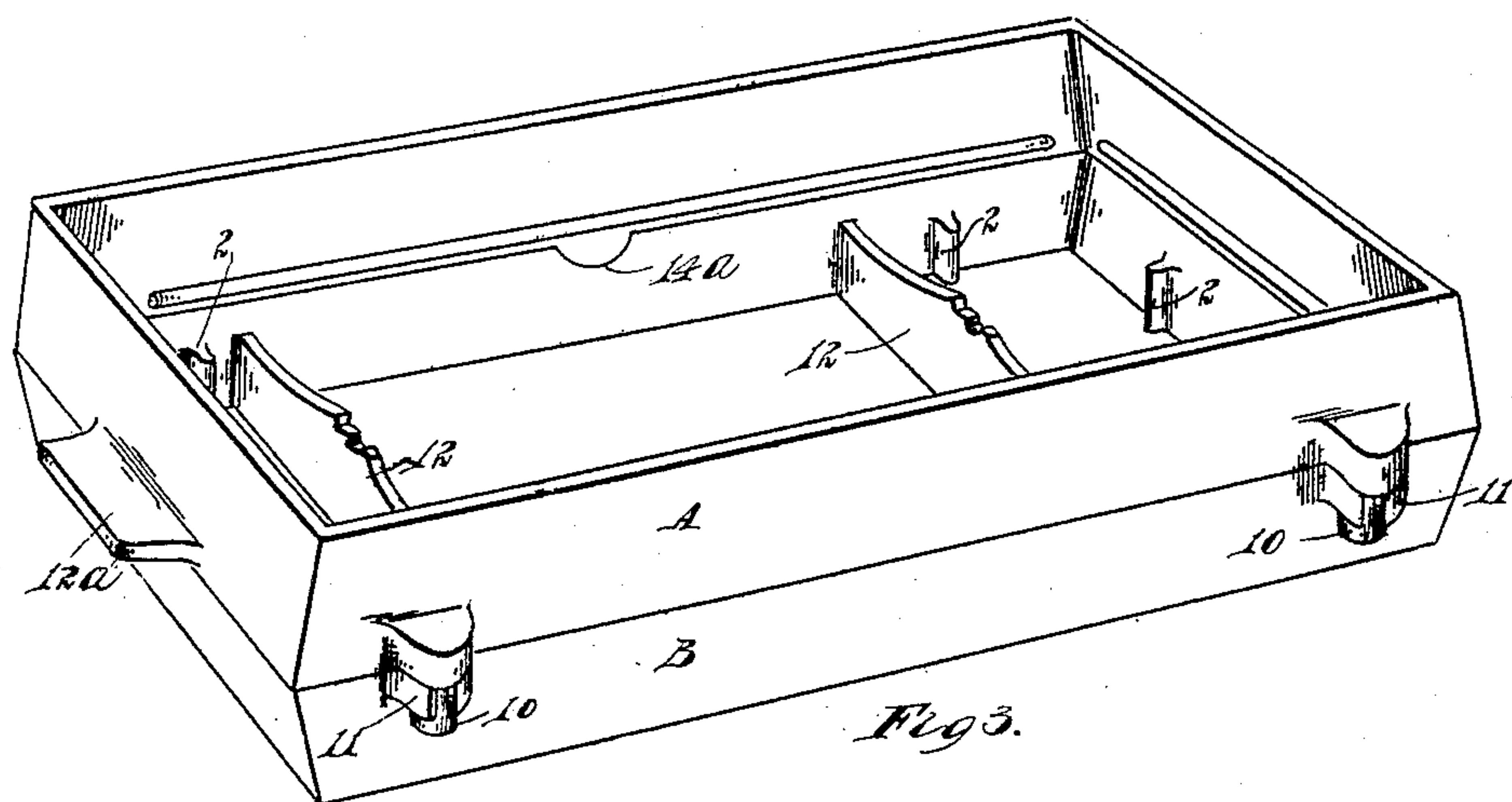
