

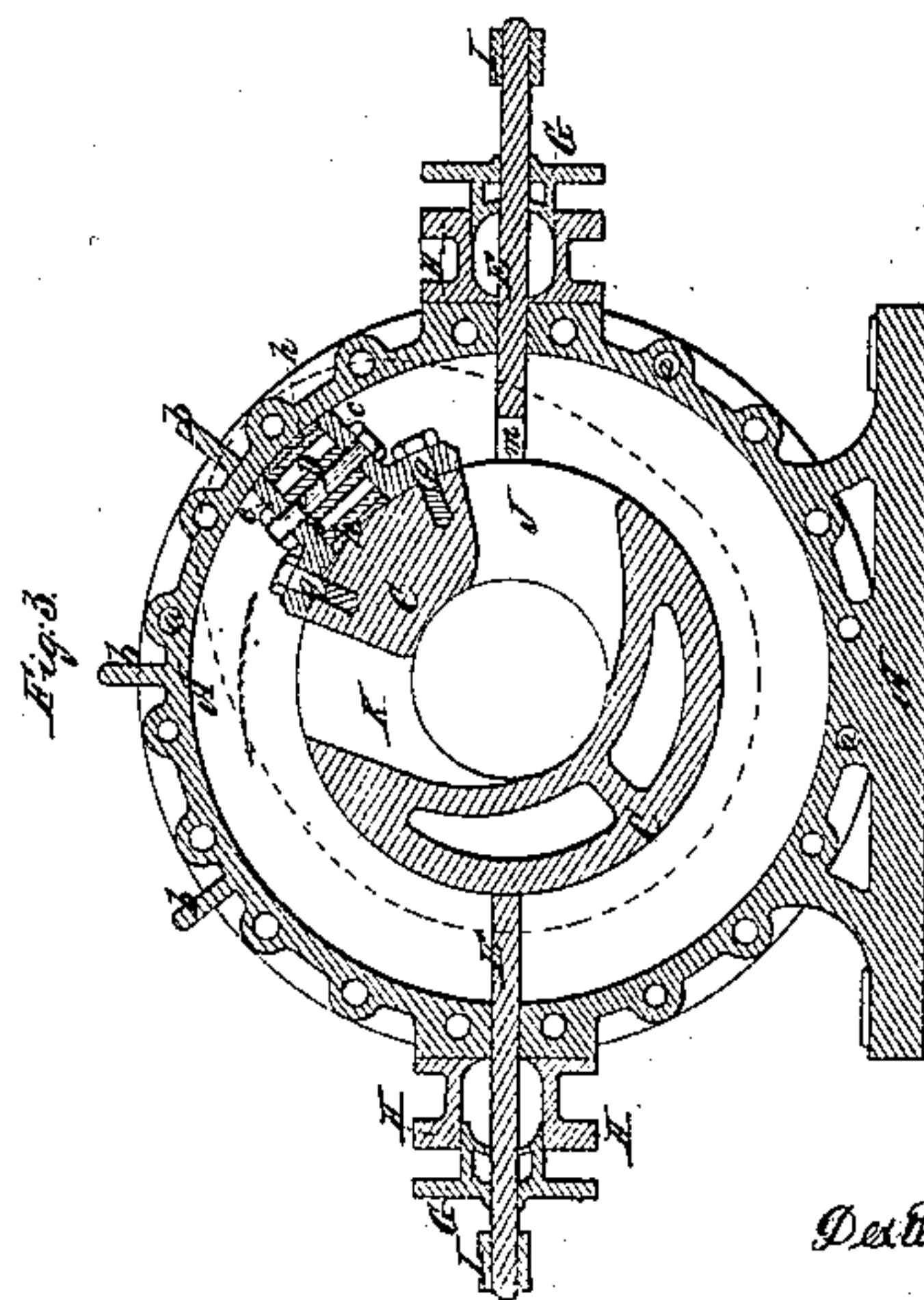
