

(No Model.)

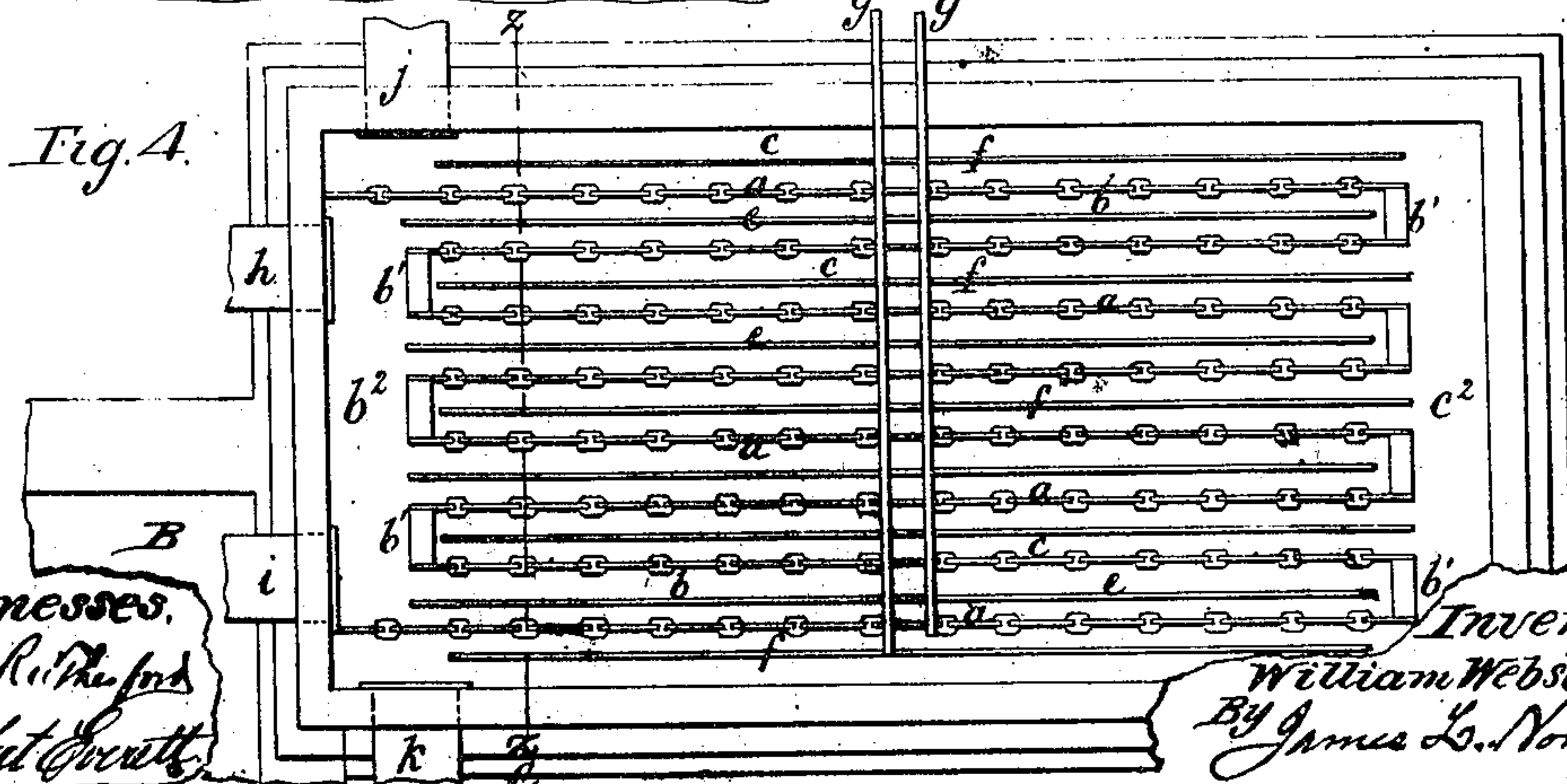
