

(No Model.)

2 Sheets—Sheet 1.

J. A. ENO.
STEAM GENERATOR.

No. 389,503.

Patented Sept. 11, 1888.

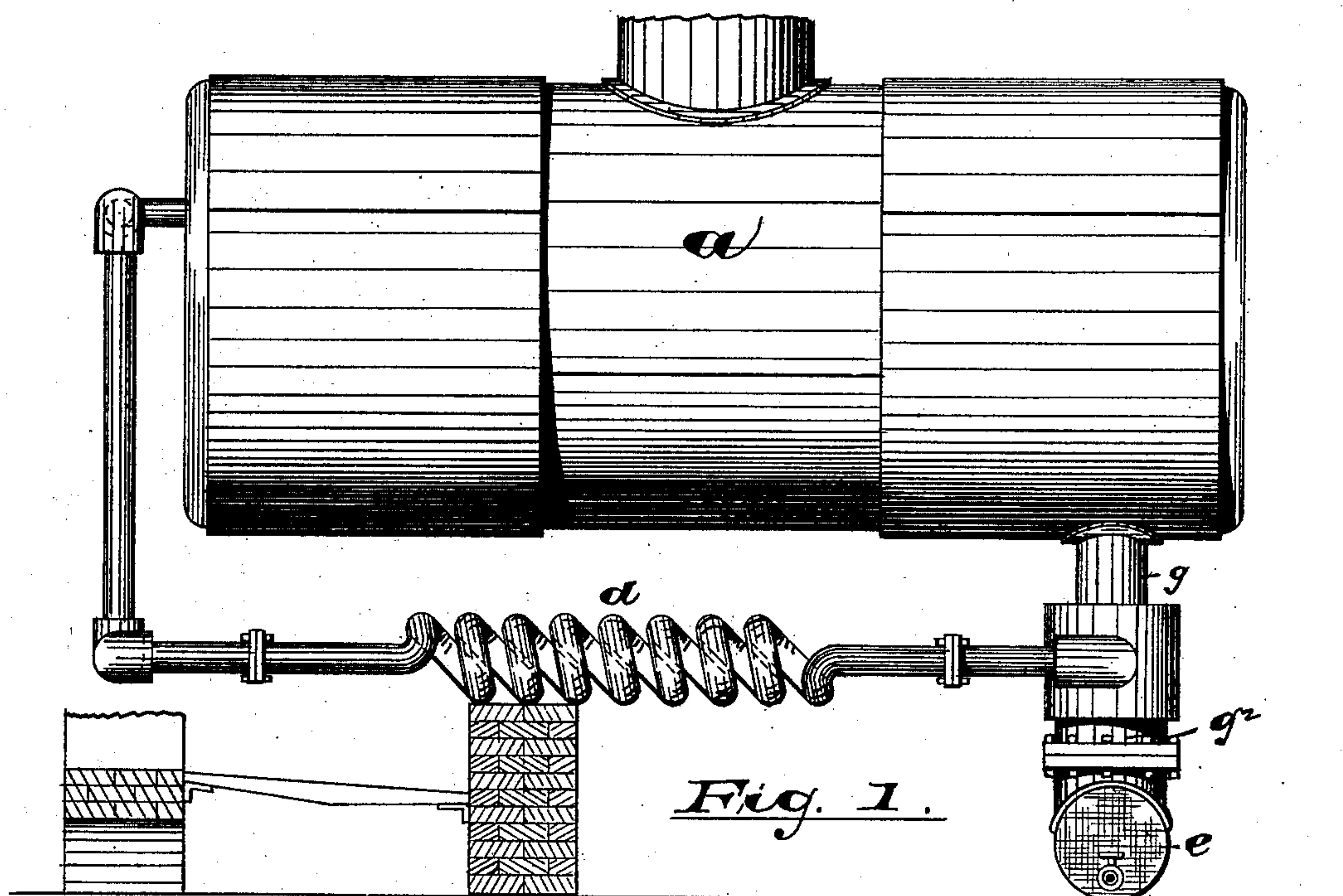
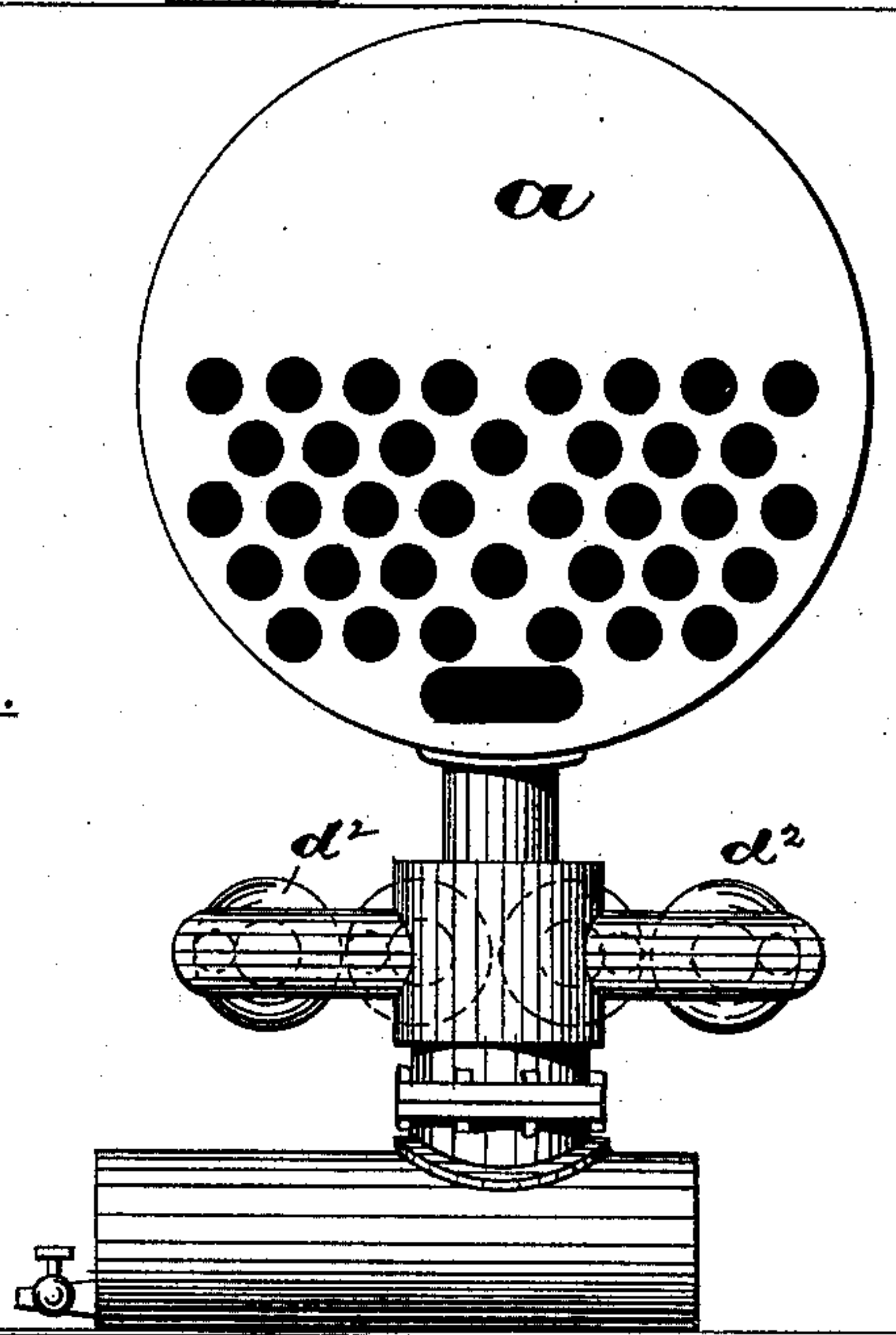


