

(No Model.)

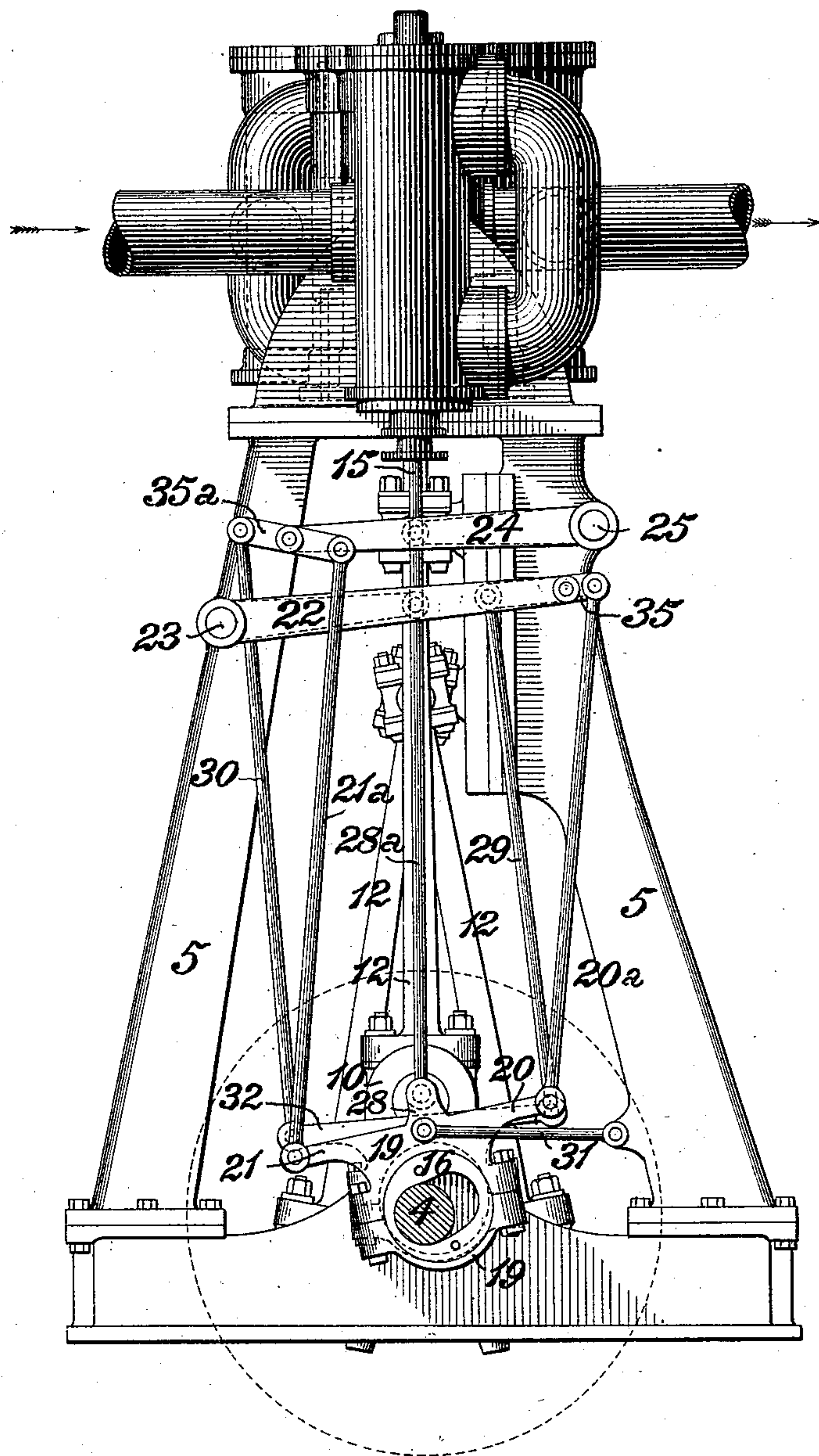
3 Sheets—Sheet 1.

F. M. RITES.  
VALVE GEAR.

No. 542,423.

Patented July 9, 1895.

FIG. 1.



WITNESSES:

*T. J. Hogan.*  
*A. C. Mather*

INVENTOR,

*Francis M. Rites.*  
*by J. F. Townsend Bell.*  
Att'y.

