

No. 757,050.

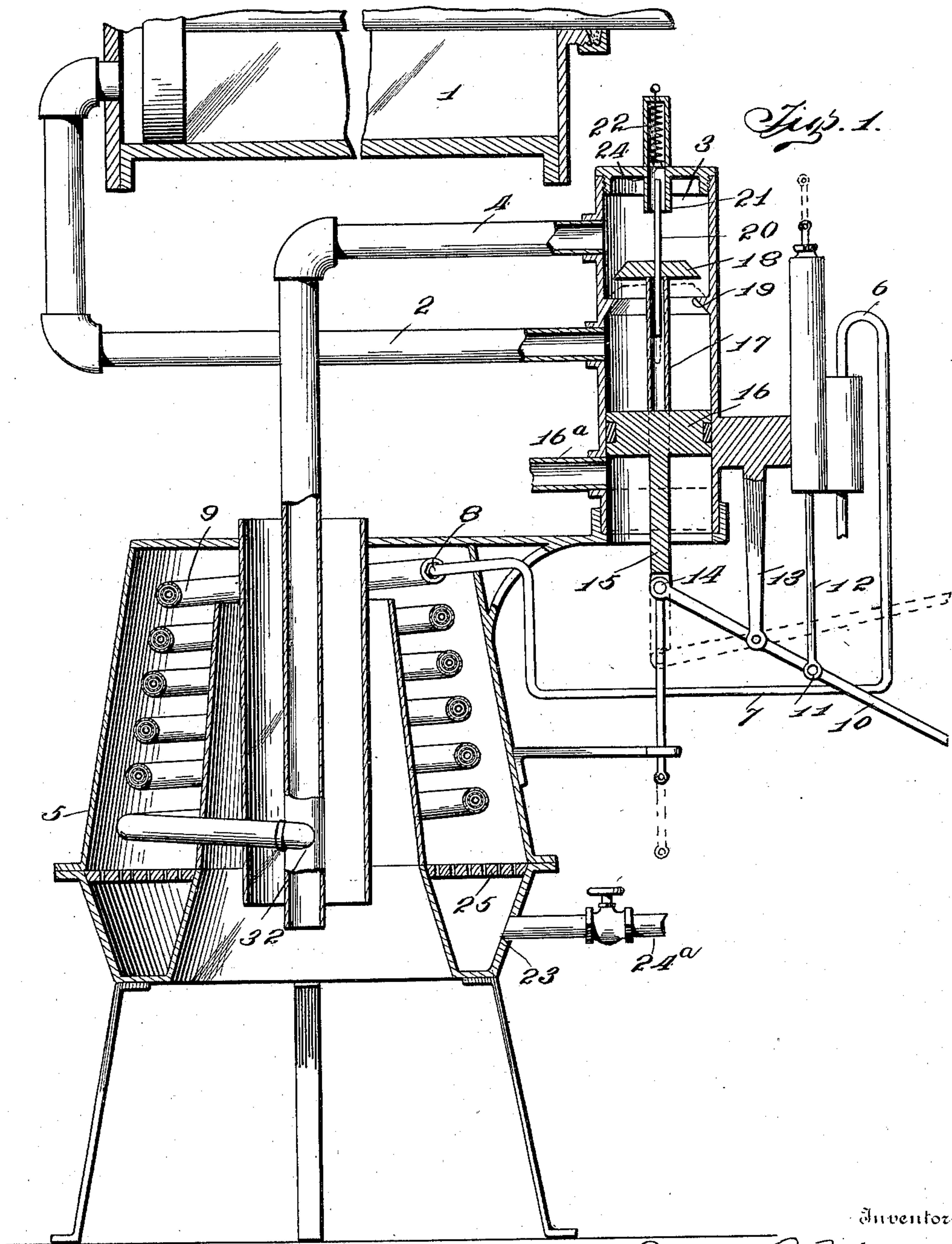
PATENTED APR. 12, 1904.

R. A. MITCHELL & L. L. LEWIS.
STEAM GENERATOR.

APPLICATION FILED JAN. 5, 1903.

NO MODEL.

