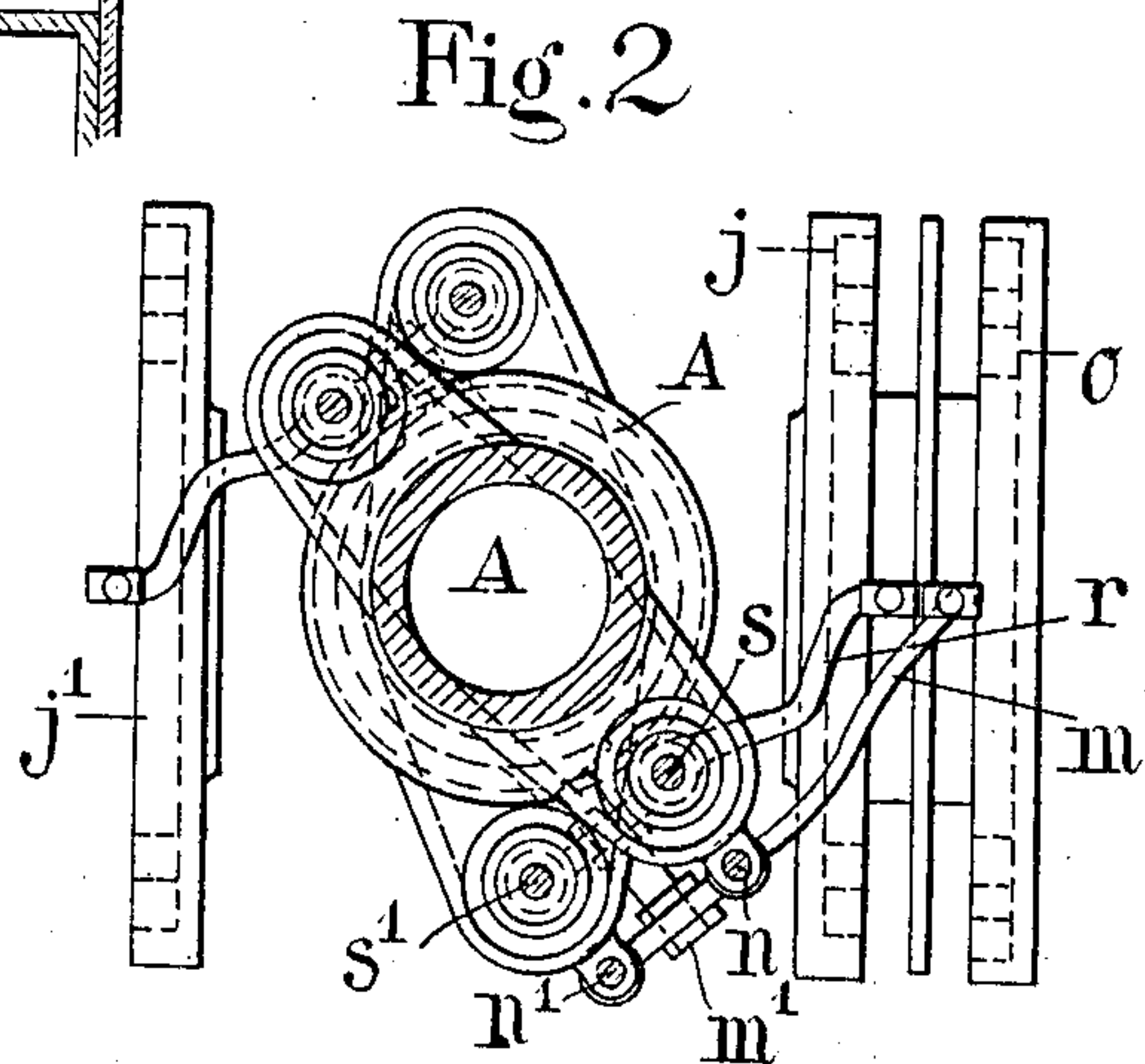