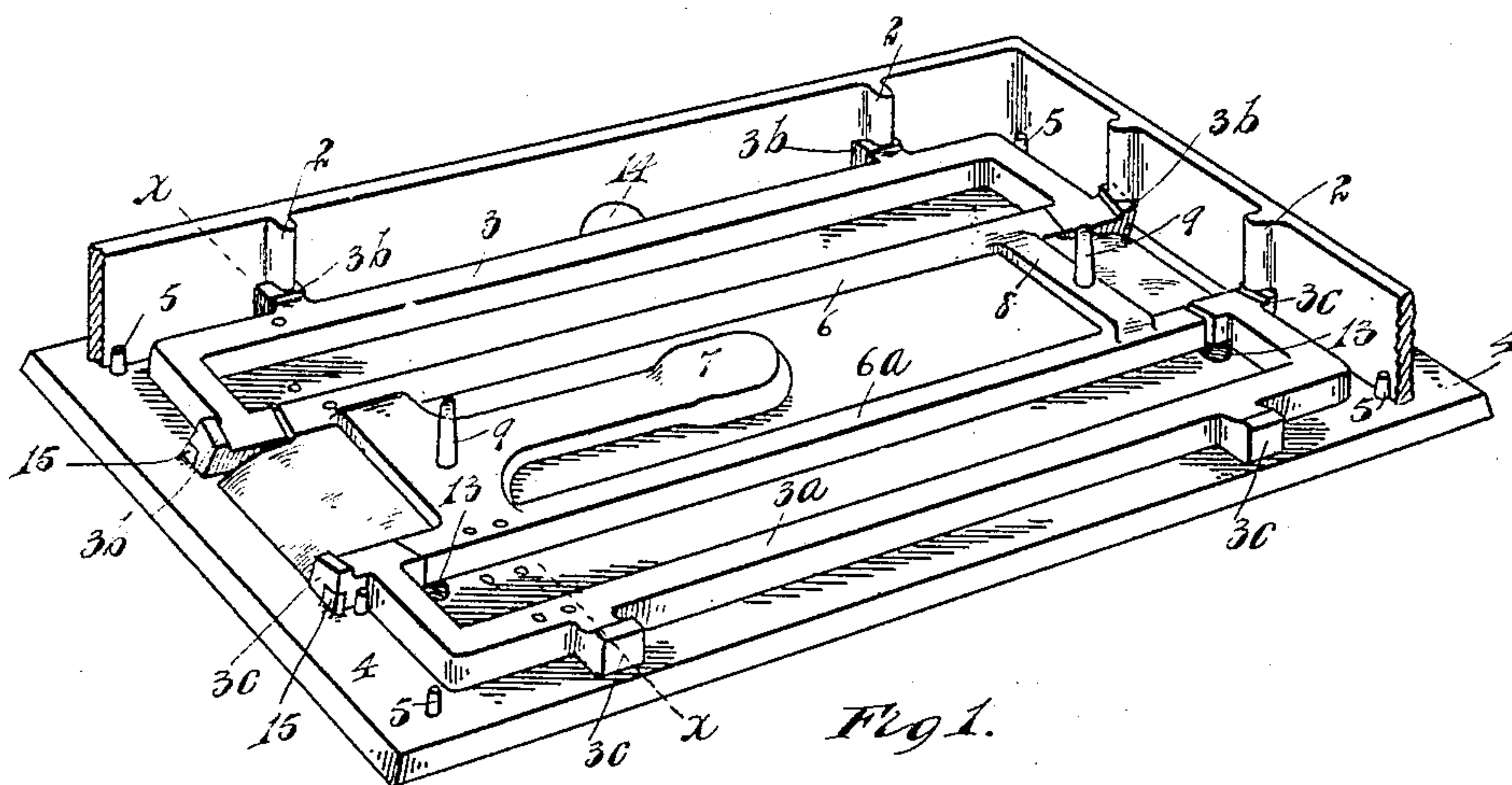


