(No Model.)

M. M. WILSON.

SPARK ARRESTER FOR SMOKE STACKS.

No. 365,114. Patented June 21, 1887.

Fig. 5.

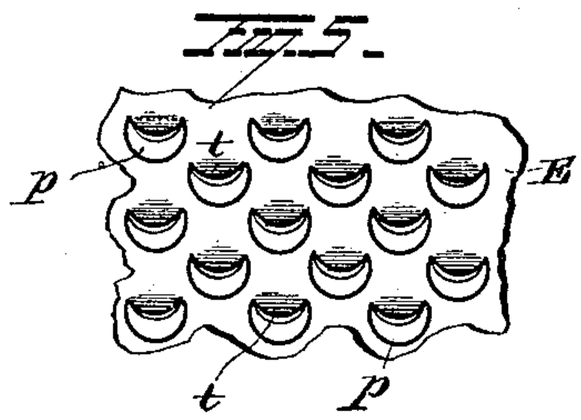
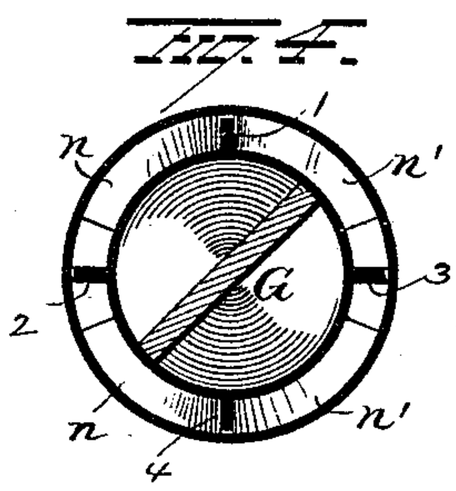
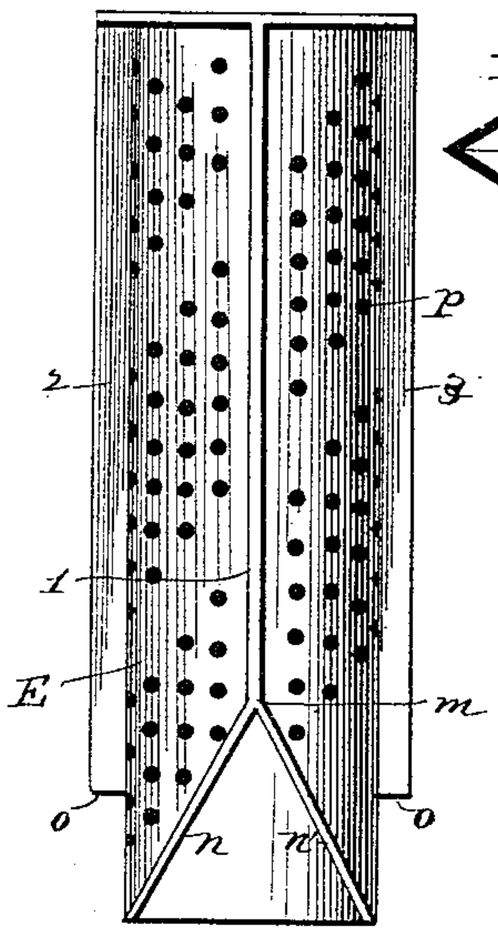


Fig. 3.

Fig. 4.





