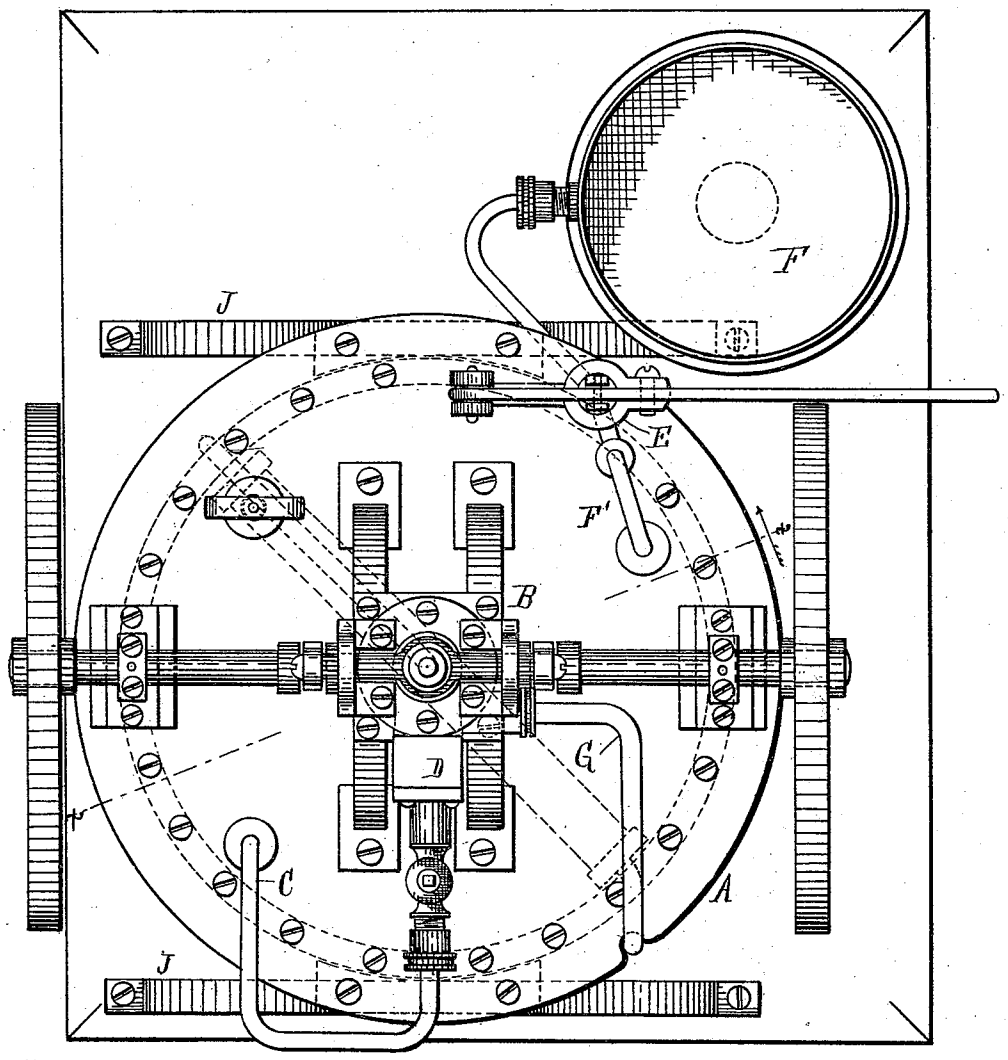
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M. J. HINDEN.

STEAM ENGINE.

No. 461,263. Patented Oct. 13, 1891.

Fig. 1.



