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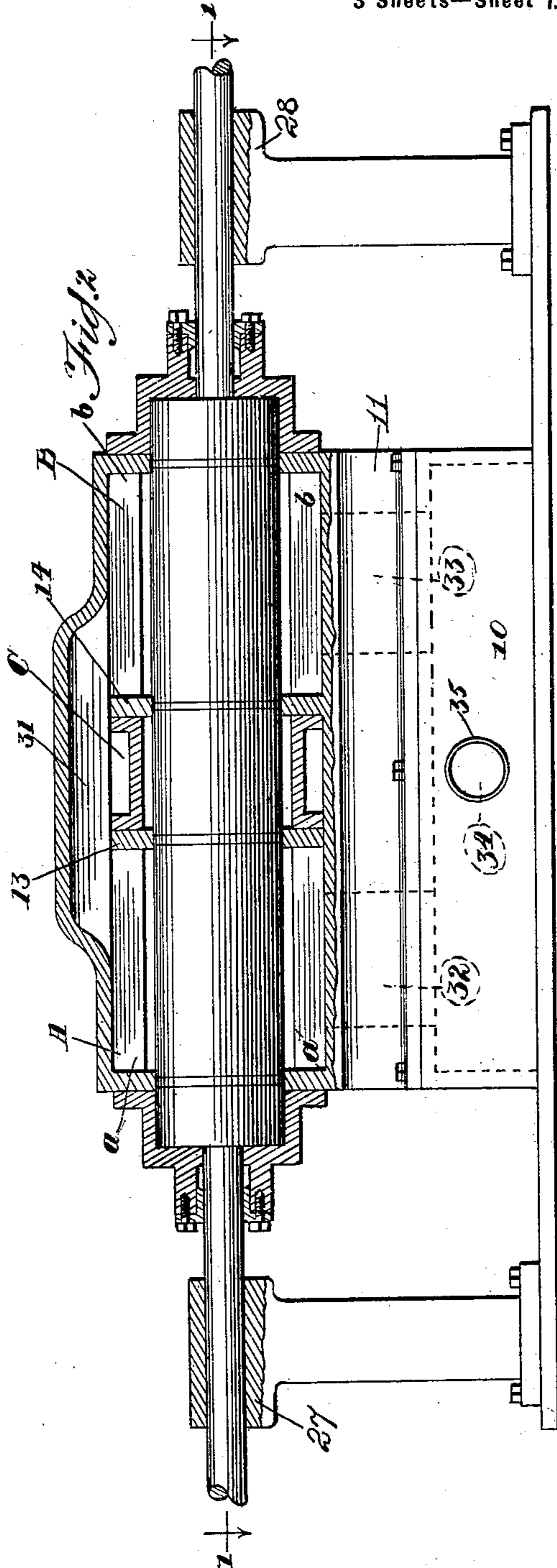
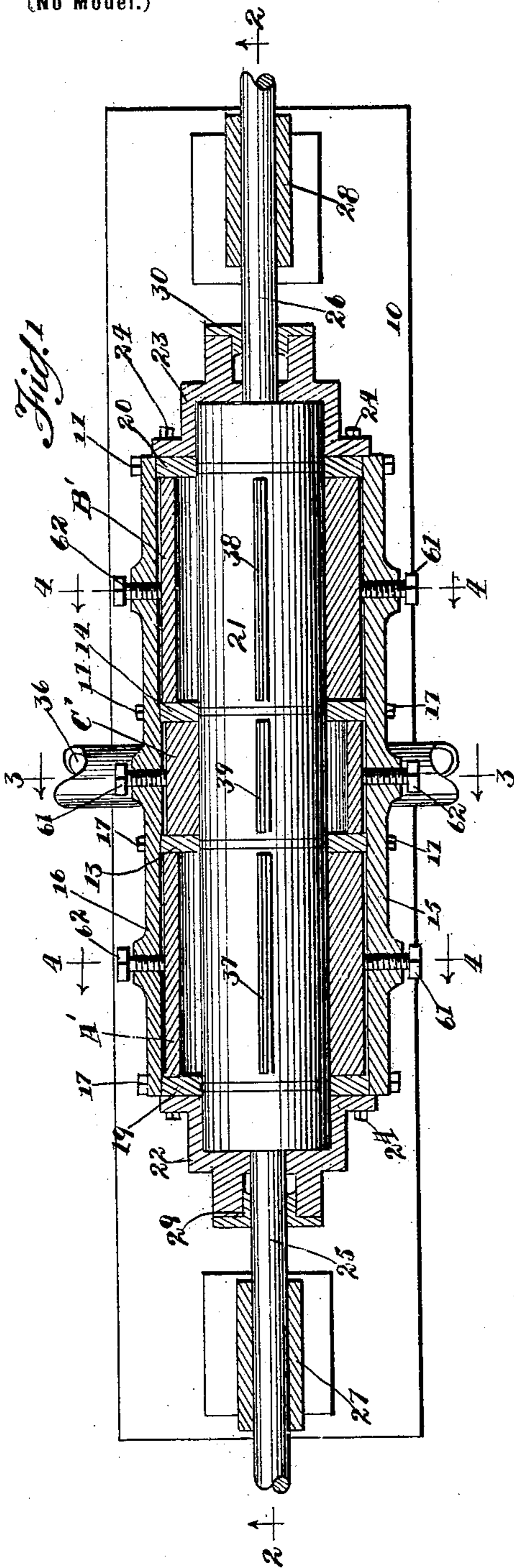
Patented Nov. 4, 1902.

M. J. HEWLETT.
ROTARY ENGINE.

(Application filed Mar. 10, 1902.)

(No Model.)

3 Sheets—Sheet 1.



Witnesses:
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Inventor.
Maddra J. Hewlett,
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his Attys.

