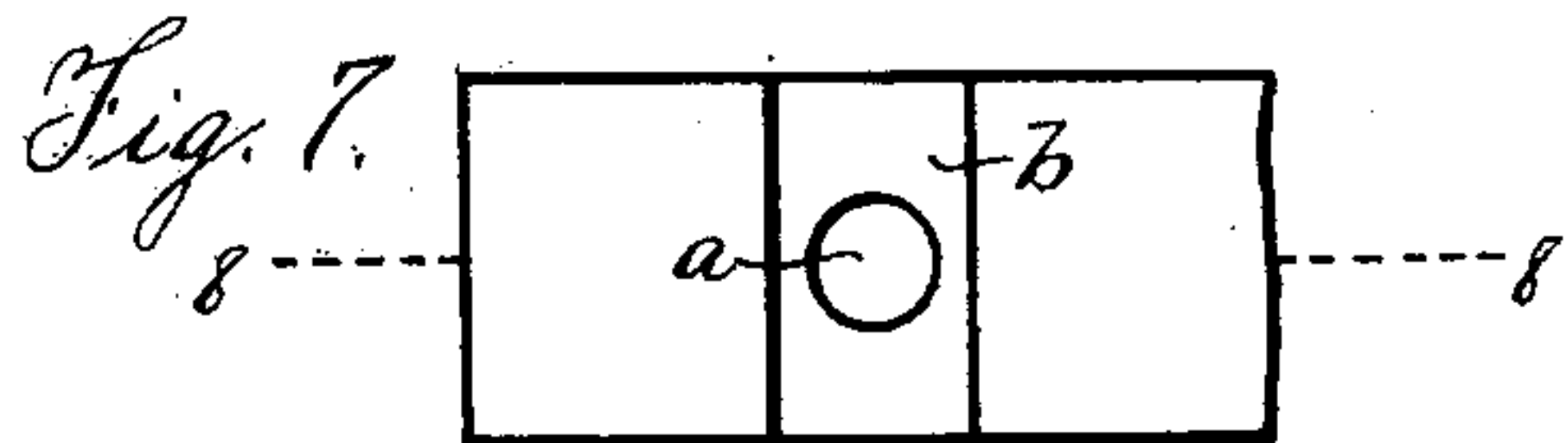
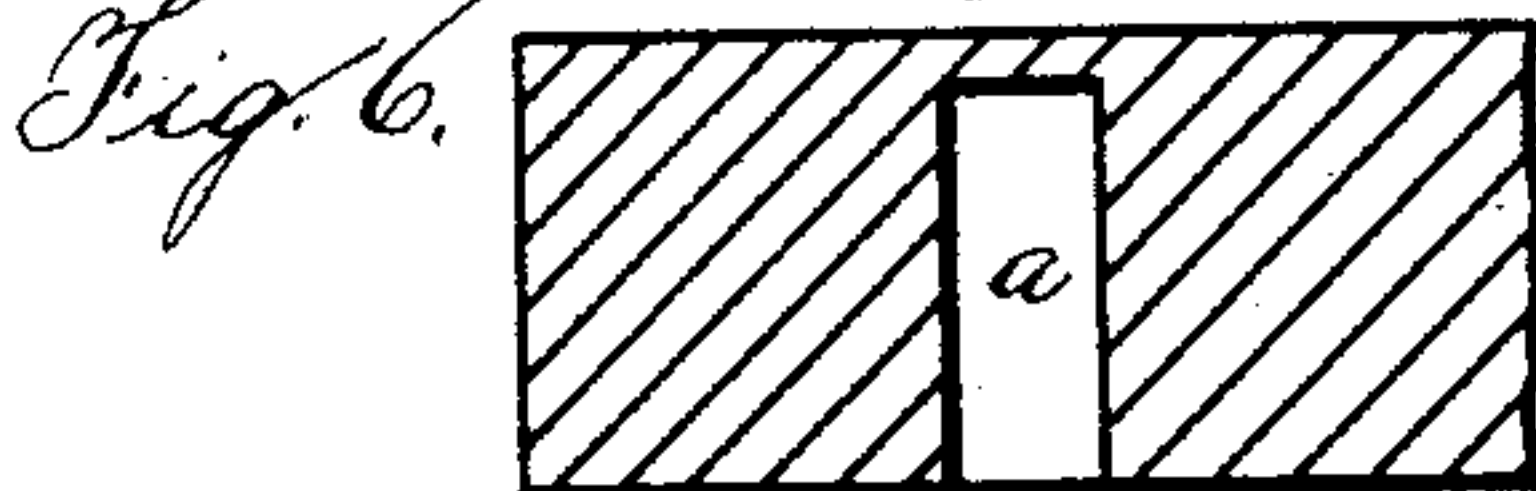
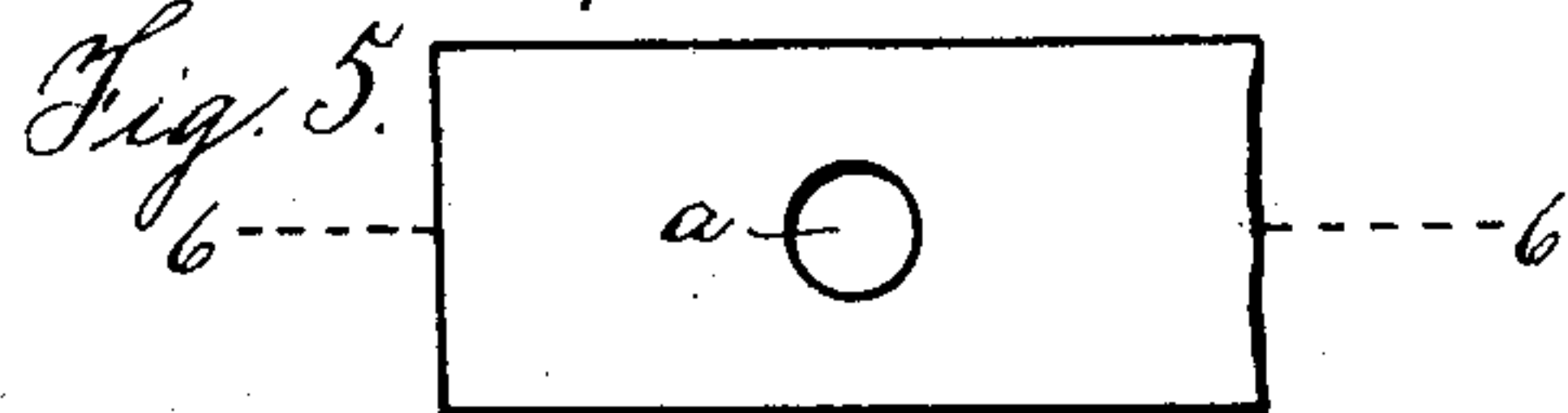
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by  
Walter A. Browne  
his Attorney.

