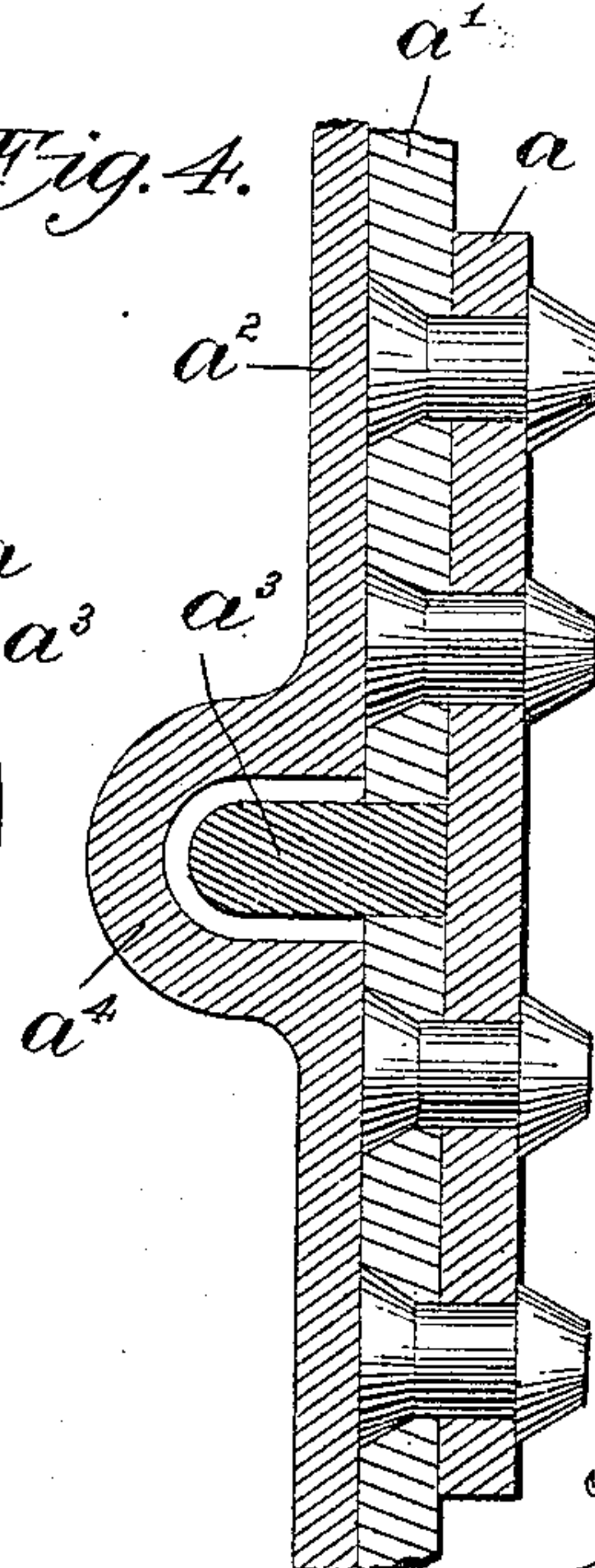
