No. 622,318.

Patented Apr. 4, 1899.

T. R. ALMOND.

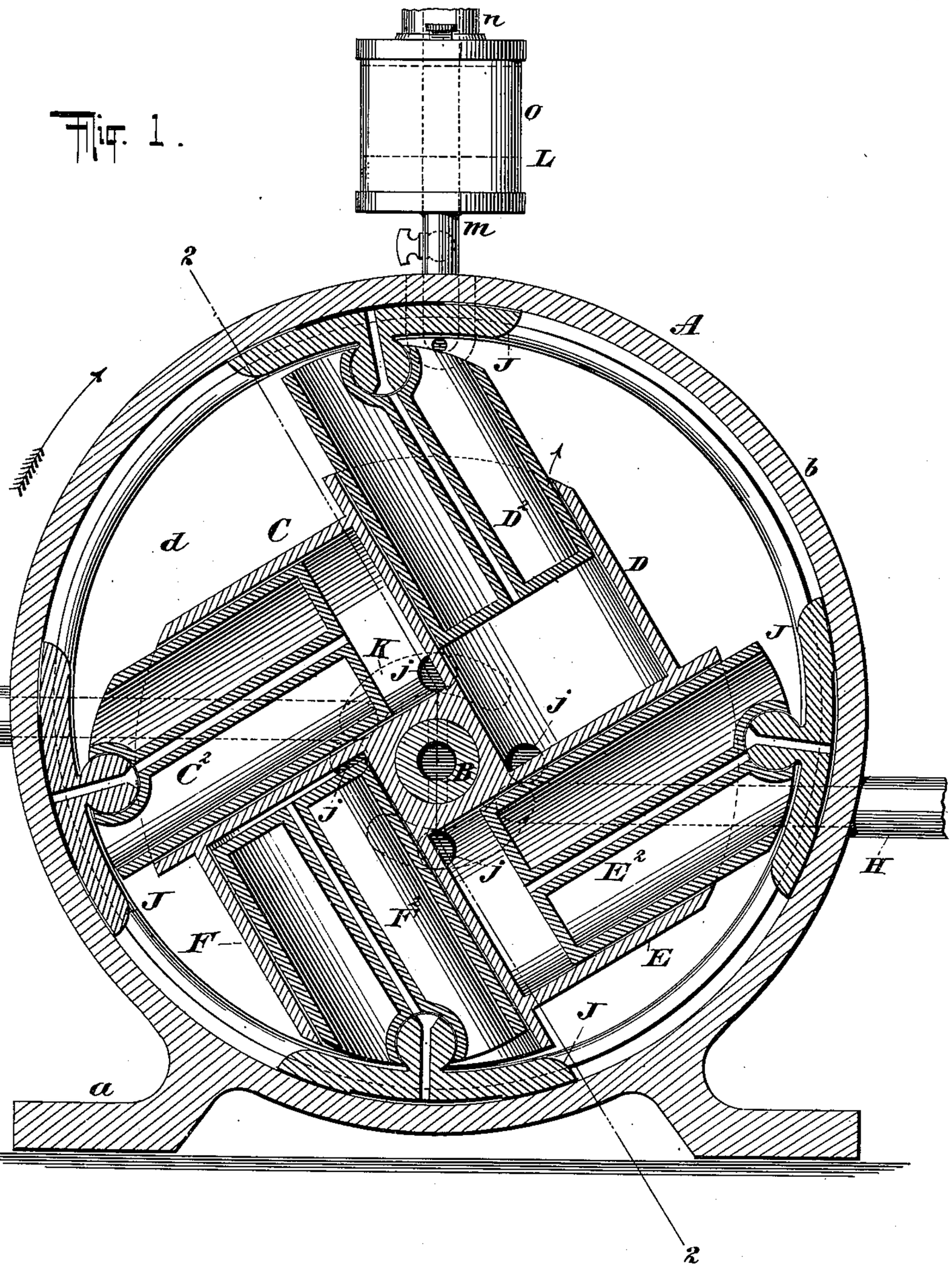
ROTARY ENGINE.

(Application filed Aug. 25, 1898.)

(No Model.)

2 Sheets—Sheet 1.

Fig. 1.



WITNESSES:

Gustave Dieterich

John Kellenbeck

INVENTOR

Thomas R. Almond

BY Briesen & Knauth

ATTORNEYS

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Fig. 3.

