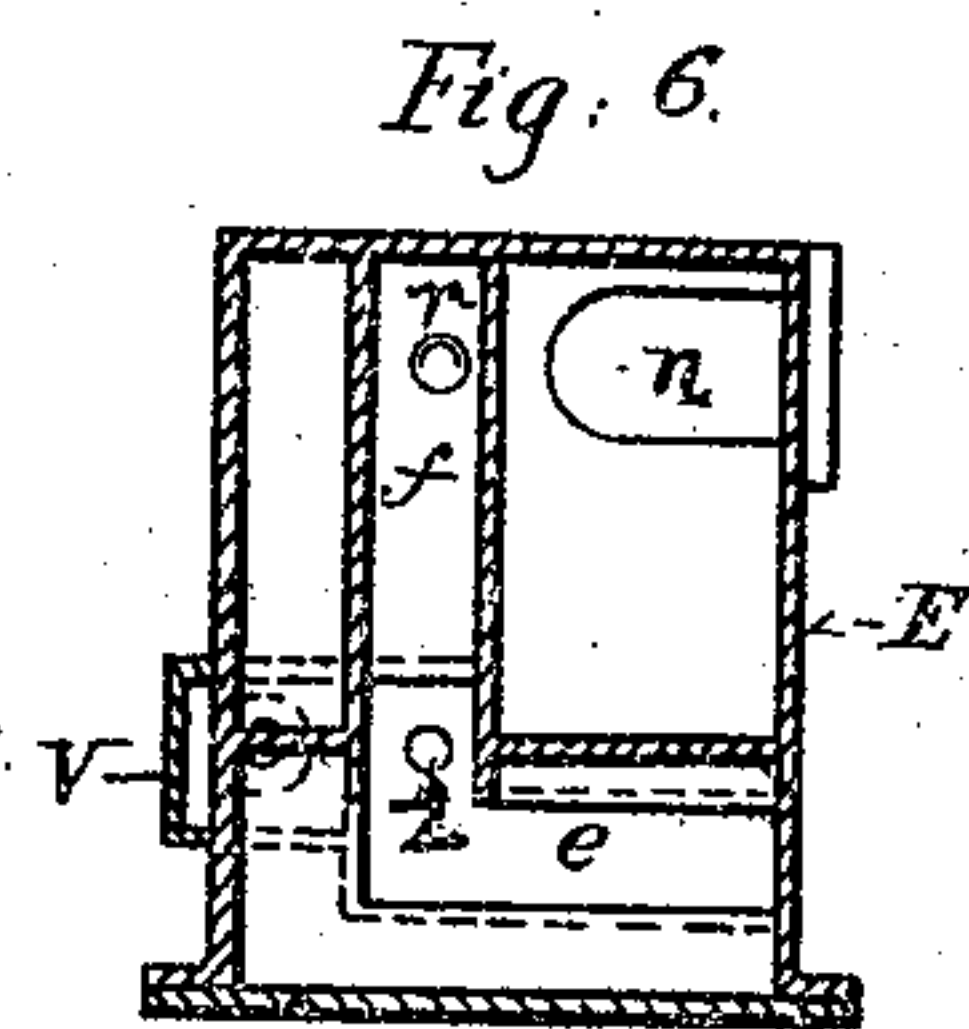
