

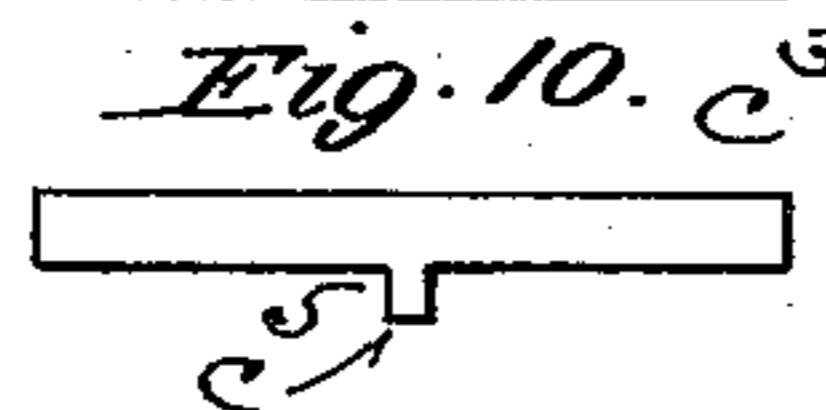
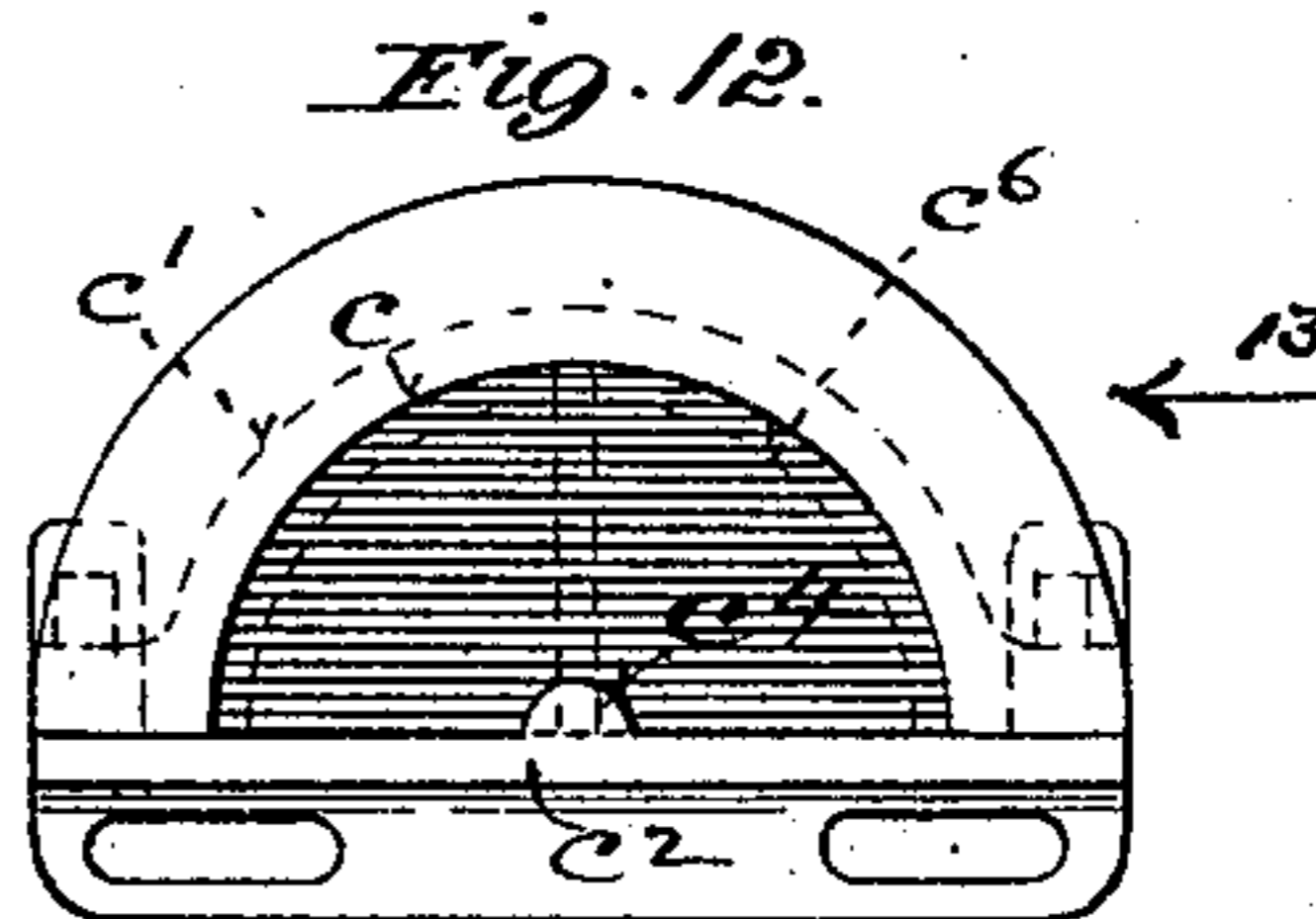
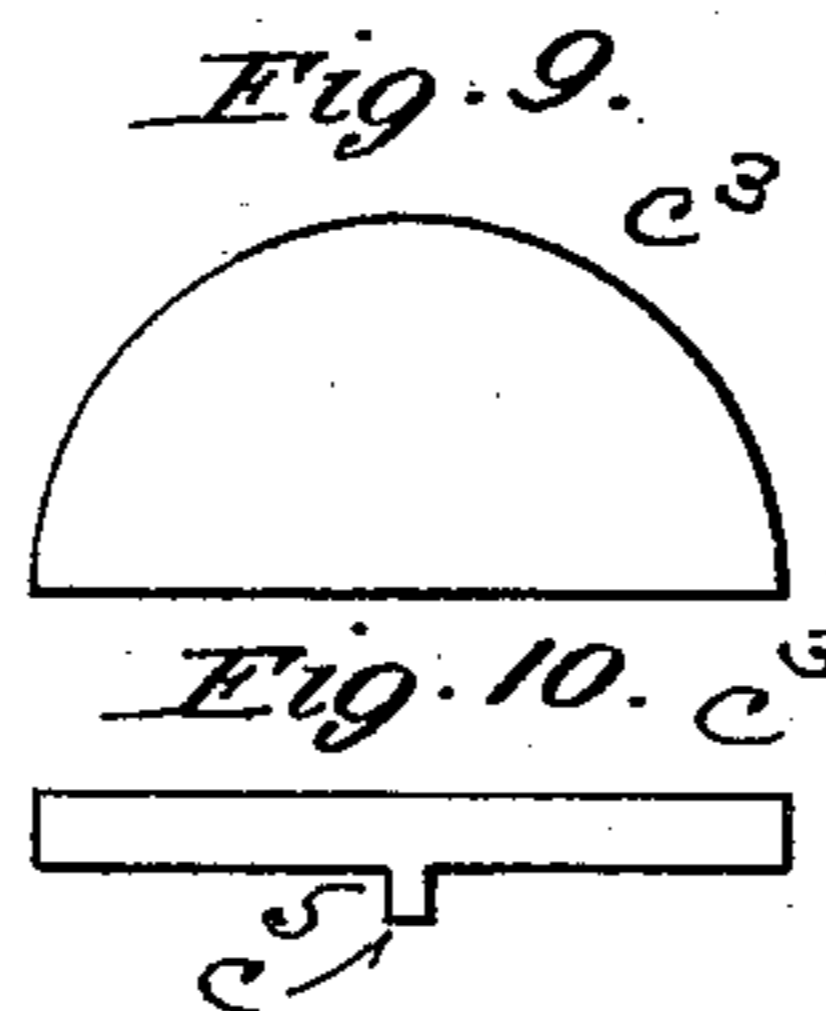
