

No. 753,404.

PATENTED MAR. 1, 1904.

R. W. KNAPP.
STEAM CONDENSER.

APPLICATION FILED AUG. 22, 1902.

NO MODEL.

4 SHEETS—SHEET 1.

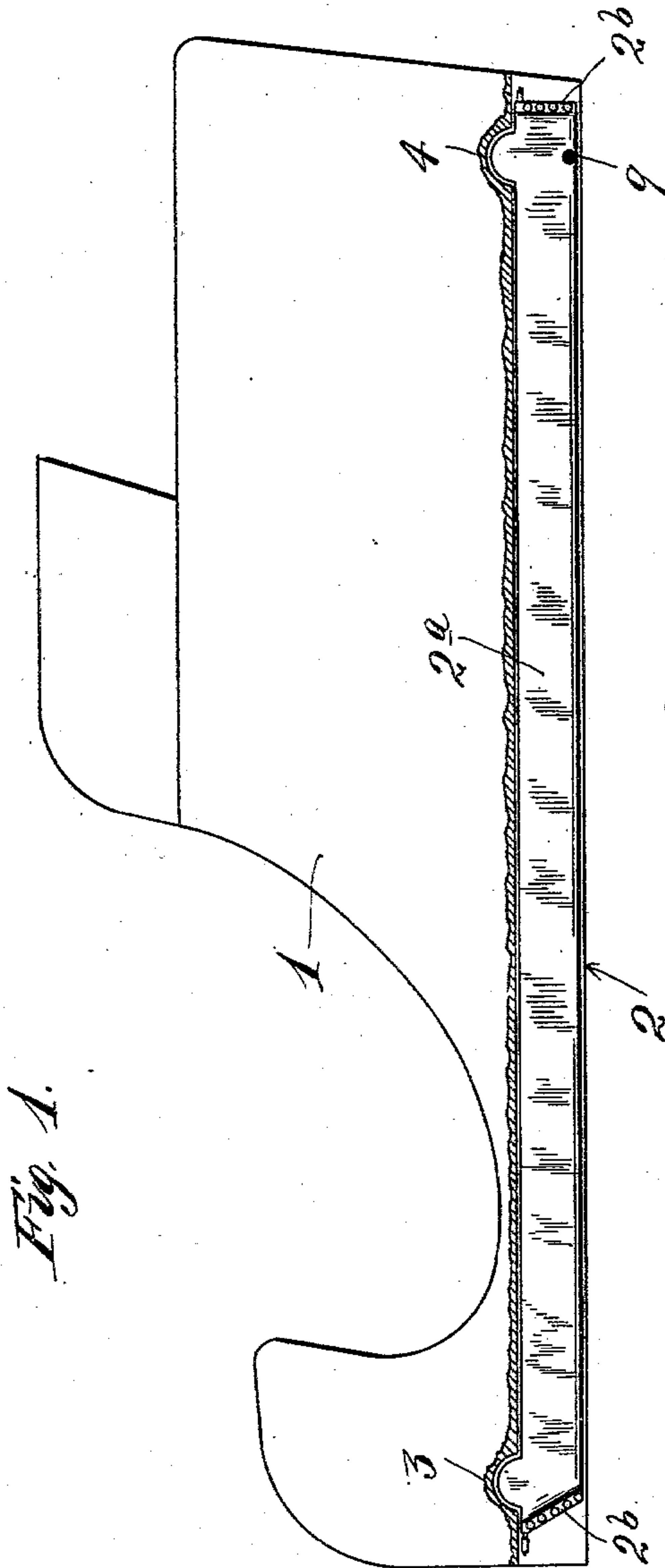
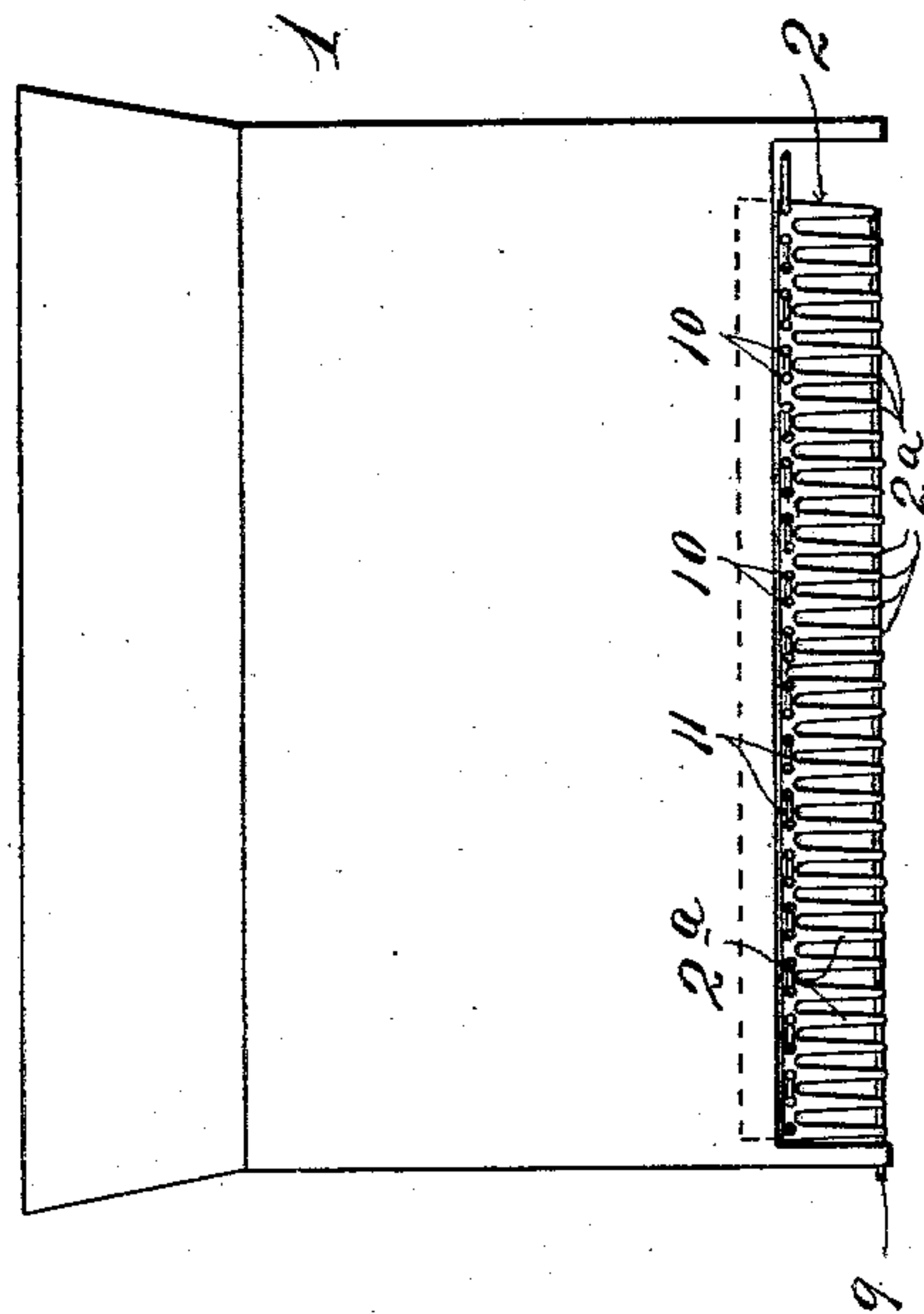


