

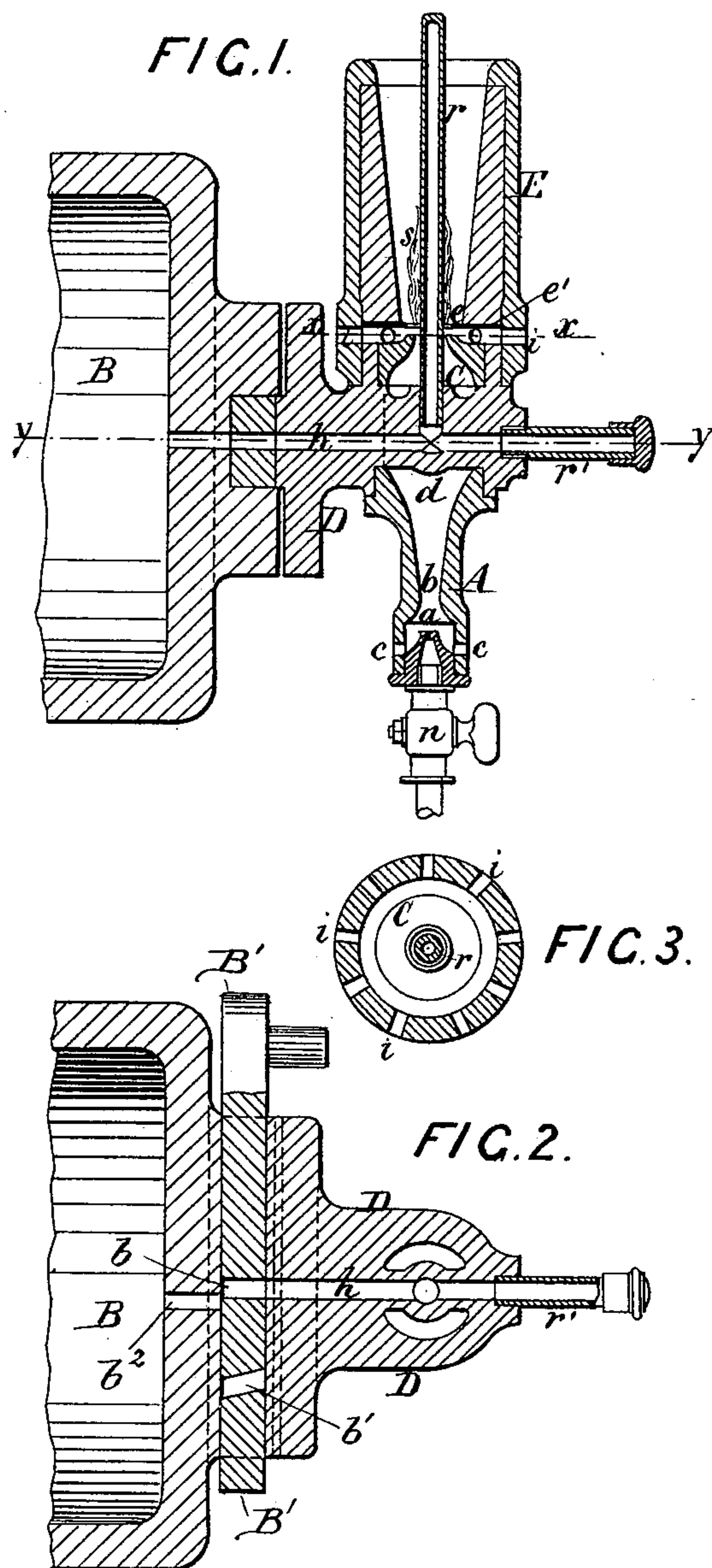
(No Model.)

N. A. OTTO.

IGNITING APPARATUS FOR GAS MOTOR ENGINES.

No. 386,929.

Patented July 31, 1888.



Witnesses,

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IGNITING APPARATUS FOR GAS-MOTOR ENGINES.

SPECIFICATION forming part of Letters Patent No. 386,929, dated July 31, 1888.

Application filed September 26, 1887. Serial No. 250,735. (No model.) Patented in England August 22, 1887, No. 11,444, and in Germany October 18, 1887, No. 41,856.

To all whom it may concern:

Be it known that I, NICOLAUS AUGUST OTTO, a citizen of Prussia, residing at Cologne, in the German Empire, have invented
5 a new and useful Improvement in Igniting Apparatus for Gas-Motor Engines, (for which I have obtained Letters Patent in Great Britain, dated August 22, 1887, No. 11,444, and have obtained a patent in Germany dated Oc-
10 tober 18, 1887, No. 41,856,) of which the following is a specification.

This invention relates to that description of apparatus for igniting the charges of gas-
15 motor engines in which a portion of the charge is brought in contact with the interior of a tube the exterior of which is heated by a gas-flame.

According to the present invention the said tube is arranged centrally within an annular
20 Bunsen burner, the flame of which consequently surrounds the tube and effectually heats it, so as to make the ignition of the charge within the same perfectly reliable. At the same time the flame is rendered of a re-
25 ducing character, and consequently protects the tube from injury through oxidation.