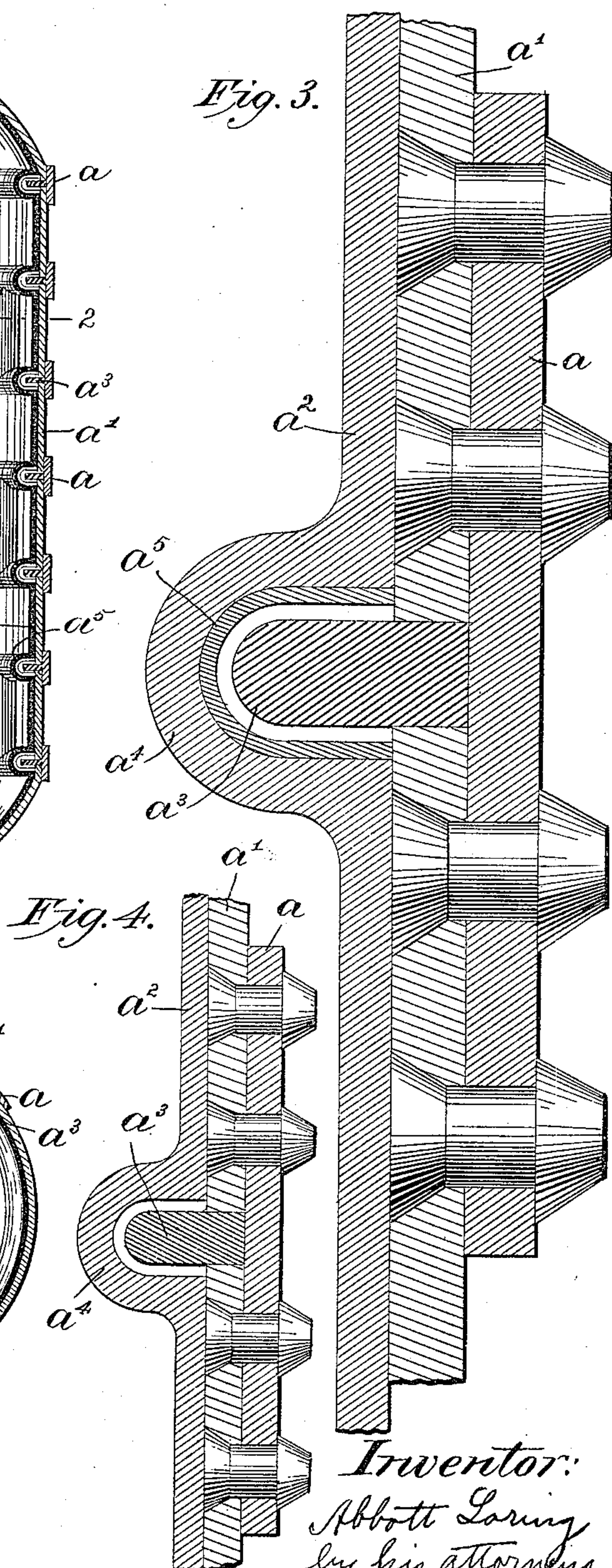
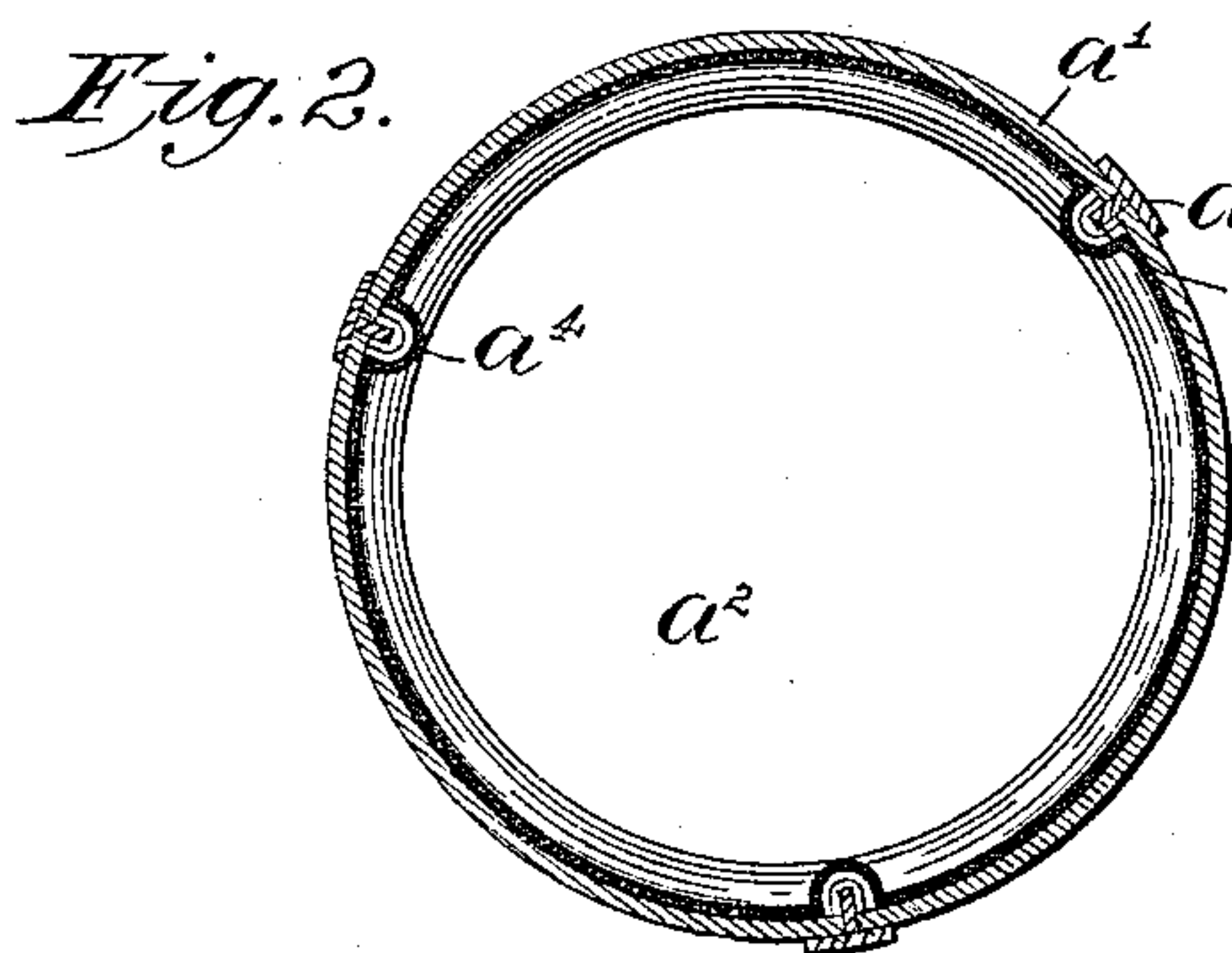
