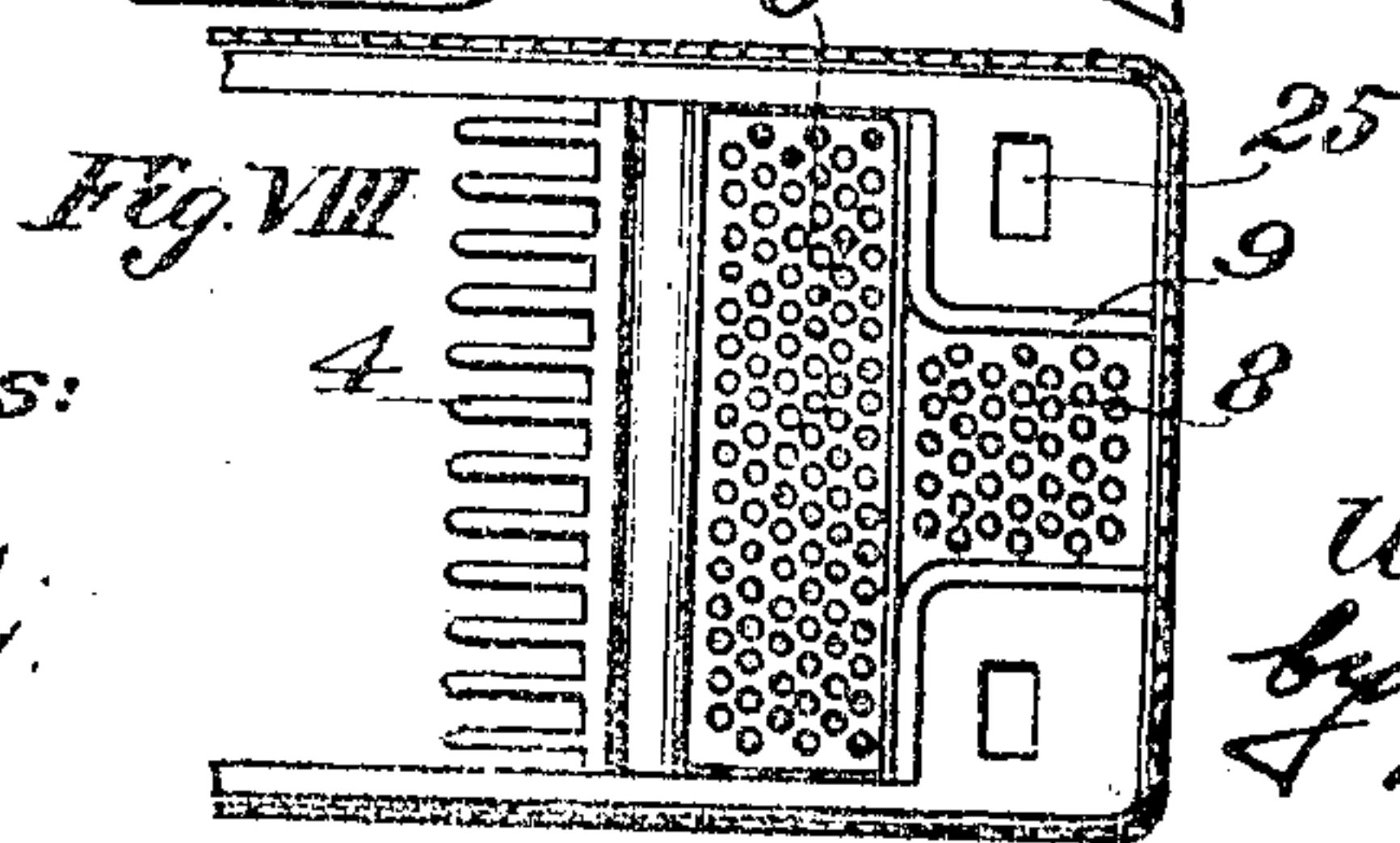
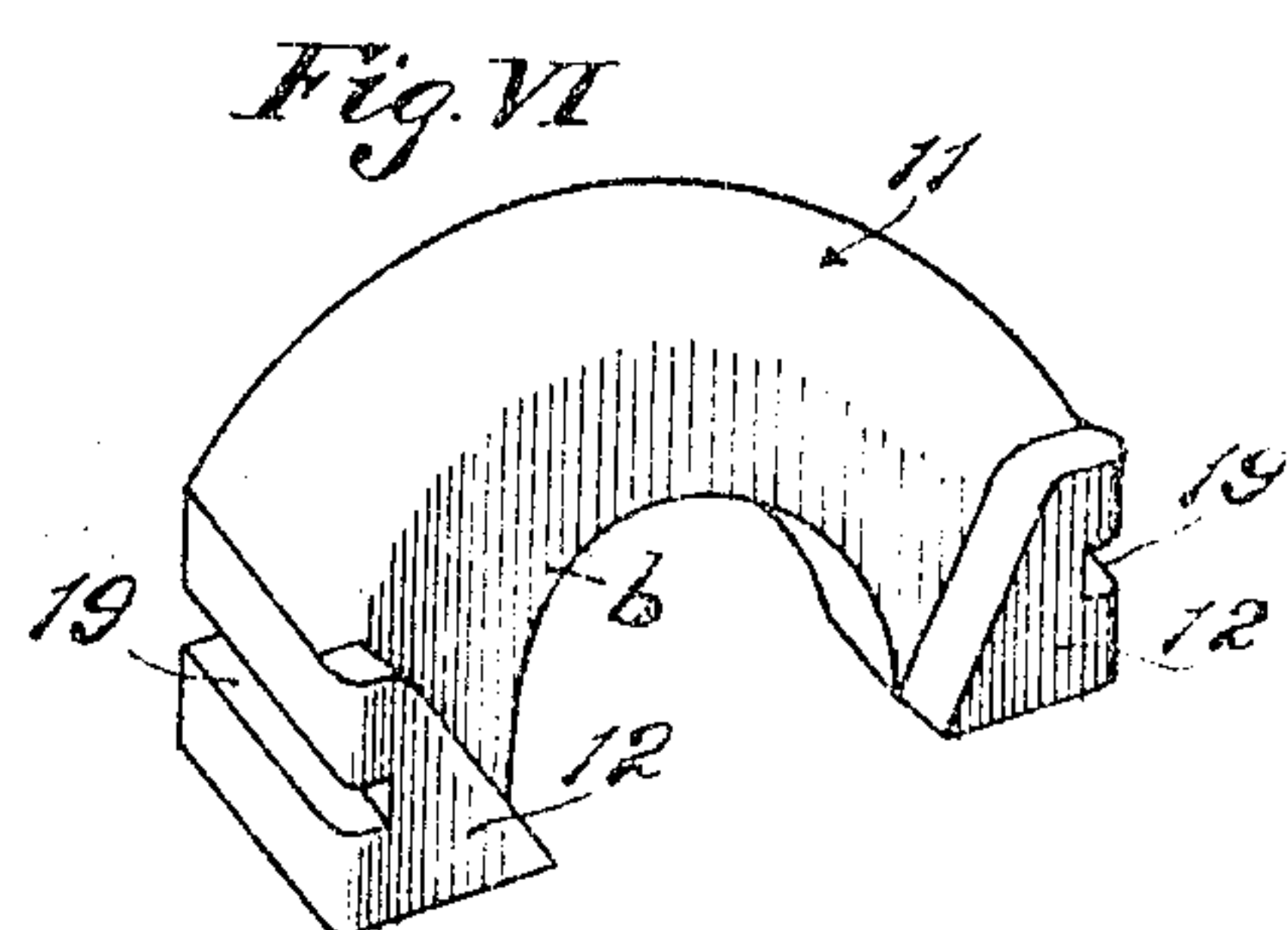
