(No Model.) 3 Sheets—Sheet 1.

V. LOUTSKY.

GAS MOTOR.

No. 460,241. Patented Sept. 29, 1891.

fig. 2.

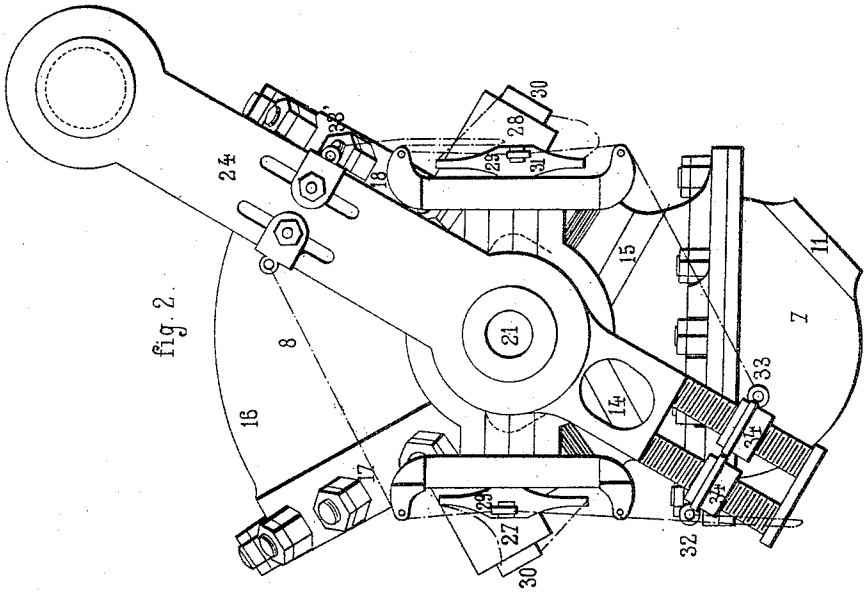
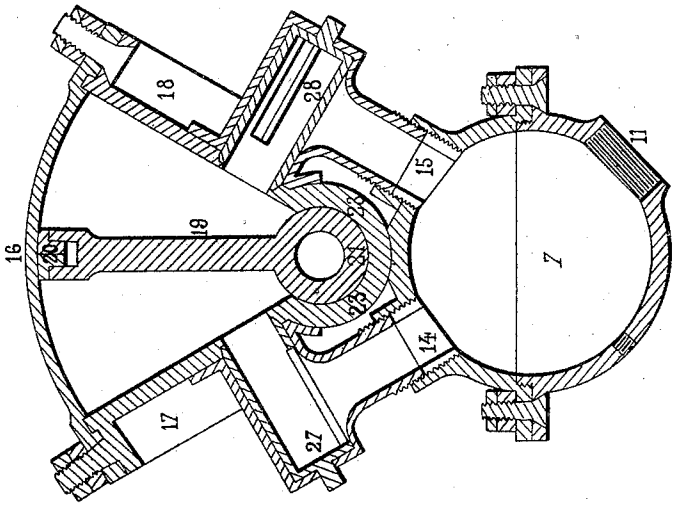


fig. 1.



