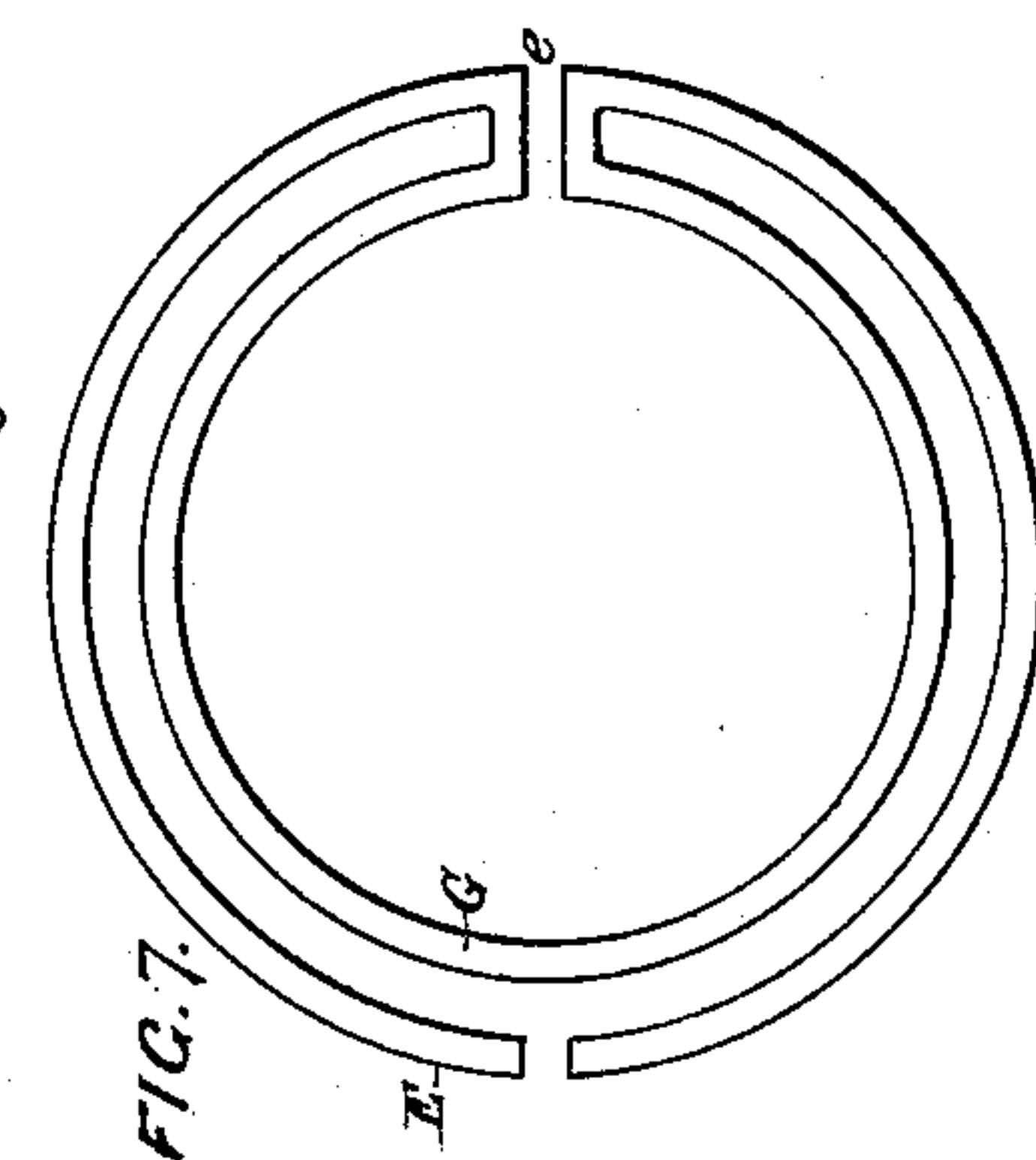
