(No Model.) 3 Sheets—Sheet 1.

O. WEGNER.

COMPRESSOR OR PUMP.

No. 575,140. Patented Jan. 12, 1897.

Fig. 1.

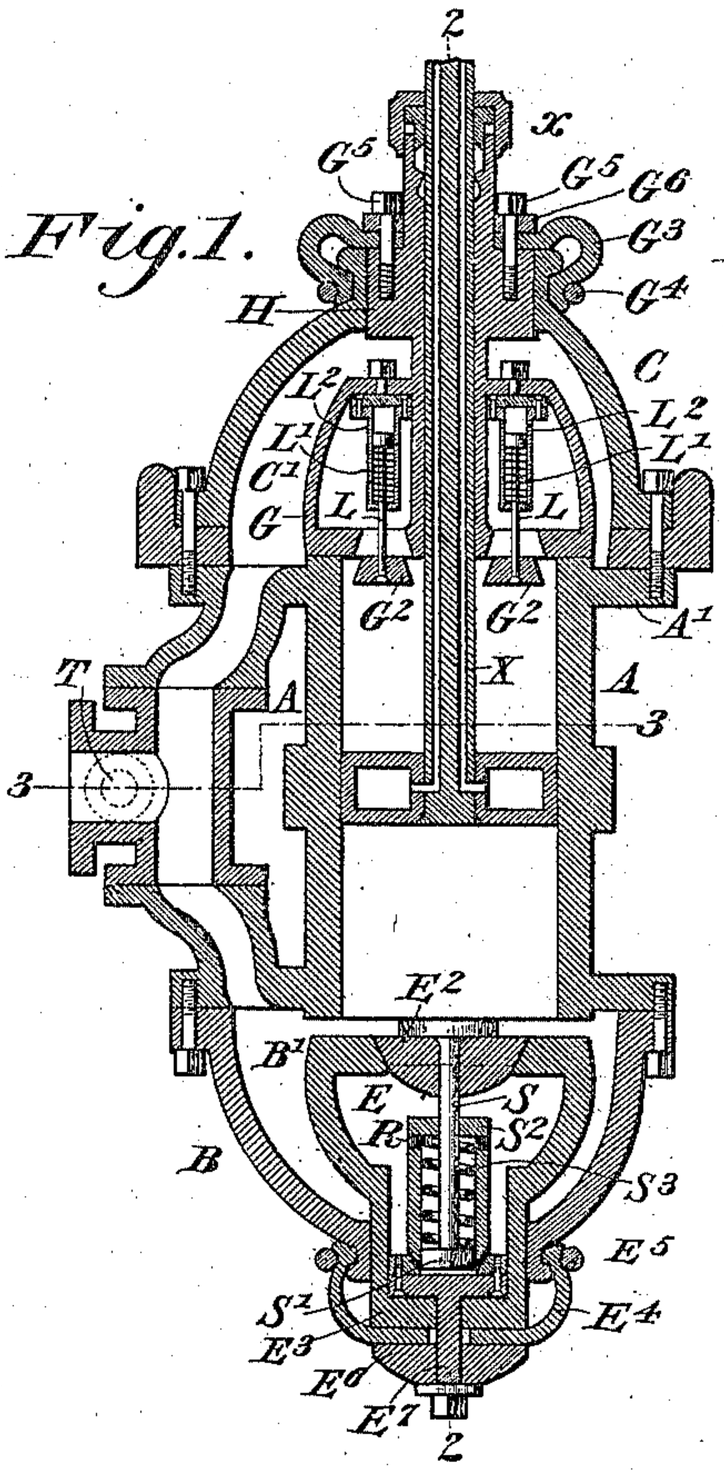


Fig. 2.

