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Patented July 26, 1898.

A. A. GRAHAM.  
SPARK ARRESTER.

(Application filed Sept. 4, 1897.)

(No Model.)

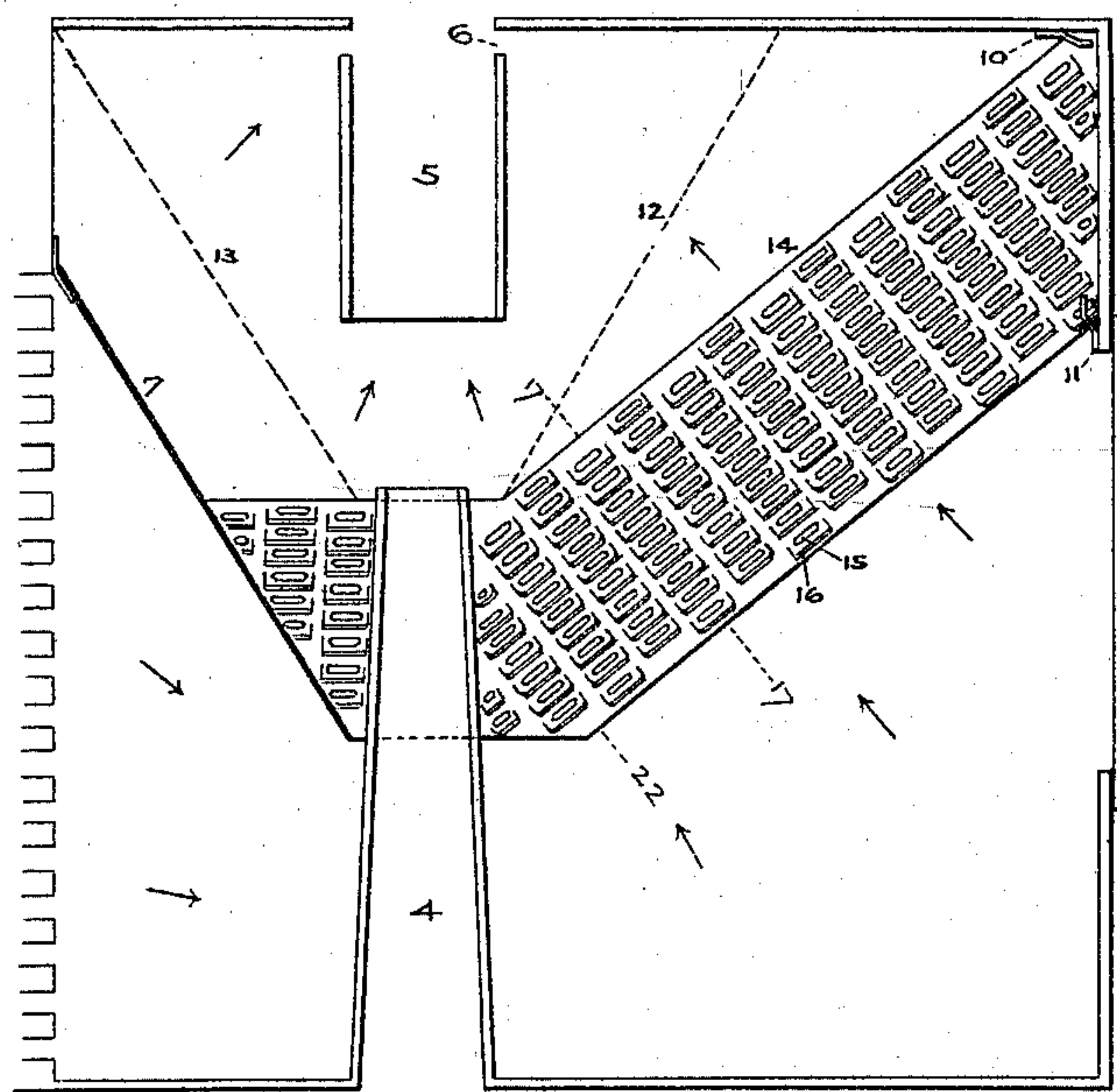


Fig. 1

Fig. 2

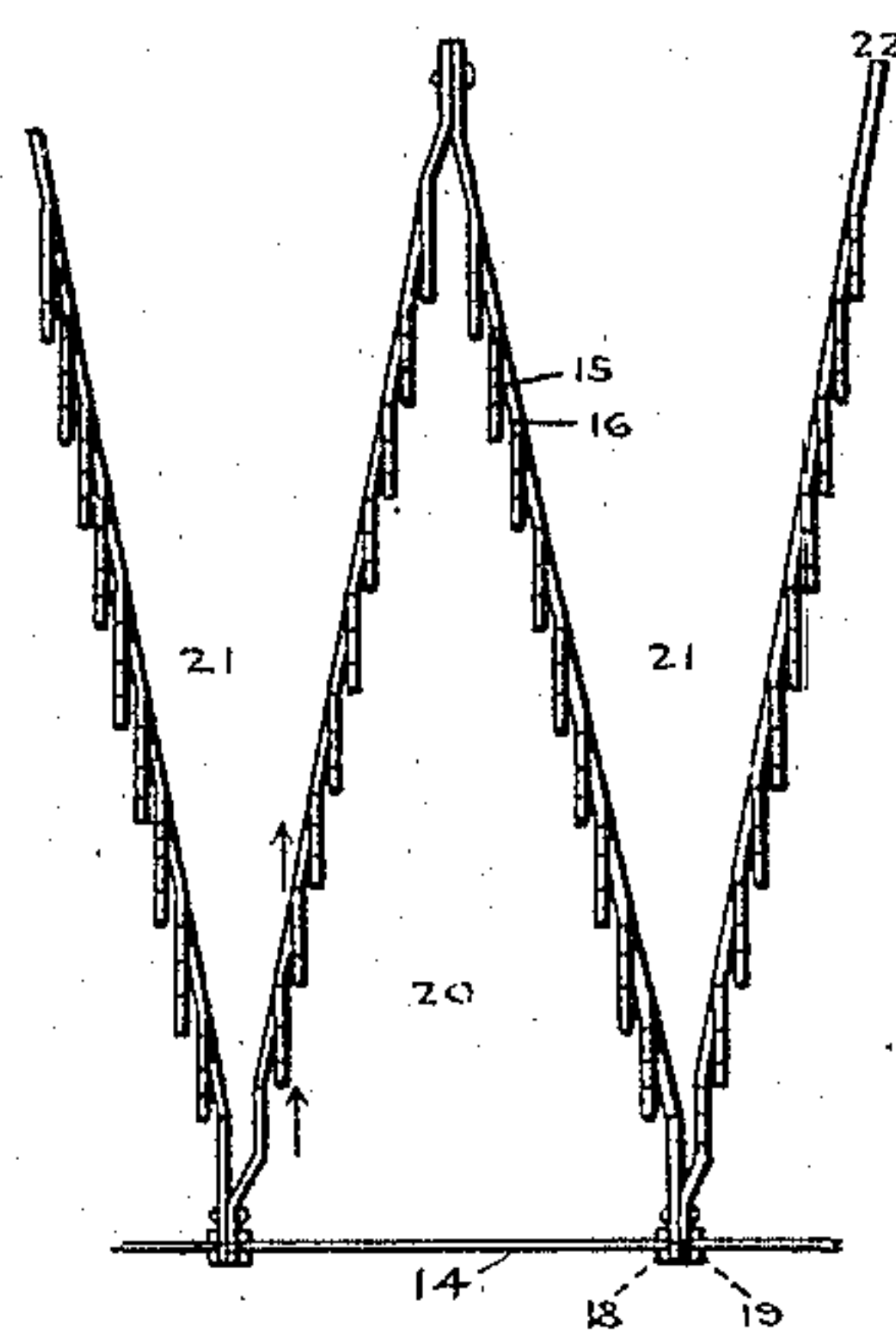