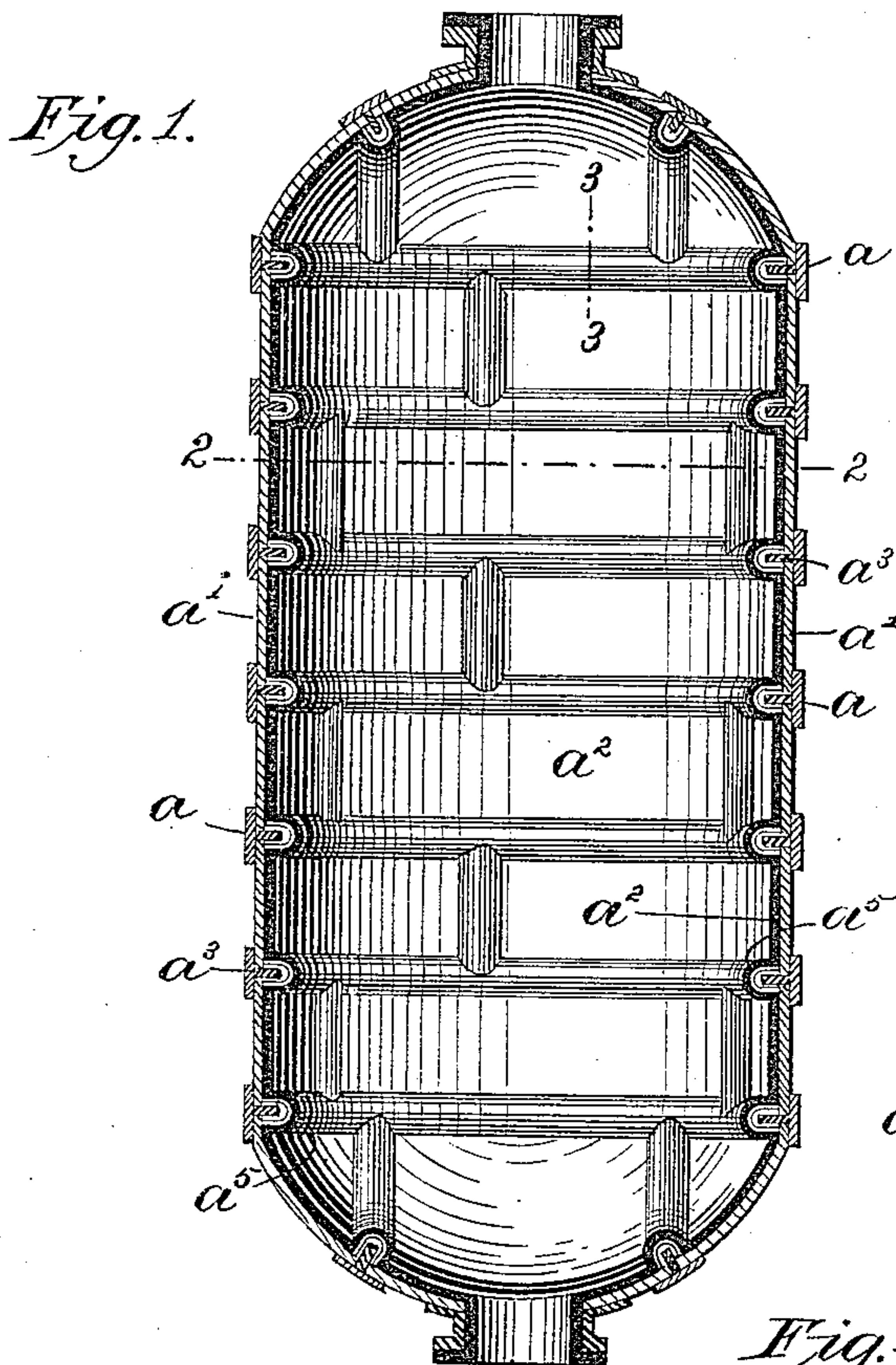