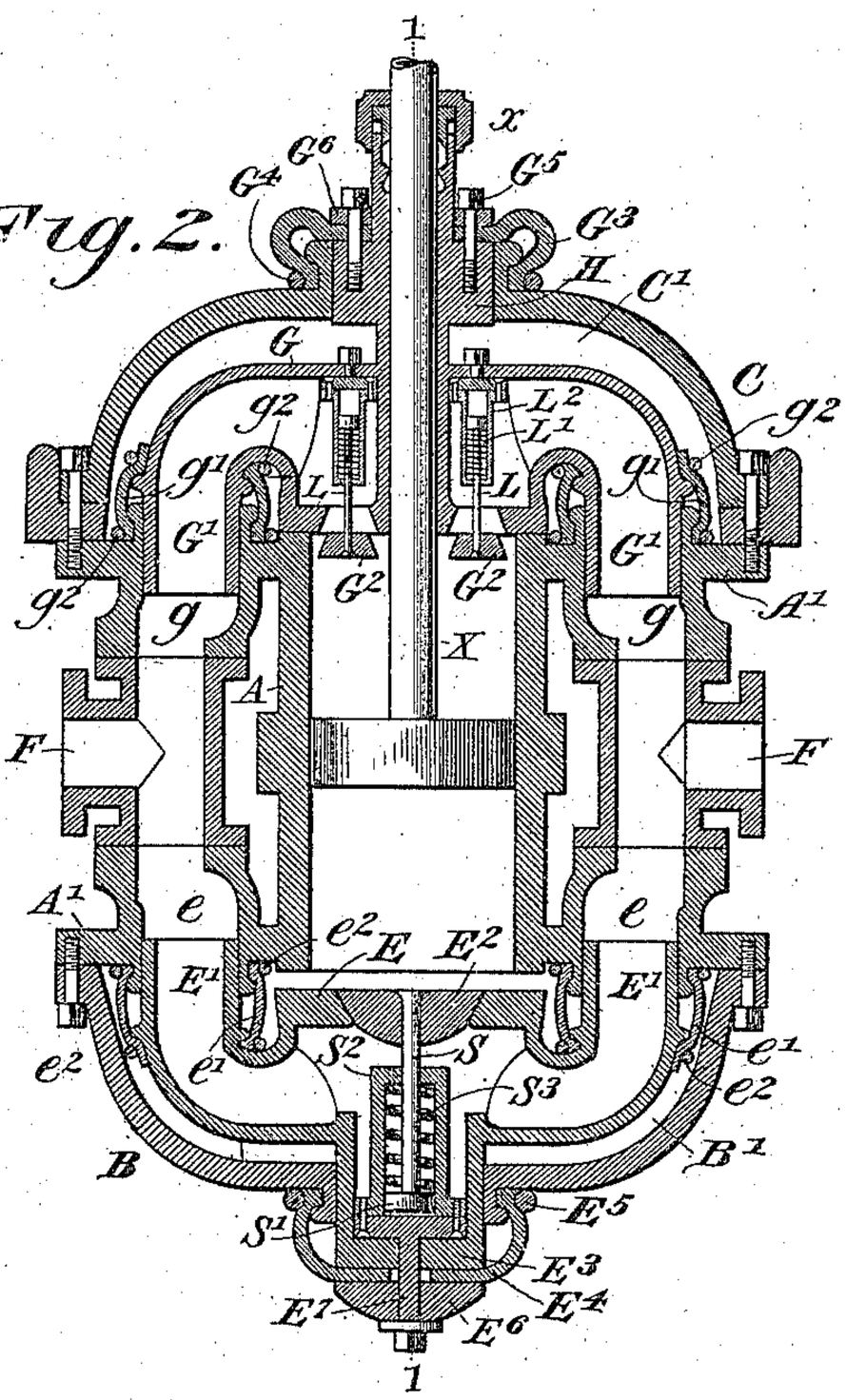


Fig. 3.

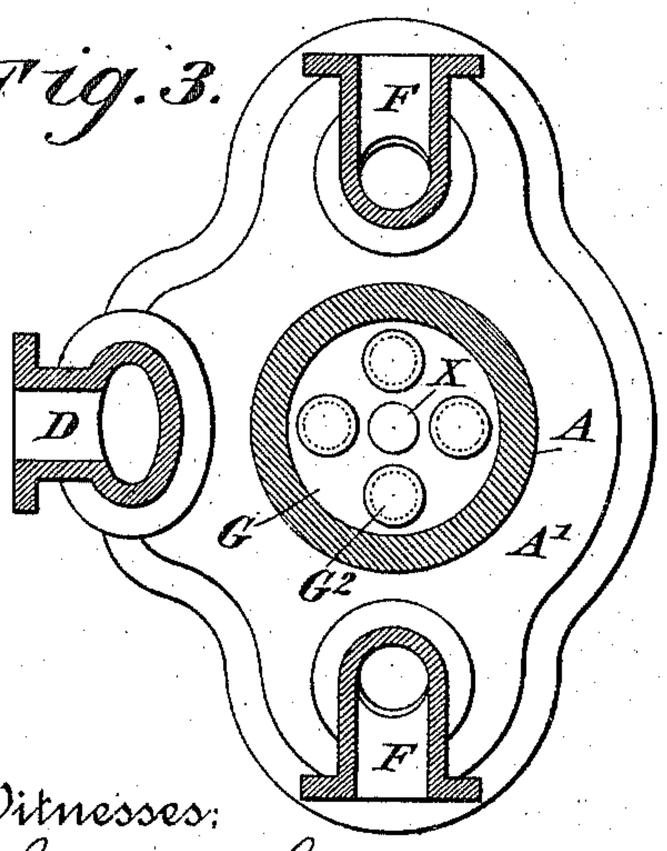


Fig. 4.