No. 778,674.

PATENTED DEC. 27, 1904.

W. J. KEEP.  
TESTING APPARATUS.  
APPLICATION FILED FEB. 1, 1904.

2 SHEETS—SHEET 1.



WITNESSES  
*T. J. Harvey*  
*Lotta Lee Hayton.*

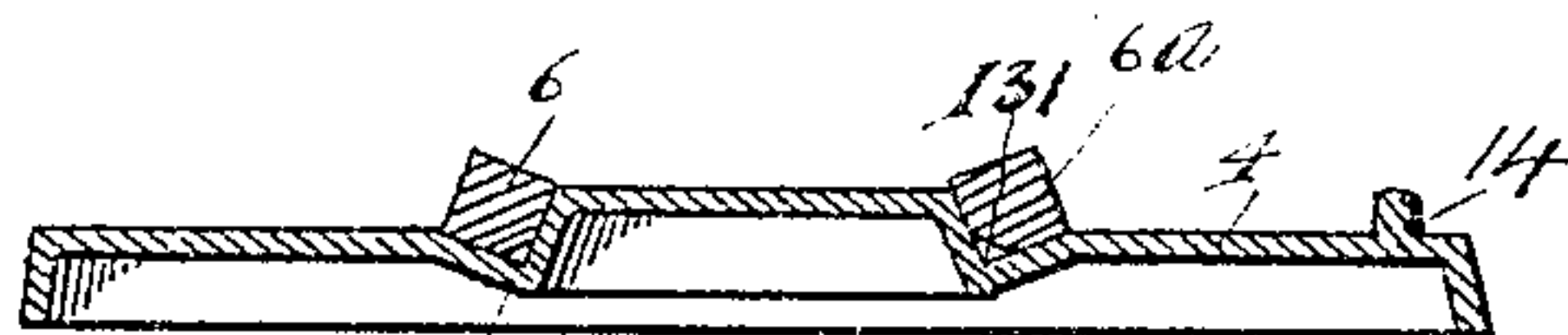
