AIDS TO THEATRE TECHNIQUE

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AIDS TO THEATRE TECHNIQUE

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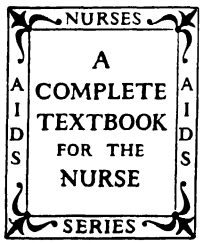


THIS BOOK IS PRODUCED IN
COMPLETE CONFORMITY WITH THE
AUTHORIZED ECONOMY STANDARDS

PRINTED IN GREAT BRITAIN

FOREWORD
TO
THE NURSES' AIDS SERIES

It appeared to us that the time had come when a Series of handy textbooks covering the field of knowledge required from the modern nurse would be acceptable, and fill a real need. It was therefore decided to produce such a Series, covering all the subjects included in the examination syllabuses of the General Nursing Council, starting with General Nursing, Surgical Nursing, Medical Nursing, and Hygiene, and continuing with other branches.

The object of this Series is to provide in condensed but easily readable form extensive and comprehensive information on each particular subject. The books are of such a size that they take up but little room and are light and easily transportable. The cost of each volume is only 4s., and it is hoped that this moderate price will bring the Series within the reach of every student nurse.

The Nurses' Aids Series as a whole, therefore, aims at supplying concisely, clearly and simply (illustrated where necessary) just that quantity of information the nurse is required to possess. In no sense is this Series of books supplementary to existing textbooks. The title implies that they are "Aids" to knowledge and not Aids to the study of a larger textbook. The authors are Sister Tutors in prominent teaching hospitals, and in each case the collaboration of medical men having expert knowledge of the subject has been secured.

The volumes are of uniform size and colour. It is hoped that they will prove handbooks suitable for the student nurse preparing for examinations and to the qualified nurse as a convenient, up-to-date reference

library, which she can easily afford to acquire for her personal use. The volumes so far issued are "Aids to Practical Nursing," "Aids to Anatomy and Physiology for Nurses," "Aids to Practical Nursing," "Aids to Hygiene for Nurses," "Aids to Medicine for Nurses," "Aids to Surgical Nursing," "Aids to Gynæcological Nursing," "Aids to Materia Medica for Nurses," "Aids to Fever Nursing," "Aids to Tray and Trolley Setting," and "Aids to Tropical Nursing."

(*Signed*) MARGARET E. HITCH, S.R.N. (*Sister Tutor at St. Bartholomew's Hospital*).
KATHARINE F. ARMSTRONG, S.R.N., S.C.M. (*Editor of the "Nursing Times": late Sister Tutor at King's College Hospital*).

GENERAL EDITORS.

LONDON.

FOREWORD

THEATRE work always seems a little bewildering to the student nurse and the time devoted to it during her training is only sufficient to enable her to grasp the basic principles. Those who have worked in the theatre know only too well the difficulty of mastering the method and instruments peculiar to each surgeon ; the same operation performed by two surgeons may be from the instrument nurse's point of view quite different procedures from the moment the pre-operative preparation of the patient's skin is begun. Yet, under war-time conditions, the newly trained nurse may suddenly be faced with the task of " laying-up " for an operation.

The Nurses' Aids Series has provided the nurse with many useful textbooks : the need for another, however, was apparent—one on " theatre technique," both as a guide to the student and a handy companion to the trained nurse.

I have been privileged to read the proofs of this book. It is clear that, depending on the hospital and the surgeon with whom she is working, the nurse will have to make alterations and additions to the instrument lists given, but the aim of providing lists for all the common operations which may be considered standard, and which the nurse may use with confidence in the absence of other guidance, has, I think, been accomplished.

The plentiful illustrations are a great improvement on the hitherto dull lists of instruments usually provided in similar works, and the arrangement makes it easy for the nurse to find the information she desires quickly.

To have produced such a book during war is a credit both to the authors and to the publishers, and I wish this new and valuable addition to the Nurses Aids Series the very great success it deserves.

WALPOLE LEWIN.

LONDON,
April 1944.

AUTHORS' PREFACE

THIS small volume is in some respects a companion to "Aids to Tray and Trolley Setting" in that it is offered as an aid to practical knowledge. It is not suggested that any manual can replace the technical knowledge gained in even a few months of actual experience in theatre work, but the book may serve as a basis on which the student nurse can build her knowledge of theatre instruments and appliances. It may also serve as an aid to memory for the qualified nurse who without recent theatre experience finds herself confronted with the task of preparing for an emergency operation.

In the chapters on "Surgical Operations" complete trolleys for certain operations have been shown, particularly where the operation is a frequent item on the theatre list or is a common emergency. In other instances the list of instruments has not been accompanied by an illustration; the majority of these are operations for which the instruments have been shown elsewhere in the book. In some of the illustrations only the special instruments required for an operation or a group of operations, as, for example, "amputation instruments," have been depicted.

It is impossible in a book of this modest size to cover the whole field of operative surgery, particularly the highly specialised departments, and it is in such specialist work that individual surgeons are likely to have strong preference for particular instruments. It is also impossible to mention every variety of instrument that may be used in any one operation, but it may be stated that each operation can be, and frequently is, performed with the instruments listed. A glossary of some common instruments has been provided. It should be noted that for the purposes of photography the instruments have not necessarily been arranged on the table in the order in which they would be used. Adherence to this rule would have frequently resulted in some of the smaller instruments being completely hidden by larger ones.

The methods of sterilisation given in Chapter IV may be criticised by those who feel that the shortened time of boiling for instruments and other boilable apparatus may be dangerous. These methods are, however, in line with recent recommendations, and have been proved safe by repeated tests.

A chapter on "Traumatic Surgery," largely based on experience gained in the treatment of air-raid injuries, has been included in the hope that it may prove useful to the nurse confronted with the organisation of the nurses' part of the arrangements for dealing with large numbers of casualties.

We are very grateful for the generous assistance given by the Surgical and Nursing Staffs of University College Hospital in preparing for the photographs, providing material and acting as models and also for much expert advice and constructive criticism. We are particularly indebted to Dr. H. N. Webber for his help in connection with the chapter on "Anæsthetics."

Captain Walpole Lewin, R.A.M.C., late Harker Smith Registrar and Assistant to the Surgical Unit of University College Hospital, has read the proofs and made many valuable suggestions. We should like to thank him very warmly for the time which he has devoted to this task and for his great help in planning the scope and pattern of the book from the time that it was first considered.

We wish to acknowledge the kindness of the Maxillo-facial Unit of Hill End Hospital in allowing us to use the picture of the extra-oral pin fixation method in the treatment of fractures of the mandible, and the courtesy of Messrs. Macmillan in giving us the block of this illustration which originally appeared in the "Nursing Times." The illustrations of blood transfusion apparatus appearing in the book are taken from "Illustrations of Surgical Treatment" by Eric L. Farquharson (E. and S. Livingstone), and we should like to thank the author and publishers. A large number of the illustrations of surgical instruments have been supplied by Messrs. Mayers and Phelps, to this firm and their representative Mr. Cathrall we offer our very sincere thanks for invaluable help in making special blocks and selecting

suitable instruments for reproduction. The illustrations of Semb's rib-holding forceps and of the flexible gastroscope were kindly supplied by the Genito-Urinary Manufacturing Company, Messrs. Thackray provided the picture of Padgett's dermatome and the Irrigation Envelope Company that of the envelope for the leg, we have great pleasure in thanking these firms for their kindness.

Over seventy photographs have been specially taken by Mr. Norman K. Harrison and we acknowledge with great gratitude both his unfailing enthusiasm and his photographic skill which has been of the greatest assistance in enlivening what might otherwise have been somewhat dull and involved descriptions.

We cannot end this list of acknowledgments without thanking the publishers. Without the constant help and advice of Mr. A. A. Tindall and Mr. R. F. West this book would not have progressed very far. Many practical difficulties have been encountered, but their encouragement and patience have been unfailing. The production of the book has been slow and by no means easy under war conditions and constant changes, but it has been an interesting task and we hope that this volume may prove as acceptable to the nursing profession as its companions in the Nurses Aids Series.

M. HARDING.
M. HOUGHTON.

UNIVERSITY COLLEGE HOSPITAL,
April 1944.

CONTENT

AIDS TO THEATRE TECHNIQUE

CHAPTER I

THE THEATRE UNIT

THE modern theatre block is planned to be self-contained and to provide an operating room or rooms which can be kept in a state as near perfection of cleanliness as possible. The unit is usually designed as a series of rooms leading off a corridor with closed doors that separates it from the main hospital thoroughfare. Surgeons, nursing staff, students, and visitors are provided with changing rooms where ordinary clothes can be changed for theatre garments or clothing covered with clean gowns, caps, and rubber boots before entering the operating or anæsthetic rooms.

Sterilising equipment is usually placed in an annexe leading out of the operating room, this arrangement keeps the actual theatre free from unnecessary heat and steam and also minimises noise. These annexes should be large enough to allow for the laying up of instrument and ligature trolleys. A sink room or " utility " room is also necessary in which instruments, bowls, mackintoshes, and other equipment can be cleaned after use. Most theatre units also provide bathrooms in addition to changing rooms for the surgeons, a staff room, and an office for the theatre sister. A linen room for the sorting and mending of clean linen with a large table for packing drums is a necessity. A stock room may be separate or may be combined with the linen room. There should be ample cupboard accommodation. A hot-air cupboard for warming patients' gowns and blankets is an

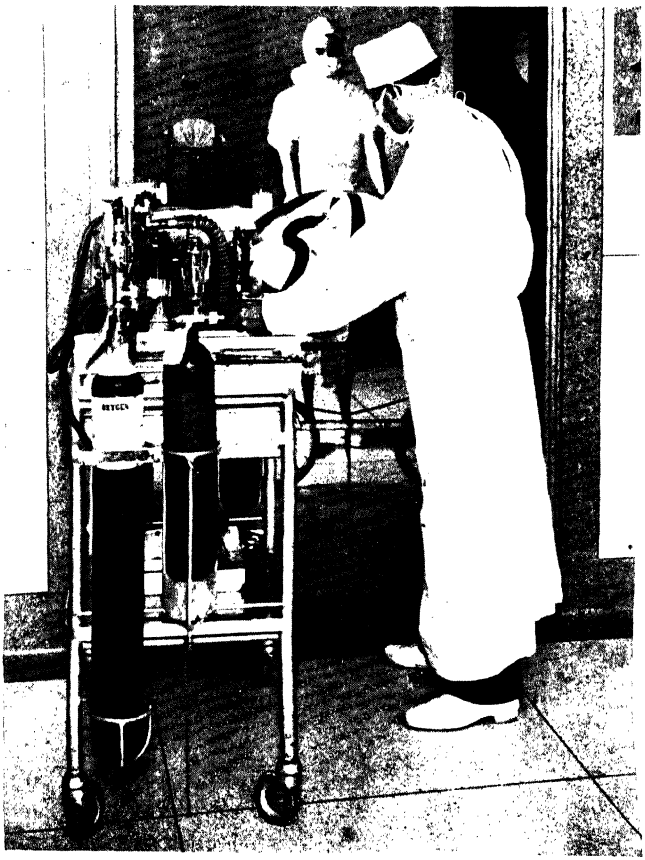
asset. Large units may include an X-ray room and electric power points are provided in the theatres for operating mobile X-ray plants.

Labour-saving and hygienic construction facilitate the daily thorough cleaning which is necessary in all operating theatres. Walls and floors are commonly covered with neutral-tinted or green terrazzo or similar washable material. The floors slope towards a gulley so that the walls and floors can be washed down easily with a hose and squeegee. As far as possible ledges and corners which may harbour dust are avoided in the construction of the building and in the fittings and furniture. Heating is usually provided by hot-water pipes which are best concealed in the walls but may be used in the form of " radiators " placed behind screens. Natural ventilation is seldom possible when a theatre is in use, as dust and draughts must be excluded, and therefore some form of artificial ventilation is needed. The " balance " system is commonly used, air is driven in through screens which remove dirt, it can also be warmed when necessary by passing over hot-water pipes. Hot air is extracted by fans in the roof. Windows are made as large as possible in order to give plenty of light when natural lighting can be used, but outside blinds are necessary as a protection against too much sunlight in the summer and also to darken the theatre when needed for certain operations. The theatre needs an efficient system of artificial lighting and an emergency system should be available in the event of the electricity from the mains failing. The table lighting is provided by a large shadowless lamp such as the " scialytic " light.

STERILISING ANNEXE

The sterilising equipment shown comprises bowl and instrument apparatus and boilers for sterile water and for normal saline solution. Some modern theatre units have the sterilising plant "built in," with the advantages of having no exposed pipes to collect dust and no metal which requires cleaning.

Sterile water and sterile normal saline solution are carried from the boilers in the sterilising annexe to foot-operated taps in the theatre.



AN ANÆSTHETIC ROOM OPENING INTO THE THEATRE

It should be noted that anæsthetic tables, stretcher trolleys, and operating tables need to be earthed to prevent accumulation of static electricity on their surfaces. This is a safety measure to prevent electrical sparks causing fire or explosion in an atmosphere containing inflammable gases. The "earth" is provided by metal chains which can be seen attached to the bottom shelf of the anæsthetic trolley and to the metal carriage of the stretcher trolley.

A GENERAL VIEW OF THE THEATRE

(1) Bowl and stand for lotion.

(2) The pedal-operated stand with reservoir for surgical spirit above a bowl which empties into a glass flask. This is an economical arrangement as the surplus spirit when the hands are rinsed is collected in the flask and can be re-distilled.

(3) A simple form of suction apparatus working from the steam-pressure system. This apparatus is shown in detail set up for use on page 8.

(4) Operating table. At the foot is an instrument table covered with the sterile sheet.

(5) Anæsthetist's stool.

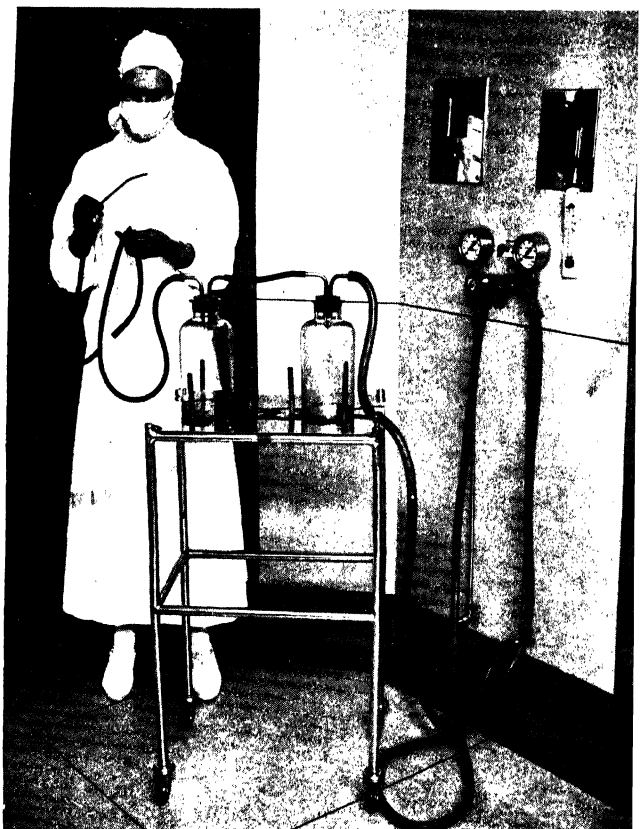
(6) Swab bucket.

(7) Second lotion stand.

(8) Ligature table.

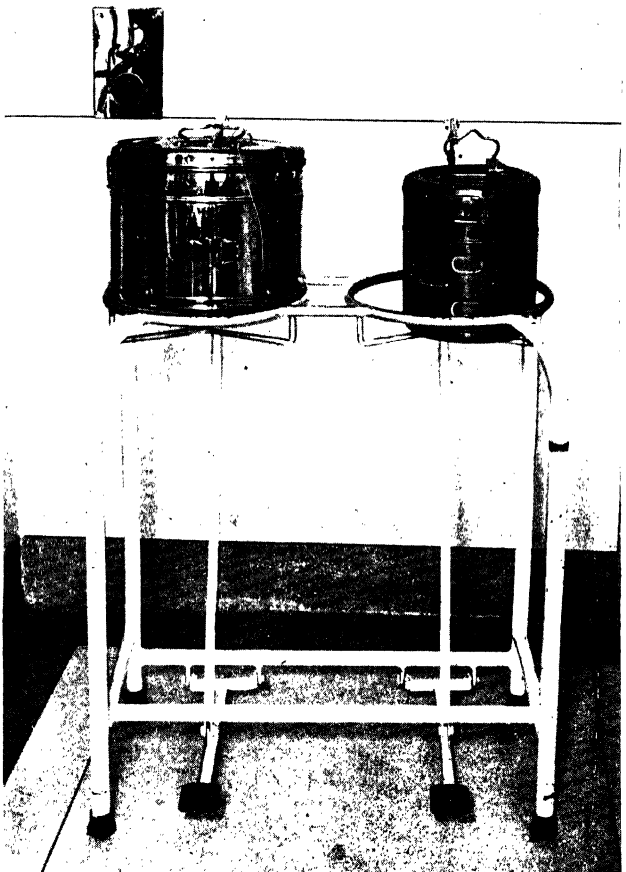
(9) Instrument table.

(10) Shadowless light.



THE SUCTION APPARATUS READY FOR USE

The nozzle and rubber tubing held by the nurse are sterilised by boiling and placed with the instruments. When the apparatus is needed the tubing is attached to the suction bottles which are not sterilised. In some theatres the suction apparatus is electrically driven.



A THEATRE DRUM STAND

Foot-operated attachments lift the lids of the drums.

CHAPTER II

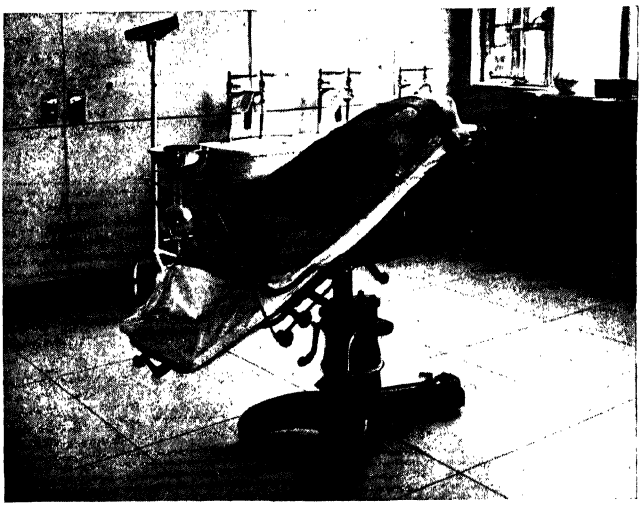
THE OPERATION TABLE

THE modern operation table with its fittings is designed to facilitate the positioning of the patient for a variety of operations. It is necessary for the theatre nurse to be quite familiar with the working of the particular table with which she is concerned, not only for the correct placing of the patient before the operation commences but so that she may be able to make any desired adjustments speedily and successfully during the progress of the operation. The careful positioning of the patient is not only desirable from the point of view of the surgeon's work but also in order to prevent any harm to the patient from pressure, particularly pressure on nerves.

The following series of pictures show the table adjusted for the positions found to be most convenient for operations on various parts of the body. The manœuvering of the table and the arrangement of the patient must be learnt by practical demonstration and by drill, but the photographs show the important points to be noted in the positions illustrated. The models in the pictures are undraped so that the essential features of each position may be clearly seen.

THE LAPAROTOMY POSITION

The patient is placed supine with the arms at the sides and the hands pronated with the thumbs underneath the body. The table is adjusted to a height convenient for the surgeon.



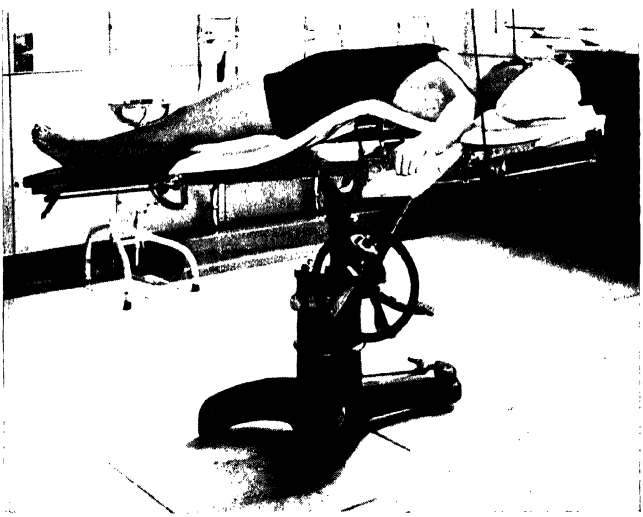
TRENDELENBERG POSITION FOR PELVIC OPERATIONS

The patient is placed supine so that the bend of the knees is exactly over the junction of the foot and central sections of the table. The foot of the table is lowered so that the patient's knees are flexed.

Shoulder rests are placed in position and these, in conjunction with the flexion of the knees, prevent the patient from slipping to the head of the table when the table is slanted. For further security a strap is fixed round the thighs. The padding of the shoulder rests must be thick and the rests placed near the root of the neck and not out at the points of the shoulders. If these precautions are neglected paralysis of the arms may result from pressure on the cords of the brachial plexus.

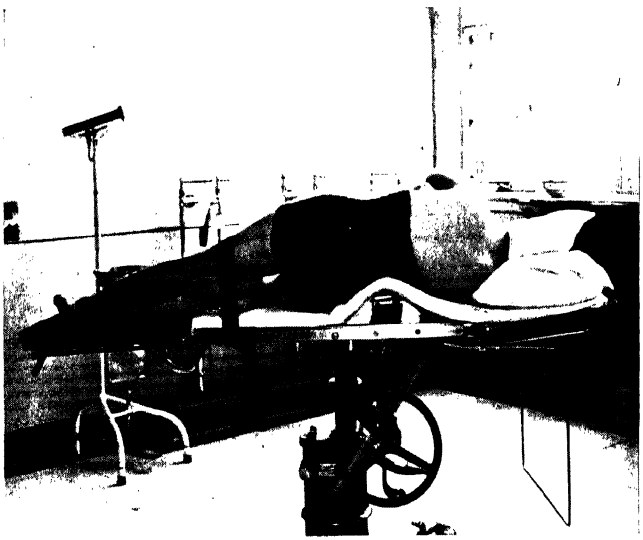
The object of the Trendelenberg position is to allow the intestines to fall away from the pelvic cavity towards the upper abdomen.

The screen frame attached to the head of the table should be noted. This will be covered with a sterile mackintosh and sheet screening the anæsthetist from the field of the operation. Some form of screen is commonly used for all operations except those on the head and neck.



THE "GALL-BLADDER" POSITION

The patient is supine with the arms extended on a padded support. The bridge of the table is raised under the lower ribs in order to push the liver and gall-bladder forward against the anterior abdominal wall.



THE "KIDNEY" POSITION

The patient is placed in the lateral position with the affected side uppermost. The underneath leg is fully flexed at the knee with the foot placed under the uppermost thigh. The legs are secured by a leather strap. Pads are used to prevent skin friction. The bridge of the table is raised to elevate the loin region between the lower ribs and the iliac crest. The uppermost arm is supported on a padded rest and the underneath arm is pulled a little away from the body and flexed at the elbow with the hand under the patient's face.

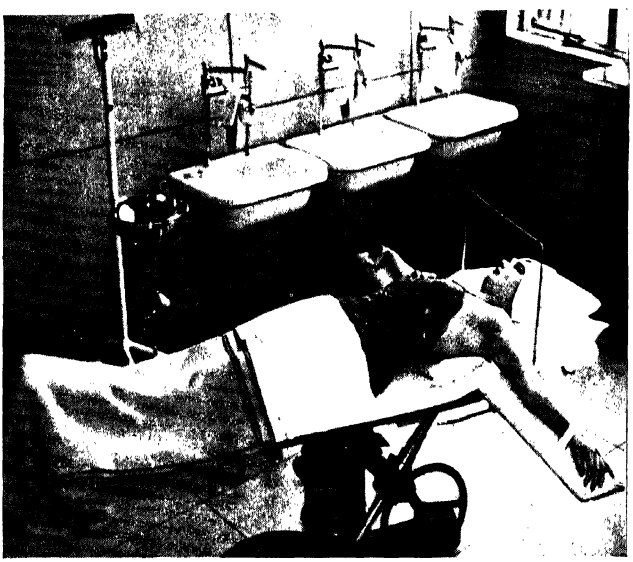
This position, but usually without the raised bridge, is used for rib resection, for draining an empyema and also for thoracoplasty.

THE LITHOTOMY POSITION

This position receives its name from the fact that it was used for one of the commonest operations of the past, lithotomy or cutting the bladder for the removal of stone. It is now used for operations on the perineum, anal region, external genital organs.

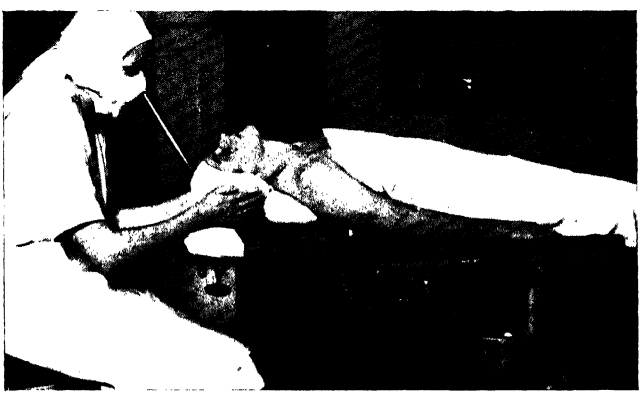
The patient is placed on the table so that the buttocks project well over the junction of the middle and lower sections of the table. The end of the table is then lowered to the vertical position. The patient's legs are raised and flexed at the hips and knees with the feet supported in the webbing slings of the crutches fixed to the sides of the table. Small pads are used to prevent pressure of the metal poles on the patient's thighs. The patient's hands are placed on her chest.

Many gynæcologists and urological surgeons now prefer a modified lithotomy position in which the thighs are less acutely flexed than those of the patient in the photograph, and the legs are supported by leg rests in place of the stirrups and poles.



THE POSITION FOR OPERATION ON THE BREAST AND AXILLA

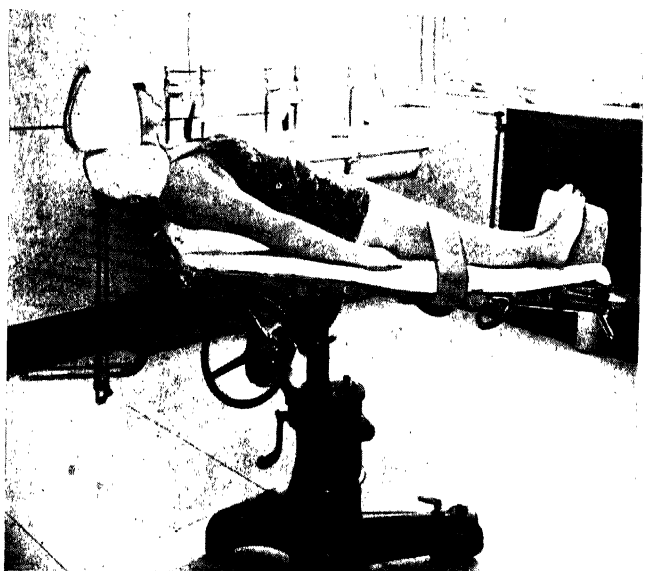
The patient is placed supine with the arms extended on a padded rest. A small pillow is placed under the chest and axilla on the affected side. An alternative position is to bring the arm away from the body by flexing it at the elbow and tying it by a clove hitch round the wrist above the patient's head to the stand of the instrument tray at the head of the table. The arm may also be held in this position by an assistant seated on a stool at the head of the table.



POSITION FOR OPERATIONS ON THE NECK

This is the position used for thyroidectomy and for trache otomy.

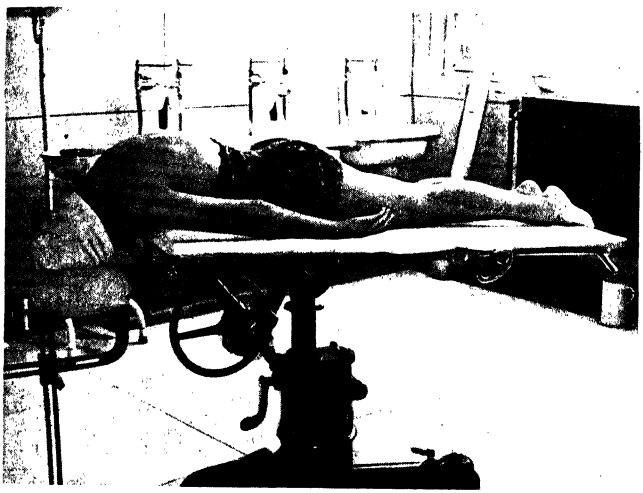
The patient is placed supine with one or two sandbags under the shoulders so that the head is hyper-extended. The anæsthetist steadies the patient's head.



POSITION FOR HEAD OPERATIONS

This position is used for craniotomy for decompression, ventriculography or for removal of a cerebral tumour.

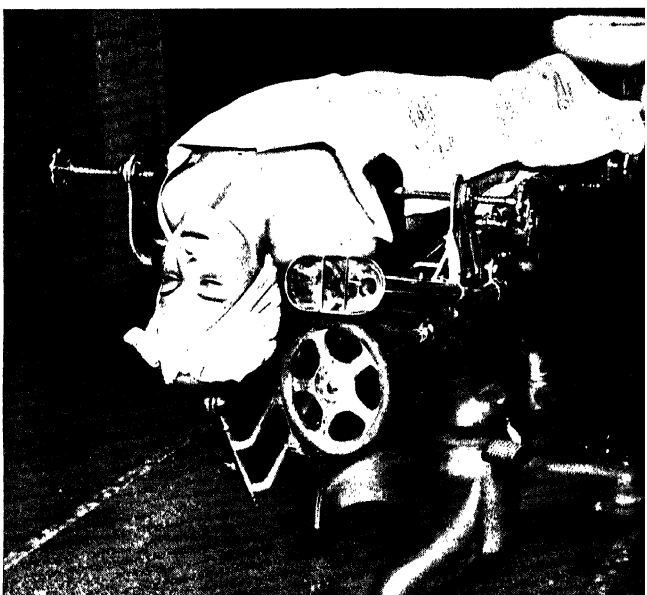
The patient is placed so that her head projects over the end of the table. A padded horse-shoe shaped rest is attached to the table and the patient's head is supported in this just below the occiput.



POSITION FOR CEREBELLAR OPERATIONS AND HIGH LAMINECTOMY

The patient lies in the prone position, and is moved up the table so that her head projects over the end and is supported by the forehead resting in the horse-shoe which is fixed about 6 inches below the level of the table top. A small pillow is placed under the upper part of the chest. The patient's arms lie at her side with the thumbs just under the thighs.

For operations on the spine below the mid-dorsal region the head support is not required. The patient lies prone with the feet just over the end of the table. The foot of the table may be dropped.



POSITION FOR BRONCHOSCOPY AND ŒSOPHAGOSCOPY

A special table may be used or an adjustable head rest clamped to the end of the ordinary theatre table, as shown in the picture. The patient's shoulders are brought to the upper edge of the table and her head supported in the rest. The wheel seen on the right-hand side alters the position of the rest so that the patient's head can be raised or lowered as desired. The triple sheath above the wheel holds the telescopes of the bronchoscope or œsophagoscope. The padded clamps just below the shoulders help to steady the patient.

CHAPTER III

THE THEATRE NURSE AND HER DUTIES

THE theatre nurse should aim at attaining such an efficient standard of aseptic technique and such a well-developed " surgical conscience " that she can be relied upon to carry out her work at all times, and particularly under conditions of emergency, with speed, accuracy, and calmness. Such a desirable standard is not obtained without a thorough knowledge of the principles of sterilisation and theatre technique. Every nurse working in the theatre needs to realise that the success of the surgeon's work depends largely on the reliable attention to detail shown by every member of the staff and the keenness, sharp observation, and dexterity which will make each member of the theatre personnel an efficient unit in the surgical team.

In the theatres nurses usually change into white, short-sleeved dresses of overall type, theatre caps covering the hair, masks, white shoes and stockings, before beginning the preparation of instruments, apparatus, and lotions for the day's operation lists. Ward nurses, students, and visitors in the theatre are required to cover their ordinary clothing with clean gowns, to wear caps and masks, and to put on white rubber or canvas boots over their shoes.

Duties during operations. The sister or nurse who is to act as the " instrument nurse " scrubs up, covers her theatre dress with a sterilised gown, and puts on sterilised rubber gloves. The correct method of putting on gloves without touching the outside of the gloves with the bare hand is shown on pages 25, 26 and 27.

The instrument nurse checks and arranges the instruments on the instrument table and hands them to the surgeon, as far as possible anticipating his wants. She also prepares ligatures and sutures, having them ready for the different stages of the operation. She hands mops and gauze pads to the surgeon and his assistant

and is responsible for accounting for all swabs and instruments, including needles, at any stage of the operation and in particular before any cavity is closed. During all bone operations, and for some surgeons during any type of operation, all instruments and swabs must be handled with forceps, as also are all ligatures and sutures, so that no sterile material coming in contact with the wound is touched by the gloved hand.

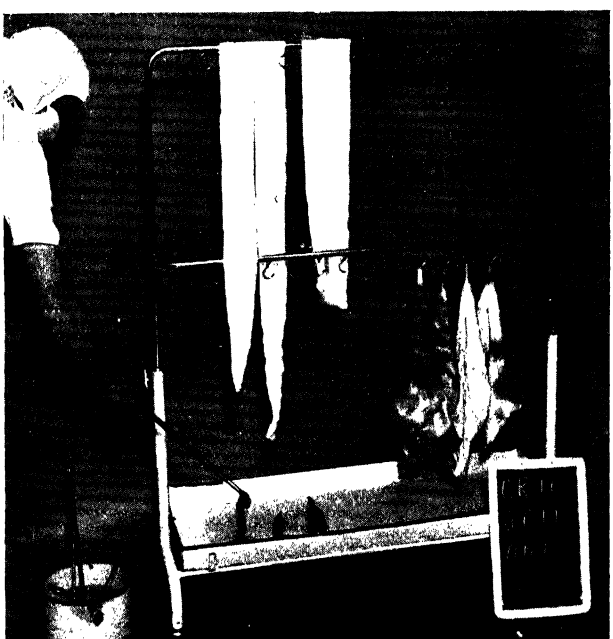
One or, if possible, two nurses who will not scrub up will act as runners. One of these should watch the instrument nurse and be ready to bring anything that she may require or to put any extra instruments in the steriliser as directed. It will be one of her duties to keep the sterilisers filled and boiling and to see that the instruments are ready for the next case. She assists in placing the patient on the theatre table if a theatre porter is not available.

The second runner hands gowns, caps, and gloves to the surgeon and assistants, removing these articles from the drums with long-handled forceps. She also ties the gowns. She puts out the lotions in the lotion bowls and changes them as necessary. For most operations hot sterile normal saline solution is required. She replenishes the mops and pads as they are used, is responsible for checking the used swabs and displaying them on the counting stand. When the other runner is in the sterilising room she must watch the instrument nurse and be ready to attend to any needs. At no time during the operation should the theatre be left without one runner.

The ward nurse in charge of the patient should see that all records such as notes and X-ray films are brought to the theatre with the patient, and she should be able to answer questions concerning the preparation of the patient, *e.g.* when the pre-medication was given or when the patient had his last feed. She remains with her patient in the anæsthetic room and when the anæsthetist is ready accompanies him into the theatre. She will assist with the placing of the patient on the table and removes his gown and the bandages. When the surgeon is ready to begin she will remove the sterile towel or dressings covering the operation area and hand the tray

with the skin paint. She should see that a warm gown and blanket are ready to cover the patient when he returns to the ward and is responsible for taking any instructions regarding the care of the patient from the surgeon or anæsthetist.

Most theatres keep a daily register of operations in which the nature of the operation, its duration, and the anæsthetic used are entered up for each case. The book is usually signed by the instrument nurse and by the anæsthetist.



THE SWAB-COUNTING STAND

Used for displaying used swabs, saline pads, and gauze rolls so that they can be quickly checked.

The " instrument nurse " putting on a sterilised gown over her theatre dress; the gown is tied by the " runner."

The sterile packet containing gloves and a packet of French chalk.

One glove has been put on with the cuff still turned back. The nurse is now putting on the second glove with the gloved hand touching only the outside of the second glove.

Completing the process by pulling the cuffs of the gloves over the sleeves of the sterile gown.

PREPARATION OF DRESSINGS

The making of swabs, pads, and various types of dressings is a part of the work of the theatre staff. The sizes used by surgeons in different hospitals vary to some extent. Gauze is the material most frequently used. Small mops may be made up into packets of ten and lightly stitched together, this is to make the counting easier. The bundles should be checked by a second person before they are packed for sterilising. Large pads, sometimes known as "saline pads," are made of thirty-two thicknesses of gauze about 9 inches by 14 inches. These are stitched with a sewing machine so that there are no loose threads, a tape is attached and a small lead weight is sewn into one corner. The lead is inserted in order to show clearly in an X-ray film should there be any doubt afterwards about a swab being left in the abdomen or other cavity.

Loose mops can be used for superficial operations where there is no chance of a swab being overlooked.

Gauze rolls 3 yards long and 3 inches wide, made by folding a 9-inch roll into three, are used for packing off a part of a cavity, *e.g.* during a gall-bladder operation, or partial gastrectomy, and may also be used for dressings, as, for example, on an amputation stump.

One-inch ribbon gauze is very often used for small mops for operations on the lung, in neuro-surgery, and for thyroid operations.

Small wool balls or "patties" are useful in neuro-surgery. These have a black silk thread attached. They are made from a small thin square of wool (about 1 inch) which is moistened, folded into three, and stitched with black thread. They are made up in bundles of ten and when autoclaved in the drums become fluffy.

Lintine is a wood-pulp dressing which can be cut into strips which are soft and have no loose threads. This is a useful mopping material particularly in small cavities.

Wool rolls, cellulose, and gamgee may all be used for dressings. These are prepared in the usual way, although theatre dressings are commonly larger than those used in the wards. Roller bandages in varying widths from

1 to 6 inches are sterilised. Special bandages are usually provided by the ward.

