

No. 654,382.

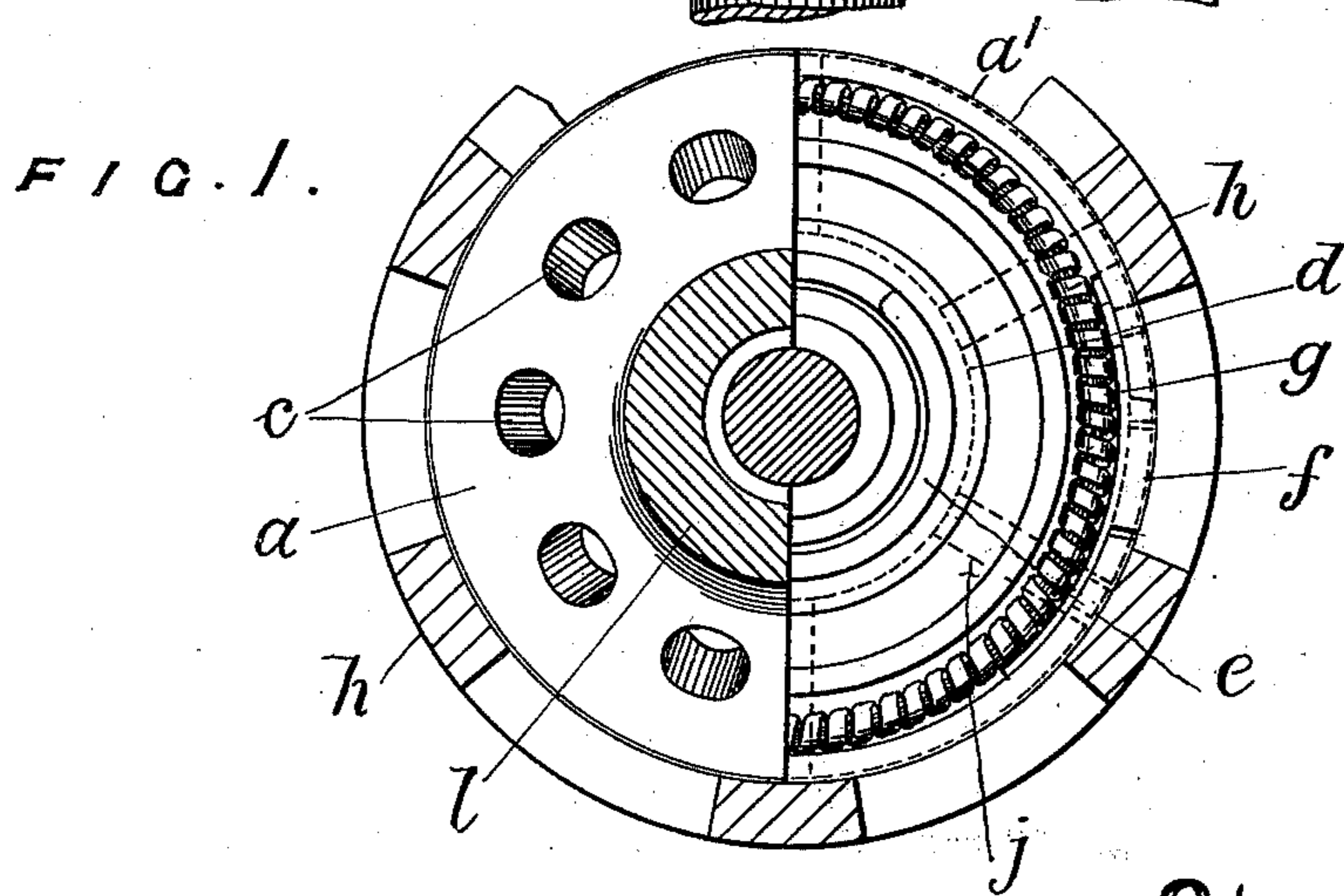
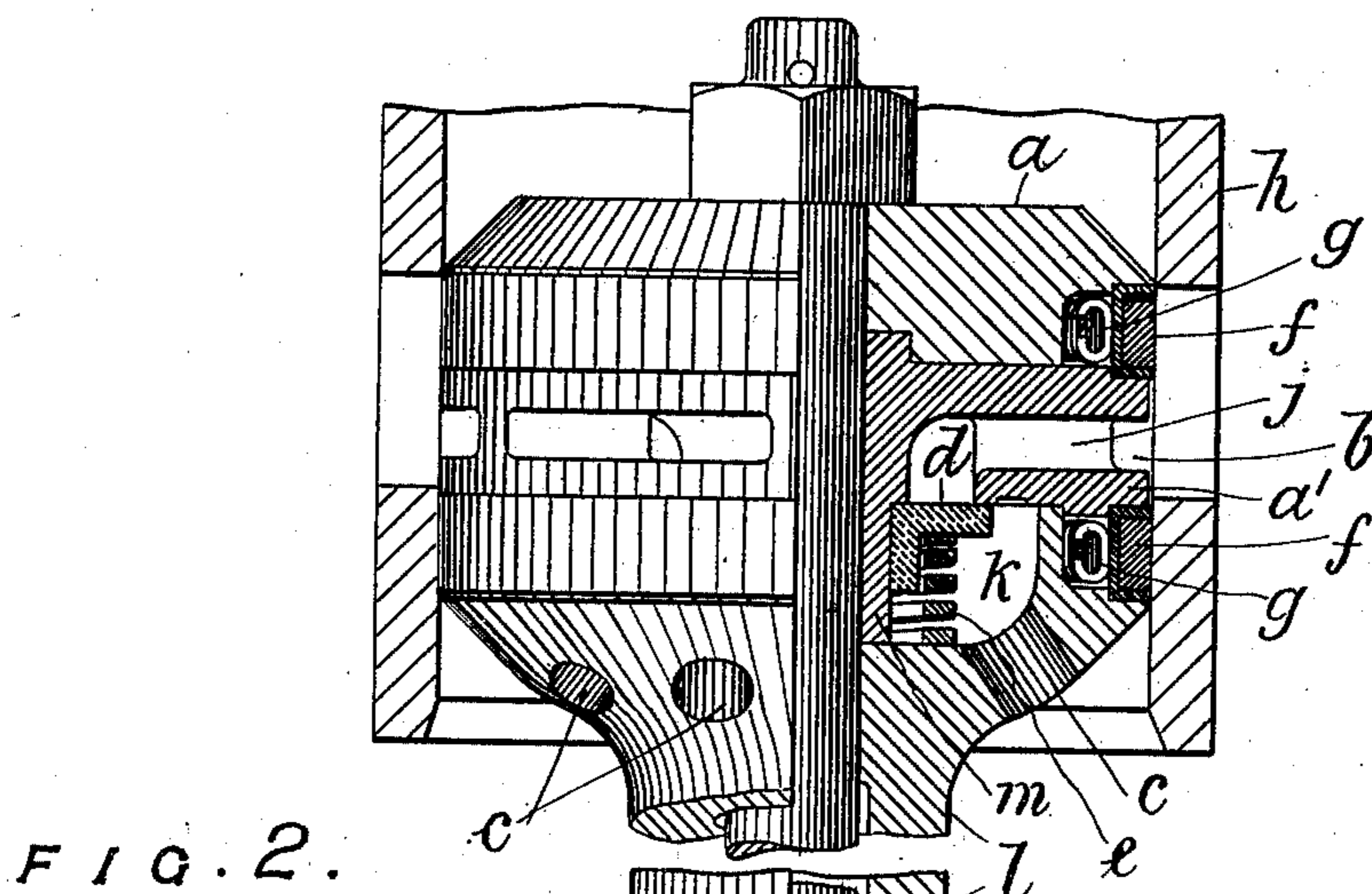
Patented July 24, 1900.