Fig. 2.



WITNESSES:

INVENTOR:

Oscar A. Michel.
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BY *Drake & Co.* ATT'YS

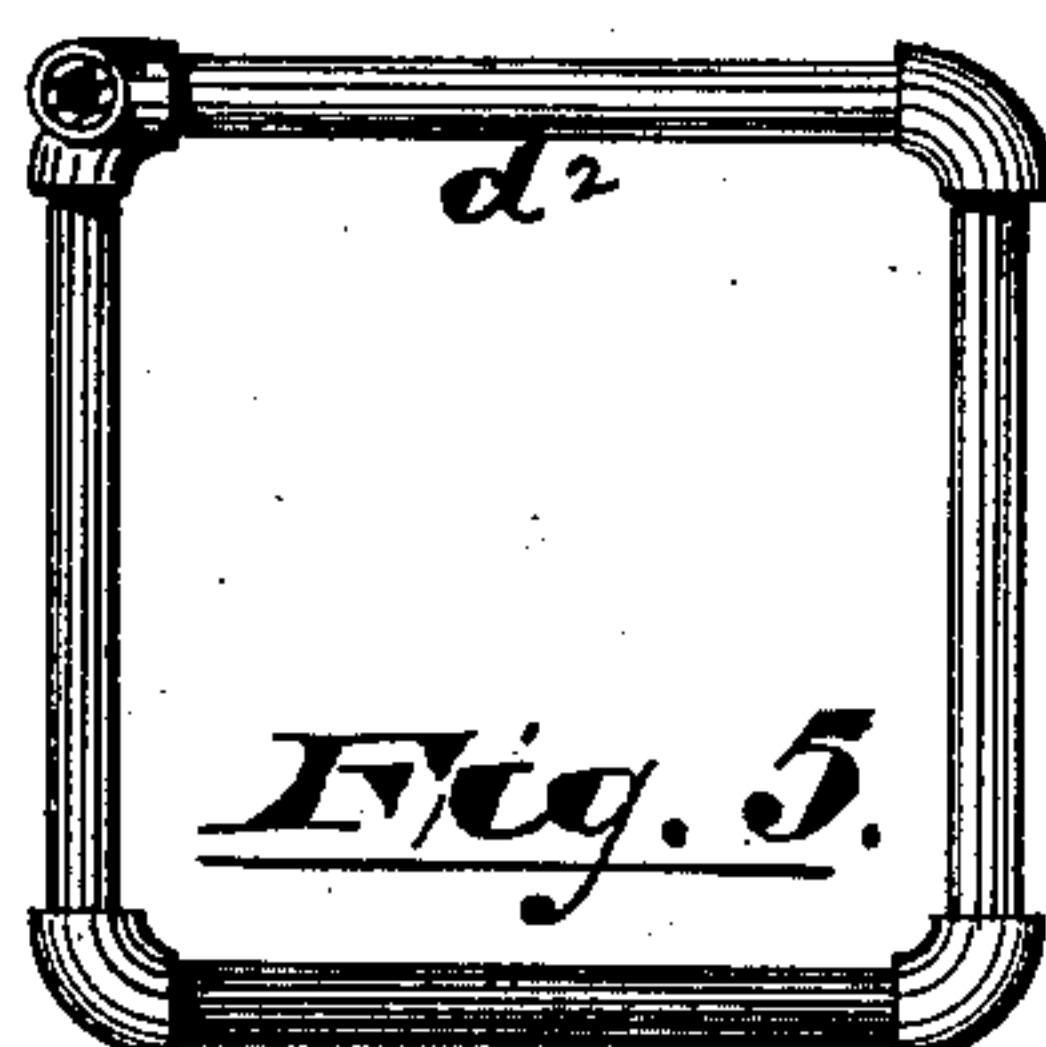
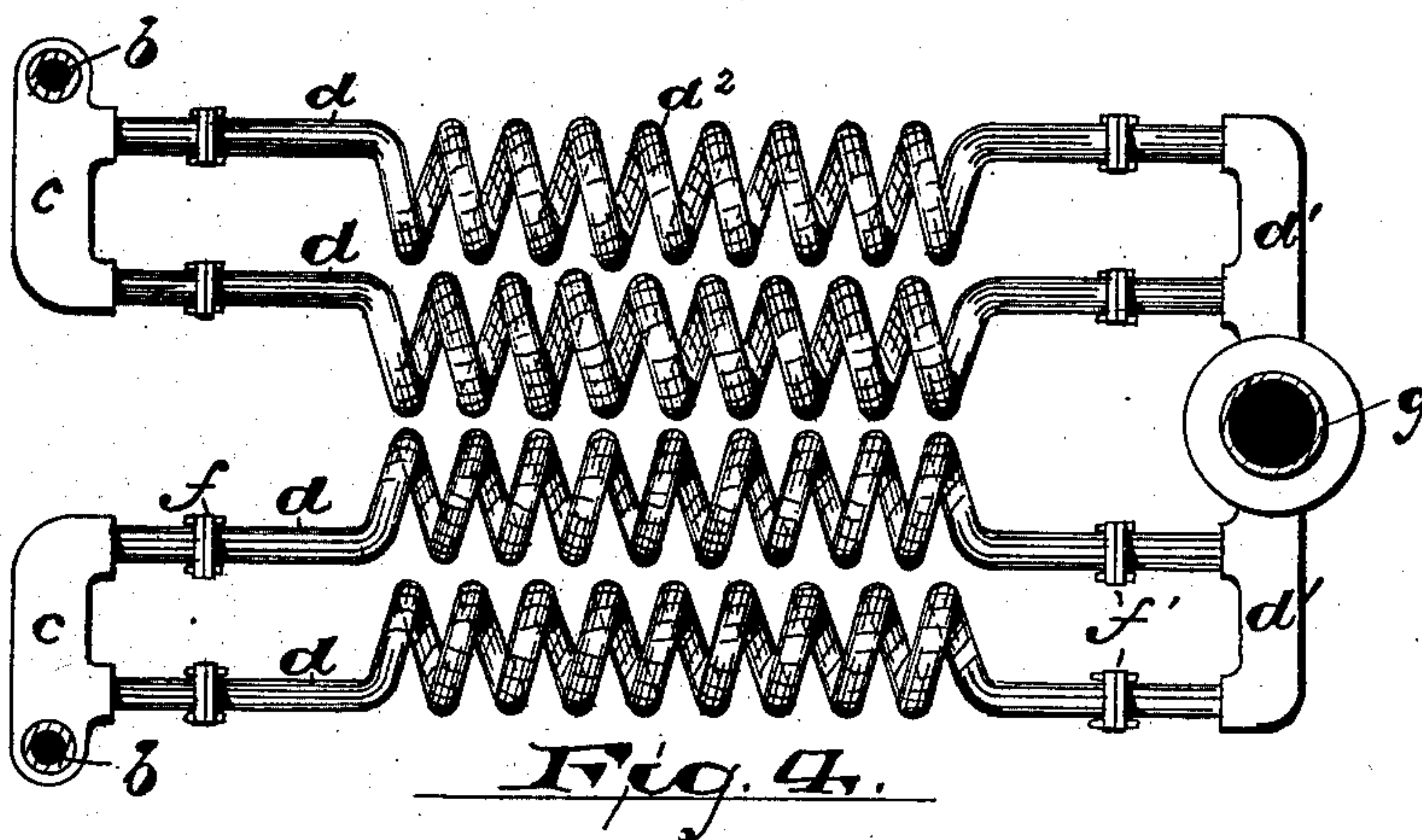
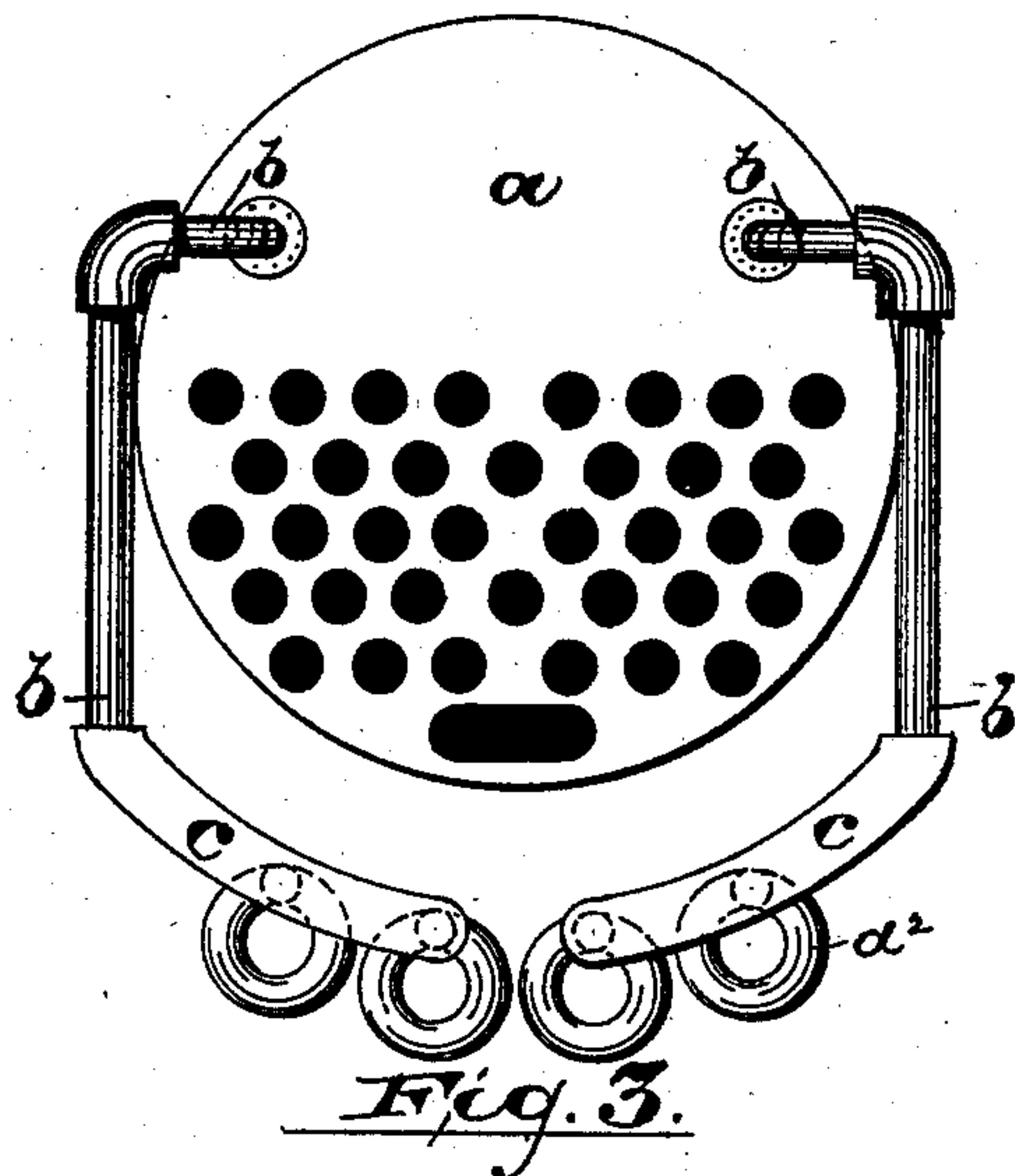
(No Model.)