Eye Dressings. The eye drum is packed with small mops of best quality gauze, eye pads of gamgee or best quality cotton wool, selvedge-edged 2-inch bandages and "Moorfields" eye bandages. The latter are made from a piece of cotton material, preferably a fine quality such as madapolam, 6 inches long and 2 inches wide, with a small notch cut in the lower border to accommodate the nose. A tape about 4 inches long is sewn on each of the four corners. At each side the ends of the two tapes are sewn together and at the join a single tape is attached which is long enough to pass round the back of the head and round to the front again where the two tapes are tied in a bow.

Oiled silk is used in certain dressings, *e.g.* colostomy. This is not autoclaved but is boiled for five minutes before use and dried with a sterile towel.

PREPARATION OF LIGATURES AND SUTURES

Material used for surgical ligatures and sutures can be divided into two main groups, absorbent and non-absorbent. The absorbent materials are catgut, kangaroo tendon, and this group also includes "living sutures" made from tendon or fascia. Non-absorbent materials are silk-worm gut, horsehair, thread, silk, and metal such as silver, aluminium, and stainless steel wire and metal skin clips.

Catgut. Catgut is made from the sub-mucous coat of sheep's intestine. Very thorough cleansing is needed before the material is ready for sterilisation, and as the sterilisation process is a long and somewhat complicated one it is usual to buy the prepared sterilised catgut in sealed glass tubes. Very stringent supervision of its preparation in all stages is observed by the manufacturers and the production of catgut for surgical use is controlled by the Therapeutic Substances Act. Some hospitals still sterilise their own catgut, purchasing it as "raw catgut," which is the form of twisted strands of gut which have been subjected to a succession of cleansing

baths. The iodine process is the one usually employed in hospitals; details of this method and the solutions used will be found in the section on sterilisation.

The sterilisation of the outside of the tubes depends on the type of fluid inside the tube. Tubes containing catgut in pure alcohol may be boiled, tubes containing a mixture of alcohol and water are sterilised by immersion in cold antiseptic such as lysol. The catgut also varies in its rate of absorption, depending on its preparation and also on the type of tissue in which it is embedded. Plain catgut is absorbed on an average in ten days, chromicised catgut may take twenty, thirty, or forty days. The type most commonly used is the " 20-day " catgut.

Sizes. From oooooo (very fine) to 6 can be obtained, but it is unusual for finer than ooo or coarser than size 4 to be needed. oo is the usual size for ligatures, size 1, 2, or 3 for tying stouter ligatures such as kidney pedicles or in gynæcological surgery. For suturing stomach and intestine oo and o are used, and for the peritoneum and for muscle sizes 1 and 2. Fine catgut oo is also occasionally used for sub-cuticular sutures and for plastic skin sutures.

Kangaroo tendon. This is obtained from the tail tendons of the animal and is bought ready for use in tubes. It is a very strong material, and although not in common use it is sometimes required in orthopædic surgery.

Living sutures are most often used in hernioplasty and are obtained from the patient's own tissues, either tendon from the plantaris muscle in the leg or fascia strips from the fascia lata of the thigh.

Silk-worm gut is obtained from the silk glands of the silkworm. The material is drawn out into threads measuring about 12 inches in length and is made in four thicknesses: fine, medium, strong, and extra strong. It is often dyed pink or bright purple. The strands are kept together by putting them through a piece of tubing or a metal holder. Silkworm gut can be boiled, but repeated boiling is not advisable. It is used entirely for skin sutures and is preferable to thread as it is non-permeable. Recently synthetic silkworm gut made from

nylon thread has been put on the market. It is sterilised in the same way, but should not be stored in coal tar disinfectants.

Horsehair. The long tail hairs are used for skin sutures, especially for the face and head, as the stitches leave little scar.

Thread. Linen thread is a very useful material. It is bought in reels of various size threads, the ones most often used being 90, 60, 35, and 25. It is wound on metal reels and boiled for thirty minutes for the first boiling and subsequently for five minutes with the instruments. It is used for ligatures in place of catgut, and some surgeons use linen thread for intestinal and muscle sutures instead of catgut.

Silk thread in sizes from 000 to 6 is used for many purposes. It can be sterilised in the same way as thread, but a convenient method for preparing a number of fine silk sutures, as for example in the requirements of neuro-surgery, is to thread the needles with appropriate lengths of silk in the different sizes and to darn these on to gauze pads which are sterilised by autoclaving.

" Serum proof " silk is also used in neuro-surgery and may be prepared by waxing the silk thread with Horsley's wax or may be bought ready prepared by the manufacturers. It may be prepared in the theatre by winding the silk on metal winders, placing in a container with melted wax, removing the silk when saturated and drying it on a sterile towel. The needles are then threaded, as described above, on to gauze pads which are placed in a drum and autoclaved. Black silk is used for the waxed and ordinary sutures in neuro-surgery.

Ophthalmic silk sutures are very fine, sizes 00, 0, and 1 are needed for most purposes. Either white or black sutures are used.

Floss silk purchased ready for use in glass tubes has a particular use in hernioplasty in place of living sutures. The tubes are sterilised by boiling.

Metal. Ligatures of flattened silver wire are used for neuro-surgery and also in lung surgery for clipping

blood vessels. They are known as "Cushing's clips." The short lengths of wire are cut into a "V" shape by special clippers and placed on a rest from which they are removed by special forceps and handed in the forceps to the surgeon. The wire, the rest, and the forceps are boiled with the other instruments for the operation. Metal skin clips, such as Michel's and Kifa's, are used where healing of the skin is rapid, *e.g.* in the neck and in conjunction with tension sutures for closing an abdominal incision. Metal clips are sterilised by boiling with the instruments.

Wire. Silver or stainless steel is sterilised by boiling with the instruments and is used for wiring the patella and the olecranon processes in the open reduction of fractures. Fine wire is used for threading aural, nasal, and tonsil snares.

INSTRUMENTS

The care and cleaning of instruments is an important duty. After operations all instruments should be thoroughly scrubbed with a stiff brush under running cold water and then boiled for five minutes. In special cases where contamination with resistant organisms such as anthrax, actinomycosis, or B. Welchii is present, at least one hour's boiling is needed. The instruments are taken from the steriliser and may be dried at once while still hot, but usually if a large number of instruments has been used it is better to place them in a special spirit soap solution, from which they are taken one at a time and polished with a dry cloth. They should be examined, oiled if necessary with a fine machine oil, and put aside for repair if need be.

Sharp instruments must be handled with the greatest care, particularly delicate knives such as cataract knives. Scalpels and blades of the Bard-Parker type are put aside for re-sharpening. Scissors need only occasional sharpening if they are of good quality. Needles after use are washed, boiled and then cleaned with cleansing powder or soap. Syringes, record syringes, or other glass and metal types are taken apart and boiled, but it is important to see that the barrels and plungers are not exchanged,

as this is a common cause of an ill-fitting piston. All glass ware should be boiled separately, as the risk of breakage is increased if it is put in a steriliser with heavy metal instruments.

Special instruments. Cystoscopes: these are washed under cold water, boilable parts are boiled and non-boilable parts placed in disinfectant solution (*e.g.* 1–25 carbolic for five minutes). The parts are dried and rinsed through with spirit to dry the interior of the apparatus. A pipe-cleaner is useful for drying the tube. When the instrument is re-assembled the valves, light, and leads should be tested before it is put away. Bronchoscopes, œsophagascopes, and laryngoscopes are all treated in the same way. These instruments may be stored in a formalin box and after twenty-four hours are considered to be sterilised.

RUBBER AND GUM-ELASTIC ARTICLES

Drainage tubes. Most theatres keep a stock of drainage tubing of various sizes stored in a disinfectant solution, such as chloro-cresol, ready for use if asked for unexpectedly. If a special drain such as a Marion's tube for draining the bladder through a supra-pubic cystotomy or a Tudor Edward's empyema drainage tube is likely to be needed, it should be boiled with the instruments and kept on the ligature trolley. Most theatres also keep a small quantity of corrugated rubber drains and Dakin's tubes ready. Dunhill's rubber tubing which is a very thin-walled variety is liable to become too soft if stored in lotion and should only be boiled as wanted. The same applies to the thin rubber tubing attached to Paul's glass tube for draining a colostomy.

Rubber gloves. Gloves when removed from the hands are put into cold water until they can be washed. The used gloves at the end of an operation list are washed in warm soapy water and should be examined to see that all blood stains are removed. They are then wrapped in a piece of old linen, weighted, and boiled in plain water for five minutes. They should then be hung

up and turned later, leaving them until both sides are dry. Finally they are tested. If holes are found they are patched and left for twenty-four hours then re-tested. If whole they are grouped in sizes and put away. In view of the present shortage of rubber many gloves have to be used in a patched condition in the theatre which would have been discarded in pre-war days. Unpatched gloves should be reserved for the surgeon, assistants and instrument nurses wearing the patched ones. The patches should all be on the inner surface of the glove. Gloves patched on the index finger are not suitable for theatre use either for the surgeon's assistant or for the instrument nurse who has to thread needles.

Other rubber articles are washed after use and boiled. It is important to remember that unless blood stains are removed before boiling they will " set " in the process. Rubber tubing, especially suction tubing, needs special attention. The lumen of the tube is best flushed by attaching the tubing to a pressure nozzle or tap and forcing cold water through it. Rolling the tube under the hand on a board so that both sides are rubbed together will dislodge adherent particles. Following this the tubing is well washed in warm soapy water, rinsed, boiled, and hung up to dry. Rubber catheters are cleaned in the same way.

Gum elastic and French silk catheters need careful handling as the varnish is easily damaged. They will, however, require thorough cleaning after use. After washing and rinsing these catheters may be boiled for two minutes wrapped in a piece of old linen and tied with a piece of tape for removing the bundle from the steriliser. Fine ureteric catheters are very difficult to clean. They should be washed and syringed through with cold water, using a record syringe and a fine needle. They are then washed in warm soapy water, rinsed with phenyl mercuric acetate 1–10,000, and hung up to dry. They may be stored in formalin and stilettes are sometimes used if they are to be put away in order to keep them straight and avoid cracking.

CHAPTER IV

STERILISATION

THERE are two main methods of sterilisation, by heat and by chemicals. Whenever possible heat is used.

The war has necessitated revision of methods of sterilisation because of the scarcity of certain chemical and materials and the need for economy in the use of fuel. Recent work has produced chemicals more effective and less injurious than many previously used and careful tests have established the minimum times of boiling and autoclaving for effective sterilisation. The great diversity of methods hitherto used arose from a lack of knowledge of their efficiency. The recommendations that follow are based on bacteriological tests.

STERILISATION BY HEAT

A. Autoclaving.
B. Boiling.
C. Dry heat.

A. Autoclaving. This is mainly used for the sterilisation of fabrics, *e.g.* clothing, towels, dressings which are not injured by heat or moisture but must be used in the dry state. Autoclaving at a pressure of pure steam of 15 lb. per square inch for twenty minutes is the most efficient method of sterilisation and should be used whenever the material to be treated will stand this treatment. Rubber goods are damaged at this pressure and are therefore treated at lower pressures. This method is only reliable if the autoclave is correctly adjusted and the materials so packed that all parts are accessible to the steam. The operation of the autoclave is a serious responsibility and should only be entrusted to one who understands its working.

B. Boiling. Although there are resistant spores that will withstand long periods of boiling, all pathogenic organisms and most spores are killed with five minutes boiling in water. If the water is made alkaline its lethal effect is increased. Sodium bicarbonate is therefore

added to the water to produce a 2 per cent. solution. The alkali also retards rusting and reduces the blunting of sharp instruments during boiling. The following points should be observed :

(1) The water must be boiling for the full five minutes. The addition of a large number of cold metal instruments to the water takes it off the boil. The water must be boiling again before the five minutes' timing is begun.
(2) All instruments in the steriliser must be completely immersed in the water.
(3) After use all instruments must be boiled for five minutes and carefully cleaned before being put away.
(4) Instruments when not in use must be stored in a dust-free and dust-proof instrument cupboard.
(5) The material to be sterilised must be either a good conductor of heat, such as metal, or so constructed that all surfaces are easily reached by the boiling water. Material such as thread wound on reels requires a longer period of boiling because the heat does not penetrate at once to the inner layers.

Five minutes is recommended as the standard time for boiling to allow a large margin for safety. Two minutes boiling under the conditions specified allows an adequate margin of safety and is recommended for some articles, *e.g.* gum-elastic material, that are more readily damaged by heat.

N.B. In cases where contamination with spore-forming organisms, such as anthrax or tetanus, is known or suspected, all instruments and other articles that have been used should be subjected to boiling for one hour. This process may be repeated after an interval for cooling during which the surviving spores revert to the vegetative form and are then killed during the second period of boiling.

C. Dry heat. This is used where moist heat would be detrimental to the material, *e.g.* French chalk used for powdering gloves. Such substances are spread in thin layers not more than one-eighth inch thick and baked in an oven at 150° C. (300° F.) for one hour.

STERILISATION BY CHEMICALS

These methods must only be used for the sterilisation of clean surfaces. Sterilisation by chemicals is effective if, and only if, the material to be sterilised is thoroughly cleaned and free of debris, blood and pus. The presence of organic matter greatly diminishes the efficiency of the chemical and in some instances may inhibit its action altogether. Penetration of the chemical into the joints of scissors, artery forceps, etc., may be slow and the short immersion will only be effective if the chemical has rapid access to all surfaces. Whenever possible instruments should be taken to pieces for chemical sterilisation. With these precautions sterilisation can be achieved by ten minutes' immersion in the following solutions:

Lysol 1 in 30 solution. * Phenol (carbolic acid) 1–25 solution. Both of these are caustic and can injure skin or mucous membranes even in dilute solutions. Careful rinsing in sterile water is necessary before the instruments are used.

Chloroxylenol 1 in 30 solution. Dettol 1 in 30 solution These substances are not caustic and are suitable for sterilising instruments such as anæsthetic masks that may come in contact with the skin.

*** Phenylmercuricacetate or nitrate 1 in 10,000 solution.** This agent is non-corrosive and is particularly useful for the sterilisation of delicate electric and optical apparatus.

Methylated spirit is not an efficient antiseptic and should not be used for sterilisation.

Formalin vapour. For certain delicate instruments and materials exposure to formalin vapour in a special airtight box is an alternative to immersion in antiseptics. This method is effective only if the instruments are clean and dry. Particular care is needed in the cleaning of the interior of tubular instruments. The instruments should be shut up in the formalin box for

* Supplies of these are short and they can only be used sparingly at present.

twenty-four hours and should be rinsed in sterile water before use.

Storage in chemicals. A solution of 1 in 500 chlorocresol is useful as a storage agent for maintaining the sterility of instruments once they have been sterilised by one of the above methods. The addition of borax to the solution retards rusting. Liquor boracis et formaldehydi of the National War Formulary 1941 is another solution which may be used for this purpose.

APPLICATION OF METHODS

Anæsthetic apparatus. Masks and airways after careful washing in soap and water should be immersed in chloroxylenol 1 in 30 for ten minutes. They should then be taken out, rinsed in sterile water and dried. They must not be stored in the solution. Rubber tubes for intubation are sterilised as catheters.

Bougies and catheters. For sterilisation of those made of rubber see under rubber goods.

Metal instruments can be boiled.

Gum elastic instruments can be boiled but are damaged by prolonged exposure to boiling water. If this method is used two minutes' boiling is adequate. Sterilisation by formalin vapour may be used and special formalin boxes with trays are made for this purpose.

Endoscopes. The construction of these instruments varies, but they are usually electrically lit and have a telescope either separate or incorporated in the instrument. Some of these instruments are boilable and for these boiling is the best method. Others, however, are damaged by boiling, and for these sterilisation by chemicals is necessary. Phenylmercuric acetate or nitrate are the most suitable of the solutions mentioned for this purpose. Many of these instruments have a metal sheath from which the lighting system and telescope can be detached, *e.g.* bronchoscopes, œsophagoscopes and sigmoidoscopes. The metal sheath of such instruments should be sterilised by boiling. It is not possible to lay down rules for the sterilisation of these instruments, but the makers usually specify which parts

cannot be boiled. Those which are made to withstand boiling of all parts usually have to be started from cold and may be damaged if plunged straight into boiling water. Sudden cooling with cold water may also damage optical instruments and must be avoided.

Electric apparatus. Apart from endoscopes other electric instruments require careful sterilisation. Many leads are now made boilable, but they should be boiled for two minutes only in water to which no soda has been added. Diathermy electrodes are not usually boilable and can be sterilised in phenylmercuric nitrate or formalin vapour. For non-boilable leads formalin vapour is most suitable.

Enamel ware. Five minutes' boiling.

Glassware. Most glass articles can be boiled but must be started from cold and left in the water five minutes after it boils. Glass is likely to break if plunged straight into boiling water. It will also break if suddenly cooled by plunging while still hot into cold water.

Gloves. These are packed with French chalk in individual packets in a drum for autoclaving at a pressure of 10 lb. per square inch pure steam for fifteen minutes.

Metal instruments, including scissors. Five minutes' boiling.

Linen. Packed in drums and autoclaved. Packing must be loose enough to ensure thorough penetration by the steam and the drum vents must be open. After autoclaving for twenty minutes at 15 lb. pressure the vents are shut. Once a month drum tests are made to ensure that sterilisation is efficient. These are done by inserting into a test drum a sealed envelope containing a spore suspension which is sent unopened to the laboratory for test.

Caps, veils, and masks are boiled after use and those required sterile are autoclaved after drying.

Lotions, sterile water, saline solution.

(*a*) Boil directly for thirty minutes.

(*b*) Using a water bath raise the temperature of the lotion (not merely that of the bath) to 100° C. and maintain for thirty minutes.

Saline and glucose-saline solutions for intravenous infusion are usually sterilised by autoclaving.

N.B. Unless very special precautions are taken any bottle of sterile water or sterile saline solution should be regarded as contaminated after it has once been opened. The contents of the bottles should not be used for rinsing instruments removed from antiseptics, or for washing instruments during operations, unless the seal of the stopper is unbroken. Once the stopper has been removed and the contents exposed to the air the label "sterile" on the bottle means nothing.

Nail brushes. Boil for five minutes. When sterile they may be stored in chlorocresol 1 in 500.

Needles. Boil for five minutes. When sterile may be stored in chlorocresol and borax solution, or the formaldehyde and borax solution of the National War Formulary.

Ophthalmic instruments. Those which are boilable are boiled for five minutes in distilled water.

Rubber goods (tubing, catheters, tracheal tubes, drains). Boil for five minutes. Care should be taken to keep the material immersed during boiling and to expel air bubbles first. It is often necessary to weight rubber articles to keep them immersed.

Jaconet and batiste sheeting are usually sterilised by autoclaving in drums with the towels.

Scalpels and knives. Immerse in 1 in 30 lysol for ten minutes. Store when sterile as recommended for needles.

Sulphanilamide powder. Recommended methods of sterilisation are :

(*a*) Exposure to dry heat in an oven for one hour at 150° C.

(*b*) Autoclaving in a dressing steriliser at 15 lb. pressure for thirty minutes.

The powder may be conveniently sterilised in test tubes containing 5 or 10 grammes each. Drying the powder by slowly heating it to a temperature of 80° C. before sterilising in the oven is recommended to prevent caking during the process. If an autoclave is used the tubes should first be heated in the autoclave chamber to prevent condensation on the inside of the test tubes, and when sterilisation is complete the steam should be

quickly cleared from the chamber by the vacuum drying attachment.

A sterilised sulphanilamide powder to which 5 per cent. zinc oxide is added to prevent caking is now obtainable.

Suture materials :

A. Linen thread and silk. After winding on reels, boil for a preliminary period of thirty minutes before passing into general theatre use. When required, re-boil for five minutes.

B. Silkworm gut and horsehair. To prepare a fresh batch boil for thirty minutes. Store in chlorocresol 1–500 solution. After an operation, boil for five minutes before replacing in storage solution.

C. Catgut. Non-boilable tubes, wash the outside of the tubes and immerse in lysol 1 in 30 solution. Boilable tubes, boil for five minutes.

Unsterile formalin catgut. This is difficult to sterilise and the procedure recommended takes ten days. Iodine preparations are used, and the sterilisation is carried out in glass jars with airtight lids.

Stage 1. Immerse in solution A for nine days :

Iodine	1 per cent.
Potassium iodide ..	2 ,,
Potassium iodate ..	0·25 ,,
Glycerol	5 ,,
Distilled water to ..	100 ,,

Stage 2. Immerse in solution B for one day :

Glycerol	2 per cent.
Alcohol	70 ,,

Stage 3. Store in solution C :

Glycerol	2 per cent.
Alcohol	70 ,,

STERILISATION OF HANDS OF THEATRE PERSONNEL

While it has been abundantly proved that hands cannot be rendered sterile by scrubbing with soap and water it is equally true that before operations all dirt must be removed, since this is a potent source of extraneous infection. Dirt is found on the surface of the hands and forearms, ingrained in the creases of the skin, beneath the nail folds, and around the bases of the nails.

Some preliminary rules must be observed:

(1) During the period of theatre work the hands should not be allowed to come in contact with pus or infected dressings; forceps should be used on all occasions.

(2) Avoid injury to the hands as far as possible.

(3) Always keep the hands as clean as possible; manicuring should be done regularly and carefully and the nails kept short so that dirt cannot gather beneath them.

Before scrubbing up, the hands should be washed with soap and water for one minute to remove the superficial dirt. The cap and mask provided are then put on. The hands are then prepared by scrubbing with soap and water, using a sterilised nail brush and running water for five minutes by the clock. During this period careful attention should be paid to the method of scrubbing. The fingers and hands should be extended to open the creases of the skin, care should be taken not to neglect the webs of the fingers, the ball of the thumb and the nail folds, places often inadequately cleaned. This scrubbing extends up to the elbows. Five minutes intelligent scrubbing of this nature is much more effective than longer periods of purposeless scrubbing. After five minutes dry the hands and arms on a sterile towel or by washing in spirit. The sterilised gown and gloves are then donned.

Care must be taken by those who have to scrub up frequently that the hands do not become raw, since then bacteria deep in the skin come to surface and are difficult to remove owing to the soreness of the skin. Precautions to be taken include the use of good nail brushes which though firm are not too hard, and the use of a hand cream for the care of sensitive skins.

Up to the present no satisfactory chemical for use on the hands has been found which is an effective disinfectant and at the same time does not harm the skin after repeated use. Efforts are now being made in this direction and suitable chemicals may be available in the near future. One substance now on trial is cetyltrimethyl ammonium bromide, known as "C.T.A.B." or Cetavlon.

CHAPTER V

ANÆSTHETICS

THE field of anæsthetics in modern surgery is a very wide one. Many new anæsthetics have come into use during recent years, and the methods of inducing anæsthesia can be divided into three main groups:

(1) General anæsthesia induced by inhalation. The drugs used in this group are either gases or volatile liquids which vaporise readily at room temperature, *e.g.* nitrous oxide, cyclopropane, chloroform, ether, trichlorethylene, and ethyl chloride.

(2) General anæsthesia induced by the rectal or intravenous administration of drugs in solution. Paraldehyde and bromethol ("avertin") are examples of drugs given by rectal injection. Soluble hexobarbitone, also known as "Evipan sodium," and pentothal are given by intravenous injection, although hexobarbitone can also be given rectally. These drugs may be used as basal anæsthetics, the anæsthesia being carried on by inhalation anæsthetics after the patient is unconscious, or may be used alone for short operations. Pentothal is sometimes used for longer procedures when it may be administered intermittently or by the drip method throughout the operation.

(3) Local or regional anæsthesia induced by the surface application or injection of cocaine, or similar synthetic preparations such as stovaine, novocain, amethocaine, and nupercaine.

The choice of anæsthetic and the proper preparation of the patient are important steps in the successful conduct of the operation and the prevention of avoidable disasters. The preparation of the patient is primarily the responsibility of the ward staff, but close liaison between the theatre and the ward is essential.

The theatre nurse will see that the necessary instruments are set out on the anæsthetic table and any special apparatus for the particular operations, for example, in lung operations suction apparatus will have to be prepared for the anæsthetist's use. The hypodermic tray and the cardiac emergency set must be ready for instant use before the operation begins. Most theatres keep a tracheotomy set sterilised in case of need. The stock bottles of ether, trichlorethylene, or whatever anæsthetic is to be used, will be placed on the anæsthetic trolley, the anæsthetist being responsible for filling the bottles which he is going to use. It is also usually his responsibility to see that the cylinders of nitrous oxide, oxygen, and carbon dioxide are ready for use. The theatre nurse should see that a reserve supply of full cylinders is at hand and that empty cylinders are removed as soon as they are discarded so that no confusion between full and empty cylinders may arise.

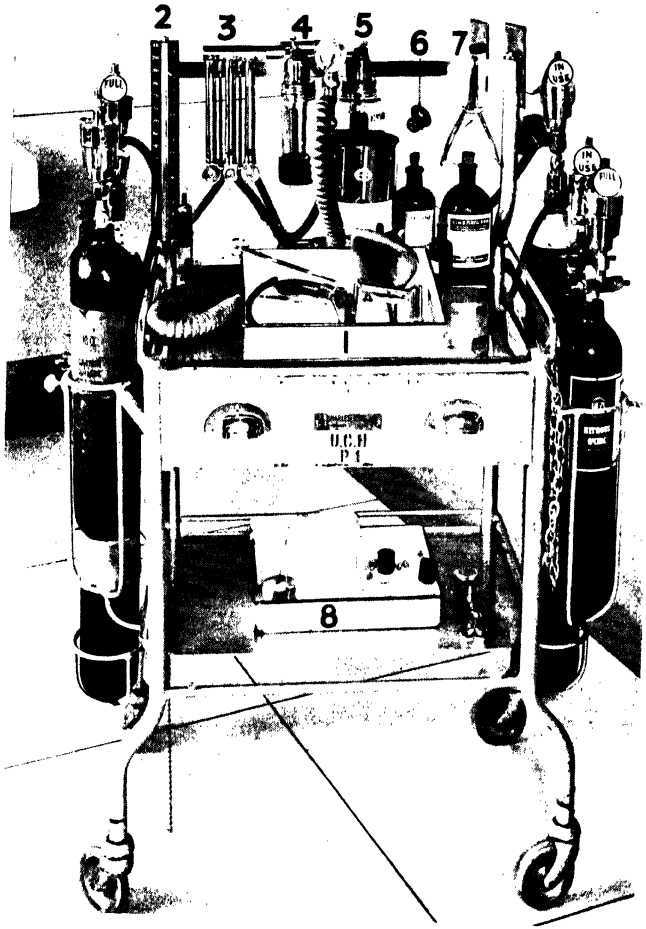
Collapse of the patient on the theatre table. This is a catastrophe which must always be anticipated, and the patient's life will depend on prompt action by everyone in the theatre from the surgeon to the junior nurse. A scheme of procedure to be adopted from the time when the warning is given by the anæsthetist should be known to the smallest detail and practised from time to time by the theatre staff. The following description gives the outline of such a scheme. The anæsthetist having given the warning tilts the table to lower the patient's head and sees that the airway is clear. The surgeon's assistant starts artificial respiration. The instrument nurse takes the place of the assistant and helps the surgeon attend to the operation. The nurse acting as runner brings the cardiac emergency box. This contains a 2 c.cs. syringe and a long fine exploring needle, $3\frac{5}{8}$ inches long and 21 bore, which is always kept ready for use. The syringe is charged with 1 c.c. of 1–1,000 adrenalin solution for injection into the cardiac muscle.

The second runner or the ward nurse helps the anæsthetist, applies hot saline packs to the patient's precordial area, or may be required to assist with artificial respiration. The instrument nurse will prepare the skin of the abdomen and lower chest and have the necessary instru-

ments ready for the surgeon to open the abdomen in the mid-line or enlarge the existing incision to reach the diaphragm through which he can massage the heart. The anæsthetist may keep a note of the time, minute by minute, from the moment of sounding the warning or may detail this duty to the nurse assisting him. His hypodermic outfit with a supply of nekethamide or other stimulant and amyl nitrite capsules is always in readiness on the anæsthetic trolley.

THE "GAS-OXYGEN" MACHINE

The apparatus shown in the picture is sometimes called a Boyle's machine but is more correctly a continuous flow, or flowmeter, gas-oxygen machine. Several modifications are met with, but they all have two gas (nitrous oxide) and two oxygen cylinders and one carbon dioxide cylinder. The extra gas and oxygen cylinders are reserves. Oxygen cylinders are black with a white top, nitrous oxide are all black, and carbon dioxide green with a black base. As very high pressures are used to fill these cylinders a regulator or reducing valve is firmly screwed into each one in order to make the delivery easily controllable. These valves are plainly marked and are not interchangeable. The rubber tubing connecting to the machine should be red or white for oxygen, black for nitrous oxide, and green for carbon dioxide. The flowmeters are accurately made glass tubes each containing a small float which rises as the volume of gas flowing increases. The graduations are fractions of a litre per minute. The oxygen flowmeter is always on the left, the nitrous oxide on the right, and the carbon dioxide in the middle. The measured gases pass into the common tube at the top of the flowmeters, from where they are directed by means of the stopcock either (*a*) straight to the patient, (*b*) into the bottle which contains chloroform or trichlorethylene (shown in this picture numbered 4), or to the large bottle holding ether (which is numbered 5). Trichlorethylene, which is coloured blue, is also known by the proprietary name of "Trilene." The ether bottle is surrounded by a metal jacket which contains warm water. The further



THE GAS-OXYGEN MACHINE

path of the mixture is to the gas bag, wide-bore corrugated rubber tubing, expiratory valve, angle mount, face-piece, and so to the patient. (The gas bag being empty is hidden by the first part of the breathing tube, the expiratory valve lies behind the rim of the enamel tray.)

(1) A tray containing :

A pair of long sponge-holding forceps and a gauze mop,
Phillip's rubber air-way,
A large face-piece with an angle mount,
Magill pattern laryngoscope,
Tongue, clip forceps,
Magill's forceps for introducing endotracheal tubes,
Rubber endotracheal tube.

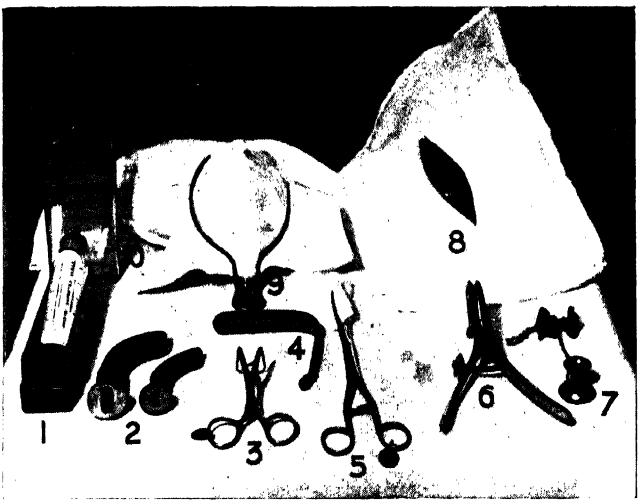
Behind the tray is a glass box which contains gauze mops and rolls to serve as throat packs, a bottle of eye drops, usually liquid paraffin, a pot of lubricant for the endotracheal tubes, the stock bottles containing ether, trichlorethylene, and chloroform.

(2) Sphygmomanometer.
(3) Flowmeters.
(4) Bottle of trichlorethylene.
(5) Bottle of ether surrounded by a metal container for warm water.
(6) A ring prop used to separate the teeth or gums.
(7) Ferguson type mouth gag.
(8) A hypodermic tray with syringes and needles ready for use in a covered box. A long $3\frac{5}{8}$-inch needle should be included for emergency cardiac puncture. Adrenalin, nekethamide (coramine), and amyl nitrite are kept in readiness for immediate use.

A universal spanner lies to the right of the tray ; this is used for turning on all cylinders and for tightening nuts. The chain on the right of the table is used to connect it to the patient's trolley so that they shall not be separated on the way from the anæsthetic room to the theatre.

OPEN ETHER

To induce anæsthesia with ether by the open method the patient is made to take each breath through a gauze pad on which ether is poured. The amount of ether required is considerable, and as the gauze tends to become saturated it must be thick enough to prevent drops of ether from falling onto the patient's face. The gauze is held away from the face by a wire frame usually of the type known as a Schimmelbusch mask. The pad is made of eight thicknesses of fourfold gauze and should measure about 9 inches by 14 inches. Two additional pads of gauze or gamgee tissue of similar size are generally used ; one rests on the patient's face and has a central hole exposing the lips and nose, the second one is used to cover the mask and has a slit through which ether can be dropped onto the gauze of the mask. These pads protect the patient's face and also prevent him from obtaining air round the edges of the mask. Ethyl chloride is commonly used to induce unconsciousness as it is less pungent and unpleasant to breathe than ether vapour.



OPEN ETHER

(1) A tube of ethyl chloride.

(2) Phillips airways in two sizes.

(3) Tongue forceps.

(4) Tongue depressor.

(5) Sponge-holding forceps with a mounted mop.

(6) Mason's gag.

(7) Hewitt type dental prop connected by a chain to a "London Hospital" ring prop.

(8) Gauze or gamgee pads to protect the face and place over the mask.

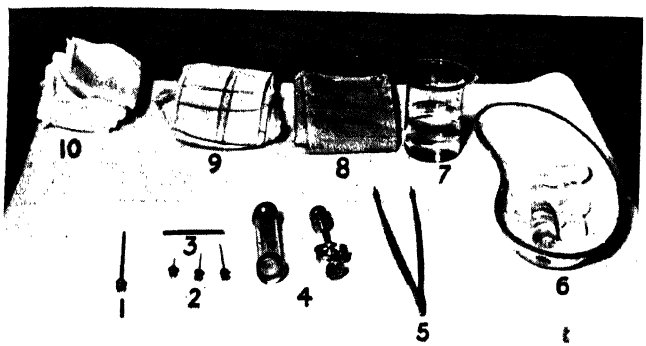
(9) Schimmelbusch type "open ether" mask. The tube opening above the handle of the mask follows the curve of the mask to the opposite end. It has several holes along it under the gauze and through these carbon dioxide, oxygen or ether vapour can be delivered to the patient at will.

(10) Ether bottle with Bellamy Gardner dropper.

INTRAVENOUS ANÆSTHESIA

Intravenous injections are commonly made for short operations and for the production of unconsciousness when nitrous oxide and oxygen or other inhalation agents are to be used for the actual operation. Less frequently injections are used alone even for long operations, the syringe being left in place so that small quantities may be given whenever the patient shows signs of recovery. In such a case several syringes are required and are filled with the solution beforehand. Other methods are to have a slow continuous flow of very weak anæsthetic solution, made up in bulk before starting, or to inject small quantities of the usual anæsthetic solution into a normal saline solution which is running continuously throughout the operation.

The two agents in general use are penthothal sodium made up as a 5 per cent. solution, or hexobarbitone soluble ("evipan sodium" and other trade names) as a 10 per cent. solution in distilled water.



INTRAVENOUS ANÆSTHETIC

(1) A needle long and coarse enough to empty the ampoule quickly and completely.

(2) Selection of intravenous needles.

(3) File.

(4) 10 c.cs. syringe for penthothal sodium. A 20 c.cs. syringe may be necessary. All intravenous syringes should have an eccentric nozzle.

(5) Dissecting forceps.

(6) Dish containing ampoules (usually in spirit).

(7) Beaker of sterile water.

(8) Sterile mackintosh.

(9) Sterile towels.

(10) Mops.

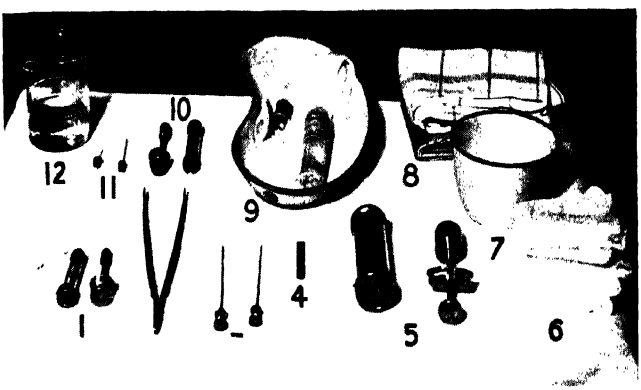
A tourniquet is often required and strapping, or a special gadget, to hold the syringe in place.

Whenever an intravenous anæsthetic is given, oxygen, carbon dioxide, the usual restorative agents and anæsthetic instruments, *i.e.* gag, tongue forceps, and sponge forceps, should be available.

SPINAL INJECTIONS

A spinal or intrathecal injection is made by injecting a solution of a drug into the cerebro-spinal fluid so that it bathes a portion of the spinal cord and nerve roots and so renders part of the body analgesic as well as paralysing the muscles, the extent of its action being determined by the operator. A " high " spinal injection should affect the body up to the level of the fourth dorsal nerve and is therefore suitable for any abdominal procedure and even for some chest operations. A " low " spinal injection involves the sacral nerves only and is used for perineal operations. The volume of the solution and the position in which the patient is placed during and immediately after making the injection determine the height to which the loss of sensation will rise. Stovaine, nupercaine, and procaine (novocaine) are the agents most commonly used. Stovaine 10 per cent. in normal saline, or 5 per cent. with glucose, and nupercaine 1 in 200, with or without glucose, give solutions that are alike in their characteristics of being higher in specific gravity than the cerebro-spinal fluid and in being used in small amounts. Nupercaine in a strength of only 1 in 1,500 in half normal saline is given in volumes up to 15 to 18 c.cs. and has a specific gravity less than that of cerebro-spinal fluid, *i.e.* a " light " solution.

The anæsthetist will give directions for the position of the patient on the table during and after the spinal injection. The most convenient positions for the injection are: (1) lying on his side with the spine brought to the edge of the table near the anæsthetist; (2) or sitting up with the legs over the side of the table. If lying on the side the thighs should be flexed on the abdomen and the head flexed on the chest, the nurse supports him by passing her left hand behind his knees, holding them firmly in the flexed position and placing her right hand across the patient's shoulders, keeping the head well bent on his chest. The patient may also assist in maintaining the position by clasping his knees with his hands. When a " light " solution is used the table is tilted towards the head to allow the solution to flow by gravity to the required level. When a " heavy " solution is used the table is tilted towards the foot immediately after the injection is made and then adjusted to the horizontal position.



SPINAL ANÆSTHETIC

(1) 2 c.cs. syringe for " heavy " solutions.

(2) Dissecting forceps.

(3) Two spinal needles with stillettes in position.

