

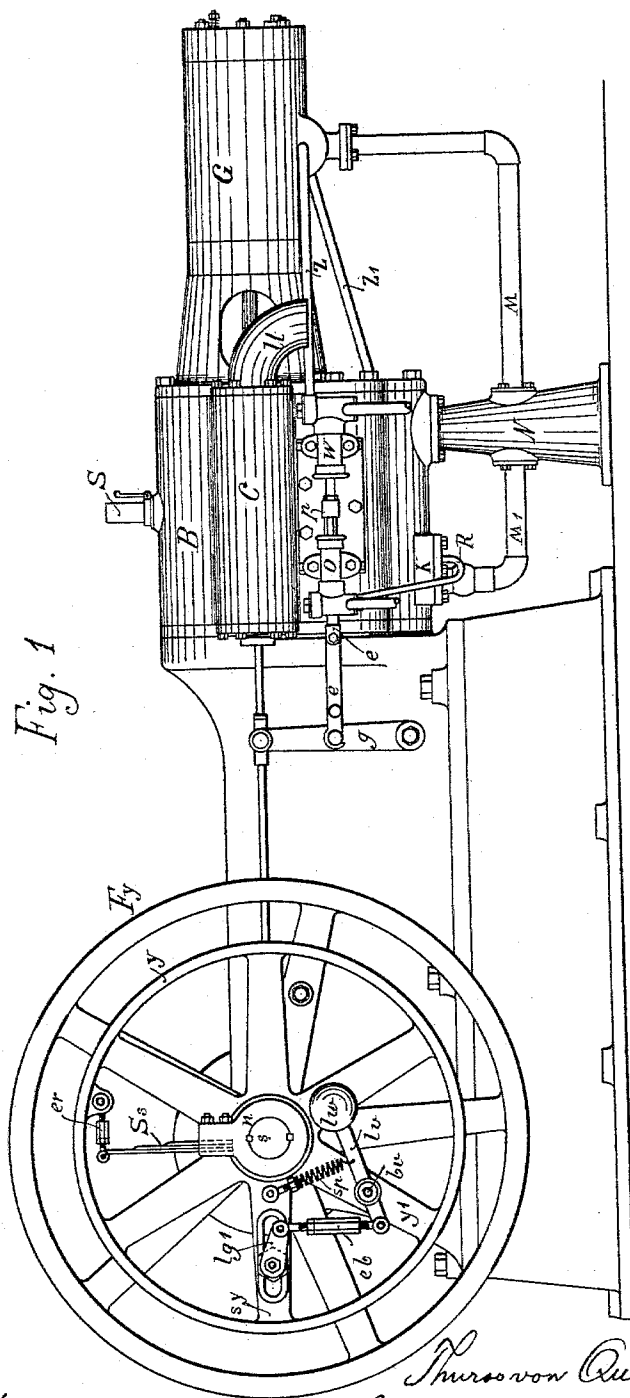
(No Model.)

4 Sheets—Sheet 1.

T. VON QUERFURTH.
OIL ENGINE.

No. 569,672.

Patented Oct. 20, 1896.



Witnesses
William Mueser
Walter F. Wolf.

