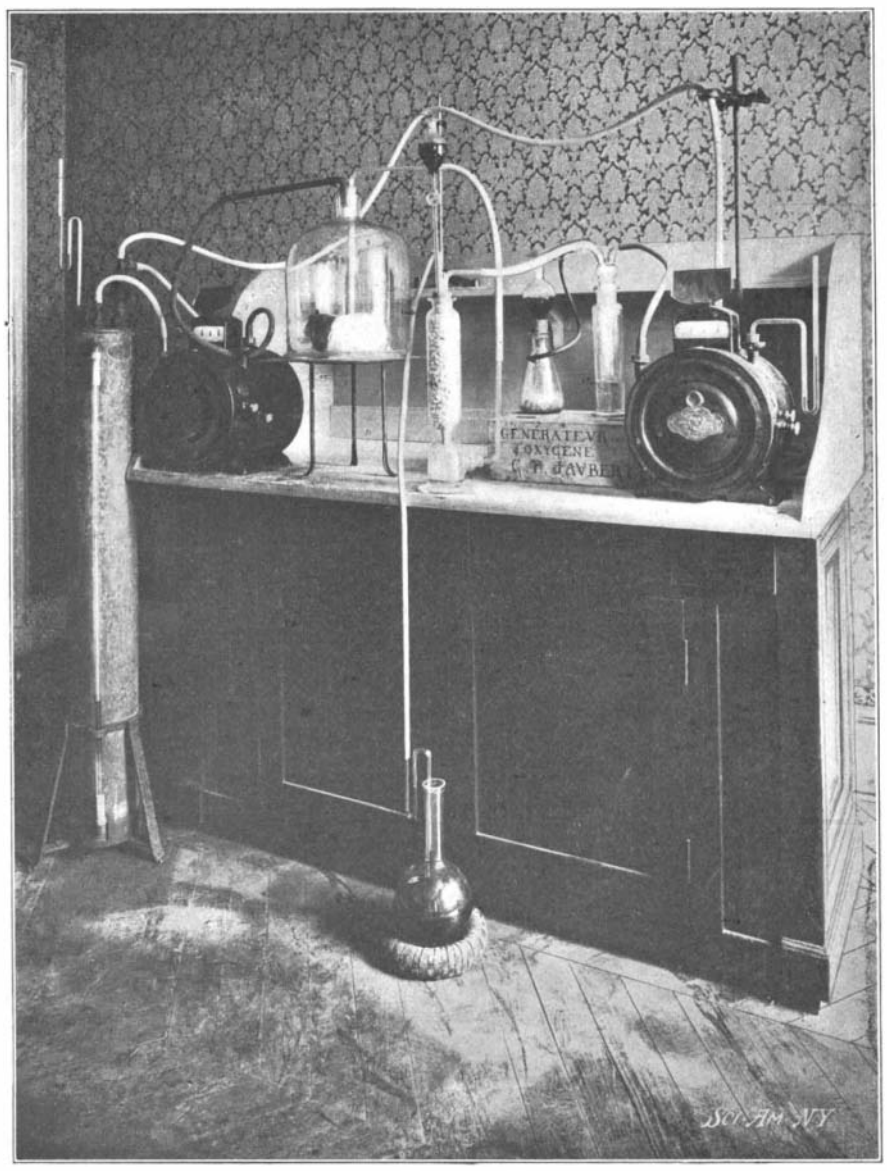
Detecting Blood-Stains.

