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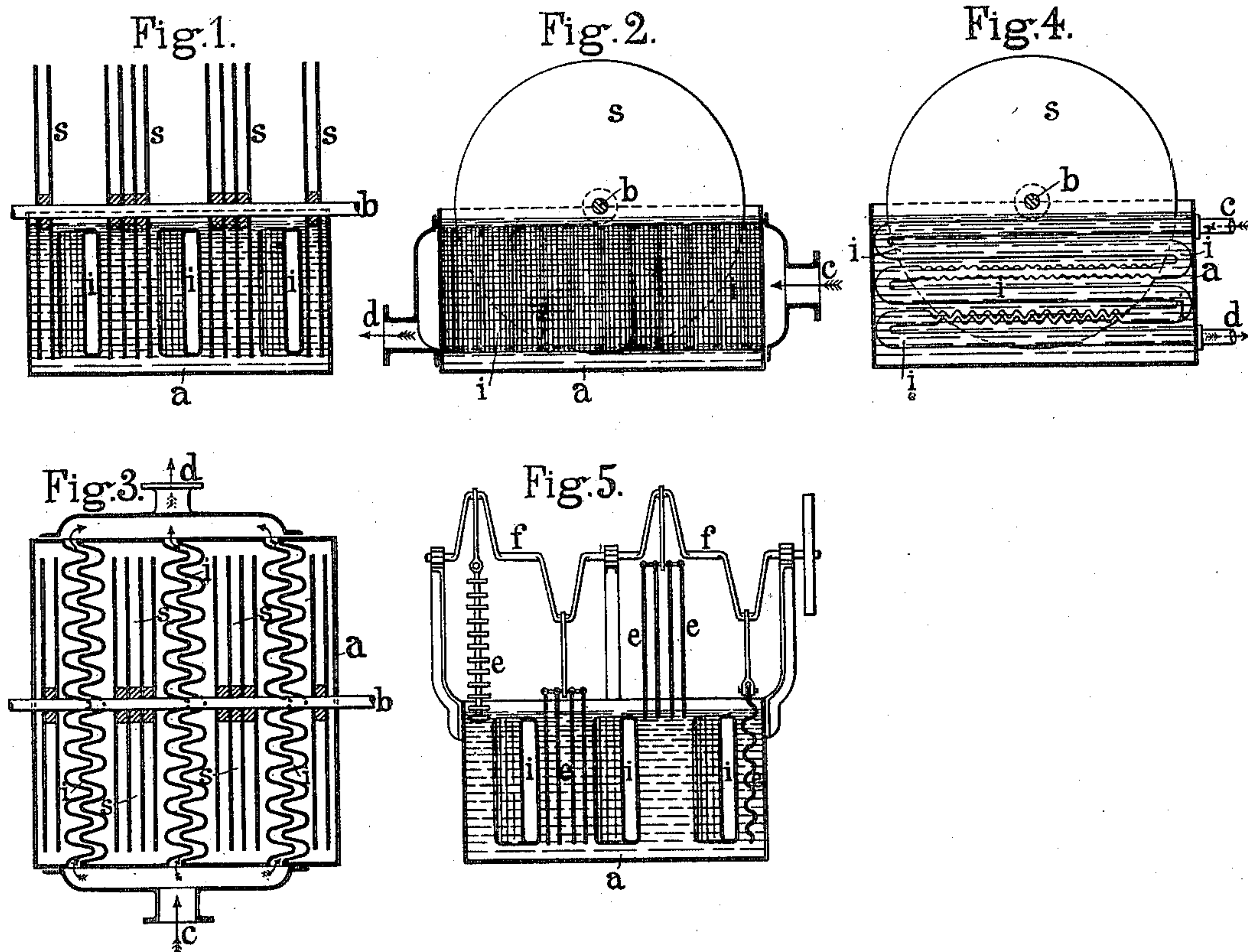
2 Sheets—Sheet 1.

E. THEISEN.

COOLING AND CONDENSING APPARATUS.

No. 363,094.

Patented May 17, 1887.



Witnesses

Chas. H. Smith
J. Staley

Inventor

Eduard Theisen
per Lemuel W. Lerrall,
att'y

(No Model.)

