

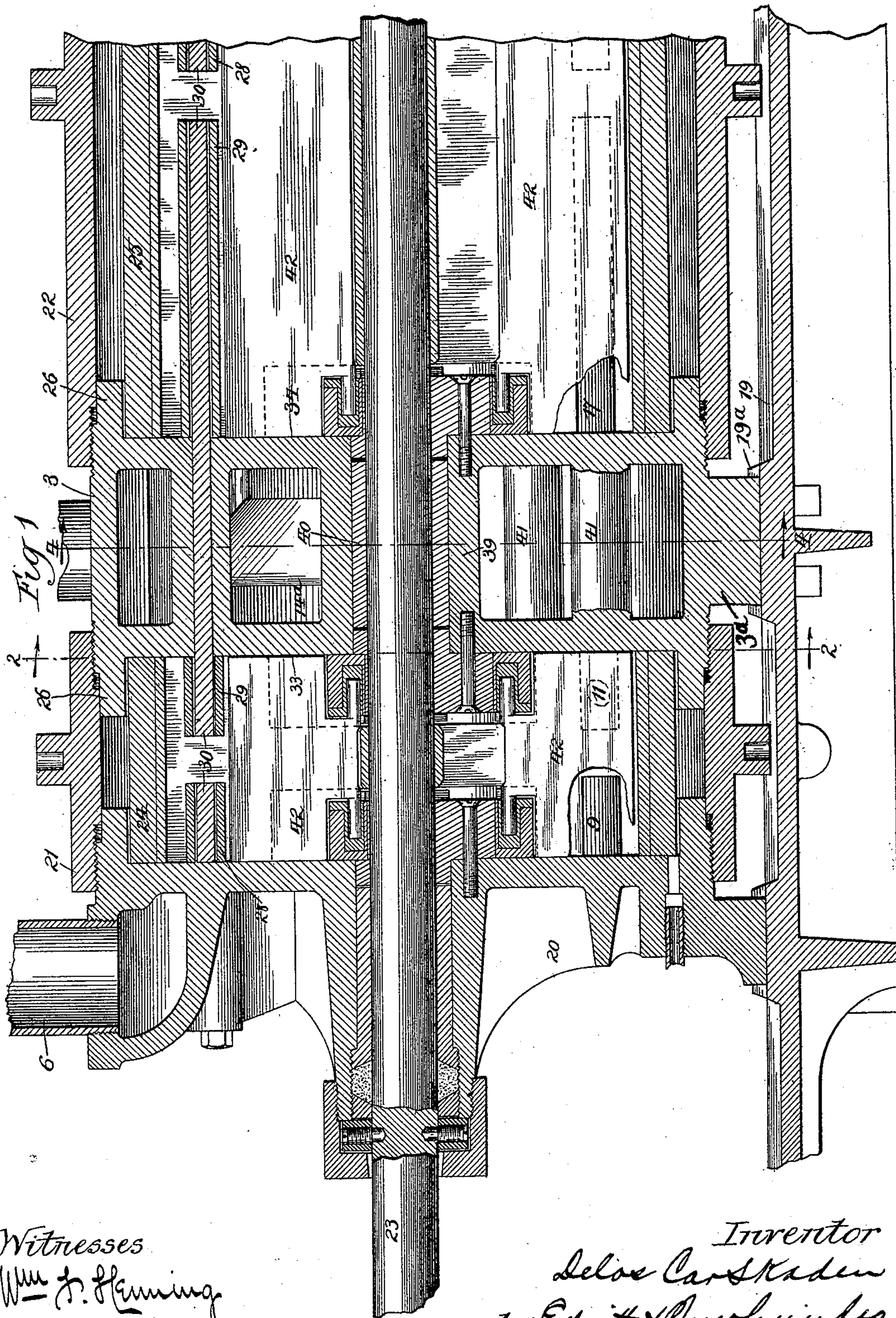
(No Model.)

3 Sheets—Sheet 1.

D. CARSKADEN.  
ROTARY ENGINE.

No. 497,403.

Patented May 16, 1893.



