

(No Model.)

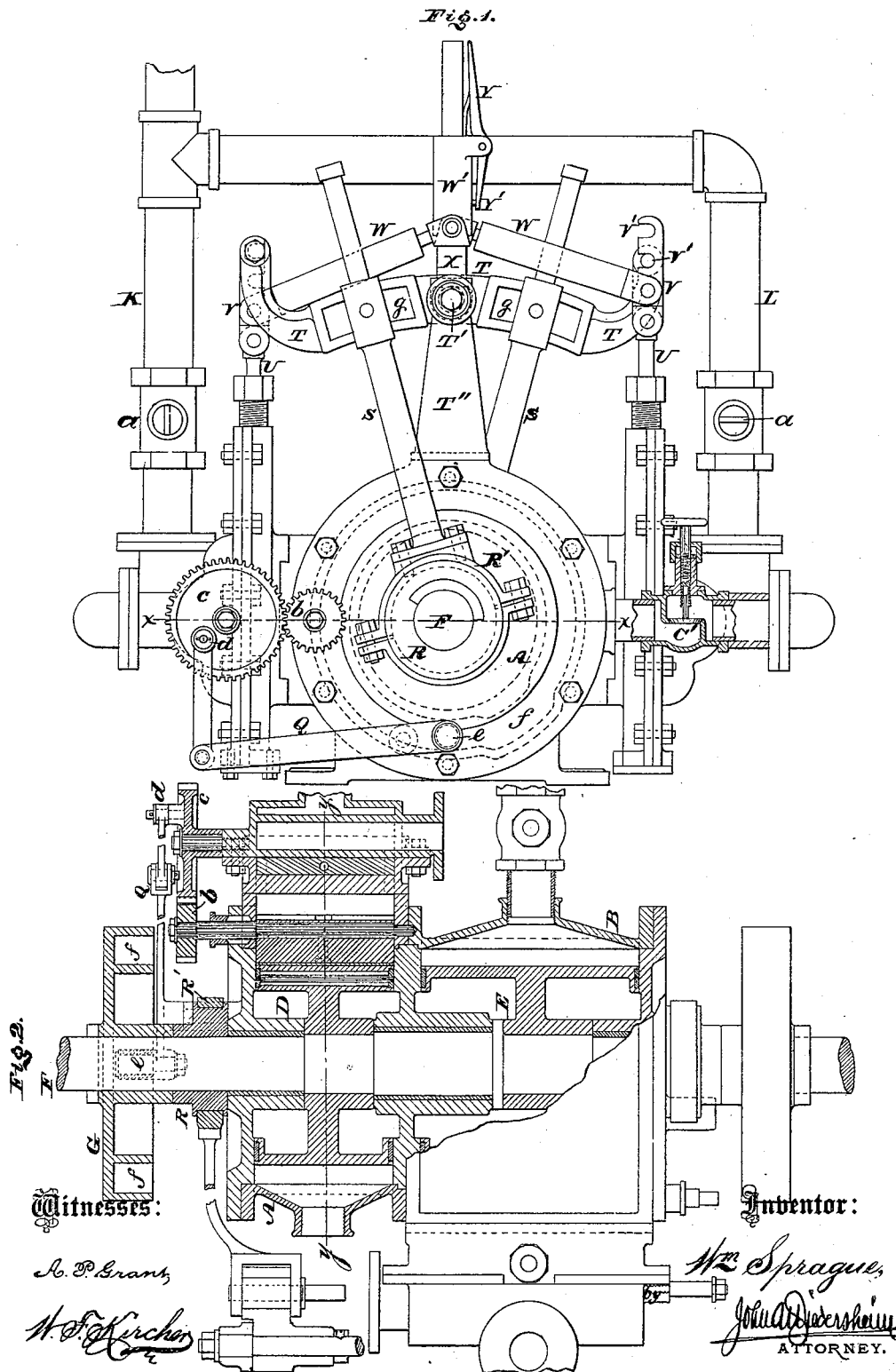
2 Sheets—Sheet 1.

W. SPRAGUE.

## ROTARY ENGINE.

No. 262,141.