A new method of distinguishing human blood stains is now being employed with some success. It is the practical result of the experiments made by Bordet in 1898-99. He showed that by injecting defibrinated blood of an animal into animals of different species, the serum of the latter animals acquired the property, after a certain time, of agglomerating and dissolving the red corpuscles pertaining to the species whose blood had been injected. The serum thus obtained has been called *cytolitic*. He also showed that this serum, when mixed with defibrinated blood of another species, furnished at the end of a few minutes a red liquid, clear and limpid, while if added to the serum of the first animal whose blood had been used to prepare the cytolitic serum it gave an opaque liquid which soon formed a flaky precipitate. It is this observation which Uhlenbach has applied to the diagnosis of human blood. He injected every 6 or 8 days about 10 cubic centimeters of defibrinated beef's blood into a rabbit, and after five injections he obtained a serum which dissolves beef's blood exclusively. By taking a one per cent solution of the blood of 18 different animals and adding 6 or 8 drops of the serum obtained from the rabbit, he found that all the tubes except that containing the beef's blood remained perfectly limpid, while the latter became cloudy and gave finally a woolly precipitate. A series of similar experiments upon human blood gave the same results, and he was able to distinguish between the former and beef's blood in samples which had been dried for over a month. The researches of Wassermann and those of Schultze in which human blood has been compared with that of 23 different animals, confirm those of Uhlenbach, and the precipitate was obtained only with human blood; one exception must be made, that of monkey's blood, which at the end of a certain time gave a very slight precipitate. The method is very efficacious, and blood which is three or four months old may be detected in this way, where other methods would fail. The experimenters state that the material of the blood stain to be examined should be soaked in a small quantity of a normal salt solution, and after filtering, the liquid is divided in equal parts in two test tubes. To one is added a few drops of the serum of a rabbit which has undergone the treatment with human blood, and to the second, the serum of an untreated rabbit. A third tube contains diluted blood of another kind of animal and to it is added another portion of the serum of the first rabbit. The tubes are kept at 37 deg. C. and if at the end of an hour the contents of the first tube become cloudy and then precipitate while the other two remain clear, it is certain that the spot is that of human blood, except in the remote case where monkey's blood might be considered.

The popular interest in the so-called Correspondence Schools continues to increase, so that new institutions in this line are pursuing new measures to gain the attention of future patrons. One of the latest ideas is the consolidation of the American School of Correspondence of Boston with the Armour Institute of Technology of Chicago, Ill., whereby the corresponding students may have the advantage of the new institute in finishing any course they may take by personal study at the institute. Under the system arranged, the marks the corresponding student receives will be given due credit in the institute.

THE JAUBERT METHOD OF PRODUCING OXYGEN GAS.

M. George F. Jaubert, an eminent scientist of Paris, has invented a method for producing oxygen which is extremely simple and cheap, and will no doubt find numerous applications. The inventor has been working in this direction for a number of years with a view of finding a body which would produce oxygen in a manner analogous to the production of acetylene by carbide of calcium.