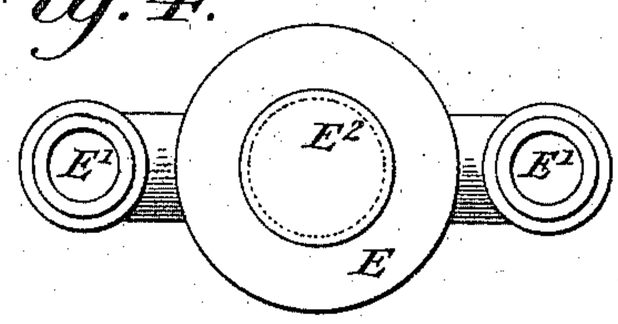
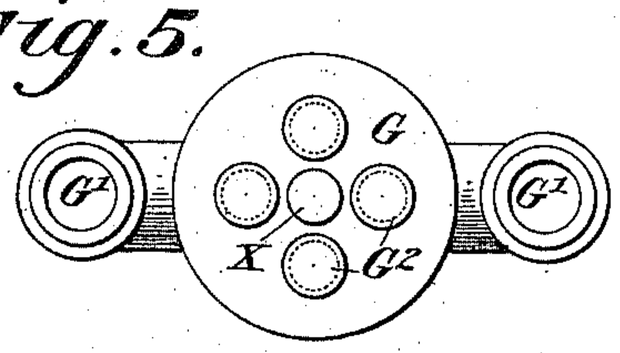


Fig. 5.



Witnesses:

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(No Model.) 3 Sheets—Sheet 2.

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Fig. 6.

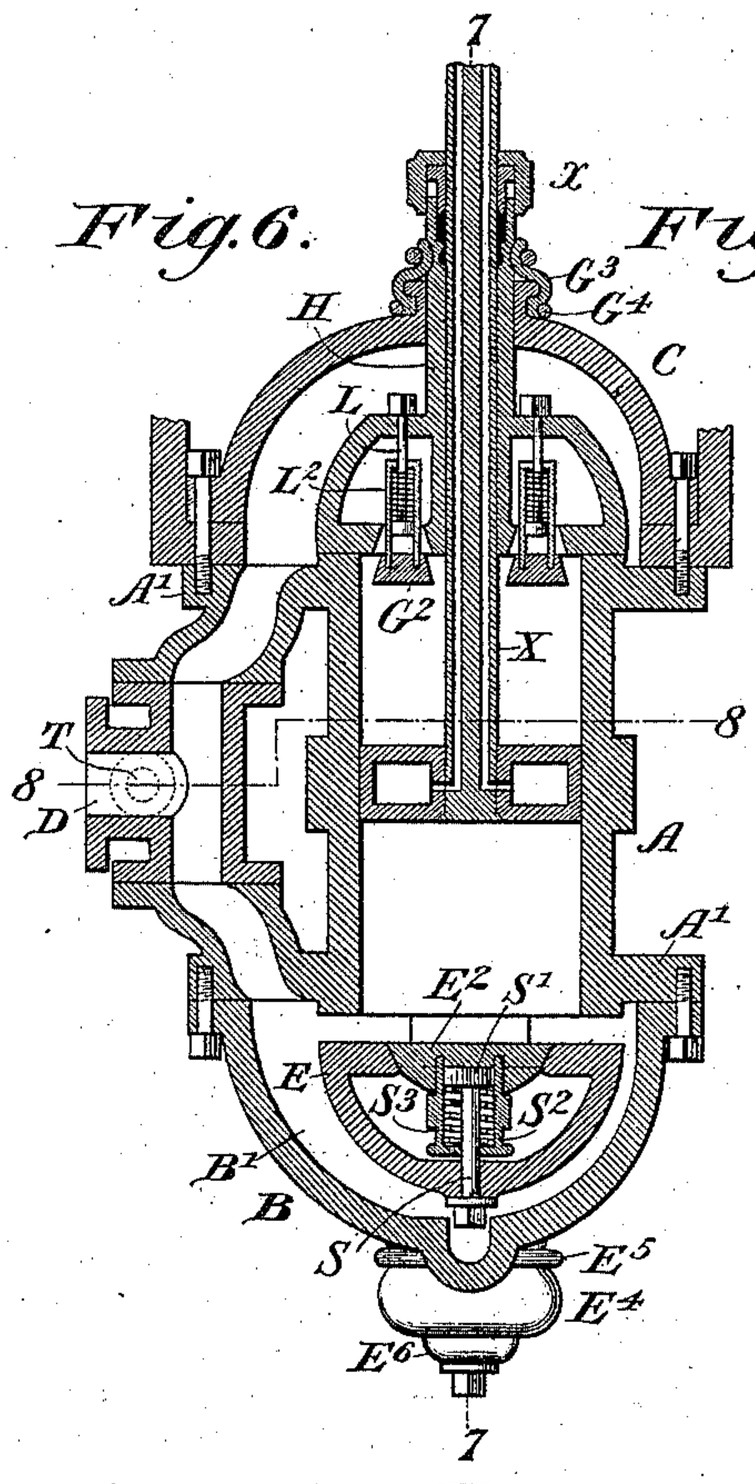

Fig. 7.