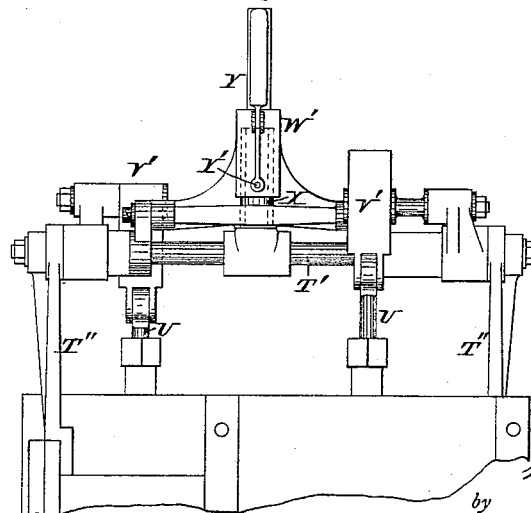
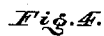
Patented Aug. 1, 1882.



2 Sheets—Sheet 2.

No. 262,141.

Patented Aug. 1, 1882.



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# UNITED STATES PATENT OFFICE.

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## ROTARY ENGINE.

SPECIFICATION forming part of Letters Patent No. 262,141, dated August 1, 1882.

Application filed March 22, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM SPRAGUE, a citizen of the United States, residing in the city and county of Philadelphia, and State of Pennsylvania, have invented a new and useful Improvement in Rotary Engines, which improvement is fully set forth in the following specification and accompanying drawings, in which—

Figure 1 is a side elevation of the rotary engine embodying my invention. Fig. 2 is a horizontal section of a portion thereof in line *xx*, Fig. 1. Fig. 3 is a vertical section thereof in line *yy*, Fig. 2. Fig. 4 is a view of a detached part.

Similar letters of reference indicate corresponding parts in the several figures.

My invention consists of a rotary compound steam-engine adapted to run at a high degree of speed and with increased effectiveness, and provided with reversing mechanism, the construction and operation thereof being herein-after fully set forth.

Referring to the drawings, A represents a small cylinder, and B a larger cylinder, which are suitably flanged and bolted or otherwise connected together, and though independent of each other are in communication by means of pipes C, each of which is provided with a check-valve, C', also constituting a stop-valve.

Within the cylinder A is a piston-wheel, D, and within the cylinder B is a piston-wheel, E, the two wheels being fixed on a shaft, F, which is passed centrally through the heads of the two cylinders and carries the pulley G, by which the power of the engine may be utilized or transmitted to machinery.

The cylinder A is provided with a valve and valve mechanism, with live and exhaust steam ports, as at H, and the cylinder B is similarly provided, as at J, a steam-supply pipe, K, leading to the valve mechanism H, and a steam-supply pipe, L, leading to the valve mechanism J, each supply-pipe having a cock, *a*.

The wheels are each provided with a piston, M, on the periphery thereof, that M' of the wheel E being shown by the dotted lines, Fig. 3.

N represents the abutment-blocks, one for

each cylinder, the same being fitted between the walls of the ports *a'*, and bearing against the periphery of the wheel, and having an opening in which is fitted an eccentric, P, the shaft of which passes through the head of the cylinder, and carrying on its outer end a pinion, *b*, which gears with a spur-wheel, *c*, properly mounted on the outer walls of the valve mechanism, and having pivoted to its wrist-pin *d* a jointed arm, Q, one limb of which is pivoted to the head of the cylinder, and carries at its outer end a stud or pulley, *e*, adapted to be engaged at intervals by a cam, *f*, on or a cam-groove in the pulley G, so that rotation is imparted to the wheels *c b*, and consequently to the eccentric P, whereby the abutment-block will be moved from the periphery of the piston-wheel to allow the passage of the piston M, and afterward again moved against said periphery as the closing point of the wheel.

On the outer ends of the shaft F are eccentrics R, the surrounding yoke R' of each of which is connected to an arm, S, whose upper end is adjustably fitted to a rocking lever, T, the shaft T' whereof is mounted on standards T'', rising from the frame or cylinders of the engine, the rocking lever T having segmental slots *g* to receive blocks to which the arms S are pivoted, and formed with notches into which drop the holding-teeth of said arms S, the teeth being adapted to be raised to clear the notches of the lever T, and when the arms are moved or adjusted the teeth drop into the respective notches, and so hold the arms in position.