2 SHEETS—SHEET 1.



Witnesses

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384

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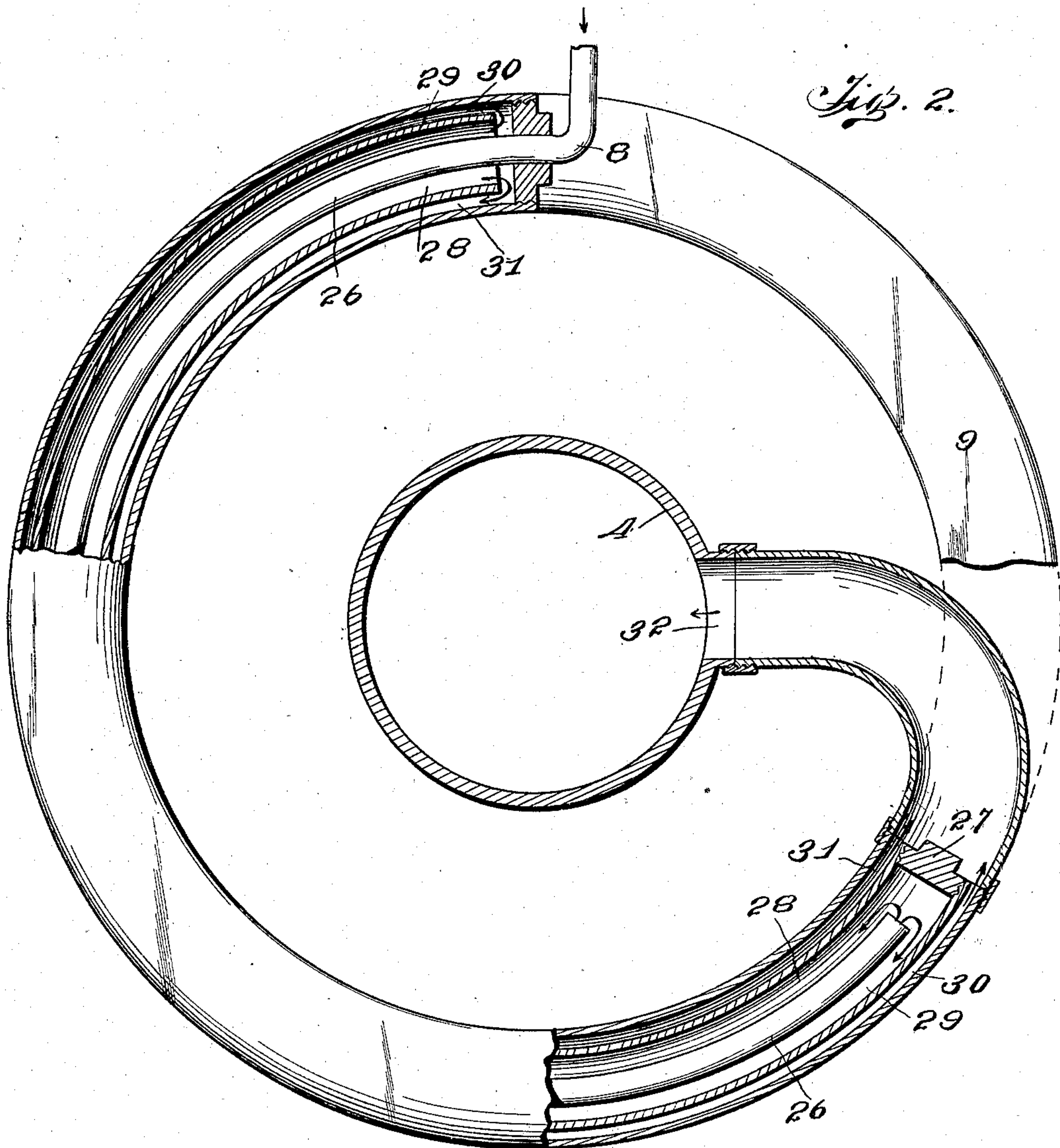
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Witnesses

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UNITED STATES PATENT OFFICE.

REUBEN A. MITCHELL AND LESTER L. LEWIS, OF OIL CITY, PENNSYLVANIA, ASSIGNORS TO THE OIL CITY GAS ENGINE STARTER COMPANY, OF OIL CITY, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

STEAM-GENERATOR.

SPECIFICATION forming part of Letters Patent No. 757,050, dated April 12, 1904.

Original application filed December 28, 1901, Serial No. 87,612. Divided and this application filed January 5, 1903. Serial No. 137,928. (No model.)

