

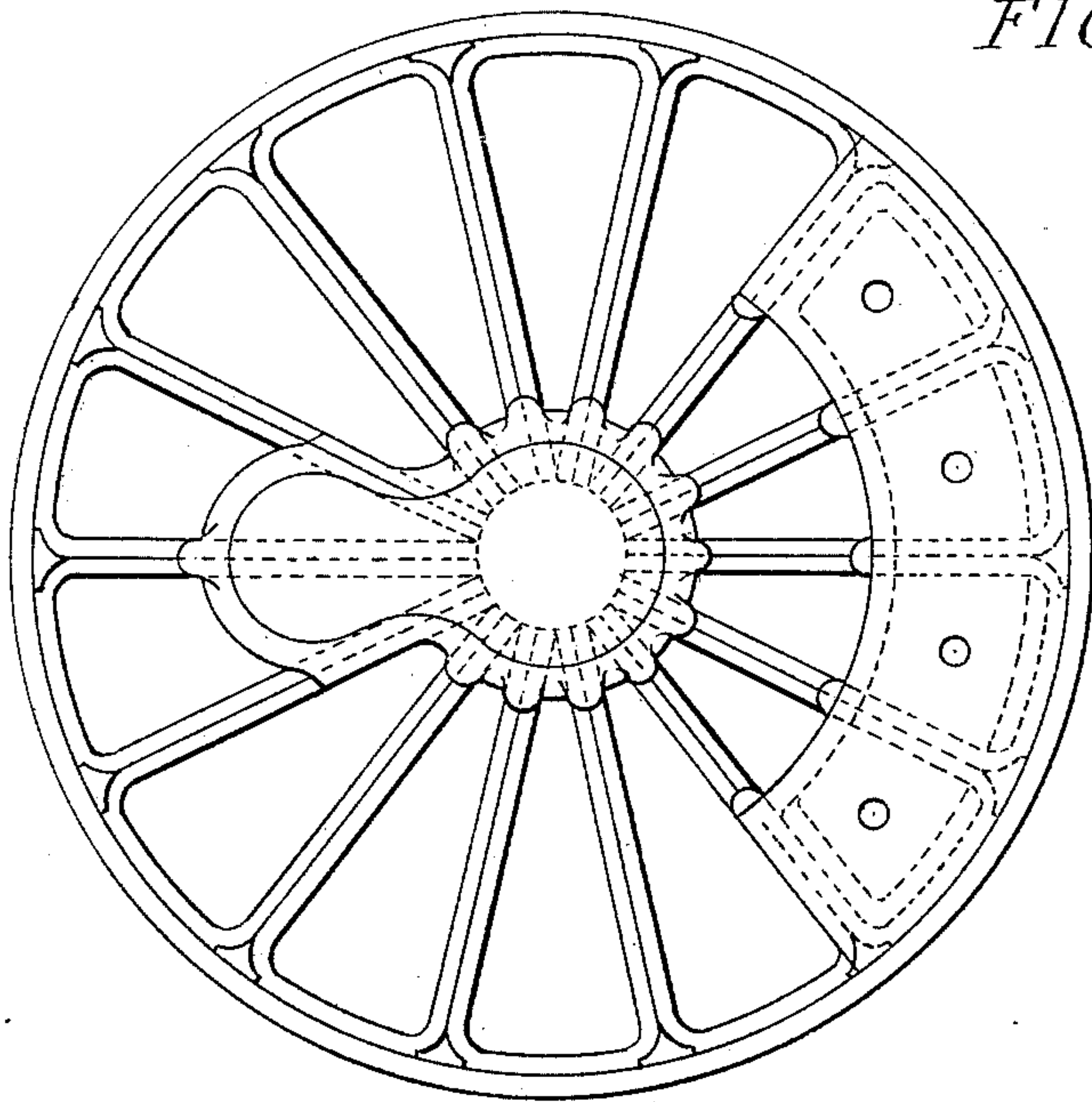
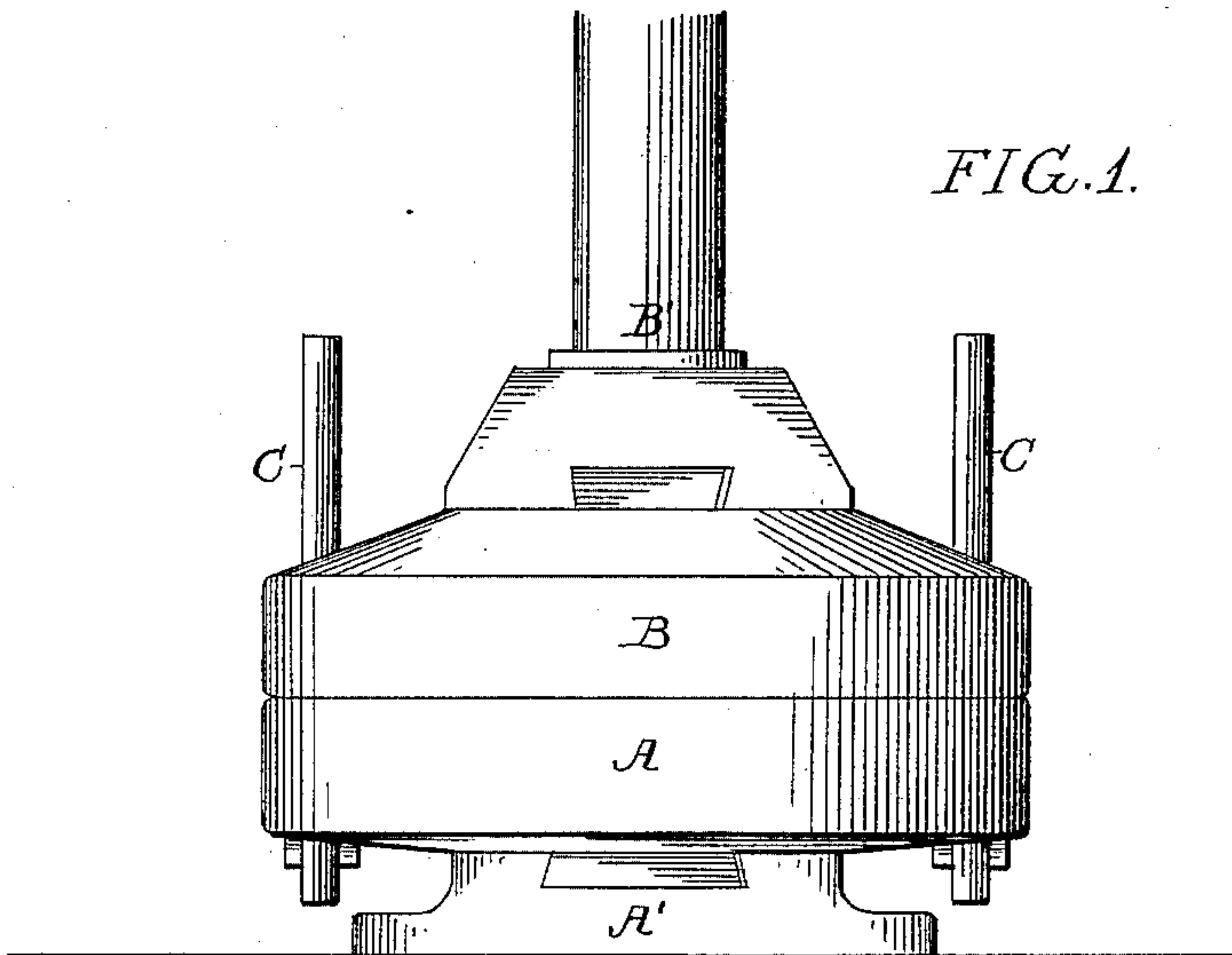
(No Model.)

4 Sheets—Sheet 1.

S. M. VAUCLAIN.  
DIE FOR FORGING WHEELS.

No. 462,605.

Patented Nov. 3, 1891.



Witnesses:  
Hamilton D. Turner.  
R. Schleicher.