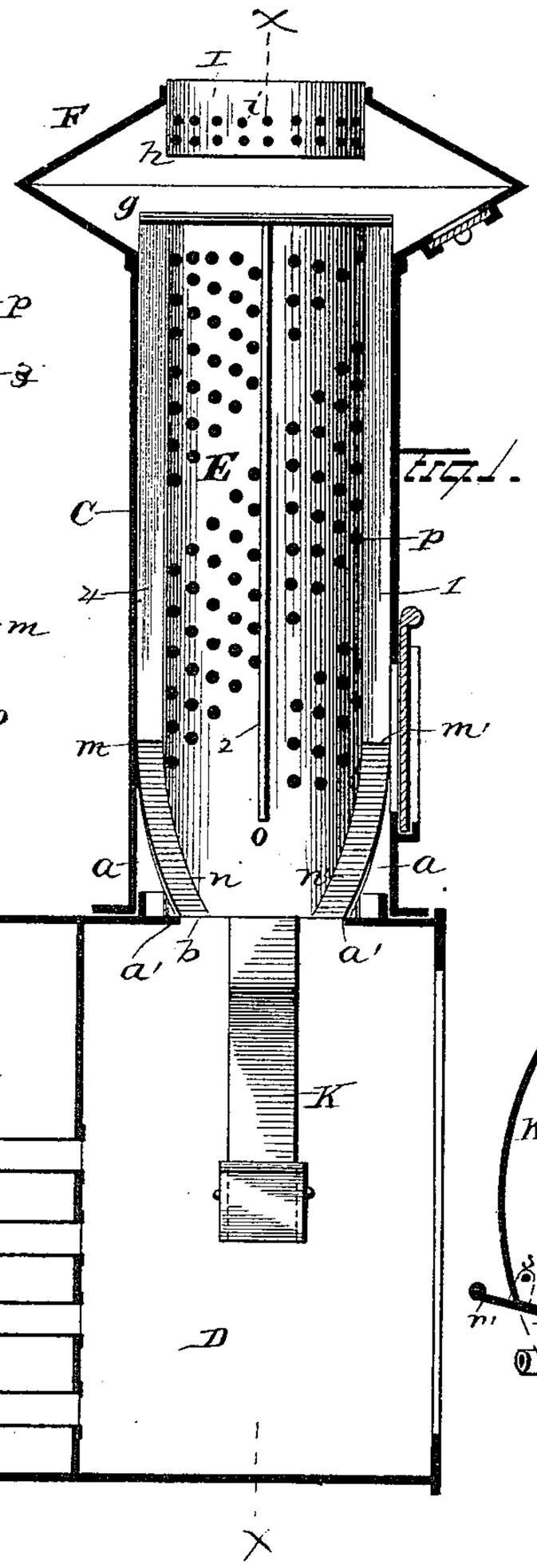


Fig. 1.

