

No. 742,339.

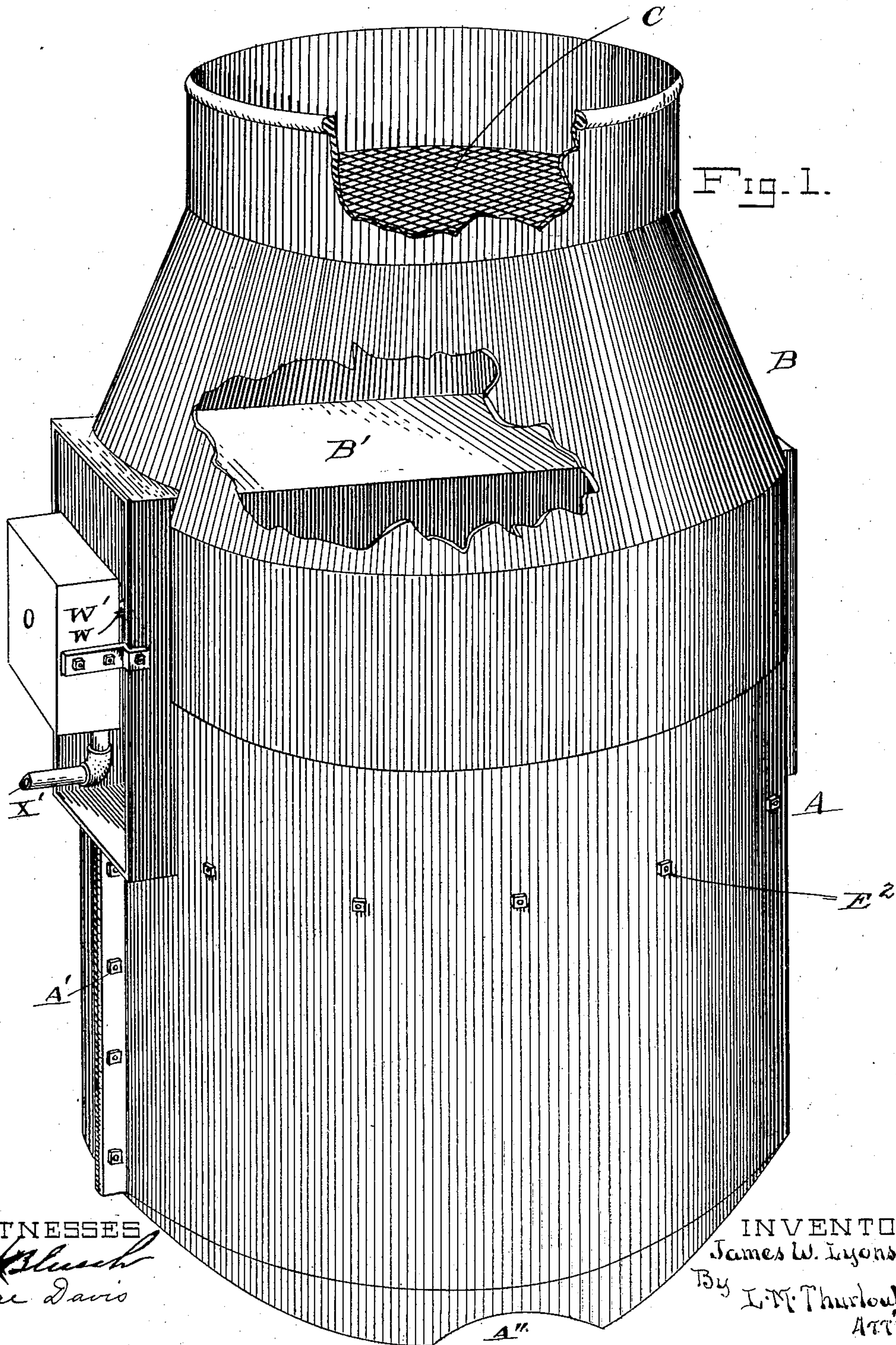
PATENTED OCT. 27, 1903.

J. W. LYONS.  
SPARK ARRESTER.

APPLICATION FILED FEB. 27, 1902.

NO MODEL.