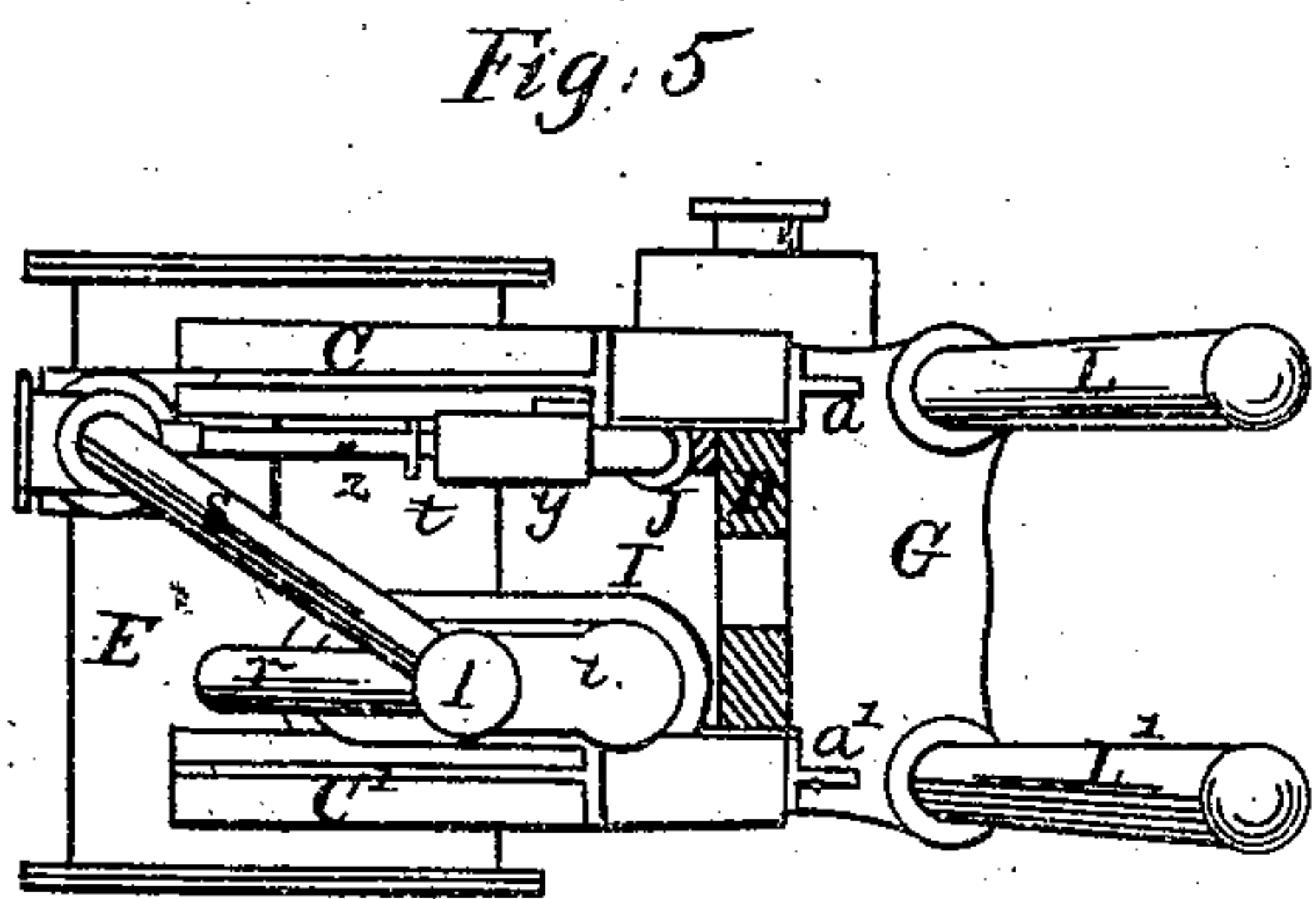
