

WILLIAM E. KELLY.
Improvement in Steam-Pumps.
No. 126,814. *Fig. 1.*

Patented May 14, 1872.

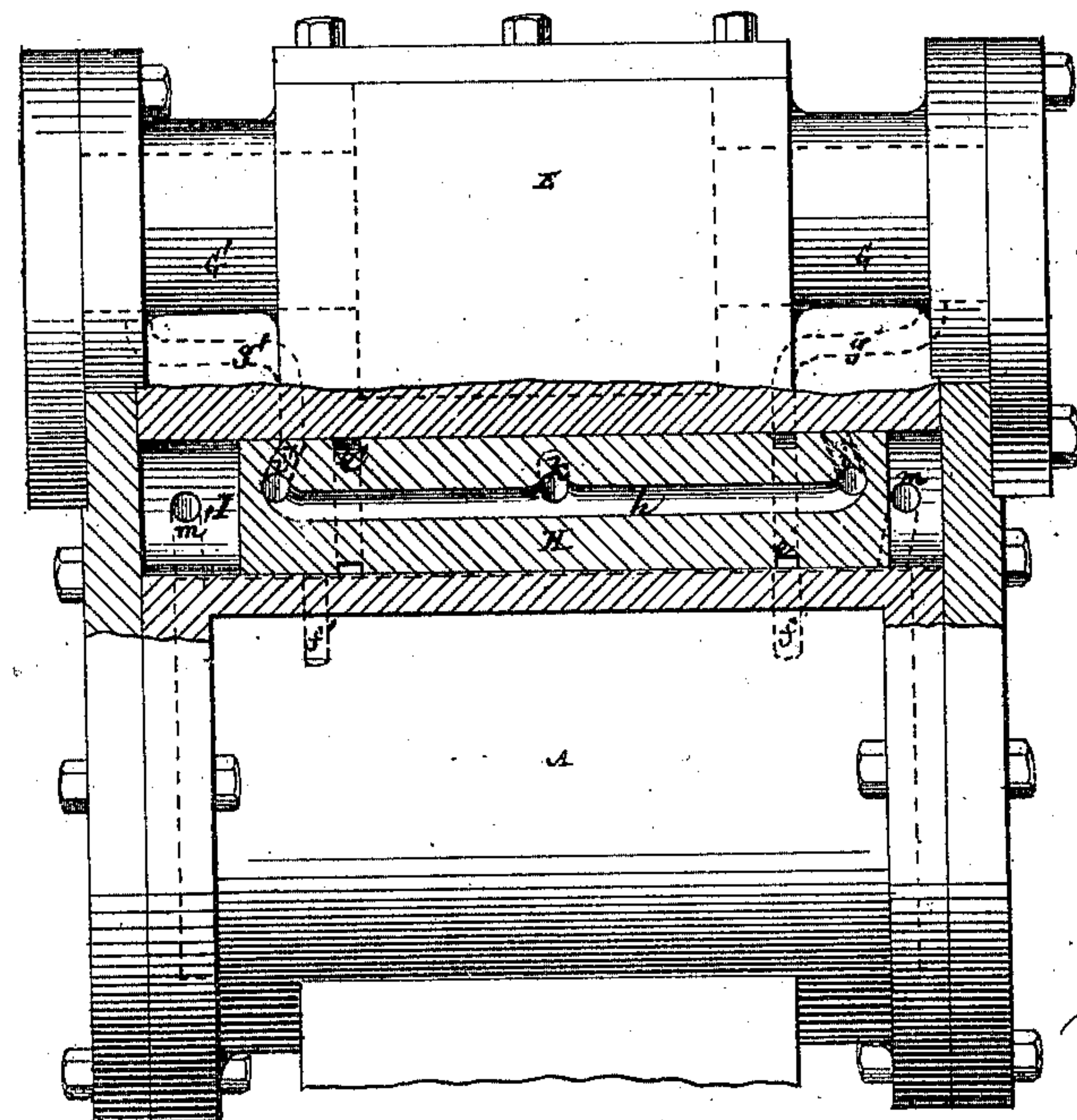
