June 22, 1926. 1,589,441

V. R. STENGER

VALVE FOR INTERNAL COMBUSTION ENGINES

Filed April 15, 1919 2 Sheets-Sheet 1

Fig. 1.

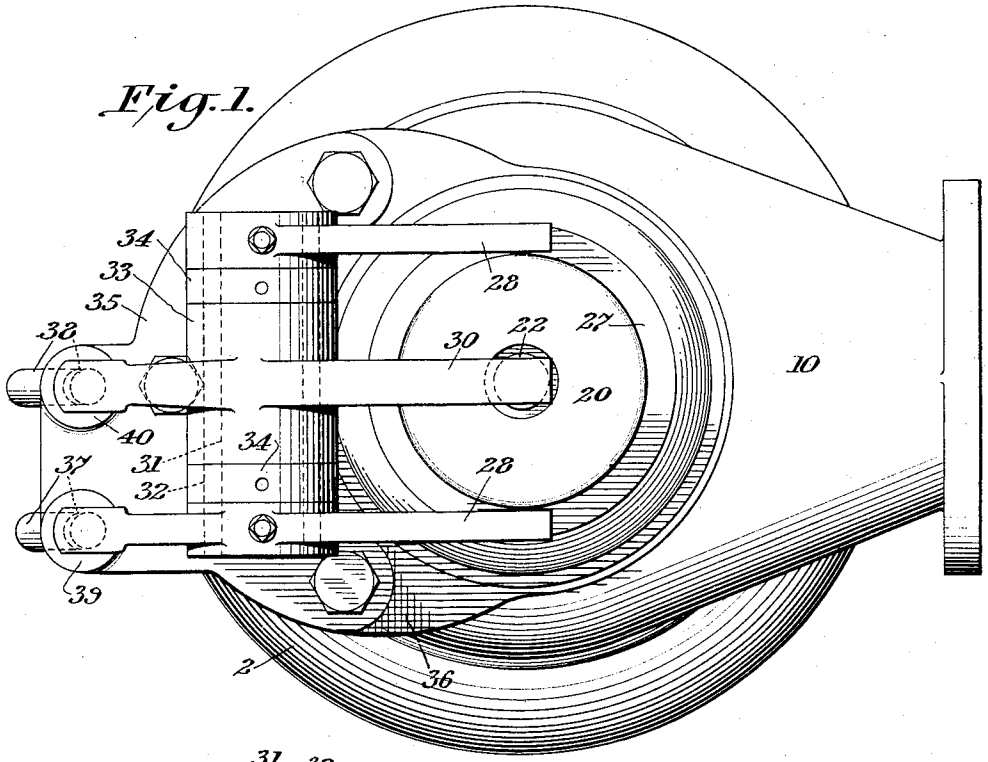
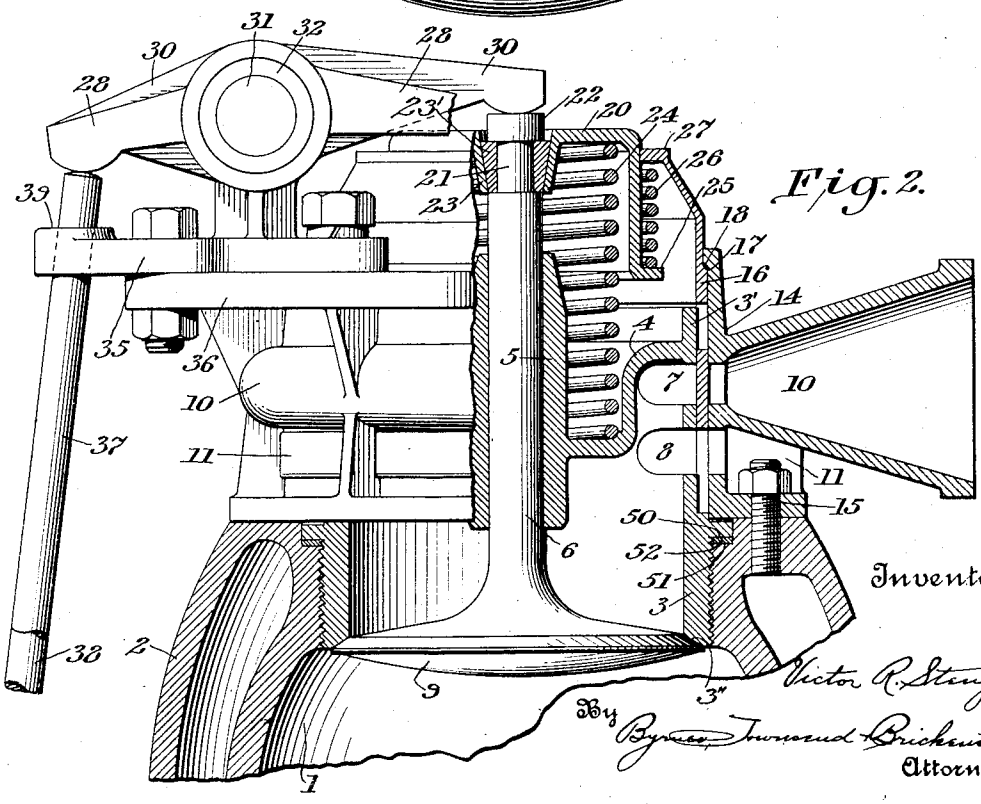


