

No. 706,636.

Patented Aug. 12, 1902.

R. E. BOUSFIELD.  
EXHAUST MUFFLER.

(Application filed Oct. 8, 1900.)

(No Model.)

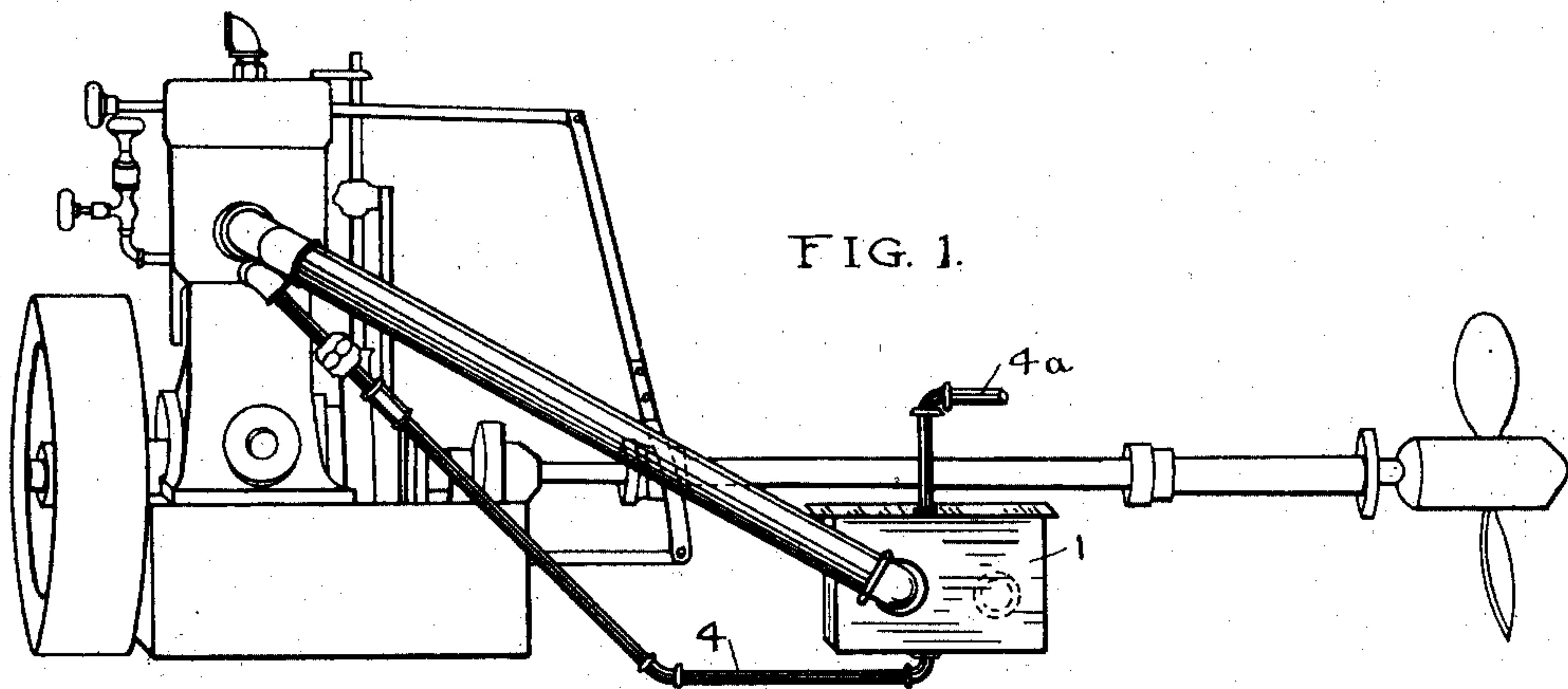


FIG. 1.

FIG. 2.