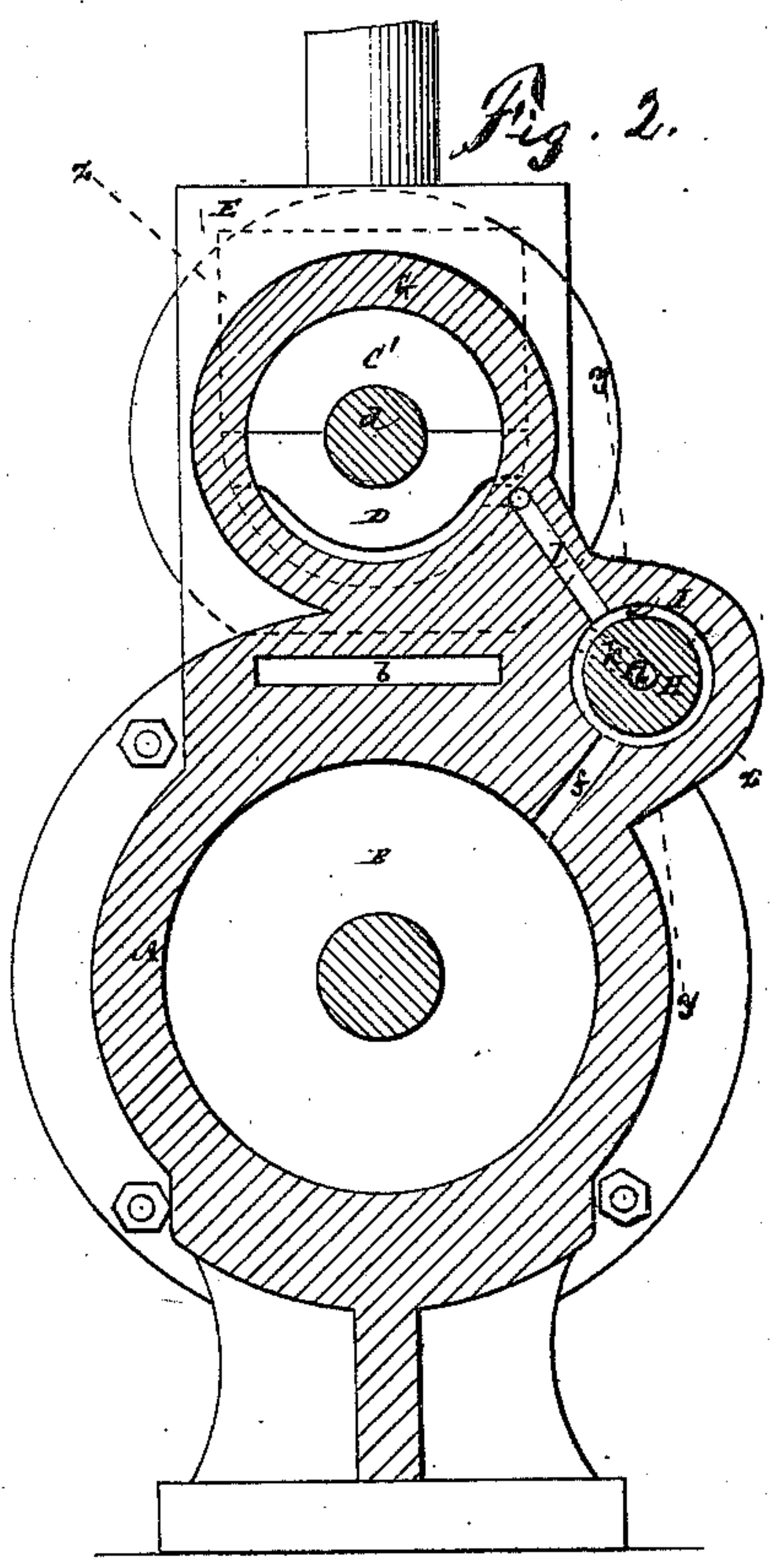
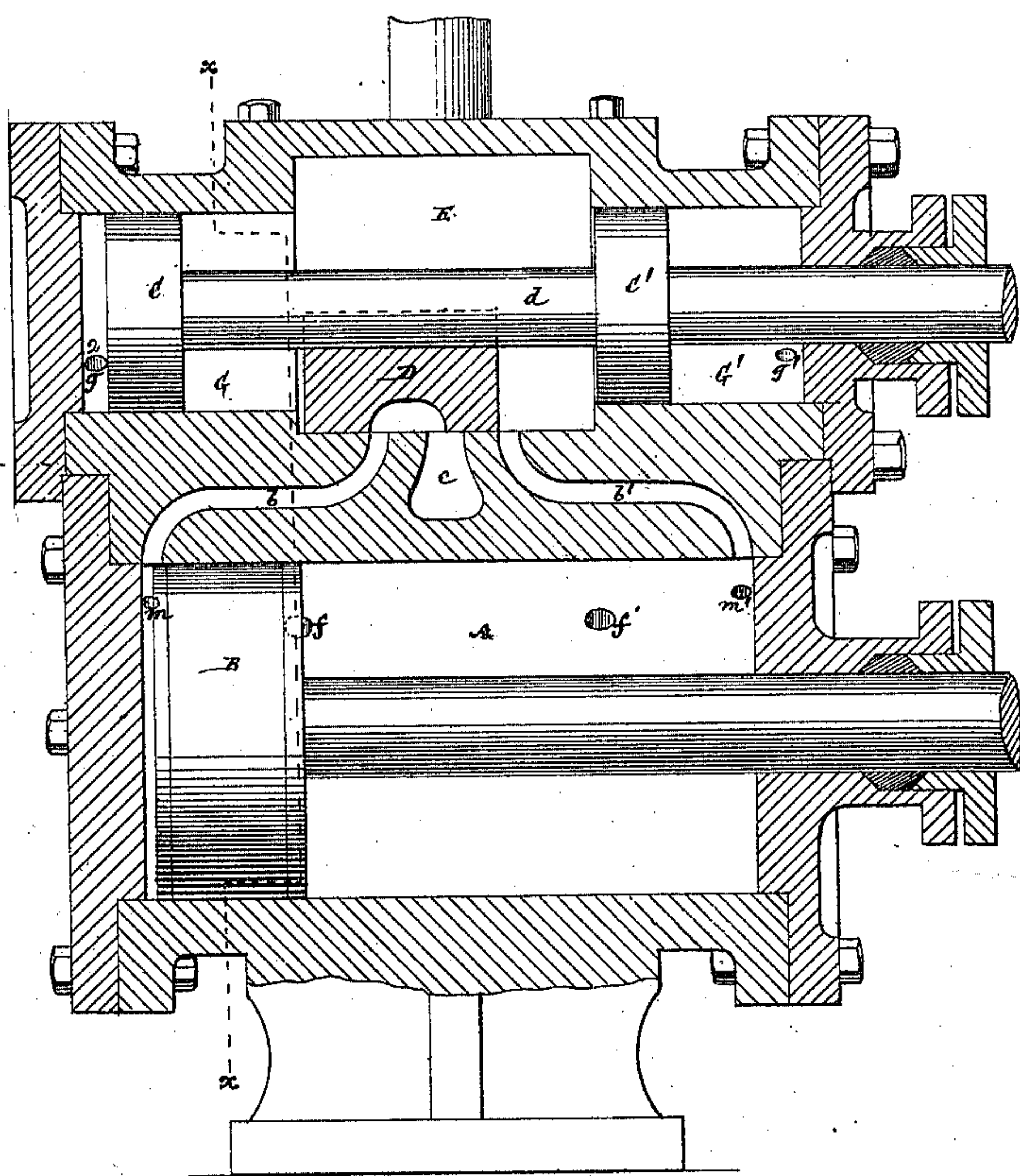