(No Model.)

3 Sheets—Sheet 2.

F. M. RITES.  
VALVE GEAR.

No. 542,423.

Patented July 9, 1895.

FIG. 2.

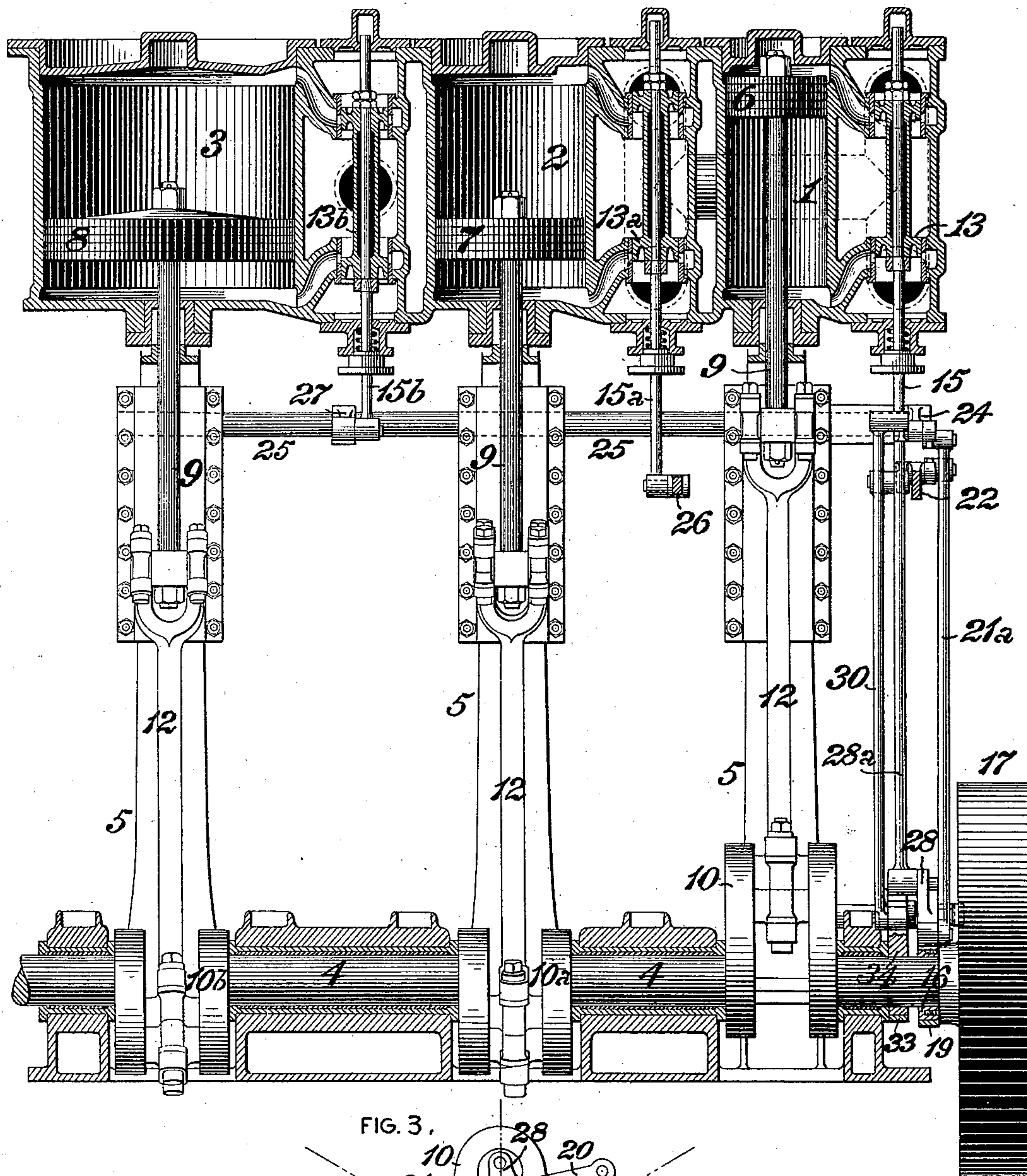
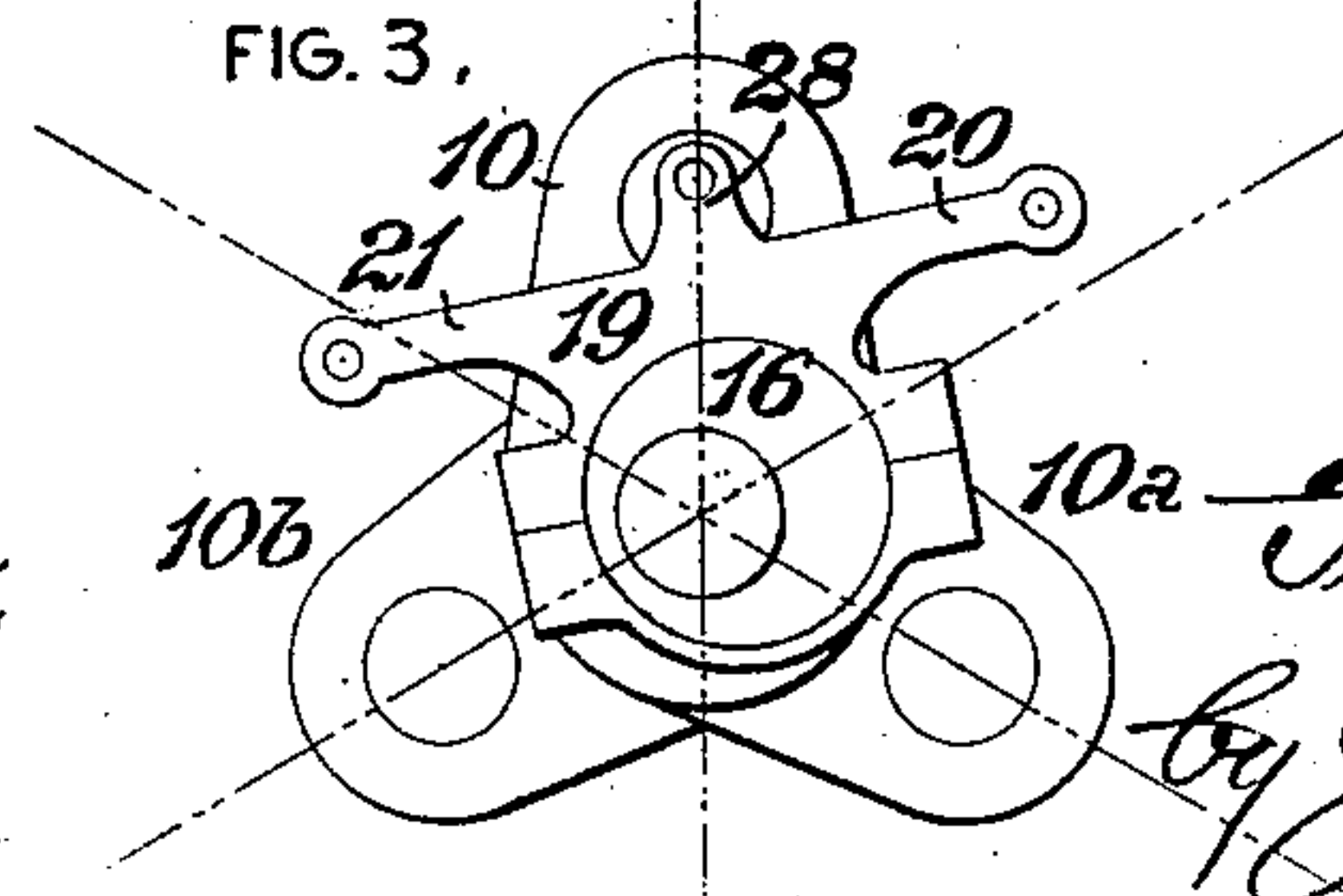


