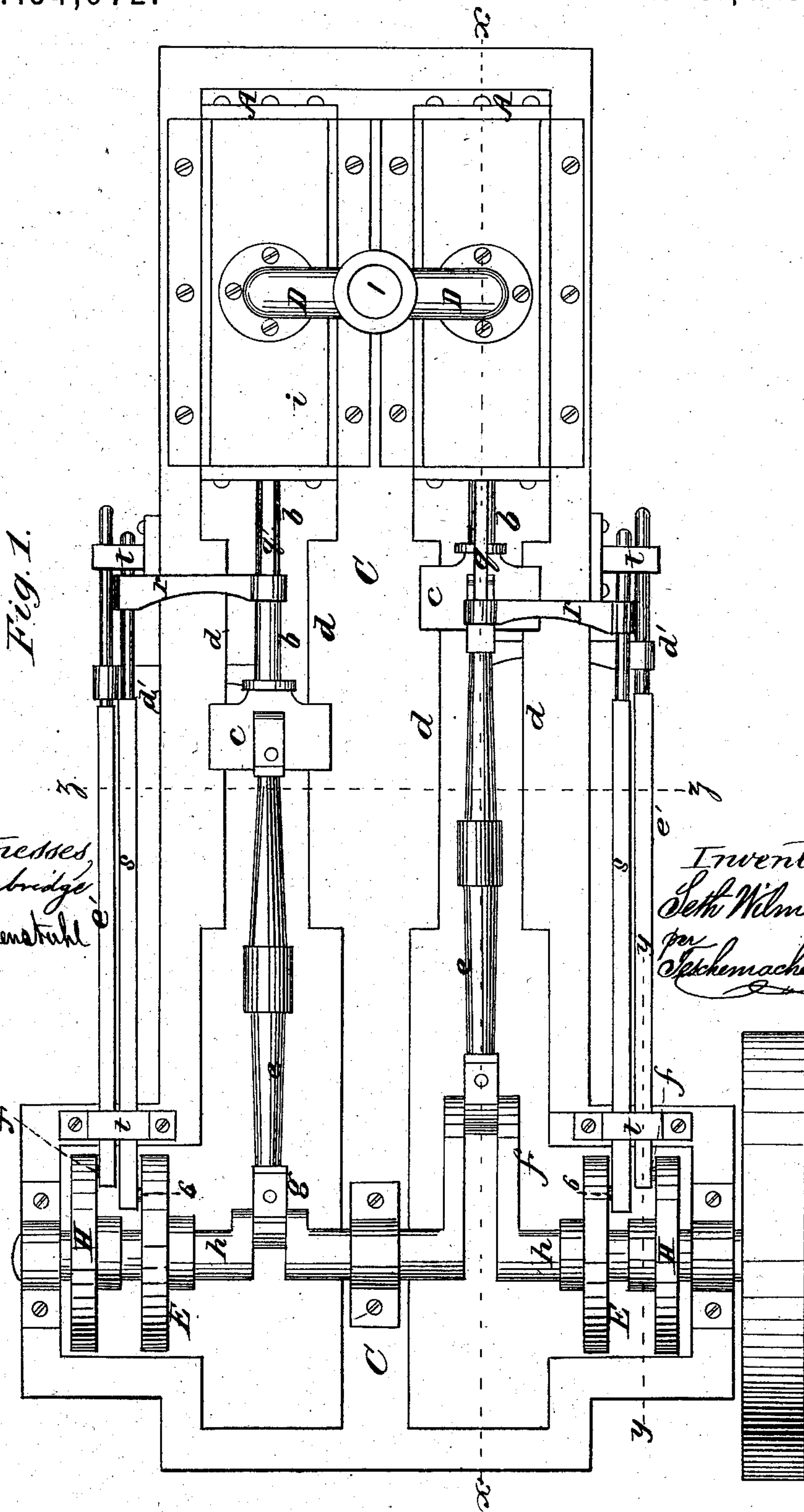


**S. WILMARTH.**  
**Water Engines and Motors.**

No. 154,972.

Patented Sept. 15, 1874.