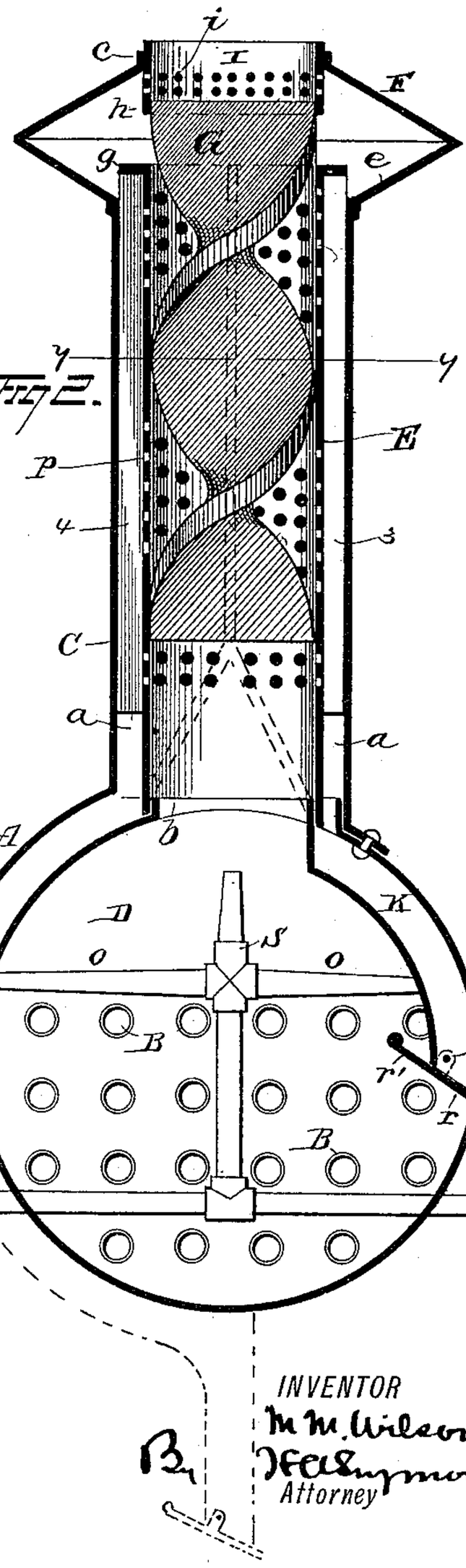


Fig. 2.

WITNESSES

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MARTIN M. WILSON, OF HONEY GROVE, TEXAS.

SPARK-ARRESTER FOR SMOKE-STACKS.

SPECIFICATION forming part of Letters Patent No. 365,114, dated June 21, 1887.

Application filed November 23, 1886. Serial No. 219,676. (No model.)

To all whom it may concern:

Be it known that I, MARTIN M. WILSON, of Honey Grove, in the county of Fannin and State of Texas, have invented certain new and useful Improvements in Spark-Arresters for Smoke-Stacks; 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 spark-arresters for smoke-stacks, and more particularly to spark-arresters for locomotive flue boilers.

The nature and object of this invention consist, essentially, in the employment of a direct flue or smoke-stack that will not impede the upward escape of smoke or affect the draft, while it projects and deflects the sparks or cinders through perforations in a vertical wall of the stack into a dead-air space that surrounds the draft-flue, there causing these sparks, by the initial impetus they have received, to impinge against vertical ribs that subdivide the annular air-space that intervenes between an inner and outer cylindrical wall of the stack, gravity of the accumulating mass of cinders causing their discharge from this annular space through gates that are opened by the weight of the sparks above them and closed by their own gravity to prevent air influx to the intervening space or spark-chamber.

My invention, as indicated in the foregoing statement, consists, therefore, in certain peculiar details of construction; also, the arrangement and combinations of relative parts, as will be hereinafter described, illustrated in the drawings, and pointed out in the claims.

In the drawings making a part of this specification, Figure 1 is a side elevation in section of the smoke-stack of a boiler with the spark-arrester in adjusted position therein. Fig. 2 is a cross-section of the stack, taken on line *x x*, Fig. 1. Fig. 3 is a view in elevation of the stack with the outer cylindrical shell removed. Fig. 4 is a view of the stack and spark-arrester, taken on the line *y y*, Fig. 2. Fig. 5 represents a portion of the inner wall of the stack, enlarged to show the form of the perforations made in it for disintegration as well as discharge of the sparks.

A represents the boiler-shell, B the flues, and C the outer shell, of the smoke-stack. The cylindrical shell C is made of sufficient height for draft purposes, which, in case the device is applied to a locomotive-engine, may be aided by a blower or live-steam pipe introduced into the smoke-box D. Ordinarily the introduction of the exhaust-steam into the tight smoke-box D is sufficient to give proper intensity to the draft for purposes of combustion. A concentric smaller cylinder-wall, E, is located interior to the shell C, their relative diameter being such as to permit an annular space, *a*, to intervene between their opposed vertical surfaces. The inner wall, E, is made to coincide at its lower end with an orifice, *b*, cut through the top of the smoke-box D, this end of cylinder E being inserted and secured in the round perforation *b*, so as to effect an air-tight joint therewith. At the upper termination of the shell C a bonnet, F, is riveted. This consists, preferably, of two short cone-frustums of same size, that have their base edges joined at the center of the bonnet rigidly, the upper and lower terminations of the bonnet F having short flanges, the upper edge being preferably stayed by a hoop or band, *c*, the lower end forming a junction with the stack-body C, to which it is firmly secured. The inner wall, E, of the stack is extended a short distance above the inclined wall *c* of the lower part of the bonnet F, as shown in Fig. 1 at *g*. From the lower termination of the inner cylindrical wall, E, a spirally-formed plate, G, is extended upwardly through this cylinder E. The outer edge of this spiral twisted plate G is of such a relative diameter to the caliber of the cylinder E, in which it is placed, that it will fit the same neatly, to prevent any escape of air between its edge and the opposed cylinder-wall. The bonnet F has a short cylindrical wall, I, inserted from the top edge downwardly, this wall or short tubular section I being of the same diameter as the upright inner wall, E, of the stack. The upper end of the shell E is produced a sufficient distance to enter the lower part of the lower cone of the bonnet F. (See Fig. 1 at *h*.) The short circular wall I is perforated with a sufficient number of orifices *i*, that permit the escape of smoke that enters the bonnet F and