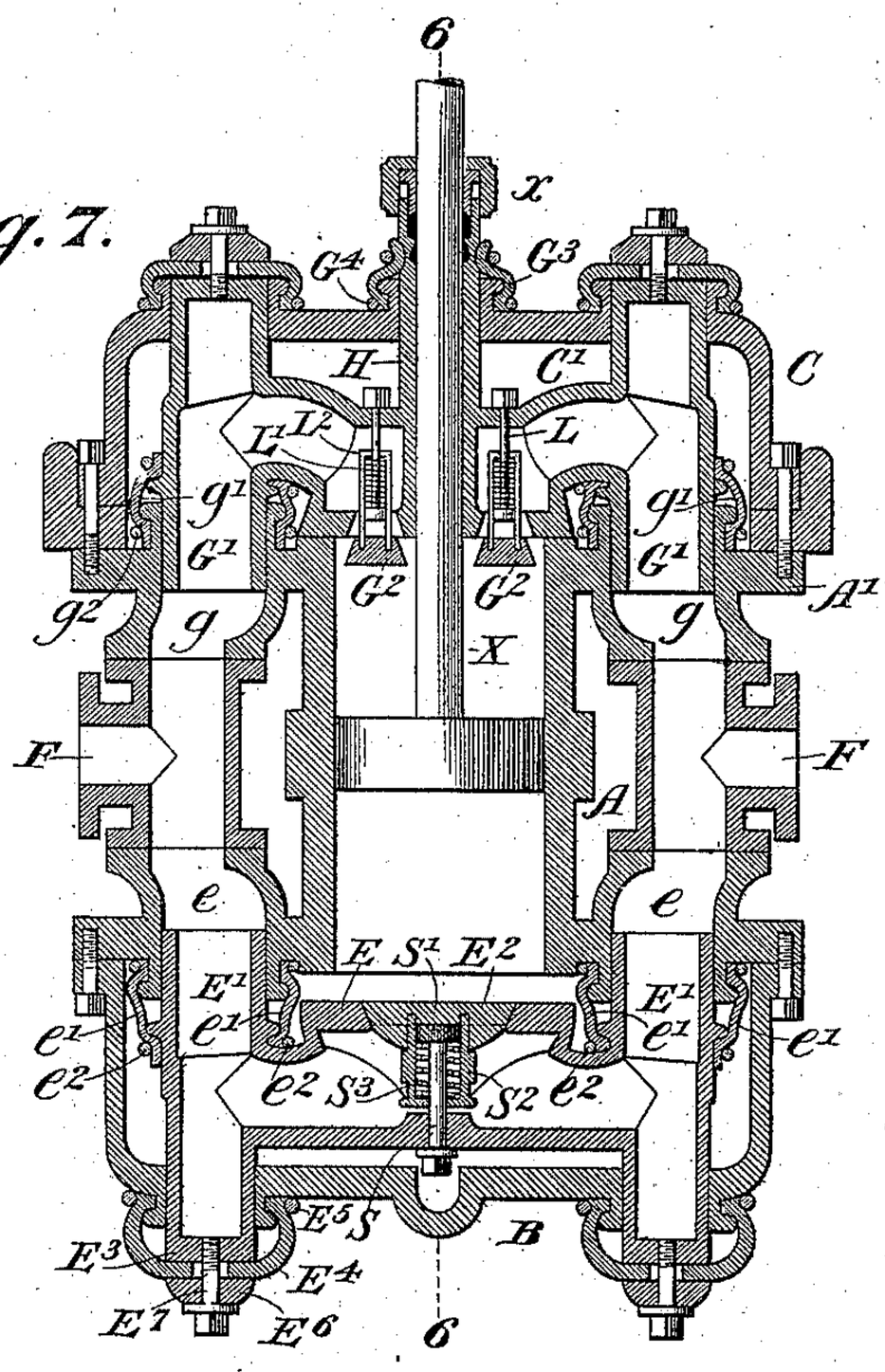

Fig. 8.

