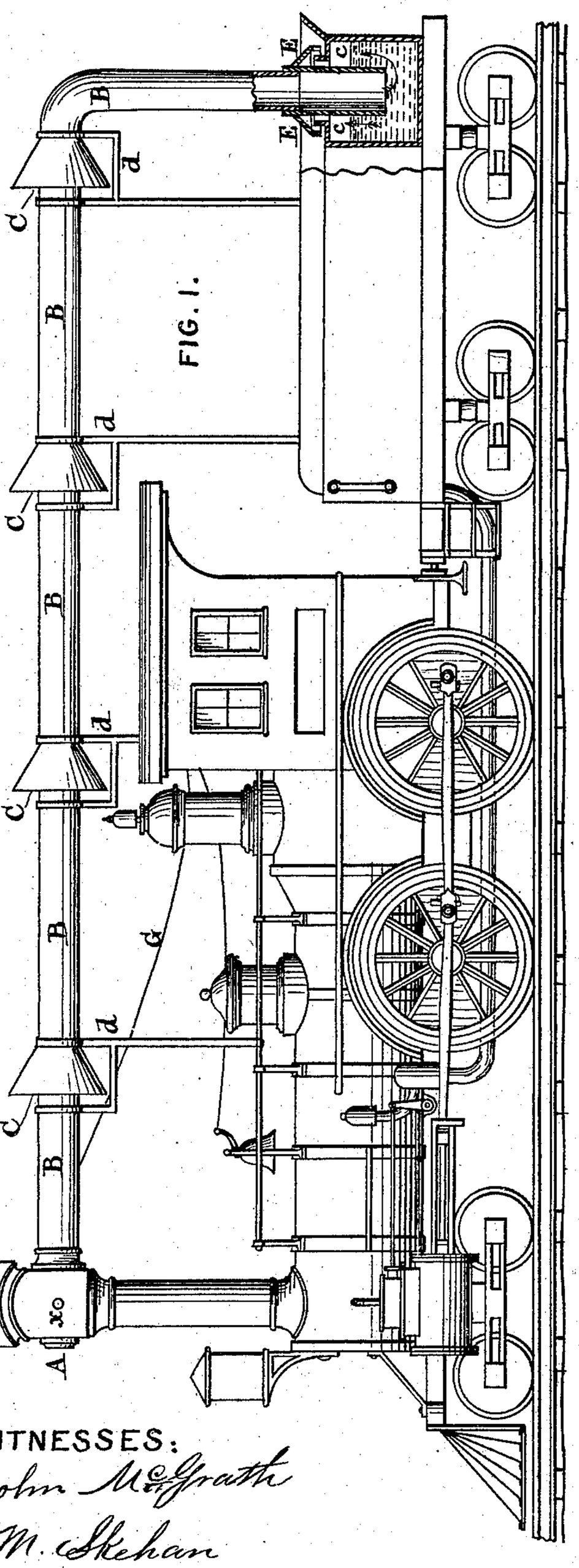
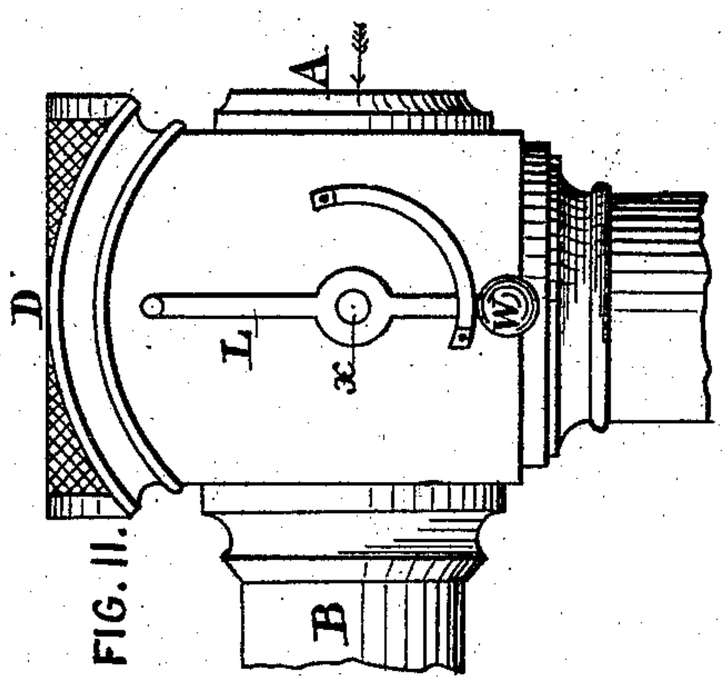
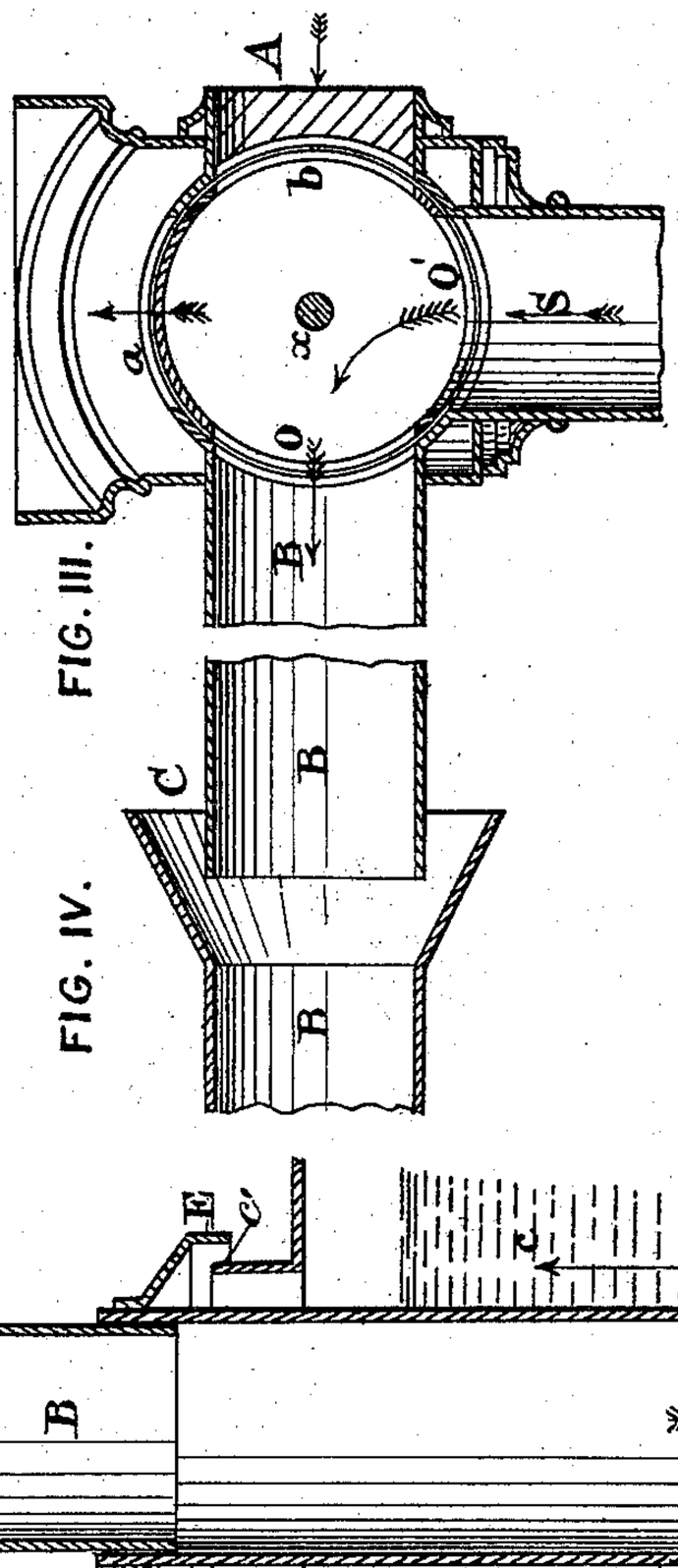
J. MARSHALL.