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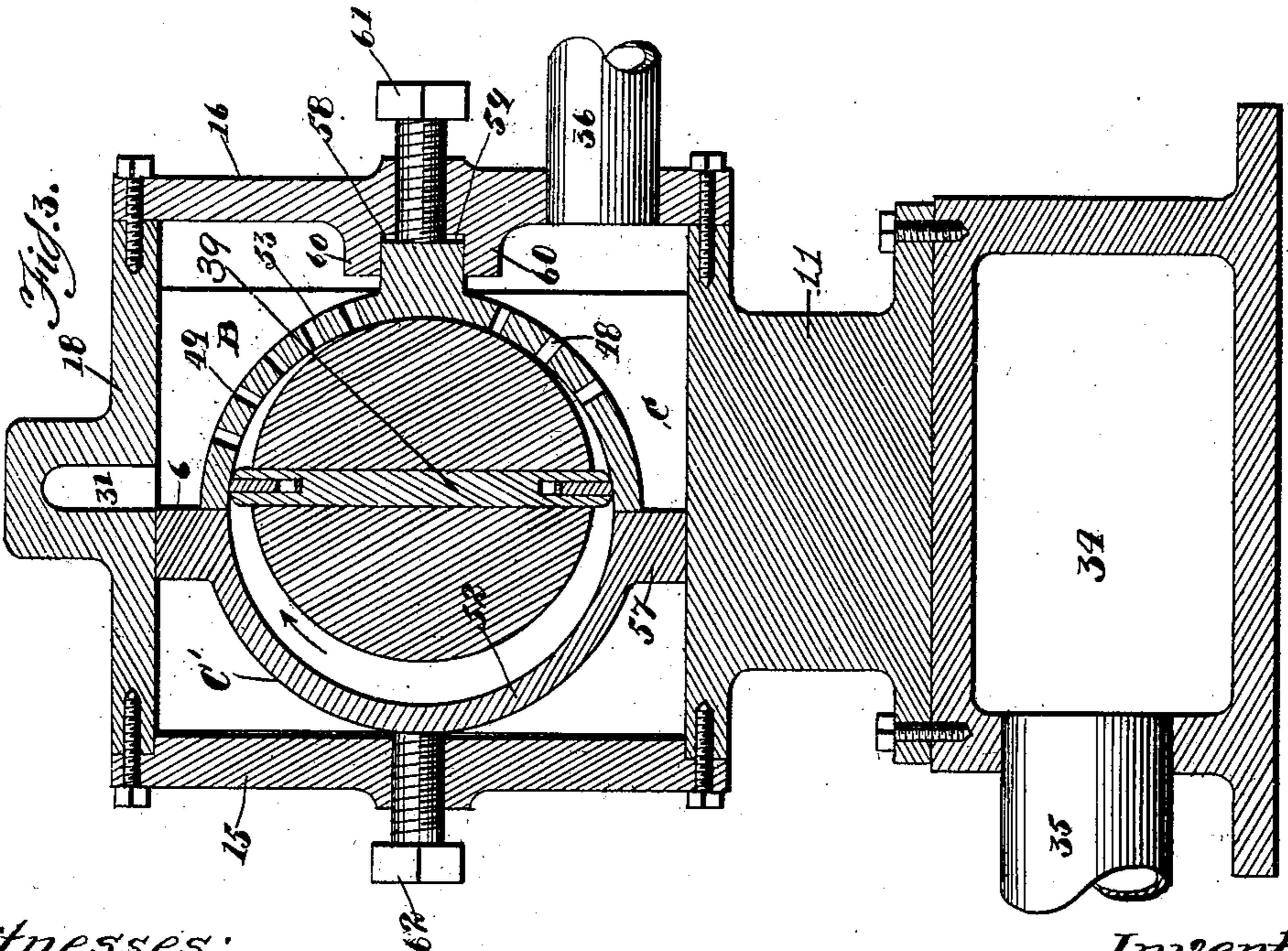
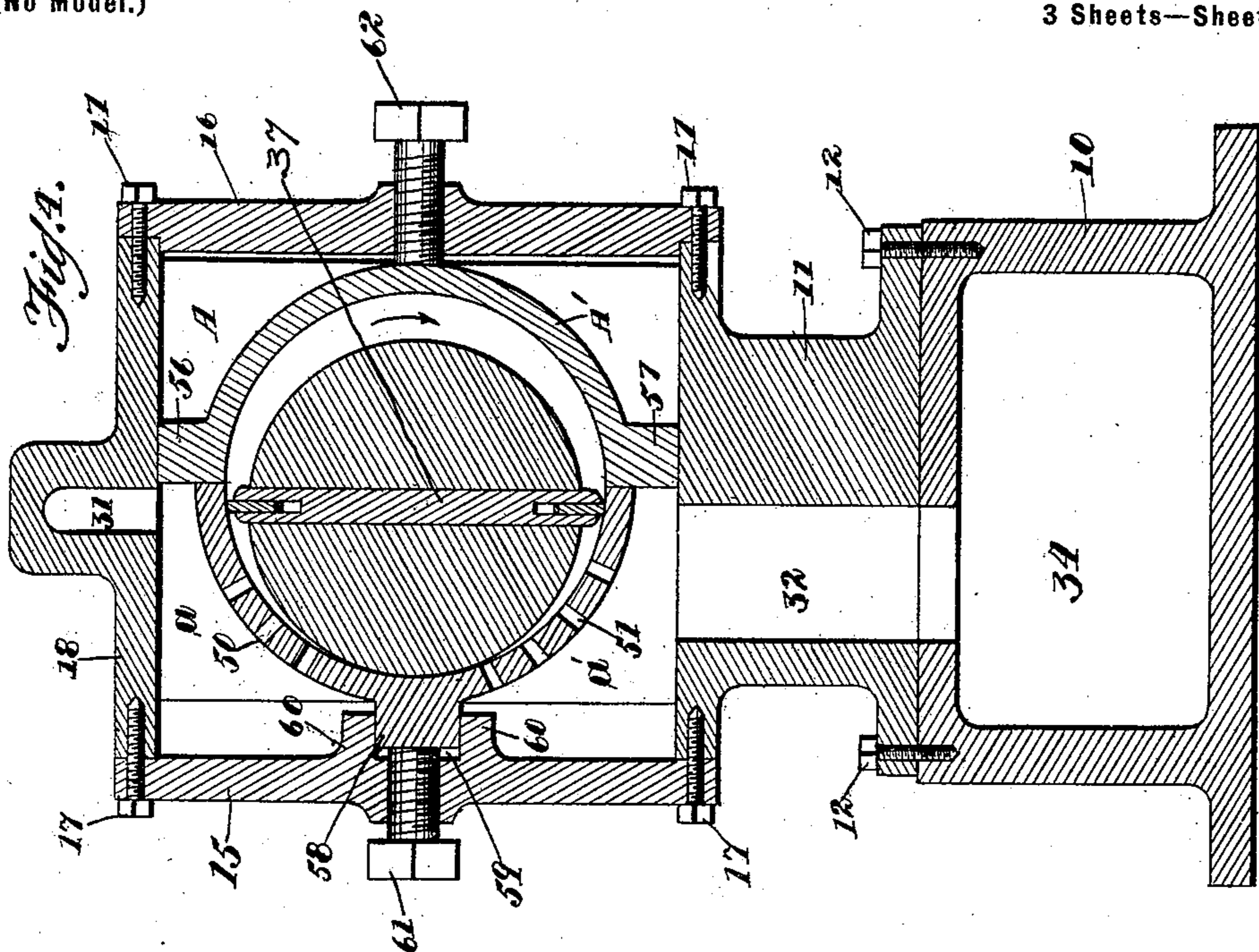