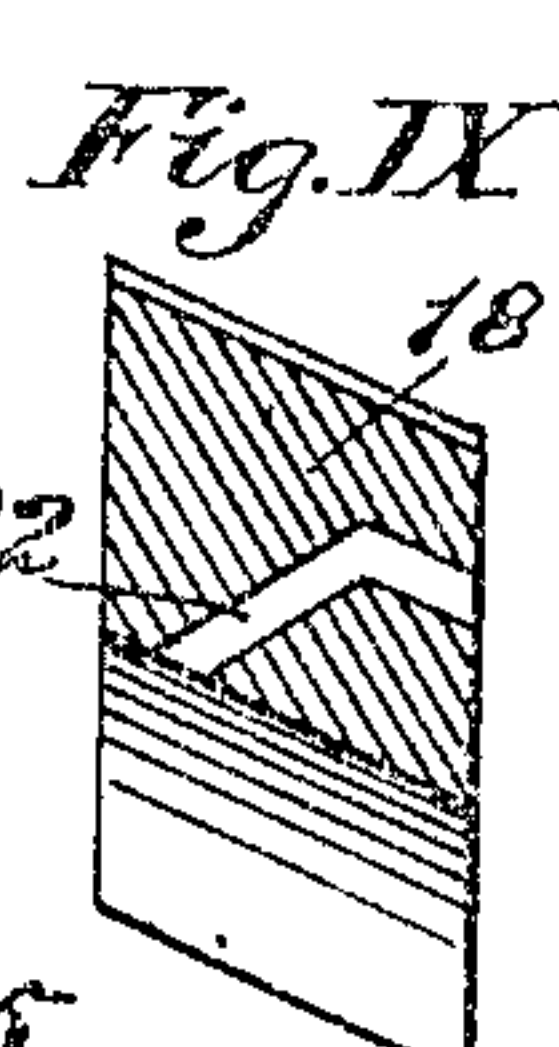
