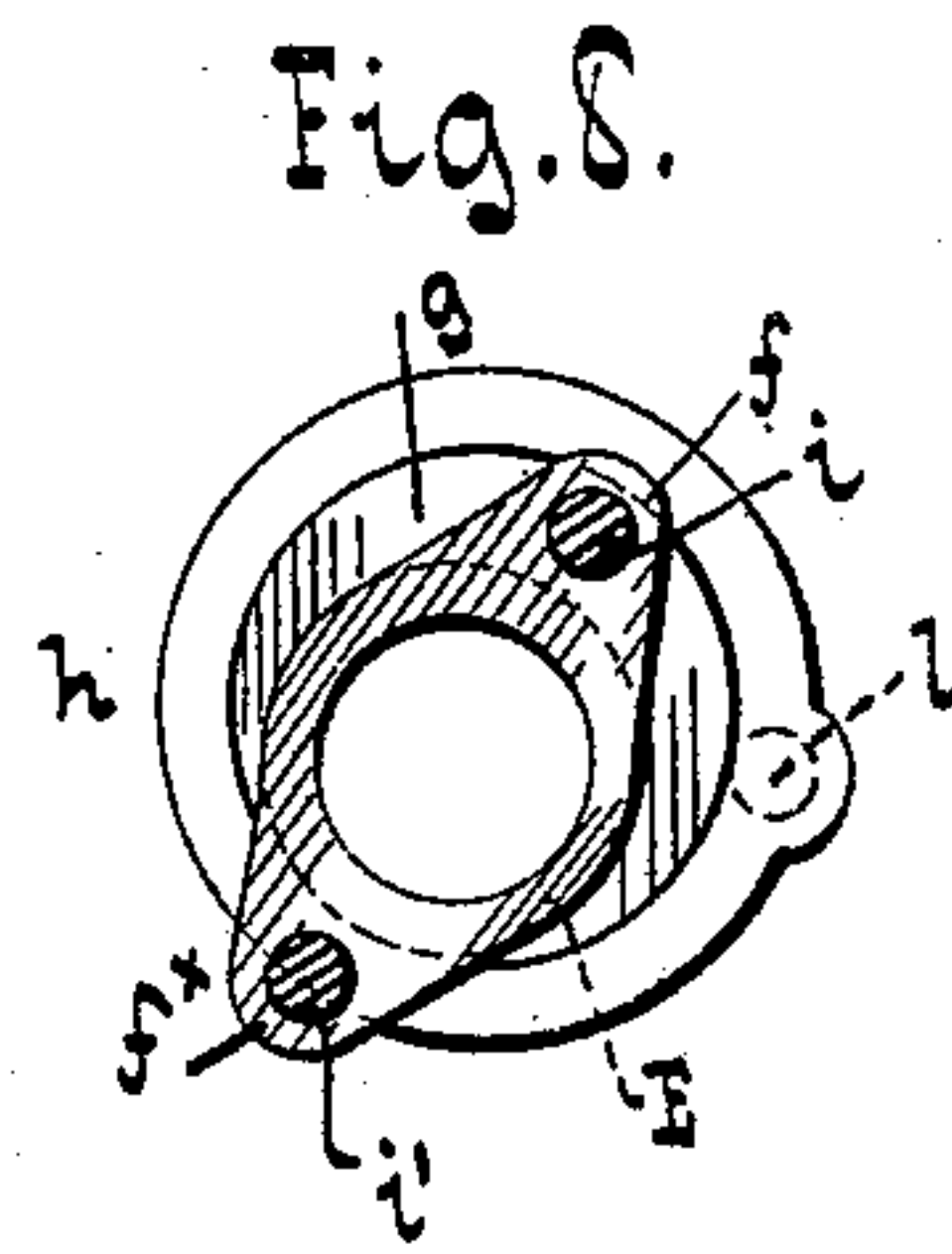