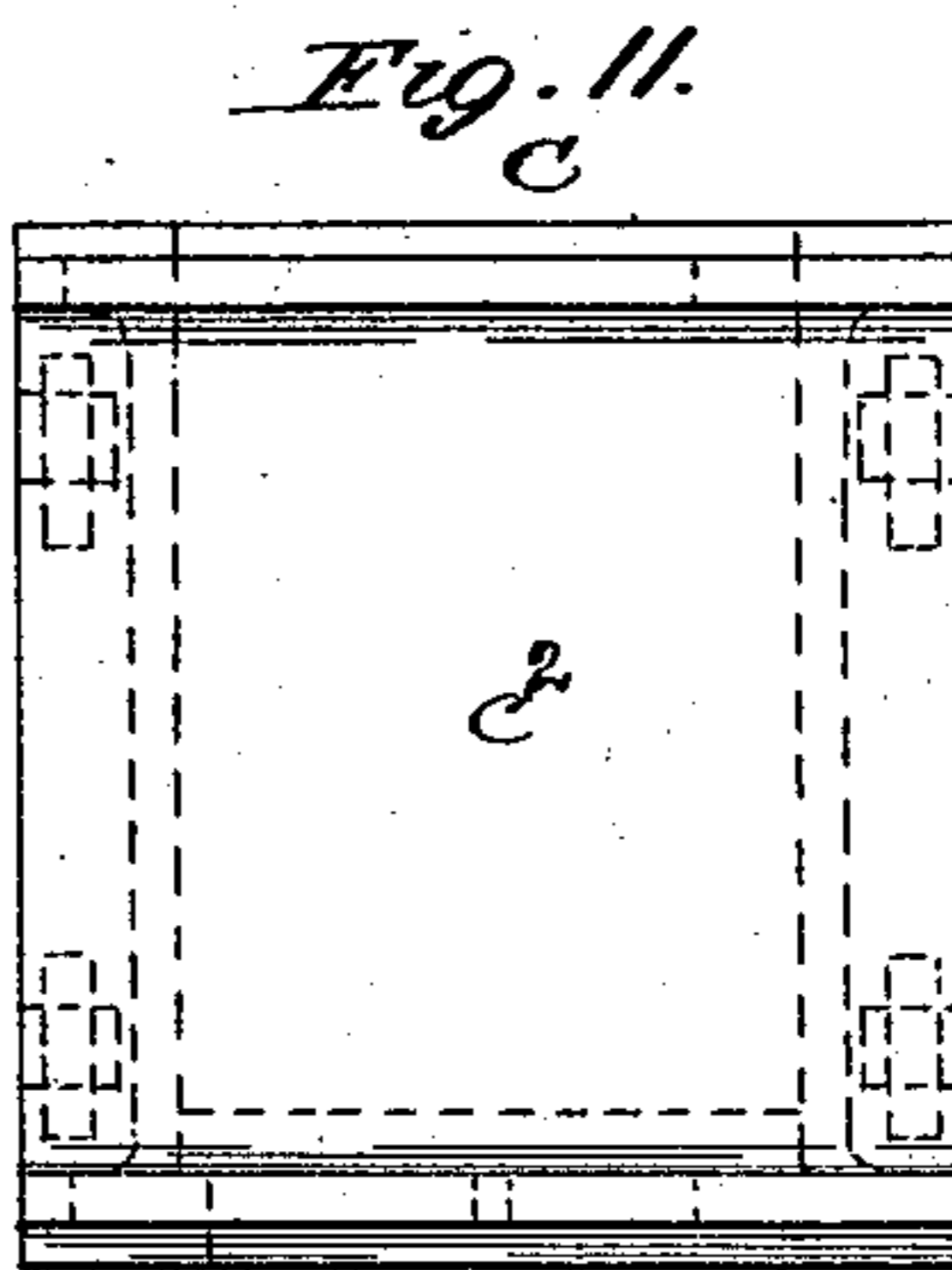
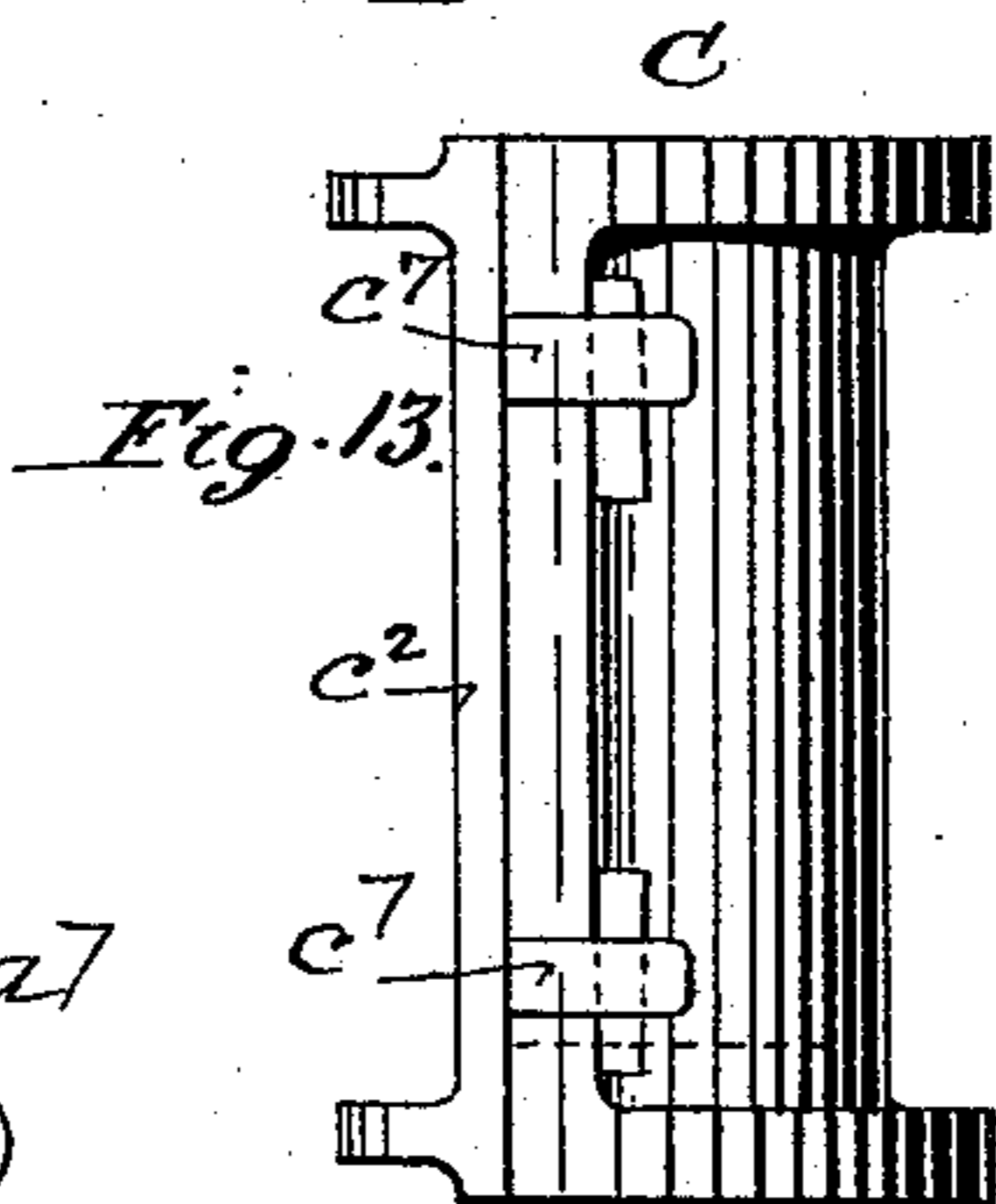
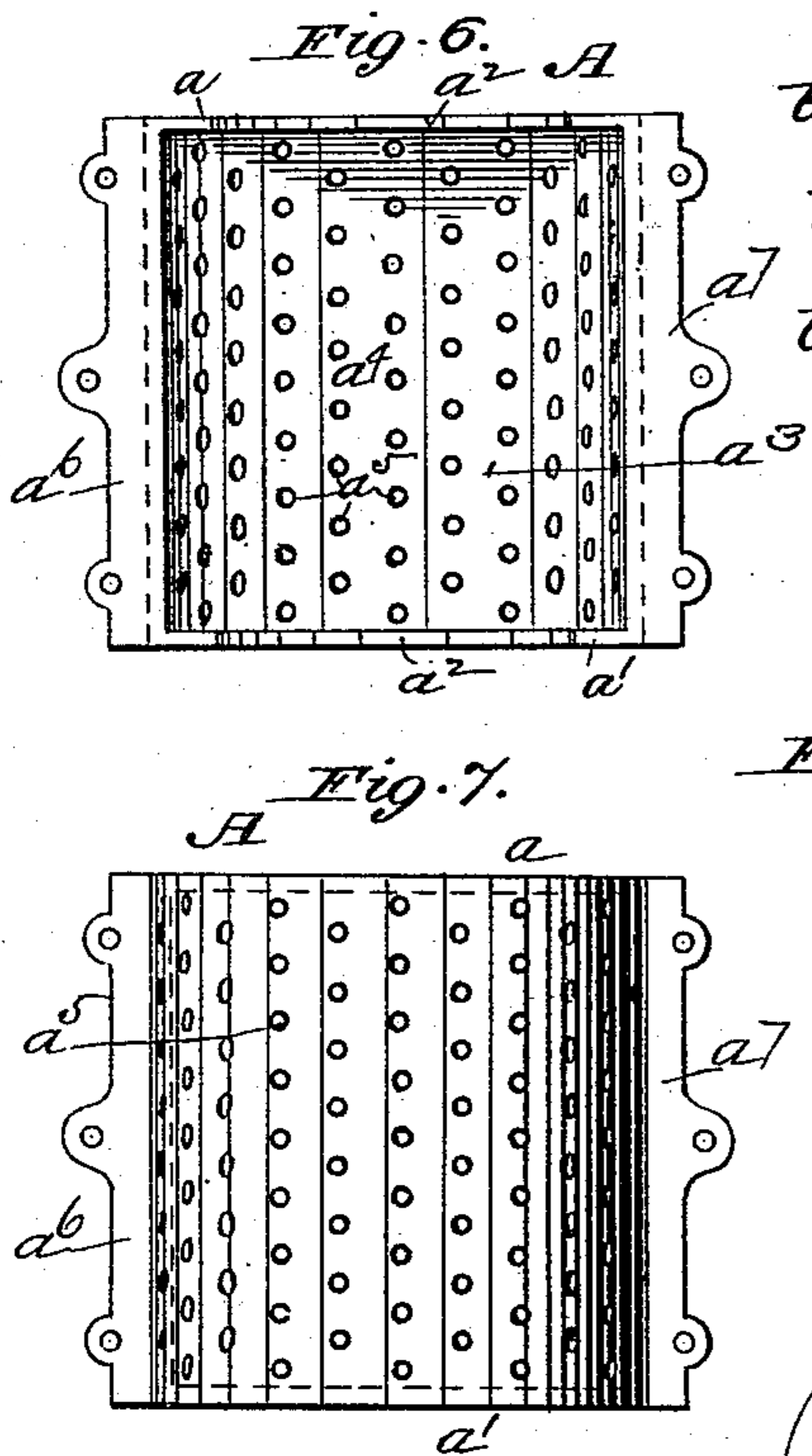
