

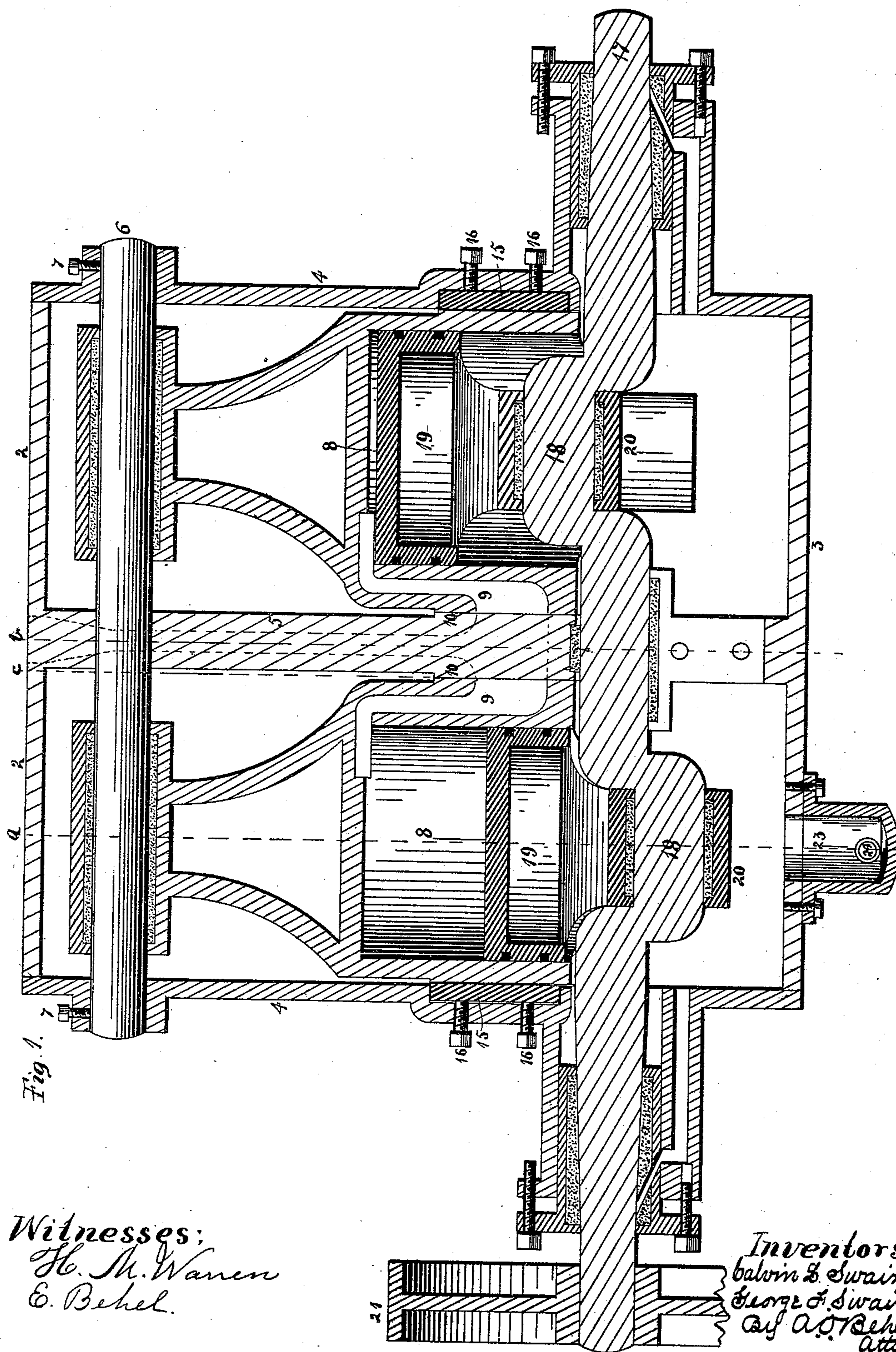
(No Model.)

3 Sheets—Sheet 1.

C. L. & G. F. SWAIN.
STEAM ENGINE.

No. 459,370.

Patented Sept. 8, 1891.



Witnesses:
H. M. Warren
E. Behel.

Inventors:
Calvin S. Swain,
George F. Swain,
By A. J. Behel
Atty.

(No Model.)

