

No. 635,003.

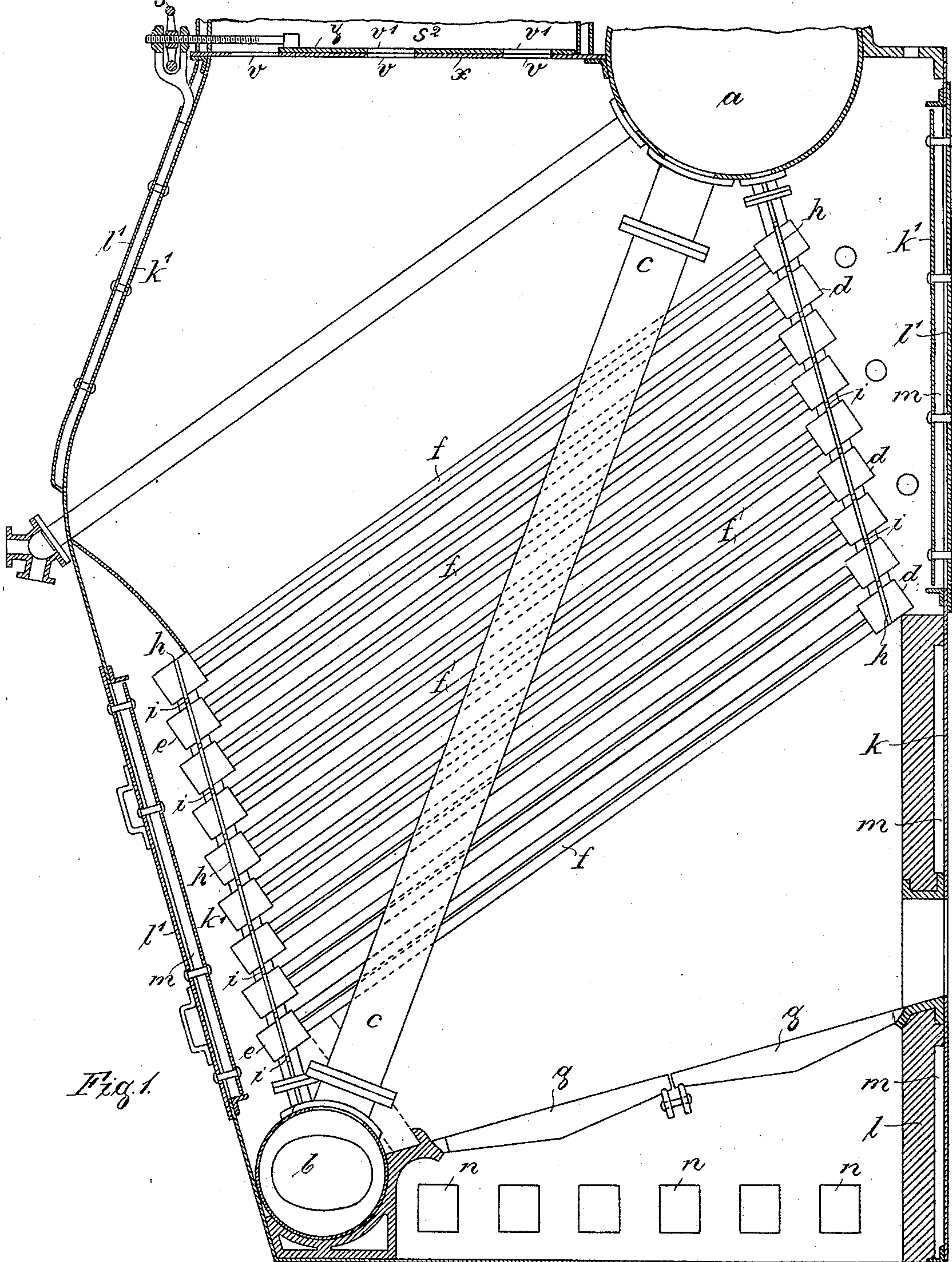
Patented Oct. 17, 1899.

H. SIEBERT.
TUBULAR MARINE BOILER.

(Application filed Apr. 29, 1899.)

(No Model.)

