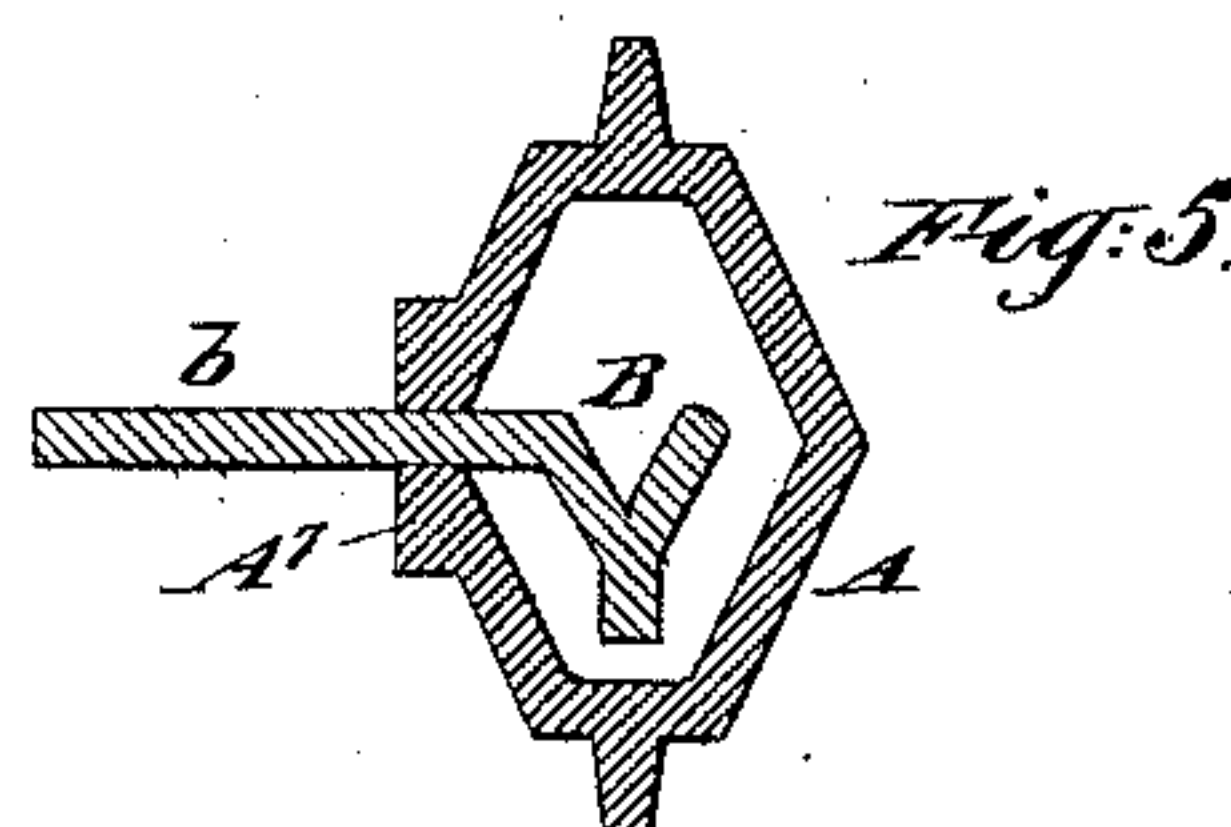