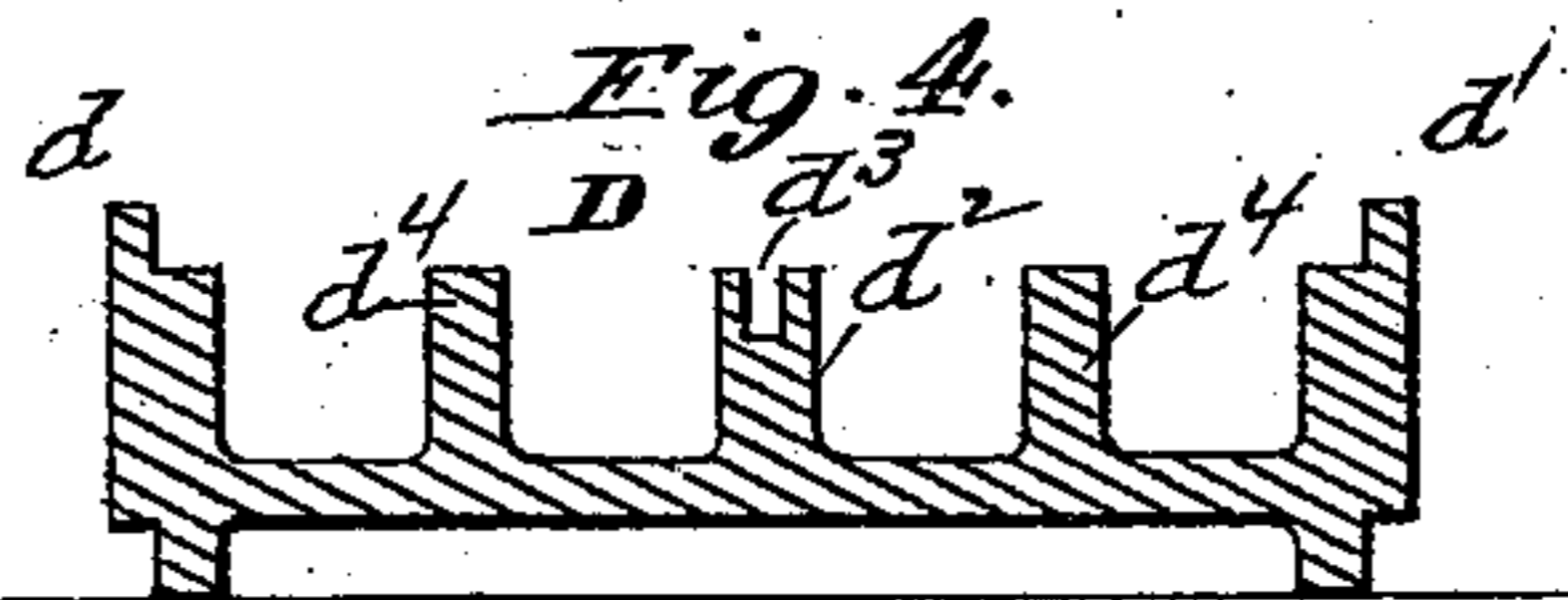
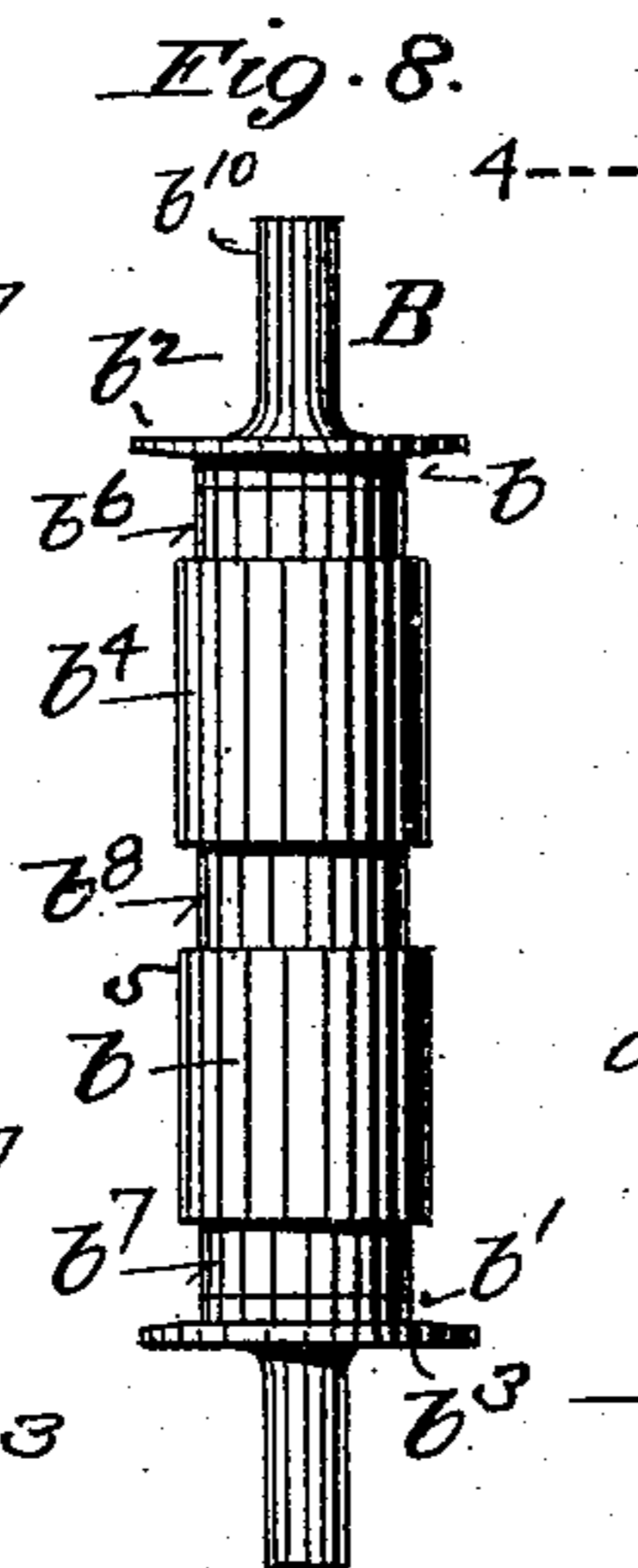
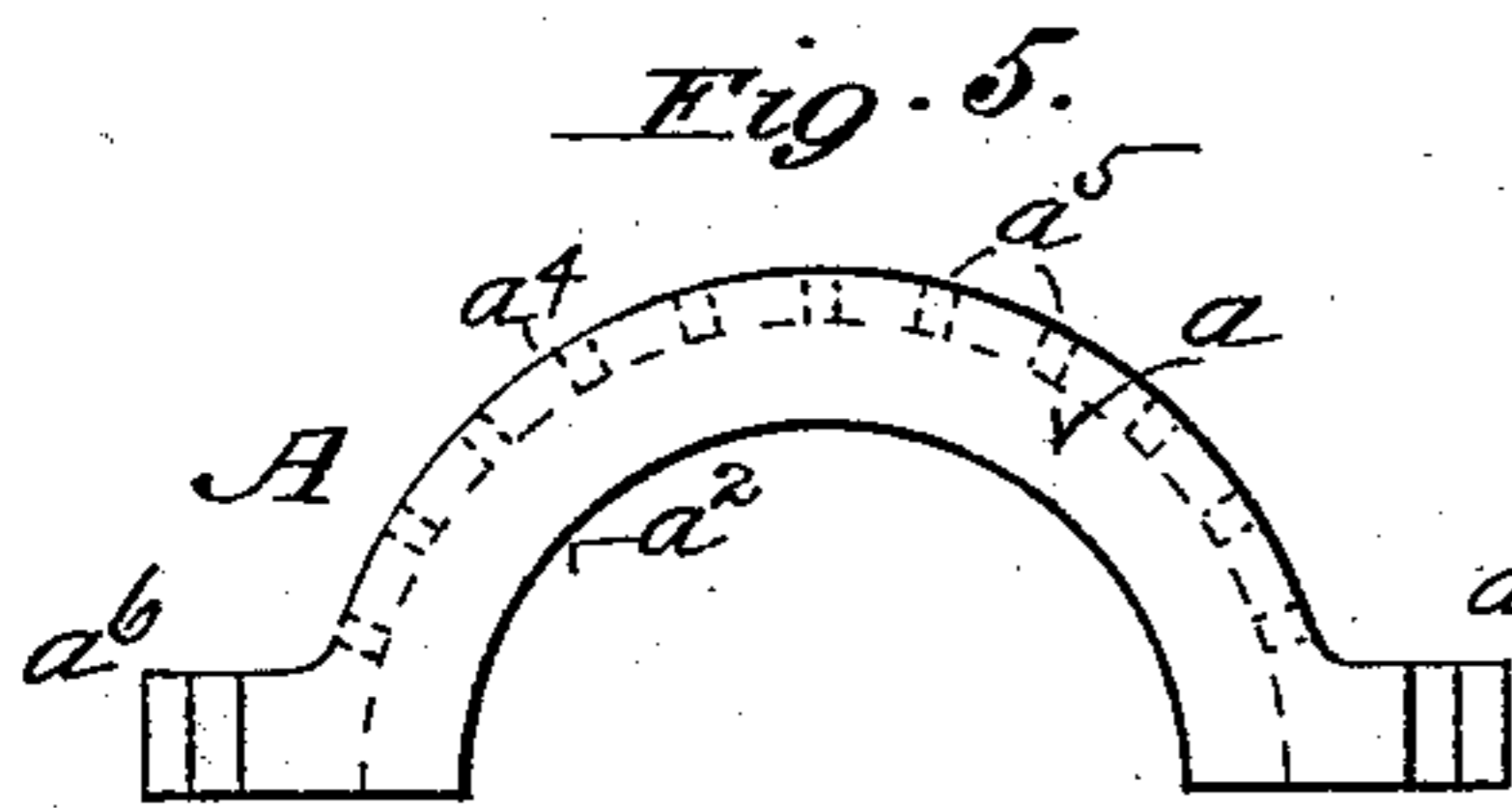
