

(No Model.)

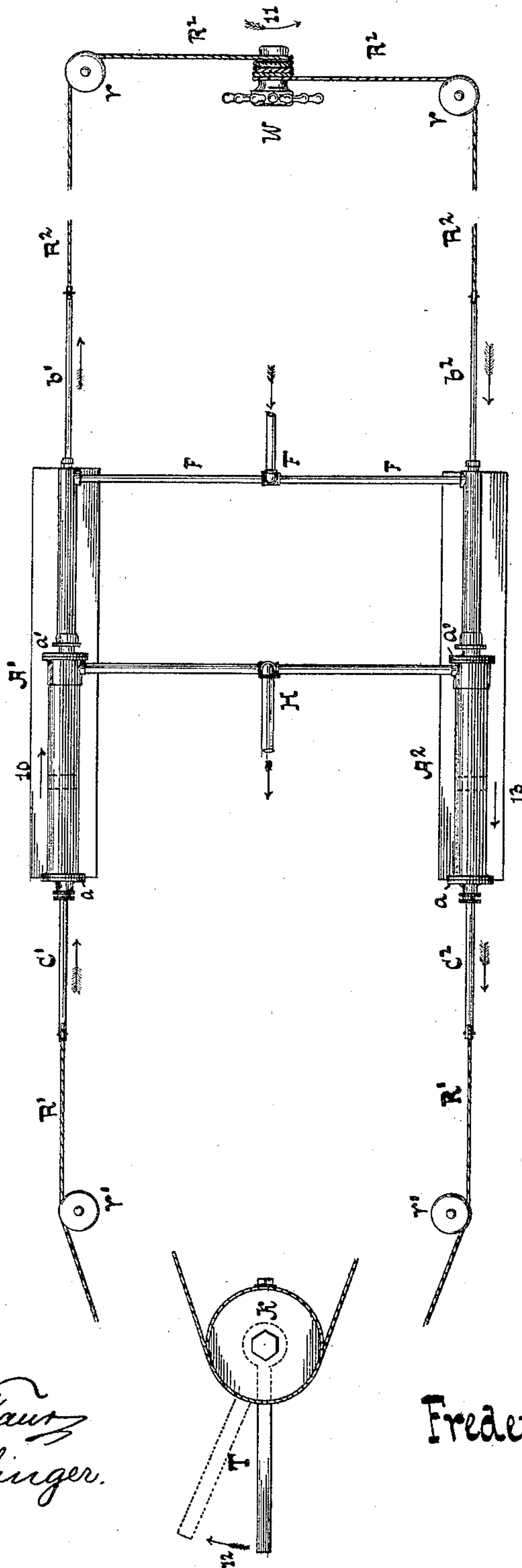
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F. C. LANG.  
STEAM STEERING APPARATUS.

No. 409,749.

Patented Aug. 27, 1889.