(4) File for ampoules.

(5) 20 c.cs. syringe for " light " solution.

(6) Mops.

(7) Gallipot containing skin paint.

(8) Sterile mackintosh and towel.

(9) Dish containing one ampoule of " light " solution and one of " heavy " solution. The ampoules are usually placed in spirit.

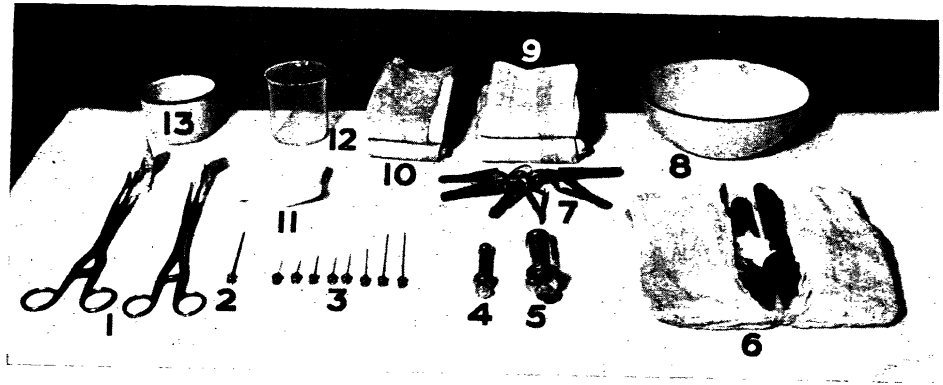
(10) Syringe and (11) needles for injection of procaine or other analgesic solution into the skin and proposed track of the spinal needle.

(12) Beaker containing sterile water.

A sphygmomanometer should be provided as blood-pressure readings will be taken at intervals.

LOCAL OR REGIONAL INJECTIONS

These injections may range from an elaborate procedure to one quite trivial and the range of needles and quantity of solution will vary accordingly. The solutions commonly used are procaine (novocaine) 0·5, 1, or 2 per cent. in graduated strengths of saline to render them isotonic with the tissues, but amethocaine (decicain) 1 in 1,000 or nupercaine 1 in 1,500 or less are alternatives. Adrenalin 1 in 1,000 solution is usually added at the time of injection. The solutions may be in ampoules, requiring a file, or in sterile bottles with rubber caps which are swabbed with antiseptic solution or spirit before a needle is inserted for the withdrawal of the solution. This needle is usually left in position for any necessary syringe refills. Larger bottles may be supplied and their contents emptied into a sterile beaker.



LOCAL ANÆSTHETIC

(1) Sponge-holding forceps.
(2) Long coarse needle for withdrawal of solution from the container.
(3) A selection of injection needles. For a splanchnic injection a needle 12 centimetres long is needed.
(4) Small syringe for measuring adrenalin solution or for initial intradermic injections.
(5) Injection syringe, usually 10 or 20 c.cs.
(6) Sterile gloves.
(7) Towel clips.
(8) Bowl for sterile water.
(9) Sterile towels.
(10) Sterile mackintoshes.
(11) Mops.
(12) Beaker for anæsthetic solution.
(13) Gallipot for skin antiseptic.

The bottles of the various agents are not shown.

CHAPTER VI

NOTES ON SOME TECHNICAL TERMS

It may not be out of place to precede the section dealing with instruments and requirements for various surgical operations by a short glossary of some of the technical terms used. Some of these may be unfamiliar to the beginner and many of them are by no means self-explanatory. Definitions of some of the commoner suffixes may help the nurse to understand strange, and often alarmingly long, words, although it must be stated that these word-endings are not always used correctly and that in some instances the incorrect terminology is sanctioned by common usage.

-ectomy : a suffix denoting removal or excision of a structure, *e.g.* hysterectomy, removal of the uterus.

-orrhaphy : a plastic or repair operation, *e.g.* perineorrhaphy, repair of the perineum. The ending " plasty " is also used to describe a plastic operation where the aim is to rebuild and restore tissues destroyed by injury or disease.

-oscopy : inspection of the interior of an organ or passage by means of special instruments, usually carrying a light, *e.g.* cystoscopy, examination of the bladder by means of a cystoscope.

-ostomy : constructing an artificial opening into an organ, *e.g.* gastrostomy, making an opening from the stomach on to the surface of the abdomen.

-otomy : incising or dividing a structure, *e.g.* laparotomy, incising and opening the abdomen, tenotomy, dividing a tendon.

It is in the use of the last two terms that inaccuracies are most commonly found ; for example, the operation of constructing an opening from the colon on to the surface of the body is correctly called " colostomy," but is not infrequently referred to as a " colotomy."

Antrostomy. Making an opening into the maxillary antrum to provide drainage. The most extensive type of antrostomy is known as Caldwell-Luc's operation.

Appendicectomy. Removal of the appendix.

Appendicostomy. Establishing an opening between the lumen of the appendix and the abdominal wall for the purpose of irrigating the colon.

Arthrodesis. An operation to stiffen a joint permanently and prevent movement.

Arthroplasty. An operation designed to increase the amount of movement at a joint.

Arthrotomy. Making an opening into a joint for drainage or exploration.

Bronchoscopy. Inspection of the interior of the bronchial tree by means of a bronchoscope. Draining an abscess, removal of a foreign body or of a section of a growth may all be carried out as part of a bronchoscopy.

Cæsarian Section. Removal of the fœtus, at or near term, from the uterus by an abdominal incision.

Cholecystectomy. Removal of the gall-bladder.

Cholecystenterostomy. Establishing an opening between the gall-bladder and the small intestine. Cholecystgastrostomy is a similar operation connecting the gall-bladder and the stomach. These operations are performed to provide drainage of the bile into the alimentary tract when the common bile duct is permanently obstructed, as, for example, by the pressure of a growth in the head of the pancreas.

Cholecystotomy. Opening the gall-bladder.

Choledochotomy. Opening the common bile duct.

Chordotomy. Division of nerve tracts within the spinal cord.

Colostomy. Making an opening into the colon to act as a temporary or permanent anus for the discharge of fæces. The usual sites are the descending and transverse colon. Cæcostomy is the term used when the opening is made into the cæcum.

Colporrhaphy. A repair operation on the vaginal wall in the treatment of pelvic prolapse. Stretching of the anterior vaginal wall and prolapse of the uterus may allow the bladder and urethra to bulge into the vaginal canal, producing the condition known as a cystocele; for this the operation of anterior colporrhaphy is performed. A similar condition of the posterior vaginal wall producing a rectocele is dealt with by the operation of posterior colporrhaphy. Both these operations may be combined with perineorrhaphy.

Craniotomy. Opening the cavity of the skull, as, for example, for the removal of a tumour, draining an abscess, or in the treatment of cranial injuries.

Cystectomy. Excision of the urinary bladder.

Cystoscopy. Inspection of the interior of the bladder by means of a cystoscope passed per urethra. Catheterisation of the ureters, cauterising papillomata (fulguration) and resection of the prostate gland may be carried out *via* an operating cystoscope.

Curettage. Removing tissue by scraping with a curette or spoon. The term is most commonly used for the removal of overgrown lymphatic tissue (adenoids) in the naso-pharynx and for curettage of the interior of the uterus.

Diathermy. A high-frequency electric current producing great heat. In surgery diathermy is used for cautery and as the "diathermy knife" which seals the tissues as it cuts.

Ectopic gestation. Implantation and development of a fertilised ovum outside the cavity of the uterus, usually in a Fallopian tube. A ruptured ectopic gestation is a condition that usually requires urgent operation.

Embolectomy. Removal of an embolus from an artery or vein. Pulmonary embolectomy is also known as Trendelenberg's operation.

Epididymectomy. Excision of the epididymis, a series of tubules lying behind the testis and continuous with the vas deferens.

Episiotomy. Incision of the perineum in the second stage of labour to prevent extensive laceration.

Gastrectomy. Excision of the stomach. Total removal is a rare operation. The usual operation is a partial gastrectomy.

Gastroenterostomy. Making an anastomosis between the stomach and the small intestine, usually the jejunum. Following this operation the stomach contents by-pass the pyloric end of the stomach and the duodenum, therefore it is sometimes referred to as " short-circuiting."

Gastroscopy. Inspection of the mucous lining of the stomach using a flexible gastroscope.

Gastrostomy. Making an artificial opening into the stomach for the purpose of feeding a patient with an œsophageal stricture.

Gastrotomy. Opening the stomach for exploration or removal of a foreign body. The operation of incising the muscular coat of the stomach for the relief of congenital pyloric stenosis in infants is known as Rammstedt's operation.

Hydrocele. A collection of fluid in the tunica vaginalis of the scrotum.

Hymenectomy. Excising and trimming an imperforate or rigid hymen.

Hysterectomy. Removal of the uterus. A sub-total hysterectomy implies removal of the body of the uterus leaving the cervix ; total hysterectomy, removal of the entire uterus ; pan-hysterectomy, removal of the uterus, Fallopian tubes, and ovaries ; radical or Wertheim's hysterectomy, removal of the uterus, appendages, upper part of the vagina and adjacent connective tissue.

Iridectomy. Removal of a section of the iris of the eye as a preliminary to cataract extraction or for the relief of tension in glaucoma.

Laparotomy. Opening the abdominal cavity. A varying number of conditions which come under the heading of the " acute abdomen " may be the reason for an emergency laparotomy, *e.g.* acute appendicitis, acute cholecystitis, intestinal obstruction, as, for example, strangulated hernia, intussusception, malignant growth, or volvulus.

Laminectomy. Cutting through and removing the laminæ of the vertebral column as an approach to the spinal cord.

Laryngectomy. Removal of the larynx.

Laryngoscopy. Inspection of the interior of the larynx by a mirror and reflected light, indirect laryngoscopy, or by means of a laryngoscope, direct laryngoscopy.

Laryngo-fissure. Splitting the thyroid cartilage of the larynx to expose the vocal cords.

Laryngotomy. Opening the larynx and introducing a laryngotomy tube, an operation sometimes performed in cases of extreme urgency when the glottis is blocked. N.B. The terms laryngotomy and tracheotomy are in common use for the operations of introducing a tube into the larynx or trachea, although the more correct terms would be " laryngostomy " and " tracheostomy."

Litholapaxy or **Lithotrity.** Crushing a vesical calculus by means of an instrument known as a lithotrite introduced per urethram.

Lobectomy. Removal of one lobe of the lung.

Mastectomy. Removal of the breast. Radical mastectomy denotes removal of the breast, the underlying pectoral muscles and adjacent lymph glands in the treatment of carcinoma of the breast.

Myomectomy. Removal of a fibro-myoma or " fibroid " from the uterus.

Myringotomy. Incision of the tympanic membrane of the ear to drain the middle ear. This operation is also known as paracentesis tympani.

Nephrectomy. Removal of a kidney.

Nephropexy. Suturing the kidney to the posterior abdominal wall.

Nephrostomy. Establishing an opening into the pelvis of the kidney for the purpose of drainage.

Nephrotomy. Incising the kidney, usually for the removal of a renal calculus. This operation is also known as " nephro-lithotomy."

Œsophagoscopy. Examination of the interior of the œsophagus as a diagnostic procedure or for the removal of a foreign body.

Oöphorectomy. Removal of one or both ovaries. The older term " ovariotomy " is also used.

Orchidectomy. Removal of the testis.

Osteotomy. Division of a bone to correct a deformity or as part of an arthroplastic operation. The instrument used is an osteotome and differs from a chisel in that it is bevelled on both sides.

Perineorrhaphy. Repair of the perineum. The term is used for the repair carried out when prolapse of the uterus has occurred as a result of a weakened pelvic floor and is not usually used for the simple suturing of a lacerated perineum performed immediately after labour.

Pharyngotomy. Opening the pharynx to gain access to a malignant growth of the upper part of the œsophagus. As the approach is from the side the operation is known as " lateral pharyngotomy."

Phrenic avulsion. Tearing the fibres of the phrenic nerve from their attachment to the diaphragm, producing paralysis of one dome of the diaphragm and collapse of the lower part of the lung on that side. The approach to the nerve is made through a small incision in the neck, division of the nerve is carried out in addition to avulsion.

Pneumothorax. Air in the pleural space. The operation, referred to as an " extra-pleural " pneumothorax, involves injecting air between the pleura and the chest wall after stripping off the parietal pleura.

Pneumonectomy. Removal of one lung in the radial treatment of bronchiectasis or malignant disease of the lung.

Prostatectomy. Removal of the prostate gland, which lies at the base of the bladder in the male, usually through a supra-pubic incision. Transurethral resection of the prostate gland is carried out by diathermy.

Splenectomy. Removal of the spleen. Traumatic rupture of the spleen is a common reason for its removal,

but the operation may also be performed for new growth and in certain diseases of the blood.

Thoracotomy. Opening the chest cavity, *e.g.* to drain an empyema.

Thoracoplasty. Removal of several ribs on one side of the chest to produce collapse of the underlying lung.

Thoracoscopy. Examination of the pleural space by means of a thoracoscope inserted through the chest wall.

Trachelorrhaphy. The operation for the repair of a lacerated cervix uteri.

Tracheotomy. Opening the trachea and introducing a tracheotomy tube. In the usual operation the trachea is opened at the level of the isthmus of the thyroid gland. The operation referred to as a "high" tracheotomy may be performed in emergencies, the opening being made through the upper rings of the trachea which are close to the skin surface.

Trephining. Removal of a disc of tissue, usually applied to the removal of a disc of bone from the skull, but is also used for the operation of removing a small disc of the sclerotic coat of the eye in cases of chronic glaucoma.

Uretero-Lithotomy. The operation of opening the ureter to remove a calculus.

Urethrotomy. Incising the urethra for the relief of stricture. Internal urethrotomy is the term used for the operation of slitting the stricture with a guarded knife passed into the urethra. External urethrotomy implies opening the urethra from the outside, the incision being made through the perineum.

Ventriculography. Radiography of the cerebral ventricles after removal of cerebro-spinal fluid and its replacement by air introduced *via* a hollow needle. Trephine holes are made in the skull through which the needles are passed.

Ventro-suspension. The term is usually used for the operation of shortening the round ligaments of the uterus, which run forward to the inguinal canal, suspending the uterus in the anteverted position. Gilliam's is the most common type of this operation.

Vulvectomy. Excision of the vulva.

CHAPTER VII

GENERAL INSTRUMENTS, LIGATURES AND SUTURES

The General Set

A collection of generally useful instruments including knives, scissors, hæmostats, dissecting instruments, tissue forceps and retractors is commonly referred to as the " general " or " laparotomy " set.

In the following sections, where lists of instruments for various operations are given, the complete lists are set out in some instances, in others only the special instruments that are needed in addition to the general set are mentioned.

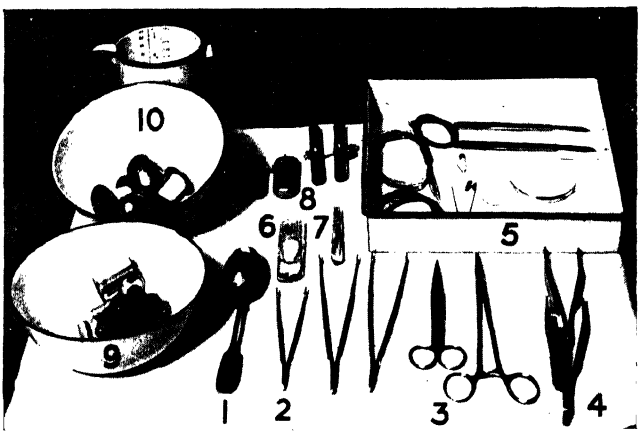
The general set used in the hospital in which these lists were compiled is illustrated on page 66.

The Ligature Trolley

In readiness for a series of operations the instrument nurse usually prepares a trolley with a suitable selection of ligatures, sutures, needles, pointed scissors and dressing forceps. Straight and curved round-bodied and triangular needles are required and in addition any special needles favoured by the surgeon or used in certain operations, *e.g.* Gallie's needles for hernia operations where " living " sutures are used.

Round-bodied needles are used for intestinal sutures, for nerve sutures, for peritoneum and other membranes, and may be used for muscle and fascia. For deep sutures curved needles held in a needle holder are most convenient. For skin sutures straight or curved triangular needles are required. Atraumatic sutures in which the suture is fused with the needle so that there is no double thread or large needle eye to damage the tissues are now frequently used in general surgery, in ophthalmic work and in plastic surgery.

The ligature table may be used as a " stock trolley " for a reserve supply of knives, scissors, drainage tubing, safety pins, record syringe and hypodermic and exploring needles which may be called for during any operation.



LIGATURE TROLLEY

(1) Metal ligature holder or "egg" and spoon for handling.

(2) Three pairs of "serving forceps" with horse-shoe blades, 5 inch and 7 inch.

(3) Mayo's needle-holder.

(4) Michel's skin clips and forceps.

(5) Tray containing silkworm gut, horsehair, round-bodied and triangular needles, safety pins and extra knives.

(6) Atraumatic suture in tube.

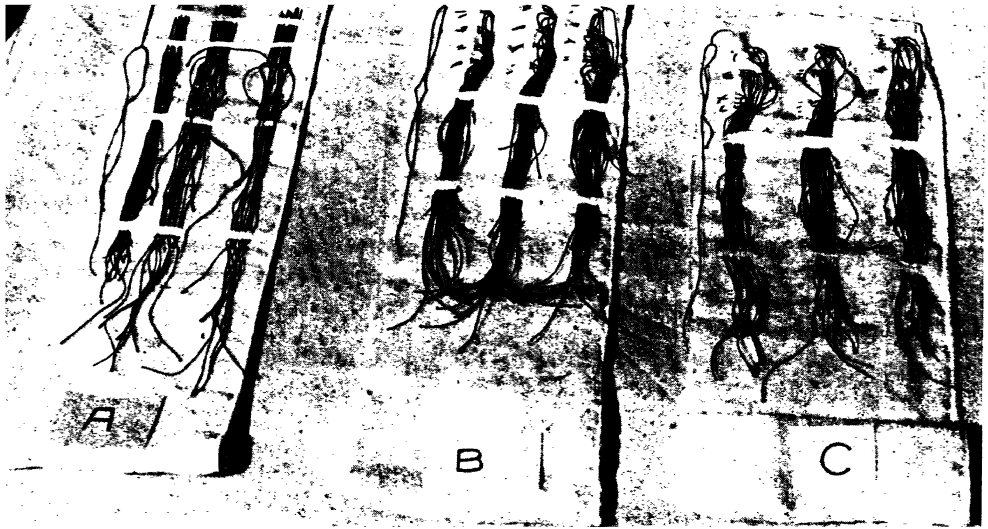
(7) Tubed catgut.

(8) Metal tube breakers, two patterns are shown.

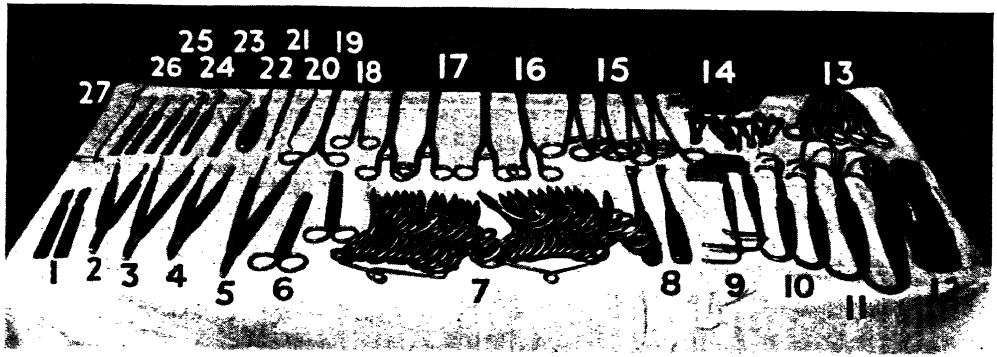
(9) Bowl containing reels of catgut.

(10) Bowl containing spools of thread and extra ligature eggs.

The enamel jug seen behind the bowls contains an antiseptic solution, *e.g.* 2 per cent. chlorocresol, in which the forceps and scissors in use are kept during the operation. The instruments are re-sterilised and a fresh jug provided between each case.



Needles threaded ready for use, darned on to gauze pads and sterilised in the autoclave. This is a convenient method when a large number of fine sutures will be needed.
(A) Straight round-bodied needles. (B) Curved trocar-pointed needles. (C) Curved round-bodied needles.



THE GENERAL SET

(1) Two Bard-Parker knives.
(2) Two pairs of non-toothed dissecting forceps, 5-inch.
(3) Two pairs of non-toothed dissecting forceps, 7-inch.
(4) Two pairs of toothed dissecting forceps, 5-inch.
(5) Two pairs of toothed dissecting forceps, 7-inch.
(6) Two pairs of round-ended scissors, 6-inch.

(7) Two dozen straight Spencer Wells' artery forceps.
(8) Two Kocher's gland retractors.
(9) Two Czerny's retractors.
(10) Two small Pollard's retractors.
(11) Two large Pollard's retractors.
(12) Two malleable copper retractors or depressors.
(13) Six Doyen's skin clip forceps.
(14) Twelve cross-action towel clips.
(15) Four Lane's tissue forceps.
(16) Non-clip sponge forceps.
(17) Three clip sponge forceps.
(18) Sinus forceps.
(19) Long dressing forceps.
(20) Watson Cheyne's dissector.
(21) Macdonald's raspatory.
(22) Small Volkmann's spoon.
(23) Aneurysm needle.
(24) Two double hooks.
(25) Two single hooks.
(26) Sharp hook.
(27) Probe.

CHAPTER VIII

OPERATIONS ON THE FACE AND NECK

EXCISION OF SUPERFICIAL RODENT ULCER OR NÆVUS

Six towel clips.
Two fine scalpels or Bard-Parker knives.
Two fine-toothed dissecting forceps.
Two fine non-toothed dissecting forceps.
Two pairs of scissors, round-ended and pointed.
One dozen fine Spencer Wells' artery forceps.
Four fine tissue forceps, *e.g.* Allis'.
Needle-holder.
Small curved round-bodied and triangular needles.
Catgut 2/o and o, fine silkworm gut, black silk or horsehair.
A skin graft from the thigh may be used.
For radium treatment, *see* p. 220.

REPAIR OF HARELIP

Gag, *e.g.* Lane's spring gag, Waugh's or Doyen's.
Tongue clip.
Tongue depressor.
Fine scalpels.
Six towel clips.
Six fine Spencer Wells' or mosquito forceps.
Two fine-toothed dissecting forceps.
Two fine non-toothed dissecting forceps.
Two pairs of fine tissue forceps, *e.g.* Allis'.
Cleft palate scissors or fine-pointed scissors.
Cleft palate elevator.
Macdonald's raspatory.
Suction connection and fine nozzle.
Fine rubber tubing for threading on tension sutures.
Fine triangular needles.

Needle-holder.

Atraumatic sutures.

Catgut size 3/o and 2/o, thread size 60.

A harelip bow may be used.

REPAIR OF CLEFT PALATE

Six towel clips.

Gag, *e.g.* Lane's spring gag.

Tongue clip.

Fine scalpels, tenotomy knife.

Scissors, round-ended and cleft palate or fine-pointed scissors.

Cleft palate elevator.

Macdonald's raspatory.

Two pairs of non-toothed dissecting forceps.

Two pairs of cleft palate forceps or 7-inch toothed dissecting forceps.

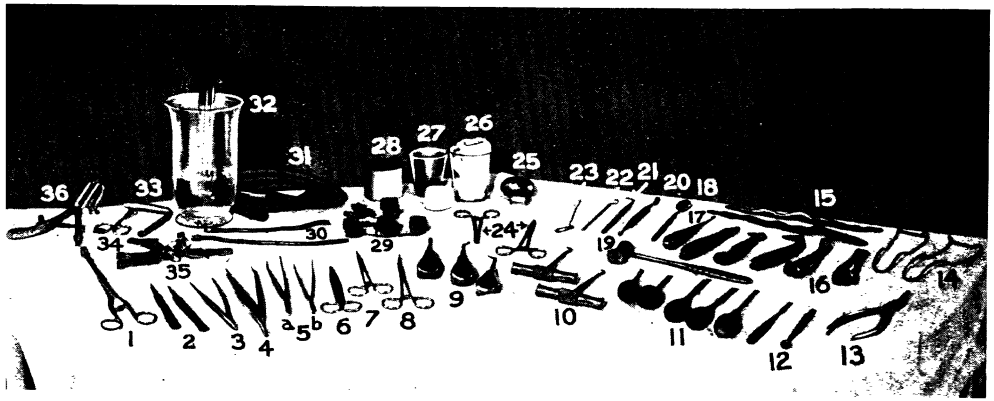
Suction and fine nozzle.

Sponge forceps.

Small curved triangular needles, or Lane's cleft palate needles.

Needle-holder.

Catgut size 3/o and o/o.



REMOVAL OF DENTAL CYST AND REMOVAL OF IMPACTED WISDOM TOOTH

(1) Sponge-holding forceps. (2) Bard-Parker knife and scalpel.
(3) Dissecting forceps, 5-inch. (4) Dissecting forceps, 7-inch.
(5) (*a*) Stout dental conveying forceps ; (*b*) Fine conveying forceps.

(6) Scissors. (7) Straight Spencer Wells' forceps.
(8) Curved Spencer Wells' forceps.
(9) Three root elevators, one straight, two curved, right and left.
(10) A pair of Winter's elevators.
(11) Wooden-handled chisels, round and square ended.
(12) Two metal-handled square-ended chisels.
(13) Bone-nibbling forceps. (14) Wire cheek retractors.
(15) Malleable copper retractors. (16) Dental extraction forceps.
(17) Volkmann's spoon. (18) Mouth mirror. (19) Metal mallet.
(20) Bone file. (21) Moon's right-angled probe.
(22) Fine curved dental probe. (23) Silver probe.
(24) Two needle holders. (25) Ligature egg, thread and needles.
(26) Throat pack. (27) Ribbon gauze and flavine in paraffin 1–1000.
(28) Sterile vaseline. (29) Mouth props.
(30) Malleable nozzles for suction apparatus. (31) Suction connection.
(32) Ball syringe in normal saline. (33) Lack's tongue depressor.
(34) Tongue clip forceps. (35) Towel clips. (36) Mason's gag.

Dental Extractions

Gag.
Mouth props.
Tongue clip.
Tongue depressor.
Dental conveying forceps.
Set of dental extraction forceps.
Dental elevators.
Dental probes.

Excision or Partial Excision of Jaw

General instruments except for large retractors.
Gag, *e.g.* Waugh's or Ferguson's.
Cheek retractors.
Tongue clip.
Tongue depressor.
Small saw, *e.g.* Wood's.
Gigli's wire saw, handles and De Martel's guide.
Periosteal elevators.
Bone-holding forceps, Ferguson's lion.
Small bone-cutting forceps.
Drills.
Bradawl.
Silver wire.
Wire cutters.
Pliers.
Suction connection and nozzle.

For the operative treatment of fractures of the mandible, see p. 177.

OPERATIONS ON THE TONGUE AND FLOOR OF THE MOUTH

Excision of an Ulcer and Partial Amputation of Tongue

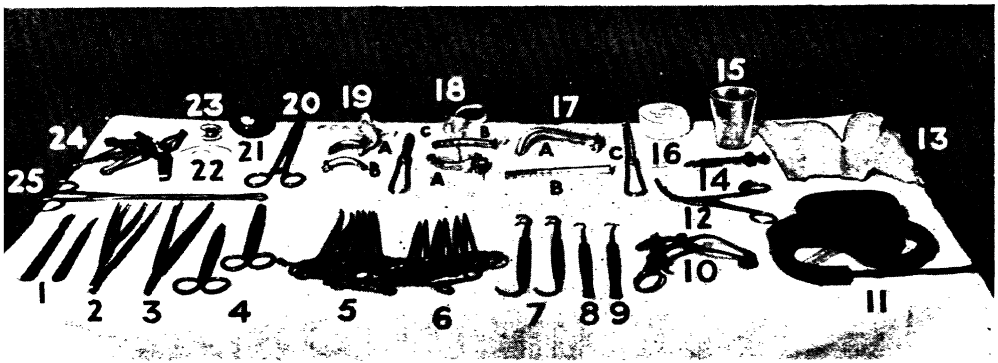
General instruments except for large retractors.
Gags, *e.g.* Waugh's and Doyen's.
Cheek retractors.
Tongue clip.
Tongue depressor.
Curved needles.
Needle-holder.
Catgut, size 3/0 thread.

Excision of Growth in the Floor of the Mouth

Instruments as above with the addition of :
Saw, *e.g.* Wood's medium saw.
Gigli's wire saw, handles and De Martel's guide.
Drills.
Bradawl.
Bone-cutting forceps.
Ferguson's bone-holding forceps.
Farabœuf's rugine.
Diathermy may be used.
For interstitial radium insertion, *see* p. 220.

LATERAL PHARYNGOTOMY, for carcinoma of the pharynx.

General instruments except for large retractors with the addition of :
One dozen fine Spencer Wells' artery forceps.
Small bone-cutting forceps.
Curved scissors.
Tracheotomy tube, and tracheal dilators.
Roll of gauze plugging.
10 per cent. cocaine.
No. 12 rubber Jaques' œsophageal catheter for insertion as a feeding tube, screw clip.
Atraumatic sutures, plain catgut, size 0.

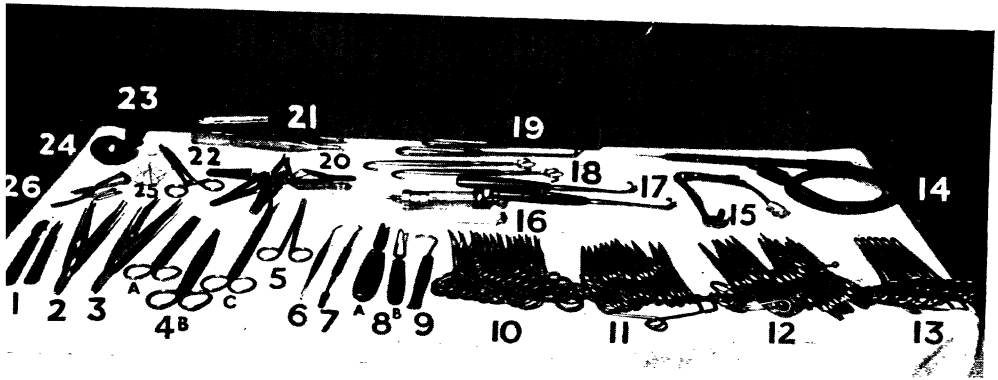


TRACHEOTOMY AND LARYNGOTOMY

(1) Two Bard-Parker knives, medium and small.
(2) Two toothed dissecting forceps.
(3) Two non-toothed dissecting forceps.
(4) Two pairs of scissors, Mayo's and round-ended.
(5) Six curved Spencer Wells' artery forceps.

(6) Six straight Spencer Wells' artery forceps, fine.
(7) Two small Pollard's retractors.
(8) Single blunt hook. (9) Sharp hook.
(10) Self-retaining retractor.
(11) Suction nozzle and connection.
(12) Tracheal dilators.
(13) Tracheotomy dressing cut to fit round the tube.
(14) Record syringe and needle for local anæsthetic.
(15) Measure containing local anæsthetic.
(16) Roll of 1-inch gauze for packing and swabbing.
(17) Large " Jumbo " tracheotomy tube: (*a*) outer tube ; (*b*) inner tube ; (*c*) introducer.
(18) Durham's tracheotomy tube: (*a*) outer tube ; (*b*) inner tube.
(19) Laryngotomy tube: (*a*) outer tube ; (*b*) inner tube.
(20) Mayo's needle holder. (21) Ligature egg.
(22) Curved, round-bodied and triangular needles.
(23) Spool of catgut, size 0.
(24) Six towel clips.

N.B.—A tracheotomy tube and introducer, tracheal dilators, a single sharp hook, dissecting forceps and knife are kept ready sterilised in the theatre as an " emergency set."



OPERATIONS ON THE THYROID GLAND, REMOVAL OF ADENOMA OF THE THYROID, PARTIAL THYROIDECTOMY

(1) Two Bard-Parker knives, medium and fine.

(2) Two toothed dissecting forceps.

(3) Two non-toothed dissecting forceps.

(4) Three pairs of scissors: (*a*) round-ended; (*b*) Mayo's; (*c*) long curved, *e.g.* Wheeler's tonsil scissors.

(5) Sinus forceps. (6) Watson Cheyne's dissector.
(7) Macdonald's raspatory.
(8) Kocher's gland enucleators, plain and fenestrated.
(9) Aneurysm needles. (10) One dozen curved Spencer Wells' artery forceps.
(11) One dozen straight Spencer Wells' artery forceps.
(12) One dozen Kocher's artery forceps.
(13) Six Allis' tissue forceps.
(14) Diathermy needle and lead.
(15) Kocher's self-retaining retractor.
(16) Test tube for cyst fluid, record syringe and needle for aspirating fluid.
(17) Two Kocher's gland retractors.
(18) Two small Pollard's retractors.
(19) Langenbeck's retractors.
(20) Six towel clips. (21) Michel's skin clips and forceps.
(22) Needle-holder with atraumatic suture 2/0. (23) Spool of catgut.
(24) Ligature egg. (25) Dunhill's thin-walled tubing and safety pins.

For removal of a thyro-glossal cyst the above instruments with the addition of a pair of small bone-cutting forceps will be needed.

OPERATIONS ON THE SALIVARY GLANDS

Removal of Salivary Calculus

Six towel clips.
Gag.
Tongue depressor.
Tongue clip.
Fine Bard-Parker knife or scalpel.
Fine pointed scissors.
Two fine non-toothed dissecting forceps.
Two fine-toothed dissecting forceps.
Sinus forceps.
Probe.
Small retractors.
Six fine Spencer Wells' artery forceps.
Double-ended spoon.
Suction connection and nozzle.
A local anæsthetic is usually needed.

Removal of Parotid Tumour

Six towel clips.
Two Bard-Parker knives.
Two non-toothed dissecting forceps.
Two toothed dissecting forceps.
Scissors, round-ended, Mayo's straight and curved.
One dozen Spencer Wells' artery forceps.
Retractors.
Six Allis' tissue forceps.
Curved round-bodied and triangular needles.
Needle-holder.
Catgut, size o and thread.

OPERATIONS ON THE CERVICAL LYMPH GLANDS

Opening an Abscess

Bard-Parker knife or scapel.
Scissors, round-ended and pointed.
Sinus forceps. Six artery forceps.
Toothed dissecting forceps.
Non-toothed dissecting forceps.
1-inch ribbon gauze.
Rubber drainage tube and safety pin.
Culture tube.

Curetting Tuberculous Glands

Scalpel or Bard-Parker knife.
Two pairs of scissors, round-ended and Mayo's.
Two non-toothed dissecting forceps.
Two toothed dissecting forceps.
One dozen fine Spencer Wells' artery forceps.
Six tissue forceps, *e.g.* Allis' or Lane's.
Two small retractors, *e.g.* Kocher's or Langenbeck's.
Sinus forceps.
Probe.
Small Volkmann's spoon.
Special gland-holding forceps may be used.
Catgut or thread for ligature.
Triangular needles and skin sutures.

Block Dissection for Malignant Disease

General instruments except for large retractors with the addition of:

One dozen fine Spencer Wells' artery forceps.

Six pairs of fine tissue forceps.

Catgut and thread for ligatures.

Curved, round-bodied and triangular needles.

Skin sutures.

Michel's skin clips and forceps.

REMOVAL OF CERVICAL RIB

Instruments as above with the addition of :

Ferguson's lion bone-holding forceps.

Bone-cutting forceps.

Farabœuf's rugine.

Curved bone-nibbling forceps, *e.g.* Wilm's.

PHRENIC AVULSION OR "CRUSH"

Six towel clips.

Bard-Parker knife.

Two pairs of scissors, round-ended and Mayo's.

Two non-toothed dissecting forceps.

Two toothed dissecting forceps.

One dozen fine Spencer Wells' artery forceps.

Macdonald's dissector.

Retractors, Kocher's or Langenbeck's.

Aneurysm needles, half and fully curved.

Curved, round-bodied and triangular needles.

Needle-holder.

Catgut, thread and silkworm gut.

A local anæsthetic is commonly used.

NOTES

CHAPTER IX

OPERATION ON THE NOSE, ACCESSORY NASAL SINUSES, EAR AND THROAT

OPERATIONS ON THE NOSE AND ACCESSORY NASAL SINUSES

Local Anæsthesia for Nasal Operations

Packing the nasal cavity before operations on the nose or accessory nasal sinuses may be the duty of the nurse. In any case she should know what to prepare. The anæsthetics usually employed and the requirements for packing are listed below :

Spray containing 10 per cent. cocaine. This is used ten minutes before the packing is begun.

Nasal speculum. Thudicum's speculum is commonly used.

Nasal dressing forceps, Tilley's or Keen's.

Roll of ½-inch ribbon gauze.

Minim measure containing 1 drachm of 20 per cent. cocaine.

Minim measure containing 1 drachm of 1–1000 solution of adrenaline.

Head light and lamp.

Towel to protect the patient's lips.

Reduction of Nasal Fracture

Nasal speculum.

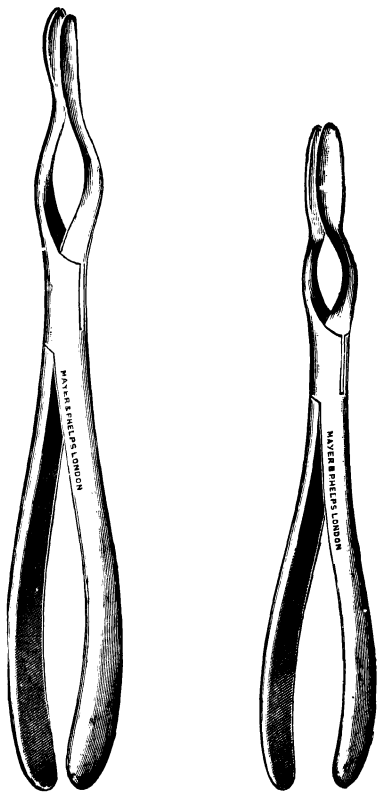
Nasal dressing forceps.

Walsham's redressing forceps.

Ribbon gauze.

Scissors.