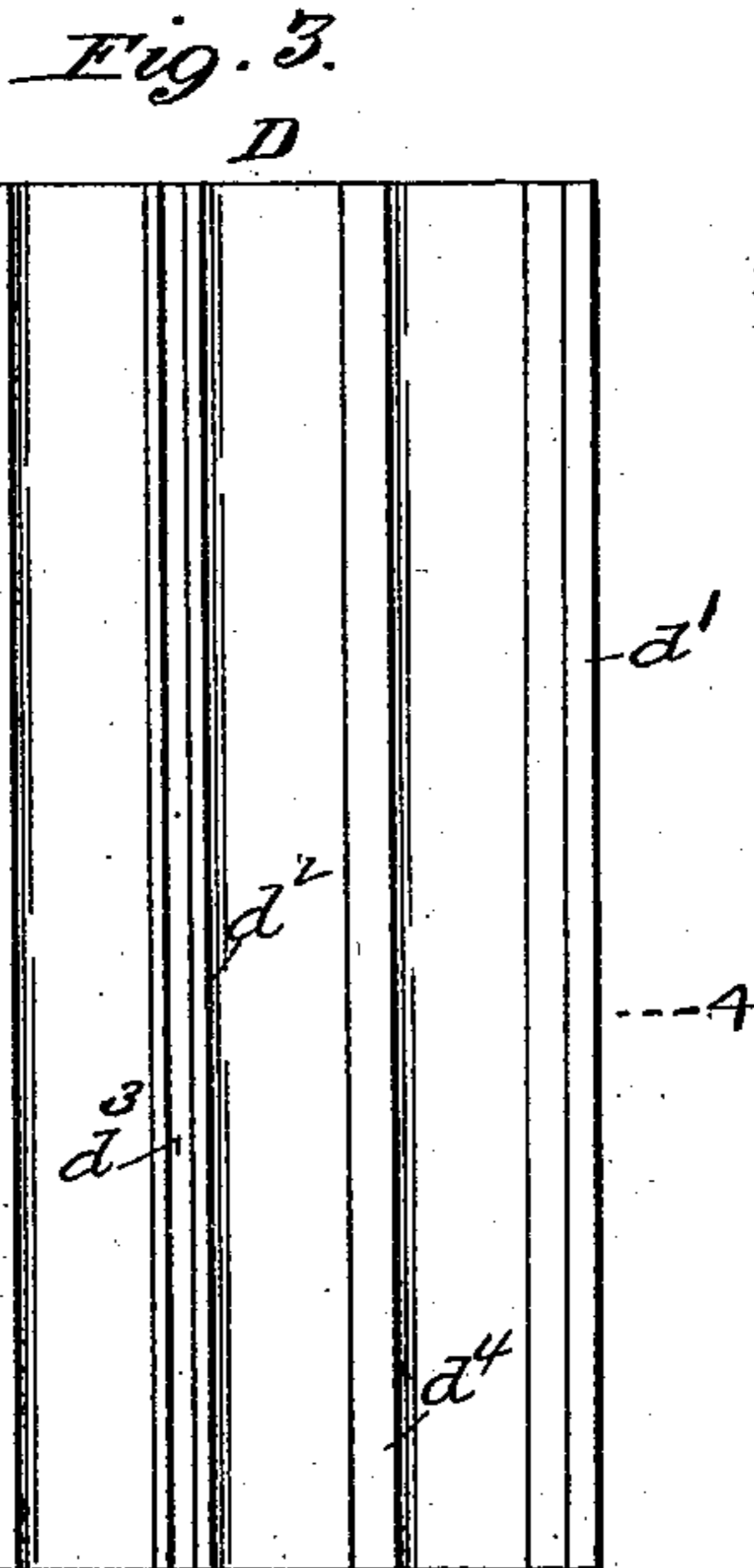
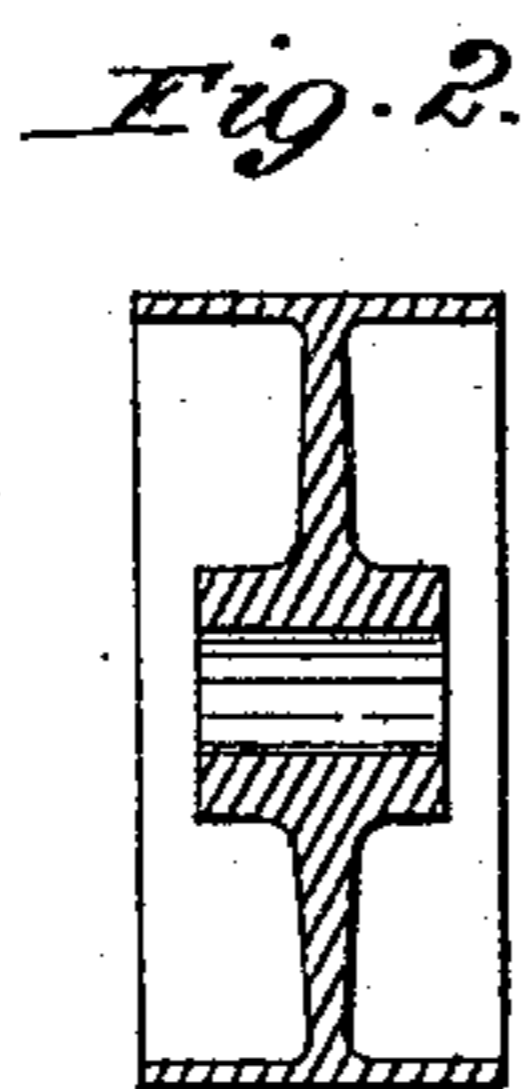
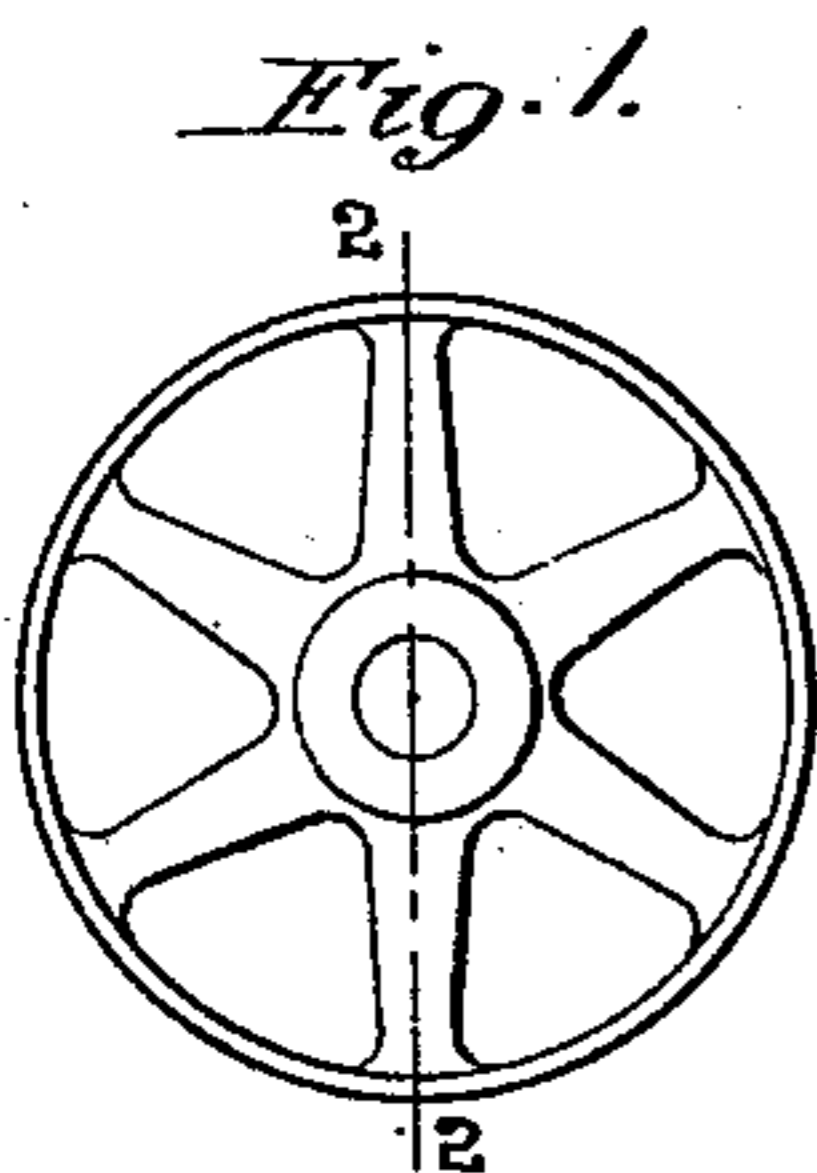
(No Model.)