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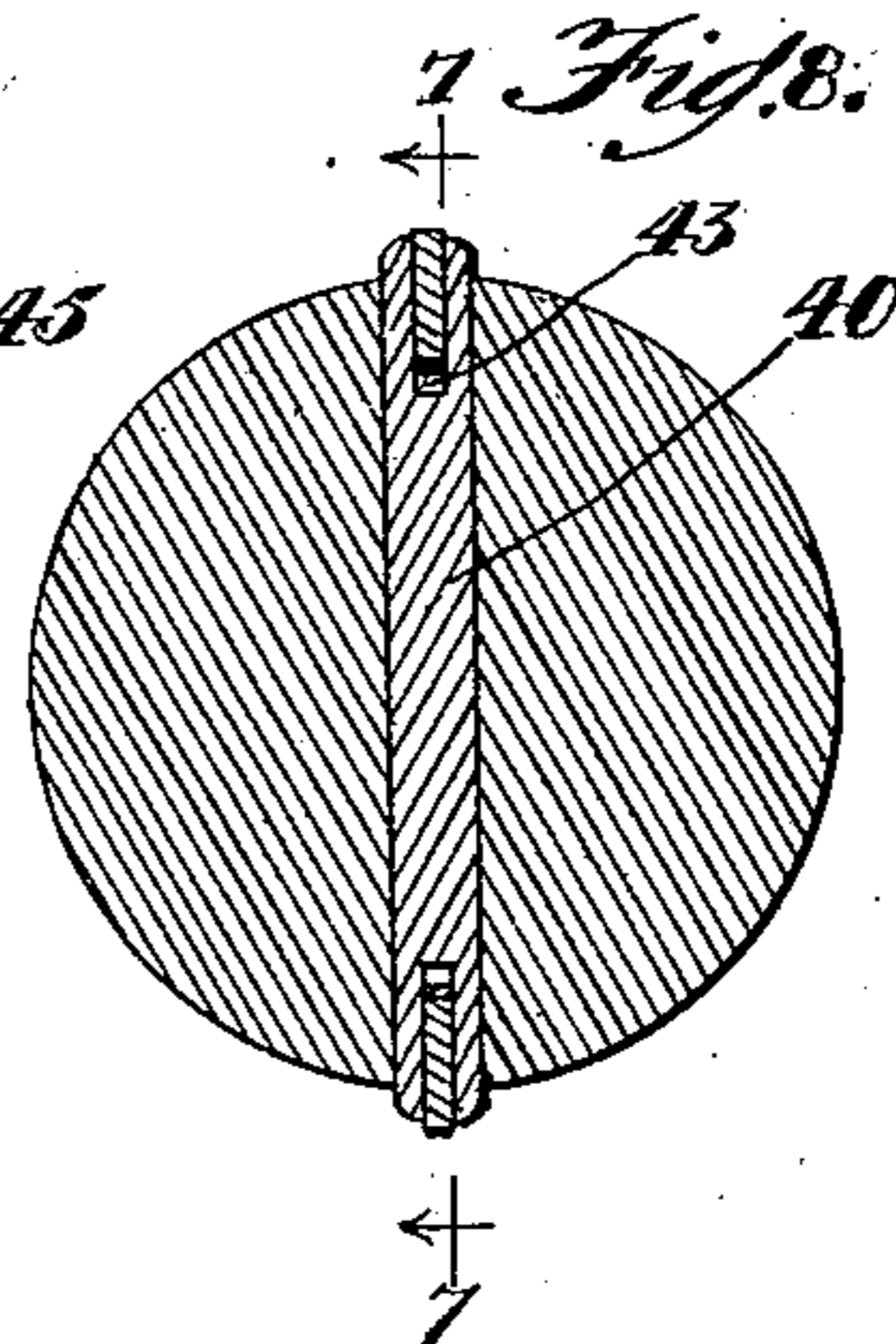
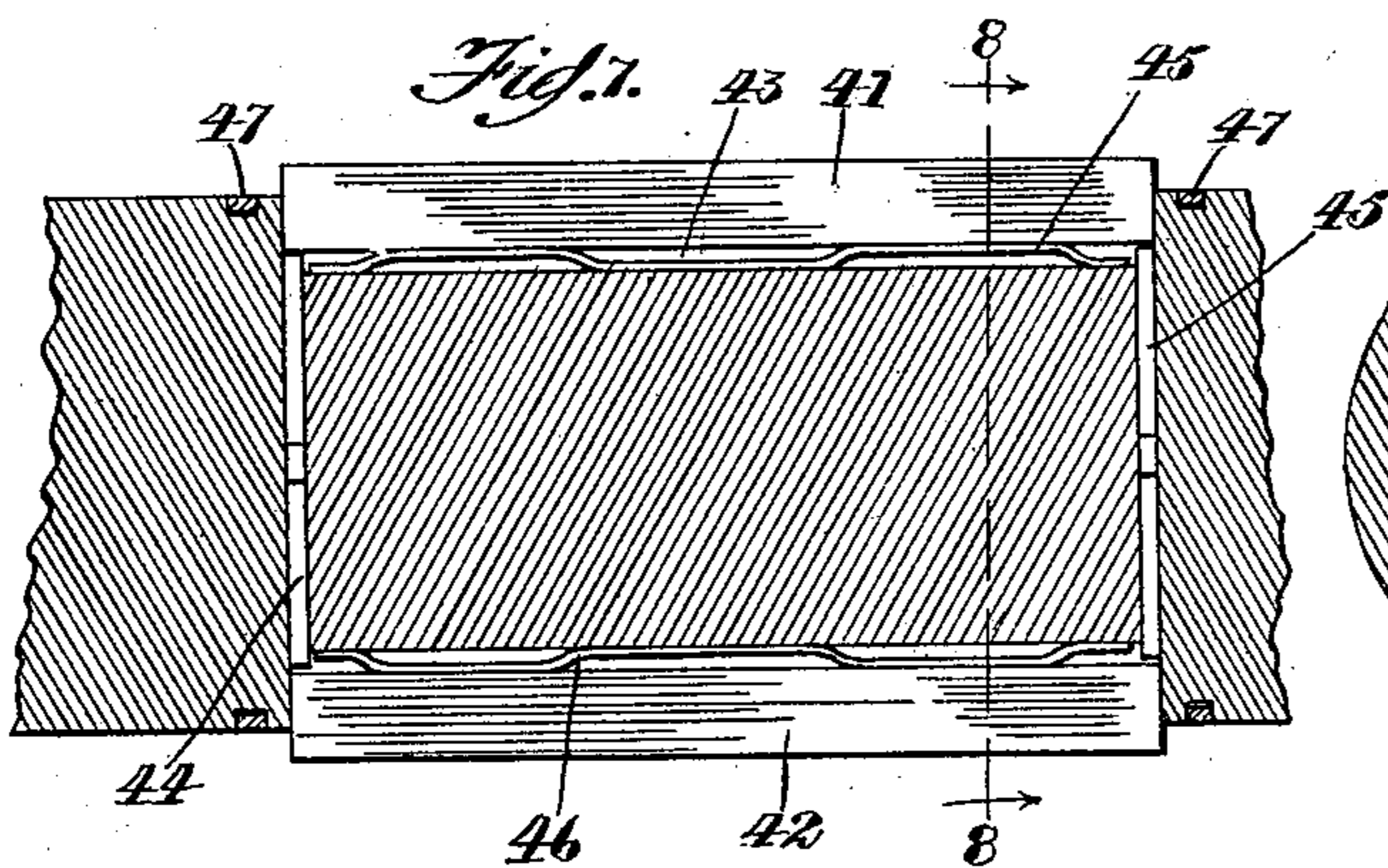