Fig. 3

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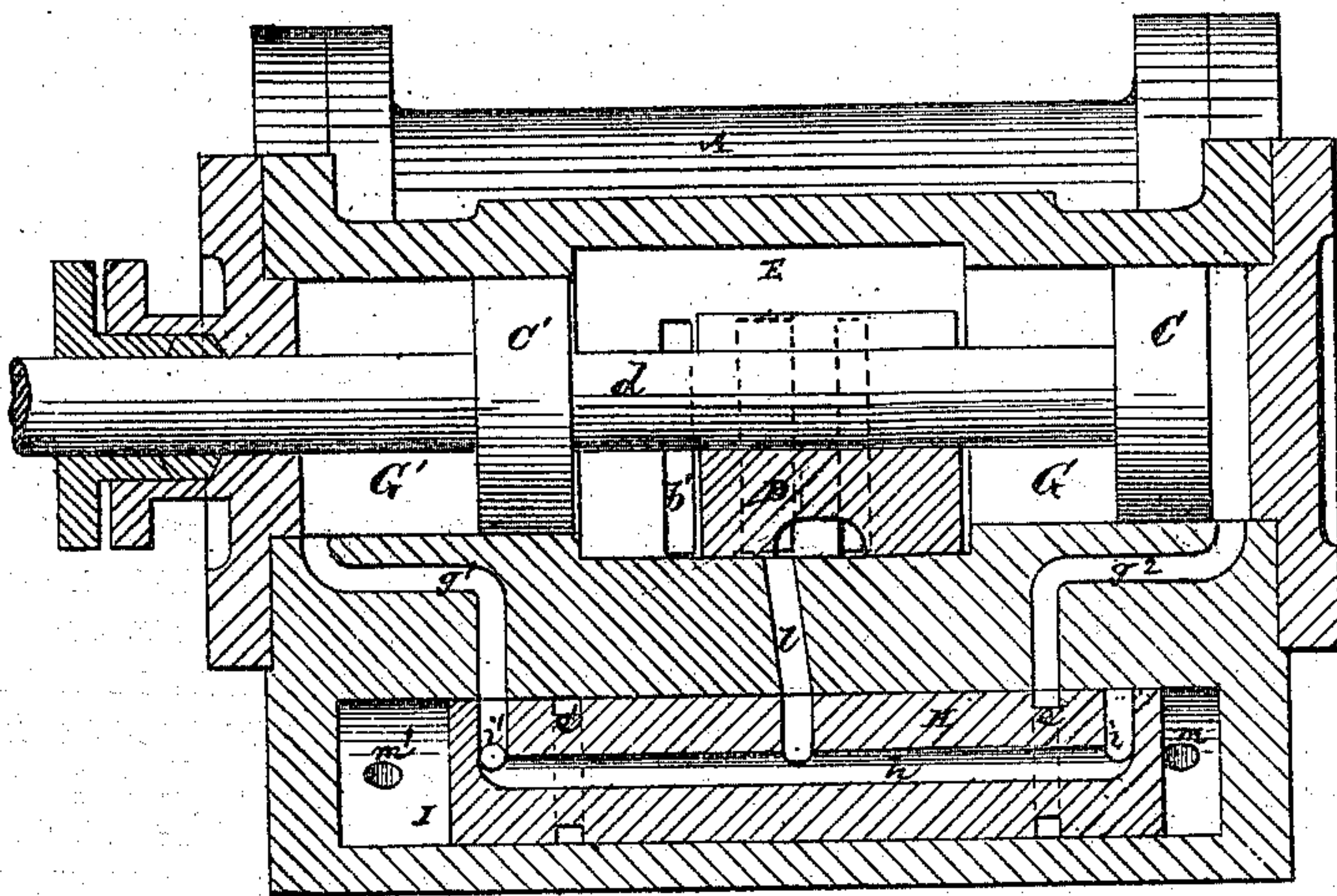
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Improvement in Steam-Pumps.

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Fig: 4



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UNITED STATES PATENT OFFICE.

WILLIAM E. KELLY, OF NEW BRUNSWICK, NEW JERSEY.

IMPROVEMENT IN STEAM-PUMPS.

Specification forming part of Letters Patent No. 126,814, dated May 14, 1872.

Specification describing certain Improvements in Valves for Steam-Pumps and Direct-Acting Steam-Engines, invented by WILLIAM E. KELLY, of New Brunswick, in the county of Middlesex and State of New Jersey.

This invention relates to that description of valves for steam-pumps and direct-acting steam-engines, in which live steam from the engine or main steam-cylinder is used to throw a main valve for the purpose of reversing the stroke of the piston in said cylinder, and in which a supplementary valve operated by the steam is used for controlling the action of the main valve. The improvements consist in a novel connection of the valves or their chambers with each other and the engine or main steam-cylinder, whereby the steam or engine piston as it approaches either end of its stroke uncovers a passage which establishes communication around or about the supplementary valve to the main valve for the purpose of throwing the latter to reverse the travel of the piston, and so that after the live steam has been thus reversed in the main cylinder, said steam throws the supplementary valve to shut off steam from the main cylinder to the main valve, and to establish communication with the exhaust for the purpose of balancing the main valve, thus accomplishing the desired automatic action of the valves in a very simple and efficient manner. The improvements also consist in a hollow construction of a supplementary valve, whereby the steam, after it has performed its duty on the main valve is exhausted through the supplementary valve.

In the accompanying drawing, Figure 1 represents a central vertical longitudinal section through the steam-cylinder of a steam-pump with my improved valve arrangement applied thereto; Fig. 2, a vertical transverse section of the same at the irregular line *xx* in Fig. 1; Fig. 3, a partly sectional side view, looking in the reverse direction to Fig. 1, and the section being taken at the line *yy* in Fig. 2; Fig. 4, a sectional view at the line *zz* in Fig. 2.