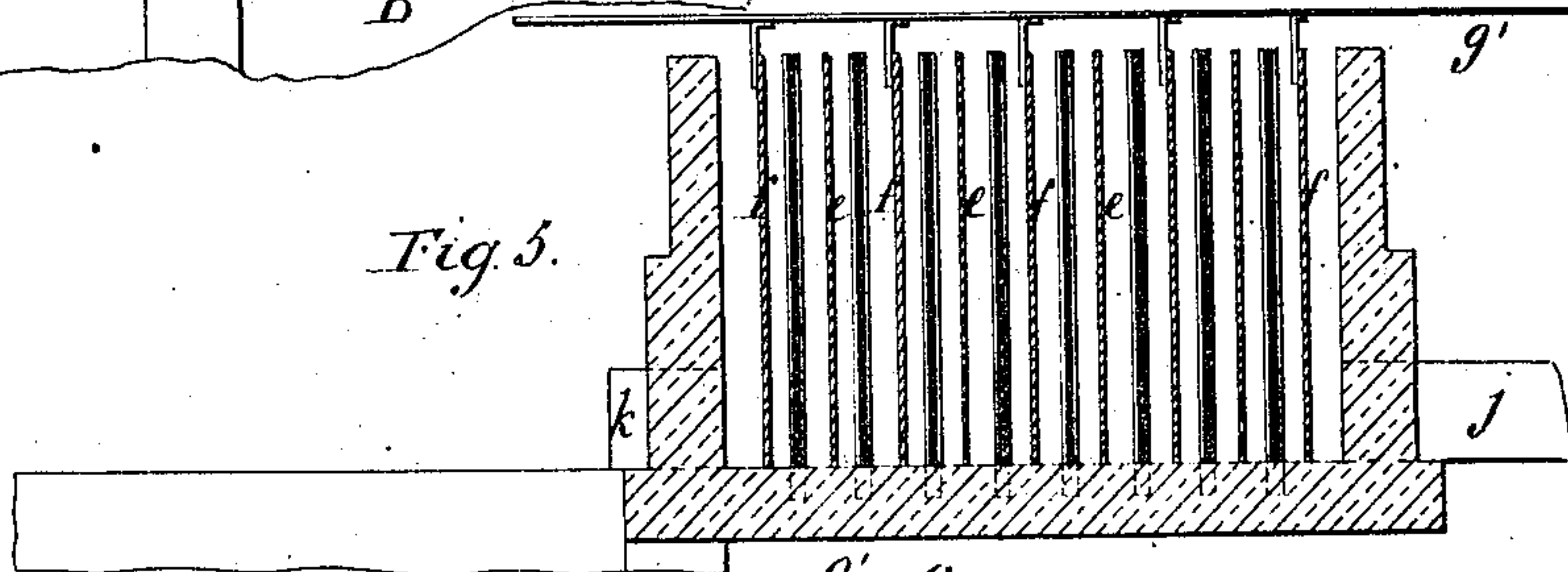
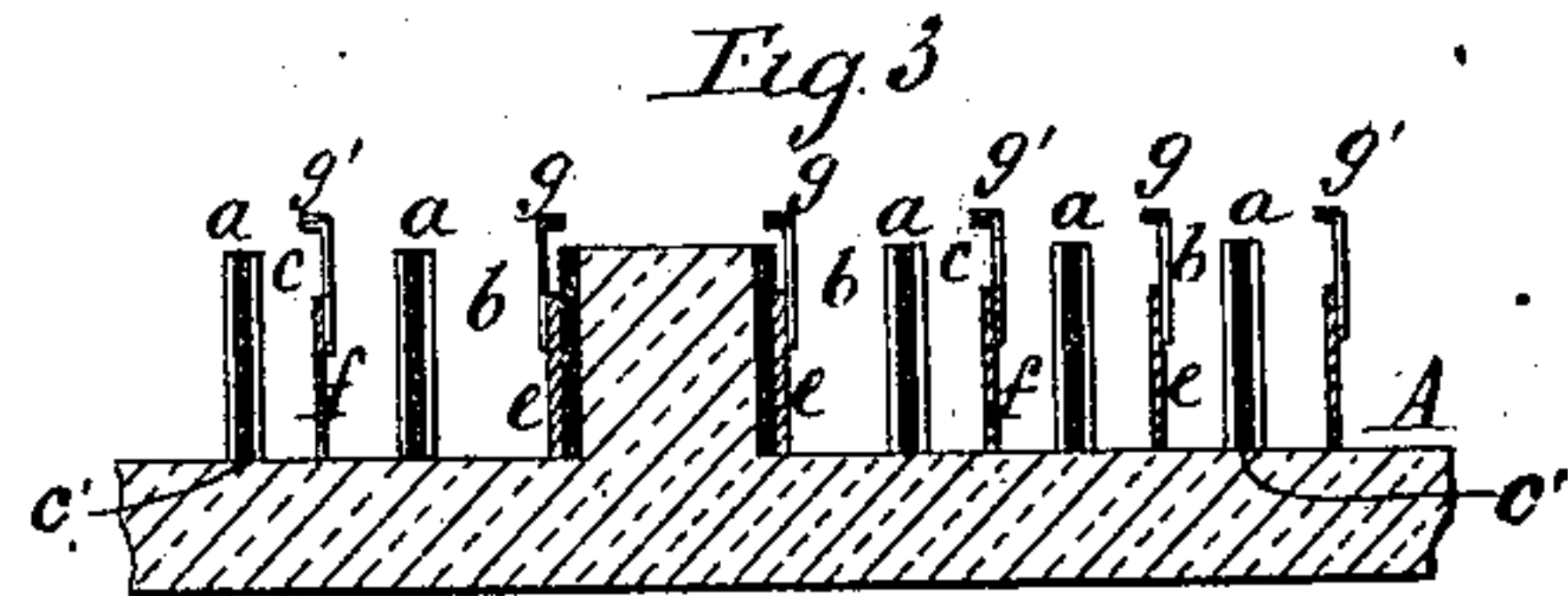
