It seems, therefore, that of the various proteins, carbohydrates and lipoids which we tested so far, only the complex phosphorus-containing proteins are active. Of other substances we found leech extract active and among inorganic substances only colloidal metals.

Very young tumors, from two to six days old, do not seem to be as easily influenced as are those from nine to fourteen days old. Only intravenous injection was effective.

We also investigated the action of some of these substances on experimentally produced placentomas in the guinea-pig and rabbit. We found, usually, after one injection of casein, some hemorrhages and subsequent necrosis; colloidal copper seemed, so far, to be without any marked effect on placentomas. With Dr. Leighton we examined the effect of casein and of colloidal copper on wound-healing in white mice. The intravenous injection of these substances had no marked effect on the process of wound-healing.

In order to study still further the action of the substances we injected a series of normal guinea-pigs intravenously with the various solutions which we had tested in the case of tumors, and we found that one single injection of nucleoprotein, casein, and perhaps egg albumin protamin caused frequently multiple necroses of the liver. The necrotic areas were usually situated midway between the portal and central part of the acinus. Other substances, like gelatin and starch, have not so far caused necroses of the liver in our experience. We notice that there is no absolute correspondence between the action of the various substances on tumors and on the liver. In the guinea-pig some substances which are without effect on tumors cause necroses of the liver. Moreover, we have not been able to observe these necroses in the liver of the mouse, even after repeated injections of those substances.

We have been well aware of the fact that many guinea-pigs which have not previously been injected with those substances may show scattered areas of necrosis in various parts of the liver. The necroses which we find after the injection of the substances mentioned above seem, however, to differ in some respects from the necroses found in control guinea-pigs. We are investigating still further the question of how much of the necrosis found is to be attributed to the injection of those substances and how much is due to other causes. At present, therefore, we do not wish to make our statement in regard to the causation of the necroses in the guinea-pig a definite one.

We think it most probable that the various substances which we found active in cancer of the mouse change the capillaries primarily, increasing their permeability to the various constituents of the blood.

We reported previously that the intravenous injections of colloidal copper exerted a definite action on a number of human cancers, provided they had not been growing too rapidly. These injections of colloidal copper, as we also stated before, can, even in the most favorable cases, at present lead only to a partial retrogression of carcinoma in man. It is noteworthy that while some cases are affected favorably, other apparently similar cases are either affected unfavorably, or very little influenced by these injections. In further experiments carried out in conjunction with Drs. H. N. Lyon, C. B. McClurg and W. O. Sweek, we found that intravenous injections of solutions of casein also may exert a certain inhibiting action on the growth of some carcinomas in man; it is, however, less effective than colloidal copper. In one case of sarcoma of the humerus which we treated,

injections of colloidal copper followed by injections of casein produced a decided retrogression and partial calcification of the tumor.

Although we have not so far noticed that the casein has any injurious effect in patients, our observations regarding the possible production of necrosis of the liver in the guinea-pig after intravenous injection of various proteins—observations which we first made in the latter part of March—seem to us to make the use of such proteins in the case of human beings inadvisable at present. We expect to publish a more complete report of our observations concerning the effect of colloidal copper and of casein in human cancer in the near future. There we shall discuss in detail the limitations and the various difficulties in this mode of treatment.

AN ARTIFICIAL AIRWAY FOR SURGICAL ANESTHESIA

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During the past eight months I have used Sir Frederick Hewitt's artificial airway in several anesthetics for which some special method for maintaining a free

Figs. 1 and 2.—Hewitt's artificial airway.

pharyngeal airway was imperative, and also, by way of experiment, in several cases in which the tongue gave no trouble whatever. It is an instrument of great value. The airway as made in England, however, is not adapted for use during anesthesia by open ether, which is the common method of anesthesia in the United States. Therefore I have essentially modified the instrument.

Hewitt's airway (Fig. 1) consists of a somewhat rigid rubber tube, C, curved so that when it is in position in the patient's mouth, it will conform to the upper aspect of the base of the tongue. It has its laryngeal end beveled to correspond with the opening into the larynx. At the proximal end a metal funnel-shaped mouthpiece is attached (Figs. 1 and 2, B). This has a deep groove so as to enable it to be clutched by the teeth in order to hold it in position.

Of the two forms of breathing, namely, that through the nose and that through the mouth, the latter is of greater value during anesthesia. The purpose of this airway is to establish and maintain oral respiration in cases in which it does not exist. The tube is introduced into the pharynx and respiration takes place through it.

For use with the closed method or with the semi-open (cone) method of anesthesia, Hewitt's airway is

complete in itself and satisfactory. But for open ether I do not consider the instrument to be safe, at least if it is not in the hands of an expert anesthetist; and even with him an accident may happen.

