

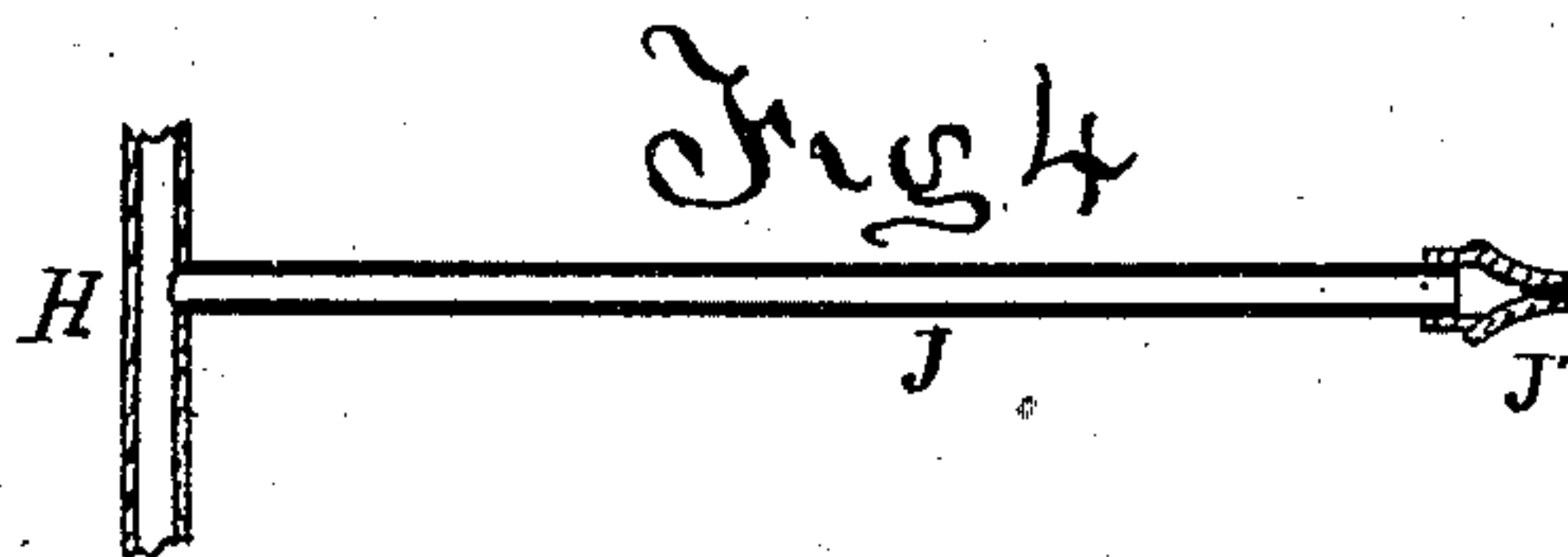