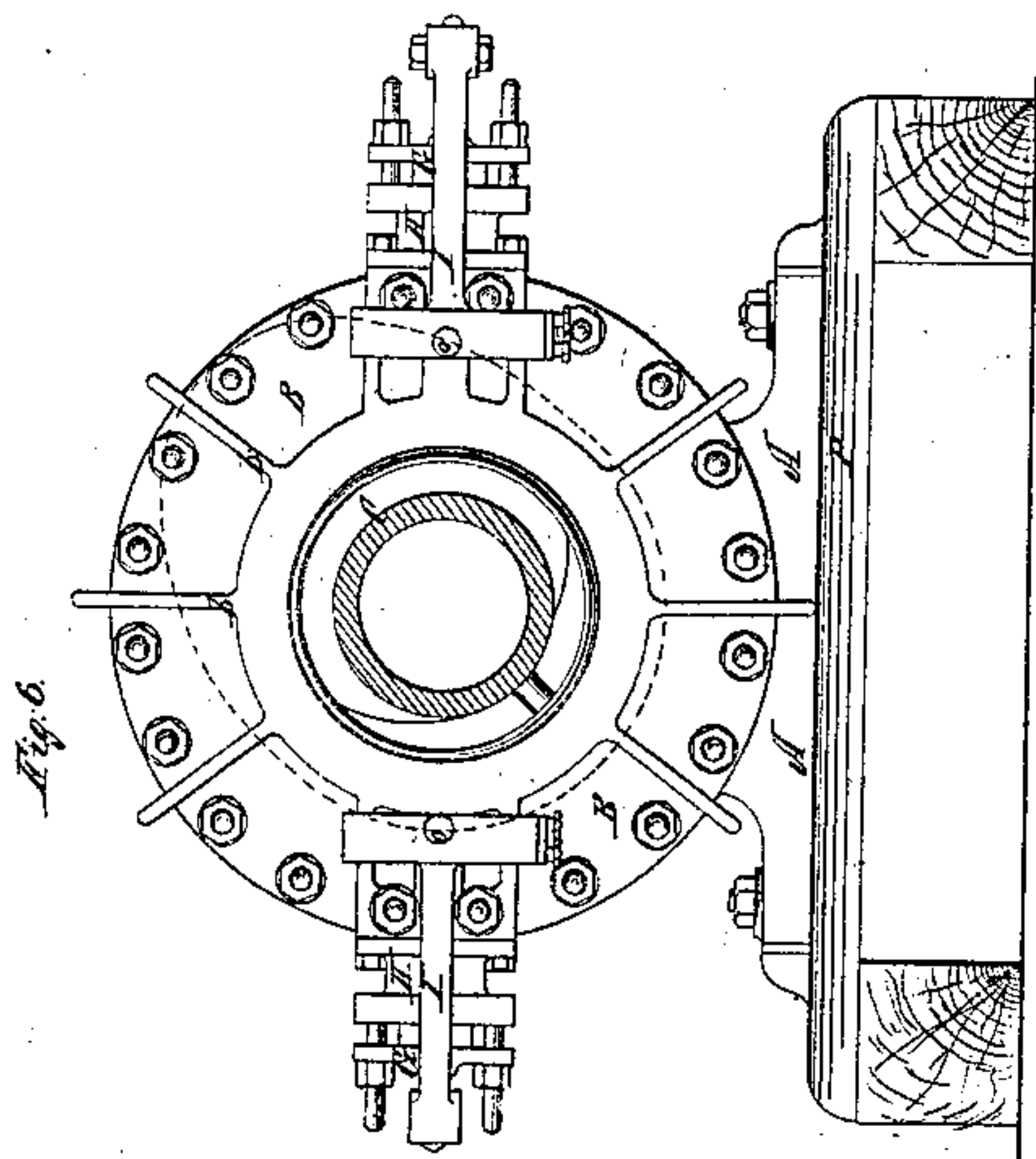
