

(No Model.)

2 Sheets—Sheet 1.

W. H. WOOD,
VAPOR ENGINE.

No. 338,814.

Patented Mar. 30, 1886.

Fig. 1

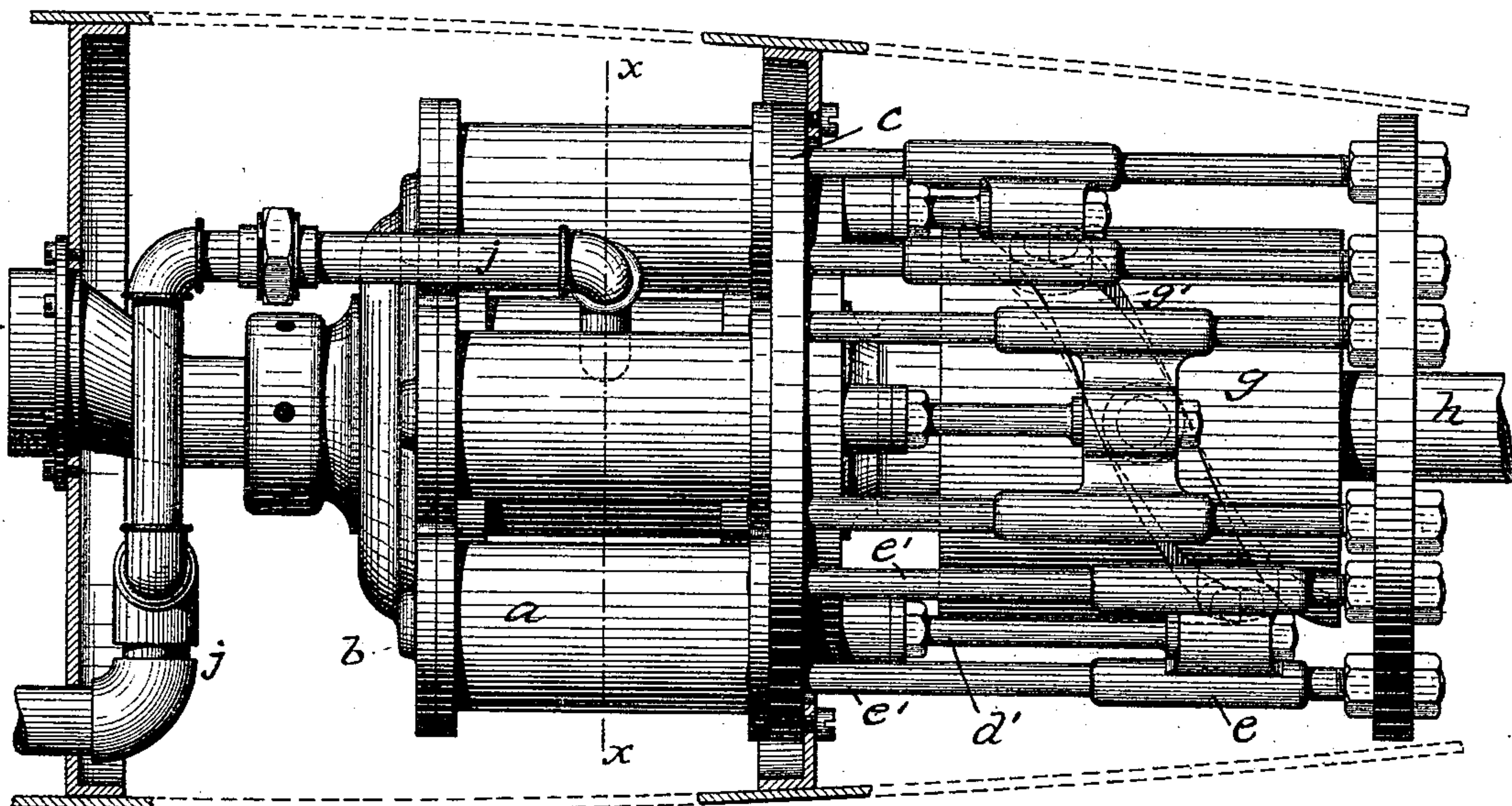
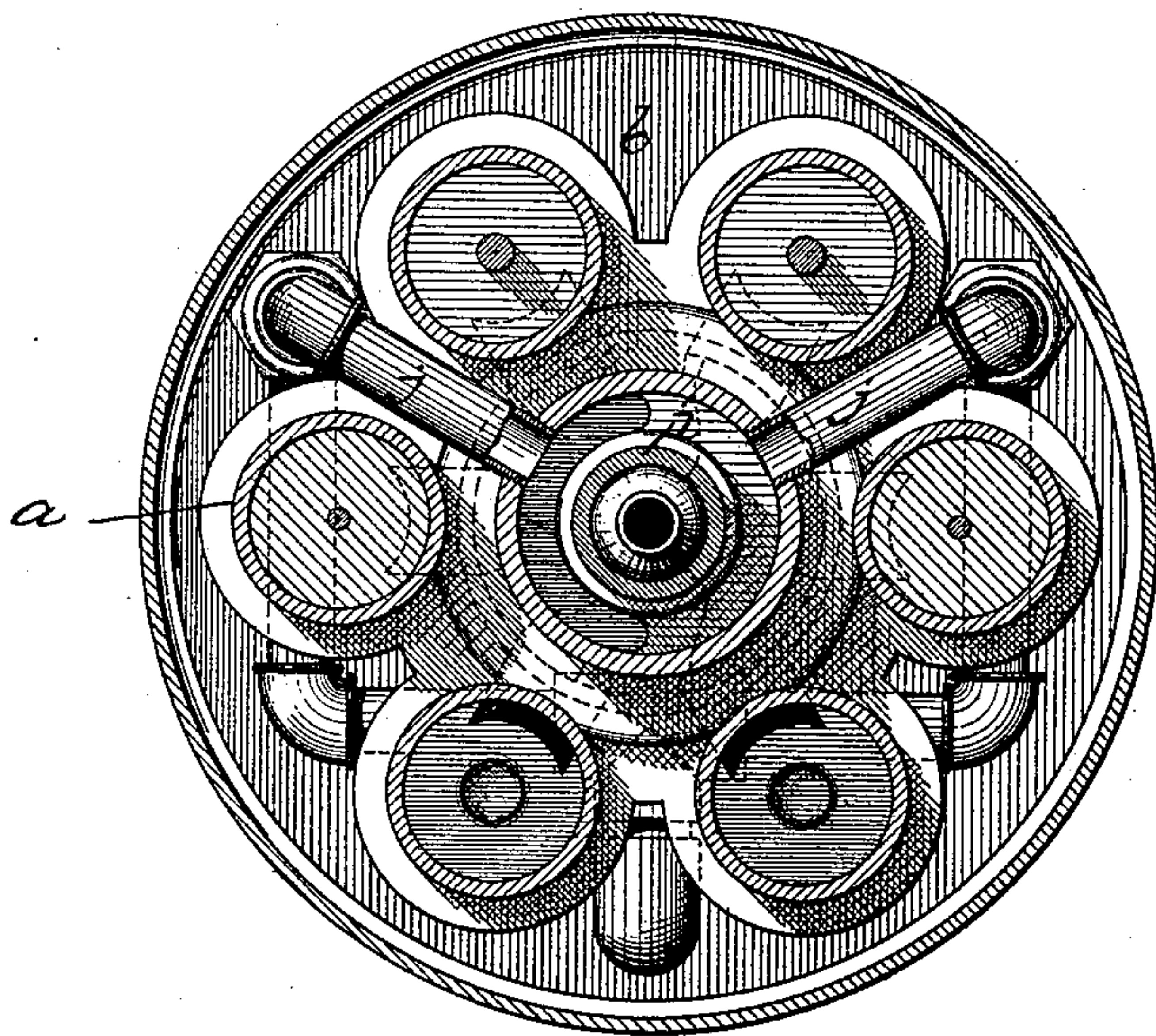