The said apparatus is by preference arranged as follows: To the engine-cylinder is fixed an injector Bunsen burner having formed
30 transversely through it a passage that constitutes a continuation of the ignition-passage of the cylinder, the outer end of such passage being provided with a tubular continuation closed by a removable cap. At the center of
35 the burner, and at about the middle of the passage, a branch passage extending vertically upward is formed thereon, and on this branch passage is fixed the vertical igniting-tube, closed at its upper end and communicating
40 with the cylinder through the passage at its lower end. The upper end of the chamber of the burner, in which part of the horizontal passage and the lower part of the igniting-tube are situated, narrows toward the said
45 tube, so as to leave only a narrow annular opening surrounding the same, through which the mixture of gas and air entering at the lower end of the burner issues. Surrounding the part of the tube above such annular orifice of

the burner is a cylinder or chimney, by pref- 50
erence lined with fire-clay, and having a number of openings at the level of the burner's orifice, through which air can pass in to assist the combustion of the mixture of gas and air issuing from the burner. This mixture, 55
being ignited, burns as an annular flame, surrounding the tube within the chimney, and the supply of air to the gas jet of the burner being so regulated as to render the flame of a
60 reducing character the tube will be protected against oxidation.

Figure 1 of the accompanying drawings shows a vertical section of the igniting appa-
65 ratus; and Figs. 2 and 3 show sectional plan taken, respectively, on lines *y y* and *x x*.

r is the vertical ignition-tube connected on the one side by the passage *h*, leading to the cylinder chamber B, and on the other side to a tubular gas chamber, *r'*. This gas-chamber, 70
situated behind the orifice of the ignition-tube *r*, is of considerable importance, as, in the first place, it takes up the residual products of combustion, and, secondly, it causes the ignit-
75 ing-flame to be propelled into the cylinder, as will be described.

The compressed-gas mixture to be ignited in passing back out of the cylinder first forces back the residual combustion-gases in *h* and then enters *r* and *r'* simultaneously. In *r* the mixture is ignited by the hot sides of 80
the tube, and the flame will travel down to the junction of *r* with *h*, from which point the ignition travels in both directions toward *h* and *r'*, as combustible mixture will also have entered the latter. On account of the limited 85
space in *r'* the flame will travel with increased speed toward the cylinder, and will thus insure the immediate ignition of its charge.

The burner consists of the casing D, the injector A, the annular piece C, the ignition-pipe 90
r, and the chimney E. The casing D is fixed to the cylinder, and has two passages, of which one, *h*, is put in communication with the interior of the cylinder B at the moment of ignition by means of a suitable valve or slide, 95
B', having a port, *b*, and supplemental port or passage, *b'*, which lead to the cylinder through port *b*² in the cylinder-head. The other pas-

sage has fixed to it the ignition-pipe *r*. The injector A is fixed to the bottom of the casing D, and the chamber *d* thereof, after expanding from the neck *b* upward, is contracted to a narrow annular orifice at *e*, round the tube *r*, formed by the separate annular piece C, the mixture of gas and air being made to issue through such orifice. The chimney E is lined with fire-clay, and has a number of openings, *i*, for the entrance of air, as shown at Fig. 3.

The action of the apparatus is as follows: The gas is admitted through the cock *n* and issues under pressure from the small hole of the nozzle *a*, thereby inducing currents of air through the openings *c c*. The gas and air mix intimately on passing through the conical neck *b*, and after passing through the chamber *d* issue through the annular opening *e*, where the mixture is ignited. The opening *e* is of such a small width that the flame cannot strike back into the chamber *d*. In consequence of the peculiar arrangement of the annular burner the flame S is made to immediately surround the ignition-tube *r*, whereby a sufficient heating effect is obtained with a comparatively small flame. Only so much air is drawn in through the holes *c c* as is requisite for producing intense combustion. In consequence hereof the flame S has at that part where it surrounds the tube *r* a reducing action, whereby any oxidation of the outer highly-heated surface of the tube, and consequently the rapid destruction thereof, is prevented. The openings *i*, Fig. 3, have for their object to admit sufficient air to produce perfect combustion in the flame S. Any excess of air only passes to the outer circumference of the flame and does not come in contact with the red-hot part of the tube, and therefore cannot injuriously affect it.

The tube *r'* is so fixed to the casing as to form a continuation of the passage *h*. Its object, as before stated, is to insure the certain ignition of the cylinder-charge. It also serves to receive any dirt or particles of lubricant when the compressed-gas mixture is allowed to enter the passage *h* on the opening of the valve or

slide. The end of the tube *r'* is closed by a cap, as shown, on the removal of which it as also the passage *h*, can easily be cleansed.

In the construction shown a special passage, *b'*, is formed on the slide B', which is brought opposite the passage *h* and the firing-port *b²* of the cylinder at the time when the piston is drawing in the charge in order that the combustion-gases which exist under pressure in the passage *h* and tubes *r r'* may escape or be reduced to atmospheric pressure, so that afterward the compressed combustible charge may effectually penetrate into them.

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

1. An apparatus for heating an igniting-tube for gas-motor engines, consisting of a gas-injector, A, casing D, ring C, igniting-tube *r*, and chimney E, with lateral openings, substantially as described.

2. In an igniting apparatus for gas-motor engines, the combination, with the casing D, having a passage, *h*, leading to the cylinder, of the tubular gas-chamber *r'*, forming a prolongation of the passage *h*, the vertical igniting-tube *r*, entering the passage *h* between the cylinder and the gas-chamber *r'*, and an injector fixed to the bottom of the casing D, substantially as described.

3. In igniting apparatus for gas-motor engines, the combination, with the igniting-tube *r*, and passage *h* leading to the cylinder, of the tubular gas-chamber *r'* to the rear of the opening of the igniting-tube, and means, substantially as described, for allowing the escape of the non-combustible gases under pressure from the said passages and tubes, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 3d day of September, A. D. 1887.

NICOLAUS AUGUST OTTO.

Witnesses:

GUSTAVE ALBERT OELRICHS,
MICHEL MULLER.