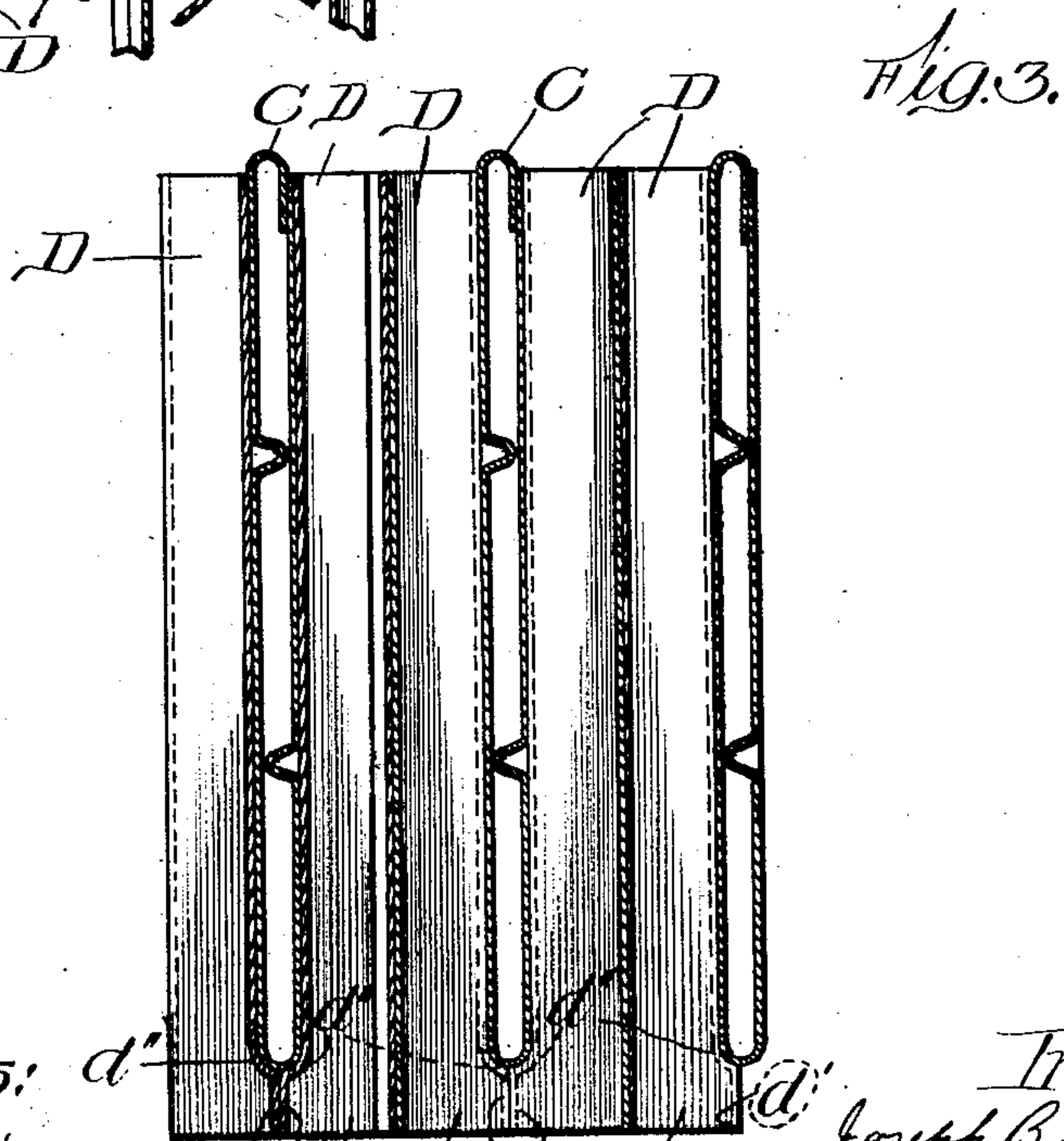