W. BUCKLEY.
PISTON VALVE.

(Application filed Sept. 1, 1899.)

(No Model.)

4 Sheets—Sheet 1.



Witnesses.
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FIG. 4.

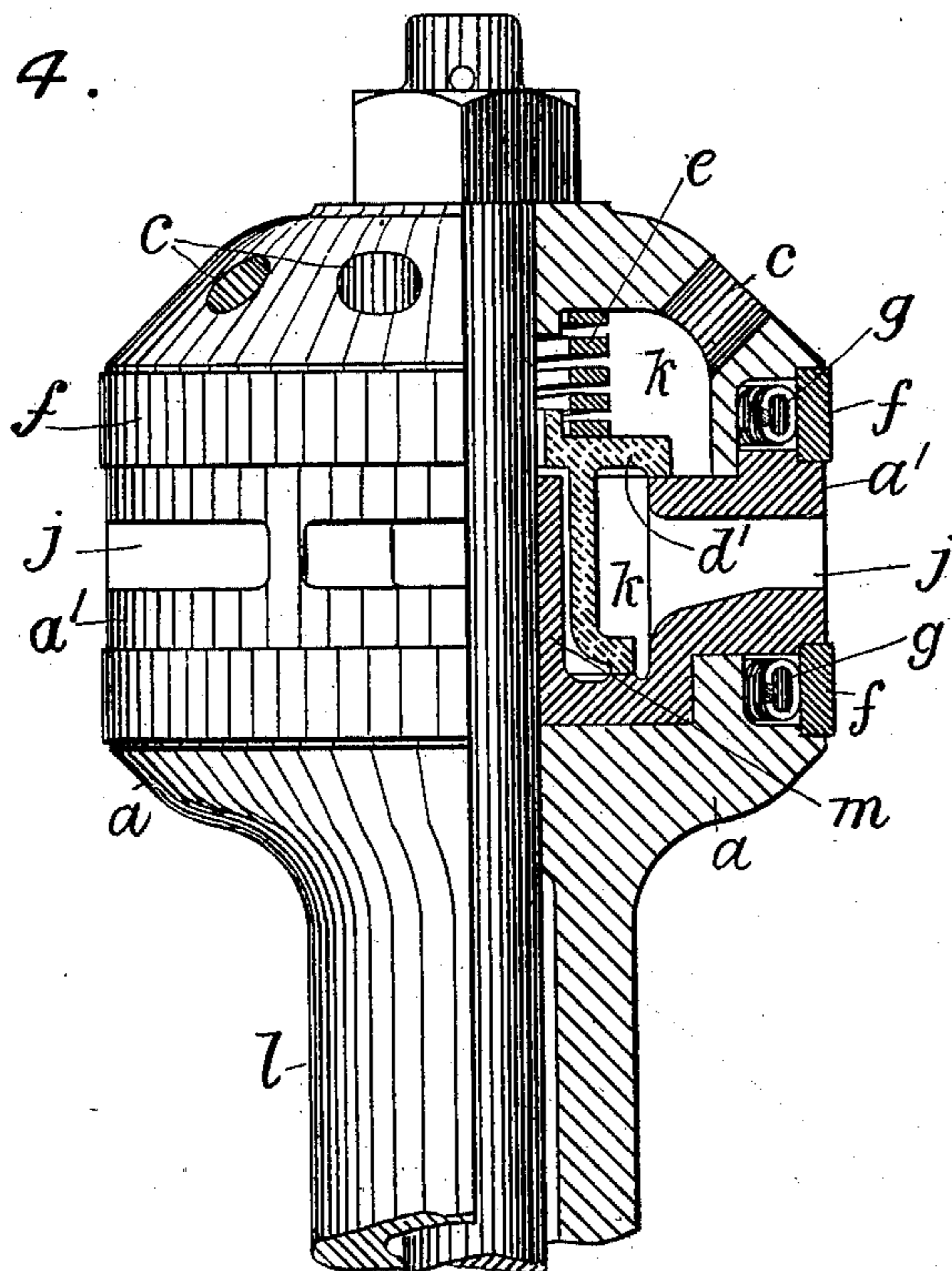
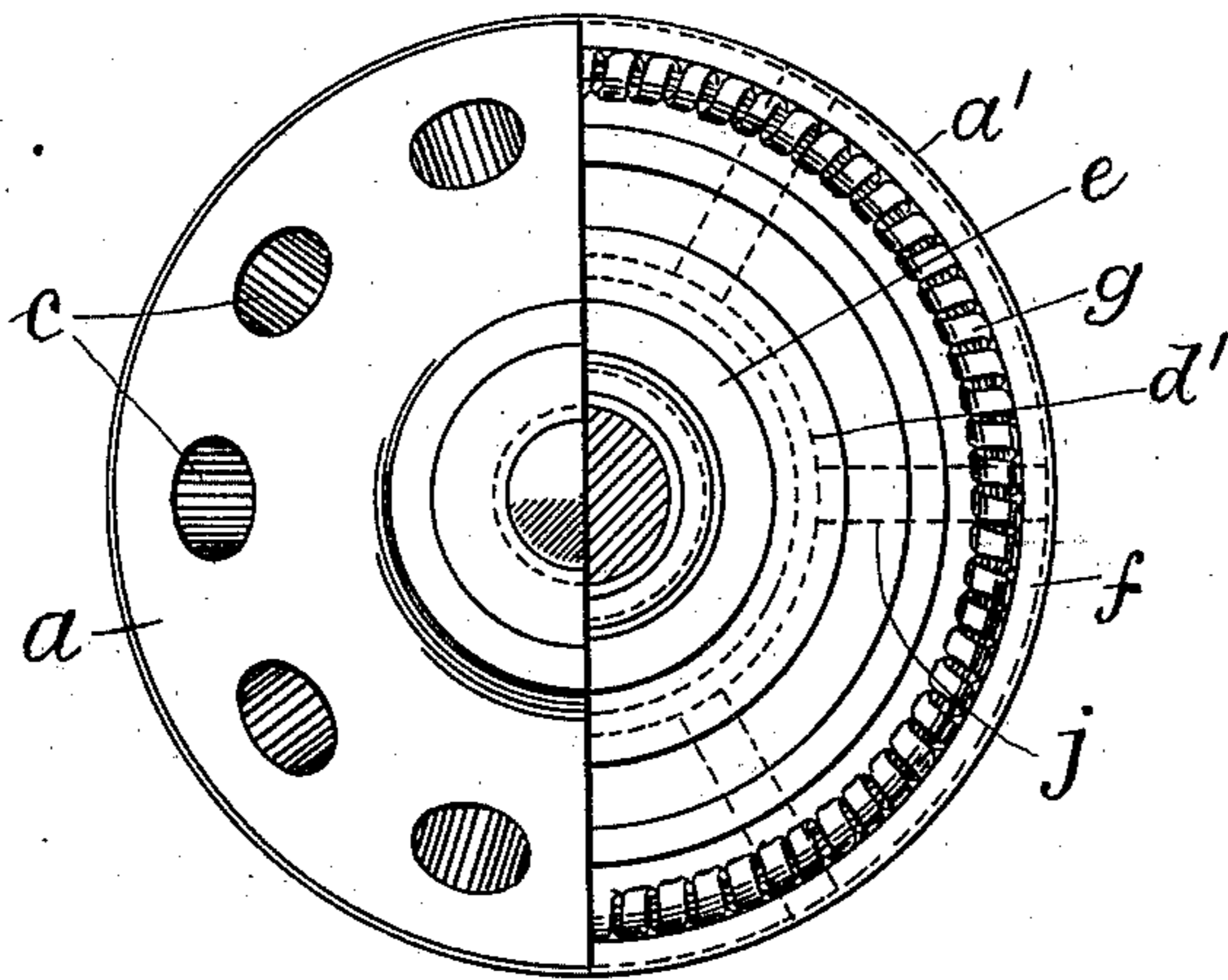


