pounder, eight 1 pounder quick fire and two Maxim guns. The Olympia, with a displacement of 5,500 tons and engines of 13,500 indicated horse power, has a speed of 20·2 knots. In her batteries she carries four 8 inch breech-loading rifles, sixteen 5 inch rapid fire, fourteen 6 pounder, six 3 pounder quick fire and four Maxim guns. Among the first of the new ships, the Detroit was built on a contract calling for a displacement of 2,000 tons, driven by engines of 5,400 indicated horse power at a speed of 18 knots. She mounts two 6 inch breech-loading rifles, four 3½ inch rapid fire, four 6 pounders, two 1 pounder quick fire and two Maxim guns.

Among the vessels commissioned in 1894 was the naval training ship Bancroft of 838 tons displacement, with engines of 1,300 indicated horse power, developing a speed of 13·5 knots. For practice and drill her batteries comprise four 4 inch rapid fire, two 6 pounder, two 3 pounder, one 1 pounder quick fire and two Maxim guns.

The Dolphin, which was one of the first four ships contracted for of the new navy, is of 1,485 tons displacement, with engines of 2,300 indicated horse power and a speed of 15·5 knots. She is now the dispatch boat of the U. S. navy, carrying but a light armament comprising two 4 inch rapid fire, two 6 pounder quick fire and six Maxim guns.

Of the monitors, the Puritan, with two turrets mounting four 10½ inch breech-loading rifles, four quick fire and eight Maxim guns, with a displacement of 6,060 tons and indicated horse power of 3,700, attaining a low speed of 13 knots, is the largest and heaviest of her type.

The Amphitrite, another of the monitor class, carries four 10½ inch breech-loading rifles in two turrets, with a secondary battery comprising six quick fire and four Maxim guns; she has a displacement of 3,990 tons, and engines of 1,600 indicated horse power, developing a 12 knot speed, and is one of three ships of this class that stand next to the Puritan.

The torpedo boats Ericsson and the one now known as No. 2 are greatly different in size, the former having 750 tons displacement against No. 2's 120. These little fliers have a speed of 23 knots in the Ericsson and 24 in No. 2.

### An Expedition to the Antarctic Regions.

Dr. Frederick A. Cook, the well known explorer, has recently declared his intention of leading a small but well equipped body of scientific men on an exploring expedition to the Antarctic regions. The time for leaving New York has been fixed for September 1, 1895, and it is expected that the voyage will last for probably three years. There can be little doubt but that there will be much of scientific interest learned by such an expedition. The floor of the Antarctic Ocean is covered with an abundant fauna which will well repay a careful study. And it is thought probable that some isolated tribe of men may be discovered on the Antarctic shores. There is also much to be learned of the magnetic properties of this little known region, of its ethnology, and much of more technical scientific interest.

The details of the manner in which the expedition is to be equipped are interesting.

The party intend to sail in two small sailing vessels, each of about one hundred feet in length and of from 100 to 200 tons burden. Each vessel will be of the type known as "sealers" and will be manned by five men. The hulls of the boats will be thickly sheathed in timber and heavily braced in order to resist the pressure of ice jams. Provisions will be supplied to last for three years. The garments to be worn will be of the Esquimau pattern and there will be a plentiful supply of fur sleeping bags, robes, etc.

A fine pack of Esquimau sledge dogs will also be provided. The scientific corps will consist of five men, who will carry with them such equipments as will assist them in carrying out their various lines of investigation. It is expected that it will take about three months to reach the Gulf of Erebus and Terror, where the expedition will probably disembark. A substantial wooden house will then be erected to be used as the headquarters.

Later on the sledging parties will be sent out from this point to penetrate as far south as possible. The party will, as far as possible, be made up of men experienced in Arctic exploration. Dr. Cook, it will be remembered, was surgeon and ethnologist in Lieutenant Peary's first expedition to the North, and he has been to the Arctic regions twice since.

### Oil Production in Pennsylvania.

The oil fields of Pennsylvania have produced during the year 1894 about 30,000,000 barrels of oil. During the year 1893, the total product was 31,000,000 barrels. The oil was sold during 1893 for 64 cents, and last year for 84 cents a barrel. In all about 3,900 new wells were drilled in 1894, while in the previous year only 2,000 new wells were prepared. The demand for Pennsylvania oil showed no diminution during the year.