5 Sheets—Sheet 1.



Witnesses
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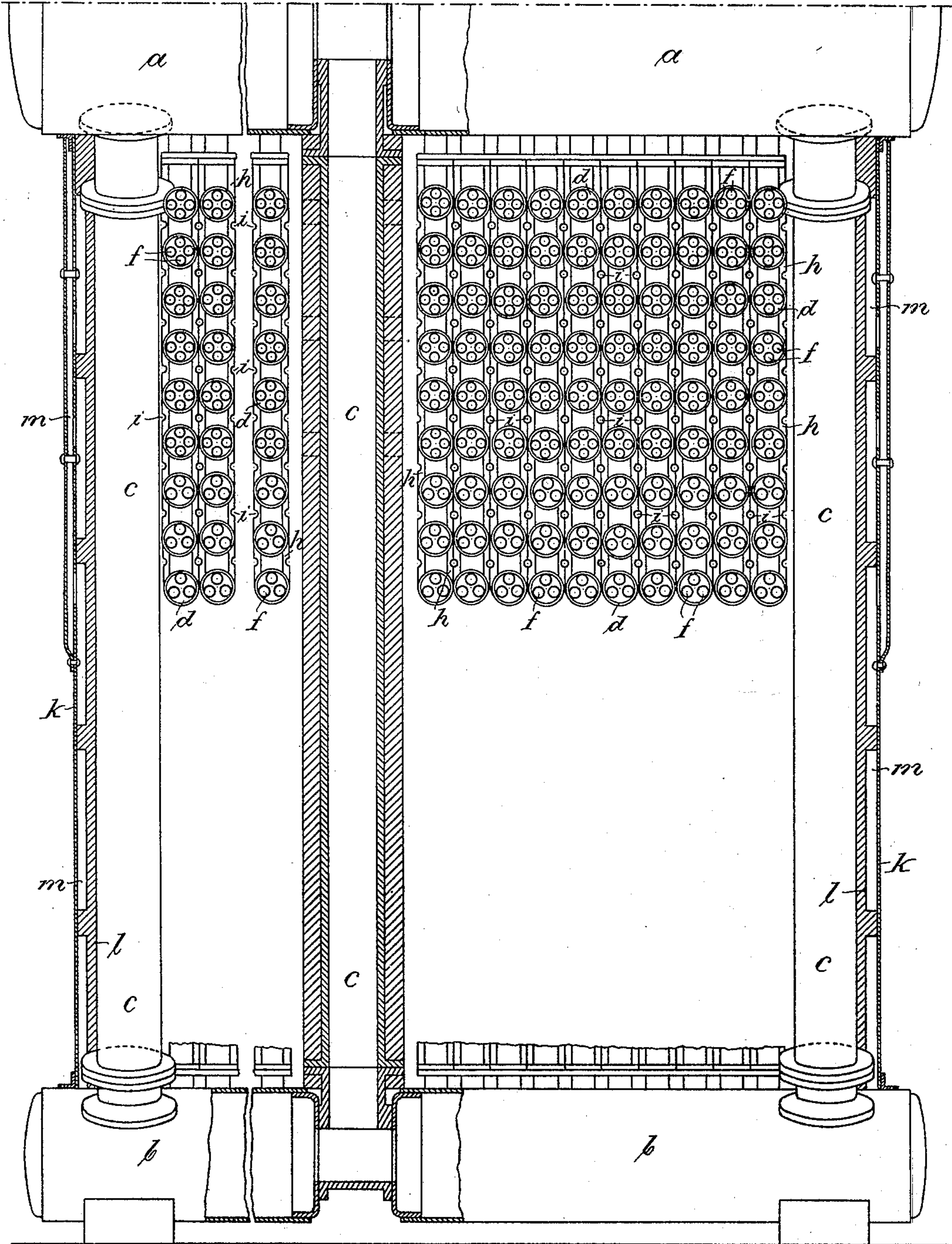
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Fig. 2.