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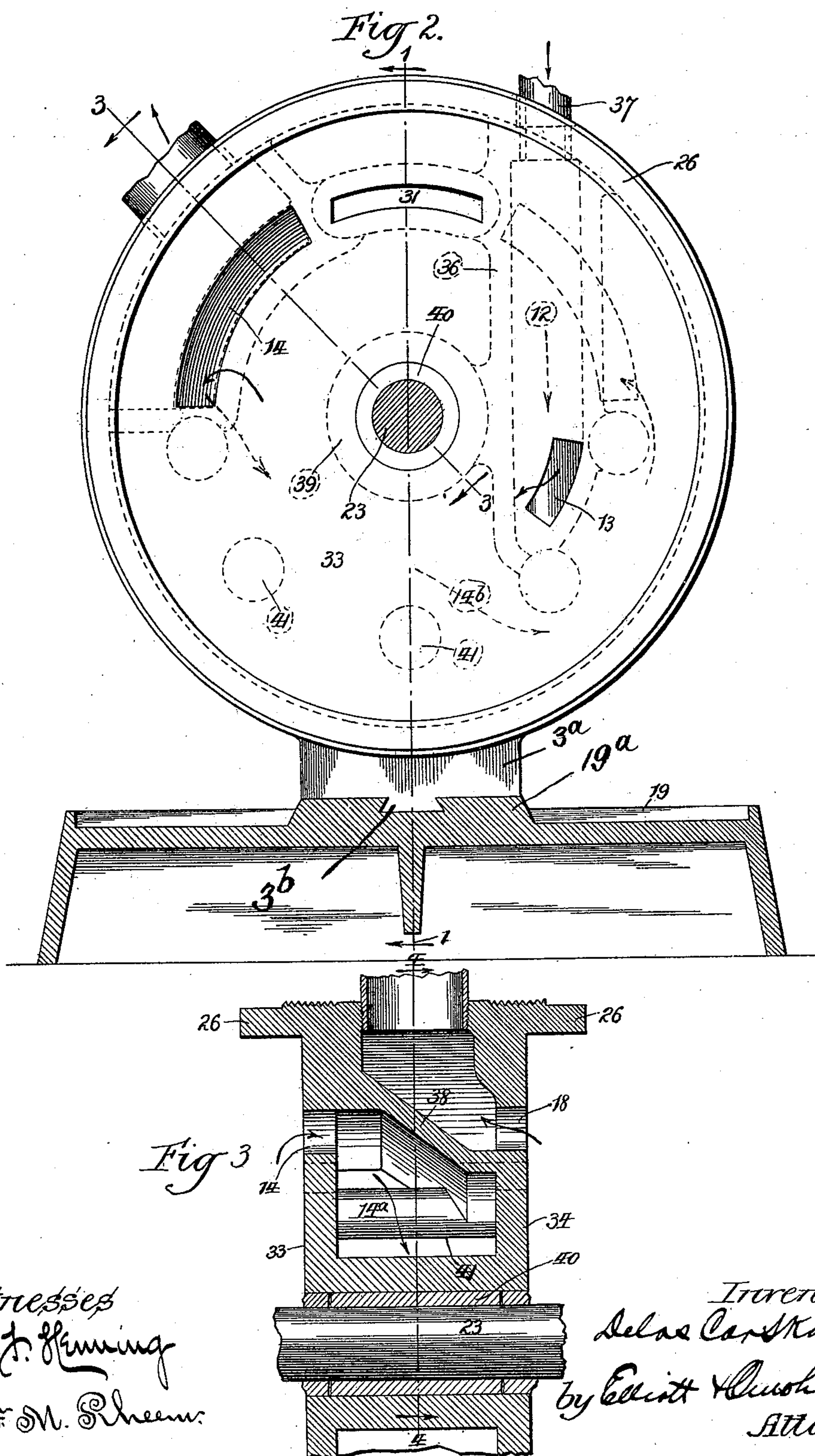
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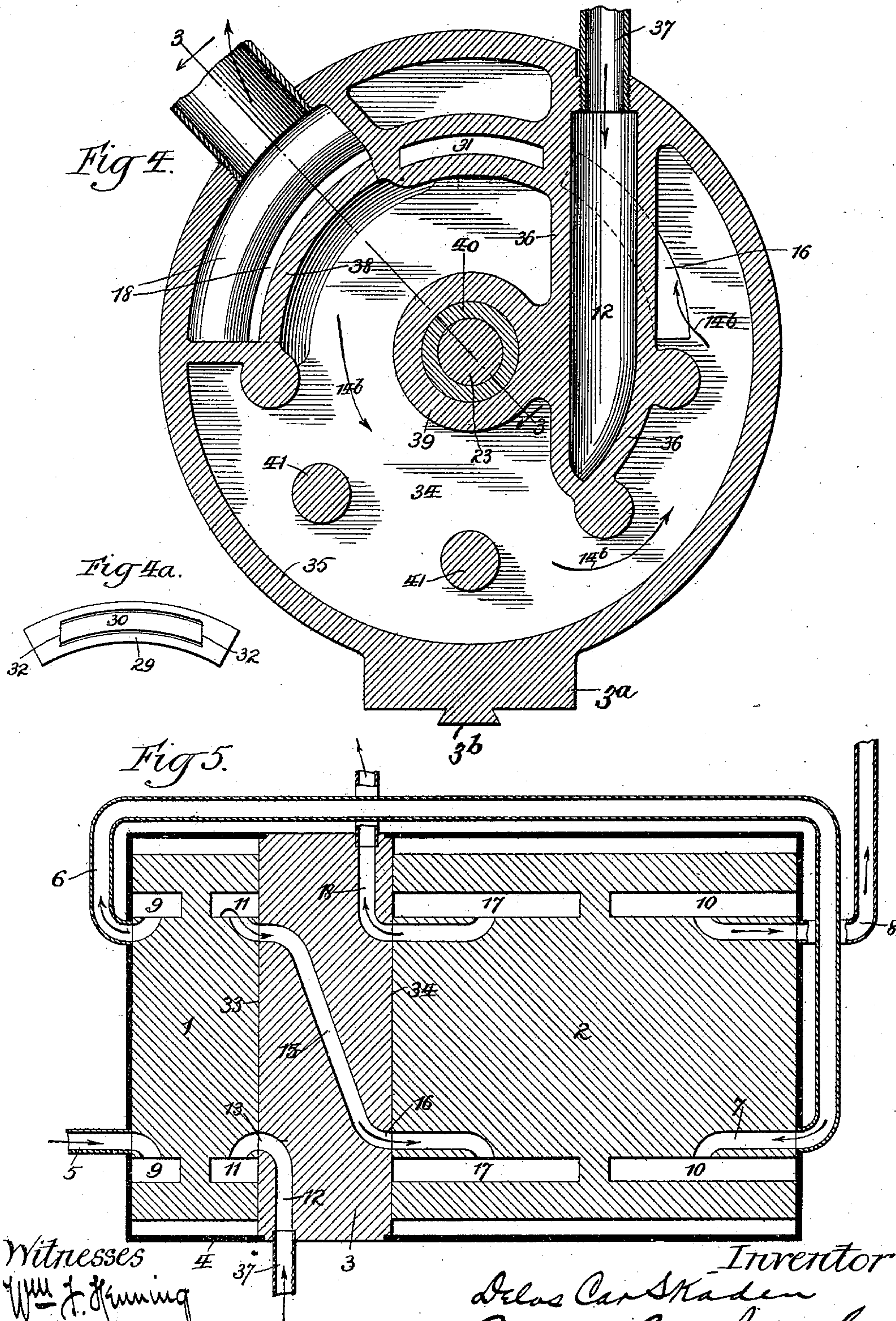
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D. CARSKADEN.  
ROTARY ENGINE.