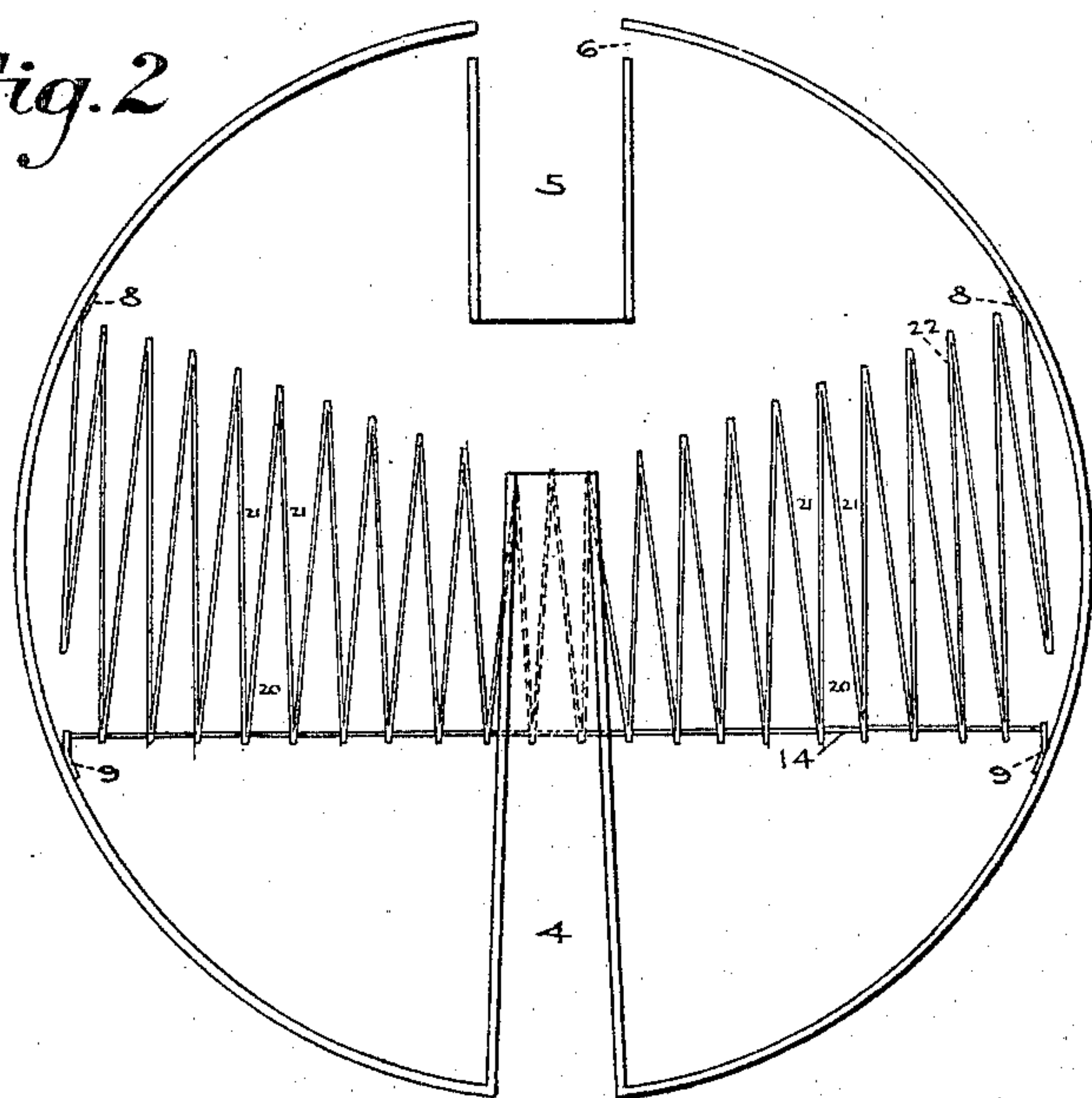


Fig. 3

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# UNITED STATES PATENT OFFICE.

