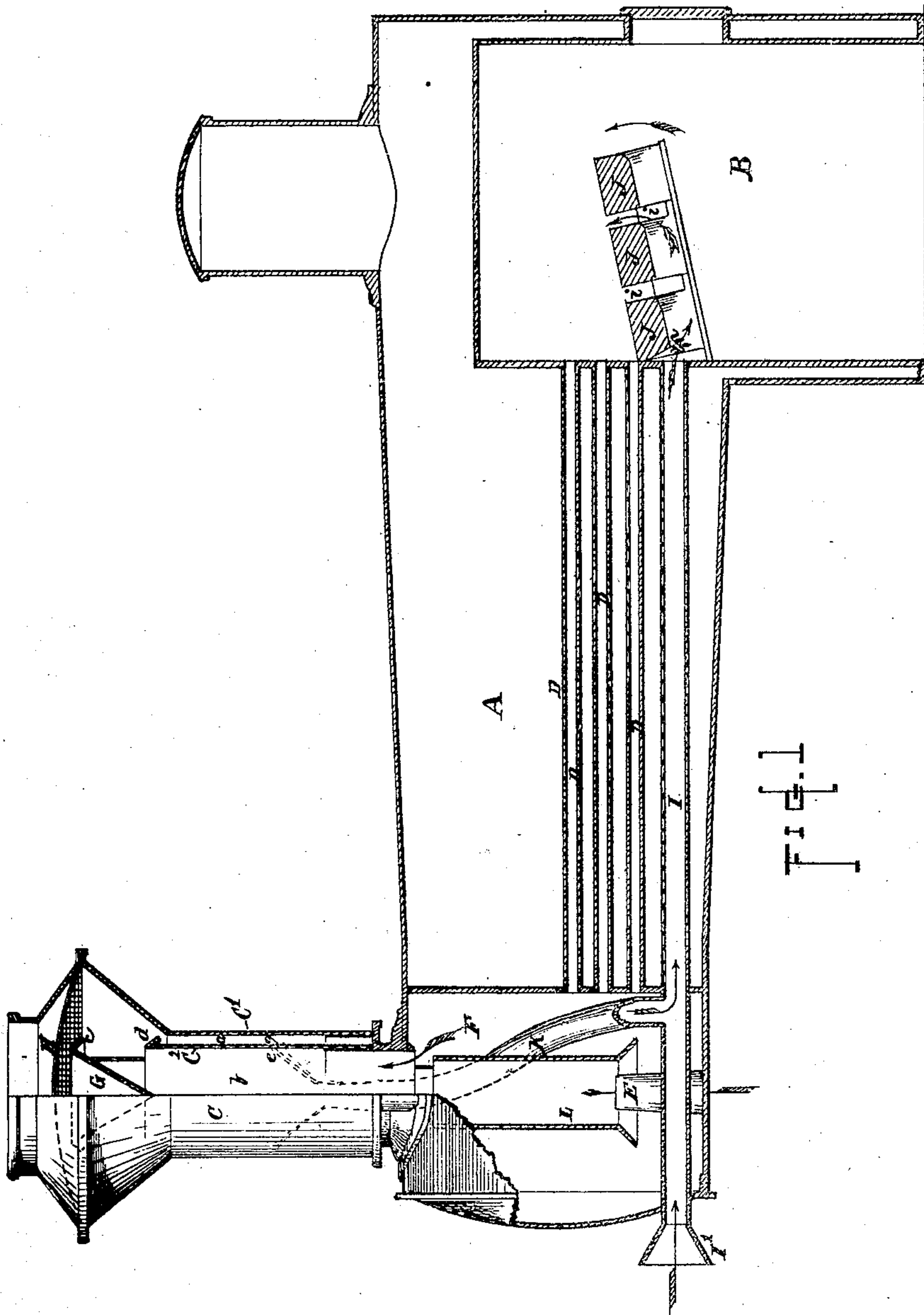


R. HAWKES & H. J. PAINE.

Spark-Arresters and Consumers for Locomotives.

No. 133,984.

Patented Dec. 17, 1872.