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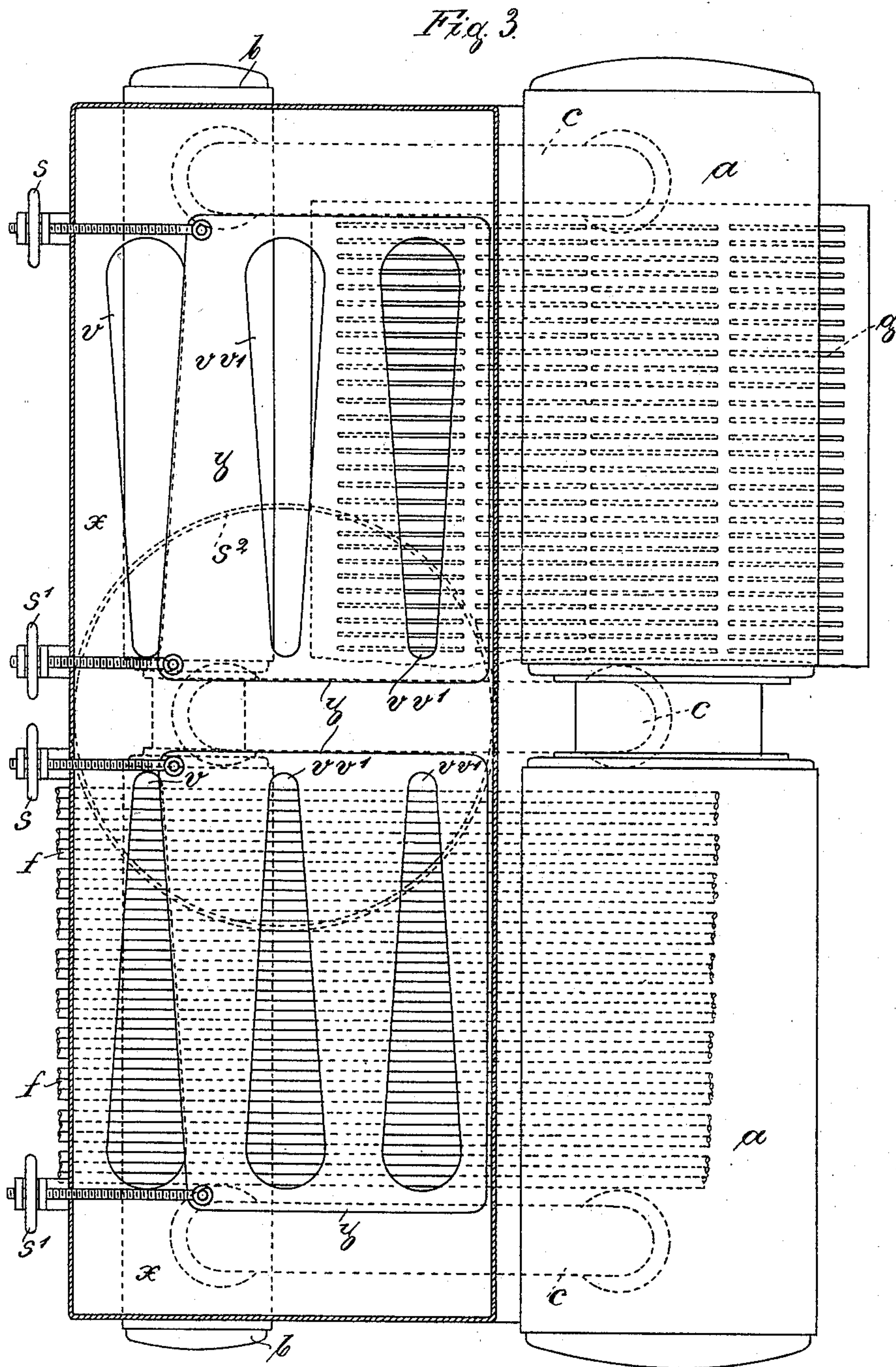
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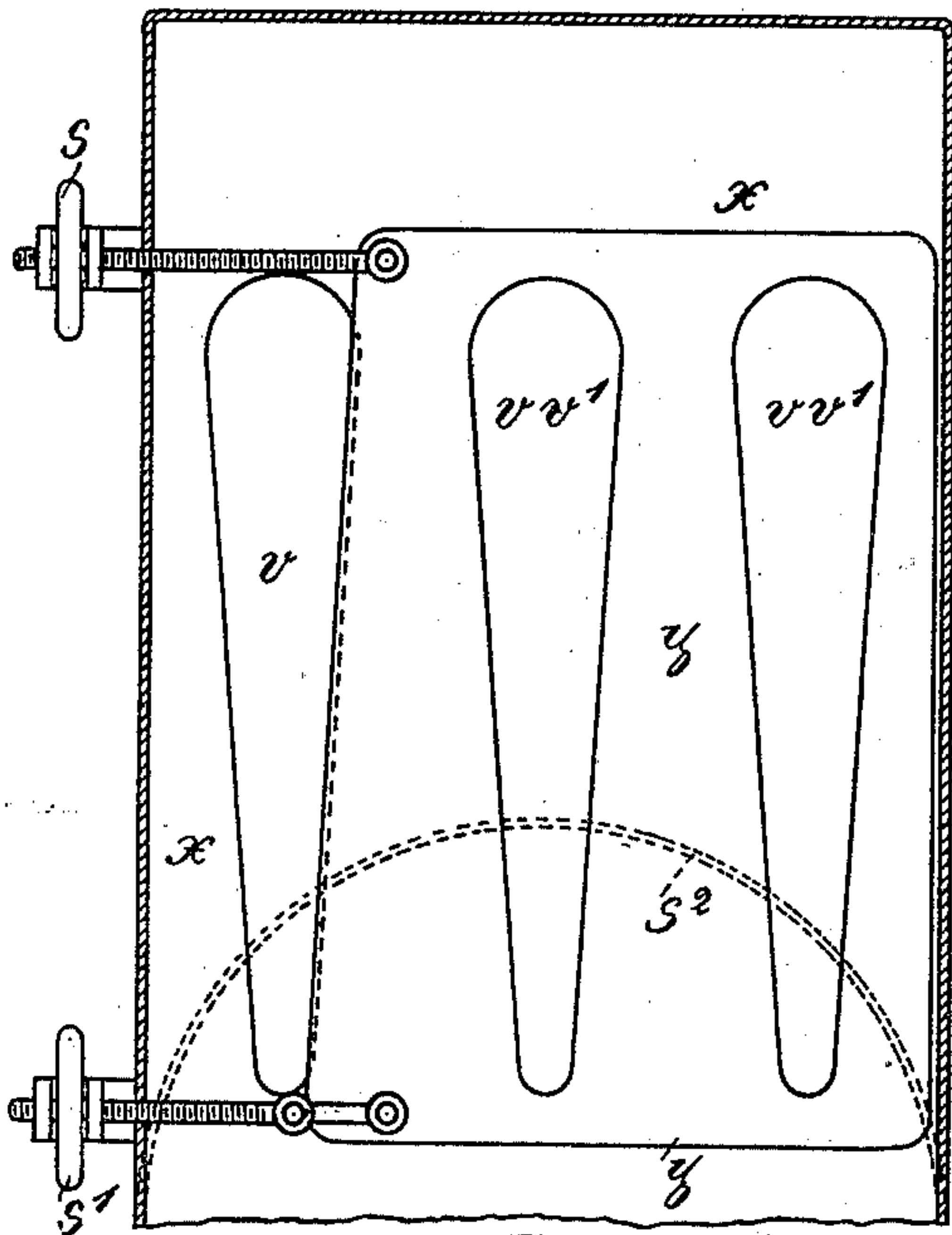


Fig. 4.

