No. 719,772. PATENTED FEB. 3, 1903.

F. FANTA.

SYSTEM FOR PRODUCTION OF VACUUM.

APPLICATION FILED NOV. 25, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

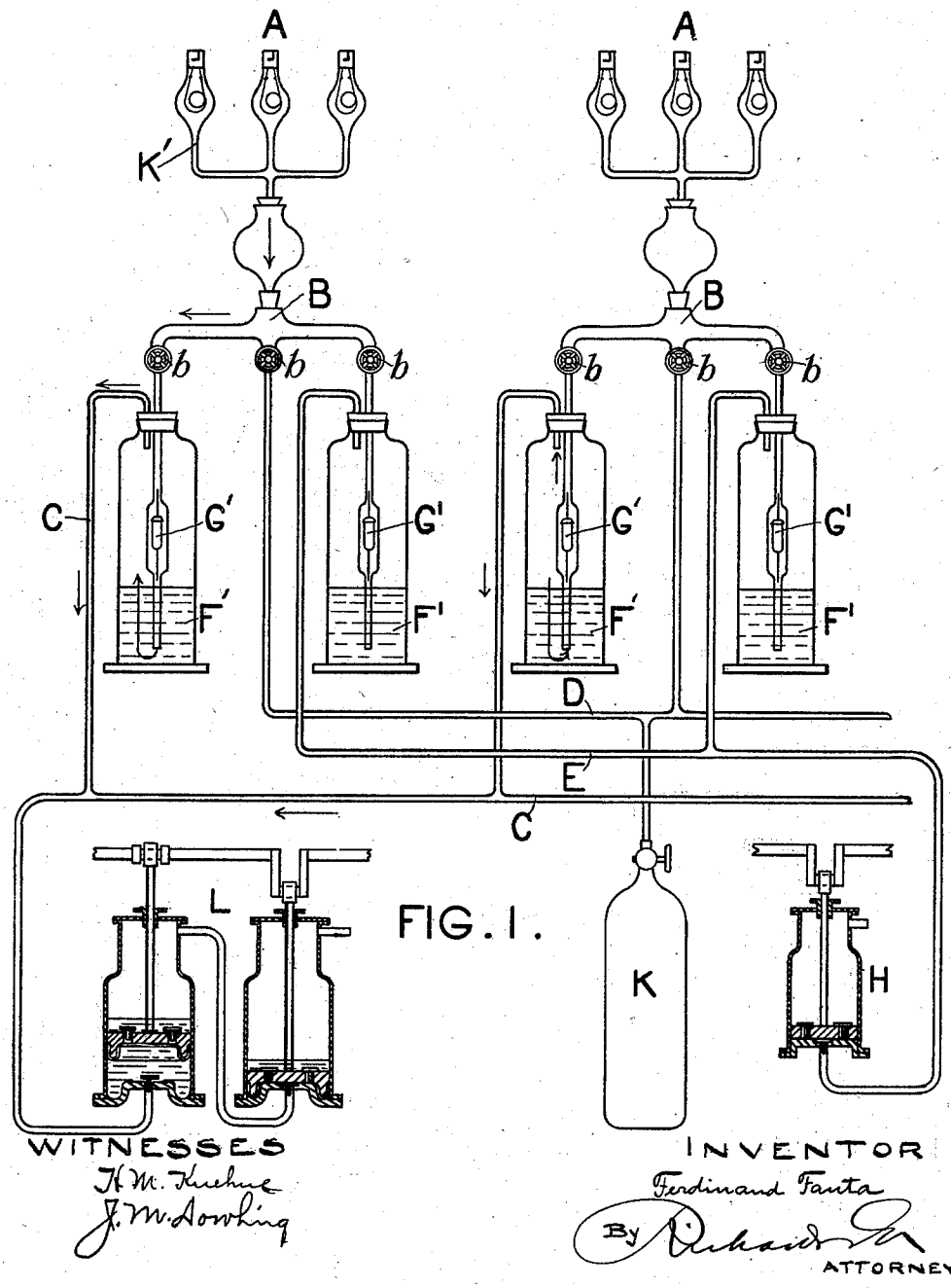


FIG. 1.