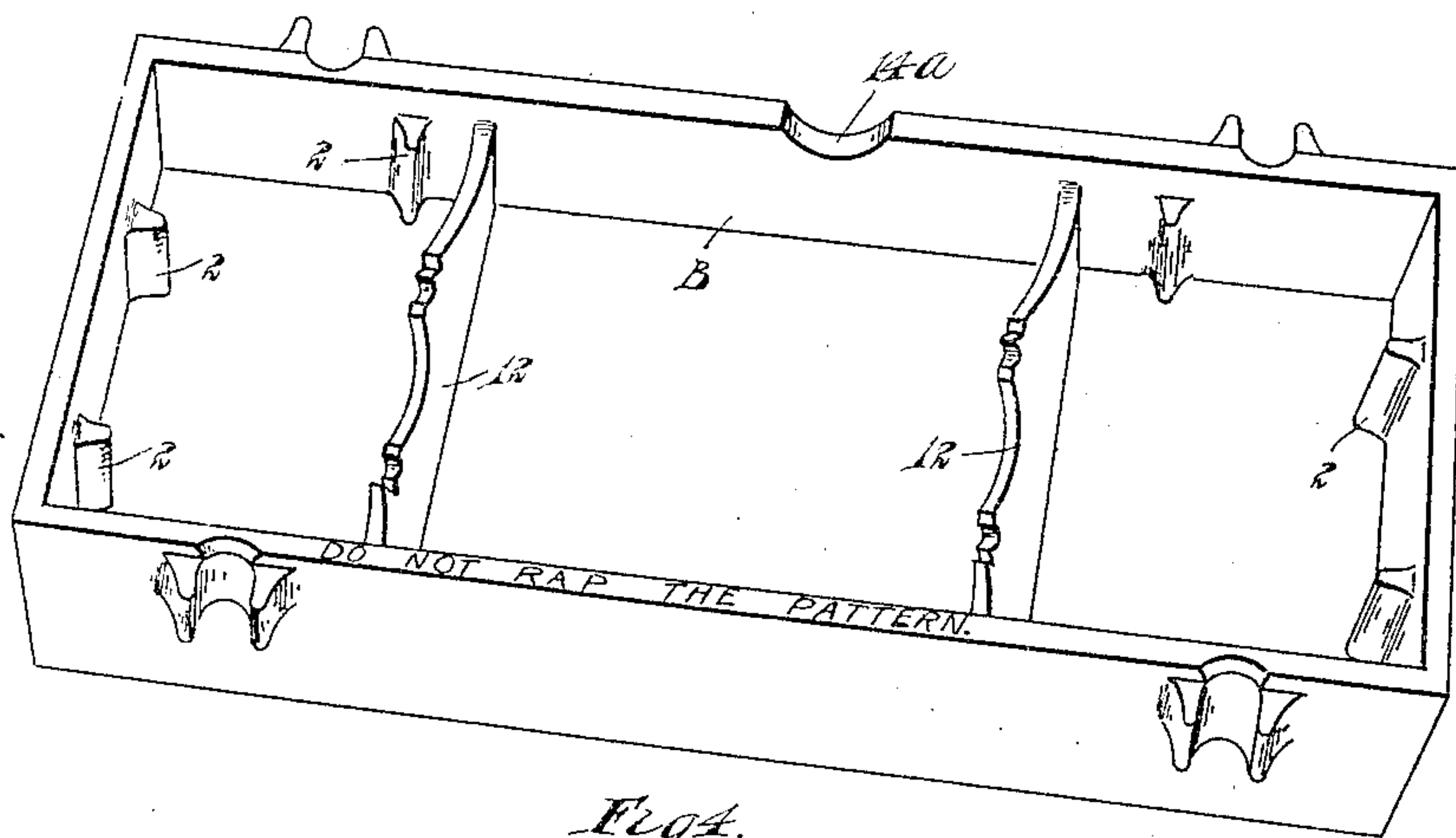
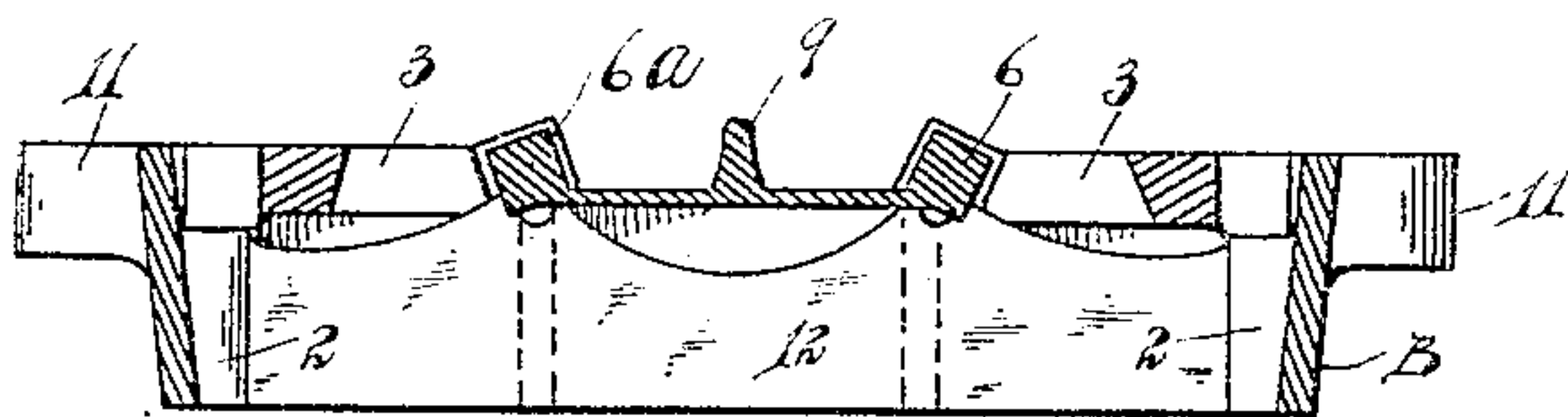
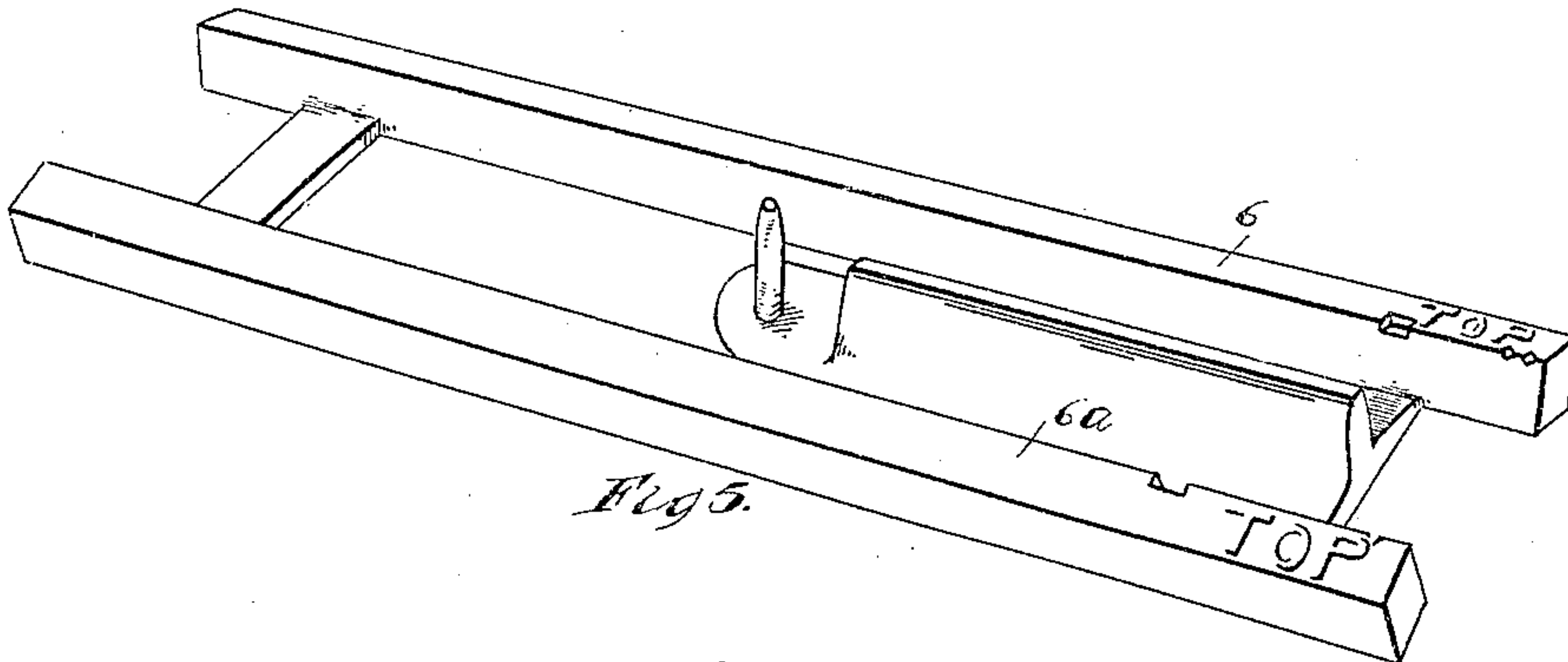
INVENTOR  
*William J. Keep*  
By *Parker & Burton* Attorneys.