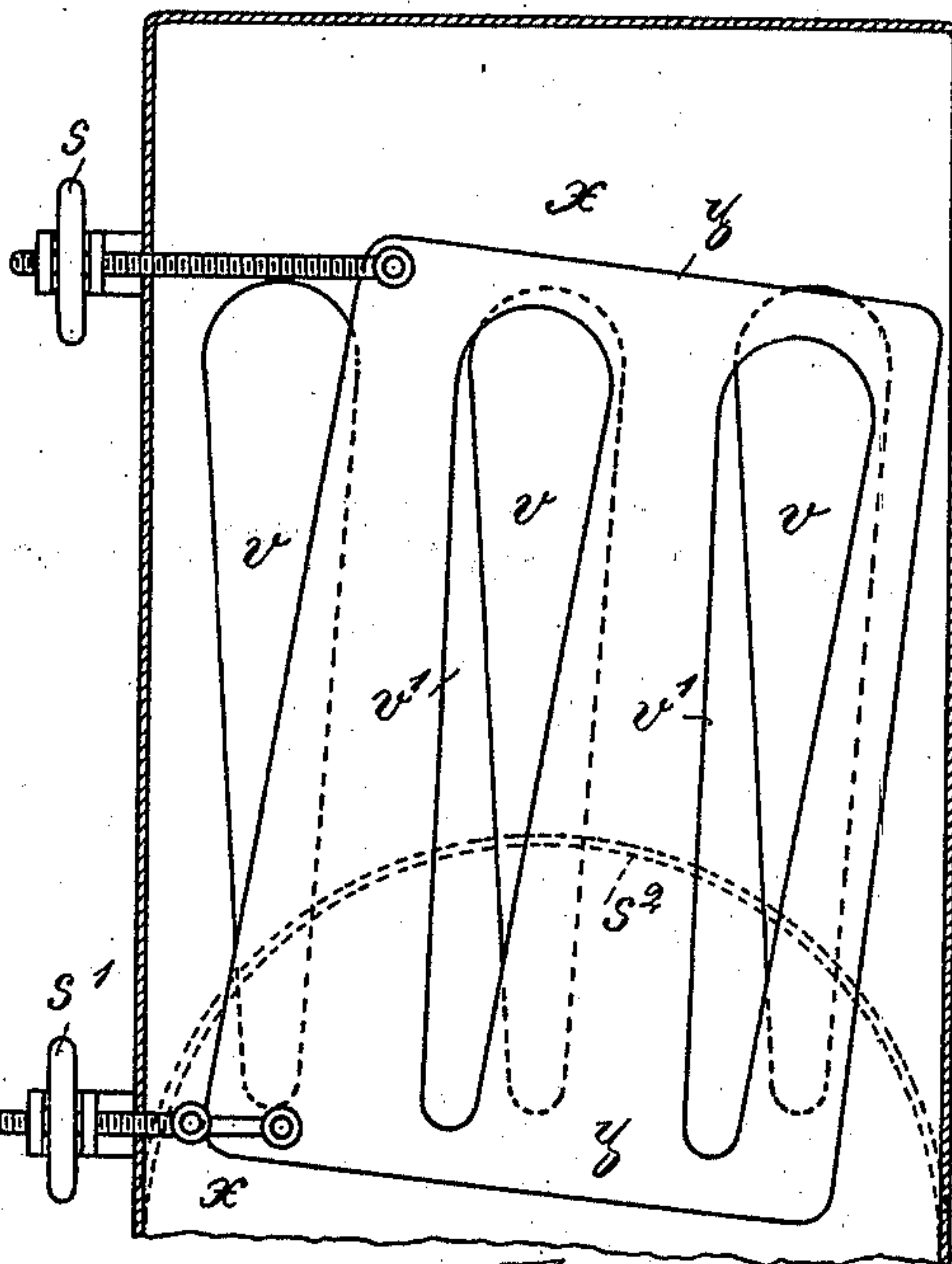


Fig. 5.