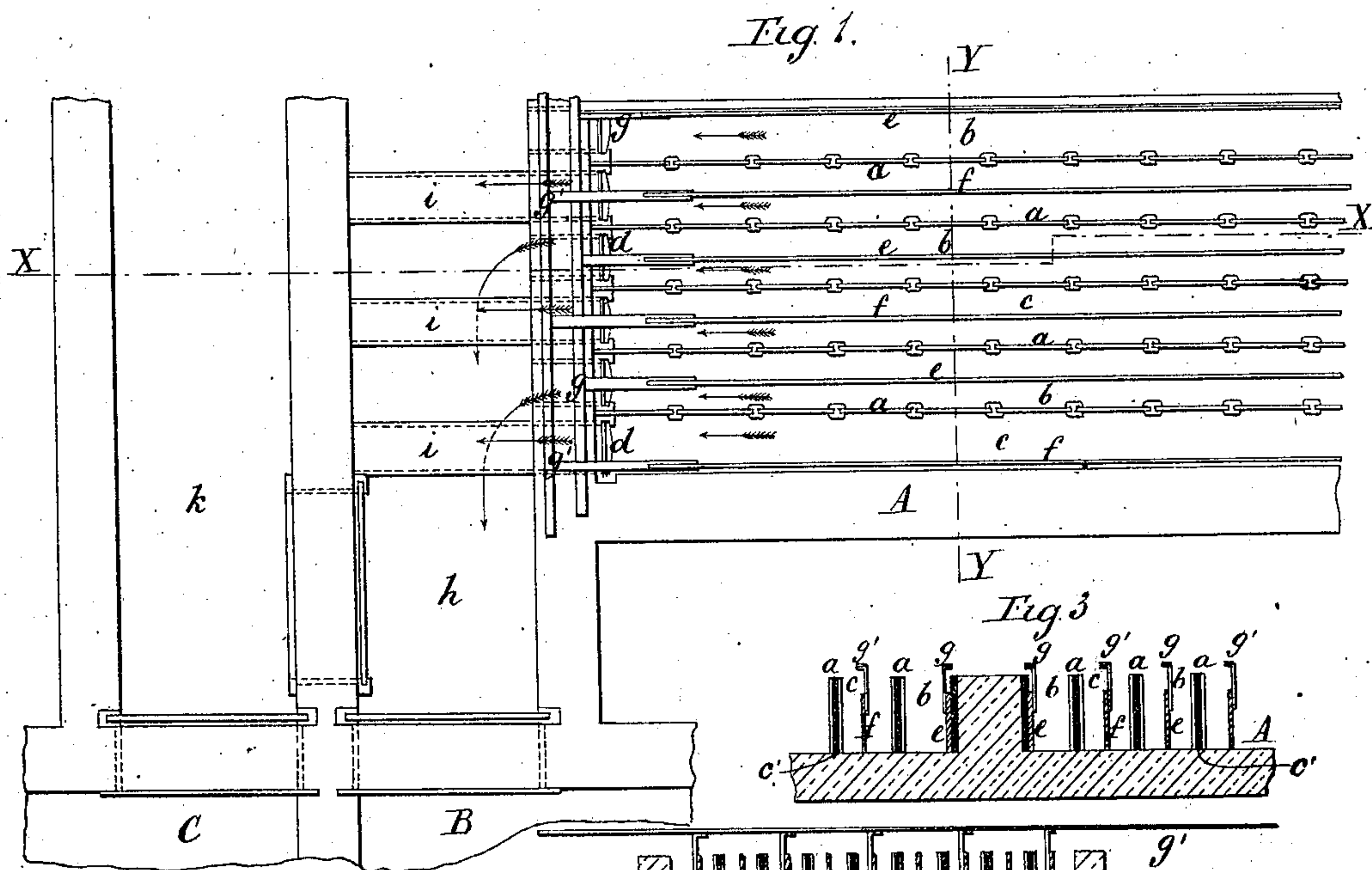