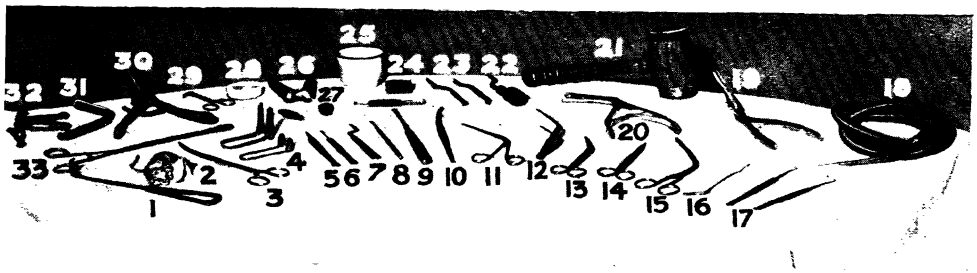
Nasal splints.



(1) (2)

(1) WALSHAM'S NASAL RE-DRESSING FORCEPS
(These are made "right" and "left")

(2) WALSHAM'S SEPTUM FORCEPS



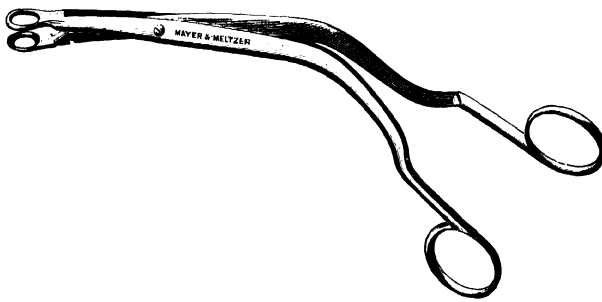
Sub-mucous Resection of the Nasal Septum

(1) Palate retractor.
(2) Post-nasal sponge with tape attached.
(3) Post-nasal sponge introducer.
(4) Thudicum's nasal specula, two sets of three sizes are usually set out.
(5) Scalpel. (6) Mackenzie's septum knife.
(7) St. Clair Thomson's septum knife. (8) Freer's dissector.
(9) Ballenger's swivel knife.
(10) Hill's dissector

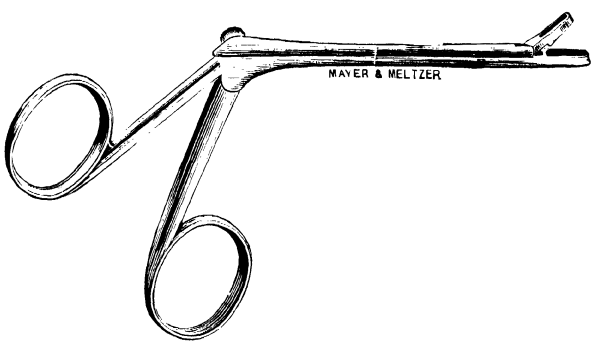
(11) Tilley's angular dressing forceps.
(12) Keen's angular dressing forceps.
(13) Angular nasal scissors.
(14) Straight-pointed scissors.
(15) Luc's forceps. (16) Probe.
(17) Two single hooks.
(18) Suction tubing and fine nozzle.
(19) Septum punch forceps.
(20) Heath's septum punch.
(21) Wooden mallet.
(22) Tilley's septum gouge. (23) Two angled gouges.
(24) Thread and catgut.
(25) Gallipot containing lubricant.
(26) Fingerstall plugs. (27) Lake's rubber splints.
(28) Ribbon gauze.
(29) Tongue clip.
(30) Mason type gag.
(31) Lack's tongue depressor.
(32) Four towel clips.
(33) Sponge-holding forceps, two usually set out.

Intra-nasal Antrostomy

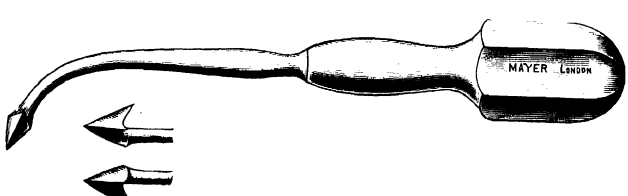
Palate retractor.
Post-nasal sponge and introducer.
Thudicum's nasal specula.
Frontal sinus bougies.
Angular nasal scissors.
Pointed suture scissors.
Keen's and Tilley's dressing forceps.
Freer's straight dissector.
Luc's forceps.
Ostrum's and Grunwald's punch forceps.
Antrum harpoons, right and left.
Gag.
Tongue clip.
Lack's tongue depressor.
Two sponge-holding forceps.
Four towel clips.
Gallipot with adrenalin 1–1000.
1-inch ribbon gauze.
Suction tubing and fine nozzle.



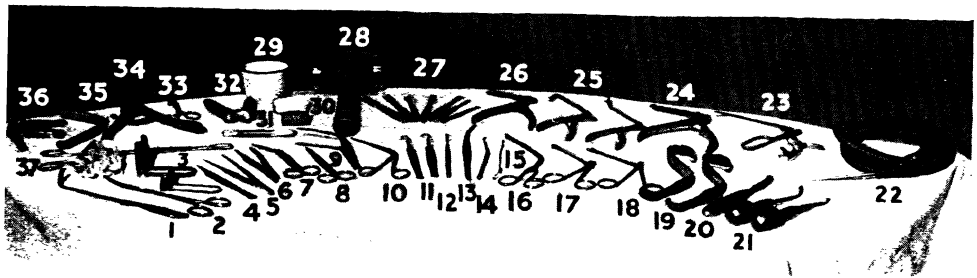
LUC'S FORCEPS



GRUNWALD'S PUNCH FORCEPS



ANTRUM HARPOON
(Right and left)



Radical Antrostomy, Caldwell-Luc's Operation

(1) Palate retractor.
(2) Post-nasal sponge and introducer.
(3) Thudicum's nasal specula, two.
(4) Scalpel.
(5) Non-toothed dissecting forceps, 7-inch.
(6) Toothed dissecting forceps, 5-inch.
(7) Angular nasal scissors.
(8) Pointed scissors.

(9) Keen's angular forceps. (10) Tilley's dressing forceps.
(11) Two single hooks. (12) Freer's dissector.
(13) Hill's dissector. (14) Dundas-Grant's probe.
(15) Straight probe. (16) Luc's forceps.
(17) Ostrum's punch forceps.
(18) Grunwald's punch forceps.
(19) Two cheek retractors.
(20) Farabœuf's rugine.
(21) Antrum harpoons, right and left.
(22) Suction tubing and fine nozzle.
(23) Universal handle and nasal scissors.
(24) Kelyson's punch forceps.
(25) Two Carwardine's punch forceps, right and left.
(26) Citelli's punch forceps.
(27) Gouges and chisels. (28) Wooden mallet.
(29) Gallipot containing lubricant.
(30) 1-inch ribbon gauze. (31) Catgut and thread.
(32) Fingerstall plugs. (33) Tongue clip.
(34) Mason's gag. (35) Lack's tongue depressor.
(36) Four towel clips. (37) Sponge-holding forceps.

Intranasal Ethmoidectomy and Removal of Nasal Polypi

Tongue clip.

Tongue depressor, Mason type gag.

Sponge-holding forceps.

Four towel clips.

Two nasal specula.

Post-nasal sponge and introducer.

Tilley's and Keen's dressing forceps.

Luc's forceps.

Dissector, Freer's or Hill's.

Straight probe.

Polypus forceps.

Punch forceps, *e.g.* Grunwald's ethmoid forceps and Hartman's nasal punch.

Ethmoid curette.

Scissors, round-ended and pointed.

Suction nozzle and connection.

External Frontal Sinus Operation

Tongue clip. Tongue depressor.

Four towel clips.

Two sponge-holding forceps.

Scalpels.

Periosteal elevator.

One dozen artery forceps.

Dissecting forceps, toothed and non-toothed.

Nasal specula.

Hill's and Freer's dissectors.

Luc's forceps.

Howell's self-retaining retractor, or mastoid retractor.

Two double-ended retractors.

Straight probe.

Punch forceps, *e.g.* Grunwald's, Hartman's and Citelli's.

Frontal sinus bougies.

Frontal sinus chisels and gouges.

Frontal sinus probe and canula.

Mallet.

Lane's bone-nibbling forceps.

Scissors, round-ended 8-inch and pointed suture scissors.

Needle-holder.

Small curved triangular needles.

Catgut and thread.

Small metal clips may be used.

OPERATIONS ON THE EAR

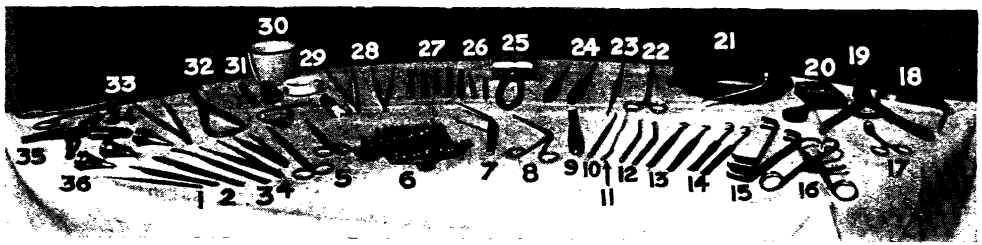
Myringotomy

Illuminated auriscope and aural specula.

Keen's or Tilley's angular forceps.

Myringotome, *e.g.* Agnew's angled or Hinton's straight myringotome.

Mackenzie's drop spoon or pipette.

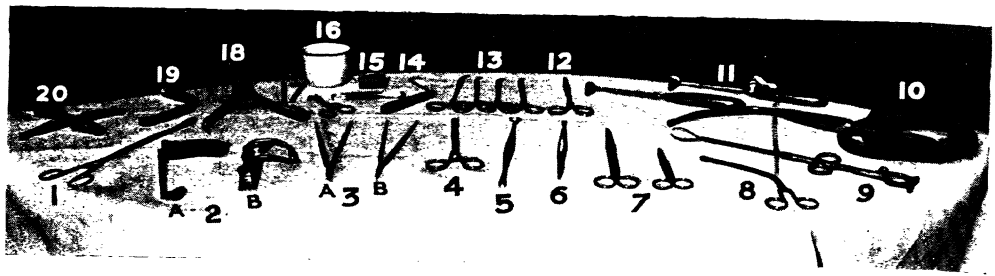


MASTOIDECTOMY

(1) Myringotome.
(2) Two scalpels.
(3) Curved bistoury.
(4) Toothed and non-toothed dissecting forceps.
(5) Scissors, round-ended 8-inch, pointed 6-inch.
(6) One dozen Spencer Wells' artery forceps.
(7) Keen's angular forceps.
(8) Tilley's angular forceps.
(9) Farabœuf's rugine. (10) Freer's dissector.
(11) Probe. (12) Two Dundas-Grant's probes.

(13) Single hooks, blunt and sharp.
(14) Two double hooks.
(15) Two double-ended retractors.
(16) Mollison's self-retaining mastoid retractor.
(17) Tongue clip.
(18) Lack's tongue depressor.
(19) Mason's gag.
(20) Magnifying glass.
(21) Suction tubing and aural nozzle.
(22) Curved artery forceps.
(23) Balance's spoon. (24) Volkmann's spoon.
(25) Heath's mastoid hammer. (26) Chisels. (27) Gouges.
(28) Fine-toothed and non-toothed dissecting forceps, 7-inch.
(29) Ribbon gauze and fingerstall plugs.
(30) Gallipot containing adrenalin 1–1000.
(31) Silkworm gut, catgut, thread and triangular needles.
(32) Needle-holder with curved needle.
(33) Sponge-holding forceps.
(34) Horse-shoe ligature forceps. (35) Four towel clips.
(36) Gruber's aural specula, small, medium and large.

OPERATIONS ON THE THROAT



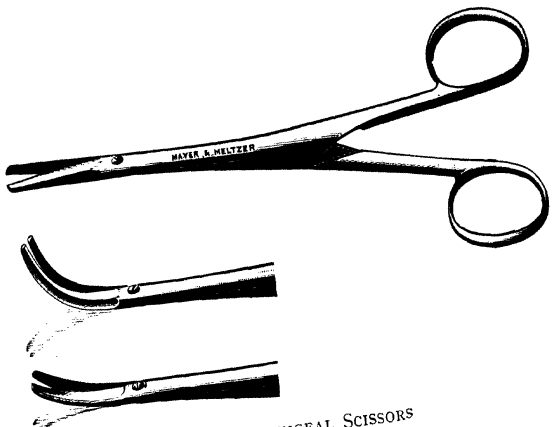
TONSILLECTOMY AND CURETTAGE OF ADENOIDS

(1) Sponge-holding forceps.
(2) (*a*) Blade of Boyle-Davis' gag, three sizes are usually set out.
(*b*) Frame of Boyle-Davis' gag.
(3) (*a*) Fine-toothed dissecting forceps.
(*b*) Medium non-toothed dissecting forceps.
(4) Tonsil-holding forceps.
(5) Mollison's pillar retractor.
(6) Gwynne Evans' tonsil dissector.

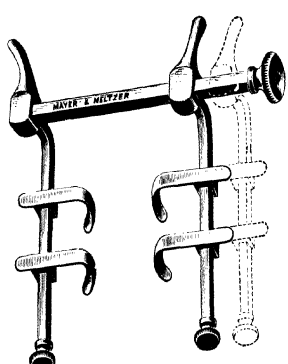
(7) Tonsil scissors, 8-inch, pointed scissors, 6-inch.
(8) Luc's forceps.
(9) Eve's tonsil snare, two are usually set out.
(10) Suction tubing and pharyngeal nozzle.
(11) Two St. Clair Thomson's adenoid curettes.
(12) Stout artery forceps, 8-inch, two usually required.
(13) Four Sydney Scott's curved artery forceps.
(14) Mackenzie's tonsil needle.
(15) Spool of thread and tube of catgut.
(16) Gallipot containing adrenalin 1-1000.
(17) Tongue clip.
(18) Mason type gag.
(19) Lack's tongue depressor.
(20) Four towel clips.

Laryngo-fissure

Tongue forceps.
Mason type gag.
Lack's tongue depressor.
Four towel clips.
Two sponge-holding forceps.
Scalpels large and small.
Dissecting forceps toothed and non-toothed.
Straight probe.
Sinus forceps.
Blunt dissector.
Sharp hook.
Small double-hook retractors.
Double-ended retractors.
Thyro-fissure retractors.
Two dozen artery forceps.
Thyroid cartilage shears. Cartilage saw.
Straight scissors.
Laryngeal scissors, straight and curved.
Large tracheotomy tube (" Jumbo ") and tape.
Tracheotomy tube introducer.
Tracheal dilators.
Suction tubing and nozzle.
Connection and tubing for anæsthetic apparatus.
Needle-holder.
Needles, fine curved, round-bodied and triangular.
Catgut.



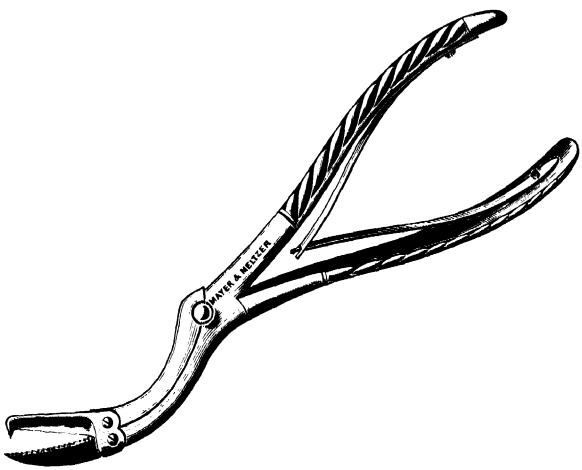
INTRA-LARYNGEAL SCISSORS



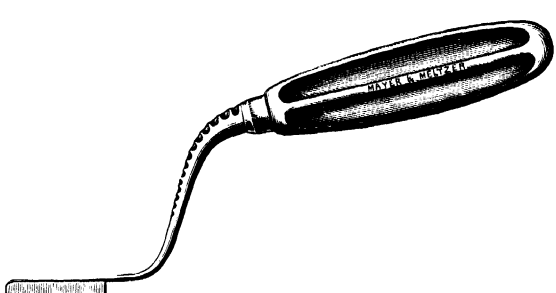
THYRO-FISSURE RETRACTOR

Total Laryngectomy

Instruments as for laryngo-fissure with the addition of four tissue forceps, *e.g.* Allis', and a Jaques' œsophageal tube, size 10 or 12.



THYROID CARTILAGE SHEARS



THYROID CARTILAGE SAW

Opening a Peritonsillar Abscess

Small scalpel, or special guarded knife or bayonet-pointed forceps.

Sinus forceps.

Sponge-holding forceps.

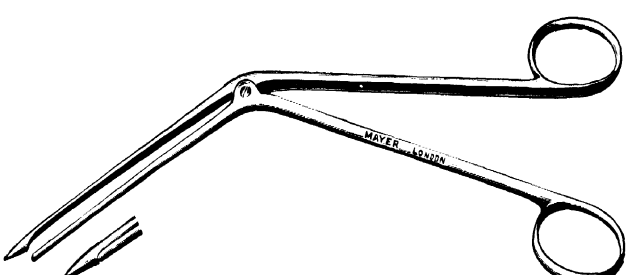
Mason's gag.

Tongue depressor.

Tongue clip.

De Vilbiss spray, 20 per cent. or 10 per cent. cocaine, and cocaine powder.

Mouth wash.



PERITONSILLAR ABSCESS FORCEPS

GUARDED PERITONSILLAR KNIFE

CHAPTER X

OPERATIONS ON THE EYE

OPERATIONS FOR SQUINT (STRABISMUS)

Tenotomy

Eye speculum.
Two fixation forceps.
Strabismus scissors.
Two strabismus hooks.
Needle-holder.
Small curved needles.
Black silk, size 0.

Tendon Advancement

Eye speculum.
Three fixation forceps.
Strabismus scissors.
Two strabismus hooks.
Two tendon forceps.
Needle-holder.
Small curved needles.
Silk, usually white silk size 0.

TREPHINING FOR GLAUCOMA

Eye speculum.
Two fixation forceps.
Conjunctival scissors.
Cornea splitting forceps.
Sclerotic trephine, 1½ or 2 mms.
Two iris forceps.
Iris scissors.

Two iris repositors.
Needle-holder.
Small curved needles.
Black silk, size o.

ABSCISSION OF PROLAPSED IRIS

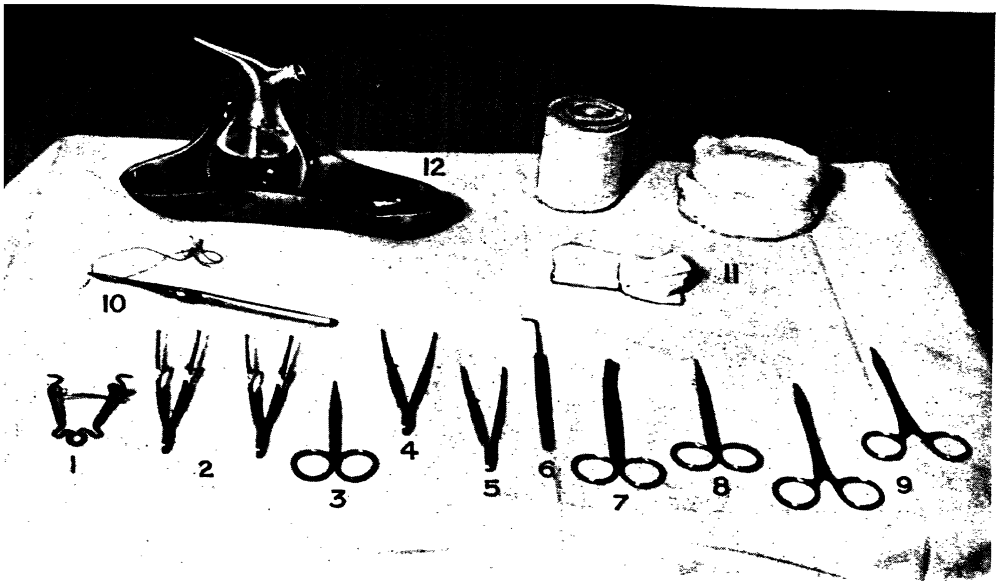
Eye speculum.
Two fixation forceps.
Three iris repositors.
Iris forceps.
Capsule forceps.
De Wecker's scissors.
Two retractors.
Needle-holder.
Small curved needles.
Black silk, size o.

NOTES

CATARACT EXTRACTION

Record syringe and needle for injection of local anæsthetic, *e.g.* 4 per cent. novocain
Wright's needle-holder, curved needle and black silk, size 1.
Eye speculum, the one shown is for the right eye.
Fixation forceps.

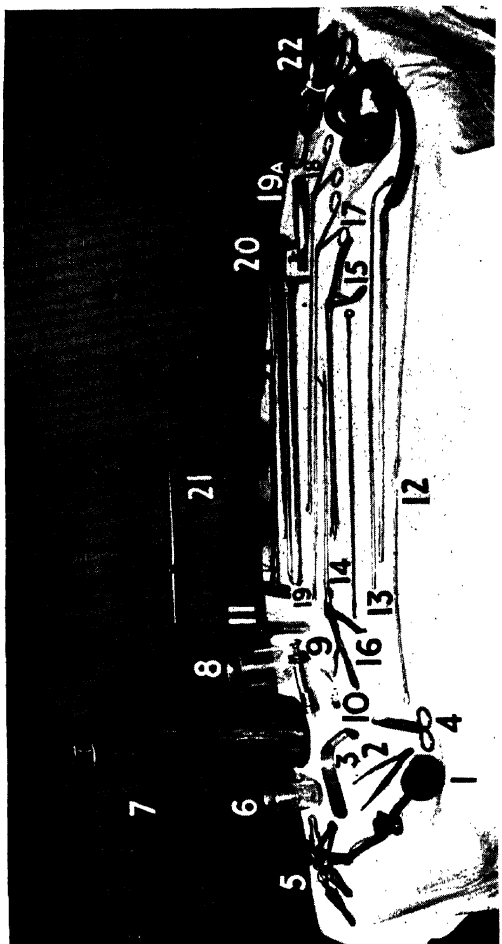
5) Graefe's cataract knife.
6) Moorfield's curette.
7) Cystotome and curette.
8) Dressing forceps.
9) Iris forceps.
10) De Wecker's iris scissors.
11) Three iris repositors.
12) Lens scoop.
13) Lens scissors.
14) Lid retractors.
15) Undine with rubber tube and nozzle for second irrigation.
16) Gauze dressing.
17) Gamgee pad.
18) Moorfield's bandage.
19) Undine in triangular tray for first irrigation.



ENUCLEATION OF EYE

(1) Eye speculum.
(2) Fixation forceps.
(3) Scissors.
(4) and (5) Dressing forceps.
(6) Squint hook.
(7) Stout curved scissors for division of nerve.
(8) Straight scissors.
(9) Spencer Wells' forceps.
(10) Wright's needle-holder with curved needle and black silk, size 1.
(11) Eye swabs, dressing and bandage.
(12) Undine in triangular tray for irrigation.

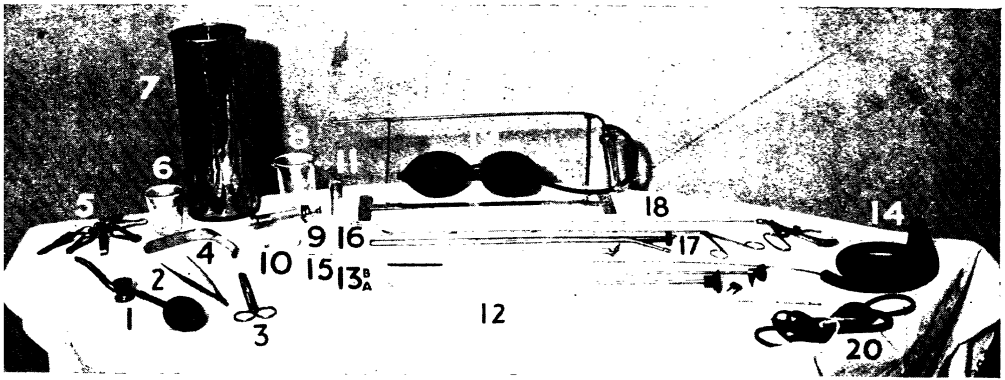
OPERATIONS ON THE CHEST



ŒSOPHAGOSCOPY

(1) De Vilbiss spray with local anæsthetic, *e.g.* amethocaine 2 per cent.
(2) Non-toothed dissecting forceps.
(3) Lack's tongue depressor. (4) Round-ended scissors.
(5) Six towel clips.
(6) Glass measure containing amethocaine.
(7) Tall jar containing hot water for telescopes.
(8) Beaker with lubricant, *e.g.* tragacanth compound.
(9) 20 c.c. syringe for flushing suction tubes.
(10) Small mops in bundles of ten on a safety pin.
(11) Test tube for specimen.
(12) Mop-holder. (13) Two suction tubes.
(14) Coin catcher, a pair of rotating grasping forceps may be used.
(15) Dental plate cutter.
(16) Grasping forceps for foreign bodies.
(17) Crocodile forceps.
(18) Punch forceps.
(19) Irwin Moore's œsophagoscope, (*a*) handle.
(20) Negus' œsophagoscope.
(21) Amethocaine spray on rest. (22) Light cable.

If a general anæsthetic is given a gag should be provided.



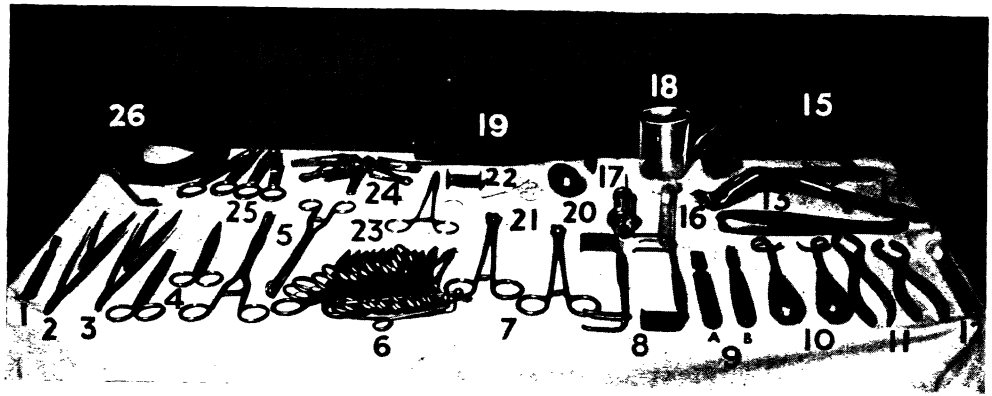
BRONCHOSCOPY

(1) De Vilbiss spray for local anæsthetic.
(2) Non-toothed dissecting forceps.
(3) Round-ended scissors.
(4) Lack's tongue depressor.

(5) Six towel clips.
(6) Glass measure containing local anæsthetic, *e.g.* amethocaine 2 per cent.
(7) Tall jar containing hot water for telescopes.
(8) Beaker for lubricant.
(9) 20 c.c. record syringe for aspiration.
(10) Small bronchoscope mops in bundles of ten on a safety pin.
(11) Test tube for specimen.
(12) Mop-holder.
(13) (*a*) and (*b*) telescopes.
(14) Suction tube with gum-elastic terminal.
(15) Light carrier.
(16) Jackson's bronchoscope.
(17) Biopsy forceps.
(18) Long punch forceps.
(19) Amethocaine spray. (20) Light cable.

A laryngoscope may be needed.

If a general anæsthetic is used a gag should be provided.



THORACOTOMY FOR DRAINAGE OF AN EMPYEMA

(1) Bard-Parker knife.
(2) Two pairs of toothed dissecting forceps.
(3) Two non-toothed dissecting forceps.
(4) Scissors, round-ended and Mayo's.

(5) Two sponge-holding forceps.

(6) One dozen Spencer Wells' artery forceps.

(7) Two Lane's tissue forceps, 7-inch.

(8) Two Czerny's retractors.

(9) Two Faraboeuf's rugines, (*a*) straight, (*b*) curved.

(10) Two Doyen's rib raspatories, right and left.

(11) Two Ferguson's lion bone-holding forceps.

(12) Culture tube.

(13) Rongeur forceps. (14) Bone cutters, or rib shears.

(15) Tuffier's rib spreader, a self-retaining retractor may be used.

(16) A test tube for pus.

(17) Record syringe and exploring needle.

(18) Mastic and paint brush.

(19) Tudor Edwards' empyema drainage tube, a self-retaining catheter or stout rubber drainage tubing may be used.

(20) Ligature egg. (21) Skin sutures. (22) Catgut.

(23) Needle-holder. (24) Six towel clips.

(25) Four Doyen's skin forceps.

(26) Suction connection and nozzle.

N.B.—For drainage of an empyema in a child intercostal drainage with a trocar, canula and self-retaining Malecot's catheter may be used.

THORACOSCOPY

Thoracoscope, consisting of stout trocar and canula, telescopes and cauteries.
Two toothed dissecting forceps.
One non-toothed dissecting forceps.
Fine scalpel.
Six towel clips.
Scissors, round-ended.
Sponge-holding forceps.
Suction connection and long fine nozzle.
Diathermy.
Skin needles and thread.
Tall jar containing hot water for telescopes.
Instruments for thoracotomy should be in readiness.
A local anæsthetic is commonly used and a long fine needle should be included.

EXTRA-PLEURAL PNEUMOTHORAX

General instruments with the addition of :
Four Moynihan's gall-bladder forceps.
Self-retaining retractor.
Rongeur forceps.
Bone-cutting forceps or rib shears.
Gouging forceps.
Rib raspatories.
Ferguson's lion forceps.
Four extra long Spencer Wells' artery forceps, 8-inch.
Long curved scissors.
20 c.c. record syringe and exploring needle.
Malleable light and cable.
Catgut thread and needles.
Artificial pneumothorax apparatus.

THORACOPLASTY

General instruments with addition of :
Rib raspatories.
Bone cutters or rib shears.
Rongeur forceps.
Lion bone-holding forceps.
Scapula retractor.
Suction nozzle and connection
Diathermy.

LOBECTOMY AND PNEUMONECTOMY

General instruments with the addition of :
Fully curved aneurysm needle.
Self-retaining retractor.
Long scissors; 8-inch.
Four long Spencer Wells' artery forceps, 8-inch.

Six gall-bladder clamps.
Two deep retractors.
Rugines.
Rib raspatories.
Bone-cutting forceps or rib shears.
Rongeur forceps.
Bone-holding forceps.
Rib approximator.
Blunt dissector.
Lung tourniquet.
Lung dissecting forceps.
Duval's lung-holding forceps.
Malleable light and cable.
40-day catgut, 3 and 4.
Chinese twist No. 5 or thread No. 18 may be used for tying the bronchus.
Atraumatic sutures.
Ligatures, skin sutures.
Curved round-bodied and triangular needles.
Diathermy.
Extra suction apparatus on the anæsthetist's trolley.
Artificial pneumothorax apparatus.
Bronchoscope may be needed.
Apparatus for intravenous saline or blood infusion should be prepared.

DRAINING A PERICARDIAL EFFUSION

Instruments as for thoracotomy.

OPERATIONS ON THE BREAST

Opening a Breast Abscess.

Bard-Parker knife or scalpel.
Scissors.
Two toothed dissecting forceps.
Two non-toothed dissecting forceps.
Sinus forceps.
Probe.
Four towel clips.
Sponge forceps.
Six Spencer Wells' artery forceps.
Drainage tubing and safety pin.
Culture tube.
Record syringe and exploring needle.

Simple Amputation of the Breast or Removal of an Adenoma

General instruments except for large retractors.

Radical Mastectomy for Malignant Disease

General instruments with the addition of :
Four extra Lane's tissue forceps, 7-inch.
Diathermy may be used.
Skin grafting may be required.

CHAPTER XII

OPERATIONS ON THE ABDOMEN

LAPAROTOMY

The illustration shows the instruments needed for laparotomy for such conditions as strangulated hernia, intussusception, volvulus or other cases of intestinal obstruction and perforation, including penetrating wounds of the abdomen.

(1) Two Bard-Parker knives.

(2) Two toothed dissecting forceps, 5-inch.

(3) One non-toothed dissecting forceps, 7-inch. (4) Two non-toothed forceps, 5-inch.

(5) (*a*) Mayo's straight scissors; (*b*) Round-ended scissors; (*c*) Mayo's curved scissors, 8-inch.

(6) One dozen Spencer Wells' artery forceps, more may be needed
(7) Two Czerny's square-ended retractors.
(8) Two Lane's tissue forceps.
(9) Two Key's hernia directors.
(10) Non-clip sponge forceps.
(11) Six Allis' tissue forceps.
(12) Two straight intestinal clasps.
(13) Two curved intestinal clamps.
(14) Suction connection and nozzle.
(15) Two Payr's crushing clamps.
(16) Catgut tube breakers. (17) Atraumatic suture.
(18) Needle-holder. (19) Round-bodied needles.
(20) Ligature egg and spool of catgut.
(21) Triangular needles and silkworm gut sutures for the skin.
(22) Jaques' rubber catheter, size 12 or 14.
(23) Sinus forceps.
(24) Corrugated rubber drain and safety pin.
(25) Six Doyen's skin clips.
(26) Six towel clips.
(27) Sponge-holding forceps.
N.B.—A deep abdominal retractor may be needed.

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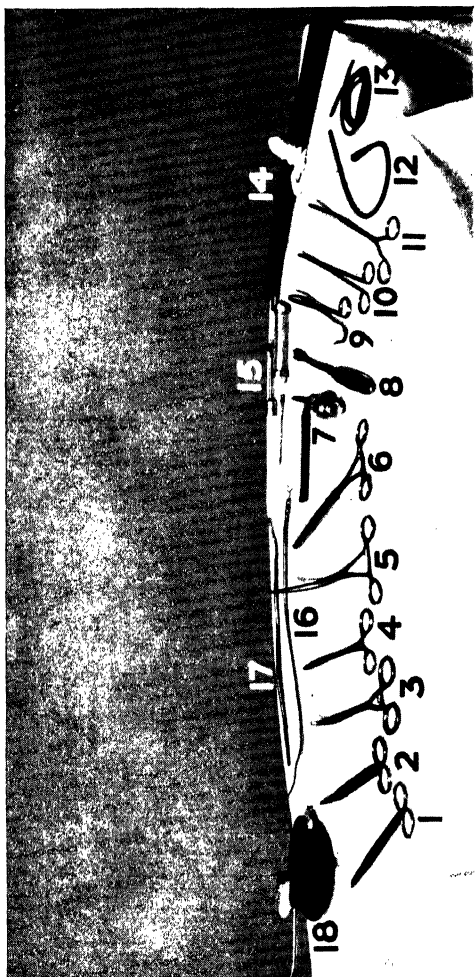


OPERATIONS ON THE GALL-BLADDER AND BILE DUCTS

Cholecystotomy, Cholecystectomy, Choledochotomy, Cholecystgastrostomy and Cholecystenterostomy

The illustration shows the instruments required in addition to the general set:

(1) Long straight scissors, 8-inch. (2) Mayo's curved scissors, 8-inch.
(3) Moynihan's gall-bladder forceps, six required.
(4) Long straight Spencer Wells' artery forceps, 8-inch, four required.
(5) Doyen's curved intestinal clamp, two required.
(6) Doyen's straight intestinal clamp, two required. 7. Trocar and canula.
(8) Gallstone scoop.
(9) Lithotomy forceps.
(10) Thompson-Walker's stone forceps.
(11) Desjardin's fenestrated stone forceps.
(12) Jaques' rubber catheter, size 8 or 10.
(13) Fine rubber tubing for draining the common bile duct, a T-tube may be used.
(14) Gum-elastic bougies, sizes 5 to 16, for exploring the bile duct.
(15) 10 c.c. syringe and exploring needle, $21 \times 3\frac{3}{8}$.
(16) Malleable probe-ended scoop.
(17) Flexible probe.
(18) Suction connection and nozzle.

Extra tissue forceps in addition to those on the general tray may be needed.

DRAINING INTRA-PERITONEAL ABSCESS

Subphrenic Abscess

General instruments with the addition of :

Deep retractors.

Farabœuf's rugines.

Rib shears or bone-cutting forceps.

Rongeur forceps.

Rib raspatories.

Lion bone-holding forceps.

Drainage tubing.

Suction connection and nozzle.

Pelvic Abscess

General instruments.

Drainage tubing.

Suction connection and nozzle.

SPLENECTOMY

General instruments.

Deep retractors.

Long Mayo's scissors.

Fully curved aneurysm needle.

Six Moynihan's gall-bladder forceps.

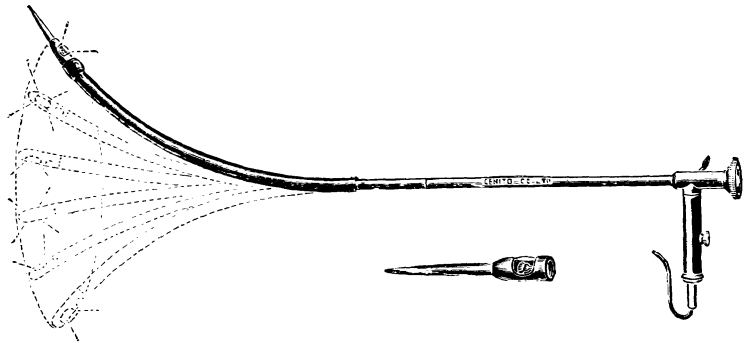
Four long Spencer Wells' artery forceps.

Suction connection and nozzle.

Blood transfusion may be needed.

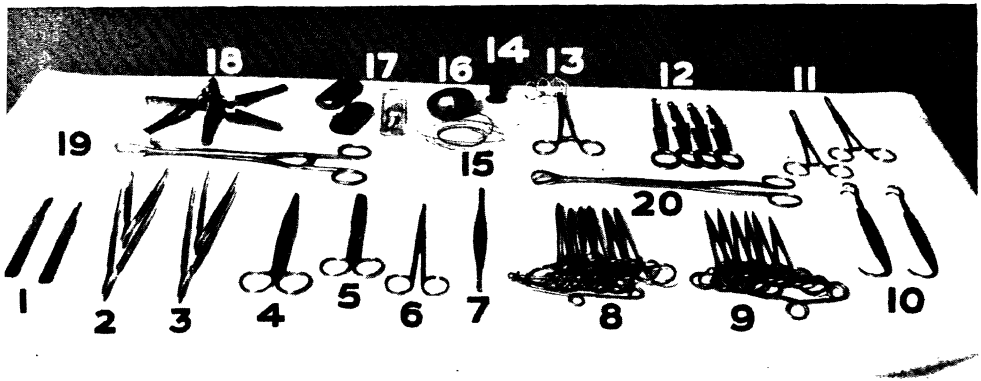
PANCREATIC CYST OR ACUTE PANCREATITIS

General instruments with the addition of those listed under "Operations on the Gall-bladder," p. 117.