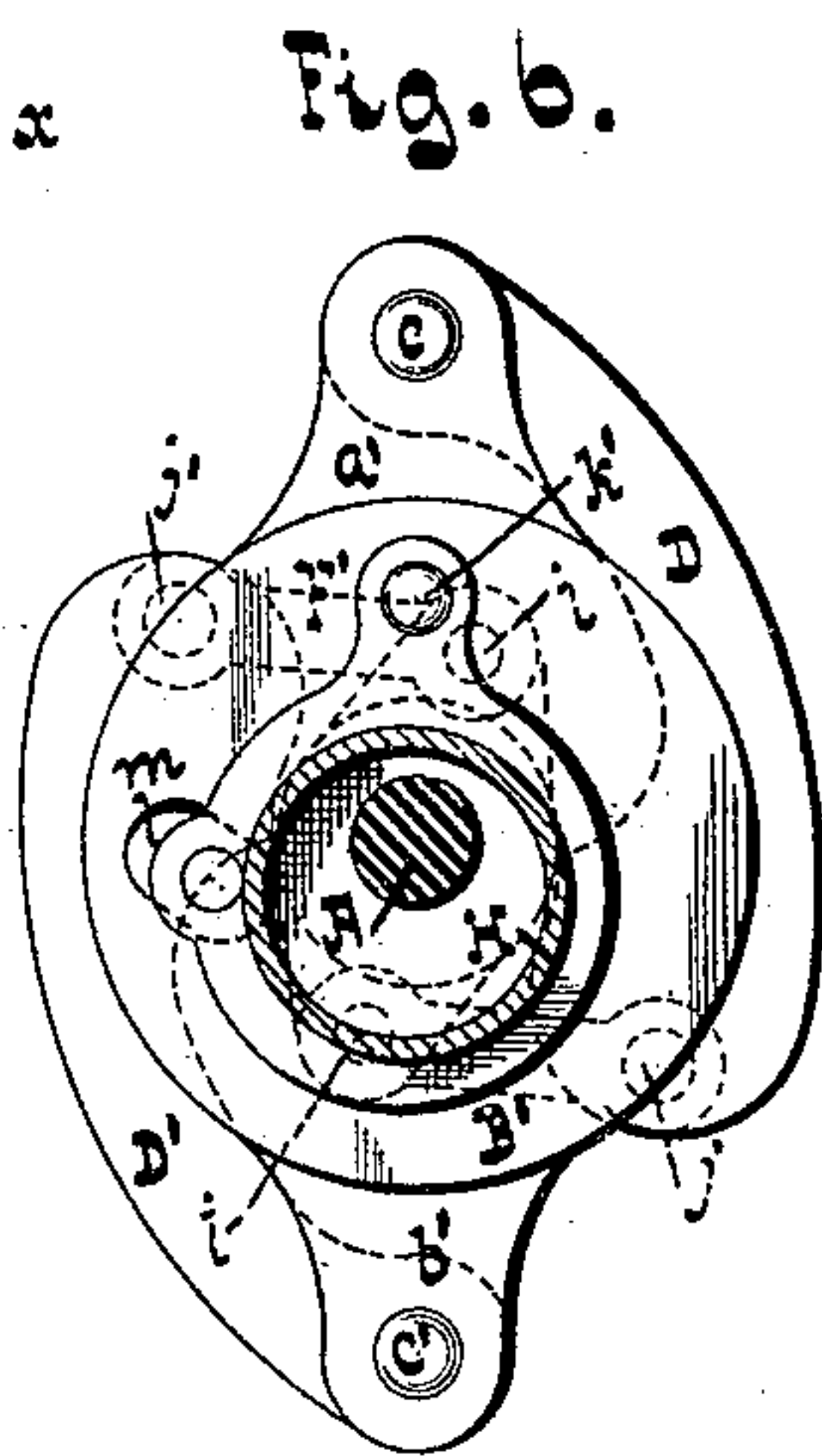