Inventor:  
Samuel M. Vauclain  
by his Attorneys  
Howson & Howson



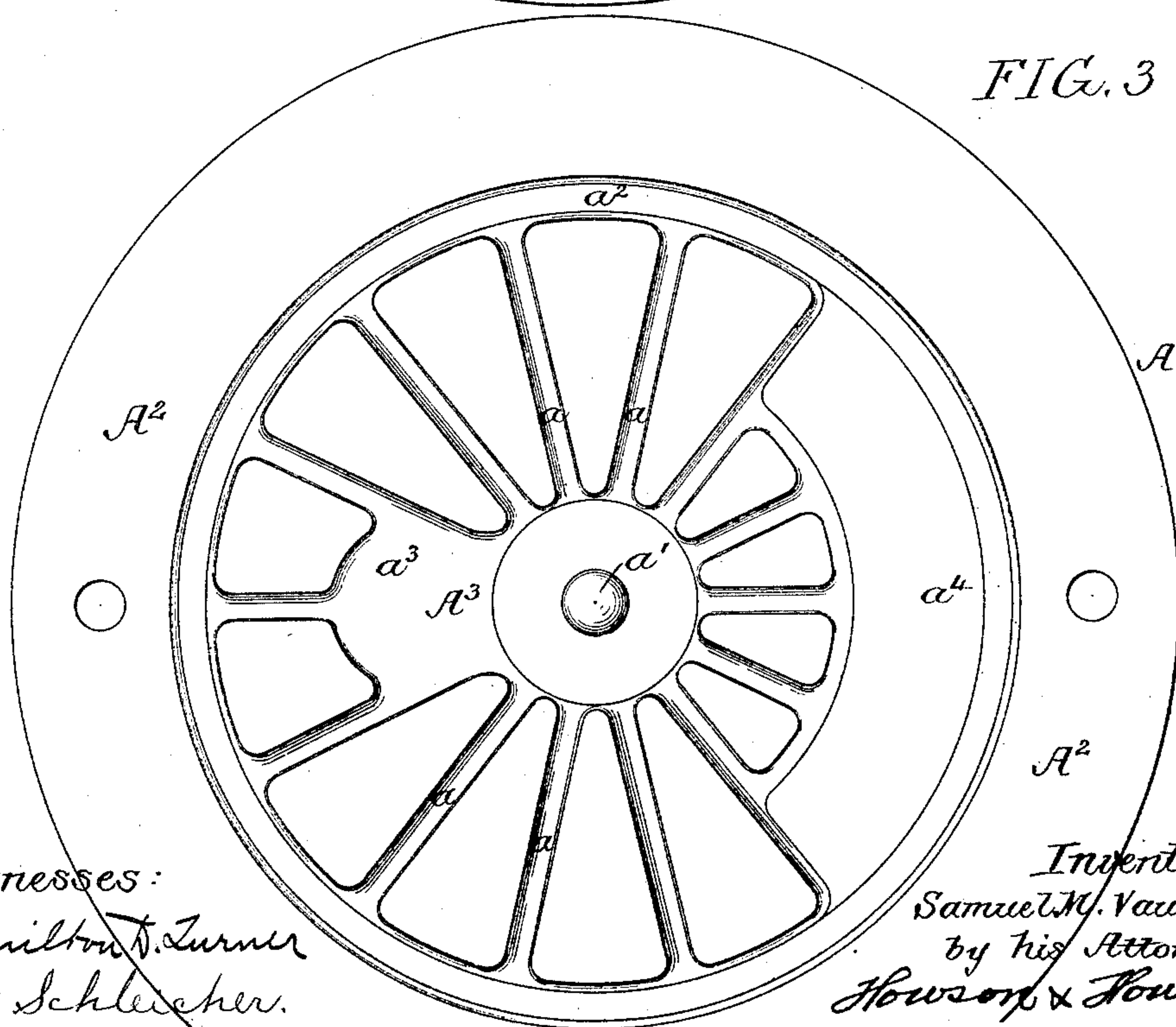
