

No. 785,444.

PATENTED MAR. 21, 1905.

R. H. TAIT.  
AUTOMATIC CONTROLLING VALVE.

APPLICATION FILED DEC. 27, 1901.

3 SHEETS—SHEET 1.

Fig. 2.

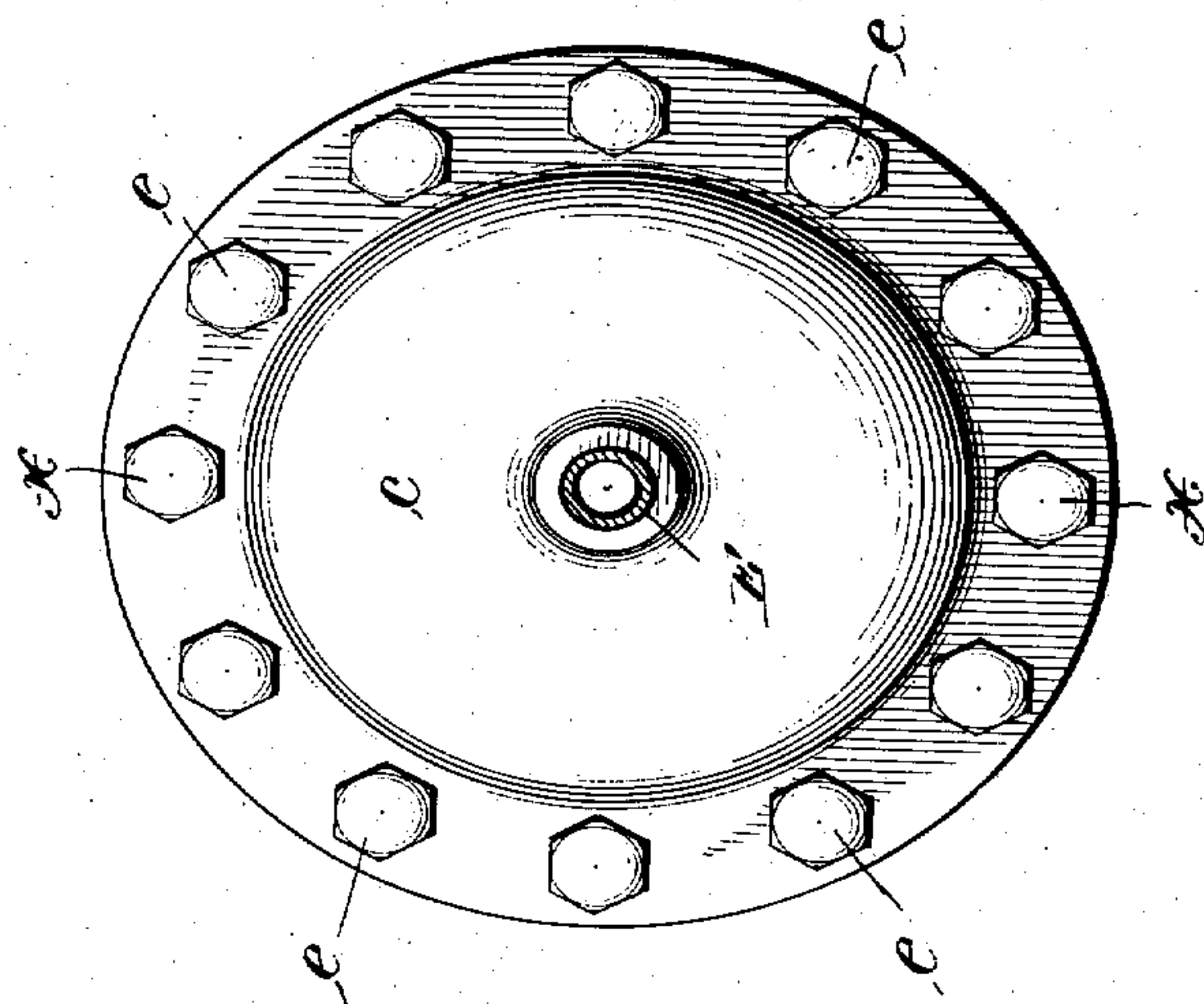
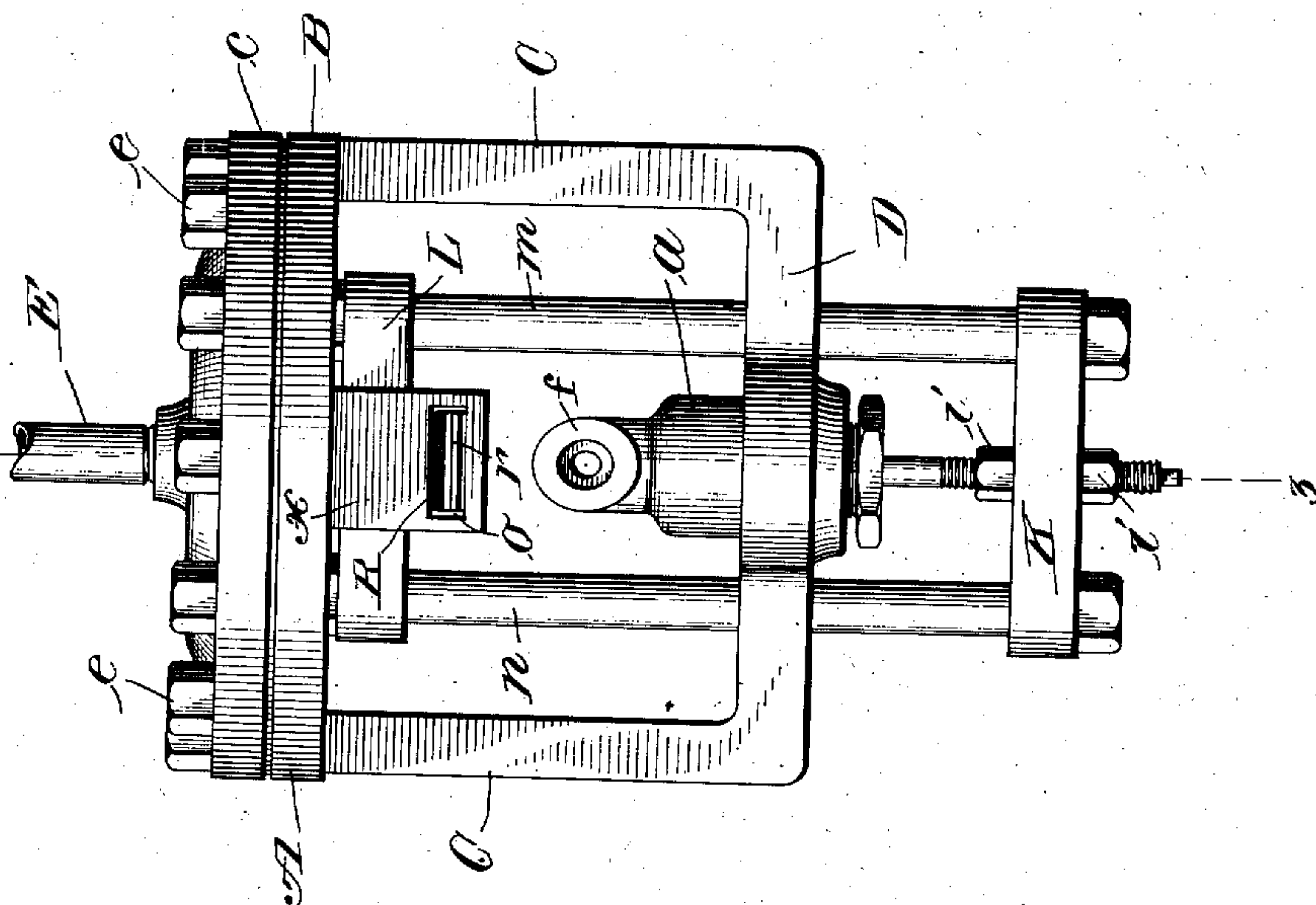