2 Sheets—Sheet 1.

D. M. SPRINGER.  
MOLDING APPARATUS.

No. 552,076.

Patented Dec. 24, 1895.



WITNESSES  
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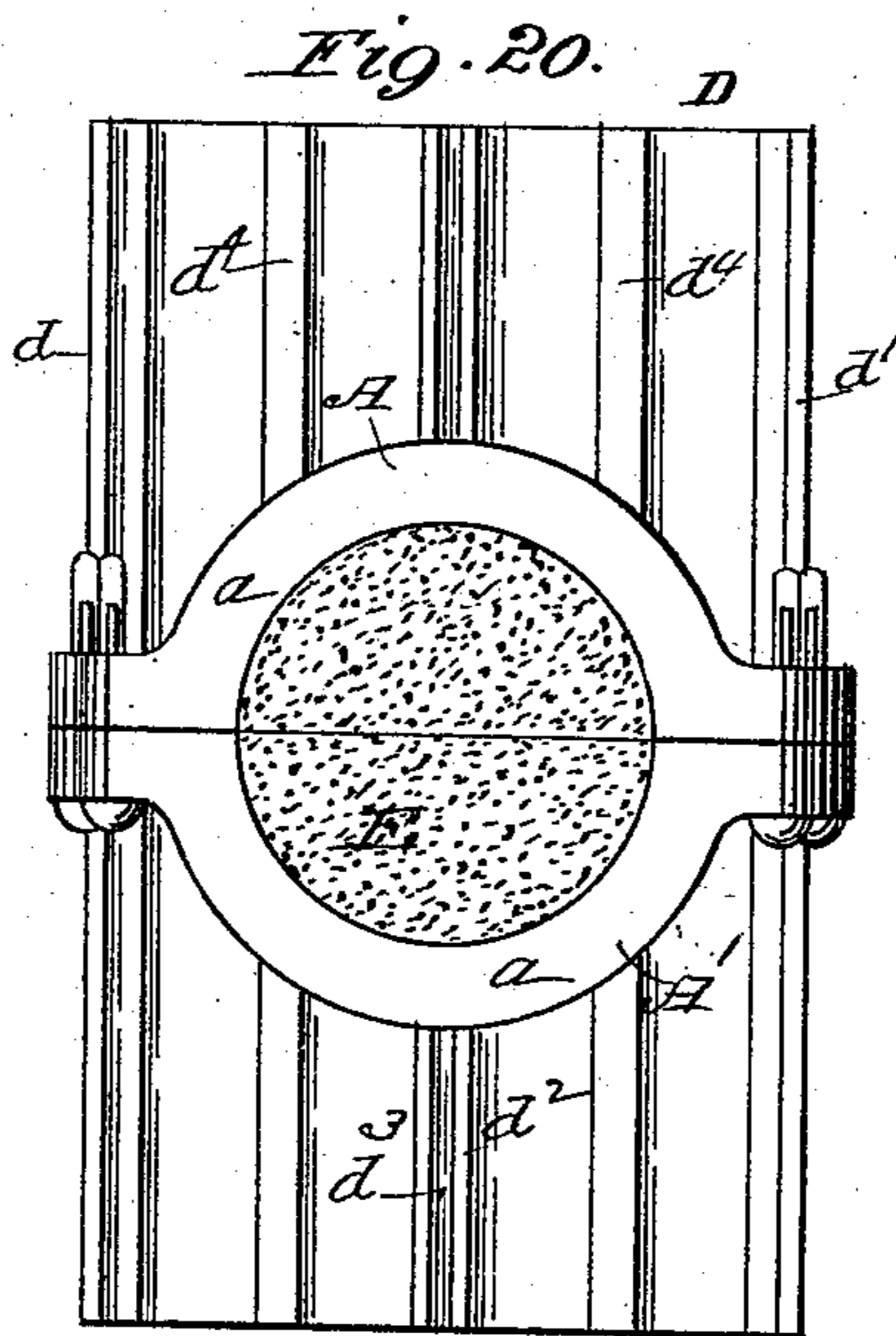
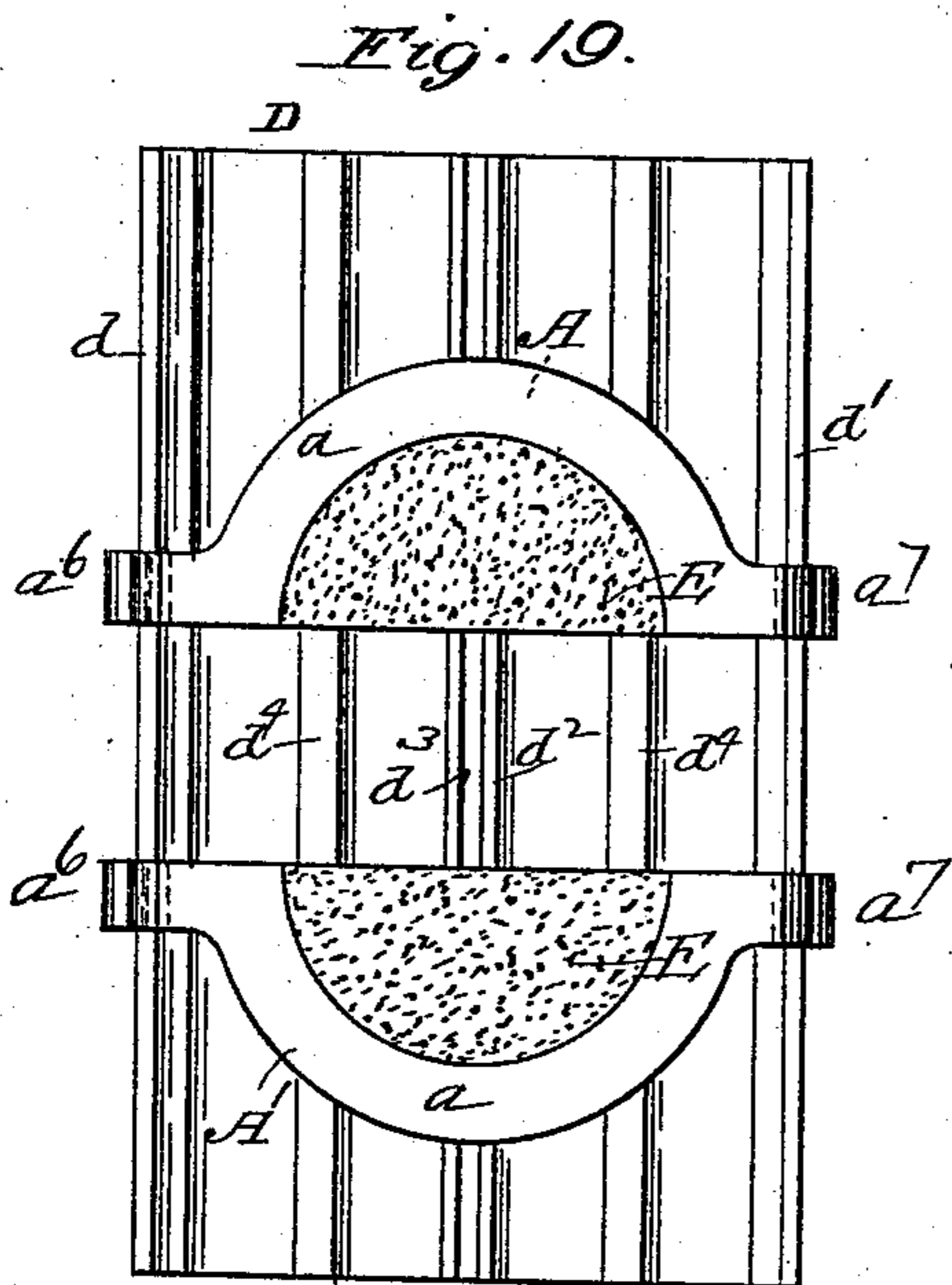