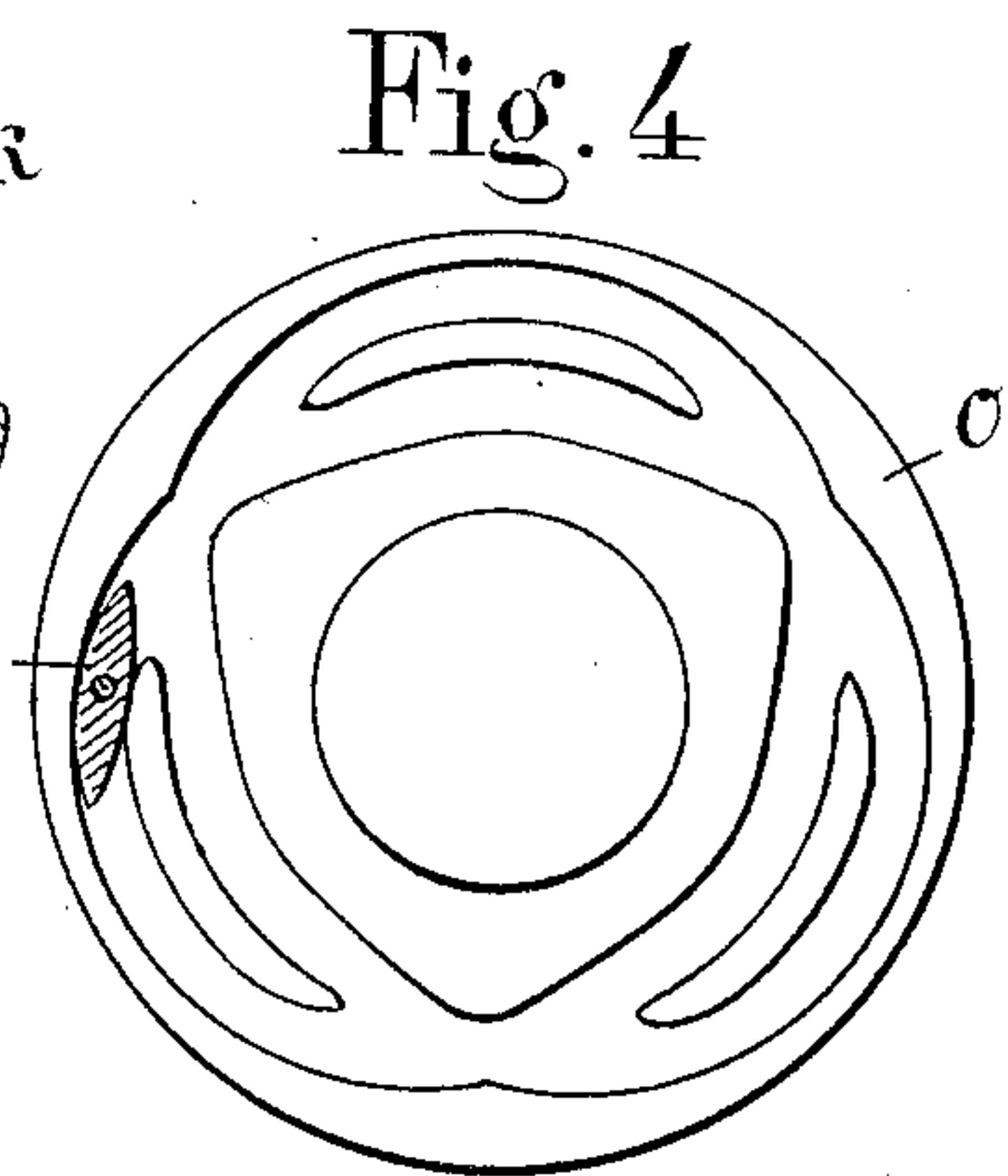