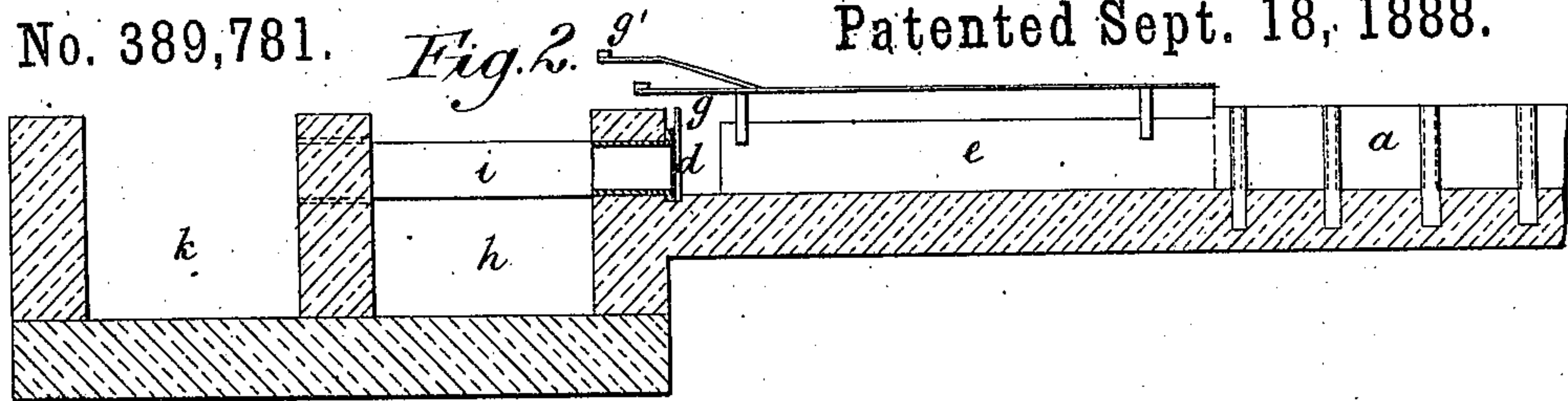
2 Sheets—Sheet 1.