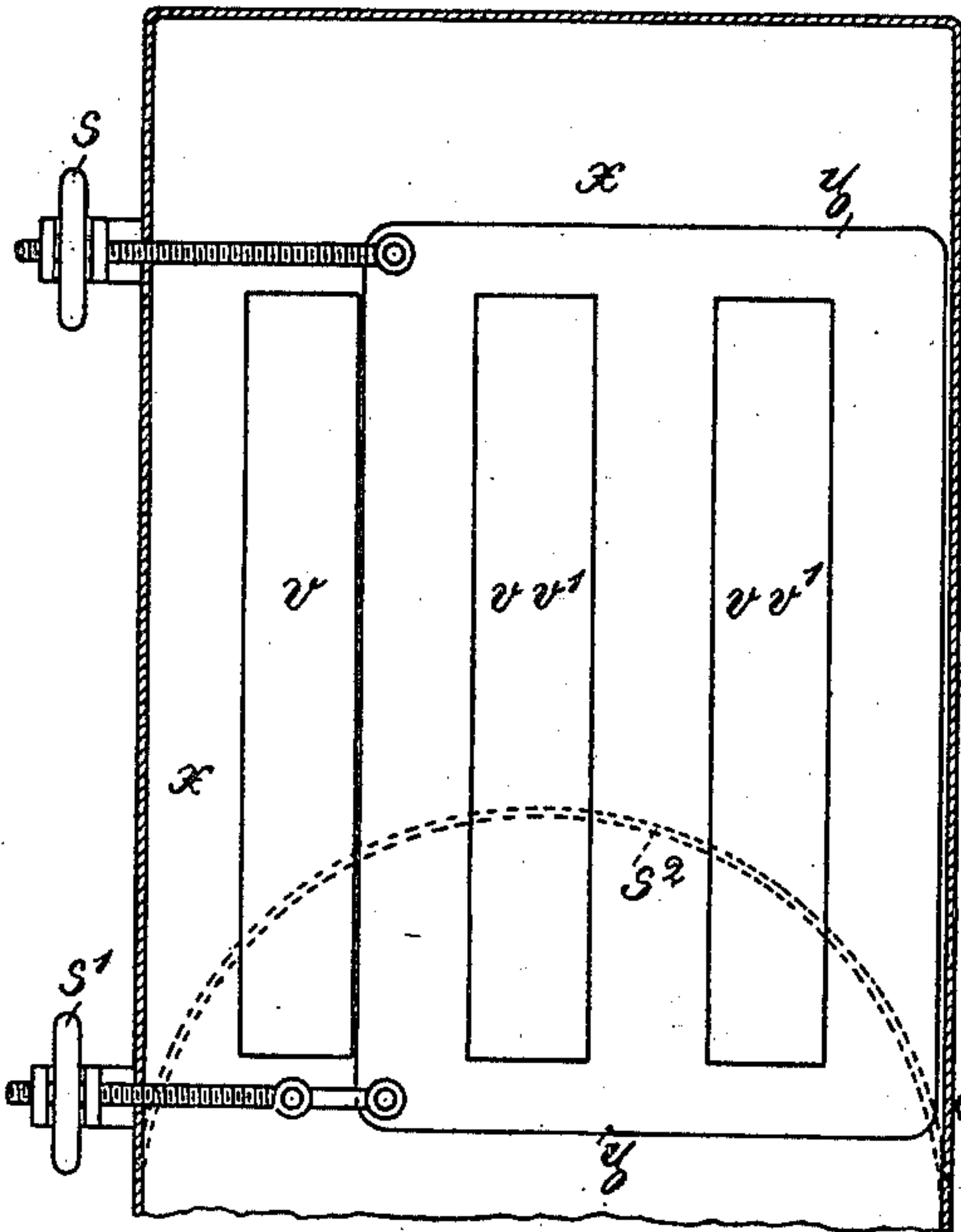


Fig. 6.

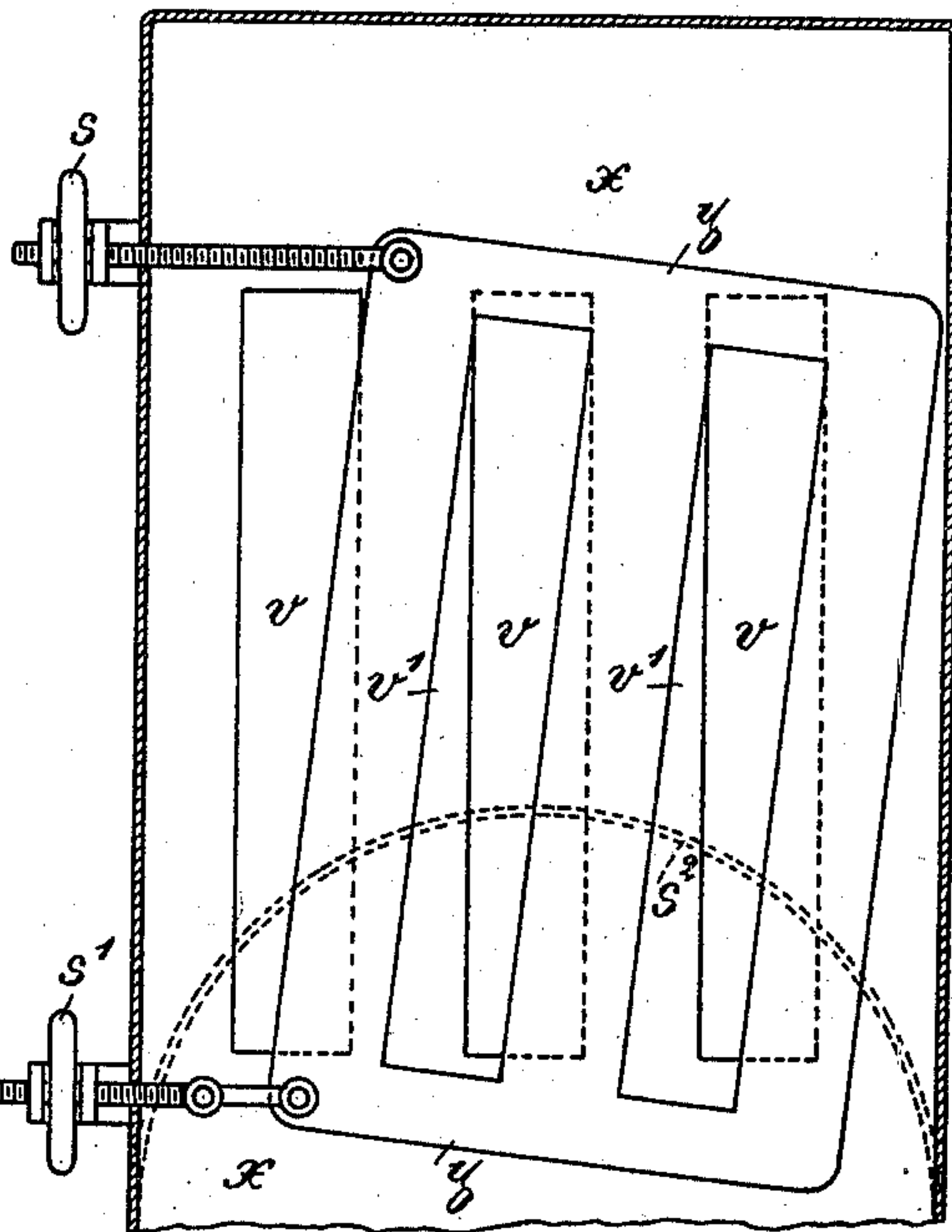


Fig. 7.

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Fig. 9.