Fig. 1.



Witnesses:  
H. S. Gaither.  
M. Friel.

Inventor:  
Roderick H. Tait  
by Frank D. Thompson  
Attorney.

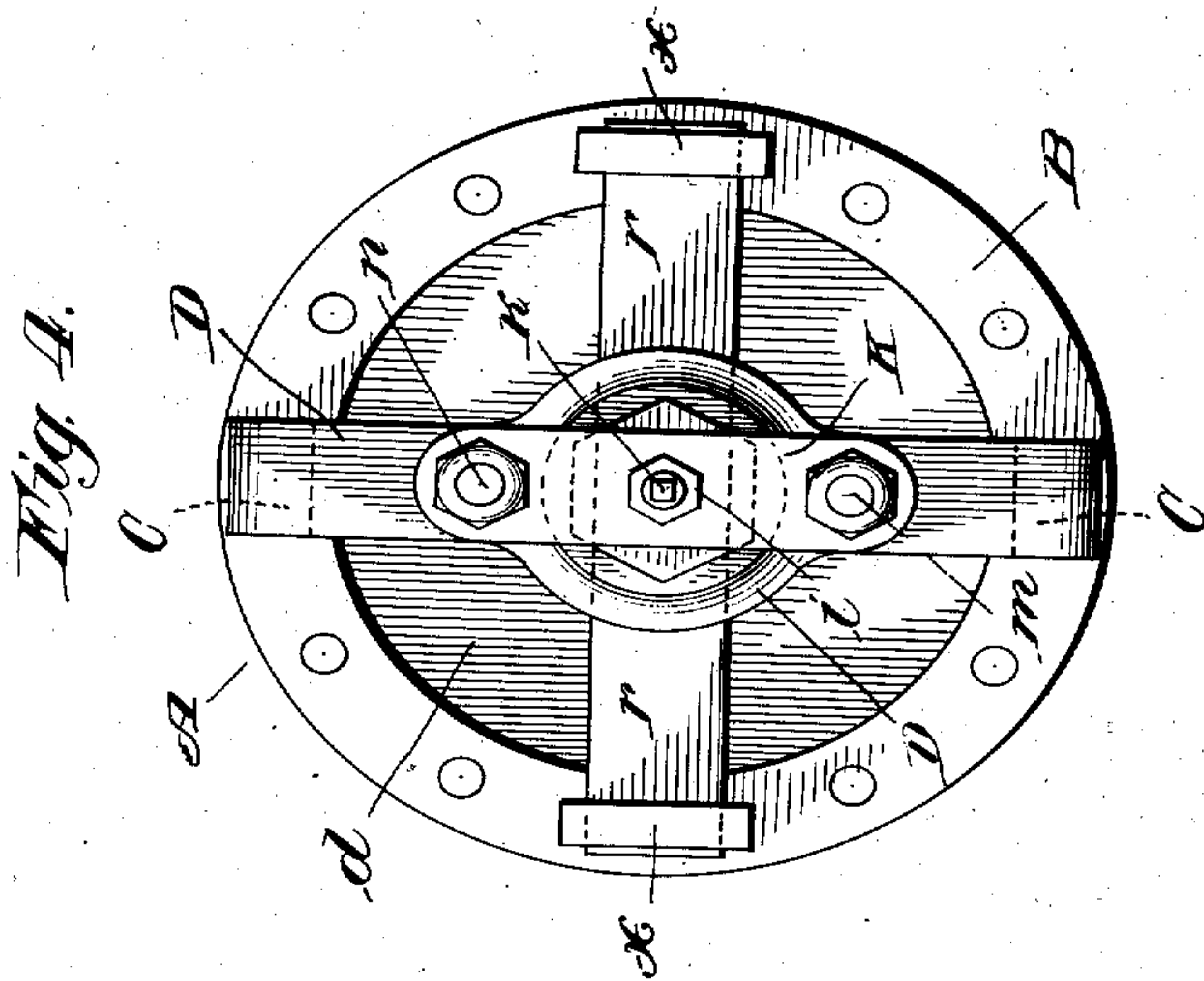