Inventor
Thurs von Querfurth
By his Attorney Henry Schreiter

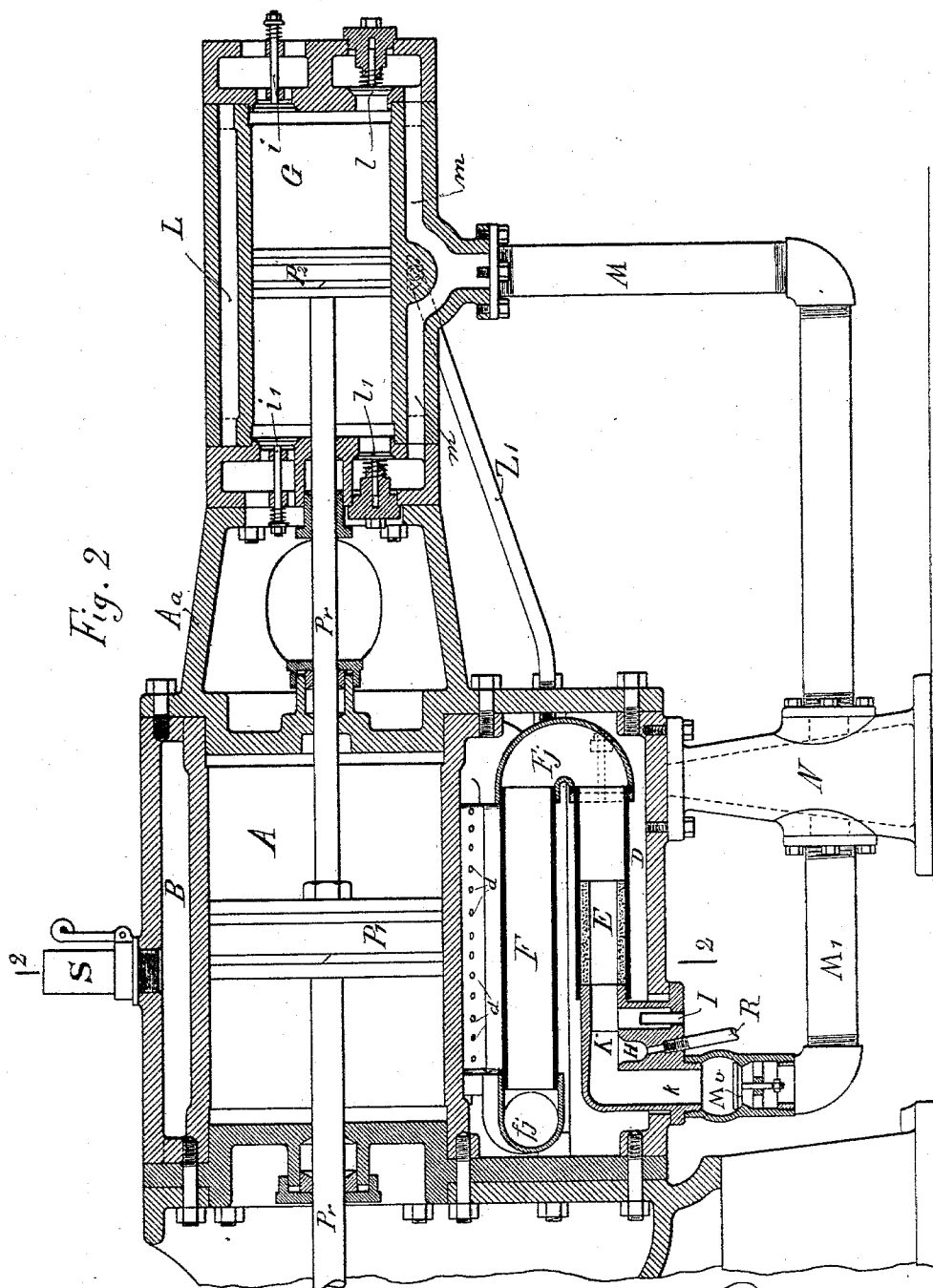
(No Model.)

4 Sheets—Sheet 2.

T. VON QUERFURTH.
OIL ENGINE.

No. 569,672.

Patented Oct. 20, 1896.



Witnesses
William Messer
Walter F. Wolf.

