

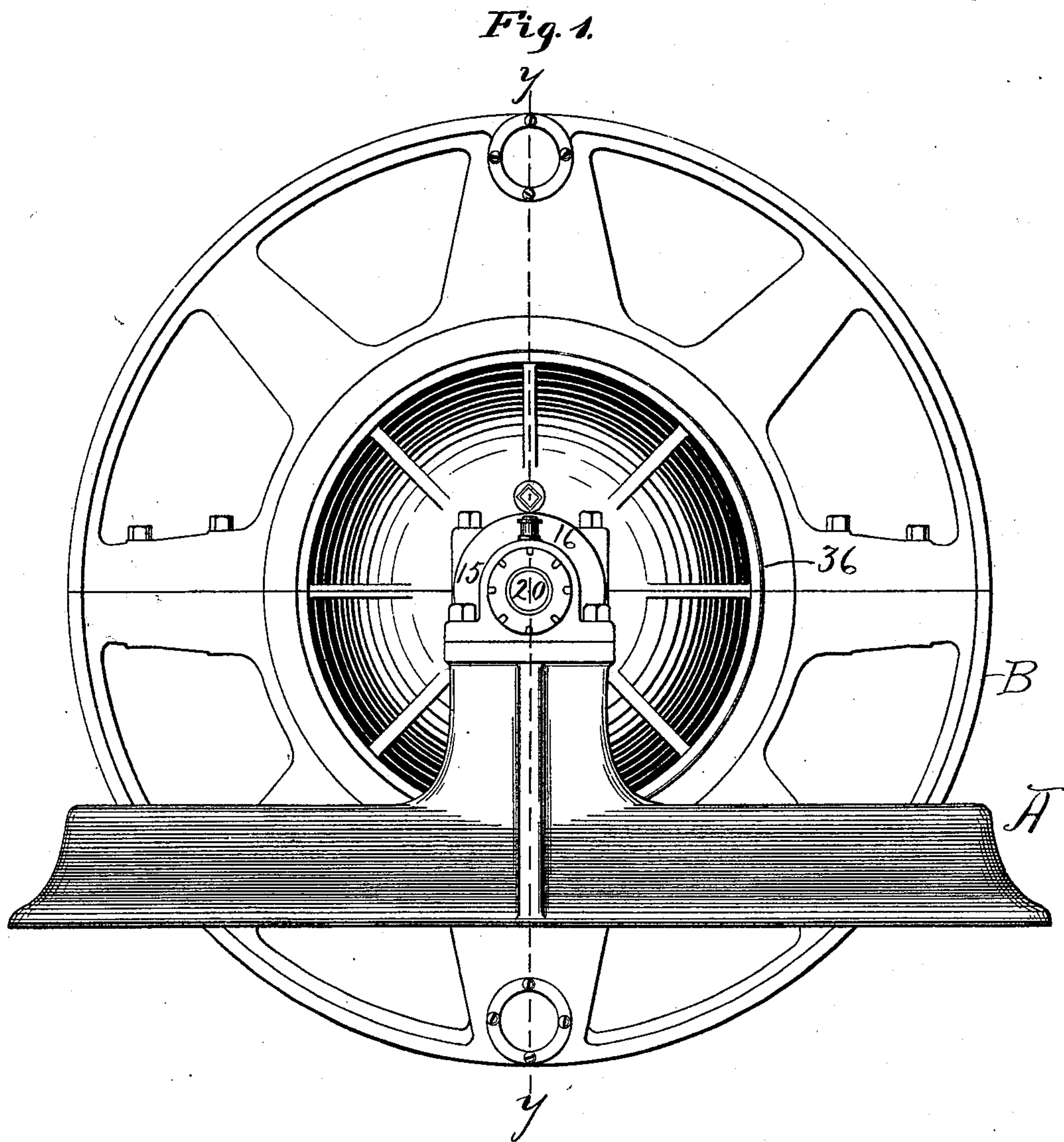
(No Model.)

9 Sheets—Sheet 1.

J. T. CASE.  
STEAM ENGINE.

No. 516,430.

Patented Mar. 13, 1894.



*Witnesses.*

*Edward M. Bush,*

*G. M. Stepek*

*Inventor.*

*Joel T. Case.*

*By James Spickard.*  
*Atty.*

(No Model.)

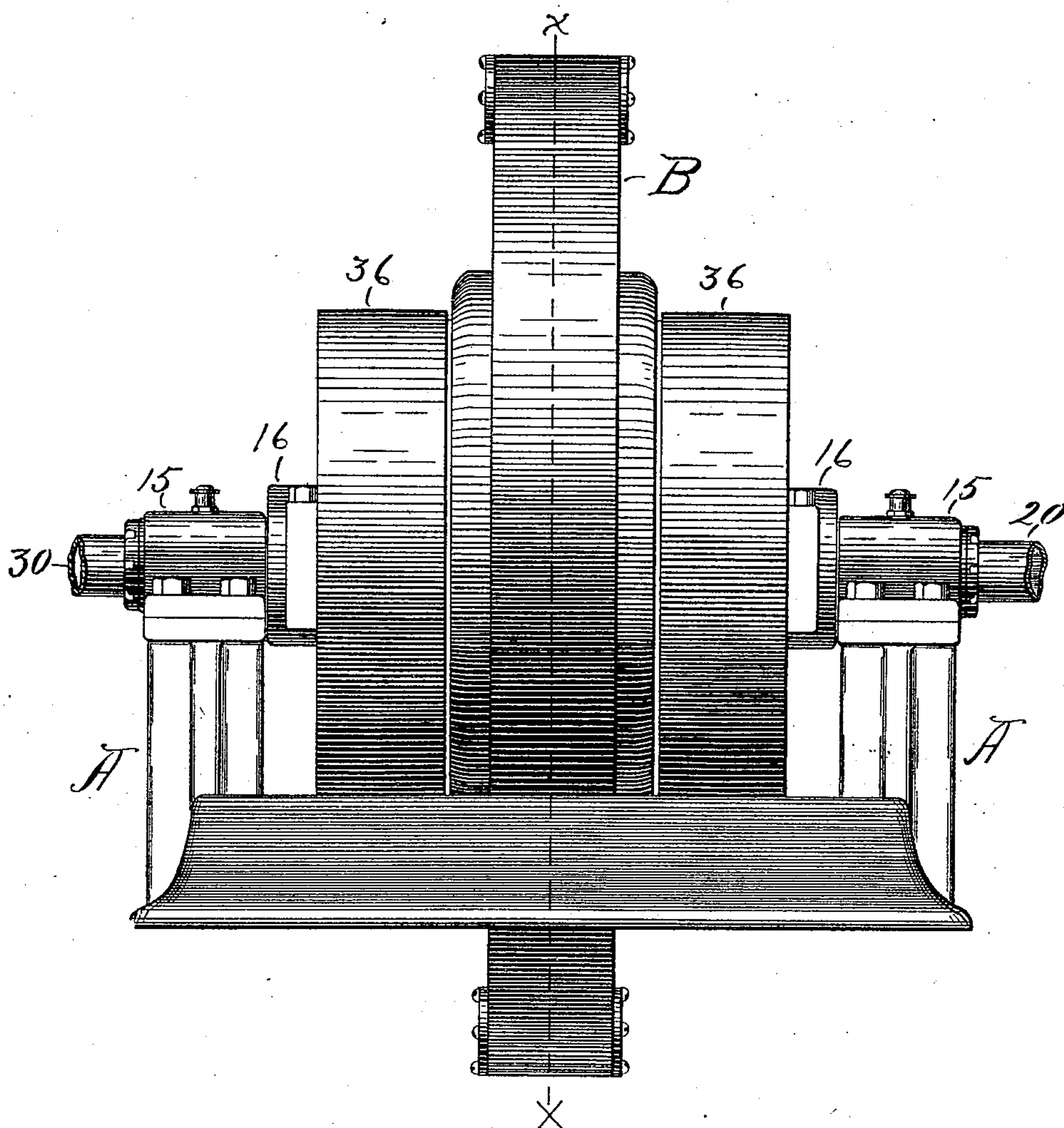
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*Fig. 2.*



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(No Model.)