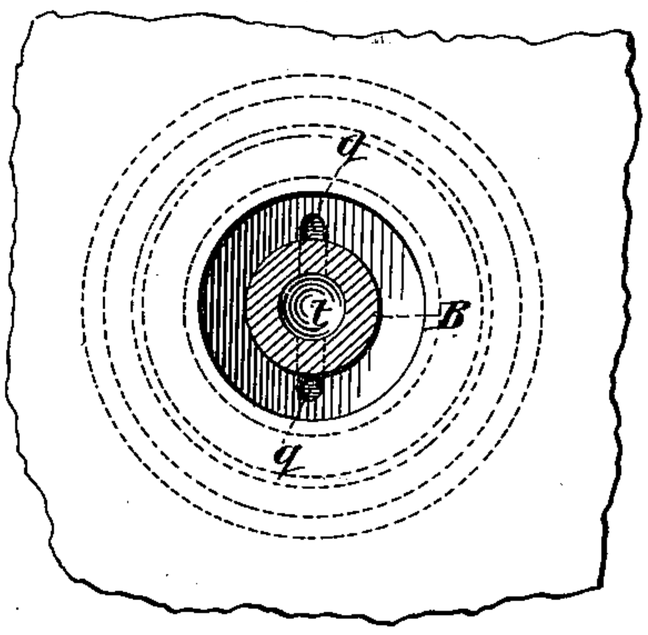

Fig. 4.

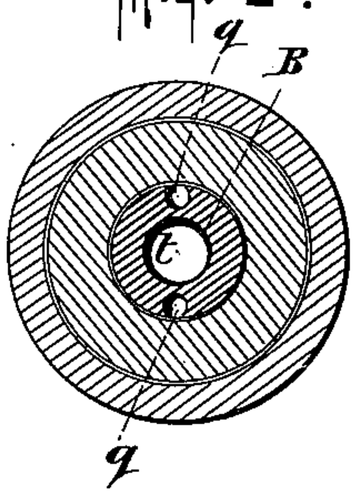

Fig. 2.

Fig. 5

WITNESSES:

Gustave Dieterich.

John Schlenbecker.

INVENTOR

Thomas R. Almond.

BY Briesen & Knauth

ATTORNEYS

UNITED STATES PATENT OFFICE.

THOMAS R. ALMOND, OF DUNWOODIE HEIGHTS, NEW YORK.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 622,318, dated April 4, 1899.

Application filed August 26, 1898. Serial No. 689,456. (No model.)

To all whom it may concern:

Be it known that I, THOMAS R. ALMOND, residing at Dunwoodie Heights, Westchester county, State of New York, have invented certain new and useful Improvements in Rotary Engines, of which the following is a full, clear, and exact description.

In the accompanying drawings, Figure 1 represents a vertical cross-section of my improved rotary engine—that is to say, a vertical section across its main shaft. Fig. 2 is a vertical longitudinal section of the same, the line 2 2, Fig. 1, indicating the plane of section. Fig. 3 is a detail vertical cross-section through the shaft, taken near the line 3 3, Fig. 2. Fig. 4 is a vertical cross-section of the shaft and the parts surrounding the same, showing a modification in the arrangement of channels; and Fig. 5 is a longitudinal section of said modified shaft.

This invention relates to improvements upon the rotary engine for which Letters Patten No. 580,838 were granted to me on April 20, 1897, and pertains more particularly to the means devised for effectuating complete lubrication of the main shaft in its bearings. Although the invention is therefore specifically applicable to the structure of my aforementioned Letters Patent, I desire it to be understood that it nevertheless is also applicable to rotary engines and analogous organisms other than the particular engine of my said patent.

The invention mainly consists in such a combination of parts as will cause the lubricating substance to travel from the inner body or casing of the engine along the outer part of the shaft toward one end thereof and thence through the shaft toward its opposite end, where it also will embrace said opposite end of the shaft in its bearings, all as hereinafter more fully described.

In the accompanying drawings the letter A represents the stationary housing or shell of my rotary engine. This housing A is of cylindrical form and consists of the circular rim *b* and of the two heads *d* and *e*. B is the shaft, carried eccentrically in said housing and so supported as to rotate within bearings that extend from or are properly secured to the said housing. These bearings, as shown in the drawings, are, first, those contained in the head *d* (see Fig. 2) and those contained in the cap *f*, which is bolted to the outer face of said head *d* at *g*, and, secondly, those contained in a hub-like extension *h*, that projects outwardly from the head *e*.

To the shaft B is rigidly secured, within the shell or housing A, the head proper of the engine. This head proper consists of four (more or less) tangentially-arranged cylinders C D E F, each provided with a piston C^2 D^2 E^2 F^2. These cylinders are open at their outer ends to allow their respective pistons to protude, the inner ends of the cylinders being closed, except where they have ports for the admission and exhaust of steam or analogous operative fluid. These different ports in said cylinders are indicated by the letter *j* in Fig. 1. Steam is admitted by pipe G to an inlet-port *k* in the head *d*. Steam is exhausted through a pipe H from an outlet-port *l*, which is also formed in the head *d*.

