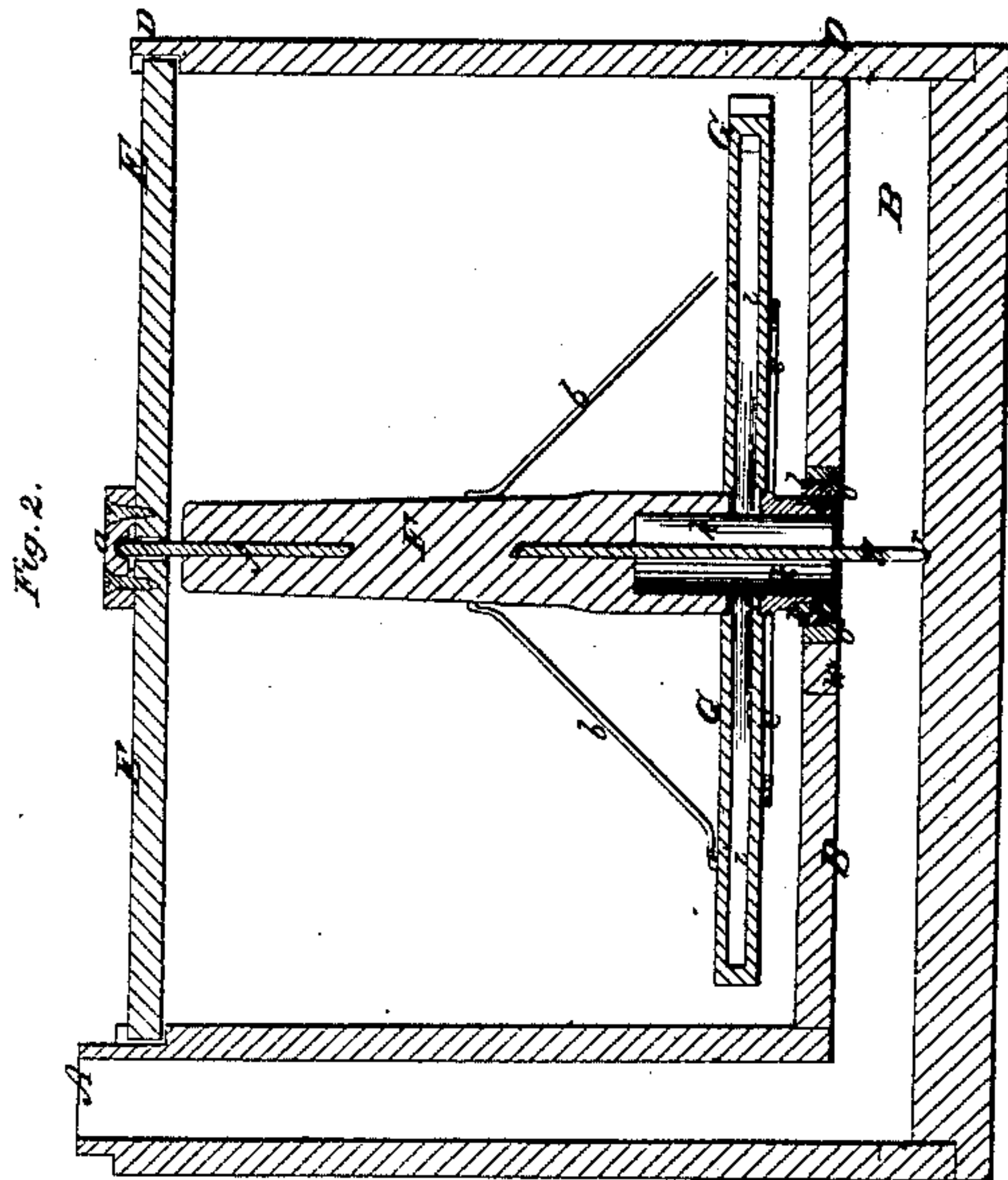