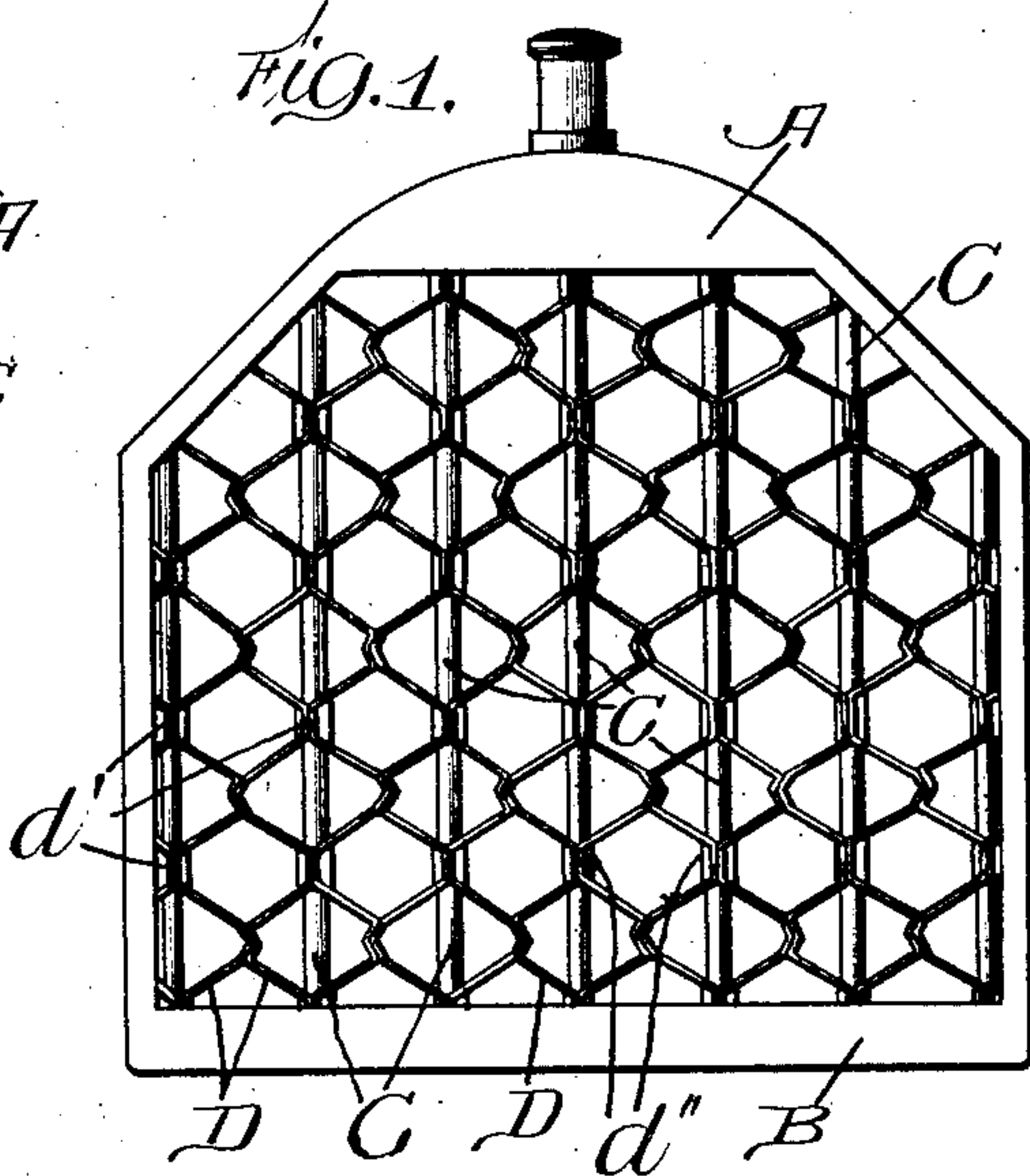