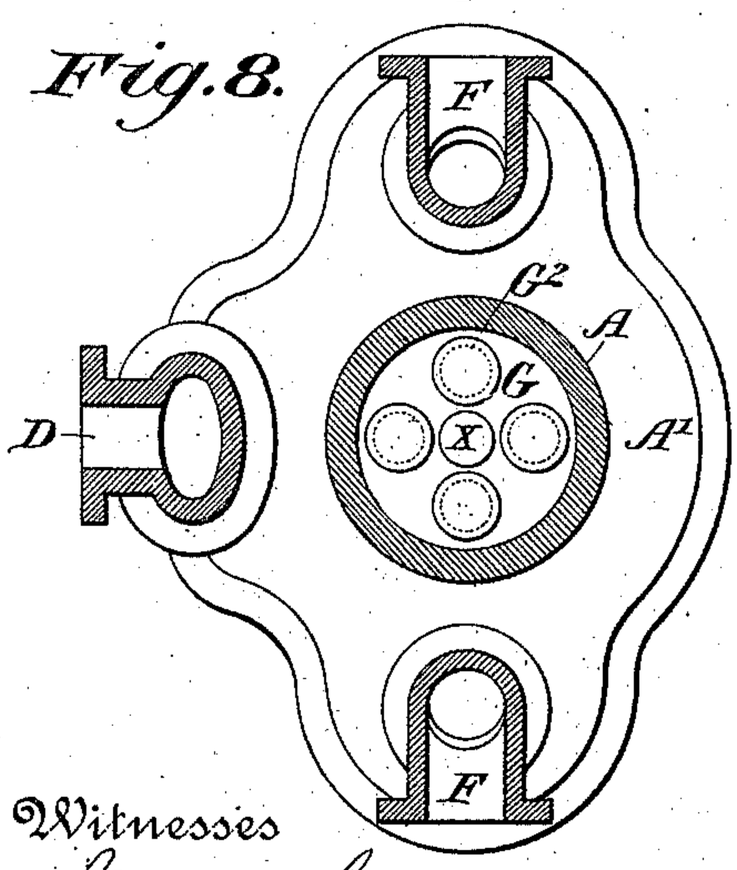

Fig. 9.

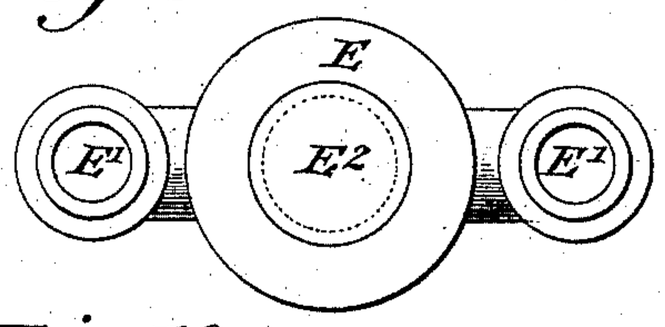

Fig 10.

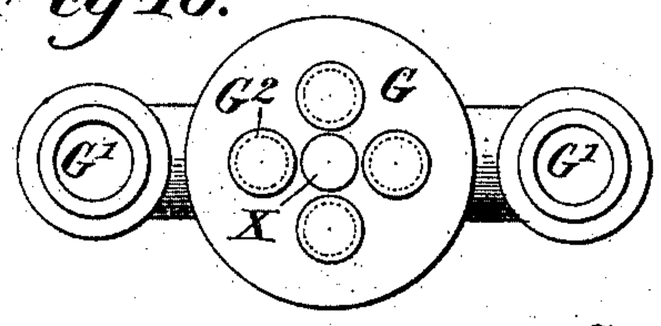

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Fig. 11.

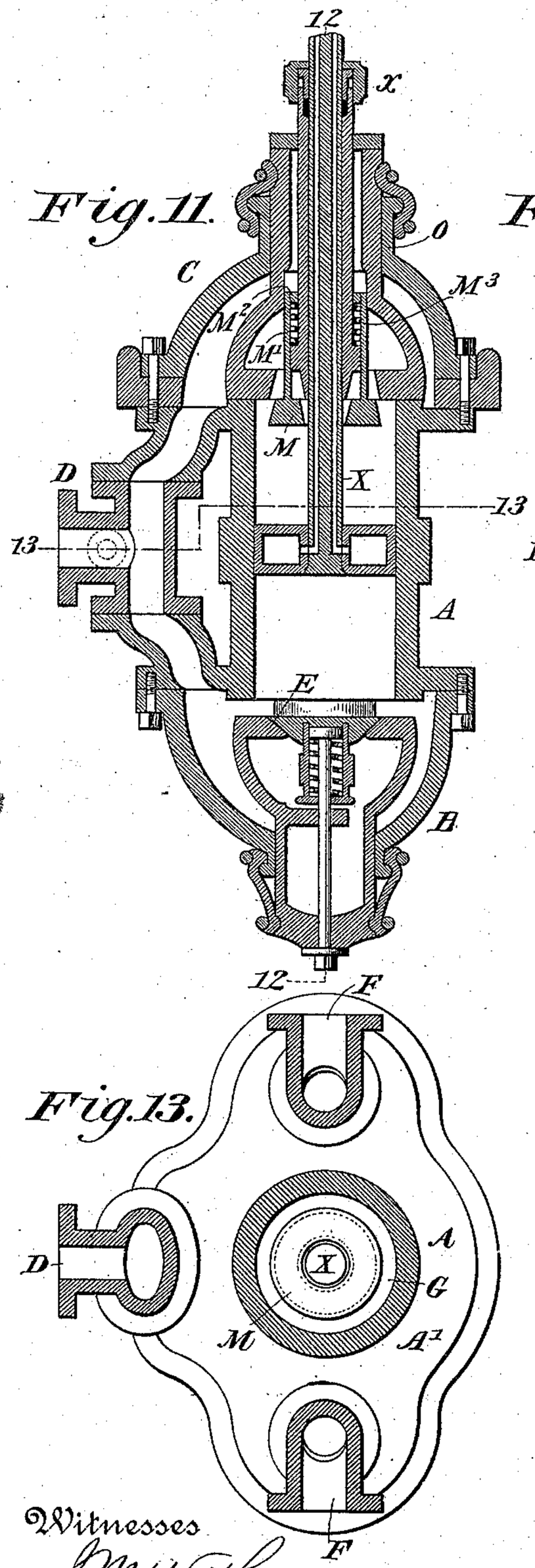

Fig. 12.