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# UNITED STATES PATENT OFFICE.

DELOS CARSKADEN, OF CHICAGO, ILLINOIS.

## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 497,403, dated May 16, 1893.

Application filed August 2, 1892. Serial No. 441,930. (No model.)

*To all whom it may concern:*

Be it known that I, DELOS CARSKADEN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact specification.

My invention relates to compound rotary engines, or to other forms consisting of a series of engines, and my improvements have more especial reference to the arrangement and manner of forming the supply and exhaust ports, and to the means of securing the abutment blocks in place.

One of the objects of my invention is to improve and simplify the arrangement and construction of the ports between the engines, whereby such ports may be made in a more compact form, occupying but a minimum of space, and reducing the liability of condensation.

Another object of my invention is to provide simple and durable means by which the abutment blocks of the two engines may be adjustably and removably held in position in the grooves or spaces into which the steam or fluid pressure is admitted.

With these ends in view, my invention consists in certain features of novelty in the construction, combination and arrangement of parts, by which the said objects and certain other objects hereinafter described are attained, as fully explained with reference to the accompanying drawings, and more particularly pointed out in the claims.

In the said drawings, Figure 1 is a vertical, longitudinal section of a compound rotary engine embodying my improvements, one end thereof being broken away. Fig. 2 is an end or face view of the duplex head hereinafter described, looking in the direction of the arrows 2, 2, Fig. 1, the high pressure engine being removed. Fig. 3 is a detail sectional view of the duplex head, taken on the line 3, 3, Fig. 2. Fig. 4 is an end section of the duplex head, taken on the line 4, 4, Figs. 1 and 3, looking in the direction of the arrows. Fig. 4<sup>a</sup> is a detail view, of the abutment; and Fig. 5 is a diagrammatic view, showing the arrangement of the inlet and exhaust ports with relation to the hubs carrying the steam

grooves or spaces, the pistons, abutment blocks and other details being omitted.