3 SHEETS—SHEET 1.



WITNESSES

*J. H. Blum*  
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INVENTOR

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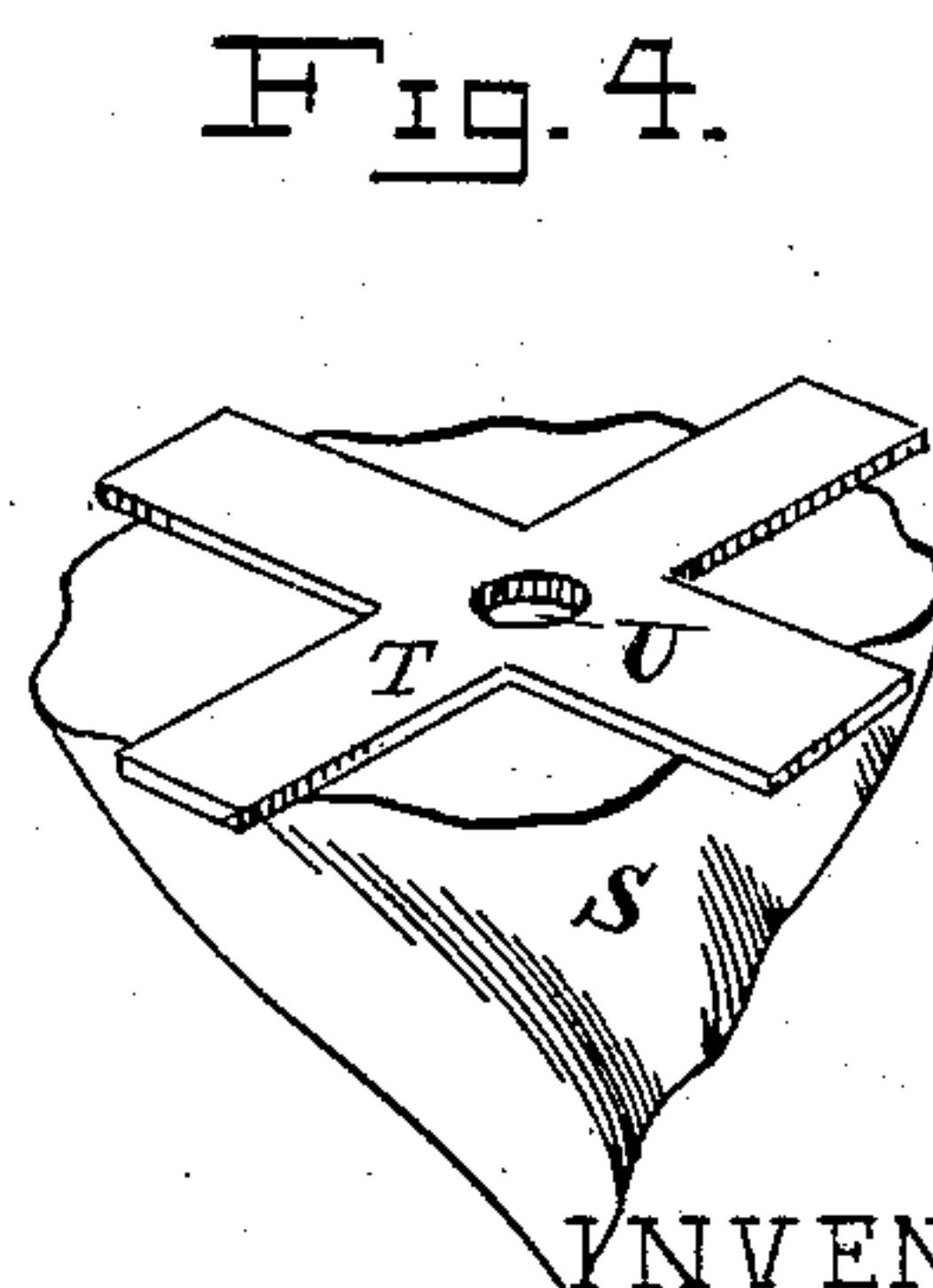
