No. 680,237. Patented Aug. 13, 1901.

M. A. EUDELIN.

MOTOR FOR AUTOMOBILES DRIVEN BY EXPLOSION OF INFLAMMABLE VAPORS.

(Application filed Nov. 12, 1900.)

(No Model.) 2 Sheets—Sheet 1.

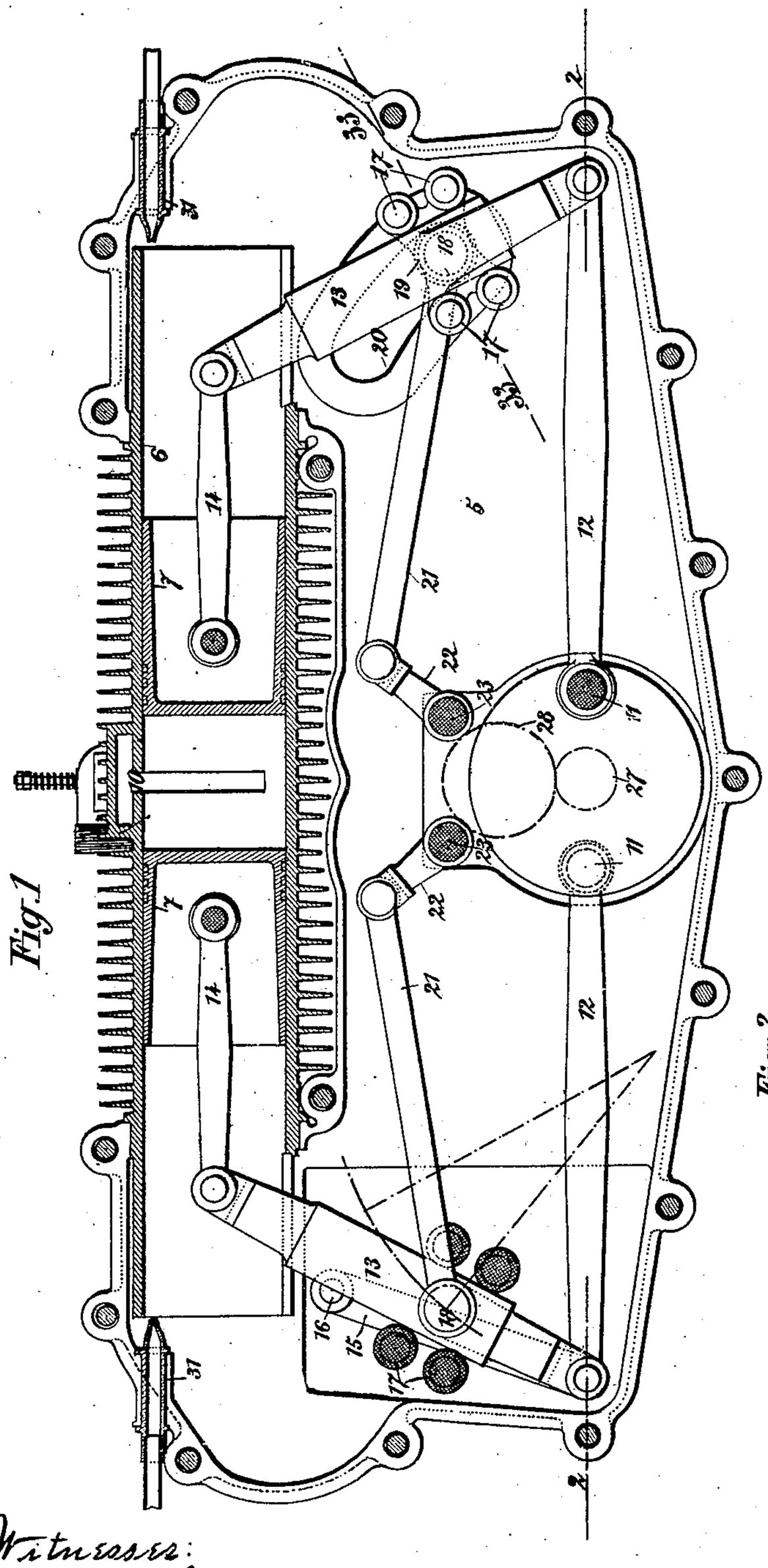

Fig. 1

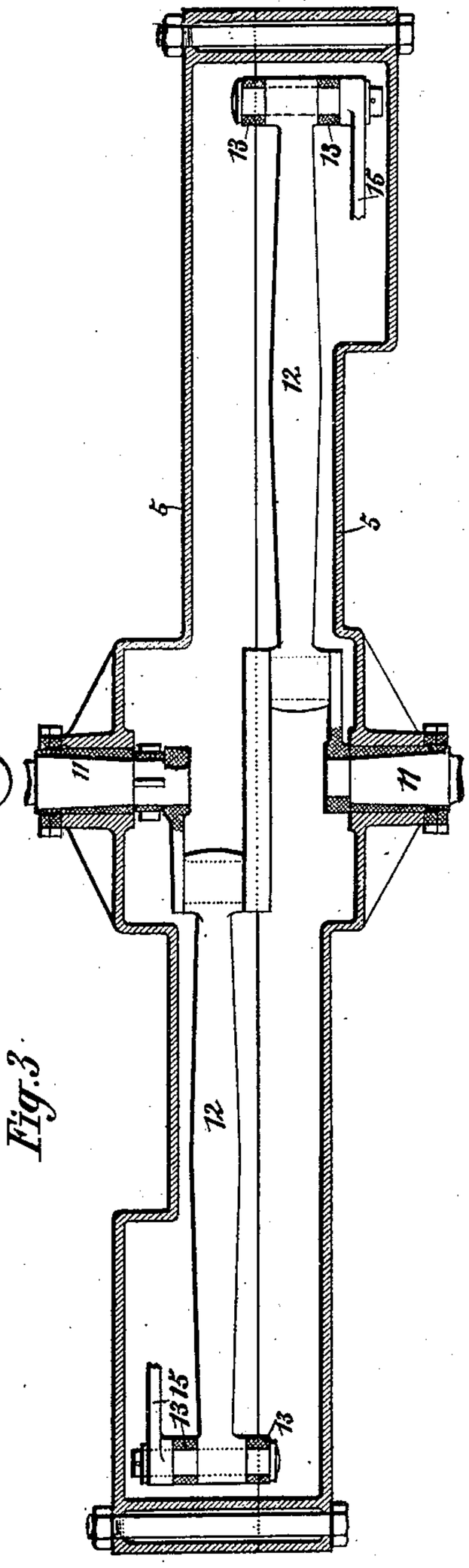

Fig. 3.