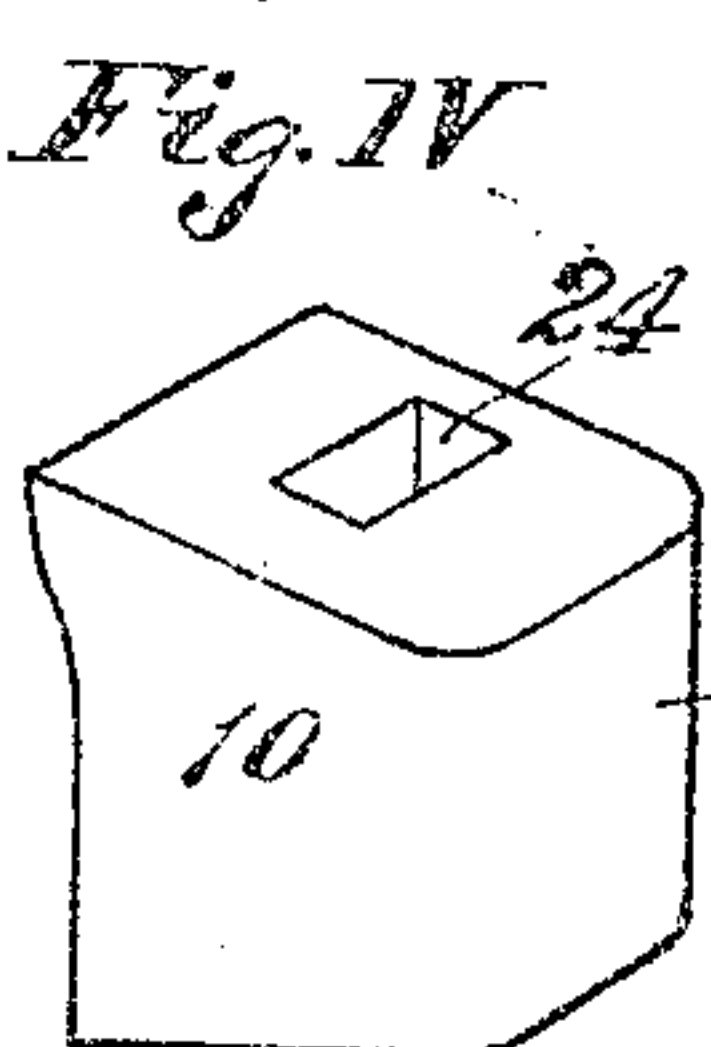
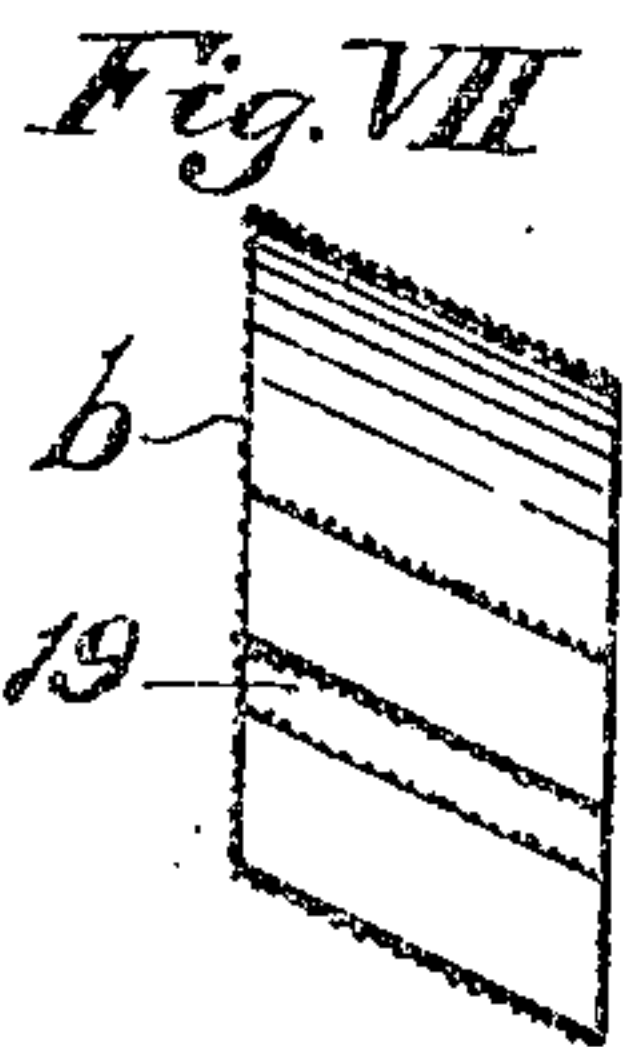