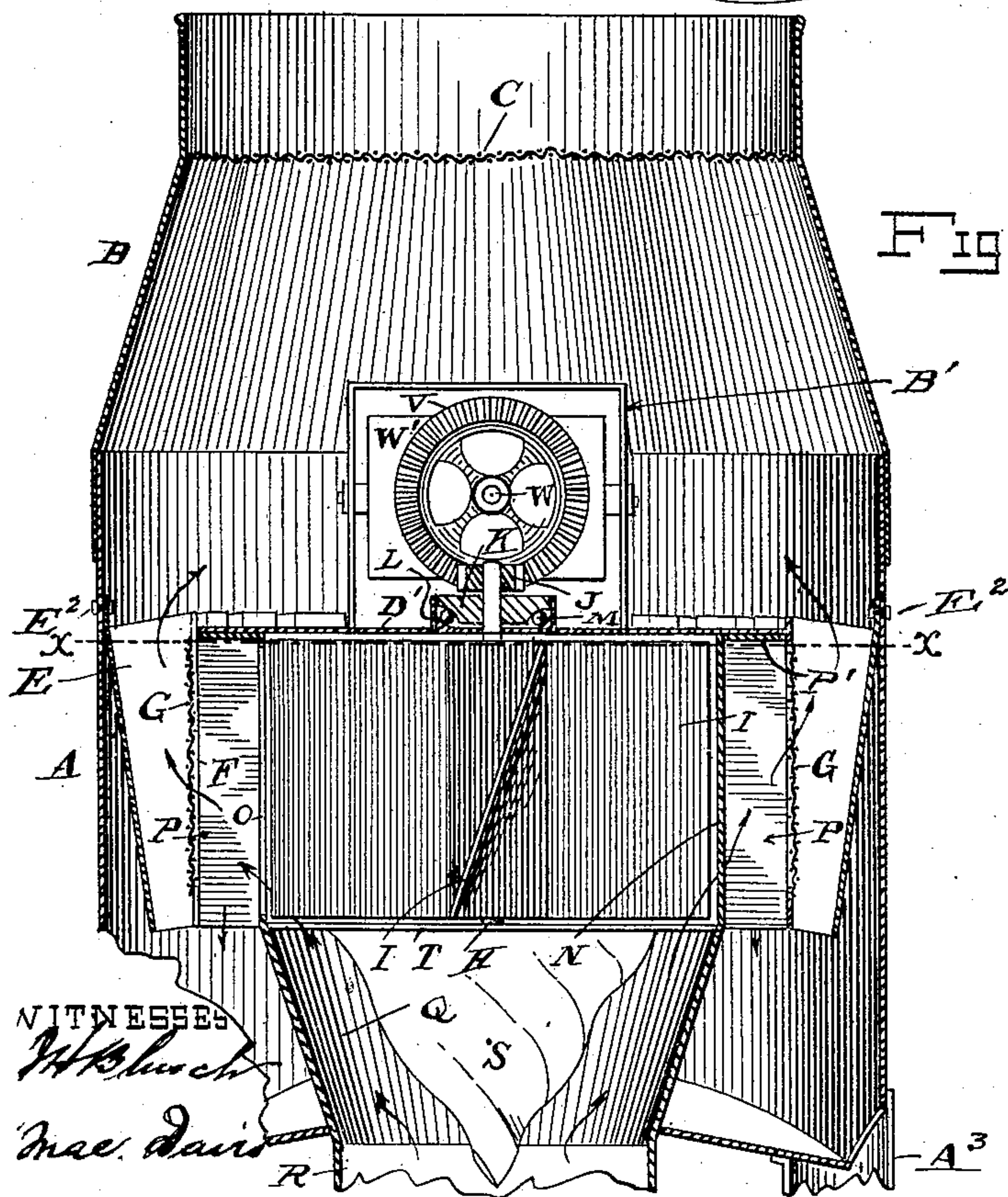
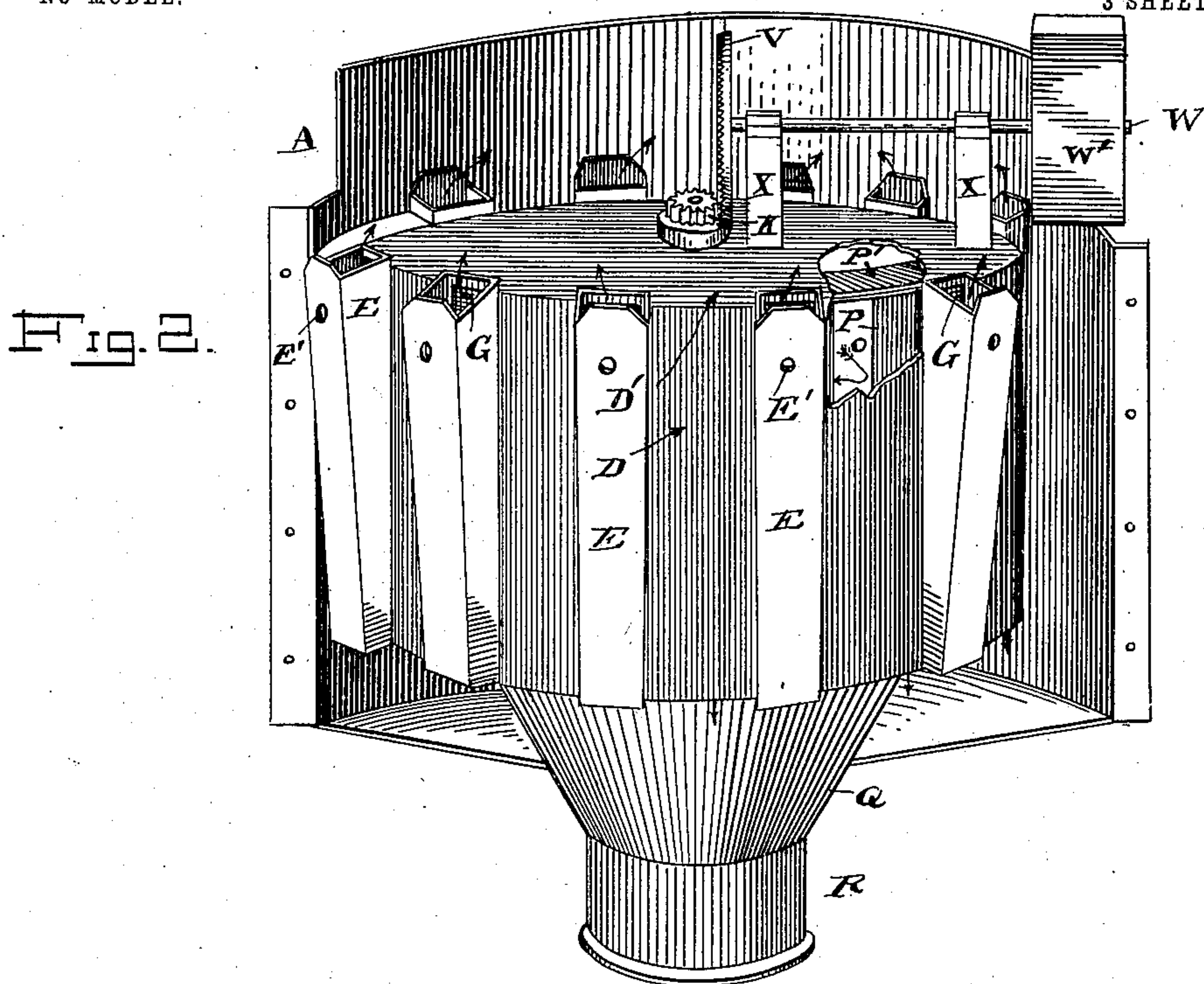
By *L. M. Thurlow*,  
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3 SHEETS—SHEET 2.