Witnesses
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Inventors
Russell Hanks
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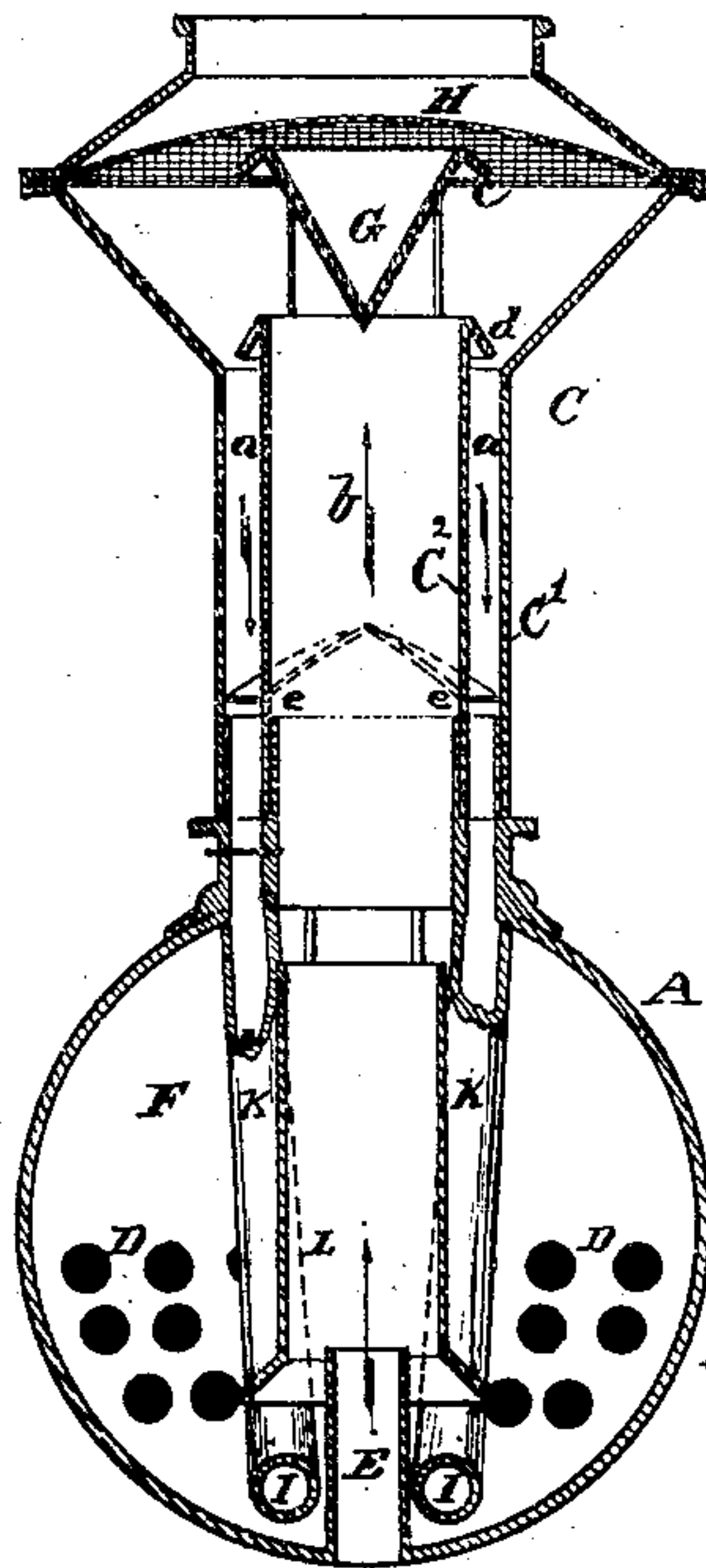