W. WEBSTER, Jr.

PROCESS OF ELECTROLYZING SEWAGE AND SEA WATER.

No. 389,781.

Patented Sept. 18, 1888.



Witnesses.
J. R. Smith
Robert Smith

Inventor.
William Webster Jr.
By James L. Norris

(No Model.)

2 Sheets—Sheet 2.

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Fig. 1.

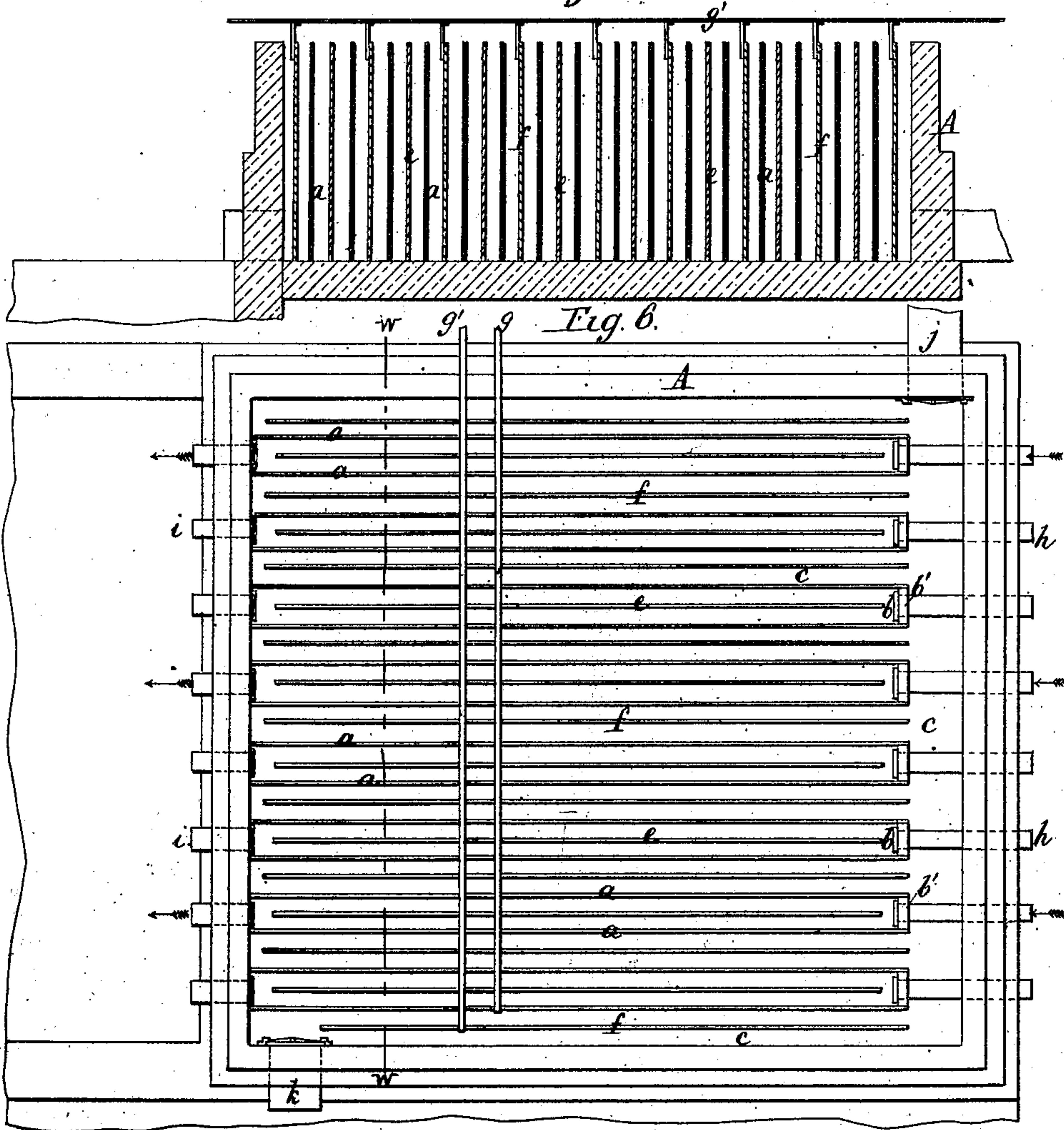


Fig. 6.

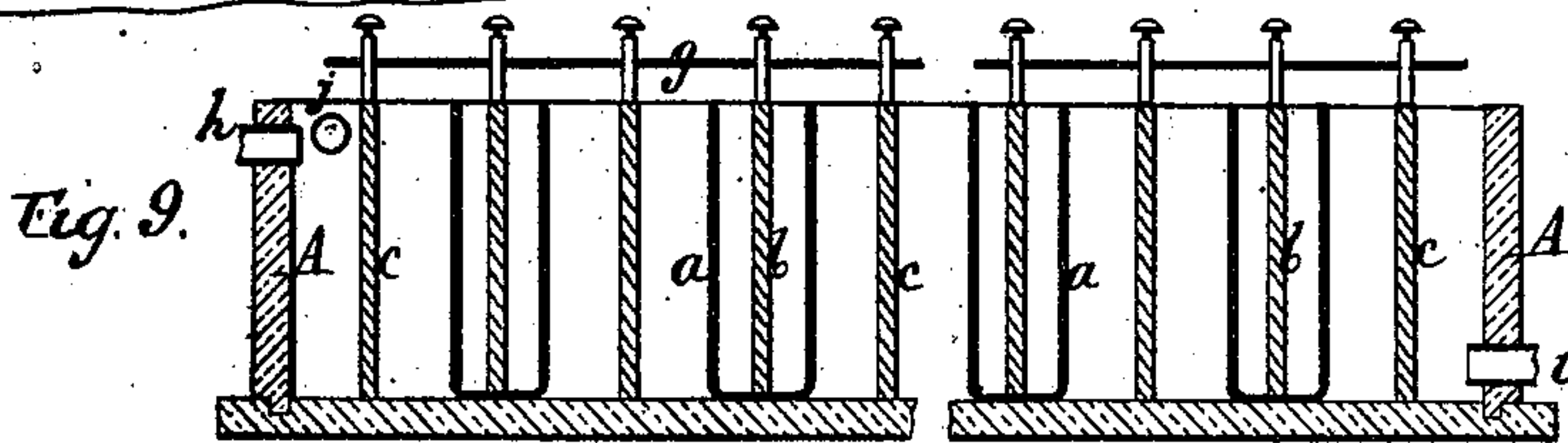


Fig. 9.