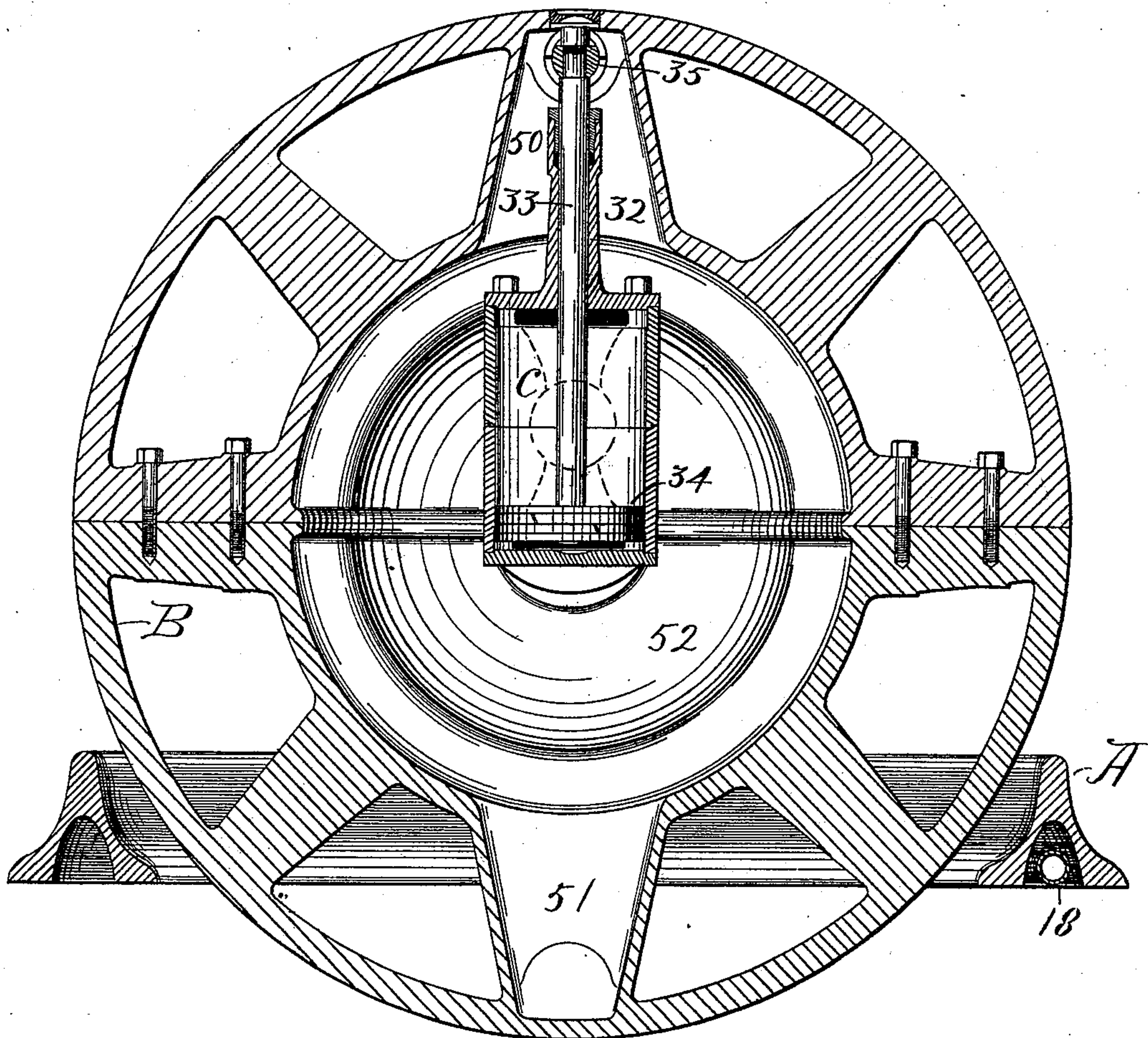
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*Fig. 3.*



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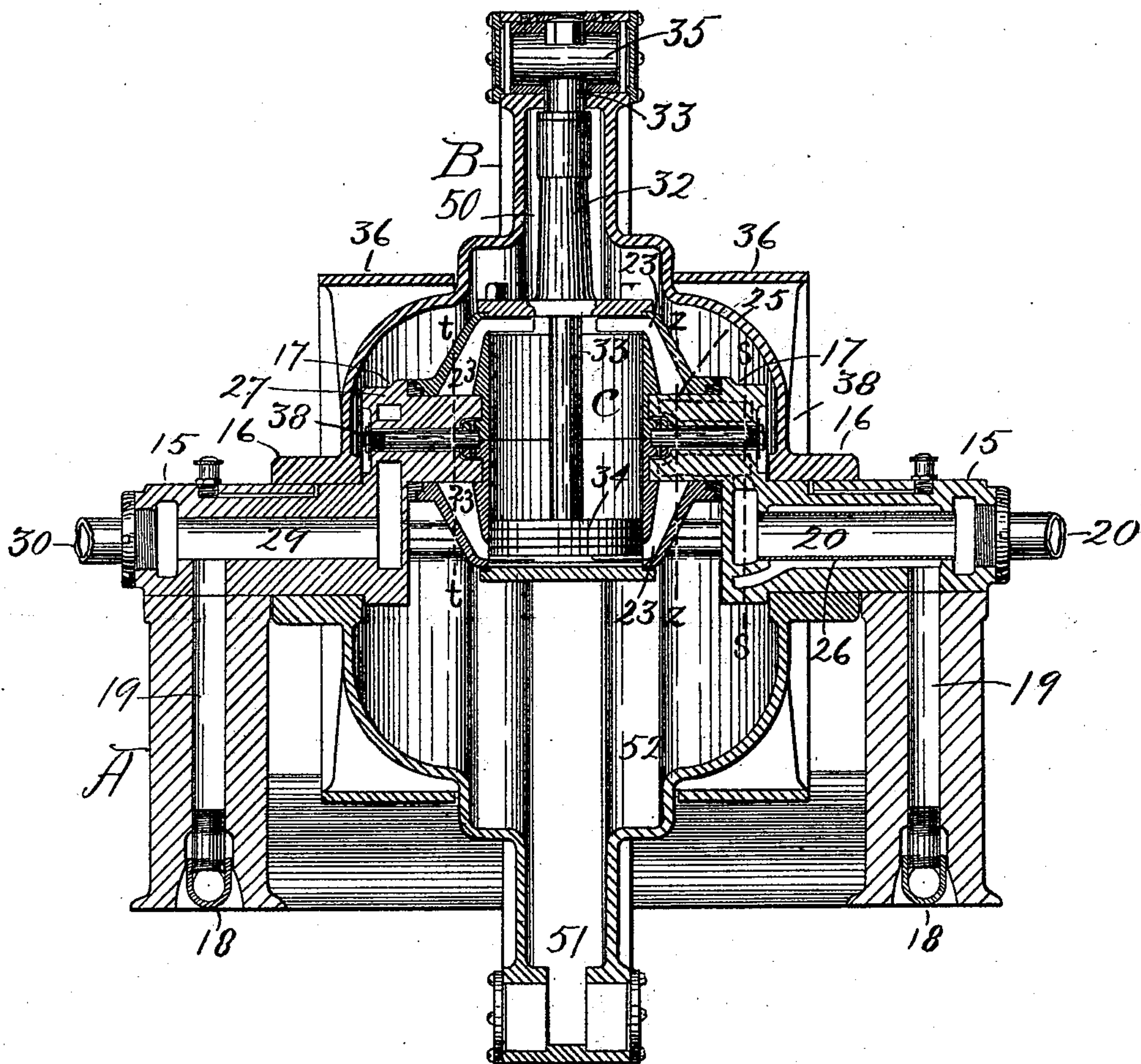
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*Fig. 4.*



Witnesses.