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Fig. 2

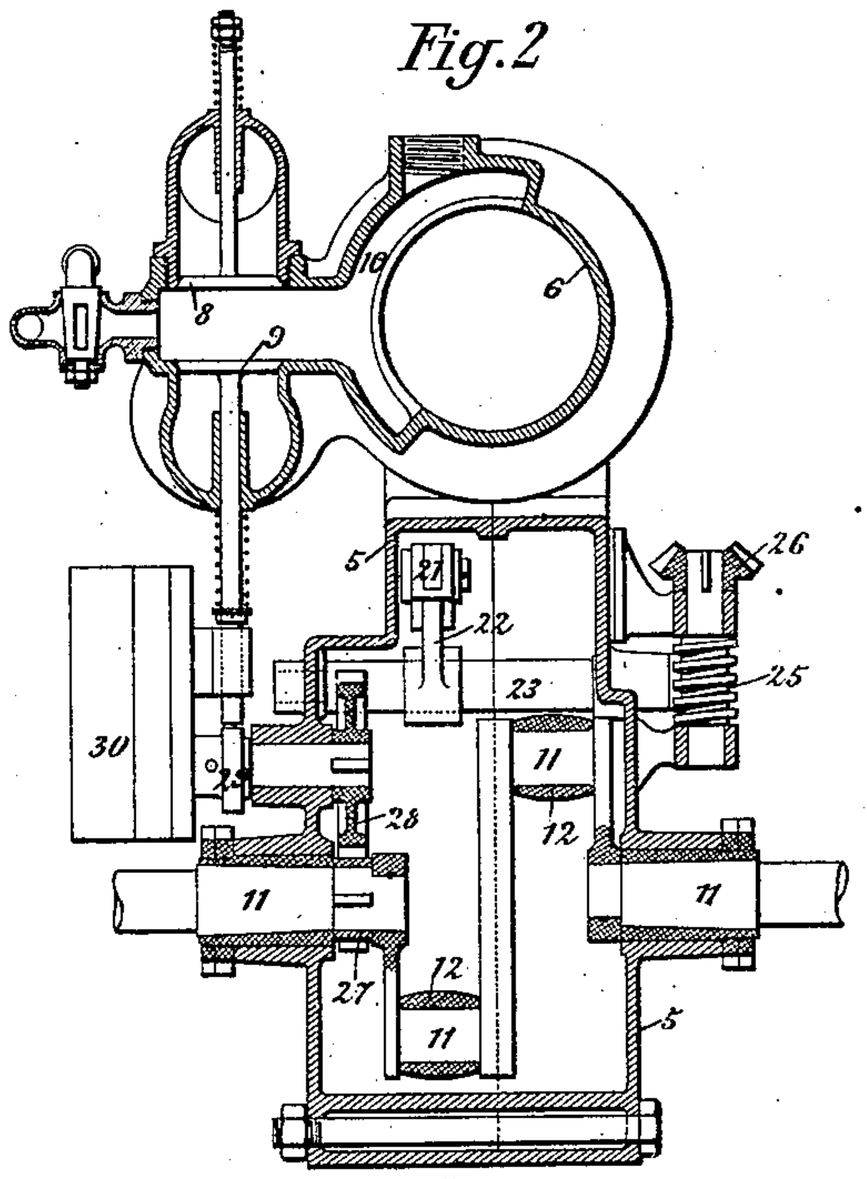


Fig. 4

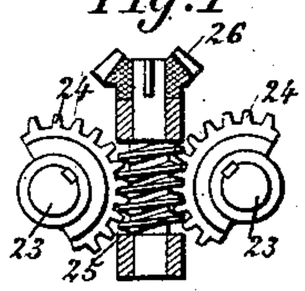
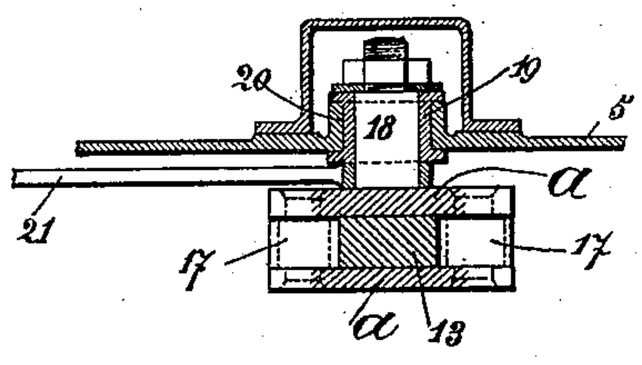


Fig. 5



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UNITED STATES PATENT OFFICE.

MAURICE AUGUSTE EUDELIN, OF PARIS, FRANCE.

MOTOR FOR AUTOMOBILES DRIVEN BY EXPLOSION OF INFLAMMABLE VAPORS.

SPECIFICATION forming part of Letters Patent No. 680,237, dated August 13, 1901.

Application filed November 12, 1900. Serial No. 36,225. (No model.)

To all whom it may concern:

Be it known that I, MAURICE AUGUSTE EUDELIN, gentleman, a citizen of the Republic of France, residing at No. 11 Avenue Hoche, Paris, France, have invented certain new and useful Improvements in the Motors for Automobiles Driven by the Explosion of Inflammable Vapors, of which the following is a specification.

My invention relates to improvements in the construction of motors for automobiles driven by the explosion of inflammable vapors; and the object of these improvements is to produce such a motor, the same being arranged so as to equilibrate the work of the pistons and susceptible at the same time of being run with an always-constant power, no matter how variable the speed may be which it is called upon to develop.

All experts agree upon the fact that there are no better motors for driving automobiles than those moved by the explosion of hydrocarbons or carbureted air, because they can be worked at a very high speed. Unfortunately all the motors of this kind made since the application of explosion-motors to automobiles are deficient, and this deficiency results from a construction which violates the laws of mechanics. One of the inconveniences of these motors is that they only work in a satisfactory manner