FIG. 3.



WITNESSES:

T. J. Hogan.  
A. E. Galtner.

INVENTOR,

Francis M. Rites.  
by J. Mendenhall.  
Att'y.



(No Model.)

3 Sheets—Sheet 3.

F. M. RITES.  
VALVE GEAR.

No. 542,423.

Patented July 9, 1895.

FIG. 6.

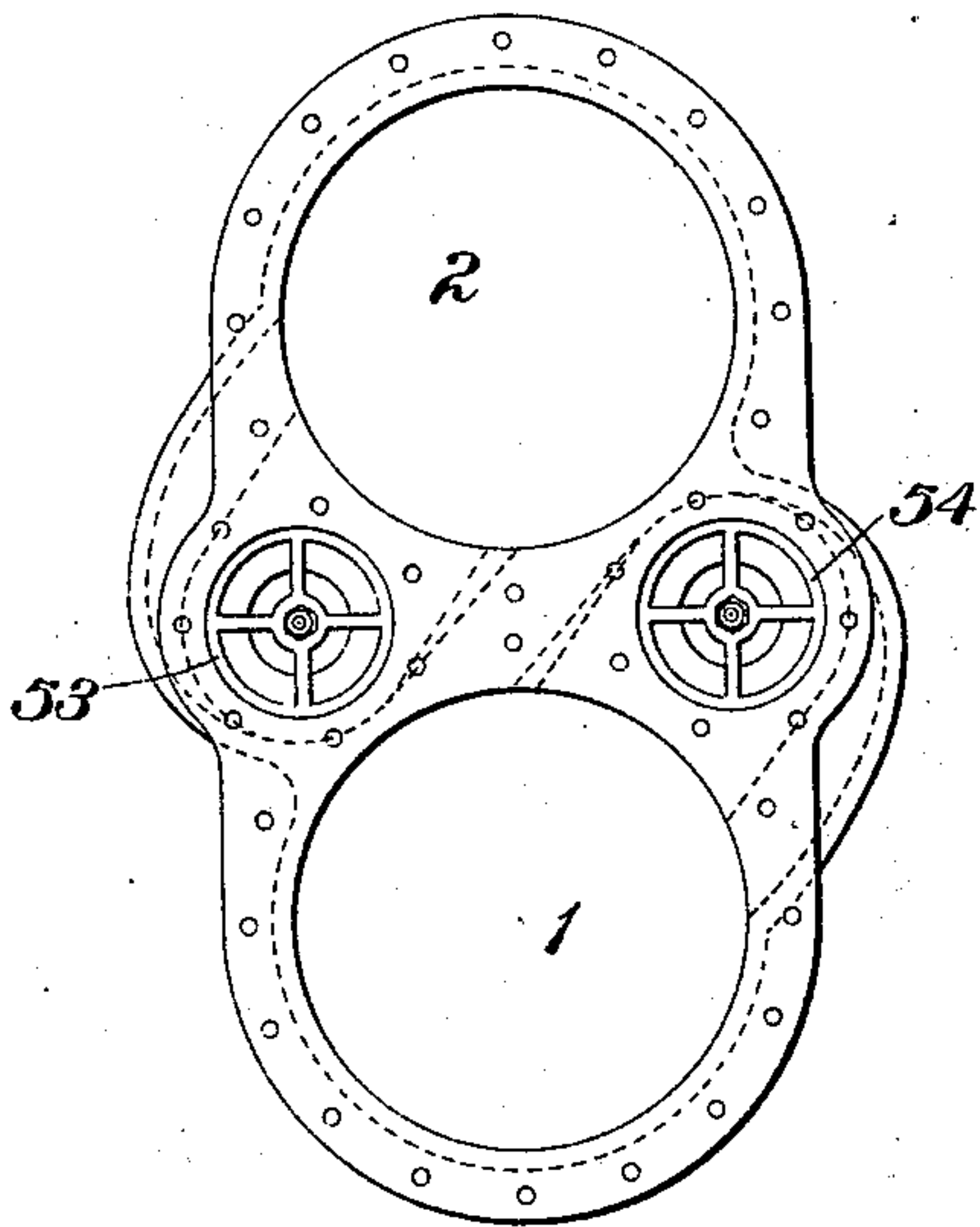


FIG. 5.

