No. 724,907. PATENTED APR. 7, 1903.

R. S. MATTESON.

ROTARY EXPANSION ENGINE.

APPLICATION FILED AUG. 11, 1902.

NO MODEL. 3 SHEETS—SHEET 1.

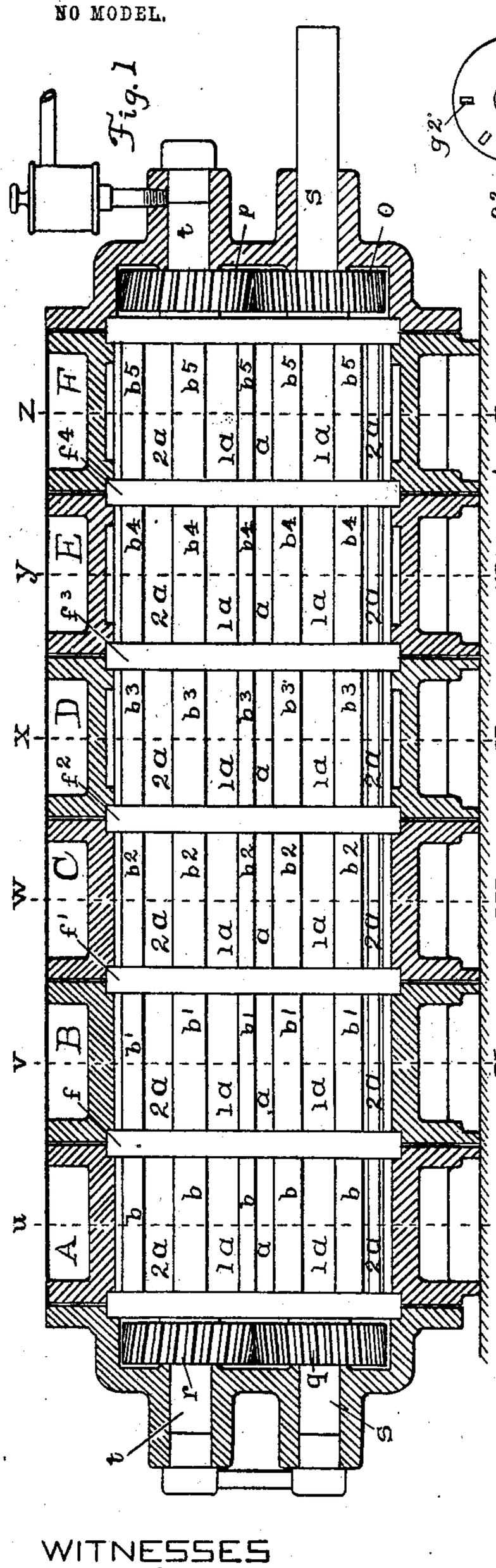

Fig. 1

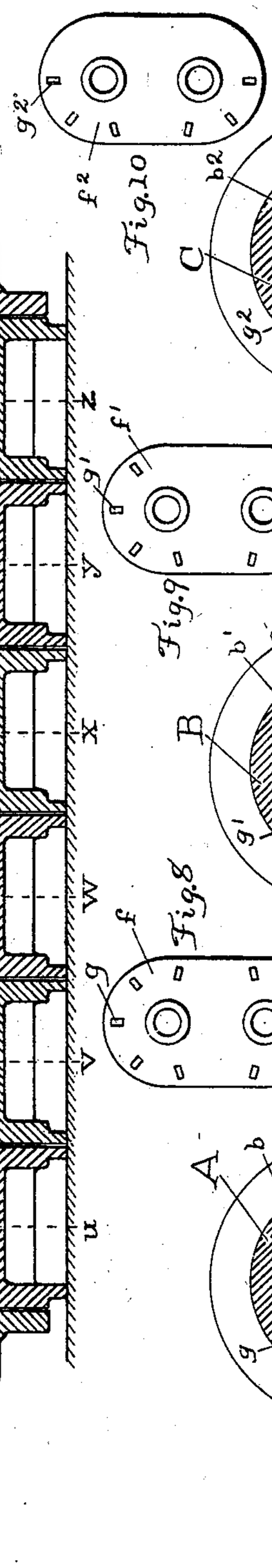

Fig. 10

Fig. 9

Fig. 8

Fig. 4

Fig. 3

Fig. 2

WITNESSES

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NO MODEL. 3 SHEETS—SHEET 2.