Fig. 2.



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Fig. 3.

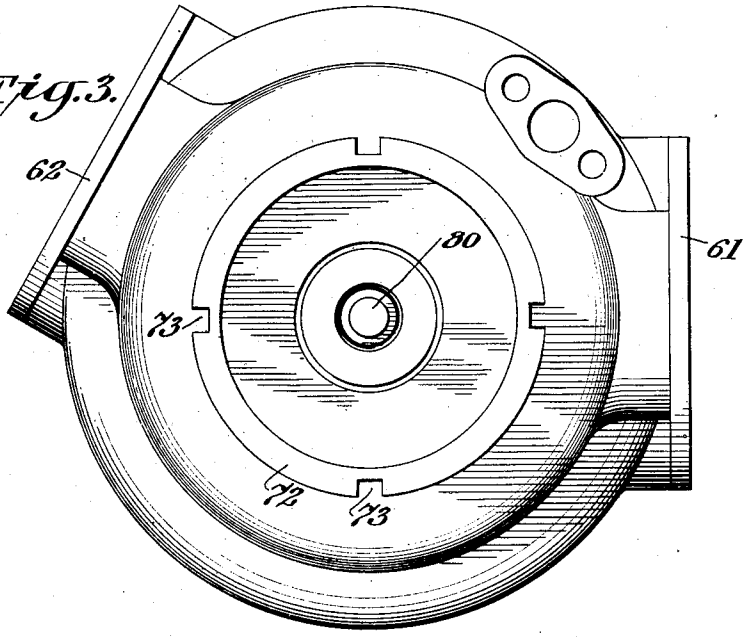
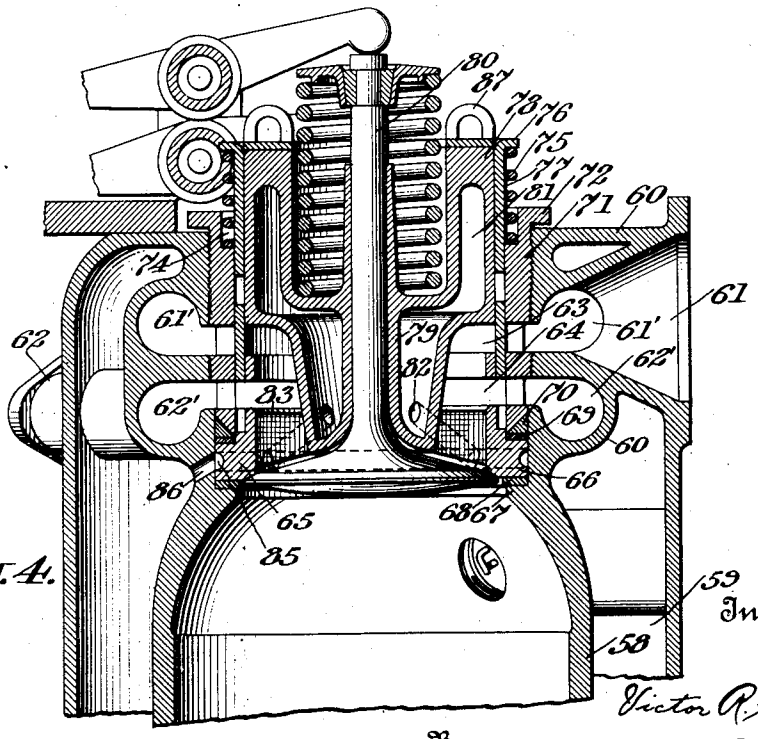


Fig. 4.