2 Sheets—Sheet 2.

J. A. ENO.
STEAM GENERATOR.

No. 389,503.

Patented Sept. 11, 1888.



WITNESSES:

INVENTOR:—

Oscar A. Nickel
Philip G. Coghtlin

Joseph A. Eno,

BY Drake & Co. ATT'YS.

UNITED STATES PATENT OFFICE.

JOSEPH A. ENO, OF NEWARK, NEW JERSEY, ASSIGNOR TO THE ENO STEAM GENERATOR COMPANY, OF SAME PLACE.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 389,503, dated September 11, 1888.

Application filed January 16, 1888. Serial No. 260,875. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH A. ENO, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Steam-Generators; 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, reference being had to the accompanying drawings, and to letters of reference marked thereon, which form a part of this specification.

This invention relates to that class of steam-generators adapted to produce a more perfect circulation within the boiler of said generating device, whereby sediment is prevented from being deposited upon the inner surfaces of said boiler and forming a non-conducting coating which prevents the access of water to the sheet metal of the boiler, and thus allows the sheet metal to be raised to a very high temperature by the heat from the fire box or chamber of said generator, and thus the said sheet metal is quickly burned out.

The object of the invention is to provide a more perfect and rapid circulation; to reduce the cost of construction; to provide means whereby the boiler attachments are prevented from opening at the joints, caused by the expansion and contraction of the metal forming the said attachments; to secure a greater heating-surface for the water, and to increase the steam-generating capacity of the device.

The invention consists in the improved steam-generator, and in the arrangements and combinations of parts, substantially as will be hereinafter set forth, and finally embodied in the clauses of the claim.

Referring to the accompanying drawings, embraced in two sheets, in which like letters of reference indicate corresponding parts in each of the several figures, Figure 1 is a side elevation of the said boiler and the attachments thereof. Fig. 2 is a rear view of the same. Fig. 3, Sheet 2, is a front view. Fig. 4 is a plan showing the arrangement of pipes disposed beneath the boiler within the fire-chamber thereunder, and Fig. 5 illustrates a modification in the construction of a portion of said pipes.