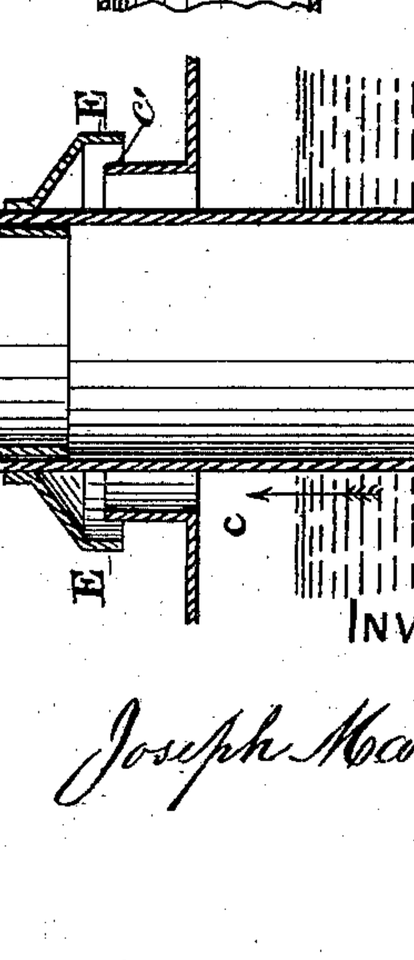
Smoke-Condenser and Spark-Extinguisher.