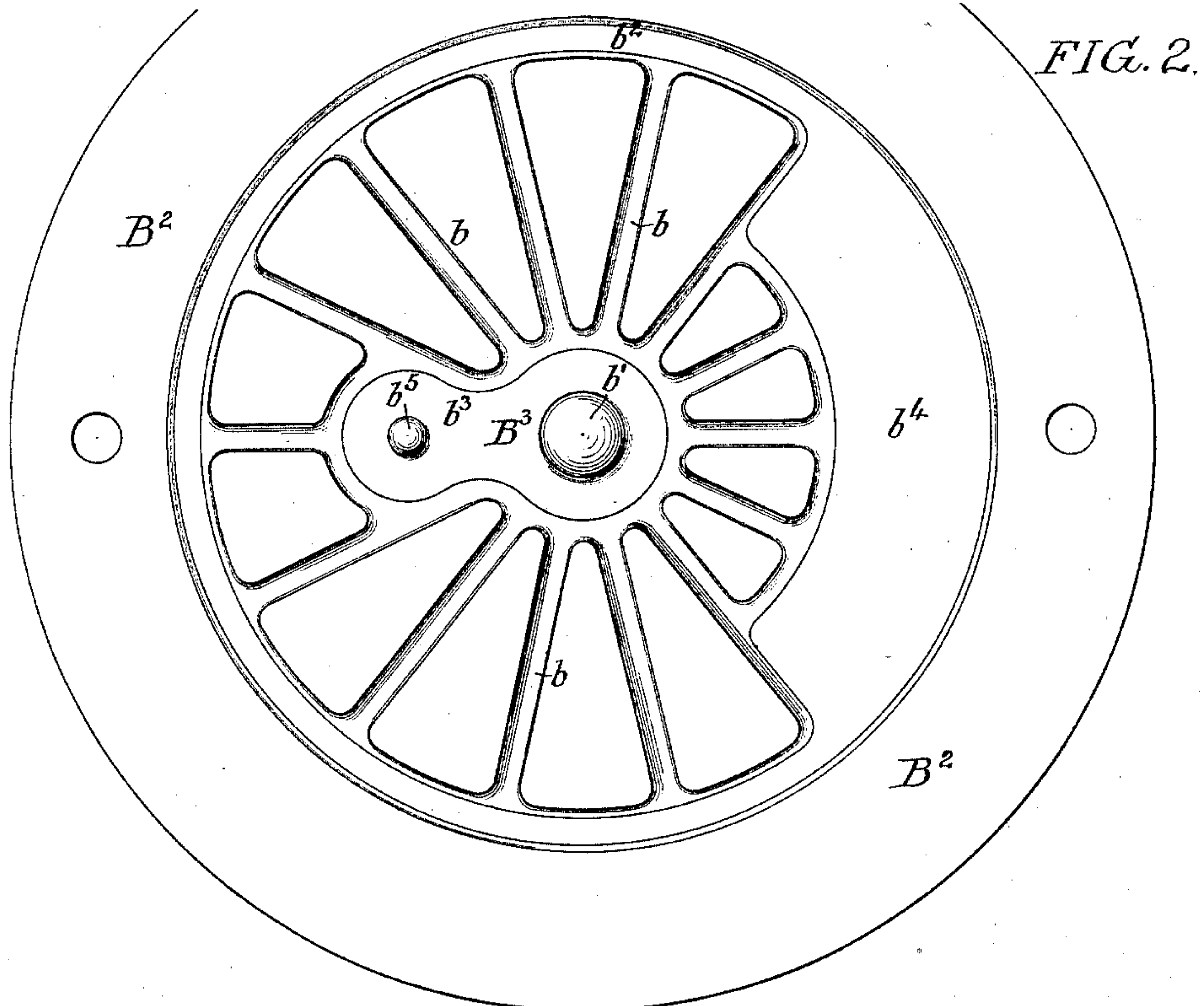
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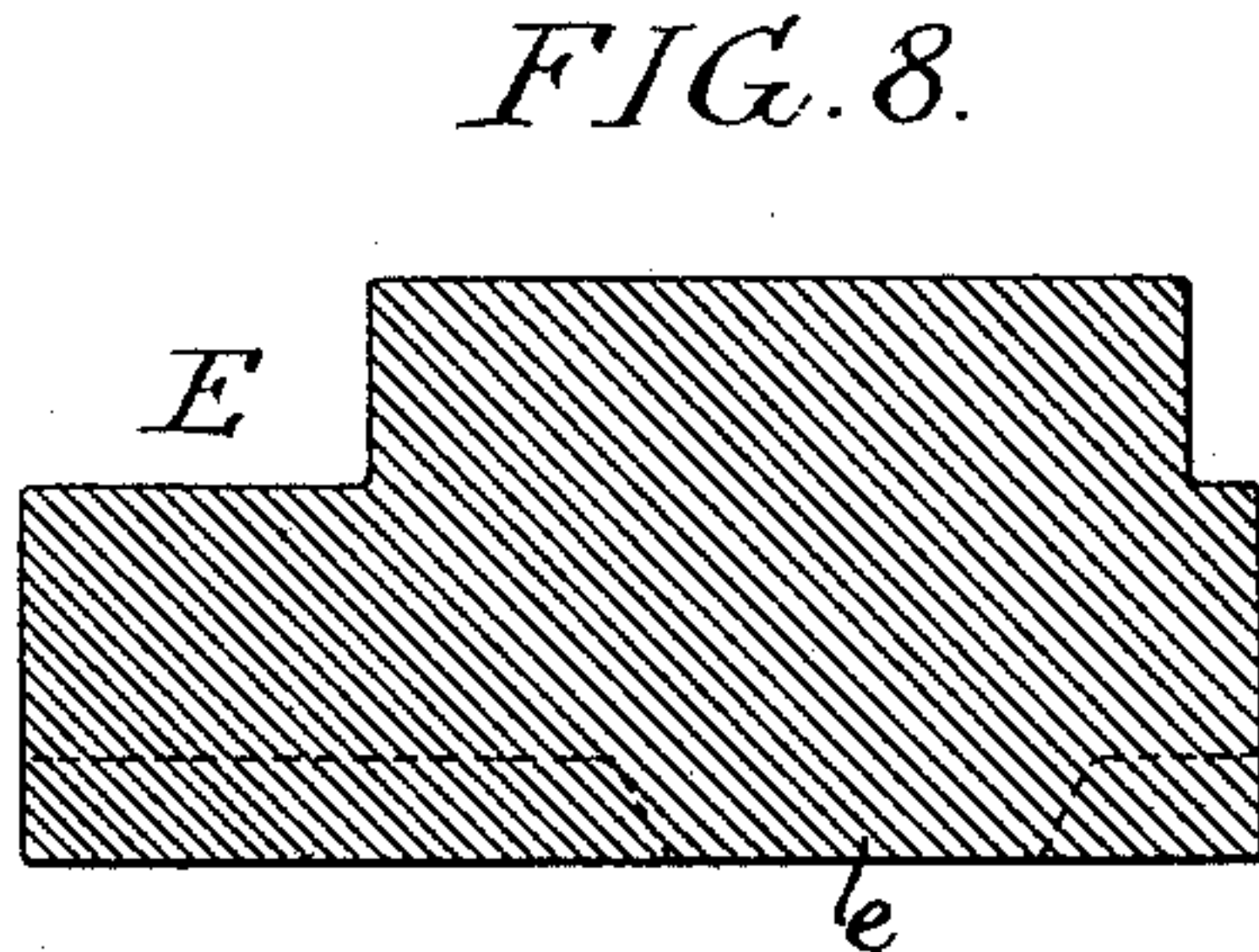
