

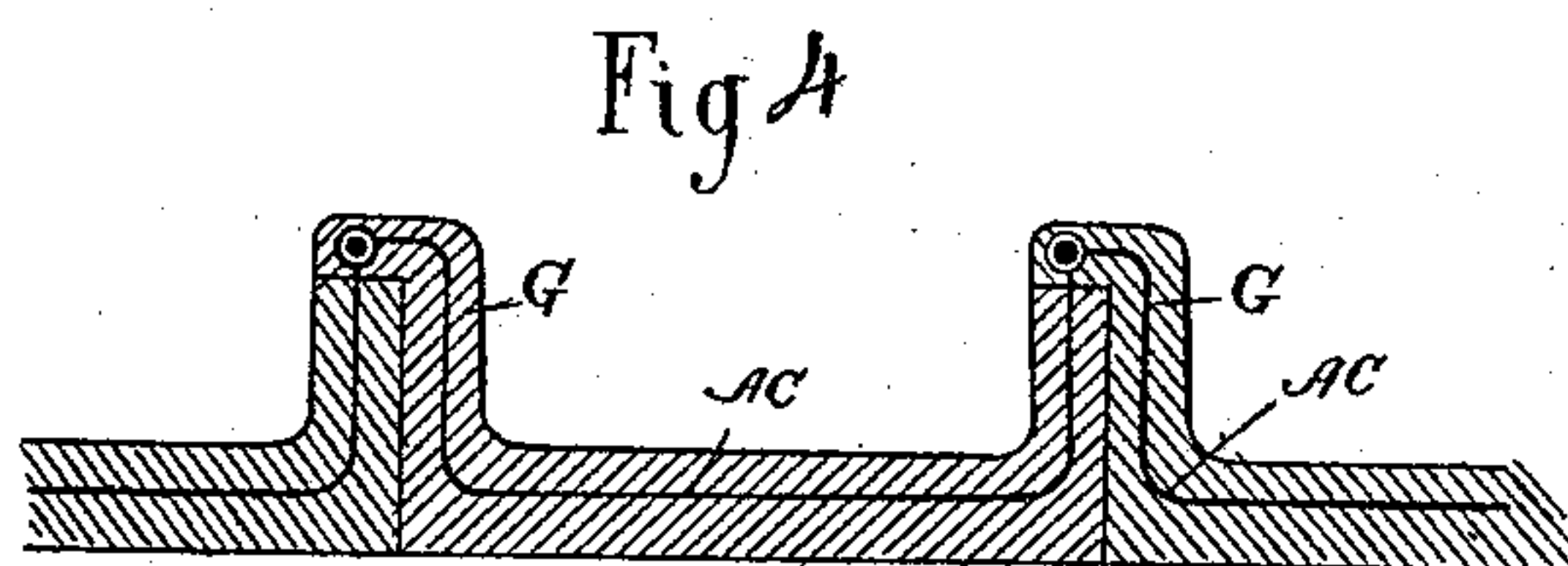
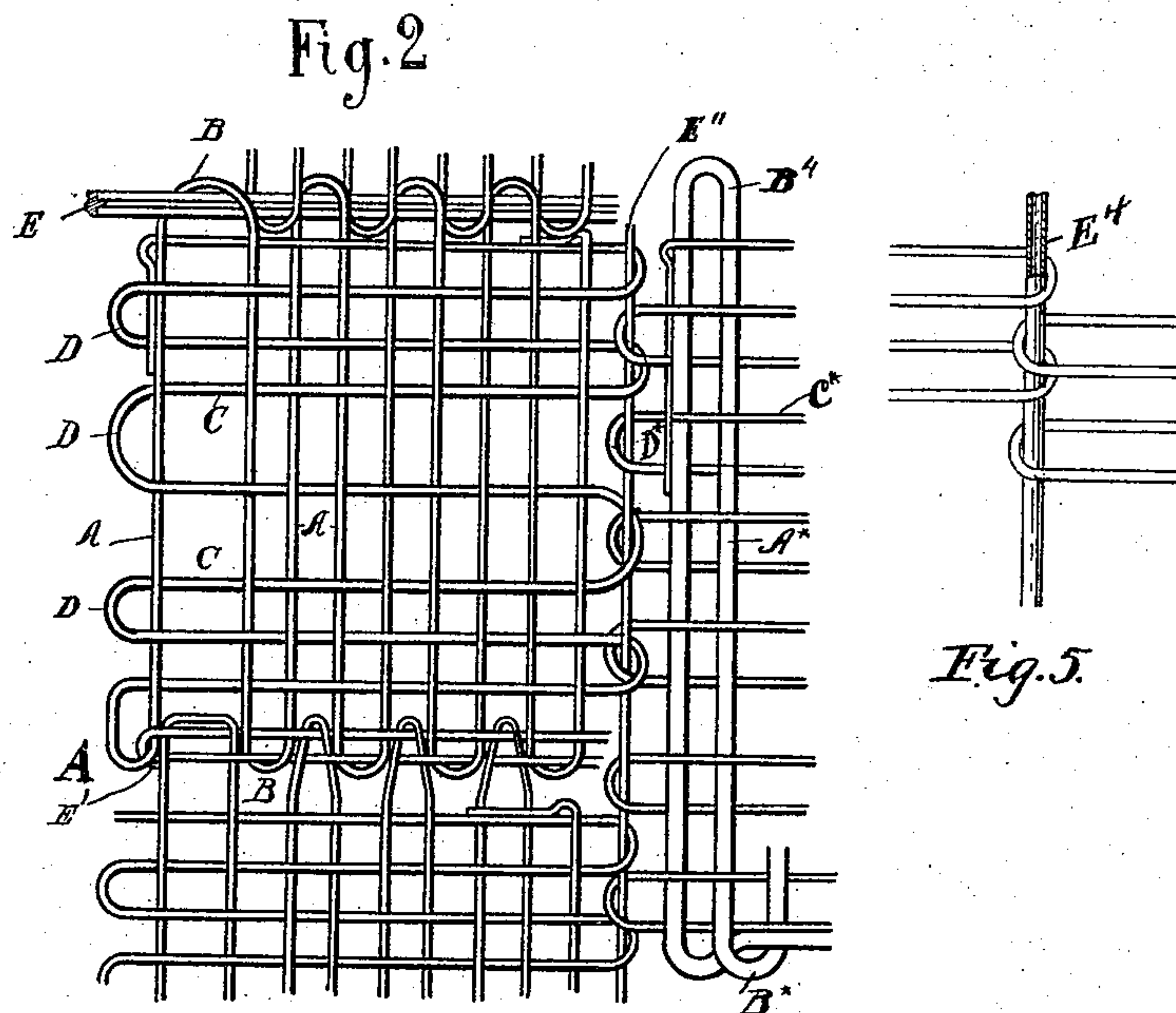