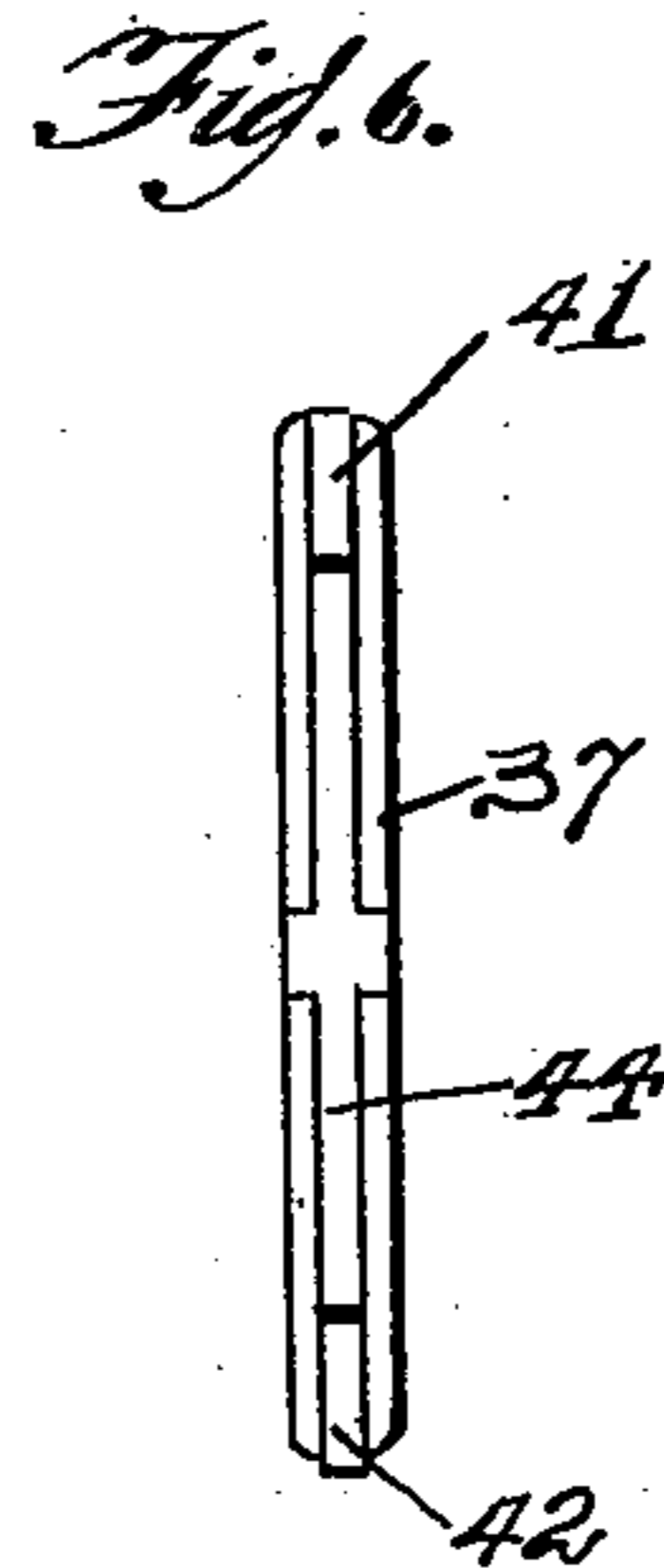
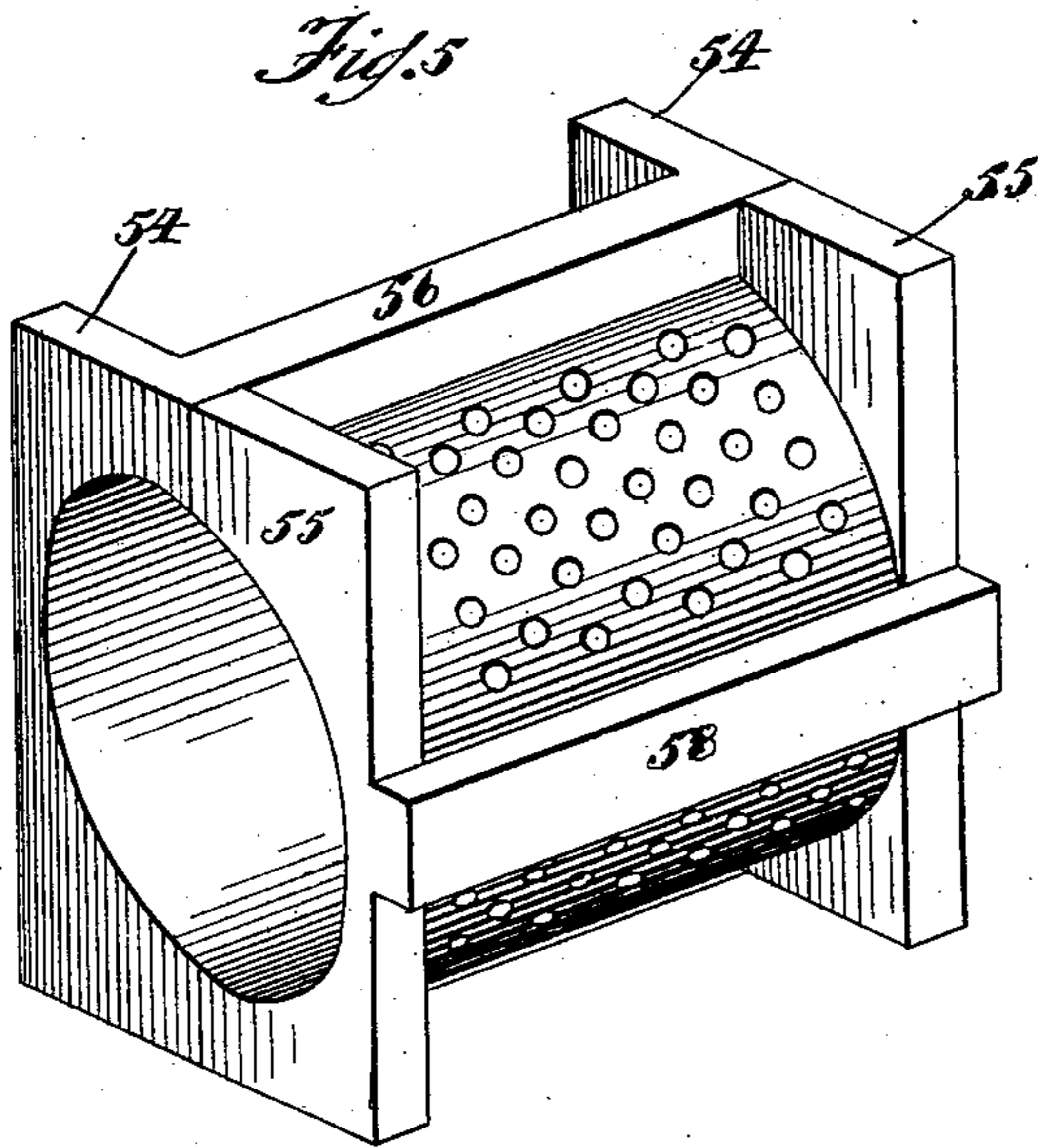
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UNITED STATES PATENT OFFICE.