When the airway is *in situ* and the patient is in a supine position with the occiput touching the table or the head turned a little to one side; or when he is in a semirecumbent posture, the funnel-shaped opening is uppermost. Now, if on account of a desire to watch the operation, the anesthetist should pour some ether onto the gauze of the inhaler, which he should never do; or if, because of carelessness or on account of an imperfectly working dropping device, the ether spurts or runs out of the container onto the gauze, then some ether would possibly find its way through the gauze into the funnel of the airway and thence by the rubber tube into the larynx and the lungs. Or, again, if too few layers of gauze are used on the mask, ether may inadvertently be dropped through the gauze down the airway. My first modification obviates this difficulty.

This new tube (Ferguson's modification of Sir Frederick Hewitt's airway, Figures 3 and 4), differs from its predecessor in having the proximal end of the funnel closed (Fig. 3, *C*) and two openings (one on each side of the truncated cone) for the ingress and egress of

(Fig. 4), and the inside metal tube will resist the pressure, and the lumen of the airway remain open.

This airway should be introduced after surgical anesthesia has been reached. If the patient is not well under the anesthetic, the contact of the tube with the pharyngeal wall may incite gagging. To adjust the airway the jaws should be separated, the tongue brought gently forward and the airway passed back into the pharynx with the convex portion of the curved rubber tube nearest the roof of the mouth. The instrument of itself will then assume a proper position. As soon as the epiglottis and the base of the tongue are thus separated from the posterior wall of the pharynx, inspiration and expiration will take place through the airway, and the jaw or the tongue will not require attention.

This airway is of use in any anesthesia in which, through muscular spasm or an improper position of the patient, the epiglottis and the base of the tongue are forced to approximate the pharyngeal wall, thereby embarrassing respiration. It is of especial value for patients with short or thick necks, and for certain very muscular subjects. It is valuable also for a patient in the Trendelenburg posture, for whom the necessary slight extension of the head cannot be maintained. In short, it is useful to do away with respiratory embarrassment due to any form of occlusion of the extrapharyngeal respiratory tract.

Two sizes of the airway are necessary, one for children and one for adults. The scale of the drawings accompanying this article is two-thirds the child's size, which is 3 inches long between parallels, and the rubber tube $\frac{9}{16}$ inch outside diameter. The size for adults is 4 inches between parallels, and the rubber tube $\frac{3}{4}$ inch outside diameter.

Figs. 3 and 4.—Ferguson's modification of Hewitt's artificial airway. The detailed description is given in the text.

air (Figs. 3 and 4, *E*). Thus there can be no danger of dropping ether into the top of the funnel, because it is not open, and since the orifices are in the sides which slope toward the lumen of the tube, and therefore away from the source of dropping, it is almost impossible to get any ether into the tube. Should the patient's cheek be resting on the table, any ether that might enter the upper fenestra would pass across the funnel and out of the lower fenestra, so that it is almost impossible for any liquid ether to enter the airway, no matter what the position of the patient may be.

The second difficulty which I have overcome is independent of any particular method of anesthesia. I have had patients whose buccal cavities were so shallow that when the laryngeal end of the airway was in position the airway projected so far beyond the teeth that they could not grasp the metal end. Such patients would bite the rubber tube *C*, the walls of which would yield to the pressure and the tube become closed. I have lengthened and otherwise changed the metal thimble (Fig. 2, *F*), so that it extends well into the rubber tube *C* without enlarging the middle of the tube (Fig. 4, *G*). Consequently a patient's teeth may clutch the rubber tube *C* anywhere between *G* and the groove near *E*

GASTRIC DILATATION.

ITS TREATMENT BY REMOVAL OF GASTRIC CONTENTS,
STARVATION, AND REST IN BED

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We speak of gastric dilatation when we can demonstrate an enlargement of the stomach and an impairment of its motor function. It has been customary to distinguish between a dilatation of the first degree, or relative dilatation, by which we are supposed to understand a dilatation which exists only when the stomach contains food, and a dilatation of the second degree, or absolute dilatation, which remains even when the stomach is empty. This differentiation not only is of very slight practical value, but even becomes actually dangerous to the patient if it conveys to the physician the erroneous idea that a dilatation of the second degree is a sort of durable and stable condition which cannot be changed, and consequently leads either to inactivity on his part or to unnecessary surgical interference. On the contrary, the fact is—and the chief purpose of this paper is to call attention to this fact—that the contractility of the stomach is wonderfully well maintained no matter for how long a time or to what degree it has been dilated.

Our failure to take into consideration this latent contractility of a dilated stomach is no doubt the reason for the non-existence of a satisfactory and universally accepted method of treatment for gastrectasia. But as soon as we realize that the dilated stomach is