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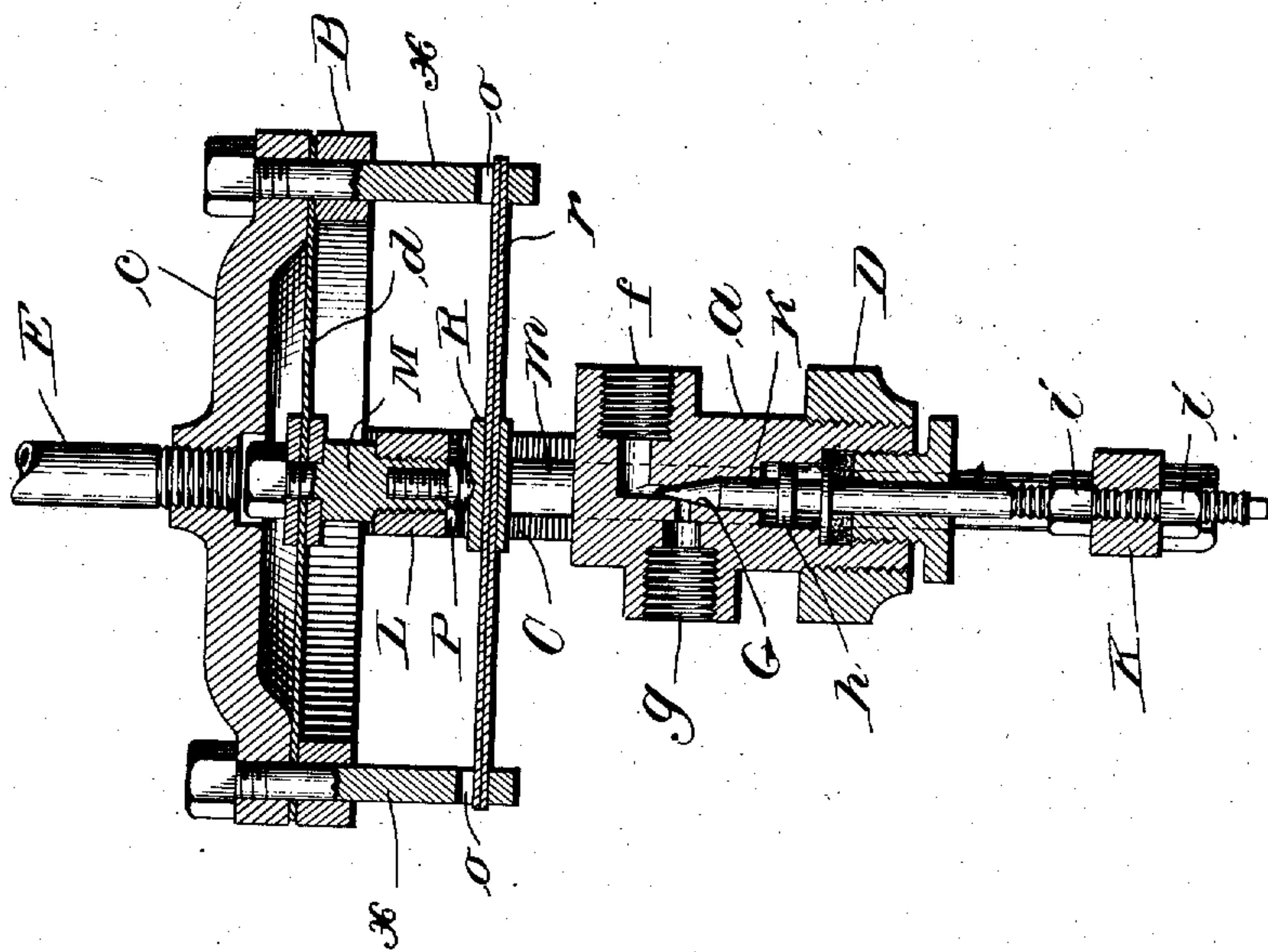
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3 SHEETS—SHEET 2.