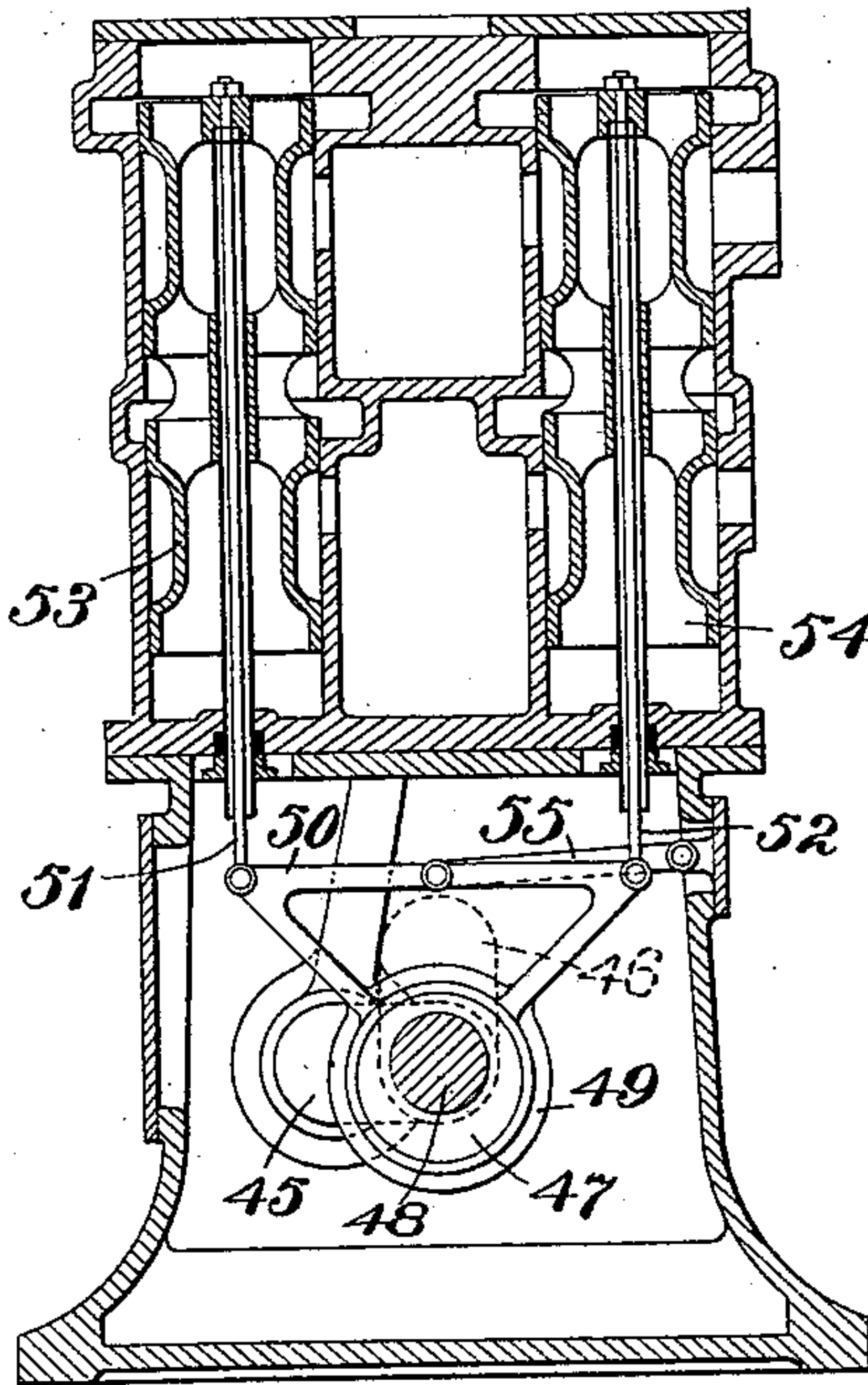
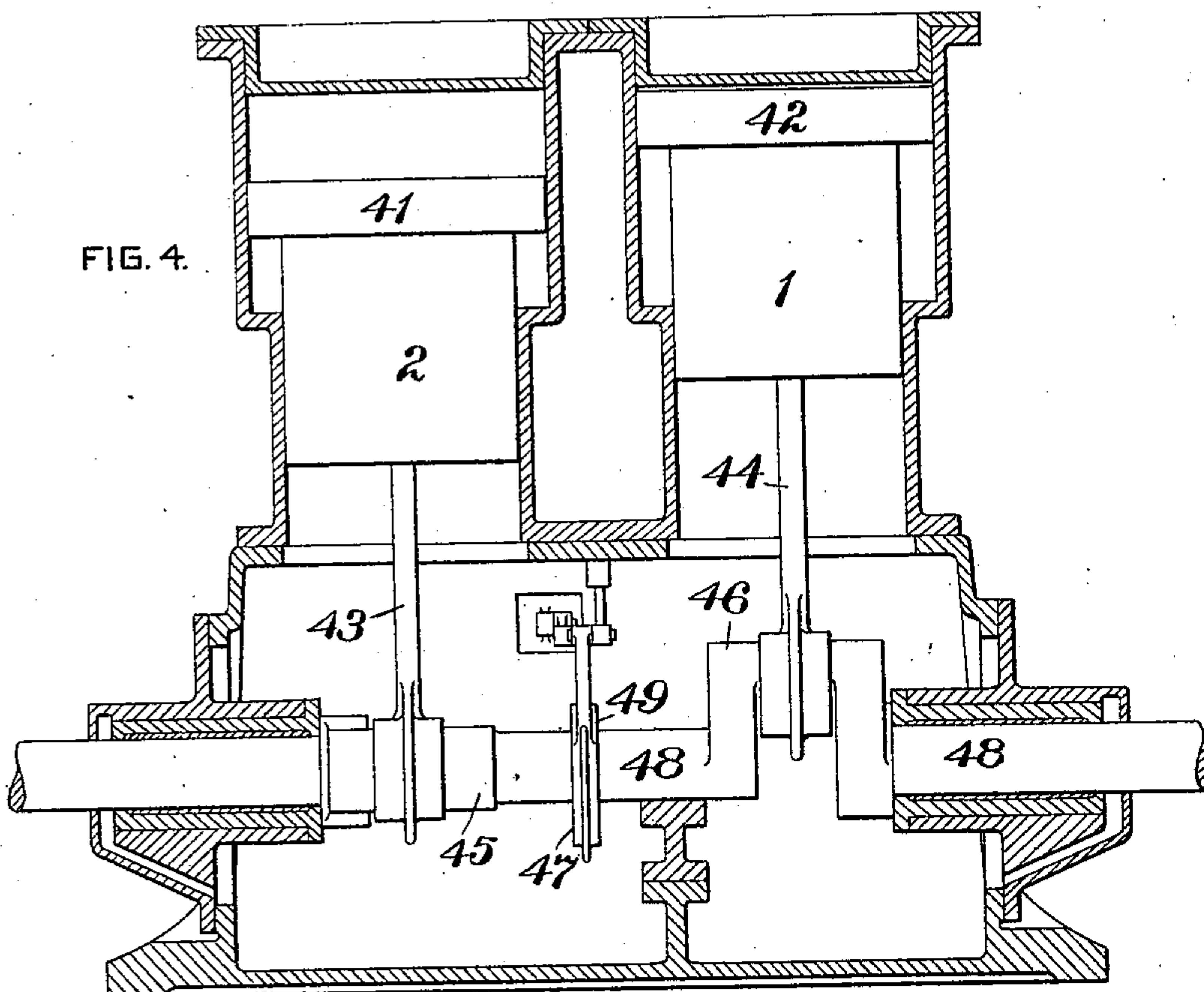