Fig. 1



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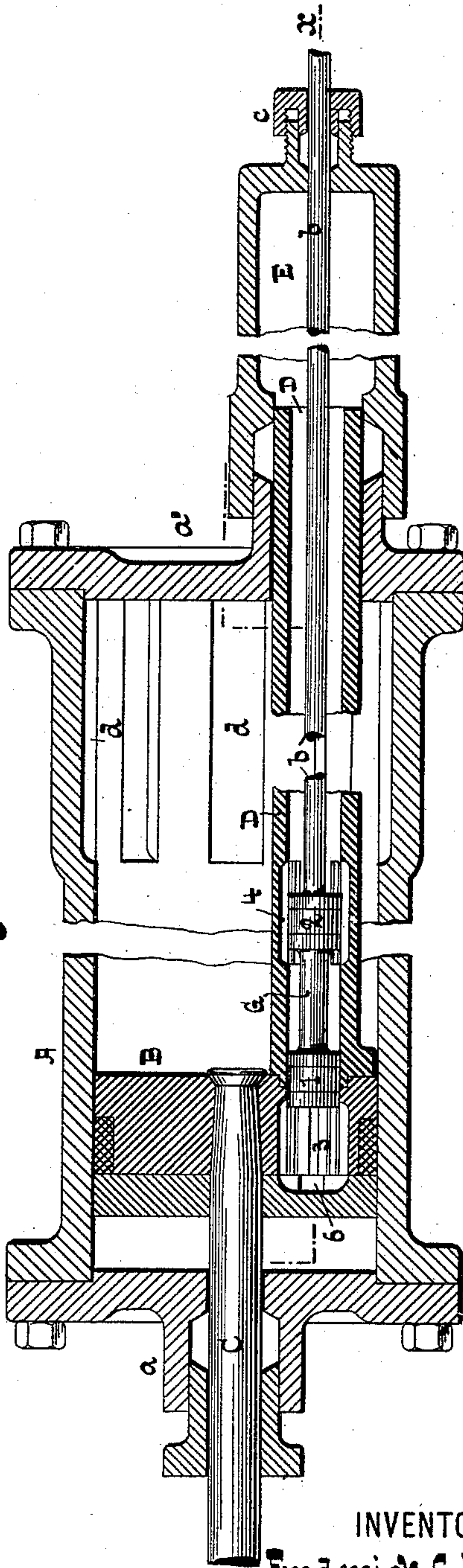