WITNESSES

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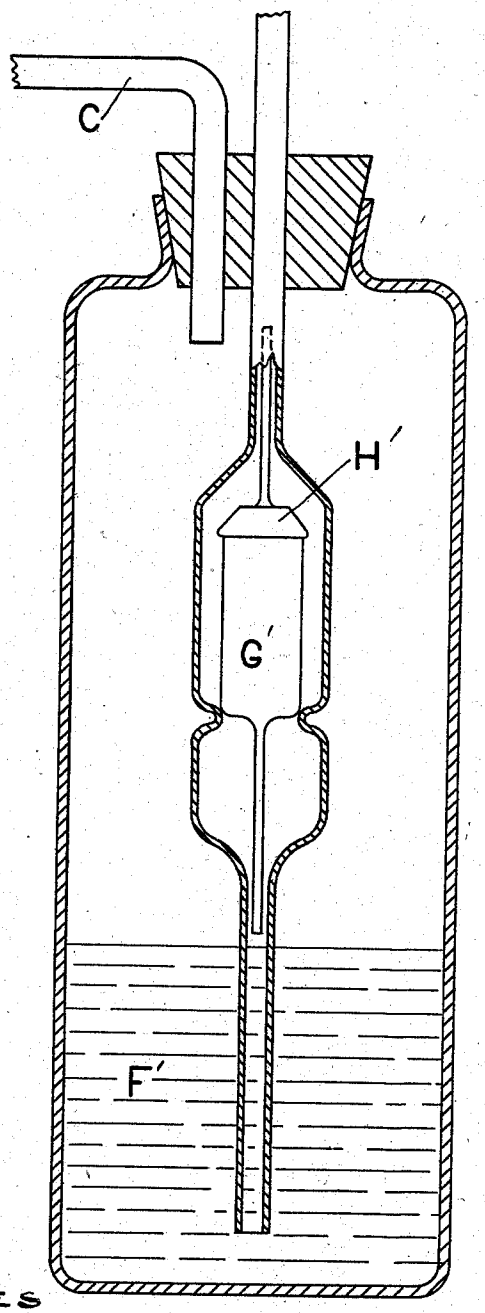


FIG. 2.

WITNESSES

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# UNITED STATES PATENT OFFICE.

FERDINAND FANTA, OF LONDON, ENGLAND.

## SYSTEM FOR PRODUCTION OF VACUUM.

SPECIFICATION forming part of Letters Patent No. 719,772, dated February 3, 1903.

Application filed November 25, 1902. Serial No. 132,819. (No model.)

*To all whom it may concern:*

Be it known that I, FERDINAND FANTA, a subject of the King of Great Britain and Ireland, residing at London, England, have invented a new and useful Improved System for the Production of Vacuum, of which the following is a specification.

This invention relates to the production of as perfect a vacuum as is practicable for industrial and commercial purposes; and it consists of an improved system or combination of appliances in which the operation of exhaustion is carried out in distinct stages with simple and specific mechanical appliances used in such stages, repectively, whereby the production of a practically perfect vacuum is greatly accelerated.

To carry my system into effect, I proceed in three distinct stages.

The first stage is an exhaustion by any ordinary vacuum mechanical pump of good construction without any liquid filling of the clearance-spaces, which are simply reduced mechanically to a minimum. The exhaustion may readily and quickly be carried out in this way to the extent of a vacuum equal to twenty-nine inches of mercury.

The second stage is the introduction by the continued exhaustion of the first set of pumps of a hydrocarbon gas into the bulb or receptacle to be exhausted, so that any remnants of air are thus mechanically displaced by the artificially-supplied hydrocarbon gas of extreme tenuity.

The third stage is now the final exhaustion of the hydrocarbon gas of extreme tenuity by another set of pumps in which all clearance-spaces are filled with oil or equivalent liquid, which thus deal only with hydrocarbon gas of extreme tenuity and through which air never passes at all. The oil or equivalent filling therefore in these pumps never alters its condition at all as regards becoming an emulsion, the hydrocarbon having an affinity for the heavy hydrocarbon oil conveniently used for filling purposes and the oil being always under a condition of extreme vacuum without contact with air or the atmosphere.

Equivalently as the proportion of air left to deal with in the last stage of exhaustion is very minute the second stage of exhaustion can be carried out with some advantage by the use of a distinct oil-packed pump which has not been used for the exhaust of any air without the use of the hydrocarbon vapor to entirely displace the air.