Like signs of reference indicate like parts throughout the several views.

My invention is here represented in connection with a compound engine, comprising a high and low pressure engine, both of which are of the duplex pattern, and my improvements are adapted for utilizing the pressure of steam as it leaves the exhaust ports of the high pressure engine, for driving the low pressure engine; but it will be understood that my improvements are equally applicable to other forms, and to triple and quadruple engines, or in short, to multiplex engines comprising any number of engines.

In carrying out my invention, I locate between the high and low pressure engines, 1, 2, respectively, a head or block, 3, which constitutes the inner end or head of the casing 4, of both engines, and which I will therefore herein term a "duplex head."

As more clearly shown in diagram in Fig. 5, the steam for driving the outer side of the high pressure engine 1 is admitted thereto *via* the inlet pipe 5, and after having performed its work is permitted to exhaust *via* the exhaust pipe 6, whence it enters the inlet port 7, of the outer side of the low pressure engine 2, and finally exhausts from this side of the low pressure engine *via* the exhaust pipe 8, into the atmosphere, it being understood, of course, that the spaces, 9, 10, represent the annular steam grooves of the outer ends of the high and low pressure engines, respectively. The steam for driving the inner side of the high pressure engine is admitted thereto *via* a pipe 12, which communicates with the inlet port 13, formed in the duplex head 3, and after having traversed the steam groove, 11, in this side of the high pressure engine, it exhausts *via* the port 14 also formed in the head 3, and is led through a passage 15 in such head to the port 16, in the opposite face of the head, which latter port constitutes the inlet port for the inner side of the low pressure engine 2. The steam having performed its duty in the steam space 17, of the inner side of the low pressure engine, exhausts therefrom into the atmosphere *via* the port 18, formed in the face of the head 3 opposite the port 14.



Referring now more particularly to Figs. 1 to 4, inclusive, 19 is the base or pedestal upon which are suitably supported the extreme ends or heads 20, of the engine, one of such heads only being shown in the drawings. Secured to these heads 20 in any suitable manner, are rings or cylinders, 21, 22, respectively, which constitute the cylindrical portion of the outer casing, as usual, and mounted in suitable bearings in the heads 20 is the main shaft, 23, upon which the rotary hubs, 24, 25, of the high and low pressure engines respectively are mounted in any suitable manner.

The duplex head, 3, above referred to, is located between the hubs 24, 25, and is provided with a foot, 3<sup>a</sup>, resting upon a boss, 19<sup>a</sup>, on the pedestal 19, and having a dovetail 3<sup>b</sup> which engages in a dovetail groove in the face of the boss 19<sup>a</sup>; thus adjustably securing the head 3 to the pedestal 19. The head 3 is secured to the inner ends of the cylinders 21, 22, in any suitable manner; as shown in the drawings, it is provided at each end with an annular flange, 26, screw threaded on its outer edge, and engaging with internal threads formed on the ends of the cylinders 21, 22, whereby the hubs may be caused to fit snugly against the faces of the head 3, by turning the cylinders 21, 22, in the proper direction, the head 3 sliding on the boss 19<sup>a</sup> to accommodate itself to the other parts. Each of the hubs 24, 25, it will be understood, is provided in both ends or faces with the annular steam groove or space, into which grooves fit the abutment blocks 28, 29, in the usual and well known manner. The outer abutment blocks 28 may be held in place in the steam grooves 9 by any of the means well known in the art, but I prefer to employ the means shown and claimed in my application for United States Letters Patent, Serial No. 435,731, filed June 6, 1892, where I secure the inner blocks, 29, by means of a longitudinal lug or bar 30, which passes through a complementary opening or socket, 31, formed through the head 3, and projects through the head 3 on both sides into the steam grooves in the inner ends of the hubs 24, 25. As shown more clearly in Fig. 4<sup>a</sup>, the abutment blocks are shell-like in form, having interiors which are complementary in shape to the form of the ends of the bar or lug 30, so as to fit perfectly thereon, and the side edges, 32, of the bar it will be seen, are strictly parallel with the vertical diameter of the head, so as to permit the abutment blocks to rise and fall with the hub, independently of the head 3, should such independent movement of the hub occur. The outer face of the duplex head 3, is provided with the ports 13, 14, which are so disposed as to permanently coincide with the steam groove 11, in the inner end of the hub, 24. The head 3 is of shell-like form, having two faces, 33, 34, connected together at their outer edges by a cylindrical portion, 35, and between these two faces, 33, 34, by means of a web, 36, is formed a downwardly extending in-