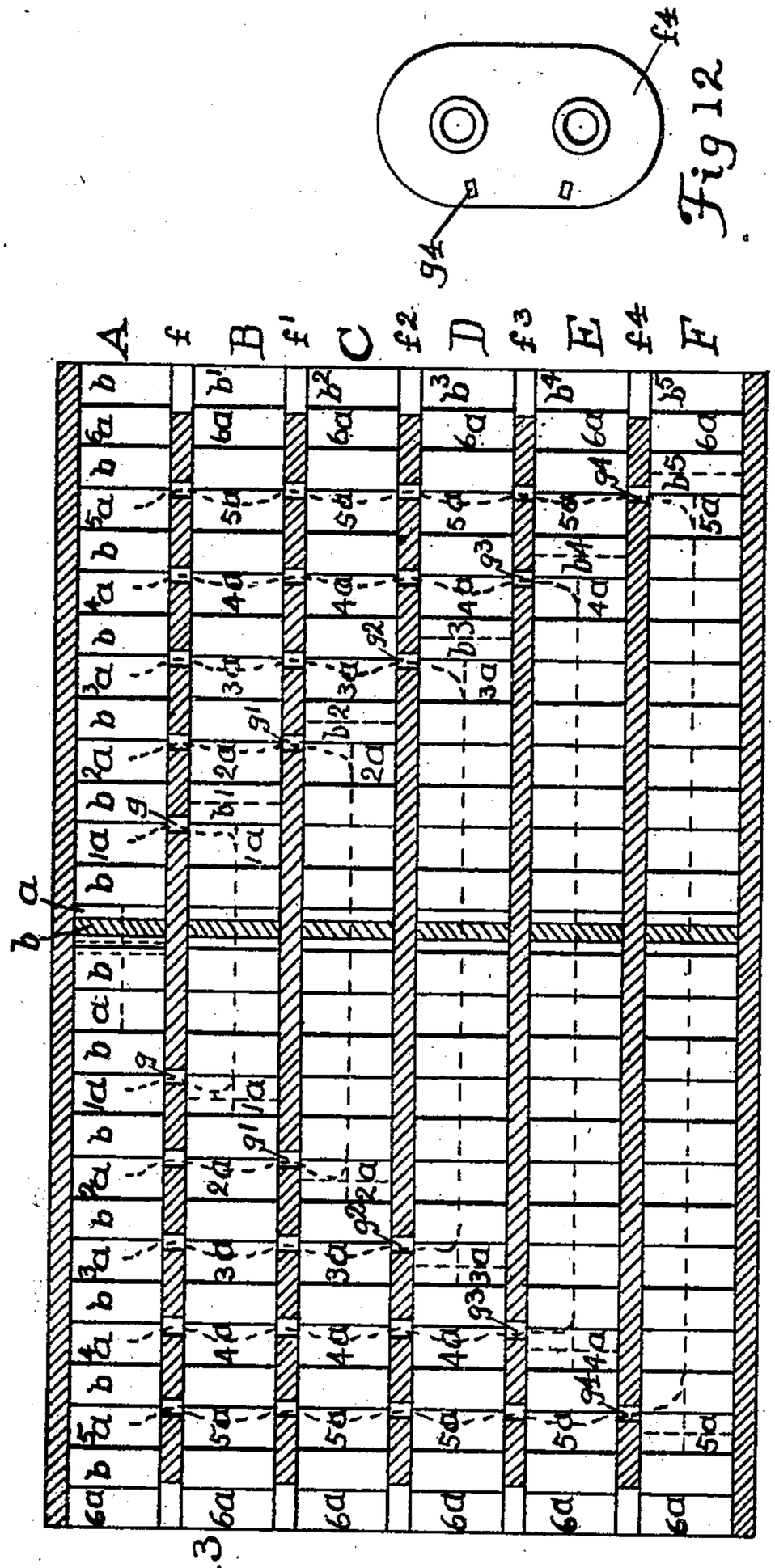

Fig 13

Fig 12

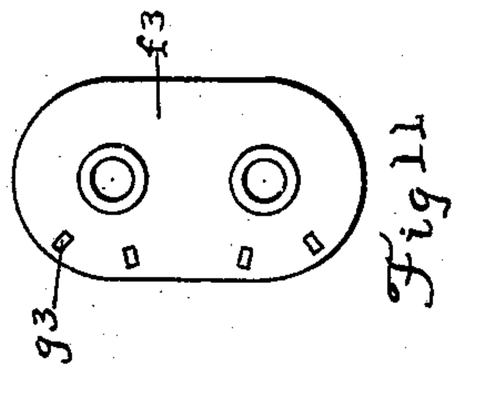

Fig 11

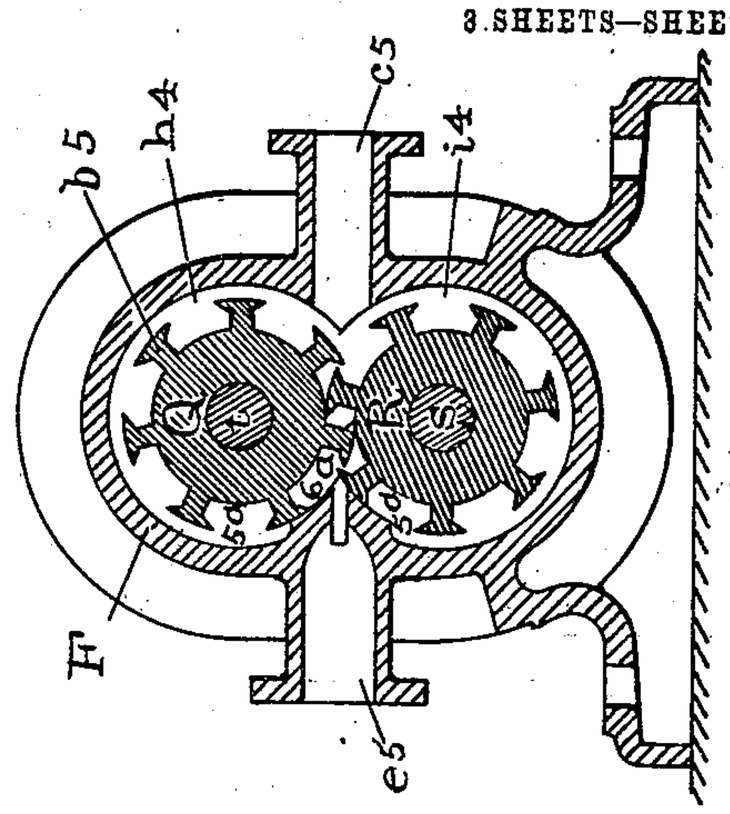