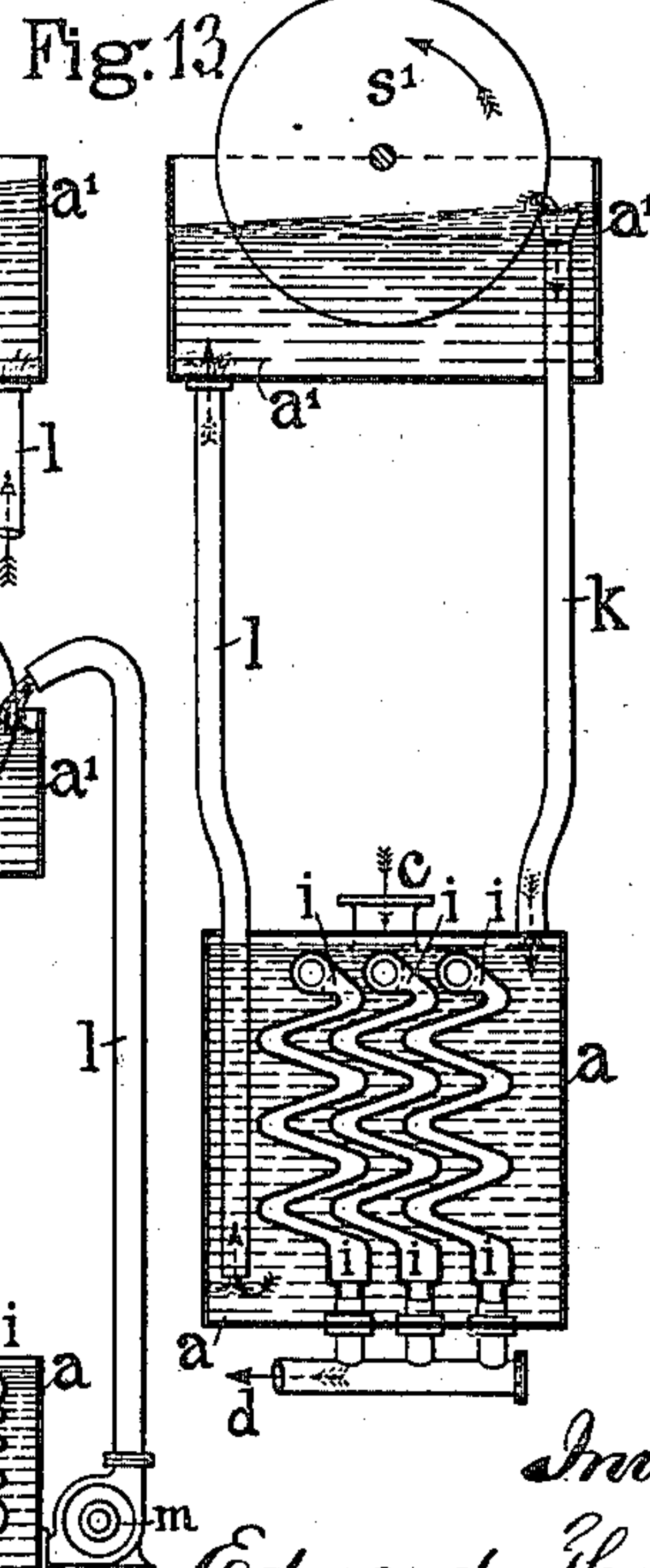