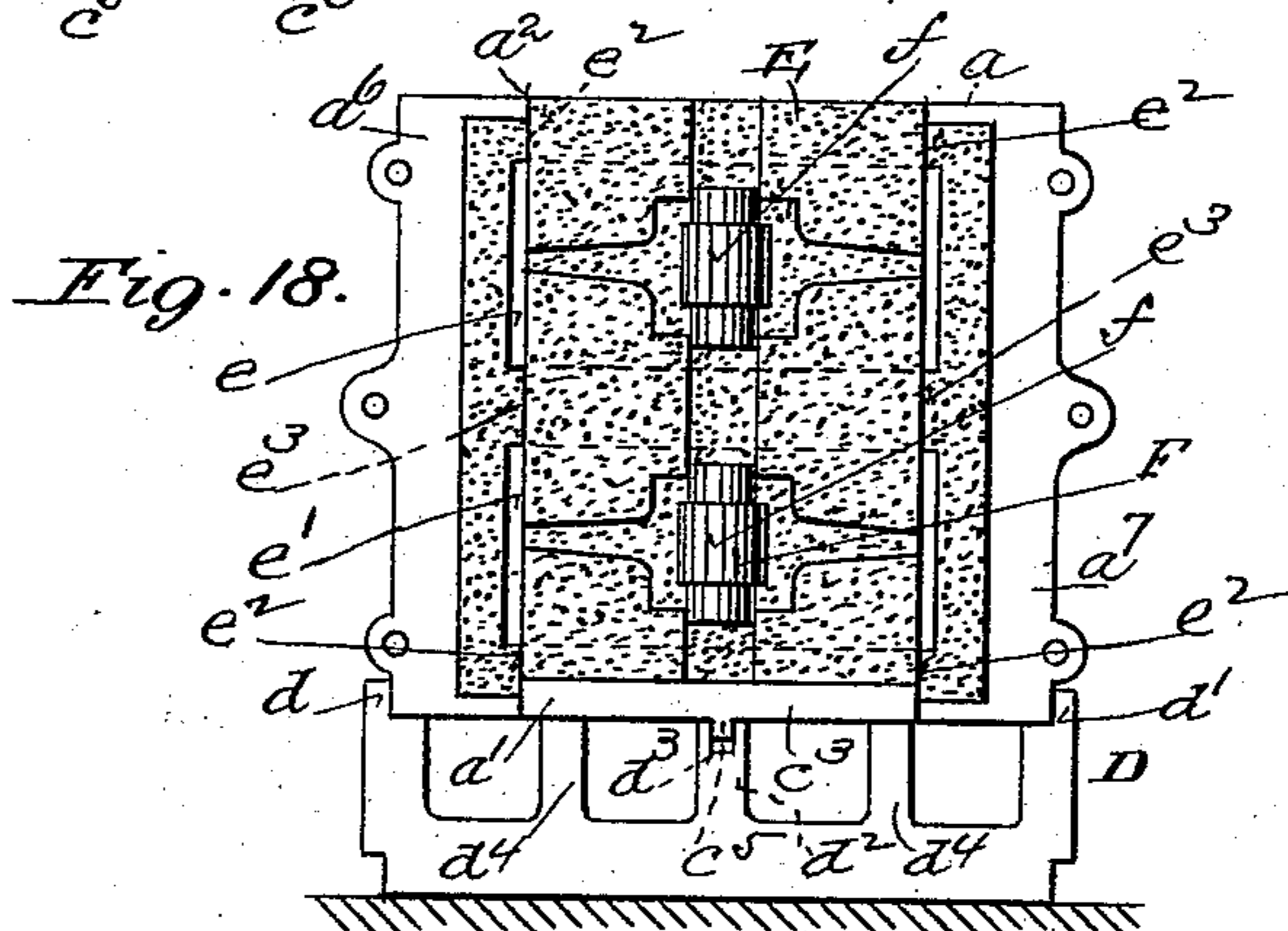
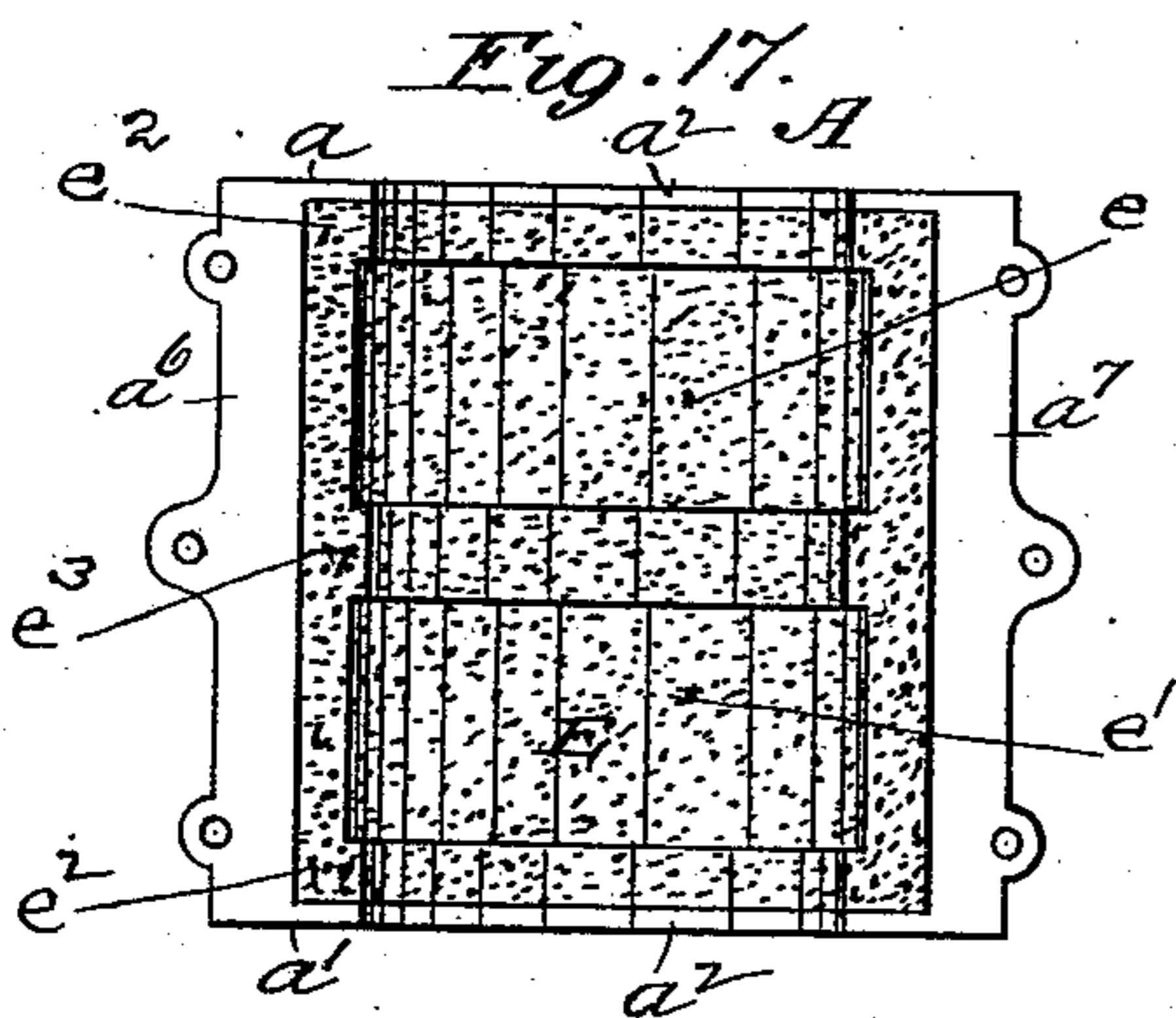
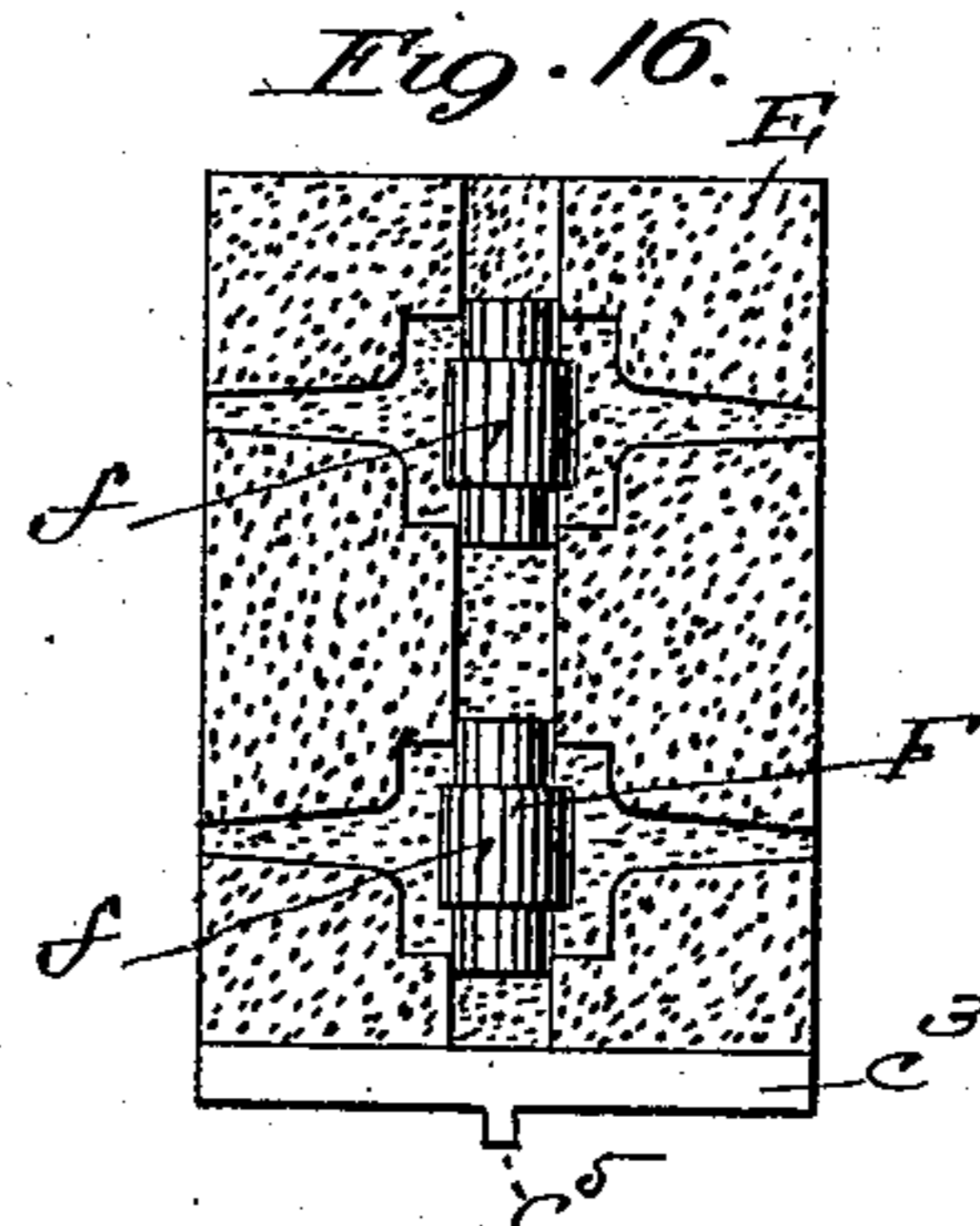
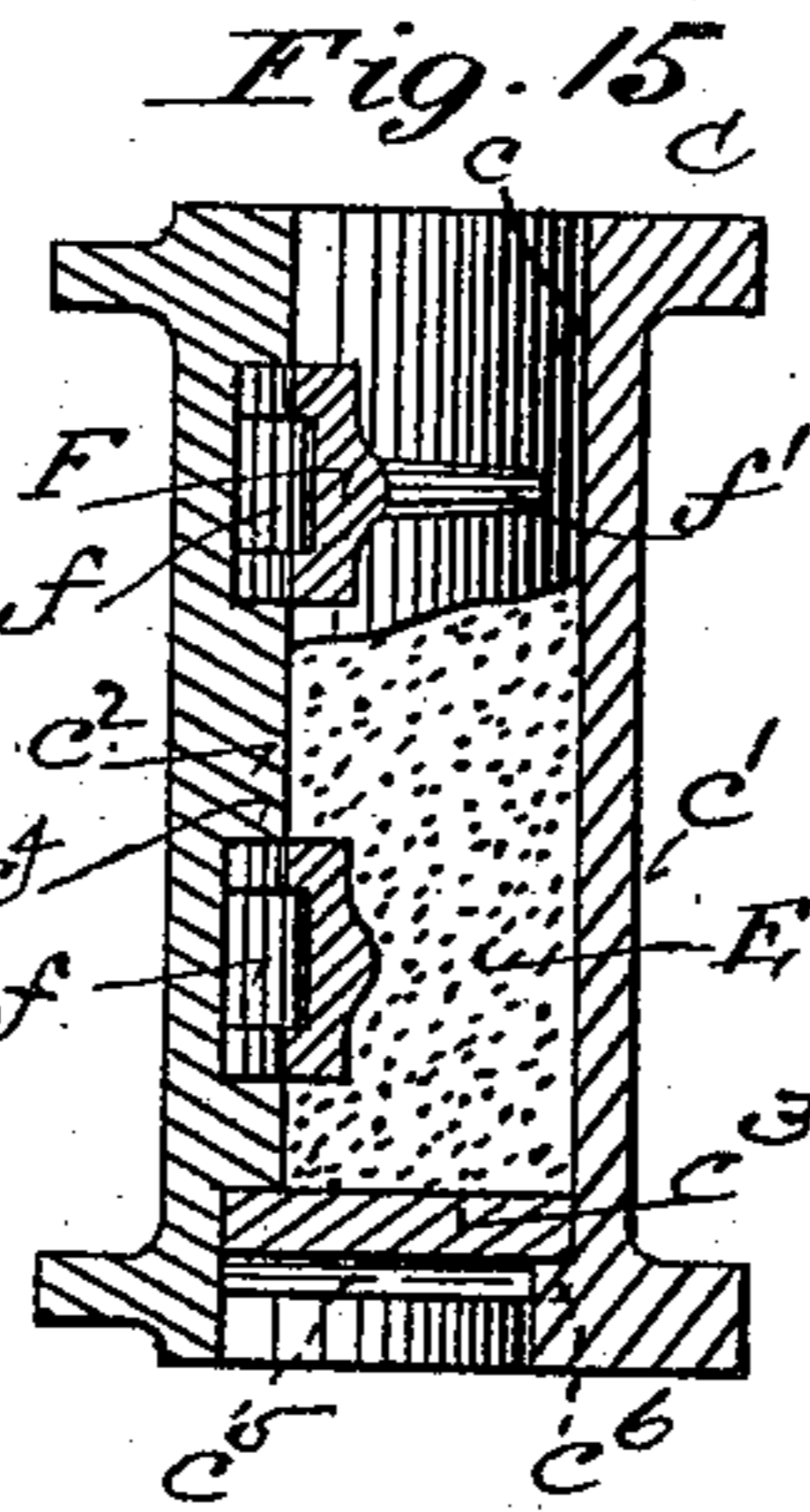
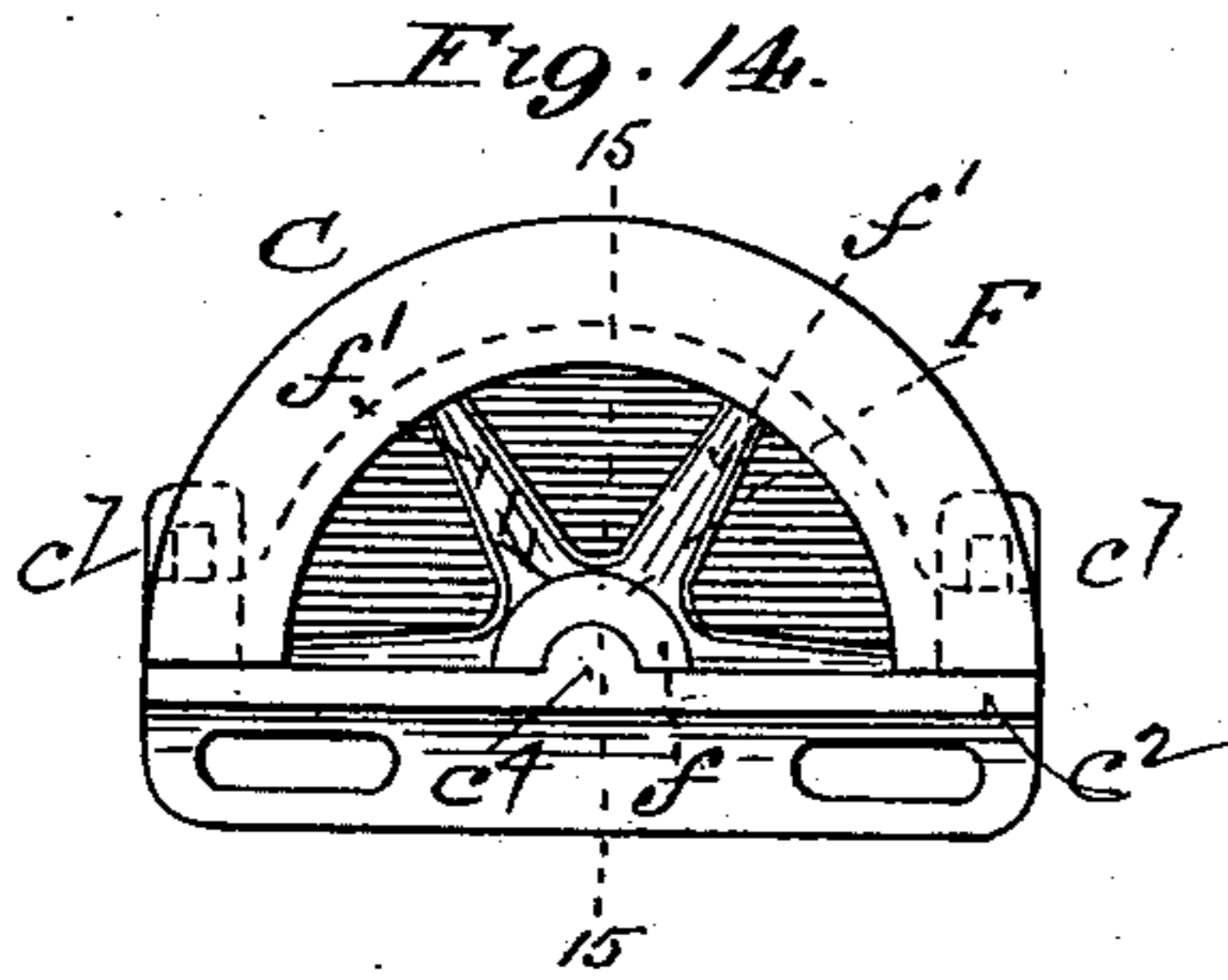
(No Model.)