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Patented June 22, 1926. 1,589,441

UNITED STATES PATENT OFFICE.

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VALVE FOR INTERNAL-COMBUSTION ENGINES.

Application filed April 15, 1919. Serial No. 290,186.

The present invention relates to valves for internal combustion engines and particularly to a valve which is a combination of a poppet and sleeve valve. Various forms of this type of valve have been proposed together with numerous other types of valve structures all tending to improve the efficiency of the internal combustion motor.

I do not suggest any radical deviation from certain valve structures heretofore known, but I propose certain changes of old structures and certain new relations of details which in the aggregate produce material improvements over existing structures.

It is the general object of my invention to provide an efficient valve structure simple in construction and operation and comprising relatively few operating elements.

It is a particular object to produce a valve structure facilitating a rapid admission and discharge of the gases.

Another special object is to provide a valve structure which may be removed from the combustion chamber together with the inlet and outlet conduits as a complete working unit.

Another object is the provision of a valve structure in which the distance between the manifolds and the combustion chamber is reduced to a practical minimum.

Still another object is to provide a valve structure in which the parts heated by the hot gases are uniformly cooled by the cool incoming gas.

Various other objects will appear from the detail description in connection with the accompanying drawings in which—

Fig. 1 is a plan view of the valve structure embodying the invention;

Fig. 2 a vertical section therethrough; and

Figs. 3 and 4 are top plan and vertical section respectively of a modification.

In the drawings 1 represents the combustion chamber of the cylinder and 2 the usual water jacket. Into the top of the cylinder is screwed the valve seat structure 3 which has an upwardly extending cylindrical wall 3′ supporting by means of transverse web 4 the guide 5 for the valve stem 6. The valve seat structure 3 carries a flange 50 fitting against a shoulder 51 on the cylinder. A suitable packing 52 is interposed between the flange 50 and the shoulder 51 to make a tight joint. Intermediate the web 4 and the valve seat 3″ are provided in vertically spaced relation the inlet port 7 and the exhaust port 8 which may be of any desired circumferential length to afford rapid admission and discharge respectively of the gases. I prefer to use a plurality of ports 7 and a plurality of ports 8 uniformly or symmetrically spaced circumferentially along the wall 3′ and in communication with the manifold. By this arrangement the height of the ports may be reduced to a minimum. It is also well to state here that the diameter of the cylindrical portion 3′ is relatively large, in fact approaching the diameter of the cylinder, whereby a maximum volume of gas can be displaced in a minimum of time. The diameter of the poppet valve 9 is likewise large in keeping with the general idea of promoting as much as possible the transfer of the gas to and out of the combustion chamber.

The inlet ports 7 are interconnected by the distributing pipe 10 leading to the intake manifold, and the exhaust ports 8 are similarly interconnected by a collecting pipe 11 leading to exhaust manifold. The distributing pipe and the collecting pipe are part of an integral structure 14 which may be secured by bolts 15 to the cylinder.

The cylindrical structure 14 has a diameter slightly larger than the external diameter of the cylindrical portion 3′ so as to define therebetween a cylindrical space sufficient to accommodate a sleeve 16 which controls the admission of gas from the distributing pipe 10 to the inlet ports 7 and the discharge of the exhaust gases from the ports 8 to the collecting pipe 11. The sleeve 16 has an external shoulder 17 cooperating with an internal shoulder 18 on the manifold structure 14 to limit the range of movement of the sleeve 16.

The valve stem 6 passes through the guide 5 and carries at its upper end a cap 20 connected thereto in any suitable manner. In practice I prefer to form the stem 6 with a neck portion 21 defining a head 22 and to form the cap 20 with a downwardly extending conical flange 23 the contracted end of which is just large enough to pass over the head 22.

Intermediate the conical flange 23 and the neck portion 21 are placed semi-circular

keys 23′ which may be inserted by slightly depressing cap 20 whereupon they are held in place by the tension of spring 24.