*Fig. B.*



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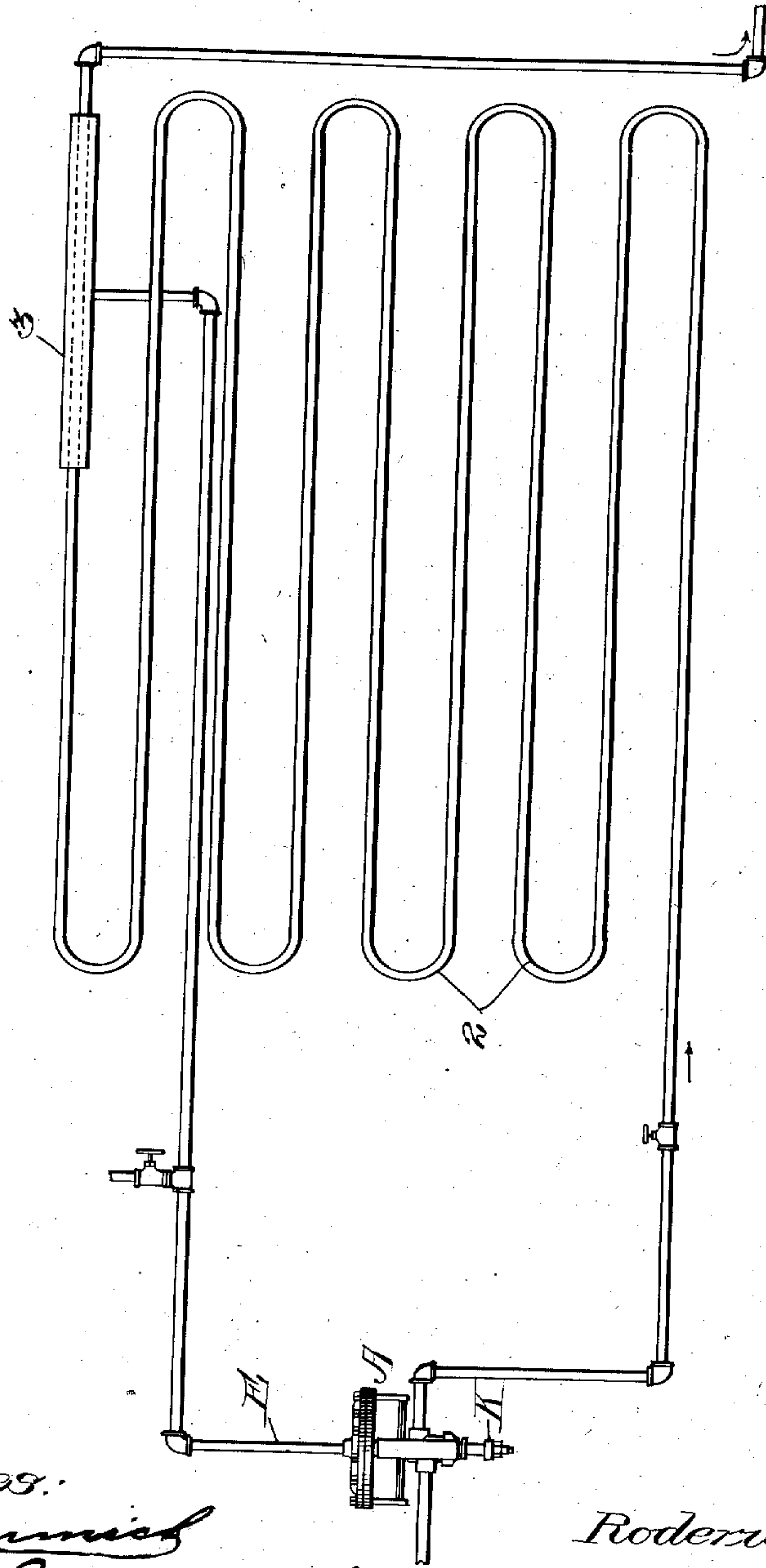
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3 SHEETS—SHEET 3.

*Figs.*



Witnesses:

*O. W. Kinnick*  
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*Inventor.*  
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*Attorney.*



# UNITED STATES PATENT OFFICE.

RODERICK H. TAIT, OF ST. LOUIS, MISSOURI, ASSIGNOR OF ONE-HALF TO  
J. M. WESTERLING AND ALLEN CAMPBELL, OF CHICAGO, ILLINOIS.

## AUTOMATIC CONTROLLING-VALVE.

SPECIFICATION forming part of Letters Patent No. 785,444, dated March 21, 1905.

Application filed December 27, 1901. Serial No. 87,513.

*To all whom it may concern:*

Be it known that I, RODERICK H. TAIT, a citizen of the United States, and a resident of the city of St. Louis, State of Missouri, have  
5 invented certain new and useful Improvements in Automatic Controlling-Valves, of which the following is a full, clear, and exact specification.