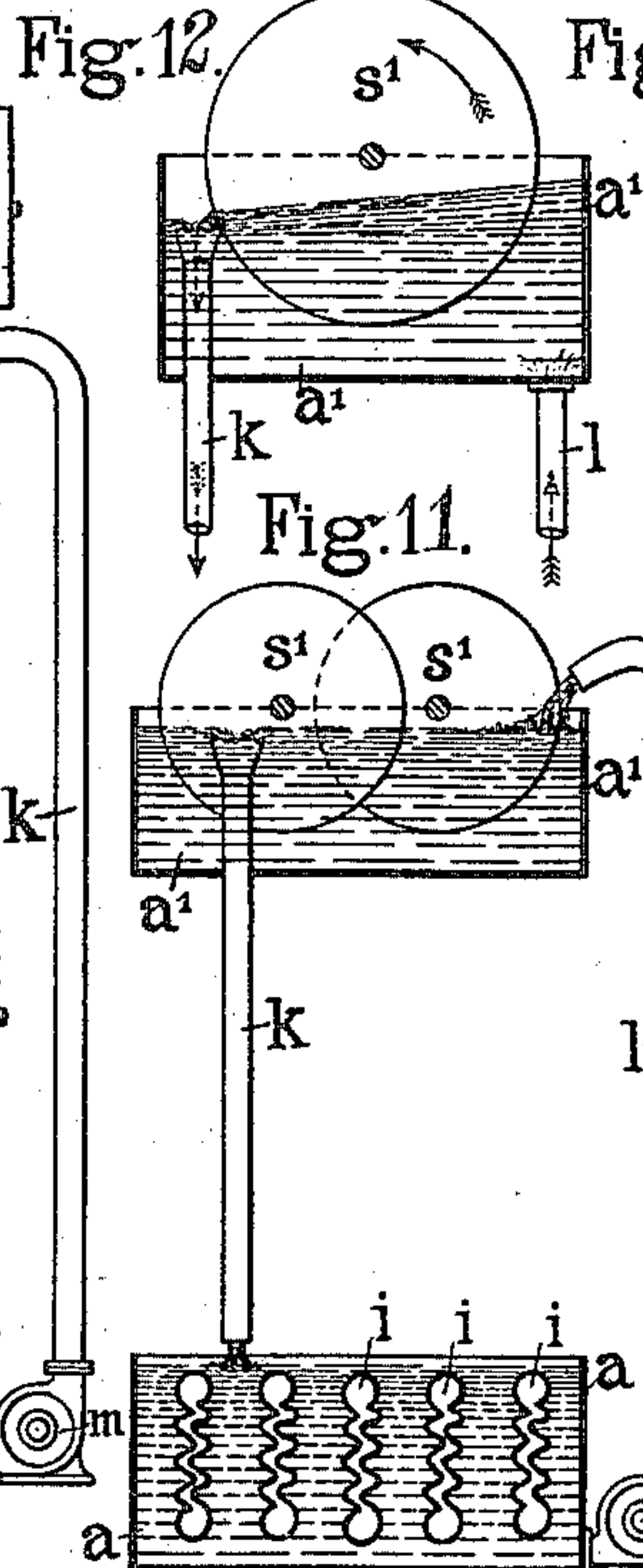
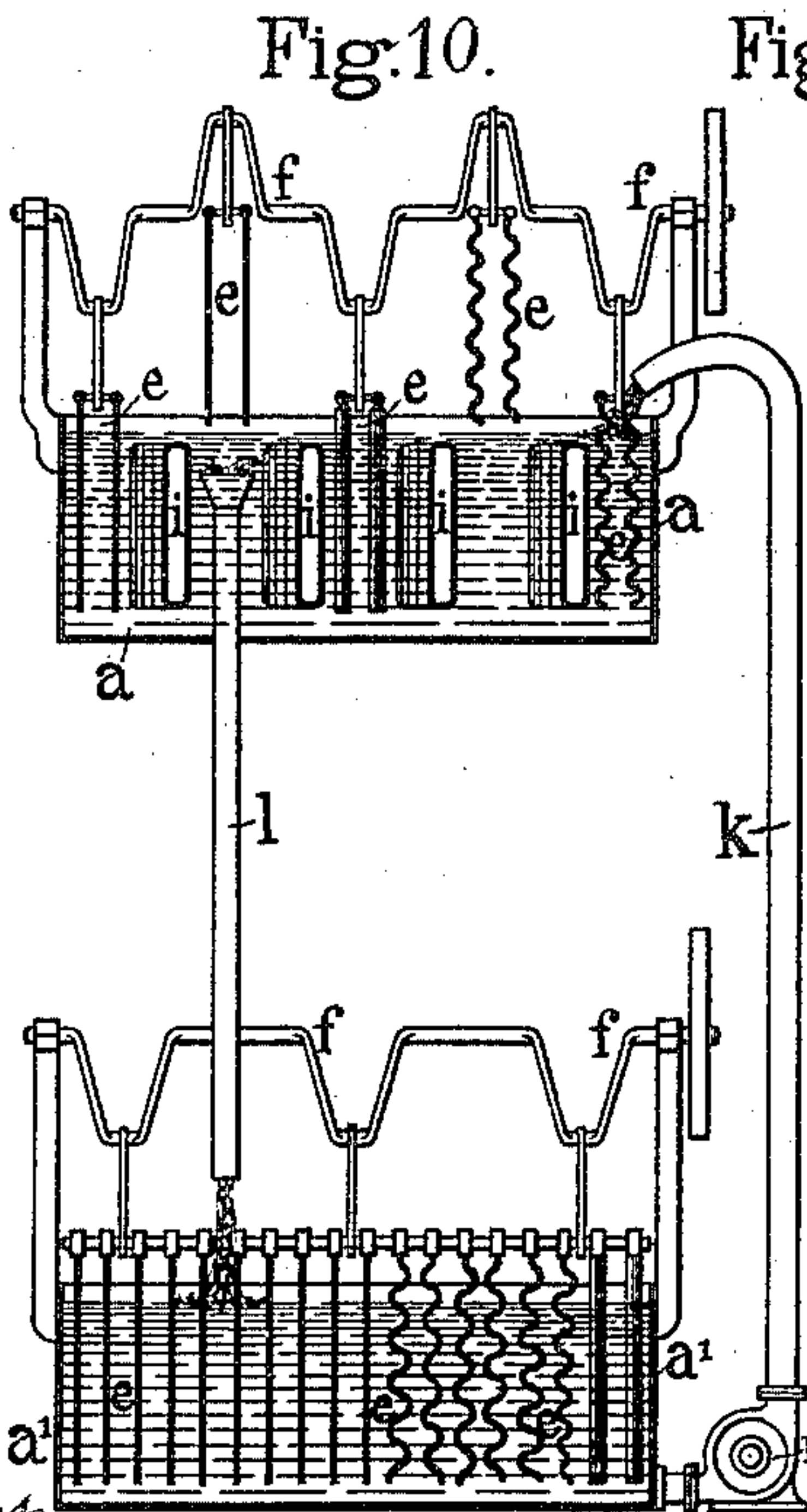