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## SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 607,927, dated July 26, 1898.

Application filed September 4, 1897. Serial No. 650,694. (No model.)

*To all whom it may concern:*

Be it known that I, ALBERT ALEXANDER GRAHAM, a citizen of the United States, residing at Topeka, in the county of Shawnee and State of Kansas, have invented new and useful Improvements in Spark-Arresters, of which the following is a specification.

My invention relates to improvements in spark-arresters for extension-front-end railway-locomotives, the objects of which are to provide means to facilitate the draft and to better arrest the escape of sparks and coals of fire than has heretofore been possible. These objects are attained in the following manner and by the device illustrated in the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the views.

Figure 1 is a vertical longitudinal section of the front end of a locomotive through the center of the nozzle, showing my arresting device in position. Fig. 2 is a vertical cross-section of the front end of a locomotive through the center of the nozzle cut on a line between the rows of slots and perforations of the arrester plates or sheets. Fig. 3 is a section on the line 17 17 of Fig. 1, showing, on an enlarged scale and more in detail, the slots and perforations for the passage of the draft.

In the construction and operation of railway-locomotives it has heretofore been impossible to secure the desired freedom of draft and at the same time prevent the setting of fires along the road by the escape of live sparks and coals of fire thrown out by the exhaust. To secure this freedom of draft and to prevent the setting of fires by escaping sparks and coals of fire are the chief objects of my invention.

The device consists of metallic plates or sheets placed in the extension front end of railway-locomotives forward of the deflector-plate, the peculiar position, construction, slotting, perforation, and use of which sheets and the advantages to be derived therefrom will be fully described in this specification and particularly pointed out in the appended claims.

The slotted and perforated plates or sheets 22, Figs. 1, 2, and 3, are placed longitudinally of the boiler in the extension-front-end

chamber of a railway-locomotive inclined slightly from the perpendicular and joined or fastened at their upper and lower edges, so as to present a zigzag line or appearance and covering the space from one side to the other of the extension-front-end chamber, so that when viewed from the top they will present the V-shaped openings 21 21 and when viewed from the bottom the inverted-V-shaped entrances 20 20.

In order to get the slotted openings on a more direct line with the course of the draft through the draft-pipe 5 and the lateral entrance at the top thereof, 6, the slotted and perforated sheets 22 are inclined slightly from the true zigzag toward the center or nozzle 4, which will incline the V-shaped openings 21 toward the draft-pipe 5.

The width of the plates or sheets 22 is increased from either side of the nozzle 4 to the sides of the front end chamber for the purpose of securing a larger area of arrester-surface, making the space above said sheets into which the draft-pipe 5 extends funnel-shaped, the tip of the nozzle being the center or pit thereof, as shown in Fig. 2. Then, too, said sheets 22 are elevated or inclined at an upward angle both forward and rearward of the nozzle 4, as shown in Fig. 1, completing the funnel-shaped space or chamber above and around the tip of the nozzle 4, thus providing a means of keeping the slotted openings 15 in the arrester-sheets as they recede from the nozzle or center of draft on a more direct line with the course of the draft, and also by the elevation of the arrester-sheets at an upward angle rearward of the nozzle the deflector-plate 7 need not, if undesirable, be interfered with, and by the elevation of said sheets at an upward angle forward of the nozzle a chamber or space for the deposit or collection of sparks and coals is secured, as shown in Fig. 1.

It is obvious that, if desired, the plates 22 may be increased in width both forward and rearward of the nozzle, as shown by the dotted lines 12 and 13 in Fig. 1.

The arrester-sheets 22 are held in position laterally by the brackets 8 8 and 9 9 on either side and at the boiler-head by the brackets 10 and 11, while their rearward ends are anchored or fastened to the deflector-plate 7, as



shown in Fig. 1, and the folds are steadied and held the proper distance apart by the rod or bolts 14, secured to the sheets by the nuts 18 and 19.

