able, and the refreshing sleep renews one for the next day. You do not start exhausted.

When autumn comes by the calendar, it is known only by a more delightful charm of air. From September to Christmas there is an almost unbroken period of delicious, sparkling days. There is not the snap or zest of a New England fall—a beauty which it alone possesses—but there is the delight of warm, dry air dancing full of sunshine. The foliage does not turn to the brilliant hues of the East, but shows a beauty of dull reds and yellows and soft deep browns, which must be seen to be appreciated. The mountain slopes and uplands appear as if spread with the richest of Persian rugs.

Winter shows the dull expanse of gray, brown plains occasionally blanketed for a day or two with snow, just long enough to give zest to a rabbit chase. With its clear, sunny, blue sky and cold, dry air, it is little more than an expectancy between summer and summer.

Taking the year round, a few facts of such ordinary interest that they are rarely mentioned will show how evenly good the weather is. In the year 1895—an average year—a friend went with his bicycle club upon its weekly Sunday run fifty-two times; not once was that excursion prevented by storm or snow or impossible roading. The open street-cars run all the year round, and the days are few when they are too exposed for riding.

NOTES ON SURGICAL GAUZES.¹

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THE study of textile fabrics, of their capillarity and other purely physical characteristics, in relation to surgery, is a department which at present receives less attention than it deserves.

It will not be considered an unreasonable supposition that the success or failure of certain operations in surgery may depend upon the speed or slowness of capillarity in the gauze used as a dressing. The surgeon knows all about his patient, all about his asepsis: pathology and bacteriology are his allies. He knows practically nothing about his dressings, beyond the fact that they are sterile and absorbent.

Sterilization is carried on under personal supervision. It is not trusted to a stranger. Absorbency—a no less important faculty of gauze—is left in a general and trusting way to a manufacturer who knows nothing about surgery and whose principal aim is profit.

It is the object of this paper to consider with some care, from the surgeon's standpoint, the capillary power of the various commercial gauzes. Gauze and drainage are so closely associated that some reference must necessarily be made to the latter subject. We may be confident that we are using good gauze, or we may not consider at all whether one gauze is better than another. At any rate, if we have no definite knowledge of the capillary power of the gauze which we use, we are trusting rather too largely to the honesty and intelligence of the manufacturers of cotton cloth. If the gauzes are uniformly excellent, it will be a comfort to know it. If they vary in any marked degree, we should not be long in choosing the best.

Taking a one-hundred-yard roll of absorbent gauze,

¹ Read at the February meeting of the Essex South Section of the Massachusetts Medical Society.

such as is furnished by any dealer in surgical supplies, we will see if throughout it possesses an even and rapid capillarity. Probably the most practical way of doing this, and the one least likely to error, is to determine by weight, the amount of water absorbed in a given time, under given conditions, by a strip of gauze of given dimensions. A little frame of wire has been devised, to which the strip of gauze can be attached and an equal degree of immersion obtained in each case.

A piece of gauze six inches long and one-half inch wide, containing in most fabrics fifteen longitudinal threads, is found to weigh, for example, two grains. When it is stretched double on the little frame we have a wick of thirty strands. The double end of the gauze is immersed in water, to the depth of one-quarter of an inch, for a period of sixty seconds. Taken from the frame, its new weight is found to be three and one-half grains. The difference between these figures equals one and one-half grains, and is the amount of water absorbed by this wick, under our chosen conditions. This is the principal method used in testing the various gauzes.

For convenience, when we have made a number of such tests in a given gauze, we will strike an average of the weight of water absorbed by the different strips and call that figure the average capillarity of the gauze in question.

Returning to our one-hundred-yard roll, we select three samples, not containing selvage, from remote parts of the gauze, and we find, after a number of tests, that the wicks vary a good deal in capillarity. If now we cut strips, side by side, from the same width of gauze, we shall see like differences in absorbency.