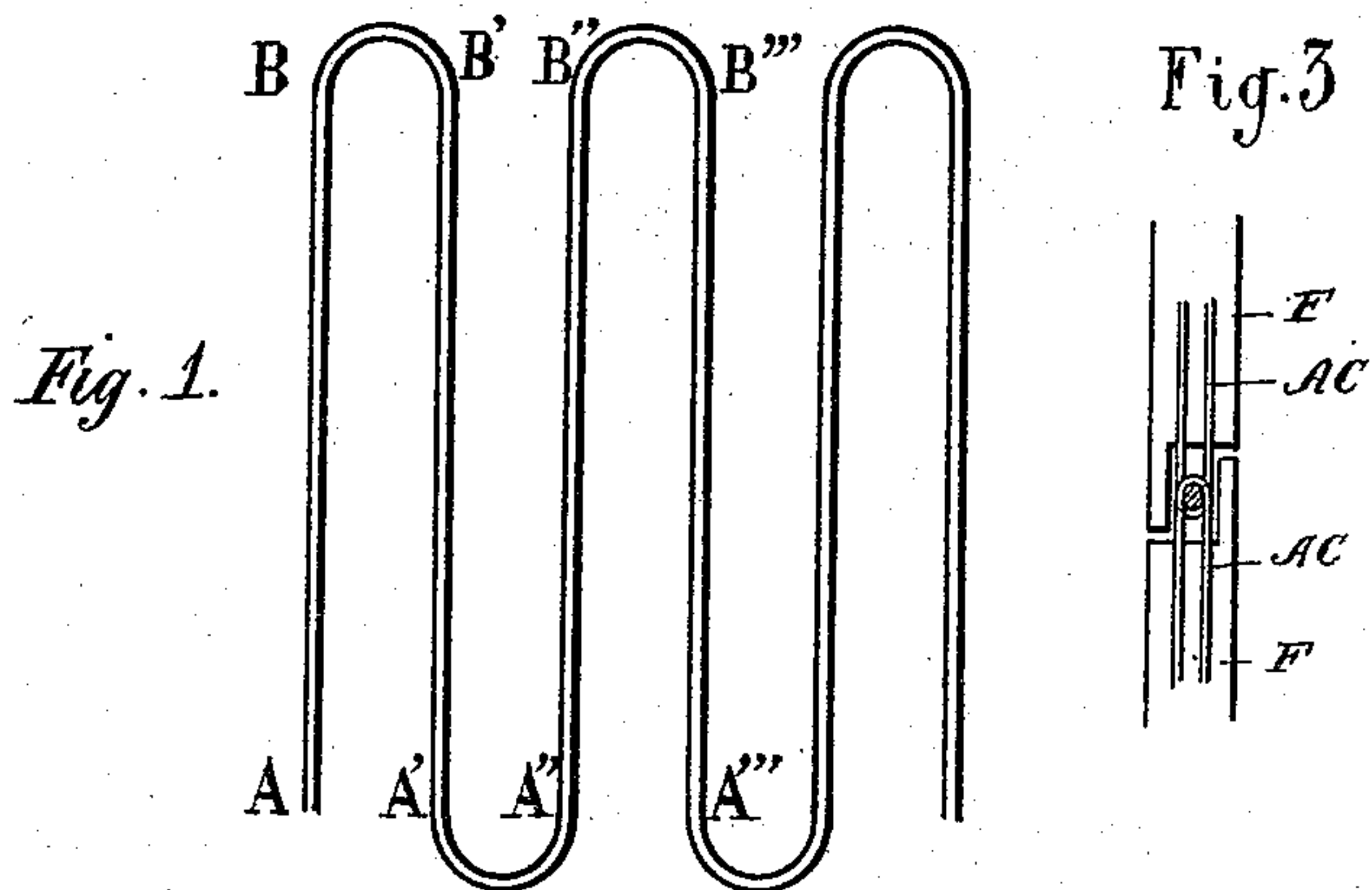
(No Model.)