FIG. 3.



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FIG. 6.

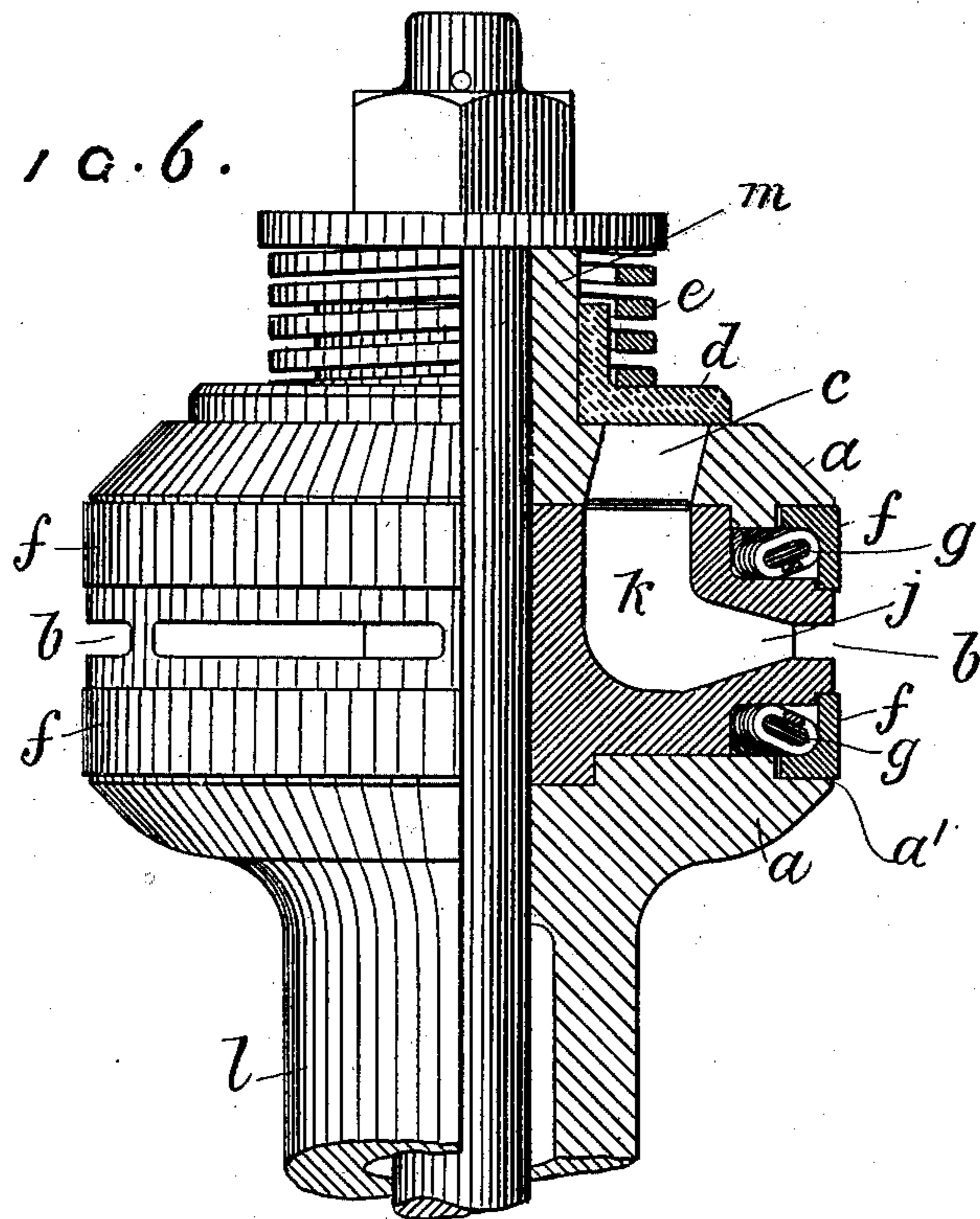
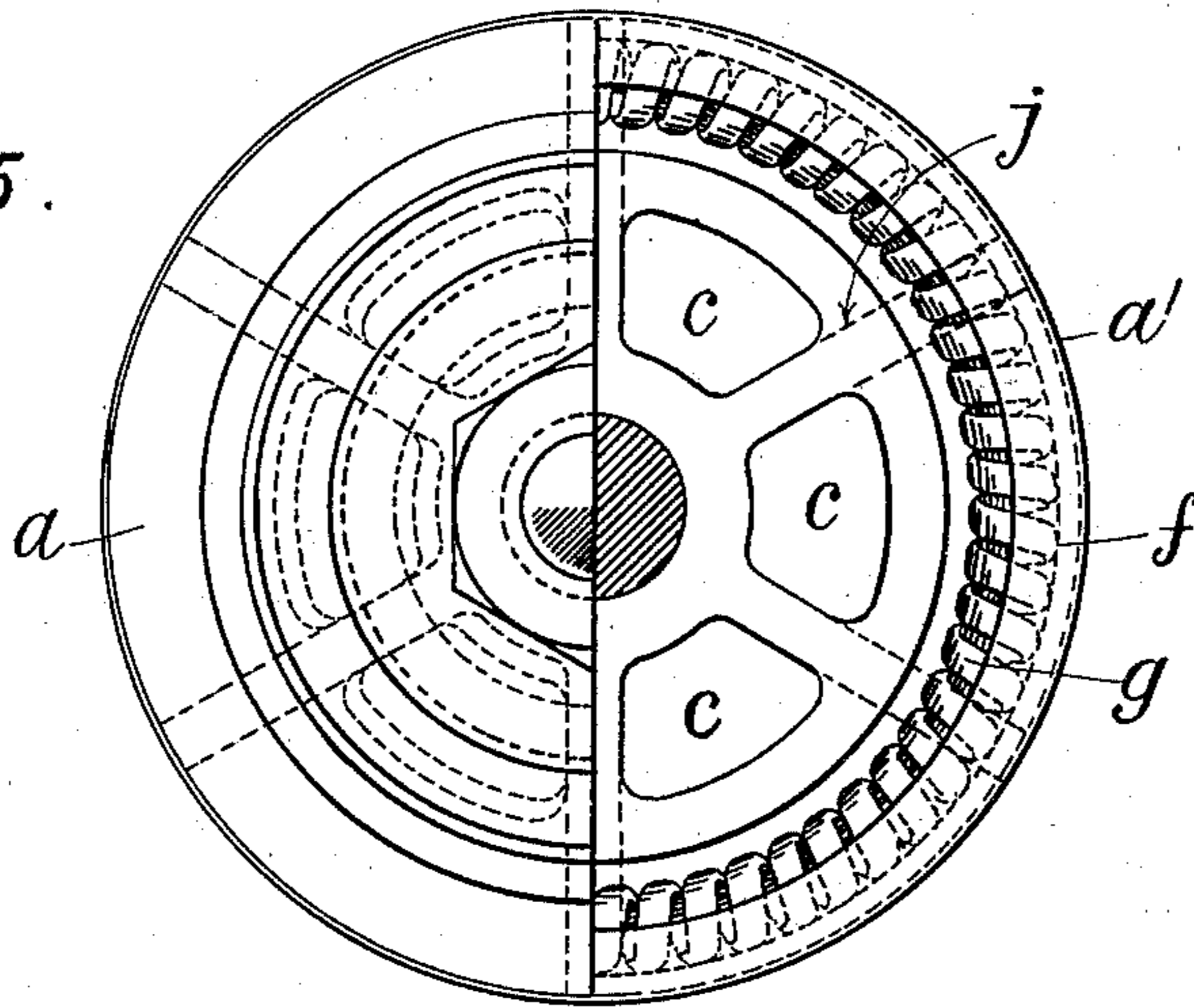


FIG. 5.



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(Application filed Sept. 1, 1899.)

(No Model.)

4 Sheets—Sheet 4.

FIG. 8.