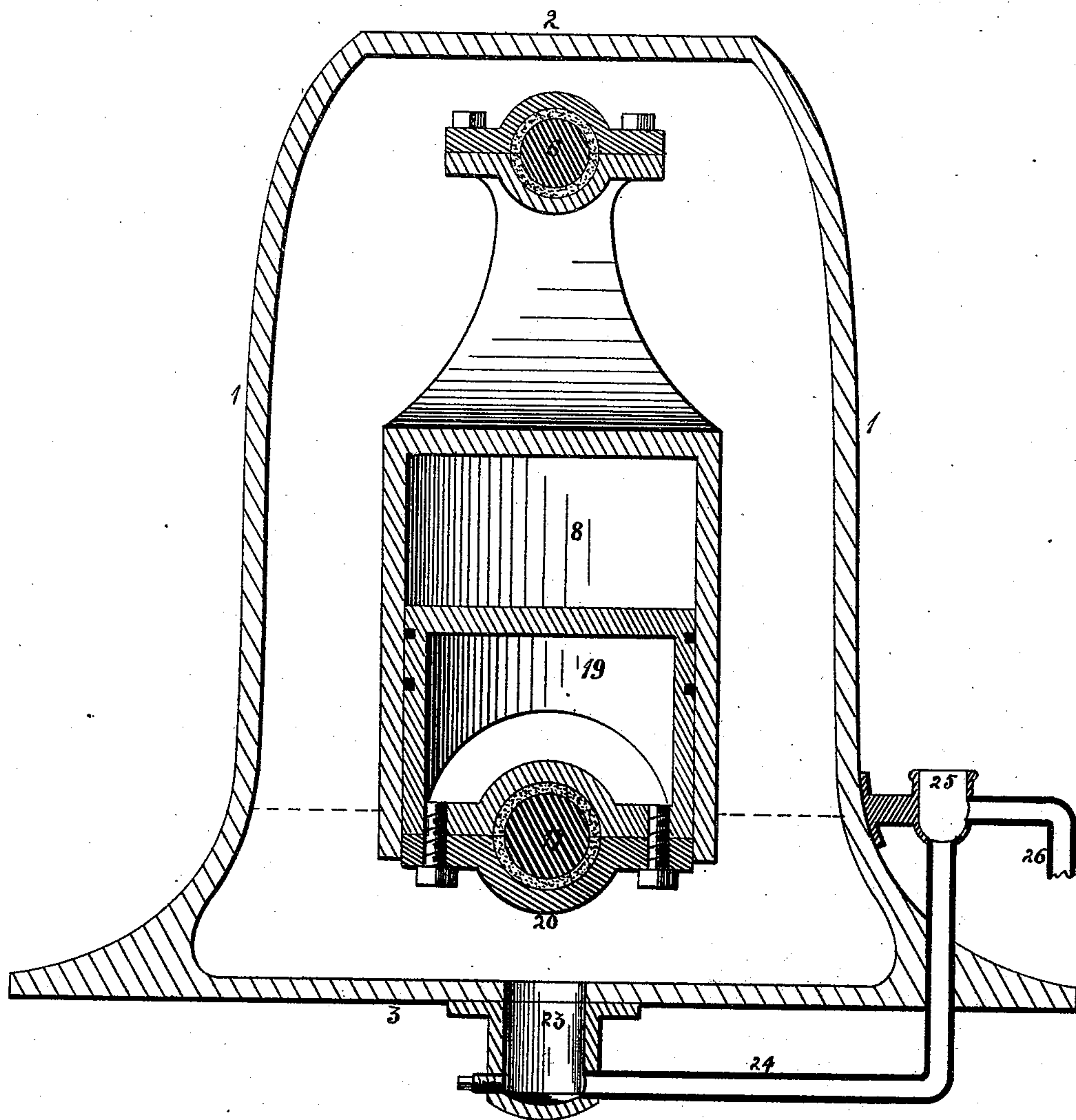
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Fig. 2.



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Fig. 5.