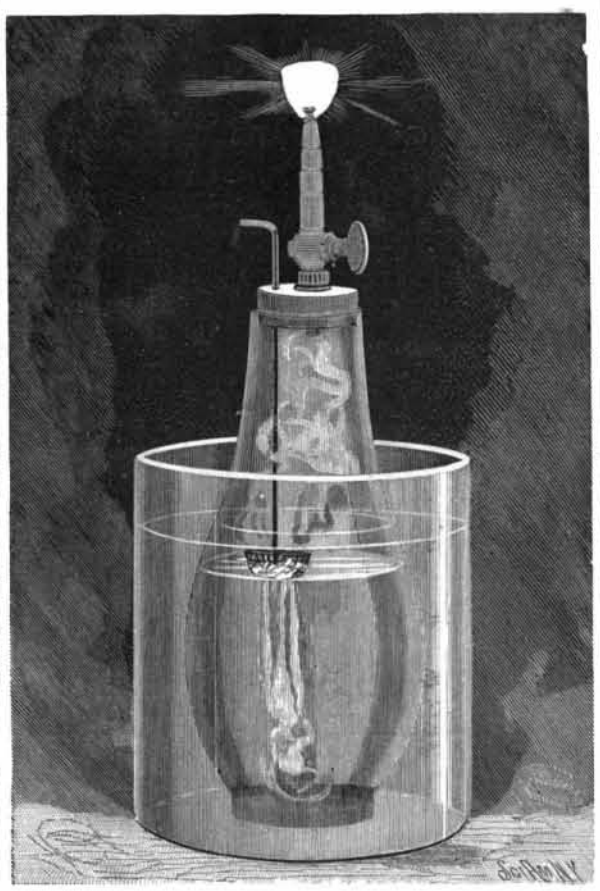
## ACETYLENE APPARATUS.

T. O'CONOR SLOANE, PH.D.

Few chemical discoveries have attracted more interest than the recent one of the method of manufacturing acetylene on a large scale. The production of the calcium carbide from which the acetylene gas is made by simple treatment with water bids fair to become a commercial process, and we have every reason to hope that the material will soon be produced by the ton. There is something fascinating in the idea of being able to evolve a gas of about 300 candle power by so simple a process. While the crudest possible apparatus, such as a tumbler of water, is sufficient to illustrate the production of the gas, the object of the present article is to show how a better demonstration can be produced with very simple appliances.

To show the gas with a tumbler of water, it is sufficient to drop into it a piece of the calcium carbide as large as a pea; the gas is at once evolved in large quantity, and a match can be applied repeatedly to the accumulation of bubbles on the surface of the water, giving a number of successive lightings. The apparatus illustrated in the cut, which gives more satisfactory results, is constructed from a battery jar and lamp chimney as the principal elements, and is made on the lines of the old hydrogen evolution apparatus.

To the top of the lamp chimney, which should be of large size, a cork should be tightly fitted. Unless the cork is better than the majority, it should be waxed or paraffined, which is very easily done by placing some fragments of wax or paraffine on it and melting the material with a hot soldering iron or poker. Through a central perforation a tube is inserted fitted



ACETYLENE APPARATUS.

with a stop cock and a gas burner; the latter must be of the smallest size made, the Bray fishtail burner answering about the best of any yet tried. Merely to exhibit the gas, a simple jet may be made by drawing a glass tube almost to a point or by drilling a very small hole in a cap fitted to the pipe leading from the stop cock. Through a hole a little to one side of the evolution pipe a wire passes which moves up and down with some friction through the hole. Its lower end is formed into a hook, to which is suspended a little basket made by bending up a little bit of coarse wire gauze. A piece with one-quarter inch meshes will be about right. The suspending wire is bent at the top to give it a better handle.

To operate it, the lamp chimney is placed in the jar, the water is poured in until within an inch or two of the top, and a piece of calcium carbide half the size of a walnut is placed in the basket, which is drawn up until pretty close to the cork. The cork is now placed in the lamp chimney and pressed down so as to make it fit tightly, and the wire slowly worked down until the basket becomes partially immersed in the water. The level of the water is at once depressed as the gas is evolved, and if the cock is open the air and gas within the chimney begin to escape. As soon as the odor of the escaping gas is strong, it can be lighted and will burn for five or ten minutes with great steadiness. If the pressure decreases and the water rises. it comes in contact with the calcium carbide, more gas is evolved, and it falls again.

