(No Model.)

P. J. WEBER.

ROTARY ENGINE.

No. 377,364. Patented Jan. 31, 1888.

Fig. I.

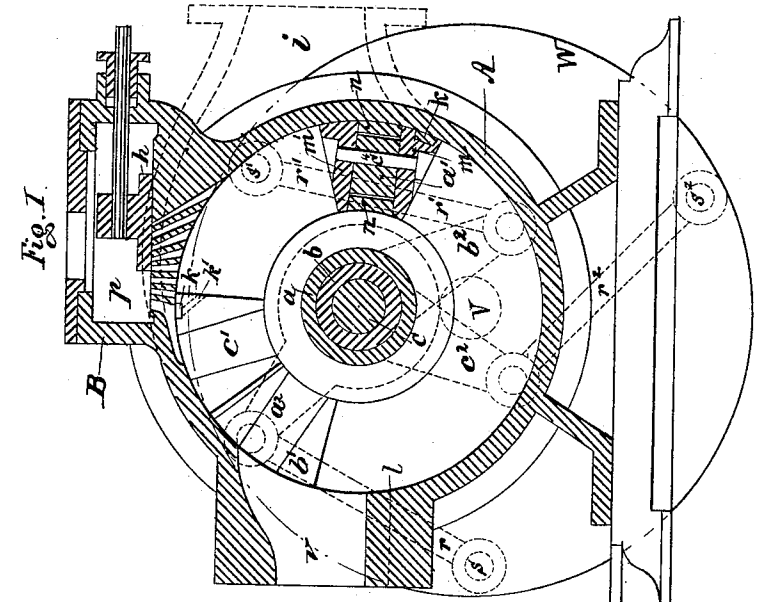
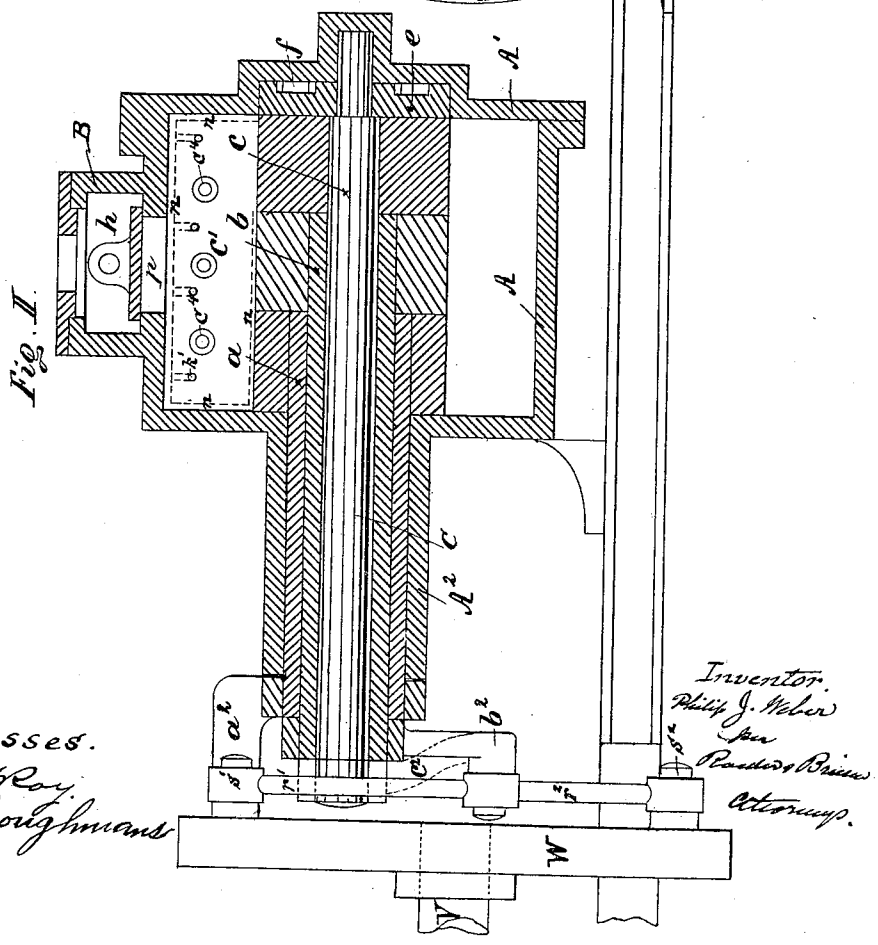


Fig. II.



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UNITED STATES PATENT OFFICE.

PHILIP J. WEBER, OF NEU-OETTING, ASSIGNOR OF ONE-HALF TO LUDWIG ZECHMEISTER, OF MUNICH, BAVARIA, GERMANY.

ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 377,364, dated January 31, 1888.

Application filed August 17, 1886. Serial No. 211,094. (No model.) Patented in Germany March 23, 1886, No. 37,424; in Italy December 14, 1886, No. 20,627; in Belgium December 15, 1886, No. 74,756, and in France February 7, 1887, No. 178,895.

To all whom it may concern:

Be it known that I, PHILIP JAMES WEBER, of Neu-Oetting, Bavaria, Germany, have invented a new and Improved Rotary Engine, (for which I have obtained the following Letters Patent: Germany, No. 37,424, dated March 23, 1886; France, No. 178,895, dated February 7, 1887; Italy, No. 20,627, dated December 14, 1886, and Belgium, No. 74,756, dated December 15, 1886,) of which the following is a full, clear, and exact description.

The nature of my invention consists in the arrangement of three or more pistons in the cylinder, revolving concentrically behind each other, connected to an axis passing through each other, to transmit motion to a driving-shaft placed eccentrically to the cylinder-shafts. When motion is applied outward, the pistons can act as pumps or blowers.