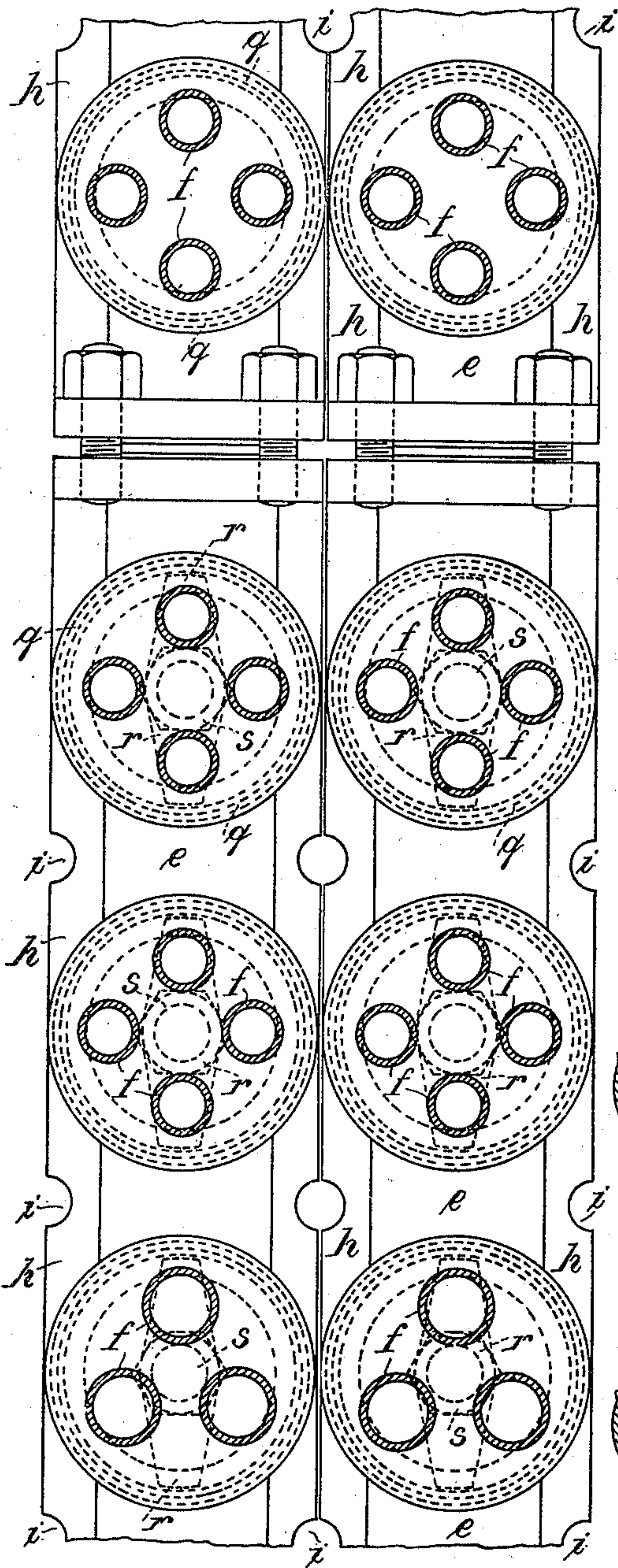
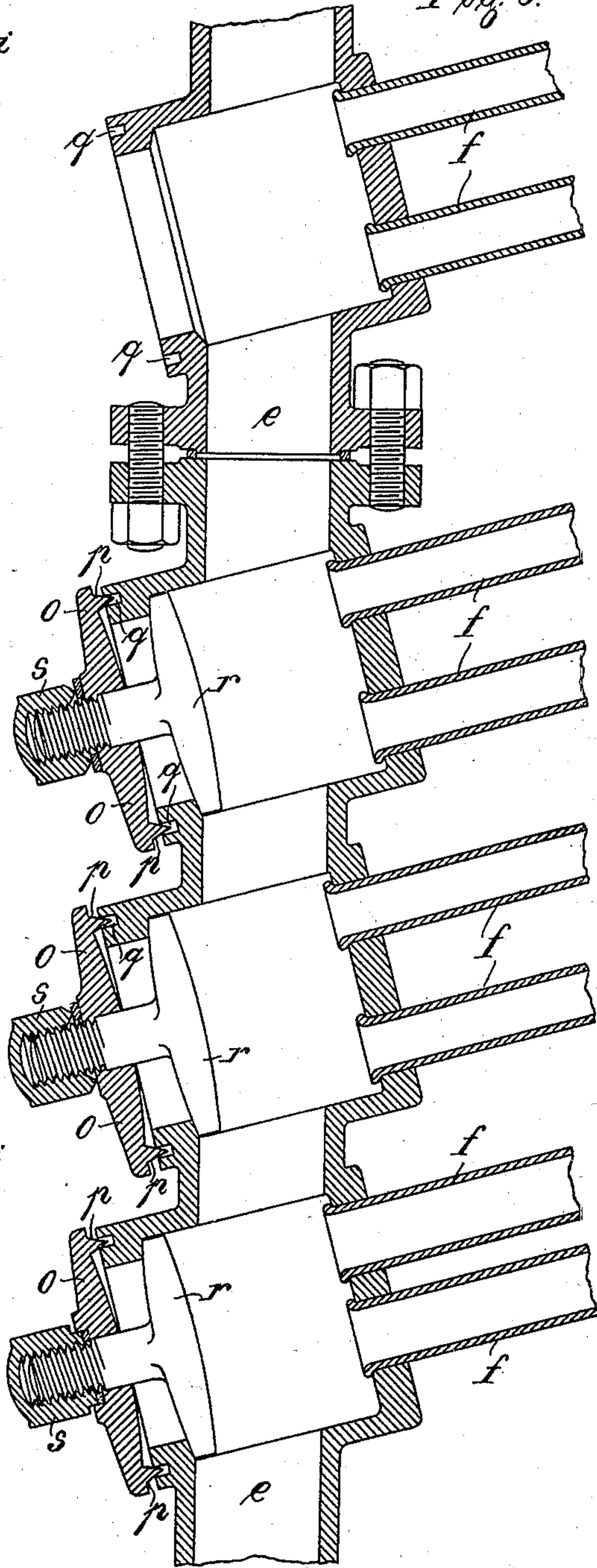


Fig. 8.