when they are run at the speed for which they are built, and the means tried to raise this speed through the instrumentality of the igniting device have proved defective and were resorted to only because no better ones were known. Besides this, it is obvious that at the moment when the vehicle is to start its movement the motor ought to work with its highest power; but just the contrary takes place. They work at this moment with their lowest power. Therefore with these motors it is alway difficult to make the vehicle start, if it does not fail altogether, which very often happens. The inconvenience heretofore mentioned is aggravated in many cases by the mechanism for changing the speed being constructed so that it only allows of four different speeds to be used—as, for instance, fifteen, twenty, twenty-five, and thirty kilometers per hour—so that at the moment when the vehicle is to be started the motor, instead of being coupled with a mechanism for a very low speed, is compelled to work on a mechanism constructed for a speed of fifteen kilometers. It is easy to understand what the results of such a defective arrangement must be. Finally, it must not be lost sight of that the speed of a carriage is the result of two elements—power and resistance. Therefore when the carriage has to ascend a slope the speed of the carriage must be made dependent on the angle of the slope, the power of the motor being limited. With the motors now in use it is impossible to obtain this result. A necessary consequence of this is that the motors nearly always work under abnormal conditions, whereby they are quickly used up, and the automobile is sure to be soon out of working order and requires frequent and expensive repairing. The owners of automobiles know that very well, having paid for the experience.