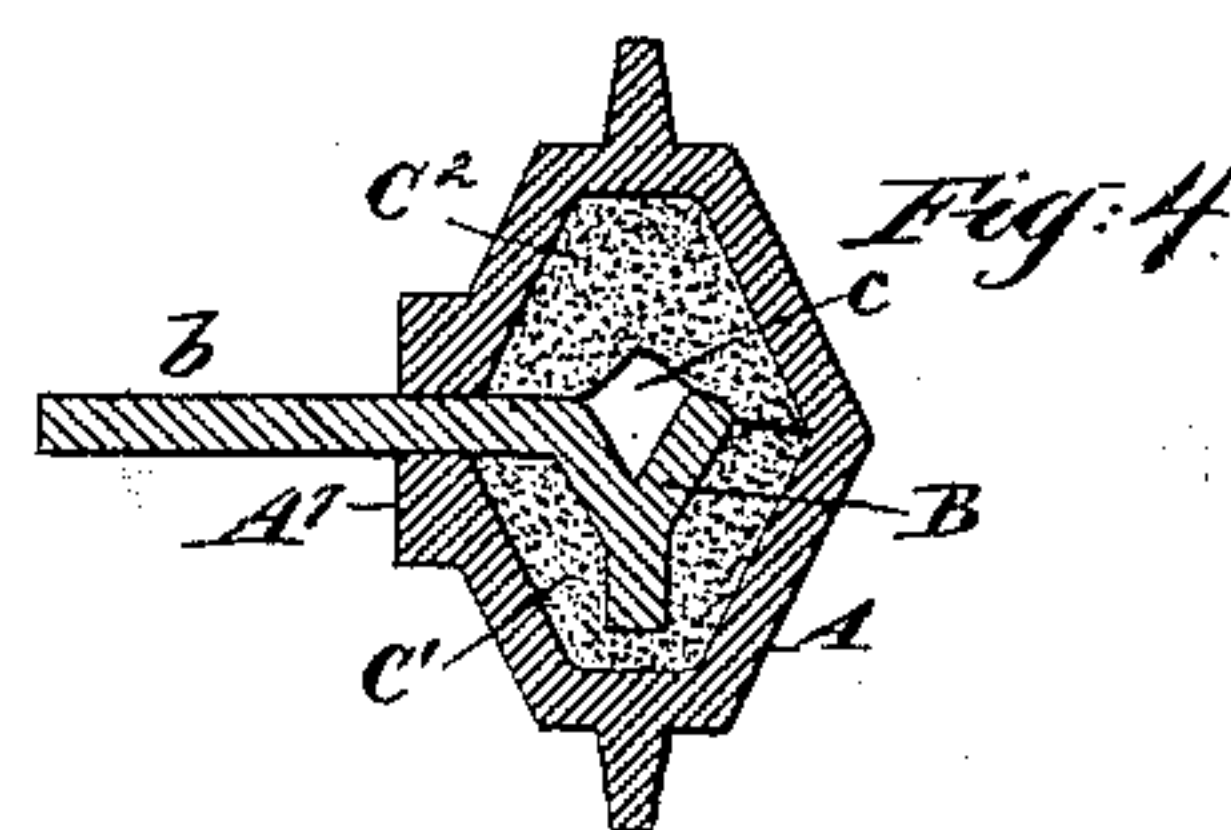
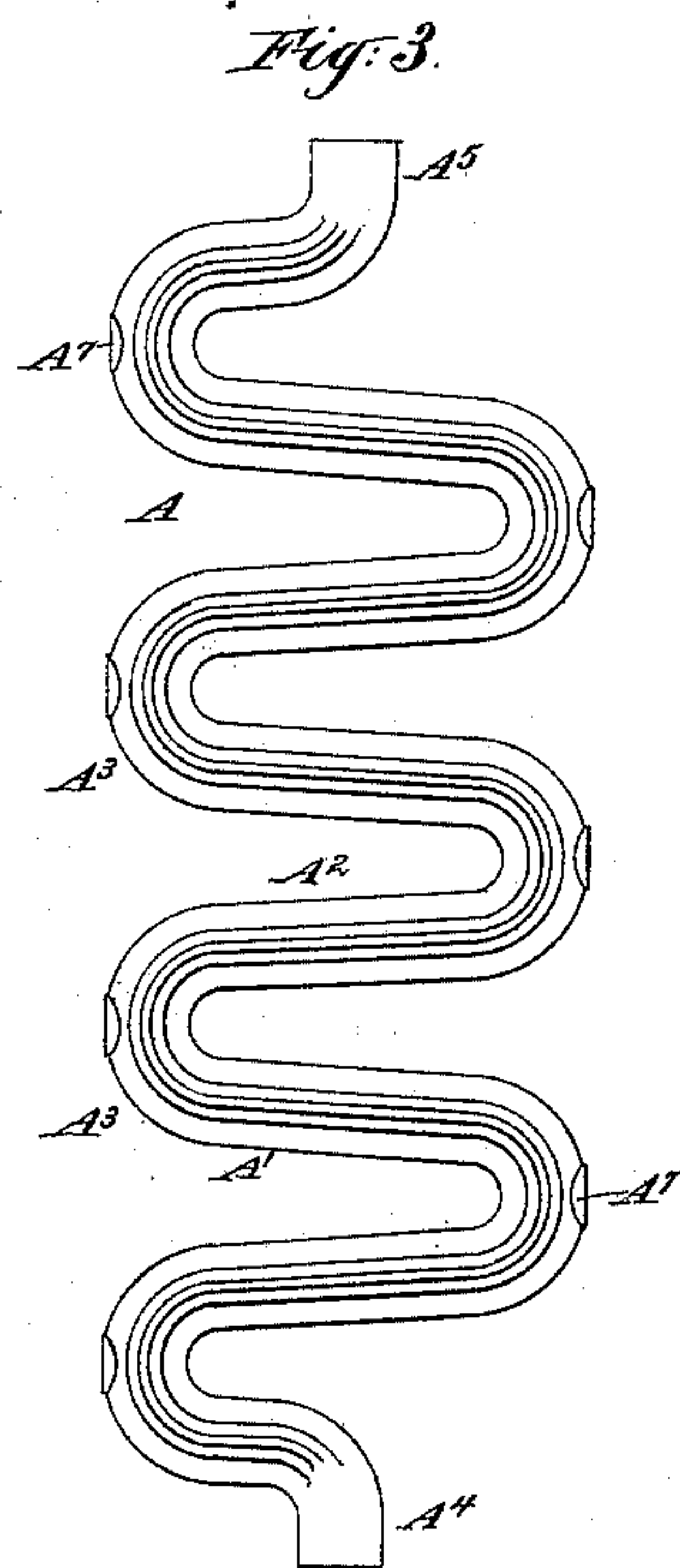