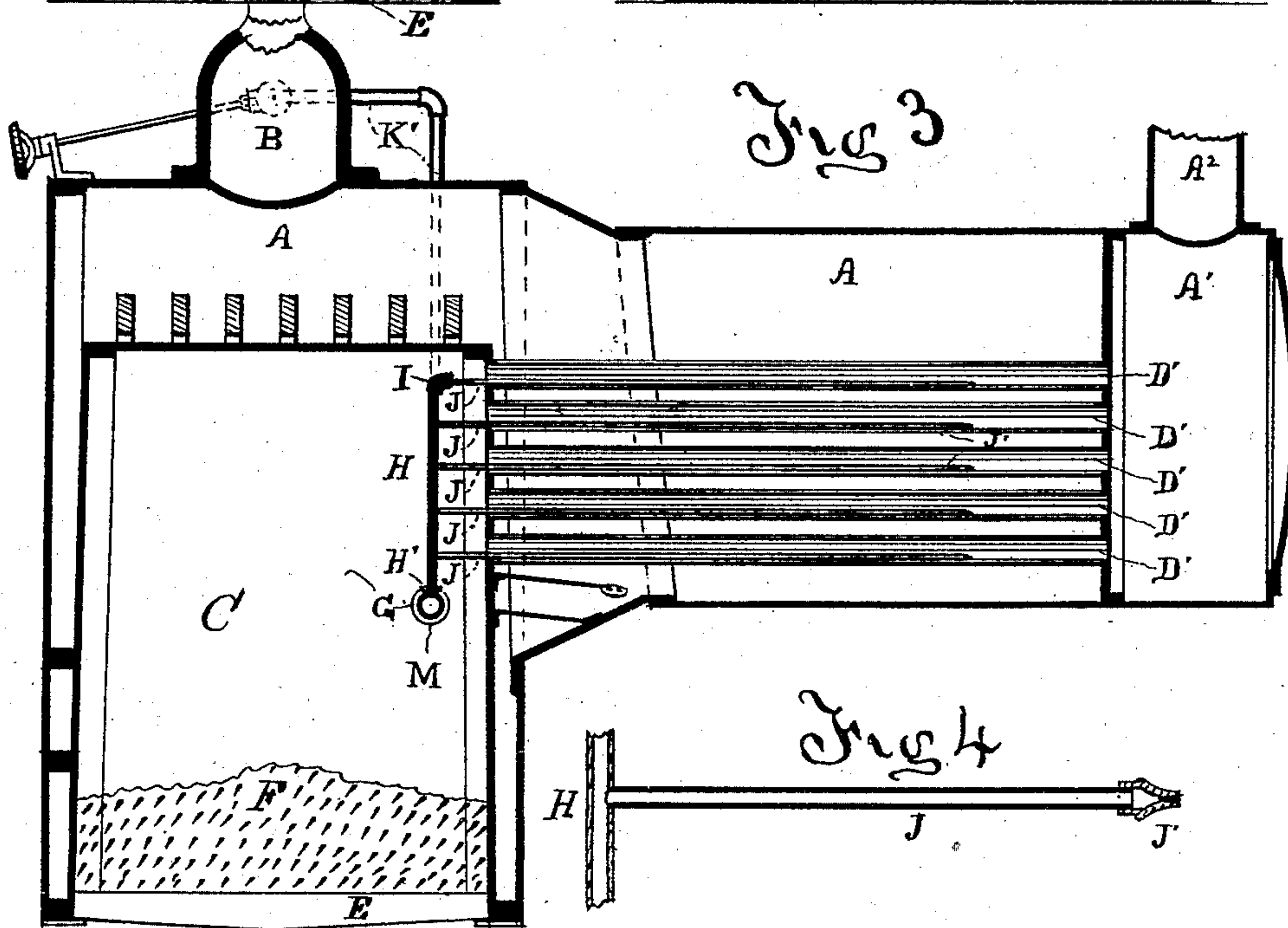
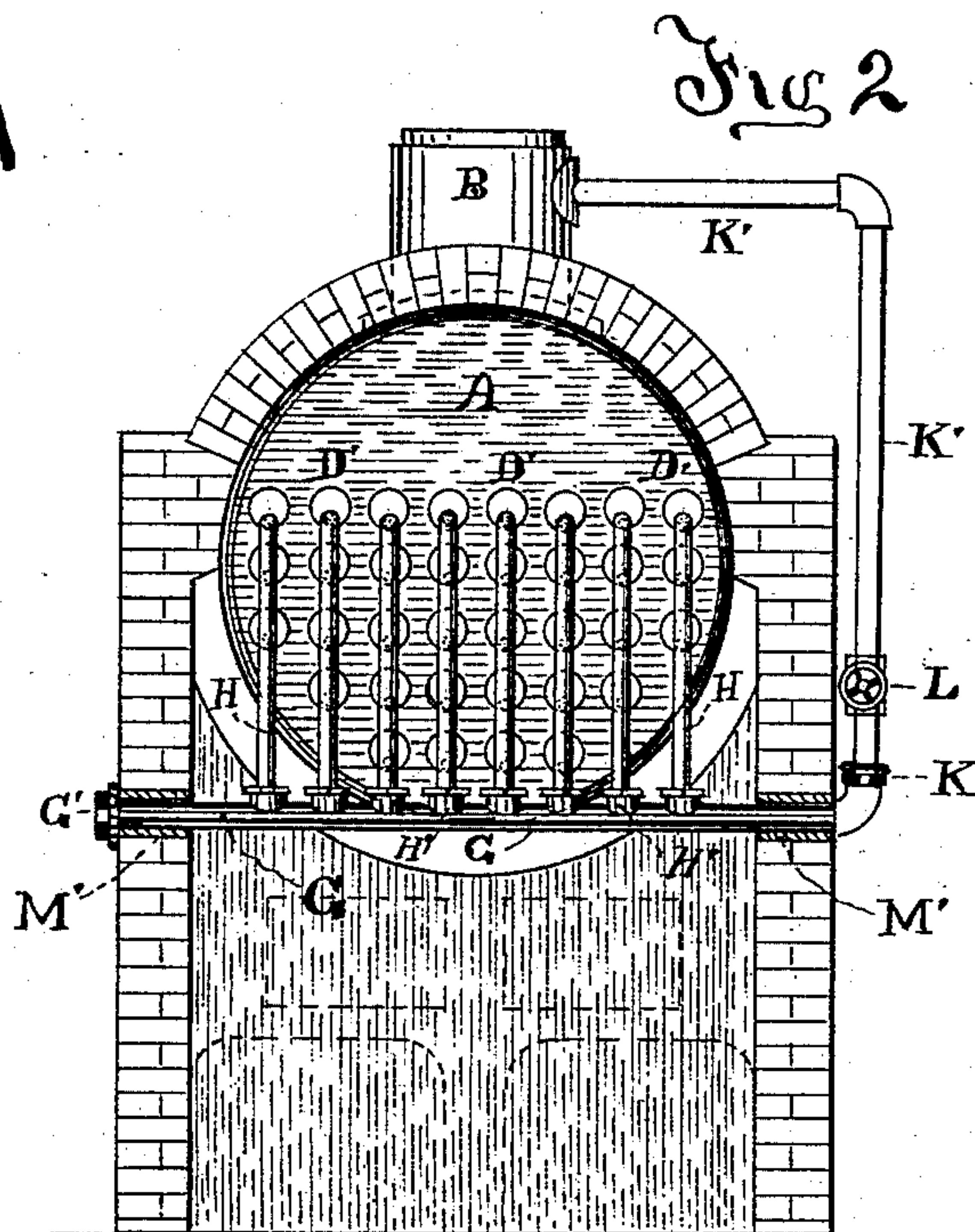
