R. BERRENBERG.

VACUUM PUMP APPARATUS.

APPLICATION FILED MAY 29, 1909.

1,038,075.

Patented Sept. 10, 1912.

2 SHEETS—SHEET 1.

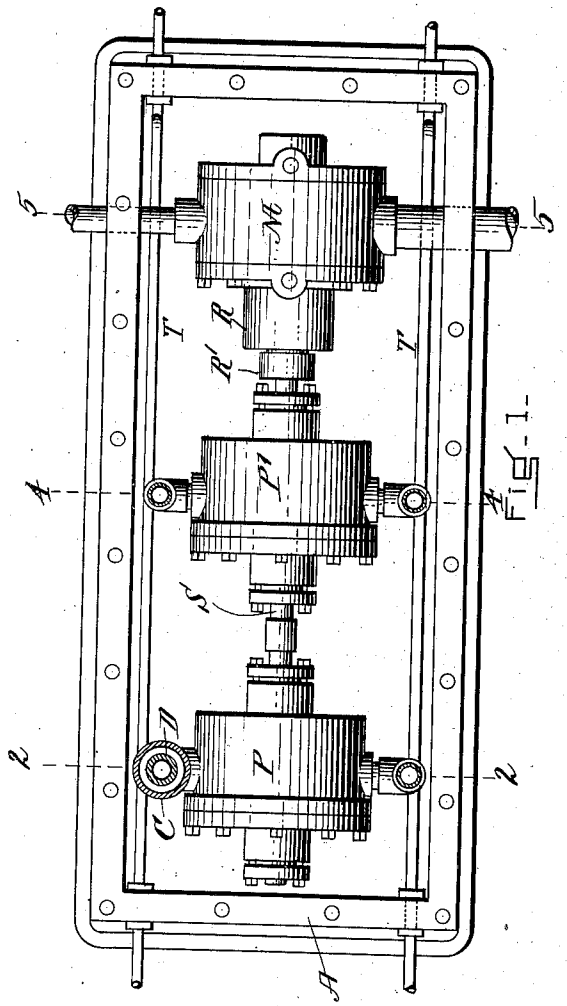

Fig. 1.

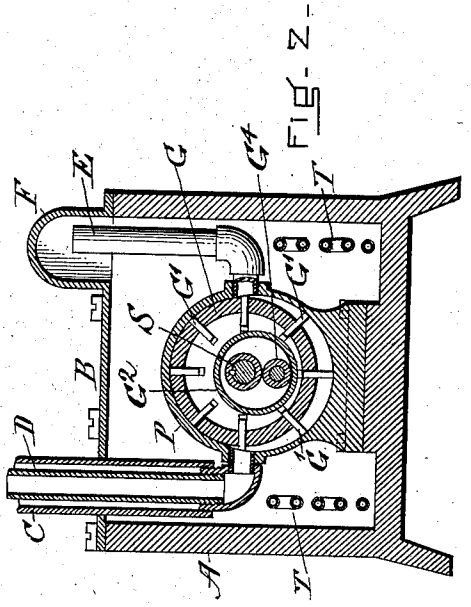

Fig. 2.

WITNESSES:

Frank G. Parker.

William Edson

INVENTOR:

Reinold Berrenberg.

R. BERRENBERG.

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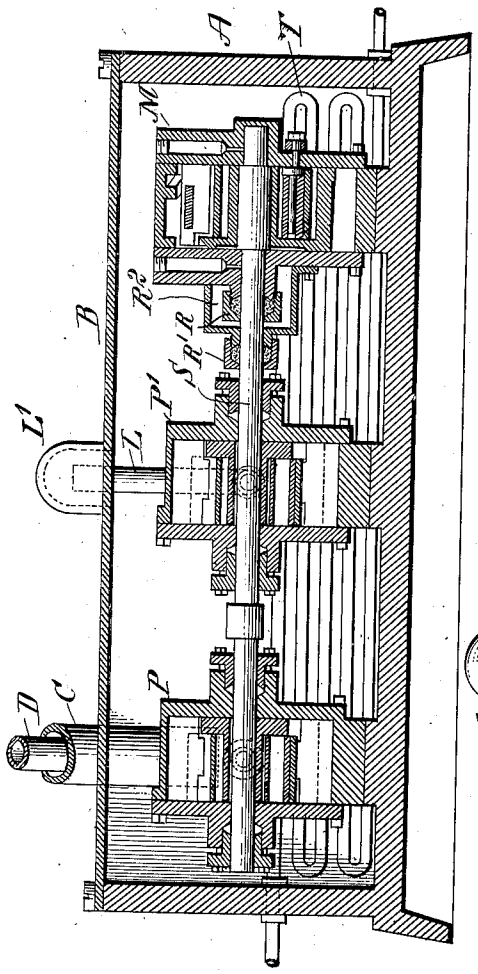


Fig. 3.