Plain, unsterilized gauzes from four hospitals were examined in the above manner, and certain rather striking averages obtained. It was believed that sterilization, especially the baking process, would make some difference in the absorbent power of the gauzes. Therefore, the hospital gauzes were tested, after being sterilized, by the two common methods—baking and steaming. The averages showed in some instances increase in capillarity by steam, and in others a diminution. A like result was obtained with the baked gauzes. All these differences, it was believed, might fall within the limit of initial variability in different parts of the same sample of gauze.

Disregarding the sterilizing and taking the results of nine immersions of each plain gauze, we make the average capillarity of

Massachusetts General Hospital plain gauze	4½
Children's Hospital, Boston,	4½
Carney Hospital, South Boston,	4
Salem Hospital	3
A gauze submitted by Sampson & Padelford, of Allston, gave an average of	3½

It is a common belief that a perfectly dry gauze will not absorb so well as a moist gauze. An apparent proof of this assumption is seen when we throw a dry gauze sponge into a basin of water. Such a sponge will float for some time and we say it does not readily absorb water. It is true that a moist sponge will sink at once, but this, as will presently be granted, is because, being moist, it already contains nearly water enough to make it sink. If a dry strip of plain gauze, like those described, absorbs, for example, three grains of water under the given conditions, we have shown by repeated trials, that the same strip of gauze, thoroughly

moistened, will again absorb three grains—no more and no less.

In further corroboration of the statement that neither method of sterilization affects materially the capillarity of a gauze, the identical test strips have been given the regulation immersion, first unsterilized, then sterilized by steam, and lastly by dry heat. No appreciable difference in capillarity is observed under these conditions.

For reasons to be stated later, the selvages in each sample were cut and tested. A selvaige contains an average of twenty-two longitudinal threads lying closely together in pairs. Doubled in the little frame, the selvaige makes a wick of forty-four threads. It will be observed the bulk of this selvaige wick is very small as compared with that of the open gauze wick, containing the same number of strands.

The selvages, according to the number of threads, do not absorb quite so much water as the open gauze wicks. But, as will be seen later, they carry the fluid farther and faster.

The Massachusetts General Hospital open gauze, thirty threads, absorbs an average of three and one-half while the selvaige absorbs two and one-half. The proportions are similar in all the different gauzes under consideration. It is only fair to suppose that, owing to its small bulk, the selvaige does not hold so much water in the lower turn of the wick as does the open gauze, and is therefore placed at a disadvantage in these experiments.

There is in the profession at the present day a strong reaction against the use of the various medicated gauzes. Iodoform gauze especially has lost much favor as a drainer of cavities. Although the other gauzes except corrosive are little used by surgeons of experience, a study of their absorptive values may be of interest.

Five different samples of iodoform gauze from as many sources were examined. The gauze used at the Massachusetts General Hospital had an average of two and one-half against four and one-half, the standard of plain absorbent gauze used at the same institution.

The Children's Hospital iodoform gauze showed an average of three against four and one-half, the average of plain gauze.

Sampson & Padelford, of Allston, submitted an iodoform gauze, which held an equal average with the plain gauze, three and one-half in each instance.

The other gauzes—from Seabury & Johnson and Johnson & Johnson—showed respectively averages of two and one-half and four, with no plain gauze for comparison.

These figures are useful in a general way as showing that the iodoform gauzes in common use in our hospitals and those of commerce are relatively poor in capillarity. To prove beyond peradventure that iodoform really diminishes the absorbency of a gauze, it is necessary to take gauze strips of known capillarity and to impregnate them with iodoform. When this is done, we find in every instance that the capillarity is lowered. Children's Hospital strips, with capillarity of four, registered three, after being drugged with iodoform. Conversely, an attempt was made to raise the standard of the various iodoform gauzes by washing in ether. The results, however, were incomplete and unsatisfactory.

