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PATENTED AUG. 21, 1906.

B. B. MEARS.  
GAS ENGINE.

APPLICATION FILED MAR. 21, 1905.

3 SHEETS—SHEET 1.

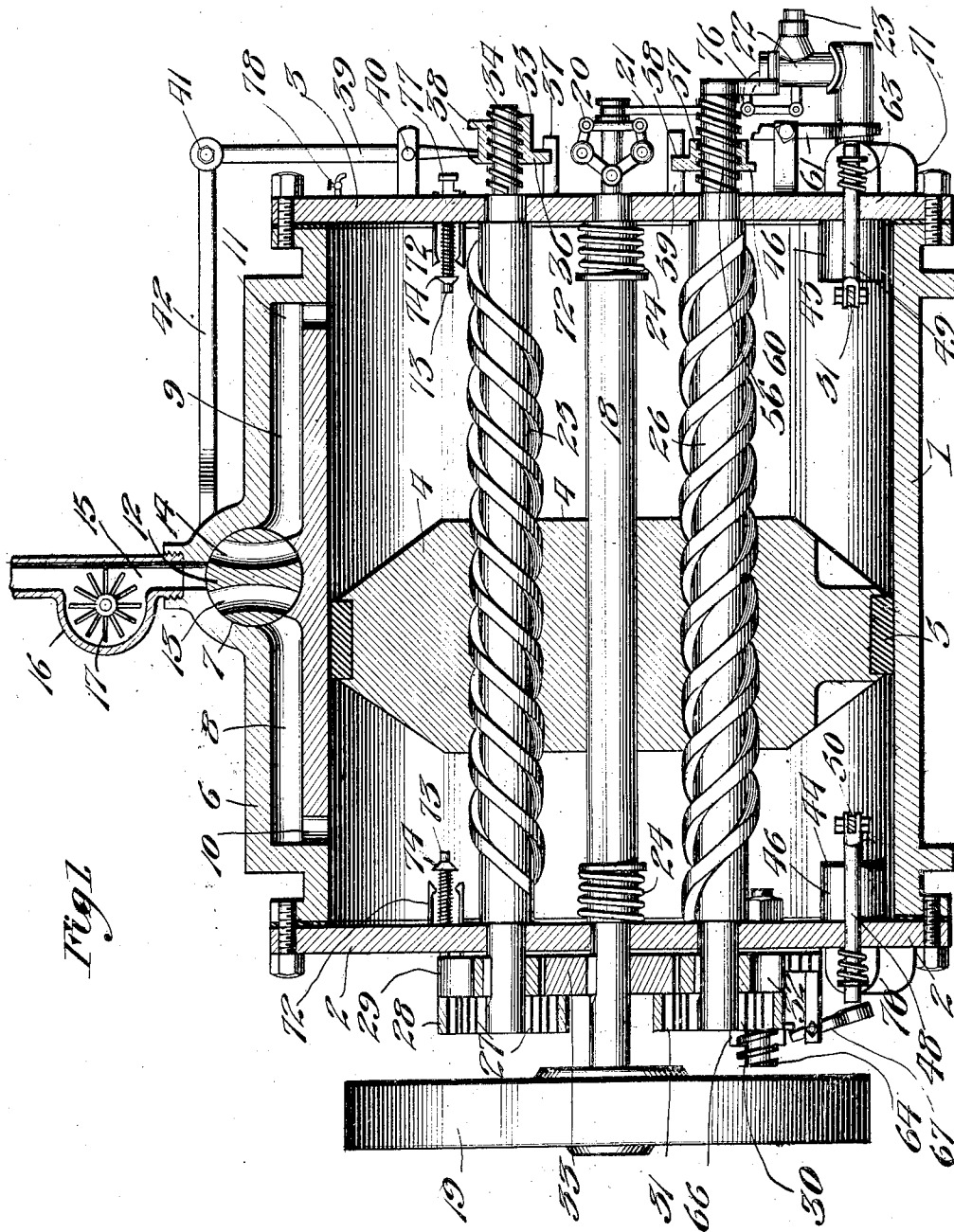


Fig. 1