MADDRA J. HEWLETT, OF KEWANEE, ILLINOIS, ASSIGNOR TO HIMSELF
AND ALFRED M. HEWLETT, OF KEWANEE, ILLINOIS.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 713,003, dated November 4, 1902.

Application filed March 10, 1902. Serial No. 97,492. (No model.)

To all whom it may concern:

Be it known that I, MADDRA J. HEWLETT, a citizen of the United States, residing at Kewanee, in the county of Henry and State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a specification, reference being had to the accompanying drawings.

My invention relates to rotary engines, and has for its object to provide an improved balanced rotary engine which will be simple in construction and efficient in operation.

In the accompanying drawings, Figure 1 is a horizontal section on line 1 1 of Fig. 2. Fig. 2 is a vertical section on line 2 2 of Fig. 1. Fig. 3 is a cross-section on line 3 3 of Fig. 1. Fig. 4 is a cross-section on either of lines 4 4 of Fig. 1. Fig. 5 is a perspective view of one of the cylinder-sections. Fig. 6 is an end view of one of the pistons. Fig. 7 is an enlarged section on line 7 7 of Fig. 8, and Fig. 8 is a cross-section on line 8 8 of Fig. 7.

My improved engine consists of a series of pistons carried by a rotary piston-support and arranged to operate in cylindrical chambers. The several chambers are arranged in line and are preferably of the same diameter, although, as hereinafter explained, they may be made of different diameters, if desired. One of the cylinders is arranged to receive high-pressure steam and to exhaust it into low-pressure cylinders at opposite ends of the high-pressure cylinder, and such low-pressure cylinders may in turn exhaust into still lower pressure cylinders arranged beside them. The area of the high-pressure cylinder is smaller than that of the low-pressure cylinders, so as to avoid or reduce back pressure. When the cylinders are all of the same diameter, this is best secured by making the low-pressure cylinders longer than the high-pressure cylinder; but if desired it may be secured by increasing the diameter of the low-pressure cylinders. The pistons of the different cylinders are all carried by a single cylindrical piston-support, which extends through the different cylinders and is mounted in suitable bearings, so as to rotate freely. Suitable partitions are provided at the ends

of the cylinders, which engage the piston-support, and thereby close the ends of said cylinders. The cylinders are inclosed in a housing the sides of which are removable to permit of the assembling or separation of the parts. The housing serves to conduct exhaust-steam from the high-pressure to the low-pressure cylinders and also to receive and discharge the exhaust-steam which comes from the low-pressure cylinders. The different cylinders are detachably fitted into the housing, so that, if desired, they may be separately removed or replaced. The different pistons consist of sliding plates, which are fitted in the cylindrical piston-support and are adapted to be projected therefrom by the rotation of said piston-support to engage the inner surface of the cylinder. The piston-support itself bears against the inner surface of each cylinder between the inlet and outlet ports thereof, forming a cut-off. The steam exhausted from the low-pressure cylinders is discharged through the base of the housing to a subbase, from whence it is exhausted into the air.

With this general statement of the construction I will now describe in detail the construction of my improved engine as illustrated in the accompanying drawings.