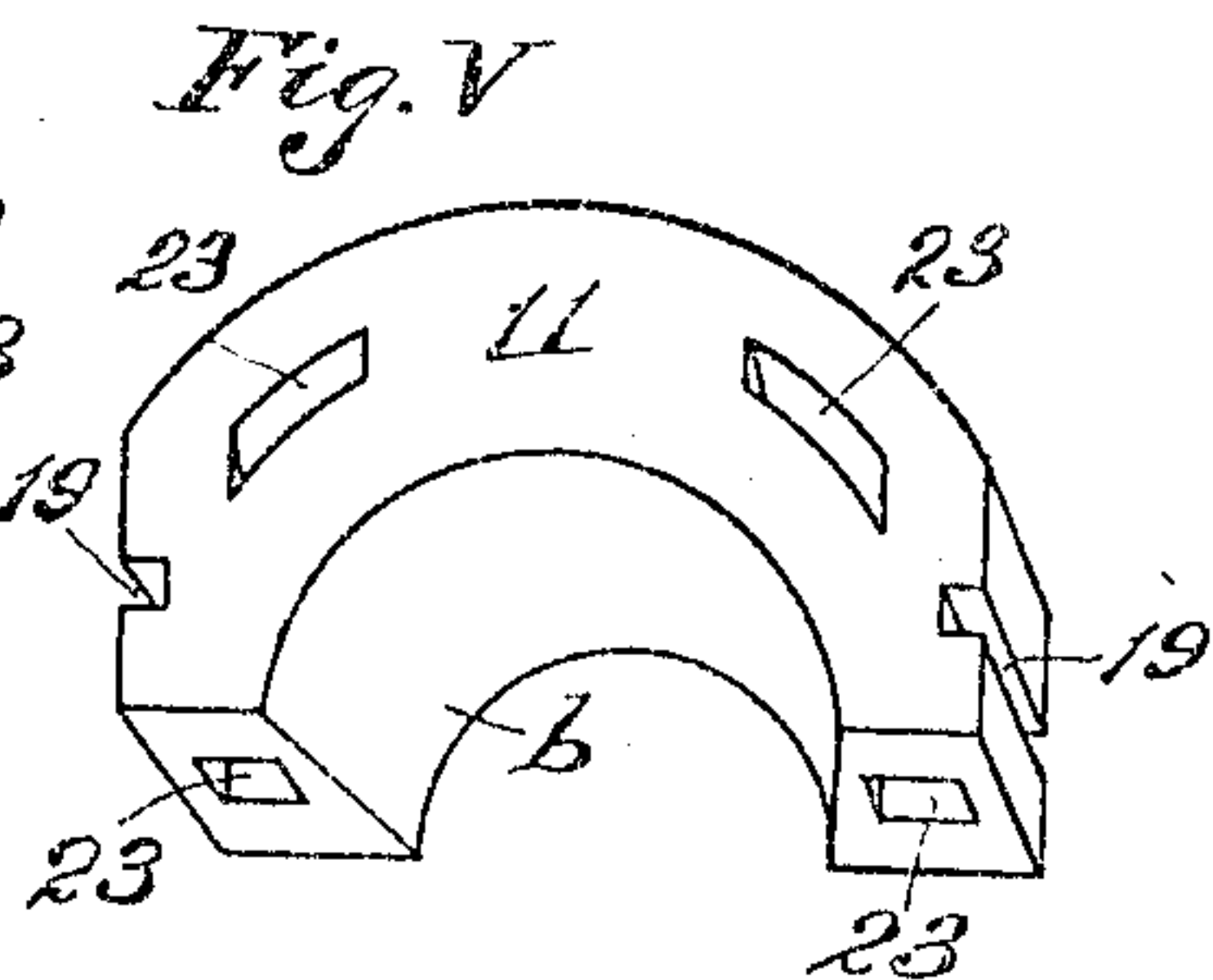