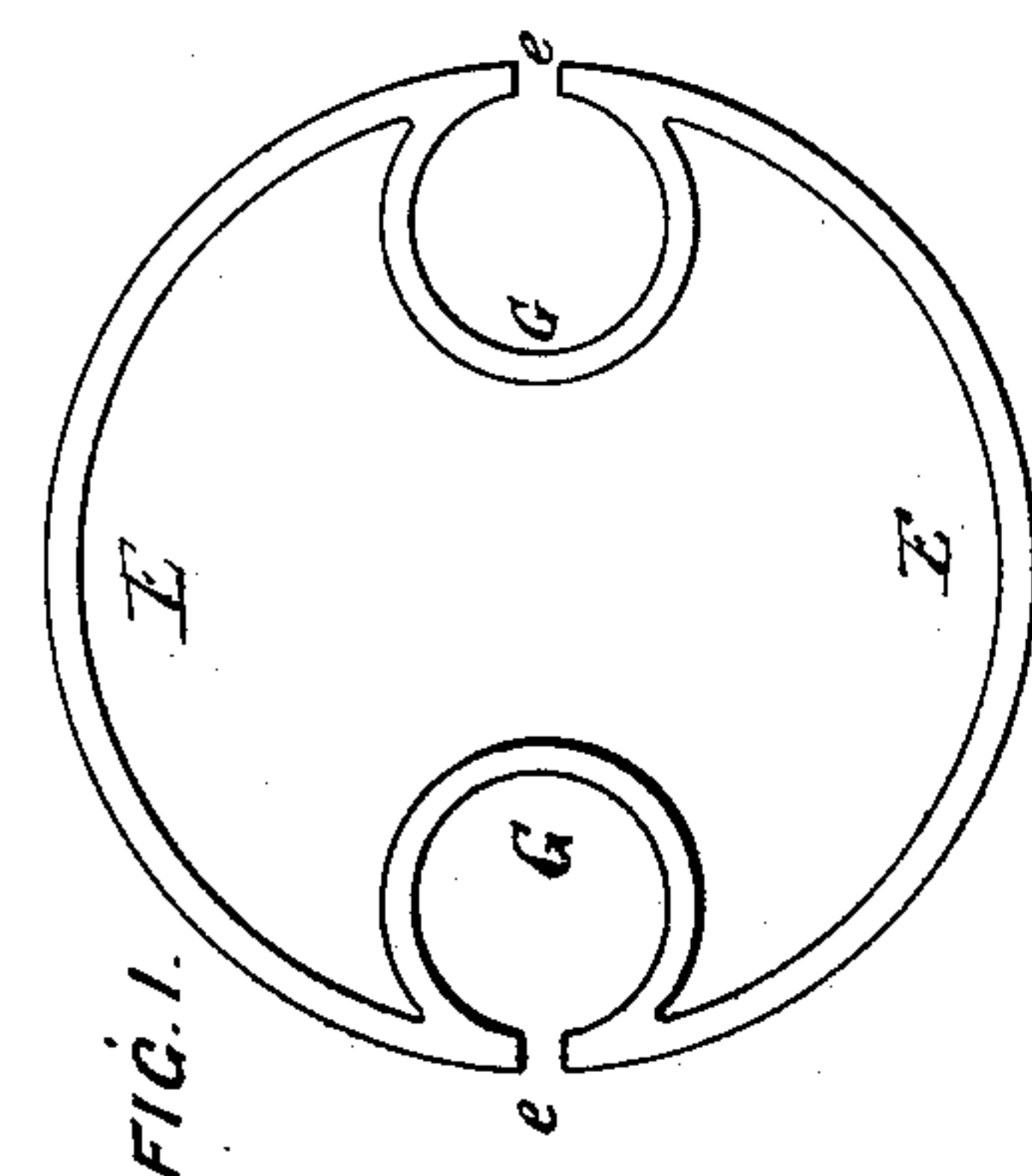