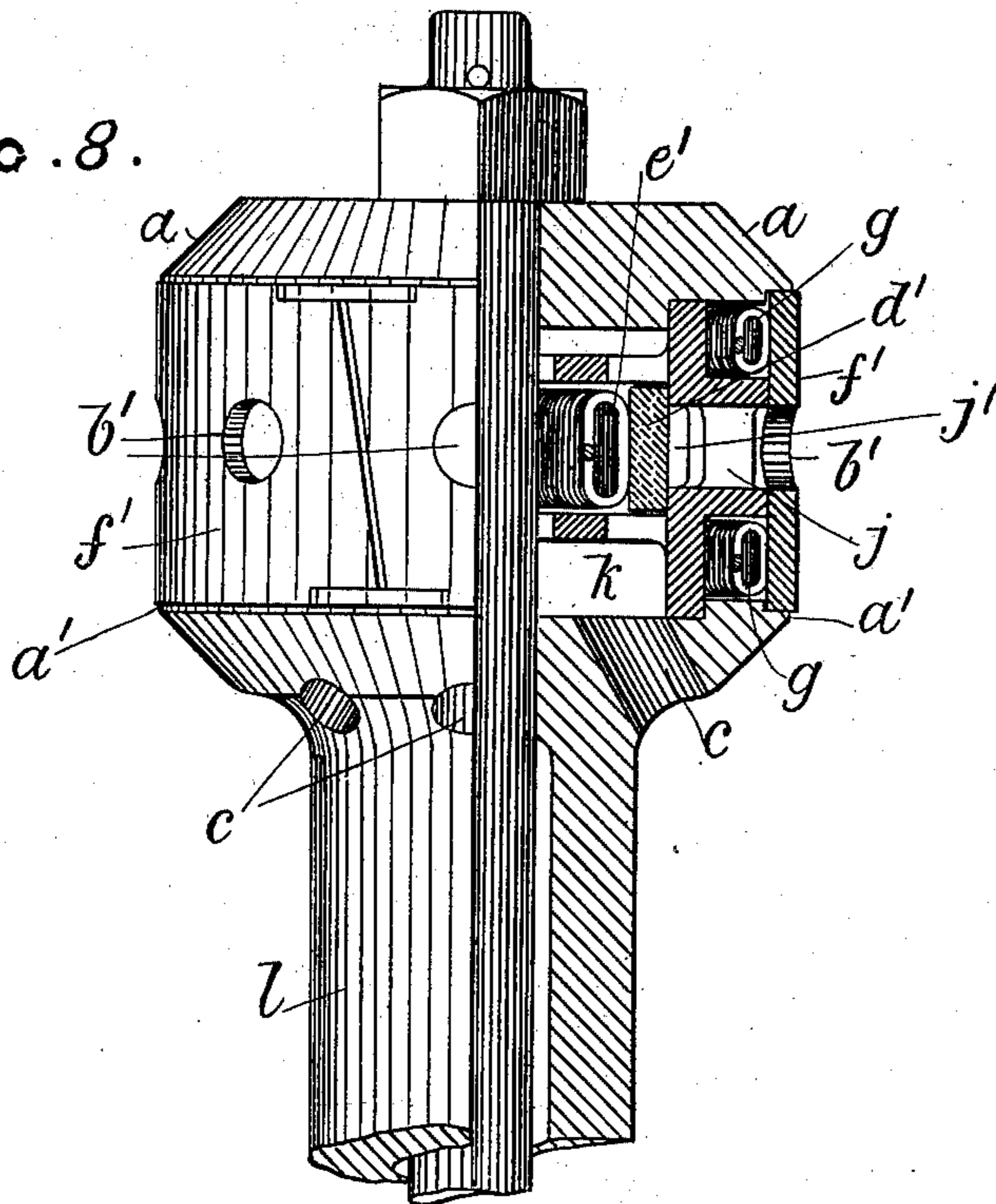
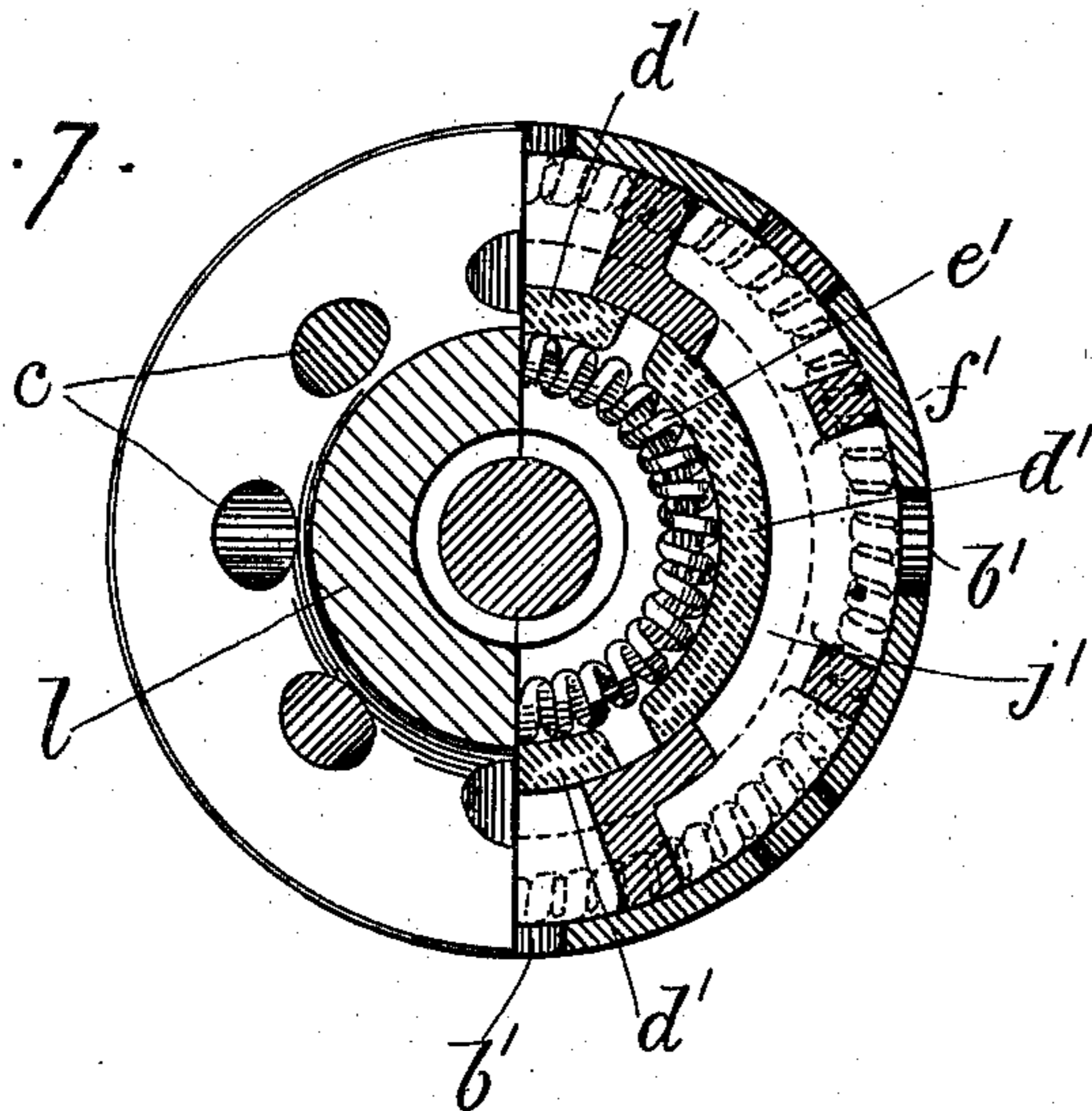