Fig 7

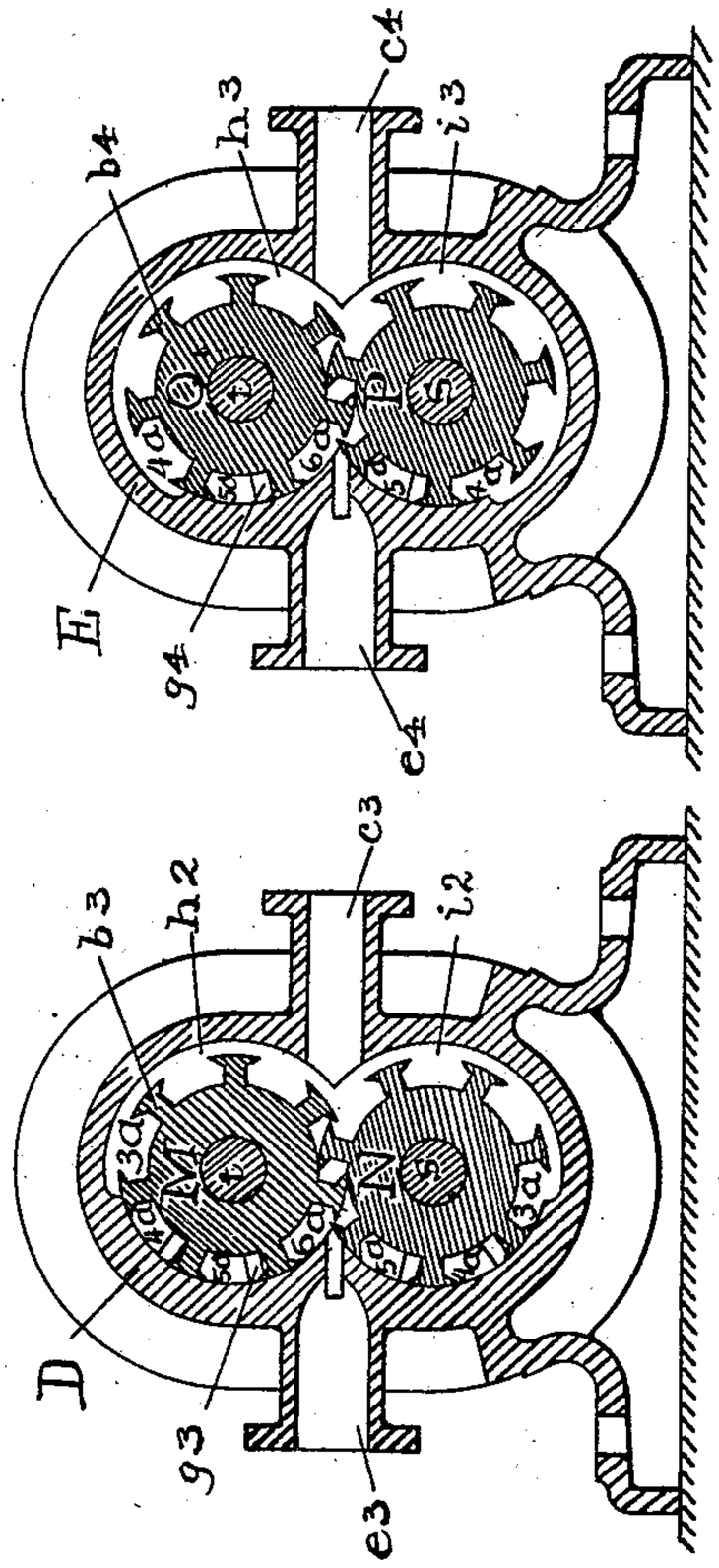

Fig 6

Fig 5

WITNESSES

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NO MODEL. 3 SHEETS—SHEET 3.