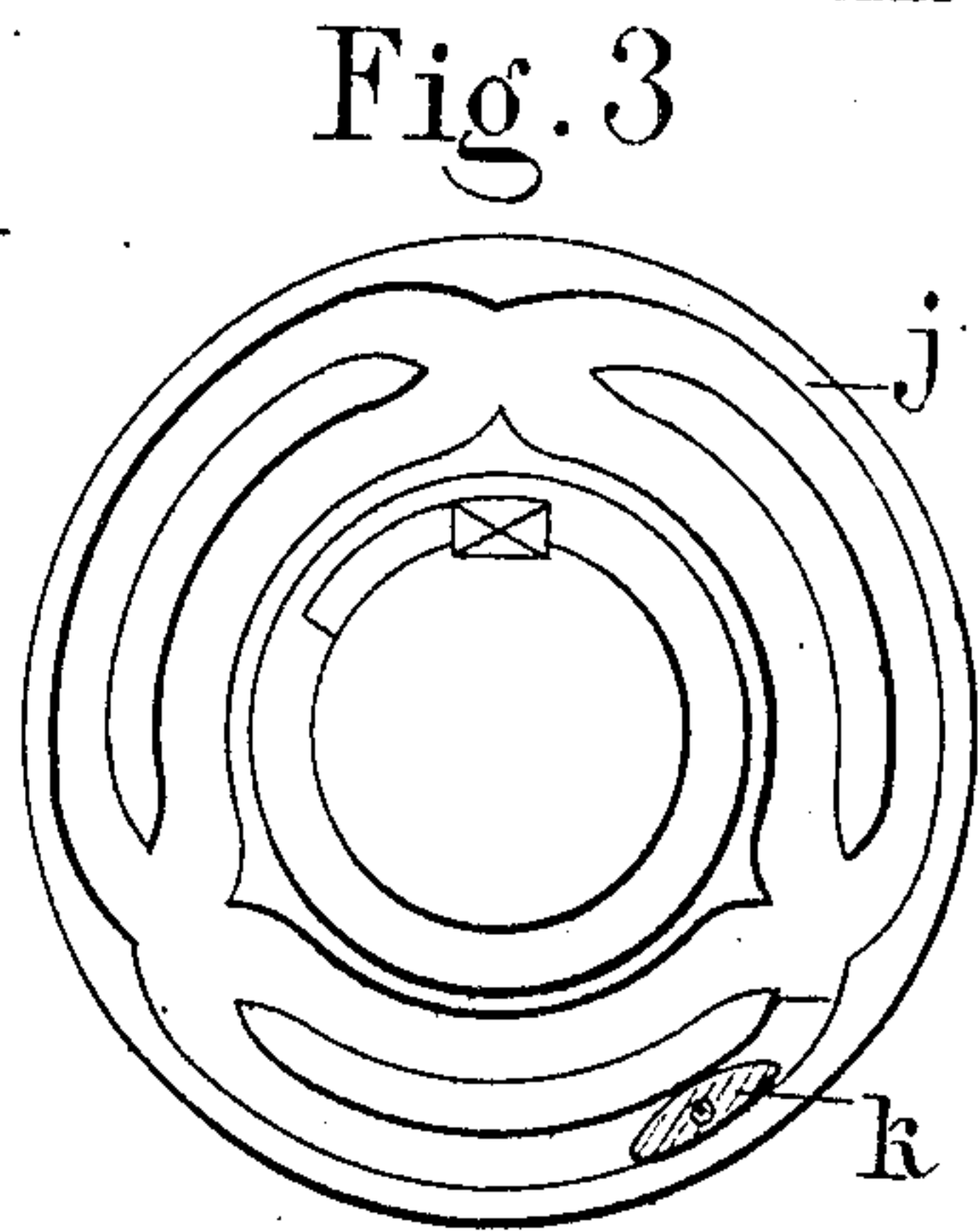