Fig. 2.



Witnesses.
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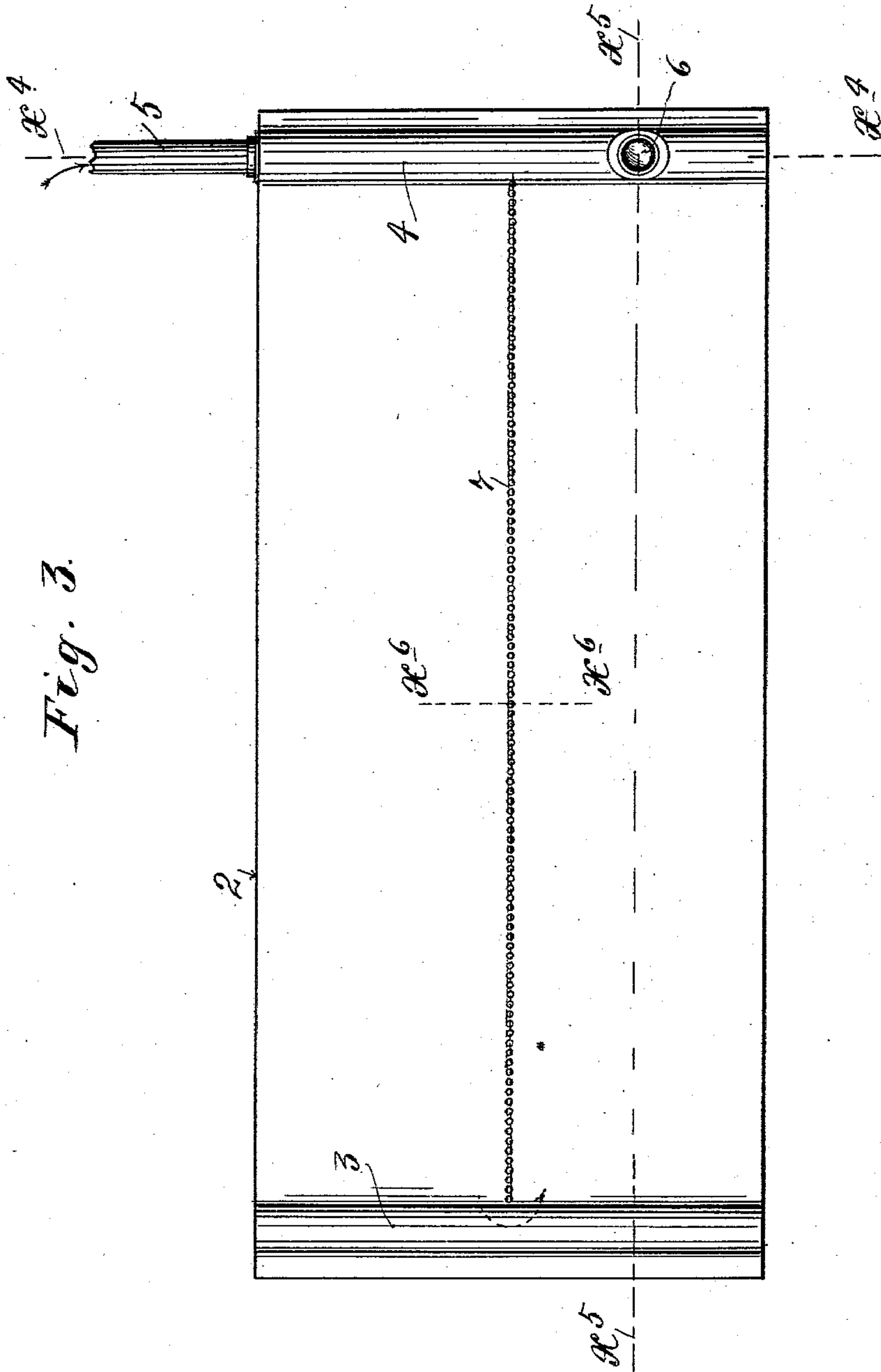
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4 SHEETS—SHEET 2.