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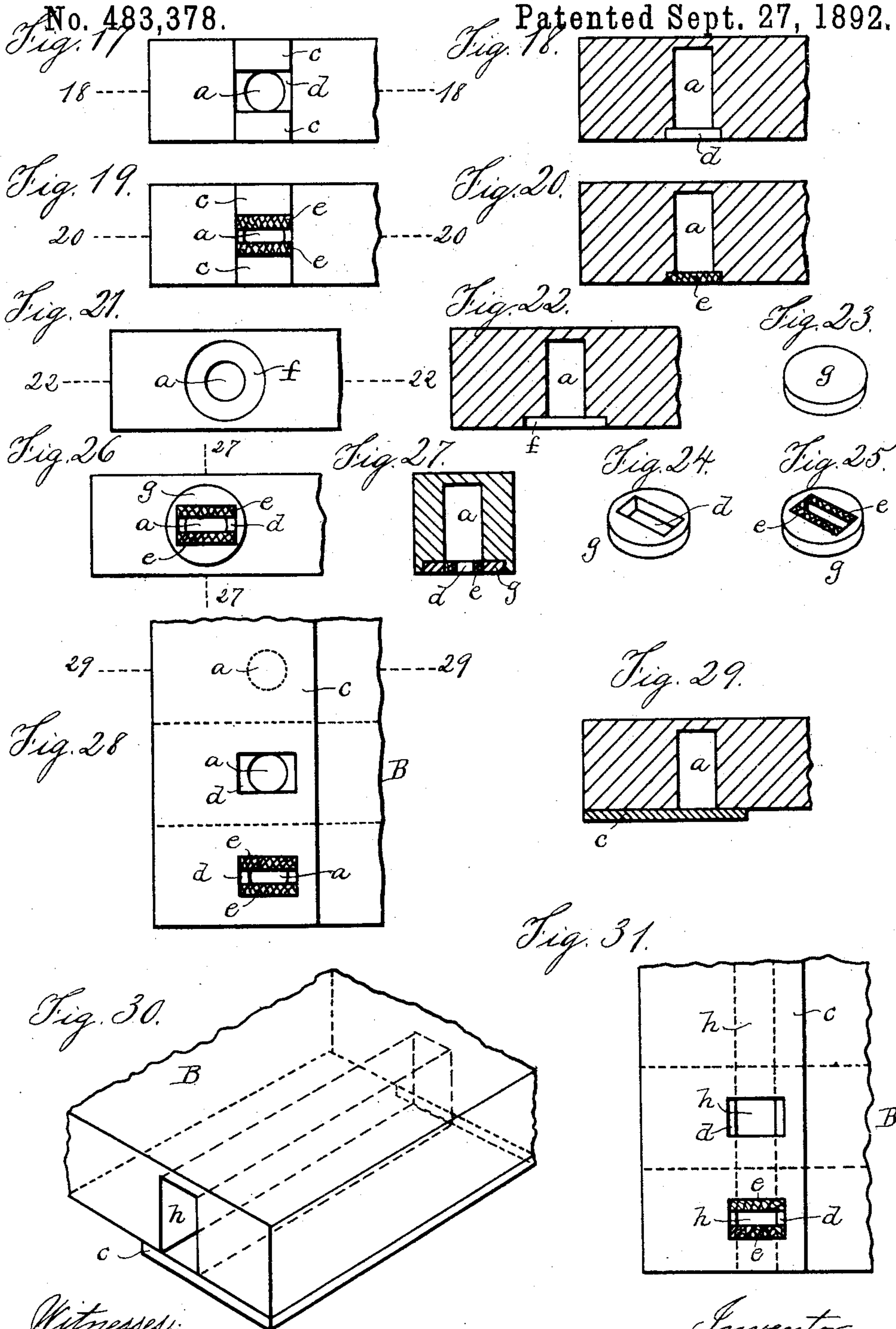
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Inventor  
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by *Walter A. Browne* his attorney.