In this manner the connection is absolutely permanent and not affected by the continuous vibrations incident to the operation of the valve.

The transverse web 4 has a depressed portion adjacent the guide 5 to receive the lower portion of a spring 24 interposed between the web and the cap 20. This spring has the usual function of holding the valve stem against the valve actuating rocker-arm 30 and the valve 9 against its seat 3″. The cap 20 has at its lower end a flange 25 against which is seated a spring 26 which acts against a flange 27 of the sleeve 16. This spring 26 is always under sufficient tension to force the sleeve 16 against the rocker-arms 28 and hold it in its uppermost position as defined by the position of the rocker arms 28.

The rocker arms 28 and 30 are mounted for movement independently of each other on a common rocker shaft 31. As indicated in the drawings, this may be done by mounting the rocker-arms 28 upon the shaft 31 by means of a sleeve 32 and by mounting the rocker arm 30 upon the sleeve 32 by means of a second sleeve 33. The rocker mechanism is supported by bearings 34 forming a part of the support frame 35 bolted upon a ledge 36 on the manifold structure 14. The shaft 31 is entirely free. In a single cylinder engine this structure is of course not material, but in a multi-cylinder engine this mode of mounting the rocker arms affords means for independent operation of all rocker arms independently of one another. The shaft 31 may be held in place at both ends by any suitable means obvious to the engineer.

The rocker arms are actuated in the usual way from translating cam mechanism connected to the engine shaft including the push rods 37 and 38 passing through guide lugs 39 and 40 respectively projecting from the frame 35.

The operation is obvious from the description in the light of the prior art. Only relatively small movements of the valve mechanism are necessary to admit the requisite volumes of gas and to discharge the used up gases. The valve 9 serves both as an inlet and exhaust valve so that it is cooled after each explosion. The surface of the valve is relatively large so that the excess heat is readily carried away from it by the cool incoming gases.

The relatively small movements of the valve mechanism reduces the wear to a minimum and prolongs the condition of accurate fit in proportion.

The distance between the ports and the combustion chamber is reduced to almost an irreducible minimum and there are no pockets to retain heat or dead gas and free intake and outlet gas is obtained.

The valve mechanism and related parts including the manifold structure can be removed from the cylinder as a single mechanical working unit which makes it freely accessible for inspection, cleaning and repair.

The various parts of the valve mechanism are easily cast, machined and assembled.

The device shown in Figs. 3 and 4 is generally the same as that shown in Figs. 1 and 2 with the principal difference, however, that the cylinder proper and the structure defining the distributing pipe and the collecting pipe leading to the manifolds are combined in one piece.

The cylinder 58 has an upward extension 60 to provide a distributing pipe or passage 61′ and a collecting pipe or passage 62′ making connection with the inlet ports 63 and exhaust ports 64 respectively. The pipe 61′ leads to the inlet opening 61 and the pipe 62′ to the exhaust opening 62. The water jacket 59 is likewise upwardly extended and surrounds the passages 61′ and 62′.

The valve seat structure 65 has a peripheral flange 66 seated on a shoulder 67 of the cylinder structure, suitable packing ring 68 being interposed to make a tight fit. Above the flange 66 is placed a second packing ring 69 held in position by a beveled ring 70. The inner cylindrical wall of the extension 60 is screw-threaded to receive a screw-threaded sleeve 71 which has peripherally disposed openings to establish communication between the pipes 61′, 62′ and the ports 63, 64 respectively and is beveled at its lower end to bear against the beveled ring 70. The upper end of sleeve 71 has a flange 72 provided with notches or recesses 73 to receive the teeth of a spanner wrench. The sleeve 71 is screwed in place and thereby forces the beveled ring against the packed flange 66, making a tight joint. The sleeve 71 has near its upper end a circular recess 74 to receive the lower end of a coil spring 75 which bears against flange 76 of sleeve valve 77.

The cylindrical portion 78 extending upwardly from the valve seat structure 65 carries the guide 79 for the valve stem 80 and the connecting parts are formed to define a water jacket 81. This jacket 81 may be connected with the water jacket 59 by bores 82 extending through the arms 83 of the spider interconnecting the water jacket 81 and the valve seat structure 65 and terminating in a circular groove 85, which groove may in turn be connected with water jacket 59 by bores 86.