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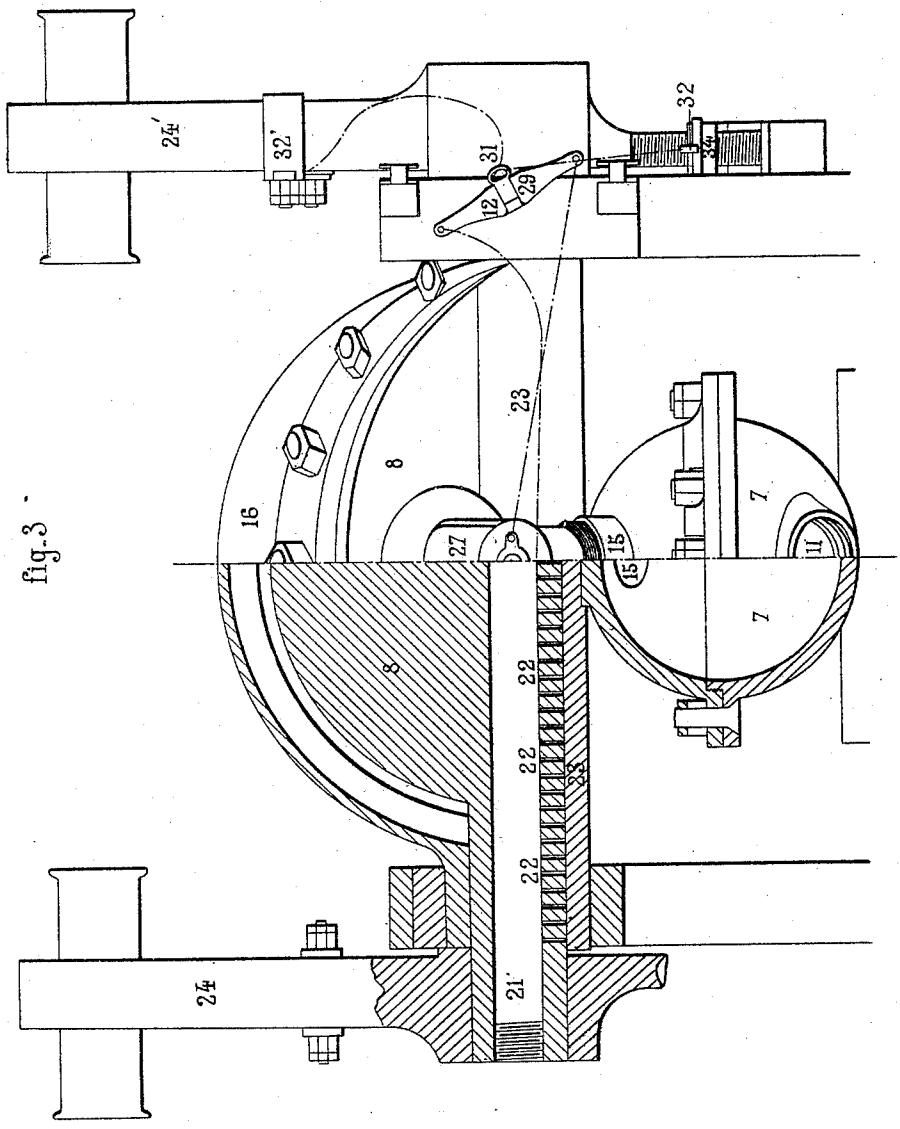

fig. 3.

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(No Model.) 3 Sheets—Sheet 3.

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Fig. 6.

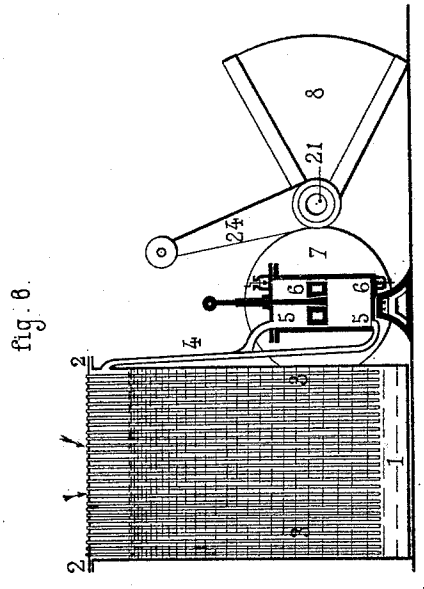


Fig. 4.

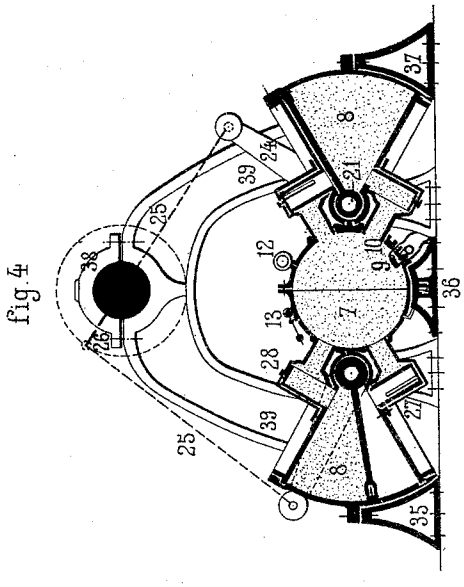
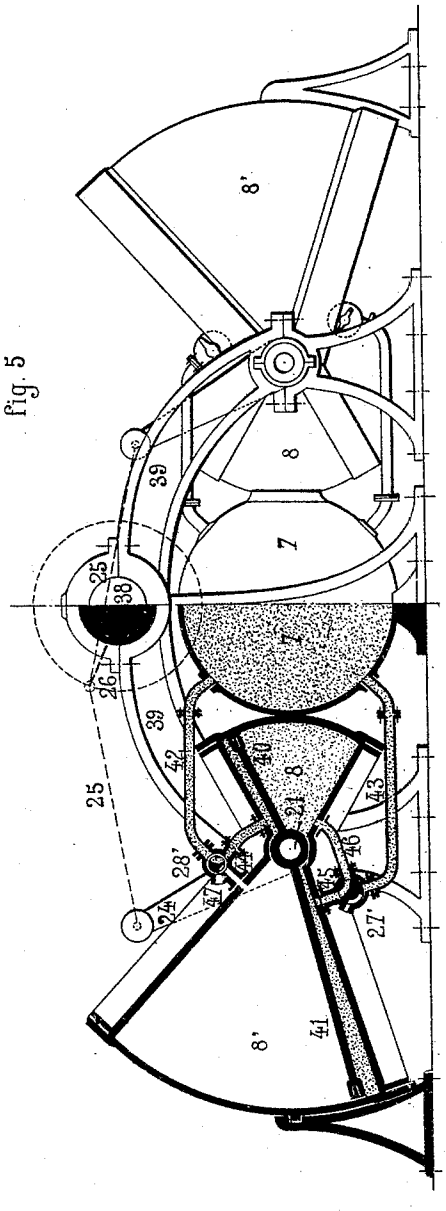


