

the cotton loose for the penetration of the heat, which occupies two or three hours. The cotton when heated is taken out of the chamber along with the weight, and placed in a wooden box to protect it from the cold. (It would be better to have a second hot chamber for this purpose, since in cold weather the cotton is apt to be too much cooled in spite of the protection of the wooden box.) The heated gauze is then at once charged with the melted mixture of carbolic acid, resin, and paraffin, in quantity equal to the weight of the cotton fabric (or slightly less), and in order to diffuse the liquid as equally as possible, it is sprinkled over the gauze by means of a syringe, with a number of minute perforations in its extremity, the body of the syringe and the piston-rod having each a wooden handle to protect the hands of the workman from the heat. The syringe is constructed to hold half the quantity of the mixture required for charging one piece of cloth. One folded piece being placed at the bottom of the hot chamber, its upper half is raised and turned aside, and one syringeful is sprinkled over the lower half. The upper half is then put back into position, and another syringeful thrown on. The same process is repeated with all the other pieces of gauze, after which the weight is put into the chamber to compress the charged cotton, and the lid applied. An hour or two are then allowed to elapse, to permit the complete diffusion of the liquid, when the material is fit for use. The apparatus above described can be made by a common tinman for about 10*l*.¹ Fig. 21 shows the apparatus employed in the Glasgow Infirmary.¹

As the muslin is the dearest item in the gauze Mr. Lister has suggested that the dressings should be washed and the gauze recharged. The larger dressings are therefore kept and sent back to the manufacturer, who washes and recharges them. This recharged gauze can then be used as loose gauze in future dressings.

In this gauze the carbolic acid is the only active agent; the resin is used to hold the acid—*i.e.* to prevent it from being washed out too soon by the discharge—while the paraffin is employed to lessen the adhesiveness of the resin. The gauze

¹ See 'Practical Papers on the Materials of the Antiseptic Method of Treatment.' By George Beatson. *Glasgow Medical Journal*, March 1880.

ought to be kept in a tin box, closing tightly to prevent evaporation of the carbolic acid. It is used either in the form of loose gauze or folded dressings and bandages.

A great many different ways of preparing gauze have been published, but none are so good as that just described.

Von Bruns has lately recommended a gauze containing castor-oil instead of paraffin.

His formula is—

| | |
|-------------------------|---------|
| Carbolic acid | 1 part |
| Resin | 4 parts |
| Castor-oil | 8 " |
| Spirit | 20 " |

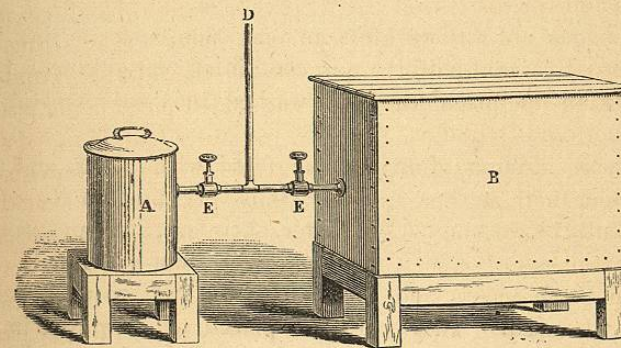


FIG. 21.—MACHINE USED IN THE GLASGOW ROYAL INFIRMARY FOR MANUFACTURING GAUZE.

A is the receptacle for the antiseptic mixture of carbolic acid, resin, and paraffin; B is the tin case in which the muslin is heated, impregnated with the mixture, and submitted to pressure. D is a pipe which conveys steam for heating the apparatus, and E E are stopcocks for turning on or shutting off the steam in connection with either A or B. (From Dr. Beatson's 'Practical Papers on Antiseptic Surgery'.)

The resin is first dissolved in the spirit, then the carbolic acid and castor-oil are added. The gauze is simply soaked in this, and then hung up to allow the spirit to evaporate. The objection to this gauze is that the castor-oil interferes with the affinity of resin for carbolic acid, and thus the carbolic acid will be sooner washed out, and the gauze thereby rendered less trustworthy.

In order to prevent the discharge from soaking directly through the dressing *macintosh cloth* is used. This is cotton cloth with a thin layer of india-rubber spread on one

side. It is placed outside the gauze dressing. As a rule one layer of the gauze comes outside it, partly in order to keep it in position, and partly also, in case any hole should exist in the macintosh, to have a little antiseptic material outside. Care is taken that the side on which the india-rubber is spread goes next the wound, for if the other side be placed inwards it absorbs discharge, and, not being itself antiseptic, it becomes in reality a piece of impure cotton in the interior of the dressing, and may thus communicate putrefaction inwards. The macintosh itself also gets spoilt when so used. The dressing consists of a piece of gauze of sufficient size folded in eight layers, beneath the outer layer of which the mackintosh cloth is placed.

Sponges are washed after an operation, and are then kept soaking till required in a jar containing carbolic acid 1-20. During an operation they are washed in 1-40 carbolic acid lotion.