P. COTTANCIN.

WORK OF RE-ENFORCED PLASTIC MATERIAL.

No. 459,944.

Patented Sept. 22, 1891.



*Jonathan C. C. -
J. G. Batchelor*

*Paul Cottancin
by Pollock Mauro
his attorneys.*

UNITED STATES PATENT OFFICE.

PAUL COTTANCIN, OF PARIS, FRANCE.

WORK OF RE-ENFORCED PLASTIC MATERIAL.

SPECIFICATION forming part of Letters Patent No. 459,944, dated September 22, 1891.

Application filed July 17, 1891. Serial No. 399,872. (No model.) Patented in France May 18, 1889, No. 196,773, and December 18, 1890, No. 210,293; in Belgium July 13, 1889, No. 86,987, and in Italy September 30, 1889, No. 26,026.

To all whom it may concern:

Be it known that I, PAUL COTTANCIN, engineer, of Paris, in the Republic of France, have invented a new and useful Improvement in Works of Re-Enforced Plastic Material, (for which I have obtained patents in France, No. 196,773, dated May 18, 1889, and No. 210,293, dated December 18, 1890; in Belgium, No. 86,987, dated July 13, 1889, and in Italy, No. 26,026, dated September 30, 1889,) of which the following specification is a full, clear, and exact description.