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3 SHEETS—SHEET 3.

Fig. 5.

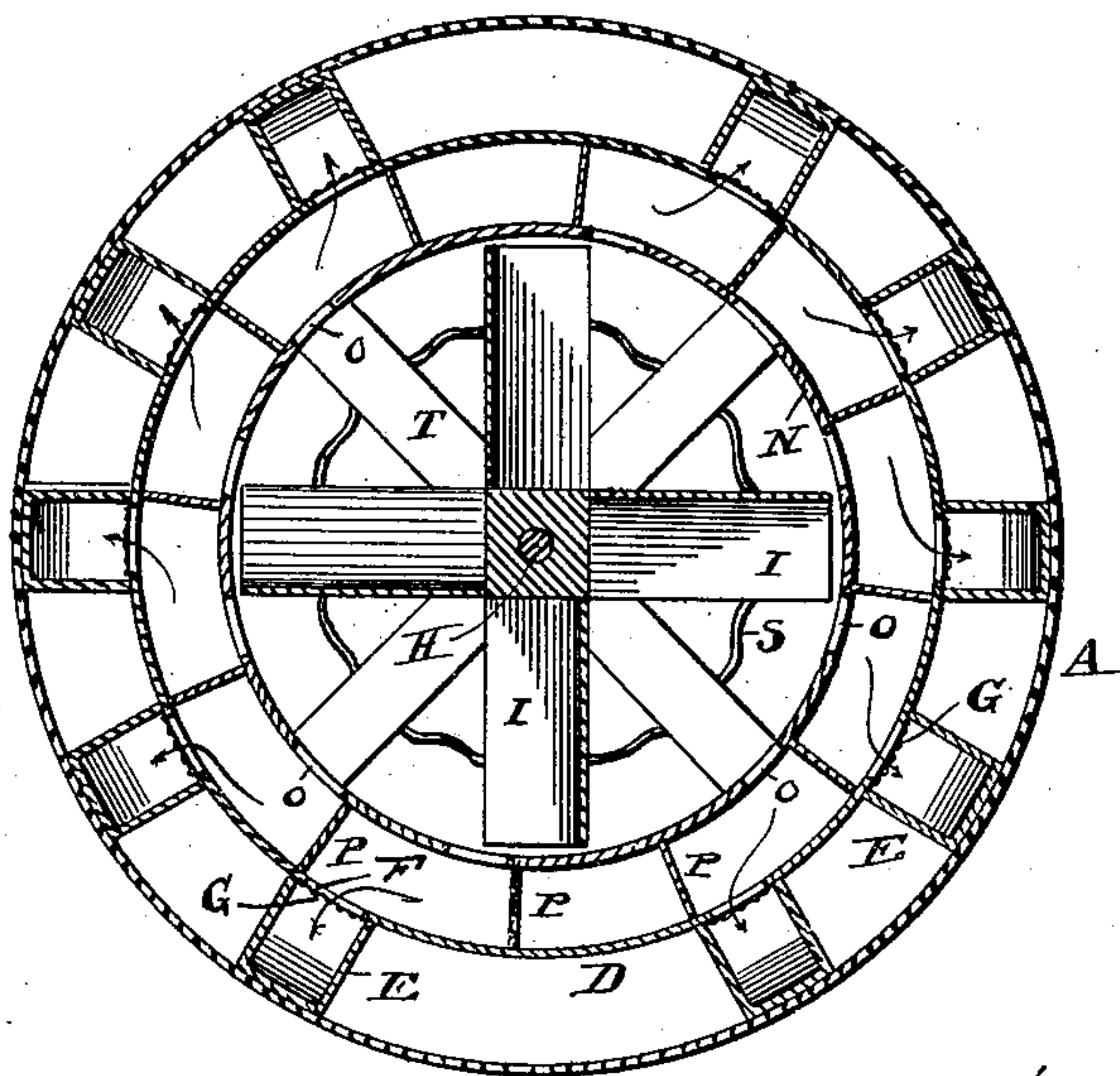


Fig. 6.