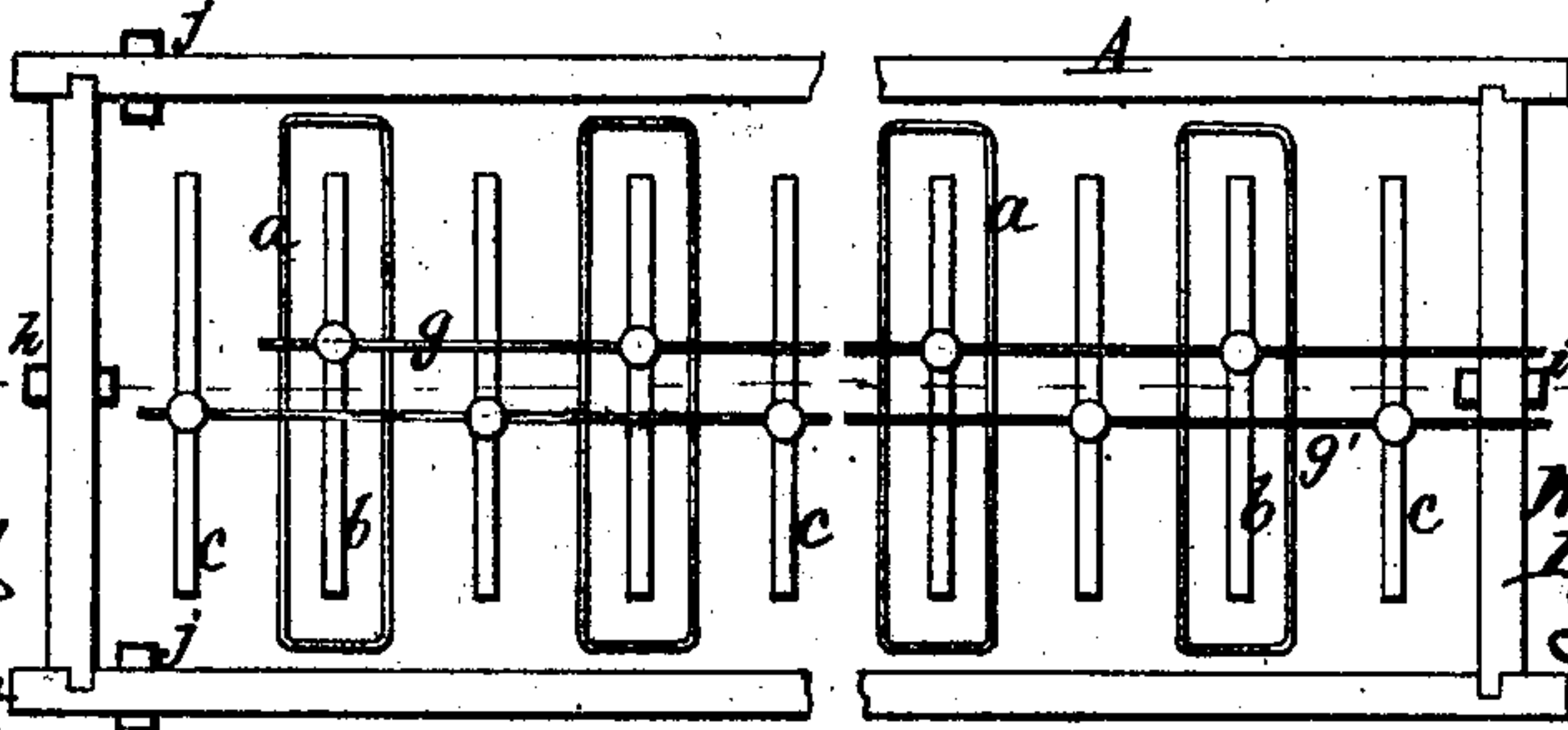


Fig. 8.

Witnesses.

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UNITED STATES PATENT OFFICE.

WILLIAM WEBSTER, JR., OF LEE PARK, LEE, COUNTY OF KENT, ENGLAND.

PROCESS OF ELECTROLYZING SEWAGE AND SEA-WATER.

SPECIFICATION forming part of Letters Patent No. 339,781, dated September 18, 1888.