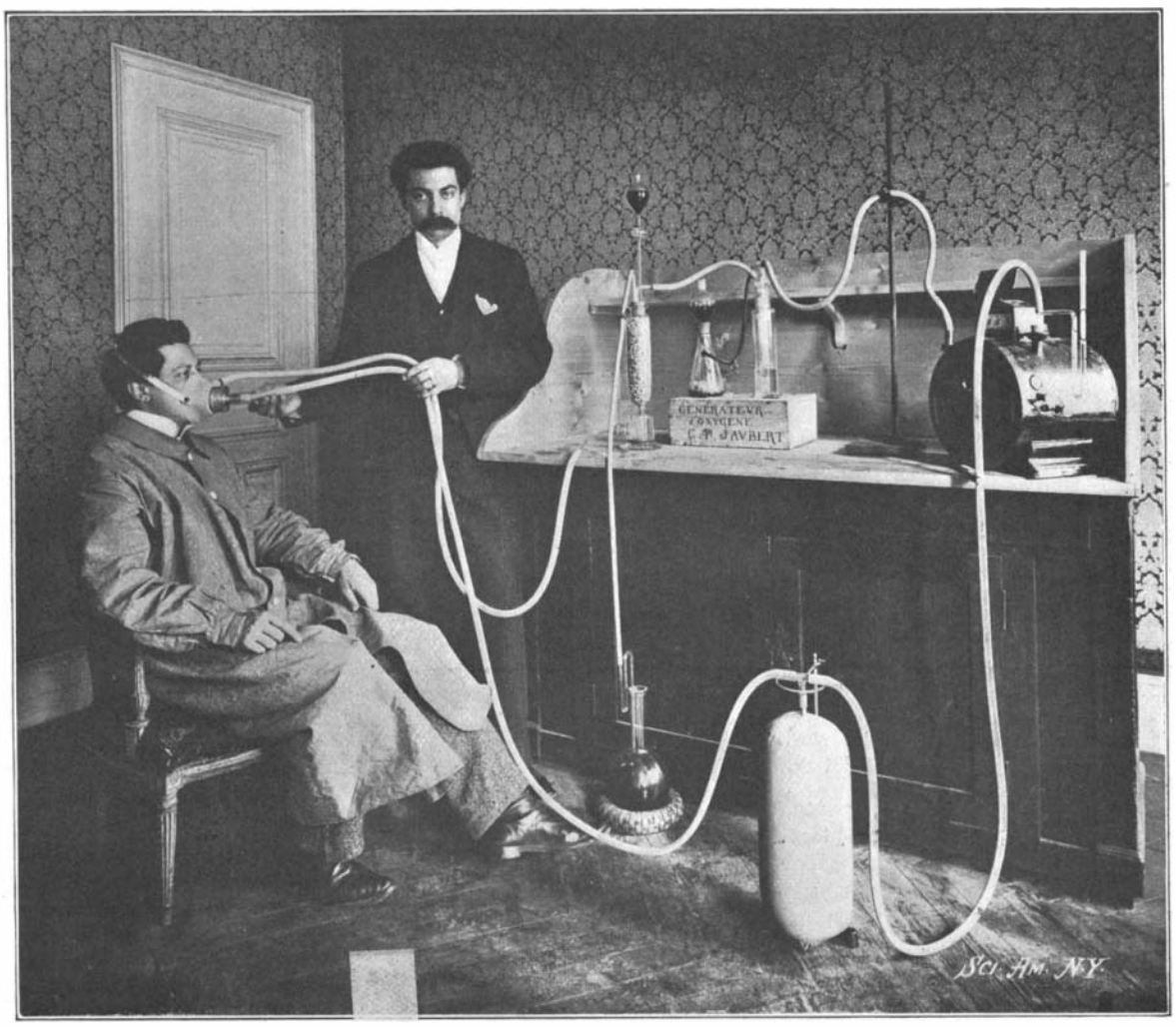
EXPERIMENT OF KEEPING ANIMALS ALIVE WITH THE JAUBERT CONTINUOUS PROCESS OXYGEN APPARATUS.

He has been studying the subject with reference to artificial respiration, to be applied to diving apparatus and especially to submarine boats. The latter question is one of great importance, and if the recent experiments can be relied upon, a great step in advance has been made. Peroxide of sodium or potassium is used to prepare the oxygen. These compounds are very rich in oxygen and will give it off again in the pure state by a proper decomposition. The peroxides are generally formed by heating the metal in a current of oxygen, when they absorb the gas in variable proportions, forming a series of higher oxides. These bodies are generally decomposed by water and it suffices to place a small quantity of peroxide in a vessel of water, when a violent disengagement of oxygen takes place.

M. Jaubert has found a method of manufacturing these bodies by the electrochemical process at a low cost, and at present a large hydraulic plant has been erected in the Isère district. For commercial use this body takes the form of compressed blocks about 1½ inches cube, or small pellets ½ inch in diameter. These are used in a gas-generator in the same way as carbide and the supply of oxygen given off is regulated in various ways. The advantages of such a method of producing oxygen need not be dwelt upon; the prime material is in a very compact form and gives a supply of gas at a moment's notice. The product, known as "oxylithe," is now on the market, and its price may reach as low as 10 cents per pound. One pound of oxylithe will furnish 75 to 125 liters of gas.

One form of gas generator is shown in the engraving and section. The oxylithe in powder is placed in the hopper, *A*, above the water reservoir; the mouth of the hopper is closed by a ball, *C*, which is connected above to a flexible diaphragm, *D*; the latter may be loaded with weights. At first the powder falls into the water and the gas is generated. When the pressure rises above a certain point, it acts upon the diaphragm, lifting the weights, and the ball closes the orifice, and *vice versa*. The output may thus be regulated by the load upon the diaphragm. This form is designed for laboratory use. On a large scale, apparatus No. 2 is used. Here the pieces of oxylithe are fed into a central tube, *E*, and fall upon an inclined platform, *F*, giving off gas and finally reaching the bottom. The gas passes off by the upper tube, *G*, and is generally passed into a water-cooled chamber to condense the water vapor.