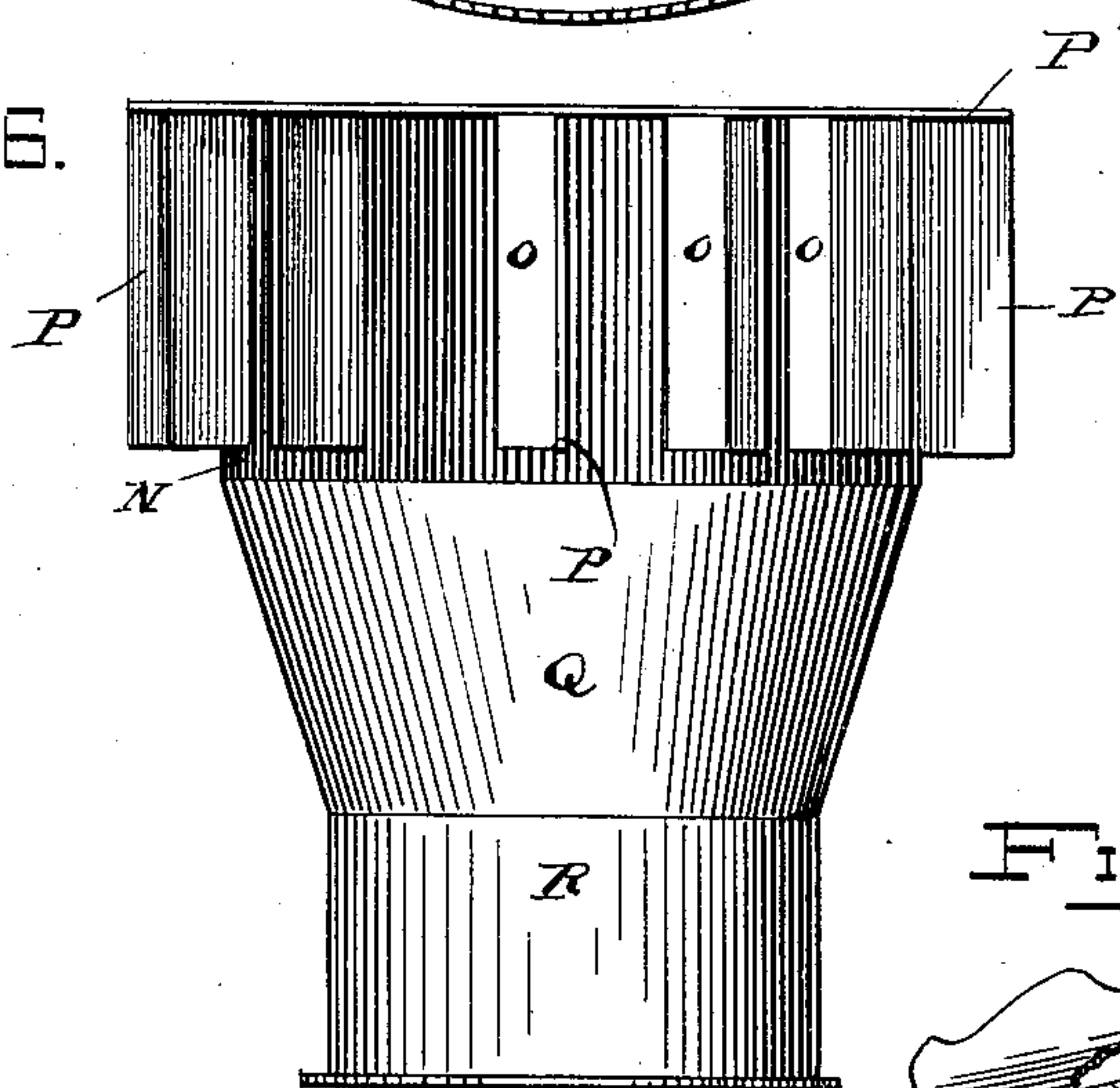


Fig. 7.

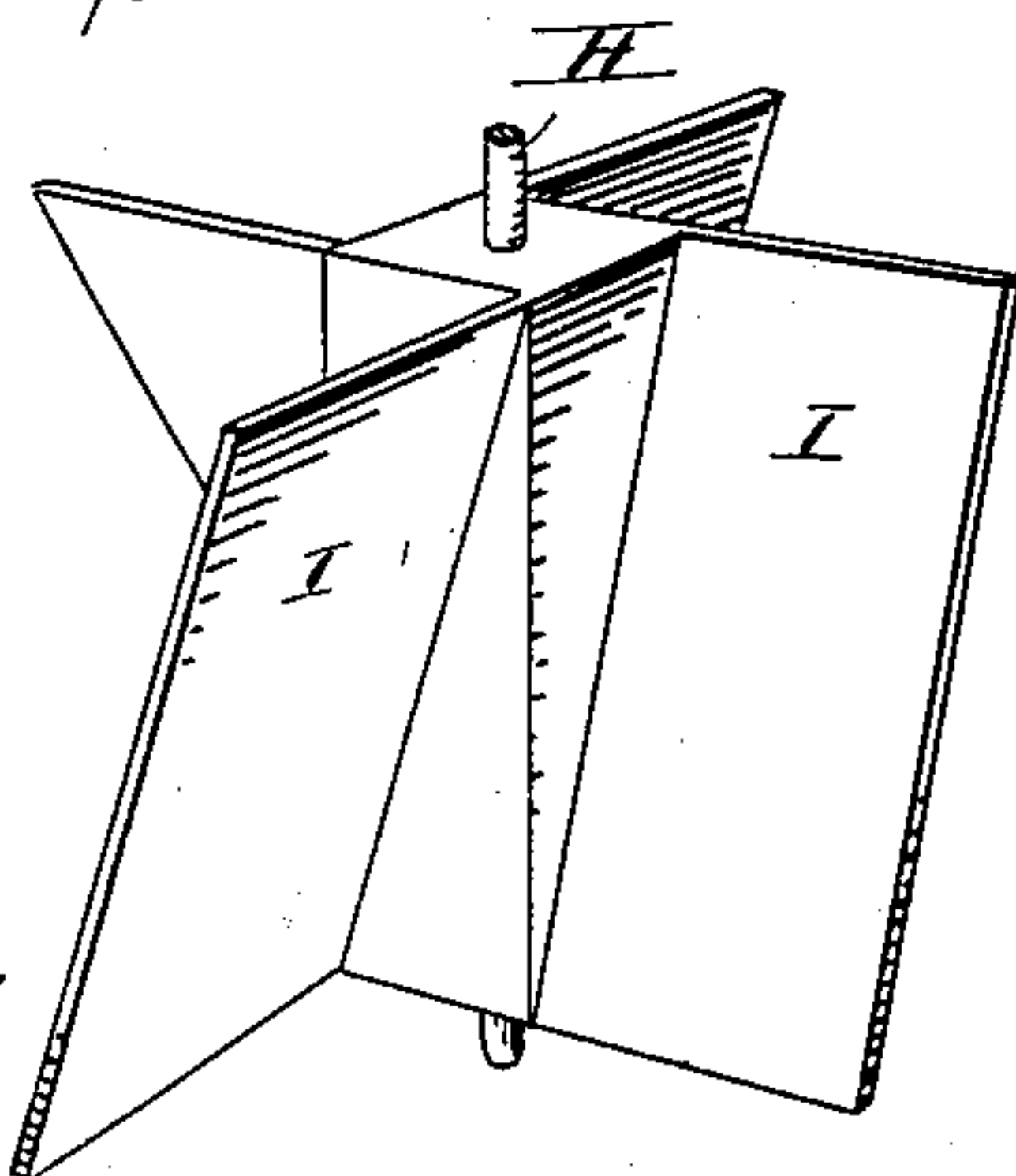
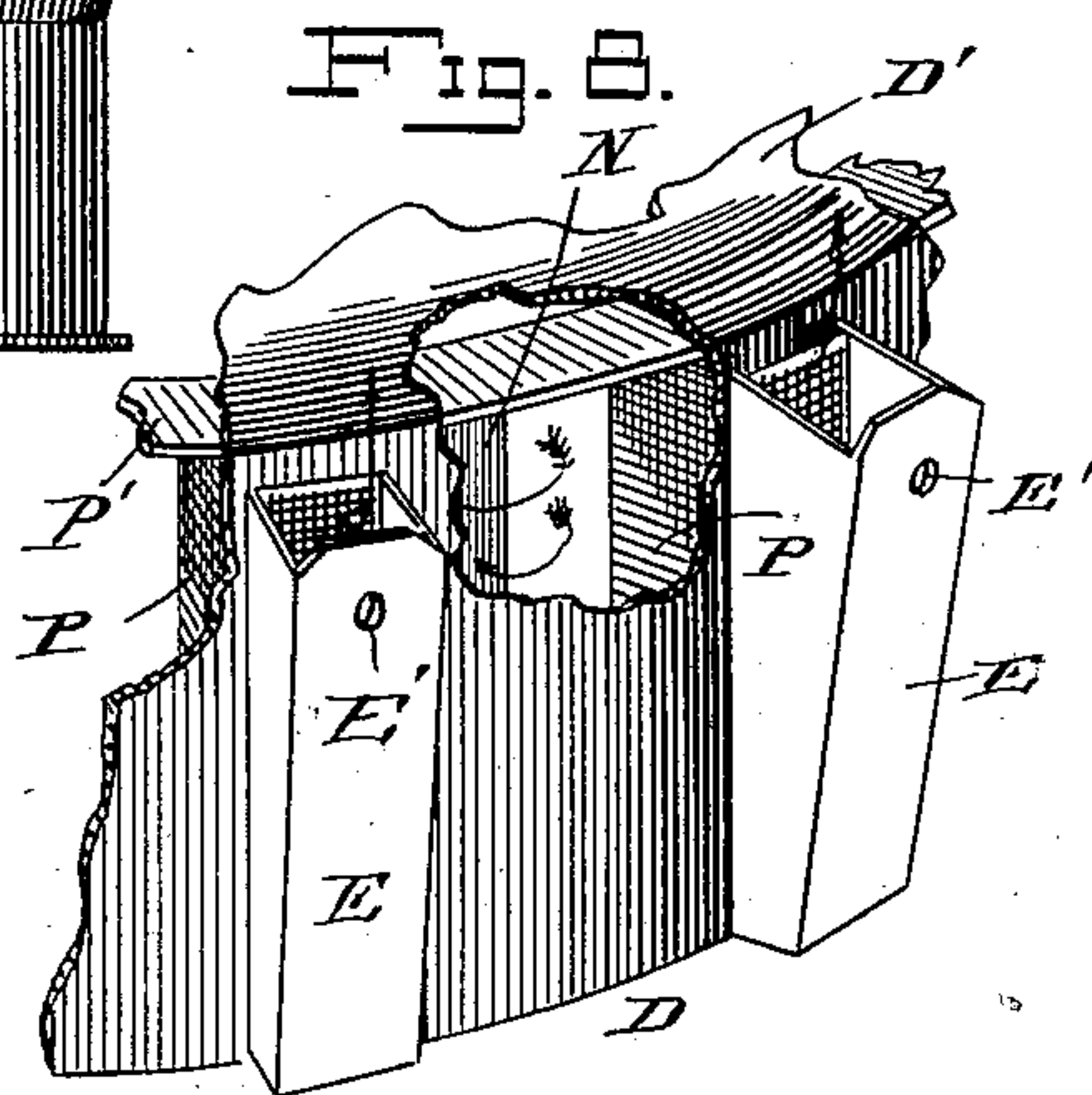