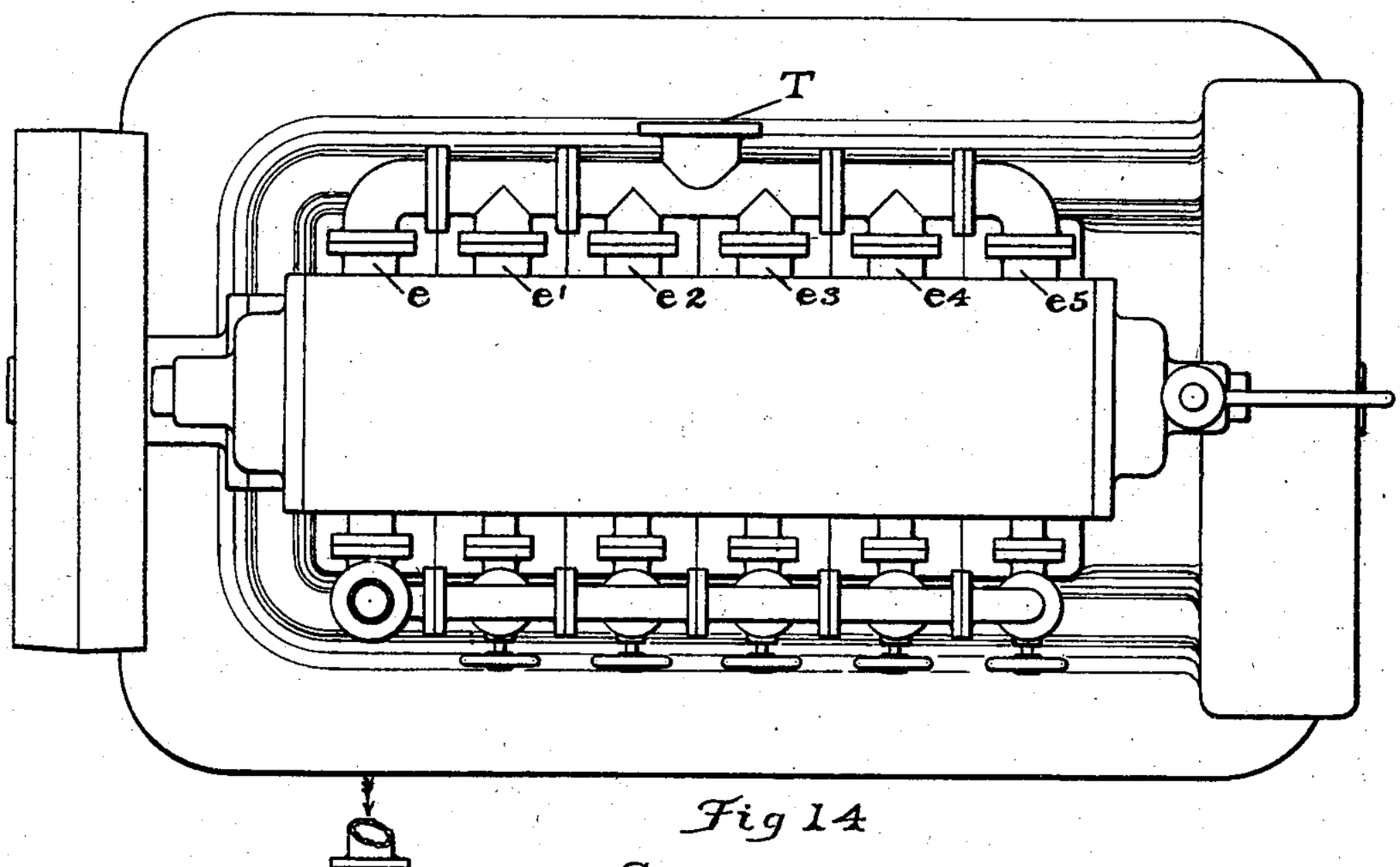

Fig 14

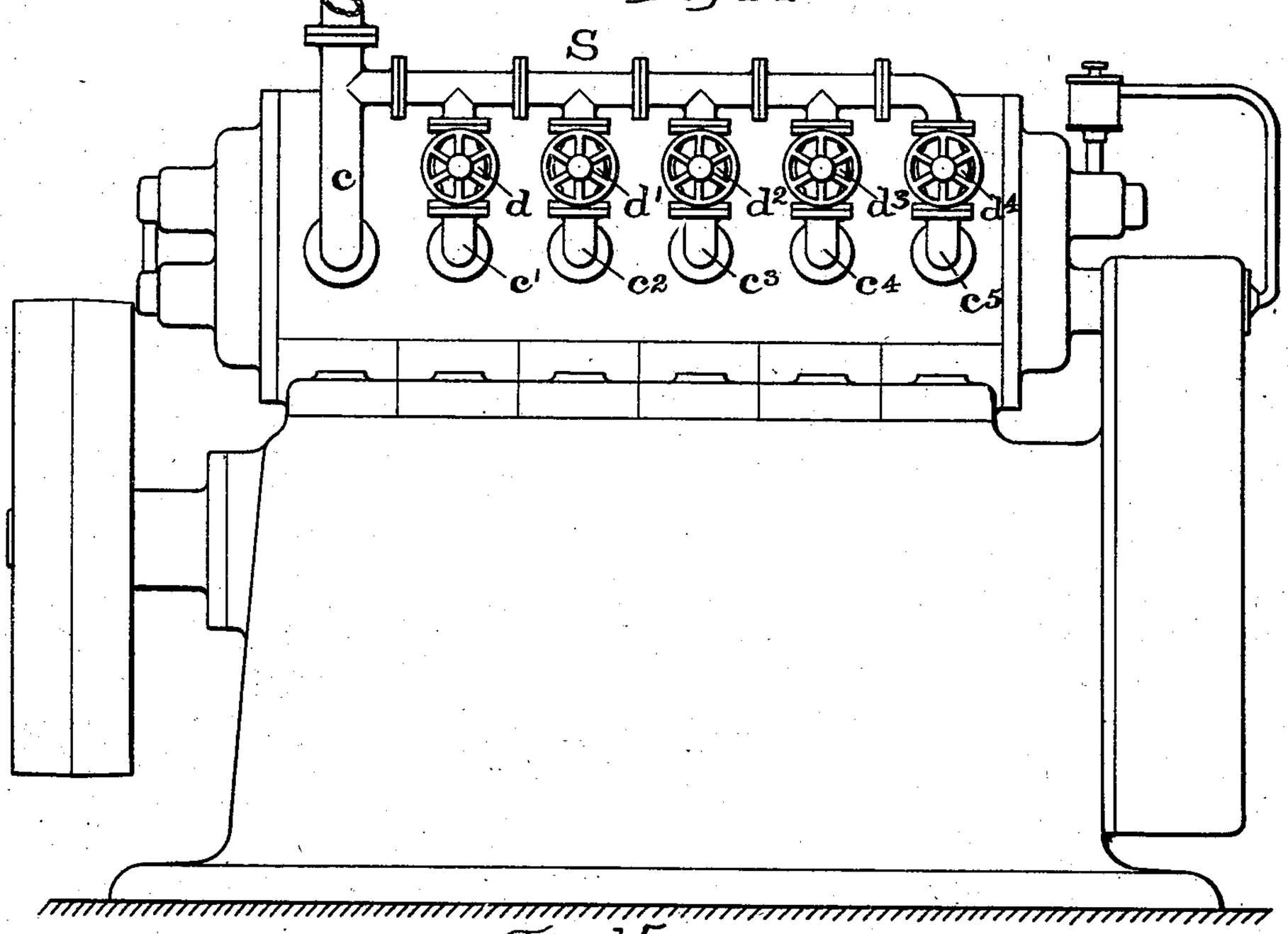

Fig 15

WITNESSES

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Olney T. Inman.

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ATTORNEY

UNITED STATES PATENT OFFICE.

RUFUS S. MATTESON, OF PROVIDENCE, RHODE ISLAND.

ROTARY EXPANSION-ENGINE.

SPECIFICATION forming part of Letters Patent No. 724,907, dated April 7, 1903.

Application filed August 11, 1902. Serial No. 119,308. (No model.)

To all whom it may concern:

Be it known that I, RUFUS S. MATTESON, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Rotary Expansion-Engines, of which the following is a specification.

My invention relates to that class of rotary engines which comprises a plurality of rotary pistons revolving with intermeshing peripheries upon parallel piston-shafts, and has for its primary purpose the absolute and complete conservation and utilization of the steam-supply. This and other incidental advantages are attained through the medium of my new structure, which is hereinafter described, and illustrated in the accompanying drawings, wherein—