GASTROSCOPY

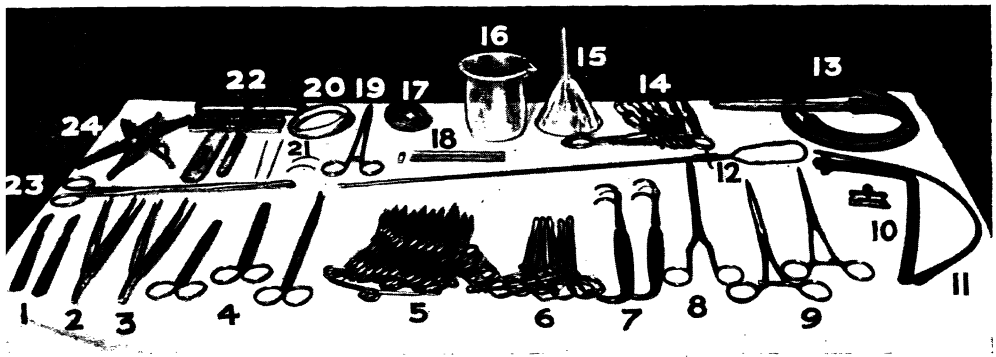
Flexible gastroscope and cable. Œsophageal bougies.
Œsophageal tube, size 16 or 18. Tudor Edwards' syringe and canula.
Gag. Tongue depressor. Tongue clip.
Tall jar containing hot water. Lubricant.
De Vilbiss spray and local anæsthetic, *e.g.* amethocaine 2 per cent.



RAMMSTEDT'S OPERATION FOR CONGENITAL PYLORIC STENOSIS

(1) Two Bard-Parker knives.
(2) Two toothed dissecting forceps.
(3) Two non-toothed dissecting forceps.
(4) Mayo's pointed scissors.

(5) Round-ended scissors.
(6) Sinus forceps.
(7) Blunt dissector.
(8) Six curved Spencer Well's artery forceps.
(9) Six straight Spencer Wells' artery forceps.
(10) Two small Pollard's retractors.
(11) Two Allis' tissue forceps.
(12) Four Doyen's skin forceps.
(13) Needle-holder with round-bodied needle and catgut suture.
(14) Spool of catgut.
(15) Horsehair suture for skin and straight triangular needle.
(16) Ligature egg.
(17) Tubed atraumatic suture and tube breakers.
(18) Six towel clips.
(19) Sponge forceps.



GASTROSTOMY

(1) Two Bard-Parker knives.
(2) Two toothed dissecting forceps.
(3) Two non-toothed dissecting forceps.
(4) Three pairs of scissors, Mayo's straight, round-ended and Mayo's curved 8-inch.
(5) One dozen Spencer Wells' artery forceps.
(6) Six Allis' tissue forceps.

(7) Two Pollard's retractors.

(8) Non-clip sponge forceps.

(9) Two straight intestinal clamps.

(10) De Pezzer self-retaining catheter, size 20, and clip.

(11) Jaques' rubber catheter, size 12 (an alternative to the self-retaining catheter).

(12) Catheter introducer.

(13) Suction connection and nozzle.

(14) Six Doyen's skin forceps.

(15) Glass funnel to fit the catheter.

(16) Beaker containing sterile water. Water is usually poured down the tube after it has been inserted to test the efficiency of the opening.

(17) Ligature egg.

(18) Corrugated rubber for superficial drainage and safety pin.

(19) Needle-holder.

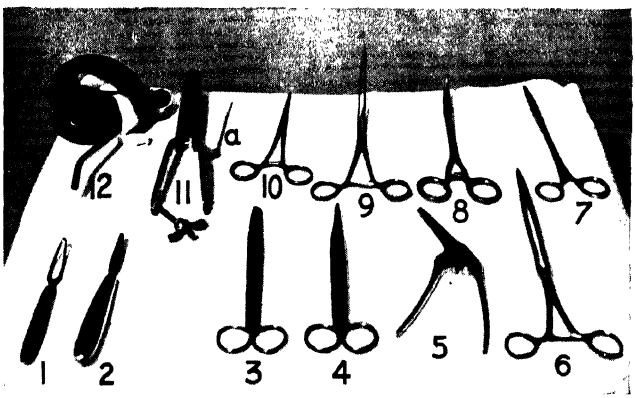
(20) Silkworm gut.

(21) Round-bodied curved needles and straight triangular needles.

(22) Tubes of catgut and tube breakers.

(23) Sponge forceps.

(24) Six towel clips.



GASTRECTOMY AND GASTRO-ENTEROSTOMY

The instruments illustrated will be needed in addition to those on the general tray :

(1) Kocher's fenestrated enucleator.

(2) Kocher's plain enucleator.

(3) Mayo's straight scissors, 8-inch.

(4) Mayo's pointed scissors, 8-inch.

(5) Payr's crushing clamp, two large and two small clamps will be needed.

(6) Doyen's straight intestinal clamp, two required.

(7) Long Spencer Wells' artery forceps, four needed.

(8) Moynihan's gall-bladder forceps, six needed.

(9) Doyen's curved intestinal clamp, two needed.

(10) Pringle's clamp, four required.

(11) Furness' clamp and (*a*) pin for clamp.

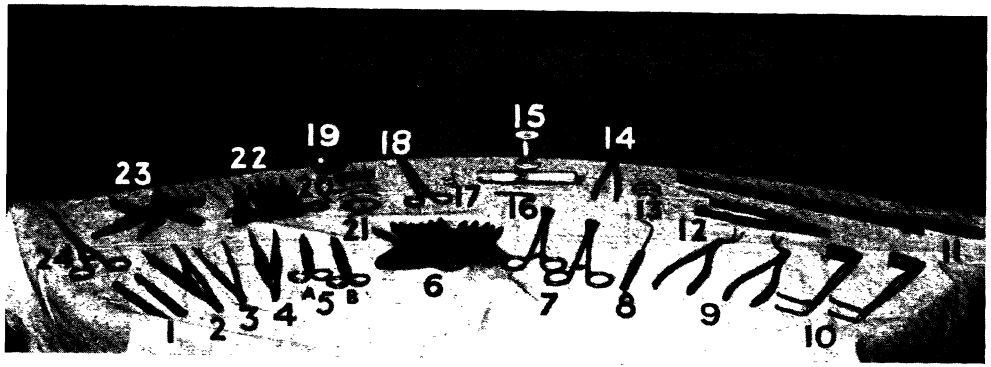
(12) Suction connection and nozzle.

Diathermy may be used.

For suturing the stomach atraumatic sutures are commonly used.

After the anastomosis is completed a trolley with fresh mackintoshes, towels, instruments, needles and sutures for completing the operation is often needed. The surgeon and all assistants will then put on fresh sterile gloves.

NOTES

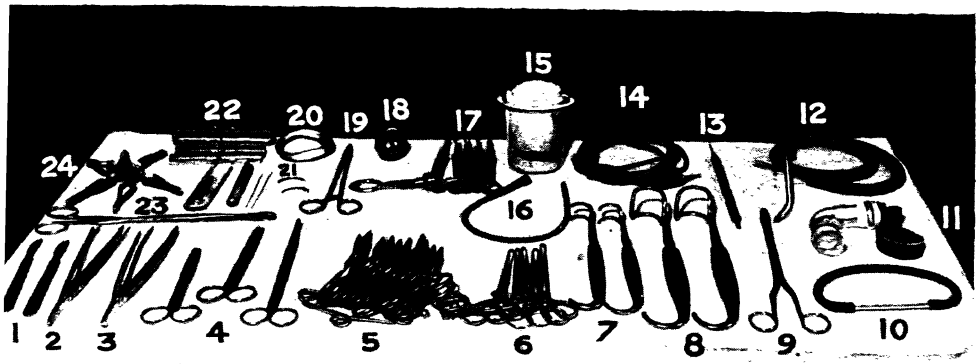


OPERATIONS FOR THE REPAIR OF HERNIA

(1) Two Bard-Parker knives.
(2) Two toothed dissecting forceps.
(3) Long non-toothed dissecting forceps, 7-inch.
(4) Two non-toothed dissecting forceps, 5-inch.
(5) (*a*) Mayo's scissors ; (*b*) round-ended scissors.

(6) One dozen Spencer Wells' artery forceps, more may be needed.
(7) Two Lane's tissue forceps.
(8) Liston's hernia needle.
*(9) Two Moseley's fascia forceps, right and left.
(10) Two double-ended retractors.
*(11) Rowland's fascia stripper.
*(12) Rowland's fascia forceps.
*(13) Gallie's needles for living sutures.
*(14) Holding forceps for Gallie's needles.
(15) Silk thread.
(16) Floss silk and file for tube.
(17) Symond's fish-hook needles.
(18) Needle-holder and catgut suture.
(19) Ligature egg.
(20) Spool of catgut.
(21) Triangular needles and silkworm gut skin sutures.
(22) Six Doyen's skin forceps.
(23) Six towel clips.
(24) Sponge forceps.

* These instruments will only be needed if fascia strips from the thigh are used for "living sutures."



COLOSTOMY AND CÆCOSTOMY

(1) Two Bard-Parker knives.
(2) Two toothed dissecting forceps.
(3) Two non-toothed dissecting forceps.
(4) Scissors, Mayo's straight, round-ended and curved 8-inch.

(5) One dozen Spencer Wells' artery forceps, more may be required.
(6) Six Allis' tissue forceps.
(7) Two small Pollard's retractors.
(8) Two large Pollard's retractors.
(9) Non-clip sponge-holding forceps.
(10) Glass rod and tubing, to keep the loop of intestine outside the abdomen.
(11) Paul's glass tube and rubber drainage tube for colostomy.
(12) Suction connection and nozzle.
(13) Diathermy needle.
(14) Diathermy lead.
(15) Vaselined gauze roll.
(16) Jaques' rubber catheter, 12 or 14, for cæcostomy drainage.
(17) Six Doyen's skin forceps.
(18) Ligature egg.
(19) Needle-holder.
(20) Silkworm gut.
(21) Round-bodied needles and triangular skin needles.
(22) Catgut tube breakers, tubed catgut and atraumatic suture.
(23) Sponge forceps.
(24) Six towel clips.

APPENDICECTOMY

General instruments with the addition of :
Four Moynihan's gall-bladder forceps.
Two deep retractors.
Suction nozzle and connection.
Straight and curved Doyen's intestinal clamps may be needed. If the diagnosis is in doubt the instruments listed under " Laparotomy " should be prepared.

APPENDICOSTOMY

General instruments with the addition of :
Jaques' rubber catheters, size 8 and 10, or De Pezzer's self-retaining catheters, size 18 or 20.
Catheter introducer.
Tubing clip.

SIGMOIDOSCOPY

Sigmoidoscope.
Junker's bellows.
Scissors.
Three towel clips.
Long dissecting forceps, 7-inch.
" Alligator " swab-holding forceps.
Mops in chloroxylenol, 1–20.
Vaselined swab.
Test tube.

HÆMORRHOIDECTOMY

Rectal speculum, Kelly's or bi-valve.
Bard-Parker knife or scalpel.
Two pairs of toothed dissecting forceps.
Two non-toothed dissecting forceps.
Scissors, round-ended and curved.
One dozen Spencer-Wells' artery forceps.
Six towel clips.
Sponge-holding forceps.
Aneurysm needle.
Six pile clamps, or Kocher's clamp forceps.
Needle-holder.
Curved round-bodied and triangular needles.
Thread, catgut and strong silk.
Stout rubber tube.

FISTULA-IN-ANO

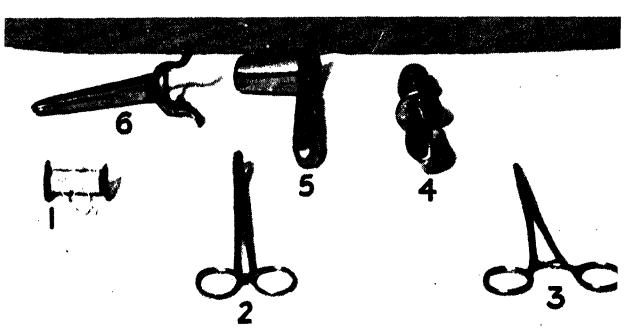
Six towel clips.
Bard-Parker knife or scalpel.

Two toothed dissecting forceps.
Two non-toothed dissecting forceps.
Scissors, round-ended and curved.
Kelly's protoscope or bi-valve speculum.
Probe.
Probe-ended director.
Small retractors.
Sinus forceps.
Long dressing forceps.
Sponge forceps.
Double-ended spoon.
Vaselined gauze roll.
Pile clamps may be required.

ANAL FISSURE

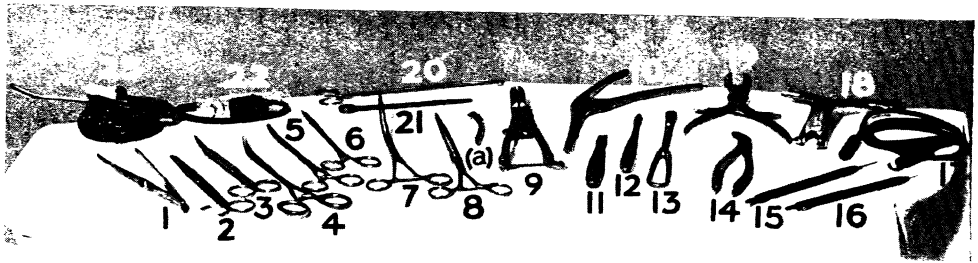
Instruments as for fistula-in-ano.

Removal of piles may be done at the same time, and these instruments should be provided.



Some Instruments Used in Hæmorrhoidectomy

(1) Stout silk thread.
(2) Pile clamps.
(3) Kocher's clamp forceps.
(4) Obturator of Kelly's protoscope.
(5) Kelly's protoscope.
(6) Bi-valve rectal speculum.



ABDOMINO-PERINEAL EXCISION OF THE RECTUM

The illustration shows the instruments that will be needed in addition to those on the general tray:

(1) Lane's long dissecting forceps, 10-inch.
(2) Long straight scissors, 8-inch.
(3) Mayo's curved scissors, 8-inch.
(4) Moynihan's gall-bladder forceps, six required.
(5) Kocher's curved artery forceps, six required.
(6) Spencer Wells' long artery forceps, 8-inch, four required.
(7) Doyen's curved intestinal clamp, two required.
(8) Doyen's straight intestinal clamp, two required.

(9) Miles' crushing clamp, (*a*) lever for clamp.
(10) Large Payr's crushing clamp.
(11) Faraboeuf's rugine. (12) Langenbeck's elevator.
(13) Lane's elevator.
(14) Trotter's rongeur forceps.
(15) Straight diathermy needle.
(16) Curved diathermy needle.
(17) Diathermy lead.
(18) Key's bone-cutting forceps.
(19) Semb's bone-gouging forceps.
(20) Vulsellum forceps, needed for female patient.
(21) Wyndham Powell's straight steel urethral sound, needed for male patient. (Gum-elastic bougies may be used in place of urethral sound.)
(22) Glass rod and tubing, Paul's glass colostomy tube and rubber tubing.
(23) Suction connection and nozzle.

N.B.—Doyen's abdominal retractor may be needed in addition to the retractors on the general tray.

Two trolleys may be laid, one for the abdominal part of the operation and the second for the perineal removal of the rectum. Both steps of the operation may be performed simultaneously by two teams.

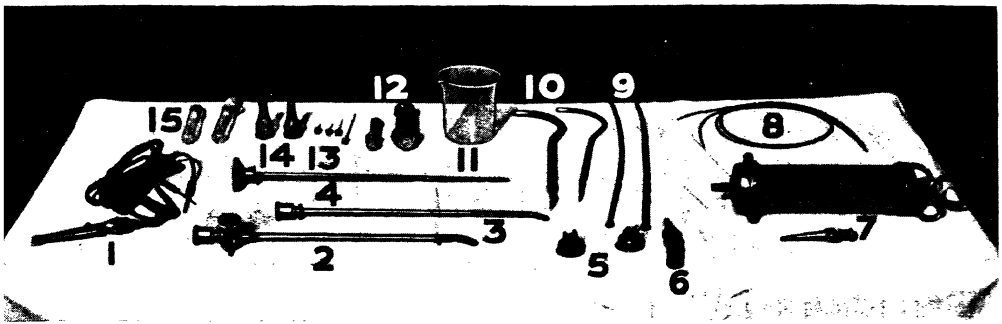
CHAPTER XIII

OPERATIONS ON THE GENITO-URINARY TRACT

CATHETERS, BOUGIES AND SOUNDS

(1) Gum-elastic catheter, fine tapering end.
(2) Gum-elastic catheter, olive-ended.
(3) Gum-elastic catheter, cylindrical.
(4) Gum-elastic catheter, coudée.

(5) Gum-elastic catheter, bi-couée.
(6) Jaques' rubber catheter.
(7) Silver catheter.
(8) Beniqué's metal prostatic catheter.
(9) Spigot.
(10) Introducer for self-retaining catheter.
(11) Malecot's self-retaining catheter.
(12) De Pezzer's self-retaining catheter.
(13) Winsbury-White's self-retaining catheter.
(14) Gum-elastic bougies, tapering, cylindrical and olive-ended.
(15) Filiform gum-elastic bougies.
(16) Lister's steel bladder sounds.
(17) Beniqué's sounds.
(18) Wyndham Powell's straight steel sounds.



CYSTOSCOPY, URETERIC CATHETERISATION AND RETROGRADE PYELOGRAPHY

(1) Lead and connection for cystoscopy.
(2) Catheterising sheath of Wolff's cystoscope.
(3) Examining sheath of cystoscope.
(4) Telescope of cystoscope.
(5) Valve.

(6) Spigot and connection for irrigator.

(7) Bladder syringe.

(8) Ureteric catheters.

(9) Gum-elastic bougies.

(10) Beniqué's sounds.

(11) Beaker for urine.

(12) 10 c.c. syringe for injection of indigo-carmine and 2 c.c. syringe for syringing through ureteric catheters.

(13) Needles for intravenous injection and two needles to fit ureteric catheters.

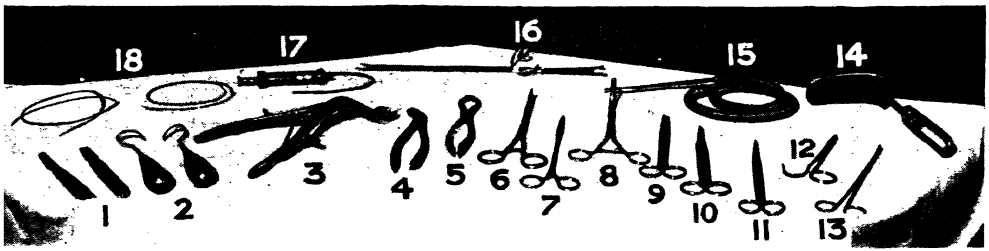
(14) Two rubber teats.

(15) Two test tubes.

The teats are attached to the test tubes, the ureteric catheters are passed through the holes in the teats to drain into the tubes.

Sterile water at a temperature of 105° F. is commonly used for syringing the bladder.

For pyelography sodium iodide solution, 15 per cent. or 30 per cent., is used, for the dye excretion test 10 c.c. of 0·4 per cent. indigo-carmine is required.

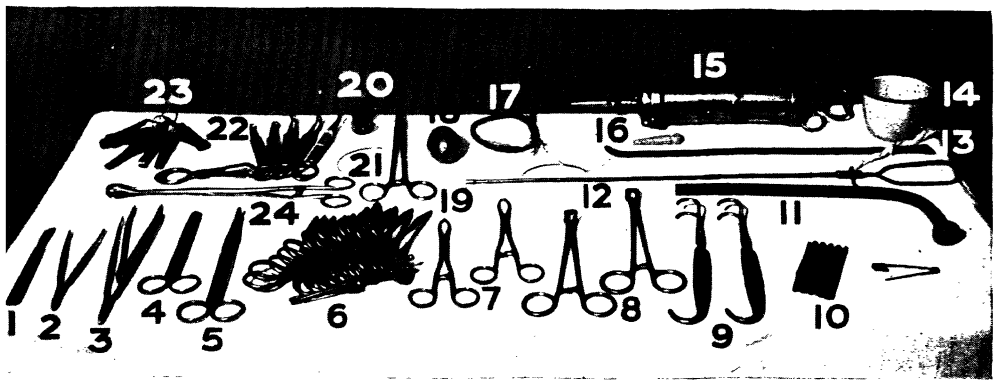


OPERATIONS ON THE KIDNEY AND URETERS, NEPHROTOMY, NEPHROLITHOTOMY, NEPHRECTOMY, NEPHROSTOMY AND URETERO-LITHOTOMY

For these operations general instruments with the addition of those shown above will be required. For nephrostomy a self-retaining catheter should be included.

(1) Two Farabœuf's rugines, curved and straight.
(2) Two Doyen's raspatories, right and left.
(3) Key's bone-cutting forceps (or rib shears).
(4) Trotter's rongeur forceps.
(5) Ferguson's lion bone-holding forceps.

(6) Gall-bladder forceps, six required.
(7) Long Spencer Wells' artery forceps, four required.
(8) Renal pedicle clamps, two required.
(9) Round-ended scissors, 8-inch.
(10) Curved Mayo's scissors, 8-inch.
(11) Pointed Mayo's scissors, 8-inch.
(12) Lithotomy forceps.
(13) Thompson-Walker's stone forceps.
(14) Deep abdominal retractor.
(15) Suction connection and nozzle.
(16) Fine bougies (sizes 5 to 10) for exploring ureter.
(17) 10 c.c. syringe and fine rubber catheter, size 4 or 6.
(18) Two ureteric catheters.



SUPRA-PUBIC CYSTOSTOMY

(1) Bard-Parker knife.
(2) Toothed dissecting forceps.
(3) Two non-toothed dissecting forceps, 5-inch and 7-inch.
(4) Round-ended scissors.
(5) Mayo's scissors, 8-inch.

(6) One dozen Spencer Wells' artery forceps.

(7) Two pairs of Skivington's or Littlewood's tissue forceps.

(8) Two pairs of Lane's tissue forceps.

(9) Two Pollard's retractors.

(10) Corrugated rubber drain and pin.

(11) De Pezzer self-retaining rubber catheter, size 28–32.

(12) Catheter introducer.

(13) Gum-elastic catheter, size 18 French gauge (introduced per urethra for the purpose of filling the bladder).

(14) Gallipot with catheter lubricant.

(15) Bladder syringe.

(16) Spigot to fit the end of the gum-elastic catheter.

(17) Silkworm gut and curved triangular needle.

(18) Ligature egg.

(19) Needle-holder. (20) Spool of catgut.

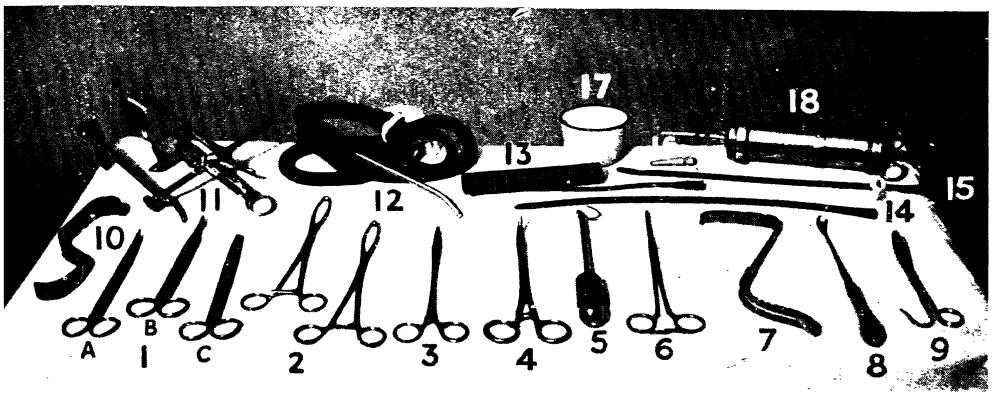
(21) Round-bodied needles.

(22) Six Doyen's skin clips.

(23) Six towel clips.

(24) Sponge-holding forceps.

N.B.—Cystostomy may be carried out by means of a bladder trocar and canula, *e.g.* Kidd's trocar, inserted through a small supra-pubic stab wound.



SUPRA-PUBIC PROSTATECTOMY

In addition to the general set of instruments those shown in the above illustration will be required:

(1) (*a*) Mayo's curved scissors, 8-inch;
(*b*) Mayo's pointed scissors, 8-inch;
(*c*) Round-ended scissors, 8-inch.

(2) Two Skivington's tissue forceps (straight vulsellum forceps may be used).

(3) Long Spencer Wells' artery forceps, four required.

(4) Moynihan's gall-bladder forceps, six required.

(5) Harris' boomerang needle.

(6) Harris' suture-holding forceps.

(7) Harris' retractor. These last three instruments will not be required for simple enucleation of the prostrate gland, but will be needed if the operation includes reconstruction of the prostratic bed.

(8) Lithotomy scoop.

(9) Lithotomy forceps.

(10) Anterior blade of Thompson-Walker's retractor.

(11) Thomson-Walker's self-retaining bladder retractor.

(12) Suction connection and nozzle.

(13) Marion's supra-pubic drainage tube (a piece of stout rubber tubing or a self-retaining catheter may be used).

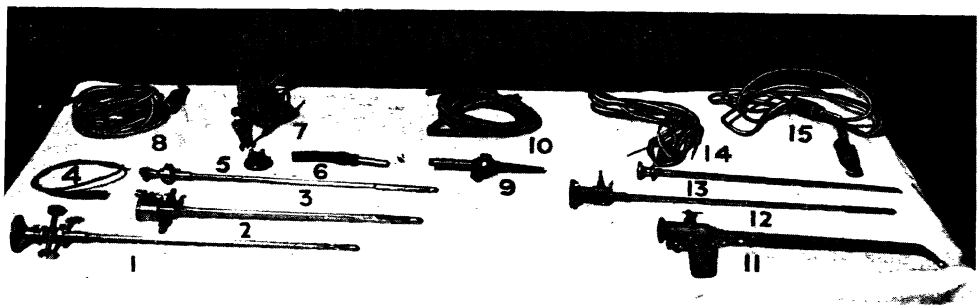
(14) Jaques' rubber catheter, size 12 or 14.

(15) Gum-elastic catheter, size 21 French gauge.

(16) Wooden spigot.

(17) Catheter lubricant.

(18) Bladder syringe.



FULGURATION OF THE BLADDER FOR PAPILLOMA OR MALIGNANT DISEASE

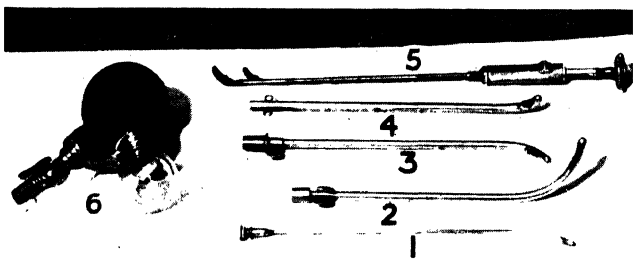
An operating cystoscope and Kidd's diathermy cystoscope are shown.

(1) Telescope of operating cystoscope.
(2) Sheath of operating cystoscope.
(3) Obturator of operating cystoscope.
(4) Diathermy electrode.
(5) Valve.

(6) Spigot.
(7) Lead for cystoscope light.
(8) Diathermy lead.
(9) Canny Ryall's irrigation connection.
(10) Tubing to connect irrigator.
(11) Sheath of Kidd's diathermy cystoscope.
(12) Telescope.
(13) Obturator.
(14) Lead for cystoscope.
(15) Diathermy lead.

For irrigation sterile water at a temperature of 105° F. will be needed.

For diathermy resection of the prostrate gland a special instrument known as a " resectotome " or " prostatic electrotome " is used.



LITHOLAPAXY (LITHOTRITY)

An examining cystoscope, a set of bladder sounds, *e.g.* Beniequé's, a bladder syringe and sterile water for irrigation will be needed in addition to the lithotrite and accessories shown in the picture.

(1) Introducer.

(2), (3) and (4) Evacuating canulæ.

(5) Lithotrite.

(6) Evacuator, Freyer's or Bigelow's

CIRCUMCISION

Scalpel or Bard-Parker knife.

Two pairs of scissors.

Two dissecting forceps, toothed and non-toothed.

Six fine Spencer Wells' artery forceps.

Sinus forceps.

Probe.

Fine curved triangular needles.

Catgut 3/o.

Dressing of Liquid Paraffin or Tinct. Benzoini Co.

AMPUTATION OF THE PENIS

General instruments except for large retractors with the addition of :

Gum-elastic bougies.

Jaques' rubber catheter, size 10 or 12.

N.B.—The operation is undertaken for malignant diseases of the penis and the inguinal glands may be removed at the same time.

ORCHIDECTOMY, EPIDIDYMECTOMY OR OPERATIONS FOR VARICOCELE

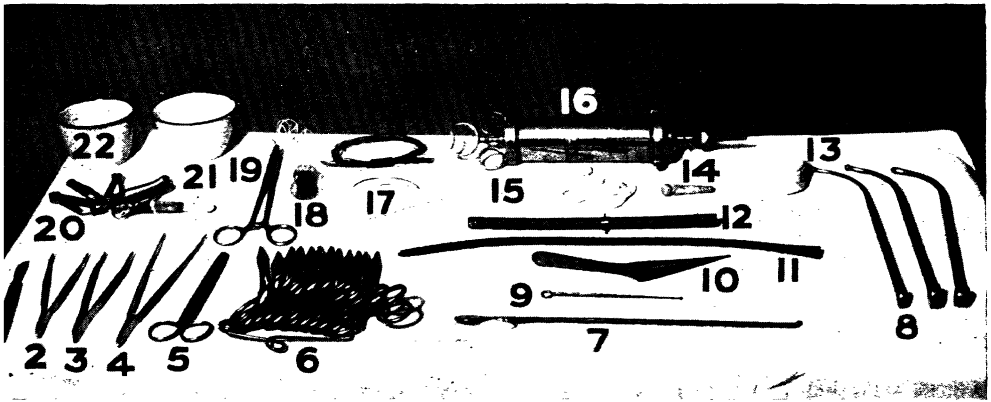
General instruments except for large retractors.

EXCISION OF HYDROCELE SAC

General dissecting instruments.

Small retractors.

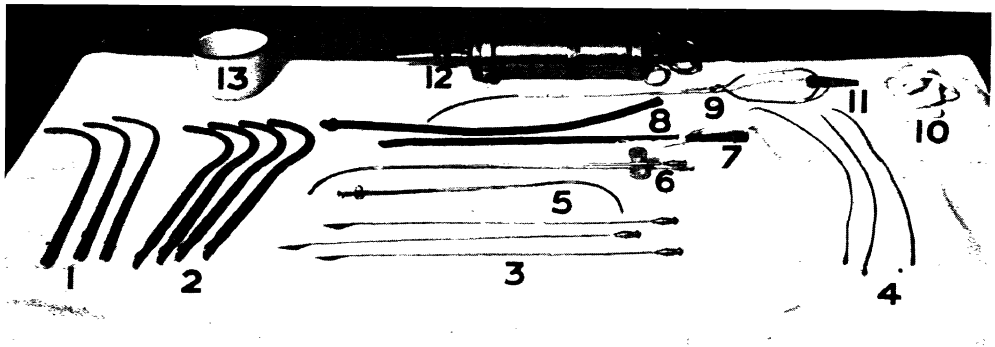
Tapping the collection of fluid is carried out by means of a hydrocele trocar and canula.



EXTERNAL URETHROTOMY, WHEELHOUSE'S OPERATION

(1) Bard-Parker knife.
(2) Non-toothed dissecting forceps, 5-inch.
(3) Non-toothed dissecting forceps, 5-inch.
(4) Non-toothed dissecting forceps, 7-inch.

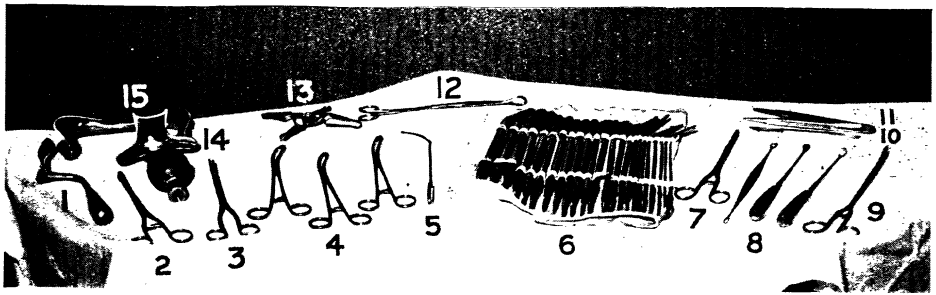
(5) Round-ended scissors.
(6) One dozen Spencer Wells' artery forceps.
(7) Wheelhouse's staff.
(8) Lister's steel sounds (a full set should be provided).
(9) Probe-pointed director.
(10) Teale's gorget.
(11) Jaques' rubber catheter, size 10 or 12.
(12) Harris' drainage tube.
(13) Roll of 1-inch ribbon gauze.
(14) Wooden spigot.
(15) Tape for tying catheter.
(16) Bladder syringe.
(17) Silkworm gut and curved triangular needles.
(18) Spool of catgut.
(19) Needle-holder, round-bodied needle and catgut.
(20) Six towel clips.
(21) Catheter lubricant.
(22) 1–1000 solution of flavine.



INTERNAL URETHROTOMY

(1) Silver catheters.
(2) Beniqué's sounds.
(3) Urethrotomy knives.
(4) Filiform bougies, the ends screw on to the guide marked (5).
(6) Grooved guide for urethrotomy knives.
(7) Gum-elastic catheter, size 21 French gauge.
(8) Malecot's self-retaining catheter, size 18.
(9) Catheter introducer.
(10) Tape (this may be used for tying in a urethral catheter).
(11) Wooden spigot.
(12) Bladder syringe.
(13) Catheter lubricant.

NOTES



DILATATION OF THE CERVIX AND UTERINE CURETTAGE

(1) Vaginal retractor.
(2) Sponge-holding forceps, this pair is discarded after the preliminary swabbing.
(3) Sponge-holding forceps, non-clip.
(4) Three vulsella forceps.
(5) Uterine sound.
(6) Set of Heywood Smith's cervical dilators.
(7) Oval-bladed forceps.

(8) Three uterine curettes.

(9) Long uterine dressing forceps.

(10) Small scalpel.

(11) Bonney's dressing forceps. These instruments are used for taking a biopsy specimen.

(12) Sponge-holding forceps.

(13) Four towel clips.

(14) Auvard's weighted vaginal speculum.

(15) Sim's vaginal speculum.

N.B.—In all gynæcological operations catheterisation is a necessary preliminary. In some hospitals this is done in the ward, possibly leaving the catheter to be removed in the theatre; in others the practice is to catheterise the patient on the theatre table. In any case sterile catheters should always be laid out ready for use.

EXAMINATIONS FOR PATENCY OF THE FALLOPIAN TUBES

Gas insufflation

Vaginal bayonet retractor.

Vaginal speculum, *e.g.* self-retaining or Sim's duckbill.

Four towel clips.

Two vulsella forceps.

Pint measure containing water at a temperature of 105° F.

The intra-uterine nozzle of the gas insufflation apparatus and the connecting tubing must be sterilised.

A stethoscope should be provided.

Injection of iodised oil, followed by X-ray examination (Salpingography)

Sponge forceps.

Vaginal retractor.

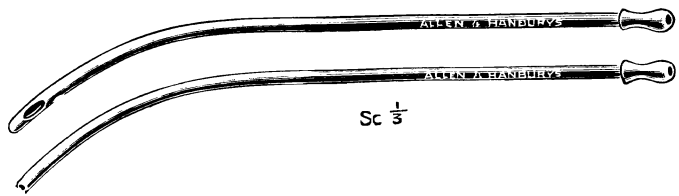
Vaginal speculum.

Four towel clips.

Two vulsella forceps.

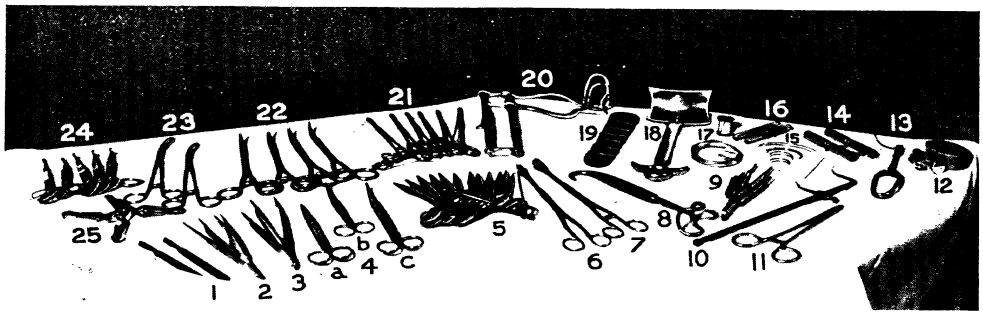
Special syringe for oil and intra-uterine nozzle, *e.g.* Fosdyke's, to fit syringe.

Container of iodised oil standing in a bowl of warm water.



Intra-uterine canulæ for injection of iodised oil.

Intra-uterine nozzle for gas insufflation.

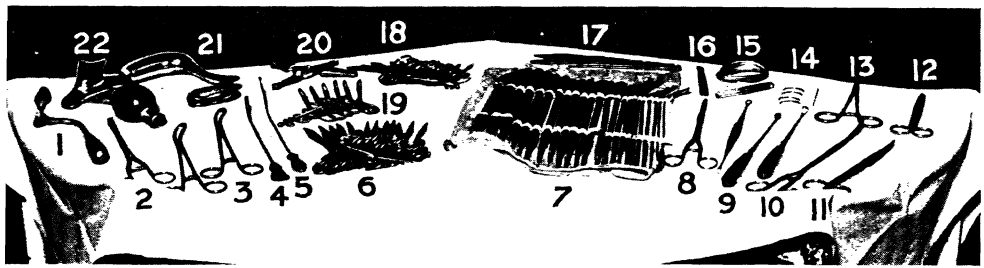


ABDOMINAL HYSTERECTOMY, OOPHORECTOMY, SALPINGECTOMY, MYOMECTOMY, OPERATIONS FOR SHORTENING THE ROUND LIGAMENTS, AND FOR RUPTURED ECTOPIC GESTATION

(1) Two Bard-Parker knives.
(2) Two non-toothed dissecting forceps.
(3) Two toothed dissecting forceps.
(4) (*a*) Straight Mayo's scissors.
(*b*) Curved Mayo's scissors.
(*c*) Long curved scissors, 8-inch.
(5) One dozen Spencer Wells' artery forceps (more may be required).