Fig. 8.



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# UNITED STATES PATENT OFFICE.

JAMES WALTER LYONS, OF SPRINGFIELD, MISSOURI.

## SPARK-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 742,339, dated October 27, 1903.

Application filed February 27, 1902. Serial No. 96,028. (No model.)

*To all whom it may concern:*

Be it known that I, JAMES WALTER LYONS, a citizen of the United States, residing at Springfield, in the county of Greene and State of Missouri, have invented certain new and useful Improvements in Spark-Arresters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in spark-arresters and draft-inducers for use on locomotives, threshing-engines, and the like.

The objects of my invention are, first, to provide an arrangement for arresting sparks and preventing the escape thereof from the smoke-stack into the air; second, to prevent the issuance of the burning cinders by the exhaust of the steam into the stack; third, to provide a fan for inducing a draft in the smoke-stack. Furthermore, my object is to combine the fan with means for arresting the sparks which would be ejected by the fan and cause them to fall where they can do no harm. By arresting the sparks there is no possibility of setting fire to buildings and grain along the road; also, the comfort of the passengers in the train is assured.

A still further object is to drive the fan within the stack by means of a steam motor, turbine, or other like means.

In addition to the above I desire to cover the construction of my device, all of which may be fully understood from the following specification, aided by the accompanying drawings, in which—

Figure 1 is a perspective view of my spark-arrester, parts thereof being broken away to show construction. Fig. 2 is a perspective view of a portion of the device with a section of the outer casing removed to show construction and arrangement of parts. Fig. 3 is a vertical section of the spark-arrester. Fig. 4 is a perspective view of a spiral cone. Fig. 5 is a plan view of the spark-arrester, showing the top portion cut off on line X X, Fig. 3. Fig. 6 is an elevation of an interior housing of the device. Fig. 7 is a perspective view of a fan. Fig. 8 is a perspective view of a portion of the inner housing shown in Fig. 6, showing a casing outside it.