5 The deflector-plate 7 is toothed or serrated at the lower edge or portion, that part standing before the inverted-V-shaped entrances 20 being cut away to give a freer passage for the draft and with less deflection forward of the  
10 nozzle, where the greater part of the arrester and the space for the collection of the sparks and coals are located.

The plates or sheets 22 have slotted openings 16, which are made by splitting the sheets  
15 parallel with their edges the desired length of the slots with a smaller cut at either end of the slot at right angles or substantially at right angles thereto, representing the two short sides and one long side of a rectangle,  
20 and then bending or pressing backward and outward from the inclined plane of the arrester-sheets the portions thus disengaged until they stand perpendicularly, or substantially so, or until a slot of the desired width  
25 is made. The slotting of the arrester-sheets 22 in this manner will necessarily leave a surface between such slots which may be utilized by making therein lateral perforations 15, thus greatly increasing the area of opening  
30 for the passage of the draft.

It is a well-known principle that an air-draft or volume of air passing rapidly through an orifice or another body of air has a lateral suction, and to utilize this principle, as well  
35 as to increase the area of opening for the passage of the draft, these lateral perforations 15 are made. Thus the draft passing through the slots 16, which are on a direct line, or substantially so, with the course of the draft,  
40 will draw laterally from and through the perforations 15, increasing the volume of the draft. By the slotting and perforation of the arrester-sheets 22 in this manner less liability is afforded for the openings to become filled  
45 or clogged with sparks and coals, as the perforations 15 are at substantially right angles with the course of the draft, and hence will only be struck laterally by glancing or deflected sparks and coals, while the sparks and  
50 coals which strike or become fastened in the slots 16 will come in contact with and be held between the sharp corners on either side of said slots, thus rendering them easy of dislodgment when struck by other sparks. It  
55 will thus be seen that a locomotive equipped with my spark-arresting device will have a very large area of arrester or netting surface for slotting and perforation, and by the peculiar manner of slotting and perforating  
60 said arrester-sheets, as herein described, I am enabled to greatly decrease the size or area of the openings through the arrester or netting for the passage of the draft and at the

same time very largely increase the number of such openings and by this means prevent 65 the escape of all but the smallest of the sparks and coals of fire—those too small to remain hot or ignited until they reach the ground after being thrown from the smoke-stack.

Having thus described my invention, what 70 I claim as new, and desire to secure by Letters Patent, is—

1. In a spark-arrester for extension-front-end railway-locomotives, slotted and perforated metallic sheets or plates placed zigzag 75 and inclined slightly from the perpendicular forward of the deflector-plate, extending from the deflector-plate to the front end of the extension-chamber, said sheets being joined together at their top and bottom edges and elevated forward and rearward of the nozzle and inclined laterally on either side of the nozzle toward the center of draft or nozzle, so as to form a funnel-shaped space or chamber, the center or pit of which is directly under the 85 draft-pipe and stack, said slots in said sheets being cut so as to form draft-openings in a direct line or course, or substantially so, from the draft-supply to the exhaust, with lateral perforations in said sheets located between 90 said slots, substantially as, and for the purpose described.

2. In a spark-arrester for extension-front-end railway-locomotives, in combination with the boiler-flues, draft-pipe, nozzle, deflector- 95 plate and extension-front-end chamber, metallic sheets or plates slotted on a direct, or nearly a direct, line with the course of the draft, with lateral perforations in said sheets at right angles, or nearly at right angles, with 100 said slot-openings, and toothed or serrated deflector-plate, substantially as, and for the purpose described.

3. In a spark-arrester for extension-front-end railway-locomotives, metallic sheets 105 placed zigzag and slightly inclined from the perpendicular, with slots or openings therein in a direct line or course, or substantially so, with the course of the draft, said slots being alternated with lateral perforations or open- 110 ings at right angles, or nearly at right angles, with the course of the draft through said slots, substantially as, and for the purpose described.

4. In combination with an extension-front- 115 end railway-locomotive and the extension-front-end chamber thereof, slotted and perforated metallic sheets or plates placed zigzag, as herein described, in conjunction with a toothed or serrated deflector-plate, for the 120 purpose described.

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