Witnesses.
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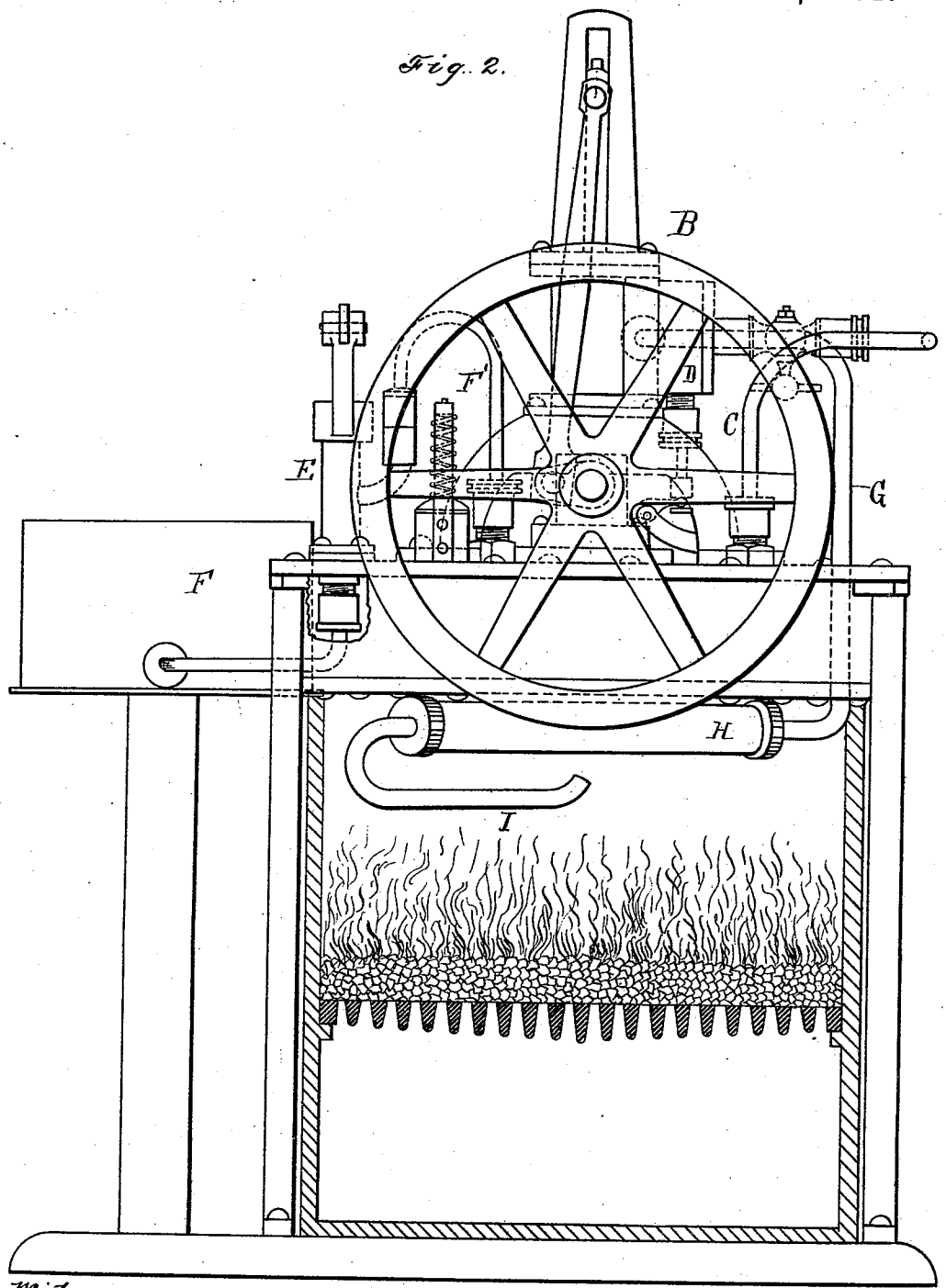
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No. 461,263. Patented Oct. 13, 1891.

Fig. 2.