In the figures, A is the outer casing, which incloses the entire mechanism. At the top of this is a cover B, which forms the bell of the stack and carries the usual screen C. Within the casing A is a second casing D, having a series of tubes E attached thereto around its perpendicular surface. The said wall within each tube is cut out the full length of the tube E at F, Fig. 3, and each opening thus formed is covered with a screen G, Figs. 2, 3, and 8. The said casing D has a top D', through which passes a perpendicular shaft H, which carries a fan composed of the wings I, Figs. 3 and 7. The said shaft carries a pinion J at the top, and a ball-cone K beneath it turns on a cone L on the top D' by means of balls M. Said fan is inclosed by a housing N, Fig. 6, whose wall is perforated by slots O, each having a wing P at one side thereof. This housing in reality forms the smoke-conductor from the boiler, and will be considered such in the claims. The wings P, as shown in Fig. 3, fill the space between the housing and the casing D, the purpose of which will presently appear. Said housing merely consists of the cylindrical portion which has the slots O, the top having a flange P' the width of the wings P, as shown in Figs. 3 and 8. The bottom of this housing terminates in a cone Q, which has the straight portion R for attachment to the usual "saddle" or fitting on the boiler of the locomotive. Within the cone Q is a cone S, supported by a spider T, held within the housing. Said spider has a hole U at the juncture of the arms, which takes the end of the shaft H. The cone S is corrugated in a spiral manner, as shown, though this is not absolutely necessary. This, however, will be described later on. The housing is the support for the entire mechanism. The casing rests upon the flange P' thereof by the top D', and the outer casing A is supported by bolts E<sup>2</sup>, which pass through its sides into holes E' in the tubes E. The lower portion of the top B and the upper portion of the casing A are notched to fit over a horizontal housing B', which forms an air-passage entirely through the device. This is merely provided to allow the outer air to circulate about the mechanism which drives the fan. This mechanism is shown in Figs. 2 and 3, in which a gear-wheel V is carried on a hori-



zontal shaft W in bearings X on the top D'. At the outer end of the shaft is a motor of one kind or another, but preferably a steam-turbine. This is indicated at W' and is driven  
 5 by steam through a pipe X, leading from the boiler. The casing A is composed of sections which are held together by flanges and bolts, as at A', Fig. 1. The lower ends of said sections terminate in funnel-shaped receptacles  
 10 having apertures A''. A pipe A<sup>3</sup> leads from these apertures to a receptacle for cinders from the stack.

Returning now to the wings P of the housing N it will be noted by a study of Fig. 5  
 15 that each wing, as before stated, extends from the housing to the casing D, and in addition is so placed as to be at one side of one of the openings F in the said casing D and whereby the apertures in the housing are opposite that  
 20 portion of the wall of the said casing that lies between the openings F. This is clearly shown in Figs. 2 and 8. The operation of the device may now be understood. The fan is started  
 25 by means of its turbine or other motive power, and this creates a suction and induces a draft. By suction the products of combustion first impinge upon the spiral cone S, and this mem-  
 30 ber by being corrugated in this manner imparts a spiral movement to smoke and cinders, and the said fan forces them out through the apertures in the housing N, where they  
 35 pass between the housing and casing, and the smoke finds exit through the screened openings F, while the burning cinders or sparks which have not already fallen down between  
 40 the housing N and casing D by striking the casing D are carried past the screen and strike against one of the wings P, when the force of gravity asserts itself and the cinders  
 45 fall into the funnels of the casing A and then through the conductors to a common receptacle, and are thus disposed of. It will be seen that the path for the smoke is so tortu-  
 50 ous that it is an impossibility for the cinders to pass through the smoke-exit. Even though the cinders should by accident pass through the screens G they will strike the tubes E and  
 55 fall through the open lower ends thereof and, as before, find their way to the cinder-receptacle. The smoke and gases find no hindrance to their passage to the places of exit, and no appreciable resistance is set up by reason  
 60 of the said tortuous passages. With larger openings the fan may be discarded, and the exhaust from the engine and the natural draft will be sufficient to expel the smoke and cinders. Cinders reaching the top D' of the casing  
 65 D and lodging there by accident will gradually fall down between the casings A and D by the vibrations of the engine and find their proper receptacle. The idea of the spiral cone S is to create a whirling or spiral motion in the smoke by the suction of the fan above, the direction of the whirl being such that the  
 smoke and cinders will be forced through the apertures O in the housing against the wings P and then reverse the direction of movement

therein and find their respective exits. However, the fan will in fact accomplish this without the aid of the spiral, and the latter feature may be omitted, if desired. When dis-  
 70 carding the fan, as above suggested, the cinders will meet with sufficient resistance to accomplish the purposes intended. I desire to make it understood that I do not limit myself  
 75 to the particular construction or arrangement of parts shown and described, as changes of one kind and another may be made without departing from the spirit of my invention.

The top B could of course be discarded as  
 80 well as the outer casing and some proper substitute employed and the sparks would still be caught and the results would be the same. In so far as I am aware a fan has not been  
 85 used within a smoke-stack for inducing draft nor has it been used in conjunction with a spark-arrester.

Evidently when the openings in the housing N and casing D are arranged as described and shown the wings P are not absolutely  
 90 necessary, as the winding passages will arrest the sparks as before, but perhaps not as perfectly. The tubes E may be eliminated from the device, and the casing A will deflect the smoke by the natural draft, and the cin-  
 95 ders will also be taken care of.