(6) Non-clip sponge forceps.
(7) Clip sponge forceps.
(8) Pollard's retractor.
(9) Skin clips and forceps.
(10) Skin stretcher.
(11) Needle-holder.
(12) Wristlet for ligature spool.
(13) Bonney's needle.
(14) Catgut tube breakers.
(15) Round-bodied and triangular needles.
(16) Catgut.
(17) Thread and silkworm gut.
(18) Doyen's deep abdominal retractor.
(19) Malleable copper spatula.
(20) Self-retaining abdominal retractor.
(21) Six pairs of Allis' tissue forceps.
(22) Four Moynihan's gall-bladder forceps.
(23) Two vulsella forceps.
(24) Six Doyen's skin forceps. (25) Six towel clips.

N.B.—For myomectomy a myomectomy screw and Bonney's myomectomy forceps may be required. Wertheim's and Bonney's clamps may be used in a Wertheim's hysterectomy. Gilliam's needles on handles are sometimes used in operations for shortening the round ligaments.

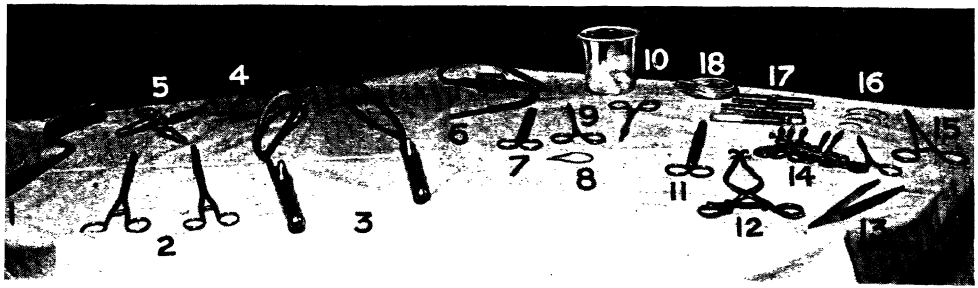


COLPORRHAPHY, PERINEORRHAPHY, PLASTIC OPERATIONS ON THE CERVIX, *i.e.* TRACHELORRHAPHY AND AMPUTATION OF THE CERVIX, VAGINAL HYSTERECTOMY AND VULVECTOMY

(1) Vaginal retractor.
(2) Sponge forceps, for preliminary swabbing.
(3) Two vulsella forceps.
(4) Bladder sound.
(5) Uterine sound.
(6) One dozen Spencer Wells' artery forceps, 5-inch.
(7) Set of Heywood Smith's cervical dilators.
(8) Second pair of sponge forceps.

(9) Three uterine curettes.
(10) Intra-uterine dressing forceps.
(11) Mayo's scissors, 8-inch.
(12) Round-ended scissors.
(13) Needle-holder.
(14) Curved needles, round-bodied and trocar pointed; straight triangular needles for stitching the sterile sheet to the vulva.
(15) Catgut and silkworm gut.
(16) Small Bard-Parker knife.
(17) Bonney's dissecting forceps.
(18) One dozen Spencer Wells' artery forceps, 7-inch.
(19) Six Allis' tissue forceps.
(20) Four towel clips.
(21) Sim's duckbill vaginal speculum.
(22) Auvard's weighted self-retaining vaginal speculum.

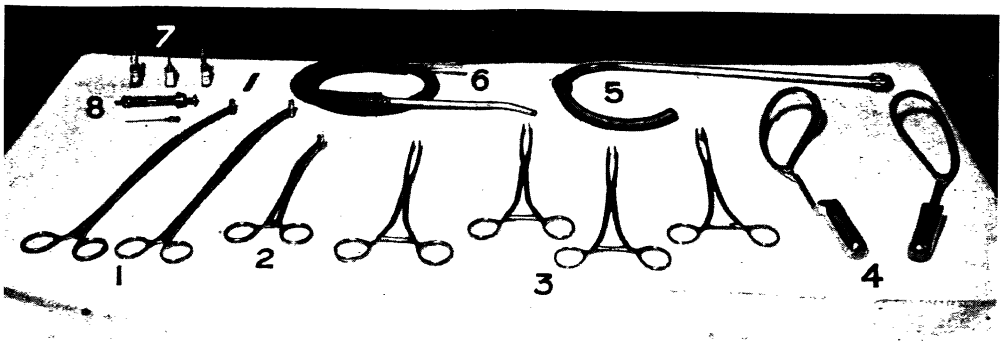
For cavitary irradiation in the radium treatment of carcinoma of the cervix, see p. 22.



FORCEPS DELIVERY, INSTRUMENTS FOR EPISIOTOMY AND FOR SUTURING THE PERINEUM

(1) Bayonet vaginal speculum.
(2) Two sponge-holding forceps.
(3) Midwifery forceps.
(4) Jaques' rubber catheter, size 8.
(5) Four towel clips.
(6) Mucus extractor.
(7) Round-ended scissors.

(8) Stout thread ligature for umbilical cord.
(9) Two pairs of Kocher's artery forceps for clamping the cord.
(10) Beaker with wool swabs and sterile water lotion for swabbing the infant's eyes.
(11) Mayo's scissors.
(12) Vaginal self-retaining retractor.
(13) Bonney's dissecting forceps.
(14) Six Spencer Wells' artery forceps.
(15) Mayo's needle-holder.
(16) Curved triangular needles.
(17) Catgut and tube breakers.
(18) Silkworm gut.



CÆSARIAN SECTION, LOWER SEGMENT OPERATION

For this operation the instruments for abdominal hysterectomy will be required in addition to the following :

(1) Two pairs of Willett's scalp forceps, long.

(2) One pair of Willett's scalp forceps, short.

(3) Four Green-Armytage's lower segment forceps.

(4) Wrigley's obstetric forceps.
(5) Suction tubing and special nozzle.
(6) Suction tubing and mucus extracting nozzle for infant.
(7) Ampoules containing pituitrin, ergometrine and lobelline.
(8) Record syringe and needles for injection of drugs.

ORTHOPÆDIC OPERATIONS

OPERATIVE TREATMENT OF FRACTURES

keletal traction using Kirschner's wire or Steinmann's pin

(1) Two Kirschner's wires.
(2) Drill for Kirschner's wire.
(3) Wire tightner.
(4) Wire cutters.

(5) Sponge-holding forceps.
(6) Tenotomy knife.
(7) Long dissecting forceps, non-toothed.
(8) Round-ended scissors.
(9) Steinmann's pin with collar (the pin shown has a nail head; Steinmann's pins are also made with a square end that fits an introducer).
(10) Stirrup for Steinmann's pin.
(11) Mallett.
(12) Cork and collar for sharp end of the pin.
(13) Screwdriver.
(14) Six towel clips.
(15) Gallipot containing flavine 1–1000 solution.
(16) Gauze roll.
(17) Syringe and needles for local anæsthetic.
(18) Beaker containing local anæsthetic.
(19) Wire extractors.
(20) Pliers.
(21) Horseshoe stirrup and hooks for Kirschner's wire.
(22) Spanner for tightening nuts on the stirrup.

Nailing operation for fractures of the neck of the femur

Two Bard-Parker knives.

Two sponge-holding forceps.

Toothed and non-toothed dissecting forceps, 5-inch and 7-inch.

Two pairs of scissors.

One dozen Spencer Wells' artery forceps.

Two medium retractors, *e.g.* Pollard's.

Small gouge or tri-fin osteotome for use as a "nail starter."

Mallet.

Rugine.

Guide pins.

Introducer for guide pin.

A drill guide and direction finder may be used.

Metal rule.

Punch.

Watson Jones' nail.

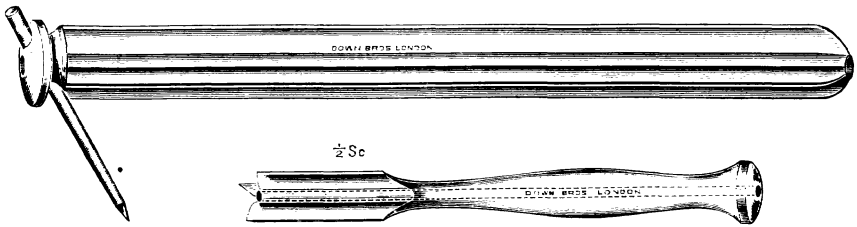
Nail extractor.

Needle-holder.

Skin sutures and needles.

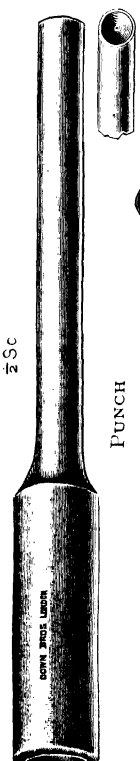
Skin clips.

WATSON JONES' NAIL WITH LATERAL PIN

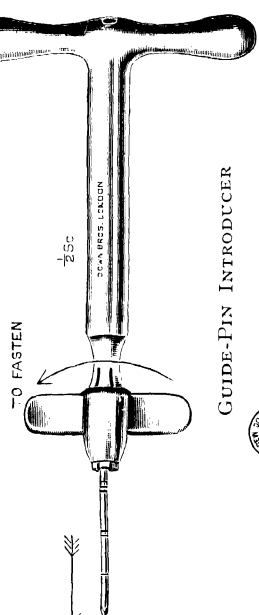


TRI-FIN OSTEOTOME

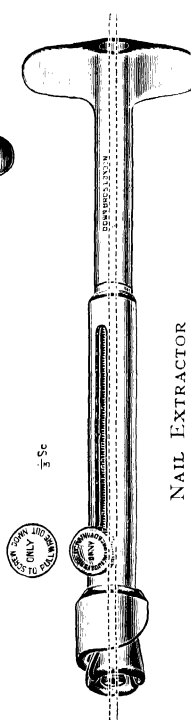
GUIDE PINS



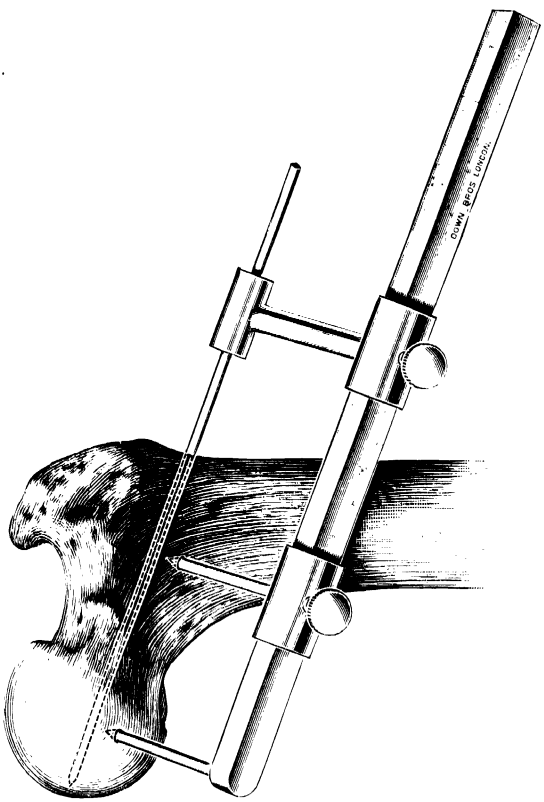
PUNCH



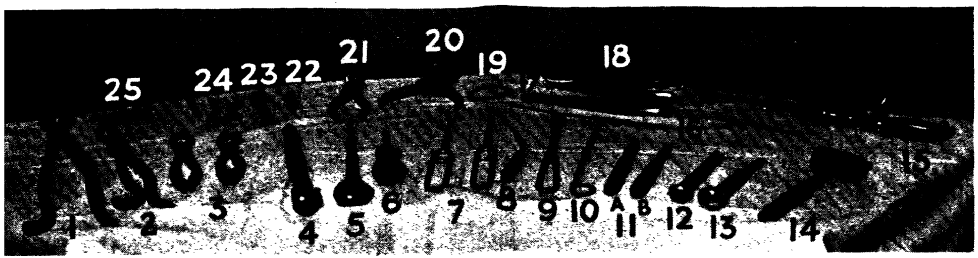
GUIDE-PIN INTRODUCER



NAIL EXTRACTOR



DRILL GUIDE AND DIRECTION FINDER



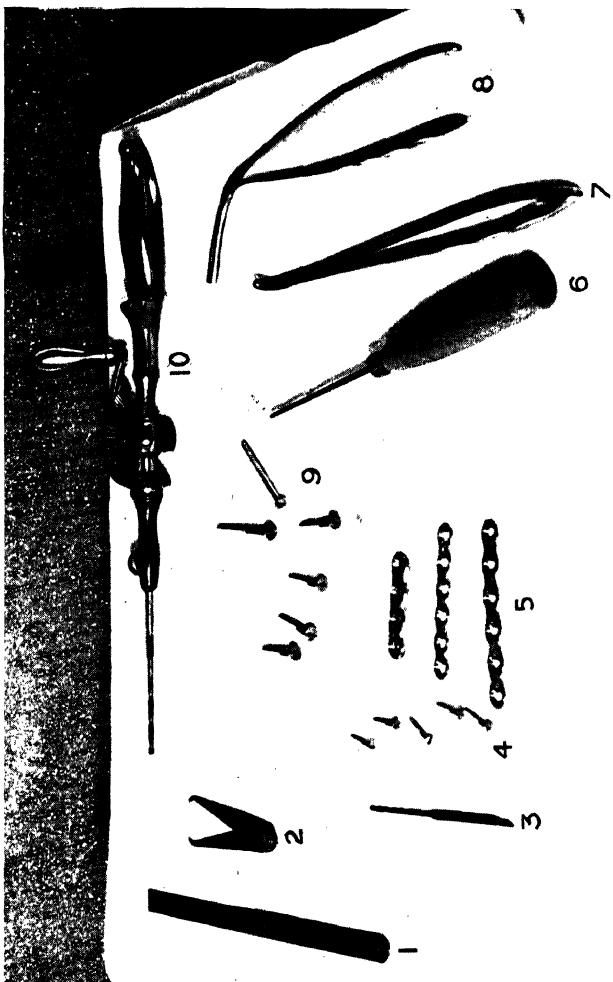
Wiring, plating and screwing of fractures, *e.g.* **femur, tibia or ulna**

The illustration shows the instruments that will be required in addition to the general set.

(1) Patella-holding forceps.
(2) Lane's bone-holding forceps.
(3) Two pairs of Ferguson's lion forceps.
(4) Tubby's bone file.
(5) Screwdriver.
(6) Wooden-handled bradawl.
(7) Two Langenbeck's bone hooks.
(8) Langenbeck's periosteal elevator.

(9) Lane's elevator.
(10) Lane's spike.
(11) (*a*) Farabœuf's straight rugine, (*b*) Farabœuf's curved rugine.
(12) Horsley's chisel.
(13) Osteotome.
(14) Mallet.
(15) Drill handle and drills.
(16) Wire twister.
(17) Trotter's bone-nibbling forceps.
(18) Wilm's bone forceps.
(19) Wire.
(20) Wire cutters.
(21) Pliers.
(22) Small metal calipers.
(23) Metal rule.
(24) Screws and plates.
(25) Drills and screws.

Details of the plates, screws and instruments for manipulating them are shown more clearly in the illustration on page 172.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Bone screws and plates

(1) Metal rule.

(2) Metal calipers.

(3) Drill end to fit handle and of the same gauge as the screws (4).

(4) Screws for metal plates, those shown are the correct size for the plates marked (5).

(6) Wooden-handled bradawl, this is sometimes preferred to the metal-handled instruments which are apt to slip in the hand.

(7) Screw-holding forceps.

(8) Plate-holding forceps.

(9) Wood screws, used for screwing fractures and are driven directly into the bone.

(10) Drill handle and drill end, suitable size for use with the screws shown.

Skull traction for the treatment of fractures and dislocations of the cervical spine

Crutchfield's skull calipers, e.g. (see illustration), are employed and are inserted through the parietal bones. The operation is done under a local anæsthetic and the following instruments will be required :

Syringe and needles for local anæsthetic.
Six towel slips.
Two sponge-holding forceps.
Two Bard-Parker knives or scalpels.
Adson's periosteal elevator.
Two self-retaining mastoid retractors.
Two pairs of toothed and two pairs of non-toothed dissecting forceps.
Watson Cheyne's dissector.
One dozen fine-curved Spencer Wells' artery forceps.
Two pairs of scissors, straight pointed and Mayo's curved.
Crutchfield's skull calipers.
Hudson's brace.
Small drill for inserting calipers with Hudson's brace attachment.
Ball syringe and normal saline solution.
Needle-holders, half-circle round-bodied and straight triangular needles.

Suturing or wiring fractures of the patella and olecranon process

Two Bard-Parker knives or scalpels.

Two pairs of toothed and two pairs of non-toothed dissecting forceps.

Two pairs of scissors.

One dozen Spencer Wells' artery forceps.

Six Doyen's skin clips (Michel's skin clips may be used for fastening the edges of the wound to the skin towels instead of the large Doyen's skin forceps).

Two sponge-holding forceps.

Six towel clips.

Medium retractors, *e.g.* Pollard's or Langenbeck's.

Bone-holding forceps, *e.g.* Ferguson's.

Bradawls or fine drills.

Stainless steel wire chromicised catgut, size 2 or 3, or kangaroo tendon may be used for approximating the bone fragments.

If wire is used, wire cutters, twister and pliers must be provided.

Bone-nibbling forceps and sequestrum forceps may be needed for the removal of fragments.

Curved triangular needles, needle-holder, skin sutures.

Esmarch's rubber bandage or tourniquet may be used.

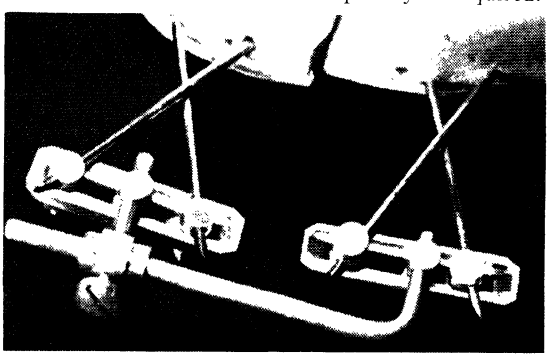
Treatment of fractures of the mandible

Extra-oral fixation with steel pins or intra-oral splinting with dental caps and wire may be used.

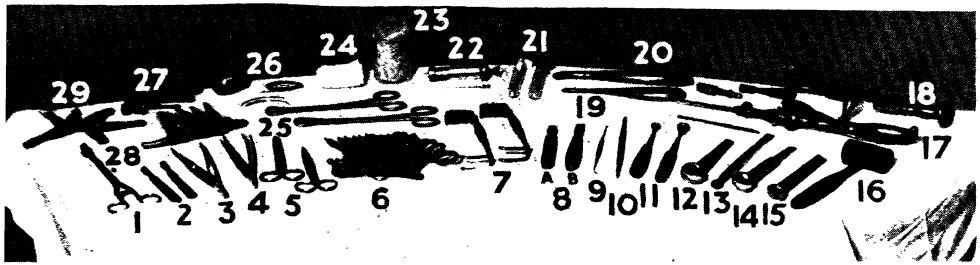
One method of extra-oral pinning is shown below.

In addition to the steel pins and clamp illustrated, a drill will be required.

For intra-oral fixation dental forceps may be required.



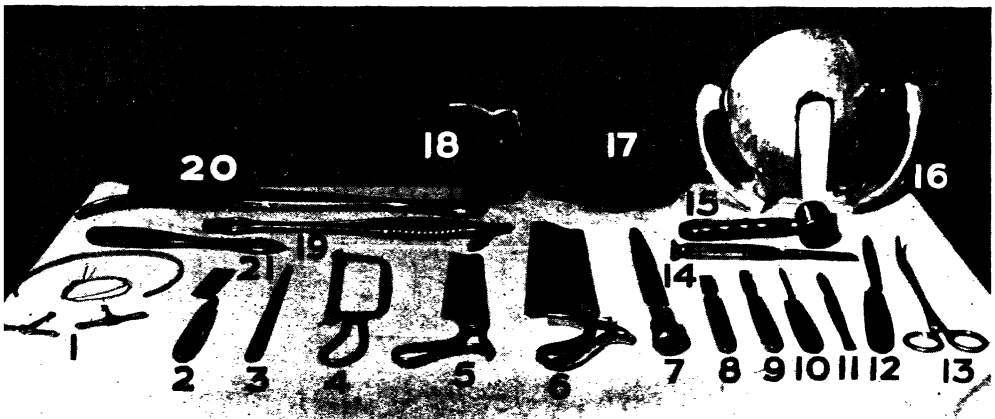
The apparatus shown in the illustration below is a combination of extra-oral steel pins and dental cap splint allowing the patient to open his mouth with the splint *in situ*.



OPERATION FOR BONE ABSCESS OR FOR OSTEOMYELITIS

(1) Sponge-holding forceps.
(2) Two Bard-Parker knives.
(3) Two toothed dissecting forceps.
(4) Two non-toothed dissecting forceps.
(5) Two pairs of scissors, round-ended and Mayo's.
(6) One dozen Spencer Wells' artery forceps.
(7) Two Czerny's retractors.
(8) Farabœuf's rugines, curved and straight.

(9) Watson Cheyne's dissector.
(10) Cleft palate elevator.
(11) Two Volkmann's spoons.
(12) and (13) Gouges.
(14) Osteotome.
(15) Chisel.
(16) Mallet.
(17) Drill.
(18) Brace and trephines.
(19) Sequestrum forceps.
(20) Rongeur forceps.
(21) Test tube and culture tube.
(22) Record syringe and exploring needle.
(23) Vaselined gauze roll.
(24) Plain gauze roll.
(25) Two Lane's tissue forceps.
(26) Ligature egg, skin sutures and needles.
(27) Drainage tubing.
(28) Six Doyen's skin clips.
(29) Six towel clips.



AMPUTATION INSTRUMENTS

For amputations through the arm or leg a selection from the following instruments will be required in addition to the general instruments. Amputations of fingers and toes are often carried out by disarticulation through a joint. The nurse should ascertain beforehand the site of the operation and the surgeon's wishes with regard to the type of saw and bone instruments to be set out.

(1) Gigli wire saw, handles and de Martel's guide.
(2) Wood's jaw saw.
(3) Finger saw.
(4) Metacarpal saw.
(5) Horsley's skull saw.
(6) Medium amputation saw.
(7) Tubby's bone file.
(8) Faraœbuf's straight rugine.
(9) Farabœuf's curved rugine.
(10) Small amputation knife.
(11) Large scalpel.
(12) Large amputation knife.
(13) Large curved Spencer Well's artery forceps or gall-bladder clamps (two usually required).
(14) Chisel. (15) Mallet.
(16) Amputation shield for thigh.
(17) Tourniquet.
(18) Esmarch's rubber bandage.
(19) Lane's bone-holding forceps.
(20) Lane's patella-holding forceps.
(21) Ferguson's lion bone-holding forceps.

BONE GRAFTING, *e.g.* TIBIA TO SPINE

General instruments.

Cheatle forceps for handing instruments.

Lane's bone-holding forceps.

Periosteal elevators.

Farabœuf's rugines.

Bone-cutting forceps.

Bone-nibbling forceps.

Sequestrum forceps.

Sharp spoons.

Hammer, chisels and gouges.

Metal rule.

Albee's or other electrically driven saw.

Drills.

Bradawl.

Screws and screw-holder.

Ball syringes and normal saline solution for irrigating the field of operation.

Plaster bandages may be used.

The instruments may be set out on two trolleys, one set for taking the graft and the second set for applying it.

OPERATION FOR INTERNAL DERANGEMENTS OF THE KNEE JOINT, *e.g.* LOOSE BODY, DETACHED SEMI-LUNAR CARTILAGE (MENISCUS)

General instruments except for large retractors.

Two Langenbeck's retractors.

Mayo's curved scissors.

Two pairs of tissue forceps.

Meniscus forceps or Kocher's artery forceps for grasping the cartilage.

Meniscus knife or scalpel.

Self-retaining retractors.

Esmarch's bandage or tourniquet.

OPERATIONS FOR HALLUX VALGUS AND HAMMER TOES

General instruments except for large retractors.

Periosteal elevators.

Bone-cutting forceps.

Bone-nibbling forceps.

Sequestrum forceps.

Medium saw.

Hammer.

Chisels.

Gouges.

Bone hooks.

Plaster bandages or splints as used by the surgeon should be provided.

OSTEOTOMY, *e.g.* OF LOWER END OF FEMUR

General instruments.

Hammer.

Osteotomes, 1, 1½ and 2-inch blades.

Plaster bandages.

ARTHRODESIS AND ARTHROPLASTY

General instruments.

Four extra Lane's tissue forceps.

Bone-holding forceps.

Bone levers.

Bone elevators.

Periosteal elevators.

Farabœuf's rugines.

Adam's osteotomy saw.

Chisels.

Gouges.

Mallet.

Bone-nibbling forceps.

Bone-cutting forceps.

Bradawls.

Electric saw.

Metal rule and caliper.

Some type of internal fixation is usually used in arthrodesis such as Watson Jones' nail, vitallium screws or bone pegs.

Plaster bandages.

TRIPLE ARTHRODESIS OF THE FOOT

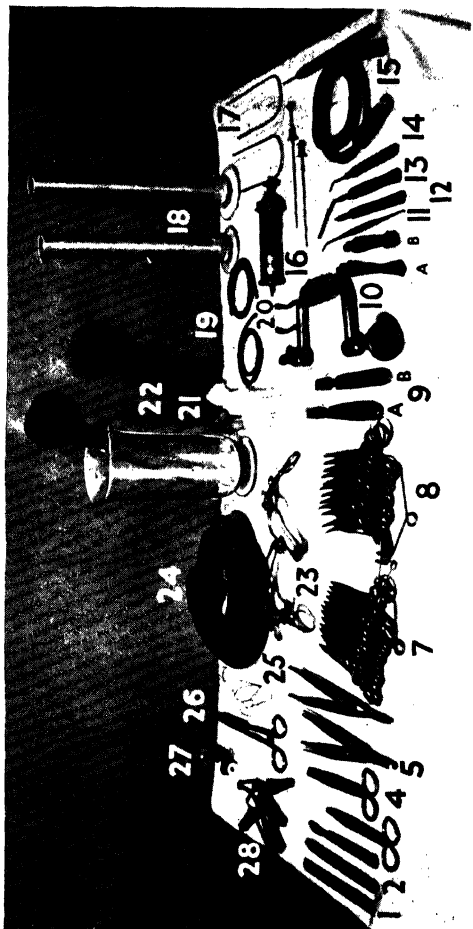
General instruments.
Periosteal elevators.
Farabœuf's rugines.
Osteotomes, ½, ¾ and 1-inch.
Chisels.
Gouges.
Mallet.
Plaster bandages.

TENDON SUTURE AND TENDON TRANSPLANTATION

General instruments except for large retractors.
Tenotomy knives.
Drills.
Bradawls.
Periosteal elevators.
Curved cutting needles.
Thread, linen and silk.
Plaster bandages.

CHAPTER XVI

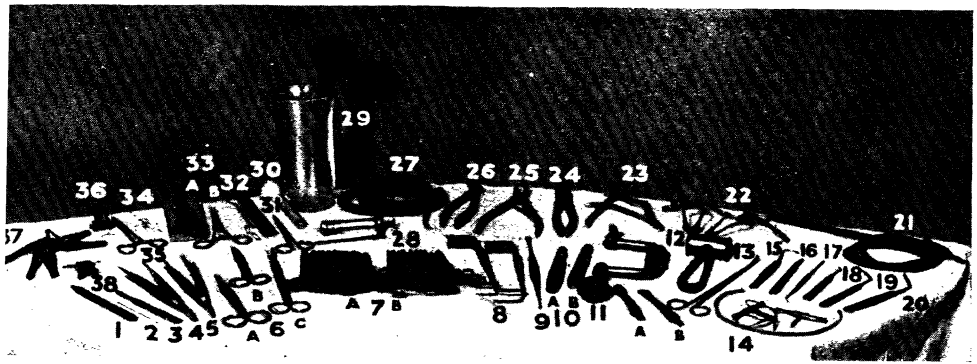
NEURO-SURGICAL (NEUROLOGICAL) OPERATIONS



VENTRICULOGRAPHY

(1) Metal rule.
(2) Skin pencil.
(3) Bard-Parker knife.
(4) Two pairs of scissors, Mayo's and round-ended.
(5) Two pairs of toothed dissecting forceps.
(6) Two non-toothed dissecting forceps.
(7) One dozen straight Spencer Wells artery forceps.
(8) One dozen curved Spencer Well's artery forceps.
(9) Two Faraboeuf's rugines : (*a*) curved, (*b*) straight.
(10) Brace : (*a*) perforator, (*b*) burr.
(11) Watson Cheyne's dissector.
(12) Small pointed knife for opening the dura mater.
(13) Sargent's elevator. (14) Horsley's seeker.
(15) Diathermy lead and needle.
(16) 20 c.c. syringe, silver brain canulæ and stilettes.
(17) Two glass manometers.
(18) Two granulated glass measures.
(19) Fine rubber tubing to fit manometer tubes.
(20) Adaptors to fit the silver canulæ.
(21) Two test tubes.
(22) Ball syringe in measure of normal saline solution.
(23) Milligan's self-retaining retractors.
(24) Suction connection and nozzle.
(25) Straight needle with black silk suture.
(26) Needle-holder with curved needle.
(27) Spools of black silk.
[28) Six towel clips.

Local anæsthetic will be used.



CRANIOTOMY, *e.g.* FOR REMOVAL OF CEREBRAL TUMOURS, OR FOR TREATMENT OF INTRACRANIAL INJURIES

(1) Skin needles. (2) Skin needles for marking.
(3) Bard-Parker knives. (4) Two toothed dissecting forceps.
(5) Two non-toothed dissecting forceps.
(6) Scissors : (*a*) Mayo's, (*b*) round-ended, (*c*) Wheeler's curved.
(7) (*a*) Curved artery forceps, (*b*) straight artery forceps. N.B.—Three or four dozen will be required.

(8) Czerny's double-ended retractors, rake retractors may be used.
(9) Balance's double-ended spoon.
(10) Farabœuf's rugines, (*a*) curved and (*b*) straight.
(11) Hudson's brace, (*a*) burr, (*b*) perforator.
(12) Heath's mallet.
(13) Foreign body forceps.
(14) De Martel's guide, Gigli's wire saw and handles.
(15) Aneurysm needle.
(16) Small knife for opening dura mater.
(17) Watson Cheyne's dissector. (18) Horsley's seeker.
(19) Horsley's dura mater elevator. (20) Sargent's elevator.
(21) Diathermy needle and lead. (22) Self-retaining retractor.
(23) De Vilbiss' skull-cutting forceps. (24) Bone-cutting forceps.
(25) Wilm's nibblers. (26) Trotter's rongeur forceps.
(27) Suction connection and fine nozzle.
(28) 20 c.c. syringe and ventriculography canula.
(29) Ball syringe in measure containing normal saline solution.
(30) Sterile test tube.
(31) Sinus forceps.
(32) Corrugated rubber drain and Dunhill's thin-walled tubing.
(33) Cushing's silver clips : (*a*) clip holder, (*b*) clip-applying forceps.
(34) Straight skin needles and black silk sutures.
(35) Mayo's needle-holder.
(36) Round-bodied needles and black silk sutures. (37) Six towel clips.
(38) Rubber bands on a safety-pin, used to gather the artery forceps into bunches.
Horsley's bone wax may be used.
Lintine and wool patties used for swabbing are shown on page 194.
Local anæsthetics may be used.

OPERATION FOR THE REPAIR OF SKULL DEFECT

The three main methods in use in the repair of these defects are :

(1) Insertion of a living piece of bone taken from the outer table of the skull adjoining the defect, or from the outer side of the ilium, or, most commonly, a portion of rib is removed and suitably fashioned.

(2) Insertion of a piece of dead bone.

(3) Insertion of a plastic shaped to fit the defect, *e.g.* acrylic resin.

The nurse must ascertain from the surgeon which method is to be used. A separate trolley will be required if a piece of rib or ilium is to be removed ; for the rib operation the instruments listed on page 110 are suitable. The insertion of acrylic resin grafts is done in conjunction with the dental surgeon who takes the impression and prepares the graft. It is assumed that the apparatus he requires will be brought by him.

The instruments listed below are those required for the skull part of operation :

Six towel clips.

Two sponge-holding forceps.

Two Bard-Parker knives or scalpels.

Two dozen fine curved and two dozen fine straight artery forceps.

Two pairs of toothed and two pairs of non-toothed dissecting forceps.

Four rake retractors, two large and two small.

Two pairs of scissors, straight-pointed and Mayo's curved.

Two Adson's periosteal elevators.

Farabœuf's rugines, curved and straight.

Large and small osteotomes
Large and small chisels
} These are used for freshening and "stepping" the margins of the defect.

Hammer.

Bone-nibbling forceps, *e.g.* Horsley's straight nibblers and Wilm's.

Brain spatula.

Bone wax.

Ball syringes and normal saline.

Needle-holders, half-circle round-bodied and straight cutting-edged needles.

Suction connection and nozzle.

Diathermy.

Lintine strips and wool patties.

Labat's syringe and needles for local anæsthetic.

OPERATIONS FOR TRIGEMINAL NEURALGIA

Alcohol injection of Trigeminal Nerve

Record syringe, fine needles and 2 per cent. novocain for local anæsthetic.

2-c.c. syringe and special needles marked in centimetres for alcohol injection.

Sterile normal saline solution.

Metal rule.

Absolute alcohol.

A skull for measuring should be provided.

Division of sensory root of Gasserian Ganglion

Skin needles for marking.

Bard-Parker knives.

Two toothed and two non-toothed dissecting forceps.

Scissors, Mayo's and Wheeler's.

One dozen curved and one dozen straight artery forceps.

Self-retaining mastoid retractors.

Rake retractors.

Adson's periosteal elevator.

Parabœuf's rugines, straight and curved.

Brace and burrs.

Rongeur forceps.

Small bone-nibbling forceps, *e.g.* Wilm's.

Macdonald's raspatory.

Watson Cheyne's dissector.

Brain spatula.

Sterile match-sticks for arresting bleeding from the middle meningeal artery.

Two small blunt-ended hooks.
One small sharp-ended hook. } Dental hooks may be used.

Long tenotomy knife.

Straight skin needles and sutures.

Lintine strips and wool patties.

Corrugated rubber drainage tube and safety-pin.

Ball syringe and sterile normal saline solution.

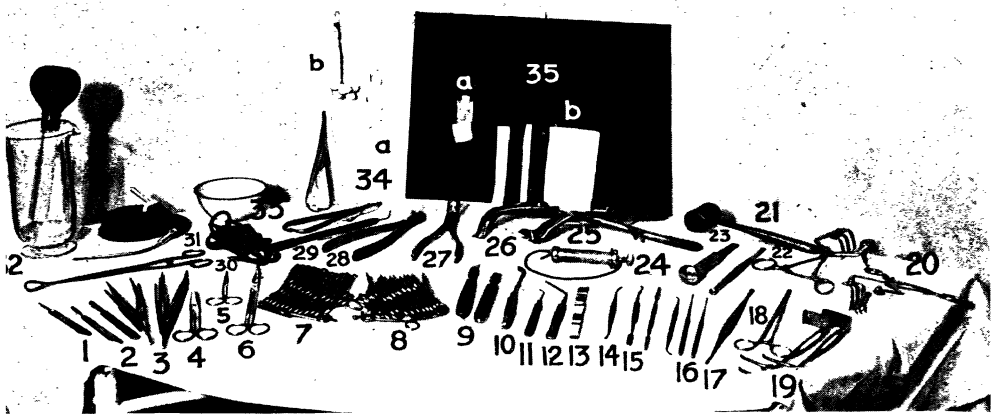
Diathermy.

Suction nozzle and connection.

NERVE SUTURE AND TRANSPLANTATION OF NERVE

General instruments, including fine scalpels, fine Bard-Parker knives, fine dissecting forceps and pointed scissors.
One dozen fine Spencer Wells' artery forceps.
Black silk threaded on small round-bodied curved needles.
Atraumatic sutures.
Tourniquet.
Plaster bandages may be required.

The operation may be a simple end-to-end suture, transplanting a nerve, grafting or freeing a nerve (neurolysis), and the instruments will vary according to the extent and site of the operation.



LAMINECTOMY

(1) Special pointed Bard-Parker knife for opening dura mater.
(2) Two Bard-Parker knives.
(3) Toothed and non-toothed dissecting forceps.
(4) Round-ended scissors.
(5) Small pointed scissors.

(6) Mayo's curved scissors, 8-inch.
(7) One dozen curved Spencer Well's forceps.
(8) One dozen straight Spencer Well's forceps.
(9) Farabœufs rugines, straight and curved.
(10) Semb's raspatory. (11) Horsley's seeker.
(12) Sargent's dura mater elevator. (13) Silver spatula.
(14) Watson Cheyne's dissector. (15) Two Macdonald's dissectors.
(16) Three small hooks, those shown are dental hooks.
(17) Balance's double-ended spoon.
(18) Straight Kocher's forceps.
(19) Two Czerny's retractors.
(20) Two Trotter's self-retaining retactors.
(21) Mallet. (22) Gouge. (23) Chisel.
(24) 20 c.c. record syringe and fine catheter.
(25) Key's bone-cutting forceps.
(26) Horsley's laminectomy forceps.
(27) Czerny's nibbling forceps.
(28) Trotter's nibbling forceps.
(29) Diathermy needle and lead.
(30) Sponge-holding forceps.
(31) Suction connection and angled nozzle.
(32) Ball syringe in measure containing normal saline.
(33) Gallipot containing Horsley's wax.
(34) Metzenbaum's needle-holders and curved needles, one with black silk and one with "serum-proof" silk.
(34*a*) Straight skin needles with black silk.
(34*b*) "Patties" of fluffed wool with black threads attached.
(35) Roll of 1-inch ribbon gauze and strips of lintine.