No. 214,676. Patented April 22, 1879.









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JOSEPH MARSHALL, OF ANDERSON, INDIANA.

IMPROVEMENT IN SMOKE-CONDENSER AND SPARK-EXTINGUISHER.

Specification forming part of Letters Patent No. **214,676**, dated April 22, 1879; application filed December 11, 1878.

To all whom it may concern:

Be it known that I, JOSEPH MARSHALL, of Anderson, in the county of Madison, in the State of Indiana, have invented a new and useful device to be attached to railroad-locomotives for the purpose of condensing smoke and steam and extinguishing sparks issuing from the smoke-stacks thereof, of which the following is a specification.

The invention relates to locomotive-engines.

Heretofore locomotives have been generally used without any device for the purpose of protecting passengers against the annoyances of smoke, gas, cinders, and ashes, which originate at the engine from the combustion of fuel and generating of steam, and are watted back to and into passenger-coaches to the great discomfort of their occupants, and besides the smoke-stacks of locomotives have not had applied to them efficient means to protect property lying along or by railroad-tracks against fire originating from sparks passing through the wire screen at their tops, which was the only means of averting disastrous conflagrations.

The object of my invention is to provide an efficient method of conducting all smoke, gas, steam, sparks, cinders, ashes, &c., emitted from the smoke-stack back to the tender and down under the water of the tank, where the steam, smoke, and gas are condensed and rendered innoxious, the sparks are totally extinguished and rendered harmless, and the ashes and cinders are prevented from interfering with the prospect of passengers and from soiling their persons or raiment.

The invention consists in, and these objects are accomplished by, the arrangement of metal tubes of sufficient capacity to contain and carry off all smoke, &c., arising from the smoke-stack leading from the stack-head to the tank of the tender, and also, in the stack-head, of certain mechanism co-operating with the above tubes. The disposition of the smoke in the stack-head is entirely under the control of the engineer, as the smoke may ascend directly upward through the stack or be conducted to the tank.

In the accompanying drawings, in which similar letters of reference indicate like parts, Figure 1 is an elevation of locomotive and tender, attached to which is shown my invention. Fig. 2 is an enlarged elevation of the engineer's (right-hand) side of the stack-head. Fig. 3 is a vertical longitudinal section through stack-head, showing the interior mechanism thereof. Fig. 4 is a longitudinal section through conducting-tubes where their forward ends are funnel-shaped. Fig. 5 is a vertical section through conducting-tube entering the tank, showing the mechanism of the slide-joint and air-escape.

