

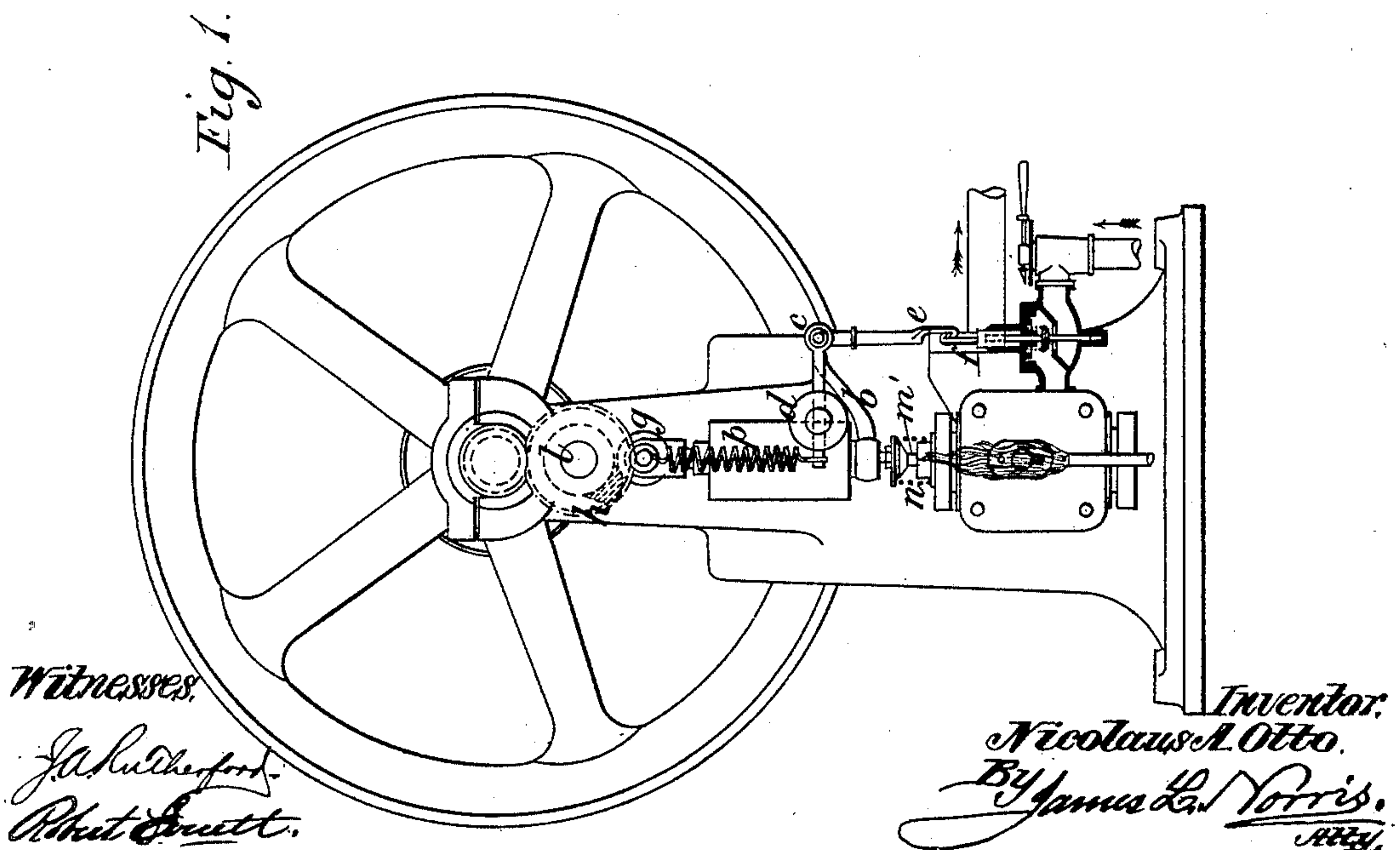
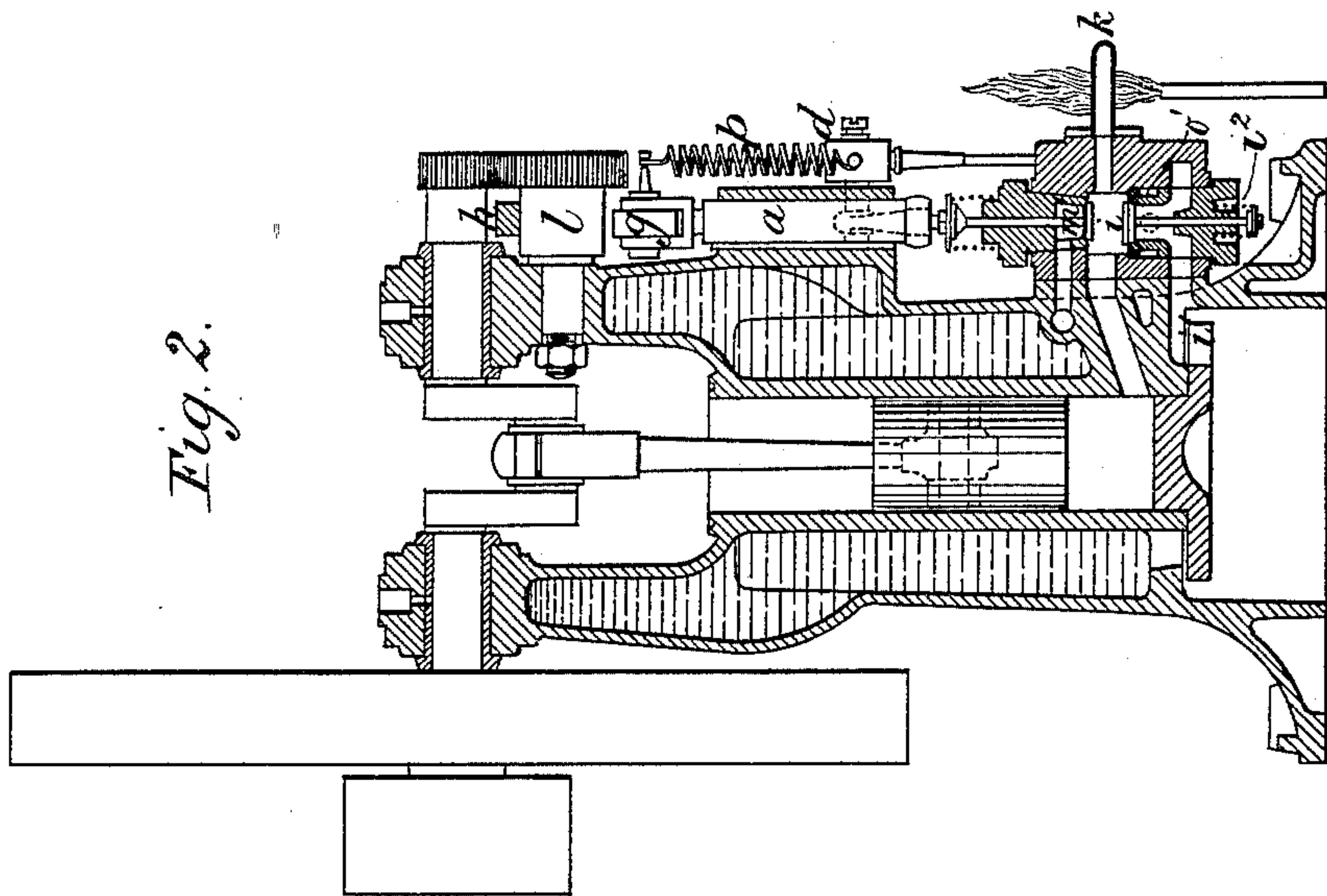
