(No Model.) 2 Sheets—Sheet 1.

W. E. NICKERSON.

VACUUM PUMP.

No. 453,276. Patented June 2, 1891.

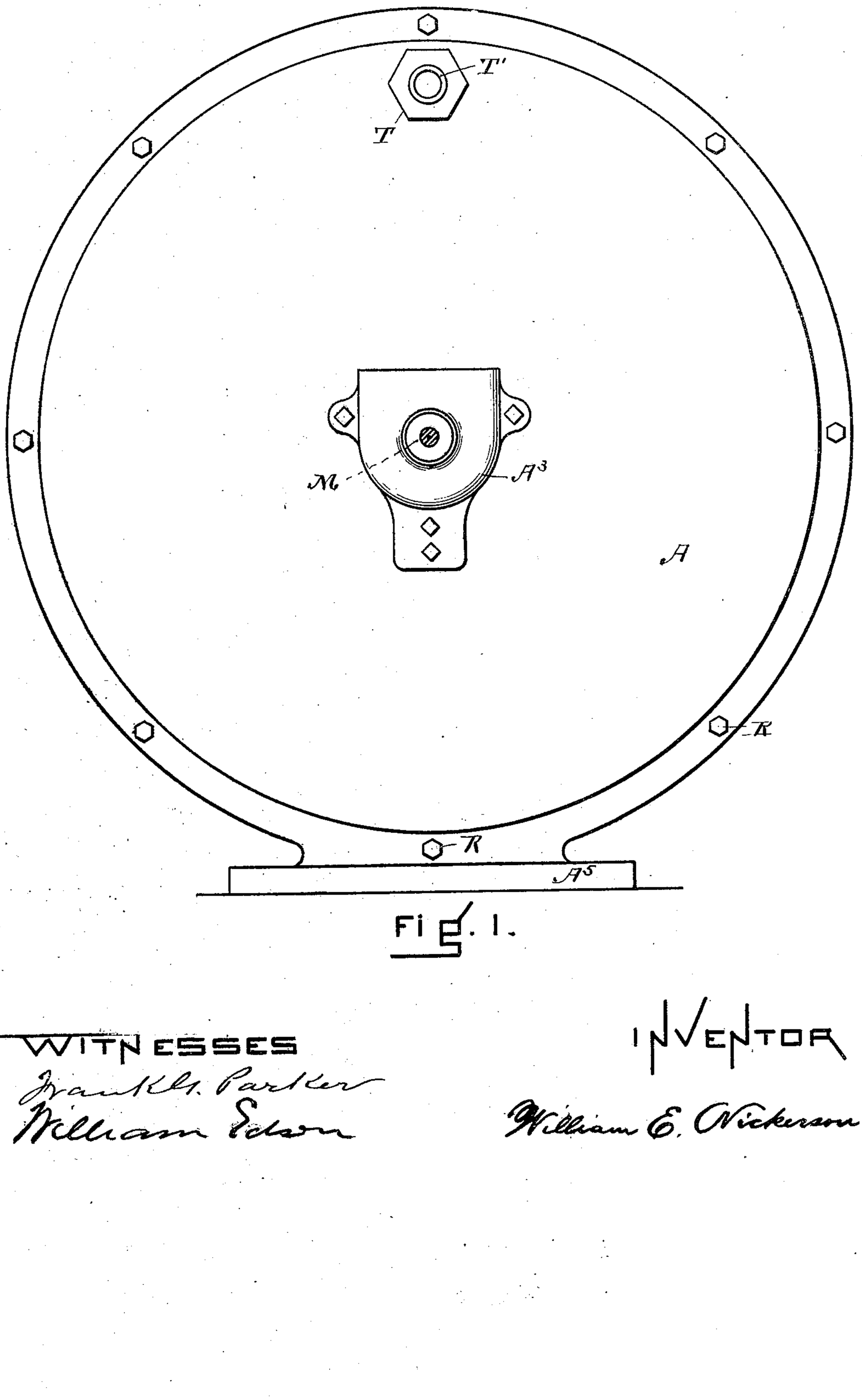

Fig. 1.

WITNESSES

Frank L. Parker

William Edson

INVENTOR

William E. Nickerson

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Fig. 2.

WITNESSES.

Frank H. Parker

William Edson

INVENTOR

William E. Nickerson

UNITED STATES PATENT OFFICE.

WILLIAM E. NICKERSON, OF CAMBRIDGE, MASSACHUSETTS, ASSIGNOR TO THE BEACON VACUUM PUMP AND ELECTRICAL COMPANY, OF PORTLAND, MAINE.

VACUUM-PUMP.

SPECIFICATION forming part of Letters Patent No. 453,276, dated June 2, 1891.

Application filed June 2, 1890. Serial No. 354,042. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. NICKERSON, of Cambridge, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Vacuum-Pumps, of which the following, taken in connection with the accompanying drawings, is a specification.

The object of this invention is to adapt a diaphragm-pump to the work of exhausting air. This object I attain by the mechanism shown in the accompanying drawings, in which—

Figure 1 is a side elevation of my device. Fig. 2 is a vertical section of the same.