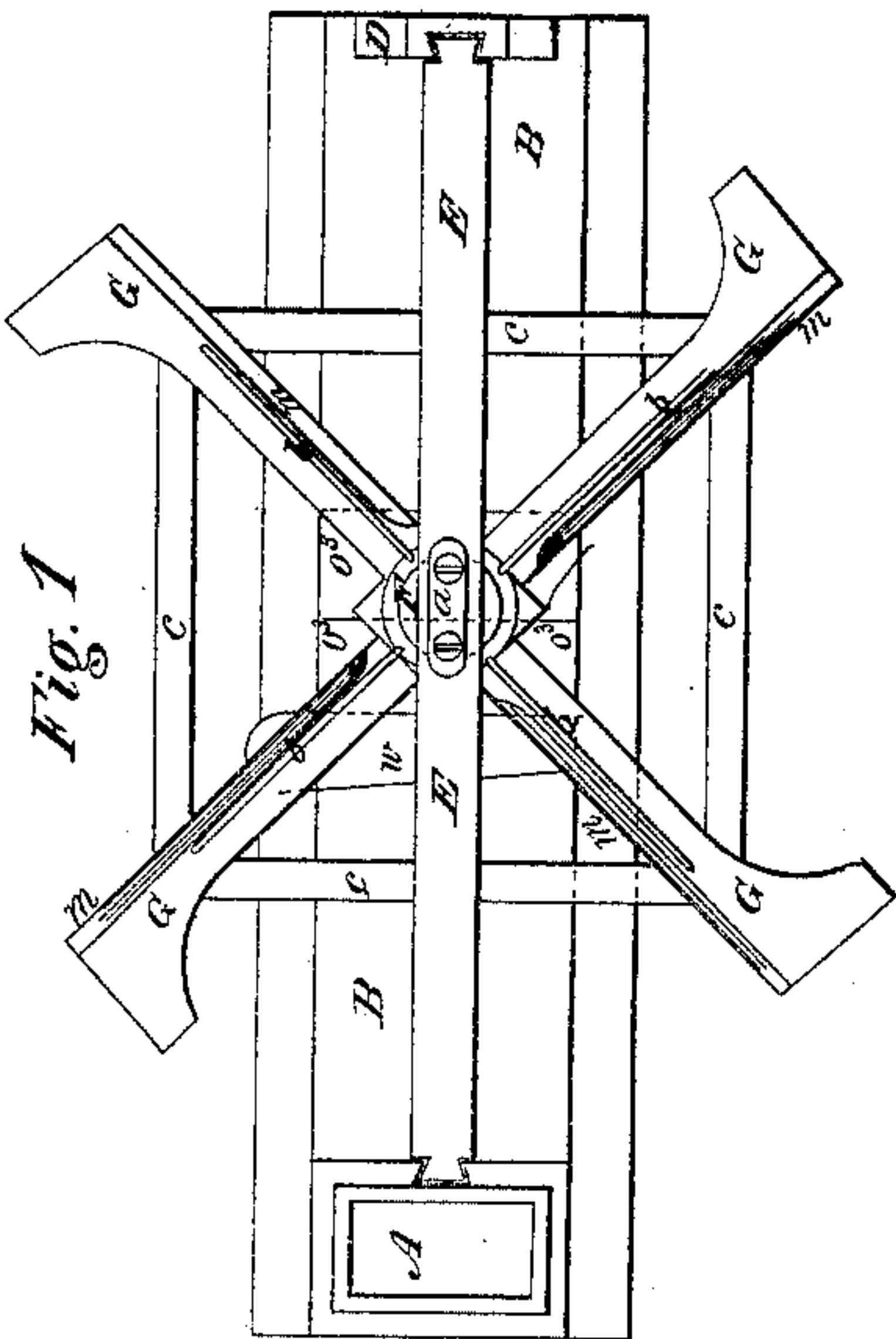
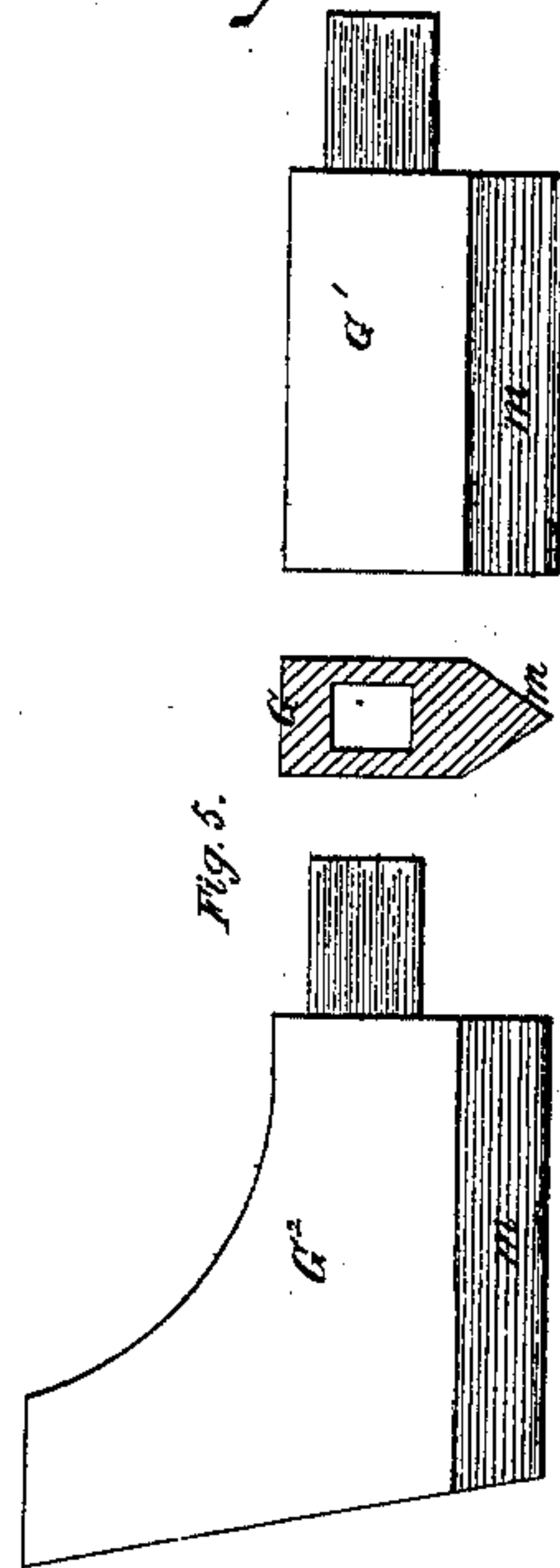