Thurs. von Querfurth Inventor
By his Attorney Henry Schreiter

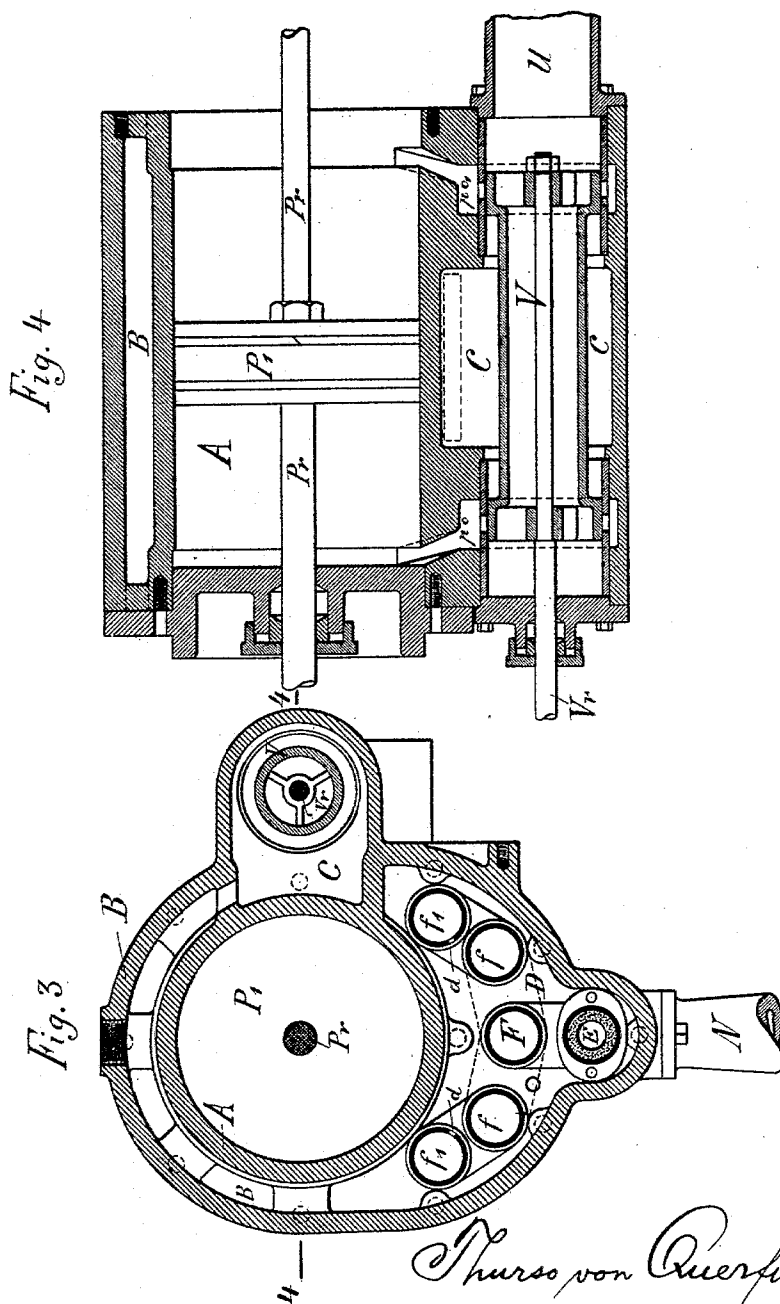
(No Model.)

4 Sheets—Sheet 3.

T. VON QUERFURTH.
OIL ENGINE.

No. 569,672.

Patented Oct. 20, 1896.



Witnesses
William Mueser
Walter F. Wolf.

Thurso von Querfurth
Inventor
By his Attorney *Henry Schreiter*

(No Model.)

4 Sheets—Sheet 4.

T. VON QUERFURTH.
OIL ENGINE.

No. 569,672.

Patented Oct. 20, 1896.

Fig. 5

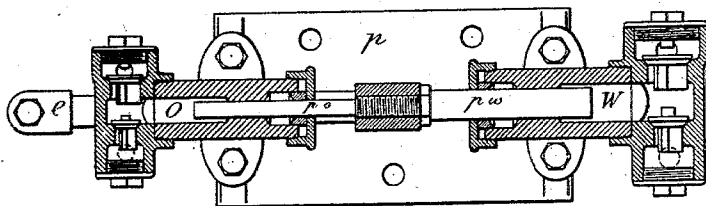
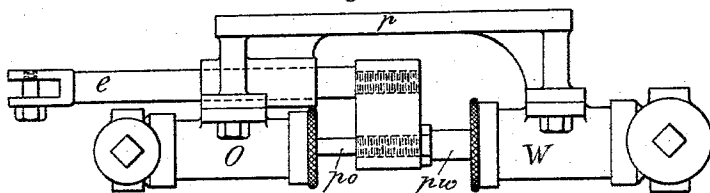


Fig. 6



Witnesses
William Mueser
Walter C. Wolf.

T. von Querfurth Inventor
By his Attorney Harry Schreier

UNITED STATES PATENT OFFICE.

THURSO VON QUERFURTH, OF NEW YORK, N. Y.

OIL-ENGINE.

SPECIFICATION forming part of Letters Patent No. 569,672, dated October 20, 1896.

Application filed January 10, 1895. Serial No. 534,477. (No model.)