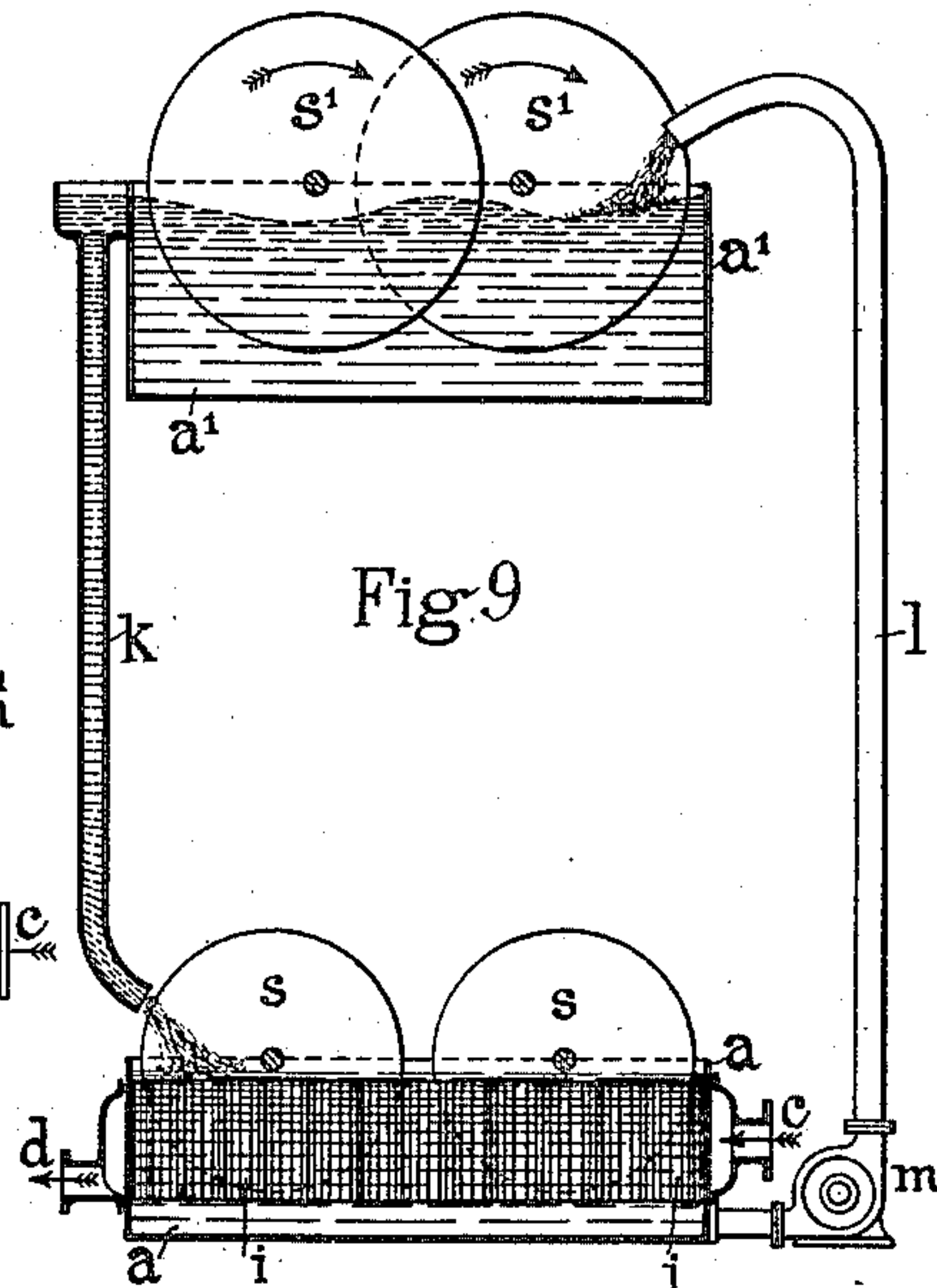