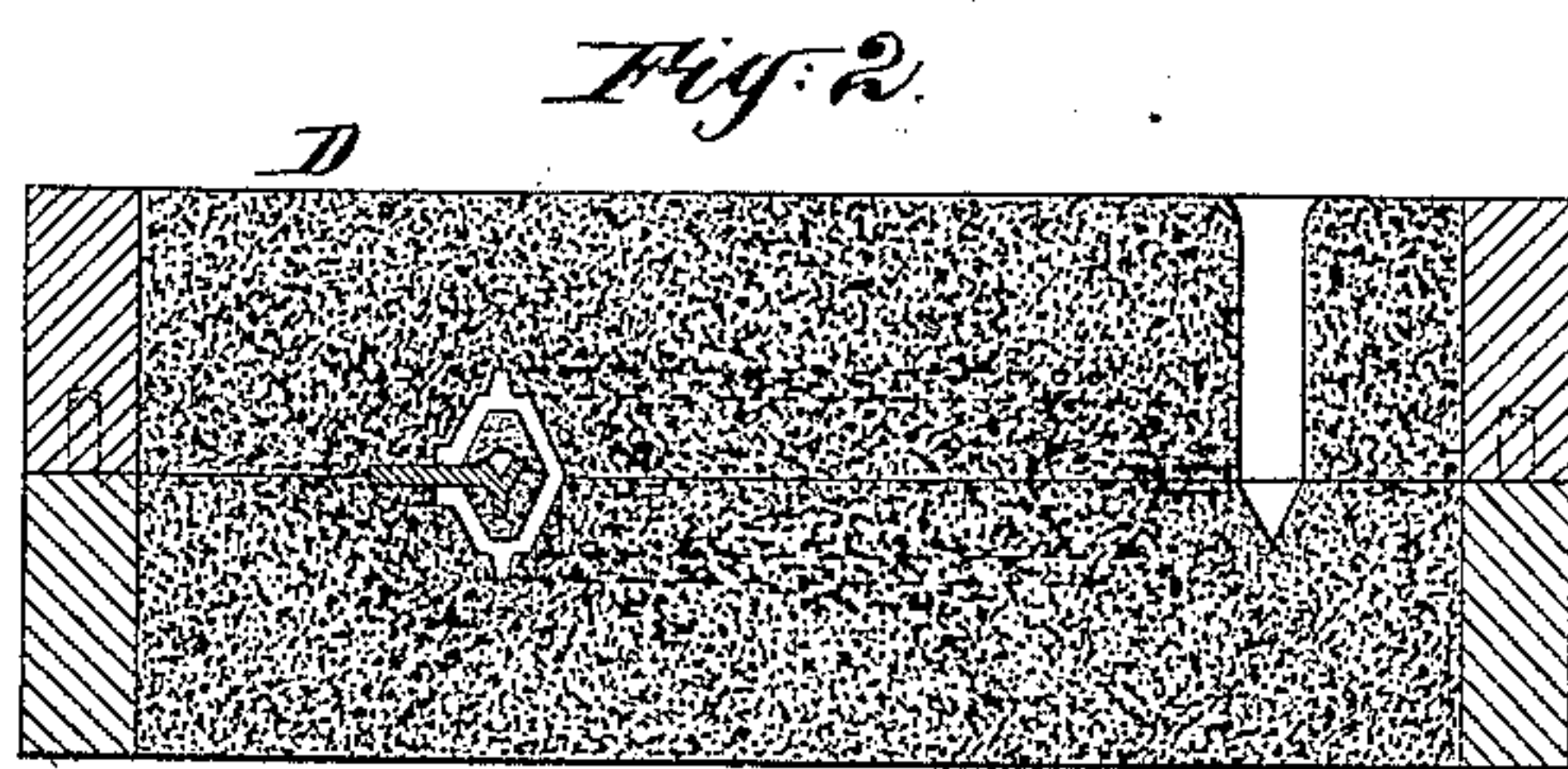