To all whom it may concern:

Be it known that I, THURSO VON QUERFURTH, mechanical engineer, a subject of the Emperor of Germany, residing at New York, county and State of New York, have invented new and useful Improvements in Oil-Engines, of which the following is a full, clear, and exact specification.

My invention relates to improvements in power-motors, more particularly to oil-engines, and comprises the construction of a combined oil and steam engine wherein new contrivances are combined with such parts as are used in steam and in oil engines, the advantages of both the steam and the oil engines being secured and their disadvantages avoided.

Petroleum-motors were heretofore constructed on the same principle as gas-engines, the driving power being produced by exploding a charge of carbureted air or of a mixture of volatile oils and air in the working cylinder. These engines have also the same disadvantages as gas-engines, the most important of which is that very high temperatures produced by combustion of the charge in the working cylinder cannot be avoided or utilized, and that consequently a constant circulation of cold water around the working cylinder must be provided to absorb this excessive heat, in order to prevent its evil effects on the working parts of the engine. The heat so absorbed is absolutely lost and so is the greatest part of all heat produced. It is proven by practical measurements that of the heat developed by combustion of an explosive charge in the working cylinder of a gas or of an oil engine not over twenty-three per cent. is utilized in work, about thirty-three per cent. being absorbed by radiation and cooling and over forty per cent. being carried off with the exhaust.

Another disadvantage of burning an explosive charge in the working cylinder is the impossibility of completely utilizing all expansive energy of the gases produced, even in such engines where the charge is ignited at the moment when the piston reaches the dead-point. Neither does a practically complete combustion take place when the charge is exploded in the working cylinder, and a considerable part of the constituents of the

charge is carried off, not evolved at all, this being also proven by the fact that the actual pressure obtained upon the piston of such an engine is seldom in excess of one-half of the pressure calculated. Led by these considerations I constructed an engine having a separate chamber for combustion of the charge (evaporated oil mingled with air) and a compartment into which cooling-water is delivered. The expansive gases produced by the combustion, before being admitted into the working cylinder, pass through this cooling-chamber, wherein their excessive heat is absorbed and utilized in converting the cooling-water into steam, which together with the expansive gases pass through a jacket and a valve-chest into the working cylinder, where they are used for driving the engine. The great advantages of such an arrangement are apparent. All heat produced by the combustion of the charge is converted into energy, and all expansive power of the gases and of the steam produced by the cooling process is utilized for driving the engine, the excessive heat of gases which must be guarded against in such engines as heretofore constructed being converted into steam having even a higher expansive energy than the gases themselves, thus increasing the volume and power of the expansive fluid admitted through a valve-chest into the working cylinder of the engine in proper proportion to its load.

The construction and general arrangement of the parts of my improved oil-engine are shown in the accompanying drawings, wherein—

Figure 1 is a side elevation of the engine; Fig. 2, a vertical longitudinal section; Fig. 3, a cross-section 2 2 of Fig. 2; Fig. 4, a horizontal longitudinal section through the working cylinder, showing also the slide-valve and the valve-chest; Fig. 5, a vertical longitudinal section through the feed-pumps; Fig. 6, a top view of these pumps, showing also arrangement for working them.

Similar letters of reference indicate corresponding parts.

The engine comprises a working cylinder A with piston P' and piston-rod P', valve-chest C with slide-valve V, valve-rod Vr, cylinder-jacket B, inclosing also cooling-chamber D, burner K with oil-evaporating

pan H and igniting-tube I, the combustion-chamber E and flues F, f , and f' , the oil-pump O with delivery-pipe R and water-pump W with circulating-pipes Z and Z' to 5 and from the jacket L of the air-compressing cylinder G, compressed-air receiver N, connecting-pipe M, and air-delivery pipe M' with a puppet-valve Mv, and the not especially described parts, bed, cross-head, 10 connecting-rod, crank-shaft, bearings, fly-wheel, eccentric, &c., which are such as usually employed in engines. Belt-pulley y and the governor attached to it will be described hereinafter.

15 Working cylinder A is cast in one piece with jacket B and valve-chest C. Its head is extended into an intermediate piece Aa, to which the air-compressing cylinder is bolted. Piston p' of the working cylinder is similar 20 to those used in steam-engines. Piston-rod Pr projects through the head of the working cylinder and carries also piston P² of the air-compressing cylinder.