Similar letters of reference indicate corresponding parts throughout the several figures of the drawing.

A is the steam-cylinder of the pump; B its piston. C C' and D is the main valve. The portion D of the main valve constitutes a D-valve, which works in a steam or valve-chest E,

and controls the main passages *b b'* and *c*, the last one, *c*, of which is the general exhaust outlet, and the other two passages, *b b'*, the ways that connect the main valve or its chest with the opposite ends of the cylinder A. The other portions C C' of the main valve constitute pistons, which are fast to the valve-stem *d*, and are arranged to work in cylindrical chambers G G' at opposite sides or ends of the valve-chest. H is the supplementary valve, which consists of an elongated piston, arranged to freely reciprocate within a cylindrical valve-chamber, I. This piston-valve is constructed with annular cavities *e e'* near its opposite ends, which cavities communicate respectively and alternately with passages *f g* near one end, and *f' g'* near the opposite end of the chamber I. The passages *f f'* connect with the main cylinder A, at such distance from its ends that as the piston B completes its stroke it uncovers or exposes said passages to escape of live steam from the main cylinder. The passages *g g'* connect respectively with the outer ends of the chambers G G'. Said piston-valve H is also constructed hollow or with an exhaust-passage, *h*, in and along it. This passage opens at its ends *i i'* through the valve, and has a similar branch or opening, *k*, at its middle. The openings *i i'* communicate respectively and alternately with the passages *g g'* in alternate relation or action with the annular cavities *e e'*. The opening *k* connects with the general exhaust-outlet *c* by a passage, *l*. The valve-chamber I connects beyond the ends of the valve H with the extreme ends of the main cylinder A by passages *m m'*.

The operation is as follows: When the piston B moves toward the left in Fig. 1, and when near the end of its stroke in that direction, it passes over the passage *f*, and allows live steam from behind the piston B to rush up said passage, around the annular cavity *e* in the valve H, and up the passage *g* behind the piston C, to throw the valve D to the right and so reverse the stroke of the piston B by admitting steam to the cylinder A through the passage *b*, and exhausting the spent steam from said cylinder by the passage *b'*. As the piston B commences its travel toward the right in Fig. 1, it closes the passage *f* and allows live steam from the back of said piston to flow through the passage *m*, and throw the supplementary valve H toward that end of the cham-

ber I into which the passage m' opens. This changed position of the valve H closes the passage f against ingress of steam after the piston B, in moving to the right, travels over said passage, by the annular cavity e moving out of line with such passage. It also puts the exhaust-passage h in communication by its opening i , with the passage g and with the main outlet c , thus exhausting the steam from behind the piston C, and leaving the main valve balanced and free to move to the left again when the piston B, as it approaches the end of its stroke to the right in Fig. 1, admits live steam by the passage f' to the back of the piston C', the last throw of the valve H having put the annular cavity e' in line with the passages $f' g'$. As the piston B commences its stroke, to the left in Fig. 1, by the changed position of the valve D, live steam passes through the passage m' to the chamber I, and pressing on the reverse end of the valve H, throws the latter toward the end of the chamber I, into which the passage m opens, thereby closing the passage f' , and establishing communication between the exhaust-passage h , the main outlet c , and by the opening i' , the passage g' , which causes the steam to be exhausted from the back of the piston C'. Such changed position of the valve H also puts the annular cavity e once more in line with passages f and g , to again

reverse the travel of the piston B on its reaching the end of its stroke, to the left in Fig. 1.

The valve H may be restricted from turning to keep its openings in line with the passages with which they communicate, by means of a key and key-way, and its length of stroke be adjusted for a like purpose by means of screw or other stops.

What is here claimed, and desired to be secured by Letters Patent, is—

1. The supplementary valve H, provided with annular cavities $e e'$ and $f f'$, $g g'$, and $m m'$, said passages being arranged in relation with the main cylinder and the valve-cambers, substantially as specified, and whereby the live steam from opposite sides of the main piston is caused first to throw the main valve and subsequently the supplementary valve to produce a reverse action of the main piston, as herein set forth.

2. The supplementary valve H, constructed with an exhaust-passage, h , in or along it, and openings $i i' k$, in connection with passages $g g'$ and the main exhaust-outlet c , all arranged for operation essentially as shown and described.

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Witnesses:

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