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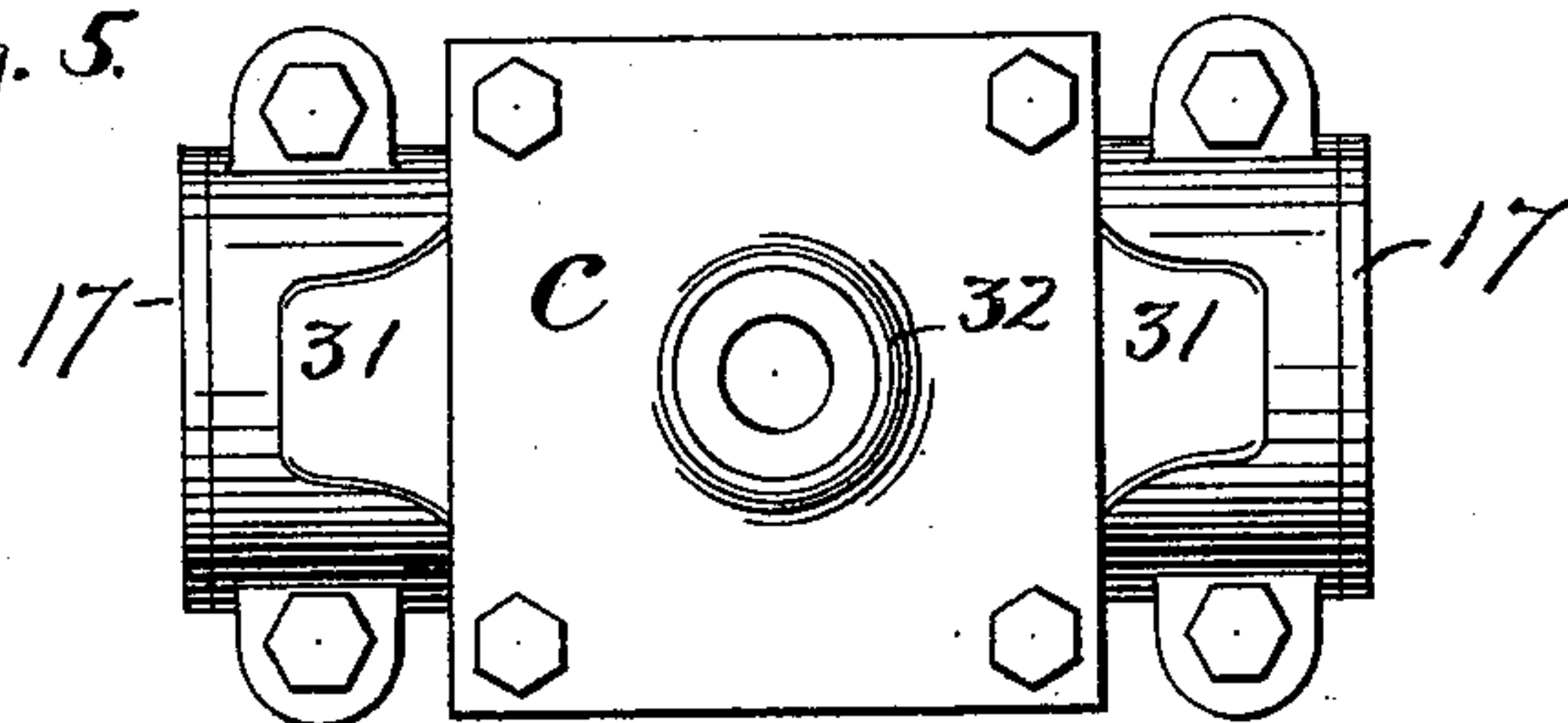
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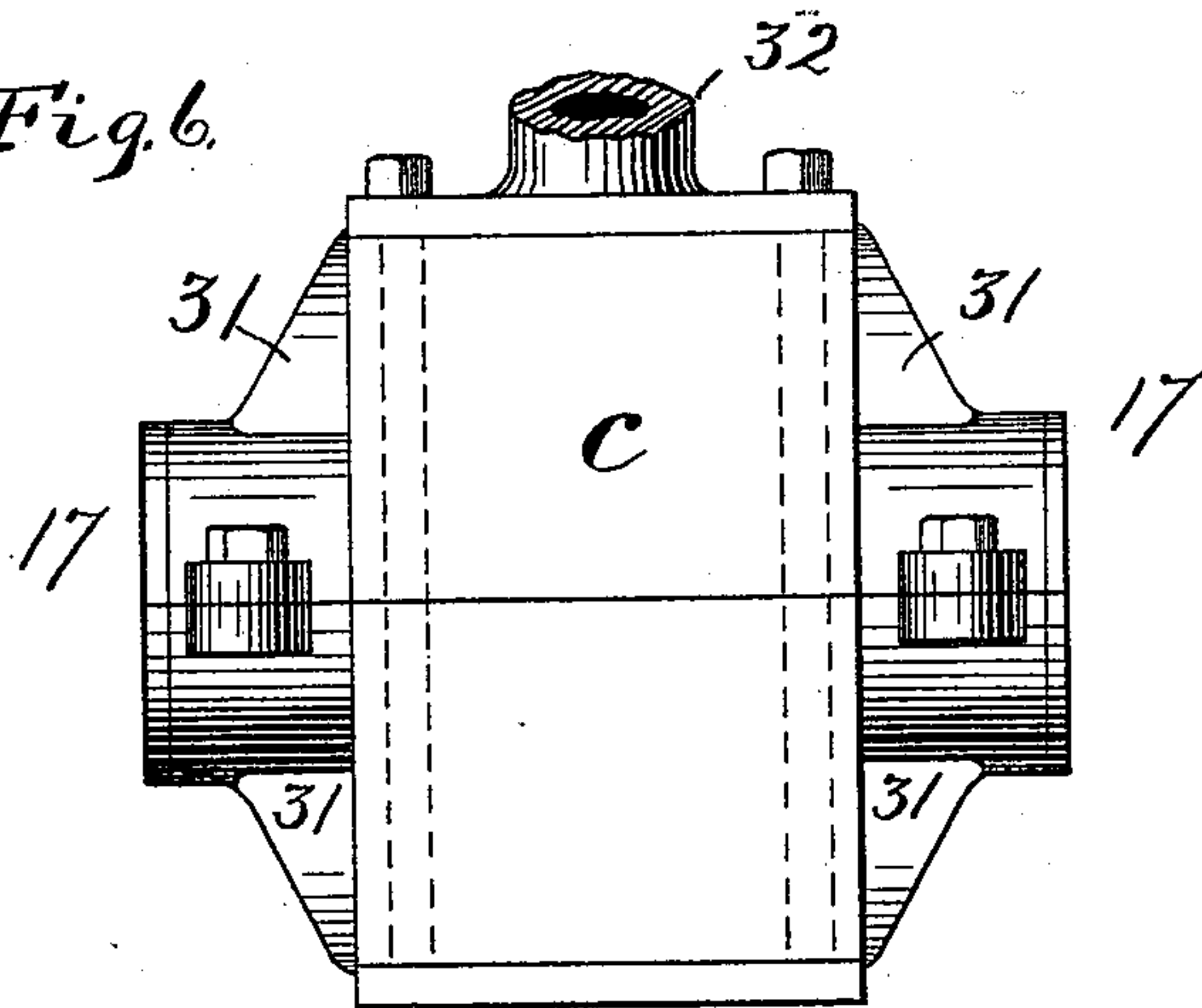
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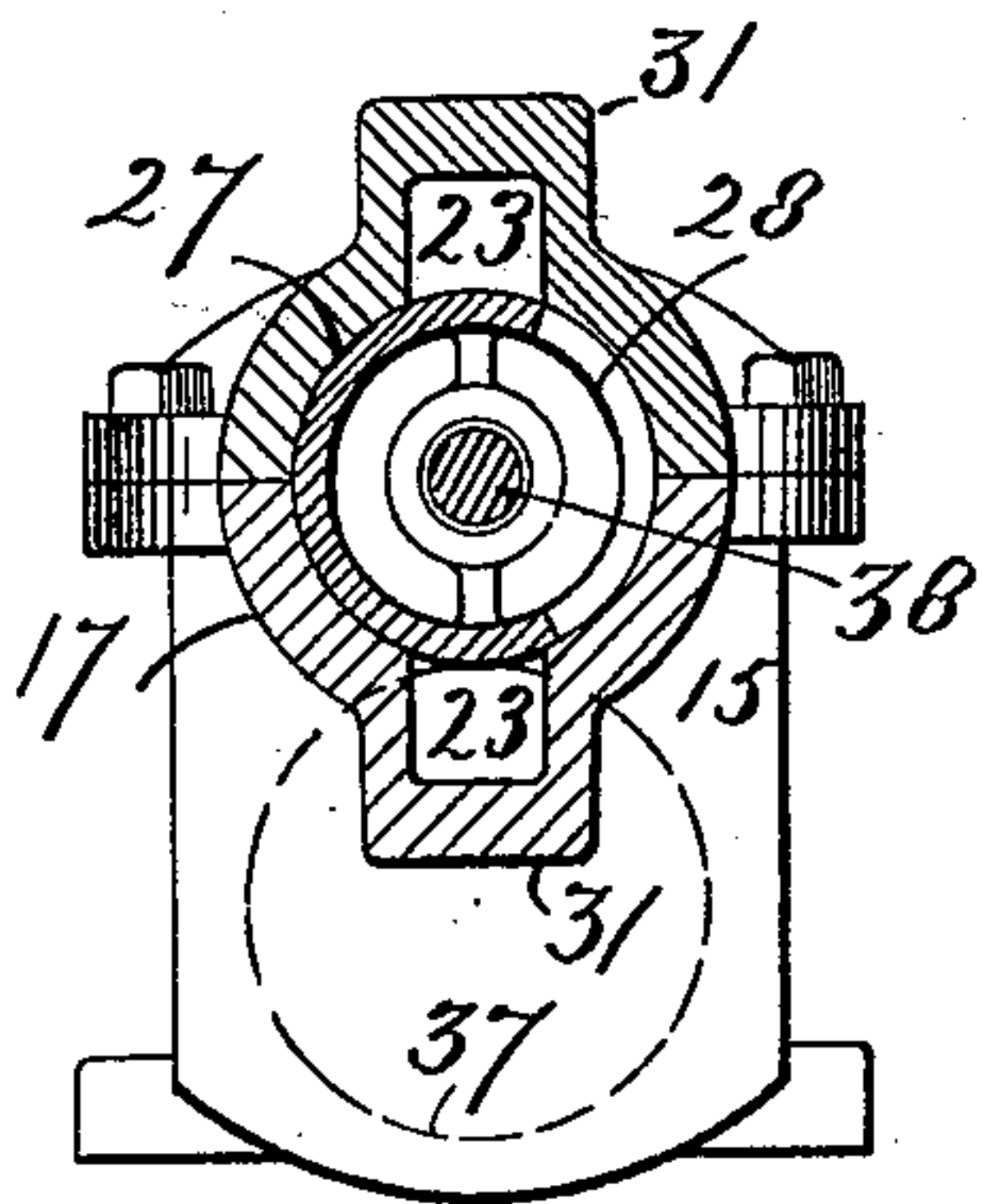
*Fig. 5.*