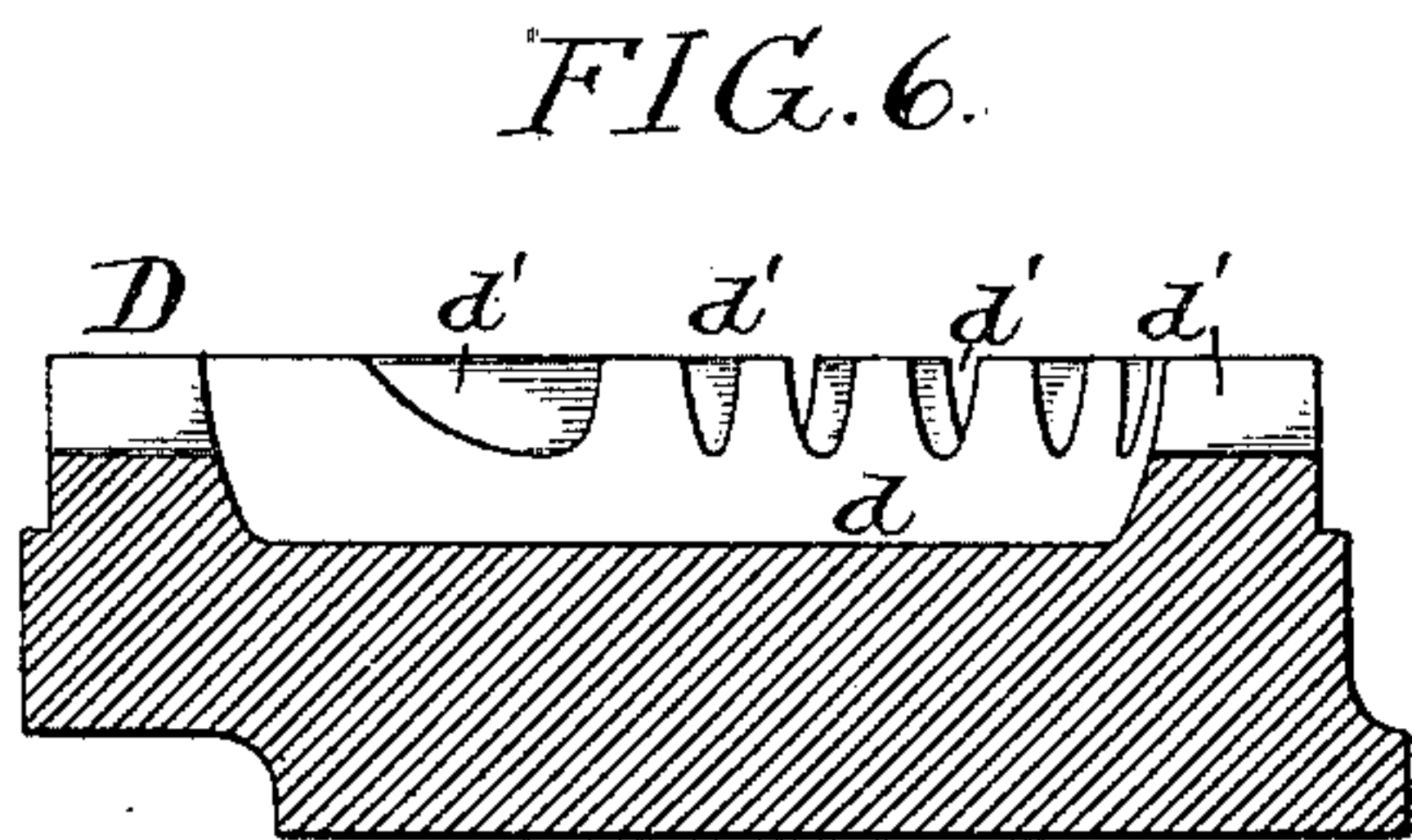
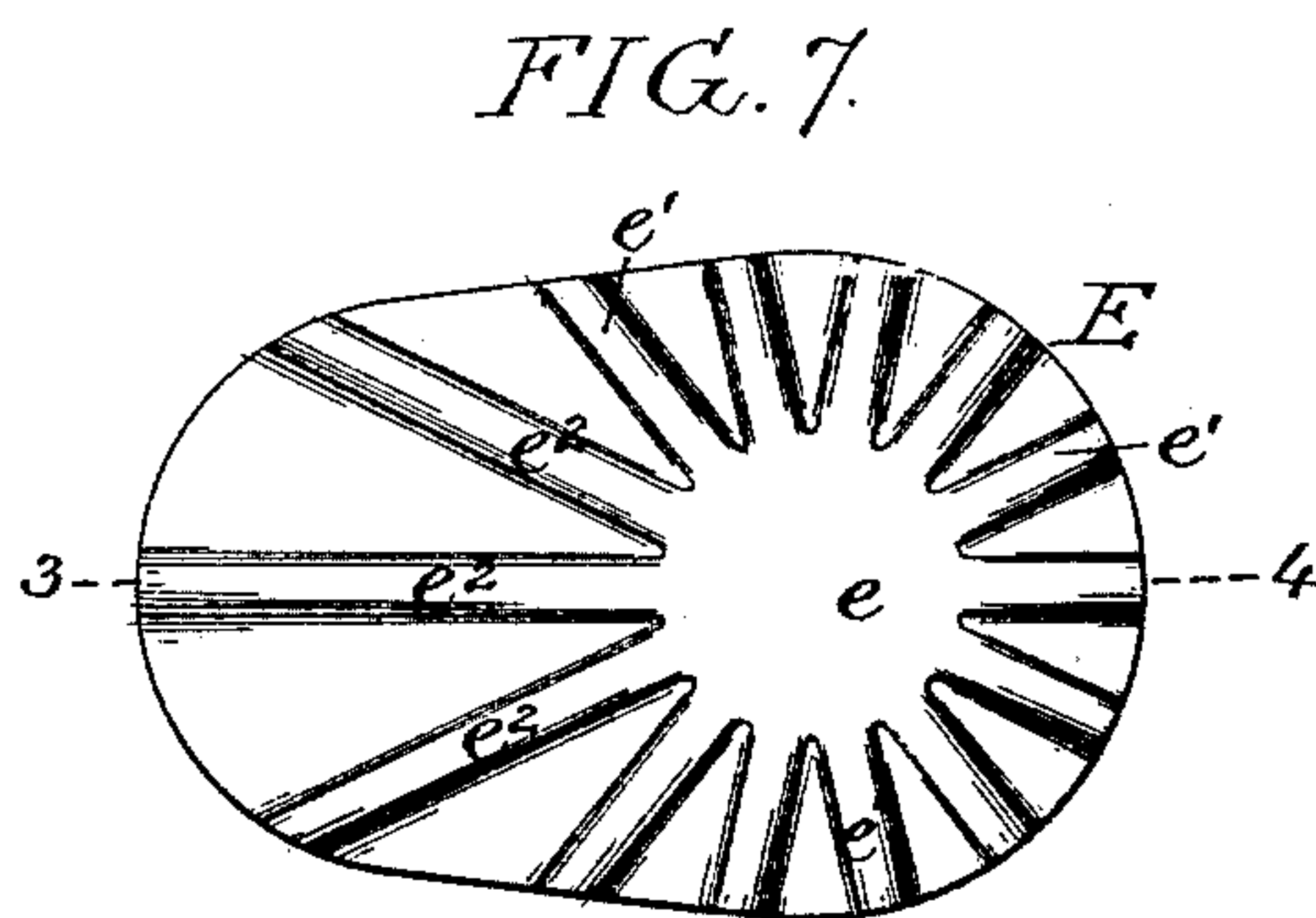
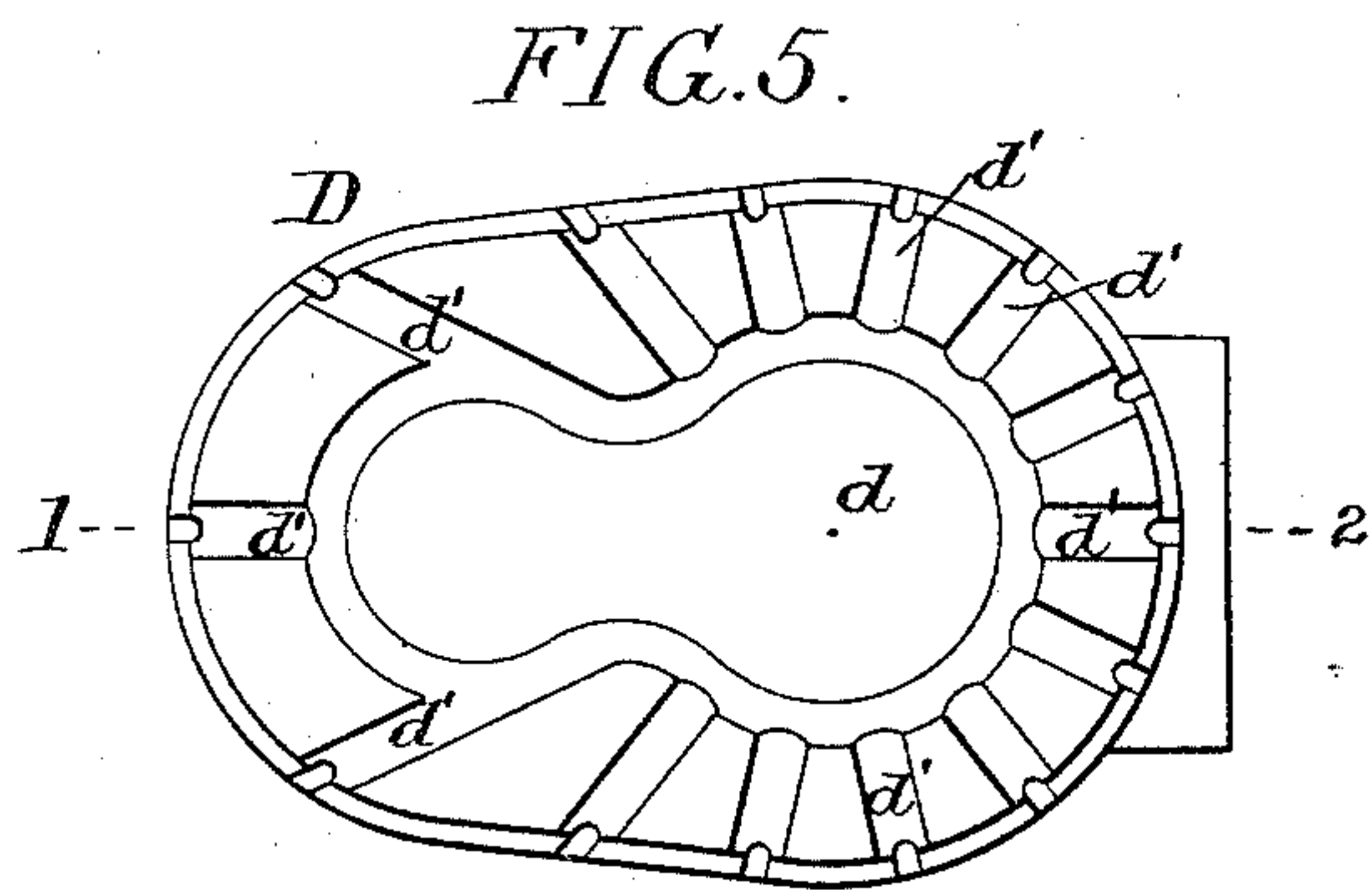