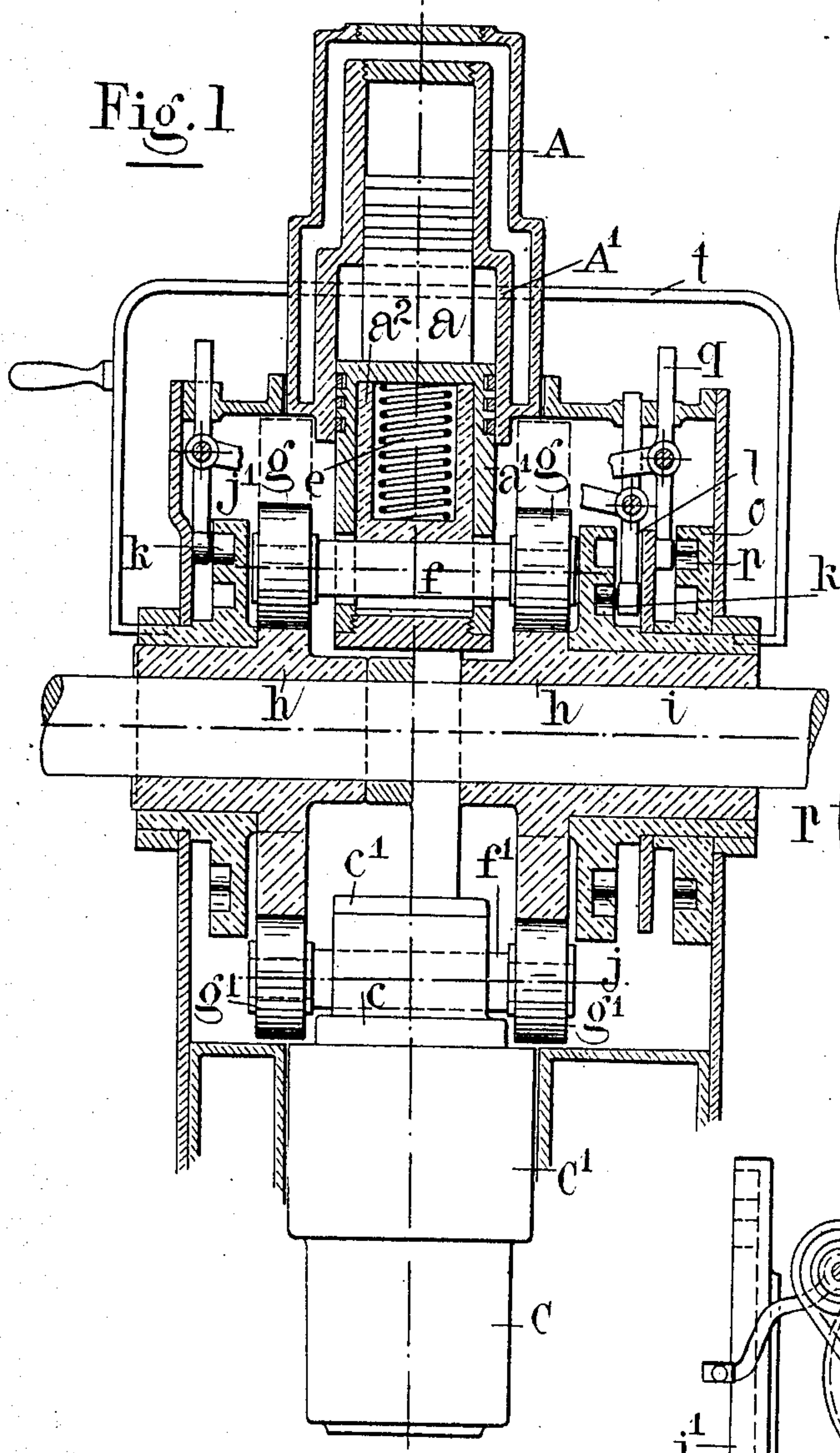