Referring to the drawings, 10 indicates the subbase of the engine, which is adapted to support the base 11 and parts carried thereby. As shown in Figs. 3 and 4, the base 11 fits upon the subbase 10 and is secured thereto by bolts 12. The base 11 carries the housing which incloses the working parts of the engine and to that end is made slightly longer than the combined length of the different cylinders, as shown in Fig. 1. The housing is provided with intermediate partitions 13 14, which extend transversely thereof and form the ends of the high-pressure cylinder. It will be seen that the partitions are respectively placed equally distant from the ends of the housing and far enough apart so that the middle section of the housing is of about one-half the width of the end section. The partitions 13 14 are preferably cast integral with the housing, and in addition to forming

the ends of the high-pressure cylinder they serve as means for securing the removable side plates in place.

15 16 indicate the side plates of the housing, which, as shown in Fig. 4, are secured, preferably, by screws 17 to the housing. The side plates 15 16 are made readily removable, so that the parts of the engine may be easily assembled or taken apart.

18 indicates the top plate of the housing.

19 20 indicate the end partitions, which are similar to the partitions 13 14 and form the outer ends of the low-pressure cylinders, the inner ends of said cylinders being formed by the partitions 13 14.

All the partitions 13, 14, 19, and 20 are provided with central circular openings, which are concentrically arranged, as shown in Figs. 1 and 2.

21 indicates a cylindrical piston-support, which extends through the housing and rests in the circular openings in the different partitions 13 14 19 20, as shown in Fig. 1. The ends of said piston-support project beyond the partitions 19 20, as shown, and over such projecting ends are fitted caps 22 23, which are secured by bolts 24 to the partitions 19 20. The caps 22 23 fit snugly upon the ends of the piston-support 21, as shown, and not only act to pack the ends thereof to prevent the escape of steam from the end cylinders, but also form extended bearings for said support.

25 26 indicate shafts, which project centrally from the ends of the piston-support 21 and are journaled in bearings carried by pillow-blocks 27 28, respectively, preferably supported on the subbase 10. Stuffing-boxes 29 30 are provided in the caps 22 23, respectively, to prevent escape of steam around the shafts 25 26.

31 indicates a duct formed in the top plate 18 of the housing and connecting the end compartments A B, formed by the partitions 13 14 with an intermediate compartment C, as shown in Fig. 2. The function of said duct 31 is to conduct the exhaust-steam from compartment C, as hereinafter explained, into compartments A and B.

32 33 indicate ducts communicating with the lower portions of the compartments A B and with a chamber 34 in the subbase 10 for conducting the exhaust-steam from said compartments A B to the subbase.

35 indicates an outlet-pipe communicating with the chamber 34.

36 indicates a steam-supply pipe communicating with the lower portion of compartment C.

37 38 39 indicate pistons carried by the piston-support 21 in the compartments A B C, respectively. The construction of said pistons is best shown in Figs. 6, 7, and 8, from which it will be seen that said pistons are composed of a plate 40, having side strips 41 42, which are fitted into suitable grooves 43 in the side edges of said plate and with end

strips 44 45, fitted into similar grooves in the ends of said plate 40. Springs 46, fitted in the grooves 43 under the side strips 41 42, serve to press said strips outward. As shown in the drawings, the pistons are fitted in slits in the piston-support 21, said slits being of suitable length, so that the end strips 44 45 bear against the piston-support with sufficient closeness to prevent the escape of steam. Packing-rings 47 are preferably provided in the piston-support 21, adjacent to the ends of each piston, which packing-rings lie opposite the inner faces of the partitions 13 14 19 20 and prevent the escape of steam between said partitions and the piston-support.

A', B', and C' indicate the cylinders of the compartments A B C, respectively. The low-pressure cylinders A' B' are similar in all respects and are similarly arranged. The high-pressure cylinder C' is similar in general construction to the other cylinders, but is oppositely arranged, as shown in Fig. 3. From an inspection of Figs. 3 and 4 it will be seen that the different cylinders are eccentrically arranged. The center of the high-pressure cylinder C' in the construction shown lies at the left of the axis of the piston-support, as shown in Fig. 3, while the center of the low-pressure cylinders A' and B' lies at the right of the axis of the piston-support. Furthermore, the inlet-ports 48 of the high-pressure cylinder lie below the center and at the right, as shown in Fig. 3, while the outlet-ports 49 thereof are above the center and at the right. In the case of the low-pressure cylinders the inlet-ports 50 are above the center thereof and at the left, while the outlet-ports 51 thereof are below the center and at the left. It will further be observed from an inspection of Figs. 3 and 4 that the piston-support 21 engages the surface of the high-pressure cylinder C' at the right between the inlet and outlet ports thereof, while it engages the low-pressure cylinders at the left between the inlet and outlet ports thereof. The general construction of the different cylinders is best shown in Fig. 5, from which it will be seen that each of the cylinders is composed of two semicylindrical sections 52 53, said sections being provided at their ends with supporting-plates 54 55, respectively. The plates 54 are connected at the top and bottom by longitudinal ribs 56 57, respectively, as shown in Figs. 3 and 5. The plates 55 are connected by a side rib 58, as shown in Figs. 3 and 5. When the parts of the cylinder are assembled, the plates 54 55 abut, forming a partition similar to the partitions 13 14 19 20. The size and shape of the plates 54 55 and the length of the different cylinders are such that the cylinders, with their end plates, are adapted to fit into the housing between the partitions 13 14 19 20—that is to say, the cylinder A' is adapted to fit between the partitions 13 and 19, the cylinder B' between the partitions 14 and 20, and the cylinder C' between the partitions 13 and 14.

When fitted into place, the end plates 54 55 of the different cylinders fit snugly against the adjacent partitions and further pack the cylinders. The ribs 56 of the different cylinders abut against the top plate 18 of the housing, as shown in Figs. 3 and 4, the ribs 56 of the high-pressure cylinder lying at the opposite side of the duct 31 from the ribs 56 of the low-pressure cylinders owing to the fact that such cylinders are reversed, as hereinbefore explained. The lower ribs 57 of the different cylinders rest on the base 11, as shown in Figs. 3 and 4. The side ribs 58 of the different cylinders project into grooves 59, formed in the side plates 15 16, ribs 60 being provided on the side plates to form extended bearings for the ribs 58, and thereby provide steam-tight connections at those points.