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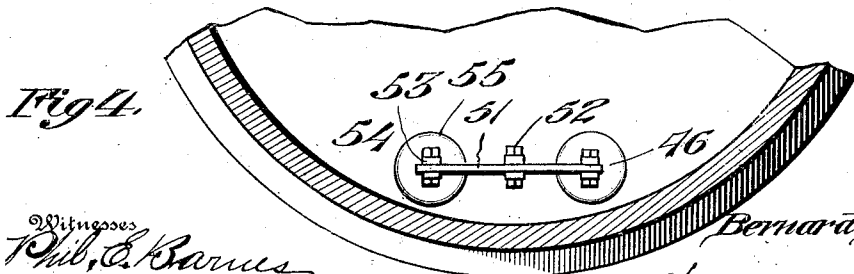
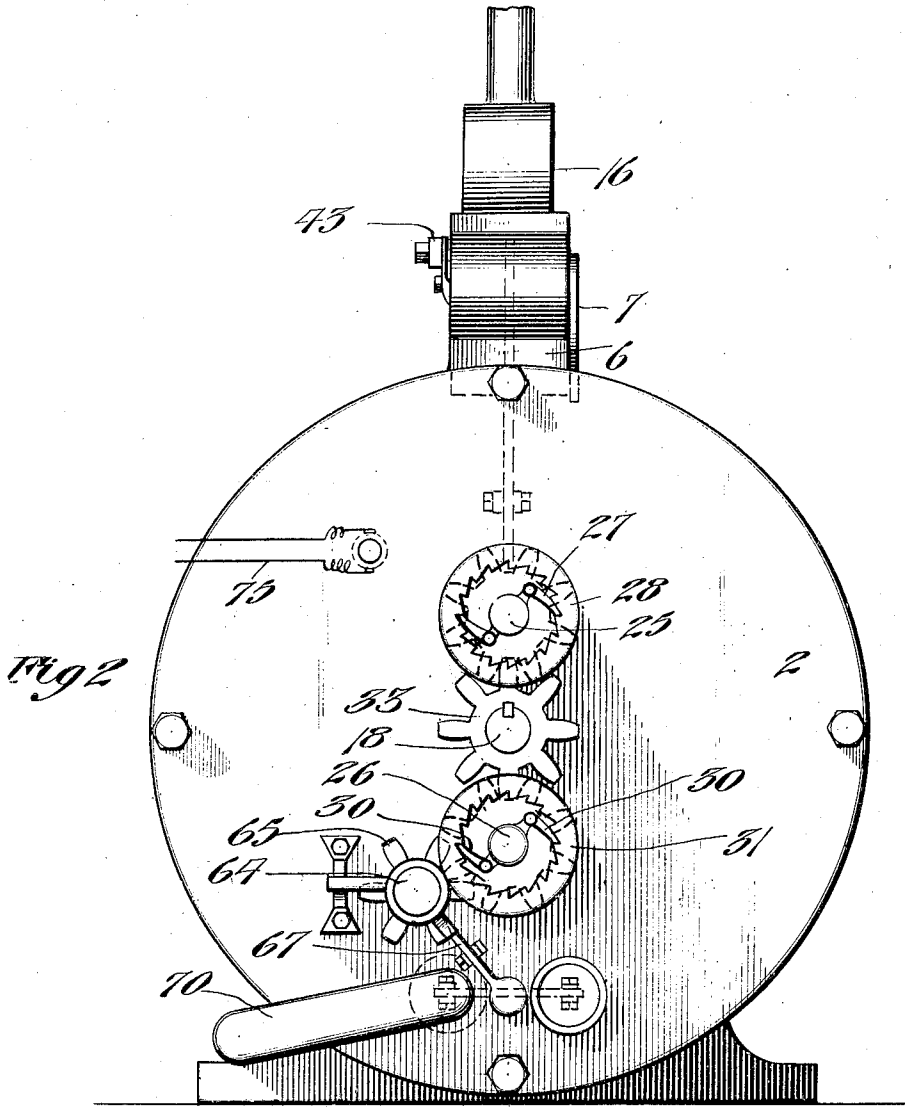
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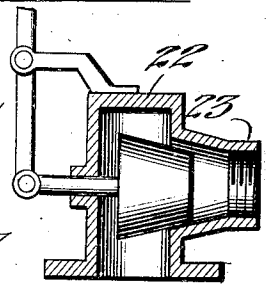