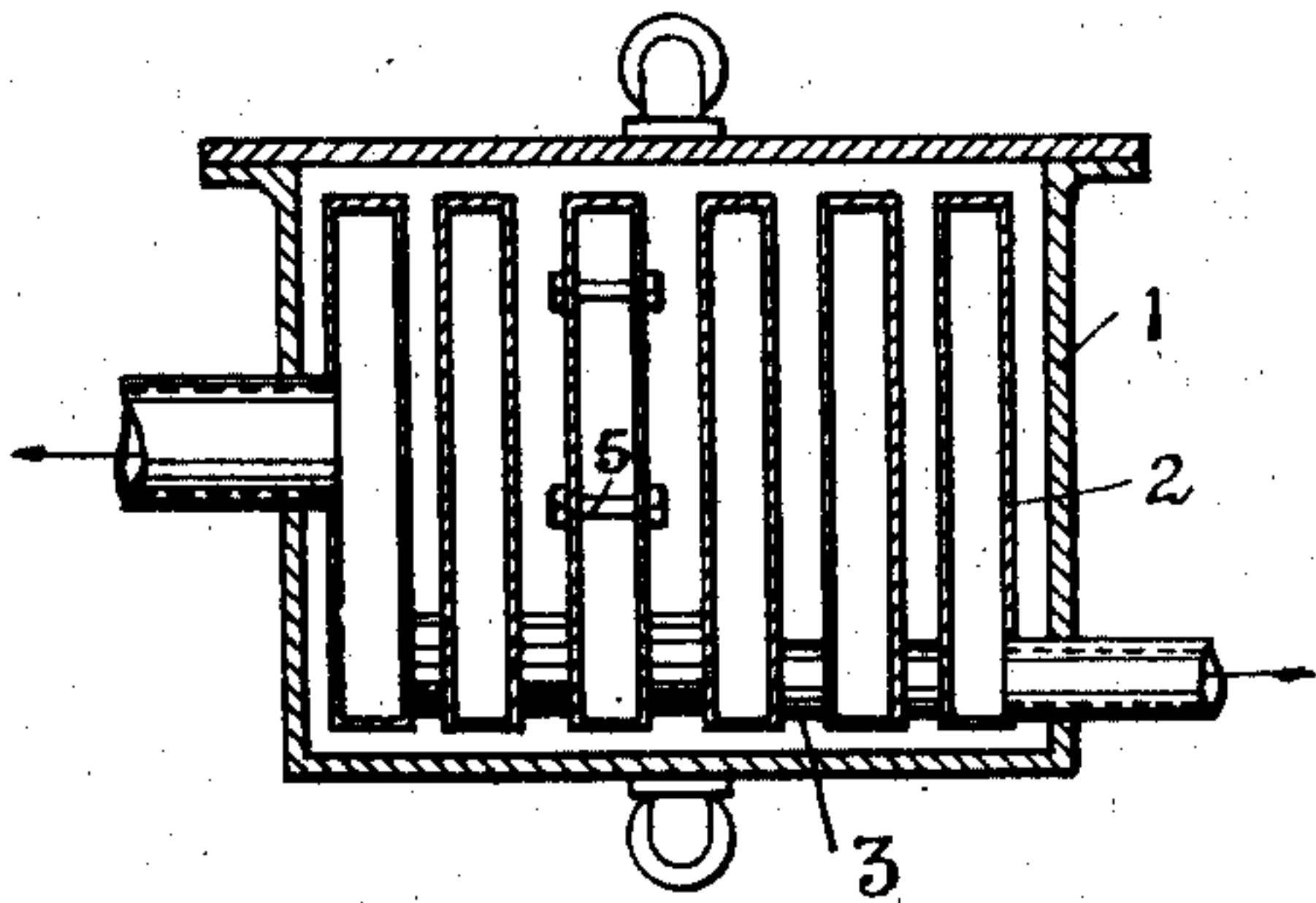