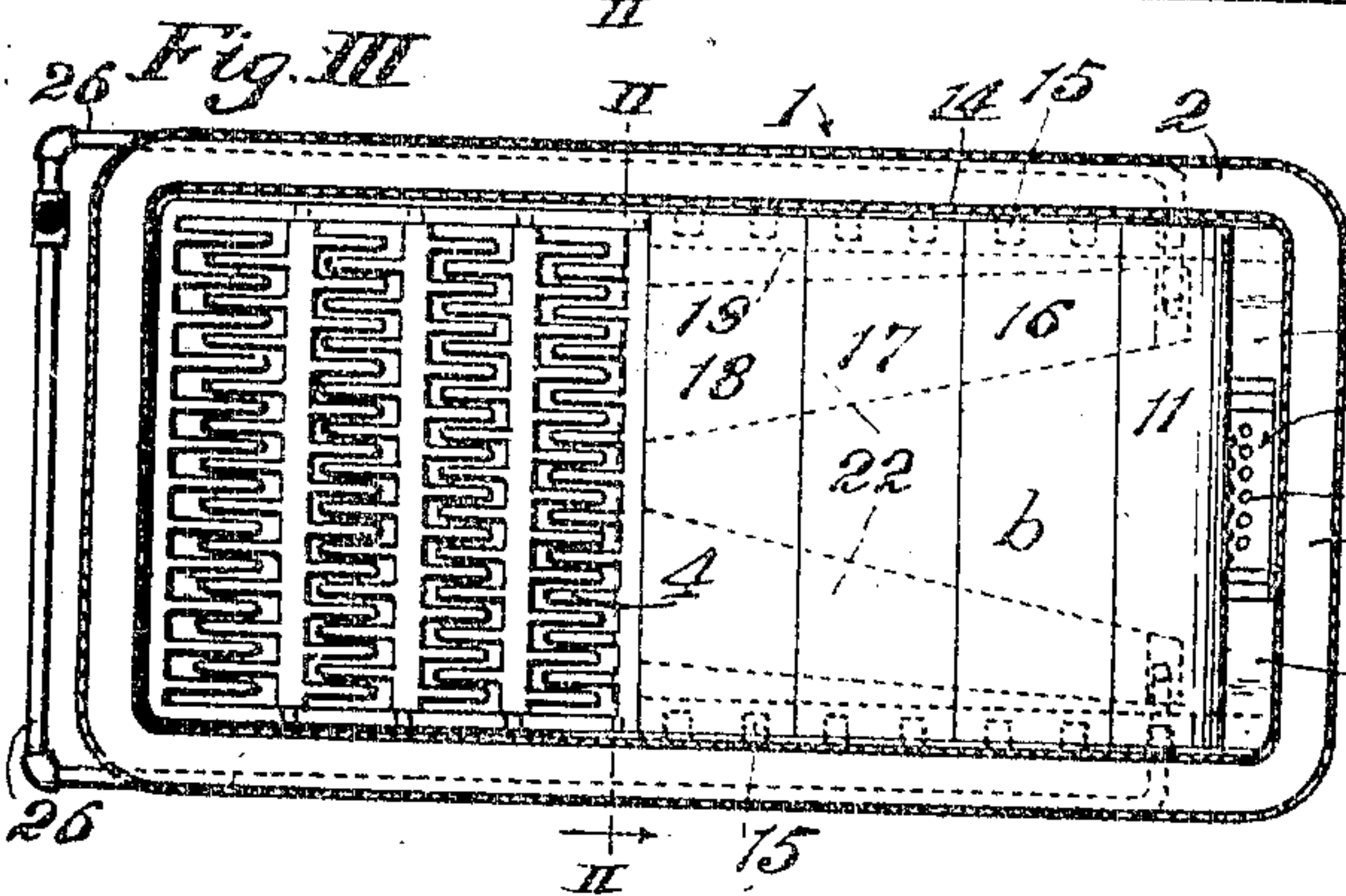
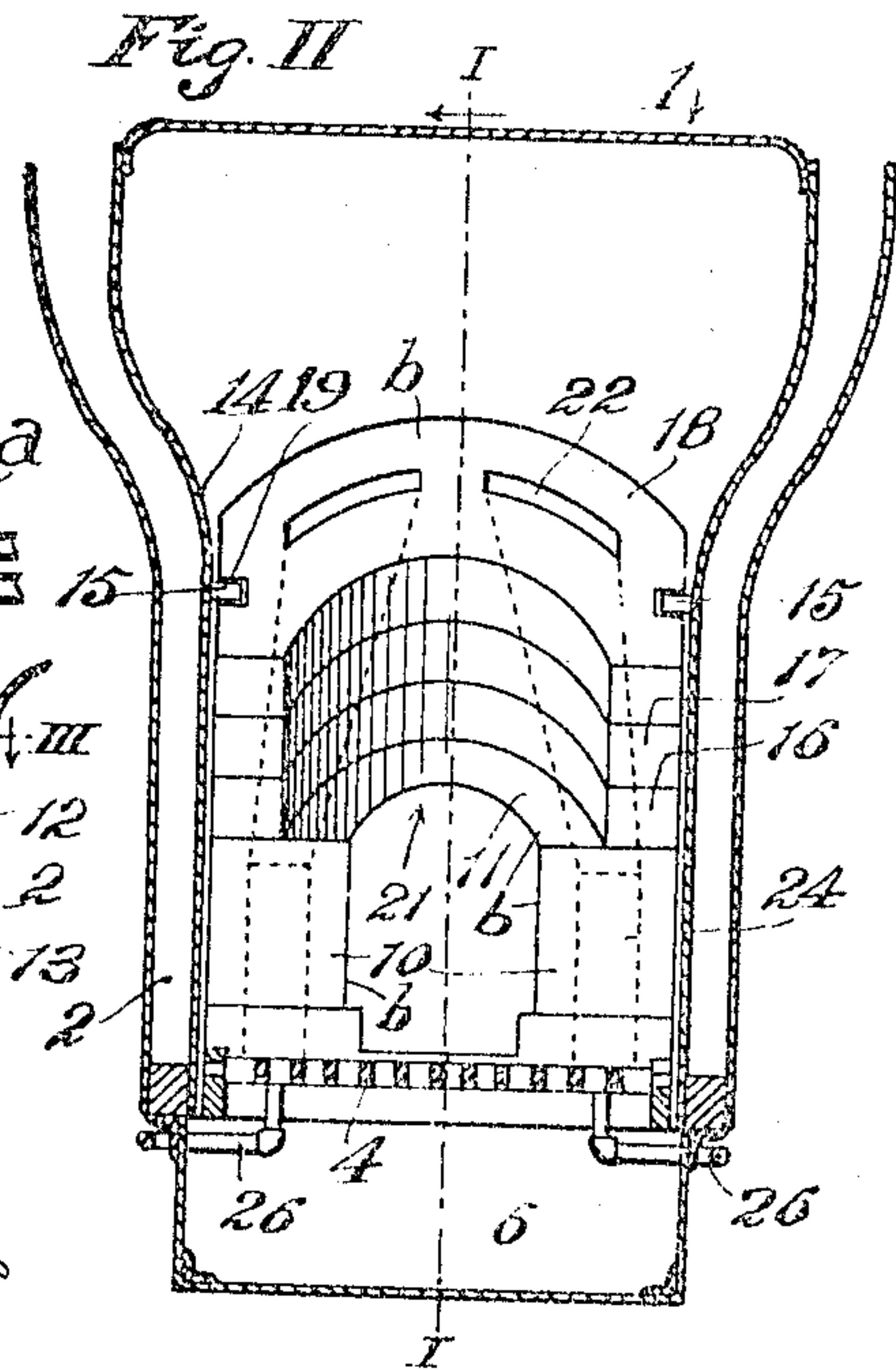