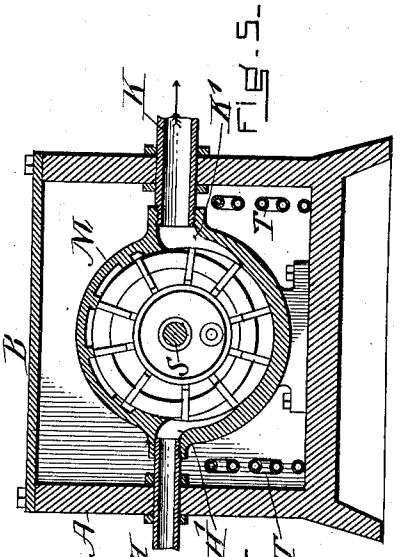
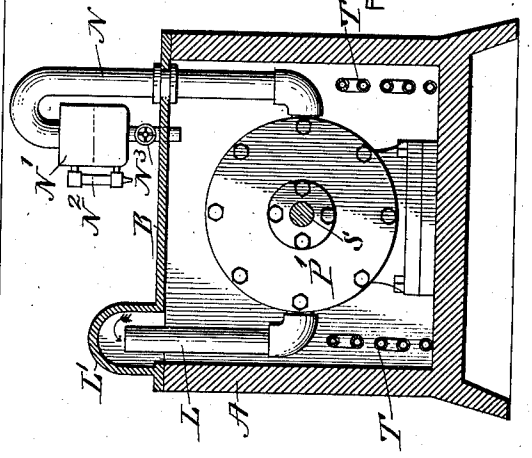


Fig. 5.

Fig. 4.



WITNESSES:

Frank G. Parker

William Edson

INVENTOR:

Reinold Berrenberg.

UNITED STATES PATENT OFFICE.

REINOLD BERRENBERG, OF BOSTON, MASSACHUSETTS.

VACUUM-PUMP APPARATUS.

1,038,075. Specification of Letters Patent. Patented Sept. 10, 1912.

Application filed May 29, 1909. Serial No. 499,239.

To all whom it may concern:

Be it known that I, REINOLD BERRENBERG, a citizen of the United States, and resident of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Vacuum-Pump Apparatus, of which the following, taken in connection with the accompanying drawings, is a specification.

My invention relates to that class of rotary vacuum pump apparatus in which an extremely high degree of rarefication is required.

The object of the invention is to provide a very compact apparatus which will produce and maintain a practically perfect vacuum.

Accordingly, a feature of the invention contemplates the provision of a plurality of rotary vacuum pumps acting in series, comprising a primary portion and a secondary portion, and wholly immersed in a tank of oil. The primary portion of the series, which is connected to the article to be exhausted, exhausts into the space above the oil in the tank, preferably into one of the domes, and the secondary portion of the series draws from the space above the oil, preferably from a second dome, and exhausts into a catch tank or muffler, which is open to the atmosphere.

A further feature of the invention consists in immersing not only the pumps but the motor and the cooling device in deaerated oil.

With the above object in view, the invention consists in the vacuum pump apparatus hereinafter described and particularly defined in the claims, the advantages of which will be obvious to those skilled in the art from the following description.

In the accompanying drawings, Figure 1 is a plan showing the interior of one of the pump tanks and the location and arrangement of the pumps and the motor, also a part of the pipe system for cooling the oil in the tank. In this view the cover of the oil tank is removed so that the interior may be seen. Fig. 2 is a transverse, vertical section taken on line 2—2 of Fig. 1. Fig. 3 is a longitudinal, vertical section of the apparatus. Fig. 4 is a transverse, vertical section taken on line 4—4 of Fig. 1. Fig. 5 is a transverse, vertical section taken on line 5—5 of Fig. 1.

As illustrated in the accompanying drawings, the apparatus comprises a metallic tank A, having a cover B. This tank must be made as much as possible without joints or openings, and whenever a joint or opening is made gaskets and packings are to be used, so that the tank will be as nearly oil- and air-tight as it is possible to make it. When in use it is filled with the best vacuum oil to such a depth as to entirely immerse the pumps and the motor therein, the spaces in the domes F and L^1 being free of oil.