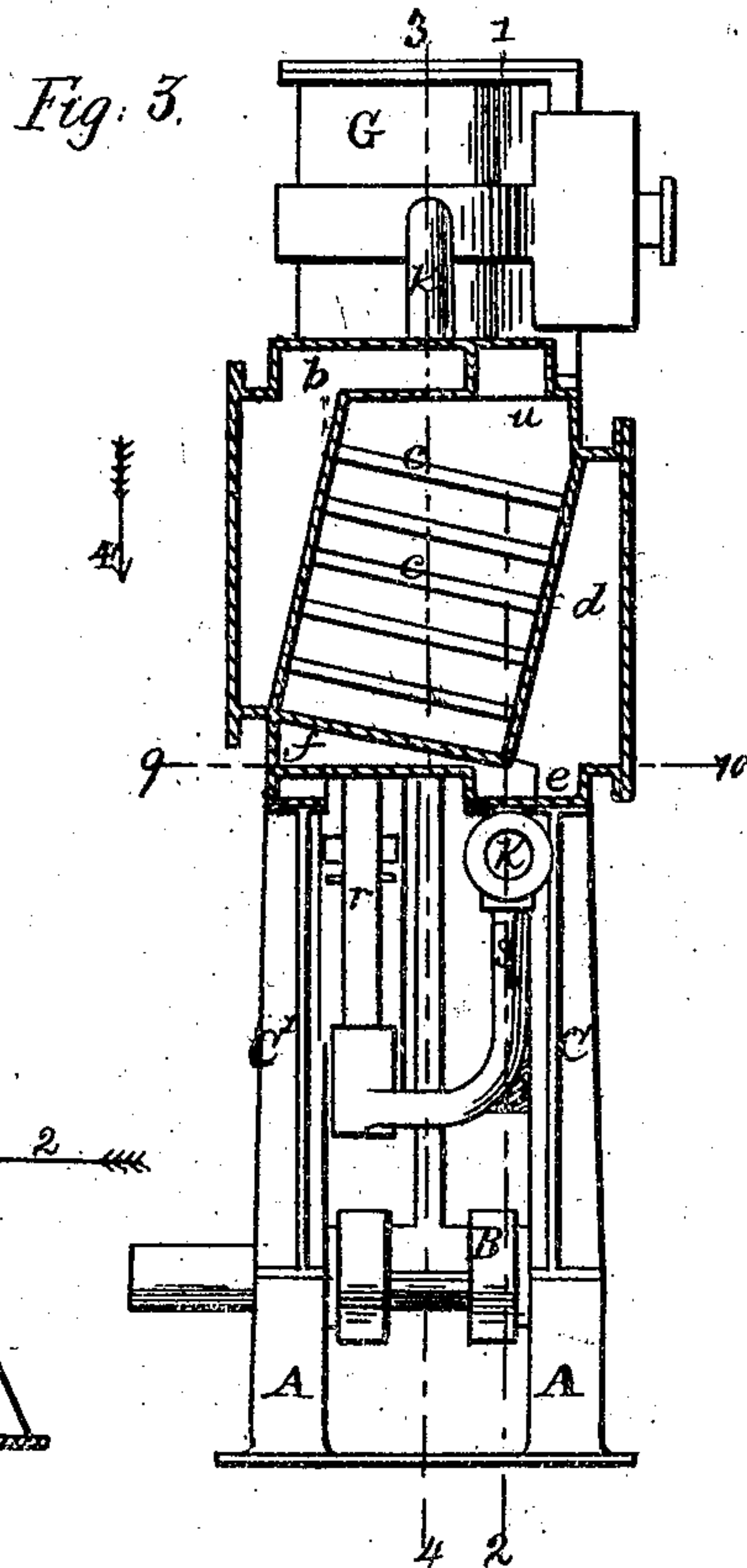