The manner of application, mode of operating, and operation are as follows: The stack-head is cubical in form, the upper side, D, being pediment, top open, and the lower extremity covered with suitable wire screen to prevent sparks passing through while the locomotive is stationary or backing, at which times the smoke passes directly upward. This head is secured to the upper extremity of the smoke-stack S. Inside the stack-head is a metal cylinder, which revolves upon its axis by means of a pivot at each end, which pass through the sides of the stack-head, as at *x*, Figs. 1 and 2. To one of these pivots (at the right-hand side) is secured the lever L, Fig. 2, and at the opposite extremity the counterbalancing-weight W.

The cylinder is perforated by three apertures corresponding precisely in shape and size with the upper extremity of the smoke-stack, the aperture A in front of stack-head, and the forward extremity of the conducting-tube B. These apertures are marked, respectively, O′, *b*, and O on Fig. 3.

When the locomotive is in forward motion the smoke ascending in the direction of the arrow S′, Fig. 3, cannot pass directly upward, because that side of the cylinder which is intact is opposed to its progress, and the current of air occasioned by the velocity of the engine passing in at the aperture A, as indicated by the arrow, Fig. 3, gives to the smoke, gas, &c., an impetus directing its course, as shown by the arrow *e*, Fig. 3, into the tube B, where in its passage through the tubes it receives additional impetus from the fresh currents of air at each funnel C C C until it is forced by the moving currents of air against the water in the tank, as at F, Fig. 5, where the steam is again condensed into water, the

smoke precipitated as carbon, and the ashes, &c., deposited on top of the water.

The air-current in the tubes B is created by the velocity of the locomotive through the surrounding atmosphere. The air, which is forced downward through the water to the end tube, (which is placed a sufficient depth in the water,) thence ascends upward and escapes around the downward-conducting tube at E E and upward-projecting flange *f*, as indicated by the arrows *c c*, Fig. 1. The current of air thus created in the tubes increases the draft in the fire-box, facilitating the combustion of fuel. The force may be regulated by the number and size of the funnels disposed between the stack-head and tank.

When it is intended to stop the engine or reverse its motion, the engineer operates the lever L, (by means of a chain, wire, or rope, G, extending from the stack-head to the cab,) causing it to traverse a quarter-circle, which brings the aperture O directly above the upper extremity of the smoke-stack, the aperture O′ being then at *b*, and the aperture *b* at *a*, which throws the unbroken side of the cylinder against the end of the tube B, effectually closing that passage, while a clear open passage is left to the top of the stack-head D, through which the smoke, &c., may pass, as indicated by the arrow *y*, Fig. 3, thus averting any check to the draft in the fire-box. When the force operating the lever is removed the weight W, by its gravity, again returns the cylinder to its proper position for forward movement.

The section of conducting-tube which is inserted in the tank from E E downward is made to slide upward, so as to be readily removed in order to supply water to the tank when required. The tube may be inserted at any other part of the tank as well as at the aperture used for filling it.

The tubes are secured in position by suitable metal bars, as at *d*, disposed at necessary points and secured to the locomotive and tender. The funnel occurring at the coupling of the tender with the locomotive must be made of an elliptical form, so as to allow the room necessary for the varying vibrations of the two parts.

What I claim as my invention is—

1. A spark-arrester for locomotives, consisting of the smoke-head provided with two cylinders, one oscillating within the other, each being provided with apertures so arranged that either an upward or horizontal direction may be given to the smoke, the inner cylinder being operated by means of the cord G and weight W, substantially as herein described.

2. The combination, with a spark-arrester for locomotives, of the smoke-stack provided with oscillating cylinders, the smoke-conveying pipes, and the descending pipe adapted to swing in its supporting-arms, substantially as described.

3. In combination with the smoke-conveying pipes for spark-arresters, the flaring pipe E E and upward-projecting flange *f*, whereby a sliding joint is formed, and an exit for the air and gases from the tank, substantially as dscribed.

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Witnesses:

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