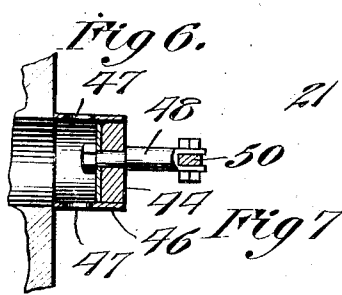
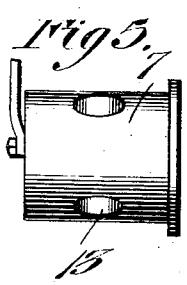
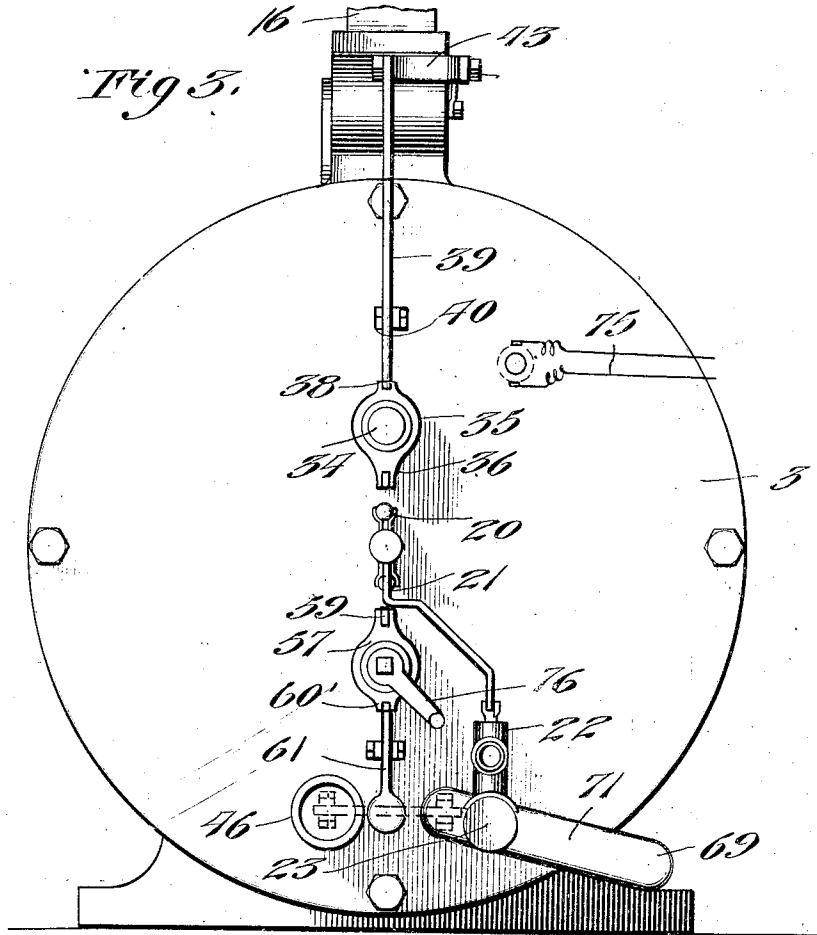
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3 SHEETS—SHEET 3.