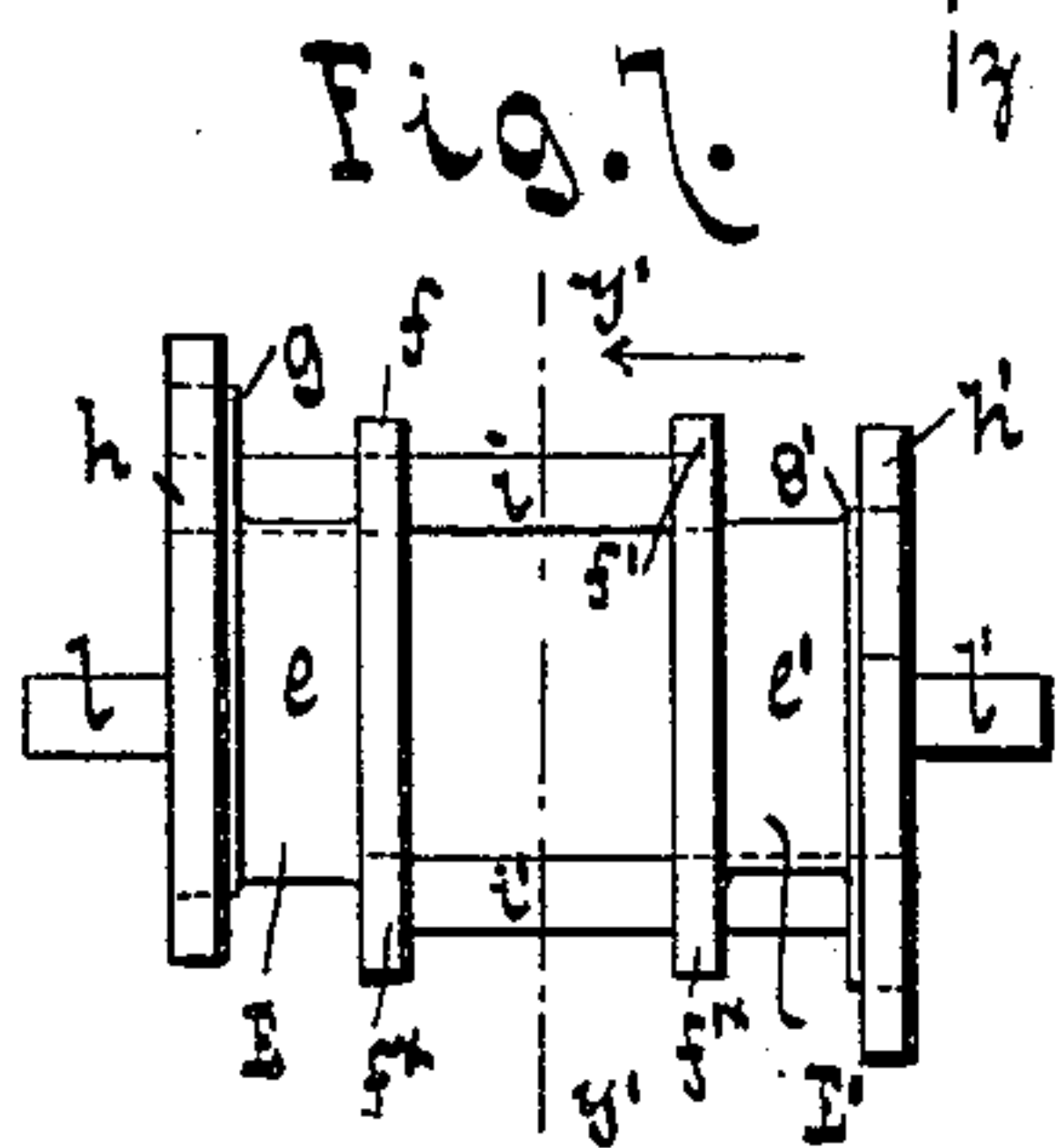