This invention relates more particularly to the construction of walls of plastic material in which are embedded one or more strengthening webs or frames of metal in the form of a lattice, trellis, reticulated or open-work fabric, or perforated plate of any suitable shape and dimensions. The plastic material may be cement or concrete, and one use of the walls thus constructed is in fortifications; but any suitable plastic material may be used and the compound material or structures thereof may be used for various purposes.

Heretofore metal in various forms has been embedded in concrete; but in the present invention a new or improved strengthening web or frame is employed, the same being characterized by the union in a reticulated fabric of a warp and a weft, each composed of a wire, band, or bar bent on itself into a sinuous or like shape. The weft and warp may be of separate pieces or in one piece with each other. The strengthening webs or frames may occupy different positions. Further, in accordance with the present invention, blocks or panels are made in which the skeleton frames or strengthening webs are exposed at the edges in such a way that the webs or frames of different blocks or panels may be joined together to constitute a larger structure.

The invention also consists in making the strengthening webs or frames with offsets, buttresses, or projections, so as to give increased strength or stiffness to the structures containing the same.

The invention also comprises the other new parts, improvements, or combinations hereinafter pointed out and claimed.

In the accompanying drawings, which form

part of this specification, Figure 1 is a view of the warp or weft separate from the fabric of which it forms part. Fig. 2 is a view of several panels of the fabric connected with one another. Fig. 3 is an edge view showing the junction of two blocks by their embedded frames or webs; and Fig. 4 is a cross-section of a number of blocks with offsets, buttresses, or projections. Fig. 5 is a view showing two adjacent panels connected by a tube.

The warp is constituted by a wire, band, or bar of any suitable metal and of any suitable section bent into a sinuous or like form, as that of a number of connected U's, as shown at A B B' A' A'' B'' A''' B''', Fig. 1. The parts A B, A' B' A'' B'', &c., may be in the same plane, or they may be inclined so as to form an irregular or a curved surface. The bends B B'' B'', &c., may be circular, square, rectangular, triangular, or of other form.

The weft is constituted by a wire, band, or bar of any suitable metal and of any suitable section extending across the warp and constituted like it of consecutive elements united by bends or loops. It may be like the warp in size and section or it may be different therefrom. It may be bent like the warp or differently therefrom. It may be a continuation of the wire, band, or bar which constitutes the warp, or it may be a separate piece.

In the principal panel of Fig. 2 the weft C D is a continuation of the wire which constitutes the warp A B, while in the partial panel at the right of said figure the weft C* D* is of a smaller wire than is the warp A* B*. The elements of the weft ride upon the elements A of the warp at their crossings. They may be interlaced therewith in any known or suitable way. They, like the elements of the warp, may extend in different directions relatively to each other and to the elements of the warp. The distances between the elements may be variable or uniform, as may be desired. The panels have the four edges selvage. (See central panel of Fig. 2.)

The fabric constituted as just described is to be surrounded with and embedded as a strengthening web or frame in cement or concrete or other plastic material and may be used in this way in the manufacture of plane

or curved surfaces. It may also be used without plastic material, as in the manufacture of gratings or trellises. It may be used with or without plastic material, according to the circumstances or the necessities of the particular use, in fences, arbors, cages, and the like, as also in the large reservoirs of cement with metallic strengthening-frames in the form of series of panels, such as described, whose warp and weft have the section desired for resisting the pressure of the water; also in sewers, tunnels, vaults, floors, roofs, flagging, and the like.

In order to construct panels which may be readily and firmly united, portions of the strengthening webs or frames suitable for joining to others are exposed beyond the plastic material at the edges of the panels. The bends B and D of the peculiar warp and weft hereinbefore described are specially adapted to enable the connection to be most readily and firmly effected. They may be placed together and a wire or rod or the like run through the bends or loops of the two panels. Thus in Fig. 2 the bar or rod E is shown as thrust through the overlapping loops or bends in the warps in adjacent panels, the bent wire E' as thrust through the overlapping warp loops or bends, and the single wire E'' as thrust through, overlapping weft loops or bends. The panels may be so connected as well without as when embedded in plastic material.