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his Attorney.



# UNITED STATES PATENT OFFICE.

LEVI K. FULLER, OF BRATTLEBOROUGH, VERMONT, ASSIGNOR TO THE ESTEY ORGAN COMPANY, OF SAME PLACE.

## KEY FOR MUSICAL INSTRUMENTS.

SPECIFICATION forming part of Letters Patent No. 483,378, dated September 27, 1892.

Application filed May 2, 1891. Serial No. 391,417. (No model.)

*To all whom it may concern:*

Be it known that I, LEVI K. FULLER, of Brattleborough, in the county of Windham and State of Vermont, have invented certain  
5 new and useful Improvements in Keys for Musical Instruments and the Method of Making the Same, of which the following is a specification.

The present invention relates to the method  
10 of making and the construction of the keys of organs, pianos, and similar musical instruments; and the particular object of the invention is to so construct the keys that the ivory or celluloid veneer with which the keys are  
15 usually covered will not be injuriously affected by reason of the other essential features embodied in the construction of the key.

The particular objects of the present invention can be best set forth by first referring to  
20 the usual method of constructing keys for musical instruments.

The usual method of construction is illustrated in Figures 1, 2, 3, and 4 of the accompanying drawings, Fig. 1 being a perspective  
25 view of the keyboard-blank as heretofore used; Fig. 2, a side elevation of a completed key as it appears upon the frame supporting it; Fig. 3, a bottom view of the key, and Fig. 4 a cross-section in a plane indicated by the  
30 line 4 4 in Figs. 2 and 3.