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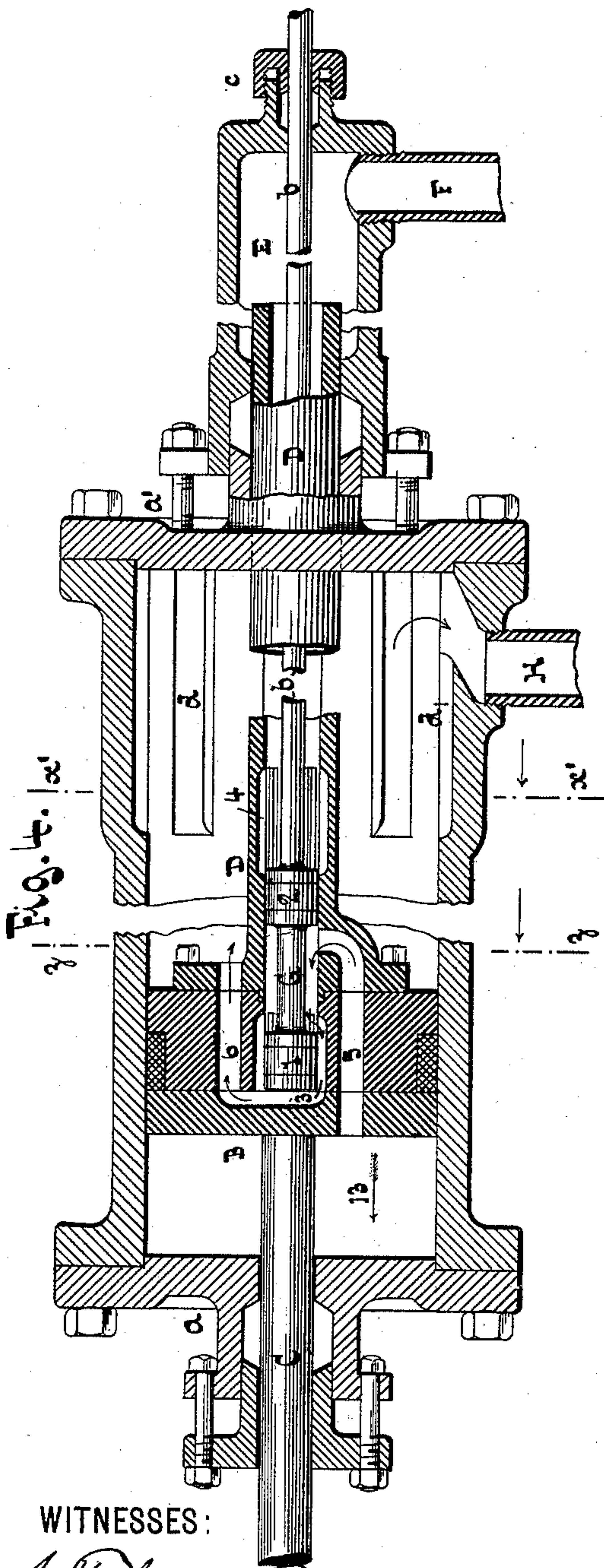