Figure 1 is a longitudinal central section of my complete engine, showing the pistons and gearing in side elevation; Figs. 2, 3, 4, 5, 6, and 7, transverse sections of the same on lines *u u*, *v v*, *w w*, *x x*, *y y*, and *z z*, respectively, of Fig. 1; Figs. 8, 9, 10, 11, 12, side elevations of the partitions between the successive piston-couplets; Fig. 13, a diagrammatic view of the piston series; Fig. 14, a plan view of a stationary engine involving my invention, and Fig. 15 a side elevation of the same.

Referring by letters and figures to my mechanism, it consists of a transversely-elliptical cylinder composed of a plurality of sections A B C D E F, bolted or otherwise joined at their extremities. Longitudinally traversing the cylinder thus formed and journaled therein are two vertically-disposed piston-shafts *s t*, the former of which extended constitutes the main shaft. Upon the extremities of these are mounted intermeshing gears *o p q r*. On each of the piston-shafts is also mounted in succession a series of cylindrical rotary pistons G H I J K L M N O P Q R, with longitudinally-disposed peripheral impellers or valves *b b'*, &c., radiating therefrom. These valves are preferably transversely segmental at their extremities, with reduced intermediate portions, whereby a series of longitudinal chambers or pockets *a* 1^a 2^a, &c., are formed sufficiently broad to permit the radial valves of the vertically-adjacent pistons to intermesh.

A steam-supply pipe *c* leads from the boiler into the side of one of the end cylinders at a point adjacent the intermeshing piston-valves. A second steam-pipe S, leading from the pipe *c*, feeds the supply-pipes *c' c*, &c., of the several sections through valves *d d'*, &c. An exhaust-pipe *e e'*, &c., diametrically opposite the supply-pipe, leads from the opposite side of each successive section, all of which converge in a common exhaust-pipe T.