*Fig. 1.*

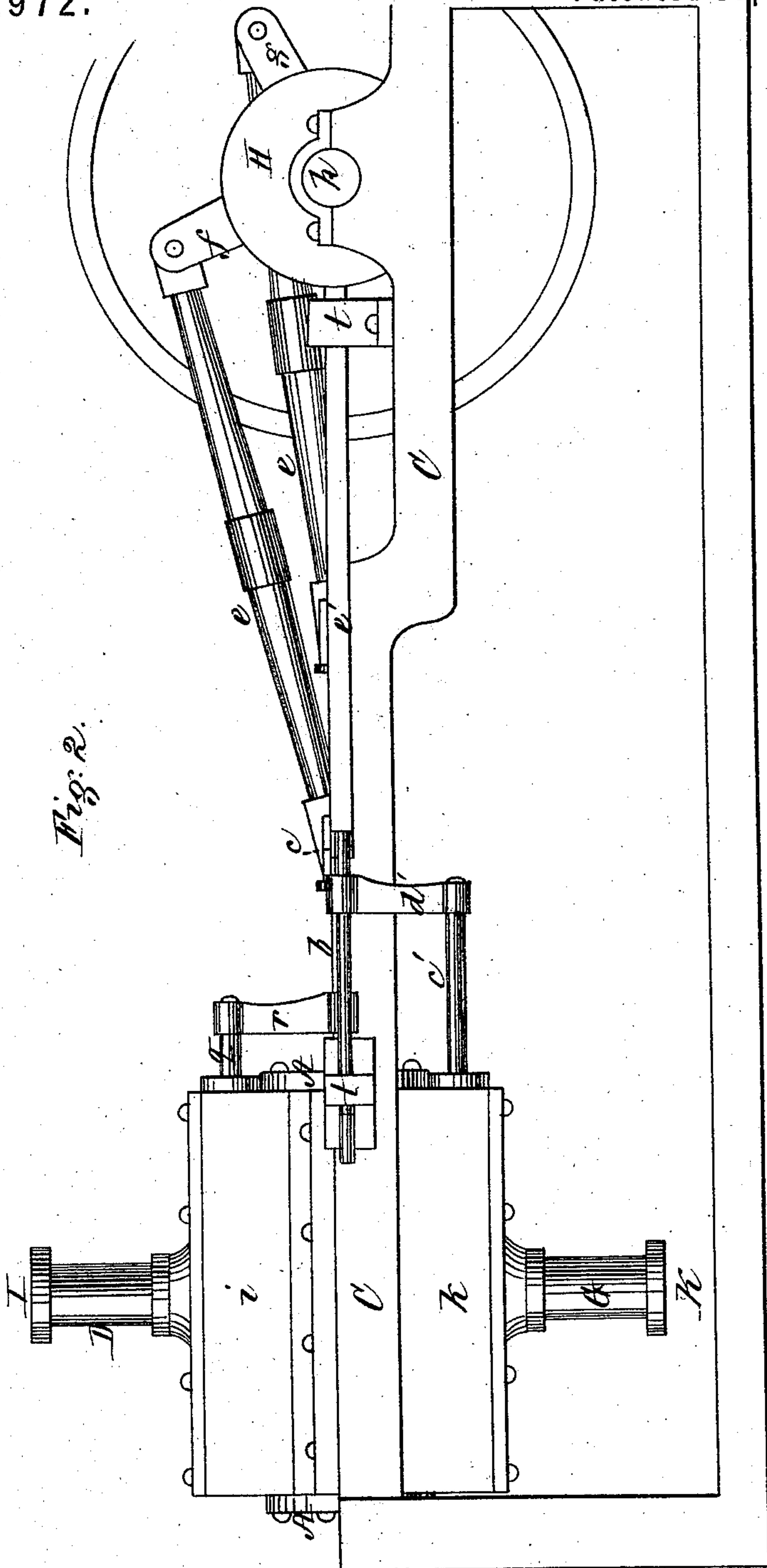
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*Spachmachers & Stearns*  
*Attys*