In Fig. 3 panels or blocks of wire frames A C embedded in concrete F are shown arranged in the position for joining by the insertion of a wire, rod, or the like through the overlapping loops or bends in the corresponding warps or wefts of the said panels. The bar E of Fig. 2 is heavier than the wire fabric A B C D and gives increased strength to the web or frame. The use of such braces in general to give increased resistance to the strengthening-web is included in the invention.

It is obvious that in the construction of the panels as many strengthening webs or frames may be combined as may be necessary to gain the desired amount of metal.

The mode described of uniting panels can easily be applied also to pipes with strengthening webs or frames of the kind shown.

In place of bars solid material of any suitable form may be used with or without appendages of the same or a different material, so as to give to the walls of plastic material inclosing the strengthening webs or frames particular physical or chemical properties.

Whatever may be the form and dimensions of the auxiliary bars imprisoned or only bound up with the strengthening web or frame, trellis, fabric, cloth, perforated plates, &c., the resisting properties will be such that projectiles will not disarrange said bars, for the effect of the shock is neutralized, since the resisting material is preserved by the envelope of plastic material, which has a certain easily-

maintainable solidarity with its strengthening web or frame and causes the parts of the latter to co-operate, whereas the bars of resisting material alone can only be brought into action with great difficulty. Thus in a trellis of iron or of wool, cotton, hemp, asbestos, fabric, or the like with my system bars of chrome-steel or other product may be incorporated, so that the wall with plastic material may not be perforated from side to side by the percussion of the balls. All these combinations, having opposition to the shock of projectiles for their object, are equally applicable to give to the trellises, fabrics, cloths, perforated plates, &c., a greater resistance to forces of flexure, traction, compression, &c., or for use in walls for conducting physical agents, heat, electricity, &c., without their being on the outside of said walls or without the said walls being affected by the passage of these agents.

The insulating quality of certain materials which cannot of themselves be used to build thin solid walls may be utilized by providing a strengthening web or frame of conducting materials, which permits the passage of electric currents for lighting, telephoning, or telegraphing; and, moreover, there is also the possibility of circulating in appropriate channels air or gases or even liquids adapted to maintain the wall at any desired temperature.

My arrangement of a compound strengthening web or frame can be applied to works in cement or other material with metallic strengthening webs or frames without ties and constituting a continuous net to give a greater resistance to the walls and to the buttresses, ribs, or projections employed in this system to break up the surface into connected U's, which have a greater moment than walls without these projections. In this way buttresses, projections, ribs, or the like can be made of any desired form, and the metal can be bent back at the desired angle as well in works with only skeleton metallic frames as for those with frames of fabric, cloth, perforated plates, and trellises of any suitable construction. This arrangement is represented in Fig. 4. The panels have each a rib or projection G at each end, through which the skeleton frame A C, of wire, as shown in Fig. 2, is extended, the frames of adjacent panels being united in the buttress or projection G by a wire of warp or of weft, as shown by the rod and wires E E' E'' of Fig. 2.

Along with or separately from the bars I may also apply solids of any suitable form, whatever may be the dimensions and the nature of the materials incorporated in the trellises, fabrics, cloths, perforated plates, &c., in order to impart at will the requisite properties, as hereinbefore specified.

Fig. 5 illustrates one way in which tubes may be incorporated in the structure, the tube E⁴ in this case being used to connect

two adjacent sections. The number, position, and direction of the tubes used will of course depend upon the purpose for which they are employed.