Air-compressing cylinder G is equally as 25 long as the working cylinder, but proportionally smaller in diameter. Air is admitted and the compressed air expelled at each stroke. Valves i and i' open alternately by suction of the piston P², admitting air into 30 the cylinder, and the compressed air is then on the end of each return stroke driven through valves l and l' into the passage m and from there through pipe M into the receiver N.

The air-compressing cylinder is surrounded 35 with water-jacket L, into which cooling-water is delivered by the pump W through pipe Z. The flow of the water is regulated by the length of the stroke of the water-pump W and circulates around the compressing-cylinder, and passes then through pipe Z into 40 the lower part of the jacket B of the working cylinder, designated as "cooling-chamber" D. This jacket B incloses also the apparatus for developing the power for driving the engine. 45 Burner K, comprising the air-passage k , oil-evaporating pan H, and igniting-tube I, is bolted to the bottom of the jacket B. Pipe M' conveys air under pressure into the passage k from receiver N, valve Mv being 50 provided to prevent combustive fluids from entering pipe M when the pressure of the air should not be sufficient to carry them into the combustion-chamber E, as the case might be, when the engine is started. Pipe R delivers the oil from pump O into the evaporating-pan H. Igniting-tube I is screwed in the 55 burner, so that it may be heated from below when the engine is started.

Combustion-chamber E, an iron tube lined 60 with clay, is screwed to the burner K and connected by a curved joint Fj with the main flue F, branching by a tripartite joint fj into sections ff and $f'f'$, laterally ascending toward the hull of the working cylinder A, as 65 shown in Fig. 3.

Upper sections f' of the flues are closed on end and perforated by a row of small holes

d . The combustion-chamber E, the main flue F, and partly, also, the lower sections f are submerged in the cooling-water flowing 70 into the cooling-chamber D from the jacket of the air-compressing cylinder. Flues F, f , and f' have no pressure to withstand. The expansive gases produced by the combustion of oil-vapors mingled with air escape through 75 the holes d into the cooling-chamber D, where they pass over the surface of the cooling-water, evaporating it and converting the vapors into steam, and mingled with this steam pass through jacket B around the working 80 cylinder into the valve-chest.

Valve-chest C is cylindrical in shape. The sliding valve V, operated by an eccentric, opens and closes ports po and po' , one on each end of the working cylinder, both for 85 inlet and exhaust, the latter escaping through channels and pipe U.

Below valve-chest C, on plate p , screwed to the jacket B, are set the oil-feed pump O and the water-pump W. (Shown in Figs. 5 and 90 6.) The areas of the plungers po and pw are calculated in proportion to the area of the piston P' of the working cylinder and in proportion to the supply of oil and water required for driving the engine. The plungers 95 of both pumps are connected and operated by rod e , attached to the valve-rocking arm g , and thus their stroke corresponds constantly with the stroke of the sliding valve V, and the delivery of oil and water to the 100 engine is regulated according to its load.

To avoid a possible disturbance in governing of large engines, consequent to the working of the pumps O and W from the valve-rocking arm, I devised the governing arrangement shown in Fig. 1. The construction of this governing arrangement I have 105 made the subject of a separate application for a United States Letters Patent, filed March 7, 1896, Serial No. 582,227, and shall therefore not describe it here more in detail only as is necessary for the understanding of the engine described in this specification. On crank-shaft s , closely adjoining fly-wheel 110 Fy, belt-pulley y is set, having a limited swing on the shaft. Spring Ss connects collar n , rigidly keyed to the shaft s by the adjustable eye-rod er , with belt-pulley y , and transmits to it the power developed by the engine, yielding and bending under the strain 120 exerted by the load on belt-pulley y . When this load increases or the power of the engine decreases, belt-pulley y will be accordingly retarded and its position on the shaft s , in relation to the fly-wheel Fy, changed. The 125 movable arm of an eccentric, set on the shaft adjoining the fly-wheel, is connected through a stud to a spoke of belt-pulley y and its other arm to a spoke of fly-wheel Fy. Thus when the belt-pulley y deviates from its normal position in relation to the fly-wheel Fy the eccentric will be swung across the shaft 130 and its lift increased.