This invention relates to automatic controlling-valves adapted to maintain a constant pressure or temperature in a circulating system for heating, refrigerating, or the like, and especially to valves which are controlled by a pressure or vacuum chamber and whose parts  
15 are actuated by the movement of a diaphragm-wall therein. A refrigerating system of this type, and in connection with which I prefer to use my improved automatic controlling-valve, is shown and described in an application for Letters Patent filed by me October  
20 10, 1901, Serial No. 78,199.

One of the objects of the invention is to provide means for accurately adjusting the parts so that the valve will respond quickly to variations in the pressure or vacuum chamber.  
25

Another object is to afford a variable tension which may be changed without disturbing the working parts of the valve.

In the drawings, Figure 1 is a side view of  
30 my invention. Fig. 2 is a plan view of the same. Fig. 3 is a vertical central section taken on line 3-3, Fig. 1. Fig. 4 is a plan view looking at the same from underneath. Fig. 5 is a diagrammatical view of a refrigerating system to which my improved valve has been applied.  
35

Referring to the drawings, A represents the main frame of the device, which is preferably made in one piece, and supports the diaphragm-chamber and the valve proper. It  
40 comprises a ring B, (preferably rectangular in cross-section,) on whose upper side the chamber is secured, and a yoke C, the arms of which depend from its lower side at points diametrically opposite each other. The cross-arm D of this yoke connecting the vertical  
45 arms thereof forms the support for the valve-casing a.

The diaphragm-chamber comprises a circular concavo-convex flanged head c, which has  
50 its annular flanges secured to the ring B of the main frame, with its concaved side toward the ring. Clamped between said ring and head, by cap-screws e or other means, is a thin resilient membrane d, which forms the lower  
55 wall of the diaphragm-chamber. A pressure-pipe E is tapped into a central boss of the head c and connects the space inclosed by said head and membrane with the thermostatic or pressure sources in connection with which it  
60 is desired to employ my invention, substantially as shown in diagrammatical form in Fig. 5 of the drawings. The refrigerating system here shown consists of a condensation-coil 2, through which the liquid refrigerant  
65 travels in the direction indicated by the arrows and upon the final coil or return-pipe of which a suitable thermostatic chamber 3 is provided. The pipe E, connecting chamber  
70 3 and the diaphragm-chamber, is constantly filled with a thermostatic gas, which is readily expanded and contracted by the rise and fall in temperature of the refrigerating fluid in the coils, as fully described in other parts  
75 of this specification.

The valve-casing a consists of a cylindrical body, having its lower end screw-threaded to engage a suitable threaded aperture in the cross-arm D of the yoke in axial alinement with the diaphragm-chamber. Near its upper  
80 end the valve-casing is provided with suitable bosses f and g, which project therefrom in opposite directions, and the former, f, of which is in a plane above the latter. This valve-casing is bored longitudinally and centrally from its lower end up to the plane of  
85 the axis of the boss f, and both of said bosses are counterbored and tapped for connecting the inlet and outlet pipes of the valve and communicate with the upper portion of the  
90 central passage or bore of the valve-casing. At about the plane of the axis of the bore of the lower boss the central passage or bore of the valve-casing is tapered to a greater diameter to form a valve-seat G and engaging  
95 this valve-seat, so as to open or close the pas-



sage between the bores of the inlet and outlet bosses *f* and *g*, is a reciprocal valve-spindle *h*, the upper end of which is cone-shaped so as to fit into the valve-seat. At a point slightly below the valve-seat the diameter of the central passage or bore of the valve-casing is increased and the portion of the spindle movable in the chamber so made is encircled by a collar *h*, which assists in guiding the same. The lower end of the valve-casing is provided with a suitable stuffing-box, which is so constructed as to prevent leakage when the valve is in operation.