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# UNITED STATES PATENT OFFICE.

BERNARD B. MEARS, OF BALTIMORE, MARYLAND.

## GAS-ENGINE.

No. 829,279.

Specification of Letters Patent.

Patented Aug. 21, 1906.

Application filed March 21, 1905. Serial No. 251,283.

To all whom it may concern:

Be it known that I, BERNARD B. MEARS, a citizen of the United States, residing at 1242 Jackson street, in the city of Baltimore and State of Maryland, have invented new and useful Improvements in Gas-Engines, of which the following is a specification.

This invention relates to gas-engines, the object being to provide a simple, economical, and efficient gas-engine of the high-speed type in which the reciprocatory movements of the piston are directly converted into rotary motion within the cylinder of the engine itself.

15 A further object of the invention is to provide a construction of engine by means of which the expansive force of gas will be nearly continuous and will be effective during several revolutions of the driving-shaft.

20 By means of the construction hereinafter described piston-rods, connecting-rods, and the usual cranks are dispensed with, as also the wear, tear, and friction incident to the use of such elements, also economizing the space required for the engine and making the same more compact and of less weight. It will also be seen that less gas is employed, and consequently smaller explosions, thus rendering the engine comparatively quiet and noiseless in operation.

30 With the above and other objects in view, the nature of which will more fully appear as the description proceeds, the invention consists in the novel construction, combination, and arrangement of parts, as hereinafter fully described, illustrated, and claimed.

35 In the accompanying drawings, Figure 1 is a longitudinal section through an engine embodying the present invention, showing the exhaust-valve closed and the piston near one end of its stroke. Fig. 2 is an end elevation of the engine looking toward the geared ends of the screw-shafts, the fly-wheel being removed. Fig. 3 is a view in elevation of the opposite end of the engine. Fig. 4 is a detail cross-section through the bottom portion of the cylinder, showing the admission-valve arrangement. Fig. 5 is a view in elevation of the exhaust-valve. Fig. 6 is a sectional view of the gas-admission valve. Fig. 7 is a similar view of the air-admission valve.

45 Like reference-numerals designate corresponding parts in all the figures of the drawings.

55 Referring to the drawings, 1 designates the

engine-cylinder, provided with the usual heads 2 and 3, bolted or otherwise secured thereto.

4 represents the piston, adapted to reciprocate lengthwise of the cylinder and provided along its periphery with suitable packing 5 for providing a gas-tight joint between the cylinder and piston. Extending along the periphery of the cylinder is an offset chamber 6, centrally of which is located an exhaust-valve casing or chamber 7, with oppositely-extending passages 8 and 9 leading from the exhaust-valve into the end portions of the cylinder and communicating with the cylinder by means of the ports 10 and 11.

70 12 designates an oscillatory exhaust-valve provided with two separate exhaust-passages 13 and 14, adapted to communicate especially with the passages 8 and 9 and also leading to an exhaust-pipe 15, provided with a laterally-offset chamber or casing 16, in which is arranged a rotary fan 17, the purpose of which will hereinafter appear.

80 Extending centrally through the cylinder is the main engine-shaft 18, the end portions of which are journaled in the cylinder-heads, one end of the shaft 18 being extended to receive the fly-wheel 19, while the opposite end of said shaft is extended beyond the cylinder and provided with a governor 20, which operates upon one end of a throttle-lever 21 when the speed of the engine becomes excessive, and thereby controls a throttle-lever mounted in a valve-casing 22, located at a suitable point in the gas-supply pipe 23, leading to the engine. Encircling the shaft 18 and located within the opposite ends of the cylinder are buffer or cushioning springs 24, adapted to receive the impact of the piston 4 and prevent the same from coming in sudden and injurious contact with the admission-valve connections, to be hereinafter described.

85 Arranged parallel to the shaft 18 and on opposite sides thereof are parallel screw-shafts 25 and 26, which extend the entire length of the cylinder, the ends of said shafts being reduced in size and journaled in the cylinder-heads. The piston 4 is provided with threaded openings to receive the screw-shafts 25 and 26, the pitch of the threads on said shafts being so formed that as the piston moves back and forth rotary motion is imparted to said shafts 25 and 26.