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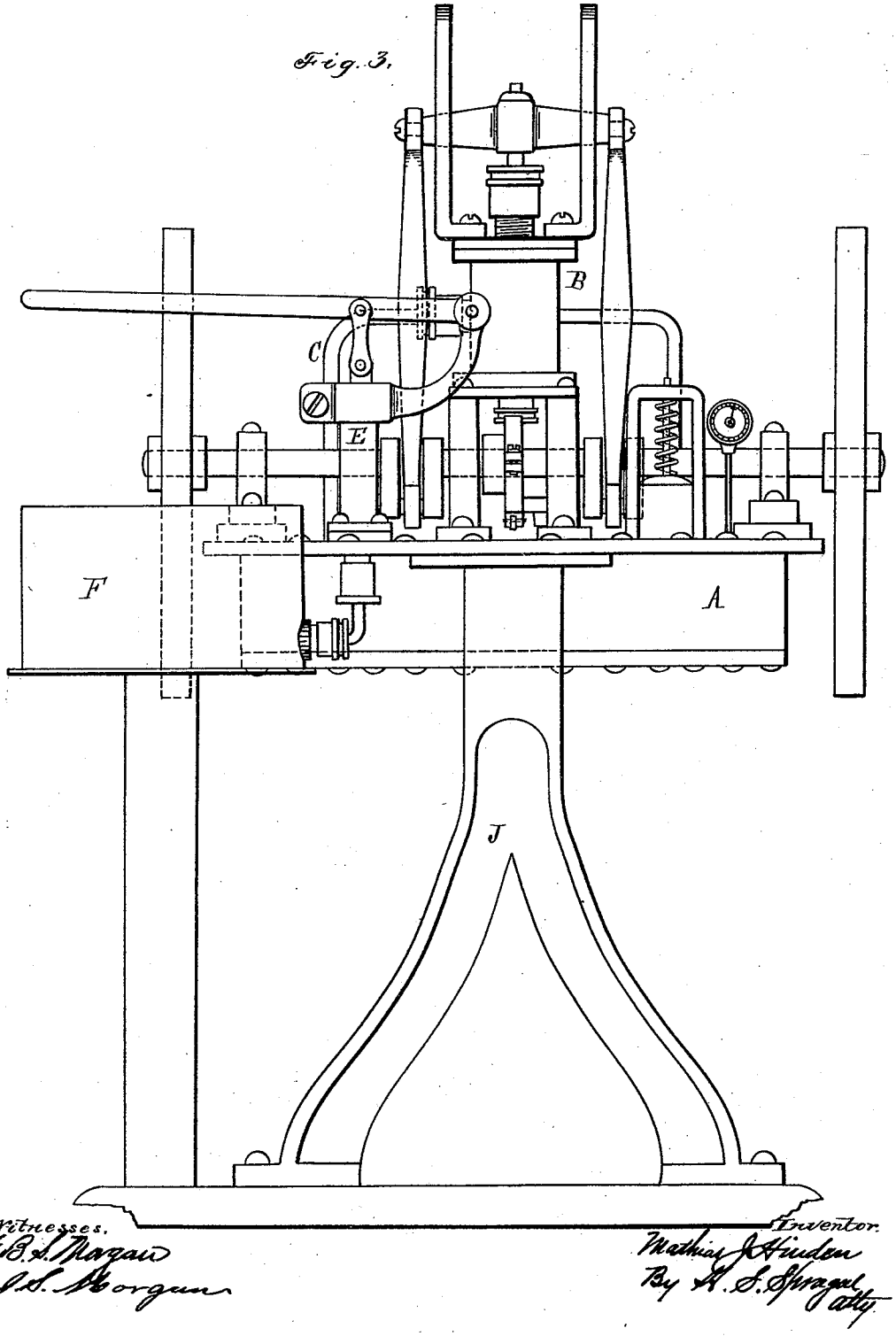
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Fig. 3.



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(No Model.) 4 Sheets—Sheet 4.