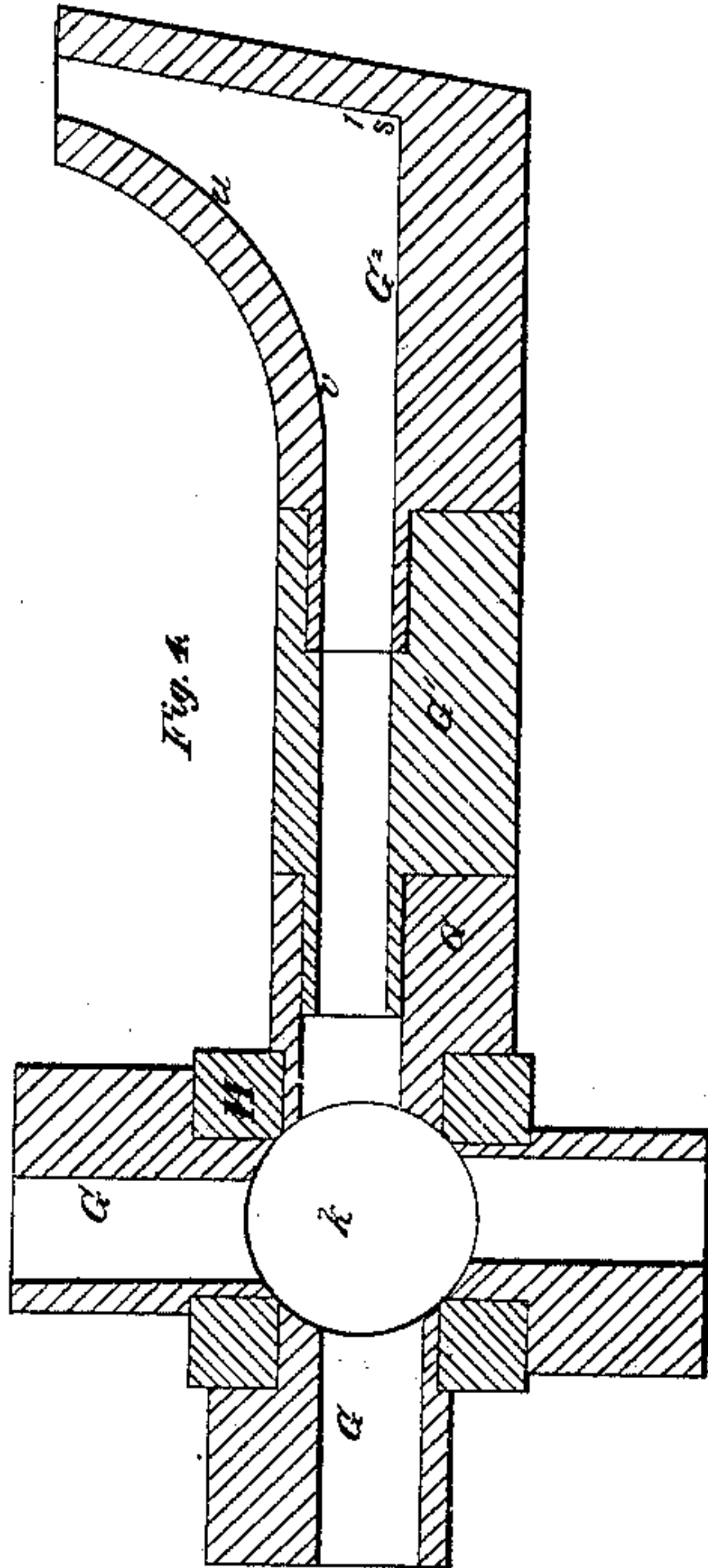