No. 871,707.

PATENTED NOV. 19, 1907.

E. KOCH.  
HYDROCARBON MOTOR.  
APPLICATION FILED MAY 31, 1907.

2 SHEETS—SHEET 1.



WITNESSES:

*Jean Germain*  
*Guillaume Pioche*

INVENTOR

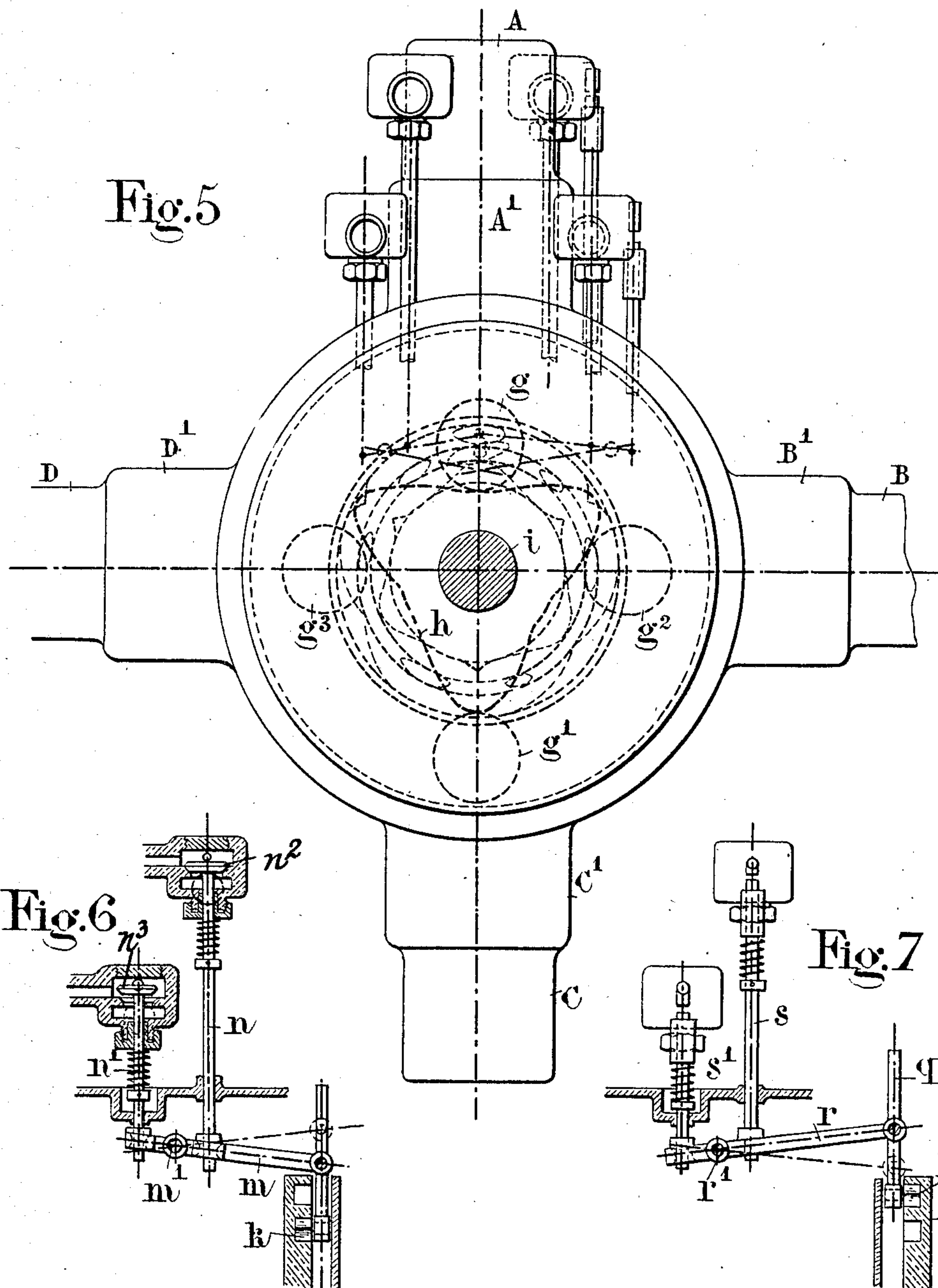
*Eugène Koch*

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WITNESSES

*Jean Germain*  
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INVENTOR

*Eugene Koch*



# UNITED STATES PATENT OFFICE.

EUGÈNE KOCH, OF LYON, FRANCE.