5 The addition of tubes to the supporting-frame, which tubes may be of any suitable material, insulating or conductive, &c., serves also to leave vacancies in the walls for the circulation therein of gases and liquids or
10 for the transmission of physical agents, heat, electricity, &c., or to permit the passage of electric, telegraphic, or telephonic wires, or to permit the circulation of hot air, gases, steam, hot water, &c. These tubes, if de-
15 sired, may be filled with antiseptic substances for the disinfection of matters, whether odoriferous or not, with solid or pasty substances impregnated or not with suitable liquids for the filtration of liquids, of air, or of gases,
20 &c., or to clarify liquids or to arrest organism with animal black, turnings, or small pieces of metal, carbon, cotton, sponge, asbestos, &c., or for any other operation. They may also be filled with liquids adapted to deposit or
25 not, directly or by the action of physical or chemical agents, &c., solid matters in the canals in the interior of the walls, constituting vats, basins, chambers, &c., or air or uncongealable liquids brought to a low tempera-
30 ture or simply liquids at normal temperatures may be passed through the tubes to avoid putrefaction or fermentation or to obtain the congelation of matters contained therein, &c. In this manner, moreover, it is
35 possible to make wine-vats or cold-storage chambers for food; or, in a word, tubes may be used in the walls for any purpose to which they may be adapted.

It will be obvious that walls or structures
40 of plastic materials re-enforced by a strengthening web or frame, as specified, and having interior tubes, ducts, or channels may be applied to many other useful purposes.

Receptacles, reservoirs, basins, &c., may be
45 constructed, whose walls can be given a great solidity by filling the vacant spaces with water, sand, or other material, or by utilizing them for the decantation or the filtration of water.

50 This part of the present invention is distinguished from anything before known in that now for the first time in works of plastic or other material re-enforced by a strengthening web or frame of fabric, lattice, cloth, or
55 perforated plates of any kind imprisoned in the interior thereof bars or solids of any suitable form and dimensions are introduced without disarranging the fundamental constructions of the fabrics, cloths, lattice, or perfo-
60 rated plates, these giving a greater resistance to the plates against the shocks of projectiles or other stresses, whether of flexure or of traction, compression, torsion, &c.; also, that with

fabrics, cloths, lattice, perforated plates, both simple and with the addition in the form of
65 tubes, canals may be made for the connection of various elements of construction or to furnish passage to physical or chemical agents, electricity, heat, gas, steam, water, liquids, the walls being made insulating or conductive
70 to permit the transfer of these agents or to distribute their action at certain points, or to have surfaces whose physical or chemical properties are different or only modified in whole or in part from what they were origi-
75 nally.

I claim as my invention or discovery—

1. The metallic fabric or lattice comprising a warp and a weft crossing each other and each of a sinuous or recurved form, substan-
80 tially as described.

2. The metallic fabric or lattice comprising a warp and a weft in one continuous strip crossing each other and each of a sinuous or recurved form, substantially as described. 85

3. The metallic fabric or lattice with four selvage edges, substantially as described.

4. A block, panel, or structure comprising a metallic fabric or lattice embedded in plastic material and composed of a warp and a
90 weft crossing each other, and each of a sinuous or recurved form, substantially as described.

5. A block, panel, or structure of plastic material, having embedded therein a strength-
95 ening web or frame exposed at the edges to admit of joining to adjacent blocks, panels, or structures, substantially as described.

6. A structure composed of blocks or panels of plastic material with strengthening webs
100 or frames embedded therein, provided with buttresses or projections in which said webs or frames are embedded, as well as in the bodies of said blocks or panels, and having the webs or frames in adjacent blocks or pan-
105 els fastened together in said buttresses or projections, substantially as described.

7. A block, panel, or structure of plastic material with a strengthening web or frame
110 embedded therein, and provided with one or more auxiliary hollow bars or tubes also embedded in said plastic material, substantially as described.

8. A structure composed of panels, blocks, or smaller structures of plastic material hav-
115 ing strengthening webs or frames embedded therein and connected together by bars adapted to impart greater resistance to the structures or by tubes, substantially as described.

In testimony whereof I have signed this
120 specification in the presence of two subscribing witnesses.

PAUL COTTANCIN.

Witnesses:

ROBT. M. HOOPER,
CH. CASALONGA.