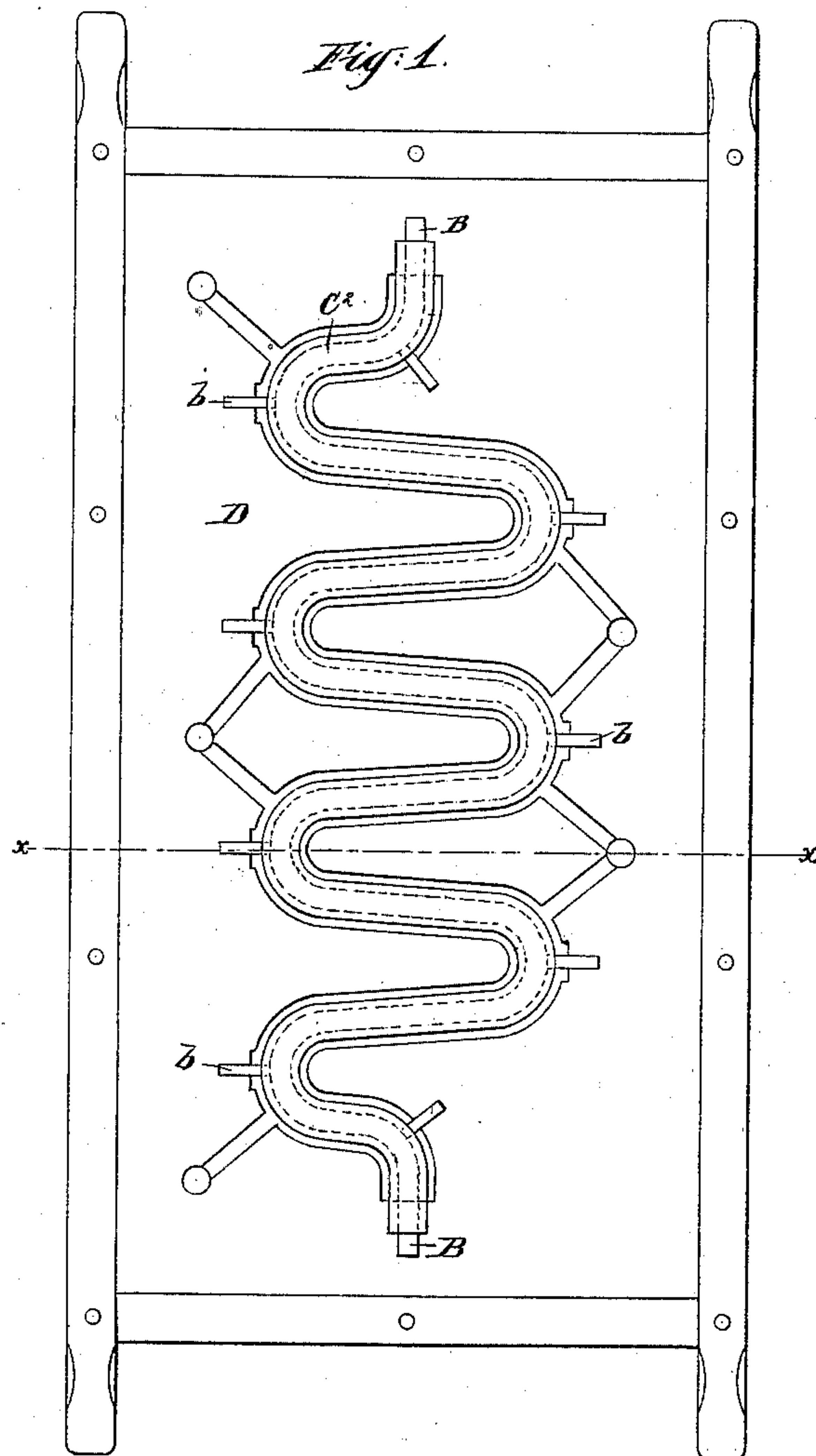