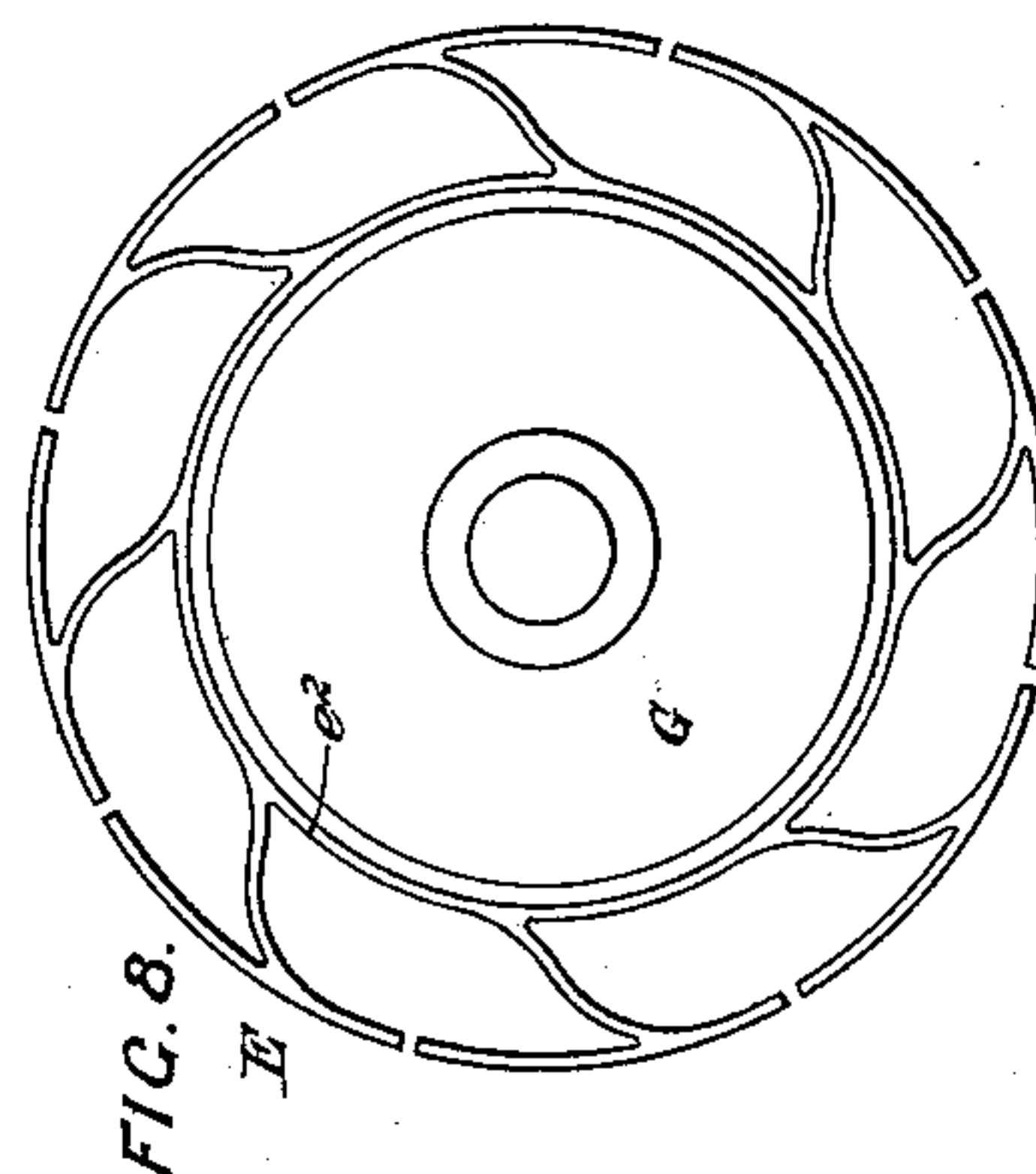