The device selected for illustration consists of two circular diaphragms B and B′, united air-tight at their edges. The diaphragm B is riveted or otherwise attached to the center piece C, and this center piece C is firmly secured or made integral with the flange-piece D, as shown. The flange-piece D is secured by screws E E to one side A′ of the outside casing.

L is a valve located in the center of the diaphragm B. This valve L has a stem L′, forked, as shown, and so fitted to the hole M′ in the rod M that it shall have a strong frictional connection with the said rod, so that the said valve L will move with the movements of the rod M unless it is held by its seat from moving in the closing direction or by the nut L^3 on the stem L^2 after opening to the desired extent. Although the valve is actuated—that is, closed and opened by the movement of the rod M—its motion is very slight in comparison to that of the rod, and it opens with the beginning of the outward movement of the rod, remaining open during the full outward stroke and closes promptly at the beginning of the inward movement and remaining closed during the entire inward movement.

Small openings V V are made in the diaphragms for the outlet of air and oil while the pump is closing and for the admission of small quantities of oil when the diaphragms are opening. These small openings, when intended for the admission and emission of oil only, may be located at any part of the diaphragm when the whole is immersed in the oil; but when the openings are intended for the emission of air, either with or without the oil, they must of necessity be made at or near the highest part of the diaphragms, as the air, being lighter than the oil, naturally seeks the top.

The action of my pump is as follows: The rod M, being actuated by any suitable mechanism, moves the diaphragms to and from each other. As they move toward each other the contained air and oil are forced out of the openings V V. The air, passing up through the oil in the space S, escapes through the pipe T′, and the oil mingles with the oil in the space S. Now, as the diaphragms begin to separate, opening the valve L, air from the vacuum-pipe F will enter, and at the same time a small quantity of oil will flow in through the openings V V and settle to the lowest part of the space between the diaphragms. As the oil is heavier than the air, it is evident that as the diaphragms close air will pass out first and then oil follows, so that when the diaphragms are closed the small spaces left between them will be filled with oil, all of the air having been expelled. When the chamber outside of the diaphragms and inside of the case formed by the parts A A′ is not filled with oil, but is a partial vacuum, then the openings V V must be provided with outwardly-opening valves, and as oil or some similar fluid is used for filling the space that is left between the diaphragms when collapsed it may be introduced through the pipe F, and after having been forced out from between the diaphragms through the openings V V into the chamber S it may be drawn off through the pipe H^2.

F is a vacuum-pipe leading from the articles to be exhausted to the pump. This pipe F has a jacketing-space S′ around it formed by the jacket-pipe H, the jacketing-space S′ being connected to the chamber S by the pipe H′. The pipe H^2 serves to connect the lower part of the chamber S with the jacket-pipe H at the extreme end of the vacuum system of pipes F, so that there may be a circulation of jacketing-fluid throughout the chamber S and the pipes H^2 H H′.

K represents a strong disk attached to the

rod M and also to the diaphragm B′. In the actio.. of the pump this disk serves to force the diaphragm B′ flat onto the diaphragm B, thus forcing out all air and nearly all the oil from between them.

K′ is a central piece attached directly to the main body of the disk K and to the rod M, as shown. This construction admits of taking out the valve L when desired.

A^2 represents a stuffing-box for the rod M.

If desirable, an oil-pocket A^3 for checking the inward leakage of air may be attached to the case A, as shown. This pocket makes it necessary to have an additional stuffing-box A^4 for the rod M.

An outlet-pipe T′ is connected to the case A A′ by means of a screw-thimble T. The parts A and A′, that form the case, are bolted together, as shown at R R. A convenient base A^5 may be cast solid with the parts A A′.

It is obvious that instead of two diaphragms one alone could be used in connection with a co-ordinate part, which may be made either of rubber or of metal. If of metal, it may have circular corrugations, in which case the part against which the single metal diaphragm closes should have corrugations to correspond with those of the diaphragm.

This form of pump will work much easier and better if an exhaust device is attached to the pipe T′, so that the external pressure on the diaphragms shall be greatly reduced or almost entirely removed.

I claim—

1. In a vacuum-pump, the combination of the diaphragms B B′, having a to-and-fro motion in relation to each other, the pipe F, connecting the space between the said diaphragms to the articles to be exhausted, and the valve L, in connection with the pipe F and openings V V, as described, with a sealing-liquid, a small quantity of which is introduced into the space between the diaphragms at each of their successive separations, thereby serving to completely expel all air at each successive closing of the same, substantially as and for the purpose set forth.

2. In a vacuum-pump, the combination of diaphragms B B′, having to-and-fro motion in relation to each other, the pipe F, connecting the space between the said diaphragms to the articles to be exhausted, and the valve L, in connection with the pipe F and openings V V, with a case A A′, filled with a suitable liquid, as described, inclosing said diaphragms, and pipe T′, connecting it to an auxiliary exhaust device, substantially as and for the purpose set forth.

WILLIAM E. NICKERSON.

Witnesses:
FRANK G. PARKER,
WILLIAM EDSON.