(No Model.)

J. HOUSTON.
METHOD OF FORMING RADIATORS.

No. 431,976.

Patented July 8, 1890.



Witnesses:

Charles R. Searle.
Lottie Whicker

Inventor:

John Houston
by his attorney
Thomas D. S. Stetson

UNITED STATES PATENT OFFICE.

JOHN HOUSTON, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE BURR & HOUSTON COMPANY, OF SAME PLACE.

METHOD OF FORMING RADIATORS.

SPECIFICATION forming part of Letters Patent No. 431,976, dated July 8, 1890.

Application filed September 4, 1889. Serial No. 322,891. (No model.)

To all whom it may concern:

Be it known that I, JOHN HOUSTON, a citizen of the United States, residing in Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Method of Forming Radiators, of which the following is a specification.

In my improvement each serpentine radiator pipe or section which is cast in my mold contains a smaller correspondingly-crooked bar of iron which serves as a core-bar. It tends in a slight degree to facilitate the circulation when my radiators are used, each standing independent. In such case the core-bar is a partial division, allowing the steam and air to pass up one side and down the other side of the interior of the radiator with less mingling and in more nearly independent channels by reason of the core-bar. I esteem it important to hold the core very effectually against becoming displaced by a twisting or tilting motion. To prevent such I extend a spur from the core-bar out through the space to be filled with hot metal to constitute the radiator at several points near the mid-length of the radiator. These points, being received in suitable "prints," hold the core very truly in position. They are simply naked spurs extending out from and being cast with and forming part of the core-bar. When the casting is cold, the outer end of each such spur is filed off or otherwise removed, and the earthy portion of the core being loosened and removed by tumbling the lot of radiators in a sufficiently-large barrel, or by other sufficient agitation, and the loose earth shaken out or blown out, or both, the radiator, with its core-bar and spurs united to the radiator and all constituting one piece, is ready to be screw-threaded and united to a base and to another radiator or otherwise used like ordinary radiators.

My radiators allow of the presence of webs on the exterior, or on both the exterior and interior, to give greater surface for receiving the heat from the steam into the metal and for delivering the heat from the metal into the air of the apartment to be warmed.

The accompanying drawings form a part of this specification.

Figure 1 is a plan view of the drag or lower

part of the mold with the cope or upper part removed. Fig. 2 is a vertical section of the complete mold ready for pouring. It is a section on the line xx in Fig. 1. Fig. 3 represents the completed casting after the spurs are removed. Figs. 4 and 5 are cross-sections of the casting, on a larger scale, before the spurs are removed. Fig. 4 represents the pipe as it comes from the mold. Fig. 5 shows the pipe after the earthy portion or core proper has been removed. The core-bar remains permanently held within its interior by a spur formed integral therewith and rigidly united with the pipe in the act of casting the latter.