Fig. 2



Witnesses

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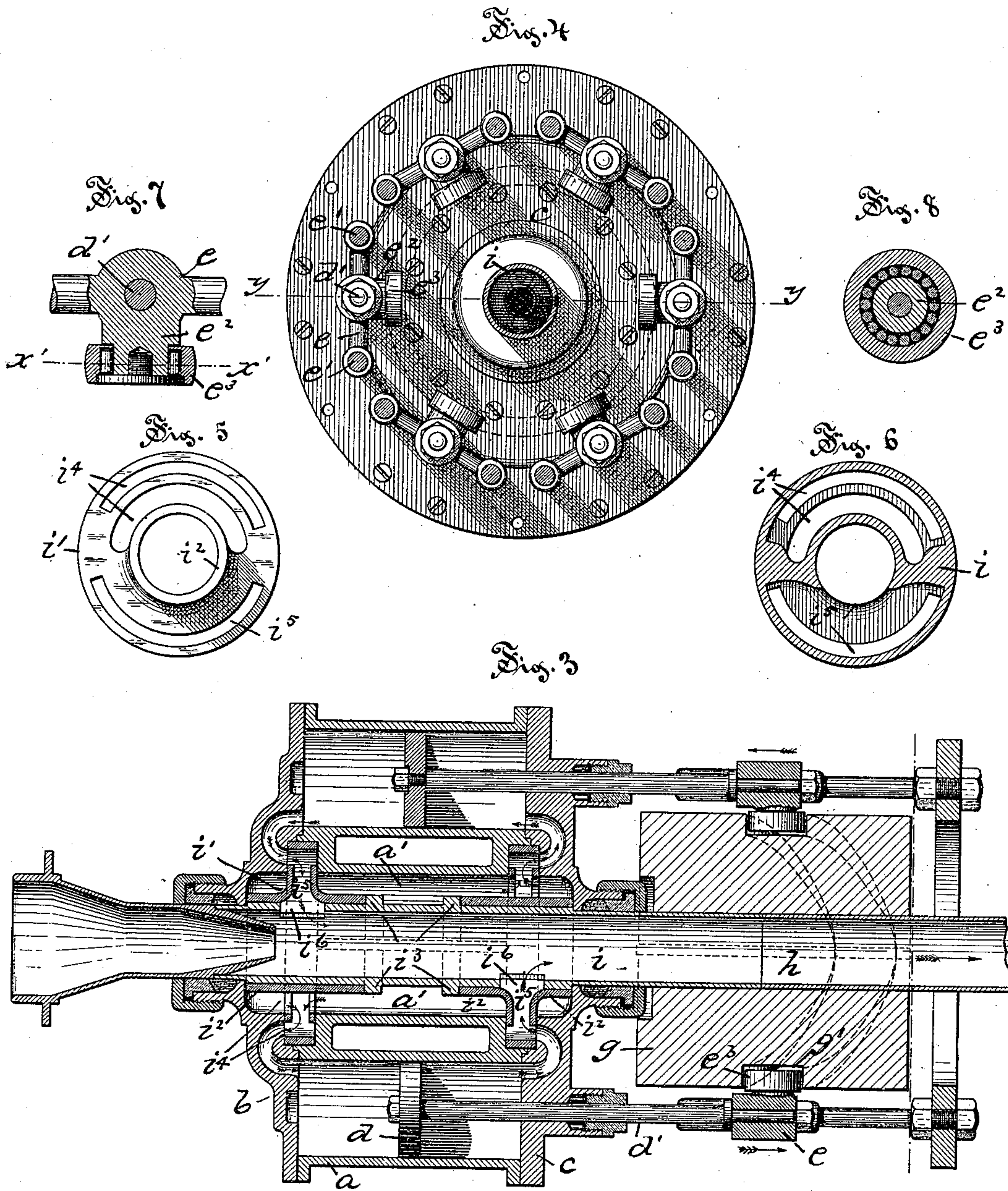
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UNITED STATES PATENT OFFICE.

WILLIAM H. WOOD, OF HARTFORD, CONNECTICUT.

VAPOR-ENGINE.

SPECIFICATION forming part of Letters Patent No. 338,814, dated March 30, 1886.

Application filed July 17, 1885. Serial No. 171,871. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. WOOD, of Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Vapor-Engines, of which the following is a description, reference being had to the accompanying drawings, and the letters of reference marked thereon, where—

Figure 1 is a plan view of an engine embodying my invention, and shown in place in a part of the shell of a torpedo-boat. Fig. 2 is a view in cross-section through the center of the cylinders on plane denoted by line *xx* of Fig. 1. Fig. 3 is a view in central longitudinal section through the valve-stem and shaft of the engine on plane *yy* of Fig. 4. Fig. 4 is an end view of the cylinder-body with the shaft removed and in cross-section through the guide rods or ways. Fig. 5 is a detail end view of one of the rotary valves used in this engine. Fig. 6 is a view in cross-section of the valve, showing the several ports. Fig. 7 is a detail view on enlarged scale of part of one of the cross-heads, showing the anti-friction rolls on the cam-engaging pin. Fig. 8 is a view on enlarged scale in cross-section through the anti-friction rolls on line *x'x'* of Fig. 7.

The object of my invention is to provide a simple and compact engine that can be operated by the expansion of vapor—as steam, carbonic acid, or the like gas—and one in which the use of a crank is avoided; and to this end my invention consists in a series of cylinders grouped about a central rotary valve-stem that is coupled to the driving-shaft that bears a cam-block, in combination with the piston-rods and cross-heads bearing and pressing against a face-cam, or bearing-pins that take into a cam-groove in the cam-block and serve to translate the reciprocating movement of the piston into the rotary movement of the shaft, and in details of the device, as more particularly hereinafter described.