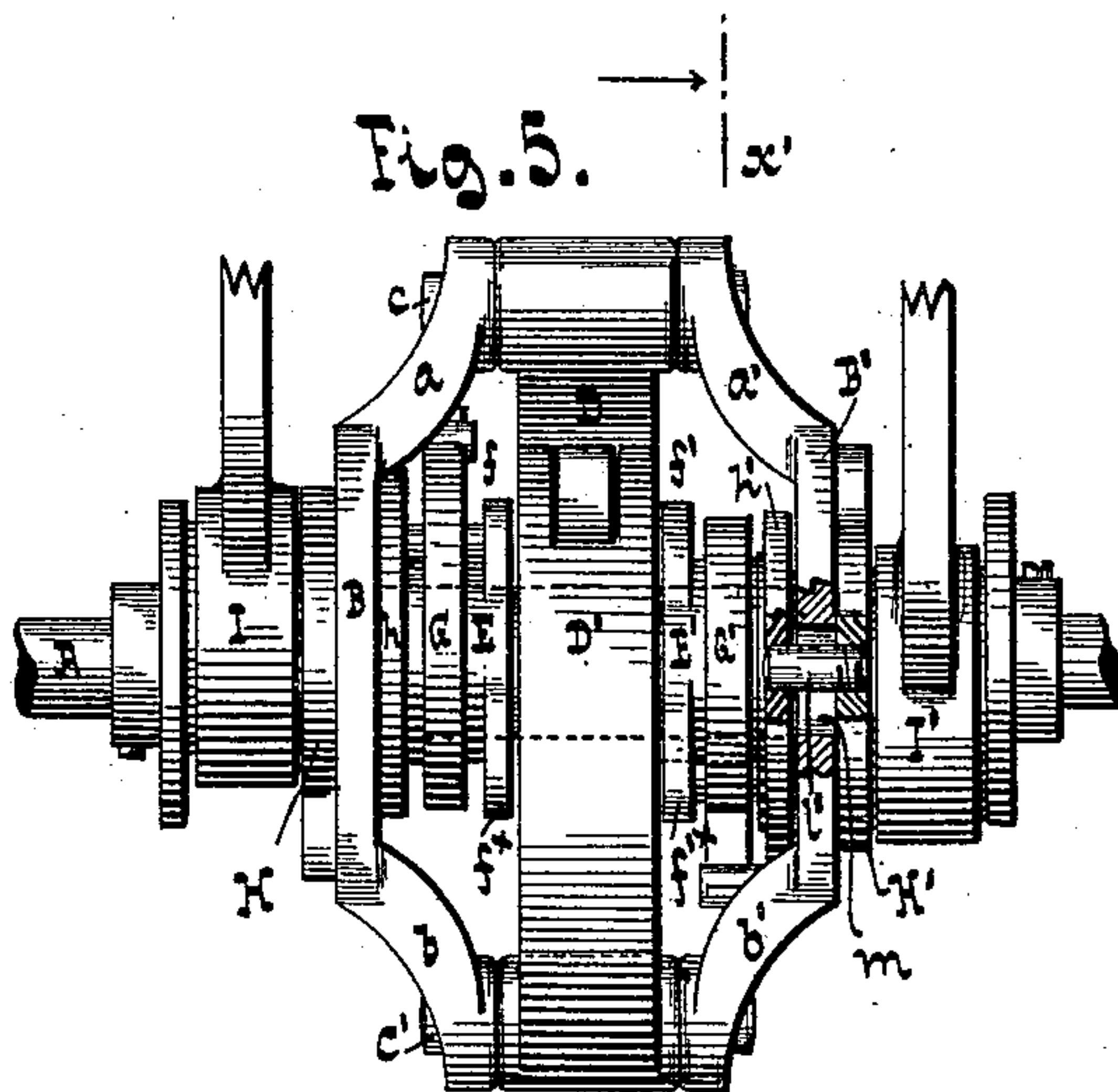
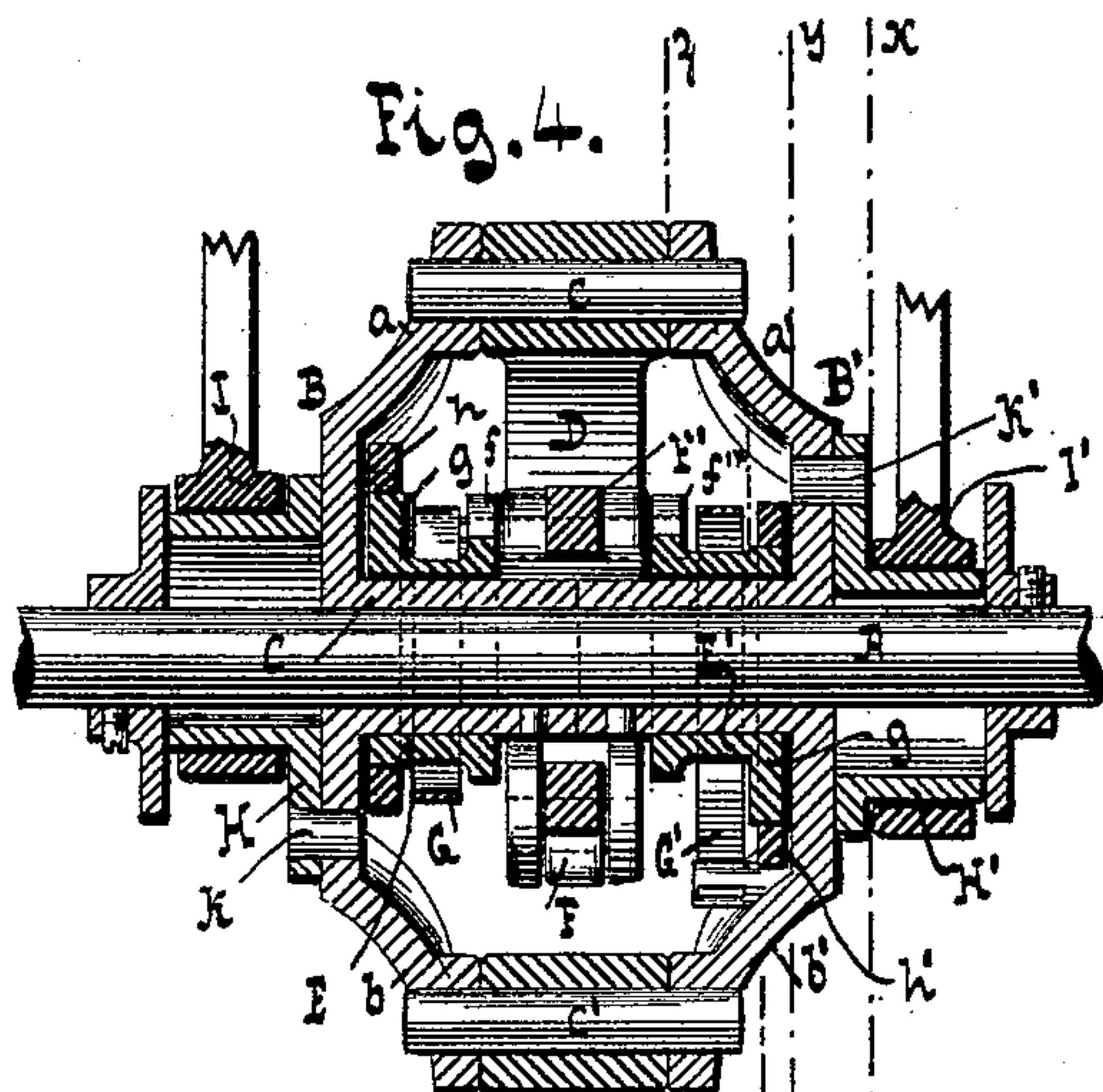