To all whom it may concern:

Be it known that we, REUBEN A. MITCHELL and LESTER L. LEWIS, citizens of the United States, residing at Oil City, in the county of Venango and State of Pennsylvania, have invented certain new and useful Improvements in Steam-Generators; and we 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.

This invention relates to certain new and useful improvements in starting apparatus for gas-engines of that type wherein the movement of the piston is effected by means of the combination of a gaseous vapor in the cylinder of the engine.

As is well known, in engines of the type above referred to it is necessary to impart to the piston of the engine an initial force which shall cause the engine to make one or two revolutions before sufficient gaseous vapor is admitted into the cylinder to effect in its combustion the necessary pressure on the piston, and hence in engines of this character various means have been suggested and employed for attaining this end and accomplishing this purpose. Various methods and means have therefore been proposed for imparting the necessary initial stroke to the pistons of the engine; and the object of this invention is therefore to provide a simple and efficient means for introducing a charge of superheated steam under pressure into the engine-cylinder, so that the engine will at once start and automatically continue its functions the same as if it were first set in motion manually or by other powers and mechanisms.

With this object in view our invention consists in the combination of this main engine and, generally speaking, certain novel means for introducing a charge of steam into the cylinder of the engine, such means consisting specifically of a steam-generator and its necessary adjuncts, means for supplying water to the generator, and means for controlling the

passage of the superheated steam drawn from the generator to the engine-cylinder.

It further consists of certain other novel constructions, combinations, and arrangement of parts, as will be hereinafter more particularly described and claimed.

With a full understanding of the merits of the invention reference is to be had to the accompanying drawings and the following description.

The invention is susceptible to various changes in form, proportion, and minor details of construction without departing from the principles or sacrificing any of the advantages thereof, and to a disclosure of the invention an adaptation thereof is shown in the accompanying drawings, wherein—

Figure 1 represents a view in side elevation, partly in section, of a mechanism embodying our improvements. Fig. 2 represents a top sectional view of our generator, showing the construction and arrangement of the coils thereof.

Referring to the drawings by numerals, 1 represents the cylinder of any ordinary and well-known type of engine, which is connected by any suitable means (not shown) to a source of gas-supply and is connected by means of the tube 2 to the chamber 3, wherein is located the valve mechanism for controlling the charge of superheated steam introduced into said valve-chamber through the medium of the pipe 4 from the generator 5. Fluid is introduced into the generator 5 by means of any well-known and suitable form of pump, as at 6, through the medium of the connecting-pipe, which is connected, as at 8, to the coil 9 of the generator. The aforesaid pump 6 is operated by means of the lever 10, which is pivoted at 11 to the plunger-rod 12 of the pump. Between the point of its connection with the plunger-rod 12 and its outer end the lever 10 is pivotally supported in the end of a depending arm 13, interposed between the pump 5 and the valve-chamber 3. At its extreme outer end the lever 10 is connected, as at 14, with

the lower stem 15 of the exhaust-valve 16, arranged in the chamber 3 and adapted to control the exhaust-port of pipe 16^a. Mounted on the upper surface of the valve 16 in the chamber 3 is a hollow slip stem or tube 17, preferably cylindrical in form, which when the starting mechanism is not in use and the lever 10 is in the position shown in dotted lines is normally held out of contact with the valve 18, which under such circumstances is adapted to rest upon the flange or, rather, seat 19, formed on the interior of the valve-chamber 3 between the point of the introduction of the superheated steam to the valve-chamber through the pipe 4 and its eduction therefrom through the pipe 2. The valve 18 is held in place against any radical movement by means of the rod 20, which has its lower end inserted in the hollow slip-stem 17 and is held at its upper end by means of the sleeve 21, which is formed in the upper portion of the casing 3. This sleeve extends some distance above the upper outer surface of the casing, as illustrated at 22, and has mounted therein a spring-valve 24, of ordinary construction, to relieve the pressure in chamber 3.