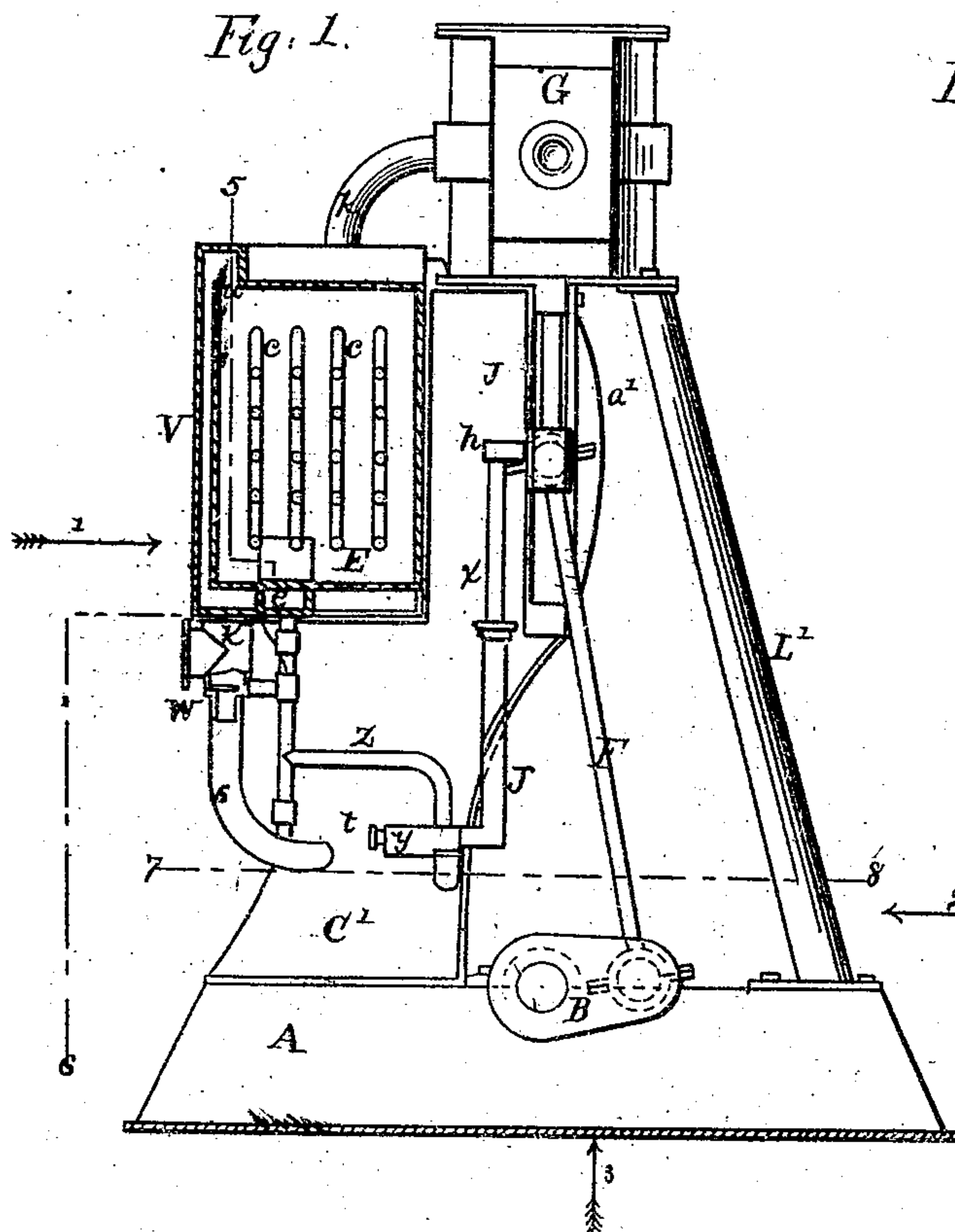