Fig. 5.



Witnesses
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Chas. Rhodes.

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UNITED STATES PATENT OFFICE.

VLADIMIR LOUTSKY, OF SOPHIA, BULGARIA.

GAS-MOTOR.

SPECIFICATION forming part of Letters Patent No. 460,241, dated September 29, 1891.

Application filed October 21, 1890. Serial No. 368,876. (No model.)

To all whom it may concern:

Be it known that I, VLADIMIR LOUTSKY, a subject of the Czar of Russia, residing at Sophia, in the principality of Bulgaria, have invented certain new and useful Improvements in Gas-Motors, of which I declare the following to be a full, clear, and exact description.

The motor which forms the object of the present application for patent operates by the action of gases formed either by explosion or by combustion of mixtures, producing high-pressure gases. That which distinguishes it essentially from other gas-motors is, first, that the gases are not formed in the cylinder, but in a separate compartment, which bears the same relation to this engine as the boiler to steam-engines, and which I will hereinafter call a "gas-chamber;" secondly, that the cylinders in my motor are replaced by sectors, which occasions a complete change of construction of all the parts of the machine.

With the object of having my invention better understood I have represented, as example, the motor, which is its object, in the drawings attached hereto.

In the drawings, Figure 1 is a vertical transverse section of a motor with a single sector through the center of the spherical gas-chamber. Fig. 2 is an elevation showing the end of the same motor. Fig. 3 represents the same motor half in longitudinal elevation (right side) and half in longitudinal and diametrical section, (left side.) Fig. 4 represents by a transverse section a motor of the same system, but with twin sectors actuating a single shaft. Fig. 5 is a view, partly in plan and partly in transverse section, of a motor analogous to the preceding with four sectors coupled to each in compound. Fig. 6 shows the general arrangement of the motor and of the generator of explosive mixture. It shows this last in longitudinal section.

The motor forming the subject of the present invention comprises three distinct apparatuses—the carburetor, the compressor, and the motor proper. These three apparatuses are represented together in Fig. 6 of the drawings attached.

Carburetor.—The carburetor has the object of forming the explosive mixture which will actuate the motor. It is a reservoir 1 of variable form and capacity containing the liquid whose vapors must serve to carburet the air—benzine, for example. This reservoir is hermetically closed at its upper part by a cover 2, through which pass a group of vertical tubes 3 3, open at their two extremities and going down to the lower part of the reservoir into the liquid which is to be evaporated. The air drawn by the pump follows the direction indicated by the arrows. It descends into the tubes and comes back to the upper part of the reservoir after having passed through the benzine and been charged with the vapors of this liquid in sufficient proportions to form with the air an explosive mixture. It passes from there by pipe 4 into the compressor.

Compressor.—The compressor is a small compression-pump with double action, to be actuated by the motor itself or by any other appropriate means. It alternately draws the gaseous mixture coming from the carburetor by the valves 5 5 and forces it through valves 6 6 into the gas-chamber 7 of the motor. Its working does not differ from that of an ordinary double-acting force-pump.

Motor.—The gaseous mixture thus forced by the compressor traverses a grating of wire-gauze, (Davy's principle,) hindering the propagation of the explosion to the compressor, and goes directly to the motor. This latter includes the gas-chamber 7 and sector 8. The gas-chamber, which is represented in Fig. 1 in section at its largest diameter, bears much the same relation to this engine as a boiler on steam-engines. It is in this gas-chamber, formed of a hollow metal ball of great resistance, that the mixture coming from the compressor is ignited continually by a wire spiral of platinum 9, Fig. 4, brought to incandescence by means of an electrical current originating from a battery or a dynamo. This spiral of platinum is carried by a plug having the form of a screw 10, which serves at the same time as a joint or coupling for the gas-induction tube, and is screwed in the opening 11 of the gas-chamber, Figs. 1 and 2. Instead of burning the gaseous mixture as soon as it comes in, the explosion could equally well be produced at intervals and at the desired moment to act on the piston, as in ordinary gas-motors.