All the parts thus far enumerated by me, with the exception of the shaft B, which will be more particularly described hereinafter, are represented and intended to be constructed the same as described in my aforesaid Letters Patent No. 580,838 and operate as there specified, including the pivoted and recessed shoes J, that connect flexibly with the hollow stems of the pistons C^2, D^2, E^2, and F^2, so as to constitute the rotary engine of my aforesaid patent; but, as already stated, the features of new invention which I am now about to describe may also be applied to engines of other construction than the particular one illustrated and heretofore patented to me.

I have found that in practice it is not feasible to produce absolutely steam-tight joints between the moving parts of a rotary engine. No matter how accurately these parts are fitted to each other some steam will escape between them. Thus between the inner wall of the cylinder D and the outer wall of its piston D^2 some steam will find its way, as indicated by an arrow in Fig. 1, into the housing or casing of the engine, and although the proportion of steam thus discharged into said housing is very small it is nevertheless of measurable quantity, and it is part of my present invention to utilize the same for lubricating purposes. Should there be absolutely steam-tight joints or the steam enter-

ing the housing be insufficient, I would provide special means for admitting some steam to the housing in order to have it serve the purposes of this invention. I place a lubricator-cup L upon the shell or housing A so that the tubular stem *m* of said lubricator-cup communicates with the interior of said housing, as indicated in Fig. 2. The lubricator-cup is of the kind, preferably, which is known as a "drip-cup," and still more preferably of that particular kind of drip-cup species which receives steam, condenses it in a condensing-chamber *n*, and allows the resulting water to reach the main oil-chamber *o* and there to displace the oil which falls in drops through the hollow stem *m*. As the oil enters the housing of the engine it drops and mingles with the steam contained in said housing, as hereinbefore stated. Such oil is at once atomized and evenly distributed by contact with the steam contained in said housing, constituting together with it a most desirable lubricating substance. The surfaces which have proved most difficult to lubricate by other means are the bearings of the shaft B in the boxes *f h*. In order to properly lubricate these surfaces or bearings, I first form around the shaft B in one of the heads—say *e*—a chamber *p*, which is open at the inner side, or otherwise widen the space between C and *e*, and this chamber I connect by channels *q* with a chamber *r*, that is formed around the shaft B between the outer end of the bearing *h* and the inner end of a spring-pressed plate *s* or an equivalent packing or stuffing box. (See Fig. 2.) The shaft B is hollow from the line of the chamber *r* toward its opposite end, its bore being indicated at *t* in the drawings. The chamber *r* communicates with this bore *t* of the shaft B by one or more transverse holes *u*, that penetrate the shaft to its bore, as shown in Fig. 2.

The channels *q*, that extend from the chamber *p* to the chamber *r*, may be drilled into or otherwise formed in the bearing *h*, as indicated in Fig. 3, in such manner, however, that their inner peripheries intersect the circumference of the shaft B, so that any lubricating matter passing through the channels *q* will be in contact with the outer circumference of the shaft B, which, rapidly revolving, takes up new lubricating matter from said channels constantly; but these channels *q* may also, if desired, be formed in the exterior portion of the shaft B, as indicated in Figs. 4 and 5. It will be understood from the foregoing that one end of the shaft B—to wit, in the example shown the end upon which the main pulley M is mounted—is properly lubricated in its bearings by the mixture of oil and steam flowing from the interior of the housing into the chamber *p*, thence through the channels *q* into the chamber *r*, and thence by the holes *u* into the hollow *t* of the shaft B. By this means the shaft B in the bearing *h* is kept thoroughly lubricated by the attenuated oil held in the steam. The chamber *r* is not essential to the proper operation, nor is the chamber *p* absolutely necessary. I prefer to use the chamber *p* because it permits the steam and oil to flow freely into the main lubricating-channels *q*, and I prefer also to use the chamber *r*, as shown in Fig. 2, because by so doing I am able to use the spring-cushioned ring *s* or equivalent packing-box, gland, or stuffing-box to good advantage; but the modification Fig. 5 shows that the chamber *r* may be entirely omitted and yet the practical results aimed at obtained. From the chamber *r* a small proportion of the mixture of oil and steam may in the construction shown in Fig. 2 be passed around the spring-pressed abutment *s* into the space formed between the hub of the pulley M and the outer surface of the bearing *h*, so as to lubricate these parts also, said mixture finally escaping into an outlet *v*, through which it reaches the air; but the main lubricating-body will pass, when it enters the hollow *t* of the shaft B, through said shaft to the opposite end of the engine, where it passes through the series of holes *w*, that are drilled through the hollow shaft, into channels q^2, drilled into the bearing *f* or into the shaft, similar to the way indicated either in Fig. 3 or Fig. 4, thus also lubricating the opposite end of said shaft, and finally escaping through a suitable port *x* into the main exhaust *l* or directly into the atmosphere, if desired. The channels q^2, it will be seen, enter an enlargement or chamber *y*, which has the port *x*, so that it takes from all the channels q^2 whatever steam and oil mixed is finally to be exhausted.