rises to its upper portion, this flange further preventing sparks from escaping at the top edge of the bonnet. Upon the exterior surface of the inner vertical wall, E, four longitudinal flanges or ribs, 1 2 3 4, are attached. These ribs are of such a width as to permit them to fill the space between the adjacent surfaces of the inner and outer walls, C E. At the points *m m'* on the front and rear ribs, 1 4, these upright flanges are each intersected by two diagonally-descending similar flanges, *n n'*, that reach with their lower extremities the base-plate *a'* of the annular space *a*. The vertical ribs 2 3 terminate at points *o*, that are in the same horizontal plane with the points of junction *m m'* of the diagonal flanges *n n'*, with their vertical extensions 1 4. The width between the lower ends of the flanges *n n'* is such that the side walls of the tubular spark-conduits K, made on each side of the smoke-box D, will line with them, and thus form a continuous chute or passage for sparks or cinders that enter the annular space *a* on each side of the smoke-stack. The inner vertical wall E of the stack is perforated with a series of holes, *p*. A preferred form for these orifices is shown in Fig. 5. It will be noticed that the perforations are so cut that the series of rows are placed, relatively, to cause the holes in one row to alternate with its contiguous row of orifices, and that the perforations are made with a punch and die that turn the portion of displaced material outward, so as to form projecting lips *t*, that extend into the annular space *a*. The lines of holes *t* fill up the spaces between the successive regular spiral twists given the plate G, and the rows of perforations *t* have the same degree of spiral inclination given them, as is shown in the pitch of the screw-turns of the plate G.

The spark-conduits K may be given a position upon the outside or on the interior wall of the smoke-box D, and thus discharge the sparks in the smoke-box D; or by a continuation of the conduit upon the outer side, as shown in Fig. 2, the cinders may be conveyed near the surface of the ground and there allowed to escape from the tube K. The lower ends of the chute K are closed by gates *r*, that are pivoted to bear air-tight upon the sloped terminal edges of these chutes K. They have a projecting top limb, *r'*, that holds the gates in a closed position by their inclination outward from a perpendicular position, causing the major portion of their weight to fall outside the pivotal point *s*, upon which these gates *r* vibrate. It should be stated that the chutes or conduits K for the sparks are so placed in relation to the steam and exhaust inlet and outlet pipes that enter the sides of the smoke-box D as to avoid any interference with them; and, as before stated, the closed spark-conduits may be located either upon the inside or outside of the smoke-box, as may be considered most feasible, proper regard being had for the relative location of other essential appliances. A small steam-pipe, O, is made to communicate between the exhaust-pipes S and the spark-conduits K to extinguish any live sparks before their discharge into the open air.

In operation it is evident that by the strong upward draft induced by the introduction of exhaust-steam forced from nozzles that are placed in a line with the lower end of the vertical shell E the smoke and sparks that enter the smoke-box D from the flues B will be made to rapidly ascend the spiral passage formed in the interior of the shell E by the fixed location therein of the convolute plate G. The sparks or cinders, by centrifugal action resulting from their upward gyratory motion, will be forcibly projected against the rough inner surface of the cylindrical wall E, the peculiar form of the inwardly-turned lips *t* of the perforations in this wall aiding their disintegration. The major portion of the cinders will be driven through the perforation *t* by centrifugal force, and such as are carried to the upper end of the cylinder E will be thrown outward and slide down the converging surface of the lower portion of the bonnet F, and from it down the annular air-space between the walls into the chutes or conduits K below.