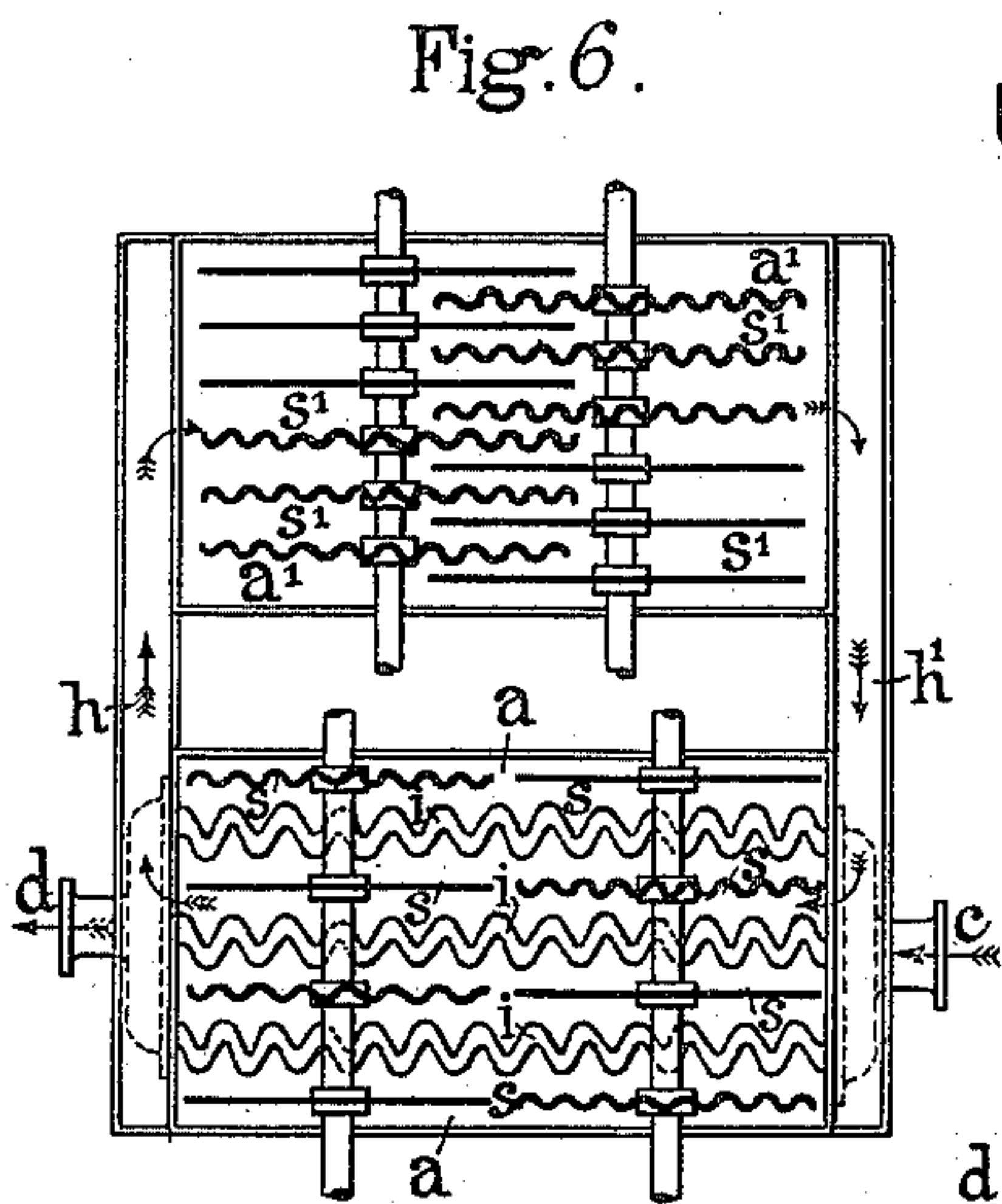
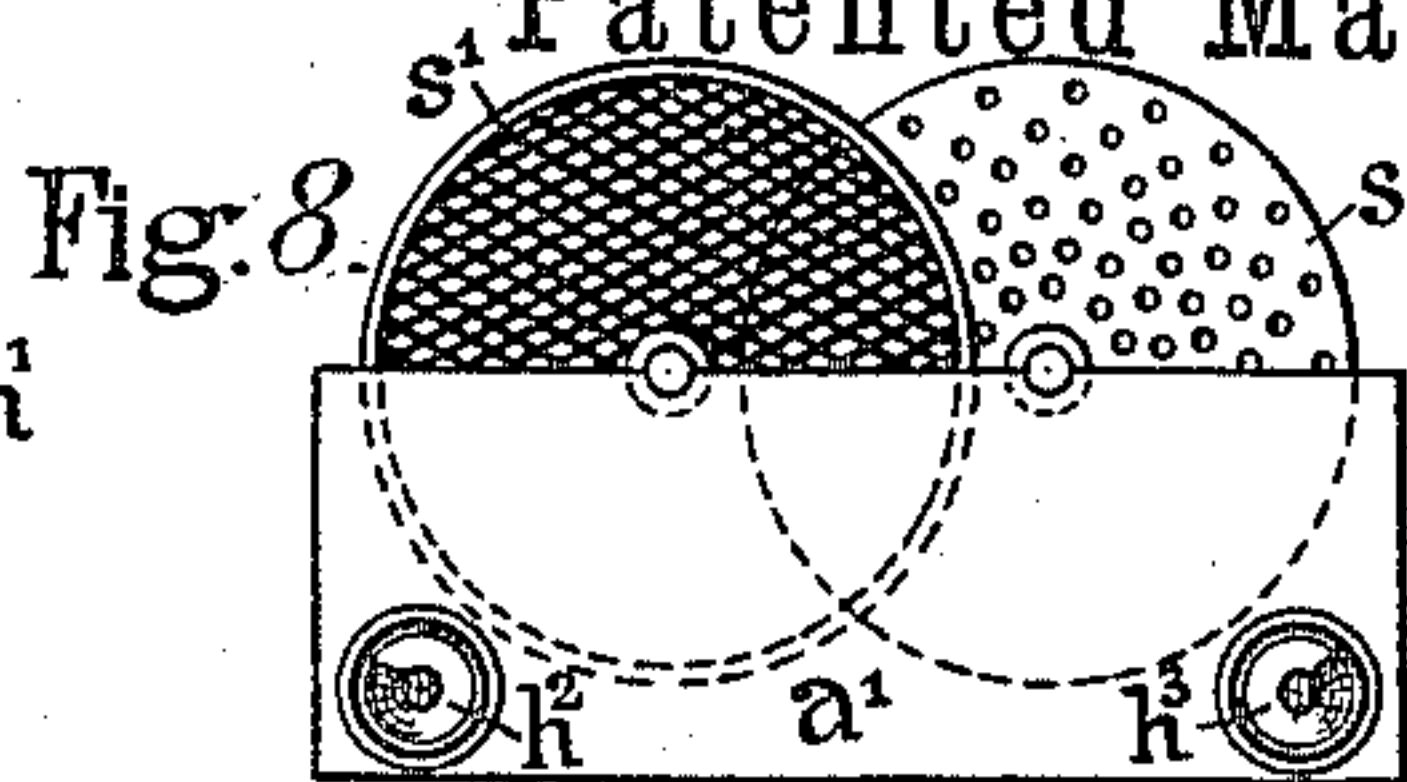