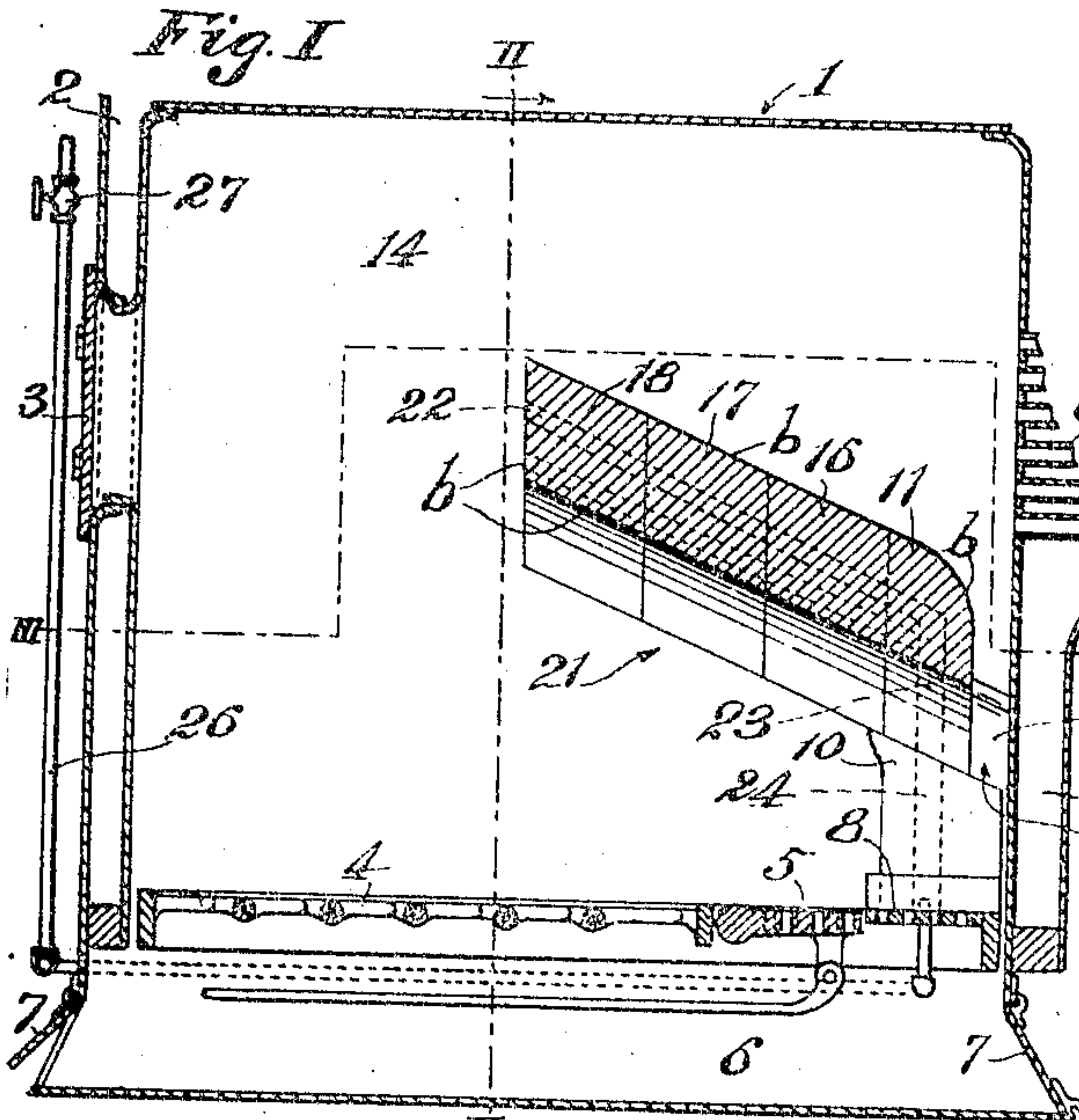