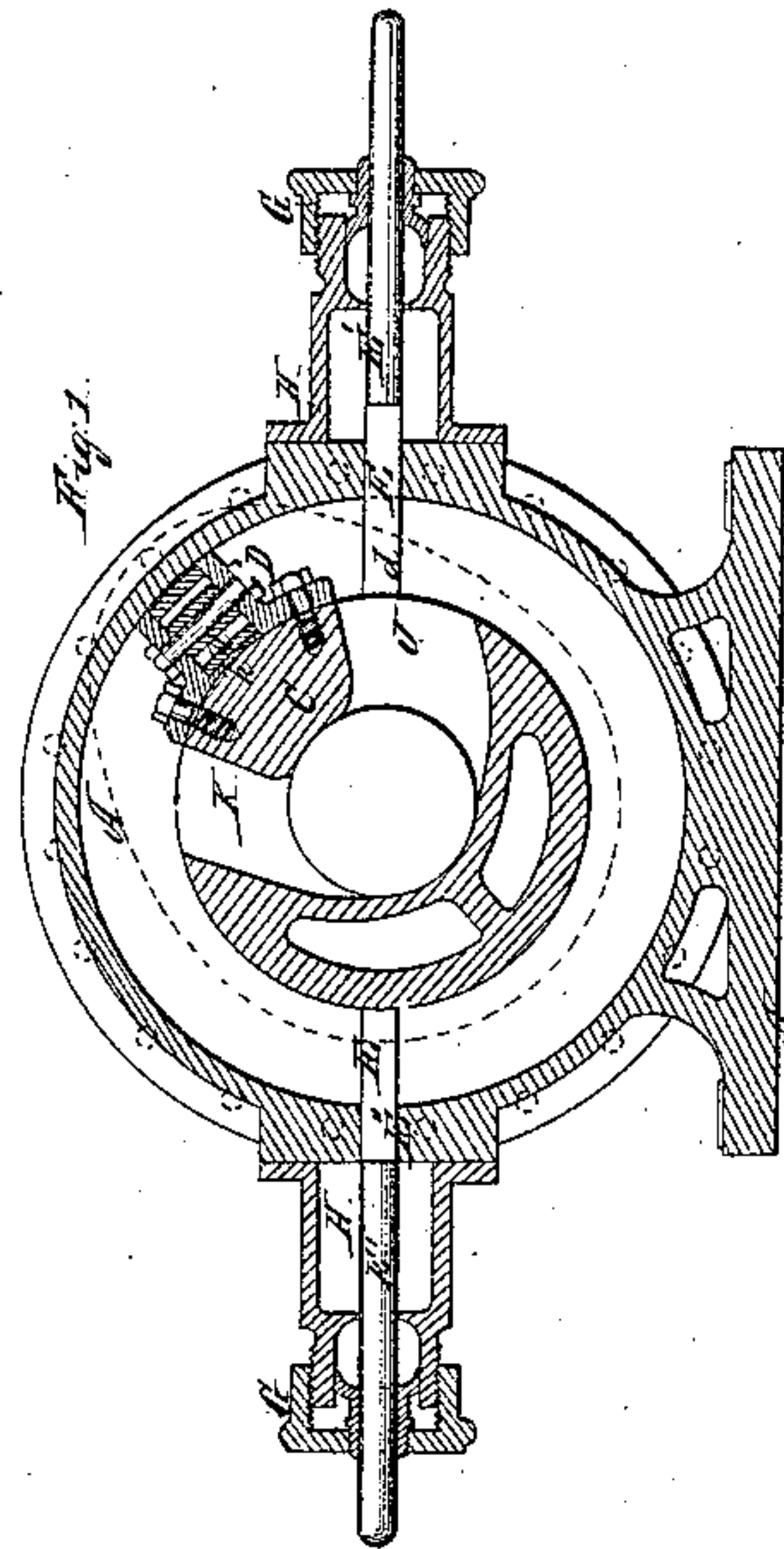