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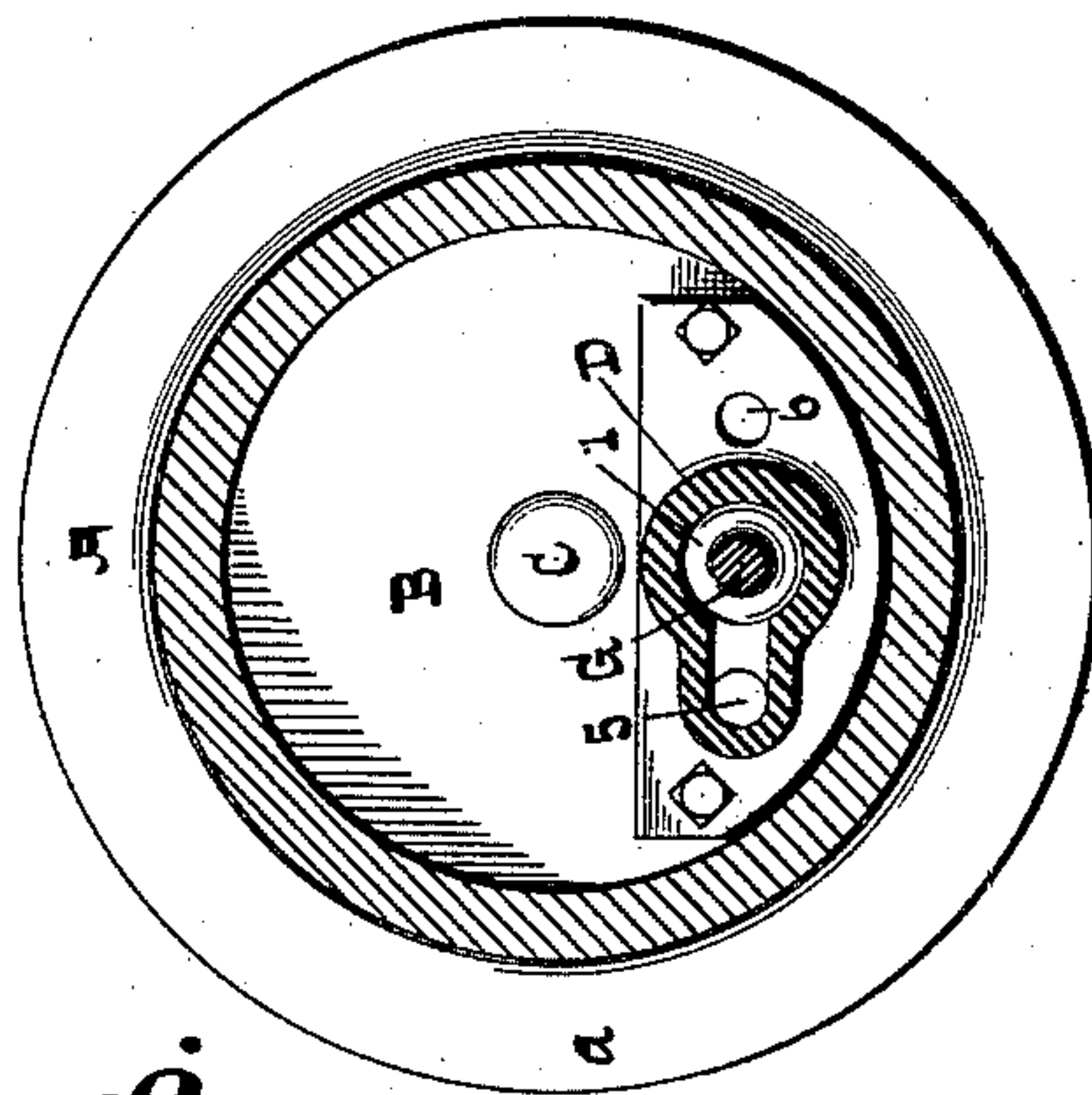
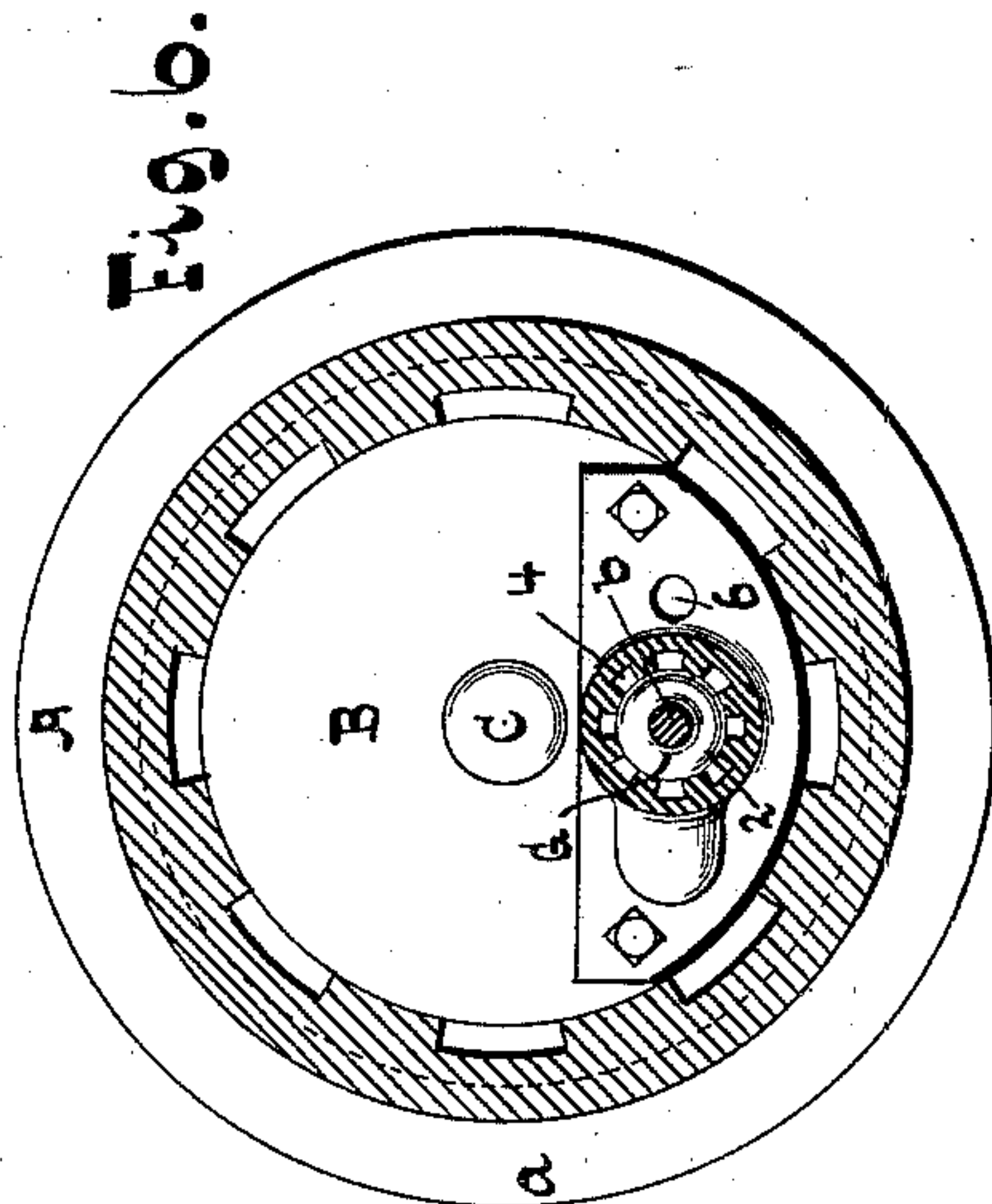