No. 75,102.

PATENTED MAR. 3, 1868.

I. S. WILSON & H. SEE.  
SURFACE CONDENSER.

2 SHEETS—SHEET 1.



*Witnesses:*

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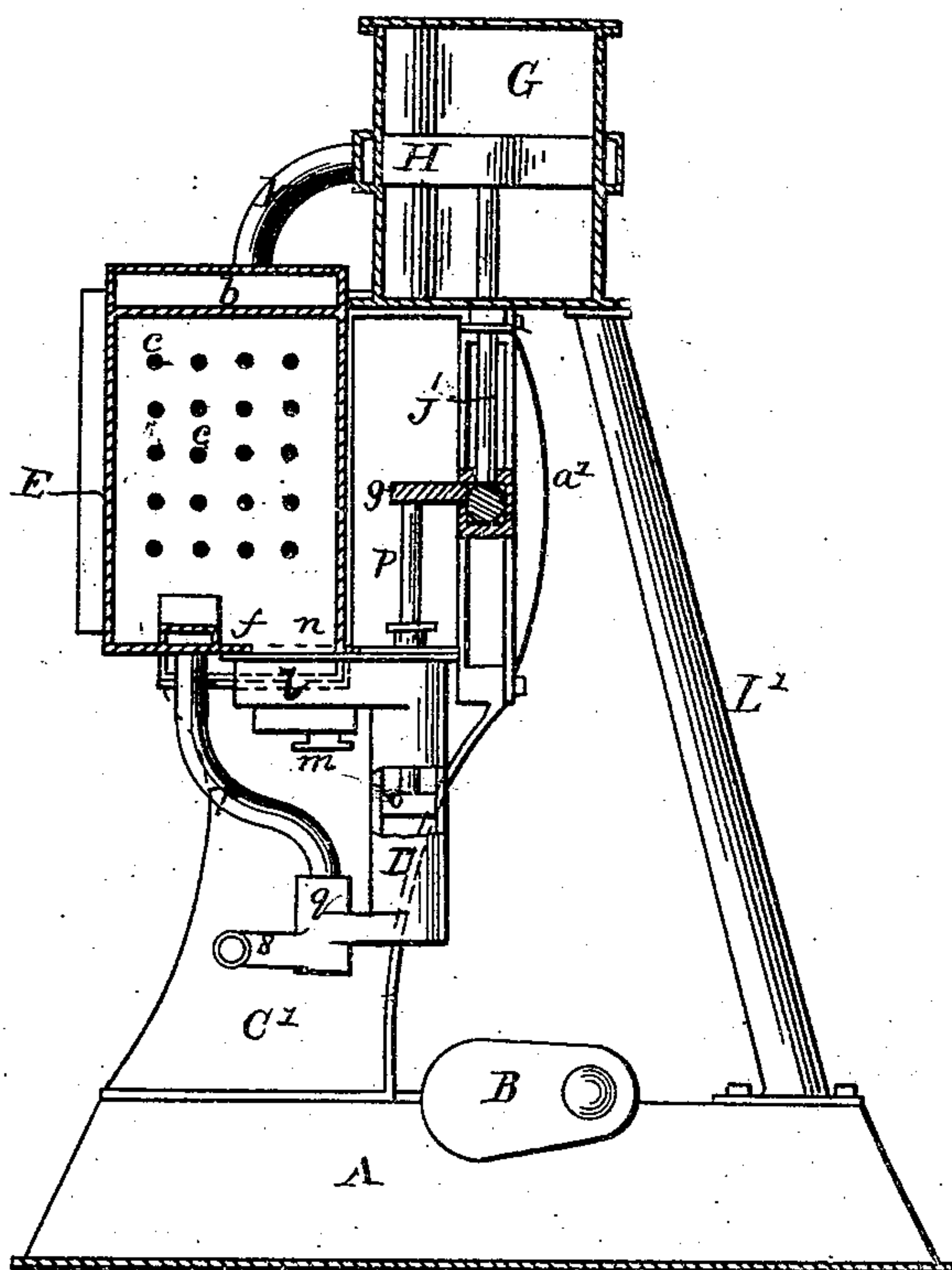