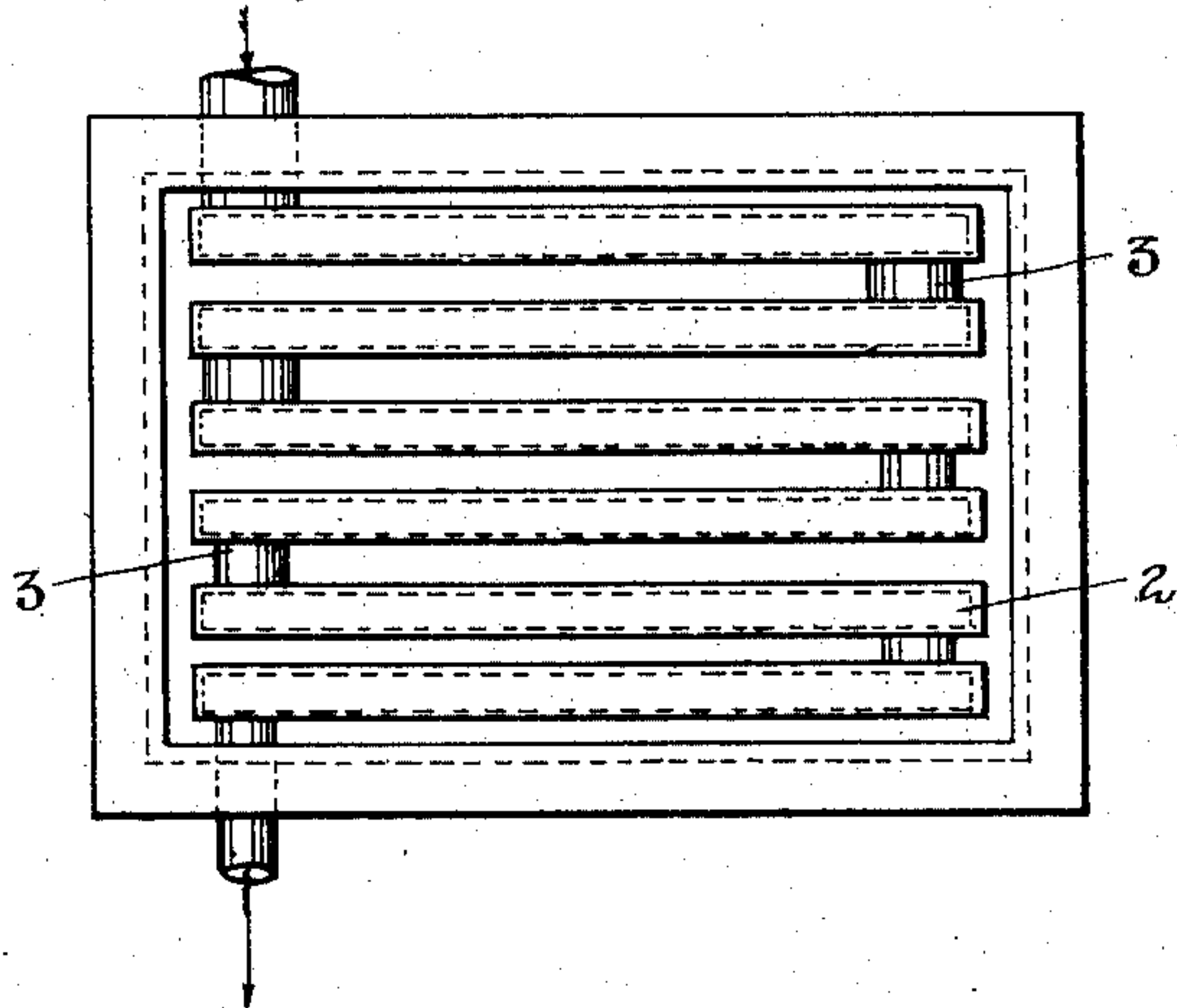