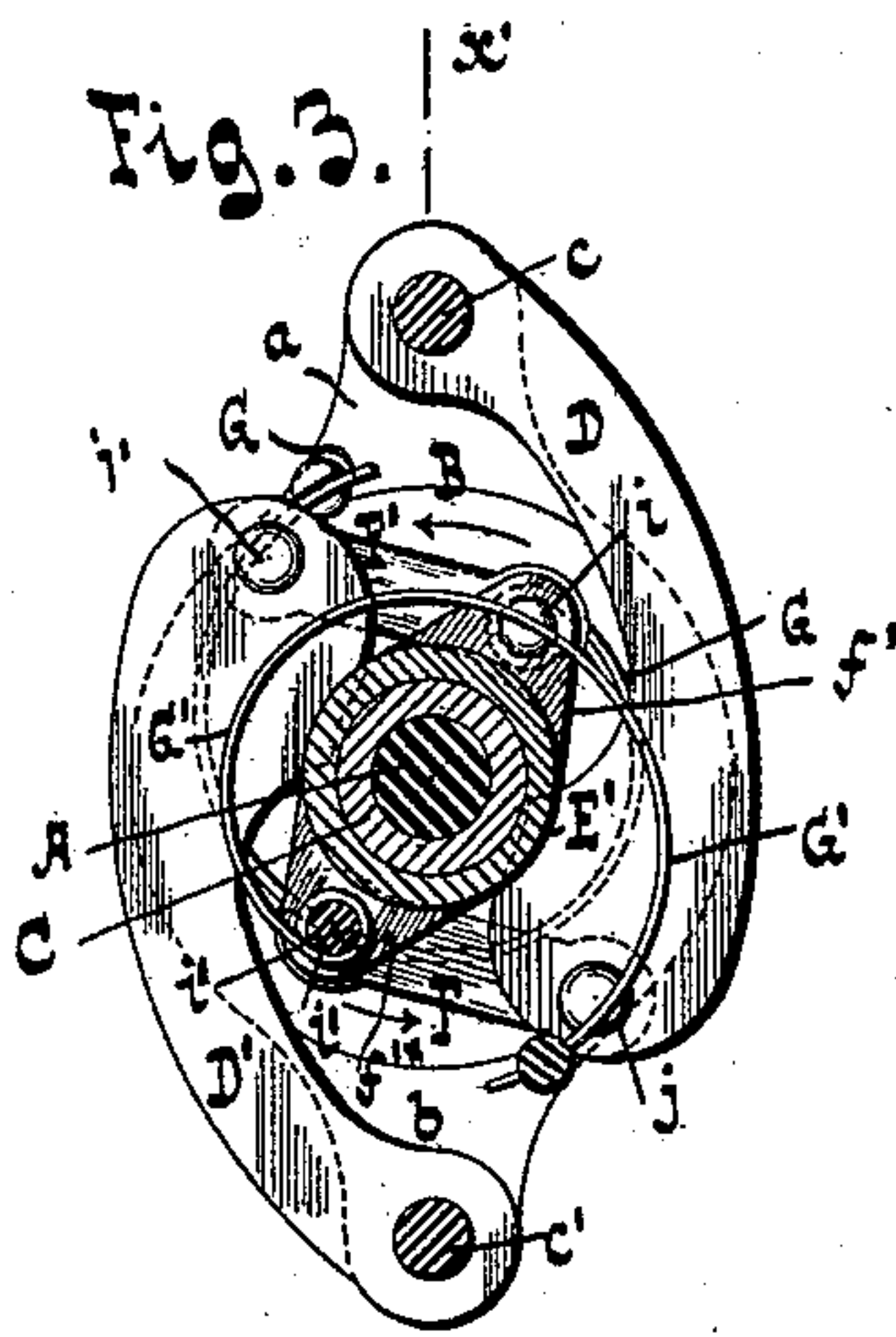