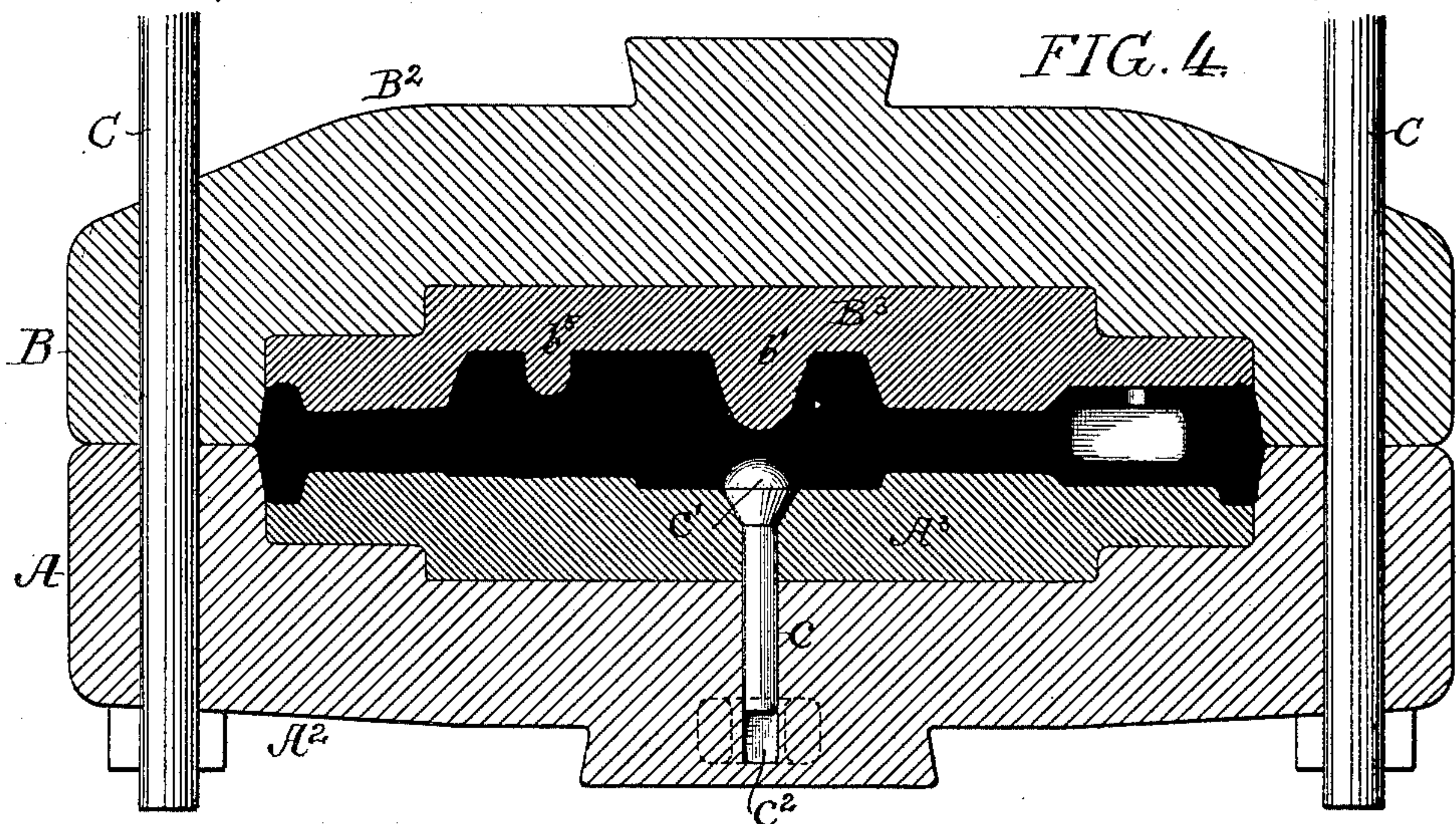
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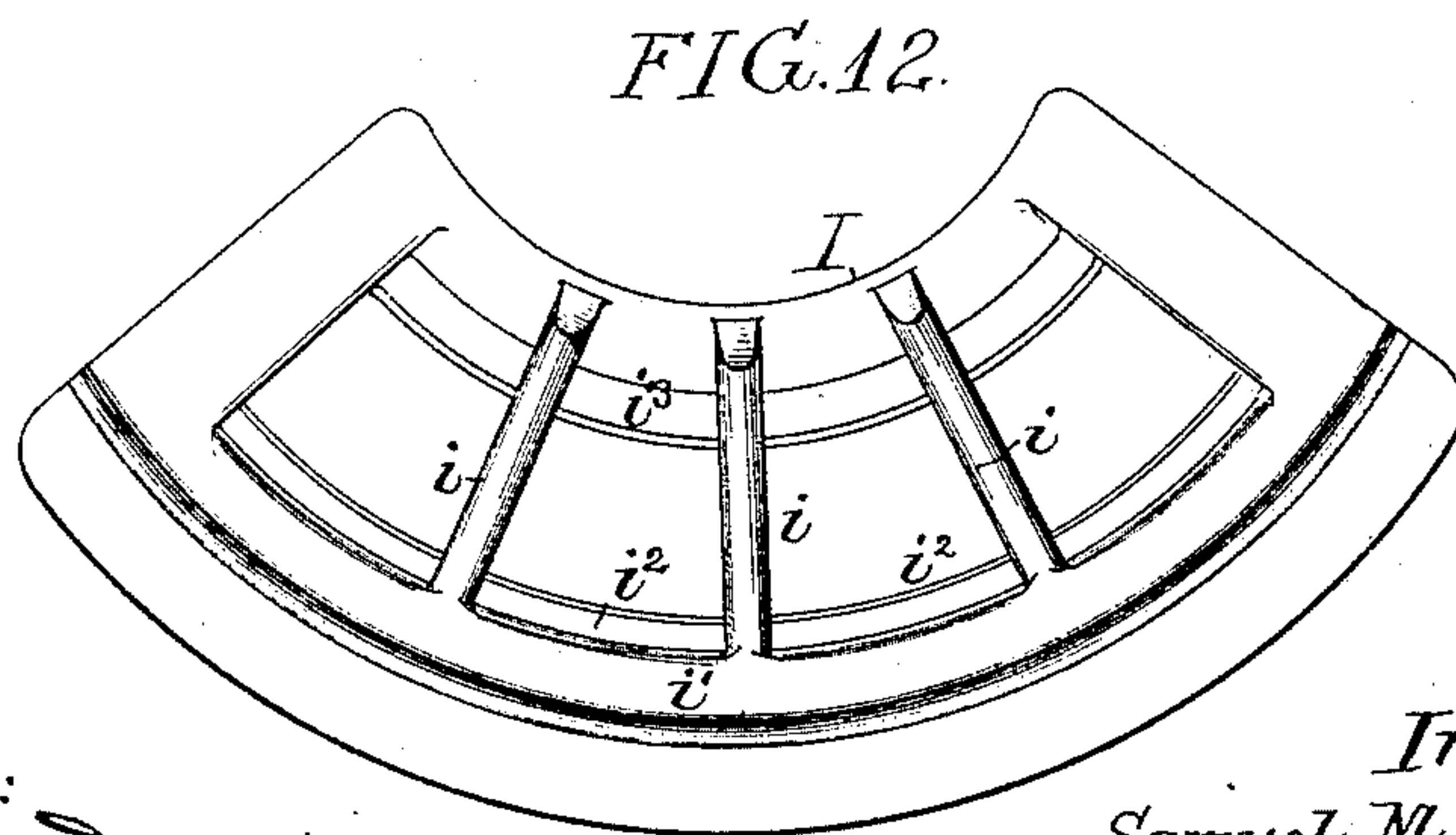