FIG. 4.



WITNESSES:

*T. J. Hogan.*  
*J. E. Gaillet.*

INVENTOR,

*Francis M. Rites.*  
*by J. M. Bell* Att'y.



# UNITED STATES PATENT OFFICE.

FRANCIS M. RITES, OF PITTSBURG, PENNSYLVANIA.

## VALVE-GEAR.

SPECIFICATION forming part of Letters Patent No. 542,423, dated July 9, 1895.

Application filed October 16, 1894. Serial No. 526,041. (No model.)

*To all whom it may concern:*

Be it known that I, FRANCIS M. RITES, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a certain new and useful Improvement in Valve-Gear, of which improvement the following is a specification.

The object of my invention is to provide a system of valve connections from a single eccentric to valve mechanisms through which the distribution of elastic fluid may be properly effected in a plurality of cylinders, the pistons of which are connected to cranks set at angles one to the other.

The improvement claimed is hereinafter set forth.

Under many conditions of service it becomes advisable to connect the pistons of two or more cylinders to independent cranks, and in such instances good practice indicates that the rotative effort should be so distributed that it shall be as nearly uniform as possible throughout each revolution of the shaft. Where the pistons of two cylinders are connected independently to a shaft, the connections are usually made to cranks set at right angles and the pistons of three cylinders are generally connected to independent cranks set at angles of one hundred and twenty degrees one from the other. The two-cylinder type with cranks at right angles is almost universally found in locomotive practice, and the three-cylinder engine with cranks at angles of one hundred and twenty degrees is characteristic of the most recent and approved practice in the marine type. In all engines of these classes a separate and independent valve-actuating mechanism for operating the distribution valve or valves of each cylinder has heretofore been essential, and my invention is designed to simplify and economize the construction and maintenance of multiple-cylinder engines by eliminating therefrom the complication due to the presence of more than one valve-actuating mechanism.