2 Sheets—Sheet 2.

D. M. SPRINGER.  
MOLDING APPARATUS.

No. 552,076.

Patented Dec. 24, 1895.



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# UNITED STATES PATENT OFFICE.

DANIEL M. SPRINGER, OF LITTLE ROCK, ARKANSAS, ASSIGNOR OF ONE-HALF TO THE THOMAS MANUFACTURING COMPANY, OF SAME PLACE.

## MOLDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 552,076, dated December 24, 1895.

Application filed October 19, 1893. Serial No. 488,625. (No model.)

*To all whom it may concern:*

Be it known that I, DANIEL M. SPRINGER, of Little Rock, Arkansas, have made a new and useful Improvement in the Manufacture of Cast-Metal Pulleys, Wheels, and other Cast Circular Articles, of which the following is a full, clear, and exact description.

This improvement relates to a molding apparatus, as is hereinafter set forth and claimed, aided by the annexed drawings, making part of this specification, in which—

Figure 1 is a side elevation of a pulley capable of being made by means of the improvement under consideration; Fig. 2, a cross-section on the line 2 2 of Fig. 1; Fig. 3, a plan of the base-plate which forms part of the apparatus in question; Fig. 4, a cross-section on the line 4 4 of Fig. 3; Fig. 5, a top view of one of the parts of the flask; Fig. 6, an inside elevation of the same; Fig. 7, an outside elevation of the same; Fig. 8, a plan of the roller that is used in conjunction with the flask parts in forming the mold; Fig. 9, a plan of the removable plate which forms the bottom of one of the flasks; Fig. 10, an edge elevation of the same; Fig. 11, an elevation, from the inner side thereof, of the flask for forming the inner mold-section; Fig. 12, a top view of the same; Fig. 13, an elevation of the same, looking in the direction of the arrow 13 of Fig. 12; Fig. 14, a top view of the same containing the patterns for forming the hub and spoke-chambers of the mold; Fig. 15, a section on the line 15 15 of Fig. 14, the flask being partially filled with sand; Fig. 16, an inside elevation of one-half of the inner mold-section, the cores employed in forming the bore of the hubs being in position and the mold-section resting upon the bottom of the flask; Fig. 17, an inside elevation of one of the outer flask parts having the sand molded therein; Fig. 18, a view showing in elevation and from the inner side thereof one-half of the entire mold, and it is shown resting upon the base-plate; Fig. 19, a top view of the mold supported upon the base-plate, the two halves of the mold being separated from each other; and Fig. 20, a view similar to that of Fig. 19, but showing the mold-sections assembled and

fastened to each other forming a complete mold.

The same letters of reference denote the same parts.

In carrying out the present improvement I employ an apparatus consisting principally of the following parts: two similar flask parts A and A', a roller B, a flask C and a base-plate D. The flask parts are for forming and holding that wall of the mold against which the face of the rim of the pulley, &c., is produced. The thickness of the rim is also formed in that part of the mold which is held in the flask parts.