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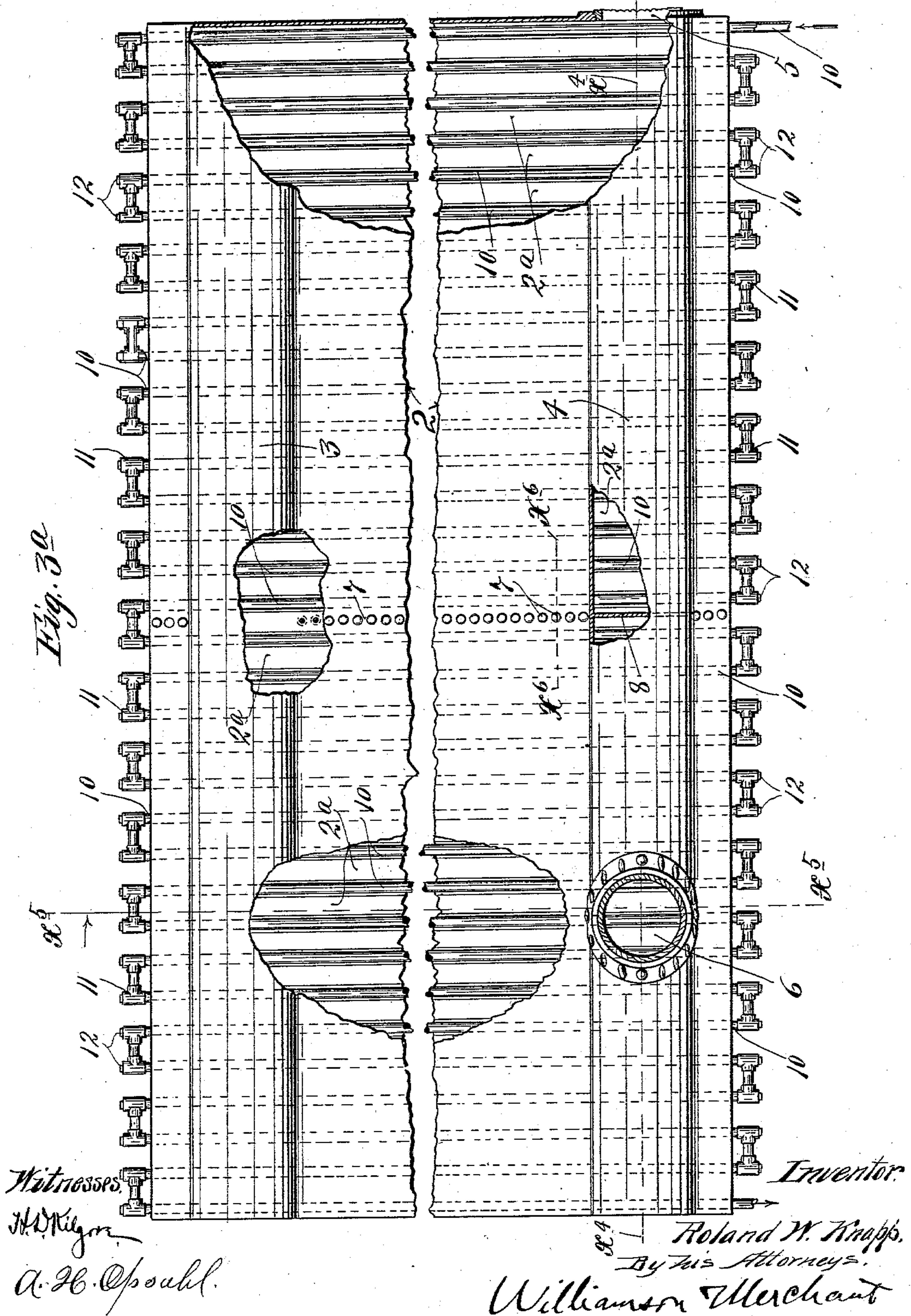
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4 SHEETS—SHEET 3.