Dr. Thayer, of Waterville, Me., says, in a recent article on "Gauze as a Means of Drainage," "So

far as capillarity is concerned, it makes but little difference practically, whether the gauze is plain or medicated. For in a series of experiments I have observed that a plain gauze wick will drain seven ounces of fluid, while a ten-per-cent. iodoform gauze drains six and one-half ounces, both drains being of the same size and number of strands, and all conditions identical."²

The medicated gauzes furnished by the different manufacturers gave averages as follows:

Johnson & Johnson (corrosive)	4
Grosvenor & Richards (corrosive)	2
Carbolic gauze by Johnson & Johnson	3
Borated "	4
Naphthol "	4
Salicylated "	2
Double cyanide Hg-Zn "	2½
Eucalyptol "	2½

Special averages were made of the selvages in each case, and they were found in general to absorb about two-thirds the amount taken up by the open gauze wicks.

These experiments are again of value only in a general and broad way. The initial value of the gauze determines its value after medication.

To supplement the method of examination which has been described a set of color tests was devised. Similar strips of gauze were placed on a rack, with their lower ends in a reservoir of analine dye solution. As the supply of dye was unlimited the rise of color in the strips indicated fairly well the speed of absorption. This procedure was repeated with acids—litmus paper being used to time the rise of the fluid. The results were found to correspond in a general way, but the uncertain absorption in strips from the same sample, robs the experiment of accuracy.

A ready test of a gauze, however, may be performed by placing a drop of dye in the centre of a square of the gauze to be examined. The test is only very roughly approximate, but in the unbleached gauze there is no spread of color, while in the highly absorbent pieces the spread is rapid and extensive. The coarse-meshed gauzes spread the color somewhat wider, because the supply of dye is limited, and in the finer gauze there is more cloth to the square inch to take up the color.

A curious and suggestive phenomenon is observed in the strip color-tests when the selvaige is included in the strip. The color runs up the selvaige much more rapidly than elsewhere in the gauze. During the last service of Dr. F. B. Harrington at the Massachusetts General Hospital, the writer, as his house-officer, was frequently requested to cut the selvaige from the gauze and to use it in draining small suppurating cavities. These color experiments fully justify Dr. Harrington's preference for the selvaige.

The reason for this advantage which the selvaige has over open gauze is probably that the longitudinal threads lie closely together and that the proportion of transverse threads is small. It is easy to see, and not too theoretical to suppose, that each transverse thread proves a little obstacle to the upward progress of fluids. Before the fluid can progress in a wick, it must saturate not only the longitudinal but the transverse threads. In each transverse thread the fluid spreads laterally

² It would seem to the writer that this conclusion might be open to question, when we consider the variability of capillarity in different parts of the same gauze. Inspection of a piece of gauze, with an ordinary hand magnifying-glass, will reveal the reason for these inequalities. The threads vary markedly in size at different points.

and so out of the line of progress. In the open gauze the transverse threads are long and, having quite as much capillarity as their longitudinal brothers, they carry far in the wrong direction large amounts of fluid. In the selvage when the drainage strikes a transverse leader, its lateral excursion is short and frequently intercepted by longitudinal threads, so that progress is almost uninterruptedly upward.

A homely, but convincing demonstration of the soundness of this reasoning can be made with ink, a medicine-dropper and a piece of blotting paper. Cut a piece of blotter one-fourth of an inch wide and the length of the width of an ordinary insurance blotter, and place five drops of ink in the middle of the strip. There are practically but two directions in which the ink can travel. The color will run along the strip for about two inches. Place in the middle of a broad piece of blotter the same number of drops, and you have a circular blot, with a diameter about half the length of the first blot. The first part of this simple experiment illustrates the action of the selvage in absorption. The second part is analogous to the action of the open gauze.

In this connection we should mention wicking or cordine, which, according to this principle, has a decided advantage over ordinary gauze wicking, as it contains in small compass a maximum number of longitudinal threads. In proportion to its bulk it is, perhaps, the best wick we have, as it will absorb, even when drugged with iodoform, thirty-three grains against perhaps eight grains, by a gauze wick, which would fully occupy the same space.