When it is desired to operate our mechanism, gas is introduced from any suitable source into the bottom of the generator 5, as at 23, through the medium of the pipe 24^a and ignited at the burner 25. The handle or lever 10 is then reciprocated a portion of the distance it occupies in the drawings and that shown in dotted lines. Water is thus forced through the pipe 7 into the coil 9. The valves when the handle is actuated, as described, will not be disturbed. These coils consist of a series of nested pipes, preferably three sizes, inserted one within the other, the largest size, of course, being the extreme exterior pipe, the second being inserted therein, the third or smallest size being inserted within the second size pipe. Upon the water entering the coils 9 at 8 it circulates through the smallest or interior pipe until it reaches the bushing 27. Thence it returns through the passage or circular chamber 28 29 over the exterior surface of the smallest interior pipe and within the interior surface of the second pipe to the bushing at the starting-point. Thence again it returns to the extremity of the coils over the exterior surface of the second size of pipe and within the interior of the largest or outside pipe through the passage or circular chamber 30 31, and is then introduced in the form of superheated steam into the stand-pipe 4 at 32. By this employment of the piping of the generator a great heating surface or area is acquired within a limited space. From the above description the operation of the device will be perfectly obvious, and, briefly, it is as follows: Gas having been introduced through the pipe 24^a and ignited at the burner 35, water is pumped, as before

described, into the coils 9, and is then conducted in the form of superheated steam into the stand-pipe 4. The valves and operating means are presumed to be occupying the relative positions shown in dotted lines in the drawings—that is, the main valve is closed and the exhaust-valve open. When sufficient pressure is attained, the lever is moved to the position shown in full lines, the main valve is moved or raised from its seat, the exhaust-passage is closed, and the charge or superheated steam will be forced through the pipe 2 and will give the piston of the engine the necessary impetus. On again moving the lever to the position shown in the dotted lines the valve 18 will drop on its seat, thus cutting off the superheated steam from the generator, and the ports 16^a will be opened for exhaust, thereby relieving pressure in the cylinder in order that the gas may flow in and ignite.

As before stated, our invention is subject to and capable of various modifications without in any way or manner departing from the spirit of the invention. For instance, instead of making use of the inlet and exhaust valve mechanism shown in the drawings and described in the specification we may attain the same ends by employing a three-way cock. Indeed, experiments have proven that for some purposes the use of the three-way cock in place of the valve mechanism above referred to is preferable, and we therefore wish to be understood as considering the employment of this device or similar mechanism as coming within the scope and spirit of the invention.

In the present application we are claiming only the elements covering the steam-generating feature of our invention, the present application being a division of an application filed by us on the 28th day of December, 1901, and designated by Serial No. 87,612.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. A steam-generator, comprising a plurality of nested, intercommunicating, coiled tubes, the inner end of each inner tube being inclosed by the next outer tube and forming a continuous passage therewith.

2. A steam-generator, comprising a plurality of nested, intercommunicating coiled tubes, each inner tube emptying into the next successive outer tube.

3. A steam-generator comprising a plurality of nested intercommunicating tubes having their alternately opposite ends closed, substantially as described.

4. A steam-generator comprising a plurality of nested intercommunicating coiled tubes having their alternately opposite ends closed, substantially as described.

5. In a steam-generator, the combination with a heating means, of a plurality of nested,

intercommunicating coiled tubes forming a continuous, circuitous passage and means for supplying liquid to one of the tubes.

5 6. In a steam-generator, the combination with a suitable heating means, of a plurality of nested, intercommunicating coiled tubes, means for passing liquid through each of the tubes, and means for causing the same, during its travel through each successive tube to
10 move in an opposite direction to its movement in the next preceding tube.

15 7. In a steam-generator the combination of nested intercommunicating coiled tubes forming a continuous passage, each outer tube having that end closed receiving the discharge from the next inner tube, means for supplying liquid to the innermost tube and means for directing heat products into contact with said coil.

20 8. A steam-generator comprising a plurality of nested tubes having their alternately opposite ends closed and each inner tube discharging against the closed end of the next successive outer tube.

25 9. A steam-generator comprising a plural-

ity of nested tubes coiled in a vertical column, the innermost tube receiving a supply at the top of the column and the outermost tube discharging at the bottom thereof, said tubes having their alternately opposite ends closed 30 and being intercommunicating and forming a continuous passage, substantially as described.

10. A water-tube boiler provided with a water-tube and with a plurality of concentric 35 pipes extending longitudinally within the water-tube and open at opposite ends, substantially as set forth.

11. A water-tube boiler provided with a coiled water-tube and with a plurality of concentric pipes extending longitudinally within 40 the water-tube and open at opposite ends, substantially as described.

In testimony whereof we hereunto affix our signatures in presence of two witnesses.

REUBEN A. MITCHELL.

LESTER L. LEWIS.

Witnesses:

JOHN M. MCGILL,

CLYDE C. SIMMONS.