Application filed December 22, 1887. Serial No. 258,726. (No model.) Patented in England November 17, 1887, No. 15,760; in France December 9, 1887, No. 187,499; in Cape of Good Hope January 28, 1888, No. 436; in Natal February 2, 1888; in Victoria February 8, 1888, No. 5,615; in New South Wales February 10, 1888, No. 495; in South Australia February 10, 1888, No. 961; in Tasmania February 12, 1888, No. 540/10, and in India April 13, 28, 1888, No. 16/522.

To all whom it may concern:

Be it known that I, WILLIAM WEBSTER, Jun., a citizen of England, residing at Lee Park, Lee, in the county of Kent, England, have invented new and useful Improvements in the Electrolytic Treatment of Sewage and Sea-Water for the decomposition thereof and the production of certain products therefrom, (for which I have obtained patents in France, dated December 9, 1887, No. 187,499; in Cape of Good Hope, dated January 28, 1888, No. 436; in Natal, dated February 2, 1888; in Victoria, dated February 8, 1888, No. 5,615; in New South Wales, dated February 10, 1888, No. 495; in South Australia, dated February 10, 1888, No. 961; in Tasmania, dated February 12, 1888, No. 540/10; in India, dated April 13/28, 1888, No. 16/522; and have made application for patent in Great Britain, dated November 17, 1887, No. 15,760,) of which the following is a specification.

My invention has for its object the decomposition of sewage or sea-water, more particularly with a view to obtain certain products therefrom. For this purpose I construct a reservoir or tank, or a series of the same, which I divide into compartments which may be either of equal or unequal size by means of porous tiles, each compartment having an independent outlet through the walls of the reservoir or otherwise. If it be desired to obtain ammonia from sewage, I place iron negative electrodes in the narrower compartments and positive carbon electrodes in the wider ones. Both sets of compartments are filled with sewage and the electrodes are connected with the corresponding poles of a dynamo-electric machine or battery, and the sewage is electrolytically acted upon for a short time. The sewage in the positive compartments is then allowed to run off and is replaced by fresh sewage, which is then acted upon in the same manner, while the charge in the negative compartments is retained, and so on, until by the continued electrolytic action in the negative compartments sufficient ammonia has been produced, whereupon the charges of these compartments are

run off into a separate tank to be subsequently treated for obtaining the ammonia, and the compartments are again filled with fresh sewage and the process is repeated. If, on the other hand, it be desired to obtain a disinfecting-liquor, valuable for many purposes, the positive carbon electrodes are placed in the smaller compartments and the negative electrodes in the larger ones. The charges in the positive compartments are in this case retained for a length of time, while the contents of the negative compartments are renewed at short intervals after having been subjected to the electrolytic treatment, as above described. After a certain time the contents of the positive compartments will be found to be charged with various compounds of chlorine of a highly-oxidizing nature, and consequently well suited for disinfecting purposes. Sea-water may also be treated in the same way, as above described, for producing a highly oxidizing or disinfecting liquor therefrom.

The accompanying drawings show various arrangements for carrying out the above-described electrolytic process.

Figure 1 shows a part plan of one arrangement. Fig. 2 shows a section on line X X, Fig. 1. Fig. 3 shows a section on line Y Y, Fig. 1. Fig. 4 shows a plan view of a modification. Fig. 5 shows a cross-section on the line Z Z, Fig. 4. Fig. 6 shows a plan view of another modification. Fig. 7 shows a cross-section on the line W W, Fig. 6. Fig. 8 shows a plan view of another modification; and Fig. 9 shows a section on the line V V, Fig. 8, of apparatus for carrying out my invention.

A is a reservoir or tank divided by porous tile partitions *a a a* into long and comparatively narrow compartments *b b b* and *c c c*, having openings at each end through which sewage can be admitted and discharged, which openings are provided with suitable closing-valves *d d d*, of which only those at the discharge end are shown. In the compartments *b b b* are placed positive electrodes *e e e*, having very extended surfaces, and which are made of carbon in any suitable manner, while

in the compartments *c c c* are placed negative electrodes *f f f*, formed of iron plates, the electrodes *c c c* being connected by conductors *g* to the positive pole of an electrical generator, and the electrodes *f f f* by conductors *g'* to the negative pole thereof.