Intermediate each piston-couplet is a partition-plate *f f'*, &c., provided with radially-disposed openings *g g'*, &c., located at regular distances corresponding to that of the valves, so that every valve of the upper piston simultaneously covers the upper valve-openings, while every valve of the lower piston is intermediate the lower set of openings. In each successive plate, however, it will be observed that the number of openings *g g'*, &c., are regularly diminished by one both upwardly and downwardly from that portion of the plate adjacent to the side of the cylinder into which the steam-supply pipe enters.

The interior faces of the sections B C D, &c., are longitudinally segmentally recessed from a point adjacent the steam-inlet, forming curved steam-chambers of equal extent upwardly directed *h h'*, &c., and downwardly directed *i i'*, &c. It will be noted that the section A lacks these chambers; further, that said chambers successively increase in length throughout the series of sections, terminating in each instance at points short of the first remaining openings in the partition-plates at a distance equivalent to *j*, Fig. 3.

The operation of the mechanism is as follows: The steam enters the several sections A B C, &c., through the steam-pipe *c* directly and through the pipes *c' c^2*, &c., indirectly by way of the pipe S. The entering steam strikes the intermeshing valves *b* and expanding in the adjacent pockets rotates the upper and lower pistons G and H, the latter clockwise and the former in the opposite direction. The relation of the valves *b* to their respective adjacent ports or openings is such that when the valves of the piston G exactly cover their ports *g* the valves of the piston H expose their

adjacent ports, respectively. As all the pistons I J K L, &c., of the series rotate synchronously with G H, it is evident that similar conditions attain in each section at every moment of revolution. In detail, the steam on entering section A fills the pockets *a* and 1^a, which during rotation exhausts through the opening *g* into the pocket 1^a, (upper piston,) section B, and fills the entire segmental chamber *h i*, including the pocket 1^a, whence the steam expands back into section A through an adjacent opening *g* into pocket 1^a, (lower piston,) where it completes an increased rectangular expansion for section B. This operation is repeated analogously in section C thus: Referring to sections A and B, pocket 1^a (upper piston) by rotation becomes 2^a, (upper piston,) sections A and B, and exhausts through its adjacent openings *g* and *g'* into pocket 2^a, section C, and fills the entire segmental chamber *h' i'*, including the pockets 2^a, (lower piston,) sections B and A, where it completes its circuit of expansion. The operations thus outlined are repeated through the several remaining sections until circuit including 6^a is reached, when all the sections simultaneously exhaust into the air or condenser.

In originally starting the engine it is advantageous to have all the valves *d d'*, &c., opened initially to secure pressure upon an extensive piston area, at which time the steam is not used expansively, but merely to secure an initial impulse. Thereafter these valves should be closed.

It will be observed that the expansion herein is continuous and that the engine is in reality simple, although in appearance compound.

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

1. In a rotary engine a series of casing-sections, piston-shafts traversing the sections, a piston-couplet in each section mounted on the piston-shafts intermeshing radial valves upon the piston-couplets, partition-plates intermediate the several sections, a series of radially-disposed openings through each partition-plate, the number of openings in the series of each successive plate diminishing as the number of sections increase.

2. In a rotary engine a series of casing-sections, piston-shafts traversing the sections, a cylindrical piston-couplet in each section mounted on the piston-shafts, longitudinally-disposed pockets upon the peripheries of the piston-couplets, partition-plates intermediate each section, a series of radially-disposed openings through partition-plate and adapted to register with the successive pockets, the number of openings in the series of each successive plate diminishing as the number of sections increase.

3. In a rotary engine a series of casing-sections, piston-shafts traversing the sections, a couplet of cylindrical pistons in each section mounted on the piston-shafts, intermeshing radial valves upon the piston-couplets, partition-plates intermediate the several sections, a series of radially-disposed openings through each partition-plate and contiguous with the valves, a steam-inlet in each casing adjacent the intermeshing valves, and longitudinal recesses segmental in cross-section extending upwardly and downwardly from the steam-inlet in each casing-section except the first.