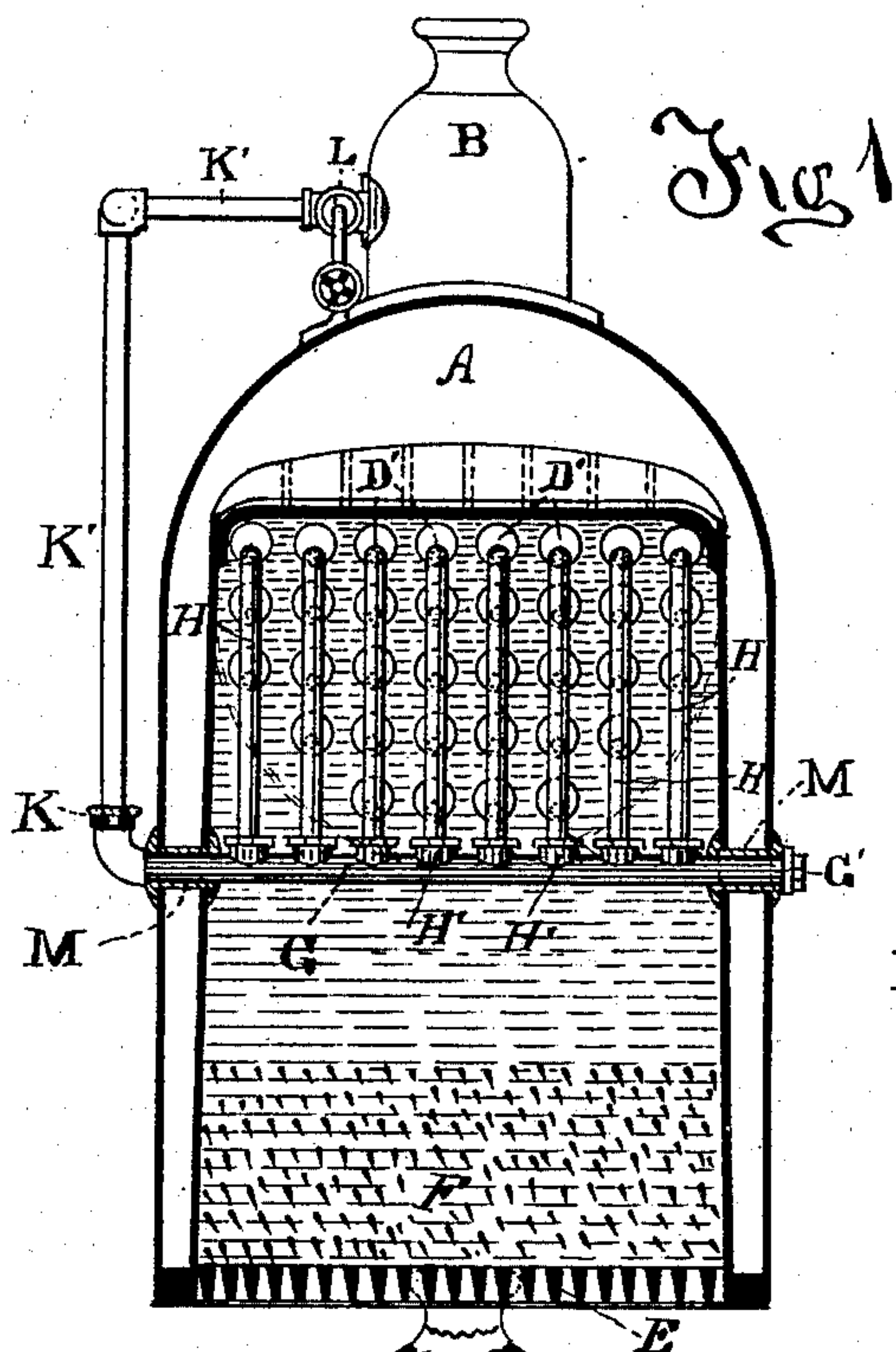
(No Model.)