Similar letters of reference indicate corresponding parts in all the figures where they occur.

A designates the entire radiator, certain portions being marked, when necessary, by supernumerals, as A' . The portions inclined in one direction are marked A' . Those inclined in the opposite direction are marked A^2 , and the curved portions by which they are united are marked A^3 . A short straight portion at one end is marked A^4 , and a straight portion at the other end is marked A^5 . By mounting a series of these radiators side by side with the ends alternately reversed the several inclined portions A' A^2 are brought sufficiently out of the plane of the corresponding inclines in the adjacent radiators to allow a free flow of the heated air upward through the series.

A^6 A^6 are webs extending up and down, as shown, and which serve to increase the surface to give off the heat.

B is a core-bar of an approximate T or more nearly a Y section. One such bar having the proper serpentine form is employed in the manufacture of the core for each radiator, and is allowed to remain in the radiator. Each core-bar is provided with spurs b , formed integral therewith, which extend out, as shown, from the outer edge of the curves A^3 ; but they may be located at other points. A less number may suffice. Whatever the number and location there must be corresponding or larger prints formed in the green sand or other mold D, in which the radiator is cast. The spurs lying in these prints support the

core-bar B and hold it exactly in place. When the core is properly applied on the core-bar and baked, the spurs extend out through it and across the thickness of the space which
 5 is to mold the radiator and engage strongly in the prints in the sand mold. When the casting is cold, it is taken out of the sand, and the ends of the spurs *b* with any additional metal which may have associated to
 10 form a thicker spur are clipped off or otherwise removed.

Special provision is made for ventilating, technically, "venting" the core. Each core is roughly shaped in two halves *C'* *C''*, one of
 15 which may be shaped on the core-bar B and caused to adhere by a coating of clay wash. The other is molded separately in a separate core-box or other device, and is applied in position against the core-bar and the other
 20 part of the core and made to adhere thereto while plastic. The baking unites the two parts into one with a diamond-section channel *c* running along the whole length.

I use a very fusible mixture of metal and
 25 raise it to as high a heat as practicable. The mold is gated at several places; but these precautions may not be necessary.

By forming the radiator with the stout projections *A'*, as shown, I insure sufficient heat
 30 at those points to effect a permanent union, a fusion of the surface of the inclosed spurs *b*, so that the metal will combine and stand thence forward as if made in one single casting, the core-bar and the radiator. This end
 35 will be facilitated by cleaning and trimming this portion of each spur *b* before putting the cores in the sand; but I do not esteem such precaution generally necessary.

Modifications may be made without departing from the principle or sacrificing the ad-

vantages of the invention. The core-bar may be of rolled iron or steel instead of cast. In such case, or in any other case, the spurs *b* may be attached by welding or by other suitable means, giving the requisite strength and
 45 rigidity, as tapping or riveting.

No claim is made herein for the article shown and described, as that is claimed in my application Serial No. 305,262, filed March 29, 1889.
 50

What I claim as new is—

1. A mold for casting serpentine pipes, having a core formed on a core-bar and a metallic spur permanently secured to said core-bar extending through the matrix into the sand
 55 of the mold, the useful function being that the spurs not only support the core-bar in the mold, but also support the core-bar permanently in the finished casting, substantially as herein specified.
 60

2. A mold for casting serpentine pipes, having a core formed on a core-bar with a continuous channel *c* remaining open along the interior to serve in venting and having one or more metallic spurs rigidly secured to
 65 said core-bar extending out through the matrix into the sand of the mold, combined and arranged as shown, so that the spurs support the core-bar in the mold and hold the core-bar rigidly in the finished casting, all substantially as herein specified.
 70

In testimony whereof I have hereunto set my hand, at New York city, New York, this 18th day of July, 1889, in the presence of two subscribing witnesses.

JOHN HOUSTON.

Witnesses:

CHAS. F. BARTER,
 CHARLES R. SEARLE.