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

1. In a spark-arrester for smoke-stacks, the combination, with the smoke-box of a boiler, of a smoke-stack having an outside vertical shell, a smaller concentric located inner cylinder, the outer shell having a double-coned bonnet, the inner cylinder entering free the lower end of this bonnet and having a single spirally-twisted plate inserted to form a vertical gyratory passage through it, and longitudinal ribs to form cinder-abutments and spark-conveying passages from the lower edge of the bonnet to the base of the stack, substantially as set forth.

2. In a spark-arrester for smoke-stacks, the combination, with an outer vertical shell and its enlarged bonnet, of an inner concentric shell having vertical ribs, the latter being branched or bifurcated at their lower ends, forming chutes to deliver the sparks into a descending closed conduit-pipe, substantially as set forth.

3. In a spark-arrester for smoke-stacks, the combination, with an outer vertical shell and its joined double-cone bonnet, of an inner smaller cylindrical shell having perforations in its body and a spirally-bent plate extending the full length of the cylinder-body interior to it, the outside of the cylindrical inner shell having rigidly-secured vertical ribs that form abutments and descending passages to deliver sparks into attached conduit-pipes that are automatically closed at their delivering ends, substantially as set forth.

4. In a spark-arrester for smoke-stacks, the combination, with an outer shell, its double conical attached bonnet, and a concentric inner shell that projects with a free upper end

into the bonnet, of a spirally-twisted plate secured to the inside of the smaller shell, vertical ribs attached to the outer surface of the inner shell, the lower ends of said ribs being branched or bifurcated, forming chutes to convey sparks, and two attached spark-conduits provided with self-operating gates that are opened to discharge cinders by the accumulating weight of the cinders and closed by their own gravity, substantially as set forth.

5. In a spark-arrester for smoke-stacks, the combination, with an outer cylindrical shell and an inner concentric cylindrical shell, the outer shell having a mounted double-coned bonnet, the inner shell provided with a spirally-twisted plate inserted in it and lipped perforations made in its cylindrical wall, of a depending perforated circular flange located in the top of the bonnet, two pairs of longitudinal ribs that form spark-chutes, and two spark-conducting pipes that have each an automatic-acting cinder-valve pivoted to the lower or discharging end of these spark-conduits, substantially as set forth.

6. In a spark-arrester for smoke-boxes, the combination, with an outer cylindrical shell and an inner concentric shell and a double-coned bonnet that has a perforated depending circular flange, of a spiral plate located within the inner shell, lipped perforations in the inner shell, two attached spark-conduits that have gates that close by gravity, and two steam-pipes that lead exhaust-steam from exhaust-steam passages to the spark-conduits, substantially as set forth.

7. The combination, with the smoke-box of a locomotive flue boiler, of a smoke-stack possessing the following instrumentalities, viz: an outer shell, an inner shell that is concentric to and smaller than the outer one, an intervening dead-air space, series of spiral rows of lipped perforations in the inner shell, a secured and tight-fitting spirally-twisted plate inserted in the inner shell, a double-cone bonnet attached to the upper end of the outer shell, a depending perforated flange attached to the upper interior surface of this bonnet, the upper end of the inner shell projecting unattached into the lower end of the bonnet, vertical ribs rigidly attached to the outer surface of the inner shell and bifurcated at their lower ends to form spark-passages, two attached spark-conduits, a gravity-operated pivoted gate to each cinder conduit-pipe that closes air-tight their lower ends, and a steam-conduit to introduce exhaust-steam into each spark-conduit, substantially as set forth.

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

MARTIN M. WILSON.

Witnesses:

C. E. CRAYCROFT,

FRED. T. HOCKADAY.