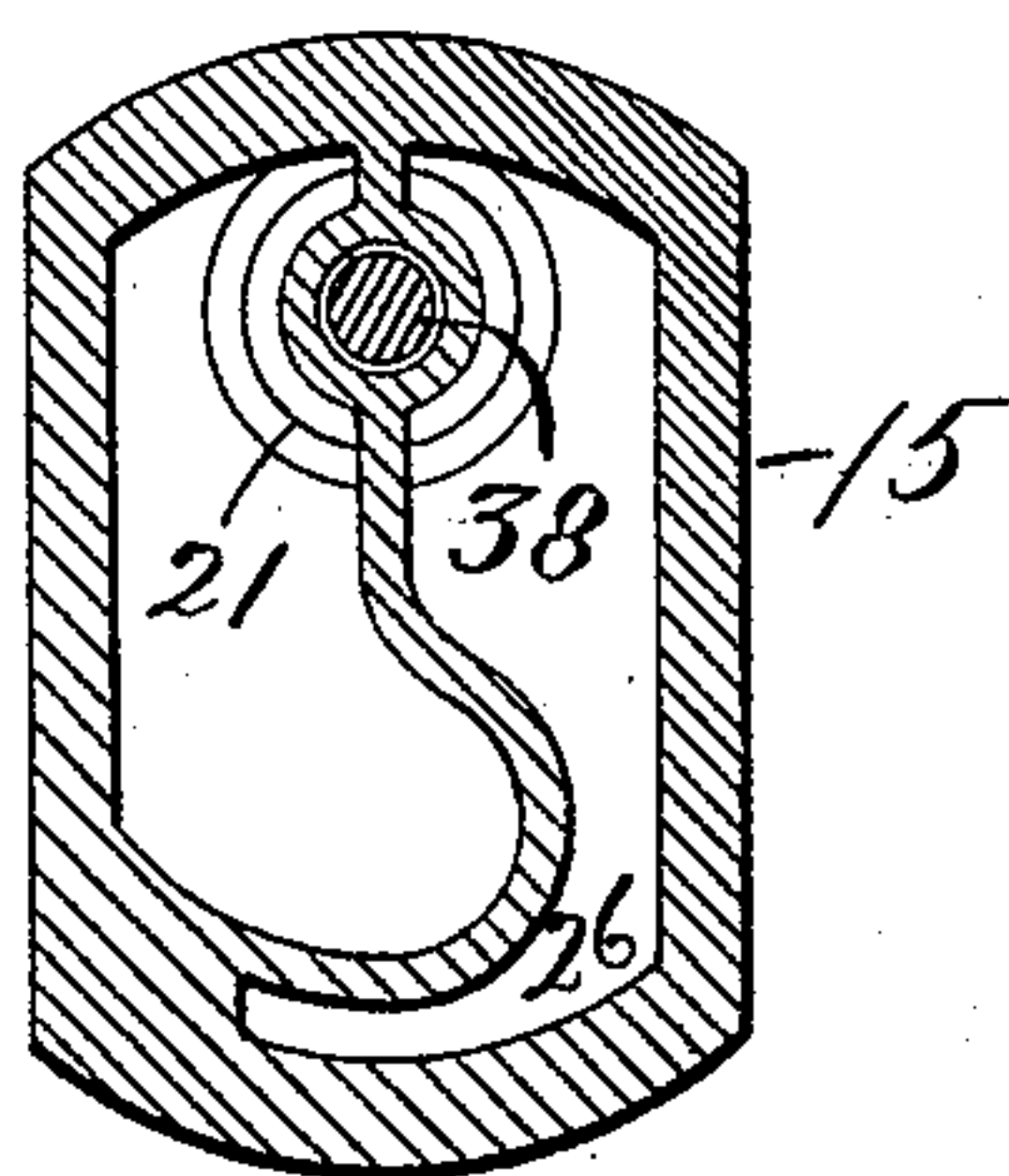
*Fig. 6.*



*Fig. 7.*



*Fig. 8.*



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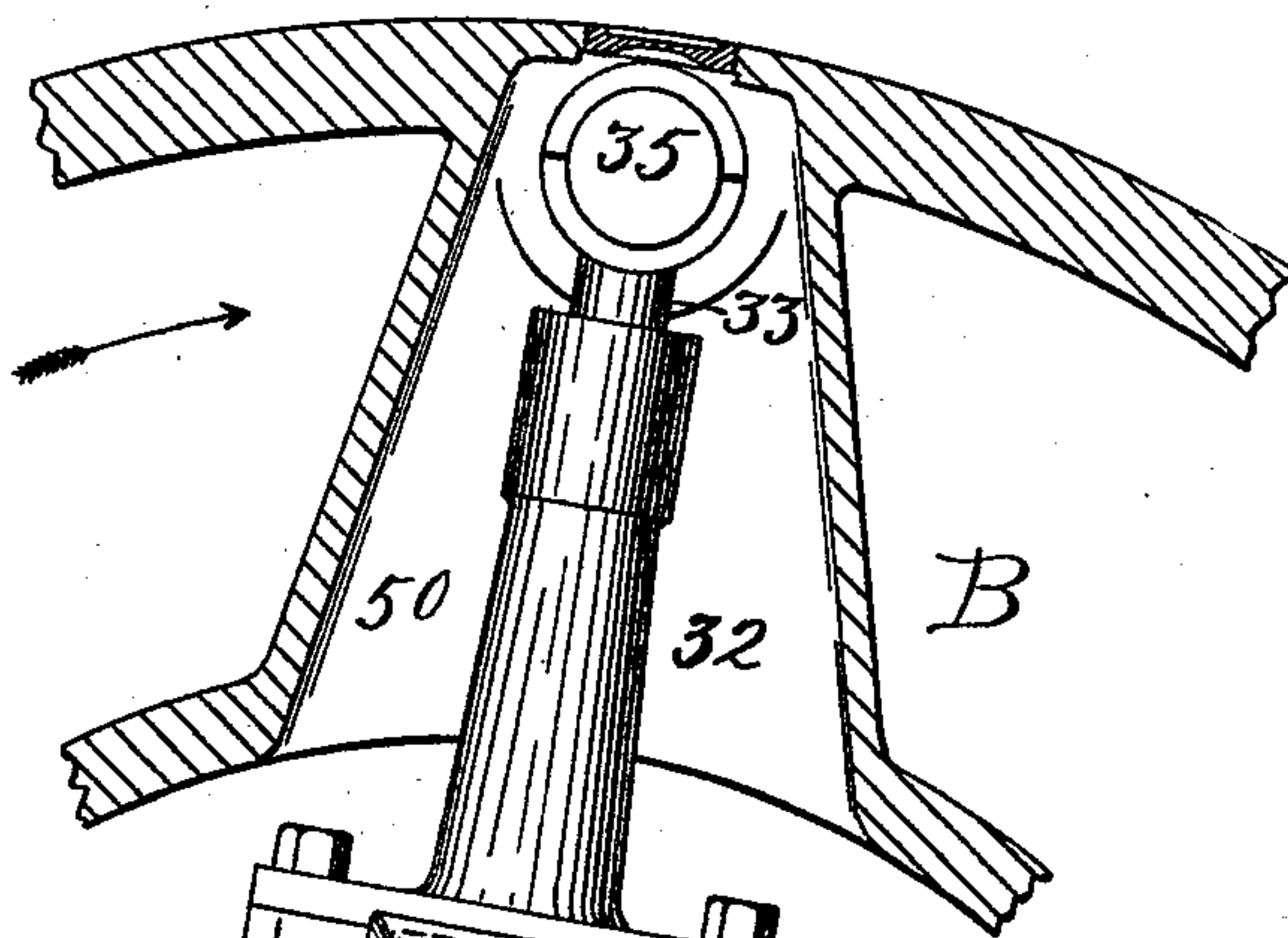