Figure 1 is an elevation of two of a considerable series of lamps in sets for treatment. Fig. 2 is an enlarged detail of the oil seal and check-valve therein.

As means for carrying this system into effect I mount the lamp-bulbs A or receptacles to be exhausted in sets, making a common connection to a four-way fitting B, three-way cock, or equivalent device, by which the interior of each set of the bulbs may be brought in succession into communication with the first vacuum pump or pumps H by the main E, then with a hydrocarbon-gas supply by a main D from a gas-cylinder K, and finally with the finishing oil-packed vacuum-pumps L by a main C, all successive operations being controlled by a multiple-way cock or by independent cocks *b b b*. The air on its way to the first mechanical exhaust-pumps is conveniently passed through an oil seal F′ in a glass transparent receptacle, by which the condition of the first stage of the operation can be watched, the air first bubbling through the oil and then forming an emulsion, which soon stops, showing that the air contained in the bulb has been practically withdrawn to a sufficient degree to mark the end of the first stage. Upon the admission of the hydrocarbon gas to the bulb by the main D and its passage through the oil seal by the suction of the pump all air is ejected both from the bulb, the passages, and the oil seal, which is brought back to its original condition ready for the next withdrawal of air in bulk. I also provide a check-valve G′ between the oil seal F′ and the bulb or vessel to be exhausted, making such valve a float with a rubber cape H′, adapted to make a joint with the outer tube on the oil should the air-pressure enter onto the oil seal, and I also provide a check-valve G′ between the bulb or vessel A and the main C of the final exhaust-pump, which latter is also an oil seal F′, so that upon accidental breakage of a bulb or connections—say at K′—the entry of the air is limited as far as possible to the bulb or small

set of bulbs adjacent to the fracture, as shown by arrows indicating the entry of the air to the oil seals and check-valves therein.

By this system I can obtain a practically perfect vacuum in from eight to ten minutes on practically any number of bulbs or similar receptacles to be exhausted, whereas it has so far not been possible to obtain anything like a perfect vacuum with mechanical exhaust-pumps, and, further, the production of even such an indifferent vacuum usually requires an operation of from forty to forty-five minutes.

Having now described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In combination a four-way coupling connecting with the vessels to be exhausted, three mains connected to the coupling; means for alternately opening or closing said mains, means for preventing pressure-backflow into the vessels on two of said mains, which are used for exhaust; a mechanical exhaust-pump connected to one of said mains; a mechanical exhaust-pump with oil-filled clearances connected to second of said mains; and means for the supply of hydrocarbon gas to the third of said mains.

2. In combination a four-way coupling connecting with the vessels to be exhausted, three mains connected to the coupling; a controlling-cock upon each of said mains; a mechanical exhaust-pump connected to one of said mains; a mechanical exhaust-pump with oil-filled clearances, connected to another of said mains; an oil seal on each of said exhaust-mains; a floating valve in each of said oil seals, adapted to close admission to said vessels, upon admission of pressure to said exhaust-mains; and means for the supply of hydrocarbon gas to the third of said mains.

3. In combination a four-way coupling connecting with the vessel to be exhausted, three mains connected to the coupling; multiple branches from each of said mains connected to other vessels to be exhausted; a mechanical exhaust-pump connected to one of said mains; a mechanical exhaust-pump with oil-filled clearances connected to another of said mains; an oil seal on each of the branches of said exhaust-mains; a floating valve in each of said oil seals, adapted to close admission to the said vessels upon admission of pressure to said exhaust-mains; and means for the supply of hydrocarbon gas to the third of said mains and branches.

4. In combination a plurality of four-way couplings connecting with the vessels to be exhausted, three mains connected by branches to all of said couplings; means for opening or closing said branches of said mains at will; a mechanical exhaust-pump connected to one of said mains; a mechanical exhaust-pump with oil-filled clearances connected to another of said mains; oil seals with transparent containers on each of said branches from both of said exhaust-mains; a floating valve in each of said oil seals adapted to close admission to the said groups of vessels upon admission of pressure to said exhaust-mains; and means for the supply of hydrocarbon gas to the third of said mains.

In witness whereof I have hereunto set my hand in presence of two witnesses.

FERDINAND FANTA.

Witnesses:

RICHARD A. HOFFMANN,

CHARLES CARTER.