Fig. 5.

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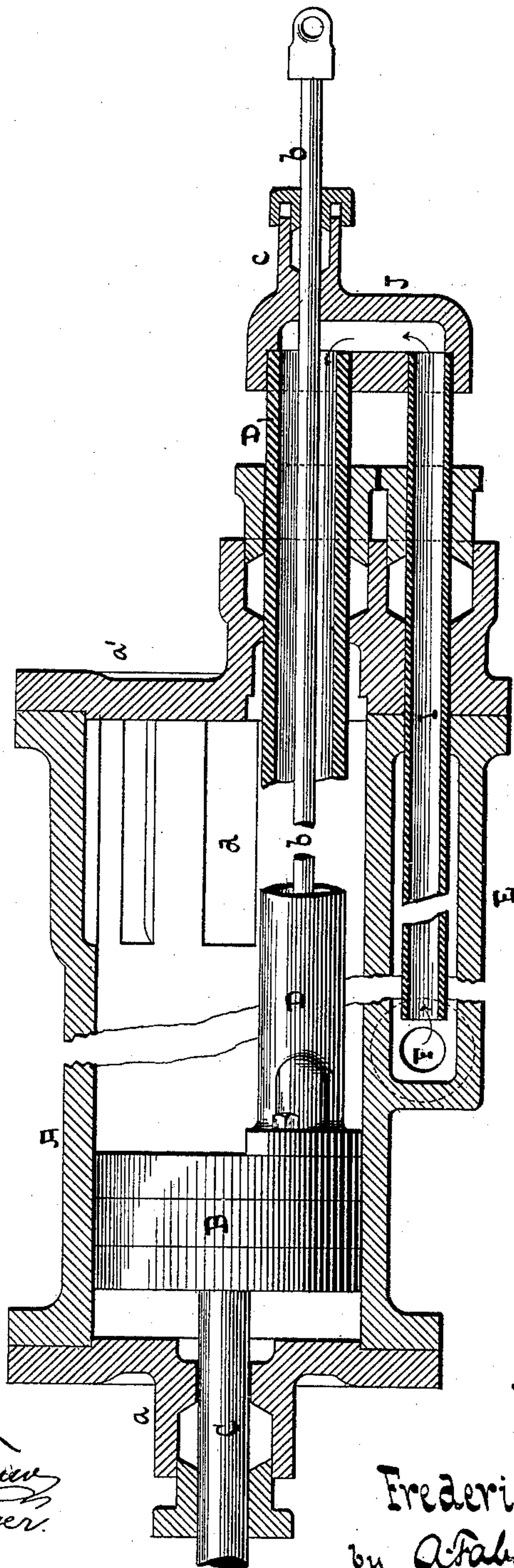
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Fig. 7



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# UNITED STATES PATENT OFFICE.

FREDERICK C. LANG, OF HOBOKEN, NEW JERSEY.

## STEAM STEERING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 409,749, dated August 27, 1889.

Application filed March 13, 1889. Serial No. 303,138. (No model.)

*To all whom it may concern:*

Be it known that I, FREDERICK C. LANG, a citizen of the United States, and a resident of Hoboken, in the county of Hudson and State of New Jersey, have invented a new and useful Improvement in Steam Steering Apparatus, of which the following is a specification.

My invention relates to improvements in steam steering apparatus, and has for its object to provide means which can be readily applied to vessels, and whereby the actual movement of the steering-gear, and especially that of the pilot-wheel, remains essentially the same as heretofore, while at the same time the power required for the operation is furnished by suitable steam-cylinders which are controlled by the pilot-wheel. By such an arrangement the wheel can be easily rotated, while the effect upon the rudder is precisely the same as when hand-power alone is used—that is, each angular movement, however large or small of the wheel in either direction, is attended by a corresponding movement of the rudder, as usual.

With the above objects in view my invention consists, essentially, in interposing between the pilot-wheel and the rudder two steam-cylinders, having their pistons connected with the tiller-ropes and their valves with the ropes from the wheel, the said pistons on the working-stroke following the travel of the valves, and said valves following the pistons in their return-stroke, all of which, together with other novel features embodied in the construction of the engines, I point out more fully in the following specification and claims, and illustrate in the accompanying drawings, in which—

Figure 1 represents a plan view of the general arrangement of the apparatus. Fig. 2 is a horizontal section of one of the cylinders in the plane  $x x$ , Fig. 3, said figure being drawn on a larger scale than Fig. 1. Fig. 3 is a longitudinal section in the vertical plane  $y y$ , Fig. 2. Fig. 4 is a section in the same plane as Fig. 2, but showing the parts in a different position. Fig. 5 is a transverse section in the plane  $z z$ , Fig. 4. Fig. 6 is a similar section in the plane  $x' x'$ , Fig. 4. Fig. 7 is a

longitudinal central section of a modified form of engine.

Similar letters indicate corresponding parts.

In order that the operation of my new steering apparatus can be clearly understood, I will proceed first to describe the construction of one of the cylinders or sections of the engine, and then describe the arrangement and connections of the cylinders on shipboard.

In the drawings, referring at present to Figs. 1, 2, and 3, the letter A designates one of the cylinders of the apparatus, which cylinder contains a piston B.

C is the piston-rod, which passes through a suitable stuffing-box in the outer head  $a$  of the cylinder, and is connected with one end of the rope from the rudder, Fig. 1.

D is a tubular valve-chest, which passes through a suitable stuffing-box in the opposite head  $a'$  of the cylinder, its inner end being secured to the piston B, and consequently said valve-chest participates in the movement of the piston. Its outer end is open and enters a steam-chamber E, which is arranged concentric with said valve-chest, and is coupled steam-tight to the cylinder A. Steam is supplied to said chamber by a steam-pipe F entering near its outer end, so that live steam can always enter the said steam-chest.