## HYDROCARBON-MOTOR.

No. 871,707.

Specification of Letters Patent.

Patented Nov. 19, 1907.

Application filed May 31, 1907. Serial No. 376,651.

*To all whom it may concern:*

Be it known that I, EUGÈNE KOCH, a citizen of the French Republic, residing at Lyon, in France, have invented certain new and useful Improvements in Hydrocarbon-Motors, of which the following is a specification.

The object of the present invention is the application to a hydrocarbon motor of means for transforming an alternating rectilinear movement into continuous circular movement by means of a cam having three bosses on which travel rollers, the latter being arranged at constant distances apart and being fixed to the coupling members of the motor pistons. Said coupling members can be joined to connect the pistons and may also form an integral part thereof and be apertured for the passage of the motor shaft.

The present invention more particularly relates to the general arrangement of the motor, and to the means for distribution and ignition which will allow of obtaining the four stroke cycle with twelve effective impulses to each revolution of the motor shaft in the case of an eight cylinder motor, and six effective impulses in the case of a four cylinder motor. Moreover, in the former case the compression in a cylinder is always made at the same time that the explosion occurs in the opposite cylinder, so that there is always an interposed cushion of gas for reducing the shocks of the motor.

In the construction represented in the annexed drawing the motor has eight cylinders arranged concentrically in pairs but it is obvious that other arrangements may be adopted without departing from the spirit of the invention. The motor is also designed so that the cam rotates within a space at the center of the cylinders which are fixed; but by an inverse arrangement the cylinders may be movable about a fixed cam. The cooling is effected by circulation of water or by ribs, according to circumstances.

Referring to the annexed drawings Figure 1 is a central section of a motor constructed according to the invention. Fig. 2 is a sectional plan view showing the position of the distribution and ignition cams. Fig. 3 is a front view of the cam controlling the distribution valves. Fig. 4 is a front view of the cam controlling the ignition. Fig. 5 is a front elevation of the motor. Fig. 6 is a section of the mechanism for controlling the

distribution and Fig. 7 is a section of the mechanism for controlling the ignition.

The motor shown comprises eight cylinders  $A A^1, B B^1, C C^1, D D^1$  placed at angles of 90 degrees to each other and arranged in such a manner that the cylinders  $A^1 B^1 C^1 D^1$  are concentric with the cylinders  $A B C D$  and so that the active surface is the same for all the pistons of these cylinders. However, if by reason of the annular arrangement of the large piston the effect of the explosion is less than the effect in the small cylinder the said annular surface may be increased. The pistons  $a b c d$  are solid whereas the pistons  $a^1 b^1 c^1 d^1$  are each hollow for reception of a dead-head  $a^2 b^2 c^2 d^2$  which transmits the pressure of an internal spring  $e$  to the shaft  $f f^1, f^2$  or  $f^3$  on which are mounted the rollers  $g g^1 g^2 g^3$  the continuous contact of which with the double cam with three bosses  $h$  effects the conversion of the reciprocating movement of the pistons into a continuous circular movement of the said cam, or vice-versa. In the form of construction shown in Fig. 1 the double cam  $h$  is keyed to the shaft  $i$ , which is, therefore, the motor shaft.

The arrangement of spring-loaded dead-heads in the large pistons is for the purpose of always insuring perfect contact of the rollers with the cam, whatever the extent of wear thereof. However, any other mechanical means may be employed for securing the same result.