However this may be, the igniting of the mixture produces a pressure more or less considerable, which will act when wanted on the surface of the piston. By the manometer 12, Fig. 4, the exact force of the pressure can be ascertained, and by safety-valve 13 a part of the gases can be let off should the pressure become excessive.

Two cast tubes 14 and 15, Fig. 1, form the communication from the top of the gas-chamber to the two bottoms of the sector. The sector 8, which replaces in this new motor the cylinders until now in use in gas-machines, is formed of a curved wall or surface 16 and by two flat walls 17 and 18, forming covers and connected with the round part, as is shown in Fig. 1.

The movable piston 19 is a half-circle of metal (see Figs. 1 and 2) and journaled at the axis of the arc of the curved wall 16 of the sector. The joint between the semi-circular end of the oscillating piston and the curved wall 16 of the sector is provided with a double packing of flexible metal segments 20, pressed by springs. This joint can also be packed with asbestus. The axle of the piston is a hollow shaft 21, pierced by small holes 22 22, which distribute the oil poured into the shaft to oil the cylindrical bearing 23, in which the shaft oscillates. The shaft carries at its two ends crank-arms 24 and 24′, which, by means of the connecting-rods 25, actuate the crank 26 of the horizontal shaft of the motor, when the pressure of the explosive mixture acts alternately on one or the other surface of the oscillating piston. The gaseous mixture coming from the gas-chamber enters the sector through two turning distributers or cylindrical valves 27 and 28, constructed as shown in Fig. 1. These rotary valves, designed to establish the alternate communication of the two parts of the sector separated by the piston with the gas-chamber for the admission of gas and with the atmosphere for the escape, are automatically put in motion by the motor itself by means of the arrangement shown by Figs. 2 and 3.

On the frame of the machine a cross-head 29 is pivoted centrally, which can oscillate around its pivot. The two ends of this cross-head are connected by small chains (indicated by dotted lines in the drawings) to the two branches of the double key 30, secured to the stem of the cylindrical valves 27 or 28. The cross-head 29 receives an oscillating motion from the main crank 24 of the machine by means of the two other chains, which run on guide-pulleys and connect eye 31 of the crank to the two eyes 32 and 33 on the other end of the crank, which can be adjusted by the threaded collars 34. These screws can be moved on the main crank 24, as is easily seen by examining Fig. 2. It is the same with eyes 32′ and 33′, carried by the crank 24′ on the opposite end of the shaft 21.

This system of distribution works in the following manner: Suppose the explosion to have taken place and the pressure be established in the gas-chamber, the valve 27 forming the communication of the gas-chamber with the left part of the sector, Fig. 1, the pressure acting on the piston would make it turn from left to right. At the same time the gaseous mixture which produced the movement of the piston during the preceding stroke would escape freely to the air by valve 28, which remained open during the duration of the stroke, since the chain which controls its movement is not drawn by side lever 24. When the piston 19 has arrived at the end of its stroke, the chain system before described would reverse the positions of the two valves, the valve 28 serving now for the admission and the valve 27 for the escape of gas, and the piston would effect a new stroke from right to left. It is easily understood that by properly regulating the length of the chains and by varying the position of the eyes by which they are secured to the cranks the degree of expansion of the gas can be varied by causing the closing of the induction-valve when the piston has made a certain fraction of its stroke.

Fig. 4 illustrates the arrangement I adopt to attach two sectors of this kind to the crank of the same horizontal shaft. The manner of construction and the working of each of these sectors taken singly differs in nowise from what I have explained on this subject in the preceding description; but in this particular case the gas-chambers of the two motors have been united in one 7 with an appropriate capacity, so as to diminish the weight and bulk of the motor. The gas-chamber and the ends of the sectors are supported by hollow cast columns or bases 35, 36, and 37, fastened on the foundation of the machine by bolts secured in the masonry.