*By James Shepard*  
*Att'y.*

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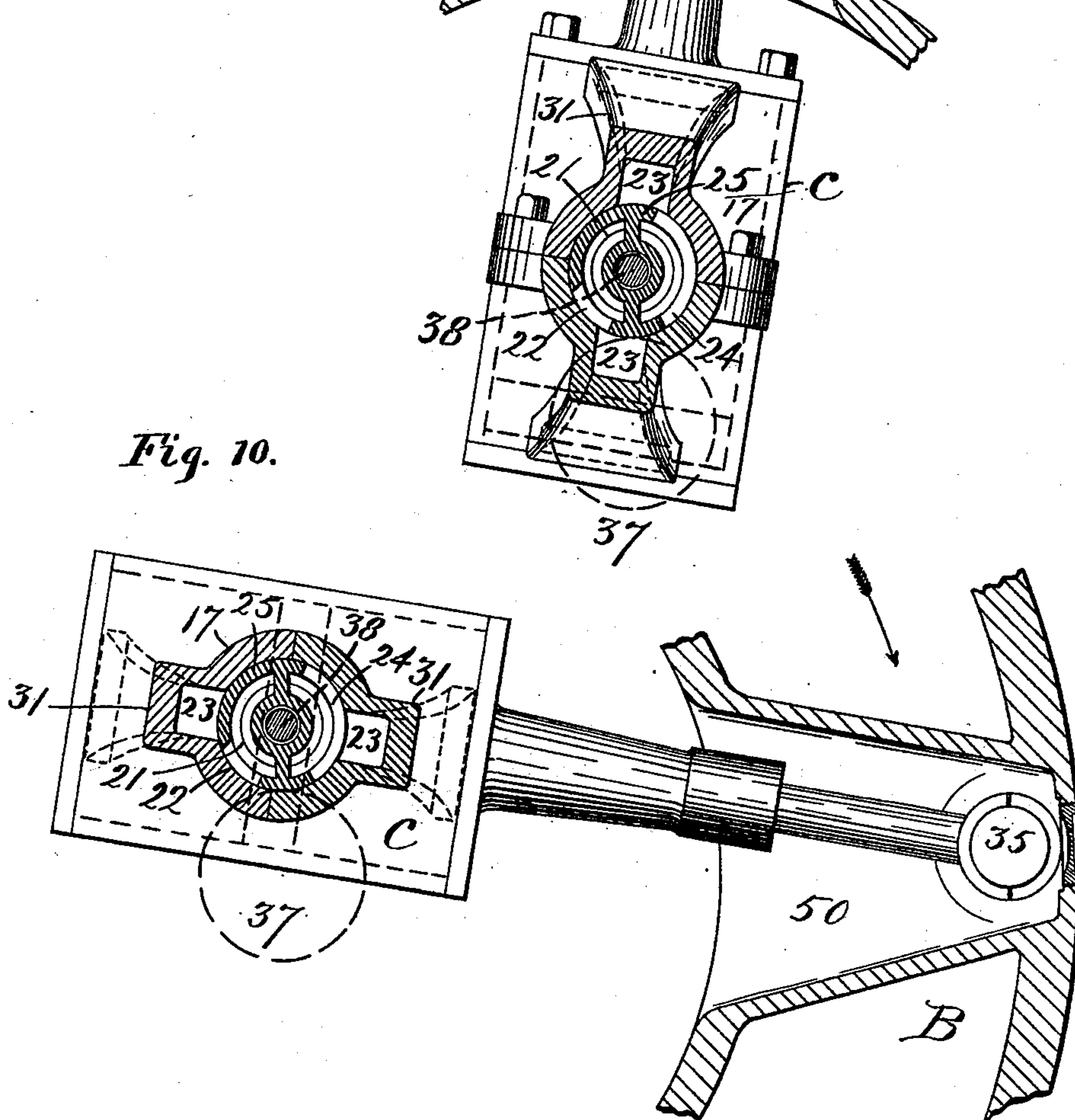
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*Fig. 9.*