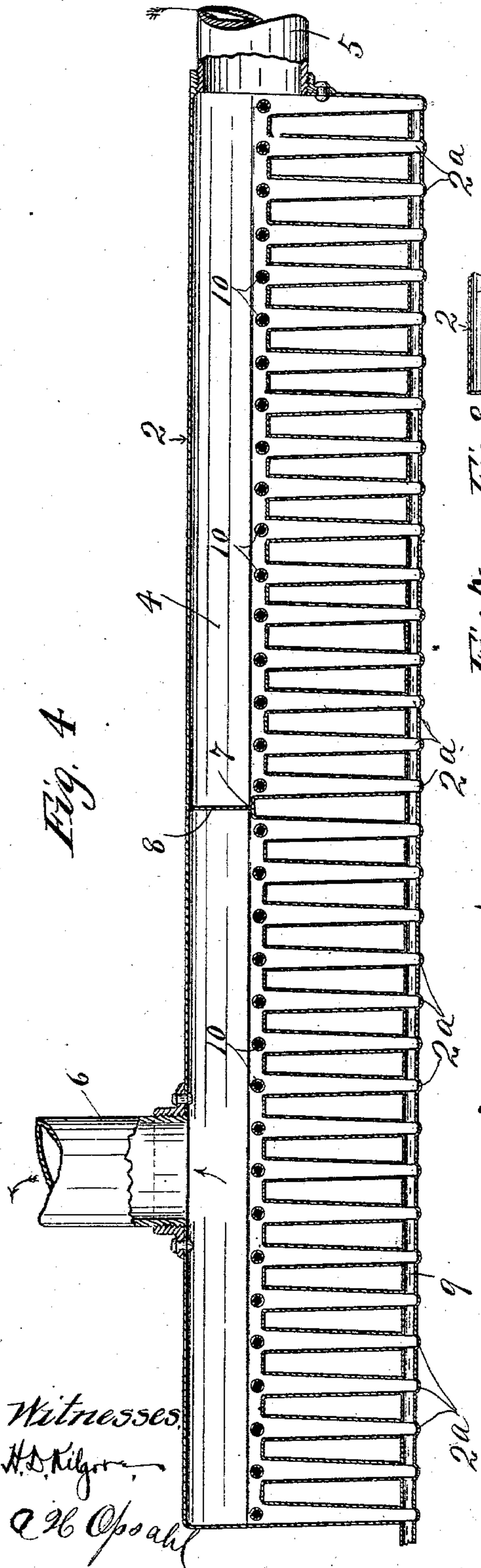


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4 SHEETS—SHEET 4.