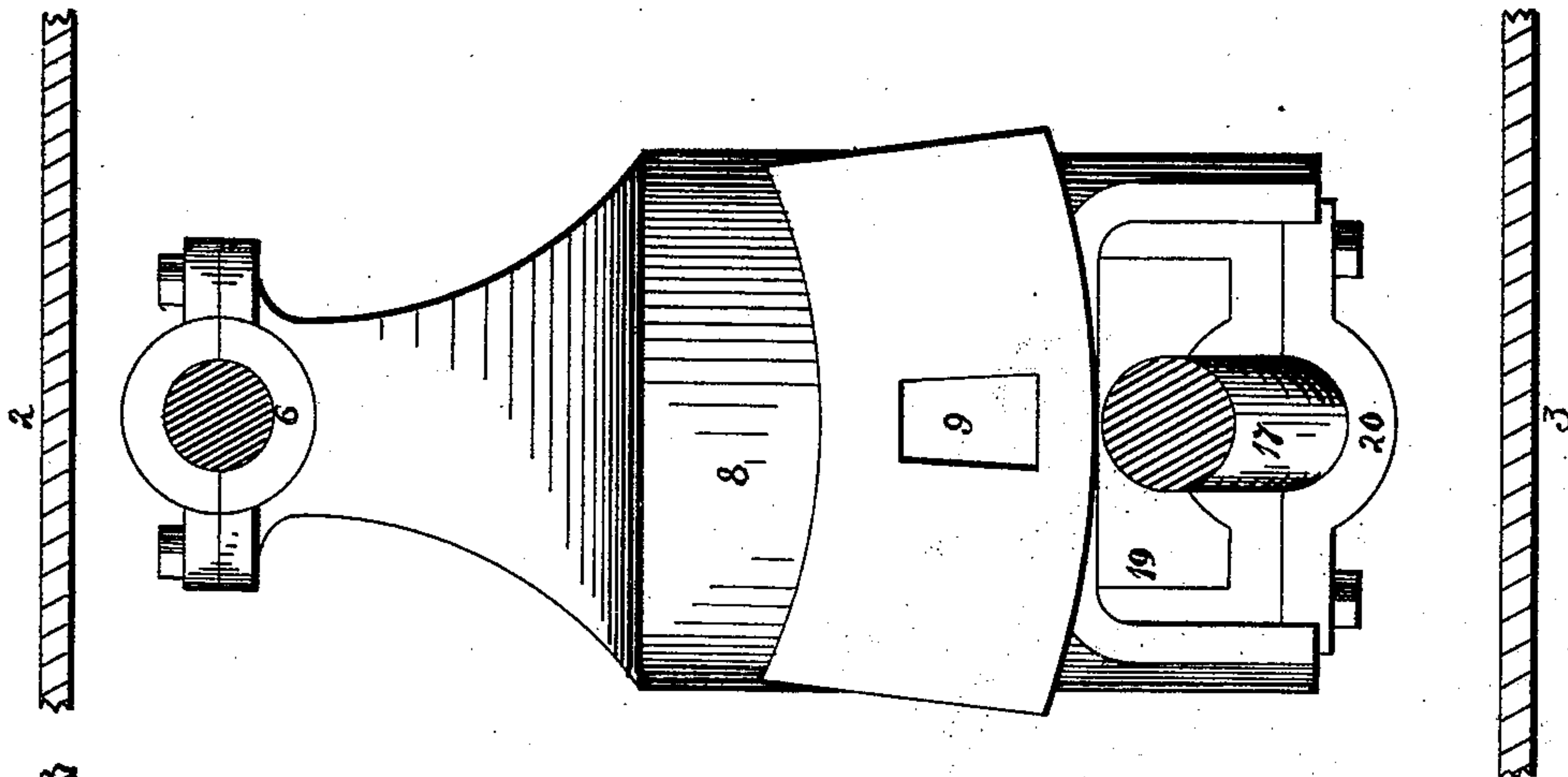


Fig. 4.