Having thus described my invention, I claim—

1. In a spark-arrester, a conductor for the smoke, there being openings in the sides of  
 100 the conductor for the passage of the products of combustion, a casing surrounding said conductor, both said casing and conductor being closed at the top when assembled, there be-  
 105 ing openings in the sides of the casing as shown for the passage therethrough of said products of combustion as they escape from the openings in said conductor, the said open-  
 110 ings in the casing being located opposite the wall of the conductor between two of the openings thereof to form tortuous passages for escape of the smoke and arrest the sparks  
 115 which by impinging on the various surfaces are retarded in their flight and are prevented from passing out through the smoke-exits.

2. In a spark-arrester, the combination of the smoke-conductor attached to the boiler, a fan located therein to revolve in a horizon-  
 120 tal plane for forcing the draft, there being openings in the side of the conductor surrounding the fan through which the fan forces the products of combustion, said conductor  
 125 being closed at the top, a casing surrounding the conductor, the same being closed at the top but having an opening in its sides between pairs of the openings in the conductor,  
 130 deflectors between the holes in the conductor and the holes of the casing and entirely closing the space between said casing and conductor such deflectors radiating from the cen-  
 ter of the conductor as shown, the recesses formed thereby being closed at the top but open at the bottom all being arranged sub-  
 stantially as described.



3. A spark-arrester comprising a conductor for the products of combustion from the fire, there being a series of openings in the perpendicular walls of the conductor, a casing surrounding the conductor and having openings in its walls, said openings each being arranged so that the smoke passes in a tortuous or winding path to its exit and the sparks are made to impinge upon the various surfaces in said winding passage to arrest them and allow them to be deposited in a receptacle for the same, the casing and conductor being entirely closed at the top, screens over the openings in the said casing, and conducting-tubes outside the screened openings for deflecting the smoke upward substantially as set forth.

4. A spark-arrester comprising a smoke-conductor having a closed top, such conductor having a series of openings in its sides, a casing surrounding said conductor, said casing being also closed at its top, there being an annular space between the casing and conductor, there being a series of openings in the walls of the casing, each of said openings being situated opposite the wall of said conductor between two of the openings thereof as shown to carry the smoke passing from the said conductor through its holes to pass between the wall of the conductor and that of the casing before finding exit through the said openings in the said casing, a series of wings or deflectors located in the annular space between the casing and conductor as shown for deflecting the smoke and arresting the sparks as set forth.

5. A spark-arrester comprising a smoke-conductor having a closed upper end, there being a series of openings in its sides, a casing surrounding said conductor, said casing being also closed at its top, there being an annular space between the casing and conductor, there being a series of openings in the walls of the casing, each of said openings being situated between the openings of the conductor whereby smoke passing from the said conductor through its holes is caused to pass between the wall of the conductor and the casing before finding exit through the said openings in the said casing, a series of wings or deflectors located in the annular space between the casing and conductor for deflecting the smoke and cinders and a screen on each opening in the casing for preventing escape of sparks through said opening as set forth.

6. A spark-arrester comprising a smoke-conductor having a closed upper end, there being a series of openings in its sides, a casing surrounding said conductor, said casing being also closed at its top, there being an annular space between the casing and conductor, there being a series of openings in the walls of the casing, each of said openings being situated between the openings of the conductor whereby smoke passing from the said conductor through its holes is caused to pass between the wall of the conductor and the

casing before finding an exit through the said openings in the said casing, a series of wings or deflectors located in the annular space between the casing and conductor for deflecting the smoke and cinders, a screen on each opening in the casing for preventing escape of sparks or cinders through said opening, and an outer casing surrounding the said apertured casing, said outer casing terminating at its bottom in a receptacle for cinders substantially as set forth.

7. A spark-arrester consisting of a conductor Q, R for the smoke from the boiler, a cone S therein having spiral corrugations formed therein, a fan I I located to revolve within the conductor above the cone, means for imparting motion to the fan for inducing a draft and expelling the smoke and cinders, there being a series of openings in the walls of the conductor, the top of such conductor being closed, a casing D surrounding the conductor but leaving a space between the two, said casing having a top D' covering the said space, there being a series of screened openings in the casing arranged whereby a tortuous path is created for the smoke whereby the cinders are made to impinge upon the various surfaces composing the tortuous passage to prevent their exit through the smoke-outlets, wings P placed in the spaces between the conductor Q, R and the casing D for the purposes explained, an outer casing A surrounding the casing D, a series of tubes E for covering the said screened openings the same being open at top and bottom, receptacles at the lower end of the said casing A for the cinders and the top B all arranged substantially as shown and described.

8. In a spark-arrester, the combination of the smoke-conductor attached to the boiler and having the enlarged extremity, a fan within the same within the said enlarged portion arranged to revolve in a horizontal plane directly above the opening of the said conductor into the boiler, means beneath said fan for imparting a spiral movement to the products of combustion as they are drawn upward by said fan, there being a series of exit-openings in the side of the conductor surrounding the fan for the egress of said products, a casing surrounding the conductor, the same having a covered top which also closes the top of the conductor, there being a series of openings in the side of the casing, each being opposite the closed wall of the conductor between two of the openings in the latter, partitions between the conductor and casing for separating the exit-openings in the conductor and those of the casing from one another as shown and for the purpose described, tubes E covering the openings in the casing at the outside as shown the same being open at the upper and lower extremities, an outer covering or casing for the conductor and casing, said outer covering being closed at the bottom close up to the conductor which it surrounds for receiving the solid particles from



the exit-openings, a horizontal housing extending across the top of the inner casing entirely through the covering from side to side and closed within said covering but open at  
5 its ends outside the covering, and means located within the housing for driving the fan substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

JAMES WALTER LYONS.

Witnesses:

S. A. HASELTINE,  
CORA GOODKNIGHT.