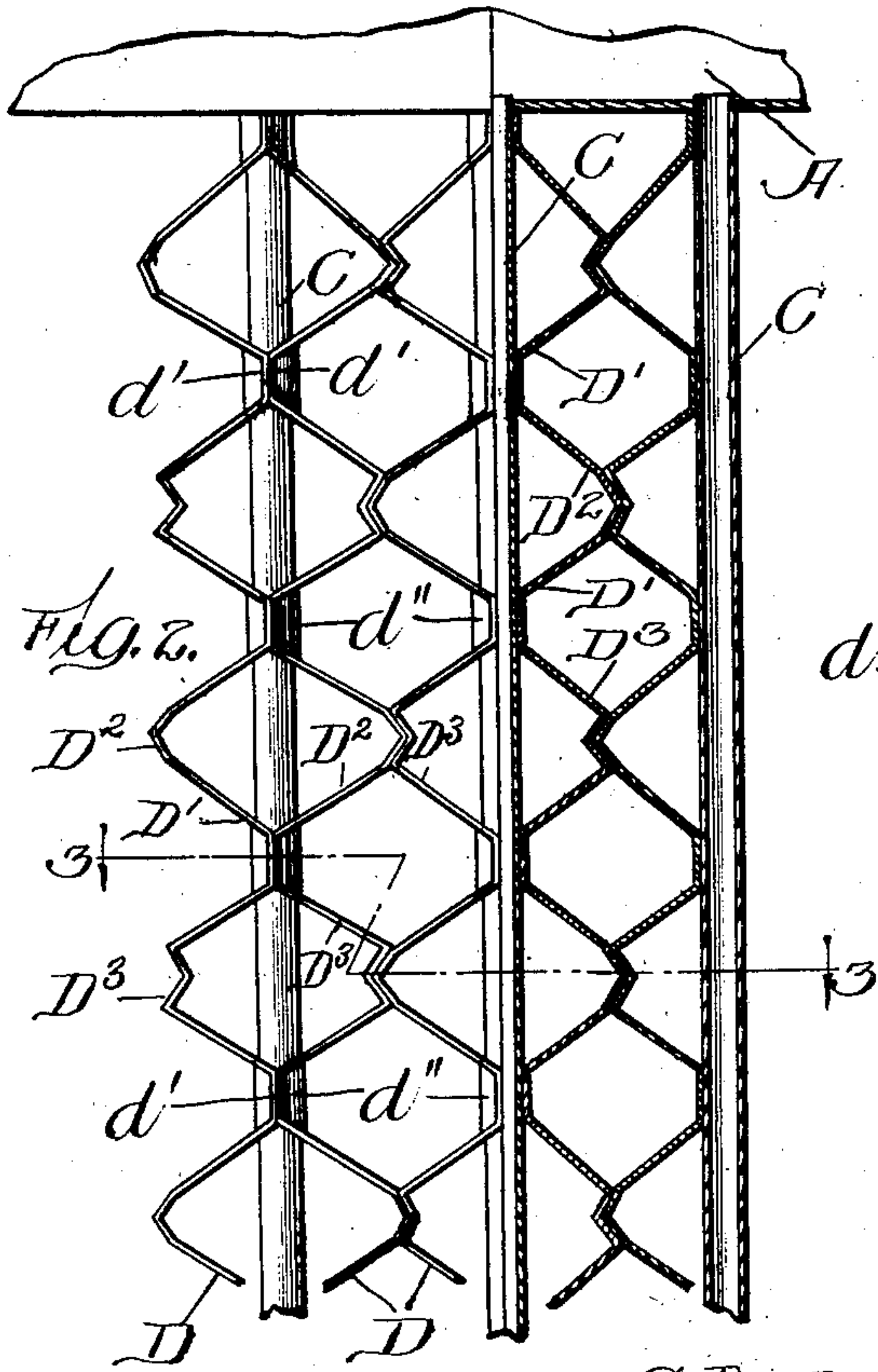