In the valve-chest is fitted a piston-valve G, having a stem  $b$ , which passes through a suitable stuffing-box  $c$  at the end of the steam-chamber E, and is connected with one end of the rope from the pilot-wheel, Fig. 1. This valve is provided with two heads 1 and 2, and in the valve-chest D are formed two byways 3 and 4, the byway 3 being located at the end of the chest and the other at a suitable distance therefrom. When the head 2 is wholly upon the induction-byway 4 live steam can pass the same, while the exhaust-byways are closed.

In the body of the piston B is formed a transverse induction-port 5, which passes through the metal of the valve-chest D and communicates with the interior of the same between the two heads of the piston-valve G. An exhaust-port 6 on the opposite side of the piston communicates with the valve-chest at its end and opens into the interior



of the cylinder on the exhaust side, the exhaust-steam finally passing through an exhaust-pipe H, connected with the cylinder.

The operation of the cylinder is as follows:

5 In starting the engine the valve G is drawn outward, as in Fig. 2, whereby a passage for live steam from the valve-chest is opened through byways 4 and induction-port 5, and a passage for the exhaust-steam is opened  
10 through byways 3 and exhaust-port 6. The piston B then moves in the direction of arrow 10 to approximately the position shown in Fig. 4, whereupon the steam-induction byways 4 are closed and the exhaust opened.  
15 During this movement of the piston the valve G remains stationary, and consequently the distance through which the valve has been moved determines the length of the stroke of the piston. In other words, the piston on its  
20 working-stroke follows the valve. The valve itself is prevented from moving with the piston in the direction of arrow 10 by the pressure of the live steam on the outer face of its head 1, while its movement in the opposite  
25 direction is prevented by the connection of the valve-stem *b* with the pilot-wheel, as will be presently explained.

I will now proceed to explain the general arrangement of the engine on shipboard and  
30 its operation, reference being had to Fig. 1. In this diagram T is the rudder, W the pilot-wheel, A' and A<sup>2</sup> the two sections or cylinders of the engine, R' the tiller-rope, and R<sup>2</sup> the wheel-rope. The wheel-rope R<sup>2</sup> passes  
35 over suitable pulleys *r*, and its ends are connected to the ends of the valve-rods *b'* *b*<sup>2</sup> of the respective cylinders A' and A<sup>2</sup>, and the tiller-rope R' passes over suitable pulleys *r'*, and its respective ends are attached to the  
40 ends of the piston-rods C' C<sup>2</sup>. The tiller-rope is preferably wound about and secured to a horizontal wheel or drum K, attached to the rudder-post.

In the diagram the rudder is shown amid-  
45 ship, and consequently the pistons of the cylinders A' A<sup>2</sup> are in their central positions with respect to the said cylinders. If the wheel W is turned in the direction of arrow 11, Fig. 1, the valve of cylinder A' is moved  
50 forward—that is, toward the head *a'*—and the end of the rope R<sup>2</sup>, attached to the valve-stem *b*<sup>2</sup> of cylinder A<sup>2</sup>, is correspondingly slackened. The piston of cylinder A' will consequently move forward in the direction  
55 of the head *a'* of the cylinder, and the rudder is turned in the direction of arrow 12. The pistons of the two cylinders being connected, the piston of engine A<sup>2</sup> will be drawn backward or in the direction of head *a* by the  
60 tiller-rope R', and its valve follows it. To make this point in regard to the valve following the piston more clear, attention is called for the present to Fig. 4, which shows the piston on the point of moving in the direction  
65 of arrow 13. In this case the full pressure of the live steam is on the head 2 of said piston,

while the exhaust-steam acts on the opposite end of the valve, the difference of pressure tending to force the valve in the direction of arrow 13, or in the same direction as the piston will move.

Assuming that the rudder has been turned in the direction of arrow 12, Fig. 1, to the position indicated by dotted lines, it is now held in that position as follows: The position  
75 of the piston B in Fig. 4 may be taken as the assumed position of the piston of cylinder C' in Fig. 1. The action of the water on the rudder would tend to turn it in a direction opposite to arrow 12, Fig. 1, and consequently  
80 it would exert a force upon the piston of cylinder A', tending to draw the same outward.