61 indicates set-screws provided in the side plates 15 16 and adapted to bear against the outer faces of the ribs 58, as shown in Figs. 3 and 4, for adjusting the position of the different cylinders. 62 indicates similar set-screws provided in the side plates 15 16 opposite the set-screws 61. If preferable, adjustable wedges can be substituted for set-screws, and in large-size engines they would be more secure. It will be understood that in the construction shown the set-screws 61 of the low-pressure cylinders are in the side plates 15, while the set-screw 61 of the high-pressure cylinder is in the side plate 16; also, the set-screws 62 of the low-pressure cylinders are in the side plate 16, while the set-screw 62 of the high-pressure cylinder is in the side plate 15. This is fully shown in Fig. 1. The set-screws 61 62 of any cylinder control the position of such cylinder in the housing, and it is evident, therefore, that by adjusting the position of such screws the cylinder may be adjusted in the housing to increase or reduce the pressure of the piston-support against the inner surface of the cylinder at the point of contact. By this means wear may readily be taken up. It will be understood, of course, that the end plates 54 55 are made slightly narrower than the inside width of the housing to provide for such adjustment. The set-screws 61 62 further serve to hold the two sections of each cylinder tightly in contact with each other to prevent escape of steam where they join. Suitable packing may, if desired, be provided at such places.

From the foregoing description it will be seen that an inlet steam-chamber *c* is provided in the lower right-hand section of the compartment C and an exhaust-steam chamber *c'* in the upper right-hand section thereof. Similarly, an inlet steam-chamber *a* is provided in the upper left-hand section of compartment A and an exhaust-chamber *a'* in the lower left-hand section of the same compartment. Similar chambers *b b'* are pro-

vided in compartment B. The steam-pipe 36 communicates with chamber *c*, while exhaust-ducts 32 33 communicate with chambers *a' b'*.

The parts are assembled as follows: The side plates 15 16 being removed, the piston-support 21 is fitted into the housing by an endwise movement and rests in its bearing in the different partitions 13 14 19 20. The caps 22 23, with their stuffing-boxes, are then fitted in place, and the shafts 25 26 are properly fitted in their bearings in the pillow-blocks 27 28. The pistons 37 38 39 may then be fitted in place, after which the different cylinders are fitted into the housing from the sides, the two halves of each cylinder being placed in position from opposite sides of the housing. The side plates are then placed in position and the proper adjustment secured by means of the set-screws 61 62.

The operation is as follows: Steam being admitted to the high-pressure chamber *c* through steam-pipe 36 enters the cylinder *C'* through ports 48, rotating the piston-support and piston in the direction indicated by the arrow in Fig. 3. When the steam reaches the outlet-ports 49, it escapes into exhaust-chamber *c'*, and thence passes through duct 31 to chambers *a* and *b* of low-pressure compartments A and B. It then enters the cylinders *A' B'* through ports 50 and acts upon the pistons in said cylinders to rotate the piston-support in the same direction as indicated by the arrow in Fig. 4, being finally exhausted through ports 51 into exhaust-chambers *a' b'*, whence it may pass through ducts 32 33 to the chamber 34 in the subbase 10. If desired, the steam after passing into exhaust-chambers *a' b'* may be employed to drive other low-pressure cylinders, in which case the operation above described will be continued to the last of the cylinders. Five, seven, or more cylinders may be employed. It will be observed that the pressure upon the piston-support in the high-pressure cylinder *C'* is the opposite of that in the cylinders *A' B'*. Consequently the one pressure neutralizes the other, balancing the piston-support. Furthermore, the increased area of the chambers *a* and *b* and cylinders *A'* and *B'* as compared with the area of the chamber *c* and cylinder *C'* permits the steam to pass readily from the high-pressure to the low-pressure cylinders, and thereby back pressure is practically eliminated. As shown in Fig. 5, the inlet and outlet ports are formed by boring a number of holes in the cylinders at appropriate points, said holes being staggered, so that the cylinder is not worn by the travel of the piston.

It should be understood that the relative areas of the high and low pressure cylinders may be varied; but I prefer to employ the proportions illustrated. To adjust the cylinders with reference to the piston-support, it is not necessary to remove the side plates

or to otherwise take the engine apart, since any ordinary adjustment may be secured by simply manipulating the set-screws 61 62.

I wish it to be understood that my invention is not restricted to the specific construction illustrated and described, except in so far as the details of the construction are particularly claimed.

That which I claim as my invention, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination of a housing, a separate cylinder inclosed in said housing, one or more compartments between the cylinder and housing, a piston-support extending through said cylinder and housing, a piston carried by said piston-support, and steam inlet and outlet ports, substantially as described.

2. In a rotary engine, the combination of a housing, a cylinder removably inclosed in said housing, a piston-support in said cylinder, a piston carried by said piston-support, and steam inlet and outlet ports, substantially as described.

3. In a rotary engine, the combination of a housing having removable sides, a piston-support mounted in said housing, a piston carried thereby, and a cylinder composed of separable parts adapted to be fitted into said housing, substantially as described.

4. In a rotary engine, the combination of a housing having removable sides, a piston-support mounted in said housing, a piston carried thereby, a cylinder composed of separable parts adapted to be fitted into said housing, and means for adjusting the cylinder to take up wear, substantially as described.

5. In a rotary engine, the combination of a housing, a piston-support mounted therein, a cylinder carried in said housing, said piston-support being eccentrically arranged with reference to said cylinder, a piston carried by said piston-support, and means for adjusting said cylinder to take up wear, substantially as described.

6. In a rotary engine, the combination of a housing, a piston-support mounted therein, a cylinder composed of separable parts carried in said housing, said piston-support being eccentrically arranged with reference to said cylinder, a piston carried by said piston-support, and means for adjusting said cylinder to take up wear, substantially as described.

7. In a rotary engine, the combination of a housing, a piston-support mounted therein, a separate cylinder carried in said housing, and steam inlet and exhaust chambers between said housing and cylinder, and communicating with said cylinder, substantially as described.

8. In a rotary engine, the combination of a housing, a piston-support mounted therein, a cylinder carried in said housing, and a piston carried by said piston-support, said cylinder having longitudinally-extending ribs

dividing the housing into inlet and exhaust steam-chambers, substantially as described.

9. In a rotary engine, the combination of a housing, a piston-support mounted therein, a cylinder carried in said housing, a piston carried by said piston-support, and set-screws at opposite sides of the housing engaging said cylinder for adjusting it laterally, substantially as described.

10. In a rotary engine, the combination of a housing having partitions extending transversely thereof, a cylinder fitted between said partitions, a rotary piston-support in said cylinder, and a piston carried by said piston-support, substantially as described.