The invention consists of the various improvements hereinafter more fully described.

In the accompanying drawings, Figure I is a vertical cross-section through the cylinder, and Fig. II is a longitudinal section of the same.

A is a cylinder attached to a bed-plate, and provided with exhaust-passage *v* and inlet-passages *p*, closed by a suitable slide-valve, *h*. The valve *h* is inclosed in a case, B, in the usual manner. A′ is the cylinder-cover. The other end of the cylinder is cast solid and provided with a long hub, A^2. In the cylinder three or more shafts, *a b c*, are arranged, the central shaft, *c*, having a bearing in the cylinder-cover A′, and the two other shafts, *b a*, being hollow, the shaft *b* passing over the shaft *c* and the shaft *a* passing over the shaft *b*. The shaft *c* extends in the cylinder through the whole width of the same, while the shaft *b* extends only two-thirds into the cylinder and the shaft *a* only one-third. To the ends of these shafts the hubs of the pistons *c′*, *b′*, and *a′* are secured, the piston *c′* extending over the hubs of the pistons *b′ a′*, the piston *b′* over the hubs of the pistons *a′* and *c′*, and the piston *a′* over the hubs of the pistons *b′ c′*, so as to fill the annular space between the respective hubs and the inside of the cylinder. At the outer ends the shafts *a b c* extend likewise some distance past each other, sufficient to receive the hubs of their respective cranks a^2, b^2, and c^2. (See Fig. II.) The ends of these cranks a^2, b^2, and c^2 are connected through rods $r\ r'\ r^2$ with pins $s\ s'\ s^2$, secured in a wheel, W, fast on the driving-shaft V, placed eccentrically to the shafts *a b c*. The cranks $a^2\ b^2\ c^2$ are describing with their pins a circle which is less in diameter than the circle which is described by the pins $s\ s'\ s^2$, so that the first circle is almost wholly lying within the second. The different sizes of these circles, combined with the application of more than two pistons, cause the avoidance of the dead-points in the rotary motion.

The end surfaces of the pistons are provided with the usual elastic packing-strips, *n*, such as india-rubber or canvas. (Shown in dotted lines in Fig. II.) To facilitate the fitting of these elastic packings, each piston is provided with two side pieces, *m m′*, ground to fit against the hubs of the adjoining pistons and against the inner surface of the cylinder, and secured to the body of the piston by screws c^4. When these elastic packings *n* pass the inlet-openings, they will be affected by the pressure and become ineffective. To obviate this difficulty, packing-plates *k* are fitted into the end surfaces of the side pieces *m* next the cylinder-surface, connected by the passages *k′* with the interior of the cylinder. The steam, entering these openings *k′*, will act upon the packing-plate *k*, and forms thus a tight packing before the elastic packing is affected by the action of the steam-pressure.

To form always a tight fit between the hubs of the pistons *a′ b′ c′*, as well as between the ends of the hubs and pistons and the ends of the cylinder, a ring or disk, *e*, is fitted against the end of the hub of piston *c′*, and a recess in the ring or disk *e* is provided with suitable packing, *f*.

The inlet-passage *p* is divided into a number of channels or passages closed more or less by the slide-valve *h*. At the same time the following piston (*c′* in Fig. I) can sooner or later shut off the steam to the preceding piston, (*a′* in Fig. I,) according to the greater or less covering of the slide-valve *h*.

In Fig. I the piston *c′* is just about to shut

off the steam from piston a'. A further motion and piston c' will receive the full action of the steam or other pressure, while piston a' operates then only by the action of the expansion of the steam. By connecting the slide-valve h with a suitable governor the motion of the pistons, and consequently of the driving-shaft V, can be regulated.

It will be understood that any other pressure besides steam may be employed.

If this rotary machine is to be used as a pump, the inlet-passage is arranged as shown in dotted lines i in Fig. I, and the outlet-passage v should be enlarged, say, to dotted lines l, Fig. I.

It will be seen that to avoid dead-points it is necessary that at any moment at least one piston is occupying a position favorable to the rotary motion. When all pistons are at the same time in unfavorable positions, there results a dead-point, which recurs in each rotation as many times as there are pistons.

The advantages of the construction herein described are due to the peculiar relation between the circles described by the cranks of the pistons and by the pins $s\ s'\ s^2$ of the driving-shaft—that is, to the fact that the circles described by the cranks of the pistons are much smaller or much larger than the circles described by the pins of the driving-shaft.

I am aware of English Patent No. 1,569 of 1853, which shows a rotary engine so constructed that the circles described by the piston-cranks are of the same diameter as the circles described by the driving-shaft cranks. In this construction, therefore, all the three pistons will at times occupy positions unfavorable to the motion of the driving-shaft, and thus dead-points will occur. This construction I do not claim; but

I do claim as my invention—

1. The combination, in a rotary engine, of three or more revolving pistons, which are with their shafts set centrally one within the other in the cylinder, with the driving-shaft outside of the cylinder and lying eccentrically thereto and receiving rotary motion from the pistons, all being so constructed that the crank-pins describe a circle much less or much greater in diameter than the circle described by the pins of the driving shaft cranks, substantially as specified.

2. In combination with the pistons rotating in a cylinder, A, the side plates, $m\ m'$, with packing k in the plate m, connected through passages k' with the interior of the cylinder, substantially as specified.

3. The combination of cylinder A and pistons $a'\ b'\ c'$, provided with packing $n\ k$, and side plates, $m\ m'$, with the head A′ and disk e, containing packing f, substantially as described.

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