J. G. KALBACH & T. P. KINSEY.

SPARK ARRESTER AND DRAFT PRODUCER FOR LOCOMOTIVES.

No. 267,220.

Patented Nov. 7, 1882.



Witnesses
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UNITED STATES PATENT OFFICE.

JOHN G. KALBACH AND THOMAS P. KINSEY, OF READING, PENNSYLVANIA.

SPARK-ARRESTER AND DRAFT-PRODUCER FOR LOCOMOTIVES.

SPECIFICATION forming part of Letters Patent No. 267,220, dated November 7, 1882.

Application filed February 3, 1882. (No model.)

To all whom it may concern:

Be it known that we, JOHN G. KALBACH and THOMAS P. KINSEY, both of the city of Reading, county of Berks, State of Pennsylvania, have invented a new and useful Improvement in Spark-Arresters and Draft-Producers and Smoke-Preventers for Locomotive and other Tubular Boilers, of which the following is a specification.

The improvement is applicable to all the tubular or flue boilers in use in which or for which an artificial draft is created by the introduction of the exhaust or live steam into the stack or chimney, and is intended to relieve the engine from the back-pressure occasioned by the exhaust delivering through contracted nozzles, at the same time improving the draft of the boiler, and to prevent or abate the smoke nuisance where soft coal is used as a fuel.