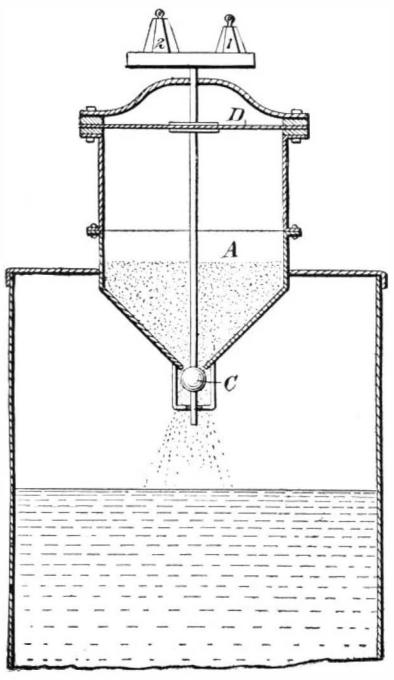
One of the chief applications is the production of "artificial air." M. Jaubert has made a number of experiments by which it is possible to maintain respiration for an indefinite period in an inclosed space. The engravings show such experiments with artificial respiration. A guinea-pig has been made to live for a number of hours inside a bell-jar; the carbonic acid gas which it gives off is sent into an oxygen generator and its supply of oxygen is renewed in the right proportion. The renewed air is sent into the bell-jar by a second tube, thus forming a closed cycle entirely separated from the exterior air. To the left of the bell-jar is an aspirator for setting up the circulation in the apparatus. The carbonic oxide passes first into a cleaning apparatus, then into the oxygen generator on the right, and returns to the bell-jar through a gas-meter. An analogous method is used for human respiration; the bell-jar is replaced by a mouth-piece with the proper tubes (as shown in the engraving). In this way a person may live for a great length of time entirely out of contact with the external air, depending only on the supply of oxylithe. Diving apparatus has been



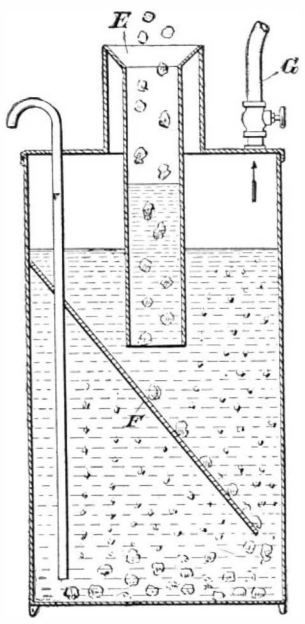
THE JAUBERT RESI ION EXPERIMENTS WITH OXYGENIZED ARTIFICIAL AIR.

equipped with a system of this kind made in compact form and placed inside the helmet. To keep up the respiration of one person during an hour required but 0.2 to 0.3 pound of oxylithe.

No doubt the most important application of artificial air is that to submarine boats, and it is in fact to this end that the efforts of the inventor have been mainly directed. The Minister of the Marine has taken an active interest in the matter and a number of experiments are now being made at St. Denis, near Paris. These relate to two different points, first to the question of respiration when the submarine is under water, and next to the use of a petrol motor with a supply of artificial air, in place of an electric motor with accumulators. As to respiration, allowing 10 persons for the equipage, 2 pounds or more of oxylithe will maintain the respiration of the crew for one hour, representing a cube of 4 inches of the compound. A supply for a long period is thus contained in an insignificant volume. A still more novel idea is to utilize the oxygen for supplying the petrol motor when used under water. In the present systems such a motor can only be used at the surface. When submerged, accumulators are generally used, which drive an electric motor. The weight of the battery is, of course, very great for the amount of power which it furnishes, this being estimated at 150 to 200 pounds per horse power, not to speak of the large amount of space it takes up, just where space needs to be most economized. By using a petrol motor supplied with oxylithe the weight of the latter is but 5 to 10 pounds per horse power. The distance to which a submarine can travel when submerged is, of course, limited to the weight of battery it carries, and is very small; by using a corresponding weight of oxylithe the range would be enormously increased, due allowance being made for the supply of petrol and difference of motor weight. The petrol motor here has its exhaust connected with a discharge-box and thence to a scrubber and an oxygen generator. The oxygen consumed in the motor is here renewed in the right proportion and the product is ready to be used again. This forms a closed cycle, out of contact with the air; when the boat is at the surface, a simple arrangement of valves allows the air to be used and the generator is shut off. The motor can be run while submerged for a period depending only upon the supply of oxylithe (and petrol) which is carried. Another point is that the resulting mixture is richer in oxygen than the air, and the output of the motor may be increased 25 to 30 per cent. Motors using heavy petroleum work especially well with the oxygenated mixture and much better than with air. The experiments now being made with petrol motors near Paris are very interesting, but have to be kept secret for the present. It may be stated that a large petrol motor of about 130 horse power, such as may be applied to a submarine, is being tested in this way. The exhaust gas passes into a cylindrical oxygen-replenisher about 7 feet high and 3 feet in diameter and other apparatus, and is then returned to the motor, where it is recarbureted and used over again. These experiments have been quite successful and will no doubt be practically applied to a submarine of the "Goubet" type before long.