FIG. 2

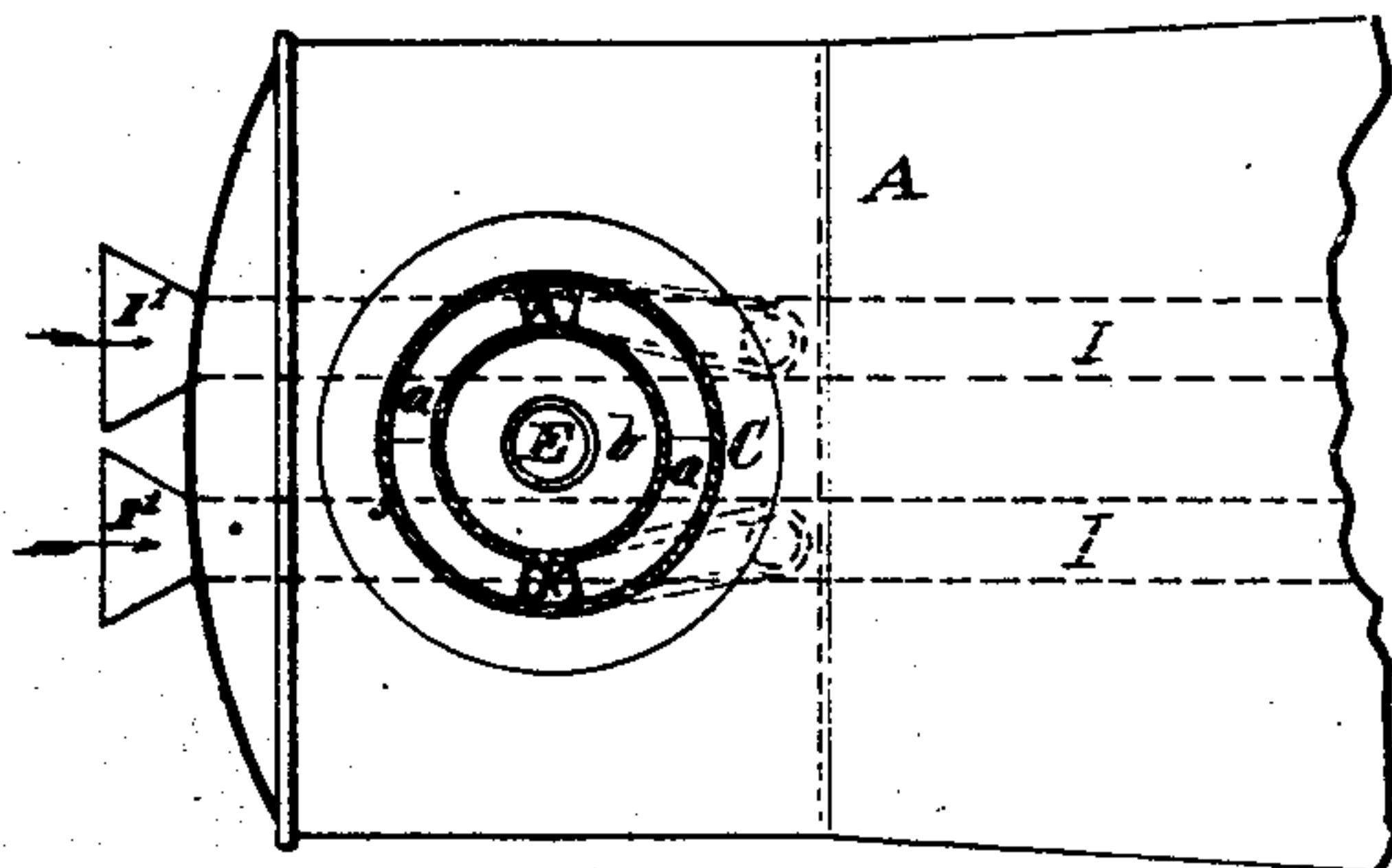


FIG. 3

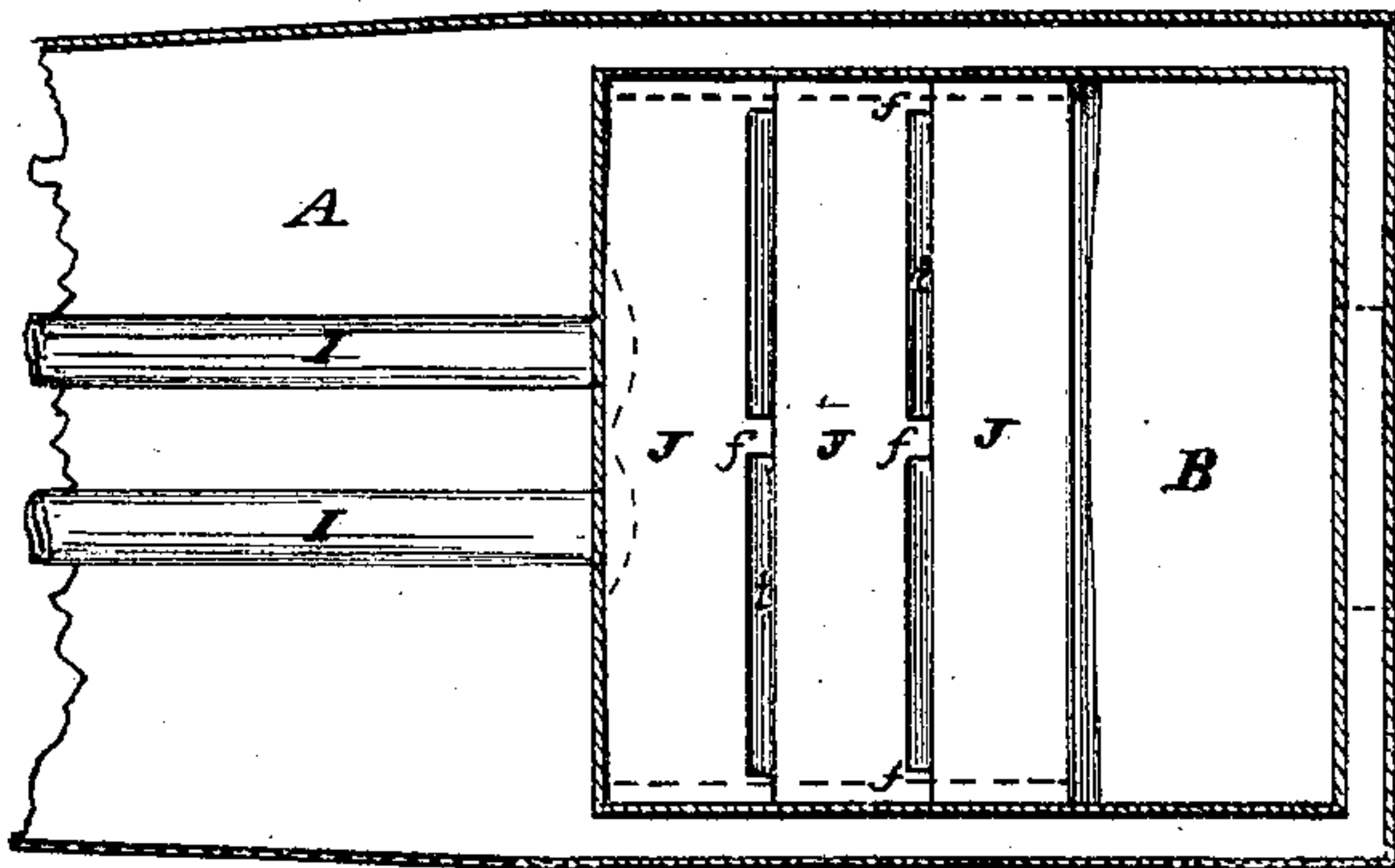


FIG. 4

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RUSSELL HAWKES AND HENRY J. PAINE, OF PROVIDENCE, R. I.

IMPROVEMENT IN SPARK ARRESTERS AND CONSUMERS FOR LOCOMOTIVES.

Specification forming part of Letters Patent No. 133,984, dated December 17, 1872.

To all whom it may concern:

Be it known that we, RUSSELL HAWKES and HENRY J. PAINE, both of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Spark and Smoke Consumers for Locomotives; and we do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawing which forms a part of this specification, in which—

Figure 1 represents a longitudinal section of such parts of a locomotive as are necessary to illustrate the construction and application of our invention, the smoke-stack being represented half in section and half in side elevation; Fig. 2 represents a transverse vertical section through the smoke-stack and spark-conducting flues; Fig. 3 represents a horizontal section through the stack and plan view of the front end of the boiler; and Fig. 4 represents a horizontal section through the fire-box and rear end of the boiler.

In the drawing, the parts marked A represent the boiler. B indicates the fire-box; C, the smoke-stack; D, the boiler-tubes; E, the exhaust-nozzle; and F, the smoke-chamber at the forward end of the boiler. The body of the smoke-stack C is made with an outer shell, C¹, and inner shell C², as indicated, so as to form a passage, *a*, at the outside, and a passage, *b*, through the center. A cone, G, is arranged in the upper part of the stack with its point downward, and having a downward-projecting rim, *c*, around its upper end, while above the cone G a wire gauze or netting, H, is secured across the opening of the stack, as shown. The inner shell or tube C² of the stack terminates at its upper end with a downward and outwardly inclined flange, *d*, which flange is for the purpose of counteracting any tendency to an upward draft in the passage *a* that might be caused by a strong and sudden blast up the central passage *b*. Two tubes or spark-flues, I I, are arranged through the lower part of the boiler for conducting the sparks and cinders back to the fire. The rear ends of the tubes or conductors I I enter the fire-box just beneath the front edge of the brick arch J, while the front ends of said tubes I extend through the front end of the boiler, and are fitted with funnel-shaped ends I' open to the external air.