The extension 78 may be provided at its upper end with lugs 87 so that it may be conveniently lifted from its normal position.

The water jackets 59 and 81 serve the

purpose of heating the incoming gas and simultaneously cooling the parts heated by the exhaust gases. This arrangement does not only improve the efficiency of the engine, but is instrumental in keeping the parts at substantially uniform temperature which brings about smooth operation.

It is understood that various minor changes may be made within the scope of the disclosure.

I claim:

1. Valve mechanism for internal combustion engines, comprising a substantially cylindrical tubular body adapted to extend to the combustion chamber, said body defining a valve seat near its inner end, a poppet valve, two rows of circumferentially spaced ports in close proximity to each other and to the valve seat and serving as intake and exhaust ports respectively, a transverse web extending from the wall of the cylindrical body at points beyond the said ports toward the center to provide a guide for the stem of the poppet valve, said guide and wall of the cylindrical body defining a substantially unobstructed annular passage for the gases intermediate the valve seat and the said ports, a casing surrounding the cylindrical body and providing manifolds and a sleeve valve intermediate the cylindrical body and the casing for controlling the ports.

2. Valve mechanism for internal combustion engines, comprising a substantially cylindrical tubular body adapted to extend to the combustion chamber, said body defining a valve seat near its inner end, a poppet valve, two rows of circumferentially spaced ports in close proximity to each other and to the valve seat and serving as intake and exhaust ports respectively, a transverse web extending from the wall of the cylindrical body at points beyond the said ports toward the center to provide a guide for the stem of the poppet valve, said guide and wall of the cylindrical body defining a substantially unobstructed annular passage for the gases intermediate the valve seat and the said ports, a sleeve valve surrounding the cylindrical body for controlling the ports, a casing surrounding the sleeve valve and providing axially spaced circumferentially extending gas-distributing and exhaust-collecting passages respectively and a water-jacket surrounding the said passages.

3. In an internal combustion engine the combination of a cylinder having an opening in its end, a water jacket surrounding the cylinder, a cylindrical tubular body and means for removably holding the said body in the opening, the cylindrical body having near its inner end inlet and exhaust ports, a sleeve valve having movement about the cylindrical body for controlling the ports, valve mechanism for controlling the flow of gas out of and into the inner end of the cylindrical body, a housing surrounding the sleeve valve and defining gas passages leading to the ports, a water-jacket inside the cylindrical body having surfaces contiguous to the ports, a water jacket surrounding the gas passages, and means for establishing communication between said water jackets.

4. In an internal combustion engine the combination of a cylinder having an opening in its end, a water jacket surrounding the cylinder, a cylindrical tubular body and means for removably holding the said body in the opening, the said cylindrical body having a valve seat near its inner end and inlet and exhaust ports near its outer end, a poppet valve for co-operation with the valve seat having a stem extending through the cylindrical body, a sleeve valve having movement about the cylindrical body for controlling the said ports, a housing surrounding the sleeve valve and defining gas passages leading to the ports, a water jacket inside the cylindrical body having surfaces contiguous to the ports and the valve, a water jacket surrounding the gas passages and means for establishing communication between the said water jackets.

5. In an internal combustion engine the combination of a cylinder, having a water jacket, a cylindrical body communicating with the cylinder, said cylindrical body defining inlet and exhaust ports, a sleeve valve having movement about the cylindrical body to control the ports, valve means near the inner end of the cylindrical body for controlling the gas flow out of and into the inner end of the cylindrical body, a water jacket within the cylindrical body having surfaces contiguous to the ports and communicating conduits between the said water jackets.

6. In an internal combustion engine the combination of a cylinder, having a water jacket, a cylindrical body communicating with the cylinder, said cylindrical body defining inlet and exhaust ports, a sleeve valve having movement about the cylindrical body to control the ports, valve means near the inner end of the cylindrical body for controlling the gas flow out of and into the inner end of the cylindrical body, a water jacket within the cylindrical body, means defining a circular groove between the cylindrical body and the cylinder structure and means defining conduits between the said water jackets and the groove.