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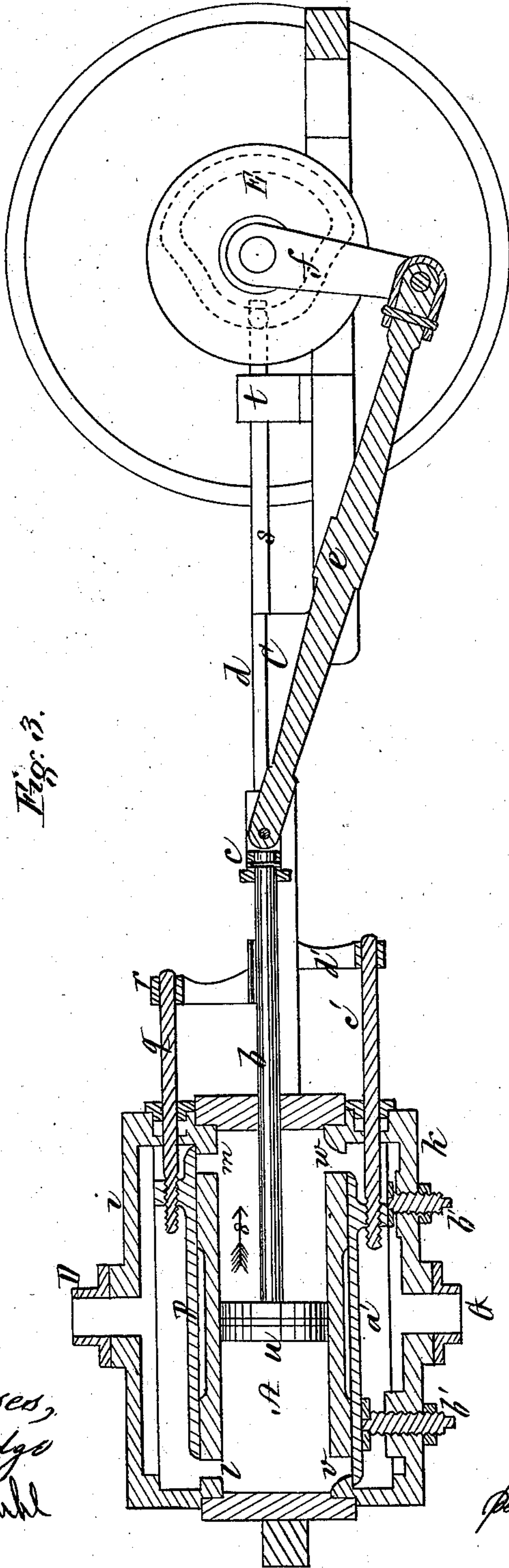
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*Fig. 3.*

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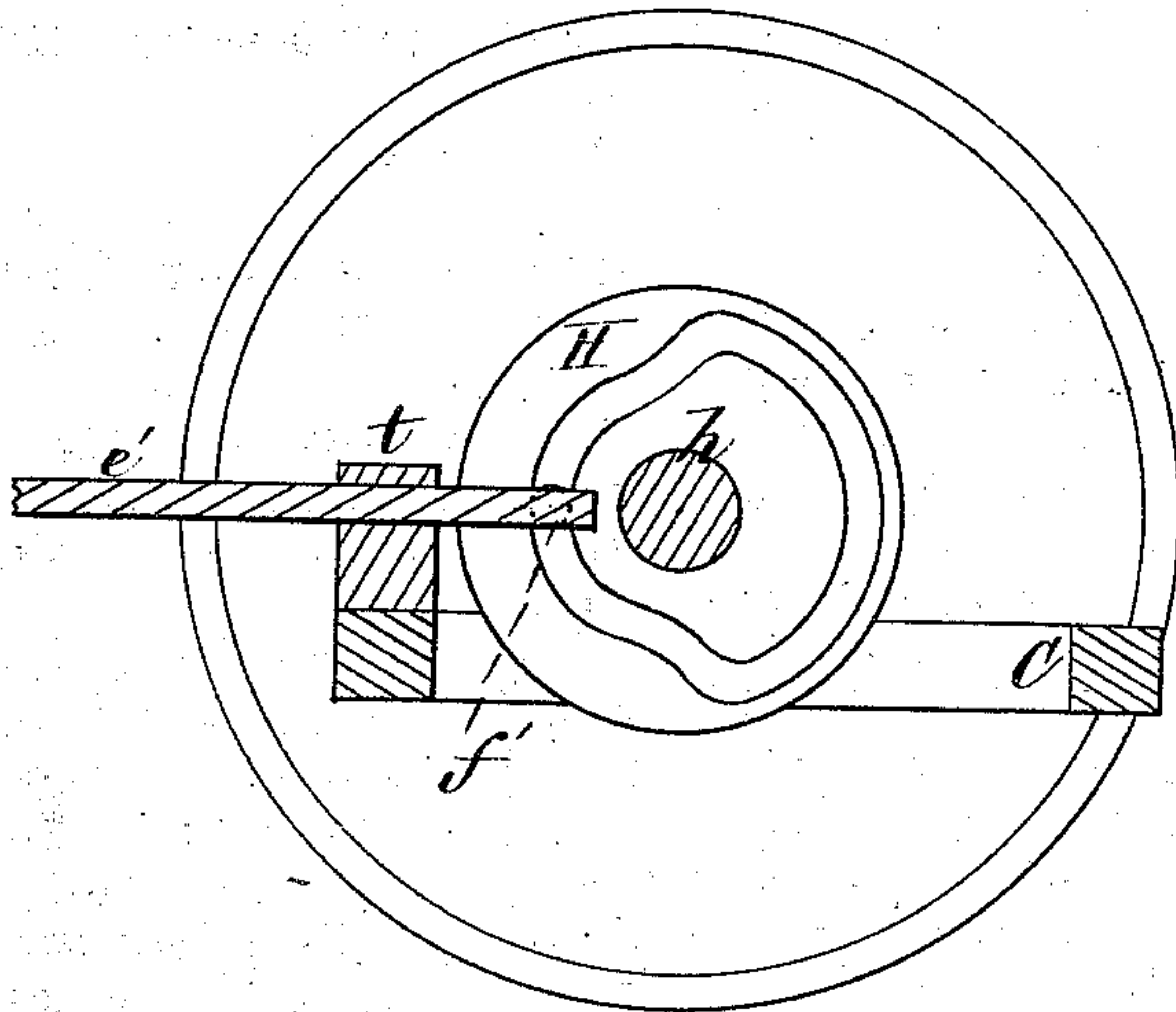