Dr. Thayer says further in his article: "It was also observed that the same number of strands as contained in the other drains, with the warp removed and the woof made into a wick, possessed no advantage over either the plain or medicated gauzes as to its power to drain fluid."

The wicking, or cordine as it is called, and also the selvages which have been considered, can scarcely be compared to a fabric with its woof removed, because they are more compact in structure, and the close proximity of the threads must be an advantage. In these structures, if there are any spaces they are tubular and capillary. If one thread ceases to absorb, its neighbor can quickly take up the work.

A study lamp which burns a pint of oil in an evening may teach a lesson in drainage. In most lamp wicks the threads all run as nearly longitudinally as is consistent with stability of the fabric.

We are now confronted with some plain facts about surgical gauzes. The commercial product is not only uneven in capillarity, but the very weave of the stuff makes it unsatisfactory for drainage purposes. We must bear these things in mind when we apply our dressings.

Steps have already been taken toward securing the manufacture of an absorbent tape on the principle of the selvage. Such a tape, it is hoped, will supplant the faulty gauze drain. Where walling off is necessary, a gauze woven with twice or three times the number of threads running longitudinally would help in making a safer dressing.

In the light of what we have seen, the most appropriate place for the ordinary absorbent gauze is in the so-called receiving mass, where lateral distribution is rather an advantage.

However high the index of absorption may be in an

iodoform gauze, we may safely say that it would be higher, if the iodoform were left out. Therefore, if we need rapid drainage, we should not use iodoform gauze.

It is a comfort to know, experimentally, that dry sterilization does not lessen the absorbency of gauze.

Whether we are able to better ourselves or not, we should not, in such a field as surgery, be ignorant of our limitations in any direction. If we have gone over the ground, if we know where we stand, we shall be able to make more intelligent use of a faulty material, until we are supplied with something which will serve our purpose better.

New Instruments.

A NEW ELECTRICAL NASAL SAW.¹

BY FREDERIC C. COBB, M.D., BOSTON.

In presenting a new electrical nasal saw it is of importance to recapitulate the work already done in this direction.

The first mention I have found of such a saw is in the "Transactions of the Laryngological Association" for 1887. Dr. Roe, of Rochester, exhibited a saw of this kind having a somewhat elaborate and expensive mechanism. In the following year these defects becoming evident to him, he modified the saw, making its mechanism more simple. This saw had a vertical driving-wheel and was connected to the flexible by a spring. To this saw the main objections seem to me to be the liability to kinking or "buckling" of the spring when resistance is put on the mechanism. Its lateral attachment to the flexible also tends to throw it out of plumb.

Next came the chain saw of Veeder.² This was a saw intended to cut vertically. The great difficulty in keeping such a complicated mechanism clean and aseptic will, I think, be evident to any one examining it carefully.³

Black followed this by a description of a saw very similar in many respects to the one shown by me, the main difference being in the lack of ability to stop and start it from the handpiece.

Scheppegrell, in April, 1897, exhibited a saw⁴ improving upon that of Black's in this respect, but one which seems to me more complicated in its mechanism.

The great disadvantage of all electric saws has been the lack of power to control them. Such a saw should be strong, and not too light, so as to give as little vibration as possible, offering a firm grasp to the hand, and so arranged that it can do no damage if it gets beyond control.

The saw shown in the cut is very strong, and its mechanism is simple, consisting only of a wheel with piston attachment connected with the saw. The length of the stroke is altered by turning a screw on the driving-wheel. It is easily cleaned and oiled, the cap on the driving-wheel being hinged so as to be easily removed for that purpose. A friction clutch on the handle, as suggested by H. M. Sweet, of Boston, enables the operator, by removing the little finger from a spring, instantly to stop the action of the saw while

¹ Read before the Laryngological, Rhinological and Otological Society, at Washington, May 2, 1897.

² New York Medical Journal, February 21, 1891.

³ Laryngoscope, July 1, 1896.

⁴ Loc. cit., vol. xi.