Curved tubes or conductors K are arranged within the smoke-chamber F, which lead from the outer passage *a* of the smoke-stack at either side, into the tubes or conductors I, as fully indicated in the drawing. Inclined guides *e* are arranged in the passage *a* to guide the sparks and cinders into the tubes K. These guides may be made with more or less inclination, as required, and their ends may be brought into close proximity with or be joined to the upper ends of the conductors K. The exhaust-nozzle projects up from the lower part of the smoke-chamber F, and its upper end is surrounded by a cylindrical petticoat, L, to direct the blast from the nozzle up into the central passage *b* of the smoke-stack. The bricks of the arch J are made with small projections *f* upon their edges, so that instead of lying close together spaces *i* will be left between for the passage of the flames and gas from the tubes or conductors I. If preferred the bricks may be made of different form from that shown, provided suitable passages are left through the arch.

The operation of our improved smoke and spark consumer is as follows: The smoke and sparks which pass through the boiler-flues D into the smoke-chamber F are forced up by the draft and blast from the exhaust-nozzle E through the central passage *b* of the stack, and, striking the cone G at the top of said passage, are deflected outward and downward by the flange *c* and pass into the outer passage *a*, while the gases of combustion pass up through the netting H and escape at the top of the stack. The sparks and cinders are carried down through the passage *a* into the tubes K and thence into the conductors I, through which strong currents of air pass from the open ends I' to the fire-box B, and by means of said currents of air the sparks are carried back into the fire, together with a quantity of oxygen which is carried to and delivered upon the under side of the arch J, and passes up through the openings *i* and around the rear edge thereof, and then mingling with the gas from the fire, renders the combustion more perfect than it otherwise would be, while the heavy sparks and cinders, as they leave the conducting-tubes, strike against the edge *m* or the brick arch J, and are thereby deflected or thrown down upon the bed of the fire, the up

per corner of the first brick being fitted close against the boiler-plates and its lower corner beveled off, as illustrated in Fig. 1. The hot sparks as they pass through the conductors I assist to heat the air which enters the funnel ends I', while the oxygen of the air helps to increase such heat by hastening the combustion of the sparks, so that when the air has reached the rear ends of the conductors it is at a very high degree of temperature, and as it impinges on the incandescent bricks of the arch J and mingles with the gas within the fire-box it serves as a hot-blast, and by greatly increasing the heat, from the more perfect consumption of the smoke, sparks, and gases, greatly reduces the required amount of fuel.

In the present instance there are two spark conductors or tubes, I K, and guides *e*; but a greater number can be used, if desired, or a single set of conductory devices may, in some instances, be used with economical results.

It has been found by practical tests that with our present arrangement of devices for arresting and returning the sparks to the fire-box the liability of clogging in the smoke-stack is greatly lessened, while at the same time the separation and return of the sparks and cinders are so perfect that the netting H in the top of the smoke-stack can be made of netting of eight meshes to the inch without injuriously interrupting the draft or interfering with the proper exit of the gases.

It will also be observed that by forming the arch J with spaces *i* between the bricks a portion of the air which enters the conductors I will pass up through the arch, and the oxygen will mingle with and insure a more perfect combustion of the gases in the upper portion of the fire-box than would take place if the arch was formed whole or solid.

Having described our improvements in spark and smoke consumers for locomotives, what we claim therein as new and of our invention, and desire to secure by Letters Patent, is—

1. The combination of the pipes or conductors K I with the outer and inner shells C¹ C² and one or more guides *e*, substantially as and for the purposes set forth.

2. The combination of the conductors K and spark-return tubes I with the outer and inner shells C¹ C² and deflecting cone G and the flanges *c* and *d* and guides *e*, substantially as and for the purposes set forth.

3. The combination, with the fire-box and boiler in a locomotive, of one or more air and spark pipes or conductors I and deflecting arch J *m*, substantially as and for the purposes set forth.

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HENRY J. PAINE.

Witnesses:

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CHAS. H. BURLEIGH.