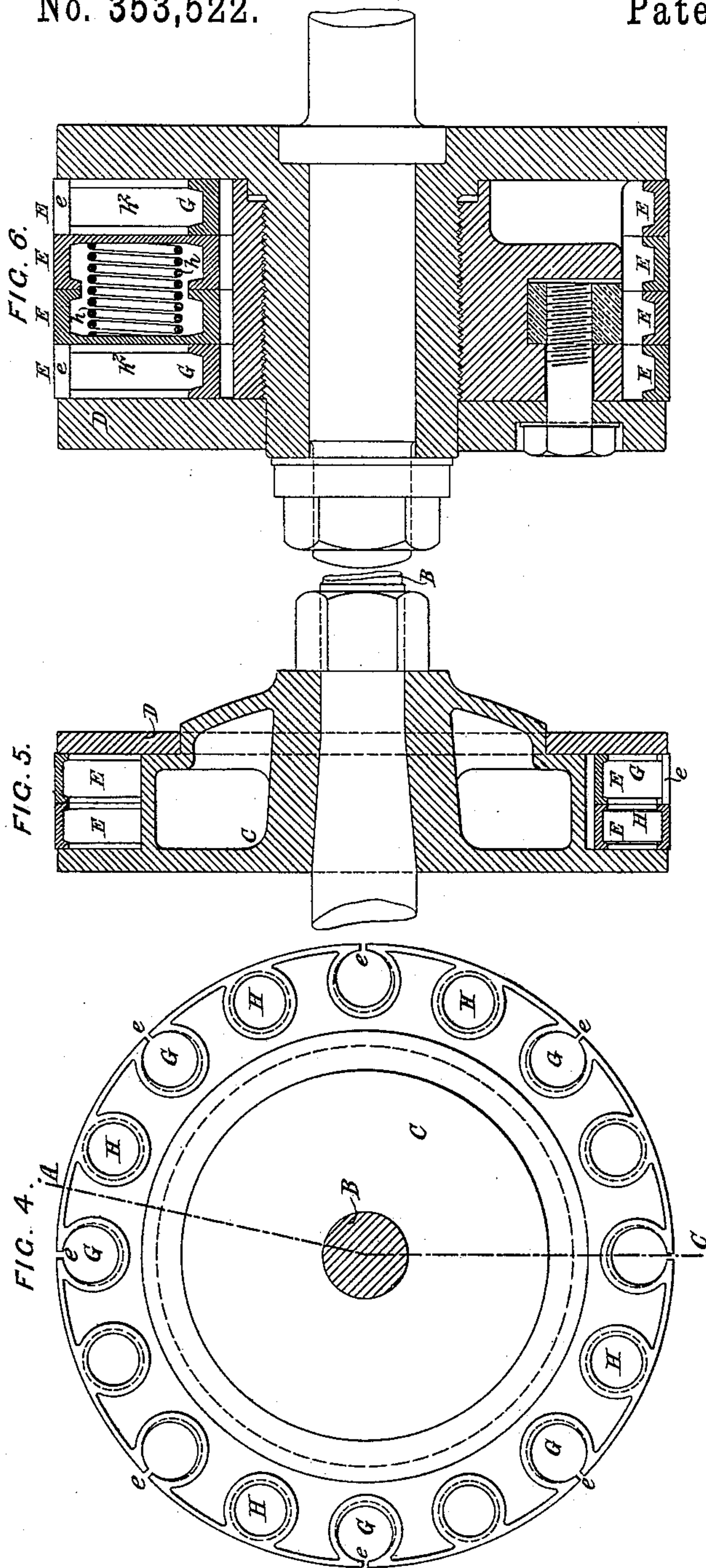