The outer ends of the rocking lever T are removably connected to the upper ends of the stems U of the valves of the two cylinders, and said ends V are hinged or swiveled to the main portions of the stems and formed with hooks V' for the reception of pins or studs on the ends of the rocking lever T. To the hooked ends V are pivoted levers W, somewhat of the order of toggle-levers, the central connecting-pivots of which are attached to a sleeve, W', which is fitted on a collar, X, supported on the standard T''. A spring, X', is placed within the collar and sleeve, and rests on the top of the standard and bears upwardly against the sleeve. A catch, Y, with a proper handle, is

pivoted to the sleeve, and has a nose, Y', which, when the sleeve is lowered, drops into an opening, k, at the bottom of the collar X, and holds the sleeve.

5 It will be seen that when the ends of the rocking lever T are to be changed from one set of hooks to the other the sleeve W' is depressed. This forces down the levers W and throws out the hooked and hinged ends V of the valve-stems U, thus disengaging the rocking lever. The latter is then raised or lowered to enter the upper or lower hooks, and the catch Y is released, and the spring X' raises the sleeve W' and with it the arms W, thus drawing in the ends V, so that the hooks again engage with the rocking lever, these features being employed when the engine is to be reversed.

10 In starting the engine both cocks a a are opened and both check-valves C' closed, both cylinders then taking live steam. The steam from cylinder A exhausts at the proper port of its valve mechanism H, and that from cylinder B at the proper port of the valve mechanism J.

25 Should less power be required, steam is shut off from the cylinder B by closing the proper cock a. The opposite check-valve C' is opened. Steam from the cylinder A then passes into the cylinder B and works there expansively; or steam from the cylinder A is shut off, the opposite cock a is closed, and the opposite check-valve is opened and the other check-valve is closed, live steam then entering the cylinder B, and, passing into the cylinder A, works there expansively.

30 It will be seen that the steam acts upon a piston of certain area and revolves the shaft F. After a half-revolution of the shaft or piston the steam is cut off and allowed to act upon the piston in the other cylinder at the same time with the first cylinder. At this moment there is steam of the same pressure on both pistons. The steam begins to expand, and, giving the area of the piston in the second cylinder the proper proportion at the end of the next half-revolution, the same pressure will be on the pistons as there was originally on the first cylinder alone. When the piston passes the port a' the cylinder A exhausts and the check-valve C' closes quickly, owing to the pressure on its under side being released by the exhaust. The steam follows the piston of cylinder B until it arrives at its exhaust-port. In the meanwhile the piston of cylinder A has arrived at its steam-port, and

the second cylinder exhausts ahead and takes live steam from the boiler.

The power gained through the expanding steam in the second cylinder is an actual gain over the live steam admitted to the first cylinder from the boiler, and the pressure will be equalized on both pistons.

During the operation and running of the engine the exhaust-ports of both cylinders are constantly open to the atmosphere, so that there is no back-pressure on the piston to overcome the slide-valves, which are balanced.

The steam-chests and their valves are so arranged and timed that steam is entirely cut off from the cylinders while the pistons pass the abutment-blocks.

The check-valves C' have their stems of two parts, fitting each other telescopically, whereby when the upper stem of a valve is fully lowered the valve proper is forced on its seat as a stop-valve, and when said stem is raised the valve proper is adapted to rise and fall as a check-valve.

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

1. In a rotary engine, the combination of the concentric piston-wheels and the movable abutment-blocks with two pistons and cylinders of different areas on the same shaft, a communicating pipe, and a compound check and stop valve, live steam being supplied to one cylinder and passing thence as exhaust-steam to the other cylinder, substantially as set forth.

2. The combination, with the eccentrics, of the arms S, the rocking lever T, with slots g, and the valve-stems, substantially as and for the purpose set forth.

3. The hooks V' of the stems U, and levers W, in combination with collar X and sleeve W', substantially as and for the purpose set forth.

4. The combination, with the levers W, collar X, and sleeve W', of the catch Y and spring X', substantially as and for the purpose set forth.

5. The combination of double cylinders, valve mechanism, and reversing mechanism, constructed and operating substantially as and for the purpose set forth.

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Witnesses:

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