M. J. HINDEN.

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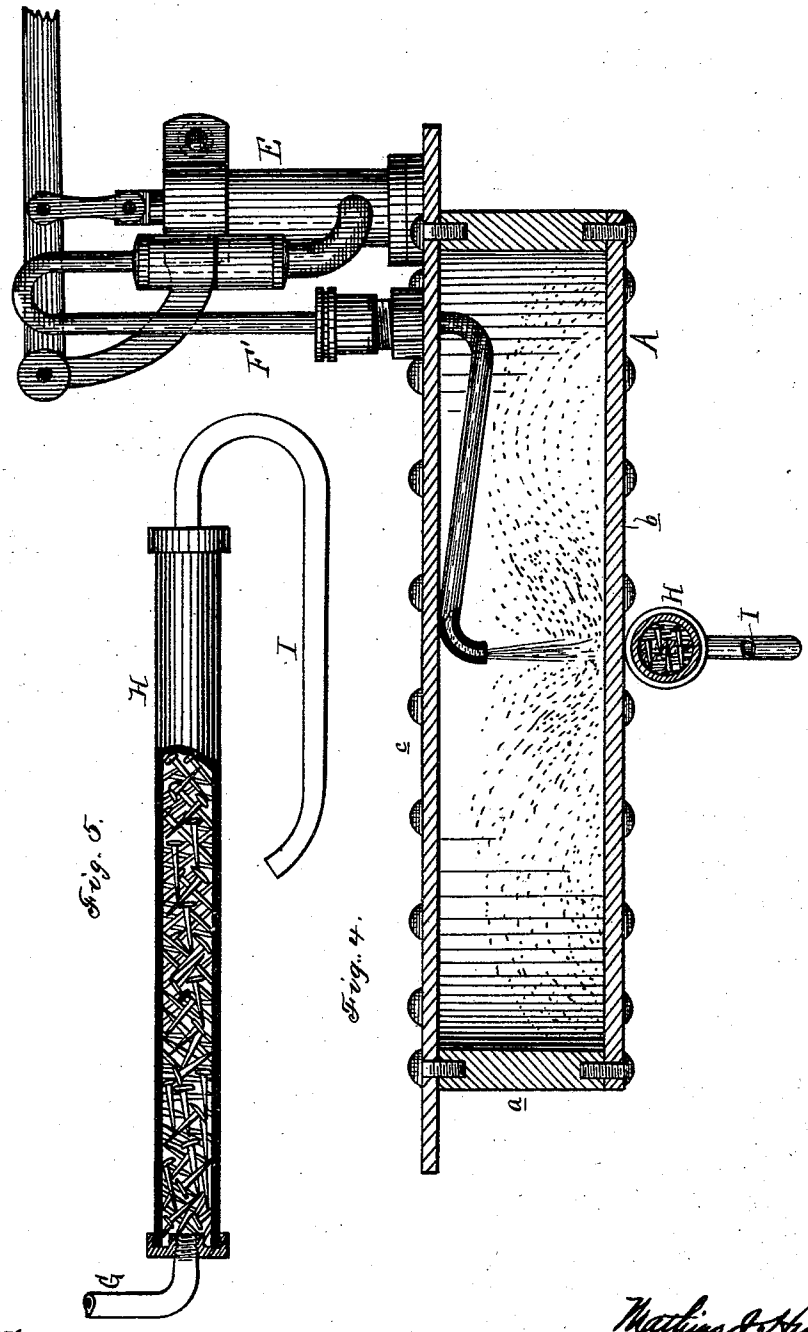


Fig. 3.

Fig. 4.

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UNITED STATES PATENT OFFICE.

MATHIAS J. HINDEN, OF CLEVELAND, OHIO.

STEAM-ENGINE.

SPECIFICATION forming part of Letters Patent No. 461,263, dated October 13, 1891.

Application filed December 2, 1890. Serial No. 373,321. (No model.)

To all whom it may concern:

Be it known that I, MATHIAS J. HINDEN, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Steam-Engines, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in steam-engines.