The principal feature of the invention resides in the application to this rotary motor of cams which allow the supply and exhaust valves and the ignition devices to be actuated only once in every two strokes in order to carry out the four stroke cycle, or in other words of each time jumping a boss of the main cam  $h$ , in order to permit the compression and explosion to take place while the valves are closed. This result is obtained by means of a cam with a double groove or path  $j$  (Fig. 3) fixed to the motor shaft and which during its rotation displaces a gudgeon  $k$  which passes alternately from the inner groove to the outer groove, and vice-versa. These movements are transmitted by a rod  $l$  (Figs. 1 and 6) to a lever  $m$  fulcrumed at  $m^1$  and actuating, at an equal distance from the center of oscillation, two rods  $n n^1$  controlling respectively the admission valves  $n^2 n^3$  to the small and large cylinders. The same device is reproduced for each of the four



pairs of cylinders. The exhaust is produced in the same manner by a similar cam  $j^1$  fixed to the motor shaft  $i$  at an angle differing from that of the cam  $j$ .

5 As will be understood, when admission is taking place for example, in a small cylinder, the corresponding large cylinder will be closed, and vice versa, this result being due to the movement of the valves controlled by  
10 the rods  $n$   $n^1$ . It follows that on each boss of the main cam  $h$  coming into action suction is produced in a large or small cylinder alternately, and that one of the pistons is always acting effectively.

15 The control of the ignition is effected by a cam  $o$  (Fig. 4) similar in construction to the cams  $j$  and  $j^1$ . The movements of the gudgeon  $p$  of this cam are transmitted to a rod  $q$  which actuates the lever  $r$  pivoted at  $r^1$ ,  
20 which acts on rods  $s$   $s^1$  controlling circuit-breakers or an igniting device of any kind. The position of the cams controlling the distribution and the ignition may of course vary according to the type of motor constructed in accordance with the present in-  
25 vention.

It will be understood that the reciprocating movements of the pistons transmitted to the rollers  $g$   $g^1$   $g^2$   $g^3$  which take part in their  
30 movement, have the effect of rotating the cam  $h$  and shaft  $i$ . Forward and rearward running are obtained by simply rotating the distribution controlling cams through  $60^\circ$  by means of a suitable lever  $t$ .

35 What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. In a motor the combination with radi-  
40 ally disposed cylinders pistons working therein rollers carried in pairs by the rods of said pistons, a motor shaft and a cam on said shaft having a plurality of bosses thereon continuously engaged by said rollers, of

inlet and exhaust valves to said cylinders and double pathed cams adapted to act on 45 said valves whereby admission and exhaust to and from each cylinder takes place only after a double stroke of said pistons substantially as described.

2. In a motor the combination with radi- 50 ally disposed cylinders pistons working therein, rollers carried in pairs by the rods of said pistons, a motor shaft and a cam on said shaft having a plurality of bosses thereon continuously engaged by said rollers, of 55 inlet and exhaust valves to said cylinders means for igniting the charge in said cylinders, and double pathed cams adapted to control said igniting means and to act on said valves whereby admission and exhaust 60 to and from each cylinder take place only after a double stroke of said pistons substantially as described.

3. In a motor the combination with radi- 65 ally disposed cylinders arranged concentrically in pairs, pistons working in said cylinders, rollers carried in pairs by the rods of said pistons, a motor shaft located at the point of intersection of the axes of said cylinders, and a cam on said shaft having three 70 bosses thereon, continuously engaged by said rollers of inlet and exhaust valves for said cylinders double pathed cams adapted to act on said valves whereby admission and exhaust to and from said cylinders take 75 place only after a double stroke of the pistons, means for igniting the charge in said cylinders and a double pathed cam controlling said igniting means substantially as described. 80

In witness whereof I have signed this specification in the presence of two witnesses.

EUGÈNE KOCH.

Witnesses:

JEAN GERMAIN,

GUILLAUME PIOCHE.