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2 SHEETS—SHEET 2.



WITNESSES  
J. W. Massey  
Lotta Lee Hayton.

Fig. 6.

By

Parker & Burton Attorneys.

INVENTOR

William J. Keep



## UNITED STATES PATENT OFFICE.

WILLIAM J. KEEP, OF DETROIT, MICHIGAN.

## TESTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 778,674, dated December 27, 1904.

Application filed February 1, 1904. Serial No. 191,479.

*To all whom it may concern:*

Be it known that I, WILLIAM J. KEEP, a citizen of the United States, residing at Detroit, county of Wayne, State of Michigan, have  
 5 invented a certain new and useful Improvement in Testing Apparatus; and I declare the following to be a full, clear, and exact description of the invention, such as will enable  
 10 others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to test-bars for cast metal. Its special object is to provide a test-  
 15 ing apparatus by means of which the shrinkage of a bar of metal incident to its cooling from a molten condition can be accurately determined. Such shrinkage indicates certain  
 20 qualities in the material under investigation.

The testing apparatus consists of a pattern which is used to form the mold in which test-  
 25 bars are to be cast, a flask or mold in which the casting is to be made, a follow-board which is used in the first instance to aid in forming the mold and in the second instance as a support for the parts under test and other parts  
 30 which are used to aid in making the test.

In the drawings, Figure 1 is a perspective of the follow-board, a part of the novel part  
 35 of the flask, the pattern and the yokes used with the pattern. Fig. 2 is a cross-section at the line *x x* of Fig. 1. Fig. 3 is a perspective of the flask. Fig. 4 is a perspective of the novel part of the flask. Fig. 5 is a perspective of the top of pattern. Fig. 6 is a cross-  
 40 section of the follow-board and pattern.

The flask is made in two parts, a cope part A and a novel part B. The novel part is provided with inwardly-projecting lugs or spurs  
 45 2, which are used to support and hold accurately in position the yoke parts 3 and 3<sup>a</sup>. There are four such lugs under each yoke, and these afford supports for each yoke at four different points. On a prominent part of the  
 50 novel are characters instructing the workman "not to rap the pattern." I have found that no amount of verbal instruction to the workmen is as impressive as this instruction im-  
 55 printed ineffaceably on the mold.