Witnesses:
H. D. Kilgore,
C. H. Osoahl

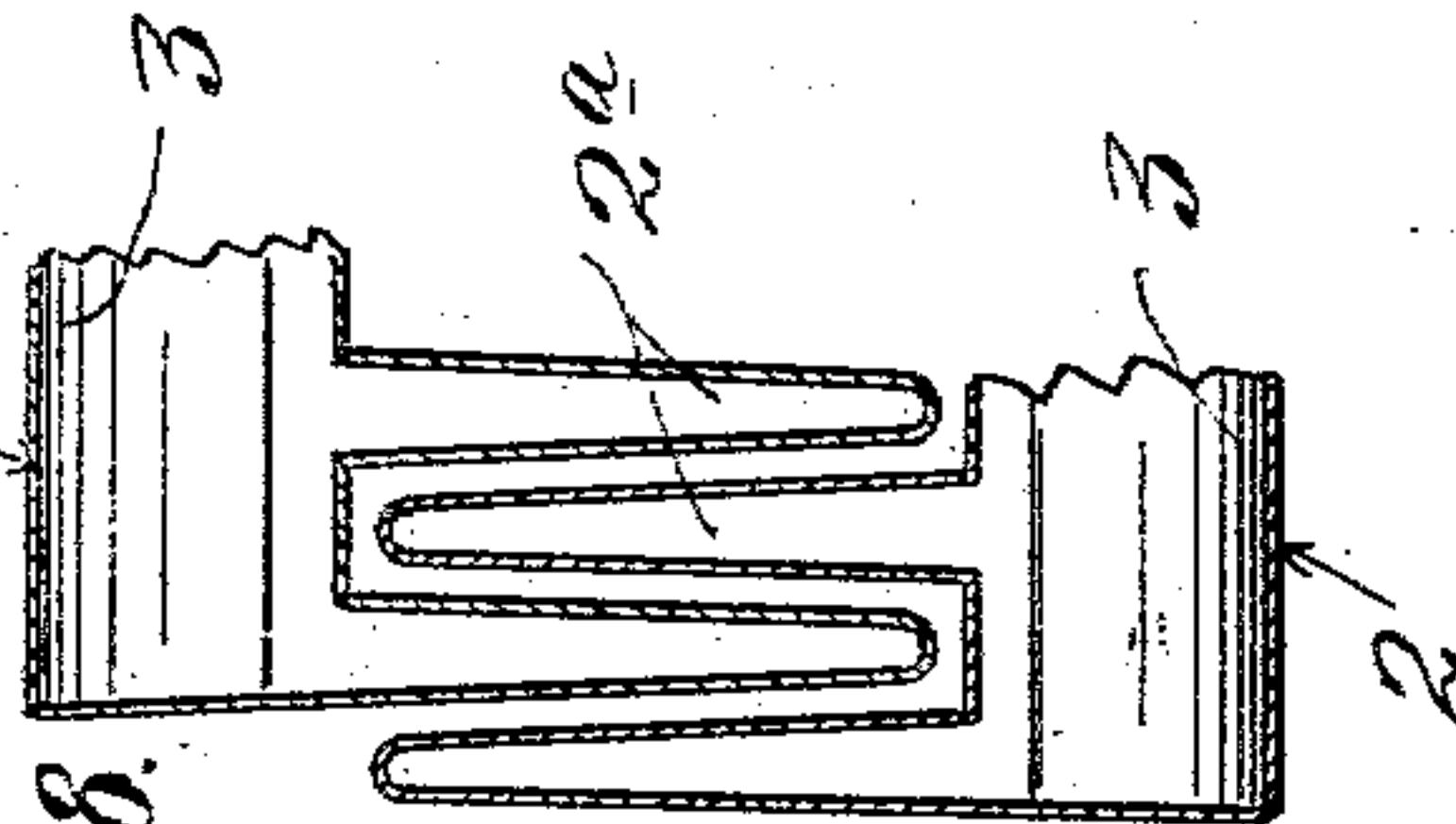


Fig. 7