Referring to the drawings herewith, in which corresponding parts are designated by similar letters, Figure 1 represents a front sectional elevation of the fire-box of a locomotive, showing the apparatus in place before the tube-sheet. Fig. 2 represents a rear sectional elevation of the smoke-chamber of a built-in or a stationary tubular boiler with the invention applied thereto. Fig. 3 is a longitudinal sectional elevation of a locomotive-boiler with the apparatus in place. Fig. 4 is a detail showing the nozzle-tips of the blow-pipes.

A represents the boiler; A', the smoke box or chamber; A², the stack; B, the steam-dome; C, the fire-box; D, the fire-door; D', the tubes; E, the fire-bars; F, the fuel; G, the bed-pipe of the spark-arrester and draft-producer; H, vertical pipes placed one in front of each vertical row of tubes; I, elbows or turns upon the same on a line with the lower edge of the upper tubes. J J are horizontal blow-pipes, tapped into the vertical pipes H, and so arranged that they shall, when connected therewith, lie upon the lower side of the tubes D' and extend within the same for one-half to three-fourths of their length. K is a union, K' a steam-pipe, and L a cock uniting the dome B with the bed-pipe of the arrester and draft-producer. M is a hollow stay in the fire-box, of sufficient size to pass the bed-pipe easily through. M' is a thimble built in the wall of a stationary boiler-setting for the same purpose. J' are nozzles secured to the ends of the blow-pipes J.

To introduce the apparatus into the fire-box the vertical pipes H, with their turns I, are drilled and tapped to the vertical pitch of the tubes and have right and left threaded thimbles H' upon their lower ends. The horizontal blow-pipes J, capped, with their nozzles J' cut to proper length and screwed at the tube-sheet end, are placed one in each tube of the boiler. The verticals H are then connected with the horizontals by screwing together. The hollow stay-bolts M or thimbles M' having been secured in place—say about six inches away from the tube-sheet—and the bed-pipe G having been drilled to the horizontal pitch of the tubes and tapped to suit the left-hand thread of the thimbles upon the verticals, the bed-pipe is shoved through from side to side of the fire-box or smoke-chamber and the vertical pipe-thimbles H' are inserted and screwed home in the bed. One end of the bed is closed by a cap, G', and the other is, by a union, K, coupled to the pipe K', which, by cock L, is connected with the dome B or the steam-space of the boiler. The cock L may be fastened directly to the dome B, or, if more convenient, may have a short pipe-connection between them.

The operation of the apparatus is as follows: When standing still (with the cock L open) as soon as steam is raised it will circulate by the pipe G through all the verticals H, and from them through the horizontals J and their nozzles J' into the tubes D', which, as the pressure in the boiler increases, will vary from a moderate to a fierce blast in the tubes and a corresponding draft through the fuel on the fire-grates. Steam being let into the cylinders the engine moves off, when the coals and sparks that usually, from the action of the contracted exhaust-nozzles, are drawn through the tubes and out of the stack in an incandescent state, are met by the steam-jets from the nozzles J', and are immediately quenched and blackened, and if carried out of the stack would prove innocuous. The action of the steam through the nozzles J' will produce a vacuum in the tubes D', and the draft through the same may be increased or retarded to any reasonable extent by operating the cock L. As the blow-pipes J subserve the same purpose as the contracted nozzles of the present exhaust-pipes, therefore the use of our invention permits their enlarge-

ment, so as to reduce the back-pressure upon the pistons to a minimum. The force of the exhaust from the enlargement of the nozzles being lost we apprehend that very little coal will be drawn from the fire-box through the tubes and be passed out of the stack. The blast from the nozzles J' being uniformly distributed through all the tubes, and not, as under the present system, confined principally to the middle horizontal rows, the aggregate blast, in all probability, will be as strong as under the present mode of operating; but, being divided up among all the tubes, will, although furnishing as free a draft for the fuel, have no tendency to carry the same out of the fire-chamber.