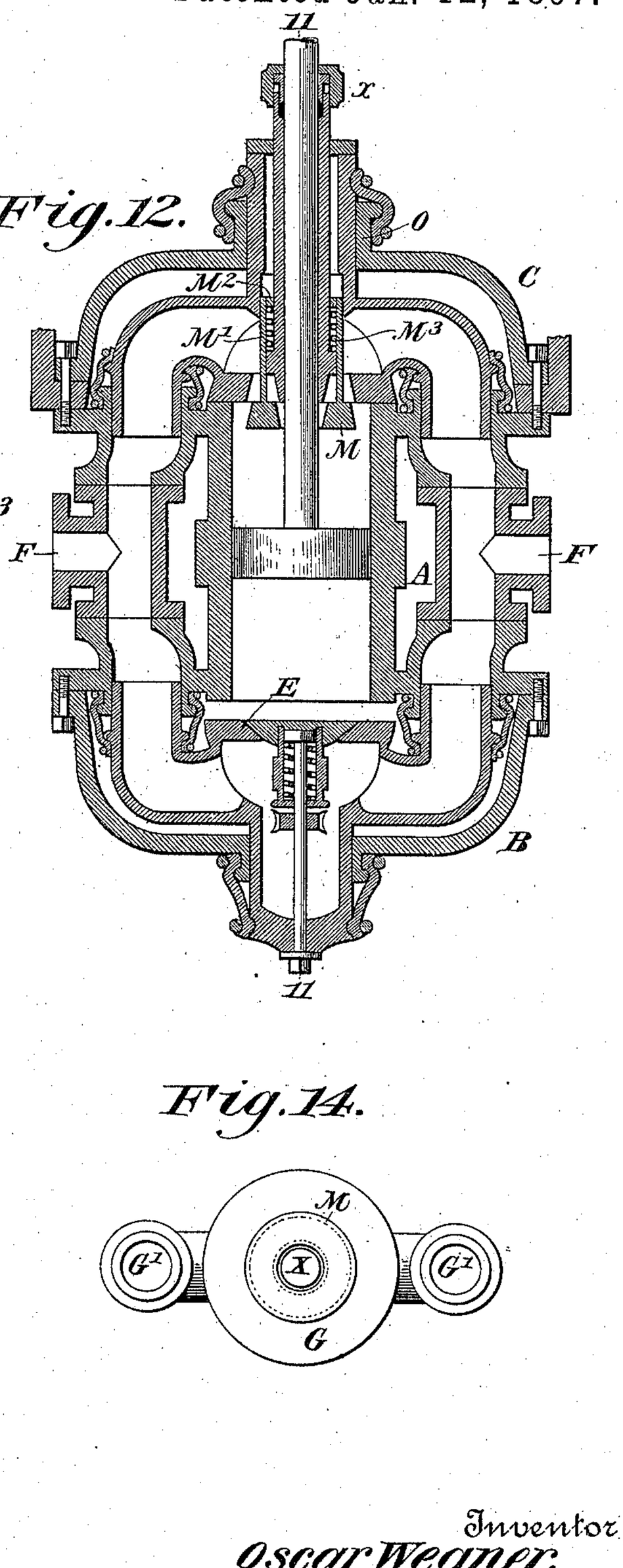

Fig. 13.

Fig. 14.

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UNITED STATES PATENT OFFICE.

OSCAR WEGNER, OF BROOKLYN, NEW YORK.

COMPRESSOR OR PUMP.

SPECIFICATION forming part of Letters Patent No. 575,140, dated January 12, 1897.

Application filed October 26, 1894. Serial No. 527,075. (No model.)

To all whom it may concern:

Be it known that I, OSCAR WEGNER, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Compressors or Pumps, of which the following is a specification.

My invention relates to pumps or compressors of that class in which the entire contents of the cylinder are expelled at each stroke of the piston; and the invention constitutes an improvement upon the particular style of such apparatus shown in my application, Serial No. 516,975, filed July 9, 1894, in which the general construction is as follows: At each end of the cylinder is a closed chamber communicating with the eduction-port. In each chamber is a hollow valve that I call a "head-valve," that seats against the radial face, *i. e.*, the end face, of the cylinder and closes its end. These hollow head-valves have therein induction-valves that open into the cylinder and tubular projections that work with an air-tight joint in induction-passages of the apparatus, there being sufficient play to allow the movement of the head-valve from its seat to discharge the contents of the cylinder as the piston approaches or lifts it in the movement of the piston to or beyond the extreme end of the cylinder. The difference in the respective collective pressure upon the opposite sides of the head-valve returns it to its seat on the radial face of the cylinder as the piston recedes, and when said valve is so seated and on the continued recession of the piston the induction valve or valves therein open and admit the air, gas, or liquid to the rear side of the piston.

The invention consists in a modification of the construction of the valves and in an organization whereby the amount of back pressure on the head-valve may be reduced to such extent as to effect the closing of the head-valve against the radial face of the cylinder without unnecessary violence of movement due to too great preponderance of the back pressure upon the exterior face of the head-valve.