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UNITED STATES PATENT OFFICE.

HEINRICH SIEBERT, OF ELBING, GERMANY.

TUBULAR MARINE BOILER.

SPECIFICATION forming part of Letters Patent No. 635,003, dated October 17, 1899.

Application filed April 29, 1899. Serial No. 715,032. (No model.)

To all whom it may concern:

Be it known that I, HEINRICH SIEBERT, a subject of the King of Prussia, German Emperor, and a resident of Elbing, in the Kingdom of Prussia, German Empire, have invented certain new and useful Improvements in Tubular Marine Boilers, (for which application for patent has been filed in Germany on the 15th of February, 1899,) of which the following is an exact specification.

This invention relates to new and useful improvements in tubular marine boilers; and it consists of a certain arrangement of parts, as fully described and hereinafter set forth.

My invention has for its object to provide a new and improved tubular marine boiler of that kind where the chief or principal heating-surface is composed of a plurality of water-tubes inclined downward from front to rear of the boiler, the lower ends of the tubes communicating with a water-cylinder and the upper ends communicating with a steam-cylinder, both cylinders being connected by one or more inclined circulating stand-pipes.

The particular arrangement of parts in a boiler according to my invention has the object, first, to attain a strong circulation of water; second, to deliver the steam in a dry state; third, to add to the safety and durability of the boiler, and, fourth, to allow an easy cleansing of the apparatus.

The construction by means of which this purpose is attained is the following: The water-tubes of a boiler according to my invention incline strongly (about twenty-five degrees) to the rear, whereby the steam produced within the tubes reaches the steam-cylinder in quite a dry state. The construction of such inclined tubes offers difficulties, insomuch as the headers could not be constructed the one overlapping the other, owing to the insufficient space. It is a special feature of my invention that these headers of the water-tubes can be suitably arranged without overlapping another. For this purpose the headers containing the water-tubes are constructed in step form. In order to arrange a great number of tubes of small diameter within the step-formed headers, each of them carries three or four, (but only a small number of tubes,) so that each header contains a group of water-tubes which

are separated by comparatively a greater space from the following group of water-tubes. Thereby is attained a great heating-surface, which is formed by only a very small number of water-tubes. The formation of smoke and the deposits of ashes on the upper sides of the tubes are prevented, for the reason that the great intermediate spaces between the different groups of water-tubes allow that the gases separated by the different tubes unite again, thereby an efficient passing of the flame around all of the water-tubes being attained.

The different parts of this boiler are arranged so that one wall formed by the series of headers is fixed to the steam-chamber, while the other wall reposes upon the water-cylinder, thereby a distorting of the boiler being prevented. Instead of two series of headers two water-legs advantageously can be employed, the outer wall of which is even, while the inner wall directed to the fire-grate has the before-described step form.

In order to make my invention more clear, I refer to the accompanying drawings, in which—

Figure 1 shows a vertical section through the boiler. Fig. 2 illustrates a transverse section through the boiler. Fig. 3 is a horizontal section showing a general view of the draft-regulation device. Fig. 4 is a detail view of the same. Fig. 5 shows the regulation device being actuated. Figs. 6 and 7 show a modified form of construction according to Figs. 4 and 5. Fig. 8 is a vertical section through a series of headers consisting of several pieces connected together. Fig. 9 is a transverse section according to Fig. 8.

In the drawings, *a* is a steam-chamber, and *b* is the water-cylinder, of the boiler. Both the steam-chamber and the water-cylinder are connected by one or more stand-pipes *c*, arranged laterally to the boiler, or in long boilers in the middle of the same.

d are the front headers for taking up the water-tubes.

e are the rear headers.

f are the water-tubes introduced in the front and in the rear headers.

g is a fire-grate arranged in the direction of the water-tubes. The fore and rear head pieces are composed in horizontal direction

of series connected together by means of plugs and in vertical direction. They are formed by one single piece or composed of several pieces connected together by suitable means, Figs. 8 and 9. Each header is provided with lateral ribs *h*, in which ribs are bored recesses *i*, so that, first, a smoke-tight wall is formed by the headers, and, second, the cleaning of the water-tubes can easily be effected from the outside.

As illustrated in the drawings, the boiler is inclosed by a double mantle *k l k' l'*, thus forming the channels *m*, through which the heated air is conducted to the openings *n*, arranged underneath the fire-grate. Thereby the radiation of the wall *k* is utilized within the boiler and is prevented from acting to the outside. It is easily to be seen from the drawings that owing to the inclination of the water-tubes *f* an energetic circulation is attained. The steam produced within these tubes *f*, owing to their strong inclination, tends to escape as quickly as possible. Therefore the circulation not only will be a very lively one, but also a good utilization of the fire, and a formation of very dry steam will be effected.