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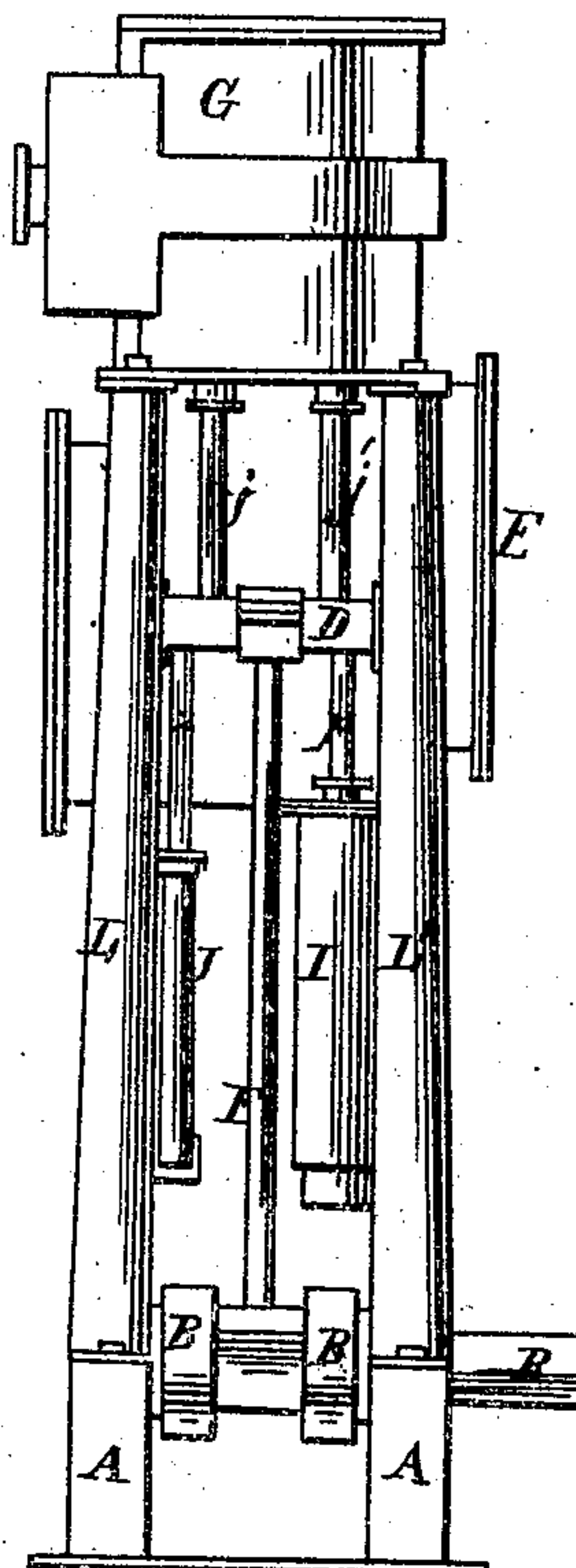
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2 SHEETS—SHEET 2.