J. WATTS.
METALLIC PISTON AND VALVE.

No. 353,522.

Patented Nov. 30, 1886.



WITNESSES:
Joseph H. Klein.
Harry Smith

INVENTOR:
John Watts
by his Attorneys
Horton and Law

(No Model.)

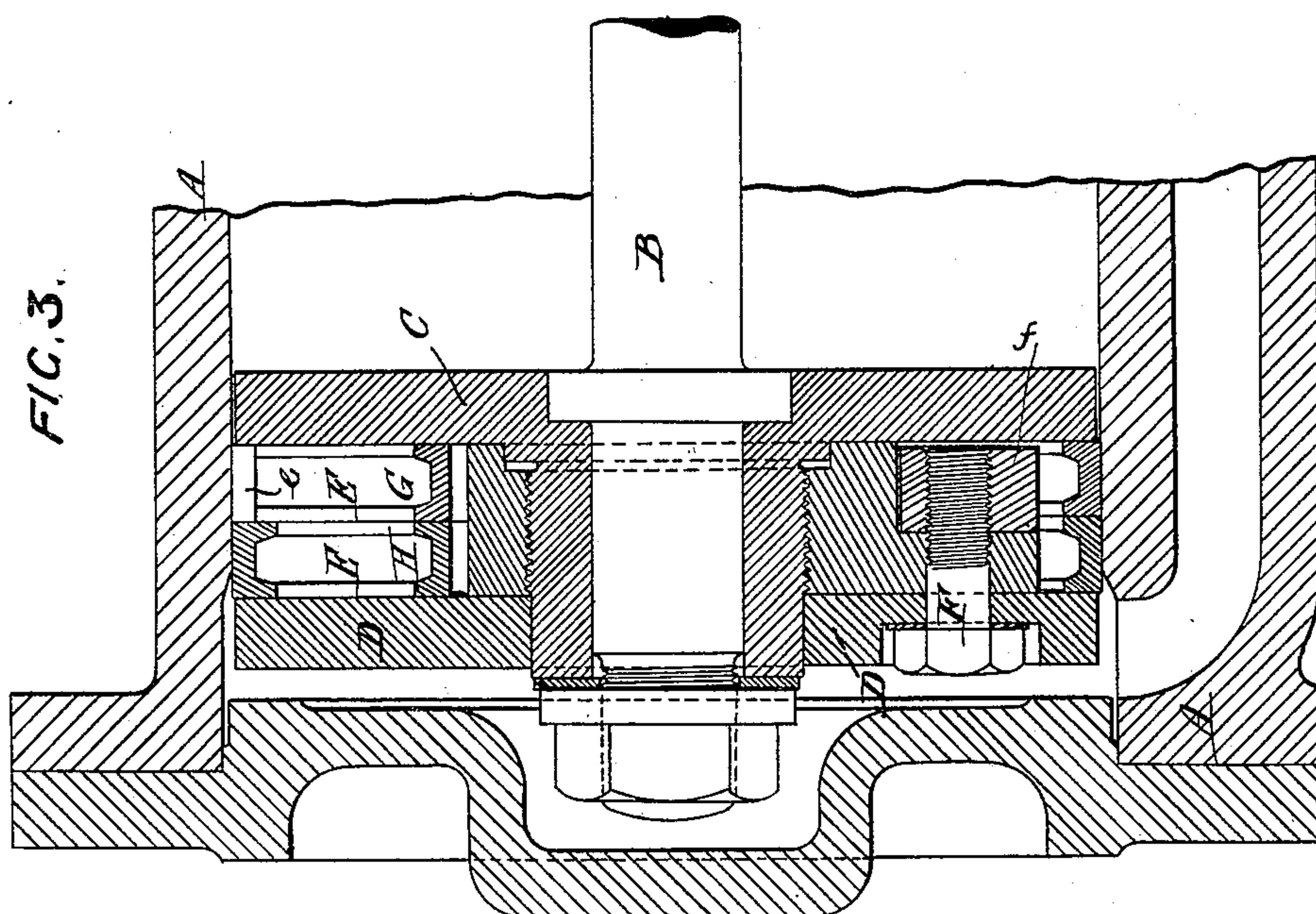
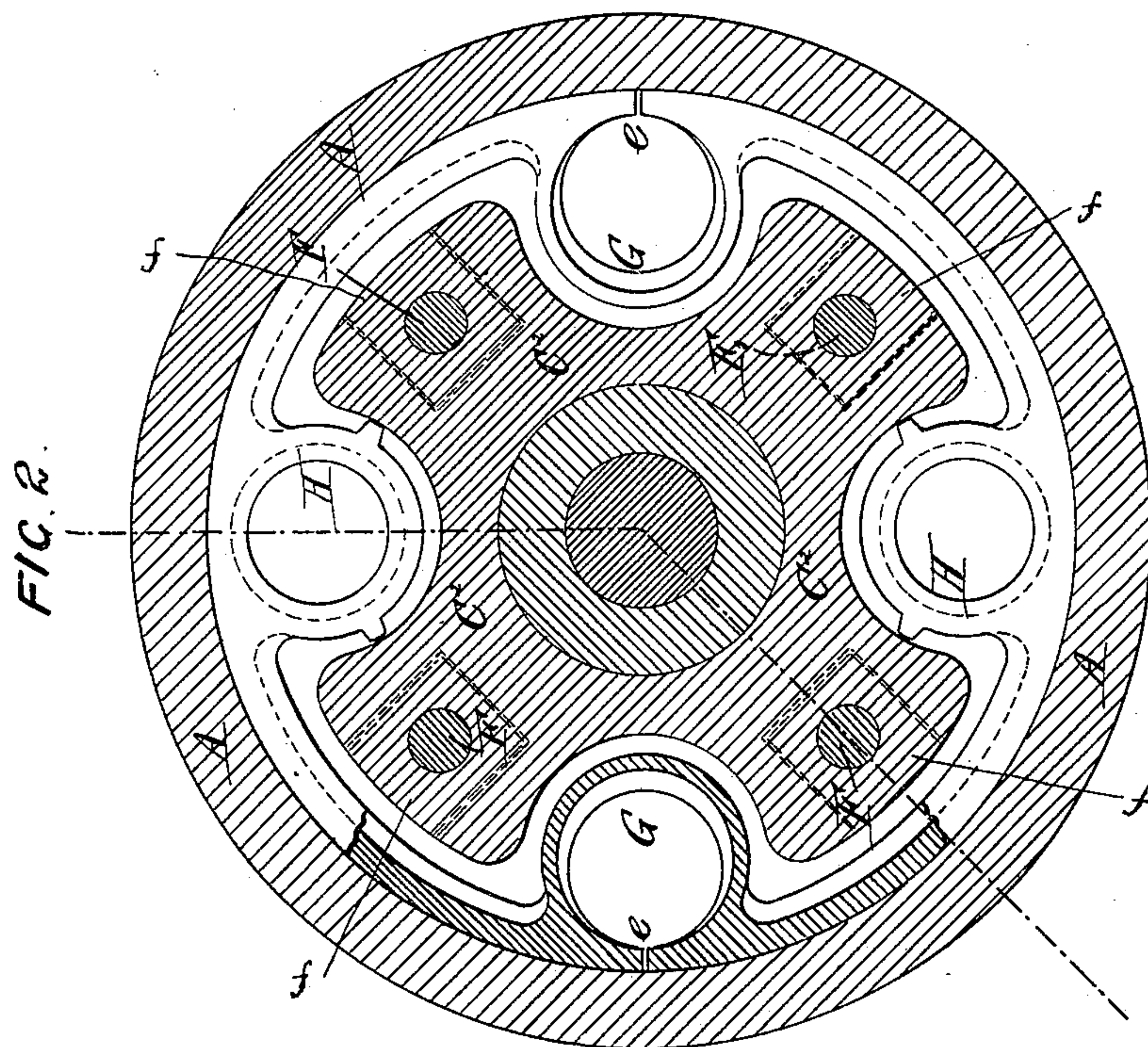
2 Sheets—Sheet 2.