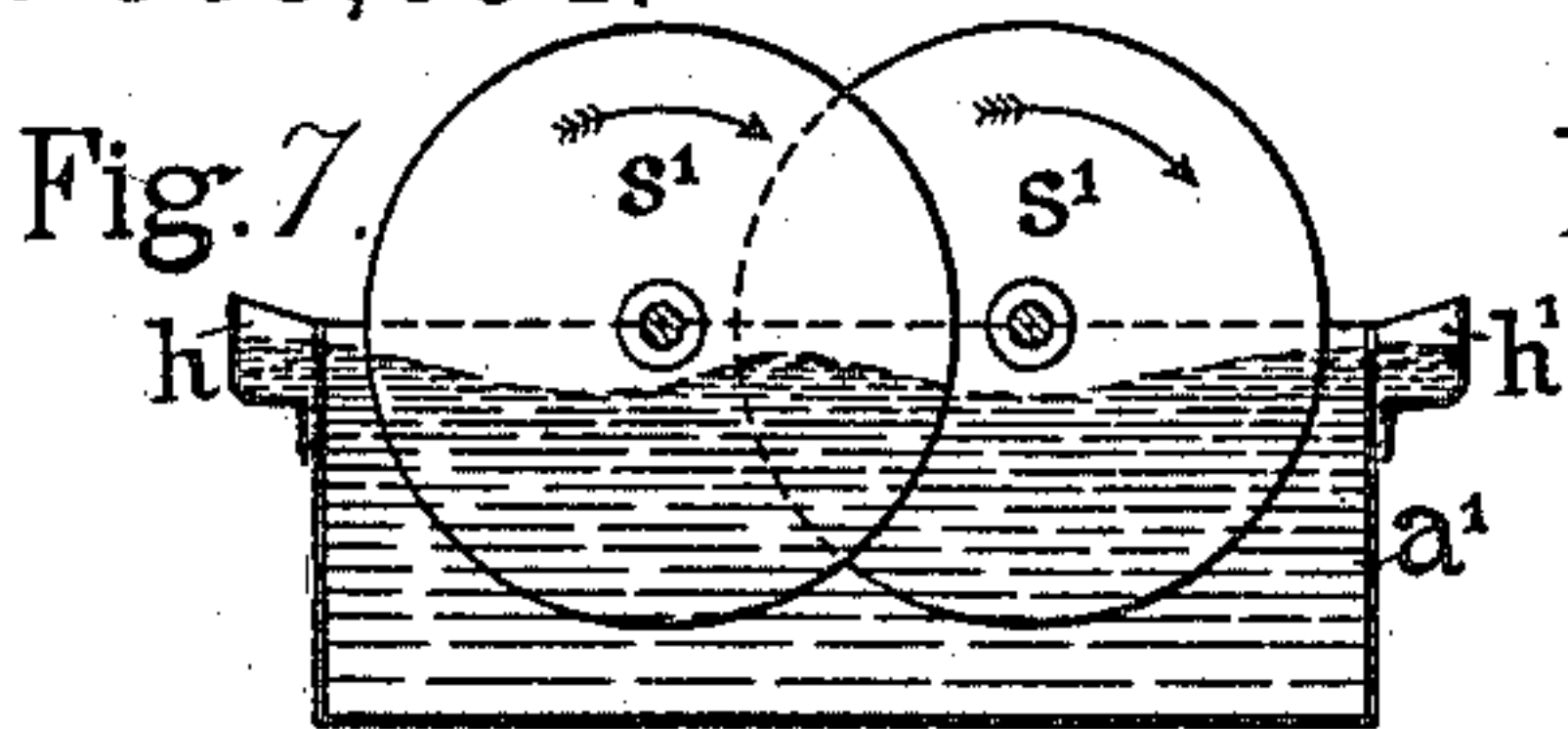
2 Sheets—Sheet 2.