The invention has for its object the construction of a steam-generator especially designed for use in producing and supplying steam to an engine only in such quantity as is required for immediate use in driving an engine—or, in other words, that will generate steam only as water is fed to the generator and as the same is required by the engine—and wherein the employment of a so-called "steam-boiler" is obviated.

The invention has still a further object in the providing of means for converting the exhaust-steam into hydrogen gas, which latter is commingled with the products of combustion and burns with the primary fire employed for heating the generator. In a broad sense the invention may properly be classed as a "flash-engine."

The invention consists in the peculiar construction, arrangement, and various combinations of the parts, all as more fully hereinafter described, and pointed out in the claim.

Figure 1 is a top plan of my improved engine. Fig. 2 is a side elevation. Fig. 3 is an elevation at right angles to Fig. 2. Fig. 4 is a vertical section on the line *x x* of Fig. 1 with the engine removed. Fig. 5 is a sectional elevation of the gas-generator detached.

In the accompanying drawings, which form a part of this specification, A represents a steam-generator, which consists of an iron ring *a*, to which are bolted or otherwise secured with steam-tight joints the lower plate *b* and the upper plate *c*, which may be of any suitable metal, though I prefer steel.

For the purpose of compactness I show an an engine B as mounted upon the top of the generator A. A steam-pipe C conveys steam from the generator to the valve-chest of the engine.

E is a pump, which in large engines should be arranged to be automatically operated by the engine; but in the drawings it is shown as separated therefrom and is designed to be operated by hand. The suction-pipe of this pump communicates with a suitable water-reservoir F, while the feed or discharge pipe F′ of the pump passes to the interior of the generator A beneath the upper plate thereof, its inner end being turned down at or about the axial center of the lower plate of the generator, as shown.

G is the exhaust-pipe from the engine. The outer end of this exhaust-pipe is connected to one end of a gas-generating cylinder H, which latter is filled or partially filled with tacks, nails, or particles of iron. The opposite end of the cylinder H is provided with a pipe I, which latter is bent so as to bring its free end below the cylinder H and at or about its longitudinal center.

In the drawings I represent the steam-generator as mounted upon legs J, and in small engines where gas can be employed as the heating agent such construction might be preferable. In large engines, however, any suitable furnace—such as that shown in the drawings—may be employed.

The steam-generator may be supplied with a safety-valve and a steam-gage, if desired.

The parts being constructed and arranged substantially in the manner herein described, the operation is as follows: Water that is to be converted into steam for operating the engine is placed within a reservoir, as F. In the model I have constructed and have successfully operated I place a large lighted gas-jet below the center of the generator, and after it has been heated I force water from the pump into the feed-pipe F′, the free end of which is provided with a small hole or opening, through which the water escapes drop by drop or in a very small spray and falls upon the heated lower plate of the steam-generator and which immediately converts the water into steam. From the generator the steam passes to the engine through the steam-pipe C. The exhaust-steam from the engine passes to the enlarged cylinder H, where it is impeded by the heated particles of iron within such cylinder, generating a hydrogen gas, which escapes through the pipe I and com-

mingles with the products of combustion and burns with the fire initially employed for heating the generator and thereby greatly intensifies the heat.

There are various forms which this device may take on and still be within the spirit of my invention, and I do not desire to confine myself to the exact construction and location of parts herein shown and described.

What I claim as my invention is—

In combination with a steam-engine, a steam-generator of the character described and means for heating said generator, a cylinder placed below the said generator, said cylinder being filled or partially filled with particles of iron, and a steam-exhaust pipe communicating with both ends of said cylinder as a means for converting the exhaust-steam into hydrogen gas, substantially as and for the purposes described.

In testimony whereof I affix my signature, in presence of two witnesses, this 29th day of November, 1890.

MATHIAS J. HINDEN.

Witnesses:
H. S. SPRAGUE,
F. B. S. MORGAN.