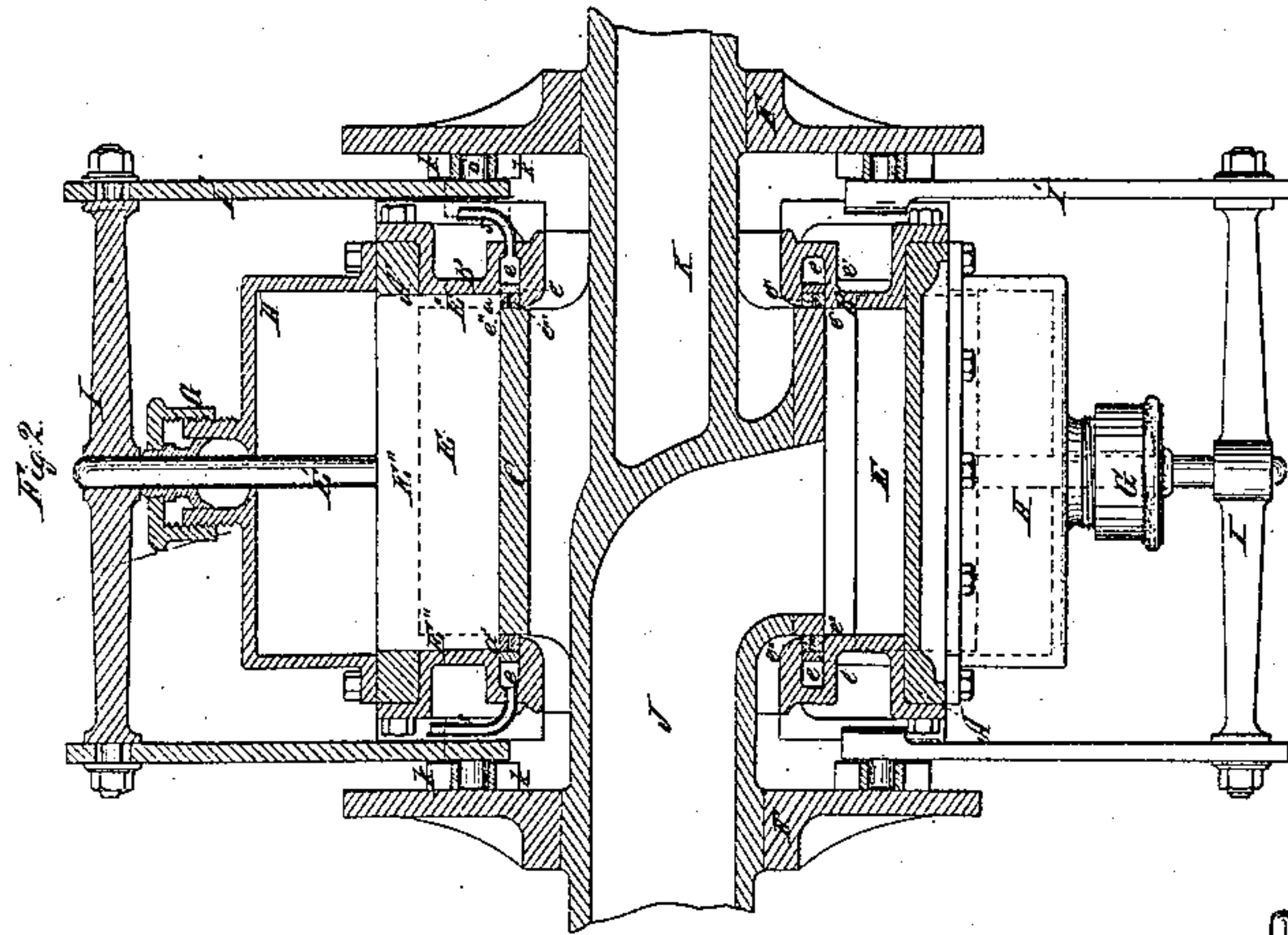
D. D. Hardy,