7. In an internal combustion engine the combination of a cylinder having a water jacket, a cylindrical body communicating with the cylinder, said cylindrical body defining inlet and exhaust ports, a sleeve valve having movement about the cylindrical body to control the ports, valve means near the inner end of the cylindrical body for controlling the gas flow out of and into the

inner end of the cylindrical body, a water jacket within the cylindrical body, the cylindrical body being provided with a circular groove adjacent its lower end, said groove defining in conjunction with the cylinder structure a conduit and means defining conduits between the said water-jackets and the said groove.

8. A valve mechanism for internal combustion engines, comprising a substantially cylindrical tubular body adapted to extend to the combustion chamber, said cylindrical body defining a valve seat in its inner end, inlet and exhaust ports in axially spaced relation and close proximity to each other, a poppet valve co-operating with the valve seat, a sleeve valve having a single set of ports co-operating with one set of said ports, and means for reciprocating said sleeve valve longitudinally so that the inner end of said sleeve valve passes beyond the other set of said ports for controlling the same.

9. The combination of a substantially cylindrical tubular body defining inlet ports and exhaust ports, a housing surrounding said tubular body and spaced therefrom and provided with gas passages leading to said ports, a cylindrical nut engaging with said housing and defining a cylindrical space between said nut and said tubular body, and a sleeve valve located in said cylindrical space and having movement to control said ports.

10. A valve mechanism for internal combustion engines, comprising a substantially cylindrical tubular body adapted to extend to the combustion chamber, said cylindrical body defining a valve seat in its inner end, inlet and exhaust ports in axially spaced relation, a poppet valve co-operating with the valve seat, a sleeve valve having a single set of inlet ports co-operating with said first-mentioned inlet ports, and means for reciprocating said sleeve valve longitudinally so that the inner end of said sleeve valve passes beyond the exhaust ports for controlling the same.

11. The combination of a substantially cylindrical tubular body defining inlet ports and exhaust ports, a housing surrounding said tubular body and spaced therefrom and provided with gas passages leading to said ports, a cylindrical nut engaging with said housing and defining a cylindrical space between said nut and said tubular body, a sleeve valve located in said cylindrical space, and means for reciprocating said sleeve valve longitudinally to control said ports.

12. In an internal combustion engine, the combination of a cylinder, a water jacket therefor, a substantially cylindrical body defining inlet ports and exhaust ports and communicating with said cylinder, a housing extending upwardly from said cylinder and surrounding said tubular body and spaced therefrom and provided with gas passages leading to said ports, a cylindrical nut engaging with said housing and defining a cylindrical space between said nut and said tubular body, a sleeve valve located in said cylindrical space and having movement to control said ports, and a water jacket surrounding said passages, said water jacket being in communication with the water jacket of said cylinder.

13. In an internal combustion engine, a cylinder having a port, a poppet-valve co-acting with said port, a chamber extending outwardly from said port, said valve having a stem projecting into said chamber, a water jacket in said chamber surrounding said stem, said chamber having intake and exhaust ports, valve means for controlling said intake and exhaust ports, a water jacket surrounding said cylinder and having communication with the water jacket surrounding said valve stem.

14. In an internal combustion engine, a cylinder having a port, a poppet-valve co-acting with said port, a chamber extending outwardly from said port, said valve having a stem projecting into said chamber, a water jacket in said chamber surrounding said stem, said chamber having intake and exhaust ports, valve means for controlling said intake and exhaust ports, an intake duct communicating with said intake port, a water jacket surrounding said cylinder and intake duct.

15. In an internal combustion engine, a cylinder having a port, a poppet-valve co-acting with said port, a chamber extending outwardly from said port, said valve having a stem projecting into said chamber, a water jacket in said chamber surrounding said stem, said chamber having intake and exhaust ports, valve means for controlling said intake and exhaust ports, intake and exhaust ducts communicating with said intake and exhaust ports, and a water jacket surrounding said cylinder and ducts.

16. A cylinder having a port in the end thereof, a housing rigid with said cylinder and extending outwardly beyond said port, a poppet-valve co-acting with said port, an outwardly facing annular shoulder, a valve cage comprising inner and outer concentric members, a sleeve valve between said members, said inner member being seated on said annular shoulder and having an outwardly extending flange, said outer member being secured to said housing and bearing against said flange.

In testimony whereof, I affix my signature.

VICTOR R. STENGER.