In the accompanying drawings, Figure 1 is an end view in elevation, illustrating an application of my invention in a three-cylinder steam-engine of the marine type, having its cranks set one hundred and twenty degrees apart; Fig. 2, a vertical longitudinal central

section through the same; Fig. 3, an end view in elevation, showing the eccentric, strap, and cranks; Fig. 4, a central section through an engine having cranks set at right angles with my improvement applied thereto; Fig. 5, a central section at right angles to that shown in Fig. 4, and Fig. 6 a plan view of the top of the engine shown in Figs. 4 and 5.

In the instance exemplified in Figs. 1, 2, and 3 the engine is of the triple-expansion marine type and is, as in standard practice, provided with a high-pressure cylinder 1, an intermediate pressure-cylinder 2, and a low-pressure cylinder 3, all supported on a frame or housing 5, the pistons 6, 7, and 8 of which cylinders are fixed upon piston-rods 9, which are coupled by connecting-rods 12 to cranks 10 10<sup>a</sup> 10<sup>b</sup>, set at angles of one hundred and twenty degrees apart. The distribution functions of the cylinders 1 2 3 are effected by distribution-valves 13 13<sup>a</sup> 13<sup>b</sup>, respectively, which are shown as of the piston type and are respectively fixed upon valve-stems 15 15<sup>a</sup> 15<sup>b</sup>. The several distribution-valves are actuated by a single eccentric 16, fitted adjustably upon the crank-shaft and adjusted in position by a governor 17, and the action of said adjustable eccentric is modified by a fixed eccentric, as hereinafter explained. The strap 19 of the eccentric 16 is provided with three arms 28 20 21, which project from it in the manner of eccentric-rods and are set angularly, the central arm 28 being at angles of ninety degrees with the two side arms 20 21. The central arm 28 is coupled by a link 28<sup>a</sup> with the stem 15 of the distribution-valve 13 of the high-pressure cylinder 1. The arm 20 is connected by a link 20<sup>a</sup> with an arm 22 on a horizontal rock-shaft 23, upon the opposite end of which is fixed an arm 26, which is coupled to the stem 15<sup>a</sup> of the distribution-valve 13<sup>a</sup> of the intermediate cylinder 2. The arm 21 is connected by a link 21<sup>a</sup> with an arm 24 on a horizontal rock-shaft 25, upon the opposite end of which is fixed an arm 27, which is coupled to the stem 15<sup>b</sup> of the distribution-valve 13<sup>b</sup> of the low-pressure cylinder 3.

The angular connections or arms 28 20 21 convert the movement of the eccentric 16 into three independent motions, and the rock-shafts transmit two of these motions in the



directions required for application to the distribution-valves of the intermediate and low-pressure cylinders. The arms 28 20 21 also form a link or frame which is rigidly connected to the strap of the eccentric and whose direction of movement is controlled by a guide of any suitable form, which is in this case shown as a link 40, coupled to the link or frame 28 20 21 and to one of the housings 5 of the engine.

It will be seen that the links 20<sup>a</sup> and 21<sup>a</sup> are not coupled directly to the arms 22 and 24 of the rock-shafts 23 and 25, but are connected thereto through the intermediation of double-armed levers or links 35 and 35<sup>a</sup>, respectively. The ends of the links 35 and 35<sup>a</sup> opposite those to which the links 20<sup>a</sup> and 21<sup>a</sup> are coupled are coupled to links 29 and 30, which are, in turn, coupled to arms 31 and 32 on the strap 33 of an eccentric 34, fixed on the crank-shaft. Such connecting mechanism and a fixed eccentric, the object of which is to apply the modifying influence of the fixed eccentric in the distribution of the later members of the series of multiple expansion-cylinders, may be dispensed with without departure from my present invention and is not claimed herein, as it is set forth in a separate application (Case B) filed by me of even date herewith, Serial No. 526,042.

