

of 78 c.m., and to filter under a pressure of 65 c.m. When the vacuum is allowed to stand, the water supply being shut off, the water remaining in the exhaust tube is frequently lifted and runs back. To prevent it from entering the bell-jar the contrivance represented in the above cut was resorted to. The exhaust pipe represented by D enters through the india-rubber cork of a wide-mouthed quart bottle, and passes down almost to its bottom. The tube connecting with the bell-jar to be exhausted c terminates on the inside of the bottle just below the cork, and so likewise does the tube forming the mercury gauge. When the water regurgitates it fills the bottle nearly to the top, but not a drop ever passes over into the bell-jar. On starting a fall of water again through the long exhaust pipe, the water in the bottle is entirely and at once removed by means of the syphon, and the exhaustion of the air follows immediately.

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#### LECTURE EXPERIMENTS.

By PROF. THOMSEN, of Copenhagen. Translated by PROF. LEEDS from the *Ber. der deutsch. chem. Gesell.* No. 18, Vol. III.

##### *Reciprocal Combustion of the Elements of Water.*

This may be demonstrated very instructively in the following manner. A pair of narrow platinum tubes, 1 centimetre long and 1 millimetre diameter are formed up of quite thin platinum foil. These tubuli are melted into a pair of small glass tubes, and are thus made the burners of the two gases, hydrogen and oxygen. The glass tubes are passed through openings about 1 to 1½ centimetres apart in an india-rubber cork. One tube is connected with the oxygen, the other with the hydrogen reservoir. After the cocks of the reservoirs are proportionately opened the hydrogen is ignited. The cork with its two burners is then inserted into a glass tube about 10 to 15 centimetres long with its upper end much narrowed down but still left open. The entire apparatus has then the form shown in the following woodcut.

The hydrogen now burns in oxygen, the fusing together of the orifice of the glass tube being prevented by the end of platinum. If now the cock of the oxygen reservoir be slowly turned off, and the quantity of oxygen so diminished, the point is soon reached at

which the supply becomes insufficient to support the combustion of the hydrogen; the hydrogen flame expands, then disappears for some moments, the flame appears at the oxygen burner, and now without any interruption the oxygen burns in hydrogen. If the oxygen cock be gently opened, the flame withdraws itself to the hydrogen burner, and again hydrogen burns in oxygen. The phenomenon can be repeated as often as desired without extinguishing the flame, provided that the increase or diminution of the stream of oxygen is not made too suddenly.

The experiment is highly captivating, and it is quite impossible for the observer who has not carefully watched it from the beginning to decide which of the two gases indeed is the combustible one. It shows the reciprocity of the combustion in the clearest manner. It is evident that while the oxygen is burning an excess of hydrogen issues from the orifice of the large tube and can be ignited there, so that the combustion of hydrogen in the air, and that of oxygen in the hydrogen, can be shown at the same time.

*Combustion of Oxygen with a Sooty Flame.*

—Heavy hydrocarbons, like benzol and oil of turpentine, burn with a very sooty flame; with a very similar flame oxygen also burns in the vapors of these bodies. The experiment is made in the following manner. Some benzol is warmed to the boiling point in a long necked flask; the flask is closed by a cork with two holes through one of which a glass tube of about 1 centimetre bore is passed and through the other a tube somewhat narrower and bent to one side. When the vapor arrives at the orifice of the wider tube it is lighted, and then a tube through which a slow stream of oxygen is flowing is passed down into the flask through the flame. The oxygen tube is bent above, and its mouth is provided with a platinum tube fused into it. A cork upon the oxygen tube closes the wider tube of the flask. The benzol flame is extinguished and the vapor issues through the side tube, while the oxygen burns in the benzol vapor with a very sooty flame.

*Easy demonstration of Oxydation and Reduction and their accompanying change of Weight.*—Oxide of copper is rubbed together



with some gum water to a stiff paste, and made into a cylinder of about 1 cent. diameter and 3 cent. length. It is then dried, ignited and reduced by hydrogen at a low temperature. The reduced copper has the form of a cylinder, is very porous, but at the same time, is tenacious enough not to fall into a powder. It is surrounded with some platinum foil, the end of which is fused into a glass tube. Two tubulated bell-glasses, connected by tubes with gas-holders, are now filled, the one with hydrogen the other with oxygen. The mouth of the hydrogen bell opens below, that of the oxygen above. The gases are now allowed to stream through the bells, the copper cylinder is made somewhat warm without allowing it to attain the point of ignition and introduced into the oxygen bell. It forthwith ignites and continues to glow until its oxydation is complete. Then it cools off and the light dies away. When taken out of the oxygen and put in the hydrogen bell it begins to glow fiercely again, much water condenses upon the sides of the bell, while the cylinder is reduced to metallic copper. We have here the highly interesting phenomenon of a body, which burns twice in succession, first in oxygen and then in hydrogen, and both times with the same intense light and heat. After the second burning it is the same body as in the beginning. Since the change of weight in such a cylinder amounts to a gramme, the addition and subtraction can very easily be verified by a common balance.

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### A LARGE INDUCTION COIL.

By WM. H. WAHL, Ph.D.

AN induction coil, which we believe to be the most powerful now existing, has been lately constructed by Mr. E. S. Ritchie, of Boston, for Prof. Henry Morton, President of the Stevens Institute of Technology.

Mr. Ritchie, as is well known, was the first, by several fundamental improvements, to make the induction coil an efficient and reliable source of electricity, and it would seem that by constant attention to the subject, and numerous judicious experiments, he has still kept in advance of all other constructors of these instruments, for though Mr. Ritchie's improvements were freely published and at once adopted, in some cases with anything but an ho-