$$3Fe(NO_3)_2.2La(NO_3)_3.24H_2O,$$

or the general type,

$$3R(NO_3)_2.2X(NO_3)_3.24H_2O,$$

where R = Mg, Mn, Co, Ni, Zn or Fe″.

Lanthanum Pyromucate, $La(C_4H_3O.COO)_3.2H_2O$.—This lanthanum compound separated very easily in the form of crystals from solution in hot water. The results of the analysis of two different preparations indicated the presence of two molecules of water of crystallization.

Yttrium Pyromucate, $Yt(C_4H_3O.COO)_3.3H_2O$.—This was prepared in a similar manner to the above. An analysis showed the presence of three molecules of water of crystallization. Upon comparing the amounts of water of crystallization contained by the terbium and yttrium salts, it would seem that more than one state of hydration occurs. These compounds willl be studied more completely later on when the writers are able to obtain a larger amount of acid.

Durham, N. H.

AN AUTOMATIC VACUUM PUMP.

By Otto Maass.

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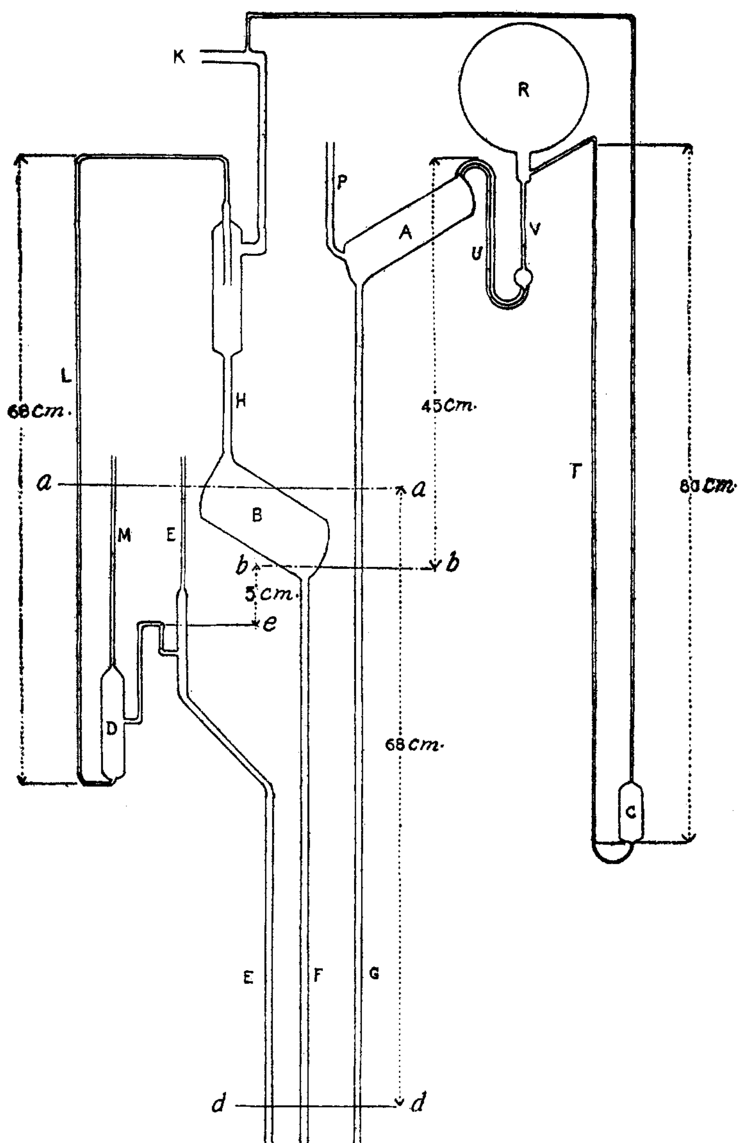
The following is a description of a Töpler[1] vacuum pump which, in conjunction with an aspirator, works automatically. The arrangement does not involve the use of a mechanical spring or valve, is very simple to make, and can, with perfect safety, be allowed to run for an indefinite period.

The diagram shown below has been drawn to scale exhibiting the exact construction of a pump which has been in use for some time.

A is the body of the Töpler pump, tube P leads to the vessel which is to be exhausted, and B is the mercury reservoir. At the start, when the air throughout the apparatus is at atmospheric pressure, the mercury stands at level *a* in B and also in tubes M, E, L, and G. Tube K leads to the water pump. When the latter is set in action air is drawn out of A, P and R through one centimeter of mercury in bulb C and out at K. Simultaneously the pressure over the mercury in B is diminished, so that, since tubes E and M are open to the air pressure, the mercury level will be lowered in these. The volume of B being large compared to the volume of the tubing, the mercury gradually drops to the level *d* in tube E while the mercury rises to the top of tube L. A further decrease in the pressure and the mercury in the bottom of bulb D is forced through L and runs down H into B. Air now enters tube M into the water pump and into B and C, where the pressure is now that of the outside atmosphere. The mercury in bulb C rises in tube T so that the pressure in A remains equal

[1] With Antropoff modification, *Chem. Ztg.*, 34, 979 (1910).

to that pressure to which it had been reduced by the water pump. Therefore the atmospheric pressure acting on the mercury in B forces the latter into A, the air in A being forced into R through capillary tube U. At the same time the mercury rises in tube E, fast at first, but then more slowly, until it rises at the same rate that the mercury rises in A. Finally when the mercury in A reaches the capillary tube the mercury in E rushes up to level *b* to which level the mercury in B has fallen. In passing the



level *e* mercury flows into bulb D, preventing further access of air to the water pump. The pressure in B immediately decreases so that the mercury is drawn back from A, which latter is now cut off from R by mercury in the capillary tube U. Simultaneously the mercury level in E is lowered below level *e*, and the mercury rising in tube L is finally forced into B so that the atmospheric pressure again presses on the mercury in B. The volume of R is larger than that of A, so that the air forced out of A into R does not increase the pressure in the latter to any great extent. In each cycle, when the pressure over C is decreased sufficiently, air is drawn out of R, so that the pressure in the latter always falls short of the column of mercury in capillary tube U. Each time that mercury is driven through the capillary tube it rises in V, out of which it is forced back into A when the mercury is leaving the latter, the difference in level of the mercury in U and in V becoming equal to the pressure in R. It is essential that tube G be connected to tube F at the same level that E is joined to F.

It was found to be serviceable to join the ends of tubes M and E to a common glass tap. This was closed at the start, enabling a thorough preliminary exhaustion by means of the water pump. Then, on opening the tap, air can enter M and E and the pump starts working. This saves a little time. Furthermore it is advantageous to have a tube and a glass tap attached near the top of tube T. This enables one to let air into the apparatus at the end of an experiment. These taps have not been included in the diagram since they are not necessary to the running of the pump, but are simply added conveniences.

The pump was found to work rapidly after the first exhaustion; it is possible to have two complete cycles occur in one minute.

That portion of the pump which has to do with the ejection of the air forced out of A is similar to an arrangement previously described in THIS JOURNAL.[1] Otherwise, as far as is known to the author, the device is new.

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ELECTRICAL TRANSFERENCE IN AMALGAMS.

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According to the electron theory, electrical conductivity of a metal is assumed to be due almost solely to the passage of the negative electrons through the body of the metal. Although the mobility of the free electron is doubtless far greater than that of any other carrier, still the other substances carrying electric charges are acted upon by the same forces which cause the motion of the electron and, having a finite mobility,

[1] F. M. G. Johnson, THIS JOURNAL, 34, 909 (1912).