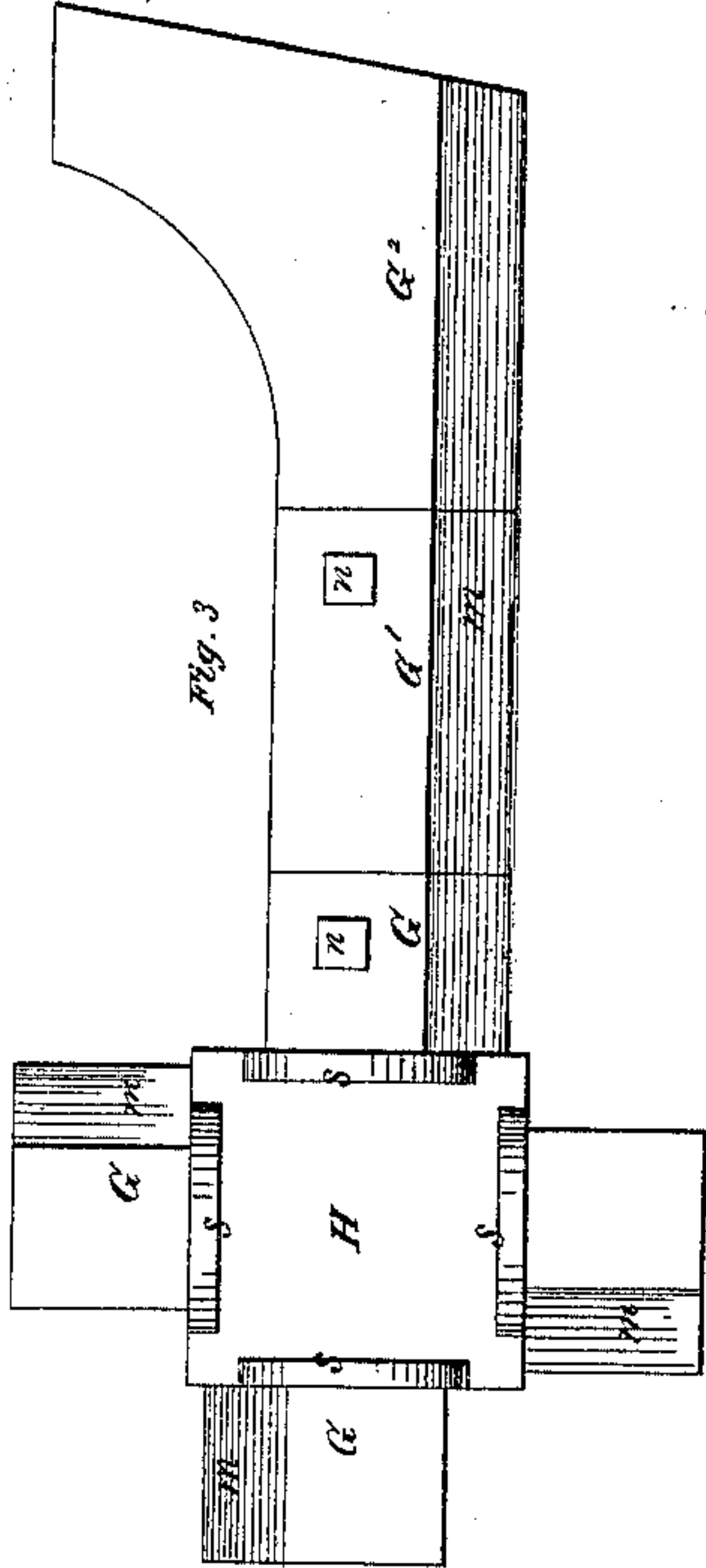