The supply-openings of all the compartments may communicate with a common supply-channel; but at the discharge end the positive compartments *b b* communicate, through their valves *d*, with a channel, *h*, leading to a settling-tank, B, while the negative compartments *c c* have tubular conduits *i i* leading from their discharge-openings across the channel *h* into a channel, *k*, which leads into the settling-tank C. Thus all the positive and negative compartments having been filled with sewage, their contents are subjected for a certain length of time to the action of an electric current passing through the electrodes *e f*, after which the contents of the positive compartments *b* are discharged into the tank B, while the contents of the negative compartments are retained. The compartments *b* are then again charged with fresh sewage, which is again discharged after a short time, and so on until the contents of the negative compartments *c* are found to be sufficiently charged with ammonia, generated at the negative electrode, when they are in their turn discharged into the tank C, to be further dealt with.

The porous partitions *a a* may be conveniently constructed of porous earthenware slabs supported between grooved uprights, as shown. Figs. 4 and 5 show another arrangement, in which the porous partitions *a a* are made of a continuous zigzag shape, so as to form spaces *b b*, closed at the end *b' b'*, and all communicating with the space *b'* at the other end, which is inclosed by the partition *a*, and communicates by an inlet, *h*, with a supply-channel, and by an outlet, *i*, with a settling-tank, B. The zigzag partition also forms other spaces, *c c*, alternating with *b b*, which are closed at the ends *c'* and communicate at the open ends with the space *c'*, the space being in communication with an inlet, *j*, from a supply-channel, and an outlet, *k*, to a settling-tank, C. In the spaces *b b* are placed the positive electrodes *e e*, and in the spaces *c c* the negative electrodes *f f*, these being connected to a generator of electricity by conductors *g g'*, whereby the above-described electrolytic action is set up, the two compartments being charged with the liquid to be treated, and the contents of either the positive or the negative one being retained for a longer time, while the other is changed at short intervals, according to the nature of the product desired to be obtained.

Figs. 6 and 7 show a modification of the last-described arrangement, in which the porous partitions *a a* are all carried up to the left-hand side of the tank, but stop short some distance from the right-hand side, the space *b* between every alternate pair of partitions

being inclosed at that end by a wall, *b'*, as shown, thus forming these spaces into separate positive compartments or cells containing the positive electrodes *e*, while the other alternate spaces *c* constitute the negative compartments containing the negative electrodes *f*. These latter compartments all have a common supply and discharge, *j k*, as before, while each of the compartments *b b* has a separate supply and discharge, *h* and *i*.

Figs. 8 and 9 show a construction of electrolytic apparatus suitable for dealing with comparatively small quantities of liquid according to my invention. In this case the tank A has porous pots, *a a*, placed in it, in which are situated either the positive or negative electrodes *b b*, while the negative or positive electrodes *c c* are situated in the tank A itself. The latter is charged and discharged at shorter intervals through openings *h* and *i*, while the porous pots are charged through lateral spouts *j*, and are discharged through either separate siphons or a compound siphon.

If sewage is to be treated for obtaining ammonia, the negative electrodes are placed in the porous pots *a*, these being of comparatively small capacity as compared with the capacity of the tank, the contents of the latter being renewed at short intervals, while that of the former is retained for a longer time in order to accumulate the required amount of ammonia. If, on the other hand, sea-water is to be treated for the production of chlorine, the positive electrodes are placed in the porous pots, so that by the electrolytic action chlorine is there evolved and accumulated.

In all the above-described arrangements the compartments in which the accumulation of either ammonia or chlorine takes place should be closed by hermetically-fitting covers if the contents are liable to become warm, in which case some of the evolved gases would be given off, and pipes lead from these compartments into vessels containing liquid capable of absorbing these gases, the pipes being allowed to dip only slightly into this liquid, in order that a pressure may not be created in the closed compartments, which would force the liquid therein through the porous partitions or pots.

Having thus described the nature of my invention and the best means I know for carrying the same into practical effect, I claim—

1. The method herein described of decomposing sewage and other liquid by electrolysis to produce disinfecting and other products, which consists in subjecting two bodies of one and the same liquid respectively to the electrolytic action of positive and negative electrodes, repeatedly renewing one of the liquid bodies and retaining and continuing the electrolytic action on the other liquid body, substantially as set forth.

2. The method herein described of decomposing sea-water by electrolysis to produce

chlorine, which consists in subjecting bodies of one and the same sea-water respectively to the electrolytic action of positive and negative electrodes, repeatedly renewing a portion
5 of the water and retaining and continuing the electrolytic action on the other portion of the sea-water, substantially in the manner set forth.

In testimony whereof I have signed my name
10 to this specification, in the presence of two sub-

scribing witnesses, this 2d day of December, A. D. 1887.

WILLIAM WEBSTER, JUN.

Witnesses:

CHAS. D. ABEL,
Patent Agent.

JNO. P. M. MILLARD,
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