*Fig. 10.*



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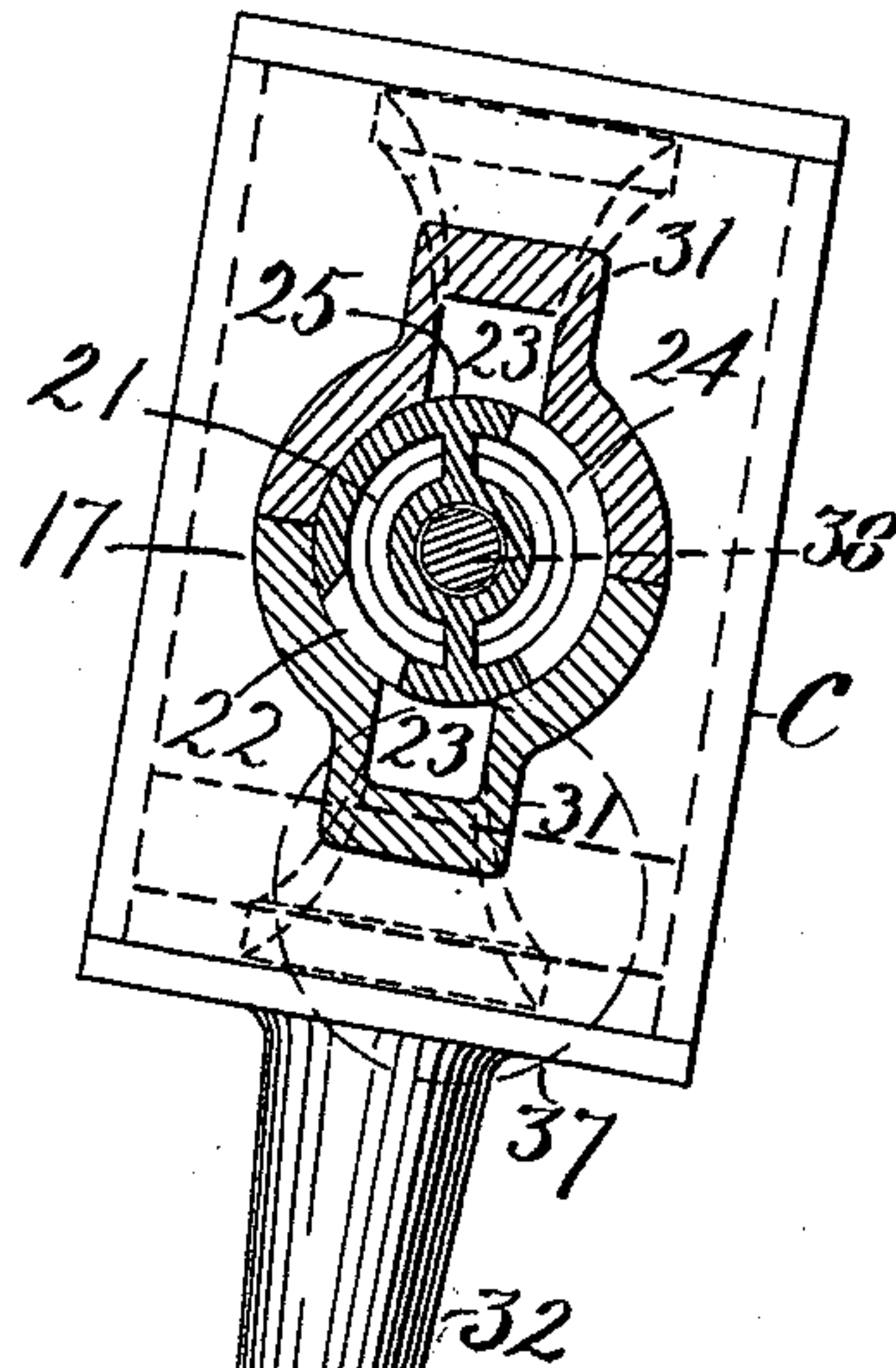
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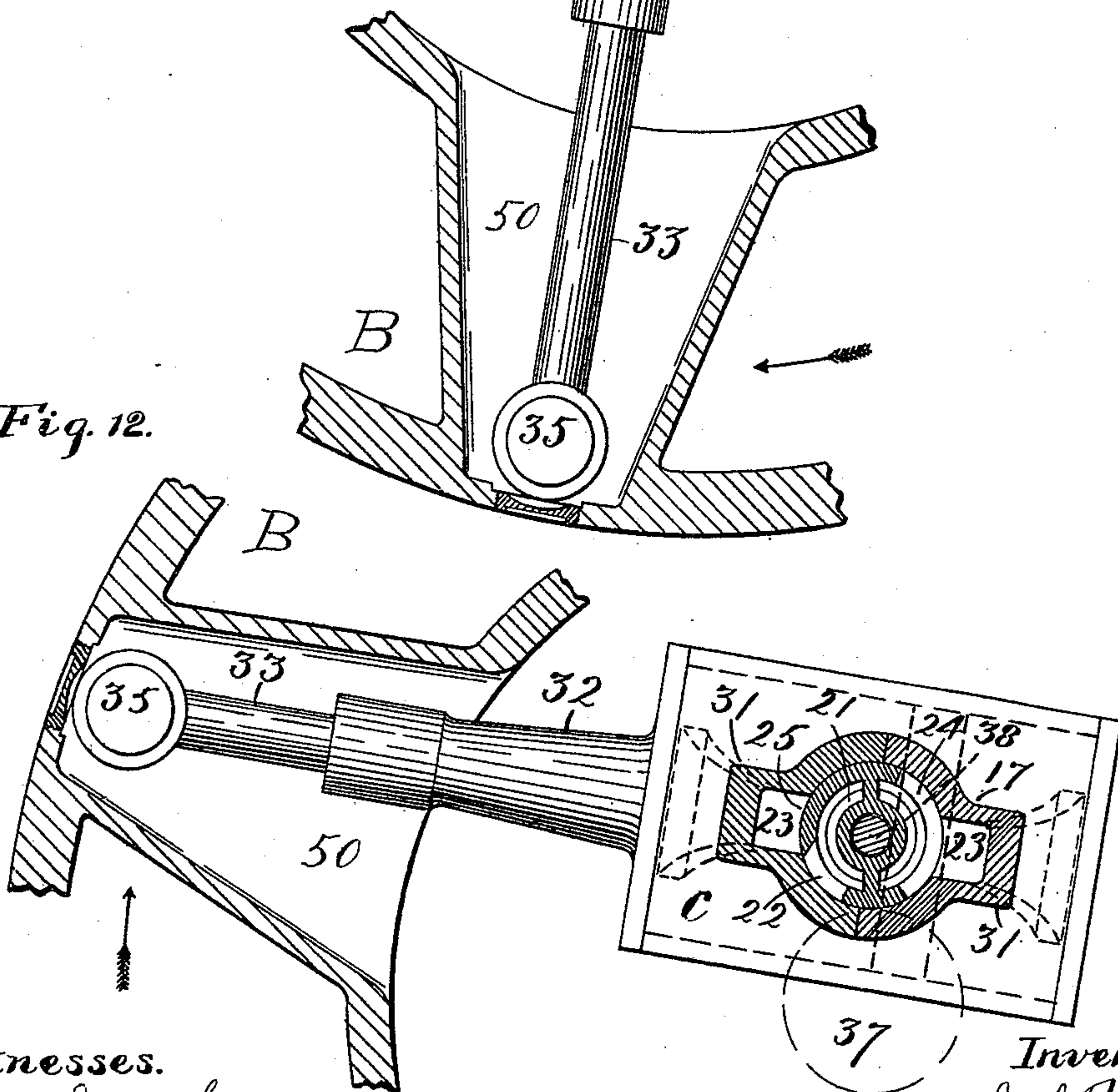
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*Fig. 11.*



*Fig. 12.*



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(No Model.)