let port, 12, which has direct communication at its inner end with the inlet port 13, and at its outer end with any suitable steam supply pipe, 37. As before explained, the steam after having traversed the steam groove 11, and imparted a partial rotation to the hub 24, emerges from such groove *via* the exhaust port 14. This exhaust port 14 empties directly into the space 14<sup>a</sup>, between the end faces 33, 34, of the head, and follows the line of arrows, 14<sup>b</sup>, around to the port 16, formed through the face 34, which constitutes the supply port of the inner end of the low pressure engine. From the steam space 17 of the low pressure engine, the steam emerges, as explained, into the exhaust port 18, which is formed through the face 34, (see Fig. 3,) opposite the port 14. The port 14 is divided from the port 18 by means of a curved, obliquely arranged web or partition, 38, which also separates the port 18 from the interior space 14<sup>a</sup>, of the head 3. The head 3, where the shaft 23 passes through it, is provided with a web, 39, which surrounds the shaft, and in which may be located any suitable bushing or bearing, 40, to save the web 39 from the immediate wear of the shaft. The end faces of the head 3 may be braced or stiffened by means of supports 41, cast integrally therewith, or otherwise secured thereto, and arranged at any suitable intervals throughout the hollow portion of the head.

It will of course be understood that the mechanism for actuating the radially reciprocating pistons, 42, forms no part of my present invention, and may be of the well known, or of any suitable construction.

With a machine thus constructed, it will be seen that the duplex head 3, forms the head or end of the casing of both of the engines, and provides the inlet and exhaust ports in a compact and convenient form, permitting the steam in its passage from one port to another to come in immediate contact with the walls of the various ports, and thereby maintain the same at a high degree of temperature and reduce the liability of condensation.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a compound rotary engine, the combination with the engines having casings, of a head, arranged between said engines, and constituting the ends or heads of the contiguous casings, and having the steam supply and exhaust ports of the contiguous engines formed therein, a pedestal upon which said casings are adjustably mounted with relation to said head substantially as set forth.

2. In a compound rotary engine, the combination with the engines, of a head arranged between said engines, and having a passage formed therein from the exhaust side of one engine to the supply side of the other engine, and a supply port for one and an exhaust port for the other of said engines, substantially as set forth.



3. In a compound rotary engine, the combination with the hubs and the outer casing, of a head arranged between said hubs, and having an inlet port formed therein for one of the engines and an exhaust port for the other of the engines, and a passage connecting the exhaust side of one engine with the supply side of the other engine, substantially as set forth.

4. In a compound rotary engine, the combination with the base or pedestal and the engines mounted thereon, of a duplex head arranged between the engines and constituting the heads or ends of the contiguous casings, said duplex head being movably secured to the pedestal and having the steam supply and exhaust ports formed therein, substantially as set forth.

5. In a compound rotary engine, the combination with the engines, of a head arranged between the engines and having faces 33, 34, the steam port 13 formed through the face 33, and having communication with an inlet, the exhaust 14 formed in the face 33, and leading into the interior of the head, the supply port 16 formed through the face 34, and communicating with the interior of the head, and the exhaust 18 formed through the face 34, substantially as set forth.

6. In a compound rotary engine, the combination with a pedestal and the engines having outer cylinders 21, 22, of a duplex head arranged between said engines, and having the

flanges 26 adjustably connected to said cylinders, said head having dove-tail and groove connection with the pedestal, and being provided with the inlet and exhaust ports for the contiguous engines, substantially as set forth.

7. In a compound rotary engine, the combination with the hubs having pistons and being provided with steam grooves formed therein, of a head interposed between such hubs, a lug or bar passing through said head and projecting into said steam grooves, on both sides of said head and the abutment blocks arranged in said grooves on both ends of said lug or bar, substantially as set forth.

8. In a compound rotary engine, the combination with the hubs having pistons and being provided with steam grooves formed therein, of a head interposed between such hubs, a lug or bar passing through said head and projecting into said steam grooves, on both sides of said head and hollow abutment blocks arranged in said grooves on the ends of said lug or bar, the side edges of said bar and of the interior of said blocks being parallel with one diameter of the hub, substantially as set forth.

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