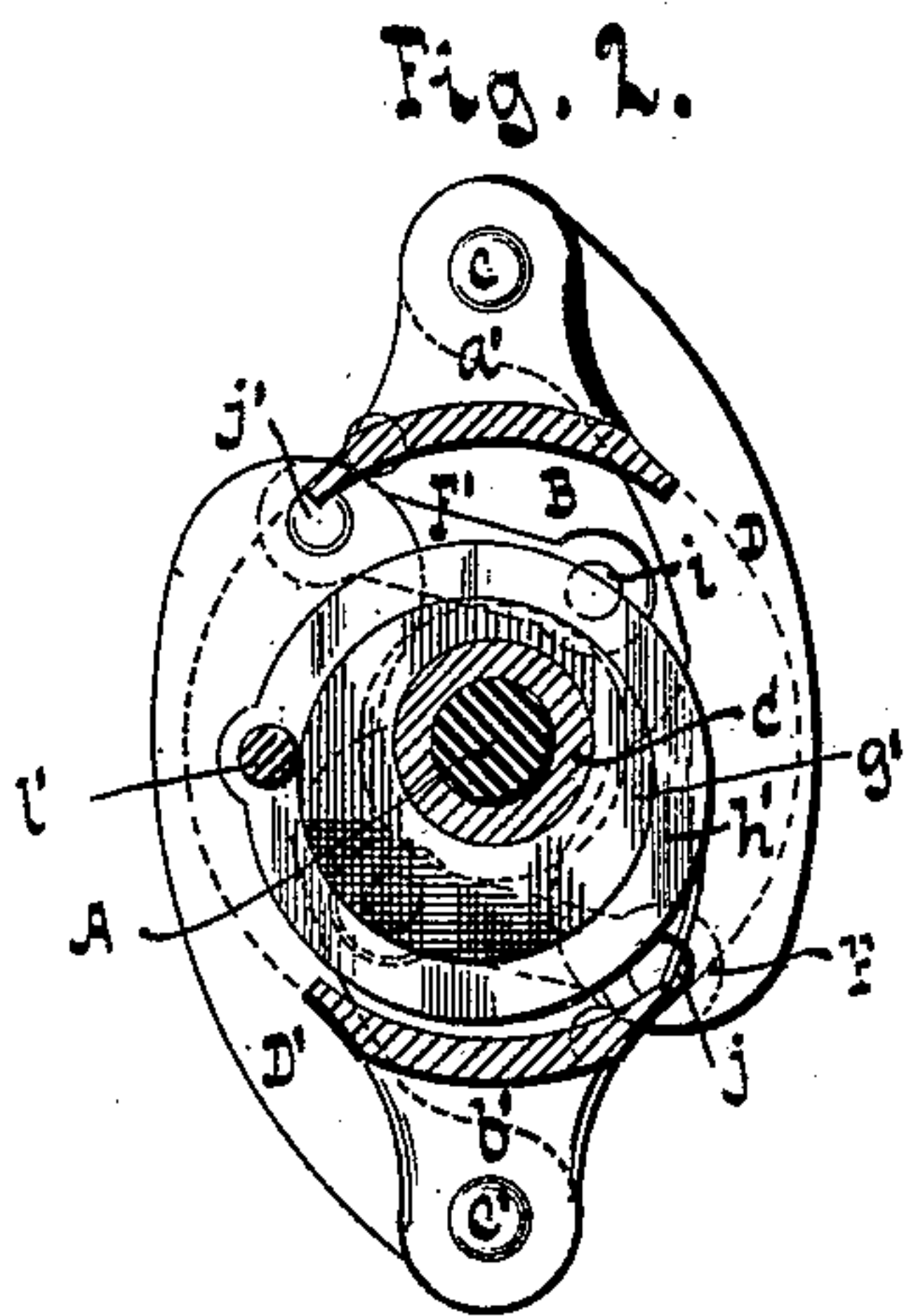