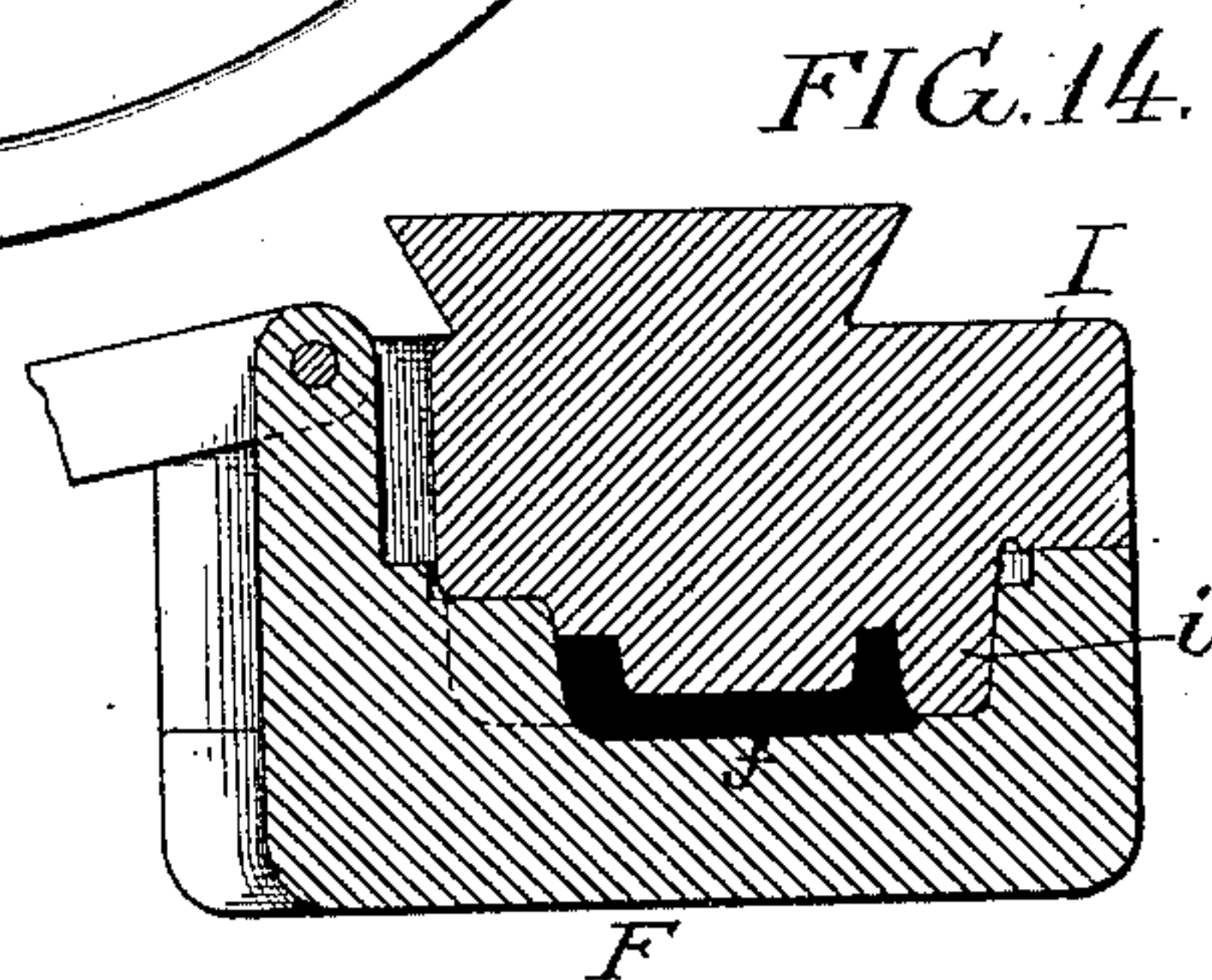
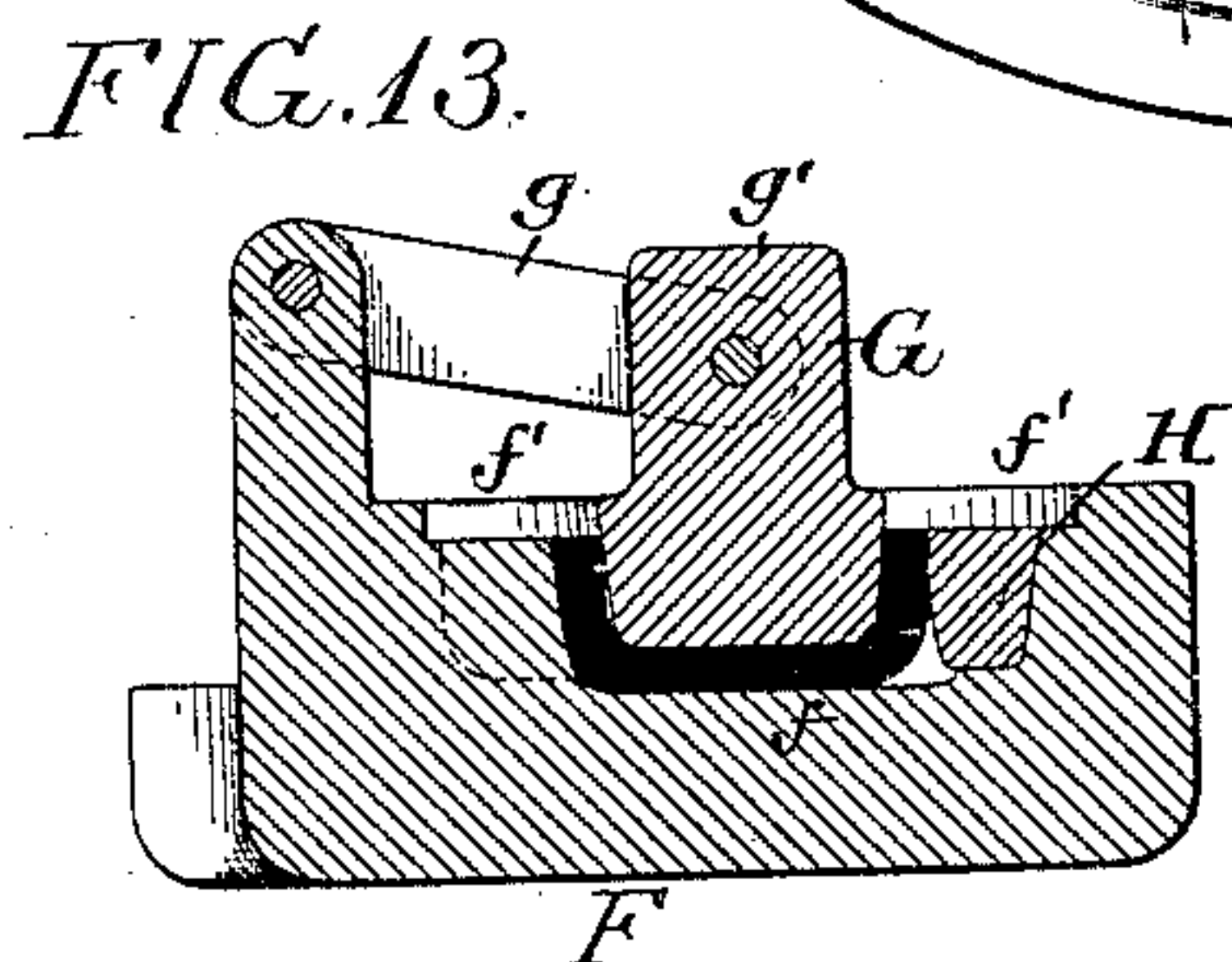
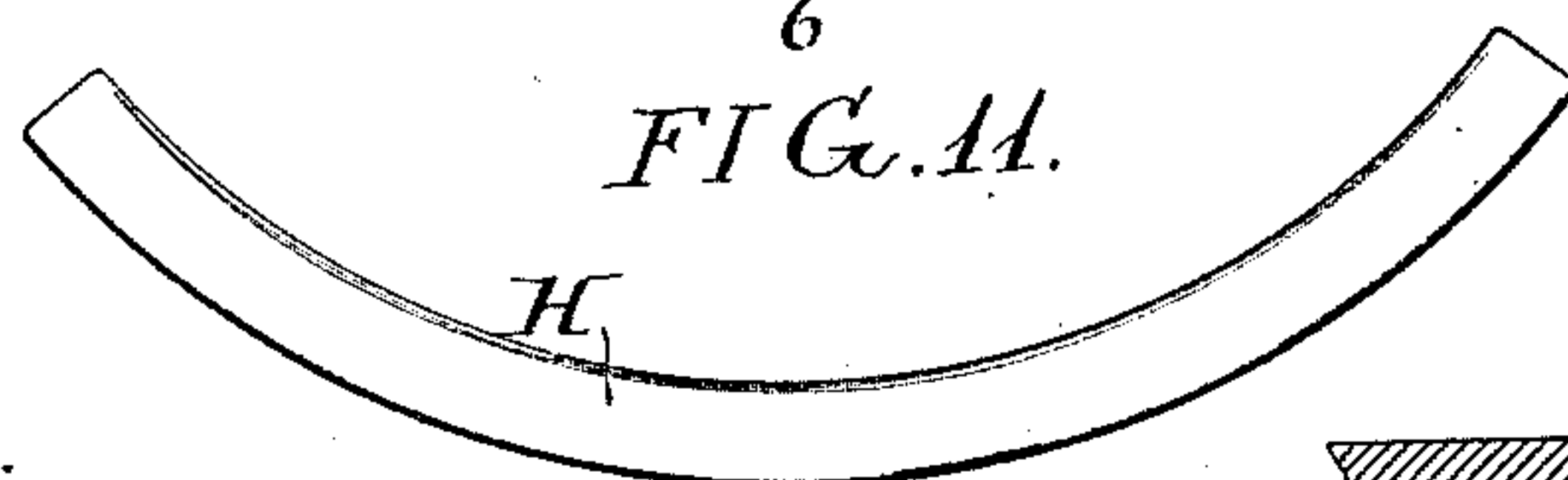
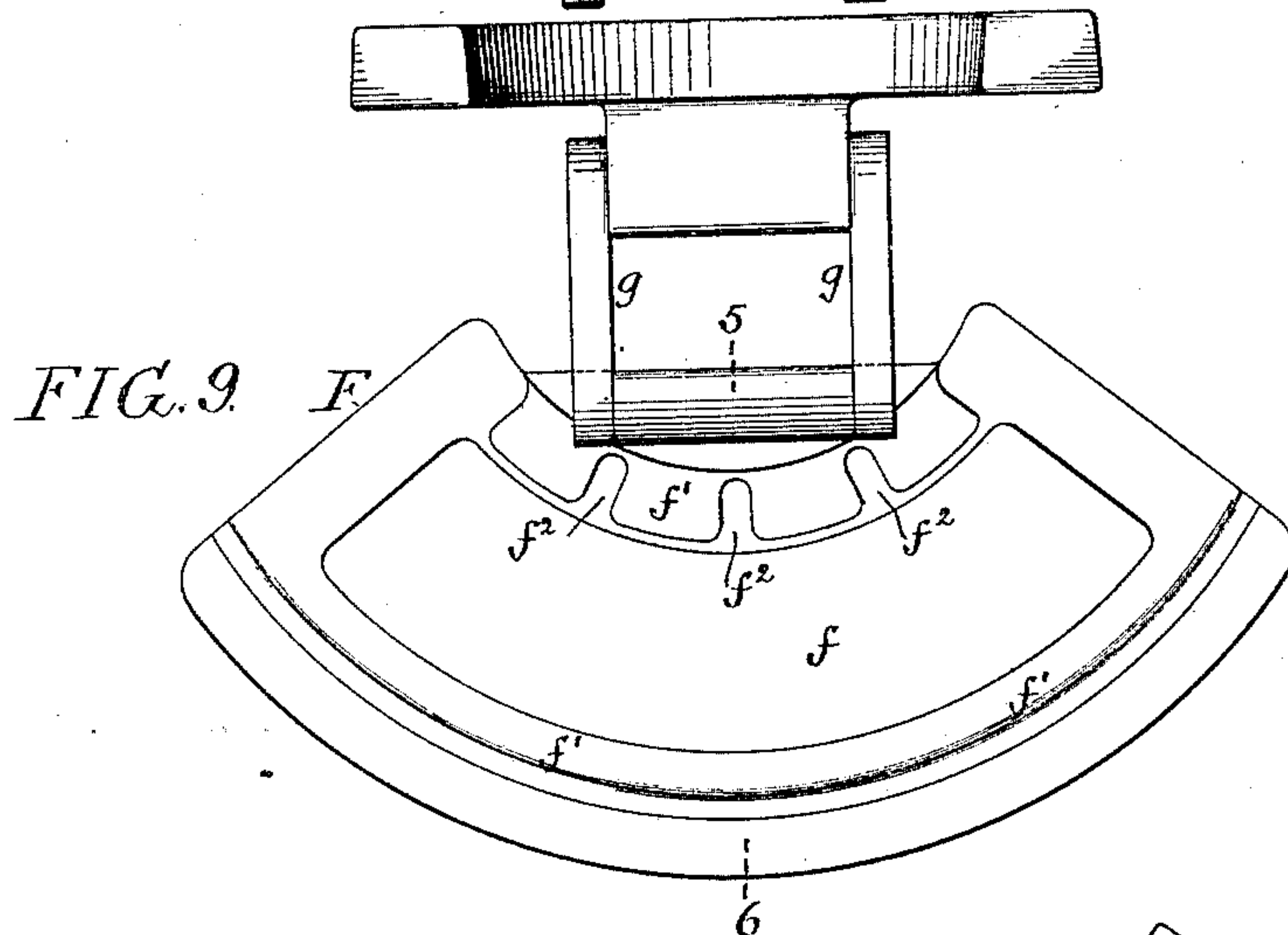