In the construction shown in Figs. 4, 5, and 6 I have shown my improvement in connection with a double compound trunk-engine having differential pistons 41 and 42, connected, by means of connecting-rods 43 and 44, to cranks 45 and 46, set at right angles. A single eccentric 47 is mounted on the shaft 48, and its strap 49 is connected to or formed integral with a link or frame 50, which is directly connected, by the rods 51 and 52, to the distribution-valves 53 and 54. Each of the valves 53 and 54 controls the distribution of steam in one of the cylinders 55 and 56, the lower portion of each valve controlling the admission and release of steam to and from the annular space below its piston, which space constitutes the high-pressure cylinder, and the upper portion of each valve controlling the admission and release of steam to and from the larger space above its piston, which space constitutes the low-pressure cylinder. A link 55 is pivotally connected at one end to the link or frame 50 and at its other end to the casing or frame of the engine and serves as a guide for controlling the movement of the link or frame 50. With this construction the necessary or desired motions are imparted to the valves of an engine having its cranks set at angles to one another, or having its pistons so connected to the shaft that the directions of movement of the pistons are relatively varying during each stroke, by means of a single eccentric and without the interposition of rock-shafts or levers or other more complicated mechanism.

The advantage of the simplicity of the con-

nection between the eccentric and the valve-rod, as shown in my improvement, is specially important in engines of the kind shown in Figs. 4, 5, and 6, in which the engines are incased and specially intended to occupy the smallest possible space.

It will be obvious that my invention is not limited in its application to steam or other engines in which elastic fluid is employed as a motive power and that it may, without variation of operative principle or structural essentials, be embodied in compressors for elastic fluids or other mechanisms in which means for controlling the distribution or passage of fluid into and out of cylinders or other receptacles are required.

I am aware that the utilization of a single eccentric for actuating a distribution-valve common to two cylinders was known in the art prior to my invention, such construction being employed in engines of the Westinghouse and other similar types, in which the crank-pins of two pistons are set oppositely or in line one with the other. I am also aware that a single eccentric has heretofore been employed to actuate, through indirect connections to its strap, the independent distribution-valves of a series of cylinders whose pistons are connected to separate crank-pins. I therefore disclaim, broadly, the combination of a single eccentric and a series of distribution-valves actuated thereby.

I claim as my invention and desire to secure by Letters Patent—

1. The combination of a plurality of cylinders, pistons fitting said cylinders and coupled to cranks set angularly upon a shaft, an eccentric, a frame or link rigidly connected to the strap of the eccentric, and constrained to move in a direction at right angles to its length, and independent connections from said link or frame to the valves of the cylinders, substantially as set forth.

2. The combination of a plurality of cylinders, pistons fitting said cylinders and coupled to cranks set at angles to each other, an eccentric, a link or frame formed on or rigidly connected to the strap of the eccentric, a guide controlling the direction of movement of the link or frame, and connections from the link or frame to the valves of the cylinders, substantially as set forth.

3. The combination of a plurality of cylinders, pistons fitting said cylinders, and coupled to cranks set at angles to each other, an eccentric, an eccentric strap, and substantially parallel connections between the eccentric strap and the valves of the cylinders, substantially as set forth.

4. The combination of a plurality of cylinders, pistons fitting said cylinders, and coupled to cranks set at angles to each other, an eccentric, an eccentric strap, a link or frame rigidly united to the eccentric strap, independent connections between the link or frame and the distributing valves, and a guide



which is connected to the link or frame and to a stationary part of the engine, substantially as set forth.

5 5. The combination of a plurality of cylinders, pistons fitting said cylinders and coupled to a shaft so as to have relatively varying movements such as are imparted by angularly set cranks, an eccentric, a frame or link rigidly connected to the strap of the eccentric, and constrained to move in a direction at right angles to its length, and independent connections from said link or frame to the valves of the cylinders, substantially as set forth.

15 6. The combination, with a plurality of cylinders and pistons fitting said cylinders, of a

link or frame constrained to move at right angles to its length, and independent connections between the valves of the several cylinders and the link or frame at such points 20 that the relative movements of each piston and its valve will be substantially similar throughout the series, for the purpose of effecting similar distributions of steam to the several cylinders, substantially as set forth. 25

In testimony whereof I have hereunto set my hand.

FRANCIS M. RITES.

Witnesses:

J. SNOWDEN BELL,  
F. E. GAITHER.