The lower screw-threaded end of the valve-spindle extends through a cross-bar K and is provided with nuts *i i*, both above and below said bar, by manipulating which said spindle can be adjusted vertically according as desired. The cross-bar K is parallel to the lower arm of the yoke C and its outer ends are rigidly connected to the lower ends of the parallel rods *n* and *m*, which latter extend up through suitable guide-apertures in the cross-arm D of the yoke and have their upper ends connected to a cross-bar L. At its center of length and in alinement with the axis of the valve-spindle the cross-bar L is connected by a coupling M to the center of the diaphragm. This coupling consists of a cylindrical body, the lower end of which is screw-threaded and engages a correspondingly-threaded aperture in the cross-bar L. It is provided with a circumferential flange near its upper end, which is adapted to bear against the under side of the diaphragm, and its upper screw-threaded end, which is reduced in diameter, extends up through a central aperture in the diaphragm and is surrounded by a washer above said diaphragm and is engaged by a suitable nut for clamping it securely to the same in such manner as to insure a perfectly-tight joint. By means of this form of coupling and the valve-spindle carriage, comprising said cross-bars K and L and parallel rods *m* and *n*, any movement of the membrane of the diaphragm-chamber causes the valve-spindle to advance or recede from the valve-seat in the valve-casing and regulates the extent of the communication between the inlet and outlet bosses thereof accordingly.

In order to assist the action of the membrane in returning the valve-spindle to its normal position, I have provided the lower ends of two diametrically opposite clamping-bolts *x x* of the diaphragm-head with corresponding flattened extensions, which near their lower ends are provided with horizontal slots *o o*. The ends of one or more flat metallic spring-bars *r* are inserted in these slots and at their centers of length press upward against the coned head of a gage-screw P, which is tapped centrally into the lower end of the coupling M. The spring-bars *o* may bear directly against the head of the screw P; but I

prefer to bind these spring-bars together at their centers of length by a clip R, substantially as shown, and to bring the head of said screw and this clip into engagement.

By suitably manipulating the gage-screw P any desired pressure can be exerted against the outer face of the membrane of the diaphragm-chamber, and by changing the spring-bars *o* (which can be quickly done) any required tension or yielding resistance can be presented to the pressure in the diaphragm-chamber. It will be noticed that the means for longitudinal adjustment of the parts of my invention is such as to enable the valve-spindle to be adjusted with the greatest accuracy relative to its valve-seat and that the minutest change of pressure in the diaphragm-chamber can be depended upon to open or close the valve. In addition to these advantages it is obvious that the construction of my invention will insure the maximum of durability and efficiency of operation at a minimum cost.

What I claim as new is—

1. An automatic controlling-valve, comprising a main frame, a pressure-chamber comprising a concavo-convex head and a resilient diaphragm clamped between said head and frame, an independent valve secured in said frame having a reciprocal valve-stem in alinement with the chamber, connecting-rods reciprocally secured at either end to the diaphragm and stem at a point below the plane of the seat of said valve and a transverse spring supported at both ends in the frame and adjustably bearing against the diaphragm.
2. An automatic controlling-valve, comprising a frame, having an annular head, a pressure-chamber comprising a concavo-convex head and a resilient diaphragm clamped between said head and annular frame-head, an independent valve secured in said frame having a reciprocal valve-stem in alinement with the chamber, connecting-rods reciprocally secured at either end to the diaphragm and stem at a point below the plane of the seat of said valve and a transverse spring supported at both ends in the frame and adjustably bearing against the diaphragm.
3. An automatic controlling-valve, comprising a frame having an annular head and a yoke secured at its ends to opposite points of one side of said head, a pressure-chamber comprising a concavo-convex head and a resilient diaphragm clamped between said head and annular frame-head, an independent valve secured to the cross-arm of the yoke, having a reciprocal valve-stem in alinement with the chamber, connecting-rods reciprocally secured at either end to the diaphragm and stem at a point below the plane of the seat



of said valve, and a transverse spring supported at both ends in the frame and adjustably bearing against the diaphragm.

4. An automatic controlling-valve, having  
5 an annular head and a yoke secured at its ends to opposite points on said head, a diaphragm-chamber secured to the head, a valve secured to the cross-arm of said yoke having a reciprocal valve-stem in alinement with the chamber,  
10 a cross-head secured to the diaphragm center, a cross-head secured to the stem at a point below the plane of the seat of said valve, rods rigidly connecting the cross-heads reciprocal in and guided by said frame, and a transverse spring secured at its ends to opposite  
15 points on the annular head adapted to bear with its middle portion against the diaphragm cross-head.