In said drawings, *a* indicates a suitable boiler for steam-generating purposes, having therein an ordinary water and steam chamber, and a series or collection of longitudinally-disposed pipes extending from the front plate of said boiler to the rear plate thereof, the water in said boiler having access to said pipes, and the heat from the fire-chamber being adapted to pass through said pipes in the ordinary manner. At a point or points near the upper part of said boiler the boiler receives a suitable pipe or pipes, *b*, which extend downward, substantially as shown in Figs. 1 and 3, and connect with suitable heads, *c*, which latter extend or lie in approximately horizontal planes or positions. I prefer to arrange said heads in pairs, substantially as shown in Fig. 4, whereby the heads may lie on each side of the center of the boiler and connect with the vertical pipes *b* in such a manner as that the said vertical pipes may lie at the opposite sides of the boiler, so that they will not interfere with the passage of the heat through the flue or pipes within the boiler. Each of said heads connects with a series of longitudinally and horizontally disposed pipes, *d*, which extend beneath the boiler *a* within the fire-chamber, substantially as shown in Figs. 1 and 3, and connect at the opposite end of the boiler with a cross-head, *d'*, which is preferably common to all the pipes extending under the boiler. The said cross-head *d'* connects with the bottom of the boiler or lower part thereof, as shown in Figs. 1 and 2, and receives the water therefrom as it circulates, as hereinafter described. Below the said cross-head is a mud-drum or sediment-receptacle, *e*; but the features thus described are not in themselves broadly new.

In the improved device I form the pipes *d* of the series lying longitudinally beneath the boiler after the fashion of spirals, the axis of which lie horizontally and longitudinally beneath the boiler. By this construction I am enabled to get a very large heating-surface relatively upon the pipes *d* within said chamber, so that the water flowing therethrough has a greater opportunity to be formed into steam. The steam thus being made in larger quantities, serves to drive the water, still in a liquid form, through the pipes at a greatly-

accelerated speed, so that the body of water within the boiler *a* is changed more often and heated with greater rapidity, and the heat passing through the fire-chamber is more perfectly utilized. At suitable points in said pipe *d* the same are jointed, as at *ff'*, a flange being formed on each section of said pipes, adapted to be bolted together. By this construction the spiral can be removed or separated from the heads without disturbing the latter, thus greatly facilitating the repairing operations on the substitution of new generating-pipes for those worn out by service.

The spirals need not be of the exact form shown in Fig. 4; nor need the spiral portion of said pipes *d* be of one integral piece, as shown therein, for I may, if I so desire, form the spiral substantially as illustrated in Fig. 5, in which an individual spiral is shown to be composed of four pieces coupled together, the spiral thus being of an angular shape or form, rather than the round form shown in Fig. 3; nor do I wish to limit myself to the number of spirals *d'* arranged in the series, as only one may be employed, or more, although for practical operations in the ordinary range of generators I prefer to use the four, as shown.

It will be noticed that by the improved construction the spirals form flues therethrough, by means of which I get a greater heating-surface with the least obstructions to the draft.

The sediment in passing down through the pipe *g* from the boiler passes over an aperture in the pipe *g'*, so that the sediment by its own weight drops into the sediment-receptacle *e*, and is thus prevented from forming a deposit, crust, or scale within the boiler.

Having thus described the invention, what I claim as new is—

1. The combination, with the boiler, of pipes *b*, connected with the upper and forward part of said boiler and descending therefrom at the opposite sides of the boiler, heads *c*, each having a series of pipes connected therewith, said pipes being coiled, as at *d'*, and extending horizontally and longitudinally beneath said boiler and connected with a common cross-head, *d'*, and pipe *g*, connecting said head *d'* with the lower part of the boiler at the rear thereof, and a mud-drum or sediment-receptacle, all said parts being arranged and combined substantially as set forth.

2. The improved generator herein described, combining therein a boiler, *a*, a series of spirals, *d'*, disposed horizontally and longitudinally beneath the boiler and forming horizontal and longitudinal flues thereunder within the fire-chamber, pipes or conduits connecting the upper part of the boiler with said spirals, pipes or conduits connecting the lower part of said boiler with said spirals and with a mud-drum, and said mud-drum, substantially as shown and described.

3. The improved generator herein described, combining a boiler, *a*, pipe *b*, head *c*, a series of pipes coiled, as at *d'*, and jointed, as at *ff'*, head *d'*, connected to the boiler, and a mud-drum, said parts being arranged and combined substantially as and for the purposes set forth.

In testimony that I claim the foregoing I have hereunto set my hand this 14th day of January, 1888.

JOSEPH A. ENO.

Witnesses:

CHARLES H. PELL.
OSCAR A. MICHEL.