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UNITED STATES PATENT OFFICE.

JOHN WATTS, OF BRISTOL, COUNTY OF BRISTOL, ENGLAND.

METALLIC PISTON AND VALVE.

SPECIFICATION forming part of Letters Patent No. 353,522, dated November 30, 1886.

Application filed March 16, 1886. Serial No. 195,455. (No model.) Patented in England March 20, 1885, No. 3,608; in France November 20, 1885, No. 172,420; in Belgium November 21, 1885, No. 70,947; in Germany November 21, 1885, No. 35,363, and in Italy June 8, 1886, No. 19,732.

To all whom it may concern:

Be it known that I, JOHN WATTS, a subject of the Queen of Great Britain and Ireland, residing in the city and county of Bristol, England, have invented certain Improvements in Metallic Pistons, Valves, and Pump-Buckets, (for which I have obtained British Patent No. 3,608, dated March 20, 1885; French Patent No. 172,420, dated November 20, 1885; Belgian Patent No. 70,947, dated November 21, 1885; German Patent No. 35,363, dated November 21, 1885, and Italian Patent No. 19,732, dated June 8, 1886,) of which the following is a specification.

My invention relates to pistons, piston-valves, and pump-buckets having packings consisting of divided or split rings expanded against the cylinder by pressure of springs from the inside.

The object of my invention is to so form the said rings that they have a better springing action and give a truer wearing of the cylinder than is the case with such piston-rings and pistons, or the like, as hitherto constructed.

In cases where it has been proposed to form the said rings by dividing them in several places at their circumference, it has been proposed to cast a piece with loops at the back over gaps formed in a ring which is V-shaped on its outer side and engages in a corresponding recess on the inner side of other rings, which form the actual packing-rings, and these rings have only been proposed to be split in one place after the manner of what is known as the "ram's bottom ring." Such an arrangement is described in the specification of Swain's British Patent No. 989 of May 4, 1858. This is expensive to make, and does not give the approximately-true expansion in a circle which it is my object to attain.

I am aware that it has been proposed to cast a piece having the outline of the ring, and with lugs or projections inside, which are afterward bored out to constitute loops, the ring being then slit through from the exterior. Such an arrangement is described in the specification of British Letters Patent to Thomas Moy, No. 977, dated March 19, 1874. This mode of forming the said rings is objectionable and does not attain my object, as the boring

of the metal to form the loops results in a very inefficient springing.

It is the object of my invention to overcome these objections and to construct a piston with rings so combined together that they form, themselves, the whole of the bearing-surface on the cylinder, and expand in a true or approximately true circle and constitute a practically steam-tight closure.

I will describe my invention with reference to a piston for a steam-cylinder, from which its application to pistons, piston-valves, and pump-buckets generally will be readily understood.

According to my invention I make each ring or component member of the periphery or bearing-surface or packing of the piston of a metal ring divided in more than one place and having a loop or connecting-piece or loops or connecting-pieces of metal cast on the internal side, tending to press the parts of the ring outward. I cast the ring with the loop or connecting-piece or loops or connecting-pieces thereon in the form of the loop itself; and I do not bore it out, as hereinbefore mentioned, as I find that when the "skin" of the metal is retained upon the inner side of the ring that a most effective, improved, and lasting springing action of the loop outward is obtained. I then cut or divide the ring at the part or parts between where the loops or connecting-pieces join the ring, or where they merge into or become part of the ring. This cutting or dividing removes a part of the metal and allows the ring to be compressed and turned to its working diameter, it afterward being released. Where a number of these rings are used for building up pistons, in order to prevent leakage through the divided portions of the rings, I place the divided part of one ring opposite an undivided part of the adjacent ring or rings, preferably forming loops or connecting-pieces at parts between and alternating with each loop or connecting-piece and severed part of the rings, as hereinbefore described, the parts of the rings where these intervening or alternating loops or connecting-pieces occur not being severed. When the rings so formed are placed together, the loops at the undivided part of the one ring are placed opposite the

loops at the divided part of the adjacent ring or rings, so as to prevent passage or leakage of fluid from side to side of the piston.

The ring or rings formed as described is or are provided with covers or junk-rings at the upper and lower sides, and are or may be operated in the same manner as ordinary pistons or the like are operated.

I do not limit myself to the use of any particular number of rings with each piston, piston-valve, or pump-bucket, as one or more may be used, as may be required in any particular case; but the whole of the bearing surface of the piston or the like upon the cylinder should be composed entirely of the ring or rings.

The casting of the loop gives a greatly-improved outwardly-springing action, owing to the unbroken skin of the metal, as described, while the division of the actual bearing ring or rings at more than one place gives an expansion of the ring or rings in a true or practically true circle, or much more nearly approaching a true circle than is the case with the ring or rings divided in only one place; and in order that my said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure 1 shows one of the simple packing-rings constructed according to my invention, E being the ring divided at *e*, and provided with loops G, connecting the divided ends of the ring, so as to have an outwardly-springing action upon them. The loops or connecting-pieces G are cast in one with the ring E, in the form shown in the figure, as I find that it is necessary to produce and leave intact a skin on the inside of the loops, which skin is produced by casting. I then cut the metal of the ring and afterward compress the ring and turn it to its working diameter, as hereinbefore described.