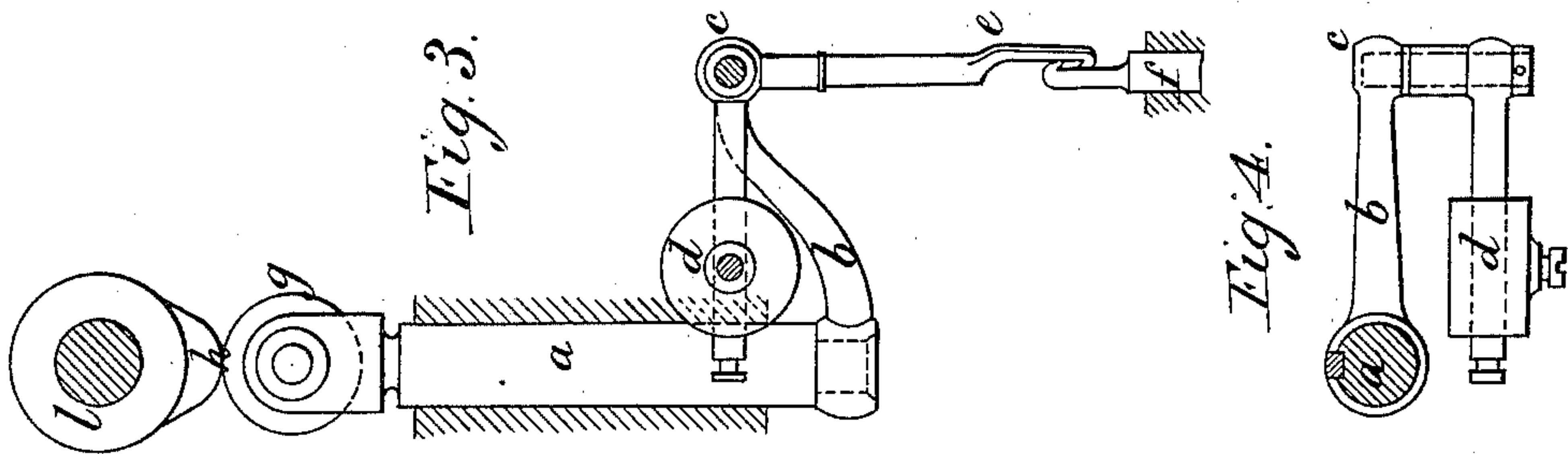
(No Model.)