5. An automatic controlling-valve, having  
20 an annular head and a yoke secured at its ends to opposite points on said head, a diaphragm-chamber secured to the head, a valve secured to the cross-arm of said yoke, a reciprocal valve-stem in alinement with the chamber, a  
25 cross-bar secured to the diaphragm center, a cross-bar secured to the stem at a point below the plane of the seat of said valve, rods rigidly connecting the cross-bars, a spring secured at its ends to opposite points on the annular head, and a gage-screw adjustably  
30 secured in the diaphragm-coupling engaging the middle portion of the spring.

6. An automatic controlling-valve, having an annular head, and a yoke secured at its ends to opposite points on said head, a diaphragm-chamber secured to the head, a valve secured to the cross-arm of said yoke, a reciprocal valve-stem in alinement with the chamber, a cross-bar secured to the diaphragm center, a cross-bar secured to said stem at a point below the plane of the seat of said valve, two  
40 parallel rods rigidly connecting the corresponding ends of the cross-bars, reciprocal in the frame and guided thereby, and a spring secured at its ends to opposite points on the annular head adapted to bear with its middle  
45 portion against the diaphragm cross-head.

7. An automatic controlling-valve, comprising a main frame, a pressure-chamber consisting of a concavo-convex head, and a resilient  
50 diaphragm clamped between said head and frame, a valve secured in said frame, a reciprocal valve-spindle, parallel connecting-rods guided by said frame adjustably secured at either end to the diaphragm and valve-spindle at a point below the plane of the seat of  
55 said valve, and a transverse spring supported at both ends in the frame and adapted to resist the movement of said diaphragm.

RODERICK H. TAIT.

Witnesses:

M. FRIEL,  
FRANK D. THOMASON.

It is hereby certified that the name of the first-mentioned assignee in Letters Patent No. 785,444, granted March 21, 1905, upon the application of Roderick H. Tait, of St. Louis, Missouri, for an improvement in "Automatic Controlling-Valves," was erroneously written and printed "J. M. Westerling," whereas the said name should have been written and printed *J. M. Westerlin*; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 18th day of April, A. D. 1905.

[SEAL.]

F. I. ALLEN,

Commissioner of Patents.

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of said valve, and a transverse spring supported at both ends in the frame and adjustably bearing against the diaphragm.

4. An automatic controlling-valve, having  
5 an annular head and a yoke secured at its ends to opposite points on said head, a diaphragm-chamber secured to the head, a valve secured to the cross-arm of said yoke having a reciprocal valve-stem in alinement with the chamber,  
10 a cross-head secured to the diaphragm center, a cross-head secured to the stem at a point below the plane of the seat of said valve, rods rigidly connecting the cross-heads reciprocal in and guided by said frame, and a transverse spring secured at its ends to opposite  
15 points on the annular head adapted to bear with its middle portion against the diaphragm cross-head.

5. An automatic controlling-valve, having  
20 an annular head and a yoke secured at its ends to opposite points on said head, a diaphragm-chamber secured to the head, a valve secured to the cross-arm of said yoke, a reciprocal valve-stem in alinement with the chamber, a  
25 cross-bar secured to the diaphragm center, a cross-bar secured to the stem at a point below the plane of the seat of said valve, rods rigidly connecting the cross-bars, a spring secured at its ends to opposite points on the annular head, and a gage-screw adjustably  
30 secured in the diaphragm-coupling engaging the middle portion of the spring.

6. An automatic controlling-valve, having an annular head, and a yoke secured at its ends to opposite points on said head, a diaphragm-chamber secured to the head, a valve secured to the cross-arm of said yoke, a reciprocal valve-stem in alinement with the chamber, a cross-bar secured to the diaphragm center, a cross-bar secured to said stem at a point below the plane of the seat of said valve, two  
40 parallel rods rigidly connecting the corresponding ends of the cross-bars, reciprocal in the frame and guided thereby, and a spring secured at its ends to opposite points on the annular head adapted to bear with its middle  
45 portion against the diaphragm cross-head.

7. An automatic controlling-valve, comprising a main frame, a pressure-chamber consisting of a concavo-convex head, and a resilient  
50 diaphragm clamped between said head and frame, a valve secured in said frame, a reciprocal valve-spindle, parallel connecting-rods guided by said frame adjustably secured at either end to the diaphragm and valve-spindle  
55 at a point below the plane of the seat of said valve, and a transverse spring supported at both ends in the frame and adapted to resist the movement of said diaphragm.

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