11. In a rotary engine, the combination of a housing having partitions extending transversely thereof, a cylinder removably fitted between said partitions, a rotary piston-support in said cylinder, and a piston carried by said piston-support, substantially as described.

12. In a rotary engine, the combination of a housing having transversely-arranged partitions, a rotary piston-support journaled in said partitions, a piston carried thereby, and a cylinder inclosing said piston-support and fitted between said partitions, substantially as described.

13. In a rotary engine, the combination of a housing having transversely-arranged partitions, a rotary piston-support journaled in said partitions, a piston carried thereby, and a separable cylinder inclosing said piston-support and fitted between said partitions, said housing having removable side plates, substantially as described.

14. In a rotary engine, the combination of a housing having transversely-arranged partitions, a rotary piston-support journaled in said partitions, a piston carried thereby, and a cylinder inclosing said piston-support and fitted between said partitions, the ends of said cylinder being squared to fit in said housing, substantially as described.

15. A cylinder for rotary engines having longitudinal ribs 56, 57 and 58, substantially as described.

16. A cylinder for rotary engines having longitudinal ribs 56, 57 and 58, in combination with a housing in which said cylinder is inclosed, said housing having ribs 60 forming a groove adapted to receive the rib 58, substantially as described.

17. In a rotary engine, the combination of a housing, a cylinder fitted therein, a piston-support in said cylinder, a piston carried thereby, said cylinder having inlet and outlet ports, said ports being staggered, substantially as described.

18. In a rotary engine, the combination of a plurality of cylinders arranged in line, a rotary piston-support extending through said cylinders, separate pistons carried by said piston-support in each of said cylinders, means

for admitting steam to one of said cylinders, an external housing, and means for exhausting the steam from said cylinder through said housing into another of said cylinders, substantially as described.

19. In a rotary engine, the combination of an external housing, a high-pressure cylinder therein, a low-pressure cylinder adapted to receive steam from said high-pressure cylinder, means for supplying steam to said high-pressure cylinder, means for conducting exhaust-steam through a passage formed by said housing to said low-pressure cylinder, substantially as described.

20. In a rotary engine, the combination of an external housing, high and low pressure cylinders therein, steam supply and exhaust compartments for said cylinders in and formed by said housing, means for supplying steam to said high-pressure cylinder, and pistons in said cylinders, substantially as described.

21. In a rotary engine, the combination of a housing, a high-pressure cylinder fitted therein, low-pressure cylinders at opposite ends of said high-pressure cylinder, a piston in each of said cylinders, and means for exhausting the steam from said high-pressure cylinder through a passage formed by the housing into said low-pressure cylinders, substantially as described.

22. In a rotary engine, the combination of a housing, transversely-extending partitions carried thereby, said partitions being arranged to divide the housing into a plurality of compartments, a rotary piston-support extending through said housing and journaled at its ends therein, said partitions having openings to receive said piston-support, a piston carried by said piston-support in each of said compartments, and a cylinder in each of said compartments, substantially as described.

23. In a rotary engine, the combination of a housing, transversely-extending partitions carried thereby, said partitions being arranged to divide the housing into a plurality of compartments, a rotary piston-support extending through said housing and journaled at its ends therein, said partitions having openings to receive said piston-support, a piston carried by said piston-support in each of said compartments, a cylinder in each of said compartments, inlet and exhaust steam-chambers formed in said compartments, and ducts connecting the exhaust-chamber of the high-pressure compartment with the inlet-chambers of the low-pressure compartments, substantially as described.

24. In a rotary engine, the combination of a housing, transversely-extending partitions carried thereby, said partitions being arranged to divide the housing into a plurality of compartments, a rotary piston-support extending through said housing and journaled at its ends therein, said partitions having openings to receive said piston-support, a piston car-

ried by said piston-support in each of said compartments, a cylinder in each of said compartments, and means for adjusting said cylinders with reference to the piston-support, substantially as described.

25. In a rotary engine, the combination of a housing, transversely-extending partitions carried thereby, said partitions being arranged to divide the housing into a plurality of compartments, a rotary piston-support extending through said housing and journaled at its ends therein, said partitions having openings to receive said piston-support, a piston carried by said piston-support in each of said compartments, and a cylinder composed of separable parts in each of said compartments, said housing having removable side plates, substantially as described.

26. In a rotary engine, the combination of a housing, a high-pressure cylinder fitted therein, low-pressure cylinders at opposite ends of said high-pressure cylinder, each of said low-pressure cylinders being of substantially double the length of the high-pressure cylinder, a piston in each of said cylinders, and means for exhausting the steam from said high-pressure cylinder into said low-pressure cylinders, substantially as described.

27. In a rotary engine, the combination of a housing, one or more compartments between the cylinder and housing, a separate cylinder inclosed in said housing, a rotary piston-support in said cylinder, a piston carried by said piston-support, and steam inlet and outlet ports for said cylinder, substantially as described.

28. In a rotary engine, the combination of a housing having a removable side, a cylinder removably fitted in said housing, and a rotary piston in said cylinder, substantially as described.

29. In a rotary engine, the combination of a housing having a removable side, a cylinder removably fitted in said housing, a rotary piston in said cylinder, and steam inlet and exhaust chambers in said housing communicating with said cylinder, substantially as described.

30. In a rotary engine, the combination of an external housing, a high-pressure cylinder therein, low-pressure cylinders at opposite ends of said high-pressure cylinder, means for supplying steam to said high-pressure cylinders, means for conducting exhaust-steam through a passage formed by the housing from said high-pressure to said low-pressure cylinders, and pistons in said cylinders, substantially as described.

31. In a rotary engine, the combination of a housing having a series of compartments, partitions separating said compartments, a series of cylinders fitted in said compartments, inlet and outlet ports for said cylinders, and pistons in said cylinders, substantially as described.

32. In a rotary engine, the combination of a

housing having a series of compartments, partitions separating said compartments, a series of cylinders fitted in said compartments, inlet and outlet ports for said cylinders, and
5 pistons in said cylinders, certain of said cylinders being arranged to receive steam from certain other of said cylinders, substantially as described.

33. In a rotary engine, the combination of a
10 housing having a series of compartments, par-

titions separating said compartments, a series of removable cylinders in said compartments, inlet and outlet ports for said cylinders, and pistons in said cylinders, substantially as described.

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Witnesses:

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