found satisfactory for tightly sealing the cover on the hepatic oncometer and cotton saturated with this mixture was used to seal the openings provided for the inlet and outlet cannulae. The oncometer was rendered impervious to air and water by means of the methods described below.

These models may be rendered air- and water-proof by heating them in an oven or hot air sterilizer until they are thoroughly dried. While still so hot that they must be handled with cloths, melted paraffin is poured into the model. By rotating the model, melted paraffin may be made to permeate all parts of the plaster, thus rendering it air- and water-tight, or it may be painted with spar varnish or brushing lacquer both inside and outside. This varnish treatment is most satisfactory for the models of the septic tanks since they may then be handled without being soiled. Dust may also be removed without leaving the plaster in a smeared condition.

SUMMARY

A method has been described whereby models of septic tanks for teaching public health and oncometers for physiological demonstration and research may be constructed by employing a wire frame and covering it with plaster of Paris.

These models should prove especially useful to teachers in rural and suburban communities and to extension workers whose task it is to keep a vast number of our population informed as to the best measures of protecting their health.

These models may be rendered impervious to air and water by means of paraffin, varnish or brushing lacquer.

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ELIMINATING OPAQUING BY ALTERNATING BLACK AND WHITE BACKGROUNDS WHILE MAKING A PHOTOGRAPH[1]

PHOTOGRAPHS of most biological subjects are more pleasing if the finished print has a white background. Such backgrounds are ordinarily secured by placing a piece of white cardboard or an illuminated ground-glass behind the object to be photographed. Unsatisfactory ones are often "blocked out" with some opaquing material, but this procedure is always tedious and, in the case of some biological subjects, impossible. Unfortunately many subjects whose print value would be enhanced by a white background refuse to yield satisfactory negatives when photographed against white backgrounds. Thus, such subjects as yellow, hairy, dark-spotted caterpillars, or sections through diseased potatoes, when photographed against a piece of black cloth yield negatives that present the object with excellent detail and gradation, but the resulting picture (print) will have a drab tone because of the black background. The loss of detail when using a white background is accountable chiefly to the great difference in exposure required by the background as compared with the object itself. Obviously it requires far less time to photograph a piece of white paper than a dark object. The white background literally overexposes a large portion of the negative as a result of the additional time required to record the object itself. Hence the white background induces sufficient halation and "fog" to obscure both the detail and color value of the outer portion of the object.

The writer's method for avoiding this difficulty consists in using a black background (black cloth) during most of the exposure, but towards the end of the time required by the object itself, inserting a piece of white cardboard so that a white background will result in the finished print. By experience it has been determined that for ordinary lighting conditions a pure white background is insured by inserting a white cardboard as background for not more than one third the total time required by the object. At first both backgrounds were used in the same plane, but after several trials better results were obtained by placing the white cardboard closer to the object and keeping it in position for only one fourth the total exposure required. This method almost entirely eliminates halation and records the desirable qualities in the negative which one expects from a black background, but insures a white background in the finished print.

The technique for carrying out the black-white background procedure is very simple. The object to be photographed is placed on a piece of plate glass mounted conveniently beneath the camera. A piece of black velvet photographic cloth is stretched at a distance of about six inches beneath the object on the glass, and the camera is then stopped down so that the exposure for the object itself will require at least twenty seconds. A large square of cardboard is held in readiness for insertion during exposure. First the shutter is opened and the negative exposed for from two thirds to four fifths the required time; then, at the end of this period, the white cardboard is put in position about two inches beneath the glass and, at the end of the total exposure, the shutter is closed. For example, if twenty-five seconds is required for optimum exposure of the object, the first seventeen seconds should be with black cloth only, and the last eight with the white cardboard inserted. For large objects, such as a potted plant, the same

[1] This method was developed at the Virginia Truck Experiment Station, Norfolk, Virginia.

effect may be obtained by hanging a white cardboard on a wire so that it may be drawn back and forth as needed.

Occasional subjects require a gray background. Any shade of gray may be obtained by varying the time for white and black. Obviously the longer the time with black, the shorter with white, the darker the background produced.

This method will eliminate the tedium of opaquing and blocking out of negative where black backgrounds have been found desirable in making the negative but undesirable in the print.

The writer intends to use a modification of the method for making photomicrographs. For this purpose it will be necessary to prepare a substage, the illumination of which may be alternated by white and black disks such as are provided on binocular microscopes.

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SPECIAL ARTICLES

COMPONENTS OF AIR IN RELATION TO ANIMAL LIFE

OXYGEN, since the time of Lavoisier, has been considered the vital component of the air. The 79 per cent. inert part has had little use assigned to it. Popular opinion had stated that animal life would be more efficient if these inert gases were replaced by oxygen.

Carefully conducted experiments, covering a period of eight years, have been carried out by the writer and his assistants.

A glass jar of five-gallon capacity was used as an air-tight container for the larger animals and a gallon bottle for the smaller ones. The gas was introduced through holes in a stopper fitting the larger mouth of the container, entering at the top and passing out near the bottom. The natural feed for the different animals and water were kept before them constantly. A small container of sodium hydroxide was placed at the bottom of the jar to take up any excess of carbon dioxide. The outflow of gas from the glass jar was passed through lime water to show that carbon dioxide was given off and the speed of the escaping gas.

The gas in the jar was frequently tested quantitatively, and the analysis showed that it never had an excess of carbon dioxide over that of ordinary atmosphere. A very accurate record was kept of the rate of breathing and the general appearance of the animals. Chemically pure oxygen was used.

Animals can not live in an atmosphere alone of oxygen, nitrogen, carbon dioxide, helium or argon. In a series of thirty experiments it was found that small animals such as mice, rats, pigeons, cats, guinea-pigs, snakes, monkeys, etc., can live in a medium of air under control, but in pure oxygen under the same conditions they will die within from two to five days. In only one case did any of the animals live over a week in oxygen—the snake lived four weeks—while in a current of air we had the different animals under control from one to three weeks without any signs of ailments. With the representative varieties of animal life it was found that in an atmosphere of pure oxygen, with other conditions normal, without a single exception every one would die in oxygen and none in air.

The breathing of the animals was usually found to increase gradually at first in the oxygen atmosphere, but later they appeared to breathe with more difficulty and more slowly until they died. From the appearance of their actions they did not seem to suffer much from pain.

AUTOPSY SHOWS HEMORRHAGE

An examination made by Dr. G. S. Terry of the lung tissue from a guinea-pig which had died in an atmosphere of pure oxygen showed marked evidence of inflammation and interstitial hemorrhage. Cultures made from the lung tissue showed a heavy infection of *Bacillus coli* associated with a few Staphylococci. The conclusion drawn from the autopsy was that an atmosphere of oxygen would not only rupture the lung tissue but also accelerate the growth of certain micro-organisms.

CARBON DIOXIDE AND OXYGEN

Animals were placed in an atmosphere of 99.97 per cent. oxygen and the normal .03 per cent. of carbon dioxide by volume. The animals used for these experiments were guinea-pigs.

With these experiments of carbon dioxide and oxygen the condition of the animals was found to be about the same as with pure oxygen. For this series of four experiments some one was watching them and taking observations day and night.

The general belief that animals could live with the normal amount of carbon dioxide that we have in the atmosphere added to the oxygen tested out to the contrary. Death followed in every case within two to five days as in the oxygen experiments.

THE EFFECT OF PURE OXYGEN UPON WATER ANIMALS

The experiments were continued with water animals in pure oxygen which was passed continuously