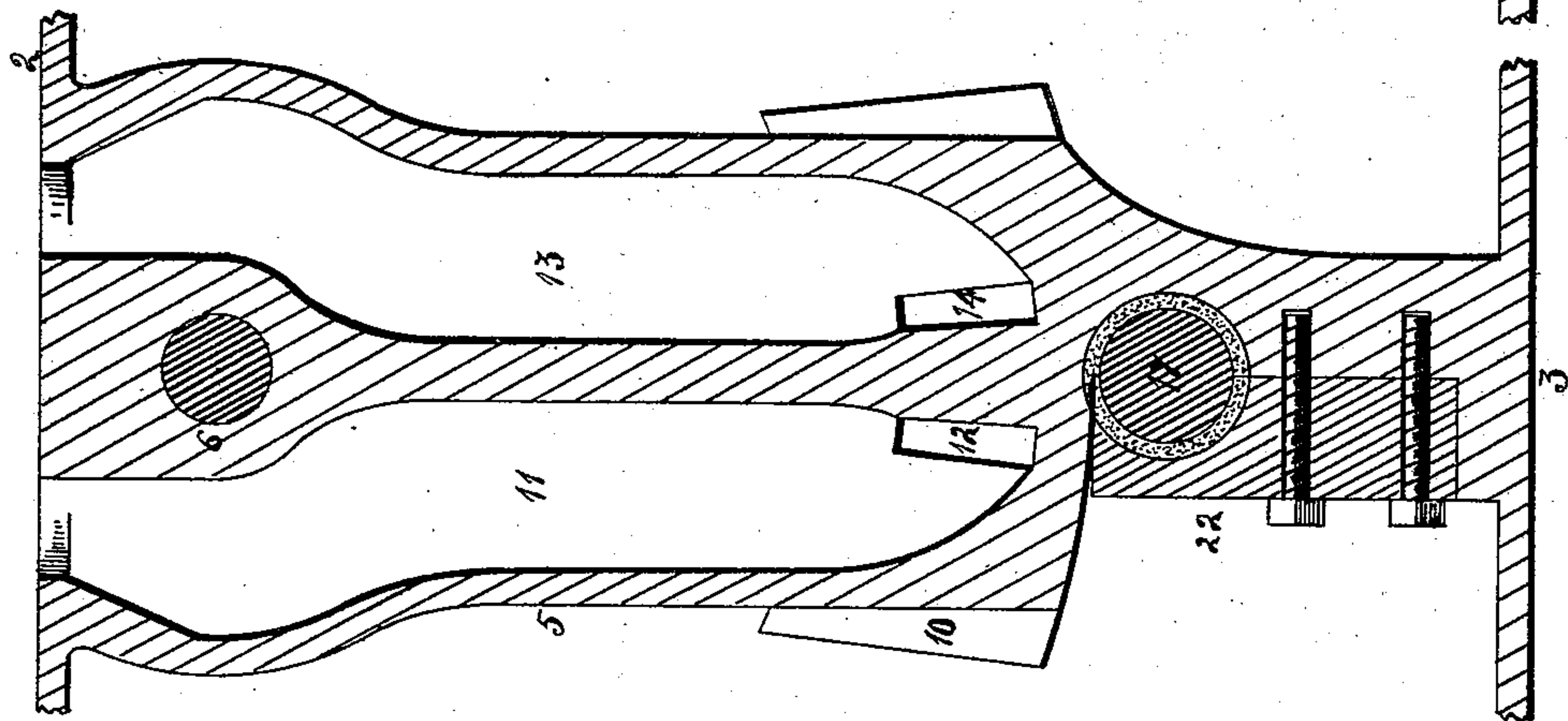
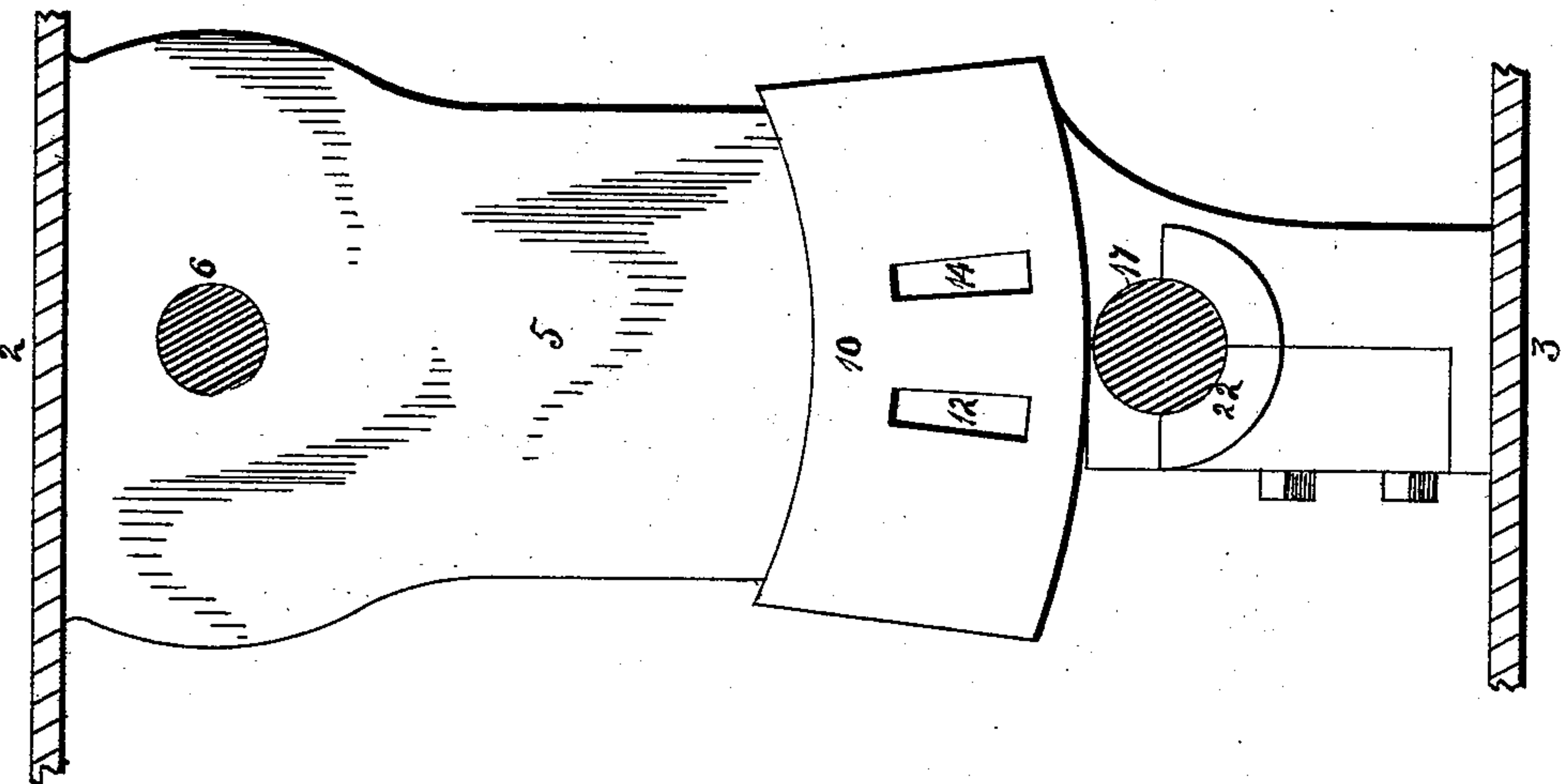