N. A. OTTO.

VALVE APPARATUS FOR GAS OR OIL MOTOR ENGINES.

No. 394,080.

Patented Dec. 4, 1888.



UNITED STATES PATENT OFFICE.

NICOLAUS AUGUST OTTO, OF COLOGNE, ASSIGNOR TO THE GAS-MOTOREN-FABRIK-DEUTZ, OF DEUTZ, GERMANY.

VALVE APPARATUS FOR GAS OR OIL MOTOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 394,080, dated December 4, 1888.

Application filed July 31, 1888. Serial No. 281,510. (No model.) Patented in England July 2, 1888, No. 9,602; in Belgium July 11, 1888, No. 82,522, and in Italy September 25, 1888, XLVII, 138.

To all whom it may concern:

Be it known that I, NICOLAUS AUGUST OTTO, a citizen of Prussia, residing at Cologne, in the Empire of Germany, have invented new and useful Improvements in Valve Apparatus for Gas or Oil Motor Engines, (for which I have obtained patents in Belgium, dated July 11, 1888, No. 82,522; Italy, dated September 25, 1888, Vol. XLVII, 138, and have made application for patent in Great Britain, dated July 2, 1888, No. 9,602,) of which the following is a specification.

This invention relates to valve apparatus for gas or oil motor engines wherein the gas-valve is opened by means of a pendulum governor or inertia mechanism which fails to open the valve when the maximum speed of the engine is exceeded. Heretofore such inertia mechanism has been applied either to the ignition-slide or to the rod or lever actuating the igniting-slide.

According to the present invention the inertia mechanism is applied to a construction of motor-engine in which there is no ignition-slide, the engine-cylinder being always in communication with an igniting-tube heated externally by a gas-flame, and the inlet-valve for gas and air being held closed by a spring, so as to open automatically on the suction-stroke of the engine-piston, the ignition of the charge being effected when the highest degree of compression has been reached. In this construction of engine the only valves that are mechanically actuated are the escape-valve for discharging the products of combustion after the working-stroke and the gas-valve. The escape-valve is held closed by a spring during the suction, compression, and working strokes, and is opened by a sliding rod acted upon by an automatic cam on the engine-shaft, or by an ordinary cam on a counter-shaft driven at half the speed of the engine-shaft. This sliding rod has an arm projecting from it, to the end of which is pivoted a pendent rod having a hook at its end, which engages with a hook on the end of the stem of the gas-valve, so that when the sliding rod performs its upward stroke, allowing the escape-valve to close, it effects the open-

ing of the gas-valve by the said hooked rod. This rod has a weighted arm projecting horizontally from it, which has its end supported by a spring of such strength that when the engine is working at the normal speed it holds the arm of the rod in such a position as to cause the rod to be engaged with the valve-stem, so as to open the valve; but when the rod moves upward at a quicker speed, in consequence of the maximum speed of the engine being exceeded, the inertia of the weighted arm in acting against the spring will cause the hooked rod to be canted to one side, so as in rising to miss the hook of the valve-stem, and consequently the gas-valve will remain closed.

The accompanying drawings show the before-described invention applied to a vertical construction of gas-motor engine.