Referring to these figures, A is the frame of the keyboard.

B is the blank from which the keys C are made.

35 D is the top strip of ivory or celluloid, and E is the front strip of ivory or celluloid. The blank is of sufficient size to be cut into a set of keys. It is dressed, mortised, grooved, and faced with the ivory or celluloid and then  
40 sawed transversely into keys, as indicated by the dotted lines, and as hereinafter described.

F is a groove cut lengthwise into the rear edge of the keyboard-blank B.

45 G are pin-holes extending vertically through the rear end of each key C.

H is the back pin, rising from the frame A through the pin-holes G. By means of these pin-holes and pins the rear hinges of the keys are formed.

50 Each key has a front pin-hole I extending from the lower face of the key upward into

the key a sufficient distance to receive the front pin J, which rises from the front portion of the frame A beneath the key. Said pin J forms a guide-arm for the front portion  
55 of the key. To adapt it to perform this function, the pin-hole is bored of a sufficient diameter and is elongated by mortising in the direction of the length of the key to permit the vertical play of the key, and at least the lower  
60 portion of the said pin-hole must have straight sides, so that the side of the pin-hole and said pin will fit closely together and prevent lateral movement of the key. On account of the  
65 vertical range of movement of the key it is necessary to extend said pin a considerable distance upward into the key, in order that the latter may not be lifted off said pin. It is the custom to bore a hole by means of a bit from the  
70 top of the blank downward to within a short distance of the lower face of the board, and when this has been done through every key to turn the board and form the lower portions of the pin-holes with parallel sides by means of a chisel. When this has been done,  
75 the upper surface of the blank has a round hole at the upper end of each pin-hole I. It has been found that it is impracticable to apply the ivory or sheet of celluloid over said openings directly without having the outlines  
80 of said openings show in the surface of the celluloid after the work is finished. This is particularly true when the sheet of celluloid is applied to the surface of the blank by means of a heated press, since in such case the heat  
85 softens the celluloid and allows it to sag into the holes. Moreover, the presence of such holes is objectionable, since the key might be driven down so far as to bring the pin J in contact with the under surface of the ivory or celluloid covering and force it off from the key,  
90 and, besides, it is unpleasant to the touch of the fingers of the player. In order to overcome these objections, it has been the custom to plane a channel K into the upper surface  
95 of the blank B over the pin-holes I and to fill said channel with a strip of wood L, said strip of wood being cut transversely to the grain and glued into said channel. It will be seen that a distinct depression could be cut around each  
100 pin-hole and such depression filled or bridged with a small piece of wood; but the continu-



ous channel K can be cut and filled more rapidly. A groove M is usually cut into the lower face of the blank B, across the pin-holes I, to receive felt bushings N at each side of said pin-holes. Said felt bushings are glued directly to the key and their edges constitute noiseless guides for the front pins J.

Experience has proved that while the strip L covers the pin-holes I and prevents the latter from affecting the surface of the top strip of celluloid the strip L itself affects the surface of the top strip of celluloid or ivory. In order to make the strip L fit properly into the groove K, said strip must be pressed into said groove. In this operation said strip is more or less compressed, and wherever there has been any compression of the said strip it will in time expand more or less and rise above the surface of the adjacent wood. Sometimes the wood adjacent to said strip is also compressed, so that it will, owing to its different cell structure, subsequently rise above the edges of the strip L, making the joints between said strip and the adjacent wood apparent. The glue or cement used in securing the strip L also affects the surface of the celluloid after the lapse of time. While perhaps the glue does not itself expand after the work is finished, it is raised by the expansion of the adjacent wood. Whatever the real action involved, the fact is that after the work is finished with the best care the line of the strip L is more or less apparent, and the goods are to that extent defective and criticised by the trade. This defect is all the more prominent because the direction of said strip is lengthwise of the keyboard and because the surface is highly polished. These defects, arising from the usual method of making the keys, have been heretofore recognized, and attempts have been made to overcome them. Two of such attempts may be referred to. It has been proposed to omit the grooves or channels K and the strips L entirely in the manufacture of the keys and to use instead a veneer of wood, which is applied by gluing to the upper surface of the keys, extending from the front edge thereof to back of the place where the celluloid covering usually terminates. Consequently where such a veneer is used the celluloid is secured not to the body of the key itself, but to the veneer. A second method is set forth in Letters Patent of the United States No. 160,515, granted to me March 9, 1875. In accordance with this patent the front pin-holes do not extend through the upper part of the key at all, so that the body of the key presents an unbroken upper surface, to which the celluloid or ivory covering may be applied without danger of the defects mentioned occurring. The construction of the keys set forth in said Patent No. 160,515, as far as it provides a smooth unbroken surface on the key-body itself for the celluloid covering, is perfectly efficient; but in some other respects the keys are defective. The method set forth in said patent for forming the