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Witnesses
Charles Smith
J. Stahl

Inventor
Eduard Theisen
per Lemuel W. Ferrell atty

UNITED STATES PATENT OFFICE.

EDUARD THEISEN, OF LINDENAU, NEAR LEIPSIC, SAXONY, GERMANY.

COOLING AND CONDENSING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 363,094, dated May 17, 1887.

Application filed July 10, 1886. Serial No. 207,682. (No model.) Patented in France October 1, 1885, No. 171,435, and in England March 1, 1886, No. 2,927.

To all whom it may concern:

Be it known that I, EDUARD THEISEN, of Lindenau, near Leipsic, Kingdom of Saxony, German Empire, have invented certain new and useful Improvements in Cooling and Condensing Apparatus, of which the following is a specification.

The fluid to be cooled or condensed is conveyed in passages through a vessel containing a cooling-liquid, and the fluid is exposed in its passage to the action of the cooling-liquid, and said cooling-liquid is agitated and exposed to the action of the atmosphere in order that its temperature may be reduced. The use of liquid in this process is reduced to a minimum, it having been ascertained by repeated trials that only about eleven liters (equal to eleven kilograms) of water are necessary for condensing about three kilograms of steam in this improved process, whereas, according to the well-known injecting process, about eighteen liters of water are used to condense one kilogram of steam. For working this process the apparatus used may be varied or modified in several ways.

The apparatus may be constructed of an open vessel filled up with the condensing-liquid, into which vessel a hollow body (or several of them) is inserted, receiving from a properly arranged inlet the steam or gas to be condensed or the liquid to be cooled. A series of rotating disks or other lifting devices is arranged adjacent to the hollow bodies, which disks or other devices, lifting the liquid constantly into the air, cool the liquid and rapidly extract the heat from the contents of the hollow bodies. This heat-extracting process may be supplemented by artificial currents of air directed against the disks or lifting devices which traverse the air. Again, the apparatus may be constructed in such manner that a second vessel is employed above or below the vessel containing the hollow bodies, and in said second vessel the rotating disks or lifting devices are placed, the two vessels being combined in any suitable manner by pipings, with or without the use of pumps, so that the cooling-fluid is exposed to the air in the second vessel, returning cooled down to the first vessel, and so circulating for the purpose set forth. The

hollow bodies may be made of undulated or plain plates, sheets, or tubes. I prefer this undulated form, for the more energetic action of the cooling-liquid and for the increased surface of contact the undulation causing the liquid to be cooled or the gas to be condensed by repeatedly striking the inside of the hollow bodies.