JAUBERT LABORATORY OXYGEN GAS GENERATOR.



FORM NO. 2 JAUBERT OXYGEN GAS GENERATOR.

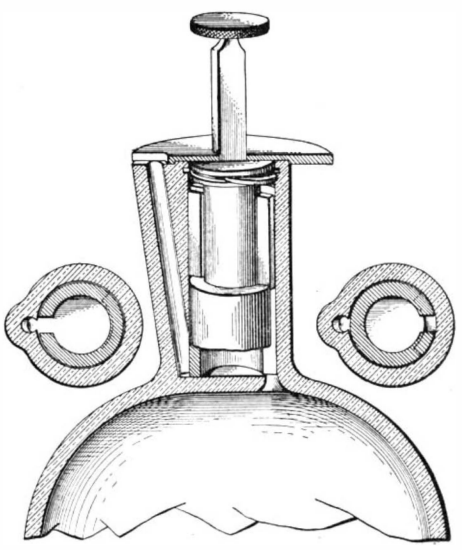
Patent Department

ODDITIES IN INVENTIONS.

LIFE PRESERVER.—Two inventors in Switzerland have designed a life preserver which not only prevents drowning, but will also sustain life for an indefinite period, and, further, is equipped with a sail by means of which a shipwrecked person may make his way to a passing vessel or eventually reach shore. A hollow tank fastened to the back serves to keep the person afloat, and a provision and drink chamber is fitted on the chest. This chamber is divided into three compartments, the lowest containing drinking water, the next an alcoholic stimulant, and the third serving as an air chamber to support this weight. Access to the water and stimulants may be had through tubes which lead up within easy reach of the mouth. Condensed food is carried in three tins on the top of the water tank. A compass also is here secured, to which may be fastened a chart of the course the wrecked vessel was pursuing. A number of blank cartridges and a pistol are also provided for use in attracting attention, and a signal of distress floats from the masthead. Surely the shipwrecked mariner thus equipped need have little fear of Old Father Neptune.

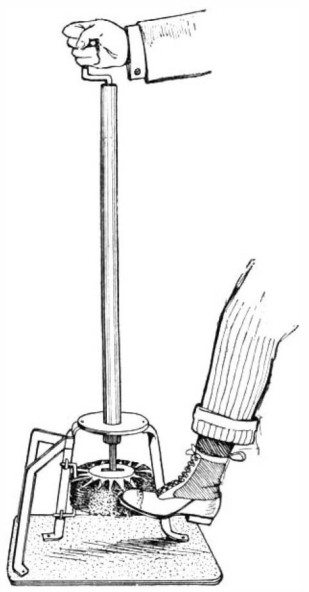
LIFE PRESERVER.