front pin-holes and bushing the same is imperfect, and in these respects the keys are inferior to the keys made in accordance with the usual method above referred to. The bushings in the pin-holes, as shown in said patent, interfere with the free movements of the keys and are not easily and economically applied to the keys.

Now the present invention has for its object the production of keys which shall present the same integral unbroken surface of the keys for the top celluloid covering as said Patent No. 160,515, and which shall at the same time have the front pin-holes made and bushed in such a way as to be an improvement both in the mode of manufacture and in the completed key over the keys as usually made. The present improvements are illustrated in Figs. 5 to 31 of the accompanying drawings, wherein—

Fig. 5 is a bottom view of one end of an unfinished key in one stage. Fig. 6 is a longitudinal section thereof in a plane indicated by the line 6 6 in Fig. 5. Fig. 7 is a bottom view of one end of an unfinished key in an advanced stage of completion. Fig. 8 is a longitudinal section thereof in a plane indicated by the line 8 8 in Fig. 7. Fig. 9 is a bottom view of a portion of an unfinished key-blank in a still further advanced stage of completion. Fig. 10 is a longitudinal section thereof in a plane indicated by the line 10 10 in Fig. 9. Fig. 11 is a bottom view of one end of the key in a still further advanced stage of completion. Fig. 12 is a longitudinal section thereof in a plane indicated by the line 12 12 in Fig. 11. Fig. 13 is a bottom view of one end of the key, showing the same completed. Fig. 14 is a longitudinal section in a plane indicated by the line 14 14 in Fig. 13. Fig. 15 is a cross-section in a plane indicated by the line 15 15 in Fig. 13. Fig. 16 is a longitudinal section of a completed key. Figs. 17, 18, 19, and 20 illustrate a modification, Figs. 17 and 19 being bottom views of one end of a key in different stages of completion and Figs. 18 and 20 being longitudinal sections in the planes indicated by the lines 18 18 and 20 20 in Figs. 17 and 19, respectively. Figs. 21 to 27 illustrate a second modification, Fig. 21 being a bottom view of one end of an unfinished key, Fig. 22 a longitudinal section thereof in a plane indicated by the line 22 22 in Fig. 21, Figs. 23, 24, and 25 detail perspective views of a filling-piece in different stages of completion, Fig. 26 a bottom view of one end of a completed key, and Fig. 27 a cross-section thereof in a plane indicated by the line 27 27 in Fig. 26. Figs. 28 and 29 illustrate a third modification, Fig. 28 being a bottom view of a portion of a key-blank and Fig. 29 being a longitudinal section in a plane indicated by the line 29 29 in Fig. 28. Figs. 30 and 31 illustrate a fourth modification, Fig. 30 being a perspective view and Fig. 31 a bottom view of a portion of a key-blank.



Referring first to Figs. 5 to 16, inclusive, it may be stated at the outset that these figures (with the exception of Fig. 9) show the method of manufacture as applied to a single key. It will be understood, however, that in the present improved method of manufacture the several manipulations are preferably effected upon a key-blank such as is ordinarily operated upon, such a key-blank being of a size for making an entire set of keys or a large number of keys. Since, however, the operations upon a large key-blank are merely duplications of the operations as they would be performed on a single key, the operations are here in the main illustrated as though made on a single key.

Since the present invention relates only to the formation of the front part of the key, the description will be confined thereto, the other operations necessary to form the completed key being accomplished in the usual manner.