In order to lead automobilism on a new and practical path, it is necessary to throw overboard all the ideas cherished heretofore as to the construction of such motors and try to solve the problem by finding a motor which is capable of adapting itself automatically to the different and variable conditions under which it may be called upon to work, so that its efforts are always in a mathematically-exact proportion to the work required. My invention realizes this desideratum by providing a motor working always normally whatever the speed may be which it is desirable to give to the same within two limits to be chosen at will, and this without ever changing its power. This is a point of capital importance, as has been explained heretofore.

The invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of the motor. Fig. 2 is a cross-section of the same cut through the axis of the driving-shaft. Fig. 3 is a longitudinal section of the motor on the line 2 2 of Fig. 1. Fig. 4 shows a detail of the mechanism. Fig. 5 is a sectional view on a plane through line 33 33 of Fig. 1, illustrating the plate carrying the rollers and its location in the curved slot.

Similar numerals refer to similar parts throughout the different views.

The motor rests in a frame composed of

two pieces 5 5, tightly joined and firmly held together by bolts or in any other suitable manner. To the upper part of the said frame is fastened the cylinder 6, which is cast with an arrangement on its outside intended to facilitate its cooling. The cylinder has two pistons 7 7. About in the middle of its length two valves are placed—the suction-valve 8 and the escapement-valve 9. As will be seen from the drawings, the arrangement of these valves is such that they suffice for both of the pistons and only one electric candle is used for the ignition of the explosive mixture. The latter apparatus is placed on the conduit 10, which connects the valve-chests with the cylinder. The driving-shaft, with its crank 11, turns in bearings arranged in the frame. The reciprocating movement of the pistons is communicated to the crank 11 by the piston-rods 14 14, the levers 13 13, and the connecting-rods 12 12, these different parts of the mechanism being articulated on each other, as shown by the drawings, Fig. 1. The levers 13 13 oscillate on the arms 15 15, on which they are articulated by the same pivots which connect them with the two connecting-rods 12 12, and the said arms 15 swing on pivots 16, which are solid with a bearing in the frame. The oscillating movement of the levers 13 is controlled by the rollers 17 17, &c., of which two are fastened on each side of each lever, as in the plates *a a*, Fig. 5, freely in a slider 19, which can be moved in the groove 20, provided in the shell of the frame. One of these grooves is in the fore part and one in the back part of the frame.

Two connecting-rods 21 are hinged with one end on the pivots 18, heretofore mentioned, and with the opposite end on the levers 22, which swing on the pivots 23. These latter pivots have outside the frame toothed segments 24, both of which gear with the endless screw 25, which has at its top a conical pinion 26 or any other suitable arrangement for imparting a rotating movement to the said screw.

The driving-shaft 11 has also a pinion with teeth 27, gearing with a wheel of twice the diameter 28 and mounted on the shaft bearing the cam 29, which latter controls the rod of the escapement-valve 9 and also that of the igniting apparatus inclosed in the casing 30. Finally, there is at each extremity of the cylinder 6, preferably at its upper part, a pipe with a mouthpiece 31, communicating with a pump, the purpose of which will be explained later.

Having thus fully described the mechanism forming my invention, I shall now proceed to explain its working.