NON-REFILLABLE BOTTLE.—A recent invention by Mr. James Y. Payton, of Waldron, Ark., provides a non-refillable bottle of an entirely new type. Fitted snugly in the lower portion of the bottle neck is a hollow dispensing cylinder divided at one side by a slot. A piston having a rib for engagement with this slot is adapted to slide freely in and out of the cylinder. A shank of the piston passes through a cap-piece which prevents the removal of the parts from the bottle. The cap-piece is held by spring dogs snapped into an angular groove in the bottle neck. This groove is provided with shoulders which permit turning of the cap and plunger in one direction only. The operation in dispensing the liquid is as follows: The plunger is forced down into the chamber and then turned until a tooth on the plunger engages a rib formed in the neck of the bottle. This act brings the slot of the dispensing cylinder into registry with an opening in a bottom wall which separates the neck from the main body of the bottle. The plunger is now raised to the position illustrated, when the tooth will clear the rib formed on the bottle neck, and the bottle is then inverted, permitting the liquid to fill the dispensing chamber. A half turn of the piston now brings the rib formed thereon into engagement with the rib on the bottle and the slot of the dispensing cylinder into registry with an outlet port which extends upward into the form of a tube to the mouth of the bottle. The cap-piece by the same act is turned so as to uncover the mouth of this port. The liquid may now be freely poured out of the dispensing cylinder. Before the dispensing cylinder can be turned to its refilling position, the plunger must again be forced in so that the rib formed thereon may pass under the rib of the bottle. This it will be seen prevents refilling of the bottle because the plunger would force out any liquid contained in the dispensing chamber before the latter could be turned into registry with the opening in the bottom wall of the neck.



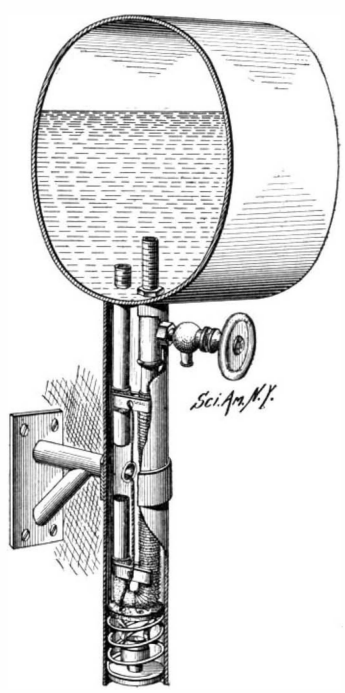
NON-REFILLABLE BOTTLE

SHOE-CLEANING MACHINE.—We have long been in need of a shoe-cleaning device which would not only scrape the mud off the soles of shoes, as with the ordinary scraper, but would also remove mud and dust from the uppers. These requirements are met in the shoe-cleaning machine recently invented by Mr. William Richardson, of Colfax, Wash. The machine comprises a number of scrapers which are used to give the shoe a preliminary cleaning, and a rotary brush for rapidly and thoroughly removing all dirt. This dirt is removed from bristle tufts of the brush by a rod against which the brush is rotated, so that clean bristles constantly operate on the shoe. As the brush wears off, this cleaner-rod may be adjusted inwardly to effectively engage the bristles.



SHOE-CLEANING MACHINE.

ELECTRIC WATER-HEATER.—For persons desiring a quantity of hot water on short notice, the water-heater here shown will prove particularly valuable, though it will be found useful on all occasions requiring hot water. The device is designed to rapdly heat flowing water, or if used in connection with a reservoir, to heat water circulating therefrom and thus store up a quantity of hot water. The reservoir or water tank, as shown, is provided with two pipes connected at their lower ends by a U-shaped coupling. One of these pipes, which is provided with means for heating the water contained therein is longer than the other pipe, so that as the water is heated it will flow to a higher level in the tank and the cooler water will pass down through the shorter pipe, thus keeping up a circulation. A discharge cock is connected with the hot-water pipe, through which the water may be drawn off as required. The heating device consists of a fine wire, wound in coils about the pipe, the latter being covered with an insulating coat of mica or other equivalent insulating substance. The wire offers a high resistance to the electric current passed through it, and sufficient heat is thus generated to heat the water. The heat of the wire cannot rise much beyond that of the pipe, because of the continuous circulation of water, so that no fear may be entertained of burning out the wire. The circuit can be closed or opened by operating the plug at the bottom of the device, which is adapted to slide between two spring contact pieces forming the terminals of the heating medium.



ELECTRIC WATER-HEATER.