In the accompanying drawings, Figure 1 is a vertical longitudinal section on the line 1 1 of Fig. 2; Fig. 2, a similar view on the line 2 2 of Fig. 1; Fig. 3, a transverse section on the line 3 3 of Fig. 1; Fig. 4, a plan view of the under face of the head-valve having central induction-valve and the induction-passages in the tubular extensions of the head. Fig. 5 is a similar view of the lower head-valve. Figs. 6 and 7 show a modified construction and are respectively longitudinal sections on the line 6 6 of Fig. 7 and the line 7 7 of Fig. 6. Fig. 8 is a transverse section on the line 8 8 of Fig. 6. Figs. 9 and 10 are respectively plans of the inner faces of the upper and lower head-valves. Figs. 11 and 12 show another modification of construction and are respectively longitudinal sections on the lines 11 11 of Fig. 12 and 12 12 of Fig. 11. Fig. 13 is a transverse section on the line 13 13 of Fig. 11, and Fig. 14 is a plan view of the lower head-valve shown in Figs. 11 and 12.

All unnecessary parts of the framing or supports have been omitted. When I speak of the "outer" face of the head-valve, I refer to the exterior face farthest from the cylinder, the inner face being the exterior face next to the cylinder.

Referring specially to Figs. 1, 2, 3, 4, and 5, the cylinder A is formed or cast with a flange A′ at each end, to which are bolted the end pieces B C, that form chambers B′ C′, that communicate with the eduction port or passage D. Within the chamber B′ is a hollow head-valve E, that seats upon the radial face of the cylinder and has on opposite sides two tubular extensions or arms E′ E′, that fit closely and work in passages *e e*, that communicate with induction-ports F. The joint between E′ E′ and *e e* may be packed, and I have shown an annular corrugated yielding sheath *e′*, closing the joint and attached to the respective parts by clamping rings or wires e^2. An induction-valve E^2 of special construction is seated centrally in the face of the hollow head-valve opposite the end of the cylinder, and when seated its outer surface is flush with the face of the hollow head-valve. When open, it establishes communication between the cylinder and the interior of the head-valve and thence to the induction port or ports through the telescoping connections E′ *e′*. The other end of the cylinder is provided with a head-

valve G of similar construction and arrangement, except it has a central opening for the piston-rod X and a concentric tubular extension H therefrom which passes through the end piece C and in which the piston-rod works, a stuffing-box *x* being applied at the end of the extension, and instead of a single induction-valve, as in the other head, it has four such valves G^2, arranged around the piston-rod, the purpose being to provide an area of inlet approximately equal to that of the valve E^2.

G′ *g g′* g^2 show parts corresponding with E′ *e e′* e^2.

The area of the induction-valve E^2 and the combined area of the four induction-valves G^2 is preferably respectively about equal to one-half the area of the respective faces of the piston.

As stated, the back pressure of the compressed air, gas, or liquid is utilized to cause the head-valves to close against the radial face of the cylinder. Where the induction-passages E′ G′ are, however, of considerable area, the differences of pressure upon the inner and outer faces of the head-valves may be such as to cause them to close against their seats with a greater impact or violence than is necessary. To counteract such tendency, I may expose part of the outer surface of each head-valve to the atmosphere and thus reduce the difference of pressure exerted upon its inner and outer faces. In Figs. 1 and 2 I illustrate such an arrangement in connection with both head-valves E and G. The head-valve E is formed with a cylindrical extension E^3, concentric with the cylinder that passes through an opening in the end piece B, which is hermetically closed by a flexible sheath E^4, secured to the flange surrounding the opening by a binding-wire E^5 and to the end of the cylindrical extension E^3 by a nut E^6, screwing on a spindle E^7, projecting from the end of E^3. The same result is accomplished with the lower head-valve by enlarging the part H, that passes through the end piece C. The opening in the end piece C is sealed with a flexible sheath G^3, secured by wire G^4 to the flange surrounding the opening in C and to the enlarged part of H by screw-bolts G^5 and washer G^6.

In Figs. 6 and 7 the construction is substantially as already described, and corresponding letters refer to like parts, as in Figs. 1 and 2, except that instead of one cylindrical extension on each head-valve concentric with the cylinder being exposed to the atmosphere there are two extensions arranged on opposite sides of the axis of the cylinder. The construction is plain from the drawings, and specific description is unnecessary.

In Figs. 11 and 12 there is one cylindrical extension concentric with the cylinder arranged substantially as shown in Figs. 1 and 2. The flexible sheaths are, however, secured at all points by binding-wires.

In all these modifications the openings through which these cylindrical extensions pass might be packed with ordinary stuffing-boxes.

The use of two cylindrical extensions exposed to the atmosphere on opposite sides of the axis of the cylinder gives, perhaps, a better balance of the head-valves.