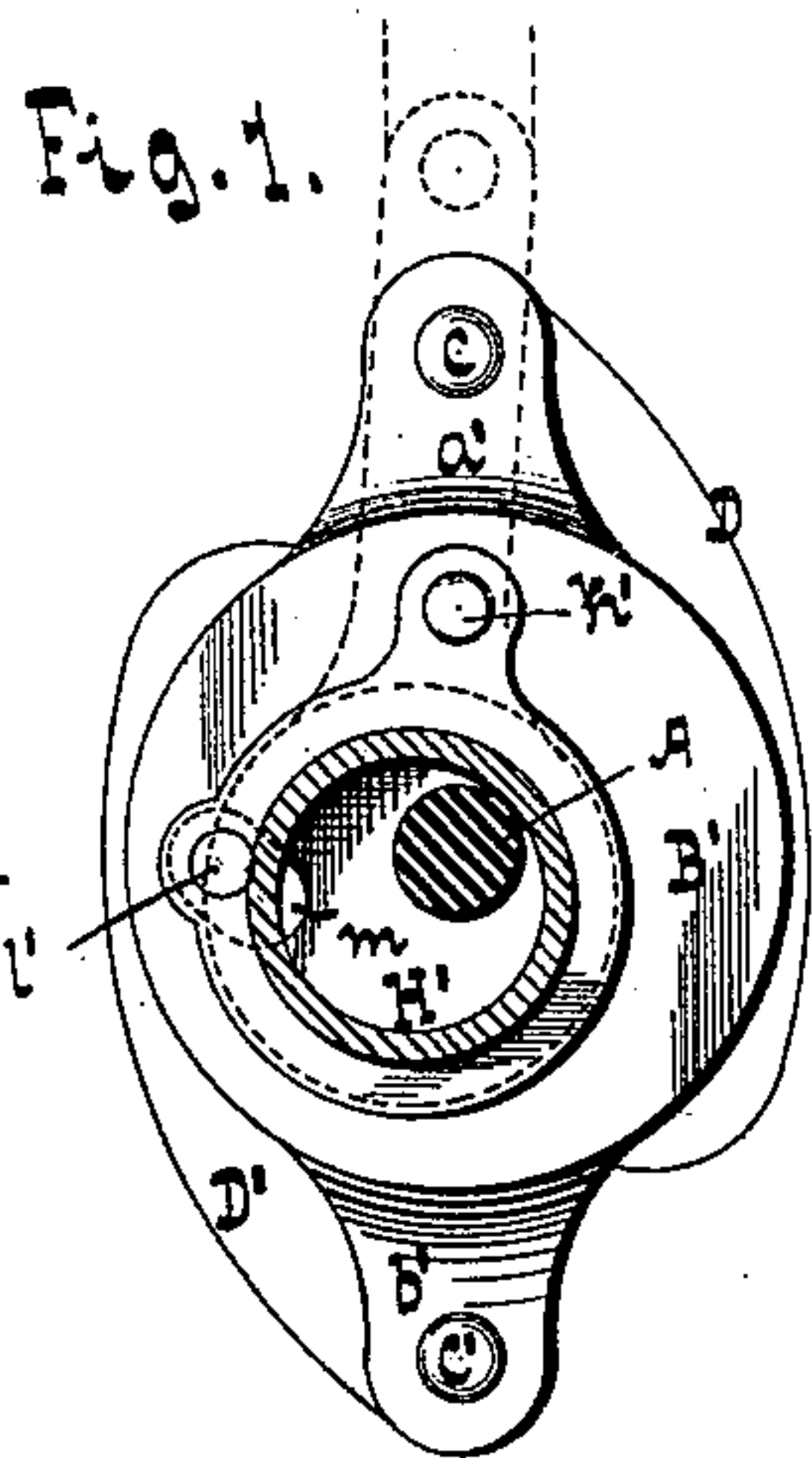