90 The shaft 25 is extended at one end and

provided with pawls 27, which engage an internally-ratcheted wheel 28 loose on the shaft 25 and rigidly connected with a spur gear-wheel 29, rigidly mounted on shaft 25. In the same manner the extended end of shaft 26 is provided with pawls 30, which engage an internally-ratcheted wheel 31, connected rigidly with a spur gear-wheel 32, mounted rigidly on the shaft 26 and meshing with an intermediate gear-wheel 33, which also meshes with the gear-wheel 29 and is keyed to or otherwise fastened upon the main engine-shaft 18, as shown in Figs. 1 and 2, thus providing for the simultaneous rotation of the shafts 25 and 26 and the transmission of the motion of said shafts to the engine-shaft. The shaft 25 is provided at its opposite end with a threaded extension 34, the threads of which are pitched similarly to the threads on said shaft within the cylinder. Mounted upon the threaded extension 34 is a nut or traveler 35, which is prevented from rotation by means of a lateral projection or lug 36, which rides in contact with a suitable guide 37, connected to the cylinder-head. At one side the nut 35 is provided with lips or stops 38, between which is received one extremity of an exhaust-valve shift-lever 39, fulcrumed at 40 on a suitable bracket and having connected to its opposite end at 41 a rod 42, which extends toward the exhaust-valve 12 and is operatively associated therewith by means of a yoke or elbow 43, whereby the motion of the lever 39 is imparted to the exhaust-valve for rocking or oscillating the latter and moving the passages 13 and 14 into and out of registry with the passages 8 and 9 above referred to. By the means described the movements of the piston are imparted to the exhaust-valve, so as to open and close the latter at properly-timed intervals.

Arranged in opposite ends of the cylinder are gas-inlet valves 44 and 45, mounted to reciprocate within suitable valve-casings 46, provided with ports 47, through which the gas is admitted into the cylinder. Connected with the valves 44 and 45 are stems 48 and 49, which are operated by means of levers 50 and 51, fulcrumed intermediate their ends, as shown at 52, the opposite ends of said levers being connected pivotally to the stems 53 of air-inlet valves 54, mounted within suitable valve-casings 55, communicating with the interior of the cylinder and the atmosphere. The gas and air admission or inlet valves work in the same direction and are so disposed as to simultaneously open and close, thus at the same time admitting air and gas in the proper proportions into the cylinder and also simultaneously cutting off the same.

The mechanism for operating the admission-valves will now be described. The shaft 26 is provided with a threaded extension 56, the threads of which are disposed reversely

to those within the cylinder. Mounted on the threaded extension 56 is a nut or runner 57, which travels back and forth and is prevented from rotating by a lateral lug 58, which rides in engagement with a guide 59 on the cylinder-head. The runner 57 is provided with a projection 60, which comes in contact with one extremity of a lever 61, fulcrumed intermediate its ends, the other extremity of said lever being adapted to cooperate with a valve-stem 49, which connects with the lever 51 for moving or rocking the latter. The admission-valves are normally held seated by means of springs 63, so that when the lever 61 is not acting thereon the springs act to seat the valve. As the runner 57 moves outward it cooperates with the lever 61, which acts in turn to unseat the admission-valves at the proper time and for the proper period to admit the charge or mixture to the cylinder. A similar arrangement of valve-operating connections is provided at the opposite end of the cylinder, the only difference being that instead of the threaded extension 56 a separate threaded counter-shaft 64 is employed, which is geared to the shaft 26 by means of a spur gear-wheel 65, meshing therewith and fast on the shaft 64. A runner 66 travels on the shaft 64 and cooperates with a lever 67, which actuates the rod 68, corresponding with the rod 62 and connecting with the lever 50. The gas-supply pipe 23 communicates with an extension 69, which runs along the outside of the cylinder and is provided with branches 70 and 71, which communicate with the gas-admission valve. In opposite ends of the cylinder are arranged pairs of elastic or spring electrodes 72, between each pair of which operates a spring-pressed plunger-stem 73, which carries a sparking point 74, which in its movements back and forth under the impulse imparted to it by the moving piston 4 produces a spark, thereby igniting the charge in its respective end of the cylinder. Conductor-wires 75 extend from the electrodes 72 to a suitable source of electrical energy.

From the foregoing description it will be seen that as the piston travels back and forth it imparts rotary motion to the shafts 25 and 26, which in turn impart rotary motion to the engine-shaft through the medium of the driven ratchets, connected pawls, and gear 33, as shown in Fig. 2. The screw-shafts also actuate and control the admission and exhaust valves by means of the connections described, the parts being so timed as to admit the charges at the proper moment, compress the same, and ignite them. In order to start the engine, one of the screw-shafts is provided with a starting-crank 76, by means of which the operator may manually move the piston to one end of the cylinder, admit a charge by manipulating one of the valves 48 or 49, and operating the proper sparking

plug by hand, so as to ignite the charge, each of the sparking devices being provided with a handle or knob 77 for that purpose.