FIG. 7.



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UNITED STATES PATENT OFFICE.

WILLIAM BUCKLEY, OF SHEFFIELD, ENGLAND.

PISTON-VALVE.

SPECIFICATION forming part of Letters Patent No. 654,382, dated July 24, 1900.

Application filed September 1, 1899. Serial No. 729,223. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM BUCKLEY, engineer, a resident of Millsands, Sheffield, England, have invented new and useful Improvements in Piston-Valves for Steam, Air, or other Motive-Fluid Engines, (for which an application for patent has been filed in Great Britain, dated June 15, 1899, No. 12,500, and in Germany, dated August 10, 1899, No. 18,090,) of which the following is a full, clear, and exact description.

This invention relates to improvements in piston-valves of steam, air, or other motive-fluid engines, and has for its object the provision of means in the piston-valves themselves for preventing excessive compression taking place in the cylinder and consequent risk of breaking the valve-rings or bursting the cylinder, which occurs at times (when the engines are being reversed and the steam-ports are closed after the cylinder has received a charge of steam) in consequence of the piston-valves being brought into and allowed to remain in their mid-position.

The invention will be fully described hereinafter and the features of novelty pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part of this specification, wherein—

Figures 1 and 2 respectively represent a part-sectional end view and a part-sectional elevation of a pair of the improved piston-valves, together with a section of the liners in which the valves work and showing the ports with the valves in their mid-position, the piston-valves being fitted with relief-valves placed within the bodies of the valves. Figs. 3 and 4 respectively represent a part-sectional end view and a part-sectional elevation of an improved piston-valve fitted with a double-beat relief-valve placed within the body of the valve. Figs. 5 and 6 respectively represent a part-sectional end view and a part-sectional elevation of an improved piston-valve with a relief-valve placed on its end or cover. Figs. 7 and 8 respectively represent a part-sectional end view and a part-sectional elevation of a modified arrangement in which segmental relief-valves, acting radially, are placed in the body of the piston-valve.

Similar letters of reference denote like parts in all the figures.