No. 843,254.

PATENTED FEB. 5, 1907.

W. N. BEST.
FURNACE.

APPLICATION FILED APR. 8, 1903.



Witnesses:
C. C. Holly.
D. P. Knight.

Inventor:
William Newton Best
by J. O. Overland Bros
his Atty.

UNITED STATES PATENT OFFICE.

WILLIAM NEWTON BEST, OF LOS ANGELES, CALIFORNIA, ASSIGNOR TO
JOHN H. BEST AND EZRA BEST, OF QUINCY, ILLINOIS.

FURNACE.

No. 843,254.

Specification of Letters Patent.

Patented Feb. 5, 1907.

Application filed April 8, 1903. Serial No. 151,632.

To all whom it may concern:

Be it known that I, WILLIAM NEWTON BEST, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented new and useful Improvements in Furnaces, of which the following is a specification.

This invention relates to a furnace for heating locomotives and stationary boilers and for other purposes.

While the invention is applicable to various kinds of furnaces, it is specially adapted for the furnaces of locomotive-engines.

The main object of this invention is to provide a durable and efficient arch construction for coal-burning boiler-furnaces which will withstand the heat and the mechanical strains of locomotive use, while maintaining substantially the full heat-absorptive capacity of the fire-box or furnace-walls.

Another object of my invention is to provide an arch of this nature that may be set up, removed, and repaired with a minimum of trouble and expense.

A further object of my invention is to provide such an arch with means whereby cinders or solid combustion products or combustible material carried over and deposited back of the arch may be returned to the main combustion-chamber and the entrance to the boiler-flues kept clear and open.

An additional object of my invention is to provide an arch with air-supply means whereby air will be supplied to the interior of the combustion-chamber at the most desirable point; and a further object is to provide a force draft for such air-supply means.

The accompanying drawings illustrate my invention as applied to the fire-box of a locomotive-boiler.

Figure I is a vertical section of the fire-box on the line I I in Fig. II. Fig. II is a transverse section on the line II II in Fig. I. Fig. III is a horizontal section on the line III III in Fig. I. Fig. IV is a perspective view of one of the foundations or anchor-bricks for the arch. Figs. V and VI are rear and front perspective views of the forward arch-section. Fig. VII is a side view of one of the main arch-sections. Fig. VIII is a plan of the rear end of the fire-box bottom. Fig. IX is a longitudinal section of a form of the terminal arch-section different from that shown in Fig. I.

1 designates the fire-box of a locomotive-boiler, or generally the casing or shell of the combustion-chamber of a furnace, said fire-box being surrounded by the water-leg 2 and having fire-door 3, grate 4, and drop-grate 5. The ash-pan 6 below the fire-box has front and rear dampers or doors 7 7. Boiler-tubes *a* open in the usual manner from the rear of the fire-box.

At the rear of the drop-grate 5 is provided a shelf or closure part having a central grate portion 8, with seats or sockets 9 9 on each side thereof for receiving and supporting foundation or anchor blocks or bricks 10, which fit into said sockets and are thereby held against lateral or longitudinal movement. The tops of these anchor-blocks are inclined upwardly and rearwardly and an arch-section 11, with similarly-inclined bottom and stop, is placed on these foundation bricks or blocks, so as to span the front end of the main combustion-chamber. On its front side this arch-section has at each end a lug or projection 12, that when the arch-section is put in place rests against the front wall of the fire-box and holds the body or central part of the arch-section away from such wall, thereby forming a passage 13, leading from the space over and back of the arch to the main combustion-chamber. The inner faces of the projections are inclined substantially from the upper outer corners inward and downward, so that the opening 13 is substantially hopper or V shaped, which will permit the cinders to enter at all points from the entire width of the arch without any shoulders or points for them to accumulate and will then direct them to the central portion of the grate, where they will be consumed by the intense heat, and at the same time a good broad support is secured by the substantially triangular lugs for the weight of the inclined arch.

On the side walls or sheets 14 of the fire-box are formed, riveted, or secured a series of lugs, studs, pins, or projections 15, that engage with the respective arch-sections 11 16 17 18, the arch-sections having grooves 19 in their ends that receive these studs, and said grooves being parallel to the inclined top and bottom faces of these sections, so that said sections can be slid over these studs from the rear. The front arch-section 11, being supported mainly by the anchor-bricks 10, a

single lug or stud 15 on each end is sufficient to hold the same in place; but for each of the other sections two or more studs are desirably provided at each end. These arch sections form a rearwardly and upwardly inclined arch 21, terminating about centrally of the fire-box, and the inclined direction of the grooves 19 in said sections causes the weight of said sections to tend to press the same forwardly and hold them in place. All of these sections 16 17 18 are provided with conduits or passages 22, extending longitudinally through the same and parallel to their inclined top and bottom faces, and the front section 11 is provided with passages 23, extending from its front face in line with passages 22 and downwardly in line with vertical passages 24 in the anchor-bricks 8, and with holes 25 in the seats 9, these passages or holes 25 communicating with the ash-pan 6. Said passages 25 24 23 22 form continuous conduits for the passage of air from the ash-pan to the rear or top end of the arch, and by making them fan-shaped as they extend toward the top of the arch, as shown in dotted lines in Figs. II and III, the air is delivered to the flames in a wide sheet extending substantially across the width of the furnace, thereby producing the most satisfactory result. Blast-pipes 26 for air or steam may be provided, extending through each of the holes or passages 25 and having a supply connection controlled by a valve 27. The conduits or passages 22 in the rearmost or end arch-section 18 may extend directly out at the end of such section, as indicated in Figs. I and II, or it may be directed obliquely downward, as shown in Fig. IX, or in any other direction that may be found desirable.