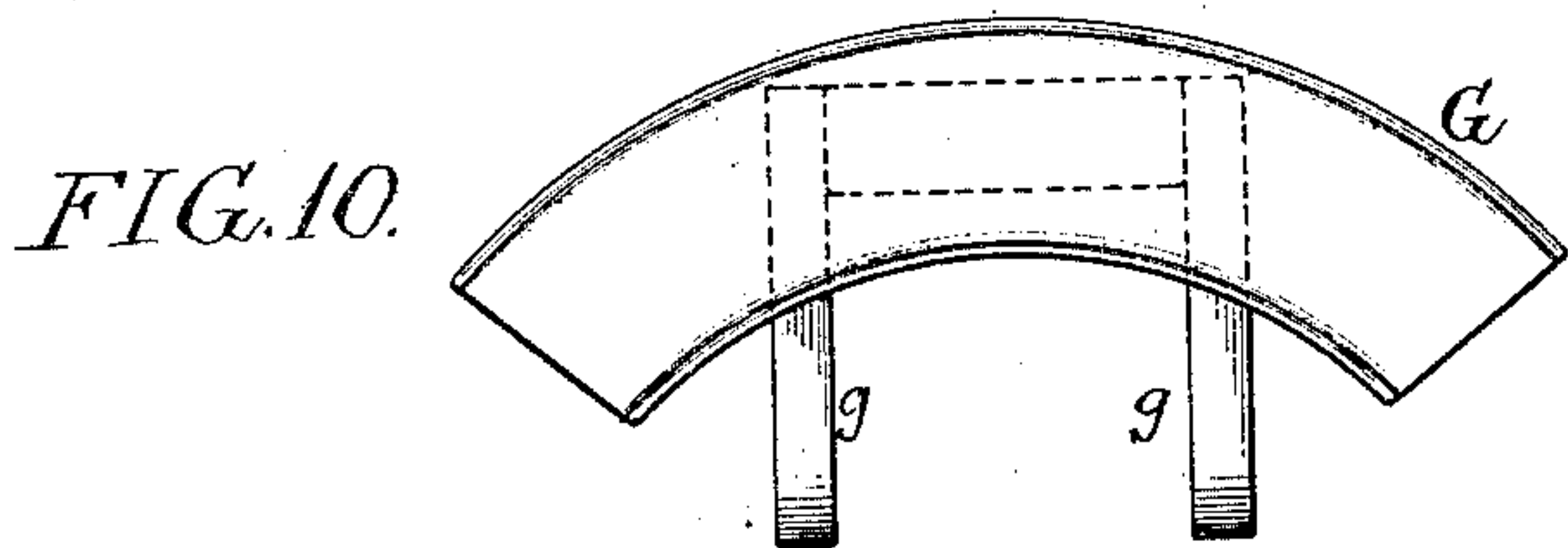
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R. Schleicher.