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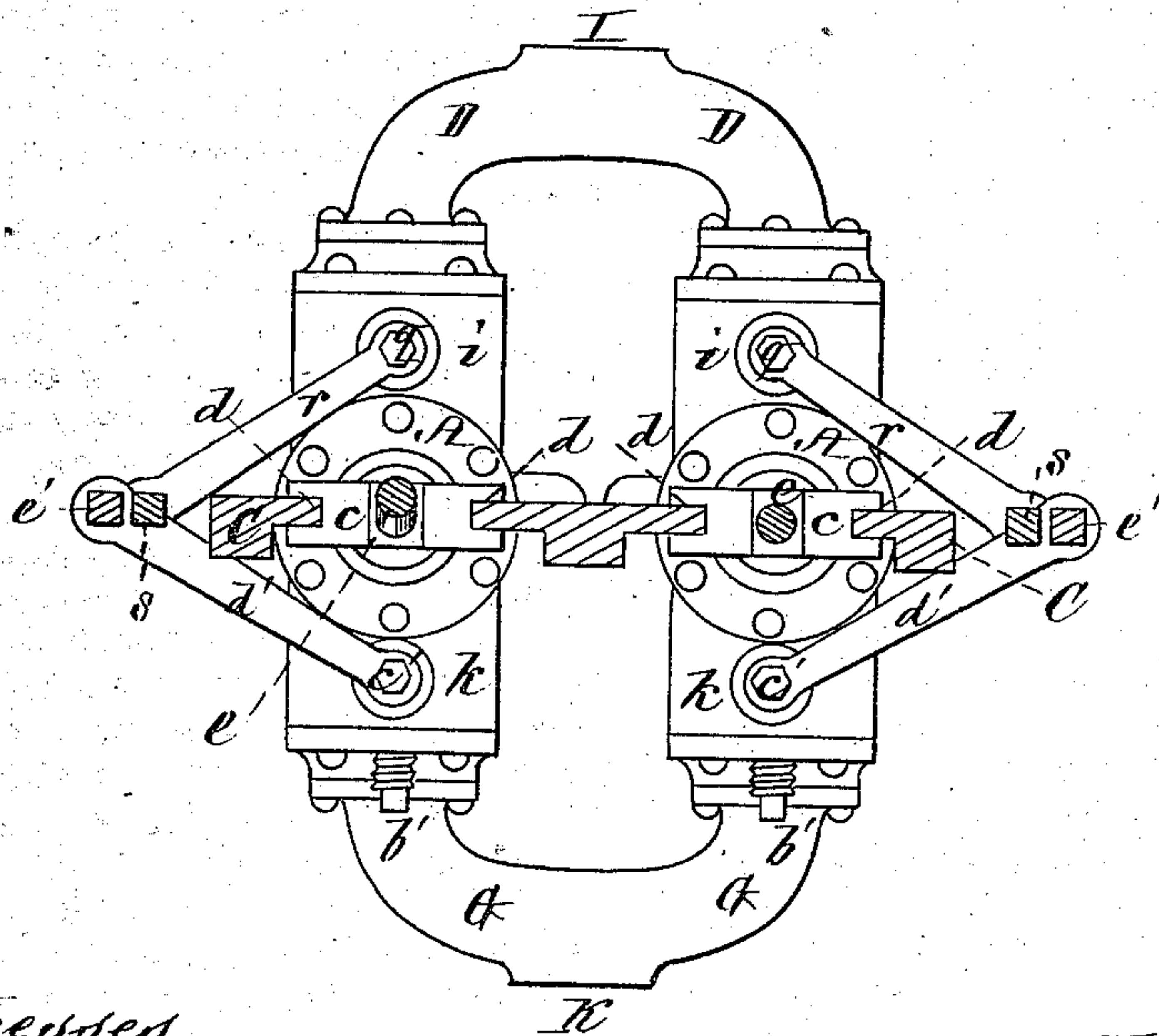
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*Fig. 4.*