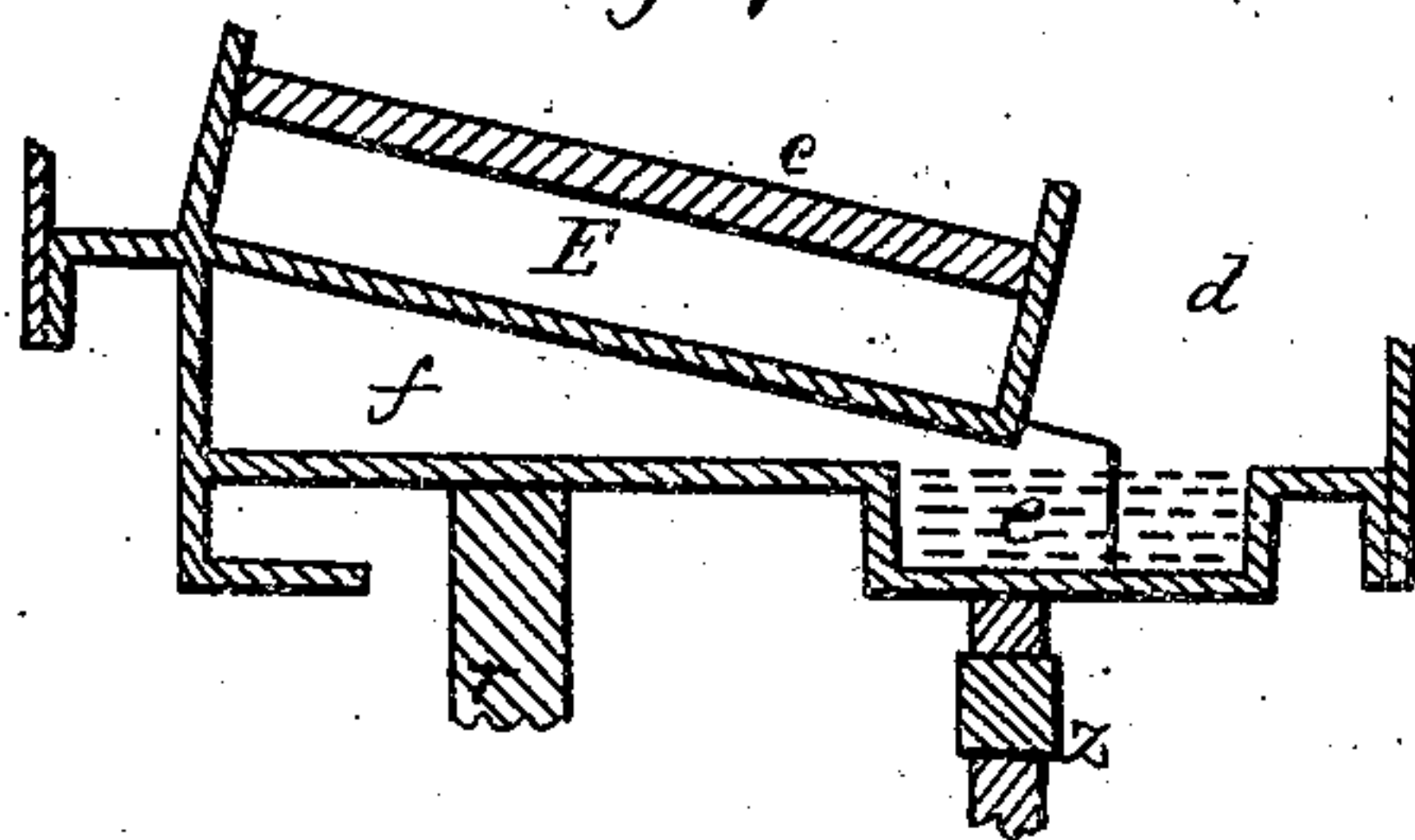
*Fig. 2.*



*Fig: 4.*



*Fig 7.*



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# United States Patent Office.

I. SHIELDS WILSON AND HORACE SEE, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS  
TO THEMSELVES AND N. D. THOMPSON, OF BORDENTOWN, NEW JERSEY.

*Letters Patent No. 75,102, dated March 3, 1868.*

## IMPROVEMENT IN SURFACE-CONDENSERS.

*The Schedule referred to in these Letters Patent and making part of the same.*

### TO ALL WHOM IT MAY CONCERN:

Be it known that we, I. SHIELDS WILSON and HORACE SEE, of Philadelphia, in the county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Surface-Condensers; and we do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the annexed drawing, and to the letters of reference marked thereon.

The nature of our invention consists, first, in removing the condensed steam after it has passed through a surface-condenser, and discharging it directly into the boiler by the feed-pump when arranged in connection with the air-pump, for removing the air, vapor, and surplus water; second, in the particular arrangement of the air and circulating-pump and feed-pump, in respect to the surface-condenser, for carrying out our improvement.

In order to enable others to make and use our invention, we will now proceed to describe its construction and operation.

On reference to the annexed drawing which forms part of this specification—

Figure 1 is a side view, with the condenser in section through 1-2, fig. 3, and the air and circulating-pump, with a portion of the piping removed.

Figure 2 is a side view in section through 3-4, fig. 3.

Figure 3 is an end view in section, through 5-6, fig. 1, looking in the direction of the arrow 1.

Figure 4 is an end view, looking in the direction of the arrow 2.

Figure 5 is a plan in section, through 7-8, fig. 1, looking in the direction of the arrow 3.

Figure 6 is a plan of the condenser, in section through 9-10, fig. 3, looking in the direction of the arrow 4.

Figure 7 is an enlarged view of *e* and *f*, as in fig. 3.

Our improvement is shown applied to a vertical direct-acting propeller-engine.

*A* is a bed-plate, provided with suitable bearings to receive the crank-axle *B*. *C* and *C'* are housings, erected on one end of *A*, which are provided with guides, *a* and *a'*, for the cross-head *D*. On the outside of *C* and *C'*, at a height sufficient to get in the pumps, is fastened the surface-condenser *E*. *b* is a passage for the exhaust-steam, *c* the tubes, *d* a box for the condensed steam and vapors, *e* a reservoir for supplying the feed-pump, and *f* a passage above the level of *e* for leading the vapor and surplus water to the air-pump. *n* is an opening, for receiving the refrigerating-water from the pump, and *u* an opening at the top, leading into the passage *v*, which discharges into the box *K*, having a nozzle for a discharge outboard.