*J. P. Hughes,*

*Water Wheel,*

*N<sup>o</sup> 24,740.*

*Patented July 12, 1859.*



*Witnesses.*  
*Wm. A. Thompson*  
*W. H. Kenter*

*Inventor.*  
*Jno. P. Hughes*



# UNITED STATES PATENT OFFICE.

JOHN P. HUGHES, OF SPOUT SPRING, VIRGINIA.

## IMPROVEMENT IN WATER-WHEELS.

Specification forming part of Letters Patent No. 24,740, dated July 12, 1859.

*To all whom it may concern:*

Be it known that I, JOHN P. HUGHES, of Spout Spring, county of Appomattox, in the State of Virginia, have invented a new and useful Improvement in Water-Wheels; and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to the letters of reference marked thereon.

The nature of my invention consists in certain improvements in the construction of water-wheels, as will be hereinafter fully described.

To enable those skilled in the art to make and use my invention, I will proceed to describe its construction and operation, referring by letter to the accompanying drawings, forming part of this invention, and in which—

Figure 1 represents a top view of my improved construction of wheel and its attachments. Fig. 2 represents a vertical section through the center of the same at line *x x*, Fig. 1. Fig. 3 represents a top view of one of the water-arms, and Fig. 3 represents a detail perspective and sectional view of one of the water-arms, illustrating fully the method of coupling together its sections.

Similar letters denote the same parts in the different views.

A represents the vertical water-box through which the head of water descends to the horizontal water-box B, from which it passes into the arms of the wheel, as will be hereinafter explained.

F is the wheel-shaft, which is arranged in a vertical position and supported by suitable bearings at top and bottom, as follows: At the upper end of shaft F is inserted a journal *f*, which runs in a suitable bearing formed in the cross-bar E, and is retained vertically by a cap *a*. In the lower end of said shaft F is a journal *g*, which rests in a step formed at *r* in the bed of the water-box B. The cross-beam E is supported at one end by the vertical box A and at the other by a standard D. The wheel-shaft F is made hollow at its lower end, as seen at *k*, Fig. 2, and at that point constitutes literally a part of the wheel. Around the lower end of said wheel-shaft (when it is made of wood) is secured a metallic band or ferrule *o*, (see Fig. 2,) which constitutes the main lower journal of the said shaft and runs in a bearing formed in the up-

per floor of the water-space B, and is surrounded by an india-rubber packing *l*. (See Fig. 2.)