25 Sheets. Sheet 1.

Rotary Steam Engine

N^o 24,388.

Patented June 14, 1859.



Witnesses:
James H. H. Hardy
James H. Hardy

Inventor:
Dexter D. Hardy

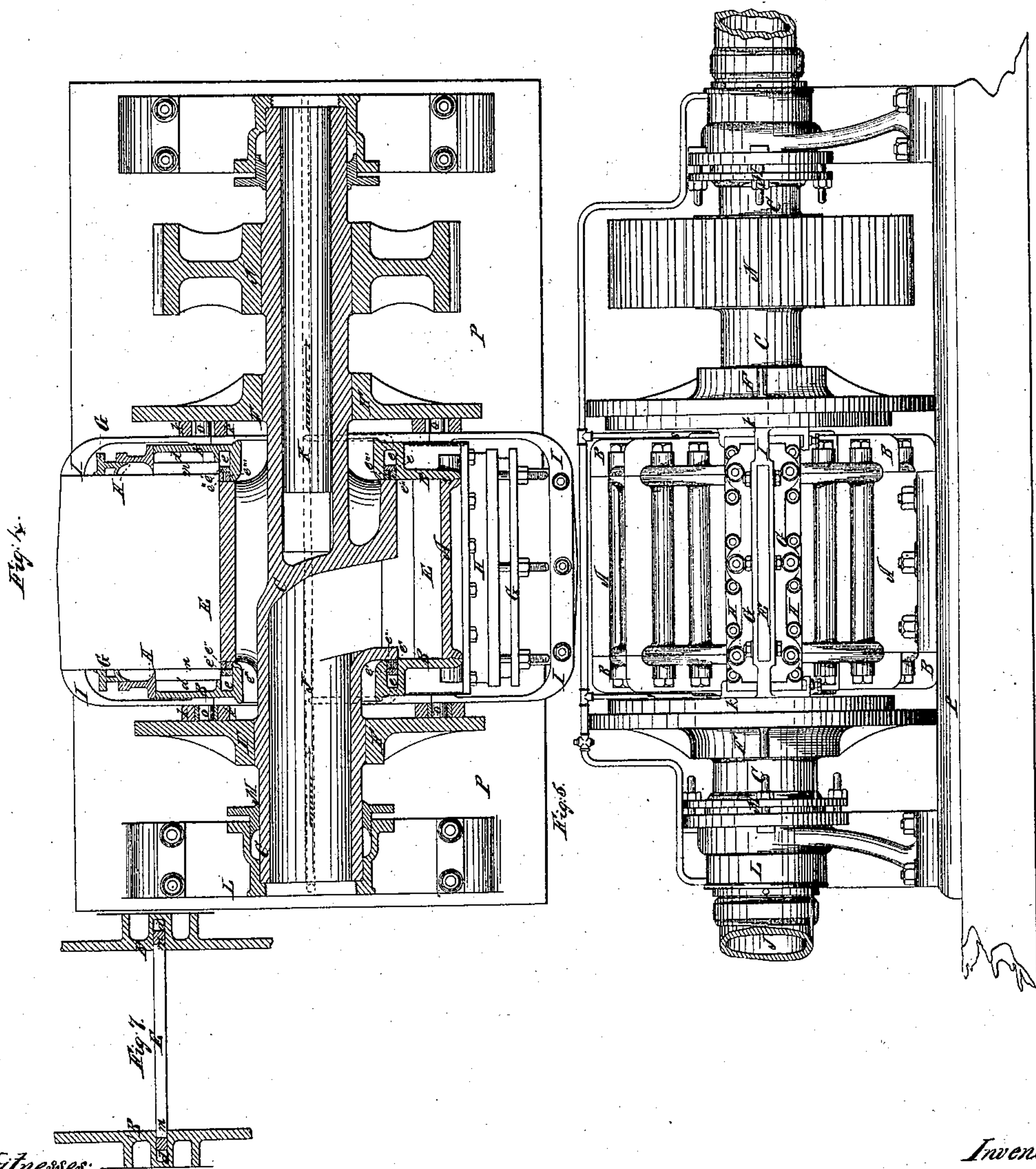
D. D. Hardy,

25 Sheets, Sheet 2.

Rotary Steam Engine.

N^o 24,388.

Patented June 14, 1859.



Witnesses:
Francis Willard
James H. Smith

Inventor:
D. D. Hardy

UNITED STATES PATENT OFFICE.