No. 898,238.

J. B. LONG & F. TODD.  
PATENTED SEPT. 8, 1908.  
RADIATOR.

APPLICATION FILED MAY 11, 1907.

2 SHEETS—SHEET 1.



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No. 898,238.

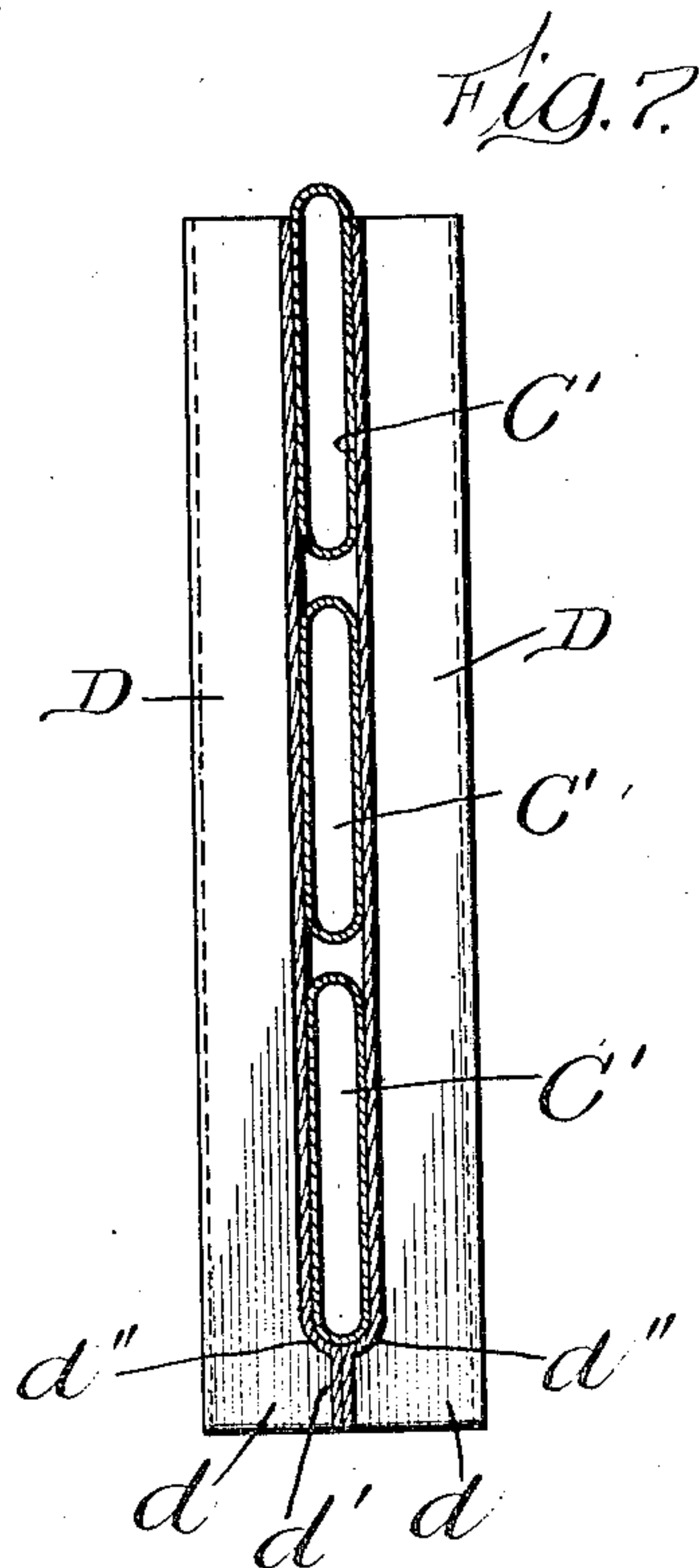