The flask C is for forming that part of the mold E in which the spokes and hub, or that portion of the casting which is within the rim, is made. It is also for forming that part of the mold against which the inner side of the pulley-rim is cast. The base-plate not only serves to sustain the mold during the casting operation but also to facilitate the assembling and the relative adjustment of the mold-sections. The roller is used in conjunction with the outer flask parts. Certain portions of the flask parts and of the flask C are concentrically made—that is, in arcs of circles whose centers coincide with that of the center of the articles to be cast, and the center of such portions is the center of the casting made therein, and this is the leading feature of the apparatus under consideration. While more and larger surfaces of the flask parts can be thus constructed I employ in each flask part two surfaces only—namely, the flanges  $a$   $a'$ —which are respectively at or near the ends of the flask parts. The inner edge  $a^2$  of each of said flanges is curved circularly, the center of said curves being as stated, the axis passing transversely through the center of the ultimate casting, and the curves being in the plane of the face of the rim of the casting. Between the flanges the flask part is hollowed out suitably and substantially, as shown, to form a receptacle  $a^3$  for the sand of that part of the mold. The shell  $a^4$  of the flask part is preferably circular, although not necessarily, as it might be otherwise shaped without de-

parting from the principle of the improvement. It is suitably perforated at  $a^5$  to provide for venting the mold. Each flask part has flanges  $a^6 a^7$  to provide for uniting the flask parts in completing the mold.

A portion of the mold is formed in the flask parts. For this purpose the roller B is brought into requisition. The roller has portions  $b$  and  $b'$ , which in the use of the roller ride upon the flanges  $a a'$  respectively of the flask part, and  $b^2 b^3$  are guide-flanges spaced just far enough apart to come upon the outer sides respectively of the flanges  $a a'$ . The roller is for pressing the sand in the flask part properly into shape to form the outer portion of the mold. So far as forming the face of the rim of the pulley or other casting is concerned the roller throughout its length between the guide-flanges may be of uniform diameter—that is, it may have the same diameter as that of the portions  $b b'$ ; but as I prefer to form the thickness of the pulley-rim in that part of the mold which is contained in the flask parts I provide the roller with bands or band-like projections  $b^4 b^5$ , which in width, contour and thickness correspond to the width, contour and thickness of the intended rim of the casting, and accordingly after the roller has been rolled forward and backward upon the flask part flanges  $a a'$ , recesses  $e e'$  are formed in the sand, substantially as shown in Fig. 17. At the points  $b^6 b^7 b^8$  the roller is of uniform diameter with the portions  $b b'$  to enable walls  $e^2 e^2 e^3$  of sand to be formed in the mold at each side of the recesses  $e e'$ , substantially as shown in Fig. 17. One-half of the outer portion of the mold is similarly formed in each of the flask parts A and A'. When the flask parts are semicircular two of them suffice to form the mold. If they are less than semicircular obviously more than two flask parts will be required.

As thus far described provision has been made whereby the face and thickness of the rim portion of the casting can be produced. The mold for that portion of the casting which is within the rim, including the wall for the inner side of the pulley-rim, is obtained by means of the flask C. This last-named part has the inner side  $c$  of its shell  $c'$  curved to conform to the curvature of the inner surface of the rim portion of the casting. The other principal parts of the flask C are the plate  $c^2$  which, when applied to the shell  $c'$ , incloses a semicylindrical space, and a semicircular plate  $c^3$ , which forms the bottom of the flask C. The plate  $c^2$  has a print in the form of a semicircular rib  $c^4$  extending vertically and centrally thereon, and the plate  $c^3$  has a rib  $c^5$  extending transversely and centrally thereon, all substantially as shown. The flask C is designed for forming one-half of the described central portion of the mold, and to form the other or remaining portion a similar flask C is employed, or after making one half of said central portion the other half thereof can be made in the same flask C, providing an ad-

ditional bottom plate is used. To form the mold of the portion of such central part which is within the rim the plate  $c^3$  is inserted in the shell  $c'$ , to rest upon a ledge  $c^6$  thereon, and the plate  $c^2$ , having a suitable sectional pattern F provided (when a pulley is to be made) with hub portions  $f$ , a central core  $f^{10}$ , of suitable material and spoke portions  $f'$  properly centered and arranged, is, by means of suitable fastenings  $c^7$ , attached to the shell  $c'$ , all substantially as shown, and the sand is rammed into the flask C, as indicated in Fig. 15. The plate  $c^2$  and the attached print are then removed and the patterns  $f$  and  $f'$  withdrawn from the sand. The described half of the central portion of the mold, resting upon the bottom plate  $c^2$ , is then removed from the shell  $c'$ . The other half of the central portion of the mold is similarly made. The entire mold in this manner has now been produced, but in four separate portions—namely, the two portions which have been formed, and which now remain held in the two flask parts, respectively, and the two portions which have been made in the flask or flasks C, and which now each rest upon a bottom plate  $c^2$ . It remains to assemble these parts and properly unite them to complete the mold, and for this purpose the base-plate is brought into requisition. Said plate has flanges  $d d'$  extending longitudinally upon the plate and spaced far enough apart from each other to receive between them and sustain the two flask parts. The base-plate also has a central rib  $d^2$  grooved at  $d^3$ , and two ribs  $d^4 d^4$ , arranged, respectively, at the sides of said central rib, and said three last-mentioned ribs serving to sustain the bottom plates, as shown. The rib upon the under side of the bottom plates engages in the groove in the central rib. The two halves of the central section of the mold are properly brought face to face and in contact with each other, the bottom plates of the flask C being slipped upon the base-plate, and guided by the bottom plate-ribs engaging in the grooved rib, as described, until the mold-sections are in contact. The two flask parts containing their respective portions of the mold are then slipped upon the base-plate until they meet and are fastened together, as in Fig. 20. When the parts are thus assembled the bottom plates of the flasks meet the flanges  $a'$  of the two outer flask parts, and the sand of the central portion of the mold meets the sand of the flask portion of the mold at the points  $e^2 e^2 e^3$ , and also meets the upper flanges  $a$ , all as indicated in Fig. 18. The mold is now complete and the casting is poured in the ordinary manner.

As illustrated in the drawings, provision is made for casting two pulleys at once. The apparatus can be designed for casting one or more pulleys, as preferred. The various projections  $b^4 b^5$  upon the roller are preferably in the form of bands which are loose upon a shaft, the object being to enable the different parts of the roller to rotate independently of

each other—that is, the roller in the present instance is composed of a shaft  $b^{10}$  and the bands  $b^4 b^5$ . The shaft is the part which rolls upon the flanges  $a a'$  and the bands as stated  
 5 are the portions which form the recesses in the mold. Each of these parts can rotate independently of the other as the roller is rolled over the flanges  $a a'$  and the sand, and thus the work of molding the sand can be readily  
 10 and properly performed. Bands of different widths can be interchangeably used.

The various described parts of the present apparatus, to obtain the best results, should be accurately made. The flask parts should  
 15 be accurately constructed and fitted to each other to enable the flanges  $a a'$  to jointly form perfect circles whose center is the center of the casting to be made, and the flask parts and the coacting portion of the flask C should  
 20 be accurately relatively constructed to enable the space in which the rim of the pulley is molded to be of uniform thickness, or otherwise constructed to suit the special shape of the casting being made, and the base-plate  
 25 should have its side flanges and its central groove, or whatever equivalent feature is substituted for such central groove, properly relatively arranged, substantially as shown, to enable the flask portions and the central  
 30 portions of the mold to be assembled concentrically. The pulley is thus enabled to be cast in a mold whose center and circular portions are mechanically true, and with reasonable care in molding the mold and the pulley  
 35 should be and are exactly made. The roller when used as described solidifies the surface portion of the sand where the face of the pulley is molded, but the sand farther back in the flask part is not so much compacted, and  
 40 thus a better outlet is provided for venting the gases.

There is much less liability in the present pulley-molding apparatus that there will be any unequal expansion or giving way of the  
 45 mold before the molten metal, and hence there is more certainty that the pulley-rim will be of uniform thickness throughout and the pulley thereby better balanced.

Another advantage accruing from the improvement is that any desired crown, or any special shape, can be imparted to the pulley-rim. By suitably shaping the band or bands upon the roller any desired form, in the respects mentioned, can be produced in the pulley or other casting being made. A grooved

pulley—such, for instance, as used in transmitting power by means of ropes or a flanged pulley—can be as easily made as a smooth pulley. It will be noted that the flanges  $a a'$   
 60 upon the flask parts are the means for gaging the impression produced in the sand in the flask parts; and while I prefer to employ a roller such as shown, and while the desired impression in the sand of the flask part is produced more satisfactorily by rolling the  
 65 roller upon the flask-flanges  $a a'$ , I desire not in all cases to be restricted thereto, as other means may be employed in connection with said flanges to produce the desired impression in the sand. 70

The flask part or parts may be used for making split pulleys. After molding a flask part and a half-central-mold portion in the manner described said part and portion may be arranged concentrically, and the space between them by any suitable means, (not shown,) be closed to form a complete mold in which a half of a split pulley may be cast, and by repeating the operation the two pulley-halves are obtained. Any needed lugs to be  
 80 used in uniting the parts of the pulley may be specially provided for in shaping the mold.

I do not broadly claim herein the series of mold-sections, the stacking-platform and the guides for directing the molds into position  
 85 on the platform.

I claim—

1. The herein described apparatus for making molds for pulleys and other cast-circular articles, consisting in combination of the outer  
 90 flask-parts, the inner flask-part, the support for the central mold sections, and the base-plate, said flask-parts and support being adapted to be assembled concentrically upon the base-plate. 95

2. The combination of the base plate flanged at its sides and grooved centrally, with the outer flask-parts and the support for the central portion of the mold provided with a lug.

3. The combination of the flask-part having the curved flanges and the sand receptacle and the roller having a band or bands loose thereon, substantially as described. 100

Witness my hand this 30th day of September, 1893.

DANIEL M. SPRINGER.

Witnesses:

H. H. SCHMUCK,  
 BEN. D. SCHAAD.