The apparatus may be further simplified by omitting the stop cock, which is unnecessary, and a bucket may be substituted for a battery jar. It may also be necessary to secure the chimney against floating upward, although in the apparatus shown this is quite unnecessary.

It is well before lighting the gas to hold a test tube over the outlet for a few seconds until filled with the gas, and to light it with a match or at a gas burner. If the contents do not explode, it is safe to light the jet on the chimney; if it does explode, the light should be deferred until purer gas is evolved. Two or three minutes are sufficient to get it in working order. It must also be remembered that it is essential to have a very small burner, as otherwise the gas will smoke and the supply will be insufficient to obtain a satisfactory flame. The suspending wire must fit tightly, as if it slips down the apparatus will blow out or overflow. A very slight immersion of the carbide starts it.

### Oil of Lemon.

Although the lemon industry in the United States has not reached any very large proportions, yet Florida lemons, says the International Confectioner, are occasionally to be found in the market, and Southern California will no doubt soon contribute. The oil is contained in the minute cells in the yellow rind of the fruit, and is removed by hand pressure, hence the term "hand pressed oil of lemon." The operator holds in the left hand a sponge and in the right a section of the lemon peel, and, by dexterous pressure against the sponge, ruptures the oil cells; the sponge absorbs the oil, and a dish held in the lap prevents any being lost. When the sponge has taken up enough of the oil to be squeezed out, this is done, and the process repeated over and over again.

The tediousness of the method will be apparent when it is estimated that about one thousand lemons are required for the production of a single pound of oil. Oil of an inferior quality is made by machine pressure, by distillation, etc., but the principal bulk is produced as described. The manufacture of the oil is carried on very largely by the peasants throughout Sicily. Every proprietor of a lemon grove, large or small, makes oil from the small and irregular shaped fruit, and sends the better class to market to be shipped to the various parts of the world.

Experiments within the last few years have proved, however, as in the case of oil of peppermint, that large establishments, where great care is taken to supervise the manufacture of the oil, turn out a much superior product to that of the small producer.

Of the adulteration of oil of lemon nothing will be said in this article, except that while enormous quantities of oil containing more or less adulteration are being sold, yet an absolutely pure oil can be had at a reasonable price, if the confectioner is willing to pay that, but if he wants the cheapest he can get, he must not expect the best. What has been said about oil of lemon will apply to oil of sweet orange.

### Asbestos Garments.

More than fifty years ago a student from Greece came to the academy, Monson, Mass., bringing with him from his native country a species of overcoat with attached hood made of asbestos. It long remained in the mineral cabinet of the above institution as an example of fireproof clothing made from this flexible mineral substance. Improvements have been made in the methods of spinning and weaving asbestos fiber, so that now it is practicable to weave a cloth of asbestos almost as fine as cotton cloth. This, of course, is not very strong, but by spinning thicker threads and doubling them a cloth can be made that is strong enough for most purposes and is still flexible. It is now recommended that this material be used as a protective dress for firemen, and at a meeting of the National Association of Fire Engineers at Montreal last summer a representative of the company that is exploiting this idea demonstrated how it could be carried out. Clad in a suit of asbestos cloth he entered a burning frame building especially prepared for this test and remained there for several minutes, during which time he gave an exhibition of the utility of the fireproof asbestos rope for life saving, etc.

The asbestos suit which was worn consisted of a pair of boots, protected by iron soles, gaiters, pantaloons, jacket, apron, gloves and helmet, the last being provided with eye pieces of mica. Inside of the jacket is carried a respirator which cools and purifies the hot, smoky air and allows the air breathed to be expelled properly. The efficiency of such a suit depends not only upon the non-combustibility of the material, but also upon the fact that it is a non-conductor of heat, becoming hot so slowly that the wearer has ample warning of the proper time to flee. It is in no way hurt by water. It is not proposed that every member of a fire department shall wear such clothing, but it is urged that one or two members of every company be provided with them.

Other uses for these fabrics, such as the cloths made by H. W. Johns Mfg. Co., of this city, are for protecting merchandise against cinders; to extinguish small fires by smothering; for drawing between buildings; and as a protection covering for the fire hose. It is already used extensively for drop curtains and flies in theaters.