In the drawings, Figure 1 is a cross section, Fig. 2 a longitudinal section, and Fig. 3 a horizontal section, of an apparatus consisting of a vessel, *a*, into which a series of hollow bodies, made of undulated plates or sheets *i*, are inserted. There is arranged a revolving shaft, *b*, with disks *s*, which revolve on both sides of said hollow bodies *i*. The disks may be plain or undulated or may be provided with cups or gutters or any suitable devices for lifting the liquid from the vessel *a* into the air. The steam to be condensed or the liquid to be cooled is admitted in the hollow bodies at *c*, which have their exit *d*. The undulations in the sides of the hollow bodies being placed vertically, the gas to be condensed or the liquid to be cooled will, within the narrow limits of *i*, strike against such undulations in finding its way, thereby adding to the condensing or cooling action of the surrounding liquid. The vessel *a* is arranged open at top. An artificial current of air may be directed over it to increase the cooling tendency of the lifted sheets of water. The hollow bodies may extend downward to the bottom of vessel *a*, and by providing corresponding holes or apertures in said bottom, which may be covered by suitable lids, facilities are afforded to clean the inside of the said hollow bodies by means of brushes. This may be still more facilitated by arranging corresponding holes or apertures covered by lids on the top of the hollow bodies.

In Fig. 4 the hollow bodies *i* are constituted by pipes, which may be inserted into vessel *a* separately or in form of a serpentine, in which latter case the bodies *i* may be provided with one inlet and one outlet common to all.

Fig. 5 shows an apparatus in cross-section in which, between the hollow bodies *i*, bars or plates *e* are provided, either plain or undulated, or provided with horizontal projections of any suitable shape, which plates or bars are

moved up and down by crank-shaft *f*, so as to expose the liquid in a consecutive change to the air.

In Figs. 6 and 7, showing ground plan and cross-section, a disposition of apparatus is shown in which a second vessel, *a'*, is shown in connection with vessel *a*. Vessel *a'* contains the cooling-liquid and the disks or lifting devices *s'*. The two vessels *a* and *a'* are connected by gutters or pipes *h h'*, in such a manner that the liquid, warmed or heated in *a*, is caused to circulate by *h* into *a'*. The liquid cooled down in *a'* by contact with air returns by pipe *h'* into *a*, as indicated by arrows in the ground plan, Fig. 10.

The connection between the two vessels *a* and *a'* may be made, instead of by open gutters *h h'*, Fig. 7, by horizontal pipes *h²*, as indicated in Fig. 8, in which case screws may be employed, agitating the water, so as to circulate in the desired direction.

Fig. 9 indicates a disposition in which the two separated vessels *a a'* are situated one above the other, the cooling-liquid coming from *a'* through pipe *k*, and, having produced its effect in *a*, is raised in a somewhat warm or heated state by pump *m* into vessel *a'*.

Fig. 10 is the reverse of Fig. 9, inasmuch as the vessel *a'* is situated below and the vessel *a* with the hollow bodies above, both vessels being indicated as provided with lifting devices instead of disks; but I beg to say that it is within the scope of my invention to use the disks or the lifting devices, or both simultaneously. The heated fluid will run, by *l*, downwardly, and, after cooling in *a'*, will be raised by pump *r* up to *a*.

Fig. 11 shows a modification of the disposition of Fig. 9. The circulation of the cooling water or liquid is the same, only the disks or lifting devices being removed from vessel *a*,

which contains hollow bodies *i* only. Such disks or lifting devices are applied only for cooling purposes in vessels *a'*.

Figs. 12 and 13 show a disposition of the apparatus in which the circulation of the cooling-liquid is effected without pumps or other lifting device. The liquid, after having been cooled down in *a'* by the disks, is taken off by the pipe *k* into vessel *a*, whereas the liquid heated in *a* will, by its lighter weight, rise by pressure exerted by the water rushing in through *k* up the pipe *l* to *a'*. To cause this self-acting circulation of the liquid, the vessel *a* must be closed on top, allowing apertures for the inlet and outlet pipes *k* and *l*.

I claim as my invention—

1. A vessel for containing a liquid, passages through that vessel for the fluid to be cooled, plates within the vessel, and mechanism, substantially as specified, for giving motion to such plates, so that the surfaces thereof will be alternately immersed in the liquid and exposed to the atmosphere, substantially as set forth.

2. Two vessels for containing liquid, passages through one of said vessels for the fluid to be cooled, plates within the other vessel, and mechanism, substantially as specified, for giving motion to such plates, so that the surfaces thereof will be alternately immersed in the liquid and exposed to the atmosphere, and a passage-way through which the liquid passes from one vessel to the other, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

EDUARD THEISEN.

Witnesses:

C. BORNGRAEBER,
W. HANSEL.