DEXTER D. HARDY, OF CINCINNATI, OHIO.

ROTARY ENGINE.

Application of Letters Patent No. 24,388, dated June 14, 1859.

To all whom it may concern:

Be it known that I, DEXTER D. HARDY, of Cincinnati, Hamilton county, Ohio, have invented certain new and useful Improvements in Rotary Engines and Pumps; and I hereby declare the following to be a full and exact description thereof, reference being had to the annexed drawings, making part of this specification.

My invention consists in the peculiar arrangement of annular rings for packing the side faces of the revolving shaft containing the receiving and discharge ports by means of steam or fluid as applied respectively to a rotary engine or pump as hereinafter more fully described also the combination and arrangement of the revolving shaft with the stationary cylinder and valves as hereinafter more fully described.

In the accompanying drawings my invention is represented as follows:

Figure 1, is a sectional elevation of the pump. Fig. 2, is a longitudinal section. Figs. 3, 4, 5, 6, and 7, represent parts of modification of engine with a plain flat valve and packing box to suit the size and shape of valve as shown; but with the same annular packing to revolving shaft as in Figs. 1 and 2.

A, is the outside casing of cylinders fitted with stuffing boxes and glands G, H.

B, B, are plates forming the sides of cylinders into which are turned the annular packing cavities *e, e*. The packing rings *e''*, are turned a "shade" larger than the outside diameter of the groove *e*; cut and forced in. The inside rings *e''' e'''* are turned a little smaller in their inside diameter than the small diameter of the packing groove, after which they are cut and forced in in the usual way. The ring *e'* is turned the width of the groove and not cut. It is used merely to cover and break the joint of the rings *e''*, *e'''*, and also to receive the pressure of steam or water, in the application of the device to steam engine and pump respectively. The pressure is used to force the packing rings *e''* and *e'''* against the side faces of the revolving shaft making a tight joint thereby preventing any escape of steam

or water from the cylinder to the outside. The pressure is communicated through the pipes *s, s*, in the case of a steam engine from the receiving side and of a pump from the discharge side or in other words in either case where the pressure is equal to the greatest pressure in the cylinder at any time.

C, is the revolving shaft the faces of which are ground and made steam tight as above described by the rings *e'' e'''*. The drawing of the revolving shaft in all figures represents its application to a pump; J being the suction and K, the discharge port.

D, is the piston bolted at *g, g*, to the shaft. The piston packing is formed according to the mode of constructing piston rings for the ordinary round piston. The outside pieces are all cut on each side each joint or cutting closing a plane surface on the next piece. The whole is forced out against the faces of the casing or cylinder by the inside pieces impelled by steel springs (in a steam engine, or gum elastic for a pump).

E, E, are the valves fitted into the grooves *d, d*, and forming a face or joint on the sides of said grooves and on the face *E''*, of the outside casing by the aid of the discharging water or receiving steam and also making a joint by contact with the revolving shaft when down or closed. The valves in the arrangement shown in Figs. 3, 4, 5, 6, 7, are packed at the sides with metallic packing strips and pressure of water or steam or their equivalent as shown in Fig. 7. In the arrangement Figs. 1 and 2, it is not necessary as the valves face on the sides of the grooves and outside casing.

E' Figs. 1 and 2 is a round valve stem connected to the yoke I and straps or links I'. The valves receive their motion from the cams F, fixed to the revolving shaft as shown in connection with the studs *o*, on the ends of the side links as shown. The valves are raised and lowered alternately so as to obtain a uniform suction and discharge.

I claim as new and of my invention herein,

1. The arrangement of the rings *e' e'' e'''* operating in the described combination with the pipes *s s* to pack the revolving shaft C in its connection with the stationary cylinder

der A by the use of steam or water pressure as explained.

2. The combination and arrangement of the revolving shaft C, containing the receiving and discharge ports J, K; with the stationary cylinder A, B, and valves E, E, substantially as described.

In testimony of which invention, I hereto set my hand.

DEXTER D. HARDY.

Witnesses:

GEO. H. KNIGHT,
FRANCIS MILLWARD.