To compensate for differences in the pres-

sure of the expansive fluids and for the frictional resistance in the moving parts of the engine, the movable arm of the eccentric may be, as shown in Fig. 1, connected to crank set on a spindle passing through the stud and crank *lg'* to a centrifugal shaft-governor of the type used on high-speed engines. In the construction shown in the drawings the governor, attached to the belt-pulley *y*, consists of a weighted lever *lv*, oscillating on bolt *bv* and carrying on its longer arm the ball *bw*. This weighted lever is suspended on spring *sp*, and its shorter arm is linked by the adjustable rod *cb* to the crank *lg'*. The centrifugal power developed by revolving of the belt-pulley will drive the weighted-lever arm outward, according to the speed, and whenever the pressure of the expansive fluids will decrease in the working cylinder, or the friction in the moving parts of the engine increase, the speed of the engine will be reduced, the weighted-lever arm *lv* will recede outward on the shaft, and thereby the lift of the eccentric will be increased.

In this specification only the principles of my invention are described as applied to a certain type of the motor and the arrangement of parts selected for the purpose of showing their practical use. It is apparent that the several parts may be differently arranged and also combined in other constructions than the one described. Instead of the single working cylinder compound systems of low or high pressure may be employed with any of the known systems of valve-gear. Other devices for driving the feed-pumps may be used. The engine may be arranged in upright position. The power-generating apparatus—viz., burner, combustion-chamber, flues, and cooling-chamber—may be arranged within the bed or within the foundation of the engine and connected with the jacket of the working cylinder. The arrangement of the flue-tubes and of the cooling-chamber may be changed to suit different types of construction involving the fundamental parts and combinations described in this specification and for the purpose sought to be attained in my invention.

I claim as new and desire to secure by Letters Patent—

1. The combination, with an engine, adapted to be driven by expansive fluids, and having a working cylinder with a piston and a piston-rod, with ports for inlet and exhaust of the expansive fluids at each stroke, a valve-chest with a sliding valve and a valve-gear driven from an eccentric, set on the crank-shaft, of apparatus for developing the expansive fluids comprising a burner with an oil-evaporating pan, an oil and an air delivery pipe and an igniting-tube, a combustion-chamber attached to the burner and connect-

ing with flues, arranged in the jacket, surrounding the working cylinder, in sections laterally ascending, the uppermost section of these flues being closed on end and perforated on sides by a row of small holes, admitting the hot combustion-gases into direct contact with cooling-water, pumps attached to the engine and operated by a connecting-rod from the valve-gear and delivering continuously the supply of oil and water; an air-compressing cylinder, joined to the working cylinder and worked with the same piston-rod; a compressed-air receiver connected with the discharge-valve of the air-compressing cylinder, and with the air-delivery pipe attached to the burner.

2. In an engine, adapted to be driven by expansive fluids, the combination with a burner with an air and a fuel delivery pipe, an oil-evaporating pan and an igniting-tube, of a combustion-chamber attached to the burner and connecting with flues, for the purpose of producing expansive fluids by continuous combustion of evaporated oil mingled with air.

3. In an engine, adapted to be driven by expansive fluids and provided with an apparatus for producing such expansive fluids by continuous combustion of evaporated oil mingled with air, the combination with a combustion-chamber, of flues, connected with the combustion-chamber and arranged within a cooling-chamber, in sections laterally ascending, the upper section being closed on end and perforated on sides by a row of small holes, for the purpose of conducting the hot gases through cooling-water, and utilizing their excessive heat for developing of steam to be used together with the gases for driving the engine.

4. In an engine, adapted to be driven by expansive fluids, produced by continuous combustion of evaporated oil, and by steam produced from the cooling-water, used in the process of reducing the excessive heat of the combustion-gases, the combination with an oil and a water supply pump, secured to the engine in suitable position, and having plungers of proportionate areas, with rods coupled together in a block, of a gear, comprising a rocking rod, pivoted on one end, and having its other end adjustably secured to the valve-gear, and a connecting-rod, adjustably attached to the rocking rod, and secured to the coupling-block of the plunger-rods of the pumps, for the purpose of working the supply-pumps and regulating the supply of oil and water to the engine, according to its load.

THURSO VON QUERFURTH.

Witnesses:

WALTER F. WOLF,
WILLIAM MUESER.