CHAPTER XVII

OPERATIONS ON THE VASCULAR SYSTEM

TRANSFUSION OF WHOLE BLOOD, PLASMA OR SERUM

Requirements for collecting blood

The usual apparatus used is the simple one devised for the Emergency Medical Service.

The collecting bottle is similar in appearance to the ordinary pint size milk bottle but is made with a " waist " for convenience in handling. When received ready for use it contains 100 c.c. of 3 per cent. sodium citrate solution and 20 c.c. of 15 per cent. glucose solution and is fitted with a screw cap. A rubber bung is supplied pierced by two holes through which pass two pieces of glass tubing 3 inches long. A length of rubber tubing is attached to one glass tube, the other is lightly packed with cotton wool, to act as a filter, and is the air vent.

An adaptor and a stainless steel needle complete the set.

Other requirements are :

A sphygmomanometer or a piece of rubber tubing to act as a tourniquet.

2 c.c. record syringe, needles and local anæsthetic, *e.g.* 2 per cent. novocaine.

Gallipot containing surgical spirit or other suitable skin cleaner.

A small packet containing sterile swabs, towels, and small dressings.

A dressing mackintosh.

Administration of blood serum and plasma

Many different types of apparatus have come into use during the past few years, the simplest of these are those devised for use in the Services and the Emergency Medical Service. Variations and improvements in some of the details have been made from time to time, but the apparatus consists essentially of the following parts :

1. The modified milk bottle described above, fitted with a screw cap which is replaced either by a rubber

bung or by a rubber cap when the apparatus is set up for use.

2. An outlet tube for the fluid and an inlet or air-vent. Two glass tubes are used with the two-hole rubber bung, one 3 inches in length which is the outlet tube and the other a long tube reaching almost to the bottom of the bottle which is the air-vent. When the rubber cap is used this is pierced by two sharp-ended canulæ, one long and one short, corresponding to the two glass tubes just mentioned.

3. A filter, which may be inside the bottle or placed in a special container attached to the outlet tube by a short connecting rubber tube. The most common types of filter met at present are :

(*a*) Glass beads either loose in the bottle or in a container.

(*b*) A gas mantle attached around the outlet tube and the bung inside the bottle or in a container outside.

(*c*) A stainless steel wire-gauze filter used in the same way as the gas mantle.

Hard glass for the beads is not easily obtainable at the present time and the beads are apt to get lost when the apparatus is cleaned. The gas-mantle filter can only be used once, but the wire-gauze filter can be cleaned and re-sterilised.

4. A drip connection or " drop counter." This is a wide-bore glass connection enclosing a dropper and is attached by a 6-inch length of rubber tubing to the outlet tube, or to the filter container where the filter is placed outside the bottle.

5. Four feet of rubber tubing and a tubing clip.

6. An adaptor and a stainless steel needle.

Other requirements for setting up a transfusion are:

Tourniquet, preferably a sphygmomanometer cuff.

Local anæsthetic, hypodermic syringe and needles.

Intravenous canula and instruments for cutting down on the vein where it is not possible to enter the vein with the needle, or in the event of a continuous infusion being required. Various types of canulæ are used, *e.g.* the steel Army pattern. Hamilton Bailey's gold-plated

canula and Sigger's or Kekwick's glass canulæ. For infants Bateman's needle may be used.

Where many transfusion sets have to be made up it is desirable to reduce the number of instruments in each set to a minimum, and in practical experience the following list, exclusive of syringes and needles for local anæsthetic, has been found adequate :

Scalpel.

One pair of fine-toothed and one pair of fine non-toothed dissecting forceps.

One pair of fine-pointed scissors.

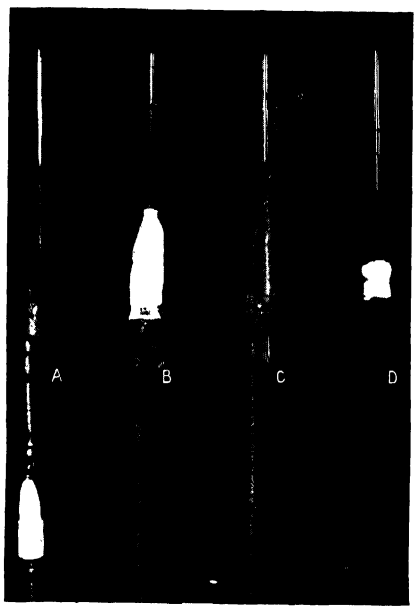
Two " mosquito " fine artery forceps.

One aneurysm needle.

Thread, size 60, or catgut, size 0, for tying in the canula.

Two curved triangular needles and skin sutures.

If the administration is likely to be a continuous one or where a bottle of blood is to be followed by plasma, serum or saline, it is convenient to have a Y-shaped glass connection attached by a short piece of rubber tubing from the stem of the Y to the drip connection or to the filter container. Each arm of the Y is connected by a piece of rubber tubing to the outlet tubes of two bottles and controlled by a screw tubing clip on each. Such an arrangement avoids any interruption of the flow when the change over to the second bottle is made.



TYPES OF FILTER USED FOR BLOOD TRANSFUSION

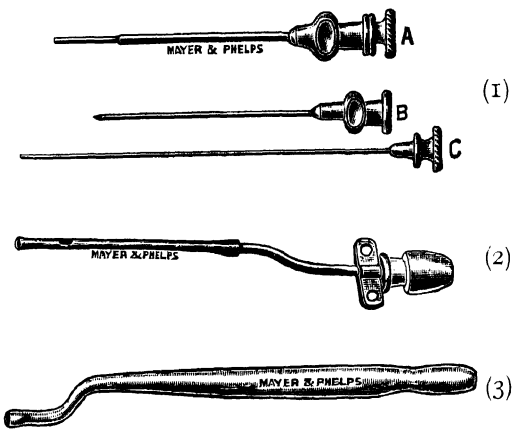
A. Gas-mantle filter in special container.

B. Gas-mantle filter attached to the cork of the bottle.

C. Stainless steel wire-gauze filter attached to the cork of the bottle.

D. Improvised filter made by winding two feet of 1-inch ribbon gauze round the air inlet tube.

From " Illustrations of Surgical Treatment," by Eric L. Farquharson (F. and S. Livingstone).

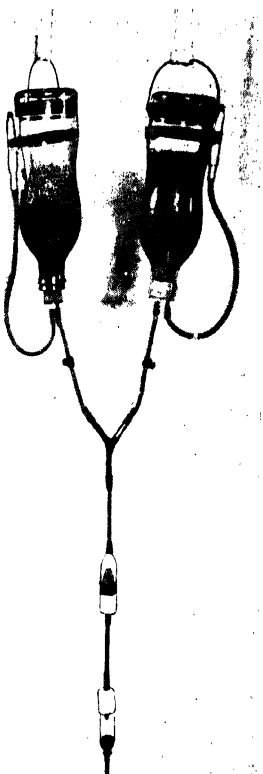


VARIOUS TYPES OF INTRAVENOUS CANULÆ

(1) Bateman's needle.
   A. Outer needle with stilette.
   B. Fine inner needle.
   C. Stilette.

(2) Hamilton Bailey's gold-plated canula.

(3) Kekwick's glass canula.



Apparatus for blood and plasma transfusion using two bottles connected to one filter. The drop counter or " drip connection " is seen below the glass filter container. From " Illustrations of Surgical Treatment," by Eric L. Farquharson (E. and S. Livingstone).

LIGATION OF A VESSEL

This may be required for the arrest of hæmorrhage, to check the spread of a septic thrombus, in the treatment of an aneurysm, and as a preliminary to amputation of a limb.

Instruments required :

Scalpels or Bard-Parker knives, scissors.
Two pairs of toothed dissecting forceps.
Two non-toothed dissecting forceps, 7-inch.
Two single hooks.
Two small retractors, *e.g.* Kocher's gland retractors.
Two tissue forceps, Lane's or Allis'.
One dozen Spencer Wells' artery forceps.
One blunt dissector, *e.g.* Macdonald's.
Two aneurysm needles, one fully curved.
Needle-holder.
Curved triangular needles.
Thread and skin sutures.
Ligature for the vessel, *e.g.* silk, tape, or strong thread.

OPERATIONS FOR VARICOSE VEINS

The usual operation for varicose veins of the legs is tying the Internal Saphenous Vein in the groin and injection of a sclerosing agent into the vessels below the site of the ligature.

The instruments required will be those listed for ligation of a vessel with the addition of a record syringe, 10 c.c., and a gum elastic catheter, size 8 or 10, for injecting the sclerosing agent.

The solution used may be sodium morrhuate 5 or 10 per cent., or quinine urethane 5 per cent. solution.

For the injection treatment of varicose veins without tying the vessels only a syringe, either a special vein syringe or a 2 c.c. record syringe and fine short needles will be needed.

For the surgical treatment of hæmorrhoids and varicocele, see p. 130.

EMBOLECTOMY

General instruments except for large retractors with the addition of :

Long flexible grasping forceps.
One extra aneurysm needle, fully curved.
Fine rubber tubing.
Rubber catheters, sizes 4, 6, and 8.

Fine atraumatic silk sutures.
Fine silk on round-bodied needles.
Suction connection and fine nozzle.
Sodium citrate ½ per cent. or 1 per cent. may be required.

Pulmonary embolectomy (Trendelenberg's operation)

This operation is only very occasionally performed, but if it is proposed to operate on a patient with a large pulmonary embolism the matter is one of the very greatest urgency and all the requirements should be packed in drums and sterilised ready for use at a moment's notice. The patient is usually unconscious and no anæsthetic is required.

The first drum contains:

Two caps and masks.
Two surgeon's gowns.
Two pairs of rubber gloves, usually size 7.
Two mackintoshes.
Two towels.
One sheet.
Three saline pads.
Two gauze rolls, dressings.

The second drum contains:

Two scalpels.
Two toothed dissecting forceps.
Two tissue forceps, Lane's or Allis'.
Periosteal elevator.
Farabœuf's rugine.
Two rib raspatories, *e.g.* Doyen's.
Bone-cutting forceps or rib shears.
Long dissecting forceps, 7-inch.
Artery hook and tubing.
Embolus suction tube.
Artery dilators.
Embolus forceps.
Artery clamp.
Two pairs of Duval's lung forceps.
One pair of scissors.
Four pairs of stout Spencer Wells' artery forceps.
Black silk atraumatic sutures, skin sutures, and skin needles.

CERVICAL SYMPATHECTOMY, *e.g.* for relief of Raynaud's Disease of the fingers.

General instruments with the addition of :
Langenbeck's retractors.
Fully curved aneurysm needle.
Four long (8-inch) Spencer Wells' artery forceps.
Mayo's long curved scissors.
Suction connection and nozzle.

These instruments are all that are usually required for the anterior approach. For the posterior approach rib resection instruments will also be needed.

LUMBAR SYMPATHECTOMY, *e.g.* for thrombo-angeitis obliterans, or for threatened gangrene of the lower extremities.

General instruments.
Deep retractors.
Four long Spencer Wells' artery forceps.
Fully curved aneurysm needle.
Long Mayo's scissors.
Four gall-bladder clamps.
Tenotomy knife.
Suction connection and nozzle.

CHAPTER XVIII

TRAUMATIC SURGERY

Organisation of Theatres in a Casualty Station

The theatre plays an important part in any plan for the treatment of large numbers of casualties. Under emergency conditions the theatres will have to work at higher pressure and for longer periods than in normal times, and to provide for these conditions adequate staff and extra accommodation will be needed. This last requirement is usually met by setting up an extra operating table in each theatre so that when necessary two teams can work side by side.

When casualties likely to require operative treatment are admitted to hospital the theatre sister will probably undertake general supervisory duties, assigning an instrument nurse and a runner to each surgical team. She will need to find out from the reception rooms the number and the nature of the cases for operation and in consultation with the surgeons allocate the cases to the surgical teams ensuring priority of treatment for urgent cases. She will inform each instrument nurse regarding the list for which the nurse will be responsible and see that the runners are given the necessary information so that they may prepare the instruments and any other theatre requirements. Extra helpers will be usefully employed in assisting with resuscitation and with the preparation of the patients for the theatre, where possible removing soiled clothing, washing the skin and giving any drugs that are ordered. In some instances the patient cannot be undressed or any preliminary cleansing carried out until he is anæsthetised. The theatre runner should be prepared to cut off the patient's clothing and should put it in a labelled canvas bag so that it can be examined later. It is important that articles of clothing, which may contain important papers or other valuables, should not be dropped into soiled dressing buckets and then destroyed.

For cutting off clothing several pairs of stout round-

ended scissors of the type sold as upholstery or carpet scissors are very useful. Labels should be provided for clothing bags and if the patient's name is not known he should be given a number. Small bags are useful for any valuables, and these should be handed over at once to the person responsible for their safe keeping. If patients who are unconscious or who are to be anæsthetised are wearing dentures these must be removed and placed in a suitable receptacle with the patient's name or number.

Notes made in the reception room of the patient's injuries and the treatment, including morphia and tetanus antitoxin given before or on admission to hospital, should accompany him to the theatre. In the event of the patient being brought straight from the site of accident to the anæsthetic room of the theatre the nurse should look for a label attached to his clothing or an indelible pencil mark on his forehead indicating the suggested diagnosis and the treatment given. There are official symbols used in the Emergency Medical Service which should be known to all whose duties include the care of casualties. These are :

" X " Denoting that the case should receive priority of examination, is used for all unconscious cases, suspected internal hæmorrhage and penetrating wounds of the chest and abdomen.

" T " Tourniquet applied, the label should give the time of the application and of subsequent releases and re-applications.

" H " Indicates that the patient has had a severe hæmorrhage.

" M " Morphine given, the label should bear the record of the dose and the time at which it was given.

" C " Contamination or suspected contamination with persistent gas, *i.e.* vesicants.

" XX " Suspected contact with phosgene or other non-persistent gas, *i.e.* lung irritants.

" P " Phosphorus burns.

Resuscitation

In many cases the immediate treatment needed is resuscitation, and this department may also be the responsibility of the theatre staff as regards its equipment. This will include electric cradles and blankets, oxygen and B.L.B. masks, the apparatus for blood and plasma transfusion and the stock of blood, plasma and serum. Complete sets for transfusion including dressing towels, mackintoshes, dressings and instruments can be packed in tins, autoclaved and sealed until needed. For the storing of blood and plasma a cold store maintaining a temperature between 36° and 40° F. is required. Dried plasma and serum can be kept in any cool dark place.

TYPES OF INJURY

1. Wounds of the soft tissues which may be multiple and may include foreign bodies.—The following list of instruments is suggested as representing the basis requirements for dealing with such wounds including compound fracture, unless amputation is required.

Instruments and requirements for wound toilet and extraction of foreign bodies.

Six towel clips.
Two sponge-holding forceps.
Bard-Parker knives or scalpels.
Dissecting forceps, toothed and non-toothed, 5-inch and 7-inch.
One dozen Spencer Wells' artery forceps,
Scissors, round-ended and Mayo's.
Small and medium retractors.
Double hooks.
Single hooks.
Aneurysm needles.
Four tissue forceps, Lane's or Allis'.
Blunt dissector.
Probe.
Probe pointed director.
Desjardin's stone forceps, or bullet forceps.
Bone-holding forceps, *e.g.* Ferguson's lion forceps.
Periosteal elevator.

Rugine, *e.g.* Farabœuf's.
Bone-cutting forceps.
Needle-holder.
Triangular and round-bodied needles.
Catgut, thread and atraumatic intestinal sutures.
Tulle gras, or vaselined gauze.
Sulphanilamide powder and spray.
Plaster bandages.
When dealing with wounds of the mouth and neck it is necessary to have tracheotomy instruments ready for immediate use.

2. Compound fractures.—All such fractures are regarded as priority theatre cases. The usual surgical treatment is cleansing of the limb and excision of the damaged tissue. In some cases the wound may be sutured. In all cases the limb will be splinted, usually by plaster, but the theatre nurse should also have at hand suitably padded wooden splints or other special splints likely to be used by the surgeon, *e.g.* Thomas' or Braun's splint and Cramer's wire splinting.

3. Head injuries.—Simple scalp wounds are amongst the commonest of war casualties. The preliminary cleaning of the scalp is an essential step in the successful treatment. For single wounds shaving of an area of at least 2 inches and preferably 3 inches all round the wound is adequate, for multiple wounds the whole head should be shaved and the scalp then washed. Good hair clippers and a supply of really sharp razors are needed; an electric razor, if available, is very useful.

Instruments required for the treatment of scalp wounds:

Six towel clips.
Two sponge-holding forceps.
Bard-Parker knives or scalpels.
Toothed and non-toothed dissecting forceps, 5-inch and 7-inch.
One dozen fine curved Spencer Wells' artery forceps.
Round-ended and Mayo's scissors.
Self-retaining retractor, mastoid type.
Probe.
Adson's periosteal elevator.

Farabœuf's rugine.
Needle-holder.
Needles and suture material including silk.
Sulphanilamide powder.
Tulle gras and dressing.

The instruments required for dealing with penetrating wounds of the skull and exploration of an extra-dural or sub-dural hæmatoma are those described for craniotomy on p. 188.

4. Penetrating wounds of the chest and abdomen

(*a*) **Chest.**—Operative treatment will probably consist of exploring the wound, removing damaged tissue and foreign bodies, drainage, or closure and aspiration. As a basic guide to the surgeon's requirements the instruments shown on p. 110 for thoracotomy are suggested.

(*b*) **Abdomen.**—Penetrating wounds of the abdomen are urgent emergencies on account of the dangers of general peritonitis from perforation of hollow viscera and of severe hæmorrhage from injury to large blood vessels or to such organs as the liver or spleen. The nurse should inquire if there is any probability of a colostomy or supra-pubic cystotomy being required and should, if such is the case, prepare the appropriate instruments in addition to those needed for laparotomy as shown on p. 114.

5. Burns.—The treatment of burns may be divided into three stages :

(1) **The treatment of shock.**—Morphia for the relief of pain, warmth supplied by electric blankets or cradles and fluids supplied by serum or plasma infusion and by hot sweet fluids given by mouth are the usual methods of combating this condition.

(2) **Cleaning the burnt area.**—This is carried out in the theatre under anæsthesia. Although the cleansing must be very thorough it is now considered that the vigorous scrubbing advocated at one time is harmful and the process employed is a gentle swabbing of the burnt area, using swabs soaked in warm normal saline solution. Scissors and forceps for the removal of dead skin should

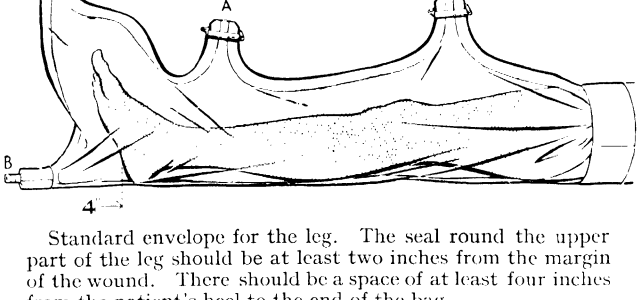
be provided. Some surgeons use ether soap for cleansing the undamaged skin around the burns.

(3) **The application of the dressing.**—This stage of the treatment is not standardised and will vary according to the depth of the burn, the area of the body affected, and may also have to be adapted to suit the circumstances under which the treatment is carried out. The nurse should ascertain from the surgeon which method is to be employed.

(*a*) **Coagulant applications.**—Tannic acid in dilute solution, $2\frac{1}{2}$ per cent., or in stronger solution, 5–10 per cent., with or without silver nitrate solution, 5 per cent.; gentian violet 1 per cent. solution; triple dye solution (gentian violet, brilliant green and acriflavine) are examples of coagulants. The chief use of these substances is for extensive superficial burns of the trunk. They are not considered suitable for use on the hands, feet, or face on account of the constricting effect of the inelastic coagulum, nor are they suitable for the treatment of burns when the whole thickness of the skin is destroyed.

(*b*) **Normal saline dressings and saline baths.**—This method is considered most suitable for deep burns and burns of the face and extremities. Dressings soaked in saline and frequently moistened or changed are applied over a covering of tulle gras (a fine-meshed cotton net impregnated with a mixture of vaseline and balsam of Peru). Alternatively, especially for very extensive sloughing or dirty burns, saline baths are used. Baths for this purpose filled from thermostatically controlled tanks of sterile saline solution have been installed in some special units. The irrigation envelope is another method of carrying out this type of treatment. Envelopes of different patterns designed for the trunk and for limbs can be obtained. The envelopes are made of silk specially treated with a resinous compound to make them watertight, and they are provided with inlets and outlets for irrigation purposes. Irrigations are carried out two or three times daily with a solution of electrolytic sodium hypochlorite solution in strengths of from 1 to 5 per cent. or with normal saline. Following

the drainage of the irrigating fluid the bag is dried out and left slightly inflated by blowing oxygen or filtered air through it. These envelopes are now being used for first-aid treatment of burns as a protective dressing.



Standard envelope for the leg. The seal round the upper part of the leg should be at least two inches from the margin of the wound. There should be a space of at least four inches from the patient's heel to the end of the bag.

A. Inlets for irrigating.

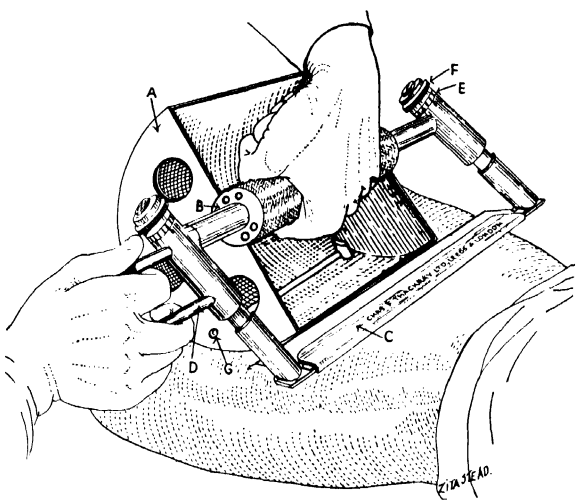
B. Outlet nozzle for drainage.

(*c*) **Occlusive treatment.**—The affected area is dusted with sulphanilamide powder and covered with vaselined gauze or tulle gras and enclosed in a plaster. A special tulle gras in which sulphanilamide powder is incorporated is also available. The plaster method is suitable for burns of the limbs and is particularly useful if circumstances are such that the patient may have to be moved at short notice from the casualty station.

Skin grafting

Where loss of skin is extensive as the result of burns or other injuries, healing will be extremely slow and the formation of large areas of scar tissue will lead to subsequent contraction, deformity, and loss of function. In order to avoid these results of injury, skin grafting is often carried out as soon as the granulating areas are clean. Occasionally small deep burns seen within six hours of the injury may be excised and grafted without delay.

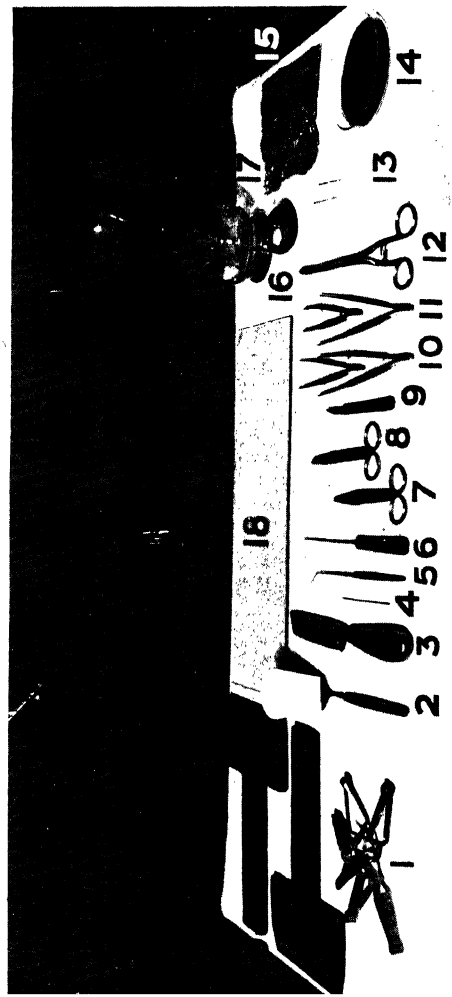
Small " pinch " grafts of the whole thickness of the skin, or thin strips of epidermis, " Thiersch " grafts, may be used. Pedicle grafts which include subcutaneous tissue are used to reconstruct areas that have been extensively damaged and also in the treatment of certain deformities other than those due to injury.



The accompanying illustration shows a mechanical cutter, Padget's dermatome, recently introduced, which has the advantage of cutting large areas of skin quickly and accurately.

Other instruments used in skin grafting are shown on page 214.

NOTES



SKIN GRAFTING

(1) Six towel clips.
(2) Ballance's spade.
(3) Ballance's skin-grafting knife.
(4) Straight triangular needles for " pinch " grafts.
(5) Angled Ballance's spreader.
(6) Straight Ballance's spreader.
(7) Mayo's straight scissors.
(8) Round-ended scissors.
(9) Bard-Parker knife with small pointed blade.
(10) Two toothed plastic forceps.
(11) Two non-toothed plastic forceps.
(12) Sponge-holding forceps.
(13) Fine straight needle and fine thread.
(14) Stent's composition modelling material.
(15) Tinfoil.
(16) Ligature egg with fine thread.
(17) Ball syringe in measure containing normal saline.
(18) Glass slab.
(19) Wooden spreaders for stretching the skin when cutting the graft.

For thick grafts small curved triangular needles and Sillies' plastic needle-holder may be required.

CHAPTER XIX

RADIUM IN THE THEATRE

RADIUM is an element which undergoes constant disintegration. During this process energy is liberated mainly in three forms described as Alpha, Beta, and Gamma radiation. It is the Gamma rays that are used in the destruction of malignant tissue, and special precautions have to be taken to exclude the Alpha and Beta radiation by the use of metal screens, usually consisting of platinum 0·5 or 0·6 millimetres thick. Radium is chiefly used in the form of its salt, radium sulphate, and in the form of the emanation or gas, radon, which is given off from it. The salt is placed in needles or sometimes in larger containers and the emanation is collected in radon " seeds."

Radium needles.—The needles are made with a hollow central part containing the radium salt, an eye at one end to which a thread can be attached and a trocar point. The hollow portion within which the radium salt is distributed constitutes what is referred to as the " active length " of the needle. The needles are made in varying sizes containing from 0·5 to 50 milligrammes of radium salt. Needles may be packed inside silver boxes or tubes to form larger applicators, and these applicators are covered with a rubber envelope or a piece of rubber tubing. Needles used individually are threaded with a double linen thread, size 25 or 35. Six inches is a convenient length, if need be the thr ad can be shortened to the desired length later. The thread should be secured by a double knot tied near, but not on, the eye of the needle. If the thread is knotted on the needle it may cut through while the needle is in the tissues. The threaded needles are sterilised by boiling. They should be placed in a tray with the thread attached to clip forceps so that they do not get tangled.

Radon seeds

Radon is collected in capillary glass tubes enclosed in a metal screen usually made of platinum or gold 0·3 to 0·5 mm. thick. The seeds are made in one length only, 0·65 mm. The emanation is only active for a limited time and the seeds can be left in the tissues in which they have been buried, but they are often removed on account of the value of the containers.

Methods of application of radium

1. **Surface application.**—The needles or applicators are embedded in a suitable mould made of Columba paste or Stent's dental composition, or may be attached to sorbo rubber or other suitable material which can be accurately applied to the desired area.

2. **Teletherapy.**—In this form of treatment a large amount of radium, 1 gramme or more, is contained within a thick-walled chamber, sometimes known as a "radium bomb," and from this source the radiation is focussed on the area of the body which it is desired to treat.

3. **Interstitial irradiation.**—Needles or radon seeds are inserted into the tissues.

4. **Cavitary irradiation.**—Applicators are placed inside natural cavities of the body, *e.g.* the vagina and cervical canal.

The theatre nurse will probably only be concerned with the last two of these methods of application.

Rules and precautions in the handling of radium

1. Radium needles or containers, including radon seeds, should never be touched by hand but must always be manipulated with long-handled forceps the handles of which are covered with rubber. When radium is removed from the safe and carried to and from the theatre a lead-lined box with a long carrying handle should be used for its transport.

2. The threading of needles and the preparation of applicators must be carried out on a special table provided with a lead screen.

3. Proximity to the radium must be for as short a time as possible.

4. The time at which the radium treatment is begun and the time at which it is due to be terminated must be carefully noted. The success of the treatment and the safety of the patient depend on careful calculation of the dosage to be employed. The time during which the radium is in contact with the tissues is one factor in these calculations.

5. Careful checking of the radium is essential. The theatre nurse or sister is responsible for checking the containers when brought to the theatre and when removed from the steriliser. The amount of radium, the number and size of the needles used are entered on a record card, unused containers are checked and returned to the radium safe.

Radium is a valuable substance and the careful checking at each stage is the best safeguard against accidental loss. Radium is also a dangerous substance. Radium containers left about in the theatre or ward or a radium needle that has slipped from its proper site and is lying in contact with healthy tissue constitute a risk in the one instance to the hospital personnel and in the other instance to the patient.

Routine blood examinations are carried out on all staff whose work entails the handling of radium over any considerable period of time.

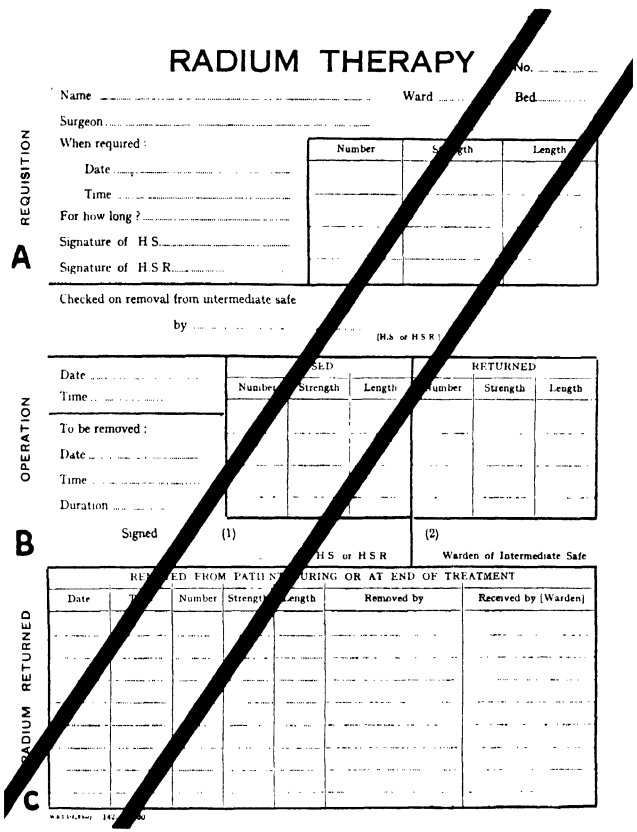
It is usual to issue rules for the guidance of those concerned with the care of radium and the nursing of patients undergoing radium treatment. In the theatre a special card is filled in giving details of the number and type of needles and containers used, the time of insertion and of removal. This card is sent to the ward when the patient leaves the theatre. An example of such a record card is shown on the opposite page.

Section A is completed when the radium is removed from the safe.

Section B is completed in the theatre.

Section C is filled in as the radium is removed from the patient.

In the original card the two broad stripes are in red so that this record is easily distinguished from other forms.



RADIUM THERAPY

No. .....

Name ..... Ward ..... Bed .....

Surgeon .....

A REQUISITION

When required :

Date .....

Time .....

For how long ? .....

Signature of H S .....

Signature of H S R .....

Number	Strength	Length

Checked on removal from intermediate safe

by ....

(H.S or H S R)

B OPERATION

Date .....

Time .....

To be removed :

Date .....

Time .....

Duration .....

	ISSUED			RETURNED		
	Number	Strength	Length	Number	Strength	Length
(1)						
(2)						

Signed ..... H S or H S R

Warden of Intermediate Safe

C RADIUM RETURNED

RETURNED FROM PATIENT DURING OR AT END OF TREATMENT

Date	Time	Number	Strength	Length	Removed by	Received by [Warden]

INTERSTITIAL APPLICATION OF RADIUM

For cancer of the tongue

Gag, tongue clip, tongue depressor.

Bard-Parker knife and small blade.

Six towel clips.

Scissors, round-ended and pointed.

Toothed and non-toothed dissecting forceps.

Radium needles.

Radium-holding forceps.

Radium rams for pushing the needles into the tissues.

Stout exploring needle to bore holes for the radium needles.

Round needle and long thread stitch to pass through the tongue.

Needle-holder, thread and small triangular needles.

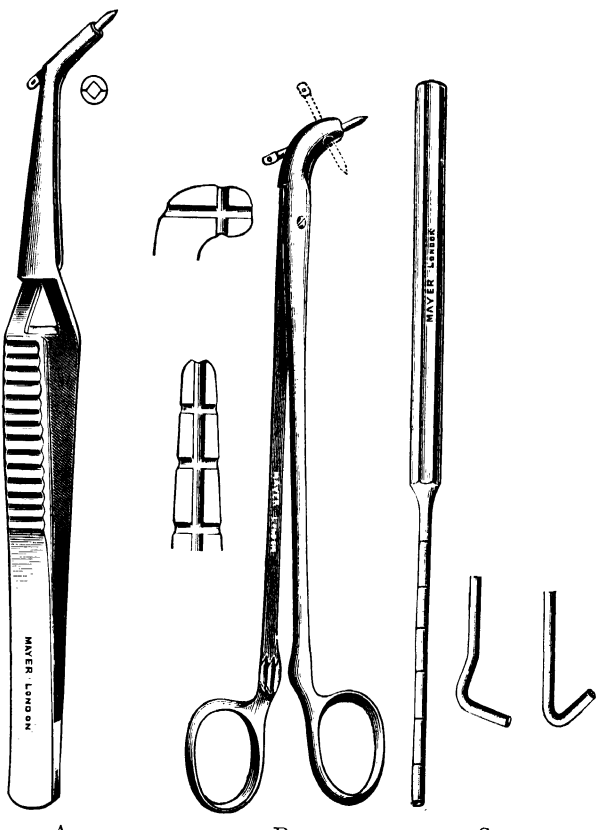
Two-inch roll of gauze for use as a pack.

Sponge-holding forceps.

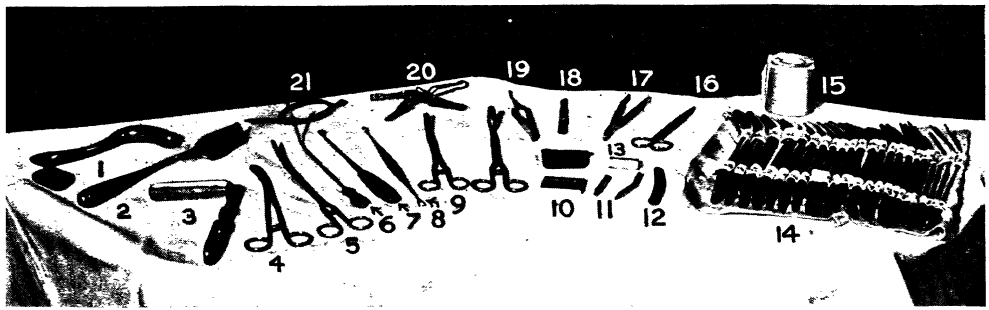
Suction.

Tracheotomy instruments should be in readiness.

When interstitial radium is used in other sites the requirements in addition to the special radium instruments will be those appropriate to the particular method of approach. In most cases general dissecting instruments, a stout exploring needle, and a tenotomy knife will be needed.



A. Radon seed forceps.
B. Finzi's radium forceps.
C. Radium rams.



CAVITARY IRRADIATION

Insertion of Radium for Carcinoma of the Cervix Uteri

(1) Sim's duckbill speculum.
(2) Vaginal retractor.
(3) Anterior vaginal retractor.
(4) Vulsella forceps.
(5) Intra-uterine dressing forceps.
(6) Simpson's uterine sound.

(7) Volkmann's spoon.

(8) Uterine curette.

(9) Sponge forceps and holding forceps for cylindrical applicators.

(10) Silver box applicator for radium needles, the rubber pouch in which the box is enclosed is shown behind.

(11) Intra-uterine radium applicators.

(12) Rubber tubing to cover applicators.

(13) Large applicator.

(14) Set of Heywood Smith's cervical dilators.

(15) Gauze roll for packing the vagina.

(16) Mayo's scissors.

(17) Bonney's forceps.

(18) Bard-Parker knife.

(19) Chester William's radium needle-holding forceps.

(20) Towel clips.

(21) Jaques' rubber catheter, size 8 or 10.

CHAPTER XX

PLASTER OF PARIS APPLICATION IN THE THEATRE

PLASTER splinting is very commonly used in orthopædic operations and in the treatment of injuries. The following requirements are usually sufficient for the making of the plaster splint although some surgeons may have additions to make to this list for special plasters :

A deep bowl or pail filled with tepid water for soaking the bandages.
Mackintoshes.
A tray of plaster bandages of the required widths.
Dry plaster.
A bowl for mixing plaster cream.
Plaster knives.
Ordinary round-ended scissors and plaster scissors such as Böhler's.
Plaster saw.
Plaster shears will be needed if a plaster has to be removed before the application of a fresh one.
Tape measure.
Blue pencil.
Jugs of warm water.
Dusting powder may be used for the patient's skin or, if the plaster is being applied without any padding, the skin may be oiled with olive oil or substitute.
Vaseline is sometimes used, a light coating is applied to the inside surface of bowls in which bandages are soaked or plaster cream is made to facilitate the subsequent removal of hardened plaster.
A suitable table top or a board is needed for the making of plaster slabs.
Tubular stockinette may be used to cover the limb under the plaster or, in the case of the trunk, a stockinette vest.
Dressmaker's wadding, thick felt or sorbo rubber may be used as padding over bony prominences.

In the theatre the operator is usually already dressed in gloves, a rubber apron, and theatre boots, otherwise these should be provided, canvas over-boots may be used in place of rubber boots.

The pail or bowl provided for soaking the bandages should be deep enough to contain sufficient water to submerge the bandages completely. The bandages are placed in the water one at a time and left until all the air has bubbled out of the bandage and the water has soaked through to the centre. When the bubbling has ceased the bandage is removed from the water holding it by both ends and gently squeezed towards the centre so that surplus water is removed but the plaster is not squeezed out.