4. In a rotary engine a series of casing-sections, piston-shafts traversing the sections, a couplet of cylindrical pistons in each section mounted on the piston-shafts, intermeshing radial valves upon the piston-couplets, partition-plates intermediate the several sections, a series of radially-disposed openings through each partition-plate and contiguous with the valves, a steam-inlet in each casing adjacent the intermeshing valves, and longitudinal recesses segmental in cross-section extending upwardly and downwardly from the steam-inlet in each casing-section except the first, and of increased length in each successive section.

5. In a rotary engine a series of casing-sections, piston-shafts traversing the sections, a couplet of cylindrical pistons in each section mounted on the piston-shafts, intermeshing radial valves upon the piston-couplets, partition-plates intermediate the several sections, a series of radially-disposed openings through each partition-plate, and contiguous with the valves, the number of openings in the series of each successive plate regularly diminishing as the number of sections increase, a steam-inlet in each casing adjacent the intermeshing valves, and longitudinal recesses segmental in cross-section extending upwardly and downwardly from the steam-inlet to points short of the first remaining openings in the partition-plates, in each casing-section except the first.

6. In a rotary engine the combination with a series of casing-sections of a pair of rotating cylindrical pistons in each section, peripheral valves radiating from the pistons, a steam-inlet to each section, transversely-arcuate chambers adjacent the several steam-inlets, and means for exhausting the steam successively from the chamber of one section to the chamber of a more remote section.

7. In a rotary engine the combination with a series of casing-sections, of common piston-shafts, a piston-couplet mounted on the piston-shafts in each section, intermeshing radial valves on the piston-couplets forming intermediate peripheral pockets in longitudinal alinement throughout the piston series, passages between the alined pockets successively diminishing in number as the number of casing-sections increase, and a passage in each casing-section except the first connecting the terminals of two sets of alined pockets, to complete a series of expansion-chambers.

8. In a rotary engine the combination with

a series of casing-sections, of common piston-shafts, a piston-couplet mounted on the piston-shafts in each section, peripheral pockets similarly located upon the peripheries of each piston-couplet, steam-passages adapted to connect two or more of the pockets, and a steam-chamber in each casing-section transversely connecting two series of pockets to form an expansion-chamber.

9. In a rotary engine the combination with a series of casing-sections of two radially-contacting pistons in each section synchronously rotating in opposite directions, peripheral pockets upon the pistons, means intermediate each couplet for temporarily uniting the pockets of different piston-couplets, and means in each section for transversely joining the united pockets, to complete a series of constantly-enlarging expansion-chambers.

10. In a rotary engine the combination in a series of casing-sections of a plurality of piston-couplets rotating therein, and circuits of expansion intermediate the piston-couplets and the casings; said circuits increasing in area as they include successive casing-sections.

11. In a rotary engine the combination in a series of casing-sections of a plurality of piston-couplets rotating therein and expansion-circuits intermediate the piston-couplet and the casings; said circuits being concentrically arranged.

12. In a rotary engine the combination in a series of casing-sections of a plurality of piston-couplets rotating therein, concentrically-arranged expansion-circuits intermediate the piston-couplets and the casings, and means for simultaneously exhausting each entire circuit.

13. In a rotary engine, a series of casing-sections, piston-shafts traversing the sections, intermeshing piston-couplets in each section mounted on the piston-shafts, partition-plates intermediate the several sections, a series of radially-disposed openings through each partition-plate, the number of openings in the series of each successive plate diminishing as the number of sections increase.

14. In a rotary engine, the combination with a series of casing-sections of two radially-contacting pistons in each section synchronously rotating in opposite directions, a series of radially-disposed openings through each partition-plate, the number of openings in the series of each successive plate diminishing as the number of sections increase.

15. In a rotary engine, the combination with the casing of a pair of pistons, peripheral valves radiating therefrom, a steam-inlet, and longitudinal recesses extending upwardly and downwardly from the steam-inlet in the casing.

16. In a rotary engine, the combination with the casing of a pair of pistons, peripheral valves radiating therefrom, a steam-inlet in the casing adjacent the intermeshing valves, and recesses extending upwardly, and downwardly from the steam-inlet in the casing.

In testimony whereof I have affixed my signature in presence of two witnesses.

RUFUS S. MATTESON.

Witnesses:

JOSIAH A. KING,

OLNEY T. INMAN.