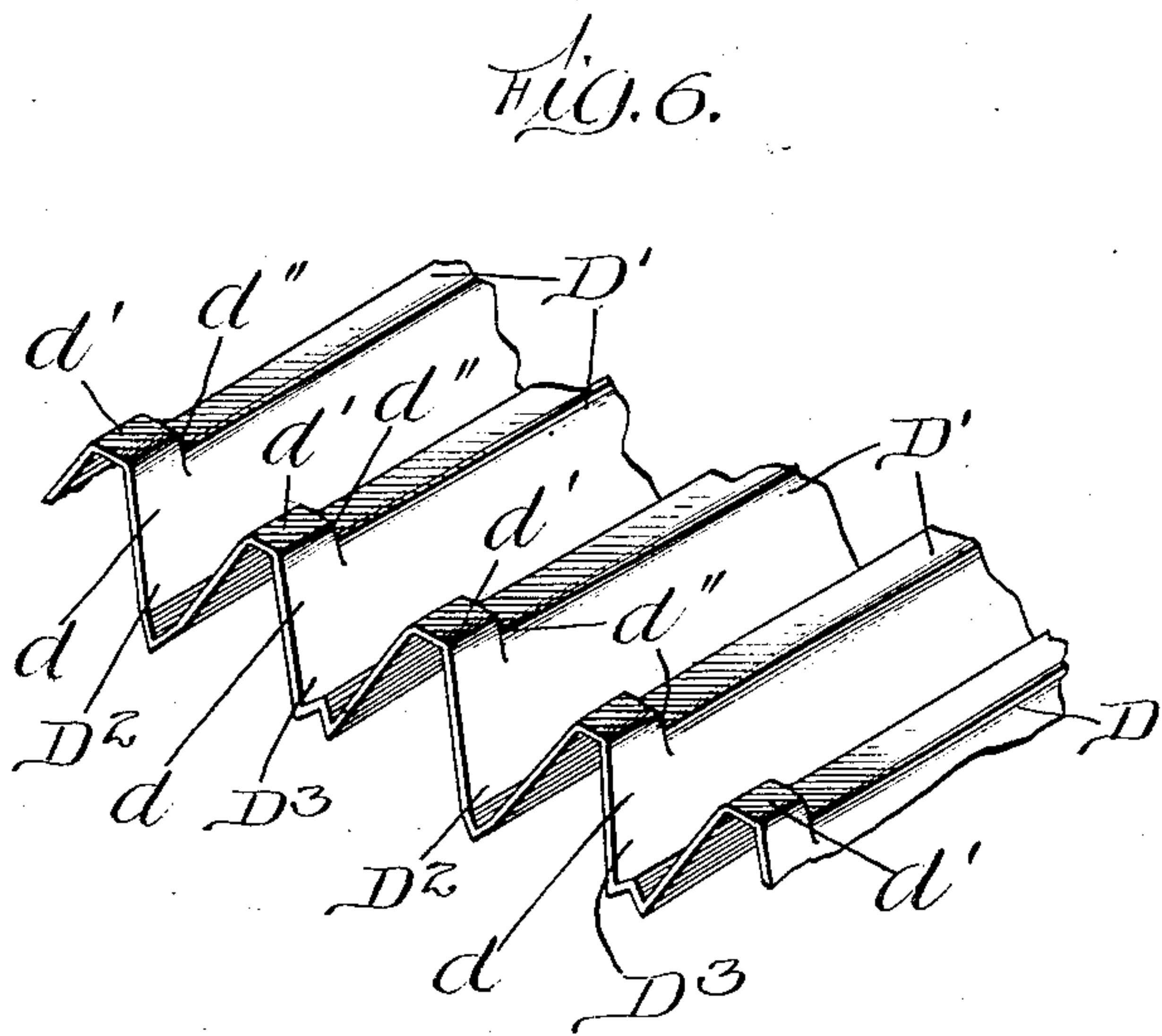
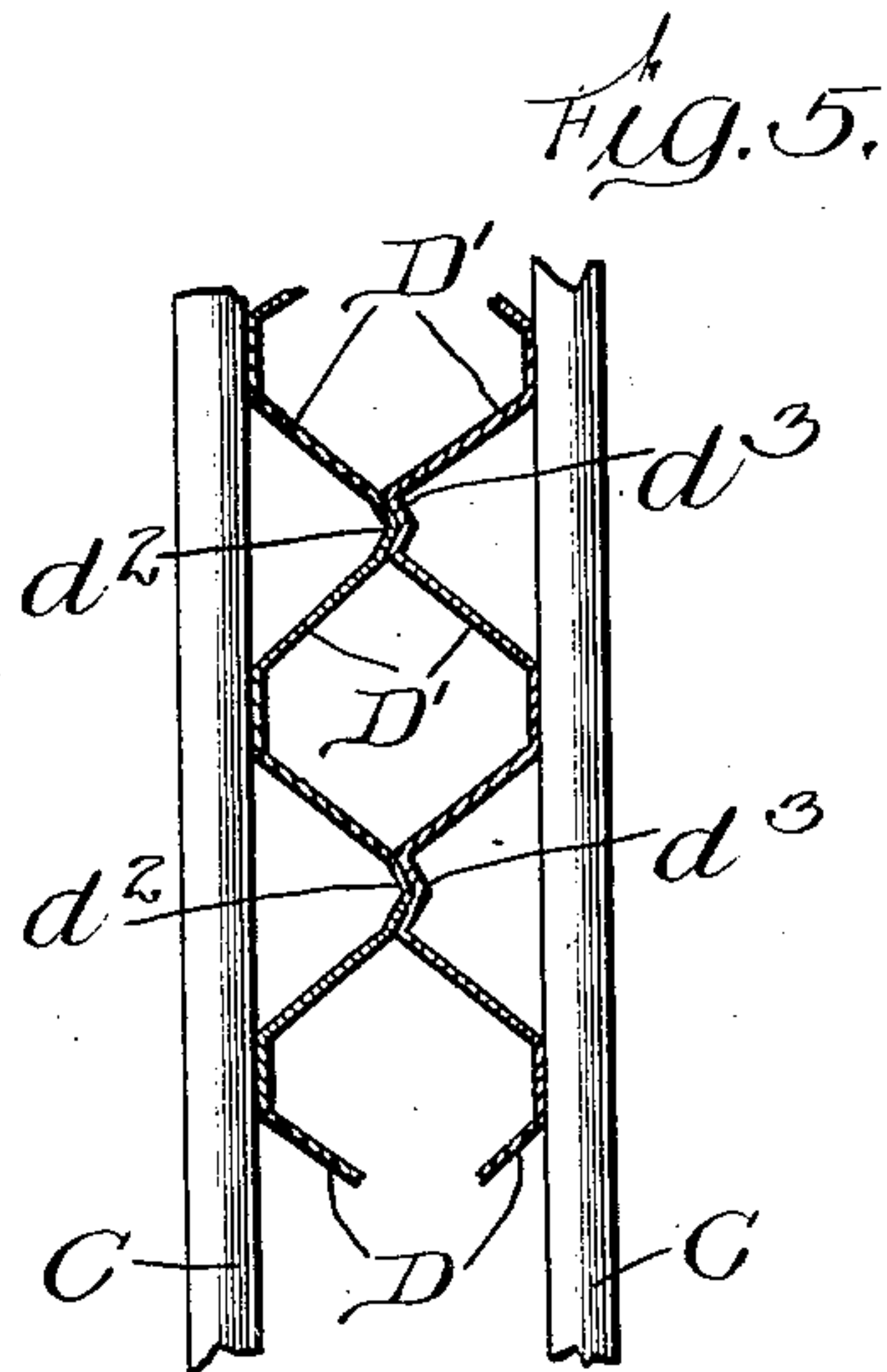
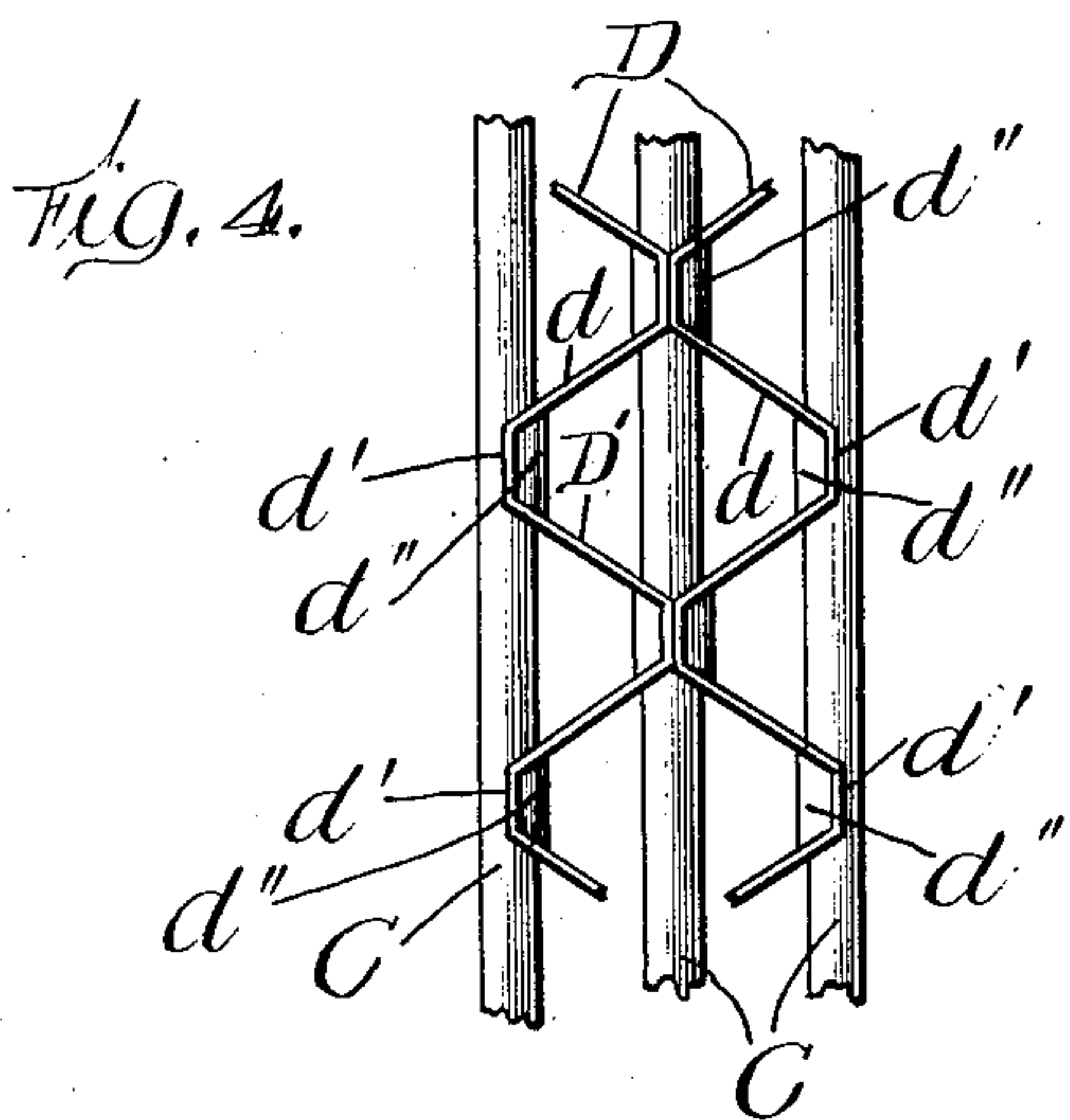
J. B. LONG & F. TODD.