The flues or tubes under our system will, as long as the apparatus is operated, be kept perfectly clean, and will therefore be more effective as steam-producers.

We propose using heavy one (1) inch pipe for the bed G, half ($\frac{1}{2}$) inch for the verticals H, and one-eighth ($\frac{1}{8}$) inch for the horizontals J, the apertures in the nozzles J' to be adjusted in diameter to the class of engine or boiler to which it is applied.

We do not anticipate any damage to the apparatus from its location in a locomotive-boiler fire-box, for as soon as steam forms it will circulate through the same and prevent it; but should it prove otherwise the pipes that are exposed in the fire-box may be covered with asbestos or any other suitable fire-resisting covering.

If thought desirable, the connection of the pipe K' may be made with the water-level of the boiler, in which case water under pressure would be driven out of the nozzles J', instead of steam, and the nozzles, we think, should then be reduced in size—say about one-half that used for steam.

Should it be found that the apparatus need not be protected, then the steam in the pipes G, H, and J will be superheated, and the volume being thereby increased there will be a corresponding decrease in the drain of steam from the boiler. We propose, however, having, as shown, connected one end of the bed-pipe G with the steam-space of the boiler, to make a similar connection between the opposite or capped end of the bed-pipe and the water-space of the same, using for this purpose a pipe of small caliber, not exceeding one-half-inch bore, with a globe valve or cock placed thereon for opening or closing the connection between the two.

The pipes J may be of any desired length, and may be arranged as short pipes of small diameters, entering within the tubes about one-fourth the length thereof. If thus arranged the pipes or nozzles J J' should be placed central to the diameter of the tubes. We prefer, however, the plan of carrying the pipe J within the tube D' forward of the tube-sheet, and making it from one-half to three-fourths the length of the tube.

We do not confine ourselves to the arrange-

ment shown, as that will vary with its application, and the blow-pipes J may be introduced in alternate tubes or in alternate rows of the same, as may be found desirable, we giving our preference to the plan described of an independent blower to each tube.

We are aware that steam, both live and exhaust, has been introduced as a draft-producer and spark-arrester into the stacks of locomotive engines and the chimneys of stationary boilers, and as a draft-producer blowing from the ends of short pipes or nozzles set at a short distance away from the tube-sheet, and in combination with air blown from pipes perforated over their top and side surfaces and lying within the tubes. We do not therefore broadly claim the application of steam for that purpose. We however do claim our special apparatus and its combination with the fire-box of a locomotive or stationary boiler for the purpose described, believing ourselves to be the first to use it in the manner and form shown and specified.

The application of the improvement is readily made, is inexpensive, and the gain from the reduction of back-pressure upon the piston will add a fair per cent. to the effective power of the engine.

Having described our invention, its construction and application, we desire to secure by Letters Patent the following claims, to wit:

1. A spark-arrester and draft-producer for locomotive, tubular, and flue boilers, consisting of steam-pipes of small-caliber, with their nozzles arranged in the tubes or flues of the same at a point of from one-half to three-fourths of their lengths from the gas or heat entering ends thereof, whereby sparks or coals drawn within the tubes or flues will be ejected therefrom and quenched thereby, substantially as and for the purpose set forth.

2. The method of arresting sparks and producing draft, consisting in the injection of steam from the ends of pipes or nozzles of small caliber into the flues or tubes of locomotive or stationary tubular boilers at a point within the same of from one-half to three-fourths of their length from the gas or heat entering ends thereof, whereby the soot held in suspension is condensed and driven into the smoke-box or smoke-flue, substantially as specified.

3. In a draft-producer and spark-arrester, as described, with its system of pipes located in the fire-box or fire-chamber of a locomotive or stationary boiler, the bed-pipe of the same connected at one end with the steam-space and at the opposite end with the water-space, whereby the blow-pipes may be operated in advance of pressure within the boiler, substantially as and for the purpose described.

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