Figure 1 shows a side elevation of the engine; Fig. 2, a cross-section, and Figs. 3 and 4 enlarged sectional elevation and plan of the valve-gear.

m is the escape-valve for the products of combustion, whose stem *m'* has a disk at its upper end, which is pressed upon by a helical spring, *n*, so as to keep the valve closed, except when the stem is pressed downward by the rod *a*, the roller *g* on the upper end of which is kept by the spring *n* in contact with the cam *h* on a spindle, *l*, driven by toothed gear at half the speed of the engine-shaft, the action of the cam *h* being so timed as to depress the rod *a*, and thus open the valve *m* after the completion of the working-stroke.

o is the gas-valve, which is pressed down on its seat by a helical spring. The stem *f* of this valve has a hook at its upper end, which is engaged with a hook on the end of a rod, *e*, hinge-jointed at its upper end, *c*, to an arm, *b*, projecting from the rod *a*.

The rod *e* has a horizontal arm carrying an adjustable weight, *d*, and connected by a spring, *p*, to a pin on the upper end of *a*. When the engine works at the normal speed, the spring *p* holds the rod *e* in the position shown, in which, during its upward motion, it raises the gas-valve by means of its hook. When the normal speed is exceeded, the in-

ertia of the weight d causes it to drag behind during the upward motion, and in doing so it tilts the rod e to one side, so as to make it miss the hook of the valve, which is thus allowed to remain closed during the ensuing suction-stroke of the piston, which consequently only draws a charge of air into the cylinder.

i is the admission-valve for gas and air, the space below it being in communication with the atmosphere by the passage i' , while the pipe from the gas-valve o communicates with the annular chamber o' , surrounding the valve-seat, from which the gas issues through small channels in the seat of the valve, when the latter is opened, so as to mix with the entering air. On the engine-piston performing its suction upstroke, the valve i opens automatically against the action of a spring, i^2 , and admits a charge of gas or oil vapor and air into the cylinder, which charge is then compressed by the downstroke of the piston, and when the highest degree of compression is reached the charge is fired by the heated igniting-tube k in a manner well known, the igniting-tube being always in communication with the cylinder.

Although the gas-valve o is held open by the rods a and e at all times, except when the products of combustion are being expelled from the cylinder, yet as the gas and air admission valve i is closed at all times, except during the suction-stroke of the piston, it will be seen that gas can only enter the cylinder during such stroke.

Having thus described the nature of invention and the best means known of carrying the same into practical effect, I claim—

1. In valve apparatus for gas or oil motor engines, the combination of a vertically-sliding rod that is made to open the escape-valve on being pressed down by the action of a cam driven by the engine, a hooked rod suspended from an arm on the sliding rod and engaging with a hook on the stem of the gas-valve, so as to open such valve as the sliding rod rises under the action of a spring, and a weighted arm on the hooked rod connected by a spring to the sliding rod, whereby when the normal speed of the engine is exceeded

the hooked rod is shifted so as not to open the gas-valve, substantially as herein described.

2. In valve apparatus for gas or oil motor engines, the combination, with the gas-supply valve, of a hooked rod engaging with a hook on the valve-stem and suspended from a vertically-sliding rod that actuates the escape-valve, said hooked rod carrying a weighted arm connected by a spring to the vertically-sliding rod, which arm is caused by its inertia to disengage the hooked rod from the valve-stem, and thus prevent the valve from being opened when the normal speed of the engine is exceeded, substantially as herein described.

3. In valve apparatus for gas or oil motor engines, the combination of a gas-supply valve actuated by an inertia-governor carried by a sliding rod that actuates the escape-valve, said inertia-governor being made to open the gas-valve at all times, except during the escape of the products of combustion, a gas and air inlet valve opening automatically during the suction-stroke of the engine-piston, and an externally-heated igniting-tube that is always in communication with the engine-cylinder, arranged and operating substantially as herein described.

4. In gas or oil motor engines, the combination, with a vertically-sliding rod actuated by a cam driven by the engine-shaft, of an escape-valve on its lower end directly actuated by its downward stroke, and a gas-supply valve connected with said rod by a hook engaging with a hooked arm that is pivotally connected with said rod, said supply-valve adapted to be operated by the upward stroke of the sliding rod, substantially as herein described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 13th day of July, A. D. 1888.

NICOLAUS AUGUST OTTO.

Witnesses:

PET. LANGEN,

Cologne,

WILHELM RINCK,

Cologne, Deutz.