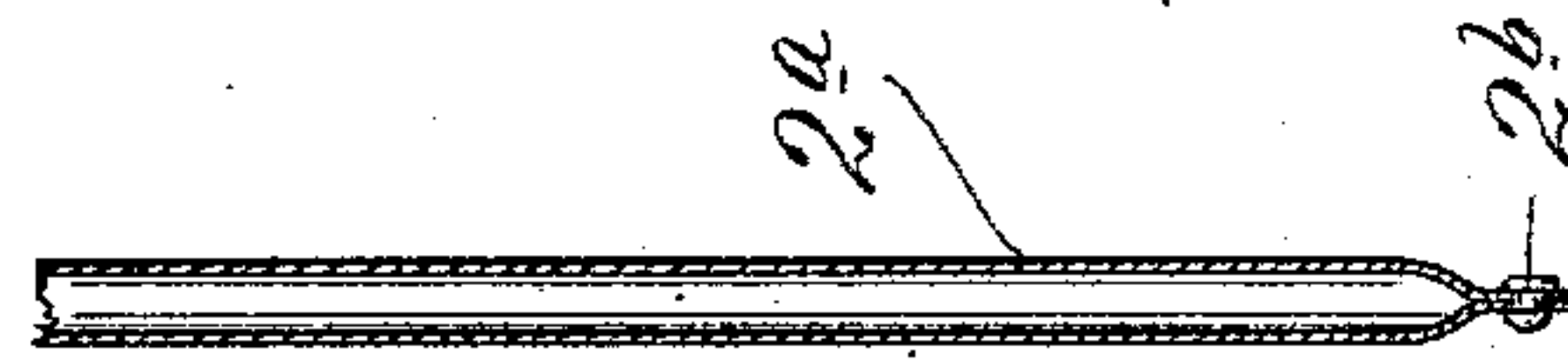
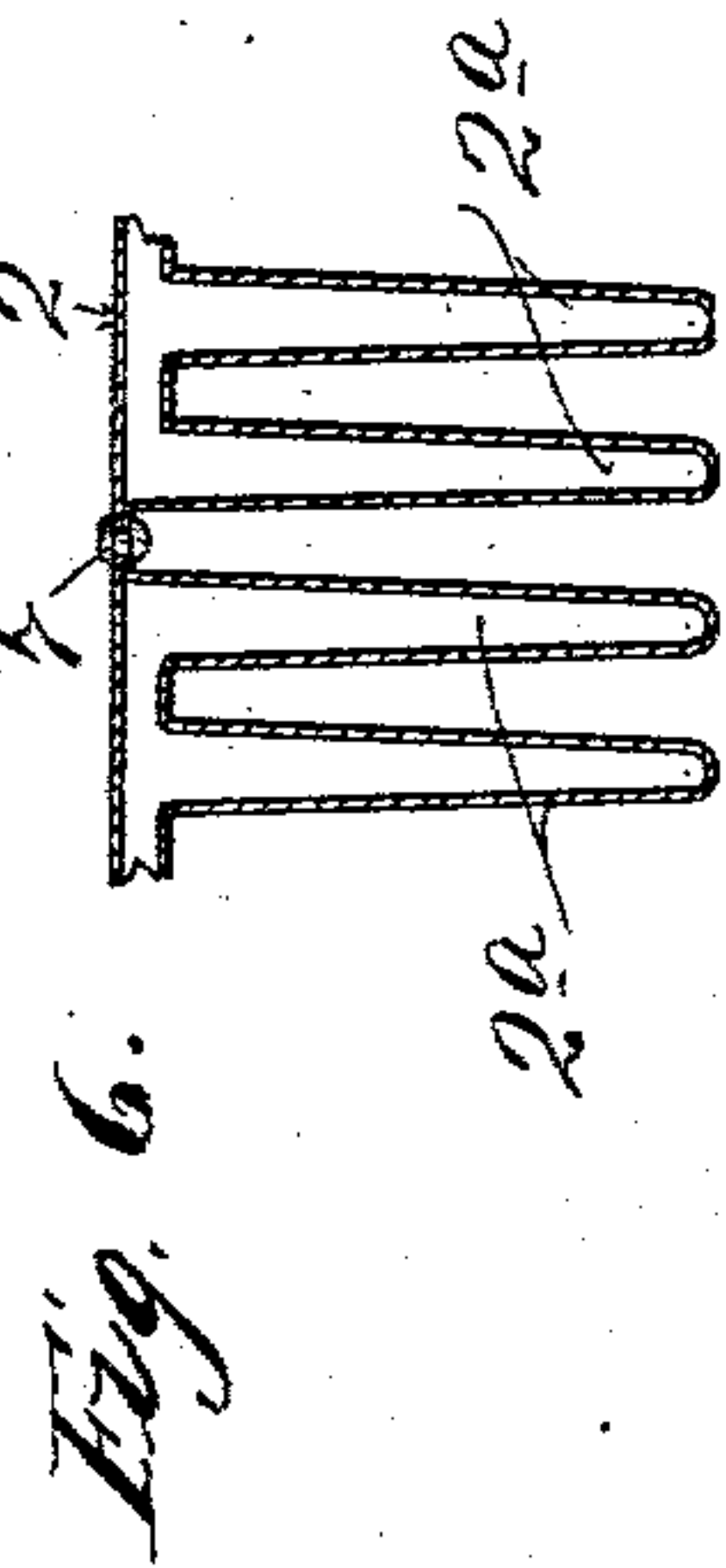
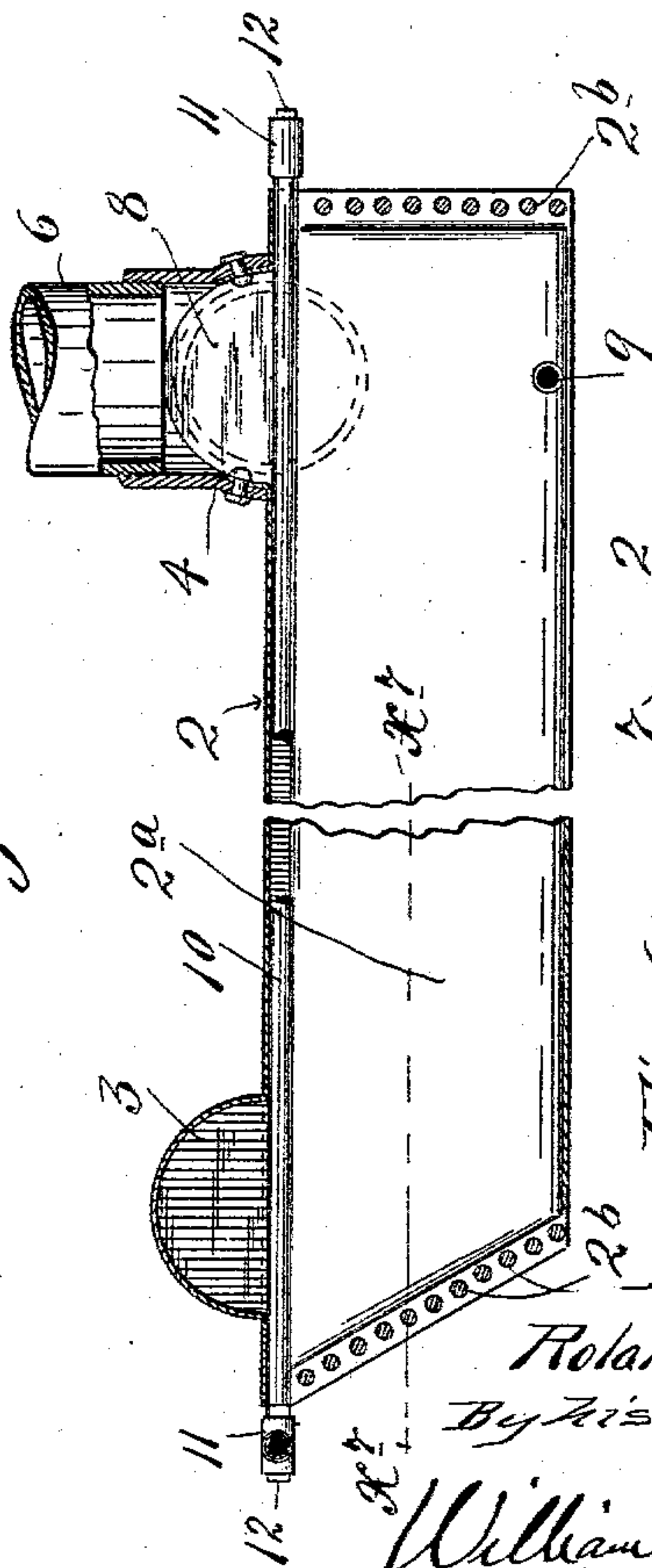