The cross-head *D* is connected to the crank-axle *B* by the rod *F*. *g* and *h* are horns on *D*, for working the air and circulating-pump and feed-pump. *G* is the steam-cylinder, secured to the top of *C* and *C'*, and further secured by the columns *L* and *L'* to *A*. For clearness, the valve-gear has not been shown. *H* is the piston, with its rods *j* and *j'* secured to the cross-head *D*. *k* is a pipe, for conveying the exhaust-steam from the cylinder *G* to the condenser *E*. *I* is the air and circulating-pump, the upper end of which is used as the circulating or refrigerating, and the lower as the air-pump. *l* is the receiving and discharge-valve box of the circulating-pump, by the flange of which the pump is secured to the condenser *E*. *m* is the receiving-nozzle. *o* is the piston and *p* its rod, secured to the horn *g* of *D*. *q* is the receiving and discharge-valve box of the air-pump. *r* is the supply-pipe attached to *f*, and *s* is the discharge-pipe, attached to *K*, a valve, *w*, being placed at the bottom of *K*. *J* is the feed-pump for supplying the boilers, and is secured to *C*. *x* is the plunger, secured to the horn *h* of *D*. *y* is the receiving and discharge-valve box. *z* is the receiving-pipe, with attachments to *e*, *K*, and *s*. *t* is the discharge-nozzle.

The engine being in motion, the operation will be as follows: The circulating end of the pump *I*, receiving its water at *m*, discharges through *n* into the condenser *E*, around the tubes *c c*, out through *u* into *v*, and from thence into and out through *K*. The exhaust-steam, leaving the cylinder by the pipe *k*, enters *b* and passes through the tubes *c c*, where it is condensed. The products of condensation pass into *a*, the water collecting in *e*, and the surplus water and vapor flowing into *f*. The feed-pump *J* takes its supply from *e* through *z*. In case of shortness of supply, or derangement, water can be taken from the box *K*, or from the discharge-pipe *s* of the air-pump. The discharge is through *t* into the boiler. The surplus water and vapor are drawn off at *f*.



through the pipe *q* into the air-pump end of *I*, and forced out through *s* into *K*, the return being checked by the valve *w*.

It has been customary heretofore to take out all the products of condensation with the air-pump, and to draw the feed-water from its discharge. Now we wish to dispense with this double work, and, to accomplish it, take our feed-water direct from the condenser; and, in order to collect a sufficient supply, we employ a reservoir, or what becomes such by the air-pump supply being taken off at a higher level than that of the feed-pump, and which we prefer placing below the lower row of tubes, so that the entire surface of the latter may be efficient for condensation. By this mode the air-pump has only to take out the surplus water and vapor. It will be observed that by this operation the air and circulating-pump can be combined in one without any of the evils attending from leakage of piston. The two pumps may also be separate.

Now, we do not confine our improvement to the particular plan of condenser shown. In applying it to the vertical tubular condenser, the lower part of the box below the tubes should be used as the reservoir, and the air-pump supply taken out at a higher level in the same.

We know that air-pumps have been discarded, and that the feed-pump has been used to take out all the products of condensation; but this plan is objectionable, because the pump, having to be made larger than when it is used merely to act as a feed-pump, so that it will drain the condenser under all conditions, will consequently place a greater load on the engine when the pump is acting against the boiler-pressure.

We also know that connection with the feed-pump has been made at the lower end of the tubes, and with the air-pump at the upper end of the same. Now, this arrangement has serious disadvantages: first, the passage of the steam into and through the tubes is impeded by the descent of the heavy products of condensation; second, in case the engine had been standing, the tubes would become so filled with water that upon re-starting all access of steam to the tubes would be cut off, and the water could only be removed by the feed-pump, the air-pump not being in a position to assist. In our arrangement the steam and products of condensation move together, and the entire product empties into what we term the fresh-water side of the condenser. Also, both pumps are so situated as to take their water before the same reaches the tubes.

Now, we do not therefore claim broadly the feed-pump, taking its supply direct from the condenser, or at a lower level than the air-pump, but

We do claim—

1. Removing the condensed steam, after it has passed through a surface-condenser, and discharging it directly into the boiler by the feed-pump, when arranged, in connection with the air-pump, in the manner and for the purpose set forth.

2. The pumps *I* and *J*, when arranged in respect to the surface-condenser *E*, substantially as described and for the purpose set forth.

In testimony whereof, we have signed our names to this specification in the presence of two subscribing witnesses.

I. SHIELDS WILSON,  
HORACE SEE.

Witnesses:

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W. OGLE.