The two cranks 24 24′ actuate, by means of the two connecting-rods 25, the same crank of the horizontal shaft. The result of this arrangement is the avoidance of the dead-centers. When in fact one of the connecting-rods is in the plane of the crank of the horizontal shaft, as is shown in Fig. 4 for the right-hand rod, the other connecting-rod (to the left in Fig. 4) is very nearly perpendicular to this plane and acts with maximum power. Owing to this arrangement there is but little variation in speed at the different points of the stroke, the action being substantially the same in this regard as that obtained in ordinary motors with two juxtaposed cylinders acting on cranks at ninety degrees. The horizontal shaft 38 is supported by two bearings 39 of the character illustrated.

In the motor with four sectors, shown in Fig. 5, I have applied the general principle of compound engines by conducting the gas escaping from the little sector 8 to expand in a larger sector 8′. These expanded gases act then at the same time on the opposite faces of the small and large pistons.

The general arrangement of the motor is the same as in the preceding case. The four cylinders are grouped two and two on opposite sides of the gas-chamber. Each of the oscillation shafts 21 is actuated by two opposed pistons 40 and 41, the first one 40 having a smaller surface than the second 41. The gas-chamber 7 is connected with the sectors by pipes 42 and 43, which can alternately be closed or put in communication with the smallest of the sectors or high-pressure sector 8 by the two-way cocks 44 and 45, constructed as shown in Fig. 1. These two cocks or distributers 44 and 45 are actuated automatically by an arrangement of chains and levers identical to the one previously described in connection with the motor with one sector. These chains have not been indicated in Fig. 5, to avoid encumbering the drawings.

Suppose the machine to be working normally at the moment its parts are in the positions shown in Fig. 5. The high-pressure gas mixture coming from chamber 7 is conducted by pipe 42 and the valve 44 to the upper end of the high-pressure sector 8. It acts then on the piston 40 and turns it in the direction of the arrow. The gaseous mixture on the other side of this piston, expanded to medium pressure, which has done its work during the preceding motion, instead of escaping directly to the atmosphere, is led by pipe 46 and valve 45 into the large sector or low-pressure sector 8′. The valve 45 remaining for the duration of the stroke in the same position indicated by Fig. 5, the same pressure prevails to a given area during a single stroke in the bottom of the two sectors, which communicate, and the work produced by the difference of the pressure exercised on the two pistons, owing to the greater surface of the larger one, is added to the work effected in the high-pressure sector. At the same time the gaseous mixture completely expanded, which occupied space 8′ on the opposite side of the larger piston, escapes into the atmosphere by opening 47. Once the stroke is finished the commanding chains shift the two valves 44 and 45, and the same motion is produced in the opposite direction.

This motor presents, compared to those of single action, the well-known advantages of compound engines over those of single cylinder, the better utilization of the fuel, a more regular strain on the cranks, &c.

As is seen from the drawings, these motors with several sectors require but one gas-chamber.

I do not limit myself to the exact forms, materials, dimensions, and proportions above indicated, and I reserve the right to use at my will all the explosive mixtures which can actuate my motor.

What I claim is—

1. In motors operated by gas or other explosive mixtures, the combination of the spherical gas-chamber 7, in which the explosion or combustion takes place, having the tubes 14 and 15, the chamber of the motor in which the piston works connected directly with such gas-chamber 7, the valve-casings on opposite sides or ends of the piston-chamber, and the pipes connecting the tubes 14 and 15 directly with the said valve-casings, substantially as set forth.

2. In motors operated by gas or other explosive mixtures, the combination of the gas-chamber in which the explosion or combustion takes place, having the tubes 14 and 15 leading therefrom, the sector-shaped piston-chamber arranged with the axis or shaft of the piston next to the gas-chamber between the tubes 14 and 15, the valves on opposite sides of the piston-chamber, and the connecting-pipes between the tubes 14 and 15 and the said valves, substantially as set forth.

3. In a gas-engine of the character described, the combination of the gas-chamber, the sectors and their pistons, the valves arranged between the gas-chamber and each sector, and chains adjustably secured to the crank-arm of the piston-axle to operate the valves, substantially as described.

4. In a gas-engine of the character described, the combination of the gas-chamber, the sector, independent pipes leading from the gas-chamber to opposite sides of the sector, a valve for each pipe, an oscillating piston mounted in the sector and provided with an axle fitted with cranks, and chains secured to the cranks for operating the valves, substantially as described.

5. In a gas-motor, the combination, substantially as described, of the gas-chamber, an igniting device arranged within the gas-chamber, the sector, with its piston, pipes leading from the gas-chamber to opposite sides of the sector, a valve arranged on each side of the sector to control the admission or exhaust of gas, and means for automatically shifting the valves.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

VLADIMIR LOUTSKY.

Witnesses:

MELITON NAEACTEDGE,

ELISE DAURGALLOFF.