The whole was boiled for an hour, allowed to cool, when one-third the volume of ninety-five per cent. alcohol was added. After standing twelve hours, it was filtered, washed with fifty per cent. alcohol, ignited and weighed.

Wt. obtained.	Calculated.	Difference.
0.2156 gram.	0.1629	0.0497

The precipitates from 8, 9 and 10, after ignition, were dissolved in hydrochloric acid, and tested with barium chloride; all gave precipitates of barium sulphate, as was expected. The following experiments were then made to determine what proportion of alcohol could be added without causing the cerium sulphate to precipitate.

a. Five cc. of the cerium sulphate solution were diluted to sixty cc., then twenty cc. of ninety-five per cent. alcohol were added in the cold, and, no precipitate forming, more alcohol was added, five cc. at a time, until seventy cc. in all had been introduced. The solution still remained perfectly clear.

[TO BE CONTINUED.]

SOME NEW LABORATORY APPARATUS.

By Ewald Sauer.

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I. HOT AIR MOTOR FOR LABORATORY PURPOSES.

IN laboratories mechanical power is desirable for many undertakings which require continued shaking and stirring of liquids, as well as for rotation and grinding. While the factory steam-engine furnishes usually the necessary power for the laboratory of the technical chemist, nevertheless it is often desirable to have a separate source of power in case, for instance, of this not being in use.

For this purpose the turbines constructed by Raabe[1] have proved themselves useful in certain kinds of work, but only when small power is required. For many purposes the power is too weak, *e. g.*, the shaking of large quantities of liquids and the stirring of thick liquids.

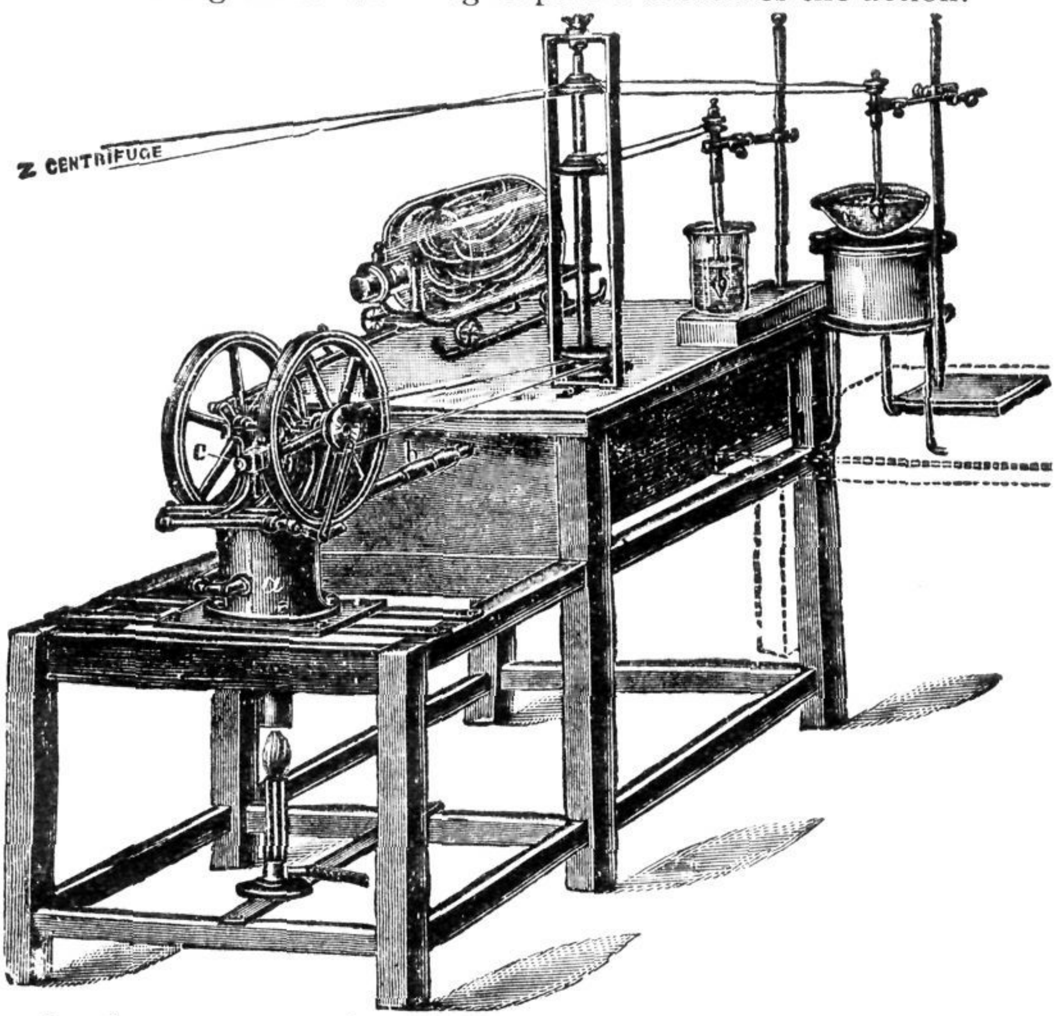
The hot air motor of Heinrici, which is pictured below, and which has already proved of practical value in several labora-

[1] *Ber. d. chem. Ges.*, *1888*, p. 1200.

tories, would in most cases furnish abundant power for the different kinds of work.

The motor is built according to the well-known principle of hot air machines, so that its use is absolutely free from danger. It may be heated by gas, petroleum, etc. The more intense the source of heat, the more power the machine furnishes, and if the fire-pot be red hot beneath, the motor furnishes the most power.

About two minutes after the burner heats the pot the motor begins its action. There must be a space of about ten mm. between the burner and pot. A brake upon the fly-wheel regulates the speed of the machine, or brings it to a standstill. While in use, cold water must circulate through the motor, otherwise a gradual warming of part *a* decreases the action.



In the accompanying illustration, the cooling reservoir is contained in the table, and the circulation of water takes place through the tube *b*. Where a water system is available the body of the motor may be fastened directly in the table by its support.

On the table is fastened a carriage. upon which bottles up to six liters capacity may be shaken vigorously to and fro. The action is most satisfactory with such large quantities.

Should it be desired to shake, at the same time, several bottles of smaller capacity, wooden boxes may be fastened on the carriage, which is partitioned and so arranged that each vessel may be easily made firm.

An axle, fastened on the table, receives the belt-cord coming from the motor and is furnished with two movable wheels which furnish connections with Witt's centrifugal stirrers for stirring, evaporating, etc. These stirrers, held as nearly perpendicular as possible in a nickel cylinder, and properly connected with the motor, act in a highly satisfactory manner.

II. ILLUMINATING APPARATUS AFTER A. LUPP.

This serves for the precise determination of the end-reaction in volumetric analysis, especially in acidimetry and alkalimetry in general, in all quantitative determinations, in which changes of color of the indicator (litmus, turmeric, cochineal, etc.) determines the analysis.

The apparatus consist of a tripod, under which a concave mirror is placed at a fixed angle.

By means of this, the sun's rays are concentrated, and so reflected as to pass through the bottom of the beaker, which is placed on the apparatus, through the solution to be titrated to the surface. Since, by means of the apparatus the titration is seen from above, one can, even in *cloudy* weather, always determine exactly the end-reaction because the liquid under examination is always strongly illuminated.

The illuminating apparatus is further adapted to enable one to recognize very fine colored precipitates or colorations, for example, in water analysis reaction for iron by means of potassium ferro- and ferricyanide, and potassium thiocyanate, etc. One needs only to hold a test-tube over the apparatus in order to recognize the slightest trace of a color or precipitate.