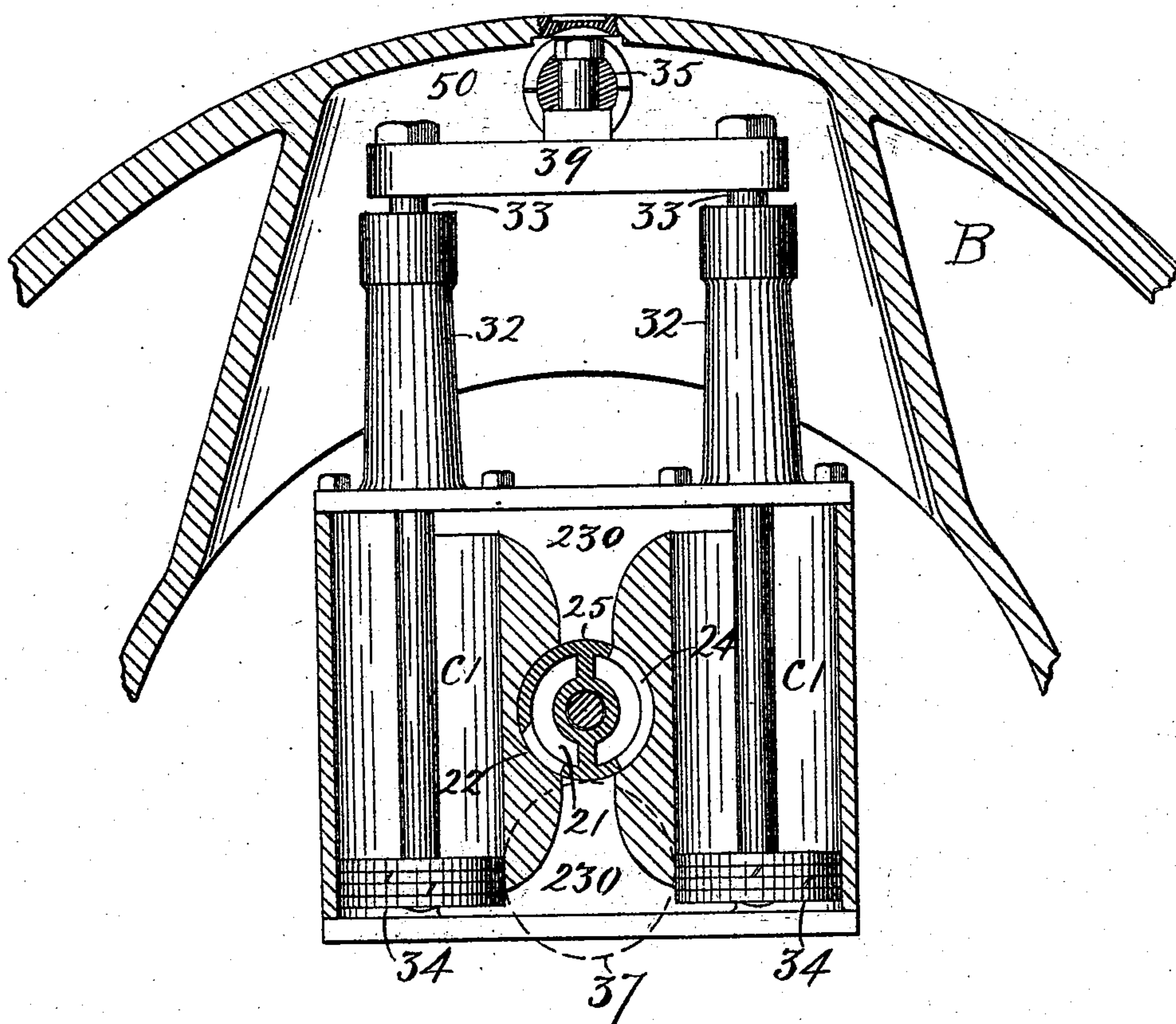
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*Fig. 13.*



Witnesses,

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(No Model.)

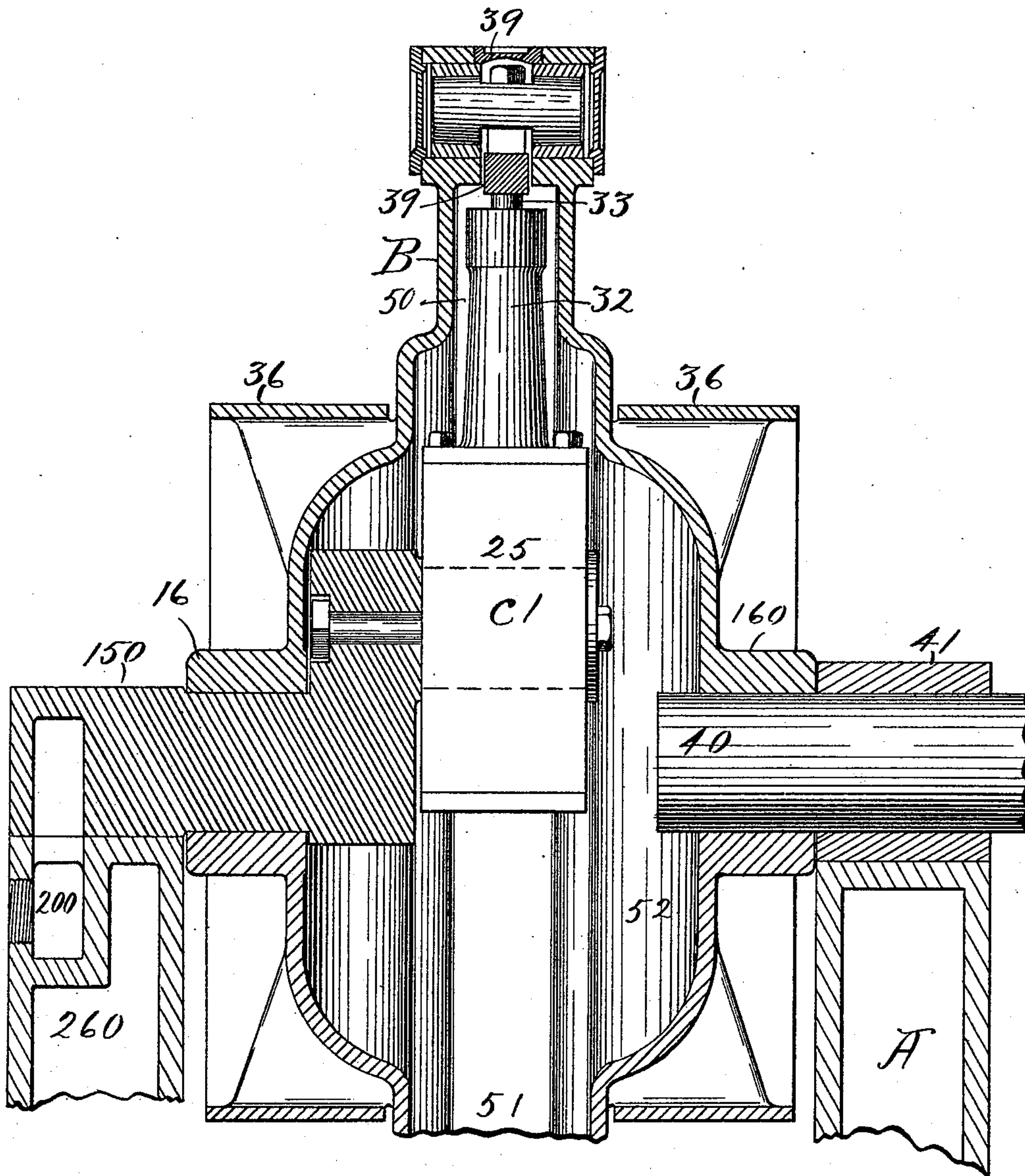
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*Fig. 14.*



*Witnesses.*

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# UNITED STATES PATENT OFFICE.

JOEL T. CASE, OF BRISTOL, CONNECTICUT.

## STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 516,430, dated March 13, 1894.

Application filed April 27, 1893. Serial No. 472,037. (No model.)

*To all whom it may concern:*

Be it known that I, JOEL T. CASE, a citizen of the United States, residing at Bristol, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

My invention relates to improvements in steam engines, and the chief objects of my improvement are to avoid vibrations, to facilitate lubrication and to inclose the engine proper within a case that serves as a fly and driving wheel.

In the accompanying drawings: Figure 1 is a side elevation of my engine. Fig. 2 is a front elevation of the same. Fig. 3 is a vertical section on the line  $xx$  of Fig. 2 some of the parts being shown in elevation. Fig. 4 is a vertical section on the line  $yy$  of Fig. 1, some of the parts being shown in elevation. Fig. 5 is a detached plan view of the cylinder. Fig. 6 is a side elevation of the same. Fig. 7 is a vertical section on the line  $tt$  of Fig. 4. Fig. 8 is a vertical section on the line  $ss$  of Fig. 4. Fig. 9 is a vertical section on the line  $zz$  of Fig. 4, together with a section of a portion of the fly wheel on the line  $xx$  of Fig. 2. Figs. 10, 11 and 12 are corresponding views of the principal parts, illustrating different points in their revolution. Fig. 13 is a vertical section illustrating a modification of my improvement, the plane of section corresponding with the line  $xx$  of Fig. 2, and Fig. 14 is a vertical section of the same on a plane at right angles to the plane of section in Fig. 13, the cylinder being shown in elevation. Figs. 5 to 14 are on an enlarged scale as compared with the preceding figures.