Inventor:  
Samuel M. VaucLain  
by his Attorneys  
Howson & Howson



# UNITED STATES PATENT OFFICE.

SAMUEL M. VAUCLAIN, OF PHILADELPHIA, PENNSYLVANIA.

## DIE FOR FORGING WHEELS.

SPECIFICATION forming part of Letters Patent No. 462,605, dated November 3, 1891.

Application filed June 11, 1891. Serial No. 395,901. (No model.)

*To all whom it may concern:*

Be it known that I, SAMUEL M. VAUCLAIN, a citizen of the United States, and a resident of Philadelphia, Pennsylvania, have invented certain Improvements in Dies for Forging Wheels, of which the following is a specification.

The object of my invention is to construct mechanism and form dies for forging wrought-iron or steel wheels. The wheel and the process of making the same form the subject of a separate application bearing even date herewith.

I have illustrated dies for making a locomotive driving-wheel; but it will be understood that dies embodying the features of my invention may be used in forging truck or other wheels without departing from my invention.

In the accompanying drawings, Figure 1 is a side view of sufficient of a drop-forging machine to illustrate my invention. Fig. 2 is an inverted plan view of the upper die. Fig. 3 is a plan view of the lower die. Fig. 4 is a sectional view through both dies, showing the forged wheel in position. Fig. 5 is a plan view of the lower die for making the hub-section of the wheel. Fig. 6 is a section on the line 1 2, Fig. 5. Fig. 7 is an inverted plan view of the upper die for making the hub-section. Fig. 8 is a section on the line 3 4, Fig. 7. Fig. 9 is a plan view of the lower die for forming the counterbalance-section, the primary upper die being thrown back. Fig. 10 is an inverted plan view of the primary upper die for forming the counter-balance. Fig. 11 is a plan view of the filling-piece adapted to the lower die, Fig. 9. Fig. 12 is an inverted plan view of the secondary upper die for forming the counter-balance. Fig. 13 is a section on the line 5 6, Fig. 9, showing the primary die in position. Fig. 14 is a sectional view on the line 5 6, Fig. 9, showing the final upper die in position; and Fig. 15 is a view showing the assembled portions of the wheel ready to be forged in the dies, as shown in Figs. 2, 3, and 4.

Referring to Fig. 1, A is the lower die secured to its base or anvil A'. B is the upper die, preferably loosely secured to the plunger B', which in the present instance is the piston-rod of a steam-hammer. Secured to

the lower die A are guides C, which pass through orifices in the upper die and guide the upper die, so that it will mesh with the lower die. The joint between the upper die and its plunger is loose to allow the upper die to adjust itself to the lower die irrespective of the line of the plunger. The lower die A is composed of an outer shell or casing A<sup>2</sup> and the die proper A<sup>3</sup>, which has a series of grooves *a* radiating from the center *a'*, and an annular depression *a*<sup>2</sup> for the reception of the spoke-section and ring-section of the wheel to be forged. The center is recessed for the reception of the hub, and a recess *a*<sup>3</sup> is also formed for the reception of the crank-pin center. A semi-annular recess *a*<sup>4</sup> is formed for the reception of the counter-balance. Projecting through the center of the lower die is a pin *c*, having a head *c'*, which projects into the formed wheel. The pin *c* extends into a transverse slot *c*<sup>2</sup>, through which can be inserted a driving-wedge for raising the pin, and thus forcing the forged wheel from the lower die if it should stick therein. The upper die is formed in the same manner as the lower die, having a casing B<sup>2</sup> and the die proper B<sup>3</sup>, radiating grooves *b* for the spokes, and an annular rim *b*<sup>2</sup>, and is recessed at *b*<sup>3</sup> for the hub and crank-pin center and has a semi-annular recess *b*<sup>4</sup> for the counterbalance-section. At the center of the die is a projection *b'*, and at the center of the crank-pin section is a projection *b*<sup>5</sup>. These two projections are clearly shown in Fig. 4 and tend to force the metal from the centers into the corners, making a solid hub clear of flaws. In some instances the projections may be dispensed with.

I will now describe the dies for forming the hub-sections of the wheel, reference being had to Figs. 5, 6, 7, and 8. D is the lower die recessed, as shown in Fig. 6, for the hub-center and crank-pin center, and radiating from the center *d* are a series of grooves *d'*, in which are formed the fins or extensions, which are the fillets between the hub-section and spokes in the finished wheel. E is the upper die, Figs. 7 and 8, having the central projection *e* and radiating ribs *e'*, which pass into the grooves *d'* and form the fin for the fillet described above. The long ribs *e*<sup>2</sup> form the grooves in the crank-pin section, which



receive the spokes, as will be clearly understood on referring to Fig. 15. The depth of the recess in the die D can be increased or diminished according to the hub-section required. The hub-section on one side of the wheel is often thicker than the hub-section on the opposite side of the wheel, as shown in Fig. 4; but in making a plain wheel the hub-sections are precisely alike.

Referring to Figs. 9 and 14, I will describe the dies forming the plates composing the counter-balance of the wheel. These plates I preferably forge from sheet metal forming semi-annular flanged sections. (Clearly shown in Fig. 15 and in cross-section in Figs. 13 and 14.) F is the lower semi-annular die having a deep recess  $f$ , into which is forced the metal forming the counterbalance-section. The lower die is recessed at  $f'$  around the deep recess for the reception of the metal to be struck up or forged. The primary upper die G, which is formed as shown in Figs. 10 and 13, is hinged to the lower die by links  $g$ , as shown in Figs. 9 and 13, to enable it to be thrown back away from the lower die.

In order to properly form each counterbalance-section, I use two upper dies G and I, and I place within the lower die a semi-annular filling-piece H, Fig. 11, when the primary die G is used, so as to form the counterbalance plate in the manner shown in Fig. 13.

When the primary die is thrown back, the filling-piece H is removed and the secondary upper die I is allowed to pass into the lower die in the manner shown in Fig. 14, compressing the counterbalance-section in the manner shown in said figure.

The final upper die I is made as shown in Fig. 12, having a series of ribs  $i$  radiating from the center of the wheel, and the rim  $i'$ , which takes the place of the filling-piece H, is so formed as to give the proper curve to the outer edge of the counterbalance-section, in order that it may snugly fit the spoke-sections and ring, as shown in Fig. 15. The upper die I has deep grooves  $i^2$   $i^3$ , which receive the turned-up edges or flanges of the counterbalance-section. The lower die F has a series of recesses  $f^2$ , which radiate from the center of the die and mesh with the rib  $i$  of the die I, forming the fillet-extensions of the counterbalance-sections, as clearly shown in Fig. 15.

The die I in the present instance is used as the hammer for the die G, said die I striking the head  $g$  of said die when it is in the position shown in Fig. 13.

By the above description it will be seen that the formation of the wheel, while the ring and spoke-sections are bent to form the hub sections and counterbalance-sections, are forged in suitable dies, and when the

wheel is assembled, as shown in Fig. 15, it is heated to the proper heat for forging and placed between the dies A and B, as shown in Figs. 1 and 4, and compressed therein, so as to form a unitary structure, the upper die being guided by the standards on the lower die, and, connected loosely to its plunger, it meshes accurately with the lower die and forms a properly-forged wheel.

I claim as my invention—

1. The combination, in mechanism for forming wrought-iron car-wheels, of the fixed lower die, the reciprocating upper die, piston-rod, and loose connection between the piston-rod and the upper die, with guides carried by one of said dies and passing through the other die, whereby the dies are aligned with each other, substantially as described.

2. A die for forging a wheel built up from a number of assembled sections, said die having recesses for the ring, spoke-sections, and hub-sections, substantially as described.

3. The combination of dies for forging wheels from assembled sections, said dies having recesses for the reception of the ring and spoke-sections and hub, one of said dies having a central projection which is forced into the hub-section, expanding the metal thereof, substantially as and for the purpose described.

4. Dies for forging counterbalance driving-wheels, having recesses and grooves for the ring, spoke, and hub sections, and for the counter-balance and crank sections, substantially of the form shown and described.

5. Dies for forging the counterbalance-sections of wheels, one die having a semi-annular projection of the curve of the form of the counterbalance-section and having transverse ribs, and the other die having a recess corresponding with the projections of the opposite die, so as to form a hollow counterbalance-section with a recessed flange, substantially as shown and described.

6. The dies for forming the hub-sections of wheels of the form substantially as shown and described.

7. The combination, in dies for forming the counterbalance-section of a wrought wheel, of the recessed lower die F, the primary upper die G, pivoted thereto, the filling-piece H, with the final upper die I, said upper dies fitting the lower die, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

SAMUEL M. VAUCLAIN.

Witnesses:

FRANK H. MASSEY,  
HENRY HOWSON.