To briefly recapitulate the operation of this lubricating arrangement, it will be observed that it mainly operates, first, to atomize the oil fed to the housing of the engine, then to carry the mixture of oil and steam through longitudinal or analogous channels toward one terminal portion of the shaft, lubricating the same in the bearings at that end during such parsage, and that thereupon said mixture passes through the shaft itself to its opposite terminal portion and thence into similar longitudinal or analogous channels, wherein it lubricates said shaft and its bearing near said opposite end, the said mixture of oil and steam being finally exhausted after having thus performed the function of proper lubrication.

I regard this invention as of importance for the reason that in rotary engines perfect lubrication of the moving parts is absolutely essential. Many rotary engines admirable in structure have failed in effectiveness mainly because of the lack of sufficient lubrication of the parts in action. Experiments which I have made with my present invention have proven that it results in substantially perfect lubrication.

Although I have shown the shaft B as made in one continuous piece, it is perfectly clear that for the purposes of this invention it may be made of sections, the effective feature being the continuity of the passage *t*.

I desire to be understood that I do not limit myself to the details of the structure illustrated; but

What I claim as new, and desire to secure by Letters Patent, is—

1. In a rotary engine, the combination of the casing or housing A with internal operating organisms, substantially as described, from which steam enters said housing or casing, with an oil-supply to said housing or casing and with a hollow main shaft B, lubricating-passages q and q^2 between the bearings of said shaft and said shaft, and apertures leading from said passages q q^2 to the bore in said shaft, the passage or passages q being in communication with the interior of the housing or casing and the other q^2 with the exhaust, substantially as and for the purposes described.

2. The combination of the hollow shaft B, apertures u and w extending near its respective ends from its bore to its outer periphery, bearings h and f in which said shaft lies, channels q and q^2 between said shaft and said bearings, said channels communicating with the bore t of said shaft, housing A and lubricator L, all arranged so that the inner ends of the passages q communicate with the interior of said housing or casing and so that the passages q^2 communicate with the exhaust, as and for the purposes described.

3. The combination of the casing A of a rotary engine or the like, said casing having bearings h and f, chamber or enlargement p and channels q q^2 in said bearings respectively with the tubular shaft B which is hung in said bearings and which is provided with apertures u and w which respectively communicate with the passages q and q^2, the passage q^2 also communicating with the exhaust, as and for the purposes specified.

4. The combination of the casing A of a rotary engine or the like, said casing having bearings h and f, chamber or enlargement p and channels q q^2 in said bearings respectively with the packing s adjoining a chamber r and with the tubular shaft B which is hung in said bearings and which is provided with apertures u and w which respectively communicate with the passages q and q^2, the passage q^2 also communicating with the exhaust, as and for the purposes specified.

5. The combination of the casing A carrying the projecting bearing h with the shaft B hung in said bearing, passage or passages q between said shaft and said bearing, packing s embracing said shaft and contacting with the end of the bearing, pulley M carried by said shaft and embracing said bearing h and outlet v, all arranged so as to permit lubricating matter from the casing A to pass through the channel or channels q around the packing s into the bearing-surfaces of the pulley M, and thence to the outlet v, substantially as and for the purpose specified.

6. In a rotary engine having hollow rotary shaft B and hollow stationary casing A, which casing is adapted to receive the lubricant, the lubricator passage or passages q extending from said casing along one terminal portion of said shaft on the outer side thereof in communication with its interior, and lubricator-passages q^2 in communication with the interior of said shaft near its opposite end and extending along the other terminal portion of said shaft to an exhaust, all arranged so that the lubricating substance within the casing will first lubricate one terminal portion of the shaft, then pass through the said shaft to its opposite end, then lubricate the other terminal portion of said shaft and finally escape into the exhaust, as and for the purpose specified.

THOMAS R. ALMOND.

Witnesses:

GEO. E. MORSE,

MAURICE BLOCK.