FIG. 4.

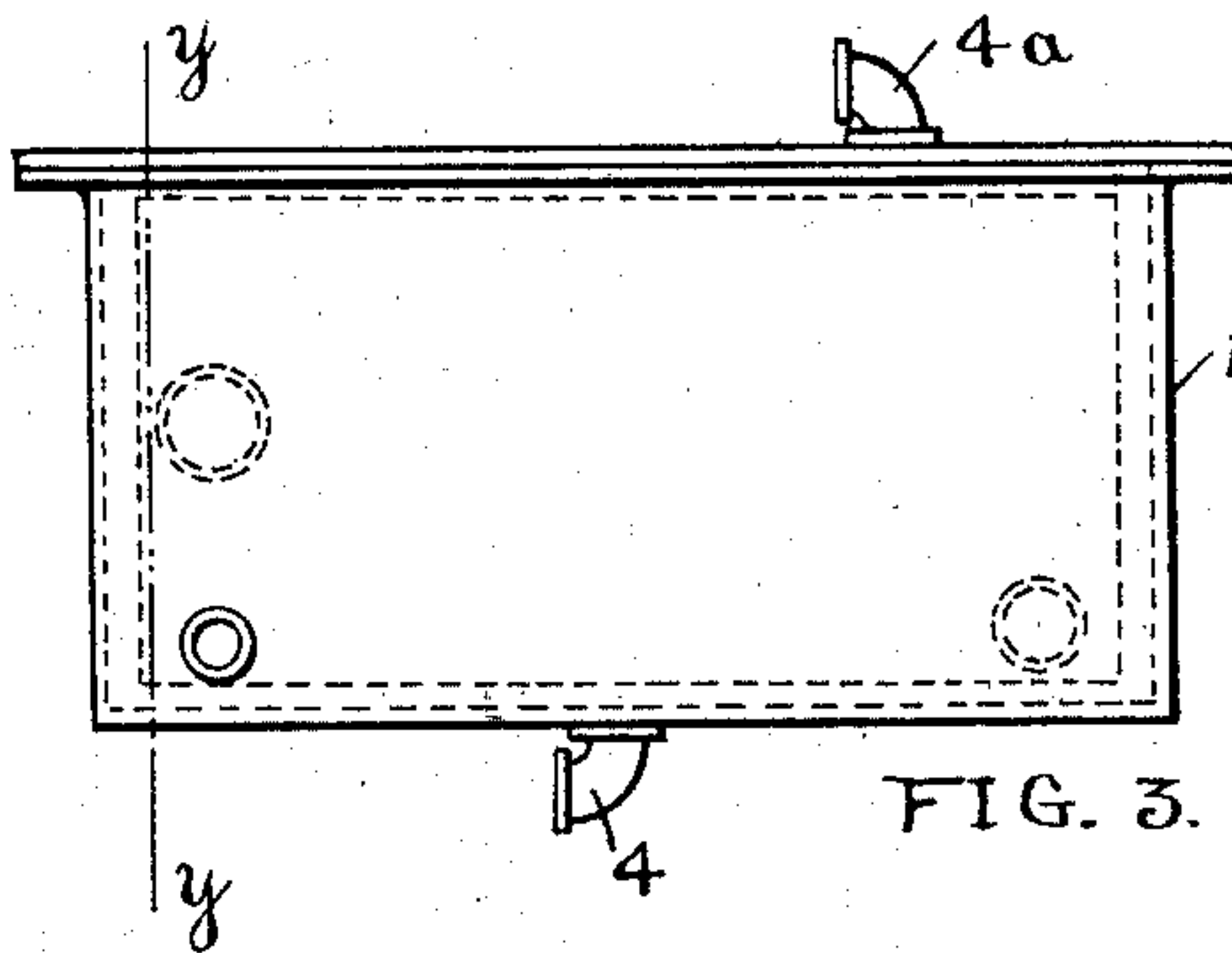


FIG. 3.

WITNESSES:  
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# UNITED STATES PATENT OFFICE.

ROBERT E. BOUSFIELD, OF BAY CITY, MICHIGAN.

## EXHAUST-MUFFLER.

SPECIFICATION forming part of Letters Patent No. 706,636, dated August 12, 1902.