The header for each group of water-tubes is rendered tight by a closing mechanism arranged at its outside. This mechanism is a very simple one and clearly represented in Figs. 8 and 9. It consists of a disk *o*, having a projecting annular border *p*, which latter engages in an angular groove *q*, arranged at the outside of the header. The tightening of the joint is effected by means of a clamp *r*, provided at the inside of the header, and a screw-bolt *s*, arranged on the outside of the disk *o* in any suitable manner. The heating of the boiler, as described heretofore, is effected in the ordinary manner—that is to say, the fire-gases flow from the bottom of the boiler to the top of the same.

A further advantage of great importance is attained by means of my draft-regulating device, which enables a uniform heating of all of the water-tubes. Hitherto the fire-gases were throttled or ejected; but in my invention I mislead the fire-gases from their natural nearest way to the chimney—that is to say, the fire-gases, which, owing to their position, could take the nearest way to the chimney, are throttled on this way and are obliged to pass a longer way, so as to cause them to pass freely over the whole heating-surface—that is to say, over the whole length and breadth of the boiler. They pass freely and uniformly around each tube in all its length, whereby the boiler may have any dimension with respect to the position of the chimney, so that the whole length of the boiler can be employed for arranging fire-grates. In this manner great fire-grates can be employed with economical combustion; also boilers of extraordinary dimensions having great heating-surfaces can be built, as in spite of the compactness of the

boiler a good distribution of the fire-gases is possible.

Evidently the draft mechanism can be constructed in such manner as to be regulable. This is effected in the simplest way when it acts as throttling mechanism, stopping the fire-gases at the one side more than at the other. Such a device is illustrated in the accompanying drawings in Figs. 3 to 7.

Fig. 3 shows a top view of a tubular marine boiler constructed according to my invention. *a* is a steam-chamber, *b* the water-cylinder, and *g* (right-hand side) illustrates the position of the fire-grate. *f* on the left-hand side of Fig. 3 shows the position of the water-tubes lying parallel to the fire-grate *g*. *s* is a common chimney. The apertures *v* for the fire-gases preferably are of trapeze form, the smaller parts lying near the chimney. The regulating mechanism is formed by a plate *x*, rigidly connected to the boiler. Upon this plate reposes a second plate *y*, displaceable by means of screws *s s'*. Apertures of the form illustrated in the drawings are provided on the plate *x*. The plate *y*, reposing upon the plate *x*, has apertures *v'*, which in form are similar to the apertures *v* of the plate *x*. The position of the plate *y* can be varied at will by screwing or unscrewing either by both the screws *s* and *s'* or one of them. For instance, in Fig. 5 the screw *s'* is screwed in and the plate *y* is moved aside, so that the apertures *v'* take the position represented in Fig. 5. It is quite evident that the position of this plate *y* with respect to the lower plate *x* can be regulated at will.

Fig. 6 shows a modified form of construction in which the apertures are not of trapeze form, as represented in Figs. 3 to 5, but of rectangular form. This modification is only of constructional nature and does not affect the idea of my invention.

In constructing a boiler in the manner hereinbefore described there are some great advantages. First, owing to the inclination of the tubes two free spaces are formed, which are of great importance for a good action of the boiler—viz., a free space is formed over the fire-grate *g*. Thereby a good formation of the flame is ascertained and a complete combustion is effected. The second space is formed between the water-tubes and the draft-regulating mechanism. This space can be employed for taking up a device for effecting the initial heating of the water or a superheater. Evidently both arrangements, the mechanism for effecting the initial heating as well as a superheater, can be arranged within the space between the draft-regulating mechanism and the water-tubes.

Having thus fully described the nature of this invention, what I desire to secure by Letters Patent of the United States is—

1. In tubular marine boilers, the combination of a steam-chamber and a water-cylinder, with an inclined circulating stand-pipe

connecting the steam-chamber to the water-cylinder, headers taking up a group of water-tubes and arranged in step form at the front and rear of the boiler, forming vertically one
5 single piece or several pieces connected together and being connected horizontally, one or more stand-pipes connecting the steam-chamber with the water-cylinder, a draft-regulating mechanism provided at the top end of
10 the boiler, substantially and for the purpose as described.

2. In tubular marine boilers, the combination of a steam-chamber *a* and a water-cylinder *b* connected with one or more stand-pipes
15 *c* connecting the two receptacles, headers *d* arranged in step form and provided with ribs *h* having openings *i* allowing an easy cleansing of the water-tubes, plates *o* having angular borders *p* engaging into grooves *q* provided in the headers, screw-bolts *s* and clamps
20 *r* tightening the plates and consequently the headers, for the purpose and substantially as described.

3. In tubular marine boilers, the combination of a steam-chamber *a*, with a water-cyl- 25
inder *b*, one or more transverse stand-pipes *c* connecting the two cylinders, water-tubes *f* arranged in groups strongly inclined within the boiler, front and rear headers *d e* arranged in step form, mantles *k l k' l'* surrounding the 30
boiler, and forming a channel *m* conducting the air underneath the fire-grate through openings *n*, a plate *x* fixed to the top end of the boiler, provided with openings *v* in trapeze or other suitable form, a plate *y* repos- 35
ing upon said plate *x*, openings *v'* in form similar to *v*, provided in said plate *y*, screws *s s'* for altering the position of the plate *y* thus regulating the draft, for the purpose and
substantially as described. 40

In witness whereof I have hereunto set my hand in presence of two witnesses.

HEINRICH SIEBERT.

Witnesses:

BERNHARD DUER,
WILHELM AMMOR.