Referring to Fig. 4, if the piston is moved toward the head *a* while the valve remains  
85 stationary, it being held by its connection with the pilot-wheel, the by-ways 4 would open a passage for live steam to the induction-port 5. Consequently the steam admitted behind the piston will force it inward again, &c. In  
90 practice, however, the piston originally will not move as far forward as shown in Fig. 4, but will stop about simultaneously with the first closure of the byways 4. Consequently the vibrations of the piston would be inap-  
95 preciable, as the smallest movement outward of the same would immediately open the steam-port. If the wheel is now turned in a direction opposite to arrow 12, the valves of cylinder A<sup>2</sup> are moved away from the piston,  
100 and the rudder is turned in a direction opposite to arrow 12.

I do not wish to restrict myself to the precise arrangement of the cylinders, or to the exact connections of the same to the rudder  
105 and to the wheel, as they will be changed to suit circumstances.

To provide for cases of accident—such, for instance, as the breakage of one of the ropes connecting the pistons with the rudder—I  
110 make the cylinder longer than necessary for the stroke of the piston, and form longitudinal recesses or channels *d* in its inner periphery, said recesses or channels being longer  
115 than the depth of the piston, so that if the same is propelled toward the head, in case of such a breakage as described, the pressure of steam will be equalized, and the water thus prevented from striking violently upon the  
120 piston-head.

The steam-chamber E, instead of being placed in line with the cylinder, may be placed to one side of the same, as shown in Fig. 7. In this case I place a steam-pipe I centrally  
125 within the same, said pipe passing through a suitable stuffing-box at the end of the chamber. The pipe I is united to the steam-chest D by a hollow cross-head or coupling J, having a stuffing-box *c*, through which the valve-stem passes. By this construction the length  
130 of the engine is decreased, which is preferable in some cases.



Any suitable arrangement may be made for blowing off the water of condensation in the cylinders A.

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

1. In a steam steering apparatus, the combination, with the pilot-wheel and the rudder, of two interposed cylinders having their respective valves connected with the pilot-wheel and their pistons with the rudder, said pistons in their working-stroke following the travel of the valves, substantially as described.

2. In a steam steering apparatus, the combination, with the pilot-wheel, the rudder, and the tiller-ropes, of two interposed cylinders having their respective valves connected to the ropes from the pilot-wheel and their pistons with the rope from the rudder, said pistons in their working-stroke following the stroke of the valves, substantially as described.

3. In a steam steering apparatus, the combination, with the pilot-wheel and the rudder, of two interposed cylinders having their valves connected with the pilot-wheel and their pistons with the rudder, said pistons in their working-stroke following the travel of the valves and said valves moving with the pistons on the return-stroke, substantially as described.

4. In a steam steering apparatus, two interpolated cylinders having their valves connected with the pilot-wheel and their pistons with the rudder, the motion of said pistons being arrested at any point by the adjustment of the valves, substantially as described.

5. In a steam steering apparatus, two interpolated cylinders having their valves connected with the pilot-wheel and their pistons with the rudder, the motion of the pistons being automatically arrested at any point by the adjustment of a valve, the said stroke of the

pistons being the same in length as the stroke of the valve, substantially as described.

6. In a steam steering apparatus, an engine composed of two cylinders, each provided with a piston, a tubular valve-chest connected with the piston and participating in the movement thereof, a valve fitted to the valve-chest, suitable rope-connections between the valves and the pilot-wheel, or its equivalent, and between the pistons and the rudder, said valves being prevented from moving with the pistons on the working-strokes of the latter by steam-pressure and returned by steam-pressure on the reverse strokes of the pistons, substantially as described.

7. The combination, with the cylinder and its piston, of a valve-chest moving with the piston, a steam-chamber located parallel to the cylinder and directly to one side of the same, a steam-pipe entering the steam-chamber, and a coupling uniting the steam-pipe and the valve-chest and provided with a stuffing-box for the passage of the valve-rod, substantially as described.

8. The combination, with the cylinder and the piston, of a tubular valve-chest attached to the piston, induction and exhaust byways formed in the interior of the valve-chest, a piston-valve provided with two heads for controlling the respective byways, induction and exhaust ports in the piston communicating with the byways and opening through opposite sides of the piston, a valve-stem extending through one head of the cylinder, and a piston-rod, substantially as described, and for the purpose set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two witnesses.

FREDERICK C. LANG.

Witnesses:

HENRY F. LIPPOLD,  
A. FABER DU FAUR.