Referring to Figs. 1 and 2, the body *a* of each member of a pair of piston-valves is fitted with two packing-rings *f*, held against the liner *h*, in which the valve works by the springs *g*, as usual. Between the packing-rings *f* the body *a* of the valve extends to the full diameter, as at *a'*, and serves to hold apart the packing-rings. In this portion of the piston-valve body are formed radial passages *j*, leading from a series of apertures *b* in the periphery of the valve to an annular passage *k*, communicating by holes *c* in the inner ends of the piston-valves with the space between the two valves, which are joined together by the waist *l*. The passage *k* is normally closed against pressure from within the cylinder by the relief-valve *d*, which is a straight-faced circular disk valve mounted to slide axially upon a central boss *m* in the body of the piston-valve and held against the seat by a spring *e*. Steam from the boiler has free access to the space between the two piston-valves and thence through the holes *c* (which are made of ample area for this purpose) to the back of each relief-valve *d*, so that these valves can open only when the pressure on their faces from within the cylinder somewhat exceeds the boiler-pressure plus that due to the strength of the springs *e*.

In Figs. 3 and 4 the body *a* of the piston-valve is constructed substantially as in Figs. 1 and 2; but the passage *k* communicates by holes *c* in the outer end or cover of the piston-valve with the space outside the end of the latter, the annular passage *k* being normally closed against pressure from within the cylinder by a concentric double-beat relief-valve *d'*, held against its seat by a spring *e*. This arrangement admits of the relief-valve being weighted (against pressure from within the cylinder) by the exhaust or receiver pressure, aided by the spring *e*.

In Figs. 5 and 6 the annular passage *k* opens directly through holes *c* in the cover of the piston-valve into the space outside the end of the latter, the ring of holes *c* being normally closed against pressure from within the cylinder by the relief-valve *d*, which is a straight-faced disk valve mounted externally of and concentric with the body *a* of the piston-valve

and held against its seat by a spring *e*. This arrangement is applicable either when steam is admitted to the cylinder from beyond the ends of the piston-valves or from between the piston-valves. In the latter case the exhaust or receiver pressure being at the end of the valves would require to be reinforced by more powerful springs, tending to close the relief-valves.

10 In Figs. 7 and 8 the piston-valve body *a* carries the single broad packing-ring *f'*, through which the holes *b'* in its circumference give access to the radial passages *j* in the body of the piston-valve. These passages
15 open through a series of—say three—thoroughfares *j'* into an annular chamber *k*, formed in the center of the valve-body, the chamber *k* communicating with the space between the piston-valves through openings *c*
20 in the inner ends of the valves. The thoroughfares *j'* are normally closed against pressure from within the cylinder by the segmental relief-valves *d'*, which are held against their seats by the helically-coiled spring-ring
25 *e'* and are weighted either by the steam or exhaust pressure admitted through the holes *c*, as in the previous examples.

It is to be understood that the form and arrangement of the relief-valves need not be
30 precisely as represented in the drawings, as other equivalent forms and arrangements adapted to serve the same ends may be used in lieu thereof without departing from the spirit of the invention.

35 It will be seen that in each of the forms of construction illustrated the piston-valve consists of two spaced bodies of analogous construction and that in each case the valve-body has two packing-rings, between which are located the outer ends of the radial passages
40 leading to the relief-valve, and that one end of each valve-body is imperforate, while the other end has apertures the communication of which with the said radial passages is controlled by the relief-valve.
45

I claim—

1. The combination of the piston-valve body having an imperforate plate at one end, per-

forations in the other end, and inward passages leading from the periphery of the valve
50 between the perforated and imperforate ends thereof, with a relief-valve controlling the communication of said passages with the said perforations, and a spring for pressing the relief-valve outwardly against the inner ends
55 of said passages.

2. The combination of the piston-valve body having two spaced packing-rings, an imperforate plate at one end, perforations at the other end, radial passages leading to the pe-
60 riphery of the body between the two packing-rings thereof, with a relief-valve controlling the communication of said passages with said perforations, and a spring for pressing the relief-valve outwardly against the inner ends
65 of said passages.

3. The combination of the piston-valve body having an imperforate plate at one end, perforations at the other end, and radial passages leading inwardly from the periphery of
70 the valve between the perforated and imperforate ends thereof, a circularly-curved relief-valve movable radially outward against the inner ends of said radial passages and controlling their communication with the said
75 perforations, and a spring surrounded by said relief-valve and arranged to press it outwardly.

4. The combination of the piston-valve having two spaced connected valve-bodies of analogous construction, each of said bodies having two spaced packing-rings, an imperforate plate at one end, perforations at the other end, radial passages leading to the periphery of
80 the body between the two packing-rings thereof, with a relief-valve controlling the communication of said passages with said perforations, and a spring for pressing the relief-valve outwardly against the inner ends
85 of said passages.

Signed by the said WILLIAM BUCKLEY this
19th day of August, 1899.

WILLIAM BUCKLEY.

In presence of—

JOHN THOMAS PAGAN,
WILLIAM KYNOCH.