A follow-board 4, provided with pins 5 to

guide the novel part of the flask to position, supports a pattern for two test-bars 6 and 6<sup>a</sup>. The pattern is united to a sprue and runner 7, and the two parts 6 and 6<sup>a</sup> are united at the  
 55 end opposite the gated end by a cross-tie 8. Steady-pins 9 project from the cross-tie and from the sprue-runner into the drag. With each test-bar is an iron yoke 3 3<sup>a</sup>, provided with lugs 3<sup>b</sup> and 3<sup>c</sup>, which engage closely  
 60 against the inside walls of the novel part of the flask and rest on the lugs 2 thereof. Each yoke has the terminals which are directed toward each other and which lie contiguous to or adjacent to the ends of the pattern of the  
 65 test-bar or of the test-bar itself, as nearly as possible one foot distant from each other. The pattern 6 of the test-bar is slightly shorter than the distance between the ends of the yoke, and the pattern 6<sup>a</sup> is also slightly shorter than  
 70 the distance between the ends of the yoke with which it is used, a slight space being left in order that the pattern may be drawn from the sand without disturbing the yoke, and any  
 75 sand or other mold material that may fall into the space is cleaned out before the mold is finished. The opening in the mold left by the cross-tie 8 is also stopped off in the finished  
 80 mold.

The cope part of the flask is provided with pins 10 on its external side that engage in per-  
 85 forated lugs 11 in the drag part of the flask. The bars 12, extending from side to side of the novel part, are of the same material as the frame thereof. The cope part is provided with lifting-handles 12<sup>a</sup>. One side of the cope  
 90 or one side of the novel at 14<sup>a</sup> is notched, and a lug 14 on the follow-board engages in this notch to insure the certain assemblage of the parts in the same relation at all times. This  
 95 certainty of assemblage is important, because the test-bar cast between the terminals of either yoke must always be tested by comparing it with that yoke. If this were not done, any inequality in the spread of the yoke-  
 100 terminals would render the test valueless; but if the test-bar be placed for test between the terminals of its own yoke a slight variation in the spread of the yoke from an accurately-measured foot will not materially affect the results. The follow-board is provided with



four holes 13, one hole being under each junction between the end of the yoke and the end of the test-bar cast from the pattern. Each hole furnishes a free passage for the end of a  
 5 graduated measuring-bar that is thrust, preferably from above, downward between the end of the yoke and the end of the test-bar.

In practice the mold is formed in the usual way by placing the yokes and the pattern on  
 10 the follow-board, placing the inverted nowel part of the flask on the follow-board, filling the nowel part with molding, said reversing lifting off the follow-board, leaving the yokes and the pattern in the sand, after which the  
 15 cope part of the flask is placed in position filled with molding-sand. The two parts of the mold thus filled with sand are separated and pattern of the test-bar is removed, leaving the yoke-bars in place. The sprue-hole is made  
 20 in the ordinary way, the hole of the cross-tie stopped off, and the casting is poured. After the casting has been taken from the sand the gates are cut off, the test-bars are placed on the follow-board between the ends of the  
 25 yokes, which are also preplaced on the follow-board, and the test for shrinkage is made by measuring between an end of a yoke and an end of a test-bar with a wedge-shaped graduated measure, which indicates the space intervening between the end of the yoke and the  
 30 end of the casting.

In preparing test-bars to be used in the way hereinbefore described great accuracy must be maintained, great care must be exercised  
 35 to make a bar that will register properly axially with the yoke with which it is to be compared, and to make a bar which in its molten condition completely fills a cavity that extends entirely from one end of the yoke to  
 40 the other end of the yoke, and to insure re-assembling of the yoke itself with the special bar to be compared the yoke should be and in this case is a part of the mold.

Every precaution should be taken to prevent improper disturbance of the several parts  
 45 when the mold is making, and care should be exercised so that the test-bar may be laid back on the follow-board, which is used as a test-board, in the same position which the pattern  
 50 had with respect thereto and to bring it into the same condition of alinement which the molten metal had with respect to the yoke when the mold was filling. To enhance this accuracy, the workman is instructed not to  
 55 rap the pattern. The pattern-pieces and other parts are placed in the flask and onto the follow-board in a way to hold the parts in position as securely as possible and prevent any difficulties that would arise from any of these  
 60 sources of error. Measurements are to be taken to the one-thousandth of an inch or perhaps even less, and this requires not only accuracy of work, but the use of tools which will eliminate as much as possible any errors  
 65 which might arise from displacement, want