Fig. 2 is a transverse section, and Fig. 3 is a longitudinal section, of a piston provided with two rings and built up according to my invention. The portion of the cylinder shown is marked A, while B is the piston-rod, and C is the piston-body, between which and the junk-ring D the rings E are secured by the bolts F, screwing into the squared pieces *f*, held in the squared recesses in the part C², which fills up the space left by the rings between the piston-body and the junk-ring, the said part C² being screwed on the piston-body, as shown in Fig. 3. Each ring E is divided at *ee* in two places, and the parts are connected by loops or connecting-pieces G G, cast thereon, which act as springs to force the parts of the ring outward against the interior of the cylinder A. The rings I have shown are of a channel form in section, which form I prefer; but the section may of course be varied, as desired, and, as before stated, there may be one ring or two or more than two rings for each piston. Mid-

way between each of the divisions in the rings there are formed loops H H, so that when more than one ring is used, when the rings are placed together, as shown in the drawings, a closure is formed to prevent steam or other fluid leaking past the piston through the divided parts of the rings at *e*. The rings, when several are used, are arranged as shown clearly in the drawings, so that the divided parts and the corresponding loops or connecting-pieces of one ring are over the parts which are not divided, but which have corresponding loops or connecting-pieces.

Figs. 4 and 5 are similar views to those shown in Figs. 2 and 3, in which the piston-body or fitting-piece is not recessed, and in which a much larger number of divided parts and connecting and intermediate loops are shown. The parts in these figures are marked with the same letters of reference as are used to indicate similar parts in the preceding figures.

In Fig. 6 I have shown four rings, together with the divided parts of the two outer rings situated in the same longitudinal line, the divided parts of the two mid-rings being situated in other longitudinal lines midway between the longitudinal lines in which the divided parts of the outer rings occur. I have shown in this Fig. 6 in the drawings a spring, *h*, bearing upon the parts *h*², which are formed on the two inner rings. Several of these springs are used at equidistant portions of the rings to press the inner rings into close contact with the outer rings and the outer rings into close contact with the junk-rings.

As an example of a variation, I have shown at Fig. 7 a ring divided at more than one place, but with only one loop. This figure serves to illustrate not only that it is possible to divide the ring at more than one place with but one connecting-loop, but also that the loop may take any convenient form. It is here shown as being much enlarged and made concentric with the packing-ring E.

Fig. 8 shows a modification, wherein the equivalent of the loops hereinbefore described is provided, by means of an inner ring, G, with connecting pieces, arms, webs, or strips *g*, connecting thereto each divided part of the ring E, so that the said connecting pieces, arms, webs, or strips serve as outwardly-pressing springs to keep the rings in close contact with the cylinder, with the piston-valve, or pump-bucket for which a ring or rings thus constructed is or are used.

I claim as my invention—

1. The mode herein described of making metallic piston-rings and the like by casting the part of the ring which in work bears on the cylinder with internal loops, cast to leave a skin on the inside of the loops, and then cutting the parts of the rings at which the loops are situated, and then compressing the ring to contract or close the gaps, and then turning the ring to its proper diameter, as hereinbefore set forth.

2. In a piston, piston-valve, or pump-bucket,

the combination of a ring or rings, E, divided in more than one place and provided with spring-loops, the piston-body C, and junk-ring D, with intervening piece C², and pieces f
5 and screws F, substantially as hereinbefore described.

3. In a piston, piston-valve, or pump-bucket, the combination of a ring or rings, E, divided in more than one place and provided with
10 spring-loops, with the unrecessed piston-body C, junk-ring D, and securing-screws F, substantially as hereinbefore described.

4. In pistons, piston-valves, and pump-buckets, the combination of rings E, divided
15 in more than one place and provided with

spring-loops, a junk-ring, and piston-body, and means for securing them together, with springs h, and bearing part h² on some of the rings, substantially as and for the purpose
hereinbefore described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JOHN WATTS.

Witnesses:

W. M. KEMP,
41 Broad Street, Bristol, Accountant.

WM. DAVIES,
18 Terrell Street, Kingsdown, Bristol, Solicitor's Clerk.