The first operation is shown in Figs. 5 and 6, and consists in boring a front pin-hole *a* in the bottom of the key. This front pin-hole does not extend entirely through the key, the top surface of the key being thereby maintained unperforated and unaffected. This hole is of a diameter and height to permit the necessary vertical movement of the key.

The second operation is shown in Figs. 7 and 8, and consists in planing or otherwise forming a groove, recess, or channel *b* in the bottom of the key. This groove or recess extends crosswise of the key and intersects the front pin-hole *a*. It will be understood that this groove or recess extends clear across the entire key-blank, so that one operation forms this groove, recess, or channel in all the keys made from the blank.

The third operation is shown in Figs. 9 and 10, and consists in filling the groove or recess *b* with a filling-strip *c*. This filling-strip is glued in position. As indicated in Fig. 9, a single filling-strip extending the entire extent of the key-blank may be employed. This operation, it will be noted, entirely closes the front pin-holes *a*.

The fourth operation is shown in Figs. 11 and 12, and consists in cutting or otherwise forming a mortise *d* in the filling-strip *b*, said mortise constituting a space in line with each pin-hole. This mortise or space *d* is of sufficient size lengthwise of the key to accommodate the front pin during the vertical movement of the key, and is of sufficient width to receive the bushing-felts or strips of cloth which guide the key on the front pin, prevent lateral movement of the key, and render the movements of the key noiseless. These bushings will be hereinafter referred to as "bushing-felts" or "felts" simply, it being understood, however, that the bushing referred to may be made of any of the well-known materials used in the art for this purpose.

The fifth operation is illustrated in Figs. 13, 14, and 15, and consists in applying the bushing-felts *e e*. These felts are applied in any

well-known way, as by gluing, to the filling-strip along the sides of the mortise *d*. By thus applying the bushing-felts they are securely held to the key and their parallelism is insured with certainty. It is of great importance that these bushing-felts should be exactly parallel, so that the slot formed between them shall be rectilinear and of uniform width, in order that the key may be guided properly on the front pin. Furthermore, it will be noted that a seat is formed by the portions of the key-body surrounding the pin-hole against which the felts rest, so that the proper position of the felts cannot be affected by the movements of the key. The top surface of the key and its front end are then finished by the application of the celluloid or ivory coverings *D* and *E*, unbroken and uniform surfaces being afforded for said coverings. The completed key is shown in Fig. 16.

The essential features of the completed key are that the front pin-hole is formed from the bottom of the key and not extending through the upper face of the key, so that an unbroken surface is provided for the celluloid or ivory covering, and that the bushing guide-felts for the front pin are secured not directly to the key-body, but to a separate piece or pieces applied to the key.

The essential characteristics of the improved key can be secured by various modified or alternative methods of making, of which several are shown in the drawings and will now be described.

The first alternative or modified method is illustrated in Figs. 17 to 20. In this method the first three operations and the fifth are the same as in the first-described method. The only difference consists in making the mortise *d*. In the method first described the mortise only extends a portion of the width of the filling-strip. This is not essential, since the length of the mortise is immaterial, as long as it is equal to or exceeds the play of the pin in the pin-hole. As shown in the modification in Figs. 17 to 20, the mortise *d* is cut entirely across the filling-strip and the bushing-felts *e* likewise extend entirely across the groove or recess *b*. In Figs. 17 and 18 the key is shown with the mortise cut entirely across, and in Figs. 19 and 20 the bushing-felts *e* are shown applied.

The second alternative or modified method is illustrated in Figs. 21 to 27. In this method the pin-holes *a* are first formed; but instead of then forming a cross groove or recess a countersunk recess *f* is formed around the pin-hole, as shown in Figs. 21 and 22. This countersunk recess may be of any shape, but circular is preferable. For each countersunk recess *f* a filling-disk *g* is provided of such shape and size as will snugly fit in the countersunk recess. This filling piece or disk *g* may be mortised and bushed after being applied to the key, but is preferably so treated before being put in place. It is quite imma-



terial in any of the several methods here described whether the filling-pieces be bushed before or after being glued to the key. Fig. 24 shows a mortise *d* cut in the filling-piece *g*, and Fig. 25 shows the bushing-felts *e* applied thereto. Figs. 26 and 27 show the filling-piece *g* inserted and glued into the countersunk recess *f*.