A designates the frame upon the uprights of which are mounted the trunnion brackets 15 which project inwardly toward each other, and the lower portion of which serves as a shaft like stationary outer bearing for the hub 16 of the fly wheel B to revolve on, while the portion 27 on the left side and 25 on the right hand side serve as bearings for the hollow trunnions 17 of the cylinder C to revolve on. The bed of the frame A is left hollow on the under side, and a pipe 18 is placed in this hollow to extend from the passage 19 in the upright of the frame upon one side to the like passage in the upright of

the frame on the opposite side, as best shown in Figs. 3 and 4. The trunnion brackets 15 are hollow and connected with said passages 19 and pipe 18, while the live steam pipe 20 extends through the chamber of the bracket 15 on the right hand side to the live steam passage 21 through the inner bearing 25 of the bracket 15 to the port 22 which admits steam to the passages 23 of the cylinder. The exhaust port 24 communicates with the passage in the other side of the inner bearing 25 of the bracket, and the annular passage 26 around the steam pipe 20 which communicates with the passage 19 and pipe 18. The inner bearing 27 of the left hand bracket 15 is provided with only an exhaust port 28, Fig. 7, and the passages through it both open into the horizontal passage 29, Fig. 4, in the outer bearing of said bracket which is connected with the exhaust pipe 30. The cylinder C is preferably made square in plan view and its bore or chamber may be either round or square in cross section as may be desired. The passages 23 leading from each end of the cylinder pass through lateral projections or wings 31 to the interior of the trunnions 17, the cylinder being preferably made in halves and bolted together, as best shown in Figs. 5 and 6. The cap at the upper end of the cylinder is provided with an ordinary sleeve 32 for the piston rod 33, to the inner end of which is attached the piston 34, the position of said piston being shown by broken lines in Figs. 9, 10, 11 and 12. The outer end of the piston rod is secured to the rock shaft 35 near the periphery of the fly wheel B. This fly wheel is made in two parts and bolted together, as best shown in Figs. 1 and 3. It is in the form of a case and revolves upon stationary bearings to which its hubs 16 are fitted at the lower part of the brackets 15 and it wholly incloses the inner ends of the brackets and all of the moving parts of the engine. Upon each side I form pulleys 36, either or both of which may serve as driving wheels, or if desired, the largest central portion of the fly wheel may be used as the driver. The interior of the fly wheel or case may be supplied with a quantity of oil, and oil may also be fed into the steam as it passes to the engine. The steam entering at 20 passes to the port 22 in the



inner bearing 25 of the right hand bracket 15 and as the cylinder revolves upon said bearing, this port opens to one or the other of the passages 23 for the admission of steam. In Fig. 9, the parts are represented with this port opening into the lower passage 23 to admit steam to the lower end of the cylinder. At the same time the exhaust port 24 opens into the corresponding passage 23 at the opposite end of the cylinder to let the exhaust pass out down through the annular exhaust passage 26 and passage 19 to the pipe 18 on one side, half way around the bed and up through the passage 19 to the exhaust pipe 30 on the opposite side. The exhaust port 28 at the opposite end of the cylinder will also be open at the same time and let steam exhaust through the passage 29 to the exhaust pipe 30. The outer bearing of the bracket upon which the fly wheel revolves is indicated in several of the figures by the broken circle 37. When the outer end of the piston rod has been carried by the fly wheel B one quarter of a revolution from the position shown in Fig. 9 the parts will be in the position shown in Fig. 10 in which the live steam port 22 is closed by the solid portion of the cylinder trunnion 17 coming in front of it as shown, the exhaust port being still opened. The engine is now driven by the expansive force of the steam and when the outer end of the piston rod has traveled another one quarter of a revolution, the live steam port is again opened to admit steam into the opposite end of the cylinder and on the opposite side of the piston and the exhaust port communicates with the opposite end of the cylinder as shown in Fig. 11, while at the next one quarter of a revolution the live steam port is again closed as shown in Fig. 12. The lubricating material introduced into the live steam passage will not only lubricate the cylinder and piston, but it will also lubricate the cylinder trunnions and their bearings on both sides of the engine, while the oil inclosed within the fly wheel will lubricate the piston rod cross head pin, or rock shaft and at the same time will prevent oil from being thrown from the machine, keeping the supply confined within said wheel.

In assembling the parts, the brackets 15 may be first set in position and the two part cylinder placed in position thereon and secured together, after which the two part fly wheel or case is secured in position to inclose the other parts and the piston rod is secured to the rock shaft 35. If desired, the cylinder may be further secured upon its bearings by means of the pins 38 as best shown in Fig. 4. It should be noted that the pocket 50 in which the end of the piston is secured is balanced by a like pocket 51 on the other side of the fly wheel while the main part 52 of the chamber within said wheel is round, and therefore no matter how much water or combined water and oil may accumulate within the wheel it will not be thrown out of balance thereby. At the same time the pockets are small so

that but little oil or combined water and oil is required to fill them sufficiently to oil the wrist pin and piston rod. This also leaves only a small portion of the periphery of the larger central portion of the wheel B adjacent to the main chamber of the fly wheel so that said periphery is isolated therefrom sufficiently to keep it cool and in condition for use as a driving pulley for a belt. The pulleys 36 on each side are also isolated from the chamber of the wheel by space, so that they will not be heated too much for running a driving belt thereon. It should also be noted that the engine may be run in any position, that is to say, its bed may be secured to the floor, to the side wall, or to an overhead support and it will make no difference in the operation.

While I have shown and described an engine with a single cylinder, with its fly wheel revolving about a stationary shaft or bearing at each end, it is evident that I may employ a double cylinder and have a rotating shaft extend from one end of the fly wheel while the other end is supported as before described. Such a modification is shown in Figs. 13 and 14 in which I arrange two cylinders C' side by side with the inner bearing of a bracket 150 between said cylinders, which cylinders have the passages 230 and equivalent of the hollow trunnion in the connecting metal between said cylinders for fitting them to revolve on the inner bearing 25 of the bracket 150. The two piston rods of these cylinders are connected by a yoke 39 to the rock shaft 35 substantially the same as with the single piston rod. The ports in the part 25 are the same as before described and the passages on its two sides may be connected in any proper manner with the live steam passage 200 and exhaust passage 260, the operation being the same as before described, excepting that the steam is simultaneously admitted into two cylinders and the cylinders are supported on one bearing only, instead of two, consequently all of the exhaust is at one side instead of being partly on both sides. As in the construction before described the hub 16 of the fly wheel B revolves upon the outer bearing of the bracket 150, but the hub 160 in alignment therewith is rigidly connected to the revolving shaft 40 which turns in a suitable bearing 41 on the opposite upright of the frame A. It is evident that a double cylinder may be mounted on the inner bearings of a pair of brackets as in the construction first described, and also that the passages and ports on each side may if desired be like those on the right hand side in the construction first described or otherwise changed as circumstances may require. For example the inner bearings and hollow trunnion of the cylinder may be reversed in so far as their bore and projection are concerned, the bearings being made hollow and the cylinder trunnion cylindrical. By making the exhaust pass out through the annular passage that surrounds the steam inlet pipe



within the shaft like bearing of the fly wheel said bearing will not be heated so as to burn the lubricating material. By making both ends of the cylinder steam tight, the waters of condensation pass out of said cylinder with the exhaust so that the case or chamber which incloses said cylinder does not rapidly fill up with water as it would if the cylinder were left open at one end.

10 I claim as my invention—

1. In an engine of the class described, a bracket having a hollow cylinder bearing with a port in its periphery, a revolving cylinder having a hollow trunnion and passages leading from the opposite ends of said cylinder to the interior of said trunnions and then through the port in the periphery of the hollow cylinder bearing of said bracket to its interior substantially as described and for the purpose specified.

2. In an engine of the class described, a re-

volving cylinder having hollow trunnions on opposite sides and passages leading from the opposite ends of said cylinder to the bore of each of said hollow trunnions, cylindrical bearings upon which said hollow trunnions are mounted, one of which bearings is provided with an exhaust port only while the other one of said bearings is provided with both live steam and exhaust ports, substantially as described and for the purpose specified.

3. In an engine of the class described, a fly wheel in the form of a case having the main port or chamber 51 inclosing working parts, and pockets 50 and 51 on opposite sides thereof, one of which pockets contains the wrist pin and end of the piston rod, substantially as described and for the purpose specified.

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