of alinement, and want of proper axial relation. The pattern is provided on that side of it which is uppermost when it is ready to draw with indicating characters to indicate  
 70 that the side which is at the top will in the casting be the side which is also to be at the top in testing, and the nowel part of the flask is provided with an inscription instructing the workman to refrain from rapping or otherwise disturbing the pattern. To still further  
 75 insure the placing of the test-bar in the same relative position with the yokes and other parts that the pattern had from which the test-bars are made, there are bars or projections  
 80 12, extending from the sides of the flask, which engage the pattern and make it practically impossible for the molder to move the pattern in the mold even if he raps it or presses upon it. These bars engage against the molten iron  
 85 when the test-bar is cast; but the surface of contact is very small and produces no appreciable effect on the test-bar, nor does the molten iron injure the projection. Projections  
 90 131 are also placed on the follow-board under each of the patterns and engage in thin notches in the patterns, and these notches by making cores produce thin notches in the test-bars cast in the mold. The projections are so  
 95 arranged with reference to the two patterns that the patterns cannot be reversed, nor can the test-bars cast from the pattern be re-arranged on the follow-board different from  
 100 the arrangement which its pattern had when it was cast. Similar lugs 15, placed on the follow-board or the yoke engaging with a notch  
 105 in the other part, prevent the assembling of the yokes and follow-board in any other than their proper relation. The pattern has its sides inclined to the plane of the follow-board to insure its easy withdrawal from the sand,  
 110 and the gate or runner 7 is arranged to cause metal to flow upward to fill the mold-cavity.

What I claim is—

1. In combination with a molding-flask, provided with lugs to support test-yokes, a  
 110 follow-board, test-yokes, and a pattern supported by the follow-board and engaging between the ends of the test-yokes, substantially as described.

2. In combination with a pattern, a test-yoke, a follow-board provided with holes  
 115 therethrough located between the ends of the pattern and the test-yokes, and arranged to allow the passage therethrough of a measuring-tool inserted between an end of the test-yoke and a test-bar placed upon said follow-board, substantially as described. 120

3. In combination, a follow-board for a molding-flask, a test-yoke and a pattern from  
 125 which to cast a test-bar, an interengaging means between the follow-board and the pattern adapted to insure the placing of the bar cast from said pattern on the follow-board in the same relation as that occupied previously  
 130 by the pattern, substantially as described.



4. In combination, a molder's flask provided with lugs on the inside walls thereof, a follow-board, a yoke engaging on the follow-board and adapted to be transferred from the follow-board to the lugs, substantially as described.

5. A measuring device to determine shrinkage of metals, comprising a support used as a follow-board to support a pattern while making a mold, and to support a bar while taking measurements, the said follow-board being provided with means to insure the same relative association between itself and the pattern and between itself and the test-bar cast therefrom, substantially as described.

6. In a flask for casting test-bars, having one of the parts thereof provided with a notch, and the other of the parts provided with a lug to engage in said notch, a follow-board having a like lug to engage the drag part of the flask, lugs on said flask, and yokes adapted to be supported by said lugs, and means whereby the parts are necessarily always used in the same relation, substantially as described.

7. A testing device for the shrinkage of metal, having in combination a board adapted to be used as a follow-board in making test-bars and a support for testing yokes, and means for compelling the repeated reassembling of the yoke and the follow-board in the same relation, a pattern and interengaging

parts between the pattern and follow-board adapted to compel the assembling of the casting from said pattern in the same relation to the follow-board that the pattern had thereto, substantially as described.

8. In combination with a flask, a yoke and a follow-board, said follow-board and said yoke being provided with interlocking parts which prevent an interchange of yokes, substantially as described.

9. In combination with a flask, a follow-board, and a pattern, a projection on said follow-board which interlocks with said pattern and the test-bar cast therefrom, and prevents the interchange of patterns on said follow-board, substantially as described.

10. In a flask for casting test-bars, a plurality of transverse bars extending from the novel parts thereof adapted to rigidly support and to engage with a small surface of contact against the pattern of the test-bar and prevent the movement thereof, while the mold is in process of making, substantially as described.

In testimony whereof I sign this specification in the presence of two witnesses.

WILLIAM J. KEEP.

Witnesses:

MAY E. KOTT,  
LOTTA LEE HAYTON.