A third alternative or modified method is illustrated in Figs. 28 and 29. In this method no groove or recess is formed along the bottom of the key or key-blank after the pin-holes *a* are formed. Instead of so doing, the filling strip or piece *c* is glued to the bottom of the key or key-blank, covering the open mouths of the pin-holes. The subsequent operations are then formed in the strip *c*, as shown in Fig. 28. A mortise *d* is cut in line with each pin-hole and the bushing-felts *e* are then applied.

A fourth alternative or modified method is illustrated in Figs. 30 and 31. In this method no separate pin-holes are formed in the several keys of the key-blank. Instead of forming separate pin-holes a deep channel *h* is formed crosswise of each key, this channel being of course continuous across the entire blank. This channel *h* is open at the bottom of the keys and is of the same depth (height) as the pin-holes *a* in the other methods, so that this channel has the same functions as the pin-holes. The key (or key-blank) being thus channeled, it is finished as in the third modification. A strip *c* is glued to the bottom of the key, bridging and closing the channel *h*. In this strip the mortise *d* is formed in the proper position and the felts *e* are applied to the mortise.

Where the filling strip or piece is applied to the bottom of the key instead of in a groove or counter-sink therein and where additional height of the key is impracticable or undesirable, the body of the key may be of correspondingly-less height than is usual, or the key-frame can be modified.

All of the several methods described produce a key having the same essential characteristics and all of the methods have certain general features in common which produce the key.

I claim as my invention—

1. A key for a musical instrument, having a front pin-hole extending upwardly from the bottom thereof, said pin-hole not extending through the top of the key, whereby its presence does not affect the ivory or celluloid covering of the key, and said key having bushing-felts for guiding the front pin, which enters said pin-hole, said bushing-felts being applied to a strip or strips secured to the key at its bottom, substantially as set forth.

2. A key for a musical instrument, having a front pin-hole extending upwardly from the bottom thereof, said pin-hole not extending

through the top of the key, whereby its presence does not affect the ivory or celluloid covering of the key, and said key having at its bottom a strip or strips applied thereto, and bushing-felts secured to said strip or strips on either side of said pin-hole, substantially as set forth.

3. A key for a musical instrument, having a front pin-hole, a recess in the bottom of said key communicating with said pin-hole, filling strip or strips inserted in said recess, said strip or strips being formed so as to leave a space in line with said pin-hole, and bushing guide-felts applied to said filling strip or strips, substantially as set forth.

4. A key for a musical instrument, having a front pin-hole, a recess extending crosswise of the bottom of said key communicating with said pin-hole, a filling-strip inserted in said recess, said filling-strip having a mortise across the same in line with said pin-hole, and bushing-felts attached to said strip on opposite sides of said mortise, substantially as set forth.

5. A key having pin-hole *a*, recess *b*, strip *c*, having mortise *d*, and felts *e e*, substantially as set forth.

6. In the manufacture of keys for musical instruments, the method of forming the front ends thereof, which consists in forming a front pin-hole, attaching a separate strip or piece to the key at its bottom, and applying a bushing-felt to said strip or piece, substantially as set forth.

7. In the manufacture of keys for musical instruments, the method of forming the front ends thereof, which consists in forming a front pin-hole from the bottom of the key so that it does not extend through or to the upper surface of the key, applying a separate strip or strips to the bottom of the key, and applying bushing-felts to such strip or strips, substantially as set forth.

8. In the manufacture of keys for musical instruments, the method of forming the front ends thereof, which consists in forming a front pin-hole from the bottom of the key so as not to extend to the upper surface of the key, forming a groove or recess extending crosswise of the bottom of the key, intersecting said pin-hole, inserting a filling-strip in said groove or recess, cutting a mortise in said strip in line with said pin-hole, and applying bushing-felts to said filling-strip at the sides of said mortise, substantially as set forth.

In witness whereof I have heretuno signed my name in the presence of two subscribing witnesses.

LEVI K. FULLER.

Witnesses:

W. H. CHILDS,  
J. E. HALL.