PATENTED SEPT. 8, 1908.

RADIATOR.

APPLICATION FILED MAY 11, 1907.

2 SHEETS—SHEET 2.



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# UNITED STATES PATENT OFFICE.

JOSEPH B. LONG AND FRANK TODD, OF CHICAGO, ILLINOIS; SAID TODD ASSIGNOR TO SAID LONG.

## RADIATOR.

No. 898,238.

Specification of Letters Patent.

Patented Sept. 8, 1908.

Application filed May 11, 1907. Serial No. 373,157.

*To all whom it may concern:*

Be it known that we, JOSEPH B. LONG and FRANK TODD, citizens of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Radiators, of which the following is a specification.

The present invention relates to radiators of the class particularly adapted for use on automobiles, but which are also adapted for use wherever it is desired to radiate or absorb heat for heating or cooling purposes.

The object of the invention is to provide a radiator of improved construction and the invention consists in the features of novelty that are hereinafter described with reference to the accompanying drawing, which is made a part of this specification and in which:

Figure 1 is a conventionalized front elevation of a radiator embodying the invention in its preferred form. Fig. 2 is a view on an enlarged scale, of a portion thereof partly in front elevation and partly in vertical section in a plane parallel with the front of the radiator and cutting the tubes. Fig. 3 is a horizontal section thereof in the planes indicated by the line 5—3, Fig. 2. Figs. 4 and 5 are fragmentary views showing two modifications. Fig. 6 is a perspective view of a portion of one of the corrugated strips. Fig. 7 is a view similar to Fig. 6 showing a modification.

The radiator consists of a suitable frame having headers A and B, a plurality of tubes C, the opposite ends of which are in internal communication with the headers, in customary manner, and a plurality of strips, D, of sheet metal, arranged between the tubes, lengthwise thereof, and provided with transverse flutes or corrugations, the summits of which are in heat-conducting contact with the tubes. The tubes have flat sides and are arranged with their flat sides parallel with the direction of the air currents that pass through the radiator and preferably vertical. Preferably all of the strips are alike and each has a series of flutes or corrugations  $D^1$ ,  $D^2$ ,  $D^3$ , repeated as often as necessary.

The summits of all of the flutes ( $D^1$ ) on one side of each strip are in heat-conducting contact with one side of one of the tubes, and in order to increase the area of contact their summits are made flat. At the front (or rear) side of the radiator the sides of strips

extend beyond the front (or rear) sides of the tubes, as shown at  $d$  and at these projecting portions the summits of the flutes  $D^1$  project, as shown at  $d'$ , beyond the summits of the portions in rear thereof to the extent of one-half the thickness of the tube, so that when two strips are in proper positions upon opposite sides of a tube the projecting summits  $d'$  of the flutes  $D^1$  in the extended portions of the strips will come together, as shown in Figs. 1, 2, 3, 4 and 6. One advantage of this is that in the completed radiator the extended portions of the strips obscure the view of the tubes and by bringing the summits of their flutes together a symmetrical geometrical design, resembling a honeycomb in appearance, results. Another advantage is that the parts are additionally braced against each other and the rigidity of the structure thereby increased and still another advantage is that the shoulders, resulting from the projecting summits of the flutes cooperate with the tubes and form stops or gages which assist in the exact assembling of the parts, to the end that the front edges of all of the strips shall be perfectly flush. Still another advantage is that the tubes are protected.