Fig. 5



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UNITED STATES PATENT OFFICE.

ROLAND W. KNAPP, OF MINNEAPOLIS, MINNESOTA.

STEAM-CONDENSER.

SPECIFICATION forming part of Letters Patent No. 753,404, dated March 1, 1904.

Application filed August 22, 1902. Serial No. 120,658. (No model.)

To all whom it may concern:

Be it known that I, ROLAND W. KNAPP, a citizen of the United States, residing at Minneapolis, in the county of Hennepin and State of Minnesota, have invented certain new and useful Improvements in Air-Cooled Steam-Condensers; 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 present invention has for its especial object to provide an improved steam-condenser for steam-propelled automobiles; and to this end it consists of the novel devices and combinations of devices hereinafter described, and defined in the claim.

The invention is illustrated in the accompanying drawings, wherein like characters indicate like parts throughout the several views.

Figure 1 is a view in side elevation with some parts broken away, showing my improved condenser applied in working position to the body or box of an automobile or steam-carriage. Fig. 2 is a rear elevation of the parts shown in Fig. 1. Fig. 3 is a plan view showing in outline the condenser removed from the box or carriage body. Fig. 3^a is a plan view of the said condenser, on an enlarged scale, some parts being broken away and others sectioned and showing the front and rear portions thereof moved close together. Fig. 4 is a transverse vertical section on the line $x^4 x^4$ of Figs. 3 and 3^a. Fig. 5 is a longitudinal vertical section on the line $x^5 x^5$ of Figs. 3 and 3^a. Fig. 6 is a detail in transverse vertical section on the line $x^6 x^6$ of Figs. 3 and 3^a. Fig. 7 is a detail in section on the line $x^7 x^7$ of Fig. 5, and Fig. 8 is a detail in transverse vertical section illustrating a slightly-modified construction of the body of the condenser.

The box or body of the carriage is indicated as an entirety by the numeral 1, and the body of the condenser is indicated as an entirety by the numeral 2. This condenser 2 is afforded by a thin sheet-metal shell of approximately rectangular form and which approximately underlies the entire bottom of the box. The said condenser, or rather the body thereof, is made up of a plurality of depending folds or

corrugations 2^a, which communicate at their upper portions, as best shown in Figs. 4 and 5 and also in Fig. 6. The ends of said corrugations or folds are closed, preferably, by pressing the sides thereof together and riveting the same, as indicated at 2^b in Figs. 1, 5, and 7. The said condenser-body may be secured to the bottom of the box or carriage-body 1 in any suitable way; but the corrugations or folds thereof must run longitudinally or from front to rear of the box, and the said box directly in front and in the rear of the corrugations or folds 2^a must be left open, so as to permit of the free circulation of air between the said folds under the forward movement of the machine.