These sponges often become filled with fibrin, and thus rendered more or less useless. It is very difficult to remove this fibrin by washing. Mr. Lister, therefore, after an operation places the sponges in a tank containing water. Putrefaction of the fibrin occurs, and after some days the sponges can be easily cleansed. They are then placed till required in the 1-20 carbolic solution.

When the wound becomes quite superficial, various preparations of BORACIC ACID may be employed with advantage.

Boracic lotion is a cold saturated solution of boracic acid ($B_2O_3 \cdot 3H_2O$) in water. This acid is soluble in 25 to 30 parts of cold water, and in very much larger proportion when the water is boiling. It is convenient to tinge this solution with litmus in order to distinguish it from the carbolic lotions.

Boracic lint is ordinary surgical lint soaked in a hot saturated solution of boracic acid and then hung up to dry. About half its weight consists of crystals of the acid. This is also stained with litmus.

Boracic ointment is employed in certain cases. Two strengths are commonly used, called full strength and half strength; the former being applied to wounds where cavities exist, the latter to superficial wounds which one wishes to heal

rapidly. The following is the original formula for the full strength ointment:—

| | |
|---------------------------------|---------|
| Boracic acid crystals | 1 part |
| White wax | 1 " |
| Paraffin | 2 parts |
| Almond-oil | 2 " |

First mix the wax and paraffin by heating them together, then add the oil; mix the crystals with this in a warm mortar, and continue the process of mixing till the liquid solidifies. Spread on thin cotton cloth.

The half strength contains half the quantity of boracic acid.

A much softer and more manageable boracic ointment is now made with vaseline. The following is the best formula:—

Make a basis of 2 parts of paraffin to 1 part of vaseline.

Take of this 5 parts

„ boracic acid, 1 part. Mix.

Salicylic acid cream is used for applying around a wound when a dressing is to be left on for some days. It prevents irritation by the discharge. It formerly consisted of salicylic acid crystals mixed with 1-20 carbolic acid lotion in sufficient quantity to form a creamy fluid. This is apt to separate into two layers, and therefore it is better to make a cream by mixing salicylic acid with glycerine so as to form a paste. This latter cream remains of uniform consistence, and is easily applied. For this purpose Mr. Lister uses glycerine and carbolic acid 1-10.

The formula for *salicylic ointment* is—

| | |
|--|----------|
| Of the same base as is used for boracic acid | 29 parts |
| Salicylic acid | 1 part. |

For the purpose of purifying sinuses, putrid ulcers, &c., a solution of *chloride of zinc* is used of the strength of 40 grs. to the oz. of water. This is either applied on lint to the whole surface of a wound, or it is injected by means of a syringe and catheter into all the deep parts of the wound, care being taken to provide free exit for the fluid injected. If the exit of the solution is obstructed, it may pass into the tissues and cause gangrene.

Iodoform is now applied to the surface of ulcers, and

BIBLIOTHECA
FAC. DE MED. UANL

answers the same purpose as the chloride of zinc solution, while it causes no pain.

Carbolised cotton wool is used in some cases of gangrene. It is obtained by soaking pure cotton wool in a 1 per cent. solution of carbolic acid in ether. The cotton is then dried and used immediately.

CHAPTER IV.

ASEPTIC SURGERY (*continued*).

Example of an aseptic operation: Purification of the skin—Fingers—Instruments: Spray—Precautions—Probable errors, and mode of remedying them: Guard: Ligature of arteries: Drainage of wounds—India-rubber tubes—Catgut drains—Horse hair—Decalcified bone tubes (Neuber's and MacEwen's): Sutures: Button stitches—Stitches of relaxation—Stitches of coaptation—Aseptic strapping—Protective: Deep dressing: Loose gauze: Gauze dressing: Elastic bandage. CHANGING THE DRESSINGS—Time—Method. TREATMENT OF ULCERS: Purification of the sore: Boracic dressing: Boracic and salicylic ointment: Boracic poultice.

HAVING described the materials employed in aseptic surgery, we must now consider how they may best be employed. Take as an example of an operation the removal of a fatty tumour.

The patient having been brought under the influence of chloroform or other anæsthetic, the skin over the tumour, and for some distance in the vicinity, is thoroughly purified from any active dust by washing it well with a solution of carbolic acid 1-20. The surgeon and his assistants also wash their hands in 1-40 carbolic lotion, while the instruments are put to soak in 1-20. A towel is arranged close to the tumour, generally on the part of the table between the operator and the patient, which towel has been well soaked in 1-20 carbolic lotion, and is meant as an antiseptic basis on which instruments may be laid during the course of the operation without any fear of their contamination. This towel is so arranged as to be within the cloud of spray. A spray being now made to play over the part from a convenient distance, the surgeon makes his incisions, removes the tumour, ties the vessels with catgut, introduces a suitable drain, stitches up the wound, and applies a piece of protective but little larger than the wound—the protective being of course dipped in the 1-40 carbolic solution.