The arch-sections and anchor-bricks are desirably made of fire-brick or similar refractory material coated with carborundum or other material more refractory than fire-brick, as indicated at b. Such material is necessarily comparatively weak and subject to breakage and wear, and my invention has the special advantage that it enables an arch of such material to be supported with a minimum strain on the refractory material, as the arch-sections are supported by direct vertical engagement at each end without overhang such as would expose the material to a bending strain. At the same time this improved construction allows the full exposure of the side sheets or walls of the fire-box to the heat of the combustion-chamber, as there are no foundation or side walls of refractory heat-insulating material below the ends of the arch to screen the said side sheets from the fire. These arch-sections are desirably formed of single pieces of fire brick, arched, as shown, thereby giving a construction of maximum strain and minimum weight. The use of a plurality of sections not only

facilitates setting up and repairing of the arch, but prevents undue strain being brought on any part of the arch material. Each arch-section being integral and extending from side to side of the fire-box its weight is brought directly downward on the supporting projections without any side thrust such as would arise with an arch made with one or more breaks or joints between the ends. The air-draft through passages 22 in these arch-sections keeps down the temperature of the arch material to some extent, thereby increasing the durability of the structure, and such air-draft is delivered in a highly-heated condition to the interior of the combustion-chamber at the point where it is most effective—namely, at the point where the flame is deflected by the arch. The mixing of the partially-consumed substances and gases and of the hot air is aided both by the draft or velocity of the air and by the movement of said substances and gases transversely to said draft.

The object of providing the passage 13 between the arch and the front of the fire-box is to allow any material, such as cinders, that is carried over and settles back of the arch to fall down through this passage onto the rear grate-space 8, where any part of it that is combustible will be burned, while the rest accumulates or is discharged through the grate-openings into the ash-pan. If passage 13 were not provided, the space back of the arch would soon fill up with such material, thereby clogging or blocking the entrances to the boiler-tubes a. By coating the fire-brick arch-sections and anchor-bricks with carborundum I add greatly to the durability of the structure, as carborundum is much more refractory than fire-brick.

In cases of needed repair a furnace of this construction can be made ready for use by simply replacing with new the arch-sections required. I am not aware that there has heretofore been a furnace constructed with arch-sections capable of such ready repair and such enduring qualities. These results are obtained by constructing the arch-sections with the highly-refractory coating integral therewith, so that if immediate repairs are required the furnace may be cooled and the new sections placed in position as required, thus greatly avoiding loss of time in making repairs.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. A furnace provided with a grate and a forwardly-inclined arch provided at its forward end with a substantially hopper or V shaped recess constructed to permit the cinders to enter from the entire width of the arch and to direct them to the central portion of the grate at the front thereof.

2. In a furnace, a shelf having a grate por-

tion, anchor-blocks on said shelf, and an arch, the forward end of which rests on said blocks and is provided with an opening directly above said grate portion.

5 3. In a furnace, a shelf having a central grate portion and a socket on each side thereof, an anchor-block in each socket, and an inclined arch resting at its forward end on said blocks and having an opening directly above
10 said grate portion.

4. In a furnace, a shelf having a central grate portion and a perforated socket on each side thereof, an anchor-block in each socket having a passage communicating with said
15 perforation, and an inclined arch resting at its forward end on said blocks and having two passages communicating with the passages in the blocks, the forward end of the arch being provided with an opening to reg-
20 ister with said grate portion.

5. In a furnace, a shelf having a central grate portion and a perforated socket at each side thereof, an anchor-block in each socket having a passage communicating with said
25 perforation, and an inclined arch resting at its forward end on said blocks and having two fan-shaped passages communicating with the passages in said blocks, the forward end

of said arch being provided with an opening to register with said grate portion. 30

6. In a furnace, a shelf, two anchor-blocks resting thereon at a distance apart, the top of each of which is inclined, and an inclined arch formed from a series of sections, each section extending from side to side of the
35 furnace and the forward section resting on said inclined tops and provided with an opening to register with the space between said blocks, and means for supporting the other sections. 40

7. A section for an arch in a furnace consisting of a curved piece of fireproof material, each end of which is provided with a groove and the forward side with a lug at each end, said section being further provided with a
45 passage at each end which extends from the bottom upward and rearward to the rear face.

In witness whereof I have signed my name to this specification, in the presence of two
50 subscribing witnesses, at Los Angeles, California, this 3d day of April, 1903.

WILLIAM NEWTON BEST.

Witnesses:

ARTHUR P. KNIGHT,
JULIA TOWNSEND.