Plaster cream is made by mixing dry plaster into a little water in a small bowl. It should be prepared as required, otherwise it will have set hard before it can be used. The cream is rubbed into the applied bandages to give a smooth finish and to strengthen the splint.

Plaster bandages

Ready prepared " Cellona " bandages may be used or their preparation may be the duty of the theatre staff.

For the foundation of the bandages either butter muslin, which is a thin soft material, or book muslin, which is also thin but stiff, is used. The material is torn into lengths of from one to six yards and varying widths of which four, six, and seven inches are the most generally useful. Narrow bandages of one or two inches are usually made one or two yards in length, the wider bandages, six, seven, or eight inches, are made in lengths of five or six yards.

The strips of material are folded and loose thread removed. The dry plaster is then rubbed into the material as evenly as possible, using the flat part of the palm of the hand. A short strip of muslin is unfolded at a time and loosely rolled as the plaster is rubbed into the mesh. It is convenient to run a red thread through the free end of the finished bandage so that the end may be easily found after the bandage has been soaked. Until sufficient experience has been gained in rolling plaster bandages some difficulty may be found in gauging

the right amount of dry plaster to impregnate the muslin properly so that it is not on the one hand so full of plaster that the centre of the bandage remains dry when it is immersed in water, and on the other hand so deficient in plaster as to be finally little more than a piece of wet muslin. Another common mistake is to roll the bandages so tightly that the water cannot soak completely through and a considerable portion of the bandage is wasted. A fine quality quick-setting plaster should be used. If it has not been stored in airtight tins it may be lumpy, and in this case should be sieved before use. The finished bandages should also be stored in airtight tins and may with advantage be dried out in a warm oven before being put away.

The application of a plaster splint

The nurse will often have to assist in the application of the splint, and in some circumstances may be entrusted with the carrying out of the entire procedure. Plaster bandages should be applied evenly but not tightly and no reverses should be made. The bandage should be folded to bring about a change in the direction of the turn. Plaster sets quickly and the moulding of the casing to the limb should be done during the application of the bandages. " Moulding " means pressing the plaster into the natural hollow contours of the part to which it is applied so that it fits the part accurately and pressure on bony prominences is as far as possible avoided. Reinforcement of the splint may be carried out by strips of plaster bandage applied up and down the length of the limb and secured by further circular turns. Metal strips or pieces of Cramer's wire splinting are sometimes incorporated in a plaster splint. The finished splint should not be subjected to pressure, as for example by letting the heel of a leg plaster rest on the table, until it has set ; this usually takes about five minutes. Thorough drying of the plaster takes several hours, the time depending on the size and thickness of the plaster.

Plaster slabs are often used for limbs and have the advantage of being quick and simple to make, supplying a well-fitting splint which can be removed if necessary

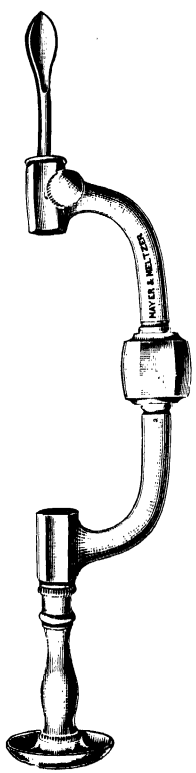
for dressings. The desired length of the slab is marked on a board or table and wet plaster bandages are folded smoothly lengthways up and down the marked area on the board until the requisite even thickness is obtained. The slab of bandage is then applied to the limb, moulded, and then removed and trimmed. The splint is kept in place by a roller bandage.*

Plaster shells may be used in the treatment of diseases or injuries of the spine. These are made by immersing long strips of muslin eight folds thick in thin plaster cream. The strips are applied and moulded on the patient's body usually directly on the skin which may be previously oiled. One pound of dry plaster mixed with one pint of water makes a cream of the right consistency. The shell is removed for drying, trimmed, and lined with wool or gamgee tissue before use.

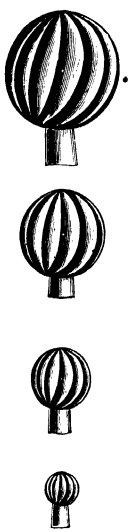
* Ready made "Cellona" slabs in suitable sizes for various parts of the body are obtainable.

GLOSSARY OF INSTRUMENTS

BRACE, BURRS, AND DRILL



DOYEN'S BRACE, FITTED WITH PERFORATOR



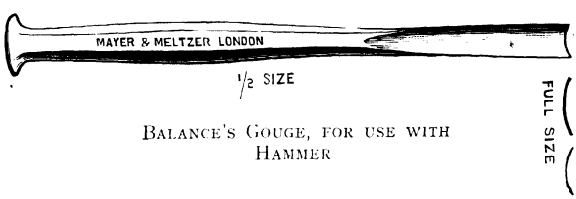
DOYEN'S BURRS

FERGUSON'S BONE DRILL

CHISELS, OSTEOTOME, GOUGE, ETC.

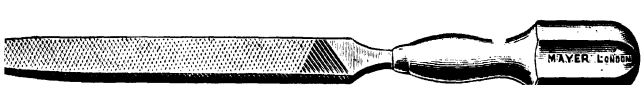
HORSLEY'S CHISEL

MACEWEN'S OSTEOTOME



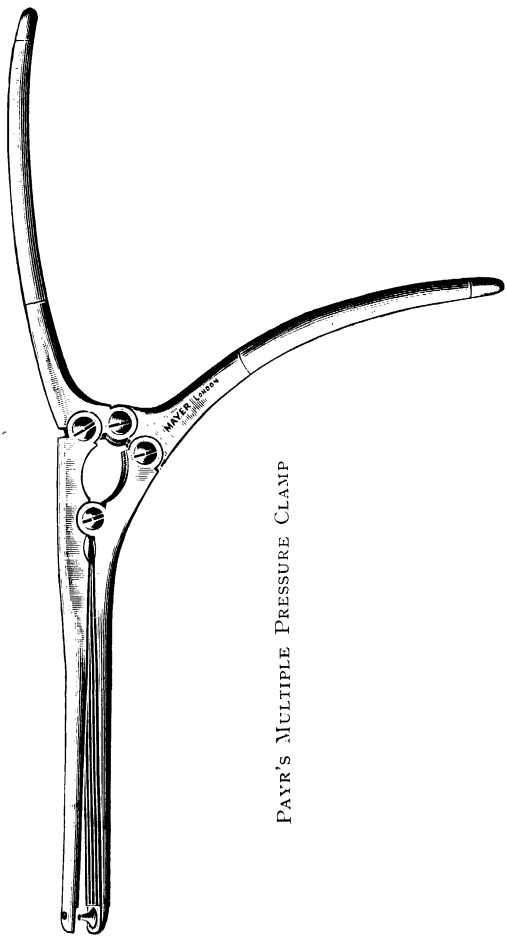
BALANCE'S GOUGE, FOR USE WITH HAMMER

LANGENBECK'S BONE HOOK



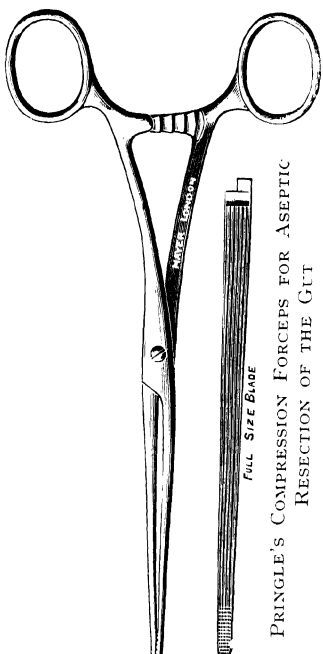
TUBBY'S BONE FILE

CLAMPS

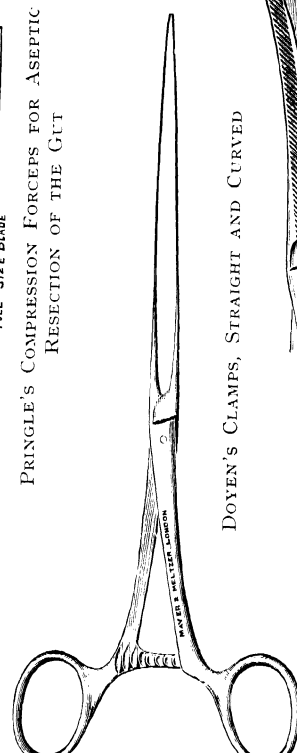


PAYR'S MULTIPLE PRESSURE CLAMP

CLAMPS



PRINGLE'S COMPRESSION FORCEPS FOR ASEPTIC RESECTION OF THE GUT

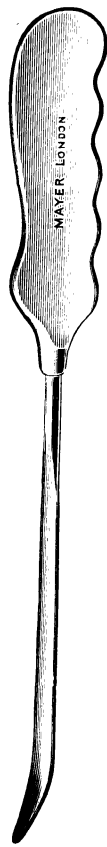


DOYEN'S CLAMPS, STRAIGHT AND CURVED

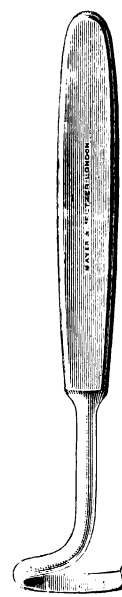
DISSECTORS, ELEVATORS, RASPATORIES, AND RUGINES

WATSON CHEYNE'S DISSECTOR

MACDONALD'S DOUBLE DISSECTOR

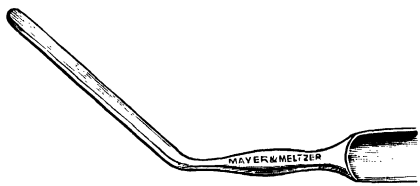


LANE'S PERIOSTEAL ELEVATOR



DOYEN'S RASPATORY, FOR RIB

DISSECTORS, ELEVATORS, RASPATORIES, AND RUGINES



HORSLEY'S DURA MATER ELEVATOR

(1)

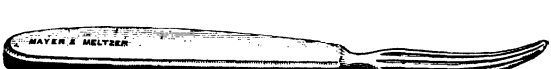
(2)

(3)

LANGENBECK'S RASPATORIES

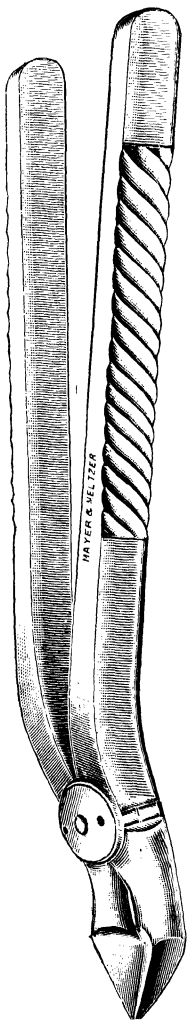
1. Tapering
2. Round
3. Fanshaped

FARABŒUF'S RUGINE, STRAIGHT

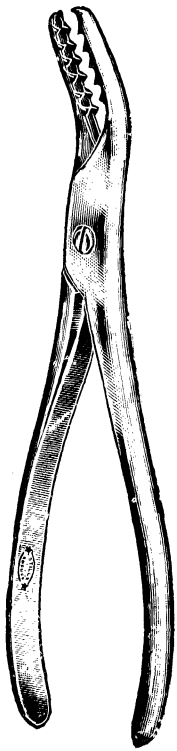


KOCHER'S THYROID ENUCLEATOR

FORCEPS

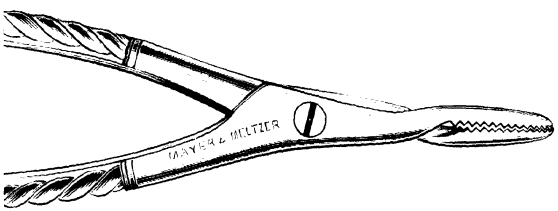


HORSLEY'S LAMINECTOMY FORCEPS

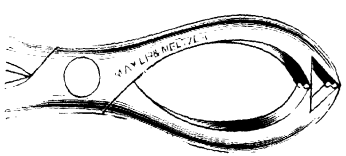


SEMB'S RIB-HOLDING FORCEPS

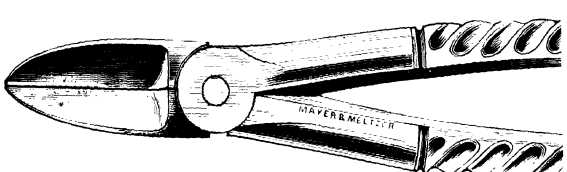
FORCEPS



STRAIGHT SEQUESTRUM FORCEPS

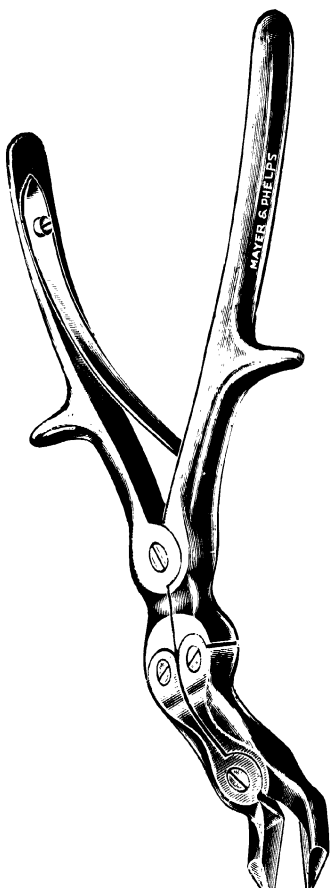


FERGUSON'S LION BONE-HOLDING FORCEPS

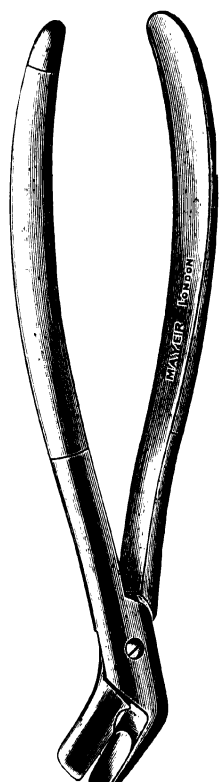


FERGUSON'S BONE-CUTTING FORCEPS

FORCEPS

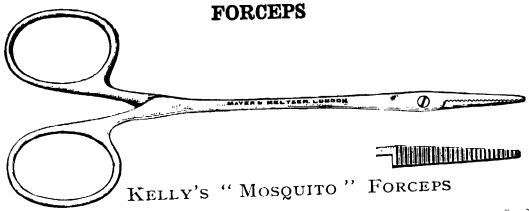


KEY'S DOUBLE-ACTION BONE CUTTERS

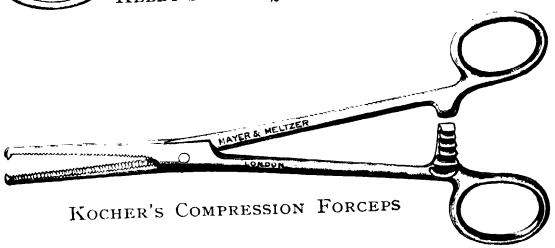


TROTTER'S RONGEUR FORCEPS

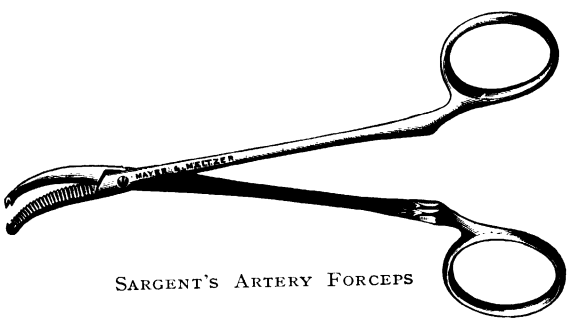
FORCEPS



KELLY'S "MOSQUITO" FORCEPS



KOCHER'S COMPRESSION FORCEPS

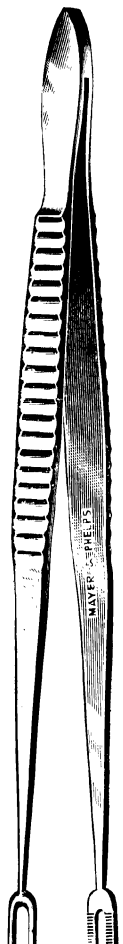


SARGENT'S ARTERY FORCEPS

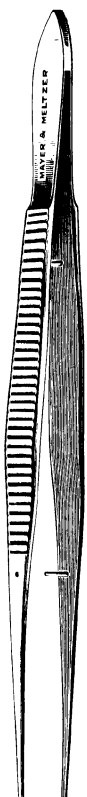
MOYNIHAN HALSTED'S FINE

FORCEPS

MOYNIHAN'S CHOLECYSTECTOMY CLAMP FORCEPS

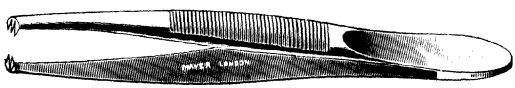


LIGATURE AND NEEDLE FORCEPS. University College Hospital

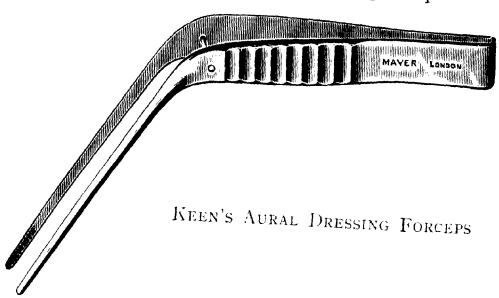


BOZEMANN'S FORCEPS

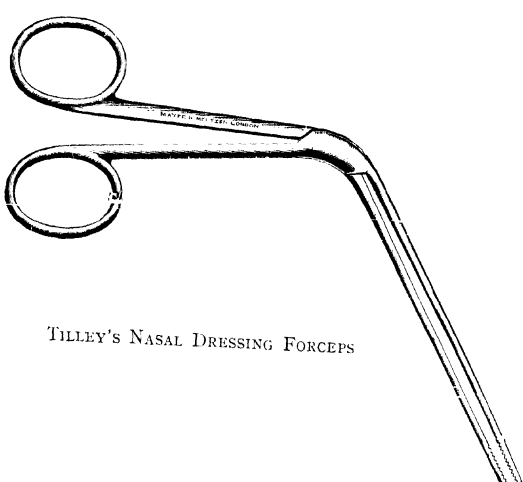
FORCEPS



TOOTHED FORCEPS. University College Hospital

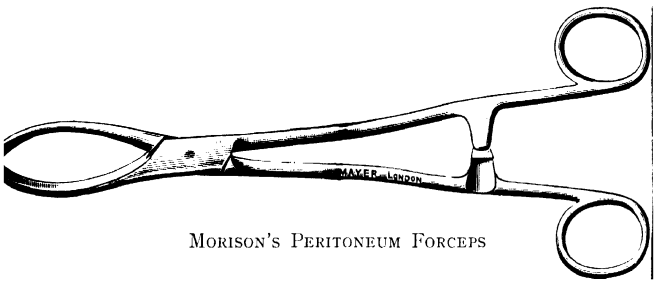


KEEN'S AURAL DRESSING FORCEPS

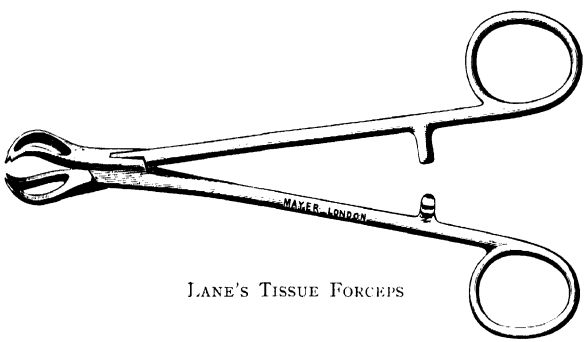


TILLEY'S NASAL DRESSING FORCEPS

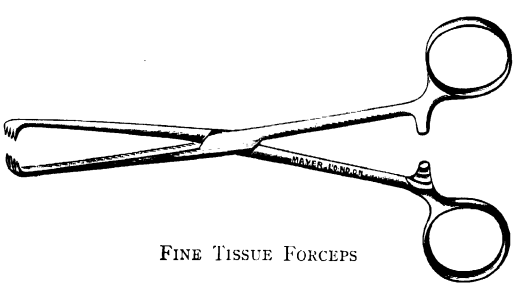
FORCEPS



MORISON'S PERITONEUM FORCEPS

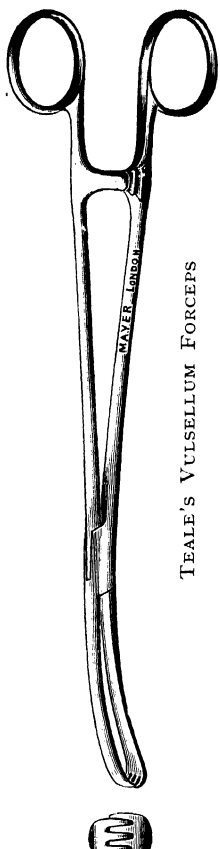


LANE'S TISSUE FORCEPS

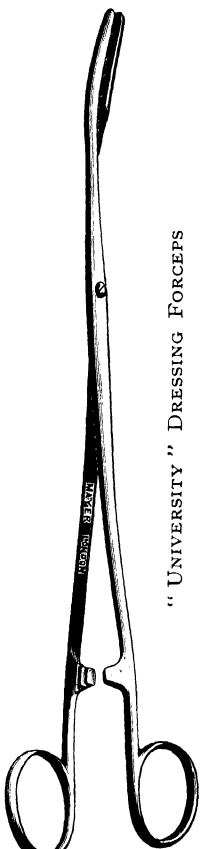


FINE TISSUE FORCEPS

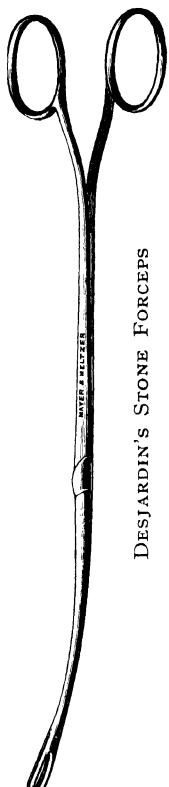
FORCEPS



TEALE'S VULSELLUM FORCEPS

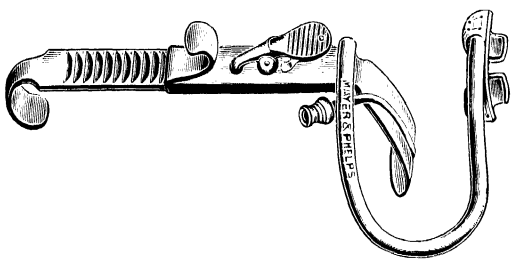


"UNIVERSITY" DRESSING FORCEPS

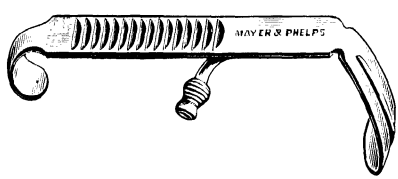


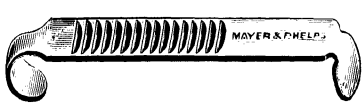
DESJARDIN'S STONE FORCEPS

GAG



DAVIS' GAG WITH TONGUE PLATES

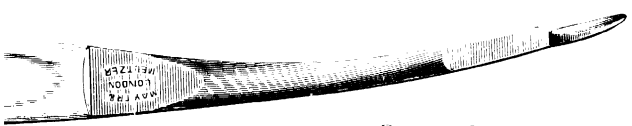




EDENTULOUS PLATE

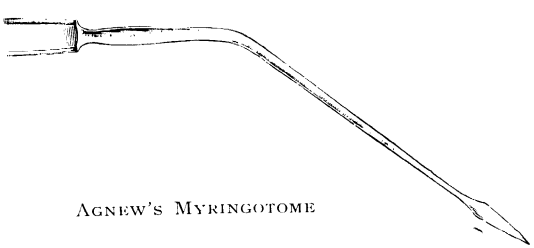
KNIVES

BREAST KNIFE



McEWEN'S HERNIA BISTOURY

ADAMS' TENOTOMY KNIFE



AGNEW'S MYRINGOTOME

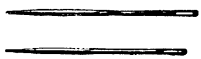
NEEDLES

ANEURISM NEEDLE

STRONG PEDICLE NEEDLE

BONNEY-REVERDIN NEEDLE-HOLDER WITH SET OF 3 SHARP AND 1 BLUNT NEEDLES

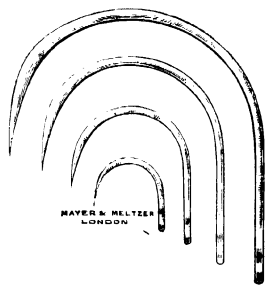
NEEDLES AND NEEDLE-HOLDER



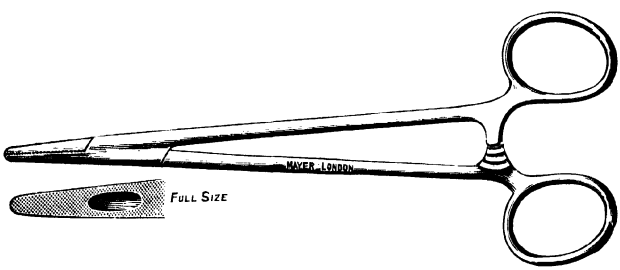
A. Straight triangular

B. Curved triangular

C. Triangular half-circle

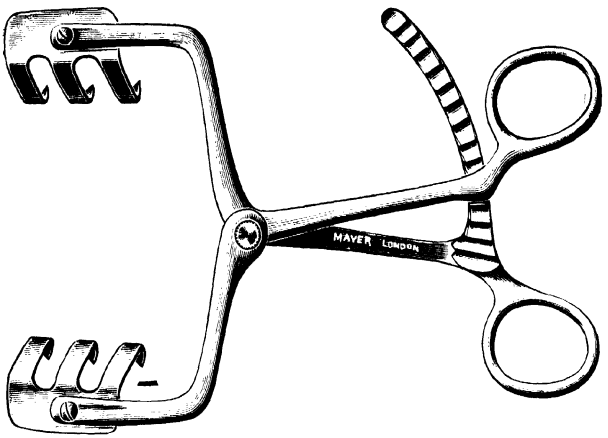


SYMOND'S FISH-HOOK SHAPE
HAGEDORN'S POINTS

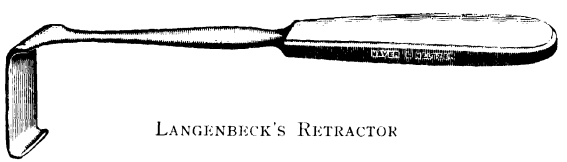


MAYO-HEGAR'S NEEDLE-HOLDER

RETRACTORS



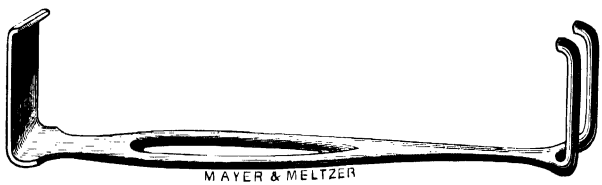
SELF-RETAINING RETRACTOR



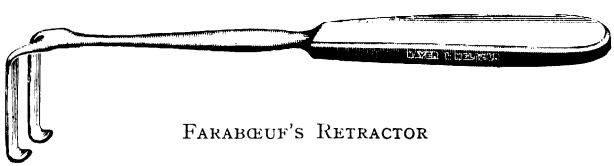
LANGENBECK'S RETRACTOR

POLLARD'S RETRACTOR

RETRACTORS



CZERNY'S DOUBLE-ENDED RETRACTOR

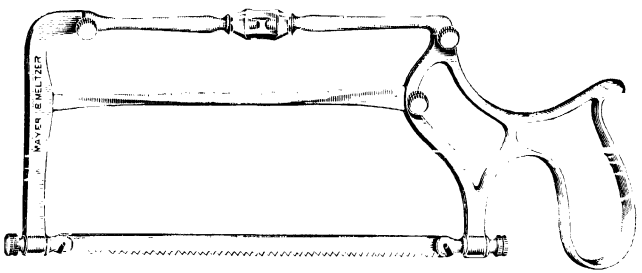


FARABŒUF'S RETRACTOR

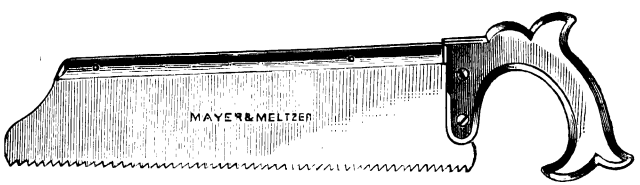
SINGLE HOOK

DOUBLE HOOK

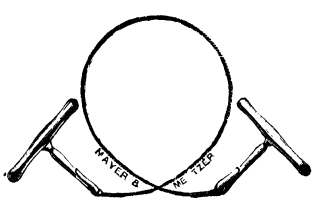
SAWS



BUTCHER'S SAW



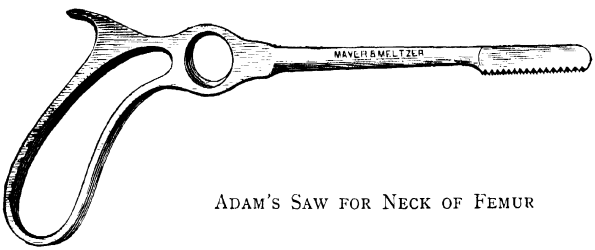
AMPUTATION SAW



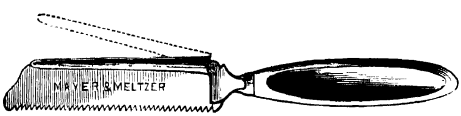
GIGLI'S WIRE SAW

DE MARTEL'S GUIDE FOR GIGLI SAW

SAWS

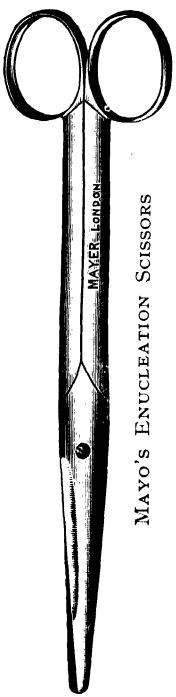


ADAM'S SAW FOR NECK OF FEMUR

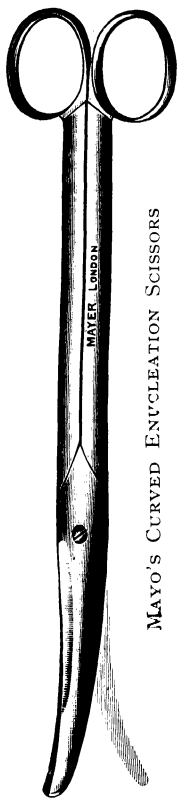


FERGUSON'S METACARPAL SAW

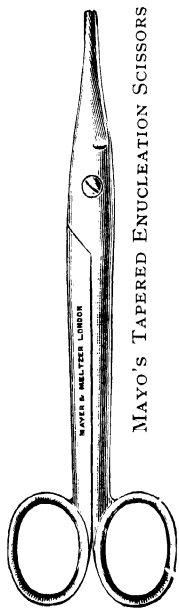
SCISSORS



MAYO'S ENUCLEATION SCISSORS

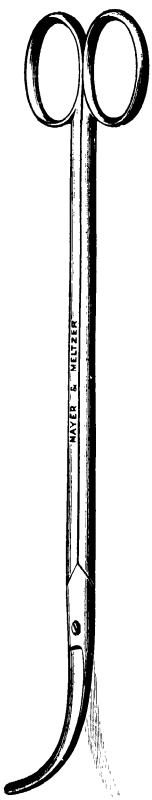


MAYO'S CURVED ENUCLEATION SCISSORS

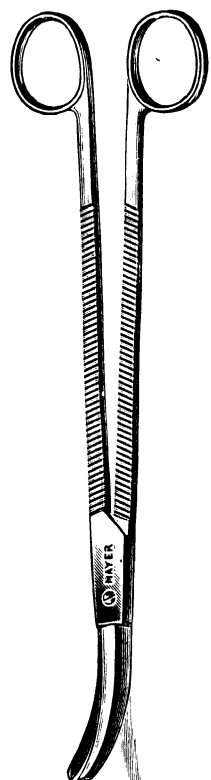


MAYO'S TAPERED ENUCLEATION SCISSORS

SCISSORS



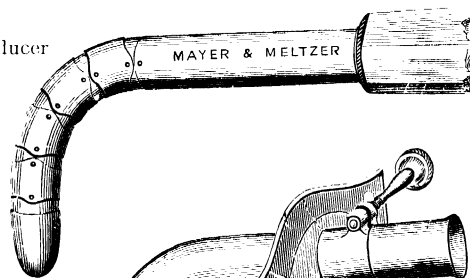
CLEFT PALATE SCISSORS, EXTRA CURVED



WHEELER'S TONSIL SCISSORS

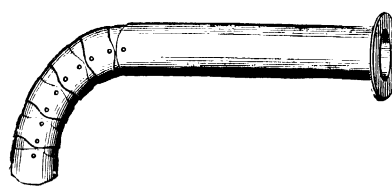
TRACHEOTOMY TUBES

(*a*) Introducer

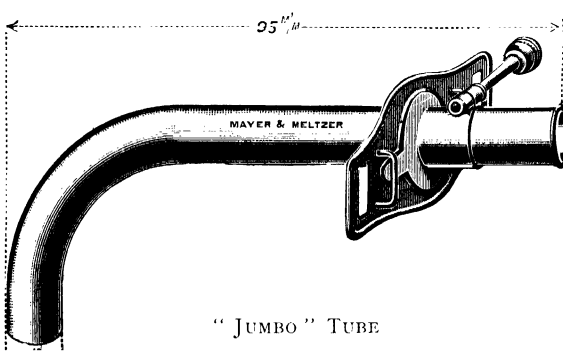


(*b*) Outer tube

(*c*) Inner tube

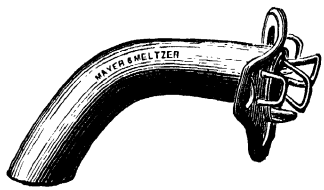


DURHAM'S TRACHEOTOMY TUBE

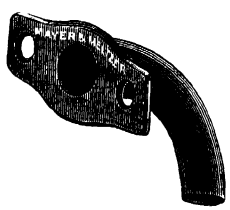


"JUMBO" TUBE

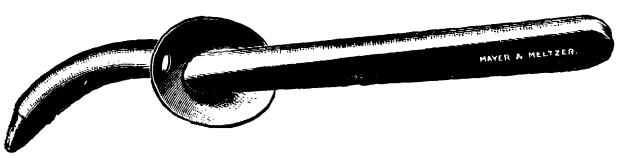
TRACHEOTOMY TUBES



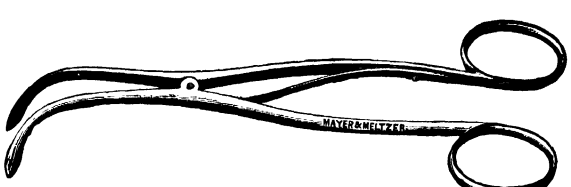
PARKER'S TRACHEOTOMY TUBE



BAKER'S INDIA-RUBBER TRACHEOTOMY TUBE

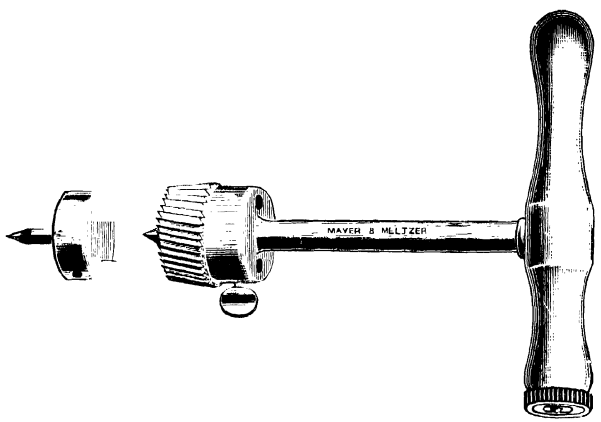


BUTLIN'S LARYNGOTOMY TUBE



BOWLBY'S TRACHEAL DILATORS

TREPHINE



HORSLEY'S TREPHINE

INDEX

A

B

C

D

E

R

S

T

U

V

W

X

Z

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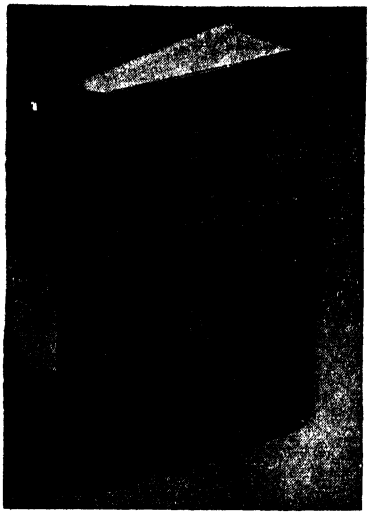

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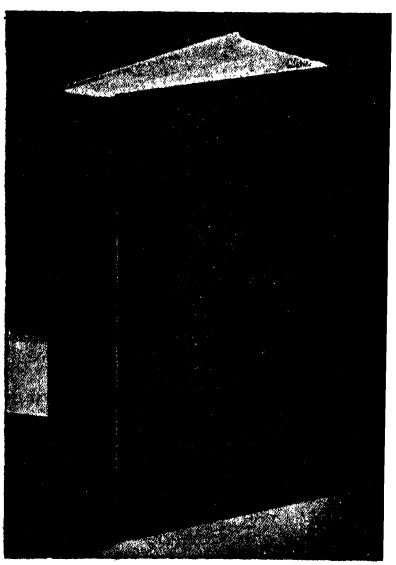

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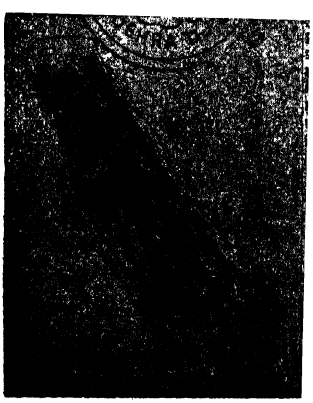

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