G are the water-arms, which are arranged radially around the lower (and hollow) portion of the shaft F, as seen at Figs. 1 and 2, and are braced by bottom connecting-strips *c* and upper stay-rods *b*. These arms G are hollow and of a peculiar formation, which I will presently describe. The shaft F is represented at Figs. 1 and 2 as being wholly of wood with a metallic band *o* to form its lower journal-surface, and the arms G are illustrated as made of wood; but I propose as a more perfect and durable method of construction in working-machines to make the lower hollow portion of the shaft F of metal with vertical flanges *s* to receive and be secured to the lower end of the wooden and solid portion of the shaft, and also with short projecting sections G or portions of the arms, to which may be secured the sections G' G<sup>2</sup> of said arms. The water-arms may be more or less in number than is shown, as may be deemed expedient, and may be made either of metal or wood, but should be made in sections, one fitting within the other and in such manner as to be perfectly secured to each other by bolts, as seen at *n*, Fig. 3, or in any other desirable manner. The water-arms are hollow and communicate with the hollow portion *k* of the shaft F.

The peculiar internal formation of the hollow arms G is best comprehended from the drawings, where it will be seen by vertical section at Fig. 2 that the cavity in said water is of an equal capacity throughout its extent in one direction—that is, from top to bottom—and it will be seen by reference to Fig. 4 that said cavity is of about the same capacity from the shaft end to near the extremity, where its form changes, the rear side of the hollow keeping along in a right line to the point *s'*, and from there running off at an angle little more than right (or ninety degrees) to the mouth of the opening, while the forward side of the hollow commences at the point *v* to curve, and runs in a circular direction toward *u* to *l*, leaving a mouth about equal in capacity to the straight or rectangular portion of the cavity. The lower end of the shaft F, as before mentioned, is surrounded by an india-rubber packing. This packing, forming the bearing



of the said shaft, is held between two boxes  $o^3$ , which are firmly held in position in the upper floor of the water-box B by a wedge or key  $w$ . By this arrangement it will be seen the lower bearing can be opened very readily for repair or adjustment.

One great advantage in the combination of the hollow shaft with the water-box B, as shown, is that the force of the water is continually exerted (when the wheel is running) to lift the wheel or support, whereby its bearing is much relieved, in consequence of which the apparatus is rendered exceedingly durable. The journal  $g$ , though intended to support the weight of the wheel, has very little labor when the wheel is running, as is evident from the fact that it is necessary to place a cap over the upper journal  $f$  to prevent its rising through its bearing. Those edges or sides of the water-arms which cut the air are feathered or chamfered off during their whole length, as seen at  $m$  in the drawings. (See Fig. 5.)

By making the arms in sections the capacity of the wheel may be readily varied to adapt it to different circumstances by simply extracting or adding a section, as the case may require, while at the same time the whole

apparatus may be more readily made, transported, and put together and taken apart. By enlarging the cavity in the water-arms near their extremities, as shown and described, the water is allowed to fill up in the angles  $s'$ , (see Fig. 4,) where a portion of it remains at rest, while through and past it the driving-current passes, modeling its own course of direction according to the size of the wheel and the head employed, as the latter is nearly always varying, and there is only one most economical and effective line of discharge with a given head, the great advantage of so forming the hollow arm as that the water will fill in and form its own direction is obvious.

Having described the construction and operation of my improved water-wheel, what I claim therein as new, and desire to secure by Letters Patent, is—

Making the water-arm  $e$  in sections, essentially as described, for the purpose set forth.

In testimony whereof I have hereunto set my hand this 25th day of March, 1859.

JNO. P. HUGHES.

Witnesses:

WM. A. THOMPSON,  
C. W. HUNTER.