Within the tank two rotary vacuum pumps P and P^1 are placed. These two pumps, a section of one of which is shown in Fig. 2, are alike in internal construction and may be briefly described as follows: Within the casing P a rotary piston-carrier G rotates on its axis G^3. The rotary piston-carrier G has a series of radial pistons G^1 G^1, which are arranged to slide freely in a radial direction, their motion being governed by the eccentrically placed ring G^2 which is held in place by a friction roll at G^4. These need not be more fully described as they are of well known construction.

The pump P, which may be termed the primary pump, draws air from the article to be exhausted through the pipe D, which is surrounded by an oil-jacketing pipe C. This pump exhausts through the pipe into the dome F above the oil in the tank. The pump P^1 shown in elevation in Fig. 4, which may be termed the secondary pump, draws from the dome L^1 through the pipe L and exhausts through the pipe N into the oil-catch tank N^1. The catch-tank N^1 is open at the top and has a sight gage N^2 which indicates the amount of oil in the catch-tank and when it has accumulated a certain amount the cock N^3 is opened and the surplus oil allowed to run back into the main tank.

By the above described arrangement and construction it may be understood that the primary pump P pumps direct from the lamp bulb or other article to be exhausted and discharges into the dome F. As the secondary pump P^1 is also in operation it will be understood that there is already a partial vacuum in the dome F and also in the dome L^1. Now, the secondary pump forms a partial vacuum above the oil and will draw incidentally from the vacuum oil any air or gases that may be in it, and will assist the primary pump P in making a better vacuum. That is, the two pumps acting in

series will make a better vacuum than one pump alone would make.

The two pumps P and P^1 are driven by the same shaft S that is also the shaft of the motor M. The motor M has an internal construction substantially like the pump P but the inlet and outlet are different in size, that is, the inlet port H H^1 is made smaller than the outlet port K^1 K. That is done so that there may be a free passage for the exhaust and thus prevent any back pressure on the revolving pistons. The motor is driven by a vacuum oil under pressure. The pipes H and K at the places where they pass through the case of the tank are made tight by metallic packing or by cemented or soldered joints; as these are rigidly fixed the joints may be easily made absolutely air-tight.

For preventing the oil in the tank from becoming too highly heated by the action of the machine, sets of pipes T T are placed in the tank and are provided with a constant current of cold water.

The oil that is used for driving the motor M has more or less air in it. To prevent this contained air from passing through the bearing of the shaft S, the following device is used: A stuffing box R of usual construction is provided and is inclosed in a casing R^3, having a chamber R^2, which is filled with vacuum oil, and a second stuffing box R^1 is provided on the outside of the casing R^3. This construction insures an air-tight joint about the shaft S, and prevents air from getting into the oil in the tank.

I claim:—

1. A vacuum pump apparatus, comprising a primary rotary air pump and a secondary rotary air pump both inclosed in a tank and wholly immersed in oil, said primary pump discharging into the tank and said secondary pump drawing from the tank so as to free the oil from any included air or gases, and acting in series with said primary pump to produce a high degree of vacuum, substantially as described.

2. A vacuum pump apparatus, comprising a tank containing oil and having a pair of domes above the level of the oil, a primary rotary air pump and a secondary rotary air pump both inclosed in the tank and wholly immersed in the oil, said primary pump having its discharge communicating with one of said domes, and said secondary pump having its inlet communicating with the other of said domes, said secondary pump operating to free the oil in the tank from any included air or gases and acting in series with said primary pump to produce a high degree of vacuum, substantially as described.

3. A vacuum pump apparatus, comprising a tank containing oil and having a pair of domes above the level of the oil, a primary rotary air pump having its discharge communicating with one of said domes, a secondary pump having its inlet communicating with the other of said domes, a fluid driven motor for driving said pumps, all of said pumps and motor being inclosed in the tank and wholly immersed in the oil, said secondary pump operating to free the oil from any included air or gases and acting in series with said primary pump to produce a high degree of vacuum, substantially as described.

4. A vacuum pump apparatus, comprising a closed tank containing oil with a free space above the oil, a primary rotary pump unit having an inlet adapted to be connected to the receptacle which is to be exhausted and an outlet communicating with the free space above the oil, and a secondary pump unit having an inlet communicating with said free space and an outlet communicating with the atmosphere, said primary and secondary units operating in series to produce a high degree of vacuum, substantially as described.

In testimony whereof, I have signed my name to this specification in the presence of two subscribing witnesses, on this eighth day of May, A. D. 1909.

REINOLD BERRENBERG.

Witnesses:

FRANK G. PARKER,

WILLIAM EDSON.