*Fig. 5.*



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# UNITED STATES PATENT OFFICE

SETH WILMARTH, OF MALDEN, MASSACHUSETTS.

## IMPROVEMENT IN WATER ENGINES AND MOTORS.

Specification forming part of Letters Patent No. 154,972, dated September 15, 1874; application filed August 7, 1874.

*To all whom it may concern:*

Be it known that I, SETH WILMARTH, of Malden, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Water Engines or Motors, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a plan of my improved water-engine. Fig. 2 is a side elevation of the same. Fig. 3 is a longitudinal vertical section on the line *x x* of Fig. 1. Fig. 4 is a longitudinal vertical section on the line *y y* of Fig. 1. Fig. 5 is a transverse section on the line *z z* of Fig. 1.

My invention has for its object to produce a water-engine which will have a steady and reliable motion, and in which the discharge or waste valve is opened a short time previous to the arrival of the piston at the end of its stroke, thus giving more time than heretofore for the cylinder to empty itself of waste water, whereby the water ram or "pound" at the end of each stroke, which stops or retards the motion of the engine, and causes it to run irregularly, is entirely avoided; and my invention consists in a pair of engines connected with a single shaft, and having their cylinders placed in a horizontal, or nearly horizontal, position, to allow of the waste water being discharged by its own gravity, each cylinder having an inlet-chest on its upper side, and an outlet-chest on its under side, provided with inlet and outlet valves, which are operated with a sudden motion, and afterward remain stationary until a short time before the arrival of the piston at the end of its stroke in the opposite direction, the piston being elongated, and each inlet-port being placed at such distance from the end of the cylinder that it will be closed by the piston a short time before it arrives at the end of its stroke, and not uncovered thereby until its return; which construction admits of the inlet-port at the opposite end of the cylinder being closed just previous to the opening of the discharge-port, which takes place a short time before the arrival of the piston at the end of its stroke, thus giving much more time than heretofore for the waste water to run out of the cylinder, and entirely preventing the water ram or pound at the end of each stroke,

which has heretofore proved such a serious objection to the use of engines of this description.

To enable others skilled in the art to understand and use my invention, I will proceed to describe the manner in which I have carried it out.

In the said drawings, *A A* represent the cylinders, which are secured to the frame *C* in a horizontal position, to allow of the waste water being discharged, by its own gravity, after each stroke of the piston, thus avoiding the necessity of lifting the water on one side of the piston, as would be the case if the cylinders were placed in a vertical position. *b b* are the piston-rods; *c c*, the cross-heads, which slide on guides *d*, and *e e* the connecting-rods, which are attached to cranks *f g* on the driving-shaft *h*, these cranks being placed at right angles to each other, so that one will be at its most effective point while the other is on the center.

As the construction and operation of each of the two engines are the same, I will describe but one.

On the upper side of the cylinder *A* is an inlet-chest, *i*, and on the under side an outlet or discharge chest, *k*. *D* is the inlet-pipe, by which the water, under pressure, enters the chest *i*, thence passing alternately through the inlet-ports *lm* into the cylinder *A*. These ports *lm* are, alternately, opened and closed by a slide-valve, *p*, the stem *q* of which passes through a stuffing-box, and has secured to its outer end an arm, *r*, which is also attached to a horizontal rod, *s*, which slides in bearings *t*, and is provided at its outer end with a pin, *6*, which fits into the groove of a cam-wheel, *E*, secured to the driving-shaft *h*, the form of the cam-groove (seen dotted in Fig. 3) being such that the valve *p* will be operated with a sudden motion a short time before the arrival of the piston *u* at the end of its stroke in one direction, and then remain stationary until a short time before the arrival of the piston at the end of its stroke in the opposite direction. *v w* are the outlet or discharge ports, through which the waste water flows, alternately, by its own gravity, from the cylinder into the chest *k*, and thence into the discharge-pipe *G*. These ports *v w* are alternately opened and closed by a slide-valve, *e'*, *a'*, which is kept up against its