The summits of all the flutes on the other side of each strip contact with the summits of corresponding flutes on an adjacent strip, two strips, in the preferred form of the invention, being arranged between each two adjacent tubes. The summits of the flutes  $D^2$  are of V-shape and the summits of the flutes  $D^3$  are bent to form outwardly presented V-shaped grooves, and these two forms of flutes alternate, throughout the entire length of the strip. In assembling the parts, two strips are placed together with the summits of the flutes  $D^2$  of one strip engaging the grooves in the summits of the flutes  $D^3$  of the other strip, and while held in these relations the two strips are slipped in, from the front of the radiator, between two adjacent tubes until their shoulders  $d''$  resulting from the projecting summits  $d'$  engage the front sides of the tubes. This operation is repeated until the full complement of strips is in place and then the strips and tubes may be secured together by complete or partial immersion in a solder bath, or they may be soldered by hand as the strips are put in place.

The advantages in providing the strips with flutes having interengaging features are



that they increase the rigidity of the structure, and, which is of great importance, they greatly facilitate the holding of the strips in proper relations to each other in assembling the parts. Preferably these interengaging features are similar on both strips, and the dissimilar features alternate on each strip, because this enables all of the strips to be made by one set of dies; it avoids the necessity for selecting two dissimilar strips for each pair in assembling the parts; and in the completed structure the appearance is more symmetrical. We desire to have it understood, however, that all of the flutes similar to the flutes  $D^2$  may be made on one strip and all of the flutes similar to the flutes  $D^3$  may be made on the other strips, as shown at  $d^2$  and  $d^3$  in Fig. 5.

In the preferred form of the invention, above described, two strips  $D$  are arranged between adjacent tubes, but if desired but a single strip may be used, as shown in Fig. 4. In this case the flutes on both sides of the strip will be like the flutes  $D'$ .

It should be noted that the tubes do not pass through the radiating strips and this is of importance, especially for repair purposes. With the described construction, should a tube spring a leak, or require to be removed, it is simply necessary to loosen and remove the strips on one or both sides of it, and this will give access to the tube, either for repairing it while still in place, or for removing it.

In the preferred form of the invention we use a single row of tubes extending from side to side of the radiator, but instead thereof we may use a plurality of rows of tubes, so arranged that the tubes of the several rows fall in longitudinal rows as shown at  $C'$  in Fig. 7.

What we claim as new and desire to secure by Letters Patent is:

1. A radiator having a plurality of tubes and a plurality of strips of sheet metal having transverse flutes or corrugations, a pair of said strips being arranged between each two adjacent tubes, lengthwise thereof, with the flutes on the adjacent sides of each pair in contact with each other and the flutes on the remote sides of each pair in contact with adjacent tubes, the summit of one of each two contacting flutes having a groove into which the summit of the other projects.

2. A radiator having a plurality of tubes and a plurality of strips of sheet metal hav-

ing transverse flutes or corrugations, the alternate flutes on one side of each strip having grooves in their summits, a pair of said strips being arranged between each two adjacent tubes with the summits of alternate flutes on one strip projecting into the grooves in the summits of alternate flutes on the other strip, the summits of the flutes on the remote sides of the strips of each pair being in contact with the sides of adjacent tubes.

3. A radiator having a plurality of tubes and a plurality of strips of sheet metal, having transverse flutes or corrugations, arranged between the tubes, lengthwise thereof, and having portions extended beyond the tubes, the flutes in the extended portion of the two strips on opposite sides of each tube being high and in contact with each other and the flutes in the remaining portion of said strips being low and in contact with the sides of the tube, the lower portions of the flutes extending from the higher portions quite to the opposite sides of the strips whereby the strips may be inserted or removed while the tubes are in place.

4. A radiator having a plurality of tubes and a plurality of strips of sheet metal having transverse flutes or corrugations, a pair of said strips being arranged between each two adjacent tubes, lengthwise thereof, and having portions extending beyond the tubes, the summits of the flutes on adjacent sides of the strips of each pair being in contact with each other and the summits of the flutes on the remote sides of the strips of each pair being higher in the extended portions than in the remaining portions of said strips, whereby the summits of the flutes in the extended portions of the two strips arranged on opposite sides of each tube contact with each other and the summits of the same flutes in the remaining portions of said strips contact with the sides of the tube, the lower portions of the flutes extending from the higher portions quite to the opposite edges of the strips, whereby the strips may be put in place or removed while the tubes are in place.

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