Near its forward end the top of the body or shell 2 is formed with the transversely-extended bulge 3, and near its rear end it is provided with a similar bulge 4, which bulges, as shown, fit within recesses formed for the same in the bottom of the box 1, as best shown in Fig. 1. As shown, the steam-inlet pipe 5 opens into the right-hand side of the shell or body 2 in line with the bulge 4, and the exhaust-pipe 6 opens vertically upward in the top of the said bulge 4 on the left-hand side of the device. The bulges 3 and 4 afford free communication between the tops of the depending corrugations or folds 2^a. The said body or shell 2 is divided into two longitudinally-extended main compartments by means of a centrally-disposed and longitudinally-extended dividing-partition, preferably afforded by bringing one of the folds up to the top of the shell and riveting the same, as shown at 7 in Figs. 3, 3^a, 4, and 6. The bulge 4 is also divided at its center by a partition-section 8. (Shown in Figs. 4 and 5.) The bulge 3 affords free communication between the forward ends of the two main compartments as well as between the folds or depending corrugations.

All of the folds or depending corrugations of the condenser are in communication with a drip pipe or tube 9. (Best shown in Fig. 4.)

The travel of the steam through the condenser will be as follows: Entering into the right-hand compartment of the condenser, at the rear end thereof, through the inlet-pipe

5, it will fill the depending corrugations or folds of that section and will travel forward therethrough until it comes to the bulge 3, through which it will pass into the forward
 5 end of the left-hand compartment and will then be caused to travel rearward through the corrugations or folds of the left-hand compartment until such of the steam as may not be condensed, if any, will pass outward through
 10 the exhaust-pipe 6.

It will thus be seen that the steam is permitted to greatly expand within the condenser and is then caused to travel slowly and in thin sheets over condensing-surfaces, all of which
 15 are exposed to the direct cooling action of the air which surrounds the many folds or corrugations. It will also be seen that a maximum amount of cooling-surface is exposed to the external air by the arrangement of the
 20 corrugations or folds. The fact that the said folds or corrugations extend longitudinally of the carriage body or box, or, in other words, in the direction of the travel of the carriage, and are exposed at their ends is, as already
 25 stated, very important, since under the forward movement of the carriage air will be blown or caused to rapidly travel longitudinally over the surfaces of the said folds, and thus insures a rapid cooling action. With
 30 the corrugations extended transversely of the carriage air would not freely circulate between the same under the movement of the carriage, since the said corrugations would simply afford a plurality of dead-air spaces
 35 in which the air would be caged to a very considerable extent.

The obvious purpose of a condenser of this character is to save water, which is an important feature in steam automobiles or car-
 40 riages, which must frequently make long trips where water is not always available. Aside from this feature of economy in the use of water the inconvenience of having to frequently recharge the tank is obviated to a
 45 great extent. As another feature I run a feed-water-heating tube or pipe 10 alternately in one direction and then in the other through the condenser, as best shown in Fig. 3^a, but also in Figs. 4 and 5, wherein it will be noted

that one section of the said tubes 10 directly
 50 overlies each depending fold or corrugation 2^a. The ends of the sections of the tube 10 preferably extend through the sides of the shell 2 and are connected alternately by couplings 11, having plugs 12, which plugs when
 55 removed permit the sections to be readily cleaned. The feed-water tube will of course extend to the boiler of the engine.

It will of course be understood that the condenser disclosed is capable of considerable
 60 modification within the scope of my invention as herein set forth and claimed.

The boxes or bodies of some steam-carriages are inclined upward at their forward ends, and in this case the corrugated or folded body
 65 of the condenser would be also turned upward at its forward end, so as to follow the said box.

It will also be understood that the device herein for convenience termed a "steam-con-
 70 denser" is capable of a more general use and would make an extremely-efficient device for cooling the circulating water of an explosive-engine, especially when used in connection with an automobile.

It will be further understood that the con-
 75 denser might be provided with more than one dividing-partition and that such partitions may be formed in a great many different ways.

What I claim, and desire to secure by Letters Patent of the United States, is as follows:
 80

A condenser having longitudinally-extending depending corrugations or folds communicating at their tops, and a longitudinally-extended partition dividing said condenser in
 85 two compartments, a communicating passage through said partition at one end of the condenser, and inlet and outlet passages at the other end of the condenser, the one opening into one compartment, and the other opening
 90 from the other compartment of said condenser, substantially as and for the purposes set forth.

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

ROLAND W. KNAPP.

Witnesses:

ELIZABETH H. KELIHER,
 F. D. MERCHANT.