seat by screws  $b'$ , or otherwise, the stem  $c$  of this valve passing through a stuffing-box, and having secured to its outer end an arm,  $d'$ , which is also attached to a sliding rod,  $e'$ , placed alongside of the rod  $s$ , and in close proximity therewith. The rod  $e'$  is provided, at its outer end, with a pin,  $f'$ , which fits into the groove of a cam-wheel,  $H$ , secured to the shaft  $h$  a short distance from the cam-wheel  $E$ .

The form of the cam-groove in the wheel  $H$  is the same as that of the wheel  $E$ , which causes the valve  $a'$  to be operated with a sudden motion a short time before the arrival of the piston at the end of its stroke in one direction, and then remains stationary until a short time before the arrival of the piston at the end of its stroke in the opposite direction. The cam-wheels  $E$   $H$  are so placed upon the shaft  $h$  that the movement of the inlet and outlet valves will take place at the exact times required.

The piston  $u$  is elongated, as seen in Fig. 3; and each of the inlet-ports  $lm$  is placed a short distance from the end of the cylinder, instead of close up against it, as heretofore; and thus, as the piston moves in the direction of the arrow 8, Fig. 3, it will be seen that the port  $m$  will be covered by it some little time previous to its arrival at the end of the stroke, the position of the port and the length of the piston causing the port to remain covered by the piston until the latter has passed it on the return stroke. As soon as the port  $m$  has been covered by the piston, the slide-valve  $p$  is suddenly moved by the cam-wheel  $E$  so as to close the inlet-port  $l$ , and open the opposite inlet-port,  $m$ ; but, as the latter is covered by the piston, no water can enter the cylinder. Immediately after the closing of the inlet-port  $l$  the slide-valve  $a'$  is suddenly moved by the cam-wheel  $H$ , which opens the outlet-port  $v$ , and closes the opposite outlet-port,  $w$ , through which the water has previously been discharged. The water now flows out of the cylinder by its own gravity, through the port  $b$  into the chest  $k$ , and thence out through the discharge-pipe  $G$ , and, as the discharge-port is thus opened some little time before the arrival of the piston at the end of its stroke, it will be seen that much more time is allowed for the waste water to run out of the cylinder than in an engine where the discharge-port is

not opened until the completion of the stroke of the piston; and I am thus enabled to entirely prevent the water ram or pound at the end of each stroke of the piston, and the consequent irregular motion incident to water-engines as heretofore constructed.

From the time that the inlet-port  $l$  is closed until the inlet-port  $m$  is uncovered on the return of the piston there is no water-pressure within the cylinder, and, consequently, the movement of the piston is effected by the other engine, the crank of which, at that time, is at its most effective point, so that the greatest power of one engine is exerted at a time, when there is no water-pressure whatever on the piston of the other engine. On the return of the piston in a direction contrary to that of the arrow 8 the inlet-port  $l$  is opened, and the port  $m$  closed, and immediately thereafter the outlet-port  $w$  is opened and the port  $v$  closed in the same manner and at the same relative times with respect to each other, as previously described. The inlet-pipes  $D$  of the two cylinders are united together so as to receive their supply of water from a single pipe,  $I$ ; and the waste-pipes  $G$  are also united, so as to discharge through a single pipe,  $K$ .

I do not confine myself to the use of cams for operating the valves, as any other suitable mechanism, which will produce a sudden movement of the valves at the required times, may be employed instead.

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

The two horizontal cylinders  $A$   $A$ , each provided with an inlet-chest,  $i$ , on its upper side, and an outlet-chest,  $k$ , on its under side, and with inlet-ports  $lm$  placed a short distance from its ends, and outlet-ports  $v$   $w$ , in combination with the elongated pistons  $u$ , connected with a single shaft,  $h$ , and the slide-valves  $p$   $a'$ , all constructed and arranged to operate together substantially in the manner and for the purpose set forth.

Witness my hand this 5th day of August, 1874.

SETH WILMARTH.

In presence of—

P. E. TESCHEMACHER,  
N. W. STEARNS.