The back pressure of the compressed air, gas, or liquid holds the head-valve upon its seat against the pressure in the induction-passages as the piston moves away from the head-valve and the induction-valve therein opens to admit the incoming air, &c. After the head-valve has been moved from its seat by the action of the piston which passes to or beyond the extreme end of the cylinder and expels its entire contents, as the piston recedes the head-valve follows with it and comes to its seat. Such action is due to the fact that the area of the head-valve upon which the compressed air, &c., acts to close it against its seat is greater than the area thereof upon which the compressed air acts in the opposite direction. This difference of area is due to the fact that the tubular extensions working in the induction-passages are isolated or occluded from and reduce the area next or adjacent to the end of the cylinder upon which the back pressure acts with a tendency to move the head-valve away from its seat, and such difference of area is amply sufficient to effect the closing of the head-valves by the back pressure. If the surface of contact of the face of the piston and the face of the head-valve were perfectly true and close the back pressure would be excluded from the area of the head-valve covered by the piston, but I do not rely upon such a condition to obtain the requisite difference in area or pressure. Such difference in area, and consequently difference in pressure, upon the opposing faces of the head-valve as may be required in any particular case may readily be obtained by constructing the tubular induction extensions and the cylindrical extensions connected with the head-valve of different areas.

The machine may be arranged vertically, as shown, or in other positions.

The apparatus may be assumed to be placed in a closed circulating system of liquid or gas, as, for instance, the closed circulation system of a refrigerating-machine using ammonia or other element, wherein the normal back pressure will be sufficient to close the cylinder head-valves against their seats. When used as an ordinary liquid-pump, the back pressure of the column of liquid will be sufficient to accomplish the same end. When used as an air or gas compressor working into a receiver or into an auxiliary chamber connected with the main receiver through a pressure-valve, the requisite initial pressure may be obtained by the use of an auxiliary compressor of ordinary construction.

I have indicated at T in dotted lines an or-

dinary pressure-regulating valve located in the eduction-port D. This valve may be used to obtain the necessary back pressure in starting the machine where there is not sufficient initial back pressure in the system in which the apparatus is working.

In Figs. 1 and 2 the induction-valves in the upper and lower head-valves are carried by stems L, having beaded ends that work against springs L′ in cylinders L^2, attached to the interior of the hollow head-valves. With this construction there is the least obstruction of the induction-passages.

In Figs. 11 and 12, instead of a series of induction-valves in the lower valve-head, I show a single annular valve M, surrounding the piston and carried by a number of arms or spindles M′, connected with a ring M^2, that works against a spring M^3, surrounding the hub H. In these figures the spindle of the upper valve is guided at O in the cap C.

In Figs. 1 and 2 the valve E^2 is on the end of the spindle S, having a head S′ at the opposite end working in a cylinder S^2 against the coiled spring S^3. The flanged end of this cylinder is bolted to the flanged end of the bolt or spindle E^7, that passes through the end of the cylindrical extension E^3 and receives the nut that secures the flexible sheath. In assembling, the parts S, S′, S^2, S^3, and E^7 are brought together and inserted into the hollow head-valve through the passage-way surrounded by the seat of valve E^2. The parts are so related that there is no danger of the pendent cylinder S^2 becoming detached from the part E^7. The cylinder S^2 is perforated, as at R.

This apparatus may also be used as a vacuum-pump.

I claim as my invention—

1. The combination, substantially as set forth, of the cylinder, the piston, the end chamber communicating with the eduction-port, the hollow head-valve arranged in said chamber, seated against the radial face of the cylinder, and having an area of its outer face exposed to the atmosphere, the induction-port with which the interior of said head communicates by an extensible or telescoping joint, and the induction-valve arranged in the head-valve, the organization being such that the head is forced from its seat by the compressing action of the piston, and is returned to its seat as the piston recedes by the back pressure.

2. The combination, substantially as set forth, with the cylinder and piston working therein and the end chamber communicating with the eduction-port, of the hollow head-valve in said chamber and having part of the area of its outer face exposed to the atmosphere, an induction-valve therein opposite the end of the cylinder, and a yielding connection between the induction-port and the interior of the head-valve located on the face of the head-valve toward the end of the cylinder, for the purpose described.

3. The combination, substantially as set forth, with the cylinder, the piston working therein and the end chamber communicating with the eduction-port, of the hollow valved head-valve, having part of the area of its outer face exposed to the atmosphere, in said chamber, seating against the radial face of the cylinder and having one or more tubular extensions on its face next to the cylinder working in an induction passage or passages, for the purpose described.

4. The combination of the valve-spindle S, the pendent cylinder S^2, and the flanged bolt E^7, substantially as set forth.

5. The combination of the valve-spindle S, its valve E^2, the pendent cylinder S^2, the flanged bolt E^7, and the hollow head-valve E, having a valve-seat for the valve E^2, and containing the parts S, S^2, E^7, which parts are inserted thereinto through the said valve-seat, substantially as set forth.

In testimony whereof I have hereunto subscribed my name.

OSCAR WEGNER.

Witnesses:

FRANK S. OBER,

CATHARINE GEORGI.