Fig. 3.



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UNITED STATES PATENT OFFICE.

CALVIN L. SWAIN AND GEORGE F. SWAIN, OF BELVIDERE, ILLINOIS,
ASSIGNORS OF ONE-HALF TO EUGENE E. P. TRUESDELL, OF SAME
PLACE.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 459,370, dated September 8, 1891.

Application filed December 5, 1890. Serial No. 373,712. (No model.)

To all whom it may concern:

Be it known that we, CALVIN L. SWAIN and GEORGE F. SWAIN, citizens of the United States, residing at Belvidere, in the county of Boone and State of Illinois, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification.

The object of this invention is to construct a steam-engine in which the cylinders are suspended from a support in such manner as to swing with the least possible friction or resistance.

The further object is to place a series of these cylinders in a line, each provided with a piston which has a direct connection with its crank, so that as the crank revolves it will cause the cylinders to swing and in their swinging movement will take steam and exhaust at proper intervals.

In the accompanying drawings, Figure 1 is a lengthwise vertical central section through the engine, showing the pistons in the cylinders in their extreme positions. Fig. 2 is a transverse vertical section through one of the cylinders on dotted line *a*, Fig. 1. Fig. 3 is a face view of the center partition through which the steam is supplied and a passage-way for the exhaust. Fig. 4 is a transverse section through the center partition on dotted line *b*, Fig. 1. Fig. 5 is a face representation of a cylinder, as seen from a section cut on dotted line *c*, Fig. 1.