78 designates a relief-cock to relieve compression from the cylinder in the operation of starting the engine.

It will be noted from the operation described that the ignition of the gas takes place just previous to the limit of movement of the piston on the compression-stroke.

It will be apparent that the invention is susceptible of various changes in the form, proportions, and minor details of construction, which may accordingly be resorted to without departing from the principle or sacrificing any of the advantages of the invention.

Having thus fully described the invention, what I claim as new is—

1. An engine embodying a main driving-shaft, a fly-wheel thereon, a piston movable lengthwise of said shaft, a cylinder surrounding the piston and shaft, and parallel screw-shafts extending through the piston lengthwise of the cylinder, said shafts being geared to the engine-shaft and also having connections for controlling the admission and exhaust, substantially as described.

2. A gas-engine comprising a cylinder, a driving-shaft extending lengthwise thereof, a piston movable lengthwise of the cylinder upon the driving-shaft, and a screw-shaft actuated by said piston and geared to the driving-shaft, said screw-shaft being operatively connected with the inlet and exhaust mechanism.

3. A gas-engine comprising a cylinder, a driving-shaft extending lengthwise thereof, a piston movable lengthwise on said shaft within the cylinder, a screw-shaft arranged parallel to the driving-shaft and actuated by the piston, said screw-shaft being geared to the driving-shaft, operative connections between the screw-shaft and the supply and exhaust mechanism, and a sparking device arranged in the path of the piston.

4. A gas-engine comprising a cylinder, a driving-shaft extending through the piston lengthwise of the cylinder and journaled therein, a piston movable within the cylinder lengthwise of the driving-shaft, twin screw-shafts arranged parallel to the driving-shaft on opposite sides thereof, said screw-shafts being geared to the driving-shaft, threaded extensions on the screw-shafts, and connections between said threaded extensions and the admission and exhaust valves for operating the latter.

5. A gas-engine comprising a cylinder, a driving-shaft extending lengthwise through the same, a piston mounted within the cylinder to move lengthwise of the driving-shaft, a screw-shaft extending parallel to the driving-shaft and actuated by the piston, an ex-

ension of said screw-shaft having threads inclined reversely to the threads within the cylinder, a runner movable on said threaded extension, and connections between the said runner and one of the engine-valves for automatically controlling the same.

6. A gas-engine comprising a cylinder, a driving-shaft extending centrally through the same, a reciprocatory piston movable lengthwise on said shaft, screw-shafts parallel to the driving-shaft on opposite sides of the latter and within the cylinder, said shafts being actuated by the piston, runners mounted on extensions of said screw-shafts, an exhaust-valve, air and gas admission valves coupled in pairs, and connections between the runners and said valves for operating the latter.

7. A gas-engine comprising a cylinder, a driving-shaft extending centrally through the cylinder, a piston mounted to travel lengthwise of the cylinder upon said shaft, screw-shafts on opposite sides of the driving-shaft parallel therewith and actuated by the piston, runners mounted on extensions of said shafts, an exhaust-valve, admission-valves, and levers cooperating with said runners and adapted to impart movement to the admission and exhaust valves, substantially as described.

8. A gas-engine comprising a cylinder, a driving-shaft mounted to rotate centrally thereof, a piston movable lengthwise of said shaft within the cylinder, and means for communicating motion from said piston to the driving-shaft, said means serving to operate the admission and exhaust valves.

9. A gas-engine comprising a cylinder, a driving-shaft mounted for movement within the cylinder, a piston movable lengthwise said shaft within the cylinder, means mounted within the cylinder and operated by the piston, said means being geared to the driving-shaft and revolved within the cylinder by the reciprocating movement of the piston.

10. A gas-engine comprising a cylinder, a driving-shaft mounted to rotate centrally thereof, a piston movable lengthwise of said shaft within the cylinder, duplicate shafts arranged within the cylinder and passing through the piston, said shafts being revolved in reverse directions in the reciprocating movement of the piston, the driving-shaft and said duplicate shafts being arranged in different planes longitudinally of the cylinder to prevent rotary movement of the piston during its reciprocation.

In testimony whereof I affix my signature in presence of two witnesses.

BERNARD B. MEARS.

Witnesses:

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B. BLUMENTHAL.