(No Model.)

A. LORING.
LINED BOILER.

No. 440,318.

Patented Nov. 11, 1890.



Witnesses:

Frederick W. Möller.
John R. Snow.

Inventor:

Abbott Loring
by his attorneys
Mesquaden & Beach.

UNITED STATES PATENT OFFICE.

ABBOTT LORING, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO HARRISON LORING, OF SAME PLACE.

LINED BOILER.

SPECIFICATION forming part of Letters Patent No. 440,318, dated November 11, 1890.

Application filed July 26, 1889. Serial No. 318,798. (No model.)

To all whom it may concern:

Be it known that I, ABBOTT LORING, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Lined Boilers, of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a central longitudinal sectional view of one form of lined boiler embodying my invention. Fig. 2 is a transverse section of such a boiler, taken at a line indicated by line 2 2 in Fig. 1; and Fig. 3 is a sectional view on a larger scale, taken at line 3 3 of Fig. 1, illustrating my new construction. Fig. 4 shows a modification, the supporting-lining being dispensed with.

My invention relates to lined boilers, and is especially useful in lead-lined boilers.

My invention consists in the combination of a hollow-ribbed boiler-lining with a shell having inwardly-projecting fins which project into the trough of the hollow-ribbed lining, leaving between the surfaces of the fins and the walls of the ribs a space in which the lining is free to move as it expands and contracts.

My boiler is especially adapted for use in making pulp, and is lined usually with lead to prevent the acids from attacking the shell. Lead-lined boilers have long been in use by pulp-makers and have been constructed in a variety of forms. No one has, however, so far as I know, made a lined boiler in which there has been adequate provision for the expansions and contractions of the linings due to the variations in temperature to which the linings are necessarily subjected.

In the drawings, in which I show my invention embodied in the best way now known to me, a is the outer plate, a' the shell, and a^2 the lining, (a lead lining, for example,) of an ordinary boiler, the shell and outer plate being secured together. Shell a' is provided with one or more inwardly-projecting fins a^3 , according to the size of the boiler and the preferences of the constructor, and the lining is formed with corresponding hollow ribs a^4 , within the trough of which the fins a^3 project. Shells a' are ordinarily provided with a se-

ries of the inwardly-projecting fins a^3 , although in some small constructions a single fin may be used. The fins are usually about eighteen or twenty inches apart, but these distances will vary greatly, according to the shape and size of boilers and notions of constructors. The fins are conveniently formed of strips of metal rectangular in cross-section, the inner edges being rounded off in some cases, as shown in the drawings. The troughs of the hollow ribs are always enough wider than the fins are thick to afford between the sides of the fins and walls of the trough a space in which the lining is free to move as it contracts and expands. It is desirable, in my opinion, to line the hollow ribs with an elastic metal lining a^5 , as shown in Figs. 1, 2, and 3; but the lining may be dispensed with in some cases, as will be clear to all skilled in the art. This modification is illustrated in Fig. 4. The linings of lined boilers, especially of lead-lined boilers, are in most uses to which they are put subjected to very considerable changes in temperature and to consequent expansion and contraction. It will be seen that one function of the inwardly-projecting fins is to limit the expansion and contraction of the lining, the hollow ribs taking up the expansion should the lining move against the sides of the fins, which are ordinarily of steel. The fins also serve to support the weight of the lining in some constructions. The metallic linings of the ribs should be of elastic metal and tend to prevent the hollow ribs from collapsing and also assist the linings in their contraction, as will be plain to all skilled in the art.

The construction of a boiler of any form embodying my invention will be readily understood by all skilled in the art without more particular description.

Boilers embodying my invention are readily constructed and are strong and durable.

I am aware of Patents No. 348,457 to Flodquist, August 31, 1886, and No. 328,812 to Ritter and Keller, October 20, 1885, and disclaim all that is shown in them, boilers embodying my invention differing radically from boilers constructed as described in these patents in that the lining in my boiler is not bolted or

clamped to the shell, while it is so bolted or clamped in the constructions set forth in the patents mentioned.

What I claim is—

5 1. In a lined boiler, the combination of the shell and the lining, the shell being provided with inwardly-projecting fins and the lining formed with inwardly-projecting hollow ribs in the trough of which the fins lie, with a
10 space between the sides of the fins and the walls of said trough, substantially as and for the purpose set forth.

2. In a lined boiler, the combination of the

shell and a lining having inwardly-projecting hollow ribs, with a lining for the hollow ribs, 15 the shell being provided with fins projecting into the trough of the hollow ribs, the fins being thinner than the width of the trough to form a space between the sides of the fins and the walls of said trough, and the fins being 20 mounted in the shell, all substantially as and for the purpose set forth.

ABBOTT LORING.

Witnesses:

EDWARD S. BEACH,
JOHN R. SNOW.