The motor works on the principle of the four-timed cycle. During the suction period the pistons 7 7 being apart from each other—that is to say, at the extremity of their outward stroke—the valve 8 is lowered automatically by the action of the pressure produced by the partial vacuum in the cylinder and the explosive mixture is admitted. During the second period the pistons execute their inward stroke and compress between themselves in the cylinder and the explosion-chamber formed by the space between the valves and the conduit 10 the volume of the explosive mixture admitted before through the lowering of the admission-valve. At the beginning of the third period the electric spark passes into the conduit 10 and ignites the explosive mixture, whereby the pistons are compelled to execute their outward stroke. At last, during the fourth period, the pistons approach each other and the explosive gas being compressed by them escapes under the influence of this pressure through the valve 9. Now it will be understood by looking at the drawings that during the active period of the explosion each piston 7 acts through its rod 14 on the levers 13, respectively, and the latter oscillate on the pivot 18, which turns in the slider 19, and they work between the rollers 17, imparting their movement to the connecting-rods 12, which act on the crank 11, so that the latter receives its impulse simultaneously from both the pistons 7 7. As these two pistons have the same diameter they receive the same pressure, so that the efforts on both of them being absolutely equal the motor will work without causing any vibration, the two levers 13 hanging on the arms 15, which determine their position and prevent them from being raised or lowered, the lower ends of the said levers running always on the same line and having the same length of stroke. Therefore if the slider 19 is displaced in its groove 20 the upper ends of the levers will have a stroke varying in length according to the place of the sliders 19, wherein their pivots 18 turn, so that when the sliders are lowered the pistons 7, being limited in their movement by the said levers, will have a longer stroke, and when the said sliders are raised the pistons will have a shorter stroke. Now as the speed of the motor depends on the length of the stroke of its pistons it is plain that when the sliding bearings 19 are raised the motor will work at a higher speed, and when they are lowered at a lower speed—that is to say, the speed of the motor is determined by the position of the sliding bearings 19. On the other hand, however, this change of speed will have no influence on the power of the motor, as the lineal speed of the pistons remains the same just as well as the medium pressure acting on the pistons. This latter allegation has to be demonstrated. In order to preserve the same medium pressure on the pistons, it is necessary and sufficient that the degree of compression be kept constant, so that the solution of the problem lies in finding the center points for the pivots 18 in such a manner that the degree of compression shall remain constant. In the case before us these points are to be found in the arc of a circle, and by this fact one may be led to re-

place the arrangement heretofore described by another one, if this should be desirable. As the curved groove 20 forms an arc, it may be dispensed with and the pivot 18 placed at the extremity of a one-armed or double-armed lever having its point of articulation at the center of the said arc. Such an arrangement would answer the purpose just as well. In order to displace the sliding bearings 19 in their grooves 20, according to the speed to be obtained from the motor, it is only necessary to turn the endless screw 25, Fig. 4, in the proper direction, whereby the toothed segments 24, the pivots 23, the levers 22, and the connecting-rods 21 are moved, and by their movement raise or lower the said bearings, as the case may be. Furthermore, the two connecting-rods 21 being displaced symmetrically the raising or lowering of the bearings 19 will be exactly the same on both sides of the mechanism. When the invention is carried out, it will be best to have the endless screw 25 controlled by the regulating device of the motor, so that the speed may be determined automatically in accordance with the resistance to be overcome.

The teeth of the wheels and the pinions are to be cut in such a way that they gear with a certain freedom in order to prevent them from acting on the screws under the action of the oscillations of the lever.

The motor may have but one single piston; but then of course its work cannot be equilibrated, which would be no great harm with motors of small power. It may also be made with more than one cylinder. In such a case it would, however, be well to arrange each cylinder so as to have two pistons in order to equilibrate the working of the motor.

It will be seen from the foregoing description that the motor of my invention is particularly well adapted to be used as a motor for automobiles; but it may also be employed with advantage as a motor for propelling small craft. Finally, if the distributing device be changed accordingly it may be worked with other fluids than hydrocarbons.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. In an explosion-motor the combination with a cylinder having but one admission and one escapement valve of two pistons, of two oscillating levers articulated on one end to the piston-rods and with the other end on the connecting-rods acting on the crank, of two arms on which the said levers are suspended; of friction-rollers regulating respectively the swinging of the levers, of two connecting-rods articulated on the pivots on which the levers swing, of movable bearings for said pivots, of two toothed segments mounted on the shafts of the said connecting-rods and of an endless screw gearing with the two segments, substantially as shown and described and for the purpose specified.

2. In an explosion-motor the combination with each piston of a lever transmitting its movement to the driving-shaft, of an articulation consisting of friction-rollers on both sides of said lever mounted on a piece having a circular groove, of a bearing of a pivot of articulation movable in said groove, substantially as shown and described and for the purpose set forth.

3. In an explosion-motor the system of changing the position of the movable articulations consisting in a combination with said articulations of connecting-rods articulated respectively to the pivots of said articulations, of levers articulated on those connecting-rods, of toothed segments mounted on the shafts of said levers and of an endless screw gearing with the said segments, substantially as shown and described.

Signed at Paris, France, this 29th day of October, 1900.

MAURICE AUGUSTE EUDELIN.

Witnesses:

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