Application filed October 8, 1900. Serial No. 32,354. (No model.)

*To all whom it may concern:*

Be it known that I, ROBERT E. BOUSFIELD, a citizen of the United States, residing at Bay City, in the county of Bay and State of Michigan, have invented certain new and useful Improvements in Exhaust-Mufflers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to mufflers for deadening the noise of exhaust from gas, gasoline, and other explosive engines.

The improvements consist in a peculiar structure and combination of parts in an exhaust-muffler, whereby the objects of my invention are accomplished. These objects are, first, to produce an exhaust-muffler for gas-engines and the like that is simple in construction, light, compact, and capable of entirely eliminating the noise of the engine-exhaust; second, to reduce the velocity of the exhaust-gases passing through the muffler by cooling and progressively expanding them through a series of chambers surrounded by cooling-water and connected by passages of less area than the chambers; third, to arrange a muffler that will utilize the water from the engine-cylinder jacket to cool the exhaust-gases as they pass through the muffler without mixing with them. I accomplish these objects by the means shown in the accompanying drawings, throughout the several views of which similar characters of reference designate corresponding parts.

Figure 1 is a view showing my improved muffler and its connections attached to a marine engine. Fig. 2 is a top view of the muffler without cover. Fig. 3 is a side view. Fig. 4 is a transverse section on the line *y y* of Fig. 3.

As clearly shown in the drawings, the muffler consists of an outer shell 1, of rectangular or other suitable shape, within which is inclosed a series of water-tight hollow chambers 2, of sheet metal or other heat-transmitting material. Each chamber is connected to the next by a tube 3. The tubes connecting alternate pairs of chambers are preferably placed at opposite ends of the muffler and near the bottom of the compartments, so as to properly drain. The outer chamber on

one side of the muffler is connected to the exhaust-pipe from the engine, and the outer chamber on the other side of the muffler is connected to the outboard-discharge.

A water-pipe 4 admits cooling-water to the interior of the shell 1, where the water circulates around the chambers 2 and is discharged through a pipe 4<sup>a</sup>. It has been found convenient and economical in practice to connect the pipe 4 to the water-jacket of the engine-cylinders, thus using the jacket-water to circulate through the muffler.

The operation of the device is as follows: The hot gases are projected from the engine by the quick puff of the exhaust into the first compartment of the muffler, where they expand somewhat and are cooled by the water surrounding the compartment. Under the action of successive exhausts from the engine the gas is injected through the tube 3 into the next compartment, but with much lighter impact. In the second compartment it again expands and then flows through the second tube into the third compartment. By this means the gas is successively expanded, thereby losing a large part of its velocity, and cooled, thereby decreasing its pressure, and passed from the compartment through a tube smaller than the compartment, thereby retarding the gas and further decreasing its velocity of flow.

A series of compartments, usually four to six, arranged in the form of a muffler of this kind entirely eliminates the noise of the exhaust, and the gases by reason of the large amount of cooling-surface in the muffler are discharged in the form of a cool vapor.

In practice I prefer to successively reduce the size of the tubes 3, using the larger tube for the first compartment and smaller tubes for each of the remaining compartments, thereby retarding the gases at each compartment in proportion as they are cooled in their passage.

Stay-bolts 5 are commonly provided for each compartment to strengthen its walls.

What I claim is—

In an exhaust-muffler for gas-engines the combination of a closed water-tight containing vessel having a water-inlet near its bottom and a water-outlet at its top; of a plurality of flat-sided water-tight cells spaced a

short distance apart and arranged side by side within said containing vessel, the first cell of the series being connected at one end with the exhaust-pipe of the gas-engine, and  
5 connected near the lower part of its opposite end with the second cell of the series by means of a short tube; the remaining cells being connected alternately at their opposite ends, and the last cell having a discharge-

outlet outside the containing vessel, substantially as described.

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

ROBERT E. BOUSFIELD.

Witnesses:

GEO. B. WILLCOX,  
WILLIAM STEPHENS.