The casing for our improved engine consists of the sides 1, top 2, and bottom 3 of a single piece. The ends 4 are held in place in their connection with the center portion of the frame by belts, in any suitable manner. A center transverse partition 5 is cast with the center portion of the frame. A shaft 6, which serves to support the cylinders, is held in supports formed in the ends 4 and center partition, and is secured by set-screws 7. The cylinders 8 have their upper ends closed and their lower ends open. A portion of two opposite sides of the lower end of the cylinders is cut away in order to permit the crank to revolve, and the depending portion serves to guide the piston in its full movements and the piston is less liable to cramp

in the cylinder when the crank is in its lowest position, as shown at Figs. 1, 2, and 5. When it is swinging the cylinder past the center, less force is required of the crank, as the piston is close to it and has full bearing-surface in the cylinder. The cylinders are suspended from their shaft-support 6, one on each side of the center partition 5. The sides of the cylinders facing the center partition are planed, and a port 9 communicates with the inside of the cylinder. This port is located so that its exit will be in the central lengthwise direction of the cylinder. Both faces 10 of the center partition are planed and receive the planed faces of the cylinders. This partition has a steam-supply passage 11, its upper end connecting with the steam-supply, while its lower end terminates in openings 12 communicating with the cylinders. This partition also has a steam-exhaust escape 13, similar to the steam-supply, having its lower openings 14 communicating with the cylinders. The opposite or outer sides of the cylinders have their surfaces planed, and a plate 15, seated in a recess formed in the inside of the ends 4 of the casing, comes in contact with the outer surfaces of the cylinders, and by means of the set-screws 16 the cylinders can be held to their seats in contact with the center partition. A shaft 17 is supported below the open ends of the cylinders and is in double-crank form, a crank 18 for each of the cylinders. The crank portion has a piston 19 supported thereby, and a half-box 20 connects the piston with the crank, so that any movement imparted the piston will be transmitted to the crank. The ends of the shaft are supported by the ends of the casing and have a portion of their length tapering. A bushing is placed over the tapering portion of the shaft and by means of bolts this bushing may be adjusted to take up any wear and insure smooth running. Pulleys 21 may be placed on either or both ends of the shaft for the purpose of transmitting power. This shaft has a central bearing in the partition 5, and half-box 22 holds the shaft in position.

This engine is constructed to run in oil, and when at a standstill the oil will reach

the dotted line shown at Fig. 2. We have provided a cup 23, which is placed below the bottom of the casing and communicates with the inside of the casing. A pipe 24 communicates with this cup and extends upward along the outside of the casing and has an open-ended cup 25 located at its upper end, an overflow-pipe 26 connects with the open-ended cup and is on a line with the level of the oil within the casing. Some water is generally employed in connection with the oil, which will settle at the bottom, and the sediment will be received in the cup 23. By means of the overflow-pipe the oil can be held at the proper level at all times and will be prevented from rising above a certain level, as the water can escape through the overflow-pipe.

The operation of the engine will now be explained. If steam be admitted to the steam-passage, it will descend and seek to escape through the lower openings; but as long as the cranks are on the dead-center, as shown in the drawings, the engine will remain at a standstill; but should the crank be thrown past the dead-center the port-opening of one of the cylinders will move until a communication is formed between the steam-passage of the partition and the cylinder, when the steam will enter the cylinder and drive the piston down, which will cause the crank-shaft to revolve as soon as a communication is formed between the steam-passage and the cylinders. A communication is also formed between the outer cylinder and the exhaust-passage in the partition, which will remain so until the cranks have passed the center, when the cylinder that was taking steam will begin to exhaust and the cylinder which had been exhausting will begin to take steam. When the pistons move they cause the crank-

shaft to revolve, which will cause the cylinders to swing on their supports. This swinging movement will bring the port of the cylinder over the steam-passage during about one-half of a revolution and over the exhaust-passage the balance of the revolution, and while one cylinder is taking steam the other is exhausting. By this arrangement we are able to form a direct connection between the crank and piston, and, suspending the cylinders, very little power is required to move them in order to take steam or exhaust, and by taking steam in at the side of the cylinder a close fit can always be had and any wear can be readily taken up.

The device herein shown and described for regulating the height of oil in the casing is reserved for a separate application.

We claim as our invention—

In a steam-engine, the combination of a suitable casing having a center division-wall, which is provided with steam-supply and steam-exhaust passages, a cylinder located on each side of the division-wall and oscillatory, suspended from a stationary support, having one end open and the other end closed, a port communicating with the cylinder near its closed end and with the passages in the partition at the side and near its lower end, an adjustable plate for taking up the wear and holding the cylinders in contact with the center partition, and a crank for each cylinder having a direct communication with the pistons.

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