The form of engine herein described and shown is arranged for use in a submarine torpedo-boat, for which purpose it is particularly adapted; and in the accompanying drawings the letter *a* denotes one of the cylinders, a group of which are preferably formed in a single casting and arranged about a common

center with their axes parallel; *b*, the back head of the group of cylinders, and *c* the front head, both secured to the flanged edge of the group in any ordinary manner—as by nuts and bolts; *d*, the piston; *d'*, the piston-rod projecting through the opening in the front head, that has the usual stuffing-box and packing; *e*, a cross-head that is supported on the guide rods or ways *e'*.

In one of the forms shown the cross-head *e* bears a pin or lug, *e''*, on which is held a roller, *e'''*, that is preferably provided with any suitable form of anti-friction device—as a series of small rollers, as shown in Figs. 7 and 8—arranged between the inner edge of the roller and the bearing. The rollers are fast to several cross-heads in such position that they lie in a cam-groove, *g'*, that is cut in the cam-block *g*. This groove is so shaped that the reciprocating movement of the piston causes the block to rotate by the contact of the rollers with the face of the cam, and this cam-block is securely keyed to the central shaft, *h*, and also to the valve-stem *i*, which extends within an opening in the center of the cylinder-body that forms the steam-chest *a'*.

The valve *i'* is made in the shape of a hollow disk with the centrally-projecting hubs *i''*, which fit closely upon the valve-stem, and is secured to it by means of a key. There are two of these valves—one at each end of the group of cylinders—and they are seated in a recess formed between the end of the cylinder-body and each cylinder-head, and are held between the shoulders *i'''* on the outside of the valve-stem and the inner side of the cylinder-heads. This serves to prevent any endwise play of the stem. Each valve is provided with the inlet-ports *i⁴* and the outlet-ports *i⁵*, the former being made in the shape of the curved slots through the walls of the valve-body upon one side of the center in the case of the inlet-ports, while the outlet-ports are made up of the curved slot through the walls and the opening through the center wall, which is arranged to register with the opening *i⁶* through the wall of the hollow valve-stem *i*, as shown in Fig. 3. The inlet-ports of the valves which lie nearest the center open into the steam-chest *a'*, while the outer ones connect with the steamways, which are passages formed in the cylinder-heads and which

open into the cylinders at their other ends. The several valves are so arranged that the steam or other vapor, the expansion of which forms the motive power, is taken into or exhausted from the cylinders in pairs that are arranged diametrically opposite each other, and while the pistons of one side are on the return-stroke those on the opposite side are beginning a stroke. This arrangement of the valves and ports is clearly shown in Fig. 3, and the direction of the currents of expanding steam or other motive force is indicated by the several arrows in the same view. The cam-block *g* is keyed to both the valve-stem *i* and the shaft *h*, and forms a coupling for these parts that meet within the block, the shaft in this instance being hollow, to form an outlet for the exhaust that enters the hollow valve-stem *i* and passes through the shaft out of the stern of the boat.

It is evident that the relative functions of the ports as inlets and outlets may be reversed by introducing the supply of steam or its equivalent motive power through the hollow stem and using the present inlet-tube *j* as an outlet for the exhaust, and it is also possible without departing from my invention to construct the engine with the shaft and valve-stem fixed against rotation and allow the group of cylinders to be revolved by the thrust of the pistons against the curved cams.

I claim as my invention—

1. In a vapor-engine, in combination, a group of cylinders arranged about a common center, the pistons with connected rods that engage a curved cam formed on a cam-block fast to

the central shaft, and the hollow rotary valve-stem bearing the rotary valves with the several inlet and outlet ports, all substantially as described.

2. In a vapor-engine, in combination, a cylinder, a piston with its piston-rod bearing the anti-friction roller that engages a curved cam, the cam-block bearing the cam and fast to the driving-shaft, and the hollow rotary valve-stem bearing the rotary valves with the several inlet and outlet ports, all substantially as described.

3. In combination with a group of cylinders arranged about a common center and with their axes parallel, the pistons with connected rods, the curved cam fast to the main shaft and set in a plane transversely of the line of movement of the rods, the hollow valve-stem bearing the rotary valves having inlet and outlet ports and held between the cylinder-heads and the shoulders on the valve-stem, all substantially as described.

4. In combination with the group of cylinders arranged about a common center, the pistons connected to the main shaft, whereby the latter is rotated, the hollow valve-stem bearing the rotary valves with the inlet-ports cut through both walls of the hollow disk-like valves, whereby the valve is counterbalanced, and the outlet-ports opening into the valve-stem, all substantially as described.

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Witnesses:

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CHAS. L. BURDETTE.