(No Model.)

F. A. GARDNER.  
VALVE GEAR.

No. 405,207

Patented June 11, 1889.



WITNESSES:

*A. Faber du Raurp.*  
*Edvard Wolff.*

INVENTOR

*Frederick A. Gardner.*

BY *Van Santvoord & Hauck*

ATTORNEYS



# UNITED STATES PATENT OFFICE.

FREDERICK A. GARDNER, OF CATSKILL, NEW YORK, ASSIGNOR TO F. A. GARDNER & CO., OF SAME PLACE.

## VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 405,207, dated June 11, 1889.

Application filed September 6, 1888. Serial No. 284,703. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK A. GARDNER, a citizen of the United States, residing at Catskill, in the county of Greene and State of New York, have invented new and useful Improvements in Automatic Valve-Gear for Steam-Engines, of which the following is a specification.

The object of this invention is to delay or advance the movement of the valve of a steam-engine automatically as the speed of the engine increases or decreases. The mechanism which I have devised for this purpose, and which forms the subject-matter of my present invention, is pointed out in the following specification and claim, and illustrated in the accompanying drawings, in which—

Figure 1 represents a transverse section in the plane  $x x$ , Fig. 4. Fig. 2 is a similar section in the plane  $y y$ , Fig. 4. Fig. 3 is a similar section in the plane  $z z$ , Fig. 4. Fig. 4 is a longitudinal section in the plane  $x' x'$ , Fig. 3. Fig. 5 is a front elevation. Fig. 6 is a similar section to that represented in Fig. 1, showing the operating parts in a different position. Fig. 7 is a detached elevation of one of the transmitting-sleeves. Fig. 8 is a transverse section in the plane  $y' y'$ , Fig. 7.

Similar letters indicate corresponding parts.

In the drawings, the letter A designates a shaft on which are firmly mounted two disks B B', which are connected by a hub C. From each of these disks extend arms  $a a'$   $b b'$ , which form bearings for pins  $c c'$ , respectively, and on these pins are mounted the weights D D'. On the hub C of the disks B B' are loosely mounted the transmitting-sleeves E E', one close to the inner surface of the disk B and the other close to the inner surface of the disk B'. Each of these transmitting-sleeves consists of a hub  $e e'$ , Figs. 7 and 8, respectively, and from the inner ends of these hubs extend the arms  $f f'$   $f' f'^*$ , Figs. 3 and 8, while on their outer ends are formed eccentric disks  $g g'$ , on which are mounted the rings or straps  $h h'$ . The transmitting-sleeves E E' are connected to the weights D D' by links F F', the connection between these links and the transmitting-sleeves being formed by pins  $i i'$ ,

while the connection between the links and the weights is formed by pins  $j j'$ . The transmitting-sleeves E E' are subjected to the action of springs G G', which have a tendency to draw the weights D D' inward to the position shown in Figs. 1 to 5, inclusive; but if the shaft A revolves with such a velocity that the centrifugal force of the weights D D' overcomes the force of the springs G G' the weights fly out to the position shown in Fig. 6, and the transmitting-sleeves E E' are turned, as will be presently more fully explained.

On the outside of each of the disks B B' is situated an eccentric H H', respectively, and these eccentrics are hollow, so that they do not come in contact with the shaft A. They are connected with the disks B B' by pivots  $k k'$ , Figs. 4 and 6, on which they can swing, and they are provided with straps I I', which actuate the valves of a steam-engine. From the rings or straps  $h h'$  of the transmitting-sleeves E E' extend pins  $l l'$  through slots  $m$  in the disks B B', Figs. 1, 5, and 6, and these pins engage the eccentrics H H'. (Best seen in Figs. 1 and 6.) When the weights D D' fly out to the position shown in Fig. 6, the eccentrics H H' are moved from the position shown in Fig. 1 to that shown in Fig. 6, and consequently the movement of the valves controlled by said eccentrics is changed.

It will be seen from this description that the movement of the weights D D' is transmitted to the eccentrics H H' by the action of the eccentric disks  $g g'$  and the rings  $h h'$  of the transmitting-sleeves, and by these means a very sensitive device is obtained by which the slightest movement of the weights D D' is transmitted to the eccentrics H H'.

I distinctly disclaim the construction of the automatic valve-gear described in Letters Patent No. 352,238, granted to me November 9, 1886.

What I claim as new, and desire to secure by Letters Patent, is—

The combination, with the shaft A, of two disks B B', pins  $c c'$ , mounted in said disks, weights D D', mounted on said pins, a transmitting-sleeve E', situated on the inside of the disk B' and connected to the weights by pins  $i i'$ , an eccentric disk  $g'$ , formed on the

transmitting-sleeve, a ring or strap  $h'$ , fitted  
on this eccentric disk, the hollow eccentric  
 $H'$ , connected to the disk  $B'$  by the pivot  $k'$ ,  
and the pin  $l'$ , connecting the ring  $h'$  with the  
5 hollow eccentric  $H'$ , substantially as de-  
scribed.

In testimony whereof I have hereunto set

my hand and seal in the presence of two sub-  
scribing witnesses.

FREDERICK A. GARDNER. [L. S.]

Witnesses:

JOSEPH HALLOCK,  
HENRY D. SHORES.